

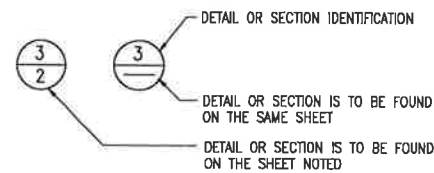
LEGEND

UTILITY POLE	
GATE OR FENCE POST	
SURVEY CONTROL POINT	
MONITORING WELL	
TELEPHONE PED.	
SURFACE WATER FLOW DIRECTION	
DRILL OR TEST HOLE	
SPOT ELEVATION (GRADING)	
STRUCTURE ELEVATION	
PROJECT BENCH MARK	
US BOR INSTRUMENTATION POINT	
SLOPE DIRECTION INDICATOR	

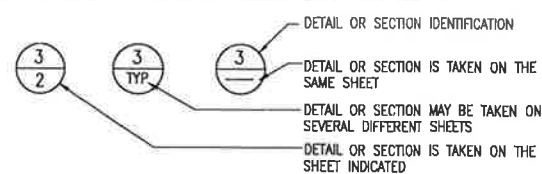
	FEATURE LINE
	HIDDEN FEATURE LINE
	SECTION LINE
	CENTERLINE
	EXISTING 5-FOOT CONTOUR
	EXISTING 1-FOOT CONTOUR
	FENCE LINE
	OVERHEAD POWER LINE

DETAIL & SECTION DESIGNATION

TYPICAL CALLOUT WHERE DETAIL OR SECTION IS TAKEN



TYPICAL CALLOUT WHERE DETAIL OR SECTION IS SHOWN



ABBREVIATIONS

AB	ANCHOR BOLT	INT	INTERIOR OR INTERSECTION
AC	ASPHALTIC CONCRETE	L	LENGTH
ADDL	ADDITIONAL	LB	POUND
AL	ALUMINUM	LF	LINEAL FEET
APPROX	APPROXIMATE	LG	LONG
BC	BOTTOM OF CURB OR BOLT CIRCLE	LW OR L/W	LOCK WASHER
BI OR B.I.	BLACK IRON	MATL	MATERIAL
BLDG	BUILDING	MAX	MAXIMUM
BM	BENCH MARK	MECH	MECHANICAL
BOT	BOTTOM	MFGR	MANUFACTURER
BOR	BUREAU OF RECLAMATION	MH	MAN HOLE
BVC	BEGIN VERTICAL CURVE	MIN	MINIMUM
BTN	BETWEEN	MJ	MECHANICAL JOINT
C	CONDUIT	MO OR M.O.	MIDDLE OFFSET
C-C	CENTER TO CENTER	N	NORTH
CI OR C.I.	CAST IRON	NIC	NOT IN CONTRACT
CISP	CAST IRON SOIL PIPE	NO.	NUMBER
CJ	CONSTRUCTION JOINT	NS OR N.S.	NEAR SIDE
CL	CENTERLINE	NTS	NOT TO SCALE
CLR	CLEAR	OC	ON CENTER
CMP	CORRIGATED METAL PIPE	OHP	OVERHEAD POWER
CMU	CONCRETE MASONRY UNIT	OPNG	OPENING
CONC	CONCRETE	PC	POINT OF CURVE
CONN	CONNECT OR CONNECTION	PT	POINT OF TANGENT
CONST	CONSTRUCTION	PCF	POUNDS PER CUBIC FOOT
CONT	CONTINUATION	PEN	PENETRATION
CORP	CORPORATION	PE	PLAIN END
CPLG	COUPLINE	PERF	PERFORATED
CTR	CENTER	PI	POINT OF INTERSECTION
CU	CUBIC	PJF	PREMOLDED JOINT FILLER
CW	COLD WATER	PL	PLATE
CF	CUBIC FEET	PNL	PANEL
D	DRAIN	PRC	POINT OF REVERSE CURVE
DI OR D.I.	DUCTILE IRON	PRES	PRESSURE
DI MJ	DUCTILE IRON MECHANICAL JOINT	PSF	POUNDS PER SQUARE FOOT
DET	DETAIL	PUD	PUBLIC UTILITY DISTRICT
DIA	DIAMETER	PVC	POLYVINYL CHLORIDE
DIM	DIMENSION	RAD,R	RADIUS
DWG	DRAWING	RCP	REINFORCED CONCRETE PIPE
E	EAST	RD	ROAD
EA	EACH	REINF	REINFORCING
EF	EACH FACE	REM	REMOVE
EFF	EFFLUENT	REQD	REQUIRED
EG	EXISTING GRADE	RM	ROOM
EJ	EXPANSION JOINT	ROW	RIGHT OF WAY
ELB	ELBOW	S	SLOPE
ELEC	ELECTRICAL	SCH	SCHEDULE
EL OR ELEV	ELEVATION	SG	SUB GRADE
EQ	EQUAL	SH OR SHT	SHEET
EQUIP	EQUIPMENT	SIM	SIMILAR
EVC	END VERTICAL CURVE	SL OR S	SLOPE
EW	EACH WAY	SPEC	SPECIFICATION
EWEF	EACH WAY EACH FACE	SQ	SQUARE
EXC	EXCAVATION	SS	STAINLESS STEEL
EXP	EXPANSION OR EXPAND	STA	STATION
EXIST	EXISTING	STD	STANDARD
EXT	EXTERIOR	STL	STEEL
F	FLANGE	SYM	SYMBOL
FB	FLAT BAR	T	TANGENT
FCA	FLANGED COUPLING ADAPTER	T&B	TOP & BOTTOM
FF	FINISHED FLOOR	TBD	TO BE DETERMINED
FG	FINAL GRADE	TC	TOP OF CURVE
FLEX	FLEXIBLE	THK	THICK OR THICKNESS
FL	FLOW LINE	THRU	THROUGH
FLG	FLANGE	TYP	TYPICAL
FM	FORCE MAIN	UD	UNDER DRAIN
FIN	FINISH	VC	VERTICAL CURVE
FS OR F.S.	FAR SIDE	VERT	VERTICAL
FT	FOOT OR FEET	VPI	VERTICAL POINT OF INTERSECTION
FTG	FOOTING OR FITTING	w/	WITH
FUT	FUTURE	W	WATER LINE
GALV	GALVANIZED	W/	WITH
GD	GROUND	W/O	WITHOUT
HORIZ	HORIZONTAL	WS	WELDED STEEL
HPU	HYDRAULIC POWER UNIT	WWF	WELDED WIRE FABRIC
H.P.	HIGH PRESSURE	WWM	WELDED WIRE MESH
HW	HOW WATER	YD	YARD
HYD	HYDRAULIC		
IE	INVERT ELEVATION		
INF	INFLUENT		
INV	INVERT		

SCALE NOTED SORENSEN SHEET NO. CA-2 USBR DRAWING NO. 4-100-997	SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS, REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS ABBREVIATIONS, DEPEND, DETAIL & SHEET DESIGNATIONS	DATE	JULY 2008	REV LTR	AS-BUILT 2010
				DATE			

A. DESIGN CODE:

- 1. INTERNATIONAL BUILDING CODE, 2006 EDITION.
- 2. ALL REFERENCE TO OTHER CODES AND STANDARDS (ACI, ASTM, ETC.) SHALL BE FOR THE LATEST OR MOST CURRENT EDITION AVAILABLE.
- 3. ACI 350-06 "ENVIROMENTAL ENGINEERING CONCRETE STRUCTURES"

B. DESIGN CRITERIA:

POWERHOUSE FLOORS	125 PSF
Ocupancy Category	IV
Seismic Importance Factor (I _e)	1.5
Mapped Spectral Response, S _{ms}	0.581
Mapped Spectral Response, S _{mi}	0.278
Site Class	D
Spectral Response Coeff., S _{ds}	0.387
Spectral Response Coeff., S _{d1}	0.185
Seismic Design Category	D

C GENERAL:

- 1. UNLESS OTHERWISE NOTED, ALL MATERIAL AND DESIGN SPECIFICATIONS CITED HEREIN SHALL CONFORM TO THE MOST RECENTLY ADOPTED SPECIFICATION OF CODE.
- 2. THESE STRUCTURAL NOTES ARE A SUPPLEMENT TO THE PROJECT SPECIFICATIONS. ANY DISCREPANCY FOUND AMONG THE DRAWINGS, SPECIFICATIONS, THESE NOTES, AND ANY SITE CONDITIONS SHALL BE REPORTED IN A TIMELY MANNER TO THE ENGINEER OF RECORD WHO SHALL CORRECT ANY DISCREPANCY IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK.
- 3. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE DIMENSIONS AMONG DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION.
- 4. THE STRUCTURAL DRAWINGS REPRESENT THE COMPLETED STRUCTURE AND ARE NOT INTENDED TO INDICATE THE MEANS AND METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR ALL DEMOLITION AND CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCING, AND SAFETY REQUIRED FOR THIS PROJECT.
- 5. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF ALL ERECTION BRACING, FORM WORK, AND TEMPORARY SHORING REQUIRED FOR THIS PROJECT.
- 6. SEE SUBMITTAL KEY FOR REQUIRED SHOP DRAWING SUBMITTALS. UNLESS STATED OTHERWISE IN THE PROJECT SPECIFICATIONS, PROVIDE A MINIMUM OF TWO SETS OF SUBMITTALS FOR APPROVAL OR CORRECTIONS.
- 7. ALL FEATURES OF CONSTRUCTION NOT FULLY SHOWN SHALL BE OF THE SAME TYPE AND CHARACTER AS SHOWN FOR SIMILAR CONDITIONS SUBJECT TO REVIEW BY THE ARCHITECT AND STRUCTURAL ENGINEER OF RECORD.
- 8. ALL PRODUCTS AND MATERIALS USED BY THE CONTRACTOR SHALL BE APPLIED, PLACED, ERECTED OR INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- 9. THESE DOCUMENTS CONTAIN NOTES THAT MAY APPLY GENERALLY TO ALL STRUCTURAL ELEMENTS, SPECIFICALLY TO ONE SHEET, OR SPECIFICALLY TO ONE OR MORE STRUCTURAL ELEMENTS. THE NOTES ARE NOT MERE GUIDELINES, THEY ARE PART AND PARCEL OF OUR DESIGN. ANY WORK THAT IS PERFORMED THAT IS NOT IN COMPLIANCE WITH THE NOTES IS NOT IN COMPLIANCE WITH THE DESIGN AND IS SUBJECT TO REJECTION. ANY ALTERATION, MODIFICATION, DELETION, OR ADDITION TO THE NOTES BY WRITING, ACT OR FAILURE TO ACT, SHALL BE CARRIED OUT ONLY WITH THE PRIOR EXPRESS WRITTEN CONSENT AND APPROVAL OF SORENSON ENGINEERING.

D. FOUNDATIONS:

- 1. FOUNDATION SIZES ARE BASED UPON A MAXIMUM TOTAL LOAD BEARING SOIL PRESSURE = 8000 PSF FOR BEARING ON STABLE BASALT ROCK.
- 2. FOOTINGS SHALL BE FOUNDED ON SOLID UNDISTURBED BEDROCK.
- 3. ALL DISTURBED SOIL SHALL BE REMOVED BY HAND OPERATION FROM FOOTING
- 4. THE CONTRACTOR SHALL REVIEW ALL GEOTECHNICAL ENGINEER RECOMMENDATIONS PRIOR TO THE COMMENCEMENT OF ANY SITEWORK.
- 5. ALL GENERAL EXCAVATIONS AND FOOTINGS SHALL BE INSPECTED AND APPROVED PRIOR TO THE PLACEMENT OF ANY SOIL BACKFILL AND/OR CONCRETE.
- 6. ROCK ANCHORS DESIGNED FOR 300 PSI ALLOWABLE FRICTION/BOND BETWEEN ROCK AND GROUT PER P.T.I. STANDARDS.

E. CONCRETE (CAST IN PLACE):

- 1. ALL CONCRETE SHALL BE NORMAL WEIGHT AND SHALL DEVELOP A MINIMUM 28 DAY LABORATORY CURED COMPRESSIVE-CYLINDER STRENGTH OF: 4000 PSI FOR FOUNDATION WALLS AND FLOORS 4000 PSI FOR FILL CONCRETE AROUND EQUIPMENT, STRUCTURES AND PENSTOCKS.
- 2. A MINIMUM OF 5 CONCRETE TEST CYLINDERS SHALL BE PROVIDED FOR EACH 100 CU. YARDS OF EACH CONCRETE STRENGTH, EACH DAY. CYLINDERS SHALL BE TESTED AS FOLLOWS: 1 AT 7 DAYS, 2 AT 28 DAYS, 1 PRIOR TO REMOVAL OF FORMS FOR SLABS AND BEAMS AND 1 HELD IN RESERVE. SLUMP, AIR ENTRAINMENT, LOCATION IN STRUCTURE, ETC., SHALL BE MEASURED AND RECORDED FOR EACH SET OF CYLINDERS, PER ASTM.
- 3. CONCRETE CYLINDER AND TESTING SHALL CONFORM TO ASTM SPECIFICATIONS.
- 4. CONCRETE, FORMS, MIXING, PLACING AND CURING SHALL CONFORM TO ACI MANUAL OF CONCRETE PRACTICE, LATEST EDITION, AND SPECIFICATIONS.
- 5. CONCRETE WATER CEMENT RATIO SHALL NOT EXCEED 0.45.
- 6. CONCRETE EXPOSED TO WEATHER SHALL HAVE 6% +/- 1% ENTRAINED AIR.
- 7. CONCRETE SUPPLIER TO PROVIDE STAMPED MIX DESIGN CALCULATIONS AND TEST RESULTS TO ENGINEER OF RECORD FOR REVIEW PRIOR TO POURING OF CONCRETE
- 8. SIZE AND LOCATION OF SLEEVES THRU FLOORS OR WALLS FOR MECHANICAL OR ELECTRICAL ACCESS SHALL BE APPROVED BY THE ENGINEER PRIOR TO PLACING CONCRETE.
- 9. ALL BOLTS IN CONCRETE SHALL CONFORM TO ASTM SPECIFICATION A307 (UNLESS NOTED OTHERWISE ON DRAWINGS) AND SHALL BE OF THE SIZE INDICATED ON THE DRAWINGS. INSTALL STAINLESS STEEL ANCHORS WHERE CONNECTIONS WILL BE EXPOSED TO MOISTURE.
- 10. ALL CONCRETE REMOVAL & REPAIR SHALL CONFORM TO "GUIDE FOR CONCRETE REPAIR" BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION.

F. REINFORCING STEEL:

- 1. ALL REINFORCING BARS SHALL CONFORM TO ASTM A-615 OF THE FOLLOWING GRADES: ASTM A615 GRADE 60 FOR ALL REINFORCEMENT INCLUDING BEAM STIRRUPS, COLUMN TIES AND AS NOTED.
- 2. ALL WELDED REINFORCING BARS SHALL CONFORM TO ASTM A-706 OF THE FOLLOWING GRADES: GRADE 60 FOR ALL WELDED REINFORCEMENT
- 3. ALL WELDED REINFORCING STEEL, METAL INSERTS AND CONNECTIONS SHALL CONFORM TO IBC STANDARDS NO. 19-2.
- 4. ALL WELDING OF REINFORCING STEEL SHALL CONFORM TO AWS SPECIFICATIONS. ALL WELDING SHALL BE DONE BY WELDERS CERTIFIED UNDER AWS SPECIFICATIONS USING LOW HYDROGEN E70XX ELECTRODES.
- 5. REINFORCEMENT SHALL BE DETAILED, FABRICATED AND PLACED IN ACCORDANCE WITH ACI CODE 318 AND ACI MANUAL 315, UNLESS OTHERWISE NOTED. ALL REINFORCEMENT SHALL BE FREE OF LOOSE MILL AND RUST SCALE, OIL, DIRT AND COATINGS OF ANY MANNER THAT WILL REDUCE BOND. ALL REINFORCEMENT IS CONTINUOUS WITH ADEQUATE LAPS.
- 6. REINFORCEMENT SHALL BE SECURED IN FORMS WITH SUITABLE TIES AND ANCHORAGE TO PREVENT DISPLACEMENT. BARS ADJACENT TO EARTH SHALL BE SUPPORTED BY CEMENT MORTAR CUBES.
- 7. REINFORCING STEEL SHALL NOT BE DISPLACED FOR THE CONVENIENCE OF OTHER TRADES UNLESS APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.
- 8. 'WET SETTING' OF REINFORCEMENT, ANCHOR BOLTS, AND INSERTS IS NOT PERMITTED
- 9. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR CAST-IN-PLACE REINFORCEMENT:
 - A) CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 3"
 - B) CONCRETE EXPOSED TO EARTH OR WEATHER
 - #6 THROUGH #18 BARS 2"
 - #5 BAR AND SMALLER 1-1/2"
 - C) CONCRETE NOT EXPOSED TO EARTH OR WEATHER
 - SLABS, WALLS AND JOISTS: #14 AND #18 BARS 1-1/2"
 - #11 BAR AND SMALLER 3/4"
 - BEAMS AND COLUMNS: PRIMARY REINFORCEMENT, TIES, STIRRUPS, SPIRALS 1-1/2"
- 10. PLACE 2'-0" x 2'-0" BARS AT CORNERS AND INTERSECTIONS FOR WALLS AND FOUNDATIONS EQUAL IN SIZE, NUMBER AND SPACING TO HORIZONTAL REINFORCING U.N.O.
- 11. REINFORCEMENT SPLICES, SHALL BE 48 BAR DIA. (24" MIN.), UNLESS NOTED OTHERWISE.
- 12. UNLESS OTHERWISE NOTED, DOWEL CONCRETE WALLS TO FOOTING WITH BARS OF SAME SIZE & SPACING AS WALL REINFORCEMENT.
- 13. UNLESS OTHERWISE NOTED, PLACE 2-#6 OVER, 2-#6 UNDER AND 2-#6 EACH SIDE OF ALL WALL OPENINGS, VERTICAL BARS STORY HEIGHT + 2'-6" HORIZONTAL BARS OPENING WIDTH + 4'-0" EACH END, PLACE 2-#6 x 4'-0" DIAGONAL BARS AT EACH CORNER OF ALL OPENINGS.
- 14. BEAM, JOIST OR SLAB TOP REINFORCING BARS THAT TERMINATE IN A WALL OR COLUMN SHALL HAVE A STANDARD 90 DEGREE HOOK, UNLESS OTHERWISE DETAILED. BEAM, JOIST OR SLAB BOTTOM BARS THAT TERMINATE IN A COLUMN OR WALL SHALL EXTEND TO WITHIN 2" OF OPPOSITE FACE OF COLUMN OR WALL, UNLESS DETAILED OTHERWISE.
- 15. PLACE 2-#5 x OPENING DIMENSION PLUS 4'-0" EACH SIDE OF ALL OPENINGS AND 2-#5 x 4'-0" DIAGONAL BARS AT EACH CORNER OF ALL SLAB OPENINGS GREATER THAN 1'-6" IN DIMENSION.
- 16. PROVIDE CARRIER BAR #6 @ 3'-0" O/C MAX. SPACING FOR ALL SLAB, JOIST AND WALL REINFORCING NOT SUPPORTED BY OTHER TRANSVERSE REINFORCING.
- 17. IN ALL LOCATIONS WHERE CONSTRUCTION REQUIRES THE CUTTING OF EXISTING CONCRETE & EXPOSING THE EXISTING REINSORCING BARS AND THE NEW CONSTRUCTION DOES NOT CONTINUE THE REINFORCING, THE FOLLOWING BAR PROTECTION SHALL BE ACCOMPLISHED TO PROTECT THE EXISTING REBARS CUT ENDS FROM CORROSION OR OTHER DAMAGE. REMOVE THE EXISTING REBARS TO A DEPTH OF 2-INCHES BELOW THE CUT SURFACE FACE OF CONCRETE. REMOVE THE CONCRETE BY DRILLING OR OTHER APPROVED METHODS. THE HOLE SHALL BE CLEANED AND EVACUATED OF ALL METAL, DUST, DAMAGED CONCRETE OR OTHER FOREIGN MATERIALS TO INSURE ADEQUATE BOND. THE PREPARED HOLE SHALL BE FILLED WITH DRY PACK AS DESCRIBED IN THE BUREAU OF RECLAMATION "GUIDE TO CONCRETE REPAIR" CHAPTER IV, SECTION 26, PAGES 48 TO 50.

G. CONCRETE (POST-TENSIONED):

- 1. FABRICATE, PLACE AND STRESS ALL POST-TENSIONING BARS USING ONLY EXPERIENCED PERSONNEL WHO CAN SHOW EVIDENCE OF HAVING SATISFACTORILY COMPLETED SIMILAR PROJECTS. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, SUPERVISION AND SERVICES NECESSARY TO FURNISH AND INSTALL ALL POST-TENSION REINFORCING AND TO PERFORM POST-TENSIONING.
- 2. FABRICATION AND PLACEMENT TOLERANCES SHALL CONFORM TO THE REQUIREMENTS OF CHAPTER 15 OF ACI-301. BARS, SHEATHING AND ANCHORAGES SHALL BE PLACED WITHIN A TOLERANCE OF +/-1/8 INCH IN CONCRETE DIMENSIONS LESS THAN EIGHT INCHES , AND +/-1/4 INCH IN CONCRETE DIMENSIONS EIGHT INCHES OR GREATER.
- 3. SUBMIT DESIGNS, SHOP DRAWINGS AND CALCULATIONS BEARING THE STAMP OF A REGISTERED ENGINEER (WITH STATE OF IDAHO LISCENSE) FOR REVIEW. SEE SUBMITTAL KEY FOR REQUIREMENTS.
- 4. DESIGNS, SHOP DRAWINGS AND CALCULATIONS SHALL INCLUDE THE FOLLOWING INFORMATION:
 - A) DIMENSION TOLERANCES FOR LOCATING BARS.
 - B) PLAN LAYOUT OF BARS AND DIMENSIONS LOCATING BARS IN THE HORIZONTAL PLANE.
 - C) JACKING FORCES AT ANCHORAGE LOCATIONS AND TEMPORARY JACKING FORCES.
 - D) REQUIRED ELONGATION OR TORQUE AND CALCULATIONS.

H. POST-TENSIONED REINFORCING:

- 1. POST-TENSIONED REINFORCEMENT SHALL CONSIST OF 1-3/8" THREAD BAR, "THREADBAR" AS MANUFACTURED BY DYWIDAG SYSTEMS INTERNATIONAL (OR APPROVED EQUAL) CONFORMING TO ASTM A-615, A-772 AND A-775, AND HAVING A MINIMUM ULTIMATE STRENGTH OF 150,000 PSI.
- 2. BARS SHALL BE COATED WITH AN APPROVED COATING COMPOUND BEFORE WRAPPING. WRAPPING SHALL BE PLASTIC TO ENSURE FREE SLIPPAGE OF BARS WHEN TENSIONED.
- 3. ANCHORS SHALL DEVELOP A MINIMUM OF 100% OF THE ULTIMATE STRENGTH OF THE BARS WHICH IS BEING ANCHORED.
- 4. POST-TENSIONED BAR MANUFACTURER SHALL SUBMIT GROUT DESIGN MIX FOR INSTALATION. MINIMUM 5000 PSI @ 28 DAY FLOWABLE MIX REQUIRED.

THE BASE STRUCTURAL SPECIFICATIONS FOR THIS PROJECT SHALL BE THE ARROWROCK HYDROELECTRIC PROJECT PHASE 2 AND PHASE 3 SPECIFICATIONS. THESE FOLLOWING STRUCTURAL NOTES SHALL SUPERSEDE THE BASE SPECIFICATIONS UNLESS OTHERWISE NOTED.

REVISIONS					
DATE	REV	DESCRIPTION	BY	CHKD	APP'D
JULY 2008	1	SPB			
	2	SUB			
	3	TSS			
	4	THUNDER			
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT					
BOISE-KUNA IRRIGATION DISTRICT NAMPAA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT					
PHASE 2 PROJECT FERC PROJECT NO. 4656					
AS-BUILT 2010					
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL NOTES					
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO					
SCALE NOTED					
SORENSEN SHEET NO. S-1					
USBR DRAWING NO. 4-100-1000					

I. ROCK ANCHORS AND THREADBARS:

- 1. ALL BARS SHALL CONFORM TO THE FOLLOWING GRADES:
ASTM A772 GRADE 150
- 2. BARS SHALL BE DETAILED, FABRICATED AND PLACED IN ACCORDANCE WITH ACI CODE 350 AND ACI MANUAL 315, UNLESS OTHERWISE NOTED. ALL REINFORCEMENT SHALL BE FREE OF LOOSE MILL AND RUST SCALE, OIL, GREASE, SHARP BENDS, KINKS, DIRT, NICKS OR NOTCHES, AND COATINGS OF ANY MANNER THAT WILL REDUCE BOND. ALL REINFORCEMENT SHALL BE CONTINUOUS WITH ADEQUATE SPLICES.
- 3. REINFORCEMENT SHALL BE SECURED IN HOLES WITH SUITABLE CENTRALIZERS TO POSITION THE ANCHORS TO MAINTAIN THE MINIMUM GROUT COVER AROUND THE TENDON.
- 4. THE STRESSING ANCHORAGE SHALL BE INSTALLED PROPERLY ALIGNED WITH THE ANCHOR TENDON AXIS.
- 5. AFTER GROUTING, THE BARS SHALL REMAIN UNDISTURBED UNTIL THE GROUT HAS CURED.
- 6. GROUT SHALL CONFORM TO ASTM C845-76T, USE "WILLIAMS S5Z WIL-X" CEMENT GROUT. 6000 PSI AT 28 DAYS MINIMUM STRENGTH.
- 7. A MINIMUM OF 4 TEST CYLINDERS SHALL BE PROVIDED FOR EACH 100 CU. YARDS OF EACH GROUT STRENGTH, EACH DAY. CYLINDERS SHALL BE TESTED AS FOLLOWS: 1 AT 7 DAYS, 2 AT 28 DAYS AND 1 PRIOR TO REMOVAL OF FORMS FOR SLABS AND BEAMS. SLUMP, AIR ENTRAINMENT, LOCATION IN STRUCTURE, ETC., SHALL BE MEASURED AND RECORDED FOR EACH SET OF CYLINDERS, PER ASTM.
- 8. CYLINDER AND TESTING SHALL CONFORM TO ASTM SPECIFICATIONS.
- 9. GROUT, FORMS, MIXING, PLACING AND CURING SHALL CONFORM TO ACI MANUAL OF CONCRETE PRACTICE, LATEST EDITION, AND SPECIFICATIONS.
- 10. ROCK ANCHORS SHALL BE PROOF TESTED PER POST TENSIONING INSTITUTE STANDARDS. PROOF TEST TO 80% G.U.T.S. TEST THE FIRST THREE ANCHORS INSTALLED, PLUS 5% OF THE REMAINING ANCHORS (OR A MINIMUM OF TWO MORE) AT EACH INSTALLATION.

J. STRUCTURAL STEEL:

- 1. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING MINIMUM ASTM SPECIFICATIONS AND GRADES:
WIDE FLANGE SECTIONS ASTM A-992, GRADE 50 (Fy=50 KSI)
CHANNELS, ANGLES, PLATES ASTM A-36 (Fy=36 KSI)
HOLLOW STRUCTURAL SECTIONS A-500, GRADE B (Fy=46 KSI)
PIPE ASTM A53, TYPE E OR S (Fy=35 KSI)
- 2. ALL FABRICATION, ERECTION AND IDENTIFICATION OF STRUCTURAL STEEL SHALL CONFORM TO AISC-LRFD, AISC 335, OR AISC-HSS.
- 3. ALL WELDING SHALL CONFORM TO AWS SPECIFICATIONS. ALL WELDING SHALL BE DONE BY WELDERS QUALIFIED UNDER AWS SPECIFICATIONS, USING E70XX, LOW HYDROGEN, ELECTRODES.
- 4. ALL SHOP WELDING SHALL BE PERFORMED IN AN AWS APPROVED SHOP.
- 5. WELD TESTING AND INSPECTION SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF AWS D1.1 AND AISC.
- 6. THE STEEL FABRICATOR AND ERECTOR SHALL DEVELOP A WELDING PROCEDURE SPECIFICATION (WPS) PER AWS D1.1 FOR ALL WELDS. SUBMIT WRITTEN COPIES TO THE INSPECTOR FOR APPROVAL.
- 7. ALL BOLTED CONNECTIONS SHALL BE MADE WITH MACHINE BOLTS (M.B.) CONFORMING TO ASTM A307. INSTALL STAINLESS STEEL ANCHORS WHERE CONNECTIONS WILL BE EXPOSED TO MOISTURE.
- 8. HIGH STRENGTH (H.S.) BOLTS SHALL CONFORM TO ASTM A325-SC WHERE NOTED.
- 9. SUBMIT ALL PRE QUALIFIED JOINT WELDING PROCEDURES FOR REVIEW.
- 10. ALL FULL PENETRATION WELDS SHALL BE INSPECTED BY ULTRASONIC OR OTHER APPROVED NON-DESTRUCTIVE TESTING PROCEDURES. RESULTS OF TESTS SHALL BE SUBMITTED IN WRITING TO THE ENGINEER OF RECORD.
- 11. ALL STEEL EXPOSED TO WEATHER, MOISTURE, SOIL, OR AS NOTED SHALL BE HOT DIP GALVANIZED PER ASTM A-123, OR HAVE AN APPROVED PROTECTIVE COATING.
- 12. THE DRAWINGS ARE DIMENSIONED FOR GENERAL LAYOUT AND NOT NECESSARILY DIMENSIONED PER AISC STANDARDS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE SHOP DRAWINGS WITH DETAIL DIMENSIONS PER AISC CODE OF STANDARD PRACTICE.

K. STEEL/CONCRETE ACCESORIES:

- 1. HEADED STUDS SHALL BE NELSON HEADED ANCHORS WITH FLUXED ENDS OR APPROVED EQUAL.
- 2. DEFORMED BARS ANCHORS (DBA) SHALL BE NELSON TYPE D2L OR APPROVED EQUAL.
- 3. HEADED STUDS AND DBA SHALL BE AUTOMATICALLY END WELDED WITH MANUFACTURER'S STANDARD EQUIPMENT, PER MANUFACTURER'S PRODUCT SPECIFICATIONS.

L. METAL DECKING:

- 1. ALL METAL DECKING SHALL CONFORM TO THE SPECIFICATIONS OF METAL STEEL DECK INSTITUTE.
- 2. METAL DECKING SHALL BE UNSHORED VERO FORMLOCK W3 x 18 GAGE, GALVANIZED 36" WIDE DECKING OF TYPES INDICATED IN THE DRAWINGS.
- 3. DECKING SHALL BE CONTINUOUS ON 3 OR MORE SUPPORTS.
- 4. DECK SIDE LAPS TO BE CONNECTED BY (1) OF THE FOLLOWING METHODS:
A) PUNCHLOK TOOL @ 36" O.C. MAX
B) 1-1/2" TOP SEAM WLD @ 36" O.C. MAX
C) BUTTON PUNCH @ 36" O.C. MAX
- 5. CONNECT DECKING TO SUPPORTING MEMBERS WITH 1/2" DIA. PUDDLE WELDS, 4 WELDS PER SHEET
- 6. DECKING LAID PARALLEL TO SUPPORTING WALLS OR FRAMES SHALL BE CONNECTED WITH 1/2" DIA. PUDDLE WELDS AT 12" O.C.
- 7. ALL WELDING SHALL BE DONE BY WELDERS QUALIFIED UNDER AWS SPECIFICATIONS USING E60XX, ELECTRODES.
- 8. WELDERS SHALL BE AWS QUALIFIED FOR LIGHT GAGE METAL WELDING.

M. DEFERRED SUBMITTALS:

- 1. PURSUANT TO THE IBC, SUBMITTAL DOCUMENTS FOR DEFERRED ITEMS SHALL BE PROVIDED TO THE ENGINEER AND/OR THE STRUCTURAL ENGINEER OF RECORD FOR REVIEW.

ITEM	STRUCTURAL ENGINEER OF RECORD
1. SRTUCTURAL STEEL SHOP DRAWINGS	X
2. GROUT/CONCRETE MIX DESIGN	X
3. STRUCTURAL STEEL MILL CERTS	X
4. REINF. STEEL SHOP DRAWINGS	X
5. REINF. STEEL MILL CERTS	X
6. WELDING PROCED. SPECS (AWS D1.1)	X
7. POST-TENSIONING LAYOUT & CERTS	X

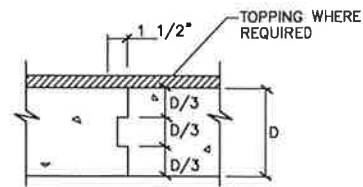
N. SPECIAL INSPECTIONS:

- 1. A QUALIFIED SPECIAL INSPECTOR IS TO BE CONTRACTED BY THE OWNER PER IBC CHAPTER 17 REQUIREMENTS, AND ALL LOCAL ORDINANCES.
- 2. SPECIAL INSPECTIONS ARE REQUIRED BY IBC SECTION 1704 FOR THE FOLLOWING CONSTRUCTION, WHERE AND AS INDICATED ON THE DRAWINGS:
A) CONCRETE (SECTION 1704.4, TABLE 1704.4)
i) INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING AND POSTSTRESSING TENDONS, AND PLACEMENT (PERIODIC)
ii) TAKING OF TEST SPECIMENS (CONTINUOUS)
iii) BOLTS CAST IN CONCRETE (CONTINUOUS)
iv) POST-TENSIONING STRESSING, AND GROUTING (CONTINUOUS)
B) STEEL (SECTION 1704.3, TABLE 1704.3)
i) FABRICATOR/ERECTOR SHALL SUBMIT WPS TO INSPECTOR, WITH THE EXCEPTION OF SHOP WELDING PERFORMED BY AN APPROVED FABRICATION FACILITY IN ACCORDANCE WITH THE IBC.
ii) HIGH-STRENGTH BOLTING, BEARING TYPE (PERIODIC)
iii) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS (CONTINUOUS)
iv) MULTI-PASS FILET WELDS (CONTINUOUS)
v) SINGLE PASS FILLET WELDS NOT EXCEEDING 5/16" (PERIODIC)
vi) WELDING OF STEEL REINFORCEMENT (CONTINUOUS)
vii) METAL FLOOR AND ROOF DECK WELDS (PERIODIC)
C) EPOXY ANCHORS (CONTINUOUS)
i) DURING THE PREPARATION FOR EPOXY ANCHOR INSTALLATION
ii) INSTALLATION OF EPOXY ANCHORS
- 3. IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE ALL INSPECTIONS WITH THE DESIGNATED SPECIAL INSPECTOR IN A TIMELY MANNER PRIOR TO ALL WORK REQUIRING SPECIAL INSPECTION.
- 4. ALL SPECIAL INSPECTORS SHALL BE CERTIFIED TO PERFORM THE NECESSARY INSPECTIONS ON THE MATERIALS AND OPERATIONS INDICATED PER IBC, ACI, AWS OR OTHER APPROVED GOVERNING INSTITUTION STANDARDS.
A) ROCK ANCHORS AND THREADBARS (SECTION 1704.4, TABLE 1704.4)
i) INSPECTION OF REINFORCING STEEL, INCLUDING POST-TENSION BARS, AND PLACEMENT (PERIODIC)
ii) VERIFYING USE OF REQUIRED DESIGN MIX (PERIODIC)
iii) TAKING OF TEST SPECIMENS (CONTINUOUS)
iv) POST-TENSIONING STRESSING, AND GROUTING (CONTINUOUS)
v) ERECTION OF PRECAST MEMBERS (PERIODIC)

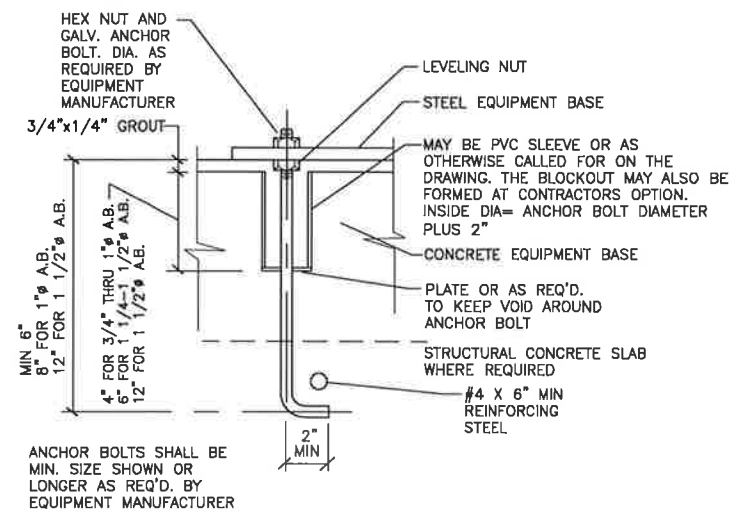
O. STRUCTURAL OBSERVATIONS:

- PURSUANT TO IBC SECTION 1709.1, STRUCTURAL OBSERVATIONS BY THE STRUCTURAL ENGINEER-OF-RECORD OR THEIR REPRESENTATIVE SHALL BE REQUIRED AT THE FOLLOWING STAGES OF CONSTRUCTION:
A) DURING THE PLACING OF FOUNDATION REINFORCEMENT, CONCRETE PLACEMENT, TIEBACKS AND ANCHORS.
B) DURING THE POURING OF CONCRETE WALLS
C) AT COMPLETION OF ROOF AND FLOOR SYSTEMS
- 2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER-OF-RECORD A MINIMUM OF FOUR (4) WORKING DAYS PRIOR TO THE COMPLETION OF ANY CONSTRUCTION STAGE REQUIRING STRUCTURAL OBSERVATIONS.

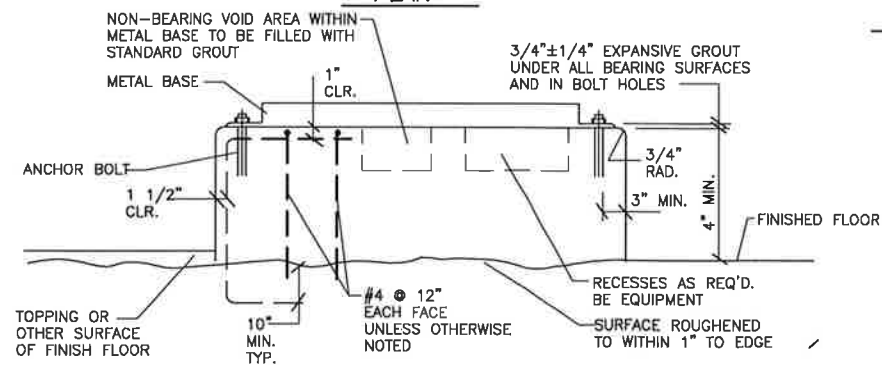
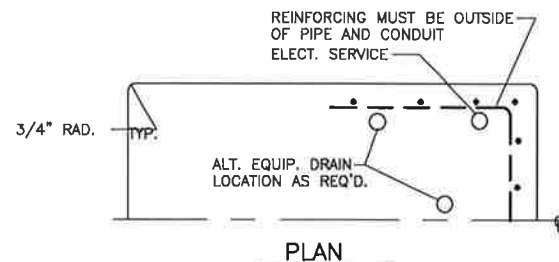
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	BOISE-KUNA IRRIGATION DISTRICT NAMPAN & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT		UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT		REV LIT	REVISIONS
	PHASE 2 PROJECT FERC PROJECT NO. 4656		OUTLET WORKS REHABILITATION GATE HOUSE, BRUICATION & PENSTOCKS GATE HOUSE STRUCTURAL NOTES		JULY 2008	AS-BUILT 2010
SCALE NOTED		SORENSEN SHEET NO. S-2		USBR DRAWING NO. 4-100-1001		



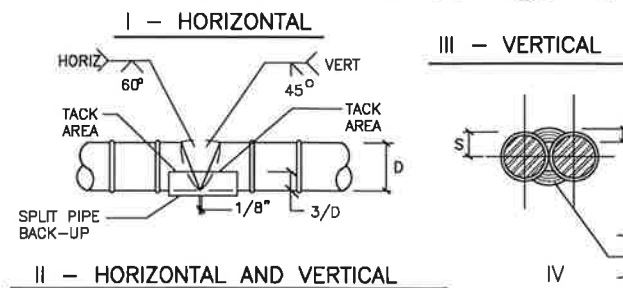
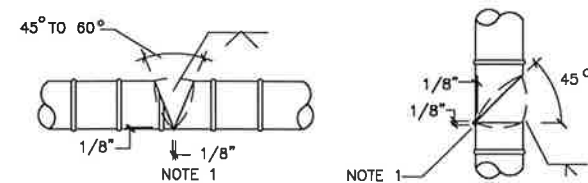
HORIZONTAL JOINT IN SLAB
(UNLESS OTHERWISE NOTED ON PLAN SHEETS)



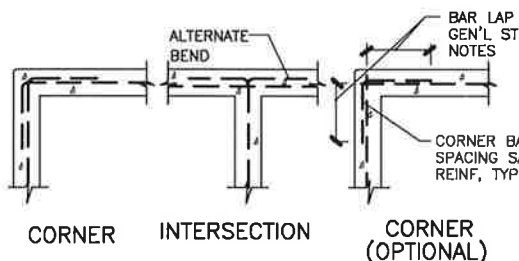
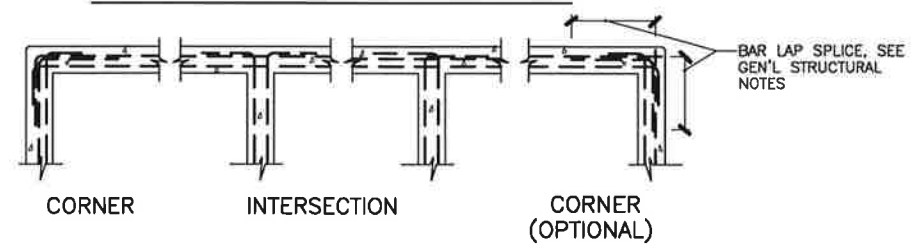
ANCHOR BOLT FOR EQUIPMENT



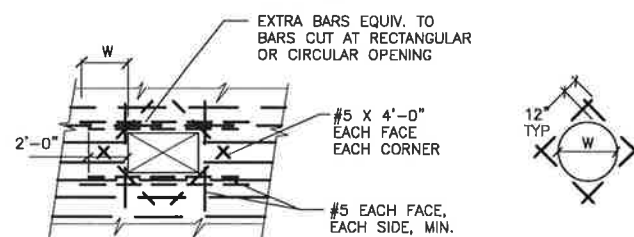
SECTION EQUIPMENT BASE



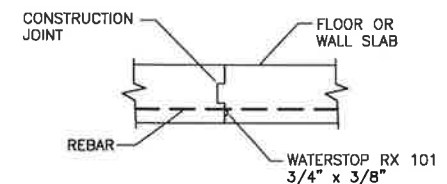
WELDED REINFORCING SPLICE DETAIL



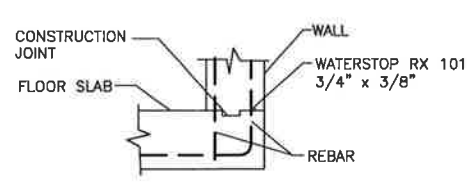
REINFORCEMENT AT SLAB AND WALL OPENINGS



REINFORCEMENT AT SLAB AND WALL OPENINGS



FLOOR OR WALL JOINT



FLOOR SLAB TO WALL

NOTE: PLACE WATER STOPS WHERE SHOWN ON THE PLANS AND AS REQUIRED BY THE SPECIFICATIONS. INSTALLATION SHALL BE PER THE SUPPLIER INSTRUCTIONS.

COLD JOINT WATER STOP DETAIL

REINFORCING WELDING NOTES:

1. CHIP, GRIND OR GOUGE TO SOUND METAL BEFORE WELDING OTHER SIDE.
2. DETAIL I AND III FOR NO. 9 AND LARGER. DETAIL II FOR NO. 8 AND SMALLER. DETAIL IV FOR NO. 6 AND SMALLER.
3. E70 ELECTRODE FOR GR40 E90 ELECTRODE FOR GR60.
4. SEE AWS D12-1 FOR WELDING PROCESS AND OTHER DETAILS.
5. GRADE 60 WELDABLE REBAR IN ACCORDANCE WITH ASTM A706 REBAR SHALL BE USED WHEN WELDING OF REBAR IS REQUIRED.

NOTE: ALL 90° BENDS SHALL BE STANDARD HOOKS PER ACI 315 UNLESS OTHERWISE SPECIFIED.

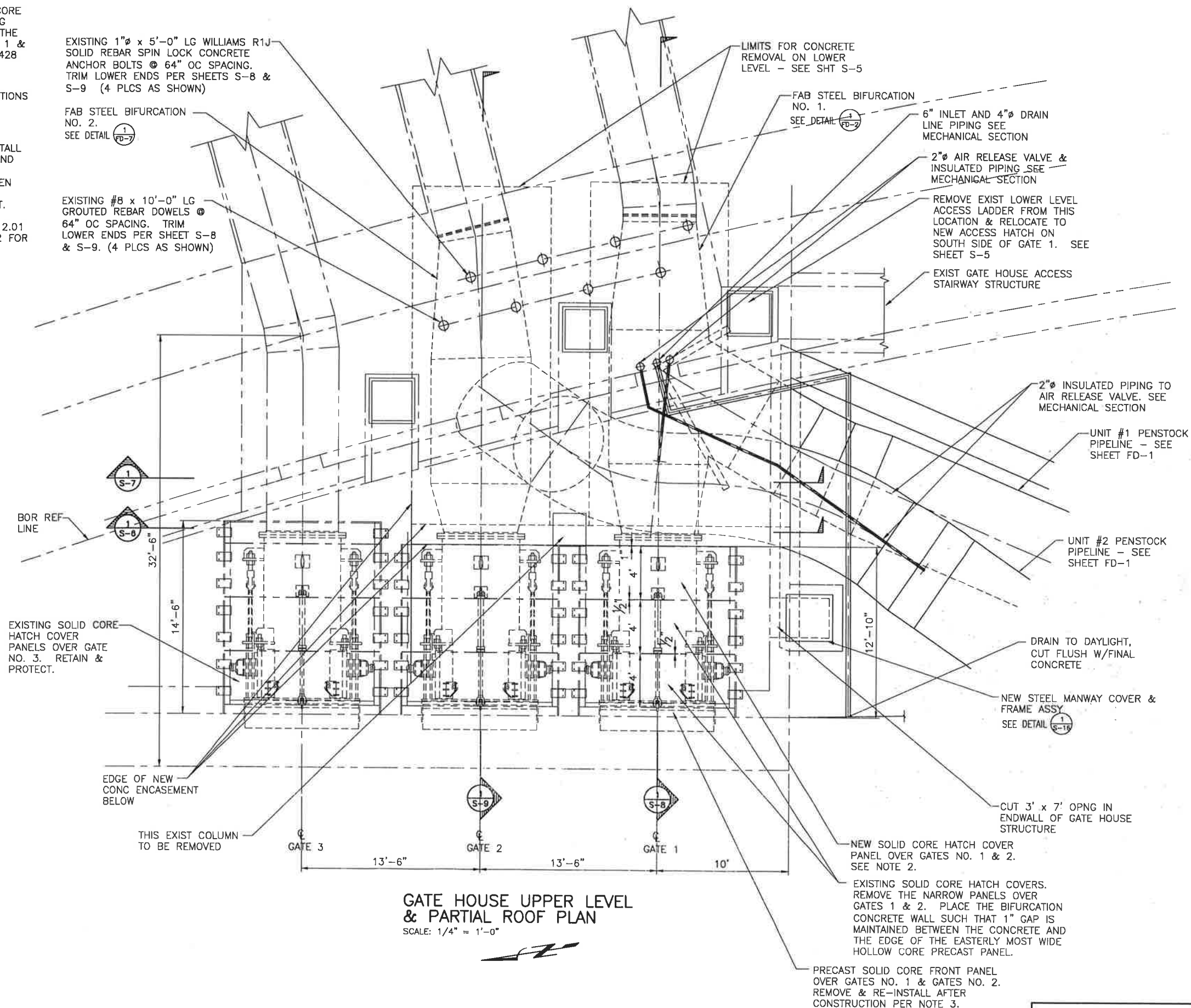
NOTES:

1. TRANSVERSE REINFORCEMENT NOT SPECIFIED, BUT SHALL BE TREATED IN SAME MANNER AS BARS SHOWN.
2. W = DIMENSION OF OPENING PERPENDICULAR TO BARS CUT. FOR CIRCULAR OPENINGS W = DIAMETER.
3. SEE MECH AND SRCH DRAWINGS FOR SLAB AND WALL OPENINGS NOT SPECIFIED ON STRUCTURAL DRAWINGS.
4. SUPPLEMENTARY REINF. MAY BE OMITTED ONLY WHERE OPENING IS FRAMED BY BEAMS OR WALLS.

SCALE	NOTED	DATE	REV	BY	REVISIONS
1/2" = 1'-0"	NOTED	JULY 2008	SPB	SPB	AS-BUILT 2010
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BRUICATION & PENSTOCKS GATE HOUSE STRUCTURAL STANDARD DETAILS					
BOISE-KUNA IRRIGATION DISTRICT NANPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656					
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO					
THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY					
SORENSEN SHEET NO. S-3 USBR DRAWING NO. 4-100-1002					

NOTES:

1. REMOVE THE WIDER PRECAST CONCRETE SOLID CORE PANELS SHOWN OVER GATE NO. 1 AND GATE NO. 2 AS SHOWN ON USBR DRAWING 4-D-2427 AND RETURN TO THE OWNER FOR STORAGE AND/OR DISPOSAL. REMOVE THE 4 REMAINING PRECAST CONCRETE SOLID CORE PANELS OVER GATES NO. 1 & NO. 2 AS SHOWN ON USBR DRAWING 4-D-2427 AND STORE ON SITE DURING CONSTRUCTION. REMOVE THE TWO PRECAST CONCRETE FRONT PANELS SHOWN ABOVE GATES NO. 1 & NO. 2 AS SHOWN ON USBR AS SHOWN ON USBR DRAWING 4-D-2428 AND STORE ON SITE DURING CONSTRUCTION.
2. FABRICATE TWO NEW 4'-0" WIDE x 8" THICK STANDARD PANEL SECTIONS IN ACCORDANCE WITH USBR DRAWINGS 4-D-2427, 4-D-2429, 4-D-2430 & 4-D-2432.
3. AFTER COMPLETION OF THE BIFURCATIONS AND PENSTOCKS, RE-INSTALL THE 4 PRECAST CONCRETE SOLID CORE PANELS STORED ON SITE AND THE 2 NEW FABRICATED 4' WIDE x 8" PANELS PER USBR DRAWING 4-D-2427 AND THIS DRAWING SHEET. AFTER THE PANELS HAVE BEEN PLACED, SEAL ALL GAPS AROUND AND BETWEEN THE PANELS WITH SIKAFLEX-1A POLYURETHANE-BASE, NON-SAG ELASTOMERIC SEALANT. THE SEALANT SHALL CONFORM TO ARROWROCK DAM OUTLET WORKS REHABILITATION SPECIFICATIONS SECTION 07925-SEALANTS, SECTION 2.01 FOR MATERIALS, SECTION 3.01 FOR PREPARATION AND SECTION 3.02 FOR INSTALLATION.

GATE HOUSE UPPER LEVEL
& PARTIAL ROOF PLAN

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

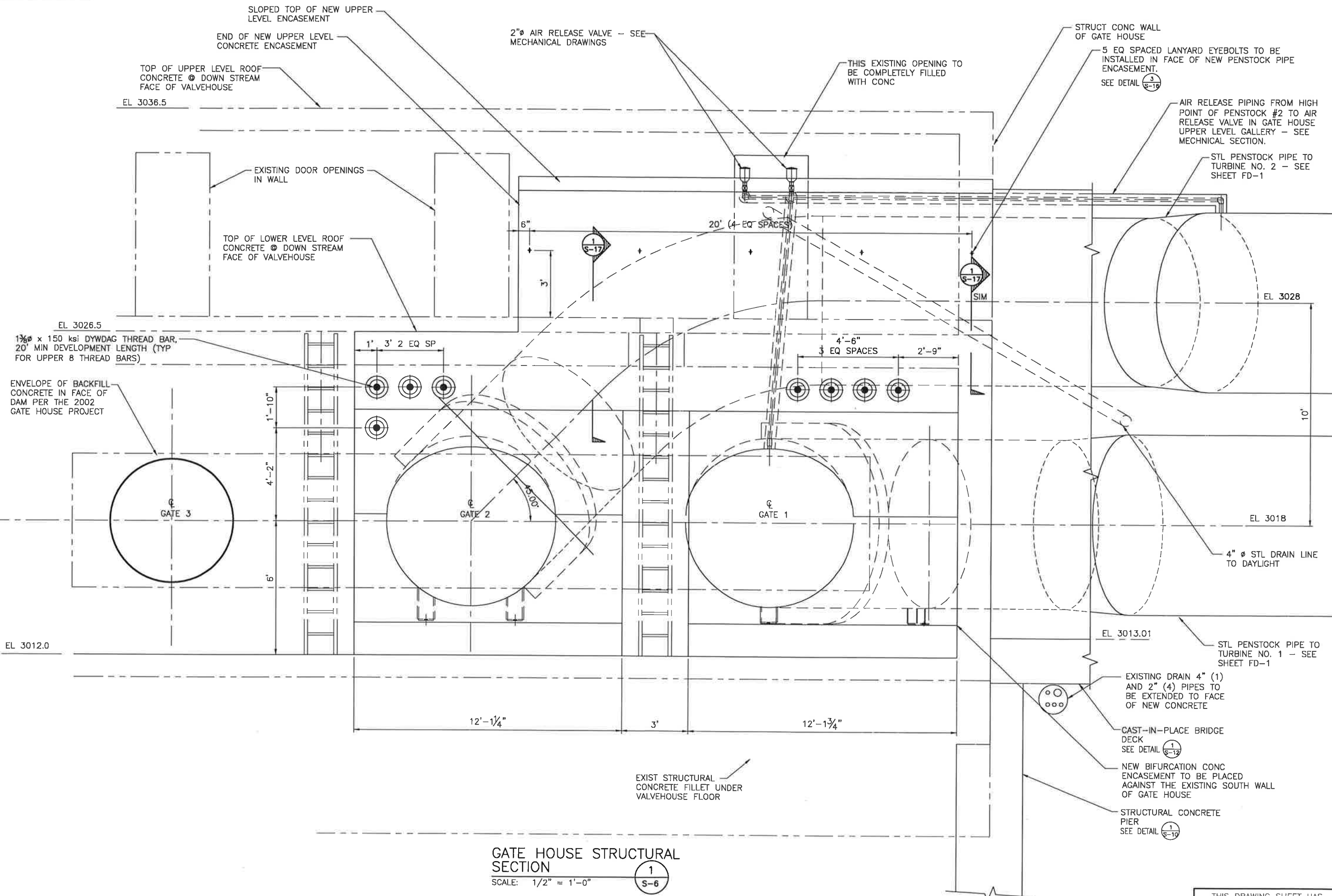
REVISIONS		REV	LTR	DATE	BY	CHKD	APPD	DESC
AS-BUILT 2010				JULY 2008	SPB	SIB	TSS	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO								
ARROWROCK DAM HYDROELECTRIC PROJECT								
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL UPPER LEVEL & PARTIAL ROOF PLAN								
BOISE-KUNA IRRIGATION DISTRICT NANPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT								
PHASE 2 PROJECT FERC PROJECT NO. 4666								
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO								
SCALE NOTED								
SORENSEN SHEET NO. S-4								
USBR DRAWING NO. 4-100-1003								

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY



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

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY



GATE HOUSE STRUCTURAL SECTION

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

1
S-6

THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY

REVISIONS

REV JULY, 2008
LIT SPB
SUB
TSS
DOK

AS-BUILT 2010

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ARROWROCK DIVISION - BOISE PROJECT - IDAHO
ARROWROCK DAM HYDROELECTRIC PROJECT

OUTLET WORKS REHABILITATION
GATE HOUSE, BIFURCATION & PENSTOCKS
GATE HOUSE STRUCTURAL SECTION

BOISE-KUNA IRRIGATION DISTRICT
NAMPA & MERIDIAN IRRIGATION DISTRICT
NEW YORK IRRIGATION DISTRICT
WILDER IRRIGATION DISTRICT
BIG BEND IRRIGATION DISTRICT

PHASE 2 PROJECT
FERC PROJECT NO. 4656

SORENSEN ENGINEERING
CONSULTING ENGINEERS
IDAHO FALLS, IDAHO

SCALE NOTED

SORENSEN SHEET NO.

S-6

USBR DRAWING NO.

4-100-1005

END OF NEW UPPER LEVEL
CONCRETE ENCASEMENT

TOP OF UPPER LEVEL ROOF
CONCRETE @ DOWN STREAM
FACE OF VALVEHOUSE

EL 3036.5

EXISTING DOOR OPENINGS
IN WALL

TOP OF LOWER LEVEL ROOF
CONCRETE @ DOWN STREAM
FACE OF VALVEHOUSE

ENVELOPE OF BACKFILL
CONCRETE IN FACE OF
DAM PER THE 2002
GATE HOUSE PROJECT

THREAD BAR—
ANCHOR RODS
(4 PLCS)

EL 3012.0

GATE 3

① 12" OC
AROUND
GATE 2

#5 HOBPS @
12" O/C

12" OC
AROUND
GATE 1

—#5 HOOPS @
12" OD

GATE HOUSE STRUCTURAL
SECTION

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

1

S-7

THIS EXISTING OPENING TO
BE COMPLETELY FILLED
WITH CONC

— STRUCT CONC WALL
OF GATE HOUSE

#5 SPIRAL x 12"
O.D. @ 3" PITCH x
16" LG (TYP 8
PLACES)

— STL PENSTOCK PIPE TO
TURBINE NO. 2 - SEE
SHEET FD-1

EL 3028

EL 3018

—STL PENSTOCK PIPE TO
TURBINE NO. 1 - SEE
SHEET FD-1

— APPROX LOCATION OF
SACRIFICIAL TIEBACK FOR
PROOF-TESTING PRIOR TO
CONSTRUCTION

— #6 @ 12" OC

— NEW BIFURCATION CONC
ENCASEMENT TO BE PLACED
AGAINST THE EXISTING SOUTH WALL
OF GATE HOUSE

— EXIST STRUCTURAL
CONCRETE FILLET UNDER
VALVEHOUSE FLOOR

REVISIONS

REV
LTR

JULY, 2008

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ARROWROCK DIVISION - BOISE PROJECT - IDAHO
ARROWROCK DAM HYDROELECTRIC PROJECT

BOISE-KUNA IRRIGATION DISTRICT
NANPA & MERIDIAN IRRIGATION DISTRICT
NEW YORK IRRIGATION DISTRICT
WILDER IRRIGATION DISTRICT
BIG BEND IRRIGATION DISTRICT

--	--

SORENSEN ENGINEERING
CONSULTING ENGINEERS

SCALE NOTED

NOTED
ROBINSON SHEET M

S-7

USER DRAWING N

4-100-

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

EXISTING CURTAIN OF #6 BARS
PER BOR DWG 4-D-2276

EXISTING CURTAIN OF #10 BARS
PER BOR DWG 4-D-2276

4 EXISTING GROUT IN #8 REBARS TO
BE CUT OFF 3" BELOW THE OVERHEAD
NEAT LINE OF THE CONCRETE REMOVAL.
SEE SHEET S-4 FOR PLAN LOCATION.

4 EXISTING WILLIAMS SOLID REBAR SPIN
LOCK CONCRETE ANCHOR BOLTS TO BE
CUT OFF 3" BELOW THE OVERHEAD NEAT
LINE OF THE CONCRETE REMOVAL AREA.
SEE SHEET S-4 FOR PLAN LOCATION.

EXISTING CURTAIN OF #6 BARS
PER BOR DWG 4-D-2276

EXISTING CURTAIN OF #10 BARS
PER BOR DWG 4-D-2276

1"Ø x 12" LG w/ 6" EMBEDMENT HILTI HSA STL
ANCHOR RODS. EPOXY IN WITH J-51. LOCATE
AT 24" OCEW IN OVHD EXISTING CONCRETE.

BACKER PLATE WELD JOINT TO CONNECT
TO THE EXISTING PIPELINE
SEE DETAIL (1)
(S-1)

DRILL 4"Ø FOR 1½"Ø x 150 ksi
DYWIDAG THREAD BAR, 20' MIN
DEVELOPMENT LENGTH AS MEASURED
FROM THE FACE OF THE EXISTING
STRUCTURAL CONCRETE.

UPSTREAM PENSTOCK HEADLOSS
MEASUREMENT POINT MANIFOLD TO
BE INSTALLED PRIOR TO THE
PLACEMENT OF THE NEW
ENCASEMENT CONCRETE (SEE
MECHANICAL DRAWINGS)

EXIST POWER OUTLET
CONDUIT IN CONCRETE DAM
STRUCTURE

EXISTING 66" I.D. x ½" WALL
PIPE THRU EXISTING CONC DAM
STRUCTURE

NOTE 1:
NOT USED.

NOTE 2.
ROUGHEN SURFACES OF EXISTING CONCRETE TO AN AMPLITUDE
OF ¼" MINIMUM WHERE NEW CONCRETE WILL BE PLACED
AGAINST THE EXISTING CONCRETE. THE FINAL 12"± OF
EXISTING CONCRETE EXCAVATION SHALL BE ACCOMPLISHED WITH
JACKHAMMERS NOT EXCEEDING 60 POUNDS FORCE.
SANDBLAST AND CLEAN THE FINAL SURFACES. ALL CONCRETE
REMOVAL & REPAIR SHALL CONFORM TO THE "GUIDE TO
CONCRETE REPAIR" BY THE UNITED STATES DEPARTMENT OF
THE INTERIOR, BUREAU OF RECLAMATION.

NOTE 3.
BOND ½" THK x 12" WIDE SPONGE RUBBER WALL SEAL TO
EXTERIOR OF BIFURCATION ALL AROUND AT FACE OF CONCRETE.

GATEHOUSE STRUCTURAL SECTION THRU UNIT NO. 1

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

1
S-8

REVISIONS		REV	DATE	BY	CHKD	APP'D	DESC
1	AS-BUILT	2010					
2	JULY 2008			SPB			
3				SUB			
4				TSS			
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT							
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL SECTION THRU UNIT NO. 1							
BOISE-KUNA IRRIGATION DISTRICT Nampa & Meridian Irrigation District New York Irrigation District Wildier Irrigation District Big Bend Irrigation District							
PHASE 2 PROJECT FERC PROJECT NO. 4656							
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO							
SCALE NOTED							
SORENSEN SHEET NO. S-8							
USBR DRAWING NO. 4-100-1007							

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

EXISTING CURTAIN OF #6 BARS
PER BOR DWG 4-D-2276

EXISTING CURTAIN OF #10 BARS
PER BOR DWG 4-D-2276

2"Ø AIR RELEASE VALVE &
INSULATED PIPING SEE
MECHANICAL SECTION

EXIST 3'-4" x 7'-0"
DOOR OPNG TO BE CONC
FILLED

4 EXISTING GROUT IN #8 REBARS TO BE CUT OFF 3" BELOW THE OVERHEAD NEAT LINE OF THE CONCRETE REMOVAL. SEE SHEET S-4 FOR PLAN LOCATION.

4 EXISTING WILLIAMS SOLID REBAR SPIN-LOCK CONCRETE ANCHOR BOLTS TO BE CUT OFF 3" BELOW THE OVERHEAD NEAT LINE OF THE CONCRETE REMOVAL AREA. SEE SHEET S-4 FOR PLAN LOCATION.

EXISTING CURTAIN OF #6 BARS
PER BOR DWG 4-D-2276

EXISTING CURTAIN OF #10 BARS
PER BOR DWG 4-D-2276

BACKER PLATE WELD JOINT TO
CONNECT TO THE EXISTING
PIPELINE
SEE DETAIL 

DRILL 4"Ø FOR 1½Ø x 150 ksi DYWDAG THREAD
BAR, 20' MIN DEVELOPMENT LENGTH AS
MEASURED FROM THE FACE OF THE EXISTING
STRUCTURAL CONCRETE.

1"Ø x 12" LG w/ 6" EMBEDMENT HILTI HSA STL
ANCHOR RODS. EPOXY IN WITH J-51. LOCATE
AT 24" OCEW IN OVHD EXISTING CONCRETE.

EXIST POWER OUTLET
CONDUIT IN CONCRETE DAM
STRUCTURE

EXISTING 66" I.D. x 1#2" WALL
PIPE THRU EXISTING CONC DAM
STRUCTURE

UPSTREAM PENSTOCK HEADLOSS —
MEASUREMENT POINT MANIFOLD TO
BE INSTALLED PRIOR TO THE
PLACEMENT OF THE NEW
ENCASEMENT CONCRETE (SEE
MECHANICAL DRAWINGS)

NOTE 1:
NOT USED.

NOTE 2.
ROUGHEN SURFACES OF EXISTING CONCRETE TO AN AMPLITUDE OF 1/4" MINIMUM WHERE NEW CONCRETE WILL BE PLACED AGAINST THE EXISTING CONCRETE. THE FINAL 12"± OF EXISTING CONCRETE EXCAVATION SHALL BE ACCOMPLISHED WITH JACKHAMMERS NOT EXCEEDING 60 POUNDS FORCE. SANDBLAST AND CLEAN THE FINAL SURFACES. ALL CONCRETE REMOVAL & REPAIR SHALL CONFORM TO THE "GUIDE TO CONCRETE REPAIR" BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION.

NOTE 3.
BOND $\frac{1}{2}$ " THK x 12" WIDE SPONGE RUBBER WALL SEAL TO
EXTERIOR OF BIFURCATION ALL AROUND AT FACE OF CONCRETE.

LAYOUT SCALE 1/24XP

FAB STEEL BIFURCATION
NO. 2.
SEE DETAIL 

EXISTING DBL CURTAIN OF
#10 BARS SPACED PER
BOR DWG 4-D-2269 SEE
NOTE 2.

EXISTING CURTAIN OF #6 BARS
PER BOR DWG 4-D-2276

EXIST FLG CONNECTION
FOR CLAMSHELL GATE

REMOVE EXISTING 72"Ø FLANGE AND
RE-CONDITION FOR FIELD WELDING TO END
OF NEW BIFURCATION ASSEMBLY (NOTE THAT
A 72" OD AWWA CL D WELD FLANGE HAS
BEEN INSTALLED PER BOR DWG 4-D-2329
& 4-D-2324)

EL 3010.0 DAM FACE
SLOPE TRANSITION POINT

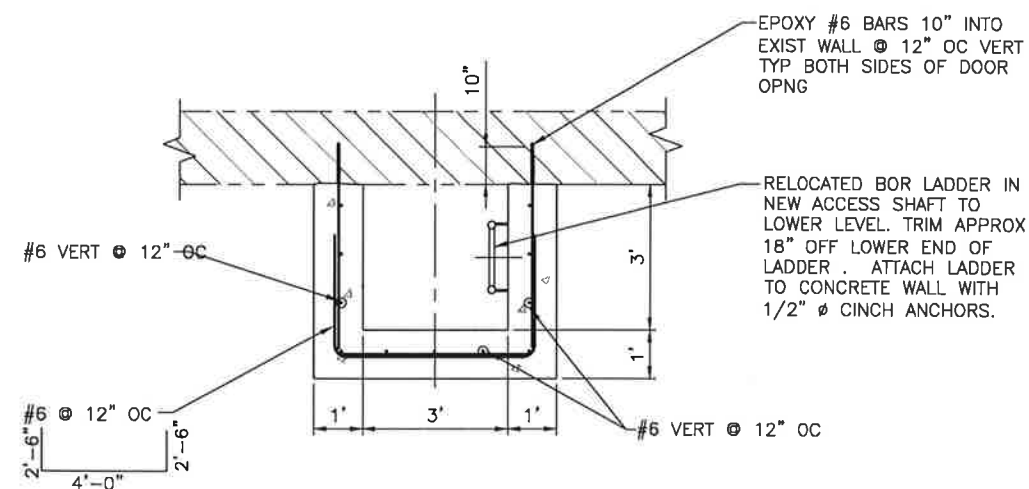
GATEHOUSE STRUCTURAL SECTION
THRU UNIT NO. 2

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

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO		DATE JULY, 2008	REV LTR
		ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL SECTION THRU UNIT NO. 2		DRAWN SPB	AS-BUILT 2010
				CHECKED SUB	
				APPROVED TSS	
				ENGINEER	

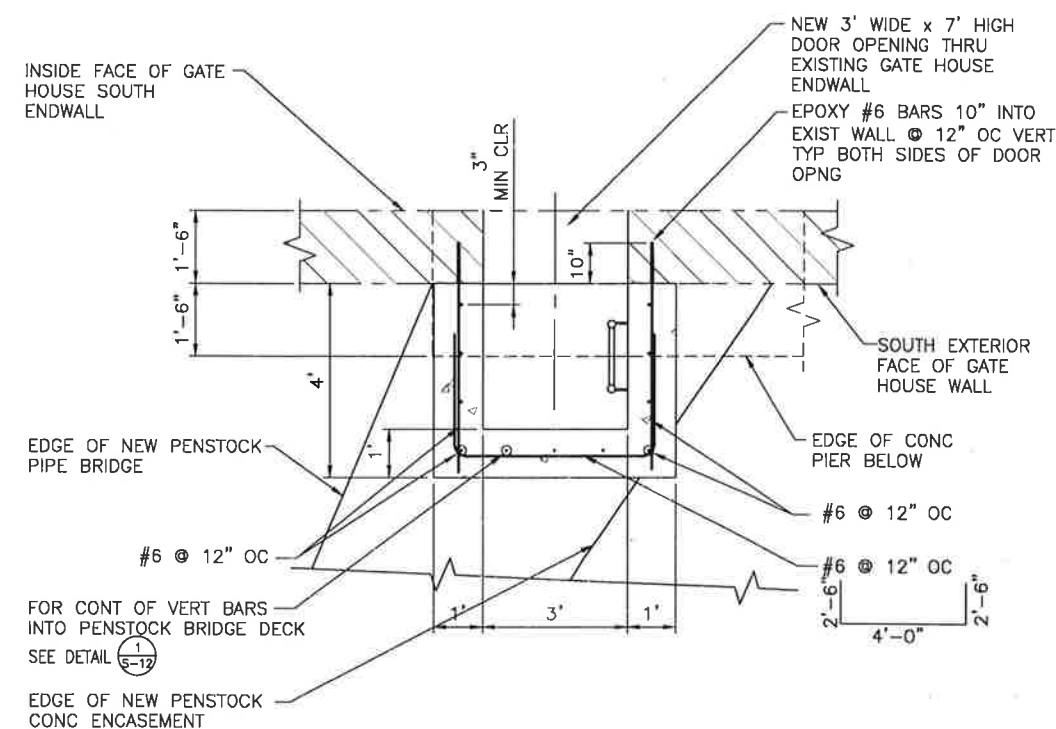
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	SCALE NOTED	SORENSEN SHEET NO. S-10 USER DRAWING NO. 4-100-1009	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO	DATE AUG 4, 2008	REV LTR	REVISIONS AS-BUILT 2010
				ARROWROCK DAM HYDROELECTRIC PROJECT	DRAWN SPB		
					CHECKED SUB		
					APPROVED TSS		
				OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL SOFTLY ELEVATION	CHECKED DICKER		



ACCESS MANWAY SECTION
ABOVE NEW DOOR

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

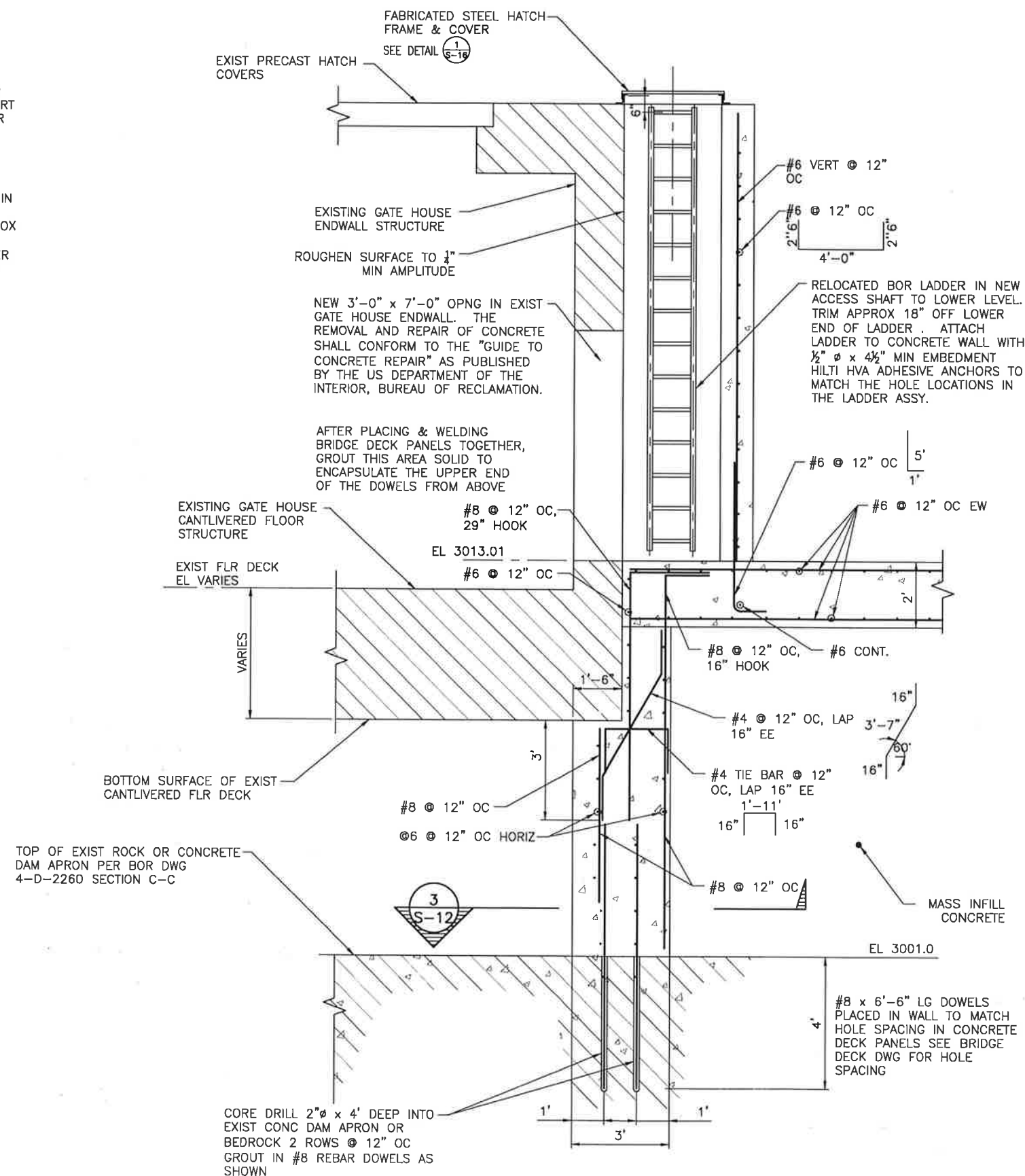
3
S-11



ACCESS MANWAY SECTION THRU
GATE HOUSE DOOR

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

4
S-11



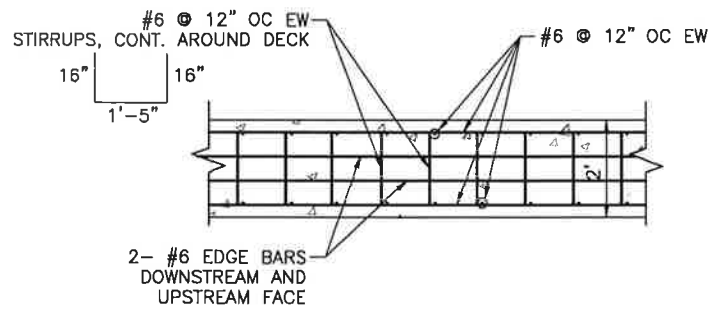
ACCESS MANWAY SECTION THRU
ACCESS SHAFT

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

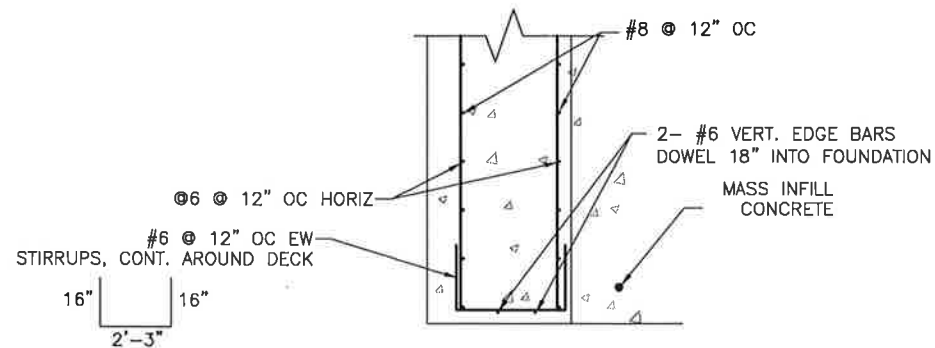
2
S-11

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SIZE--REDUCE SCALES
ACCORDINGLY

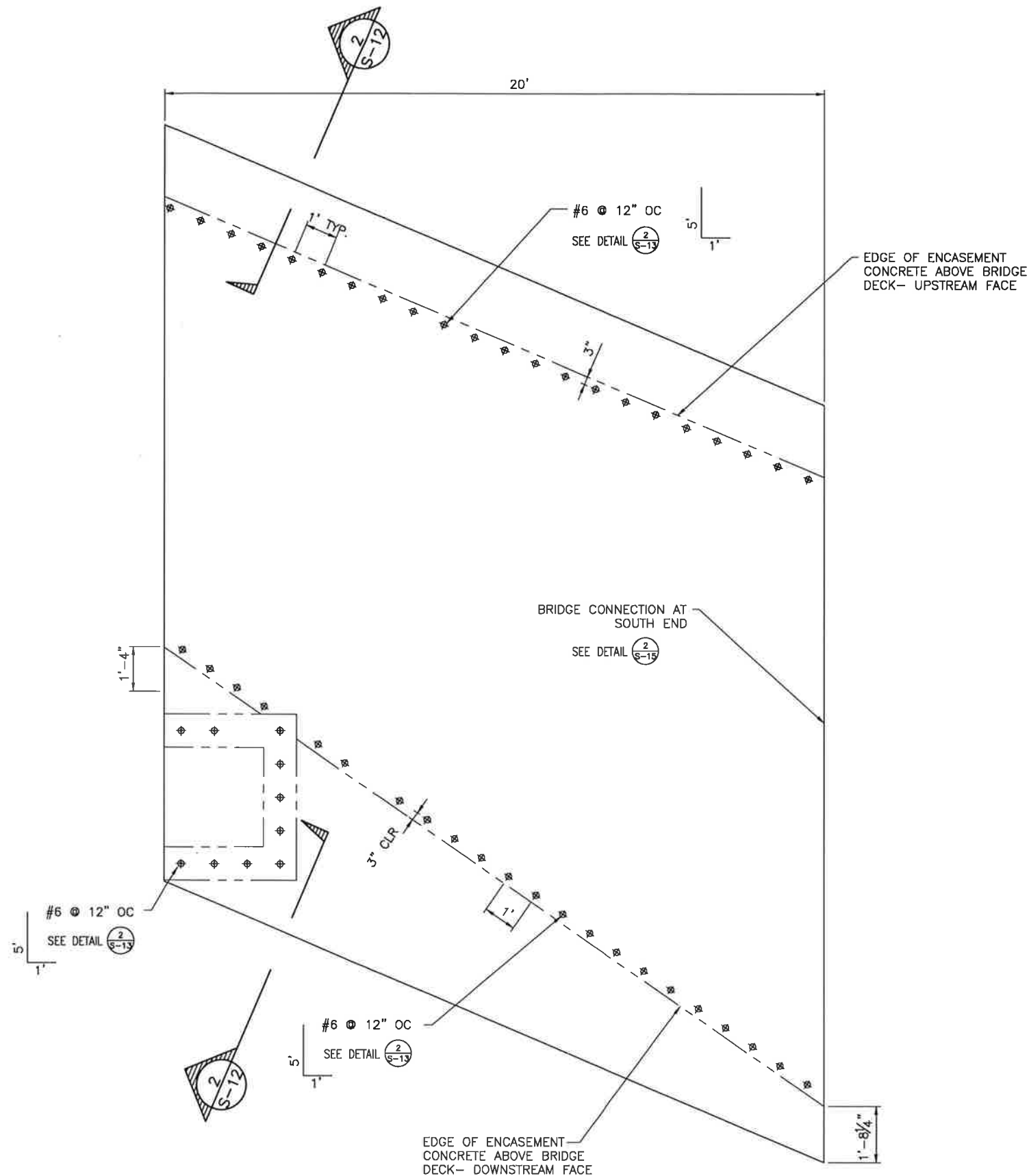
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO		DATE	AUG 2008	REV LTR	AS-BUILT 2010
		ARROWROCK DAM HYDROELECTRIC PROJECT		DESIGNED	SPB		
		OUTLET WORKS REHABILITATION		CHECKED	SJB		
		GATE HOUSE, BIFURCATION & PENSTOCKS		APPROVED	TSS		
		GATE HOUSE STRUCTURAL DETAILS		ENGINEER			



PENSTOCK MASS CONC/DECK
BASIC EDGE DETAIL 2
SCALE: 1/2" = 1'-0" S-12



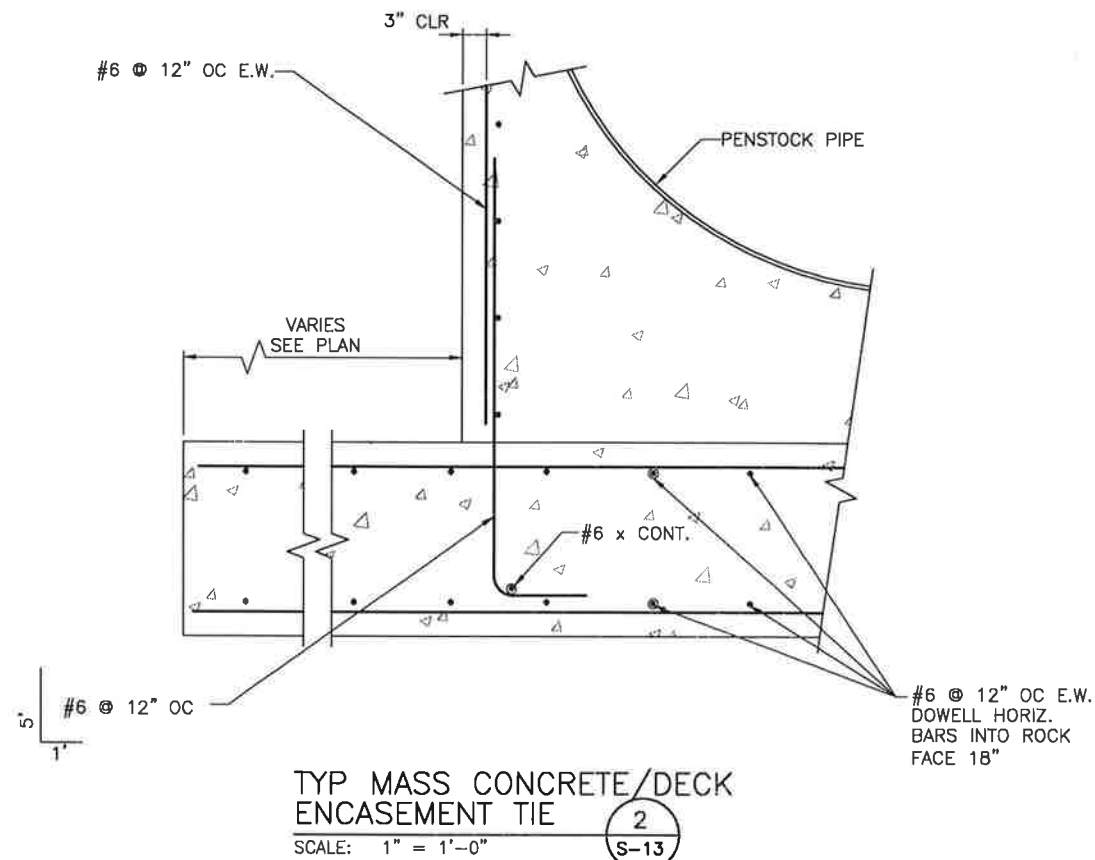
PIER WALL DOWNSTREAM
PLAN DETAIL 3
SCALE: 1/2" = 1'-0" S-12



PENSTOCK MASS CONC/DECK
STRUCTURAL PLAN 1
SCALE: 1/2" = 1'-0" S-12

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ACCORDINGLY

REVISIONS		DATE	REV	BY	APP	CHK	DES	APP	CHK	DES
AS-BUILT 2010		AUG 2008	1	SPB	SUB	TSS				
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT										
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS										
PENSTOCK BRIDGE DECK STRUCTURAL PLAN										
BOISE-KUNA IRRIGATION DISTRICT Nampa & Meridian Irrigation District New York Irrigation District Wilder Irrigation District Big Bend Irrigation District										
PHASE 2 PROJECT FERC PROJECT NO. 4656										
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO										
SCALE NOTED										
SORENSEN SHEET NO. S-12										
USBR DRAWING NO. 4-100-1011										



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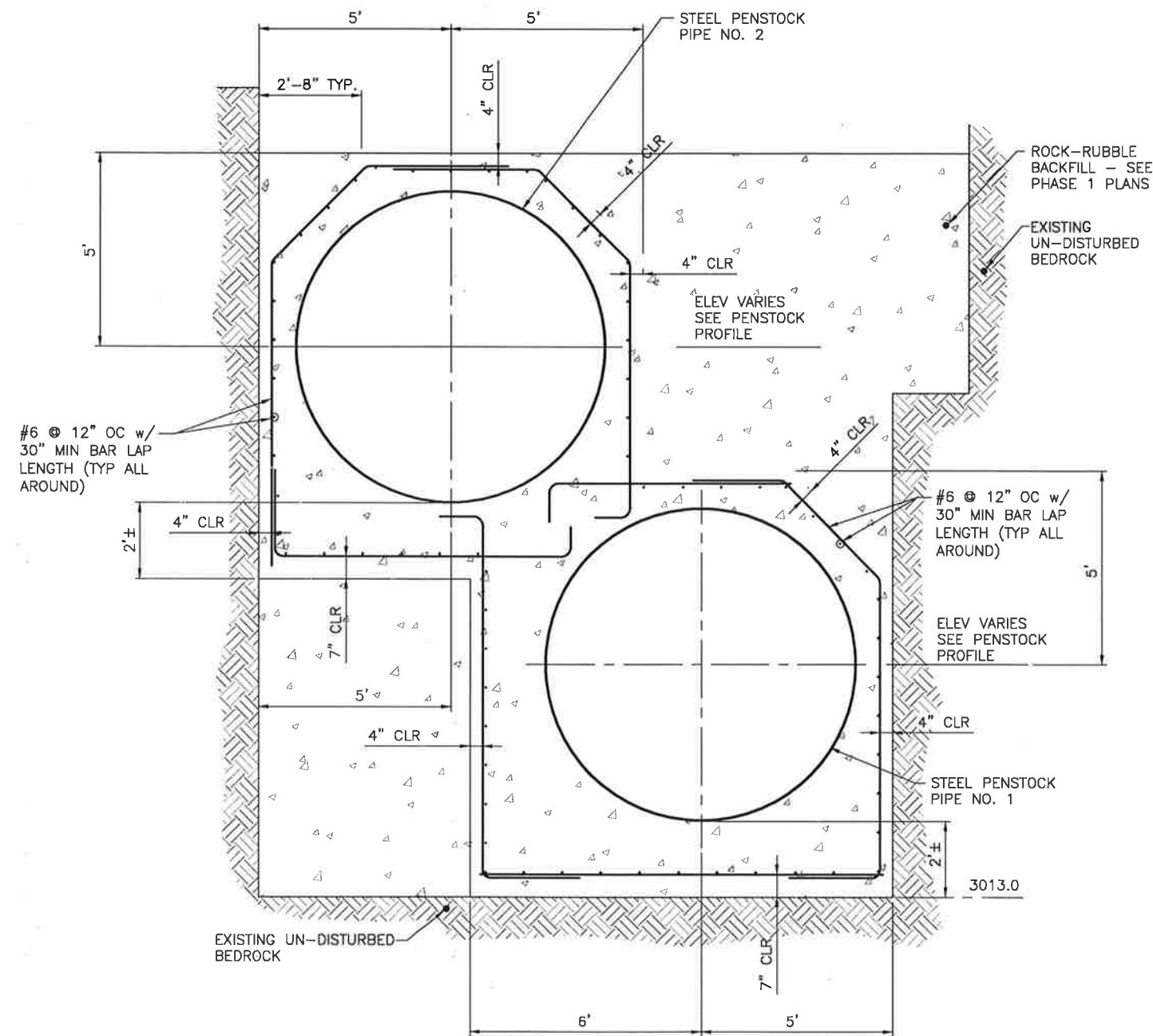
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CONSULTING ENGINEERS
IDAHO FALLS, IDAHO

SCALE NOTED
SORENSON SHEET NO. **S-13**
USBR DRAWING NO. **4-100-1012**

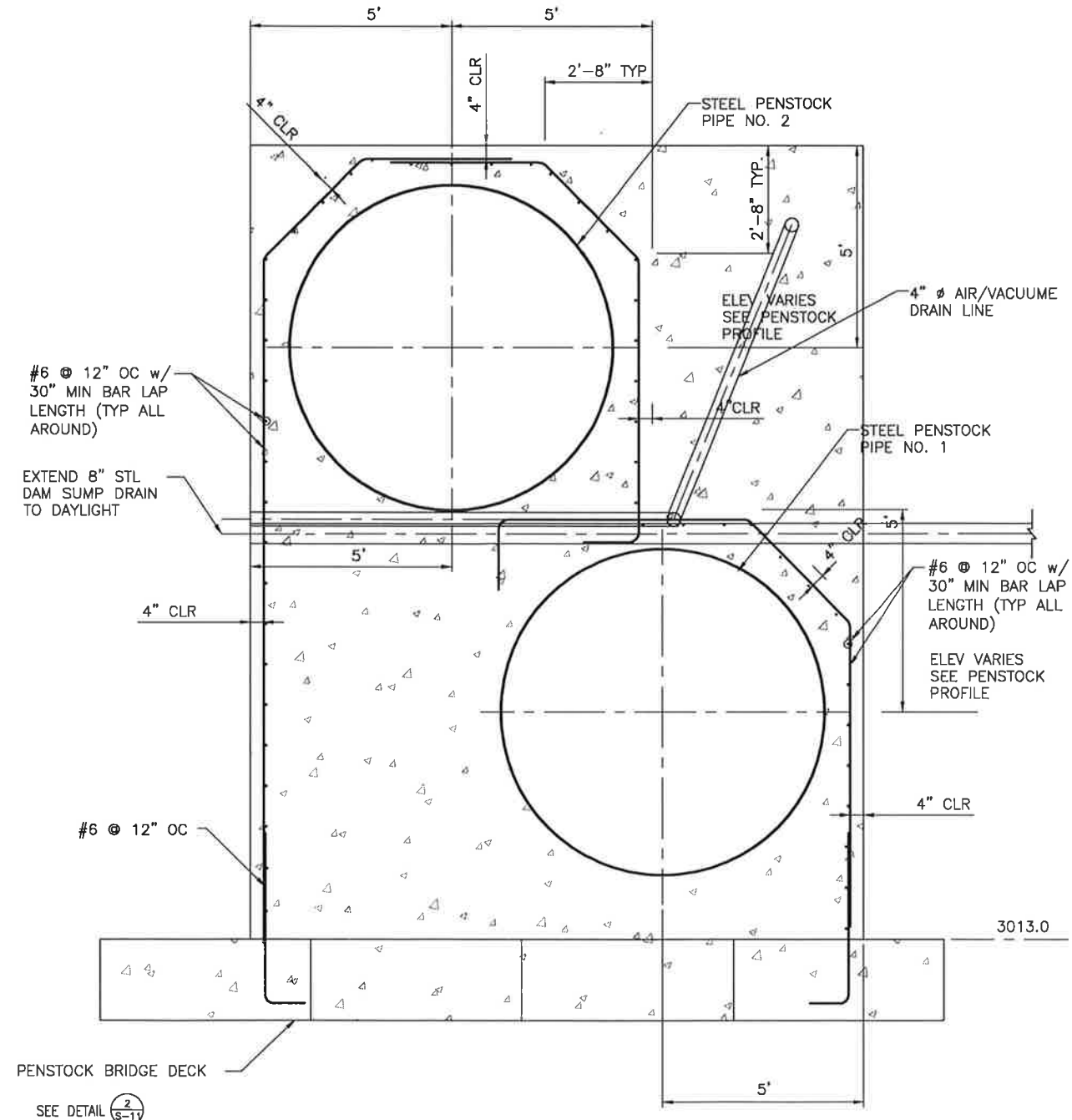
BOISE-KUNA IRRIGATION DISTRICT
NANPA & MERIDIAN IRRIGATION DISTRICT
NEW YORK IRRIGATION DISTRICT
WILDER IRRIGATION DISTRICT
BIG BEND IRRIGATION DISTRICT
PHASE 2 PROJECT
FERC PROJECT NO. 4656

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ARROWROCK DIVISION - BOISE PROJECT - IDAHO
ARROWROCK DAM HYDROELECTRIC PROJECT
OUTLET WORKS REHABILITATION
GATE HOUSE, BRUCCATION & PENSTOCKS
PENSTOCK BRIDGE DECK STRUCTURAL DETAILS

DATE	REV	DESCRIPTION	BY
AUG 2008	1	AS-BUILT 2010	SPB
	2		SJB
	3		TSS
	4		DOH



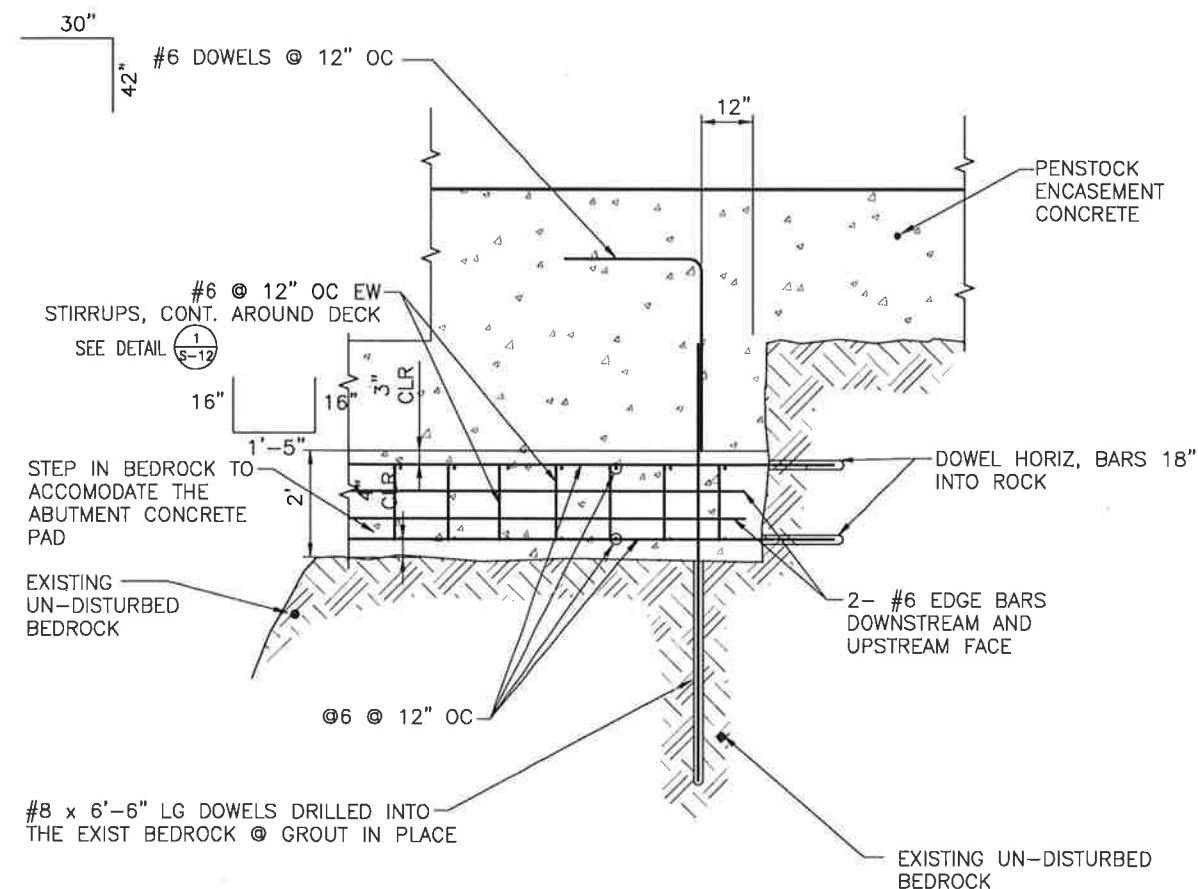
PENSTOCK STRUCTURAL
CONC. ENCASEMENT 2
SCALE: 1/2" = 1'-0"
S-14



PENSTOCK STRUCTURAL
CONC. ENCASEMENT 1
SCALE: 1/2" = 1'-0"
S-14

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ACCORDINGLY

REVISIONS		DATE	BY	CHKD	APP'D
AS-BUILT 2010		AUG 2008	SPB	SJB	TSS
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT					
BOISE-KUNA IRRIGATION DISTRICT Nampa & Meridian Irrigation District NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT					
OUTLET WORKS REHABILITATION GATE HOUSE, BRUICATION & PENSTOCKS PENSTOCK ENCASUREMENT TYPICAL SECTIONS					
PHASE 2 PROJECT FERC PROJECT NO. 4656					
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO					
SCALE: NOTED					
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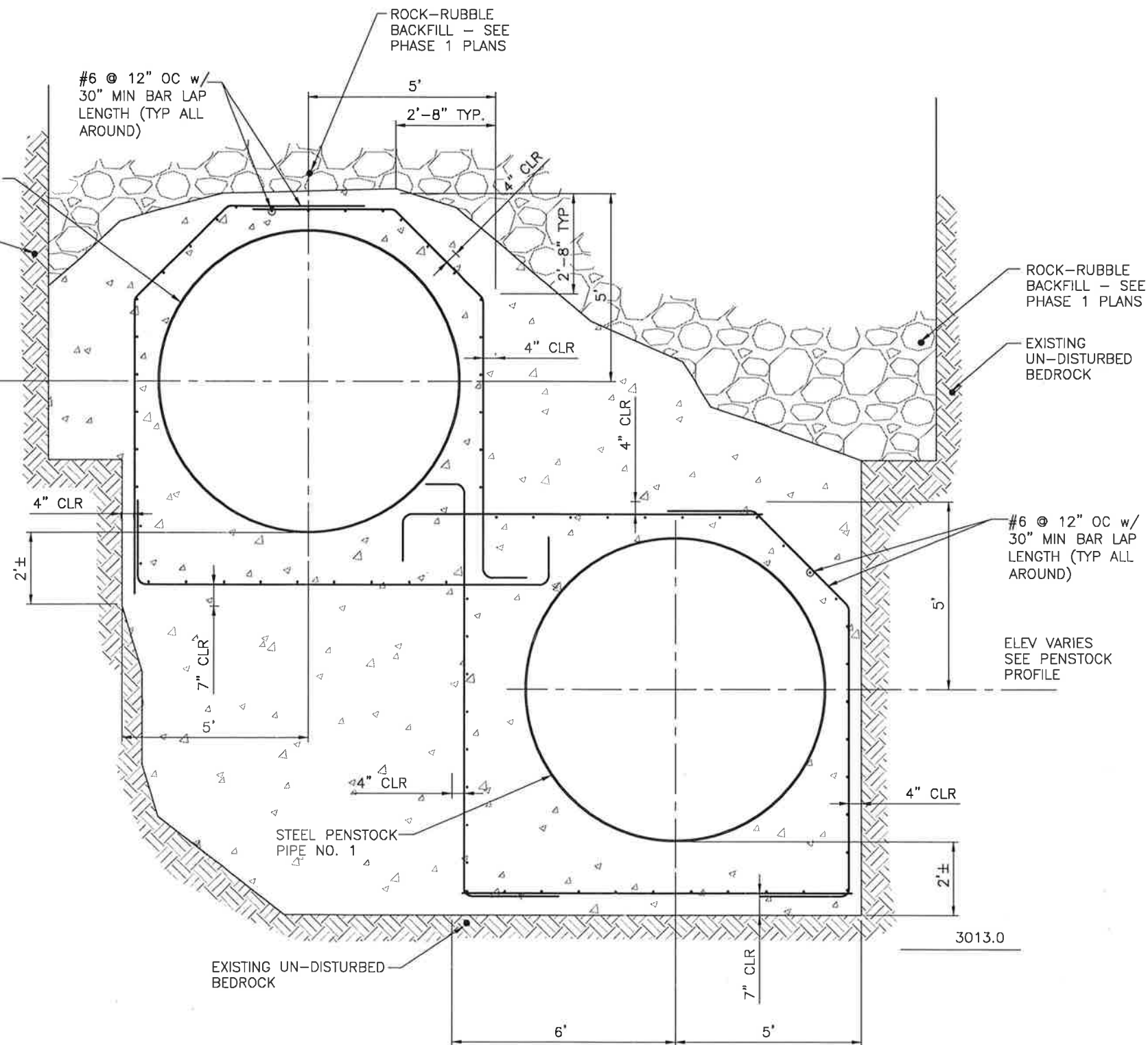


MASS CONC./DECK CONNECTION
AT SOUTH END

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

2

S-15



PENSTOCK STRUCTURAL
CONC. ENCASEMENT

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

1

S-15

THIS DRAWING SHEET HAS
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SIZE--REDUCE SCALES
ACCORDINGLY

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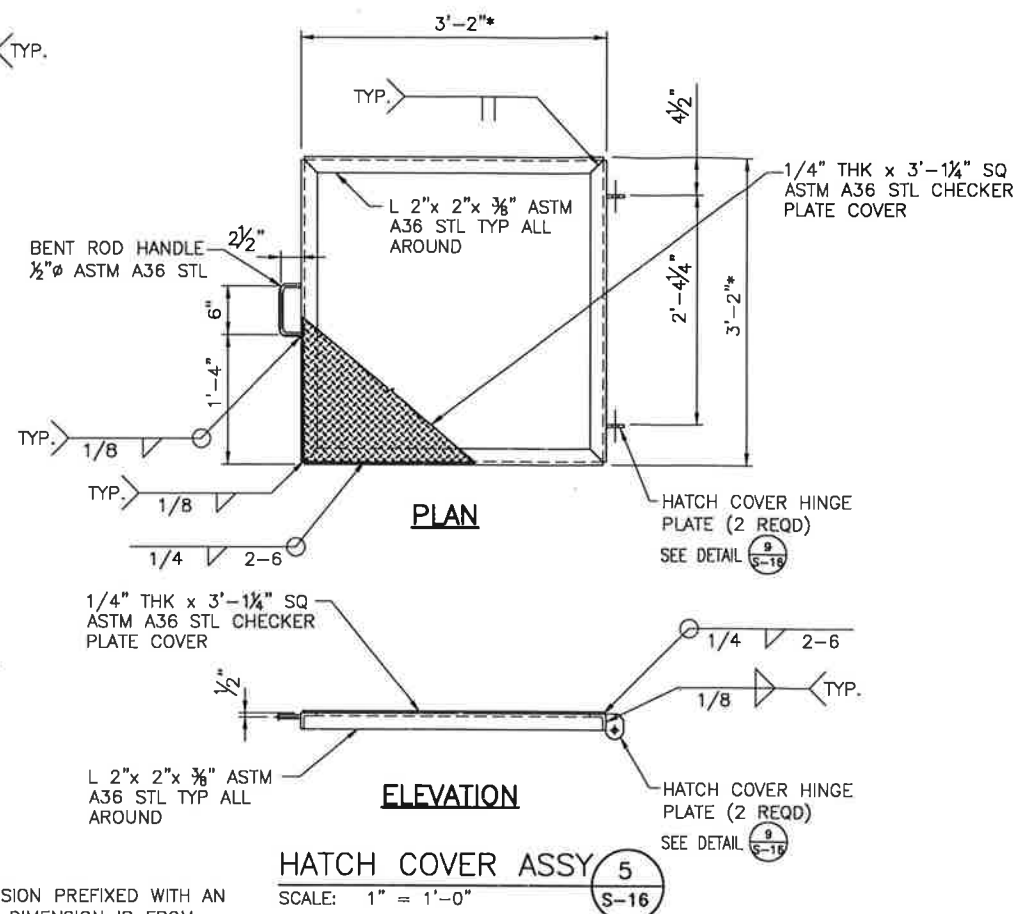
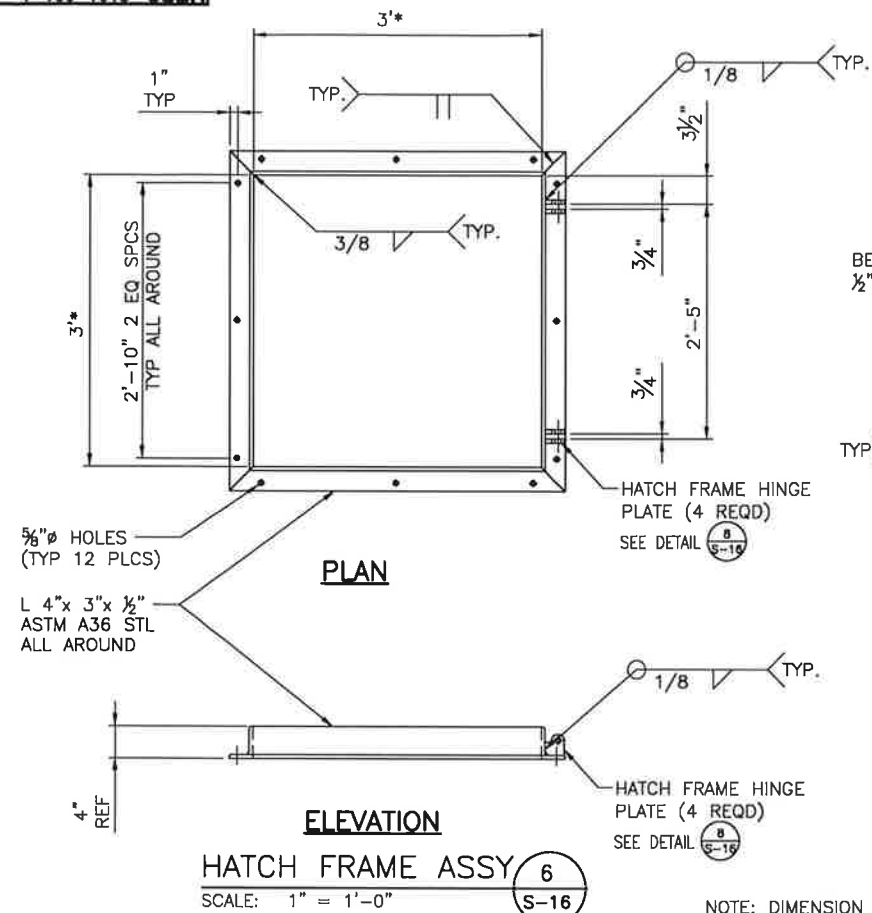
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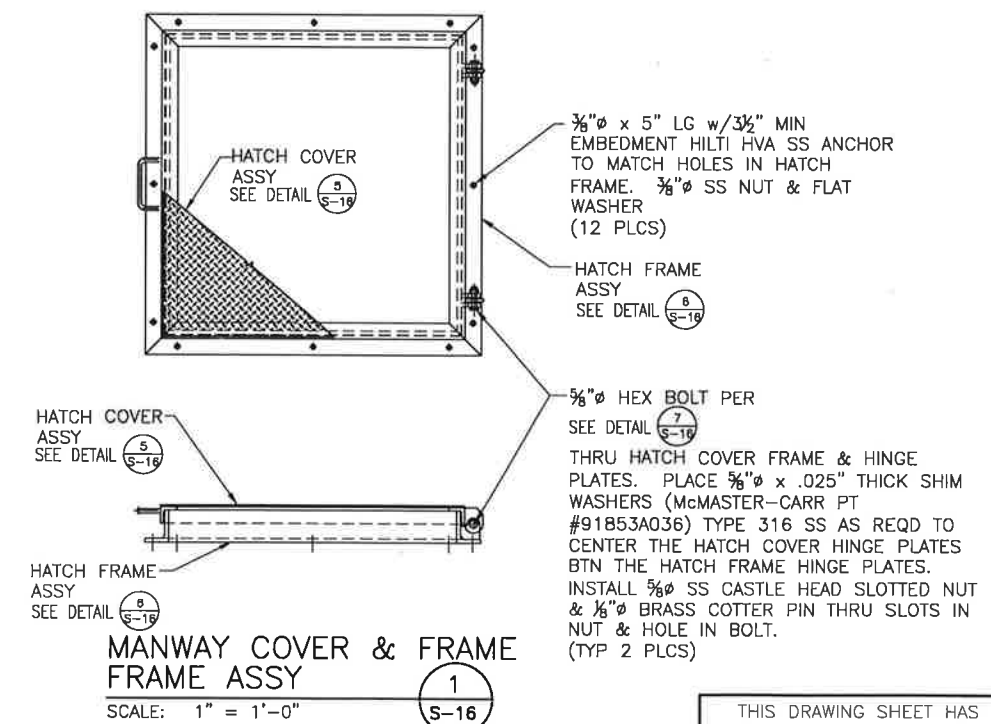
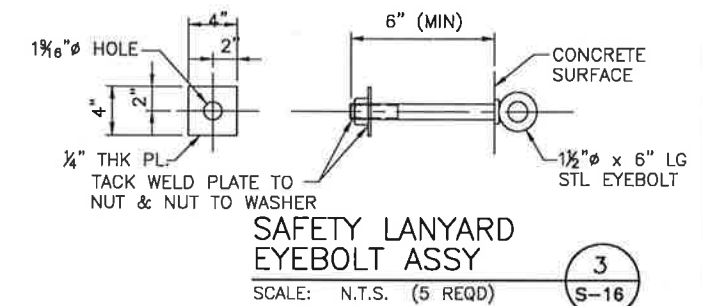
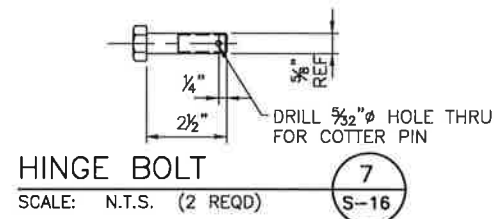
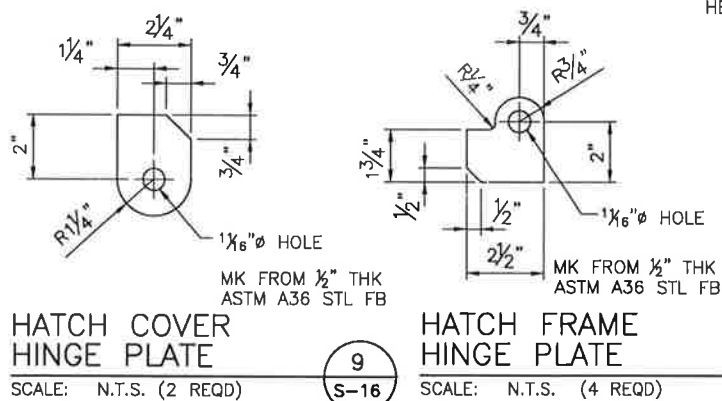
APPROVED

DESIGNED

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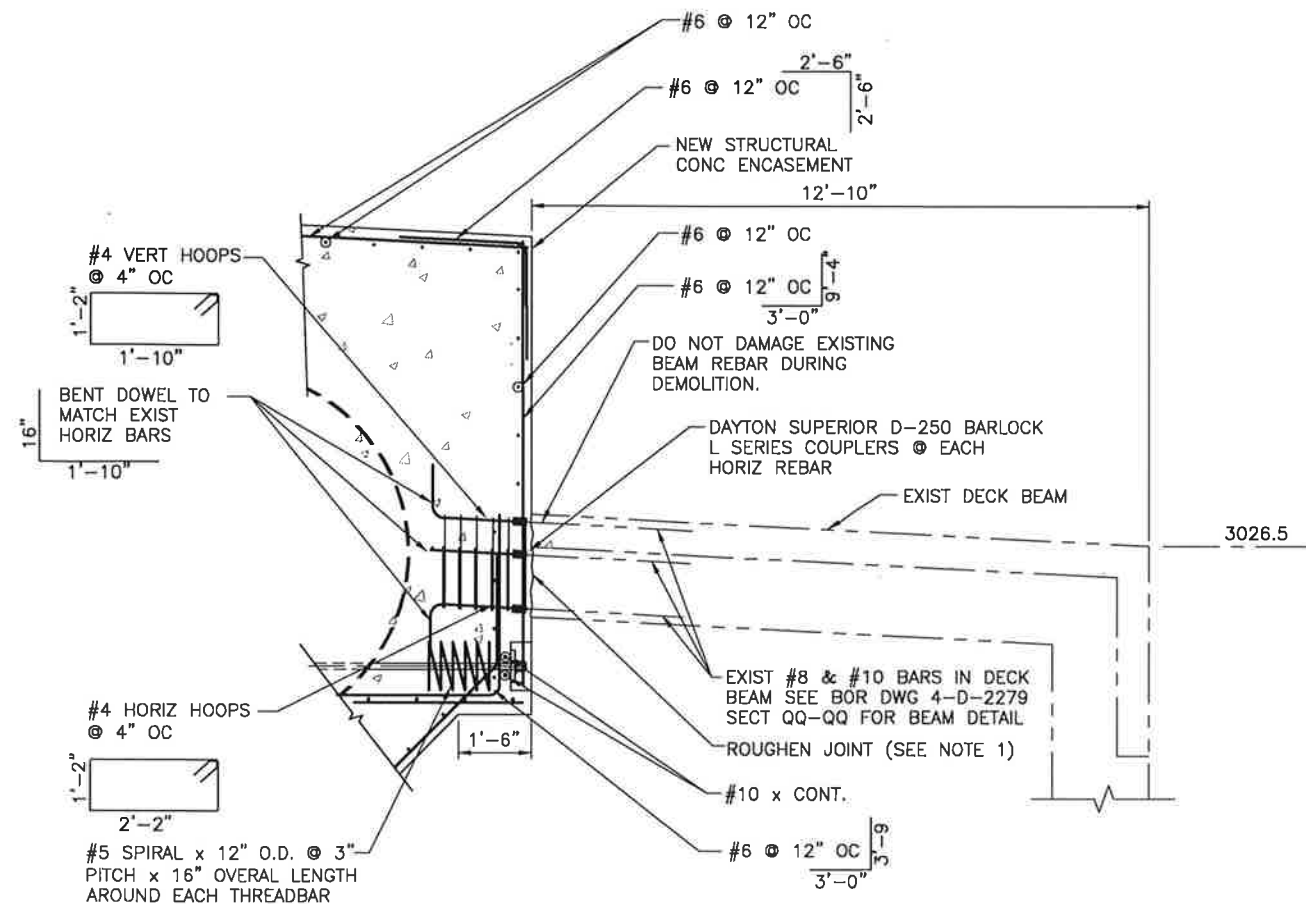


NOTE 1:
INSTEAD OF MANUFACTURED LID A DUR-ROD
LADDER HATCH LH 3'-0" X 3'-0" G
COMMERCIAL HATCH LID WAS USED. HATCH
FRAME ASSY AND OTHER DETAILS REMAIN
SIMILAR.



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BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE MAINWAY HATCH & SAFETY RAILING POST DETAILS	DATE	AUG 2008	REV	AS-BUILT	REVISIONS	
			SCALE	NOTED				
			SORENSEN SHEET NO.	S-16				
			USBR DRAWING NO.	4-100-1015				



NOTE 1:
REMOVE EXISTING CONCRETE AS SHOWN. MIN AMPLITUDE SHALL BE $\frac{1}{4}$ " & SAND BLAST THE SURFACE WHERE NEW CONCRETE WILL BE PLACED. USE 30 POUND FORCE MAX JACKHAMMERS & 15 POUND FORCE CHIPPING HAMMERS AROUND THE EXISTING REBARS. CONCRETE REMOVAL & REPAIR SHALL CONFORM TO THE "GUIDE TO CONCRETE REPAIR" BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION.

GATE HOUSE STRUCTURAL BEAM SPLICE DETAIL 1

SCALE: $\frac{1}{2}" = 1'-0"$

S-17

REVISIONS		DATE	REV	BY	DATE	REV	BY
AS-BUILT 2010							
		AUG 2008		SPB			
				SJB			
				TSS			
				DOCK			
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT							
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE STRUCTURAL DETAILS							
BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT							
PHASE 2 PROJECT FERC PROJECT NO. 4656							
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO							
SCALE: NOTED							
SORENSEN SHEET NO. S-17							
USBR DRAWING NO. 4-100-1016							

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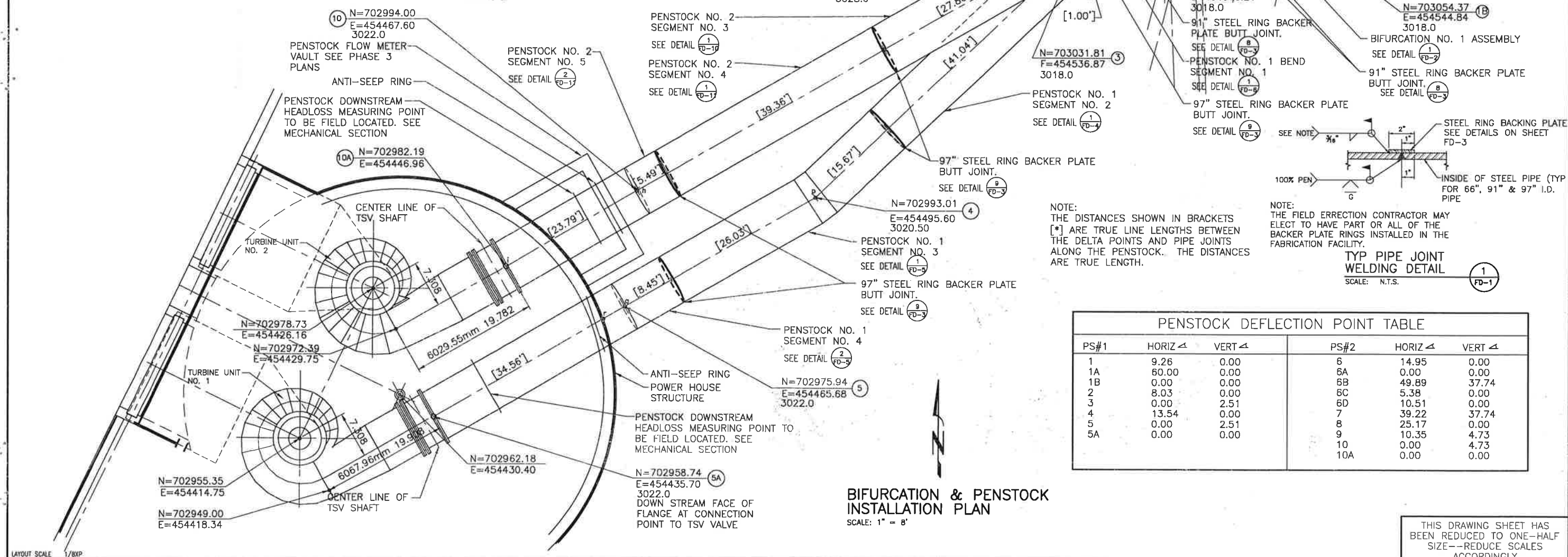
BILL OF MATERIALS

SHIP MARK	TOT PCS	PC MARK	DESCRIPTION	LENGTH FT IN	REMARKS	WT
---	---	---	BIFURCATION & PENSTOCK INSTL		SHT FD-1	
1			BIFURCATION NO 1.		SHT FD-2	
1			SEG 1, BEND 1		SHT FD-6	
1			SEG 2, PENSTOCK 1		SHT FD-4	
1			SEG 3 & SEG 4, PENSTOCK 1		SHT FD-5	
1			BIFURCATION NO 2.		SHT FD-7	
1			SEG 1, BEND 1, PENSTOCK 2		SHT FD-9	
1			SEG 2, BEND 2, PENSTOCK 2		SHT FD-9	
1			SEG 3, PENSTOCK 2		SHT FD-10	
1			SEG 4 & 5, PENSTOCK 2		SHT FD-11	
4			67" STL RING BACKER PLATE		SHT FD-3	
8			91" STL RING BACKER PLATE		SHT FD-3	
6			97" STL RING BACKER PLATE		SHT FD-3	
2			72" EXIST FLG REFERB-NOTE 7		SHT FD-3	
2			RUBBER O-RING SEAL-NOTE 7		SHT FD-3	
60			EXIST SS FLG BOLT SEE NOTE 7			
60			EXIST SS FLG NUT SEE NOTE 7			
60			EXIST SS FLG WASHER SEE NOTE 7			

NOTES

- MANUFACTURING AND TESTING REQUIREMENTS:
 - ALL WELDING SHALL BE 100% PENETRATION WELDS PER THE PROJECT GENERAL SPECIFICATION SECTION PERTAINING TO WELDING. INTERIOR WELDS SHALL BE GROUND FLUSH WITH THE PARENT MATERIAL. POCKETS AND RECESSED AREAS SHALL BE RE-WELDED AND GROUND FLUSH.
 - THE FABRICATED STRUCTURAL STEEL BIFURCATION WYE SHALL BE FABRICATED AND TESTED IN ACCORDANCE WITH THE AMERICAN WATER WORKS (AWWA) STANDARD SPECIFICATION C200-80 AND MANUAL M11. THE TESTING OF THESE ITEMS WILL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
 - FINISH THE COMPLETED BIFURCATION ASSEMBLY IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. NO EXTERIOR FINISH IS REQUIRED IN AREAS THAT ARE TO BE ENCASED IN CONCRETE. FIELD TOUCH UP IN AREAS WHERE FIELD WELDING HAS BEEN ACCOMPLISHED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
- ALL WELDING ON THE PENSTOCKS, BIFURCATION WYES AND MANIFOLD PIPING, BOTH SHOP AND FIELD, SHALL BE ACCOMPLISHED BY AWS QUALIFIED WELDERS. SUBMIT WELDER CERTIFICATIONS AND PRE-QUALIFICATION OF WELDS TO THE ENGINEER PRIOR TO FABRICATION. ALL WELDING IS TO CONFORM TO AWWA C206 SPECIFICATIONS. ADDITIONALLY, WELDING OF PIPES IS TO CONFORM TO AD1.1, AND WELDED FITTINGS ARE TO CONFORM TO ANSI B16.9. FIELD JOINTS ARE TO BE BACKER PLATE TYPE PER DETAIL 1/FD-1 (SHOWN ON THIS SHEET) WITH 100% UT PER AWS D1.1 SPECIFICATIONS. STRESS RELIEVE AS REQUIRED BY SPECIFICATIONS. POST WELD HEAT TREATMENT AND PREHEAT REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE ASME SECTION VIII, DIVISION 1 OF THE BOILER AND PRESSURE VESSEL CODE.
- THE PENSTOCK BIFURCATION ASSEMBLY SHALL BE MANUFACTURED FROM ASTM A36 STEEL PLATE AND PIPE SECTIONS. THE OPTION FOR SUBSTITUTION WITH HIGHER STRENGTH STEEL AS IDENTIFIED IN AWWA C200 WILL NOT BE ALLOWED FOR THE FABRICATION OF THE PENSTOCKS.
- MIL CERTIFICATION FOR THE MATERIALS USED TO FABRICATE THE BIFURCATION WYE SHALL BE PROVIDED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF FABRICATION. ALL CERTIFICATION SHALL BE IN ACCORDANCE WITH THE AISC MANUAL OF STEEL CONSTRUCTION, LATEST EDITION AND ASTM A6.
- AFTER THE BIFURCATION ASSEMBLY HAS BEEN COMPLETED AND TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, WELDING ON THE ASSEMBLY WILL NOT BE ALLOWED WITHOUT A COMPLETE RE-TEST IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
- THE DIMENSIONS TO THE 2" HOLES IN THE INSTALLATION HOLD DOWN ASSEMBLIES SHALL BE MAINTAINED TO $\pm \frac{1}{8}"$. THIS IS A CRITICAL DIMENSION AS ANCHOR/LEVELING BOLTS WILL BE PLACED IN THE CONCRETE FOUNDATION STRUCTURE TO LEVEL & ALIGN THE BIFURCATION ASSEMBLY. SEE THE GATE HOUSE STRUCTURAL DRAWINGS FOR THE DETAIL FOR THE PLACEMENT & PROCEDURE FOR INSTALLING THE ANCHOR/LEVELING BOLTS IN THE FOUNDATION CONCRETE.

- THE EXISTING BOLT FLANGE SHALL BE REMOVED FROM THE END OF THE 66" PIPELINE ALONG WITH 18" OF THE PIPELINE AND SHIPPED TO THE FABRICATION FACILITY IN ACCORDANCE WITH THE INSTRUCTIONS ON SHEET FD-2 & FD-7. THE EXISTING STAINLESS STEEL BOLTS, NUTS & WASHERS SHALL BE INCLUDED WITH THE BOLT FLANGE FOR CLEAN-UP AND RE-USE. ANY BOLTS DAMAGED DURING REMOVAL SHALL BE REPLACED WITH SIMILAR MATERIAL TYPES. BOR DRAWINGS DO NOT SPECIFY ANY MATERIAL TYPES ON THE AS-BUILT DRAWINGS. THE EXISTING O-RING SEAL SHALL BE REMOVED AND REPLACED WITH A NEW SEAL THAT ARE COMPATIBLE FOR COLD WATER SERVICE.
- COATINGS: NO EXTERIOR COATINGS ARE REQUIRED. INTERIOR COATINGS ARE TO BE LIQUID EPOXY COATINGS THAT CONFORM TO AWWA C210-03 SPECIFICATIONS. A MINIMUM OF 15 MILS DFT IS REQUIRED.
- HYDROSTATIC FIELD TEST IS TO BE PERFORMED ON ALL PIPES UNLESS PREVIOUSLY FACTORY TESTED. HYDROSTATIC TESTS ARE TO CONFORM TO ASTM A 53 OR ASTM A 139 STANDARDS WITH A MINIMUM TEST PRESSURE OF 175 PSI.



NOTE:
THE DISTANCES SHOWN IN BRACKETS
[*] ARE TRUE LINE LENGTHS BETWEEN
THE DELTA POINTS AND PIPE JOINTS
ALONG THE PENSTOCK. THE DISTANCES
ARE TRUE LENGTH.

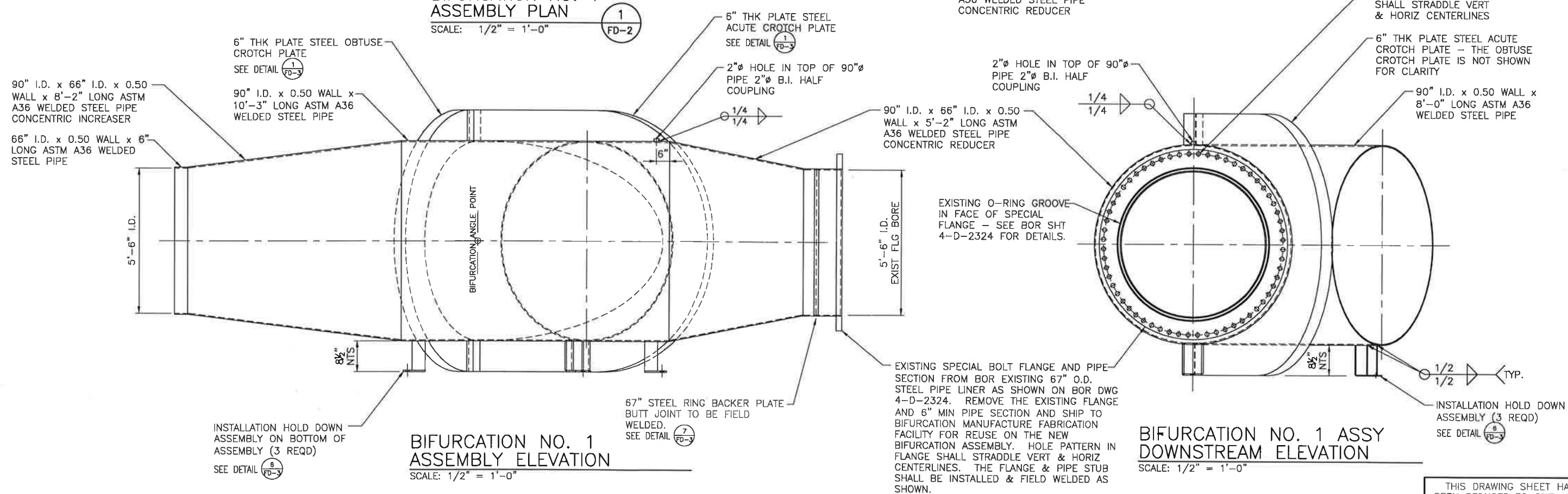
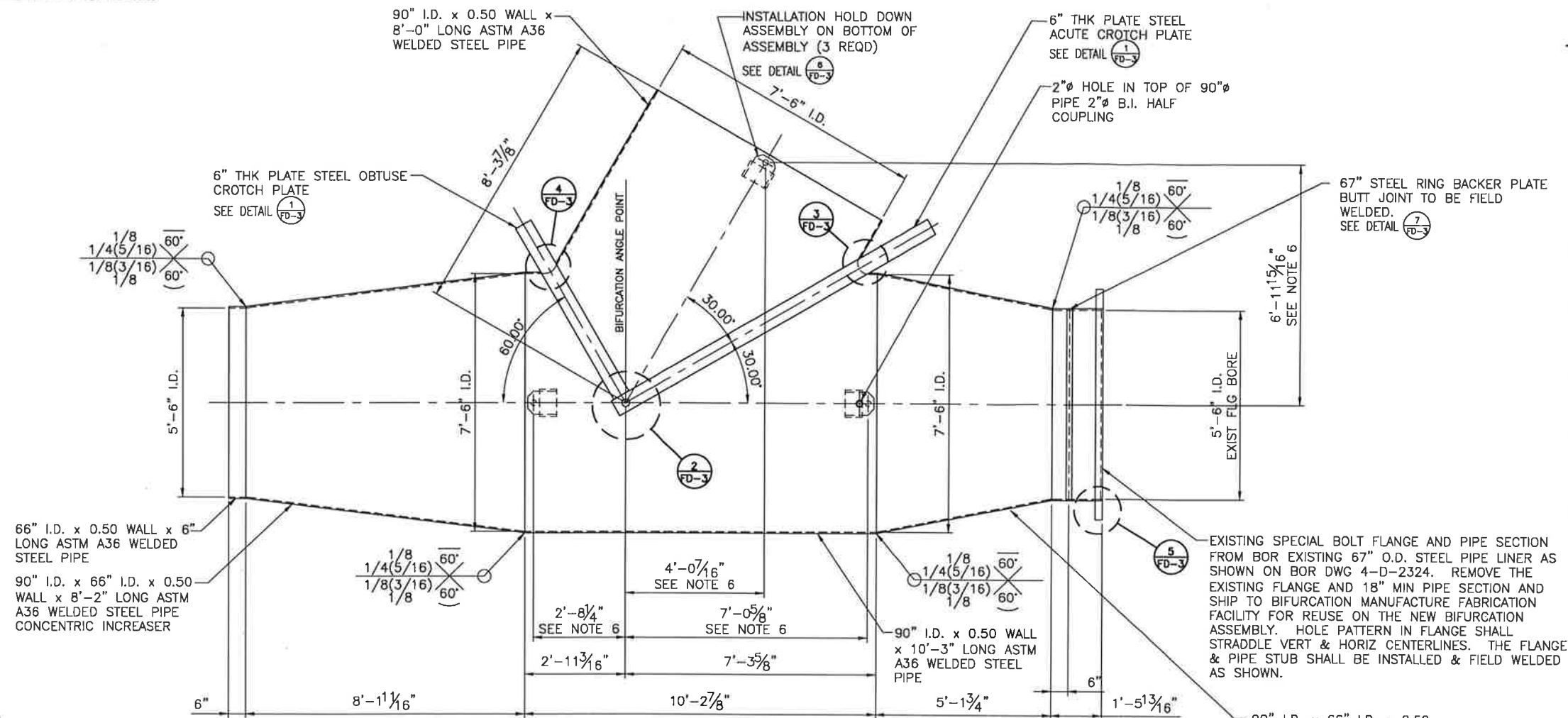
NOTE:
THE FIELD ERECTION CONTRACTOR MAY
ELECT TO HAVE PART OR ALL OF THE
BACKER PLATE RINGS INSTALLED IN THE
FABRICATION FACILITY.

TYP PIPE JOINT
WELDING DETAIL
SCALE: N.T.S.

PENSTOCK DEFLECTION POINT TABLE					
PS#1	HORIZ Δ	VERT Δ	PS#2	HORIZ Δ	VERT Δ
1	9.26	0.00	6	14.95	0.00
1A	60.00	0.00	6A	0.00	0.00
1B	0.00	0.00	6B	49.89	37.74
2	8.03	0.00	6C	5.38	0.00
3	0.00	2.51	6D	10.51	0.00
4	13.54	0.00	7	39.22	37.74
5	0.00	2.51	8	25.17	0.00
5A	0.00	0.00	9	10.35	4.73
			10	0.00	4.73
			10A	0.00	0.00

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

REVISIONS		REV		LIT		DATE		BY		CHKD		APPD		DESIGNED	
AS-BUILT 2010						JULY 2008		SPB		SUB		TSS		OWNER	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT - IDAHO															
ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS INSTALLATION OF BIFURCATION & PENSTOCKS FABRICATED DETAILS															
BOISE-KUNA IRRIGATION DISTRICT NAMPANA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656															
SORENSON ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO															
SCALE: NOTED															
SORENSON SHEET NO. FD-1															
USBR DRAWING NO. 4-100-1020															

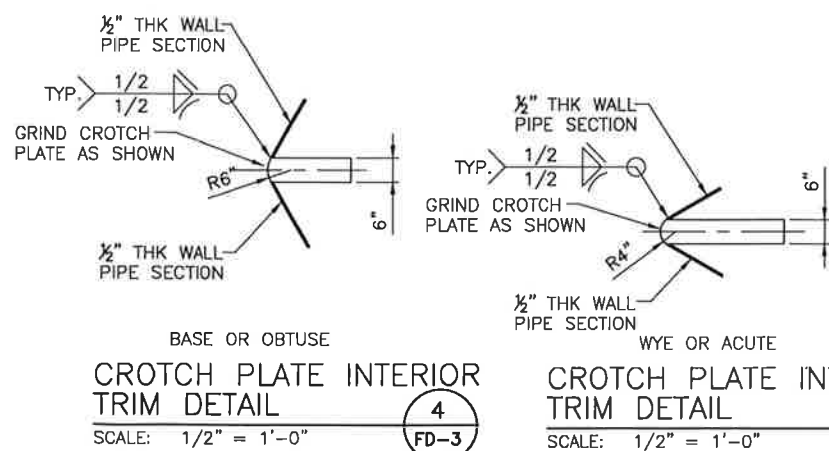
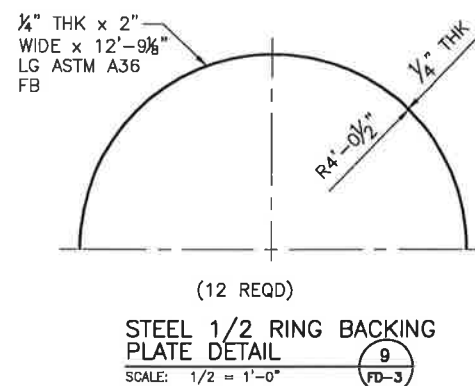
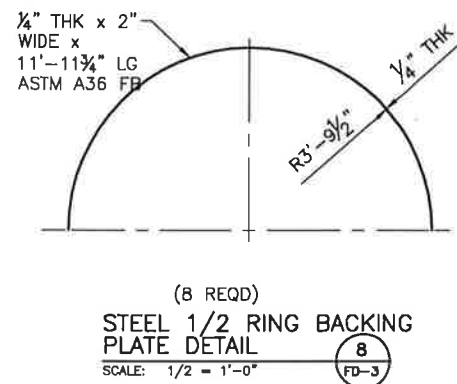
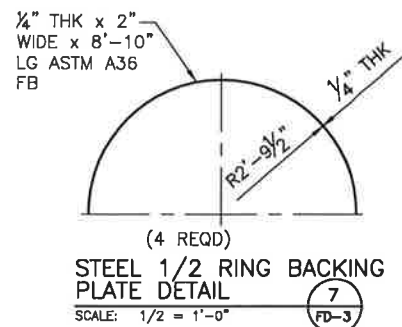


NOTES

- MANUFACTURING AND TESTING REQUIREMENTS:
 - ALL WELDING SHALL BE 100% PENETRATION WELDS PER THE PROJECT GENERAL SPECIFICATION SECTION PRETAINING TO WELDING. INTERIOR WELDS SHALL BE GROUND FLUSH WITH THE PARENT MATERIAL. POCKETS AND RECESSED AREAS SHALL BE RE-WELDED AND GROUND FLUSH.
 - THE FABRICATED STRUCTURAL STEEL BIFURCATION WYE SHALL BE FABRICATED AND TESTED IN ACCORDANCE WITH THE AMERICAN WATER WORKS (AWWA) STANDARD SPECIFICATION C200-80 AND MANUAL M11. THE TESTING OF THESE ITEMS WILL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
 - FINISH THE COMPLETED BIFURCATION ASSEMBLY IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. NO EXTERIOR FINISH IS REQUIRED IN AREAS THAT ARE TO BE ENCASED IN CONCRETE. FIELD TOUCH UP IN AREAS WHERE FIELD WELDING HAS BEEN ACCOMPLISHED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
- ALL WELDING ON THE BIFURCATION WYES AND MANIFOLD PIPING, BOTH SHOP AND FIELD, SHALL BE ACCOMPLISHED BY AWS QUALIFIED WELDERS. SUBMIT WELDER CERTIFICATIONS AND PRE-QUALIFICATION OF WELDS TO THE ENGINEER PRIOR TO FABRICATION.
- THE PENSTOCK BIFURCATION ASSEMBLY SHALL BE MANUFACTURED FROM ASTM A36 STEEL PLATE AND PIPE SECTIONS. THE OPTION FOR SUBSTITUTION WITH HIGHER STRENGTH STEEL AS IDENTIFIED IN AWWA C200 WILL NOT BE ALLOWED FOR THE FABRICATION OF THE PENSTOCK BIFURCATION ASSEMBLY. 96" I.D. x 1/2" WALL PIPE ASTM A36
- MIL CERTIFICATION FOR THE MATERIALS USED TO FABRICATE THE BIFURCATION WYE SHALL BE PROVIDED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF FABRICATION. ALL CERTIFICATION SHALL BE IN ACCORDANCE WITH THE AISC MANUAL OF STEEL CONSTRUCTION, LATEST EDITION AND ASTM A6.
- AFTER THE BIFURCATION ASSEMBLY HAS BEEN COMPLETED AND SHOP TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND HYDROSTATIC TESTING OF THE COMPLETED ASSEMBLY UP TO 175 PSI, WELDING ON THE ASSEMBLY WILL NOT BE ALLOWED WITHOUT A COMPLETE RE-TEST IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND THE AFOREMENTIONED HYDROSTATIC TEST.
- THE DIMENSIONS TO THE 2" Ø HOLES IN THE INSTALLATION HOLD DOWN ASSEMBLIES SHALL BE MAINTAINED TO $\pm 1/8"$. THIS IS A CRITICAL DIMENSION AS ANCHOR/LEVELING BOLTS WILL BE PLACED IN THE CONCRETE FOUNDATION STRUCTURE TO LEVEL & ALIGN THE BIFURCATION ASSEMBLY.

REVISIONS		REV	LTR	DATE	BY	CHKD	APPD	DATE	DESCRIPTION
AS-BUILT 2010				JULY 2008	SPB	SJB	TSS		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO									
ARROWROCK DAM HYDROELECTRIC PROJECT									
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS BIFURCATION NO. 1 FABRICATED DETAILS									
BOISE-KUNA IRRIGATION DISTRICT Nampa & Meridian Irrigation District New York Irrigation District Wilder Irrigation District Big Bend Irrigation District									
PHASE 2 PROJECT FERC PROJECT NO. 4656									
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO									
SCALE: NOTED									
SORENSEN SHEET NO. FD-2									
USBR DRAWING NO. 4-100-1021									

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3 INSTALLATION HOLD DOWN ASSEMBLIES REQUIRED



NEW 90° I.D. x 66" I.D. x 1/2" THICK ASTM A36 STEEL PIPE REDUCER SECTION

67" STEEL RING BACKER PLATE BUTT JOINT TO BE FIELD WELDED. SEE DETAIL 7 FD-3

PORTION OF EXISTING BOR 1/2" WALL x 67" O.D. STEEL PIPE LINER (SEE BOR DWG 4-D-2523)

6" NTS VARIES PER FIELD REQMTS

EXIST WELD

EXISTING O-RING GROOVE SEE BOR DWG 4-D-2324

EXISTING 72"Ø MODIFIED AWWA CLASS D STEEL PIPE FLANGE WITH MACHINED GROOVE FOR O-RING SEAL AND 67" I.D. (SEE BOR DWG 4-D-2324 FOR ADDITIONAL DETAILS)

EXIST BOLT FLANGE RE-USE DETAIL

5 FD-3

5'-6 3/8"

3"

8 1/2"

8 1/2"

4"

10'-6 7/8"

6" THK x 10'-8" x 9'-11" LG ASTM A36 STL PLATE

4'-5 3/8"

1'-5 3/4"

7'-6" MINOR AXIS

8'-11"

7'-6" MINOR AXIS

5'-9 3/8"

4'-4 5/8" 1/2 MAJOR AXIS

1'-6 3/4"

7'-10" 1/2 MAJOR AXIS

2'-4 7/8"

ACUTE CROTCH PLATE

ELLIPITICAL CUTOUT

ELLIPITICAL CUTOUT

OBTUSE CROTCH PLATE

STIFFENING CROTCH PLATE DETAILS

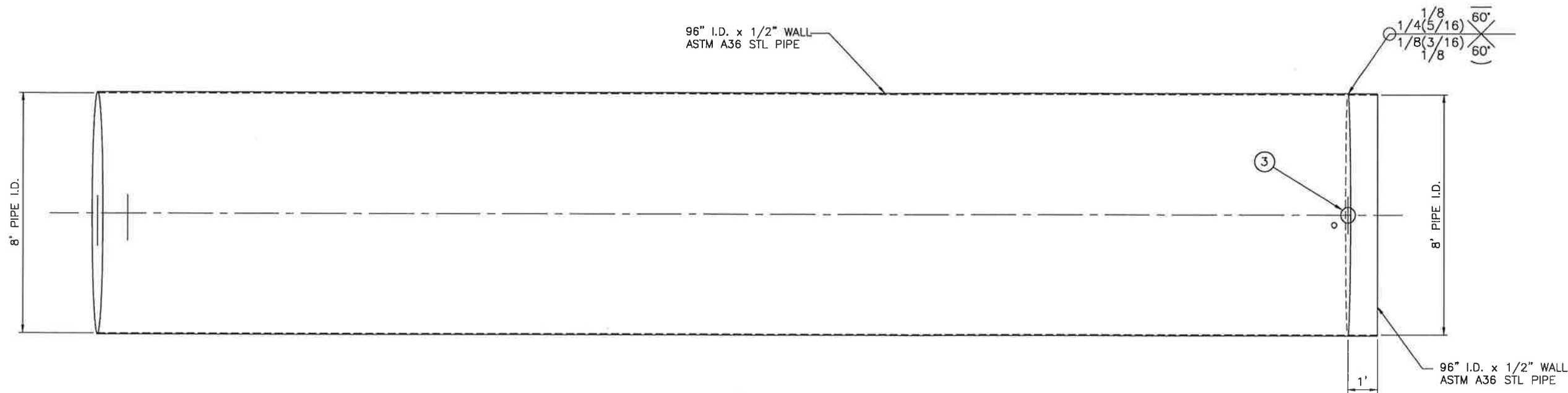
SCALE: 1/2" = 1'-0"

1 FD-3

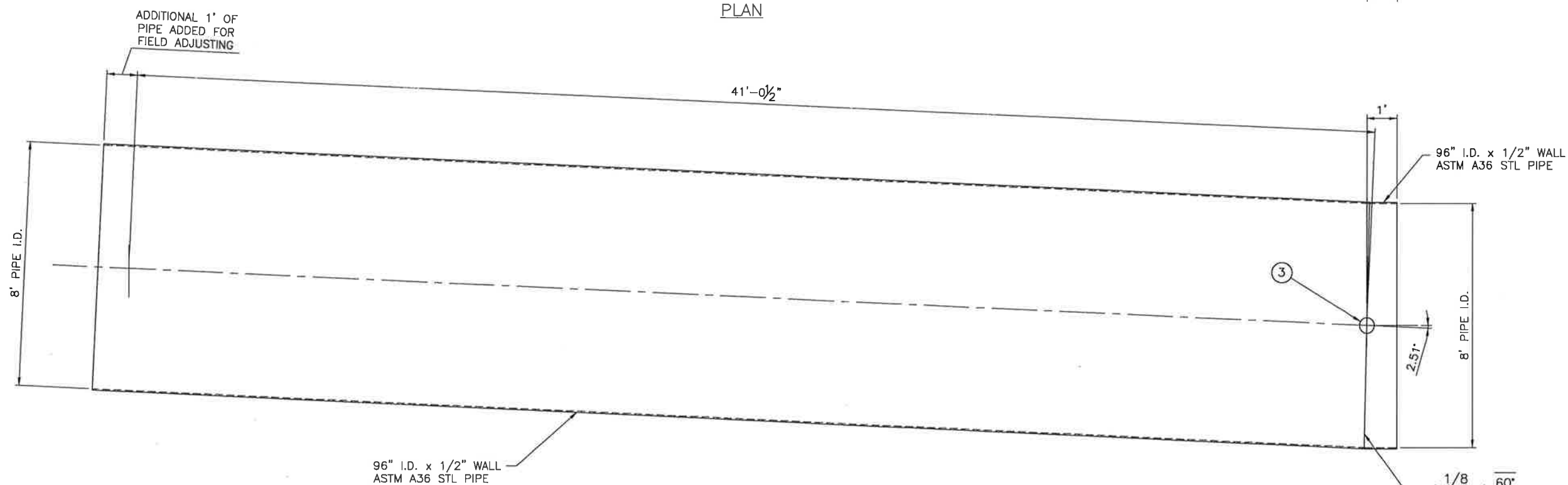
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REVISIONS		AS-BUILT 2010	
REV	DATE	BY	CHKD
1	JULY 2008	SPB	SJB
2			TSS
3			DOCK
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO			
ARROWROCK DAM HYDROELECTRIC PROJECT		OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS BIFURCATION NO. 1 DETAILS	
BOISE-KUNA IRRIGATION DISTRICT NAMPAN & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT		PHASE 2 PROJECT FERC PROJECT NO. 4656	
REGISTERED PROFESSIONAL ENGINEER 3458 STATE OF IDAHO		SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	
NOTED		FD-3	
SORENSEN SHEET NO.		4-100-1022	

LAYOUT SCALE 1/24XP



PLAN



ELEVATION

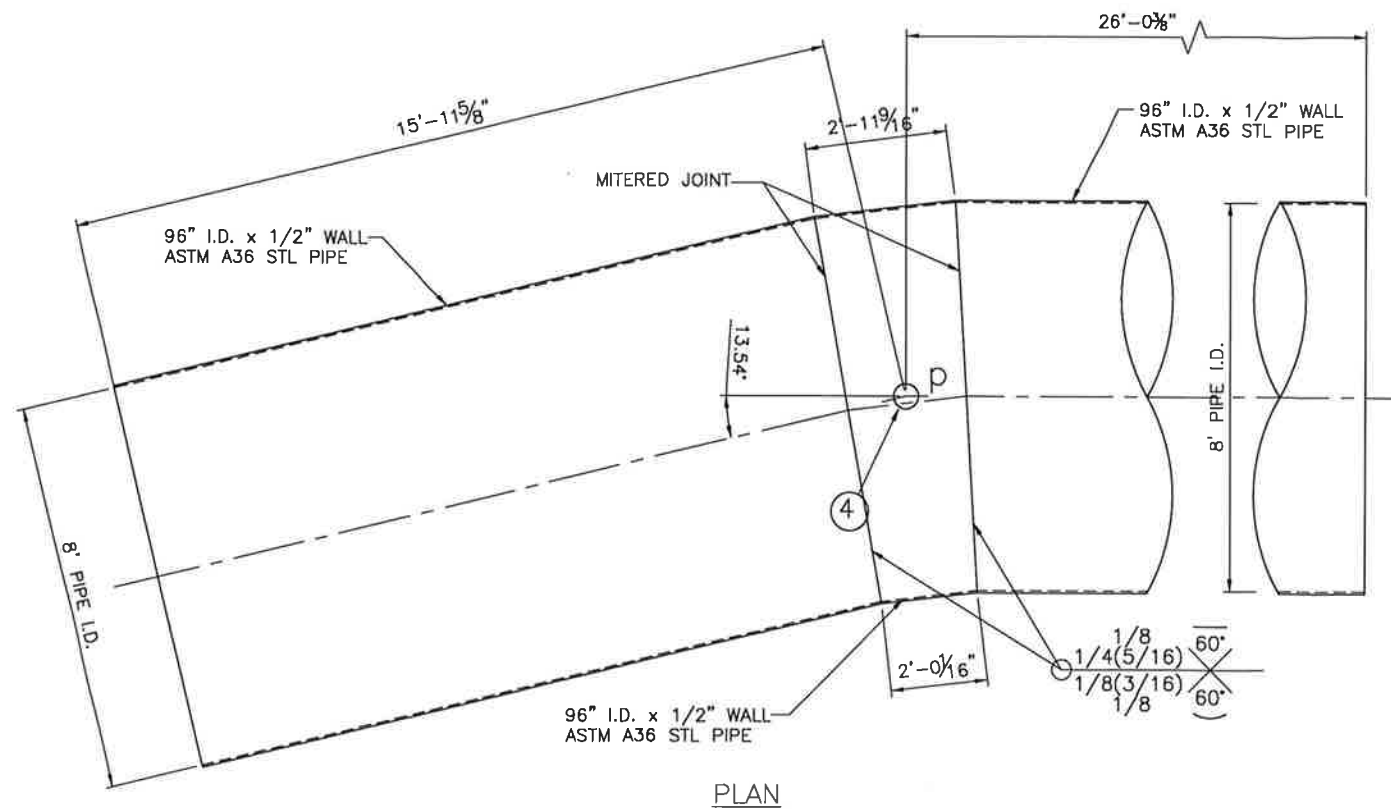
PENSTOCK NO. 1
SEGMENT 2

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

1
FD-4

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

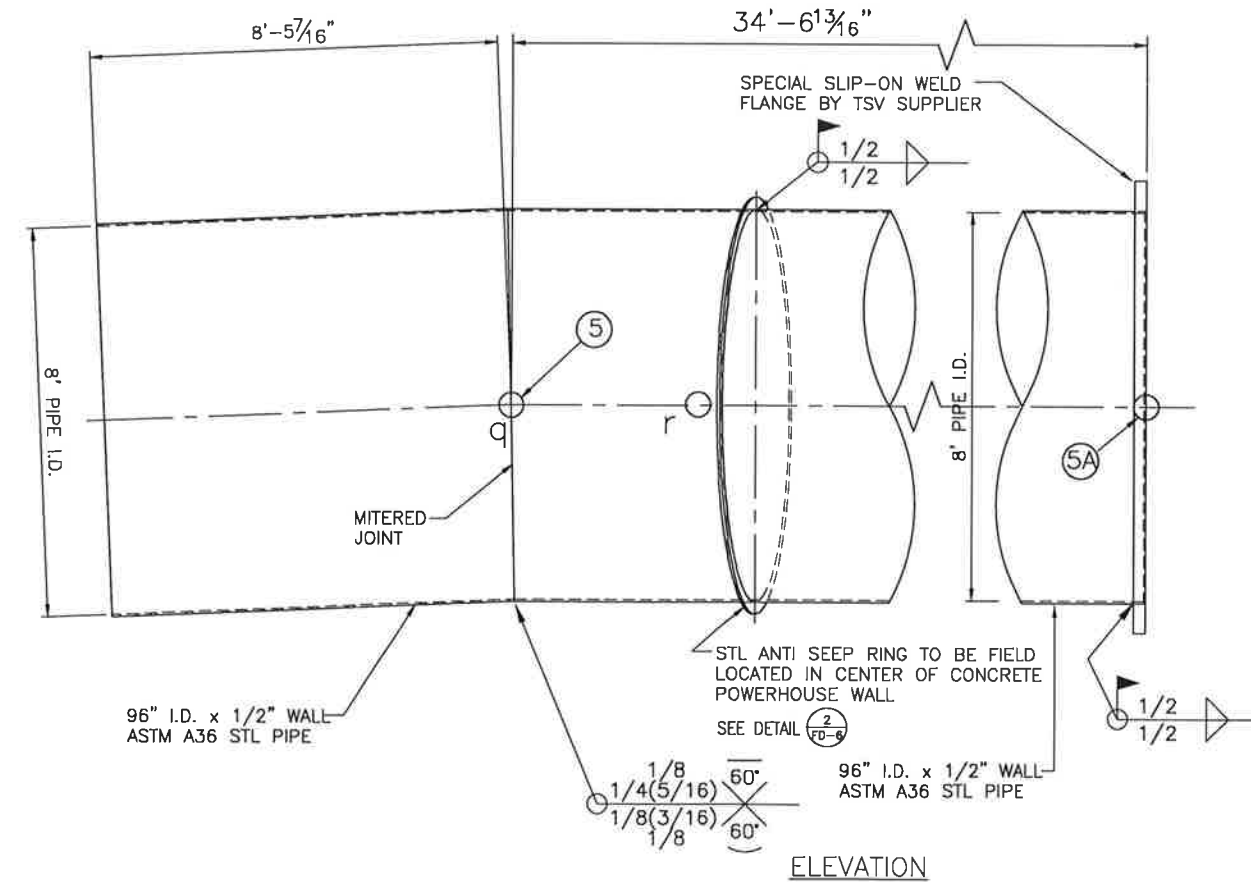
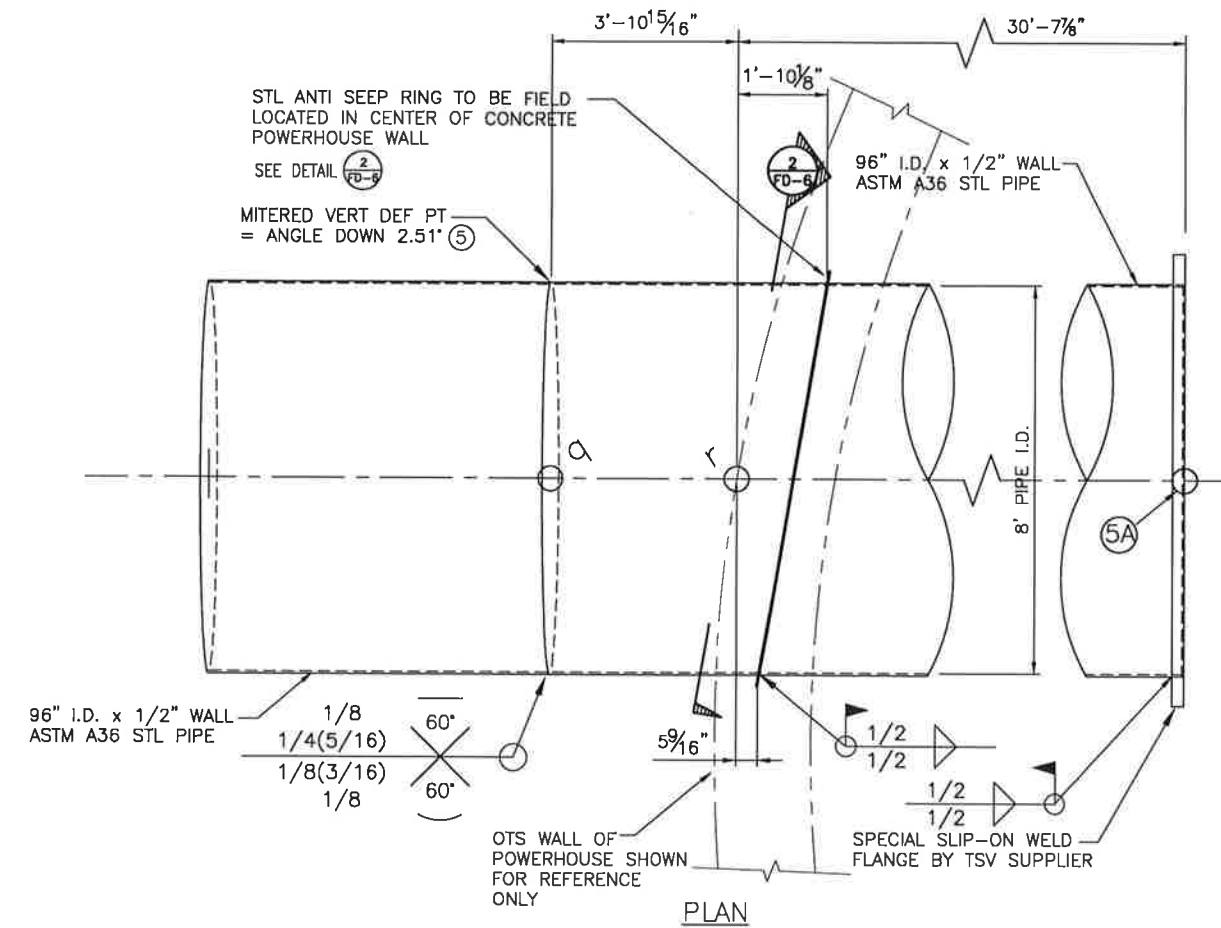
REVISIONS		DATE	REV	DESCRIPTION
AS-BUILT 2010		JULY 2008	SPB	
			SUB	
			TSS	
			DRCKER	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS PENSTOCK NO. 1, SEGMENT NO. 2				
BOISE-KUNA IRRIGATION DISTRICT NANPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656				
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO				
NOTED				
SORENSEN SHEET NO. FD-4				
USBR DRAWING NO. 4-100-1023				



PENSTOCK NO. 1
SEGMENT 3

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

1
FD-5



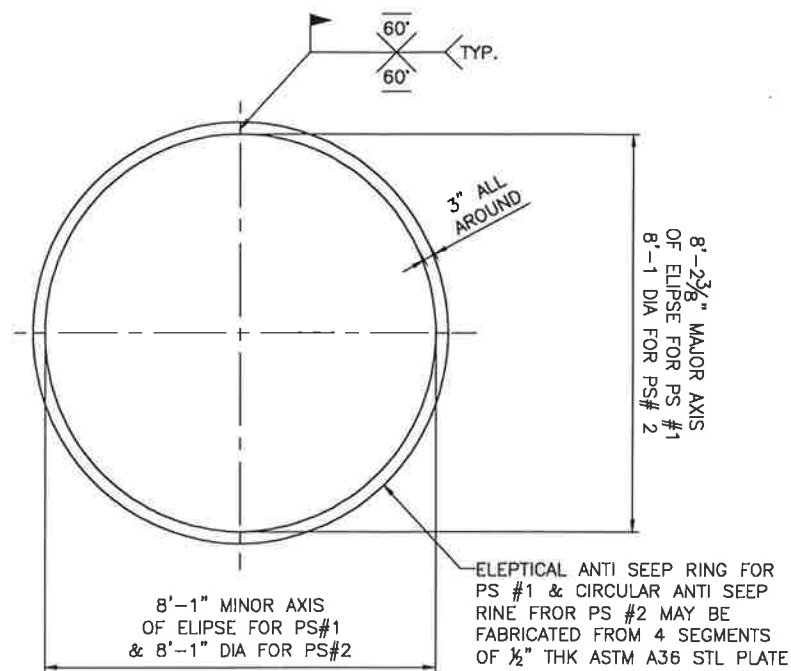
PENSTOCK NO. 1
SEGMENT 4

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

2
FD-5

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

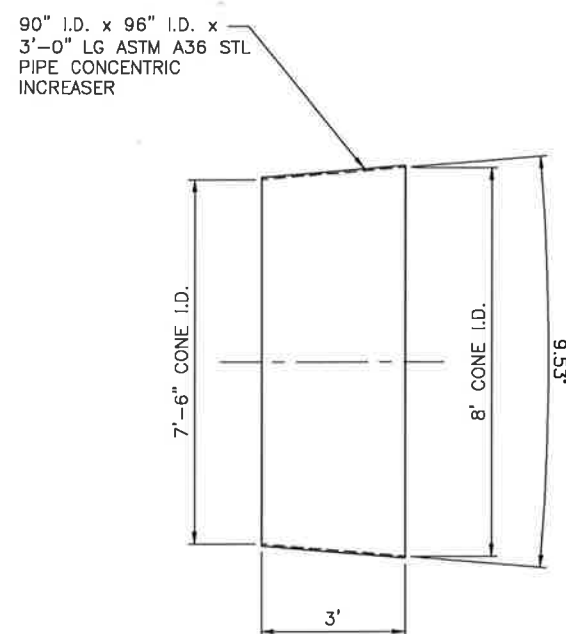
REVISIONS JULY 2008 SPB SUB TSS AS-BUILT 2010	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS PENSTOCK NO. 1, SEGMENT NO. 3	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	REGISTERED PROFESSIONAL ENGINEER 3458 STATE OF IDAHO S. SOOK	SORENSON ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO
SCALE	NOTED	SORENSON SHEET NO.	FD-5	USBR DRAWING NO.
4-100-1024				



PENSTOCK NO. 1 & 2
ANTI-SEEP RING

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

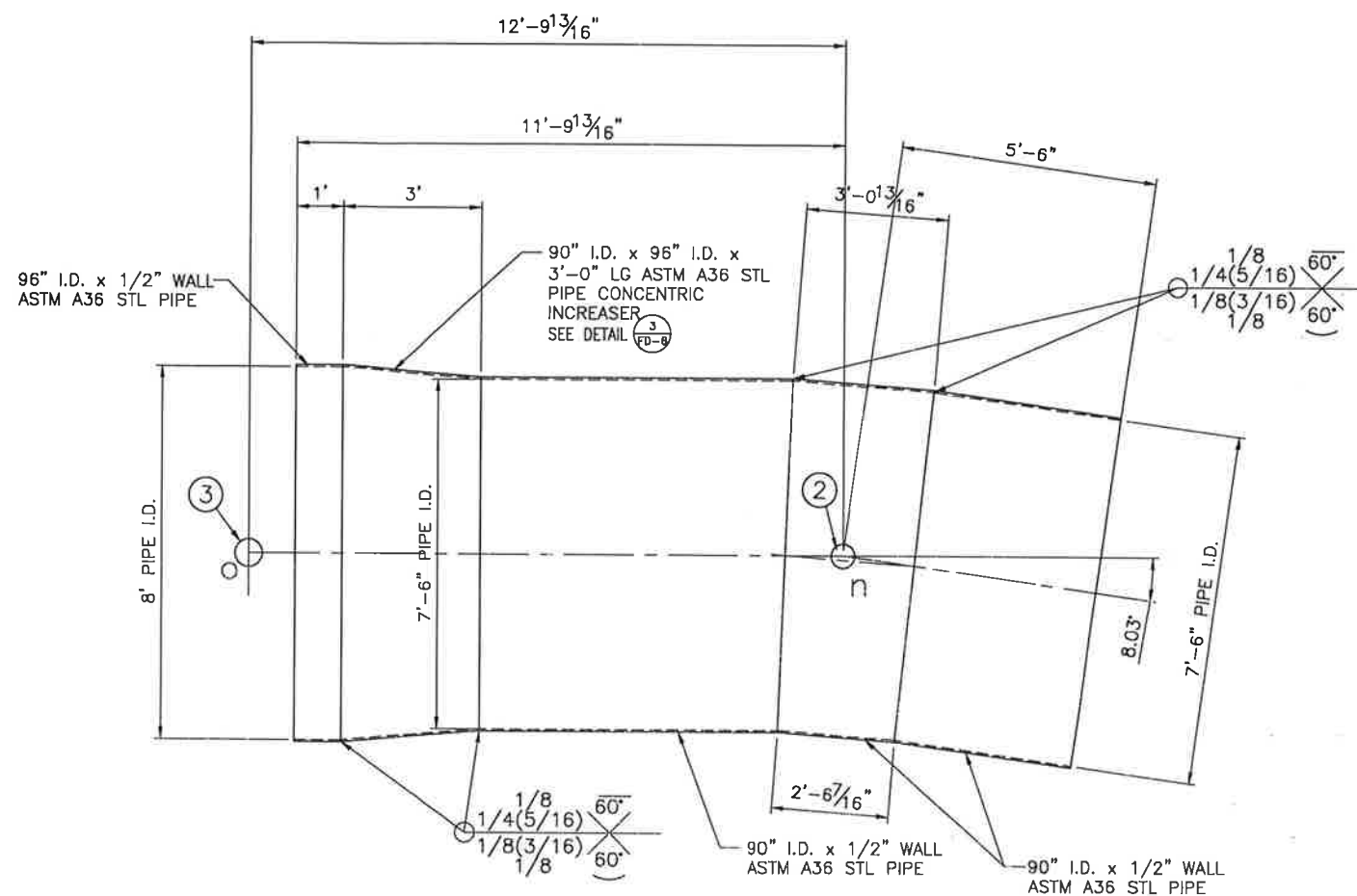
2
FD-6



PENSTOCK CONCENTRIC
PIPE INCREASER

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

3
FD-6



PLAN

PENSTOCK NO. 1
SEGMENT 1

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

1
FD-6

REVISIONS JULY 2008 SPB SUB TSS AS-BUILT 2010	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS PENSTOCK NO. 1, SEGMENT NO. 3 & MISC FAB DETAILS	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656		SORENSON ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO
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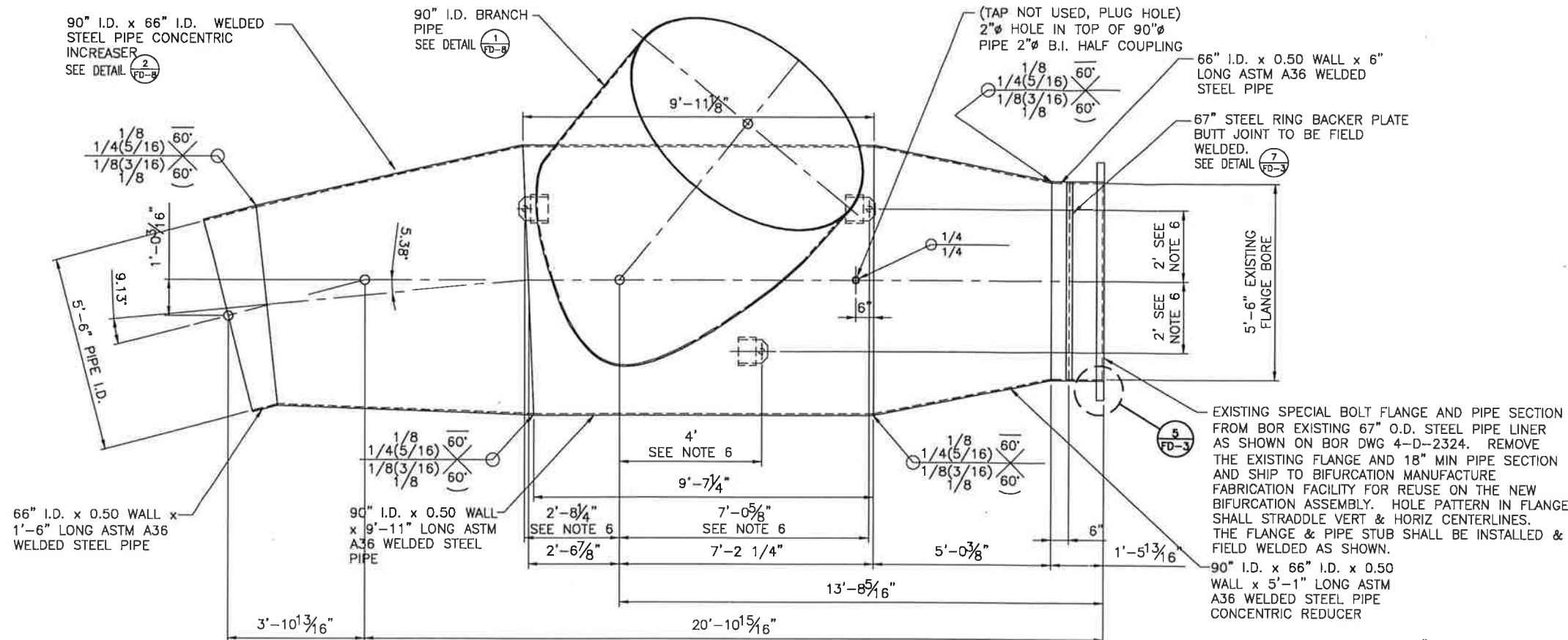
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BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

NOTED

FD-6

USBR DRAWING NO.

4-100-1025

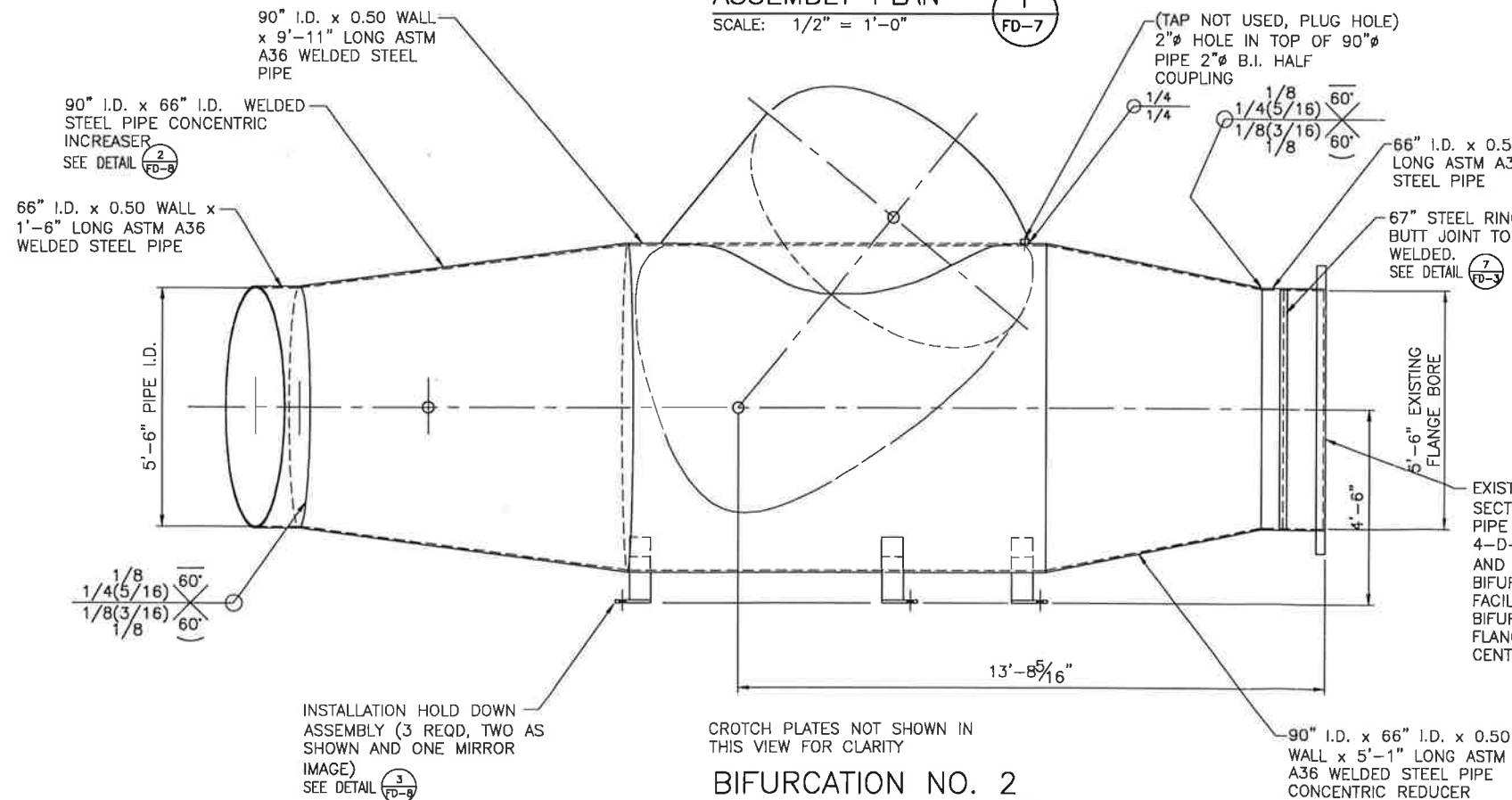


CROTCH PLATES NOT SHOWN IN THIS VIEW FOR CLARITY

BIFURCATION NO. 2 ASSEMBLY PLAN

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

1
FD-7



INSTALLATION HOLD DOWN ASSEMBLY (3 REQD, TWO AS SHOWN AND ONE MIRROR IMAGE) SEE DETAIL 3 FD-8

CROTCH PLATES NOT SHOWN IN THIS VIEW FOR CLARITY

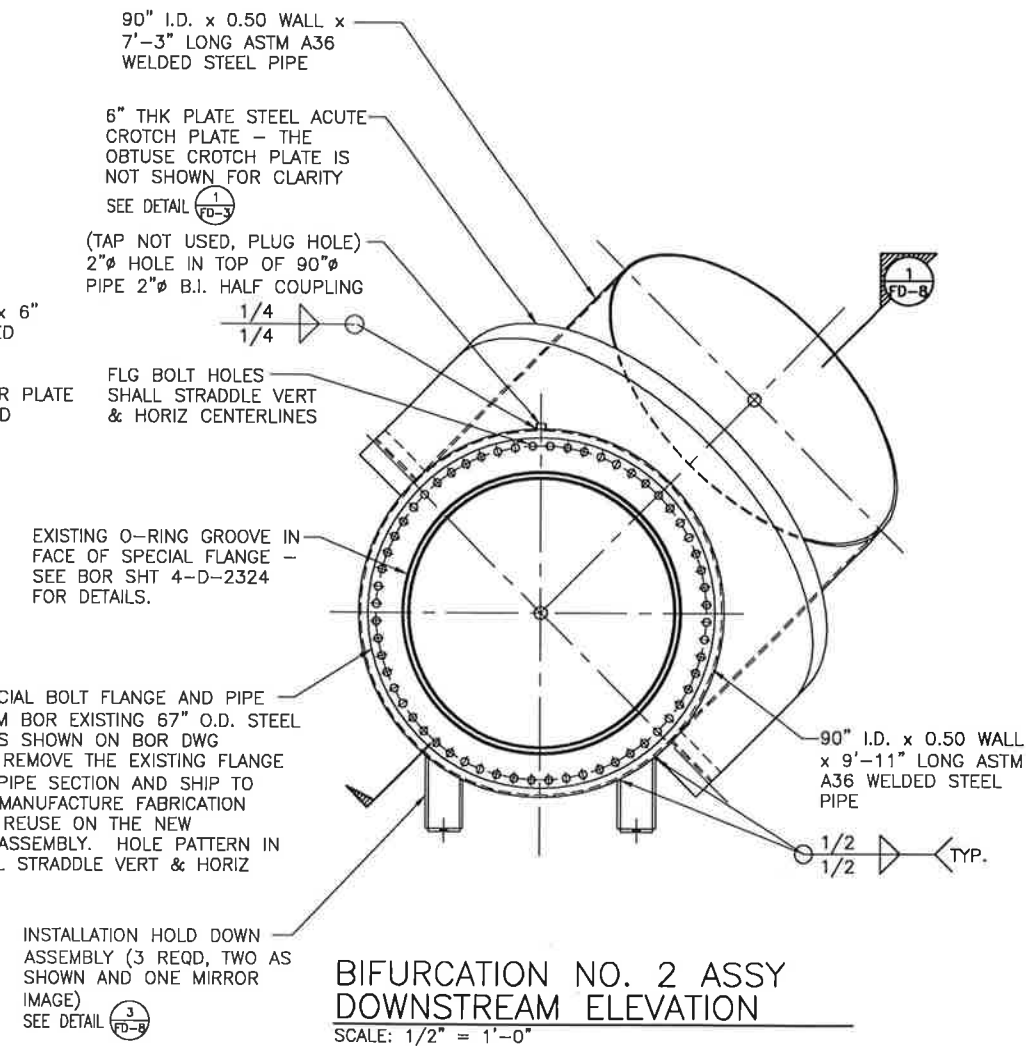
BIFURCATION NO. 2 ASSEMBLY ELEVATION

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

3
FD-8

NOTES

- MANUFACTURING AND TESTING REQUIREMENTS:
 - ALL WELDING SHALL BE 100% PENETRATION WELDS PER THE PROJECT GENERAL SPECIFICATION SECTION PERTAINING TO WELDING. INTERIOR WELDS SHALL BE GROUND FLUSH WITH THE PARENT MATERIAL. POCKETS AND RECESSED AREAS SHALL BE RE-WELDED AND GROUND FLUSH.
 - THE FABRICATED STRUCTURAL STEEL BIFURCATION WYE SHALL BE FABRICATED AND TESTED IN ACCORDANCE WITH THE AMERICAN WATER WORKS (AWWA) STANDARD SPECIFICATION C200-80 AND MANUAL M11. THE TESTING OF THESE ITEMS WILL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
 - FINISH THE COMPLETED BIFURCATION ASSEMBLY IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. NO EXTERIOR FINISH IS REQUIRED IN AREAS THAT ARE TO BE ENCASED IN CONCRETE. FIELD TOUCH UP IN AREAS WHERE FIELD WELDING HAS BEEN ACCOMPLISHED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
- ALL WELDING ON THE BIFURCATION WYES AND MANIFOLD PIPING, BOTH SHOP AND FIELD, SHALL BE ACCOMPLISHED BY AWS QUALIFIED WELDERS. SUBMIT WELDER CERTIFICATIONS AND PRE-QUALIFICATION OF WELDS TO THE ENGINEER PRIOR TO FABRICATION.
- THE PENSTOCK BIFURCATION ASSEMBLY SHALL BE MANUFACTURED FROM ASTM A36 STEEL PLATE AND PIPE SECTIONS. THE OPTION FOR SUBSTITUTION WITH HIGHER STRENGTH STEEL AS IDENTIFIED IN AWWA C200 WILL NOT BE ALLOWED FOR THE FABRICATION OF THE PENSTOCK BIFURCATION ASSEMBLY. 96" I.D. x 1/2" WALL PIPE ASTM A36
- MIL CERTIFICATION FOR THE MATERIALS USED TO FABRICATE THE BIFURCATION WYE SHALL BE PROVIDED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF FABRICATION. ALL CERTIFICATION SHALL BE IN ACCORDANCE WITH THE AISC MANUAL OF STEEL CONSTRUCTION, LATEST EDITION AND ASTM A6.
- AFTER THE BIFURCATION ASSEMBLY HAS BEEN COMPLETED AND SHOP TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND HYDROSTATIC TESTING OF THE COMPLETED ASSEMBLY UP TO 175 PSI, WELDING ON THE ASSEMBLY WILL NOT BE ALLOWED WITHOUT A COMPLETE RE-TEST IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND THE FOREMENTIONED HYDROSTATIC TEST.
- THE DIMENSIONS TO THE 2" HOLES IN THE INSTALLATION HOLD DOWN ASSEMBLIES SHALL BE MAINTAINED TO $\pm 1/8"$. THIS IS A CRITICAL DIMENSION AS ANCHOR/LEVELING BOLTS WILL BE PLACED IN THE CONCRETE FOUNDATION STRUCTURE TO LEVEL & ALIGN THE BIFURCATION ASSEMBLY.



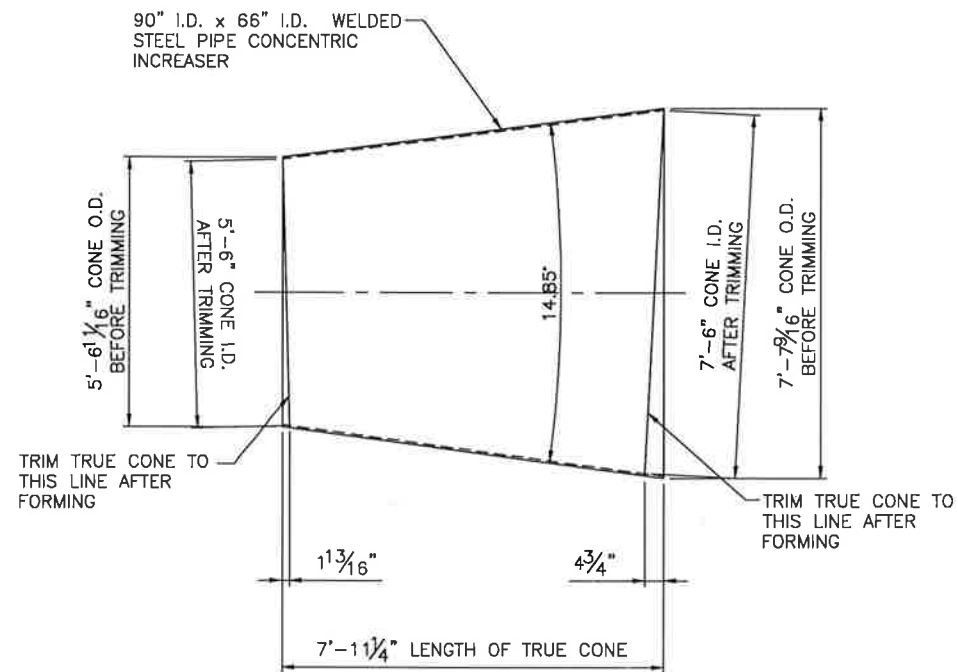
INSTALLATION HOLD DOWN ASSEMBLY (3 REQD, TWO AS SHOWN AND ONE MIRROR IMAGE) SEE DETAIL 3 FD-8

BIFURCATION NO. 2 ASSY DOWNSTREAM ELEVATION

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

THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY

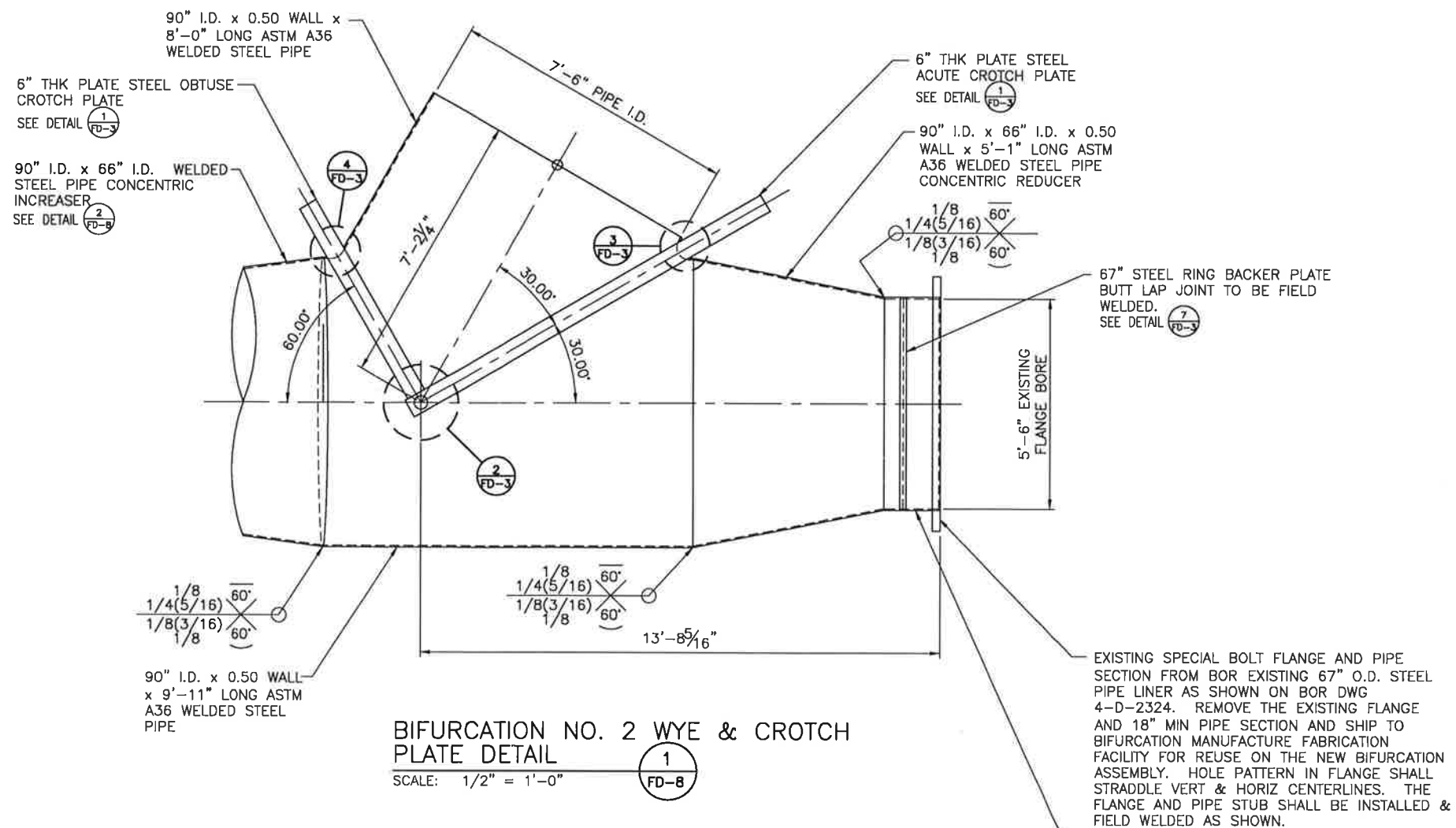
REVISIONS		DATE	BY	CHKD	APP'D	REV
AS-BUILT 2010		JULY 2008	SPB	SUB	TSS	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS BIFURCATION NO. 2 FABRICATED DETAILS						
BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656						
SORENSON ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO						
SCALE: NOTED						
SORENSON SHEET NO. FD-7						
USBR DRAWING NO. 4-100-1026						



BIFURCATION INLET INCREASER
FABRICATION DETAIL 2

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

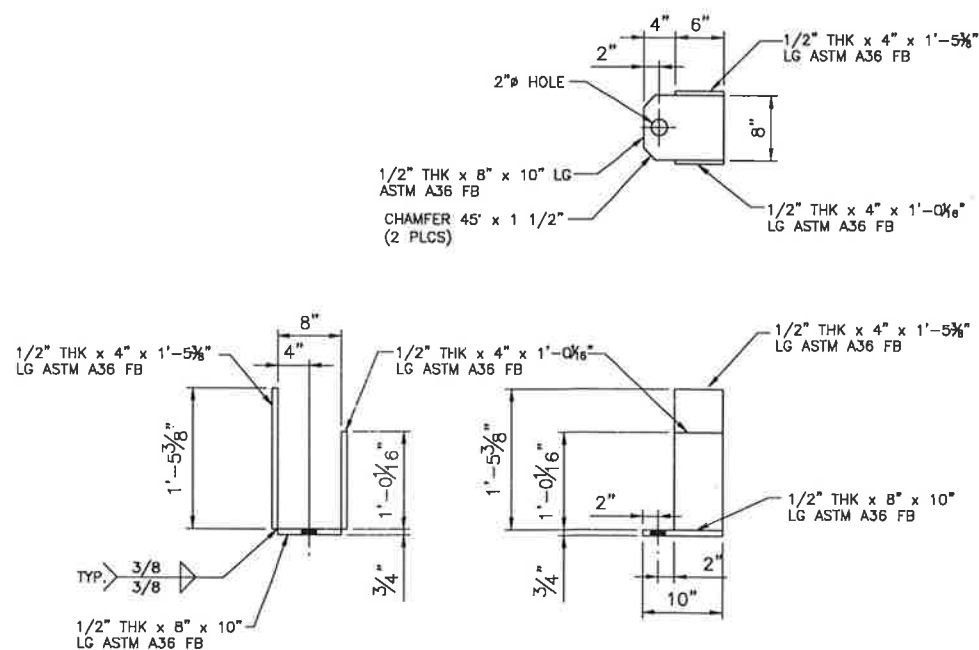
FD-8



BIFURCATION NO. 2 WYE & CROTCH
PLATE DETAIL 1

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

FD-8



3 INSTALLATION HOLD DOWN
ASSEMBLIES REQUIRED-2 AS
SHOWN & 1 MIRROR IMAGE

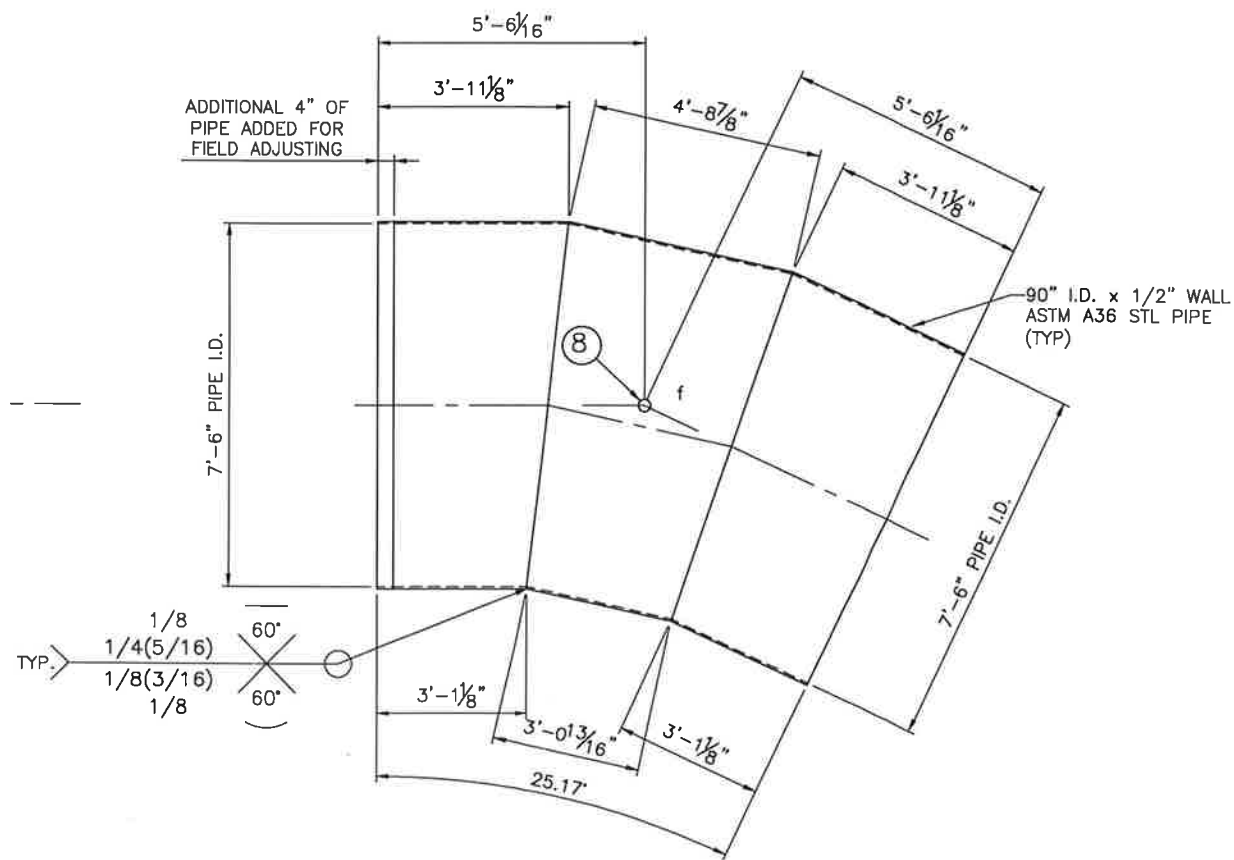
BIFURCATION NO. 2
HOLD DOWN DETAIL 3

SCALE: 1" = 1'-0"

FD-8

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

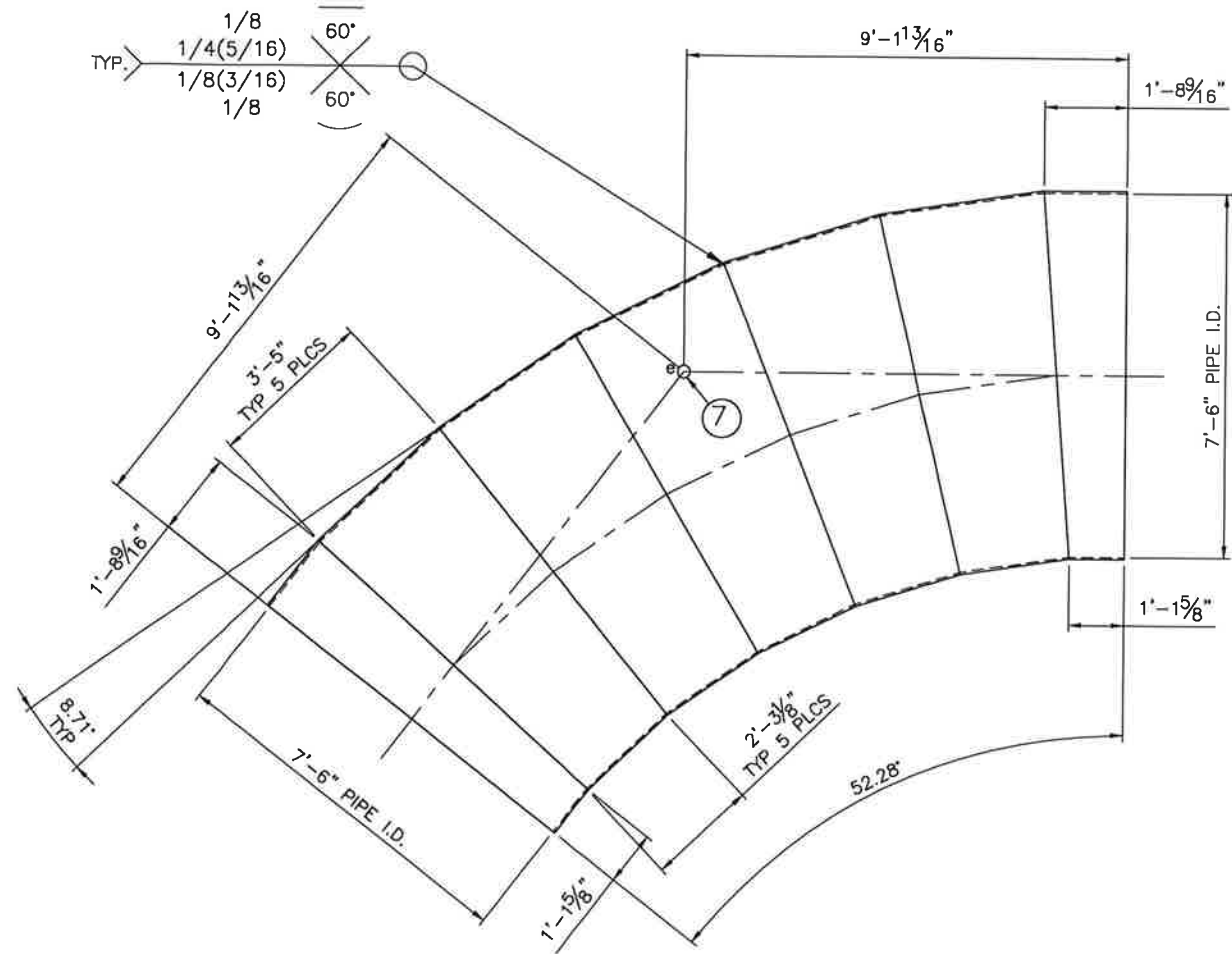
REVISIONS		DATE	BY	CHKD	APP'D	ENG'G
REV	LTR	JULY 2008	SPB	SUB	TSS	
AS-BUILT 2010						
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DAM HYDROELECTRIC PROJECT						
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS BIFURCATION NO. 2 MISC FABRICATED DETAILS						
BOISE-KUNA IRRIGATION DISTRICT Nampa & Meridian Irrigation District New York Irrigation District Wilder Irrigation District Big Bend Irrigation District						
PHASE 2 PROJECT FERC PROJECT NO. 4656						
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO						
SCALE: NOTED SORENSEN SHEET NO. FD-8 USBR DRAWING NO. 4-100-1027						



PENSTOCK NO. 2
SEGMENT 2

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

2
FD-9

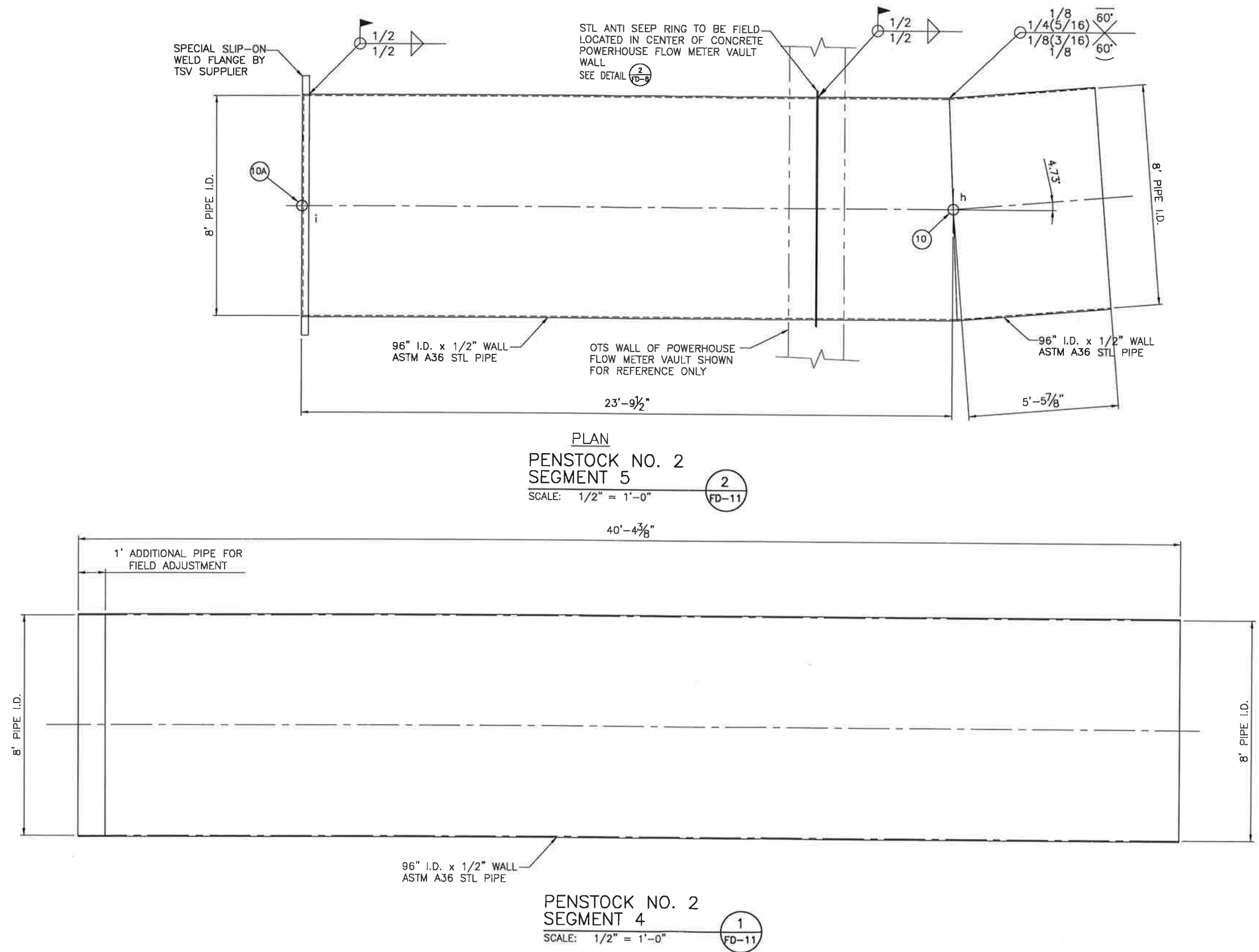


PENSTOCK NO. 2
SEGMENT 1

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

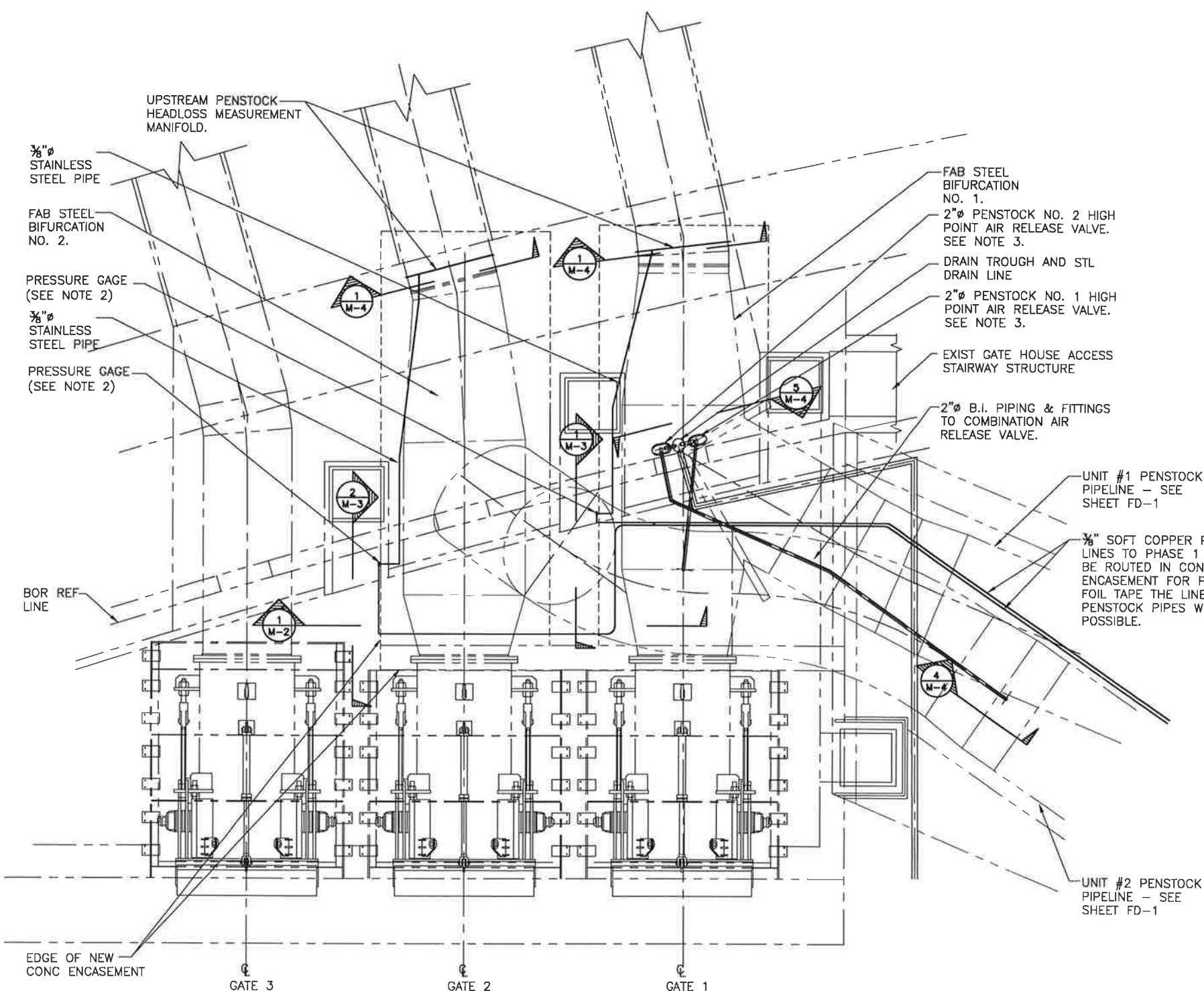
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FD-9

SORENSON ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	REVISIONS JULY 2008 SPB SUB TSS		AS-BUILT 2010	
	DATE	REV	LTR	DESCRIPTION
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS PENSTOCK NO. 2, SEGMENT NO. 1 & 2 FABRICATED DETAILS				
BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656				
REGISTERED PROFESSIONAL ENGINEER 3458 STATE OF IDAHO				
NOTED SURENSON SHEET NO. FD-9 USBR DRAWING NO. 4-100-1028				



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SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO		BOISE-KUNA IRRIGATION DISTRICT NAMPAN & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT		UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO		DATE	REV	REVISIONS
		PHASE 2 PROJECT FERC PROJECT NO. 4656		ARROWROCK DAM HYDROELECTRIC PROJECT		JULY 2008	LTR	AS-BUILT 2010
NOTED		OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS PENSTOCK NO. 2, SEGMENT NO. 4 FABRICATED DETAILS		SPB	SPB			
FD-11				SUB	SUB			
4-100-1030				TSS	TSS			



GATE HOUSE MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

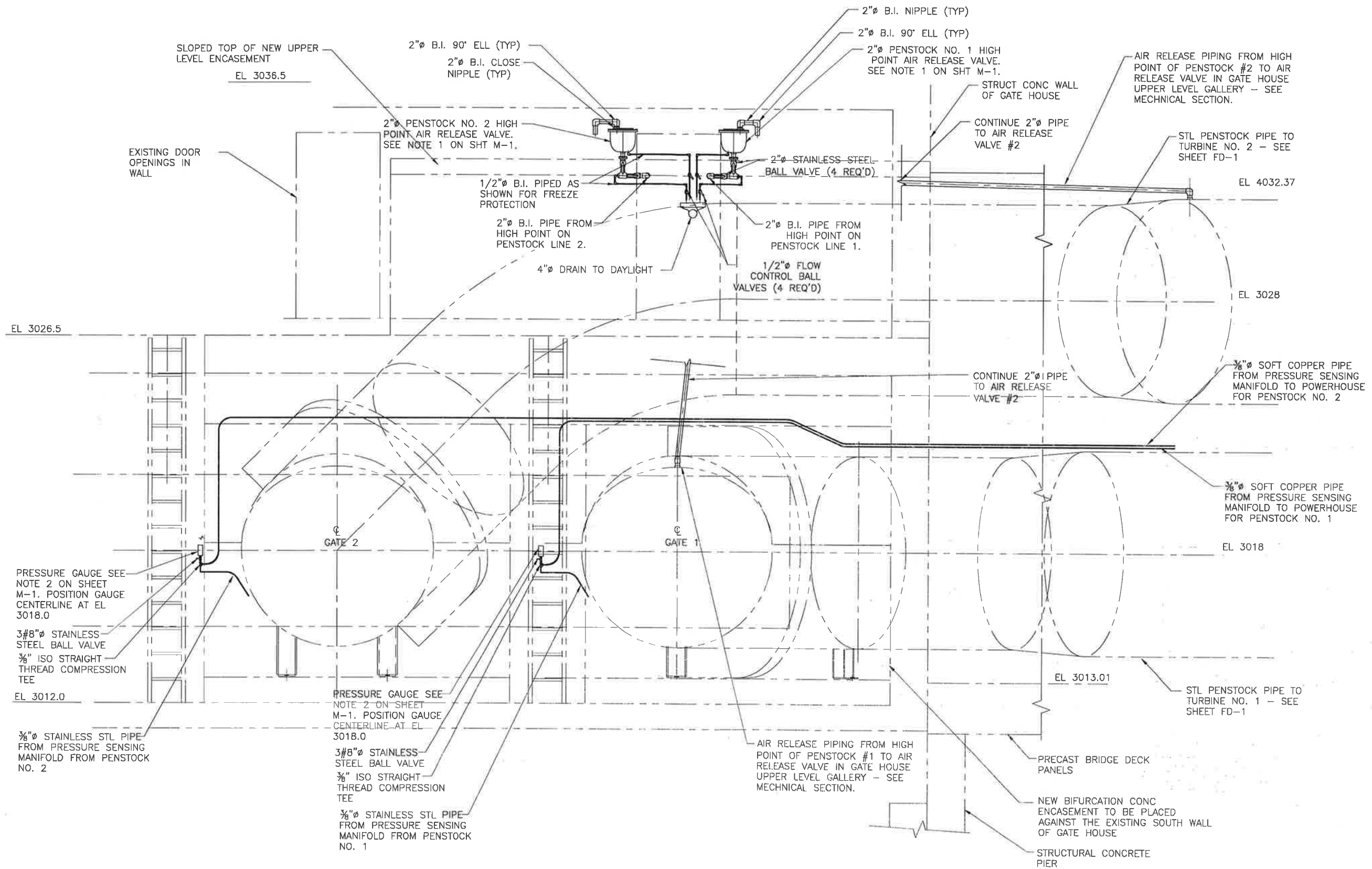
NOTE 1.
THE 2" COMBINATION AIR RELEASE VALVE SHALL BE A SERIES 145C AS MANUFACTURED BY THE APCO VALVE & PRIMER CORPORATION 1-800-323-6969 OR APPROVED EQUAL. THE VALVE SHALL BE THE SINGLE BODY STYLE THAT ALLOWS LARGE VOLUMES OF AIR TO ESCAPE WHEN FILLING THE PIPELINE AND ALSO SMALL VOLUMES OF AIR TO ESCAPE AUTOMATICALLY AND INDEPENDENTLY OF THE LARGE ORIFICE. THE MATERIALS OF CONSTRUCTION SHALL BE CERTIFIED TO CONFORM TO A.S.T.M. SPECIFICATION AS FOLLOWS:
BODY & COVER DUCTILE IRON ASTM A536, GR 65-45-12
FLOAT STAINLESS STEEL ASTM A240
NEEDLE & SEAT BUNA-N
PLUG BRONZE ASTM B124
LEVERAGE FRAME DELRIN/CAST IRON ASTM D4181/ASTM A126 GR. B

NOTE 2.
THE PRESSURE GAUGE SHALL BE A 4-INCH DIAMETER GAUGE WITH STEM MOUNTING AND LIQUID FILLED. THE GAUGE SHALL BE CAPABLE OF LONG TERM SUBMERSION IN COLD CLEAR WATER. THE FACE OF THE GAUGE SHALL BE GRADUATED IN INCREMENTS FROM 0 TO 100 PSI WITH AN ACCURACY OF ± 1.0 PERCENT OF FULL SCALE. THE MATERIALS OF CONSTRUCTION SHALL BE CERTIFIED AS FOLLOWS:
CASE HIGH QUALITY STAINLESS STEEL
BENZEL BRASS
LENS ACRYLIC PLASTIC
BOURDON TUBE PHOSPHOR BRONZE
THE GAUGE SHALL INCLUDE A BUILT-IN SNUBBER, DUAL SCALE PSI/BAR AND BUILT IN RELIEF VALVE. THE GAUGE SHALL BE AS PROVIDED BY LHA PRODUCTS, INC., 216-292-7281 OR APPROVED EQUAL.

NOTE 3.
THE 2" B.I. LINES FROM THE HIGH POINT TAPPING PORT ON THE BIFURCATIONS OR THE PENSTOCK TO THE COMBINATION AIR RELEASE VALVES SHALL SLOPE UP AT 1/8" PER HORIZONTAL FOOT MINIMUM. LOW POINTS SHALL NOT BE ALLOWED.

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	SCALE NOTED	M-1 SOORENSEN SHEET NO.	USBR DRAWING NO. 4-100-1040	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT	PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO ARROWROCK DAM HYDROELECTRIC PROJECT OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE MECHANICAL PLAN & MECHANICAL NOTES	DATE	JULY 2008	REV LIR	REVISIONS
							OWNER	SPB		AS-BUILT 2010
							DESIGNER	SJB		
							APPROVED	TSS		
				CHECKER						

THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY



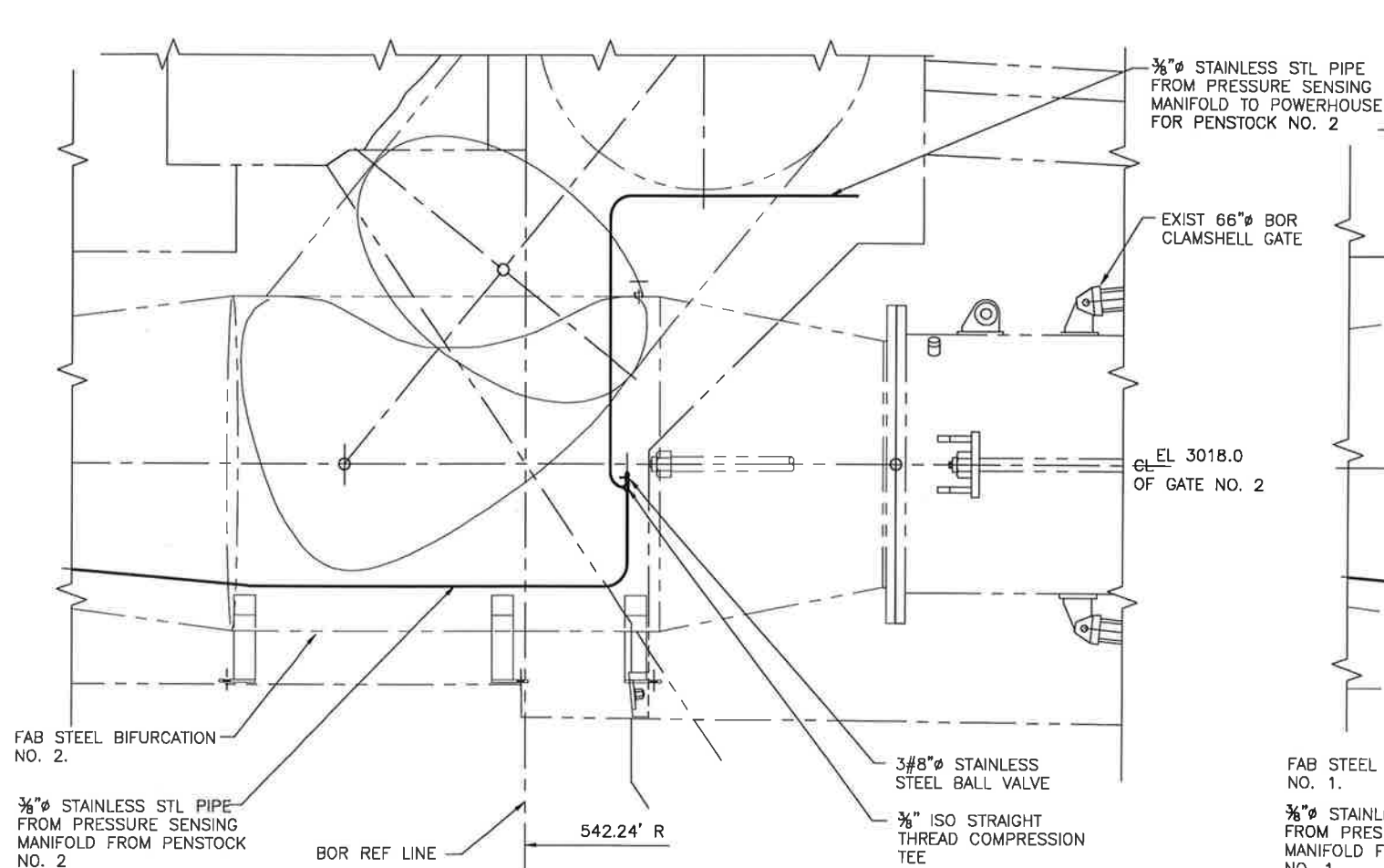
GATE HOUSE MECHANICAL
SECTION

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



THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

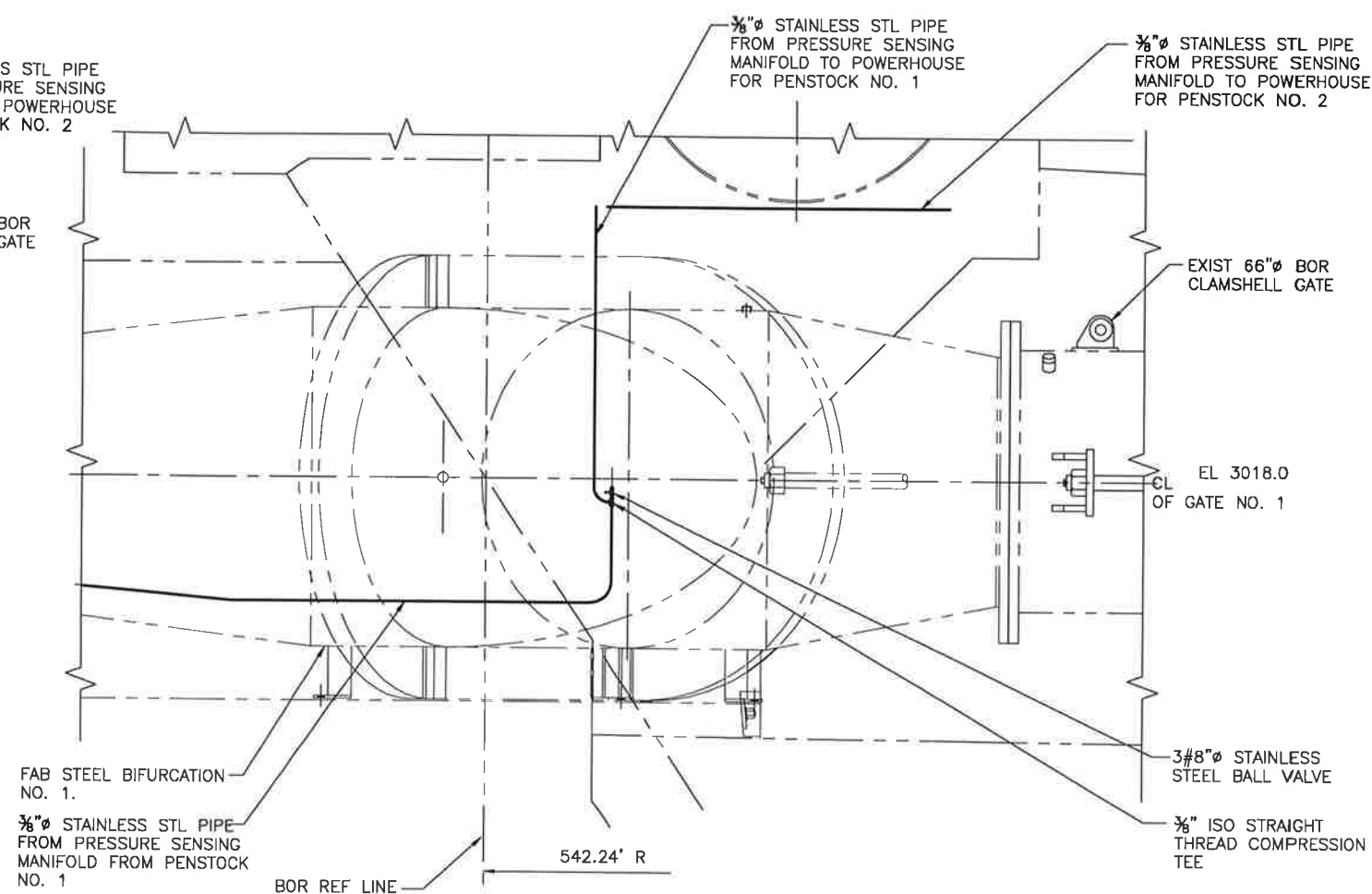
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO	SCALE NOTED	BOISE-KUNA IRRIGATION DISTRICT NAMPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT PHASE 2 PROJECT FERC PROJECT NO. 4656	UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO	DATE JULY 2008	REV LTR	REVISIONS AS-BUILT 2010
	ARROWROCK DAM HYDROELECTRIC PROJECT			DRAWN SPB		
				CHECKED SUB		
				APPROVED TSS		
				INCHES GATE HOUSE MECHANICAL ELEVATION		



GATEHOUSE MECHANICAL ELEV
THRU UNIT NO. 2

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

2
M-3



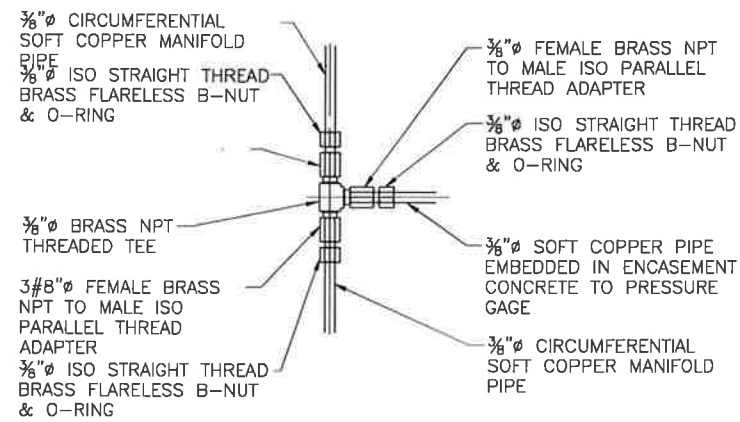
GATEHOUSE MECHANICAL ELEV
THRU UNIT NO. 1

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

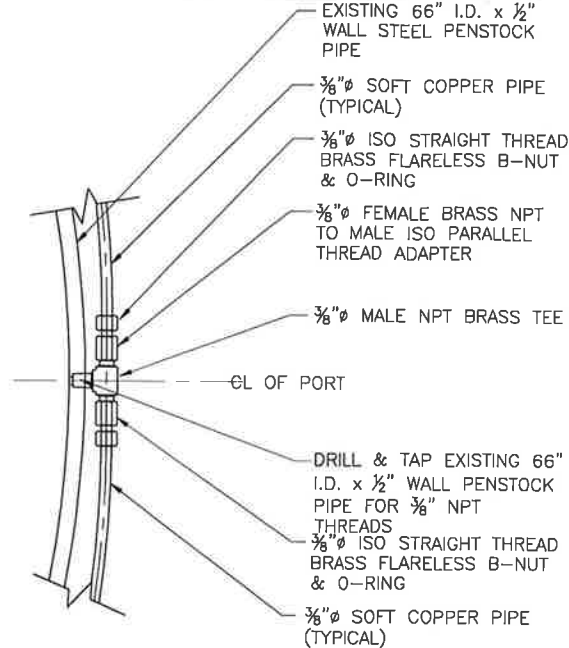
1
M-3

REVISIONS		DATE	REV	LTR	BY	CHKD	APP'D	DESCRIPTION
AS-BUILT 2010		JULY, 2008			SPB	SIB	TSS	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO								
ARROWROCK DAM HYDROELECTRIC PROJECT								
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE MECHANICAL DETAILS								
BOISE-KUNA IRRIGATION DISTRICT NANPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT								
PHASE 2 PROJECT FERC PROJECT NO. 4666								
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO								
SCALE NOTED								
SORENSEN SHEET NO. M-3								
USBR DRAWING NO. 4-100-1042								

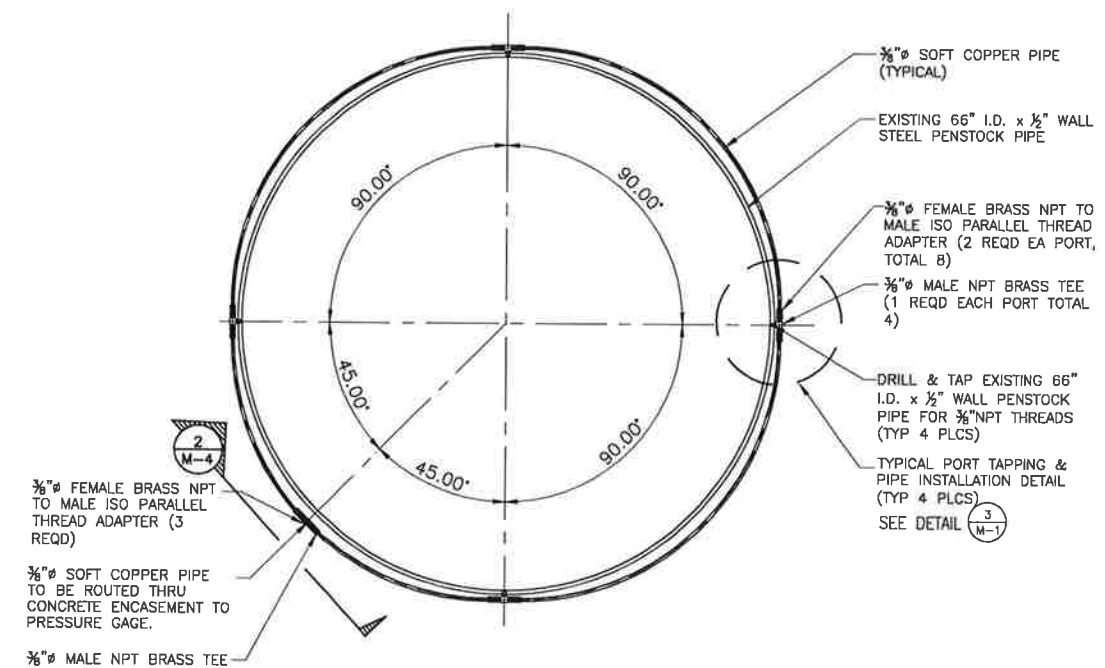
THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY



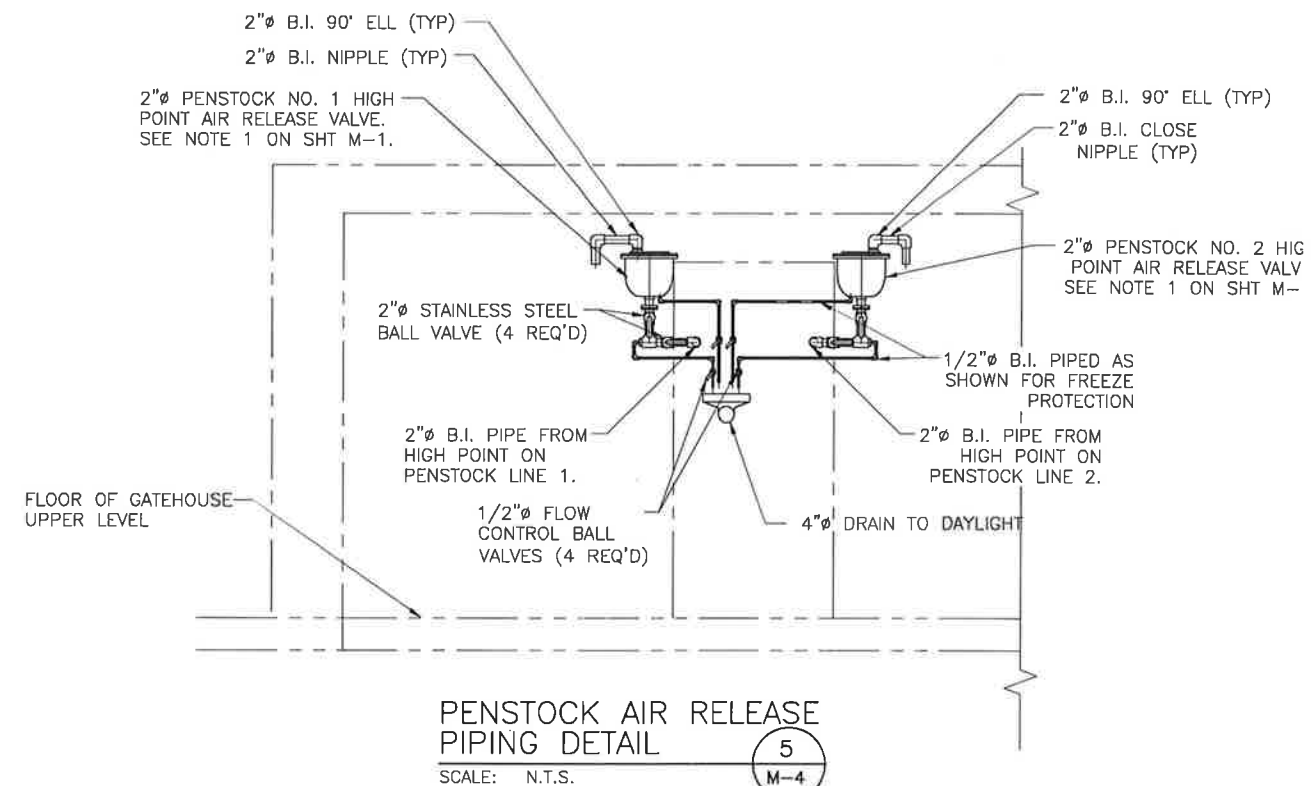
PENSTOCK MEASUREMENT PIPING DETAIL (2)
SCALE: N.T.S. M-4



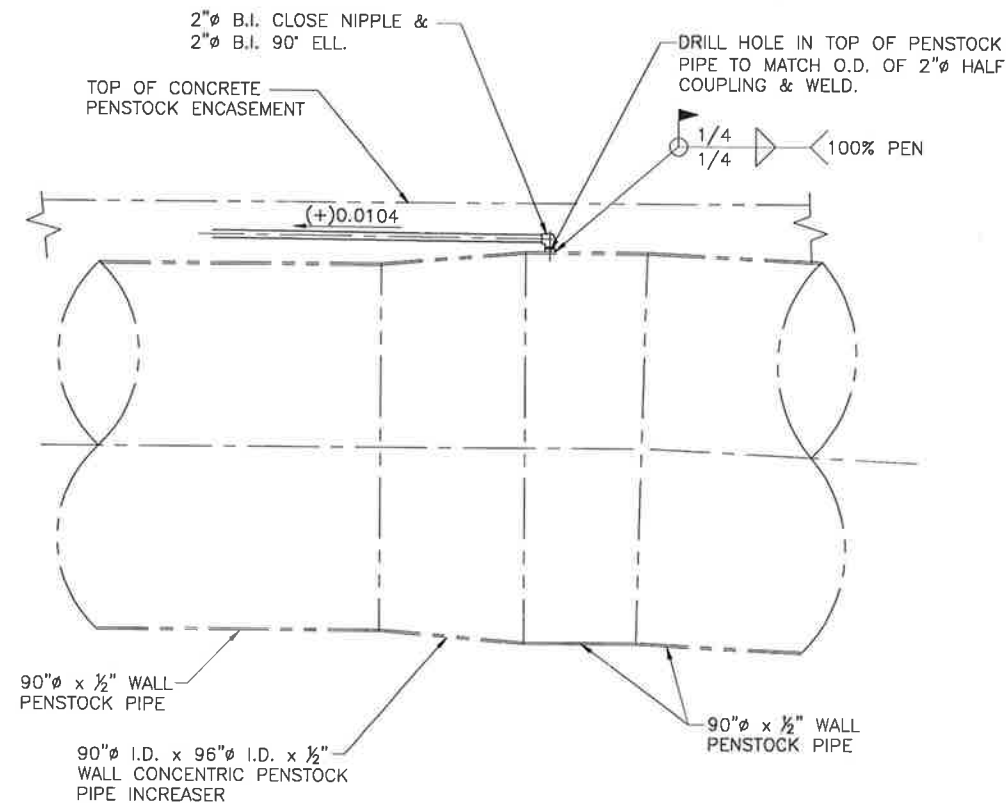
PENSTOCK MEASUREMENT PIPING SECTION (3)
SCALE: N.T.S. M-4



PENSTOCK MEASUREMENT HEADLOSS MANIFOLD (1)
SCALE: N.T.S. M-4



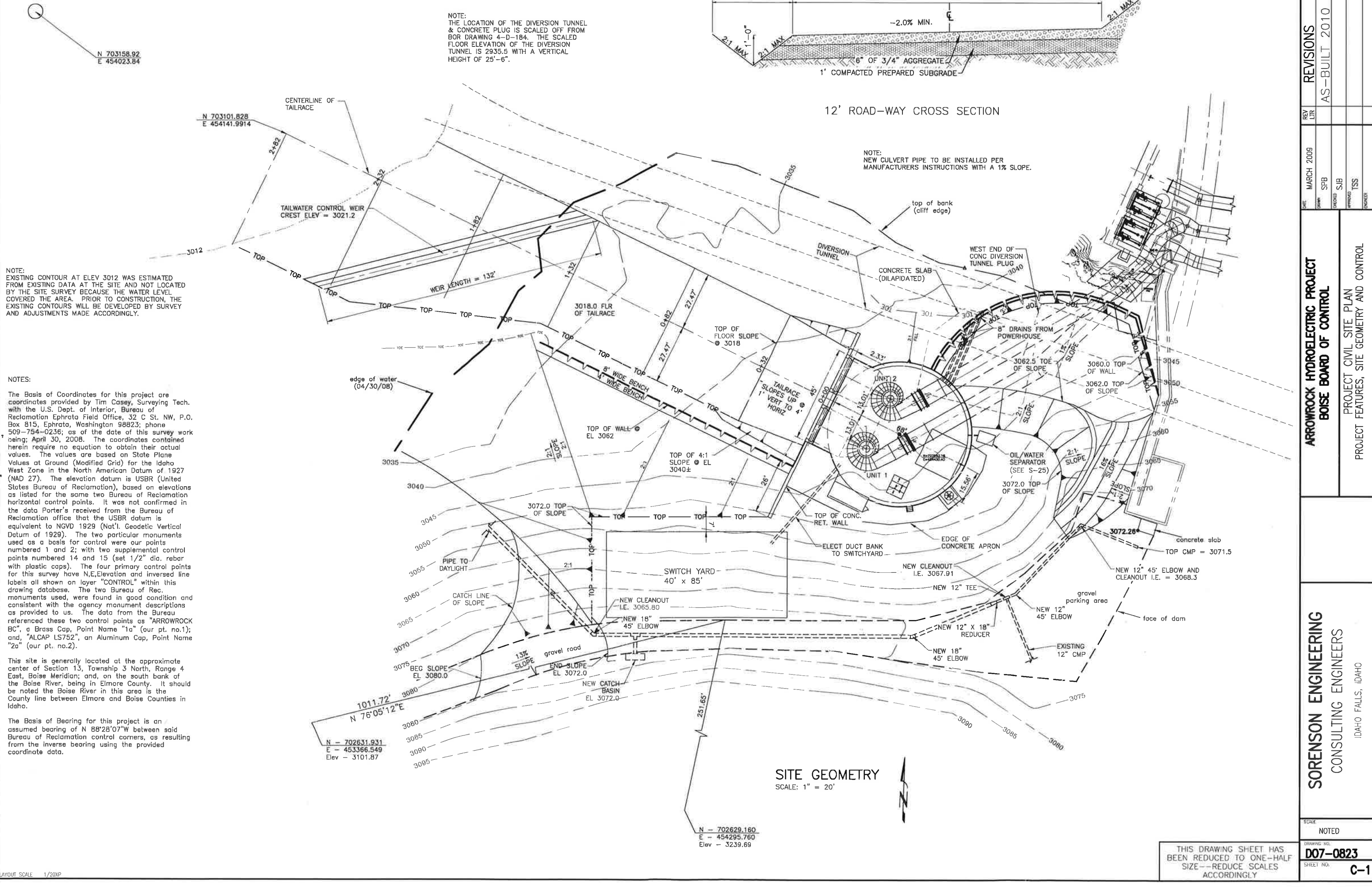
PENSTOCK AIR RELEASE PIPING DETAIL (5)
SCALE: N.T.S. M-4



AIR RELEASE PIPING DETAIL (4)
SCALE: N.T.S. M-4

REVISIONS		AS-BUILT 2010		DATE		BY		CHECKED		APPROVED		DESIGNED	
REV	LTR	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
		JULY 2008	SPB										
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION ARROWROCK DIVISION - BOISE PROJECT - IDAHO													
ARROWROCK DAM HYDROELECTRIC PROJECT													
OUTLET WORKS REHABILITATION GATE HOUSE, BIFURCATION & PENSTOCKS GATE HOUSE MECHANICAL SECTIONS & DETAILS													
BOISE-KUNA IRRIGATION DISTRICT NANPA & MERIDIAN IRRIGATION DISTRICT NEW YORK IRRIGATION DISTRICT WILDER IRRIGATION DISTRICT BIG BEND IRRIGATION DISTRICT													
PHASE 2 PROJECT FERC PROJECT NO. 4656													
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO													
SCALE: NOTED													
SORENSEN SHEET NO. M-4													
USBR DRAWING NO. 4-100-1043													

THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY



NOTE:
EXISTING CONTOUR AT ELEV 3012 WAS ESTIMATED FROM EXISTING DATA AT THE SITE AND NOT LOCATED BY THE SITE SURVEY BECAUSE THE WATER LEVEL COVERED THE AREA. PRIOR TO CONSTRUCTION, THE EXISTING CONTOURS WILL BE DEVELOPED BY SURVEY AND ADJUSTMENTS MADE ACCORDINGLY.

NOTES:
The Basis of Coordinates for this project are coordinates provided by Tim Casey, Surveying Tech. with the U.S. Dept. of Interior, Bureau of Reclamation Ephrata Field Office, 32 C St. NW, P.O. Box 815, Ephrata, Washington 98823; phone 509-754-0236; as of the date of this survey work being; April 30, 2008. The coordinates contained herein require no equation to obtain their actual values. The values are based on State Plane Values at Ground (Modified Grid) for the Idaho West Zone in the North American Datum of 1927 (NAD 27). The elevation datum is USBR (United States Bureau of Reclamation), based on elevations as listed for the same two Bureau of Reclamation horizontal control points. It was not confirmed in the data Porter's received from the Bureau of Reclamation office that the USBR datum is equivalent to NGVD 1929 (Nat'l. Geodetic Vertical Datum of 1929). The two particular monuments used as a basis for control were our points numbered 1 and 2; with two supplemental control points numbered 14 and 15 (set 1/2" dia. rebar with plastic caps). The four primary control points for this survey have N.E. Elevation and Inverse line labels all shown on layer "CONTROL" within this drawing database. The two Bureau of Rec. monuments used, were found in good condition and consistent with the agency monument descriptions as provided to us. The data from the Bureau referenced these two control points as "ARROWROCK BC", a Brass Cap, Point Name "1a" (our pt. no.1); and, "ALCAP LS752", an Aluminum Cap, Point Name "2a" (our pt. no.2).

This site is generally located at the approximate center of Section 13, Township 3 North, Range 4 East, Boise Meridian; and, on the south bank of the Boise River, being in Elmore County. It should be noted the Boise River in this area is the County line between Elmore and Boise Counties in Idaho.

The Basis of Bearing for this project is an assumed bearing of N 88°28'07"W between said Bureau of Reclamation control corners, as resulting from the inverse bearing using the provided coordinate data.

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO		ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL		PROJECT CIVIL SITE PLAN PROJECT FEATURES, SITE GEOMETRY AND CONTROL		REV LTR		REVISIONS	
SCALE NOTED						DATE		MARCH 2009	
DRAWING NO. D07-0823						DRAWN		SPB	
SHEET NO.						CHECKED		SJB	
C-1						APPROVED		TSS	
						DRAWN			

INLET BELLMOUTH PER BOR DWGS
4-D-2341 & 4-D-2342

CLAM SHELL VALVE &
TURBINE #2 INTAKE
PIPELINE

CLAM SHELL VALVE &
TURBINE #1 INTAKE
PIPELINE

NOTE:
SEE BOR DRAWINGS 4-D-1630 AND 4-D-1632
FOR DETAILS OF THE EXISTING INTAKE STRUCTURE
AND TRASHRACKS FOR THE 66" I.D. PENSTOCKS.

EXISTING 66" I.D. x 1/2" WALL
PENSTOCK PIPELINE - SEE BOR
DRAWING 4-D-2324.

EXIST 66" I.D. x
1/2" WALL PIPE

66" I.D. x 90" I.D. x
1/2" WALL CONCENTRIC
INCREASER

VALVEHOUSE & PENSTOCK PARTIAL PLAN

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

EXIST 66" I.D. x
1/2" WALL PIPE

66" I.D. x 90" I.D. x
1/2" WALL CONCENTRIC
INCREASER

CONCENTRIC 90" I.D. x 96"
I.D. INCREASER (INTERIOR
ANGLE FOR BOTH INCREASERS
IS 9.53°)

90" I.D. x
1/2" WALL STL
PIPE

MITERED VERT DEF
PT = ANGLE UP
2.51°

CONCENTRIC 90" I.D. x 96"
I.D. INCREASER

UNIT #1 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL PIPE

90" I.D. x
1/2" WALL STL
PIPE

66" I.D. x
1/2" WALL
PIPE

MITERED VERT DEF
PT = ANGLE DOWN
4.12°

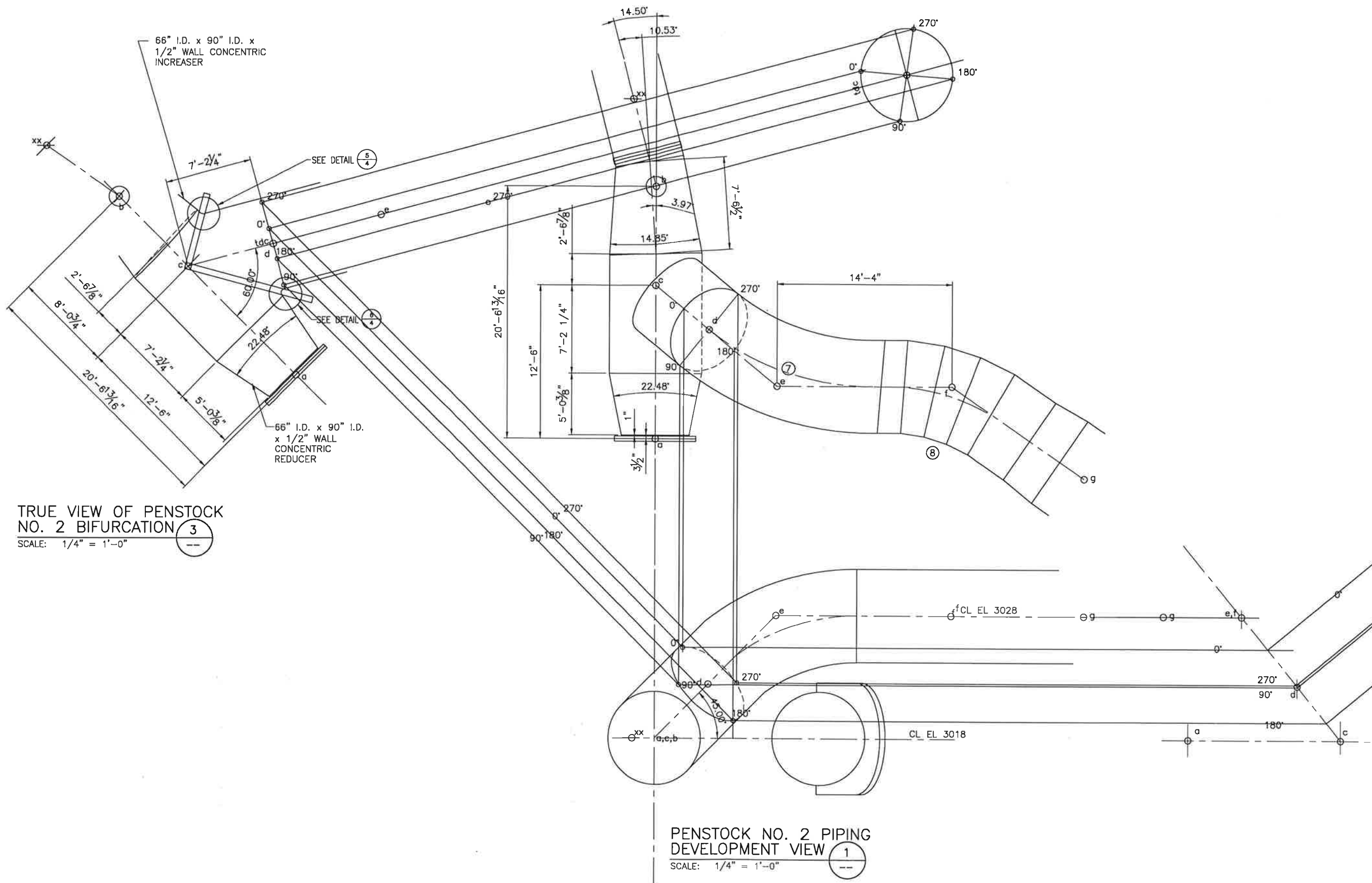
UNIT #2 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL PIPE

66" I.D. CLAMHELL GATES - SEE
BOR DRAWINGS 4-D-2327 &
4-D-2328

NOTE:
SEE FD-1 OF CIVIL DRAWINGS
FOR FINAL PENSTOCK GEOMETRY

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO										ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL										JUNE 2008		REV LTR		REVISIONS			
										PENSTOCK GEOMETRY										DATE		BY		REVISIONS			
																				DRAWN		SPB		AS-BUILT 2010			
																				CHECKED		SJB					
																				APPROVED		TSS					
																				CHECKED							
SCALE NOTED																											
DRAWING NO. D08-0102																											
SHEET NO. G-1																											



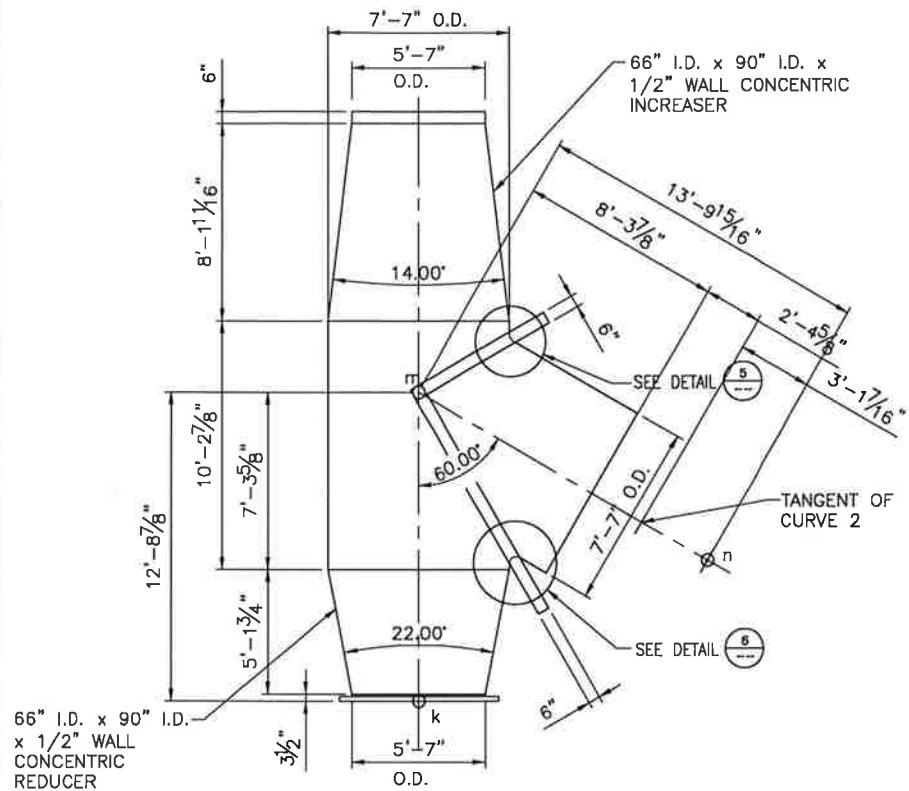
TRUE VIEW OF PENSTOCK
NO. 2 BIFURCATION (3)
SCALE: 1/4" = 1'-0"

PENSTOCK NO. 2 PIPING
DEVELOPMENT VIEW (1)
SCALE: 1/4" = 1'-0"

NOTE:
SEE FD-1 OF CIVIL DRAWINGS
FOR FINAL PENSTOCK GEOMETRY

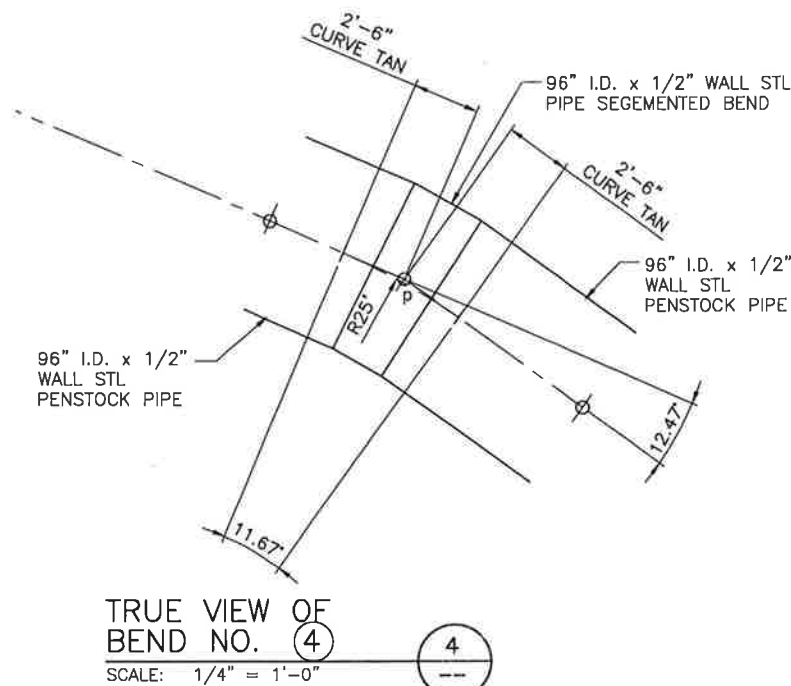
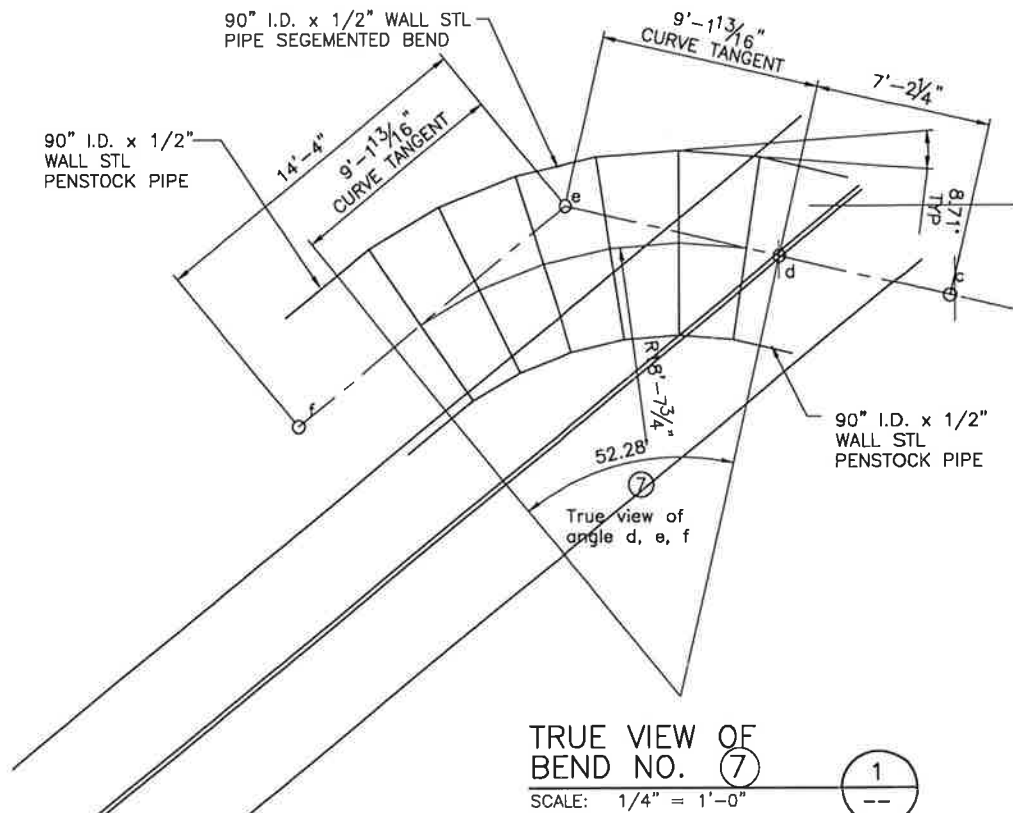
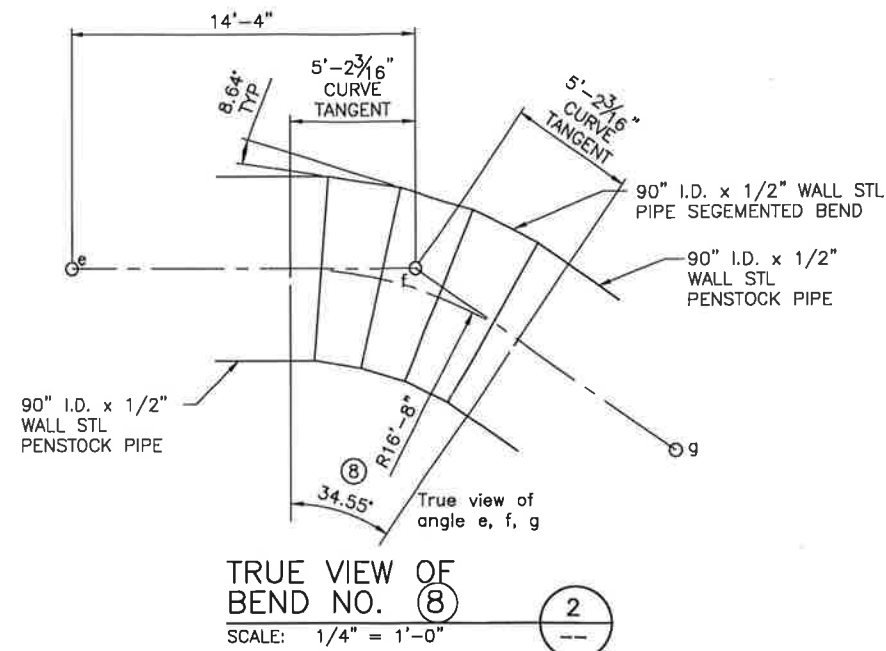
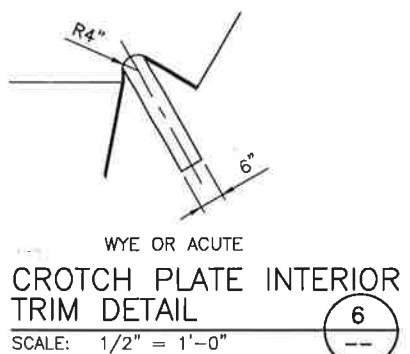
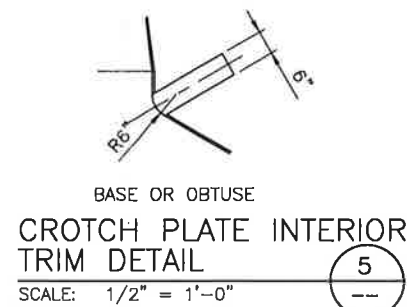
THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

REVISIONS		DATE		JUNE, 2008		AS-BUILT 2010	
REV	LTR	DATE	BY	CHKD	APPD	DATE	BY
				SPB			
				SJB			
				TSS			
ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL		PENSTOCK GEOMETRY					
SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO		DRAWING NO. D08-0102		SHEET NO. G-3			
SCALE		NOTED					



TRUE VIEW OF PENSTOCK NO. 1 BIFURCATION (3)

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



SEGMENT LENGTH TABLE			
PENSTOCK 1		PENSTOCK 2	
m - n	13'-9 15/16"	c - d	7'-2 1/4"
n - o	6'-6 11/16"	d - e	9'-1 13/16"
o - p	56'-5 5/16"	e - f	14'-4"
p - r	34'-8"	f - g	13'-2 5/16"
r - s	3'-10 15/16"	g - h	83'-5 7/16"
s - TSV Flg Face	30'-7 7/8"	h - i	4'-8 3/8"
		i - TSV Flg Face	8'-4"

MITERED BEND & DEFLECTION DATA TABLE

MITERED BEND NO.	DEFLECTION ANGLE	RADIUS	REMARKS	TRUE VIEW SHOWN ON SHT NO.
1	13.01'	22.0'	EXIST 66"Ø MITERED PIPE JOINT	G-1
2	7.14'	50.0'		G-5
3	2.51'	--	VERT DEFLECTION	G-5
4	11.74'	25.0'	HORIZ DEFLECTION	G-4
5	2.51'	--	VERT DEFLECTION	G-5
6A	10.53'		REPLACES ORIG BOR 14.50' BEND	G-1
6B	3.97'		REPLACES ORIG BOR 14.50' BEND	G-1
7	52.28'	18.65'		G-4
8	34.55'	16.67'		G-4
9	4.12'	--	VERT DEFLECTION	G-6
10	4.12'	--	VERT DEFLECTION	G-6

NOTE:

- ALL BENDS GREATER THAN 11.0 SHALL BE MITERED SEGMENT BENDS WITH THE MAXIMUM DEFLECTION ANGLE BETWEEN EACH SEGMENT BEING 11.0° OR LESS.
- ALL DEFLECTIONS THAT ARE 11.0° OR LESS DEFLECTION ANGLE MAY BE SINGLE WELD PIPE MITERS.

CURVE IDENTIFICATION SYMBOL TO CORRELATE BETWEEN THIS TABLE AND CALLOUTS ON THE VARIOUS VIEWS ON THE DRAWING SHEETS.

NOTE:
DIMENSIONS ARE SHOWN ON THIS DRAWING FOR TRUE DISTANCE AND TRUE ANGLE ONLY.

NOTE:
SEE FD-1 OF CIVIL DRAWINGS FOR FINAL PENSTOCK GEOMETRY

THIS DRAWING SHEET HAS BEEN REDUCED TO ONE-HALF SIZE--REDUCE SCALES ACCORDINGLY

ARROWROCK HYDROELECTRIC PROJECT
BOISE BOARD OF CONTROL

SORENSEN ENGINEERING
CONSULTING ENGINEERS
IDAHO FALLS, IDAHO

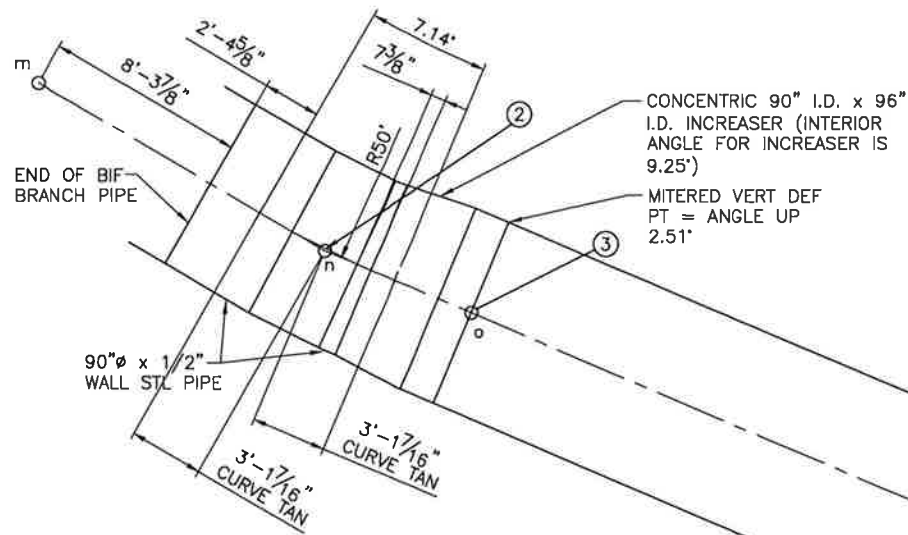
REVISIONS
AS-BUILT 2010

REV	DATE	BY	CHKD	APP'D	DESCRIPTION
JUNE 2008	SPB	SUB	TSS	DOCK	

PENSTOCK GEOMETRY DETAILS & TABLES

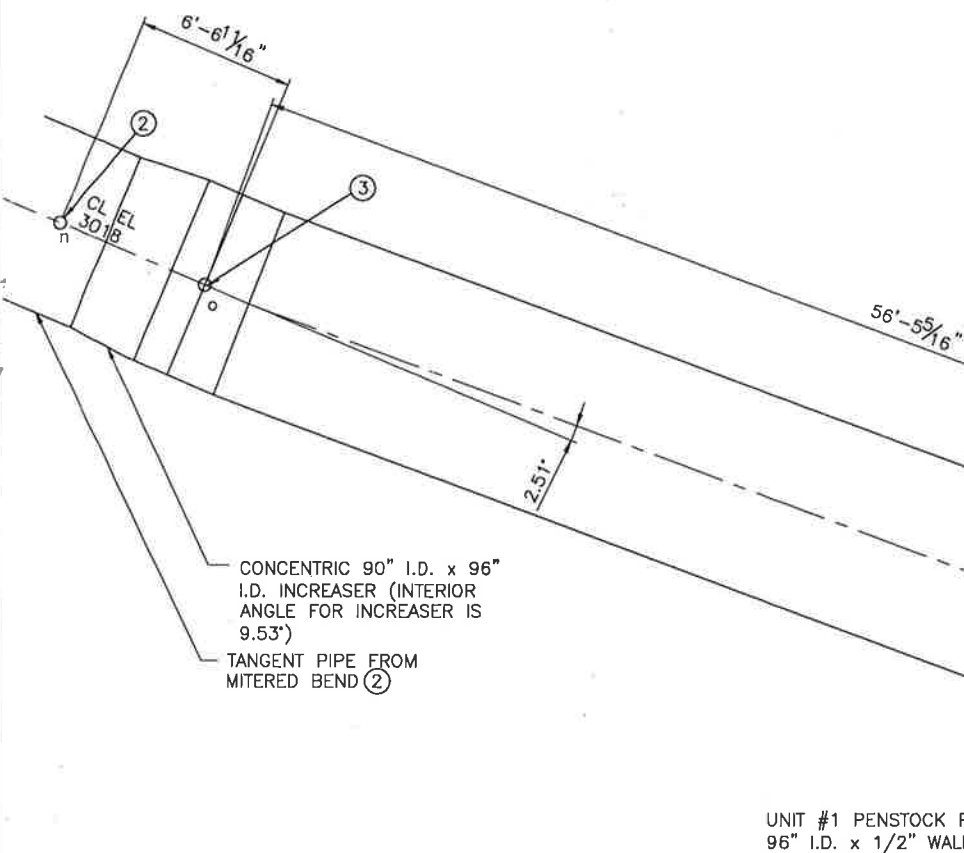
NOTED

DRAWING NO.
D08-0102
SHEET NO.
G-4



PENSTOCK NO. 1
PLAN

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



PENSTOCK NO. 1
ELEVATION

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



NOTE:
FOR CONTINUATION OF
PENSTOCK PIPES IN
POWERHOUSE SEE THE
PRELIMINARY POWERHOUSE
DRAWINGS

UNIT #1 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL PIPE

OTS WALL OF
POWERHOUSE

MITERED VERT DEF
PT = ANGLE DOWN
2.51"

MITERED VERT DEF
PT = ANGLE DOWN
2.51"

INS OF OTS WALL OF
POWERHOUSE &
PENSTOCK CENTER LINE

FACE OF
FLANGE @ TSV
VALVE

NOTE:
SEE FD-1 OF CIVIL DRAWINGS
FOR FINAL PENSTOCK GEOMETRY

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

REVISIONS		DATE		BY		CHECKED		APPROVED		REVISIONS	
1		JUNE 2008		SPB		SJB		TSS		AS-BUILT 2010	
ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL											
SORENSEN ENGINEERING CONSULTING ENGINEERS											
IDAHO FALLS, IDAHO											
PENSTOCK GEOMETRY											
SCALE: NOTED											
DRAWING NO. D08-0102											
SHEET NO. G-5											

UNIT #1 PENSTOCK
PIPELINE 90" I.D. x 1/2"
WALL STL PIPE

CONCENTRIC 90" I.D.
x 96" I.D. INCREASER

MITERED WELD
JOINT

CONCENTRIC 90" I.D.
x 96" I.D. INCREASER

MITERED WELD
JOINT

PENSTOCK NO. 2 PLAN

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

PENSTOCK NO. 2 ELEVATION

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

NOTE:
DIMENSIONS ARE SHOWN ON THIS
DRAWING FOR TRUE DISTANCE AND
TRUE ANGLE ONLY.

UNIT #2 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL PIPE

NOTE:
FOR CONTINUATION OF
PENSTOCK PIPES IN
POWERHOUSE SEE THE
PRELIMINARY POWERHOUSE
DRAWINGS

MITERED WELD
JOINT

UNIT #2 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL
PIPE

UNIT #2 PENSTOCK PIPELINE
96" I.D. x 1/2" WALL STL PIPE

OTS WALL OF
POWERHOUSE

INS OF OTS WALL OF
POWERHOUSE &
PENSTOCK CENTER LINE

UNIT #2 PENSTOCK
PIPELINE
96" I.D. x 1/2"
WALL STL PIPE

FACE OF FLANGE
@ TSV VALVE

INS OF OTS WALL OF
POWERHOUSE &
PENSTOCK CENTER LINE

NOTE:
SEE FD-1 OF CIVIL DRAWINGS
FOR FINAL PENSTOCK GEOMETRY

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

REVISIONS

REV	DATE	BY	APP
1	JUNE 2008	SPB	SPB
2		SJB	SJB
3		TSS	TSS
4		DOCK	DOCK

ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL

PENSTOCK GEOMETRY

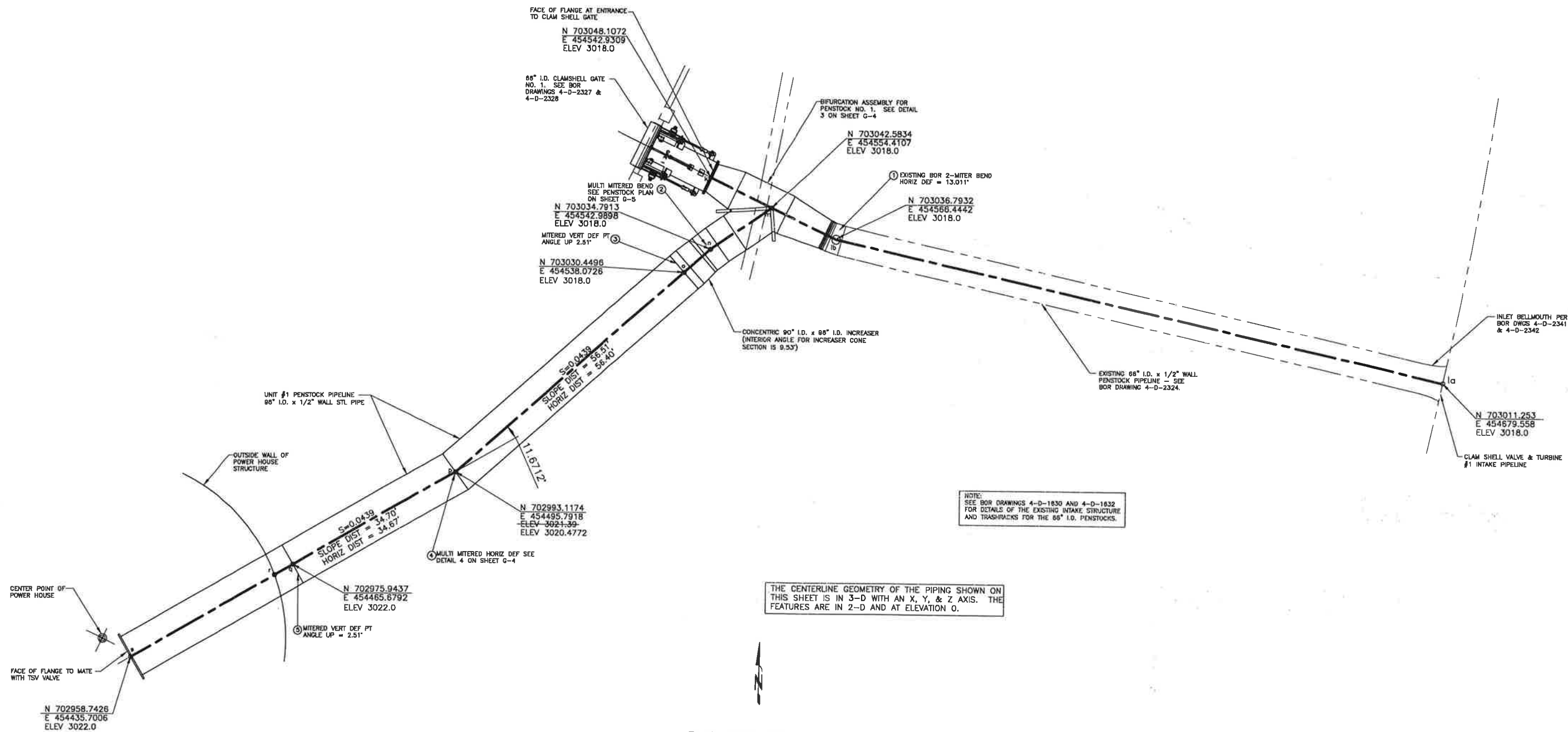
SORENSON ENGINEERING CONSULTING ENGINEERS

IDAHO FALLS, IDAHO

SCALE NOTED

DRAWING NO.
D08-0102

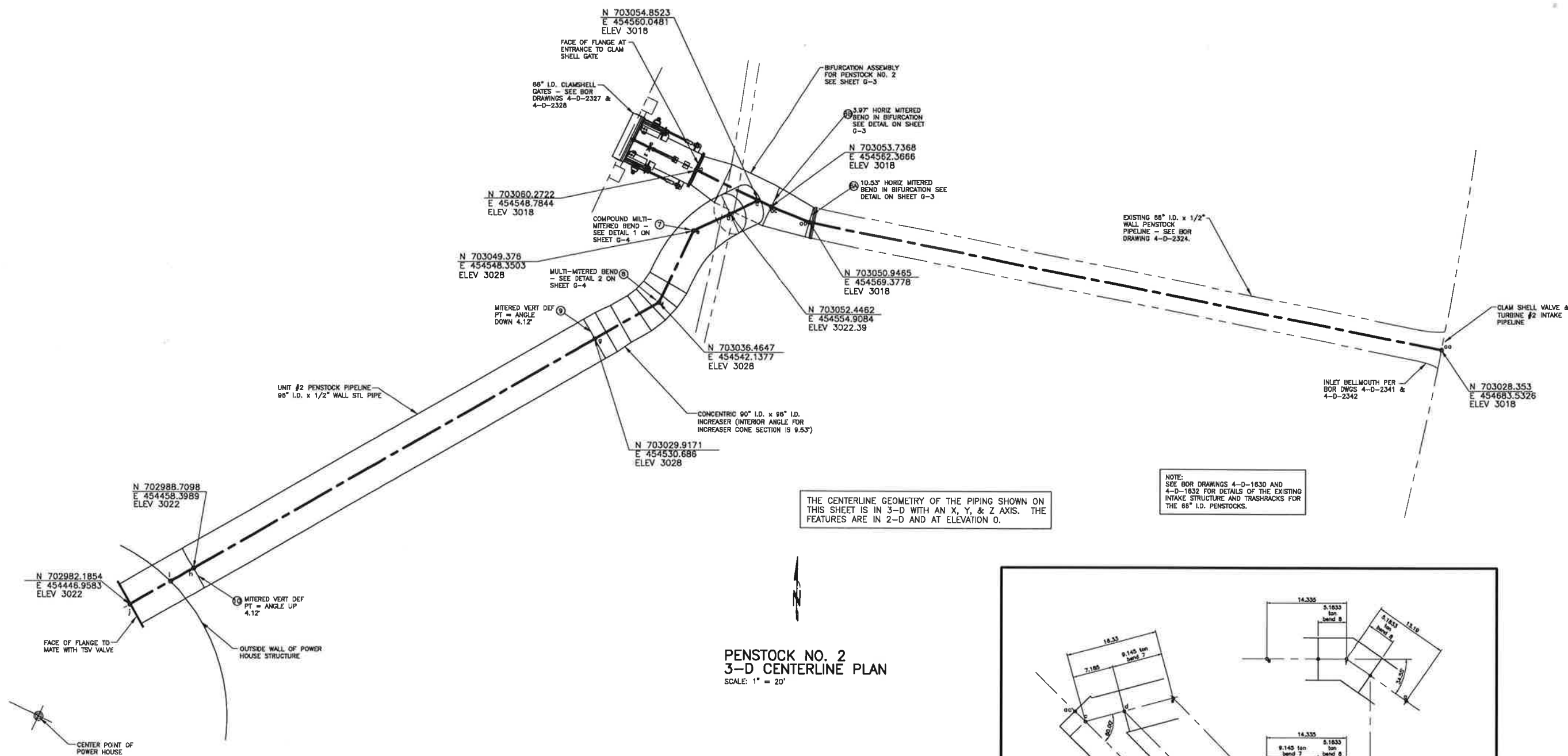
SHEET NO.
G-6



PENSTOCK NO. 1
3-D CENTERLINE VIEW
SCALE: 1" = 20'

SORENSEN ENGINEERING CONSULTING ENGINEERS IDAHO FALLS, IDAHO			ARROWROCK HYDROELECTRIC PROJECT BOISE BOARD OF CONTROL		DATE	JUNE 2008	REV	LTR	REVISIONS
					DRAWN	SPB			AS-BUILT 2010
					CHECKED	SJB			
					APPROVED	TSS			
					ENGINEER				
					PENSTOCK GEOMETRY PENSTOCK NO. 1				

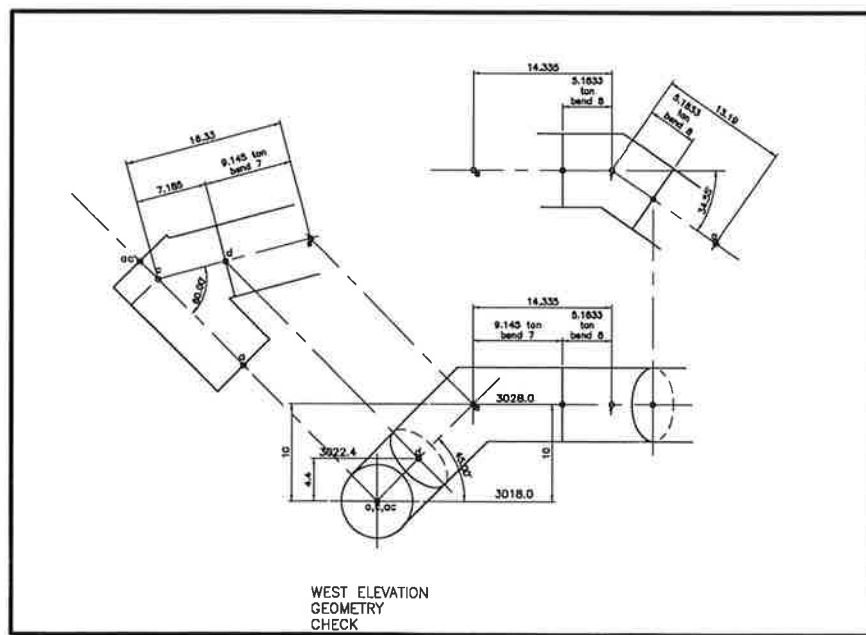
SCALE	NOTED
DRAWING NO.	D08-0102
SHEET NO.	G-7



THE CENTERLINE GEOMETRY OF THE PIPING SHOWN ON THIS SHEET IS IN 3-D WITH AN X, Y, & Z AXIS. THE FEATURES ARE IN 2-D AND AT ELEVATION 0.

NOTE:
SEE BOR DRAWINGS 4-D-1630 AND
4-D-1632 FOR DETAILS OF THE EXISTING
INTAKE STRUCTURE AND TRASHRACKS FOR
THE 66" I.D. PENSTOCKS.

PENSTOCK NO. 2
3-D CENTERLINE PLAN
SCALE: 1" = 20'



NOTE:
SEE FD-1 OF CIVIL DRAWINGS
FOR FINAL PENSTOCK GEOMETRY

THIS DRAWING SHEET HAS
BEEN REDUCED TO ONE-HALF
SIZE--REDUCE SCALES
ACCORDINGLY

REVISIONS		DATE		BY		CHECKED		APPROVED		DATE	
REV	LTR	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
		JUNE 2008	SPB								
			SJB								
			TSS								
ARROWROCK HYDROELECTRIC PROJECT											
BOISE BOARD OF CONTROL											
PENSTOCK GEOMETRY											
PENSTOCK NO. 2											
SORENSEN ENGINEERING											
CONSULTING ENGINEERS											
IDAHO FALLS, IDAHO											
SCALE											
NOTED											
DRAWING NO.											
D08-0102											
SHEET NO.											
G-8											