US Army Corps
of Engineers
St. Paul District

# OPERATION AND MAINTENANCE MANUAL

## ENVIRONMENTAL MANAGEMENT PROGRAM (HREP)

## GUTTENBERG WATERFOWL PONDS

## CLAYTON COUNTY, IOWA

SEPTEMBER 1997

## PREFACE

The Guttenberg Waterfowl Ponds Habitat Rehabilitation and Enhancement Project, constructed by the Corps of Engineers, was completed in November, 1996. In accordance with Section 906(e) of the Water Resources Development Act of 1986 and the policies set forth in the Fourth and Fifth Annual Addendums, the U.S. Fish and Wildlife Service has the responsibility for operation and maintenance. The Corps of Engineers has prepared this manual to assist the U.S. Fish and Wildlife Service 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 waterfowl habitat at the Guttenberg Waterfowl Ponds, located immediately downstream of the earthen dike at Lock and Dam 10. However, continued successful functioning of the project will depend upon the manner in which it is operated and 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 MANAGEMEMENT PROGRAM

GUTTENBERG WATERFOWL PONDS
POOL 11, UPPER MISSISSIPPI RIVER
CLAYTON COUNTY, IOWA

OPERATION AND MAINTENANCE MANUAL

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## INTRODUCTION

This manual has been prepared to serve as a guide for the operation and maintenance of the Guttenberg Waterfowl Ponds Habitat Rehabilitation and Enhancement Project in Clayton County, Iowa. Operation and maintenance instructions for the major features of the projects are presented. These instructions are consistent with the general procedures found in the Guttenberg Waterfowl Ponds Definite Project Report dated July 1988, and 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 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 Guttenberg Waterfowl Ponds 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). The Guttenberg Waterfowl Ponds are located in pool 11, immediately below Lock and Dam 10. The project lies within the Upper Mississippi River National Wildlife and Fish Refuge. Project drawings (appendix A) show the location of the project.

Because the Guttenberg Waterfowl Ponds project is located on Federal lands managed as a National Wildlife Refuge, operation and maintenance are to be carried out in compliance with Section 906(e) of the 1986 Water Resources Development Act and policies set forth in the Fourth and Fifth Annual Addendums.

### DESCRIPTION OF PROJECT

#### General

The Guttenberg Waterfowl Ponds are located on the site of an abandoned fish rearing pond complex, formerly part of the Guttenberg National Fish Hatchery. Operation of the fish ponds by the U.S. Fish and Wildlife Service ceased in 1973. Following abandonment, the original water supply pump and existing pond outlet control structures were rendered inoperable by disuse, vandalism, and beaver activity. Water levels in the ponds either fluctuated with changes in the river level or remained stable because vegetation and beaver activity had clogged the outlet structures. The original Guttenberg Waterfowl Pond project, as planned and designed in 1989, was to provide a controlled moist soil impoundment within the abandoned ponds which then would be managed primarily for the production of moist-soil plants and associated invertebrates to benefit migratory water birds. This was to be accomplished primarily through installation of a dependable water supply system and restoration of the pond outlet facilities. The total managed area of the ponds would have been approximately 35 acres.

The planning for a nearby habitat project at Bussey Lake resulted in dredging being the recommended action. 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 and construct one additional 15-acre pond for moist soil management. In addition, as part of this plan, additional water supply capabilities would be

provided, interior pond dikes would be modified, and new outlet structures would be constructed at the Guttenberg Waterfowl Ponds.

The Definite Project Report/Environmental Assessment (SP-2), Guttenberg Waterfowl Ponds Habitat Rehabilitation and Enhancement Project, July, 1988, and the Definite Project Report/Environmental Assessment (SP-5), Bussey Lake Habitat Rehabilitation and Enhancement Project, August, 1990, provide additional details on the planning and design of the Guttenberg Waterfowl Pond features.

## Design Considerations

General - The Guttenberg Waterfowl Ponds were designed to be managed as moist soil units for the production of moist-soil plants and associated invertebrates for the benefit of migratory water birds. The typical management plan would be to have the ponds dewatered by the end of June. The ponds would be left dry during July-August to promote the growth of desired plant species. In late August-early September, the ponds would be reflooded with 12-18 inches of water to provide feeding habitat for migratory water birds. The ponds would either be drained or left flooded over the winter depending upon management goals at the time.

Periodically, the ponds would be extensively dewatered to allow the use of farm equipment to grade, till, and/or seed the ponds. In addition, the ponds periodically would be flooded with up to 3 feet of water for an entire growing season to assist in the control of undesirable vegetation growth such as woody shrub invasions.

The design bottom elevation of the ponds is 608.0. The normal pool elevation for pool 10 (source of water supply) is 611.0. This will allow for placing a minimum of 3 feet of water in the ponds for management purposes. During high water periods, pool 10 will rise above 611.0, which would allow for placing more than 3 feet of water in the ponds if so desired.

Originally there were four ponds (#1 though #4) at the site. An additional pond (#5) was constructed in conjunction with the Bussey Lake project. Interior dikes were removed so that the ponds can be operated as two units. Unit #1 consists of the former ponds #3 and #4. Unit #2 consists of the former ponds #1 and #2 and the new pond #5.

Dikes - The original pond dikes have elevations ranging to over 620.0 in some locations. These dikes have been in place since pond construction in the 1920's and were considered stable, not requiring any modification for the project. Woody vegetation was cleared from the dikes to make future

inspection and maintenance easier.

The new pond #5 dike was constructed to elevation 615.0. This elevation was selected to prevent overtopping by high water during the June-November period when water levels within the ponds are being managed for habitat purposes. Construction to a higher elevation to prevent overtopping by spring flood events was not considered cost-effective.

Overtopping by high water in 1993 and 1996 resulted in a breach being eroded in the pond #5 dike where it crosses Deadman's Slough. Settlement in this area creates a low spot where water crossing the dike eroded the sand sediments with the which the dike was constructed. To alleviate this problem, a rock overflow section was placed in this section of the dike.

Water Supply - In moist soil unit management, the most critical water supply criteria is to be able to flood the units within a 2-week period in early September prior to the fall migration period. The original water supply line to the ponds was designed to provide approximately 80-acre feet of water to the ponds within about 6 days, assuming a pool 10 headwater elevation of 611.0. The 80-acre feet was required because the pond bottoms were not level, and portions of the ponds would be covered with more water than necessary to insure the entire ponds had a minimum amount of water depth. The water supply line was sized at 24 inches to meet this flow requirement. A single knife valve was installed in the line for water control.

Under the revised design the pond bottoms were elevated and leveled. In addition, acreage of the ponds was increased from about 35 acres to about 50 acres. However, providing 1 to 2 feet of water over this larger pond area will require only 50 to 100-acre feet of water. The raising of the pond bottoms reduced the head differential. However, analysis indicates that even under the reduced head differential conditions, it should be possible to fill the ponds within a two week period.

Under the revised design where the ponds would be managed as two units, it was desired to be able to independently manage water levels in the two units. The original water supply line provided water to the area later designated as Unit #1. A branch water supply line was installed to provide water to Unit #2. A junction box was constructed at the intersection of the two lines. Slide gates were installed in the junction box to allow independent control of water to the two units. The original knife valve remains in place above the junction box to provide the ability to completely shut off water to the system if necessary.

Both the main water supply line and the branch water supply line outlet into preformed scour holes lined with rock. The purpose was to prevent

formation of uncontrolled scour at the outlets of the water supply lines.

Outlet Structures - The outlet from the Guttenberg Waterfowl Ponds to Cassville Slough (here-in-after referred to as outlet #1) was refurbished in 1990. However, raising the pond bottom elevation made this structure inoperable as an outlet for Unit #1, requiring installation of a new outlet structure at this location. In addition, a new outlet structure was required for Unit #2 (outlet #2). A common design was used for these two structures.

As noted earlier, management of the ponds will require on occasion the ability to access the ponds with farm equipment. This will require drying of the pond sediments as much as possible. Therefore, outlet structures were designed to maximize this as much as practicable. The tailwater elevation for L/D 10 is elevation 603.0, though available records indicate it seldom falls below 604.0. Thus, an invert elevation of 604.0 was selected as the most practical for the outlets.

Outlet structures #1 and #2 have to serve a number of functions. They must control the rate of flow out of the ponds, control the elevation of water within the ponds, keep the river from backing into the ponds, and minimize the potential for carp to enter the ponds. The most salient features to perform these functions are stop logs, a sluice gate, and a carp rack. During normal operation, the stop logs will control the water levels within the moist soil units. When a unit is being drained, the stop logs can be removed to the new desired elevation and the slide gate set to achieve a desired rate of discharge. It would also be possible, though more labor intensive, to periodically remove stop logs to draw down the water in a unit. When a moist soil unit is being filled, the stop logs will be set at the desired water elevation.

One of the problems faced will be to keep the river from backing into the ponds when river levels rise, which can happen quite frequently in this area because of fluctuations in dam tailwater elevations. The stop logs can perform this function to a point. However, the slide gates can be used to keep the river from backing into the ponds until such point as the structure and/or the dike may be overtopped.

Keeping carp totally out of the moist soil units is deemed impossible. The carp rack is designed to keep adult carp out of the structure, lessening the chance that they will be able to bypass the stop logs and slide gate. In most instances the head difference between the top of the stop logs and the outlet should be sufficient to keep juvenille carp from getting over the stop logs. However, in instances when the river stages rise or when the ponds are being drained, this head differential will be small or non-existant. It is recognized that eventually carp will establish themselves in the moist soil

units. If they become a problem, the solution will be to drain the ponds over winter and freeze out the carp.

Outlet #3 from Unit #1 is primarily to take advantage of the ability to provide flows to the Big Pond area below the waterfowl pond dikes to assist in alleviating dissolved oxygen depletion problems in that area. This is a secondary function and will be only be accomplished if it does not interfere with the primary management purpose of the moist soil units. This outlet was present from the original pond construction. A slide gate was added to provide the ability to control flows out of this structure.

Drainage - It was recognized that dewatering of the pond sediments will not be easy because of the fine nature of the sediments. Therefore, drainage ditches were excavated around the perimeter of the moist soil units to facilitate dewatering and drainage to the outlet structures.

## CONSTRUCTION HISTORY

Initial construction at the Guttenberg Waterfowl Ponds took place in conjunction with the L/D 10 abutment raise. The Guttenberg Waterfowl Pond construction consisted of installing a water supply line and restoration of the pond outlet structures. The construction contract was awarded in September 1989 and was considered complete in October, 1990. The work was performed by Taylor Construction, Inc., P.O. Box 10, New Vienna, Iowa 52065.

A 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 was completed in October 1992 when pond #5 was filled to its design elevation. Final grading of the pond dikes and seeding was delayed until the late summer of 1994 by the summer flood of 1993 and persistent high water in the early summer of 1994.

The construction contract for installation of a branch water supply line and the installation of new water control structures at the Guttenberg Waterfowl Ponds was awarded in October, 1994, to Taylor Construction, Inc. This work was essentially completed during 1995, with final completion occurring in November, 1996.

A contract to repair a breach one of the Guttenberg Waterfowl Pond dikes by installing a rock-lined overflow section was awarded in September, 1996, to Weymiller Marine, Inc., P.O. Box 400, Lansing, Iowa 52151-0400. This work was completed in October, 1996.

## PART II - OPERATION AND MAINTENANCE

### GENERAL RESPONSIBILITIES AND PROCEDURES

#### Approved Responsibilities

Operation and maintenance responsibilities for the Guttenberg Waterfowl Pond habitat project was originally outlined in the Definite Project Reports for the Guttenberg Waterfowl Pond and Bussey Lake projects. The acceptance of these responsibilities was formally recognized by agreements signed by the U.S. Fish and Wildlife Service (USFWS) and the St. Paul District, Corps of Engineers. These agreements, dated 12 January 1989 and 20 February 1992, are contained in appendix B. The capability of the USFWS to carry out their operation and maintenance responsibilities will be contingent upon the passage of sufficient appropriations by Congress. Annual operation and maintenance costs estimated during the preparation of the Definte Project Reports were cummulatively $3,500 (1990 dollars).

#### District Manager

Typically, the USFWS operation and maintenance responsibility for habitat projects is given to the district manager in charge of that portion of the appropriate National Wildlife Refuge. For the Guttenberg Waterfowl Pond projects, the current address for the district manager is District Manager, U.S. Fish and Wildlife Service, P.O. Box 460, McGregor, Iowa 52157. Hereafter, for the purposes of this manual, when describing responsibilities, etc., the term "District Manager" will be used.

#### 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.

#### Inspections

The District Engineer or his representative will be kept informed on operation and maintenance activities for the Guttenberg Waterfowl Ponds habitat projects through periodic inspection of the project by the Corps and through analysis of an annual report submitted by the USFWS. A representative

of the Corps will coordinate the periodic inspection in advance with the USFWS. 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 USFWS will jointly review the inspection plans and make any appropriate revisions.

The findings of the periodic inspections will be transmitted to the USFWS and could include recommendations for any remedial work considered necessary to maintain the habitat project in a satisfactory operating condition. Any agreed upon remedial work should be completed as soon as possible by the USFWS as provided in the Memorandum of Agreement between the USFWS and the Corps.

An inspection of the project features should be made by the District Manager at a minimum frequency of once a year. Inspections should also be made after any flood whose elevation exceeds 615.0 feet msl at the L/D 10 tailwater gage.

The frequency for inspection will be subject to review by the USFWS and Corps and could change upon mutual agreement of both parties. The timing of the annual inspection can be made at the discretion of the District Manager.

Annual Report

An annual report covering inspection, operation, and maintenance of the habitat project shall be submitted to the District Engineer by April 30 of the ensuing year. The USFWS may send the Guttenberg Waterfowl Pond report in conjunction with reports on other habitat projects for which it has responsibility. If so desired, these reports can be sent to the Corps with the annual Cooperative Agreement Report which is done every April by the USFWS.

A sample copy of a checklist to be included with the annual report can be found in appendix C. Besides completion of the inspection checklist, each individual report should briefly summarize the condition of the project, including any maintenance work done during the past 1-year period.

## OPERATION

The Guttenberg Waterfowl Ponds are to be operated by the USFWS as moist soil units for the benefit of migratory water birds and other fish and wildlife. The basic purpose of the project is to manage water levels within the moist soil units to promote the growth and use by migratory water birds of moist soil plants and associated invertebrates.

The junction box gate and the outlet structure gates should be operated in accordance with the manufacturer's instructions (appendix D).

## 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.

The manufacturer's operation and maintenance instructions for the outlet structure gates are contained in appendix D and should be followed.

Allowing trees and brush to grow on the overflow spillway may eventually lead to failure of the rock protection. In addition, allowing vegetation growth on the rock makes it more difficult to identify small problem areas.

Allowing trees and brush to grow on the pond dikes may lead to their failure. It is recommended that vegetation on the dikes be limited to herbaceous growth.

### Repair Materials

Appendix E contains those portions of the construction specifications describing the materials used in the original construction. Materials used for repair should meet these specifications. Included in appendix D are the catalogs and other manufacturer's information pertaining to the gated structures at the Guttenberg Waterfowl ponds. This information should be used in the procurement of replacement parts.

## INSPECTIONS, TESTS, AND OPERATIONS FOLLOWING MAJOR STORMS OR FLOODS

### General

As stated in the Memorandum of Agreement between the USFWS and the Corps, the Corps will be responsible for any mutually agreed upon repair and rehabilitation of the Guttenberg Waterfowl Ponds projects that exceeds the annual maintenance requirements and that may be needed as a result of a specific storm or flood. The Guttenberg Waterfowl Ponds project will be inspected, as previously described, following flood events producing a water surface elevation greater than 615.0 feet msl at the lock 10 tailwater gage.

### Project Rehabilitation or Abandonment

Should inspection of the project area following a major flood or natural disaster disclose substantial damage to the entire project that appears to exceed the annual operation and maintenance as specified in this manual and the Definite Project Report, the Corps and USFWS should meet and discuss the appropriate course of action in light of original project design. The inspections by the District Manager and the joint inspections with the Corps will be the basis for determining maintenance responsibility by the U.S. Fish and Wildlife Service versus potential rehabilitation by the Corps of Engineers. Repair of damage attributable to lack of maintenance would be considered a U.S. Fish and Wildlife Service responsibility.

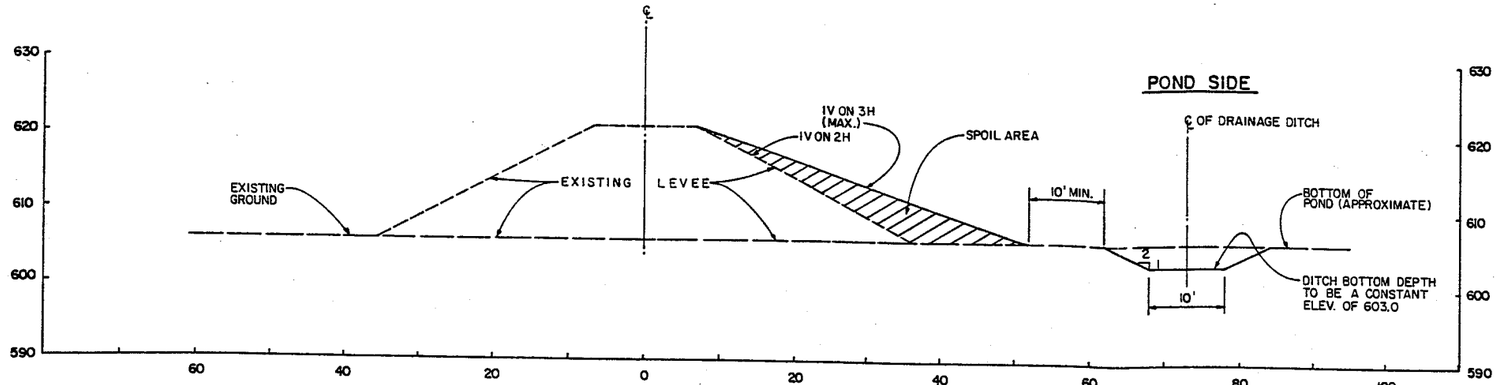
The options of rehabilitation or abandonment of the project may be considered at this time. Any decision would be carried forth only upon written mutual agreement of the USFWS and the Corps. Included within such agreement would be a description of the agreed upon course of action and funding responsibilities, if any. The Iowa Department of Natural Resources will be consulted prior to coming to any final determination on a course of action.

## PROJECT MONITORING AND EVALUATION

Performance monitoring of the Guttenberg Waterfowl Pond projects will be conducted by the Corps of Engineers to help determine the extent to which the design meets the habitat improvement objectives. Information from this monitoring will also be used, if required, when ascertaining whether rehabilitation or abandonment of portions of this project would be the wisest choice.

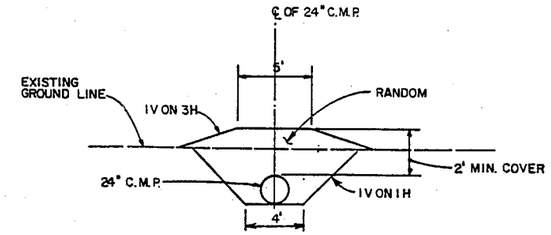
# APPENDIX A

## PROJECT DRAWINGS

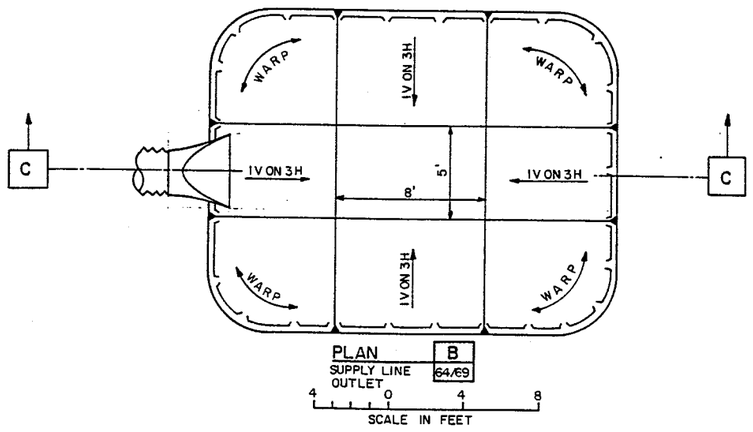



SECTION A 10/8

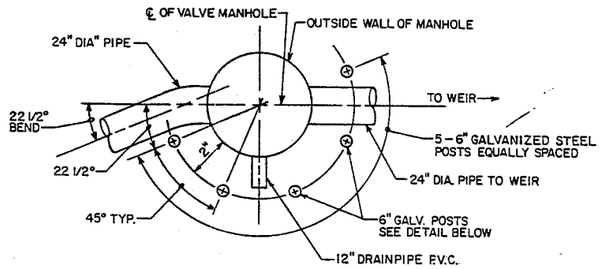
TYPICAL POND SIDE DRAINAGE DITCH AND SPOIL AREA
SCALE AS SHOWN




TYPICAL SECTION D 64/69 10/8 61/22
SCALE AS SHOWN




PLAN B 64/69
SUPPLY LINE OUTLET
4 0 4 8
SCALE IN FEET




GUARD POST DETAIL E 61/22
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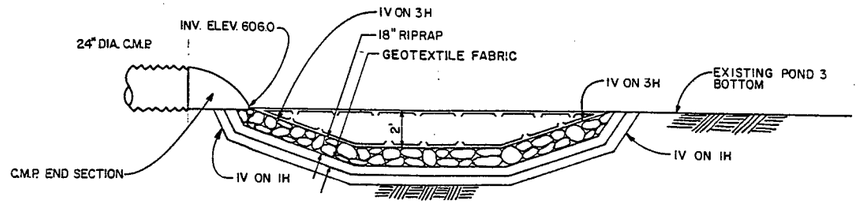


SECTION C
SUPPLY LINE OUTLET
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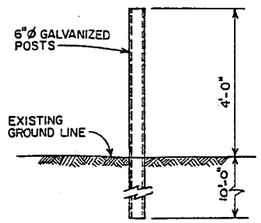



DETAIL F 61/22
NO SCALE

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

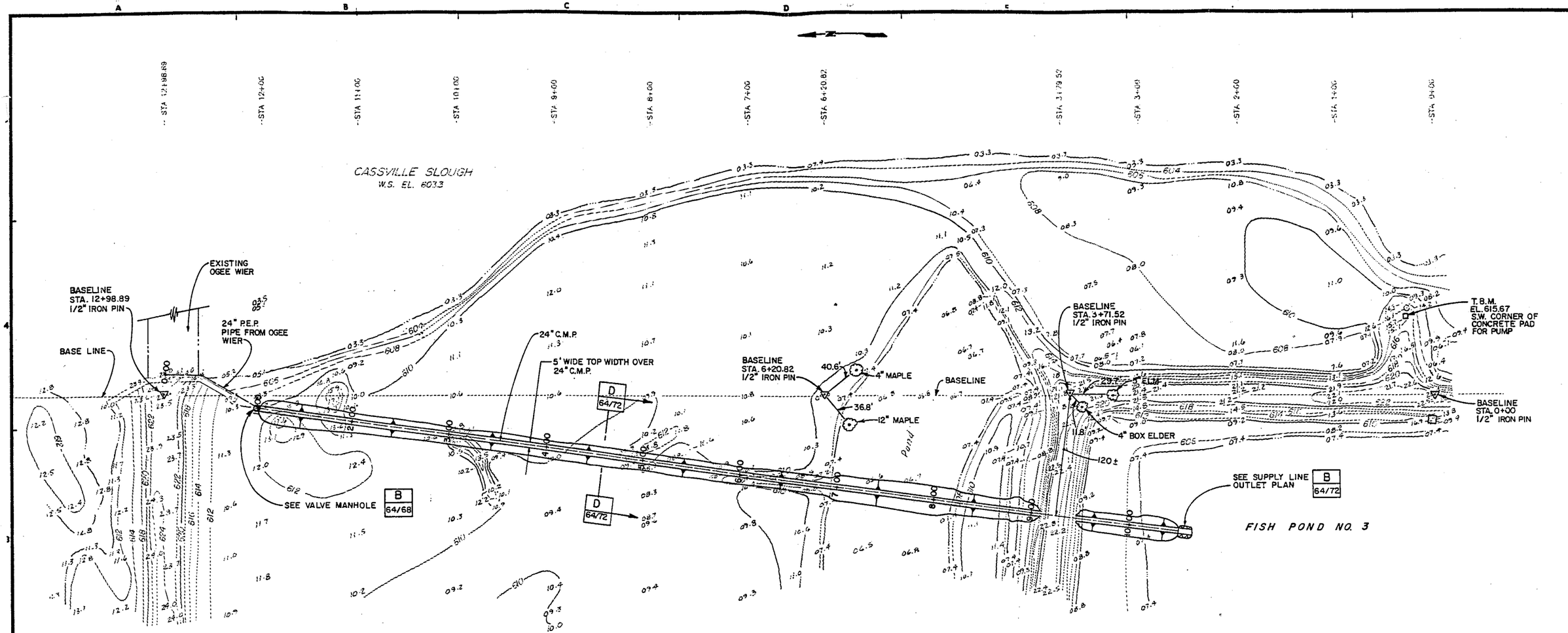
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: W.P.R. D.J.O.
DRAWN BY: KL DPF
CHECKED BY: JBM
SUBMITTED BY: CHIEF ED-D BRANCH / CHIEF ED-GM BRANCH
APPROVED BY: Acting CHIEF ENGR. DIVISION

EMP — MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBURG, IOWA
SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
MISCELLANEOUS PLAN AND SECTIONS

DATE: AUGUST 1989
SCALE: AS SHOWN
SPEC. NO. DACW 37-89-B-1008
DRAWING NUMBER M-P10-64/72
SHEET 13 OF 16

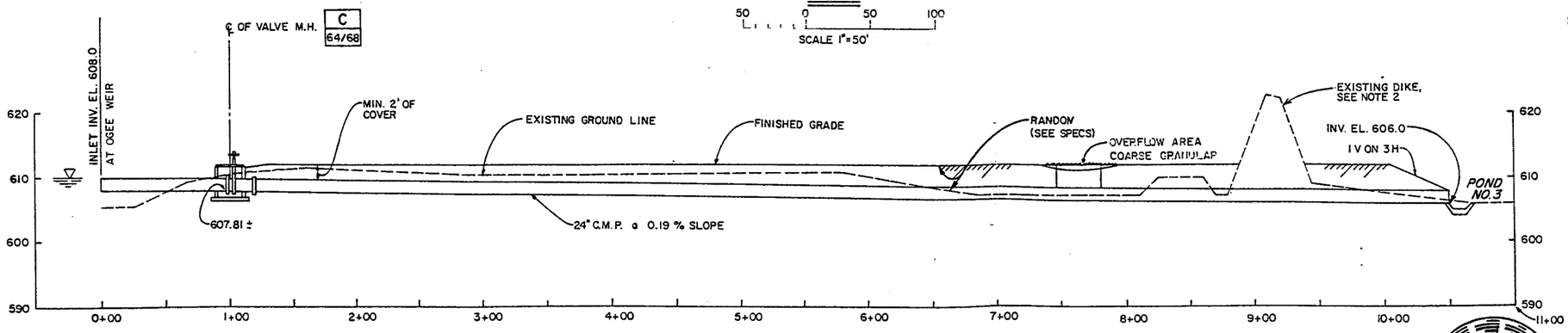
AS BUILT




PLAN

50 0 50 100

SCALE 1"=50'




PROFILE

WATER SUPPLY LINE TO POND 3

NOTE:

1.) SURVEYS TAKEN JUNE, 1988.
2.) CONTRACTOR TO RECONSTRUCT EXISTING DIKE THAT IS IMPACTED BY INSTALLATION OF 24" C.M.P. TO PRECONSTRUCTION HEIGHT AND SIDE SLOPE CONDITIONS.
3.) WORK LIMITS NOT SHOWN, SEE DWG 10/8.

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: W.P.R. D.J.O.
DRAWN BY: D.P.F.
CHECKED BY: J.B.M.
SUBMITTED BY: Chief ED-D Branch
Chief ED-GH Branch
APPROVED BY: Chief Engr. Division

EMP - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBURG, IOWA
SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
WATER SUPPLY LINE, PLAN & PROFILE

DATE: AUGUST 1989
SCALE: AS SHOWN
SPEC. NO. DACW 37-89-B-1008
DRAWING NUMBER M-P10-64/69
SHEET 10 OF 16

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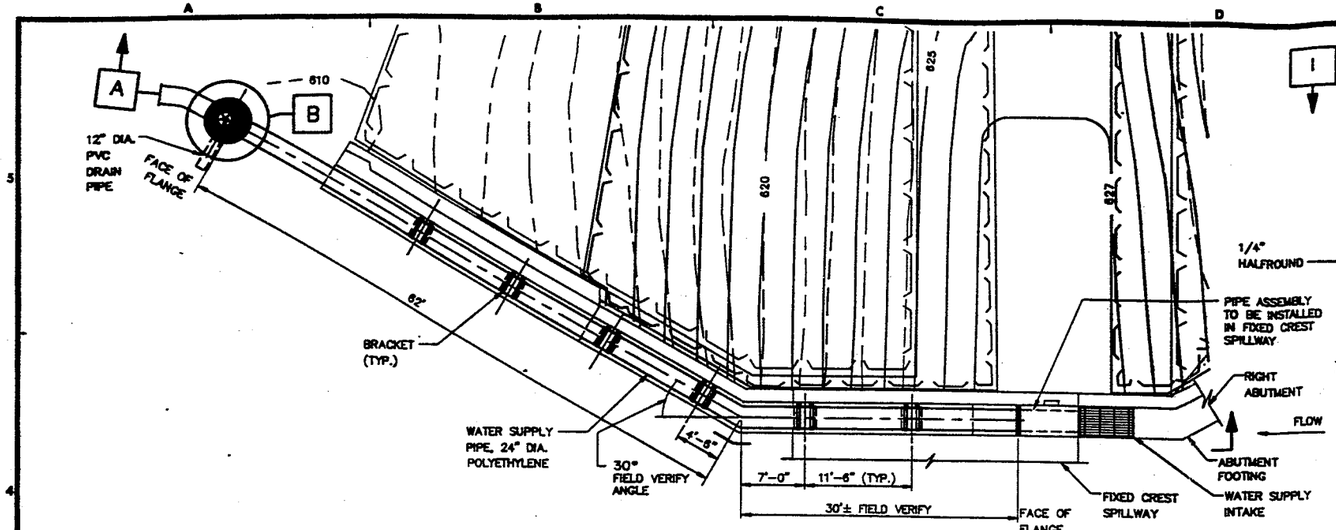
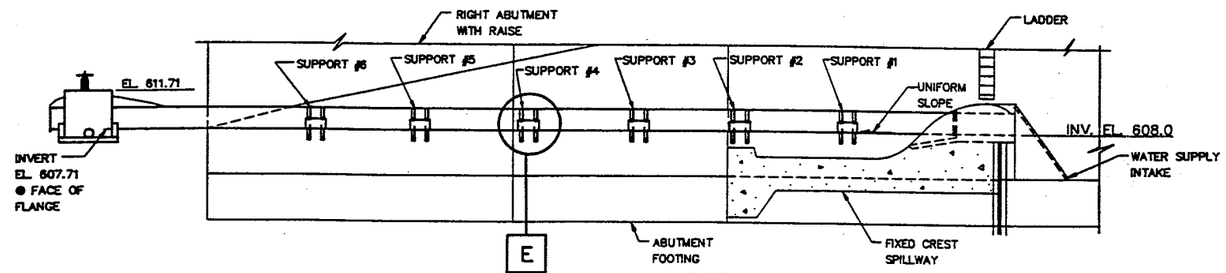



## PLAN
WATER SUPPLY PIPELINE
SCALE: 1/8" = 1'-0"

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WATER SUPPLY PIPELINE
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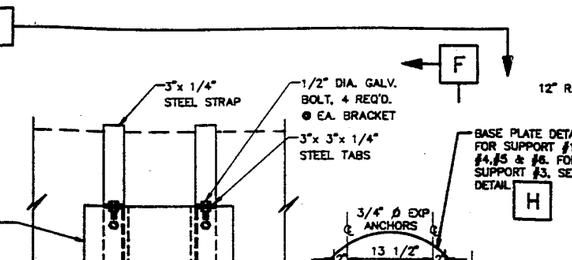


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WATER SUPPLY BRACKET
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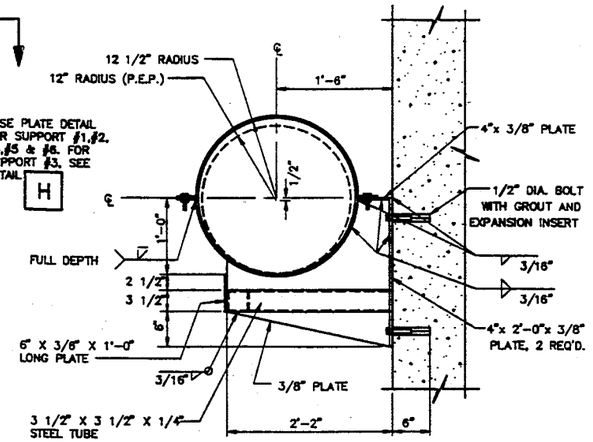
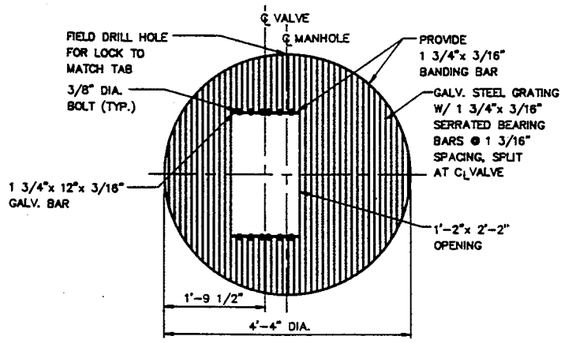
E 61/25




## F SECTION
WATER SUPPLY BRACKET
SCALE: 1" = 1'-0"

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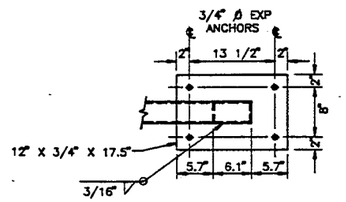


## DETAIL
BASE PLATE DETAIL FOR SUPPORT #3
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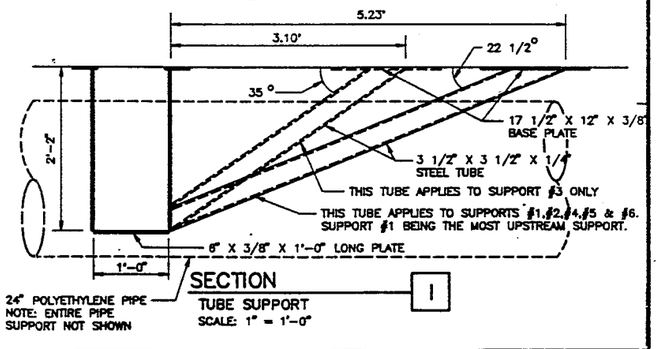
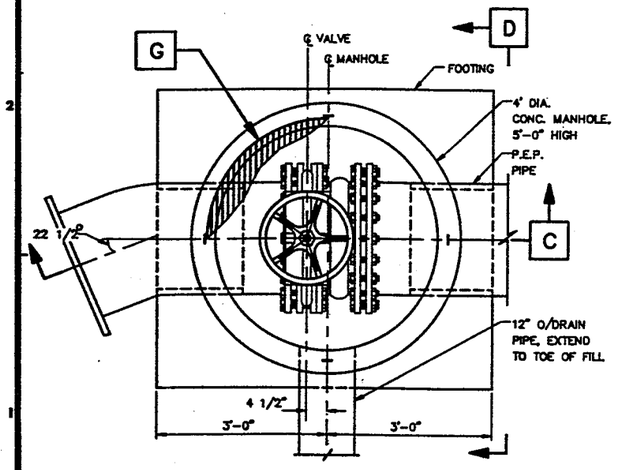
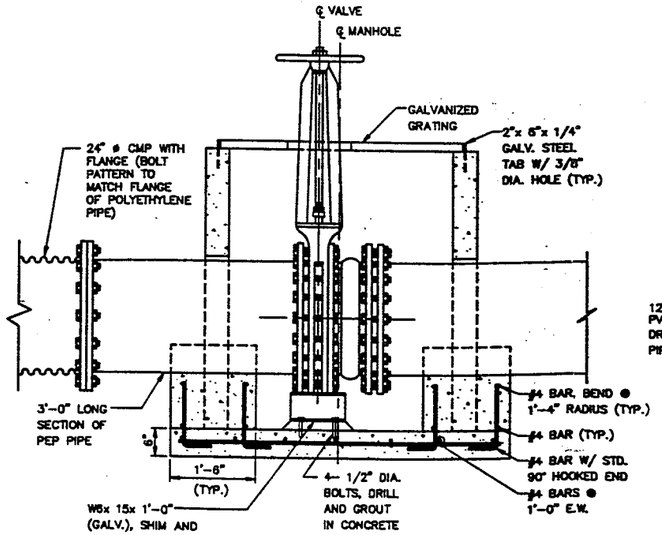



## SECTION
TUBE SUPPORT
SCALE: 1" = 1'-0"
I



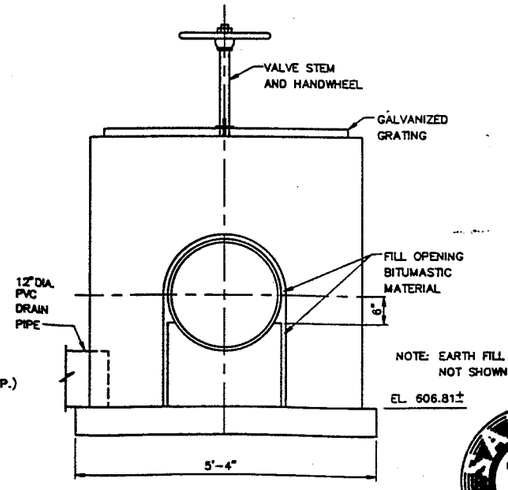

## DETAIL
MANHOLE AND VALVE
SCALE: 3/4" = 1'-0"
B

NOTE: EARTH FILL AND GRATING NOT SHOWN




## SECTION
MANHOLE AND VALVE
SCALE: 3/4" = 1'-0"
C

NOTE: EARTH FILL NOT SHOWN




## SECTION
MANHOLE
SCALE: 3/4" = 1'-0"
D

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

Barr ENGINEERING CO. Minneapolis, Minn.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: TFP, JRL, PBS
DRAWN BY: TFP DPF
CHECKED BY: JRL, PBS
SUBMITTED BY: CHIEF ENGR DIV BRANCH
APPROVED BY: CHIEF ENGR. DIVISION
DATE: AUGUST 1989

MAJOR MAINTENANCE - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBERG, IOWA

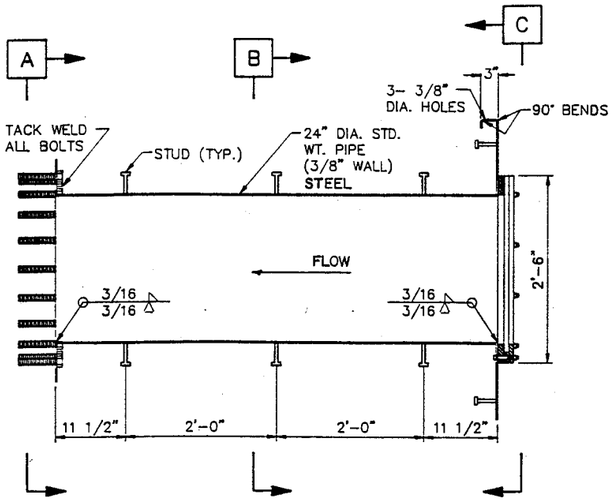
# SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS

WATER SUPPLY PIPELINE:
PLAN, ELEVATION, SECTIONS, & DETAILS

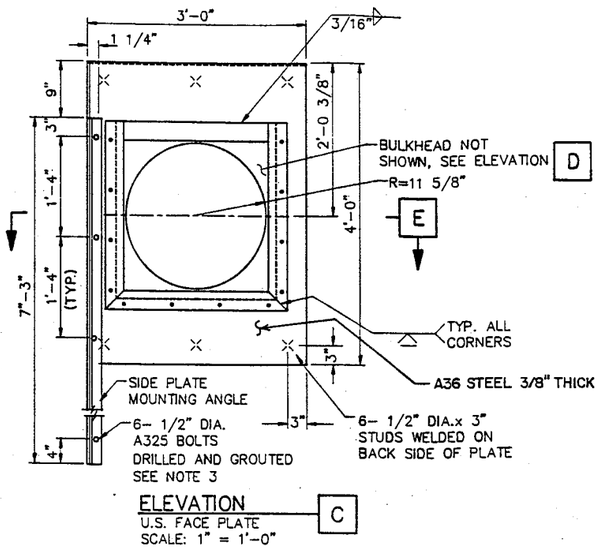
AUTOCAD DRAWING FILE
IF MANUALLY CHANGED
NOTIFY CAD OPERATOR
LD10-WS
MARCH 17, 1989

SCALE: AS SHOWN
SPEC. NO. DACW37-89-B-1008
DRAWING NUMBER M-P10-64/68
SHEET 9 OF 16

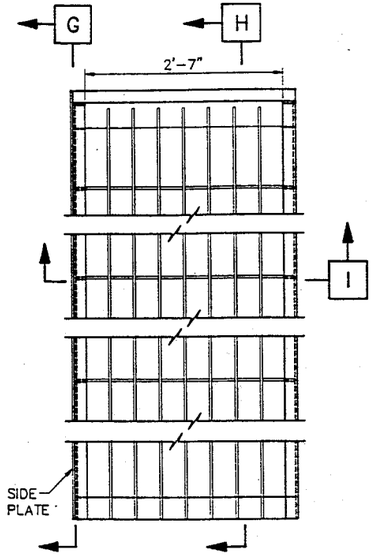
AS BUILT



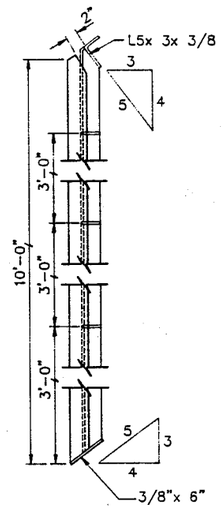

PIPE ASSEMBLY DETAIL
SCALE: 1" = 1'-0"



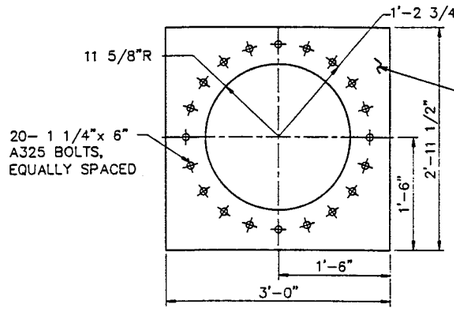

ELEVATION C
U.S. FACE PLATE
SCALE: 1" = 1'-0"



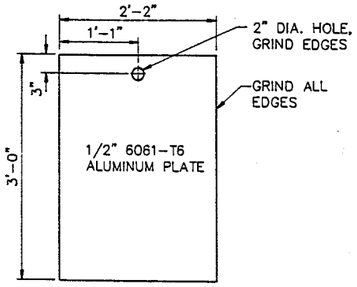

TRASH RACK DETAIL
SCALE: 1" = 1'-0"



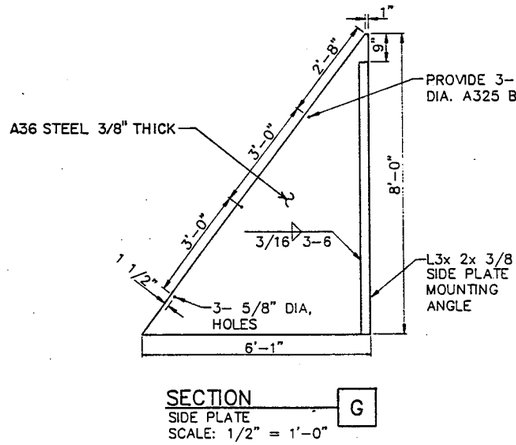

SECTION H
TRASH RACK
SCALE: 1" = 1'-0"



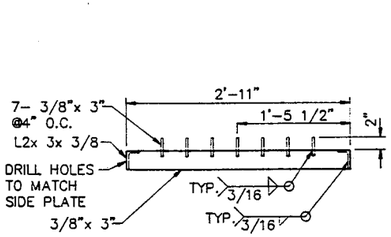

ELEVATION A
D.S. FACE PLATE
SCALE: 1" = 1'-0"



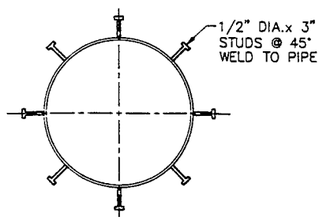

ELEVATION D
BULKHEAD
SCALE: 1" = 1'-0"



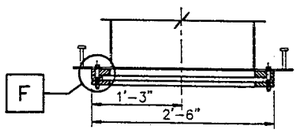

SECTION G
SIDE PLATE
SCALE: 1/2" = 1'-0"



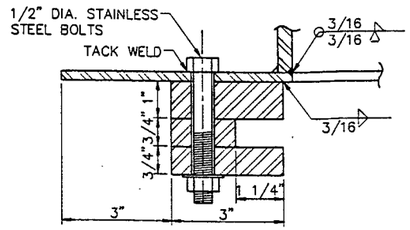

SECTION I
TRASH RACK
SCALE: 1" = 1'-0"




SECTION B
PIPE: STUD LAYOUT
SCALE: 1" = 1'-0"




SECTION E
BULKHEAD SLIDE
SCALE: 1" = 1'-0"




DETAIL F
BULKHEAD SLIDE
6" = 1'-0"

## NOTES:

1) ALL METAL HOT DIPPED GALVANIZED ASTM-A36 UNLESS OTHERWISE INDICATED.
2) ALL BOLTS GALVANIZED A325 EXCEPT WHERE NOTED.
3) PROVIDE 3 HOLES IN U.S. FACEPLATE TO MATCH SIDE PLATE MOUNTING ANGLE AS SHOWN.

| DRAWING REFERENCE | |
|---|---|
| SHEET NO. | DRAWING NO. |
| 2 | M-P10-61/22 |
| 5 | M-P10-61/25 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

Barr ENGINEERING CO. Minneapolis, Mn.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: TFP/JRL/PBS
DRAWN BY: TFP DPF
CHECKED BY: JRL/PBS
SUBMITTED BY: CHIEF ENGR. DIV. BRANCH
APPROVED BY: CHIEF ENGR. DIVISION BRANCH

MAJOR MAINTENANCE - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBERG, IOWA

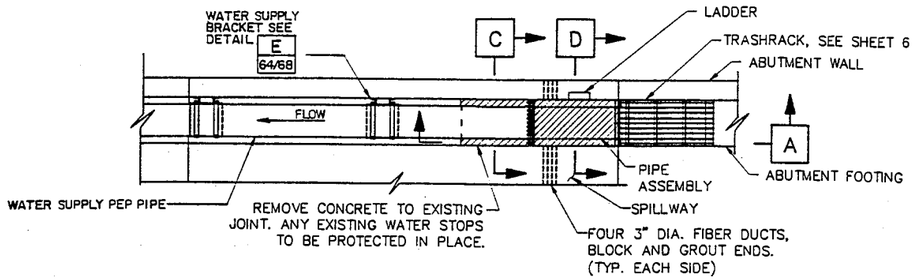
SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
WATER SUPPLY SYSTEM: SECTIONS & DETAILS

DATE: AUGUST 1989
SCALE: AS SHOWN
SPEC. NO. DACW37-89-B-1008

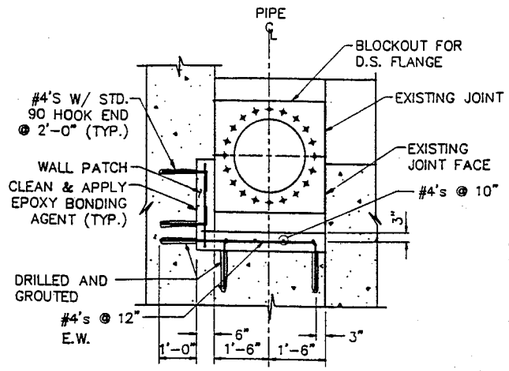
AUTOCAD DRAWING FILE
IF MANUALLY CHANGED NOTIFY CAD OPERATOR
:FILE NAME
:PLOT DATE

DRAWING NUMBER
M-P10-61/30
SHEET 6 OF 16

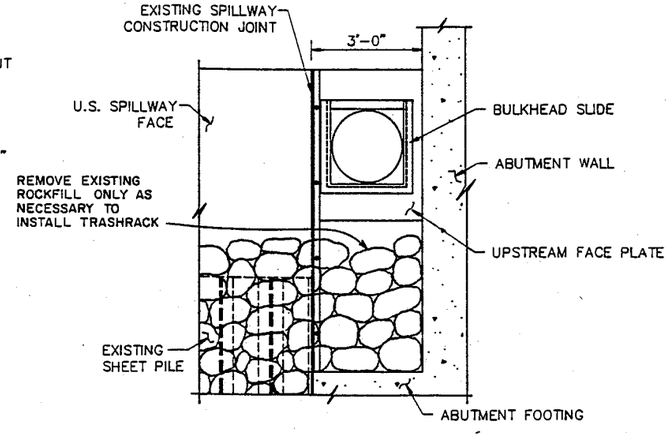
AS BUILT



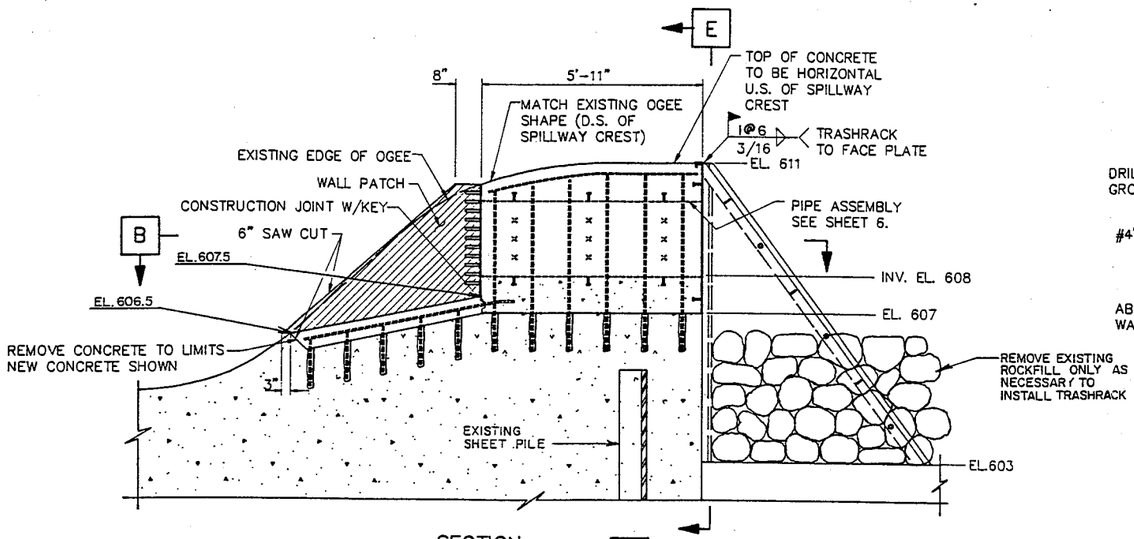

PLAN
WATER SUPPLY SYSTEM
SCALE 3/16" = 1'-0"



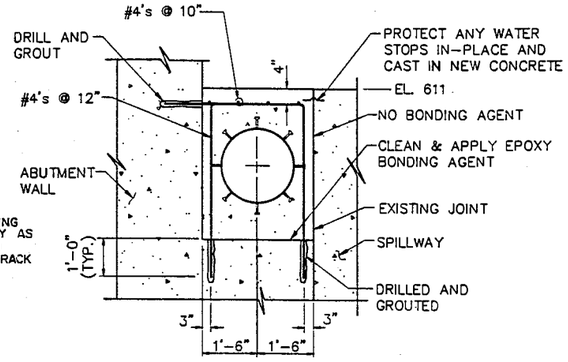

SECTION
SPILLWAY RECONSTRUCTION C
SCALE 1/2"=1'-0"



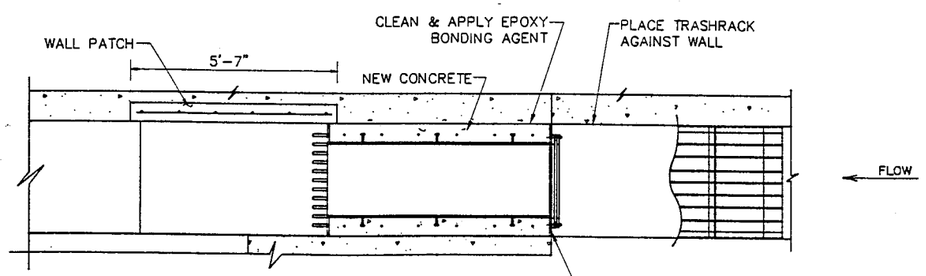

SECTION
UPSTREAM FACE E
SCALE 1/2"=1'-0"




SECTION
SCALE 1/2"=1'-0" A




SECTION
SPILLWAY RECONSTRUCTION D
SCALE 1/2"=1'-0"




SECTION
SCALE 1/2"=1'-0" B

| DRAWING REFERENCES | |
|---|---|
| SHEET NO. | DRAWING NO. |
| 2 | M-P10-61/22 |
| 3 | M-P10-61/26 |
| 6 | M-P10-61/30 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

Barr ENGINEERING CO. Minneapolis, Mn.

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: TFP/JRL/PBS
DRAWN BY: TFP DPF
CHECKED BY: JRL/PBS
SUBMITTED BY: CHIEF A-E BRANCH
APPROVED BY: CHIEF ENGR DIVISION
CHIEF BRANCH

MAJOR MAINTENANCE - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBERG, IOWA

SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
WATER SUPPLY SYSTEM:
PLAN, ELEVATION, SECTIONS AND DETAILS

DATE: AUGUST 1989

AUTOCAD DRAWING FILE
IF MANUALLY CHANGED
NOTIFY CAD OPERATOR
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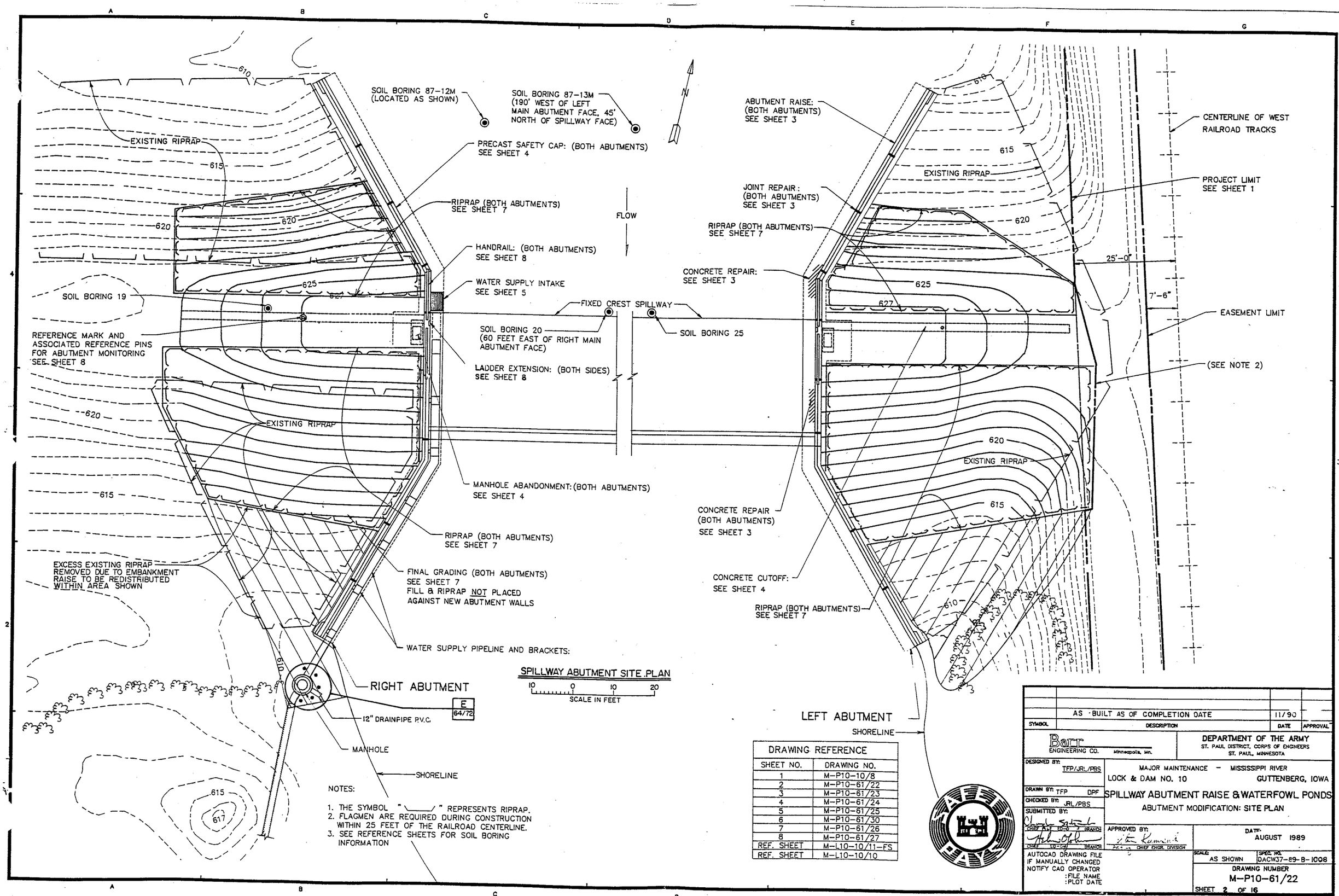
:PLOT DATE

SCALE: AS SHOWN
SPEC. NO. DACW37-89-B-1008

DRAWING NUMBER
M-P10-61/25

SHEET 5 OF 16

AS BUILT




SPILLWAY ABUTMENT SITE PLAN

10 0 10 20
SCALE IN FEET

NOTES:

1. THE SYMBOL " ____/ " REPRESENTS RIPRAP.
2. FLAGMEN ARE REQUIRED DURING CONSTRUCTION WITHIN 25 FEET OF THE RAILROAD CENTERLINE.
3. SEE REFERENCE SHEETS FOR SOIL BORING INFORMATION

| DRAWING REFERENCE | |
|---|---|
| SHEET NO. | DRAWING NO. |
| 1 | M-P10-10/8 |
| 2 | M-P10-61/22 |
| 3 | M-P10-61/23 |
| 4 | M-P10-61/24 |
| 5 | M-P10-61/25 |
| 6 | M-P10-61/30 |
| 7 | M-P10-61/26 |
| 8 | M-P10-61/27 |
| REF. SHEET | M-L10-10/11-FS |
| REF. SHEET | M-L10-10/10 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

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DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

DESIGNED BY: TFP/JRL/PBS
DRAWN BY: TFP DPF
CHECKED BY: JRL/PBS
SUBMITTED BY: CHIEF A-E SECTION BRANCH
CHIEF ED-DC BRANCH
APPROVED BY: CHIEF ENGR. DIVISION

MAJOR MAINTENANCE - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBERG, IOWA

# SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
ABUTMENT MODIFICATION: SITE PLAN

DATE: AUGUST 1989

AUTOCAD DRAWING FILE IF MANUALLY CHANGED NOTIFY CAD OPERATOR :FILE NAME :PLOT DATE

SCALE: AS SHOWN
SPEC. NO. DACW37-89-B-1008

DRAWING NUMBER
M-P10-61/22

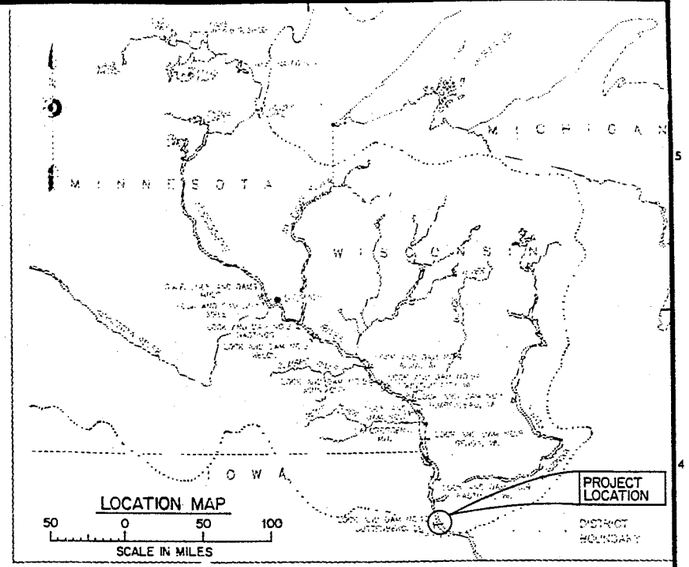
SHEET 2 OF 16

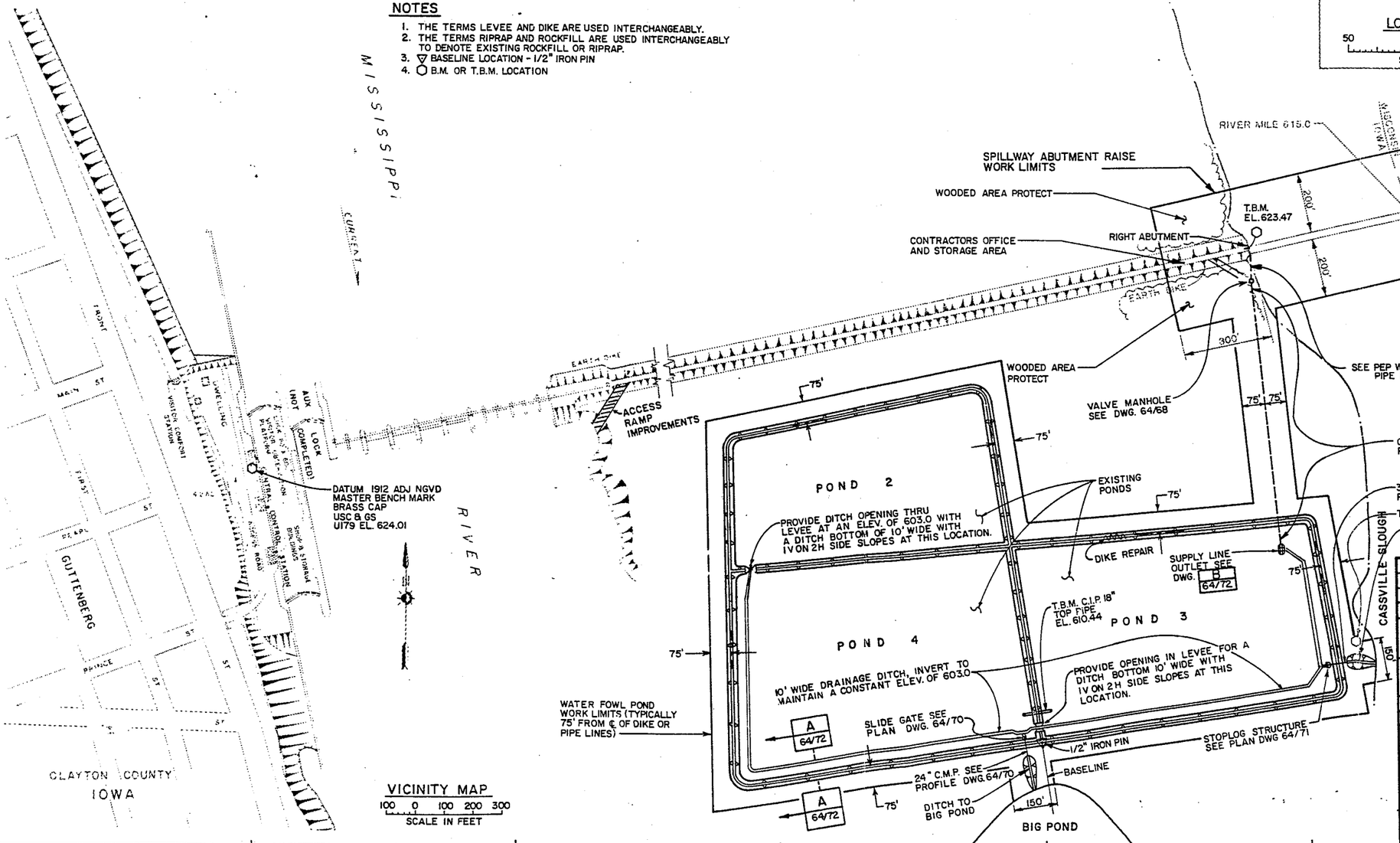
AS BUILT

| DRAWING SCHEDULE | | |
|---|---|---|
| | SHT. NO. | DESCRIPTION |
| M-P10-10/8 | 1 | LOCATION AND SITE MAP AND DRAWING SCHEDULE |
| M-P10-61/22 | 2 | ABUTMENT MODIFICATION: SITE |
| ~~M-P10-61/23~~ | ~~3~~ | ~~ABUTMENT MODIFICATION: PLAN, ELEV. SECTIONS AND DETAILS~~ |
| ~~M-P10-61/24~~ | ~~4~~ | ~~ABUTMENT MODIFICATION: CUTOFF WALL & MISC. CONC. DETAILS~~ |
| M-P10-61/25 | 5 | WATER SUPPLY SYSTEM: PLAN, ELEV. SECTIONS AND DETAILS |
| M-P10-61/30 | 6 | WATER SUPPLY SYSTEM: SECTIONS AND DETAILS |
| ~~M-P10-61/26~~ | ~~7~~ | ~~ABUTMENT MODIFICATION: FINAL GRADING PLAN, SECTIONS, AND DETAILS~~ |
| ~~M-P10-61/27~~ | ~~8~~ | ~~SURVEY MARKERS AND MISCELLANEOUS DETAILS~~ |
| M-P10-64/68 | 9 | WATER SUPPLY PIPELINE: PLAN, ELEVATION, SECTIONS, AND DETAILS |
| M-P10-64/69 | 10 | WATER SUPPLY LINE, PLAN AND PROFILE |
| ~~M-P10-64/70~~ | ~~11~~ | ~~SLIDE GATE STRUCTURE - PLAN AND PROFILE~~ |
| ~~M-P10-64/71~~ | ~~12~~ | ~~STOP LOG STRUCTURE - PLAN AND PROFILE~~ |
| M-P10-64/72 | 13 | MISCELLANEOUS PLAN AND SECTIONS |
| ~~M-P10-64/73~~ | ~~14~~ | ~~SLIDEGATE PLATFORM AND DETAILS~~ |
| ~~M-P10-64/74~~ | ~~15~~ | ~~STOPLOG STRUCTURE - PLATFORM AND DETAILS~~ |
| ~~M-P10-64/75~~ | ~~16~~ | ~~STOPLOG STRUCTURE - PLATFORM DETAILS~~ |
| REFERENCE DRAWINGS | | |
| ~~M-L10-10/11~~ | | ~~BORINGS~~ |
| ~~M-P10-10/10~~ | | ~~BORING LOGS-87-12M AND 87-13M~~ |

## NOTES

1. THE TERMS LEVEE AND DIKE ARE USED INTERCHANGEABLY.
2. THE TERMS RIPRAP AND ROCKFILL ARE USED INTERCHANGEABLY TO DENOTE EXISTING ROCKFILL OR RIPRAP.
3. ▽ BASELINE LOCATION - 1/2" IRON PIN
4. ⬡ B.M. OR T.B.M. LOCATION




| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS BUILT AS OF COMPLETION DATE | 11/90 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

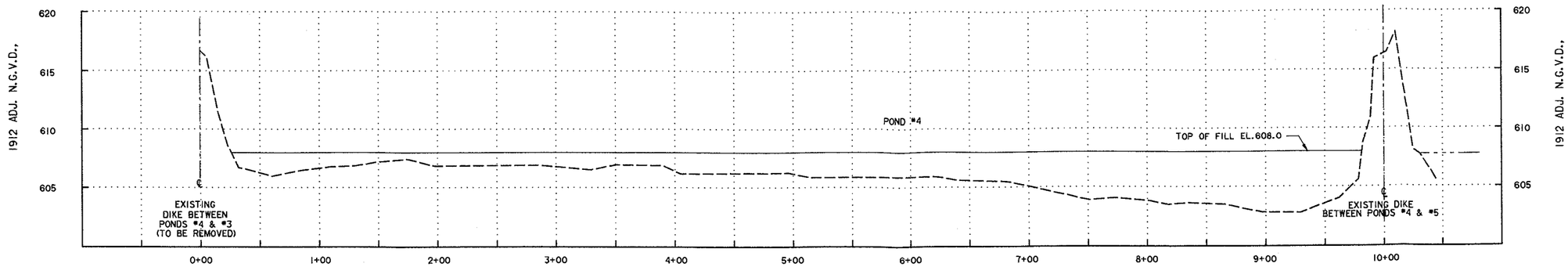
DESIGNED BY: W.P.R. D.J.O.
DRAWN BY: DPF
CHECKED BY: J.B.M.
SUBMITTED BY:
CHIEF ENGINEERING BRANCH

EMP - MISSISSIPPI RIVER
LOCK & DAM NO. 10 GUTTENBURG, IOWA
SPILLWAY ABUTMENT RAISE & WATERFOWL PONDS
SITE PLAN, LOCATION MAP & DRAWING SCHEDULE

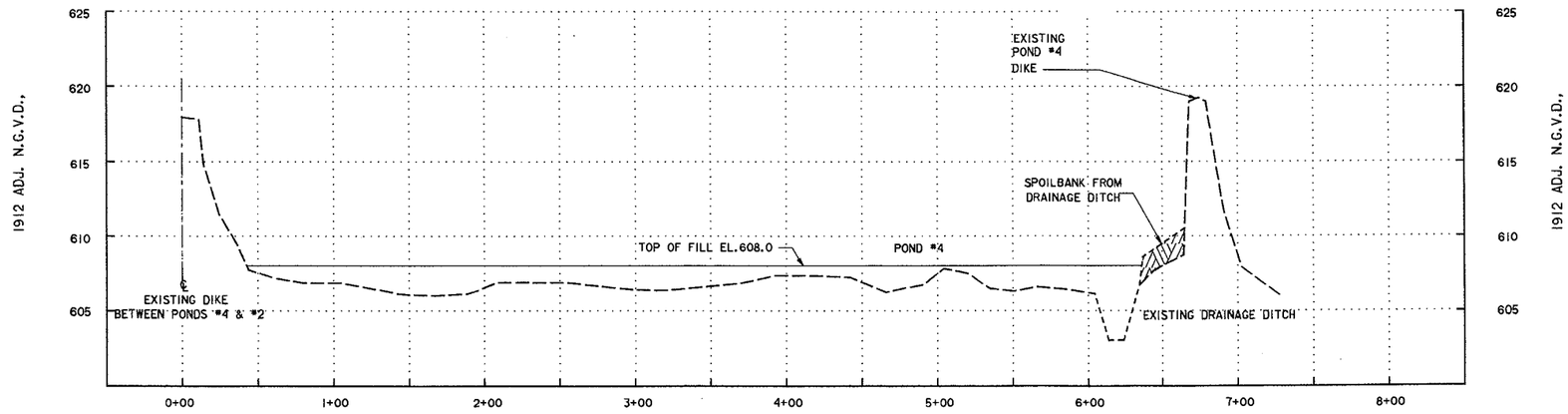
APPROVED BY: Kim Kamsvag, CHIEF ENGR. DIVISION
DATE: AUGUST 1989
SCALE: AS SHOWN
SPEC. NO. DACW37-89-B-1008
DRAWING NUMBER M-P10-10/8
SHEET 1 OF 16

COL, CORPS OF ENGINEERS

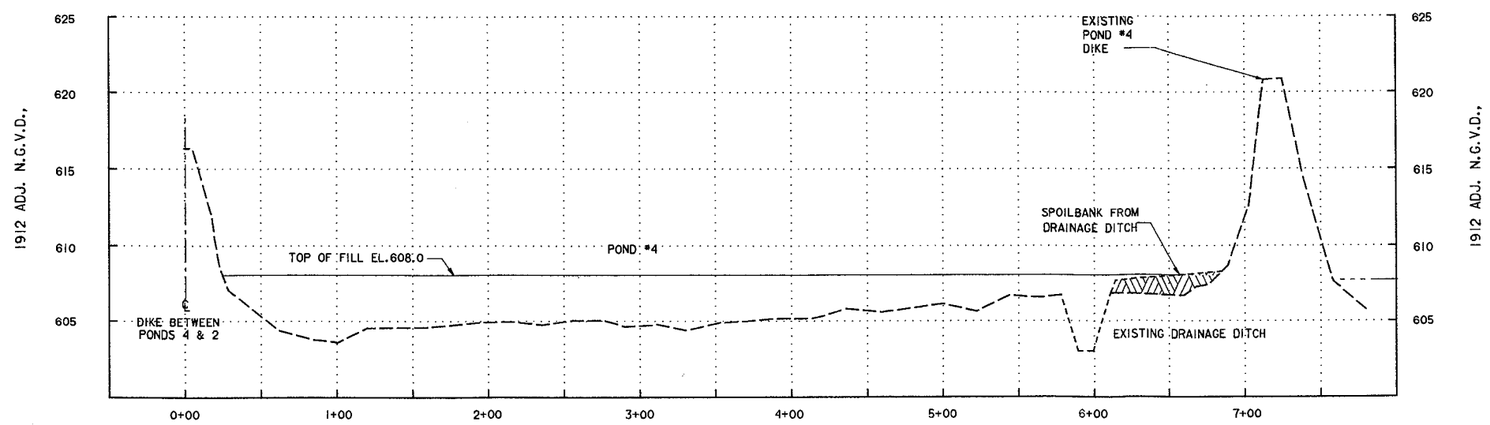
AS BUILT




SECTION 7
POND #4 LOOKING DOWN STREAM 4/16




SECTION 8
POND #4 LOOKING EAST 4/16




SECTION 9
POND #4 LOOKING EAST 4/16

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.,
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.

REFERENCES:

| | DWG. NO. |
|---|---|
| 1. SITE PLAN, LOCATION MAP & DRAWING SCHEDULE. | M-P10-10/11 |
| 2. GENERAL PLAN (POND FILL SITE) | M-P10-61/33 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

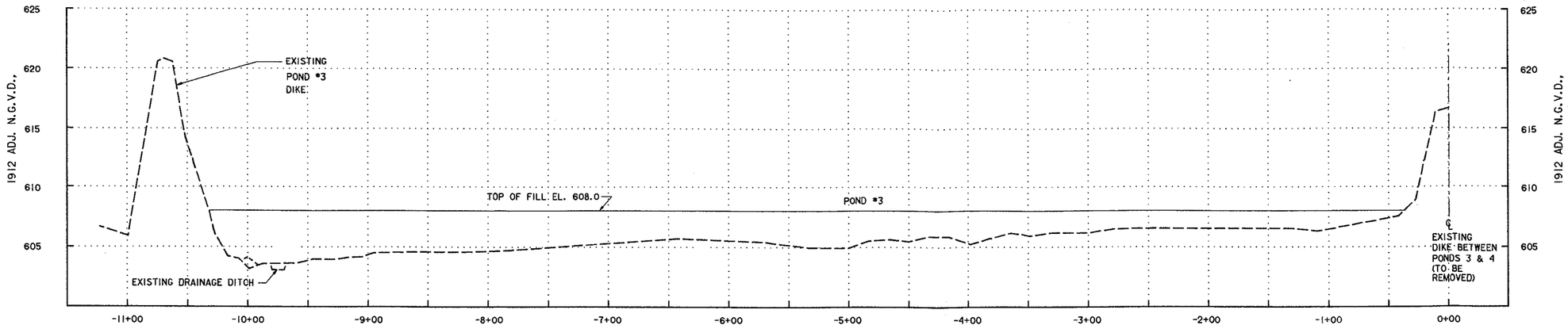
AE APPROVING OFFICIAL:

PE-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.
PE-H: DESIGNED: ; CHECKED:
DATE: 2/92

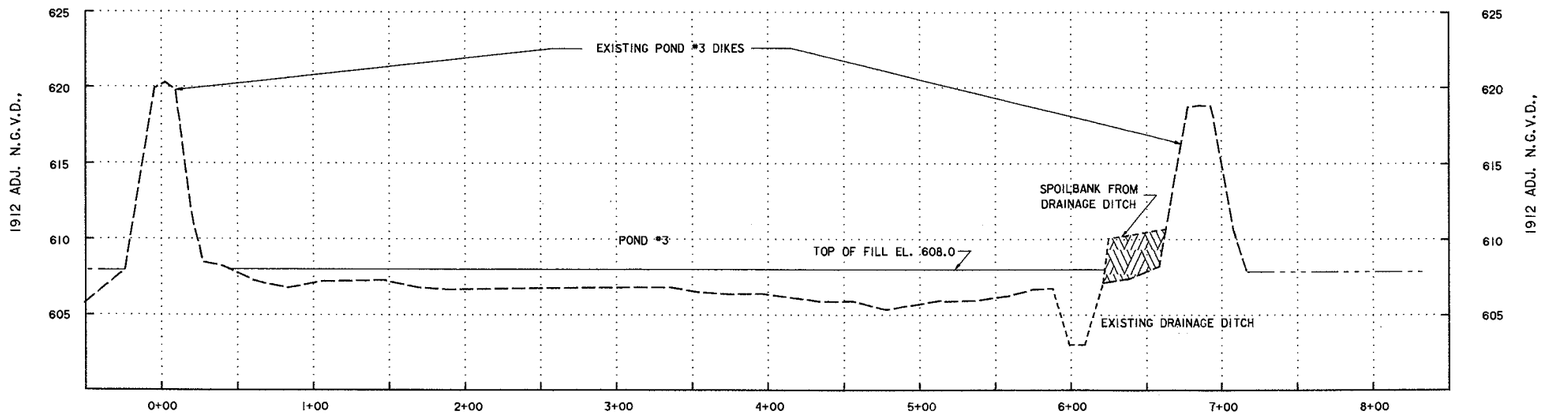
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #4 FILL SITE CROSS SECTIONS 7 THRU 9

CAD FILE NAME: MM04A018.DGN
SOL NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/45
SHT 16 OF 16

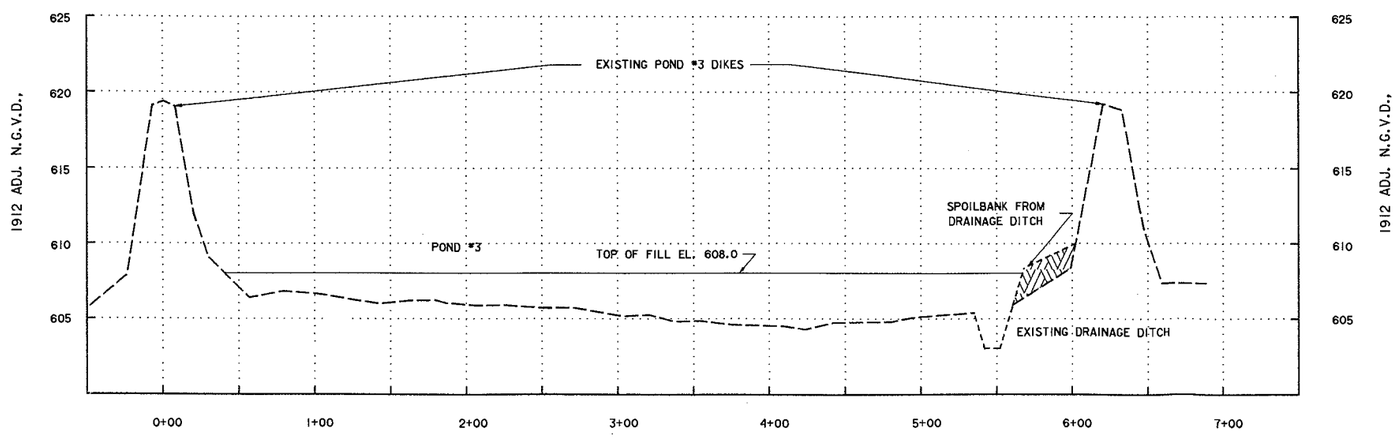
AS-BUILT




SECTION 4
POND #3 LOOKING DOWN STREAM 4/16




SECTION 5
POND #3 LOOKING EAST 4/16




SECTION 6
POND #3 LOOKING EAST 4/16

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.,
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.

REFERENCES:

| | DWG. NO. |
|---|---|
| 1. SITE PLAN, LOCATION MAP & DRAWING SCHEDULE. | M-P10-10/11 |
| 2. GENERAL PLAN (POND FILL SITE) | M-P10-61/33 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

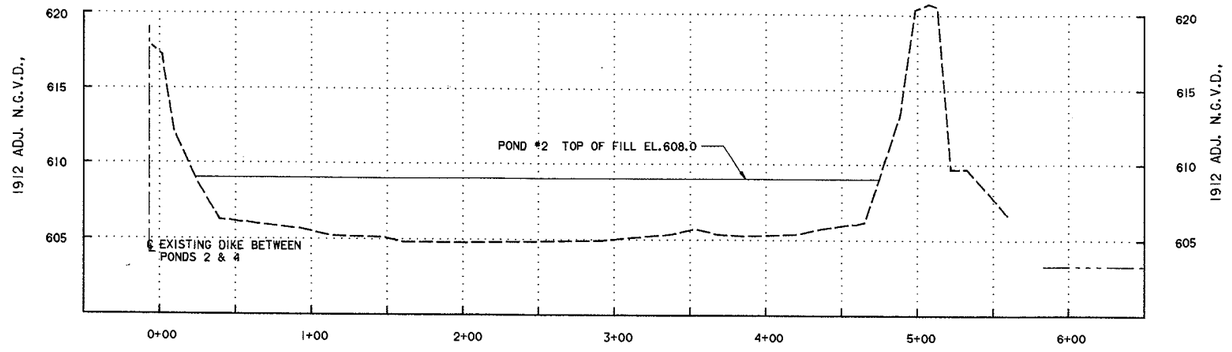
AE APPROVING OFFICIAL:

PE-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.
PE-H: DESIGNED: ; CHECKED:
DATE: 2/92

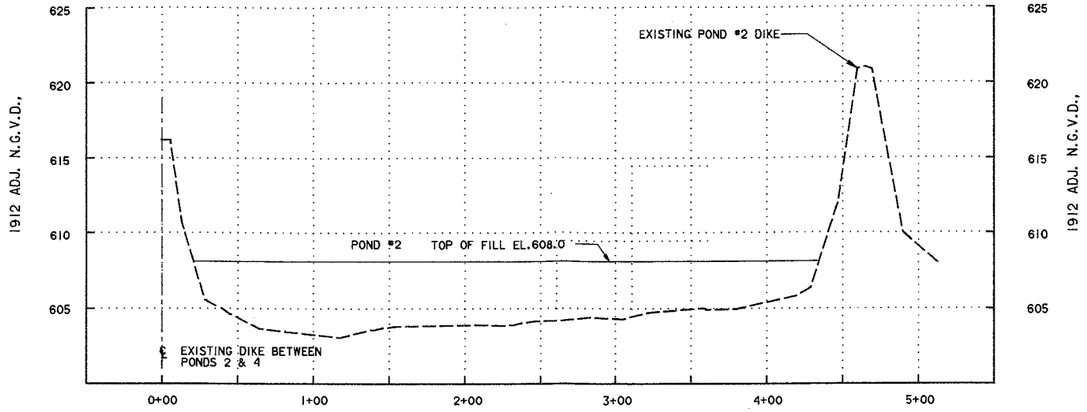
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #3 FILL SITE CROSS
SECTIONS 4 THRU 6

CAD FILE NAME: MM04A017.DGN
SOL. NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/44
SHT 15 OF 16

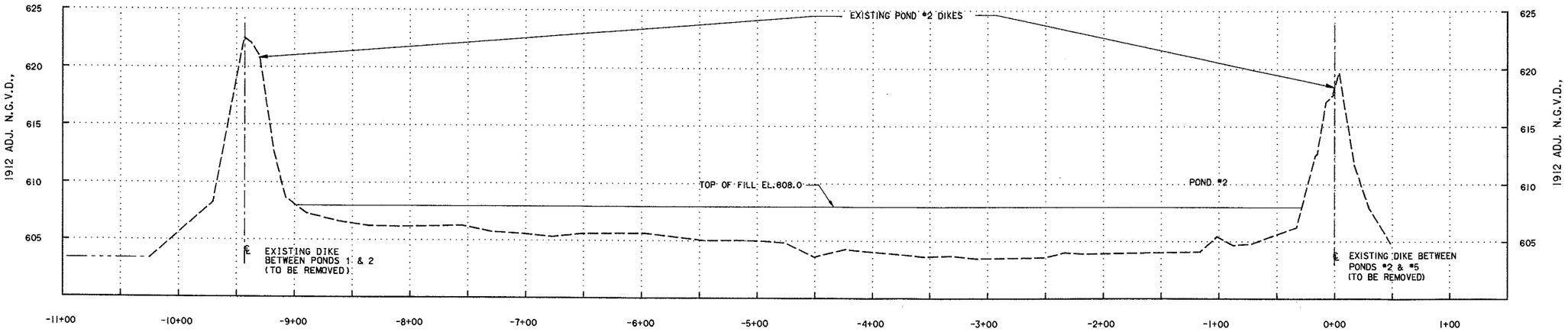
AS-BUILT




SECTION 1
POND #2 LOOKING WEST 4/16




SECTION 2
POND #2 LOOKING WEST 4/16




SECTION 3
POND #2 LOOKING DOWNSTREAM 4/16

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.,
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.

REFERENCES:

| | DWG. NO. |
|---|---|
| 1. SITE PLAN, LOCATION MAP & DRAWING SCHEDULE. | M-P10-10/11 |
| 2. GENERAL PLAN (POND FILL SITE) | M-P10-61/33 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

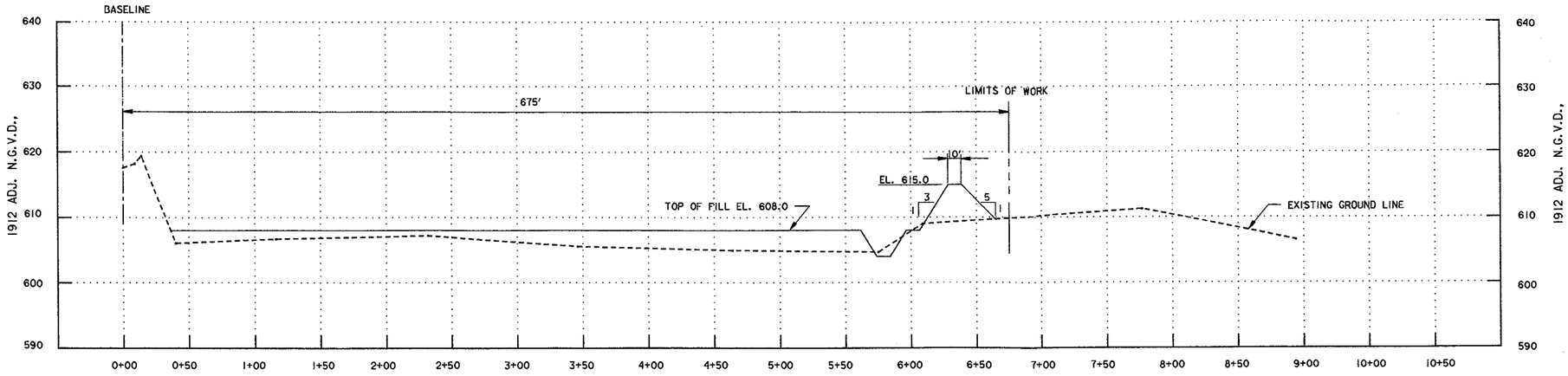
AE APPROVING OFFICIAL:

| | | |
|---|---|---|
| RE-D | DESIGNED: WPR | |
| | CHECKED: J.G. | |
| | DRAWN: FJB/T.J. | |
| RE-H | DESIGNED: | |
| | CHECKED: | |
| DATE: 2/92 | | |

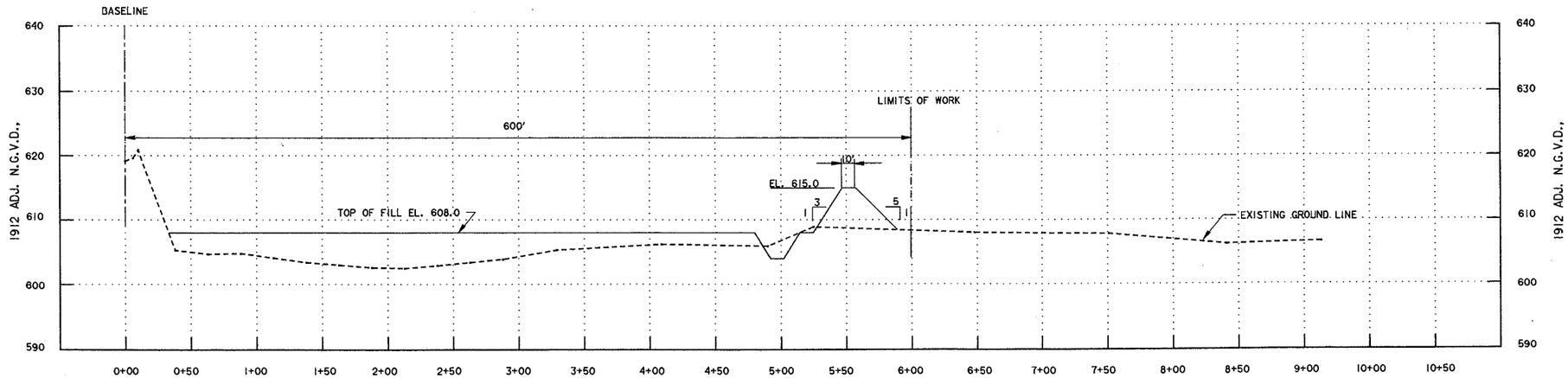
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #2 FILL SITE CROSS SECTIONS
SECTIONS 1 THRU 3

| | | |
|---|---|---|
| CAD FILE NAME: MM04A016.DGN | DRAWING NUMBER: | SHT 14 |
| SOL NO: DACW37-92-B-0002 | M-P10-61/43 | OF 16 |

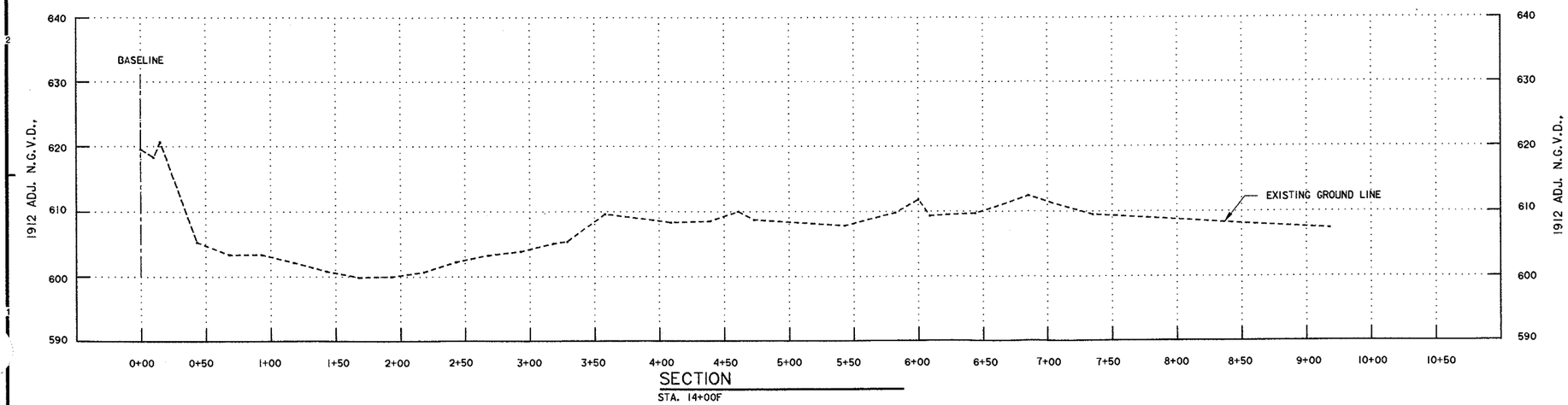
AS-BUILT




SECTION
STA. 10+00F




SECTION
STA. 12+00F




SECTION
STA. 14+00F

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.,
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. SECTIONS DRAWN LOOKING DOWNSTREAM.

REFERENCES

POND #5 FILL SITE CROSS SECTIONS

DWG. NO.
M-P10-61/39

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

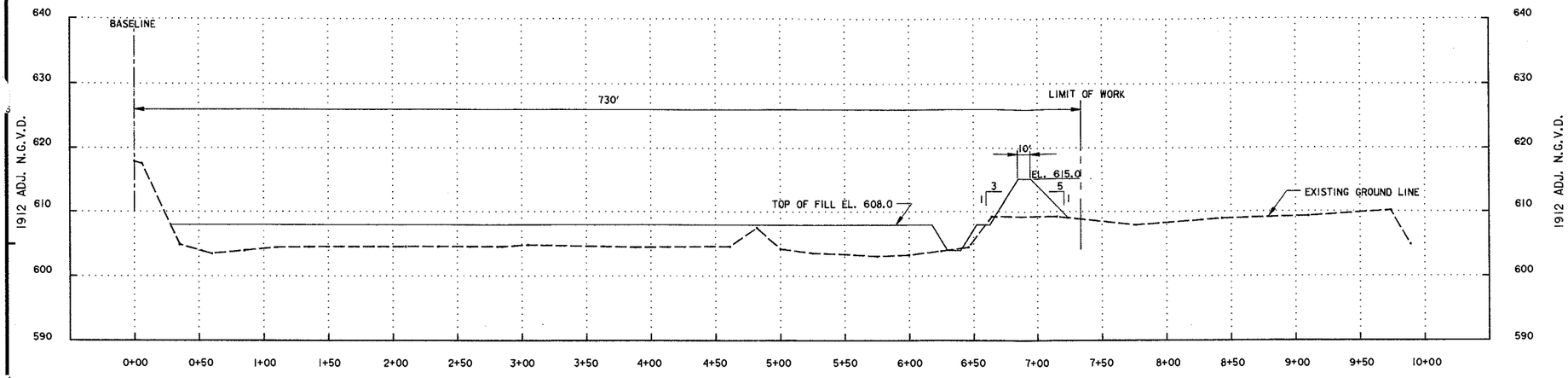
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #5 FILL SITE CROSS SECTIONS
STA.10+00F TO 14+00F

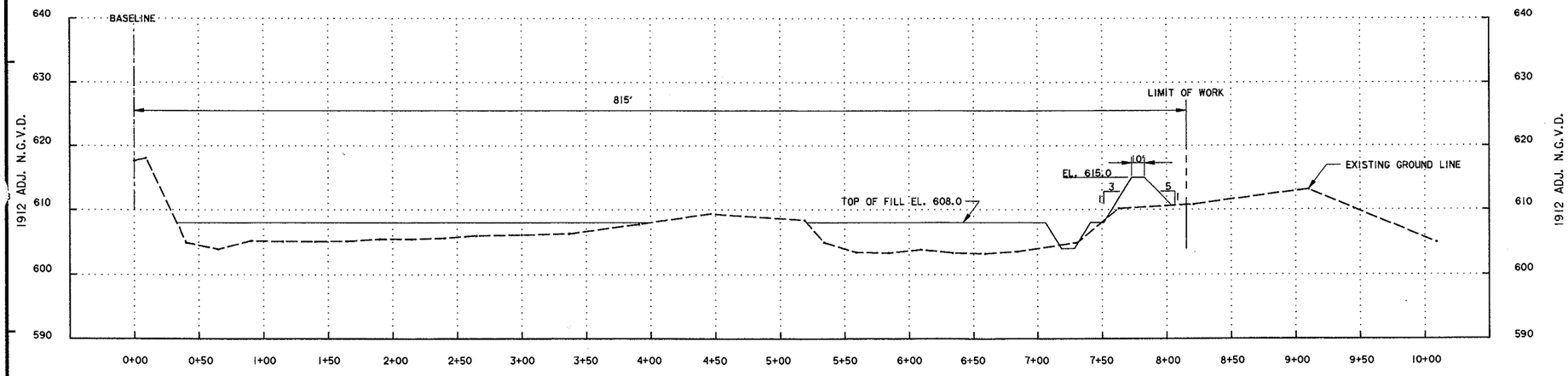
PE-D: DESIGNED: WPR; CHECKED: J.C.; DRAWN: FJB/T.J.
PE-H: DESIGNED: ; CHECKED:
DATE: 2/92

CAD FILE NAME: MM04A012.DGN
SOL NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/42
SHT 13 OF 16

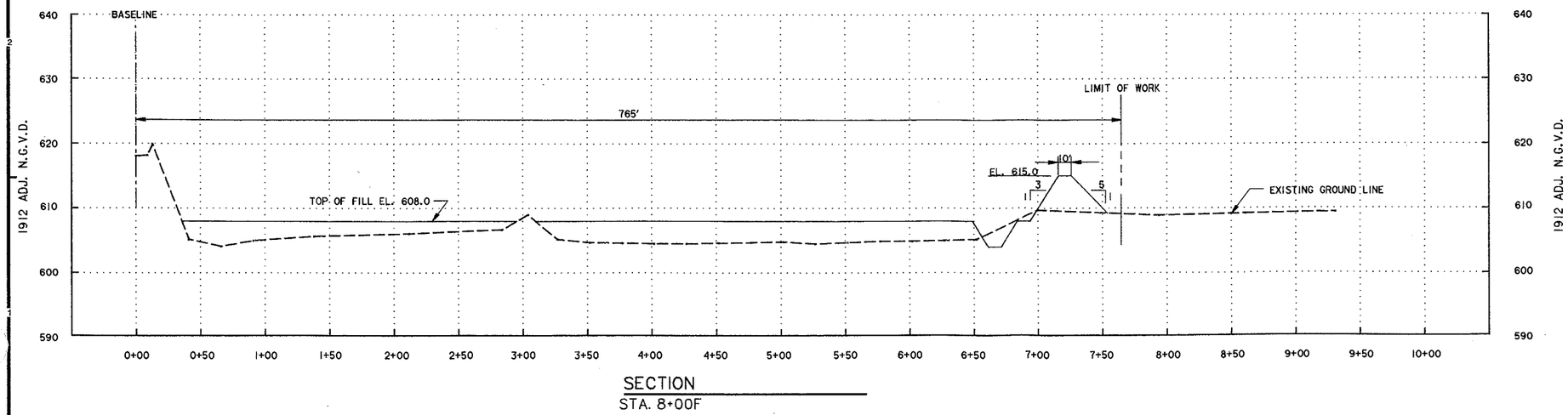
AS-BUILT




SECTION
STA. 4+00F




SECTION
STA. 6+00F




SECTION
STA. 8+00F

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. SECTIONS DRAWN LOOKING DOWNSTREAM.

REFERENCES

POND #5 FILL SITE CROSS SECTIONS

DWG. NO.

M-P10-61/39

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

AE APPROVING OFFICIAL:

PE-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.

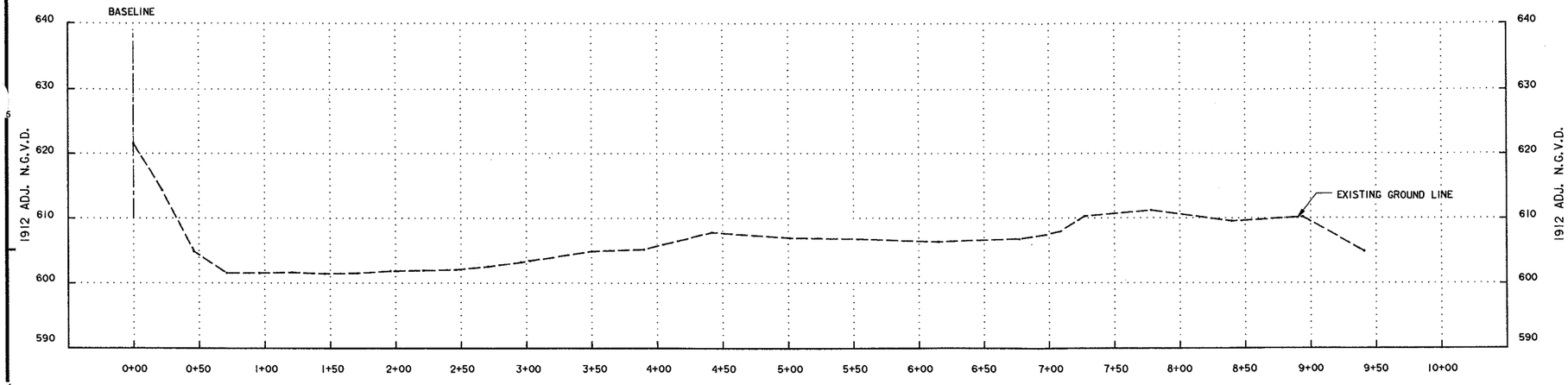
PE-H: DESIGNED: ; CHECKED:

DATE: 2/92

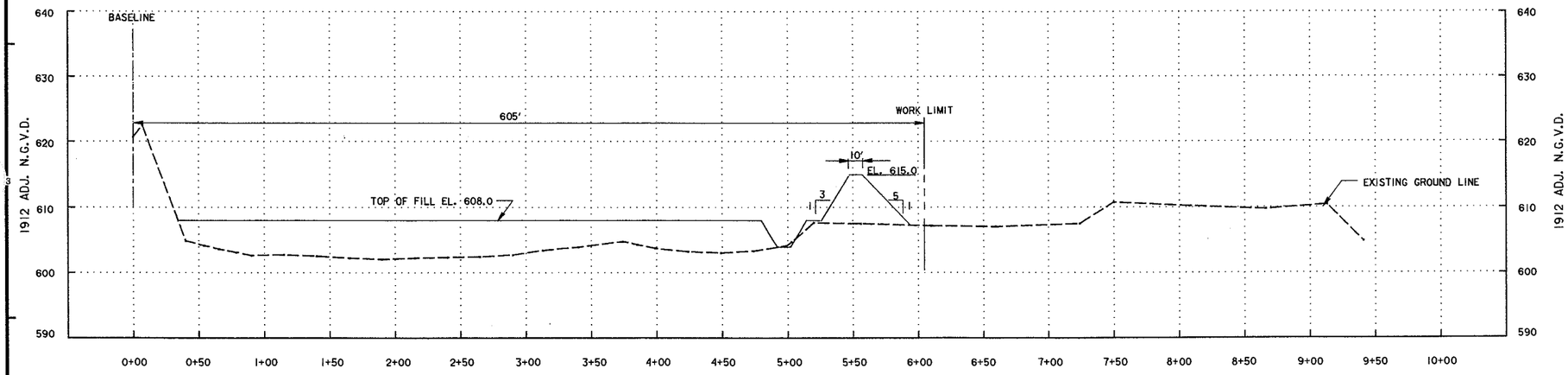
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #5 FILL SITE CROSS SECTIONS
STA. 4+00F TO 8+00F

CAD FILE NAME: MM04A013.DGN
SOL NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/41
SHT 12 OF 16

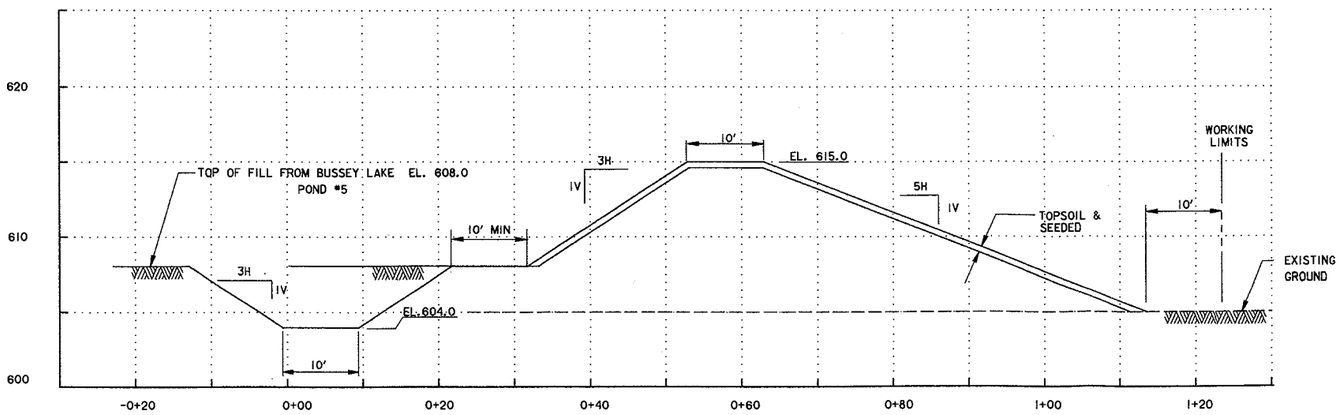
AS-BUILT




SECTION
STA. 0+00F




SECTION
STA. 2+00F




TYPICAL FINISHED SECTION
FOR PERIMETER DIKE

NOTES:

1. CROSS SECTIONS ARE BASED ON 1912 ADJ. N.G.V.D.
2. EXISTING GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.
3. SECTIONS DRAWN LOOKING DOWNSTREAM.

REFERENCES

POND #5 FILL SITE

DWG. NO.

M-P10-61/39

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #5 FILL SITE CROSS SECTIONS
STA. 0+00F & 2+00F

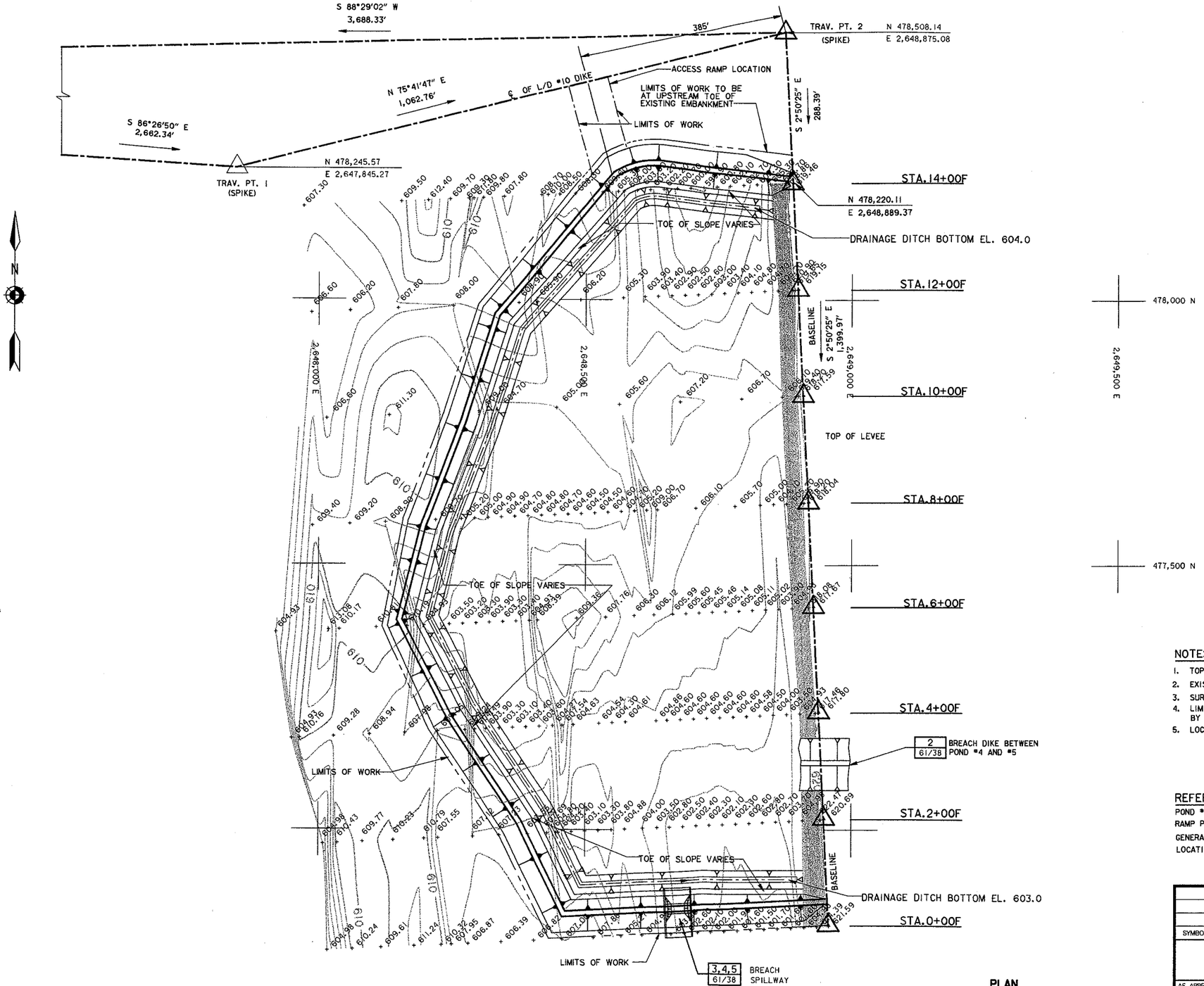
PE-D
DESIGNED: WPR
CHECKED: J.C.
DRAWN: FJB/T.J.

PE-H
DESIGNED:
CHECKED:

DATE: 2/92

CAD FILE NAME: MM04A014.DGN
SOL NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/40
SHT 11 OF 16

AS-BUILT




| PROJECT | | | | |
|---|---|---|---|---|
| CONTROL POINTS POND #5 | | | | |
| STATION | BEARING | DISTANCE | COORDINATES NORTH | COORDINATES EAST |
| 0+00F | | | 476,821.86 | 2,648,958.75 |
| 2+00F | N 2° 50'25"W | 200.00' | 477,021.44 | 2,648,948.84 |
| 4+00F | N 2° 50'25"W | 200.00' | 477,221.22 | 2,648,938.93 |
| 6+00F | N 2° 50'25"W | 200.00' | 477,421.00 | 2,648,929.02 |
| 8+00F | N 2° 50'25"W | 200.00' | 477,620.77 | 2,648,919.11 |
| 10+00F | N 2° 50'25"W | 200.00' | 477,820.55 | 2,648,909.19 |
| 12+00F | N 2° 50'25"W | 200.00' | 478,020.33 | 2,648,899.28 |
| 14+00F | N 2° 50'25"W | 200.00' | 478,220.10 | 2,648,889.37 |
| TRAV.#2 | N 2° 50'25"W | 288.39' | 478,508.14 | 2,648,875.08 |
| TRAV.#1 | S75° 41'47"W | 1062.76' | 478,245.57 | 2,647,845.27 |

**PLAN**

POND #5 FILL SITE

100 0 100 200

SCALE IN FEET

NOTES:

1. TOPOGRAPHY BASED ON 1912 ADJ. N.G.V.D.
2. EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN.
3. SURVEYED 2/6/91
4. LIMITS OF WORK FOR ACCESS RAMP TO BE STAKED BY CONTRACTING OFFICER.
5. LOCATION OF BREACH SPILLWAY APPROXIMATE.

REFERENCES

| | DWG. NO. |
|---|---|
| POND #5 FILL SITE CROSS SECTIONS | M-P10-61/40,41,42 |
| RAMP PROFILES & SECTIONS, BREACH DETAILS | M-P10-61/38 |
| GENERAL PLAN | M-P10-61/32 |
| LOCATION, VICINITY MAP, & DRAWING INDEX | M-P10-10/11 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

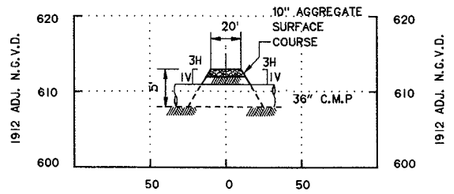
US Army Corps of Engineers
St. Paul District

AE APPROVING OFFICIAL:

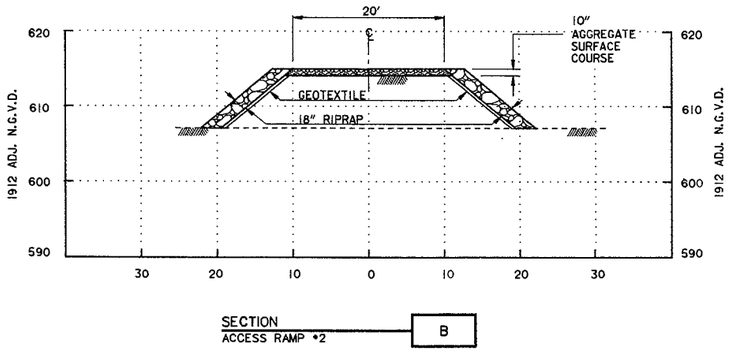
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
POND #5 FILL SITE PLAN
AND CONTROL DATA

| | | | |
|---|---|---|---|
| PE-D | DESIGNED: WPR | | |
| | CHECKED: J.G. | | |
| | DRAWN: FJB/T.J. | | |
| PE-H | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MM04A011.DGN | DRAWING NUMBER: M-P10-61/39 SHT 10 OF 16 |
| DATE: 2/92 | | SOL NO: DACW37-92-B-0002 | |

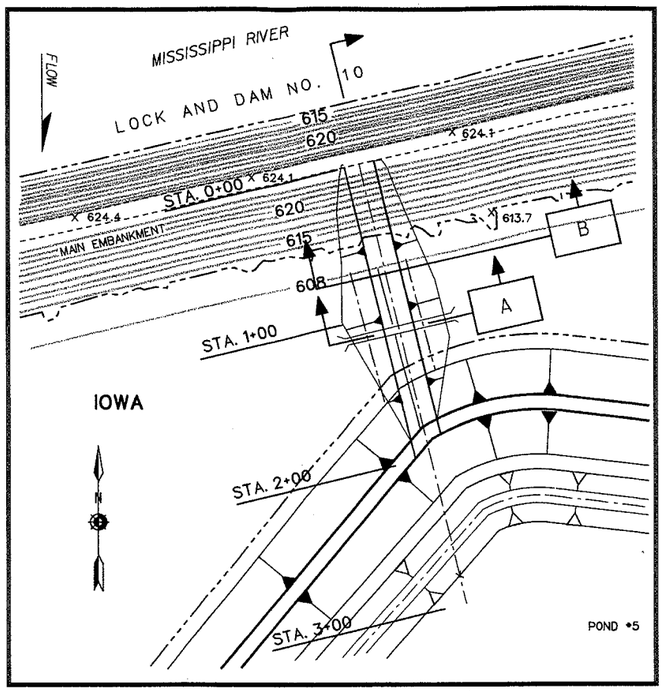
AS-BUILT



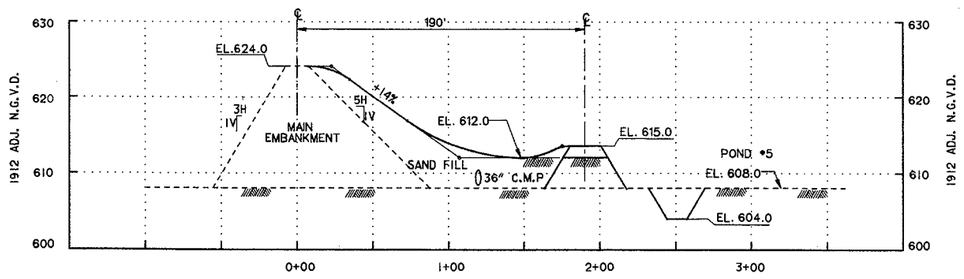

SECTION
ACCESS RAMP #2 36" C.M.P. — A



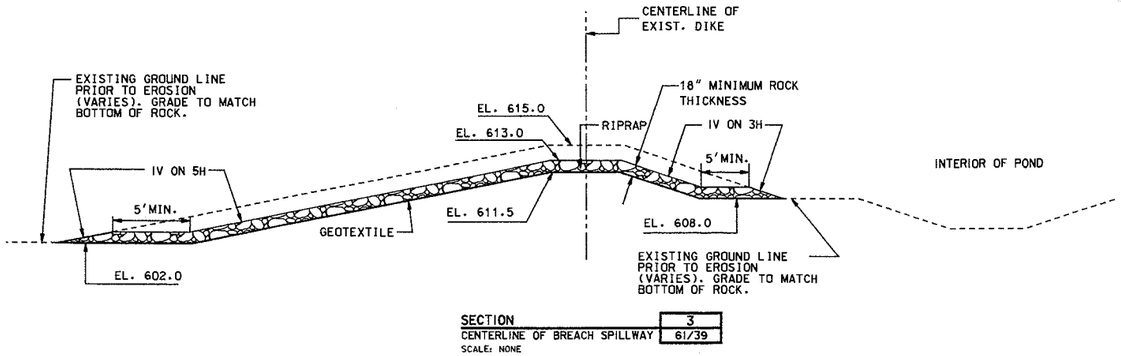

SECTION
ACCESS RAMP #2 — B



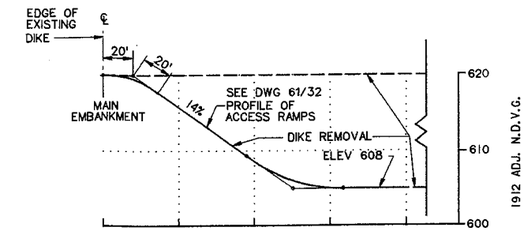

PLAN
ACCESS RAMP #2
50 0 50 100
SCALE IN FEET



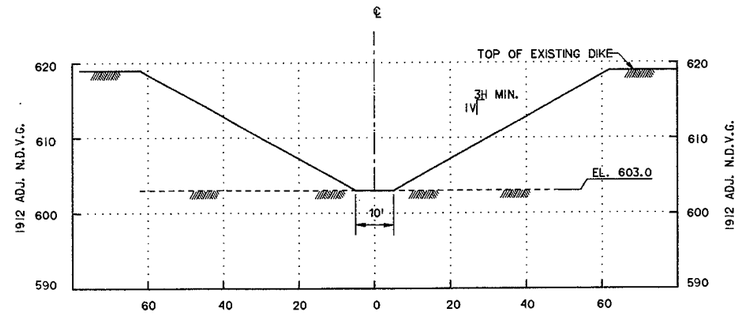

PROFILE
ACCESS RAMP #2 — C



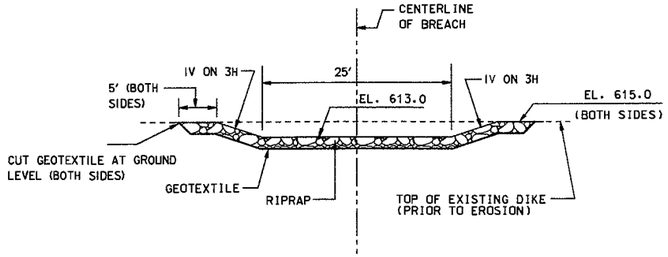

SECTION
CENTERLINE OF BREACH SPILLWAY — 3 / 61/39
SCALE: NONE



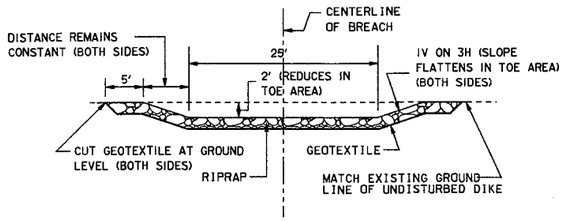

△2 TYPICAL PROFILE
RAMPS INTO PONDS 2&5,3&4 — 1 / 61/38




SECTION
BREACH BETWEEN POND #4 & #5 — 2 / 61/38




SECTION
CENTERLINE OF EXISTING DIKE — 4 / 61/39
SCALE: NONE




TYPICAL SECTION
DOWNSLOPE FROM TOP OF EXIST. DIKE — 5 / 61/39
SCALE: NONE

NOTE:

1. APPROXIMATE LOCATION OF RAMPS. TO BE STAKED BY CONTRACTING OFFICERS REPRESENTATIVE.
2. ESTABLISH 36" DRAIN UNDER RAMP AT LOW POINT. 36" CMP TO HAVE FLARED ENDS.
3. TOE DRAIN OF MAIN EMBANKMENT MUST NOT BE DISTURBED.

REFERENCE: — DWG:

| | |
|---|---|
| LOCATION, VICINITY MAP & DRAWING INDEX | M-P10-10/11 |
| GENERAL PLAN | M-P10-61/32 |
| POND #5 FILL SITE & CONTROL DATA | M-P10-61/39 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

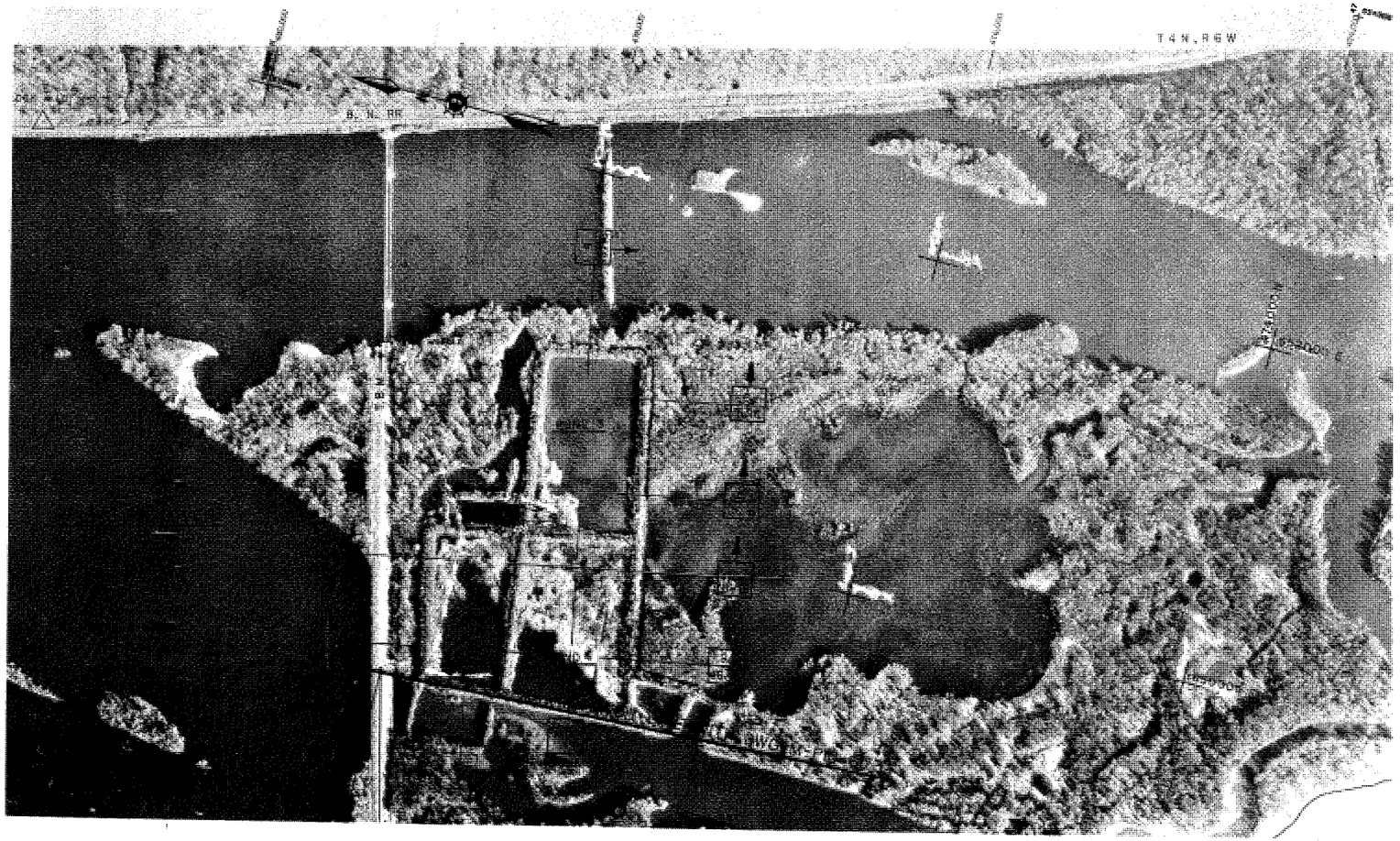
AE APPROVING OFFICIAL:

PE-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.
PE-H: DESIGNED: ; CHECKED:

AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 — CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
RAMP PROFILE AND SECTIONS
BREACH DETAIL

DATE: 2/92
CAD FILE NAME: MM04A015.DGN
SOL NO: DACW37-92-B-0002
DRAWING NUMBER: M-P10-61/38
SHT 9 OF 16

AS-BUILT




GENERAL PLAN

400 0 400 800

SCALE IN FEET

NOTE:

1. POND 1,2,3 & 4 ARE EXISTING.

| REFERENCES | | DWG.NO. |
|---|---|---|
| 1. | POND #2 FILL SITE CROSS SECTIONS 1 THRU 3 . | M-P10-61/43 |
| 2. | POND #3 FILL SITE CROSS SECTIONS 4 THRU 6 | M-P10-61/44 |
| 3. | POND #4 FILL SITE CROSS SECTION 7 THRU 9 | M-P10-61/45 |
| 4. | LIMITS OF WORK FOR PONDS #2,3 & 4, WILL BE 10' FROM TOE OF LEVEE NOT 75' FROM ℄ OF DIKE AS SHOWN. | M-P10-10/8 |

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

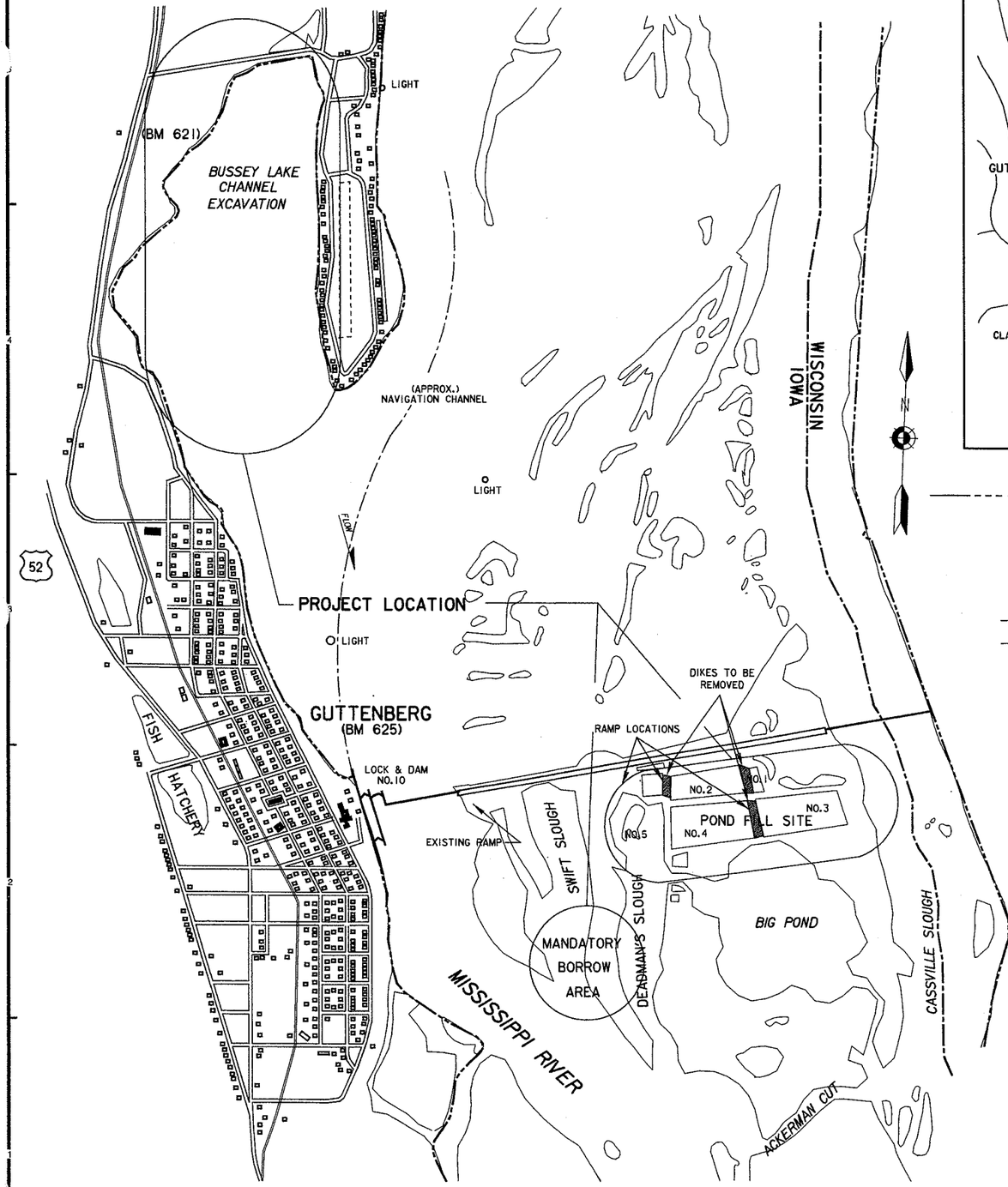
AE APPROVING OFFICIAL:

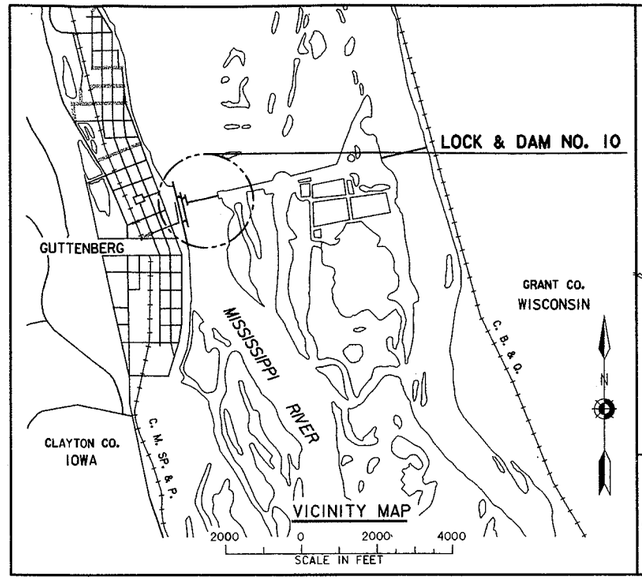
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM-UPPER MISS. RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
GENERAL PLAN (POND FILL SITE)

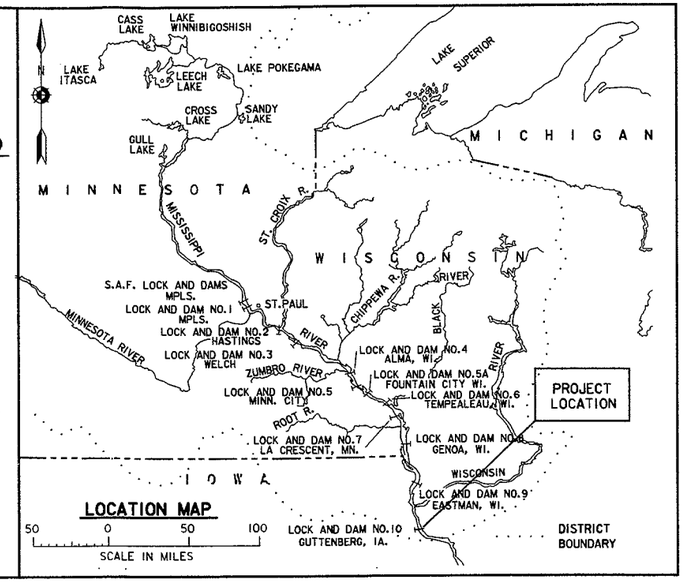
ED-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB
ED-GW: DESIGNED: ; CHECKED:
DATE: 9/91

CAD FILE NAME:
DRAWING NUMBER: M-P10-61/33
SHT 4 OF 16
SPEC NO: DACW37-92-B-0002

AS-BUILT




LEGEND

- LIMITS OF WORK
- BORINGS
- PROJECT ALIGNMENT POINT
- PROJECT CHANNEL CONTROL POINTS
- P.I. POINTS
- FILL
- CUT
- MAPPING CONTROL POINTS
- MAPPING CONTROL POINTS
- MAPPING CONTROL POINTS

## DRAWING INDEX

| CADD FILE | DRAWING NO. | SHT. | DESCRIPTION |
|---|---|---|---|
| MM04A001.DGN | M-P10-10/11 | 1 | LOCATION, VICINITY MAP, & DRAWING INDEX |
| ~~MYLAR~~ | ~~M-P10-61/37~~ | ~~2~~ | ~~GENERAL PLAN (BUSSEY LAKE CHANNEL EXCAV. HORIZONTAL CONTROL DATA & BORING LOCATIONS~~ |
| ~~MYLAR~~ | ~~M-P10-61/38~~ | ~~3~~ | ~~GENERAL PLAN (SHT. 1 SLOUGH MANDATORY BORROW AREA, BORING LOCATIONS & HORIZONTAL CONTROL DATA~~ |
| MYLAR | M-P10-61/33 | 4 | GENERAL PLAN (POND FILL SITE) |
| ~~MM04A005.DGN~~ | ~~M-P10-61/34~~ | ~~5~~ | ~~BUSSEY LAKE CHANNEL EXCAVATION ALIGNMENT, PLAN & TYPICAL SECTION~~ |
| ~~MM04A006.DGN~~ | ~~M-P10-61/35~~ | ~~6~~ | ~~PLAN & PROFILE EXISTING DIKE~~ |
| ~~MM04A007.DGN~~ | ~~M-P10-61/36~~ | ~~7~~ | ~~SHT. 1 SLOUGH MANDATORY BORROW AREA, DETAILS, CROSS SECTIONS STA. 0+00B TO STA. 2+00B~~ |
| ~~MM04A008.DGN~~ | ~~M-P10-61/37~~ | ~~8~~ | ~~SHT. 1 SLOUGH MANDATORY BORROW AREA, CROSS SECTIONS STA. 3+00B TO 7+00B~~ |
| MM04A015.DGN | M-P10-61/38 | 9 | RAMP PROFILE AND SECTIONS, BREACH DETAILS |
| MM04A011.DGN | M-P10-61/39 | 10 | POND #5 FILL SITE PLAN & CONTROL DATA |
| MM04A014.DGN | M-P10-61/40 | 11 | POND #5 FILL SITE CROSS SECTIONS STA. 0+00F TO 2+00F |
| MM04A013.DGN | M-P10-61/41 | 12 | POND #5 FILL SITE CROSS SECTIONS STA. 4+00F TO 8+00F |
| MM04A012.DGN | M-P10-61/42 | 13 | POND #5 FILL SITE CROSS SECTIONS STA. 10+00F TO 14+00F |
| MM04A016.DGN | M-P10-61/43 | 14 | POND #2 FILL SITE CROSS SECTIONS 1 THRU 3 |
| MM04A017.DGN | M-P10-61/44 | 15 | POND #3 FILL SITE CROSS SECTIONS 4 THRU 6 |
| MM04A018.DGN | M-P10-61/45 | 16 | POND #4 FILL SITE CROSS SECTIONS 7 THRU 9 |

## REFERENCES DWG. INDEX

| DRAWING NO. | SHT. | DESCRIPTION | |
|---|---|---|---|
| ~~M-P10-10/12~~ | | ~~BORING LOG 90-1M THRU 90-4M~~ | |
| M-P10-10/13 | | BORING LOG 90-5M THRU 90-12M | |
| M-P10-10/14 | | BORING LOG 90-13M THRU 90-19M | |
| M-P10-14/5 | | HYDROGRAPH | |
| M-P10-14/6 | | HYDROGRAPH | |
| M-P10-14/7 | | HYDROGRAPH | |
| M-P10-14/8 | | ELEVATION - DURATION CURVES | |
| M-P10-14/9 | | ELEVATION - DURATION CURVES | |
| M-P10-14/10 | | ELEVATION - DURATION CURVES | |
| M-P10-14/11 | | ELEVATION - DURATION CURVES | |
| M-P10-10/8 | | SITE PLAN, LOCATION MAP & DRAWING SCHEDULE | (AS-BUILT) |
| M-P10-64/69 | | WATER SUPPLY LINE, PLAN & PROFILE | (AS-BUILT) |
| M-P10-64/70 | | SLIDE GATE STRUCTURE - PLAN & PROFILE | (AS-BUILT) |
| M-P10-64/71 | | STOPLOG STRUCTURE - PLAN & PROFILE | (AS-BUILT) |
| M-P10-64/72 | | MISCELLANEOUS PLAN & SECTIONS | (AS-BUILT) |
| M-P10-64/73 | | SLIDEGATE PLATFORM & DETAILS | (AS-BUILT) |
| ~~M-P10-64/74~~ | | ~~STOPLOG STRUCTURE PLATFORM & DETAILS~~ | ~~(AS-BUILT)~~ |

NOTE:
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.

APPROVAL RECOMMENDED BY:

CHARLES P SPITZACK — CHIEF ED-D BRANCH

HELMER O JOHSON — CHIEF ED-GH BRANCH

ROBERT F POST — CHIEF ENGINEERING DIVISION

APPROVED BY:

RICHARD W CRAIG — COL., CORPS OF ENGINEERS

GARY D PALESH — ENGINEER MANAGER
GREG M FRANKOSKY — CHIEF SPECS. & TECH. SUPPORT SECTION
JAMES B MOSNER — CHIEF GENERAL ENGINEERING SECTION
N/A — CHIEF STRUCTURAL SECTION
N/A — CHIEF MECH/ELEC/ARCH SECTION
PATRICK M FOLEY — CHIEF HYDRAULICS SECTION
ROBERT G ENGELSTAD — CHIEF HYDROLOGY SECTION
DAVID W RYDEEN — CHIEF GEOTECHNICAL DESIGN SECTION

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 6/97 | |

US Army Corps of Engineers
St. Paul District

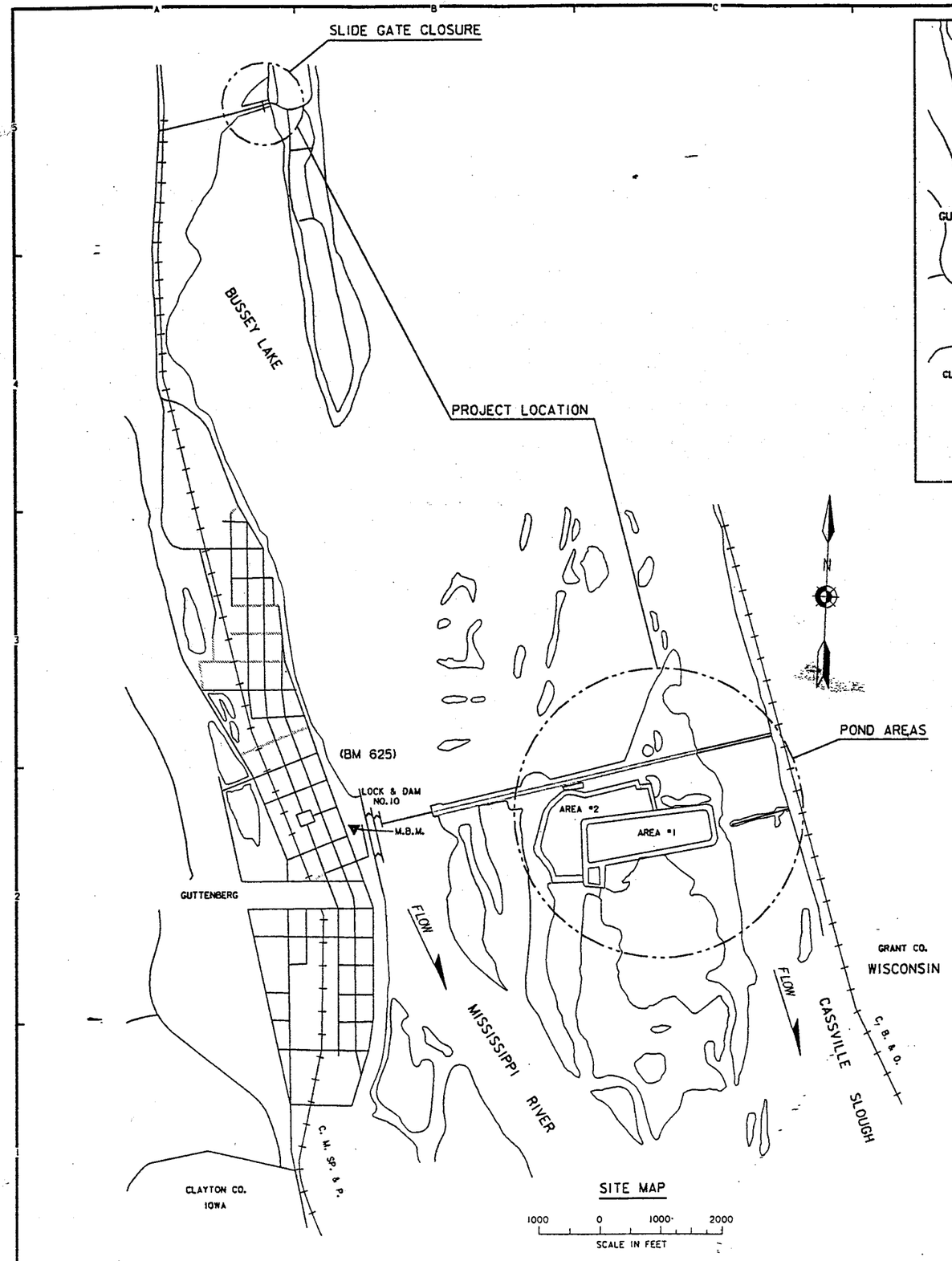
AE APPROVING OFFICIAL:

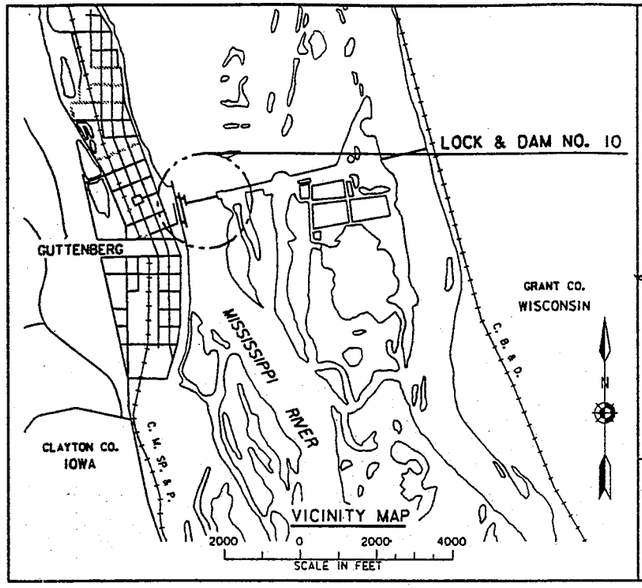
PE-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.
PE-H: DESIGNED:; CHECKED:
DATE: 2/92

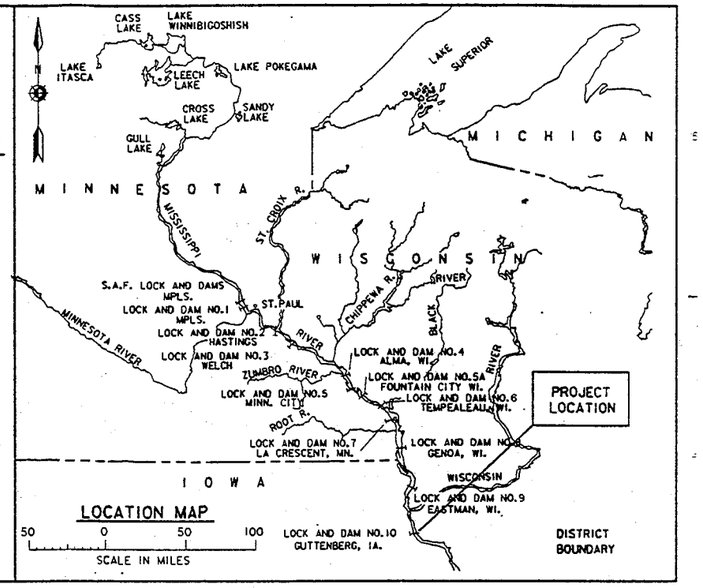
AS-BUILT
BUSSEY LAKE - (HREP)
ENVIROMENTAL MANAGEMENT PROGRAM - UPPER MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
POOL #10 BUSSEY LAKE DREDGING (HREP)
LOCATION AND VICINITY MAP, AND
DRAWING INDEX

CAD FILE NAME: MM04A001.DGN | DRAWING NUMBER: M-P10-10/11 | SHT 1 OF 16
SOL NO: DACW37-92-B-0002

AS-BUILT




LEGEND

- LIMITS OF WORK
- BORINGS
- PROJECT
- EXISTING
- MASTER BENCH MARK (M.B.M.) BRASS CAP U.S.C. & G.S. 0179 DATUM 1912 ADJ. M.S.L., EL. 624.01
- FILL
- CUT

NOTES:

1. ALL ELEVATIONS ARE M.S.L. 1912 ADJ.
2. 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
HYDR
GEOTECH
STR ENG

## SITE PLAN FOR AREAS 1&2

| DRAWING NO. | SHT. | DESCRIPTION | CAD FILES |
|---|---|---|---|
| M-P10-10/15 | 1 | LOCATION, VICINITY AND SITE MAPS AND DRAWING INDEX | MT10P000 |
| M-P10-10/16 | 2 | GENERAL PLAN BORING LOG LOCATIONS | MT10P001 |
| ~~M-P10-64/78~~ | ~~3~~ | ~~SLIDE GATE CLOSURE, PLAN, PROFILE, SECTIONS AND DETAILS~~ | ~~MT10P002~~ |
| M-P10-64/79 | 4 | NEW 24" CMP WATER SUPPLY LINE TO AREA #2, SECTIONS AND DETAILS | MT10P003 |
| M-P10-64/80 | 5 | OUTLET NO. 1 PLAN AND SECTION | MT64P000 |
| M-P10-64/81 | 6 | OUTLET NO. 2 PLAN, SECTION AND DETAIL | MT64P001 |
| M-P10-64/82 | 7 | GATEWELLS - OUTLETS NO. 1 AND NO. 2 PLAN, SECTIONS, DETAIL AND TABLE | MT64P002 |
| M-P10-64/83 | 8 | GATEWELL REINFORCEMENT PLAN, SECTIONS AND DETAILS | MT64P003 |
| M-P10-64/84 | 9 | JUNCTION BOX PLAN, SECTIONS AND DETAILS | MT64P004 |
| M-P10-64/85 | 10 | MISCELLANEOUS METALS SECTIONS AND DETAILS | MT64P005 |
| M-P10-64/86 | 11 | MISCELLANEOUS METALS ELEVATIONS, SECTIONS AND DETAILS | MT64P006 |
| M-P10-64/87 | 12 | TRASH GUARD AND RAILING VIEWS, PLAN, ELEVATION, SECTION AND DETAIL | MT64P007 |
| M-P10-64/88 | 13 | CARP RACK SECTIONS AND DETAILS | MT64P008 |
| M-P10-64/89 | 14 | STOPLOGS AND STOPLOG STORAGE ELEVATIONS, SECTIONS AND DETAILS | MT64P009 |
| M-P10-64/90 | 15 | OUTLET NO. 3 PLAN, SECTIONS AND DETAILS | MT64P010 |
| M-P10-61/91 | 16 | OUTLET NO. 3 SECTIONS AND DETAILS | MT64P011 |
| M-P10-64/92 | 17 | ACCESS RAMP PLAN, SECTIONS AND DETAILS | MT64P012 |
| M-P10-64/93 | 18 | ACCESS RAMP SECTIONS AND DETAILS | MT64P013 |
| ~~M-P10-64/94~~ | ~~19~~ | ~~SLIDE GATE CLOSURE PLAN, SECTIONS AND DETAILS~~ | ~~MT64P014~~ |
| ~~M-P10-64/95~~ | ~~20~~ | ~~SLIDE GATE CLOSURE SECTIONS AND DETAILS~~ | ~~MT64P015~~ |

### REFERENCES DWG. INDEX

| DRAWING NO. | SHT. | DESCRIPTION | CAD FILES |
|---|---|---|---|
| ~~M-P10-10/17~~ | | ~~BORING LOGS, 90-10M AND 93-20M THRU 93-27M~~ | ~~SUBSTC01~~ |
| M-P10-14/12 | | ELEVATION DURATION CURVES | 01_DAM10P |
| M-P10-14/13 | | ELEVATION DURATION CURVES | 02_DAM10P |
| M-P10-14/14 | | ELEVATION DURATION CURVES | 01_DAM10T |
| M-P10-14/15 | | ELEVATION DURATION CURVES | 02_DAM10T |
| M-P10-14/16 | | HYDROGRAPH CHARTS 1983-1987 (POOL) | H1_DAM10P |
| M-P10-14/17 | | HYDROGRAPH CHARTS 1988-1992 (POOL) | H2_DAM10P |
| M-P10-14/18 | | HYDROGRAPH CHARTS 1983-1987 (TAILWATER) | H1_DAM10T |
| M-P10-14/19 | | HYDROGRAPH CHARTS 1988-1992 (TAILWATER) | H2_DAM10T |
| M-P10-10/11 | | LOCATION AND VICINITY MAP, AND DRAWING INDEX | MM04P001 |
| M-P10-61/38 | | RAMP PROFILE AND SECTIONS, BEACH DETAILS | MM04P015 |
| M-P10-61/39 | | POND #5 FILL SITE PLAN AND CONTROL DATA | MM04P011 |
| M-P10-64/69 | | WATER SUPPLY LINE, PLAN AND PROFILE | |
| M-P10-64/70 | | SLIDE GATE STRUCTURE, PLAN AND PROFILE | |
| M-P10-64/72 | | MISCELLANEOUS PLAN AND SECTIONS | |
| ~~M-P10-64/73~~ | | ~~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:

CHIEF ED-D BRANCH

CHIEF ED-GH BRANCH

CHIEF ENGINEERING DIVISION

APPROVED BY:

COL., CORPS OF ENGINEERS

ENGINEER MANAGER

CHIEF SPECS. & TECH. SUPPORT SECTION

CHIEF GENERAL ENGINEERING SECTION

CHIEF STRUCTURAL SECTION

CHIEF MECH/ELEC/ARCH SECTION

CHIEF HYDRAULICS SECTION

CHIEF HYDROLOGY SECTION

CHIEF GEOTECHNICAL DESIGN SECTION

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AE APPROVING OFFICIAL:

AS-BUILT

BUSSEY LAKE - STAGE 2

ENVIROMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER

POOL #10 CLAYTON COUNTY IOWA

LOCATION, VICINITY AND SITE MAPS AND DRAWING INDEX

ED-D: DESIGNED: WPR; CHECKED: J.G.; DRAWN: FJB/T.J.

ED-GH: DESIGNED: MAR; CHECKED: JSH

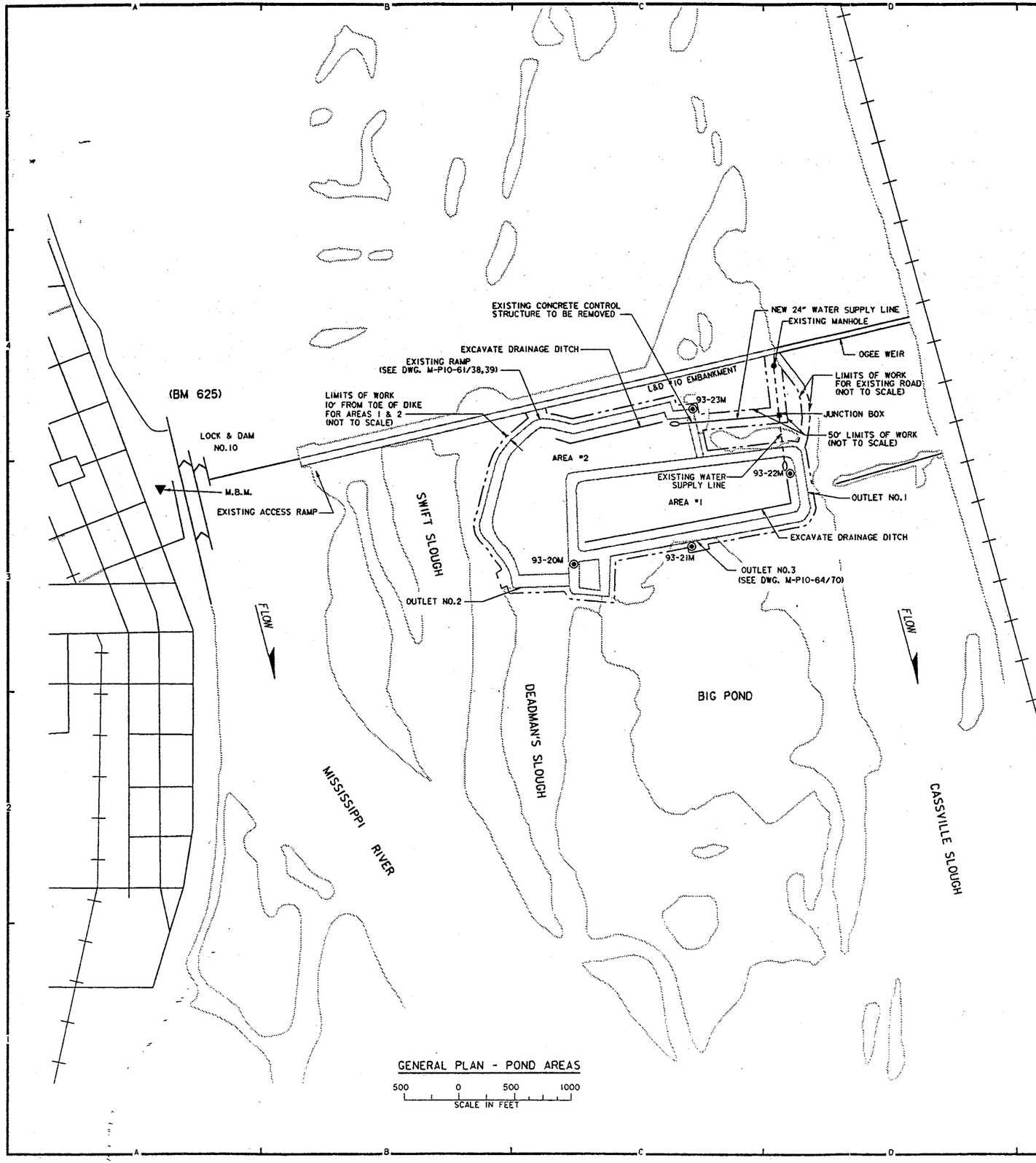
DATE: 11-01-93

CAD FILE NAME: MT10P000.DGN

SPEC NO: DACW37-93-B-0038

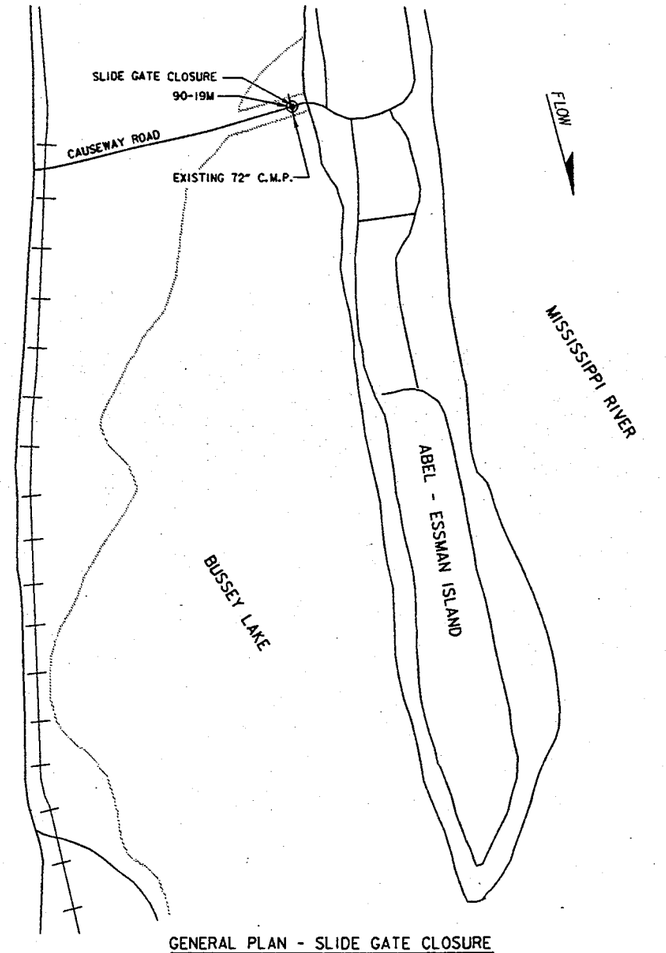
DRAWING NUMBER: M-P10-10/15

SHT 1 OF 20




GENERAL PLAN - POND AREAS

500 0 500 1000
SCALE IN FEET




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

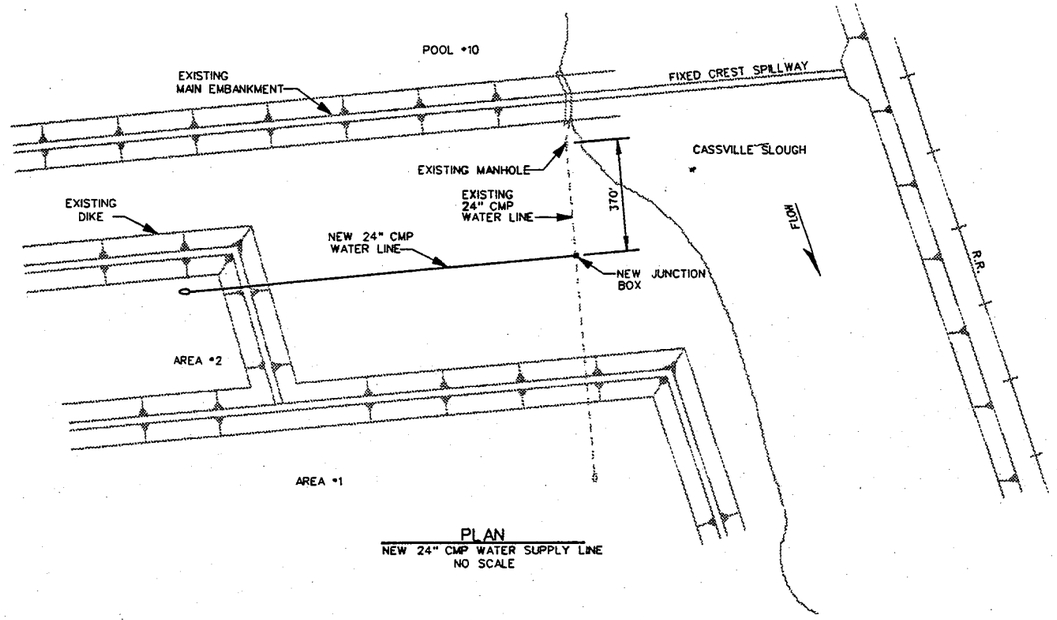
| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 11/95 | |

**DEPARTMENT OF THE ARMY**
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

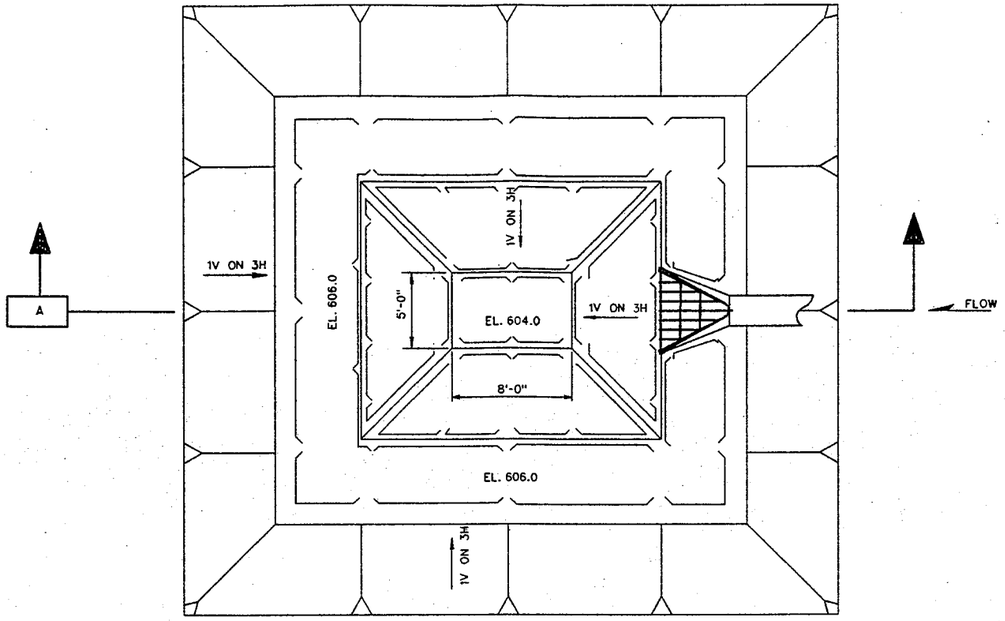
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2 &
ENVIROMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER
POOL #10 CLAYTON COUNTY IOWA
DITCHES, CULVERTS & DIKES
GENERAL PLAN
BORING LOG LOCATIONS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: WPR | | |
| | CHECKED: J.C. | | |
| | DRAWN: FJB/T.J. | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MT10P001.DGN | DRAWING NUMBER: M-P10-10/16 SHT 2 OF 20 |
| | DATE: 11-01-93 | SPEC NO: DACW37-93-B-0038 | |

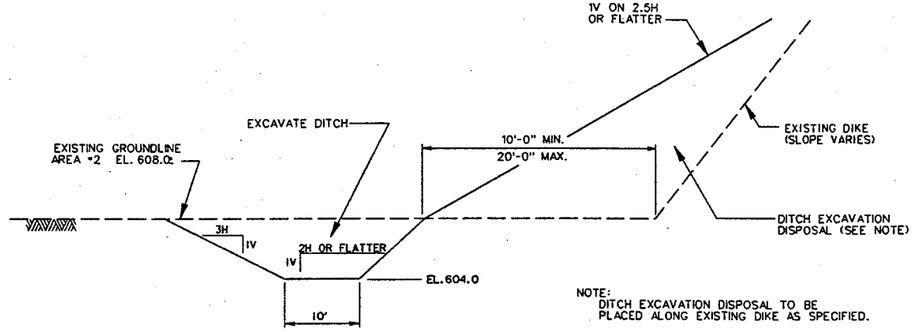



PLAN
NEW 24" CMP WATER SUPPLY LINE
NO SCALE



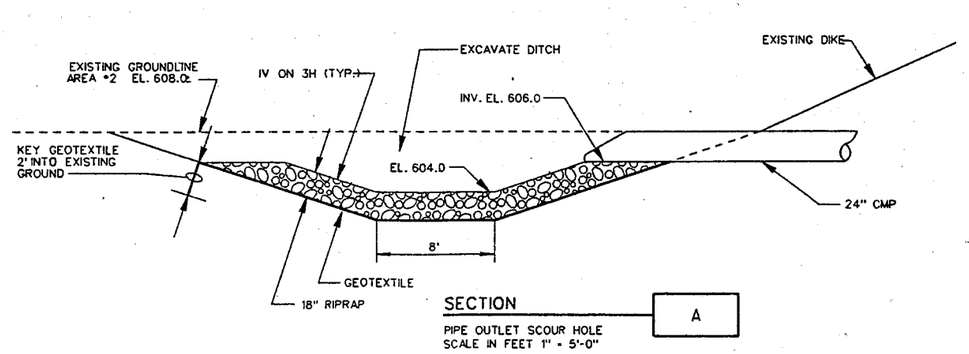

PLAN
PIPE OUTLET PREFORMED SCOUR HOLE

5' 2.5' 0 5'
SCALE IN FEET



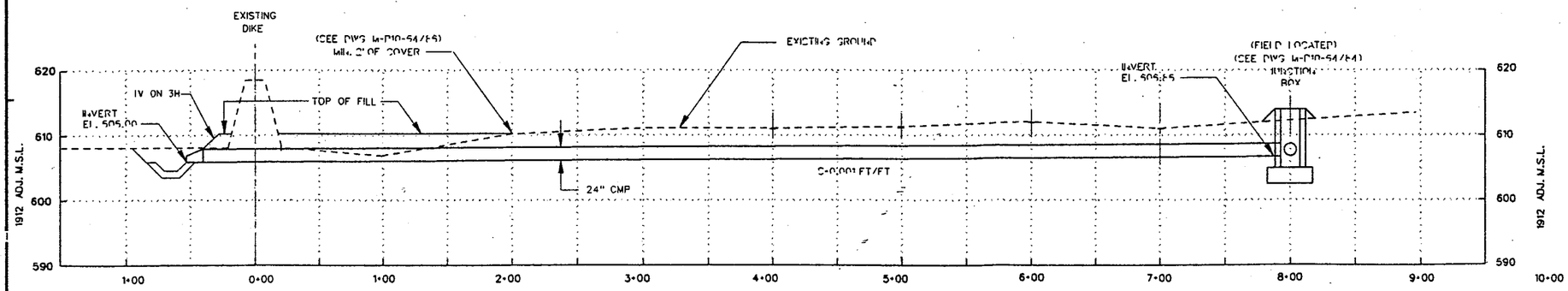

NOTE:
DITCH EXCAVATION DISPOSAL TO BE PLACED ALONG EXISTING DIKE AS SPECIFIED.

SECTION
TYPICAL DITCH EXCAVATION
NO SCALE




SECTION
PIPE OUTLET SCOUR HOLE
SCALE IN FEET 1" = 5'-0"

A




PROFILE - NEW 24" CMP
WATER LINE TO AREA *2

GEN ENG
HYD
HYDR
GEOTECH
STR ENG

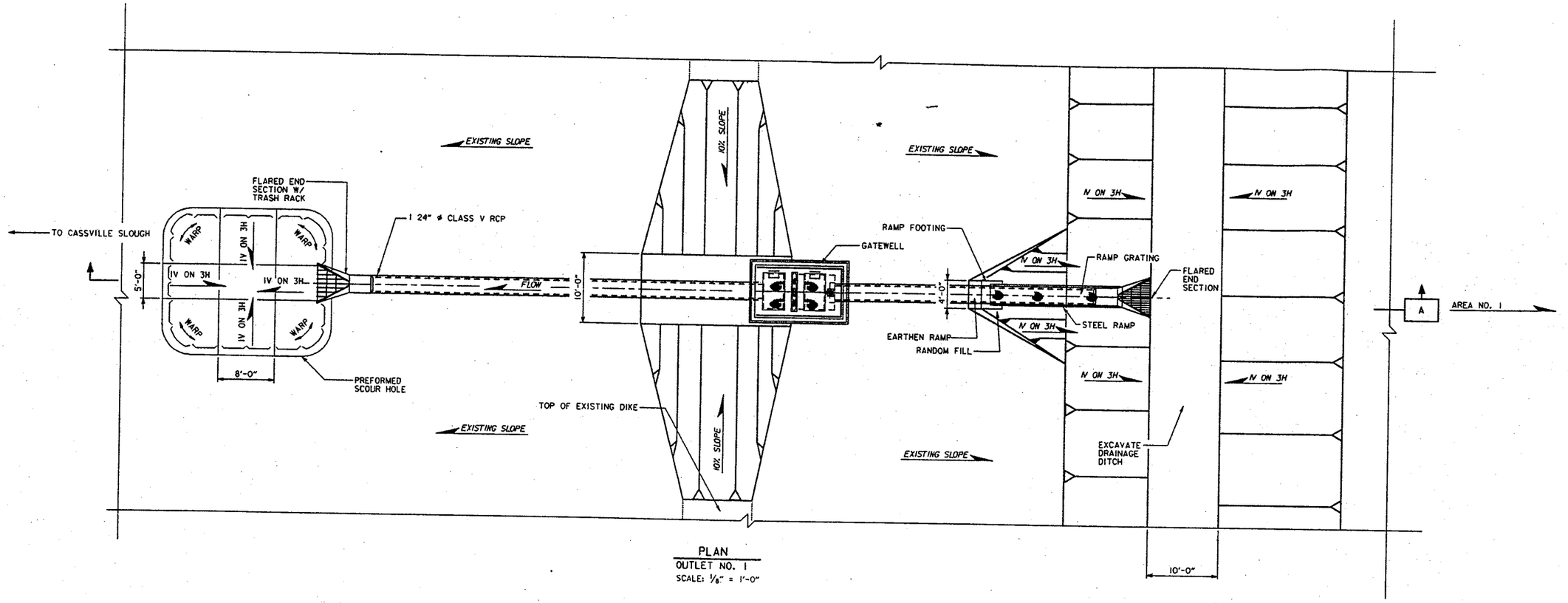
| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 11/95 | |

**DEPARTMENT OF THE ARMY**
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

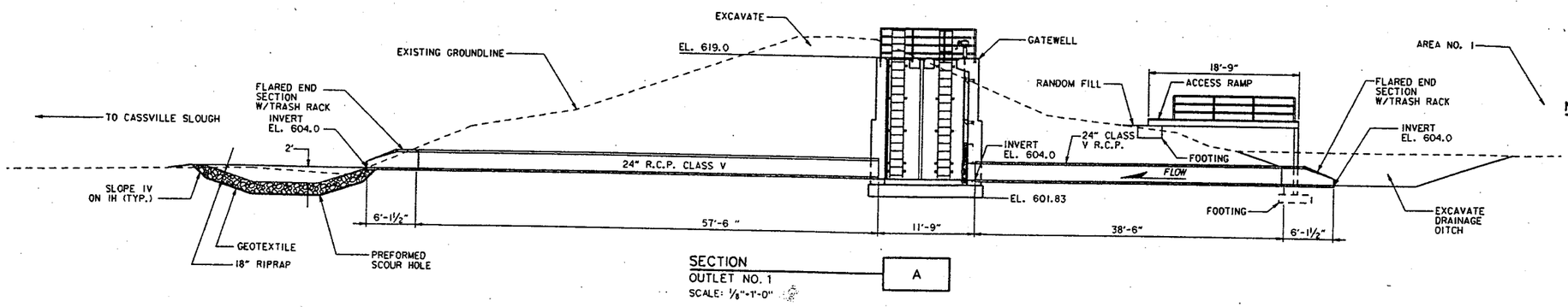
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER
POOL *10 CLAYTON COUNTY, IOWA
DITCHES, CULVERTS & DIKES
NEW 24" CMP WATER SUPPLY LINE TO AREA *2
SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: WPR | | |
| | CHECKED: | | |
| | DRAWN: SKM/GRS | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MT10P003.DGN | DRAWING NUMBER: M-P10-64/79 SHT 4 OF 20 |
| | DATE: 11-01-93 | SPEC NO: DACW37-93-B-0038 | |




PLAN
OUTLET NO. 1
SCALE: 1/8" = 1'-0"




SECTION
OUTLET NO. 1
SCALE: 1/8"=1'-0"

A

**NOTES:**

1. FINAL LOCATION OF OUTLET NO. 1 TO BE STAKED IN THE FIELD AND APPROVED BY THE CONTRACTING OFFICER'S REPRESENTATIVE.
2. SEE DRWG. 64/81 FOR TYPICAL RCP PLACEMENT DETAILS.
3. DISTURBED AREAS TO BE SEEDED AS SPECIFIED.
4. SEE DRWG. 10/16 FOR LIMITS OF DITCH EXCAVATION AND DRWG. 64/79 FOR DISPOSAL LOCATION.

SCALE: 1/8" = 1'-0"

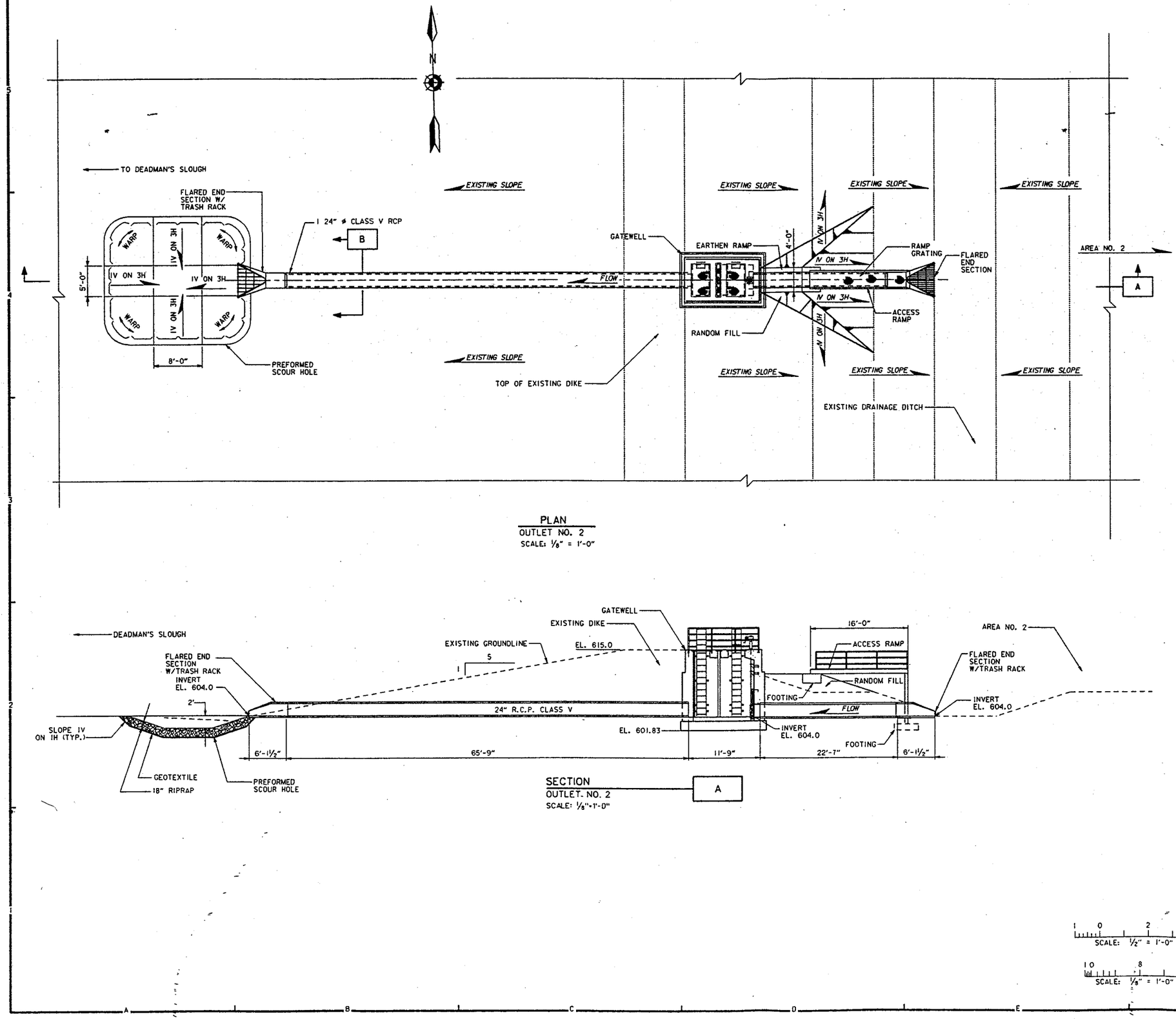
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

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 & DIKES
OUTLET NO. 1
PLAN AND SECTION

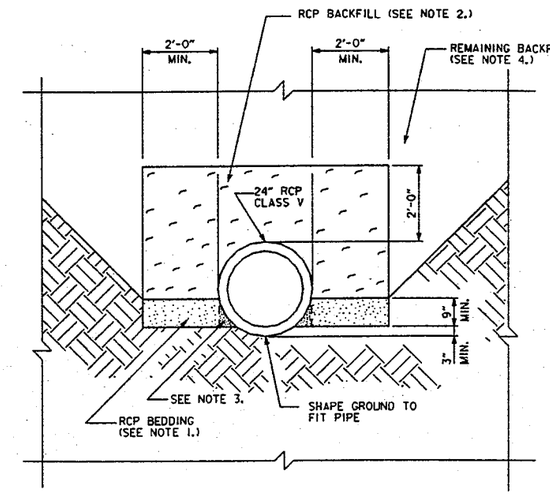
| | |
|---|---|
| ED-D DESIGNED: | PWS |
| ED-D CHECKED: | |
| ED-D DRAWN: | MKC |
| ED-DH DESIGNED: | |
| ED-DH CHECKED: | |
| DATE: | 05-01-94 |
| CAD FILE NAME: | MT64P000.DGN |
| SPEC NO: | DACW37-93-8-0038 |
| DRAWING NUMBER: | M-P10-64/80 |
| SHT | 5 OF 20 |




PLAN
OUTLET NO. 2
SCALE: 1/8" = 1'-0"




SECTION
OUTLET NO. 2
SCALE: 1/8"=1'-0"
A




NOTES:

1. RCP BEDDING TO BE SATISFACTORY EXISTING DIKE MATERIAL COMPACTED AS SPECIFIED.
2. RCP BACKFILL TO BE SATISFACTORY EXISTING DIKE MATERIAL COMPACTED AS SPECIFIED
3. HAND PLACE AND HAND TAMP RCP BEDDING BENEATH HAUNCHES.
4. REMAINING BACKFILL TO BE SATISFACTORY EXISTING DIKE MATERIAL COMPACTED AS SPECIFIED. EXTEND TO THE FULL HEIGHT OF THE DIKE.

SECTION
TYP. RCP PLACEMENT
SCALE: 1/2" = 1'-0"
B

NOTES:

1. FINAL LOCATION OF OUTLET NO. 2 TO BE STAKED IN THE FIELD AND APPROVED BY THE CONTRACTING OFFICER'S REPRESENTATIVE.

SCALE: 1/2" = 1'-0"

SCALE: 1/8" = 1'-0"

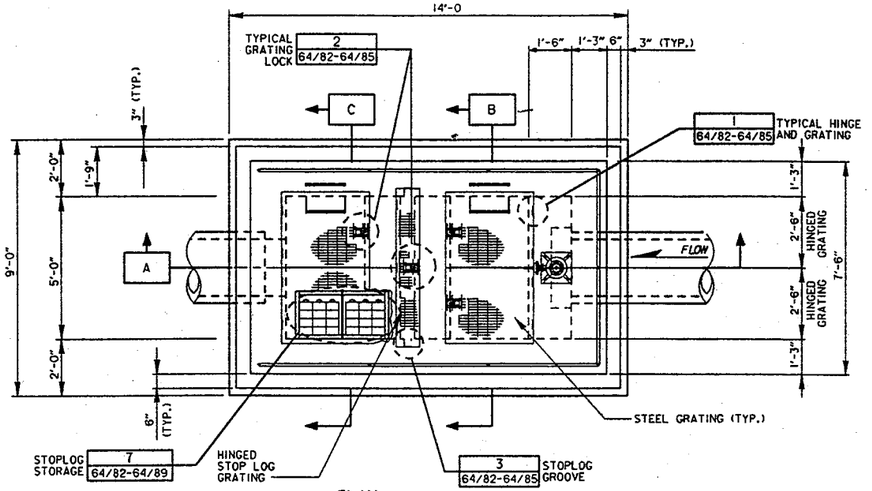
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/94 | |

**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 & DIKES
OUTLET NO. 2
PLAN, SECTION AND DETAIL

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: MKC | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | | |
| DATE: 05-01-94 | CAD FILE NAME: MT64P001.DGN | DRAWING NUMBER: M-P10-64/81 | SHT 6 OF 20 |
| | SPEC NO: DACW37-93-B-0038 | | |

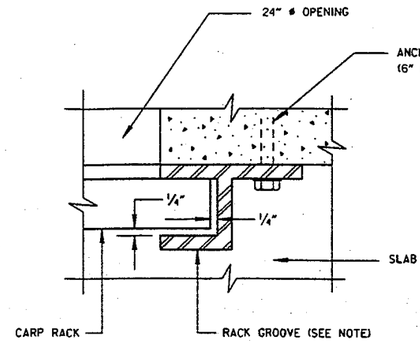



PLAN
GATEWELL
SCALE: 3/8" = 1'-0"

NOTE:
PROVIDE LOCKS FOR ALL HINGED GRATING.

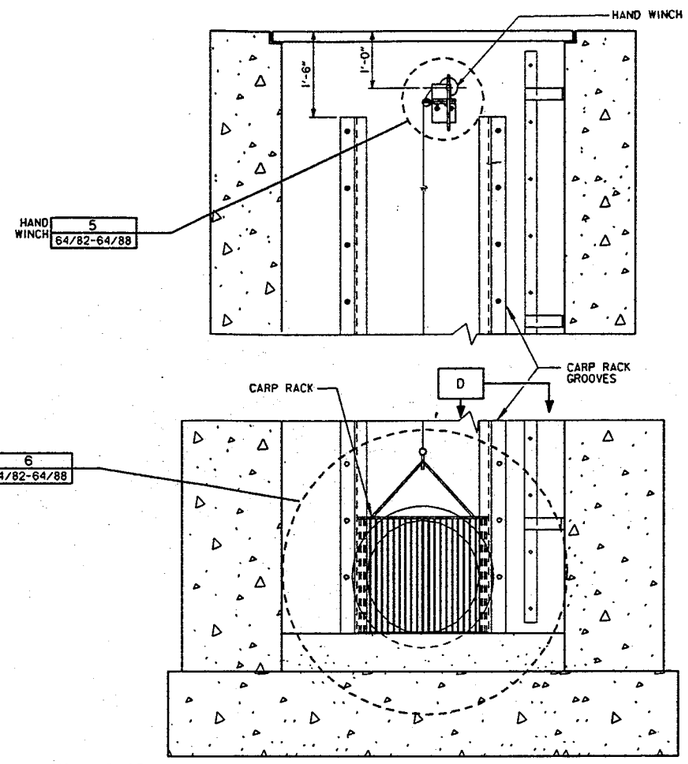
| GATEWELL | DIM. A | EL. A |
|---|---|---|
| NO. 1 | 7'-8" | 619.0 |
| NO. 2 | 3'-8" | 615.0 |

GATEWELL TABLE



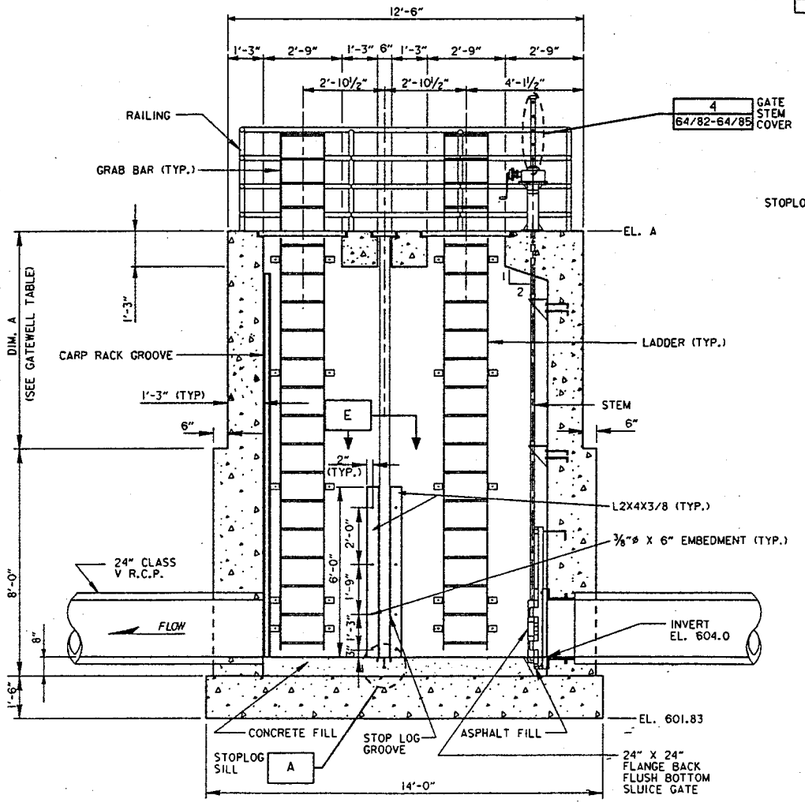

NOTE:
RACK GROOVES TO BE NEENAH R-7500 SERIES TYPE E, SIZE 2" X 2" OR EQUAL.

SECTION
CARP RACK GROOVE — D
SCALE: NONE

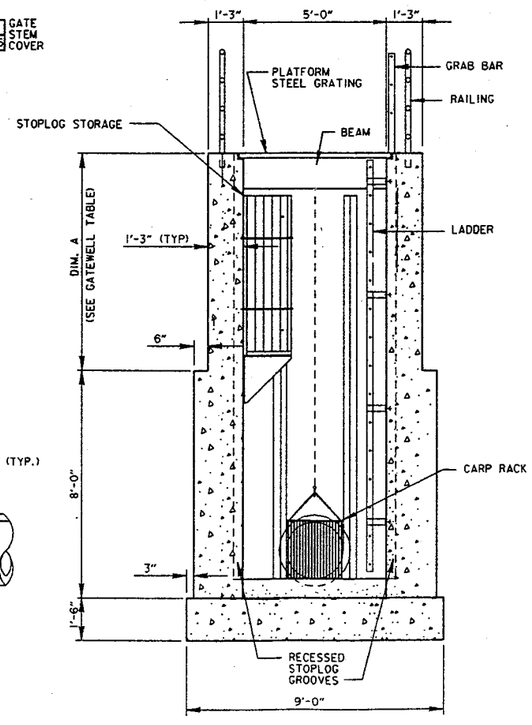



NOTE:
STOPLOG STORAGE NOT SHOWN FOR CLARITY.

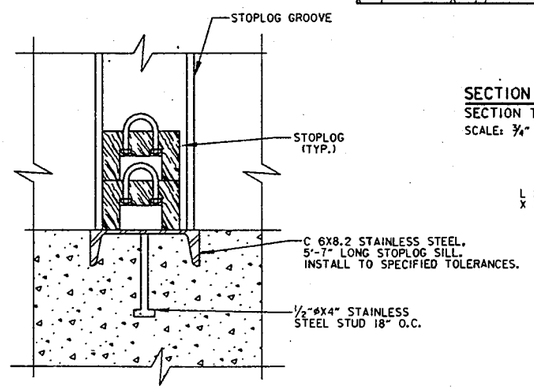
SECTION
SECTION THRU GATEWELL — C
SCALE: 3/4" = 1'-0"




SECTION
SECTION THRU GATEWELL — A
SCALE: 3/8" = 1'-0"

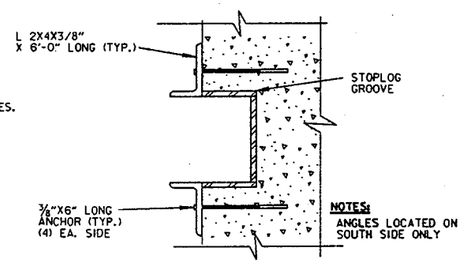



SECTION
SECTION THRU GATEWELL — B
SCALE: 3/8" = 1'-0"




NOTES:
1. CENTER STOPLOG SILL ON CENTER OF STOPLOG GROOVE.
2. COAT ALL SURFACES OF STOPLOG SILL IN CONTACT WITH CONCRETE WITH SPECIFIED BONDING AGENT.

DETAIL
STOPLOG SILL — A
SCALE: 3" = 1'-0"




NOTES:
ANGLES LOCATED ON SOUTH SIDE ONLY

SECTION
STOPLOG GROOVE — E

1" 0 4" 8"
SCALE: 3" = 1'-0"

6" 0 1 2
SCALE: 3/4" = 1'-0"

1 0 2 4 6
SCALE: 3/8" = 1'-0"

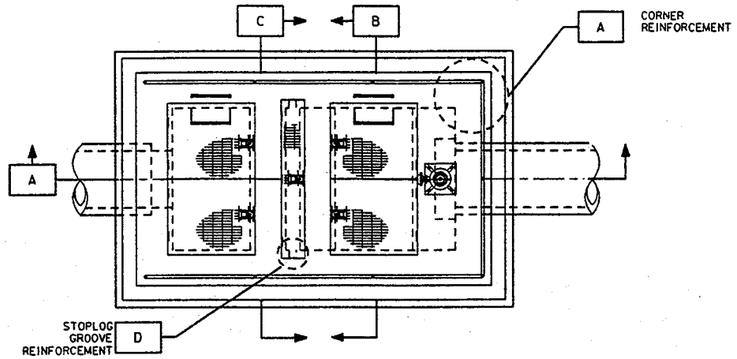
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

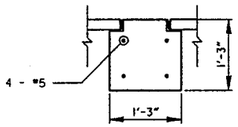
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AS-BUILT
BUSSEY LAKE - STAGE 2;
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
GATEWELLS - OUTLETS NO. 1 AND NO. 2
PLAN, SECTIONS, DETAIL AND TABLE

ED-O: DESIGNED: PWS; CHECKED:; DRAWN: SKM
ED-GH: DESIGNED:; CHECKED:
DATE: 05-01-94
CAD FILE NAME: MT64P002.DGN
SPEC NO: DACW37-93-B-0038
DRAWING NUMBER: M-P10-64/82
SHT 7 OF 20

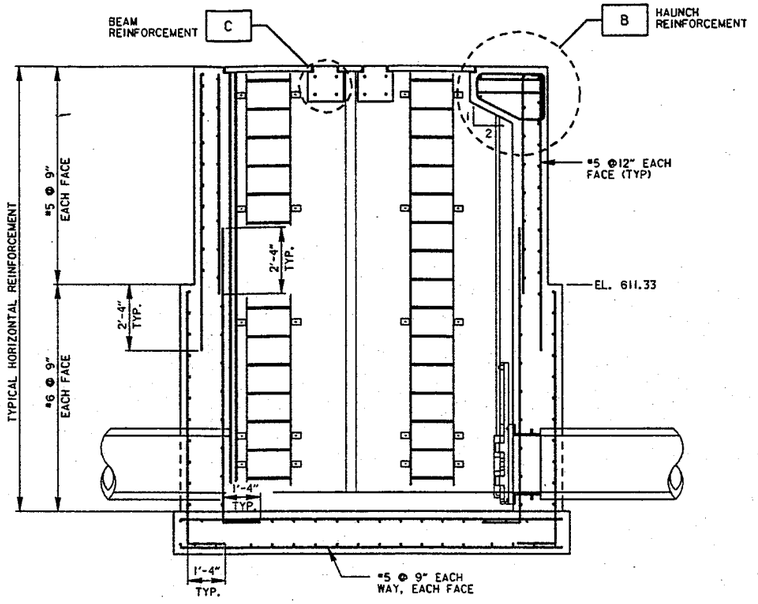



PLAN
GATEWELL
SCALE: 3/8" = 1'-0"

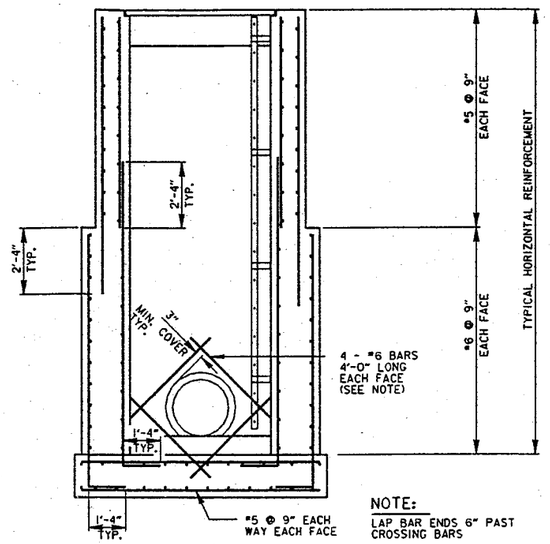



NOTE:
PROVIDE MIN. 2" CLEARANCE BETWEEN ANGLES AND REINFORCING BAR

DETAIL
BEAM REINFORCEMENT — C
SCALE: 3/4" = 1'-0"

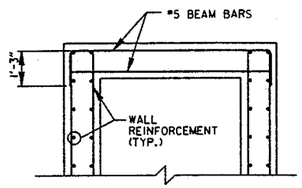



SECTION
SECTION THRU GATEWELL — A
SCALE: 3/8" = 1'-0"

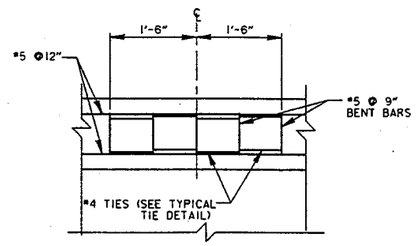



NOTE:
LAP BAR ENDS 6" PAST CROSSING BARS

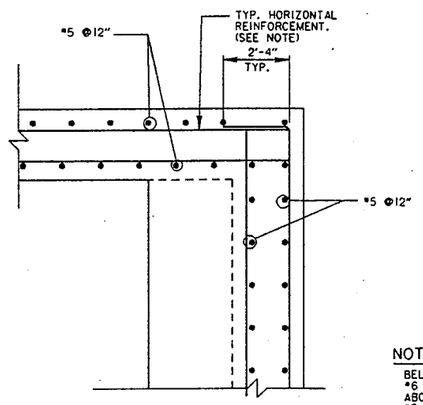
SECTION
SECTION THRU GATEWELL — B
SCALE: 3/8" = 1'-0"




SECTION
TYPICAL BEAM REINFORCING — C
SCALE: 3/8" = 1'-0"

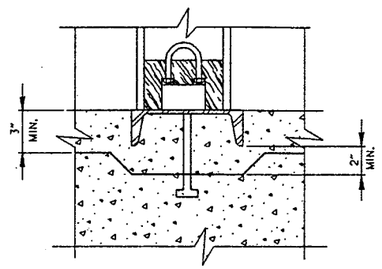



SECTION
HAUNCH REINFORCEMENT TIES — D
SCALE: 3/4" = 1'-0"




NOTE:
BELOW EL. 611.33, #6 @9" EACH FACE
ABOVE EL. 611.33, #5 @9" EACH FACE

DETAIL
CORNER REINFORCEMENT — A
SCALE: 3/4" = 1'-0"

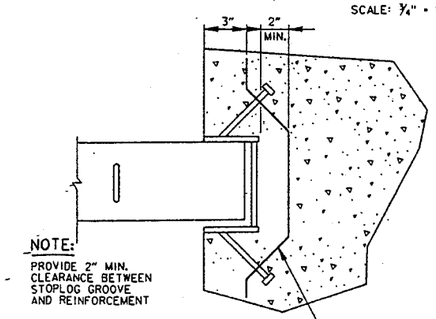



NOTE:
PROVIDE MIN. 2" CLEARANCE BETWEEN ANGLES AND REINFORCING BAR

DETAIL
HAUNCH REINFORCEMENT — B
SCALE: 3/4" = 1'-0"

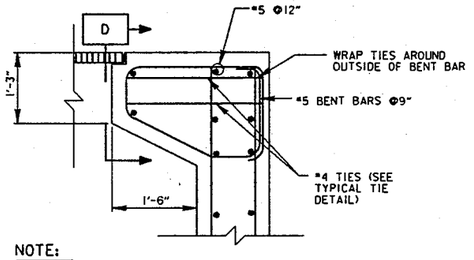
NOTE:
PROVIDE MIN. 2" CLEARANCE BETWEEN STOPLOG SILL AND REINFORCEMENT

DETAIL
STOPLOG SILL REINFORCEMENT
SCALE: NONE

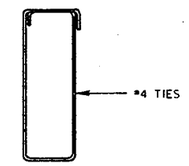



NOTE:
PROVIDE 2" MIN. CLEARANCE BETWEEN STOPLOG GROOVE AND REINFORCEMENT

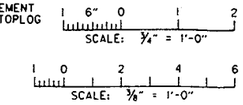
DETAIL
STOPLOG GROOVE REINFORCEMENT — D
SCALE: NONE

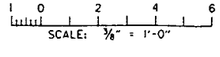



NOTE:
PROVIDE MIN. 2" CLEARANCE BETWEEN ANGLES AND REINFORCING BAR




DETAIL
TYPICAL TIE
SCALE: NONE




NOTES:
1. 3" MIN. CONCRETE COVER UNLESS OTHERWISE SPECIFIED.

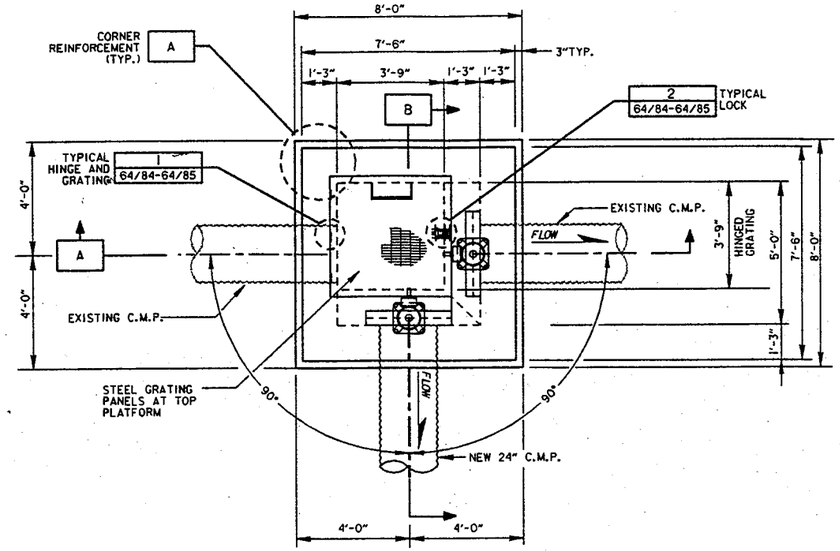
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/93 | |

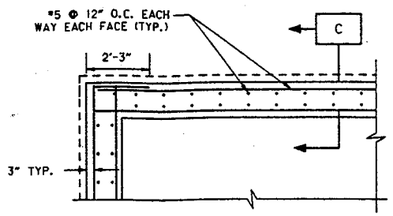
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
GATEWELL REINFORCEMENT
PLAN, SECTIONS AND DETAILS

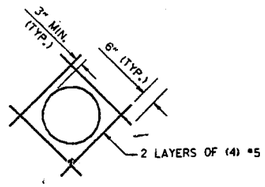
| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: SKM | | |
| ED-CH | DESIGNED: | | |
| | CHECKED: | | |
| DATE: 05-01-94 | CAD FILE NAME: MT64P003.DGN | DRAWING NUMBER: M-P10-64/83 | SHT 8 OF 20 |
| | SPEC NO: DACW37-93-B-0038 | | |




PLAN
JUNCTION BOX
SCALE: 3/8" = 1'-0"

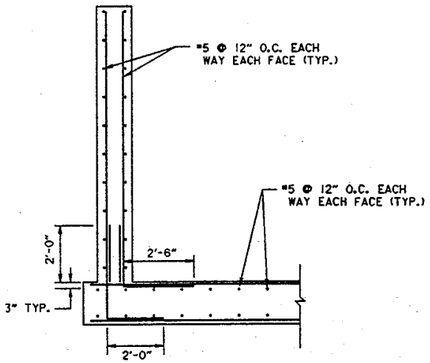



DETAIL
CORNER REINFORCEMENT (TYP.) A
SCALE: 3/4" = 1'-0"

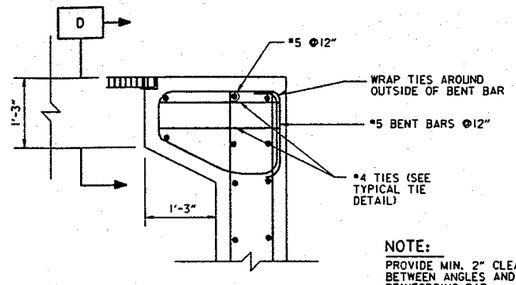



NOTE:
PROVIDE 3" MIN. COVER FOR HORIZONTAL AND VERTICAL WALL REINFORCEMENT AROUND OPENING.

DETAIL
TYP. REINFORCING AROUND OPENING
SCALE: 3/4" = 1'-0"

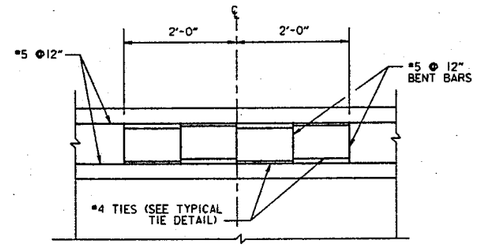



SECTION
CORNER REINFORCEMENT(TYP.) C
SCALE: 3/4" = 1'-0"

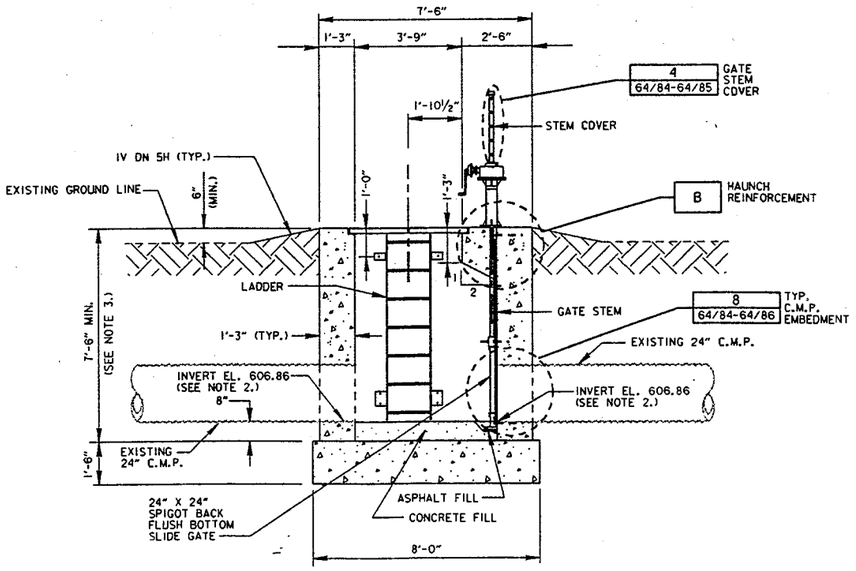



NOTE:
PROVIDE MIN. 2" CLEARANCE BETWEEN ANGLES AND REINFORCING BAR

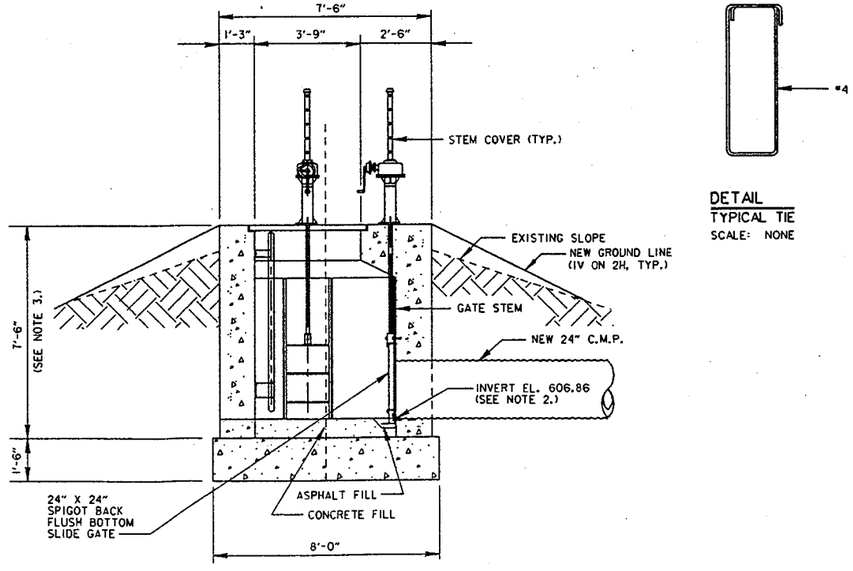
DETAIL
HAUNCH REINFORCEMENT B
SCALE: 3/4" = 1'-0"




SECTION
HAUNCH REINFORCEMENT TIES D
SCALE: 3/4" = 1'-0"




SECTION
SECTION THRU JUNCTION BOX A
SCALE: 3/8" = 1'-0"




SECTION
SECTION THRU JUNCTION BOX B
SCALE: 3/8" = 1'-0"




DETAIL
TYPICAL TIE
SCALE: NONE

NOTES:
1. 3" MIN. CONCRETE COVER UNLESS OTHERWISE SPECIFIED.
2. JUNTION BOX LOCATION TO BE FIELD FIT. VERIFY PIPE INVERT ELEVATIONS IN THE FIELD.
3. DIMENSION SHOWN IS MINIMUM REQUIRED FOR GATE OPERATION. SLOPE UP FROM EXISTING GROUND TO TOP OF GATEWELL AS SHOWN.
4. CUT OUT SECTION OF EXISTING C.M.P. TO MATCH INSIDE DIMENSION OF JUNCTION BOX. MAINTAIN ROUNDNESS OF PIPE AND SMOOTH ALL ROUGHENED EDGES.

SCALE: 3/4" = 1'-0"

SCALE: 3/8" = 1'-0"

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

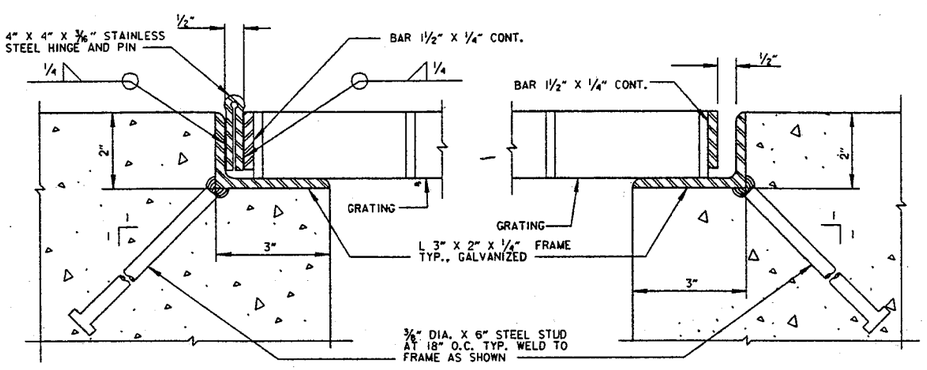
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
JUNCTION BOX
PLAN, SECTIONS AND DETAILS

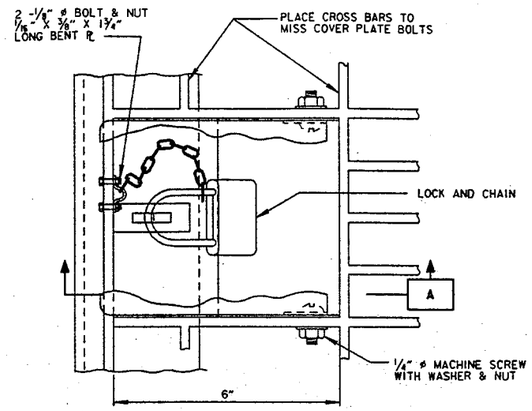
| ED-O | DESIGNED: PWS |
|---|---|
| | CHECKED: |
| | DRAWN: MKC |
| ED-CH | DESIGNED: |
| | CHECKED: |
| DATE: 05-01-94 | |

CAD FILE NAME: MT64P004
SPEC NO: DACW37-93-B-0038
DRAWING NUMBER: M-P10-64/84
SHT 9 OF 20

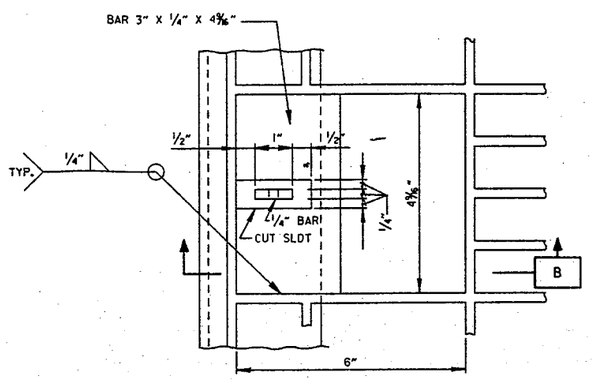
GEN ENG
HYD
HYDR
GEOTECH
STR ENG



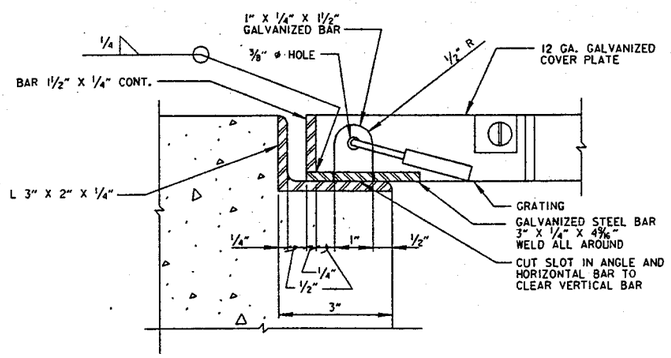

**DETAIL 1** — TYPICAL HINGE AND GRATING — 64/82-64/85, 64/84-64/85
SCALE: 6" = 1'-0"



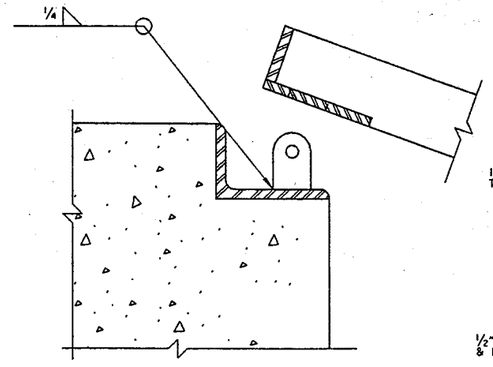

**DETAIL 2** — TYPICAL GRATING LOCK (WITH COVER AND LOCK) — 64/82-64/85, 64/84-64/85
SCALE: 6" = 1'-0"



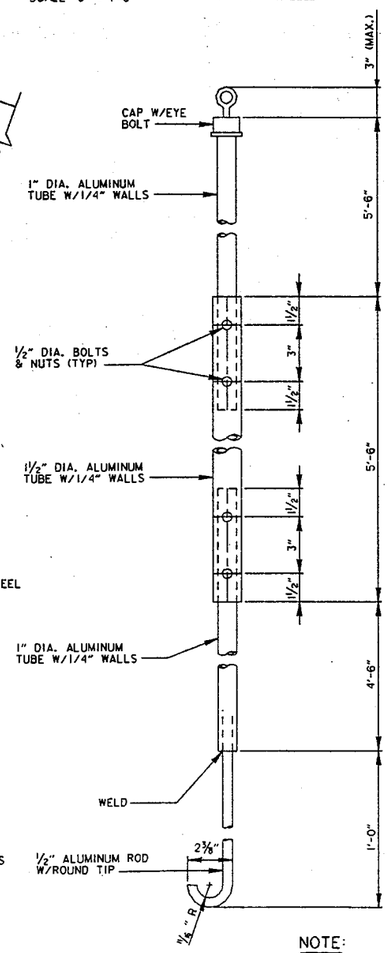

**DETAIL 2** — TYPICAL GRATING LOCK (WITHOUT COVER AND LOCK) — 64/82-64/85, 64/84-64/85
SCALE: 6" = 1'-0"




**SECTION A** — GRATING LOCK ASSEMBLY WITH COVER AND LOCK
SCALE: 6" = 1'-0"




**SECTION B** — GRATING LOCK ASSEMBLY WITH COVER PARTIALLY OPEN
SCALE: 6" = 1'-0"

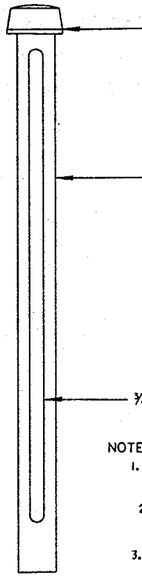



**DETAIL** — STOPLOG HOOK
SCALE: 3" = 1'-0"

NOTE:
PROVIDE 2 HOOKS FOR EACH GATEWELL

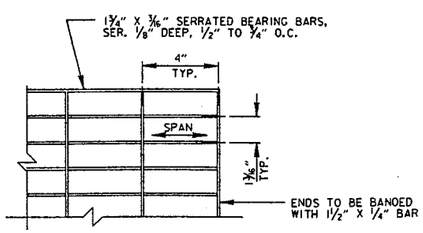
1" 0 4" 8"
SCALE: 3" = 1'-0"

1" 0 2" 4"
SCALE: 6" = 1'-0"



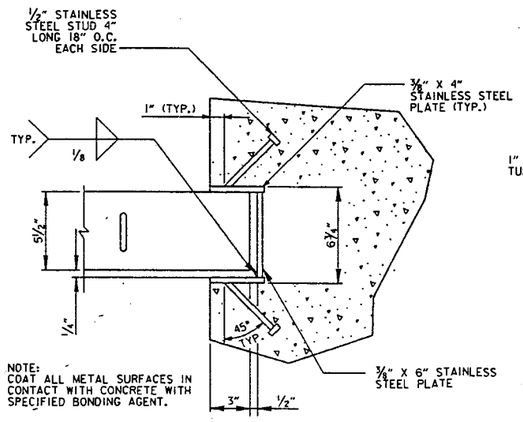

NOTES:
1. PROVIDE PAIRS OF SLOTTED HOLES ON OPPOSITE SIDES.
2. PROVIDE CLEAR PLASTIC STEM COVER ON INSIDE OF PIPE AS SPECIFIED
3. TOP SLOT SHALL PROVIDE VIEW OF STEM WITH GATE IN FULLY OPEN POSITION. BOTTOM SLOT SHALL SHALL PROVIDE VIEW OF STEM WITH GATE IN FULLY CLOSED POSITION.

**DETAIL 4** — GATE STEM COVER — 64/82-64/85, 64/84-64/85
NO SCALE




NOTE: ALL GRATING TO BE GALVANIZED STEEL AS SPECIFIED.

**DETAIL** — TYPICAL GRATING
SCALE: 3" = 1'-0"




NOTE:
COAT ALL METAL SURFACES IN CONTACT WITH CONCRETE WITH SPECIFIED BONDING AGENT.

**DETAIL 3** — TYP. STOPLOG GROOVE — 64/82-64/85
SCALE: NONE

NOTE:
1. ALL STEEL TO BE A36 GALVANIZED UNLESS OTHERWISE SPECIFIED.

GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

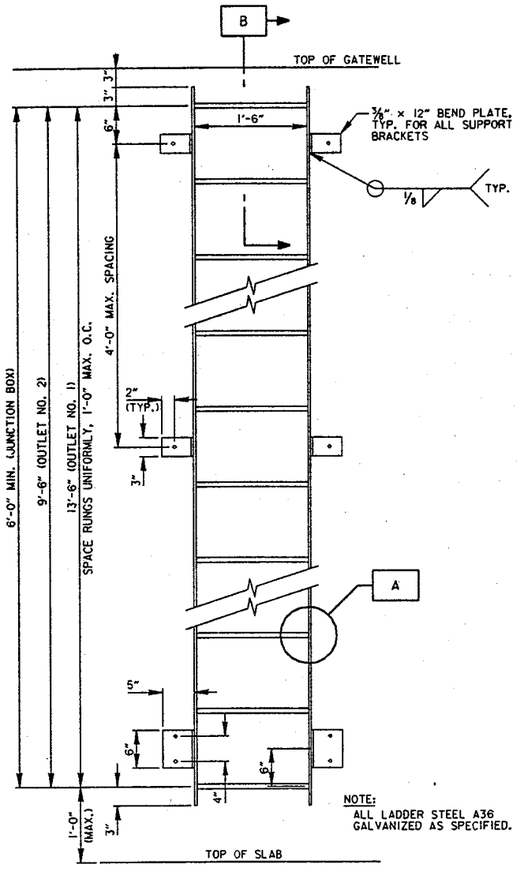
**DEPARTMENT OF THE ARMY**
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AE APPROVING OFFICIAL:

ED-D: DESIGNED: PWS; CHECKED:; DRAWN: SKM
ED-CH: DESIGNED:; CHECKED:; DATE: 05-01-94

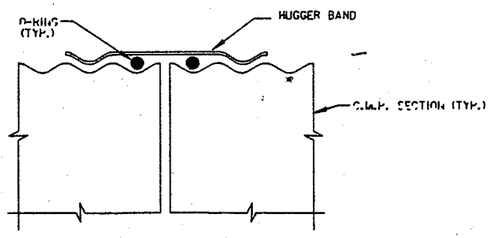
AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES, CULVERTS & DIKES
MISCELLANEOUS METALS
SECTIONS AND DETAILS

CAD FILE NAME: MT64P005.DGN
SPEC NO: DACW37-93-B-0038
DRAWING NUMBER: M-P10-64/85
SHT 10 OF 20



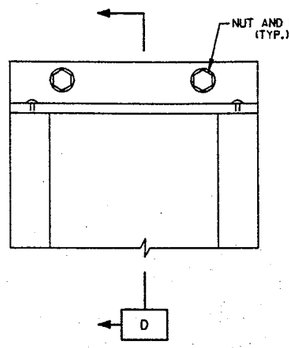

NOTE:
ALL LADDER STEEL A36 GALVANIZED AS SPECIFIED.

ELEVATION
LADDER
SCALE: 1" = 1'-0"

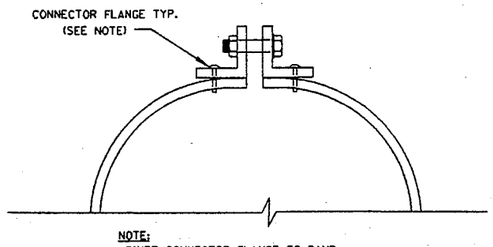



NOTE:
HUGGERBAND TO BE SAME GAGE THICKNESS AS C.M.P.

DETAIL
TYP. CMP JOINT
NO SCALE:

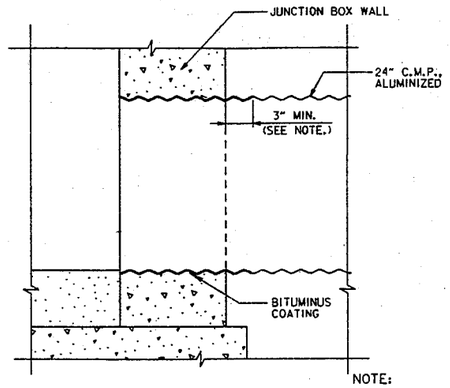



DETAIL
TYP. C.M.P. HUGGER BAND
NO SCALE:



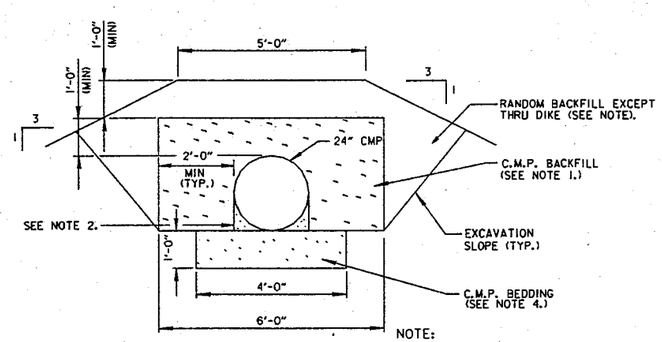

NOTE:
RIVET CONNECTOR FLANGE TO BAND

SECTION
TYP. C.M.P. HUGGER BAND — D
NO SCALE:



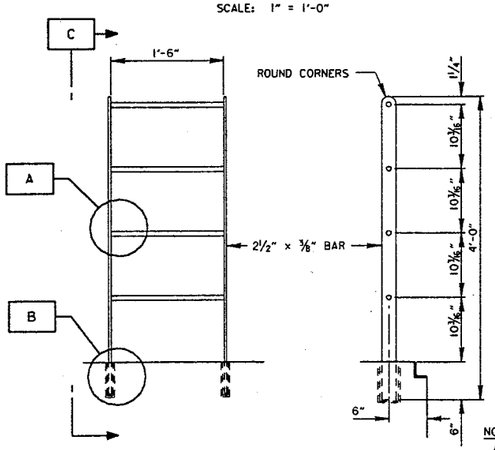

NOTE:
COAT OUTSIDE SURFACE OF CMP W/ BITUMINUS COATING AS SPECIFIED.

DETAIL — 8
TYP C.M.P. EMBEDMENT — 64/84-64/86
SCALE: 3" = 1'-0"




NOTE:
ALL C.M.P. BACKFILL AND BEDDING TO BE SATISFACTORY PERVIOUS MATERIAL EXCEPT ALL PIPE FILL THROUGH DIKE TO BE SATISFACTORY EXISTING DIKE MATERIAL.

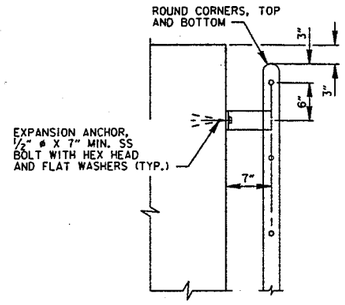
DETAIL
C.M.P. PLACEMENT
SCALE: 1"=1'-0"



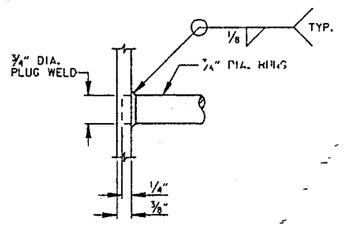

NOTE:
ALL GRAB BAR STEEL A36, GALVANIZED AS SPECIFIED.

ELEVATION
GRAB BAR
SCALE: 1" = 1'-0"

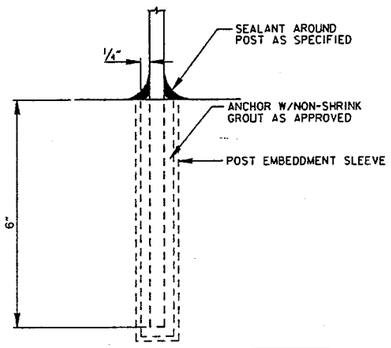
SECTION
GRAB BAR — C
SCALE: 1" = 1'-0"



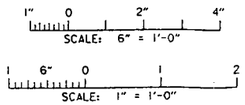

SECTION
LADDER — B
SCALE: 1"=1'-0"




DETAIL
TYP. LADDER & GRAB BAR RUNG CONNECTION — A
SCALE: 6"=1'-0"




DETAIL
TYP. GRAB BAR ANCHORAGE — B
SCALE: 6"=1'-0"




NOTES:
1. C.M.P. BACKFILL TO BE SATISFACTORY MATERIAL AS SPECIFIED. PLACE C.M.P. BACKFILL TO A MINIMUM OF ONE FOOT ABOVE TOP OF PIPE COMPACT BACKFILL WITH HAND EQUIPMENT TO SPECIFIED COMPACTION.
2. HAND PLACE AND HAND TAMP UNDER CMP HAUNCHES.
3. PROVIDE MIN. OF 2 FT. COVER ABOVE TOP OF PIPE AS SHOWN.
4. REMOVE NON-PERVIOUS MATERIAL AND REPLACE WITH SATISFACTORY BEDDING MATERIAL AS SPECIFIED.
5. 24" C.M.P. TO BE 14 GAGE THICKNESS, ALUMINIZED.

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/99 | |

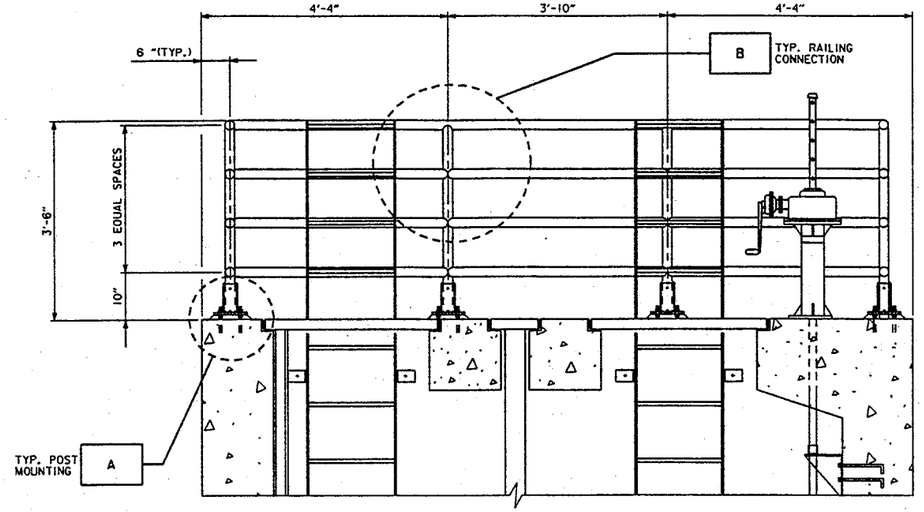
**DEPARTMENT OF THE ARMY**
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AE APPROVING OFFICIAL:

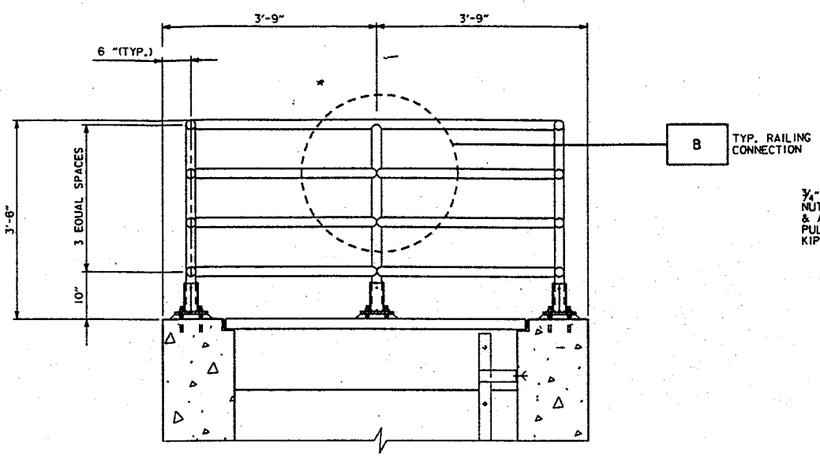
AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
MISCELLANEOUS METALS
ELEVATIONS, SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: SKM | | |
| ED-CH | DESIGNED: | | |
| | CHECKED: | | |
| DATE: 05-01-94 | CAD FILE NAME: MT64P006.DGN | DRAWING NUMBER: M-P10-64/86 | SHT 11 OF 20 |
| | SPEC NO: DACW37-93-B-0038 | | |

GEN ENG
HYD
HYDR
GEOTECH
STR ENG



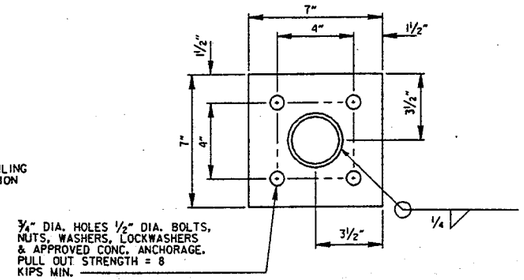

SIDE VIEW



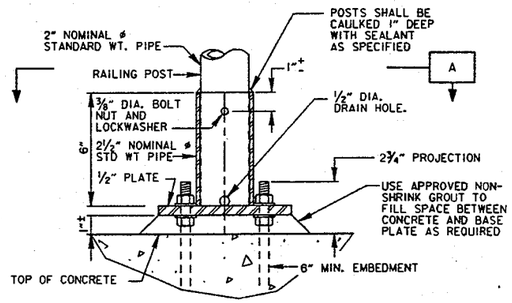

NOTE: GATE OPERATOR NOT SHOWN FOR CLARITY.

BACK VIEW

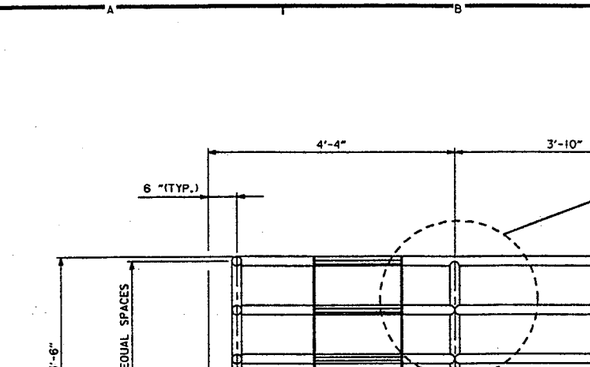
ELEVATION
RAILING, OUTLETS NO. 1 AND NO. 2
SCALE: ¾" = 1'-0"



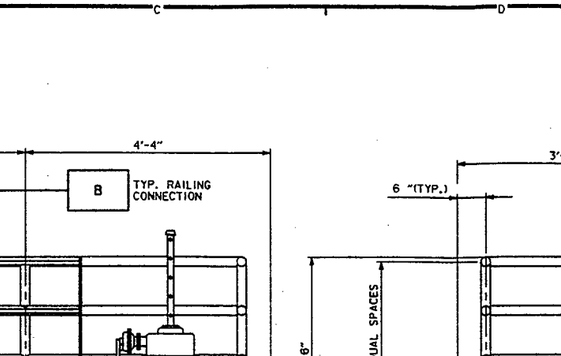

SECTION
TYP. POST MOUNTING
SCALE: 3" = 1'-0"
A




DETAIL
TYP. POST MOUNTING
SCALE: 3" = 1'-0"
A




INLET SIDE




OUTLET SIDE

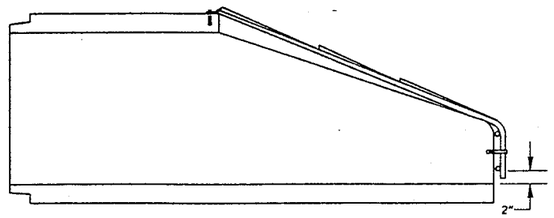


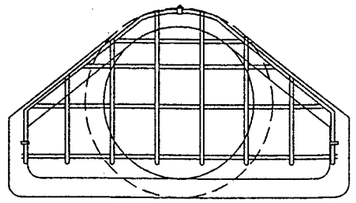

NOTE: SIMILAR DETAIL AT CORNERS EXCEPT MITER TOP RAILS AND WELD ALL AROUND.

DETAIL
TYP. RAILING CONNECTION
SCALE: ½"=1'-0"
B

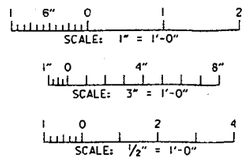
NOTES:

1. ALL RAILS TO BE NOMINAL 2" ø STANDARD WT. PIPE AS SPECIFIED
2. ALL POSTS TO BE NOMINAL 2" ø STANDARD WT. PIPE AS SPECIFIED
3. GATEWELL RAILINGS PROVIDED ON THREE SIDES ONLY (SEE SHEET 7).
4. ALL STEEL TO BE A36, GALVANIZED AS SPECIFIED.
5. ALL NUTS, BOLTS, WASHERS AND ANCHORS TO BE GALVANIZED AS SPECIFIED.
6. TIE LAST 3 RCP JOINTS USING 2 TIE BOLT FASTENERS PER JOINT.



SAFETY/TRASH GUARD FOR RCP
TYPICAL END SECTIONS
SCALE: NONE




| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

**DEPARTMENT OF THE ARMY**
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

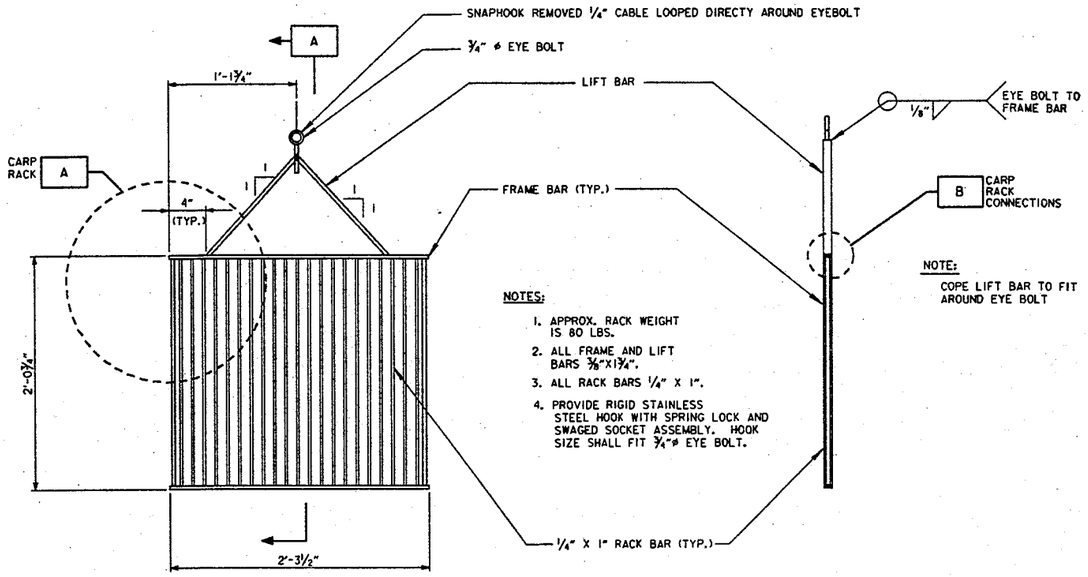
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2:
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
TRASH GUARD AND RAILING
VIEWS, PLAN, ELEVATIONS, SECTION AND DETAIL

ED-D: DESIGNED: PWS; CHECKED:; DRAWN: MKC
ED-CH: DESIGNED:; CHECKED:

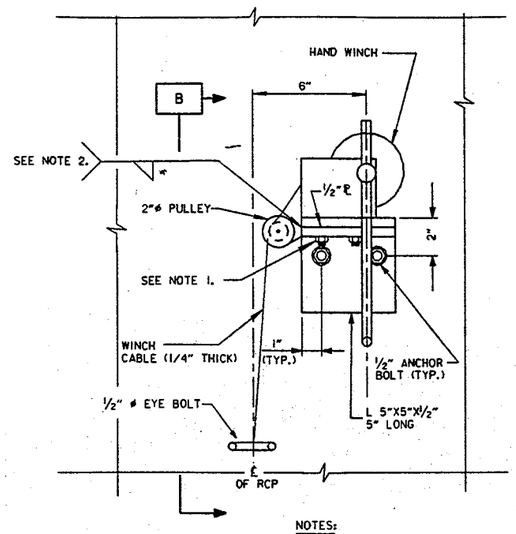
CAD FILE NAME: MT64P007
DRAWING NUMBER: M-P10-64/87
SHT 12 OF 20
DATE: 05-01-94
SPEC NO: DACW37-93-B-0038

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



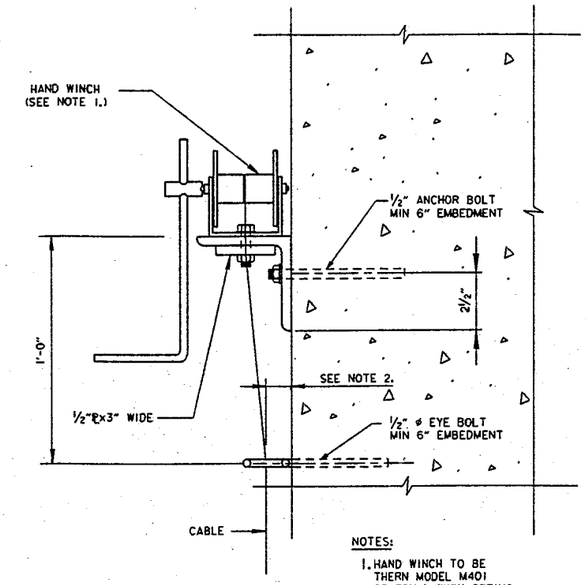

DETAIL
CARP RACK
SCALE: 1 1/2"= 1'-0"
6
64/82-64/88

SECTION
CARP RACK
SCALE: 1 1/2"= 1'-0"
A



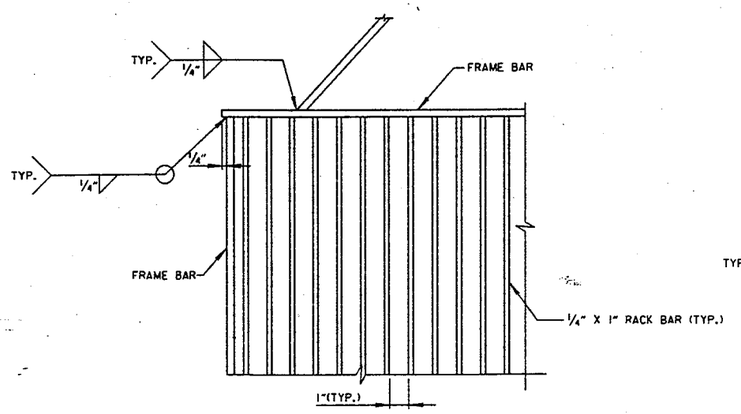

NOTES:
1. PROVIDE (2) 3/8" ø BOLTS, NUTS & WASHERS AT 3" SPACING
2. WELD PULLEY TO 1/2" PLATE

DETAIL
HAND WINCH
SCALE: 3"= 1'-0"
5
64/82-64/88

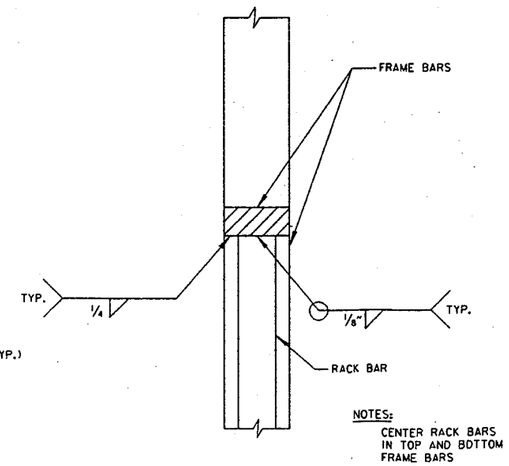



NOTES:
1. HAND WINCH TO BE THERN MODEL M401 OR EQUAL WITH SPRING LOADED RACHET.
2. PLACE EYE BOLT TO ALIGN CABLE WITH CENTER LINE OF RACK

SECTION
HAND WINCH
SCALE: 3"= 1'-0"
B




DETAIL
CARP RACK
SCALE: 3"= 1'-0"
A




NOTES:
CENTER RACK BARS IN TOP AND BOTTOM FRAME BARS

DETAIL
CARP RACK CONNECTIONS
SCALE: 6"= 1'-0"
B

NOTES:
1. ALL RACK STEEL, ANGLE AND PLATE STOCK TO BE A 36, GALVANIZED AS SPECIFIED.
2. ALL BOLTS, ANCHORS, NUTS AND WASHERS TO BE GALVANIZED AS SPECIFIED.

1" 0 4" 8"
SCALE: 3" = 1'-0"

1" 0 2" 4"
SCALE: 6" = 1'-0"

1 9" 6" 3" 0 1
SCALE: 1 1/2" = 1'-0"

GEN ENG
HYD
HYDR
GEOTECH
STR ENG

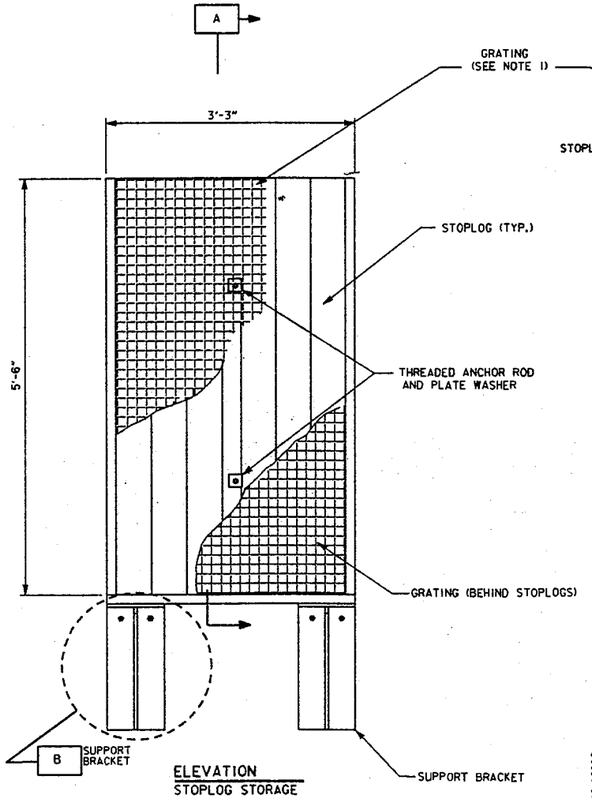
| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

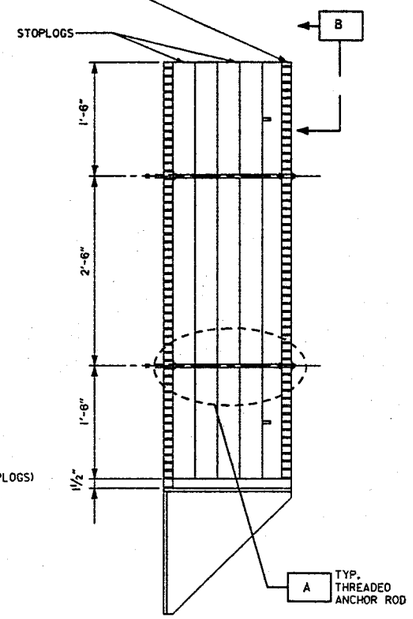
AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES CULVERTS & DIKES
CARP RACK
SECTIONS AND DETAILS

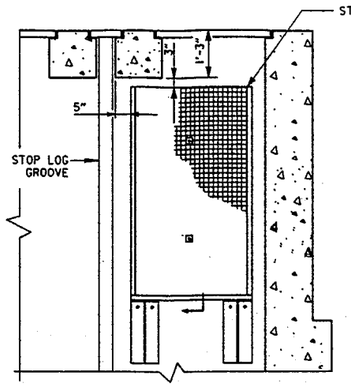
| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: SKM | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | | |
| DATE: 05-01-94 | CAD FILE NAME: MT64P008.DGN | DRAWING NUMBER: M-P10-64/88 | SHT 13 OF 20 |
| | SPEC NO: DACW37-93-B-0038 | | |



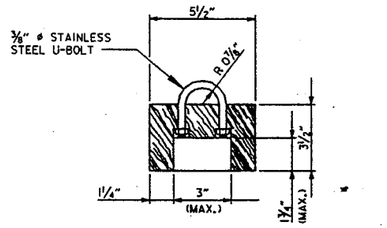

ELEVATION
STOPLOG STORAGE
SCALE: 1"= 1'-0"




SECTION
STOPLOG STORAGE — A
SCALE: 1"= 1'-0"

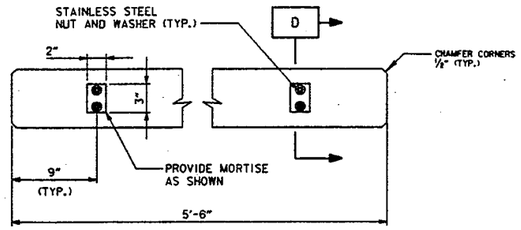



ELEVATION
STOPLOG STORAGE
SCALE: ½"=1'-0"

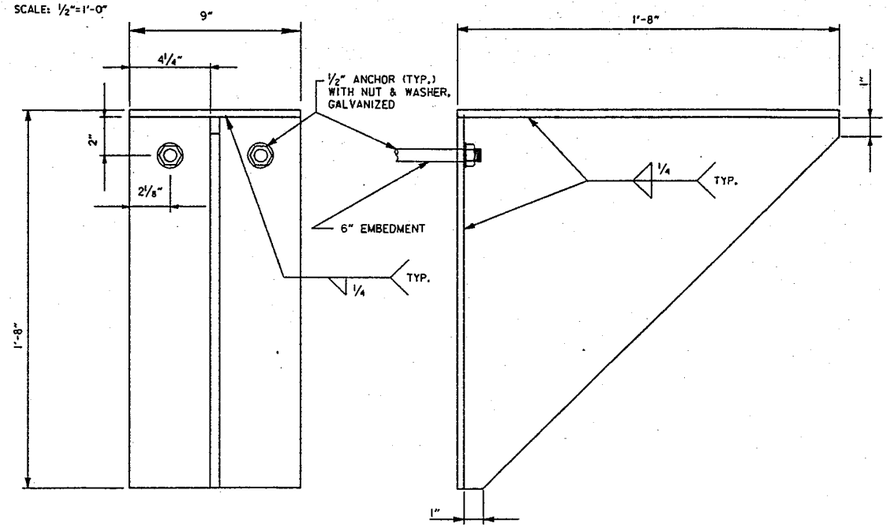



NOTE:
NOMINAL DIMENSIONS SHOWN FOR STOPLOGS

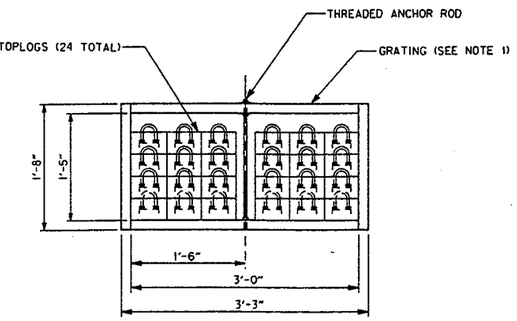
SECTION
TYP. STOPLOG — D
SCALE: 3"= 1'-0"



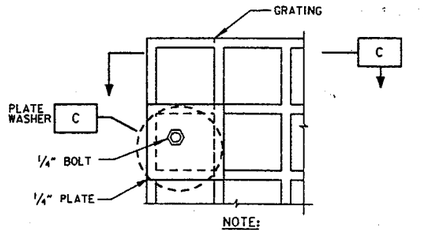

BOTTOM VIEW
TYP. STOPLOG
SCALE: 1½" = 1'-0"




DETAIL
SUPPORT BRACKET — B
SCALE: 3"= 1'-0"

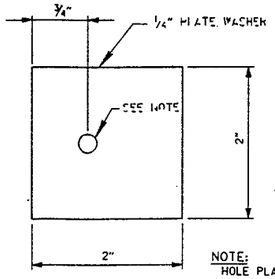



DETAIL
STOPLOG STORAGE — 7 / 64/82-64/89
SCALE: 1"= 1'-0"



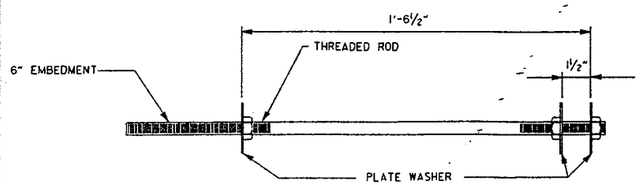

NOTE:
PLACE CORNER CONNECTORS AT 12" O.C. AND 3" FROM ENDS.

SECTION
CORNER CONNECTORS — B
SCALE: 6"= 1'-0"

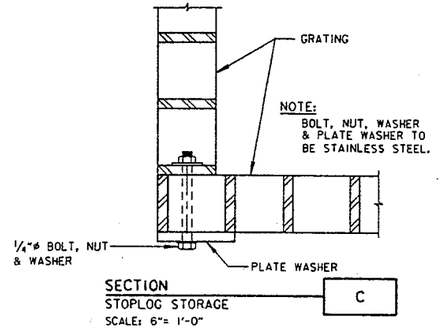



NOTE:
HOLE PLACEMENT SHOWN FOR CORNER PLATES. PLACE HOLE IN CENTER OF PLATE FOR THREADED RODS.

DETAIL
PLATE WASHER — C
SCALE: FULL SIZE




DETAIL
TYP. THREADED ANCHOR ROD — A
SCALE: 3"= 1'-0"




SECTION
STOPLOG STORAGE — C
SCALE: 6"= 1'-0"

1" 0 4" 8"
SCALE: 3" = 1'-0"

1 6" 0 1 2
SCALE: ¾" = 1'-0"

1 0 2 4
SCALE: ½" = 1'-0"

1 6" 0 1 2
SCALE: 1" = 1'-0"

## NOTES:

1. ALL STOPLOG STORAGE GRATING TO BE FIBERGLASS REINFORCED PLASTIC, 1½" X 1½" MESH, 1½" DEEP, ¼" THICK.
2. ALL THREADED ANCHOR RODS, NUTS & WASHERS FOR STORAGE GRATING TO BE ½" DIA. STAINLESS STEEL.
3. ALL BRACKET PLATE TO BE ½" A36 STEEL GALVANIZED AFTER FABRICATION.
4. RECOAT ALL CUTENDS AND DRILLED HOLES IN GRATING AS SPECIFIED.

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/95 | |

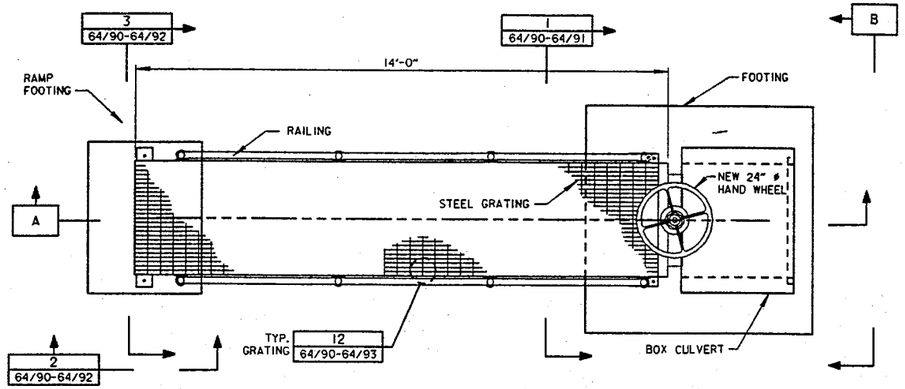
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON CO., IOWA

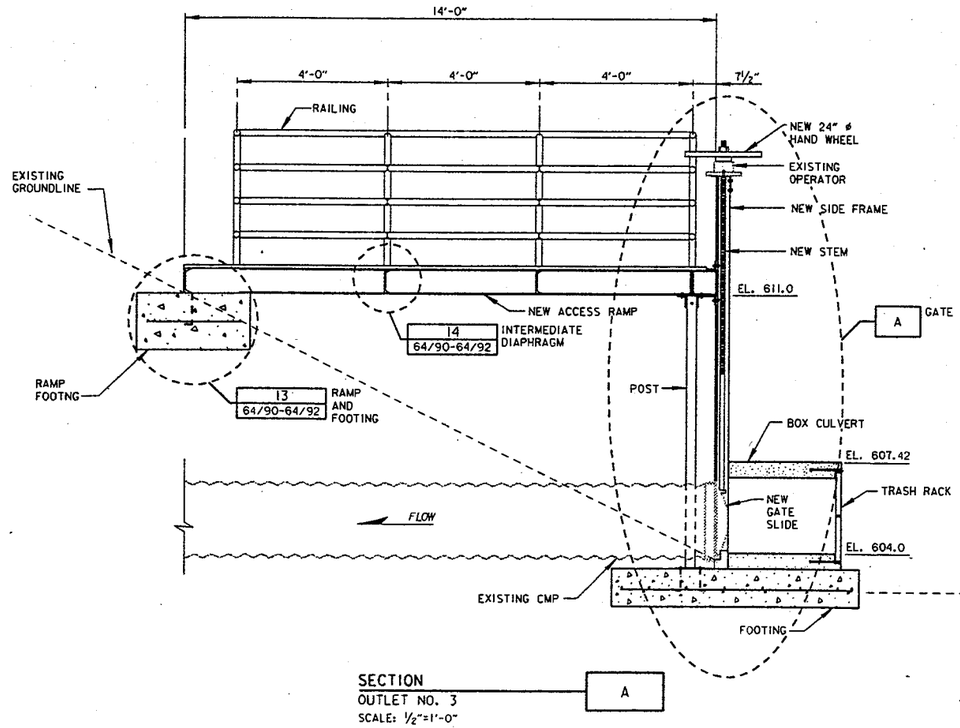
STOPLOGS AND STOPLOG STORAGE
ELEVATIONS, SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: SKM | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MT64P009.DGN | DRAWING NUMBER: M-P10-64/89 SHT 14 OF 20 |
| DATE: 05-01-94 | SPEC NO: DACW37-93-B-0038 | | |

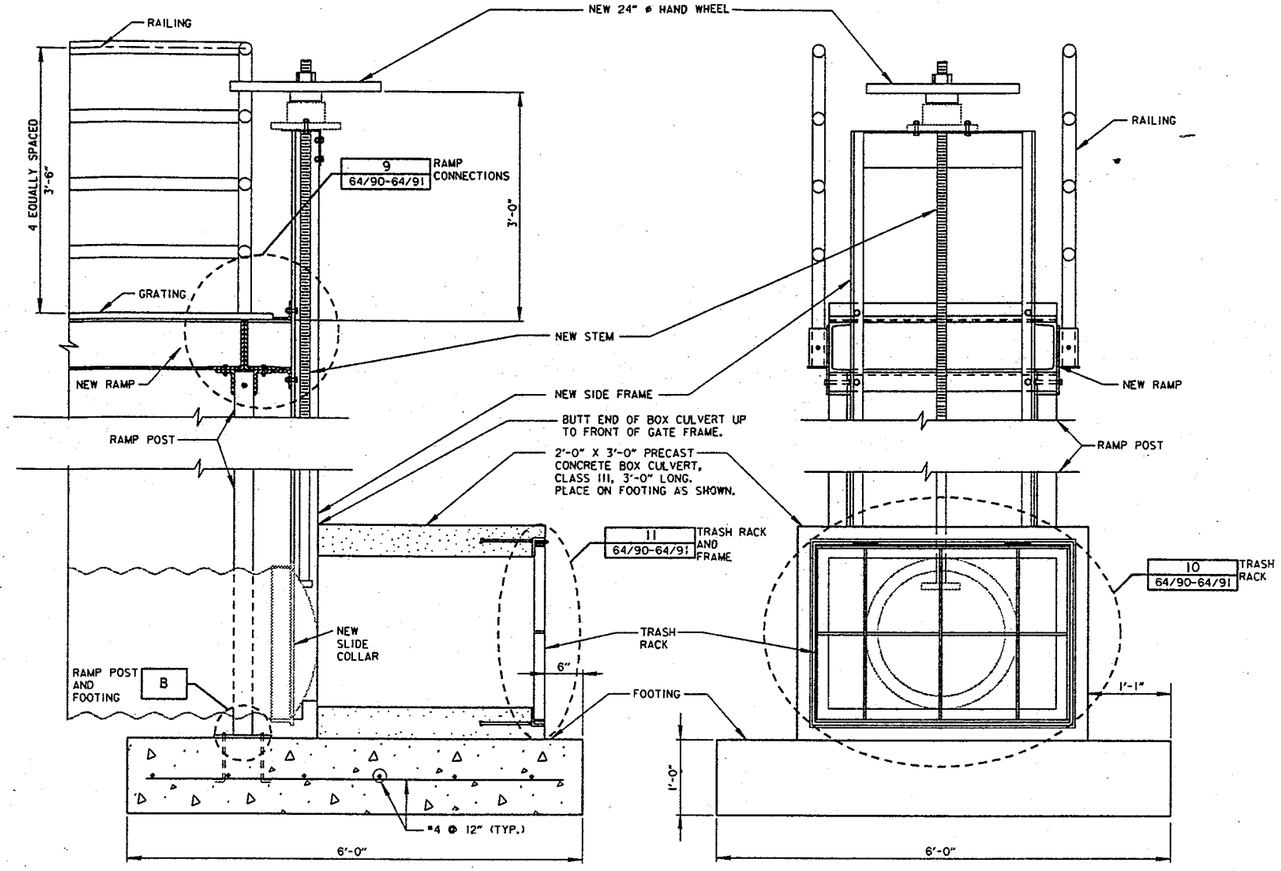
GEN ENG
HYD
HYDR
GEOTECH
STR ENG




PLAN
OUTLET NO. 3
SCALE: ½" = 1'-0"

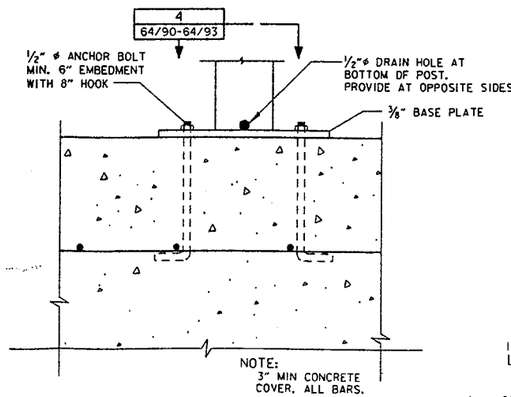



SECTION
OUTLET NO. 3
SCALE: ½"=1'-0"




DETAIL
GATE
SCALE: 1"=1'-0"
A

SECTION
GATE
SCALE: 1"=1'-0"
B




DETAIL
RAMP POST AND FOOTING
SCALE: 3"=1'-0"
B

SCALE: ½" = 1'-0"

SCALE: 1" = 1'-0"

SCALE: 3" = 1'-0"

NOTE:
1. REMOVE EXISTING RAMP
2. REPLACE EXISTING HANDWHEEL, STEM AND SIDE FRAME PIECES. USE REMAINING EXISTING GATE PIECES.
3. SEE REFERENCE DRAWINGS FOR EXISTING STRUCTURE DETAILS.

REFERENCE DRWGS.

| | DRWG. NO. |
|---|---|
| SLIDE GATE STRUCTURE PLAN AND PROFILE | M-P10-64/70 |
| SLIDEGATE PLATFORM & DETAILS | M-P10-64/73 |

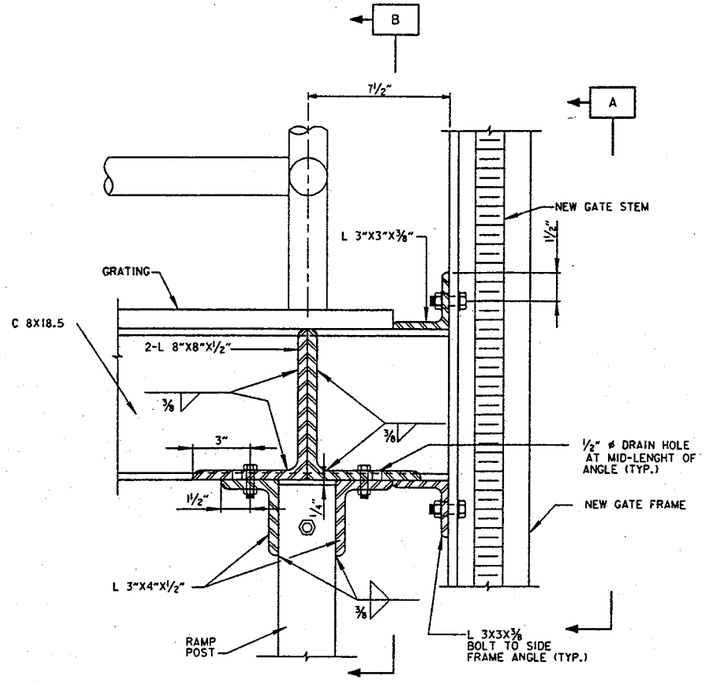
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

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 & DIKES
OUTLET NO. 3
PLAN, SECTIONS AND DETAILS

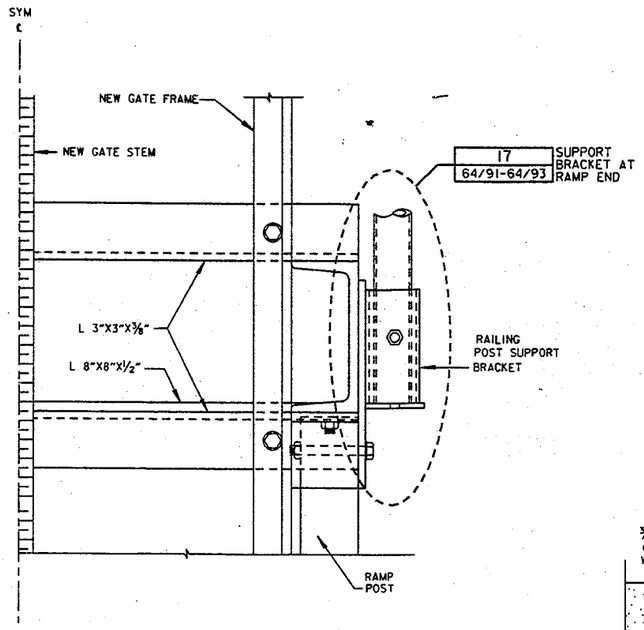
| | |
|---|---|
| ED-D DESIGNED: PWS | |
| ED-D CHECKED: | |
| ED-D DRAWN: SKM/LAR | |
| ED-GH DESIGNED: | |
| ED-GH CHECKED: | |
| DATE: 05-01-94 | SPEC NO: DACW37-93-B-0038 |
| CAD FILE NAME: MT64P010.DGN | DRAWING NUMBER: M-P10-64/90 |
| SHT 15 OF 20 | |




NOTE: ALL BOLTS, NUTS & WASHERS ½" ø GALV.

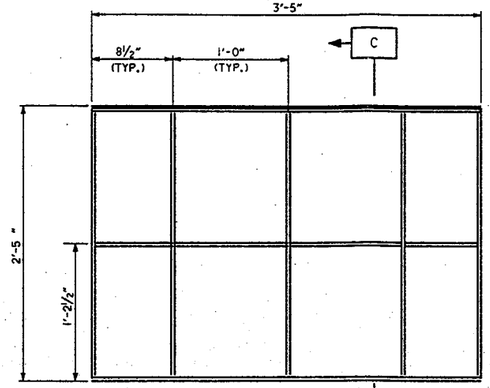
DETAIL
RAMP CONNECTIONS
SCALE: 3"=1'-0"

9
64/90-64/91



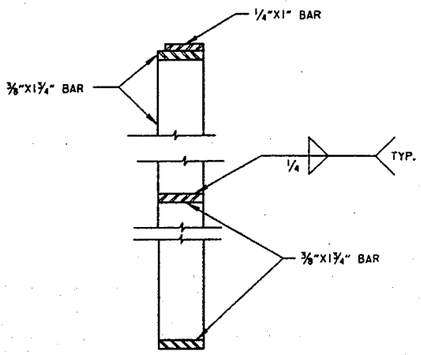

SECTION
RAMP CONNECTIONS
SCALE: 3"=1'-0"

A



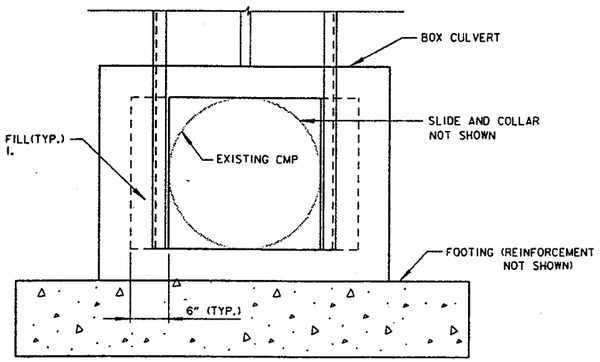

DETAIL
TRASH RACK
SCALE: 1½"=1'-0"

10
64/90-64/91




SECTION
TRASH RACK
NO SCALE

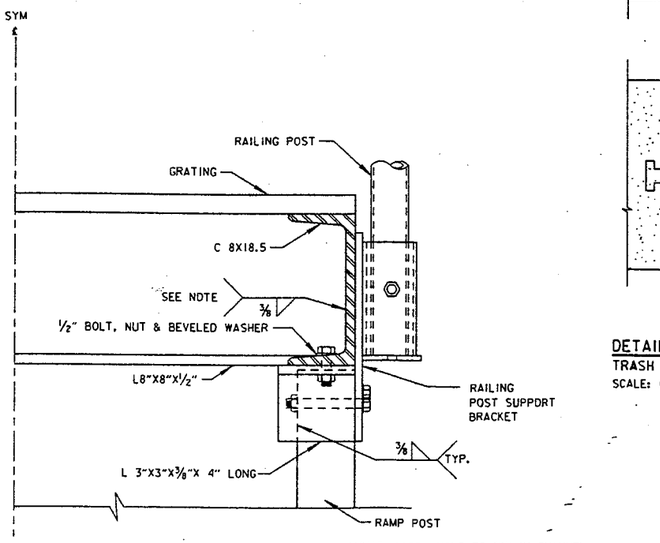
C




NOTE:
1. FILL IN WITH CONCRETE WITH SAME THICKNESS AND REINFORCEMENT AS BOX CULVERT.
2. POSTS NOT SHOWN FOR CLARITY.

SECTION
BOX CULVERT
SCALE: 1"=1'-0"

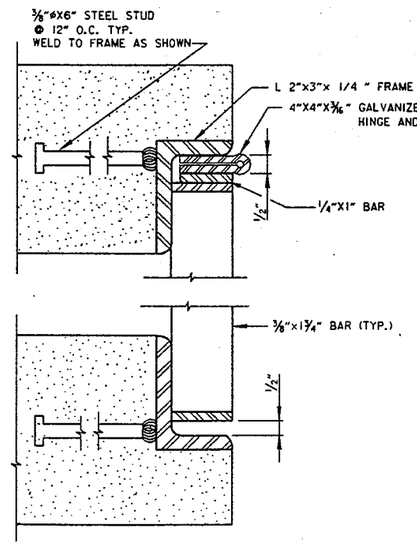
1
64/90-64/91




NOTE: COPE ANGLE TO FIT IN CHANNEL, WELD ANGLE TO CHANNEL WEB AND FLANGE.

SECTION
RAMP CONNECTIONS
SCALE: 3"=1'-0"

B




DETAIL
TRASH RACK AND FRAME
SCALE: 6"=1'-0"

11
64/90-64/91

1" 0 4" 8"
SCALE: 3" = 1'-0"

1" 0 2" 4"
SCALE: 6" = 1'-0"

1 6" 0 1 2
SCALE: 1" = 1'-0"

1 9" 6" 3" 0 1
SCALE: 1½" = 1'-0"

NOTES:

1. ALL STEEL ASTM A36 UNLESS OTHERWISE NOTED.
2. ALL STEEL GALVANIZED UNLESS OTHERWISE NOTED.

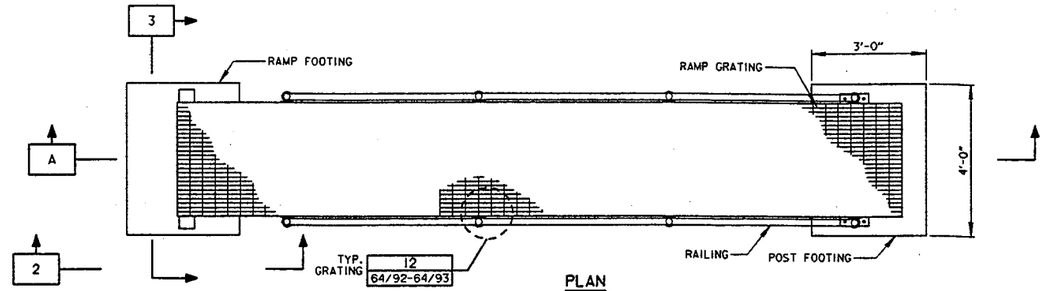
| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

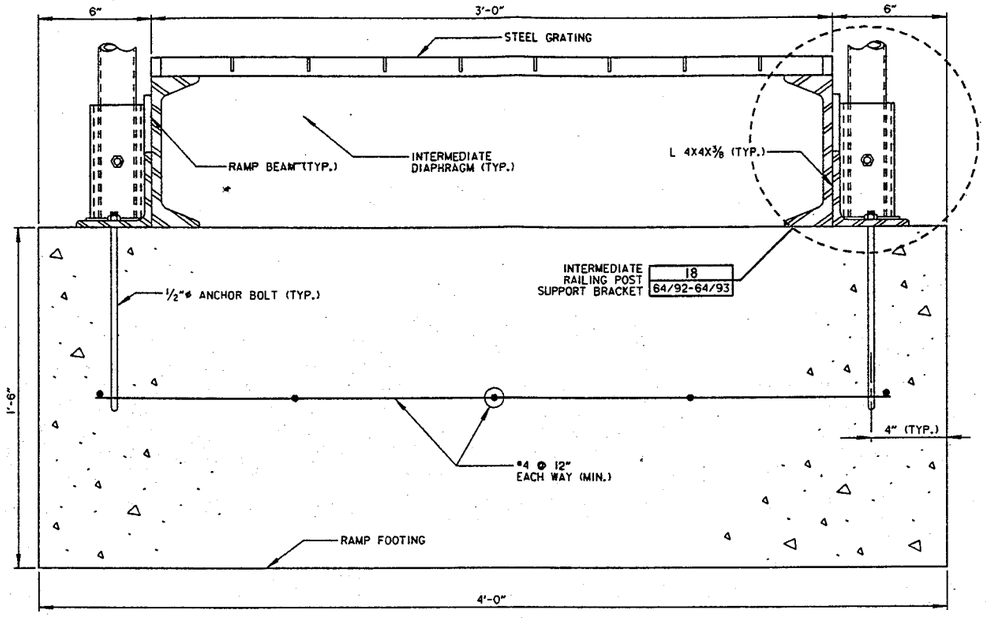
AS-BUILT
BUSSEY LAKE - STAGE 2½
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON, CO., IOWA
DITCHES CULVERTS & DIKES
OUTLET NO. 3
SECTIONS AND DETAILS

ED-D: DESIGNED: PWS; CHECKED:; DRAWN: SKM
ED-DH: DESIGNED:; CHECKED:
DATE: 05-01-94
CAD FILE NAME: MT64P011.DGN
SPEC NO: DACW37-93-B-0038
DRAWING NUMBER: M-P10-64/91
SHT 16 OF 20

GEN ENG
HYD
HYDR
GEOTECH
STR ENG




PLAN
ACCESS RAMP
SCALE: ½" = 1'-0"

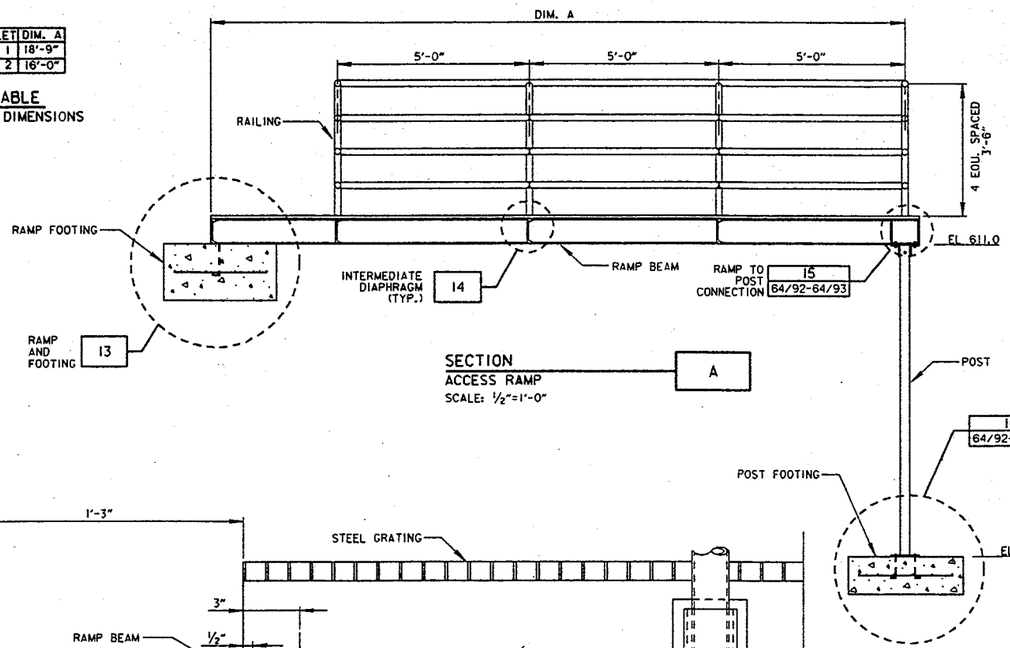



| SECTION | 3 |
|---|---|
| RAMP AND FOOTING | 64/90-64/92 |
| SCALE: 3"=1'-0" | 64/92-64/93 |

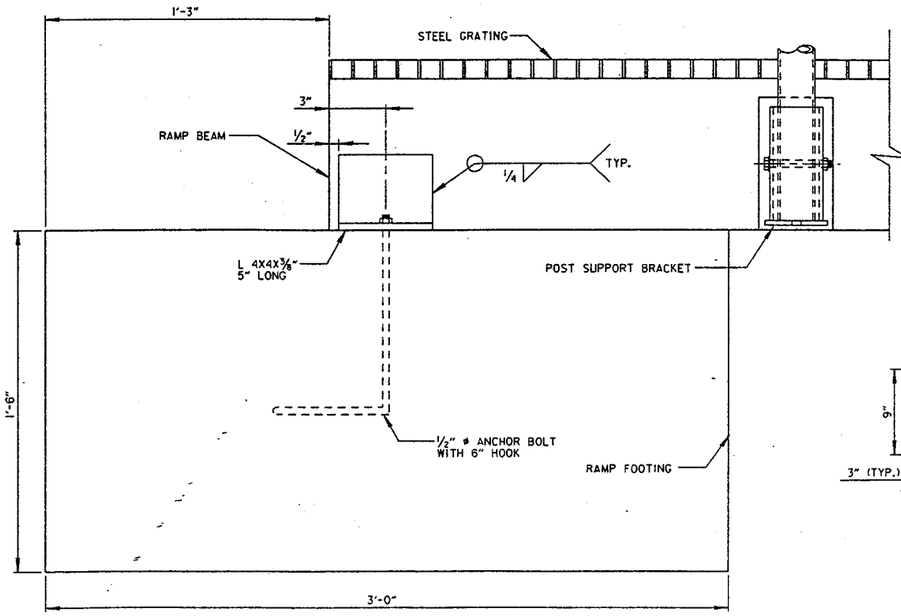
NOTES:
1. 3" MIN. CONCRETE COVER, ALL BARS.

| OUTLET | DIM. A |
|---|---|
| NO. 1 | 18'-9" |
| NO. 2 | 16'-0" |

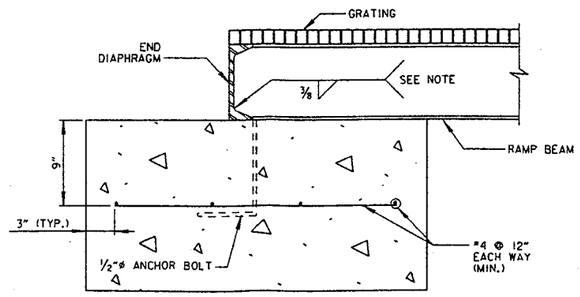
TABLE
RAILING DIMENSIONS




SECTION
ACCESS RAMP
A
SCALE: ½"=1'-0"

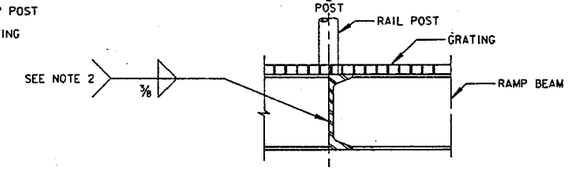



| SECTION | 2 |
|---|---|
| RAMP AND FOOTING | 64/90-64/92 |
| SCALE: 3"=1'-0" | 64/92-64/93 |



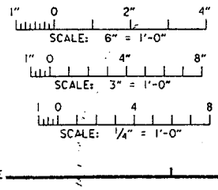

NOTE:
COPE END DIAPHRAGM TO FIT IN BEAM SECTIONS. WELD WEBS AND FLANGES OF DIAPHRAGM TO WEBS AND FLANGES OF BEAMS.

| DETAIL | 13 |
|---|---|
| RAMP AND FOOTING | 64/90-64/92 |
| SCALE: 1½"=1'-0" | 64/92-64/93 |




NOTES:
1. CENTER OF POST TO ALIGN WITH FACE OF DIAPHRAGM AS SHOWN.
2. COPE END DIAPHRAGM TO FIT IN BEAM SECTIONS. WELD WEBS AND FLANGES OF DIAPHRAGM TO WEBS AND FLANGES OF BEAMS.

| DETAIL | 14 |
|---|---|
| INTERMEDIATE DIAPHRAGM (TYP.) | 64/90-64/92 |
| SCALE: 1½"=1'-0" | 64/92-64/93 |




NOTES:
1. ALL STEEL A36 GALVANIZED UNLESS OTHERWISE SPECIFIED.
2. ALL BOLTS, NUTS, WASHERS AND ANCHORS TO BE GALVANIZED AS SPECIFIED.
3. VERIFY RAMP DIMENSIONS IN THE FIELD PRIOR TO FABRICATION.
4. RAMP BEAMS AND DIAPHRAGMS TO BE C 8 X 18.75 STEEL SECTIONS.

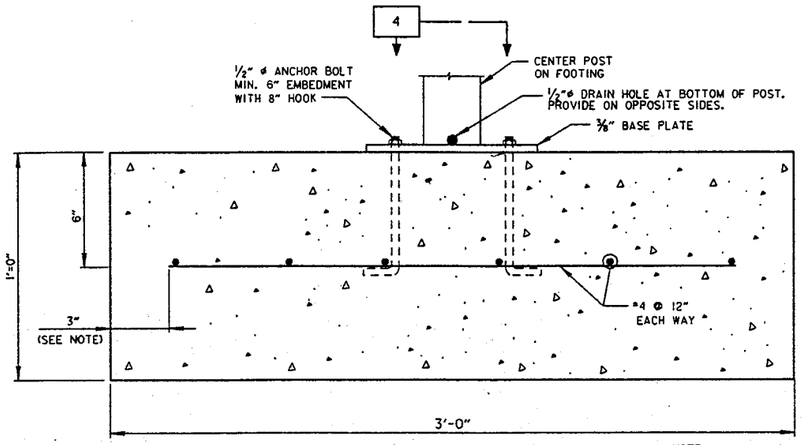
GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/96 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

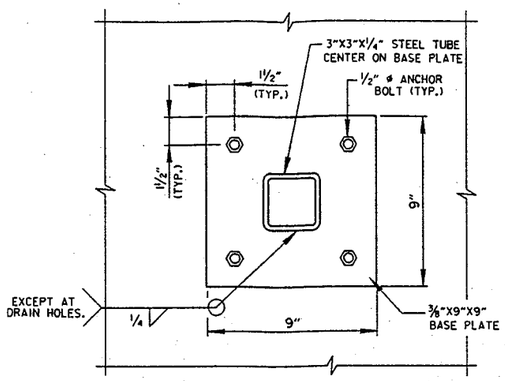
AS-BUILT
BUSSEY LAKE - STAGE 2 ;
ENVIRONEMENTAL MGMT PROGRAM - MISSISSIPPIE RIVER
POOL 10 CLAYTON CO., IOWA
DITCHES, CULVERTS AND DIKES
ACCESS RAMPS - OUTLETS NO. 1 AND NO. 2
PLAN, SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: MKC/LAR | | |
| ED-GH | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MT64P012.DGN | DRAWING NUMBER: M-P10-64/92 SHT 17 OF 20 |
| DATE: 05-01-94 | | SPEC NO: DACW37-93-B-0038 | |

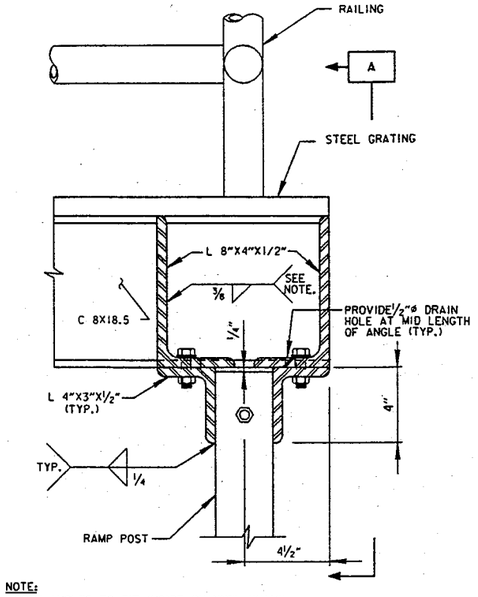



NOTE:
3" MIN CONCRETE COVER, ALL BARS.

**DETAIL** — RAMP POST AND FOOTING OUTLETS NO.1 AND NO.2 — 16 — 64/92-64/93
SCALE: 3"=1'-0"

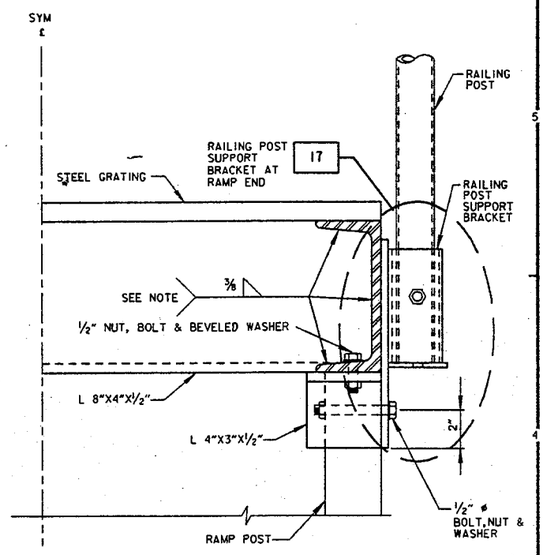



**SECTION** — RAMP POST TO FOOTING CONNECTION — 4 — 64/90-64/93, 64/93-64/93
SCALE: 3"=1'-0"



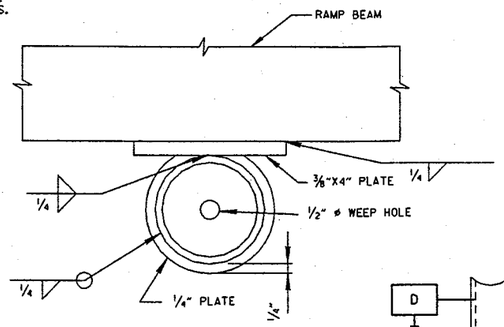

NOTE:
COPE ANGLES TO FIT INSIDE CHANNEL BEAMS.
WELD ANGLES TO CHANNEL WEB AND FLANGES.

**DETAIL** — RAMP TO POST CONNECTION — 15 — 64/92-64/93
SCALE: 3"=1'-0"



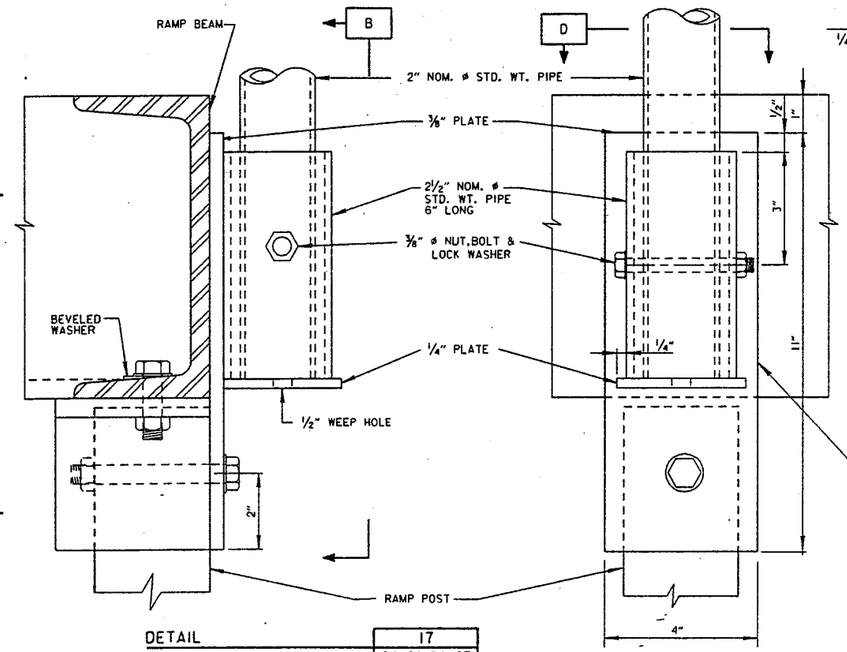

NOTE:
COPE DIAPHRAGM TO FIT INSIDE CHANNEL BEAMS.
WELD DIAPHRAGM TO CHANNEL WEB AND FLANGES.

**SECTION** — RAMP TO POST CONNECTION — A
SCALE: 3"=1'-0"



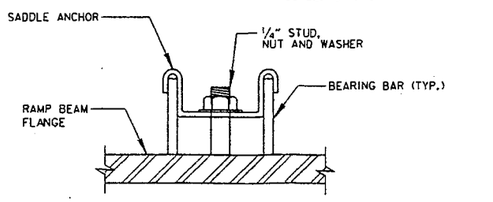

NOTE:
RAIL POST AND CONNECTING BOLT NOT SHOWN FOR CLARITY.

**SECTION** — TYP. RAILING POST SUPPORT BRACKET — D



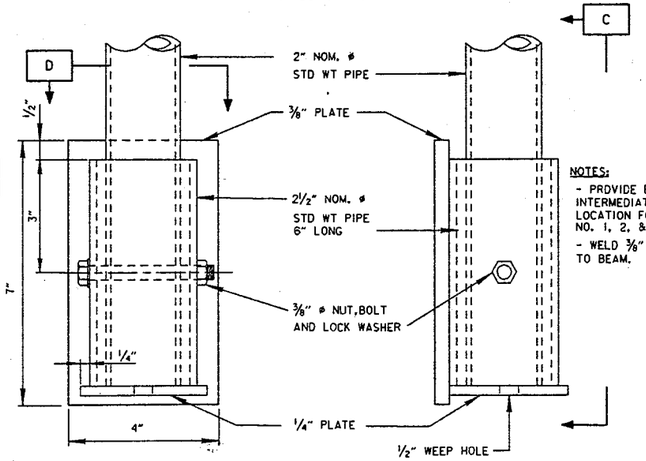

**DETAIL** — RAILING POST SUPPORT BRACKET AT RAMP END — 17 — 64/91-64/93, 64/93-64/93
SCALE: 6"=1'-0"

**SECTION** — RAILING POST SUPPORT BRACKET AT RAMP END — B
SCALE: 6"=1'-0"




NOTE:
PROVIDE GRATING ANCHORS AT MIN. 12" SPACINGS.

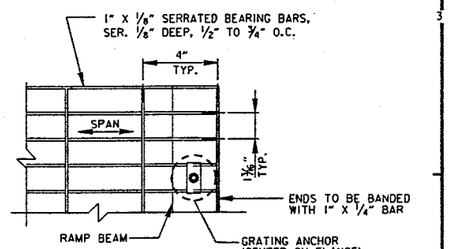
**DETAIL** — TYPICAL GRATING ANCHOR
NO SCALE




NOTES:
- PROVIDE BRACKET AT EACH INTERMEDIATE DIAPHRAGM LOCATION FOR RAMPS AT OUTLET NO. 1, 2, & 3.
- WELD ⅜" PLATE ALL AROUND TO BEAM.

**SECTION** — TYP. INTERMEDIATE POST SUPPORT BRACKET — C
SCALE: 6"=1'-0"

**DETAIL** — TYP. INTERMEDIATE POST SUPPORT BRACKET — 18 — 64/92-64/93
SCALE: 6"=1'-0"




NOTE:
ALL GRATING TO BE GALVANIZED STEEL AS SPECIFIED.

**DETAIL** — TYPICAL GRATING — 12 — 64/90-64/93, 64/92-64/93
SCALE: 3"=1'-0"

**NOTES:**
1. ALL STEEL A36 GALVANIZED UNLESS OTHERWISE SPECIFIED.
2. ALL ANCHORS, NUTS, BOLTS AND WASHERS GALVANIZED AS SPECIFIED.

1" 0 4" 8"
SCALE: 3" = 1'-0"

1" 0 2" 4"
SCALE: 6" = 1'-0"

1 9" 6" 3" 0 1
SCALE: 1½" = 1'-0"

GEN ENG
HYD
HYDR
GEOTECH
STR ENG

| SYMBOL | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| | AS-BUILT AS OF COMPLETION DATE | 12/95 | |

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

AE APPROVING OFFICIAL:

AS-BUILT
BUSSEY LAKE - STAGE 2
ENVIRONMENTAL MGMT PROGRAM - MISSISSIPPI RIVER
POOL 10 CLAYTON, CO., IOWA
DITCHES CULVERTS & DIKES
ACCESS RAMP
SECTIONS AND DETAILS

| | | | |
|---|---|---|---|
| ED-D | DESIGNED: PWS | | |
| | CHECKED: | | |
| | DRAWN: SKM | | |
| ED-GM | DESIGNED: | | |
| | CHECKED: | CAD FILE NAME: MT64P013.DGN | DRAWING NUMBER: M-P10-64/93 |
| DATE: 05-01-94 | | SPEC NO: DACW37-93-B-0038 | SHT 18 OF 20 |

# APPENDIX B

## MEMORANDUM OF AGREEMENT

Guttenberg Waterfowl Ponds, Iowa
Operation, Maintenance, Repair
and
Rehabilitation Agreement

This is to formally consolidate all operation, maintenance, repair, and rehabilitation responsibilities and agreements for the Guttenberg Waterfowl Ponds, Habitat Rehabilitation and Enhancement Project. Through past correspondence, the following has been mutually agreed:

1. The operation and maintenance responsibilities of this project have been outlined in the Definite Project Report (DPR), Guttenberg Waterfowl Ponds, Habitat Rehabilitation and Enhancement Project, dated July 1988. An operation and maintenance manual will be prepared by the USACE in cooperation with the USFWS for use by the USFWS in carrying out these responsibilities.

2. The USFWS, in a letter from Marvin Moriarity, Deputy Regional Director, to Colonel Joseph Briggs (USACE, St. Paul District Engineer), dated July 5, 1988, has agreed to assume the operation and maintenance responsibilities for the project as defined in the DPR. Included in the DPR under the operation and maintenance section is an assurance that the USFWS will fulfill these responsibilities in conformance with Section 906(e) of the Water Resources Development Act of 1986.

3. Section 906(e) provides that a non-Federal participant should bear 25 percent of the operation and maintenance responsibilities. The USFWS has a cooperative agreement with the Iowa Department of Natural Resources concerning assumption of the project operation and maintenance. This share will be provided upon request by the USFWS for their use in accomplishing 25 percent of all required annual operation and maintenance.

The USACE will be responsible for any mutually agreed upon repair and rehabilitation of the subject project that exceeds the annual operation and maintenance requirements identified in the DPR, and that is needed as a result of a specific storm or flood event.

ROGER L. BALDWIN
Colonel, Corps of Engineers
District Engineer

Date 11/12/89

JAMES C. GRITMAN
Regional Director
U.S. Fish and Wildlife Service

Date 11/11/89

MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES FISH AND WILDLIFE SERVICE
AND
THE DEPARTMENT OF THE ARMY
FOR
ENHANCING FISH AND WILDLIFE RESOURCES
OF THE
UPPER MISSISSIPPI RIVER SYSTEM
AT
BUSSEY LAKE
CLAYTON COUNTY, IOWA

## I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (FWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Bussey Lake separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

## II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, with the exception of a control structure on a culvert that is located outside of the Upper Mississippi River National Wildlife and Fish Refuge, all construction costs of those fish and wildlife features for the Bussey Lake project are 100 percent Federal, and all operation, maintenance, repair, and rehabilitation costs are to be cost shared 75 percent Federal and 25 percent non-Federal.

## III. GENERAL SCOPE

The Bussey Lake project rehabilitates and improves the fishery habitat in the lake primarily through the reestablishment of habitat diversity in the lake. This would be accomplished through the establishment of 29 acres of deeper water with reduced aquatic plant cover, the creation of about 27,000 linear feet of open water/vegetation bed edge, and an increase in the variety of water depths in the lake through the dredging of channels within the lake.

## IV. RESPONSIBILITIES

A. DOA is responsible for:

1. Construction: Construction of the Project which consists of dredging about 12,000 linear feet of channel in Bussey Lake. The material from this excavation will be used at the Guttenberg waterfowl ponds (located southeast of Bussey Lake) to elevate and level the bottoms of the three existing moist soil units and create one new moist soil unit.

2. Major Rehabilitation: Any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. Construction Management: Subject to and using funds appropriated by the Congress of the United States, DOA will construct the Bussey Lake project as described in the Definite Project Report/Environmental Assessment, Bussey Lake, Habitat Rehabilitation and Enhancement, dated May 1990, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The FWS 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. If DOA encounters potential delays related to construction of the Project, DOA will promptly notify FWS of such delays.

4. Maintenance of Records: DOA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the Project to the extent and in such detail as will properly reflect total costs. DOA 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 its offices, at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the FWS.

B. FWS is responsible for:

1. Operation, Maintenance, and Repair: Upon completion of construction as determined by the District Engineer, St. Paul, the FWS shall accept the Project and shall operate, maintain, and repair the Project as defined in the Definite Project Report entitled "Bussey Lake Habitat Rehabilitation and Enhancement," dated May 1990, in accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662.

2. Non-Federal Responsibilities: In accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662, the FWS shall obtain 25 percent of all costs associated with the operation, maintenance, and repair of the Project from the Iowa Department of Natural Resources.

## V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the Project.

## VI. REPRESENTATIVES

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties:

FWS: Regional Director
U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

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

VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY

BY: (signature)
RICHARD W. CRAIG
Colonel, Corps of Engineers
St. Paul District

Date: FEB 20 1992

THE U.S. FISH AND WILDLIFE SERVICE

BY: John C. Eadie (signature)
for JAMES C. GRITMAN
Acting Regional Director
U.S. Fish and Wildlife Service

Date: FEB 18 1992

# APPENDIX C

## CHECKLIST FORM COVERING INSPECTIONS

SUBJECT: Annual Inspection Report, Guttenberg Waterfowl Ponds Habitat Rehabilitation and Enhancement Projects, Pool 11, Upper Mississippi River, for the period _____ to _____.

TO: St. Paul District, Corps of Engineers
ATTN: CO-TS
190 Fifth Street East
St. Paul, Minnesota 55101-1638

Indicate deficiencies by noting location and condition. Indicate repairs made under the remarks section.

| Item | Date of Inspection | Identified Deficiencies | | Remarks |
|---|---|---|---|---|
| | | Location (use figure on reverse) | Condition (describe deficiency) | |
| Water Supply Lines | | | | |
| | | | | |
| | | | | |
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| Outlet #2 | | | | |
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| Outlet #3 | | | | |
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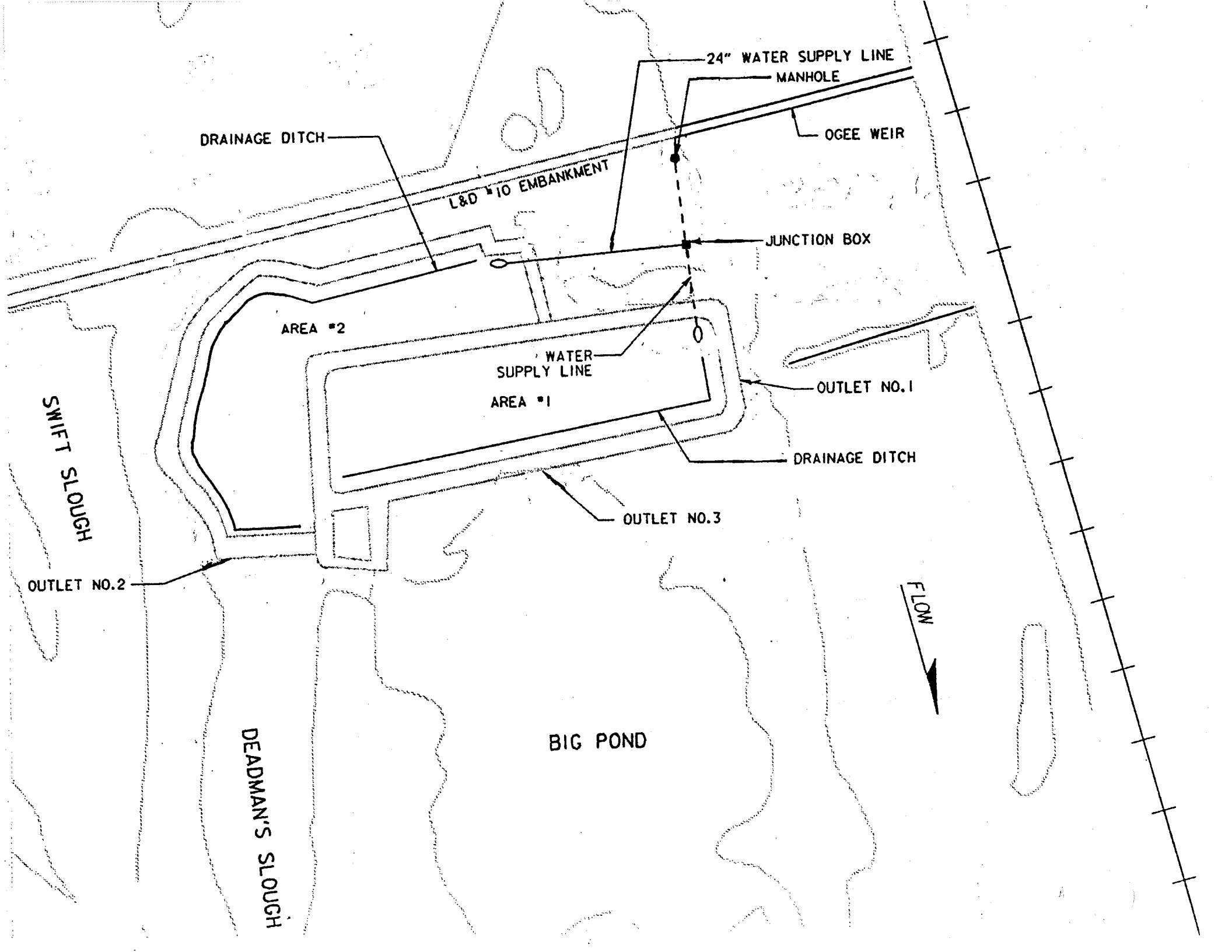
24" WATER SUPPLY LINE
MANHOLE
OGEE WEIR
DRAINAGE DITCH
L&D #10 EMBANKMENT
JUNCTION BOX
AREA #2
WATER
SUPPLY LINE
AREA #1
OUTLET NO.1
DRAINAGE DITCH
OUTLET NO.3
SWIFT SLOUGH
OUTLET NO.2
FLOW
BIG POND
DEADMAN'S SLOUGH

# 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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Long Term Storage

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Parts List

**SECTION 5**
Detailed Record Drawing
Material Coating Drawing

**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

Title: Design Engineer

Effective Date: Start Up

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. 1
1 - 24 X 24 Sluice Gate Series 501
Location: Gate Well No. 2
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 101C
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

Sluice Gates for Outlets #1 and #2

# INSTALLATION, OPERATION, MAINTENANCE, and TRAINING MANUAL

## for

## HYDRO SLUICE GATES

## HEAVY DUTY SERIES

HYDRO
HYDRO GATE Corporation

6101 No. Dexter St. · Commerce City, CO 80022

**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 Sluice Gate and its components parts.**

The gate, lift and accessories were accurately machined, assembled, adjusted and inspected before leaving the factory. All wedges and wedge blocks were adjusted to make proper metal-to-metal contact. With the sluice in its fully closed position, the clearance between seating faces was adjusted to .004 inch or less. For best results, follow the applicable parts of this installation booklet carefully, including thorough cleaning and lubrication of moving parts and final wedge adjustment. CAUTION: **Do not disassemble the gate or lift.**

**Lubrication**

Thorough cleaning of the stem, seating faces, and wedging surfaces is required before gate operation. Details are described in the appropriate sections of this manual. The following lubricants have been found satisfactory for this use:

Lubriplate Lithium Base No. 630 AA or AAA
Texaco's "Multi-Fax Heavy Duty No.2"
Conoco's "All Purpose Superlube"
Shell's "Alvania No.1"
Lubriplate Super FML2

For stem lubrication a Teflon paste additive similar to La-Co Slic-Tite is recommended. (See page 15, paragraph 6.)

## 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.

## Installation of wall thimble and gate on wall thimble

1. Place the wall thimble in the correct position in the forms and block it in this position. The top center line of the thimble is stamped on its machined face. The bottom center line is also marked.

2. Plumb the front face of the thimble using the marks indicating top and bottom center line. This face should be plumbed with respect to final location of the gate, stem and lift.

3. Studs furnished for attaching of the gate may be used in the attachment of the thimble to the forms. If these studs are not used, threaded holes in the thimble must be plugged to prevent concrete from entering them.

4. Use timbers or other bracing material on the inside opening of the thimble while concrete is being poured.

CAUTION: **Use extreme care in placing of these supports to prevent warping of the thimble.**

5. Pour concrete, using care not to tilt the thimble from its original position in the forms.

6. Remove forms and bracing.

7. Clean the front machined face of the thimble of all foreign materials just before gate installation. Check flatness and plumbness of embedded thimble. Flatness must be within 1/64" of true flat plane. Thimble should be plumb within 1/8", if not, consult factory for ways to correct and compensate for deviations. Place threaded studs in the holes provided in the face of the thimble.

8. Clean the back of the gate frame thoroughly.

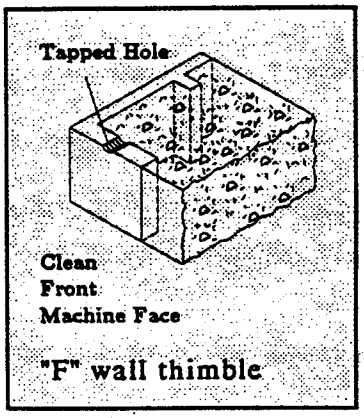
9. Check installation drawing for use of anchor bolts to stabilize the upper frame guides or extensions. If shown, install a nut on these anchors and run on as far as possible.

10. Apply a thin coating of sealer (1/16" to 1/8" thick) on the front face of the thimble.

A good grade of roofing cement, or Sikaflex-1A may be used.

NOTE: On those installations where a rubber gasket is furnished, omit Step 9 above and place the gasket on face of the thimble. Mount assembled gate on studs. Place nuts on studs and tighten uniformly until rubber gasket seals between flanges. The gate frame will be warped if nuts on studs are not uniformly torque tightened.

11. Mount the completely assembled gate on the thimble. Place nuts on the studs and tighten uniformly until only a very thin layer of sealer remains. Remove and discard excess sealer.




12. For installation of a round opening, flange back sluice gate on a pipe flange with a machined face is similar to the procedure outline in steps 7 through 11.

CAUTION: If the pipe flange is not machined or has been warped from a true plane, such as a steel flange welded to a pipe, the gate frame will be badly warped if nuts or bolts are torque tightened. Consult the factory for precautions to be followed.

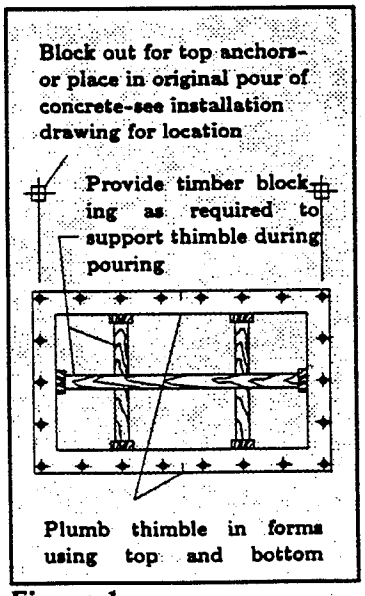



Figure 1

13. To complete gate assembly install nuts on upper frame extension anchor bolt (No. 9 above). Bring both front and back nuts in firm contact with frame. Tightening both without distorting the frame.

## Installation of flat or flange back gates, concrete poured before gate is in place without thimble.

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

2. Two nuts and washers are provided per bolt. Grout space must be left for adjustment of the back nut on the anchor bolt as shown in Figures 2 and 3. The anchor bolt projection shown on the installation drawing provides for the suggested thickness of grout shown.

3. Pour concrete as required. Strip forms.

4. Place one nut on each anchor bolt and adjust them to establish a true flat and vertical plane. Starting with nuts on corner anchors, string taught lines (horizontal) and plumb lines (vertical) to bring all nuts around the opening to a flat vertical plane. Place the completely assembled gate into position on the anchor bolts, straightening them as required. Install second nut and washer on each anchor bolt. Bring front nuts into light uniform contact with the gate frame, aligning it as required. Check for firm contact at back nut then uniformly tight0x all front nuts around opening.

5. Carefully grout in the gate, using 5-star grout or equal.

6. 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.)

7. Tighten all nuts on anchor bolts UNIFORMLY, and DO NOT WARP GATE TO CONFORM TO UNEVEN SURFACE.

8. To complete gate assembly, install nuts on upper frame extension anchor bolt. Bring both front and back nuts in firm contact with frame. Tightening both without distorting the frame.

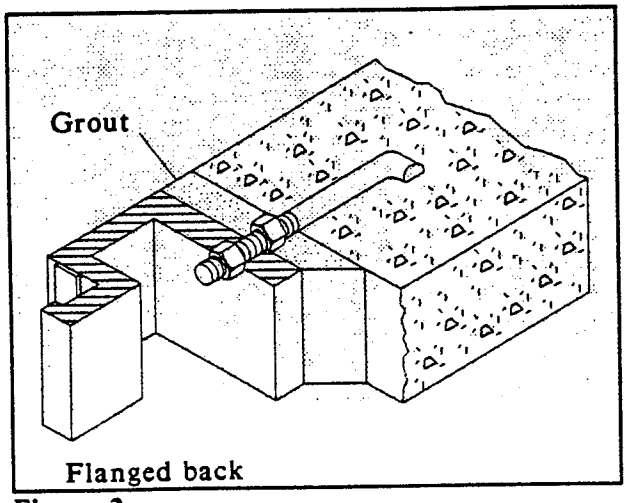


Figure 2

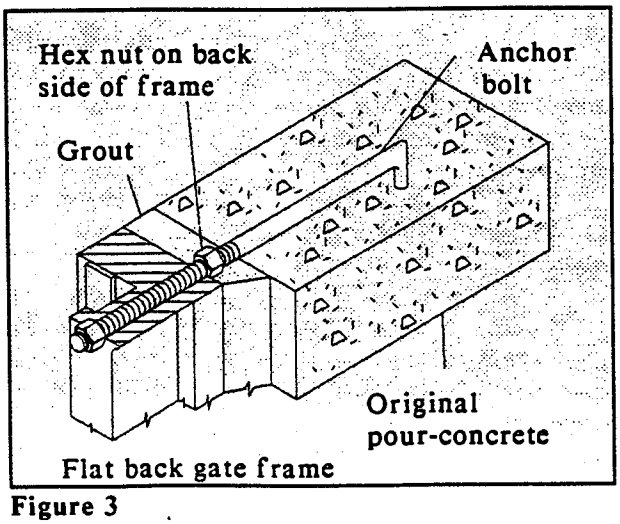


Figure 3

## Gate stem and guides

1. Place anchor bolts for lift and stem guides as shown on installation drawing. Check for proper alignment of lift, stem guides and gate.

2. Provide opening with adequate clearance in lift platform for gate stem as indicated on the installation drawing.

3. Pour concrete as required. Remove forms.

4. Install stem guide brackets on anchors, but do not tighten nuts. Leave them loose enough so bracket can be moved in later alignment. Loosen all assembly bolts holding collars to bracket. Stem guide collars may be of one- or two-piece construction. One-piece collars must be placed on each succeeding section of stem as it is installed. After each collar is installed, rebolt it to its bracket, but do not tighten.

5. When more than one gate is to be installed, stems may be of different diameters, lengths, etc. Stems are marked and/or tagged for each gate installation. Separate the stems per individual gate installation. Refer to installation drawing.

CAUTION: **Extreme care must be taken in handling and installing threaded stems. Nicks or burrs will damage threads in the lift nut.**

6. Insert stem block in a gate slide pocket. On some models there are two pockets. Place the block in the pocket to minimize the vertical clearance.

7. Stems may be in more than one piece both to facilitate shipment and installation. If two or more pieces are furnished for an installation, they must be installed in their proper order from bottom to top to place splices in correct location so that they will not interfere with the stem guides when the gate is opened or closed.

8. Lower bottom section of stem into place through the hole of the gate slide and thread it all the way into the block and align the keyways. Figure 4.

9. CAUTION: **Immediately insert the key to lock bottom section of the stem to the block.** (The key is omitted on non-rising stem gates as the turning motion is between the block and the stem.)

10. Place all succeeding stem sections. Double check the installation drawing to make sure that one-piece stem guide collars are in place. Join together with splices as provided.

11. CAUTION: **Insert all bolts or keys in each stem splice immediately after stem sections are installed and aligned. Failure to take this safety precaution may cause one section to be disconnected from another when the gate is operated. Breakage of gate parts or serious injury to personnel might result.**

12. Immediately prior to lowering the lift over the threaded portion of the stem, remove protective wrapping from the stem and thoroughly clean off all foreign material. LUBRICATE STEM THREADS WITH LUBRICANT RECOMMENDED ON PAGE 15.

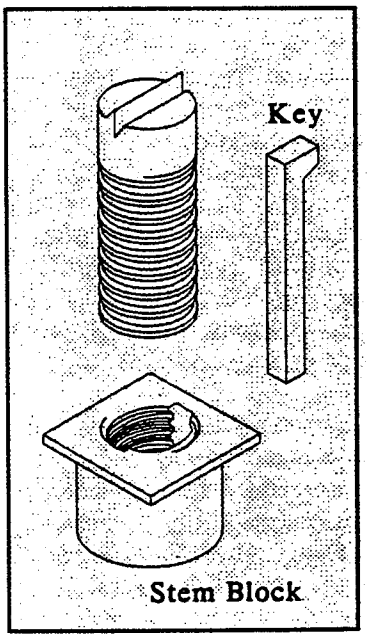


**Figure 4**

## Lift installation and adjustment of stem guides

1. The lifting device was shipped with a plastic plug in the top of the tapped hole to protect the threads in the lift nut. Remove this plug and carefully clean the interior threads of the nut. Since any foreign material in these threads may cause damage to them and make the gate harder to operate, each threaded nut should be carefully swabbed out even though it appears to be clean.

2. Electrically operated lifting devices have threaded nuts that are identified by tags showing the appropriate Hydro drawing numbers. Make certain that these matching parts are used together to insure ease of installation and avoid possible service problems. Refer to electric operator manual for lift nut installation procedure.

3. If electrical or hydraulic powered actuators are used, follow the manufacture's instructions for storage, handling, installation, and start-up. Special precautions must be taken to protect delicate electrical controls until they are connected to their power source. See electric operators manuals. Space heaters should be powered to prevent condensation in a electric component. Torque and limit switches must be set after the gate and lift installation is completed.

4. Clean threaded section of stem of all foreign material and lubricate with a grease as recommended on page 1.

5. Raise lift and lower over the previously installed threaded stem section. 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 threaded 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.

6. The gate was shipped with a steel clip or clips attached to the frame at the top of the slide (See Figure 5).

The clip held the slide in the closed position during shipment and handling. If it hasn't been removed, it should now be taken off and discarded.

7. By use of shims, double nuts on anchors, or other leveling devices under the base of the lift, align center line of lift nut until it is parallel with the center line of the stem. Snug up nuts on anchors uniformly.

8. The crank should be able to be turned freely for two or three turns in each direction until the clearance between the top or bottom of the stem block in the gate slide is taken up. 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 all threads on stem and in lift nut are clean.

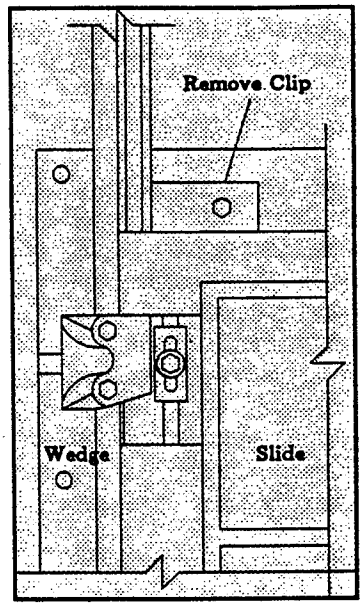


Figure 5

9. Place two-piece stem guide collars around the stem above each bracket. Place bolts through the projection of the bracket and the ends of the collars. Do not tighten.

10. Grout under the lift (if required). After grout has set, tighten the anchor bolts uniformly.

11. CAUTION: **Before opening the gate, clean all**

grout, stones or other foreign material from the top of the gate. Also recheck projection of anchors or studs across the top of the gate opening. Excess bolt projection will damage the top corrosion-resistant metal seating face on the slide as it is opened. (or bottom in the case of a downward opening gate.)

12. Turn lift crank or handwheel to open gate, until gate slide is pulled from its wedges. The stem is now in tension and should be straight. Check stem to make certain it is straight. Tighten nuts on anchors through wall brackets and tighten assembly bolts holding collars in position on brackets.

13. Move the gate to its fully opened position. Check position of stems, if stem is being deflected by the collars, a stem alignment problem exists and must be corrected. It indicates that the gate may not be plumb. Consult the factory for ways to correct or compensate the condition. Apply grease to the stem as the gate is being closed.

14. Place stop collar, if used, against the upward stop. Mark stem with set screw. Slide collar out of position and spot drill stem $^1/_8$-inch deep. Reposition collar and tighten all collar fasteners securely.

15. Lower the gate to its fully closed position and check wedges and seating faces as described under final gate adjustment. Run stop nut down on the top of the projecting threaded stem until it makes contact with the top of the lift nut. A gap of up to 1/8" is advisable to allow gate closure as sliding and bearing surfaces wear in.

16. Tighten the set screws through the stop nut to hold it in place.

17. Install stem cover, indicator, etc., as required (See page 12.)

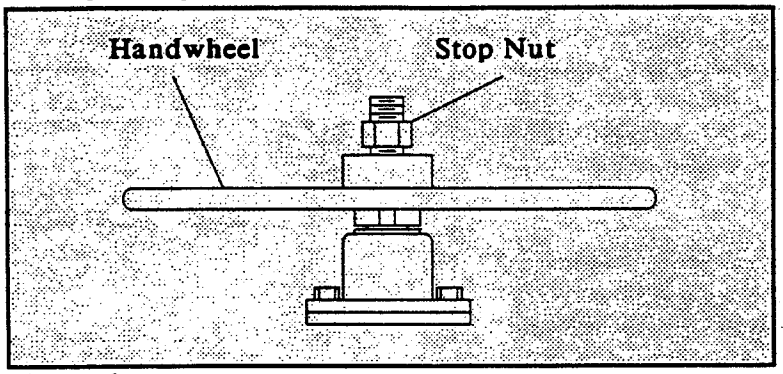


Figure 6

## Clean and adjust gate

1. Move the slide to the fully opened position.

2. Clean all dirt, grit, paint or other foreign material off of gate seating faces and wedging surfaces on both slide and frame.

3. Grease seating faces and wedge surfaces with water resistant grease such as: Conoco's "All Purpose Superlube," Texaco's "Multi-Fax Heavy Duty No. 2," or Shell Oil Company's "Alvania No. 1," or "Lubriplate No. 630 AAA". Lubriplate Super FML2 has a vegetable base and is recommended for use on gates in potable water treatment plants.

4. Close gate completely and check for proper wedge adjustment per pages 9, 10 and 11 of this manual.

## Wedge adjustment

1. All wedging devices were adjusted to make proper metal-to-metal contact before gate was shipped. Vibration during shipment or normal handling during installation may have caused some loosening or changing of settings.

2. After installation and with the slide in the fully closed position, use a .004-inch feeler gauge to check for excess clearance between seating faces. Best results are obtained by making this check from the back side of the slide.

3. If feeler gauge is admitted between seating faces along the top near the stem, excess compression on the stem may be causing a slight deflection of the slide; to relieve and correct, turn crank or handwheel in direction to open gate until it turns freely.

4. If wedge settings have been changed during installation or if it is necessary to readjust all wedging devices, a suggested order of adjustment is shown in Figure 7. The number of wedges, side, top and bottom may vary, but the pattern of adjustment should be similar.

5. Adjust individual wedges as required, using the following procedure.

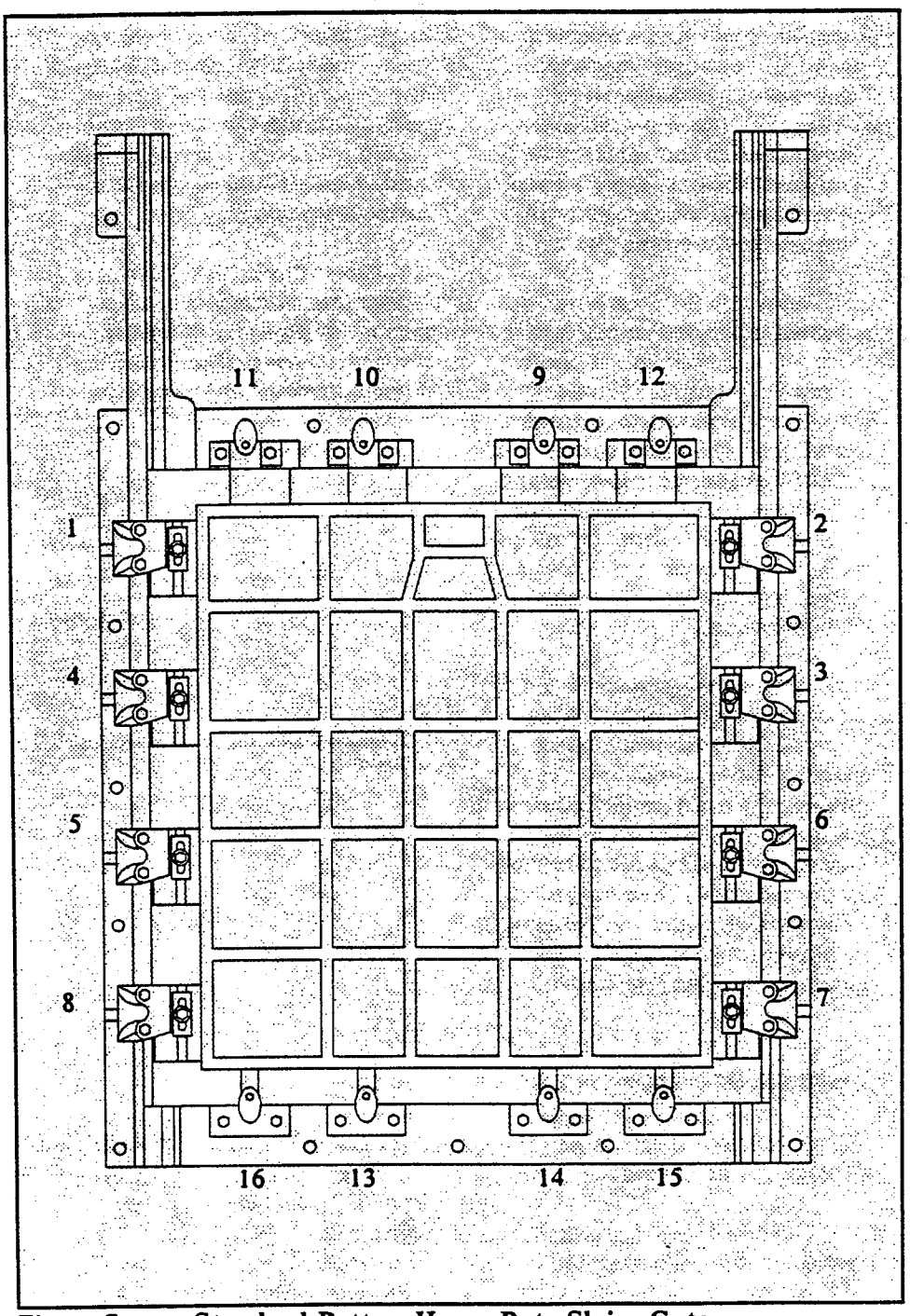



**Figure 7** **Standard Bottom Heavy Duty Sluice Gate with Top and Bottom Wedges**

## Side wedge adjustment

1. Loosen nut on stud through wedge on slide until wedge can be moved by tapping lightly.

2. Be certain that bolts holding wedge block to frame are tight. See torque table.

3. With the aid of a punch or discarded bolt, drive wedge down until firm contact is made with overhang portion of wedge block and seating faces are pushed together. Do not over-drive any given wedge, since it may cause that wedge to engage prematurely during closing. Check all wedge faces for uniform and simultaneous contact during closing.

4. Tighten nut on stud through wedge. (See Torque Table for proper tightening.)

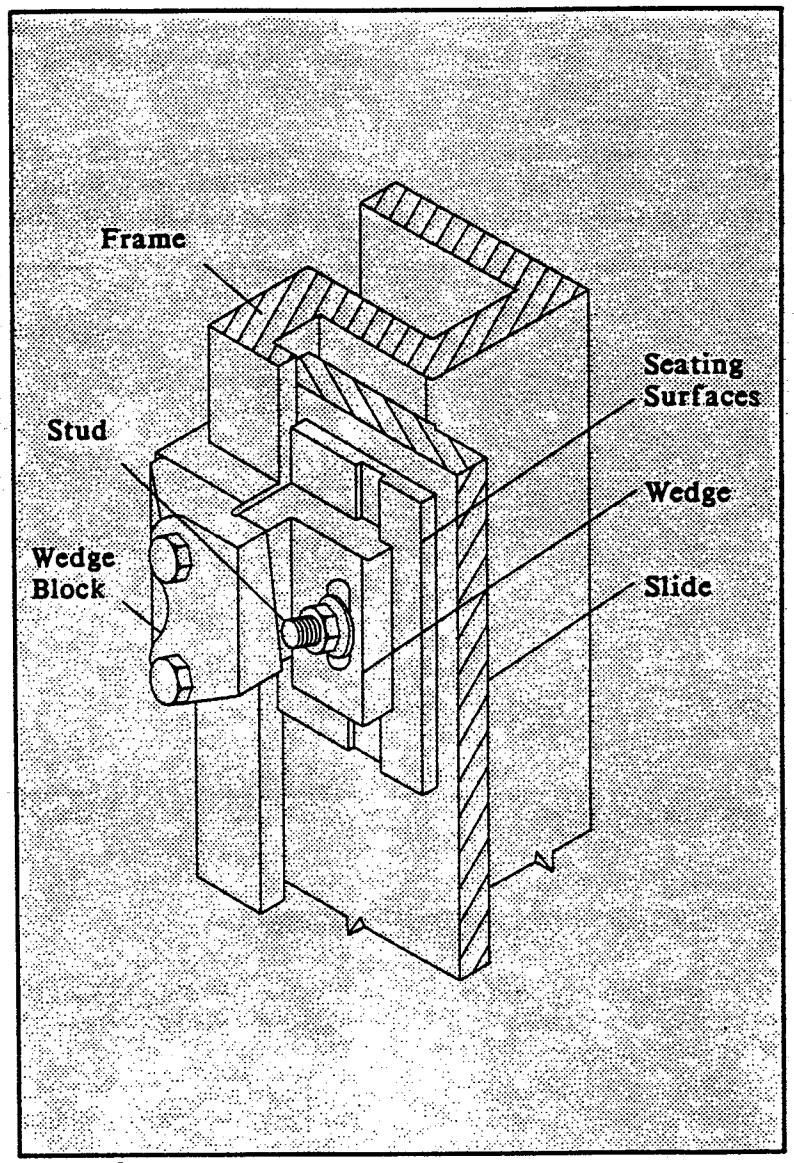


Figure 8

| Torque table for tightening nuts or hex bolts used for assembly. | |
|---|---|
| Cap screw diameter in. | Torque to be applied Foot Pounds |
| 3/8 | 20 |
| 1/2 | 45 |
| 5/8 | 75 |
| 3/4 | 125 |
| 7/8 | 200 |
| 1 | 300 |
| 1 1/8 | 450 |
| 1 1/4 | 500 |
| 1 1/2 | 600 |

## Top and bottom wedge adjustment

1. Loosen adjusting screw "H" and then loosen cap screws "F" a fraction of a turn until wedge block can be moved by tapping lightly. **NOTE:** Do not loosen too much as leakage or damage to wedges can occur when the wedge is readjusted and tightened.

2. Tighten adjusting screw "H" (Torque on adjusting screw is variable, but should not normally exceed values in torque table for fasteners).

3. Tighten cap screw "F"

4. Tighten lock nut "G".

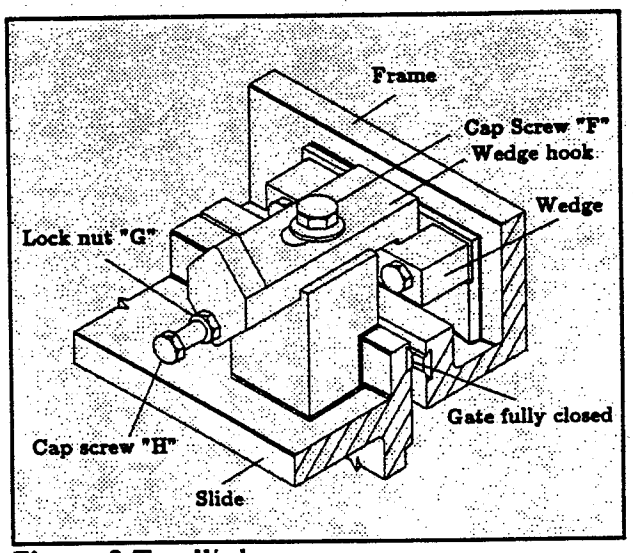


Figure 9 Top Wedge

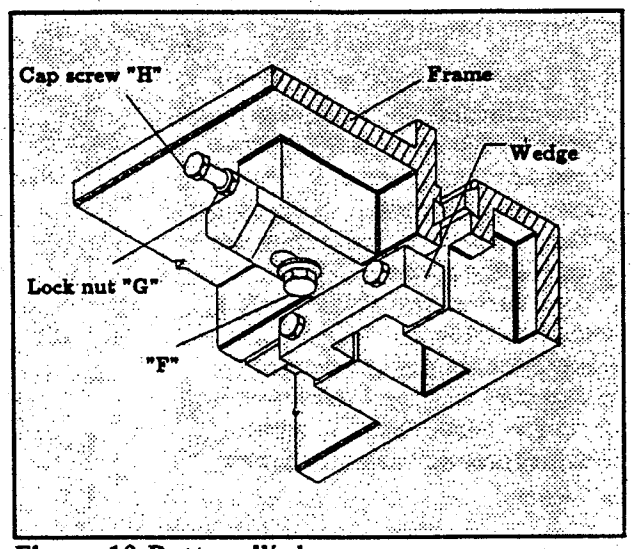


Figure 10 Bottom Wedge

## Flush bottom closure adjustment

1. All flush bottom devices were factory adjusted to make proper contact before the gate was shipped. Shipment and normal handling may have caused loosening or changing of settings.

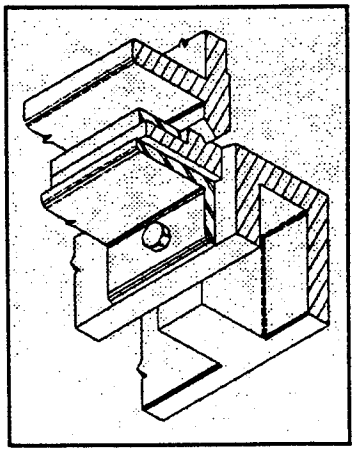
2. On those gates having flush bottom closure, move the gate slide to its fully closed position by applying a force on the handwheel or crank of the lift. Uniform contact between the bottom lip of the gate slide and the top surface of the rubber seal must be made for the full width of the gate opening. Check for proper contact by use of a light on the back side of the gate or a .004-inch thickness gauge.

3. If full closure is not being made, open the gate a fraction of an inch to relieve pressure on all wedges. Loosen all nuts on studs through side wedges as explained on page 8 and on top wedges (if used) per page 9.

4. Reclose gate until uniform contact is made between the bottom of the gate slide and the rubber seal. A slight deformation of the seal is required for the full width of the gate.

5. Adjust and retighten all wedges as explained on pages 8 and 9.

6. Grout or fill bottom recess around flush bottom closure as required.


Flush Bottom

## Installation of cylinder on yoke of gate

1. Lift cylinder into position on top of the yoke and hold in this position.

2. Place stem block in stem block pocket in gate slide. The drilled and tapped hole for the locking screw must be to the front.

3. Remove plugs from cylinder ports. Extend cylinder rod until it is in contact with the top of the threaded stem block. CAUTION: **It's easy to damage the end thread on top of the block or on the end of the lift rod.**

4. By turning the cylinder body or the piston and piston rod, thread the piston rod into the stem block. The threads on the rod must be used for final adjustment.

5. Check to make sure that the cylinder rod is completely extended. The piston inside the cylinder will make contact with the bottom of the cylinder when the rod is fully extended. Continue to thread the piston rod into the stem block.

6. As the rod is threaded into the block, the mounting flange on the bottom of the cylinder will come in contact with the top of the yoke on the gate frame. When contact is made between the mounting plate on the cylinder and the machine pad on the yoke, the stem block should also make metal-to-metal contact with the bottom of the stem block pocket on the slide.

7. Check alignment of piston rod and stem block. Bending or binding of the piston rod results from improper installation. Correct by placing thin shims between bottom of mounting plate on cylinder and top of yoke or other support, as required.

8. Insert bolts to hold mounting plate on cylinder to gate yoke and tighten nuts.

9. Tighten set screw through stem block to lock the block to the cylinder rod.

10. Connect hydraulic lines to the top and bottom ports on the cylinder as required. Use care to keep dirt out and follow hydraulic instruction manual.

11. Gate is ready for operation.
CAUTION: **Before opening, remove shipping clip and check projection of top anchor bolt per page 6 of this manual. Open the gate, clean and adjust per pages 7 through 10.**
NOTE: Check functioning of hydraulic system prior to gate testing. Failure to set or adjust release valves, or other safety devices, may result in damage to the stem or the gate.

### INSTALLATION OF CYLINDER ON WALL BRACKET, BEAMS OR OTHER SUPPORTS.

Use same procedure outlined above. Shimming (step 7) to get correct piston rod alignment will almost always be required.

When extension stems are used, the piston rod must be threaded into the stem splice instead of the stem block. All other steps are the same. See installation drawing showing lengths and placement of stems and stem guides.

## 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.

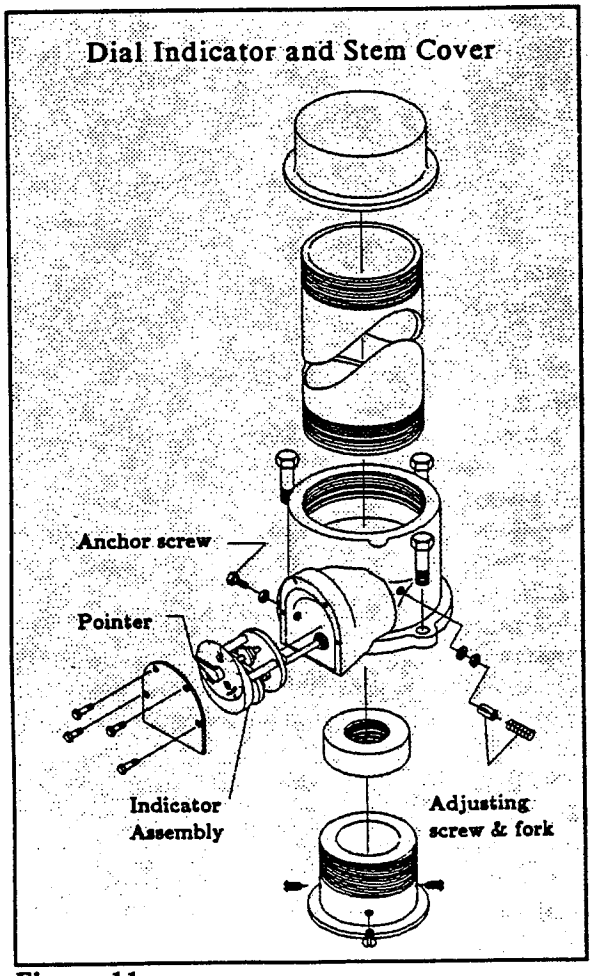



Figure 11

## Field cleaning and painting

1. Hydro Gate standard paint system on Heavy Duty Sluice Gates commercial grade blast and Hi-build epoxy paint. It does not require top coating. Should blast cleaning be needed to condition the gate for top coating, the gate should be fully closed and any exposed metallic seating faces protected from blast and paint. Prior to painting blow all grit off gate, particularly in and around seating faces. Do not remove any wedges or disassemble the gate except as described in the next paragraph.

2. Hydro Gate does not usually recommend removing the slide from the frame to apply finish/top coats due to the risk of damage to seating faces during handling. If there are sufficient reasons such as a badly deteriorated paint on an old gate or a complete change of paint system that is incompatible with the existing paint, then complete disassembly and thorough blast of all surfaces is needed to obtain a quality recoated product.

When disassembling the gate or gates, keep parts segregated and match marked so that parts are not mixed gate to gate since inter changeability between gate parts is not always certain. Protect all seating surfaces on the slide and frame with duct or masking tape. Use special care in handling the slide and frame to avoid damage to seating faces.

3. Blast clean and paint frame and slide as required by specifications or paint manufacture recommendations.

4. Do not paint contact faces of wedges or metal seat.

5. **Remove masking tape or other material used to protect machined faces. Clean all faces thoroughly, and relubricate.**

6. Reinsert slides in the proper frame.

7. With the gate in the fully closed position, recheck maximum clearance between seating faces with .004-inch thickness gauge. Readjust wedges if required. See page 8, 9, and 10.

## Maintenance and lubrication

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

2. When there is excess leakage through the gate seating surfaces or when the gate has been in the closed or opened position for long periods of time without movement, seating faces and wedging surfaces should be cleaned and greased per page 7 and wedges should be readjusted per pages 8 through 10.

## Lift and Stem Maintenance

1. Maintenance of the threaded operating portion of the gate stem is critical and should be preformed as frequently as the operating environment requires. Failure to maintain stem thread lubrication causes operating difficulties and premature failure of the lift nut and stem threads.

2. Recommended inspection frequency and procedures are as follows:

A. Initial inspection - after 24 cycles of gate operation.

B. Subsequent inspection - after 48 cycles of gate operation.

C. Operational inspection - after each 100 cycles of gate operation or six months, whichever occurs first.

A cycle of gate operation is operation of the gate slide from closed to open to closed position. At each inspection verify the following items:

A. Inspect stem threads and lift nut threads for wear and verify trueness and dimension of thread form.

B. Check amount of lubricant remaining and add if necessary.

C. Relubricate if necessary - threads should be cleaned and relubricated with fresh lubricant.

More severe conditions or operating modes require slightly different schedule of inspection and service. For example: Modulating gates with electric motor operators may make position changes several times a day but seldom go full stroke. There is a portion of stem that gets a lot of use. These stems should be inspected at least weekly. The lubricant on the stem threads should be monitored closely. As it depletes and becomes contaminated, it should be cleaned away and replenished.

3. 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 thread 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.

4. Stem threads may be cleaned with solvent, rags, and brushes. Run the gate open. While in the process of opening (running the stem out above the lift nut), clean off old grease. Inspect the threads for roughness. If the threads are rough, they may be filed and polished. Be careful to keep filings and grit out of the lift nut. Rough stem threads accelerate the wear of the lift nut threads since lift nuts are usually brass, sometimes nylon.

5. Relubricate stem threads by brushing or smearing grease onto/into the threads as gate is closing (stem going into lift). This puts fresh lubricant into the lift nut and carries out the old contaminated grease. It is recommended that the contaminated grease be cleaned from the stem as it exits underneath the lift where the stem is accessible from below. Of course, replenish grease on the

underside stem.

6. Recommended stem thread lubricant is a mixture of "La Co Slic-Tite Paste" and Fiske Bros. "Lubriplate No. 630 AAA" in the ratio of 24 ounces of paste per gallon of grease.

"Slic-Tite Paste" is a pipe dope with teflon fibers and is available from plumbing supply stores or from

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

An equal alternate for "Slic-Tite" is "Dayton Pipe Thread Sealant Paste with Teflon" Stock No. 4X222 or 5X998, available at W. W. Grainger Inc. stores in major cities nationwide.

Equivalent greases are:

Conoco's "All Purpose Superlube"

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

Shell Oil Company's "Alvania No. 1"

Mobil's "Mobilux EP2"

Exxon's "Ronex MP"

Fiske Bros. "Lubriplate No. 630 AA"

A recommended grease for potable water service is vegetable base lubricant, "Lubriplate Super FML-2".

7. Lifts may be furnished with optional "stem lubricator flanges" to facilitate lubrication of stem threads with pressure greasing equipment. This flange is sandwiched under the lift. To be effective, grease should be injected while the stem is moving through the lift.

8. Manual lifts have zerk type fittings for relubrication of the bearings and gears. These fittings do not lubricate the stem threads (except for the optional lubricator flange in No. 7 above). Recommended greases for the lift bearings and gears is any of the above greases without the teflon paste.

9. Service and recommended maintenance of electric motor lifts is covered in the respective manufacture's maintenance manual.

10. Exercise of infrequently operated lift and gate is recommended. An annual exercise will ensure the gate is operable when needed and lubrication condition will be maintained.

11. Removal of stem nuts for thread inspection of frequently modulated gates is recommended. This avoids "surprise" when the nut threads have worn so thin they strip out and drop the gate. Replacement/spare nuts can be ordered from Hydro Gate. Spare parts are usually not needed or recommended, since the are readily made on short notice to Hydro Gate. In those cases where equipment operation of downtime is critical and gate is operated extremely often, a spare lift nut may be wise.

Most electric operator nuts can be removed from either the top or the bottom of the operator without total disassembly of the operator. See electric motor operator maintenance manual.

Note: Whenever the nut is removed and reinstalled in an electric operator, the position limit switches will need readjustment.

## Manual Lifts, Parts and Assemblies

1. Typical assemblies of manual lifts are included for reference. These lifts may be either bench mounted or pedestal mounted. All Hydro Gate lifts have bowls or housings that can be removed from the pedestal leaving the lift nut in place supporting the gate weight. Remove the bowl/housing capscrews and lift the bowl off, should inspection of and service of gears and bearing be necessary.

Bench mounted lifts must be removed from the stem in order to disassemble the bowl, since the heads of the bowl capscrews are under the base or bearing flange.

2. All Hydro Gate lifts may be arranged in tandem. these lifts are connected with a interconnecting (pinion) shaft, sometimes called tandem shaft. See the gate installation drawing for more information.

Hydro Gate's single speed

tandem lifts (CPE-2 and CPE-4) require that one of the gate stems be left-hand and the other be right-hand. Two-speed tandem lifts will have the same thread direction in both lifts.

Assembly of tandem lifts requires that 1) the proper hand of stem be in the proper place on the gate, and 2) the stems and lifts are synchronized so the gate lifts evenly. Synchronization is accomplished with the interconnecting shaft coupling, i.e. make up the couplings when the gate and stems are even and level.

## 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 that 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 sluice 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 this occurs, all of the fine adjustments that were made in our plant are completely lost. It is then necessary to clean all of the contact faces, reinstall the slide and adjust all wedging devices in strict accordance with our instructions.

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 cast iron gates, the gate sear, or frame, is comparatively flexible and is easily pulled out of line if it is not correctly installed. This will result in leakage, the amount depending upon the deflection of the castings by tightening of nuts on anchors.

In order to minimize leakage through heavy duty sluice gates and meet or exceed the AWWA Sluice Gate Standard, installation must be very precise. Installation procedures for heavy duty sluice gates are covered in our manual G-1000. Our instructions not only call for careful installation of gates, but also points out the importance of final cleaning and lubrication of seating faces and wedge contact surfaces prior to putting the gate into operation. We also recommend that a water resistant grease be applied to all these surfaces. This grease does allow for proper seating of the gate in the last turn or two of the hand crank. For example, when the slide is moved downward in a vertical direction by as little as 1/64 of an inch, the wedging devices cause it to move towards the seating surface by .002 inch. This almost negligible horizontal movement can make considerable difference in the amount of leakage through a sluice gate.

AWWA leakage rates for Heavy Duty Sluice Gates is 0.1 gallon per minute per foot of seating perimeter for seating heads and 0.2 gallons per minute per foot of perimeter for unseating heads up to the rated unseating head.

## Maintenance Summary and Lubrication Sheet for Sluice Gates, 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 WHEN NECESSARY

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

   **Lubricant:** Mixture of 24 fluid ounces of **"La-Co Slic-Tite Paste" and on gallon 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. Granger, 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 or AA"

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

   **Frequency:** Annually or whenever the gate is dewatered. Exercise gate, at least partially, every six months if dewatering, inspection, cleanng and lubrication is not possible.

   **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. Exxon "Ronex MP"

** La-Co Slic-Tite Paste available at plumbing supply stores or it can be ordered from:

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

## Lubrication requirements for gate stems with modulating controls

LUBRICANT: Mixture of 16 fluid ounces La-Co Slic-Tite paste and 3/4 gallon Lubriplate 630 AAA. See page 16. Multipurpose greases may be used, but the mixture above is superior for wear protection.

LUBRICANT APPLICATION: Apply lubricant to stem threads with a brush or by hand smearing. Optional stem lubricator flanges are available to aid application. To use lubricator flange attach grease gun or pump to the lube fitting in the flange, which is mounted under the lift. The lubricator works best if lubricant is injected while the stem is moving upward, thus carrying lubricant into the stem nut threads.

Hand or brush application works best by applying lubricant to stem above operator while stem is moving down through the nut. Remove stem cover if so equipped and start with gate up. The stem nut is located down inside the actuator, such that a natural well or pool of lubricant is formed above the nut.

Apply lubricant so that entire working length of thread is completely covered.

INITIAL LUBRICATION: Lubricate the stem threads during stem and lift installation or before the gate is operated the first time.

INITIAL INSPECTION: Inspect stem threads after 10 to 20 complete gate operations: complete operation means: full stroke of gate from closed to open to closed position. Inspection may require cleaning of threads to visually check the thread surfaces for gouges, galling, tears, roughness or other damage. Relubricate with recommended lubricant.

RELUBRICATION FREQUENCY: General rule for manual operators is relubricate every 100 cycles or every 6 months, whichever occurs first. Electric Operators have a "Natural Lube Reservoir" above the stem and are usually equipped with stem covers, so the number of cycles between lubrication can be increased, depending on actual conditions, such as, wind blown dirt, rain, moisture and frequency of modulation.

A "cycle" for a modulating gate is one passage of a given stem thread up and down through the nut. Since the gate typically modulates over a short span, which is often a lot less than full gate travel. This used length of thread and the nut threads see a lot of "cycles". This highly used length of thread must be relubricated frequently, to prevent wear and premature failure of stem nut threads.

The actual frequency of relubrication can be determined by observation during the first days and weeks of operation. Begin by using the general rule of 100 cycles to inspect and lubricate.

Example: Gate modulates (moves) over the same span every 30 minutes throughout the day. The gate makes 24 "cycles" per day. The used or modulating length of stem should be relubed every 4 days.
(100 / 24 = 4.17).

Do not let the used length of stem become dry looking. If following the example, the stem is well greased and pool of lubricant is maintained above the stem nut, the length of time between regreasing can be increased.

PERIODIC THREAD INSPECTION: Thoroughly inspect the stem threads after 1000 "cycles" or 1 month of operation. Recommended procedure is as follows:

1. Remove stem cover if so required.

2. Take samples of used grease from above and below stem nut.

3. Check for wear particles from stem or nut, or other grit and dirt. CAUTION: The recommended mixture of La-Co Slic-Tite and grease feels "gritty". The La-Co paste contains teflon particles, like saw dust. These are easily distinguished from other particles by washing the sample in solvent. The teflon particles are white or cream colored. The stem nut

may be bronze or nylon. The nylon is either blue or black.

4. Thoroughly degrease and clean the used length of stem threads. Watch for bronze (yellow) or nylon particles (blue or black). Check threads for roughness. If particles or roughness are found, removal of stem nut for inspection is recommended. See Electric Operator Manual for instructions on how to remove/install nut and how to set limits. Recalibration of electronic modulating control should generally not be required.

5. Correct conditions causing any unusual wear, suggestions are:

A. Increase lubrication frequency.

B. Slow down modulation frequency.

C. Remove or block sources of outside grit and dirt.

D. Smooth out minor roughness of stem threads with file and emery: be sure to clean out filings and grit.

E. Consult Hydro Gate if extreme roughness of stem exists.

F. Maintain spare stem nut/s.

LIMITATIONS: Modulation or "cycle" frequency greater than 1 "cycle" every 5 minutes is not recommended. It greatly increases relubrication frequency and generates heat in the nut, which leads to lubricant depletion and highly accelerated wear of threads and entire machine.

# Troubleshooting Heavy Duty Sluice Gates

**1. Excessive leakage under slide on flush bottom closure**

Excessive leakage occurring with a uniform sheet of water flowing underneath the gate slide indicates that some or all of the wedges are too tight and the slide is being stopped short of its fully closed position. Locate offending wedges with .004 feeler gauges. Tight wedges will not permit insertion of the gauge. If only 1 or 2 wedges are the problem, readjust them. It may be necessary to completely loosen and readjust the entire gate. See pages 6 through 10 to readjust the gate.

**2. Excessive leakage along sides and or top of slide with flush bottom closure**

With the gate fully closed, excess leakage can occur at the sides, but is possible also along the top. Check that there is proper contact between the bottom of the slide and the face of the flush bottom seal. It is likely that one or more of the side wedges, or the top wedges at the location where leakage is occurring is not tight enough. Adjust side and top wedges as described under "Wedge adjustment".

**3. Excessive leakage at one particular location**

Excess leakage occurring at one particular location indicates that one wedge is improperly adjusted. Check between tapered face of wedge and wedge block with .004 thickness gauge. If feeler gauge passes between these surfaces, readjust that wedge. Even if the .004 feeler gauge cannot be passed between tapered wedge faces, loosen nut on stud through wedge and adjust the wedge tighter.

If you are unable to correct the leakage by readjusting the wedge, it may be caused by foreign material between gate seating faces. Open the gate an inch or two if it is a piece of rag, stick or other foreign material, flush out. If the leakage still persists, foreign material in the form of paint, or grit may be on seating faces. To correct this problem, dewater the gate completely, clean all seating faces and wedge surfaces, and grease faces. Follow procedure under "Clean and adjust gate".

**4. Excessive leakage along top; stem block pocket located at or near the top of the slide**

Leakage is occurring at the center top of the gate only. With this slide configuration, it is possible to push down on the stem so hard that the stem block is pulling the gate slide from its seating faces at the top. Turn the handwheel gear crank or power actuated lift to relieve the compression on the stem and the excess force on the top of the slide. If the slide was being deflected, the excess leakage will diminish or stop when the compression in the stem is relieved.

CAUTION: DO NOT RAISE THE SLIDE FROM ITS WEDGING DEVICES. Actuate the lift only enough to allow the stem to relax.

To prevent the slide from deflecting at the stem block, readjust the stop nut on manually operated lifts, or the torque and limit switches on electrically actuated lifts.

**5. Excessive localized leakage; sides or top or bottom; gate installed on concrete, wedges are tight**

This indicates that the frame has been warped from true flat plane by over tightening of a couple of anchor bolts. Loosen the bolts in the area of the leak. The frame will usually spring back. Check seating face with .004" gauge. Check wedge adjustment. Shim as required between gate frame and wall. Retighten bolts. Caulk or regrout to seal off crack or gap between frame and wall.

If the warp is severe it may save time to completely remove the gate and reinstall the gate on new grout, or a bead of epoxy or sealant such as Sikaflex 1-A. Be careful so that gate is installed flat the second time. Review instructions on page 3 of this manual.

**6. Dirty seating faces**

Excess leakage can also be caused by foreign material on 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, scape off the foreign material from the perimeter of the seating faces on both slide and frame and reseat the gate.

**7. Sluice gate installed on wall thimble - Excessive leakage**

First, verify the point of leakage. Gates installed on thimbles may not have proper sealing material, or compression on gasket between the back of the gate and the face of the thimble. Foreign material on the face of the thimble resulting from excess paint dribbles, or cement and fine sand from pours of concrete or other obstructions, will hold the gate frame from making proper contact with the thimble. Leakage occurs between the front face of the thimble and the back of the gate. Loosen nuts on all studs, pulling the gate away from the thimble, or removal of the gate is the only solution. To correct this problem, clean and reseal, as described under "Installation of wall thimble".

Leakage between the two machined faces will also occur if mastic has not been applied continuously around the perimeter of the front face of the thimble, or if it has been applied too sparsely in any one location. One or more spots without mastic, or too little mastic, will cause leakage between the back of the gate and the front face of the thimble. To correct, loosen all fasteners, move the gate out on the studs, reapply mastic to the front face of the thimble and uniformly tighten nuts.

On rare occasions, improper installation of the thimble itself may be the cause of the problem. It is possible for the thimble to be warped out of true flat plane through incorrect installation, or as a result of improper blocking of the thimble opening before the concrete is poured. Check warp of the thimble by use of straight edges or thin wires. These wires should be very tightly stretched diagonally across the opening to form an "X". One wire is placed at the upper right hand corner to lower left hand corner. If these wires touch at the center, reverse to place the top diagonal wire underneath the other wire to make sure that the warpage of the thimble isn't actually causing the wires to touch at the center. Thimble warp may also be checked with a pair of plumb bobs. Each suspended past the top horizontal seating face near each side of opening. Bobs should be equidistant from lower horizontal seating face.

The straightness of individual sides of the thimble can be checked with one wire,or a long, straight edge to make sure each face is in a straight line. Except in a few cases when thimble warpage is very severe, the gate frame can be properly aligned by shimming to support the back of the frame. Tighten nuts on studs uniformly. The space between the front face of the warped thimble and the back of the gate frame should then be sealed by packing with epoxy sealant.

Severe warping of thimble may require complete removal of the gate in order to clean off old mastic, Shim and block between thimble and frame to maintain true flat plane and then fill the gap with fresh mastic.

Adhesive grout contractors can provide services of injecting epoxy in the gap between the thimble and frame. The advantage is that it hardens to a variable thickness load bearing shim or gasket and it can be injected into very tiny spaces to assure water tightness.

**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 our 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 during closing of the gate, 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 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 surface condition of seating faces. Rough and galled seat can cause additional friction load during operation. Depending on severity, the faces make be filed or sanded smooth. Some sealability may be sacrificed.

## 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.

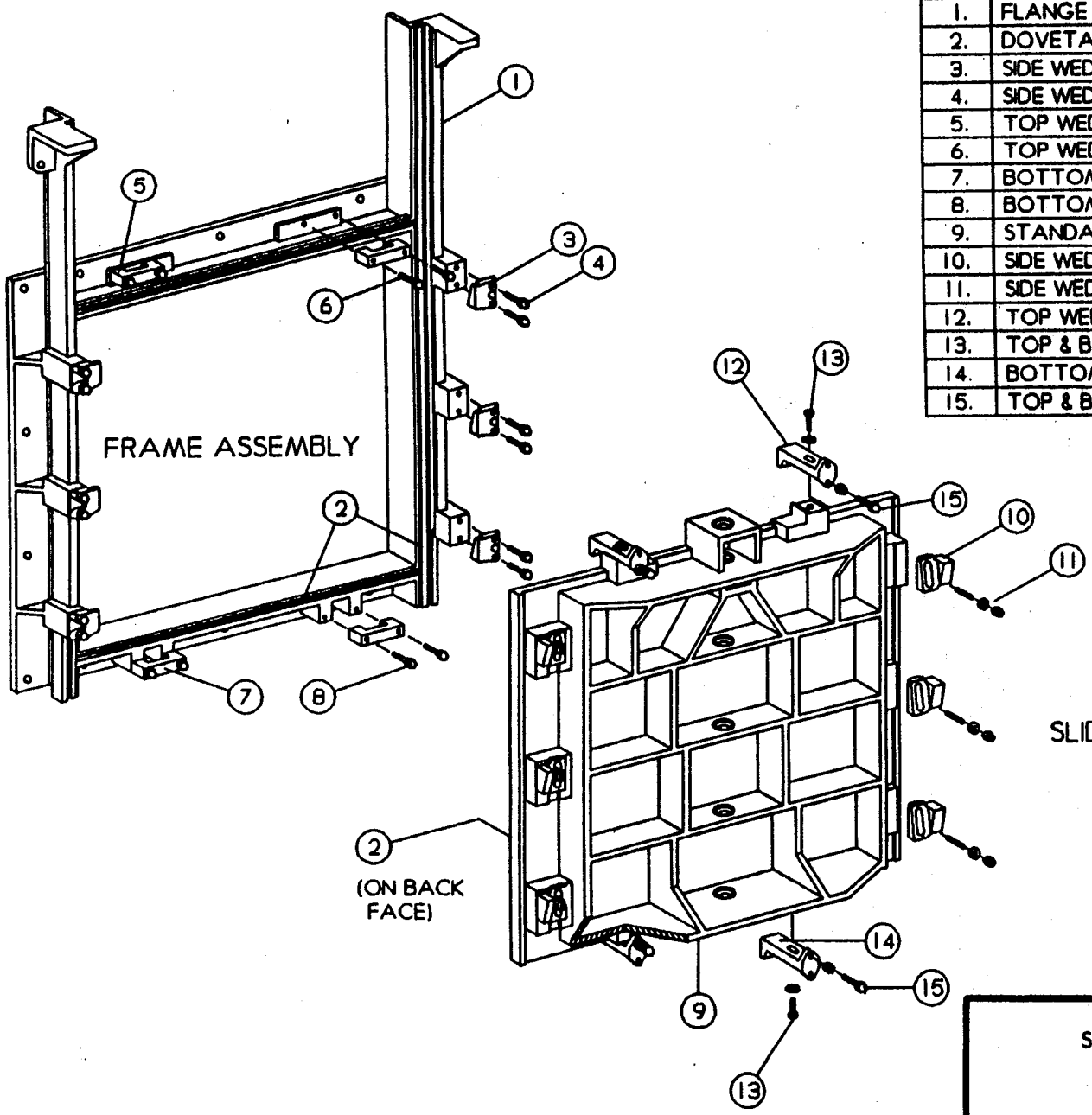
9. Bronze stem blocks, wedges, lift nuts and stainless steel accessories are targets for theft and resale as scrap. Report all shortages at once and note same on shipping papers. Hydro Gate cannot be held responsible for theft and loss of equipment stored on job site.

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.

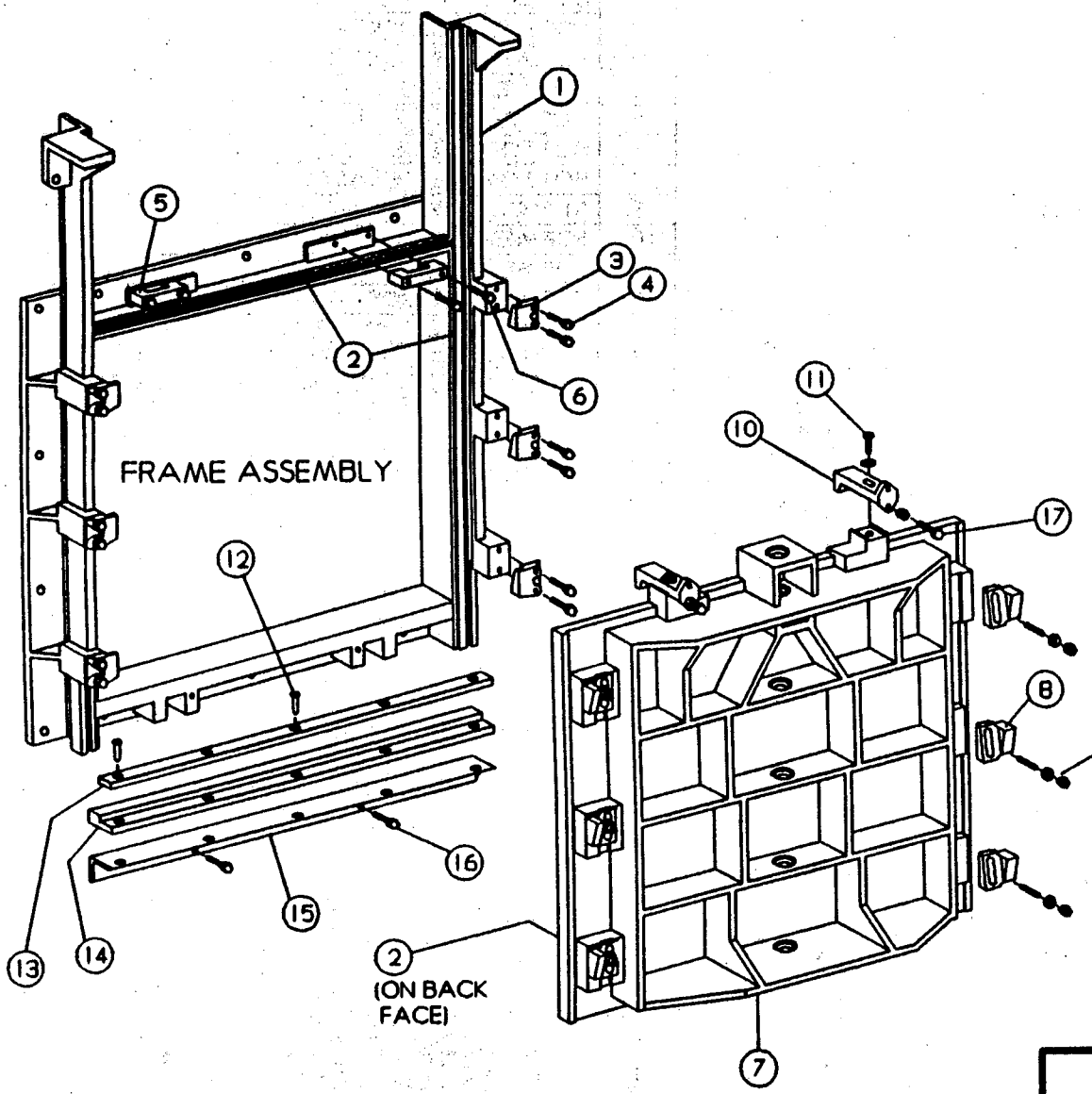
Refer to operator manufacturer's storage instructions, located within the manufacturer's operation and maintenance manual.

| NO. | PARTS LIST |
|---|---|
| 1. | FLANGE FRAME |
| 2. | DOVETAIL METAL SEATING FACES |
| 3. | SIDE WEDGE BLOCK |
| 4. | SIDE WEDGE BLOCK FASTENERS |
| 5. | TOP WEDGE |
| 6. | TOP WEDGE FASTENERS |
| 7. | BOTTOM WEDGE |
| 8. | BOTTOM WEDGE FASTENERS |
| 9. | STANDARD BOTTOM SLIDE |
| 10. | SIDE WEDGE |
| 11. | SIDE WEDGE FASTENER SET |
| 12. | TOP WEDGE HOOK |
| 13. | TOP & BOTTOM WEDGE HOOK FASTENER SET |
| 14. | BOTTOM WEDGE HOOK |
| 15. | TOP & BOTTOM WEDGE HOOK ADJUSTING SCREW SET |




HYDRO GATE Corporation

EXPLODED VIEW & PARTS LIST FOR
SERIES 501 HEAVY DUTY SLUICE GATE
STANDARD BOTTOM
NOT SELF CONTAINED
FULL WEDGING

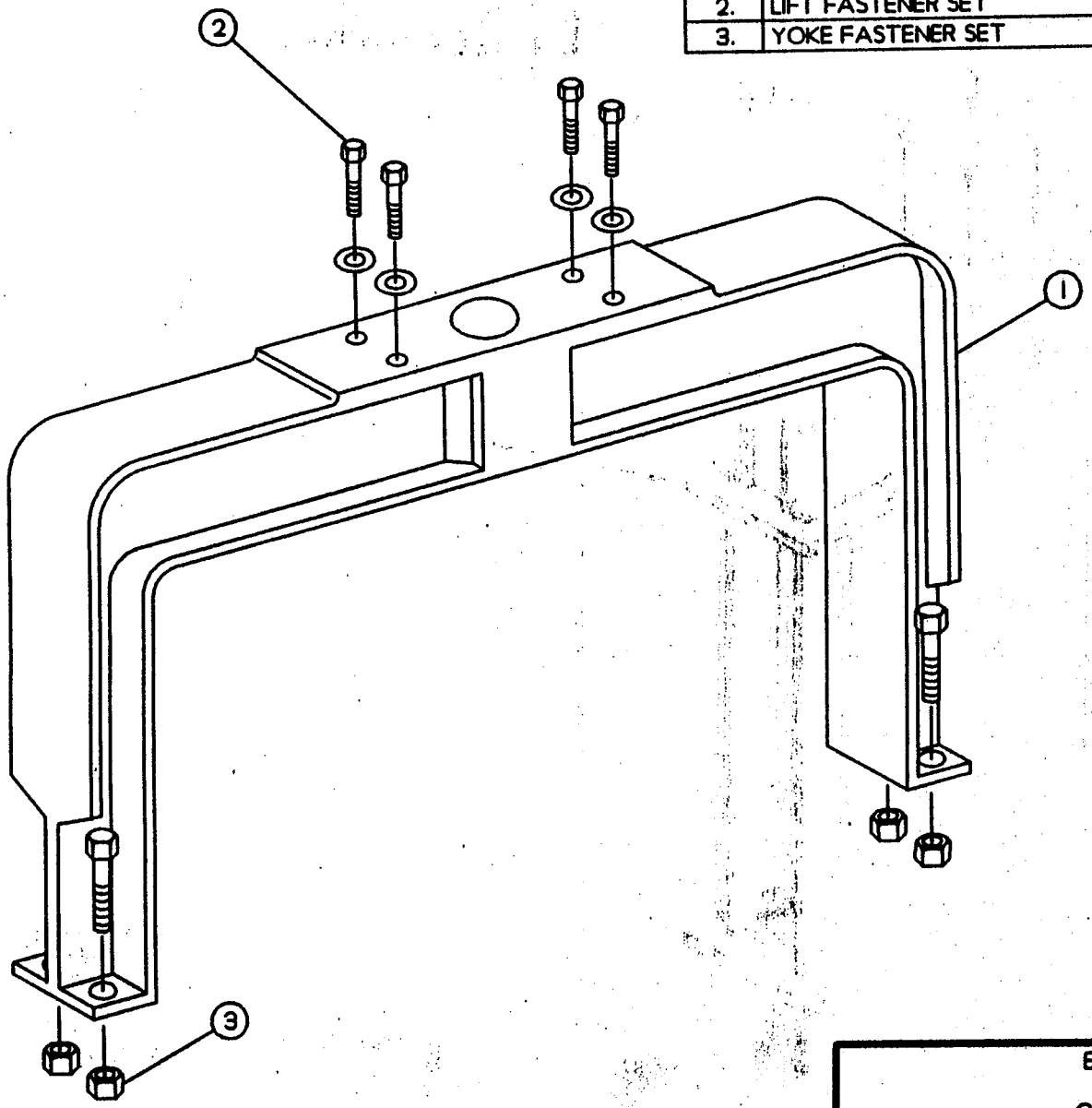



| NO. | PARTS LIST |
|---|---|
| 1. | FLANGE FRAME |
| 2. | DOVETAIL METAL SEATING FACES |
| 3. | SIDE WEDGE BLOCK |
| 4. | SIDE WEDGE BLOCK FASTENERS |
| 5. | TOP WEDGE |
| 6. | TOP WEDGE FASTENERS |
| 7. | FLUSH BOTTOM SLIDE |
| 8. | SIDE WEDGE |
| 9. | SIDE WEDGE FASTENER SET |
| 10. | TOP WEDGE HOOK |
| 11. | TOP WEDGE HOOK FASTENER SET |
| 12. | FLUSH BOTTOM SEAL RETAINER FASTENERS |
| 13. | SEAL RETAINER FLAT |
| 14. | FLUSH BOTTOM RESILIENT SEAL |
| 15. | FLUSH BOTTOM ANGLE |
| 16. | FLUSH BOTTOM ANGLE FASTENERS |
| 17. | WEDGE HOOK ADJUSTING SCREW SET |

HYDRO GATE Corporation

EXPLODED VIEW & PARTS LIST FOR
SERIES 501 HEAVY DUTY SLUICE GATE
FLUSH BOTTOM
NOT SELF CONTAINED
FULL WEDGING

| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | YOKE (CAST IRON) | 1 |
| 2. | LIFT FASTENER SET | 4 |
| 3. | YOKE FASTENER SET | AR |



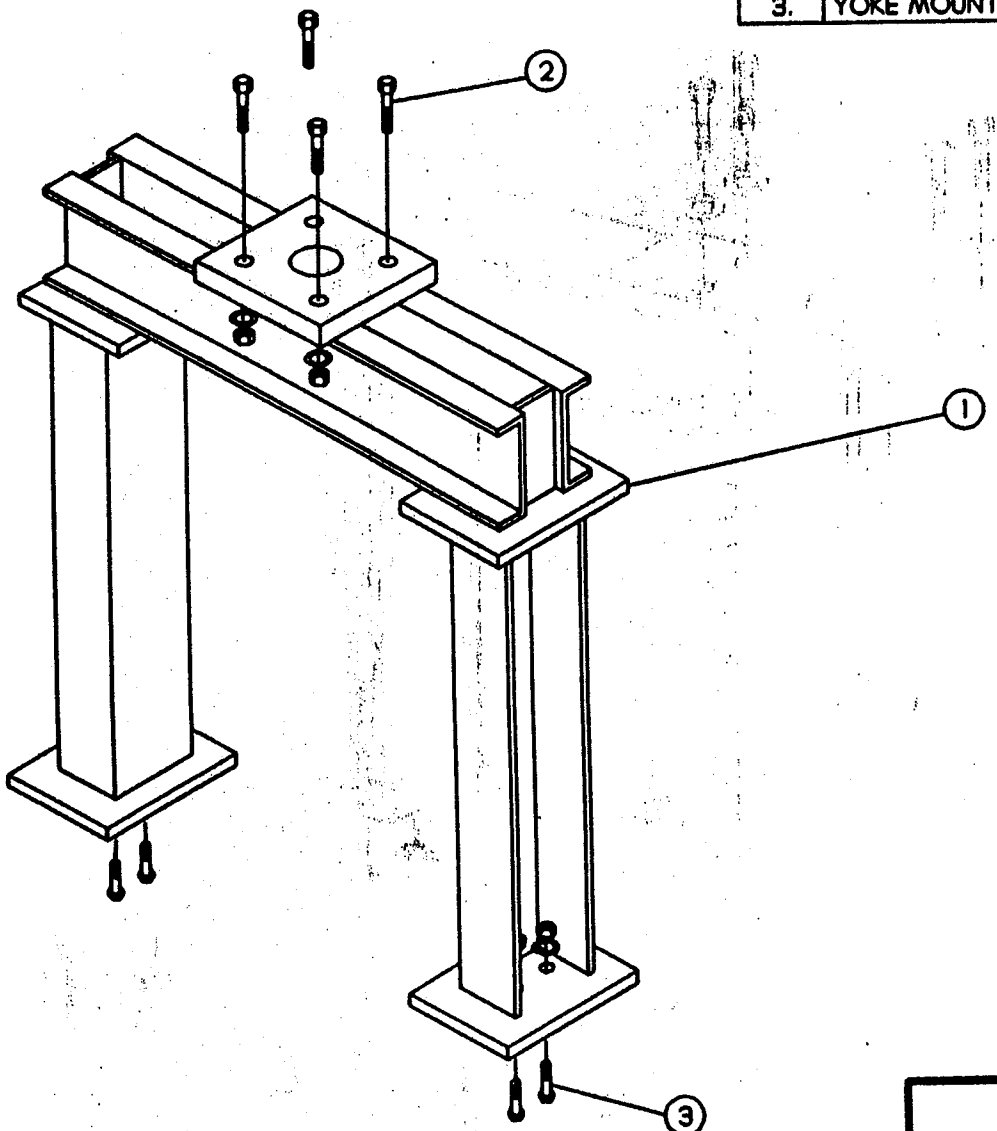

HYDRO GATE Corporation

EXPLODED VIEW

CAST IRON YOKE

HEAVY DUTY SLUICE GATE

| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | FABRICATED YOKE ASSEMBLY, STRUCTURAL STEEL | 1 |
| 2. | LIFT FASTNER SET | 4 |
| 3. | YOKE MOUNTING FASTNER SET | 4 |

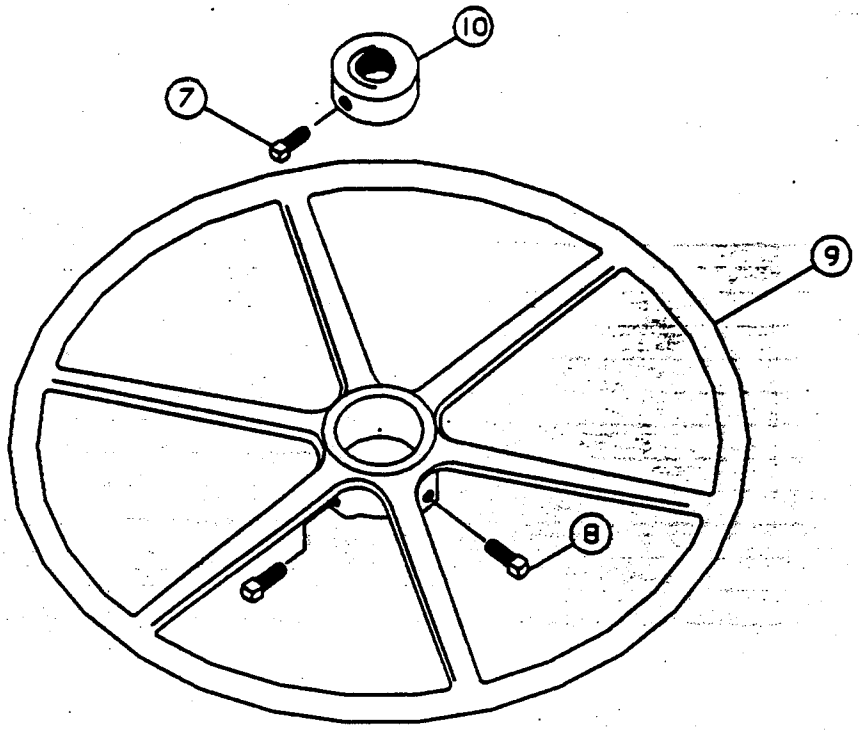


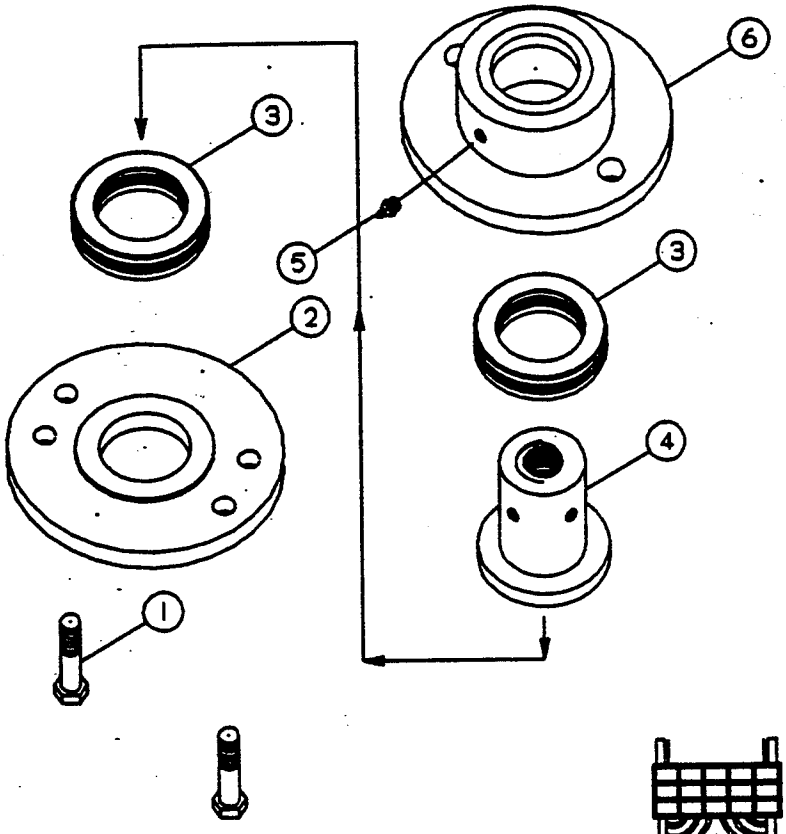

HYDRO GATE Corporation

EXPLODED VIEW

FABRICATED YOKE FOR

HEAVY DUTY SLUICE GATE



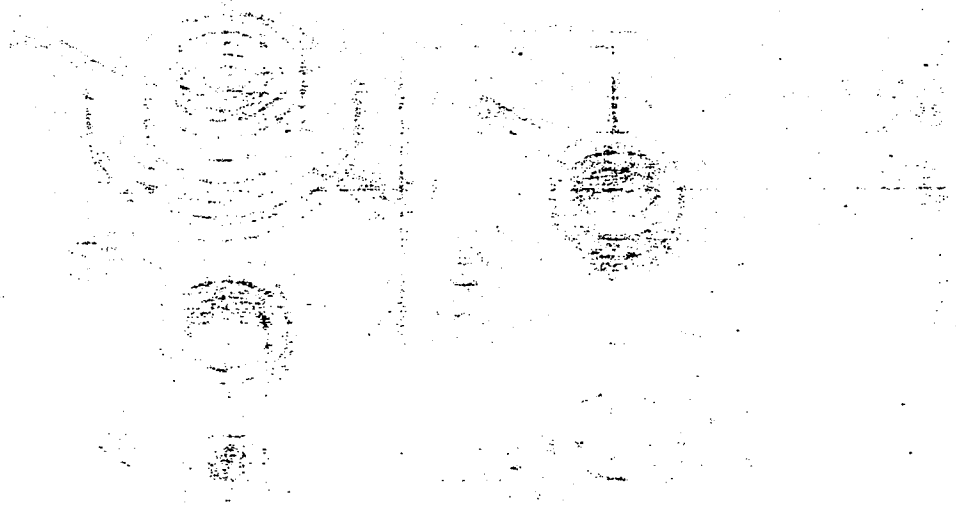

HYDRO GATE Corporation

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 |

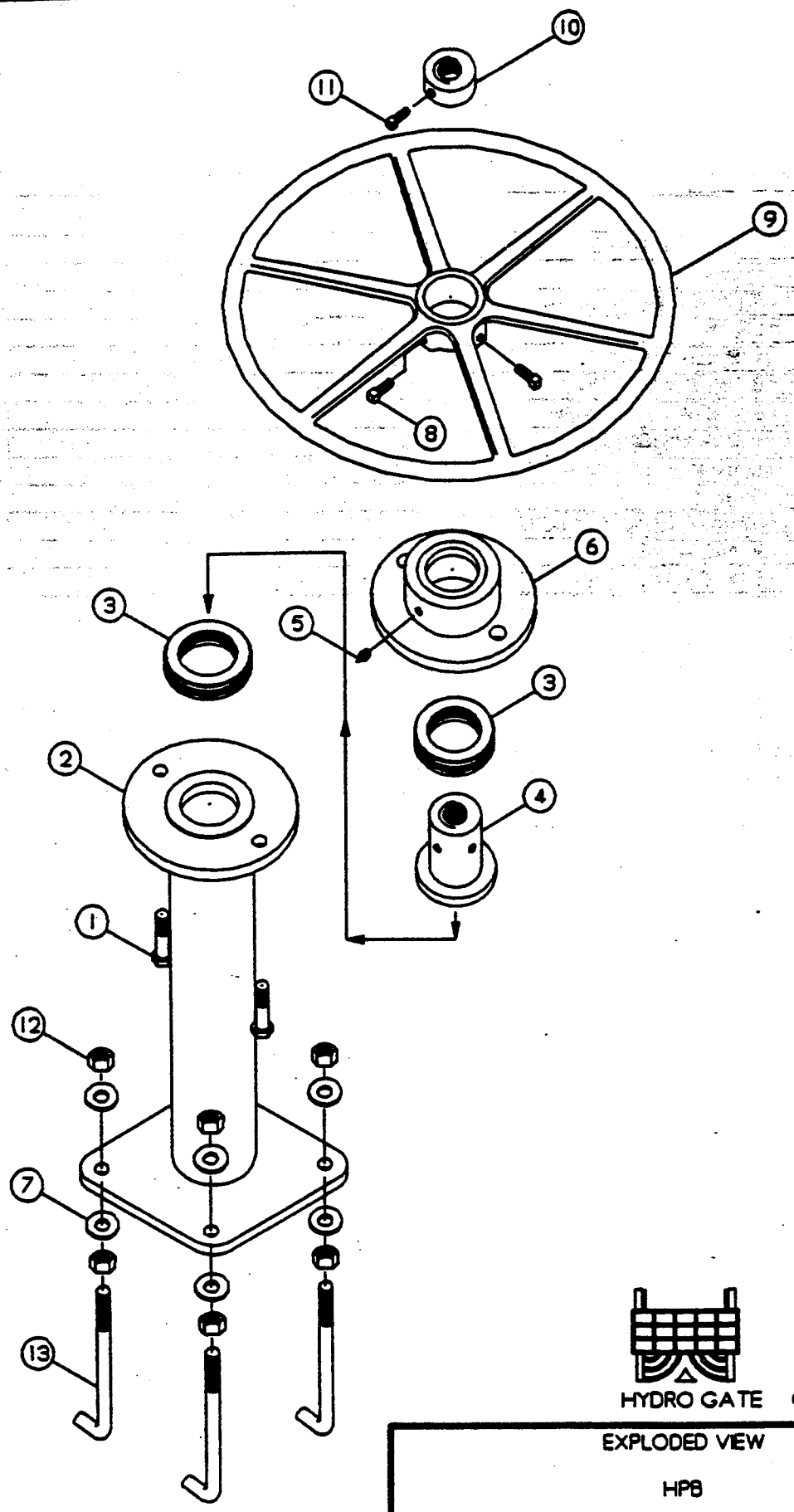


HYDRO GATE Corporation

PARTS LIST FOR

HB

HANDWHEEL LIFT



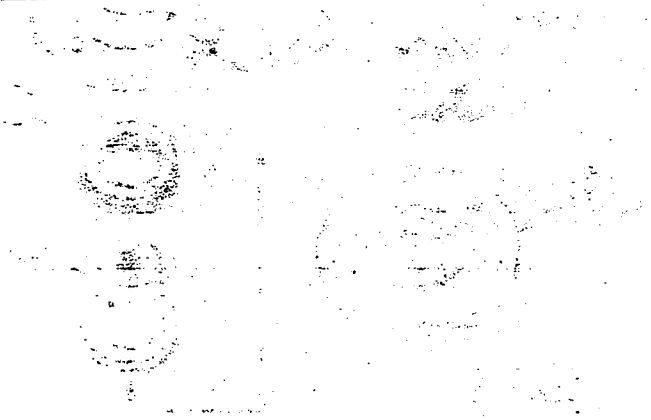

HYDRO GATE Corporation

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. | LIFT 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 |

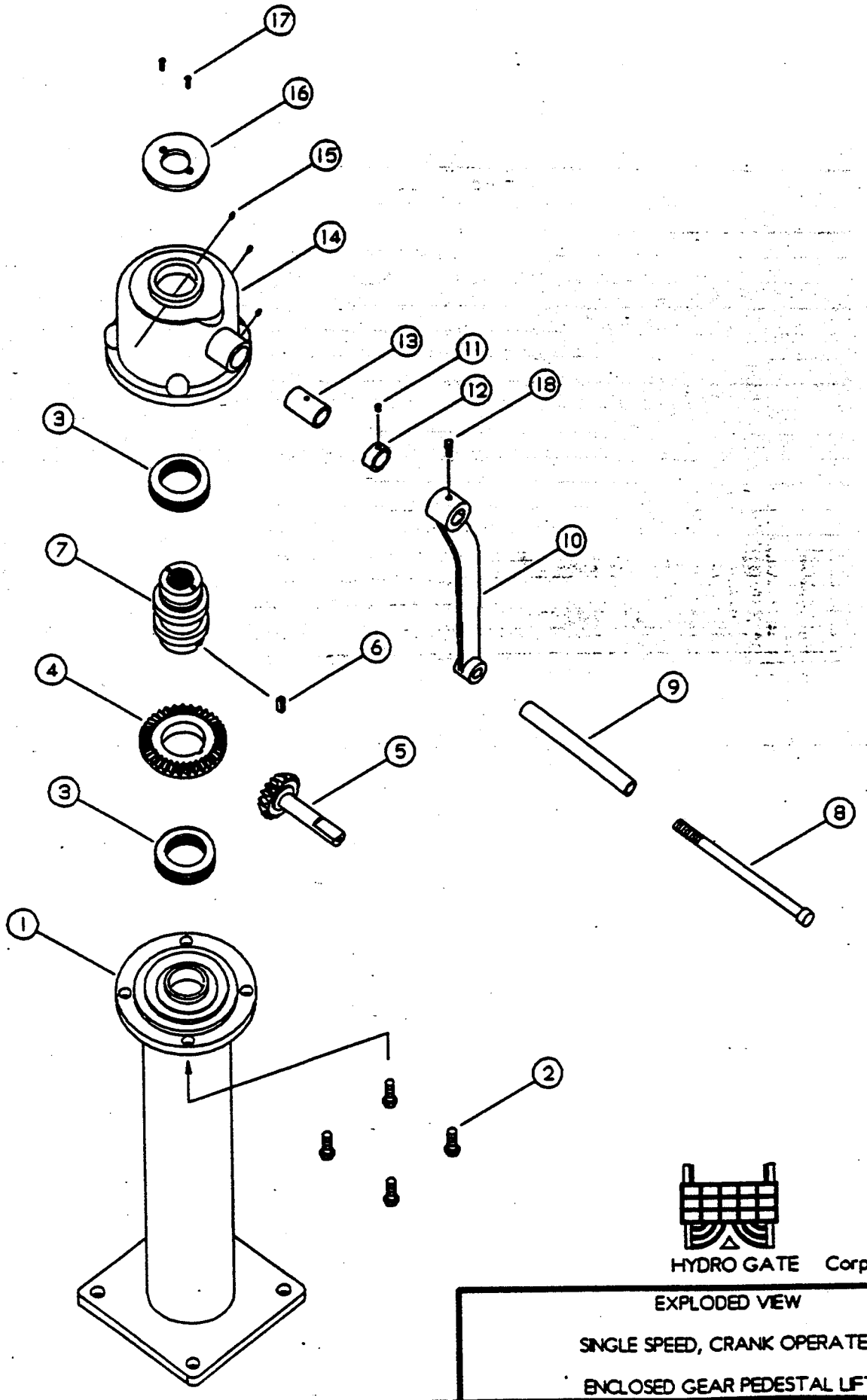


HYDRO GATE Corporation

PARTS LIST FOR

HPB

HANDWHEEL PEDESTAL LIFT




HYDRO GATE Corporation

EXPLODED VIEW

SINGLE SPEED, CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT

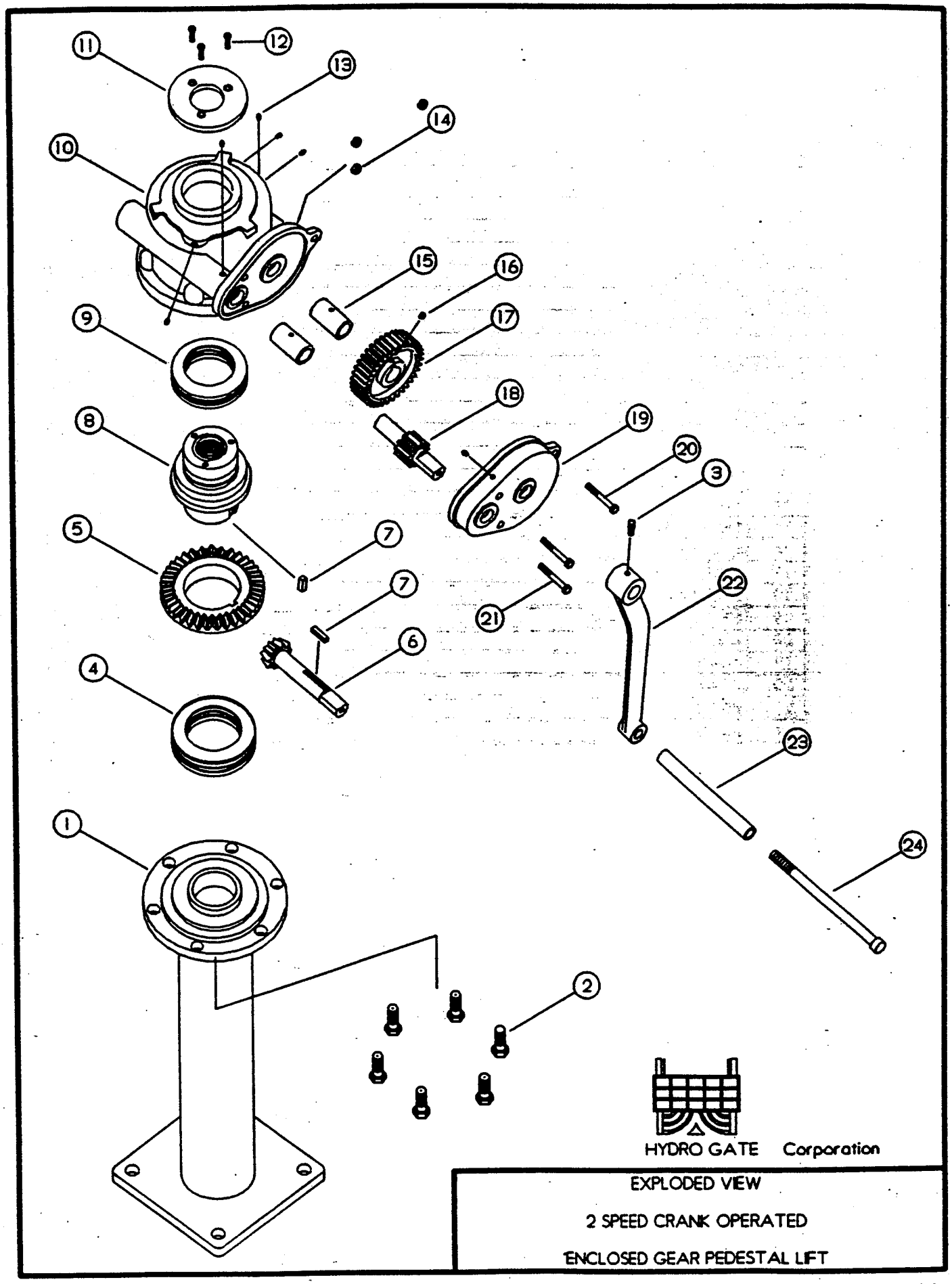
| NO. | PARTS LIST |
|---|---|
| 1. | PEDESTAL |
| 2. | CAP SCREWS |
| 3. | BALL BEARINGS |
| 4. | BEVEL GEAR |
| 5. | BEVEL PINION AND SHAFT |
| 6. | KEY |
| 7. | LIFT NUT |
| 8. | MACH. BOLT |
| 9. | BRASS HANDLE |
| 10. | CRANK ARM |
| 11. | SET SCREWS |
| 12. | STOP COLLAR |
| 13. | BRONZE BUSHING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

HYDRO GATE Corporation

PARTS LIST FOR

SINGLE SPEED CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT




HYDRO GATE Corporation

EXPLODED VIEW

2 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 |

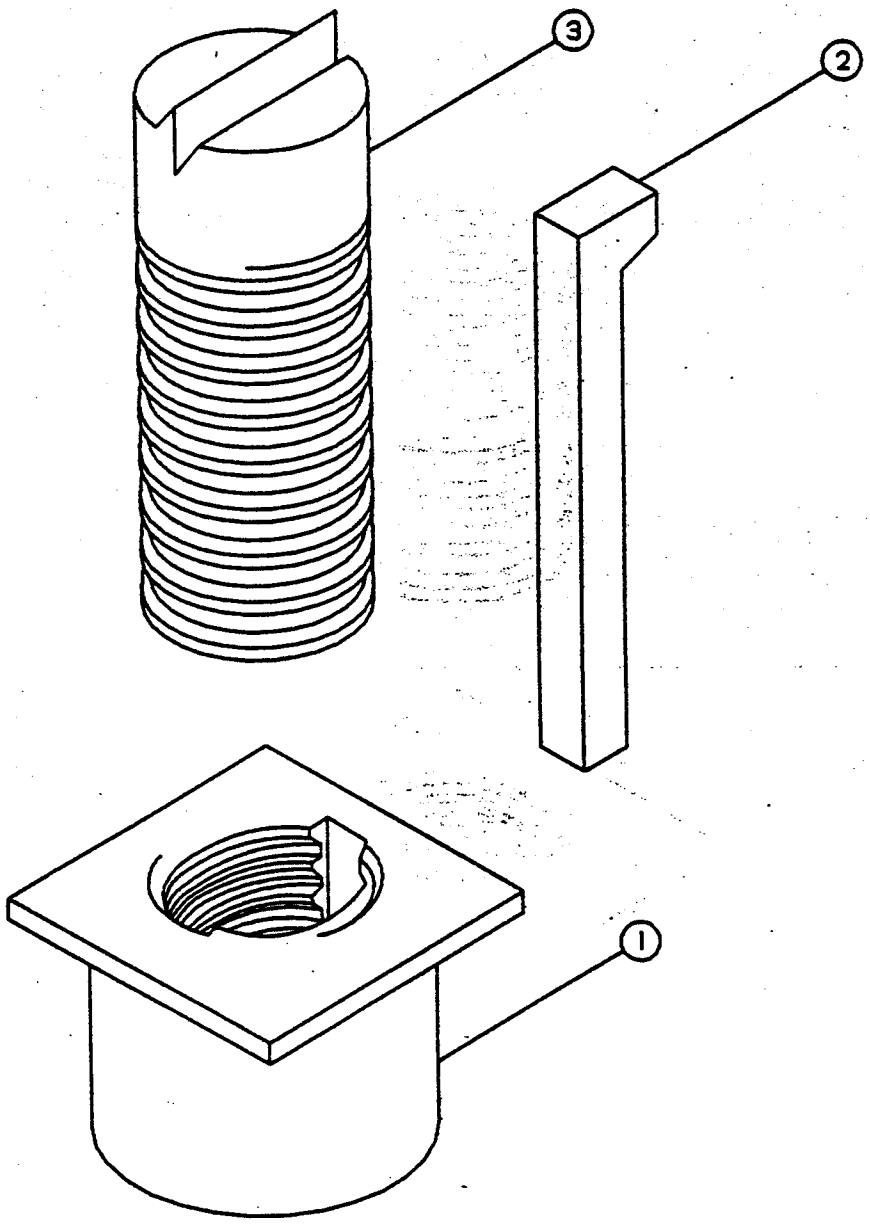
HYDRO GATE Corporation

PARTS LIST FOR

2 SPEED CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT

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



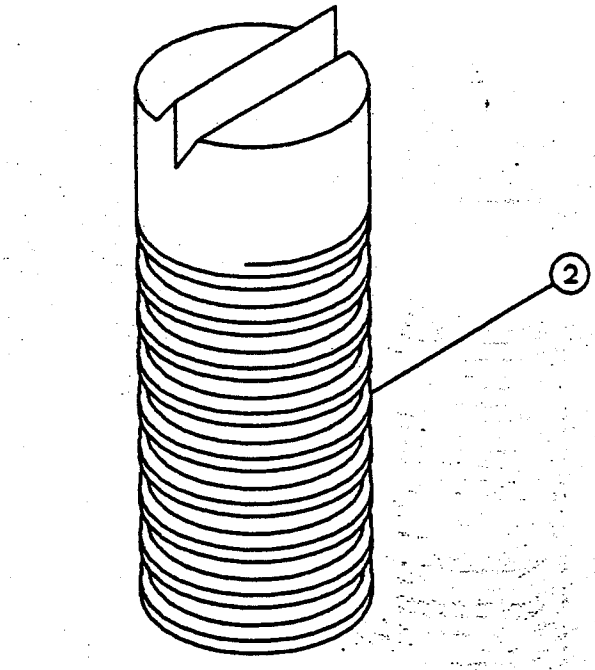

HYDRO GATE Corporation

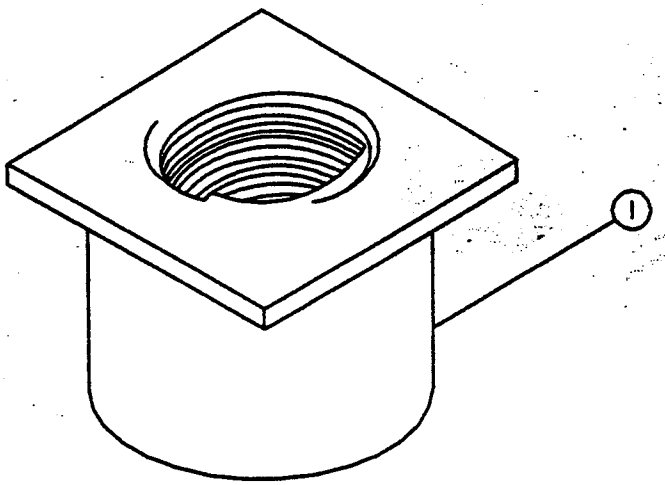
EXPLODED VIEW

STEM BLOCK

RISING STEM

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



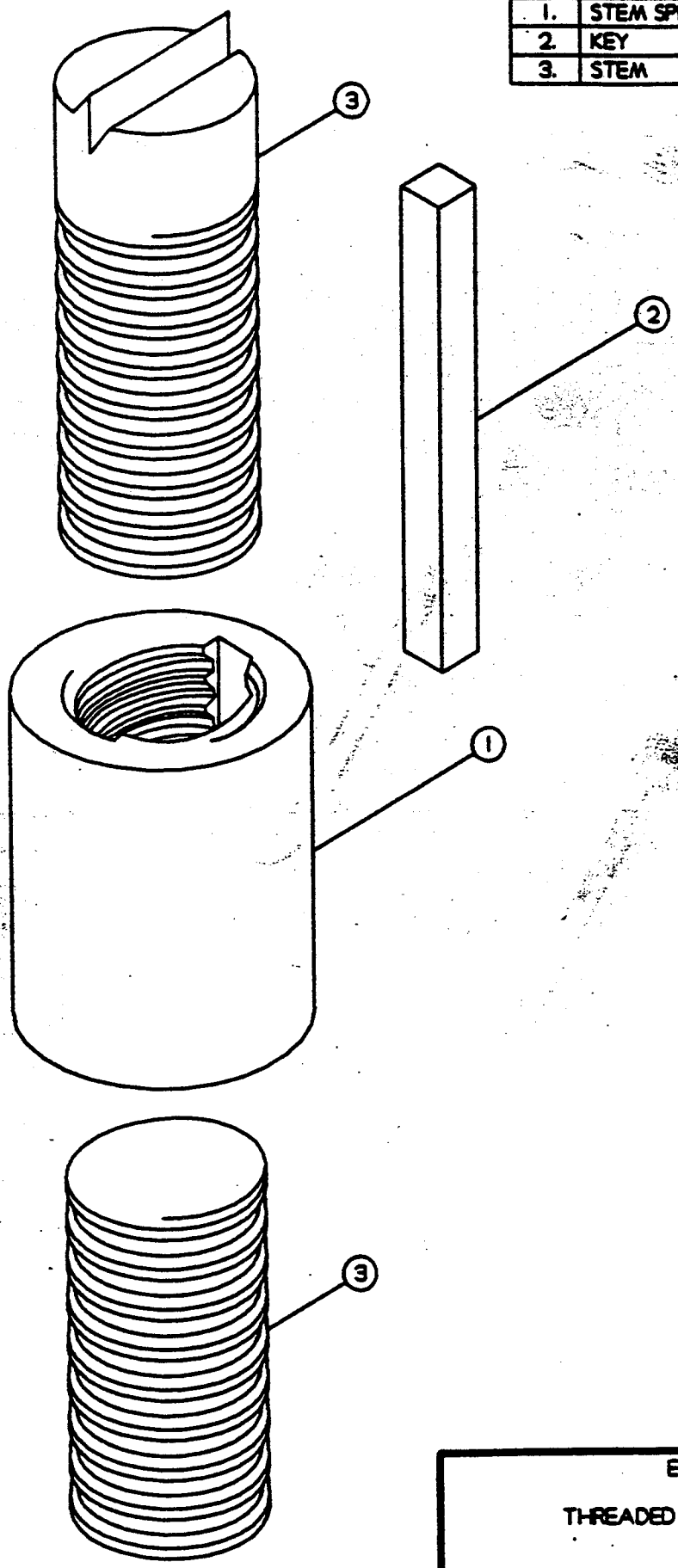

HYDRO GATE Corporation

EXPLODED VIEW

STEM BLOCK

NON-RISING STEM

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

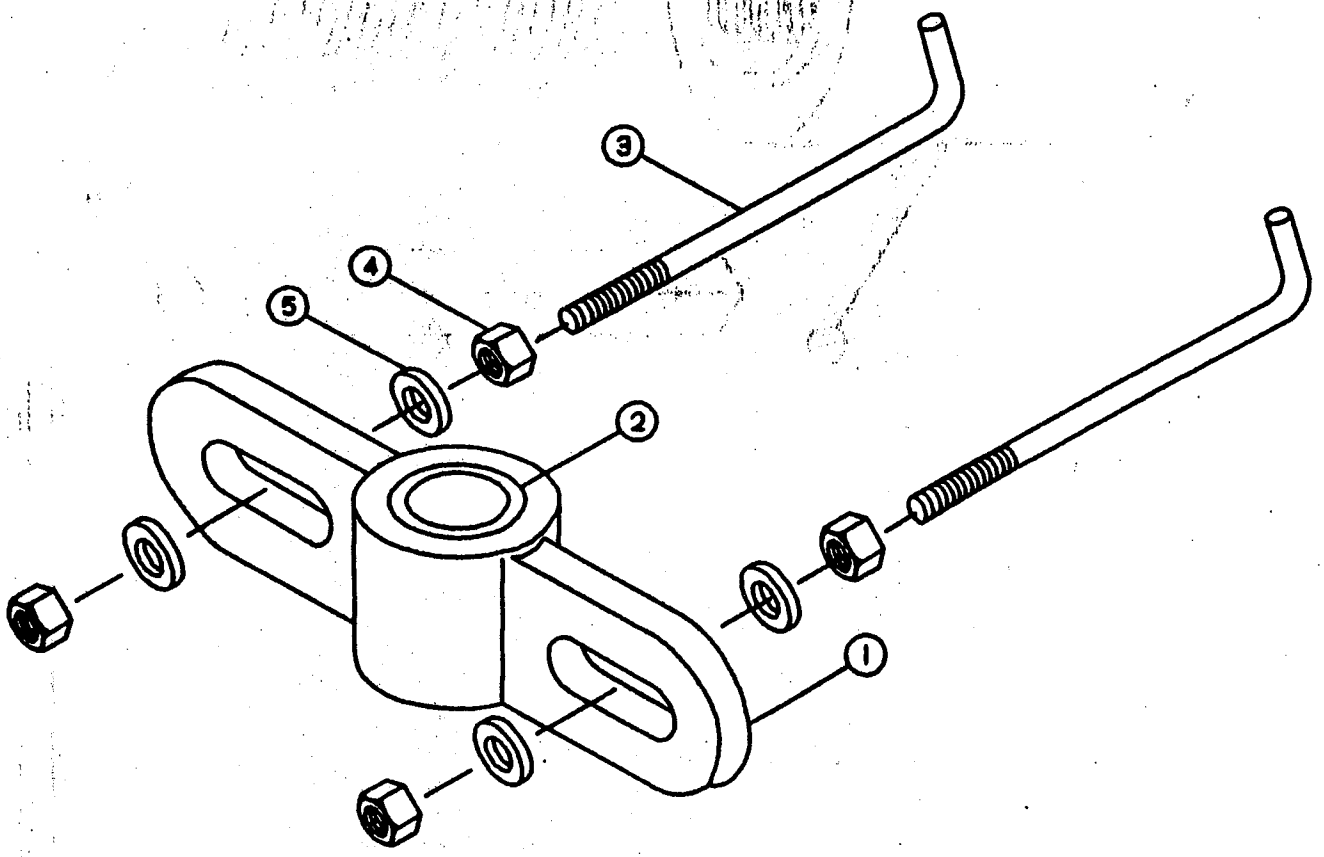



HYDRO GATE Corporation

EXPLODED VIEW

THREADED AND KEYED STEM SPLICE

| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | STEM GUIDE (CAST IRON) | 1 |
| 2. | BUSHING | 1 |
| 3. | 3/4" X 16" ANCHOR BOLTS | 2 |
| 4. | 3/4" DIA. HEX NUT | 4 |
| 5. | 3/4 DIA. FLAT WASHER | 4 |



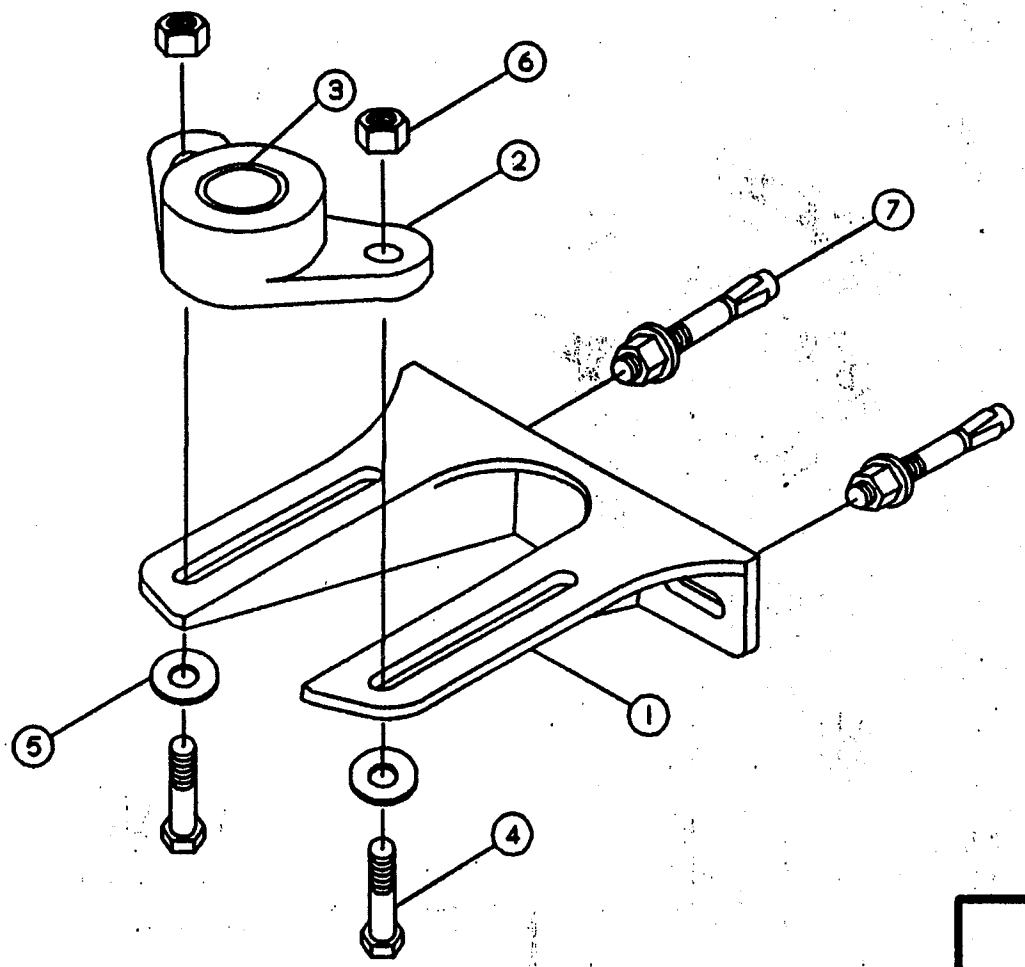

HYDRO GATE Corporation

EXPLODED VIEW

TYPE "A"

STEM GUIDE

| 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 |



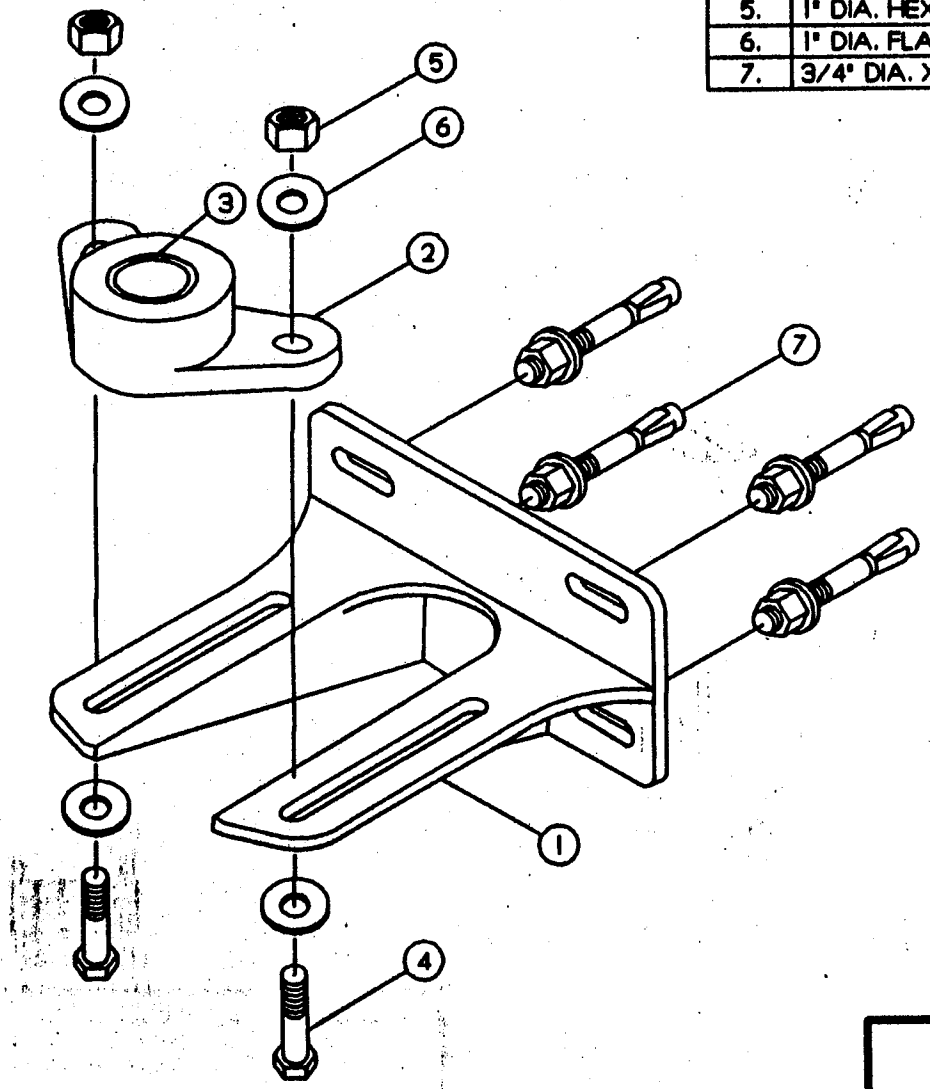

HYDRO GATE Corporation

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 |

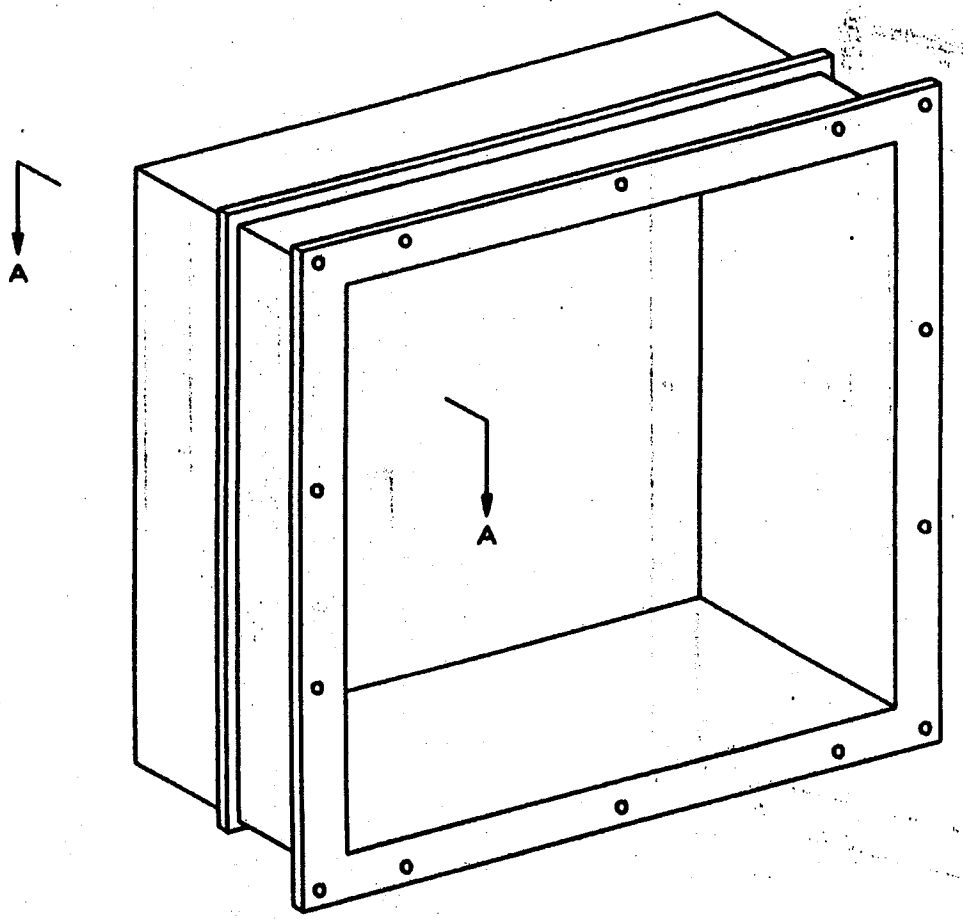


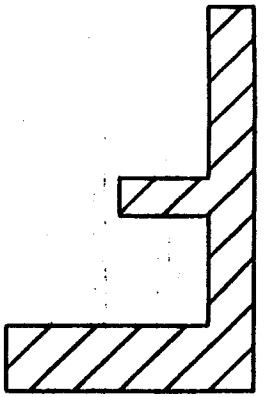

HYDRO GATE Corporation

EXPLODED VIEW

TYPE "C"

STEM GUIDE



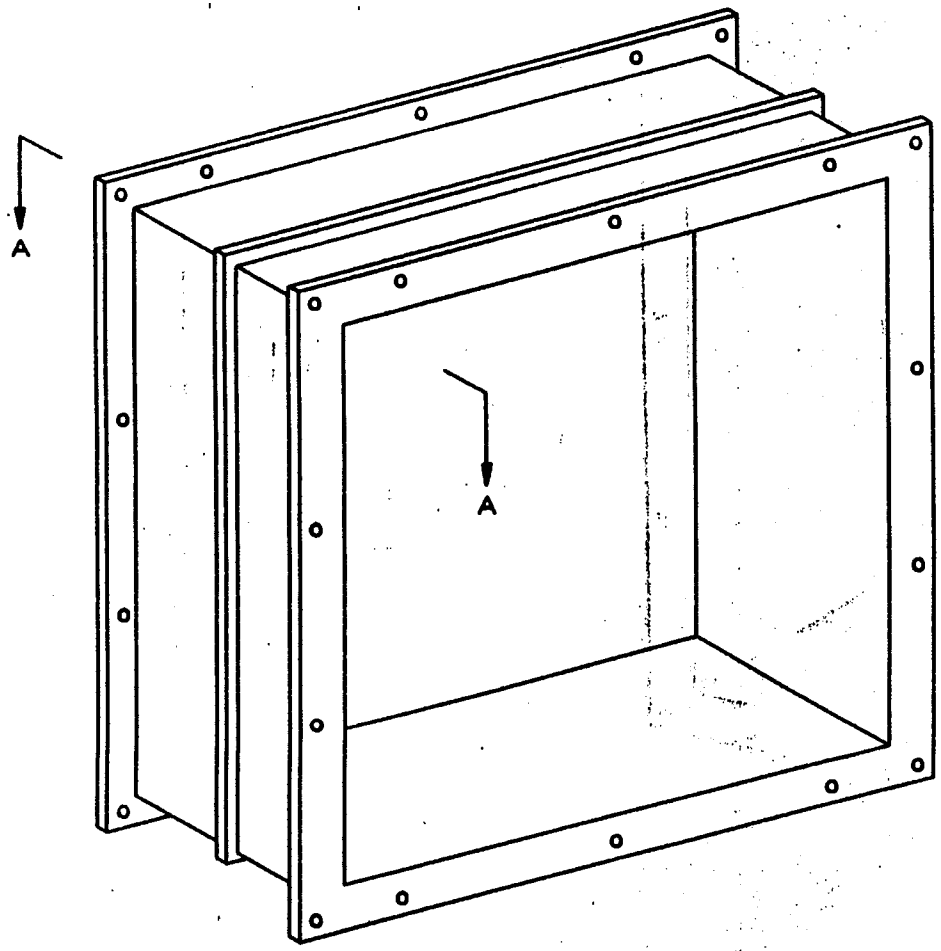
SECTION A - A

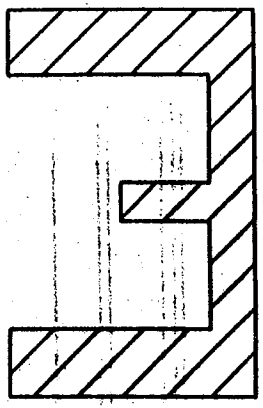
HYDRO GATE Corporation

EXPLODED VIEW

SQUARE 'F' TYPE

WALL THIMBLE



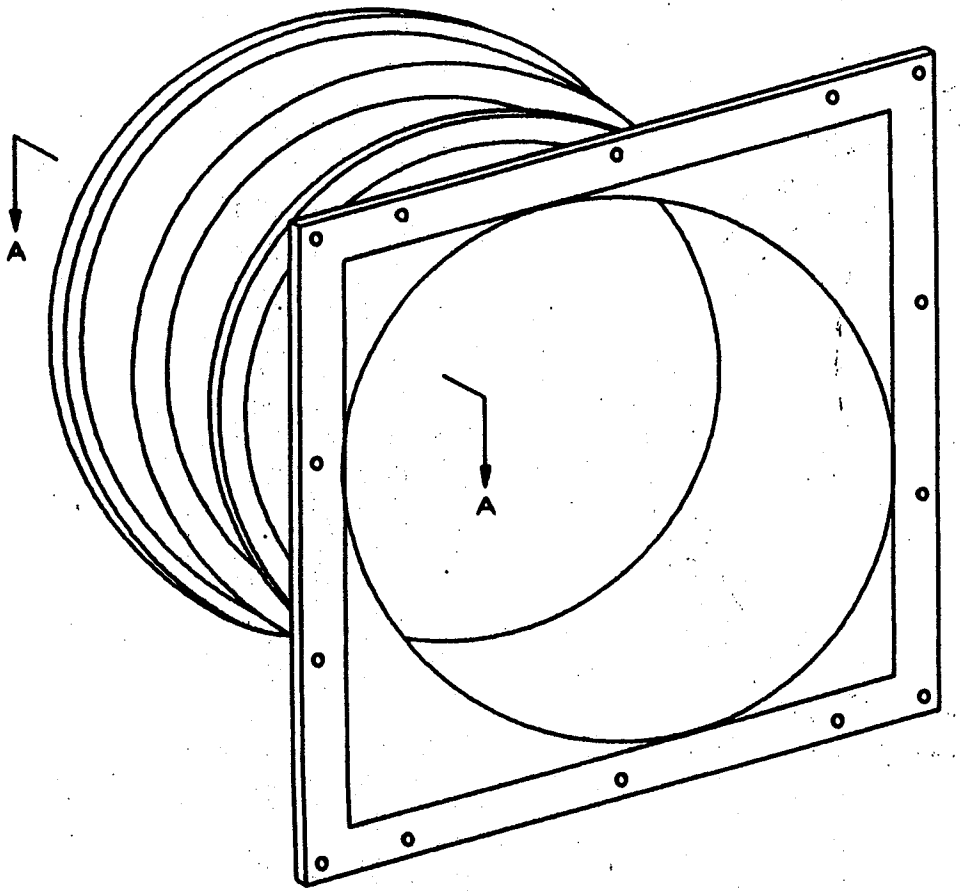
SECTION A - A

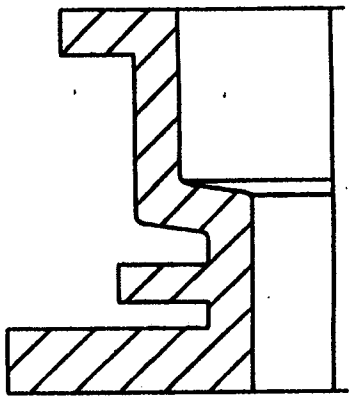
HYDRO GATE Corporation

EXPLODED VIEW

SQUARE "E" TYPE

WALL THIMBLE



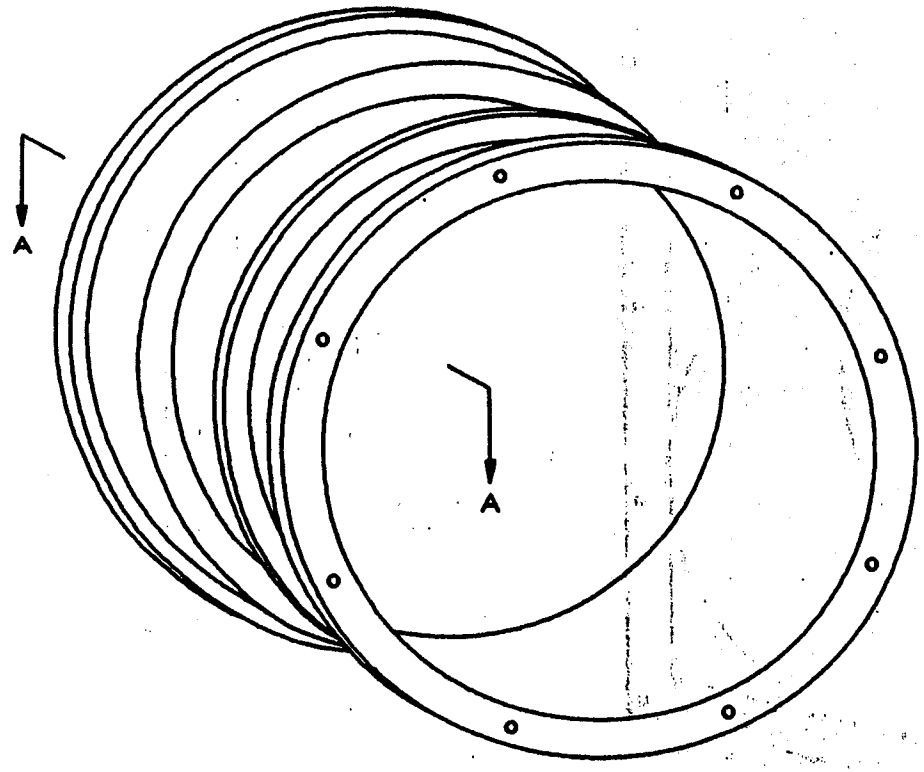
SECTION A - A

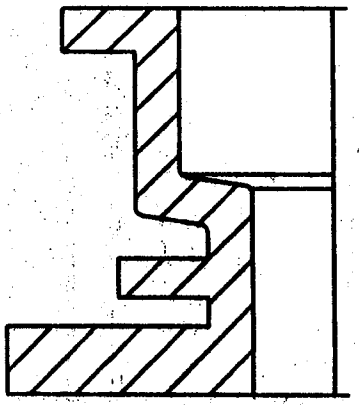
HYDRO GATE Corporation

EXPLODED VIEW

SQUARE FLANGE ROUND OPENING

MECHANICAL JOINT TYPE WALL THIMBLE



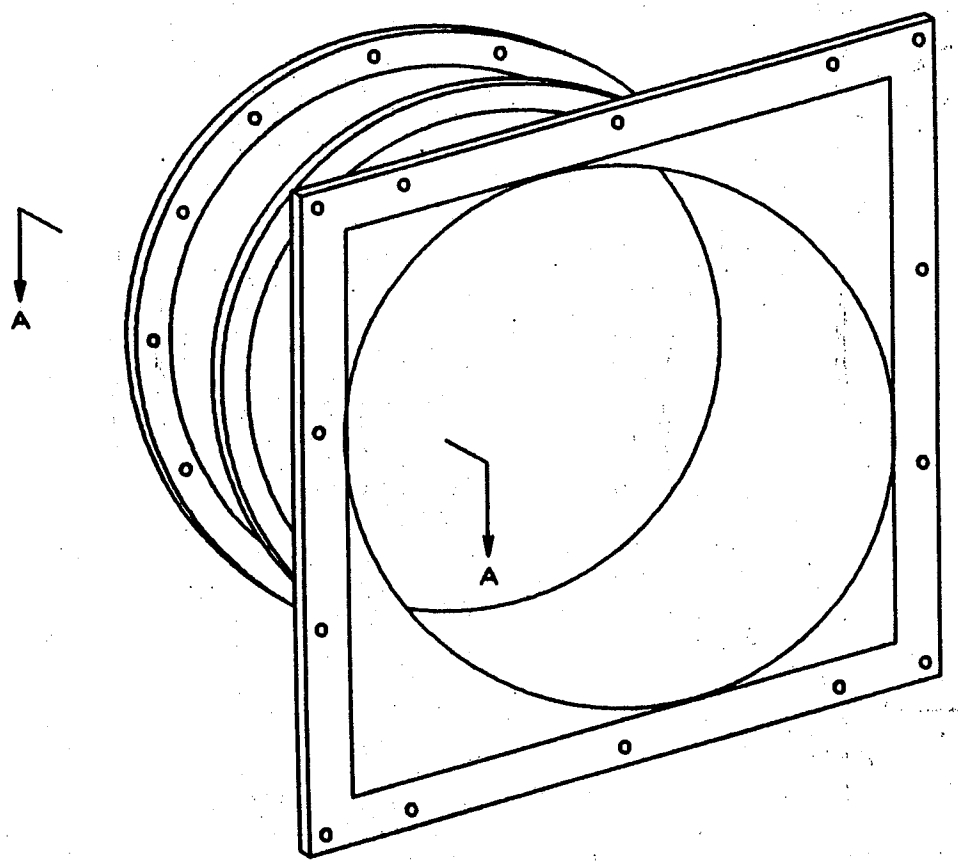
SECTION A - A

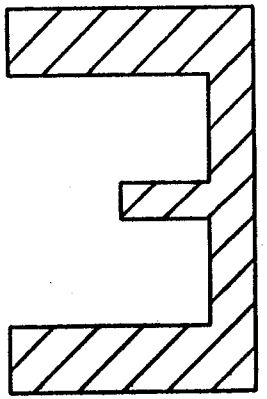
HYDRO GATE Corporation

EXPLODED VIEW

ROUND FLANGE ROUND OPENING

MECHANICAL JOINT TYPE WALL THIMBLE



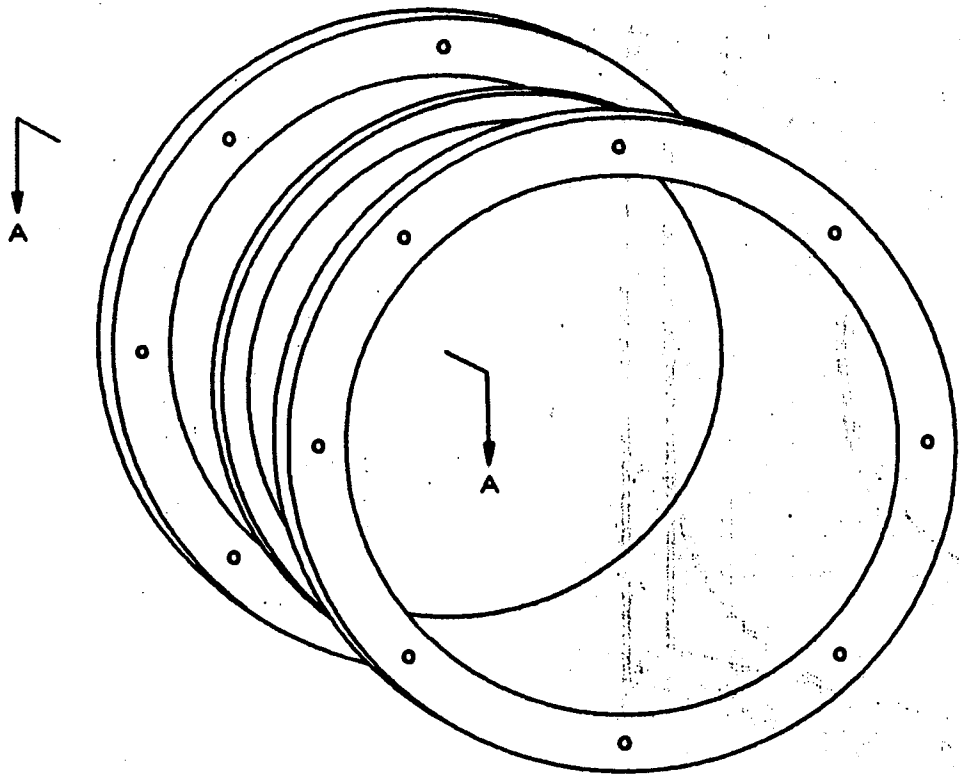
SECTION A - A

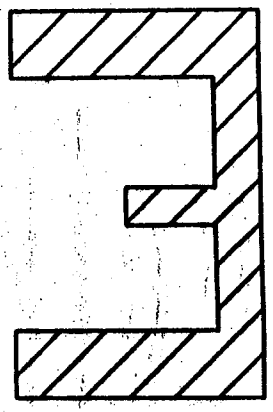
HYDRO GATE Corporation

EXPLODED VIEW

SQUARE FLANGE ROUND OPENING

"E" TYPE WALL THIMBLE



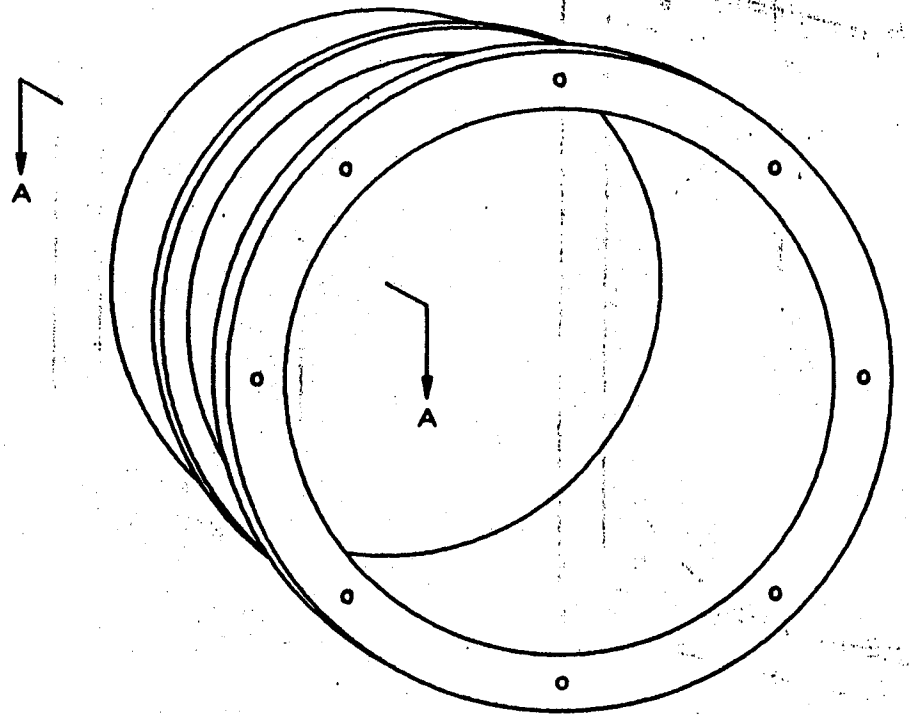
SECTION A - A

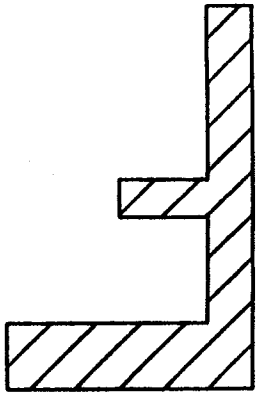
HYDRO GATE Corporation

EXPLODED VIEW

ROUND FLANGE ROUND OPENING

"E" TYPE WALL THIMBLE



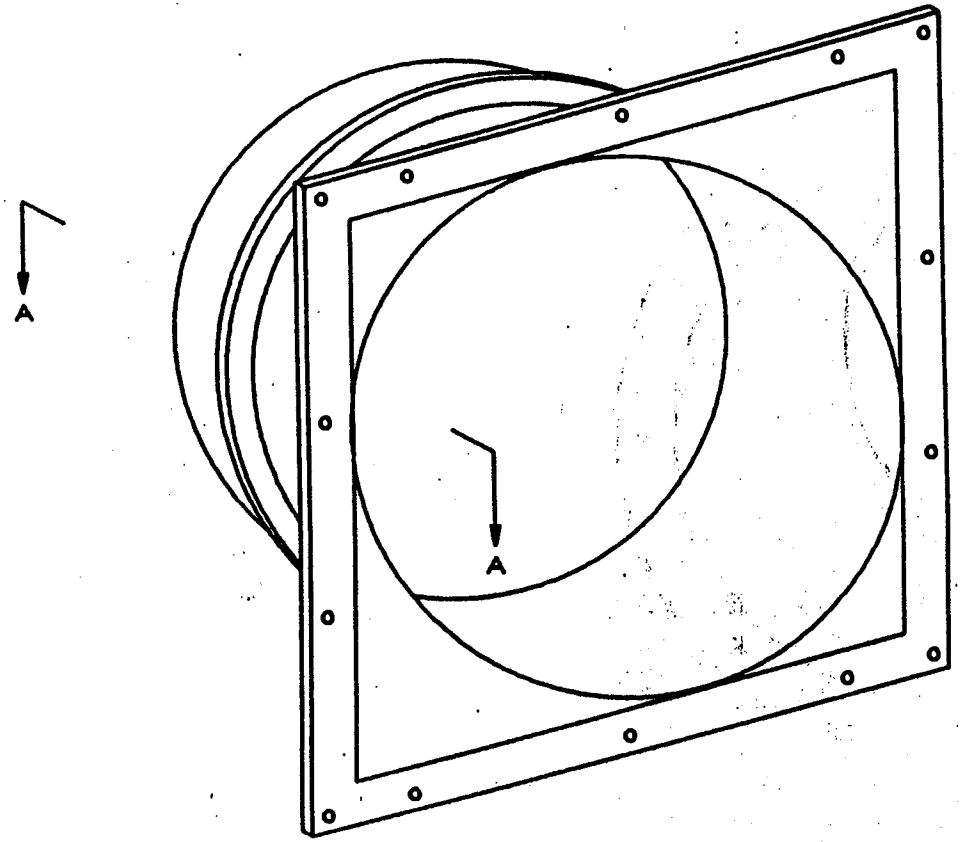
SECTION A - A

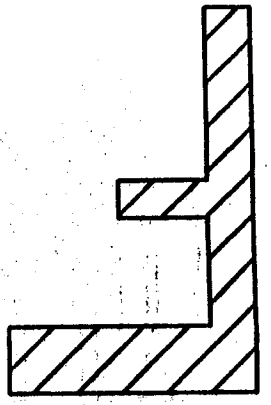
HYDRO GATE Corporation

EXPLODED VIEW

ROUND FLANGE ROUND OPENING

"F" TYPE WALL THIMBLE



SECTION A - A

HYDRO GATE Corporation

EXPLODED VIEW

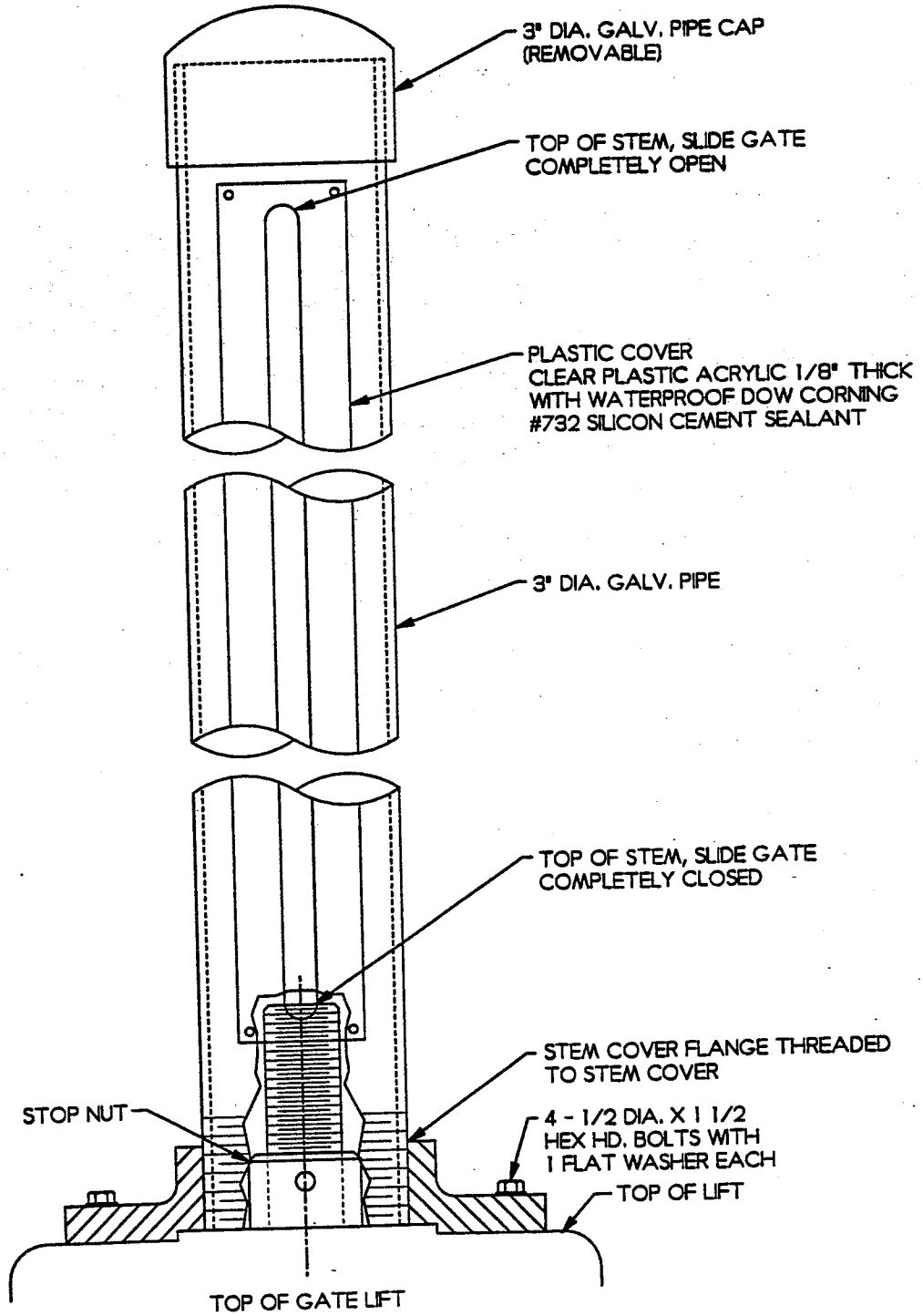
SQUARE FLANGE ROUND OPENING

"F" TYPE WALL THIMBLE

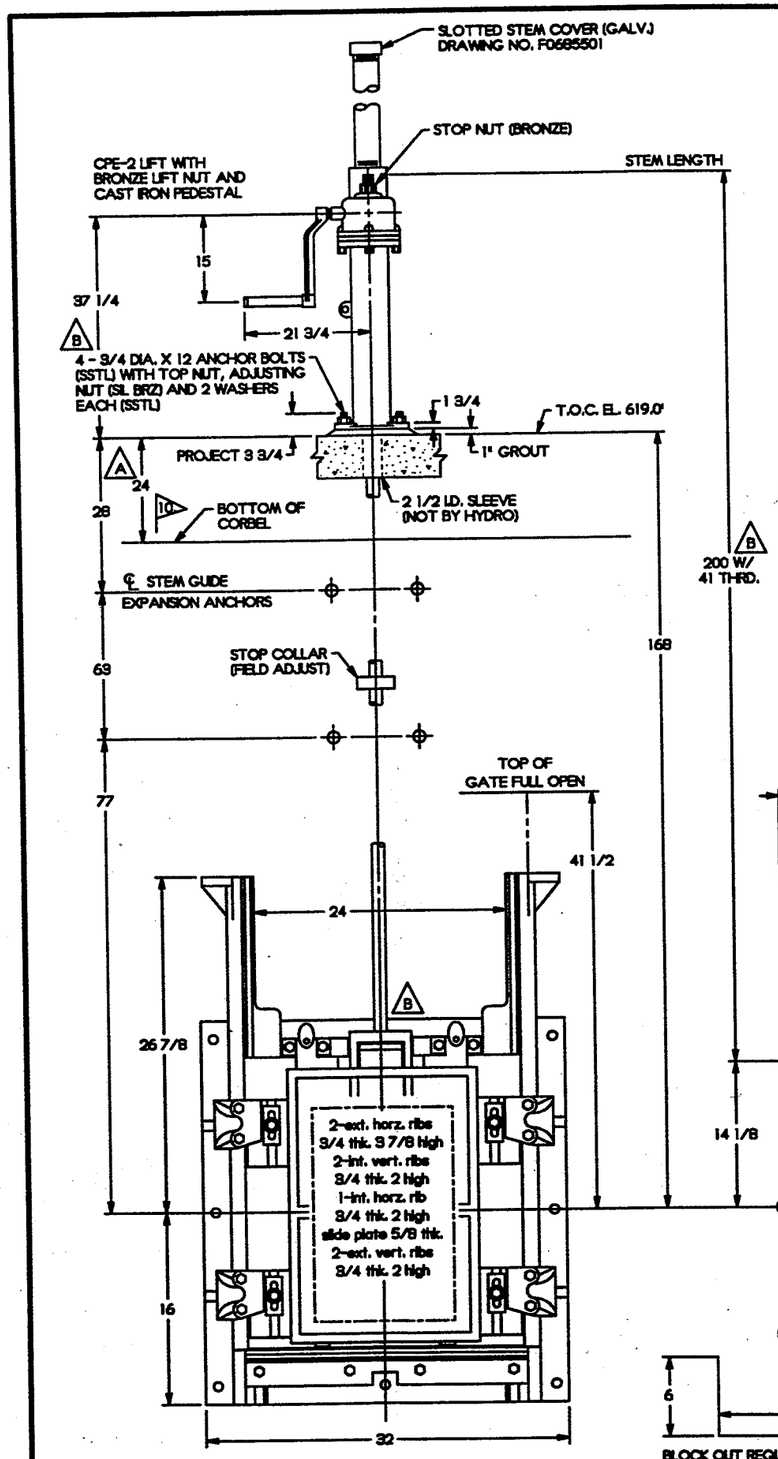
FABRICATION TOLERANCES, UNLESS OTHERWISE NOTED,
DIM. BET. UNMACH SUR: ±1/16 THRU 60", ±1/8 OVER 60"
DIM. BET. MACH SUR: ±1/32 THRU 60", ±1/16 OVER 60"
OUT OF SQ: ±1/64" PER FT. OF LG - MAX. 1/8"
DIAG. MEASUREMENT: ±1/32" PER FT. OF DIAG - MAX 1/8"
FLATNESS OR CAMBER: ±1/16 PER 3' LENGTH
ANGULARITY OF PERPENDICULAR MEMBERS: ± 0° 30'

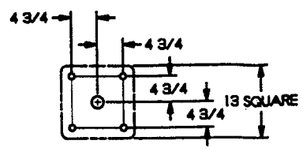
HYDRO GATE Corporation

UNLESS OTHERWISE NOTED, TOLERANCES
MACH DIM LESS THAN 30 ± .016
MACH DIM 30 AND GREATER ± .031
ANGLES ± 0° 30' SURFACES .250
SEATING SURFACES .063

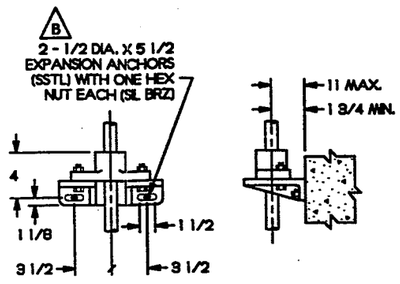



| | | | |
|---|---|---|---|
| SLOTTED GALVANIZED STEM COVER | | DRAWN RMV | CHK'D |
| FOR 24" GATE TRAVEL | | DATE 10/25/94 | |
| REFERENCE DRAWINGS: F0685001,~002 & ~003 | CUSTOMER NO TK-0299-94 | SALES ORDER 94-0685 | |
| | REV. DATE | DWG. NO. F0685501 | |

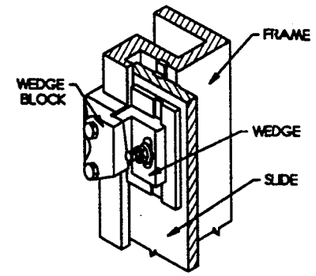


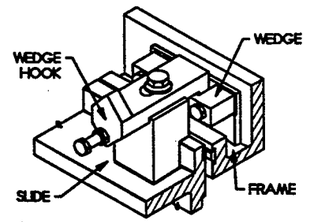

CPE-2 LIFT
ANCHOR BOLT LAYOUT



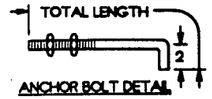

TYPE B STEM GUIDE
BRONZE BUSHED




SIDE WEDGING DEVICE DETAIL

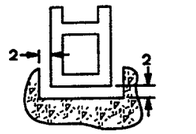



B TOP WEDGING DEVICE DETAIL

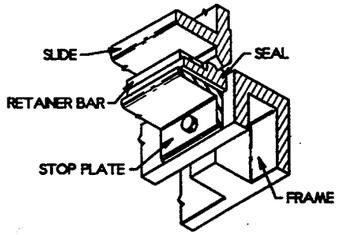



ANCHOR BOLT DETAIL

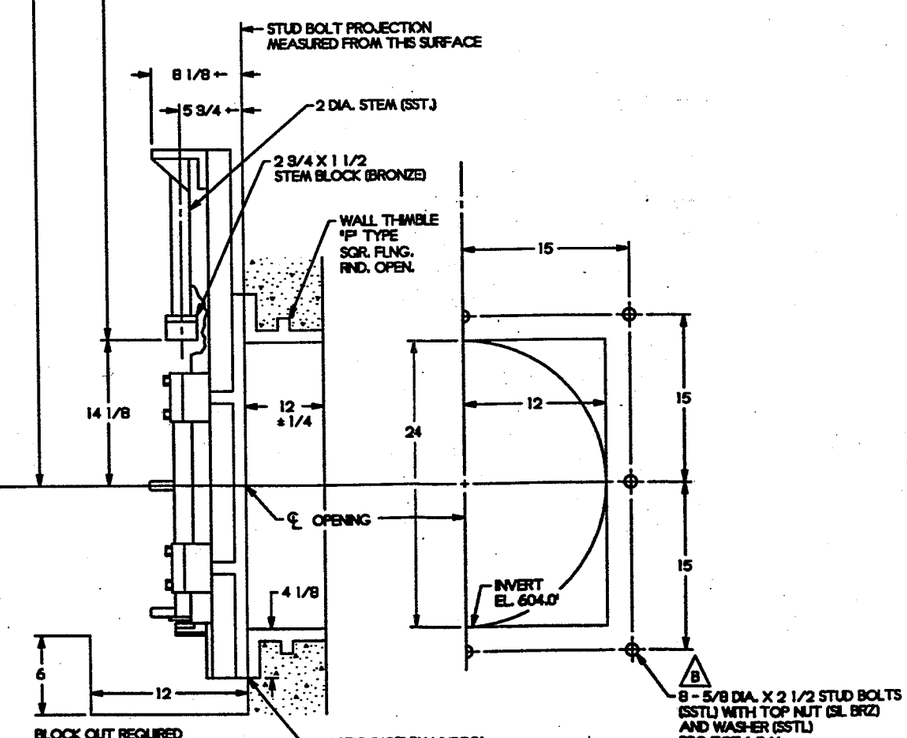
EXPANSION ANCHOR




INSTALLATION CLEARANCE




RESILIENT SEAL BOTTOM DETAIL




A BLOCK OUT REQUIRED FOR RESILIENT SEAL BOTTOM. ASPHALT FILL AFTER GATE INSTALLATION PER JOB SPECIFICATIONS.

STUD BOLT LAYOUT ON FACE OF THIMBLE

NOTES:

1. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
2. OUTLINE DIMENSIONS FOR CASTING OR STRUCTURAL EQUIPMENT HAVE A TOLERANCE OF + OR - 1/4 INCH. DIMENSIONS FOR BOLT LOCATIONS A TOLERANCE OF + OR - 1/16 INCH AS MEASURED FROM THE APPLICABLE AXIS AT CENTERLINE OF GATE OPENING.
3. MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: F0685500
4. PROJECT DESIGN HEAD: 12 FEET SEATING
   7 FEET UNSEATING
   OPERATING HEAD: 12 FEET SEATING
5. SEE MANUAL G-1000 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS
6. TAG :
7. LOCATION : GATE WELL NO. 1
8. SPECIFICATION SECTION : 15A - VERTICAL LIFT GATES
9. PLAN DRAWINGS :
10. PLEASE CONFIRM THE DISTANCE FROM THE TOP OF CONCRETE TO BOTTOM OF CORBEL.
A. CONFIRMED VIA RETURNED SUBMITTAL RECEIVED JANUARY 31, 1995.



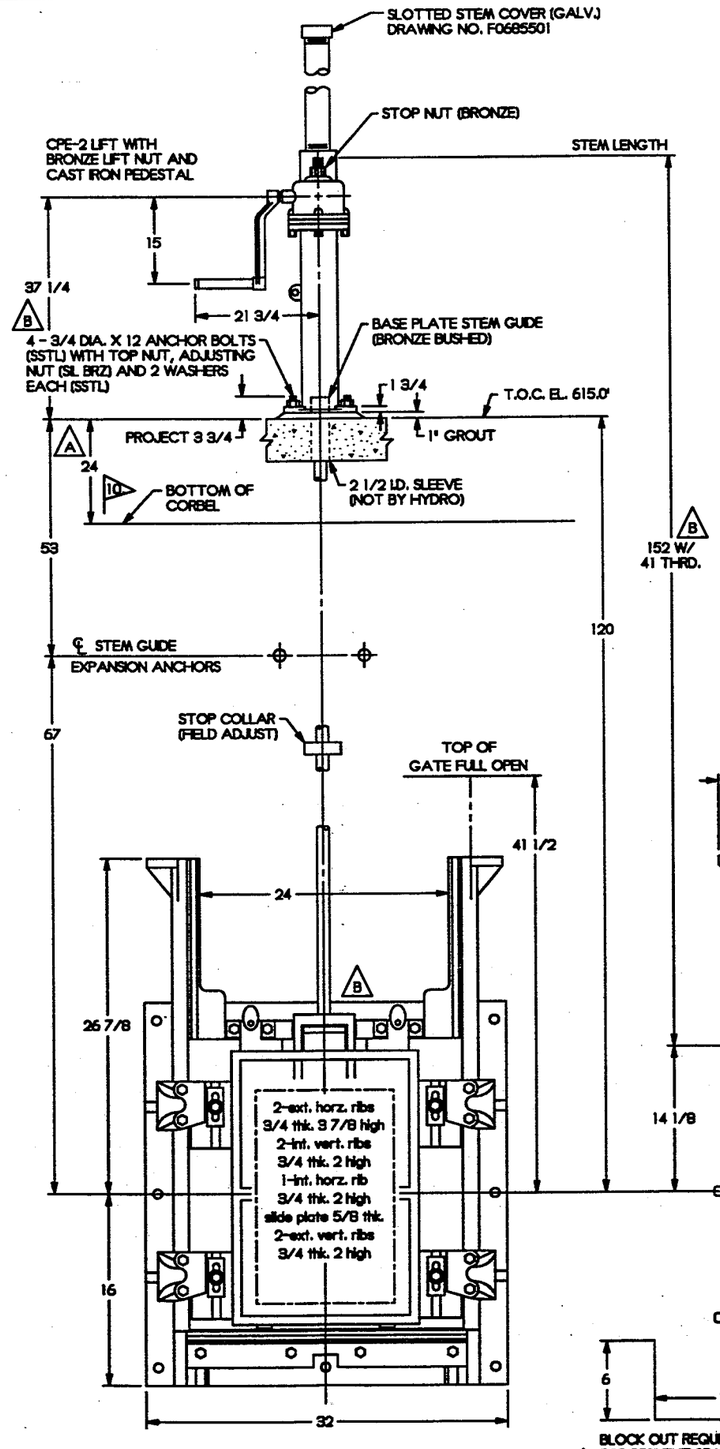
DO NOT SCALE DRAWING

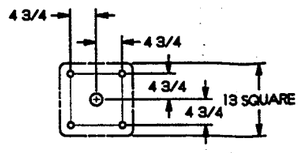
HYDRO GATE Corporation

SLUICE GATE SERIES 501

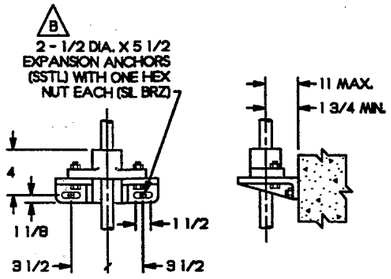
SIZE 24 x 24 — NOT SELF-CONTAINED
UNIVERSAL FRAME-FLANGE — RISING STEM
RESILIENT SEAL BOTTOM
1 REQUIRED

| REVISED | DRAWN BY | CUSTOMER NO. | SALES |
|---|---|---|---|
| | RMV | TK-0299-94 | 94-0685 |
| B DAL 06/08/95 RMV 7/5/95 | CHECKED BY | DATE 10/25/94 | DRAWING NO. F0685001 |
| A | | | |

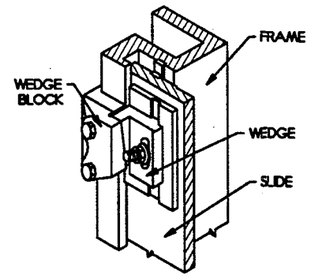


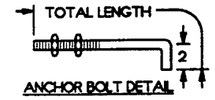

CPE-2 LIFT
ANCHOR BOLT LAYOUT




TYPE B STEM GUIDE
BRONZE BUSHED

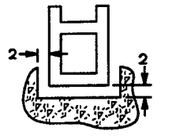



SIDE WEDGING DEVICE DETAIL

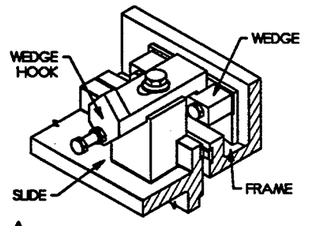



ANCHOR BOLT DETAIL

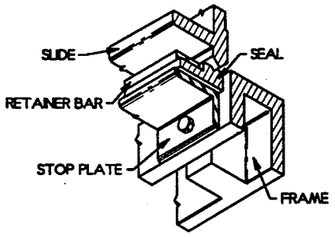
EXPANSION ANCHOR




INSTALLATION CLEARANCE




B TOP WEDGING DEVICE DETAIL




RESILIENT SEAL BOTTOM DETAIL

NOTES:

1. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
2. OUTLINE DIMENSIONS FOR CASTING OR STRUCTURAL EQUIPMENT HAVE A TOLERANCE OF + OR - 1/4 INCH. DIMENSIONS FOR BOLT LOCATIONS A TOLERANCE OF + OR - 1/16 INCH AS MEASURED FROM THE APPLICABLE AXIS AT CENTERLINE OF GATE OPENING.
3. MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: F0665500
4. PROJECT DESIGN HEAD: 12 FEET SEATING
   7 FEET UNSEATING
   OPERATING HEAD: 12 FEET SEATING
5. SEE MANUAL G-1000 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS
6. TAG :
7. LOCATION : GATE WELL NO. 2
8. SPECIFICATION SECTION : 15A - VERTICAL LIFT GATES
9. PLAN DRAWINGS :

10 PLEASE CONFIRM THE DISTANCE FROM THE TOP OF CONCRETE TO BOTTOM OF CORBEL.

A CONFIRMED VIA RETURNED SUBMITTAL RECEIVED JANUARY 31, 1995.



DO NOT SCALE DRAWING

HYDRO GATE Corporation

SLUICE GATE SERIES 501

SIZE 24 x 24
UNIVERSAL FRAME-FLANGE
RESILIENT SEAL BOTTOM
1 REQUIRED

NOT SELF-CONTAINED
RISING STEM

| REVISED | DRAWN BY | CUSTOMER NO. | SALES |
|---|---|---|---|
| | RMV | TK-0299-94 | 94-0685 |
| | CHECKED BY | DATE | DRAWING NO. |
| JAL 05/08/95 RMV 2/5/95 | | 10/25/94 | F0685002 |

B A

## MATERIAL SPECIFICATIONS

| GATE PART OR ITEM OF ASSEMBLY | MATERIAL DESCRIPTION | MATERIAL CODE | MATERIALS SHOWN IN ASTM SPECIFICATION UNLESS NOTED OTHERWISE |
|---|---|---|---|
| **EMBEDMENTS** | | | |
| WALL THIMBLE | CAST IRON | (A) | A126, CLASS B |
| WALL THIMBLE STUDS | STAINLESS STEEL | (L) | A276, TYPE 304 |
| WALL THIMBLE NUTS | (A) SILICON BRONZE | (J) | B98, ALLOY 655 |
| ANCHOR BOLTS | STAINLESS STEEL | (L) | A276, TYPE 304 |
| ANCHOR BOLT NUTS | (A) SILICON BRONZE | (J) | B98, ALLOY 655 |
| **GATE ASSEMBLY** | | | |
| FRAME AND SLIDE | CAST IRON | (A) | A126, CLASS B |
| SEATING FACES | NAVAL BRONZE | (F) | B21, ALLOY 482 |
| SIDE WEDGE BLOCKS | MANGANESE BRONZE | (K) | B584, ALLOY 862 |
| SIDE WEDGES | MANGANESE BRONZE | (K) | B584, ALLOY 862 |
| TOP AND BOTTOM WEDGES | MANGANESE BRONZE | (K) | B584, ALLOY 862 |
| FASTENERS | STAINLESS STEEL | (L) | F593 (BOLTS), ALLOY GROUP 1 (304) |
| | (A) SILICON BRONZE | (J) | B98, ALLOY 655 |
| STOP PLATE AND RETAINER | STAINLESS STEEL | (L) | A276, TYPE 304 |
| FLUSH BOTTOM SEAL | RUBBER | (B) | D2000, GRADE 1AA625 |
| **STEM AND ACCESSORIES** | | | |
| STEM | STAINLESS STEEL | (L) | A276, TYPE 304 |
| STEM BLOCK | MANGANESE BRONZE | (K) | B584, ALLOY 865 |
| KEY | STAINLESS STEEL | (L) | A276, TYPE 304 |
| **LIFT ASSEMBLY** | | | |
| 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 |
| **STEM GUIDE** | | | |
| STEM GUIDE | CAST IRON | (A) | A126, CLASS B |
| STEM GUIDE BUSHING | TIN BRONZE | (E) | B584, ALLOY 932 |
| FASTENERS | STAINLESS STEEL | (L) | F593 (BOLTS), ALLOY GROUP 1 (304) |
| | (A) SILICON BRONZE | (J) | B98, ALLOY 655 |
| BASE PLATE STEM GUIDE | CARBON STEEL | (V) | A36 |

## 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 PART NO.: 45598T — TNEMEC, SERIES 140-1211 POTA-POX COLOR RED

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

FOR THE FOLLOWING COMPONENTS:

| | | |
|---|---|---|
| ☒ GATE | ☒ THIMBLE | ☐ STEM |
| ☒ STEM GUIDES | ☐ WALL BRACKET | ☒ LIFT |
| ☒ BASE PLATE STEM GUIDE | ☐ STEM BLOCK | ☐ _____ |

COATING PART NO.: 45599T — TNEMEC, SERIES 140-1255 POTA-POX COLOR BEIGE

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

FOR THE FOLLOWING COMPONENTS:

| | | |
|---|---|---|
| ☒ GATE | ☒ THIMBLE | ☐ STEM |
| ☒ STEM GUIDES | ☐ WALL BRACKET | ☒ LIFT |
| ☒ BASE PLATE STEM GUIDE | ☐ STEM BLOCK | ☐ _____ |

NOTES:

1. SEATING SURFACES MACHINED TO 63 MICRO-INCH FINISH.
2. .004 CLEARANCE CHECK PROVIDED ON SEATING SURFACES BETWEEN FRAME AND SLIDE.
3. SURFACES EMBEDDED IN CONCRETE ARE NOT PAINTED.
4. WALL THIMBLES STAMPED WITH THE WORD "TOP" FOR ALIGNMENT.



HYDRO GATE Corporation

| | | |
|---|---|---|
| MATERIAL AND COATING SPECIFICATIONS<br>HEAVY DUTY SLUICE GATE SERIES 501<br>MATERIAL COMBINATION NO. 1 | DRAWN RMV | CHK'D |
| | DATE 10/29/94 | |
| CUST. NO. TK-0299-94 | SALES ORDER 94-0685 | |
| REV. JAL DATE 06/08/95 | DWG. NO. F0685500 | A |

Sluice Gate for Outlet #3

# INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR MEDIUM DUTY SLUICE GATES MANUAL G-1500


HYDRO GATE Corporation

HYDRO

P.O. Box 620 · Commerce City, CO 80037-0620
6101 No. Dexter St. · Commerce City, CO 80022


**DO NOT DISASSEMBLE GATE FOR INSTALLATION**


8-1990

HYDRO Gate Corporation P.O. BOX 629 • COMMERCE CITY, COLORADO 80037-0629
(303) 288-7873
FAX: (303) 287-8531

Caution-These models are easily warped during installation. These instructions must be carefully followed for correct gate installation.

This gate was accurately machined, assembled and inspected before it left the factory. Wedges and wedge blocks were adjusted to make proper metal-to-metal contact. The space between the seating face was adjusted to less than four thousandths (0.004) of an inch. Since only one wedge per side is used on these models and they are relatively light, the seating faces may open up in shipment. If these installation instructions are carefully followed, the gates will operate properly.

**Instructions for installing gate attached to pipe**

1. Set assembled gate with attached pipe in desired position.

2. The attached pipe may be connected to other pipe by means of band couplers or a concrete headwall may be poured around the attached pipe section. **CAUTION:** Deflection or distortion of attached pipe section from its original shape will cause warping of the gate seat. Excess leakage will result. Bracing of the pipe section to maintain its original shape may be necessary. After bracing, check the seating faces to make sure that the seal casting has not been distorted.

3. After Adjacent backfill has been consolidated or concrete headwall has been poured, remove all interior bracing.

4. With the gate in the fully closed position and before placing in operation, check to see that the slide and seat make proper contact around the full circumference of the seating surfaces.

Hydro Gate Corporation
P.O. BOX 629 · COMMERCE CITY, COLORADO 80037-0629
(303) 288-7873
FAX: (303) 287-8531

# Instructions for installation of spigot back gate

1. Insert all anchor bolts in the holes provided in the gate. Two nuts are used with each bolt. Place one nut on each anchor, near the bottom end of the threaded section. Insert the bolts into the proper holes in the gate from the back. Place the second nut on each anchor and tighten firmly.

2. Set the completely assembled gate in the forms.

3. **BE SURE THE SLIDE IN THE FULLY-CLOSED POSITION BEFORE POURING CONCRETE.** Check sealing surfaces with the feeler gauge to insure correct gate adjustment.

4. Pour concrete. **EXTREME CARE IN PLACING OF THE CONCRETE MUST BE USED TO PREVENT WARPAGE OF THE SEATING CASTING.**

5. After removal of forms, carefully check for voids between the back and the concrete. Such voids must be filled.

## Instruction for installation of flap back gates

Satisfactory installation can be made by either of the following methods.

### METHOD "A" PER FIGURE 1

1. Secure anchor bolts in positions in the forms. For proper size, length, projection and spacing, see drawing or tables. A recess must be provided around the perimeter of the gate seal similar to that shown in figure 1. This recess is necessary in order to adjust the back nuts on each anchor bolt for proper gate alignment before grouting.

2. Pour concrete.

3. Two nuts are provided with each anchor. Place one nut on each anchor bolt and run it down to the end of the threaded section. Align anchors by bending if required. Place completely assembled gate into position on the anchors. Place second or front nut on each anchor.

4. Align gate in final desired position by bringing both nuts on all anchor bolts in light, uniform contact with the gate.

5. Check seating faces with feeler gauge. If gate seating faces show an access opening at any point, adjust back and front nuts to bring the face of the seat casting into proper contact with the seating face on the slide by slight warping of the seat casting. Tighten front nuts uniformly.

6. Carefully grout gate in place.

7. After grout is set, check gate seating faces. Check for voids behind the gate seat. Regrout if necessary.

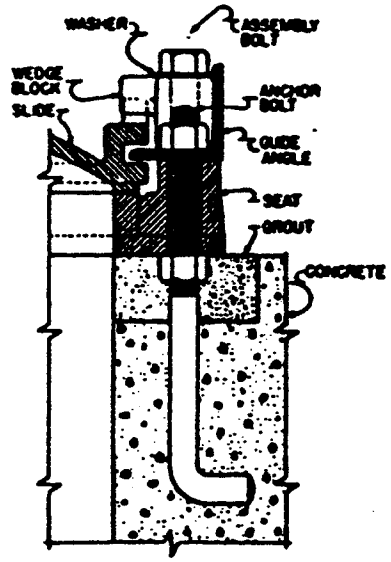



FIGURE 1

## METHOD "B" PER FIGURE 2

1. Secure anchor bolts in proper position in the forms. For proper size, length, projection and spacing, see accompanying drawing or table.

2. Pour concrete.

3. Two nuts are provided for each anchor bolt for use with other methods of installation. For this method use only one nut on each bolt, as indicated in figure 2. Before placing the completely assembled gate into position on the anchor bolts, place a mastic or grout over the entire area to be covered by the gate seat. (NOTE: This is necessary to provide uniform bearing and a seal between the gate and the wall.

4. Place the completely assembled gate into position on the anchors, aligning them if required. Place one nut on each anchor.

5. Tighten all nuts uniformly. Check gate seating faces as bolts are being tightened to insure that the gate seat is not warped out of line. If warpage occurs, it may be necessary to drive thin wedges between the concrete and the gate. These wedges will push the gate casting away from the concrete until the seating faces make proper contact. Regrout if required.

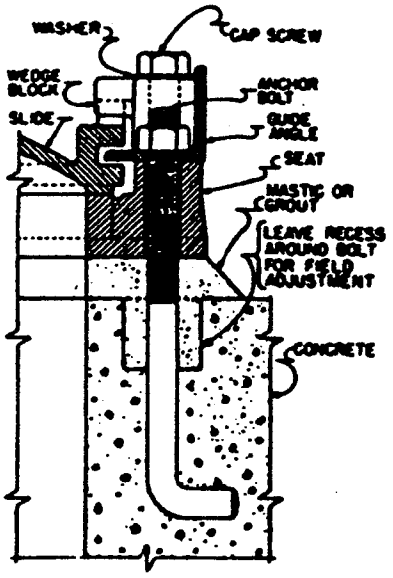



FIGURE 2

Hydro Gate Corporation P. O. BOX 629 · COMMERCE CITY, COLORADO 80037-0629
(303) 288-7873

# INSTALLATION AND LEAKAGE

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) under shelf 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 and operating instructions furnished for automatic lifts during approval submittals. Manufacturer's assistance in setting and adjusting these units is not included in the purchase agreement, although field service rates are available on request.

DO----------contact your Hydro Gate representative with any questions you may have regarding Hydro Gates. Hydro Gates benefit from a combined gate design and manufacturing experience of over 100 years - 70 plus of Armco and 30 - plus of Fresno Valves and Castings, Inc., Hydro's parent company a treasured background of expertise and development.

DON'T-------stack gates in storage.

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.

## 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 sluice 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 this occurs, all of the fine adjustments that were made in our plant are completely lost. It is then necessary to clean all of the contact faces, reinstall the slide and adjust all wedging devices in strict accordance with our instructions.

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 cast iron gates, the gate seat, or frame, is comparatively flexible and is easily pulled out of line if it is not correctly installed. This will result in leakage, the amount depending upon the deflection of the castings by tightening of nuts on anchors.

In order to minimize leakage through heavy duty sluice gates and meet or exceed the AWWA Sluice Gate Standard, installation must be very precise. Installation procedures for heavy duty sluice gates are covered in our manual G-1000. Our instructions not only call for careful installation of gates, but also points out the importance of final cleaning and lubrication of seating faces and wedge contact surfaces prior to putting the gate into operation. We also recommend that a water resistant grease be applied to all these surfaces. This grease does allow for proper seating of the gate in the last turn or two of the hand crank. For example, when the slide is moved downward in a vertical direction by as little as 1/64 of an inch, the wedging devices cause it to move towards the seating surface by .002 inch. This almost negligible horizontal movement can make considerable difference in the amount of leakage through a sluice gate.

In the case of fabricated slide gates, such as our Model 5-00 and 10-00 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 seating 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.

Flap gates are designed strictly for seating heads. Watertightness under seating heads depends on the accuracy of the installation. As the head of water builds up on the face of the flap, it is pushed more firmly against the seat and watertightness may improve. The flap is not designed to be flexible so it would take a great depth of water before slight deflection would overcome any misalignment in the seat during installation. On those installations where leakage through the flap gates is critical, then a rubber seating face on its frame will improve watertightness with a minumum water depth equal to 1.5 times the diameter of the gate. Up to that point, there is not sufficient force against the flap to compress the rubber to eliminate all leakage. Under very low heads, there is usually more leakage betweeen the face of the rubber and the metal dovetail face than there is through a flap gate with two metal faces.

Radial and Roller Gates are usually subjected to smaller unbalanced heads and are furnished with rubber seals. With careful installation, these gates can be made nearly watertight. For maximum watertightness, corrosion resistant rubbing angles or plates should be used for seating surfaces for rubber seals.

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Maintenance and Lubrication

1. Exposed non-operating surfaces that are not galvanized should be coated with a bituminous paint designed to withstand the operating conditions prevailing at the particular installation. Periodic inspection, cleaning and repainting are recommended as conditions at the site permit.

2. Clean and grease the gate stem threads as required to maintain maximum operating efficiency.

3. Lifts have been lubricated at the factory with a water-resistant grease designed to stay pliable and not dry out over long periods. Periodic pressure greasing of ball bearing type lifts is recommended. For best results, turn the handwheel or input shaft of geared lifts three or four times and apply grease through each fitting to insure adequate lubrication at all interior parts. If lift is equipped with dial indicator, care must be used to prevent grease from interfering with internal gearing of indicator. Greases such as Conoco's "All Purpose Superlube," Texaco's "Multi-Fax Heavy Duty No. 2," or Shell Oil Company's "Alvania No. 1" have been found entirely satisfactory.

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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" (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"

   NOTE: For water treatment plants, use a vegetable base lubricant - "Lubriplate Super FML-2."

*Equivalents to Fiske Bros. "Lubriplate No. 630 AAA"

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 North Washtenaw Avenue
Chicago, IL 60612
(312) 826-1700

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# TROUBLESHOOTING

## MODELS 101C and 20-10C GATES - USE WITH INSTALLATION, OPERATION AND MAINTENANCE MANUAL HG-1500

### 1. Excessive Leakage Under the Slide

Excess leakage occurring with a uniform sheet of water flowing underneath the gate slide indicates one or both of the wedges is too tight, and the slide is being stopped short of its fully closed position. Check between each tapered face of wedge and wedge block with a .004 feeler gage. If the feeler gage cannot be passed freely between tapered surfaces, that wedge is too tight and is preventing the slide from closing. Check both wedges with the feeler gage. Loosen the side wedge that is too tight. Lower slide until seating faces on slide and frame are aligned, then retighten wedges

### 2. Excessive Leakage at One Particular Location

Excess leakage occurring at one particular location indicates that one wedge is improperly adjusted. Check between tapered face of wedge and wedge block with .004 thickness gage. If feeler gage passes between these surfaces, readjust that wedge. Even if the .004 feeler gage cannot be passed between tapered wedge faces, loosen the bolts through wedge and adjust the wedge tighter.

If you are unable to correct the leakage by readjusting the wedge, it may be caused by foreign material between gate seating faces. Open the gate an inch or two if it is a piece of rag, stick, or other foreign material, and flush out. If the leakage still persists, foreign material in the form of paint or grit may be on seating faces. To correct this problem, dewater the gate completely, clean all seating faces and wedge surfaces and grease faces.

### 3. Excessive Leakage Along Top; Stem Block Pocket Located at or Near the Top of the Slide

Leakage is occurring at the center top of the gate only. With this slide configuration, it is possible to push down on the stem so hard that the stem block is pulling the gate slide from its seating faces at the top. Reverse the direction of rotation on the handwheel, geared lift, or power actuated lift to relieve the compression on the stem and the excess force on the top of the slide. If the slide was being deflected, the excess leakage will diminish or stop when the compression in the stem is released.
**CAUTION: DO NOT RAISE THE SLIDE FROM ITS WEDGING DEVICES.** Actuate the lift only enough to allow the stem to straighten.
To prevent the slide from deflecting at the stem block pocket, readjust the stop nut on manually operated lifts, or the torque and limit switches on electrically actuated lifts.

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4. Dirty Seating Faces

Excess leakage can also be caused by foreign material on 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 off the foreign materials from the perimeter of the seating faces on both slide and frame, and reseat the gate.

5. 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 our 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.

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6. Excess Force is Required on Handwheel or Crank

When this condition exists:

A. Check first that the stem is lubricated. If necessary, follow lubrication instructions in manual HG-1500.

B. If a simple application of lubricant does not appear to solve the problem, foreign material is undoubtedly present inside the threaded nut. In extreme cases, this foreign material is packed between the threads of the stem and the nut so tightly that it is almost impossible to turn the handwheel or crank. When the crank does not turn the lift nut, there is usually a "groaning noise which is the slow movement of the lift nut on the stem.

To correct, apply liberal amounts of penetrating oil to the top of the stem, so it will run down into the thread in the lift nut. Turn the crank, or handwheel, to rotate the lift nut back and forth on the stem. Through repeated applications of penetrating oil, the foreign material will begin to be washed out of the threads. As it loosens, the stem can be moved further up or down. After it is free, the entire lift should be removed so that the interior of the thread nut and the threaded section of the stem can be thoroughly cleaned and relubricated. Check for thread damage within the nut and on the stem, prior to reinstallation.

C. If the nut 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.

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# 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.

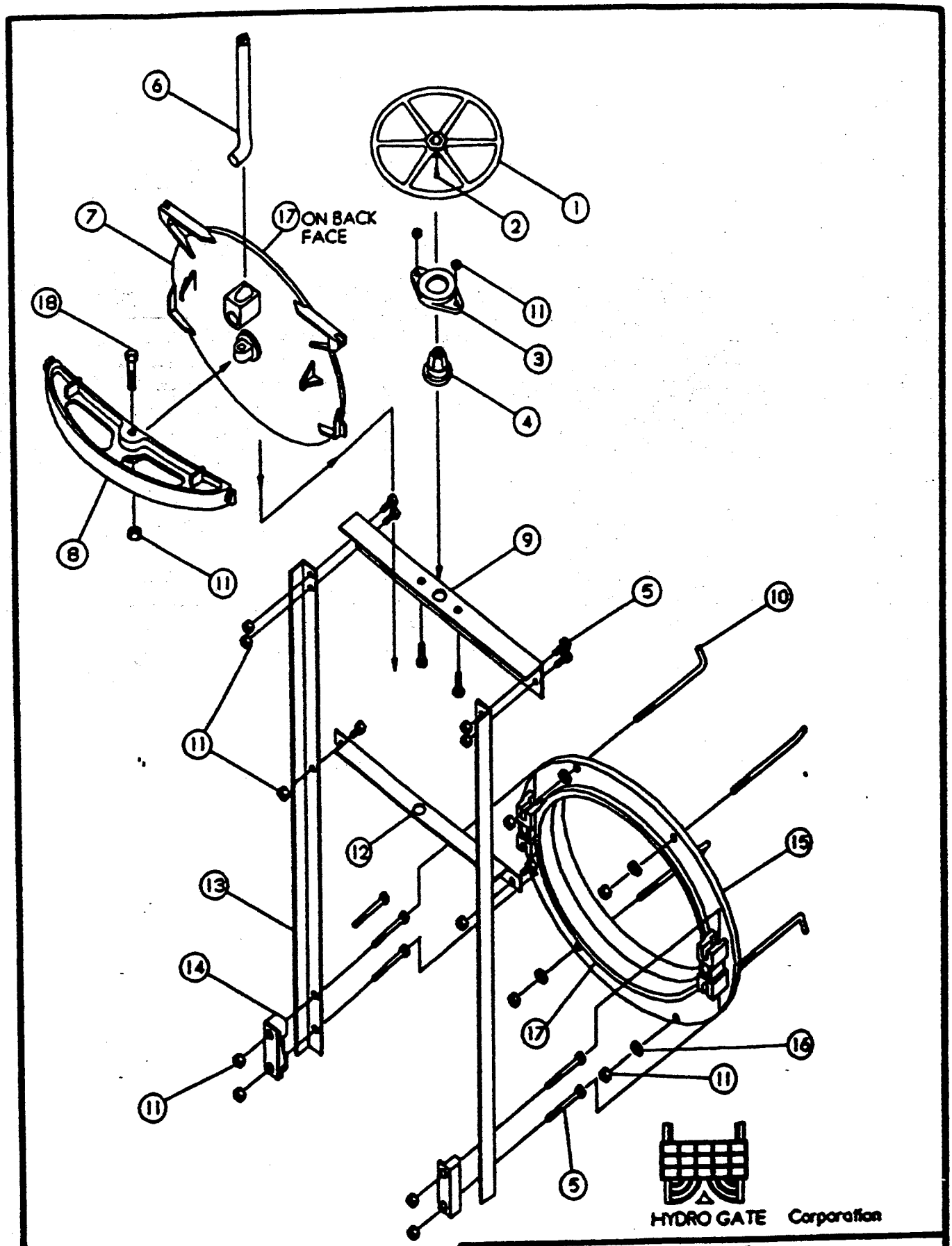
6. Store lift assemblies either upright with plastic plugs/caps in place to keep dirt out of nut threads or leave in original shipping carton. Do not store the lifts directly on the ground.

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.




EXPLODED VIEW

MEDIUM DUTY SLUICE GATE

MODEL 20-10C

| NO. | PARTS LIST |
|---|---|
| 1. | HANDWHEEL (CAST IRON) |
| 2. | SET SCREW |
| 3. | LFT KEEPER (CAST IRON) |
| 4. | LFT NUT |
| 5. | MACHINE ASSEMBLY BOLTS |
| 6. | STEM |
| 7. | SLIDE (CAST IRON) |
| 8. | CROSS BAR (CAST IRON) |
| 9. | HEAD ANGLE |
| 10. | ANCHOR BOLTS |
| 11. | HEX NUTS |
| 12. | STEM SUPPORT ANGLE |
| 13. | GUIDE ANGLES |
| 14. | WEDGE BLOCKS (CAST IRON) |
| 15. | SEAT (CAST IRON) |
| 16. | FLAT WASHERS |
| 17. | SEATING FACES |
| 16. | CROSS BAR BOLT |

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PARTS LIST FOR

MEDIUM DUTY SLUICE GATE

MODEL 20-10C

## 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:
PART NO.: 45598T

TNEMEC, SERIES 140 - 1211 POTA-POX COLOR RED

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

FOR THE FOLLOWING COMPONENTS:

- ☒ GATE (SLIDE & SEAT)
- ☐ STEM GUIDES
- ☐ LIFT
- ☐ WALL BRACKET
- ☐ PIPE CAPS
- ☒ STEM
- ☐ WALL THIMBLE
- ☐ BASE PLATE STEM GUIDE

(A)

COATING:
PART NO.: 45599T

TNEMEC, SERIES 140 - 1255 POTA-POX COLOR BEIGE

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

FOR THE FOLLOWING COMPONENTS:

- ☒ LIFT
- (A) ☒ STEM

## MATERIAL SPECIFICATIONS

| GATE PART OR ITEM OF ASSEMBLY | MATERIAL DESCRIPTION | MATERIAL CODE | MATERIALS SHOWN IN ASTM SPECIFICATION UNLESS NOTED OTHERWISE |
|---|---|---|---|
| **GATE ASSEMBLY** | | | |
| SEAT AND SLIDE | CAST IRON | (A) | A126, CLASS B |
| SEATING FACES (SEAT) | CAST IRON | (A) | A126, CLASS B |
| SEATING FACES (SLIDE) | CAST IRON | (A) | A126, CLASS B |
| SIDE WEDGE BLOCKS | CAST IRON | (A) | A126, CLASS B |
| STRUCTURALS | GALVANIZED STEEL | (N) | A36, A123 (COATING) |
| FASTENERS | GALVANIZED STEEL | (N) | A307, A164 (COATING) |
| STEM | CARBON STEEL | (Y) | A108, GRADE 1045 |
| LIFT HOUSING | CAST IRON | (A) | A126, CLASS B |
| LIFT NUT | RED BRASS | (FF) | B584, ALLOY 844 |
| STOP NUT | NAVAL BRONZE | (F) | B21, ALLOY 485 |

NOTES:

1. SEATING SURFACES MACHINED TO 63 MICRO-INCH FINISH.

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BILL OF MATERIAL AND COATING SPECIFICATIONS
LIGHT DUTY SLUICE GATE - MODEL 101C
MATERIAL COMBINATION NO. 1

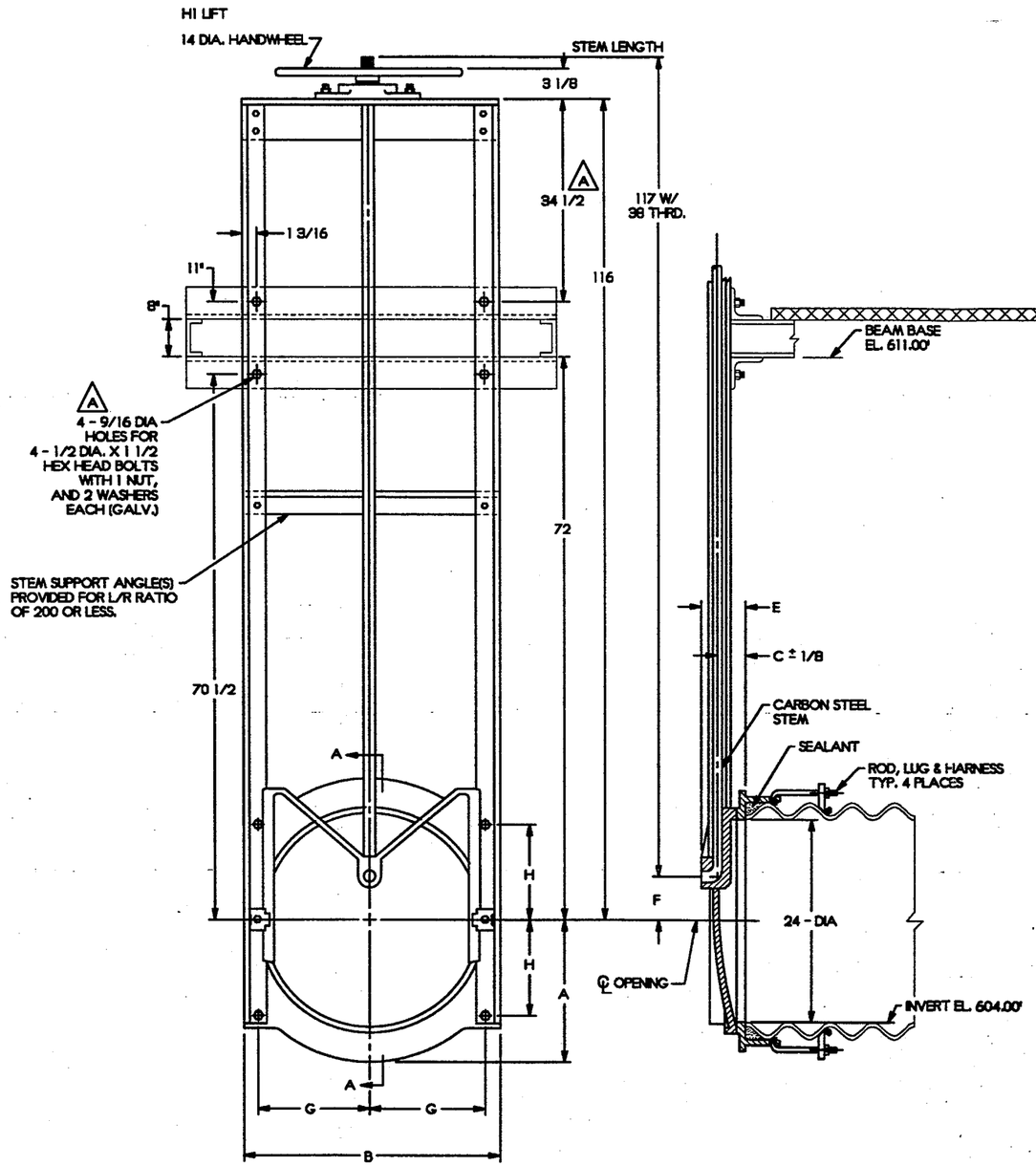
| | | | |
|---|---|---|---|
| DRAWN RMV | DATE 2/22/95 | CUST. NO. TK-0299-94 | SALES ORDER 94-0685 |
| REV. JAL DATE 06/28/95 | CHK'D | DWG. NO. F0685504 | A |

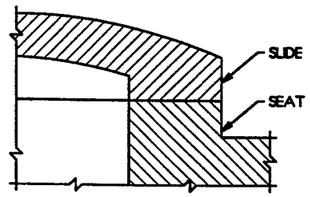
| | |
|---|---|
| 1. 3/16" ALLEN HEX KEY (STOP NUT AND COLLAR) | ONE REQUIRED |
| 2. 1/2" ALLEN HEX KEY (CPE-2 LIFT BOWL) | ONE REQUIRED |
| 3. 5/8" ALLEN HEX KEY (CPE-4 LIFT BOWL) | ONE REQUIRED |
| 4. 8" CRESCENT WRENCH | 2 REQUIRED |
| 5. 18" CRESCENT WRENCH | 2 REQUIRED |
| 6. 6" SCREWDRIVER | ONE REQUIRED |
| 7. 10" SCREWDRIVER | ONE REQUIRED |
| 8. PADLOCK WITH 2 KEYS | ONE REQUIRED |
| 9. TOOLBOX; 20" LONG, 8 1/2" WIDE, 9 1/2" HIGH ALL PURPOSE BOX | ONE REQUIRED |



HYDRO GATE Corporation

| | | | |
|---|---|---|---|
| TOOLS AND TOOLBOX | | DRAWN JAL | CH'K'D |
| | | DATE 06/14/95 | |
| | CUST NO | SALES ORDER 94-0685 | |
| | REV DATE | DWG NO F0685007 | |




DETAIL - CAST IRON SEATING FACES

| DIMENSIONAL DATA | |
|---|---|
| A | 13 5/8 |
| B | 29 |
| C | 2 7/8 |
| E | 4 7/8 |
| F | 6 |
| STEM DIA. | 1 1/8 |
| G | 13 1/2 |
| H | 7 |

NOTES:

1. CASTING TOLERANCES APPLY ON ALL UNMACHINED SURFACES.
2. SEE MANUAL G-1500 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS
3. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
4. MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: F0685504
5. GATE DESIGN HEAD: 12 FEET SEATING MAX.
   0 FEET UNSEATING
6. TAG :
7. LOCATION : OUTLET NO. 3
8. SPECIFICATION SECTION : 15A - VERTICAL LIFT GATES
9. PLAN DRAWING : FAXXED DRAWINGS AND DETAILS RECEIVED 2/27/95.



DO NOT SCALE DRAWING

HYDRO GATE Corporation

LIGHT DUTY SLUICE GATE - MODEL 101C
DESIGNED FOR 12' SEATING 0' UNSEATING HEAD
24 DIAMETER SPIGOT BACK
CAST IRON SEATING FACES
BRASS LIFT NUT
1 REQUIRED

| REVISED | DRAWN BY | CUSTOMER NO. | SALES ORDER |
|---|---|---|---|
| | RMV | TK-0299-94 | 94-0685 |
| | CHECKED BY | DATE | DRAWING NO. |
| A1 05/28/95 | | 2/27/95 | F0685005 |

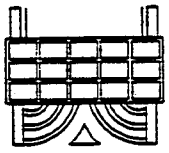
THIS DRAWING REPLACES THE DRAWING DATED 10/28/94

# Junction Box Slide Gate

# INSTALLATION, OPERATION, and MAINTENANCE MANUAL

## for

# HYDRO FABRICATED SLIDE GATES



HYDRO
GATE Corporation

HYDRO

6101 No. Dexter St. · Commerce City, CO 80022

**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 ar0xavailable 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 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 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.

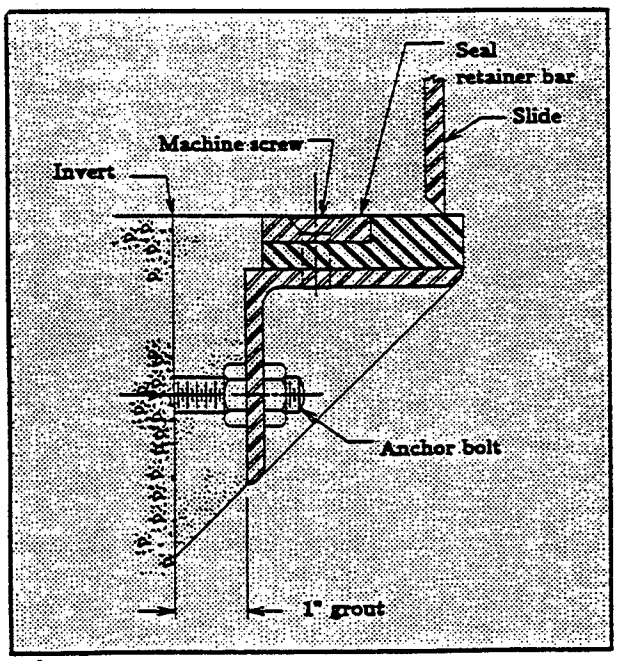



**Figure 1**
Flange Back Bottom Section

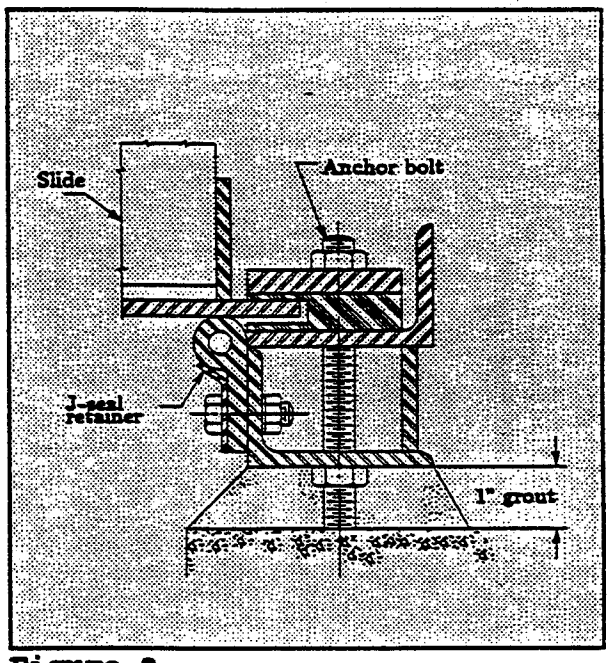



**Figure 2**
Flange Back Side Section

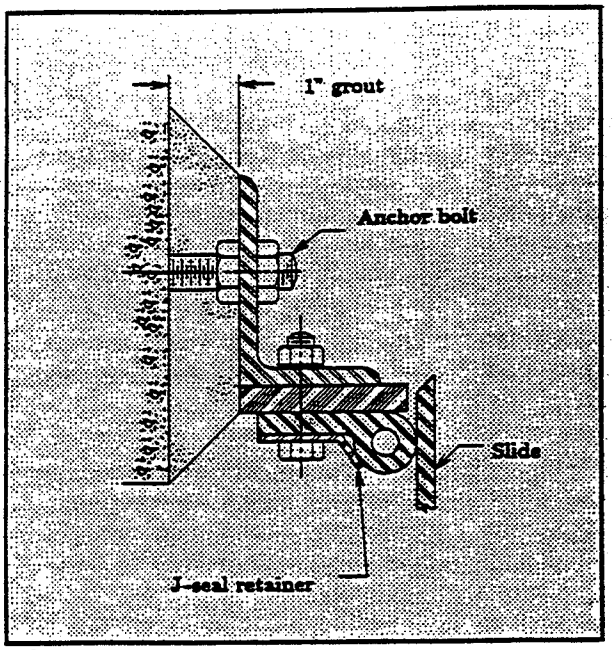



**Figure 3**
Flange Back Top Section

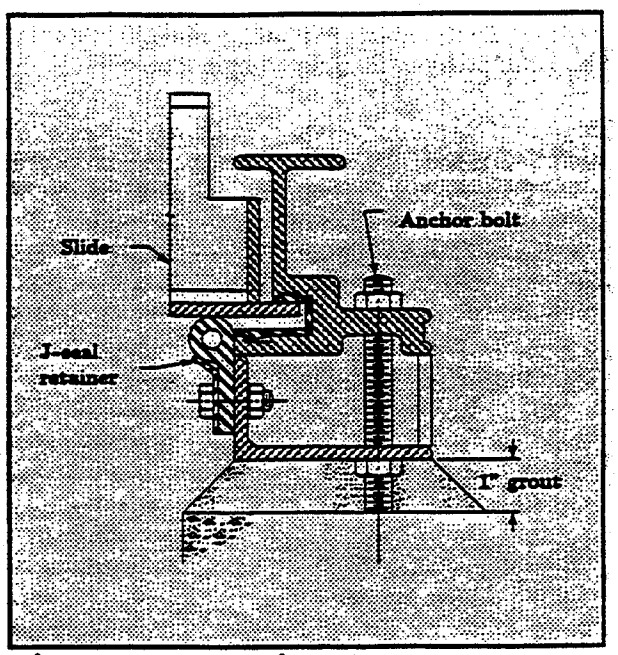



**Figure 4** (Aluminum)
Flange Back Side Section

## 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 ± 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 equiped 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.

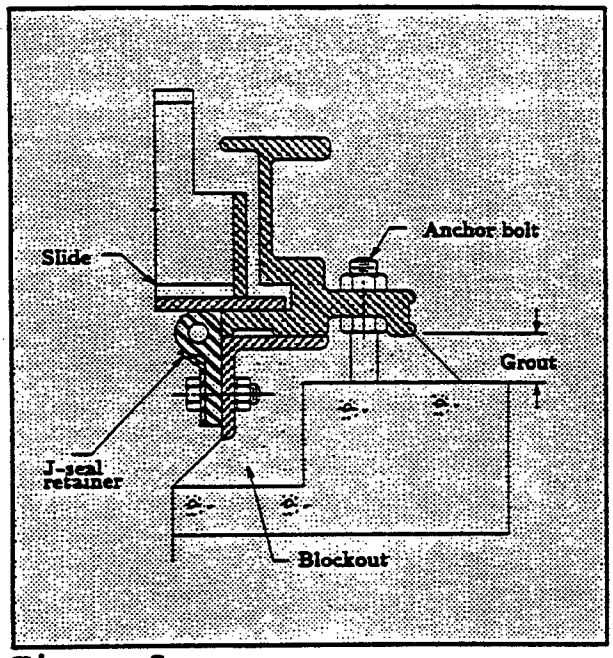



**Figure 5**
Spigot Back Side Section

## 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 straightnes 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.

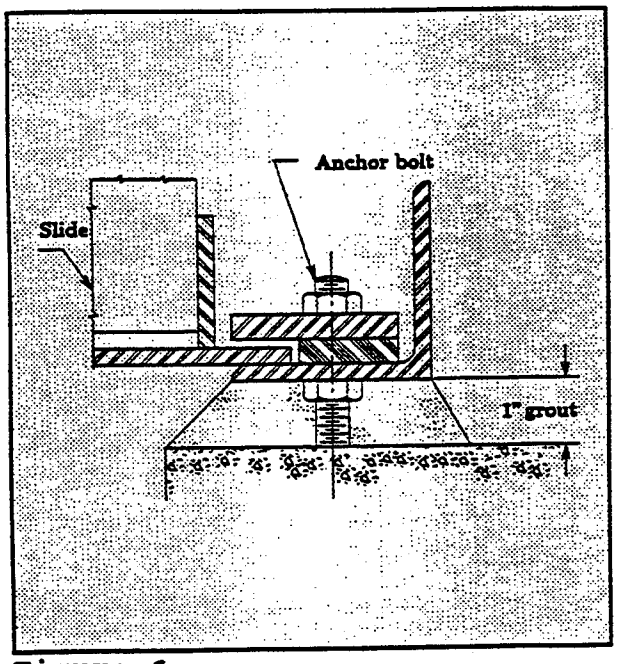



**Figure 6**
Flat Back Side Section

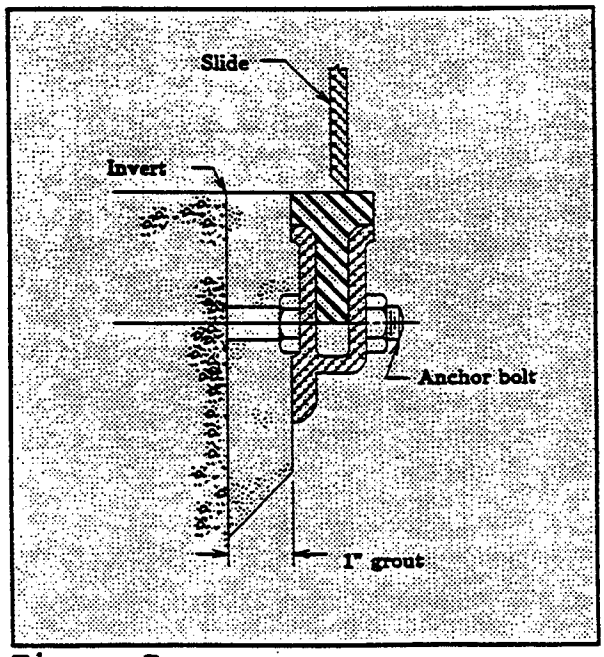



**Figure 7**
Flat Back Bottom Section

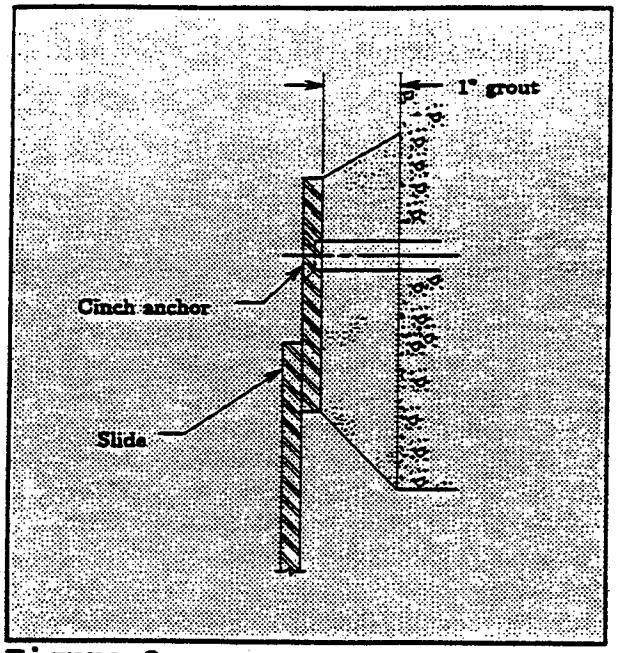



**Figure 8**
Flat Back Top Section

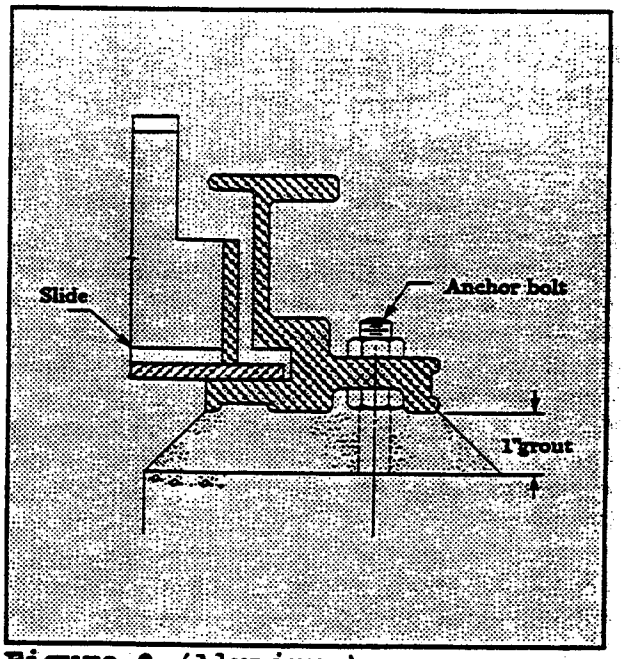



**Figure 9** (Aluminum)
Flat Back Side Section

## 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.

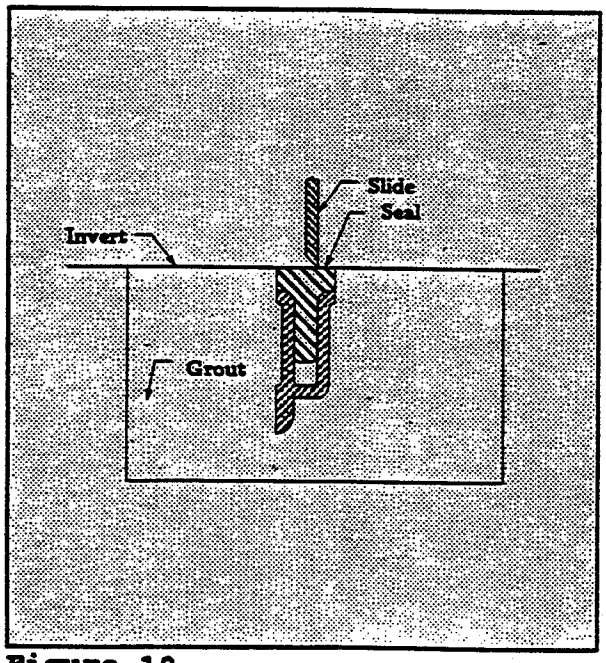



**Figure 10**
Embedded Bottom Section

## 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 befor 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.

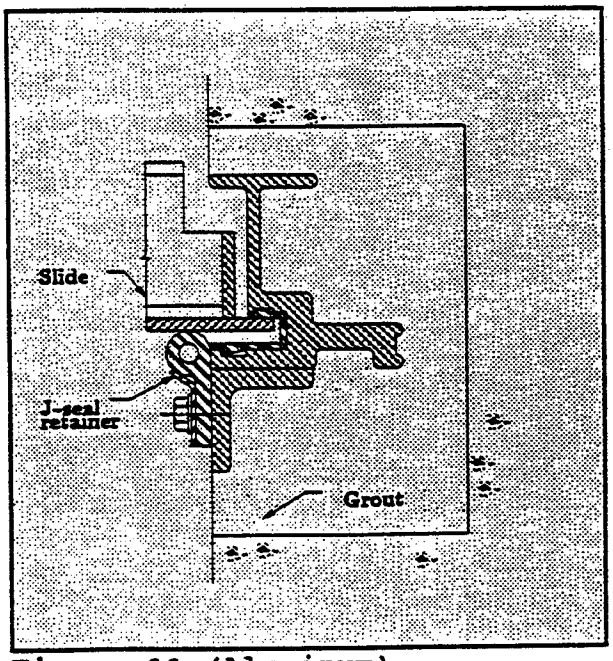



**Figure 11** (Aluminum)
Embedded Side Section

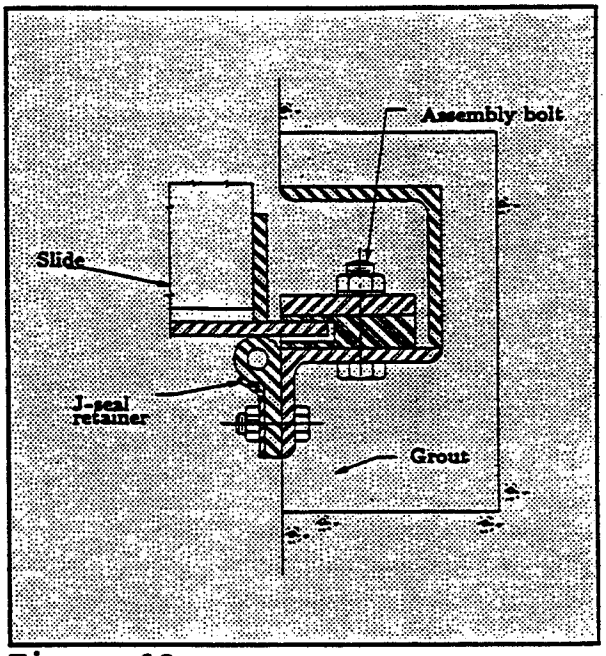



**Figure 12**
Embedded Side Section

## 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 minute 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.

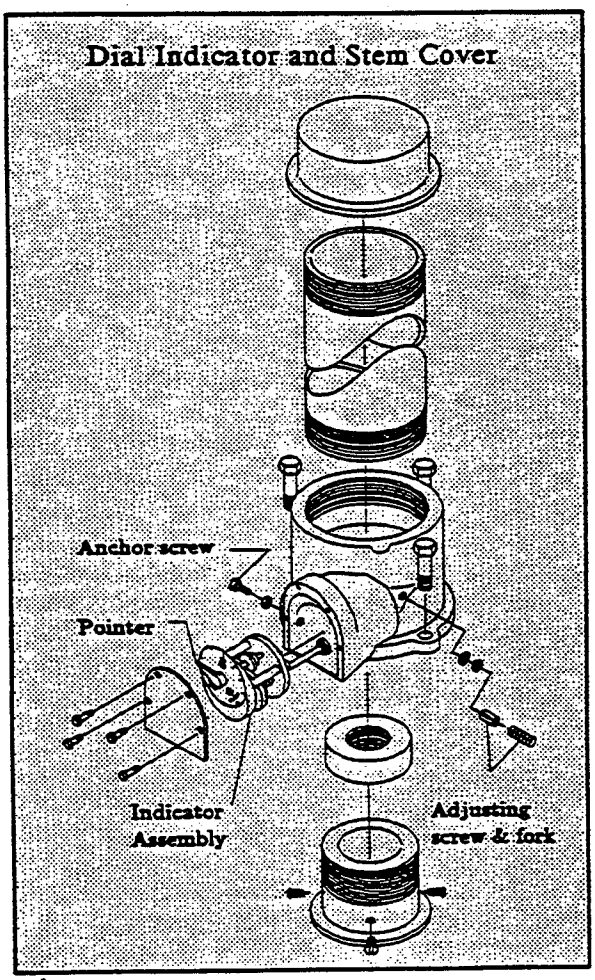



Figure 11

## 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 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.

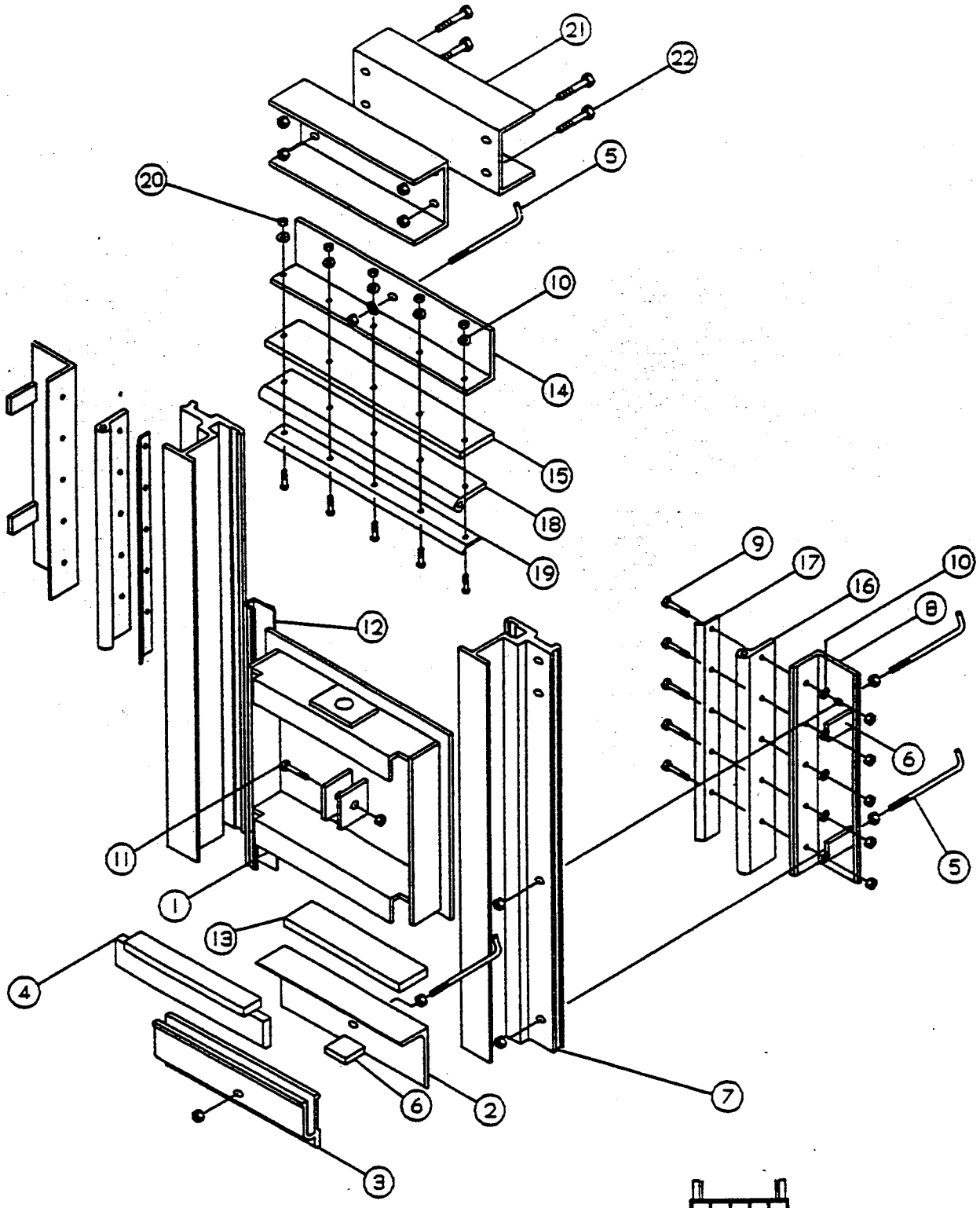
8. Miscellaneous accessories and hardware should be stored off the ground.

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

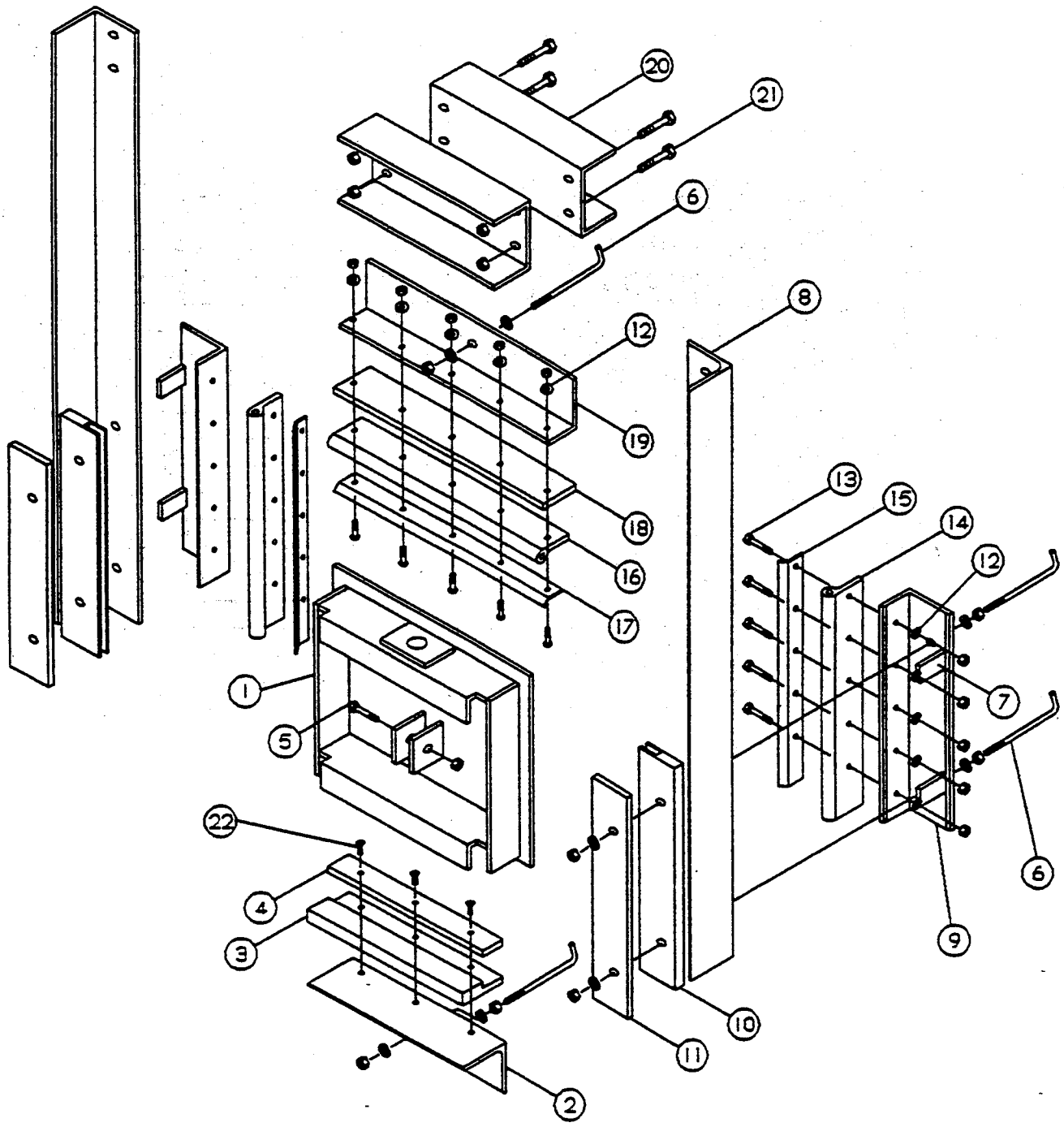
| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | SLIDE | 1 |
| 2. | FLUSH BOTTOM ANGLE FRAME EXTRUSION | 1 |
| 3. | FLUSH BOTTOM FRAME EXTRUSION | 1 |
| 4. | FLUSH BOTTOM SEAL, NEOPRENE | 1 |
| 5. | ANCHOR BOLT | AR |
| 6. | FLAT PLATE SPACER FOR ANCHOR BOLT | AR |
| 7. | FRAME EXTRUSION | 2 |
| 8. | 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




HYDRO GATE Corporation

EXPLODED VIEW

FABRICATED GATE

CARBON STEEL

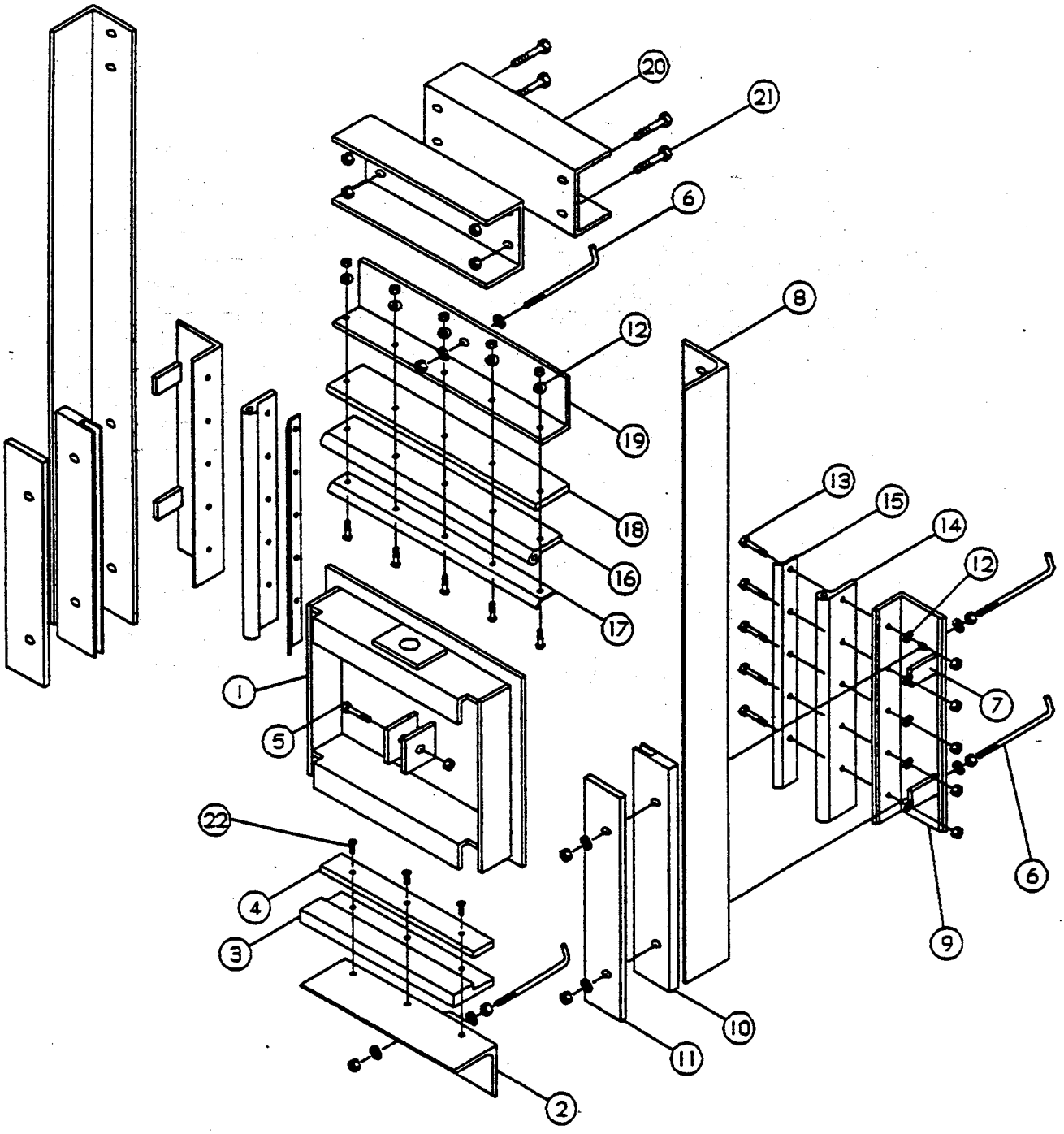
| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | SLIDE | 1 |
| 2. | FLUSH BOTTOM ANGLE FRAME | 1 |
| 3. | FLUSH BOTTOM SEAL | 1 |
| 4. | SEAL RETAINER FLAT | 1 |
| 5. | STEM CONNECTOR FASTENER SET | 1 |
| 6. | ANCHOR BOLT | AR |
| 7. | FLAT PLATE SPACER FOR ANCHOR BOLT | AR |
| 8. | SIDE ANGLE FRAME | 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 |

HYDRO GATE Corporation

PARTS LIST FOR

FABRICATED GATE

CARBON STEEL




HYDRO GATE Corporation

EXPLODED VIEW

FABRICATED GATE

GALVANIZED STEEL

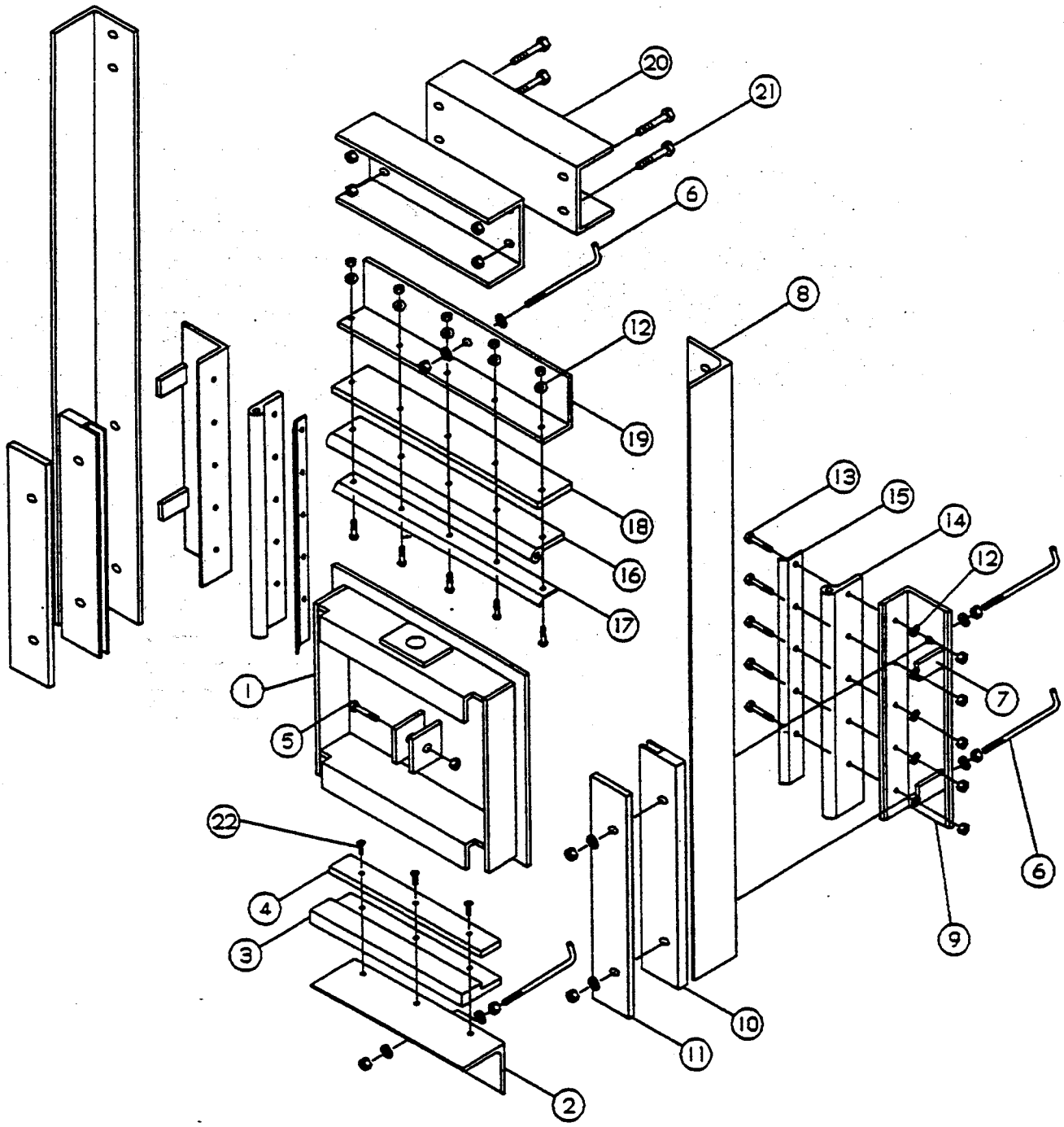
| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | SLIDE | 1 |
| 2. | FLUSH BOTTOM ANGLE FRAME | 1 |
| 3. | FLUSH BOTTOM SEAL | 1 |
| 4. | SEAL RETAINER FLAT | 1 |
| 5. | STEM CONNECTOR FASTENER SET | 1 |
| 6. | ANCHOR BOLT | AR |
| 7. | FLAT PLATE SPACER FOR ANCHOR BOLT | AR |
| 8. | SIDE ANGLE FRAME | 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 |

HYDRO GATE Corporation

PARTS LIST FOR

FABRICATED GATE

GALVANIZED STEEL




HYDRO GATE Corporation

EXPLODED VIEW

FABRICATED GATE

STAINLESS STEEL

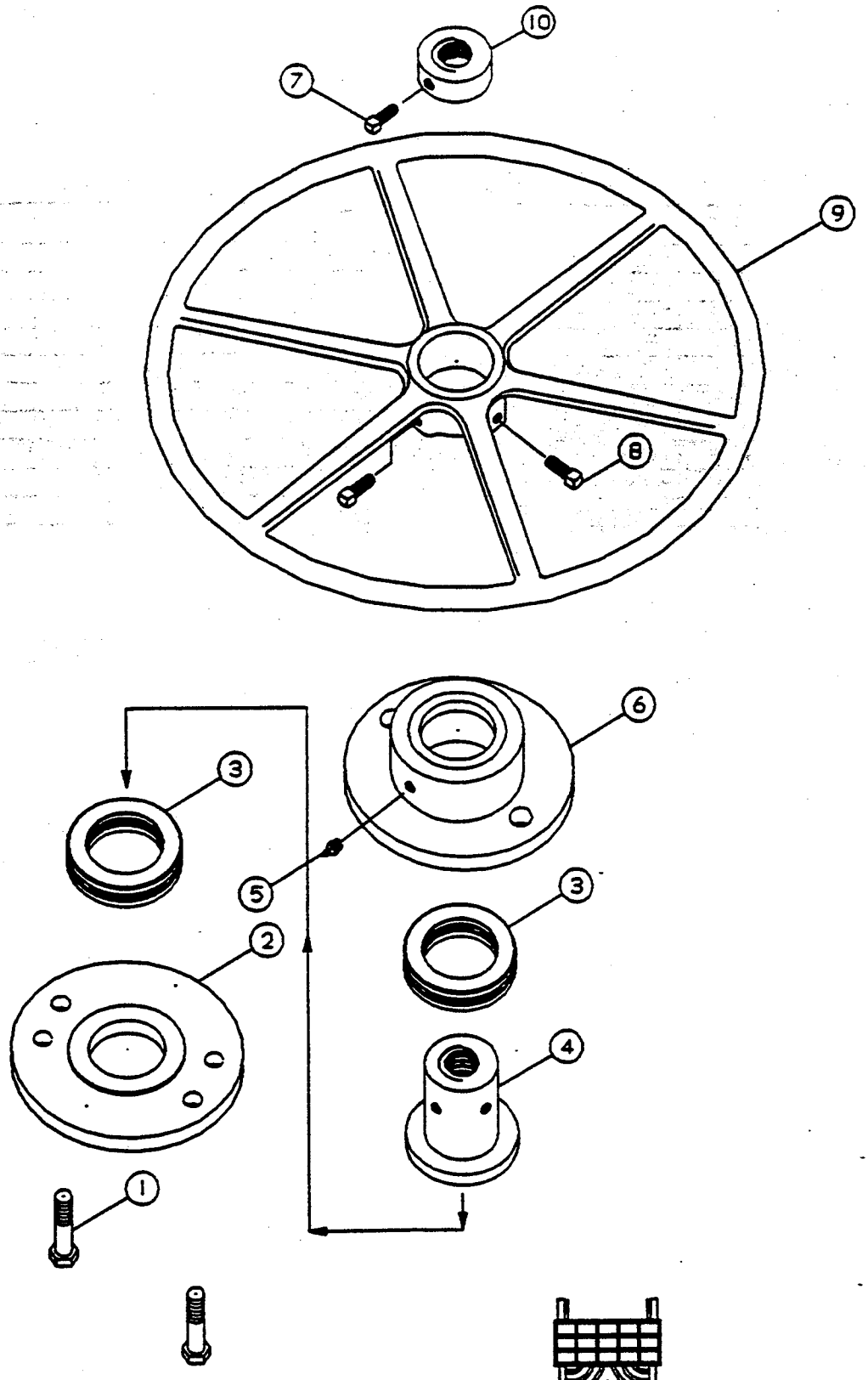
| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | SLIDE | 1 |
| 2. | FLUSH BOTTOM ANGLE FRAME | 1 |
| 3. | FLUSH BOTTOM SEAL | 1 |
| 4. | SEAL RETAINER FLAT | 1 |
| 5. | STEM CONNECTOR FASTENER SET | 1 |
| 6. | ANCHOR BOLT | AR |
| 7. | FLAT PLATE SPACER FOR ANCHOR BOLT | AR |
| 8. | SIDE ANGLE FRAME | 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 |

HYDRO GATE Corporation

PARTS LIST FOR

FABRICATED GATE

STAINLESS STEEL




HYDRO GATE Corporation

EXPLODED VIEW

HB

HANDWHEEL LIFT

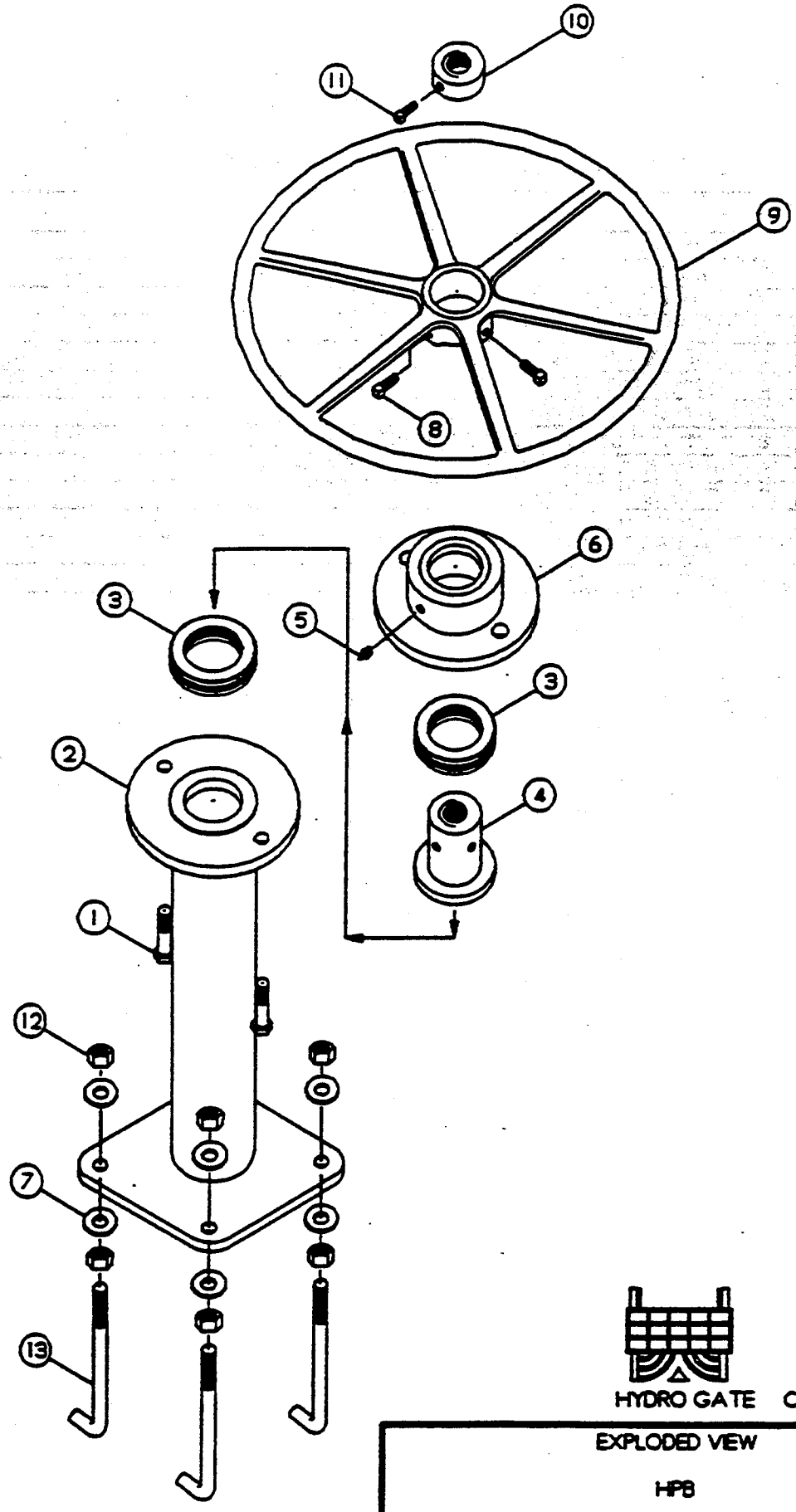
| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | 5/8" X 1 1/4" HEX HEAD MACHINE BOLTS | 2 |
| 2. | BASE | 1 |
| 3. | THRUST BEARING, BALL | 2 |
| 4. | LIFT NUT | 1 |
| 5. | 1/8" ZERK FITTING | 1 |
| 6. | BOWL (CAST IRON) | 1 |
| 7. | SQUARE HEAD SET SCREW | 1 |
| 8. | 1/2" X 1" SQUARE HEAD SET SCREWS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

HYDRO GATE Corporation

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. | LIFT 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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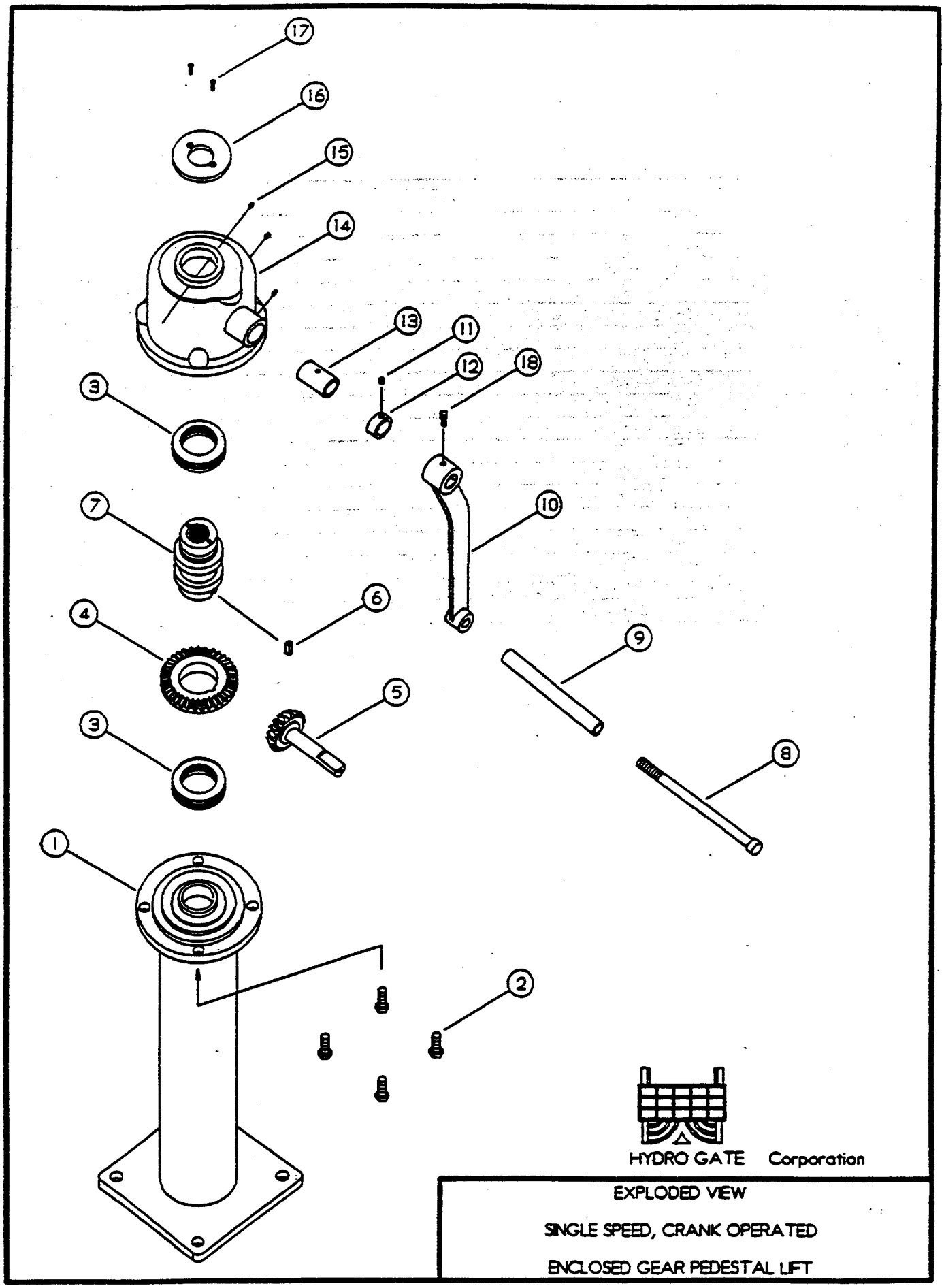
PARTS LIST FOR

HPB

HANDWHEEL PEDESTAL LIFT

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EXPLODED VIEW

SINGLE SPEED, CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT

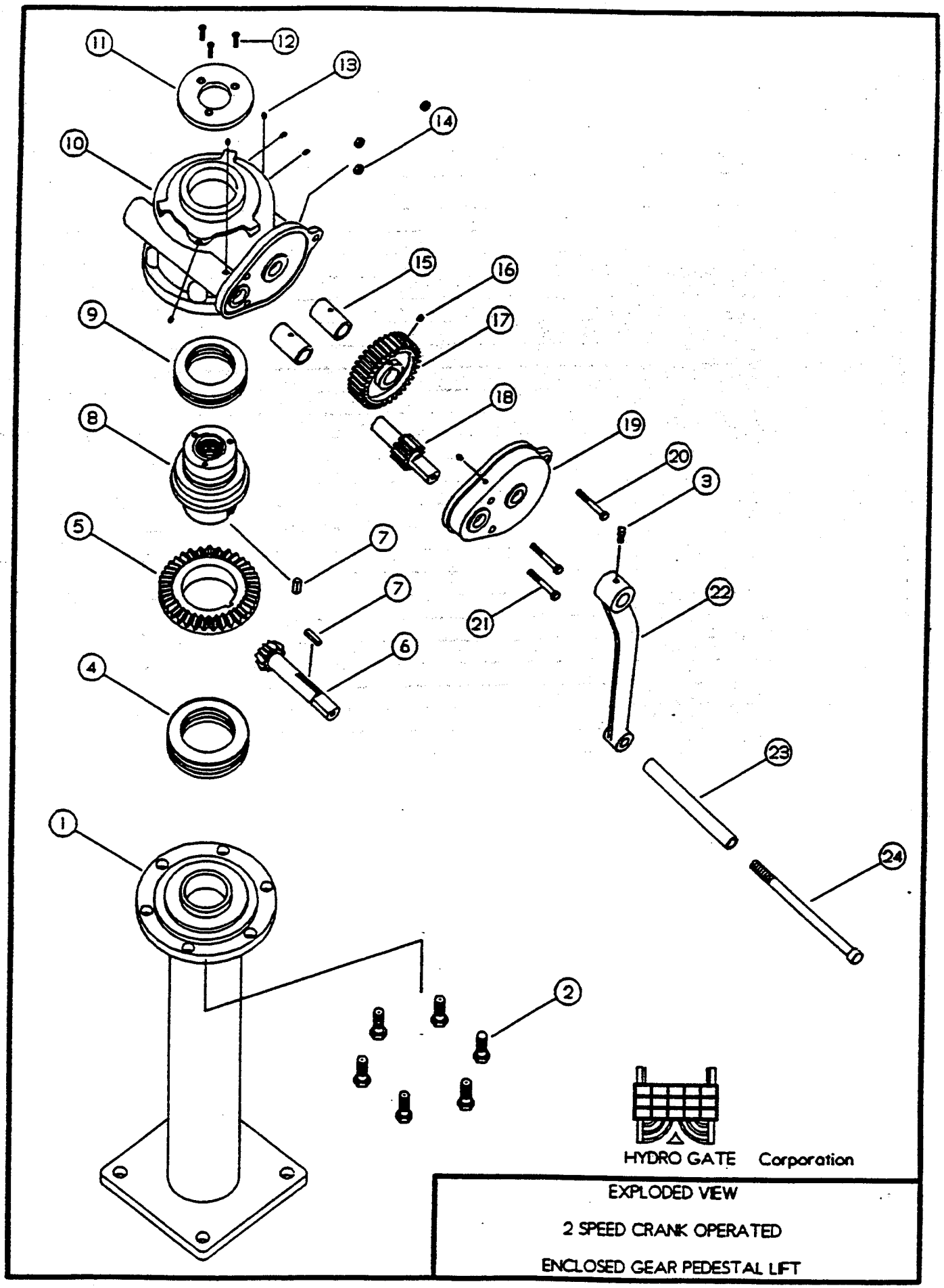
| NO. | PARTS LIST |
|---|---|
| 1. | PEDESTAL |
| 2. | CAP SCREWS |
| 3. | BALL BEARINGS |
| 4. | BEVEL GEAR |
| 5. | BEVEL PINION AND SHAFT |
| 6. | KEY |
| 7. | LIFT NUT |
| 8. | MACH. BOLT |
| 9. | BRASS HANDLE |
| 10. | CRANK ARM |
| 11. | SET SCREWS |
| 12. | STOP COLLAR |
| 13. | BRONZE BUSHING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

HYDRO GATE Corporation

PARTS LIST FOR

SINGLE SPEED CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT




EXPLODED VIEW

2 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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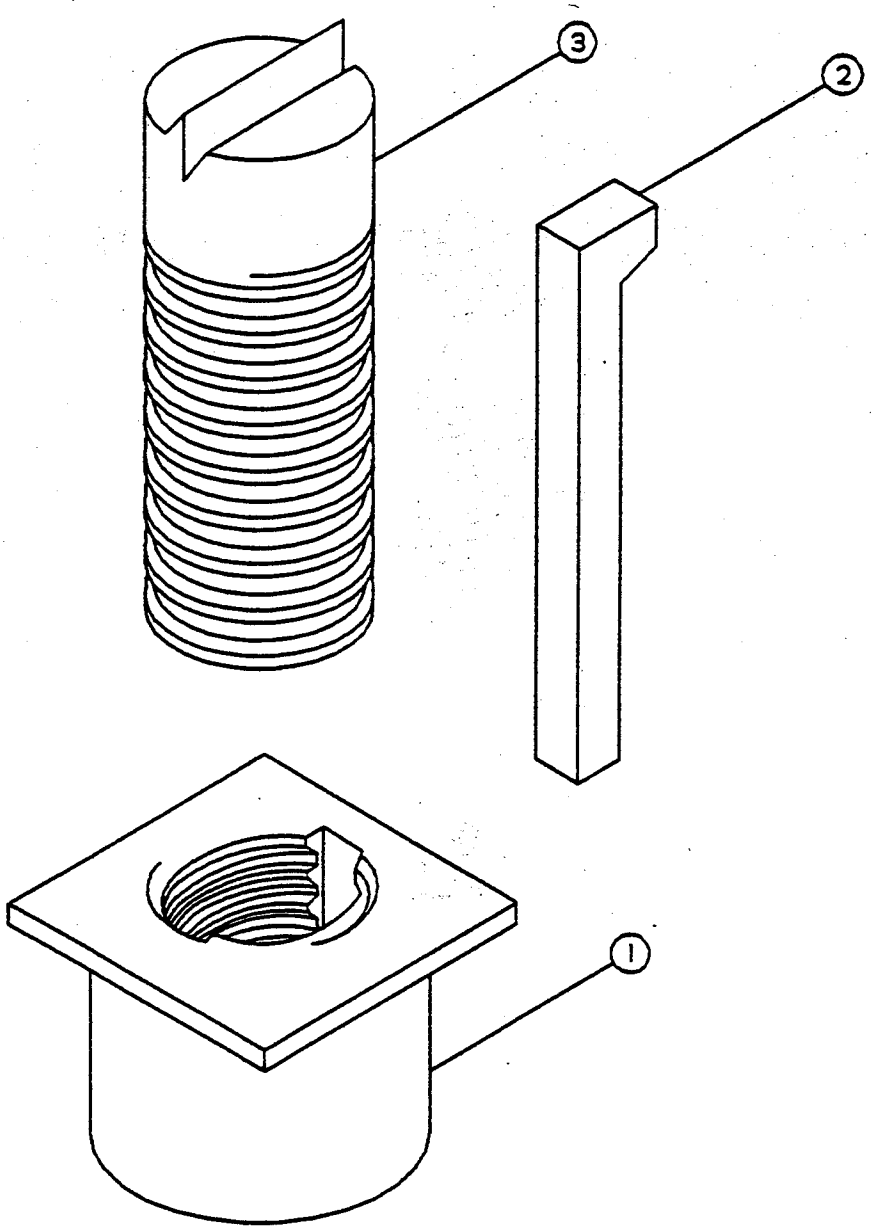
PARTS LIST FOR

2 SPEED CRANK OPERATED

ENCLOSED GEAR PEDESTAL LIFT

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



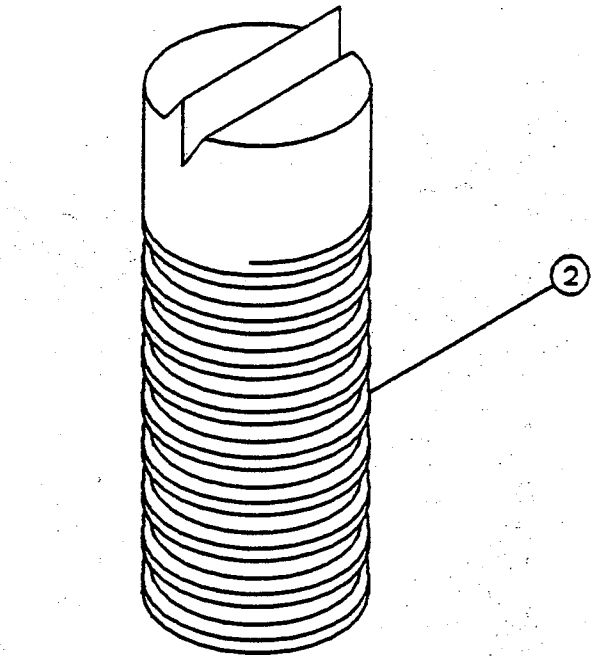

HYDRO GATE Corporation

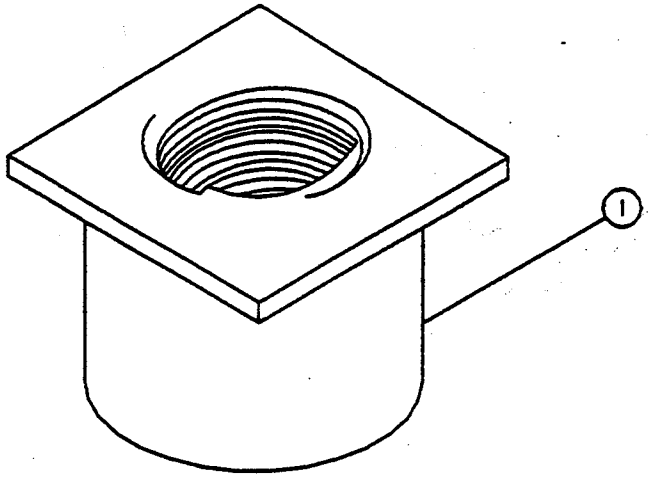
EXPLODED VIEW

STEM BLOCK

RISING STEM

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



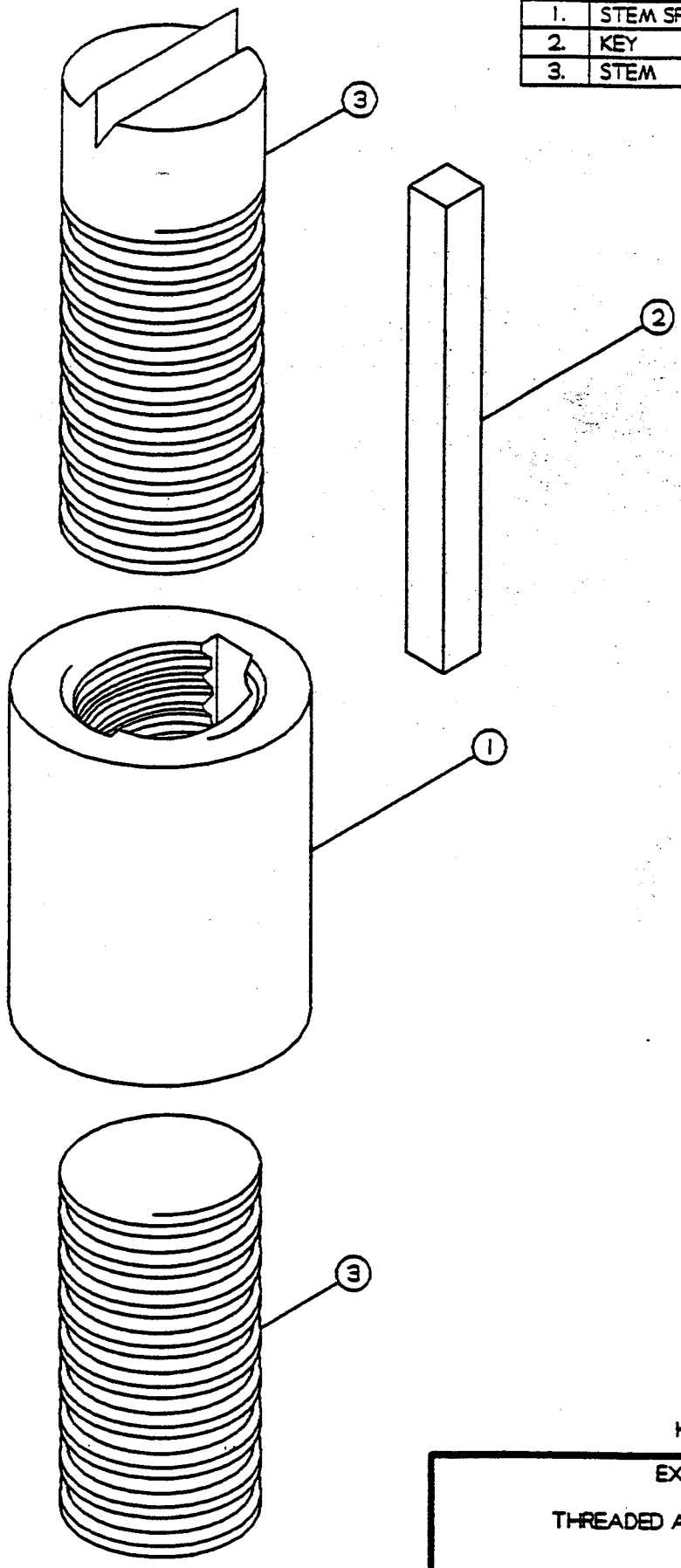

HYDRO GATE Corporation

EXPLODED VIEW

STEM BLOCK

NON-RISING STEM

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

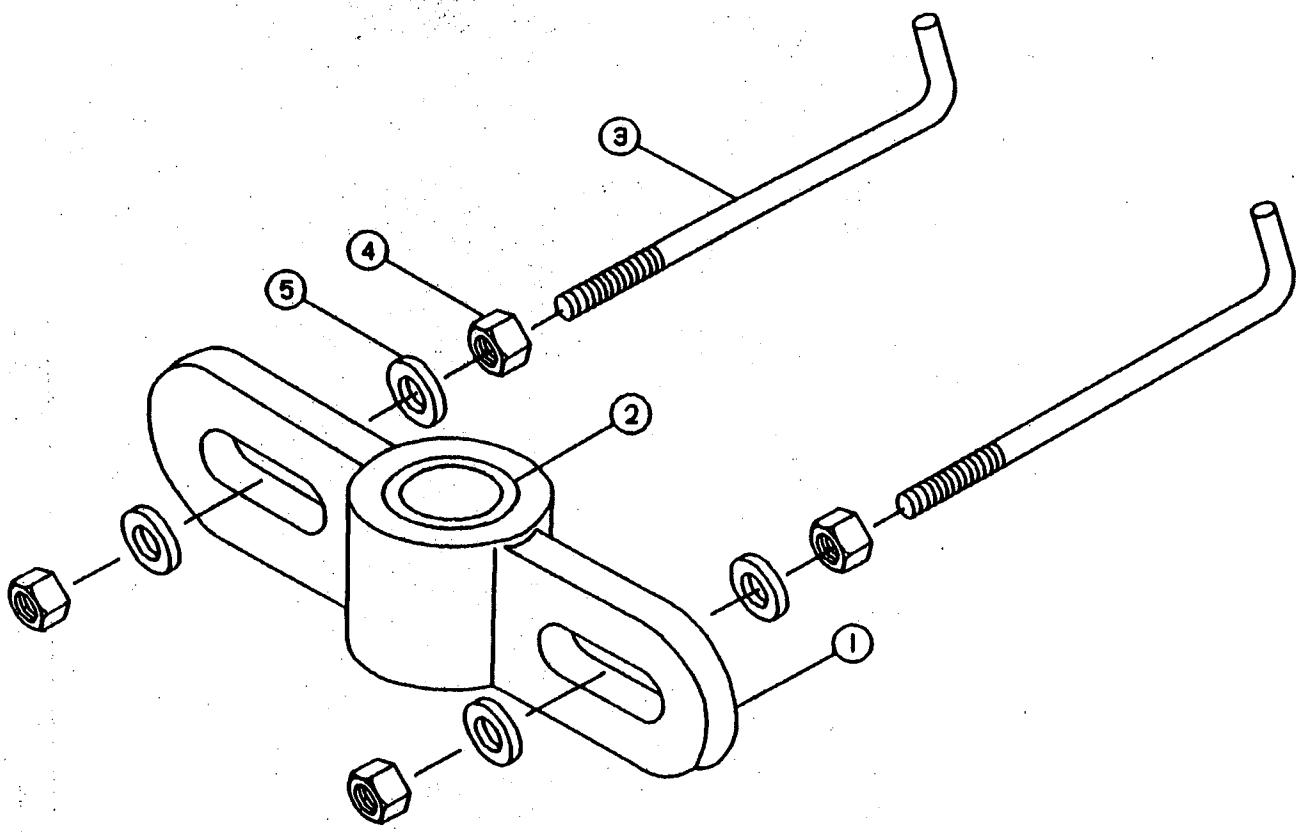



HYDRO GATE Corporation

EXPLODED VIEW

THREADED AND KEYED STEM SPLICE

| NO. | PARTS LIST | QTY. |
|---|---|---|
| 1. | STEM GUIDE (CAST IRON) | 1 |
| 2. | BUSHING | 1 |
| 3. | 3/4" X 16" ANCHOR BOLTS | 2 |
| 4. | 3/4" DIA. HEX NUT | 4 |
| 5. | 3/4 DIA. FLAT WASHER | 4 |



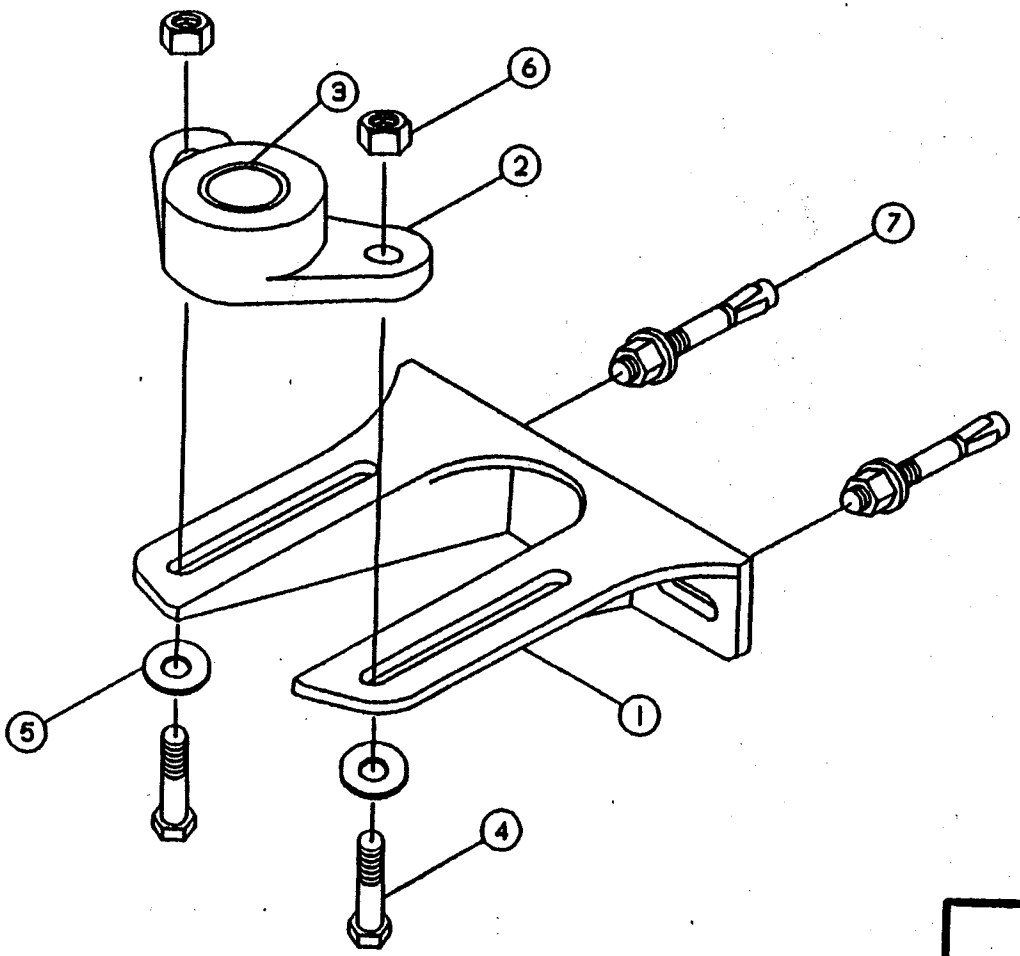

HYDRO GATE Corporation

EXPLODED VIEW

TYPE "A"

STEM GUIDE

| 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 |



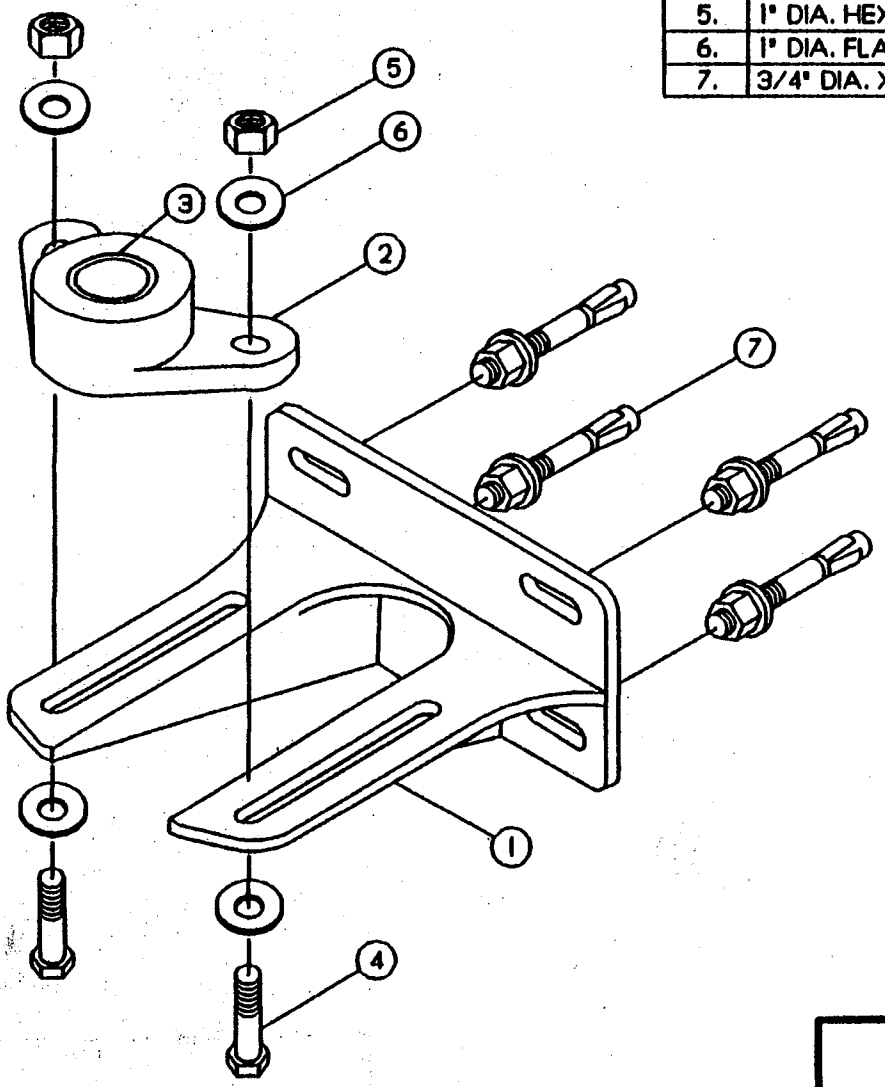

HYDRO GATE Corporation

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 |



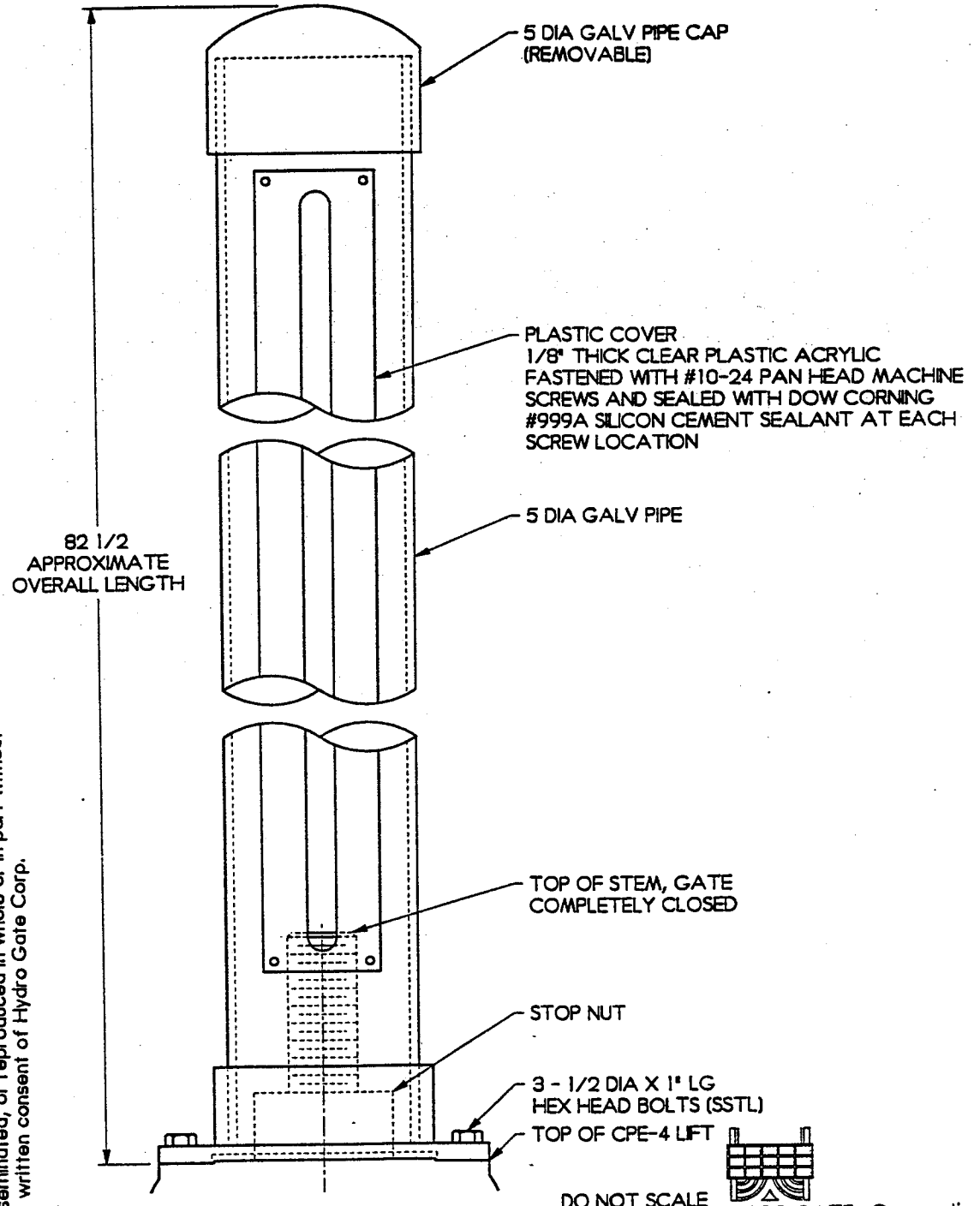

HYDRO GATE Corporation

EXPLODED VIEW

TYPE "C"

STEM GUIDE

THIS DRAWING REPLACES DRAWING F0685503 DATED 02/10/95

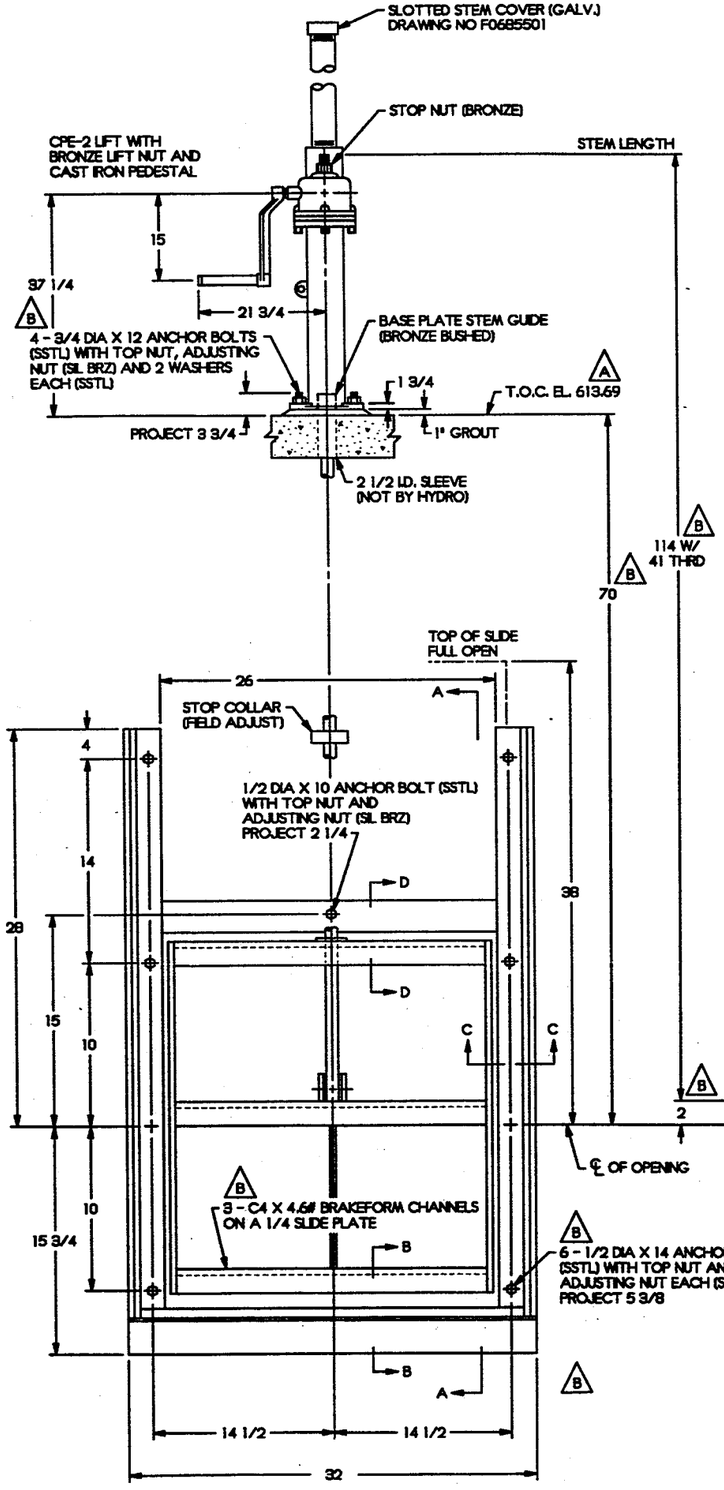





DO NOT SCALE DRAWING

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:

1. CASTING TOLERANCES APPLY ON ALL UNMACHINED SURFACES.
2. SEE MANUAL G-1900 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS.
3. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
4. MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: F0695505
5. PROJECT DESIGN HEAD: 12 FEET SEATING
   7 FEET UNSEATING
   OPERATING HEAD: 12 FEET SEATING
6. TAG:
7. LOCATION: JUNCTION BOX
8. SPECIFICATION SECTION: 15A - VERTICAL LIFT GATES
9. REFERENCE PLAN DRAWINGS:



DO NOT SCALE DRAWING

HYDRO GATE Corporation

FABRICATED SLIDE GATE
SIZE: 24 x 24
MATERIAL: STAINLESS STEEL
FLANGE BACK, J-SEALS, POLYMER GUIDES, FLUSH-BOTTOM
2 REQUIRED
NOT SELF CONTAINED

| REVISED | DRAWN BY | CUSTOMER NO. | SALES |
|---|---|---|---|
| | RMV | TK-0299-94 | 94-0685 |
| | CHECKED BY | DATE | DRAWING NO. |
| JAL 05/08/95 RMV 07/09/95 | | 10/27/94 | F0685003 |

## MATERIAL SPECIFICATIONS

| GATE PART OR ITEM OF ASSEMBLY | | MATERIAL DESCRIPTION | MATERIAL CODE | | MATERIALS SHOWN IN ASTM SPECIFICATION UNLESS NOTED OTHERWISE |
|---|---|---|---|---|---|
| **EMBEDMENTS** | | | | | |
| ANCHOR BOLTS | | STAINLESS STEEL | (L) | | A276, TYPE 304 |
| ANCHOR BOLT NUTS | B | SILICON BRONZE | (J) | | B98, ALLOY 655 |
| BEVELED STUD BOLTS | | STAINLESS STEEL | (L) | | A276, TYPE 304 |
| BEVELED STUD BOLT NUTS | B | SILICON BRONZE | (J) | | B98, ALLOY 655 |
| **GATE ASSEMBLY** | | | | | |
| FRAME (SLIDE ANGLES, FILLER AND COVER BARS) | | GALVANIZED STEEL | (N) | A | A36, A123 (COATING) |
| SLIDE PLATES AND REINFORCINGS | | | | | |
| FASTENERS | | STAINLESS STEEL | (L) | | F593 (BOLTS), ALLOY GROUP 1 (304) |
| | B | SILICON BRONZE | (J) | | B98, ALLOY 655 |
| RETAINER | | GALVANIZED STEEL | (N) | A | A36, A123 (COATING) |
| 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 |
| **STEM AND ACCESSORIES** | | | | | |
| STEM | | STAINLESS STEEL | (L) | | A276, TYPE 304 |
| STEM BLOCK | B | MANGANESE BRONZE | (K) | | B584, ALLOY 865 |
| KEY | | STAINLESS STEEL | (L) | | A276, TYPE 304 |
| **LIFT ASSEMBLY** | | | | | |
| LIFT PEDESTAL | B | 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 |
| YOKE ADAPTOR PLATE | | GALVANIZED STEEL | (N) | A | A36, A123 (COATING) |
| BASE PLATE STEM GUIDE | B | 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: PART NO.: 45598T — TNEMEC, SERIES 140-1211 POTA-POX COLOR RED

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

FOR THE FOLLOWING COMPONENTS:

☒ LIFT ☒ B BASE PLATE STEM GUIDE

COATING: PART NO.: 45599T — TNEMEC, SERIES 140-1255 POTA-POX COLOR BEIGE

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

FOR THE FOLLOWING COMPONENTS:

☒ LIFT ☒ B BASE PLATE STEM GUIDE

NOTES:



HYDRO GATE Corporation

| | | | |
|---|---|---|---|
| BILL OF MATERIAL & COATING SPECIFICATIONS FABRICATED GATES MATERIAL COMBINATION NO. 2 A | | DRAWN RMV | CHK'D |
| | | DATE 10/31/94 | |
| | CUST. NO. TK-0299-94 | SALES ORDER 94-0685 | |
| | REV. JAL DATE 06/09/95 | DWG. NO. F0685502 | B |

# APPENDIX E

## CONSTRUCTION SPECIFICATION SECTIONS FOR REPAIR MATERIAL

PART I
SECTION C
DIVISION 2
SECTION 2S

STONE PROTECTION

INDEX

# SECTION 2S - STONE PROTECTION

1. SCOPE. This section covers riprap stone protection.

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

2.1 Dewatering: SECTION 1C: GENERAL.

2.2 Scour hole excavation: SECTION 2N: EXCAVATION.

2.3 Installation of geotextile: SECTION 2SS: GEOTEXTILE.

3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referenced to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 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).

4. GENERAL.

4.1 Tolerances. Where tolerances are shown or specified, plus shall be above lines and grades, and minus shall be below lines and grades.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION E.

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

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

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

5.4 Weighing plan and schedule as specified in PARAGRAPH: MEASUREMENT AND PAYMENT.

6. MATERIALS.

6.1 Riprap shall be a durable, field or quarried stone of a quality suitable to ensure permanence of the structure in the climate in which it is used. The stone shall be well graded within the limits shown in the gradation curves at the end of this section, and shall be free from cracks, seams, and other defects that would unduly increase its deterioration from natural causes. No more than 3% of the total materials by weight shall pass the No. 4 sieve. Neither the breadth nor thickness of any piece of stone shall be less than one-third of its length. Occasional pieces of stone slightly larger than the maximum weight will be permitted, provided the gradation and voids are not unduly affected and that

surface tolerances are met. In order to meet the structural design requirements for weight, gradation, and layer thickness, stone for riprap shall have a specific gravity between 2.60 and 2.70.

6.2 Geotextile shall be in accordance with SECTION 2SS: GEOTEXTILE.

7. SOURCES. The Contractor shall be responsible for making his own investigations for sources of suitable materials other than those sources listed in the SECTION H, CLAUSE: MATERIAL SOURCES and for making his own arrangements with the owners of the pits or land for procuring the required quantities of suitable materials. The sources from which the Contractor proposes to obtain the material shall be selected well in advance of the time when the material will be required in the work.

8. TESTS FOR ACCEPTABILITY.

8.1 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.

8.2 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.

9. TESTS FOR GRADATION AND SHAPE.

9.1 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.

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

| Material | Minimum Sample Size |
|---|---|
| Riprap | 4 cubic yards |

9.3 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.

| Material | Minimum Number of Tests |
|---|---|
| Riprap | 1 test |

9.4 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.

10. FOUNDATION PREPARATION. Foundation areas shall be excavated or filled to the lines and grades shown, or otherwise established, within a tolerance of plus or minus 2 inches for areas above and 3 inches plus or minus for areas below the water line. Filling shall be with earth similar to the adjacent material or with random fill material, as specified in SECTION 2C: EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES, and well compacted. When overexcavation occurs the filling shall be at no additional expense to the Government. Immediately prior to placing geotextile or riprap, the prepared subgrade will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

11. PLACEMENT

11.1 General. 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 shall be place in the dry. Dewatering shall be in accordance with SECTION 1C: GENERAL. Riprap 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 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.

11.2 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 2SS: 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 (1) foot. Riprap placement shall generally be initiated at the center of the scour hole and progress outwards and up the side slopes of the scour hole. Stone for 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 by the Contractor at no additional cost to the Government.

12. QUALITY CONTROL. The Contractor shall establish and maintain quality control for work under this section to ensure compliance with contract requirements and maintain records of his quality control for all construction including, but not limited to, the following:

(1) Quality of materials.
(2) Gradation and shape.
(3) Foundation preparation.
(4) Elevations of all underlying materials.
(5) Uniformity of in place materials.
(6) Finished elevations of all materials.

Quality control shall be in accordance with Section E. A copy of the records of inspections and tests, as well as the records of corrective actions taken, shall be furnished to the Government.

13. MEASUREMENT AND PAYMENT.

13.1 Measurement. Riprap shall be weighed on accurate, approved scales furnished or made available by the Contractor. Before being approved for use, the scales shall have been 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 based 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.

13.1.1 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 weighed.
(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 operations.

13.1.2 A plan indicating the location and proposed schedule of weighing operations shall be submitted for approval at least 15 days prior to delivery of stone to the site.

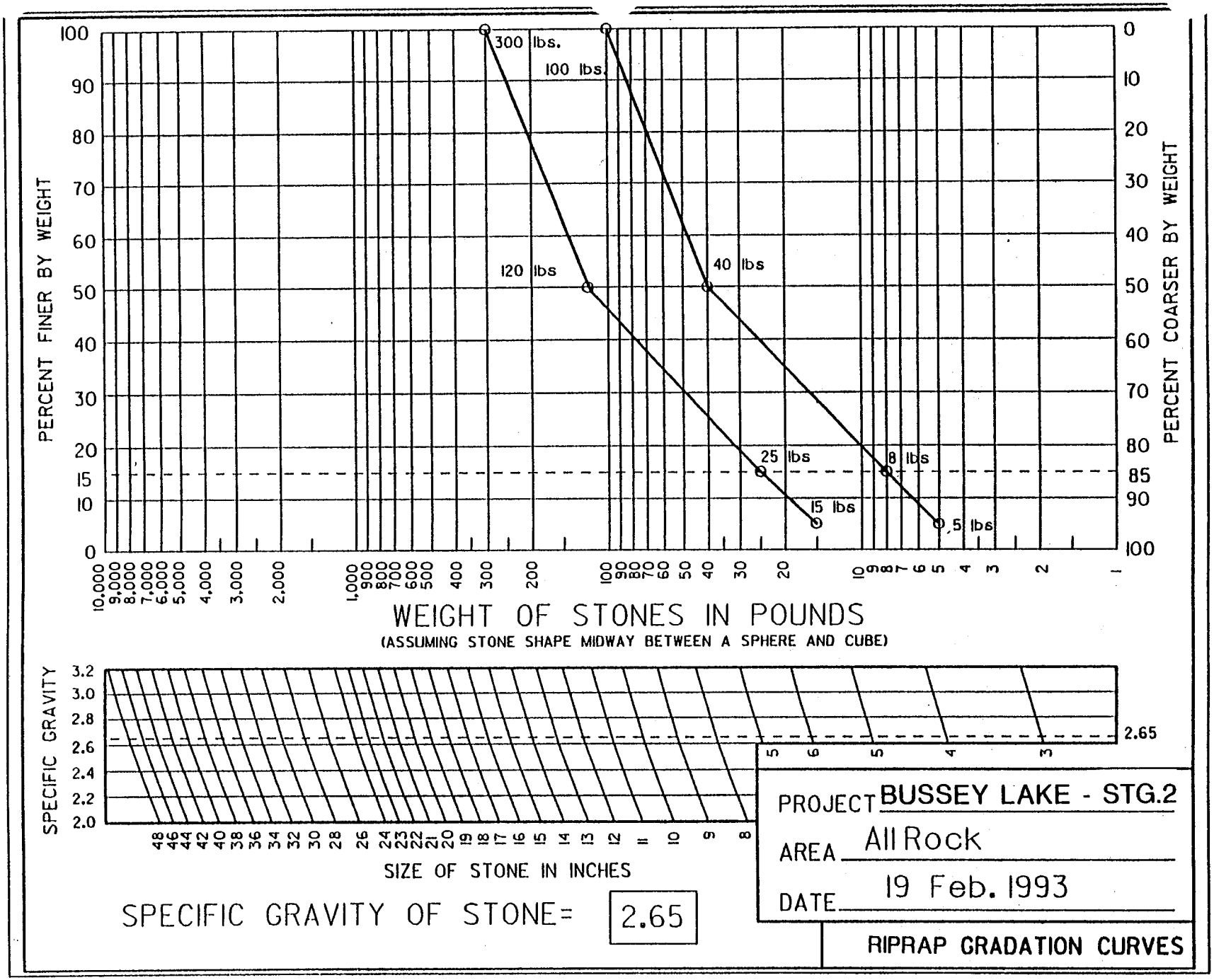
13.2 Payment for riprap shall be by the ton (2000 pounds avoirdupois) of material acceptably placed within the tolerances specified, and shall constitute full payment for all work, including excavation, associated with the placement as shown and specified.

13.3 Deductions. All stone permitted by the Contracting Officer to remain outside the tolerances specified will be deducted from the quantity to be paid for. Volume of excess stone 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 100 pounds per cubic foot, regardless of actual weight per cubic foot.

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

| Item | Unit |
|---|---|
| Riprap | TN |

* * * * *


PERCENT FINER BY WEIGHT
PERCENT COARSER BY WEIGHT
300 lbs.
100 lbs.
120 lbs
40 lbs
25 lbs
8 lbs
15 lbs
.5 lbs
WEIGHT OF STONES IN POUNDS
(ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE)
SPECIFIC GRAVITY
2.65
SIZE OF STONE IN INCHES
SPECIFIC GRAVITY OF STONE= 2.65
PROJECT BUSSEY LAKE - STG.2
AREA All Rock
DATE 19 Feb. 1993
RIPRAP GRADATION CURVES

PART I
SECTION C
DIVISION 2
SECTION 2SS

GEOTEXTILE

INDEX

# SECTION 2SS - GEOTEXTILE

1. SCOPE. The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishing, hauling, and placing the geotextile, complete, as specified herein and shown on the contract drawings, and maintaining the geotextile until the structure is completed and accepted.

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

2.1 Dewatering: SECTION 1C: GENERAL.

2.2 Riprap placement on geotextile: SECTION 2S: STONE PROTECTION.

3. APPLICABLE PUBLICATIONS. The current issues of the publications listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Society for Testing and Materials (ASTM):

| | |
|---|---|
| D 123-92 | Terminology Relating to Textile/Materials |
| D 1683 Rev A-90 | 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 |

3.2 U. S. Army Corps of Engineers:

EM 1110-2-1906 Laboratory Soils Testing

4. NOT USED.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION E.

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

5.2 Samples. The Contractor shall submit samples of the geotextile as specified in PARAGRAPH: MATERIALS.

5.3 Certificates of Compliance. The Contractor shall submit certificates of compliance as specified in PARAGRAPH: MATERIALS.

6. MATERIALS.

6.1 Geotextile. The geotextile shall be a woven or a non-woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall meet the physical requirements listed in Table No. 1 of the specifications. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filament resistant to deterioration due to ultra-violet and heat exposure. The edge of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

6.2 Seams. The seams of the geotextile sections shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 20 feet wide. Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table 1) of the unaged geotextile in any principal direction.

6.3 Acceptance Requirements. All brands of geotextile and all seams to be used shall be accepted on the following basis. The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification. The Contractor shall provide to the Government geotextile samples and certified testing results to determine compliance with any or all of the requirements in this specification. Samples shall be submitted a minimum of 60 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 ft. long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 ft. Samples submitted for testing shall be identified by manufacturers lot designation.

Table No. 1 - Physical Requirements

| Physical Property | Test Procedure | Acceptable Values ++ |
|---|---|---|
| Tensile Strength +(unaged geotextile) | ASTM D 4632 Grab Test Method using 1 inch square jaws and a 12 inches per minute constant rate of traverse. | 200 pound minimum in all principal directions. |
| Breaking Elongation +(unaged geotextile) | ASTM D 4632 Determine Apparent Breaking Elongation | 15% minimum in all principal direction. |
| Puncture Strength +(unaged geotextile) | ASTM D 3787 except polished steel ball replaced with a 5/16-inch diameter solid steel cylinder with a hemispherical tip centered within the ring clamp. | 80 pound minimum. |
| Abrasion Resistance | ASTM D 3884 Rubber-base abrasive wheels equal to CS-17 "Calibrase" by Taber Instrument Co; 1 kilogram load per wheel; 1000 revolutions, determine residual breaking load. | 55 pound minimum Residual Breaking Load in all principal directions. |
| Apparent Opening Size (AOS) | ASTM D 4751 | No finer than the U.S. Standard Sieve No. 120 and no coarser than the U.S. Standard Sieve No. 30 |
| Tear Strength | ASTM D 4533 Trapezoidal Tear strength | 30 lb. minimum in all principal direction. |

+ Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.
++ All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

7. SHIPMENT AND STORAGE. During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees fahrenheit, mud, dirt, dust and debris. To the extent possible, the geotextile shall be maintained wrapped in a heavy duty protective covering.

8. INSTALLATION OF THE GEOTEXTILE. The geotextile shall be placed in the dry in the manner and at the locations shown on the drawings. Dewatering shall be in accordance with SECTION 1C: GENERAL. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The surface to receive the geotextile 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 drainage pipe 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 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.

8.1 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.

8.2 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.

8.3 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.

9. QUALITY CONTROL. The Contractor shall establish and maintain quality control for work under this section to assure compliance with the contract requirements and maintain records of his quality control for all construction operations. Quality control shall be in accordance with Section E. A copy of the records of inspections and tests, as well as the records of corrective action taken, shall be furnished to the Government.

10. MEASUREMENT AND PAYMENT.

10.1 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 Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile. Payment for the following items is included in the contract unit price for "Geotextile" and shall not be counted a second time in the process of determining the extent of geotextile placed:

a. material and associated equipment and operation used in laps, seams, or extra length;

b. securing anchors and associated material, equipment, and operations;

10.2 No payment shall be made for geotextile replaced because of contamination

or damage due to Contractor fault or negligence.

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

| ITEM | UNIT |
|---|---|
| Geotextile | SY |

* * * * *

PART I
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GUARDRAIL

INDEX

PART I
SECTION C
DIVISION 2
SECTION 2ZZ

# STOPLOG STORAGE GRATING

INDEX

# SECTION 2ZZ - STOPLOG STORAGE GRATING

1. SCOPE. This section covers the furnishing and installation of the fiberglass grating system.

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

2.1 Support brackets and fasteners: SECTION 5A: MISCELLANEOUS METALS, STANDARD ARTICLES, SHOP FABRICATED ITEMS AND METALWORK FABRICATION.

3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Society of Testing Materials (ASTM).

| | |
|---|---|
| E84 Rev A-91 | Standard Test Method for Surface Burning Characteristics of Building Materials. |
| D635-91 | Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, Test Method for. |

4. GENERAL. Grating shall be of fire-retardant (green) fiberglass reinforced plastic.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION E:

5.1 Shop drawings, samples, lists of materials, certified test reports for materials tests and analysis, disposition records, manufacturer's literature and installation procedures for the grating shall be submitted for approval. Samples of standard or fabricated items shall be full size and complete as required for installation in the work, and may be installed in the work, provided each sample is clearly identified and its location recorded.

6. MATERIALS.

6.1 Grating shall be fiberglass reinforced plastic. The grating shall be a solid molded structure such that the cross bars and bearing bars are in the same plane, and shall be of the grid size and thickness as indicated on the drawings.

6.2 The grating shall be molded from a resin producing a fire retardant grating with a Class I flame spread rating and a fuel contribution of zero (0) when tested in accordance with ASTM E 84. The grating must meet the self-extinguishing requirements of ASTM D 635.

6.3 If the grating is cut resealing is required. The Contractor shall provide all sealing materials as per the grating manufacturer's written recommendations. Grating cut by the Contractor shall be edge-sealed and banded as recommended by

the grating manufacturer.

7. FABRICATION. Grating shall be able to support a uniformly distributed load of 200 psf with a deflection of 1/8 inch or less in a 2 foot span. Grating shall be self-cleaning, i.e. self-draining.

8. INSTALLATION. The grating shall be installed with the appurtanent support brackets and fasteners as specified in SECTION 5A: MISCELLANEOUS METALS, STANDARD ARTICLES, SHOP FABRICATED ITEMS AND METALWORK FABRICATION, and as shown on the drawings.

9. MEASUREMENT. The work of this section will not be measured for separate payment and costs therefore shall be included in the price bid for the structure to which the work pertains.

* * * * *

PART I
SECTION C
DIVISION 5
SECTION 5A

# MISCELLANEOUS METALS, STANDARD ARTICLES, SHOP FABRICATED ITEMS AND METALWORK FABRICATION

INDEX

SECTION 5A - MISCELLANEOUS METALS, STANDARD ARTICLES, SHOP FABRICATED ITEMS AND METALWORK FABRICATION

1. SCOPE. The work covered by this section consists of providing all equipment, materials, and labor for fabricating, furnishing, and installing metal grating, trash racks, trash guards, ladders, grab bars, access ramps, handrailing, gate stem cover, hand winch, cable, pulley, carp racks and grooves, miscellaneous supports, posts, and metal items not specified elsewhere.

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

2.1 Stoplog storage grating: SECTION 2ZZ: STOPLOG STORAGE GRATING.

2.2 Non-shrink grout: SECTION 3A: CONCRETE.

2.3 Slide gates and sluice gates: SECTION 15A: VERTICAL LIFT GATES.

3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Institute of Steel Construction (AISC) Publication.

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Nov. 1989 with Commentary).

3.2 American Welding Society (AWS).

| | |
|---|---|
| D1.1-90 | Structural Welding Code. |

3.3 American Society for Testing and Materials (ASTM).

| | |
|---|---|
| A 36/A36M-91 | Structural Steel. |
| A 53-90 Rev. B | Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless. |
| A 108-90 Rev. A | Steel Bars, Carbon, Cold-Finished, Standard Quality. |
| A 123-89a E1 | Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. |
| A 153-82 | Zinc Coating (Hot-Dip) on Iron and Steel Hardware. |
| A 276-92 | Stainless and Heat-Resisting Steel Bars and Shapes. |
| A 501-89 | Hot-Formed Welded and Seamless Carbon Steel Structural Tubing. |
| A 325 Rev A-92 | High-Strength Bolts for Structural Steel Joints. |

| | |
|---|---|
| A 385-80 | Providing High-Quality Zinc Coatings (Hot Dip). |
| A 307 Rev A-92 | Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength. |
| A 563 Rev A-92 | Carbon and Alloy Steel Nuts. |
| A 444-89 | Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Storm Sewer and Drainage Pipe. |
| A 446-91 | Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality. |
| A 525 E1 Rev B-91 | General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process. |
| B 209 Rev A-92 | Aluminum and Aluminum-Alloy Sheet and Plate. |
| B 211 Rev A-92 | Aluminum and Aluminum-Alloy Bar, Rod, and Wire. |
| B 241/B241M Rev A-92 | Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube. |
| F 594 | Stainless Steel Nuts |

3.4 Federal Specifications (Fed. Spec.).

| | |
|---|---|
| FF-S-325 | Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry). |
| RR-G-661E (as amended) | Grating, Metal, Bar Type. |

3.5 American Society of Mechanical Engineers Boiler and Pressure Vessel Code

| | |
|---|---|
| Section IX | Welding and Brazing Qualifications. |

3.6 Military Specifications (Mil. Spec.).

| | |
|---|---|
| DOD-P-21035A | Paint, High Zinc Dust Content, Galvanizing Repair. |

3.7 American National Standards Institute (ANSI).

| | |
|---|---|
| B 18.22.1 (R 1990) | Plain Washers. |
| B 18.21.1-90 | Lock Washers. |

4. GENERAL.

4.1 The AISC Specification for Design, Fabrication and Erection of Structural Steel Buildings shall govern the work. Welding shall be in accordance with AWS

code D1.1.

4.2 The Contractor shall verify dimensions and shall take field measurements necessary before fabrication. Exposed accessories shall be compatible, and shall match in color and finish with the material to which the accessories are being applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Miscellaneous supports, braces and connections necessary for completion of the metal-work shall be provided. Fastenings shall be concealed where practicable. Joints shall be formed to exclude water.

5. SUBMITTALS. Contractor submittals shall be in accordance with the requirements of the particular sections of these specifications for the respective items and as herein specified. The following items shall be submitted in accordance with SECTION E:

5.1 Shop Drawings including Manufacturers data, catalog cuts and installation instructions shall be submitted for approval for the following items:

(1) Anchor bolts
(2) Post embedment sleeve detail and non-shrink grout
(3) Grating and grating framework
(4) Padlocks, chain and locking assembly
(5) Safety/Trash guard and connections
(6) Stoplog hooks, sill, grooves, storage brackets and connectors
(7) Ladder and grab bar
(8) Handrailing and splices
(9) Carp rack and grooves
(10) Stem gate cover and cap
(11) Trash rack
(12) Access ramps
(13) Slide gate closure cover plate and gate operator supports
(14) Hand winch, cable and pulley

The above shall include fabrication and assembly details and type, grade and class of materials as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the shop drawings.

5.2 Certificates of Compliance stating that materials provided and work performed meet the requirements specified.

5.3 Welding procedures, welding operator qualifications and weld schedule shall be submitted for approval.

6. MATERIALS.

6.1 Grating. Fed. Spec. RR-G-661E, Type I, Class 1 or 2, Material S. Grating bars shall be of the size shown. The surface of the bearing bars shall be serrated. Edges of gratings which require the cutting of more than one bearing bar shall be banded. Grating shall be galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS. Grating shall be fastened as

indicated on the drawings or as approved.

6.2 Steel studs shall be of length and diameter as shown and shall be inaccordance with ASTM A 325.

6.3 Steel bars and rods for trash guards, trash racks, ladders and grab bars. ASTM A 108, Grades 1010 through 1020, unless indicated otherwise.

6.4 Structural steel plates, channels, and angles shall be in accordance with ASTM A 36. Structural steel items shall be galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS.

6.5 Expansion anchors. Fed. Spec. FF-S-325, group and type as required, except that nail driven types will not be accepted. Anchors shall be stainless steel unless otherwise indicated. Expansion anchors shall be proof load tested in accordance with FF-S-325.

6.6 Bolts, nuts, washers and other fasteners shall be of the material, grade, type, class, style, and finish indicated; or best suited for the intended use as determined by the Contracting Officer.

6.6.1 High-strength bolts, nuts, and washers. ASTM A 325.

6.6.2 Bolts, nuts, and washers (other than high-strength).

6.6.2.1 Bolts and nuts. ASTM A 307, Grade A.

6.6.2.1.1 Stainless Steel Nuts. ASTM F 594.

6.6.2.2 Washers.

6.6.2.2.1 Plain. ANSI B18.22.1, Type B.

6.6.2.2.2 Lock. ANSI B18.21.1.

6.7 Grating hinges shall be of the size as shown and shall be full surface, not swagged, with fixed pin. Hinges and pins shall be made of ASTM A 276, Type 316 stainless steel.

6.8 Non-shrink grout shall be as specified in SECTION 3A: CONCRETE.

6.9 Handrailing. ASTM A 53, Type E or S, Grade A or B, standard strength pipe, galvanized after fabrication in accordance with ASTM A 123 and ASTM A 385. Size and class shall be as shown on the drawings. All fastening hardware shall be galvanized in accordance with ASTM A 123 and ASTM A 153.

6.10 Aluminum.

6.10.1 Tubes and Pipe. ASTM B 241, Alloy 6061, Temper T6.

6.10.2 Plates. ASTM B 209, Alloy 6061, Temper T6.

6.10.3 Bars and Rods. ASTM B 211-90, Alloy 6061, Temper T6.

6.11 Stoplog grooves and Stoplogs shall be of the shape and size indicated on the drawings, and shall be made of stainless steel in accordance with ASTM A 240, Type 304.

6.12 Stoplog Sill, Storage Anchor Rods and Stoplog U-bolts shall be of the shape and size indicated on the drawings, and shall be made of stainless steel in accordance with ASTM A 276, Type 304.

6.13 Square structural tubing shall be of the shape and size indicated on the drawings, and shall be made of steel in accordance with ASTM A 501.

6.14 Stem gate cover pipe and cap shall be schedule 40 galvanized pipe in accordance with ASTM A 53.

6.15 Hand winch shall have a minimum full drum and second layer load rating of 300 pounds and 1000 pounds, respectively. Gears shall be machine cut spur gears cut from solid steel, and shall be protected with a steel gear cover. The handle shall be of steel with free spinning sleeves, and the drum shafts and countershafts shall turn on bronze bearings. The hand winch shall have a corrosion resistant finish, and all fasteners, springs and the cable (1/4 inch dia.) shall be stainless steel.

6.16 Pulley shall have a 2 inch diameter stainless steel wheel with self lubricating bronze bushing. Frame shall be carbon steel and shall be galvanized in accordance with PARAGRAPH: ZINC COATINGS.

7. SHOP FABRICATED METAL ITEMS. Shop fabricated metal items shall conform to the requirements and details as specified or shown on the drawings and to the workmanship provisions and other applicable fabrication requirements as specified herein.

7.1 Grating shall be of the material specified herein, and shall be fabricated in sectional panels of the width and length as necessary to accurately fit on the supporting frame.

7.2 Ladders shall be fixed-rail metal ladders as shown. Ladders, grab bars and accessories shall be fabricated with steel, galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS. Fabrication of ladders shall be as indicated on the drawings. Splices in side bars shall be made using full penetration welds and shall be a smooth transition between connecting ends without sharp or extensive projections. All welds shall be ground smooth. Ladders and grab bars shall be anchored to supporting structure as indicated.

7.3 Padlocks for hinged grating shall be Master No. 160-D or approved equal. Padlocks shall have case hardened steel shackles and solid brass bodies and cylinders. Padlocks shall be keyed alike and each lock shall be furnished with at least one key.

7.4 Chain for grating shall be 3/8" nominal size, shall be made of case hardened steel, shall be electric welded and shall have a zinc-coated finish. Chain shall

be attached to grating as shown.

7.5 Handrailing shall be steel pipe as specified herein, size as shown on the drawings and shall be furnished and installed complete with all fittings, rail post anchorage, hardware, sleeves and other appurtances as shown and required for proper installation.

7.5.1 Steel pipe handrailing shall be fabricated from pipe sections by mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve. Railings shall be free of burrs, sharp corners, and sharp edges.

7.6 Stoplog hooks shall be made of aluminum as indicated and specified herein and shall be fabricated as shown on the drawings. Stoplog hooks shall be placed in the stoplog storage holders by the Contractor.

7.7 Carp rack grooves shall be Neenah R-7500, Type E or approved equal. Carp rack grooves shall be cast iron, mounted as indicated on the drawings. Size shall be as shown and strength shall be in accordance with rack groove manufacturer's written recommendations.

7.8 Carp racks and hand winch support angles and plates shall be structural steel as indicated and specified herein and shall be fabricated as shown on the drawings. Carp racks and hand winch support angles and plates, shall be galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS. All bolts, eyebolts, anchors, nuts and washers shall be galvanized in accordance with ASTM A 153.

7.9 Hand winch, cable, and pulley shall be from a reputable manufacturer, and shall be of the type as indicated and specified herein and installed as indicated on the drawings.

7.10 Trash guards and racks shall be structural steel as specified herein and fabricated as shown on the drawings. All welds shall be ground smooth. Trash racks and trash guards, including hinged connections, shall be galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS.

7.11 Stoplog grooves and sill shall be stainless steel as indicated and specified herein, and shall fabricated and installed as shown on the drawings. The stoplog grooves and sill surfaces in contact with concrete shall be coated with a bonding agent equal to Sika Armatec 110.

7.12 Stoplog storage support brackets shall be structural steel as indicated on the drawings and specified herein, and shall be fabricated and installed as shown on the drawings. Support brackets shall be galvanized after fabrication in accordance with PARAGRAPH: ZINC COATINGS.

7.13 Access ramps, steel grating, posts, and connections shall be structural steel of the shapes and sizes as indicated on the drawings and specified herein, and shall be fabricated and installed complete with all fittings, hardware, and other appurtances as shown and required for proper installation. All items

indicated to be galvanized shall meet the requirements of PARAGRAPH: ZINC COATINGS.

7.14 Slide gate closure cover plate, column base plates, and angle connectors shall be structural steel, and all structural square tubing shall be as specified herein, size as shown on the drawings and shall be furnished and installed complete with all fittings, hardware, and other appurtances as shown and required for proper installation.

7.15 Stoplog storage grating anchor rods, bolts, nuts, washers and plate washers shall be stainless steel as indicated and specified herein, and shall be installed as shown on the drawings.

7.16 Gate stem cover pipe and cap shall be as indicated and specified herein, and shall be fabricated and installed complete as shown, and required for proper installation as per the gate manufacturer's recommendations.

8. WORKMANSHIP. Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications and approved shop drawings for the item of work being furnished. Metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean, true lines and surfaces. Welding shall be continuous along the entire area of contact, except where tack welding is permitted. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, unless otherwise specified.

9. STRUCTURAL FABRICATION.

9.1 General. Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated on the drawings or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on shop drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown on the drawings. Re-entrant cuts shall be filleted to a minimum radius of 3/4-inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

9.2 Dimensional Tolerances for Structural Work. Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured at the time of measurement. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown on the drawings an allowable variation of 1/32-inch is permissible in the overall length of component members with both ends milled and

component members without milled ends shall not deviate from the dimensions shown on the drawings by more than 1/16-inch for members 30 feet or less in length and by more than 1/8-inch for members 30 feet in length.

9.2.1 The stoplog sill shall be installed perpendicular to the gatewell walls in a flat, horizontal alignment such that no point along the installed sill deviates by more than 1/16" out of a straight horizontal or vertical alignment. The stoplog grooves shall be installed such that no point along the installed grooves deviates by more than 1/8" from plumb in the vertical or horizontal direction, and shall be such that no binding of the stoplogs is encountered.

9.3 Structural Steel Fabrication. Structural steel may be cut by mechanically guided or hand guides or hand guided torches provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded chipping or grinding will not be required except as necessary to removed slag and sharp edges of mechanically guided or hand guided cuts not exposed to view. Hand guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

10. WELDING.

10.1 Welding Process. Welding, unless otherwise specified, shall meet the applicable requirements of AWS D1.1.

10.2 Qualifications of Welders and Welding Operators. Welders and welding operators shall pass successfully the qualification tests as prescribed by Section 5 of AWS D1.1, or Section IX or ASME Boiler and Pressure Vessel Code, before being assigned to production work. The Contractor shall certify by name the welders and welding operators so qualified, the date of qualification and code and procedures under which qualified. Prior qualification will be accepted if welders have performed satisfactory work under the codes for which qualified within the preceding three months. The Contractor shall require welders and welding operators to repeat the qualifying tests when in the opinion of the Contracting Officer their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests shall be recertified. Those not passing shall be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

11. INSTALLATION.

11.1 General. All parts to be installed shall be thoroughly cleaned; all packing compounds, rust, dirt, grit and other foreign matter removed; and all enclosed chambers or passages examined to make sure that they are free from injurious materials. When units or items are shipped as assemblies, they will be inspected by the Contracting Officer prior to installation. Disassembly, cleaning and lubrication will not be required, except where there is indication that such work is necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause injury to the surfaces of rods, nuts or other parts shall not be used for thework of assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly, but care shall be taken not to overstress the threads. When a

half nut is placed for the purpose of locking a full nut, the half nut shall be placed first and followed by the full nut. Threads of all nuts, screws, bolts, except for high-strength bolts, shall be lubricated by graphite and oil before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with a suitable anti-galling compound. Driving and drifting bolts or keys will not be permitted.

11.2 Alignment and Setting. Each unit shall be accurately aligned by the use of steel shims or other approved methods, such that binding or distortion of any member will not occur before it is finally fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. The units shall be set true to the elevations shown on the drawings.

11.3 Grating shall be installed in accordance with manufacturer's written recommendations and as indicated.

11.4 Anchor bolts and expansion anchors shall be installed in locations shown in accordance with manufacturer's written recommendations and as approved by the Contracting Officer.

11.5 Non-shrink grout shall be placed as shown and as specified in SECTION 3A: CONCRETE.

11.6 Handrailing shall be installed as indicated with all posts vertical.

12. ZINC COATINGS. Zinc coatings shall be applied in a manner and of thickness and quality in accordance with ASTM A 123. Galvanizing shall be after fabrication to the maximum extent practicable. Where zinc coating is damaged by cutting, welding, transporting, assembling, installing, or other cause, the affected areas shall be regalvanized by one of the followng methods. Coatings 2 ounces per square foot or heavier shall be regalvanized with suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness quality specified for the original zinc coating. Coatings less than 2 ounces per square foot shall be regalvanized by a repair compound meeting the requirements of Mil Spec. DOD-P-21035A.

13. QUALITY CONTROL. The Contractor shall establish and maintain quality control for work under this section to assure compliance with contract requirements, and maintain records of his quality control for all construction operations. Quality Control shall be in accordance with Section E. A copy of the records of inspections and tests, as well as corrective action taken, shall be furnished to the Government.

14. MEASUREMENT AND PAYMENT.

14.1 Stoplog hooks and trash guards will be measured by the unit, in place, complete.

14.2 The remaining work of this section will not be measured for separate payment and costs therefore shall be included in the price bid for the feature

to which the work pertains.

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

| Item | Unit |
|---|---|
| Stoplog Hooks | EA |
| 24" RCP Trash Guards | EA |
| 24" CMP Trash Guard | EA |

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PART I
SECTION C
DIVISION 6
SECTION 6A

ROUGH CARPENTRY

INDEX

SECTION 6A - ROUGH CARPENTRY

1. SCOPE. This section covers timber stoplogs.

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

2.1 U bolts and stainless steel plate: SECTION 5A: MISCELLANEOUS METALS, STANDARD ARTICLES, SHOP FABRICATED ITEMS AND METALWORK FABRICATION.

3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Society for Testing and Materials (ASTM).

| | |
|---|---|
| D 245-92 | Establishing Structural Grades Related Allowable Properties for Graded Lumber. |
| D 1760-86a | Pressure Treatment of Timber Products. |
| D 1625-86 | Chromated Copper Arsenate. |

3.2 American Wood Preservers Association (AWPA).

| | |
|---|---|
| C2-1992 | Lumber, Timbers, Bridge Ties,and Ties - Preservative Treatment by Pressure Processes. |
| M4-1991 | The Care of Preservative-Treated Wood Products. |

4. NOT USED.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION E:

5.1 Certificates of Compliance for timber. The Contractor shall furnish the Contracting Officer a certificate showing that the timber meets the requirements of this contract, including, but not limited to the type of timber provided, cross sectional properties, design values, and preservative treatment.

6. MATERIALS.

6.1 Timber. Timber materials shall be of the length and cross section as indicated on the drawings. Timber shall be manufactured from No. 1 structural grade dimension lumber which, when loaded perpendicular to the narrow face of the lumber, has an allowable bending stress of 1,200 psi or greater and a horizontal shear resistance of 70 psi or greater. Timber shall be free of checks, shakes, splits, decay, and shall bear a lumber grade stamp indicating grade of material and rules or standards under which produced. The maximum size and number of knots allowed in the timber shall be in accordance with ASTM D 245. Timber shall be full length pressure treated with chromated copper arsenate (CCA) per AWPA P5

PART I
SECTION C
DIVISION 7
SECTION 7C

SEALANTS

INDEX

## SECTION 7C - SEALANTS

1. SCOPE. This section covers sealant to be placed on the grab bar posts.

2. NOT USED.

3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 Federal Specifications (Fed. Spec.):

| | |
|---|---|
| TT-S-00230 (Rev. C; Am. 2) | Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures) |

4. NOT USED.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION E:

5.1 Manufacturer's Catalog Data. Descriptive data for elastomeric sealant shall include shelf life, curing time, and application instructions shall be submitted for approval.

5.2 Certificates of Compliance. Certificates of compliance stating that the sealant conforms to the specified requirements shall be submitted.

6. MATERIALS.

6.1 Sealant shall be a one-component, elastomeric-type compound conforming to Fed. Spec. TT-S-00230, Type II, Class B.

7. DELIVERY AND STORAGE. Materials shall be delivered to the job in the manufacturer's original unopened containers. The containers shall include the following information on the label: manufacturer, name of material, formula or specification number, lot number, date of manufacturer, shelf life, and curing time. Sealant compound outdated as indicated by shelf life shall not be used. Materials shall be carefully handled and stored to prevent inclusion of foreign materials or exposure to temperatures exceeding 90 degrees F.

8. SURFACE PREPARATION.

8.1 The surfaces of joints to be sealed shall be dry. Oil, grease, curing compounds, dirt, chalk, particles of mortar, dust, loose mill scale, and other foreign substances shall be removed from joint surfaces to be sealed. Oil and grease shall be removed with solvent and surfaces shall be wiped with clean cloths. Curing compounds shall be removed by sandblasting or wire brushing.

9. APPLICATION.

9.1 Sealant shall be applied to grab bar posts as indicated on the drawings.

9.2 Surfaces to be sealed shall be within the limits of 40 to 90 degrees F when the sealant is applied or in accordance with manufacturer's written recommendations, if more restrictive.

9.2 Sealant shall be applied in accordance with approved manufacturer's instructions.

10. CLEANING. The surfaces adjoining the sealed surfaces shall be cleaned of smears and other soiling resulting from the sealant operations as work progresses.

11. QUALITY CONTROL. The Contractor shall establish and maintain quality control for work under this section to assure compliance with the contract requirements and maintain records of his quality control for all construction operations. Quality control shall be in accordance with Section E. A copy of the records of inspections and tests, as well as the records of corrective action taken, shall be furnished to the Government.

12. MEASUREMENT AND PAYMENT. The work of this section will not be measured for separate payment and the costs therefore shall be included in the price bid for the feature to which the work pertains.

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