



US Army Corps
of Engineers
Louisville District



Louisville District U.S. Army Corps of Engineers

Mark A. Robertson, P.E.

502-315-6264

mark.a.robertson@lrl02.usace.army.mil



US Army Corps
of Engineers
Louisville District



DUCK CREEK AUTOMATED GATE CONSIDERATIONS



US Army Corps
of Engineers
Louisville District



Design Issues and Problems

***Associated with the
Automated Flood
Closure Gate***



US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



■ *Engineering Manual EM 1110-2-2705*
**STRUCTURAL DESIGN OF CLOSURE
STRUCTURES FOR LOCAL FLOOD
PROTECTION PROJECTS**



US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



- ***There are numerous types of closure structures or gates for openings in levees and floodwalls gates shown in the Engineering Manual***



US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



1. STEEL SWING



**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



- 1. STEEL SWING
- 2. MITER

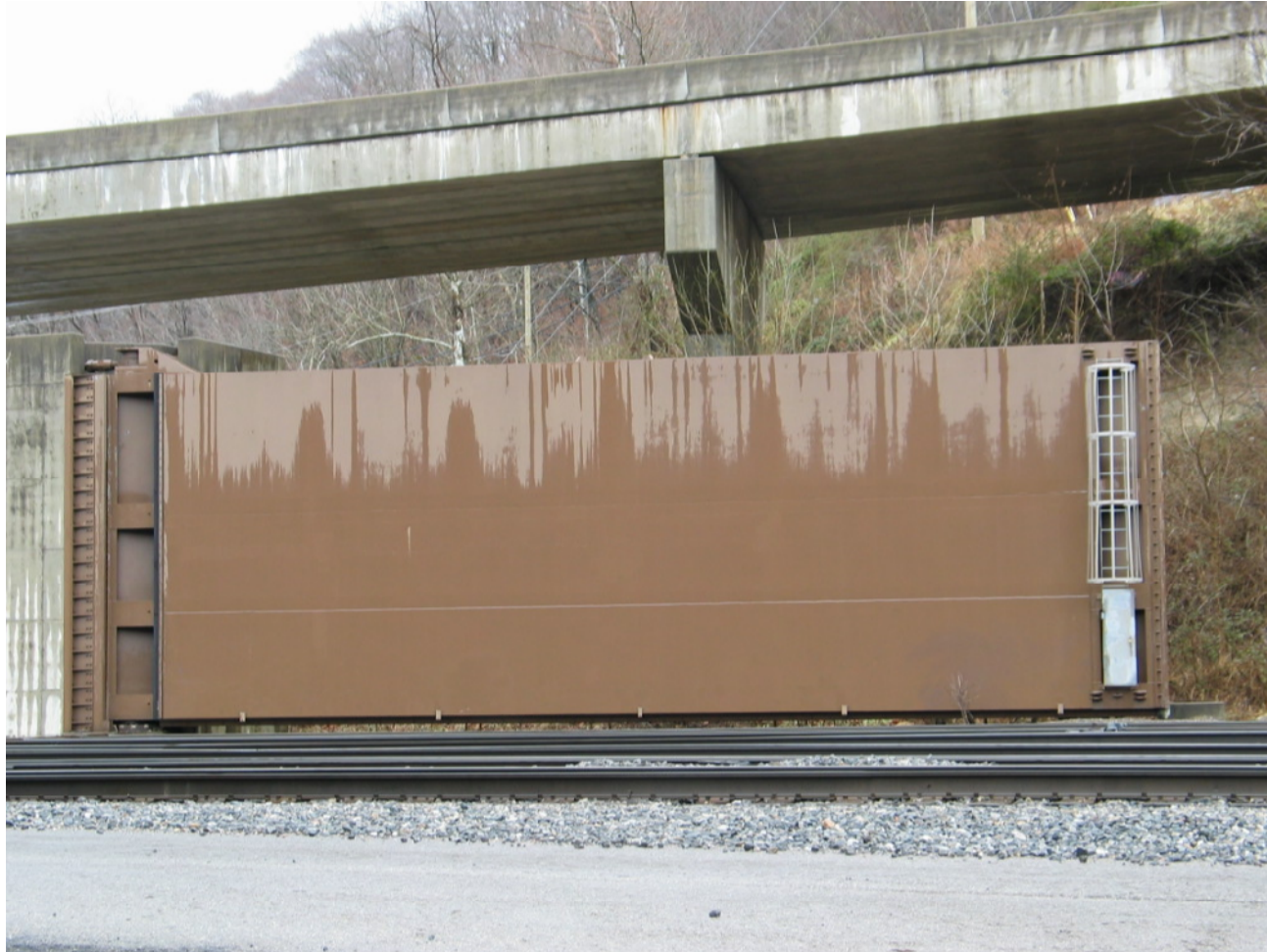


**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



- 1. STEEL SWING
- 2. MITER
- 3. TROLLEY



**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





US Army Corps
of Engineers
Louisville District

DESIGN CRITERIA



- 1. STEEL SWING
- 2. MITER
- 3. TROLLEY
- 4. ROLLING GATE



**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





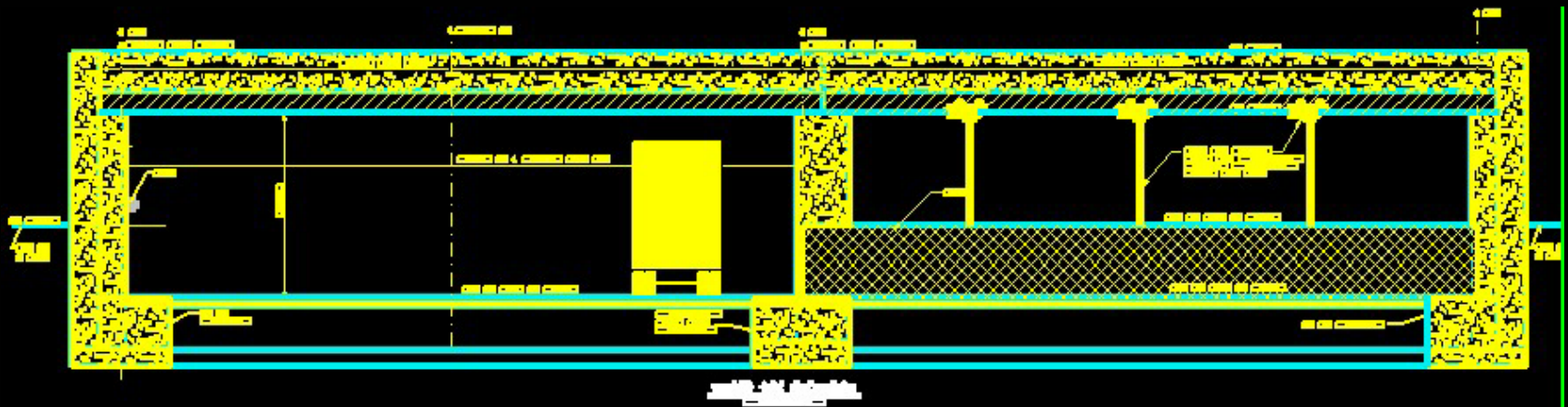
US Army Corps
of Engineers
Louisville District

Design criteria



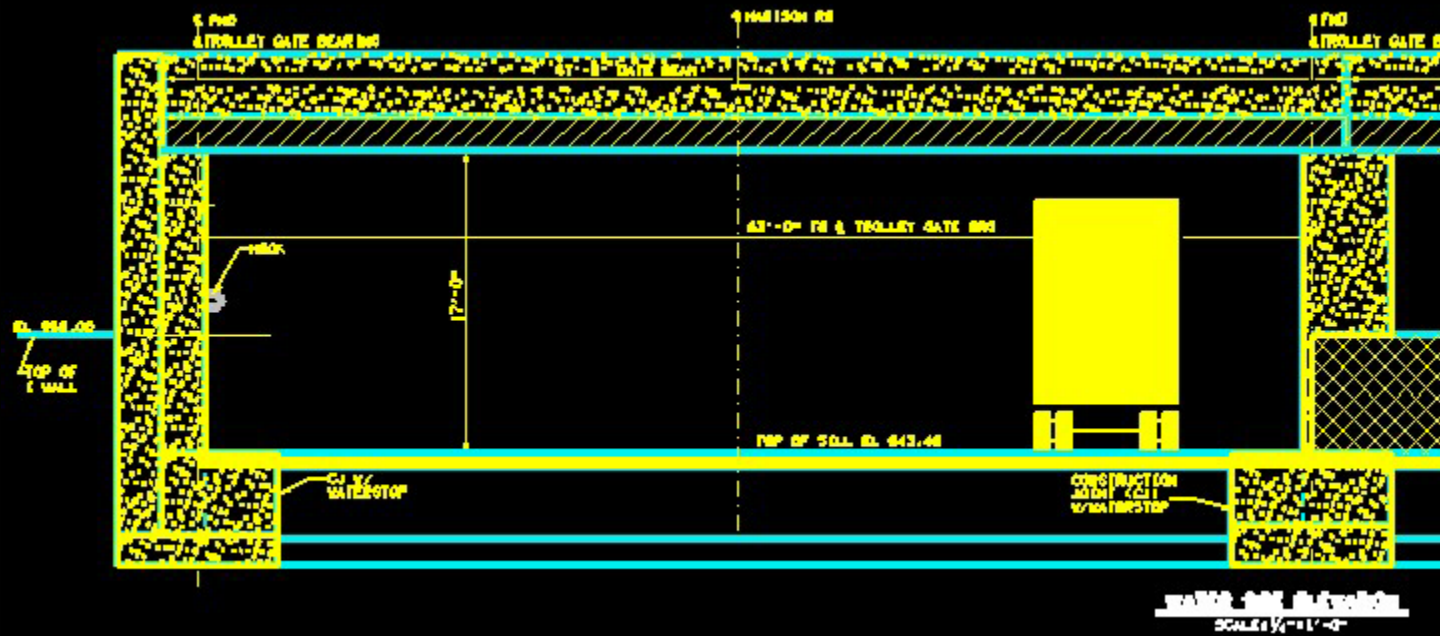
- ***There are several different types of gates listed and information in the Engineering Manual that provides design guidance for the structural closures for openings in levees and floodwalls of inland local flood protection projects***

*Duck Creek Automated Gate Closure
Using the Trolley Design (Note the
Overhead Beam that is Required for
This Type of Design)*





Road Opening Where Automated Gate Closes Road



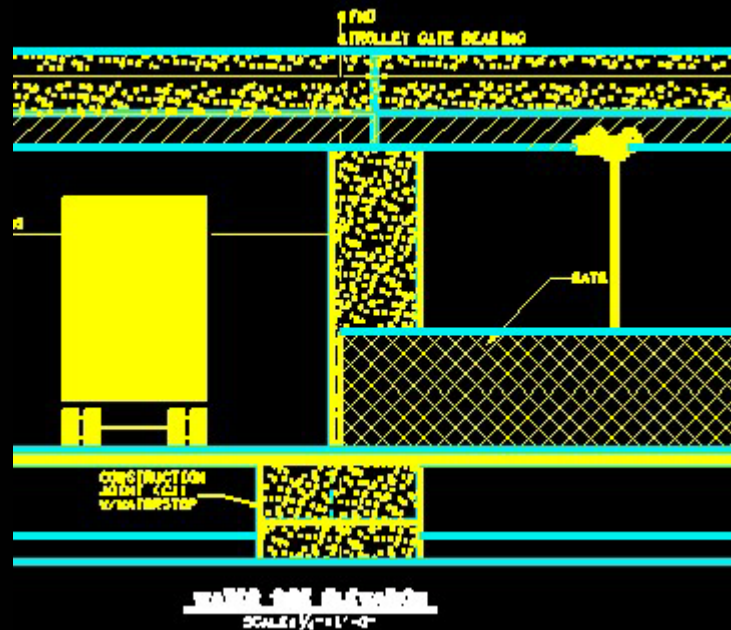


Automated Gate with Trolley Attachments





Trolley Gate with Truck Shown in Road





US Army Corps
of Engineers
Louisville District

Design criteria



1. Steel Swing
2. Miter
3. Trolley
4. Rolling Gate



US Army Corps
of Engineers
Louisville District

Design criteria



- ***FIRST SUGGESTED THE USE OF AN OVERHEAD GATE THAT WOULD BE POSITIONED OVER THE ROAD. THIS WOULD HAVE BEEN A BETTER DESIGN BUT THERE WAS A FEAR THAT THE GATE WOULD FALL AND POSSIBLE INJURY SOMEONE.***



US Army Corps
of Engineers
Louisville District

Design criteria



- ***THE SECOND BRAINSTORMING IDEA WAS TO USE A TROLLEY TYPE DESIGN TO HELP ASSIST THE GATE ACROSS THE ROAD.***
- ***THIS IS WHAT WAS ORIGINALLY STARTED FOR THE DESIGN OF THE CLOSURE GATE.***



US Army Corps
of Engineers
Louisville District

Design criteria



- ***THIS WAS A GOOD IDEA AND HAD BEEN USED BY THE HUNTSVILLE DISTRICT WITH WEST VIRGINIA AS YOU CAN SEE BY THE FOLLOWING PHOTOS.***



**US Army Corps
of Engineers**
Louisville District





**US Army Corps
of Engineers**
Louisville District





Plan View of the Location for the Automated Gate





US Army Corps
of Engineers
Louisville District



**THIS TYPE OF DESIGN
WOULD NOT WORK FOR THE
FOLLOWING REASON:**



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***1. THE GATE WAS APPROXIMATELY 70 FEET IN LENGTH AND WOULD SWAY TO MUCH DUE TO WIND LOAD.***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***1. THE GATE WAS APPROXIMATELY 70 FEET IN LENGTH AND WOULD SWAY TO MUCH DUE TO WIND LOAD.***
- ***2. THE GATE WAS ONLY SUPPORTED BY THE TROLLEY AND SINCE IT WAS AUTOMATED THE GATE WOULD HAVE TO SEAT WITH OUT ANY MAINTENANCE PERSONNEL AT THE SITE***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***THEREFORE WE THEN LOOKED AT ANOTHER OPTION SUCH AS THE ONE WE USE ON MITER GATES, WHICH IS A RACK AND PINOIN TYPE SYSTEM AS SHOWN IN THE FOLLOWING PHOTO.***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***THE RACK AND PINOIN SYSTEM WOULD HAVE REQUIRED SUCH PRECISION TYPE MACHINING AND PLACEMENT OF THE COMPONENTS THAT IT WAS DETERMINED NOT BE THE RIGHT TYPE OF DESIGN FOR THIS APPLICATION***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- *I THEN PROPOSED THE FOLLOWING IDEA THAT LED TO THE DESIGN OF THE CLOSURE SYSTEM TO BE A WINCH TYPE SYSTEM WHICH IS TYPICALLY USED TO MOVE RAILROAD CARS.*



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***THE PROBLEM WAS FINDING A CUSTOM TYPE WINCH TO BE USED TO PULL THE GATE ACROSS THE ROAD AND THEN BACK TO ITS ORIGINAL STORED POSITION***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***I CONSULTED RUSSEL WITTEN IN THE HUNTSVILLE DISTRICT ABOUT THIS TYPE OF WINCH DESIGN AND HE INFORMED ME OF THE FOLLOWING COMPANY SUPERIOR LIDGERWOOD MUNDY OF SUPERIOR WISCONSIN***



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- *I HAD A VERY SHORT DESIGN SCHEDULE AND WAS PROVIDED INFORMATION FROM KEVIN BERG AND DAVE BEATTY FROM SUPERIOR LIDGERWOOD MUNDY TO HELP ME WITH THE CADD DRAWINGS FOR THE WINCH TO MEET THE SCHEDULE*



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- ***WORKING CLOSELY WITH THE STRUCTURAL DESIGN ENGINEER WE WERE ABLE TO COMPLETE THE DESIGN ON SCHEDULE. THE WINCH IS PLACED NEAR THE OPENING SO THAT IT USED TO PULL THE GATE ACROSS THE ROAD AND BACK TO STORAGE.***



US Army Corps
of Engineers
Louisville District

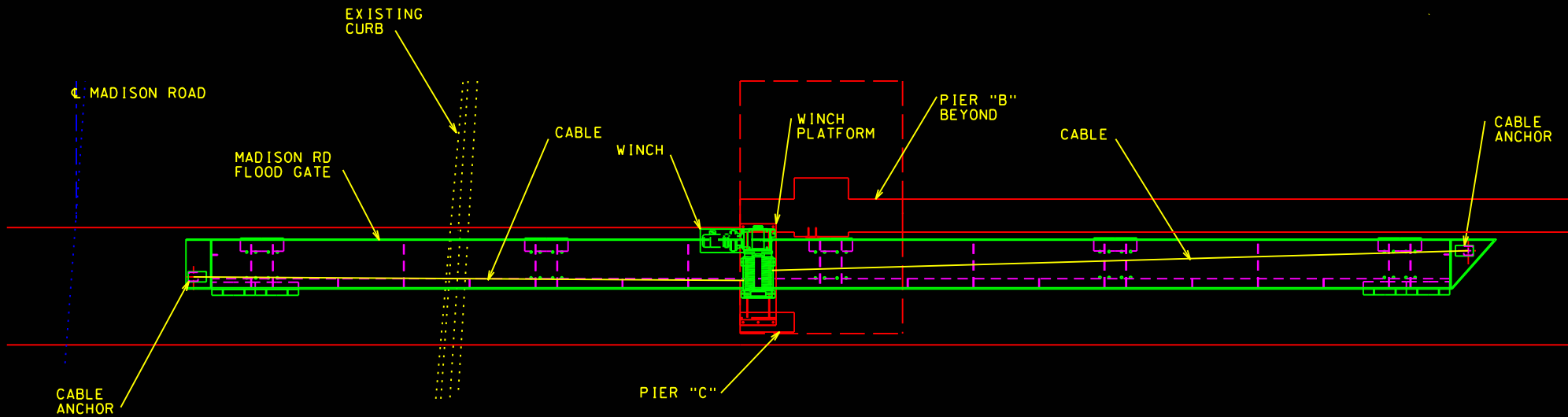
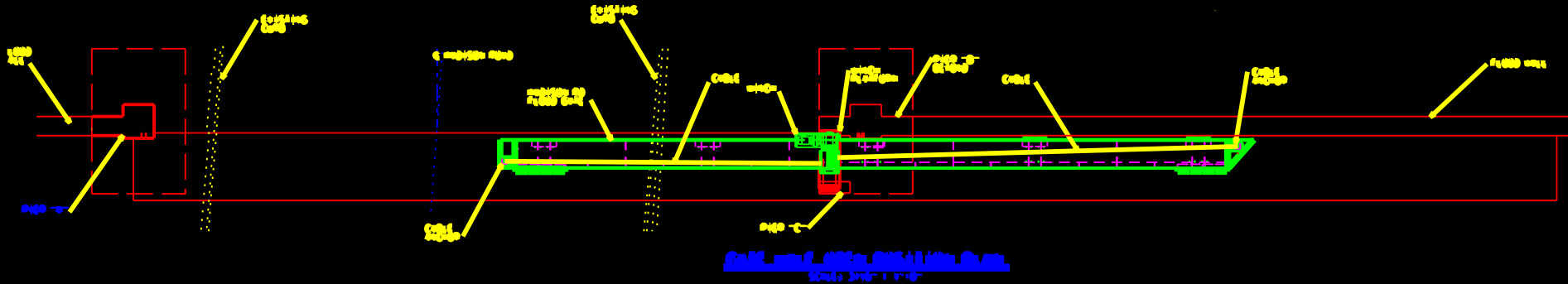
DESIGN INFORMATION



- ***REVIEWERS OF THE DESIGN COULD NOT UNDERSTAND HOW THIS WOULD WORK, THEY COMMENTED THAT THE REQUIRED A PLAN AND SECTION AS INDICATED IN THE FOLLOWING SLIDE:***



PLAN VIEW OF GATE & WINCH

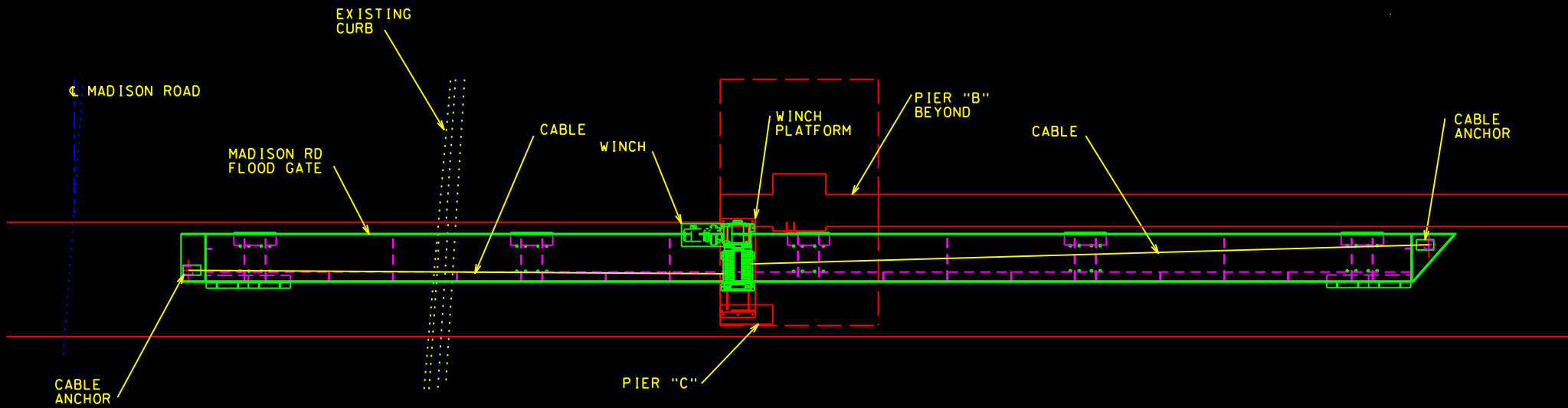


GATE HALF OPEN POSITION PLAN

SCALE: 3/16" = 1'-0"



ENLARGEMENT OF GATE & WINCH



GATE HALF OPEN POSITION PLAN

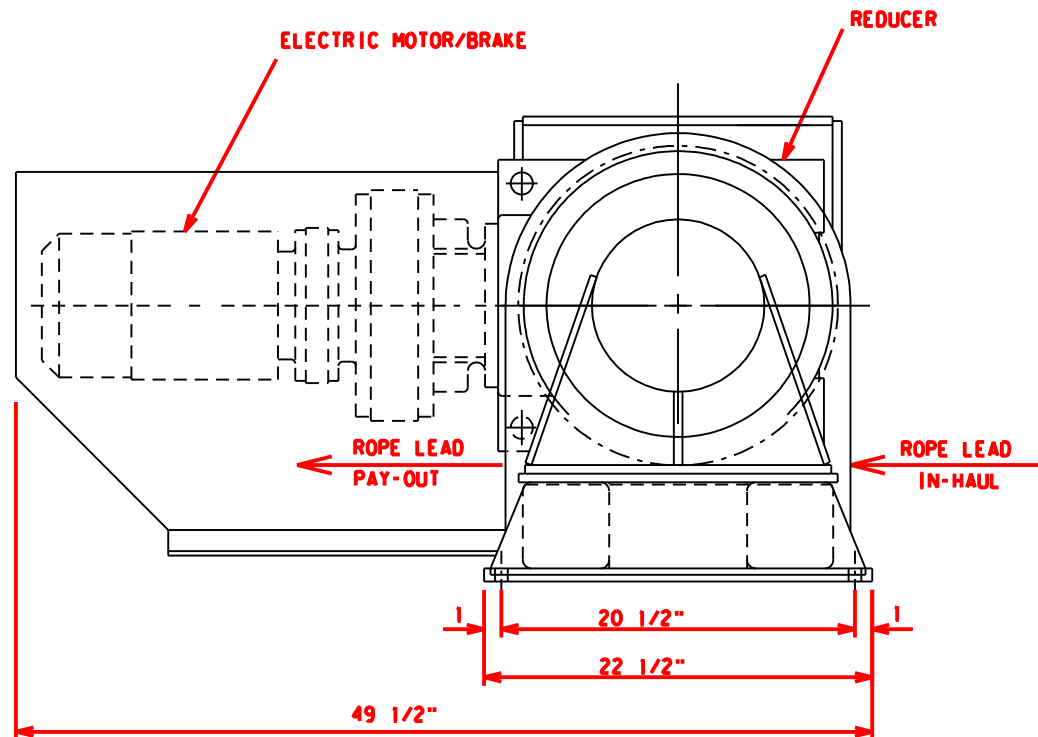
SCALE: 3/16" = 1'-0"



US Army Corps
of Engineers
Louisville District



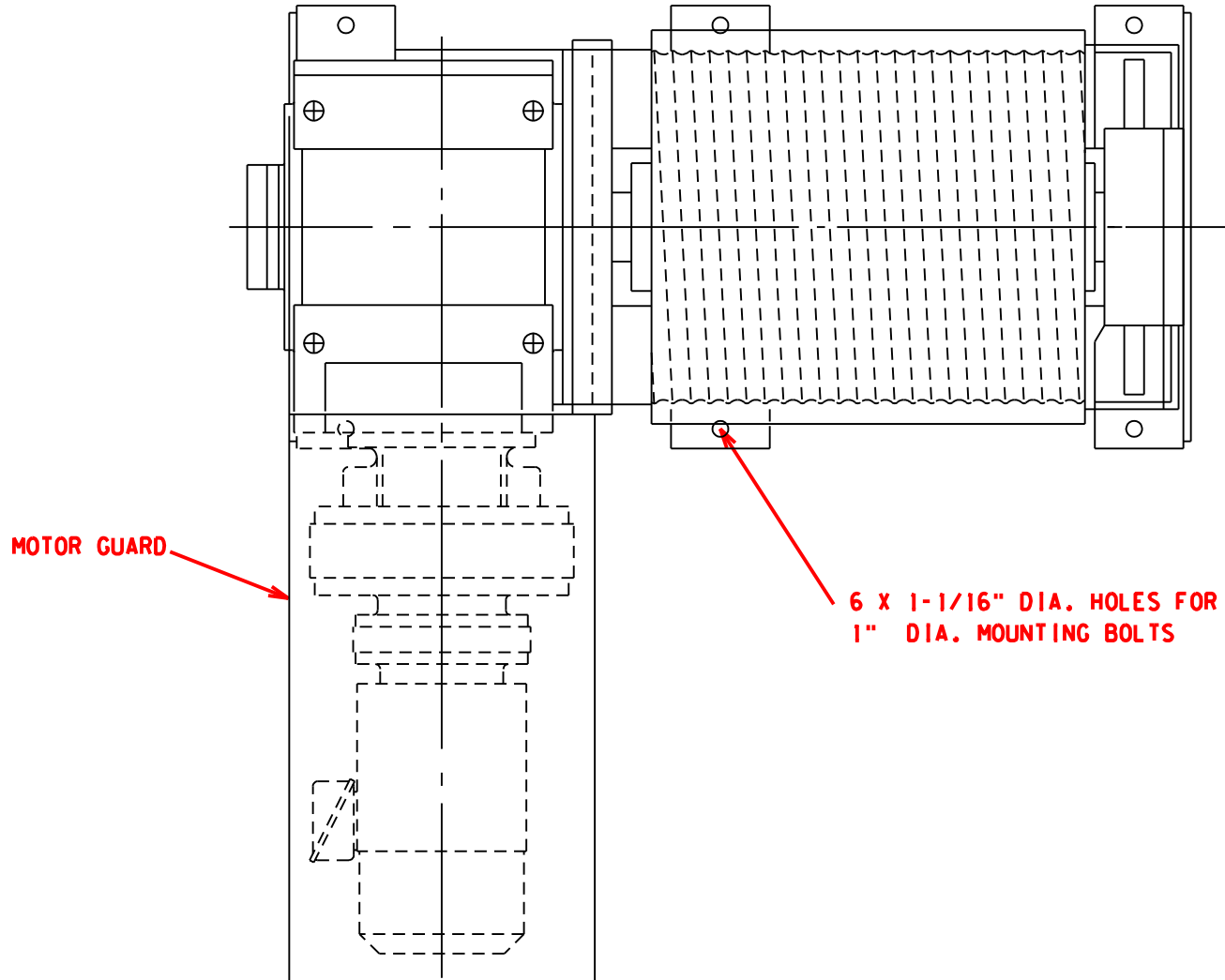
SIDE VIEW OF WINCH





US Army Corps
of Engineers
Louisville District

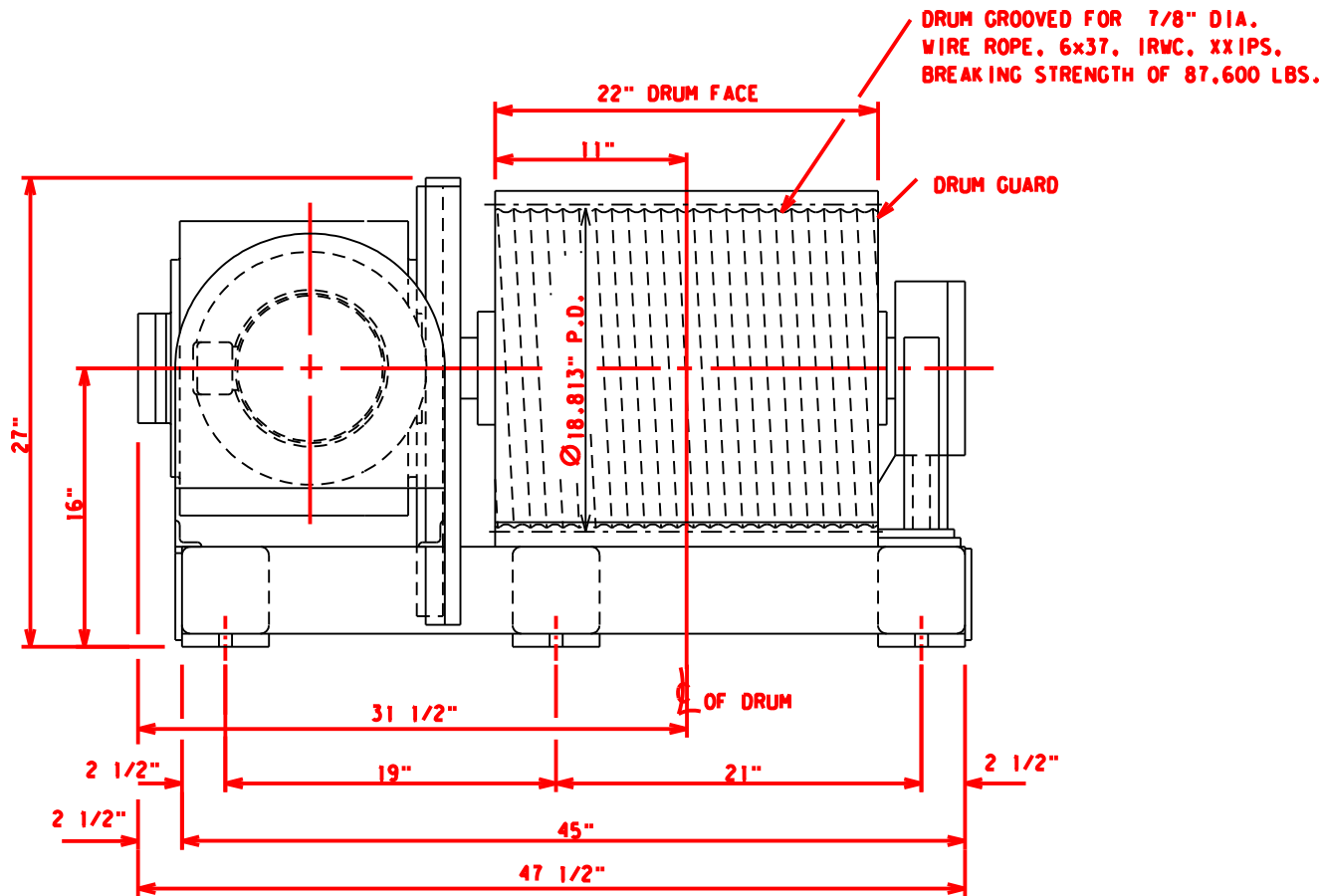
TOP VIEW OF WINCH WITH A SINGLE DRUM





US Army Corps
of Engineers
Louisville District

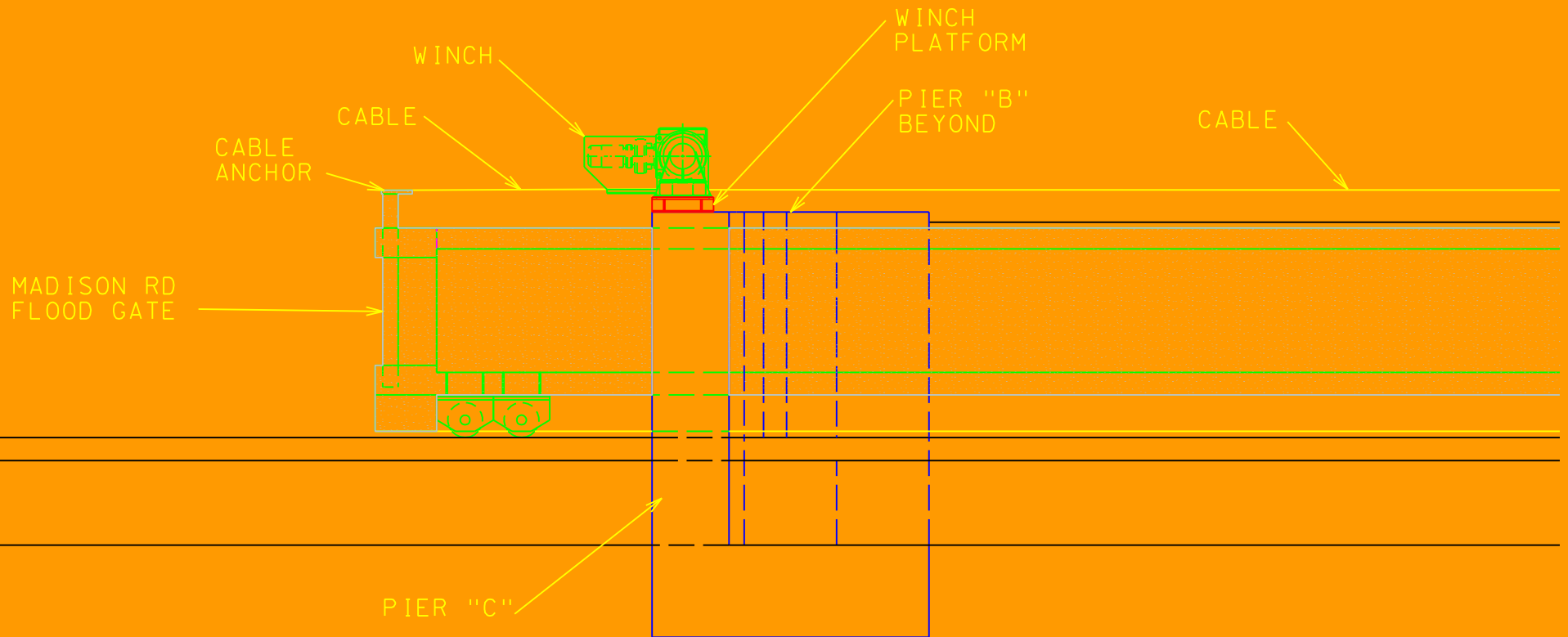
SIDE VIEW OF ELECTRIC WINCH





US Army Corps
of Engineers
Louisville District

Enlargement of Winch and Gate



GATE OPEN POSITION ELEVATION

SCALE: 3/16" = 1'-0"



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- *ONE MAJOR CONCERN FROM THE LOCAL SPONSOR CINCINNATI MSD WAS THE FEAR THAT THE WINCH CABLE MIGHT FAIL AND INJURY SOMEONE*



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- *I INFORMED THEM THE WINCH AND GATE WAS WELL OVERDESIGNED. THE NORMAL INDUSTRY PRACTICE FOR THE CABLE ON THE WINCH WOULD INCLUDE A FACTORY OF SAFETY OF 3 FOR THE CABLE AGAINST THE OPERATING LOAD.*



US Army Corps
of Engineers
Louisville District

DESIGN INFORMATION



- *MY CABLE WAS DESIGNED TO A FACTOR OF SAFETY OF 5 AGAINST THE STARTING LOAD AND THAT THE WINCH WOULD OVERLOAD AT APPROXIMATELY 21,000 LBS. THE CABLE IS DESIGNED FOR A LOAD.*



US Army Corps
of Engineers
Louisville District

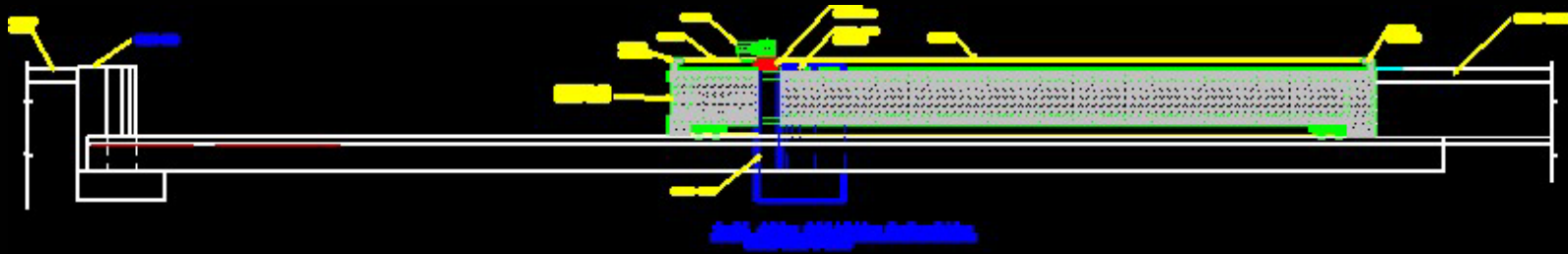
DESIGN INFORMATION



- *I PROPOSED THE FOLLOWING IDEA THAT LED TO THE DESIGN OF THE CLOSURE SYSTEM TO BE A WINCH TYPE SYSTEM WHICH IS TYPICALLY USED TO MOVE RAILROAD CARS.*

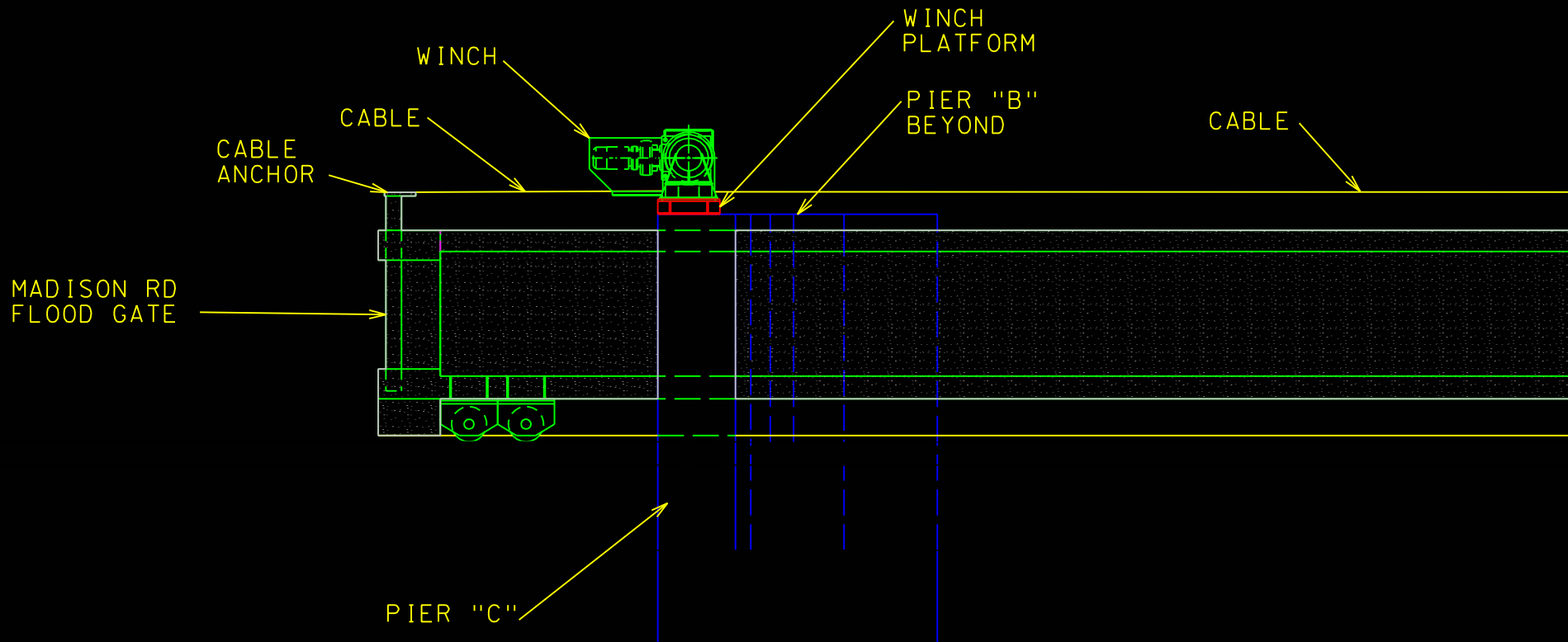


Automated Closure Gate with Winch Design





Automated Closure Gate, Note Winch is Designed to Reel and Unreel with One Drum



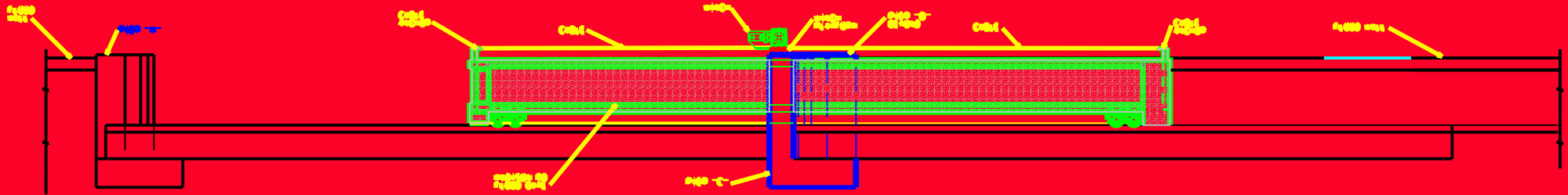
GATE OPEN POSITION ELEVATION

SCALE: 3/16" = 1'-0"



US Army Corps
of Engineers
Louisville District

Gate in Half Open or Closed Position



Gate in Half Open or Closed Position



US Army Corps
of Engineers
Louisville District



Louisville District U.S. Army Corps of Engineers

Mark A. Robertson, P.E.

502-315-6264

mark.a.robertson@lrl02.usace.army.mil