

**US ARMY CORPS  
OF ENGINEERS  
PORTLAND DISTRICT**

# BONNEVILLE LOCK AND DAM SECOND POWERHOUSE TURBULENCE REDUCTION DEVICE

**SOLICITATION NUMBER:  
DATE: 07/24/2012**



**LOCAL VICINITY MAP**



**PROJECT PHOTO**

**THIS PROJECT WAS DESIGNED BY THE PORTLAND DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152 AND INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL THE DRAWINGS IN THIS SET.**

SUBMITTED

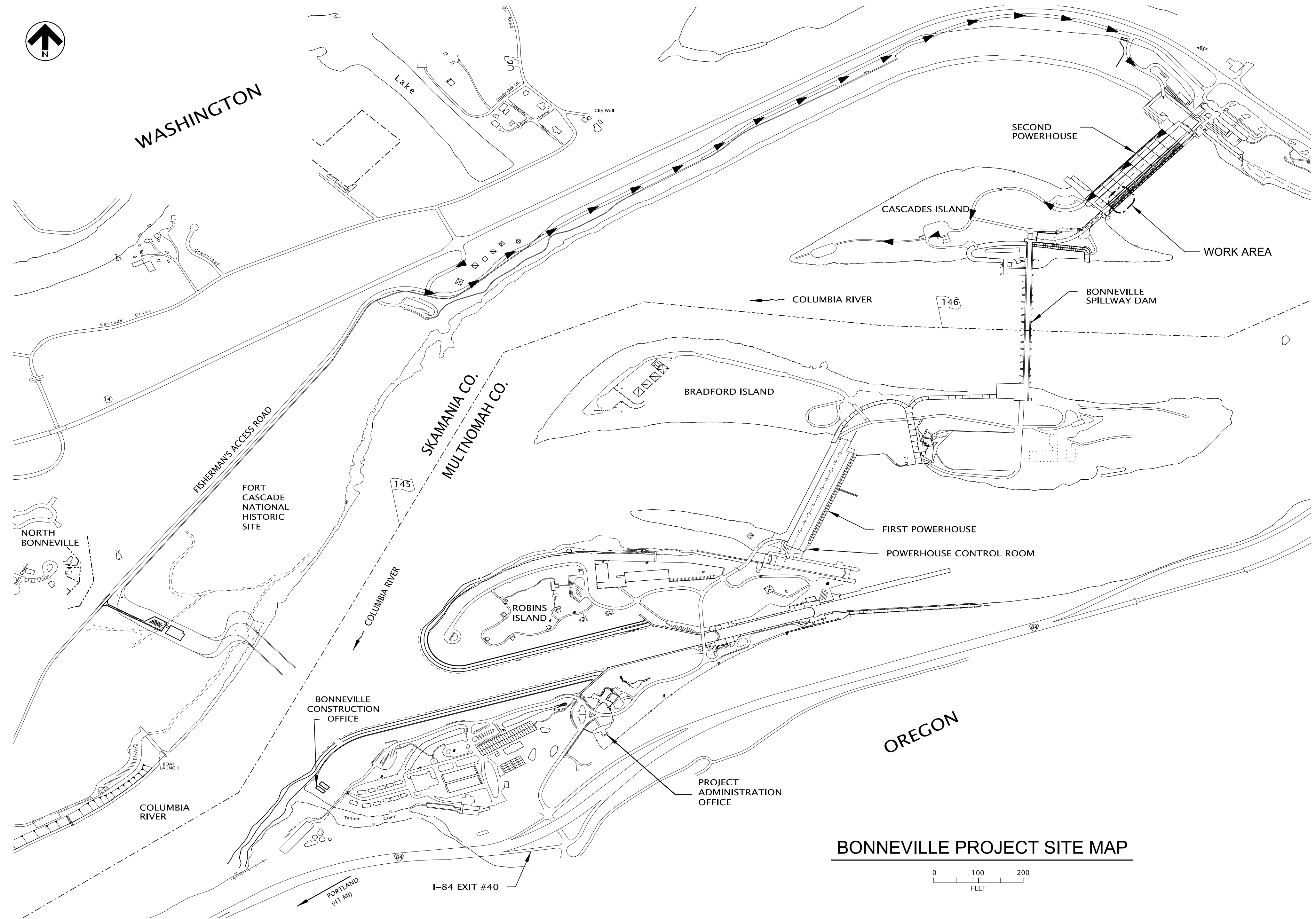
**MARK J. SAWKA, P.E.  
CHIEF, DESIGN BRANCH**

SUBMITTED

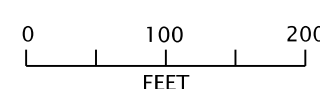
**LANCE A. HELWIG, P.E.  
CHIEF, ENGINEERING & CONSTRUCTION DIVISION**

APPROVED

**JOHN W. EISENHauer, P.E.  
COLONEL, CORPS OF ENGINEERS  
DISTRICT COMMANDER**



**BONNEVILLE PROJECT SITE MAP**



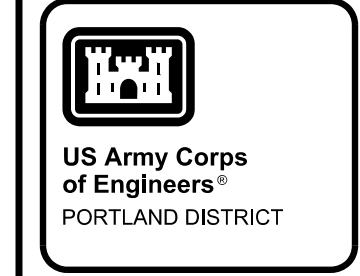
**PROJECT SITE MAP**

DRAWING PLOT SIZE: ANSI D

DATE AND TIME PLOTTED: 7/26/2012 9:55:02 AM

BY USERNAME: g2ecddwp ()

SHEET NAME: Sheet G-001



**US Army Corps  
of Engineers®  
PORTLAND DISTRICT**

NO.	DATE	DESCRIPTION	MARK

DESIGNED BY: REGINA G2ECDDWP	DESIGNED BY: G2ECDDWP	DESIGNED BY: G2ECDDWP	DESIGNED BY: G2ECDDWP
SUBMITTED BY: MATTHEW D. HANSON, P.E.	SUBMITTED BY: MATTHEW D. HANSON, P.E.	SUBMITTED BY: MATTHEW D. HANSON, P.E.	SUBMITTED BY: MATTHEW D. HANSON, P.E.
PLOT SCALE: 1" = 100'	PLOT SCALE: 1" = 100'	PLOT SCALE: 1" = 100'	PLOT SCALE: 1" = 100'
FILE NAME: IDBFD02_G-001xxx.dgn	FILE NAME: IDBFD02_G-001xxx.dgn	FILE NAME: IDBFD02_G-001xxx.dgn	FILE NAME: IDBFD02_G-001xxx.dgn

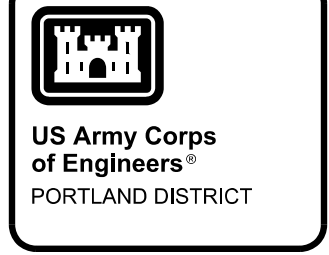
**BONNEVILLE LOCK AND DAM  
SECOND POWERHOUSE  
TURBULENCE REDUCTION DEVICE**

COVER/SIGNATURE:  
PROJECT SITE AND VICINITY MAP

**SHEET  
IDENTIFICATION  
G-001**

# DRAWING INDEX

REVISION MARK	FILE NAME	SHEET ID	DRAWING TITLE
<b>GENERAL</b>			
	BDF1.102_G-001xxx	G-001	COVER SHEET
	BDF1.102_G-002xxx	G-002	DREAWING INDEX
	BDF1.102_G-003xxx	G-003	GENERAL NOTES AND LEGEND
<b>STRUCTURAL</b>			
	BDF1.102_S-401xxx	S-401	ISOMETRIC AND ELEVATIONS
	BDF1.103_S-402XXX	S-402	SECTIONS
<b>MECHANICAL</b>			
	BDF1.102_M-501xxx	M-501	MECHANICAL DETAILS 1
	BDF1.102_M-502xxx	M-502	MECHANICAL DETAILS 2



<b>90 PERCENT REVIEW</b>		DATE	APPR.
		MARK	DESCRIPTION

U.S. ARMY CORPS OF ENGINEERS PORTLAND DISTRICT PORTLAND, OR	DESIGNED BY:	DATE:	SOLICITATION NO.:
	DRAWN BY: G2ECDDWP	CHK BY:	CONTRACT NO.:
	SUBMITTED BY:	PLOT DATE: 7/24/2012	DRAWING NUMBER:
	PLOT SCALE: 1:1	FILE NAME: BDF1.102_G-002xxx	ANSI D

BONNEVILLE LOCK AND DAM  
SECOND POWERHOUSE  
TURBULENCE REDUCTION DEVICE  
DRAWING INDEX

SHEET IDENTIFICATION  
**G002**  
SHEET 0 OF 0

**GENERAL NOTES:**

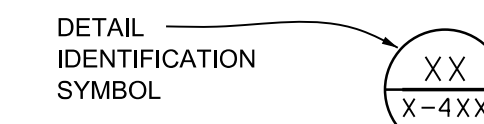
- 1.) SEE SHEETS G-001 FOR COVER/SIGNATURE, PROJECT SITE AND VICINITY MAP
- 2.) SEE SHEET G-002 FOR DRAWING INDEX
- 3.) SEE THIS SHEET FOR MECHANICAL GENERAL NOTES.
- 4.) PROJECT ELEVATION DATUM IS NAVD88.
- 5.) FIELD VERIFY ALL DIMENSIONS SHOWN.

**THE FOLLOWING ABBREVIATIONS MAY BE USED ON THE DRAWINGS IN THIS VOLUME**

ANCH. = ANCHOR	OS = OUTSIDE
A.B. = ANCHOR BOLT	OSAY = OUTSIDE STEM AND YOKE (VALVES)
AC = ASPHALT CONCRETE	O TO O = OUT TO OUT
APPROX. = APPROXIMATE	PC = POINT OF CURVATURE
ARCH. = ARCHITECTURAL	PCF = POUNDS PER CUBIC FOOT
ARV = AIR RELEASE VALVE	PERF. = PERFORATED
AWS = ATTRACTION WATER SUPPLY	PL = PLATE
B.C. = BOLT CENTERS	PLF = POUNDS PER LINEAR FOOT
B.F. = BOTTOM FACE	PRE-FAB = PREVIOUSLY FABRICATED
BG = BACK GOUGE	PSF = POUNDS PER SQUARE FOOT
B.L. = BOTTOM LAYER	PSI = POUNDS PER SQUARE INCH
BLDG. = BUILDING	PSPD = POST SORT POOL DRAIN
BRG = BEARING	PT = POINT OF TANGENCY (CIVIL SHEETS)
B TO B = BACK TO BACK	PT. = POINT
C = CHANNEL	PTFE = POLYTETRAFLUORIDETHYLENE (TEFLON)
C TO C = CENTER TO CENTER	PVC = POLYVINYL CHLORIDE
C/E JT = CONTRACTION JOINT/EXPANSION JOINT	PVI = POINT OF VERTICAL INTERSECTION
CF = CUBIC FEET	RAD. = RADIUS
CI = CAST IRON	R.H. = ROUND HEAD
C.J. = CONSTRUCTION JOINT	REF = REFERENCE
CJP = COMPLETE JOINT PENETRATION	REINF. = REINFORCEMENT
C/L = CENTERLINE	REQ'D = REQUIRED
CL2 = CHLORINE	R.O. = ROUGH OPENING
CLR = CLEAR	RT = RIGHT
CONC. = CONCRETE	SCH = SCHEDULE
CONN = CONNECTION	SHT = SHEET
CONT = CONTINUOUS	SIM = SIMILAR
CONT. JT. = CONTRACTION JOINT	STAG. SPL. = STAGGER SPLICE
C.M.P. = CORRUGATED METAL PIPE	STD = STANDARD
CP = COMPLETE PENETRATION	STIR. = STIRRUP
CRES = CORROSION RESISTING STEEL	STL. = STEEL
CSP = CORNER SUPPORT PIECE	S.F. = SQUARE FOOT
CSK = COUNTERSINK	SHLDR = SHOULDER
CU = COPPER	SQ = SQUARE
DET. = DETAIL	S.S. = STAINLESS STEEL
D&G = DRILL & GROUT	STA. = STATION
DIA. = DIAMETER	STC = STEEL TROWELED CONCRETE
DI = DUCTILE IRON	SYM = SYMMETRICAL
DIP = DUCTILE IRON PIPE	T & B = TOP AND BOTTOM
D/S = DOWNSTREAM	T.B.D. = TO BE DETERMINED
DWG = DRAWING	T.F. = TOP FACE
DWLS = DOWELS	T.J. = TROWELED JOINT
EA. = EACH	T.L. = TOP LAYER
EF. = EACH FACE	T.O. = TOP OF
E.L. = EACH LAYER	TOC = TOP OF CONCRETE
ELEV. = ELEVATION	TOF = TOP OF FOOTING
E.J. = EXPANSION JOINT	TOS = TOP OF SLAB
EQ.SP. = EQUALLY SPACED	TOW = TOP OF WALL
E.W. = EACH WAY	T.S. = TUBULAR STEEL
EXAM. = EXAMINATION	TYP. = TYPICAL
E.W. = EACH WAY	UNO = UNLESS NOTED OTHERWISE
EXIST. = EXISTING	U.N.O. = UNLESS NOTED OTHERWISE
F.B. = FLAT BAR	U/S = UPSTREAM
F.D. = FLOOR DRAIN	V = VERTICAL
F.F. = FAR FACE	VBS = VERTICAL BARRIER SCREEN
FG = FINISH GRADE	VC = VERTICAL CURVE
F.H. = FLAT HEAD	VERT. = VERTICAL
FLG = FLANGE	W/ = WITH
FT. = FOOT, FEET	WL = WATERLINE
F.W. = FLAT WASHER	WP = WELD PLATE
FWS = FACILITY WATER SUPPLY	W.P. = WORK POINT
GA. = GAUGE	W.S. = WATERSTOP
GAC = GRANULAR ACTIVATED CARBON	WCJ = WALL CONSTRUCTION JOINT
GALV. = GALVANIZED	WWF = WELDED WIRE FABRIC
GV = GATE VALVE	
H = HORIZONTAL	
H.D. = HEAVY DUTY	
H.M. = HOLLOW METAL	
HOR. = HORIZONTAL	
HSS = HOLLOW STRUCTURAL SECTION	
ID = INSIDE DIAMETER	
IF = INVERT ELEVATION	
I.F. = INSIDE FACE	
I.L. = INSIDE LAYER	
IN. = INCH, INCHES	
INFO = INFORMATION	
IS = INSIDE	
ISO JT = ISOLATION JOINT	
IWRC = INDEPENDENT WIRE ROPE CORE	
JFR = JUVENILE FISH RETURN	
JT. = JOINT	
KSI = KIPS PER SQUARE INCH	
L = ANGLE	
LF. = LINEAR FEET	
LFS = LAMPREY FLUME SUPPLY	
LG. = LONG	
LT = LEFT	
LTH = LENGTH	
LONG. = LONGITUDINAL	
L.P. = LOW POINT	
MAX. = MAXIMUM	
MIN. = MINIMUM	
M.B. = MACHINE BOLT	
MECH. = MECHANICAL	
MK = MARK	
MSE = MECHANICALLY STABILIZED EARTH	
NAT. = NATURAL	
N.C. = NO CHAMFER	
NF = NEAR FACE	
NO. = NUMBER	
NOM = NOMINAL	
NPS = NOMINAL PIPE SIZE	
NPT = NATIONAL PIPE THREAD	
NTS = NOT TO SCALE	
O.A.L. = OVER ALL LENGTH	
O.C. = ON CENTER	
O.D. = OUTSIDE DIAMETER	
OF = OUTSIDE FACE	
O.L. = OUTSIDE LAYER	
OPP = OPPOSITE	

**LEGEND:**

1. DETAILING CONVENTION SHALL BE INTERPRETED AS SHOWN BELOW:



DETAIL IDENTIFICATION SYMBOL

SHEET NUMBER ON WHICH DETAIL APPEARS

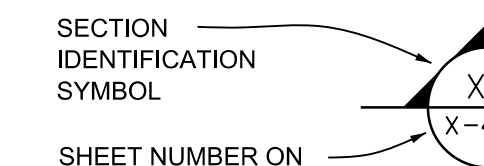
\* WHEN BLANK, DETAIL APPEARS ON THE SAME SHEET AS IT WAS TAKEN



DETAIL

SHEET NUMBER WHERE DETAIL WAS TAKEN \*

2. SECTIONING CONVENTION SHALL BE INTERPRETED AS SHOWN BELOW:



SECTION IDENTIFICATION SYMBOL

SHEET NUMBER ON WHICH SECTION APPEARS \*

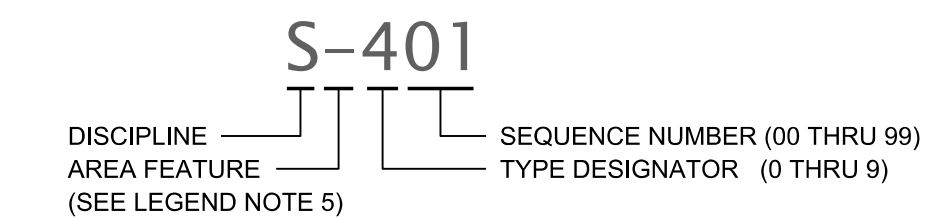
\* WHEN BLANK, SECTION APPEARS ON THE SAME SHEET AS IT WAS TAKEN



SECTION

SHEET NUMBER WHERE SECTION WAS TAKEN \*

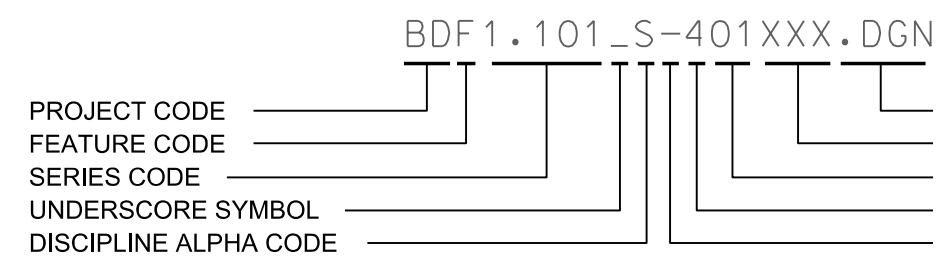
3. SHEET IDENTIFICATION CONVENTION SHALL BE INTERPRETED AS SHOWN BELOW:



DISCIPLINE  
AREA FEATURE  
(SEE LEGEND NOTE 5)

SEQUENCE NUMBER (00 THRU 99)  
TYPE DESIGNATOR (0 THRU 9)

4. FILE NAME CONVENTION SHALL BE INTERPRETED AS SHOWN BELOW:

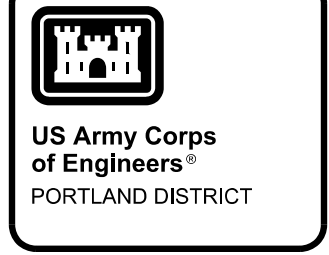


PROJECT CODE  
FEATURE CODE  
SERIES CODE  
UNDERSCORE SYMBOL  
DISCIPLINE ALPHA CODE

FILE EXTENSION  
USER DEFINABLE  
SEQUENCE NUMBER (0 THRU 99)  
TYPE DESIGNATOR (0 THRU 9)  
AREA FEATURE

5. AREA FEATURE DESIGNATOR FOR ALL SHEETS SHALL BE AS SHOWN BELOW:

- DENOTES GENERAL FEATURES
- D DENOTES DEMO
- P DENOTES PIPING
  
- B DENOTES ELECTRICAL \_\_\_ FEATURE
- C DENOTES ELECTRICAL \_\_\_ FEATURE
- E DENOTES ELECTRICAL \_\_\_ FEATURE
- I DENOTES ELECTRICAL \_\_\_ FEATURE



DATE	07/24/2012
SOLICITATION NO.	
CONTRACT NO.	
DRAWING NUMBER	
FILE NAME	BDF1.101_G-003XXX.dgn
ANSI D	

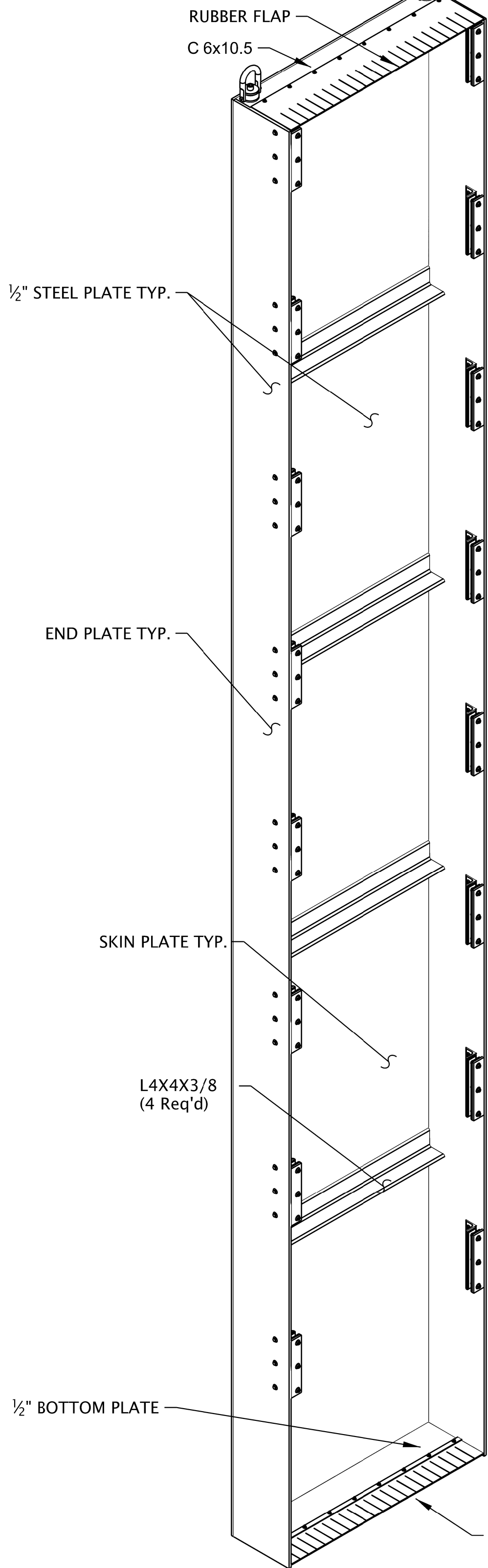
DESIGNED BY	DESIGNED BY	DATE	07/24/2012
CHECKED BY	CHECKED BY	SOLICITATION NO.	
DATE	DATE	CONTRACT NO.	
07/24/2012	07/24/2012	DRAWING NUMBER	
GREGGAW	GREGGAW	FILE NAME	BDF1.101_G-003XXX.dgn
MATTHEW D. HANSON P.E.	MATTHEW D. HANSON P.E.	ANSI D	

BONNEVILLE LOCK AND DAM  
SECOND POWERHOUSE  
TURBULENCE REDUCTION DEVICE  
GENERAL NOTES AND LEGEND

SHEET IDENTIFICATION  
**G-003**  
SHEET 0 OF 0

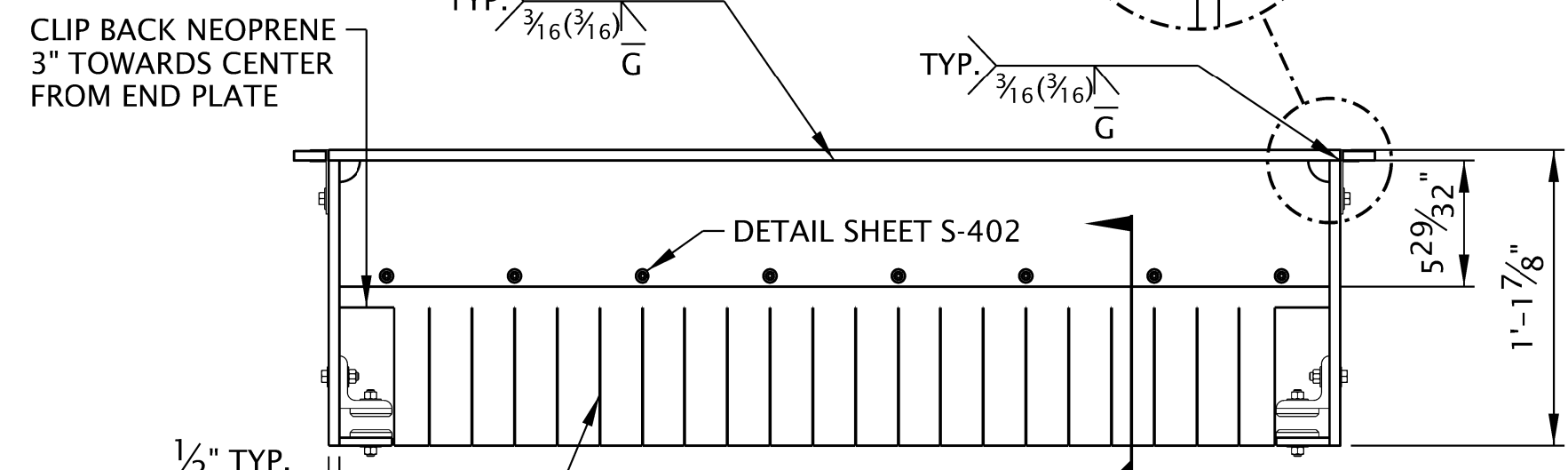
CROSBY UNC SWIVEL HOIST RING HR-125  
 3/4 - 10 x 3.5 WORKING LOAD LIMIT  
 7000# OR APPROVED EQUAL. SWIVEL  
 HOIST RINGS AT APPROXIMATE  
 LOCATIONS. CONTRACTOR TO LOCATE  
 CENTER OF GRAVITY AND INSTALL HOIST  
 RINGS PRIOR TO INSTALLATION OF  
 TURBULENCE REDUCTION DEVICES.

AMERICAN BRUSH COMPANY 1.5" LENGTH  
 BRUSH FULL HEIGHT OF TRD. USE 'F' RIGHT ANGLE  
 HOLDER AND 0.018 BCU BRISTLES. TOP EDGE OF 'F'  
 HOLDER TO BE FLUSH WITH FRONT EDGE OF TRD.  
 ATTACH TO TRD USING MATCHING HARDWARE TO  
 REST OF TRD. LOCATE BOLTS AT 6" SPACING. HOLES  
 TO BE 1/8" LARGER THAN BOLTS.



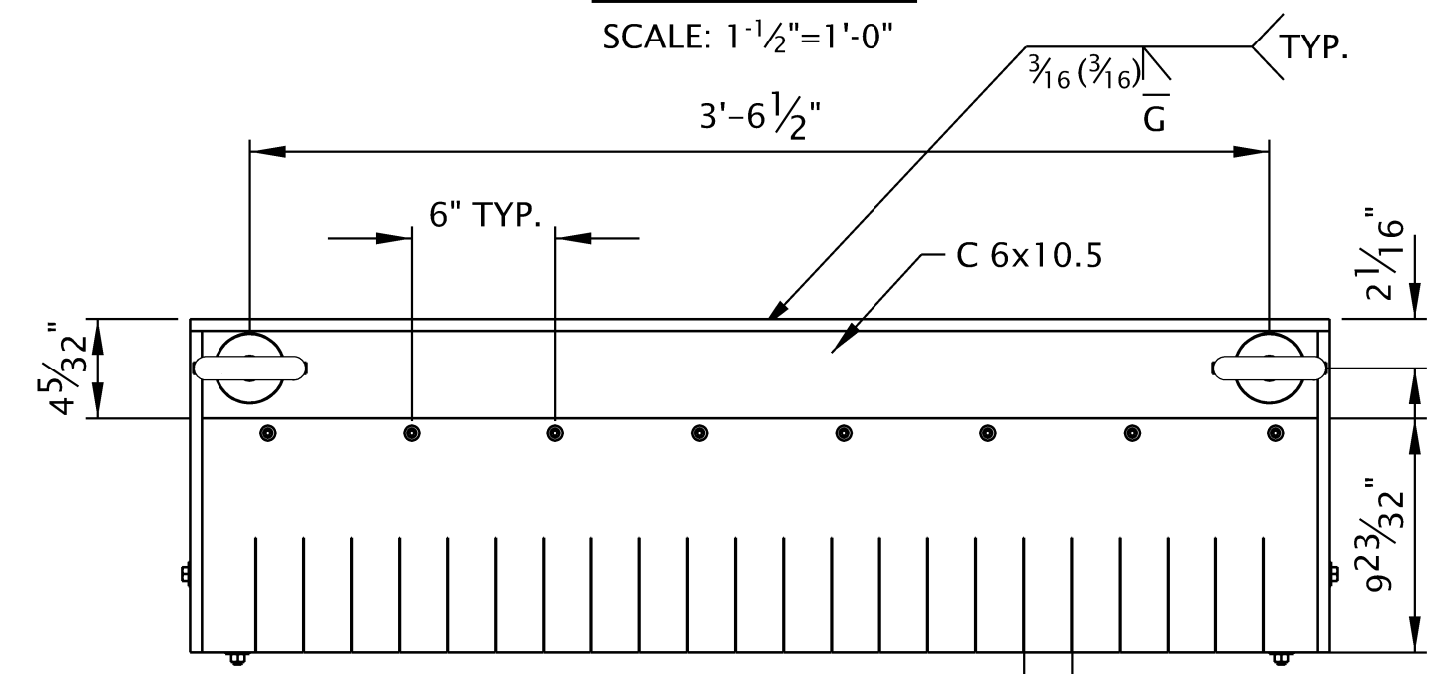
**ISOMETRIC-TURBULENCE REDUCTION DEVICE**

N.T.S.



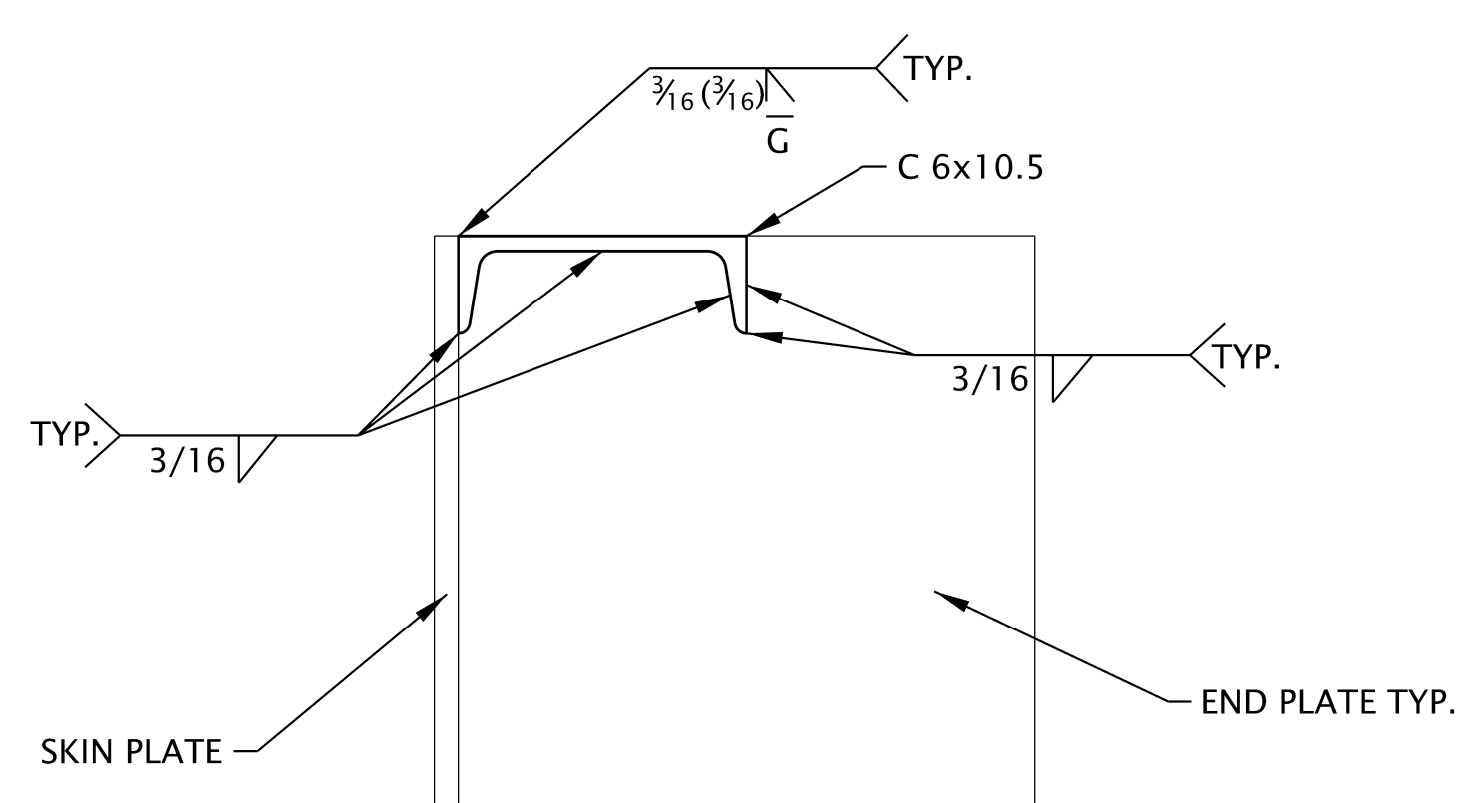
**PLAN BOTTOM**

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



**PLAN TOP**

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

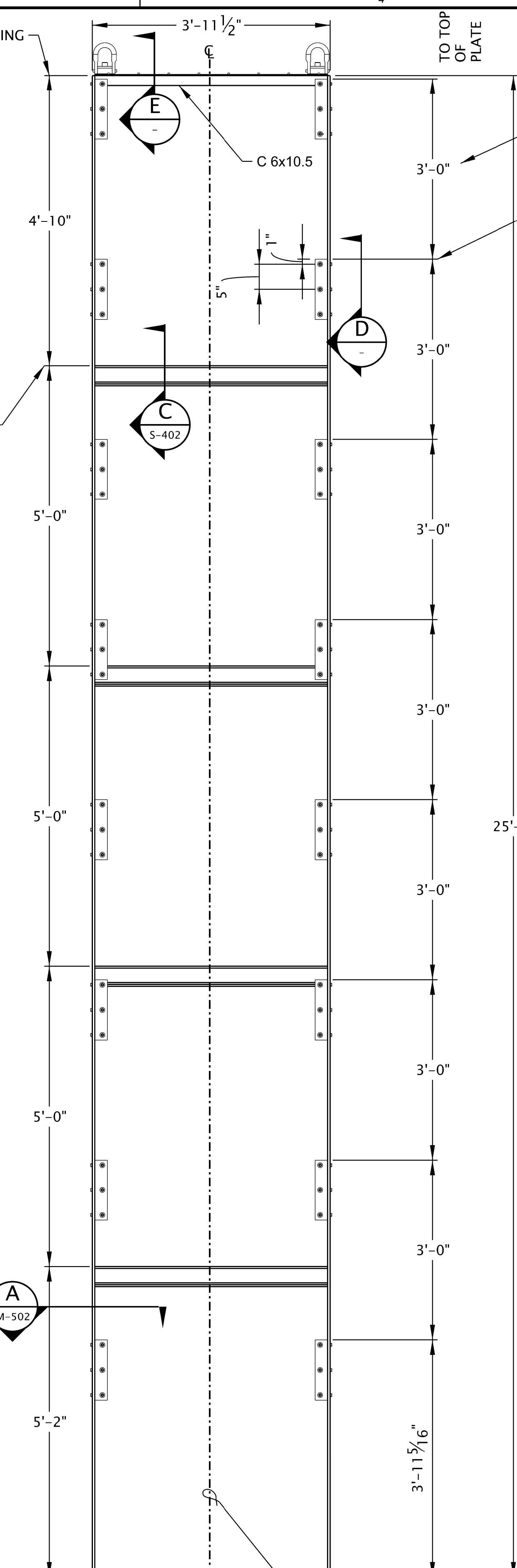


**E ELEVATION**

3" = 1'-0"

**A ELEVATION**

M-502



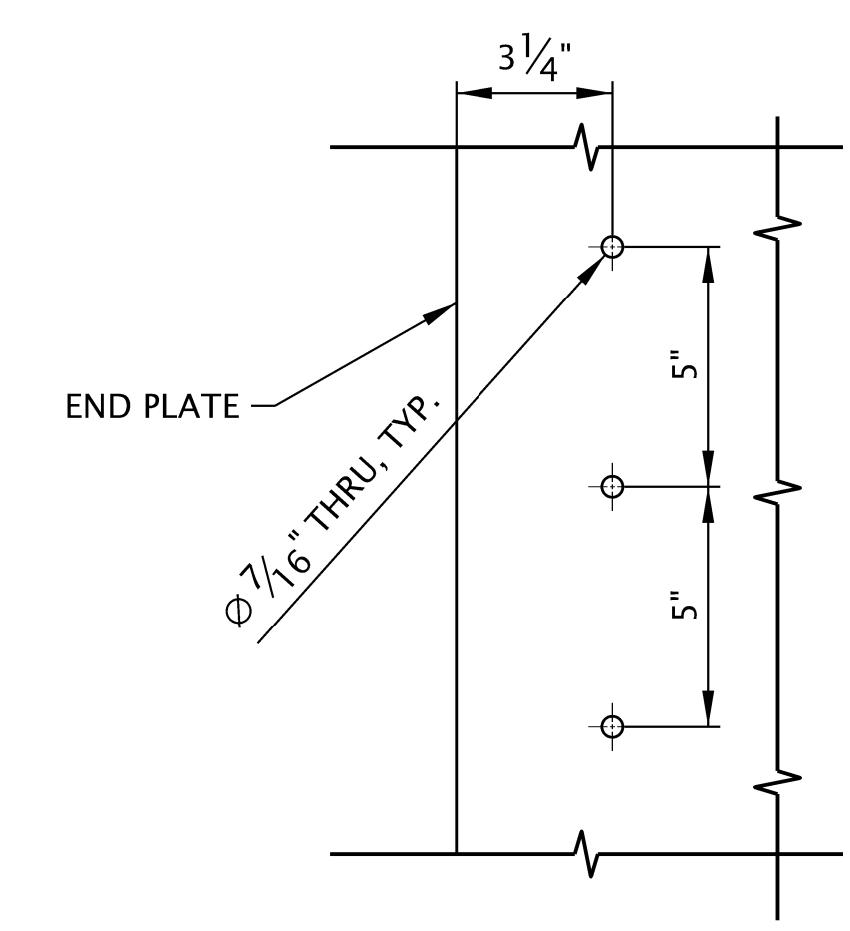
**ELEVATION**

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

PART SYMMETRIC ABOUT C

GUIDE SPACING

TOP OF GUIDE BAR SUPPORT



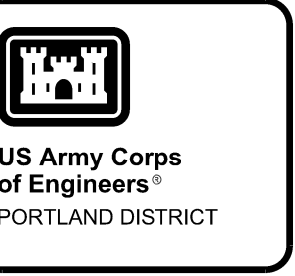
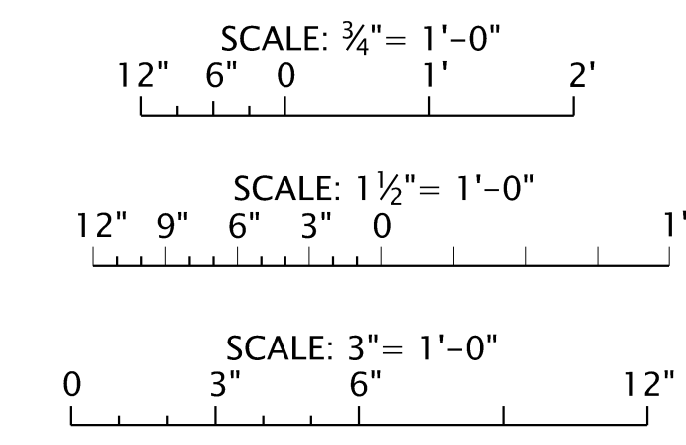
**D ELEVATION**

3" = 1'-0"

(SIM @ 16 LOCATIONS)

**NOTE:**

1. PROVIDE TWO (2) TRD ASSEMBLIES
2. ALL STRUCTURAL STEEL SHAPES AND PLATE THIS SHEET SHALL BE A36 UNO. SEE SPEC. 05 50 01.00 25
3. PAINT CARBON STEEL PER SPEC. 05 50 01.00 25 SECTION 3.9
4. SPLICES PERMITTED IN SKIN PLATE WITH CJP WELD AND GROUND FLUSH BOTH SIDES. SEE SKIN PLATE SPLICE SECTION IF REQUIRED.
5. 100% MT ALL WELDS.
6. TOLERANCE OF NO MORE THAN 1/8" FROM FABRICATION TO FIELD INSTALL IS ACCEPTABLE.
7. DRILL HOLES, INSTALL SWIVEL HOISTS, AND USE NUTS PER MANUFACTURER'S RECOMMENDATIONS.



DATE	DESCRIPTION	MARK

DESIGNED BY: GREGG DWP	DATE: 7/24/2012
CHECKED BY: GREGG DWP	SUBMITTED BY: GREGG DWP
SUBMITTED BY: GREGG DWP	PLOTTED BY: GREGG DWP
APPROVED BY: MATTHEW D. HANSON, P.E.	CONTRACT NO.:
PROJECT NO.:	DATE: 7/24/2012
PLOT SCALE: 1:1	DRAWING NUMBER:
FILE NAME: BDFP.XXX_S-401.PXX	SIZE: 1:1
ANSI D	

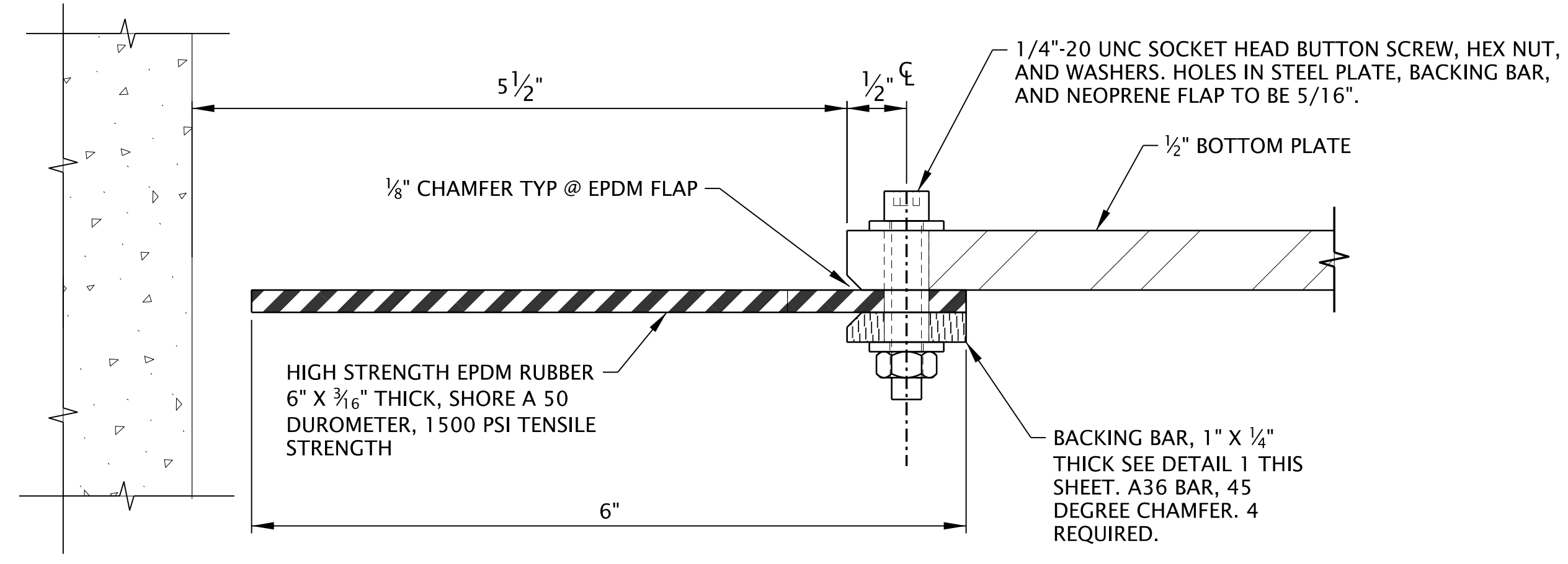
**BONNEVILLE LOCK AND DAM  
 SECOND POWERHOUSE  
 TURBULENCE REDUCTION DEVICE**  
 ISOMETRIC AND ELEVATION

**SHEET IDENTIFICATION**  
**S-401**  
 SHEET 0 OF 0

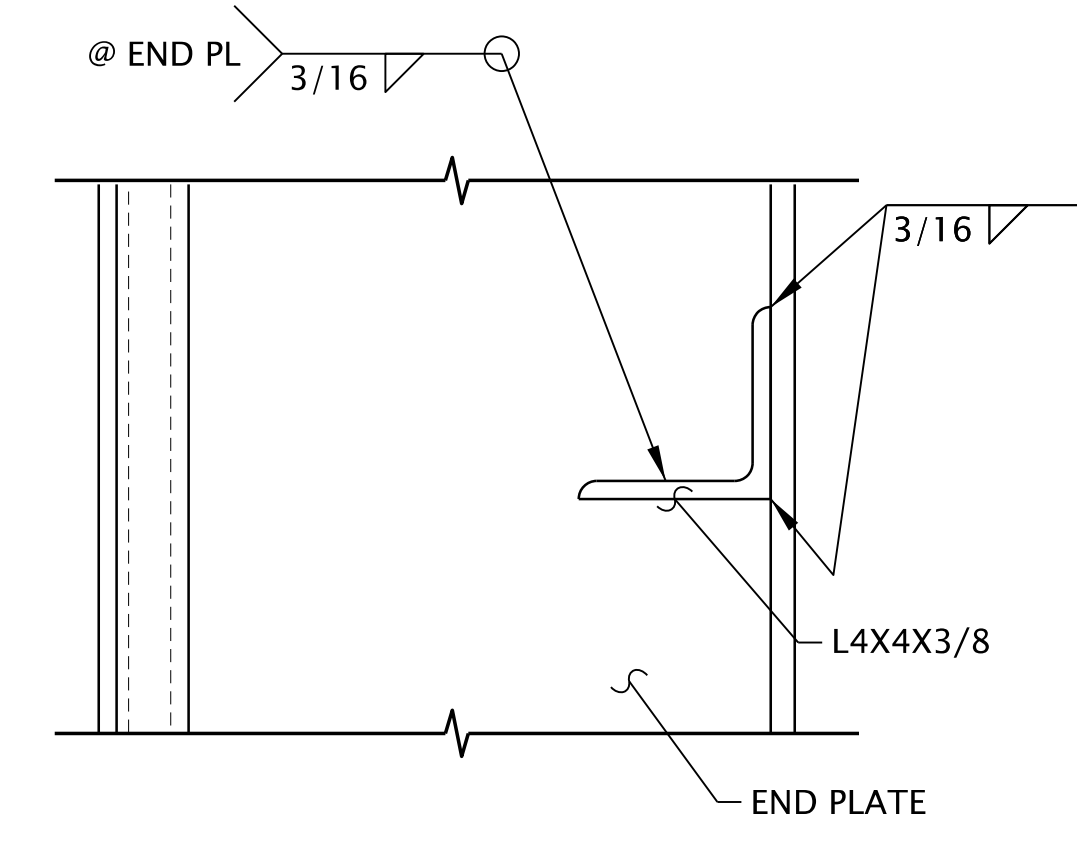
DATE	DESCRIPTION	MARK

DESIGNED BY: GREGORY W. GREGG	DATE: 07/26/2012
SUBMITTED BY: MATTHEW D. HANSON, P.E.	SOLICITATION NO.:
PLOT SCALE: 1:1	CONTRACT NO.:
SIZE: ANSI D	DRAWING NUMBER:
FILE NAME: BDPX.LXXX_S-402XXX	

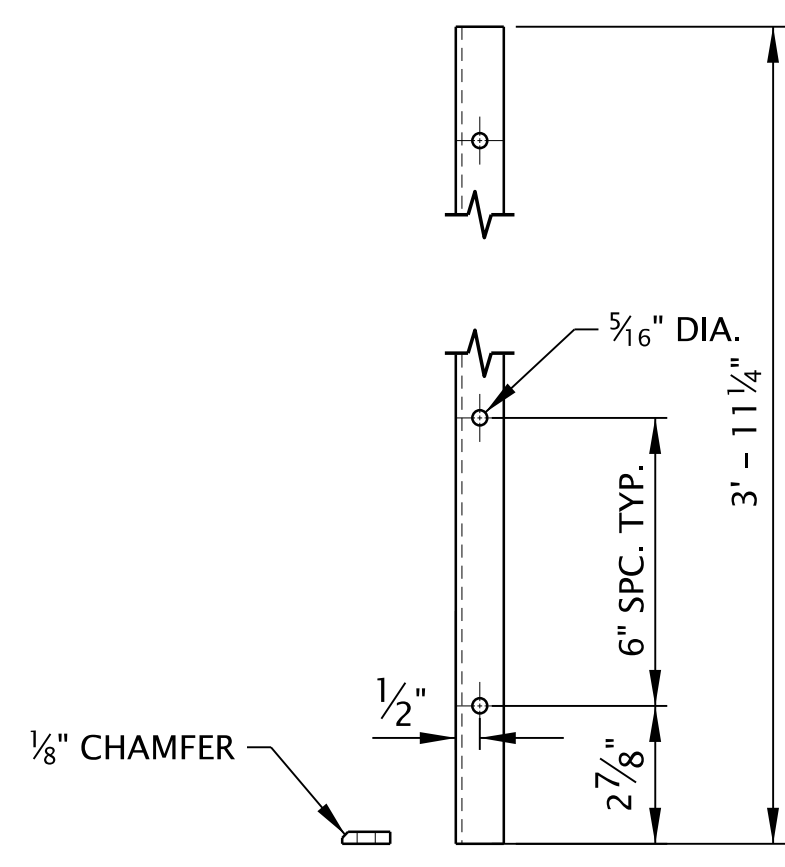
BONNEVILLE LOCK AND DAM  
SECOND POWERHOUSE  
TURBULENCE REDUCTION DEVICE  
SECTIONS



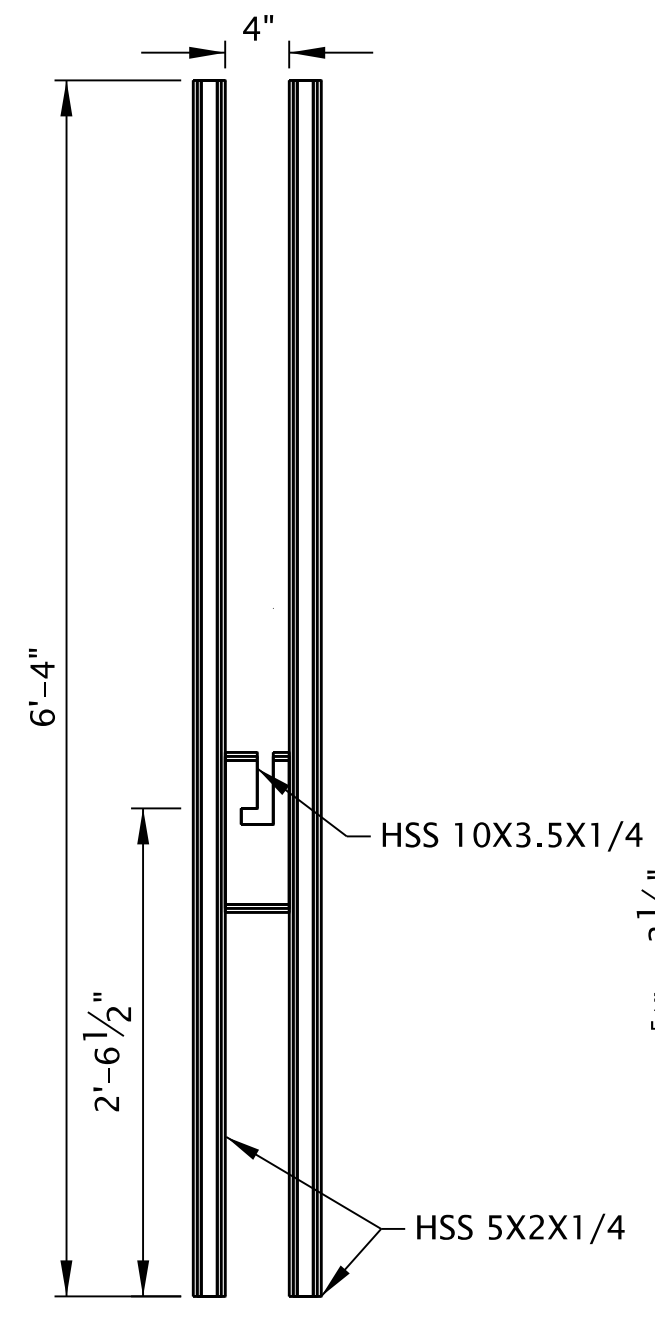
**B SECTION**  
SCALE 12" = 1'-0"



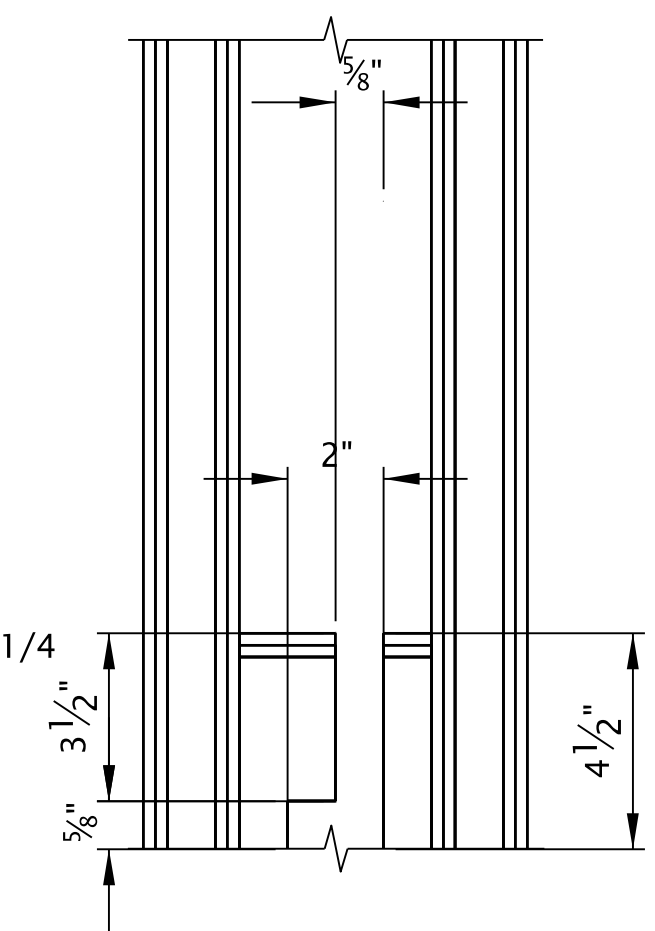
**C SECTION**  
SCALE 3" = 1'-0"



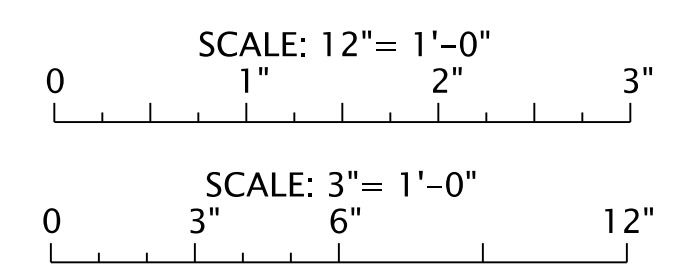
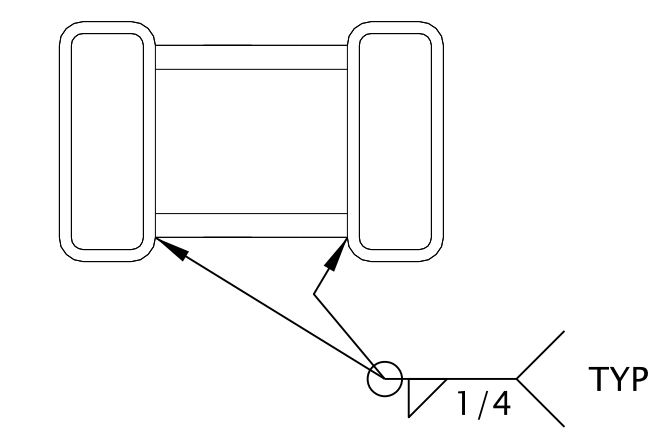
**1 BACKING BAR DETAIL**  
SCALE 3" = 1'-0"



**D PLAN**  
SCALE 1" = 1'-0"



**2 DOGGING BEAM DETAIL**  
SCALE 3" = 1'-0" 2 REQ'D



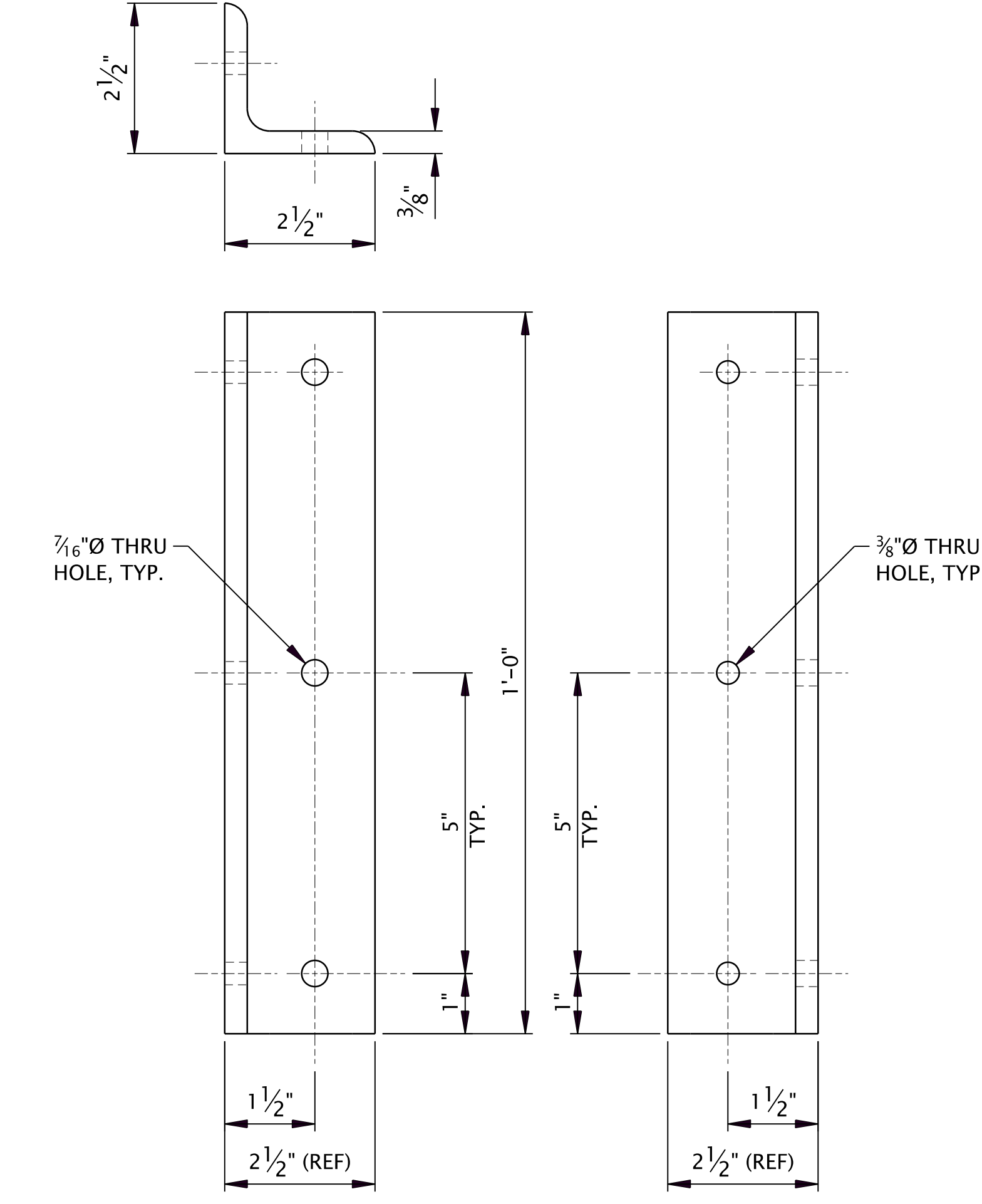
DATE	DESCRIPTION

DESIGNED BY: SCOTT HINNEN	DATE: 01/24/2012
PROJECT: G2ECDSH9	SOLICITATION NO.:
DRAWN BY: G2ECDSH9	CONTRACT NO.:
SUBMITTED BY: JAMES D. CALNON, P.E.	PLOT DATE: 7/24/2012
DESIGNER: G2ECDSH9	FILE NAME: BDPX1XXX_M-501XXX.dgn
DESIGN CHECKED BY: G2ECDSH9	SIZE: ANSI D

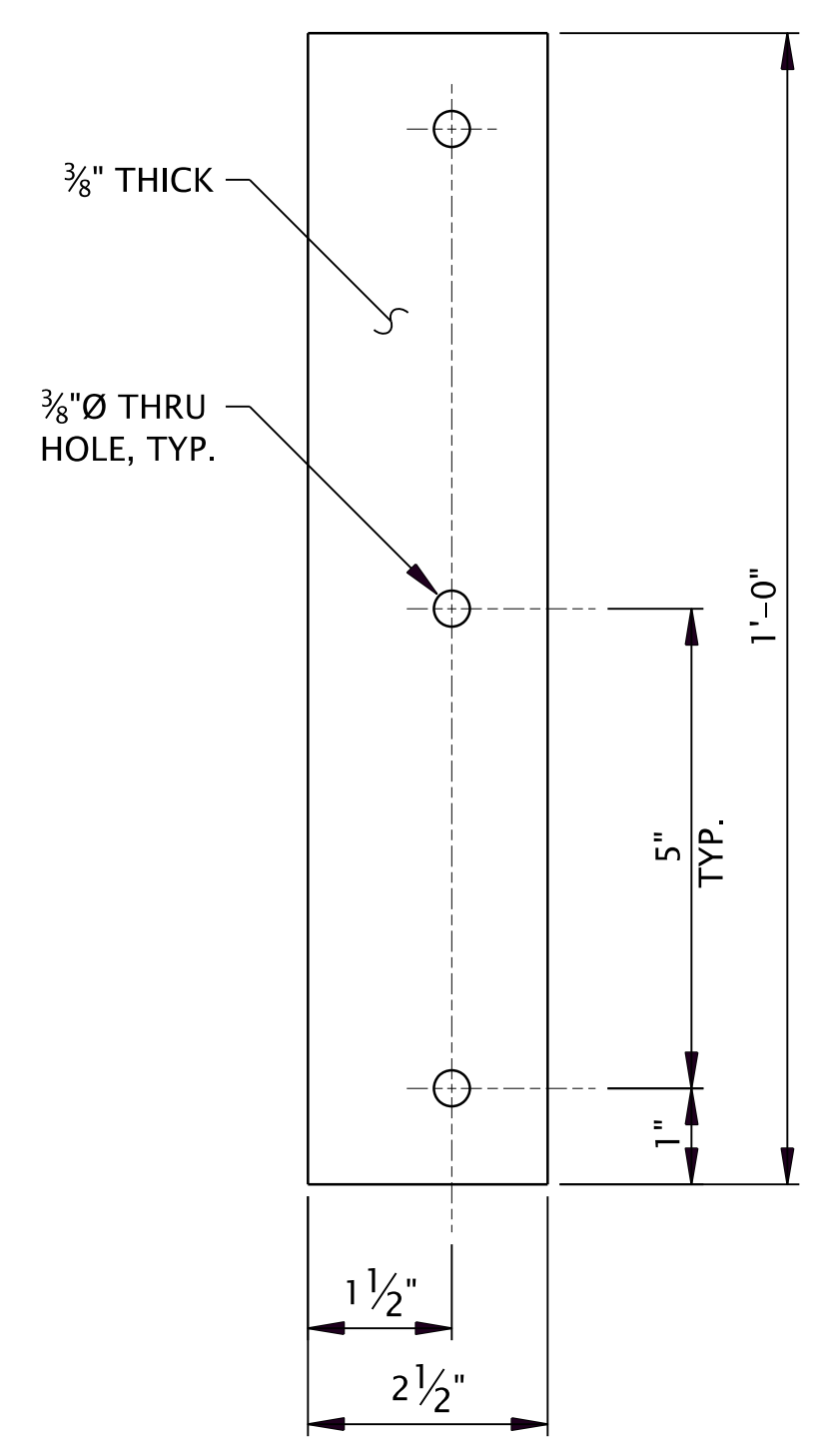
BONNEVILLE LOCK AND DAM SECOND POWERHOUSE TURBULENCE REDUCTION DEVICE  
MECHANICAL DETAILS 1

SHEET IDENTIFICATION  
**M-501**

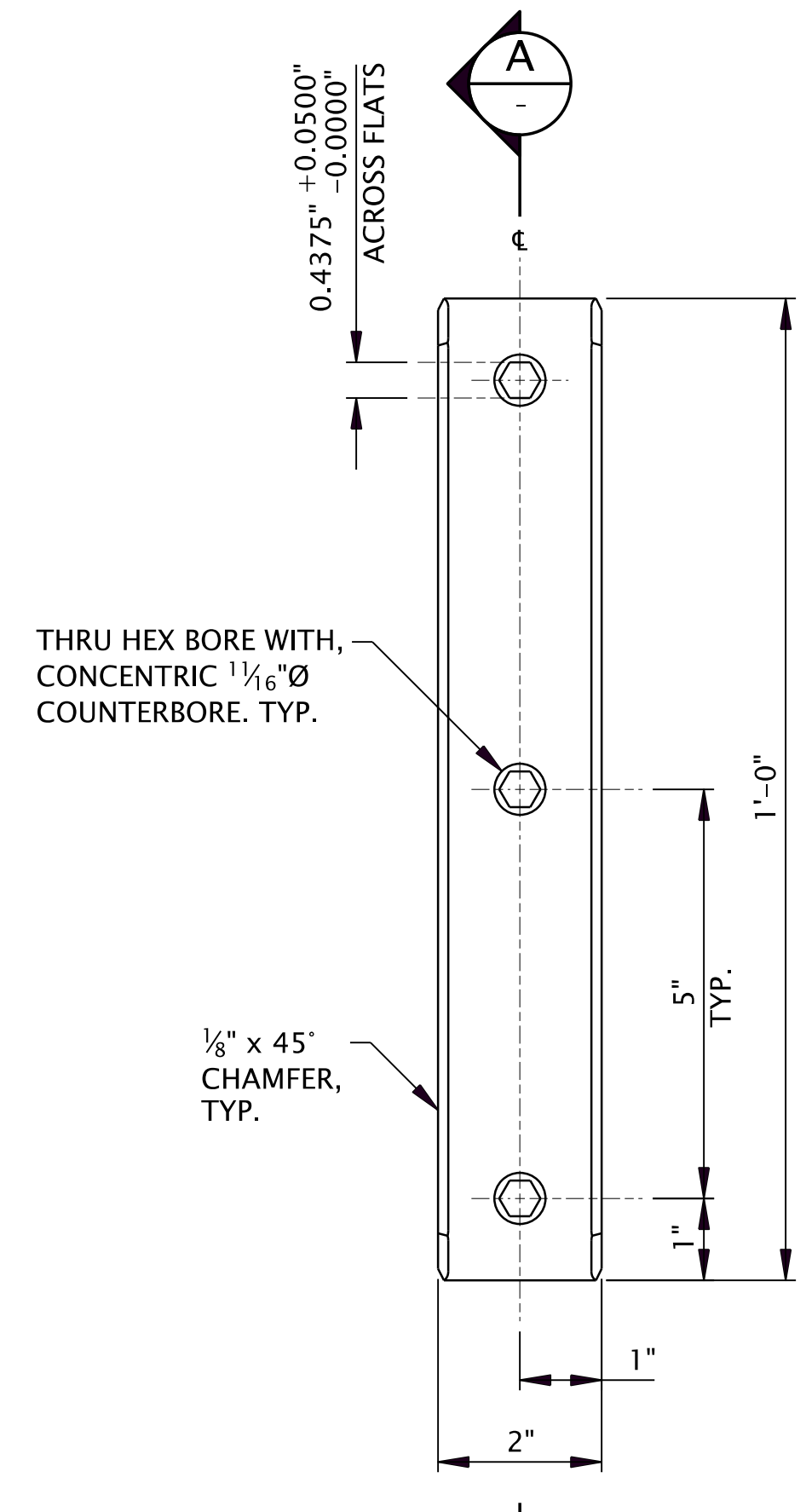
CHAMFERS AND FILLETS SAME AS OPPOSITE END.



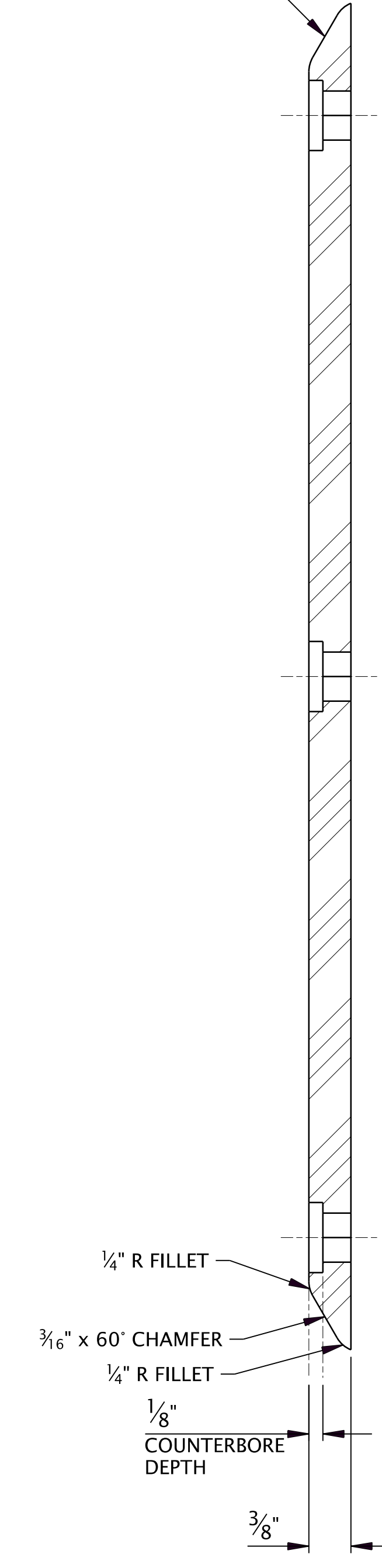
**GUIDE BAR SUPPORT 1**  
SCALE: 6"= 1'-0"  
MATERIAL: STEEL  
PER: ASTM A36  
NO. REQD: 16 PER TRD, 32 TOTAL



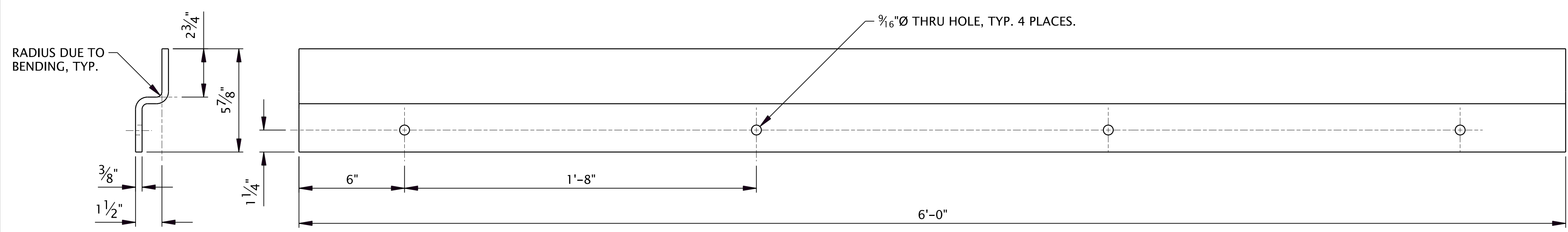
**GUIDE BAR SUPPORT 2**  
SCALE: 6"= 1'-0"  
MATERIAL: STEEL  
PER: ASTM A36  
NO. REQD: 16 PER TRD, 32 TOTAL



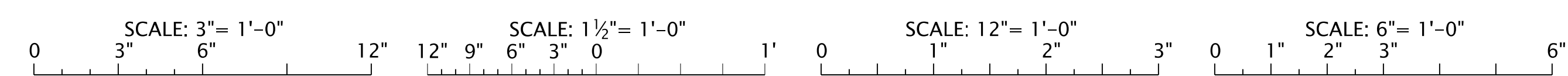
**GUIDE BAR**  
SCALE: 6"= 1'-0"  
MATERIAL: UV-RESISTANT UHMW POLYETHYLENE  
NO. REQD: 32 PER TRD, 4 SPARE, 68 TOTAL



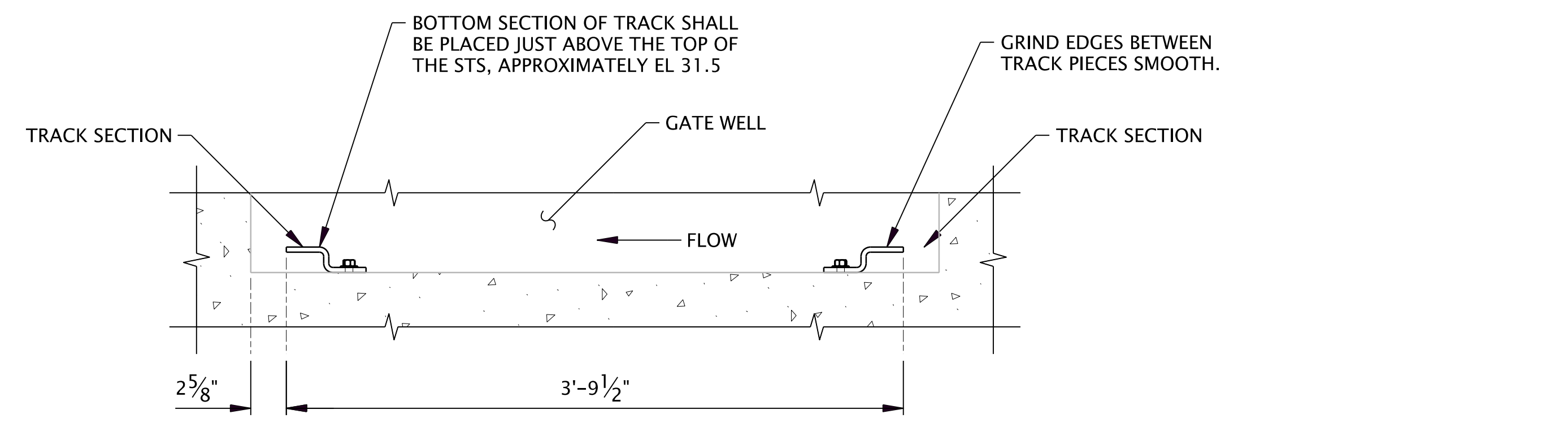
**SECTION A**  
SCALE: 12"= 1'-0"



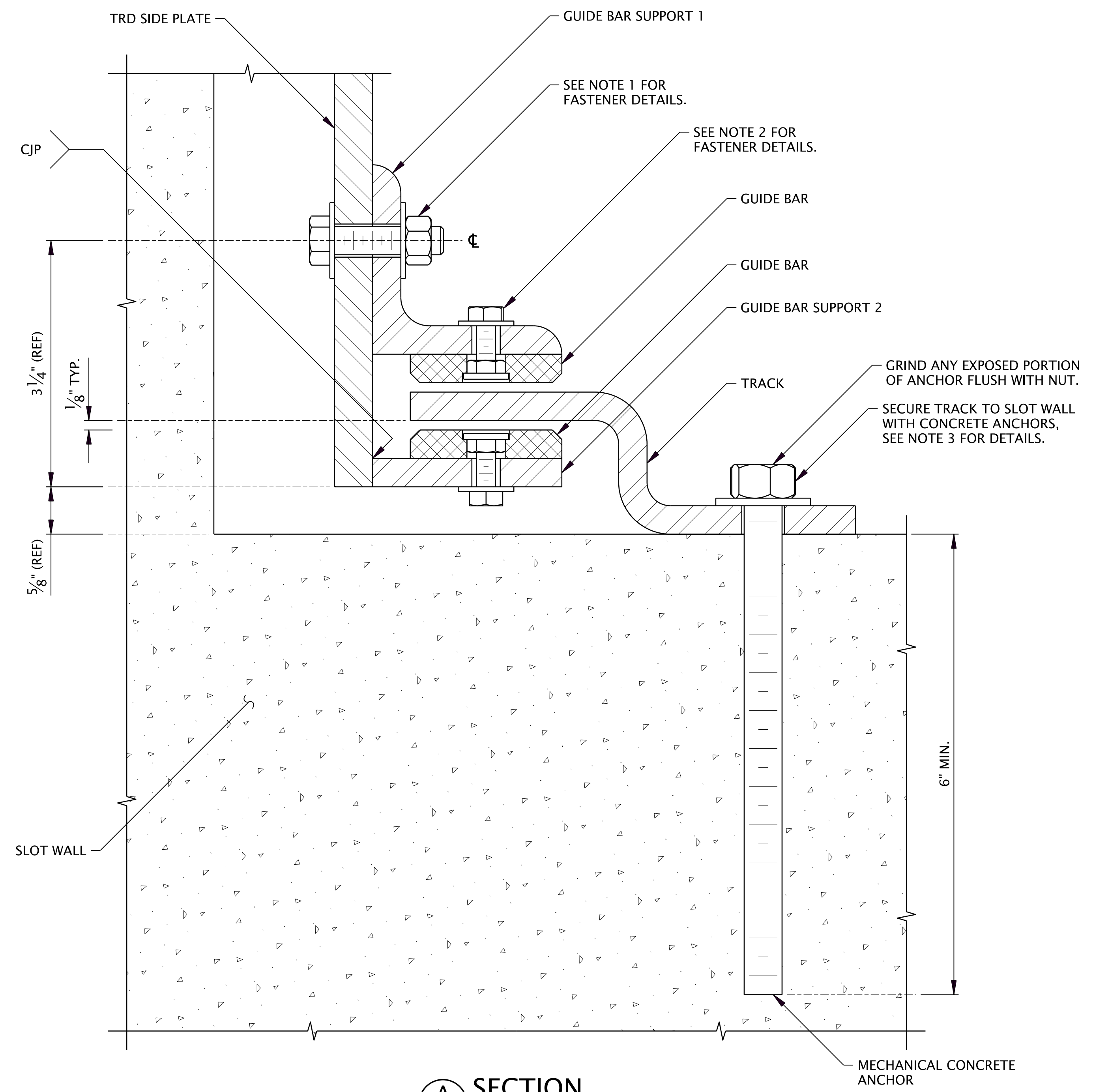
**TRACK SECTION**  
SCALE: 3"= 1'-0"  
MATERIAL: STEEL  
PER: ASTM A36  
NO. REQD: 18 PER SIDE, 36 TOTAL



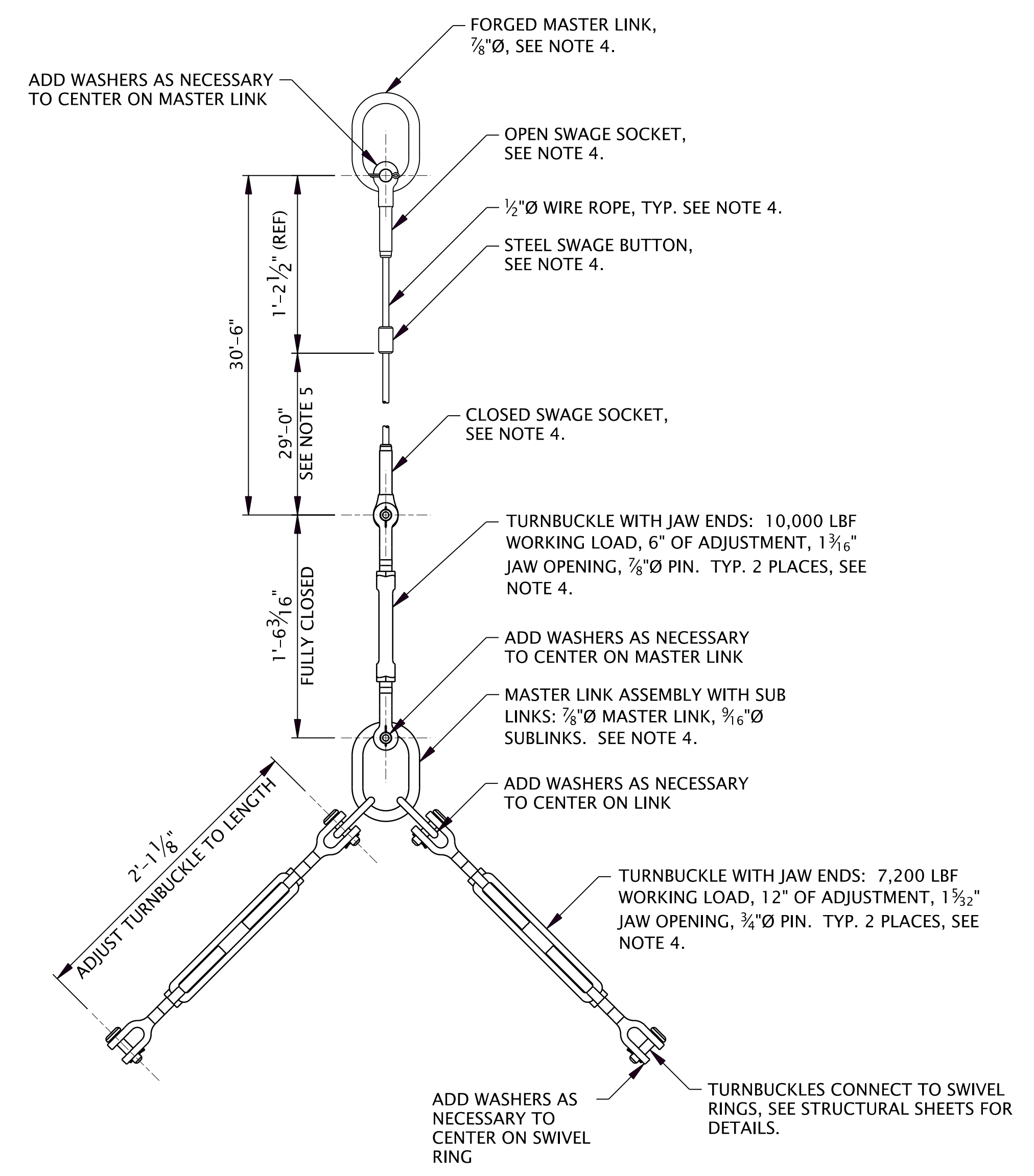
- NOTES:
- DIMENSIONAL TOLERANCES SHALL BE ±1/32" LINEAR AND 0.5° ANGULAR, UNLESS OTHERWISE SHOWN.
  - ALL CARBON STEEL SHALL BE PAINTED PER SECTION 05 50 01.00 25
  - ALL EXPOSED JOINTS, WELDS, EDGES, ETC. THAT FISH MAY COME INTO CONTACT WITH SHALL BE GROUND FLUSH AND SMOOTH TO THE TOUCH.



**TRACK MOUNTING**  
SCALE: 3" = 1'-0"



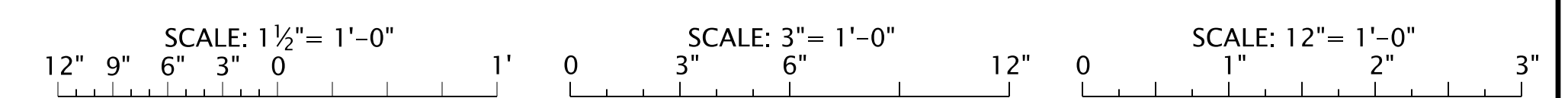
**SECTION A**  
SCALE: 12" = 1'-0"



**WIRE ROPE ASSEMBLY**  
SCALE: 1 1/2" = 1'-0"  
NO. REQD: 2

**NOTES:**

- ATTACH GUIDE BAR SUPPORT TO TRD WITH: 3/8"-16 UNC HEX-HEAD BOLT, 3/8"-16 UNC HEX-NUT, AND TWO 3/8"Ø WASHERS. TYP. 3 PLACES PER GUIDE BAR SUPPORT 1
- ATTACH GUIDE BAR TO SUPPORTS WITH: 1/4"-20 UNC HEX-HEAD BOLT, 1/4"Ø WASHER, AND 1/4"-20 UNC FLANGED HEX NUT. TYP. 3 PLACES PER GUIDE BAR.
- ATTACH TRACK TO SLOT WALL USING MEDIUM DUTY MECHANICAL EXPANSION CONCRETE ANCHORS. ANCHORS SHALL BE MADE FROM T304 STAINLESS STEEL AND HAVE 1/2"-13 UNC THREADS. INSTALL PER MANUFACTURERS INSTRUCTIONS WITH A MINIMUM OF 6" OF EMBEDMENT. ANCHOR SHALL BE HILTI KWIK BOLT TZ OR APPROVED EQUAL. SECURE TRACK USING STAINLESS STEEL 1/2"-UNC HEX-NUTS AND 1/2"Ø WASHERS. TYP. 4 PLACES PER TRACK SECTION.
- SEE SPECIFICATION SECTION 05 50 01.00 25 FOR ADDITIONAL DETAILS.
- FIELD VERIFY BEFORE SWAGING BUTTON TO ENSURE THAT TRD DOES NOT REST ON TOP OF THE STS.
- WELDING OF STEEL SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF AWS D1.1.
- DIMENSIONAL TOLERANCES SHALL BE ±1/32" LINEAR AND 0.5" ANGULAR, UNLESS OTHERWISE SHOWN.
- STAINLESS STEEL FASTENERS SHALL BE INSTALLED USING AN APPROVED ANTI-GALLING COMPOUND.
- ALL EXPOSED JOINTS, WELDS, EDGES, ETC. THAT FISH MAY COME INTO CONTACT WITH SHALL BE GROUND FLUSH AND SMOOTH TO THE TOUCH.



DATE	DESCRIPTION	MARK	APPR.

DESIGNED BY: SCOTT HINNEN	DATE: 01/24/2012	SOLICITATION NO.:
PROJECT: BONNEVILLE LOCK AND DAM	DESIGNED BY: G2ECDSH9	CONTRACT NO.:
SUBMITTED BY: JAMES D. CALNON, P.E.	DATE: 7/24/2012	DRAWING NUMBER:
FILE NAME: BDFX1.LXXX_M-502XXX.dgn	SIZE: 11"	ANSI D

BONNEVILLE LOCK AND DAM  
SECOND POWERHOUSE  
TURBULENCE REDUCTION DEVICE  
MECHANICAL DETAILS 2

SHEET IDENTIFICATION  
**M-502**