



US Army Corps  
of Engineers  
St. Paul District

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# **OPERATION AND MAINTENANCE MANUAL ENVIRONMENTAL MANAGEMENT PROGRAM (HREP)**

**BUSSEY LAKE (IOWA DEPT OF NATURAL RESOURCES)**

**CLAYTON COUNTY, IOWA**

**SEPTEMBER 1997**

CEMVP-0000081758

## PREFACE

The Bussey Lake Habitat Rehabilitation and Enhancement Project, constructed by the Corps of Engineers, was completed in June, 1996. In accordance with a Local Cooperation Agreement, the Iowa Department of Natural Resources has operation and maintenance responsibility for selected features of the project. The Corps of Engineers has prepared this manual to assist the Iowa Department of Natural Resources in fulfilling their responsibilities.

The manual and appendices contain the latest information pertinent to operation and maintenance of this project. The project as designed and constructed will improve fish habitat in the Bussey Lake. However, continued successful functioning of the project will depend upon the manner in which they are maintained. Careful inspection and proper maintenance can help accomplish that goal.

The planning, design, and construction of the project was the result of an extensive cooperative effort on the part of the involved Federal and State agencies and the public. The continuation of this cooperation and coordination as part of the operation and maintenance of the project will be important to the success of the project and is strongly recommended.

DEPARTMENT OF THE ARMY  
St. Paul District, Corps of Engineers  
Army Corps of Engineers Centre, 190 Fifth Street East  
St. Paul, Minnesota 55101-1638

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT PROGRAM

BUSSEY LAKE  
POOLS 10, UPPER MISSISSIPPI RIVER  
CLAYTON COUNTY, IOWA

OPERATION AND MAINTENANCE MANUAL  
FOR  
IOWA DEPARTMENT OF NATURAL RESOURCES MANAGED FEATURES

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## INTRODUCTION

This manual has been prepared to serve as a guide for the operation and maintenance of selected features of the Bussey Lake Habitat Rehabilitation and Enhancement Projects in Clayton County, Iowa. These instructions are consistent with the general procedures found in the Bussey Lake Definite Project Report dated August 1990. This manual has been written for project and management personnel familiar with the project. It does not contain detailed information which is common knowledge to personnel or which is presented in other existing manuals or regulations.

The intent of the maintenance instructions is to present preventive operation and maintenance information consisting of systematic inspections and subsequent corrective actions which should ensure long-term use of project features. A timely maintenance program prevents major damage to constructed features by early corrective action.

For ease in use, this manual is divided into two sections.

Part I. This section describes the project features and provides historical information on the project.

Part II. This section gives details on the operation and maintenance of the project.

## PART I - PROJECT FEATURES AND CONSTRUCTION HISTORY

### AUTHORIZATION AND LOCATION

The Bussey Lake Project was authorized under the provisions of the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99- 662). Bussey Lake is located in pool 10 of the Upper Mississippi River, approximately 2 miles above Lock and Dam 10, just north of Guttenberg, Iowa. Project drawings (appendix A) show the location of the project.

## DESCRIPTION OF PROJECT

### General

Bussey Lake is a 213-acre backwater lake that prior to inundation by pool 10 was primarily marsh. Once created by inundation, Bussey Lake became a highly productive lake for backwater fish species such as largemouth bass, bluegill, and black crappie. Because of its isolation from river currents, the lake was especially desirable as overwintering habitat for many fish species. Over time, sedimentation and increased growth of aquatic vegetation reduced the habitat quality of Bussey Lake. The recommended project for Bussey Lake was the dredging of approximately 29 acres of the lake to increase water depths and habitat diversity, and alleviate dissolved oxygen depletion problems which were becoming more frequent in the lake. Operation and maintenance for the dredged areas within Bussey Lake are the responsibility of the U.S. Fish and Wildlife Service and are addressed in a separate operation and maintenance manual.

An important feature of the project was the installation of a gate on a culvert at the head of Bussey Lake. The purpose of this gate is to provide the capability to cut off sediment laden flows from entering Bussey Lake from upstream. This gate is one of the project features for which the Iowa Department of Natural Resources has operation and maintenance responsibility.

The recommended dredged material placement plan for the Bussey Lake project was to use the dredged material from Bussey Lake to level the bottoms of the existing Guttenberg Waterfowl Ponds (located below the Lock and Dam 10 dike). During the dredging of Bussey Lake it was discovered that the Guttenberg Waterfowl Ponds did not have the capacity for dredged material placement that was originally projected. Therefore, an additional dredged material placement site was developed just downstream of Bussey Lake, the Willow Island site. The maintenance of the Willow Island site is the responsibility of the Iowa Department of Natural Resources.

The Definite Project Report/Environmental Assessment (SP-5), Bussey Lake Habitat Rehabilitation and Enhancement Project, August, 1990, provides additional details on the project.

## Design Considerations

### Slide Gate at the Head of Bussey Lake

The slide gate was placed on an existing culvert at the head of Bussey Lake. Thus, the size of the gate was determined by the size of the existing culvert.

A 4.8-foot culvert extension was placed on the upstream side of the slide gate structure to accommodate fill associated with reconstruction of the road embankment in this area.

### Willow Island Containment Site

The Willow Island containment site was sized to handle an estimated 150,000 cubic yards of dredged material plus 15 percent expansion of the material during dredging. In addition, the height of the containment dikes were selected to provide a minimum of 3 feet of ponding plus 1 foot of freeboard at the end of dredging.

The riprap and groin rock protection was designed to provide acceptable protection while minimizing rock requirements.

The willow plantings were primarily for the purpose of providing additional stabilization. The species selected for turf establishment were those considered best suited for growth at the particular elevations and moisture conditions present at the site.

## CONSTRUCTION HISTORY

The initial contract for the dredging of Bussey Lake and the construction of the new moist soil unit (pond #5) at the Guttenberg Waterfowl Ponds site was awarded in June, 1992, to J.F. Brennan Co., Inc., P.O. Box 2557, 820 Bainbridge St., La Crosse, Wisconsin 54602-2557. Construction began in July, 1992, and dredging was terminated in October, 1992, when placement site capacity was reached.

The construction contract that included the addition of the slide gate to the culvert at the head of Bussey Lake was awarded to Taylor Construction, Inc., P.O. Box 10, New Vienna, Iowa 52065. This contract was awarded in October 1994 and the work was essentially completed during 1995.

A dredging contract to complete the dredging of Bussey Lake using the Willow Island placement site was awarded in May, 1995, to J.F. Brennan Co., Inc. This work was completed in October, 1995, save for the final grading and seeding of the placement site dikes which took place in June, 1996.

Subsequent to project construction, high water during the spring of 1997 eroded a breach in the upstream containment dike for the Willow Island site. The Iowa Department of Natural Resources determined that this breach did not need to be repaired as it allows exchange of water between the river and the interior of the site.

## LOCAL COOPERATION REQUIREMENTS

Operation and maintenance responsibilities for the Bussey Lake project were originally outlined in the Definite Project Report. The acceptance of these responsibilities was formally recognized by a Local Cooperation Agreement signed September 1, 1993, and amended on May 5, 1995 (appendix B). Annual operation and maintenance costs estimated during the preparation of the Definite Project Reports for the slide gate structure at the head of Bussey Lake were \$1,000 (1990 dollars). No operation and maintenance costs were estimated for the Willow Island containment site, but they were considered minimal.

## PART II - OPERATION AND MAINTENANCE

### GENERAL RESPONSIBILITIES AND PROCEDURES

#### Responsibility

Inasmuch as Iowa Department of Natural Resources agreed to the terms of local cooperation, Department officials with authority in these matters are obligated to maintain and operate the project modifications.

The Local Cooperation Agreement, Article VIII, requires the local sponsor to operate, maintain, repair, replace, and rehabilitate (OMRRR) the completed project in accordance with regulations or directions prescribed by the Government. No regulations have been developed for the OMRRR of UMRS-EMP projects. The following directions are provided:

a. The project features constructed by the United States for fish and wildlife habitat restoration shall be maintained in a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

b. The Iowa Department of Natural Resources shall designate an official, hereinafter called the 'Superintendent,' who shall be responsible for the operation and maintenance of the project, and for inspection of the project.

Whenever there is a change of Superintendent, the Corps of Engineers should be advised of the name, address, and telephone number of the new superintendent with thirty (30) calendar days of the change. This information should be sent to the address contained at the head of this O&M manual, attn: CO-TS.

#### Inspections

The District Engineer or his representative will inspect the project works to insure satisfactory maintenance and operating condition. A representative of the Corps will coordinate the periodic inspections in advance with the Iowa Department of Natural Resources. The first inspection will occur within 2 years after project completion. Subsequent inspections will occur at 3 year intervals. After the first 5 years of project operation, the Corps and the Iowa Department of Natural Resources will jointly review the inspection plans and make any appropriate revisions.

The findings of the periodic inspections will be transmitted to the Superintendent and will include recommendations for any remedial work considered necessary to maintain the project in a satisfactory operating condition. This remedial work should be completed promptly by the Iowa Department of Natural Resources, and the District Engineer shall be advised upon its completion (see Article VIII, subparagraph b. of the Local Cooperation Agreement which is provided as appendix B of this document). In order to insure prompt completion of remedial work, within thirty (30) calendar days of receipt of an inspection report which includes recommendations for remedial work, the Department shall submit to the District Engineer a schedule for completing the remedial work. This information should be sent to the address contained at the head of this O&M manual, attn: CO-TS.

An inspection of the project features should be made by the Superintendent at a minimum frequency of once a year. The timing of the inspection can be made at the discretion of the Superintendent. No special inspections are required after high water events.

#### Reports

An annual report should be submitted each year which summarizes the condition of the project features, the manner in which the project functioned during the past 12 months, maintenance work done during the past 12 months, action taken on measures considered necessary by the District Engineer or his representative, and maintenance work scheduled for the next 12 month period. This report should be submitted by April 30 of the ensuing year.

Appendix C contains a checklist for use in this process. The checklist contains drawings on their reverse side for noting the locations of deficiencies. Given the simple nature of the project, the annual report could take the form of a annual letter addressing the above. The report should be sent to the address contained at the head of this O&M manual, attn: CO-TS.

#### Improvements or Alterations

It is understood that improvements and alterations to any portion of the habitat project that would affect the ability of that element to function as intended to meet the project's habitat goals and objectives would be coordinated with other involved agencies.

## OPERATION

The slide gate at the head of Bussey Lake is to be operated by the Iowa Department of Natural Resources as necessary to provide fish and wildlife habitat benefits for which the structure was constructed. The gate should be operated in accordance with the manufacturer's instructions (appendix D).

There are no operation requirements associated with the Willow Island dredged material placement site feature.

## MAINTENANCE

Maintenance of the project features will be accomplished on an as needed basis such that their integrity is maintained and they continue to function in the manner for which they were designed.

Slide Gate at the Head of Bussey Lake - The manufacturer's operation and maintenance instructions for the slide gate are contained in appendix D and should be followed.

Willow Island - Willow Island was designed as a dredged material placement site and as such, does not require any maintenance other than what may be required to prevent environmental degradation. It is recognized that there will be some reshaping of the sand dikes by river flows. The long term goal is prevent erosion of the dikes to the point where the fine sediments contained within the placement site are exposed to river currents. The rock protection was designed to control erosion. The following are recommended actions to assist in the maintenance of the rock protection:

a. Small failures of the rock slope protection should be repaired as soon as possible. Small failures can quickly become large failures with a site such as Willow Island where sand materials would become exposed to river forces.

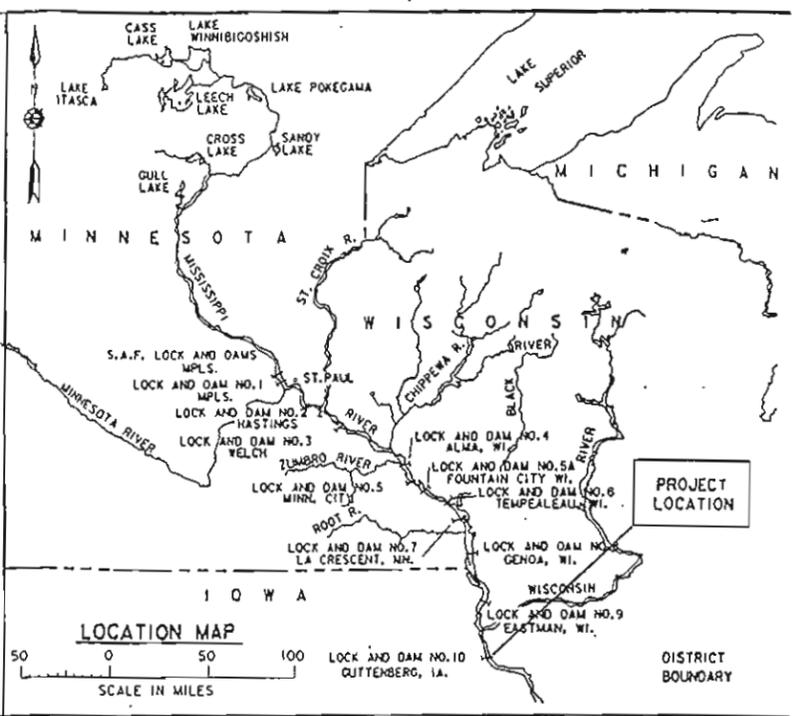
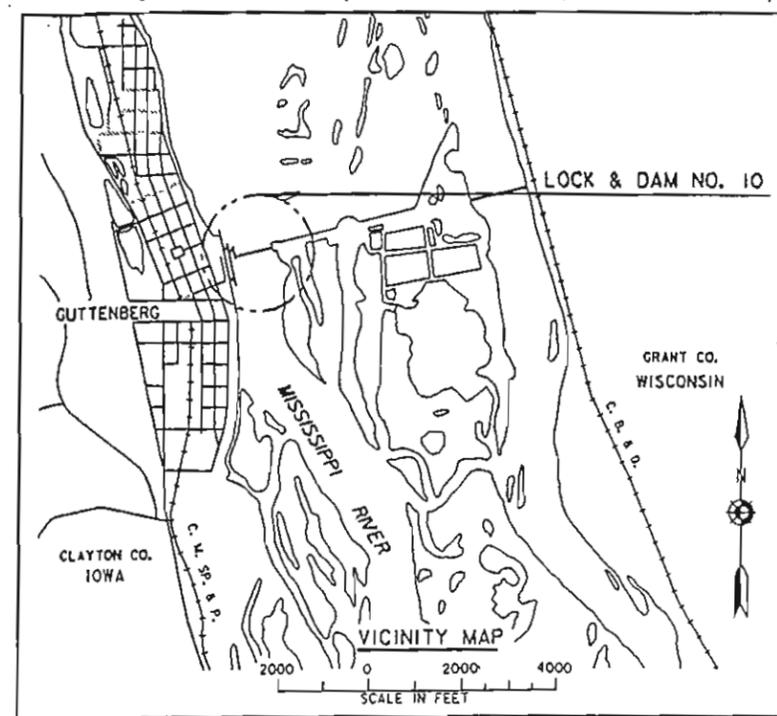
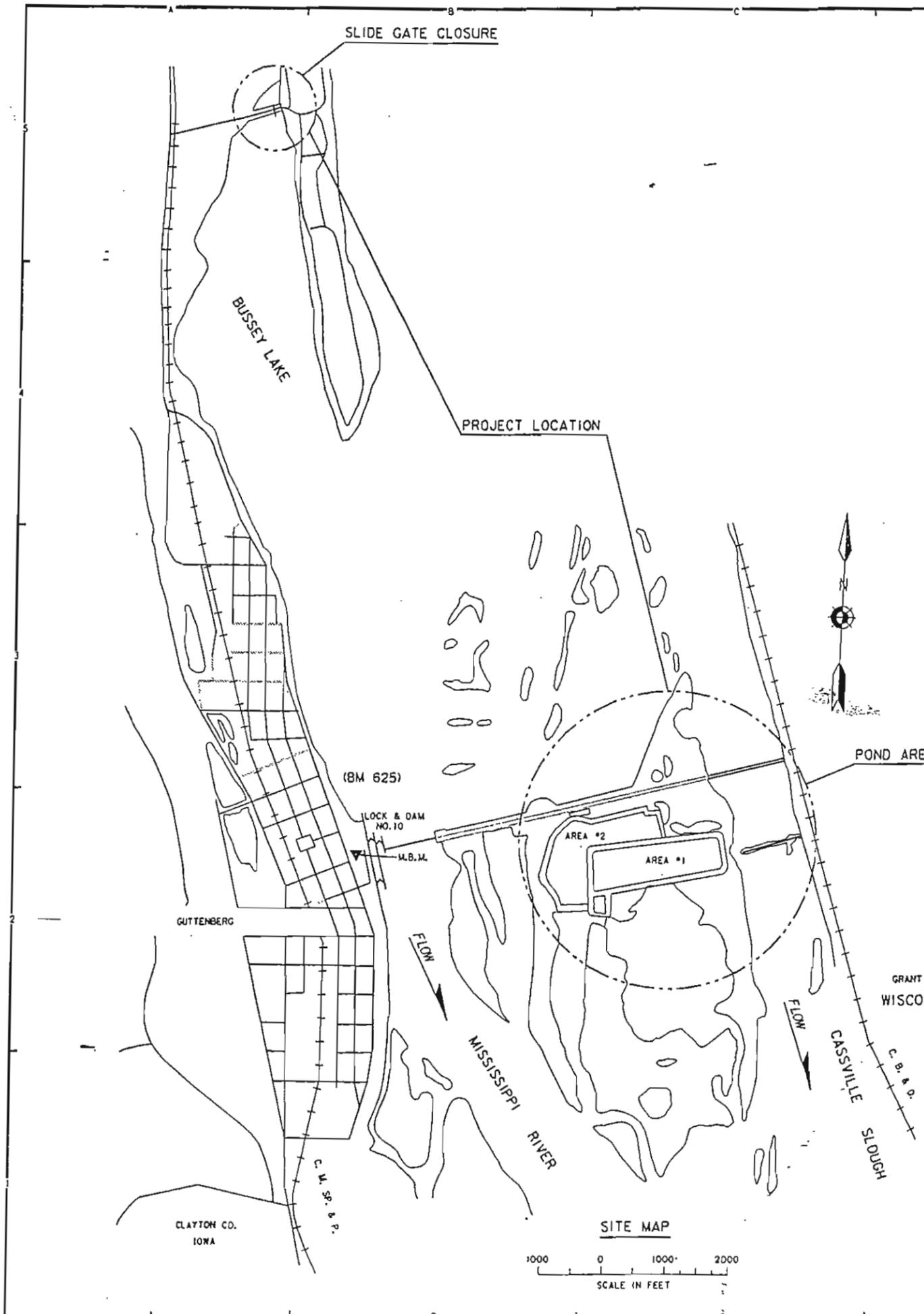
b. The growth of vegetation, especially woody vegetation, should be controlled on the rock slope protection. In general, the growth of vegetation makes it more difficult to detect small rock failures. Woody vegetation will eventually become dislodged either after it matures and dies, or from ice action. The dislodging of the root mass results in dislodging of the surrounding rock.

### Repair Materials

Appendix D contains the catalogs and other manufacturer's information pertaining to the structure at the head of Bussey Lake. This information should be used in the procurement of replacement parts. Appendix E contains the riprap protection and geotextile sections of the construction specification. This information should be used in the repair of the bank protection on Willow Island.

APPENDIX A

PROJECT DRAWINGS



- LEGEND**
- LIMITS OF WORK
  - BORINGS
  - PROJECT
  - - - EXISTING
  - ▲ MASTER BENCH MARK (M.B.M.)  
BRASS CAP U.S.C. & G.S. U179  
DATUM 1912 ADJ. M.S.L., EL. 824.01
  - ▲ FILL
  - ▽ CUT

- NOTES:**
- ALL ELEVATIONS ARE M.S.L. 1912 ADJ.
  - SEE REFERENCE DRAWINGS FOR LOCATIONS OF FORMER PONDS 1, 2, 3, 4 AND 5. AREA 1 IS COMPOSED OF FORMER PONDS 3 AND 4 AND AREA 2 IS COMPOSED OF FORMER PONDS 1, 2 AND 5.

- GEN ENG
- HYD
- HYOR
- GEOTECH
- STR ENG

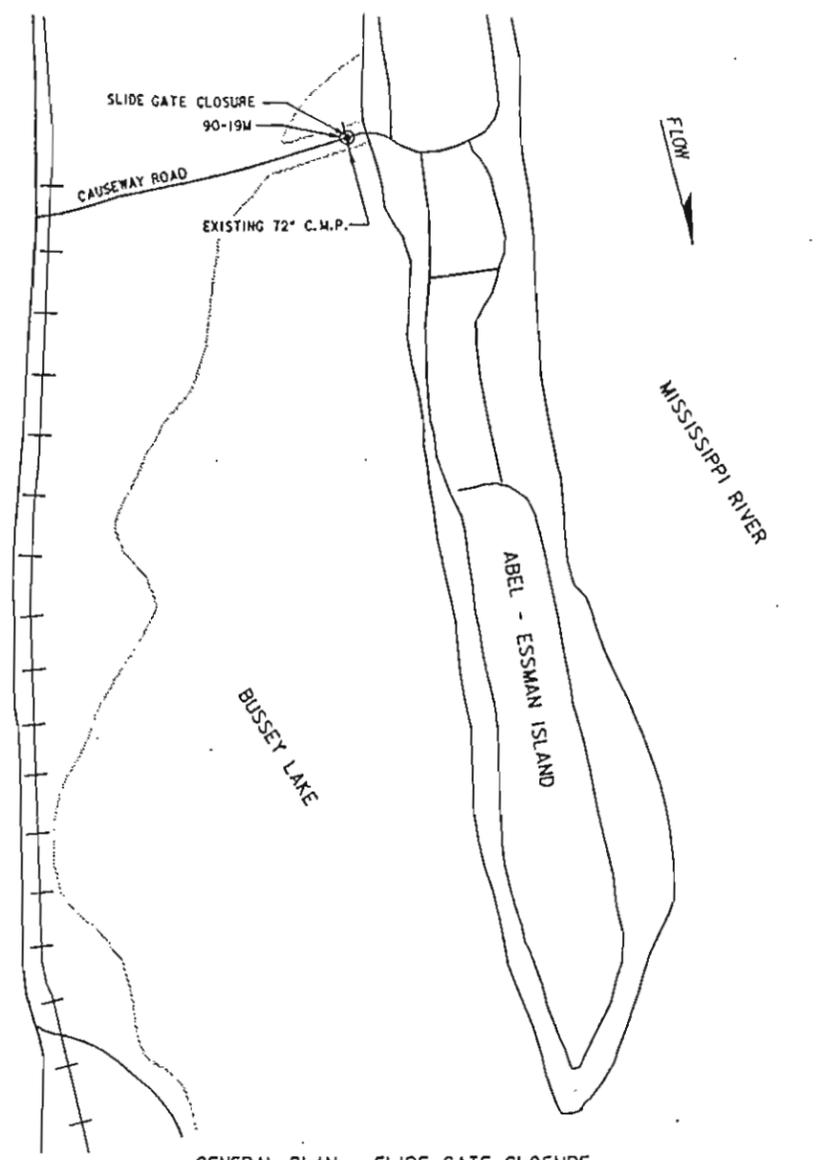
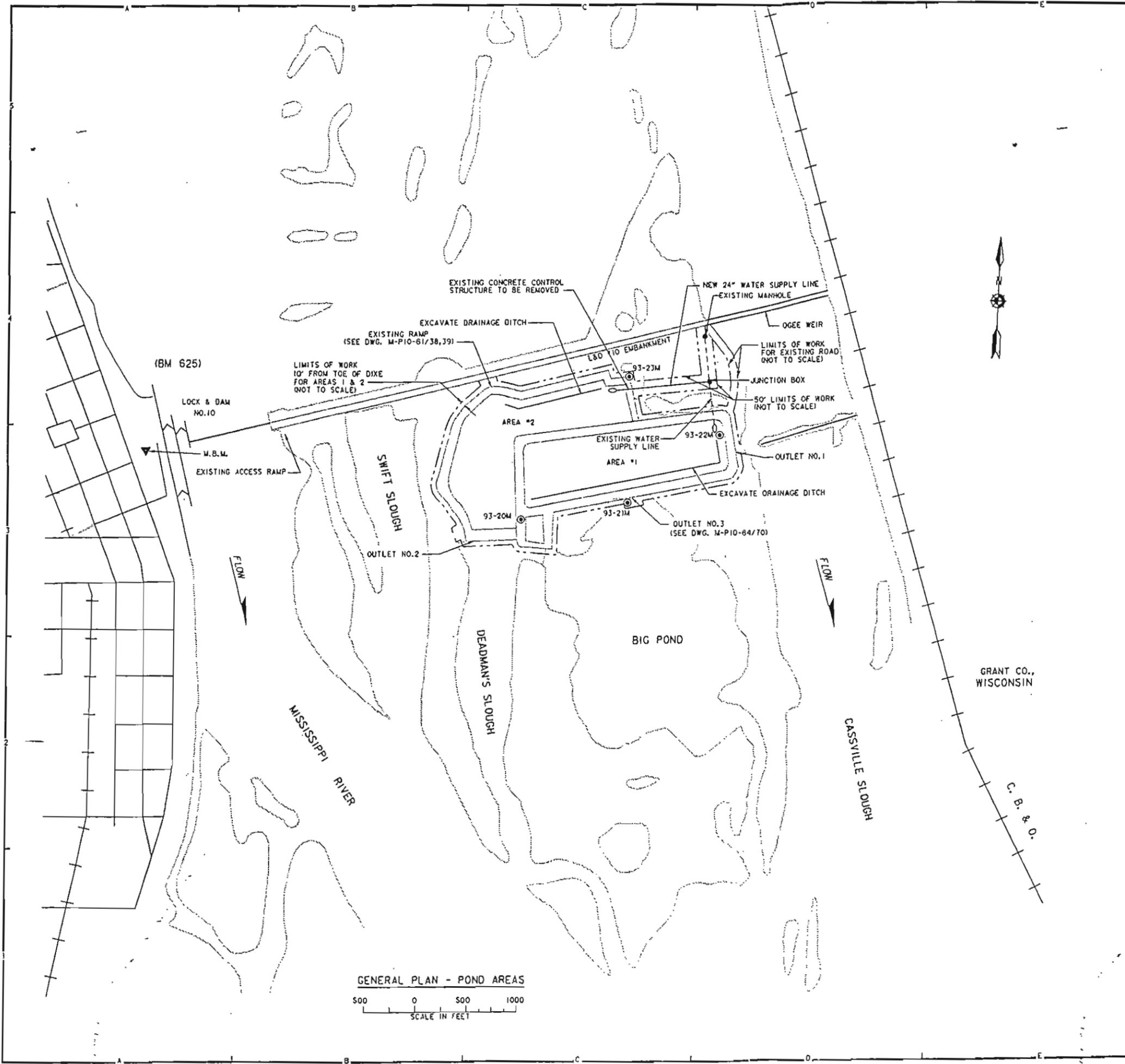
SITE PLAN FOR AREAS 1&2			
DRAWING NO.	SHT.	DESCRIPTION	CAD FILES
M-PIO-10/15	1	LOCATION, VICINITY AND SITE MAPS AND DRAWING INDEX	MT10P000
M-PIO-10/16	2	GENERAL PLAN BORING LOG LOCATIONS	MT10P001
M-PIO-64/78	3	SLIDE GATE CLOSURE, PLAN, PROFILE, SECTIONS AND DETAILS	MT10P002
M-PIO-64/79	4	NEW 24" CMP WATER SUPPLY LINE TO AREA #2, SECTIONS AND DETAILS	MT10P003
M-PIO-64/80	5	OUTLET NO. 1 PLAN AND SECTION	MT84P000
M-PIO-64/81	6	OUTLET NO. 2 PLAN, SECTION AND DETAIL	MT84P001
M-PIO-64/82	7	GATEWELLS - OUTLETS NO. 1 AND NO. 2 PLAN, SECTIONS, DETAIL AND TABLE	MT84P002
M-PIO-64/83	8	GATEWELL REINFORCEMENT PLAN, SECTIONS AND DETAILS	MT84P003
M-PIO-64/84	9	JUNCTION BOX PLAN, SECTIONS AND DETAILS	MT84P004
M-PIO-64/85	10	MISCELLANEOUS METALS SECTIONS AND DETAILS	MT84P005
M-PIO-64/86	11	MISCELLANEOUS METALS ELEVATIONS, SECTIONS AND DETAILS	MT84P006
M-PIO-64/87	12	TRASH GUARD AND RAILING VIEWS, PLAN, ELEVATION, SECTION AND DETAIL	MT84P007
M-PIO-64/88	13	CARP RACK SECTIONS AND DETAILS	MT84P008
M-PIO-64/89	14	STOPLOGS AND STOPLOG STORAGE ELEVATIONS, SECTIONS AND DETAILS	MT84P009
M-PIO-64/90	15	OUTLET NO. 3 PLAN, SECTIONS AND DETAILS	MT84P010
M-PIO-61/91	16	OUTLET NO. 3 SECTIONS AND DETAILS	MT84P011
M-PIO-64/92	17	ACCESS RAMP PLAN, SECTIONS AND DETAILS	MT84P012
M-PIO-64/93	18	ACCESS RAMP SECTIONS AND DETAILS	MT84P013
M-PIO-64/94	19	SLIDE GATE CLOSURE PLAN, SECTIONS AND DETAILS	MT84P014
M-PIO-64/95	20	SLIDE GATE CLOSURE SECTIONS AND DETAILS	MT84P015

REFERENCES DWG. INDEX			
DRAWING NO.	SHT.	DESCRIPTION	CAD FILES
M-PIO-10/17		BORING LOGS, 90-101 AND 92-101 THRU 92-101	BU25TC01
M-PIO-14/12		ELEVATION DURATION CURVES	01.DAMI0P
M-PIO-14/13		ELEVATION DURATION CURVES	02.DAMI0P
M-PIO-14/14		ELEVATION DURATION CURVES	01.DAMI0T
M-PIO-14/15		ELEVATION DURATION CURVES	02.DAMI0T
M-PIO-14/16		HYDROGRAPH CHARTS 1983-1987 (POOL)	H1.DAMI0P
M-PIO-14/17		HYDROGRAPH CHARTS 1988-1992 (POOL)	H2.DAMI0P
M-PIO-14/18		HYDROGRAPH CHARTS 1983-1987 (TAILWATER)	H1.DAMI0T
M-PIO-14/19		HYDROGRAPH CHARTS 1988-1992 (TAILWATER)	H2.DAMI0T
M-PIO-10/11		LOCATION AND VICINITY MAP, AND DRAWING INDEX	MM04P001
M-PIO-61/38		RAMP PROFILE AND SECTIONS, BEACH DETAILS	MM04P015
M-PIO-61/39		POND #5 FILL SITE PLAN AND CONTROL DATA	MM04P011
M-PIO-64/69		WATER SUPPLY LINE, PLAN AND PROFILE	
M-PIO-64/70		SLIDE GATE STRUCTURE, PLAN AND PROFILE	
M-PIO-64/72		MISCELLANEOUS PLAN AND SECTIONS	
M-PIO-64/73		SLIDE GATE PLATFORM AND DETAILS	

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET, AS INDEXED ON THIS SHEET.

APPROVAL RECOMMENDED BY:	ENGINEER MANAGER	AS-BUILT AS OF COMPLETION DATE	12/98
CHIEF ED-D BRANCH	CHIEF SPECS. & TECH. SUPPORT SECTION	SYMBOL	DESCRIPTION
CHIEF ED-GH BRANCH	CHIEF GENERAL ENGINEERING SECTION	DATE	APP1
CHIEF ENGINEERING DIVISION	CHIEF STRUCTURAL SECTION	DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
APPROVED BY:	CHIEF MECH/ELEC/ARCH SECTION	AS-BUILT BUSSEY LAKE - STAGE 2 ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL #10 CLAYTON COUNTY IA LOCATION, VICINITY AND SITE MAPS AND DRAWING INDEX	
COL., CORPS OF ENGINEERS	CHIEF HYDRAULICS SECTION	DESIGNED: NFR	CAD FILE NAME: MT10P000.DGN
	CHIEF HYDROLOGY SECTION	CHECKED: J.G.	DRAWING NUMBER:
	CHIEF GEOTECHNICAL DESIGN SECTION	DRAWN: FJB/T.J.	
		DESIGNED: WAR	
		CHECKED: JSH	DATE: 11-01-93
		DATE: 11-01-93	SPEC NO: DACW37-93-B-0038





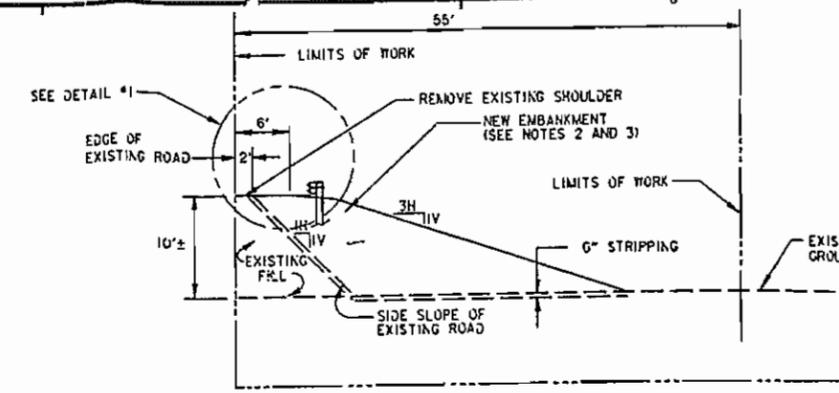
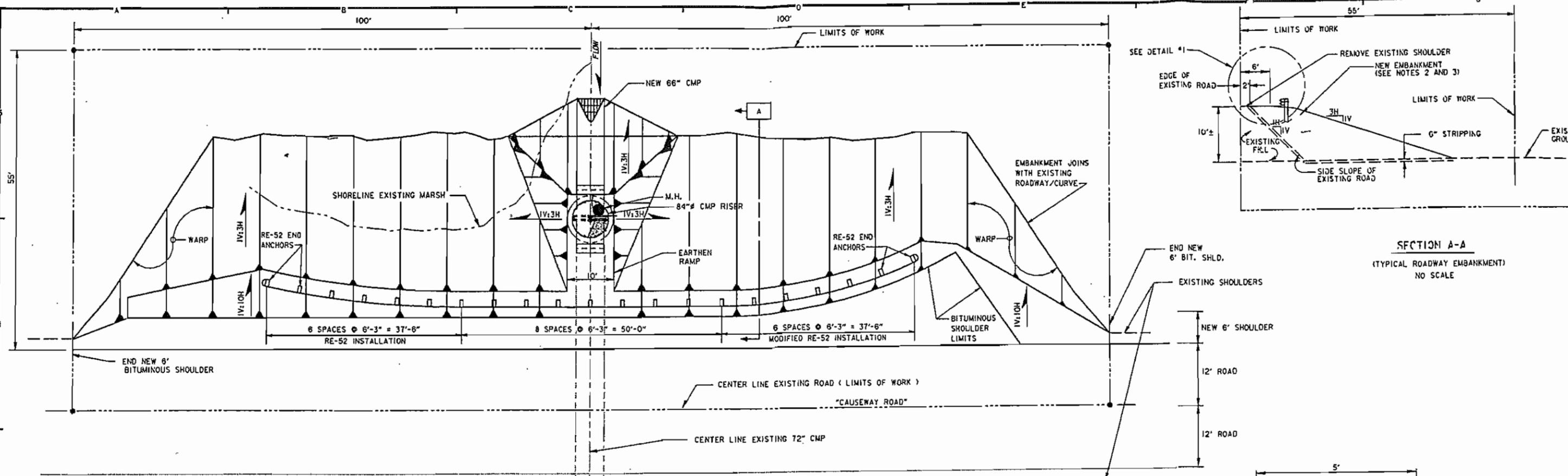
GENERAL PLAN - SLIDE GATE CLOSURE  
NO SCALE

**NOTE:**  
1. FINAL LIMITS OF DRAINAGE DITCH TO BE STAKED IN THE FIELD BY CONTRACTOR AND APPROVED BY CONTRACTING OFFICER'S REPRESENTATIVE.

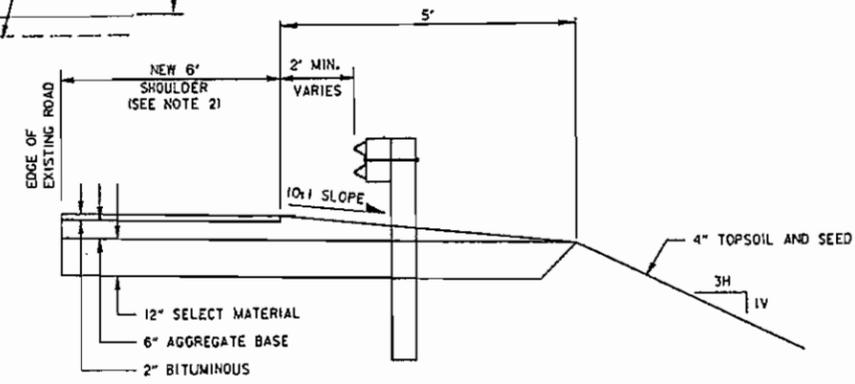
- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG

GENERAL PLAN - POND AREAS  
SCALE IN FEET  
0 500 1000

AS-BUILT AS OF COMPLETION DATE		11/95
SYMBOL	DESCRIPTION	DATE APP
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEER ST. PAUL, MINNESOTA		
AS-BUILT BUSSEY LAKE - STAGE 2 ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL #10 CLAYTON COUNTY IL		
DESIGNED: WPR		
CHECKED: J.G.		
DRAWN: FJB/T.J.		
DESIGNED:		
CHECKED:		
DATE: 11-01-93	CAD FILE NAME: MTIOP001.DGN	DRAWING NUMBER: M-P10-10/16
	SPEC NO: DACW37-93-B-0038	SHT OF



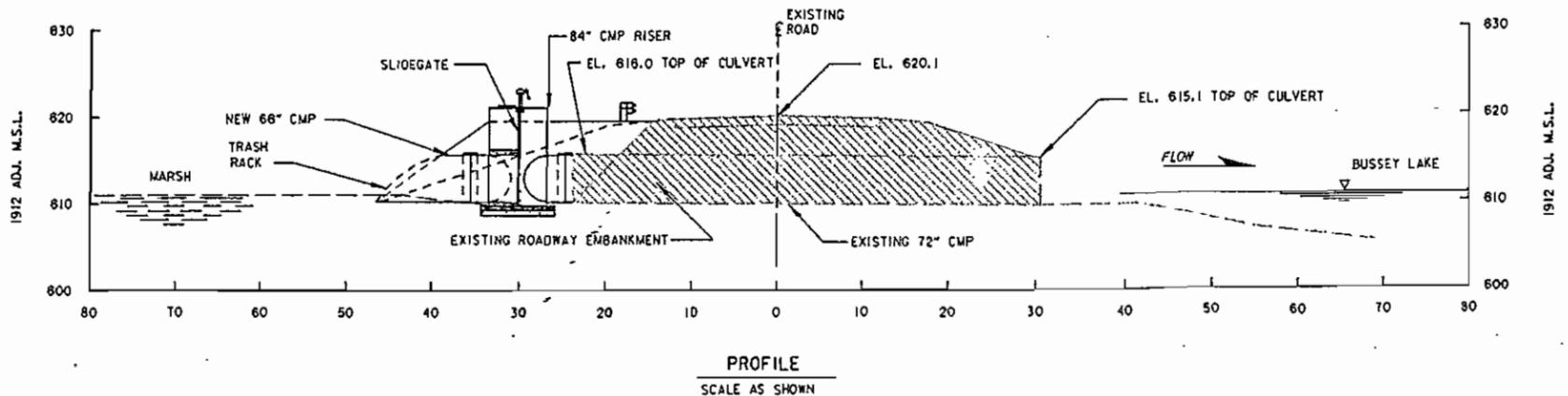
SECTION A-A  
(TYPICAL ROADWAY EMBANKMENT)  
NO SCALE



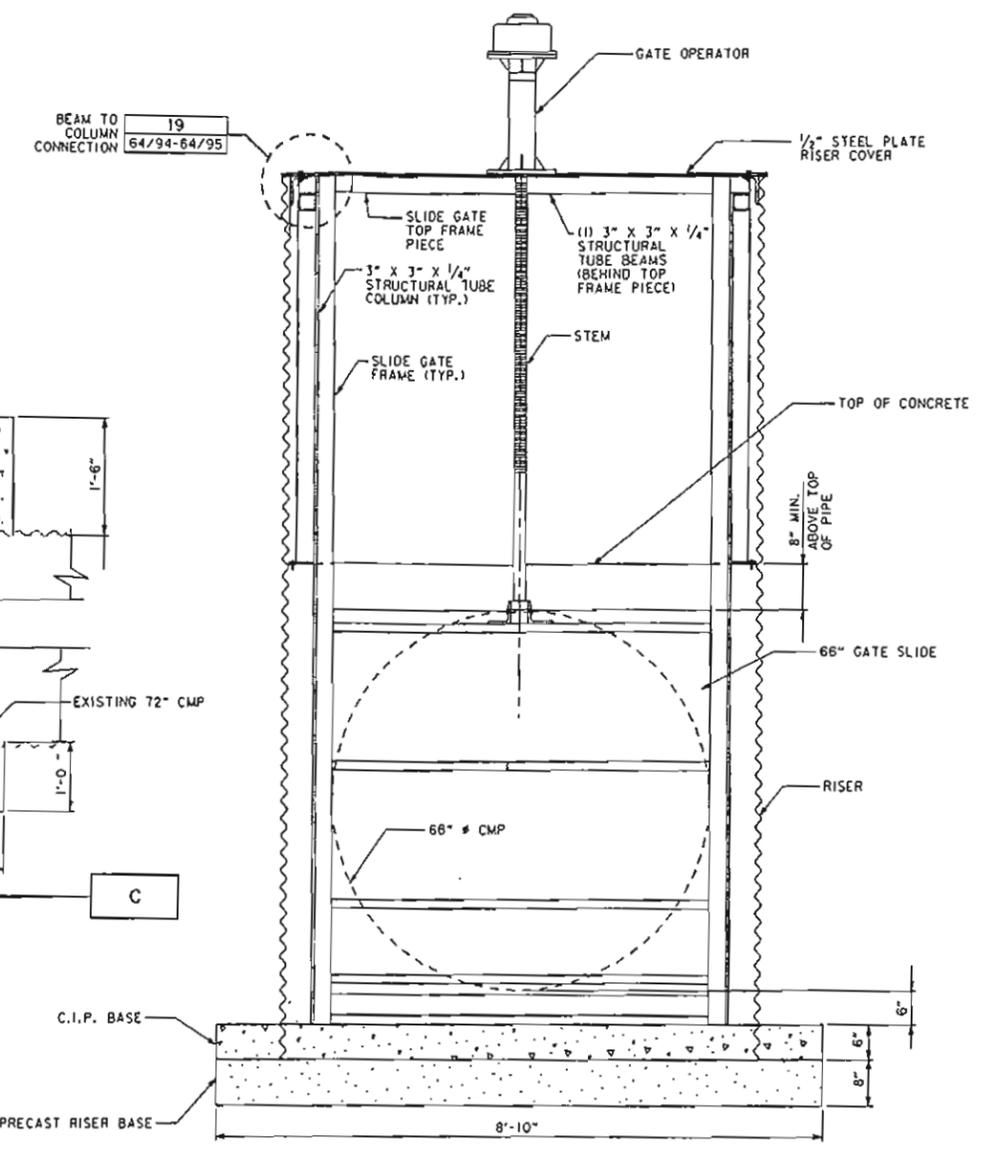
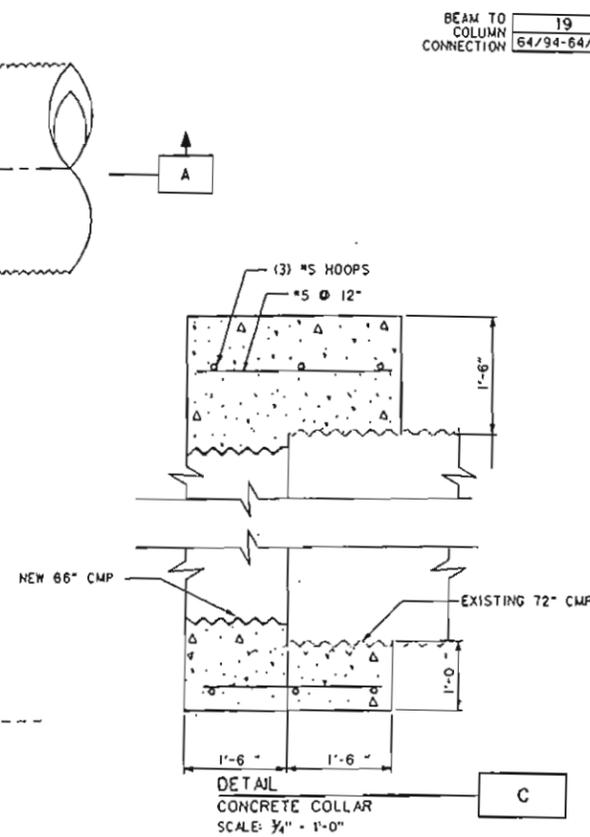
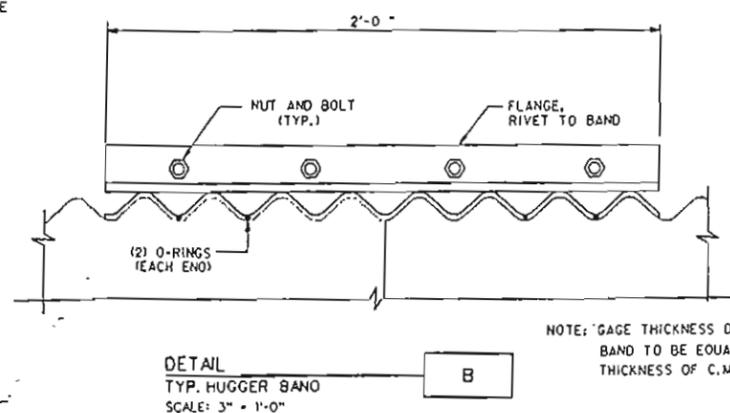
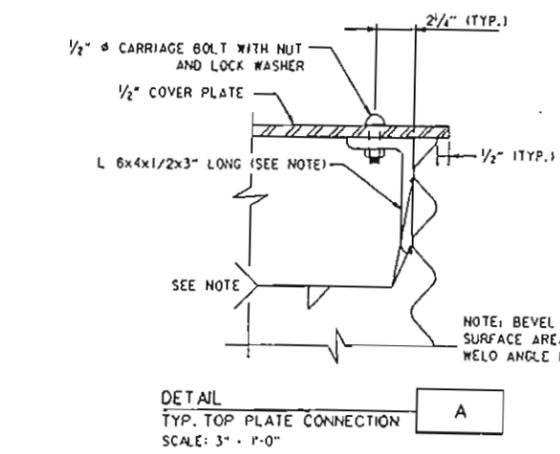
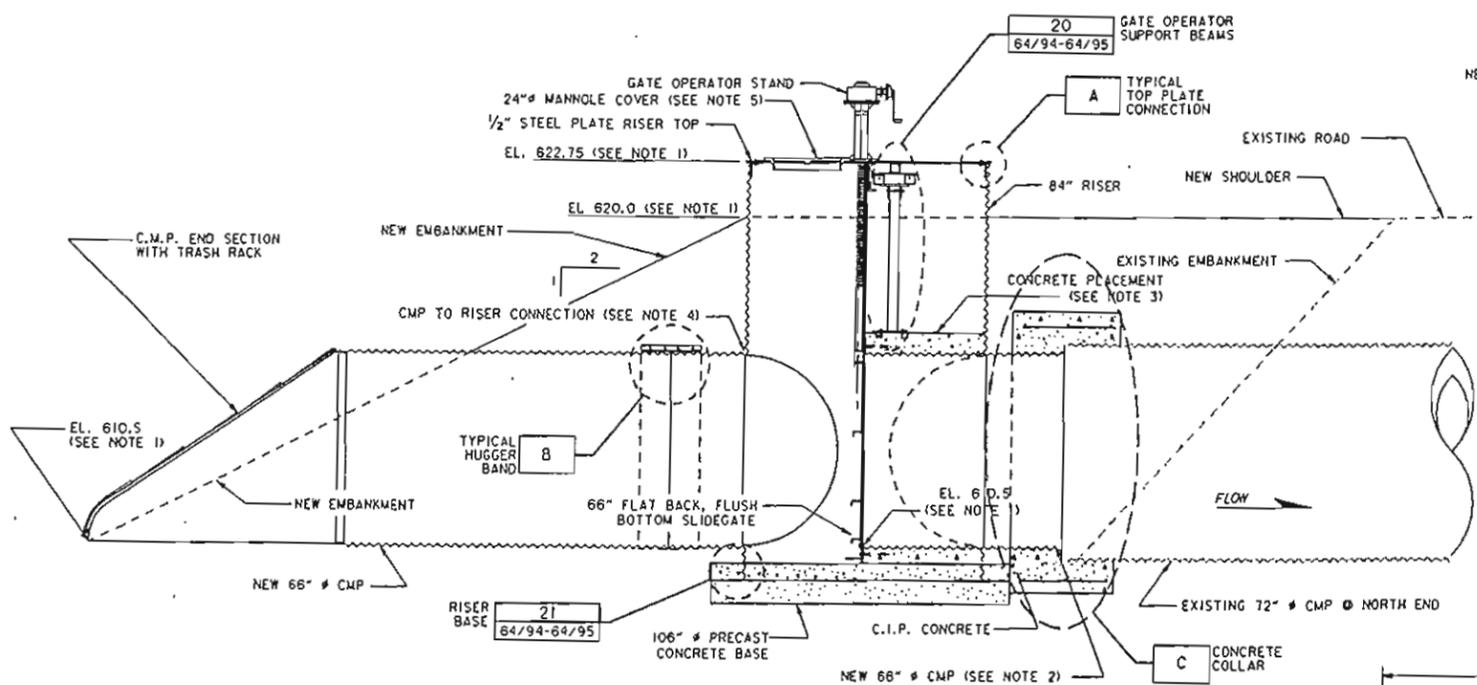
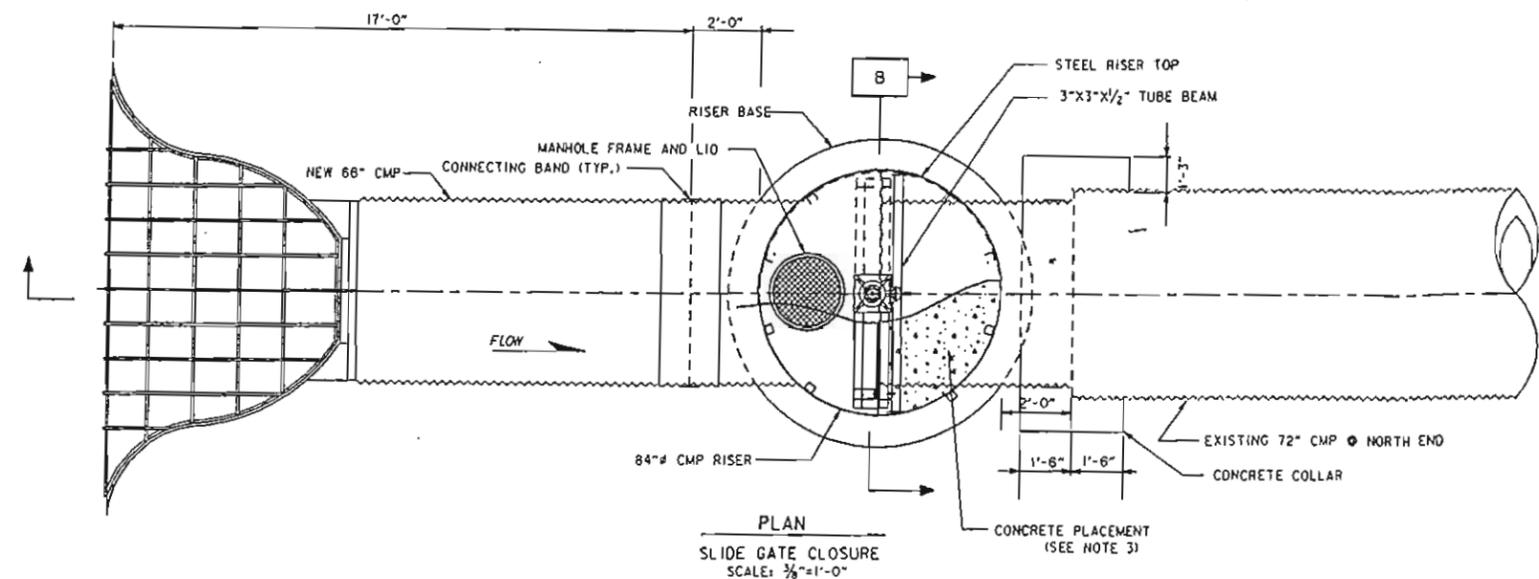
DETAIL #1 SHOULDER

- NOTE:
- GUARD RAIL TO FOLLOW IOWA D.O.T. STANDARDS. SEE SPECIFICATIONS FOR REFERENCED STANDARDS.
  - HORIZONTAL AND VERTICAL ALIGNMENT FOR NEW 6' SHOULDER AND SIDE SLOPES SHALL MATCH EXISTING ROAD ALIGNMENT.
  - EXISTING GROUND BENEATH NEW EMBANKMENT SHALL BE PRELOADED. SEE SPECIFICATIONS FOR PRELOAD MATERIAL TYPE AND PLACEMENT.

- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG



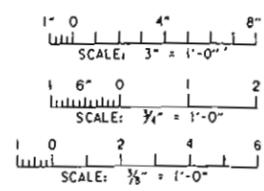
AS-BUILT AS OF COMPLETION DATE		11/95
SYMBOL	DESCRIPTION	DATE
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
APPROVED BY	AS-BUILT	
CHIEF, DESIGN BRANCH	BUSSEY LAKE - STAGE 2	
DESIGNED: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER	
CHECKED:	POOL #10	
DRAWN: DPF/GRS	CLAYTON COUNTY, IOWA	
DESIGNED:	DITCHES, CULVERTS & DIKES	
CHECKED:	SLIDE GATE CLOSURE	
DATE: 11-01-93	CAD FILE NAME: M10P002.DGN	DRAWING NUMBER: M-P10-64/78
	SPEC NO: DACW37-93-B-0038	SHT: OF:



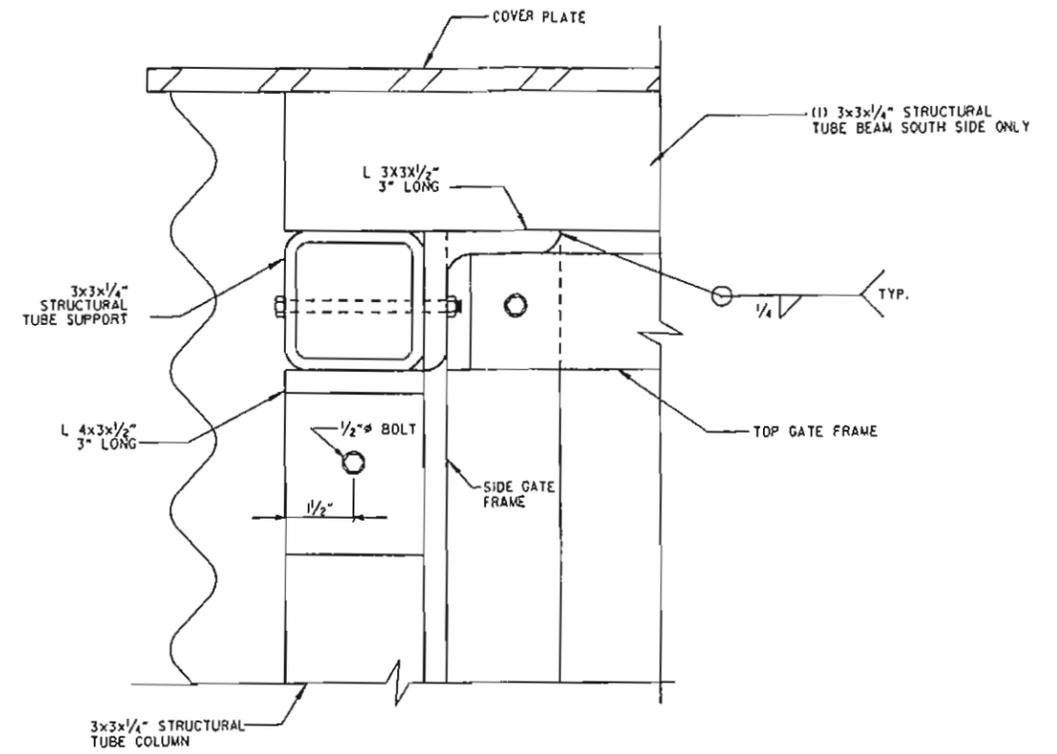
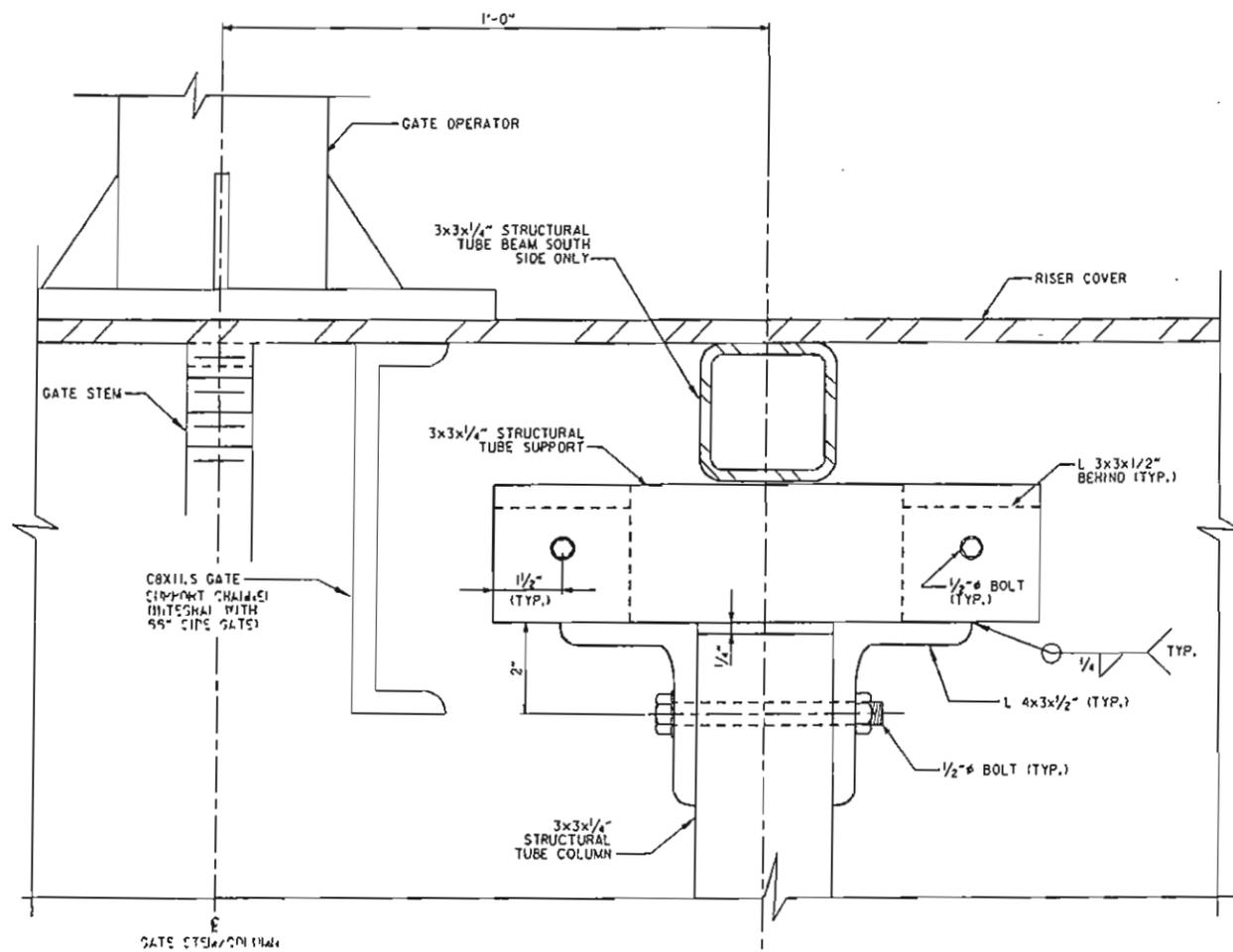
SECTION  
SLIDE GATE CLOSURE  
SCALE: 3/8" = 1'-0"

- NOTES:
1. VERIFY ALL ELEVATIONS IN THE FIELD.
  2. EXTEND 66" CMP TO GATE SLIDE. WELD ALL AROUND 66" CMP TO RISER.
  3. PLACE CONCRETE AROUND 66" CMP TO PROVIDE SUPPORT FOR THE SLIDE GATE. PROVIDE SUPPORT FOR THE CMP TO AVOID ANY DAMAGE DURING PLACEMENT.
  4. WELD ALL AROUND 66" CMP TO RISER.
  5. WELD MANHOLE FRAME TO RISER COVER PLATE TO SECURE. MANHOLE FRAME AND LID TO BE NEENAH R-5900-F OR EQUAL.
  6. RISER TO BE 8 GAGE THICKNESS WITH 3" x 1" CORRUGATIONS, ALUMINIZED.
  7. NEW 66" CMP TO BE 12 GAGE THICKNESS WITH 3" x 1" CORRUGATIONS, ALUMINIZED.
  8. COAT ALL C.M.P. IN CONTACT WITH CONCRETE WITH BITUMINUS COATING AS SPECIFIED.

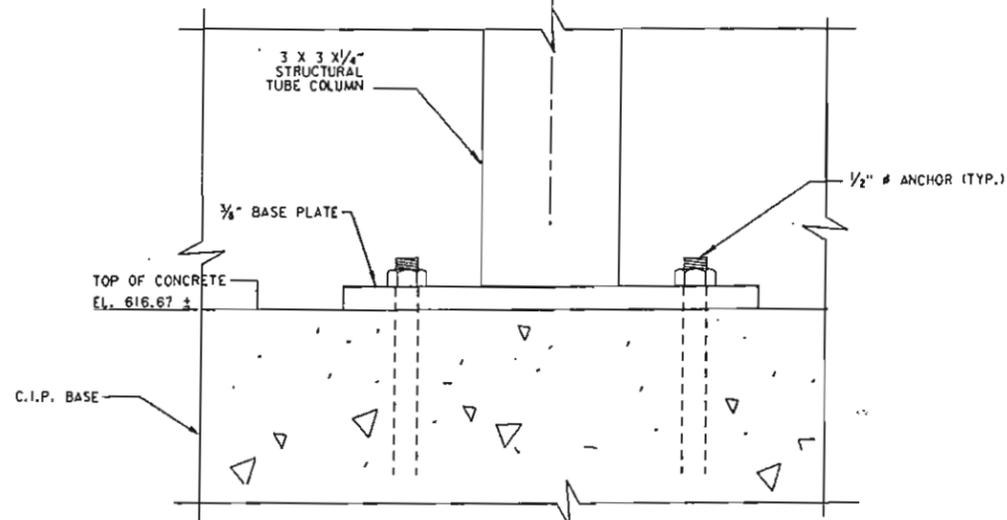
AS-BUILT AS OF COMPLETION DATE		12/96	
SYMBOL	DESCRIPTION	DATE	APPROVA
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AS-BUILT BUSSEY LAKE - STAGE 2 ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER POOL 10 CLAYTON CO., IOWA DITCHES, CULVERTS & DIKS SLIDE GATE CLOSURE PLAN, SECTIONS AND DETAILS			
DESIGNED: PWS	CHECKED:	DATE: 05-01-94	CAD FILE NAME: MT64P014.DGN
DRAWN: MKC/LAR	CHECKED:	SPEC NO: DAC#37-93-B-0038	DRAWING NUMBER: M-P10-64/94
			SHT 19 OF 20



GEN ENG  
HYD  
HYDR  
GEOTECH  
STR ENG

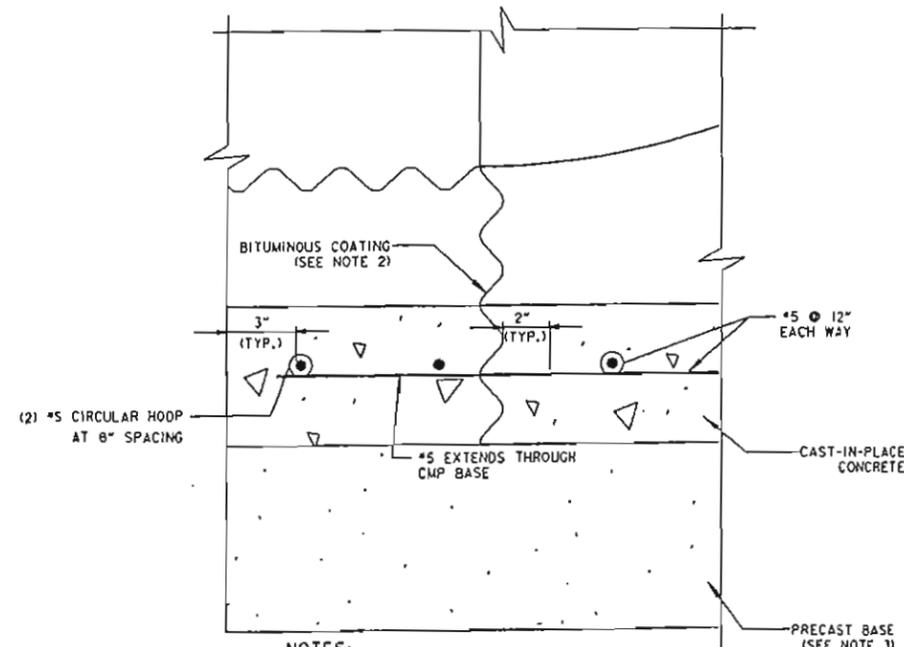


DETAIL 19  
BEAM TO COLUMN CONNECTION 64/94-64/95  
SCALE: 8"=1'-0"



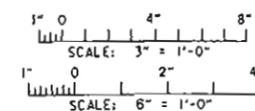
NOTES:  
SLIDE GATE SIDE FRAME NOT SHOWN FOR CLARITY.

DETAIL 20  
GATE OPERATOR SUPPORT BEAMS 64/94-64/95  
SCALE: 8"=1'-0"



NOTES:  
1. COAT INSIDE AND OUTSIDE SURFACES WITH BITUMINOUS COATING AS SPECIFIED.  
2. PRECAST BASE TO CONFORM TO ASTM C478.

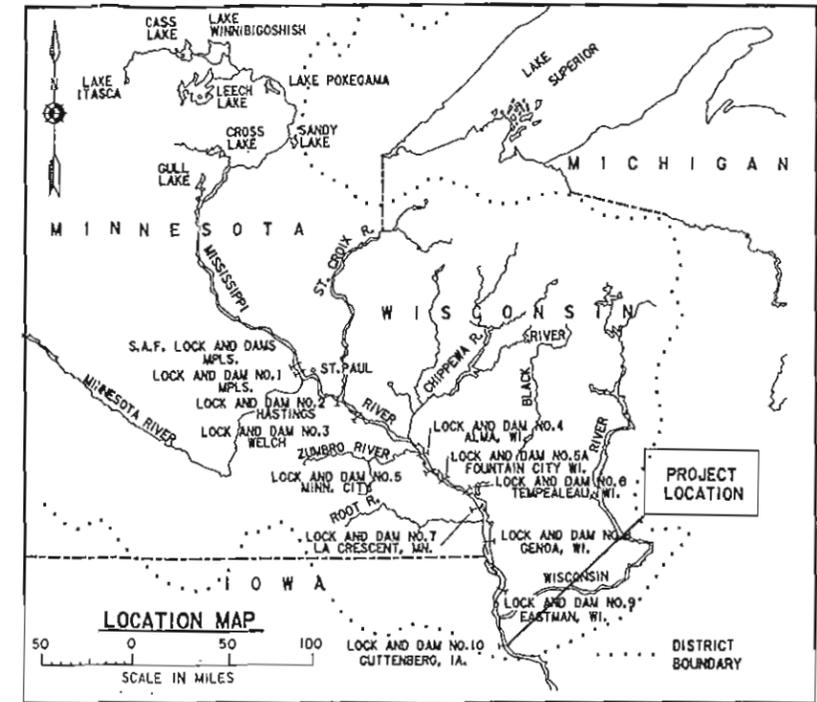
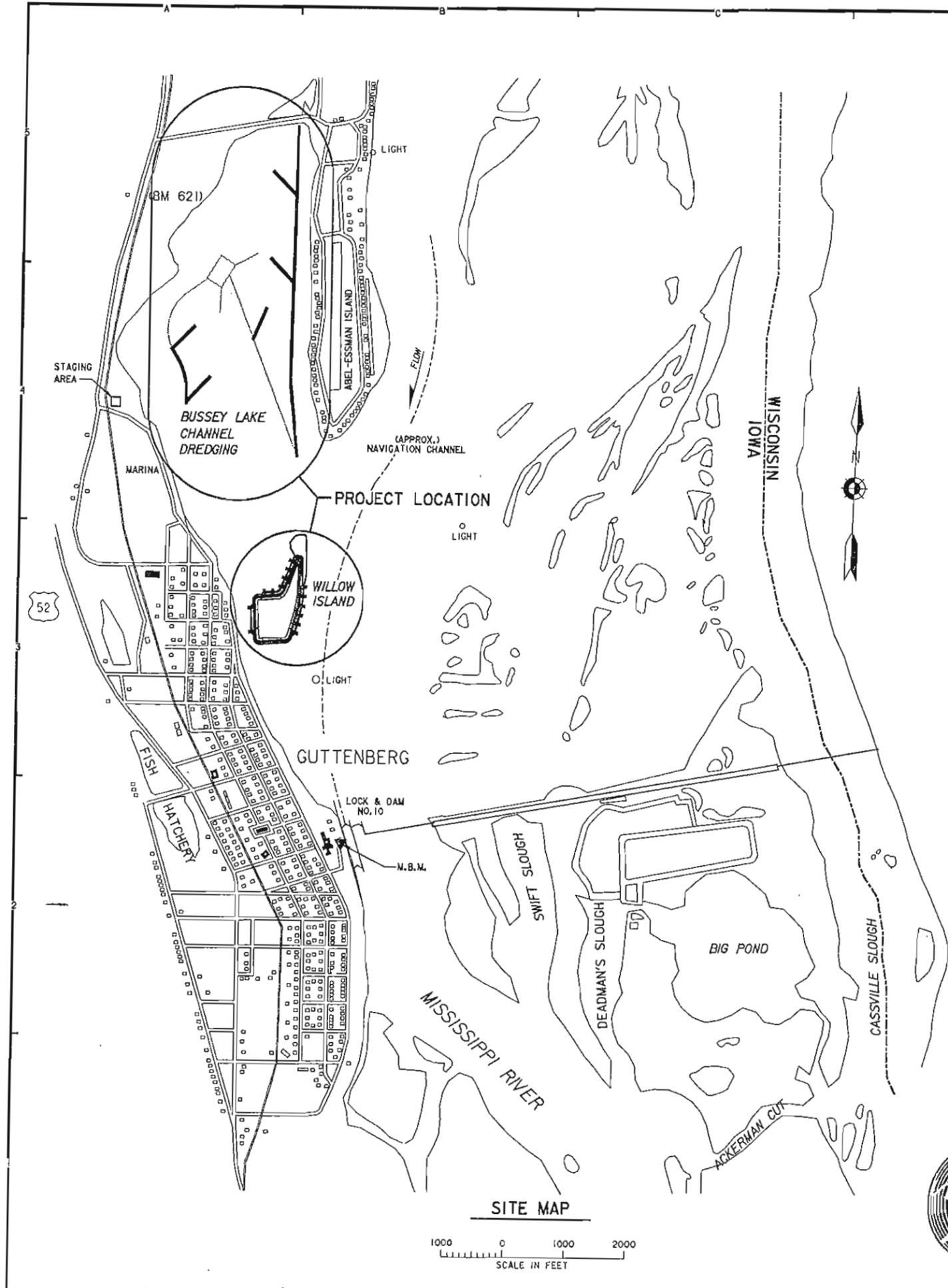
DETAIL 21  
RISER BASE 64/94-64/95  
SCALE: 3"=1'-0"



NOTES  
1. ALL BOLTS TO BE 1/2" ASTM A 325 GALVANIZED AS SPECIFIED.  
2. ALL STRUCTURAL STEEL SECTIONS AND PLATES TO BE ASTM A 36 GALVANIZED UNLESS OTHERWISE SPECIFIED OR NOTED.

DESIGNED: PWS	CHECKED: LAR	DATE: 05-01-94	CAD FILE NAME: MT64P015.DGN	SPEC NO: DACW37-93-B-0038
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		AS-BUILT BUSSEY LAKE - STAGE 2 ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER POOL 10 DITCHES, CULVERTS & DIKES SLIDE GATE CLOSURE DETAILS		
AE APPROVING OFFICIAL:		DRAWING NUMBER: M-P10-64/95		
DATE: 05-01-94		SHEET 20 OF 20		

○ GEN ENG  
○ HYD  
○ HYDR  
○ GEOTECH  
● STR ENG



**LEGEND**

- BORINGS
- ▼ MASTER BENCH MARK (M.B.M.)  
BRASS CAP U.S.C. & G.S. U179  
DATUM 1912 ADJ. M.S.L., EL. 624.01
- ▲ FILL
- ▭ RIPRAP

**NOTES:**

- 1. ELEVATIONS REFER TO MEAN SEA LEVEL (N.G.V.D. 1912 ADJ.).

- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG

DRAWING INDEX		
DRAWING NO.	SHT.	DESCRIPTION
M-PI0-10/19	1	LOCATION & SITE MAP, AND DRAWING INDEX
M-PI0-83/1	2	WILLOW ISLAND CONTAINMENT DIKE PLAN, CONTROL DATA, AND BORING LOG LOCATIONS
M-PI0-83/2	3	WILLOW ISLAND CONTAINMENT DIKE TYPICAL SECTIONS AND RIPRAP GROIN DETAIL AND SECTION
M-PI0-83/3	4	BUSSEY LAKE CHANNEL DREDGING PLAN, TYPICAL SECTION, AND CONTROL DATA
REFERENCE DRAWINGS		
DRAWING NO.	SHT.	DESCRIPTION
M-PI0-10/13	1	BUSSEY LAKE DREDGING (PREP) BORING LOGS 90-5M THRU 90-12M
M-PI0-10/14	2	BUSSEY LAKE DREDGING (PREP) BORING LOGS 90-13M THRU 90-19M
M-L10-14/14	1	HYDROGRAPHIC DATA - ELEVATION DURATION CURVES (POOL), JANUARY-JUNE (1971-1993)
M-L10-14/15	2	HYDROGRAPHIC DATA - ELEVATION DURATION CURVES (POOL), JULY-DECEMBER (1971-1993)
M-L10-14/18	1	HYDROGRAPHIC DATA - HYDROGRAPHS (POOL), JANUARY-DECEMBER (1984-1988)
M-L10-14/19	2	HYDROGRAPHIC DATA - HYDROGRAPHS (POOL), JANUARY-DECEMBER (1989-1993)

SIGNATURE NOTE: (ADDED DURING AS-BUILT STAGE)  
THE NAMES BELOW INDICATE SIGNATURES OF THE OFFICIALS  
SIGNING THIS SET OF DOCUMENTS. THIS DRAWING HAS BEEN  
REVISED AND REPLOTTED AND NEW SIGNATURES WERE NOT OBTAINED.

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL  
RECOMMENDATION AND APPROVAL OF ALL DRAWINGS  
IN THIS SET, AS INDEXED ON THIS SHEET.  
\* AS REQUIRED BY ENGINEER CIRCULAR  
NO. 1110-1-701

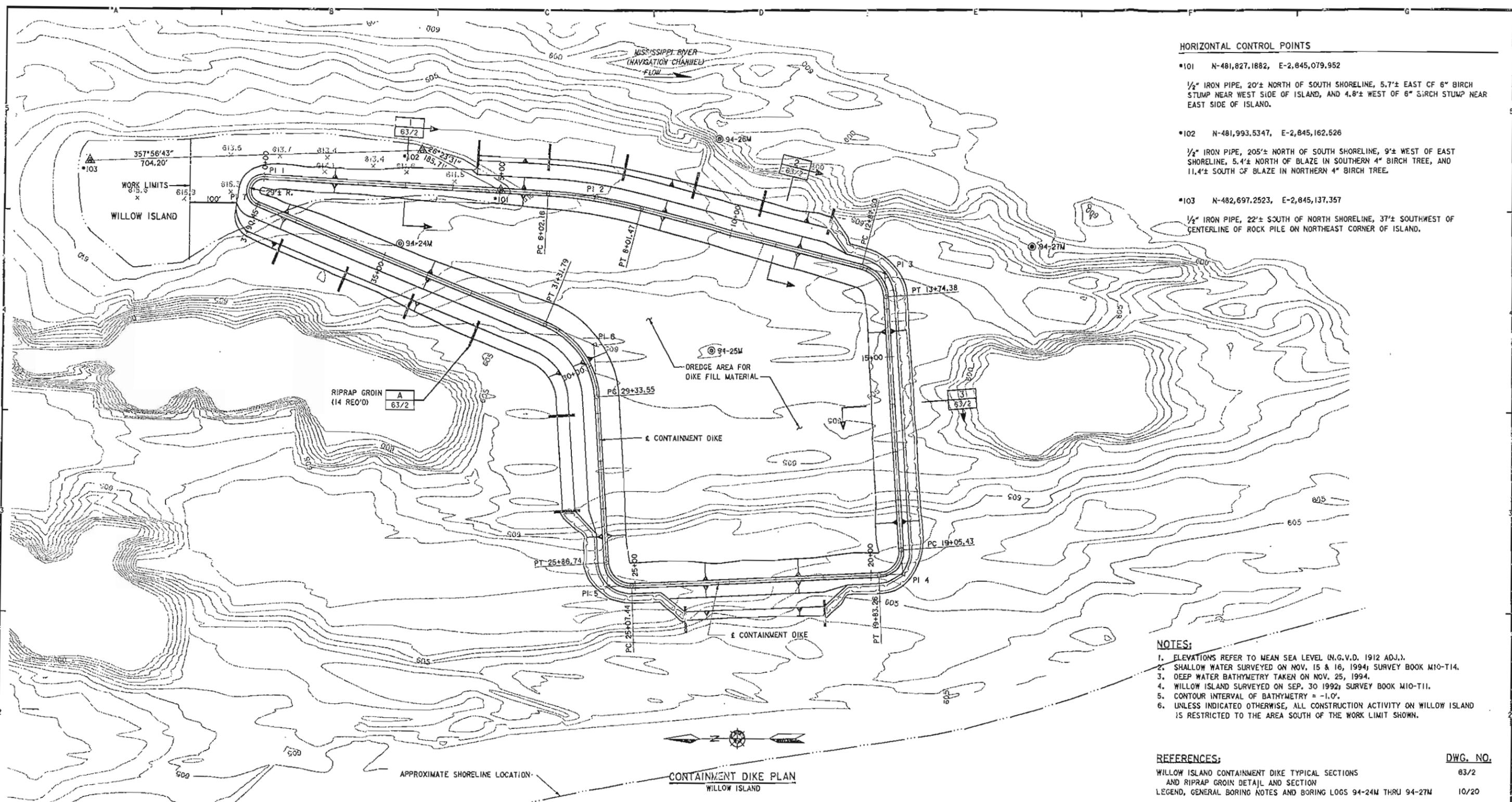
**APPROVAL RECOMMENDED BY:**

- ALLEN L. GEISEN  
CHIEF PE-O BRANCH
- PATRICK M. FOLEY  
CHIEF PE-H BRANCH
- ROBERT F. POST  
CHIEF ENGINEERING AND PLANNING DIVISION

**APPROVED BY:**  
MAJ. W. ROGERS  
DISTRICT COMMANDER

TECHNICAL MANAGER	AS-BUILT AS OF COMPLETION DATE	8/96	JEM
CHIEF COST ENGINEERING & SPECIFICATIONS SECTION	SYMBOL	DESCRIPTION	DATE APPROVAL
CHIEF GENERAL ENGINEERING SECTION	DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
CHIEF STRUCTURAL ENGINEERING SECTION	AS-BUILT BUSSEY LAKE - STAGE IB ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL 10 CLAYTON COUNTY, IOWA CHANNEL DREDGING/ISLAND EXPANSION LOCATION & SITE MAP, AND DRAWING INDEX		
CHIEF MECH/ELEC/ARCH SECTION	AE APPROVING OFFICIAL:	DESIGNED: JJC CHECKED: JBM DRAWN: JJC	
CHIEF GEOTECHNICAL AND GEOLOGY SECTION	DESIGNED:	CHECKED:	
CHIEF HYDRAULICS SECTION	DATE: APRIL 1995	CAD FILE NAME: COVER.DGN	DRAWING NUMBER: M-PI0-10/19
CHIEF HYDROLOGY SECTION		SPEC NO: DACW37-95-B-0023	SHT 1 OF 4





**HORIZONTAL CONTROL POINTS**

•101	N-481,827.1882, E-2,845,079.952
1/2" IRON PIPE, 20'± NORTH OF SOUTH SHORELINE, 5.7'± EAST OF 6" BIRCH STUMP NEAR WEST SIDE OF ISLAND, AND 4.8'± WEST OF 6" BIRCH STUMP NEAR EAST SIDE OF ISLAND.	
•102	N-481,993.5347, E-2,845,162.526
1/2" IRON PIPE, 205'± NORTH OF SOUTH SHORELINE, 9'± WEST OF EAST SHORELINE, 5.4'± NORTH OF BLAZE IN SOUTHERN 4" BIRCH TREE, AND 11.4'± SOUTH OF BLAZE IN NORTHERN 4" BIRCH TREE.	
•103	N-482,697.2523, E-2,845,137.357
1/2" IRON PIPE, 22'± SOUTH OF NORTH SHORELINE, 37'± SOUTHWEST OF CENTERLINE OF ROCK PILE ON NORTHEAST CORNER OF ISLAND.	

- NOTES:**
- ELEVATIONS REFER TO MEAN SEA LEVEL (N.G.V.D. 1912 ADJ.).
  - SHALLOW WATER SURVEYED ON NOV. 15 & 16, 1994; SURVEY BOOK M10-T14.
  - DEEP WATER BATHYMETRY TAKEN ON NOV. 25, 1994.
  - WILLOW ISLAND SURVEYED ON SEP. 30 1992; SURVEY BOOK M10-T11.
  - CONTOUR INTERVAL OF BATHYMETRY = -1.0'.
  - UNLESS INDICATED OTHERWISE, ALL CONSTRUCTION ACTIVITY ON WILLOW ISLAND IS RESTRICTED TO THE AREA SOUTH OF THE WORK LIMIT SHOWN.

**REFERENCES:**

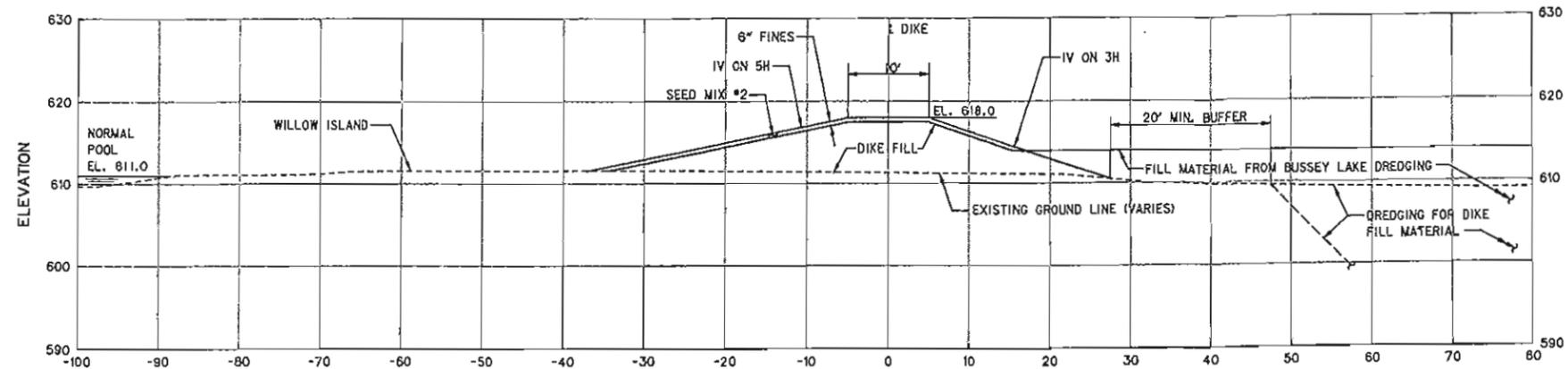
WILLOW ISLAND CONTAINMENT DIKE TYPICAL SECTIONS	DWG. NO. 83/2
AND RIPRAP GROIN DETAIL AND SECTION	
LEGEND, GENERAL BORING NOTES AND BORING LOGS 94-24M THRU 94-27M	10/20

- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG

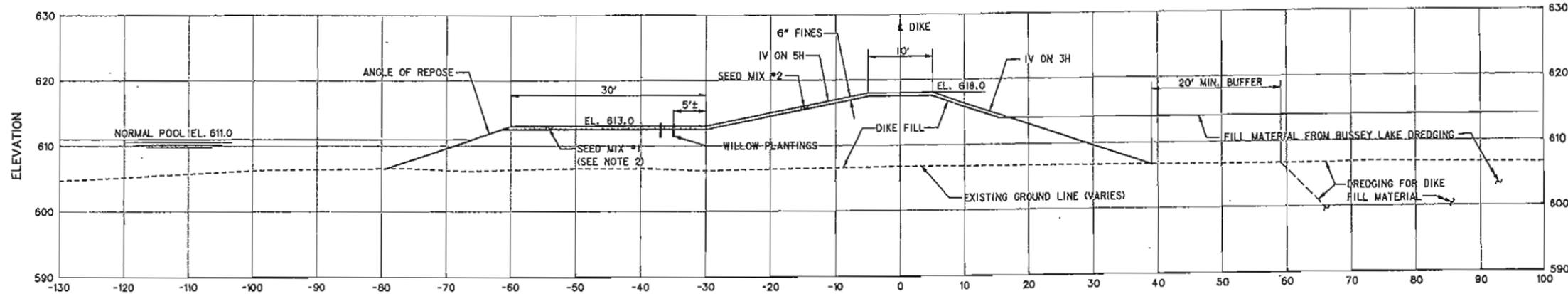
**CONTROL DATA FOR CONTAINMENT DIKE ALIGNMENT**

POINT	NORTH AZIMUTH	DISTANCE IN FEET	COORDINATES		STATIONING		CURVE DATA			
			NORTH	EAST	PC	PT	Δ	R	T	L
PI 1			482,327.76	2,845,104.83						
PI 2	182°52'34.61"	702.18	481,828.49	2,845,069.80	6+02.18	8+01.47	11°40'10.03"	978.58	100.00	199.31
PI 3	194°32'44.84"	836.33	461,010.55	2,644,909.78	12+87.80	13+74.38	71°44'53.88"	69.14	50.00	86.58
PI 4	266°17'38.32"	631.05	480,989.76	2,644,280.05	19+05.43	19+83.26	91°24'15.07"	46.79	50.00	77.53
PI 5	357°41'53.39"	824.18	481,593.44	2,844,254.98	25+07.44	25+86.74	88°29'07.92"	61.34	50.00	79.29
PI 6	88°11'01.31"	507.83	481,627.24	2,644,761.68	29+33.55	31+31.79	64°15'39.87"	176.76	111.01	198.24
PI 7	21°55'21.44"	769.67	482,341.25	2,645,049.04	37+90.45	37+90.45				

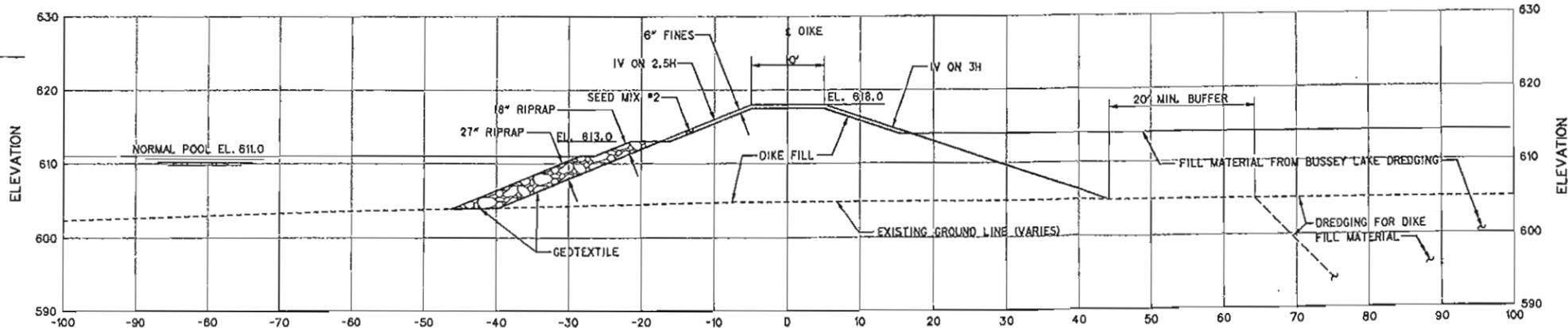
AS-BUILT AS OF COMPLETION DATE		8/96	J.B.M.
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AE APPROVING OFFICIAL:	AS-BUILT BUSSEY LAKE - STAGE 1B ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL 10 CLAYTON COUNTY, IOWA CHANNEL DREDGING/ISLAND EXPANSION WILLOW ISLAND CONTAINMENT DIKE PLAN, CONTROL DATA, AND BORING LOG LOCATIONS		
DESIGNED: JJC/JJF	CHECKED: JBM	DRAWN: JJC	DESIGNED: JSH
CHECKED: PMF	CAD FILE NAME: WILLOW.DGN	DRAWING NUMBER:	SHT 2
DATE: 03-30-95	SPEC NO: DACW37-95-B-0023	M-PI0-63/1	OF 4



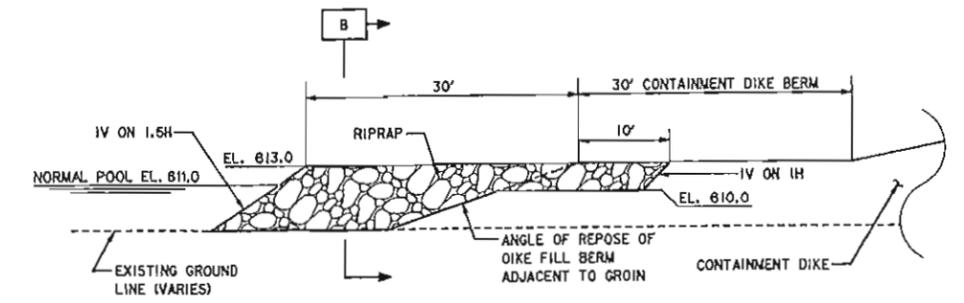
TYPICAL SECTION 1  
 STA. 0+00 TO 4+50  
 63/1



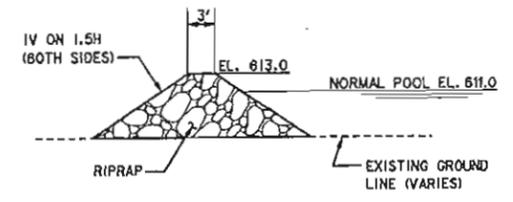
TYPICAL SECTION 2  
 STA. 4+50 TO 12+00  
 STA. 21+00 TO 23+97  
 STA. 28+97 TO 36+28  
 TRANSITION FROM TYPICAL SECTION 2 TO TYPICAL SECTION 1 FROM STA. 36+28 TO 0+00  
 63/1



TYPICAL SECTION 3  
 STA. 12+50 TO 19+50  
 STA. 24+47 TO 26+47  
 TRANSITION FROM TYPICAL SECTION 3 TO TYPICAL SECTION 2 FROM STA. 12+50 TO 12+00  
 STA. 20+50 TO 21+00  
 STA. 24+47 TO 23+97  
 STA. 26+47 TO 26+97  
 63/1



DETAIL A  
 RIPRAP GROIN  
 SCALE: NONE  
 63/1



SECTION B  
 RIPRAP GROIN  
 SCALE: NONE  
 63/1

RIPRAP GROIN LOCATIONS

STA. 4+50	STA. 23+97
STA. 8+00	STA. 26+97
STA. 7+50	STA. 28+35
STA. 9+00	STA. 31+00
STA. 10+50	STA. 32+50
STA. 12+00	STA. 34+00
STA. 20+00	STA. 35+50

- NOTES:
- ELEVATIONS REFER TO MEAN SEA LEVEL (M.S.L.) 1912 ADJ.
  - SEED MIX #1 TO BE USED ON EXTERIOR SIDE OF DIKE ON 30' WIDE BERMS.
  - DEPTH OF CONTRACTOR DREDGING INSIDE OF CONTAINMENT DIKE FOR DIKE FILL MATERIAL NOT SHOWN.
  - TOP OF FILL MATERIAL FROM BUSSEY LAKE DREDGING INDICATED ON SECTIONS IS SHOWN FOR VISUAL REPRESENTATION ONLY. FINAL TOP ELEVATION OF FILL MATERIAL FROM BUSSEY LAKE DREDGING MAY BE VARIABLE.

REFERENCES: WILLOW ISLAND CONTAINMENT DIKE PLAN AND CONTROL DATA  
 DWG. NO. 63/1

- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG

AS-BUILT AS OF COMPLETION DATE		9/98	J.B.M.
SYMBOL	DESCRIPTION	DATE	APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: JJC/JJF		BUSSEY LAKE - STAGE IB	
CHECKED: JBM		ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER	
DRAWN: JJC		POOL 10 CLAYTON COUNTY, IOWA	
DESIGNED: JSH		CHANNEL DREDGING/ISLAND EXPANSION	
CHECKED: PMF		WILLOW ISLAND CONTAINMENT DIKE TYPICAL SECTIONS	
DATE: 03-30-95		AND RIPRAP GROIN DETAIL AND SECTION	
CAD FILE NAME: DSECT.DGN		DRAWING NUMBER:	SHT 3
SPEC NO: DACW37-95-B-0023		M-PI0-63/2	OF 4

APPENDIX B

LOCAL COOPERATION AGREEMENT

LOCAL COOPERATION (28E) AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE STATE OF IOWA  
FOR CONSTRUCTION OF THE  
BUSSEY LAKE HABITAT REHABILITATION PROJECT  
CLAYTON COUNTY, IOWA

THIS AGREEMENT is entered into this 5<sup>th</sup> day of September, 1993, by and between the DEPARTMENT OF THE ARMY (hereinafter referred to as the "Government"), acting by and through the Assistant Secretary of the Army (Civil Works), and the STATE OF IOWA (hereinafter referred to as the "State"), acting by and through the Iowa Department of Natural Resources.

WITNESSETH, THAT:

WHEREAS, construction of the Bussey Lake Habitat Rehabilitation Project at Bussey Lake in Clayton County, Iowa (hereinafter referred to as the "Project", as defined in Article I.a. of this Agreement), was approved under the terms of the Upper Mississippi River System Environmental Management Program, as authorized by Section 1103(e) of the Water Resources Development Act of 1986, Public Law 99-662, as amended;

WHEREAS, Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, as amended, specifies the cost-sharing requirements applicable to the Project;

WHEREAS, Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, specifies that the cost of operation and maintenance is the responsibility of the agency that manages the land for fish and wildlife purposes, the State will provide 100 percent of the cost of operation and maintenance of the Project;

WHEREAS, Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, provides that the construction of any water resources project by the Secretary of the Army shall not be commenced until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the Project;

WHEREAS, the State has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in cost-sharing and financing in accordance with the terms of this Agreement;

NOW, THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS AND GENERAL PROVISIONS

For purposes of this Agreement:

a. The term "Project" shall mean the addition of a gated structure on an existing 6-foot-diameter culvert that allows Buck Creek to enter the upper end of Bussey Lake, as generally described in the Definite Project Report entitled "Bussey Lake Habitat Rehabilitation and Enhancement Project, Pool 10, Upper Mississippi River, Clayton County, Iowa", dated August 1990 and approved by the Assistant Secretary of the Army (Civil Works) on 10 June 1991 (hereinafter referred to as the "Definite Project Report").

b. The term "total project costs" shall mean all costs incurred by the State and the Government directly related to construction of the Project. Such costs shall include, but not necessarily be limited to, continuing planning and engineering costs incurred after October 1, 1985; costs of applicable engineering and design (including\*the Definite Project Report); actual construction costs; supervision and administration costs; costs of plans and specifications; costs of contract dispute settlements or awards; and the value of utility and facility alterations or relocations provided for the Project by the State, but shall not include any costs for lands, easements, rights-of-way, betterments, operation, maintenance, repair, replacement, or rehabilitation.

c. The term "period of construction" shall mean the time from the advertisement of the first construction contract to the time the Government representative certifies in writing to the State that construction of the Project is complete. The Government representative shall furnish to the State copies of the Government's written Notice of Acceptance of Completed Work furnished to the contractor(s) for all contracts for the Project.

d. The term "Government Representative" shall mean the U.S. Army Engineer for the St. Paul District, or his designee. The Government representative shall have the authority to represent the Government with respect to administration of this

*1/9/93*  
*1/9/93*  
\* Insert "an applicable share of"

Agreement including the authority to represent the Government under Article VII (Disputes) of this Agreement.

e. The term "highway" shall mean any highway, thoroughfare, roadway, street, or other public road or way.

f. The term "relocations" shall mean the preparation of plans and specifications for, and the accomplishment of, all alterations, modifications, lowering or raising in place, and/or new construction related to, but not limited to, existing: railroads (excluding construction, modification, or relocation of railroad bridges and approaches thereto), highways, and other bridges, buildings, pipelines, public utilities (such as municipal water and sanitary sewer lines, telephone lines, and storm drains), aerial utilities, cemeteries, and other facilities, structures, and improvements determined by the Government to be necessary for the construction, operation and maintenance of the Project.

g. The term "fiscal year" shall mean one fiscal year of the United States Government. The Government fiscal year begins on October 1 and ends on September 30.

h. The term "functional portion of the Project" shall mean a completed portion of the Project as determined by the Government representative in writing to be suitable for tender to the State to operate and maintain in advance of completion of construction of the entire Project. To be suitable for tender, the Government representative must determine that the completed portion of the Project can function independently and for a useful purpose, although the balance of the Project is not complete.

## ARTICLE II - OBLIGATIONS OF THE PARTIES

a. The Government, subject to receiving funds appropriated by the Congress of the United States and using funds provided by the State, shall expeditiously construct the Project (including relocations of railroad bridges and approaches thereto), applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The State shall be afforded the opportunity to review and comment on all contracts, including relevant plans and specifications, prior to the issuance of invitations for bids. Before initial construction of the Project can proceed, the State must concur in writing with issuance of the invitation for bids for the first construction contract. To the extent possible, the State thereafter also will be afforded the opportunity to review

and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. In those cases where providing notice to the State of the required contract modifications or change orders is not possible prior to issuance of a Notice to Proceed, such notification will be provided after the fact at the earliest date possible. The Government will, in good faith, consider the comments of the State, but award of contracts, modifications or change orders, and performance of all work on the Project (whether the work is performed under contract or by Government personnel), shall be exclusively within the control of the Government.

b. After the Government determines that the Project or a functional portion of the Project is complete, and notifies the State in writing of such determination, the Government shall turn the Project or functional portion of the Project over to the State, which shall accept the Project or functional portion of the Project and be solely responsible for operating, maintaining, repairing, replacing, and rehabilitating the Project or functional portion of the Project in accordance with Article VIII hereof.

c. As further specified in Article VI hereof, the State shall provide, during the period of construction, a cash contribution of 25 percent of total project costs.

d. As further specified in Article III hereof, the State shall provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas determined by the Government to be necessary for construction, operation, and maintenance of the Project.

e. As further specified in Article III hereof, the State shall perform all relocations determined by the Government to be necessary for construction, operation, and maintenance of the Project.

f. The value of the contributions provided under paragraph e. of this Article may be applied as a credit against the cash contribution required pursuant to paragraph c. of this Article.

g. No Federal funds may be used to meet the State's share of total project costs under this Agreement unless the expenditure of such funds is expressly authorized by statute as verified in writing by the Federal granting agency.

ARTICLE III - LANDS, FACILITIES, AND PUBLIC LAW 91-646  
RELOCATION ASSISTANCE

a. The State shall furnish to the Government all lands, easements, and rights-of-way, including suitable borrow and excavated or dredged material disposal areas, as may be determined by the Government to be necessary for the construction, operation, and maintenance of the Project, and shall furnish to the Government evidence supporting the State's legal authority to grant rights-of-entry to such lands. The necessary lands, easements, and rights-of-way may be provided incrementally, but all lands, easements, and rights-of-way determined by the Government to be necessary for work to be performed under a construction contract must be furnished prior to the advertisement of that construction contract.

b. Upon notification from the Government, the State shall accomplish or arrange for accomplishment at no cost to the Government all relocations determined by the Government to be necessary for construction, operation, and maintenance of the Project.

c. The State shall comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 C.F.R. Part 24, in acquiring lands, easements, and rights-of-way for construction and subsequent operation and maintenance of the Project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

ARTICLE IV - CREDIT FOR RELOCATIONS

The costs of relocations which will be included in total project costs and credited towards the State's share of total project costs shall be that portion of the actual costs as set forth below and approved by the Government:

a. Highways and Highway Bridges: Only that portion of the cost as would be necessary to construct substitute bridges and highways to the design standard that the State of Iowa would use in constructing a new bridge or highway under similar conditions of geography and traffic loads.

b. Utilities and Facilities (including railroads): Actual relocation costs, less depreciation, less salvage value,

plus the cost of removal, less the cost of betterments. With respect to betterments, new materials shall not be used in any alteration or relocation if materials of value and usability equal to those in the existing facility are available or can be obtained as salvage from the existing facility or otherwise, unless the provision of new material is more economical. If, despite the availability of used material, new material is used, where the use of such new material represents an additional cost, such cost will not be included in total project costs nor credited towards the State's share.

ARTICLE V - CONSTRUCTION PHASING AND MANAGEMENT

a. To provide for consistent and effective communication between the State and the Government during the period of construction, the State and the Government shall appoint representatives to coordinate on scheduling, plans, specifications, modifications, contract costs, and other matters relating to construction of the Project. The State will be informed of any changes in cost estimates.

b. The representatives appointed above shall meet as necessary during the period of construction and shall make such recommendations as they deem warranted to the Government representative.

c. The Government shall consider the recommendations of the representatives in all matters relating to construction of the Project, but the Government, having ultimate responsibility for construction of the Project, has complete discretion to accept, reject, or modify the recommendations.

ARTICLE VI - METHOD OF PAYMENT

a. The State shall provide, during the period of construction, cash payments required under Article II of this Agreement. Total project costs are currently estimated to be \$43,300.00. In order to meet its share, the State must provide a cash contribution currently estimated to be \$10,825.00. The dollar amounts set forth in this Article are based upon the Government's best estimates which will reflect projection of costs, price level changes, and anticipated inflation. Such cost estimates are subject to adjustments based upon costs actually incurred and are not to be construed as the total financial responsibilities of the Government and the State.

b. The State shall provide the required cash contribution in accordance with the following provisions. The

required cash contribution shall be provided as follows: 45 calendar days prior to the award of the first construction contract, the Government shall notify the State of the State's estimated share of project costs, including its share of costs attributable to the Project incurred prior to the initiation of construction. Within 30 calendar days thereafter, the State shall provide the Government the full amount of the required contribution by delivering a check payable to "FAO, USAED, St. Paul" to the Government representative.

c. In the event that total project costs are expected to exceed the estimate given at the outset of construction, the Government shall immediately notify the State of the additional contribution it will be required to make to meet its share of the revised estimate. Within 45 calendar days thereafter, the State shall provide the Government the full amount of the additional required contribution.

d. Upon completion of the Project and resolution of all relevant claims and appeals, the Government shall compute the total project costs and tender to the State a final accounting of the State's share of total project costs. In the event the total contribution by the State is less than its minimum required share of total project costs, the State shall, no later than 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to meet its minimum required share of total project costs.

e. If the State's total contributions under Article II.c. and II.e. of this Agreement (including relocations) exceed 25 percent of total project costs, the Government shall, no later than 90 calendar days after the final accounting is complete, subject to the availability of funds, return said excess to the State.

#### ARTICLE VII - DISPUTES

Before any party to this Agreement may bring suit in any court concerning an issue relating to this Agreement, such party must first seek in good faith to resolve the issue through negotiation or other forms of nonbinding alternative dispute resolution mutually acceptable to the parties.

ARTICLE VIII - OPERATION AND MAINTENANCE

a. After the Government has turned the completed Project, or functional portion of the Project, over to the State, the State shall operate, maintain, repair, replace, and rehabilitate the completed Project, or functional portion of the Project, at no cost to the Government, in accordance with regulations or directions prescribed by the Government.

b. The State hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon land which it owns or controls for access to the Project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. If an inspection shows that the State for any reason is failing to fulfill its obligations under this Agreement without receiving prior written approval from the Government, the Government will send a written notice to the State. If after 30 calendar days from receipt of notice, the State continues to fail to perform, then the Government shall have the right to enter, at reasonable times and in a reasonable manner, upon lands the State owns or controls for access to the Project for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Government shall operate to relieve the State of responsibility to meet its obligations as set forth in this Agreement, or to preclude the Government from pursuing any other remedy at law or equity to assure faithful performance pursuant to this Agreement.

ARTICLE IX - RELEASE OF CLAIMS

The State shall hold and save the Government free from all damages arising from the construction, operation, and maintenance of the Project, except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE X - MAINTENANCE OF RECORDS

The Government and the State shall keep books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement to the extent and in such detail as will properly reflect total project costs. The Government and the State shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the Project and resolution of all relevant claims arising therefrom, and shall make available at

their offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the parties to this Agreement.

ARTICLE XI - GOVERNMENT AUDIT

The Government shall conduct an audit when appropriate of the State's records for the Project to ascertain the allowability, reasonableness, and allocability of its costs for inclusion as credit against the non-Federal share of total project costs.

ARTICLE XII - FEDERAL AND STATE LAWS

In acting under its rights and obligations hereunder, the State agrees to comply with all applicable Federal and State laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

ARTICLE XIII - RELATIONSHIP OF PARTIES

The parties to this Agreement act in an independent capacity in the performance of their respective functions under this Agreement, and neither party is to be considered the officer, agent, or employee of the other.

ARTICLE XIV - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE XV - COVENANT AGAINST CONTINGENT FEES

The State warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the State for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability, or, in its discretion, to add to the Agreement or consideration, or otherwise recover,

the full amount of such commission, percentage, brokerage, or contingent fee.

#### ARTICLE XVI - TERMINATION OR SUSPENSION

a. If at any time the State fails to make the payments required under this Agreement, the Government shall terminate or suspend work on the Project until the State is no longer in arrears, unless the Assistant Secretary of the Army (Civil Works) determines that continuation of work on the Project is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 percentum of the average bond equivalent rate of the 13-week Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

b. If the Government fails to receive annual appropriations for the Project in amounts sufficient to meet Project expenditures for the then-current or upcoming fiscal year, the Government shall so notify the State. After 60 calendar days, either party may elect without penalty to terminate this Agreement pursuant to this Article or to defer future performance hereunder, except for the operation and maintenance of any functional portion of the project previously turned over to the State; however, deferral of future performance under this Agreement shall not affect existing obligations or relieve the parties of liability for any obligation previously incurred. In the event that either party elects to terminate this Agreement pursuant to this Article, both parties shall conclude their activities relating to the Project and proceed to a final accounting in accordance with Article VI of this Agreement. In the event that either party elects to defer future performance under this Agreement pursuant to this Article, such deferral shall remain in effect until such time as the Government receives sufficient appropriations or until either party elects to terminate this Agreement.

#### ARTICLE XVII - HAZARDOUS SUBSTANCES

a. After execution of this Agreement and upon direction by the Government representative, the State shall perform, or cause to be performed, such investigations for hazardous substances as are determined necessary by the Government or the State to identify the existence and extent of

any hazardous substances regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC 9601-9675, on lands necessary for Project construction, operation, and maintenance. All actual costs incurred by the State which are properly allowable and allocable to performance of any such investigations for hazardous substances shall be included in total project costs and cost shared as a construction cost in accordance with Section 906(e) of Public Law 99-662.

b. In the event it is discovered through an investigation for hazardous substances or other means that any lands, easements, rights-of-way, or disposal areas to be acquired or provided for the Project contain any hazardous substances regulated under CERCLA, the State and the Government shall provide prompt notice to each other, and the State shall not proceed with the acquisition of lands, easements, rights-of-way, or disposal areas until mutually agreed.

c. The Government and the State shall determine whether to initiate construction of the Project, or if already in construction, to continue with construction of the Project, or to terminate construction of the Project for the convenience of the Government in any case where hazardous substances regulated under CERCLA are found to exist on any lands necessary for the Project. Should the Government and the State determine to proceed or continue with construction after considering any liability that may arise under CERCLA, the State shall be responsible, as between the Government and the State, for any and all necessary cleanup and response costs, to include the costs of any studies and investigations necessary to determine an appropriate response to the contamination. Such costs shall not be considered a part of total project costs as defined in this Agreement. In the event the State fails to provide any funds necessary to pay for cleanup and response costs or to otherwise discharge its responsibilities under this paragraph upon direction by the Government, the Government may either terminate or suspend work on the Project or proceed with further work as provided in Article XVI of this Agreement.

d. The State and the Government shall consult with each other under Article V of this Agreement to assure that responsible parties bear any necessary cleanup and response costs as defined in CERCLA. Any decision made pursuant to paragraph c. of this Article shall not relieve any party from any liability that may arise under CERCLA.

e. As between the Government and the State, the State shall be considered the operator of the Project for purposes of

CERCLA liability. To the maximum extent practicable the State shall operate, maintain, repair, replace, and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

ARTICLE XVIII - NOTICES

a. All notices, requests, demands, and other communications required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and delivered personally, given by prepaid telegram, or mailed by first-class (postage-prepaid), registered, or certified mail, as follows:

If to the State:

Director  
Iowa Department of Natural Resources  
Wallace State Office Building  
Des Moines, Iowa 50319-0034

If to the Government:

District Engineer  
U.S. Army Engineer District, St. Paul  
180 Kellogg Boulevard East, Room 1421  
St. Paul, Minnesota 55101-1479

b. A party may change the address to which such communications are to be directed by giving written notice to the other party in the manner provided in this Article.

c. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at such time as it is personally delivered or seven calendar days after it is mailed, as the case may be.

ARTICLE XIX - OBLIGATION OF FUTURE APPROPRIATIONS

Nothing herein shall constitute, nor be deemed to constitute, an obligation of future appropriations by the State of Iowa when such obligation would be inconsistent with the State's constitutional or statutory limitations.

ARTICLE XX - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged

information when requested to do so by the providing party.

ARTICLE XXI - FILING AND RECORDING

A copy of this Agreement shall be filed with the Secretary of State and a second copy of this Agreement shall be recorded with the Clayton County Recorder before it shall be in full force and effect, all pursuant to Iowa Code Section 28.E.8.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY

THE STATE OF IOWA  
DEPARTMENT OF NATURAL RESOURCES

By: \_\_\_\_\_

James T. Scott  
Colonel, EN  
Commanding

By: \_\_\_\_\_

Larry J. Wilson  
Director, Iowa Department  
of Natural Resources

Date: \_\_\_\_\_

1 Sept 1993

Date: \_\_\_\_\_

07/19/93

STATE OF IOWA )  
COUNTY OF POLK )

On this 20 day of July, 1993, before me, a Notary Public in and for said County, personally appeared Larry J. Wilson, who stated that he is the duly appointed and acting Director of the Iowa Department of Natural Resources, that he was authorized to execute the foregoing Agreement on behalf of the Iowa Department of Natural Resources, and that he executed the foregoing Agreement as his voluntary act and deed, and as the voluntary act and deed of the Iowa Department of Natural Resources.



Notary Public  
in and for the State of Iowa

CERTIFICATE OF AUTHORITY

I, Michael H Smith, do hereby certify that I am ~~the~~ an Assistant Attorney General of the State of Iowa, that the State of Iowa is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the State of Iowa in connection with the Bussey Lake Habitat Rehabilitation Project, Clayton County, Iowa, and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, as amended, and that the persons who have executed this Agreement on behalf of the State of Iowa have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this Certificate this 10<sup>th</sup> day of August, 1993.

Michael H Smith  
Assistant Attorney General  
State of Iowa

ATTACHMENT TO THE LOCAL COOPERATION AGREEMENT BETWEEN THE  
DEPARTMENT OF THE ARMY AND THE STATE OF IOWA  
FOR CONSTRUCTION OF  
THE BUSSEY LAKE HABITAT REHABILITATION PROJECT  
CLAYTON COUNTY, IOWA

CERTIFICATION REGARDING LOBBYING

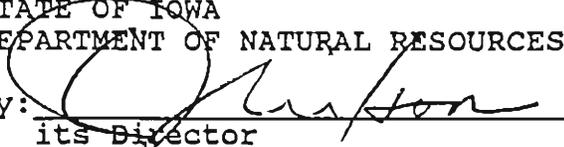
The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

STATE OF IOWA  
DEPARTMENT OF NATURAL RESOURCES  
by:   
its Director

AMENDMENT NUMBER 1  
TO  
LOCAL COOPERATION (28E) AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE STATE OF IOWA  
FOR CONSTRUCTION OF THE  
BUSSEY LAKE HABITAT REHABILITATION PROJECT  
CLAYTON COUNTY, IOWA

THIS AMENDMENT is entered into this 5<sup>th</sup> day of May, 1995, by and between the DEPARTMENT OF THE ARMY (hereinafter the "Government"), acting by and through the U.S. Army Engineer for the St. Paul District (hereinafter the "District Engineer"), and the STATE OF IOWA (hereinafter the "State"), acting by and through the Iowa Department of Natural Resources.

WITNESSETH, THAT:

WHEREAS, the State and the Government entered into a Local Cooperation Agreement on September 1, 1993, for construction of a portion of the Bussey Lake Habitat Rehabilitation Project (hereinafter the "Agreement"); and

WHEREAS, changed conditions require the development of an additional dredged material placement site to complete the dredging portion of the Bussey Lake Habitat Rehabilitation Project; and

WHEREAS, the dredged material placement site is located outside the boundaries of the Upper Mississippi River National Wildlife and Fish Refuge; and

WHEREAS, Subsection 906(e) of Public Law 99-662 authorizes the Secretary of the Army to undertake activities to enhance fish and wildlife resources and further provides that under certain specified circumstances the first costs of such enhancement shall be a Federal cost and when such specified circumstances are not satisfied, 25 percent of such first costs shall be provided by the non-Federal interest; and

WHEREAS, the Parties agree that the specified circumstances referred to in Subsection 906(e) of Public Law 99-662 are not present and the State agrees to assume the non-Federal share discussed in the preceding WHEREAS provision as it relates to construction of the dredged material disposal site located at and adjacent to Willow Island; and

WHEREAS, the Government and the Local Sponsor have the legal authority and capability to perform as hereinafter set forth.

NOW THEREFORE, the Parties agree as follows:

1. Unless otherwise provided, all Sentence, Paragraph, and Article references are to Sentences, Paragraphs, and Articles in the Agreement.

2. Paragraph a. of Article I shall be amended to read:

"The term "Project" shall mean the addition of a gated structure on an existing 66-inch-diameter culvert that allows Buck Creek to enter the upper end of Bussey Lake; and improvements needed at and adjacent to Willow Island to enable the proper disposal of dredged material (hereinafter referred to as the "Willow Island site") as generally described in the Definite Project Report entitled "Bussey Lake Habitat Rehabilitation and Enhancement Project, Pool 10, Upper Mississippi River, Clayton County, Iowa", dated August 1990 and approved by the Assistant Secretary of the Army (Civil Works) on June 10, 1991 (hereinafter referred to as the "Definite Project Report"). The term "Project" does not include the dredging of Bussey Lake or the placement of dredged material from Bussey Lake into the Willow Island site."

3. Paragraph d. of Article II shall be amended to read:

"As further specified in Article III hereof, the State shall provide all lands, easements, rights-of-way, including those necessary for suitable borrow and dredged or excavated material disposal, determined by the Government to be necessary for construction, operation, and maintenance of the Project."

4. The first sentence of Paragraph a. of Article III shall be amended to read:

"The State shall furnish to the Government all lands, easements, and rights-of-way, including those necessary for suitable borrow and excavated or dredged material disposal, as may be determined by the Government to be necessary for the construction, operation, and maintenance of the Project, and shall furnish to the Government evidence supporting the States's legal authority to grant rights-of-entry to such lands."

5. Paragraph a. of Article VI shall be amended by deleting the second and third sentences and replacing them with the following two sentences:

"Total project costs are currently estimated at \$846,000. In order to meet its share, the State must provide a cash contribution currently estimated to be \$211,500."

6. Paragraph c. of Article VI shall be amended to read:

"In the event that total project costs are expected to exceed the estimate given at the outset of construction, the Government shall, to the extent not prohibited by law or regulation, immediately notify the State of the additional contribution it will be required to make to meet its share of the revised estimate. Within 45 calendar days thereafter, the State shall provide the Government the full amount of the additional required contribution."

7. Paragraph a. of Article XVIII shall be amended by deleting the existing address for the Government and replacing it with the following address for the Government:

"District Engineer  
St. Paul District  
U.S. Army Corps of Engineers  
190 Fifth Street East  
St. Paul, Minnesota 55101-1638"

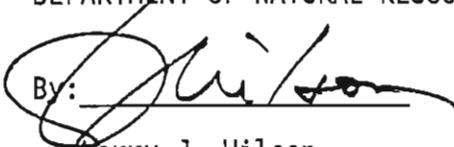
8. The first sentence of the Agreement (i.e., "THIS AGREEMENT...") shall be amended by deleting "Assistant Secretary of the Army (Civil Works)" and replacing it with "U.S. Army Engineer for the St. Paul District (hereinafter the "District Engineer")".

9. The last sentence of the Agreement (i.e., "IN WITNESS WHEREOF...") shall be amended by deleting "Assistant Secretary of the Army (Civil Works)" and replacing it with "Department of the Army."

10. All terms and conditions of the aforementioned Local Cooperation Agreement shall remain in full force and effect, except as expressly modified herein.

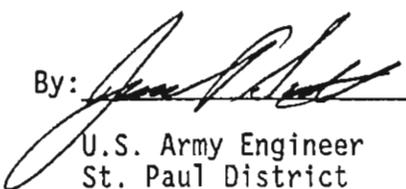
IN WITNESS WHEREOF, the parties have executed this Amendment on the date first above written.

THE STATE OF IOWA  
DEPARTMENT OF NATURAL RESOURCES

By: 

Larry J. Wilson  
Director  
Iowa Department of  
Natural Resources

THE DEPARTMENT OF THE ARMY

By: 

U.S. Army Engineer  
St. Paul District

Date: 5 May 95

CERTIFICATE OF AUTHORITY

I, Michael H Smith, do hereby certify that I am the <sup>an</sup> ~~Assistant~~ Attorney General of the State of Iowa, that the State of Iowa is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the State of Iowa in connection with the Bussey Lake Habitat Rehabilitation Project, Clayton County, Iowa, and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, and that the persons who have executed this Agreement on behalf of the State of Iowa have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this Certification this 2nd day of May, 1995.

Michael H Smith  
Assistant Attorney General  
State of Iowa

**AMENDMENT NUMBER 1  
BUSSEY LAKE HABITAT REHABILITATION PROJECT  
CERTIFICATION REGARDING LOBBYING**

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

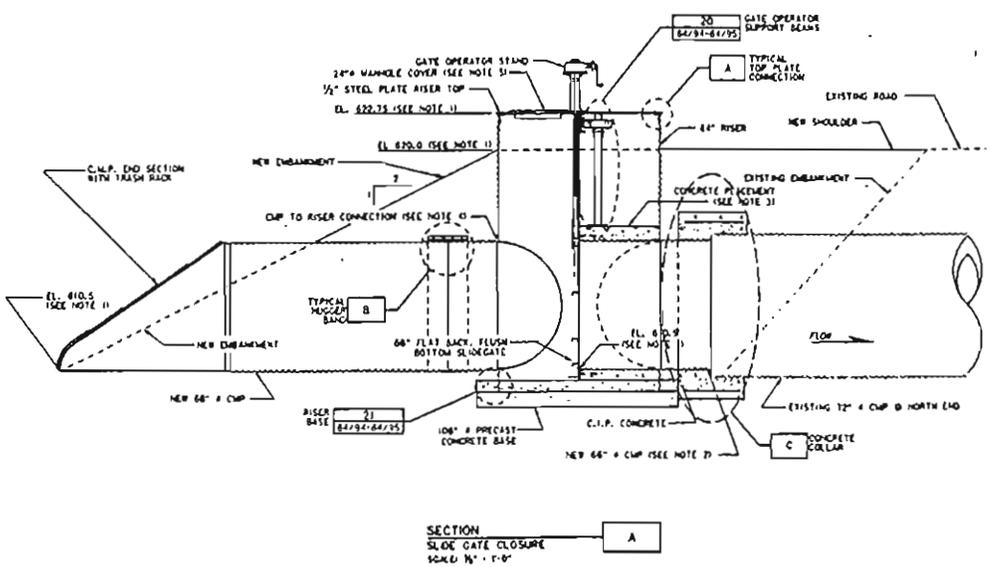
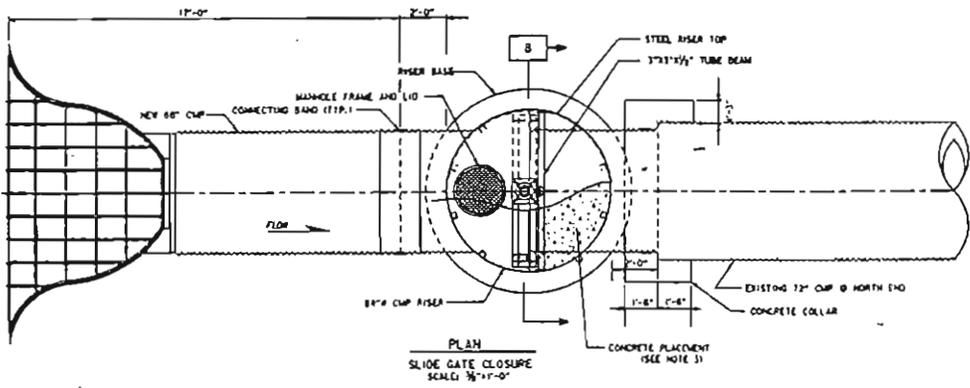
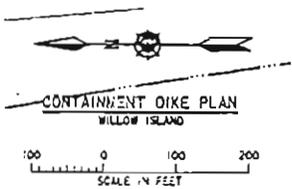
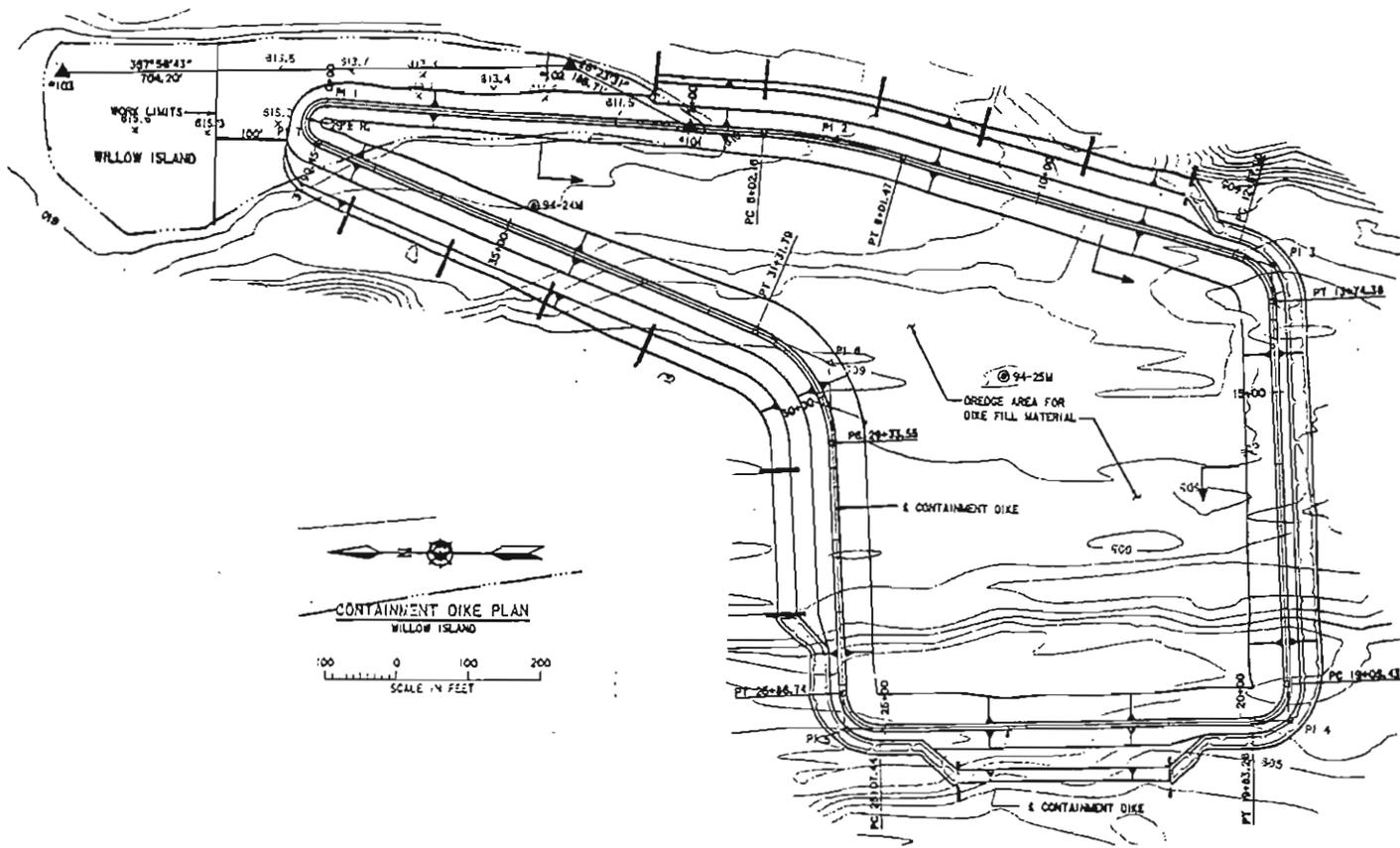
STATE OF IOWA  
DEPARTMENT OF NATURAL RESOURCES

by:   
Director

APPENDIX C

CHECKLIST FORM COVERING INSPECTIONS





SECTION  
SLIDE GATE CLOSURE  
SCALE 1/4" = 1'-0"

APPENDIX D

MANUFACTURER'S GATE OPERATION AND MAINTENANCE INSTRUCTIONS

**OPERATING AND MAINTENANCE INSTRUCTIONS  
FOR  
SLUICE GATES AND SLIDE GATES**

**CONTRACT NO. DACW37-95-C-0002**

**PROJECT**

**BUSSEY LAKE STAGE 2, ENVIRONMENTAL MANAGEMENT PROGRAM,  
UPPER MISSISSIPPI RIVER, POOL 10  
CLAYTON COUNTY, IOWA**

**ENGINEER**

**U.S. ARMY CORPS OF ENGINEERS  
ST. PAUL, MINNESOTA**

**CONTRACTOR**

**TAYLOR CONSTRUCTION, INC.  
P.O. BOX 10  
NEW VIENNA, IOWA 52065**

**HYDRO GATE REPRESENTATIVE**

**CONTECH CONSTRUCTION PRODUCTS, INC.  
5883 S.W. 29TH STREET  
TOPEKA, KS 66614  
(913)273-5950  
(913)273-1205 FAX**

**HYDRO GATE ORDER NUMBER**

**94-0685**

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**TOOLS:**

Hydro Gate Drawing F0685007

**NOTES:**

**Spare Parts:** Hydro Gate does not recommend the stocking of spare parts. Replacement parts are readily available for worn or broken parts. Contact the Hydro Gate Corporation or our representative in your area.

**Price List:** Prices for individual parts and/or assemblies may be obtained from the Hydro Gate Corporation at the time they are needed.



**Hydro Gate Corporation**

6101 DEXTER STREET • COMMERCE CITY, COLORADO 80022  
(303) 288-7873  
FAX (303) 287-8531

**WATER CONTROL GATE GUARANTEE**

For a period of one year from the date indicated, Hydro Gate Corporation hereby guarantees that its water control gates will be free from defects in material and workmanship and agrees to repair or, at its discretion, replace any part or parts found defective within such one year, provided the Purchaser gives immediate notice of such defect, and such defect, in the opinion of Hydro Gate Corporation clearly demonstrates the existence of defective materials or workmanship.

This guarantee is applicable only if the product is properly stored and protected as prescribed by us, between the interval of its receipt by the buyer and actual installation and the product is properly installed and lubricated in accordance with our instructions.

The liability of Hydro Gate Corporation shall not in any case exceed the cost of repairing or replacing the defective parts. The guarantee and the remedies provided for defective parts set forth above are in lieu of and shall supersede any and all guarantees or warranties, express or implied, or remedies provided by law or otherwise (including those set forth in purchase order forms or other sales documents). In no event shall Hydro Gate Corporation be liable for loss of income, any other expenses, consequential damages or incidental damages. At the end of said one year, all liability of Hydro Gate Corporation shall cease and terminate.

Hydro Gate Corporation guarantees equipment of other manufacturers only insofar as such equipment is guaranteed to it. Information with respect to such guarantees is available on request.

Project: Bussey Lake Stage 2, Environmental Management  
Program, Upper Mississippi River, Pool 10  
Clayton County, Iowa  
Hydro Gate Sales Order No. 94-0685

Hydro Gate Corporation

*Kent C Schlundt*

Kent Schlundt

Effective Date: Start Up

Title: Design Engineer



# Hydro Gate Corporation

6101 DEXTER STREET • COMMERCE CITY, COLORADO 80022  
(303) 288-7873  
FAX (303) 287-8531

### Manufacturer's Certificate of Compliance

**Project:** Bussey Lake Stage 2, Environmental Management Program, Upper Mississippi River, Pool 10  
Clayton County, Iowa  
Hydro Gate Sales Order No. 94-0685

**Gates:** ~~1 - 24 X 24 Sluice Gate Series 501~~  
~~Location: Gate Well No. 4~~  
~~1 - 24 X 24 Sluice Gate Series 501~~  
~~Location: Gate Well No. 3~~  
~~2 - 24 X 24 Fabricated Slide Gates~~  
~~Location: Junction Box~~  
1 - 66 X 66 Fabricated Slide Gates  
Location: Slide Gate Closure  
~~1 - 24 Dia. Light Duty Sluice Gate Model 1010~~  
~~Location: Outlet No. 3~~

This is to certify that the equipment furnished by Hydro Gate Corporation for the above-referenced project will meet or exceed the requirements as set forth in the project plans and specifications.

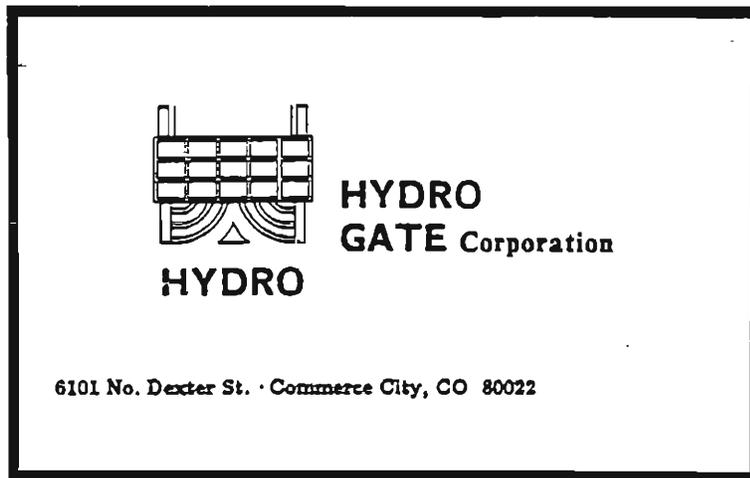
When Cast Iron Sluice Gates are furnished, Hydro Gate Corporation certifies compliance to AWWA C-501 standards for Cast Iron Sluice Gates.

**Hydro Gate Corporation**

By Kent C Schlundt  
Kent C. Schlundt

Title Design Engineer

**INSTALLATION, OPERATION, and MAINTENANCE MANUAL**  
**for**  
**HYDRO FABRICATED SLIDE GATES**



**DO NOT DISASSEMBLE GATE FOR INSTALLATION**

The purpose of this booklet is to give information on correct procedures for installation, adjustment, operation and maintenance of the Hydro Slide Gate and its component parts.

The gate, lift and accessories were accurately machined, assembled, adjusted and inspected before leaving the factory. For best results, follow the applicable parts of this installation booklet carefully, including thorough cleaning and lubrication of moving parts.

## CAUTIONARY STATEMENT FOR INSTALLATION MANUAL

This manual describes the recommended procedures for installation, adjustment, operation and maintenance of Hydro Gate gates. When it is used in conjunction with installation drawings that have been supplied by Hydro Gate, this manual will be sufficient for most installations. Proper care and precautions must be taken in handling and storing the gates at the delivery site. For further details on the handling, storing, and installation of a specific project, contact Hydro Gate headquarters.

PRECISE AND ACCURATE INSTALLATION IS CRITICAL TO SATISFACTORY OPERATION. HYDRO GATE ASSUMES NO LIABILITY, EXPRESSED OR IMPLIED, FOR INTERPRETATION OF THE CONTENTS OF THIS MANUAL. IF YOU HAVE ANY QUESTIONS CONCERNING THE INTERPRETATION OF THE CONTENTS OF THIS MANUAL OR INSTALLATION PROCEDURES IN GENERAL, YOU SHOULD CONTACT HYDRO GATE HEADQUARTERS. HYDRO GATE EXPRESSLY DISCLAIMS ALL LIABILITY, EXPRESSED OR IMPLIED, FOR FAULTY INSTALLATION OF ANY GATE OR ASSOCIATED EQUIPMENT AND FOR ANY DIRECT, CONSEQUENTIAL, OR INCIDENTAL DAMAGES THAT MAY RESULT.

## Do's & Don'ts

In order for you to complete this installation in the most effective manner, we recommend that the personnel responsible for installation of the gates study these instructions and the Installation, Operation and Maintenance Manual before the gate shipment arrive, and follow the directions carefully during installation.

Hydro Gate products are precision machined, shop adjusted, and quality checked water control equipment, intended for low leakage characteristics. Although durable and heavily constructed, attention must be given to proper storage, careful handling, and accurate location of embedded items for the gate structures to operate as designed.

### INSTALLATION

Some DO'S and DON'T'S to assure your achieving a proper gate installation.

DO-----read and follow the Installation, Operation and Maintenance Manual instructions.

DO-----carefully inspect the gates and accessories when received, prior to unloading trucks or cars. Report ALL shortages or suspected damage by marking the Bill of Lading and Receiving Reports at this time.

DO-----store gates evenly on planks or timbers. Even

the heaviest castings are subject to permanent warpage if unevenly blocked during storage.

DO-----support stems for their full length when handling and protect threaded portions during storage and handling.

DO-----accurately locate and brace embedded items during placement of concrete.

DO-----store automatic lifts (cylinders, electrical actuators) in dry storage or under cover until installation. These units are not "weatherproof" until fully installed and functioning, and Hydro Gate guarantees these units only to the extent the manufacturer guarantees them to Hydro Gate. Refer to the manufacturer's storage instructions.

DO-----request your hydraulic or electrical subcontractor to familiarize themselves with the installation, adjustment and operating instructions furnished for automatic lifts during approval submittal. Manufacturer's assistance in setting and adjusting these units is not included in the contract agreement unless specifically required. A purchase order is required for field service to adjust and inspect the installation. Field service rates are available on request.

DO-----contact your

Hydro Gate representative with any questions you may have regarding Hydro Gates. Hydro Gate and its related companies have 100 years combined experience in the water control industry.

DON'T-----stack gates without heavy wood blocking between gates.

DON'T-----disassemble the gates for installation.

DON'T-----allow excess concrete to overlap gate thimble or frame.

DON'T-----tighten nuts for studs or anchors unevenly, or try to pull a gate frame tightly against an uneven wall surface. This, in most cases, will always cause excessive leakage.

## Instructions for placing flange back gates on concrete (Per figures 1 - 4)

1. Secure all anchor bolts in proper position in the forms. For proper size, length, projection and spacing, see installation drawing.

2. Two nuts are provided per bolt. Sufficient grout space must be left for adjustment of the back nut on the anchor bolt.

3. Pour concrete as required. Strip forms.

4. Place a nut on each anchor bolt and establish a flat vertical plane as close as possible to the wall using taugt lines, plumb lines or

straight edges. Starting with upper corner anchor bolt back nuts, drop a plumb line down past the face of the nut. Bring the other back nuts up to the plumb line. Using a straight edge or taugt line, bring back nuts on anchor bolts across top and bottom in line with nuts on corner anchors.

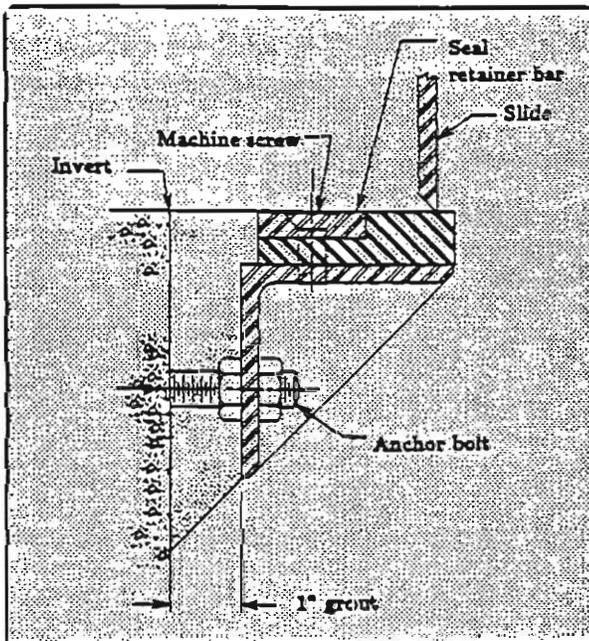
5. Place assembled gate in position on the anchor bolts. Install front nuts and tighten being careful not to move the back nut out of the plane established in No. 4 above.

6. Carefully grout in the

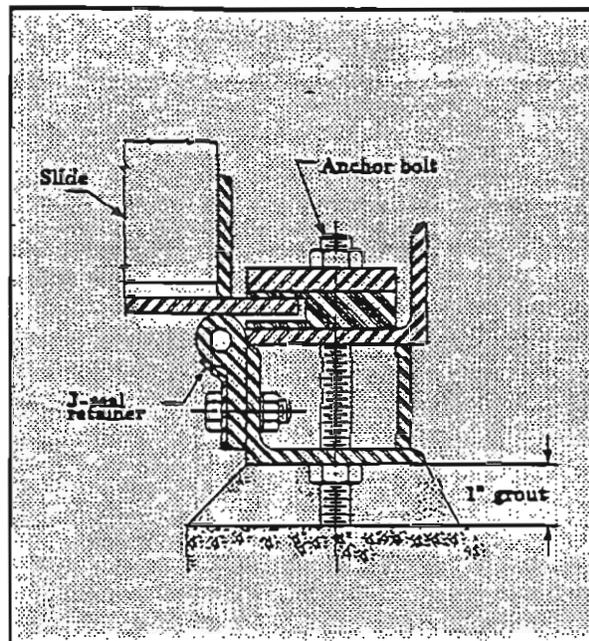
gates with a cement based "non shrink" grout such as U.S. Grout Corporation "5 Star grout".

7. After the grout has set, make certain there are no voids between the gate seat and the concrete. (NOTE: Due to possible shrinkage of certain types of grout, it may be necessary to loosen the gate and apply a sealing compound between the gate seat and the wall).

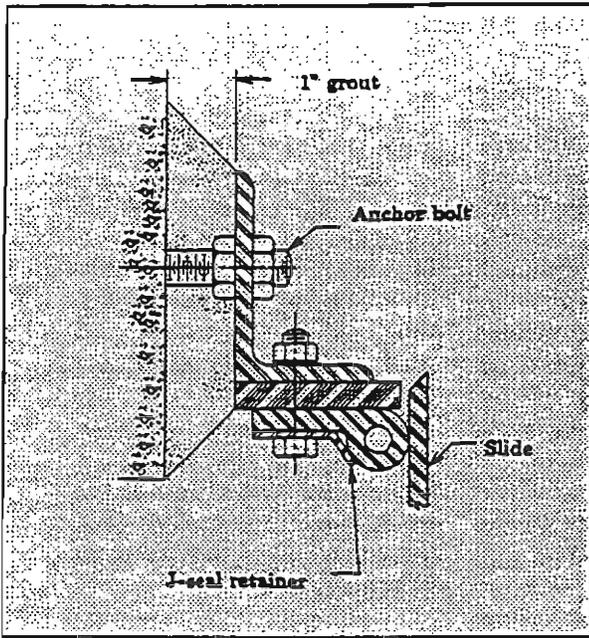
8. Tighten all nuts or anchor bolts UNIFORMLY, but DO NOT WARP GATE TO CONFORM TO UNEVEN SURFACE.



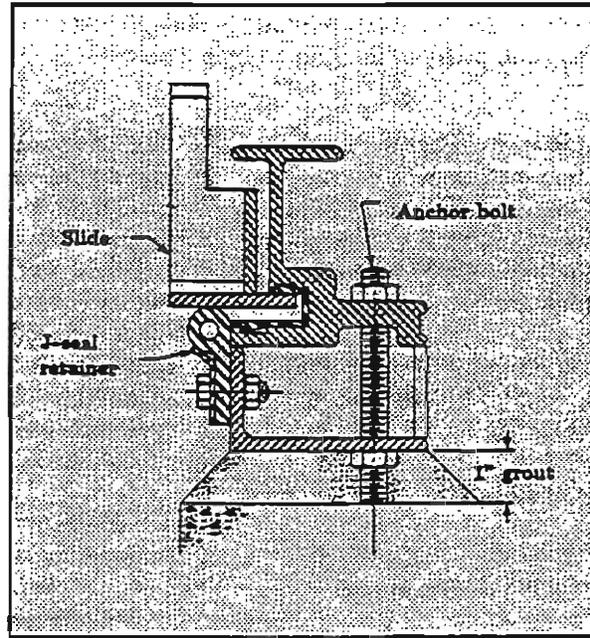
**Figure 1**  
Flange Back Bottom Section



**Figure 2**  
Flange Back Side Section



**Figure 3**  
**Flange Back Top Section**



**Figure 4 (Aluminum)**  
**Flange Back Side Section**

### **Flange back gate mounted to steel flange or plate**

1. Flange back gate may be mounted on a steel plate or flange provided the flange is flat within  $\pm 1/16$  of true flat plane. Use mastic such as Sika-Flex 1A or rubber gasket in the flange joint.
2. Tighten flange joint bolts uniformly. **DO NOT WARP THE GATE TO AN UNEVEN SURFACE.**

## Instructions for placing spigot back gate if concrete is poured before gate is in place. (Per figure 5)

1. Secure anchor bolts in proper position in the forms. For the proper size, length, projection and spacing, see gate installation drawing. A recess must be provided around the perimeter of the gate seat. The recess is necessary because of the spigot.

2. Pour concrete as required. Strip forms.

3. Two nuts have been provided for each anchor bolt for use with other methods of installation. For best results on this type installation, use only one nut on each anchor bolt. Place

the completely assembled gate into position on the anchor bolts, aligning anchor bolts as required. Block gate in correct position with respect to the location of the stem guides and lift. Bring nuts on anchor bolt into light uniform contact with gate. Check proper alignment on gate with respect to final location of stem, stem guides (if used) and lift.

4. Some gates have top frame members and may have anchor bolts to align and stabilize the top member. See the installation drawing for the specific

type and placement of anchors. The top member should be aligned so that it is straight and if equipped with a seal, the seal should make contact with the slide.

5. Carefully grout in the gate.

6. After the grout has set, make certain that there are no voids between the gate seat and the concrete. Refill voids with grout or sealing compound if necessary.

7. Tighten all anchor bolts uniformly, but do not warp gate to conform to uneven surface.

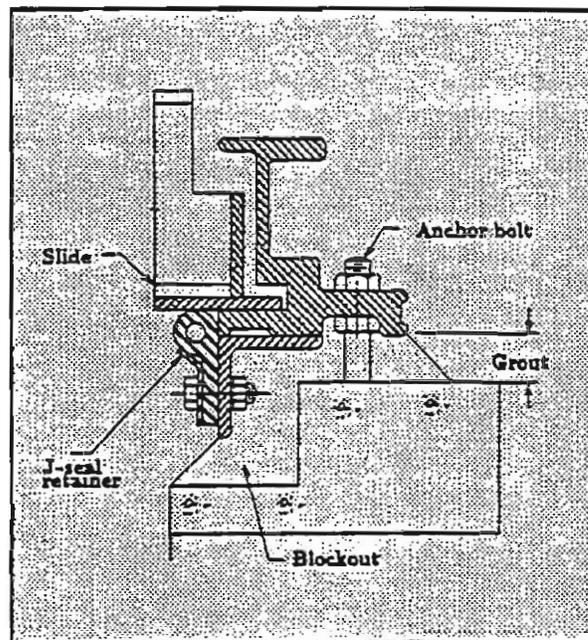


Figure 5  
Spigot Back Side Section

**Instructions for installation of flat back gates, concrete poured before gate is in place (Per figures 6, 7, 8 and 9)**

1. Secure all anchor bolts in proper position in the forms. For proper size, length, projection and spacing, see installation drawing.

2. Two nuts are provided per bolt. Sufficient grout space must be left for adjustment of the back nut on the anchor bolt.

3. Pour concrete as required. Strip forms.

4. Place on nut on each anchor bolt and establish a flat vertical plane as close as possible to the wall using taught lines, plumb lines or straight edges. Starting with upper corner anchor bolt back nuts, drop a plumb line down past the face of the

nut. Bring the other back nuts up to the plumb line. Using a straight edge or taught line bring back nut on anchor across bottom in line with nuts on lower corner anchors.

5. Place assembled gate into position on the anchor bolts. Install from nuts and tighten being careful not to move the back nut out of the plane established in No. 4 above.

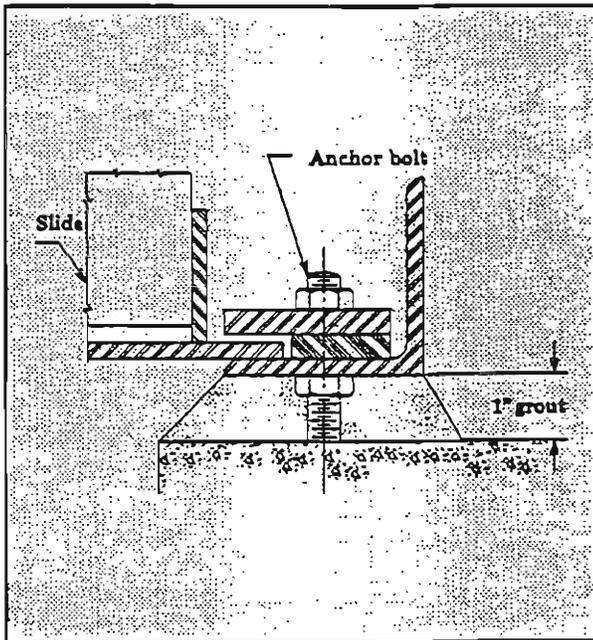
6. Align the horizontal top cross flat member with the gate frame. Drill 3/8" by 3" deep holes in concrete using this flat as a template. Install cinch anchors, using washers, shims or blocks between the flat and the concrete wall to maintain

frame alignment and straightness across the top. Tighten cinch anchor bolts uniformly.

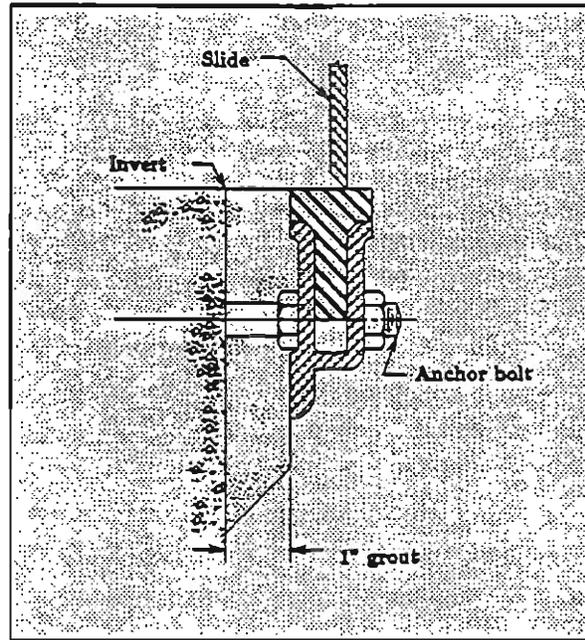
7. Carefully grout in the gate with "non shrink" grout.

8. After the grout has set, make certain there are no voids between the gate seat and the concrete. (NOTE: Due to possible shrinkage of certain types of grout, it may be necessary to loosen the gate and apply a sealing compound between the gate seat and the wall.)

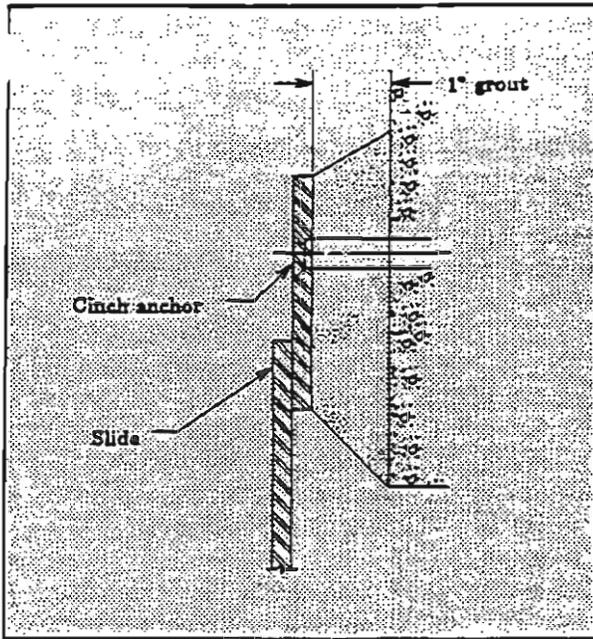
9. Tighten all nuts or anchor bolts **UNIFORMLY**, but **DO NOT WARP GATE TO CONFORM TO UNEVEN SURFACE**.



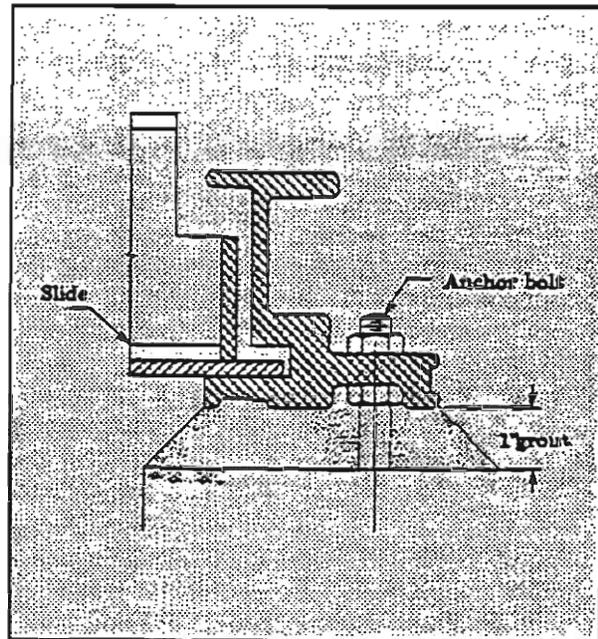
**Figure 6**  
Flat Back Side Section



**Figure 7**  
Flat Back Bottom Section



**Figure 8**  
Flat Back Top Section



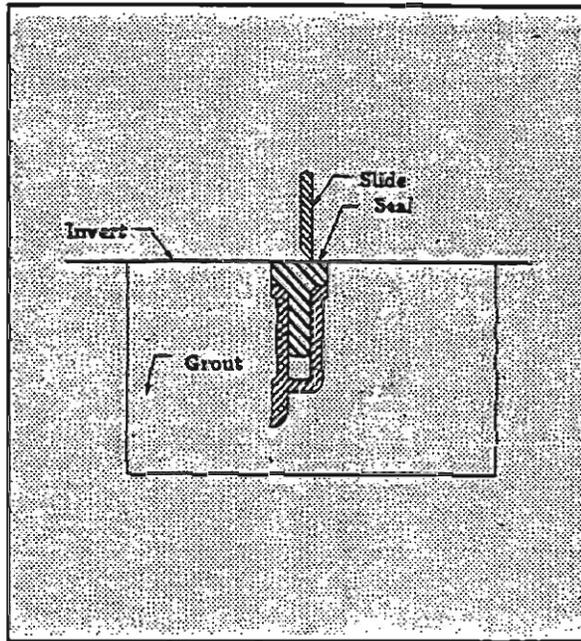
**Figure 9 (Aluminum)**  
Flat Back Side Section

### Installation of flush bottom closure gates (Per figure 10)

1. Those gates that are to be installed with bottom frame members embedded in the concrete are furnished with a rubber seal attached to the invert of the gate frame. The top surface of the rubber seal is installed at the same elevation as the invert of the gate opening. Check the installation drawing.

2. Form a recess for the bottom of the gate in the original pour of concrete. The dimensions of this recess are shown on the installation drawing.

3. After the forms are stripped, install the gate as shown for other types of installations in this manual.



**Figure 10**  
Embedded Bottom Section

## Installation for placing gates in a concrete channel after original pour of concrete has been made (Per figures 11 or 12)

1. A recess must be made in the original pour of concrete to receive the gate. For a minimum width and depth of this recess, see the installation drawing. These gates should all be flush bottom closure type. A recess for the flush bottom closure is required in the invert of the structure. (See figure 10.)

2. Pour concrete. Strip forms including removal of material used to form the block out.

3. Set the completely assembled gate in the recess

along the sides and across the bottom of the structure. Anchor bolts are not required since the irregular shape of the section serves to hold the gate frame in position after grouting.

4. By blocking and shimming, align the gate in the vertical position. Use care to maintain the slide and the side guides in a plane without warping or distorting the guides and bottom member of the frame. Use plumb lines and spirit levels to be certain that the frame is straight and plumb before pouring

concrete, or grouting.

5. Carefully grout the gate in position.

6. After the grout has set, make certain that there are no voids between the gate frame and grout. When voids are detected, refill with the grout or seal with a compound that has low cold flow characteristics.

7. Large gates may have clips which help stabilize the frame during shipment and installation. Remove these clips after installation and prior to operation.

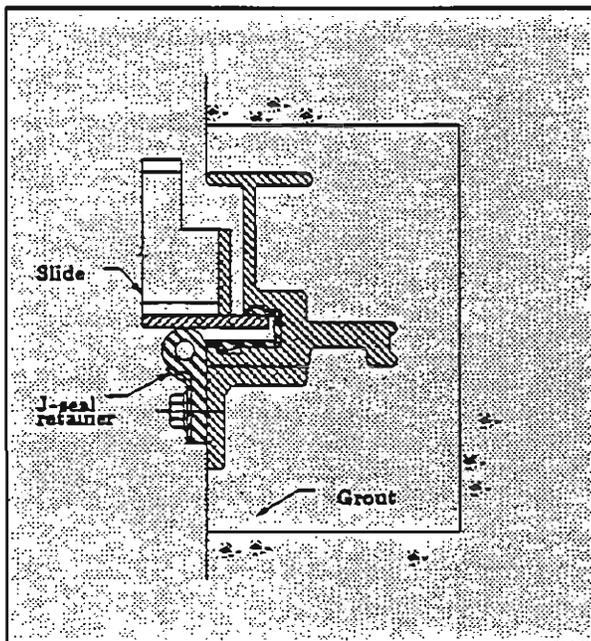


Figure 11 (Aluminum)  
Embedded Side Section

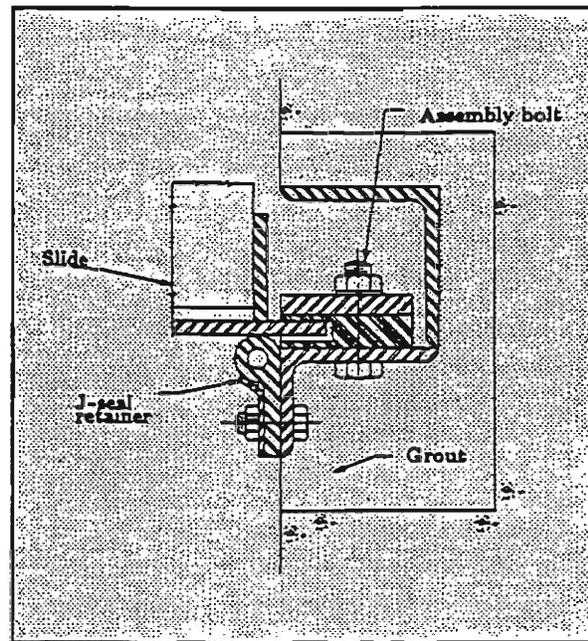


Figure 12  
Embedded Side Section

## Lift installation and adjustment of stem guides (For gates not self-contained)

1. Manual devices are shipped with plastic plugs in the top and bottom of the tapped hole through the lift nut. Remove these plastic plugs. Check the interior of the threaded nut to make sure it is clean and that no foreign material has collected on the threads. Swab out threaded lift nut if necessary.

2. Clean threaded section of stem of all foreign material and lubricate with a grease similar to Lubriplate No. 630AAA or AA.

3. The top section of the stem may be threaded into the lift before or after the last section of stem is in place. When starting threaded stem into bottom of lift nut, care must be taken to avoid damage to the threads. Rough handling may result in damage to the bottom edge of the threaded lift nut and prevent the stem from being screwed into the lift nut freely. When all

parts are thoroughly cleaned, the threaded lift nut will turn onto the threaded stem with very little effort. Hold lift to prevent its rotation. Turn the handwheel or crank to lower the pedestal onto its anchor bolts.

4. By use of shims, double nuts on anchors, or other leveling devices under the base of the lift, align centerline of the stem. Snug up nuts on anchor uniformly.

5. The handwheel or crank should be able to be turned freely in both directions. If there is any binding during the operation of the lift with the slight vertical movement of the gate slide, stem alignment should be checked. Slight misalignment will cause undue wear to the threaded lift nut. When binding is not caused by misalignment, recheck to make certain threads on stem and in lift

nut are lubricated with clean grease.

6. Grout under the lift is required.

7. After grout has set, tighten the anchor bolts uniformly. With the gate in the fully closed position, run stop nut down on the top of the projecting threaded stem until it makes contact with the top of the lift. A gap of 1/16" is advisable to allow for wear and extra travel to seat the gate right. Tighten the set screw through the stop nut to hold it in position.

8. Turn lift crank or handwheel to open gate. The stem is now in tension and should be straight. Check stem to make certain it is straight. Then tighten all nuts on anchors on stem guides.

9. Electric lifts generally have 2-piece nuts, to simplify operator installation. See the electric operator manual for nut installation instructions and limit switch adjustment.

## Installation of tandem stems

Weir gates usually have wide openings with relatively short gate heights. When the installation drawings show tandem lifts, install each lift in accordance with the preceding steps 1 through 5. After each lift has been installed and each stem is

connected to the gate slide at the bottom and the lift at the top, proceed as follows.

1. Turn the input shaft of each lift in the direction to open the gate until each stem makes firm contact with the top of its

connection on the gate slide.

2. Place a level on the top of the gate slide and move one stem or the other of the gate up or down until the slide is completely level.

3. A tandem inter-

connecting shaft is furnished to connect the two lifts and cause them to act in unison for raising or lowering the gate. Loosen the fasteners on one of the jaws of the flexible coupling and slide it towards the center of the shaft until the shaft can be connected between the two lifts. Complete the connection and retighten all fasteners.

4. Move the gate slide up and down by turning the input shaft of one lift. Check to make sure the gate is installed with its top level and it is moving freely.

5. Complete the installation of any stem guides, lubricate the stem, adjust stop nuts, and so forth as described in the preceding steps 1 through 9.

## Leakage

The most frequent cause of excess leakage through a newly installed gate is improper installation and/or failure to make final adjustments to the gate before it is put into operation. When you encounter this problem, you should first verify the Hydro's installation instructions have been carefully followed and that final adjustments and greasing has been accomplished. If they haven't been, then follow through on step-by-step procedure of adjustments as outlined in the appropriate instructions.

Another important check is to make sure that gates have not been disassembled for installation. The outside of our installation booklet shows, "DO NOT DISASSEMBLE GATE FOR INSTALLATION". This is repeated in the text of the manual at several critical locations. Occasionally, we still find that gates are disassembled for easier handling, painting, etc. When it is absolutely necessary to partially disassemble a gate or remove the slide to facilitate installation, use extreme care in handling the parts, particularly the frame. With out the slide in place, the frame is very fragile. Hydro Gate can not be responsible for performance problems caused by rough handling and damage to gate parts.

As pointed out above and in our installation instructions,

the amount of leakage through gates is highly dependent upon the quality of installation.

In the case of fabricated slide gates without rubber seals, there are no machined seating faces or wedging devices. THESE GATES ARE RECOMMENDED FOR SEATING HEADS ONLY. Slides are somewhat flexible under maximum seating heads. This slight deflection is helpful as it caused the gate slide to seat against the frame and be fairly watertight under the maximum head. THERE IS PROBABLY MORE LEAKAGE THROUGH THIS TYPE OF GATE WITH ONLY A FEW INCHES OF WATER ON THE GATE THAN THERE IS WITH MAXIMUM HEAD. As in gates with machined faces, fine particles in the water have an additional benefit of sealing the small space between faces after the gates have been closed for awhile. Rubber "J" seals can be provided to improve the watertightness of these models. The rubber seal is mounted on the back side of the gate frame or on the inside wall of the gate opening with the bulb of the seal making contact with the back of the slide. There is no standard leakage for fabricated slide gates. Fabricated gates with seals, properly installed and adjusted, can be expected to have leakage rates similar to AWWA standards for Heavy Duty Sluice Gates. This rate is 0.1 gallon per

foot of seating perimeter and 0.2 gallons per minute per foot of unseating perimeter. If the gate must be used or tested in the unseating direction, the rubber seals may have to be adjusted tighter. This may cause some additional crank effort if the gate is then used in a seating head.

## Maintenance summary and lubrication sheet for Sluice Gates and Fabricated Slide Gates and Manual Lifts

### 1. GENERAL CLEANING AND INSPECTION

Frequency: As often as conditions require or permit, or every six months.

### 2. INSPECT STEM THREADS AND LIFT NUT FOR WEAR

Frequency: Initial inspection after 24 cycles, subsequent inspection after 48 cycles, operational inspection after each 100 cycles, or every six months, whichever occurs first.

### 3. CHECK STEM FOR LUBRICANT, ADDING LUBRICANT IF NECESSARY

Frequency: After 100 cycles, or six months, whichever occurs first.

Lubricant: Mixture of 24 fluid ounces of \*\*\*La-Co Slic-Tite Paste" and one gal. of \*Fiske Bros. "Lubriplate No. 630 AAA or AA" (An equal alternate for "Slic-Tite" is

"Dayton Pipe Thread Sealant Paste with Teflon," Stock No. 4X222 or No. 5X998, available at W.W. Grainger, Inc., stores in major cities.)

Cleaning: When grease is dried and/or contains foreign material.

### 4. PRESSURE GREASING OF LIFT THROUGH THE GREASE FITTINGS

Frequency: After each 100 cycles, or six months, whichever occurs first.

Lubricant: \*Fiske Bros. "Lubriplate No. 630 AAA"

### 5. CLEAN AND GREASE SEATING FACES, ALSO WEDGE SURFACES ON SLUICE GATES

Frequency: Every six months

Lubricant: \*Fiske Bros. "Lubriplate No. 630 AAA or AA"

NOTE: For water treatment plants, use a

vegetable base lubricant - "lubriplate Super FML-2."

\*Equivalents to Fiske Bros. "Lubriplate No. 630 AAA or AA"

A) Conoco's "All Purpose Superlube"

B) Texaco's "Multi Fax Heavy Duty No. 2"

C) Shell Oil Company's "Alvania No. 1"

D) Mobil's "Mobilux EP2"

E) Fiske Bros. "Lubriplate No. 630 AA"

F) Exxon "Ronex MP"

\*\*La-Co Slic-Tite Paste available at Plumbing Supply Stores, or order from:

La-Co Industries Inc.  
270 N. Washtenaw Ave.  
Chicago, IL 60612  
(312) 826-1700

## Installation of dial indicator and stem cover

1. Figure 11 shows an exploded view of a mechanical dial position indicator. This is available on both Hydro Gate handwheel lifts and crank lifts.

Adjustment of the indicator can be accomplished in either of the following ways: a or b.

a.1 Place the gate at a known position--full open, full closed, or exactly half open. Full closed is preferred.

a.2 Remove the window screws and window. Loosen

the pointer setscrew, reposition the pointer to the corresponding gate position and retighten the setscrew.

a.3 Replace window.

b.1 Position the gate as in a.1 above

b.2 Remove the window.

b.3 Loosen the jamb nut on anchor screw and adjusting screw. Remove adjusting screw and fork. Be careful not to drop or lose the fork. Back anchor screw part way out.

b.4 Remove indicator

assembly. Rotate the input shaft (sticking out the back) until pointer position matches the gate position.

b.5 Reinsert the indicator assembly, engaging drive gear into lift nut drive sleeve. Re-engage anchor screw just enough to lightly press the plastic frame against the aluminum indicator housing. Tighten the adjusting screw just enough to engage the gear teeth. Do not overtighten. Tighten the jamb nut without changing the screw settings.

b.6 Replace window.

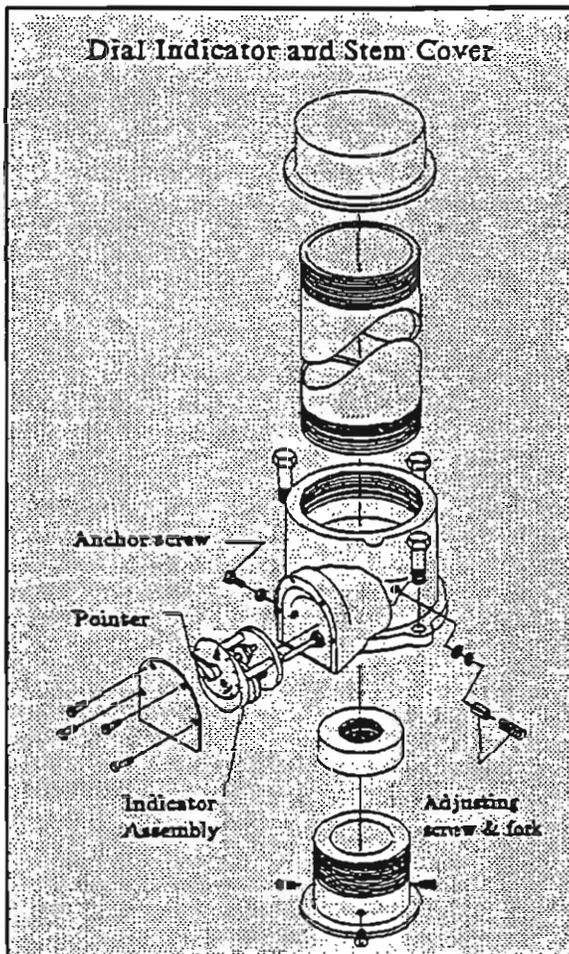


Figure 11

## Maintenance and lubrication instructions

1. Occasional adjustment, lubrication, and painting of gate components may be required. Frequency will depend upon how often the gate is used, its location, and operating conditions. Periodic inspection, cleaning and repainting are recommended as conditions at the site permit.

2. Maintenance of the threaded portion of the gate stem is critical and should be performed as often as required for long life and ease of operation. Thoroughly clean threaded portion of stem and regrease with lubricant similar to Lubriplate 630AAA or AA.

When excess dried grease or other foreign material is carried into the threads of the lift nut, extremely hard operation will result. If serious binding occurs, the only way to correct it is to remove the threaded stem from the lift nut and clean the threaded interior. If this foreign material is not cleaned from the interior threads of the lift nut, heavy pulls on the hand crank or even seizure will result.

3. The lifts have been factory lubricated with a water resistant grease designed to stay pliable and not dry out over long

periods and wide temperature ranges. Periodic pressure greasing of the lift is recommended, applied through the grease fittings. For best results the input shafts of the lift should be turned 3 or 4 times and grease applied to each fitting after each turn. This will insure adequate lubrication of all parts. If lift is equipped with dial indicator, care must be used to prevent grease from interfering with internal gearing of indicator. Grease with Conoco's "All Purpose Superlube," Texaco's "Multi-Fax Heavy Duty Number 2," or Shell Oil Company's "Alvania No. 1," or "Lubriplate No. 630AAA."

## Troubleshooting Fabricated Gates

Fabricated gates depend upon water pressure with a slight deflection of the gate slide to seal. At best, leakage through gates without rubber seals will probably be several times that which occurs through sluice gates. Proper installation and cleaning of seating faces is still necessary to cause the gate to be as watertight as possible.

Excess leakage through fabricated gates may be caused by the following:

### 1. Warped Gate Frame

Check this out by opening the gate slide to its full up position. Use thin wire, string or straight edge to check the gate frame. Stretch the wire along each side. If there is significant ( $1/32''$  or more) variation in the seating face, excess leakage will result in those locations where warpage has occurred. Also use the wire to stretch corner to corner of the opening. If the strings do not touch at the center, then one corner, or the other, has been pulled back considerably from the plane. To repair this faulty installation, it is necessary to loosen bolts, push the frame out as required and align it prior to tightening or regrouting.

### 2. Dirty Seating Faces

Excess leakage can also be caused by foreign material on the seating faces of the gate frame or on the gate

slide. Check for drops of paint, cement runs onto seating faces or other construction grime. To correct, scrape of the foreign material from the perimeter of the seating faces on both slide and frame, and reseat the gate.

### 3. Warped Slide / Over Closure

If leakage occurs primarily at the top near the stem, there is probably excess compression in the stem which is pulling the gate slide from its frame. Check by turning the handwheel or crank of the lift in the direction to open the gate. When excess pressure on the stem is removed, the slide will spring back into position. Reset the top nut, or adjust torque or limit switches as described below in the section entitled Lifts and Stems.

### 4. Warpage of the Top Frame Member

If leakage occurs primarily at the top, and the slide is not warped or being pushed out of position, then check to make sure that the top frame member has not been pulled back against the concrete. This is especially likely to occur on those gates that are wide enough to have expansion anchors in the top frame member. To correct misalignment, loosen the bolts into the cinch anchors and shim behind the top frame member, as necessary, to push it away from the

concrete headwall. Use a straight edge or thin wire stretched along upper frame member to set the member straight. Double check for seal contact or close fit with the slide before regrouting the frame member. This space may also be packed with lead wool or epoxy grout.

### 5. Leakage Past J-Seals

If the J-seals are not making good contact with the slide, the gate will leak excessively. When the seals are properly adjusted, a  $.005''$  -  $.015''$  feeler gauge should not be admitted between the seal and the slide. If a feeler gauge is not available, use a piece of light gauge shipping band material. If the leakage is localized, dewater and open the gate as required to provide access to the seal retainer bolts. Loosen the seal retainer bolts around the area of the leak and pry or pull the seal toward the slide. On occasion, the seal retainer sticks to the seal. If this happens, all the retainer bars on a side need to be loosened and the retainer pried away from the seal before the adjustment can be made.

### 6. Leakage Across the Bottom of Flush Bottom Gates

If there is a sheet of water coming out of the bottom of the gate, then the gate is not completely closed. To completely close the gate, the stop nut or limit switch may need to be reset. When

the gate is properly closed, the slide will be embedded about 1/16" into the flush bottom seal and neither a .005" - .015" feeler gauge nor a piece of light gauge shipping banding will be admitted between the flush bottom seal and the bottom of the slide. Use of flash light or trouble light on the opposite side will also indicate whether or not good contact is being made.

#### 7. Excessive Leakage at the Lower Corners on Flush Bottom Gates

This indicates that the gate is being overclosed. This pushes the side J-seals away from the bottom seal, opening up gaps. To remedy this, turn the crank or handwheel in the open direction just enough to relieve some of the pressure on the bottom seal but not enough to have the bottom of the slide separate from the bottom seal. Slightly opening and slowly closing the gate while watching the leakage will also work. When the point of minimum leakage is found, the stop nut or limit switch should be reset accordingly.

Another possible cause of corner leakage is small gaps between the J-seals and flush bottom seal even without the gate being overclosed. When the seals are dry, these gaps should be filled with caulking, such as silicone to minimize leakage.

#### 8. Stem bends when gate is closed

##### A. Hand operated lifts.

1. Check to make sure that stem guide collars are properly located to hold the stem in alignment. Bolts on collars must be tightened so that the collar is not slipping on the guide bracket.

2. Check to make sure that stem guides are all located properly. If the spacing exceeds that shown on installation drawing, the stems may be deflecting before gates are closed tight.

3. If stem guides are correctly located and collars are tight, then the load being applied to the stem by the lift is in excess of that needed to close the gate, or the load recommended for a particular stem size. Reset the stop nut to prevent an excess load from being applied to the stem after the gate is actually closed.

##### B. Electrically actuated lifts.

1. Check the setting of the bottom torque switch and the limit switch. If the stem is being bent after the gate is completely closed, it indicates that both of these switches are set improperly. The limit switch should have caused the power to be cut the power off before the stem bends. Reset these switches using the instructions prepared by the manufacturer of the electric actuated lift. Set first the limit switch to cut off the power when the gate is fully closed. Adjust the torque switch to apply less push to the stem so that it will not be bent, even if the gate encounters an obstruction

during closure.

##### C. Hydraulic cylinder lifts.

1. Screw the stem further into the stem block or stem splice coupling so that the piston "bottoms" out inside the cylinder when the gate is fully closed; or by means of pressure relief valve, adjust the maximum pressure to the top of the cylinder to prevent overloading the stem when the gate is closed. Be sure to tighten the set screw after adjustment.

#### 9. Excess force is required on handwheel or crank

When this condition exists:

- A. Check first to make sure that the stem is lubricated as recommended.

- B. If a simple application of lubricant does not appear to solve the problem, check for foreign material jammed in nut threads by either disassembly or working back and forth with generous application of penetrating oil and grease.

- C. If the stem is properly greased and the lift nut does not appear to be dirty or binding, check to make sure that the stem, stem guides and lift are in proper alignment. On most installations, the stem will be installed in the vertical position. A carpenter's level can be used to verify that it is in vertical plane in both directions. Check for binding through individual

stem guides. Check the pedestal to make sure that it is vertical in both directions and the stem threads straight through the lift nut.

D. In those locations where the stem is not installed vertically, such as up the face of a dam, alignment can be double checked by use of a thin wire stretched tightly between the top of the slide and the bottom of the lift. Realign by adjusting the stem guides and/or shimming under one side of the lift as required.

E. Check frame guide grooves. Remove any foreign material. Check tightness of rubber seals. Loosen if necessary. Reposition or replace if rolled over, torn or wadded up.

## Long term storage instructions for Medium and Heavy Duty Sluice Gates, Fabricated Slide Gates, Lifts, Stems and Accessories

1. Gate assemblies shall be stored horizontal and flat, with the back side (flange side) down. Storage area must be flat, graded, compact soil or concrete or asphalt.

2. Place timber, minimum 4" x 4", to provide substantially complete perimeter support under gate frame assembly. Longitudinal timbers, spaced a maximum of 4 feet, may also be used.

3. Stacking of gates is permissible. The stacked height should not exceed 3/4 of bottom gate width or height. Stack gates of different sizes in a pyramid fashion. Do not stack large gate on top of smaller gate.

4. Stacked gates should be separated with timber. The separating timbers should form a flat and level base for the gate above.

5. Wall thimbles may be stored similar to above. They may be stored with machined flange face up or

down. Substantial level blocking is essential; uneven support of gate assemblies and thimbles causes the gate or thimble to warp and voids the manufacturer's warranty.

6. Store lift assemblies either upright with plastic plugs/caps in place to keep dirt out of nut threads or leave in original shipping carton. Do not store the lifts directly on the ground.

7. Stems and stem covers should be stored horizontally on timbers spaced 4 - 8 feet. Protective sleeves should be left on stem threads and stem covers.

8. Miscellaneous accessories and hardware should be stored off the ground.

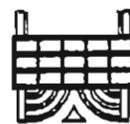
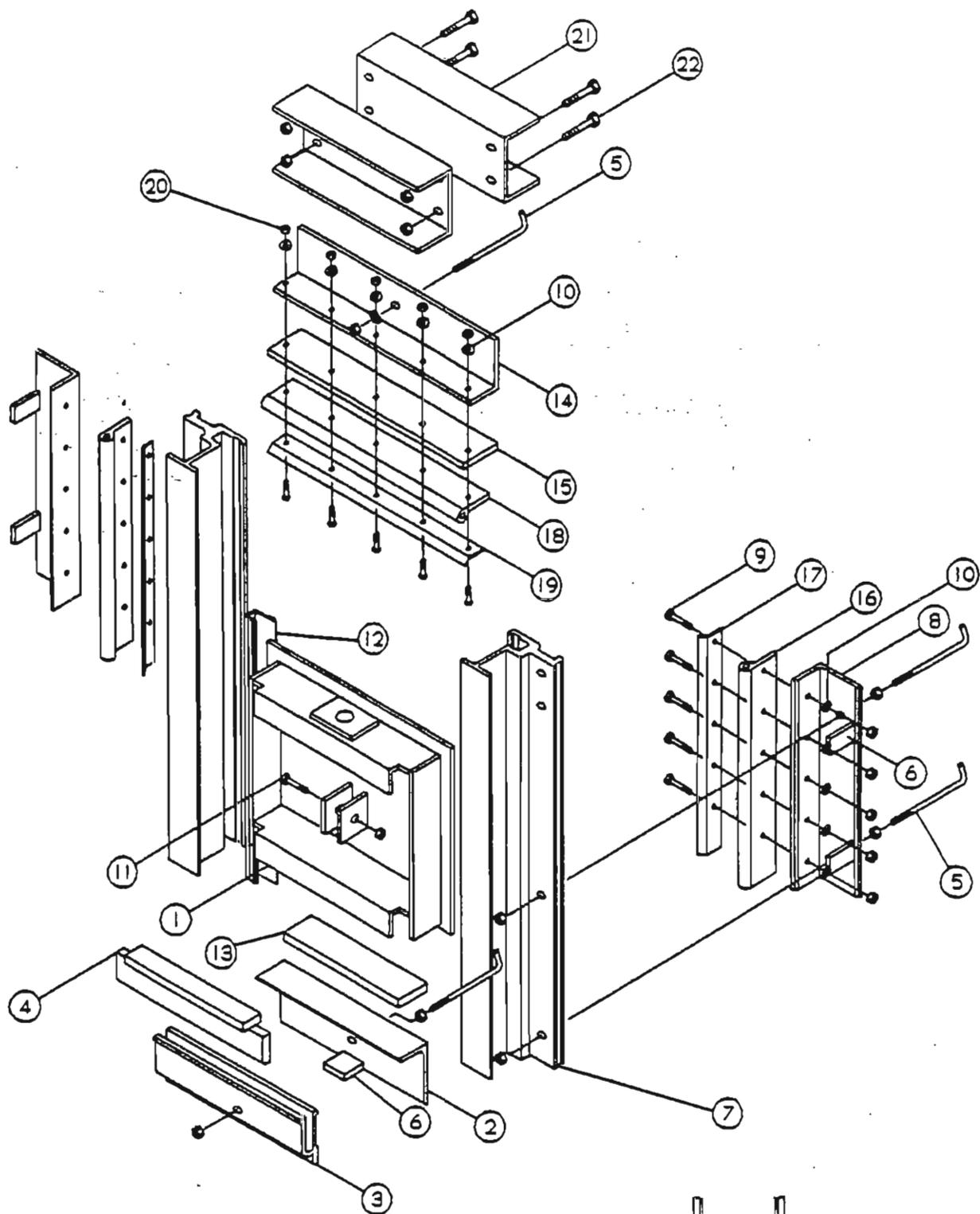
9. Bronze stem blocks, wedges, lift nuts and stainless steel accessories are targets for theft and resale as scrap. Report all shortages at once and note same on shipping papers.

Hydro Gate cannot be held responsible for theft and loss of equipment stored on job site.

10. Inside dry storage is the best for all equipment. Covering equipment stored outside with tarpaulins is recommended to minimize degradation of paint from rain and sunlight, until finish paint is applied. Uncovered outdoor storage may result in staining of painted surfaces from rain and sunlight.

11. Electric motor operators and control equipment must be connected to electricity to energize the internal space heaters, to prevent humidity build up inside the units. Units should not be stored for more than a few days outside, without connecting the space heaters.

Refer to operator manufacturer's storage instructions, located within the manufacturer's operation and maintenance manual.



HYDRO GATE Corporation

EXPLODED VIEW  
 FABRICATED GATE  
 ALUMINUM

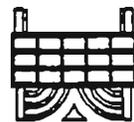
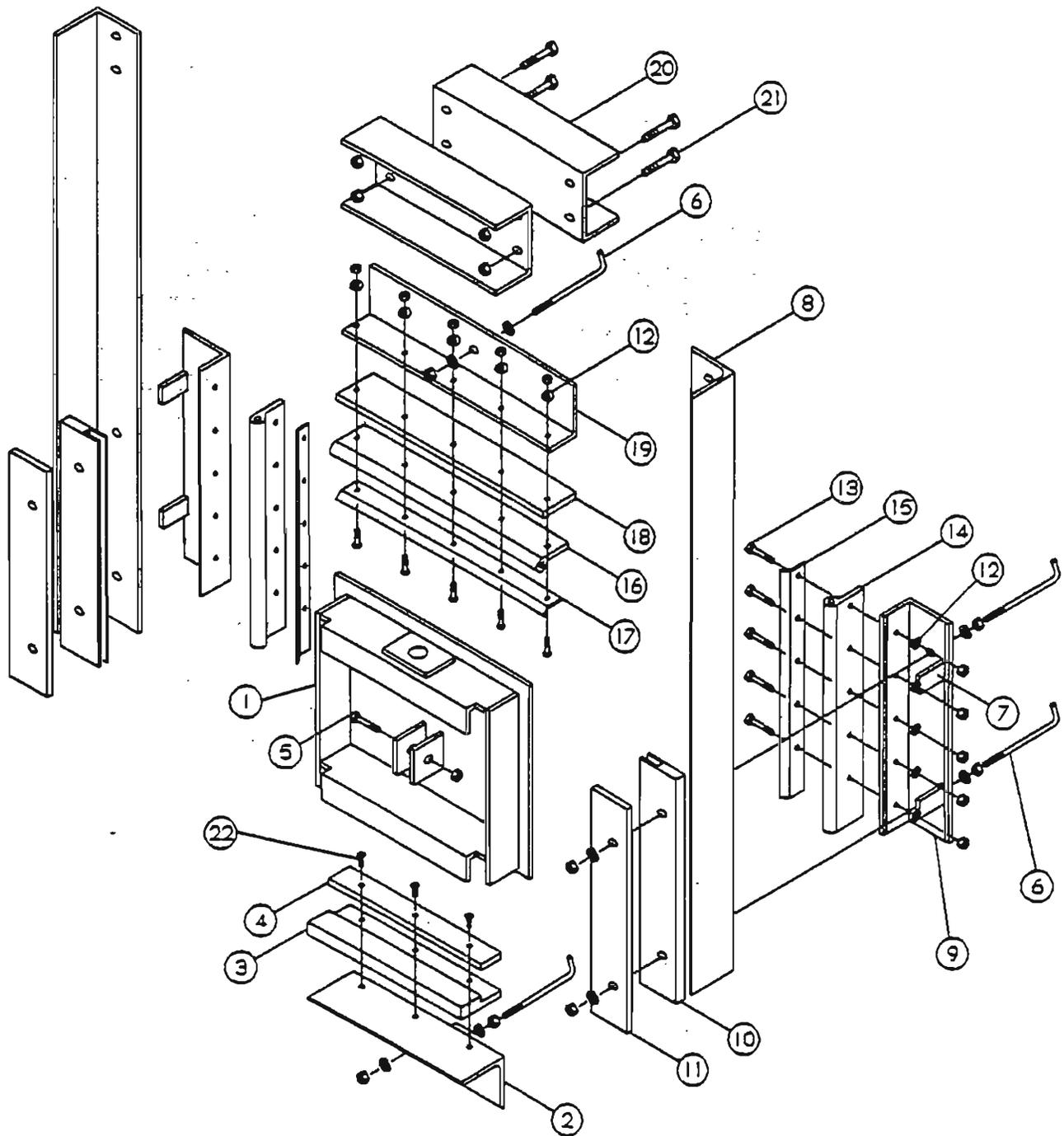
NO.	PARTS LIST	QTY.
1.	SLIDE	1
2.	FLUSH BOTTOM ANGLE FRAME EXTRUSION	1
3.	FLUSH BOTTOM FRAME EXTRUSION	1
4.	FLUSH BOTTOM SEAL, NEOPRENE	1
5.	ANCHOR BOLT	AR
6.	FLAT PLATE SPACER FOR ANCHOR BOLT	AR
7.	FRAME EXTRUSION	2
8.	SIDE J-SEAL MOUNTING ANGLE FRAME EXTRUSION	2
9.	J-SEAL ASSEMBLY FASTENER SET, SIDE	AR
10.	NYLON WASHER	AR
11.	STEM CONNECTOR FASTENER SET	1
12.	UHMW POLY LINER, SIDE	2
13.	FLUSH BOTTOM FLAT	1
14.	TOP J-SEAL MOUNTING ANGLE FRAME EXTRUSION	1
15.	UHMW POLY BAR, TOP	1
16.	J-SEAL, SIDE	2
17.	J-SEAL RETAINER SPRING CLIP, SIDE	2
18.	J-SEAL, TOP	1
19.	J-SEAL RETAINER SPRING CLIP, TOP	1
20.	J-SEAL ASSEMBLY FASTENER SET, TOP	AR
21.	SELF CONTAINED HEAD CHANNEL YOKE SET	1
22.	HEAD CHANNEL YOKE FASTENER SET	AR



HYDRO GATE Corporation

PARTS LIST FOR  
FABRICATED GATE  
ALUMINUM

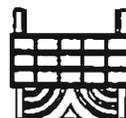
23



HYDRO GATE Corporation

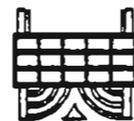
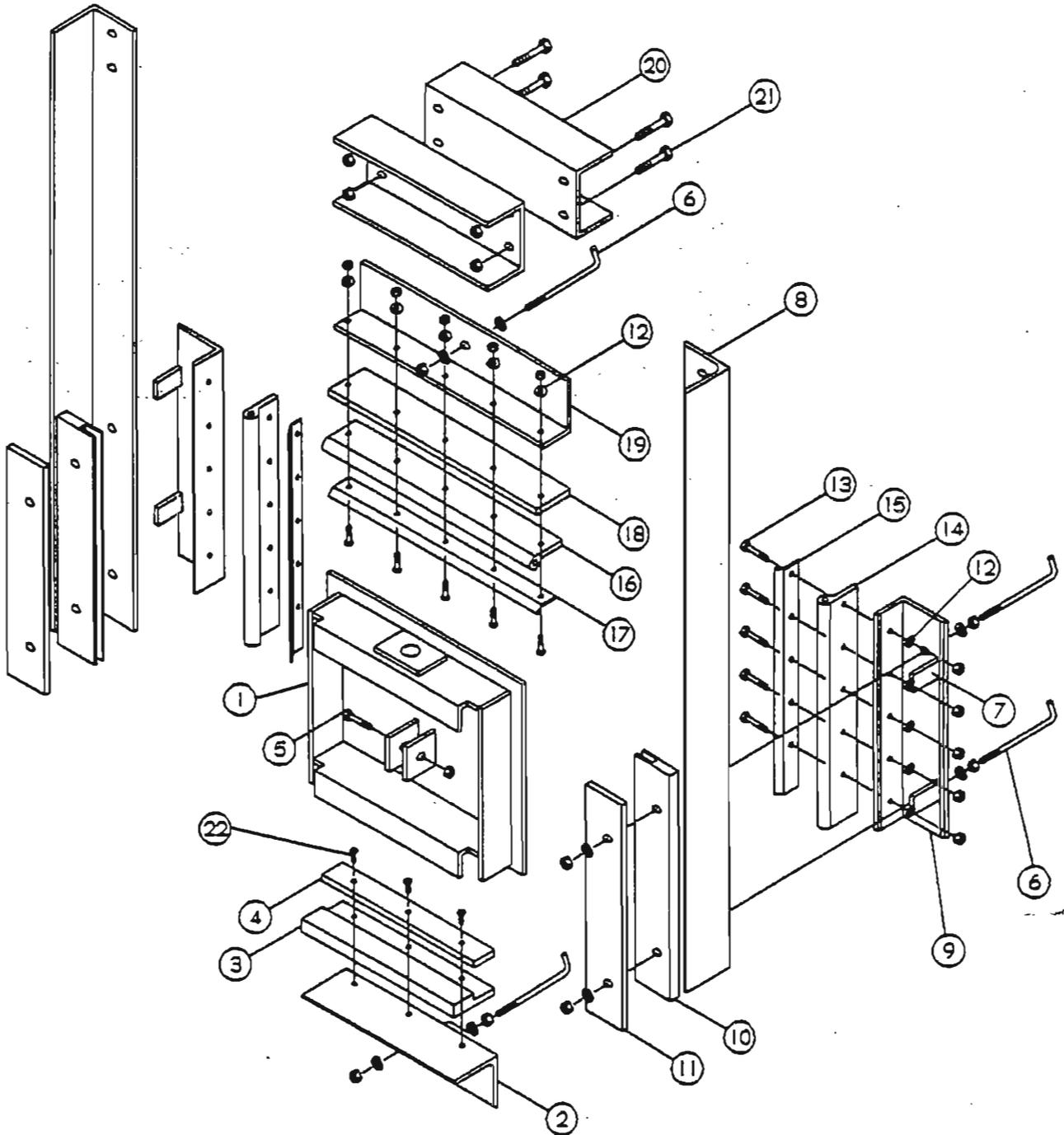
EXPLODED VIEW  
 FABRICATED GATE  
 CARBON STEEL

NO.	PARTS LIST	QTY.
1.	SLIDE	1
2.	FLUSH BOTTOM ANGLE FRAME	1
3.	FLUSH BOTTOM SEAL	1
4.	SEAL RETAINER FLAT	1
5.	STEM CONNECTOR FASTENER SET	1
6.	ANCHOR BOLT	AR
7.	FLAT PLATE SPACER FOR ANCHOR BOLT	AR
8.	SIDE ANGLE FRAME	2
9.	SIDE J-SEAL MOUNTING ANGLE FRAME	2
10.	UHMW POLYMER GUIDE BAR	2
11.	COVER BAR	2
12.	WASHER (NYLON)	AR
13.	J-SEAL FASTENER SET	AR
14.	J-SEAL, SIDE	2
15.	J-SEAL RETAINER SPRING CLIP, SIDE	2
16.	J-SEAL, TOP	1
17.	J-SEAL RETAINER SPRING CLIP, TOP	1
18.	UHMW POLY BAR, TOP	1
19.	TOP ANGLE FRAME	1
20.	SELF CONTAINED HEAD CHANNEL YOKE SET	1
21.	HEAD CHANNEL YOKE FASTENER SET	AR
22.	FLAT HEAD MACHINE SCREW	AR



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PARTS LIST FOR  
 FABRICATED GATE  
 CARBON STEEL



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EXPLODED VIEW

FABRICATED GATE

GALVANIZED STEEL

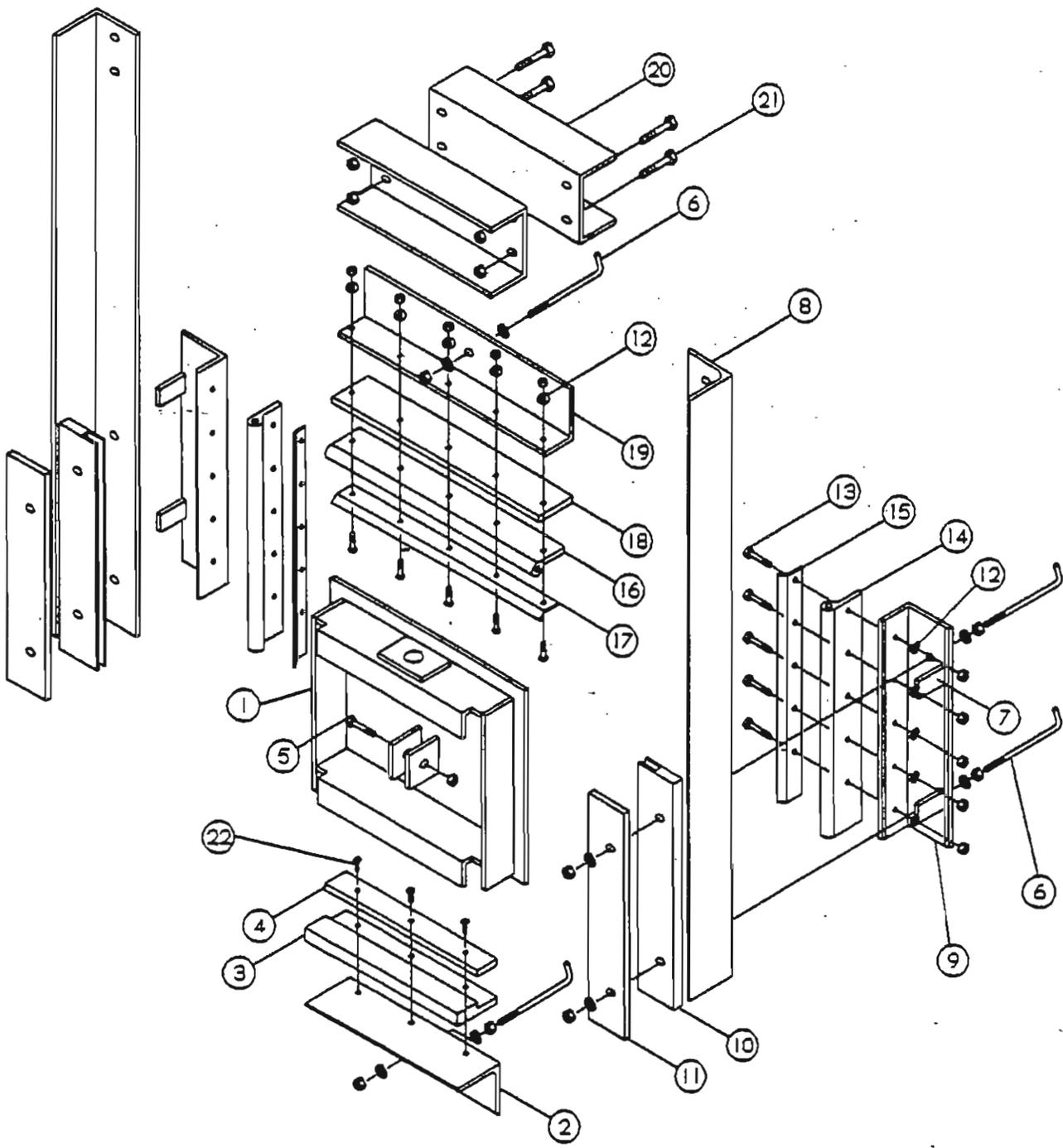
23

NO.	PARTS LIST	QTY.
1.	SLIDE	1
2.	FLUSH BOTTOM ANGLE FRAME	1
3.	FLUSH BOTTOM SEAL	1
4.	SEAL RETAINER FLAT	1
5.	STEM CONNECTOR FASTENER SET	1
6.	ANCHOR BOLT	AR
7.	FLAT PLATE SPACER FOR ANCHOR BOLT	AR
8.	SIDE ANGLE FRAME	2
9.	SIDE J-SEAL MOUNTING ANGLE FRAME	2
10.	UHMW POLYMER GUIDE BAR	2
11.	COVER BAR	2
12.	WASHER (NYLON)	AR
13.	J-SEAL FASTENER SET	AR
14.	J-SEAL, SIDE	2
15.	J-SEAL RETAINER SPRING CLIP, SIDE	2
16.	J-SEAL, TOP	1
17.	J-SEAL RETAINER SPRING CLIP, TOP	1
18.	UHMW POLY BAR, TOP	1
19.	TOP ANGLE FRAME	1
20.	SELF CONTAINED HEAD CHANNEL YOKE SET	1
21.	HEAD CHANNEL YOKE FASTENER SET	AR
22.	FLAT HEAD MACHINE SCREW	AR



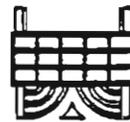
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PARTS LIST FOR  
FABRICATED GATE  
GALVANIZED STEEL



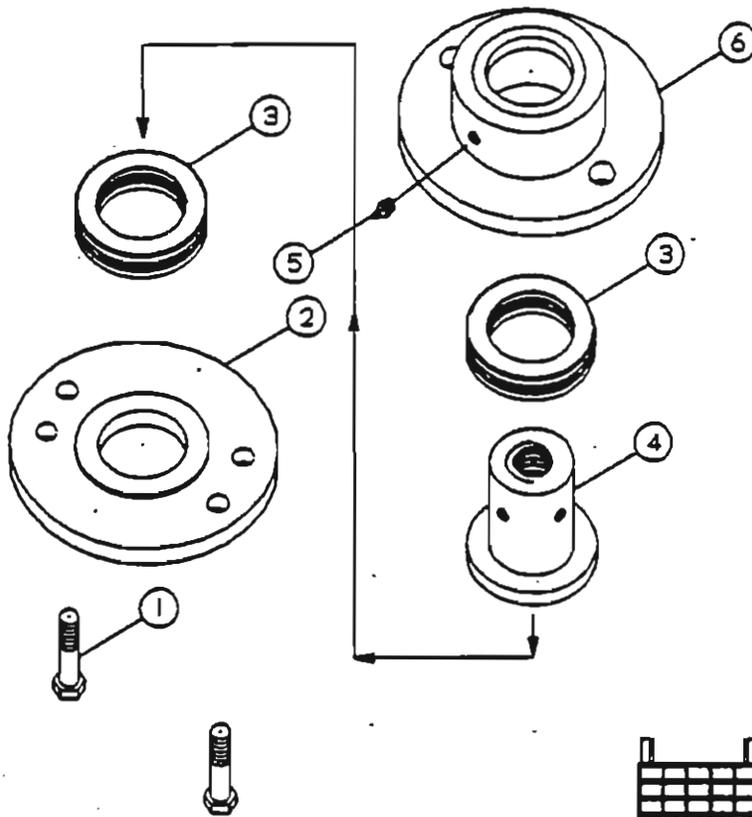
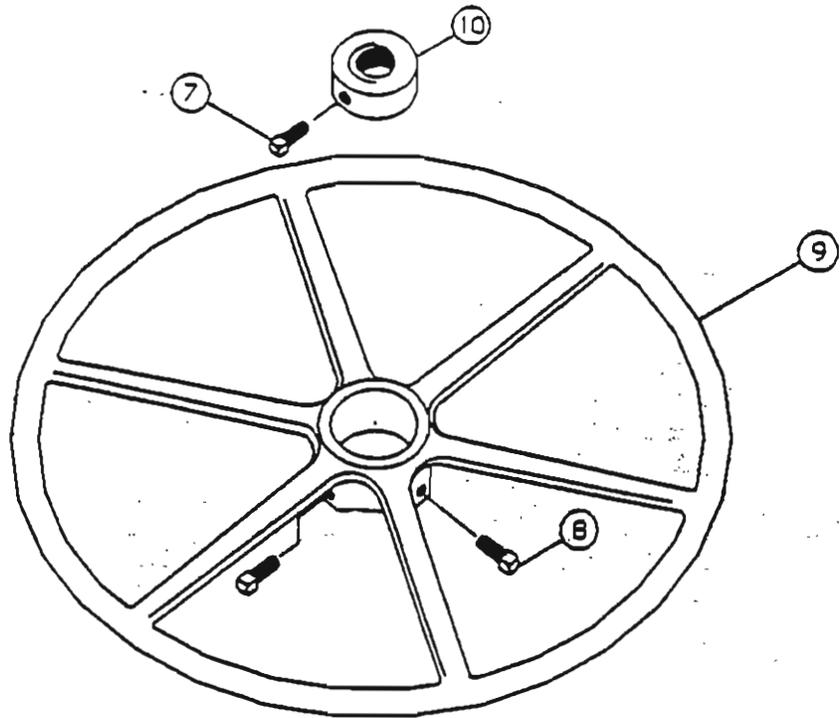
EXPLODED VIEW  
 FABRICATED GATE  
 STAINLESS STEEL

NO.	PARTS LIST	QTY.
1.	SLIDE	1
2.	FLUSH BOTTOM ANGLE FRAME	1
3.	FLUSH BOTTOM SEAL	1
4.	SEAL RETAINER FLAT	1
5.	STEM CONNECTOR FASTENER SET	1
6.	ANCHOR BOLT	AR
7.	FLAT PLATE SPACER FOR ANCHOR BOLT	AR
8.	SIDE ANGLE FRAME	2
9.	SIDE J-SEAL MOUNTING ANGLE FRAME	2
10.	UHMW POLYMER GUIDE BAR	2
11.	COVER BAR	2
12.	WASHER (NYLON)	AR
13.	J-SEAL FASTENER SET	AR
14.	J-SEAL, SIDE	2
15.	J-SEAL RETAINER SPRING CLIP, SIDE	2
16.	J-SEAL, TOP	1
17.	J-SEAL RETAINER SPRING CLIP, TOP	1
18.	UHMW POLY BAR, TOP	1
19.	TOP ANGLE FRAME	1
20.	SELF CONTAINED HEAD CHANNEL YOKE SET	1
21.	HEAD CHANNEL YOKE FASTENER SET	AR
22.	FLAT HEAD MACHINE SCREW	AR



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PARTS LIST FOR  
FABRICATED GATE  
STAINLESS STEEL



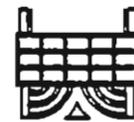
HYDRO GATE Corporation

EXPLODED VIEW

HB

HANDWHEEL LIFT

NO.	PARTS LIST	QTY.
1.	5/8" X 1 1/4" HEX HEAD MACHINE BOLTS	2
2.	BASE	1
3.	THRUST BEARING, BALL	2
4.	LIFT NUT	1
5.	1/8" ZERK FITTING	1
6.	BOWL (CAST IRON)	1
7.	SQUARE HEAD SET SCREW	1
8.	1/2" X 1" SQUARE HEAD SET SCREWS	2
9.	HANDWHEEL, 18", 24" OR 30" DIA. (CAST IRON)	1
10.	STOP NUT	1

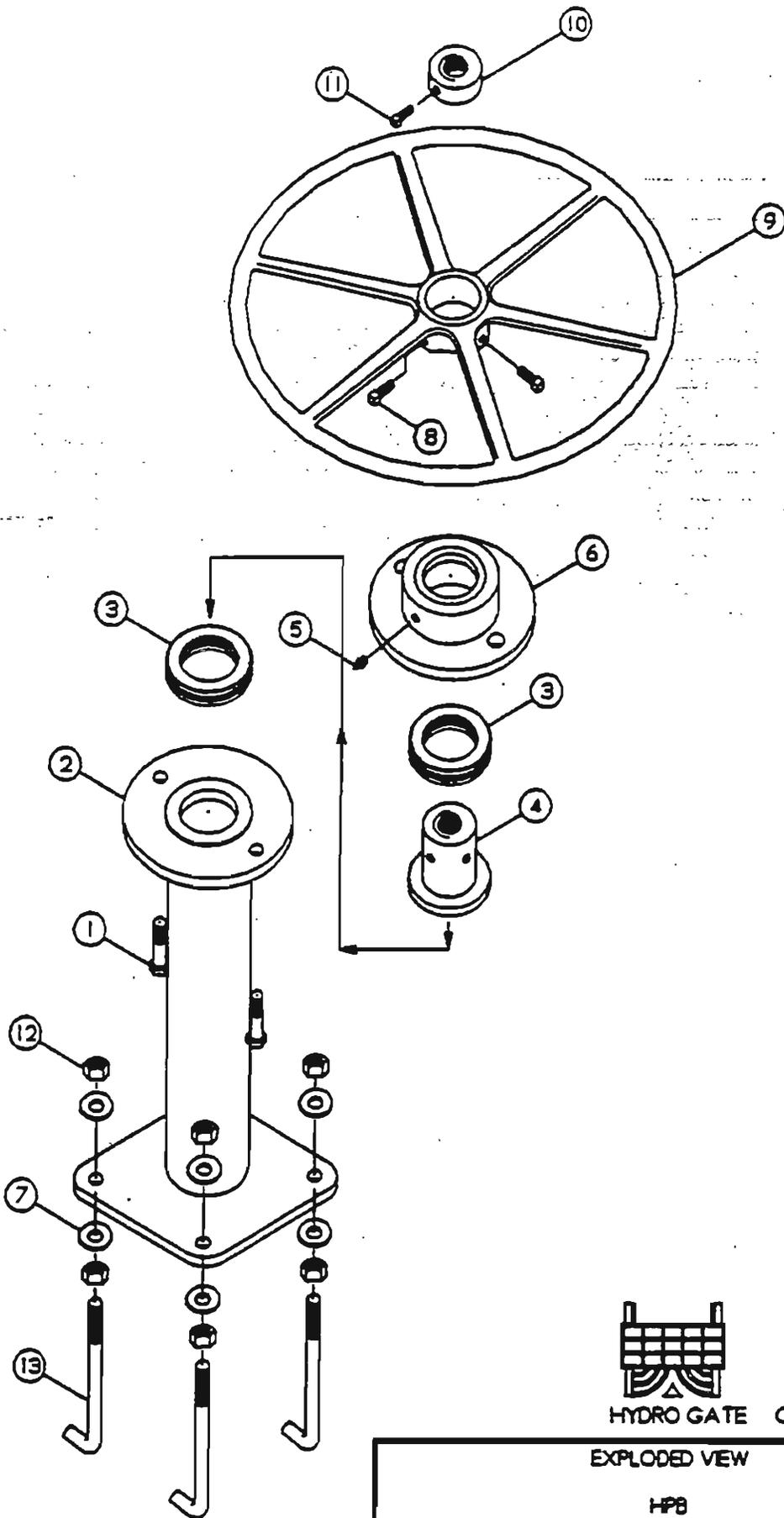


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PARTS LIST FOR

HB

HANDWHEEL LIFT



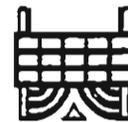
HYDRO GATE Corporation

EXPLODED VIEW

HPB

HANDWHEEL PEDESTAL LIFT

NO.	PARTS LIST	QTY.
1.	5/8" X 2 1/4" HEX HEAD MACHINE BOLTS	2
2.	PEDESTAL	1
3.	THRUST BEARING, BALL	2
4.	LFT NUT	1
5.	1/8" ZERK FITTING	1
6.	BOWL (CAST IRON)	1
7.	3/4" DIA. FLAT WASHER	2
8.	1/2" X 1" SQUARE HEAD SET SCREWS	2
9.	HANDWHEEL, 18", 24" OR 30" DIA. (CAST IRON)	1
10.	STOP NUT	1
11.	SQUARE HEAD SET SCREW	1
12.	3/4" DIA. HEX NUTS	8
13.	3/4" DIA. X 12" ANCHOR BOLT	4

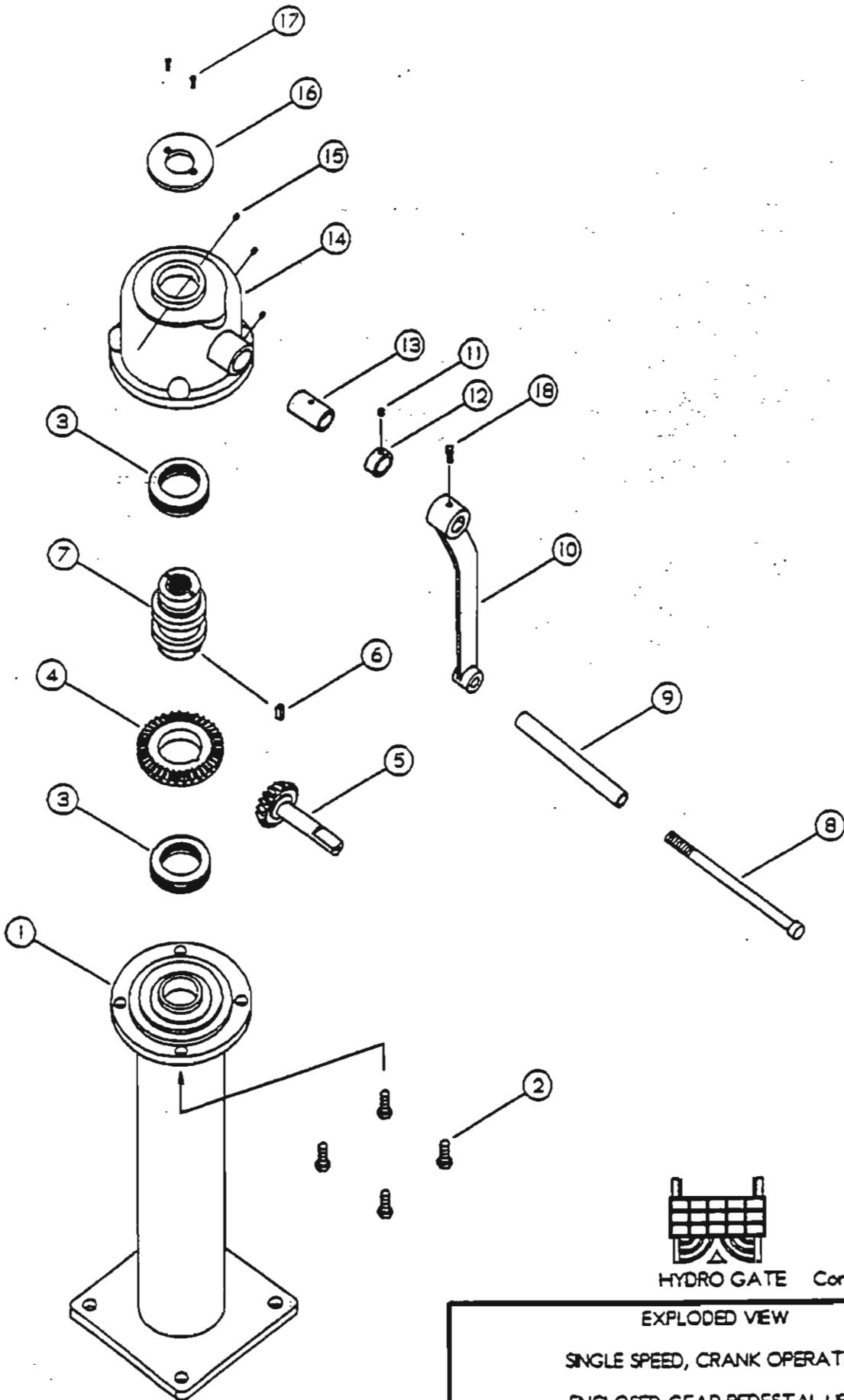


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PARTS LIST FOR

HPB

HANDWHEEL PEDESTAL LFT



HYDRO GATE Corporation

EXPLODED VIEW  
 SINGLE SPEED, CRANK OPERATED  
 ENCLOSED GEAR PEDESTAL LIFT

NO.	PARTS LIST
1.	PEDESTAL
2.	CAP SCREWS
3.	BALL BEARINGS
4.	BEVEL GEAR
5.	BEVEL PINION AND SHAFT
6.	KEY
7.	LIFT NUT
8.	MACH. BOLT
9.	BRASS HANDLE
10.	CRANK ARM
11.	SET SCREWS
12.	STOP COLLAR
13.	BRONZE BUSHING
14.	BOWL
15.	GREASE FITTING, ZERK 1/8"
16.	RAIN SHIELD
17.	FLAT HD MACH. SCREWS
18.	SET SCREW, SQ. HD.

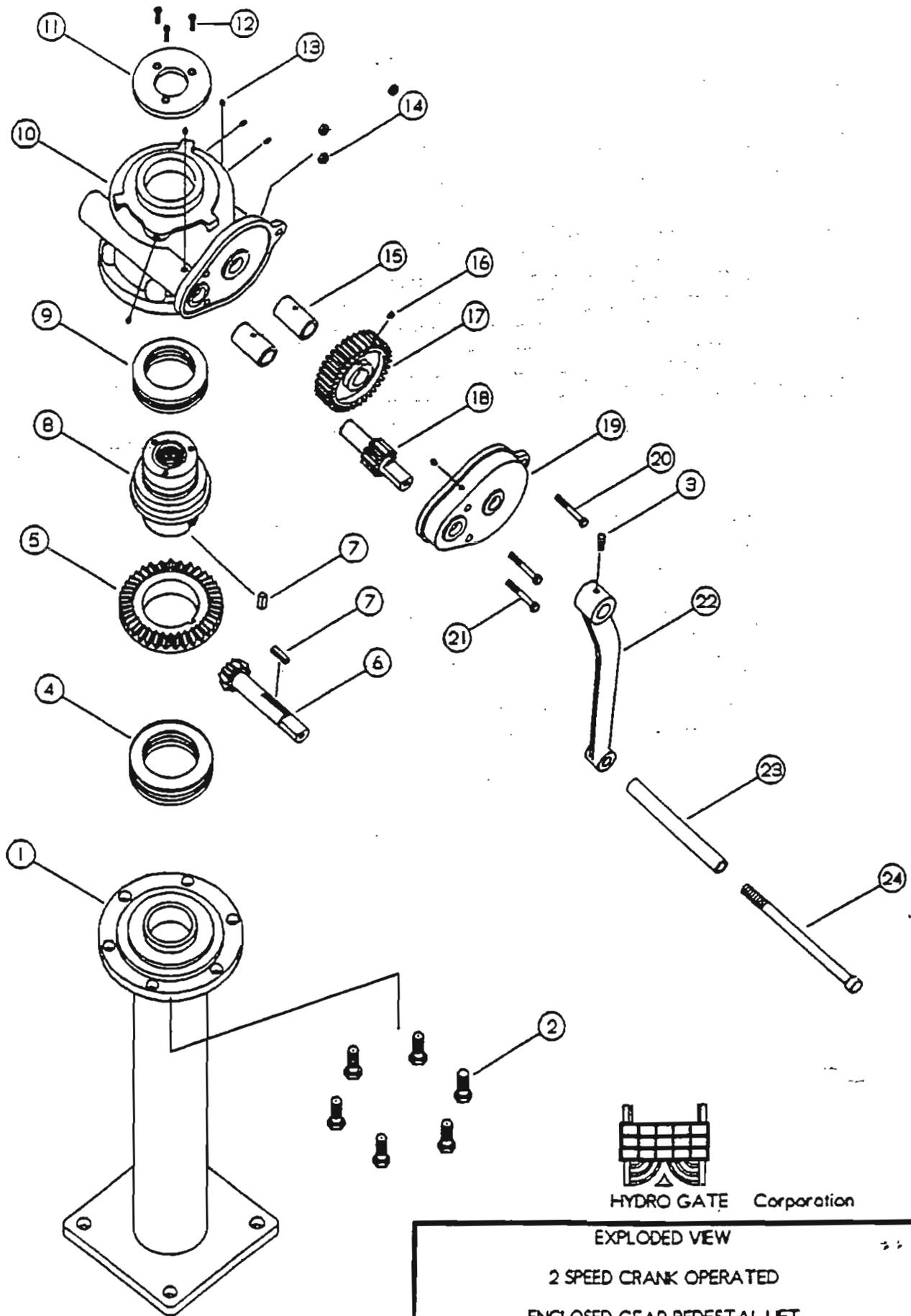


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PARTS LIST FOR

SINGLE SPEED CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT



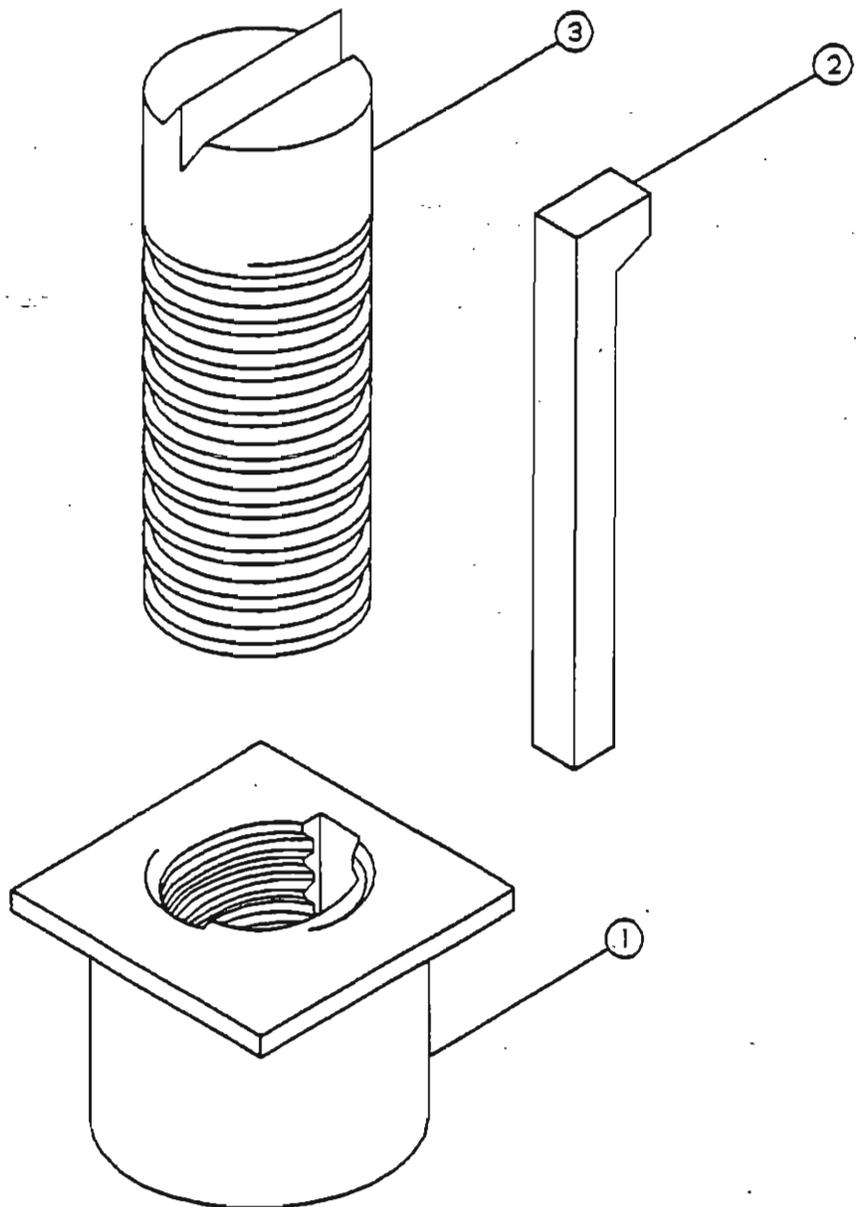
NO.	PARTS LIST
1.	PEDESTAL
2.	CAP SCREWS
3.	SET SCREW, SQ. HD.
4.	BALL BEARING
5.	BEVEL GEAR
6.	BEVEL PINION AND SHAFT
7.	KEY
8.	LIFT NUT
9.	BALL BEARING
10.	BOWL
11.	RAIN SHIELD
12.	BOLT, HEX HD.
13.	GREASE FITTINGS, 1/8" ZERK
14.	HEX NUTS
15.	BRONZE BUSHING
16.	SET SCREWS
17.	SPUR GEAR
18.	SPUR PINION
19.	SPUR GEAR COVER
20.	MACH. BOLT
21.	MACH. BOLTS
22.	CRANK ARM
23.	BRASS HANDLE
24.	MACH. BOLT



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PARTS LIST FOR  
 2 SPEED CRANK OPERATED  
 ENCLOSED GEAR PEDESTAL LIFT

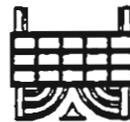
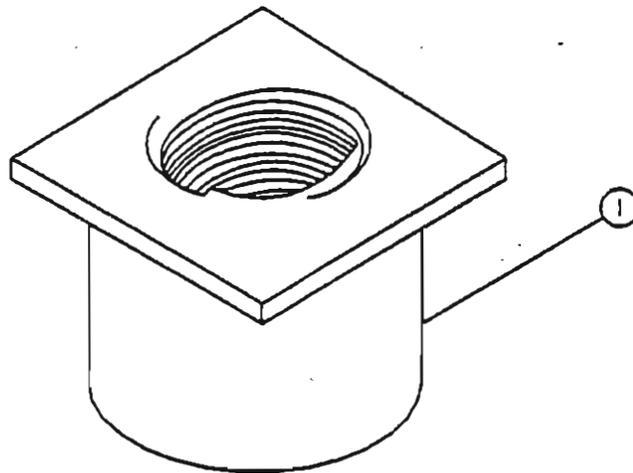
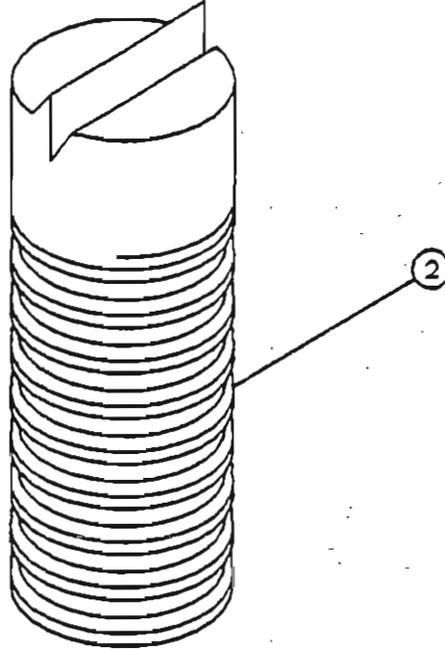
NO.	PARTS LIST	QTY.
1.	STEM BLOCK	1
2.	KEY	1
3.	STEM	-



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EXPLODED VIEW  
 STEM BLOCK  
 RISNG STEM

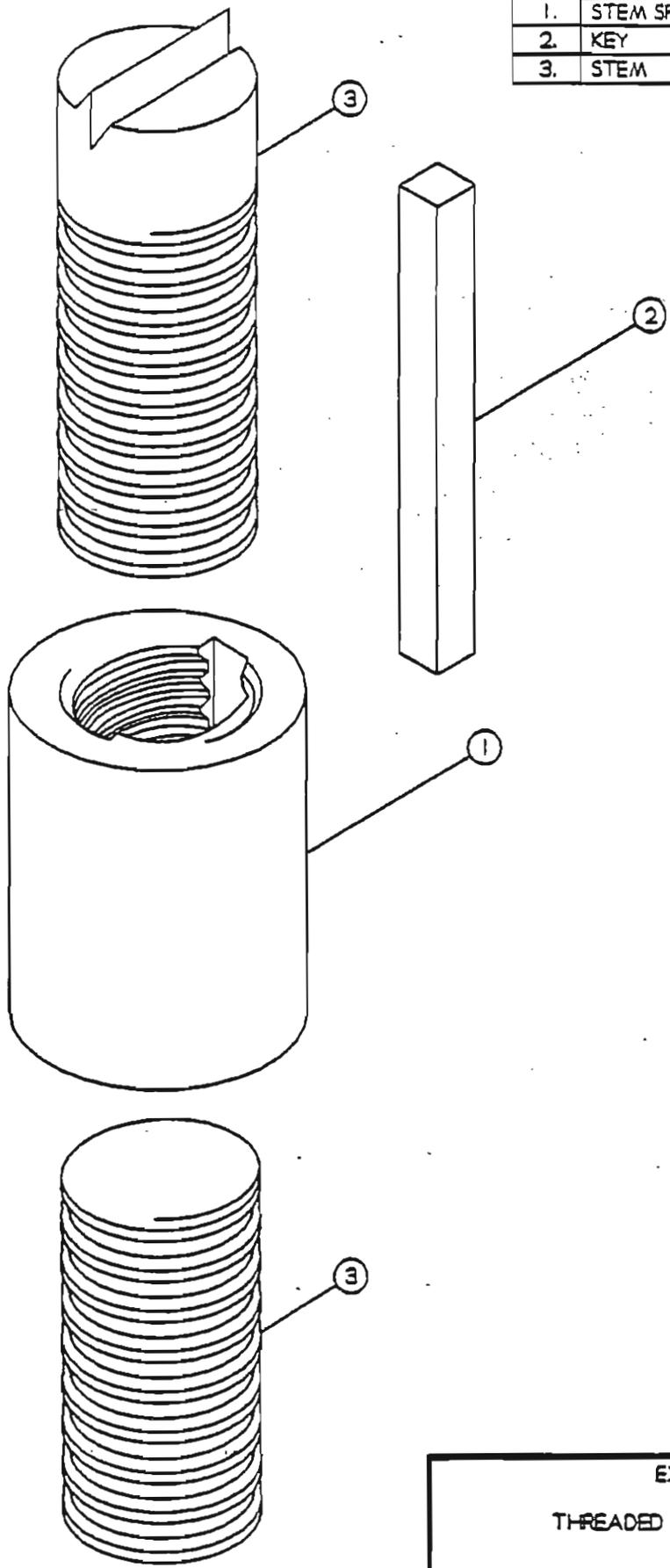
NO.	PARTS LIST	QTY.
1.	STEM BLOCK	1
2.	STEM	-



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EXPLODED VIEW  
 STEM BLOCK  
 NON-RISING STEM

NO.	PARTS LIST	QTY.
1.	STEM SPLICE	1
2.	KEY	1
3.	STEM	-

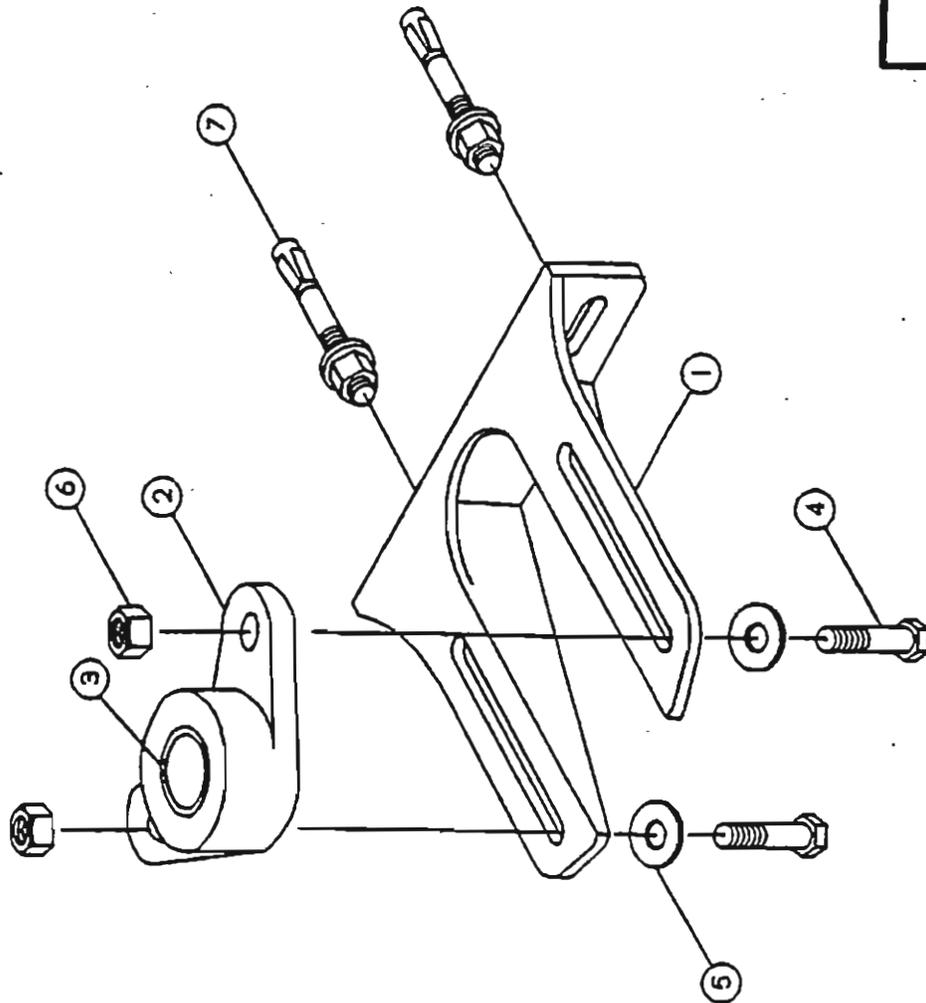


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EXPLODED VIEW  
 THREADED AND KEYED STEM SPLICE



NO.	PARTS LIST	QTY.
1.	BRACKET (CAST IRON)	1
2.	COLLAR (CAST IRON)	1
3.	BUSHING	1
4.	1/2" DIA. X 2" HEX HEAD BOLT	2
5.	1/2" DIA. FLAT WASHER	2
6.	1/2" DIA. HEX NUT	2
7.	1/2" DIA. X 5 1/2" EXPANSION ANCHOR	2

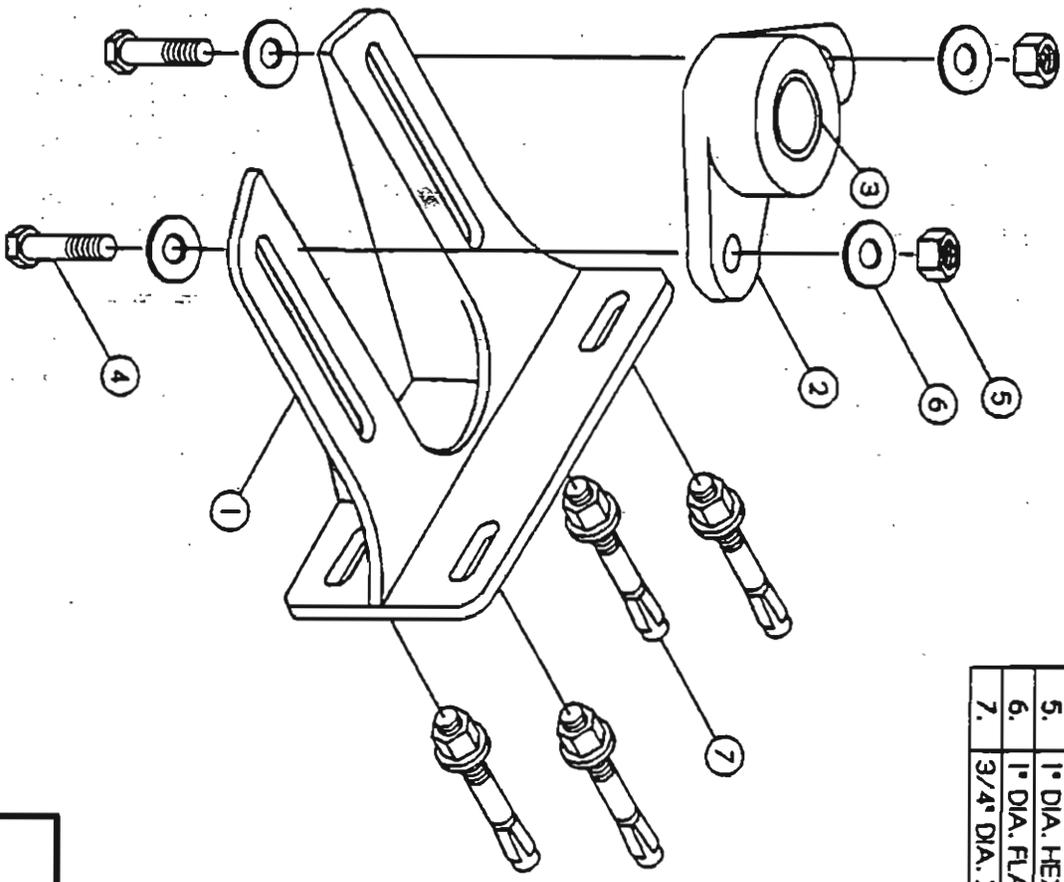


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EXPLODED VIEW

TYPE 'B' COLLAR

STEM GUIDE



NO.	PARTS LIST	QTY.
1.	BRACKET (CAST IRON)	1
2.	COLLAR (CAST IRON)	1
3.	BUSHING	1
4.	1" DIA. X 2 1/2" HEX HEAD BOLT	2
5.	1" DIA. HEX NUT	2
6.	1" DIA. FLAT WASHER	4
7.	3/4" DIA. X 7 EXPANSION ANCHOR	4



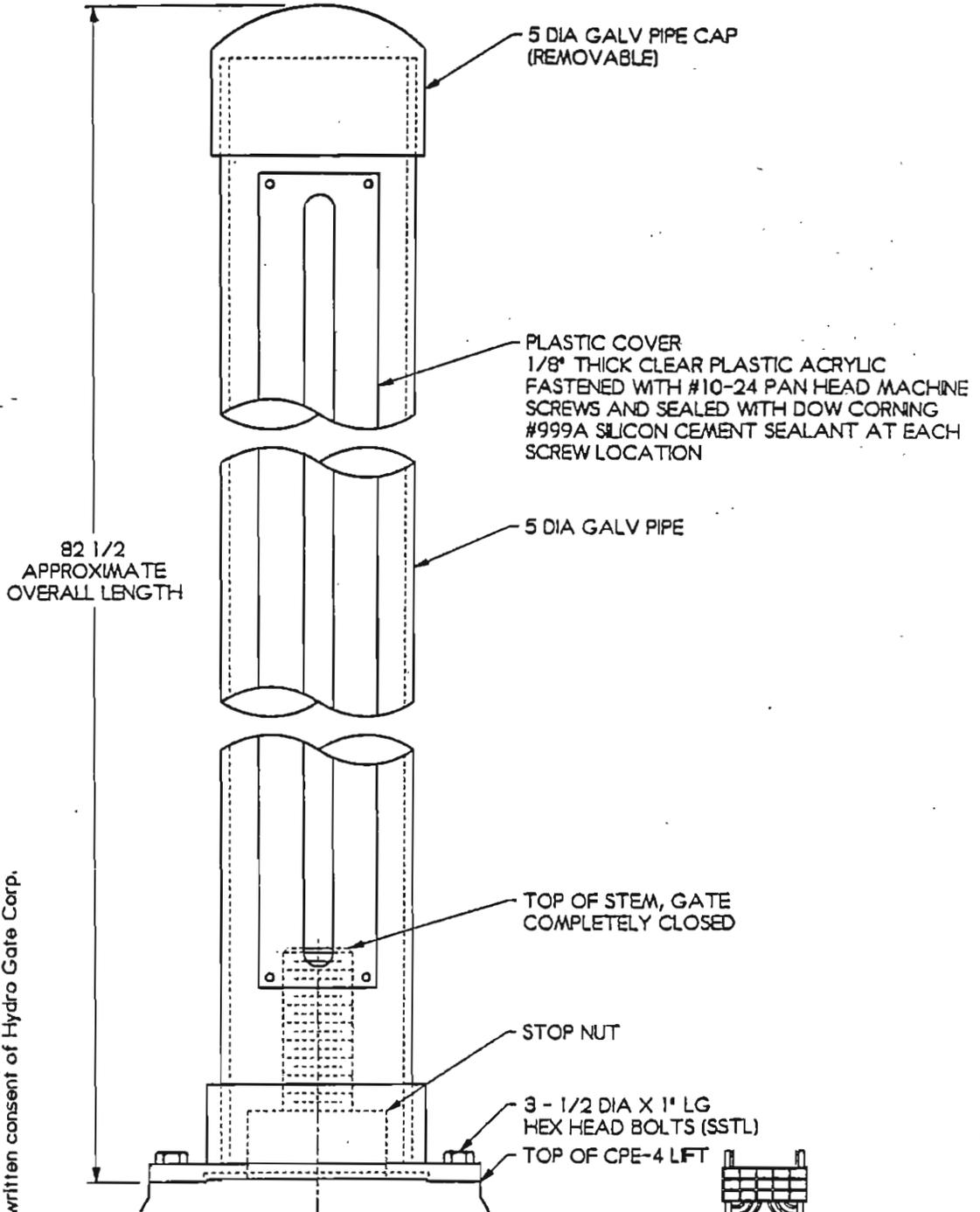
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EXPLODED VIEW

TYPE 'C'

STEM GUIDE

THIS DRAWING REPLACES DRAWING F0685503 DATED 02/10/95

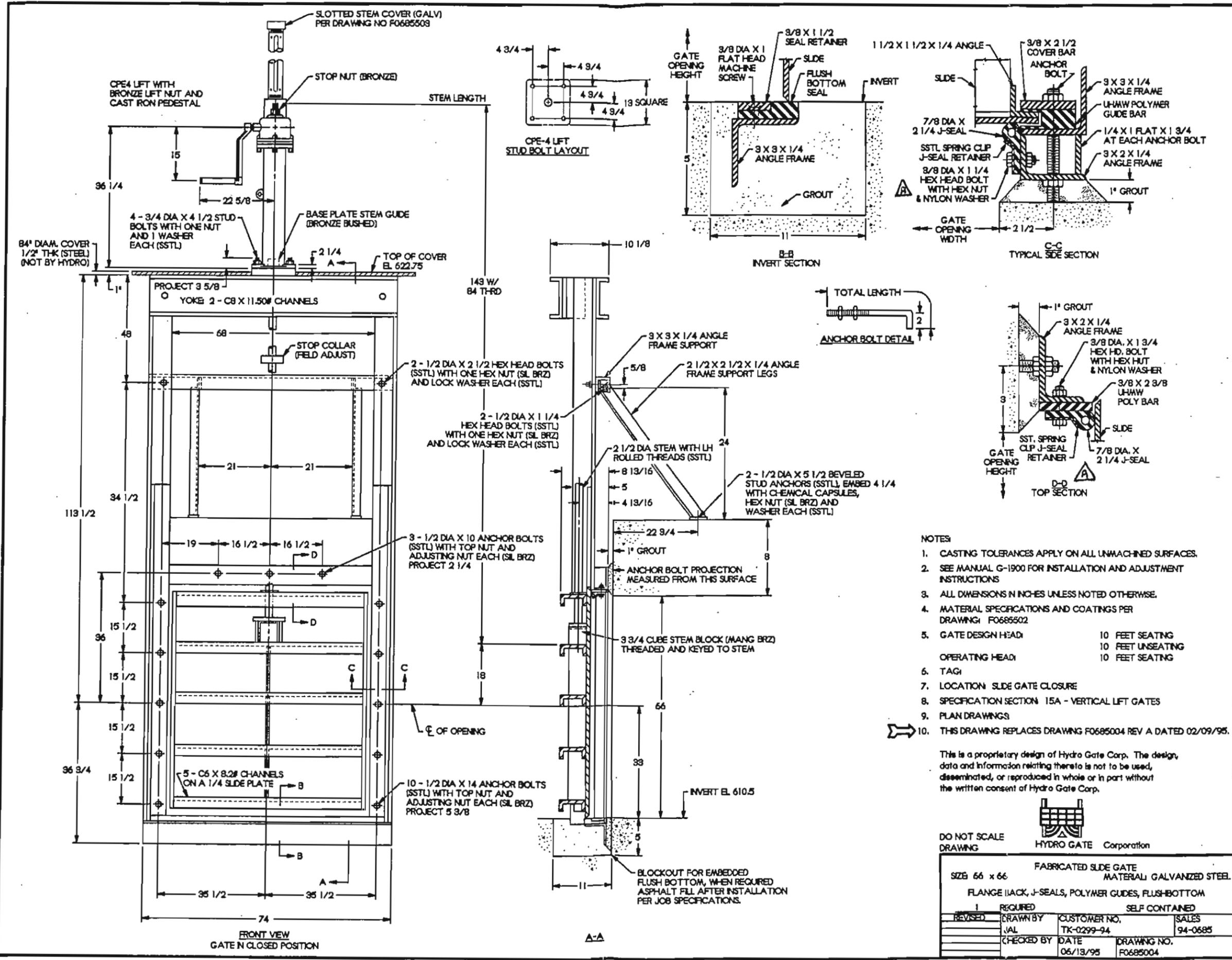


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82 1/2  
APPROXIMATE  
OVERALL LENGTH

DO NOT SCALE DRAWING HYDRO GATE Corporation

SLOTTED GALVANIZED STEM COVER		DRAWN JAL	CHK'D
STEM COVER PART NO: 940685102		DATE	06/09/95
REFERENCE DRAWING: F0685004	CUST NO TK-0299-94	SALES ORDER	94-0685
FOR 66' GATE TRAVEL	REV DATE	DWG NO	F0685503



- NOTES**
- CASTING TOLERANCES APPLY ON ALL UNMACHINED SURFACES.
  - SEE MANUAL G-1900 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS
  - ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
  - MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: F068502
  - GATE DESIGN HEAD: 10 FEET SEATING  
OPERATING HEAD: 10 FEET UNSEATING  
10 FEET SEATING
  - TAG
  - LOCATION: SLIDE GATE CLOSURE
  - SPECIFICATION SECTION 15A - VERTICAL LIFT GATES
  - PLAN DRAWINGS
  - THIS DRAWING REPLACES DRAWING F0685004 REV A DATED 02/09/95.

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DO NOT SCALE DRAWING

FABRICATED SLIDE GATE  
MATERIAL: GALVANIZED STEEL

SIZE 66 x 66  
FLANGE (BACK, J-SEALS, POLYMER GUIDES, FLUSH-BOTTOM)

REVISION	REQUIRED	CUSTOMER NO.	SALES
	DRAWN BY	TK-0299-94	94-0685
	CHECKED BY	DATE	DRAWING NO.
		06/13/95	F0685004

MATERIAL SPECIFICATIONS

GATE PART OR ITEM OF ASSEMBLY	MATERIAL DESCRIPTION	MATERIAL CODE	MATERIALS SHOWN IN ASTM SPECIFICATION UNLESS NOTED OTHERWISE
<u>EMBEDMENTS</u>			
ANCHOR BOLTS	STAINLESS STEEL	(L)	A276, TYPE 304
ANCHOR BOLT NUTS	SILICON BRONZE	(J)	B98, ALLOY 655
BEVELED STUD ANCHOR BOLTS	STAINLESS STEEL	(L)	A276, TYPE 304
BEVELED STUD ANCHOR NUTS	SILICON BRONZE	(J)	B98, ALLOY 655
<u>GATE ASSEMBLY</u>			
FRAME (SIDE ANGLES, FILLER AND COVER BARS)	STAINLESS STEEL	(L)	A276, TYPE 304 OR 304L (STRUCT) A240, TYPE 304 OR 304L (PLATES)
SLIDE PLATES AND REINFORCINGS FASTENERS	STAINLESS STEEL SILICON BRONZE	(L) (J)	F593 (BOLTS), ALLOY GROUP 1 (304) B98, ALLOY 655
RETAINER	STAINLESS STEEL	(L)	A276, TYPE 304 OR 304L
FLUSH BOTTOM SEAL AND J-SEAL	NEOPRENE	(BB)	D2000, GRADE 1BE625
J-SEAL SPRING CLIP	STAINLESS STEEL	(L)	A240, TYPE 304
UHMW POLYMER	POLYETHYLENE	(T)	D4020
<u>STEM AND ACCESSORIES</u>			
STEM	STAINLESS STEEL	(L)	A276, TYPE 304
<u>LIFT ASSEMBLY</u>			
LIFT PEDESTAL	CAST IRON	(A)	A126, CLASS B
LIFT HOUSING	CAST IRON	(A)	A126, CLASS B
LIFT NUT	MANGANESE BRONZE	(K)	B584, ALLOY 865
STOP NUT	NAVAL BRONZE	(F)	B21, ALLOY 485
CLAMP TYPE STOP COLLAR	STAINLESS STEEL	(L)	A276, TYPE 304
<u>STEM GUIDE</u>			
BASE PLATE STEM GUIDE	CARBON STEEL	(V)	A36
BASE PLATE STEM GUIDE BUSHING	TIN BRONZE	(E)	B584, ALLOY 932

COATING SPECIFICATIONS

CLEANING:  STANDARD CLEAN - REMOVAL OF LOOSE RUST, MILL SCALE AND PAINT BY AIR HOSE, SCRAPING, AND WIRE BRUSH.

BLAST CLEAN (PER STEEL STRUCTURES PAINTING COUNCIL)

NEAR WHITE METAL BLAST GRADE SSPC - SP10

COATING: TNEMEC, SERIES 140-1211 POTA-POX COLOR RED

PART NO. 45598T

TWO SHOP COATS FOR A DRY FILM THICKNESS OF 12 - 16 MILS

FOR THE FOLLOWING COMPONENTS:

LIFT

BASE PLATE STEM GUIDE

COATING: TNEMEC, SERIES 140-1255 POTA-POX COLOR BEIGE

PART NO. 45599T

ONE SHOP COAT FOR A DRY FILM THICKNESS OF 6 - 8 MILS

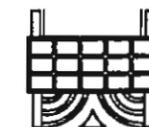
FOR THE FOLLOWING COMPONENTS:

LIFT

BASE PLATE STEM GUIDE

NOTES:

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BILL OF MATERIAL & COATING SPECIFICATIONS		DRAWN	JAL	CHK'D
FABRICATED GATES		DATE	06/09/95	
MATERIAL COMBINATION NO 3		CUST NO	TK-0299-94	
		SALES ORDER	94-0685	
		REV DATE	DWG NO	F0685505

APPENDIX E

RIPRAP PROTECTION AND GEOTEXTILE  
SPECIFICATIONS

SECTION 02271  
RIPRAP PROTECTION

INDEX

<u>PARAGRAPH</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1	GENERAL	02271-1
2	PRODUCTS	02271-2
3	EXECUTION	02271-4
	RIPRAP GRADATION CURVE	02271-6
	GRADATION ANALYSIS WORKSHEET	02271-7
	ENG FORM 4055	02271-8

SECTION 02271

RIPRAP PROTECTION

1. GENERAL.

1.1 SCOPE. This section covers riprap used for groins and slope protection.

1.2 RELATED WORK OF OTHER SECTIONS. The following items of related work are covered under other sections:

- 1) Disposal of driftwood, snags, wood debris and brush: SECTION 01000: GENERAL.
- 2) Geotextile placement: SECTION 02272: GEOTEXTILE.

1.3 APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U. S. Army Corps of Engineers, Engineer Manual (EM).

EM 1110-2-1906 Laboratory Soils Testing (Nov 70) change 1  
(May 80) and change 2 (Aug 86).

1.4 SUBMITTALS. The following shall be submitted in accordance with SECTION 01305: SUBMITTAL PROCEDURES:

1.4.1 Gradation and testing procedures as specified in PARAGRAPH: TESTS FOR GRADATION AND SHAPE.

1.4.2 Material sources as specified in PARAGRAPH: SOURCES AND EVALUATION.

1.4.3 Test results as specified in PARAGRAPH: TESTS FOR GRADATION AND SHAPE.

1.5 MEASUREMENT AND PAYMENT.

1.5.1 Measurement. Riprap shall be weighed on accurate, approved scales furnished or made available by the Contractor. Before being approved for use, the scales shall be tested by the Department of Weights and Measures or by a reliable scale servicing company so as to operate within a degree of error not greater than one percent and be sensitive to a change in load of 1/5 of one percent, both percentages being used on the total required weight of material normally weighed as a unit on the scale. Scales shall be spot checked for accuracy and sensitivity at least once each week as the work progresses. When materials are weighed in hauling vehicles, gross weights shall be checked and the vehicle tare weight determined as often as the Contracting Officer directs. The Contractor shall furnish such weights, accessories, and assistance as the Contracting Officer may require for making weighing equipment tests.

1.5.1.1 Weighing operations shall be performed offsite, as approved, in the presence of a representative of the Contracting Officer. The Contracting Officer reserves the right to waive his/her presence during weighing operations. Each load shall be accompanied by duplicate copies of delivery tickets certified by the weighmaster. As a minimum, each ticket shall contain the following information:

- (1) Date and time.
- (2) Vehicle number.
- (3) Gross weight.
- (4) Vehicle tare weight.
- (5) Net weight.
- (6) Material weight.
- (7) Signature of weighmaster.

Delivery tickets shall be collected by the Contractor and one copy thereof furnished to the Contracting Officer at the close of each day's operation.

1.5.2 Payment for riprap shall be by the ton (2000 pounds avoirdupois) of material acceptably placed within the tolerances specified, and shall constitute full compensation for all work specified in this section, including surveys, foundation preparation, riprap delivery and placement as shown and specified.

1.5.2.1 Deductions. All riprap permitted by the Contracting Officer to remain outside of the tolerances specified will be deducted from the quantity to be paid for. Volume of excess riprap will be computed using the average-end-area of excess above the tolerance line. The excess volume will be deducted from the payment quantity at a rate of 1.35 tons per cubic yard, regardless of actual weight per cubic foot.

1.6 BIDDING SCHEDULE ITEMS applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Riprap	TN

2. PRODUCTS.

2.1 MATERIALS.

2.1.1 Riprap shall be a durable quarried stone of suitable quality to ensure permanence in the Upper Mississippi River environment. Stone shall be free from cracks, seams and other defects that would unduly increase its deterioration from natural causes.

2.1.1.1 Specific gravity. Stone shall have a specific gravity of not less than 2.55 and not more than 2.75.

2.1.1.2 Shape. Neither the breadth nor thickness of any individual stone shall be less than one-third its length.

2.1.1.3 Gradation. Riprap shall be reasonably well graded within the limits shown on the riprap gradation curve located at the end of this section. The stone shall be reasonably well graded within these specified limits to permit construction of relatively dense and impervious riprap blankets. Inclusion of objectionable quantities of dirt, sand, clay, rock fines or other deleterious materials will not be allowed.

2.1.1.4 Processing. Included in the Contractor's Plan of Operations submittal, as specified in SECTION 01000: GENERAL, the Contractor shall indicate a method of processing riprap at the quarry that will preclude the inclusion of objectionable amounts of fine material or organic matter. All riprap shall be processed in accordance with the method approved.

2.2 SOURCES AND EVALUATION. Stone materials shall be produced from the sources listed in CONTRACT CLAUSE: MATERIAL SOURCES. If the Contractor proposes to furnish materials from a source not listed, the Government geologist will make such investigations and evaluations as necessary to determine whether or not materials meeting the requirements of this project can be produced from the proposed source. The Contractor shall be responsible for making his own investigations for sources of suitable materials and for making his own arrangements with the owners of the quarries or land for procuring the required quantities of suitable materials. Sources from which the Contractor proposes to obtain the materials shall be selected and submitted for approval at least 60 days in advance of the time when the material will be required in the work.

### 2.3 TESTS FOR ACCEPTABILITY.

2.3.1 Quality tests and service records will be used to determine the acceptability of stone materials. In the event suitable test reports and satisfactory service records are not available, as in the case of newly operated sources, the materials will be tested to determine acceptability. Tests to which the materials may be subjected include petrographic analysis, specific gravity, soundness, abrasion, absorption, freezing and thawing, and other tests considered necessary to demonstrate acceptability. Tests will be made by, or under the supervision of, the Government and at the Government's expense.

2.3.2 Samples. If directed, suitable samples of materials shall be submitted for approval prior to delivery of materials to the work site. Unless otherwise directed, samples shall be obtained by the Contractor, in the presence of the Contracting Officer, and delivered at the Contractor's expense to a point designated by the Contracting Officer, at least 30 days in advance of the date that the stone protection is expected to begin. The materials must be approved by the Contracting Officer before commencing placement.

### 2.4 TESTS FOR GRADATION AND SHAPE.

2.4.1 Riprap. Tests shall be performed by and at the expense of the Contractor. Testing shall be under the direction of the Contracting Officer, unless waived. Gradation test results shall be submitted on ENG Form 4055 and on the Gradation Analysis Worksheet provided at the end of this section. One sample for each type of material shall be taken from stockpiled materials and the remaining samples shall be taken from loads prior to dumping or from in-place material, when and where directed. Prior to placing materials, the Contractor shall submit for approval proposed testing and procedures. The Contractor shall state, in writing, methods of processing and handling samples and shall notify the Contracting Officer immediately when production methods are changed. A minimum of 5 weight classes shall be used in the gradation testing. The Contractor shall select weight classes to yield approximately 75, 50 and 30 percent finer by weight gradation points. The Contractor shall weigh that portion smaller than 4 inches in each sample of riprap and indicate that weight in the total weight of the gradation test sample. Determination of the gradation of riprap material smaller than 4 inches is not required.

2.4.2 Testing results shall be submitted to the Contracting Officer immediately after testing completion. The minimum sample size for tests shall be as follows:

<u>Material</u>	<u>Minimum Sample Size</u>
Riprap	6 tons.

2.4.3 Frequency. The minimum gradation tests shall be performed as follows. The Contractor shall take as many additional tests under the Contractor's quality control program as is needed to ensure that the gradation is being met. Tests performed on materials that do not meet requirements will not be counted as part of the minimum required.

<u>Material</u>	<u>Minimum Number of Tests</u>
Riprap	1 test prior to placement, and 1 test per 2,000 tons or fraction thereof.

2.4.4 Corrective Action. If materials fail to meet gradation or shape requirements, the Contractor shall adjust his operations and verify with necessary tests that acceptable materials are being produced, or he shall propose another source and verify, with necessary tests, that acceptable material can be produced from that source. Payment will not be made for material which fails to meet requirements. Material already in place that fails to meet requirements will be removed by the Contractor at no additional cost to the Government.

### 3. EXECUTION.

3.1 FOUNDATION PREPARATION. Foundation areas shall be cleared of woody vegetation materials that could prevent proper placement of riprap. Removal of driftwood, snags, wood debris and brush within the limits of riprap protection construction shall be considered part of the riprap protection construction process and shall be disposed of in accordance with SECTION 01000: GENERAL. Plant root systems may be left in place and intact. Plant trunks and stems that construction work can be built around and remain standing vertically through the completed groins may be left in place in order to assist in the natural revegetation of the site. Immediately prior to placing riprap, the foundation area will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

### 3.2 PLACEMENT AND TOLERANCES.

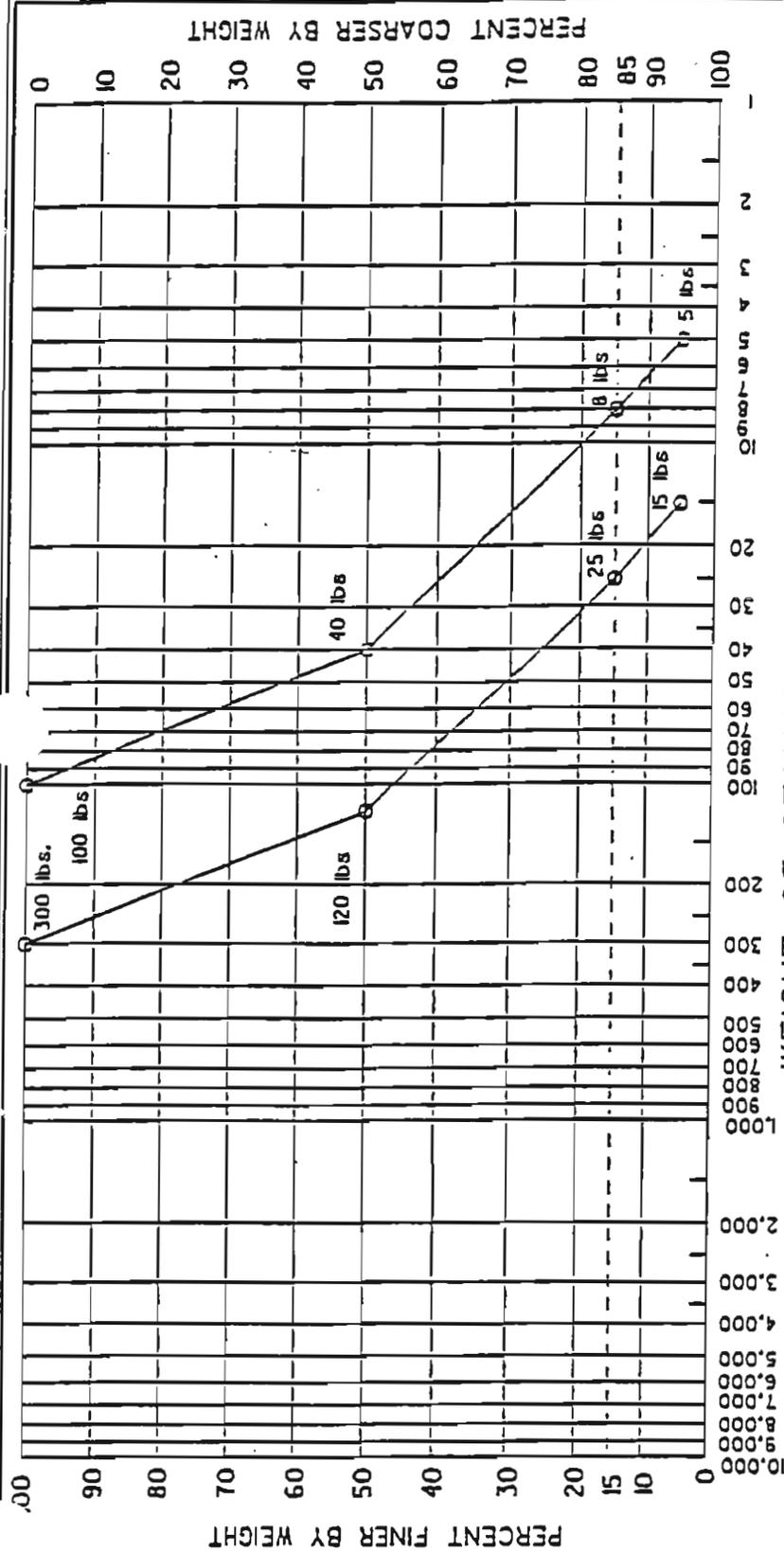
3.2.1 Riprap shall be constructed to the lines and grades shown or established within a tolerance of 6 inches above and 3 inches below the prescribed grade, except either extreme shall not be continuous over an area greater than 200 square feet. Riprap used for slope protection shall be placed to the full surface course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing riprap used for slope protection in layers shall not be permitted. All riprap shall be placed in such a manner as to produce a mass of unsegregated stone with maximum interlocking and stone to stone contact and a minimum of voids. The finished mass shall be free from pockets of small stones, clusters or larger stones and excessive voids. Placing riprap by dumping into chutes or by similar methods likely to cause segregation shall not be permitted. The Contractor shall maintain the riprap protection until accepted, and displaced material must be replaced by the Contractor at no additional cost to the Government.

3.2.2 Riprap to be placed under water shall meet gradation requirements in the bucket or container used for placing, and shall be placed in a systematic manner so as to ensure a continuous uniform layer of well-graded stone of the required thickness. Stone to be placed under water shall not be cast across the surface of the water.

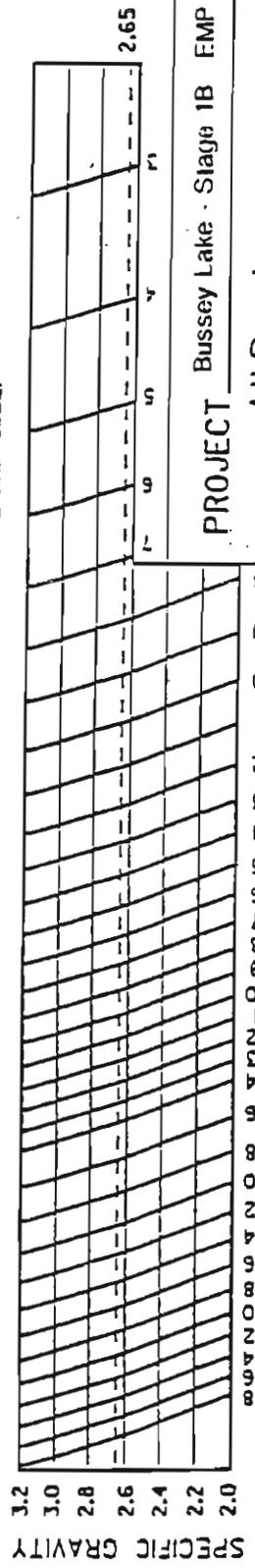
3.2.3 Placement of Riprap on Geotextile. The geotextile shall be in place prior

to placement of the riprap thereon. Placement of the geotextile is specified in SECTION 02272: GEOTEXTILE. The riprap shall be placed on the geotextile with care so as not to rupture the geotextile and shall not be dropped from a height greater than one foot. Riprap placement shall generally be initiated at the toe of the dike slope and progress up the slope towards the dike berm crest. The riprap shall not be allowed to roll down the geotextile. Riprap in direct contact with the geotextile shall not be pushed, or moved by mechanical equipment. Any damage to the geotextile that occurs during placement of the riprap shall be repaired, or replaced, by the Contractor at no additional cost to the Government.

\* \* \* \* \*



**WEIGHT OF STONES IN POUNDS**  
 (ASSUMING STONE SHAPE SIMILAR MIDWAY BETWEEN A SPHERE AND CUBE)



SIZE OF STONE IN INCHES

SPECIFIC GRAVITY OF STONE = **2.65**

PROJECT Bussey Lake - Stage 1B EMP  
 AREA All Rock  
 DATE 2 Dec. 1994

RIPRAP GRADATION CURVES

SECTION 02272

GEOTEXTILE

INDEX

<u>PARAGRAPH</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
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2	PRODUCTS	02272-2
3	EXECUTION	02272-3

SECTION 02272

GEOTEXTILE

1. GENERAL.

1.1 SCOPE. This section covers geotextile fabric to be used as a filter material underneath the riprap slope protection.

1.2 RELATED WORK OF OTHER SECTIONS. The following items of related work are covered under other sections:

- 1) Placement of Riprap on Geotextile: SECTION 02271: RIPRAP PROTECTION.

1.3 APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM):

D 123-90	Terminology Relating to Textile/Materials
D 1683-90a	Failure in Sewn Seams of Woven Fabrics
D 3787-89	Bursting Strength of Knitted Goods: Constant-Rate-of Traverse (CRT), Ball Burst Test
D 3884-92	Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
D 4533-91	Trapezoid Tearing Strength of Geotextiles
D 4632-91	Breaking Load and Elongation of Geotextiles (Grab Method)
D 4751-87	Apparent Opening Size of a Geotextile

U. S. Army Corps of Engineers, Engineering Manual (EM):

EM 1110-2-1906 Laboratory Soils Testing

1.4 SUBMITTALS. The following shall be submitted in accordance with SECTION 01305: SUBMITTAL PROCEDURES:

1.4.1 Manufacturers Data. The Contractor shall submit descriptive technical data on the geotextile.

1.4.2 Samples. The Contractor shall submit samples of the geotextile as specified in PARAGRAPH: PRODUCTS.

1.4.3 Certificates of Compliance. The Contractor shall submit certificates of compliance as specified in PARAGRAPH: PRODUCTS.

1.5 MEASUREMENT AND PAYMENT.

1.5.1 Geotextile shall be measured in place to the nearest square yard of protected area as delineated in the drawings. Payment shall be made at the contract unit price for each item and shall constitute full compensation to the

shall be prepared to a relatively smooth condition free of obstructions, depressions, debris and soft or low density pockets of material. Erosion features such as rills, gullies, etc. must be graded out of the surface before geotextile placement. The geotextile shall be placed with the long dimension parallel to the centerline of the dike and shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. The strips shall be placed to provide a minimum width of 18 inches of overlap for each joint for above-water placement, and a minimum width of 36 inches of overlap for each joint for under-water placement. The geotextile shall be placed so that the upper strip of geotextile will overlap the next lower strip and that the upstream strip of geotextile will overlap the downstream strip.

3.1.1.1 Temporary pinning of the geotextile to help hold it in place until the riprap is placed will not be allowed. The geotextile shall be securely anchored with sand bags or stones to prevent it from moving during placement of riprap.

3.1.2 The placement procedure requires that the length of the geotextile be approximately 15 percent greater than the slope length. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience.

3.1.3 Protection. The geotextile shall be protected at all times during construction from contamination by surface run-off and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. Any damage to the geotextile during its installation or during placement of riprap shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 3 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of riprap. Before placement of the riprap, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

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