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RESERVOIR STRUCTURAL GENERAL NOTES:

DESIGN REFERENCES:

- 1. ACI 350-06 CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES.
- 2. ACI 350.03-06 SEISMIC DESIGN OF LIQUID-CONTAINING CONCRETE STRUCTURES.

DESIGN LOADS:

- 1. ROOF LOAD----- 40 PSF LIVE LOAD
- 2. LIQUID (WATER)----- 62.5 PCF
- 3. SOIL BEARING CAPACITY----- 2,500 PSF
- 4. COEFFICIENT OF FRICTION----- 0.4
- 5. PASSIVE EARTH PRESSURE----- 250 PCF
- 6. SEISMIC DESIGN PARAMETERS
 - A. SPECTRAL RESPONSE ACCELERATION (5% DAMPING)----- $S_s = 1.286g$
 $S_1 = 0.371g$
 - B. SITE CLASS----- D
 - C. DESIGN SPECTRAL RESPONSE ACCELERATION----- $S_{DS} = 0.858g$
 $S_{D1} = 0.45g$
 - D. IMPORTANCE FACTOR----- 1.25
 - E. RESPONSE MODIFICATION FACTOR ----- $R_1 = 2.0$
 $R_2 = 1.00$
- 5. BACKFILL HEIGHT-----6" BELOW TOP OF FOOTING

FOUNDATION:

- 1. FOUNDATION DESIGN IS BASED ON THE RECOMMENDATIONS BY HIRATA & ASSOCIATES, INC., W.O. NO. 21-6633, DATED AUGUST 30, 2022.
- 2. CONTRACTOR SHALL PROVIDE FOR DE-WATERING OF EXCAVATION FROM EITHER SURFACE WATER, GROUND WATER OR SEEPAGE.
- 3. CONTRACTOR SHALL PROVIDE FOR DESIGN AND INSTALLATION OF ALL CRIBBING, SHEETING AND SHORING NECESSARY TO PRESERVE EXCAVATIONS AND EARTH BANKS AND ADJACENT STRUCTURES AND PROPERTY FROM DAMAGE.
- 4. BLASTING WILL NOT BE ALLOWED ON THE PROJECT.
- 5. EXCAVATIONS FOR FOOTINGS SHALL BE APPROVED BY THE SOILS ENGINEER PRIOR TO PLACING THE CONCRETE AND REINFORCING. SOILS ENGINEER SHALL SUBMIT LETTER OF COMPLIANCE TO THE DLNR.
- 6. OVER-EXCAVATION OF THE IN-SITU CLAYEY SILT MAY BE REQUIRED FOR PLACEMENT OF THE GRANULAR STRUCTURAL FILL. FOUNDATIONS SHALL BE EMBEDDED AT LEAST 6 INCHES INTO THE WEATHERED BASALT STRATUM. THE OVER-EXCAVATION SHOULD BE REPLACED WITH COMPACTED STRUCTURAL FILL MATERIALS. THE OVER-EXCAVATION FOR THE COMPACTED STRUCTURAL FILL SHOULD EXTEND BEYOND THE OUTSIDE EDGES OF THE PERIMETER RING FOOTING A MINIMUM OF 1 FOOT.
- 7. THE BOTTOM OF FOOTING EXCAVATIONS SHOULD BE THOROUGHLY TAMPED AND CLEANED OF LOOSE MATERIAL PRIOR TO PLACEMENT OF REINFORCING STEEL AND CONCRETE. IF COBBLES OR BOULDERS ARE EXPOSED AT THE BOTTOM OF STRUCTURAL EXCAVATIONS, THEY SHALL BE REMOVED AND REPLACED WITH COMPACTED GRANULAR STRUCTURAL FILL.
- 8. THE STRUCTURAL FILL MATERIALS SHOULD CONSIST OF IMPORTED, NON-EXPANSIVE, SELECT GRANULAR MATERIALS, SUCH AS CRUSHED CORAL OR BASALT. THE MATERIAL SHOULD BE WELL-GRADED FROM COARSE TO FINE WITH PARTICLES NO LARGER THAN 3 INCHES IN LARGEST DIMENSION AND SHOULD CONTAIN BETWEEN 8 AND 20 PERCENT PARTICLES PASSING THE NO. 200 SIEVE. THE MATERIAL SHOULD HAVE A CBR VALUE OF 15 OR HIGHER, AND A SWELL POTENTIAL OF 1 PERCENT OR LESS WHEN TESTED IN ACCORDANCE WITH ASTM D1883.
- 9. ALL IMPORTED SOILS SHOULD BE INSPECTED AND APPROVED AT THE BORROW SITE(S) AND TESTED PRIOR TO IMPORT BY A CONTRACTOR RETAINED GEOTECHNICAL ENGINEER FOR SPECIAL INSPECTION DURING CONSTRUCTION.
- 10. COMPACTION SHOULD BE ACCOMPLISHED BY SHEEPSFOOT ROLLERS, VIBRATORY ROLLERS, OR OTHER TYPES OF ACCEPTABLE COMPACTION EQUIPMENT. WATER TAMPING, JETTING, OR PONDING SHOULD NOT BE ALLOWED TO COMPACT THE ON-SITE CLAYEY SOILS.
- 11. STRUCTURAL FILLS REQUIRED UNDER THE TANK STRUCTURE SHALL BE PLACED IN LEVEL LIFTS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS, MOISTURE-CONDITIONED TO ABOVE THE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO A MINIMUM OF 95 PERCENT RELATIVE COMPACTION AS DETERMINED BY ASTM D 1557.
- 12. PROBE HOLES SHALL BE DRILLED BELOW THE TANK FOOTINGS AND FLOOR SLAB, SEE SHEET S-8 FOR ADDITIONAL INFORMATION.

FLOOR SLAB UNDERLAYMENT:

- 1. PREPARE AREA UNDER FLOOR SLAB BY A MINIMUM OF 12 INCHES OF IMPORTED GRANULAR STRUCTURAL FILL.
- 2. INSTALL 30 MIL CHLOROSULFONATED POLYETHYLENE (CSPE) REINFORCED SHEET MATERIAL OVER IMPORTED GRANULAR STRUCTURAL FILL. CSPE MEMBRANE SHALL BE REINFORCED WITH A POLYESTER SCRIM FABRIC AND MANUFACTURED BY THE CALANDAR PROCESS.
- 3. INSTALL CSPE SHEET WRINKLE-FREE ON THE SHAPED SUBSURFACE SOIL. FIELD SEAMS SHALL BE SEALED WITH EITHER HEAT WELDING OR SOLVENT ADHESIVE. THE SEAL AT ALL SEAMS SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AND SHALL BE CONTINUOUS AND WATERTIGHT.
- 4. THE AGGREGATE BASE COURSE SHALL BE COMPACTED IN LIFTS TO A MINIMUM 95 PERCENT COMPACTION AS DETERMINED BY ASTM D1557.
- 5. A 6 MIL VAPOR RETARDER SHEET SHALL BE INSTALLED OVER THE AGGREGATE BASE COURSE AGGREGATE. CONTINUOUSLY SEAL ALL SEAMS WITH ADHESIVE TAPE RECOMMENDED BY MANUFACTURER. THE REINFORCED CONCRETE SLAB IS TO BE PLACED DIRECTLY ON THE VAPOR BARRIER.
- 6. THE 6 MIL VAPOR RETARDER SHALL CONFORM TO ASTM E1745, CLASS B WITH NYLON OR POLYESTER-CORD REINFORCED, THREE-PLY HIGH-DENSITY POLYETHYLENE SHEET OR ONE-PLY EXTRUDED POLYOEFIN SHEET.

CONCRETE NOTES:

- 1. CONCRETE - CLASSES
 - A. WALL, COLUMNS AND ROOF SLAB ----- DWS 4000
 - B. FOOTING, FLOOR SLAB, AND CONCRETE JACKET UNDER FLOOR SLAB ----- DWS 4000
- 2. POUR OPENINGS (WINDOWS) SHALL BE PROVIDED IN FORMWORK FOR PLACING CONCRETE IN WALLS.
 - A. MINIMUM POUR OPENING SIZE SHALL BE 24" X 24".
 - B. HORIZONTAL DISTANCE BETWEEN POUR OPENINGS SHALL NOT EXCEED SEVEN (7) FEET CENTER TO CENTER.
 - C. VERTICAL DISTANCE BETWEEN ROWS OF OPENINGS OR FLOOR SLAB SHALL NOT EXCEED FOUR (4) FEET.
- 3. RESERVOIR FLOOR SLAB SHALL BE CURED WITH 6" MINIMUM WATER POND AT HIGH POINT OF SLAB FROM FINAL SET UNTIL TANK IS TO BE CLEANED AND PLACED IN OPERATION.
- 4. LAPS SHALL BE 48 BAR DIA (24" MIN), UNLESS OTHERWISE NOTED, SPLICES OF WALL HORIZONTAL REINFORCEMENT SHALL BE STAGGERED HORIZONTALLY BY MORE THAN TWO LAP LENGTHS ON CENTER AND SHALL NOT COINCIDE VERTICALLY BY MORE THAN EVERY THIRD BAR.
- 5. ALL EXTERIOR CONCRETE SURFACES SHALL RECEIVE AN ARCHITECTURAL FINISH AS SPECIFIED IN THE WATER SYSTEM STANDARDS, DIVISION 300, SECTION 303.03S, SURFACE FINISHES, UNLESS OTHERWISE SPECIFIED.
- 6. ALL EXPOSED CORNERS SHALL HAVE 3/4 INCH CHAMFERS, UNLESS NOTED OTHERWISE.
- 7. USE OF POWDER DRIVEN FASTENERS SHALL NOT BE PERMITTED IN CONCRETE WALLS EXCEPT AS NOTED IN THE SPECIFICATIONS OR AS APPROVED BY THE DEPARTMENT OF WATER.
- 8. ALL ANCHORS AND INSERTS FOR SUSPENDING MECHANICAL AND ARCHITECTURAL WORK SHALL BE CAST-IN-PLACE WHEREVER POSSIBLE. WHEN ADDITIONAL FASTENERS ARE REQUIRED, ONLY THOSE THAT ARE ANCHORED IN DRILLED HOLES WITH THE APPROVAL OF THE DEPARTMENT OF WATER SUPPLY SHALL BE PERMITTED.
- 9. RESERVOIR WALL CONSTRUCTION TOLERANCES:
 - A. OUT OF ROUND TOLERANCES: 3/4" IN 50', 3/8" IN 10' AND 3/16" IN 2' FROM SPECIFIED CURVATURE.
 - B. VERTICAL ALIGNMENT: 3/8"± FROM TOP OF WALL TO BOTTOM
 - C. WALL THICKNESS: 1/8"±
 - D. CONCRETE COVER: +3/8" TO -1/4"
- 10. TESTING OF CYLINDERS SHALL BE PAID FOR BY THE CONTRACTOR. FIVE (5) CYLINDERS SHALL BE TAKEN PER CLASS OF CONCRETE POURED IN ANY ONE DAY'S OPERATION AND SHALL BE MADE FOR EVERY 50 CY OF CONCRETE OF EACH CLASS. TWO (2) CYLINDERS SHALL BE TESTED AT THE AGE OF 7-DAYS AND 28-DAYS. THE LAST SAMPLE SHALL BE HELD IN RESERVE FOR USE TO VERIFY SUSPECT TEST RESULTS OR A SPOILED TEST SAMPLE.
- 11. TO ASSURE ADHERENCE TO APPROVED MIX DESIGNS, SLUMP TESTS SHALL BE CONDUCTED ON EACH READY-MIX CONCRETE TRUCK DISCHARGING ON-SITE FOR PROJECT SITE, WITH THE EXCEPTION OF CONCRETE FOR THRUST BLOCKS. TESTING SHALL BE PAID FOR BY THE CONTRACTOR.

REINFORCING STEEL:

- 1. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60.
- 2. CLEAR CONCRETE COVER FOR REINFORCING BARS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:
 - A. FOOTING, CONCRETE JACKET, ETC. CAST AGAINST EARTH ----- 3"
 - B. FOOTING, CONCRETE JACKET, ETC. FORMED AND EXPOSED TO EARTH OR WEATHER ----- 2"
 - C. COLUMNS ----- 2½"
 - D. ROOF SLAB ----- 2" TOP
2" BOTTOM
 - E. WALLS ----- 2"
- 3. REINFORCING STEEL SHALL BE SPLICED WHERE INDICATED ON PLANS. PROVIDE LAP SPlice LENGTH PER TYPICAL DETAILS AND SCHEDULE, UNLESS OTHERWISE NOTED.
- 4. MECHANICAL SPlice CONNECTORS SHALL HAVE AN ALLOWABLE TENSION CAPACITY EQUAL TO 125 PERCENT OF THE SPECIFIED MINIMUM YIELD STRENGTH OF REINFORCING BARS.
- 5. BAR BENDS AND HOOKS SHALL BE "STANDARD HOOKS" IN ACCORDANCE WITH TYPICAL DETAIL ON SHEET S002.
- 6. REINFORCING STEEL SHALL BE PLACED AND SECURED IN CONFORMANCE WITH CRSI MANUAL OF STANDARD PRACTICE WITH PLACEMENT TOLERANCES PER ACI STANDARD 117.

STRUCTURAL STEEL EXTERIOR LADDER AND GUARDRAIL NOTES:

- 1. ALL MATERIAL FOR EXTERIOR LADDER RUNGS, PIPE SIDERAILS, BRACKETS, CAGE AND SAF-T-CLIMB TO BE GALVANIZED STEEL.
- 2. LADDER RUNGS TO BE SOLID BARS.
- 3. ALL WELDS TO BE ¼" MINIMUM.
- 4. WELDING SHALL BE PERFORMED BY WELDERS QUALIFIED FOR WELDING PROCEDURES TO BE USED.
- 5. USE SST 316 FOR ALL BOLTS UNLESS NOTED OTHERWISE.
- 6. WHERE SST BOLTS ARE IN CONTACT WITH DISSIMILAR METALS, USE INSULATING SLEEVES AND PHENOLIC WASHERS TO ELECTRICALLY ISOLATE THE BOLTS.
- 7. POST-INSTALLED CONCRETE ANCHORS SHALL CONSIST OF ¾" Ø TYPE 316 STAINLESS STEEL THREADED ROD WITH HILTI HIT HY 200-A ADHESIVE WITH EMBEDMENT AS NOTED ON DETAILS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

STAINLESS STEEL INTERIOR LADDER NOTES:

- 1. ALL MATERIAL FOR INTERIOR LADDER RUNGS, PIPE SIDERAILS, BRACKETS, FALL PREVENTION DEVICE, AND BASE PLATES TO BE 316L SST.
- 2. LADDER RUNGS TO BE SOLID KNURLED BARS.
- 3. ALL WELDS TO BE 3/16" MINIMUM.
- 4. WELDING SHALL BE PERFORMED BY WELDERS QUALIFIED FOR WELDING PROCEDURES TO BE USED.
- 5. USE SST 316 FOR ALL BOLTS UNLESS NOTED OTHERWISE.

- 6. WHERE SST BOLTS ARE IN CONTACT WITH DISSIMILAR METALS, USE INSULATING SLEEVES AND PHENOLIC WASHERS TO ELECTRICALLY ISOLATE THE BOLTS.
- 7. POST-INSTALLED CONCRETE ANCHORS SHALL CONSIST OF ¾" Ø TYPE 316 STAINLESS STEEL THREADED ROD WITH HILTI HIT HY 200-A ADHESIVE WITH EMBEDMENT AS NOTED ON DETAILS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

WATERSTOP NOTES:

- 1. SEE SPECIFICATION FOR MATERIAL REQUIREMENTS.
- 2. WATERSTOPS SHALL BE HELD IN PLACE IN THE FORMS BY THE USE OF A SPLIT FORM OR OTHER APPROVED METHOD.
- 3. HORIZONTAL WATERSTOPS SHALL BE MANUALLY BENT-UP DURING CONCRETE PLACEMENT UNTIL CONCRETE IS PLACED TO LEVEL OF WATERSTOP; ADDITIONAL CONCRETE SHALL THEN BE PLACED, AFTER WHICH THE CONCRETE SHALL BE THOROUGHLY VIBRATED.
- 4. ALL VERTICAL WATERSTOPS SHALL BE SECURED IN CORRECT POSITION USING HOG RINGS OR GROMMETS SPACED AT 12 INCHES ON CENTER ALONG THE LENGTH OF THE WATERSTOP AND WIRE TIE TO ADJACENT REINFORCING STEEL.
- 5. DIRECTION CHANGES AND INTERSECTIONS SHALL BE PREMOLDED FITTINGS. FIELD BUTT SPLICES SHALL BE DONE BY SQUARING ENDS AND USE OF SPECIAL SPLICING TOOL SPECIFIED BY MANUFACTURER. FOLLOW APPROVED MANUFACTURER RECOMMENDATIONS. LAPPING OF WATERSTOP, USE OF ADHESIVES, OR SOLVENTS SHALL NOT BE ALLOWED.

SPECIAL INSPECTION:

- 1. SPECIAL INSPECTIONS ARE REQUIRED FOR THIS PROJECT AND SHALL BE PERFORMED IN ACCORDANCE WITH IBC CHAPTER 17. SPECIAL INSPECTIONS SHALL BE ARRANGED AND PAID FOR BY THE CONTRACTOR AND PERFORMED BY AN INSPECTOR QUALIFIED FOR SPECIAL INSPECTION IN THE CATEGORIES SPECIFIED:

CONCRETE PLACEMENT (EXCEPT CURBS, DRAINAGE SWALE SITE CONCRETE) - STRUCTURAL WELDING - CONCRETE ANCHOR INSTALLATION - REINFORCING STEEL PLACEMENT - GRADING, EXCAVATION, BACKFILLING

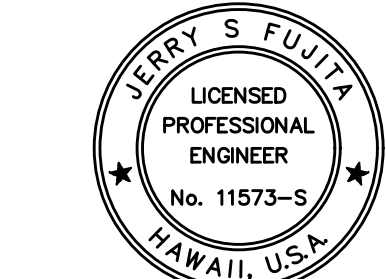
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SPECIAL INSPECTION AT NO ADDITIONAL COST TO THE STATE, AND BE RESPONSIBLE TO CORRECT DEFECTIVE WORK AND RE-INSPECTION AT NO COST TO THE STATE.

STRUCTURAL OBSERVATION:

- 1. STRUCTURAL OBSERVATION SHALL BE THE VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM BY THE ENGINEER OF RECORD OR HIS REPRESENTATIVE FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS AT SIGNIFICANT CONSTRUCTION STAGES AND AT COMPLETION OF THE STRUCTURAL SYSTEM.
- 2. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR SPECIAL INSPECTION.
- 3. AT THE CONCLUSION OF THE PROJECT'S CONSTRUCTION THE STRUCTURAL OBSERVER SHALL SUBMIT TO THE BUILDING OFFICIAL A WRITTEN STATEMENT THAT THE REQUIRED SITE VISITS HAVE BEEN MADE AND STATE ANY REPORTED DEFICIENCIES THAT, TO THE BEST OF THE STRUCTURAL OBSERVER'S KNOWLEDGE, HAVE NOT BEEN RESOLVED.
- 4. THE ENGINEER OF RECORD SHALL BE NOTIFIED AT LEAST THREE DAYS PRIOR TO EACH OF THE FOLLOWING STAGES OF THE RESERVOIR CONSTRUCTION. EACH STAGE SHALL BE OBSERVED ON THE LAST DAY BEFORE THE WORK IS COMPLETE PRIOR TO PLACING CONCRETE SO THAT CORRECTIVE ACTION CAN BE MADE DURING THE OBSERVATION PERIOD:
 - A. FLOOR AND WALL FOOTING REINFORCING
 - B. FIRST AND SECOND WALL SECTION REINFORCING
 - C. ROOF SLAB REINFORCING IN THE FIRST ROOF SLAB SECTION TO BE CONSTRUCTED.
- 5. THE REPORT PREPARED BY THE STRUCTURAL OBSERVER SHALL BE PREPARED FOR EACH SITE VISIT LISTING ANY DEFICIENCIES OBSERVED THAT WERE NOT CORRECTED PRIOR TO LEAVING THE SITE. THE REPORT SHALL BE SUBMITTED TO THE DEPT OF WATER SUPPLY WITHIN TWO DAYS OF THE SITE VISIT.

ABBREVIATIONS

AC	ASPHALT
ALUM	ALUMINUM
BOT	BOTTOM
CLR	CENTERLINE
CONT	CLEAR
	CONTINUOUS
D.I.	DUCTILE IRON
DIA/Ø	DIAMETER
DWGS	DRAWINGS
E.F.	EACH FACE
EMBED	EMBEDMENT
EXP	EXPANSION
GALV	GALVANIZED
HORIZ	HORIZONTAL
LBS	POUNDS
MAX	MAXIMUM
MIN	MINIMUM
PL	PLATE
PVC	POLYVINYL CHLORIDE
REINF	REINFORCEMENT
SCH	SCHEDULE
SQ	SQUARE
S.S.	STAINLESS STEEL
STD	STANDARD
TYP	TYPICAL
VERT	VERTICAL



EXPIRATION DATE: 04/30/2024

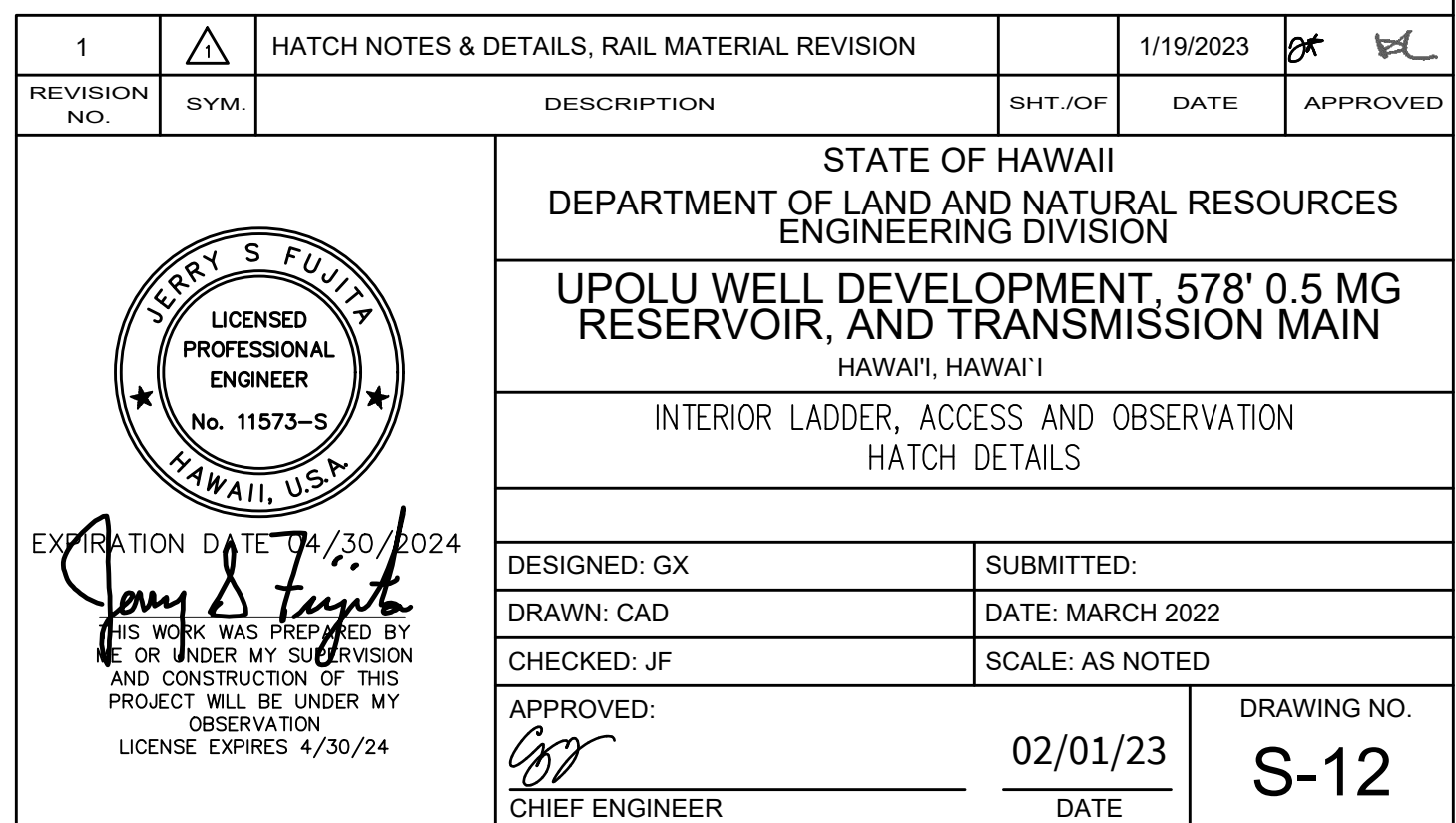
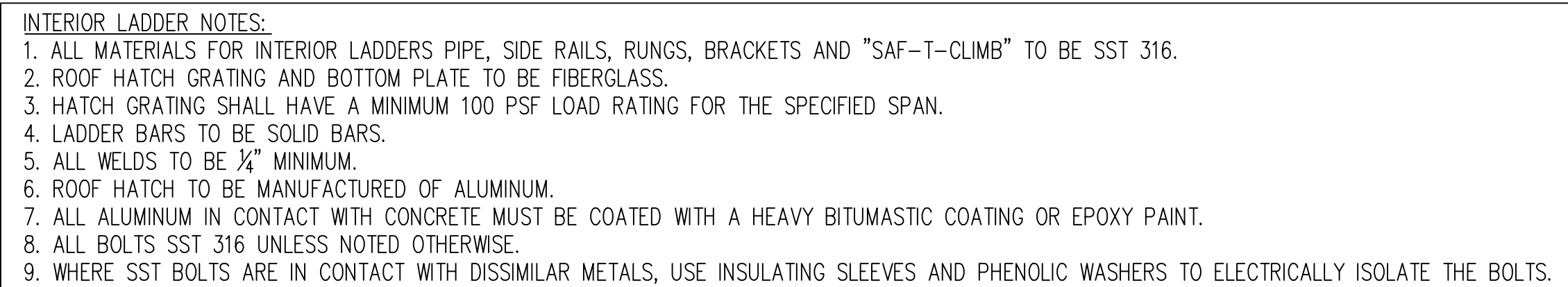
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION
LICENSE EXPIRES 4/30/24

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

UPOLU WELL DEVELOPMENT, 578' 0.5 MG
RESERVOIR, AND TRANSMISSION MAIN
HAWAII, HAWAII

RESERVOIR GENERAL NOTES

DESIGNED: GX	SUBMITTED:
DRAWN: JAD	DATE: MARCH 2022
CHECKED: CF	SCALE: AS NOTED
APPROVED: CHIEF ENGINEER	02/01/23 DATE
	DRAWING NO. S-1



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TANK STRUCTURAL GENERAL NOTES:

I. DESIGN REFERENCES

1. ACI 318-06 CODE REQUIREMENTS FOR BUILDING STRUCTURES
2. ACI 350-06 CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES.
3. ACI 350.03-06 SEISMIC DESIGN OF LIQUID-CONTAINING CONCRETE STRUCTURES.
4. AWWA D103-09 FACTORY-COATED BOLTED CARBON STEEL TANKS FOR WATER STORAGE

II. DESIGN LOADS

1. ROOF LOAD-----20 PSF LIVE LOAD
2. LIQUID (WATER)----- 62.5 PCF
3. SOIL BEARING CAPACITY-----2,500 PSF GROSS
4. SEISMIC DESIGN PARAMETERS
 - A. SPECTRAL RESPONSE ACCELERATION (5% DAMPING)
 $S_s = 1.286g$
 $S_1 = 0.371g$
 - B. SITE CLASS-----D
 - C. DESIGN SPECTRAL RESPONSE ACCELERATION
 $S_{ps} = 0.858g$
 $S_{p1} = 0.450g$
 - D. IMPORTANCE FACTOR-----1.25
 - E. RESPONSE MODIFICATION FACTOR
 $R_1 = 2.0$
 $R_c = 1.0$

III. FOUNDATION NOTES

1. FOUNDATION DESIGN IS BASED ON THE RECOMMENDATIONS BY HIRATA & ASSOCIATES, INC., W.O. NO. 21-6633, DATED AUGUST 30, 2022.
2. CONTRACTOR SHALL PROVIDE DE-WATERING OF EXCAVATED AREAS, AS REQUIRED.
3. CONTRACTOR SHALL PROVIDE DESIGN AND INSTALLATION OF ALL CRIBBING, SHEETING, AND SHORING NECESSARY TO PRESERVE EXCAVATIONS AND EARTH BANKS. SHORING SHALL CONFORM TO OSHA REGULATIONS.
4. EXCAVATIONS FOR FOOTINGS SHALL BE APPROVED BY THE LICENSED GEOTECHNICAL ENGINEER IN STATE OF HAWAII (PROVIDED BY CONTRACTOR) PRIOR TO PLACING THE CONCRETE AND REINFORCING. SOILS ENGINEER SHALL SUBMIT LETTER OF COMPLIANCE TO THE DLNR.
5. OVER-EXCAVATION OF THE IN-SITU CLAYEY SILT MAY BE REQUIRED FOR PLACEMENT OF THE GRANULAR STRUCTURAL FILL. FOUNDATIONS SHALL BE EMBEDDED AT LEAST 6 INCHES INTO THE WEATHERED BASALT STRATUM. THE OVER-EXCAVATION SHOULD BE REPLACED WITH COMPACTED STRUCTURAL FILL MATERIALS. THE OVER-EXCAVATION FOR THE COMPACTED STRUCTURAL FILL SHOULD EXTEND BEYOND THE OUTSIDE EDGES OF THE PERIMETER RING FOOTING A MINIMUM OF 1 FOOT.
6. THE BOTTOM OF FOOTING EXCAVATIONS SHOULD BE THOROUGHLY TAMPED AND CLEANED OF LOOSE MATERIAL PRIOR TO PLACEMENT OF REINFORCING STEEL AND CONCRETE. IF COBBLES OR BOULDERS ARE EXPOSED AT THE BOTTOM OF STRUCTURAL EXCAVATIONS, THEY SHALL BE REMOVED AND REPLACED WITH COMPACTED GRANULAR STRUCTURAL FILL.
7. THE STRUCTURAL FILL MATERIALS SHOULD CONSIST OF IMPORTED, NON-EXPANSIVE, SELECT GRANULAR MATERIALS, SUCH AS CRUSHED CORAL OR BASALT. THE MATERIAL SHOULD BE WELL-GRADED FROM COARSE TO FINE WITH PARTICLES NO LARGER THAN 3 INCHES IN LARGEST DIMENSION AND SHOULD CONTAIN BETWEEN 8 AND 20 PERCENT PARTICLES PASSING THE NO. 200 SIEVE. THE MATERIAL SHOULD HAVE A CBR VALUE OF 15 OR HIGHER, AND A SWELL POTENTIAL OF 1 PERCENT OR LESS WHEN TESTED IN ACCORDANCE WITH ASTM D1883.
8. STRUCTURAL FILL SHOULD BE MOISTURE CONDITIONED TO WITHIN TWO PERCENT OF THE OPTIMUM MOISTURE CONTENT AND PLACED IN HORIZONTAL LIFTS NOT TO EXCEED TWELVE (12) INCHES IN LOOSE FILL MATERIAL. FILL SHALL BE COMPACTED TO MINIMUM 95% RELATIVE COMPACTION AS MEASURED BY ASTM D1557, METHOD A OR D.

IV. CONCRETE NOTES:

1. CONCRETE CONSTRUCTION SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE ACI 318-06.
2. CONCRETE SHALL BE NORMAL WEIGHT HARD ROCK CONCRETE AND SHALL HAVE THE FOLLOWING MINIMUM 28 DAY COMPRESSIVE STRENGTHS:
 - A. FOUNDATION AND TANK FLOOR SLAB----- 4000 PSI
 - B. ALL OTHER CONCRETE----- 3000 PSI
3. THE MAXIMUM WATER-CEMENT RATIO (BY WEIGHT) FOR FOUNDATION CONCRETE SHALL BE 0.48 WITH A MINIMUM OF 6 SACKS PER CUBIC YEARD OF CEMENTITIOUS MATERIAL AND A MAXIMUM AGGREGATE SIZE OF 1-INCH AND MINIMUM SIZE 57 PER ASTM C33.
4. CONCRETE DELIVERY TICKETS SHALL RECORD ALL FREE WATER IN THE MIX AT BATCHING PLANT, ADDED FOR CONSISTENCY BY DRIVER, AND ANY ADDITIONAL REQUEST BY CONTRACTOR UP TO THE MAXIMUM AMOUNT ALLOWED BY THE MIX DESIGN.
5. ALL INSERTS, ANCHOR BOLTS, PLATES, AND OTHER ITEMS TO BE CAST IN THE CONCRETE SHALL BE HOT-DIPPED GALVANIZED ACCORDING TO ASTM A153 UNLESS OTHERWISE NOTED.
6. REINFORCING BARS, ANCHOR BOLTS, INSERTS, AND OTHER ITEMS TO BE CAST IN THE CONCRETE SHALL BE SECURED IN POSITION PRIOR TO PLACEMENT OF CONCRETE.
7. CONDUITS AND PIPES PASSING THROUGH A SLAB OR FOOTING THAT DO NOT CONFORM TO TYPICAL DETAILS SHALL BE LOCATED AND THE PROPOSED CONSTRUCTION DETAIL SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. SEE TANK MANUFACTURER'S DRAWINGS FOR CHAMFERS, EDGE RADIi, FINISHES AND OTHER NON-STRUCTURAL ITEMS NOT SHOWN OR SPECIFIED ON THE STRUCTURAL DRAWINGS.

V. REINFORCING STEEL:

1. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60.
2. CLEAR CONCRETE COVER FOR REINFORCING BARS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:
 - A. FOOTING, CONCRETE JACKET, ETC. CAST AGAINST EARTH ----- 3"
 - B. FOOTING, CONCRETE JACKET, ETC. FORMED AND EXPOSED TO EARTH OR WEATHER ----- 2"
3. ALL REINFORCING STEEL, ANCHOR BOLTS, DOWELS, AND OTHER INSERTS AND EMBEDS SHALL BE SECURED IN POSITION, INSPECTED AND APPROVED PRIOR TO PLACING CONCRETE.
4. REINFORCING BARS SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PARTS EMBEDDED IN CONCRETE, A MINIMUM OF 2 INCH CLEARANCE SHALL BE PROVIDED AT ALL TIMES, UNO.

VI. SPECIAL INSPECTION

1. SPECIAL INSPECTIONS ARE REQUIRED FOR THIS PROJECT AND SHALL BE PERFORMED IN ACCORDANCE WITH IBC CHAPTER 17. SPECIAL INSPECTIONS SHALL BE ARRANGED AND PAID FOR BY THE CONTRACTOR AND PERFORMED BY AN INSPECTOR QUALIFIED FOR SPECIAL INSPECTION IN THE CATEGORIES SPECIFIED:

CONCRETE PLACEMENT – CONCRETE ANCHORS – REINFORCING STEEL PLACEMENT – GRADING, EXCAVATION

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SPECIAL INSPECTION AT NO ADDITIONAL COST TO THE STATE, AND BE RESPONSIBLE TO CORRECT DEFECTIVE WORK AND RE-INSPECTION AT NO COST TO THE STATE.

IX. STRUCTURAL OBSERVATION

1. ENGINEER SHALL PERFORM STRUCTURAL OBSERVATION AS REQUIRED BY IBC CHAPTER 17 SECTION 1709, AND AS DEFINED BY SECTION 220. STRUCTURAL OBSERVATION SHALL BE PROVIDED DURING THE STAGES OF CONSTRUCTION LISTED BELOW. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE AT LEAST 72 HOURS ADVANCE NOTICE TO THE DESIGN ENGINEER WHEN HIS WORK IS READY FOR STRUCTURAL OBSERVATION FOR EACH OF THESE STAGES:
REINFORCING PLACEMENT FOR FLOOR AND TANK FOOTING

ABBREVIATION LEGEND

ACI – AMERICAN CONCRETE INSTITUTE
ANSI – AMERICAN NATIONAL STANDARD INSTITUTE
ASTM – AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWS – AMERICAN WELDING SOCIETY
AWWA – AMERICAN WATER WORKS ASSOCIATION
CL – CENTERLINE
CLR – CLEAR
CONC – CONCRETE
CONT – CONTINUOUS
DI – DUCTILE IRON
DIA/Ø – DIAMETER
DIAG – DIAGONAL
DWGS – DRAWINGS
EA – EACH
EF – EACH FACE
ELEV – ELEVATION
EW – EACH WAY
FF – FINISHED FLOOR
FG – FINISHED GRADE
FTG – FOOTING
GA – GAUGE
GALV – GALVANIZED

HDPE – HIGH DENSITY POLYETHYLENE
HORIZ – HORIZONTAL
IBC – INTERNATIONAL BUILDING CODE
KSI – KIP PER SQUARE INCH
LP – LOW POINT
MANUF. – MANUFACTURER
MAX – MAXIMUM
MIN – MINIMUM
NO – NUMBER
NOM – NOMINAL
OC – ON CENTER
PCF – POUNDS PER CUBIC FOOT
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
REINF – REINFORCEMENT
SCH – SCHEDULE
SECT – SECTION
SS/SST – STAINLESS STEEL
STD – STANDARD
SYMM – SYMMETRICAL
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE
VERT – VERTICAL
W/ – WITH

MINIMUM SPLICE AND DEVELOPMENT LENGTHS										
BAR SIZE	CONCRETE STRENGTH = 3,000 PSI					CONCRETE STRENGTH = 4,000 PSI				
	LAP SPLICE		DEVELOPMENT			LAP SPLICE		DEVELOPMENT		
	TOP BARS	OTHER BARS	STRAIGHT		WITH STANDARD HOOK	TOP BARS	OTHER BARS	STRAIGHT		WITH STANDARD HOOK
			TOP BARS	OTHER BARS				TOP BARS	OTHER BARS	
#3	28"	22"	22"	18"	10"	26"	20"	20"	16"	8"
#4	38"	30"	30"	22"	12"	34"	26"	26"	20"	10"
#5	48"	36"	36"	28"	14"	42"	32"	32"	24"	12"
#6	56"	44"	44"	34"	18"	50"	38"	38"	30"	16"
#7	82"	64"	64"	48"	20"	72"	54"	54"	42"	18"
#8	94"	72"	72"	56"	22"	82"	62"	62"	48"	20"
#9	106"	82"	82"	62"	26"	92"	70"	70"	54"	22"
#10	118"	92"	92"	70"	28"	102"	80"	80"	62"	26"
#11	132"	102"	102"	78"	32"	114"	88"	88"	68"	28"

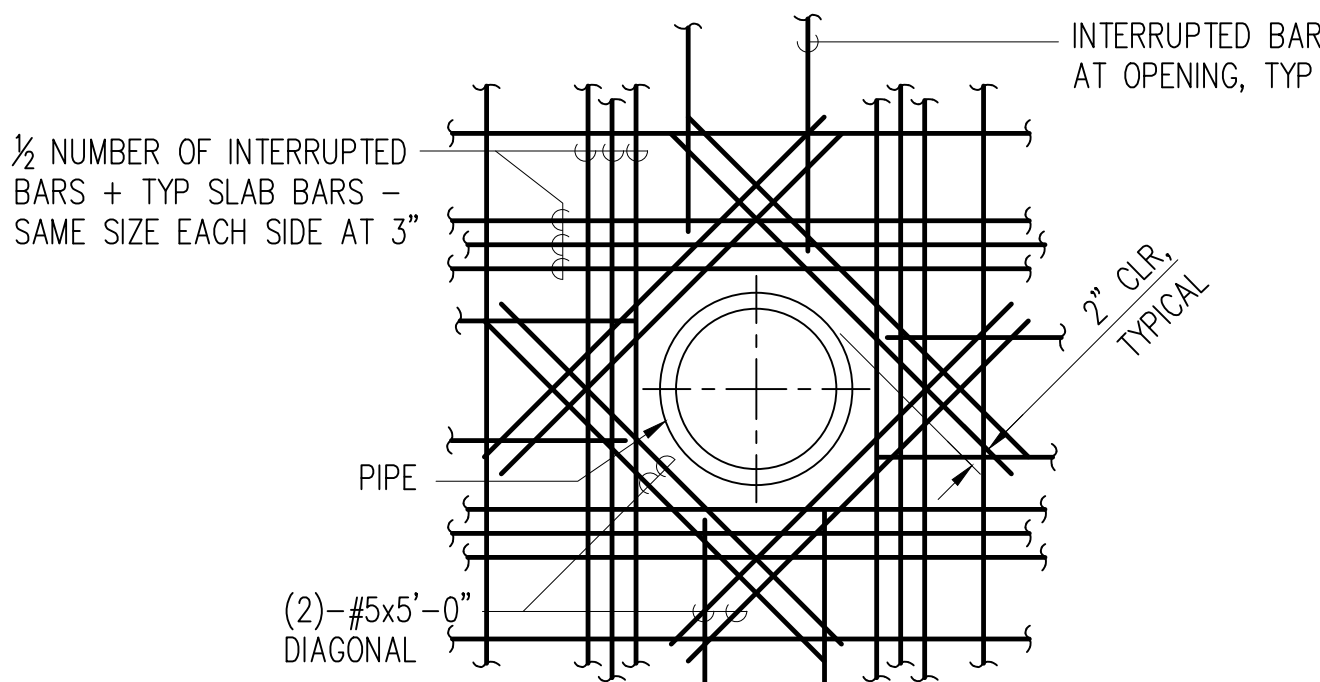
NOTES:

1. LENGTHS ARE FOR CONCRETE WITH REBAR SPACED AT 6 BAR DIAMETERS MINIMUM. INCREASE LENGTHS BY 25% FOR BARS SPACED LESS THAN 6 BAR DIAMETERS.
2. "TOP BARS" ARE HORIZONTAL BARS WITH 12" OR MORE OF CONCRETE CAST BELOW.

TYPICAL REBAR SPLICE AND DEVELOPMENT LENGTH SCHEDULE

1
S-17

NOT TO SCALE



PIPE PENETRATION

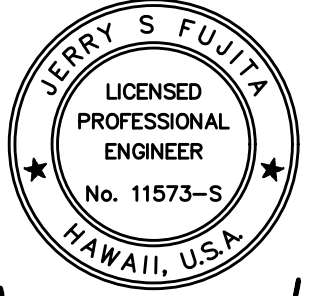
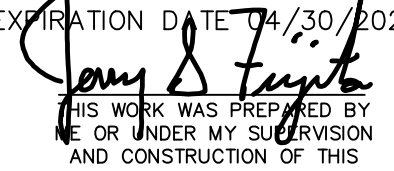

NOTES:

BEND REINFORCEMENT WHERE REQUIRED AT SLAB EDGE.

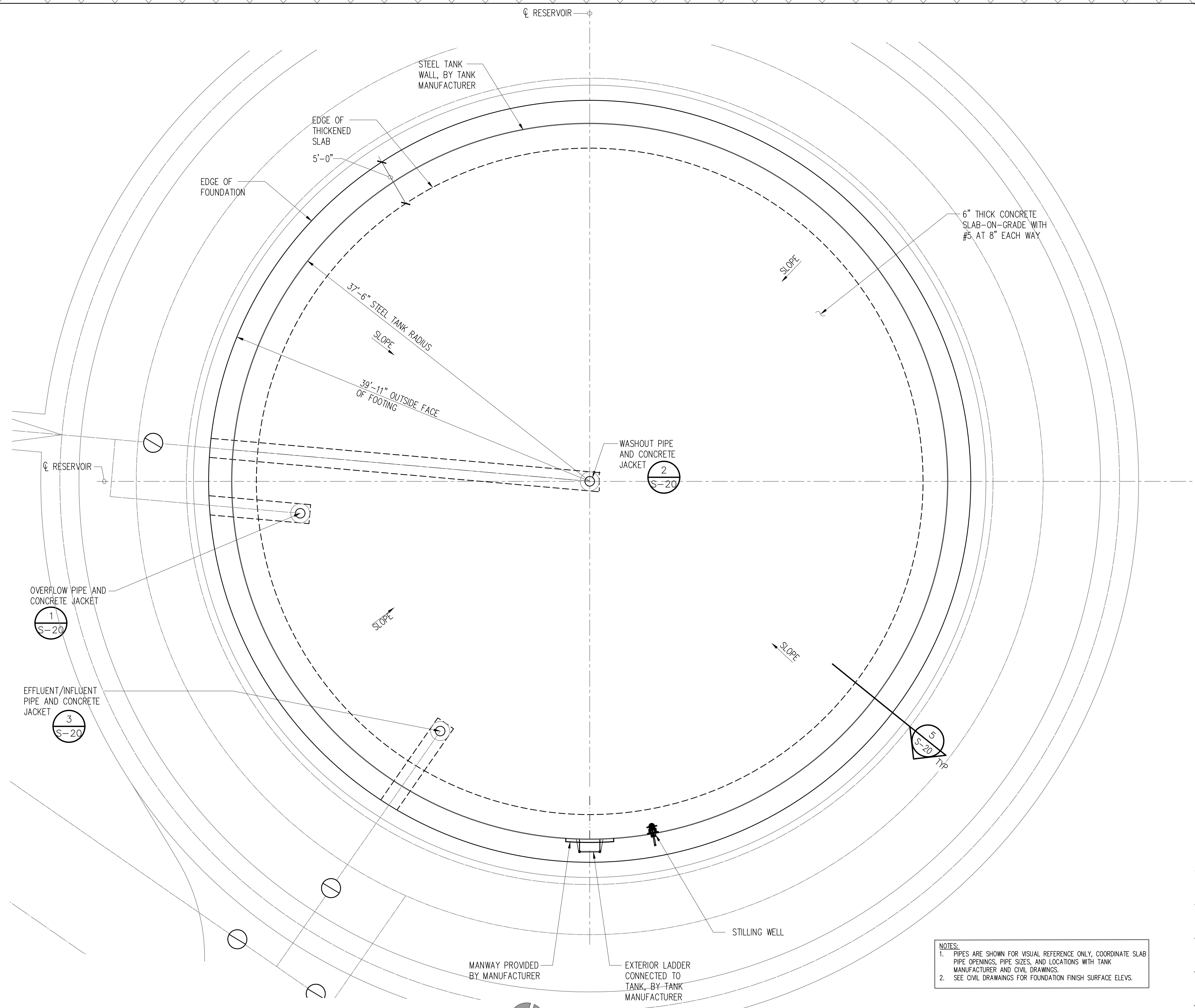
2
S-17

TYP ADDED REINFORCING AT FLOOR OPENING

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

1	△	ADD 1: STEEL TANK GENERAL NOTES		1/19/2023	✗	✗
REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED	
 EXPIRATION DATE: 04/30/2024  THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION LICENSE EXPIRES 4/30/24		STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION UPOLU WELL DEVELOPMENT, 578' 0.5 MG RESERVOIR, AND TRANSMISSION MAIN HAWAII, HAWAII OPTION STEEL TANK GENERAL NOTES ADDITIVE ALTERNATIVE NO.1				
		DESIGNED: GX		SUBMITTED:		
		DRAWN: CAD		DATE: MARCH 2022		
		CHECKED: JF		SCALE: AS NOTED		
APPROVED:  CHIEF ENGINEER		02/01/23 DATE		DRAWING NO. S-17		

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1

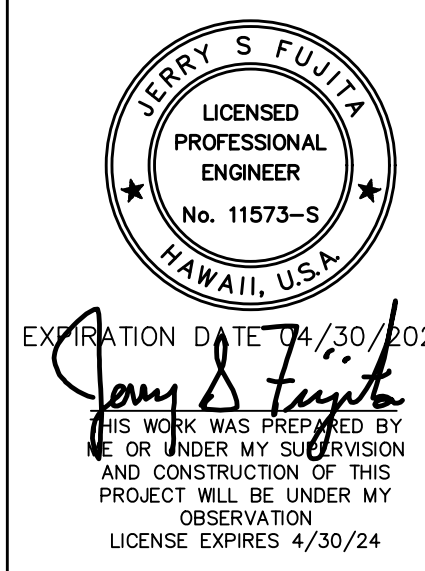
S-18

OPTION STEEL TANK FOUNDATION PLAN

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



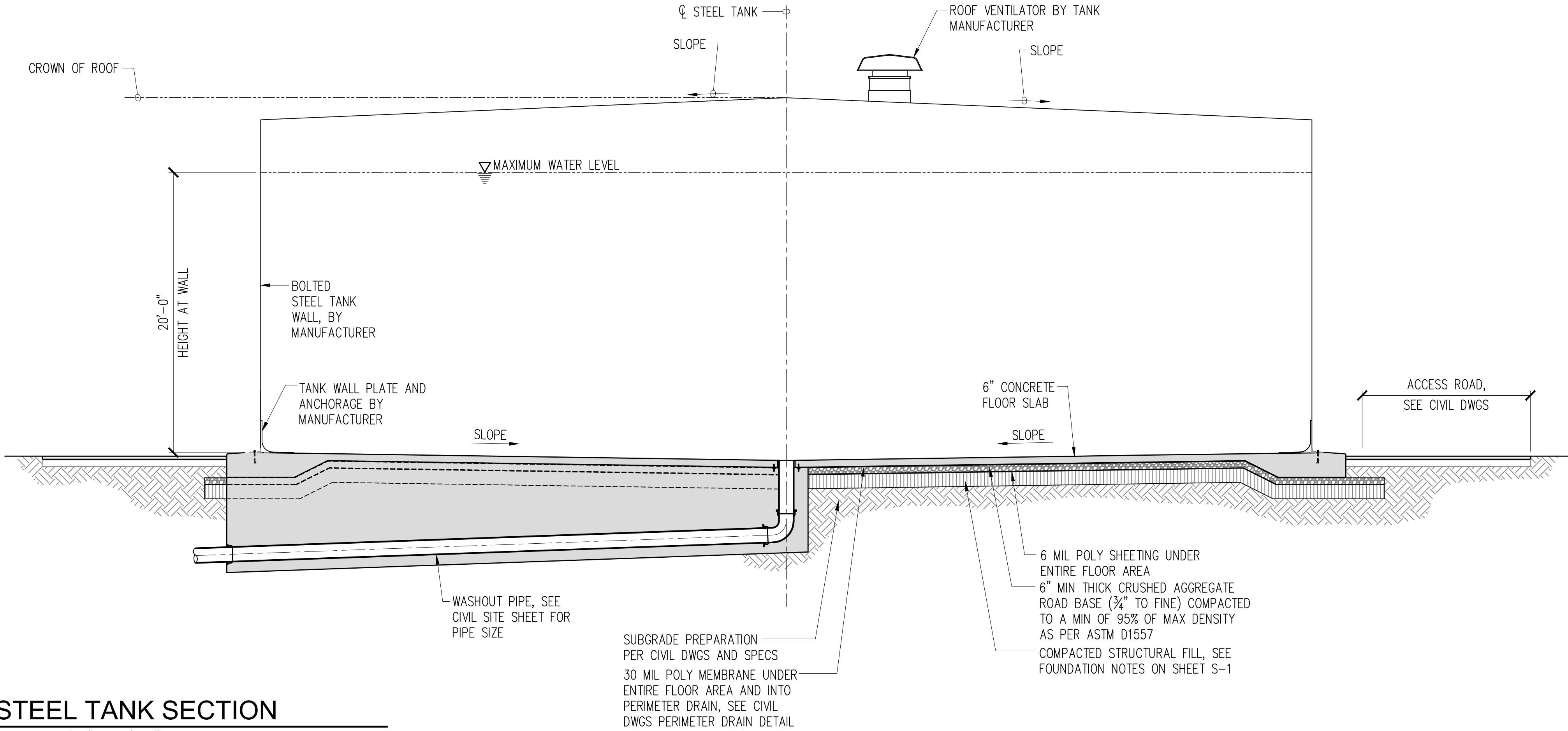
- NOTES:
- PIPES ARE SHOWN FOR VISUAL REFERENCE ONLY, COORDINATE SLAB PIPE OPENINGS, PIPE SIZES, AND LOCATIONS WITH TANK MANUFACTURER AND CIVIL DRAWINGS.
 - SEE CIVIL DRAWINGS FOR FOUNDATION FINISH SURFACE ELEV.



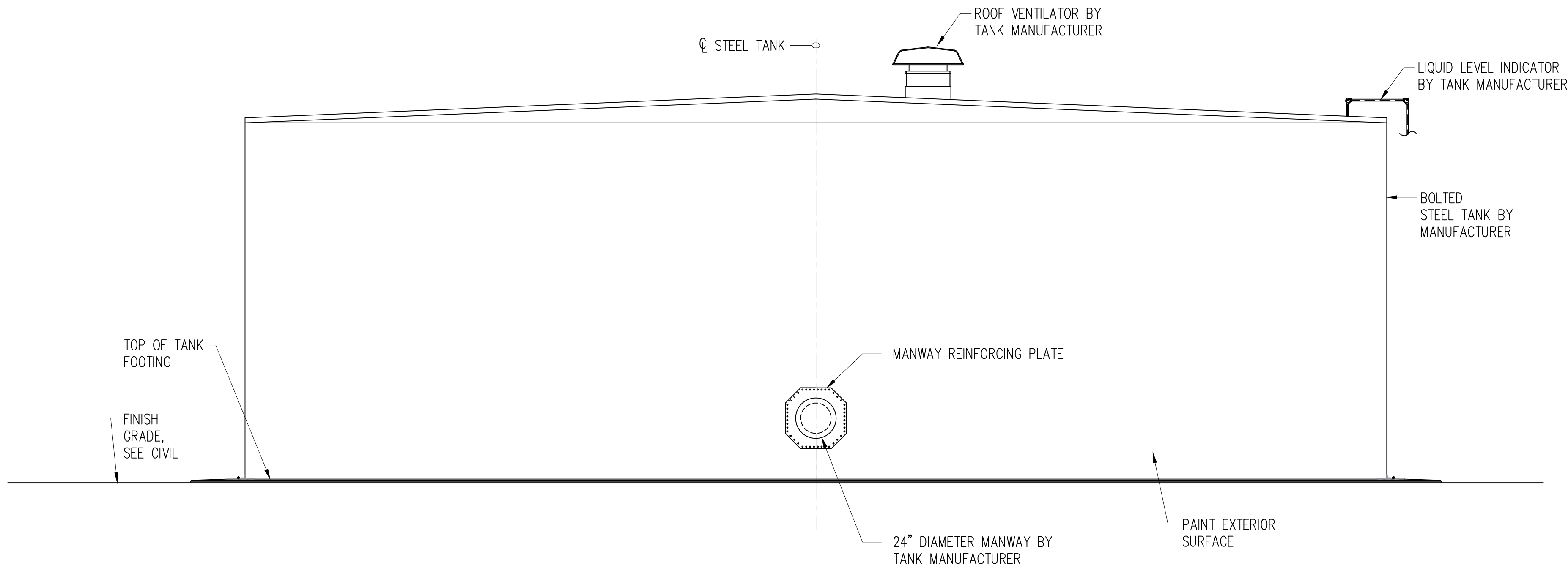
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CHECKED: JF		SCALE: AS NOTED	
APPROVED:		02/01/23	
CHIEF ENGINEER		DATE	
DRAWING NO.		S-18	

1		ADD 1: STEEL TANK FOUNDATION PLAN		1/19/2023		
REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED	

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1
S-19
STEEL TANK SECTION
SCALE: 3/16" = 1'-0"

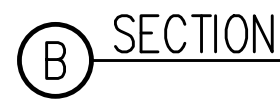


2
S-19
RESERVOIR ELEVATION
SCALE: 3/16" = 1'-0"

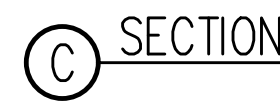
1		ADD 1: STEEL TANK SECTION AND ELEVATION		1/19/2023		
REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED	
<div><div><p>EXPIRATION DATE: 04/30/2024</p><p><i>Jerry S. Fujita</i></p><p>THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION LICENSE EXPIRES 4/30/24</p></div><div><p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES ENGINEERING DIVISION</p><p>UPOLU WELL DEVELOPMENT, 578' 0.5 MG RESERVOIR, AND TRANSMISSION MAIN HAWAII, HAWAII</p><p>OPTION STEEL TANK SECTION AND ELEVATION ADDITIVE ALTERNATIVE NO.1</p></div></div>						
DESIGNED: GX		SUBMITTED:				
DRAWN: CAD		DATE: MARCH 2022				
CHECKED: JF		SCALE: AS NOTED				
APPROVED: <i>JF</i> CHIEF ENGINEER		02/01/23 DATE		DRAWING NO. S-19		



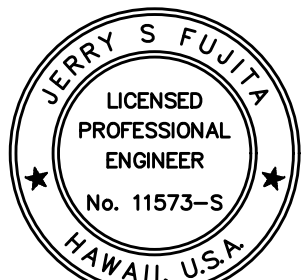




1. GRATE ASSEMBLY AND CONNECTORS SHALL BE 316 STAINLESS STEEL.
2. WHERE SST BOLTS ARE IN CONTACT WITH DISSIMILAR METALS, USE INSULATING SLEEVES AND PHENOLIC WASHERS TO ELECTRICALLY ISOLATE THE BOLTS.
3. PROVIDE MINIMUM (4) STAINLESS STEEL FASTENERS TO SECURE GRATE TO PIPE.



1. SEE CIVIL SITE SHEET FOR INFLUENT AND EFFLUENT PIPE SIZE FOR TANK.
2. CONCRETE JACKET TO BE POURED TO BOTTOM OF FOOTING AND FLOOR SLAB UNLESS OTHERWISE NOTED.



1		ADD 1: STEEL TANK DETAILS		1/19/2023	
REVISION NO.	SYM.	DESCRIPTION	SHT./OF	DATE	APPROVED
			STATE OF HAWAII		
			DEPARTMENT OF LAND AND NATURAL RESOURCES		
			ENGINEERING DIVISION		
			UPOLU WELL DEVELOPMENT, 578' 0.5 MG RESERVOIR, AND TRANSMISSION MAIN		
			HAWAII, HAWAII		
OVERFLOW, INFLUENT/EFFLUENT AND WASHOUT LINE SECTIONS AND FOOTING SECTION. ADDITIVE ALTERNATIVE NO.1					
EXPIRATION DATE 04/30/2024					
 THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION LICENSE EXPIRES 4/30/24			DESIGNED: GX		SUBMITTED:
			DRAWN: CAD		DATE: MARCH 2022
			CHECKED: JF		SCALE: AS NOTED
APPROVED:			02/01/23		DRAWING NO.
 CHIEF ENGINEER			DATE		S-20