

CONSTRUCTION PLANS FOR

# MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES

AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

TAX MAP KEY: 3RD DIVISION: 1-5-08: 1 AND 3

DEVELOPER: NA KUPA'A O KUHIO  
ADDRESS: P.O. BOX 1413  
HONOLULU, HAWAII 96806

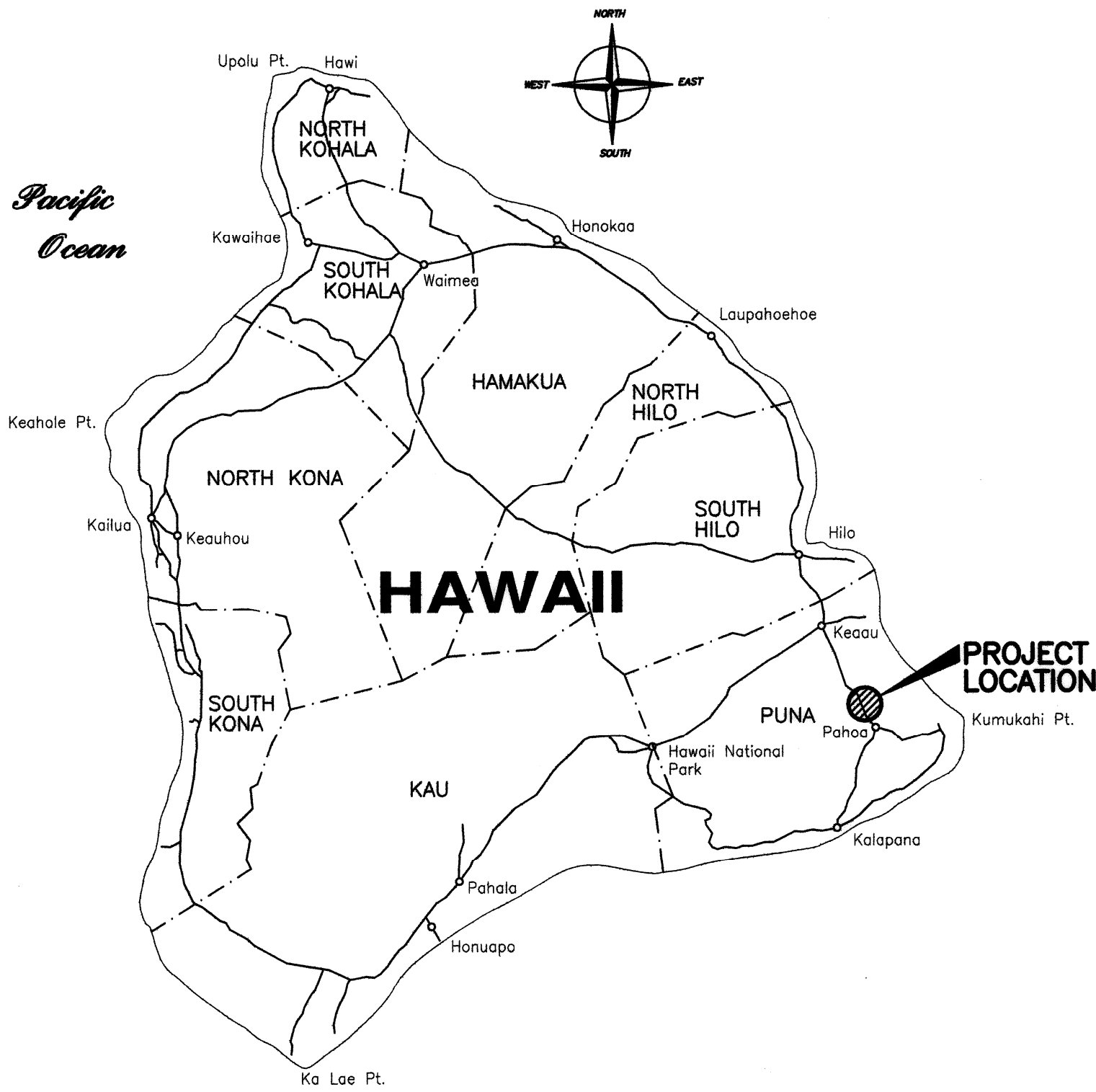
LANDOWNER: DEPT. OF HAWAIIAN HOME LANDS  
ADDRESS: 91-5420 KAPOLEI PARKWAY  
KAPOLEI, HAWAII 96707

PREPARED BY: ENGINEERS SURVEYORS HAWAII, INC.



ENGINEERS SURVEYORS PLANNERS  
1320 NORTH SCHOOL ST.  
HONOLULU, HAWAII 96817

LOCATION MAP



TMK: 3RD DIVISION: 1-5-08:1, OWNER STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES

TMK: 3RD DIVISION: 1-5-08:3, OWNER STATE OF HAWAII, DEPARTMENT OF HAWAIIAN HOME LANDS

LOCATION MAP  
NOT TO SCALE

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APPROVED

 DIRECTOR, PLANNING DEPARTMENT COUNTY OF HAWAII	12/3/09 DATE
 DIRECTOR, DEPT. OF PUBLIC WORKS COUNTY OF HAWAII (FOR GRADING PURPOSES ONLY)	9/30/09 DATE
 MANAGER, DEPARTMENT OF WATER SUPPLY COUNTY OF HAWAII	DATE
 DIRECTOR, DEPT. OF HAWAIIAN HOME LANDS STATE OF HAWAII	DATE
NOT APPLICABLE DIRECTOR, DEPARTMENT OF LAND AND NATURAL RESOURCES STATE OF HAWAII	DATE
NOT APPLICABLE CHIEF, ENVIRONMENTAL MANAGEMENT DIVISION DEPARTMENT OF HEALTH, STATE OF HAWAII	DATE
 ADMINISTRATOR, HIGHWAYS DIVISION State Department of Transportation (Approval granted for work within State right-of-way only. Letter of approval No. HWY-H 09-2.0512, dated June 17, 2009.)	9-16-09 DATE
 NA KUPA'A O KUHIO	9-3-09 DATE

RE-APPROVED DUE TO TIME LAPSE

MANAGER - CHIEF ENGINEER, DEPARTMENT OF WATER SUPPLY  
COUNTY OF HAWAII

DATE 6/20/12

ADMINISTRATOR, HIGHWAYS DIVISION  
State Department of Transportation (Approval granted for work within State right-of-way only. Letter of approval No. HWY-H 12-2.0038, dated February 22, 2012)

DATE



Y:\1985185-180.13 New Makuu Water\WORKING FOLDER\C-01\_NOTES [2012].dwg Wed, Jun 06 2012 - 4:07pm  
85-180.10 ENSH

WATER NOTES

- ALL WORK SHALL CONFORM TO THE DEPARTMENT OF WATER SUPPLY'S "WATER SYSTEM STANDARDS", DATED 2002, AS AMENDED.
- THE CONTRACTOR SHALL INFORM THE D.W.S. ENGINEER 72 HOURS PRIOR TO THE BEGINNING OF ANY WATERLINE WORK AND TWO WEEKS PRIOR TO ANY CONNECTION, CHLORINATION, SHUT-OFF OR RELOCATION WORK.
- ALL EXISTING WATERLINES, WATERLINE APPURTENANCES AND OTHER UTILITY LOCATIONS SHOWN ON THE PLANS ARE OBTAINED FROM LATEST RELIABLE SOURCES. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THE EXACT LOCATION OF ALL UTILITIES IN THE FIELD AND SHALL BEAR ALL COST FOR ALL DAMAGES DURING THE CONTRACT PERIOD.
- MINIMUM HORIZONTAL CLEARANCE BETWEEN WATERLINES AND OTHER UTILITIES SHALL BE 8 FEET UNLESS OTHERWISE SPECIFIED. MINIMUM VERTICAL CLEARANCE BETWEEN WATERLINE AND OTHER UTILITIES SHALL BE 12" PROVIDED CONCRETE JACKETS ARE USED, AND 18" IF NO JACKETS ARE USED.
- ALL FITTINGS (CLASS 250 MINIMUM) AND ALL GATE VALVES (CLASS 200), SHALL BE DUCTILE IRON, WITH MECHANICAL JOINTS UNLESS OTHERWISE SPECIFIED. BUTTERFLY VALVES SHALL BE CLASS 250 WITH EPOXY COATED INTERIOR UNLESS OTHERWISE SPECIFIED.
- THE CONTRACTOR SHALL PAY FOR ALL WORK, EQUIPMENT AND MATERIAL FURNISHED BY THE DWS.
- ALL CONNECTIONS TO EXISTING WATERLINES SHALL BE DONE BY THE D.W.S. CONTRACTOR SHALL PERFORM ALL NECESSARY EXCAVATION, BACKFILL, ROAD REPAIR, TRAFFIC CONTROL AND PROVIDE EQUIPMENT NECESSARY TO COMPLETE THE CONNECTION.
- WHERE WATER SHUT-OFF OF MORE THAN 3 HOURS BECOMES NECESSARY, THE CONTRACTOR, AT HIS OWN COST, SHALL PROVIDE A TEMPORARY BY-PASS LINE. THE D.W.S. ENGINEER SHALL DETERMINE BY-PASS LINE SIZE, IF NECESSARY. THE D.W.S. ENGINEER MAY REQUIRE A BY-PASS LINE, REGARDLESS OF THE EXPECTED WATER SHUT-OFF PERIOD.
- ALL PIPELINES, 4" AND LARGER IN DIAMETER, SHALL BE DUCTILE IRON, PUSH ON JOINT CLASS 52, AND ALL PIPELINES SMALLER THAN 4" IN DIAMETER SHALL BE SOFT COPPER, TYPE K, UNLESS OTHERWISE SPECIFIED.
- THE WATER LINE SHALL BE TESTED AT A MINIMUM OF 225 PSI OR 1 1/2 TIMES THE STATIC PRESSURE AT THE LOW POINT, WHICHEVER IS GREATER, UNDER DWS SUPERVISION JUST PRIOR TO PAVING.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CHLORINATION OF THE WATER SYSTEM AND SHALL BEAR ALL COSTS. THE PERSON(S) ENGAGED TO DO THE CHLORINATION WORK MUST HAVE THE APPROPRIATE LICENSE TO PERFORM THE WORK IN THE STATE OF HAWAII.
- SOLDER AND FLUX SHALL CONTAIN NO MORE THAN 0.2% LEAD.
- PIPE CUSHION FOR COPPER PIPES SHALL BE NO. 4 FINE, MANUFACTURED SAND.
- EXISTING VALVES, F.H. UNITS, VALVE BOXES, FRAMES AND COVERS DESIGNATED "REMOVE AND SALVAGE" SHALL BE CLEANED OF DIRT, SCABS AND CONCRETE AND DELIVERED TO THE RESPECTIVE DWS BASEYARD. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS BID ITEMS UNLESS SPECIFIED OTHERWISE.
- EXISTING WATER LINES, VALVES, FITTINGS AND APPURTENANCES NOT DESIGNATED "REMOVE AND SALVAGE" SHALL BE ABANDONED IN PLACE. ALL EXPOSED VALVE BOXES, VALVES, PIPES AND APPURTENANCES SHALL BE REMOVED AND DISPOSED OF PROPERLY AT NOT COST TO THE DWS.
- THE DWS WILL NOT ASSUME OWNERSHIP OF NOR GRANT ANY WATER SERVICE UNTIL THE WATER SYSTEM IS DEDICATED TO THE DWS ALONG WITH ALL NECESSARY EASEMENTS AND DOCUMENTS.
- WHEN COMPACTION TESTS ARE REQUIRED, THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE THE DWS WITH PROCTOR RESULTS OF MATERIALS TO BE USED FOR THAT PORTION OF WORK REQUIRING COMPACTION. THESE RESULTS SHALL BE CERTIFIED AND SHALL BE FURNISHED TO DWS ONE WEEK PRIOR TO COMMENCEMENT OF ROADWORK. COST FOR COMPACTION TESTS SHALL BE INCIDENTAL TO PIPELINE INSTALLATION.
- ALL NEWLY INSTALLED WATERLINES SHALL HAVE A BLUE WARNING TAPE LABELED "WATERLINE" PLACED DIRECTLY OVER THE COMPACTED CUSHION MATERIAL.
- CONSTRUCTION PROJECTS REQUIRING TEMPORARY WATER SERVICE SHALL BE METERED AND PAID FOR BY THE CONTRACTOR.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORD DRAWINGS (AS-BUILT DRAWINGS) AND THE LICENSED ENGINEER SHALL CERTIFY THE DRAWINGS AS TO ACCURACY AND SUBMIT THE DRAWINGS AND AS-BUILT TRACINGS TO THE DWS.

GRADING NOTES

- ALL GRADING WORK SHALL CONFORM TO CHAPTER 10 OF THE HAWAII COUNTY CODE. SHOULD A GRADING PERMIT BE REQUIRED, NO WORK SHALL COMMENCE UNTIL THE DEPARTMENT OF PUBLIC WORKS (DPW) APPROVES A GRADING PERMIT.
- THE CONTRACTOR SHALL REMOVE ALL SILT AND DEBRIS DEPOSITED IN DRAINAGE FACILITIES, ROADWAYS AND OTHER AREAS RESULTING FROM HIS WORK. THE COSTS INCURRED FOR ANY NECESSARY REMEDIAL ACTION BY THE DPW SHALL BE PAYABLE BY THE CONTRACTOR.
- THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AND SURROUNDING AREAS FREE FROM DUST NUISANCES. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION CONTROL RULES OF THE STATE DEPARTMENT OF HEALTH, HAR 11-60.1, FUGITIVE DUST.
- ALL GRADING OPERATIONS SHALL BE PERFORMED IN CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 55, WATER POLLUTION CONTROL AND CHAPTER 54, WATER QUALITY STANDARDS, AND TO THE EROSION AND SEDIMENTATION CONTROL STANDARDS AND GUIDELINES OF THE DEPARTMENT OF PUBLIC WORKS, COUNTY OF HAWAII.
- THE CONTRACTOR SHALL SOD OR PLANT ALL SLOPES AND EXPOSED AREAS. IMMEDIATELY AFTER THE GRADING WORK HAS BEEN COMPLETED.
- FILLS ON SLOPES STEEPER THAN 5:1 SHALL BE KEYED.
- THE CONTRACTOR SHALL INFORM THE DPW OF THE LOCATION OF THE DISPOSAL AND/OR BORROW SITE(S) REQUIRED FOR THIS PROJECT WHEN AN APPLICATION FOR A GRADING PERMIT IS MADE. THE DISPOSAL AND/OR BORROW SITE(S) MUST ALSO FULFILL THE REQUIREMENTS OF THE GRADING ORDINANCE.
- NO GRADING WORK SHALL BE DONE ON SATURDAYS, SUNDAYS AND HOLIDAYS ANYTIME WITHOUT PRIOR APPROVAL FROM THE DEPARTMENT OF PUBLIC WORKS. GRADING WORK ON NORMAL WORKING DAYS SHALL BE BETWEEN THE HOURS OF 8:00 A.M. TO 4:30 P.M.

CONSTRUCTION NOTES

- SHOULD ANY UNANTICIPATED ARCHAEOLOGICAL SITE(S) BE UNCOVERED, ALL WORK SHALL CEASE IN THE IMMEDIATE AREA AND THE DLNR, HISTORIC PRESERVATION DIVISION (327-3690) (KONA OFFICE) SHALL BE NOTIFIED. NO WORK SHALL RESUME UNTIL CLEARANCE HAS BEEN OBTAINED FROM THE HISTORIC PRESERVATION DIVISION.
- NO WORK SHALL BE DONE ON SATURDAYS, SUNDAYS, AND HOLIDAYS AT ANYTIME WITHOUT PRIOR APPROVAL FROM THE DEPARTMENT OF HAWAIIAN HOME LANDS. NORMAL WORKING HOURS SHALL BE BETWEEN 7:00 A.M. TO 3:30 P.M. MONDAY - FRIDAY.
- CONTRACTOR SHALL APPLY AND PAY FOR ALL PERMITS. PERMITS SHALL INCLUDE, BUT NOT LIMITED TO DEPARTMENT OF HEALTH NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS FOR STORM WATER, HYDROSTATIC TEST AND DEWATERING DISCHARGES (IF APPLICABLE) PRIOR TO COMMENCING CONSTRUCTION.
- THIS PROJECT SHALL BE SUBJECT TO THE DEPARTMENT OF WATER SUPPLY (DWS), COUNTY OF HAWAII, INSPECTIONS. CONTRACTOR SHALL COORDINATE WITH DWS AND DHHL FOR INSPECTIONS. AFTER CONSTRUCTION, DWS WILL DO THE OPERATION, REPAIR, AND MAINTENANCE OF THE WATER SYSTEM FACILITIES.
- UPON COMPLETION AND ACCEPTANCE OF THE PROJECT BY THE DHHL, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER ONE (1) COMPLETE SET OF CERTIFIED AS-BUILT DRAWINGS. THE AS-BUILT DRAWINGS SHALL SHOW THE ACTUAL CONSTRUCTION SO THAT ANY FUTURE RENOVATIONS OR TIE-INS CAN BE ANTICIPATED ACCURATELY. (SEE SPECIFICATIONS FOR DETAILED REQUIREMENTS)
- UPON COMPLETION AND ACCEPTANCE OF THE PROJECT BY THE DHHL, THE CONTRACTOR SHALL PREPARE AND SUBMIT TO THE ENGINEER AN ITEMIZED IN-PLACE COST LIST, TO THE SATISFACTION OF THE DEPARTMENT OF WATER SUPPLY (DWS). THIS IS REQUIRED FOR CONVEYANCE OF THE WATER SYSTEM TO DWS FOR OPERATION AND MAINTENANCE. IF THE BID PROPOSAL IS ITEMIZED, THEN THE PROPOSAL WITH AS-BUILT CHANGES NOTED WILL BE SUFFICIENT. IF THE BID PROPOSAL IS LUMP SUM, THEN THE CONTRACTOR SHALL PREPARE AN ITEMIZED IN-PLACE COST LIST FOR THE DWS. (FOR EXAMPLE, IF ALL ELECTRICAL WORK IS LUMP SUM, THEN CREATE AN ITEMIZED LIST OF EQUIPMENT INSTALLED).

DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR) NOTES:

- CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES, HARMLESS FROM AND AGAINST ANY LOSS, LIABILITY, CLAIM OR DEMAND FOR PROPERTY DAMAGE, PERSONAL INJURY, AND DEATH ARISING OUT OF ANY ACT OR OMISSION OF THE CONTRACTOR RELATING OR CONNECTED WITH THIS PROJECT.
- CONTRACTOR SHALL PROCURE AND MAINTAIN DURING THE ENTIRE PERIOD OF THIS PROJECT FROM AN INSURANCE COMPANY OR COMPANIES LICENSED TO DO BUSINESS IN THE STATE OF HAWAII, A POLICY OR POLICIES OF COMPREHENSIVE PUBLIC LIABILITY INSURANCE, IN AN AMOUNT OF \$500,000 PER INCIDENT / \$1,000,000 AGGREGATE INSURING THE STATE OF HAWAII AGAINST ALL CLAIMS FOR PERSONAL INJURY, DEATH, AND PROPERTY DAMAGE; THAT SAID POLICY SHALL COVER THE ENTIRE PROJECT AREA (TMK: (3)-1-5-08: 1, 3), INCLUDING THE DWS KEONEPOKO NUI WELL AND RESERVOIR SITE, & INCLUDING ALL IMPROVEMENTS AND GROUNDS AND ALL ROADWAYS OR SIDEWALKS ON OR ADJACENT TO THE SAID AREA IN THE CONTROL OR USE OF THE CONTRACTOR;
- CONTRACTOR SHALL NOT CAUSE OR PERMIT THE ESCAPE, DISPOSAL OR RELEASE OF ANY HAZARDOUS MATERIALS EXCEPT AS PERMITTED BY LAW. CONTRACTOR SHALL NOT ALLOW THE STORAGE OR USE OF SUCH MATERIALS IN ANY MANNER NOT SANCTIONED BY LAW OR BY THE HIGHEST STANDARDS PREVAILING IN THE INDUSTRY FOR THE STORAGE AND USE OF SUCH MATERIALS, NOR ALLOW TO BE BROUGHT ONTO THE PROJECT AREA ANY SUCH MATERIALS EXCEPT TO USE IN THE ORDINARY COURSE OF BUSINESS OF THE CONTRACTOR, AND THEN ONLY AFTER WRITTEN NOTICE IS GIVEN TO THE STATE OF THE IDENTITY OF SUCH MATERIALS AND UPON THE STATE'S CONSENT WHICH MAY BE WITHHELD AT THE STATE'S SOLE AND ABSOLUTE DISCRETION. IF ANY LENDER OR GOVERNMENTAL AGENCY SHALL EVER REQUIRE TESTING TO ASCERTAIN WHETHER OR NOT THERE HAS BEEN ANY RELEASE OF HAZARDOUS MATERIALS BY THE CONTRACTOR, THEN THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REASONABLE COST THEREOF.

CONTRACTOR AGREES TO INDEMNIFY, DEFEND, AND HOLD THE STATE HARMLESS, FROM ANY DAMAGES AND CLAIMS RESULTING FROM THE RELEASE OF HAZARDOUS MATERIALS ON THE PROJECT AREA OCCURRING WHILE THE CONTRACTOR IS IN POSSESSION, OR ELSEWHERE IF CAUSED BY THE CONTRACTOR.

FOR PURPOSES OF THIS "HAZARDOUS MATERIAL" SHALL MEAN ANY POLLUTANT, TOXIC SUBSTANCE, HAZARDOUS WASTE, HAZARDOUS MATERIAL, HAZARDOUS SUBSTANCE, OR OIL AS DEFINED IN OR PURSUANT TO THE RESOURCE CONSERVATION AND RECOVERY ACT, AS AMENDED, THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT, AS AMENDED, THE FEDERAL CLEAN WATER ACT, OR ANY ORDINANCE, RULE, OR BY-LAW, WHETHER EXISTING AS OF THE DATE HEREOF, PREVIOUSLY ENFORCED, OR SUBSEQUENTLY ENACTED;

- CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STATUTES, ORDINANCES, RULES AND REGULATIONS OF THE FEDERAL, STATE AND COUNTY OF HAWAII GOVERNMENTS RELATIVE TO THE RIGHTS GRANTED HEREIN;
- IN THE EVENT ANY UNANTICIPATED SITES OR REMAINS SUCH AS BONE OR CHARCOAL DEPOSITS, HUMAN BURIALS, ROCK OR CORAL ALIGNMENTS, PAVINGS OR WALLS ARE ENCOUNTERED, CONTRACTOR SHALL STOP WORK AND CONTACT THE STATE HISTORIC PRESERVATION DIVISION AT (808) 692-8015, (601 KAMOKILA BLVD., ROOM 555, KAPOLEI, HI., 96707) IMMEDIATELY;
- CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE ANY AND ALL REFUSE IT PRODUCES WITHIN THE PROJECT AREA;
- NO OPEN BURNING OF ANY TYPE SHALL BE PERMITTED ON THE PROJECT AREA AND/OR THE SURROUNDING STATE LANDS;
- CONTRACTOR SHALL USE APPROPRIATE PRECAUTIONS AND MEASURES TO MINIMIZE INCONVENIENCES TO SURROUNDING RESIDENTS, LANDOWNERS, AND THE PUBLIC IN GENERAL; AND
- THE DEPARTMENT OF LAND AND NATURAL RESOURCES, LAND DIVISION, RESERVES THE RIGHT TO IMPOSE ADDITIONAL TERMS AND CONDITIONS AT ANY TIME IF IT DEEMS NECESSARY WHILE THIS PROJECT IS UNDER CONSTRUCTION, TO BEST SERVE THE INTEREST OF THE STATE.

SUBSURFACE INVESTIGATION REPORT RECOMMENDATIONS NOTES

- SITE PREPARATION** - PRIOR TO THE START OF THE ACTUAL GRADING OPERATIONS, THE SITE SHALL BE CLEARED AND GRUBBED TO REMOVE THE SURFACE VEGETATION, ORGANICS, AND OTHER DELETERIOUS MATERIALS. THIS MATERIAL WOULD BE UNSUITABLE FOR USE AS FILL, AND SHALL BE WASTED OFF SITE. THE CLEARING AND GRUBBING SHALL BE DONE IN ACCORDANCE WITH SECTION 201 OF THE 2005 HAWAII STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (STANDARD SPECIFICATIONS), ISSUED BY: STATE OF HAWAII, DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION.
- SITE GRADING** - AFTER THE SITE PREPARATION HAS BEEN COMPLETED, THE GRADING OPERATIONS MAY BEGIN TO GENERATE THE PLANNED FINISHED GRADES. THE USE OF HEAVY ROCK EXCAVATING EQUIPMENT, SUCH AS LARGE RIPPER-EQUIPPED DOZERS AND TRACKHOE-MOUNTED HOERAMS, SHOULD BE ANTICIPATED TO FACILITATE THE REMOVAL OF THE HARD MASSIVE BASALT, WHICH WAS ENCOUNTERED AT DEPTHS OF LESS THAN 1 FOOT IN THE TEST BORINGS AND IS EXPOSED AT THE GROUND SURFACE THROUGHOUT MOST OF THE GENERAL SITE AREA.
- AFTER THE SITE GRADING HAS ATTAINED THE FINISH SUBGRADE LEVELS, THE TANK PAD SHALL BE PROOF-ROLLED TO DETERMINE IF ANY LOOSE CLINKER POCKETS, SOFT SPOTS, OR LARGE VOIDS IN THE UNDERLYING ROCK EXIST. THE PROOF-ROLLING SHALL CONSIST OF AT LEAST 6 PASSES OF A D-9 DOZER, OR EQUIVALENT, AND SHALL EXTEND AT LEAST 5 FEET LATERALLY BEYOND THE PERIMETER OF THE TANK AND ITS FOUNDATIONS. ANY POCKETS OF ASH OR LOOSE CLINKER ENCOUNTERED DURING THE PROOF-ROLLING OPERATIONS SHALL BE REMOVED DOWN TO THE UNDERLYING BASALT, AND THE RESULTING DEPRESSION ROCK BACKFILLED IN ACCORDANCE WITH THESE RECOMMENDATIONS. WHERE CAVITIES OR VOIDS WITHIN THE ROCK ARE ENCOUNTERED, THEY SHALL BE FILLED WITH LOW-STRENGTH CONCRETE. SHOULD LARGER, I.E., GREATER THAN 2 FEET IN DEPTH, VOIDS OR CAVITIES BE ENCOUNTERED, FGE, LTD. SHOULD BE NOTIFIED FOR ADDITIONAL RECOMMENDATIONS.
- THE EXCAVATED SURFACE ASH AND CLINKER MAY BE RE-USED AS FILL AND BACKFILL PROVIDED ALL VEGETATION, DELETERIOUS MATERIALS, AND SOIL CLODS AND ROCK PARTICLES GREATER THAN 3 INCHES IN DIAMETER ARE REMOVED AND THEY ARE PLACED AND COMPACTED IN ACCORDANCE WITH THESE RECOMMENDATIONS. THE EXCAVATIONS WITHIN THE BASALT WILL LIKELY GENERATE MAINLY LARGE COBBLE- AND BOULDER-SIZED ROCK FRAGMENTS, WHICH ARE UNSUITABLE FOR USE IN THIN FILLS OR AS UTILITY TRENCH BACKFILL, WITHOUT SIGNIFICANT CRUSHING.

DUE TO THE RELATIVELY INSIGNIFICANT AMOUNTS OF THE SURFACE SOILS AND THE OVERSIZED MATERIALS ANTICIPATED TO BE GENERATED FROM THE ROCK EXCAVATIONS, THE USE OF IMPORTED FILL SHOULD BE ANTICIPATED TO COMPLETE THE SITE GRADING AND FOUR UTILITY TRENCH BACKFILL. IMPORTED FILL SHALL CONSIST OF LOW EXPANSION GRANULAR SOIL, FREE OF ORGANICS, ROCKS AND CLODS GREATER THAN 3 INCHES IN DIAMETER. IT SHALL POSSESS A PLASTICITY INDEX OF LESS THAN 10 AND NO MORE THAN 1.5 PERCENT SWELL WHEN TESTING IN ACCORDANCE WITH ASTM D1883.

- FILL AND BACKFILL SHALL BE PLACED IN RELATIVELY LEVEL LIFTS NO GREATER THAN 8 INCHES IN LOOSE THICKNESS, MOISTURE CONDITIONED TO WITHIN 3 PERCENT OF ITS OPTIMUM MOISTURE CONTENT, AND UNIFORMLY COMPACTED TO AT LEAST 95 PERCENT RELATIVE COMPACTION.
- CUT SLOPES WITHIN THE BASALT SHALL BE SLOPED NO STEEPER THAN 1 HORIZONTAL TO 1 VERTICAL (1H:1V) FOR SLOPE HEIGHTS OF UP TO 5 FEET. SLOPES EXCEEDING THIS HEIGHT ARE NOT ANTICIPATED AT THIS TIME AND SHOULD BE INDIVIDUALLY EVALUATED, SHOULD THEY OCCUR.
- UTILITIES** - UTILITIES SHALL BE INSTALLED AND BACKFILLED IN ACCORDANCE WITH THE GRADING RECOMMENDATIONS OF THIS REPORT AND THE SPECIFIC REQUIREMENTS OF EACH PARTICULAR UTILITY. UTILITY BACKFILLS SHALL BE PLACED AND COMPACTED UTILIZING THE APPROPRIATE MECHANICAL COMPACTORS AROUND AND ABOVE THE PIPES. JETTING OR PONDING OF THE BACKFILL AS A METHOD TO ACHIEVE COMPACTION IS NOT ALLOWED.
- UTILITIES MAY BE FOUNDED IN PROPERLY COMPACTED FILL OR THE INTACT BASALT. WHERE SOFT SPOTS ARE ENCOUNTERED AT THE BOTTOM OF UTILITY EXCAVATIONS, THEY SHALL BE REMOVED DOWN TO THE PROPERLY COMPACTED FILL OR INTACT BASALT AND THE RESULTING DEPRESSION BACKFILLED IN ACCORDANCE WITH THE GRADING RECOMMENDATIONS. WHERE BOULDERS OR INTACT BASALT ARE ENCOUNTERED AT THE UTILITY INVERT LEVEL, THEY SHALL BE OVEREXCAVATED SUFFICIENTLY TO ALLOW THE PLACEMENT OF THE APPROPRIATE THICKNESS OF BEDDING INDICATED IN THE STANDARD SPECIFICATIONS. AT LEAST 6 INCHES OF PIPE CUSHION SHALL BE PLACED BENEATH THE PIPES FOUNDED IN BASALT.
- THE USE OF ROCK EXCAVATING EQUIPMENT SHOULD BE ANTICIPATED TO FACILITATE THE REMOVAL OF INTACT ROCK ENCOUNTERED IN THE UTILITY TRENCHES.

EARTHWORK RECAPITULATION

	EXCAVATION (C.Y.)	EMBANKMENT (C.Y.)	AREA OF GRADING (ACRES)
WELL SITE	6,550	0	0.9
ACCESS ROAD	4,379	1,230	3.6
TOTAL	10,929	1,230	4.5

EARTHWORK SUMMARY

EXCAVATION = 10,929 C.Y.

EMBANKMENT = 1,230 C.Y.

AREA OF GRADING = 4.5 AC.

- THE EARTHWORK QUANTITIES ABOVE ARE APPROXIMATE AND ARE SHOWN FOR PERMIT PURPOSE ONLY.

WATER NOTES (DEPARTMENT OF HEALTH)

CHLORINATION OF WATER SYSTEMS

- WATER MAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA STANDARD FOR DISINFECTING WATER MAINS, ANSI/AWWA C651-99, SECTION 4.4.3 CONTINUOUS-FEED METHOD.
- THE STORAGE TANK SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA STANDARD FOR DISINFECTING WATER-STORAGE FACILITIES, ANSI/AWWA C652-92, SECTION 4.1, CHLORINATION METHOD 1.
- LIQUID CHLORINE OR CALCIUM HYPOCHLORITE THAT HAS BEEN TESTED AND CERTIFIED AS MEETING THE SPECIFICATIONS OF ANSI/NSF STANDARD 60, DRINKING WATER TREATMENT CHEMICALS - HEALTH EFFECTS, SHALL BE USED FOR THE CHLORINATION OF THE WATER MAINS AND STORAGE TANK.
- PRIOR TO CHLORINATION, THE WATER MAINS AND SHALL BE THOROUGHLY FLUSHED.
- THE INTERIOR SURFACES OF THE WATER MAINS SHALL BE EXPOSED TO THE CHLORINATING SOLUTION, BY COMPLETELY FILLING THE MAIN TO REMOVE ALL AIR POCKETS, FOR A MINIMUM OF 24 HOURS AND THE FREE CHLORINE RESIDUAL SHALL NOT BE LESS THAN 10 PPM AFTER SUCH TIME.
- SHOULD CALCIUM HYPOCHLORITE BE USED, NO SOLID AND/OR UNDISSOLVED PORTION OF THE COMPOUND SHALL BE INTRODUCED INTO ANY SECTION OF THE WATER MAINS AND STORAGE TANK TO BE CHLORINATED.
- AT THE END OF THE 24 HOUR DISINFECTION PERIOD, REPRESENTATIVE SAMPLES SHALL BE TAKEN AND ANALYZED TO ASSURE A FREE CHLORINE RESIDUAL OF AT LEAST 10 PPM.
- SHOULD THE FREE CHLORINE RESIDUAL RESULTS INDICATE ADEQUATE CHLORINATION, THE WATER MAINS AND STORAGE TANK SHALL BE THOROUGHLY FLUSHED AND FILLED WITH WATER FROM THE EXISTING SYSTEM AND AGAIN TESTED FOR FREE CHLORINE RESIDUAL. THE FLUSHING SHALL BE CONSIDERED ADEQUATE IF THE FREE CHLORINE RESIDUAL TEST RESULTS INDICATE THAT THE WATER IN THE WATER MAINS AND STORAGE TANK HAS A COMPARABLE CHLORINE RESIDUAL AS THE WATER IN THE EXISTING SYSTEM.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER DISPOSAL OF CHLORINATED WATER TO SAFEGUARD PUBLIC HEALTH AND ENVIRONMENT IN ACCORDANCE WITH APPLICABLE STATE DEPARTMENT OF HEALTH REQUIREMENTS. A NEUTRALIZING CHEMICAL SHALL BE APPLIED TO THE WATER TO BE WASTED TO THOROUGHLY NEUTRALIZE THE CHLORINE RESIDUAL REMAINING IN THE WATER IN ACCORDANCE WITH AWWA C651-99, SECTION 4.5.2, AND APPENDIX C.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FROM THE DEPARTMENT OF HEALTH, CLEAN WATER BRANCH PRIOR TO THE START OF CONSTRUCTION, FOR THE DISPOSAL OF WATER USED FOR HYDROTESTING AND CHLORINATION.
- FOLLOWING THE ACCEPTABLE FLUSHING OF THE WATER MAINS, TWO CONSECUTIVE SETS OF ACCEPTABLE SAMPLES, TAKEN AT LEAST 24 HOURS APART, FROM REPRESENTATIVE POINTS SHALL BE TAKEN AND SUBJECTED TO MICROBIOLOGICAL TESTS. FOR WATERLINES, AT LEAST ONE SET OF SAMPLES SHALL BE COLLECTED FROM EVERY 1,200 FEET OF THE NEW WATER MAIN, PLUS ONE FROM THE END OF THE LINE AND AT LEAST ONE SET FROM EACH BRANCH. FOR THE STORAGE TANK, THE SAMPLE SHALL BE COLLECTED FROM THE TANK'S EFFLUENT LINE SAMPLE TAP. POSITIVE OR INVALID TEST RESULTS WILL NOT BE ACCEPTABLE AND THE PROCESS WILL BE REPEATED.
- ALL MEASUREMENTS FOR CHLORINE RESIDUAL SHALL BE ANALYZED USING E.P.A. APPROVED METHODS FOR DRINKING WATER.
- ALL MICROBIOLOGICAL TESTS SHALL BE PERFORMED BY A LABORATORY APPROVED BY THE DEPARTMENT OF HEALTH, STATE OF HAWAII.
- THE DEVELOPER/CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH ALL OF THE FOREGOING.
- SEE ANSI/AWWA C651-99, SEC. 4.3.6 FOR SWABBING CHLORINATION PROCEDURES.

OTHER

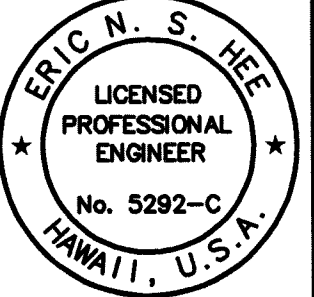

- ALL MATERIALS (PIPE, PIPE LUBRICANTS, PAINTS, SEALANTS, FORM OIL, CONCRETE ADMIXTURES, ETC.) IN DIRECT CONTACT WITH THE POTABLE WATER SHALL HAVE NATIONAL SANITATION FOUNDATIONS (NSF) APPROVALS. THE CONTRACTOR SHALL SUBMIT THESE APPROVALS TO THE DEPT. OF WATER FOR REVIEW AND APPROVAL PRIOR TO ITS APPLICATION.

ENVIRONMENTAL PROTECTION NOTES (DEPARTMENT OF HEALTH)

- IN ACCORDANCE WITH CHAPTER 11-55, WATER POLLUTION CONTROL AND CHAPTER 11-54, WATER QUALITY STANDARDS, TITLE 11, STATE ADMINISTRATIVE RULES, THE PROPERTY OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR ENSURING THAT THE BEST MANAGEMENT PRACTICE (BMP) TO MINIMIZE OR PREVENT THE DISCHARGE OR SEDIMENTS, DEBRIS, AND OTHER WATER POLLUTANT INTO STATE WATERS IS PROVIDED.

ASPHALTIC CONCRETE (AC) PAVEMENT NOTE

- CONSTRUCTION OF ALL ASPHALTIC CONCRETE (AC) PAVEMENT SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE SECTIONS OF THE CURRENT "HAWAII STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, OF THE STATE DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION. THIS SUPERSEDES SECTION 303.32 (ASPHALTIC CONCRETE PAVEMENT) OF THE WATER SYSTEM STANDARDS.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED	
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.					
ENGINEERS SURVEYORS HAWAII, INC.					
					
 ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 MON. 885-4590 KAMUELA					
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR</b> <b>AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII					
NOTES					
FILE	POCKET	FOLDER	NO.		



Y:\1985\85-180\13 New Makuu Water Working Folder\C-02\_NOTES AND DETAILS (2012).dwg Wed, Jun 06 2012 - 3:30pm  
85-180.10 ENSH

NOTES FOR CONSTRUCTION  
WITHIN STATE RIGHT-OF-WAY

- Permit construction plans shall be valid for a period of one year from the date of approval thereof. In the event construction does not commence within this one-year period, the applicant will be required to resubmit the construction plans to the State Highways Division, Hawai'i District Office, for review and approval.
- The Contractor shall obtain a PERMIT TO PERFORM WORK UPON STATE HIGHWAYS from the State Highway Division, Hawai'i District Office, at 50 Makaala Street, Hilo, HI 96720, before starting any work within the state highway right-of-way.
- Unless otherwise specified, all references to "Engineer" shall refer to the Hawaii District Engineer, at the above address, or his representative. All references to "traffic" shall include both motorized and non-motorized traffic (including pedestrians and bicyclists), where the context may so apply.
- Construction and restoration of all existing highway facilities within State right-of-way shall be done in accordance with all applicable sections of the current Standard Specifications for Road, Bridge, and Public Works Construction, and the Specifications for Installation of Miscellaneous Improvements Within State Highways, of the State Department of Transportation's Highways Division.
- The Contractor shall provide, install, and maintain all necessary signs, lights, flares, barricades, markers, cones, and other protective devices and shall take all necessary precautions for the protection, convenience, and safety of the traveling public. All such protective measures and devices shall conform with the "Administrative Rules of Hawai'i Governing the Use of Traffic Control Devices at Work Sites on, or Adjacent to, Public Streets and Highways", adopted by the Director of Transportation, and the current U.S. Federal Highway Administration "Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI - Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incidental Management Operations". If traffic may be affected in any way during construction, a traffic control plan shall be included in the construction plans and must be approved by the Engineer prior to the issuance of the permit.
- All regulatory, guide, construction signs, and barricades shall be of high intensity reflective sheeting.
- Pavement striping shall be done by the Contractor, and shall be replaced in kind.
- The contractor shall reference to the satisfaction of the Engineer, all existing traffic signs, posts, and pavement markings prior to the commencement of construction. The contractor shall replace or repair all traffic signs, posts and pavement markings disturbed by his activities, at no additional cost to the State.
- All lanes shall be open to traffic during the morning peak hours from 6:30 a.m. to 8:30 a.m. and during the afternoon peak hours from 3:30 p.m. to 5:30 p.m., and during off-work hours. Free flow of traffic shall be maintained at all other times, except when otherwise permitted by a Traffic Control Plan approved by the Engineer.
- Contractor shall inform the State permit office, (808) 933-8866, at least two (2) days prior to closing any lanes.
- Temporary road closures require advance approval in writing from the Engineer and a *Notice to Motorists* may be required. Submit the notice to the Engineer for review and acceptance a minimum of 4 weeks prior to publication.
- Unprotected pavement dropoffs greater than 2" within 8 feet of the travel way shall not be allowed during non-working hours, except as approved by the Engineer in writing.
- Clear shoulder areas shall be maintained for bicyclists and pedestrian traffic at all times. If one shoulder is to be closed, appropriate signs shall be posted directing bicyclists and pedestrians to use alternate shoulder area.
- No material and/or equipment shall be stockpiled or otherwise stored within highway right-of-way, except at locations designated in writing and approved by the Engineer.
- The minimum pavement structure shall consist of:
  - Residential Driveways:
    - 2" Hot Mix Asphalt (HMA) pavement on 6" aggregate base course or 2" HMA pavement on 2-1/2" Hot Mix Glassphalt Base (HMGB) course or Hot Mix Asphalt Base (HMAB) course.
    - 4" of Class "A" concrete reinforced with 6"x 6"-W2.9xW2.9 wire mesh on 12" aggregate subbase if deemed necessary by the Engineer.
  - Commercial driveways, side roads and utility installations on minor highways:
    - 2-1/2" HMA pavement, 8" aggregate base course on 12" aggregate subbase, or 2-1/2" HMA pavement on 8" HMGB course or HMAB course.
    - 6" of Class "A" concrete reinforced with 6"x 6"-W2.9xW2.9 wire mesh on 12" aggregate subbase if deemed necessary by Engineer.
  - Channelized intersections and utility installations on major highways:
    - 4" HMA pavement, 8" aggregate base course on 12" aggregate subbase, or 4" HMA pavement on 8" HMGB course or HMAB course, or match existing pavement structure, which ever is greater.

NOTES FOR CONSTRUCTION WITHIN  
STATE RIGHT-OF-WAY (CONT.)

- Compaction tests shall be taken in accordance with the current "Specifications for Installation of Miscellaneous Improvements Within State Highways", as follows:
  - Subbase: 1 compaction test(s) per lift each 300 Lin. Ft. of roadway.
  - Base Course: 1 compaction test(s) per lift each 200 Lin. Ft. of roadway.
  - 1 compaction test(s) per lift for each 200 lineal feet of trench.
  - A copy of the test results shall be submitted to the Engineer for acceptance.
- No open trenches shall be permitted within the Clear Zone, defined by the current edition of the *AASHTO Roadside Design Guide*, except where specified in the approved traffic control plan, or as approved by the Engineer in writing.
- No trench shall be opened more than 500 feet in advance of the installed and tested pipe and/or ductline.
- Prior to commencing trench excavation work, the Contractor shall take a surface profile along the centerline of the proposed utility trench. This information shall be used in verifying that the roadway has been restored to its original condition. A copy of the trench profile shall be submitted to the Engineer.
- The Contractor shall be required to provide adequate, safe, non-skid bridging material over the trench, including shoring, when trenching in pavement areas to handle all types of vehicular traffic. Smooth riding tapers shall be provided for pavement transitions and advanced warning signs shall be posted. Prior to installing such bridging material, the contractor shall submit to the Engineer for acceptance, drawings stamped by a licensed structural engineer.
- Longitudinal drainage along the highway shall be maintained at all times.
- Existing highway drainage systems shall remain functional at all times.
- The Contractor shall schedule his work around the Ironman Triathlon Race activities, held annually in October and any other permitted race. All pavement and shoulder areas shall be restored to smooth riding condition, completely cleaned with pavement striping installed, three weeks prior to the event. No construction work within the State right-of-way shall be permitted during this period that interferes with the preparation and running of the race. Prior to beginning construction, the Contractor shall check with the Hawai'i District Permit Office at (808) 933-8866 and the Police Department, Traffic Services Branch, at (808) 961-2227, for any permitted race.
- The Contractor shall repair all damage caused by the Contractor's operations. Any such, repair work shall be done by the Contractor at no additional cost to the State. Damages to any existing facilities shall be immediately reported to the respective utility companies, County or State agency.
- Contractor shall provide the State Highways Division, Hawai'i District Office, with "As Built" drawings upon completion of the work. This shall be done prior to the Department's release of the permit bond.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
(NPDES) REQUIREMENTS FOR PERMIT PROJECTS WITHIN  
STATE HIGHWAY RIGHT-OF-WAY

- The Contractor shall obtain and comply with the *National Pollutant Discharge Elimination System (NPDES) Requirements for Hawaii District Permit Projects*. This is available at the Hawaii District office at 50 Makaala Street, Hilo, Hawaii (Ph. 933-8866). Due to potential cost impacts, the Contractor needs to be aware of these requirements.
- All Contractor(s) involved with any construction project or permit projects within the State Highways right-of-way shall follow the guidelines of the Highways Division's "Construction Best Management Practices Field Manual" and the "Rules Relating to Soil Erosion Standards and Guidelines" of the City and County of Honolulu. Copies of these documents shall be maintained on site at all times. The respective documents may be downloaded from the web sites at <http://www.stormwaterhawaii.com/resources/> and at <http://www.usspecbook.com/files/specs/rules-relating-to-soil-erosion.pdf>.
- The Contractor shall complete and submit a *Contractor's Certification of NPDES Compliance*, including completion of the *Best Management Practice (BMP) Checklist* and submittal of a written BMP plan and drawings, prior to issuance of the "Permit to Perform Work Upon State Highways" or "Application & Permit For The Occupancy And Use Of State Highways Right-of-way".
- The Contractor shall obtain a General NPDES permit from the Department of Health, for any project 1 acre or greater in area, prior to the issuance of the "Permit to Perform Work Upon State Highways".

BMP NOTES

TEMPORARY EROSION CONTROL MEASURES

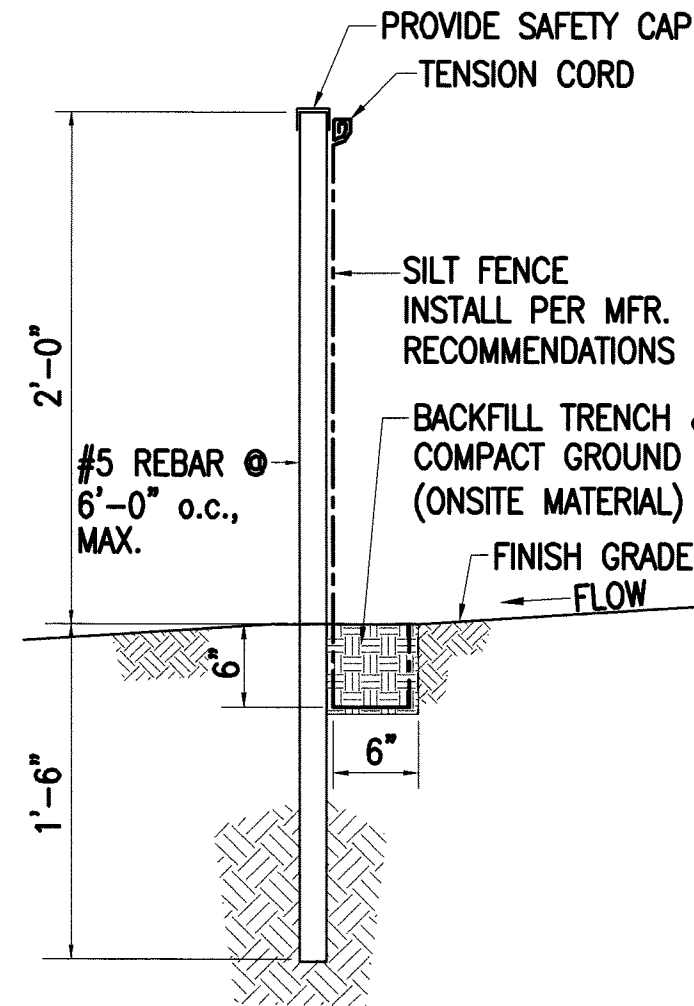
- PRIOR TO CLEARING LAND FOR GRADING, TEMPORARY EROSION CONTROL MEASURES, SUCH AS SILT FENCES SHALL BE INSTALLED.
- OPENING AND CLEARING OF LAND FOR GRADING SHALL BE PERFORMED INCREMENTALLY TO MINIMIZE EROSION POTENTIAL.
- AREAS NOT WITHIN THE LIMITS OF CLEARING AND GRUBBING SHALL REMAIN VEGETATED DURING GRADING OPERATIONS.
- SILT WHICH HAS ACCUMULATED ON SILT FENCE SHALL BE REMOVED AND DISPOSED OF ON A BI-WEEKLY BASIS.
- WHEN CLEARED OR GRUBBED AREAS ARE NOT TO BE GRADED OR DISTURBED FOR 14 DAYS OR MORE, SEED, PLANT OR HYDROSEED TEMPORARY VEGETATION. ALTERNATIVES TO GRASS INCLUDE 2" MINIMUM STRAW MULCH COVER, EROSION BLANKETS WITH ANCHORS, 6-MIL PLASTIC SHEETS, SEDIMENT TRAPS OR PONDS, OR INTERCEPTOR DIKES/SWALES. SURFACE FLOW FROM ABOVE AN EXPOSED SLOPE SHALL NOT BE ALLOWED TO FLOW OVER THE SLOPE WITHOUT PROTECTION. SLOPE PROTECTION SHALL BE USED ON AREA WITH SLOPES GREATER THAN 50% AND ON AREAS OF MODERATE SLOPES THAT ARE PRONE TO EROSION.
- STOCKPILES SHALL NOT BE LOCATED IN DRAINAGE WAYS OR OTHER AREAS OF CONCENTRATED FLOWS. SEDIMENT TRAPPING DEVICES SUCH AS FENCES, TRAPS, BASINS OR BARRIERS SHALL BE USED AROUND THE BASE OF STOCKPILES.
- SEDIMENT FENCES OR BARRIER SHALL BE DOWN SLOPE OF ALL DISTURBED AREAS OR STOCKPILE AREAS.
- CUT AND FILL SLOPES SHALL BE PROTECTED IN 5' VERTICAL SEQUENTIAL INCREMENTS AS CONSTRUCTION PROGRESSES.
- ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED PRIOR TO REMOVING EROSION AND SEDIMENT MEASURES. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED. TRAPPED SEDIMENT AN AREAS OF DISTURBED SOIL WHICH RESULT FROM THE REMOVAL OF THE TEMPORARY MEASURES SHALL BE IMMEDIATELY, PERMANENTLY STABILIZED.
- THE CONTRACTOR SHALL MAINTAIN ALL TEMPORARY BMP MEASURES UNTIL THE ENTIRE AREA IS COMPLETELY STABILIZED. ALL BMP MEASURES SHALL BE REMOVED IMMEDIATELY, AFTER THE AREA IS COMPLETELY STABILIZED.

PERMANENT BEST MANAGEMENT PRACTICE (BMP's):

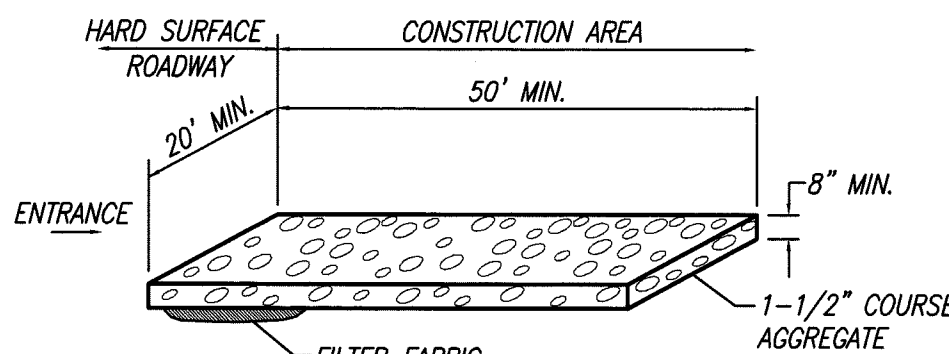
- CONSTRUCT PAVEMENT FOR ROAD, DRIVEWAY AND PARKING.
- CONSTRUCT BUILDINGS AND RESERVOIR.
- GRASSING OF EXPOSED AREAS.
- CONSTRUCT PERMANENT DRAINAGE SYSTEM.

NOTES FOR PERMIT TO PERFORM WORK UPON STATE HIGHWAYS

- APPLICANT'S ATTENTION IS CALLED TO THE DEPARTMENT OF TRANSPORTATION'S POLICY FOR THE UTILITY COMPANY'S RIGHT TO OCCUPY THE HIGHWAY RIGHT-OF-WAY. BE ADVISED THAT THE PERMIT WORK WILL NOT BE ACCEPTED UNTIL ALL OF THE CONDITIONS AND REQUIREMENTS FROM THE HIGHWAYS DIVISION, RIGHT-OF-WAY BRANCH HAVE BEEN SATISFIED. CONTRACTOR SHALL COORDINATE WITH DHHL PROJECT ENGINEER TO VERIFY THAT REQUIREMENTS HAVE BEEN MET.
- CONTRACTOR SHALL SUBMIT BMPs AND TRAFFIC HAZARD MITIGATION FOR UNPAVED AREAS WHEN SUBMITTING THE PERMIT TO PERFORM WORK UPON STATE HIGHWAYS.
- PROVIDE A COMPLETE COPY OF THE DOH NPDES PERMIT, INCLUDING THE NOTICE OF INTENT (NOI) AND NOTICE OF GENERAL PERMIT COVERAGE (NGPC) WHEN SUBMITTING THE PERMIT TO PERFORM WORK UPON STATE HIGHWAYS TO THE HIGHWAYS DIVISION, HAWAII DISTRICT. CONTRACTOR SHALL OBTAIN DOH NPDES NOI AND NGPC FROM THE DHHL PROJECT ENGINEER, AND COMPLETE THE PERMIT.
- CONTRACTOR SHALL PROVIDE PROOF OF H.R.S. CHAPTER 343 COMPLIANCE (E.A. DOCUMENTATION) WHEN SUBMITTING APPLICATION FOR PERMIT TO PERFORM WORK UPON STATE HIGHWAYS. CONTRACTOR SHALL OBTAIN THIS FROM THE DHHL PROJECT ENGINEER: A COPY OF "FINAL ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT" FOR MAKUU OFFSITE WATER SYSTEM PHASE 2. ANY QUESTIONS PERTAINING TO H.R.S. CHAPTER 343-5, CALL MR. ROBERT TAIRA AT 808-933-0498.
- CONTRACTOR SHALL SUBMIT TWO SETS OF THE FINAL PLAN AND OBTAIN A PERMIT TO PERFORM WORK UPON STATE HIGHWAYS BEFORE STARTING ANY WORK WITHIN THE HIGHWAY RIGHT-OF-WAY (R/W). SHEETS TO BE SUBMITTED TO DOT, PERTAINING TO WORK IN THE R/W ARE: T-1, C-1, C-2, C-3, C-11, C-14, C-14A, C-14B, C-26 AND C-28.
- THE INSTALLATION SHALL COMPLY WITH CHAPTER 105 OF TITLE 19, ENTITLED "ACCOMMODATION AND INSTALLATION OF UTILITIES ON STATE HIGHWAYS AND FEDERAL AID SECONDARY COUNTY HIGHWAYS."
- WHEN FILLING OUT THE PERMIT, REFER TO DOT APPROVAL LETTER NO. HWY-H 12-2.0038 AND DATE FEBRUARY 22, 2012. CONSTRUCTION MUST START WITHIN ONE YEAR OF THIS DATE. IF IT DOES NOT, THE PLANS SHALL BE RESUBMITTED FOR REVIEW AND APPROVAL.



SILT FENCE DETAIL  
NOT TO SCALE



TEMPORARY STABILIZED CONSTRUCTION ENTRANCE  
NOT TO SCALE

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED	

THIS WORK WAS PREPARED BY ME  
OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.

*Eric N. S. Hee*  
LICENSE EXPIRES 4/30/2014



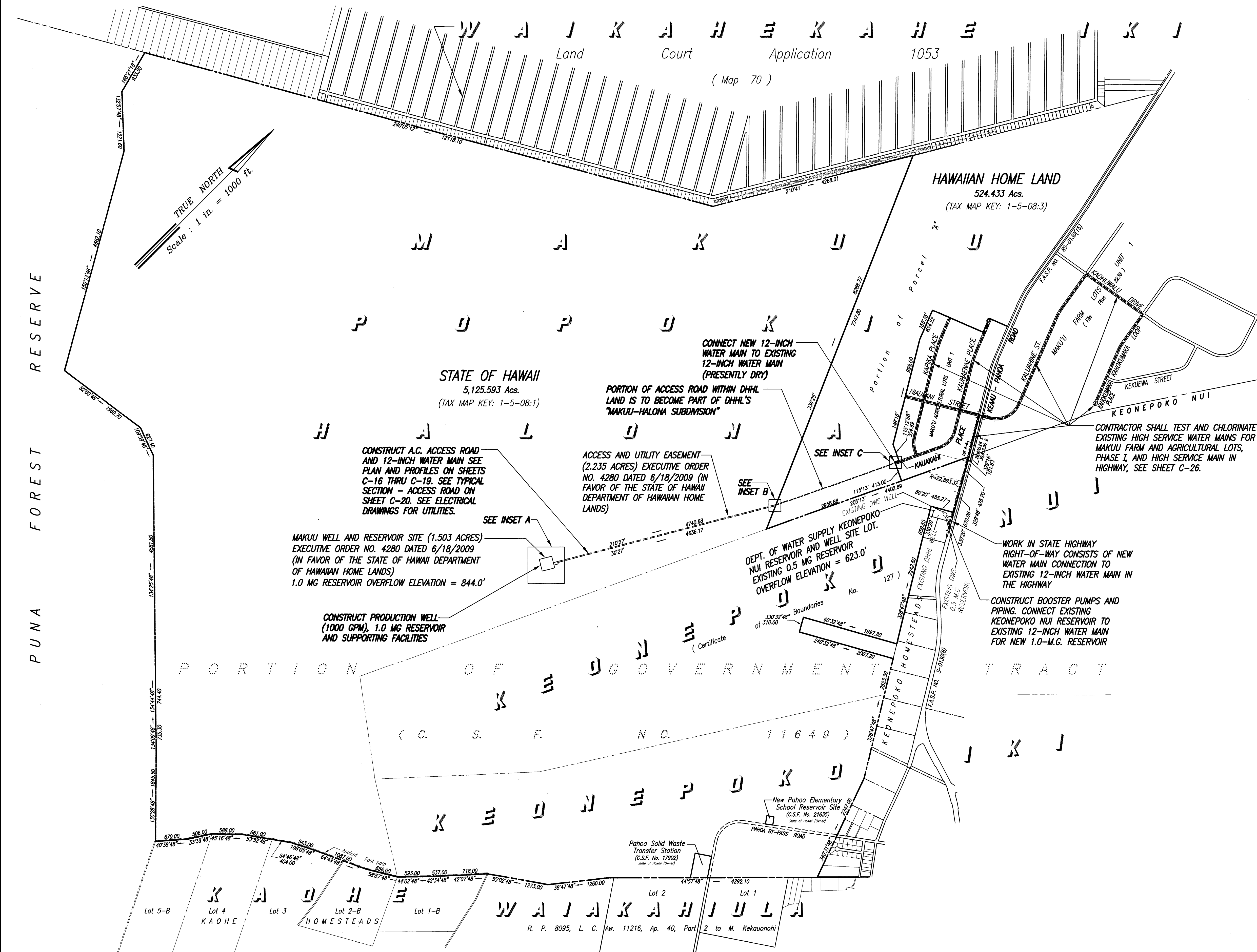
ENGINEERS SURVEYORS  
HAWAII, INC.  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**NOTES AND DETAILS**

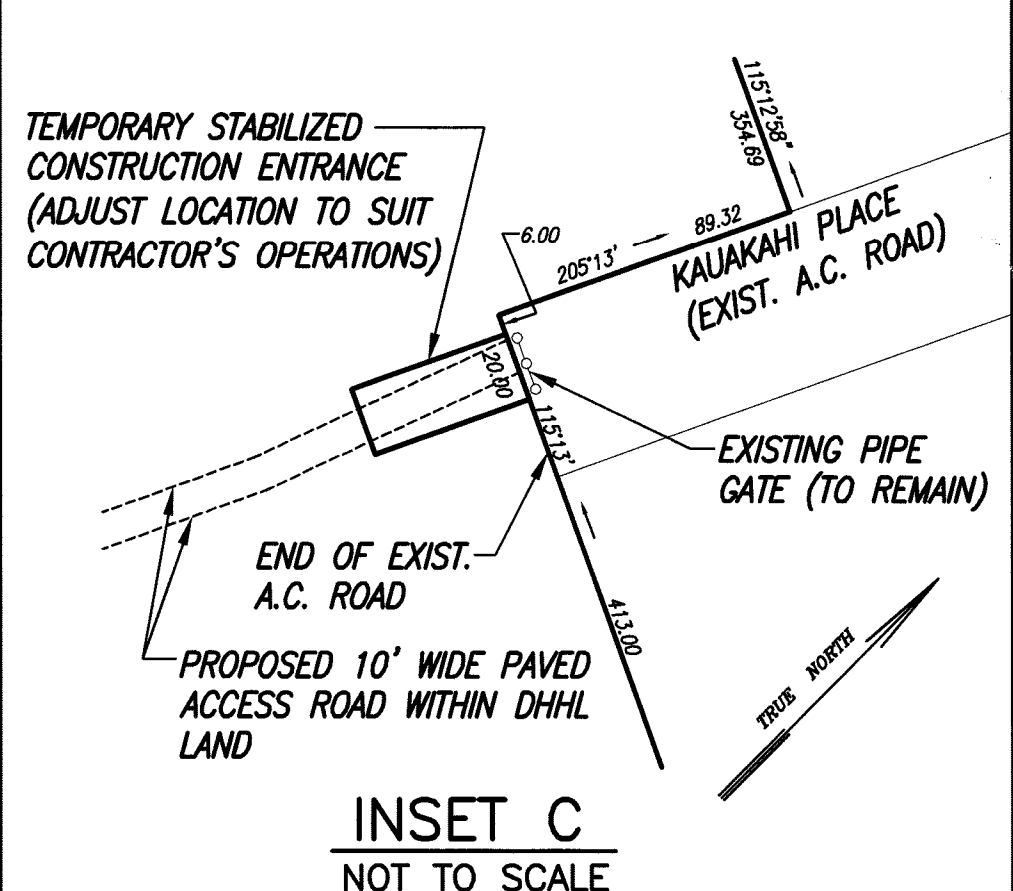
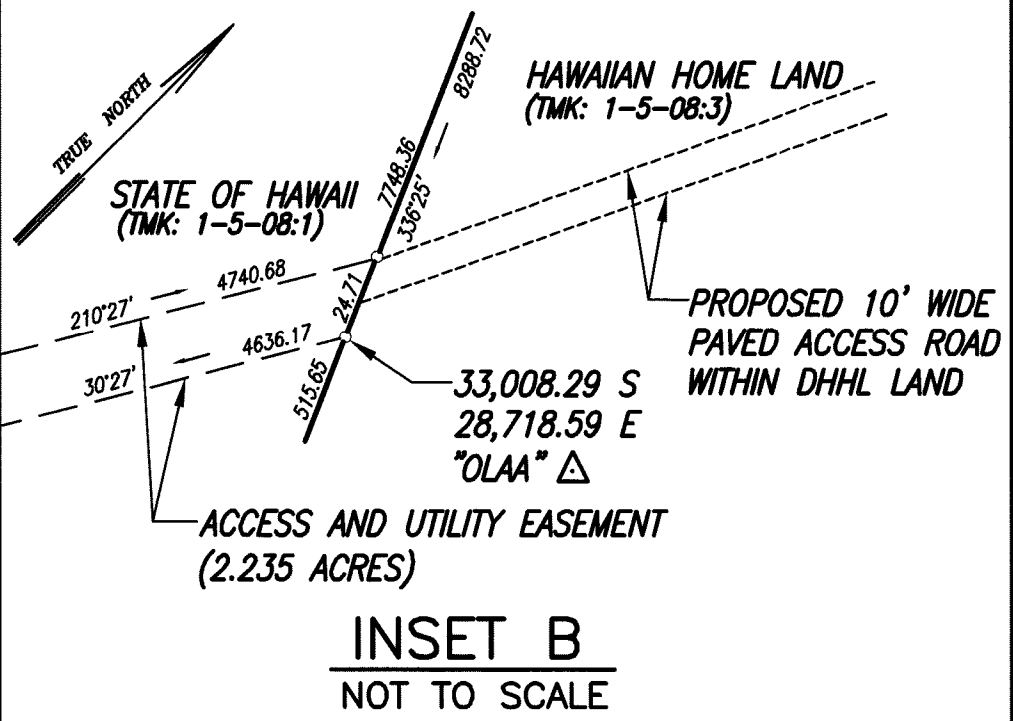
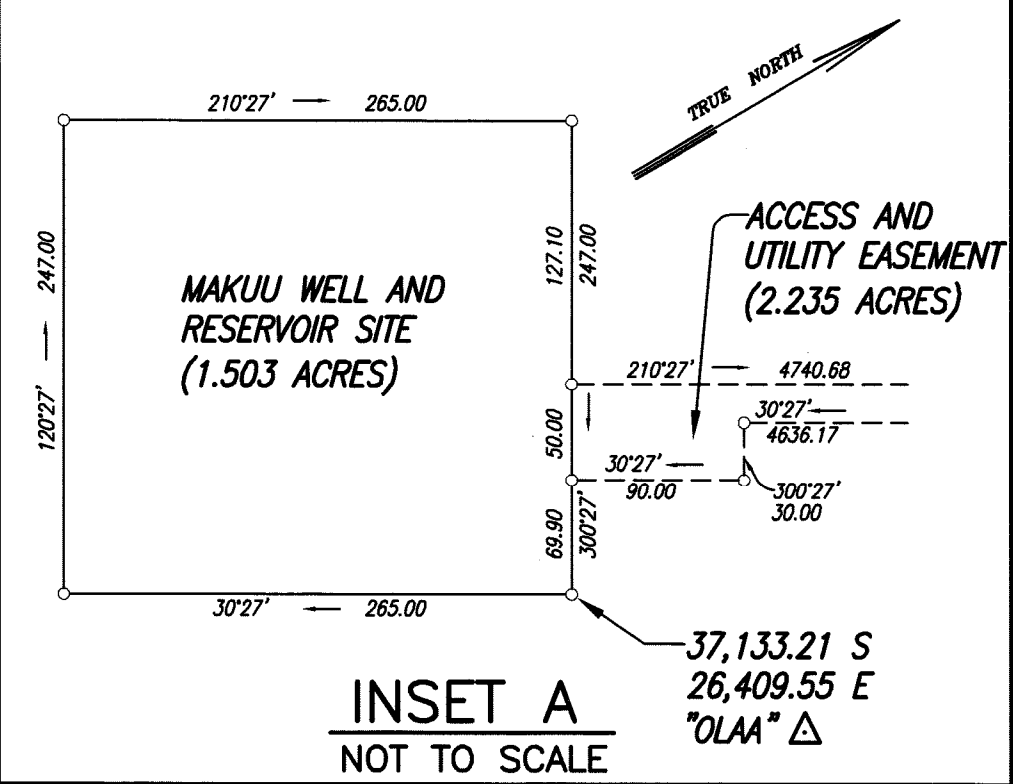
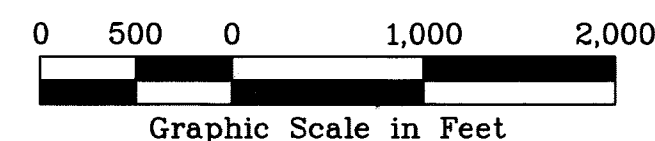
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NOTES:  
Coordinates referred to "OLAA" Δ  
dh denotes access permitted  
dd denotes no vehicle access permitted

**GENERAL PLAN**  
SCALE: 1" = 1000'



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.

*Eric N. S. Hee*

LICENSE EXPIRES 4/30/2014

**ERIC N. S. HEE**  
LICENSED PROFESSIONAL ENGINEER  
No. 5292-C  
HAWAII, U.S.A.

**ESH** ENGINEERS SURVEYORS HAWAII, INC.  
900 HALEKAUWILA ST.  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA


DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII



**GENERAL PLAN**

FILE POKET FOLDER NO.



P.M.: STY  
CURRENT TIME: Apr 09, 2012 - 2:54pm  
LAST SAVED BY: smg  
LAST MODIFIED: Fri, 23 Mar 2012 - 1:45pm  
PREFIX: G:\ESH\11-02 Makuu\ACAD\  
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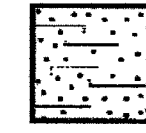
		Boring: 1			File: 2460.01	
F.G.E. Ltd. 96-1416 Waiakona Place Pearl City, Hawaii		Project: Makuu 844' 1.0M.G. Reservoir Phase 2			Project Engineer: TJC	
		Location: Pahoa, Hawaii, Hawaii			Field Engineer: TJC	
		Surface Elevation: 828' ±			Drafted by: CPD	
		Depth to Water: None Encountered			Date of Drawing: November 2004	
		Date Completed: 9-28-04				
LAB TEST RESULTS	MOIST CONT. %	DRY DEN. PCF	BLOWS PER FT.	S A M P L E	D E P T H	CLASSIFICATION
			90%REC 53%RQD	NX CORE	0	Gray Slightly Weathered Highly Vesicular BASALT (WS), medium hard, occasionally broken to massive
			100%REC 70%RQD	NX CORE	5	At 7.0', grades to hard, broken
			100%REC 86%RQD	NX CORE	10	At 11.0', grades to massive
			100%REC 58%RQD	NX CORE	15	Gray Fresh Slightly Vesicular BASALT (F), hard, broken At 14.5', grades to occasionally broken
			100%REC 93%RQD	NX CORE	20	Gray Slightly Weathered to Fresh Highly Vesicular BASALT (WS-F), medium hard to hard, broken to occasionally broken At 20.5', grades to hard, massive
					25	Reddish Gray Slightly Weathered Highly Vesicular BASALT (WS), medium hard, occasionally broken BOH @ 25.5'
					30	
					35	

		Boring: 2		File: 2460.01		
		Project: Makuu 844' 1.0M.G. Reservoir Phase 2				
		Location: Pahoa, Hawaii, Hawaii				
		Surface Elevation: 828' ±				
		Depth to Water: None Encountered				
		Date Completed: 9-28-04				
				Project Engineer: T.JC		
				Field Engineer: T.JC		
				Drafted by: CPD		
				Date of Drawing: November 2004		
LAB TEST RESULTS	MOIST. CONT. %	DRY DEN. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
						Gray Moderately to Slightly Weathered Highly Vesicular BASALT (WM-WS), medium hard, occasionally broken
			75%REC 0%RQD	NX CORE	5	At 4.5', grades to Reddish Gray, broken
			100%REC 93%RQD	NX CORE		Gray Fresh Highly Vesicular BASALT (F), hard, massive
			100%REC 55%RQD	NX CORE	10	Reddish Gray Moderately Weathered Highly Vesicular BASALT (WM), medium hard, to hard
			100%REC 100%RQD	NX CORE	15	Gray Slightly Weathered Highly Vesicular BASALT (WS), hard, massive
			100%REC 98%RQD	NX CORE	20	
					25	BOH @ 24.5'
					30	
					35	

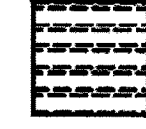
#### MAJOR ROCK TYPES



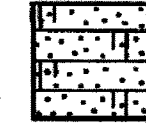
BASALT



TUFF



DECOMPOSED ROCK

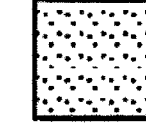


CORAL

#### SECONDARY CLASSIFICATION



GRAVELLY



SANDY



SILTY

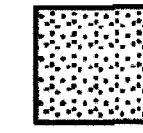


CLAYEY

#### MAJOR SOIL TYPES



GRAVEL



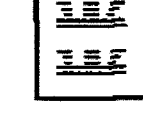
SAND



SILT

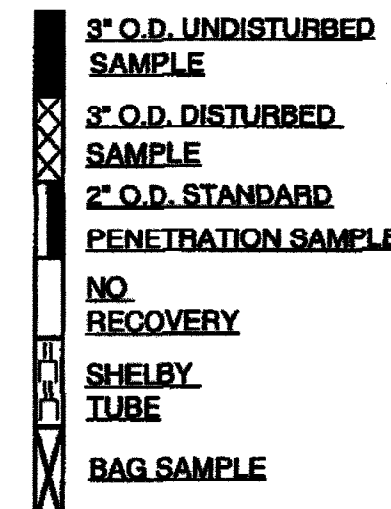


CLAY



PEAT/ORGANICS

#### SAMPLING SYMBOLS



NX-CORE

WATER LEVEL





#### TEST PIT LOG LEGEND


Makuu 844' 1.0 M.G. Reservoir  
Pahoa, Hawaii, Hawaii

File: 2460.01

November 2004

 F.G.E. Ltd. 96-1416 Waihoia Place Pearl City, Hawaii		Boring: 3 Project: Makuu 844' 1.0M.G. Reservoir Phase 2 Location: Pahoa, Hawaii, Hawaii Surface Elevation: 827' ± Depth to Water: None Encountered Date Completed: 9-28-04	File: 2460.01 Project Engineer: TJC Field Engineer: TJC Drafted by: CPD Date of Drawing: November 2004			
LAB TEST RESULTS	MOIST. CONT. %	DRY DEN. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			41 sec. 52 sec. 112 sec. 105 sec. 54 sec. 38 sec. 128 sec. 201 sec. 235 sec.		0 5 10 15 20 25 30 35	Gray Slightly Weathered Highly Vesicular BASALT (WS), medium hard  At 7.0', grades to hard  BOH @ 9.0'

		Probe: P-1 Project: Makuu 844' 1.0M.G. Reservoir Phase 2 Location: Pahoa, Hawaii, Hawaii Surface Elevation: 827' ± Depth to Water: None Encountered Date Completed: 9-28-04		File: 2460.01 Project Engineer: TJC Field Engineer: TJC Drafted by: CPD Date of Drawing: November 2004		
LAB TEST RESULTS	MOIST CONT. %	DRY DEN. PCF	BLOWS PER FT.	S A M P L E	D E P T H	CLASSIFICATION
			42 sec.		0	Gray Slightly Weathered Highly Vesicular BASALT (WS), medium hard
			53 sec.		1	
			36 sec.		2	
			104 sec.		3	
					4	
					5	BOH @ 4.0'
					6	
					7	
					8	
					9	
					10	
					11	
					12	
					13	
					14	
	15					

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.				
AKINAKA & ASSOCIATES, LTD.				
LICENSE EXPIRES 04/30/14				
				
ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
BORING LOGS				

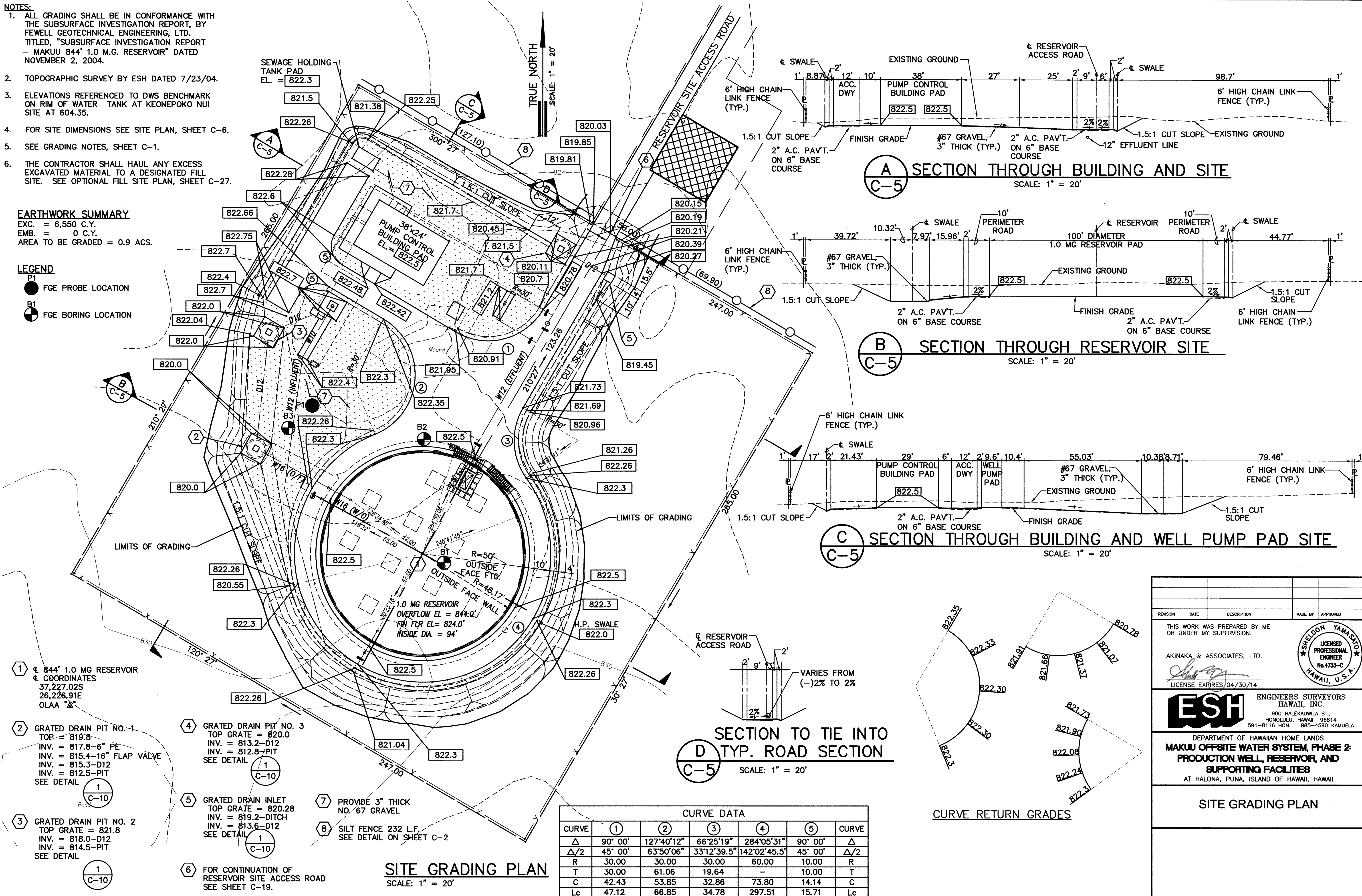


- NOTES:
1. ALL GRADING SHALL BE IN CONFORMANCE WITH THE SUBSURFACE INVESTIGATION REPORT, BY FEWELL GEOTECHNICAL ENGINEERING, LTD. TITLED, "SUBSURFACE INVESTIGATION REPORT - MAKUU 844' 1.0 M.G. RESERVOIR" DATED NOVEMBER 2, 2004.
  2. TOPOGRAPHIC SURVEY BY ESH DATED 7/23/04.
  3. ELEVATIONS REFERENCED TO DWS BENCHMARK ON RIM OF WATER TANK AT KEONEPOKO NUI SITE AT 604.35.
  4. FOR SITE DIMENSIONS SEE SITE PLAN, SHEET C-6.
  5. SEE GRADING NOTES, SHEET C-1.
  6. THE CONTRACTOR SHALL HAUL ANY EXCESS EXCAVATED MATERIAL TO A DESIGNATED FILL SITE. SEE OPTIONAL FILL SITE PLAN, SHEET C-27.

**EARTHWORK SUMMARY**  
EXC. = 6,550 C.Y.  
EMB. = 0 C.Y.  
AREA TO BE GRADED = 0.9 ACS.

**LEGEND**

- P1 FGE PROBE LOCATION  
B1 FGE BORING LOCATION



**A SECTION THROUGH BUILDING AND SITE**

SCALE: 1" = 20'

**B SECTION THROUGH RESERVOIR SITE**

SCALE: 1" = 20'

**C SECTION THROUGH BUILDING AND WELL PUMP PAD SITE**

SCALE: 1" = 20'

**D SECTION TO TIE INTO TYP. ROAD SECTION**

SCALE: 1" = 20'

**CURVE RETURN GRADES**

CURVE DATA						
CURVE	①	②	③	④	⑤	CURVE
Δ	90° 00'	127° 40' 12"	66° 25' 19"	284° 05' 31"	90° 00'	Δ
Δ/2	45° 00'	63° 50' 06"	33° 12' 39.5"	142° 02' 45.5"	45° 00'	Δ/2
R	30.00	30.00	30.00	60.00	10.00	R
T	30.00	61.06	19.64	-	10.00	T
C	42.43	53.85	32.86	73.80	14.14	C
Lc	47.12	66.85	34.78	297.51	15.71	Lc

**SITE GRADING PLAN**

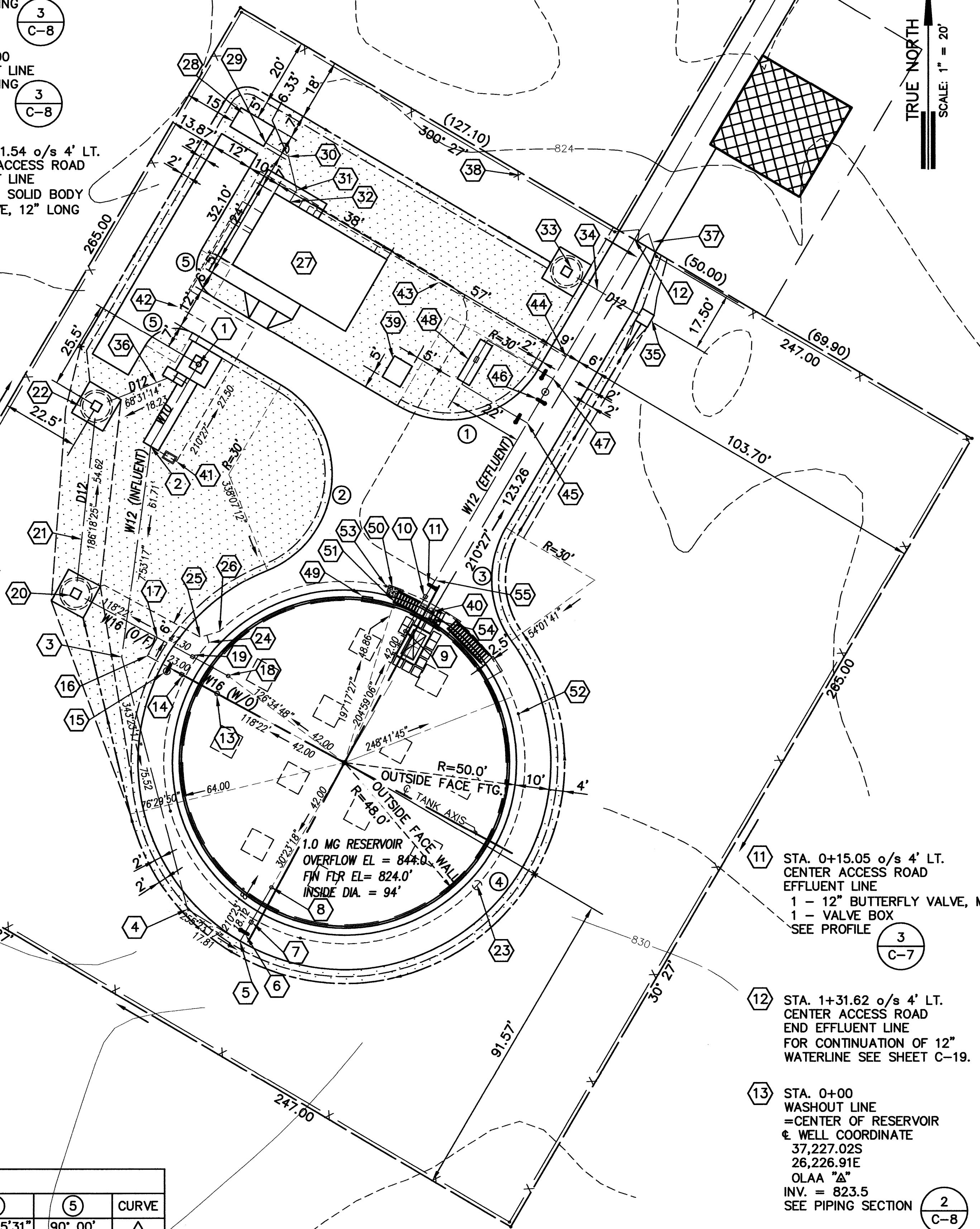
SCALE: 1" = 20'

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900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS				
<b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b>				
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>SITE GRADING PLAN</b>				



- 1 MAKUU WELL NO. STA. -0+27.5 INFLUENT LINE BENCH MARK CASING EL. = 824 E. WELL COORDINATE 37,111.70S 26,184.65E OLAA "A" SEE WELL PUMP DETAILS, SHT. M-1
- 2 STA. 0+00 INFLUENT LINE 1 - 10" NIPPLE, 12" LONG 1 - 12" X 10" REDUCER, MJ W/MEGALUGS INV. = 813.0 SEE PROFILE
- 3 STA. 0+61.71 INFLUENT LINE 1 - 12" 1/16 BEND, MJ 1 - CONC. BLOCK
- 4 STA. 1+37.23 INFLUENT LINE 1 - 12" 1/8 BEND, MJ 1 - CONC. BLOCK
- 5 STA. 1+55.04 INFLUENT LINE 1 - 12" 1/4 BEND, MJ 1 - CONC. BLOCK
- 6 STA. 1+58 INFLUENT LINE 1 - 12" BUTTERFLY VALVE, MJ 1 - VALVE BOX
- 7 STA. 1+61.5 INFLUENT LINE 1 - 12" SOLID BODY SLEEVE, 12" LONG
- 8 STA. 1+73.16 INFLUENT LINE SEE PIPING SECTION
- 9 STA. 0+00 EFFLUENT LINE SEE PIPING SECTION
- 10 STA. 0+11.54 o/s 4' LT. CENTER ACCESS ROAD EFFLUENT LINE 1 - 12" SOLID BODY SLEEVE, 12" LONG

CURVE DATA						
CURVE	①	②	③	④	⑤	CURVE
Δ	90° 00'	127° 40' 12"	66° 25' 19"	284° 05' 31"	90° 00'	Δ
Δ/2	45° 00'	63° 50' 06"	33° 12' 39.5"	142° 02' 45.5"	45° 00'	Δ/2
R	30.00	30.00	30.00	60.00	10.00	R
T	30.00	61.06	19.64	-	10.00	T
C	42.43	53.85	32.86	73.80	14.14	C
Lc	47.12	66.85	34.78	297.51	15.71	Lc



- 15 STA. 0+15.92 WASHOUT LINE 1 - 16" BUTTERFLY VALVE, MJ 1 - VALVE BOX
- 16 STA. 0+23.00 WASHOUT LINE 1 - 16" 1/4 BEND, MJ 1 - CONC. BLOCK
- 17 STA. 0+29 WASHOUT LINE =STA. 0+23.43 OVERFLOW LINE 1 - 16" TEE, MJ 1 - CONC. BLOCK
- 18 STA. 0+00 OVERFLOW LINE SEE PIPING SECTION
- 19 STA. 0+11.77 OVERFLOW LINE 1 - 16" SOLID BODY SLEEVE, 15" LONG SEE SECTION
- 20 STA. 0+50.30 OVERFLOW LINE =STA. 0+00 DRAIN LINE CONSTRUCT GRATED DRAIN PIT NO. 1 TOP GRATE = 819.8 INV. = 817.8-6" PVC DRAIN INV. = 815.4-16" FLAP VALVE INV. = 815.3-D12 INV. = 812.5-PIT SEE DETAIL
- 21 12" OVERFLOW DRAINLINE SEE PROFILE
- 22 STA. 0+54.62 DRAIN LINE CONSTRUCT GRATED DRAIN PIT NO. 2 TOP GRATE = 821.8 INV. = 818.0-D12 INV. = 814.5-PIT SEE DETAIL
- 23 6" PVC PERIMETER DRAIN HIGH POINT INV. = 819.5 & SEE DETAILS
- 24 6" PVC PERIMETER DRAIN 45° BEND INV. = 818.71 SEE DETAILS
- 25 6" PVC PERIMETER DRAIN 45° BEND INV. = 818.6 & SEE DETAILS
- 26 6" PVC PERIMETER DRAIN 25° BEND INV. = 818.7 SEE DETAILS
- 27 38'x24' PUMP CONTROL BLDG. SEE SHEET M-5, STRUCTURAL AND ELECTRICAL PLANS
- 28 SEWAGE HOLDING TANK SEE DETAIL
- 29 STA. 0+00 SEWER LINE CONNECT TO HOLDING TANK INV. = 818.13 4" PVC SEWERLINE @ 1.0 % MIN.
- 30 STA. 0+07.7 SEWER LINE 1-4" 1/8 BEND INV.=818.21 1-COTG SEE DETAIL
- 31 STA. 0+17.8 SEWER LINE 1-4" 1/8 BEND INV.=818.31 1-COTG SEE DETAIL
- 32 STA. 0+21.8 SEWER LINE FOR CONTINUATION SEE SHEETS M-5 & M-6
- 33 CONSTRUCT GRATED DRAIN PIT NO. 3 TOP = 820.0 INV. = 813.2-D12 INV. = 812.8-PIT SEE DETAIL
- 34 12" DRAINLINE "B" SEE PROFILE
- 35 CONSTRUCT GRATED DRAIN INLET TOP = 820.28 INV. = 819.2-DITCH INV. = 813.6-D12 SEE DETAIL
- 36 12" DRAINLINE "A" SEE PROFILE
- 37 INSTALL 14' WIDE DOUBLE SWING GATE. SEE DETAIL, SHEET C-13.
- 38 INSTALL APPROX. 1006' L.F. 6-FT. HIGH CHAIN LINK FENCE. SEE DETAIL, SHEET C-13.
- 39 TRANSFORMER PAD LOCATION, SEE ELECTRICAL PLANS.
- 40 SAMPLING HOSE BIBB SEE DETAIL
- 41 1" PVC PIPE FOR CHLORINE INJECTION LINE SEE DETAIL
- 42 1 1/2" COPPER PIPE FOR DEEP WELL PUMP ASSEMBLY SUPPLY
- 43 2" COPPER PIPE LINE TO CONTROL BUILDING
- 44 STA. 0+92.19 EFFLUENT LINE 1 - 12" SERVICE SADDLE FOR 2" COPPER PIPE LINE
- 45 STA. 0+70 EFFLUENT LINE 1 - 12" TEE 1 - 12" BUTTERFLY VALVE, M.J., CL. 150 1- VALVE BOX 1 - CONC. BLOCKS 22 LIN. FT. OF 12" D.I. PIPE
- 46 STA. 0+77.4 EFFLUENT LINE 1 - 12" BUTTERFLY VALVE, M.J., CL. 150 1 - VALVE BOX 1 - 1" ARV & VALVE BOX
- 47 STA. 0+84.83 EFFLUENT LINE 1 - 12" TEE 1 - 12" BUTTERFLY VALVE, M.J., CL. 150 1 - VALVE BOX 1 - CONC. BLOCKS 22 LIN. FT. OF 12" D.I. PIPE
- 48 12" FLOW METER BYPASS ASSEMBLY SEE DETAIL
- 49 LIQUID LEVEL INDICATOR, SEE STRUCTURAL DWG. S-9
- 50 CONCRETE LANDING PAD FOR EXTERIOR STAIRS. SEE DWG S-9
- 51 LOCATION OF FIRST STAIR TREAD OF EXTERIOR STAIRS. SEE DWG S-9.
- 52 OBSERVATION PORT (TYPICAL - 4 EQUALLY SPACED). SEE DETAIL
- 53 OBSERVATION PORT TO BE CLEAR OF CONCRETE LANDING PAD.
- 54 SAMPLING SPIGOT SEE DETAIL
- 55 STA. 0+17.05 o/s 4' LT. CENTER ACCESS ROAD EFFLUENT LINE 1/2" COPPER LINE CONNECTION TO CHLORINE RESIDUAL ANALYZER IN HYDRO-PNEUMATIC BOOSTER PUMP ROOM OF CONTROL BUILDING.

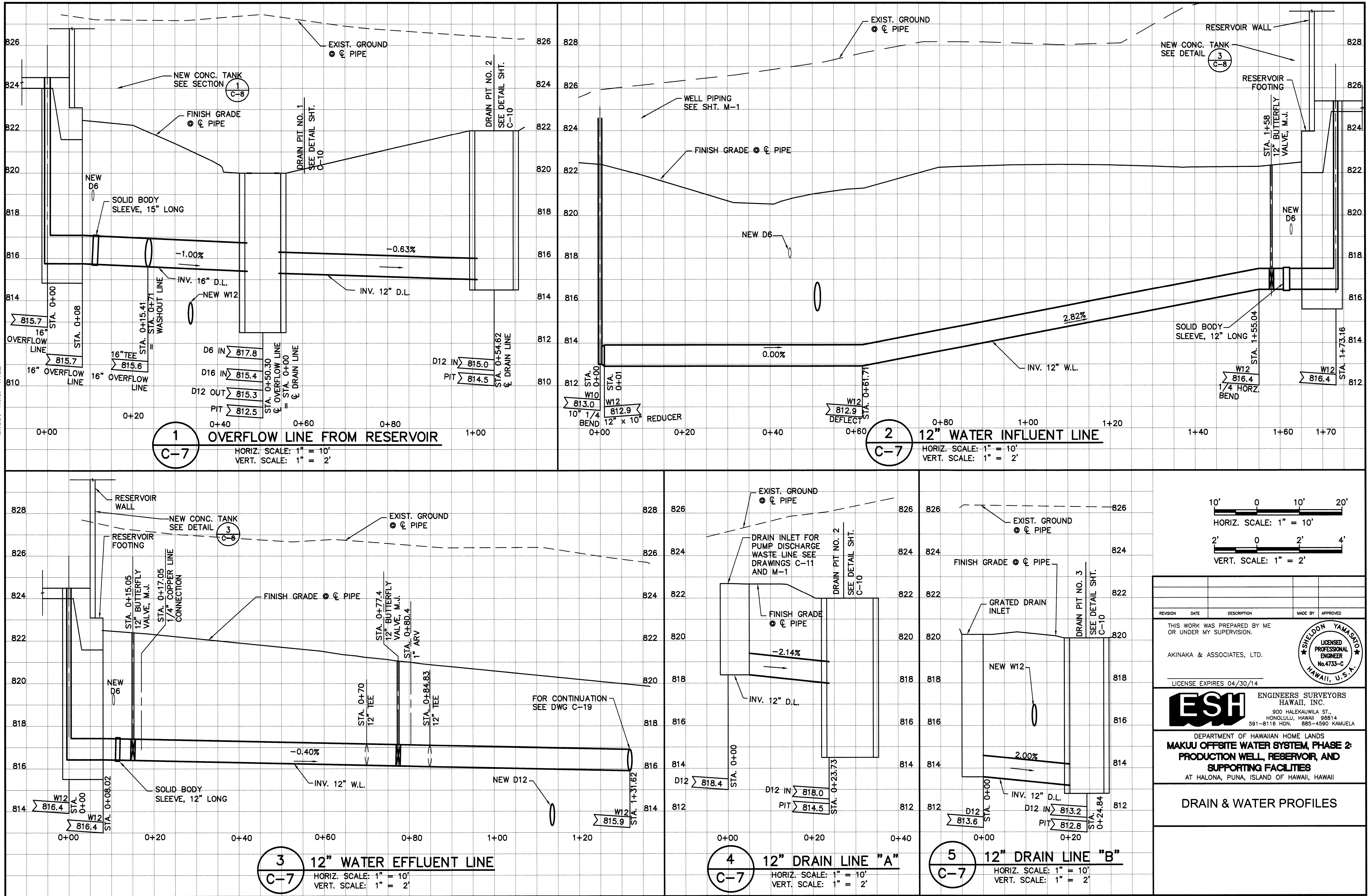
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AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>SITE PLAN</b>				



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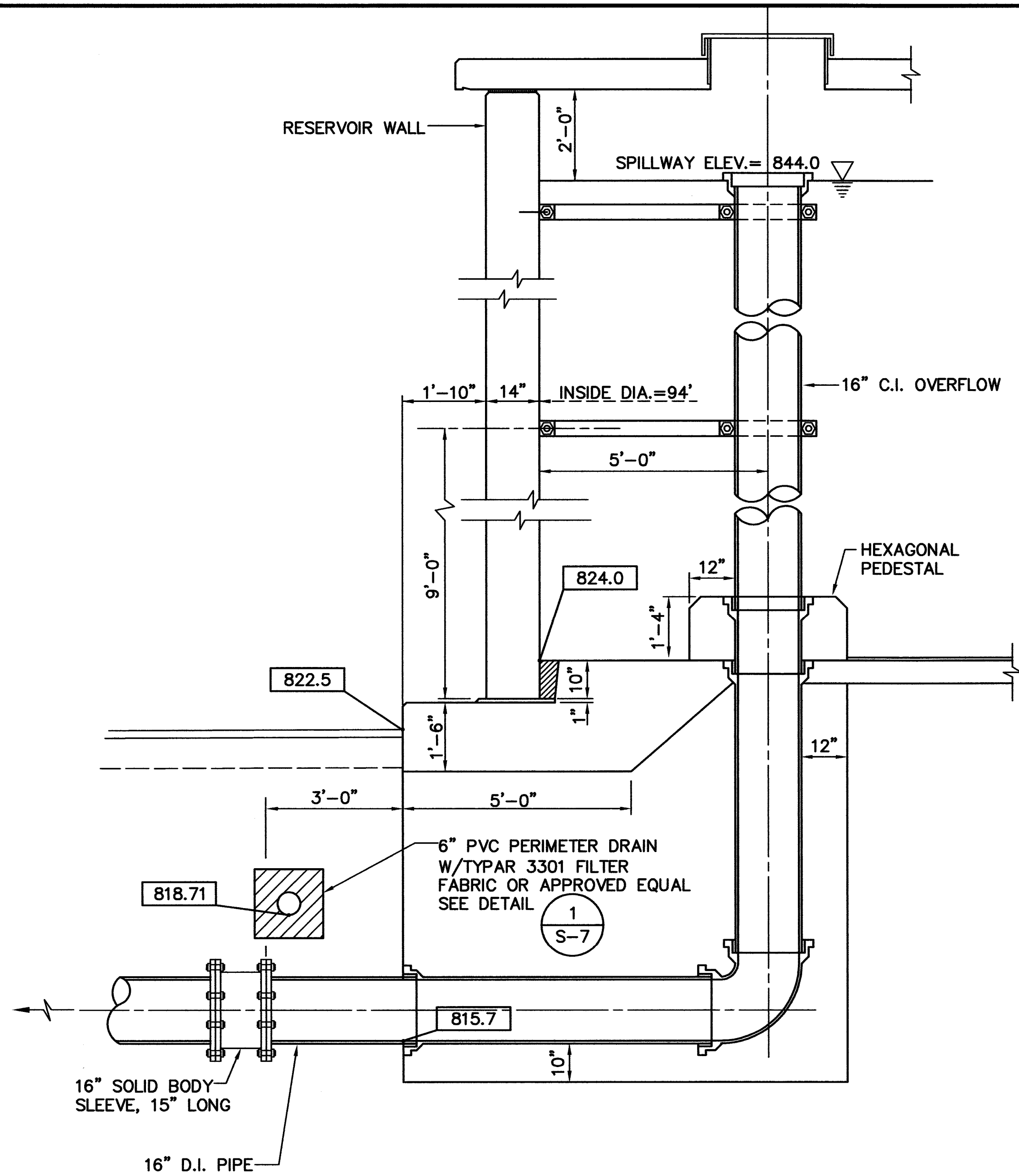
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<b>DRAIN &amp; WATER PROFILES</b>				
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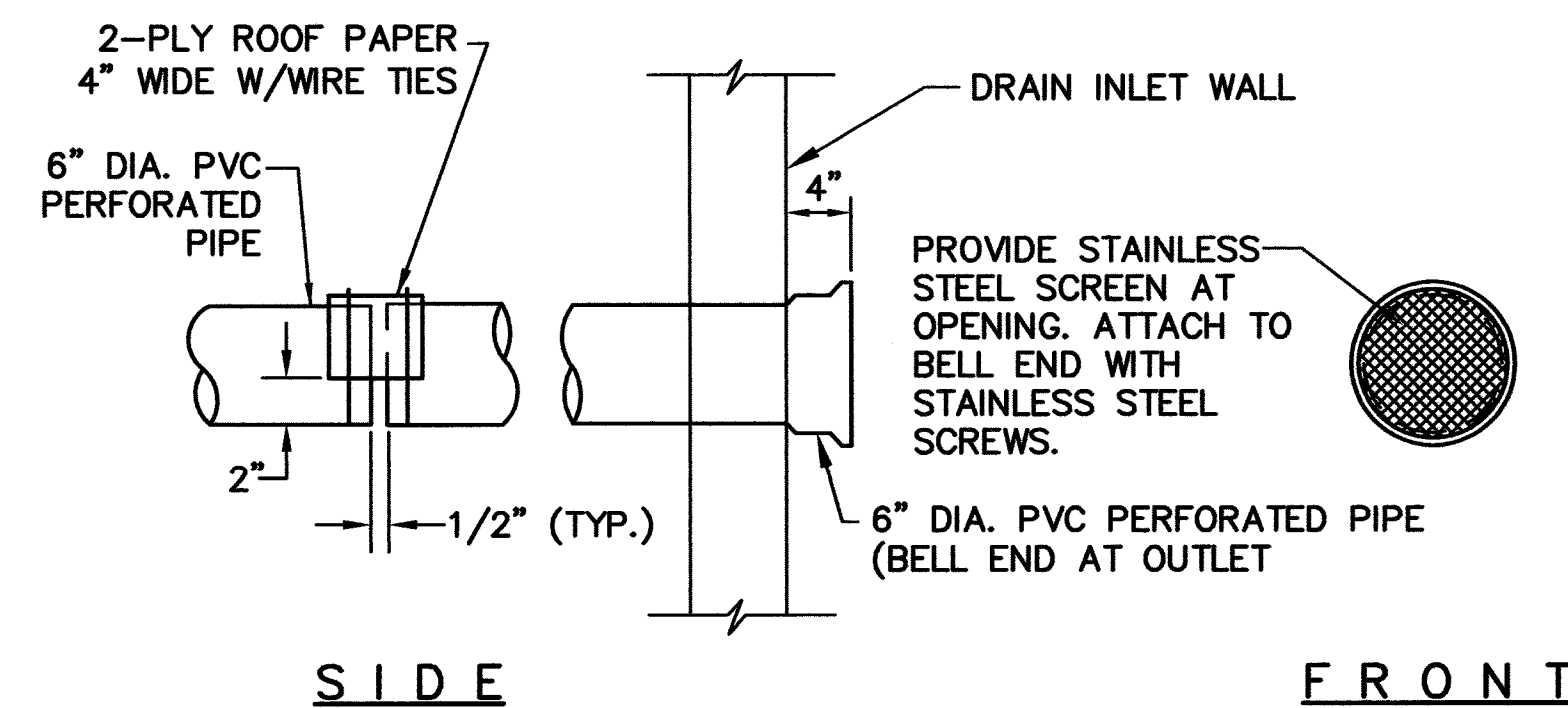
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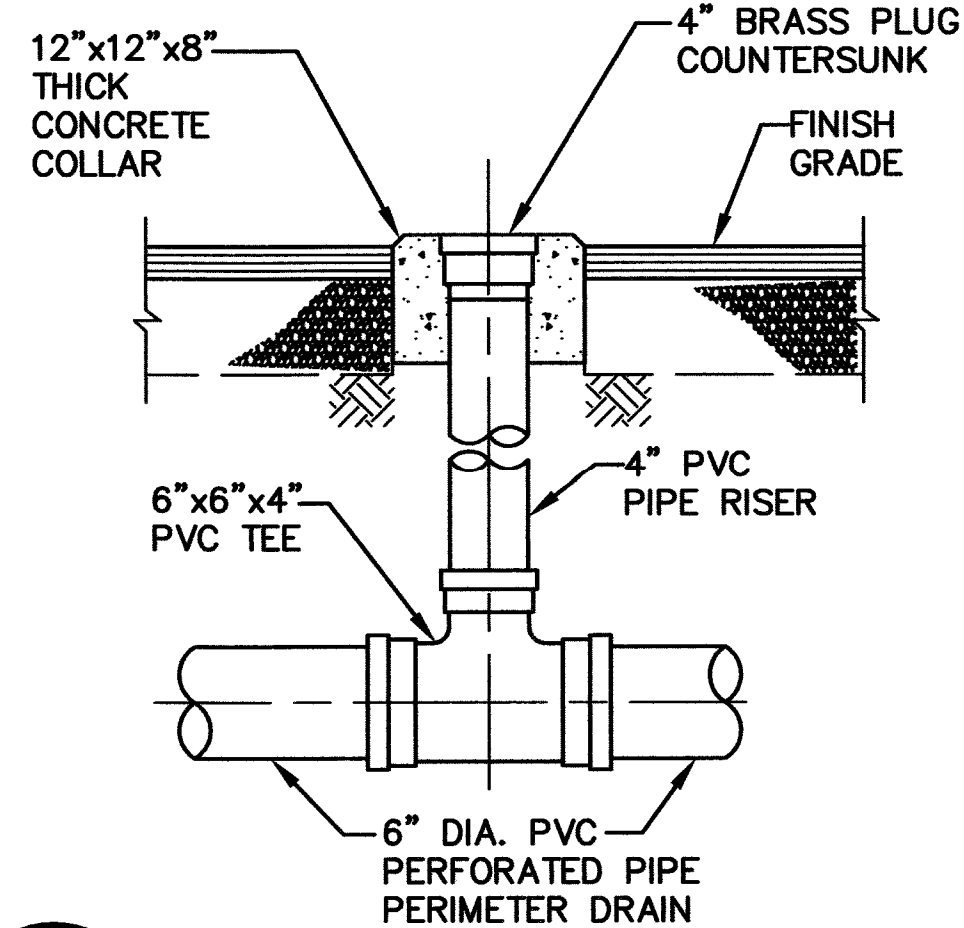
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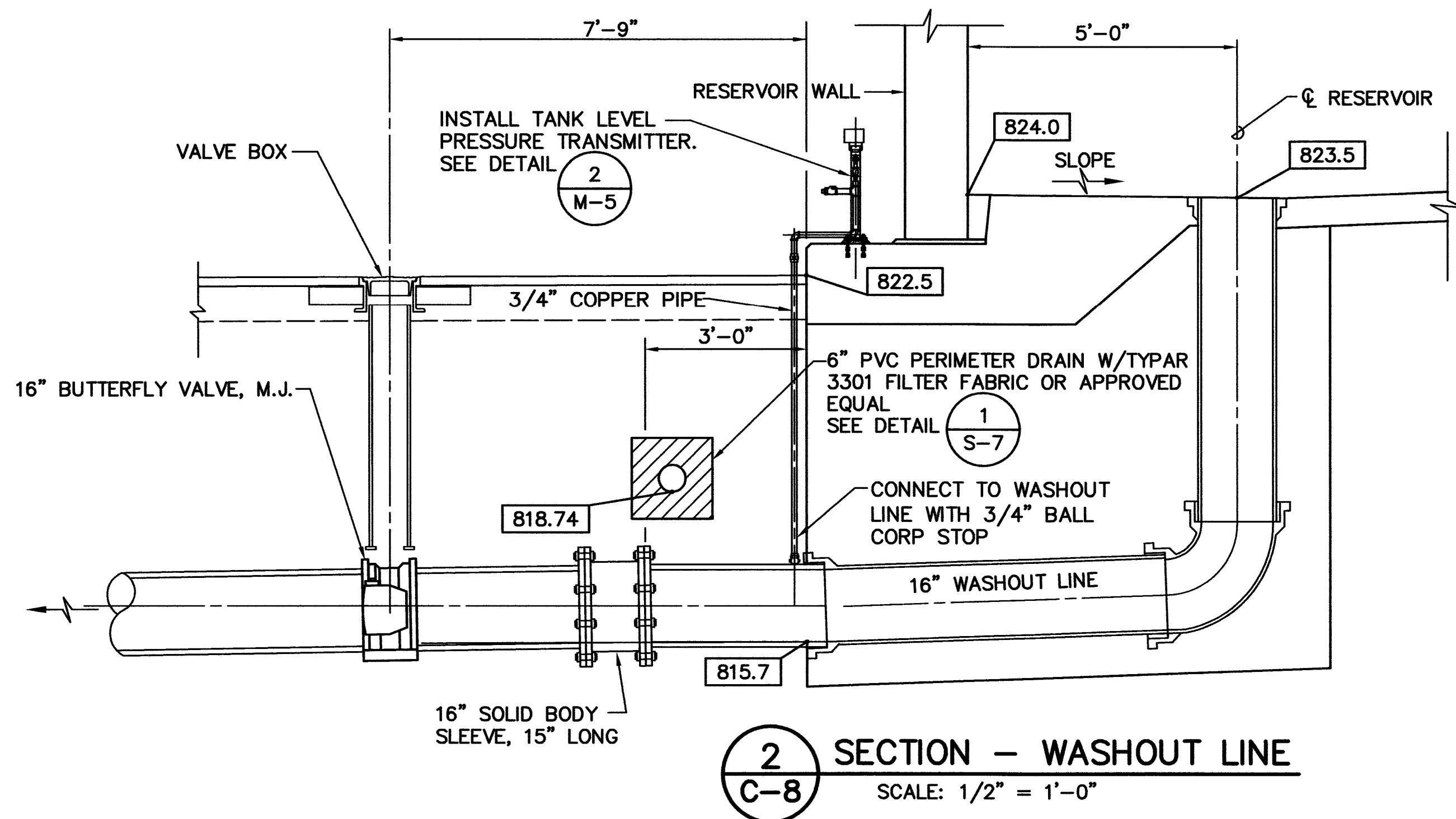
1 SECTION - OVERFLOW LINE  
C-8 SCALE: 1/2"=1'-0"



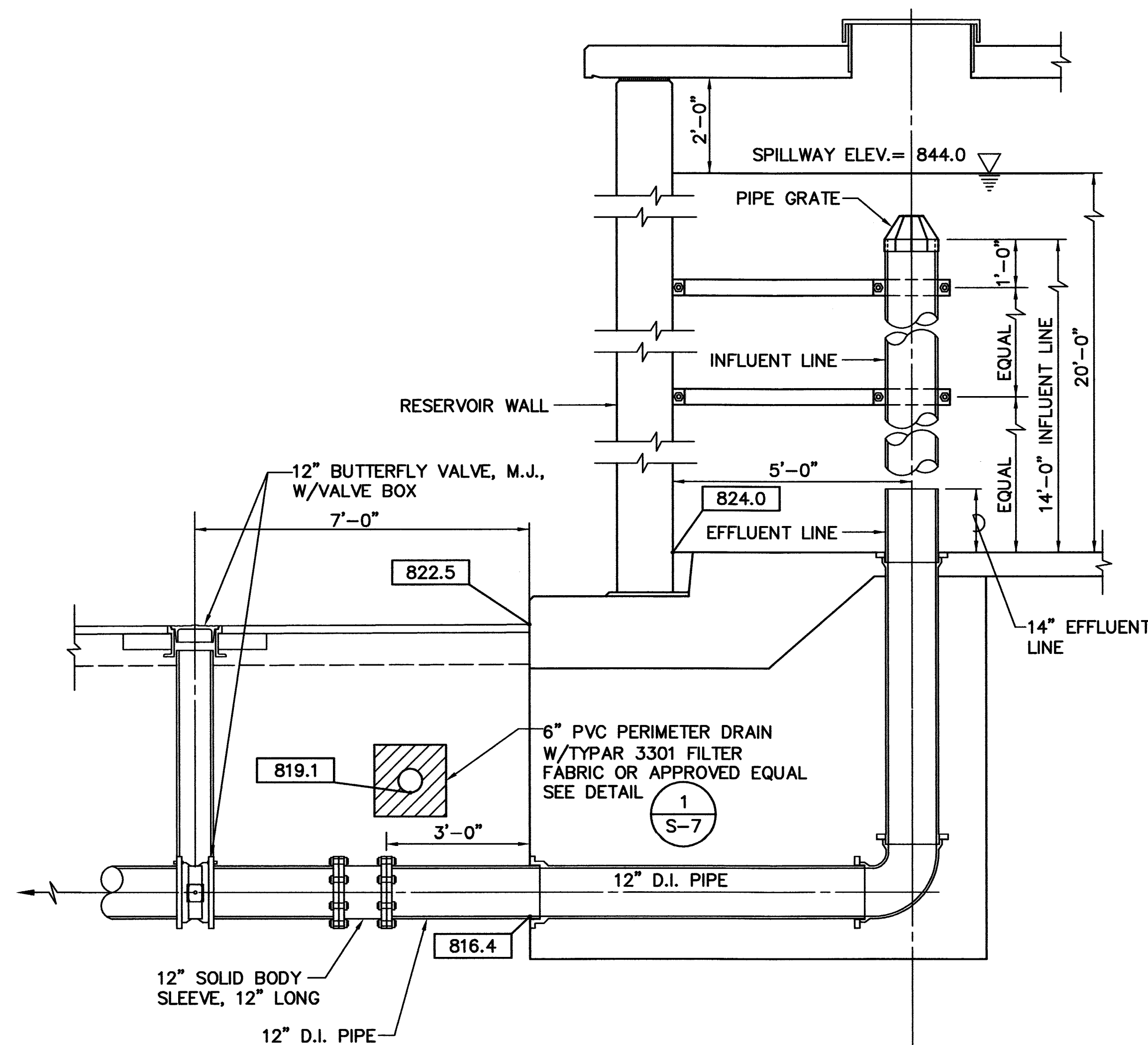
4 DETAIL-PVC PERIMETER DRAIN  
C-8 NOT TO SCALE



A DETAIL-OBSERVATION PORT  
C-8 NOT TO SCALE



2 SECTION - WASHOUT LINE  
C-8 SCALE: 1/2"=1'-0"



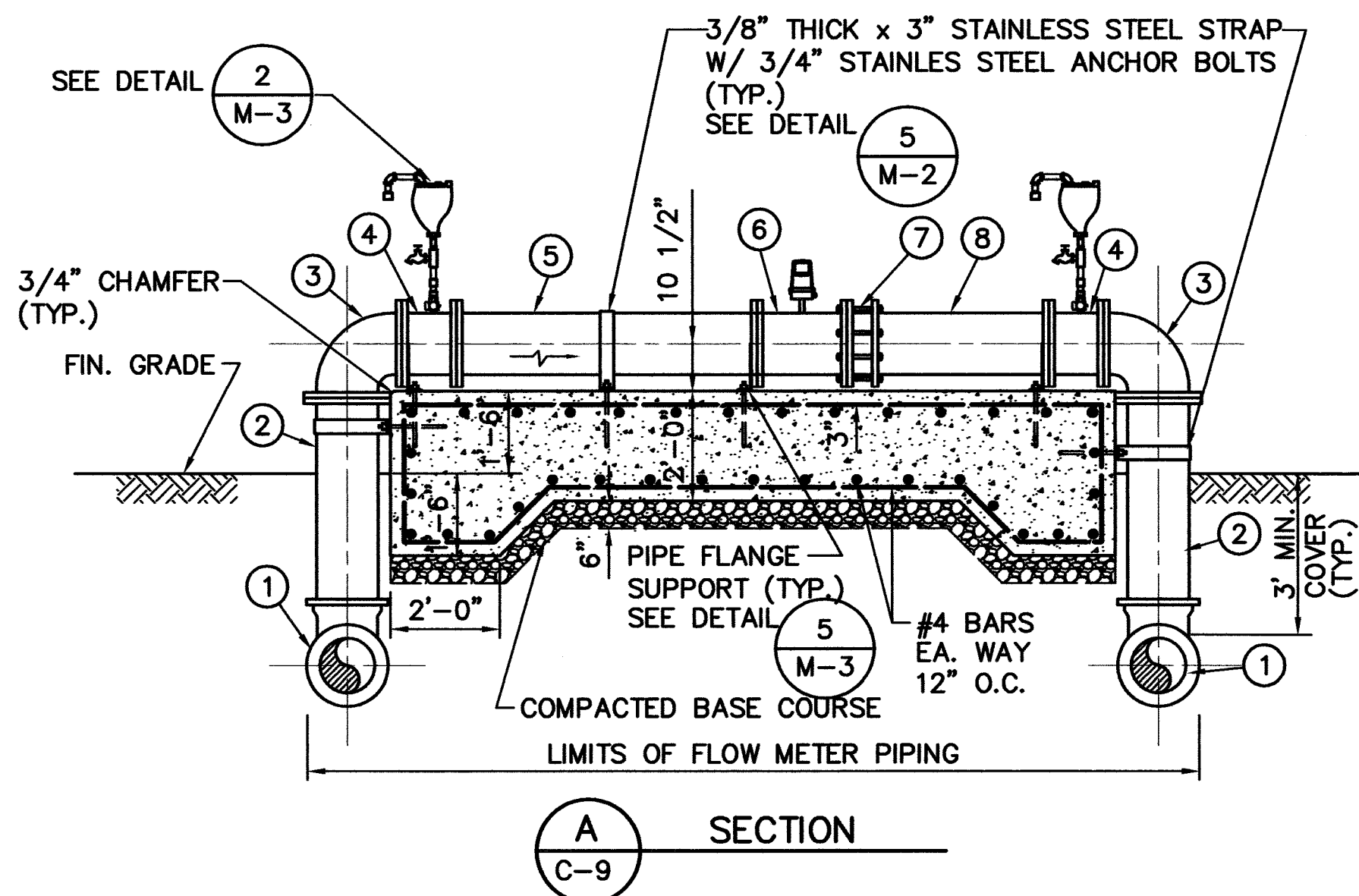
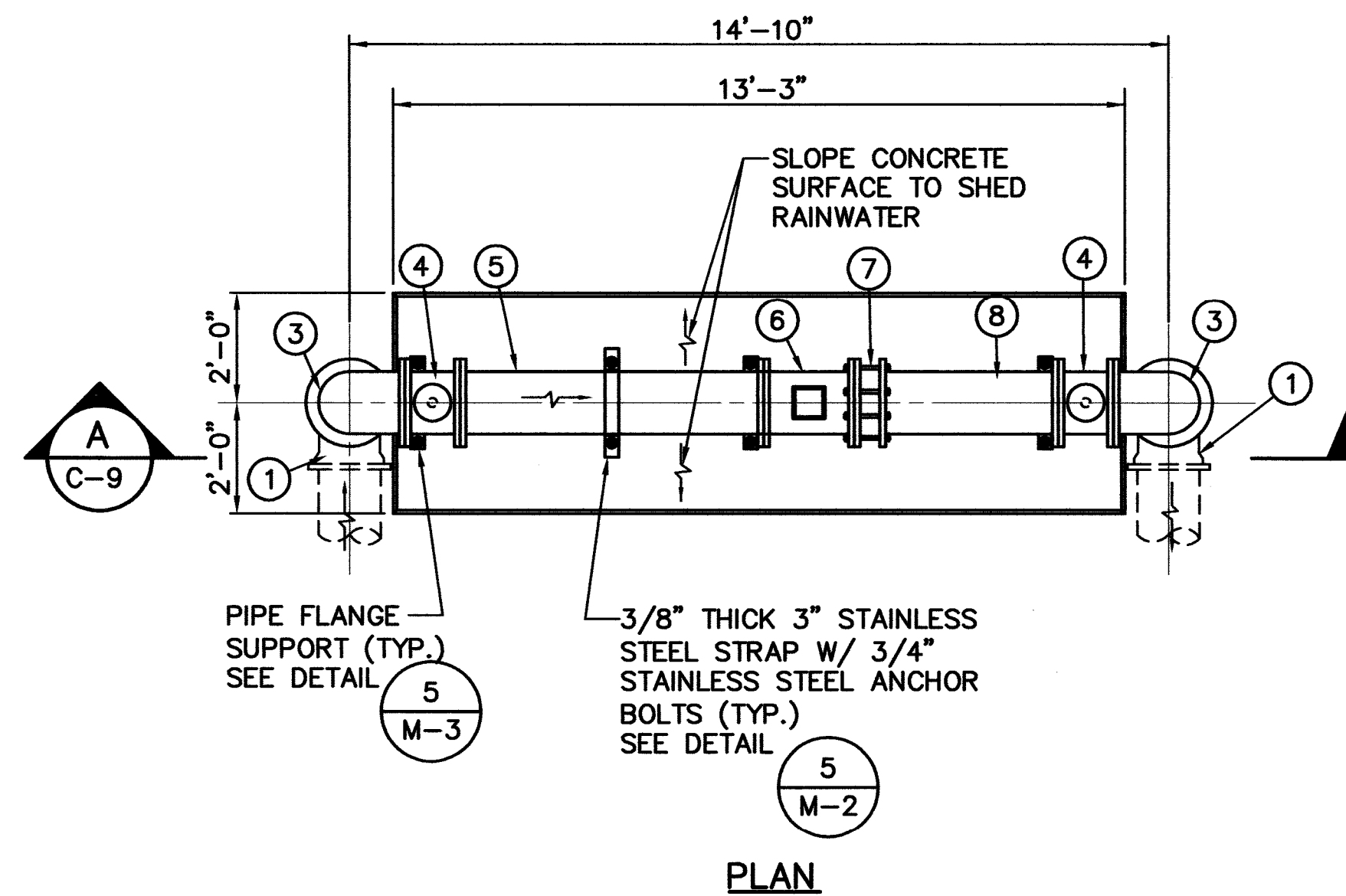
3 SECTION - INFLUENT / EFFLUENT LINE  
C-8 SCALE: 1/2"=1'-0"

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<b>RESERVOIR PIPING SECTIONS</b>				

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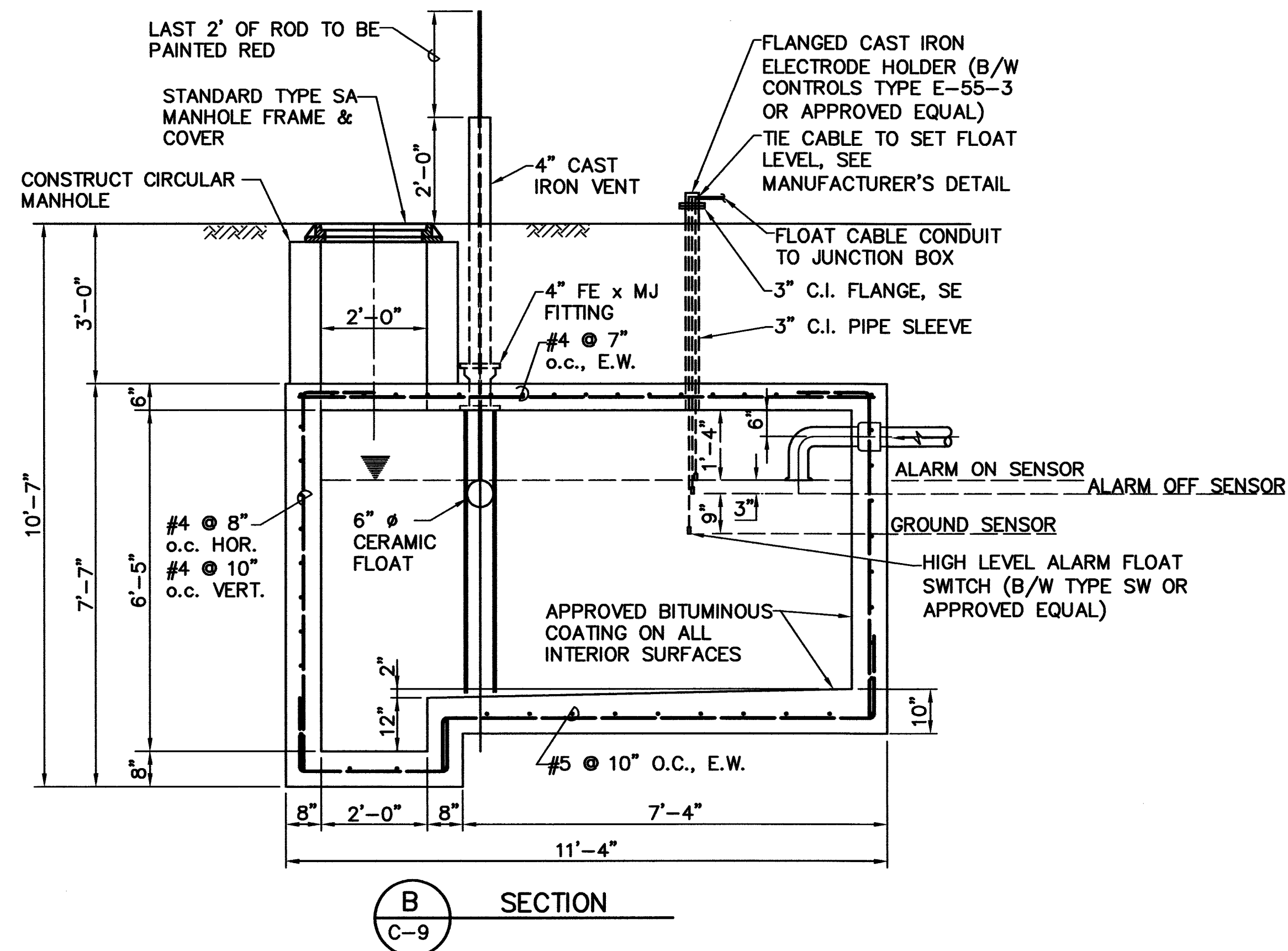
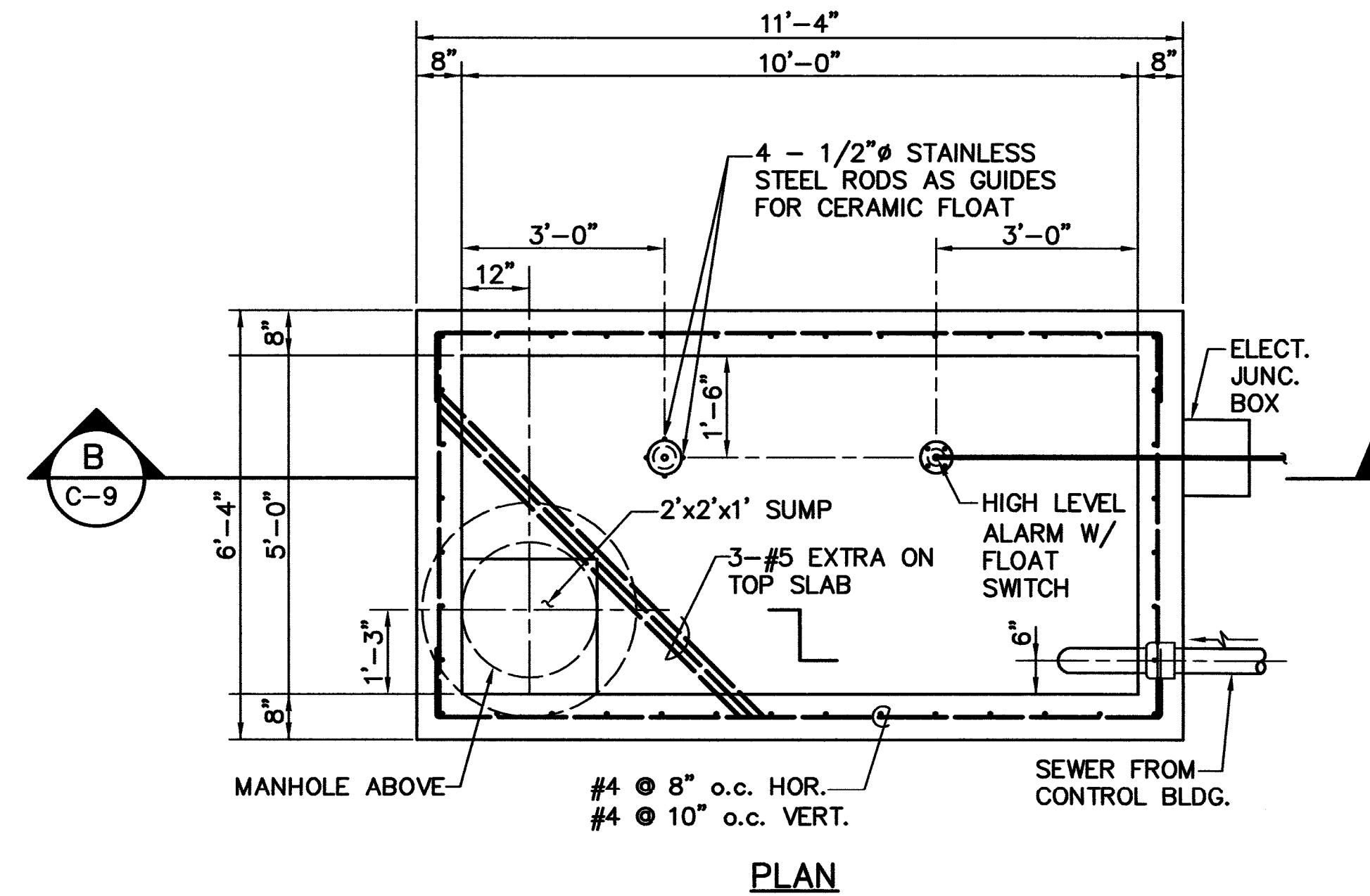


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MATERIAL LIST		
NO.	QTY.	DESCRIPTION
1	2	12" 90° BEND, M.J. W/CONCRETE BLOCK
2	2	12" D.I. PIPE, P.E. X F.E., CUT TO FIT
3	2	12" 90° BEND, F.E.
4	2	12" SPOOL, F.E. WITH 1" ARV ASSEMBLY
5	1	12" D.I. PIPE, F.E., 5'-6" LONG
6	1	12" FLOW METER, SIEMENS MAG 5100W W/SIEMENS MAG 6000 (SCADA READY) TRANSMITTER, 115/230 VAC
7	1	12" RESTRAINED FLANGE ADAPTER, EBAA MEGAFLANGE SERIES 2100 OR APPROVED EQUAL
8	1	12" D.I. PIPE, P.E. x F.E., CUT-TO-FIT (3 x DIA. (MIN.))

1 12" FLOW METER BYPASS  
SCALE: 3/8" = 1'-0"



2 DETAILS - SEWAGE HOLDING TANK DETAILS  
1/2" = 1'-0"

#### SEWAGE VAULT NOTES:

1. CONCRETE SHALL BE DWS 2500.
2. REINFORCING STEEL SHALL CONFORM TO ASTM A-825 GRADE 40.
3. UNLESS OTHERWISE NOTED, MINIMUM CONCRETE PROTECTION FOR REINFORCING SHALL BE:
  - A. FOOTING AND SLAB ON GRADE.....3"
  - B. WALL EXPOSED TO GROUND.....3"
  - C. WALL EXPOSED TO WEATHER.....2"
  - D. PROTECTED SLABS AND WALLS.....1"
4. ALL CONCRETE CORNERS SHALL BE CHAMFERED 3/4" TYPICAL UNLESS OTHERWISE NOTED.
5. APPLY 2-COATS OF COAL-TAR EPOXY (AMERICOAT 78 OR APPROVED EQUAL) TO RUNGS, INTERIOR AND EXTERIOR SURFACES OF VAULT.
6. ALL PAINTING WORK, SURFACE PREPARATIONS, AND APPLICATION SHALL BE IN ACCORDANCE WITH THE PAINT MANUFACTURER'S INSTRUCTIONS.

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

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

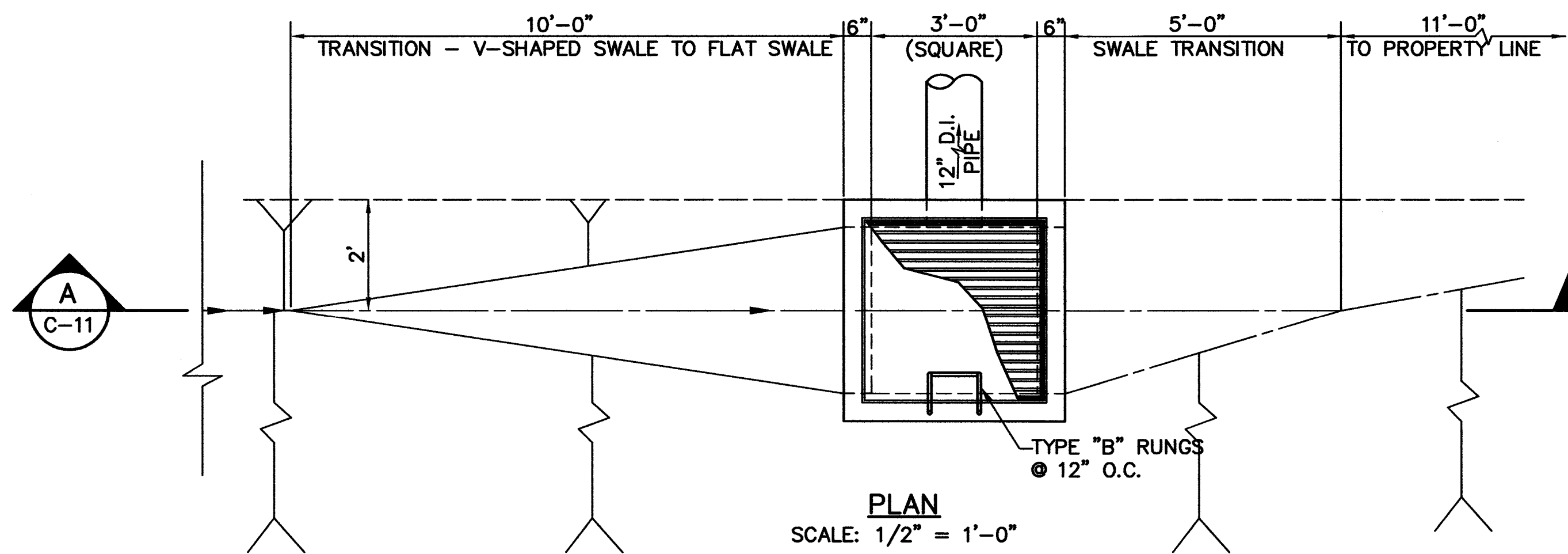
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MISCELLANEOUS WATER DETAILS				



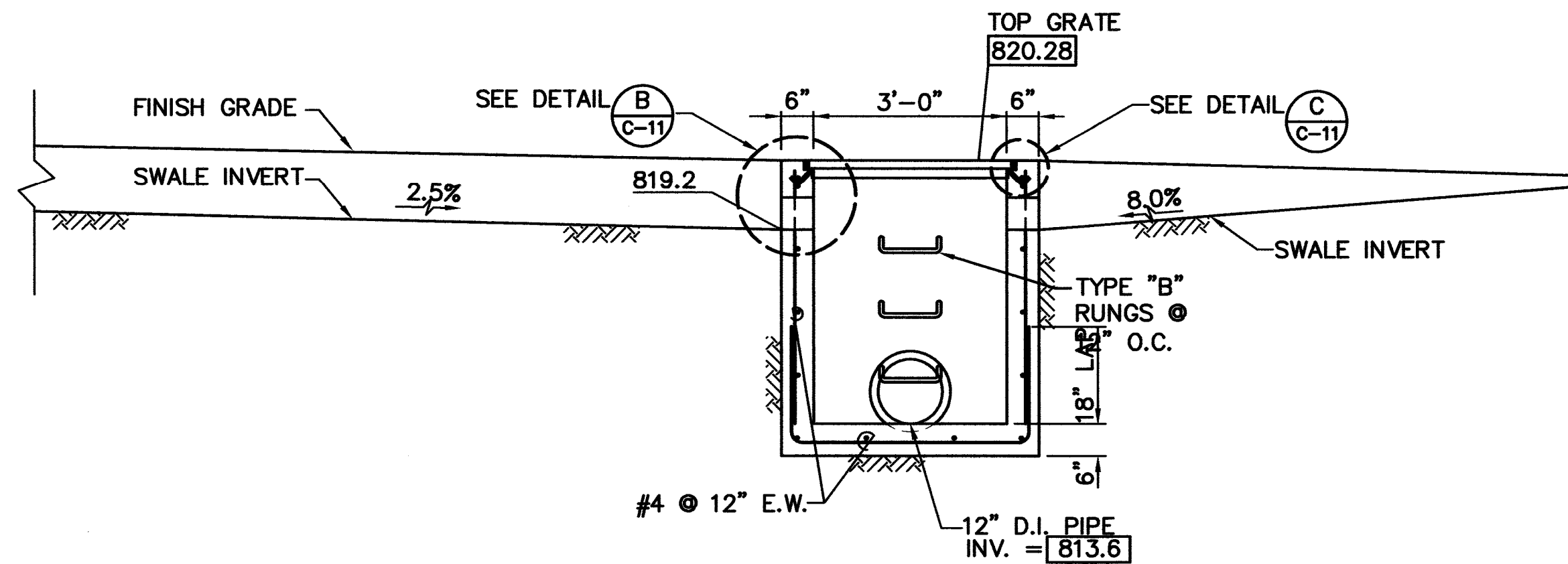




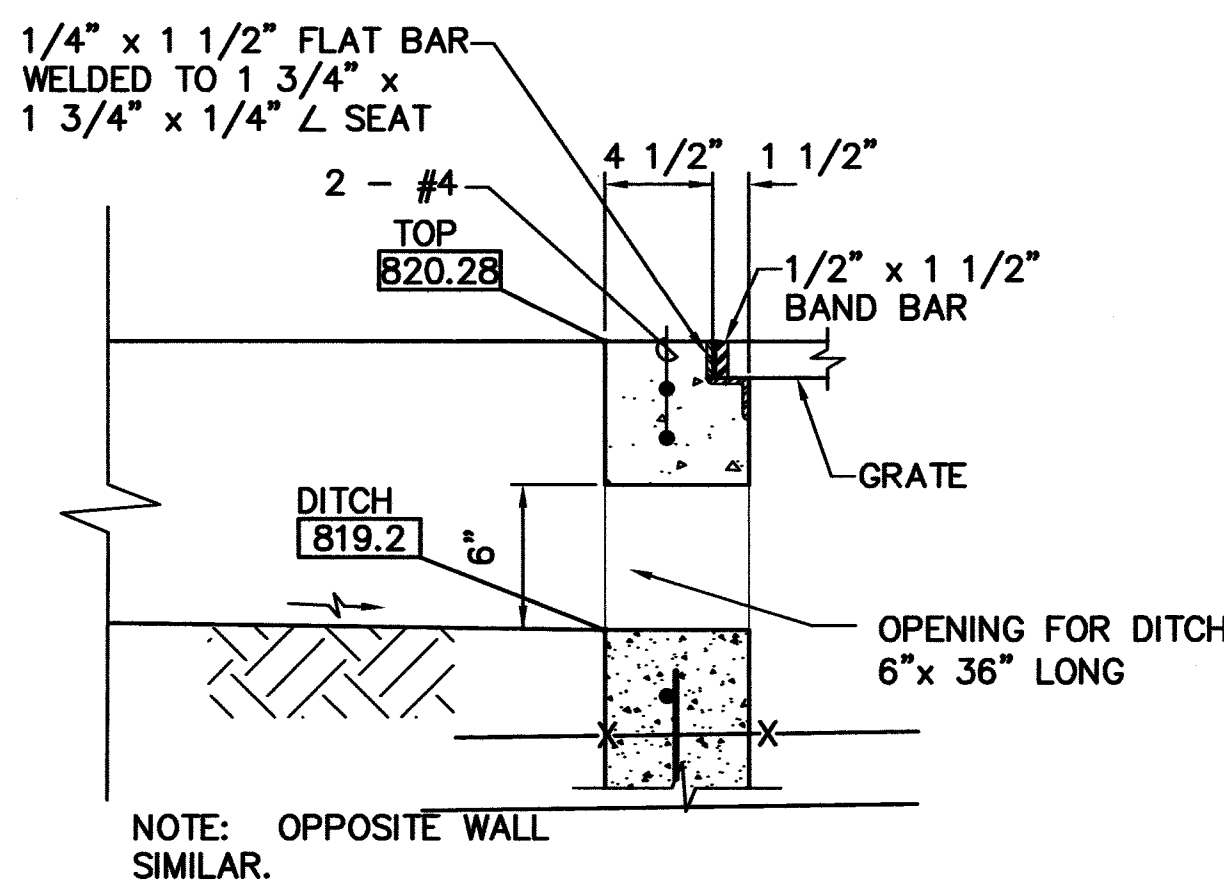
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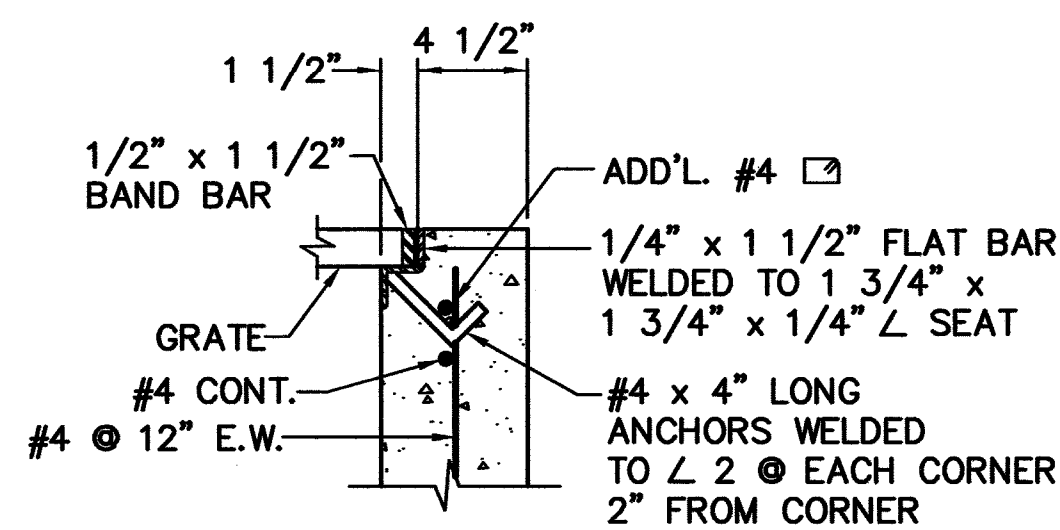
PLAN  
SCALE: 1/2" = 1'-0"



A SECTION  
C-11 SCALE: 1/2" = 1'-0"



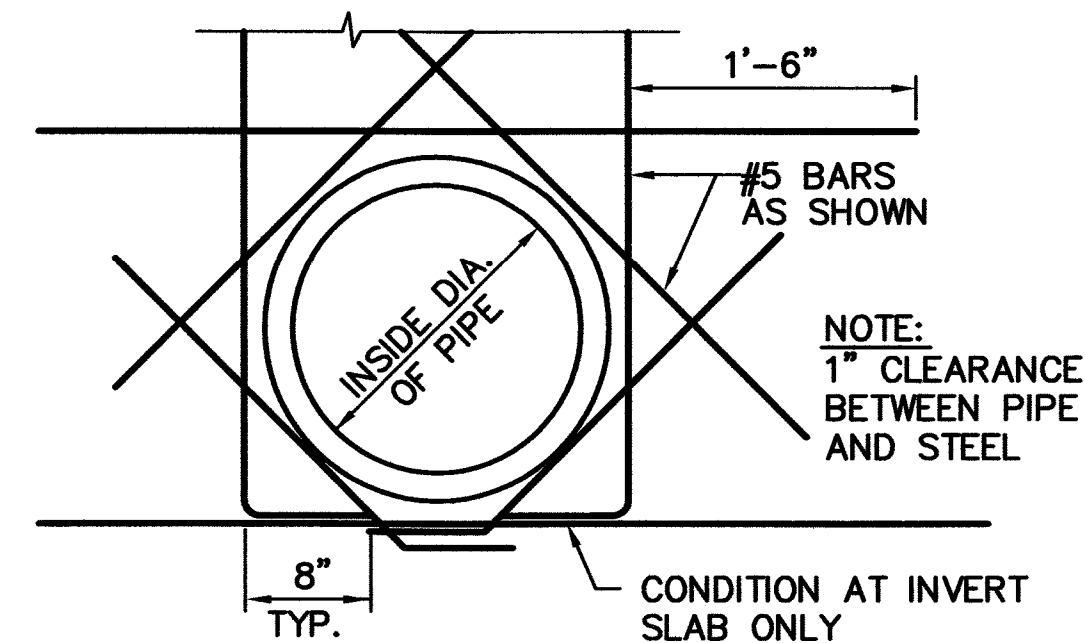
B DETAIL  
C-11 SCALE: 1 1/2" = 1'-0"



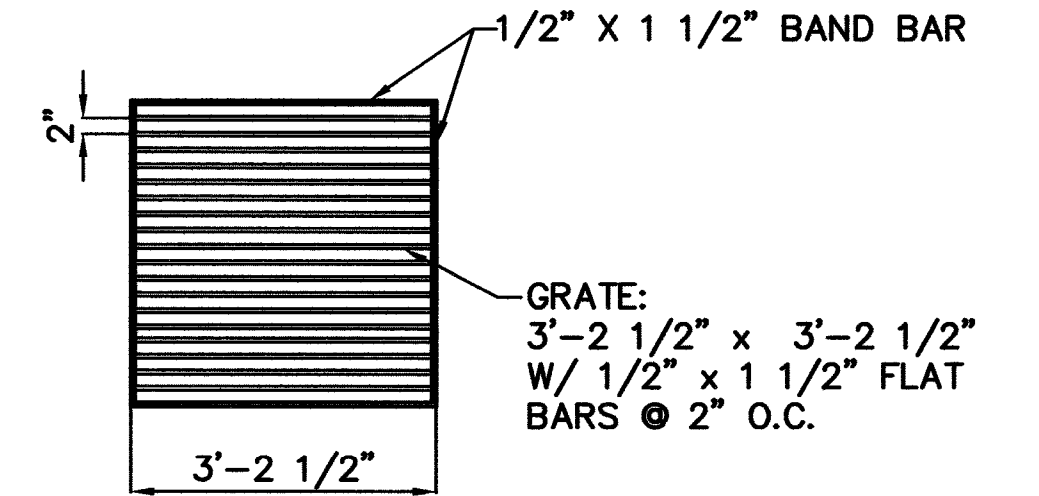
C DETAIL  
C-11 SCALE: 1 1/2" = 1'-0"

1 DETAILS - DRAIN INLET  
SCALE AS SHOWN

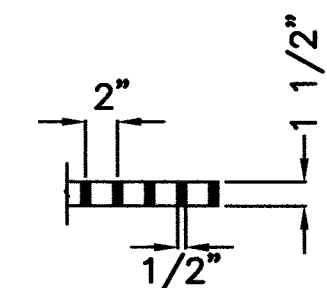
TYPICAL CORNER  
REINFORCEMENT LAPPING  
SCALE: 1" = 1'-0"



TYPICAL REINFORCEMENT  
AT PIPES  
SCALE: 1" = 1'-0"

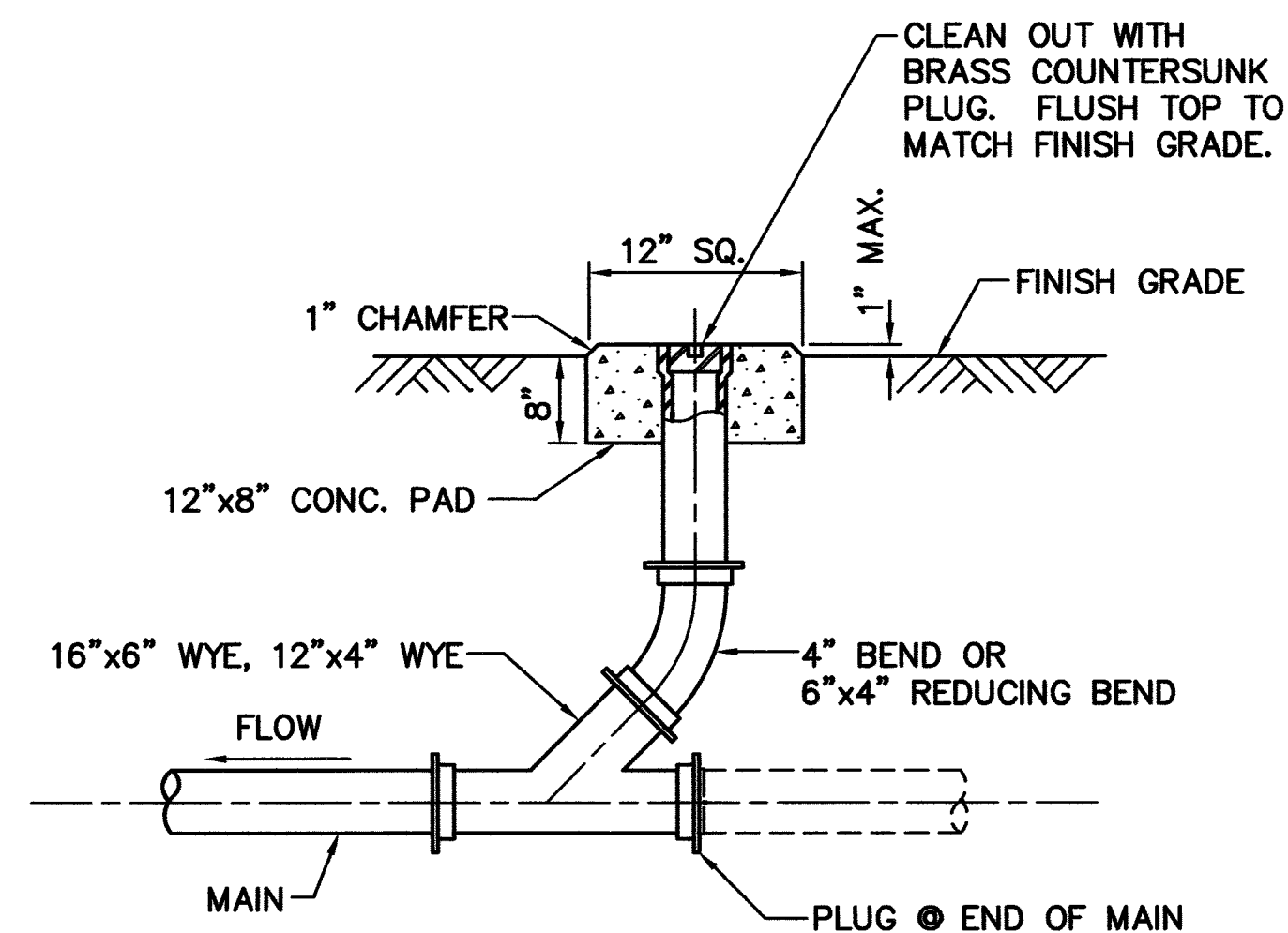


PLAN - GRATE  
SCALE: 1/2" = 1'-0"

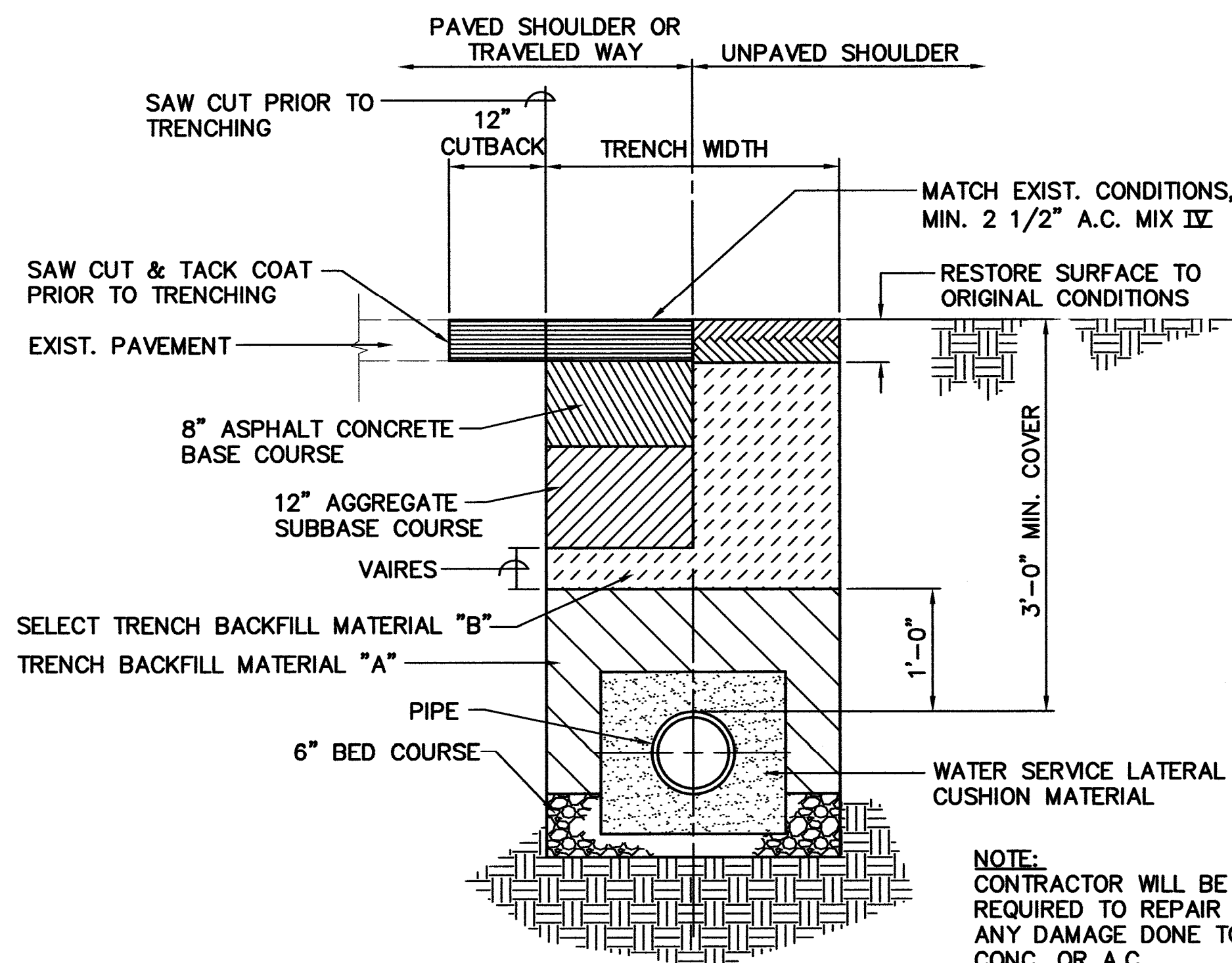


SECTION - GRATE  
SCALE: 1/4" = 1'-0"

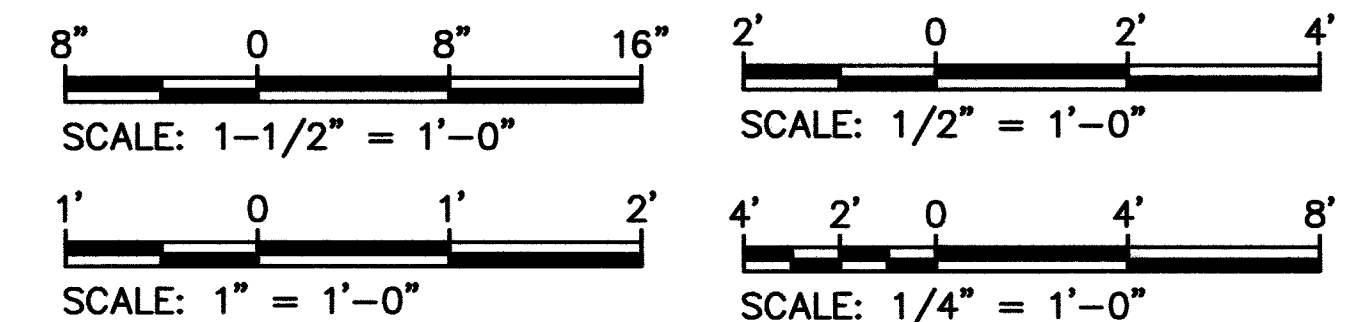
- NOTES:
1. GRATES SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
  2. ALL WELDS SHALL BE 3/8".
  3. SUBMIT EIGHT SETS OF SHOP AND LAYOUT DRAWINGS FOR APPROVAL PRIOR TO FABRICATION



2 CLEAN OUT TO GRADE DETAIL  
C-11 NOT TO SCALE



3 TYPICAL TRENCH & PAVEMENT REPAIR DETAIL  
(STATE HIGHWAYS)  
NOT TO SCALE



NOTES:

6" BED COURSE

1. WHERE UTILITIES ARE WITHIN THE WATER TABLE, USE SIZE #67(AASHTO M43)
2. FOR ALL OTHER AREAS, BED COURSE MATERIAL SHALL BE TRENCH BACKFILL MATERIAL "A".

TRENCH BACKFILL MATERIAL "A"

1. SAND EQUIVALENT (S.E.) ≥ 20
2. 8" MAXIMUM LIFTS
3. 95% COMPACTION

TRENCH BACKFILL MATERIAL "B"

1. S.E. MUST NOT BE LESS THAN THE AREA BEING FILLED AND IN NO CASE SHALL THE S.E. BE < 2 REGARDLESS OF WHERE IT IS USED.

8" MAXIMUM LIFTS

2. 8" MAXIMUM LIFTS
3. 95% COMPACTION

SUBBASE COURSE

1. S.E. ≥ 25
2. 8" MAXIMUM LIFTS
3. 95% COMPACTION

WATER SERVICE LATERAL CUSHION MATERIAL

1. PROVIDE 6" MINIMUM CUSHION MATERIAL AROUND WATER SERVICE LATERALS
2. CUSHION MATERIAL SHALL BE NO. 4 SAND OR OTHER MATERIAL APPROVED BY THE COUNTY OF HAWAII, DEPARTMENT OF WATER SUPPLY.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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LICENSE EXPIRES 04/30/14				

ENGINEERS SURVEYORS  
HAWAII, INC.  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4390 KAMUELA

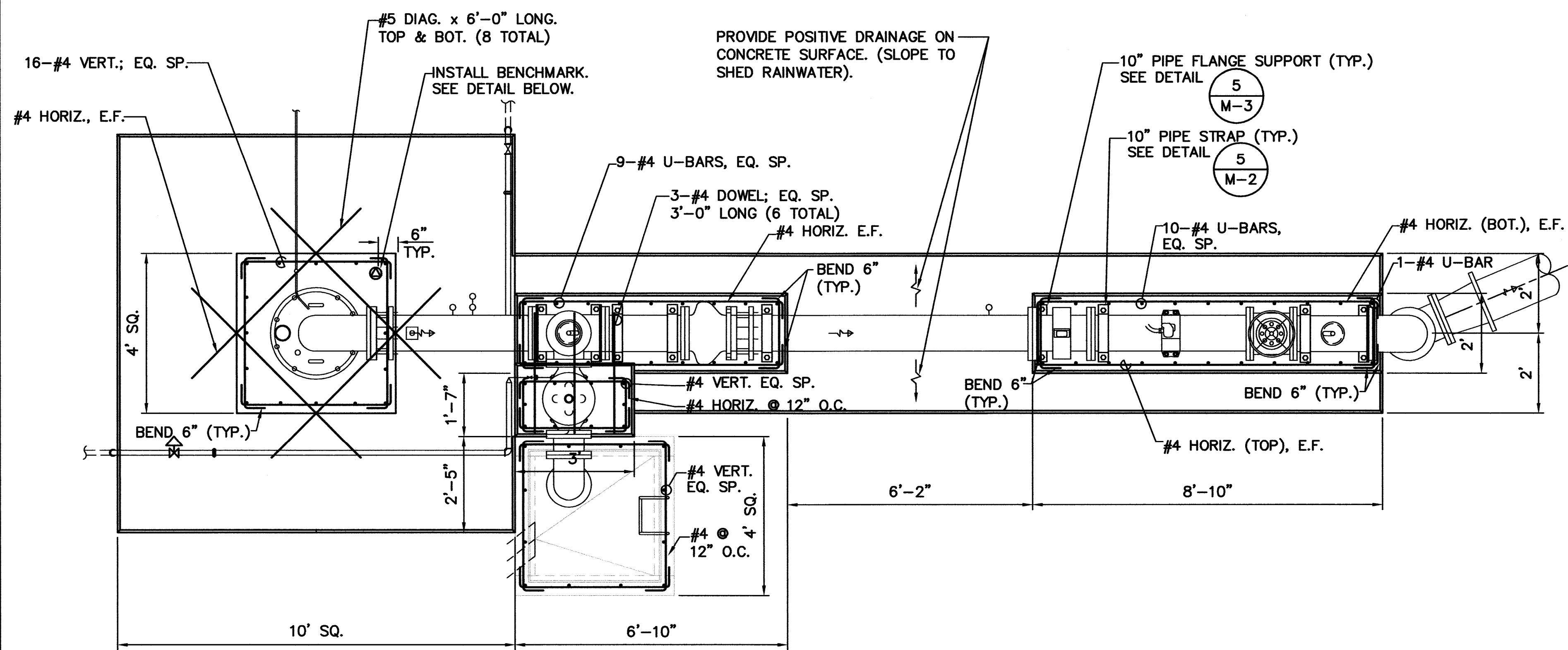
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

MISCELLANEOUS DETAILS

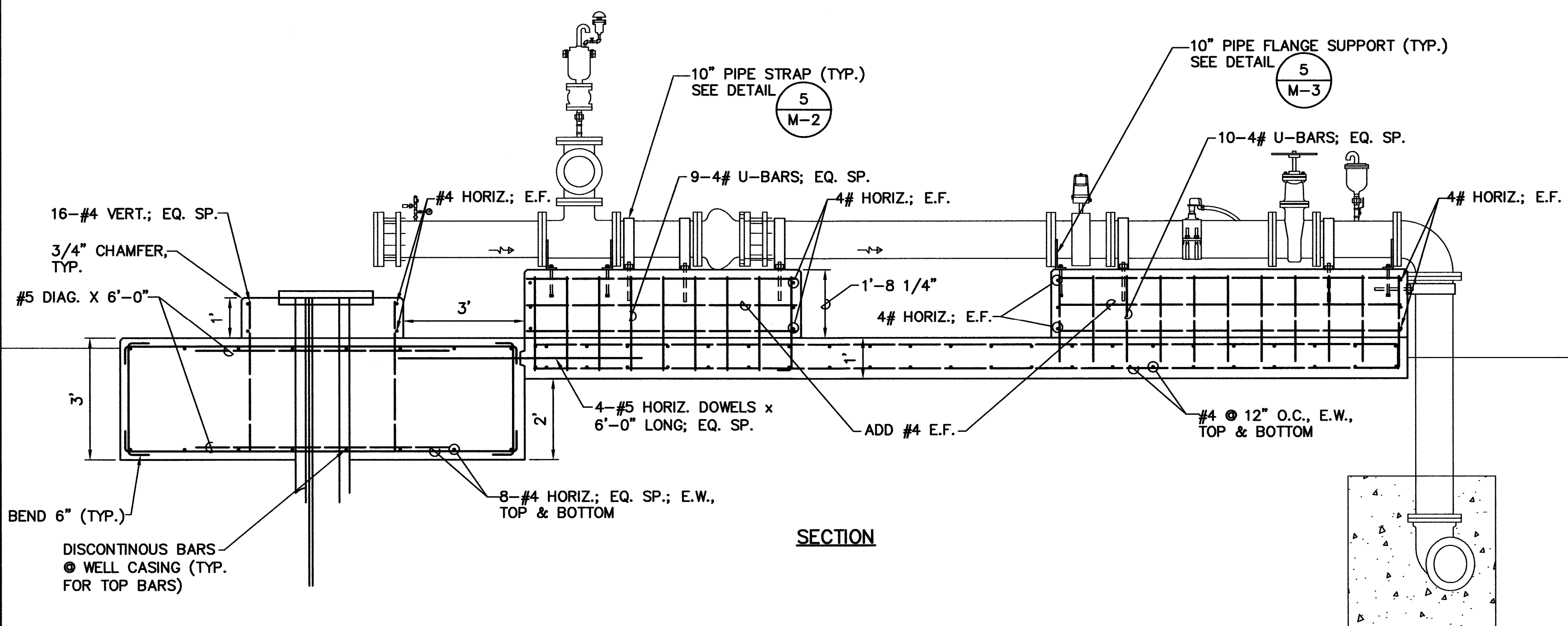


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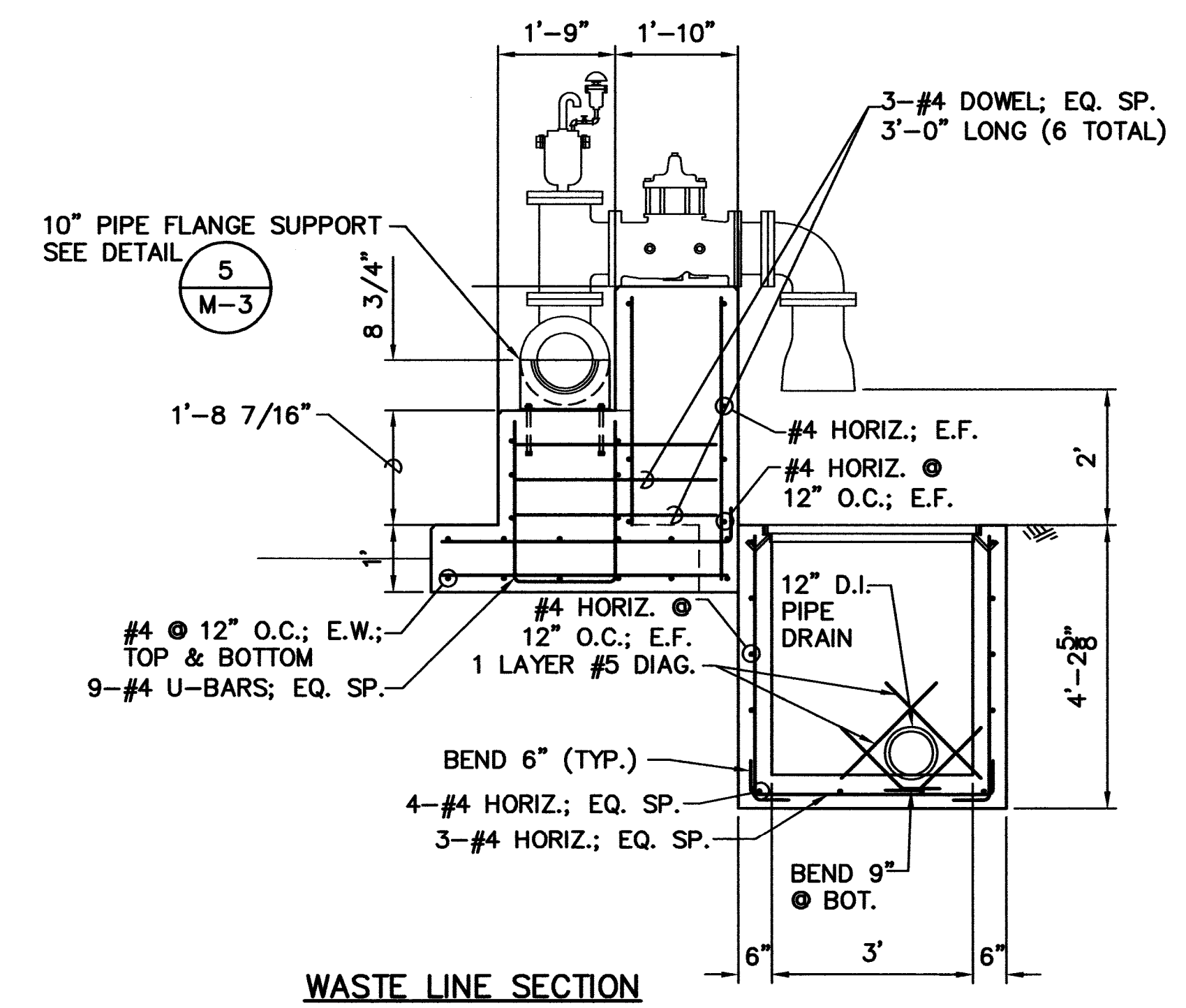


PLAN



SECTION

WELL PAD REINFORCING DETAILS  
SCALE: 1/2" = 1'-0"



WASTE LINE SECTION

3.5"

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

MAKUU WELL

3088.01

ELEVATION: 824.07 MSL  
O.P. ELEV.: 844.07 MSL  
P.F. ELEV.: 824.07 MSL

2012

3.5"

3.063"

1"

1.125"

MAKUU RESERVOIR

CAPACITY: 1.0 MG  
O.P. ELEV.: 844.07 MSL  
P.F. ELEV.: 824.07 MSL

2012

KEONEPOKO-NUI BOOSTER

ELEVATION: 604.3' MSL

2012

OFFICIAL NAME

STATE WELL ID NO.

OFFICIAL PROJECT YEAR

2'

0

2'

4'

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

GENERAL NOTES:

STATION BENCHMARK SHALL BE 3-1/2 INCH IN DIAMETER AND FABRICATED WITH STAINLESS STEEL, TYPE 316. BENCHMARK SHALL BE INSTALLED FLUSH WITH FINISHED CONCRETE SURFACE, WITHIN A 3 INCH DIAMETER, SCHEDULE 40, GALVANIZED PIPE SLEEVE, CAST OR CORED AND BONDED INTO THE CONCRETE. TEXT SHALL BE ENGRAVED IN A LEGIBLE FONT, SIZE AND DEPTH TO WITHSTAND WEATHER AND WEAR FOR THE OPERATIONAL LIFE OF THE FACILITY.

STATION ELEVATION BENCHMARK DETAILS

NOT TO SCALE

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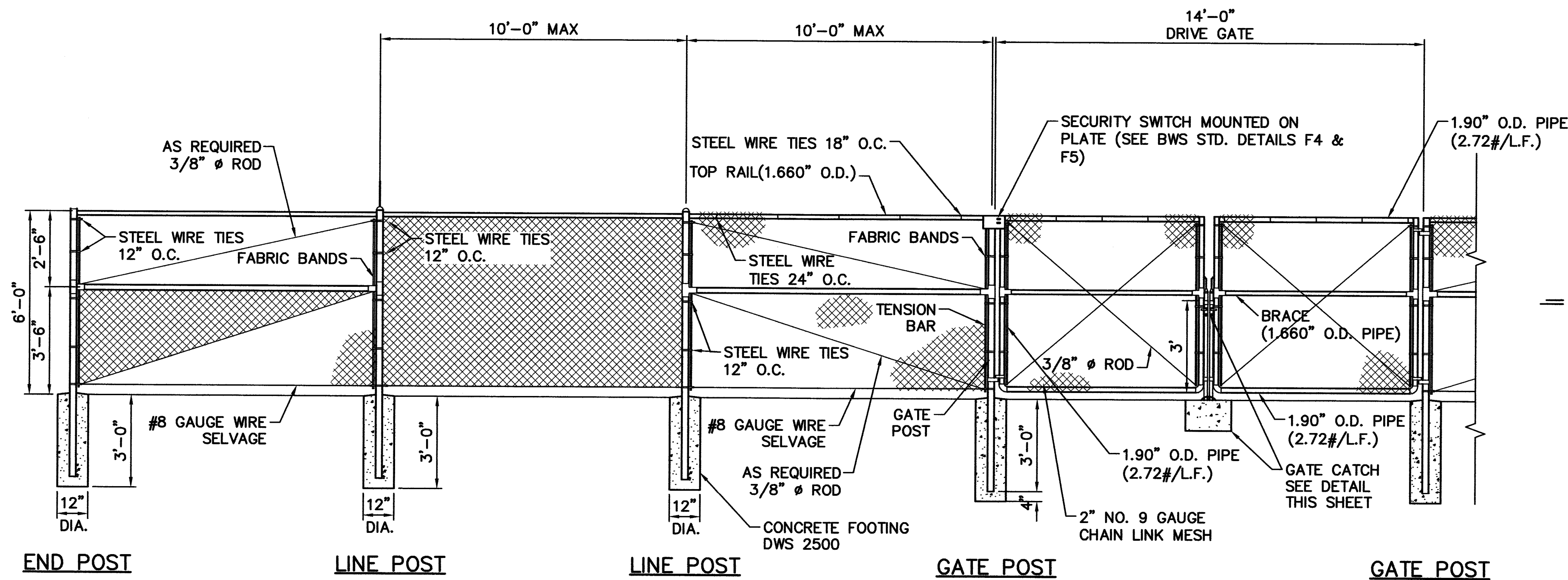
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ENGINEERS SURVEYORS HAWAII, INC.

900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4580 KAMUELA

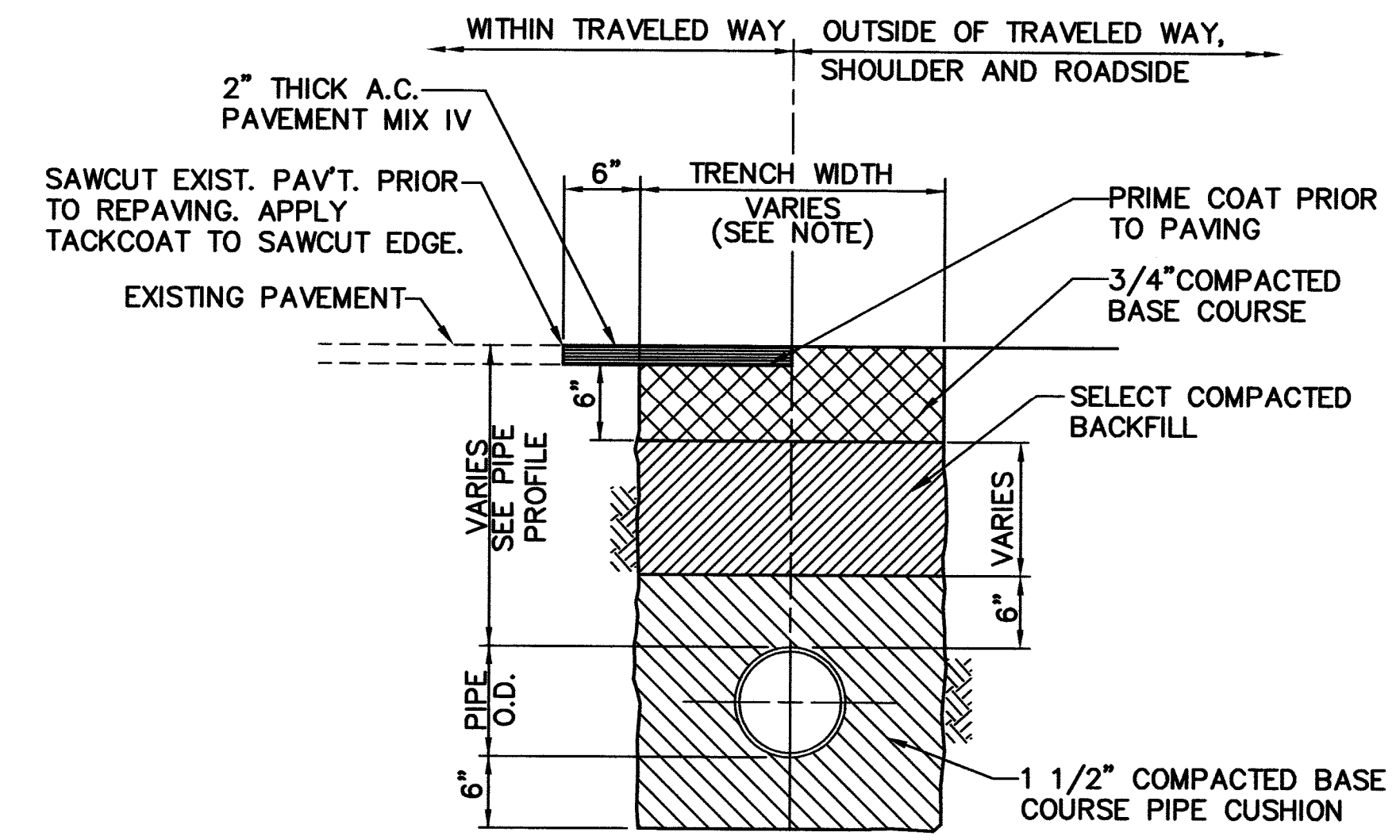
WELL PAD REINFORCING DETAILS





**DRIVE GATE DETAIL**

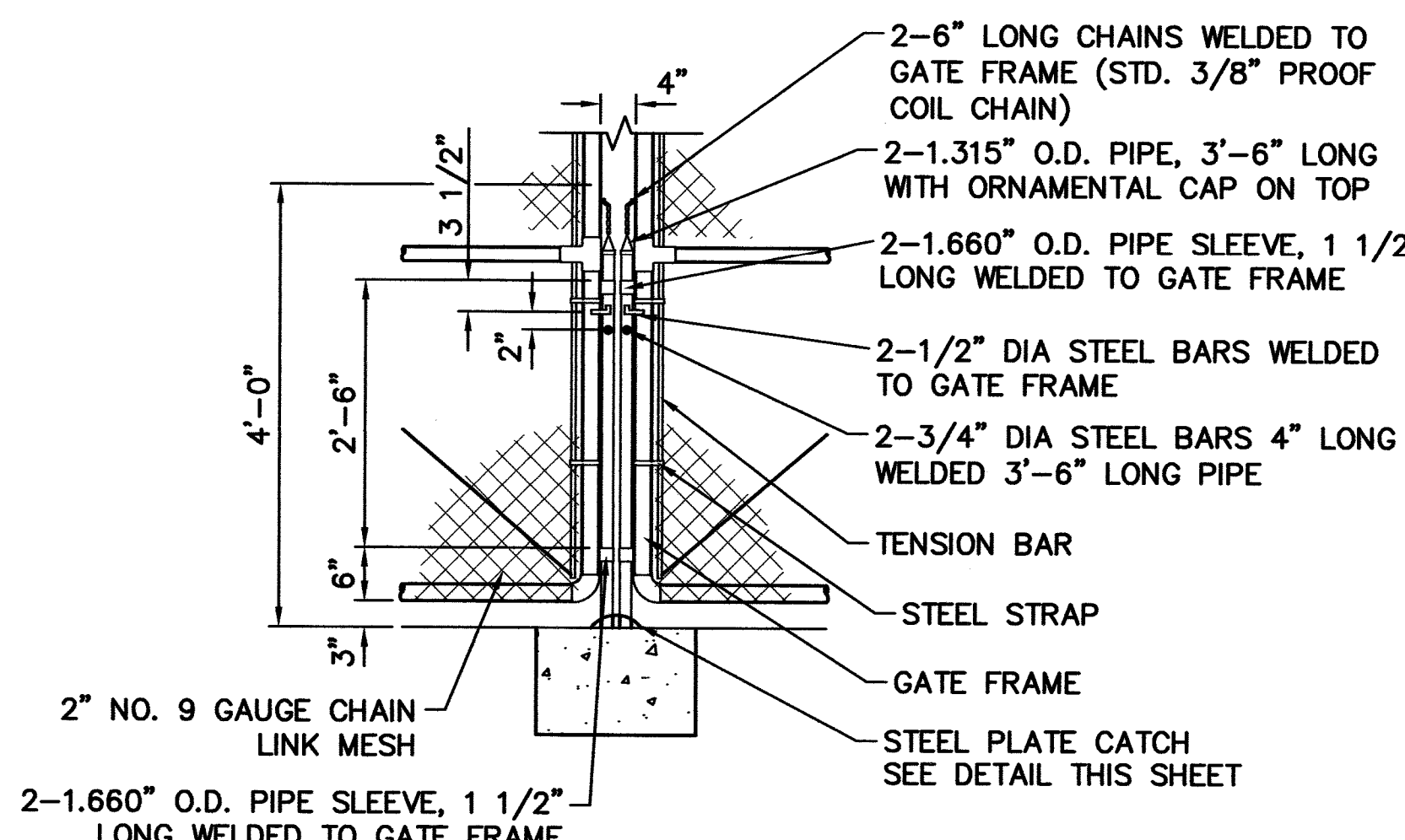
SCALE: 3/8" = 1'-0"



- NOTES:
1. FOR TRENCH WIDTH, SEE TABLE 300-1, PAGE 302-3, WATER SYSTEM STANDARDS DATED 2002, AS AMENDED.
  2. LOCAL MATERIAL MAY BE USED OUTSIDE SHOULDER AREA.

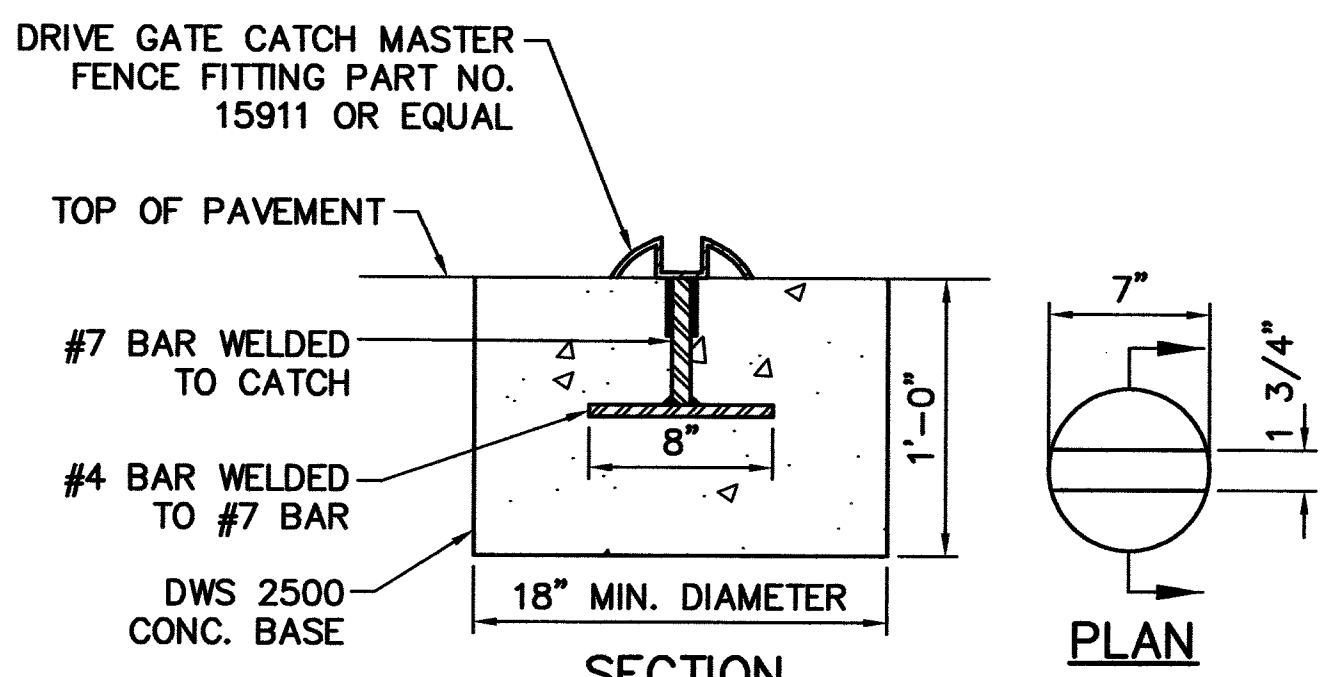
**TYPICAL TRENCH AND PAVEMENT REPAIR SECTION**

NOT TO SCALE



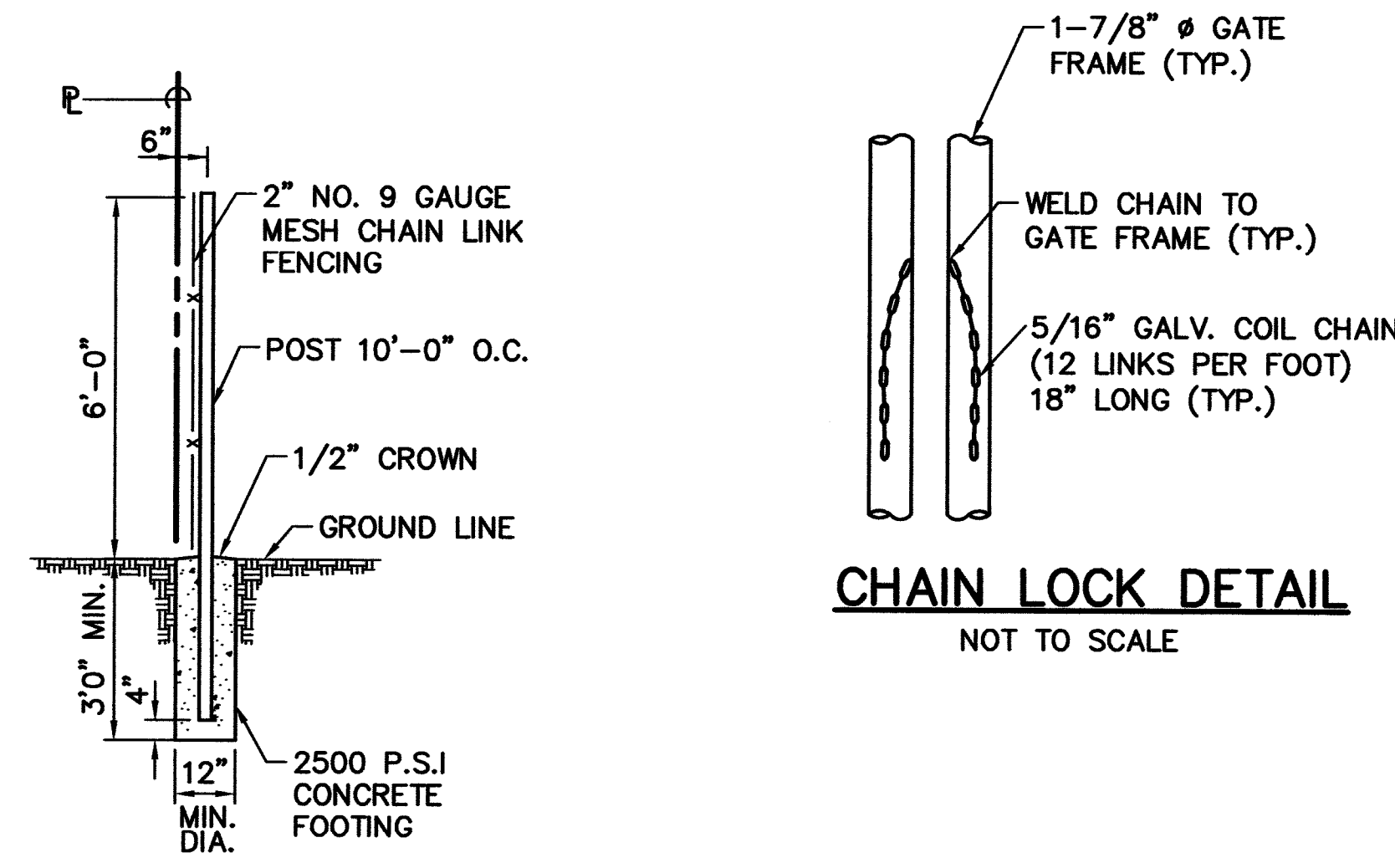
**DETAIL AT CATCH JOINT**

- NOTES:
1. PROVIDE 2 GATE STOPS, SIMILAR IN CONSTRUCTION AS GATE CATCH FOR DRIVE GATES WHEN FULLY OPEN.
  2. ALL MATERIALS SHALL BE HOT-DIPPED GALVANIZED UNLESS SPECIFIED OTHERWISE.



**GATE CATCH DETAIL**

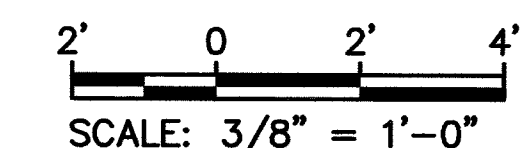
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**CHAIN LOCK DETAIL**

NOT TO SCALE

**SECTION**



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LICENSE EXPIRES 04/30/14

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591-8116 HON. 885-4590 KAMUELA

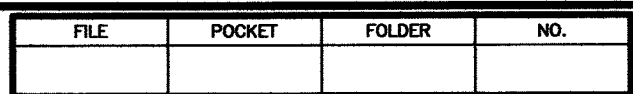
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**FENCE AND GATE DETAILS**

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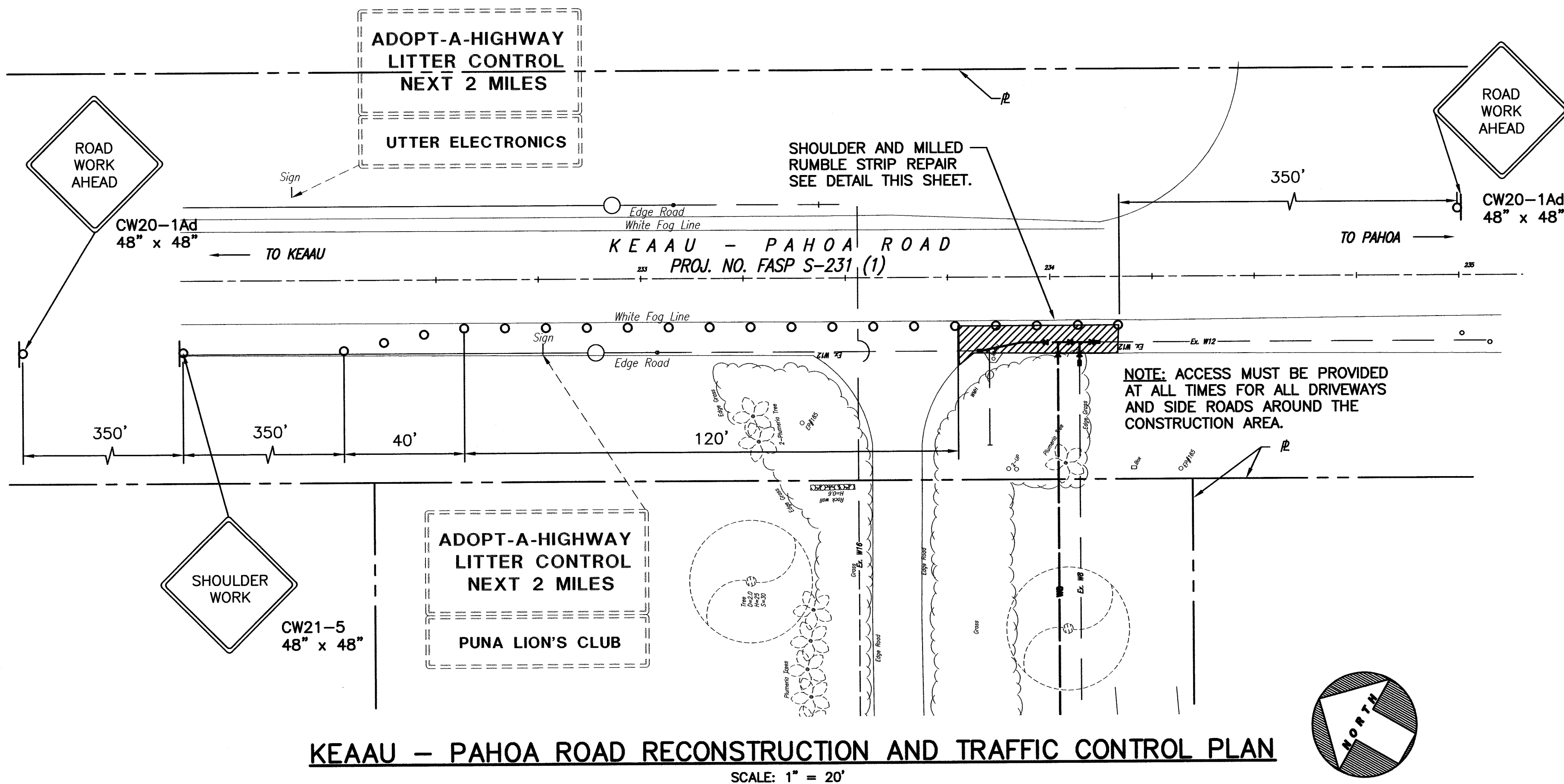
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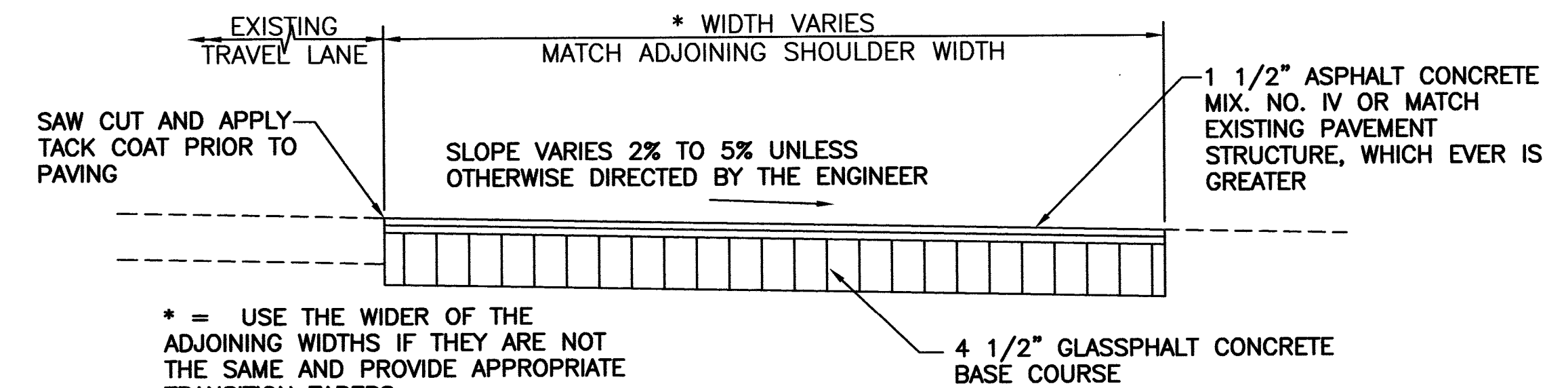


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#### GENERAL NOTES FOR TRAFFIC CONTROL PLAN

1. THE PERMITTEE SHALL MAKE MINOR ADJUSTMENTS AT INTERSECTIONS, DRIVEWAYS, STRUCTURES, ETC., TO FIT FIELD CONDITIONS.
2. CONES OR DELINEATORS SHALL BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
3. TRAFFIC CONTROL DEVICES SHALL BE INSTALLED SUCH THAT THE SIGN OR DEVICE FARTEST FROM THE WORK AREA SHALL BE PLACED FIRST. THE OTHERS SHALL THEN BE PLACED PROGRESSIVELY TOWARD THE WORK AREA.
4. REGULATORY WARNING SIGNS WITHIN THE CONSTRUCTION ZONE THAT ARE IN CONFLICT WITH THE TRAFFIC CONTROL PLANS SHALL BE REMOVED OR COVERED. ALL SIGNS SHALL BE RESTORED UPON COMPLETION OF THE WORK.
5. FLAGGERS AND/OR POLICE OFFICERS SHALL BE IN SIGHT OF EACH OTHER OR IN DIRECT COMMUNICATION AT ALL TIMES.
6. WHEN REQUIRED BY THE ISSUING OFFICE, THE PERMITTEE SHALL INSTALL A FLASHING ARROW SIGNAL AS SHOWN ON THE TRAFFIC CONTROL PLANS.
7. SIGN SPACING (L), TAPER LENGTHS (T) AND SPACINGS OF CONES OR DELINEATORS SHALL BE AS SHOWN IN TABLE 1, UNLESS OTHERWISE NOTED ON THE TRAFFIC CONTROL PLANS.
8. ALL TRAFFIC LANES SHALL BE A MINIMUM OF 10 FEET WIDE.
9. ALL CONSTRUCTION WARNING SIGNS SHALL BE PROMPTLY REMOVED OR COVERED WHENEVER THE MESSAGE IS NOT APPLICABLE OR NOT IN USE.
10. THE BACKS OF ALL SIGNS USED FOR TRAFFIC CONTROL SHALL BE APPROPRIATELY COVERED TO PRECLUDE THE DISPLAY OF INAPPLICABLE SIGN MESSAGES (I.E., WHEN SIGNS HAVE MESSAGES ON BOTH FACES).
11. AT THE END OF EACH DAY'S WORK OR AS SOON AS THE WORK IS COMPLETED, THE PERMITTEE SHALL REMOVE ALL TRAFFIC CONTROL DEVICES NO LONGER NEEDED TO PERMIT FREE AND SAFE PASSAGE OF PUBLIC TRAFFIC. REMOVAL SHALL BE IN THE REVERSE ORDER OF INSTALLATION.
12. REPLACE PERMANENT PAVEMENT MARKINGS AND TRAFFIC SIGNS UPON COMPLETION OF EACH PHASE OF WORK.
13. ALL WORK ZONE TRAFFIC CONTROL DEVICES SHALL COMPLY WITH THE PUBLICATION "GUIDELINES FOR TEMPORARY TRAFFIC CONTROL" DATED JUNE 2006.



#### FULL WIDTH PAVED SHOULDER RECONSTRUCTION DETAIL

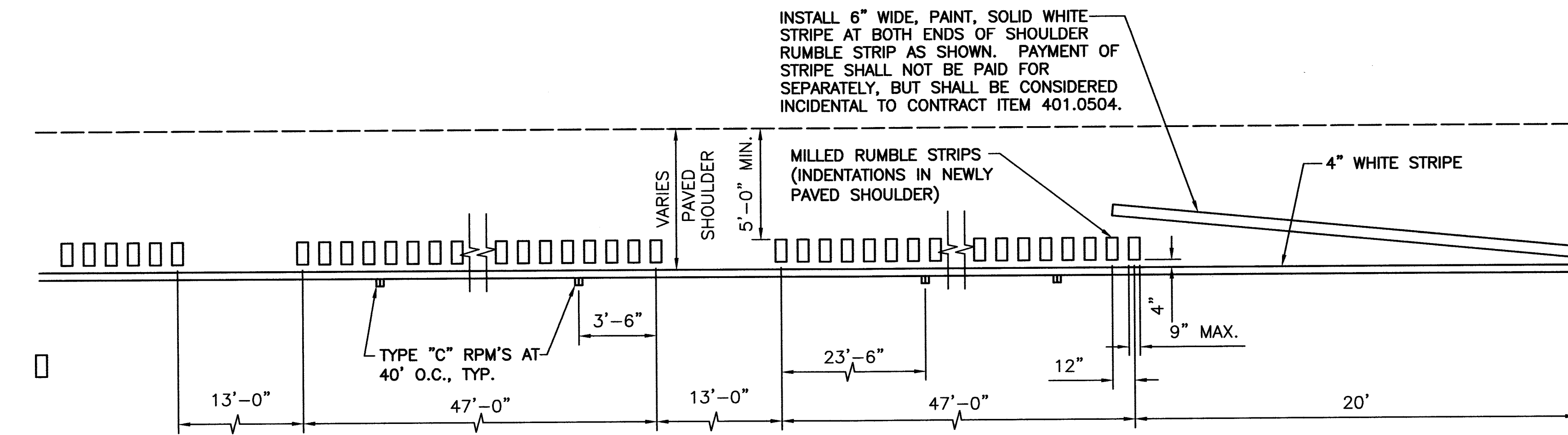
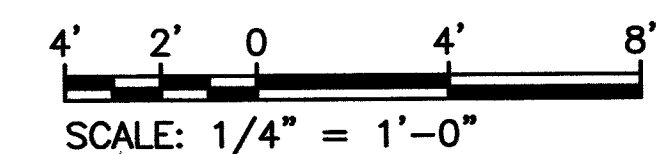
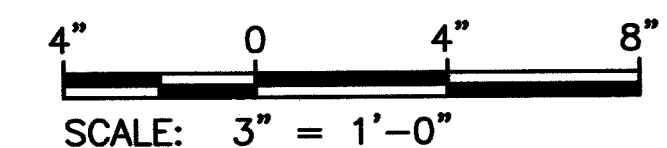
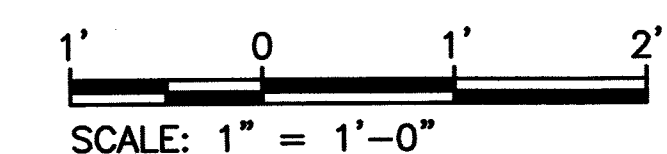
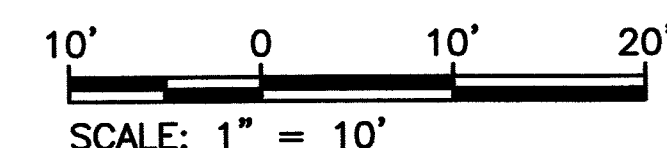
NOT TO SCALE

#### NOTES:

1. WHENEVER THE EXISTING PAVED SHOULDER OR TRAVEL LANE(S) ARE DISTURBED OR DAMAGED IN ANY WAY, THE ENTIRE WIDTH OF THE PAVED SHOULDER AND/OR TRAVEL LANE(S) SHALL BE RECONSTRUCTED PER THE DETAIL ABOVE.
2. MAKE 12" CUT BACK BEYOND THE EDGE OF TRAVEL LANE (WHITE LINE) AND/OR THE CENTERLINE STRIPE (YELLOW STRIPE) PRIOR TO THE PLACEMENT OF A.C. THE CONTRACTOR SHALL REPLACE THE WHITE STRIPE AND/OR YELLOW STRIPE WITH MATERIAL AND SIZE MATCHING THE EXISTING STRIPE AT BOTH ENDS OF THE CONSTRUCTION AREA.

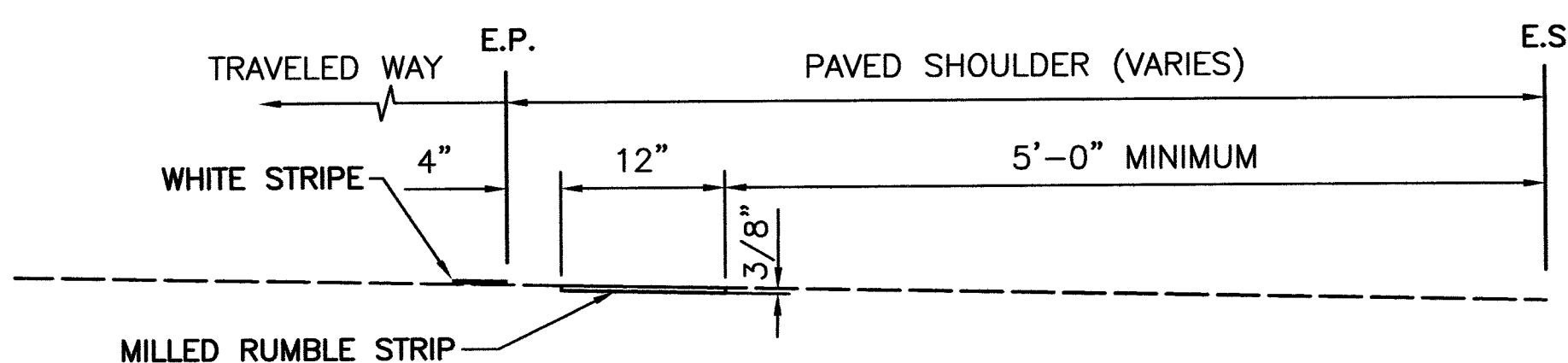
#### NOTES:

1. THE METHOD OF CONSTRUCTING THE MILLED RUMBLE STRIP SHALL BE SUBMITTED TO THE ENGINEER FOR ACCEPTANCE PRIOR TO ACTUAL WORK.
2. RUMBLE STRIPS SHALL BE INSTALLED ALONG ALL SHOULDERS, EXCEPT AT RIGHT TURN DECELERATION AND ACCELERATION LANES, AS NOTED ON THE PLANS.
3. DO NOT PLACE TYPE "C" MARKERS WITHIN 2 FT. OF THE 13 FT. RUMBLE STRIP OPENING.
4. RUMBLE STRIP WILL BE PAID FOR BY THE LINEAR FOOT. INCLUDED 13-FOOT GAPS WILL BE CONSIDERED RUMBLE STRIP AND MEASURED FOR PAYMENT. ANY OTHER GAPS IN THE RUMBLE STRIP (SUCH AS DRIVEWAYS, SIDE ROADS, CHANNELIZED INTERSECTIONS, ETC.) WILL NOT BE MEASURED FOR PAYMENT.
5. RUMBLE STRIPS ARE TO BE INSTALLED AFTER THE EDGE OF PAVEMENT STRIPS AND BEFORE THE INSTALLATION OF THE TYPE "C" MARKERS.



#### PLAN - MILLED RUMBLE STRIP

SCALE: 1/4" = 1'

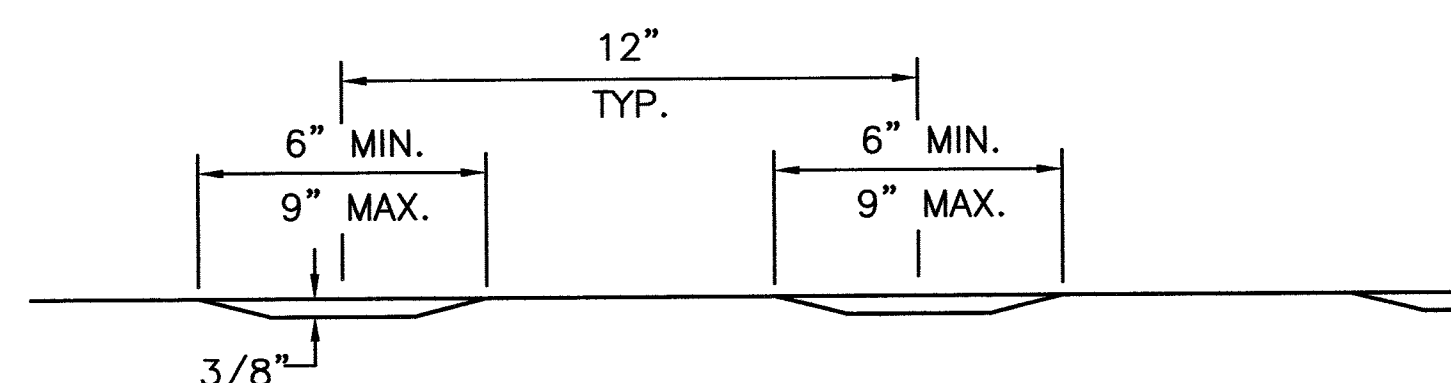


#### LONGITUDINAL SECTION - MILLED RUMBLE STRIP

SCALE: 1" = 1'

#### NOTES:

SHOULDER RUMBLE STRIPS SHOULD NOT BE USED UNLESS 1.5 METERS (5 FEET) OF CLEAR SHOULDER WIDTH FOR BICYCLE USE IS AVAILABLE BETWEEN THE RUMBLE STRIPS AND THE OUTER EDGE OF THE PAVED SHOULDER.



#### CROSS SECTION - MILLED RUMBLE STRIP

SCALE: 3" = 1'

#### NOTES:

WHENEVER EXISTING SHOULDER RUMBLE STRIPS ARE DISTURBED, THE SHOULDER RUMBLE STRIP(S) SHALL BE REPLACED EXACTLY IN THE SAME LOCATON(S) AS CONSTRUCTED ON THE GROUND, NO ALTERATIONS WILL BE ALLOWED.

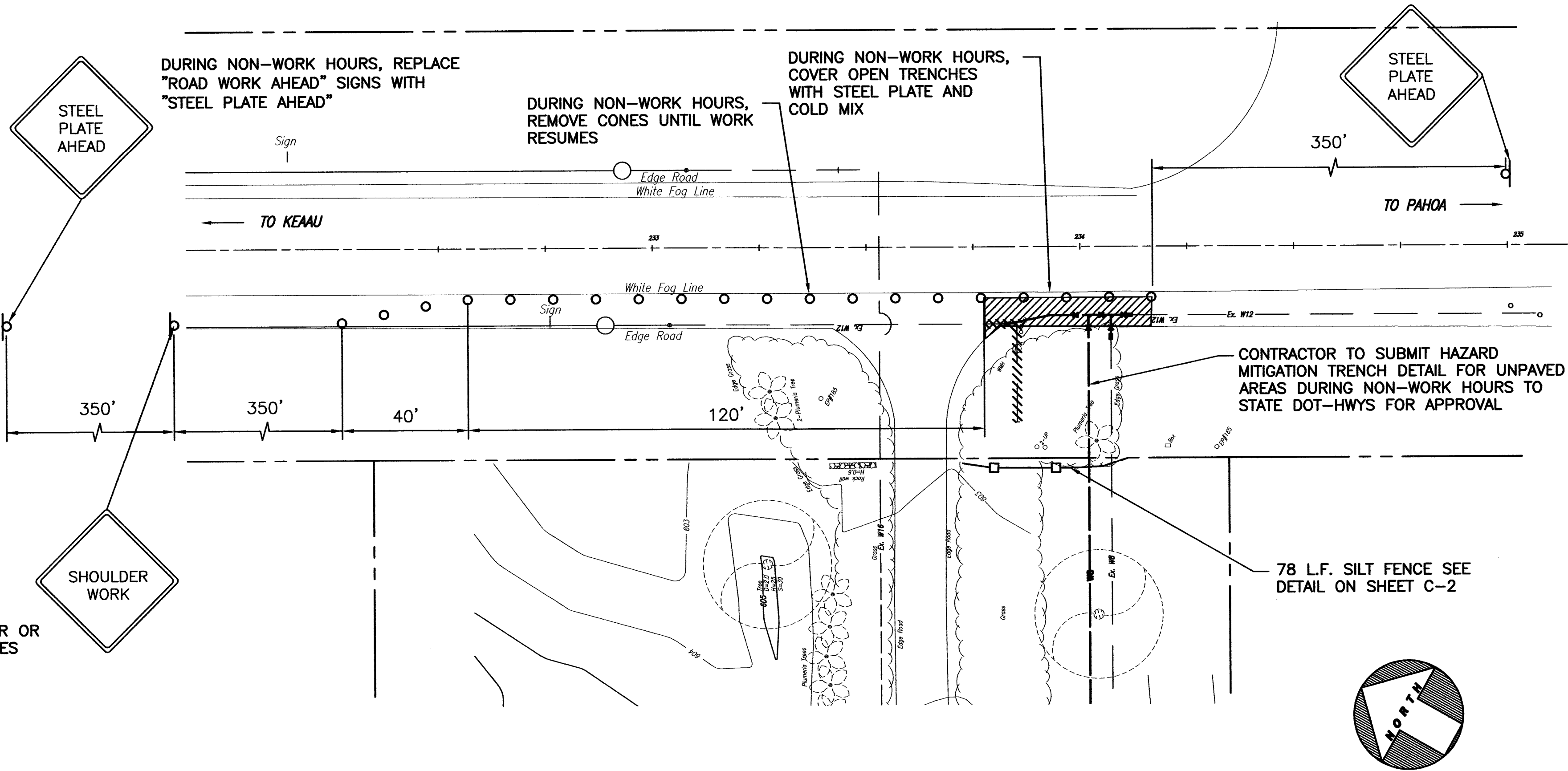
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DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ROAD WORK WITHIN STATE ROW (KEONEPOKO-NUI WELL & RES. SITE)				



ADDITIONAL NOTES

1. WHENEVER THE EXISTING PAVED SHOULDER OR TRAVEL LANE(S) ARE DISTURBED OR DAMAGED IN ANY WAY, THE ENTIRE WIDTH OF THE PAVED SHOULDER AND/OR TRAVEL LANE(S) SHALL BE RECONSTRUCTED PER DETAILS ON SHT. C-11.
2. MAKE 12" CUT BACK BEYOND THE EDGE OF TRAVEL LANE (WHITE LINE) AND/OR THE CENTERLINE STRIPE (YELLOW STRIPE) PRIOR TO THE PACEMENT OF A.C. THE CONTRACTOR SHALL REPLACE THE WHITE STRIPE AND/OR YELLOW STRIPE WITH MATERIAL AND SIZE MATCHING THE EXISTING STRIPE AT BOTH ENDS OF THE CONSTRUCTION AREA.
3. ACCESS MUST BE PROVIDED AT ALL TIMES FOR ALL THE DRIVEWAYS AND SIDE ROADS AROUND THE CONSTRUCTION AREA.
4. THE CONTRACTOR SHALL MAINTAIN ALL TEMPORARY BMP MEASURES UNTIL THE ENTIRE AREA IS COMPLETELY STABILIZED. ALL BMP MEASURES SHALL BE REMOVED IMMEDIATELY, AFTER THE AREA IS COMLETELY STABILIZED.
5. THE CONTRACTOR SHALL REFERENCE TO THE SATISFACTION OF THE DISTRICT ENGINEER, ALL EXISTING TRAFFIC SIGNS, POST AND PAVEMENT MARKINGS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR SHALL REPLACE OR REPAIR ALL TRAFFIC SIGNS, POST AND PAVEMENT MARKINGS DISTURBED BY HIS ACTIVITIES, AT NO ADDITIONAL COST TO THE STATE, UNLESS DIRECTED OTHERWISE BY THE HAWAII DISTRICT ENGINEER OR HIS REPRESENTATIVE.
6. THE CONTRACTOR TO SUBMIT SITE-SPECIFIC BMPs PRIOR TO CONSTRUCTION.
7. FOR ADDITIONAL NOTES REGARDING WORK WITHIN STATE DOT ROW AND NPDES REQUIREMENTS, SEE SHT. C-2.

DURING NON-WORK HOURS, COVER OR REMOVE SIGN UNTIL WORK RESUMES



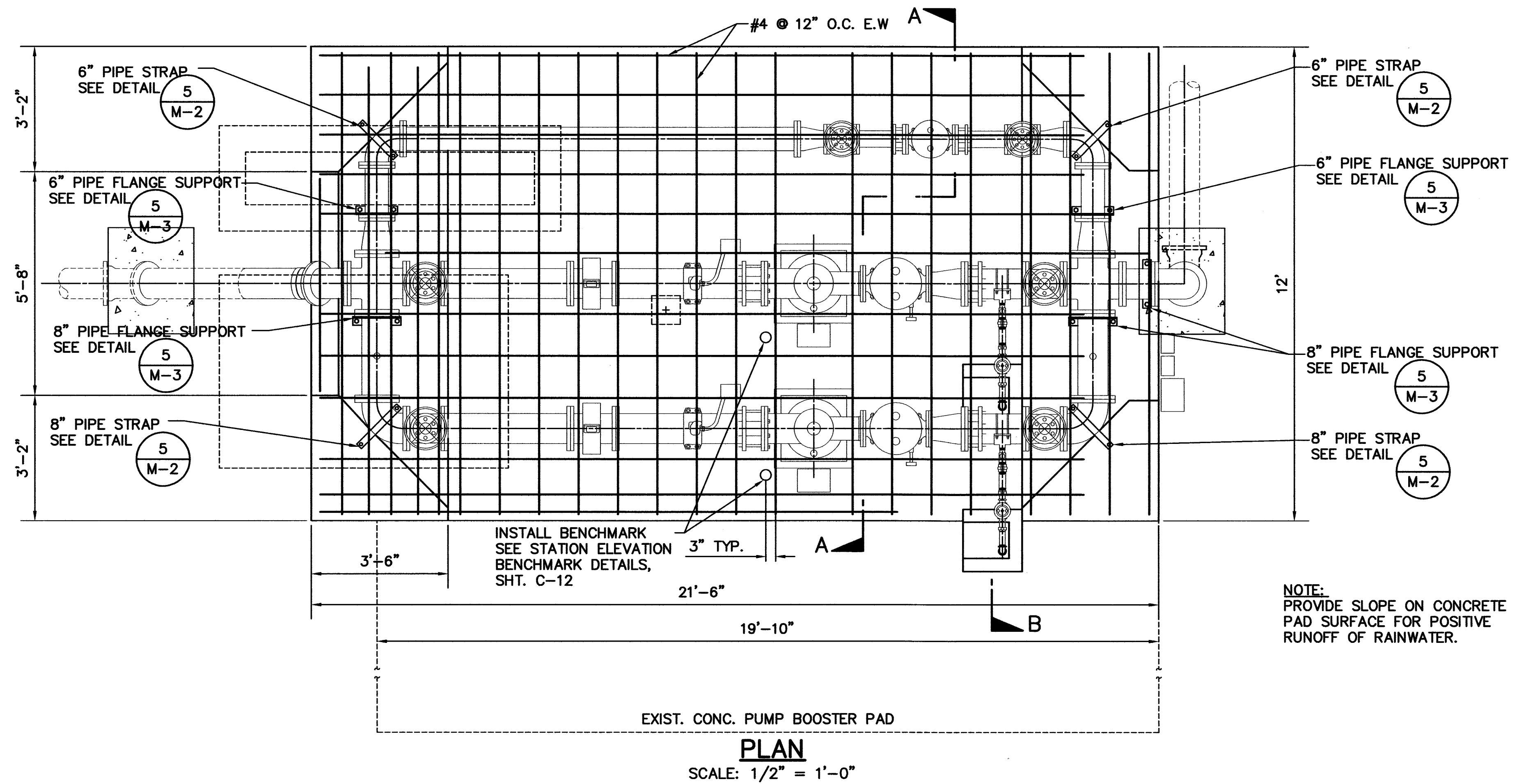
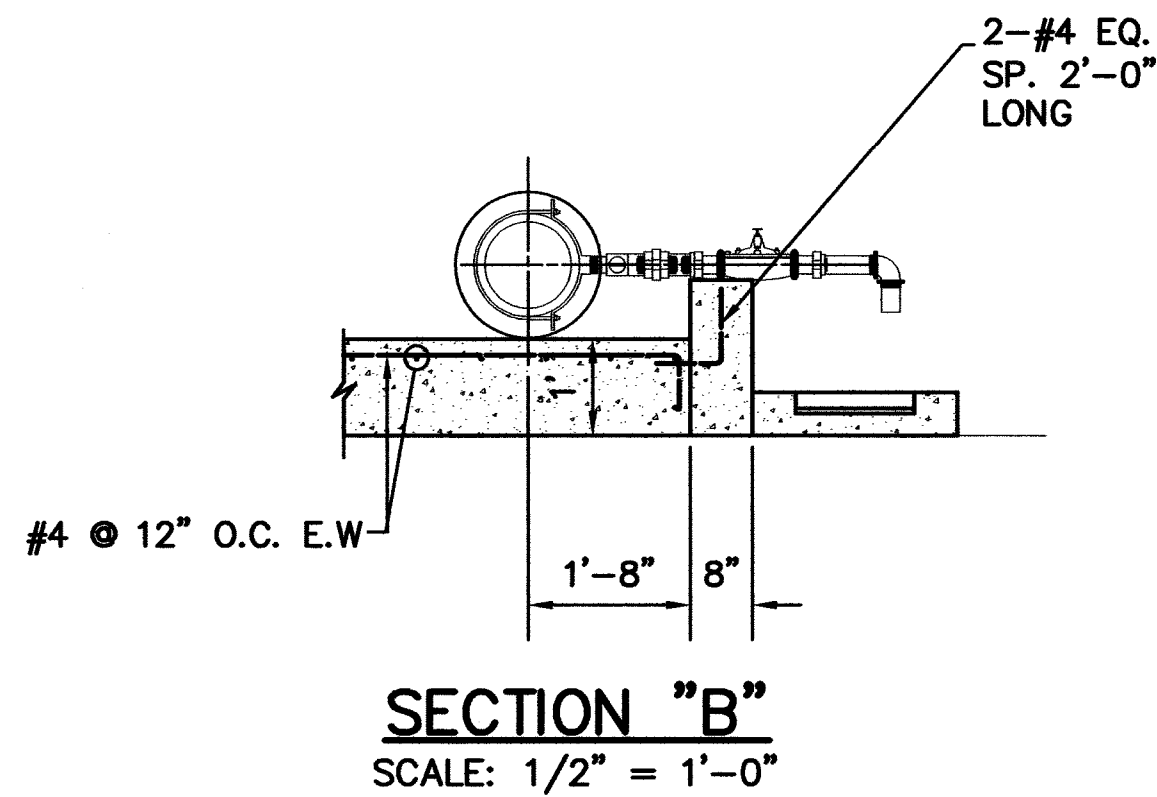
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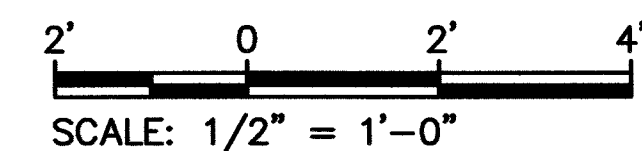
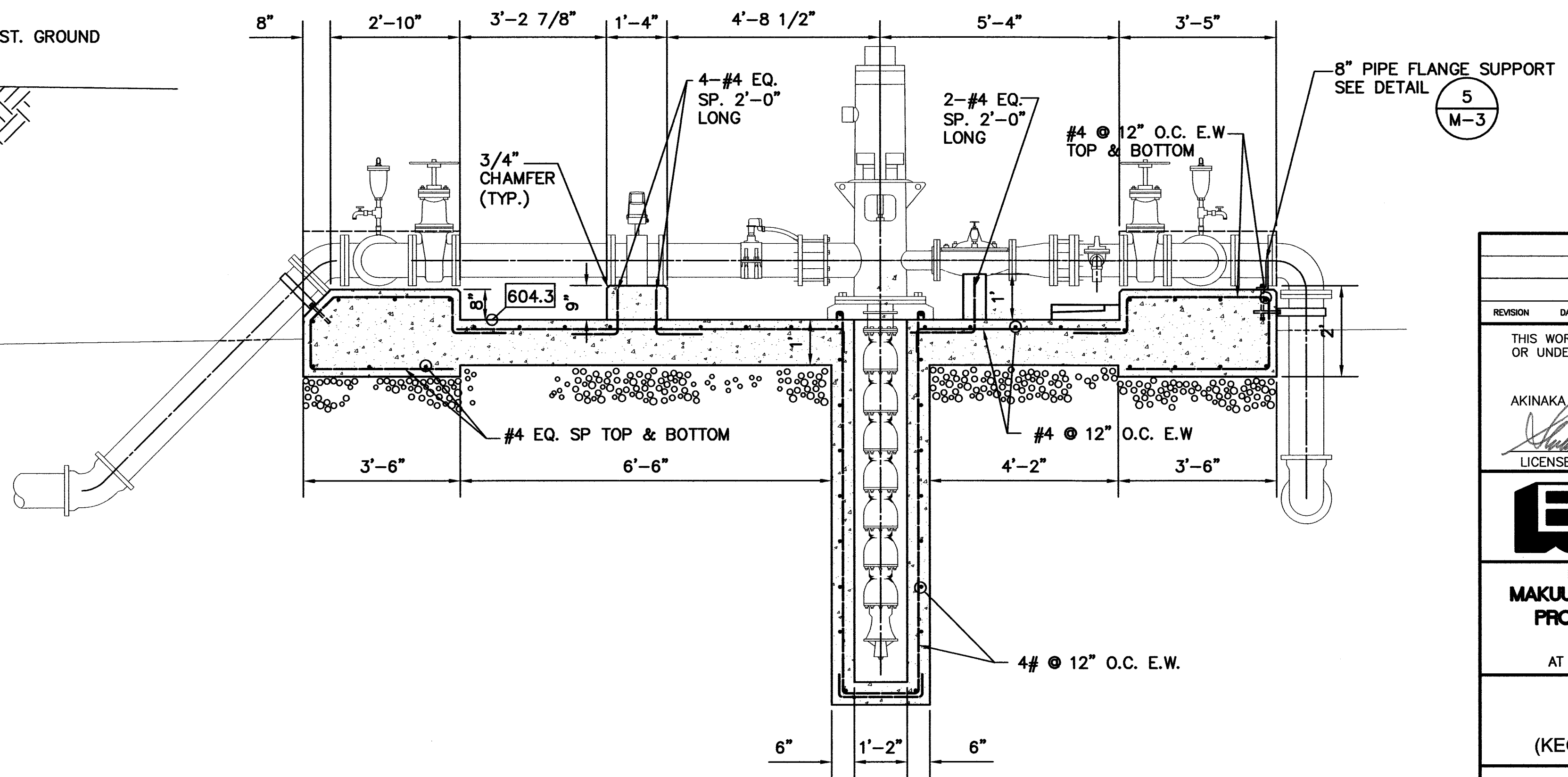
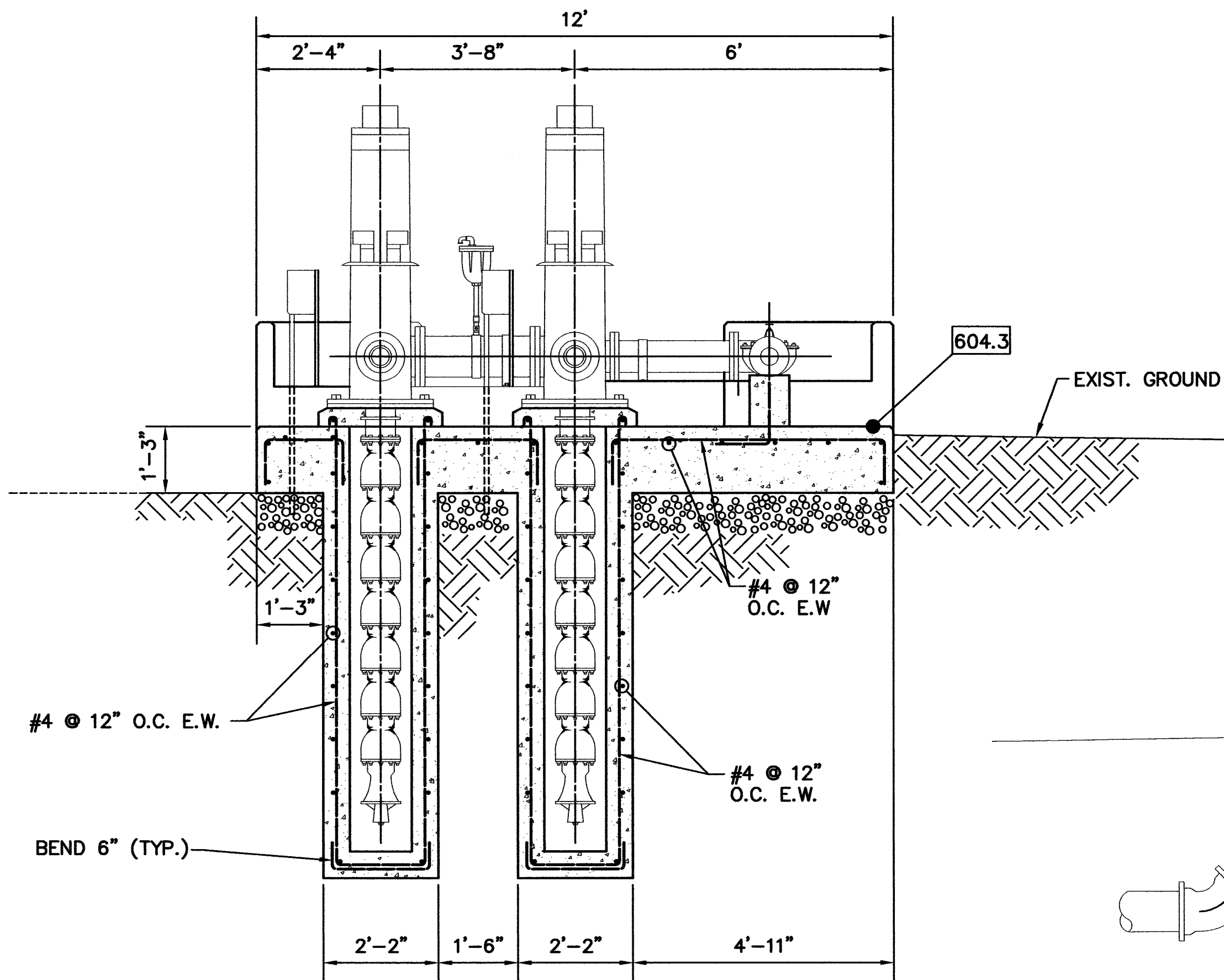
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DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>BMP &amp; NON-WORKING HOURS PLAN</b> (KEONEPOKO-NUI WELL & RES. SITE)				

FILE	POCKET	FOLDER	NO.





NOTE:  
PROVIDE SLOPE ON CONCRETE  
PAD SURFACE FOR POSITIVE  
RUNOFF OF RAINWATER.



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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LICENSE EXPIRES 04/30/14				
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<div> <div>BOOSTER PUMP PAD REINFORCING DETAILS</div> <div>(KEONEPOKO-NUI WELL &amp; RES. SITE)</div> </div>				
FILE	POCKET	FOLDER	NO.	



STA 0+00+; 0/5 20' LEFT (C.L. ROAD TO C.L. SIGN). FURNISH AND INSTALL "WOOD DWS SIGN" (DETAIL—21/C-29) AT THE END OF EXISTING KAUKAHI PAVEN. LEAVE IN PLACE AFTER CONSTRUCTION. (DWS SIGN TO BE REMOVED BY OTHERS DURING FUTURE SUBDIVISION CONSTRUCTION).

FURNISH AND INSTALL TEMPORARY USDA PROJECT SIGN AND TEMPORARY DPHL PROJECT SIGN AT A LOCATION (NEAR KEAKU-PAHOA ROAD) TO BE DESIGNATED BY THE DPHL. SEE DETAILS ON SHEET C-29. REMOVE BOTH AT END OF CONSTRUCTION.

—FUTURE MAKUU—HALONA SUBDIVISION

STA 0+20±: EXISTING TEMPORARY PIPE GATE TO REMAIN. (TO BE REMOVED BY OTHERS DURING FUTURE SUBDIVISION CONSTRUCTION).  
STA 0+18±: O/S RIGHT. FURNISH AND INSTALL "NO TRESPASSING" SIGN AND "NO OFF ROAD DRIVING" SIGN (NEXT TO EACH OTHER). SEE DETAILS ON SHEET C-29. ADJUST LOCATION OF SIGNS IN THE FIELD TO CLEAR EXISTING AC SHOULDER AND BE ON THE HIGHWAY SIDE OF THE GATE. LEAVE SIGNS IN PLACE AFTER CONSTRUCTION. (TO BE REMOVED BY OTHERS DURING FUTURE SUBDIVISION CONSTRUCTION).

RECONSTRUCT EXISTING TEMPORARY STABILIZED CONSTRUCTION ENTRANCE (THIS WAS CONSTRUCTED WITH EXPLORATORY WELL PROJECT). REMOVE WHEN READY TO CONSTRUCT ACCESS ROAD TO FINISH GRADE. SEE DETAIL ON SHEET C-2.

STA. 1+00  
12" WATER  
5 FT. O/S RIGHT  
FROM & RD.

STA. 4+45  
1-12"x8" TEE  
2-12" BVF, 250#  
1-8" GV, 200#  
3-VALVE BOXES  
1-8" CAP  
2-8" MEGALUG RESTRAINTS  
8" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
1-1" ARV UNIT  
1-2" CLEANOUT UNIT AND MANHOLE  
(DWS STD DETAIL V-20)

STA. 8+95  
1-12"x8" TEE  
2-12" BVF, 250#  
1-8" GV, 200#  
3-VALVE BOXES  
1-8" CAP  
2-8" MEGALUG R  
8" D.I. PIPE AS N  
2-CONC. BLOCKS  
1-1" ARV UNIT  
1-2" CLEANOUT U  
(DWS STD DETA

STA. 9+55 RT.  
1-12"x6" TEE  
1-6" GV, 200#  
1-VALVE BOX  
1-6" CAP  
2-6" MEGALUG RESTRAINTS  
6" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
SEE SCHEMATIC 1/C-19  
(INSTALL 6" PIPE LEVEL)

STA. 13+55  
1-12"x8" TEE  
2-12" BVF, 250#  
1-8" GV, 200#  
3-VALVE BOXES  
1-8" CAP  
2-8" MEGALUG RESTRAINTS  
8" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
1-1" ARV UNIT  
1-2" CLEANOUT UNIT & MAN

—STA. 15+75 RT.  
1-12"x6" TEE  
1-6" GV, 200#  
1-VALVE BOX  
1-6" CAP  
2-6" MEGALUG RESTRAINTS  
6" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
SEE SCHEMATIC 1/C-19  
(INSTALL 6" PIPE LEVEL) [

STA. 21+00  
1-12" BFV,  
1-VALVE BOX  
1-1" ARV  
-NEW 12" WATER  
5 FT. O/S  
FROM & RD

STA. 23+00  
12" WATER  
5 FT. O/S  
FROM & RD.  
DEFLECT PIPE

STA. 22+80 LT.—  
1-12"x6" TEE  
1-6" GV, 200#  
1-VALVE BOX  
1-6" CAP  
2-6" MEGALUG RESTRAINTS  
6" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
SEE SCHEMATIC 1/C-19  
(INSTALL 6" PIPE LEVEL)

0+00 KAUAKAHİ PL.  
= 0+00 PROPOSED ROAD A

EXIST. ST. MON. — 205.13' — 503.34' — (EX. MON. TO EX. MON.)

115.13' 95.00' (MON. TO MON.)

EXIST. ST. MON.

EXIST. KAPİKA ST.

25+44' 15.1' — 550.02' (TIE EX. MON TO STA 1+00 WATERLINE)

EXIST. 12" WATER. 13 FT O/S RIGHT FROM E. RD.

EXIST. AC ROAD

LAND SURVEY CONTROL		NOTE:
TIE EX. MON AT INTERSECTION OF KAUAKAHI PLACE AND KAPIKA STREET TO STA 1+00 WATERLINE (BASELINE)	25°44'15.1" 550.02'	1. UNLESS OTHERWISE NOTED, ALL STATIONS ARE REFERENCED TO ± 12" WATERLINE (BASELINE)
TIE EX. MON AT INTERSECTION OF KAUAKAHI PLACE AND KAPIKA STREET TO STA 1+00 FUTURE ± RD (KAUAKAHI PL EXT.)	25°13'00" 550.00'	2. ± RD REFERS TO FUTURE KAUAKAHI PLACE EXTENSION

STA. 0+10.31±  
BEGIN NEW 12" WATERLINE. (EXIST.  
12" WATER 13 FT. O/S RIGHT FROM  
E RD.) (VERIFY CONNECTION POINT IN  
THE FIELD)  
REMOVE EXIST. 12" CAP,  
2" C.O. & BOX, 1" ARV & BOX,  
AND CONC. BLOCK.  
CONNECT TO EXIST. 12" WATER.  
(CONTRACTOR TO VERIFY  
LOCATION AND INVERT).  
MATERIALS FOR CONN.:  
1-12" SLUFFE

STA. 3+80 LT.  
1-12"x6" TEE  
1-6" GV, 200#  
1-VALVE BOX  
1-6" CAP  
2-6" MEGALUG RESTRAINTS  
6" D.I. PIPE AS NECESSARY  
2-CONC. BLOCKS  
SEE SCHEMATIC 1/C-19  
(INSTALL 6" PIPE LEVEL)

PLAN - 12" D.I. WATER & ACCESS ROAD  
SCALE: 1"=100'

1-12" DI NIPPLE (AS REQ'D.)  
TEMP. FOR TESTING:  
1-12" CAP TAPPED FOR 2" IF  
1-2" C.O.  
1-CONC. BLOCK

RECORD AZ  
25° 13' →

Existing 12" Water

STA. 0+10.31  
BEGIN NEW 12" WATERLINE.

STA 0+40  
DEFLECT 3'30"±

STA 0+20  
DEFLECT 4'±

12-INCH DIAMETER WATER LINE SHALL BE DUCTILE IRON, PUSH ON JOINT CLASS 52 WITH MAXIMUM DEFLECTION OF 5 DEGREES.

20'07"11"

STA 0+80  
DEFLECT 3'30"±

90.05'

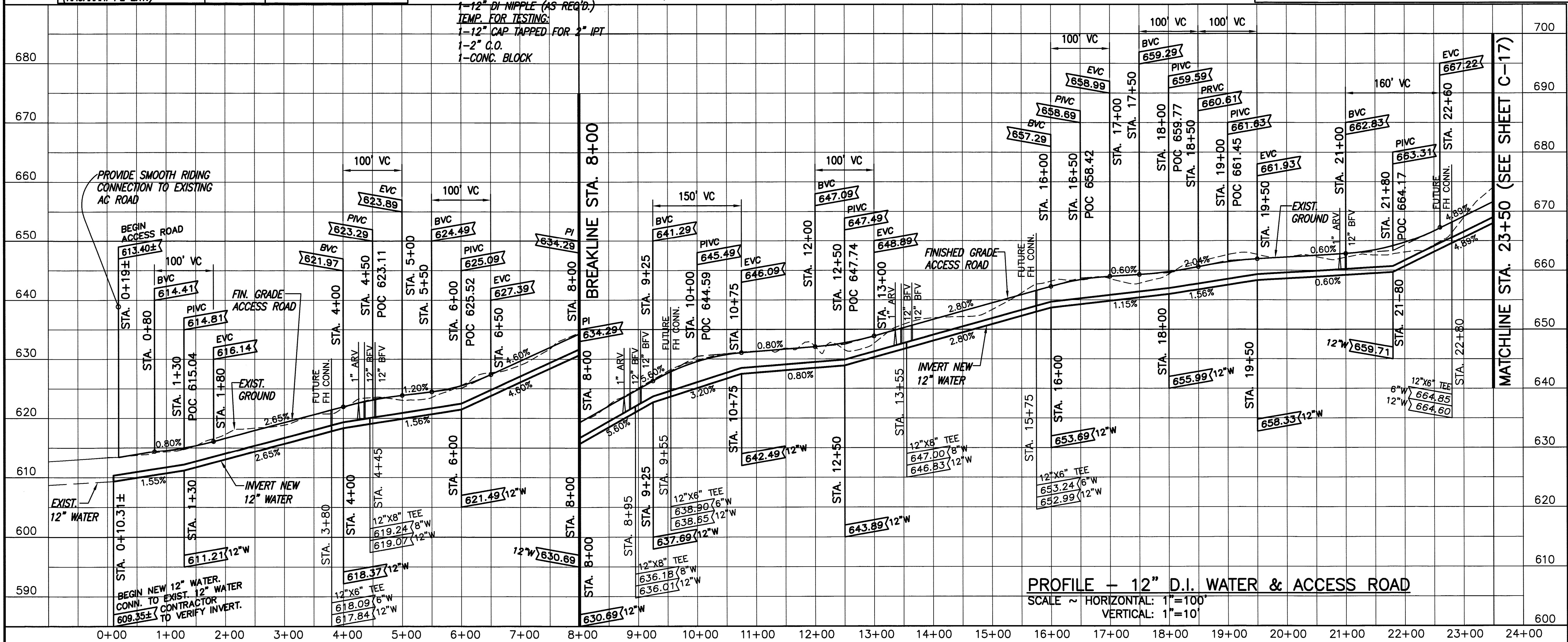
STA 1+00

DEFLECT 4'±  
@ 25° 13' → 2200.00'

12"D.I. WATER LINE

20'± 12"D.I. WATER LINE (TYPICAL)

INSET "A"  
NOT TO SCALE



**GRAPHIC SCALES:**

1"=100' 100 0 100 200

1"=10' 10 0 10 20

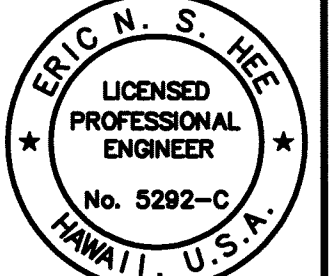
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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Eve W. J. H.  
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591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS

**MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES**

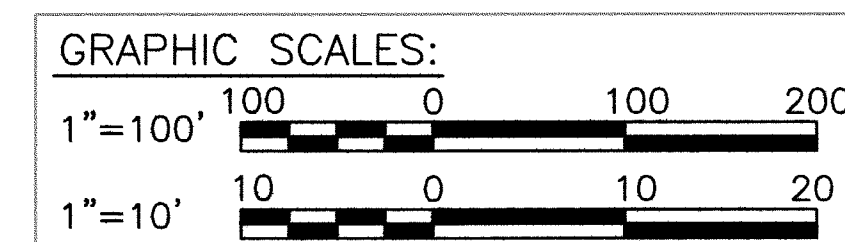
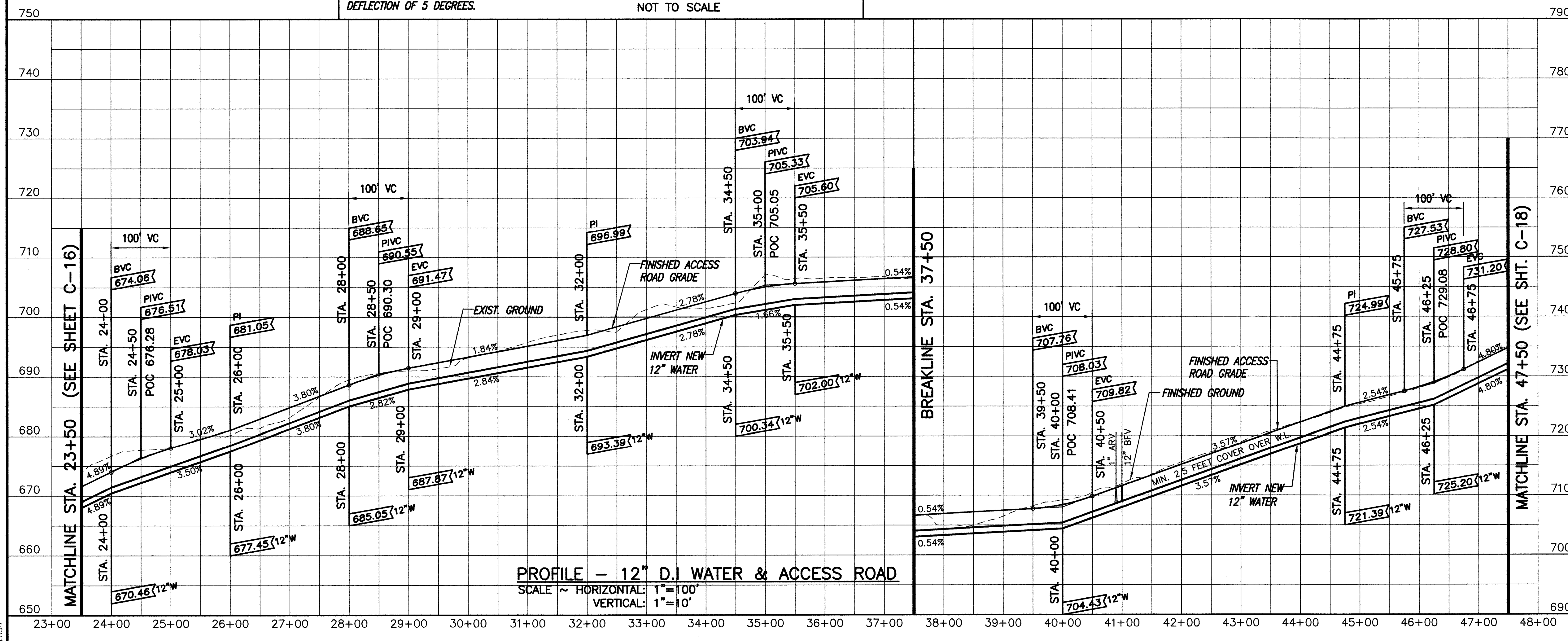
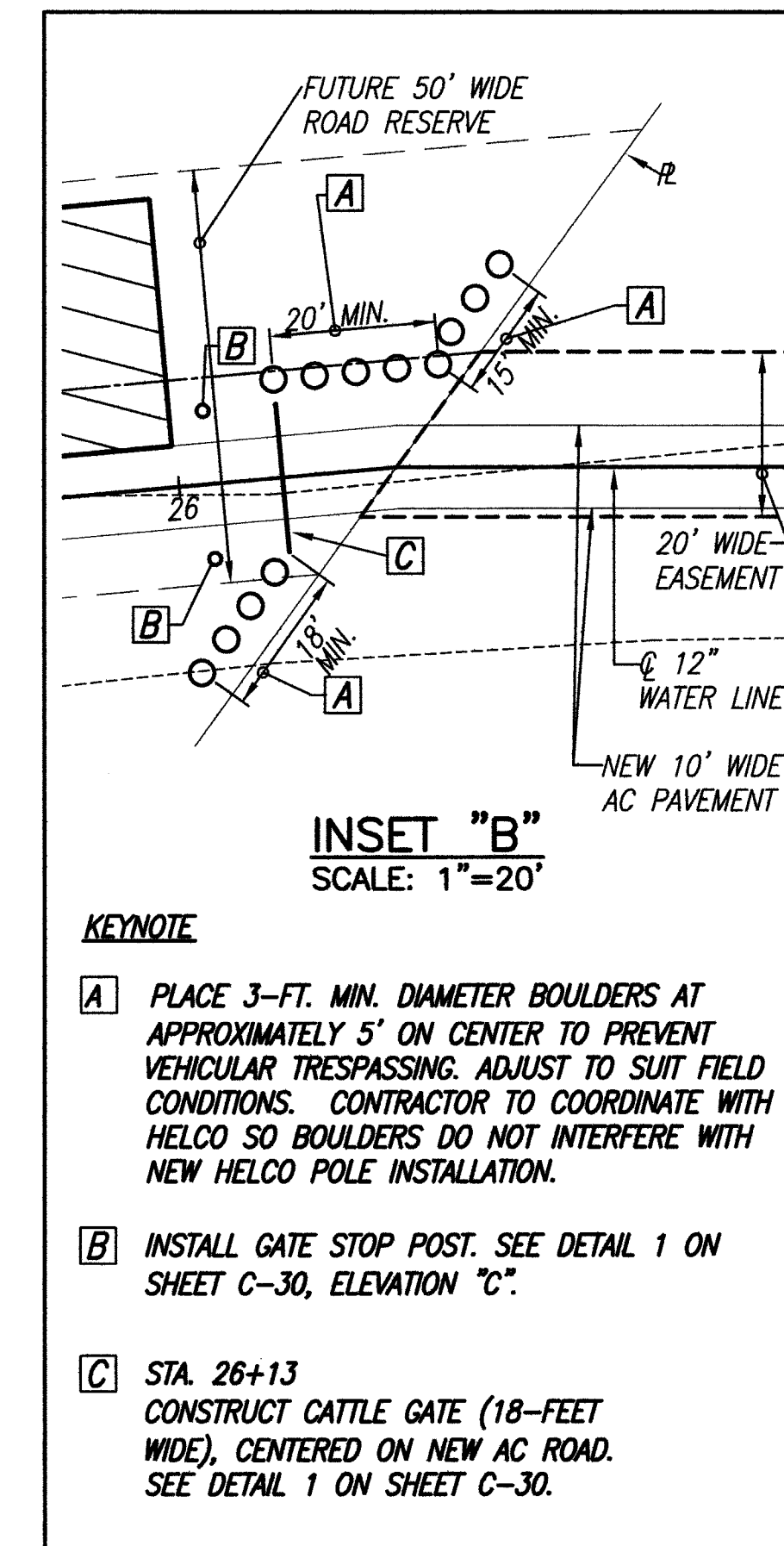
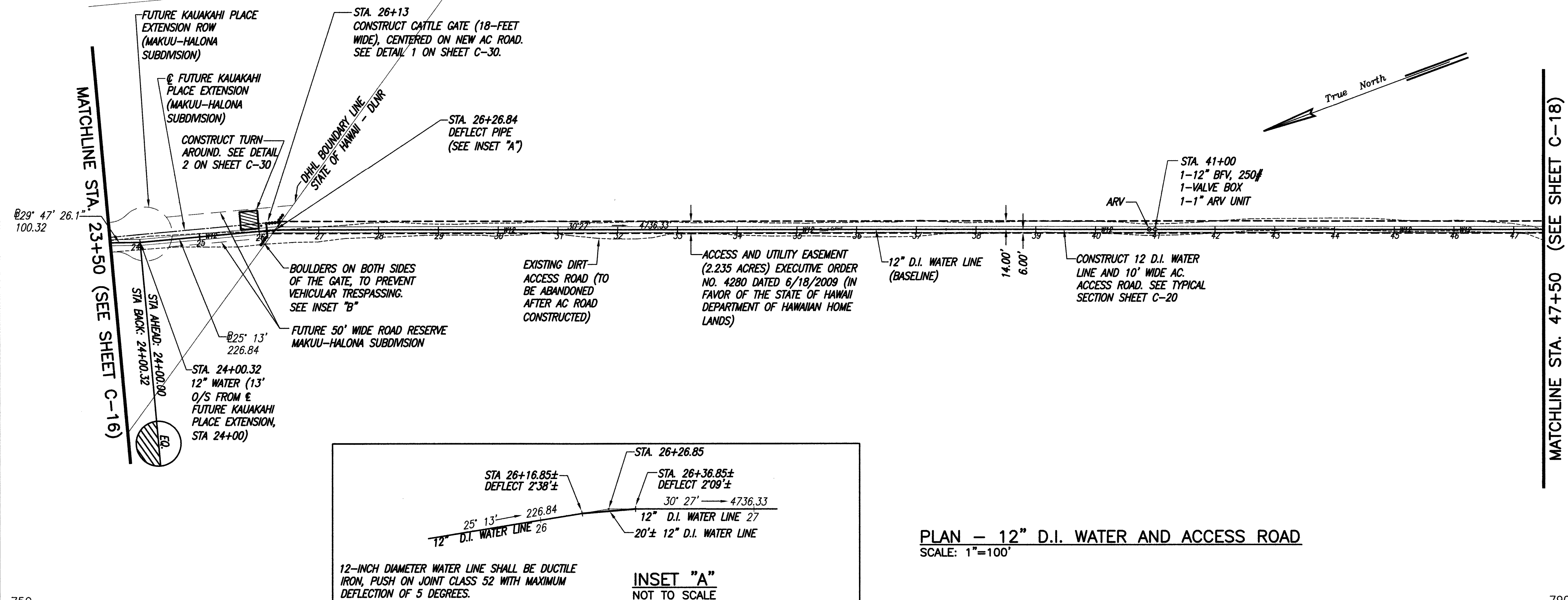
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

PLAN AND PROFILE  
12" D.I. WATER AND ACCESS ROAD  
STA. 0+00 TO STA. 23+50

(ACCESS ROAD & TRANSMISSION MAIN)

FILE	POCKET	FOLDER	NO.



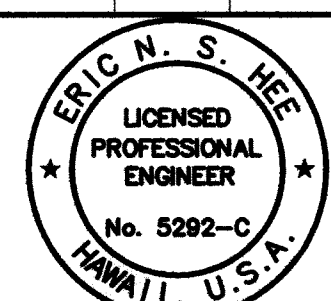


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Em N. S. Hoo  
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DEPARTMENT OF HAWAIIAN HOME LANDS  
MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

PLAN AND PROFILE  
12" D.I. WATER AND ACCESS ROAD  
STA. 23+50 TO STA. 47+50

(ACCESS ROAD & TRANSMISSION MAIN)



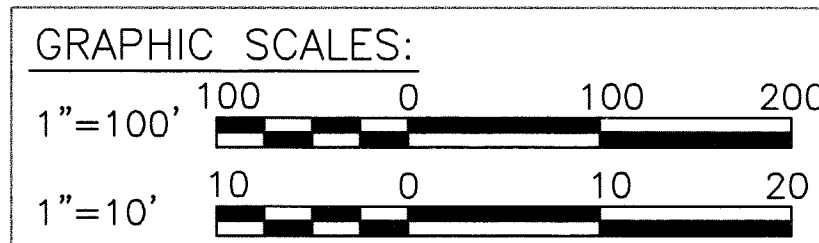
MATCHLINE STA. 47+50 (SEE SHEET C-17)

MATCHLINE STA.	65+50 (SEE SHT. C-19)
----------------	-----------------------

True North

PROFILE — 12" D.I. WATER & ACCESS ROAD

SCALE ~ HORIZONTAL: 1"=100'  
 VERTICAL: 1"=10'




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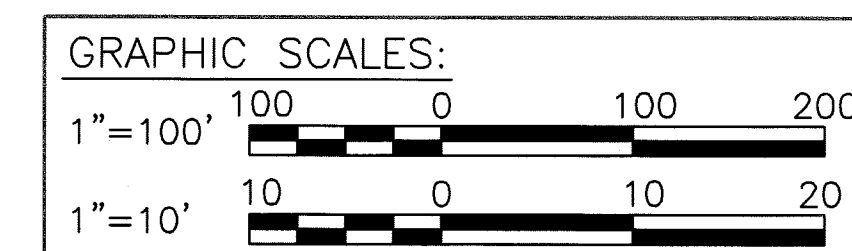
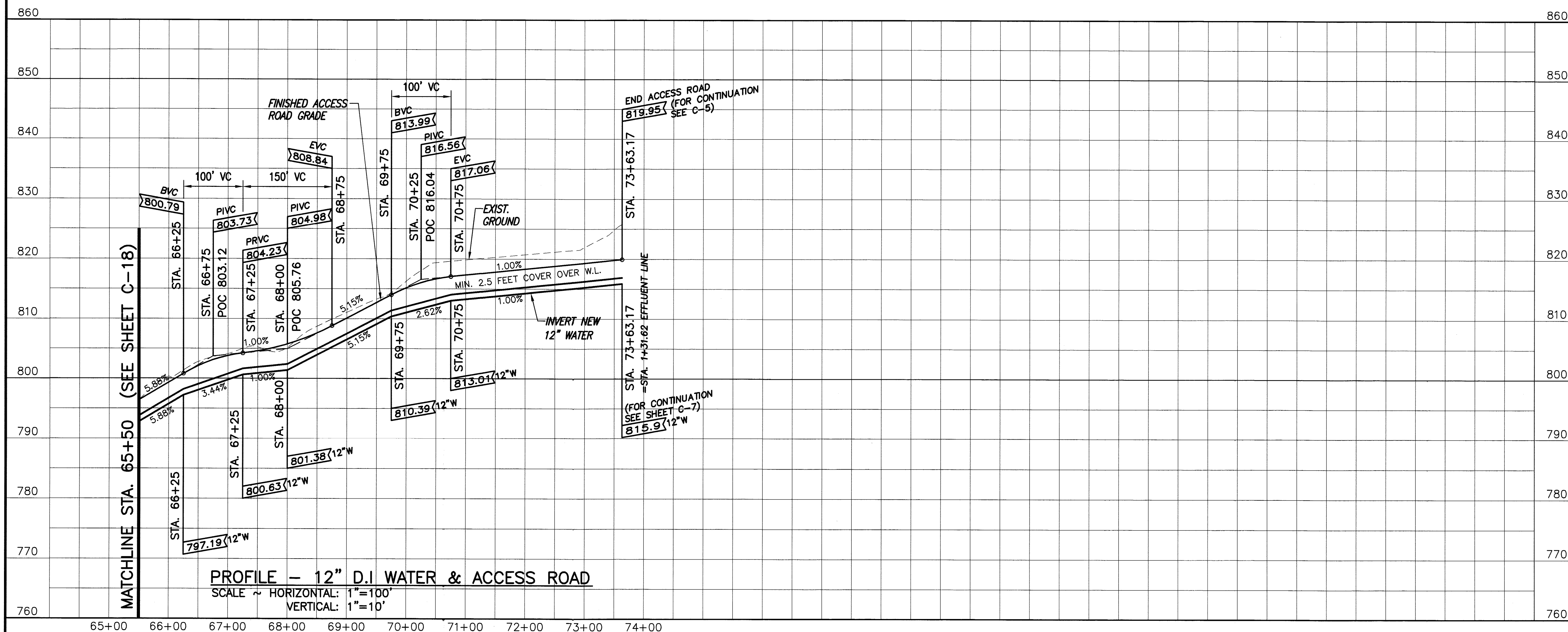
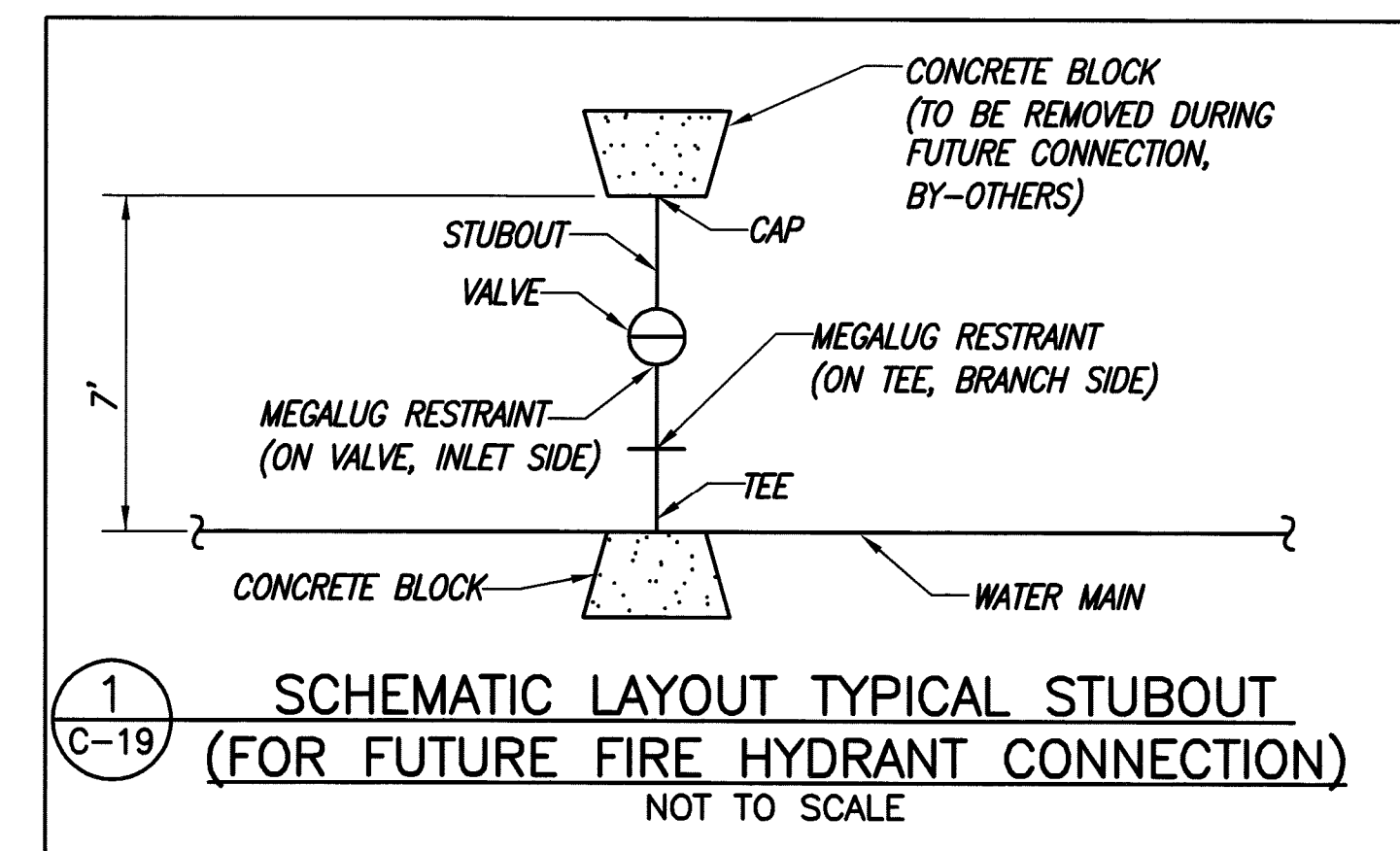
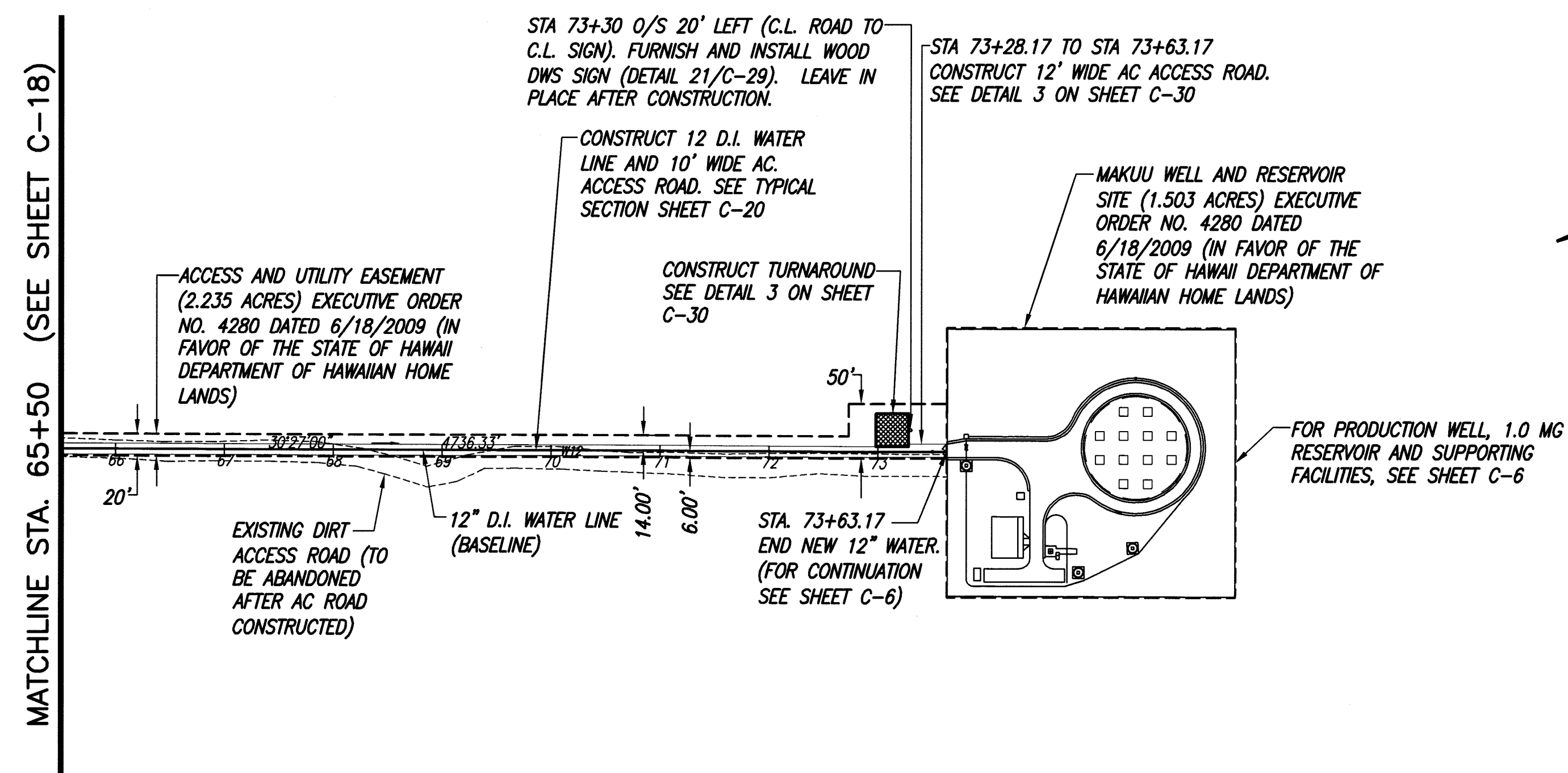
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*Eric N. S. Hee*

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(ACCESS ROAD & TRANSMISSION MAIN)



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*Eric N. S. Hef*

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The seal is circular with a double border. The outer border contains the text "ERIC N. S. HEF" at the top and "HAWAII U.S.A." at the bottom, separated by two stars. The inner circle contains the text "LICENSED PROFESSIONAL ENGINEER" and "No. 5292-C".

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HAWAII, INC.  
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591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

PLAN AND PROFILE  
12" D.I. WATER AND ACCESS ROAD  
STA. 65+50 TO END

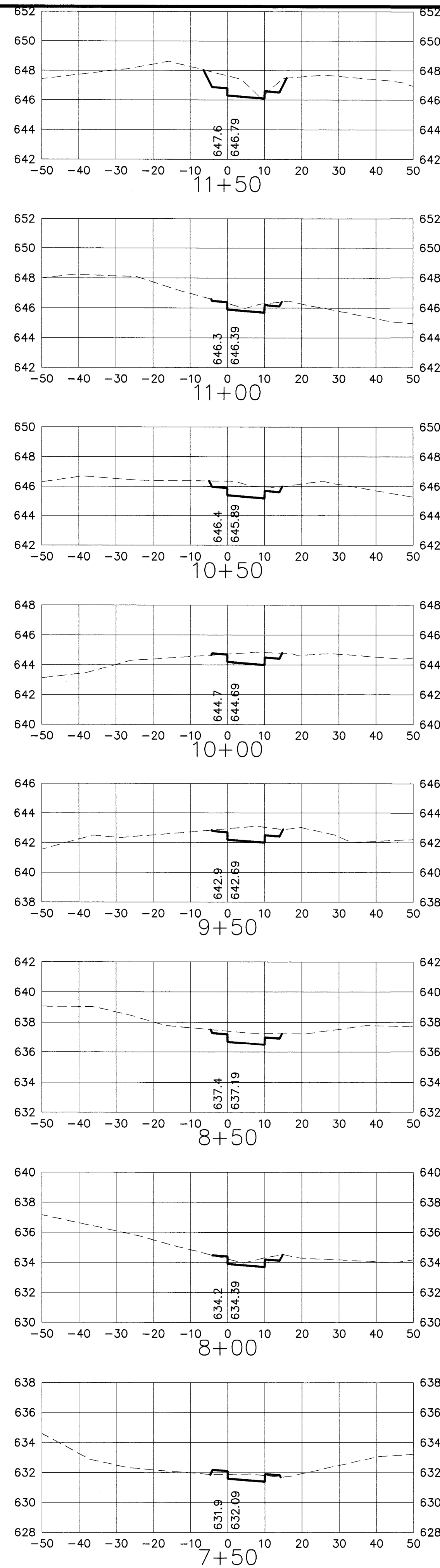
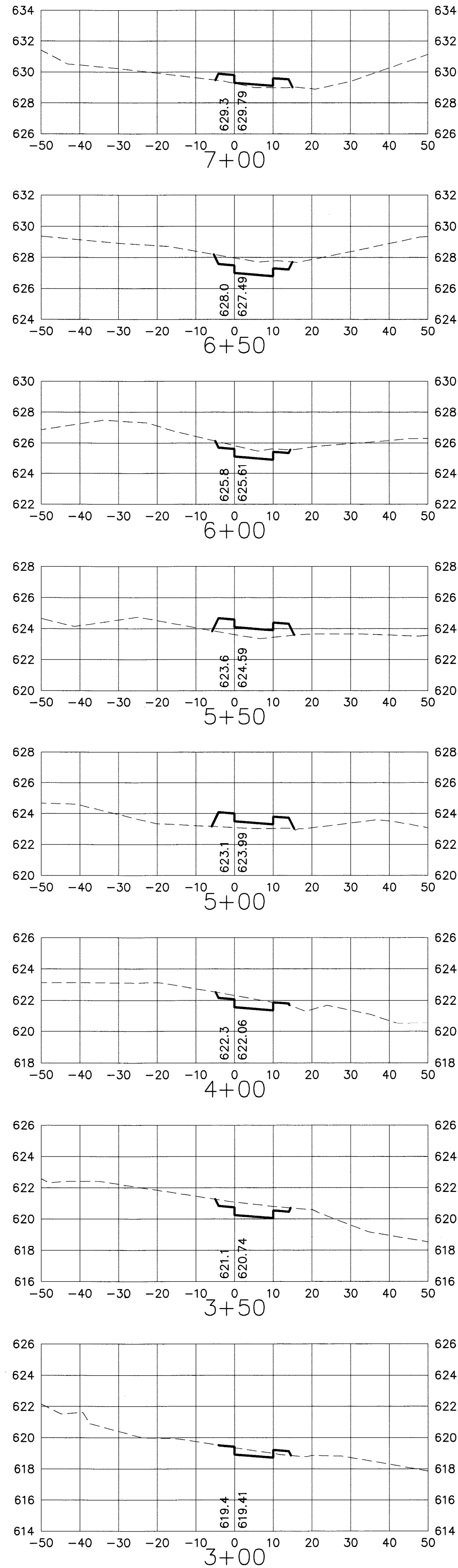
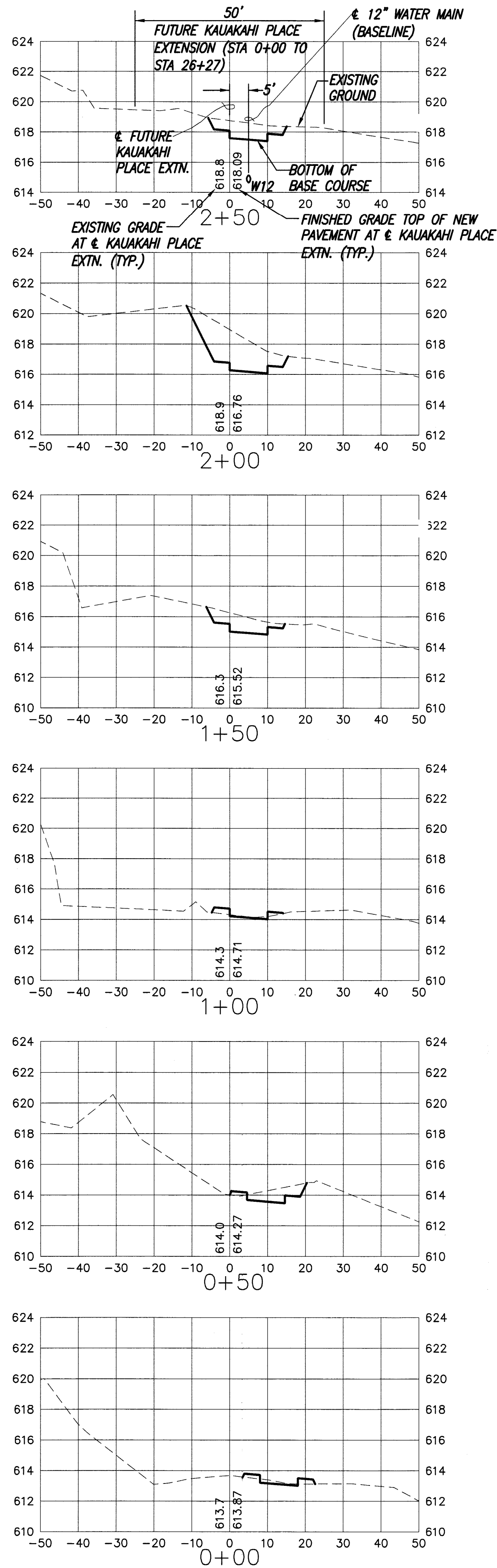
(ACCESS ROAD & TRANSMISSION MAIN)

	FILE	POCKET	FOLDER	NO.





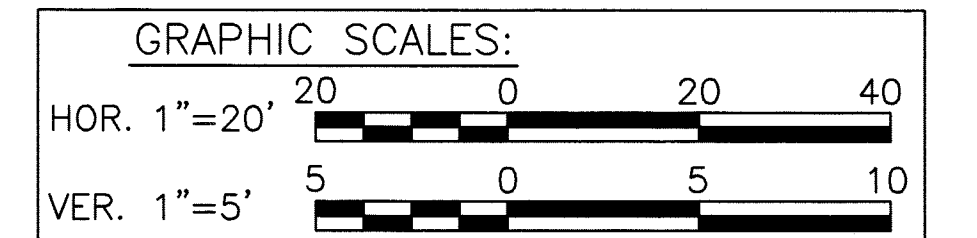
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ENSH Plot 1:1

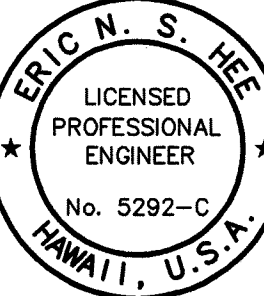



STATION	AREAS Square Feet		VOLUMES Cubic Yards	
	CUT	FILL	CUT	FILL
0+00	1.6	2.5	11.1	3.3
0+50	10.4	1.1	10.5	3.2
1+00	0.9	2.4	15.5	2.2
1+50	15.8	0.0	56.1	0.0
2+00	44.8	0.0	57.1	0.0
2+50	16.9	0.0	19.0	1.1
3+00	3.6	1.2	13.5	1.1
3+50	11.0	0.0	17.3	0.0
4+00	7.7	0.0	14.3	21.3
5+00	0.0	11.5	0.0	23.5
5+50	0.0	13.9	7.6	12.9
6+00	8.2	0.0	20.5	0.0
6+50	13.9	0.0	12.9	5.6
7+00	0.0	6.1	3.5	7.1
7+50	3.8	1.6	7.3	5.2
8+00	4.1	4.0	12.6	3.7
8+50	9.5	0.0	40.4	0.0
9+50	12.3	0.0	19.4	0.2
10+00	8.7	0.2	19.0	0.2
10+50	11.8	0.0	15.1	0.1
11+00	4.5	0.1	18.0	0.2
11+50	14.9	0.1	36.3	0.1

SEE EARTHWORK SUMMARY ON SHEET C-1

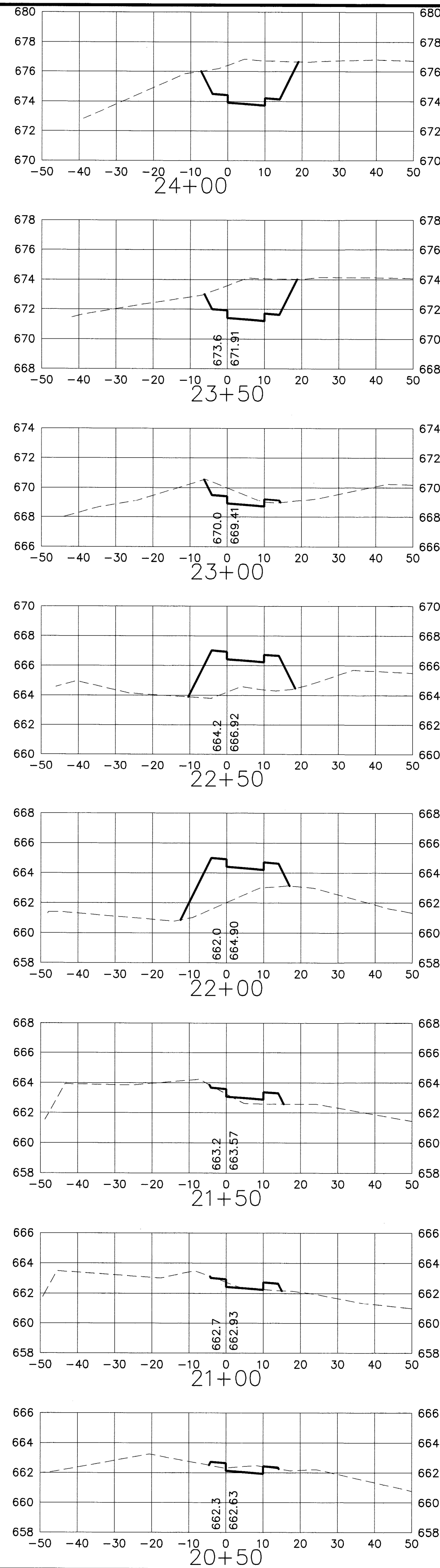
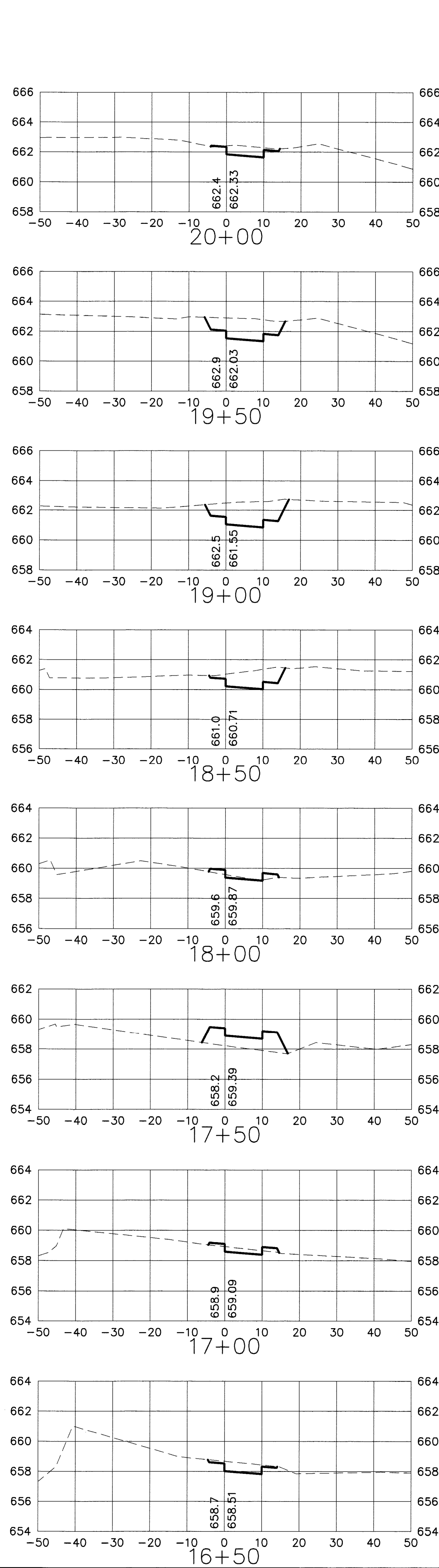
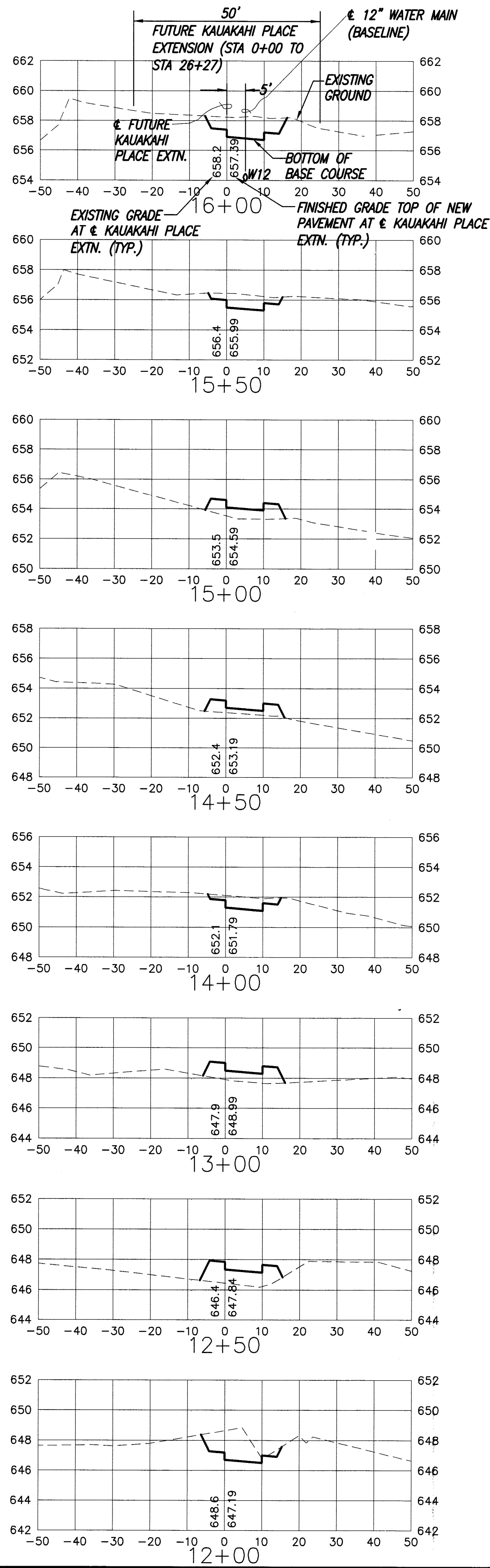
## "KAUAKAHI PLACE EXTENSION"



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ENGINEERS SURVEYORS HAWAII, INC.				
<i>Eric N. S. Hee</i> LICENSE EXPIRES 4/30/2014				
				
 ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST. HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
CROSS SECTIONS ACCESS ROAD STA. 0+00 TO STA. 11+50 (ACCESS ROAD & TRANSMISSION MAIN)				



Y:\1985\85-180.13 New Makuu Water Working FOLDER\C-21-22\_X-SECTION (2012) KAUAKAHI-for Water Project modified.dwg Wed, Jun 06 2012 - 3:44pm  
ENSH Plot 1:1



STATION	AREAS Square Feet		VOLUMES Cubic Yards	
	CUT	FILL	CUT	FILL
12+00	24.3	0.0	22.5	20.7
12+50	0.0	22.4	0.0	36.5
13+00	0.0	17.0	20.7	31.5
14+00	11.2	0.0	10.4	10.0
14+50	0.0	10.8	0.0	24.8
15+00	0.0	16.0	12.6	14.8
15+50	13.6	0.0	34.7	0.0
16+00	23.9	0.0	29.1	0.0
16+50	7.5	0.0	9.7	1.7
17+00	3.0	1.8	2.8	20.6
17+50	0.0	20.4	0.8	21.1
18+00	0.9	2.4	16.1	2.2
18+50	16.5	0.0	40.6	0.0
19+00	27.3	0.0	46.6	0.0
19+50	23.0	0.0	27.9	0.1
20+00	7.1	0.1	10.1	1.4
20+50	3.8	1.4	4.4	3.5
21+00	0.9	2.4	1.0	8.1
21+50	0.2	6.4	0.2	55.7
22+00	0.0	53.8	0.0	101.4
22+50	0.0	55.7	9.9	52.3
23+00	10.7	0.8	55.2	0.7
23+50	48.9	0.0	96.6	0.0
24+00	55.4	0.0	86.0	0.0

SEE EARTHWORK SUMMARY ON SHEET C-1

## "KAUAKAHI PLACE EXTENSION"

GRAPHIC SCALES:



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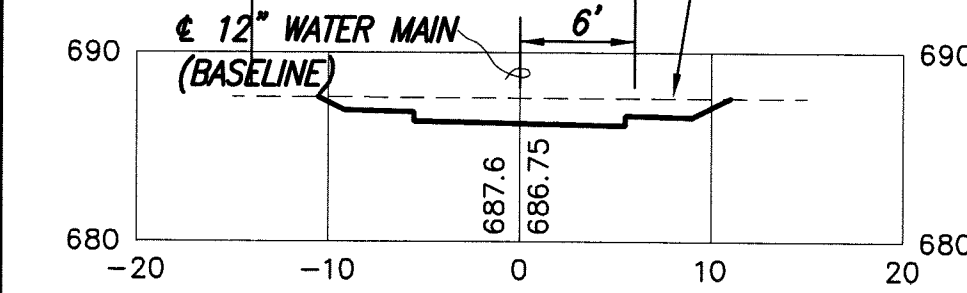
**ESH** ENGINEERS SURVEYORS  
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HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM PHASE 2:**  
**PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

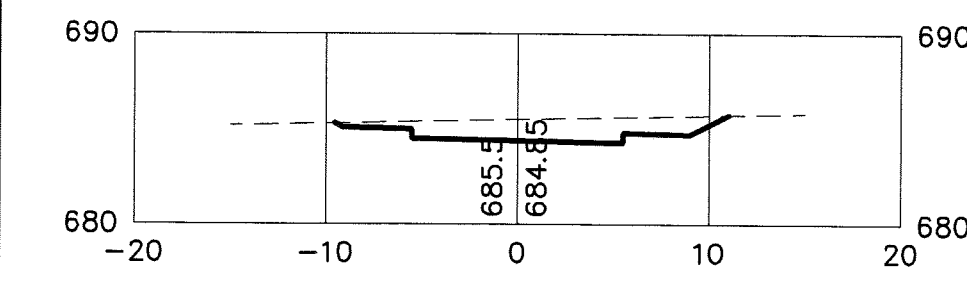
**CROSS SECTIONS  
ACCESS ROAD  
STA. 12+00 TO STA. 24+00  
(ACCESS ROAD & TRANSMISSION MAIN)**

X:\1985\85-180.13 New Moku Water Working Folder\C-23-24-25-X-SECT1 (2012) modified.dwg Wed Jun 06 2012 - 3:45pm  
85-180.10 ENSH\PILOT 1:1

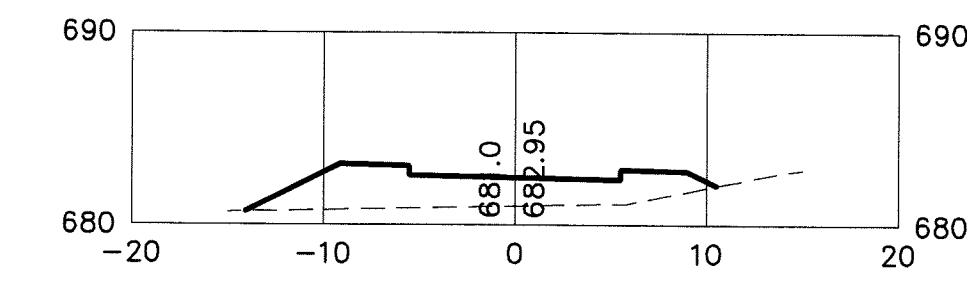
20' WIDE EASEMENT  
(STA.26+27 TO STA.73+63)  
DLNR ALLOWS ROAD CONSTRUCTION  
OUTSIDE OF EASEMENT, TYPICAL



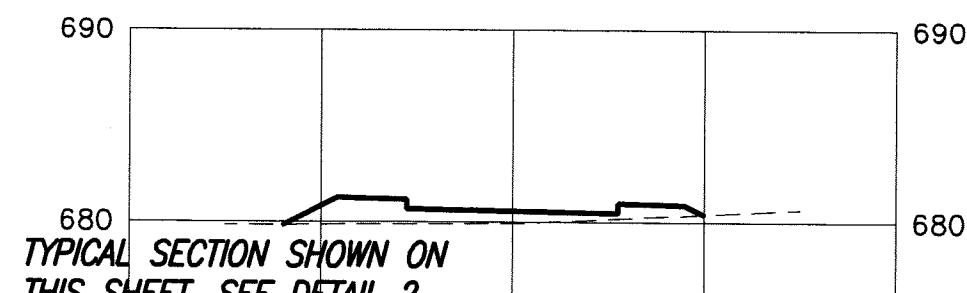
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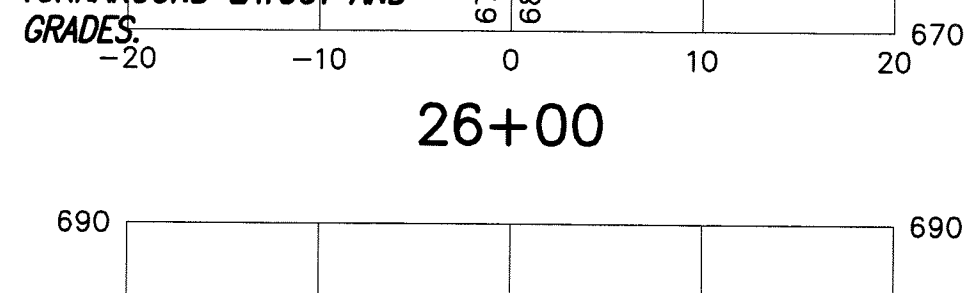
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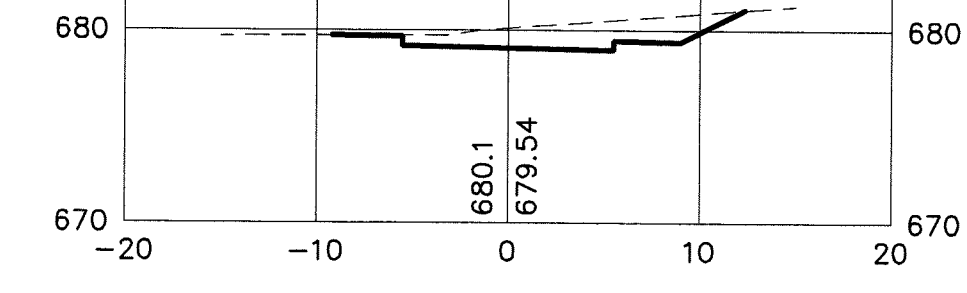
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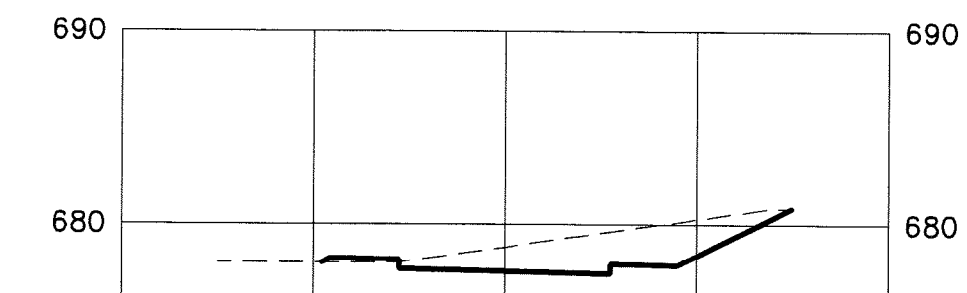
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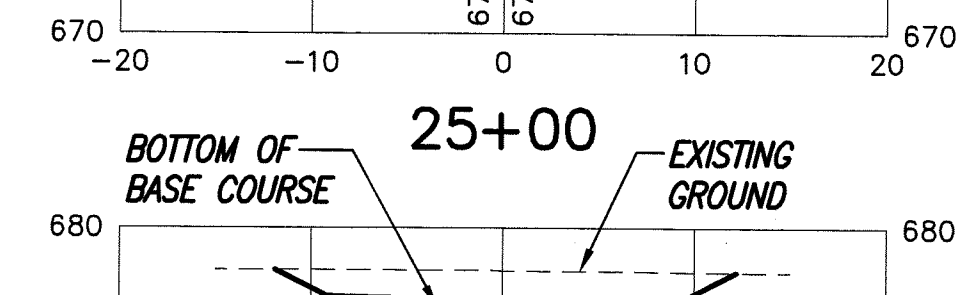
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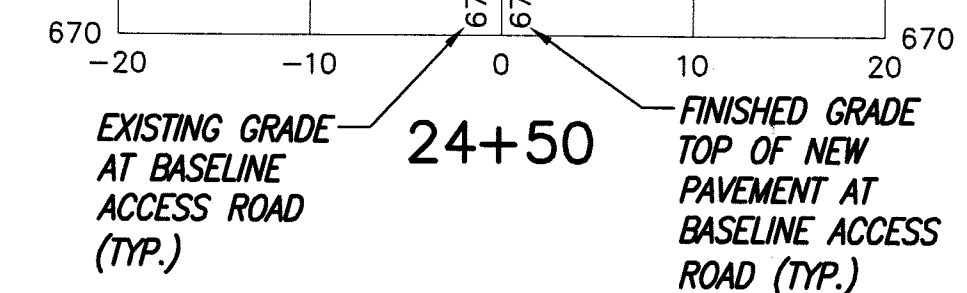
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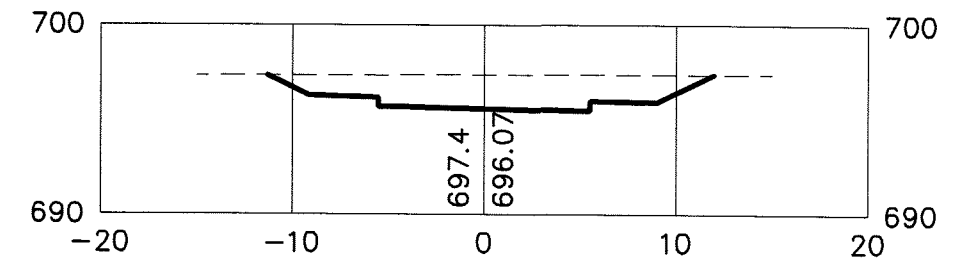
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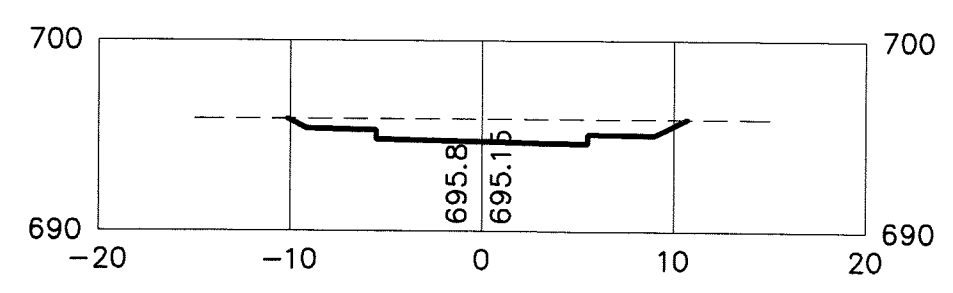
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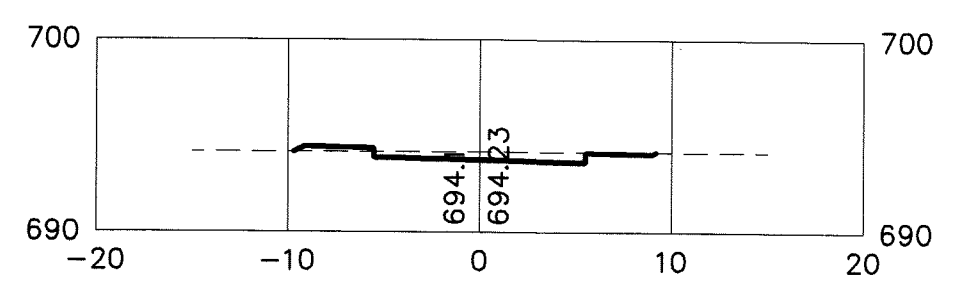
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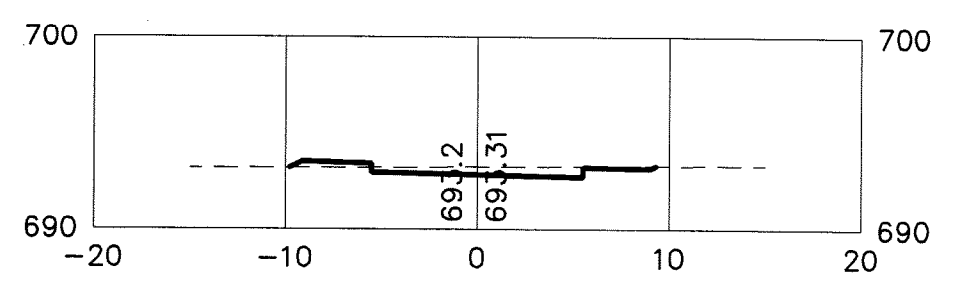
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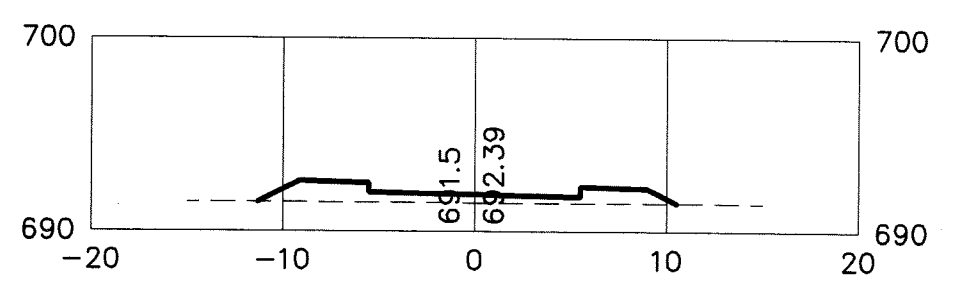
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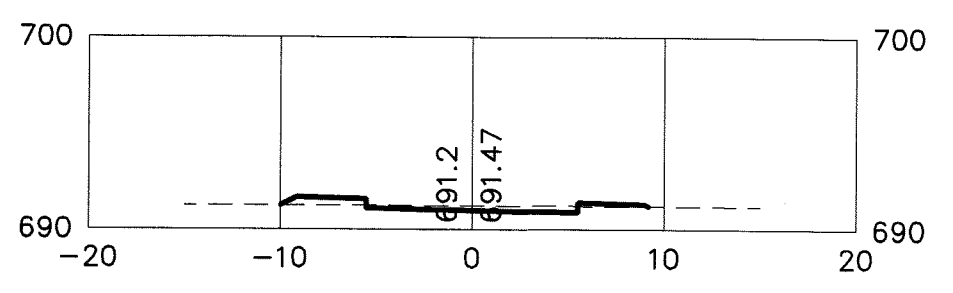
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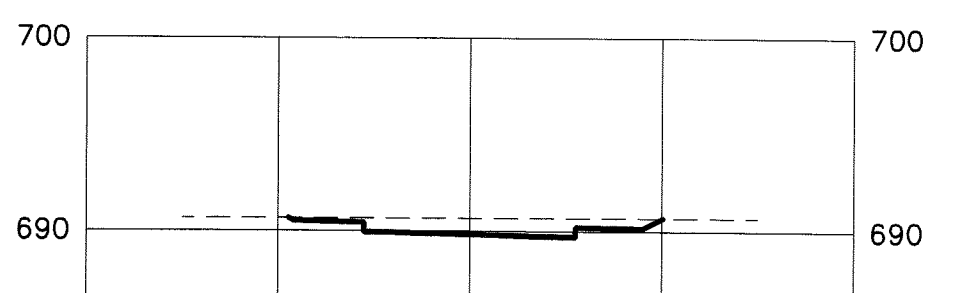
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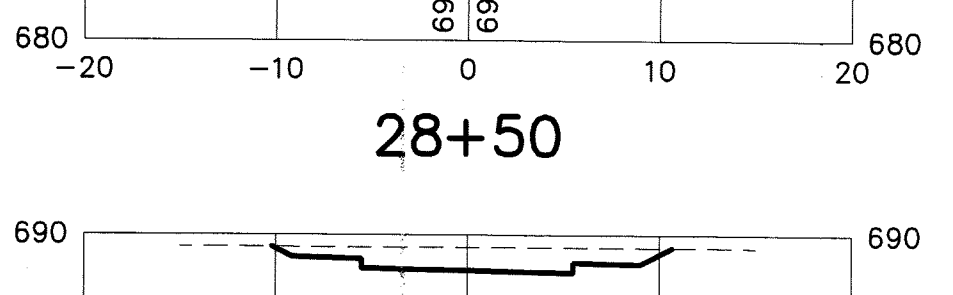
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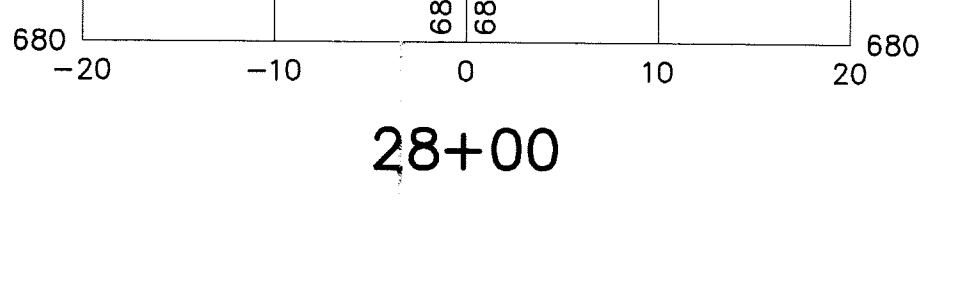
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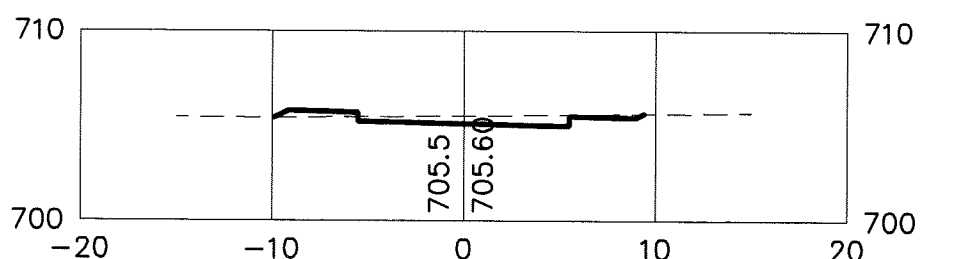
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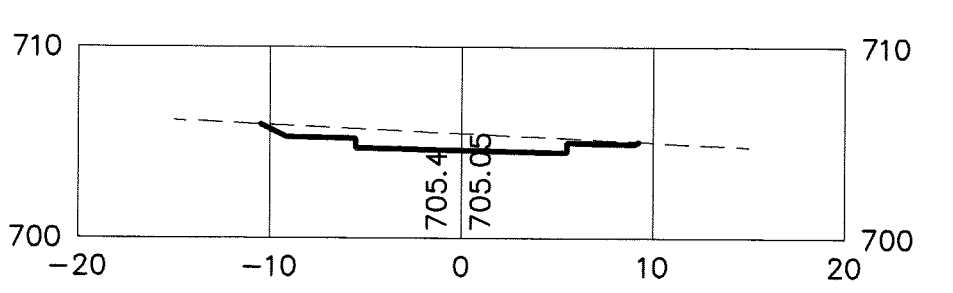
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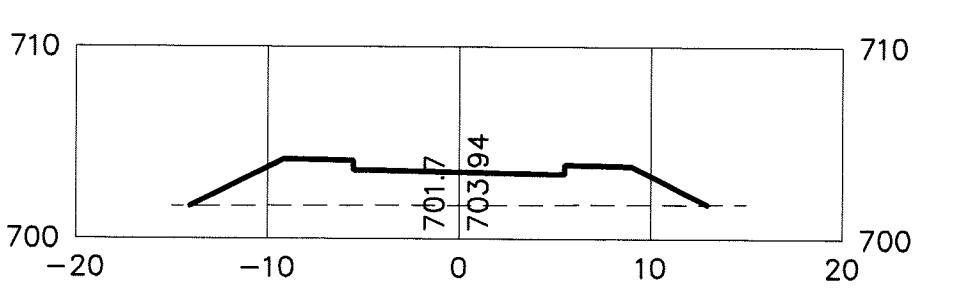
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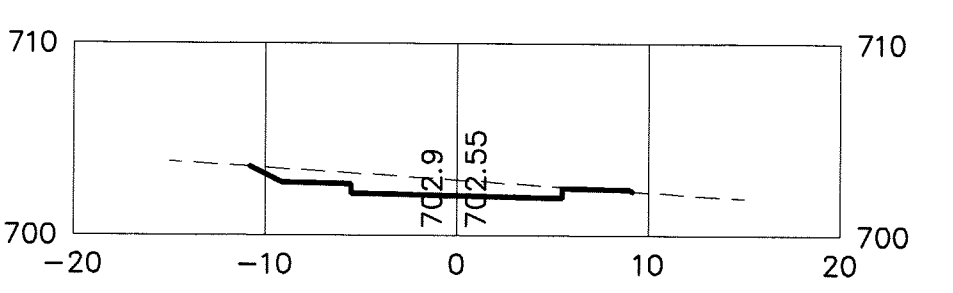
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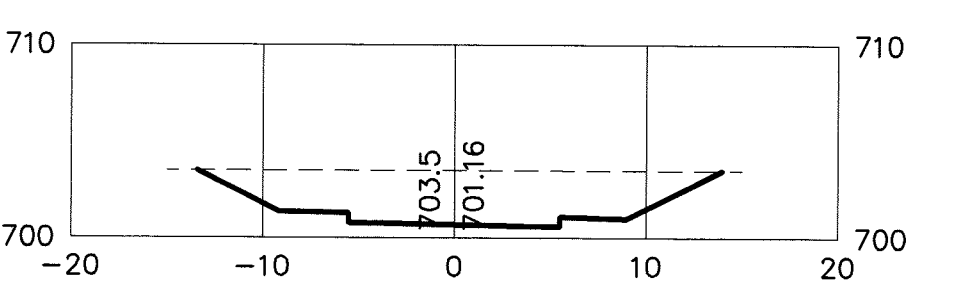
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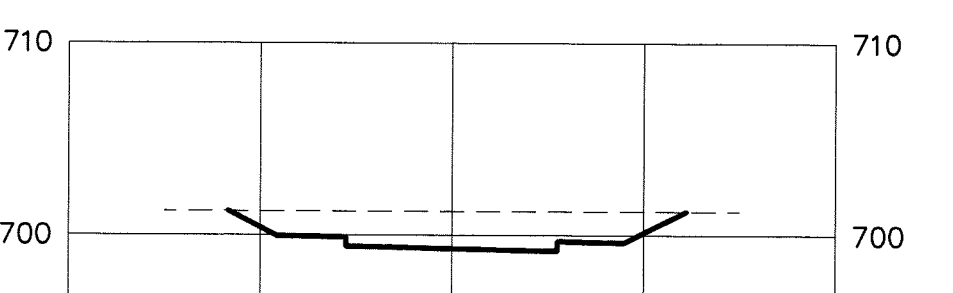
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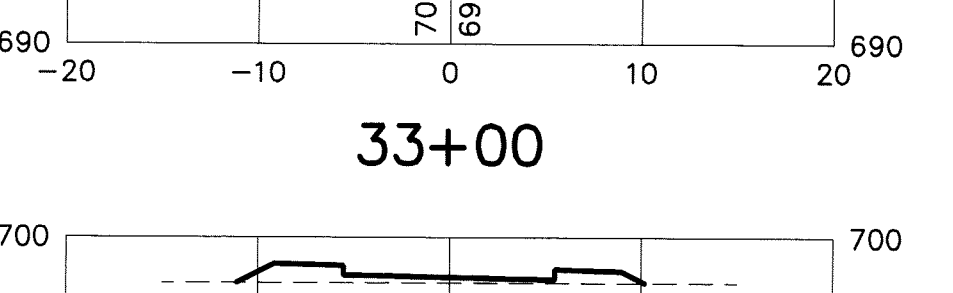
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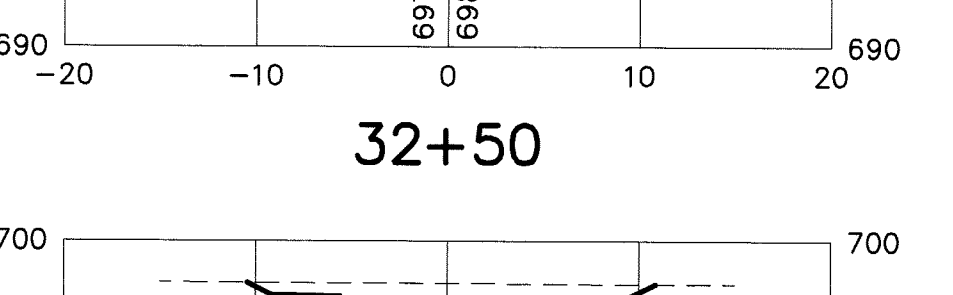
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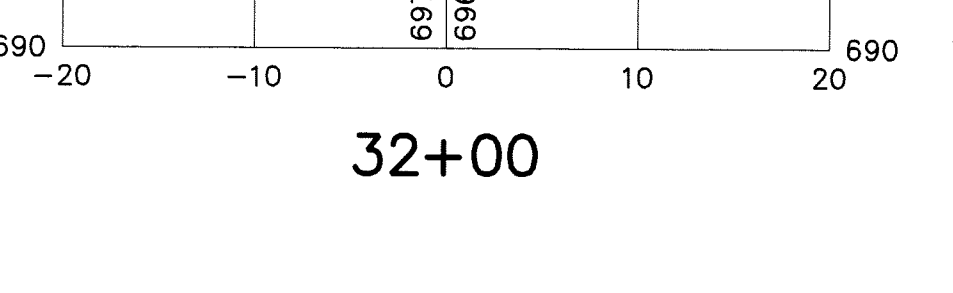
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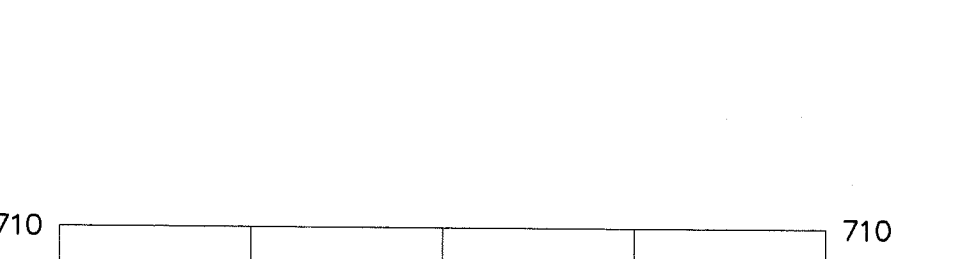
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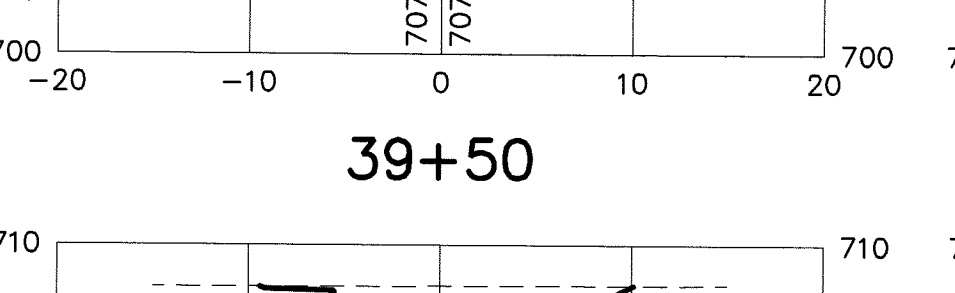
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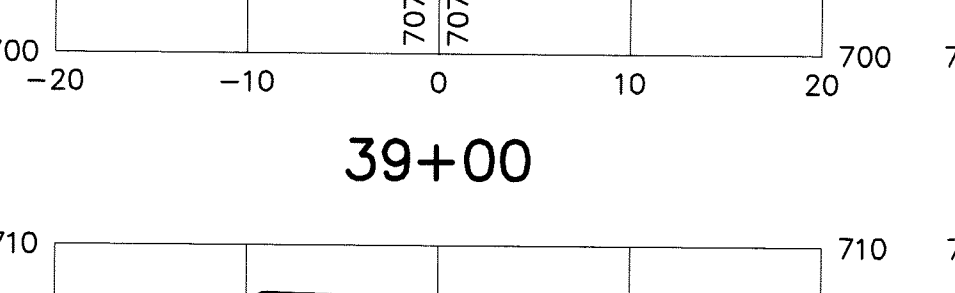
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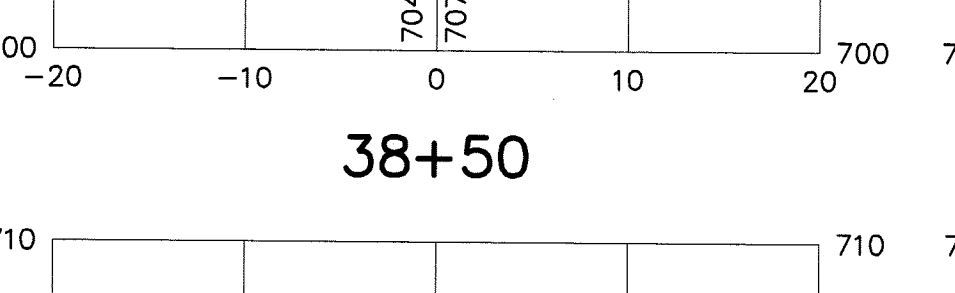
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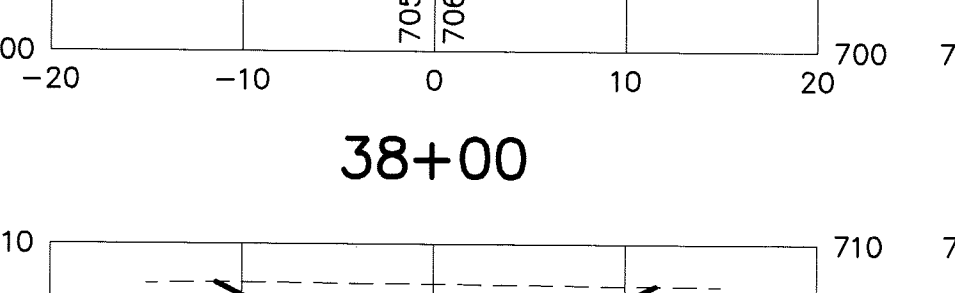
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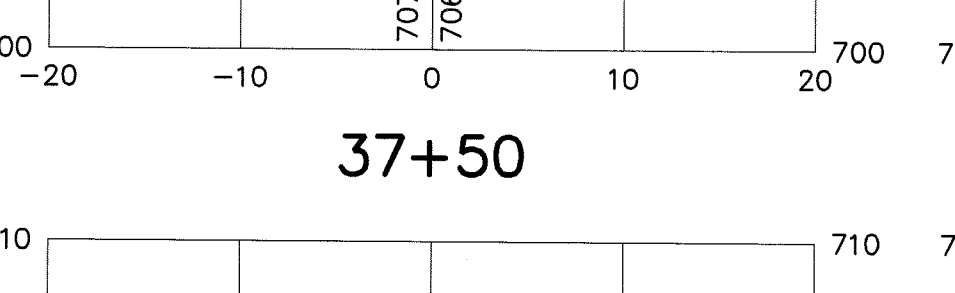
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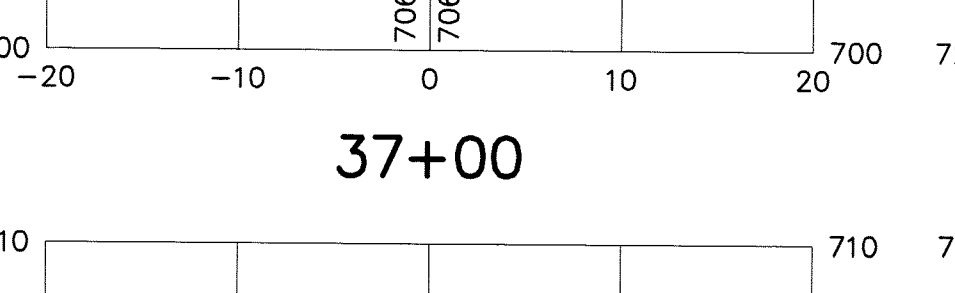
38+00



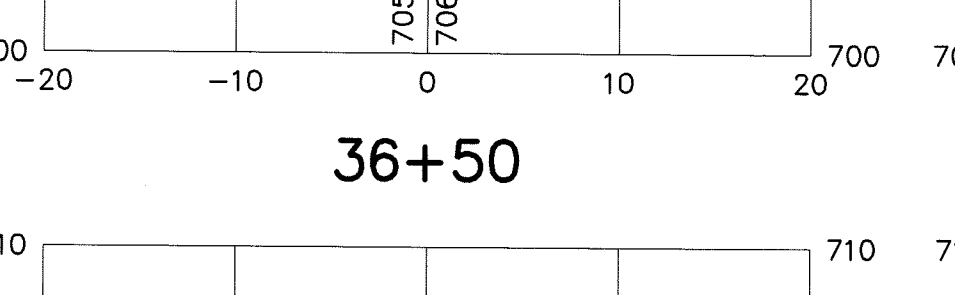
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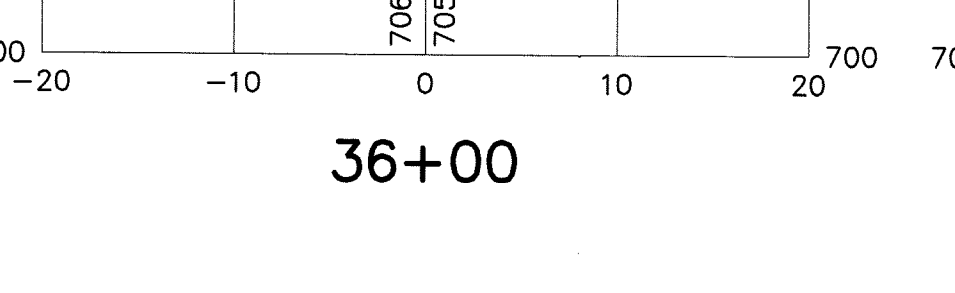
37+00



36+50



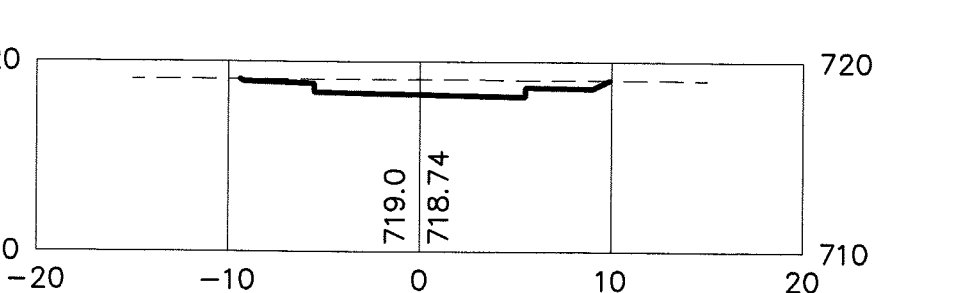
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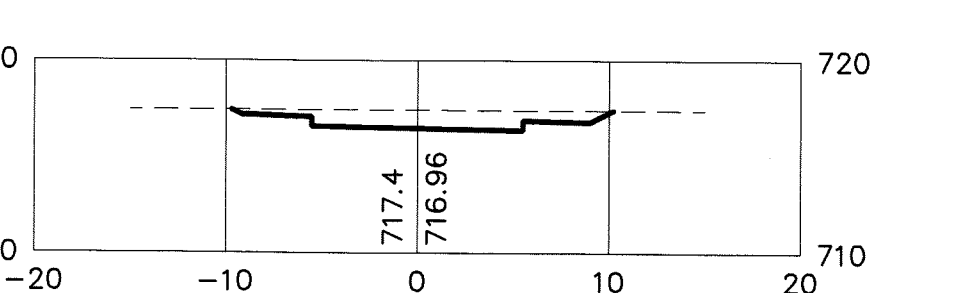
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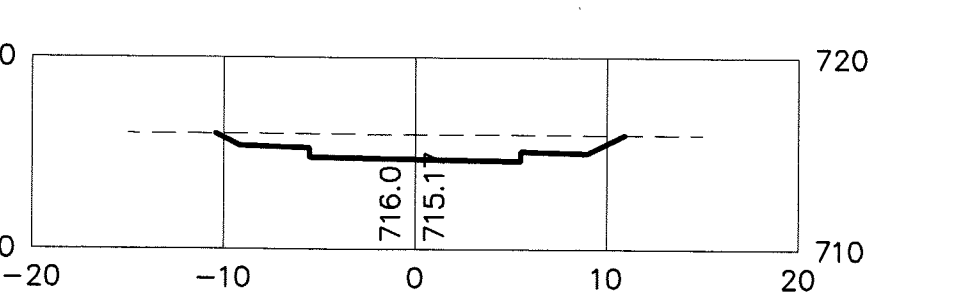
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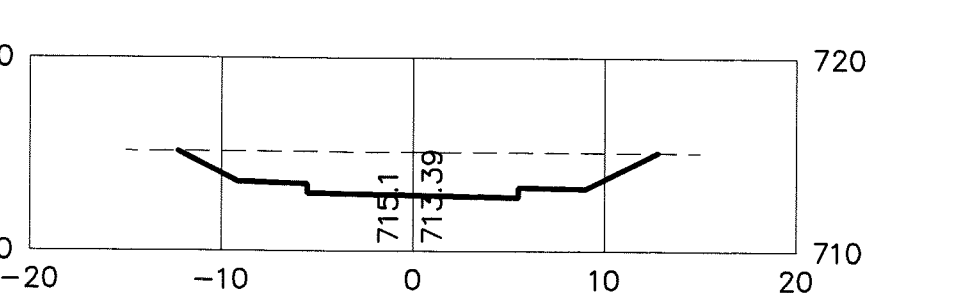
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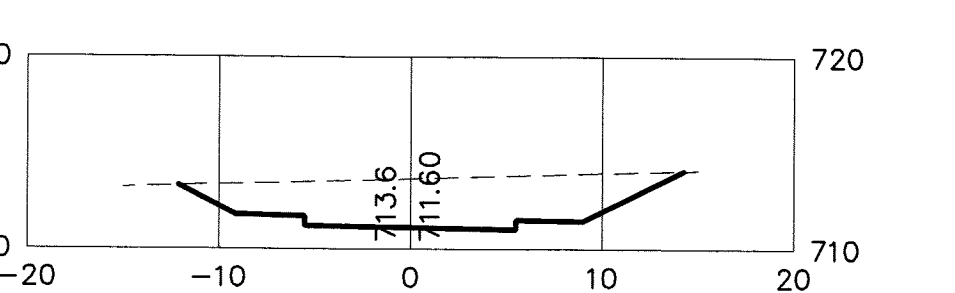
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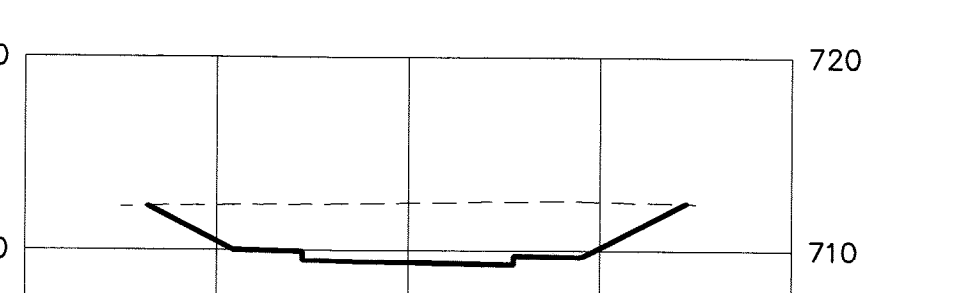
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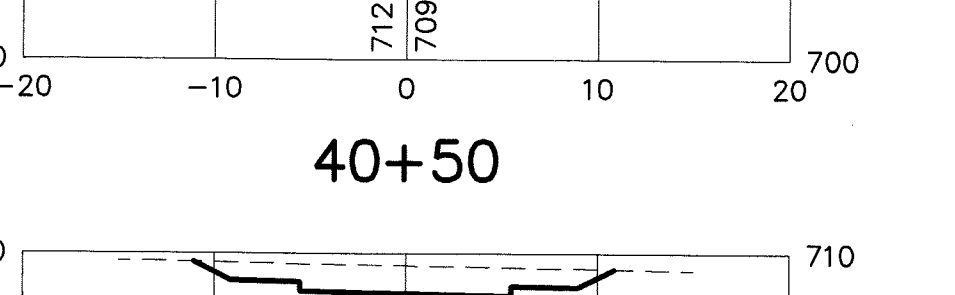
41+50



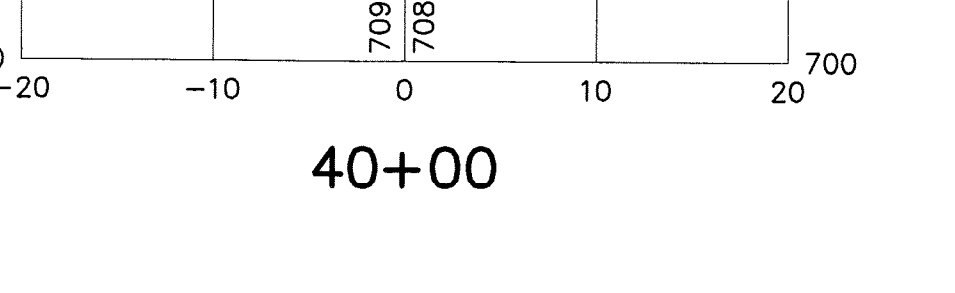
41+00



40+50



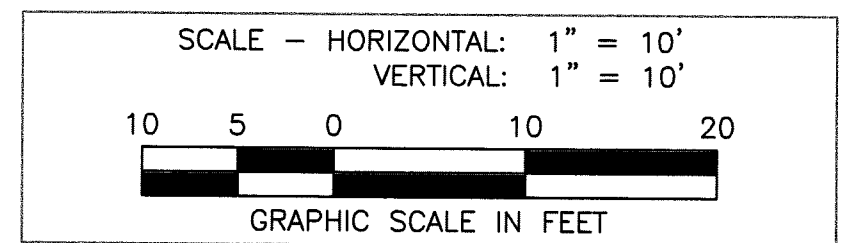
40+00



40+00

STATION	AREAS		VOLUMES	
	CUT	FILL	CUT	FILL
24+50	37.6	0.0	59.5	.7
25+00	26.6	.8	44.0	3.1
25+50	20.9	2.6	19.3	16.9
26+00	0.00	15.7	6.1	40.5
26+50	6.6	28.0	22.2	25.9
27+00	17.4	0.0	36.8	0.0
27+50	22.4	0.0	38.2	0.0
28+00	18.9	0.00	28.6	0.0
28+50	12.0	0.0	13.6	1.9
29+00	2.7	2.0	2.5	13.9
29+50	0.0	13.0	4.6	13.0
30+00	5.0	1.0	9.0	1.8
30+50	4.7	0.9	21.7	0.9
31+00	16.7	0.0	47.2	0.0
31+50	32.3	0.0	49.7	0.0
32+00	21.4	0.0	19.8	9.4
32+50	0.0	10.1	33.2	9.4
33+00	35.9	0.0	87.0	0.0
33+50	58.1	0.0	65.0	0.1
34+00	12.1	0.1	11.2	41.3
34+50	0.0	44.5	11.8	41.2
35+00	12.7	0.0	16.5	1.2
35+50	5.1	1.3	21.9	1.2
36+00	16.6	0.0	20.2	1.5
36+50	3.3	1.7	9.7	1.6
37+00	7.2	0.1	34.8	0.1
37+50	30.4	0.1	28.2	21.4
38+00	0.0	23.1	0.8	59.5
38+50	0.9	41.2	12.1	38.1
39+00	12.1	0.0	11.2	5.0
39+50	0.0	5.4	22.8	5.0
40+00	24.6	0.0	83.4	0.0
40+50	65.5	0.0	108.2	0.0
41+00	51.3	0.0	87.2	0.0
41+50	42.8	0.0	59.6	0.0
42+00	21.5	0.0	32.9	0.0
42+50	14.1	0.0	23.3	0.0
43+00	11.1	0.0	26.6	0.0

SEE EARTHWORK SUMMARY ON SHEET C-1



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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ENGINEERS SURVEYORS HAWAII, INC.

*Eric N. S. Hee*  
LICENSE EXPIRES 4/30/2014

ERIC N. S. HEE  
LICENSED PROFESSIONAL ENGINEER  
No. 5292-C  
HAWAII U.S.A.

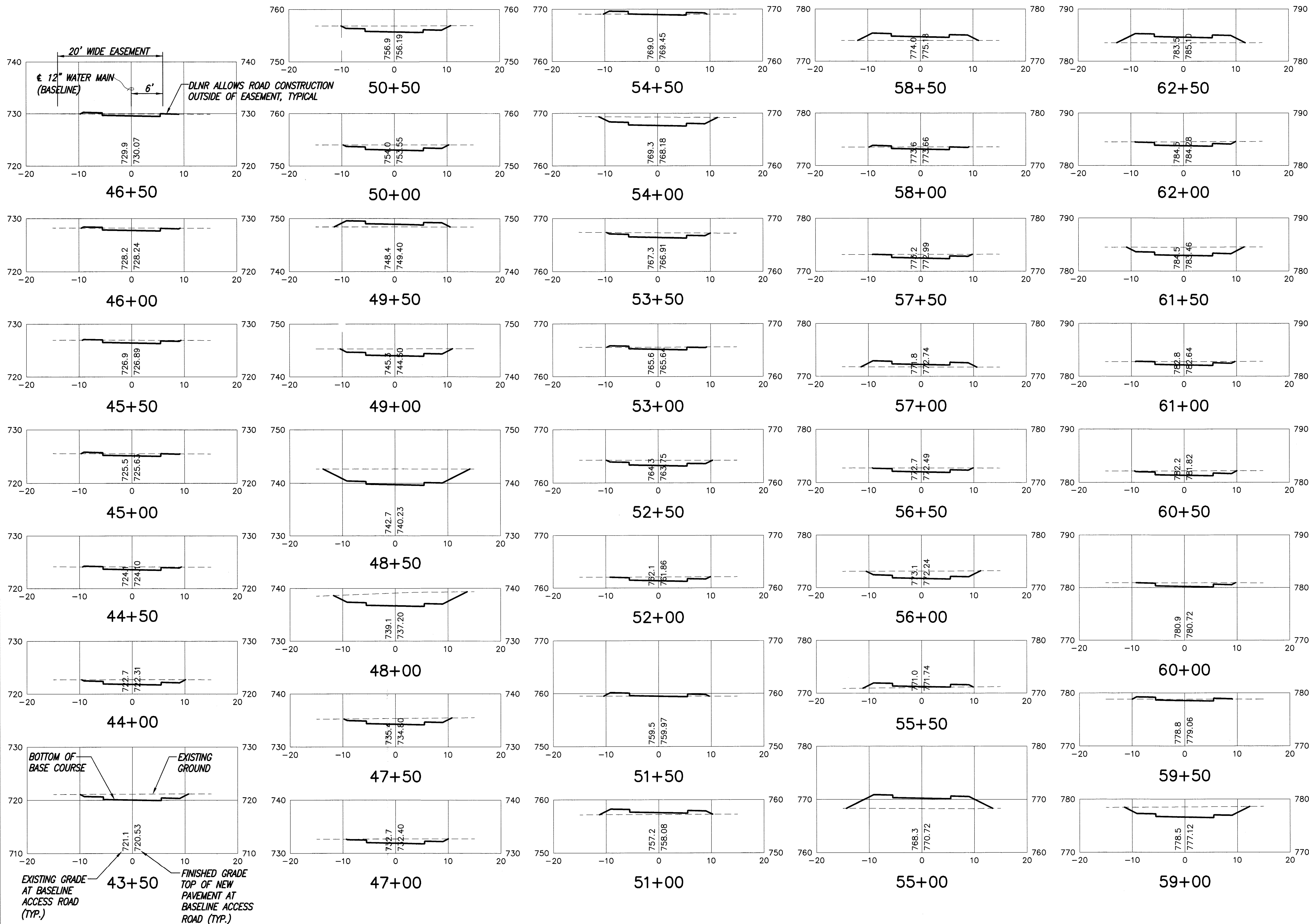
**ESH** ENGINEERS SURVEYORS.  
HAWAII, INC.  
900 HALEKAUWILA ST.  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**CROSS SECTIONS  
ACCESS ROAD  
STA. 24+50 TO STA. 43+00  
(ACCESS ROAD & TRANSMISSION MAIN)**

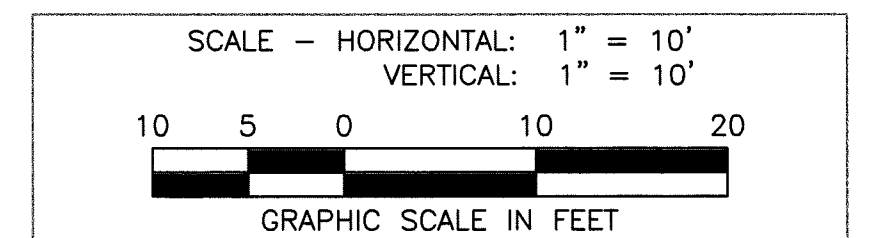


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85-180.10 ENSH\PILOT.1:1



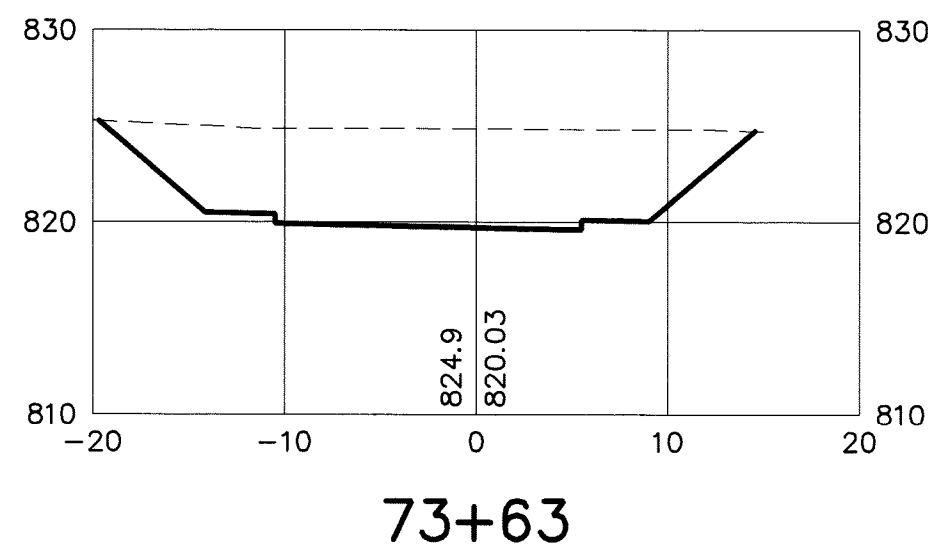
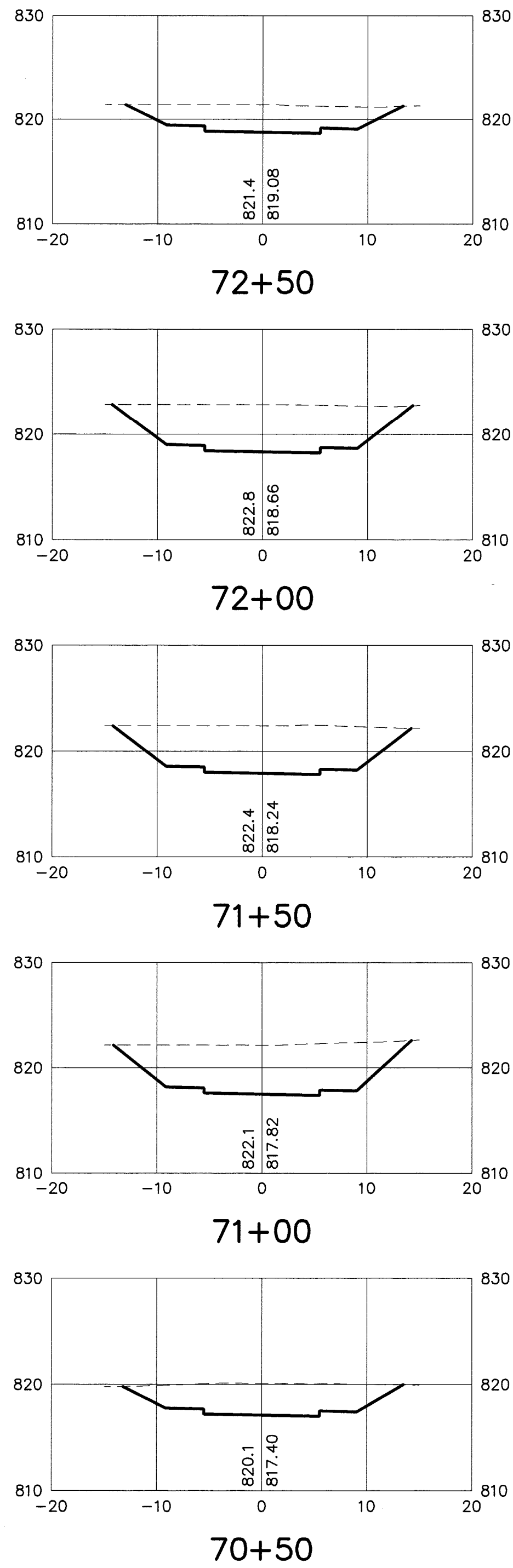
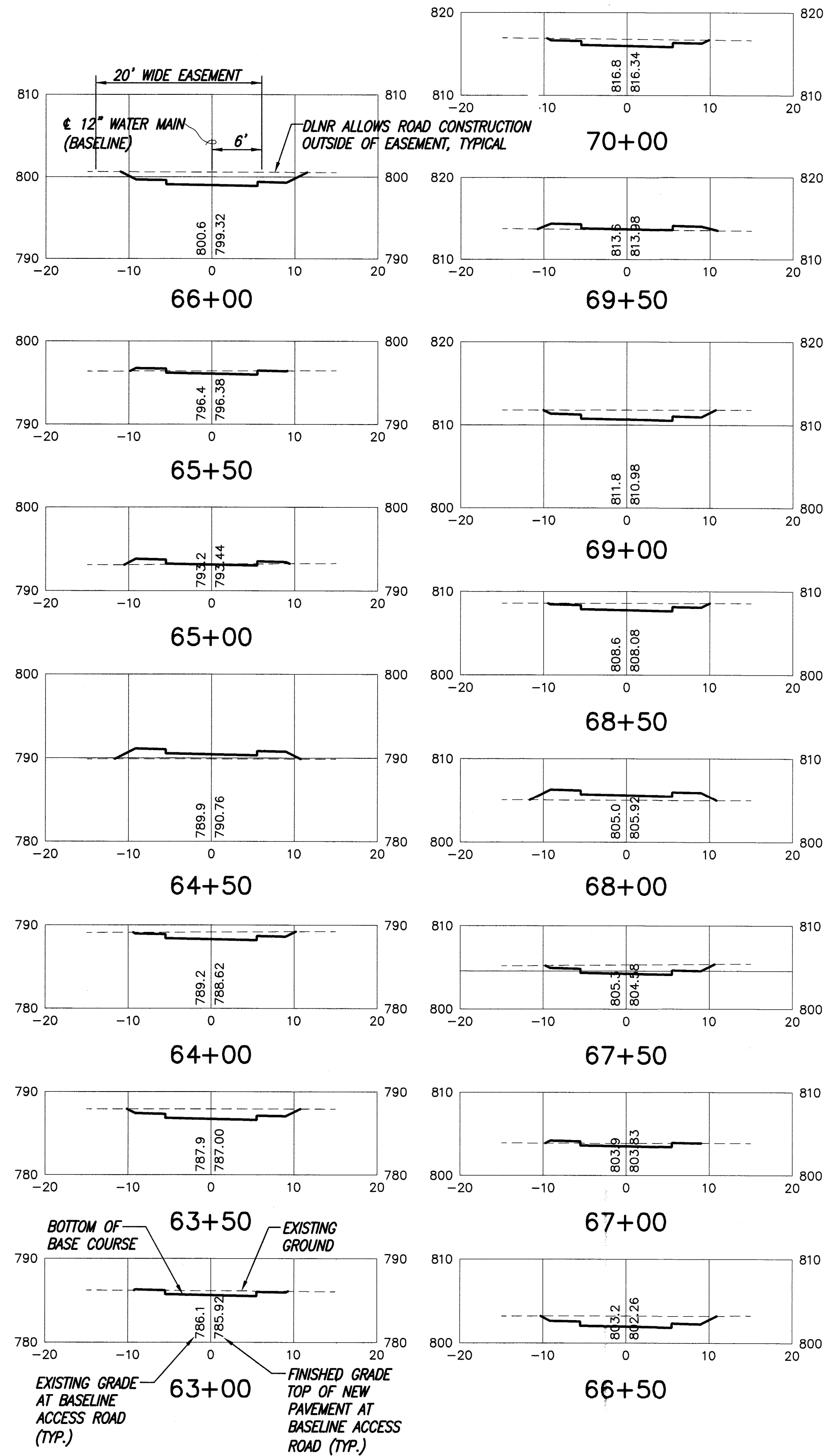
STATION	AREAS Square Feet		VOLUMES Cubic Yards	
	CUT	FILL	CUT	FILL
43+50	17.6	0.0	28.5	0.0
44+00	13.2	0.0	18.1	0.4
44+50	6.4	0.4	10.2	1.2
45+00	4.6	0.9	10.2	1.1
45+50	6.4	0.4	10.9	1.0
46+00	5.4	0.7	8.7	1.6
46+50	4.0	1.1	14.0	1.0
47+00	11.2	0.0	26.0	0.0
47+50	16.9	0.0	56.9	0.0
48+00	44.6	0.0	98.4	0.0
48+50	61.7	0.0	76.9	0.0
49+00	21.3	0.0	19.8	12.9
49+50	0.0	13.9	13.6	12.9
50+00	14.6	0.0	30.8	0.0
50+50	18.6	0.0	17.2	10.4
51+00	0.0	11.2	0.3	14.0
51+50	0.4	3.9	9.5	3.6
52+00	10.0	0.0	23.3	0.0
52+50	15.2	0.0	18.6	0.9
53+00	4.9	1.0	16.5	0.9
53+50	13.0	0.0	37.7	0.0
54+00	27.8	0.0	26.8	3.0
54+50	1.2	3.3	1.1	49.2
55+00	0.0	49.9	0.0	53.6
55+50	0.0	8.1	21.8	7.5
56+00	23.6	0.0	31.3	0.0
56+50	10.2	0.0	9.5	13.0
57+00	0.0	14.1	8.5	13.0
57+50	9.1	0.0	12.7	1.0
58+00	4.6	1.1	4.2	19.0
58+50	0.0	19.5	32.6	18.0
59+00	35.2	0.0	35.3	1.7
59+50	3.0	1.8	11.1	1.7
60+00	9.1	0.0	19.3	0.0
60+50	11.8	0.0	18.6	0.0
61+00	8.3	0.0	32.7	0.0
61+50	27.0	0.0	34.6	0.0
62+00	10.4	0.0	9.6	25.7
62+50	0.0	27.8	5.8	25.9

SEE EARTHWORK SUMMARY ON SHEET C-1



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ENGINEERS SURVEYORS HAWAII, INC.				
Eric N. S. Hee LICENSE EXPIRES 4/30/2014				
900 HALEKAUWILA ST. HONOLULU, HAWAII 96814 501-2116 HON. 885-4500 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS				
MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
CROSS SECTIONS ACCESS ROAD STA. 43+50 TO STA. 62+50 (ACCESS ROAD & TRANSMISSION MAIN)				

X:\1985185-180.13 New Makuu Water\WORKING FOLDER\C-23-24-25-X-SECT1 (2012) modified.dwg Wed, Jun 06 2012 - 3:46pm  
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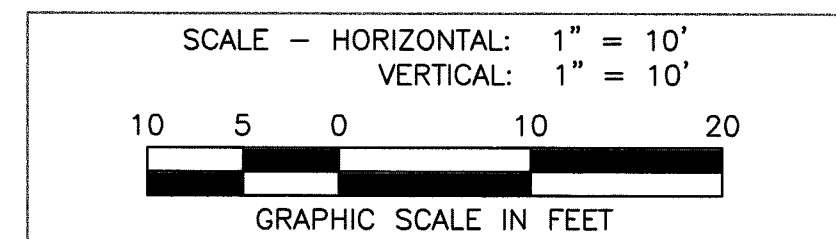


STA 73+28.17 TO STA 73+63.17  
CONSTRUCT EXTRA WIDE AC ACCESS  
ROAD. SEE DETAIL 3 ON SHEET C-30

TYPICAL SECTION SHOWN ON  
THIS SHEET. SEE DETAIL 3  
ON SHEET C-30 FOR  
TURNAROUND LAYOUT AND  
GRADES.

STATION	AREAS		VOLUMES	
	CUT	FILL	CUT	FILL
63+00	6.2	0.2	23.6	0.2
63+50	19.2	0.0	29.5	0.0
64+00	12.6	0.0	11.7	1438
64+50	0.0	16.0	0.5	18.3
65+00	0.5	3.8	4.1	4.6
65+50	3.8	1.2	29.3	1.1
66+00	27.8	0.0	45.0	0.0
66+50	20.8	0.0	22.5	1.0
67+00	3.6	1.1	18.4	1.0
67+50	16.3	0.0	15.1	15.4
68+00	0.0	16.6	11.0	15.4
68+50	11.9	0.0	27.9	0.0
69+00	18.3	0.0	16.9	5.3
69+50	0.0	5.7	10.9	5.3
70+00	11.8	0.0	67.3	0.0
70+50	60.9	0.0	152.3	0.0
71+00	103.6	0.0	18606	0.0
71+50	97.9	0.0	181.5	0.0
72+00	98.1	0.0	138.6	0.0
72+50	51.6	0.0	99.3	0.0
73+00	55.7	0.0	200.3	0.0
73+63	141.0	0.0		

TOTAL FOR ACCESS ROAD  
(SHEETS C-21 THRU C-25)  
EXCAVATION = 4,379 C.Y.  
EMBANKMENT = 1,230 C.Y.  
AREA OF GRADING = 3.6 ACRES  
SEE EARTHWORK SUMMARY ON SHEET C-1



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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ENGINEERS SURVEYORS HAWAII, INC.

*Eric N. S. Hee*  
LICENSE EXPIRES 4/30/2014

**ERIC N. S. HEE**  
LICENSED PROFESSIONAL ENGINEER  
No. 5292-C  
HAWAII U.S.A.

**ESH** ENGINEERS SURVEYORS HAWAII, INC.  
900 HALEKAUWILA ST.  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

CROSS SECTIONS  
ACCESS ROAD  
STA. 62+50 TO STA. 73+63  
(ACCESS ROAD & TRANSMISSION MAIN)

FILE	POCKET	FOLDER	NO.



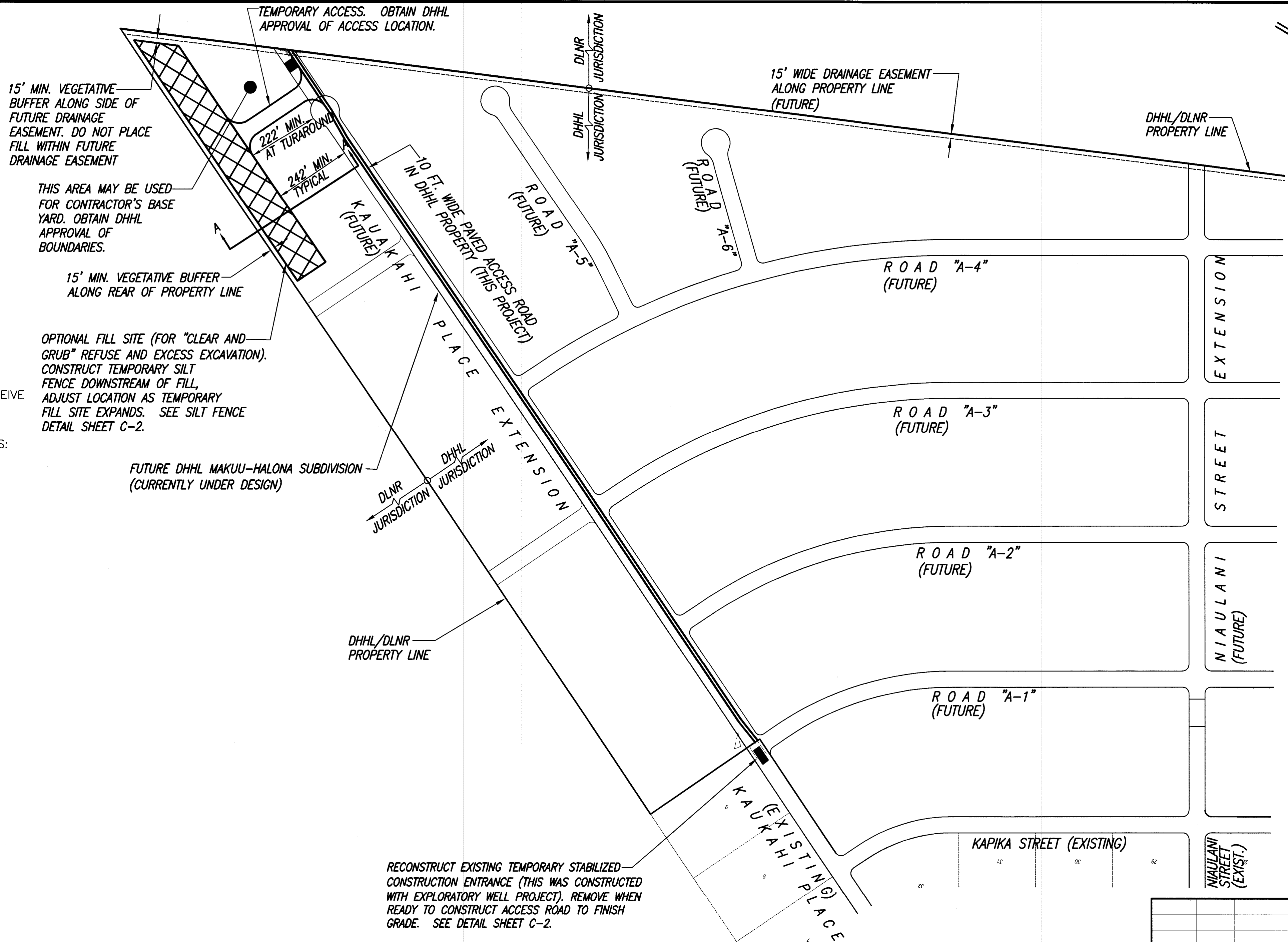
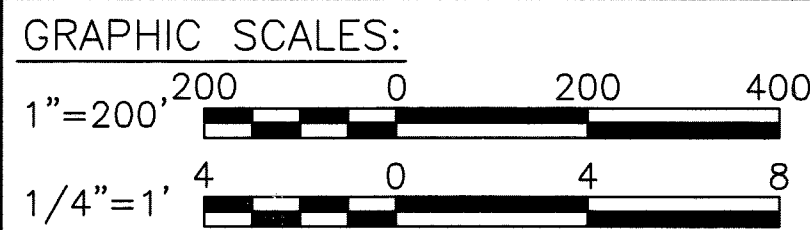


WATER QUALITY CONTROL  
BEST MANAGEMENT PRACTICES

- WASTE DISPOSAL PRACTICES:
  - A STABILIZED CONSTRUCTION ENTRANCE SHALL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS. THE PAVED STREET ADJACENT TO THE CONSTRUCTION ENTRANCE SHALL BE SWEEPED PERIODICALLY TO REMOVE EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE.
- OFFSITE VEHICLE TRACKING:
  - A STABILIZED CONSTRUCTION ENTRANCE SHALL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS. THE PAVED STREET ADJACENT TO THE CONSTRUCTION ENTRANCE SHALL BE SWEEPED PERIODICALLY TO REMOVE EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE.
- OTHER CONTROLS:
  - CONSTRUCTION MANAGEMENT TECHNIQUES: THE FOLLOWING CONSTRUCTION MANAGEMENT TECHNIQUES SHALL BE EMPLOYED AS APPROPRIATE:
    - EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE AND FUNCTIONAL BEFORE ANY EARTHWORK OPERATIONS BEGIN.
    - SURFACE RUNOFF SHALL BE DIVERTED WITH BERMS, CHANNELS, SEDIMENT TRAPS, AND OTHER APPROPRIATE MEASURES, AS PRACTICAL.
    - ALL STORM DRAIN INLETS ON SITE AND THOSE OFFSITE WHICH MAY RECEIVE RUNOFF FROM THE SITE SHALL USE AN INLET PROTECTIVE DEVICE.
    - PERMANENT VEGETATION SHALL BE INSTALLED AS SOON AS PRACTICAL.
  - MAINTENANCE AND INSPECTION PROCEDURES FOR EROSION AND SEDIMENT CONTROLS:
    - ALL CONTROL MEASURES SHALL BE INSPECTED DAILY AND FOLLOWING ANY STORM EVENT OF 0.5 INCHES OR GREATER.
    - ALL CONTROL MEASURES WILL BE MAINTAINED IN GOOD WORKING ORDER, AND IF ANY REPAIRS ARE NECESSARY, THEY WILL BE INITIATED AS SOON AS POSSIBLE.
    - THE SEDIMENT BASINS (IF ANY) SHALL BE INSPECTED FOR DEPTH OF SEDIMENT. BUILT UP SEDIMENT SHALL BE REMOVED WHEN IT REACHES 30 PERCENT OF THE DESIGN CAPACITY OR AT THE END OF THE JOB.
    - DIVERSION DITCHES SHALL BE INSPECTED AND ANY BREACHES PROMPTLY REPAIRED.
    - TEMPORARY AND PERMANENT SEEDING SHALL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND HEALTHY GROWTH.
    - THE CONTRACTOR SHALL ASSIGN INDIVIDUALS RESPONSIBLE FOR INSPECTIONS, MAINTENANCE AND REPAIRS, AND MAINTENANCE INSPECTION REPORT PREPARATION.
    - PERSONNEL SELECTED FOR INSPECTION AND MAINTENANCE RESPONSIBILITIES SHALL BE TRAINED IN ALL MAINTENANCE AND INSPECTION PRACTICES NECESSARY FOR KEEPING THE EROSION AND SEDIMENT CONTROLS IN GOOD WORKING ORDER.

TEMPORARY EROSION CONTROL

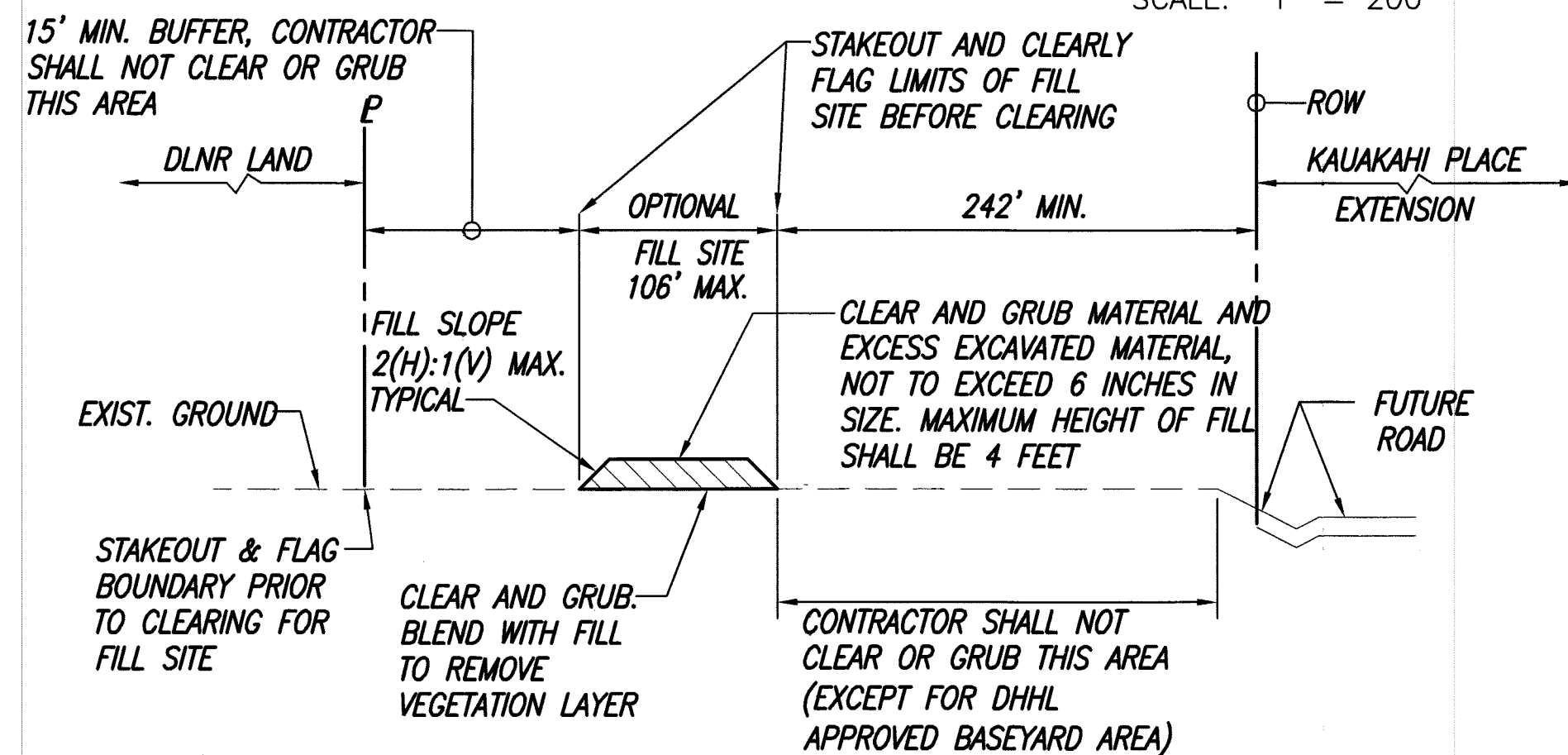
- THE CONTRACTOR SHALL MINIMIZE THE AMOUNT OF LAND TO BE EXPOSED AT ANY ONE TIME.
- GRADING OPERATIONS SHALL PROCEED FROM THE HIGHER GROUND AREA FIRST, WHERE EXCAVATION OPERATIONS ARE NECESSARY. THE EXISTING VEGETATION ON THE LOWER AREA SHALL BE LEFT IN PLACE AS LONG AS FEASIBLE TO SERVE AS A FILTERING MEDIUM.
- IF THE EXCAVATED MATERIAL FROM THE HIGHER AREA IS NEEDED TO FILL THE LOWER AREAS DESCRIBED IN #2 ABOVE, FILLING OPERATIONS SHALL BE DONE IN PHASES IN ORDER THAT EROSION AND SEDIMENTATION PROBLEMS CAN BE HELD TO A MINIMUM.
- GRASSING (COMMON BERMUDA GRASS OR STAR GRASS CUTTINGS AT THE RATE OF 50 BUSHELS PER ACRE OR AN AVERAGE OF 2 SPRIGS PER SQUARE FOOT) OF ALL AREAS GRADED SHALL BE DONE IMMEDIATELY AFTER FINAL GRADES ARE ESTABLISHED.
- GRADED AREAS THAT ARE NOT AT FINAL GRADE AND IS EXPECTED TO BE EXPOSED FOR MORE THAN 30 DAYS, SHALL BE MULCHED (AT THE RATE OF 45 CUBIC FEET PER 1,000 SQUARE FEET) IN ORDER TO PREVENT EROSION AND SILT RUNOFF.
- THE ABOVE PROCEDURE FOR EROSION AND SEDIMENT CONTROL MAY BE REVISED BY THE CONTRACTOR TO CONFORM TO HIS GRADING OPERATION PROCEDURE.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH APPROVED BEST MANAGEMENT PRACTICES (BMP) AND NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT REQUIREMENTS IF ANY.



RECONSTRUCT EXISTING TEMPORARY STABILIZED CONSTRUCTION ENTRANCE (THIS WAS CONSTRUCTED WITH EXPLORATORY WELL PROJECT). REMOVE WHEN READY TO CONSTRUCT ACCESS ROAD TO FINISH GRADE. SEE DETAIL SHEET C-2.

OPTIONAL FILL SITE PLAN

SCALE: 1" = 200'



SECTION A-A  
NOT TO SCALE

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ENGINEERS' SURVEYORS HAWAII, INC.				
Eric N. S. Hee LICENSE EXPIRES 4/30/2014				
ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST. HONOLULU, HAWAII 96814 591-8116 HON. 883-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
OPTIONAL FILL SITE AND EROSION CONTROL PLAN				

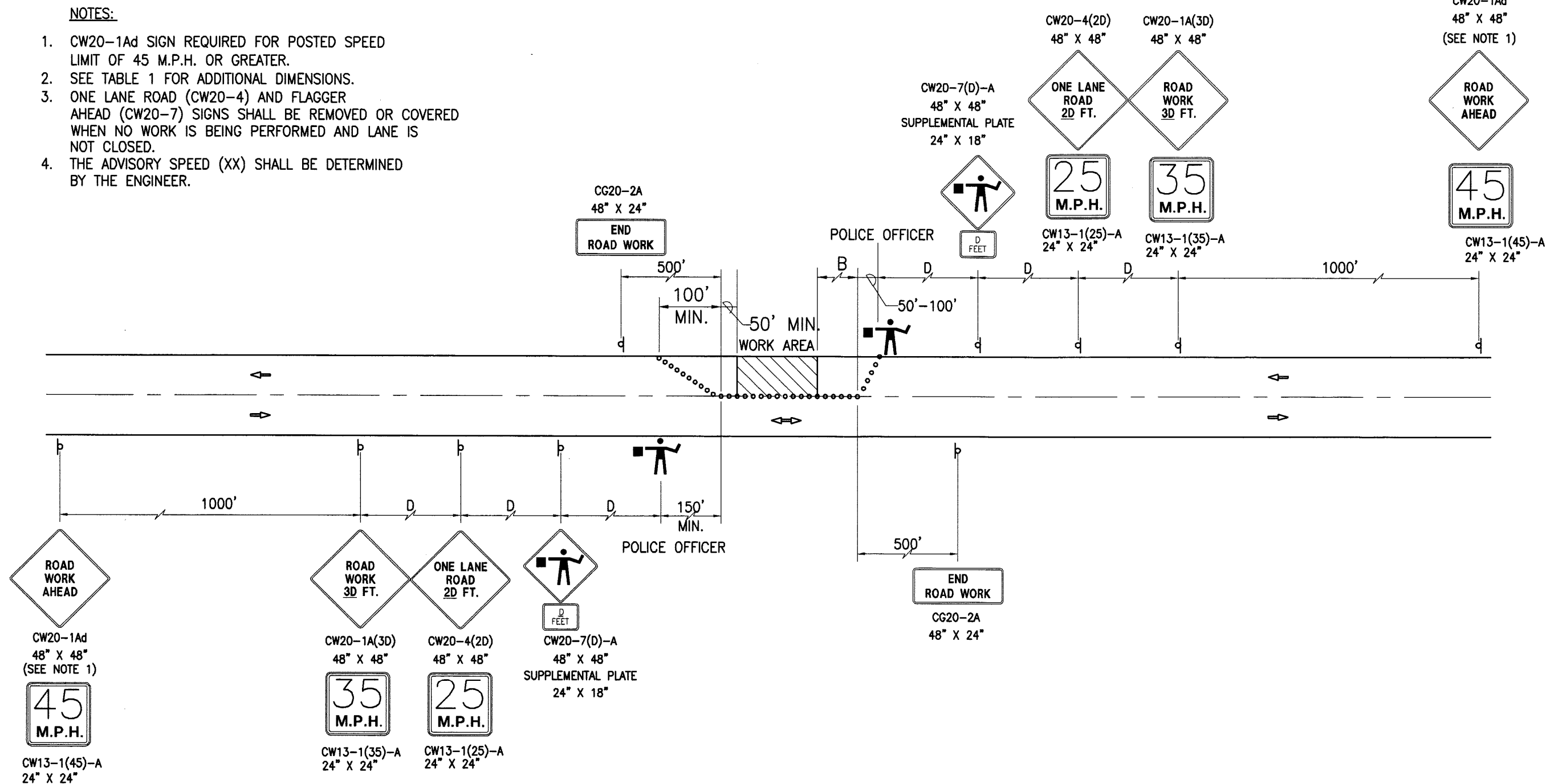
FILE	POCKET	FOLDER	NO.



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85-180.10 ENSH

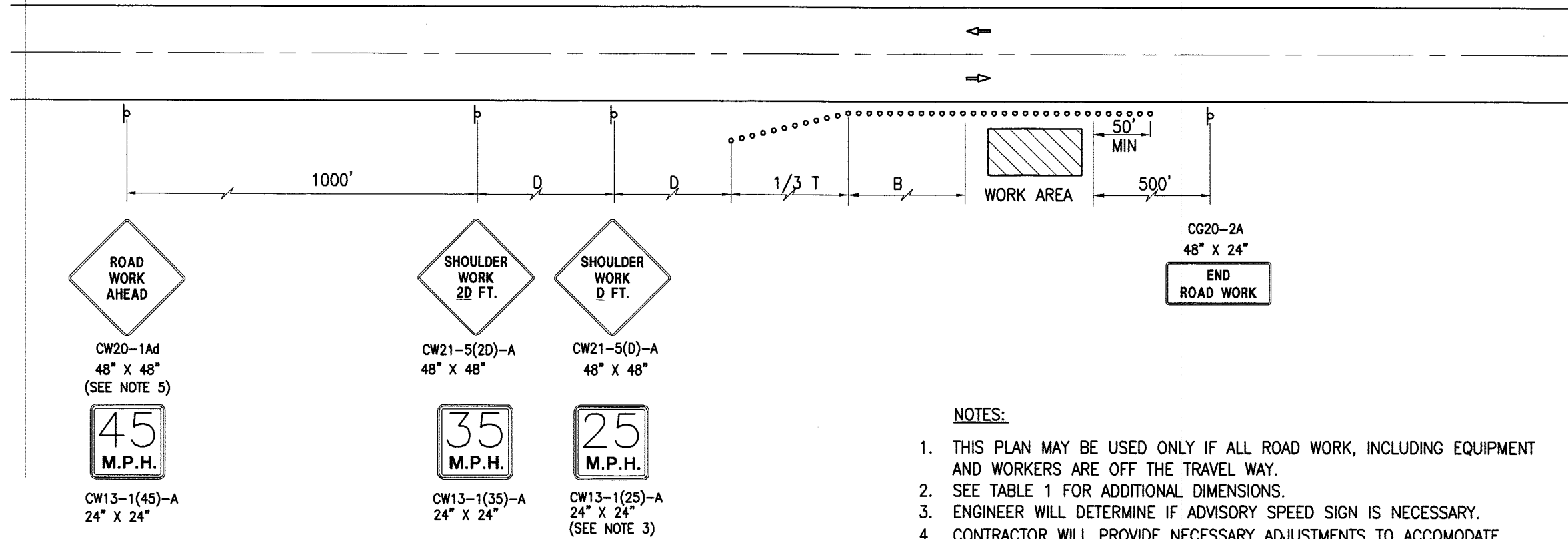
NOTES:

1. CW20-1Ad SIGN REQUIRED FOR POSTED SPEED LIMIT OF 45 M.P.H. OR GREATER.
2. SEE TABLE 1 FOR ADDITIONAL DIMENSIONS.
3. ONE LANE ROAD (CW20-4) AND FLAGGER AHEAD (CW20-7) SIGNS SHALL BE REMOVED OR COVERED WHEN NO WORK IS BEING PERFORMED AND LANE IS NOT CLOSED.
4. THE ADVISORY SPEED (XX) SHALL BE DETERMINED BY THE ENGINEER.



**TWO-LANE HIGHWAY – ONE LANE CLOSED**

NOT TO SCALE



NOTES:

1. THIS PLAN MAY BE USED ONLY IF ALL ROAD WORK, INCLUDING EQUIPMENT AND WORKERS ARE OFF THE TRAVEL WAY.
2. SEE TABLE 1 FOR ADDITIONAL DIMENSIONS.
3. ENGINEER WILL DETERMINE IF ADVISORY SPEED SIGN IS NECESSARY.
4. CONTRACTOR WILL PROVIDE NECESSARY ADJUSTMENTS TO ACCOMMODATE BICYCLISTS AND PEDESTRIANS.
5. CW20-1Ad SIGN REQUIRED FOR POSTED SPEED LIMIT OF 45 M.P.H. OR GREATER.
6. SIGNING IS NOT REQUIRED IF THE WORK AREA INCLUDING EQUIPMENT AND WORKERS IS OUTSIDE THE CLEAR ZONE DISTANCE, AS SPECIFIED IN THE LATEST AASHTO ROADSIDE DESIGN GUIDE.

**WORKING ON SHOULDER OR ROADSIDE**

NOT TO SCALE

**LEGEND**

- ..... CONES OR DELINEATOR
- ➡ DIRECTION OF TRAFFIC
- ⊥ SIGN
- ▨ WORK AREA
- 👤 POLICE OFFICER / FLAGGER

**GENERAL NOTES FOR TRAFFIC CONTROL PLAN**


1. THE PERMITTEE SHALL MAKE MINOR ADJUSTMENTS AT INTERSECTIONS, DRIVEWAYS, BRIDGES, STRUCTURES, ETC., TO FIT FIELD CONDITIONS.
2. CONES OR DELINEATORS SHALL BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
3. TRAFFIC CONTROL DEVICES SHALL BE INSTALLED SUCH THAT THE SIGN OR DEVICE FARTHEST FROM THE WORK AREA SHALL BE PLACED FIRST. THE OTHERS SHALL THEN BE PLACED PROGRESSIVELY TOWARD THE WORK AREA.
4. REGULATORY AND WARNINGS SIGNS WITHIN THE CONSTRUCTION ZONE THAT ARE IN CONFLICT WITH THE TRAFFIC CONTROL PLANS SHALL BE REMOVED OR COVERED. ALL SIGNS SHALL BE RESTORED UPON COMPLETION OF THE WORK.
5. FLAGGERS AND/OR POLICE OFFICERS SHALL BE IN SIGHT OF EACH OTHER OR IN DIRECT COMMUNICATION AT ALL TIMES.
6. WHEN REQUIRED BY THE ISSUING OFFICE, THE PERMITTEE SHALL INSTALL A FLASHING ARROW SIGNAL AS SHOWN ON THE TRAFFIC CONTROL PLANS.
7. SIGN SPACINGS, (D) TAPER LENGTHS (T) AND SPACING OR CONES OR DELINEATORS SHALL BE AS SHOWN IN TABLE 1, UNLESS OTHERWISE NOTED ON THE TRAFFIC CONTROL PLANS.
8. ALL TRAFFIC LANES SHALL BE A MINIMUM OF 10 FEET WIDE.
9. ALL CONSTRUCTION WARNING SIGNS SHALL BE PROMPTLY REMOVED OR COVERED WHENEVER THE MESSAGE IS NOT APPLICABLE OR NOT IN USE.
10. THE BACKS OF ALL SIGNS FOR TRAFFIC CONTROL SHALL BE APPROPRIATELY COVERED TO PRECLUDE THE DISPLAY OF INAPPLICABLE SIGN MESSAGES (I.E., WHEN SIGNS HAVE MESSAGES ON BOTH SIDES).
11. AT THE END OF EACH DAY'S WORK OR AS SOON AS THE WORK IS COMPLETED, THE PERMITTEE SHALL REMOVE ALL TRAFFIC CONTROL DEVICES NO LONGER NEEDED TO PERMIT FREE AND SAFE PASSAGE OF PUBLIC TRAFFIC. REMOVAL SHALL BE IN REVERSE ORDER OF INSTALLATION.
12. PERMANENT PAVEMENT MARKINGS AND TRAFFIC SIGNS SHALL BE REPLACED UPON THE COMPLETION OF EACH PHASE OF WORK.

TABLE 1 FOR TRAFFIC CONTROL PLAN						
POSTED SPEED LIMIT (M.P.H.)	SIGN SPACING (FEET) (D)	TAPER LENGTH (T) (FEET)		LONGITUDINAL BUFFER SPACE (B) (FEET)	SPACING OF CONES OR DELINEATORS (FEET)	
		W=12' OR LESS ①	W=GREATER THAN 12' ①		TAPER	TANGENT
20	250	200	W x 17	35	20	20
25	250	200	W x 17	55	25	25
30	250	250	W x 20	85	30	30
35	250	250	W x 20	120	35	35
40	500	350	W x 30	170	40	40
45	500	550	W x 45	220	45	45
50	1000	600	W x 50	280	50	50
55	1000	700	W x 55	335	55	55

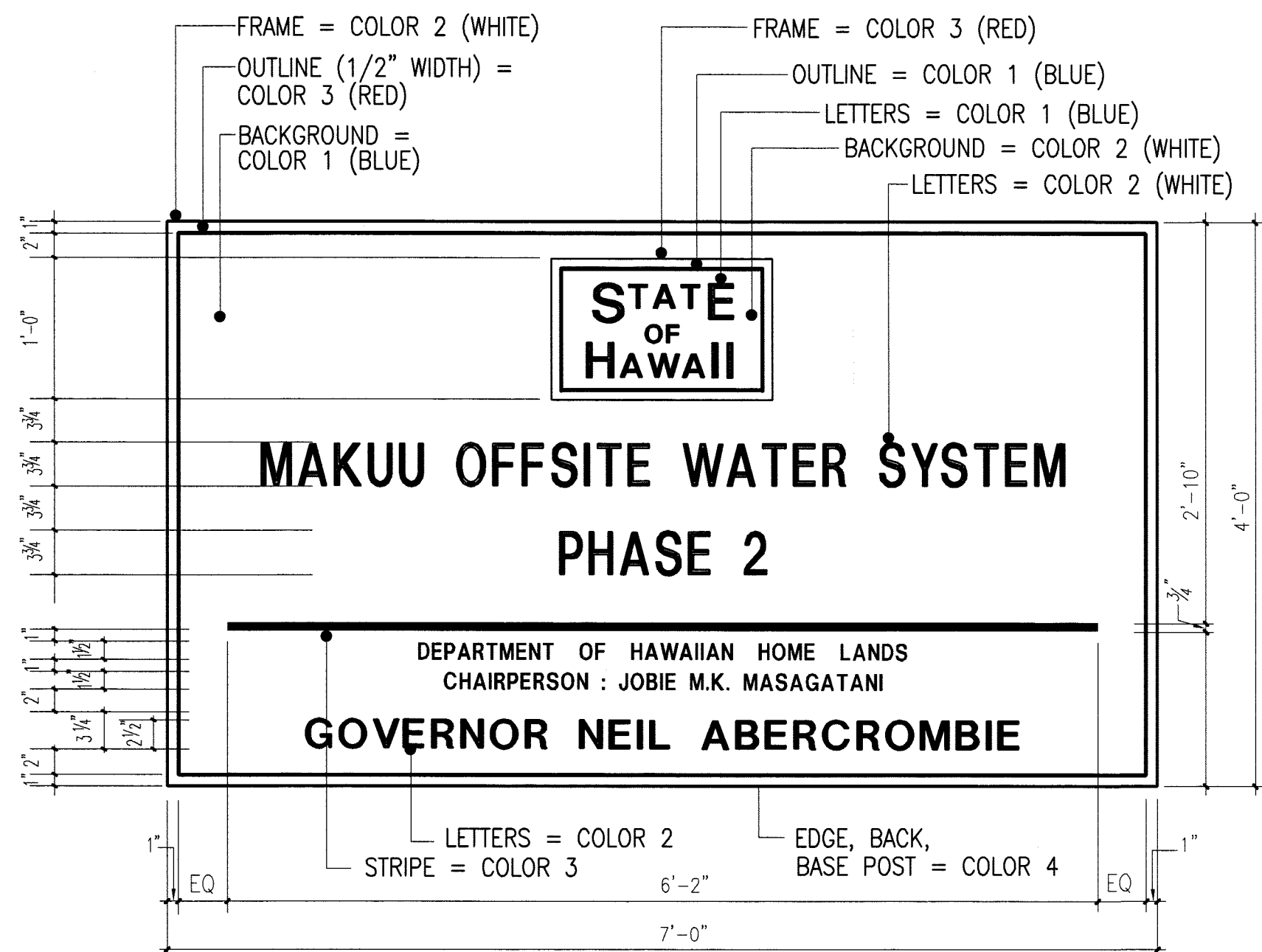
NOTE:

① W = WIDTH OF SHOULDER OR OFFSET

POSTED SPEED LIMIT IS 55 M.P.H.

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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.				
ENGINEERS SURVEYORS HAWAII, INC.				
<i>Eric N. S. Hee</i> LICENSE EXPIRES 4/30/2014				
				
 ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>TRAFFIC CONTROL PLAN</b> (KEONEPOKO-NUI WELL & RES. SITE)				
FILE	POCKET	FOLDER	NO.	

Y:\1985-85-180\13 New Mokuu Water\WORKING FOLDER\C-29\_SIGN DETAILS (2012).dwg Wed Jun 06 2012 - 3:46pm  
85-180.10 ENSH / Plot 1:1



#### MATERIALS

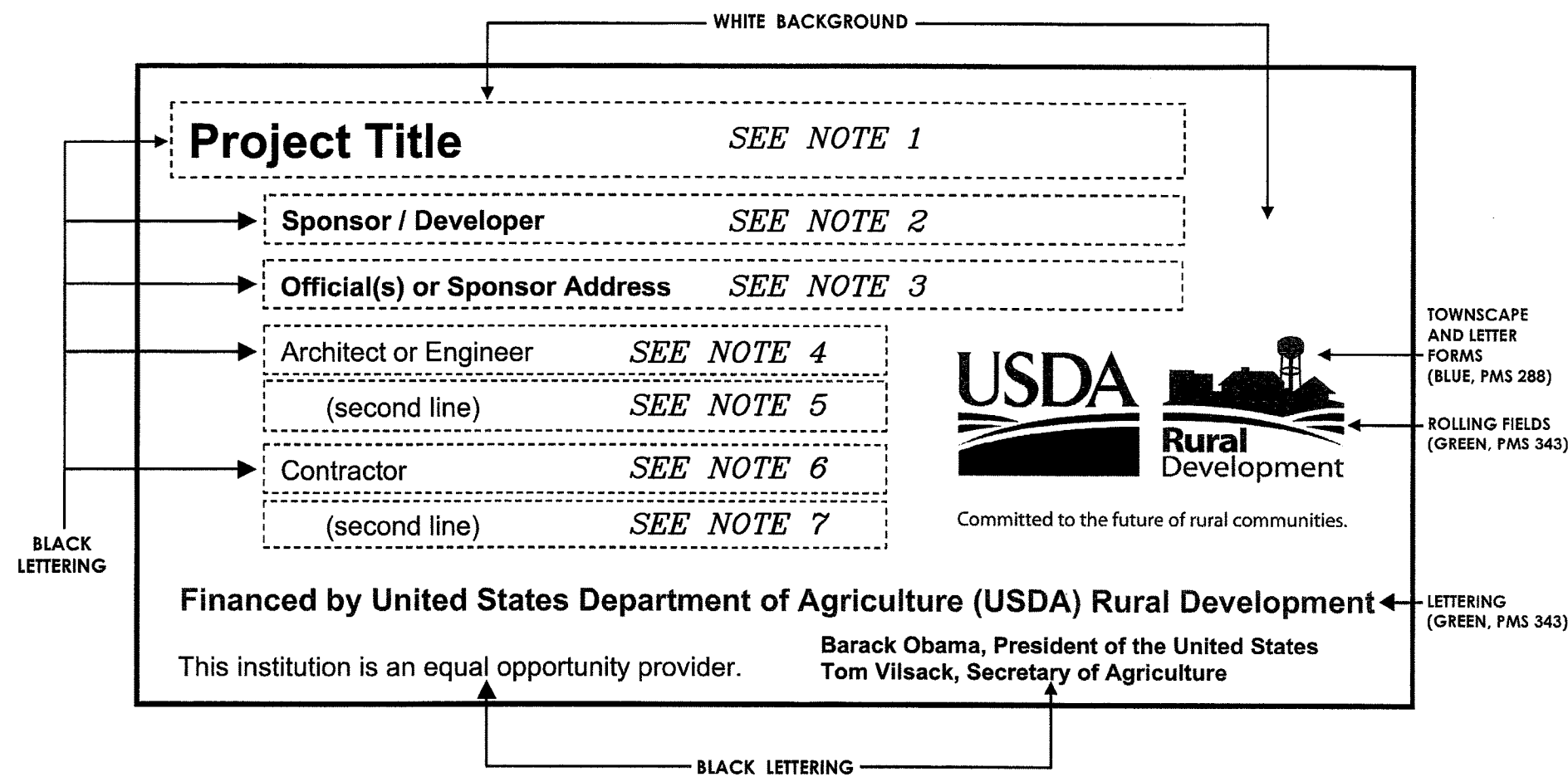
PANEL IS 3/4" EXTERIOR GRADE HIGH DENSITY OVERLAID PLYWOOD WITH RESIN BONDED SURFACES ON BOTH SIDES.

#### NOTES:

1. VERIFY CURRENT DHHL CHAIRPERSON AND GOVERNOR NAMES AT TIME OF CONSTRUCTION. UPDATE DHHL SIGN AS REQUIRED.

"TEMPORARY DHHL PROJECT" SIGN

SCALE: N.T.S. 23



**SIGN DIMENSIONS:** 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")  
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

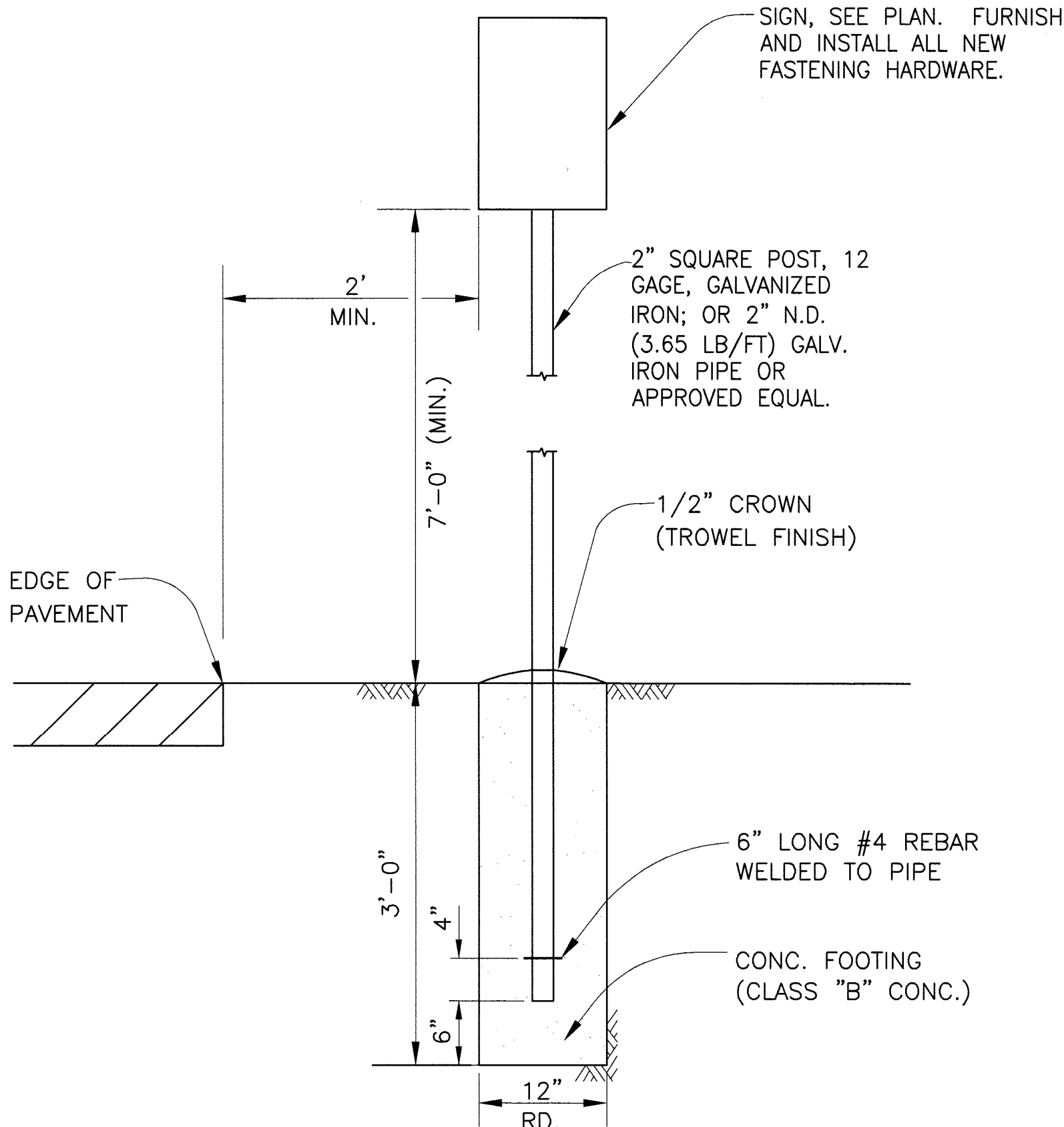
NOTE, WORDING FOR USDA SIGN AS FOLLOWS:

1. MAKUU OFFSITE WATER SYSTEM, PHASE 2
2. DEVELOPER: NA KUPA'A O KUHIO
3. LANDOWNER: DEPARTMENT OF HAWAIIAN HOME LANDS
4. ENGINEER: ENGINEERS SURVEYORS HAWAII, INC.
5. (to be left blank)
6. CONTRACTOR: (to be determined at time of construction)
7. (to be determined at time of construction)

"TEMPORARY USDA PROJECT" SIGN

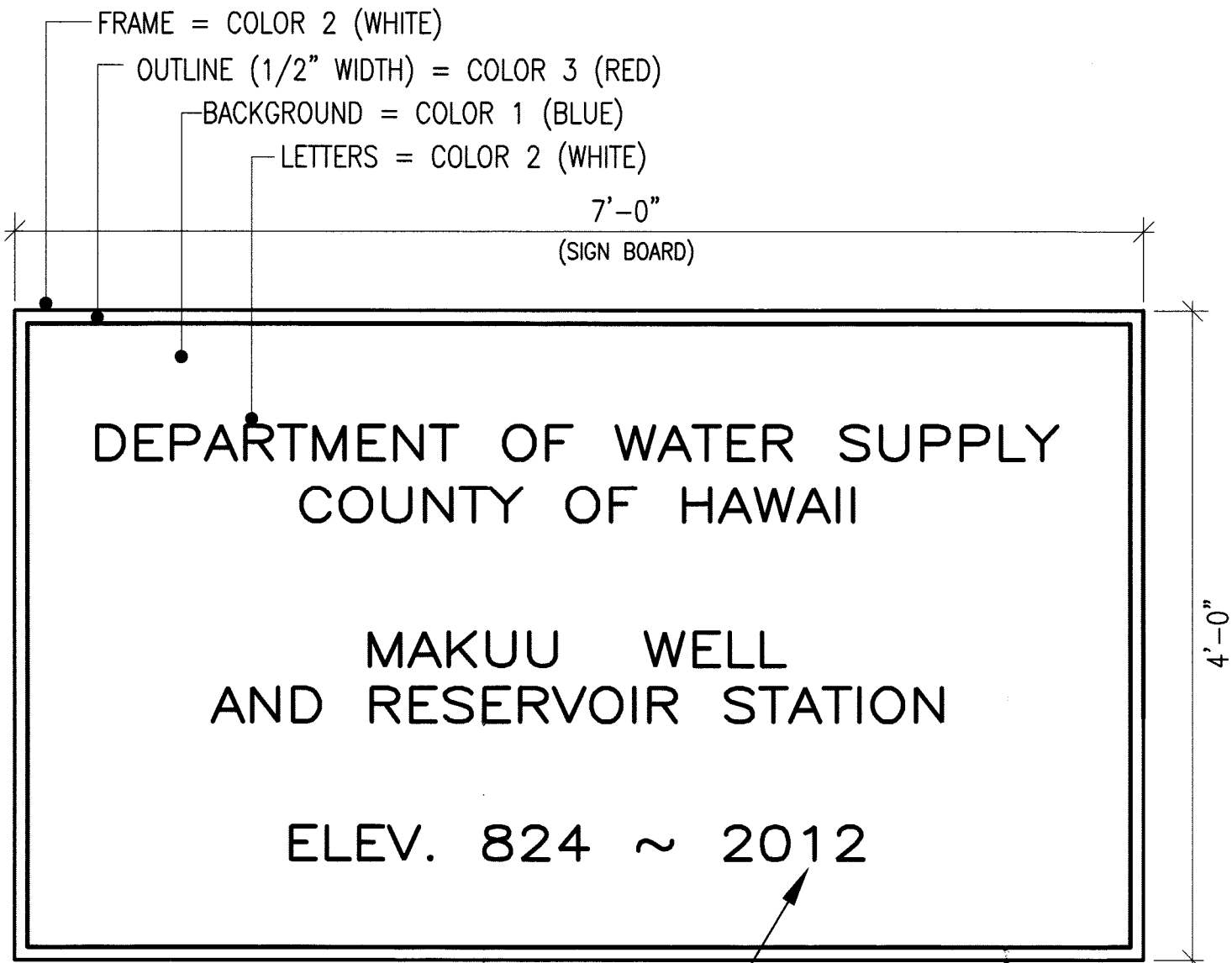
SCALE: N.T.S. 11

EDGE OF PAVEMENT



TYPICAL SIGN POST

SCALE: N.T.S. 3



YEAR TO BE DETERMINED AT TIME OF CONSTRUCTION

#### MATERIALS

PANEL IS 3/4" EXTERIOR GRADE HIGH DENSITY OVERLAID PLYWOOD WITH RESIN BONDED SURFACES ON BOTH SIDES.

#### NOTES:

1. INSTALL TWO WOOD DWS SIGNS.
2. INSTALL FIRST SIGN AT STA. 0+00±; O/S 20' LEFT (C.L. ROAD TO C.L. SIGN) SEE SHEET C-16.
3. INSTALL SECOND SIGN AT STA. 73+30; O/S 20' LEFT (C.L. ROAD TO C.L. SIGN) SEE SHEET C-19.

WOOD DWS SIGN

SCALE: N.T.S. 21

### SPECIFICATIONS:

#### LETTER STYLE

COPY IS CENTERED AND SET IN ADOBE TYPE FUTURA HEAVY. IF THIS SPECIFIC TYPE IS NOT AVAILABLE, FUTURA DEMI BOLD MAY BE SUBSTITUTED. COPY SHOULD BE SET AND SPACED BY A PROFESSIONAL TYPESETTER AND ENLARGED PHOTOGRAPHICALLY FOR PHOTO STENCIL SCREEN PROCESS.

#### ARTWORK

CONSTANT ELEMENTS OF THE SIGN LAYOUT-FRAME, OUTLINE, STRIPE, AND OFFICIAL STATE INFORMATION-MAY BE DUPLICATED FOLLOWING WORKING DRAWING MEASUREMENTS, OR BE REPRODUCED AND ENLARGED PHOTOGRAPHICALLY USING A LAYOUT TEMPLATE IF PROVIDED. THE "STATE OF HAWAII" MASTHEAD (IF APPLICABLE) SHOULD BE REPRODUCED AND ENLARGED AS SPECIFIED, USING THE ART WORK PROVIDED.

#### TITLES

THE SPECIFIC MAJOR WORK OF THE PROJECT UNDER CONSTRUCTION IS EMPHASIZED BY USING 3 3/4" TYPE, ALL CAPITALS. SECONDARY INFORMATION SUCH AS LOCATIONS OR BUILDINGS USES 2 1/4" TYPE, ALL CAPITALS. OTHER RELATED INFORMATION OF LESSER IMPORTANCE USES 2 1/4" (CAPITAL HEIGHT) TYPE IN LOWER CASE LETTERS. FOR THE DHHL PROJECT SIGN, ALL LINES OF TYPE SHOULD NOT EXCEED THE WIDTH OF THE 6'2" STRIPE.

#### PAINTS & INKS

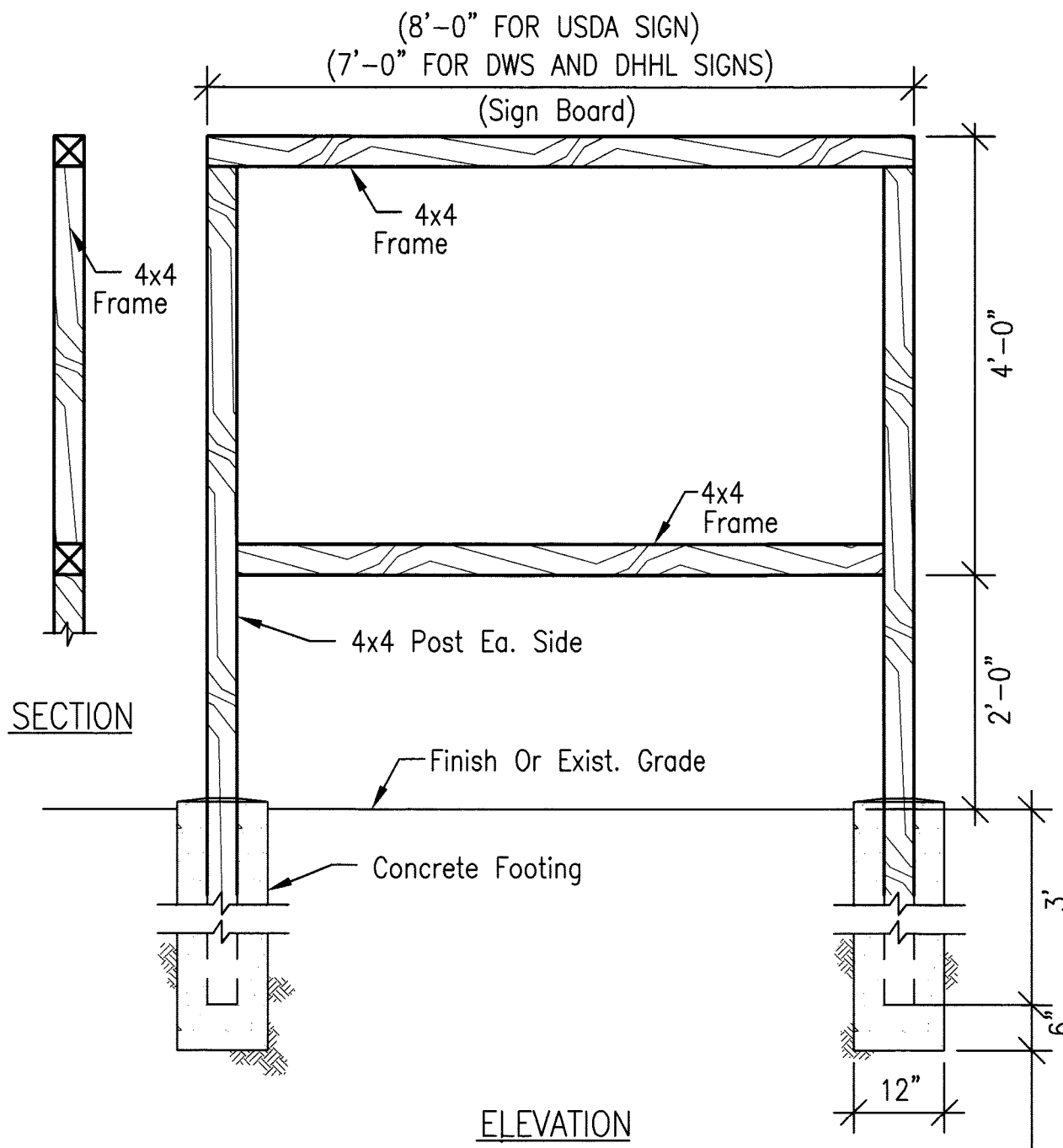
SCREEN PRINT INKS ARE MATTE FINISH. PAINTS ARE SATIN FINISH, EXTERIOR GRADE. REFERENCES TO AMERITONE COLOR KEY PAINT ARE FOR COLOR MATCH ONLY.

- COLOR: 1. 1B10A BOHEMIAN BLUE  
2. 2H16P SOFTLY (WHITE)  
3. 2VR2A HOT TANGO (RED)  
4. 1M52E TOKAY (GRAY)

REFER TO DETAIL 11/C-29 FOR COLORS FOR USDA SIGN.

#### NOTES:

1. PROVIDE SHOP DRAWING OF WORDING, FOR APPROVAL, TO THE ENGINEER (FOR DHHL, USDA AND DWS SIGNS).



WOOD SIGN FRAME DETAIL

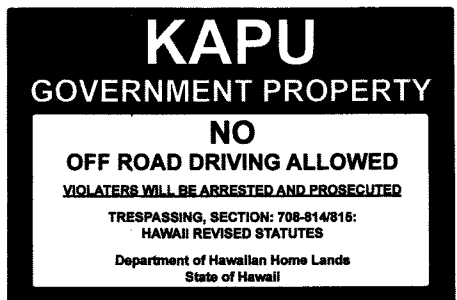
SCALE: N.T.S. 9

#### NOTES:

1. PANEL SIZE 18" X 24" (METAL).
2. SIGN SHALL BE RED AND WHITE. CONTACT DHHL FOR A SAMPLE OF THIS STANDARD DHHL LAND MANAGEMENT SIGN.
3. SEE TYPICAL SIGN POST, DETAIL 3/C-29. INSTALL ON ONE (1) POST.

"NO TRESPASSING" SIGN

SCALE: N.T.S. 6



#### NOTES:

1. PANEL SIZE 24" X 36" (METAL).
2. SIGN SHALL BE RED AND WHITE. CONTACT DHHL FOR A SAMPLE OF THIS STANDARD DHHL LAND MANAGEMENT SIGN.
3. SEE TYPICAL SIGN POST, DETAIL 3/C-29. INSTALL ON TWO (2) POSTS.

"NO OFF ROAD DRIVING" SIGN

SCALE: N.T.S. 5

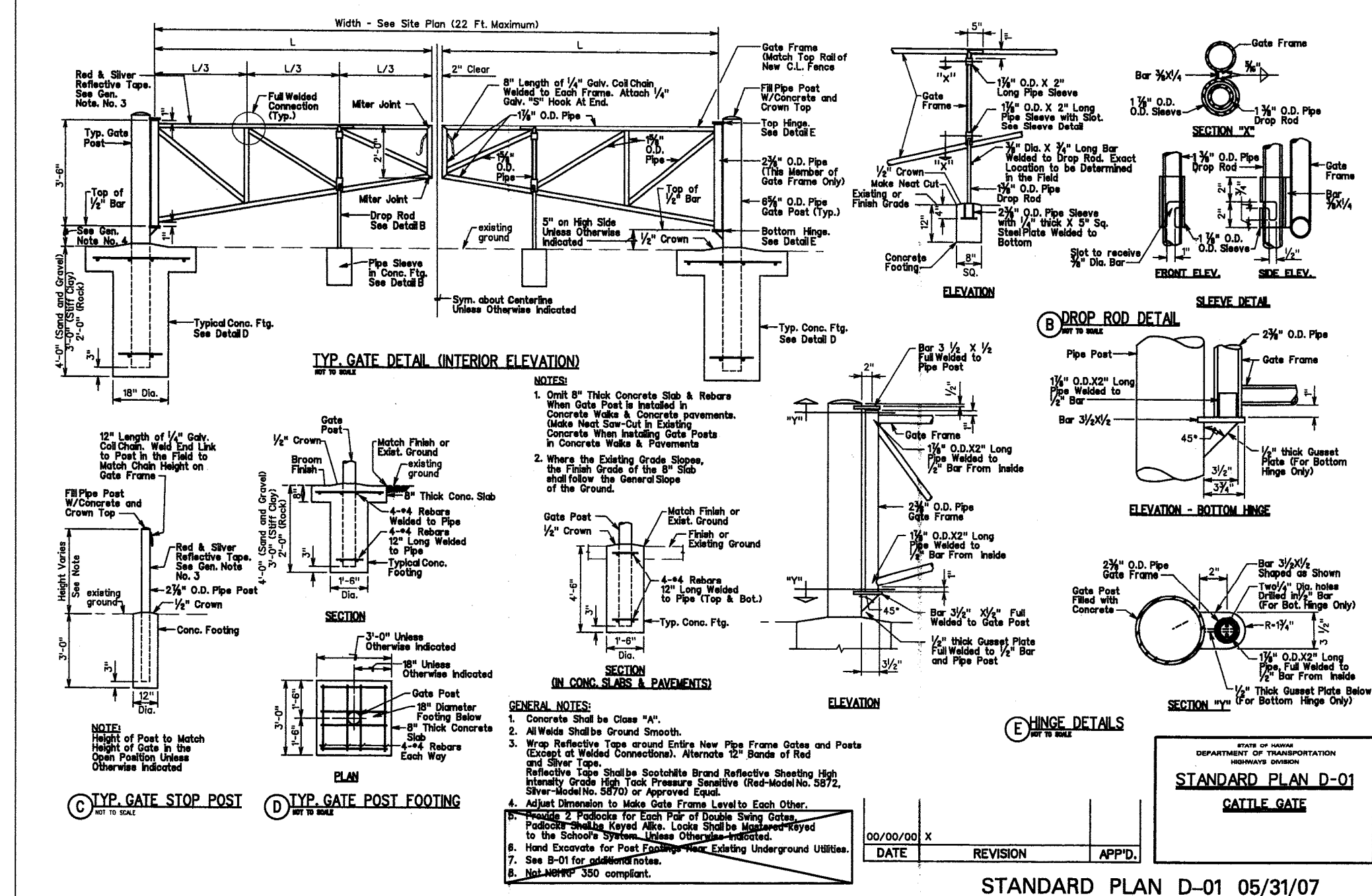
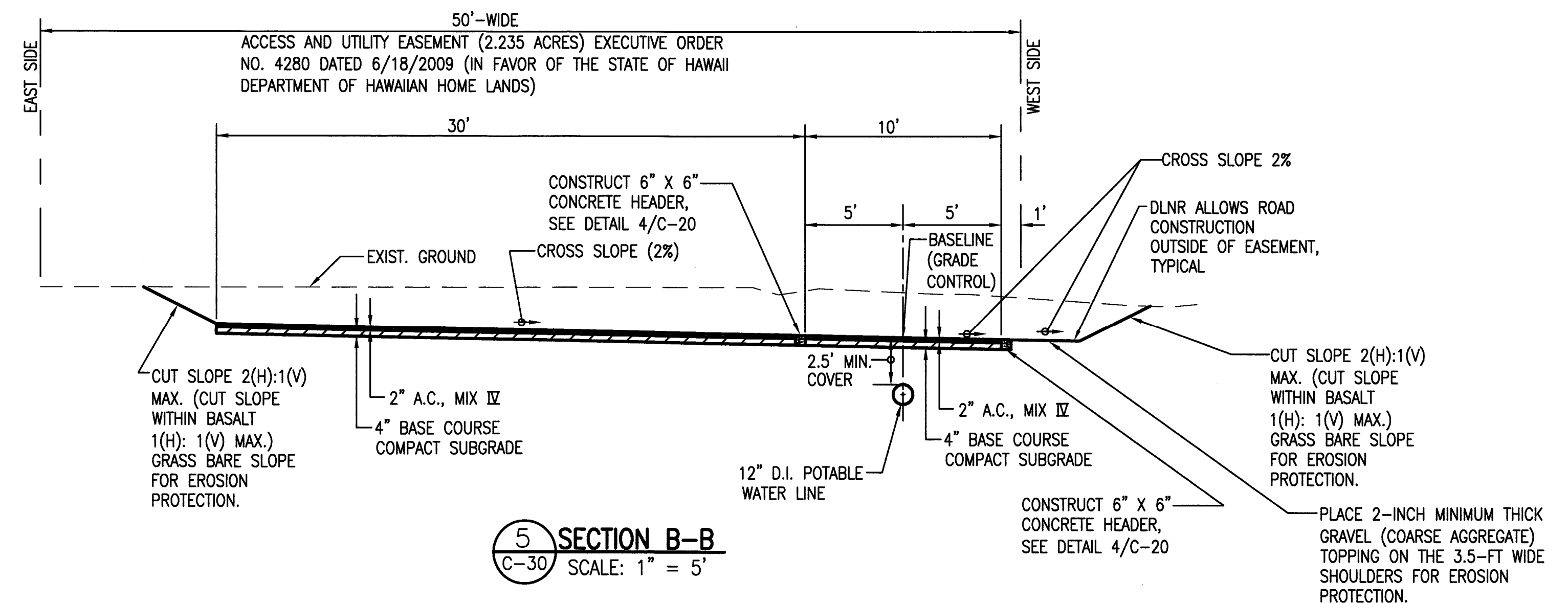
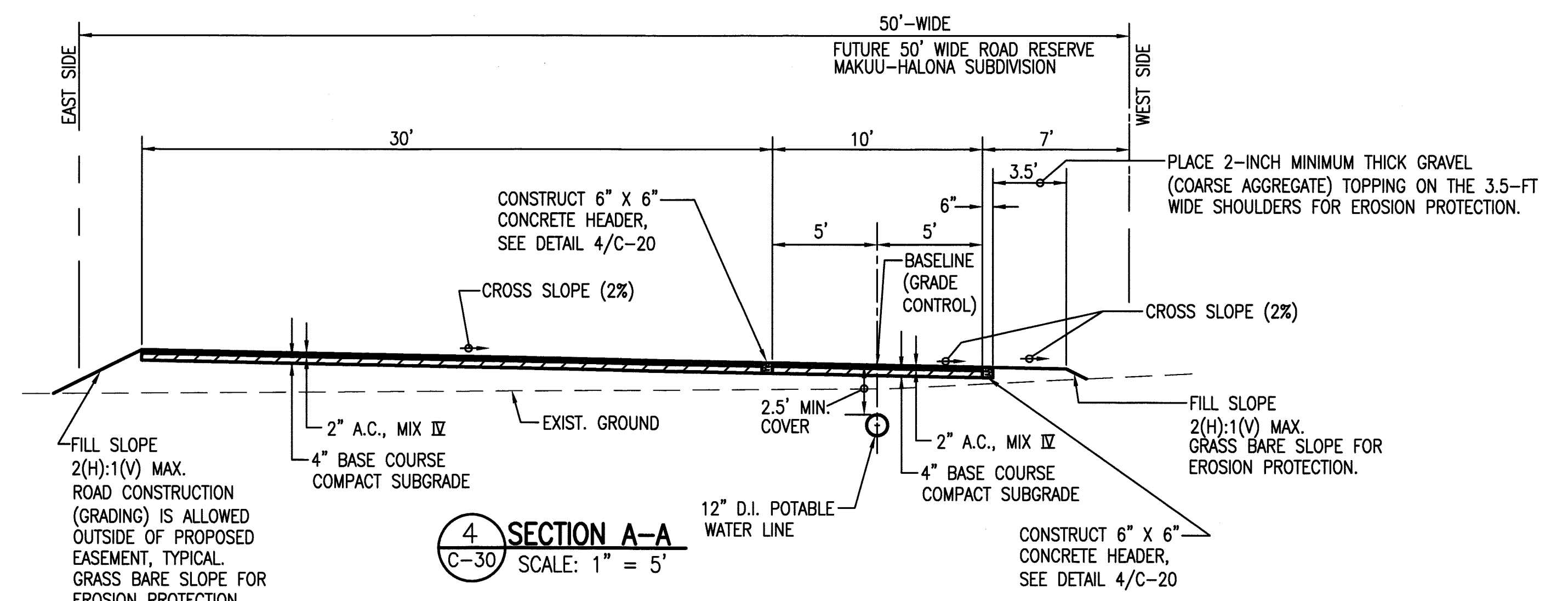
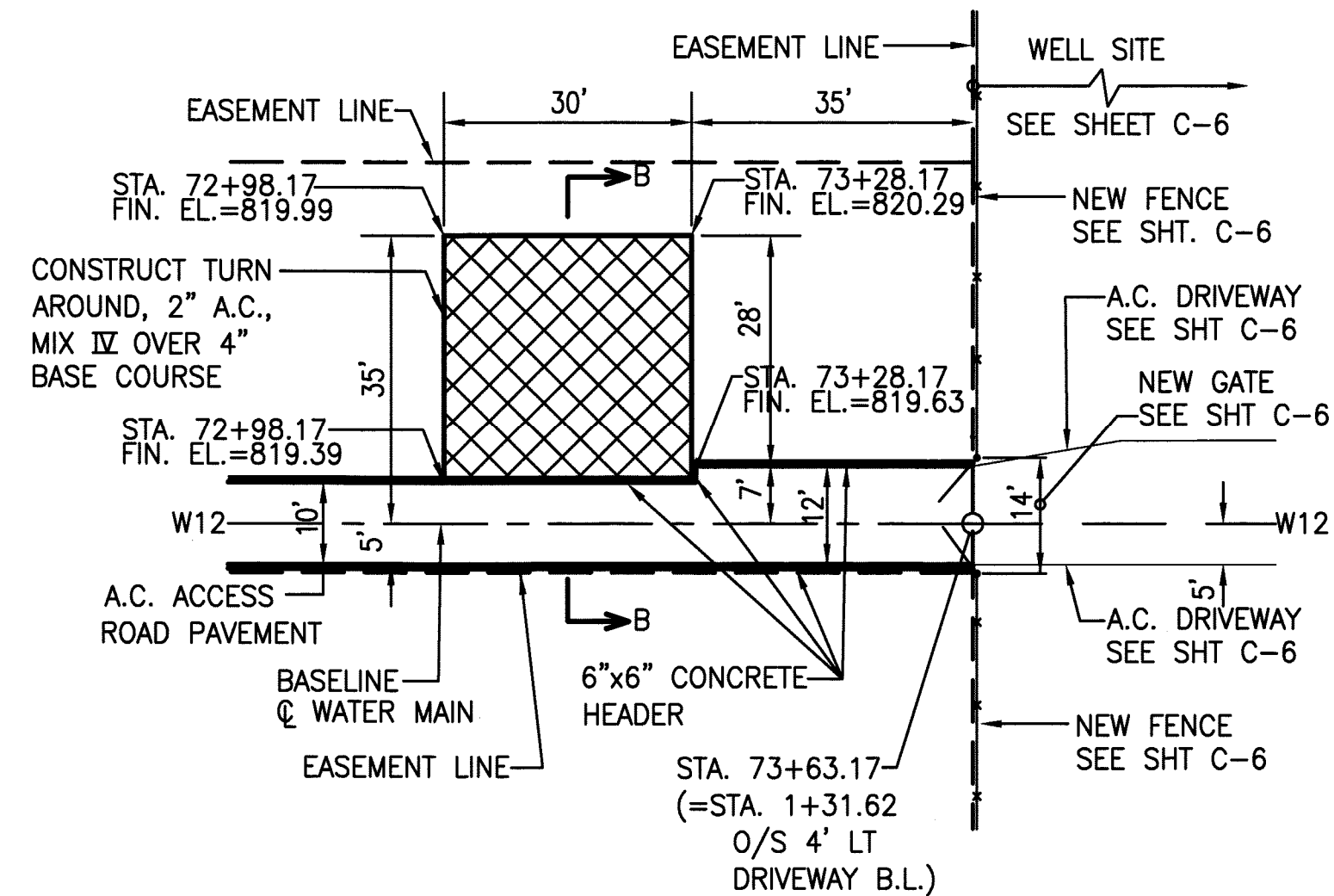
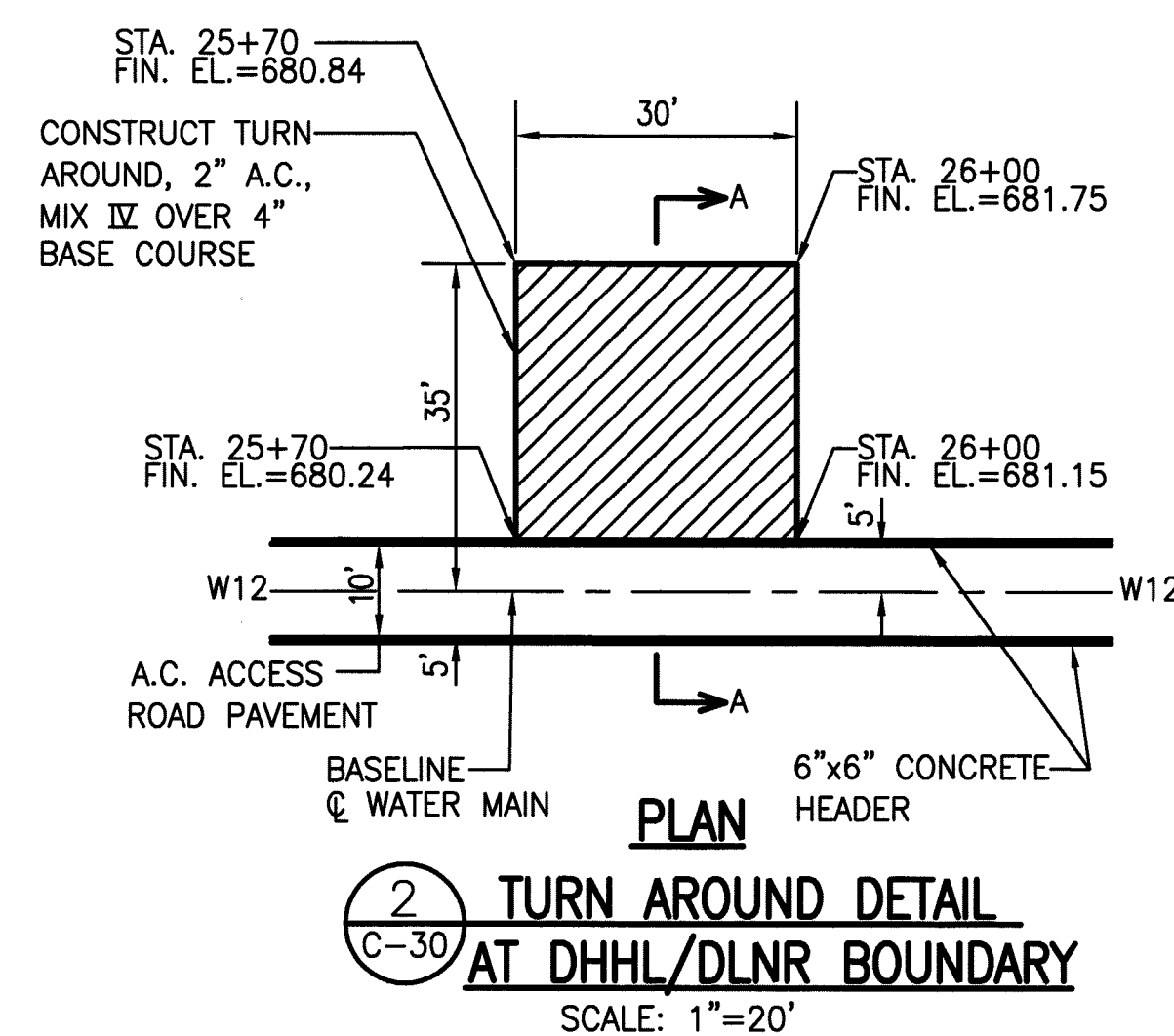


DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM PHASE 2: PRODUCTION WELL, RESERVOIR AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**SIGNS AND MISCELLANEOUS DETAILS**

(ACCESS ROAD & TRANSMISSION MAIN)





NOTES:

1. ALL GATE MATERIAL INCLUDING GATE HARDWARE SHALL BE GALVANIZED STEEL.
2. ALL WELDED CONNECTIONS SHALL BE PAINTED WITH TWO COATS OF Z.R.C. COLD GALVANIZING COMPOUND.
3. POSTS, AND GATE FRAMES SHALL BE SCHEDULED 40 (STANDARD WEIGHT) PIPE.
4. PROVIDE 3 PADLOCKS. PADLOCKS SHALL BE KEYED ALIKE. ONE PADLOCK SHALL BE FOR EXISTING GATE AT STA 0+20, ONE FOR GATE AT STA 26+13 AND ONE FOR GATE AT STA 73+28. DELIVER 6 KEYS (ENGINEER SHALL DISTRIBUTE 2 KEYS TO DWS).
5. PADLOCKS SHALL BE HEAVY DUTY TYPE, SIMILAR TO LOCK AT EXISTING GATE AT STA 0+20.
6. CONTRACTOR SHALL INSTALL A LOCK BOX ON GATE AT STA 26+13, TO PREVENT VANDALS FROM CUTTING THE LOCK.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED	

THIS WORK WAS PREPARED BY ME  
OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.


*Eric N. S. Hae*  
\_\_\_\_\_  
LICENSE EXPIRES 4/30/2014

ERIC N. S. HAE

LICENSED  
PROFESSIONAL  
ENGINEER

No. 5292-C

HAWAII, U.S.A.



**ENGINEERS SURVEYORS  
HAWAII, INC.**

900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

**DEPARTMENT OF HAWAIIAN HOME LANDS**

**MAKUU OFFSITE WATER SYSTEM PHASE 2:  
PRODUCTION WELL, RESERVOIR  
AND SUPPORTING FACILITIES**

**AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII**

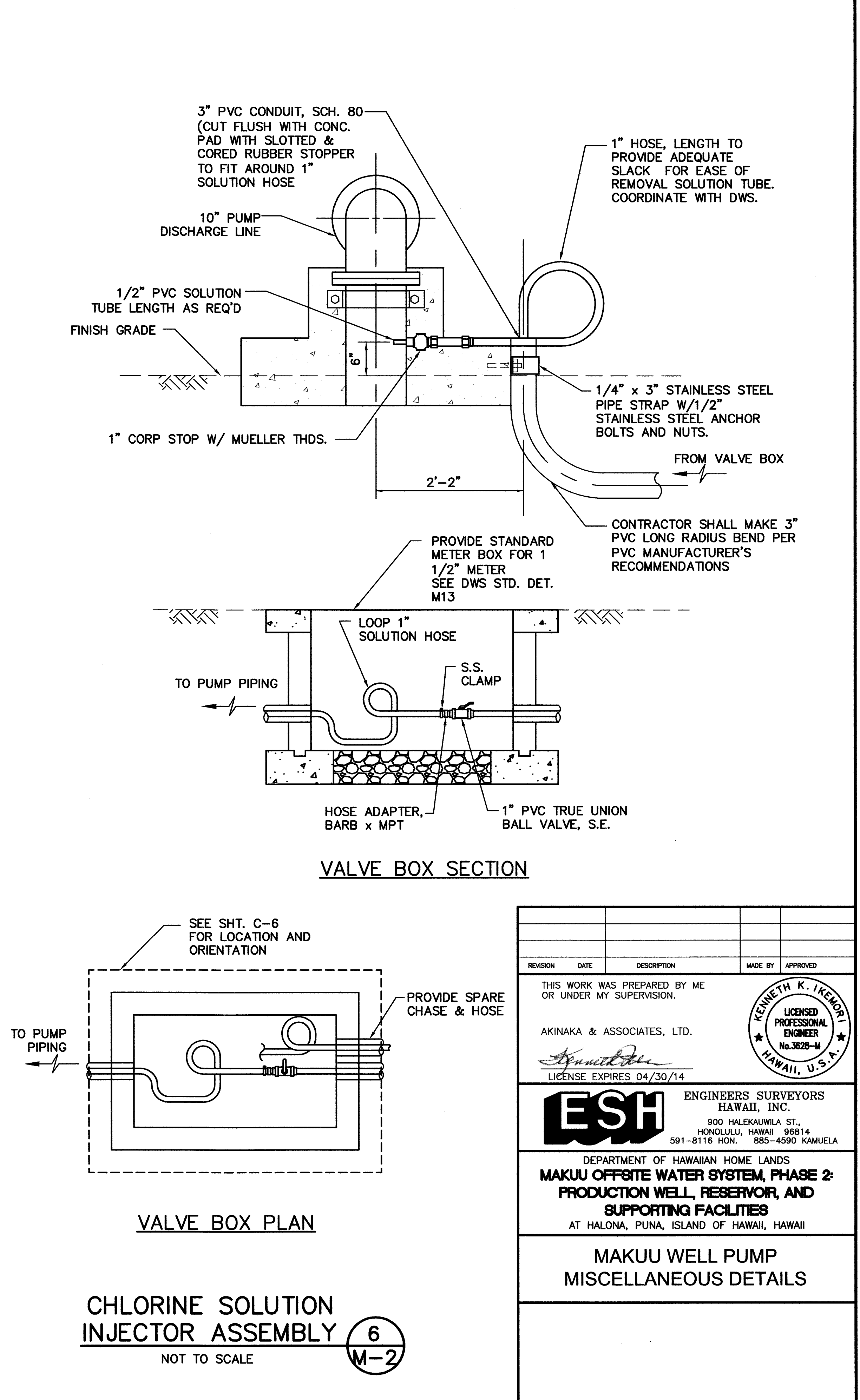
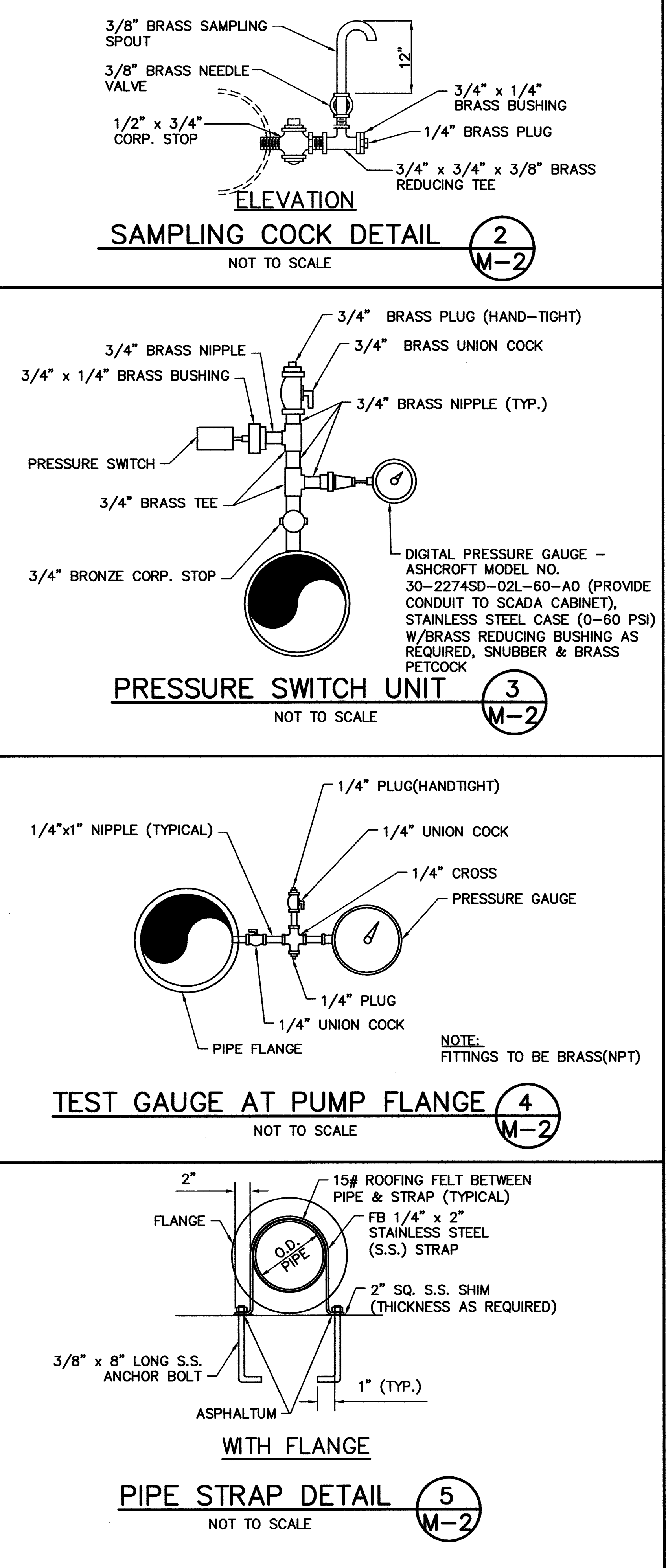
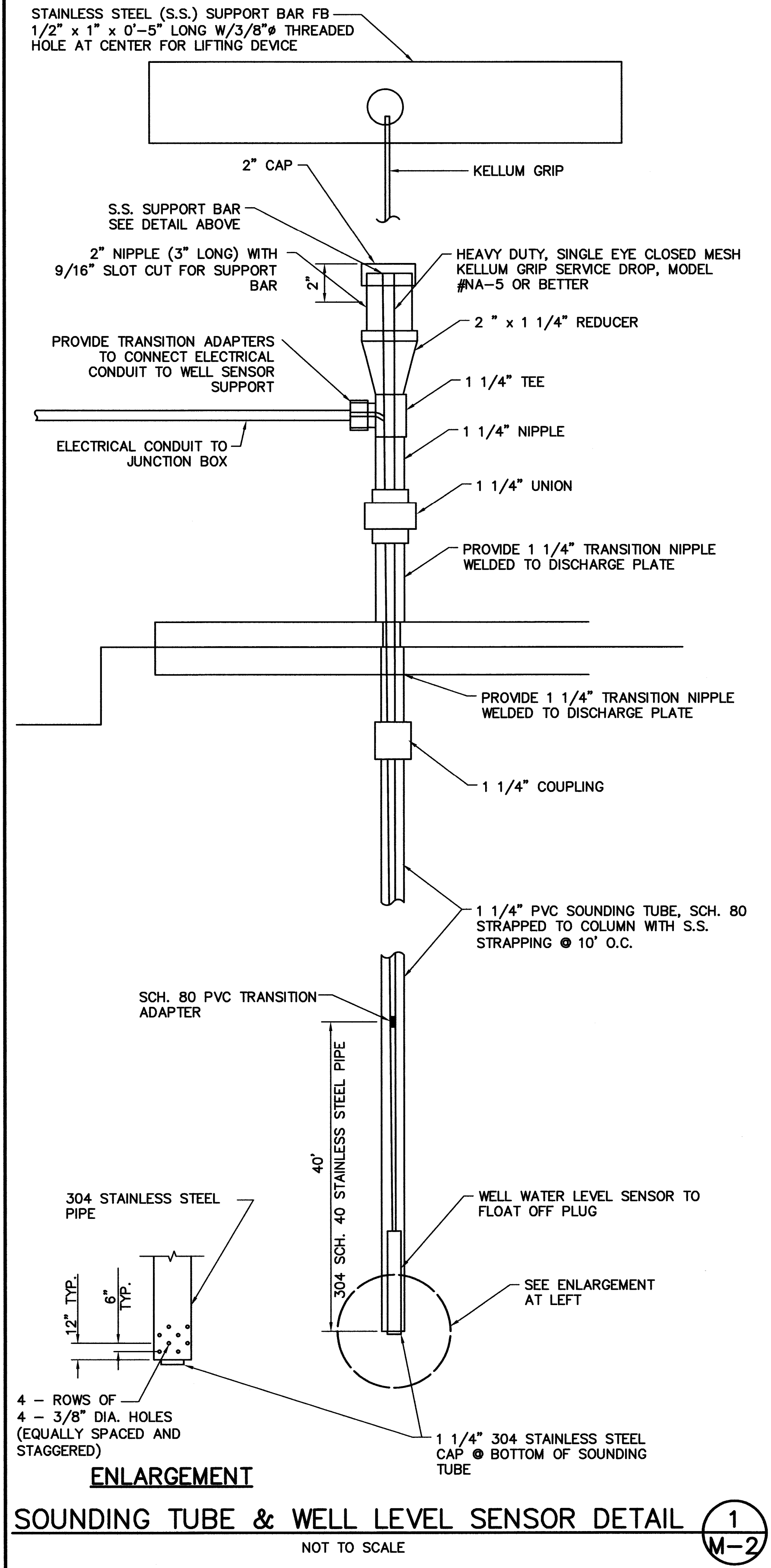
**MISCELLANEOUS DETAILS**

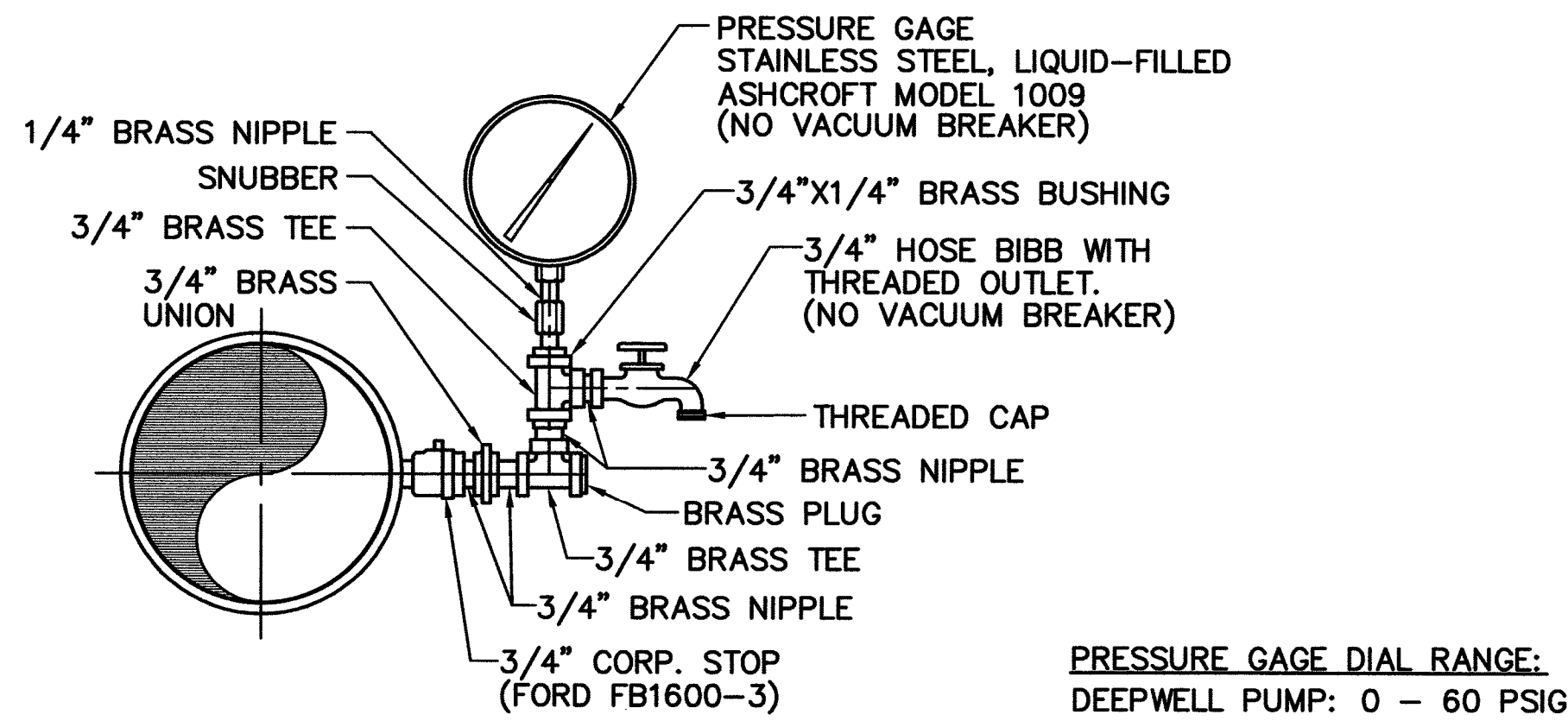




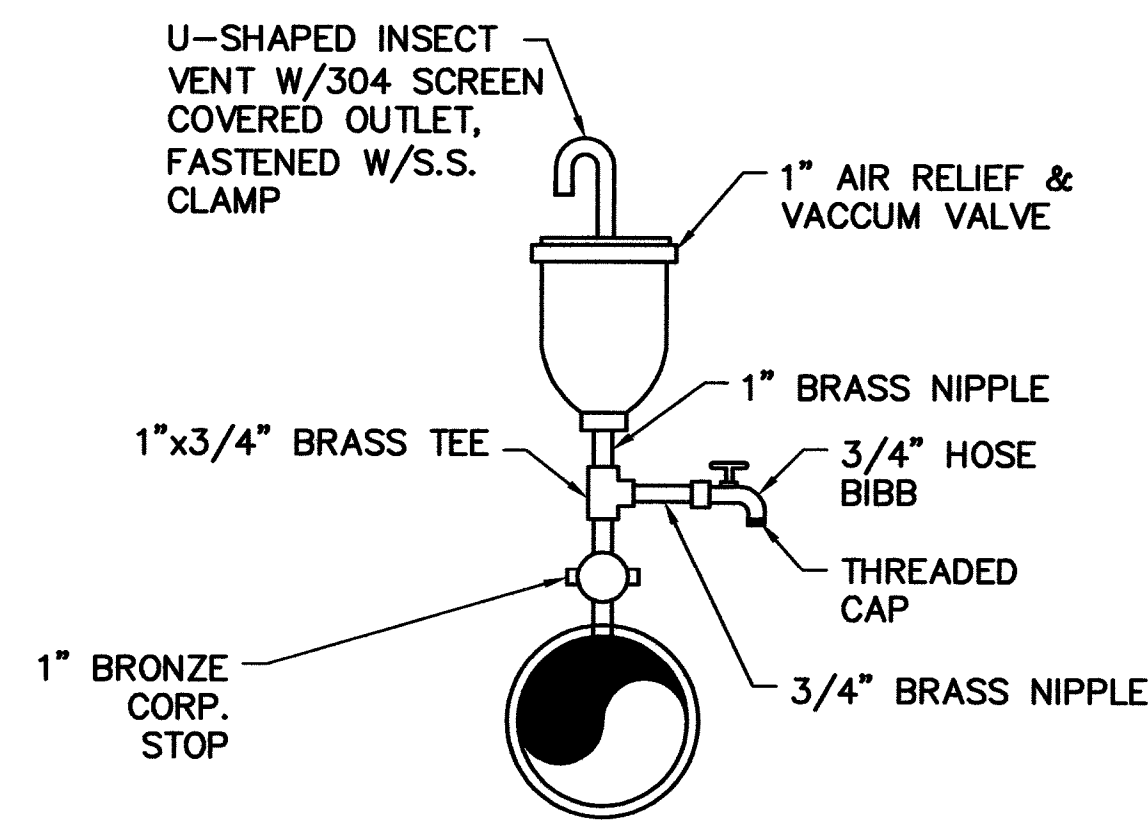
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Sheet Title:

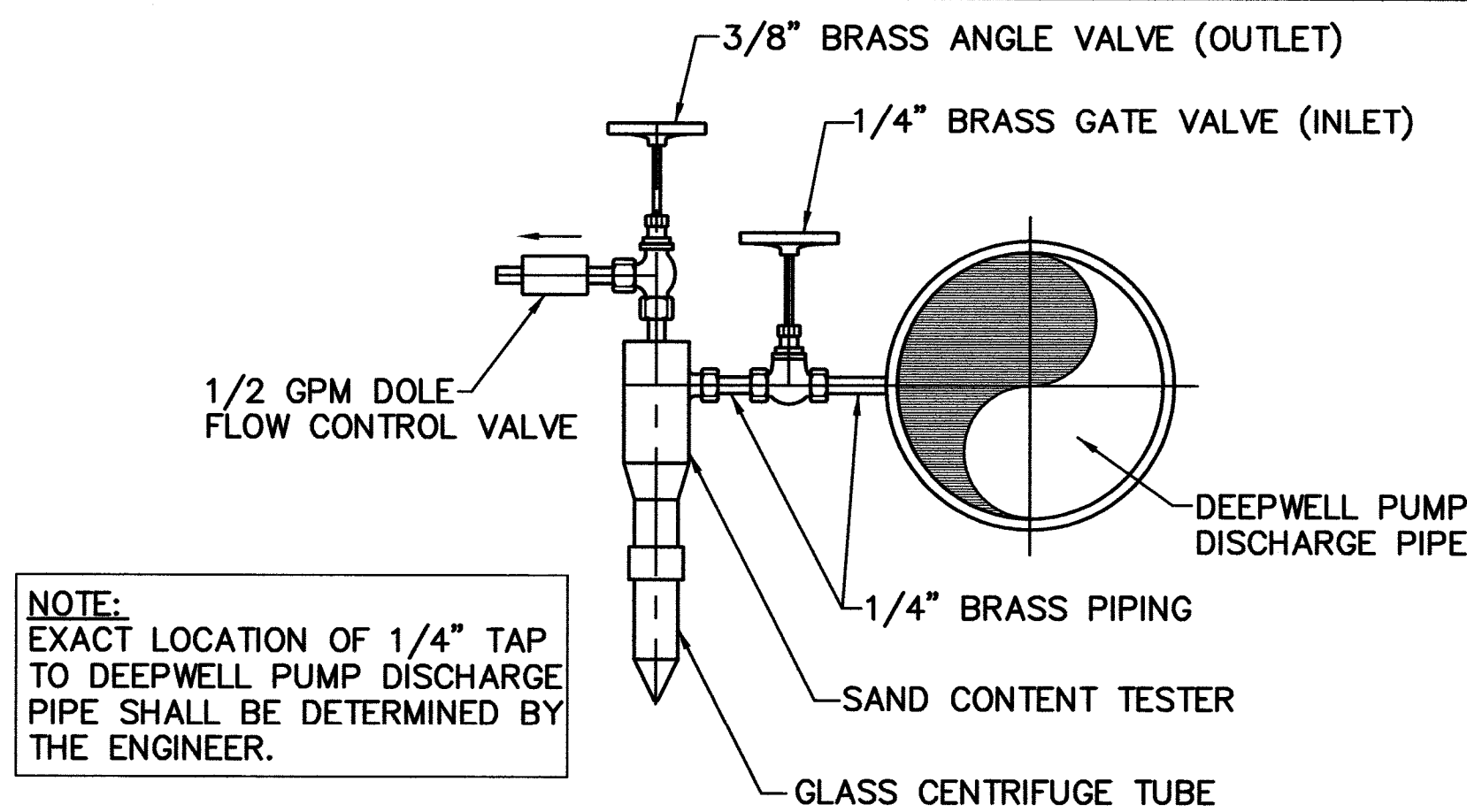




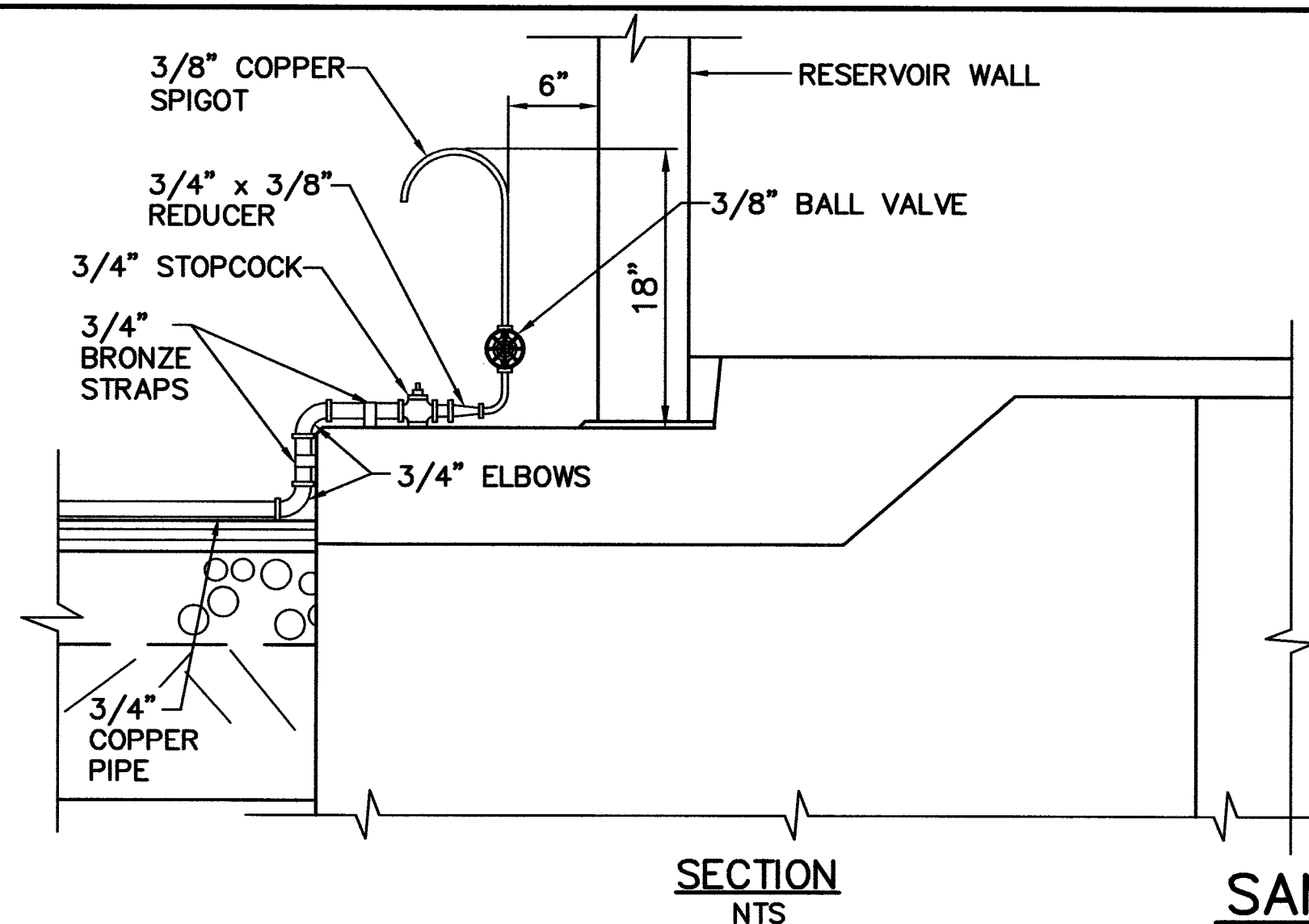
**DEEPWELL PUMP PRESSURE GAGE/HOSE BIBB ASSEMBLY DETAIL 1**  
NOT TO SCALE



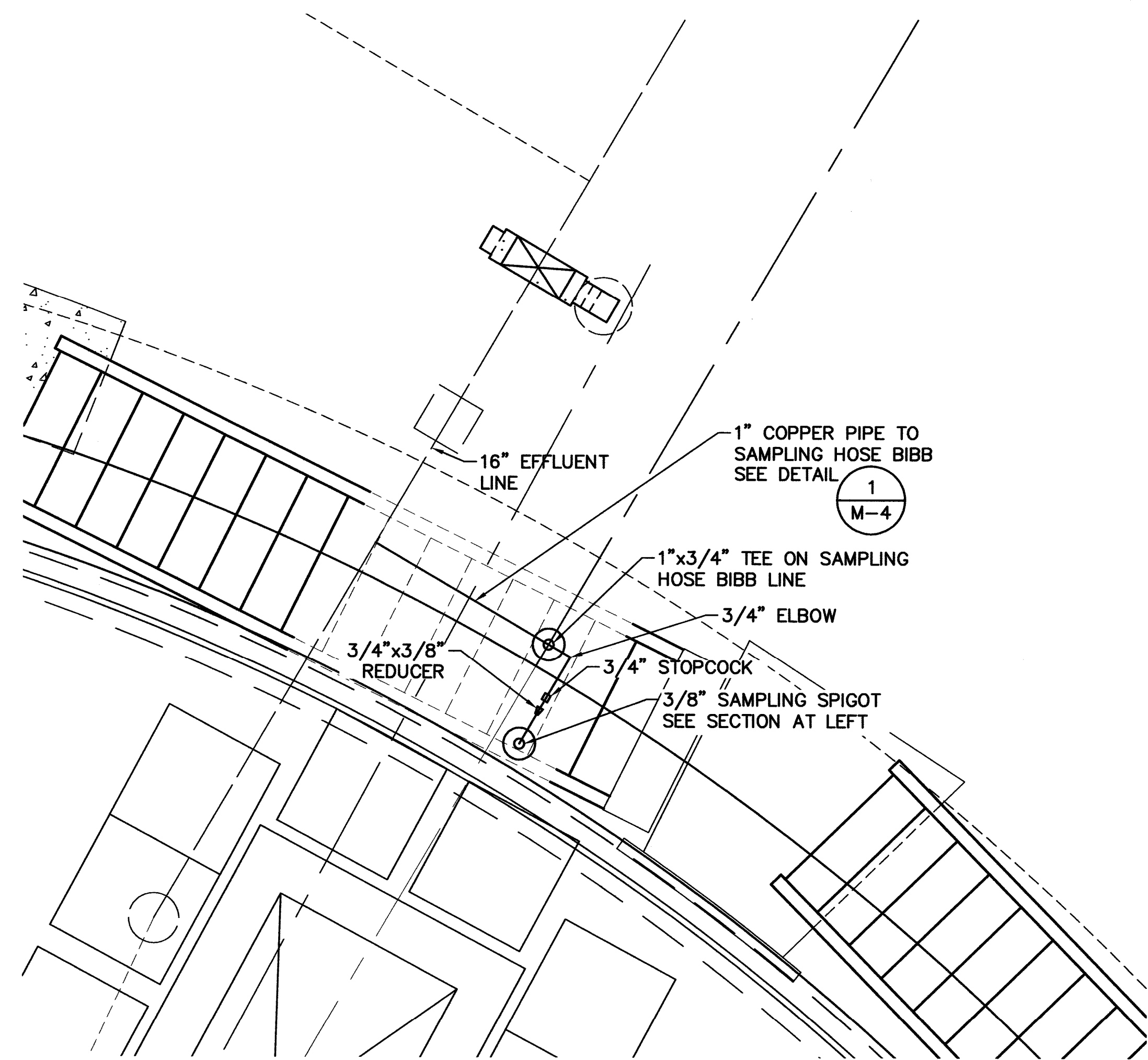
**AIR VALVE ASSEMBLY DETAIL 2**  
NOT TO SCALE



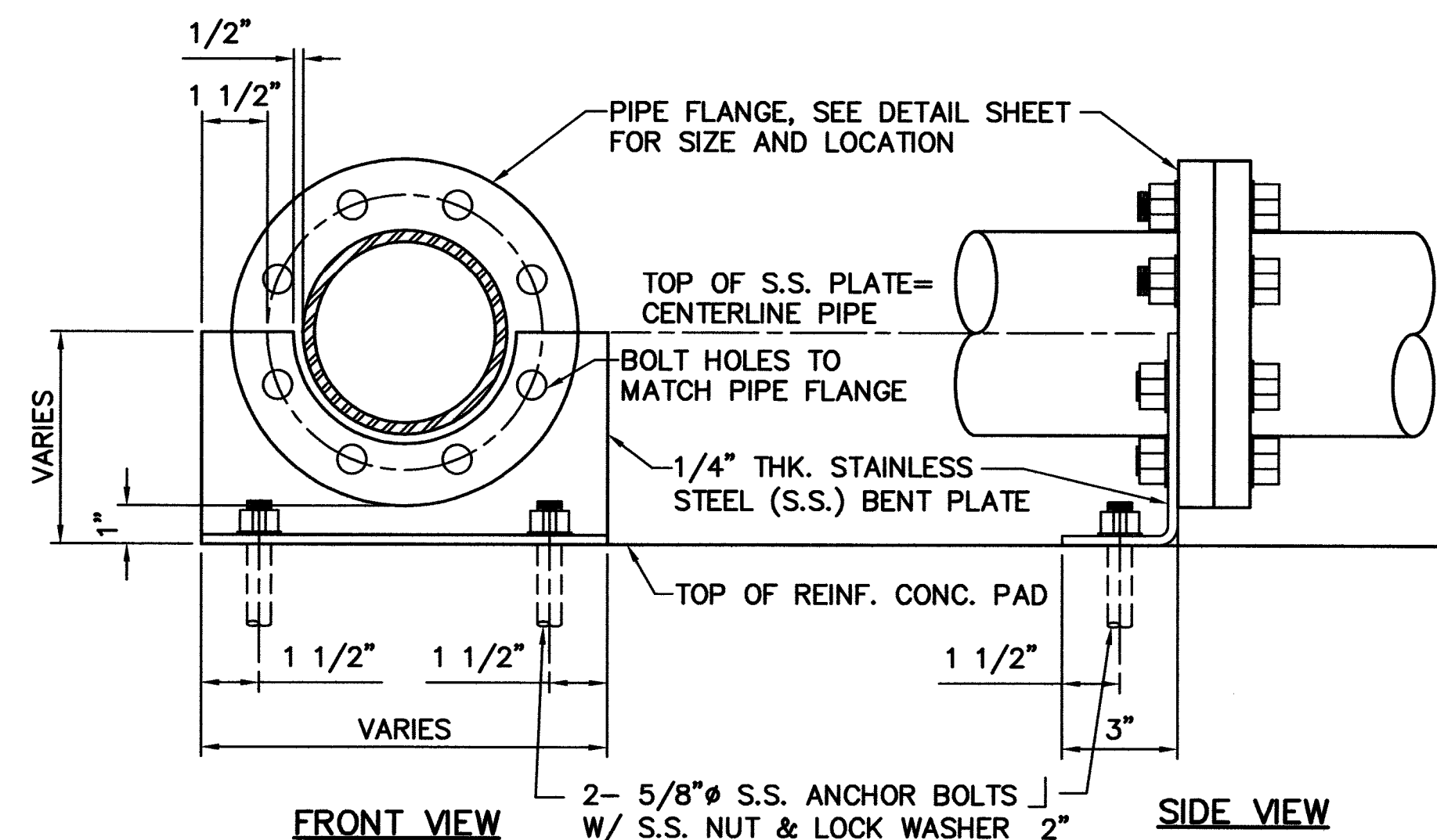
**ROSSUM CENTRIFUGAL SAND SAMPLER UNIT 3**  
NOT TO SCALE



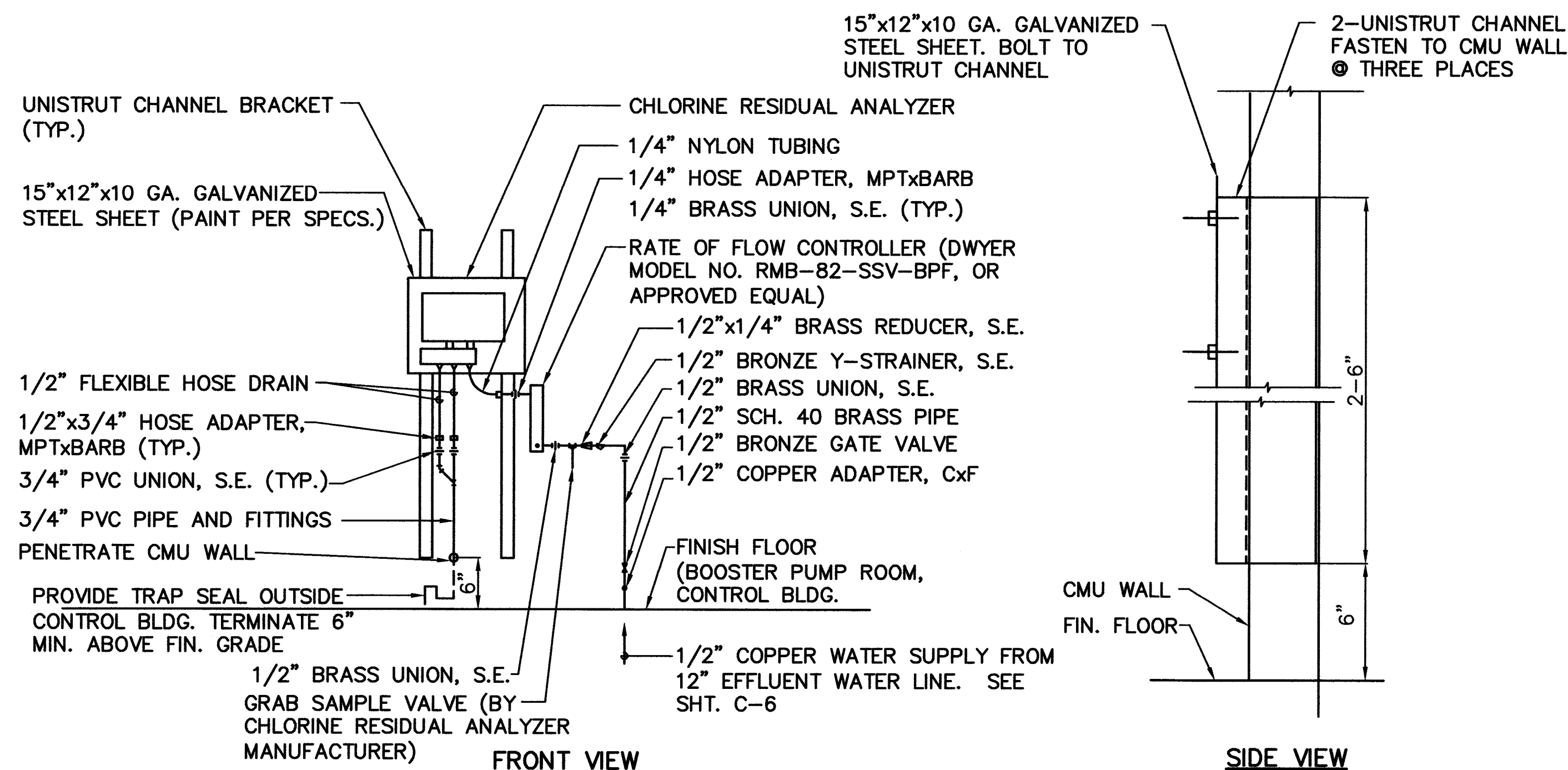
**SAMPLING SPIGOT DETAIL 4**  
AS SHOWN



**PLAN SCALE: 1" = 2'**



**PIPE FLANGE SUPPORT DETAIL 5**  
NOT TO SCALE



**CHLORINE RESIDUAL ANALYZER DETAIL 6**  
NOT TO SCALE

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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AKINAKA & ASSOCIATES, LTD.

*Kenneth K. Ikemori*

LICENSE EXPIRES 04/30/14

**KENNETH K. IKEMORI**  
LICENSED PROFESSIONAL ENGINEER  
No. 3628-M  
HAWAII, U.S.A.

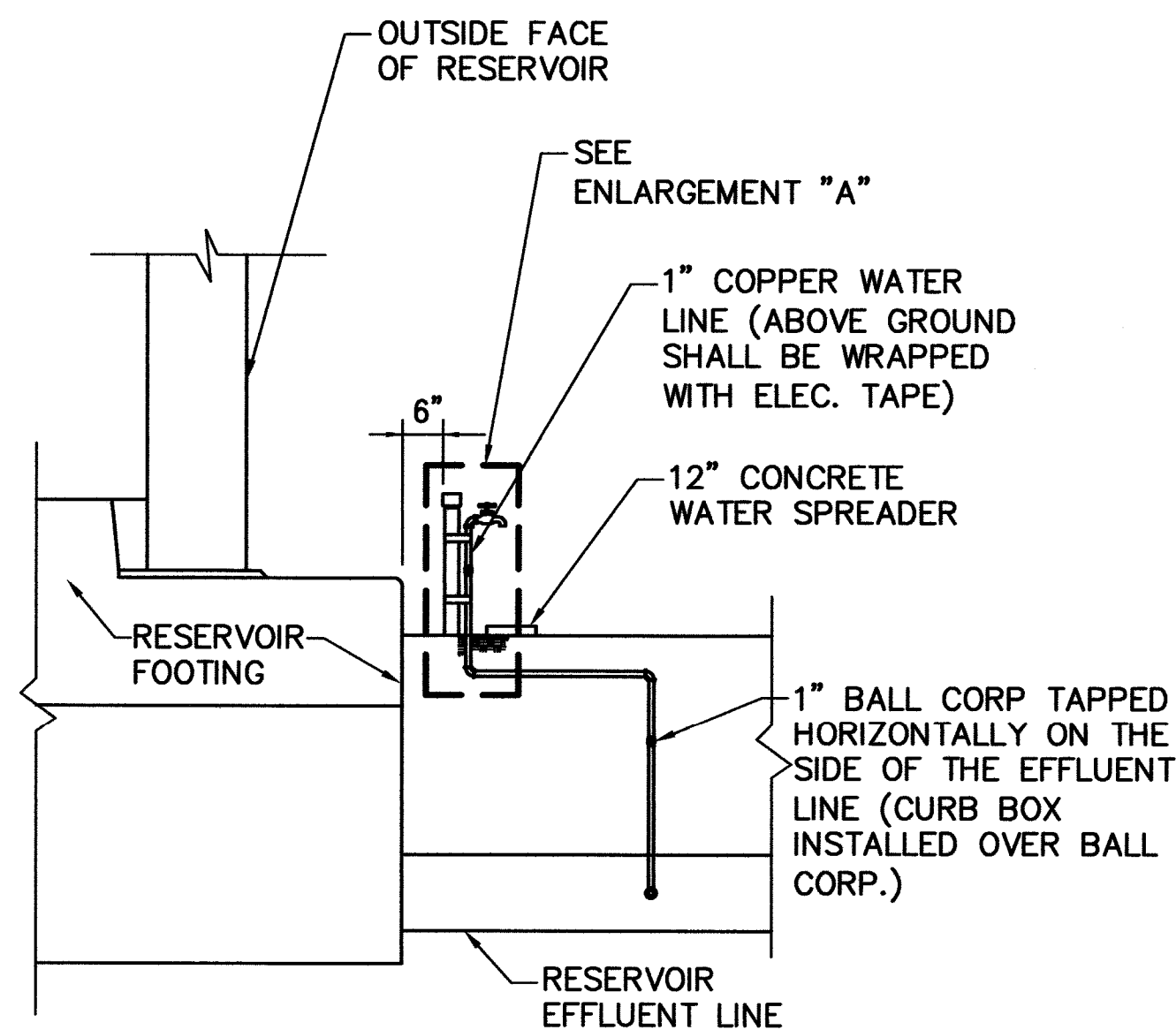
**ESH** ENGINEERS SURVEYORS HAWAII, INC.  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

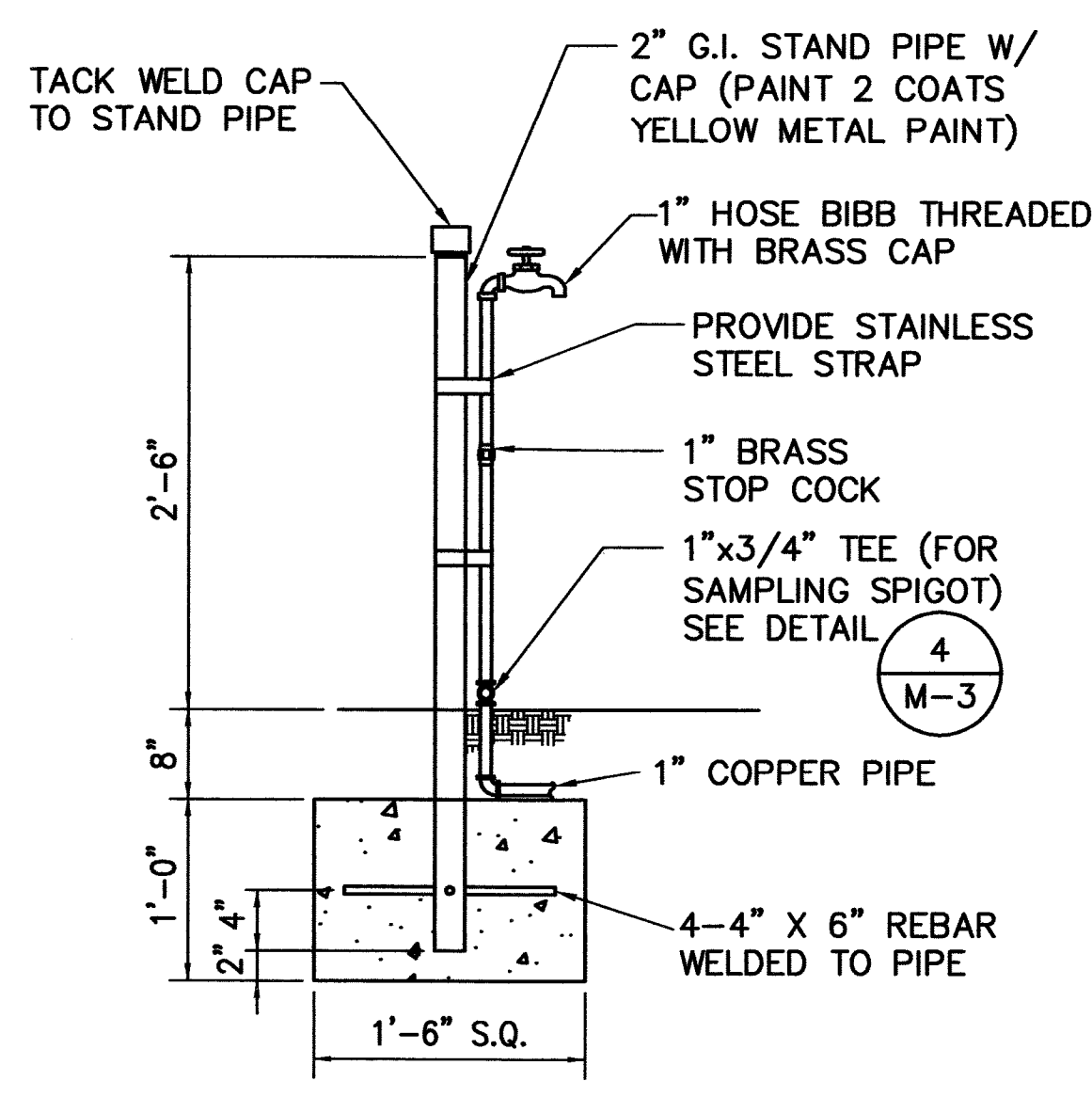
**MAKUU WELL PUMP PIPING  
PAD DETAILS**

FILE	POCKET	FOLDER	NO.



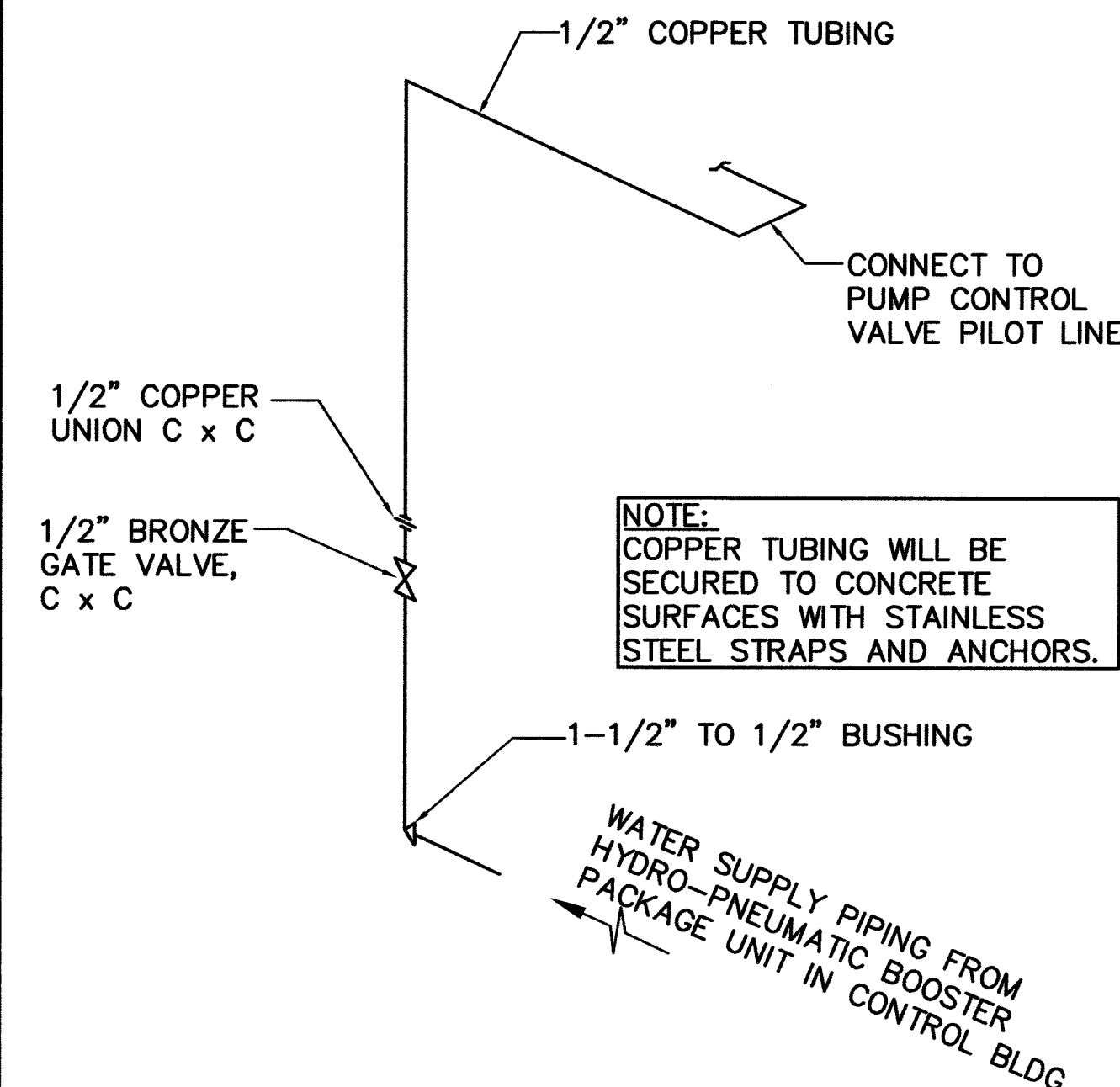


SCHEMATIC ELEVATION  
NOT TO SCALE

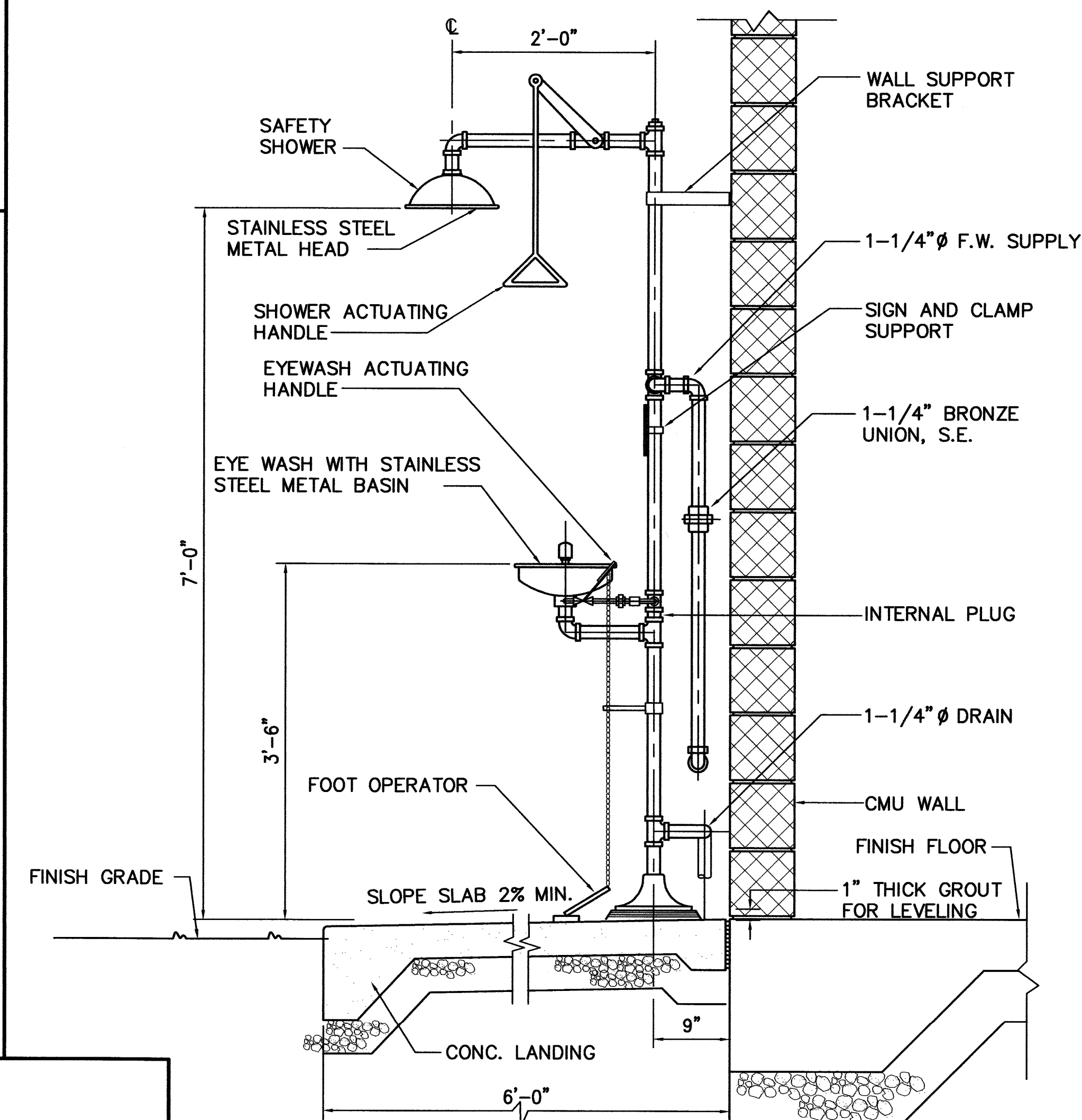


ENLARGEMENT "A"  
SCALE: 1" = 1'-0"

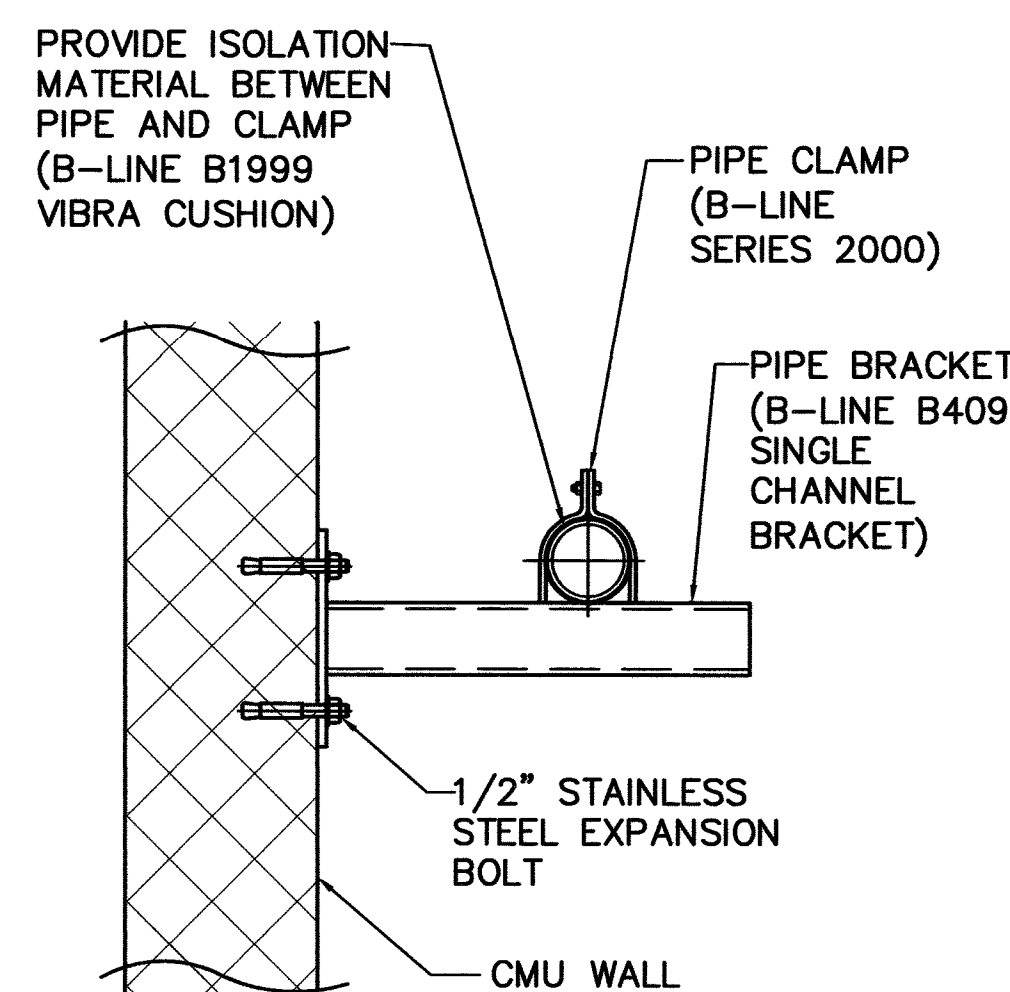
SAMPLING HOSE BIBB DETAILS  
SCALE AS SHOWN



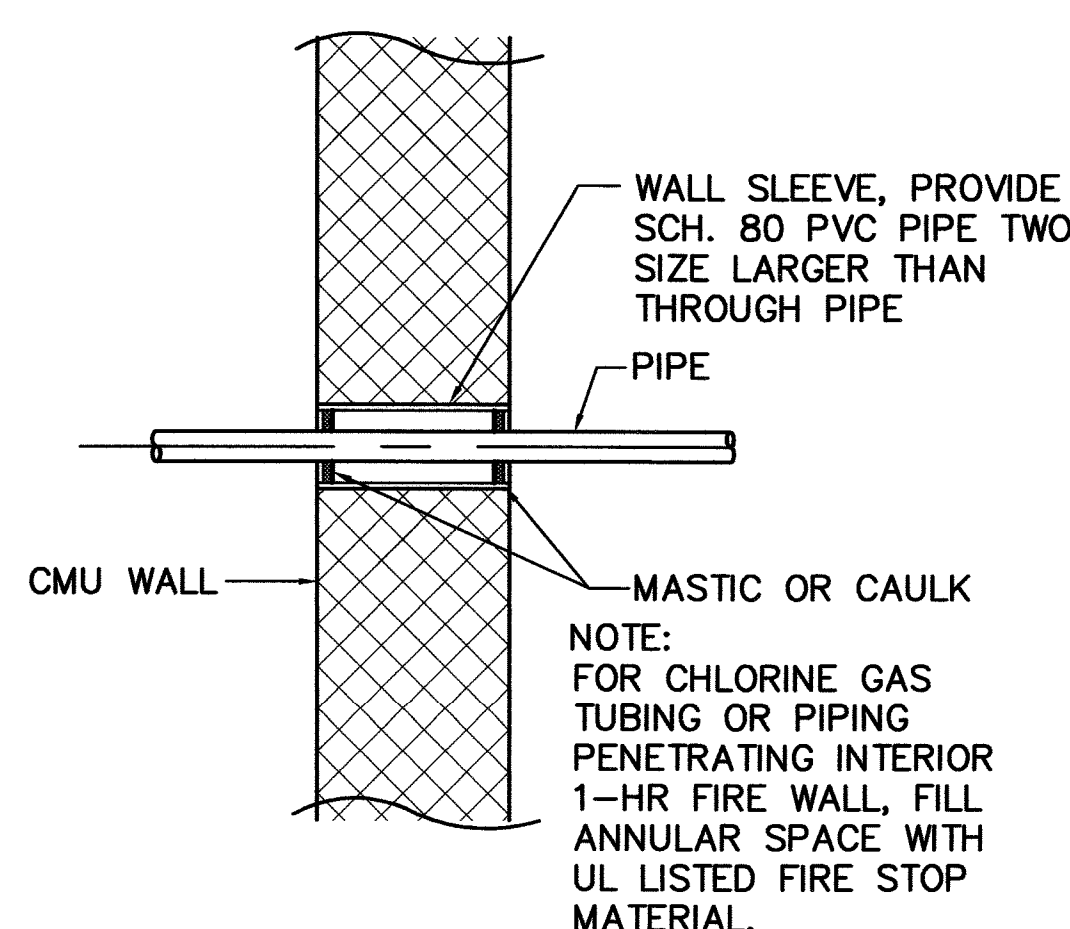
PUMP CONTROL VALVE PILOT  
SUPPLY LINE DIAGRAM  
NOT TO SCALE



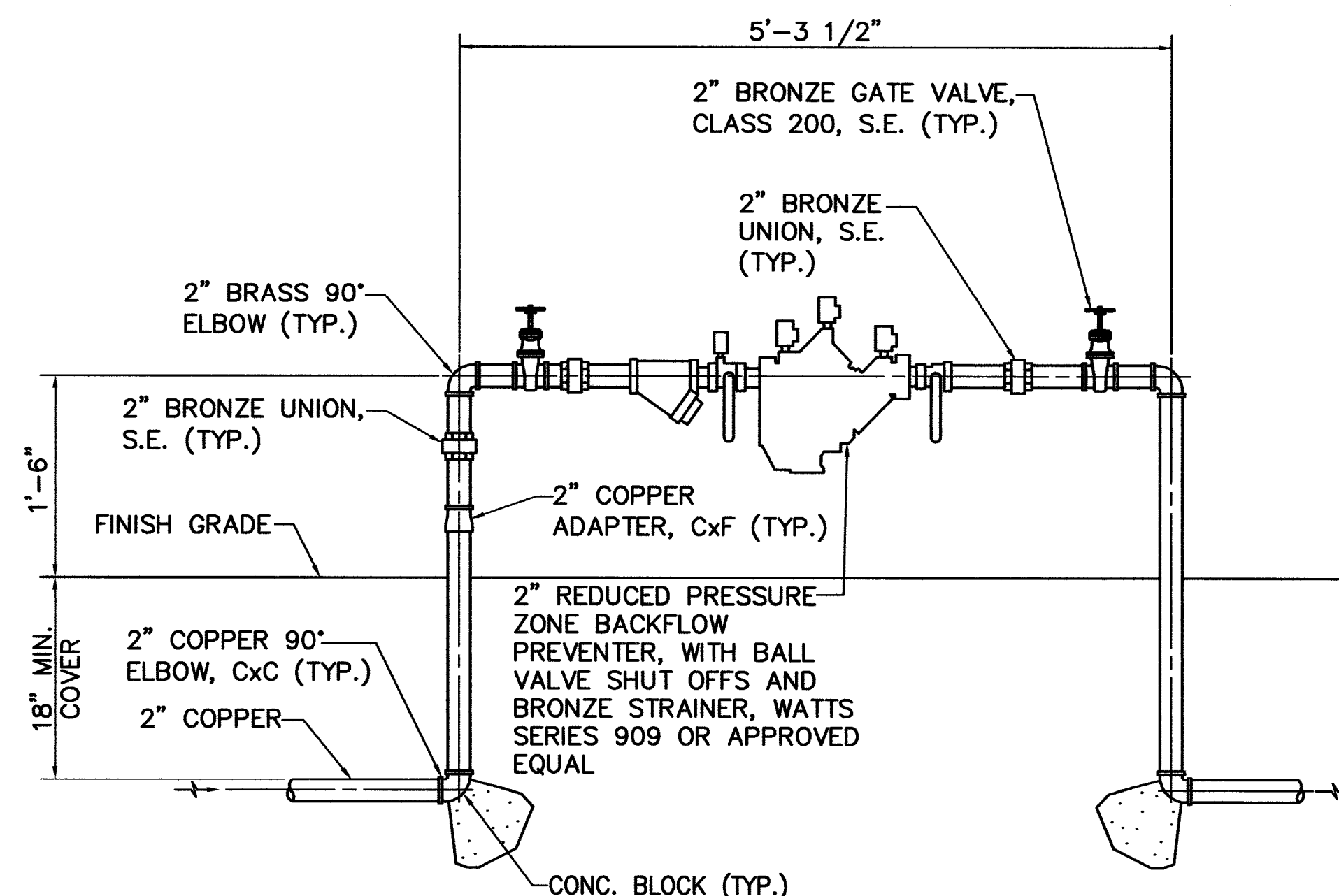
EMERGENCY EYE WASH/SHOWER DETAIL  
SCALE: 1" = 1'-0"



SUPPORT BRACKET  
FOR PIPE OR TUBING  
NOT TO SCALE

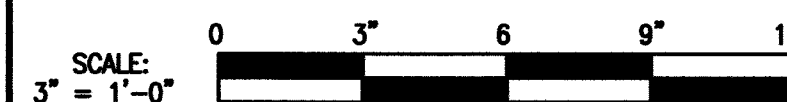
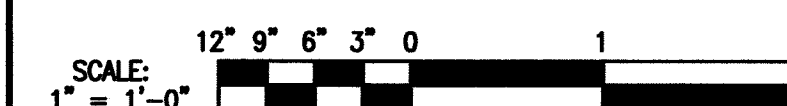


TYPICAL PIPE THROUGH  
WALL PENETRATION  
NOT TO SCALE



BACKFLOW PREVENTER DETAIL  
SCALE: 1" = 1'-0"

GRAPHIC SCALE:



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AKINAKA & ASSOCIATES, LTD.

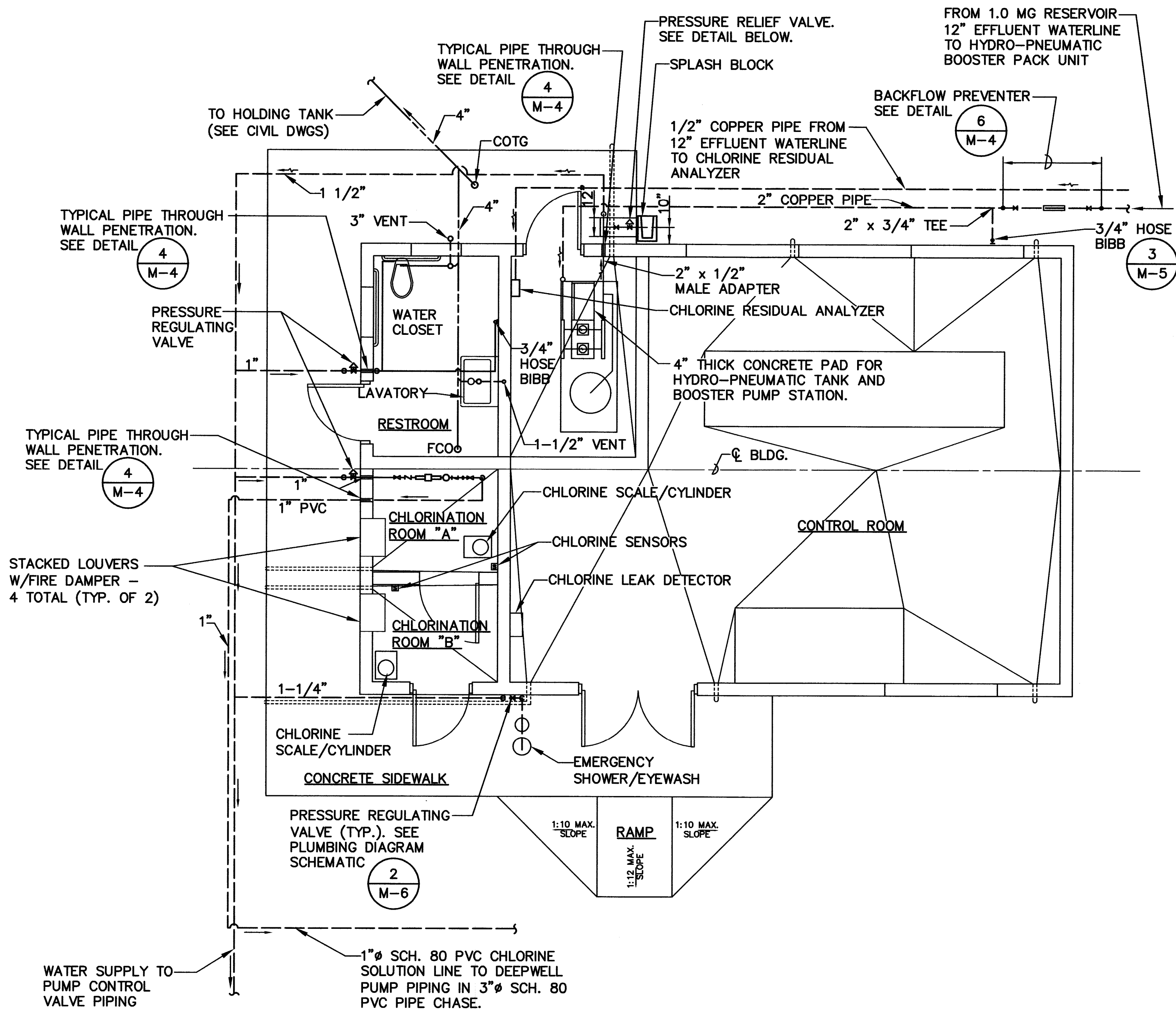
LICENSE EXPIRES 04/30/14

**ESH** ENGINEERS SURVEYORS  
HAWAII, INC.  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

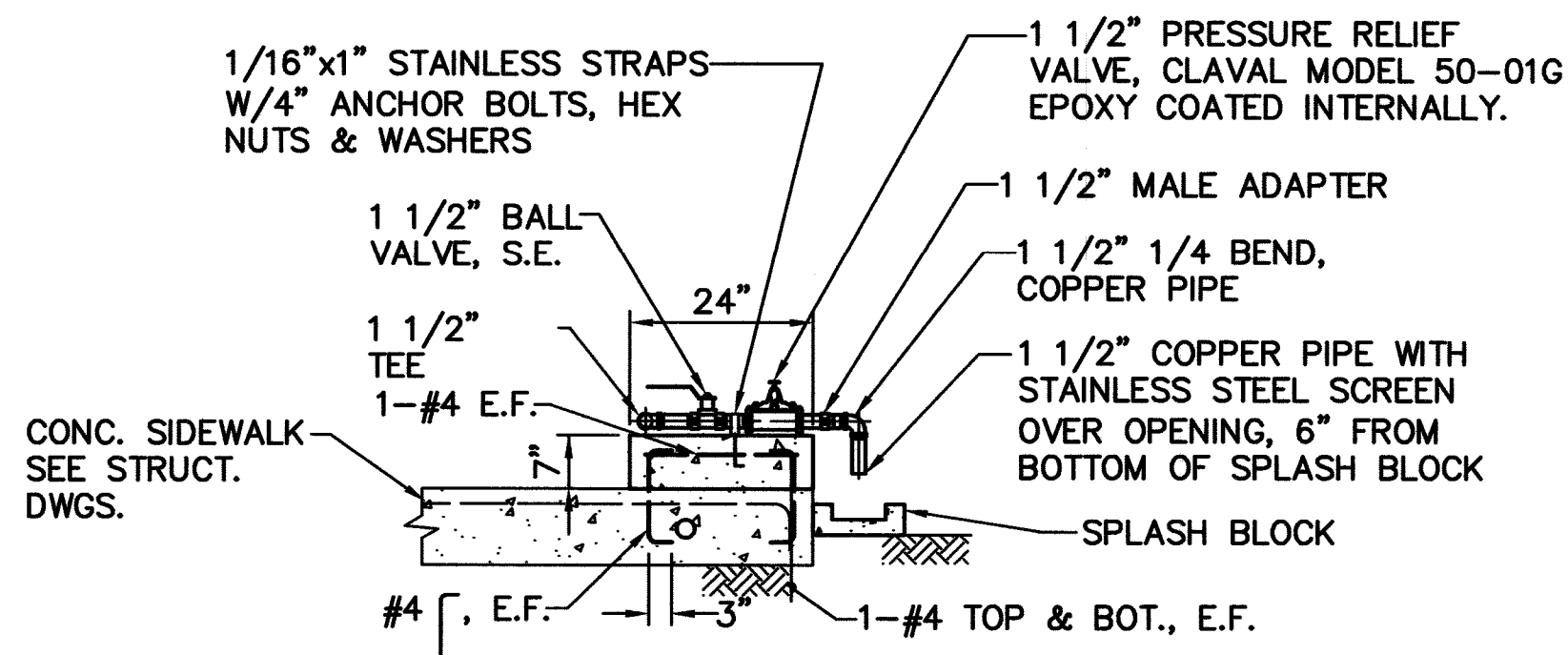
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**MAKUU MISCELLANEOUS  
MECHANICAL DETAILS**

FILE	POCKET	FOLDER	NO.

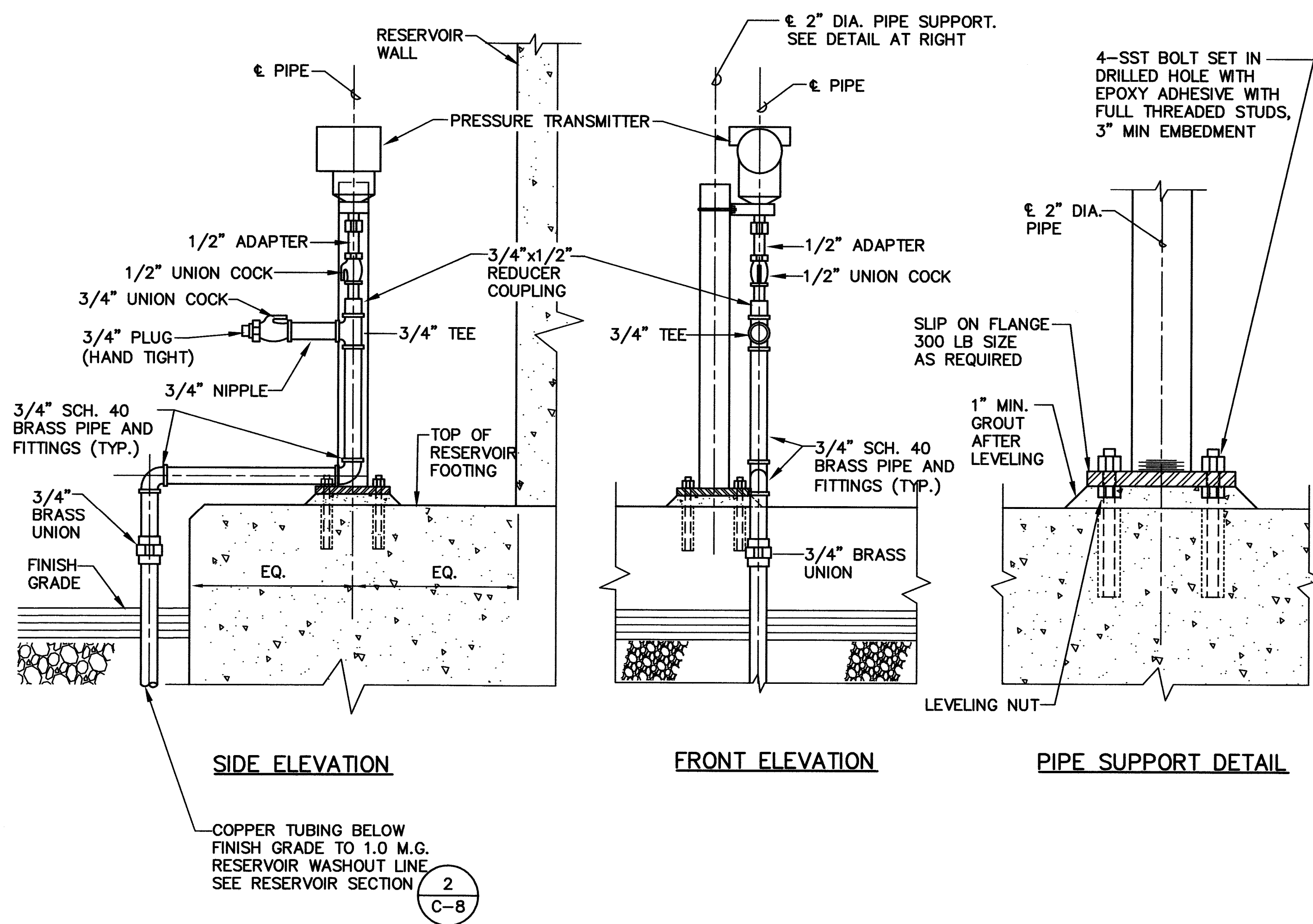


**MECHANICAL PIPING PLAN** 1  
SCALE: 1/4" = 1'-0" M-5

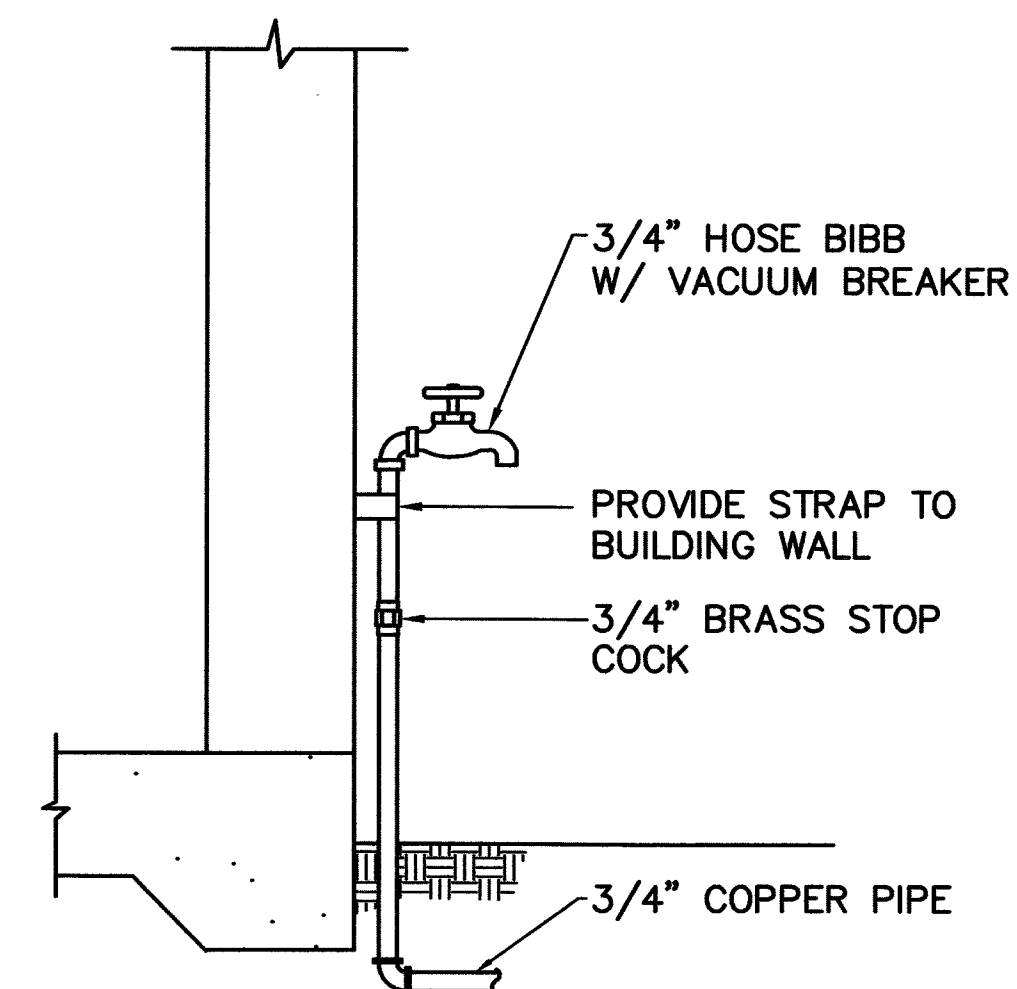


**PRESSURE RELIEF VALVE DETAIL**  
NOT TO SCALE

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



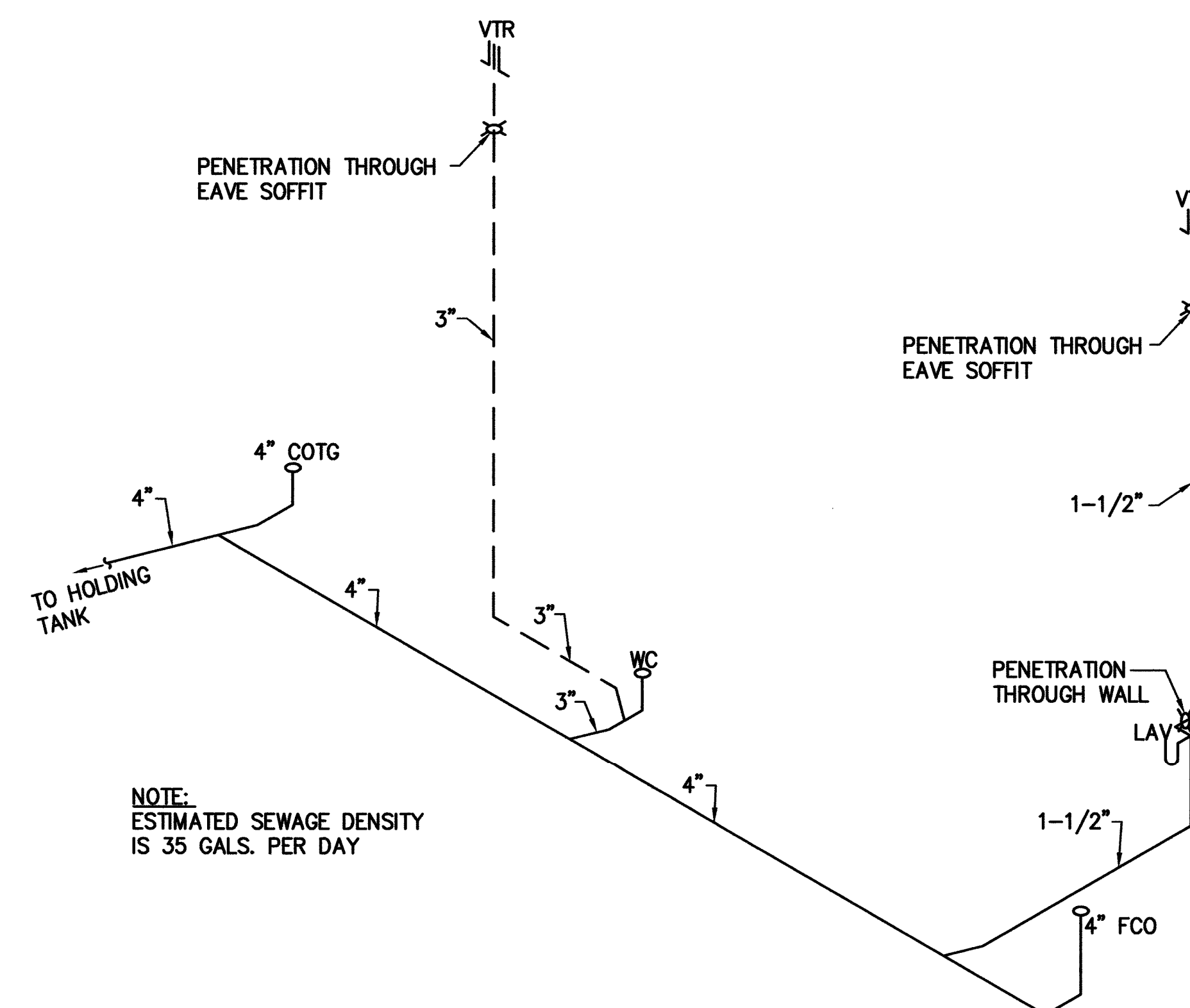
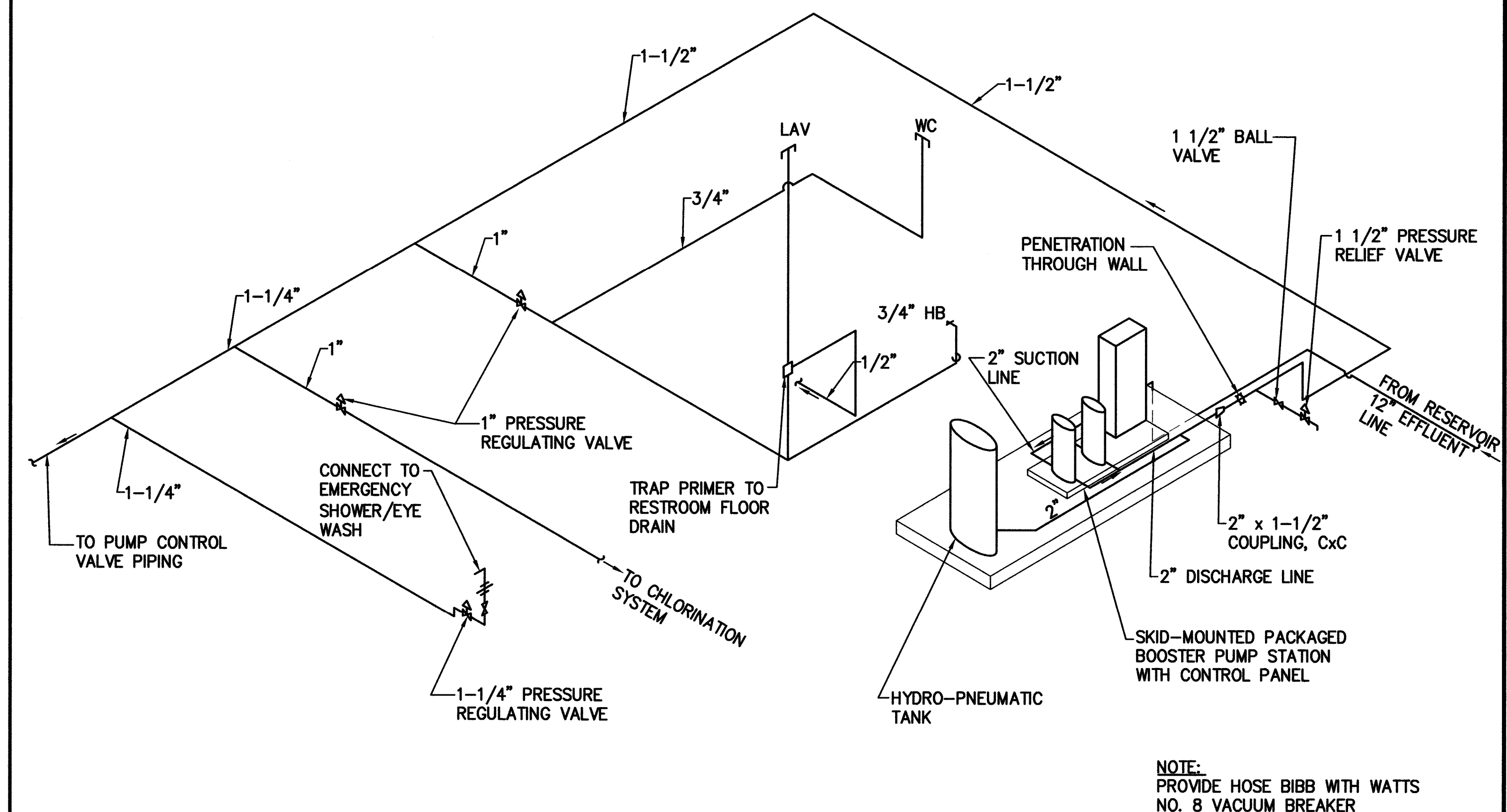
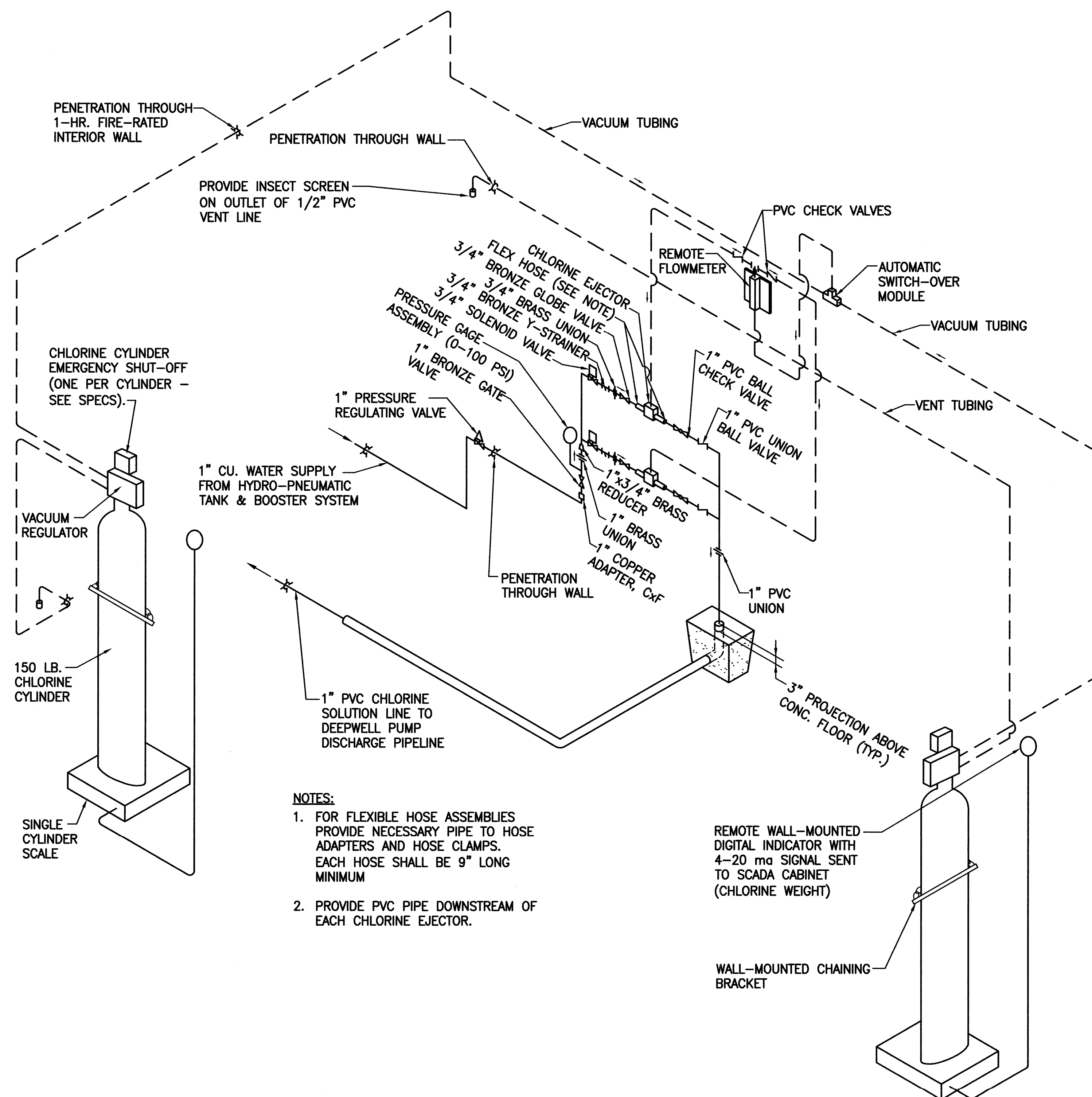
**TANK LEVEL PRESSURE TRANSMITTER DETAILS** 2  
NOT TO SCALE M-5



**HOSE BIBB DETAIL** 3  
NOT TO SCALE M-5

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
<p>THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.</p> <p>AKINAKA &amp; ASSOCIATES, LTD.</p> <p><i>[Signature]</i></p> <p>LICENSE EXPIRES 04/30/14</p> <p><b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC.</p> <p>900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA</p> <p>DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFF-SITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p> <p><b>MAKUU CONTROL BUILDING PLAN</b></p>				
FILE	POCKET	FOLDER	NO.	





REVISION	DATE	DESCRIPTION	MADE BY      APPROVED

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OR UNDER MY SUPERVISION.

AKINAKA & ASSOCIATES, LTD.

LICENSE EXPIRES 04/30/14

**KENNETH K. IKEMORI**  
**LICENSED PROFESSIONAL ENGINEER**  
**No. 3628-M**  
**HAWAII, U.S.A.**

**ESH**

**ENGINEERS SURVEYORS**  
**HAWAII, INC.**  
 900 HALEKAUWILA ST.,  
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 591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS

**MAKUU OFFSITE WATER SYSTEM, PHASE 2:**

**PRODUCTION WELL, RESERVOIR, AND**

**SUPPORTING FACILITIES**

AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

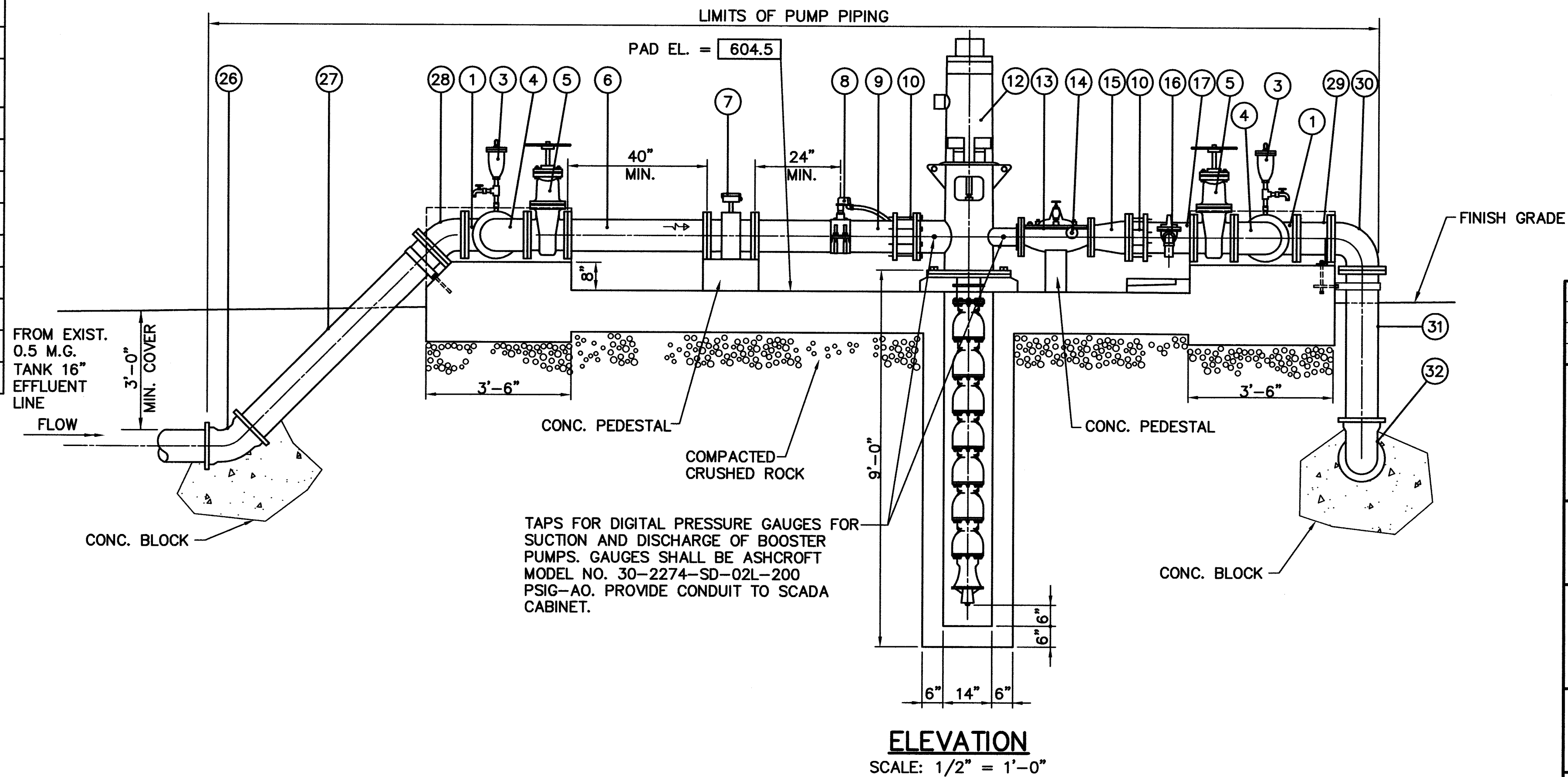
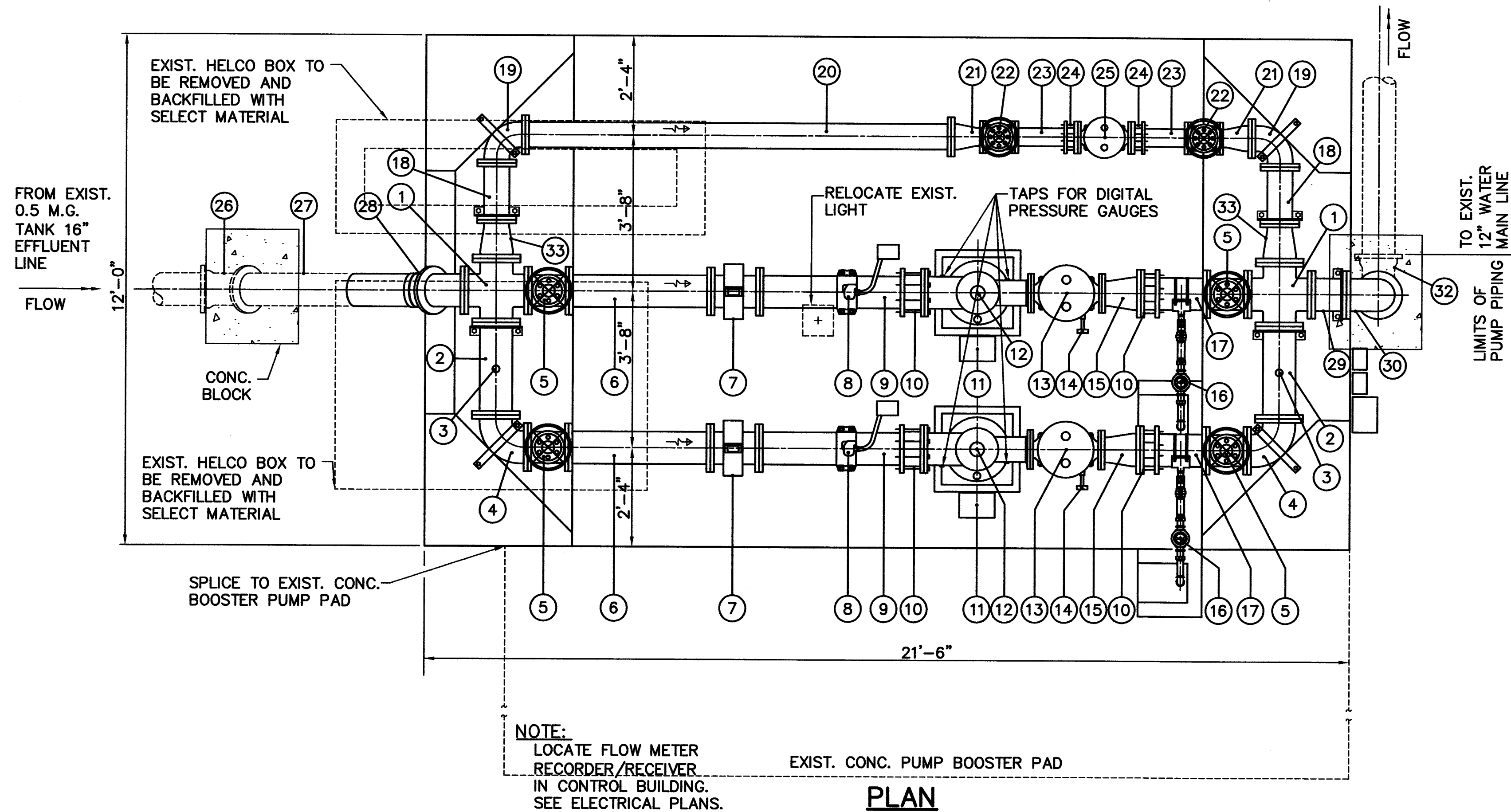
**MAKUU MECHANICAL**

**ISOMETRIC DIAGRAMS**

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CURRENT TIME: Apr 06, 2012 - 2:26pm  
LAST SAVED BY: smg  
LAST MODIFIED: Thu, 29 Mar 2012 - 11:39am  
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FILE: ESH110223.dwg


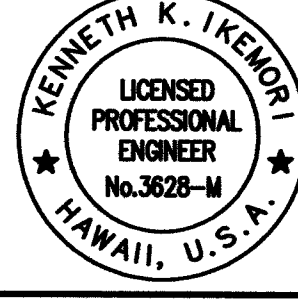
## MATERIALS LIST

ITEM NO.	QTY	DESCRIPTION
①	1	8" CROSS F.E., CLASS 125
②	2	8" PIPE, F.E., 26" LONG
③	2	1" AIR RELIEF VALVE UNIT, SEE DETAIL 2/M-3
④	3	8" 1/4 BEND PIPE, F.E., CLASS 125
⑤	4	8" O.S. & Y GATE VALVE WITH HAND WHEEL AND OPEN INDICATOR, F.E., CLASS 125
⑥	2	8" C.I. PIPE, F.E., 40" LONG
⑦	2	8" FLOW METER, SIEMENS SITRANS FM MAGFLO 5100W W/REMOTE MAG 6000 (SCADA READY) TRANSMITTER MOUNTED WITHIN EXISTING CONTROL BUILDING, 115/230VAC
⑧	2	8" OMEGA INDUSTRIAL FLOW SWITCH, MODEL NO. FSW-42A-SS, 15A, 125/250 V, RANGE 300-900GPM, W/ STAINLESS STEEL DOUBLE STRAP SERVICE SADDLE (1" NPT OUTLET). INSTALL FLOW SWITCH PLUMB WITH VERTICAL CENTERLINE OF PIPE.
⑨	2	8" PIPE, F.E. x P.E., CUT TO FIT
⑩	4	8" RESTRAINED FLANGE ADAPTER, EBAA MEGAFLANGE SERIES 2100 OR APPROVED EQUAL
⑪	2	JUNCTION BOX
⑫	2	VERTICAL TURBINE BOOSTER PUMPS AT 400 GPM EACH
⑬	2	4" PUMP CONTROL VALVE, F.E. CLA. NO. 60-73 OR EQUAL, CLASS 250
⑭	2	PRESSURE GAUGE ASSEMBLY, SEE DETAIL 2/M-8
⑮	2	8" x 4" C.I. REDUCER, F.E., CLASS 250
⑯	2	1 1/2" PRESSURE RELIEF VALVE UNIT, SEE DETAIL 3/M-8
⑰	2	8" PIPE, F.E. x P.E., LENGTH TO SUIT, CLASS 125
⑱	2	6" PIPE, F.E., 18" LONG, CLASS 125
⑲	2	6" 1/4 BEND PIPE, F.E.
⑳	1	6" PIPE, F.E., 10'-0" LONG, CLASS 125
㉑	2	6" x 4" REDUCER, F.E.
㉒	2	4" O.S. & Y GATE VALVE W/HANDWHEEL AND OPEN INDICATOR, F.E.
㉓	2	4" PIPE, F.E. x P.E., LENGTH TO SUIT
㉔	2	4" FLANGE COUPLING ADAPTER W/STAINLESS STEEL OR SILICON BRONZE BOLTS, WITH ANCHOR STUDS, CLASS 250
㉕	1	4" COMBINATION BACK PRESSURE, REMOTE CONTROL VALVE
㉖	1	8" 1/8 BEND PIPE, M.J., WITH MEGALUGS SERIES 1100
㉗	1	8" PIPE, P.E. x F.E. CUT TO FIT, CLASS 125
㉘	1	8" 1/8 BEND PIPE, F.E.
㉙	1	8" D.I. SPOOL, F.E. 10" LONG
㉚	1	8" 1/4 BEND PIPE, F.E.
㉛	1	8" PIPE, P.E. x F.E. CUT TO FIT, CLASS 125
㉜	1	8" 1/4 BEND PIPE, M.J. WITH MEGALUGS SERIES 1100
㉝	2	8" x 6" REDUCER, F.E.



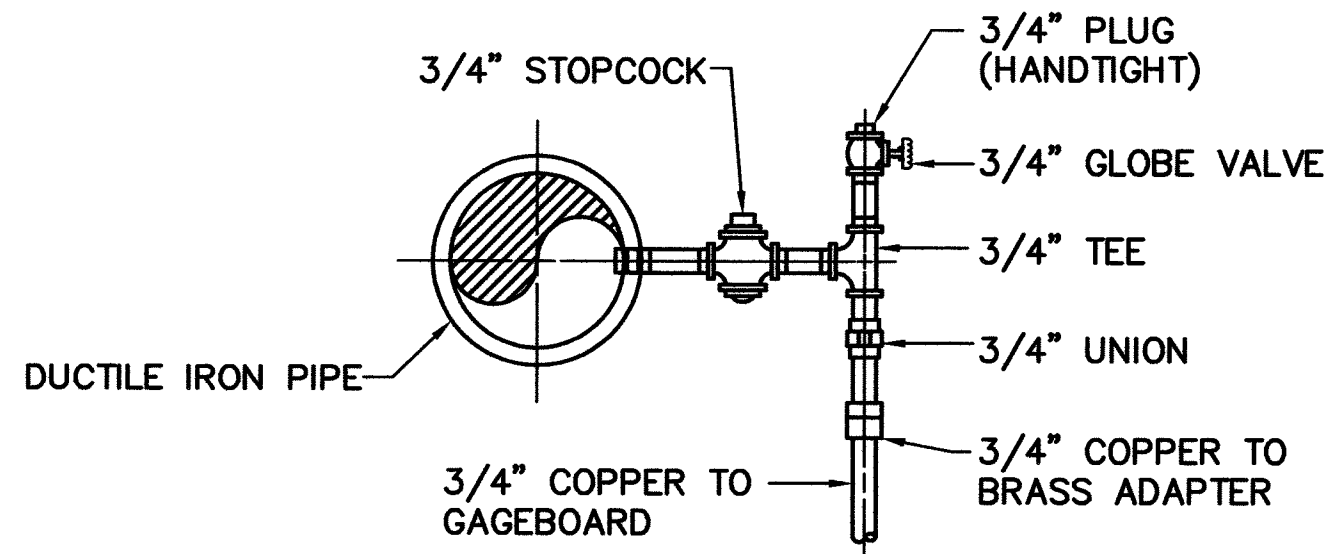
### NOTES:

- CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES (WATER, ELECTRICAL, ETC.) AND RELOCATE OUTSIDE OF THE CONSTRUCTION UNDER THE SUPERVISION OF THE DWS PROJECT ENGINEER.
- ALL PIPE SUPPORT ASSEMBLIES SHALL BE STAINLESS STEEL.
- ALL FLANGES SHALL BE ANSI 16.1 125 LBS., UNLESS OTHERWISE INDICATED.
- NUTS AND BOLTS SHALL BE SILICON BRONZE OR STAINLESS STEEL.
- PROVIDE FELT PAPER BETWEEN GALVANIZED STEEL PIPE STRAP AND PIPE.
- ALL CLAVAL VALVES SHALL BE EPOXY COATED INTERNALLY.
- CONTRACTOR SHALL VERIFY PIPE LENGTHS PRIOR TO FABRICATION OR CONSTRUCTION WORK THE ENGINEER WILL NOT BE HELD RESPONSIBLE FOR ERRORS IN PIPE LENGTHS.
- ALL ABOVE GROUND FLANGES SHALL BE CLASS 125 UNLESS OTHERWISE INDICATED.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO ANY FABRICATION OR CONSTRUCTION WORK.
- PROVIDE 3/4" CHAMFER ON ALL EXPOSED CONCRETE PADS.
- PROVIDE 1/4" PER FOOT SLOPE ON ALL CONCRETE PADS AND PUMP FOUNDATION CONCRETE SLABS TO SHED WATER.
- PROVIDE 4" CLEARANCE BETWEEN FACE OF FLANGE AND GALVANIZED STEEL STRAPS.
- INSURE ADEQUATE CLEARANCE FOR BOLT AND NUT REMOVAL.

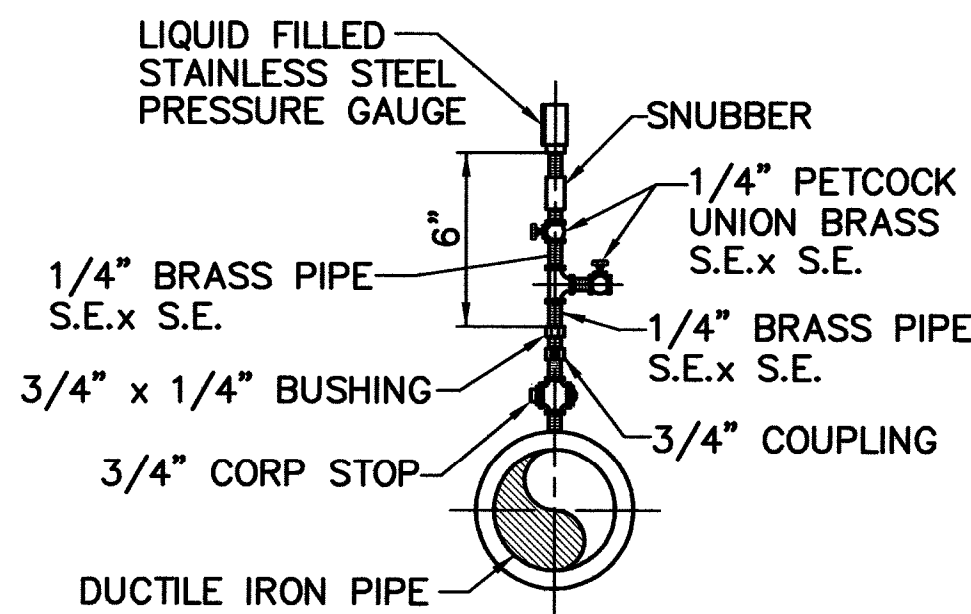
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.				
AKINAKA & ASSOCIATES, LTD.				
				
LICENSE EXPIRES 04/30/14				
				
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC.				
900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>KEONEPOKO-NUI BOOSTER PUMP PIPING DETAILS</b>				
FILE	POCKET	FOLDER	NO.	

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

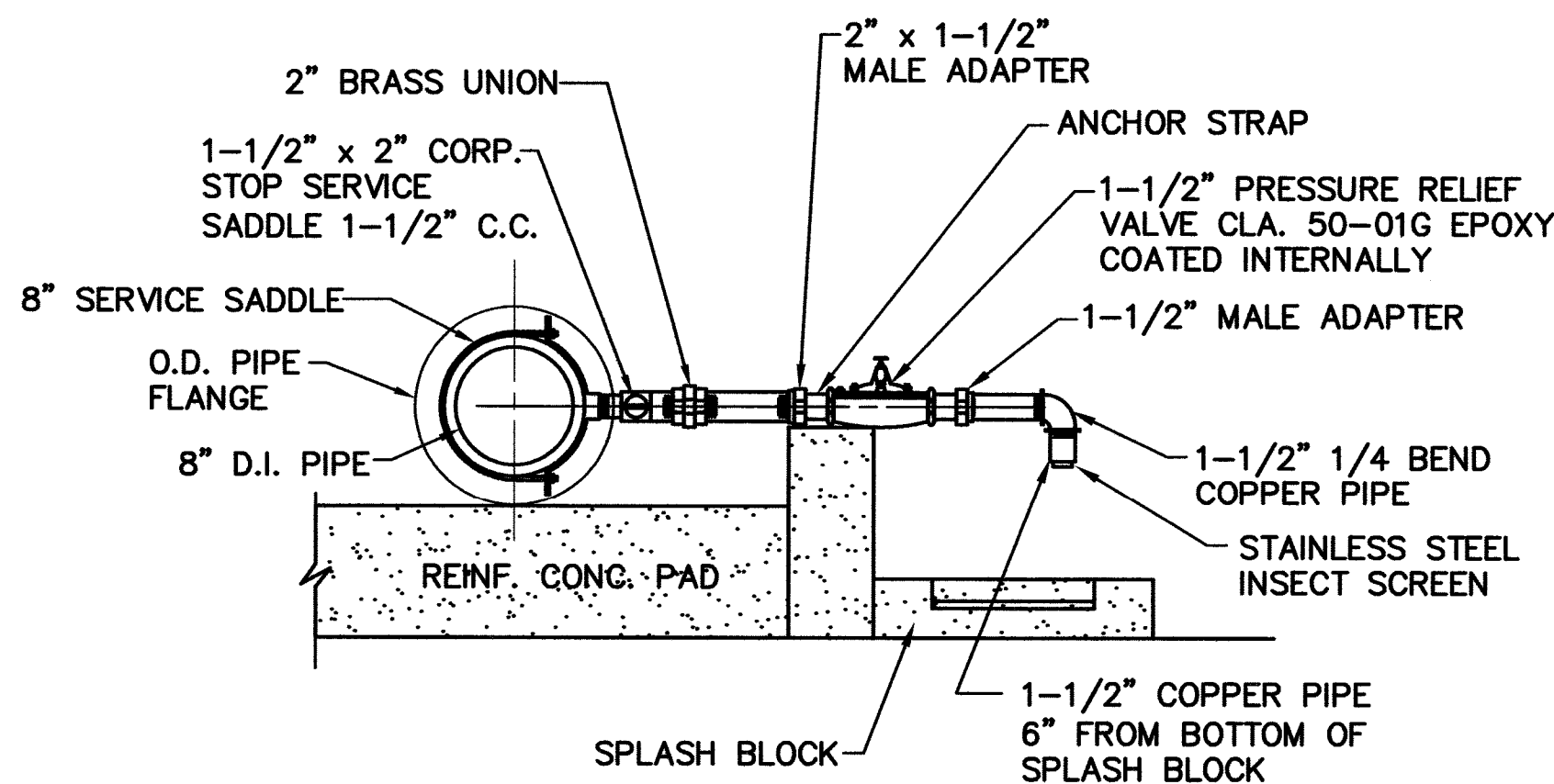




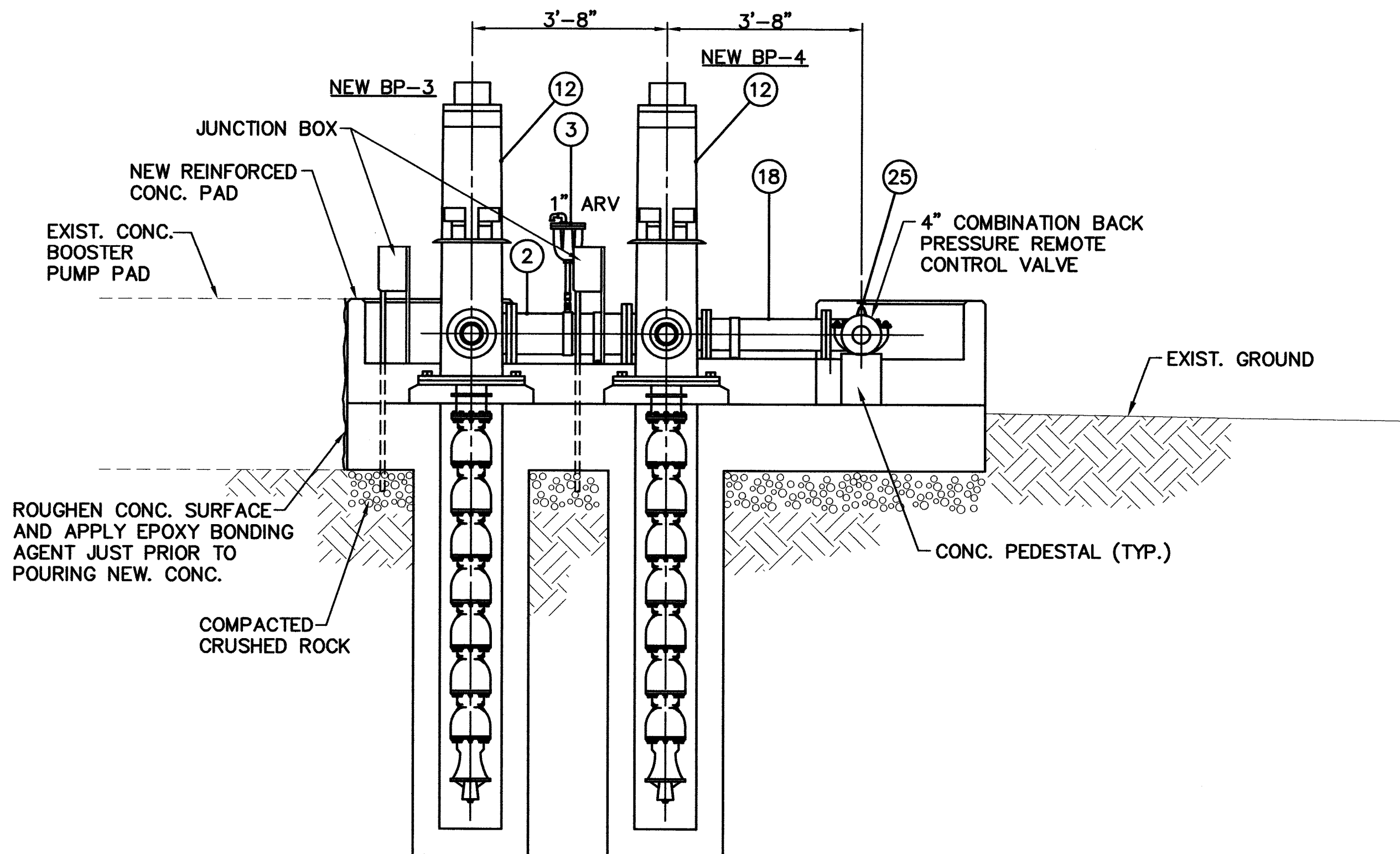
**DETAIL "F" - AT PUMP  
PIPING FOR PRESSURE LINE**  
NOT TO SCALE **1**  
**M-8**



**PRESSURE GAUGE DETAIL**  
NOT TO SCALE **2**  
**M-8**

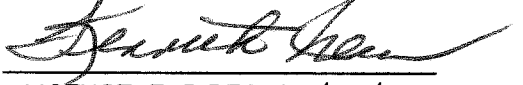



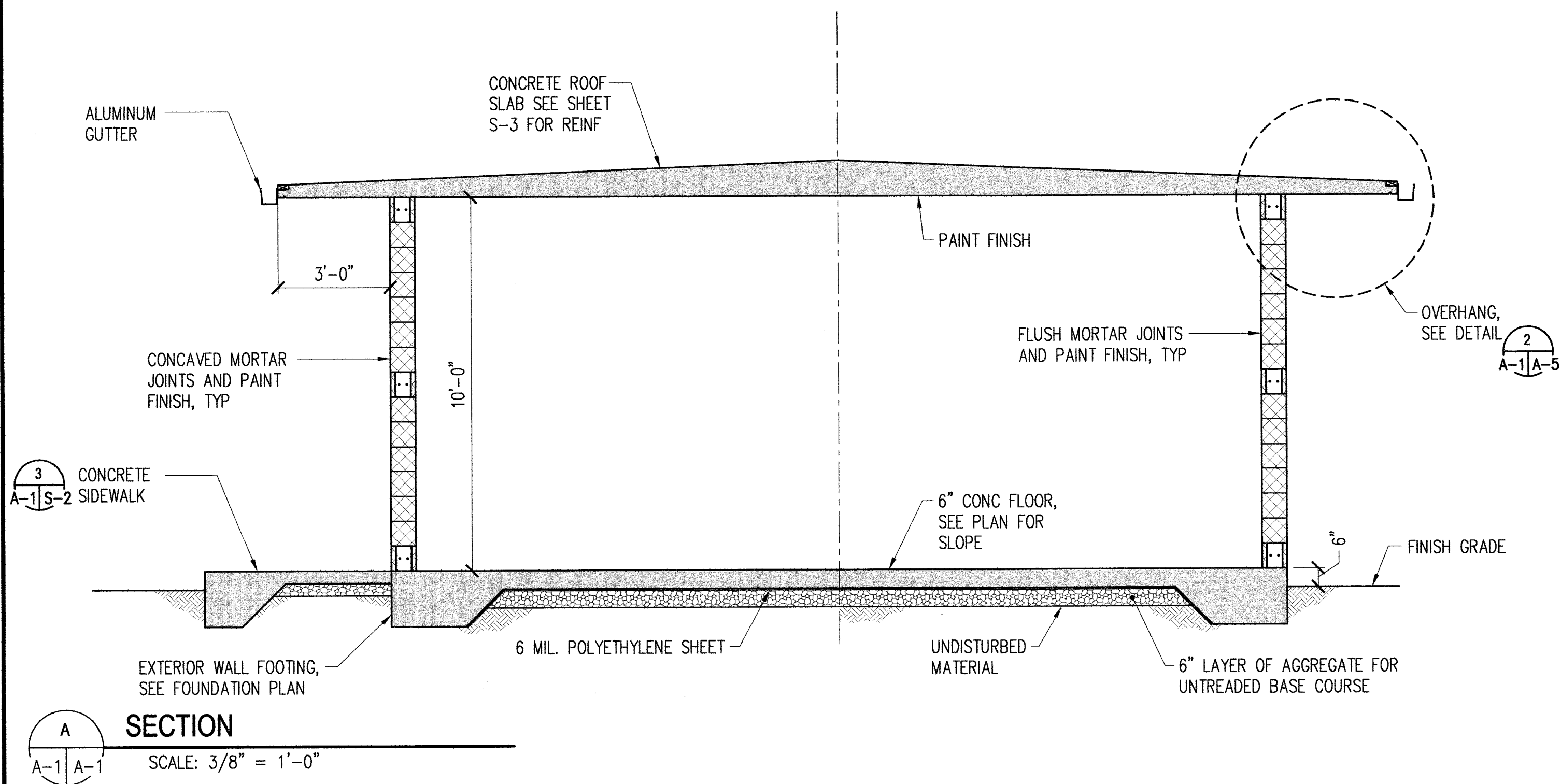
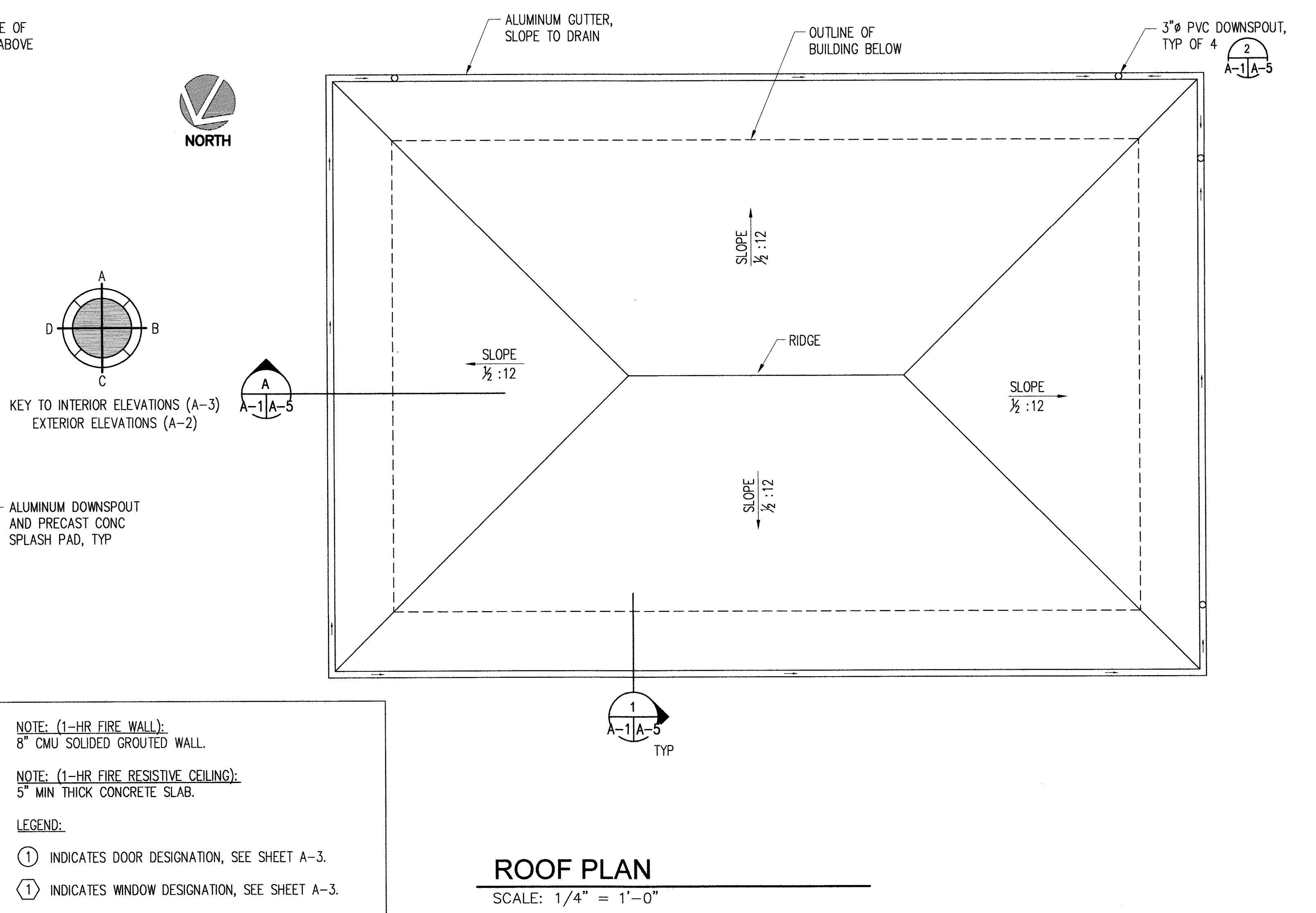
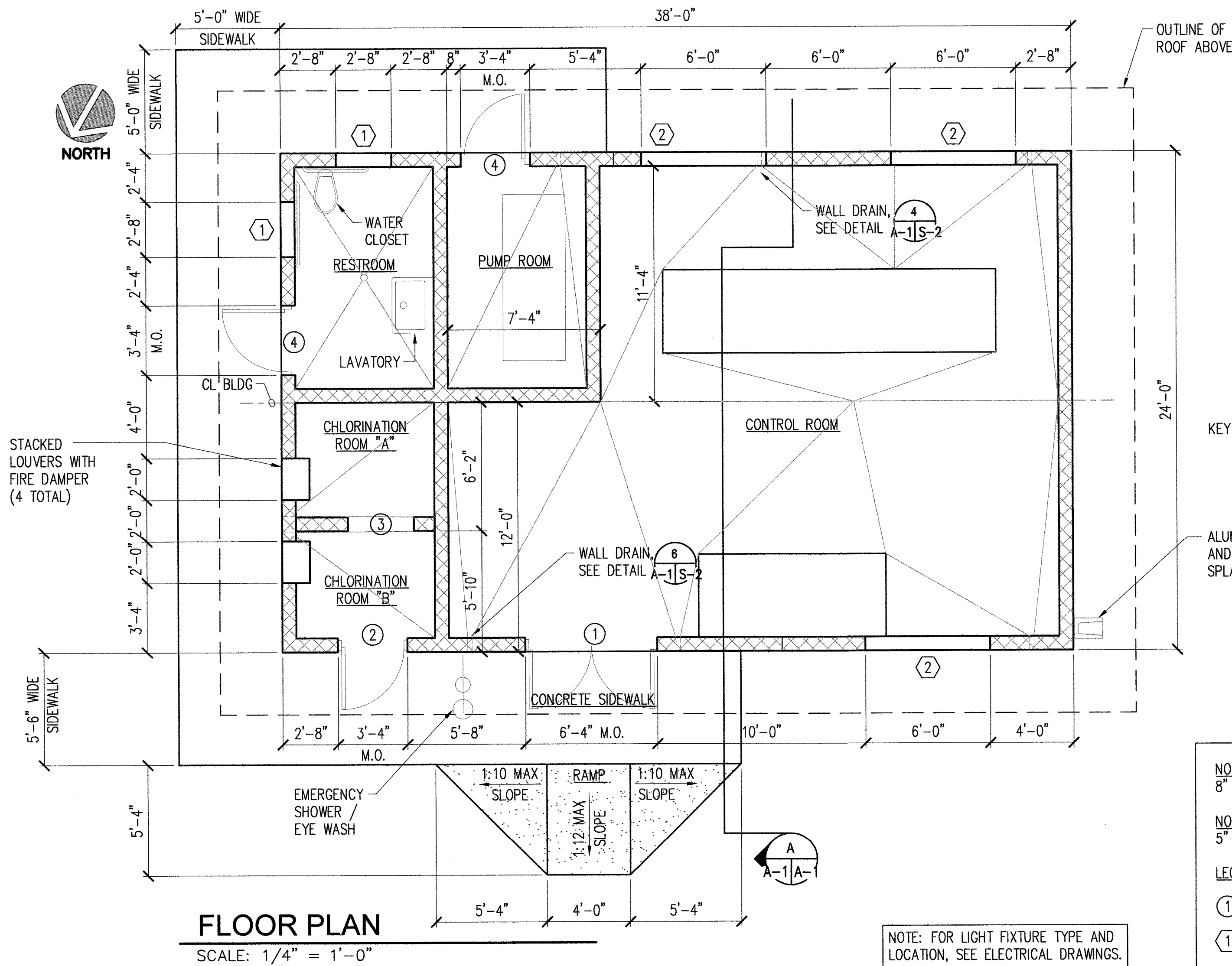
**PRESSURE RELIEF VALVE DETAIL**  
NOT TO SCALE **3**  
**M-8**



**ELEVATION**  
SCALE: 1/2" = 1'-0"  
**BOOSTER PUMP SECTION DETAIL**  
SCALE AS SHOWN **4**  
**M-8**

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

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.				
AKINAKA & ASSOCIATES, LTD.				
 LICENSE EXPIRES 04/30/14				
 ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:            PRODUCTION WELL, RESERVOIR, AND            SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>KEONEPOKO-NUI MISC.            BOOSTER PUMP DETAILS</b>				
FILE	POCKET	FOLDER	NO.	

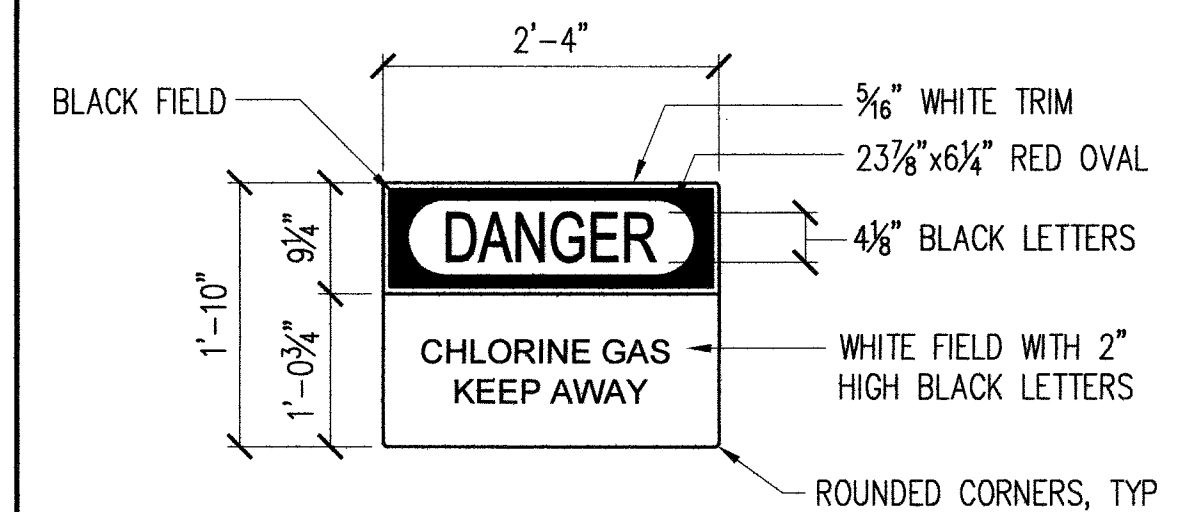
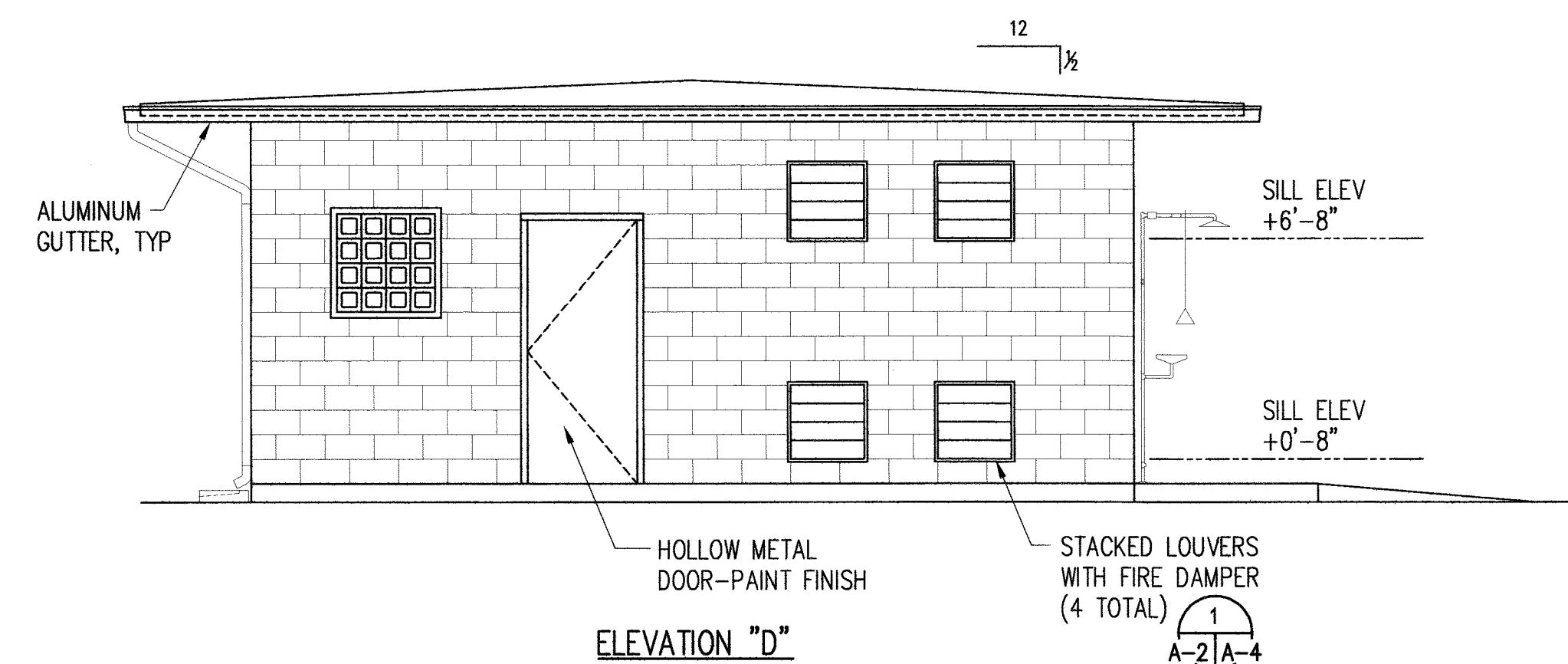
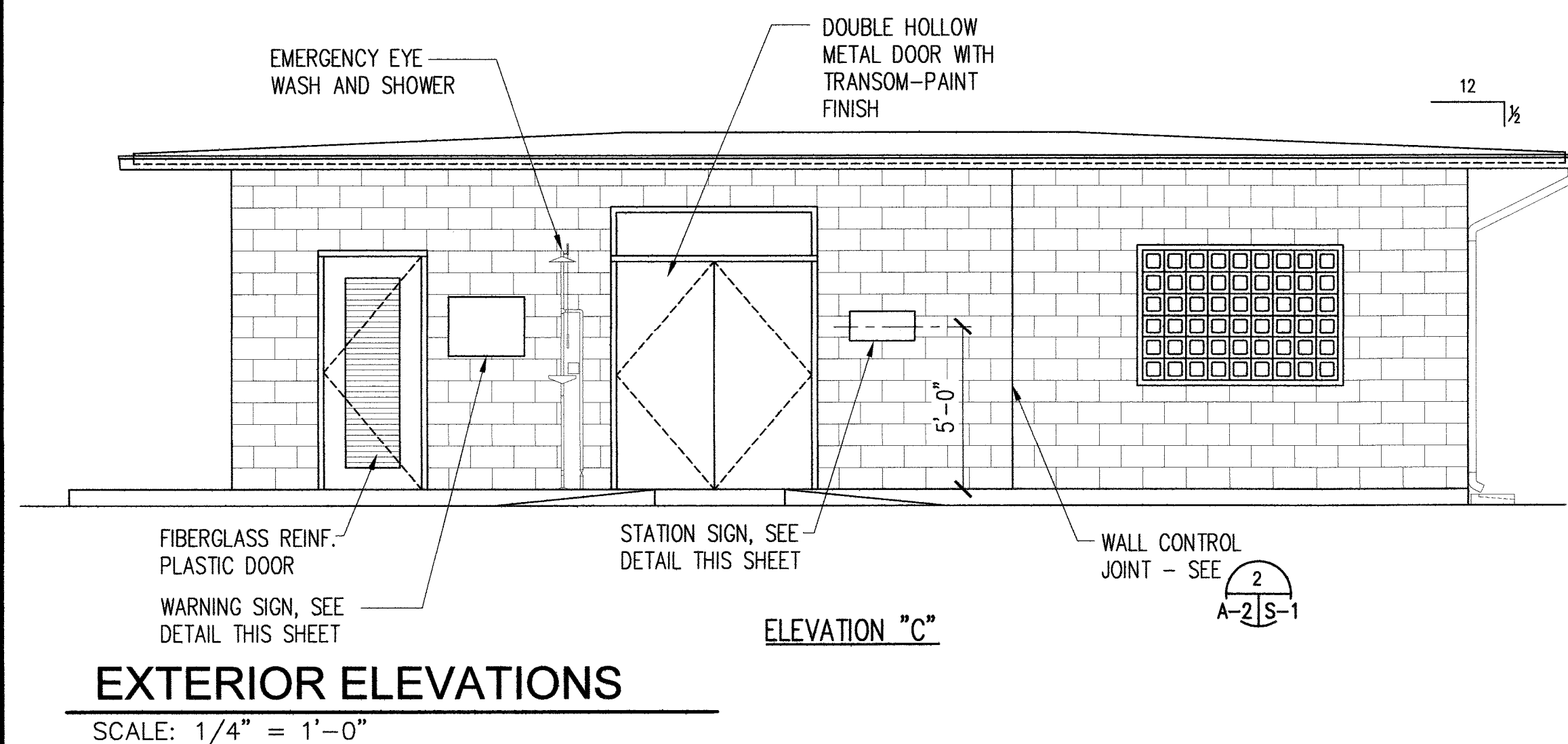
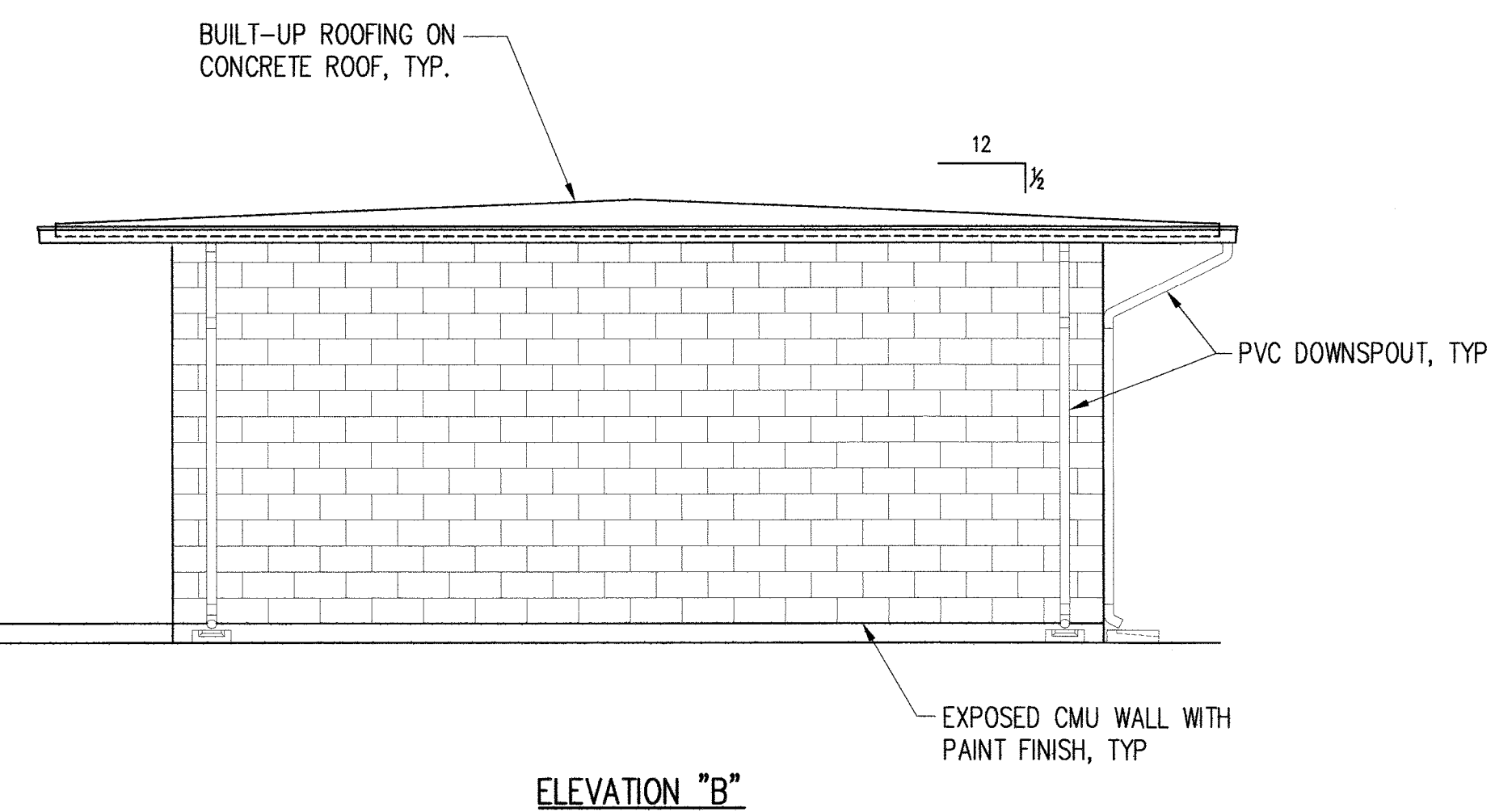
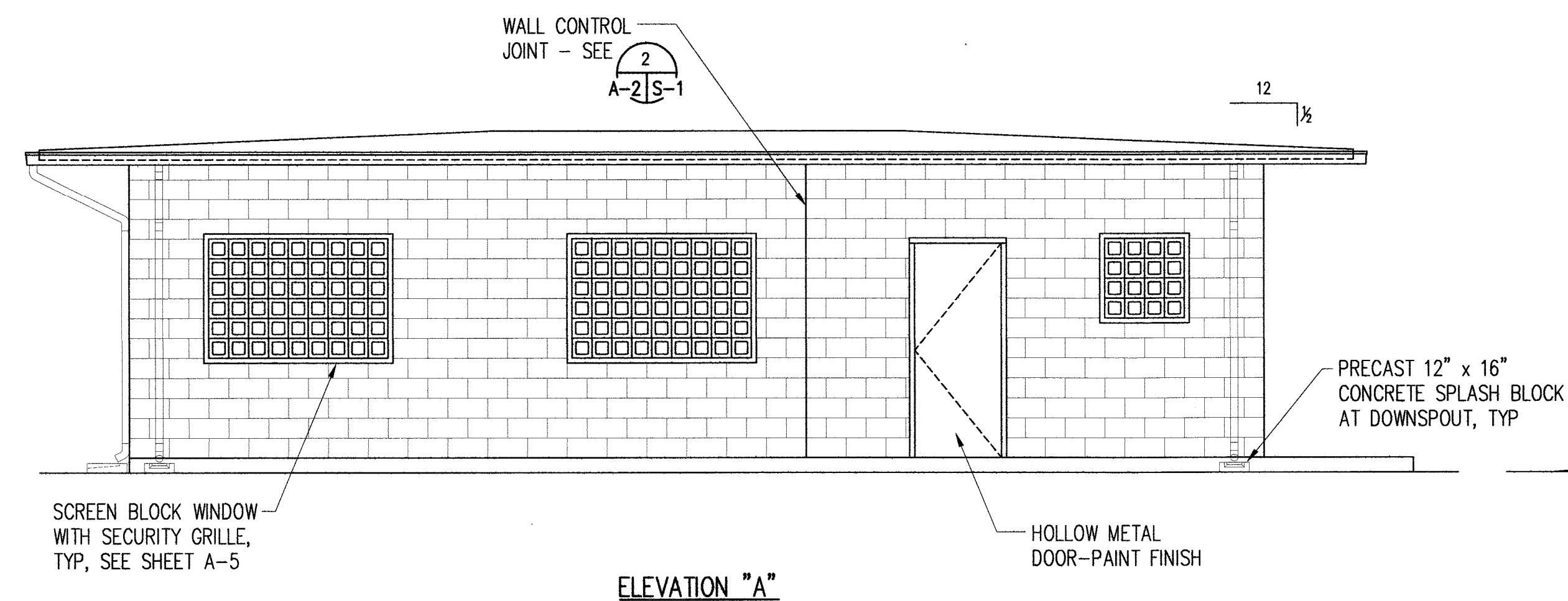
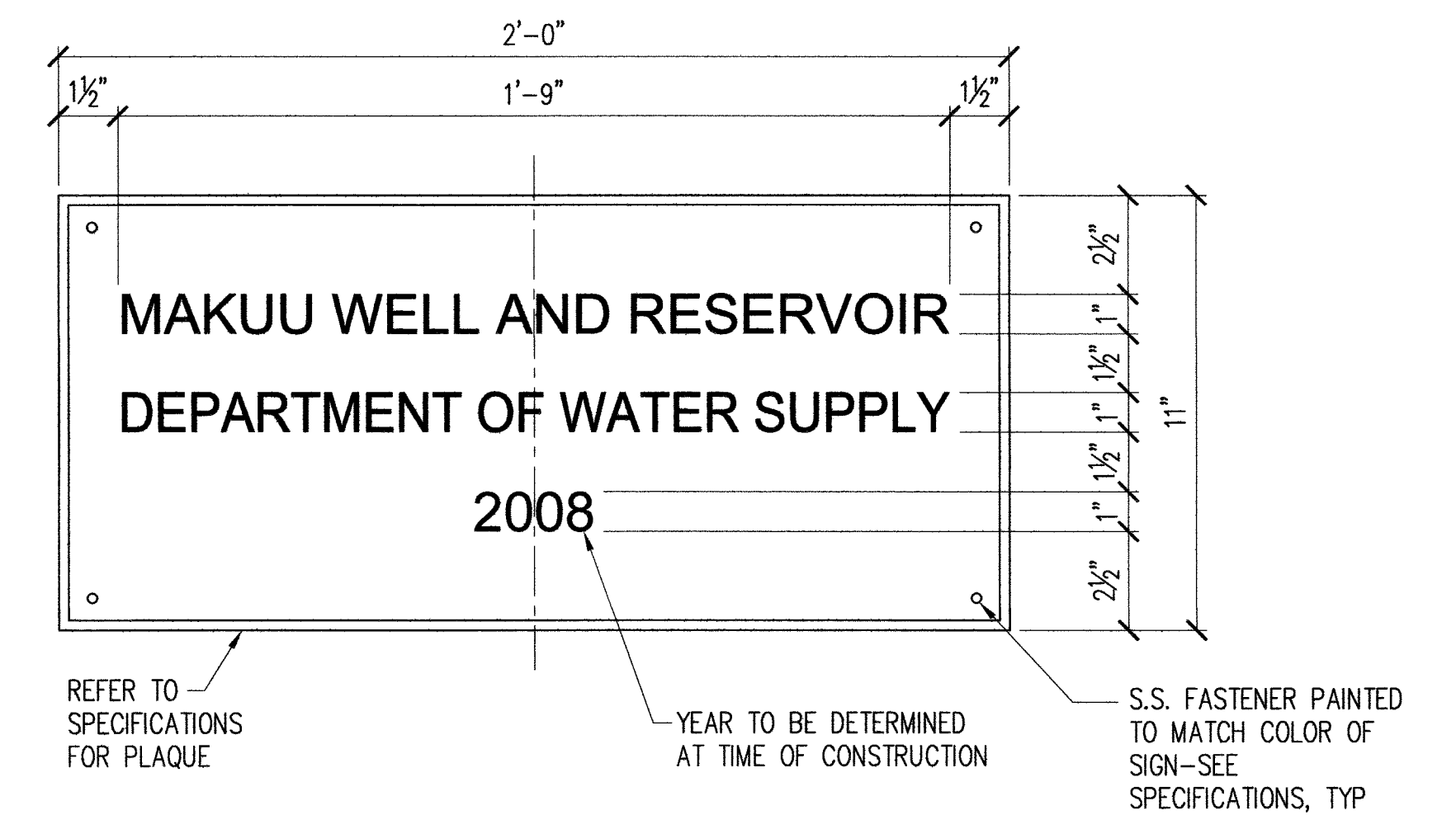


#### MAKUU WELL AND RESERVOIR CONTROL BUILDING

- JURISDICTION
  - County of Hawaii
- CODES
  - IBC 2003
- OCCUPANCY
  - U
- CONSTRUCTION TYPE
  - Type III-A
- SEISMIC ZONE
  - $S_s = 1.85g$ ;  $S_1 = 0.89g$
  - Site Class = A
  - Seismic Use Group = I
  - Seismic Design Category = E
  - Importance Factor = 1.00
- WIND LOADS
  - Basic Wind Speed = 105 mph
  - Exposure Category = B
  - Importance Factor = 1.00
- ZONE
  - A-20a
- FIRE SPRINKLERS
  - None
- GROSS BUILDING AREA
  - 912 square feet

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> <p><b>JERRY S. FUJITA</b> LICENSED PROFESSIONAL ENGINEER No. 11573-S HAWAII, U.S.A.</p> </div> <div style="text-align: right;"> <p><i>Jerry S. Fujita</i> EXPIRATION DATE OF THE LICENSE 4/30/2014 THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION</p> </div> </div>				
<p><b>KAI HAWAII</b> STRUCTURAL &amp; FORENSIC ENGINEERS</p>				
<p>DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p>				
<p><b>CONTROL BUILDING FLOOR PLAN, ROOF PLAN AND SECTION</b></p>				
<div style="display: flex; justify-content: space-between;"> <div>FILE</div> <div>POCKET</div> <div>FOLDER</div> <div>NO.</div> </div>				





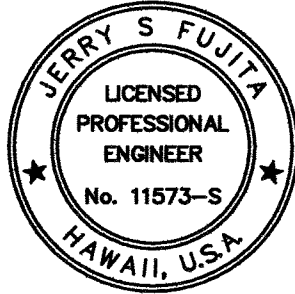
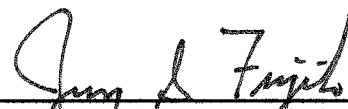
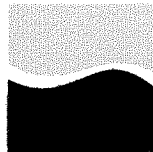
DANGER SIGN

NOTES:

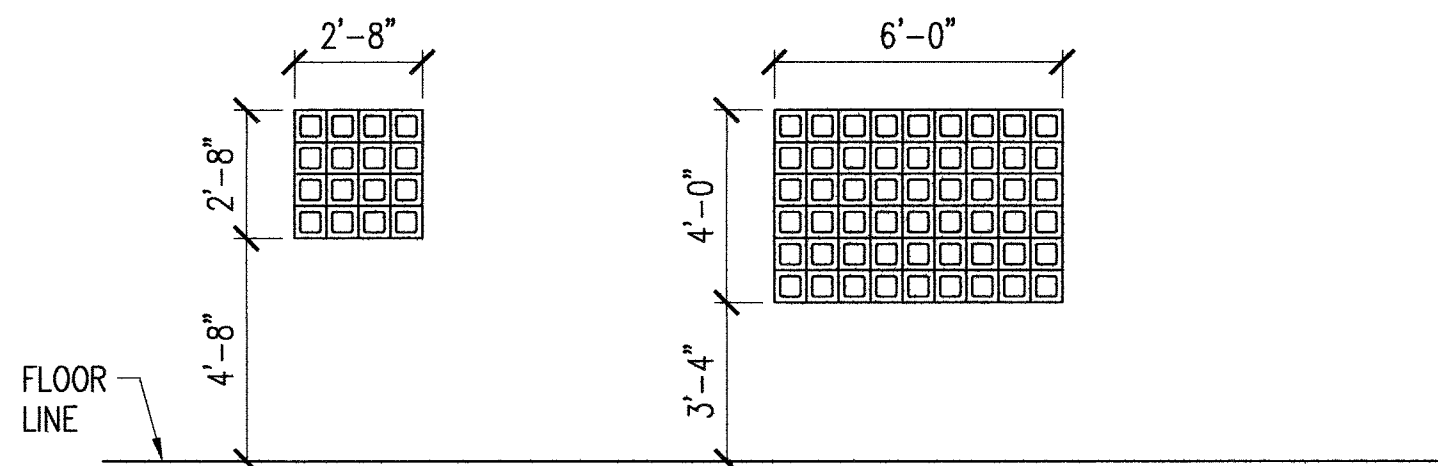
1. SIGNS SHALL BE 10 GAGE ALUMINUM PLATE WITH 8 MIL THICK ANODIZED EGG SHELL FINISH.
2. COLORS SHALL BE OPAQUE GLOSSY. SAMPLES AS SPECIFIED IN TABLE 1 OF FUNDAMENTAL SPECIFICATIONS OF SAFETY COLORS FOR CIE STANDARD SOURCE "O" AMERICAN NATIONAL STANDARD 258.1 1967.
3. LETTERS ON SIGN SHALL HAVE A WIDTH-TO-HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH-TO-HEIGHT RATIO BETWEEN 1.5 AND 1:10.
4. MOUNT SIGN AT LOCATION INDICATED IN EXTERIOR ELEVATION.

### WARNING SIGN DETAIL

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

REVISION	DATE	DESCRIPTION	MADE BY APPROVED
		 EXPIRATION DATE OF THE LICENSE 4/30/2014 THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION	
		<b>KAI HAWAII</b> STRUCTURAL & FORENSIC ENGINEERS	
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII			
<b>CONTROL BUILDING EXTERIOR</b> <b>ELEVATIONS AND SCHEDULES</b>			
<div style="text-align: right; font-size: 2em; font-weight: bold;">A-2</div>			
FILE	POCKET	FOLDER	NO.

NOTE:  
SECURITY GRILLE SHALL BE INSTALLED ON EXTERIOR  
OF ALL WINDOWS. REFER TO DETAIL SHEET A-5.



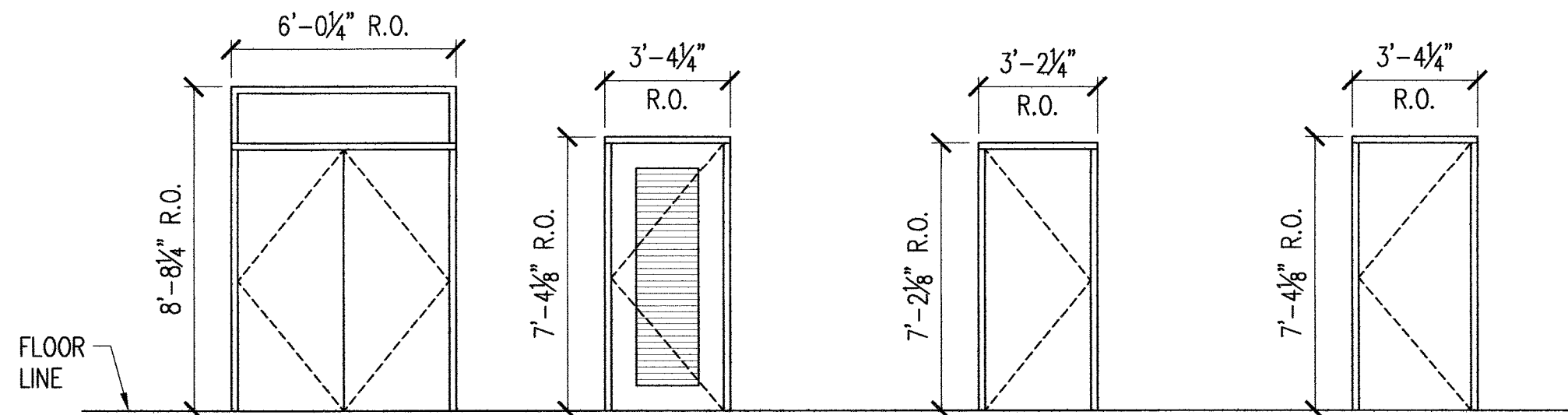
① 2'-8" x 4'-0" SCREEN  
BLOCK WINDOW (8" HALF  
BLOCK COMMON CMU ON  
EDGE) WITH ALUMINUM  
SCREEN ON INTERIOR

② 6'-0" x 4'-0" SCREEN  
BLOCK WINDOW (8" HALF  
BLOCK COMMON CMU ON  
EDGE) WITH ALUMINUM  
SCREEN ON INTERIOR

NOTE:  
DWS TO FURNISH DWS STANDARD LOCKSETS  
TO CONTRACTOR FOR DOORS ① ② AND ④

## WINDOW SCHEDULE

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



① PAIR 2'-10" x 7'-0"  
H.M. DOOR WITH  
TRANSOM

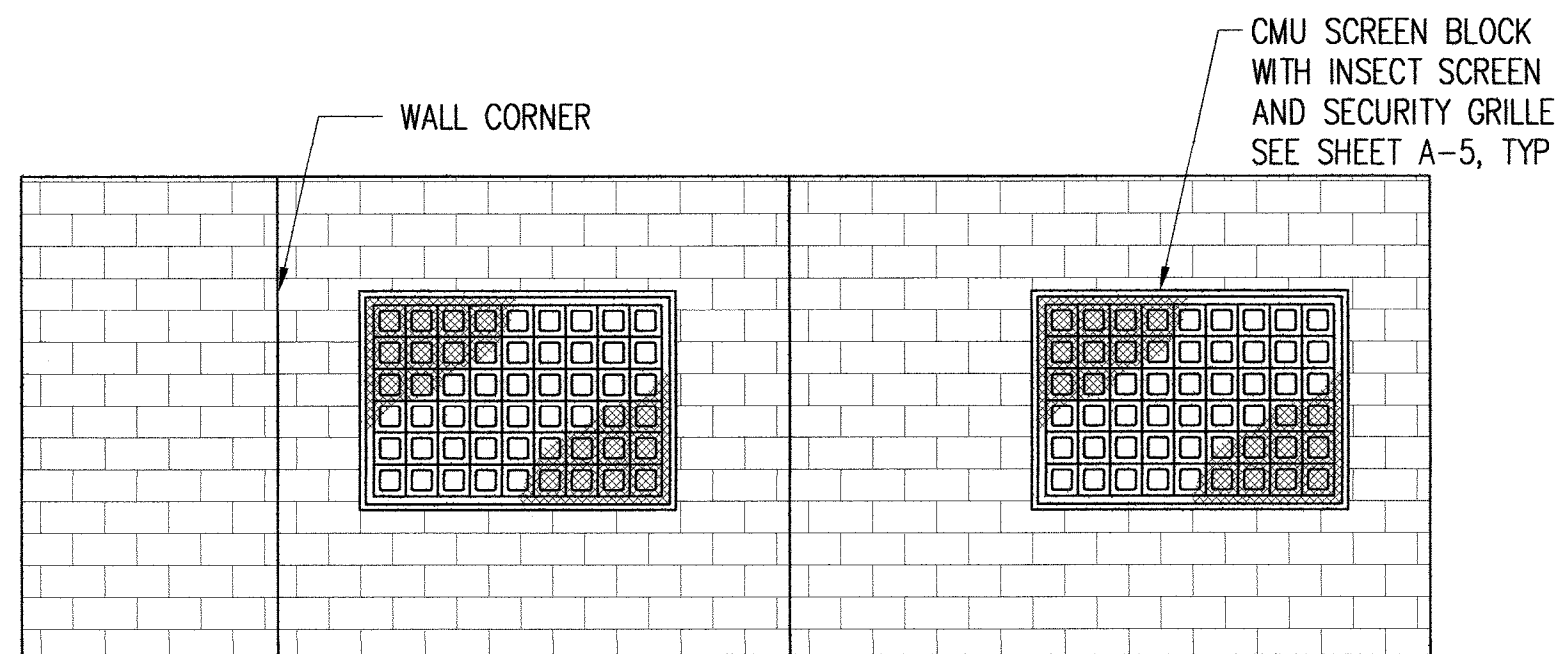
② SINGLE FIBERGLASS  
REINFORCED PLASTIC  
DOOR WITH FULL  
LOUVERED OPENING AND  
INTERIOR INSECT SCREEN

③ SINGLE 3'-0" x 7'-0"  
WOOD DOOR 1-HR FIRE  
RATED ASSEMBLY,  
SELF-CLOSING WITH  
SMOKE AND DRAFT  
CONTROL ASSEMBLY.

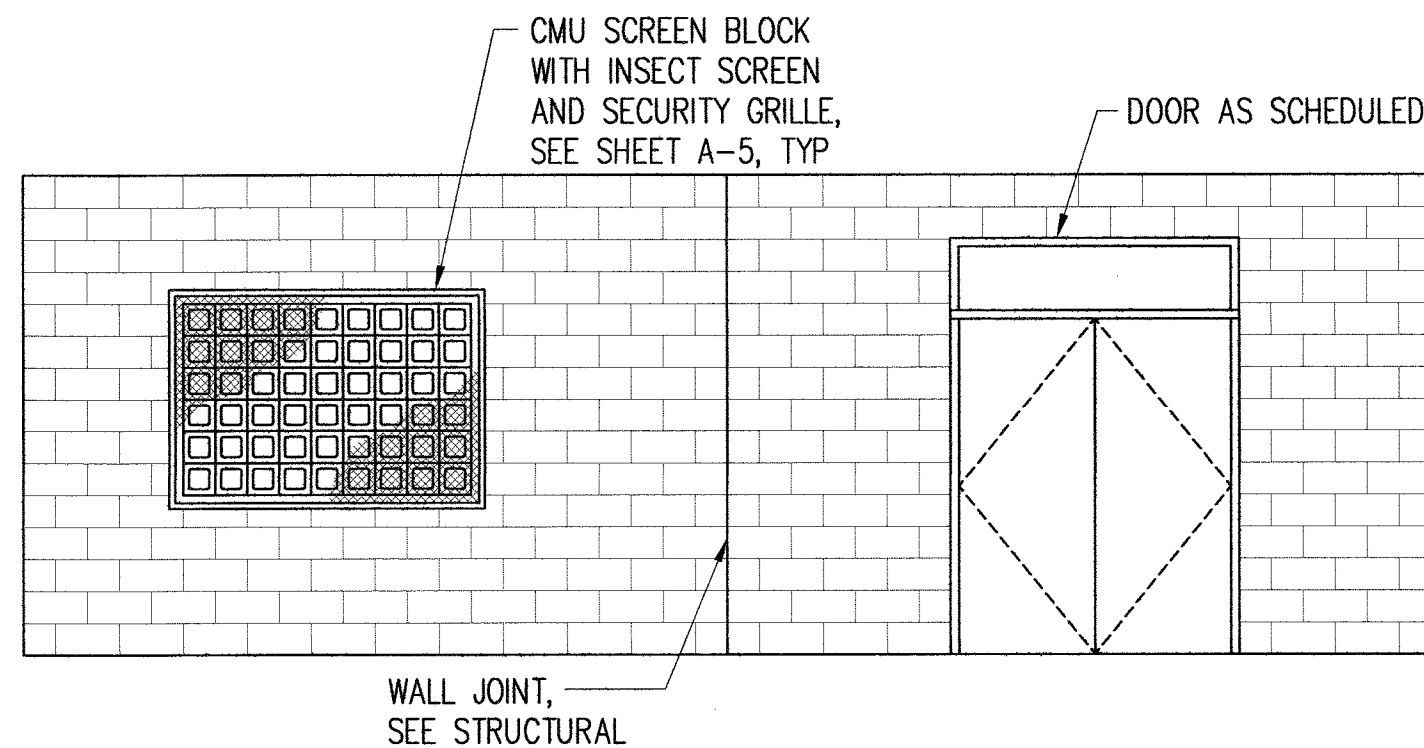
④ SINGLE 3'-0" x 7'-2"  
H.M. DOOR

## DOOR SCHEDULE

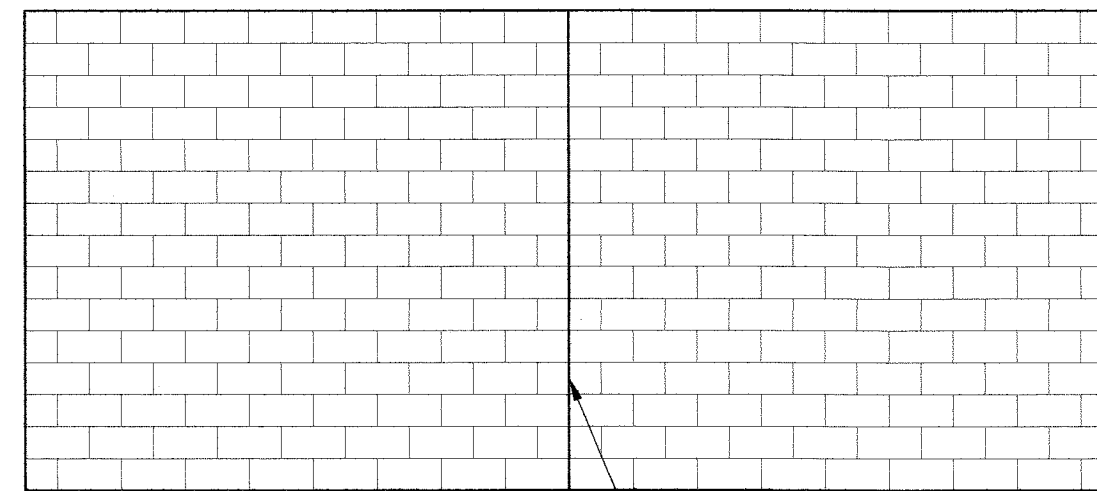
SCALE: 1/4" = 1'-0"



ELEVATION "A"

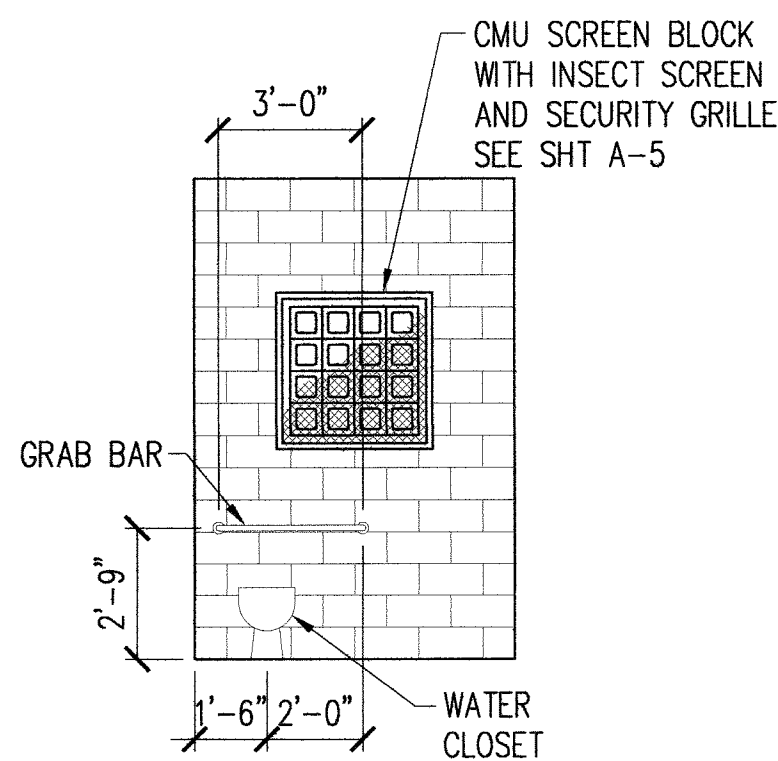


ELEVATION "C"

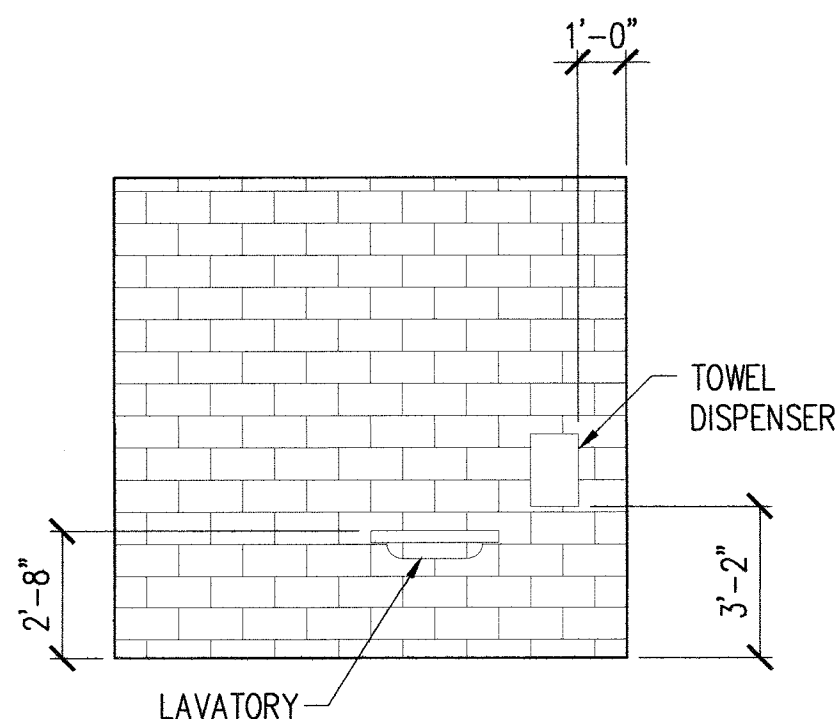


ELEVATION "D"

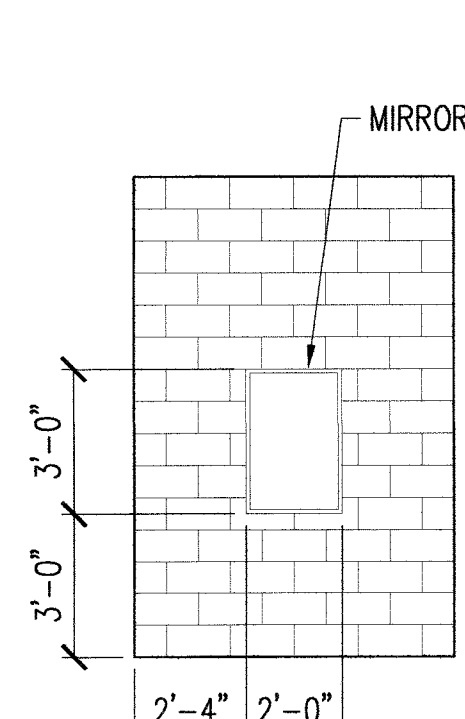
### CONTROL ROOM



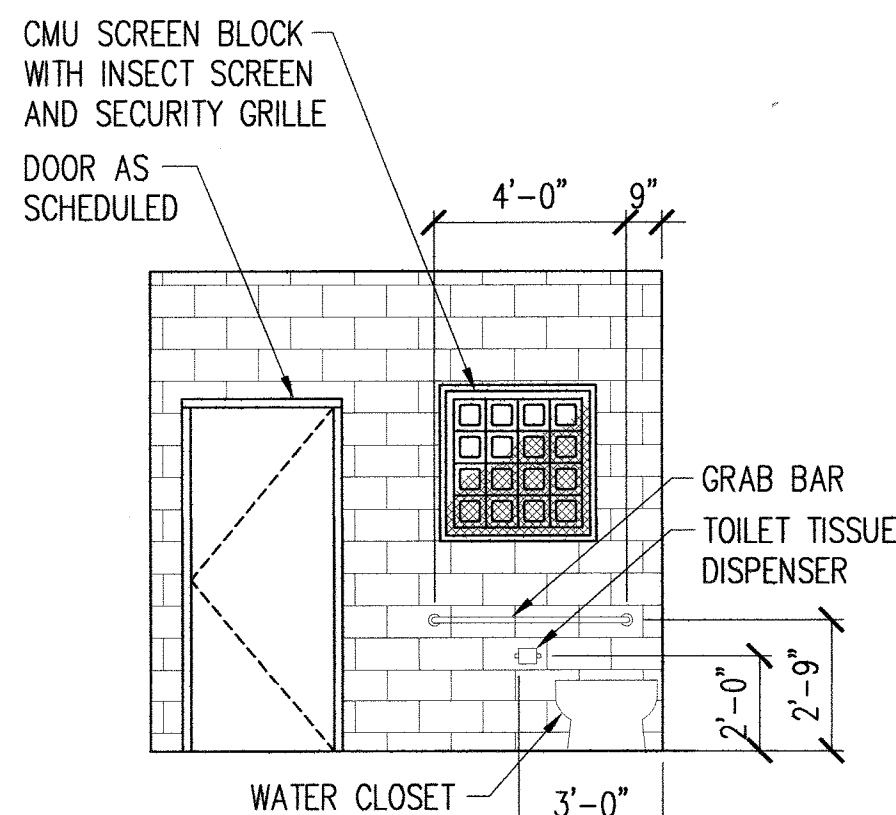
ELEVATION "A"



ELEVATION "B"



ELEVATION "C"



ELEVATION "D"

### RESTROOM

## INTERIOR ELEVATIONS

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

ROOM FINISH SCHEDULE					REMARKS
	FLOOR	WALL	CEILING		
CONTROL ROOM	CONCRETE	VINYL	CMU FLUSH JOINTS WITH LOW MAINTENANCE GLOSS FINISH PAINT ON INTERIOR WALLS	CONCRETE	
CHLORINATION ROOMS				GYP BOARD PAINT FINISH	1-HOUR FIRE RATED CEILING ASSEMBLY
RESTROOM					
PUMP ROOM					
OVERHANG SOFFIT					

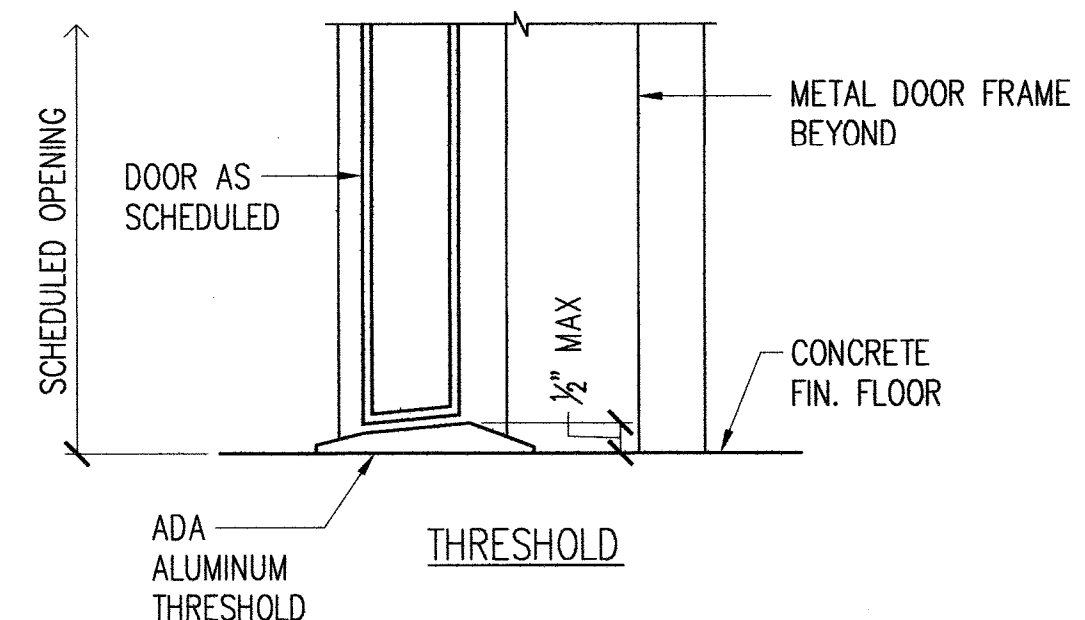
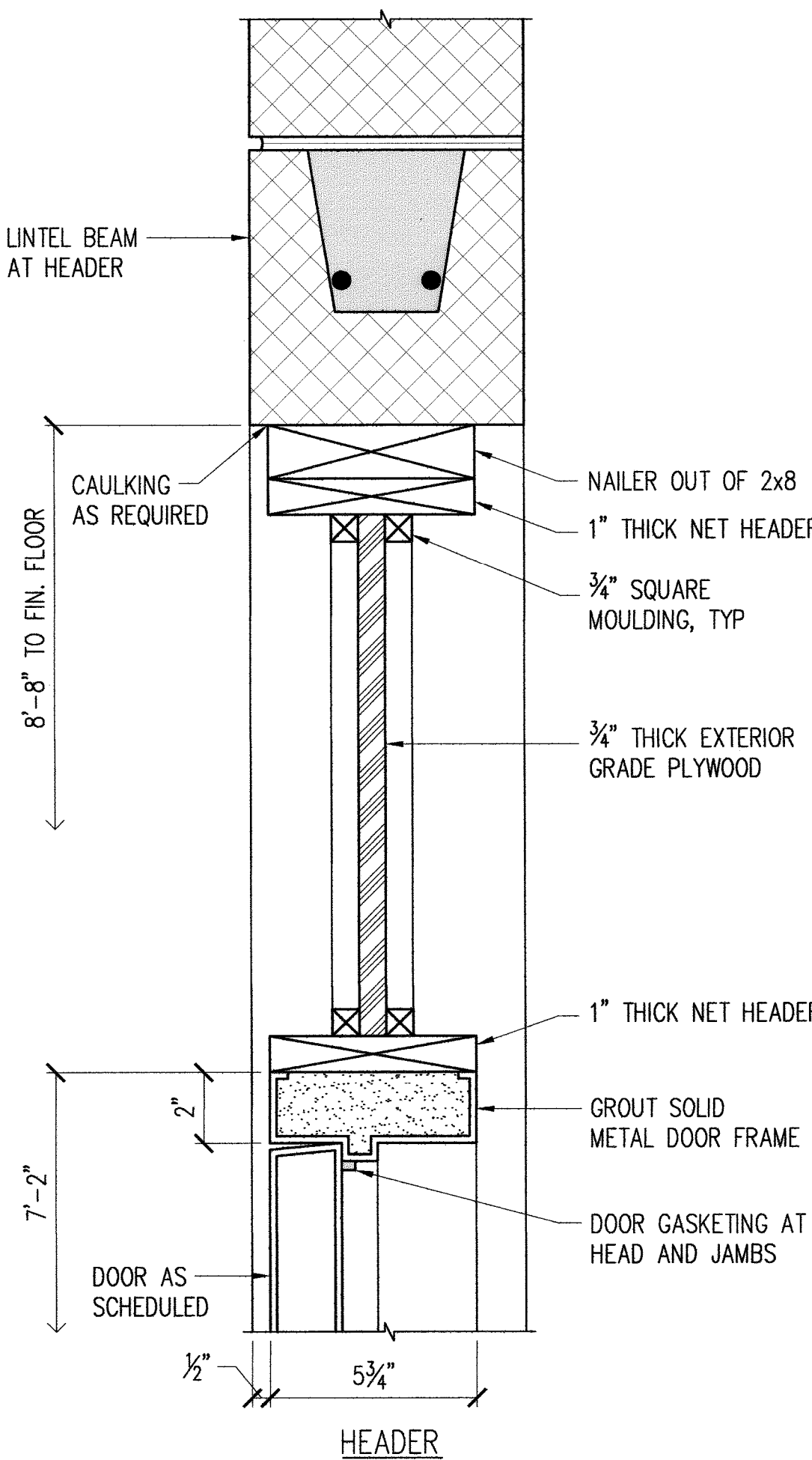
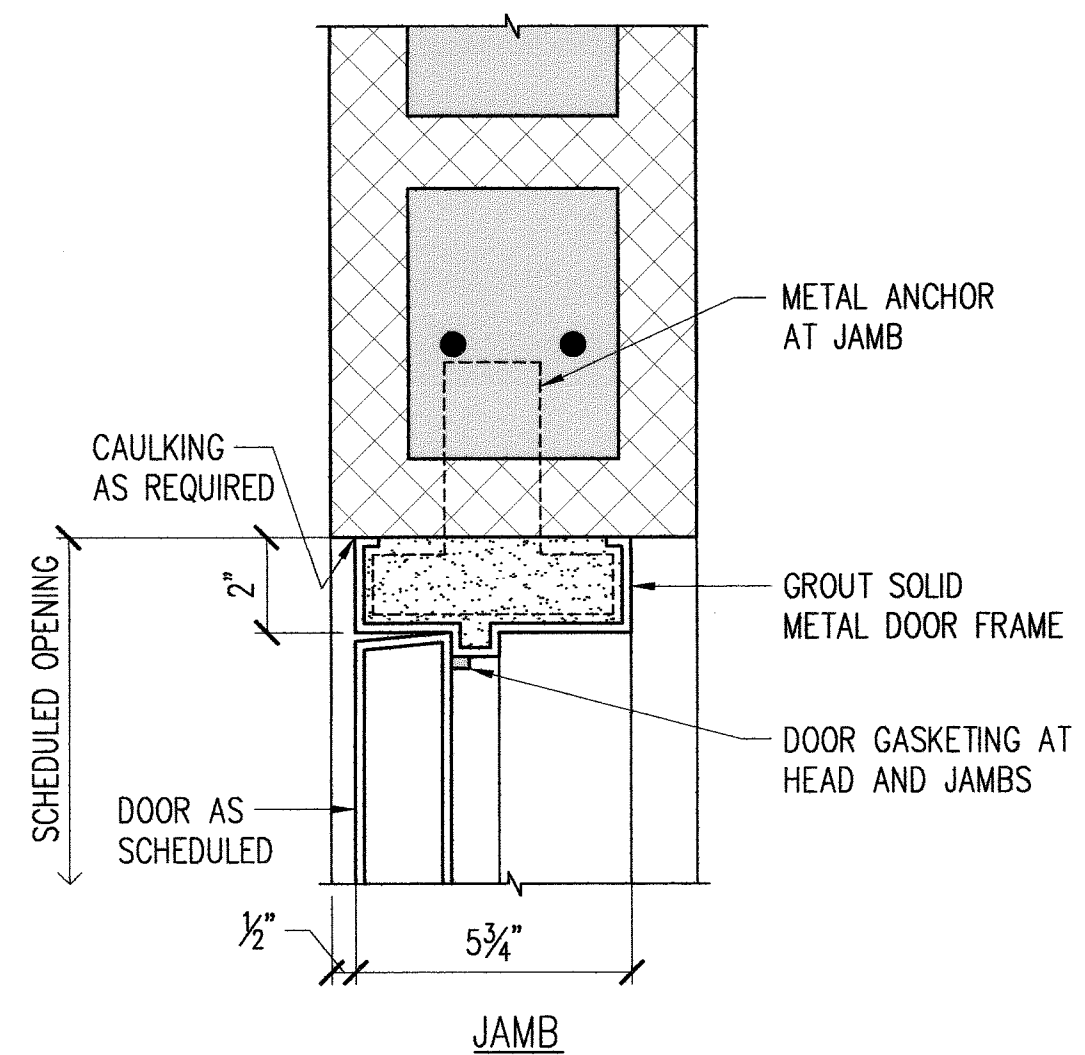
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

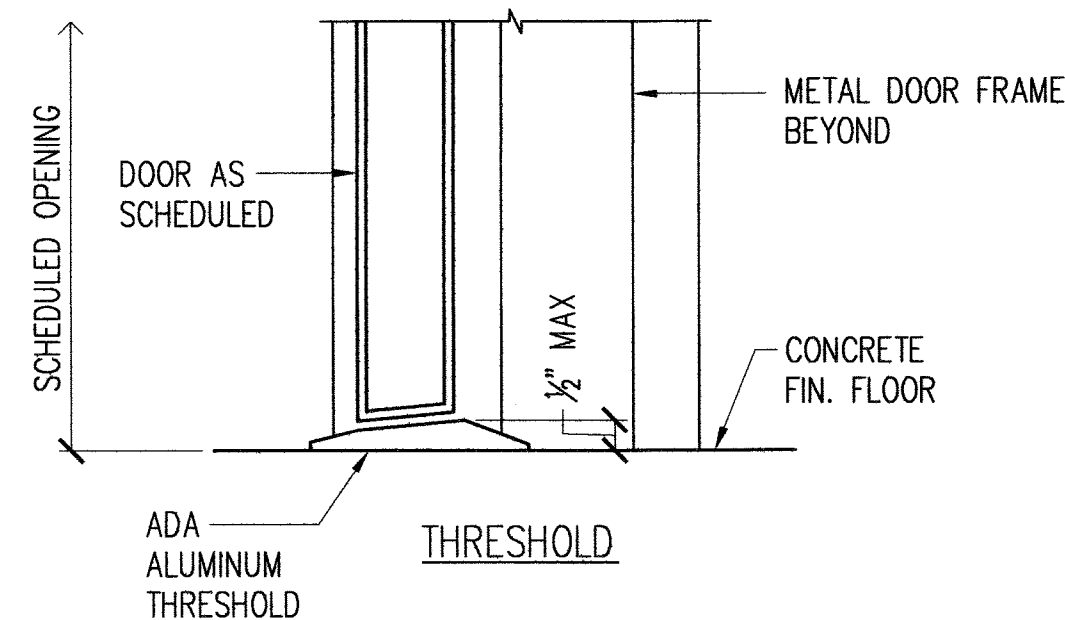
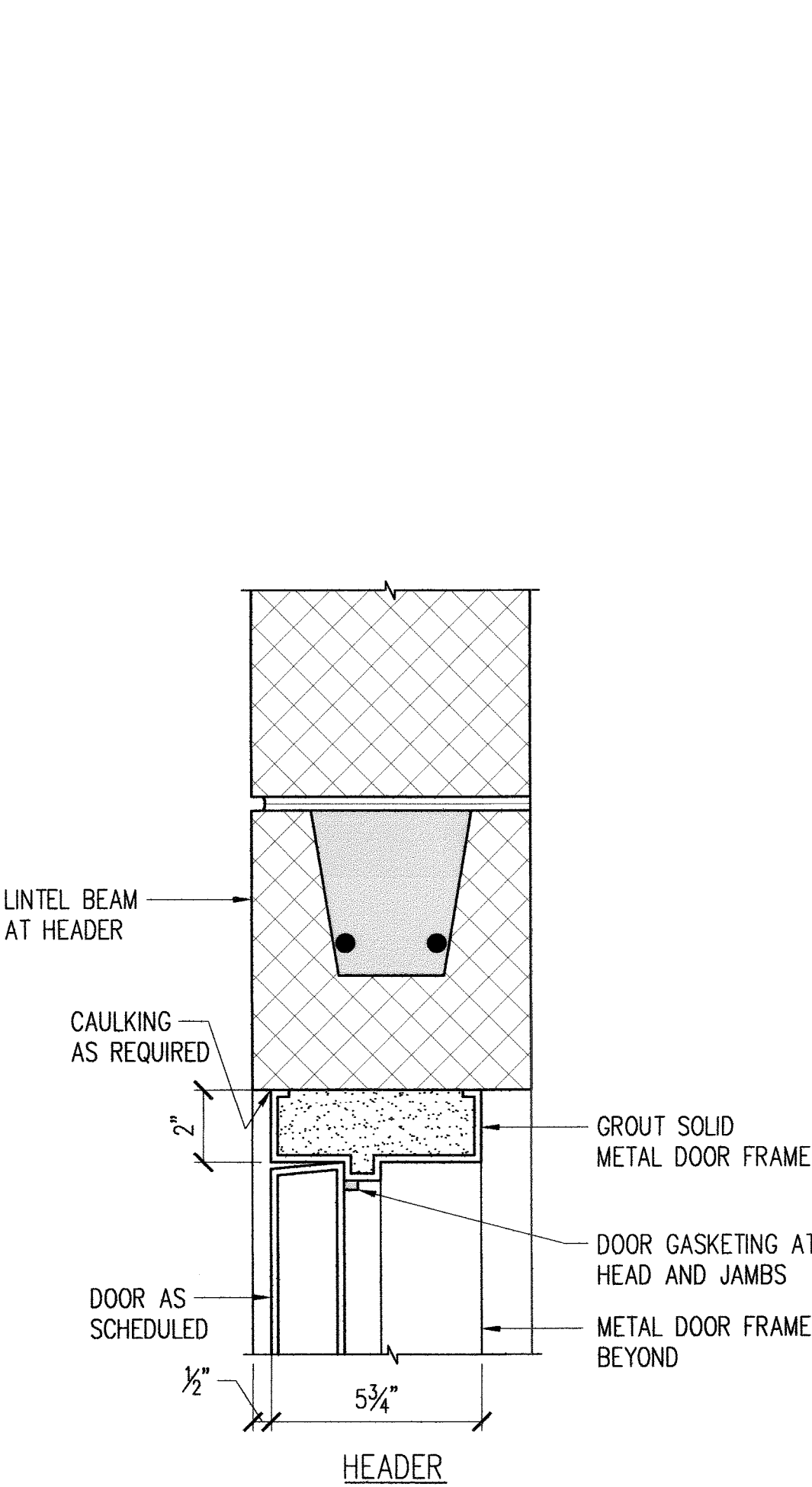
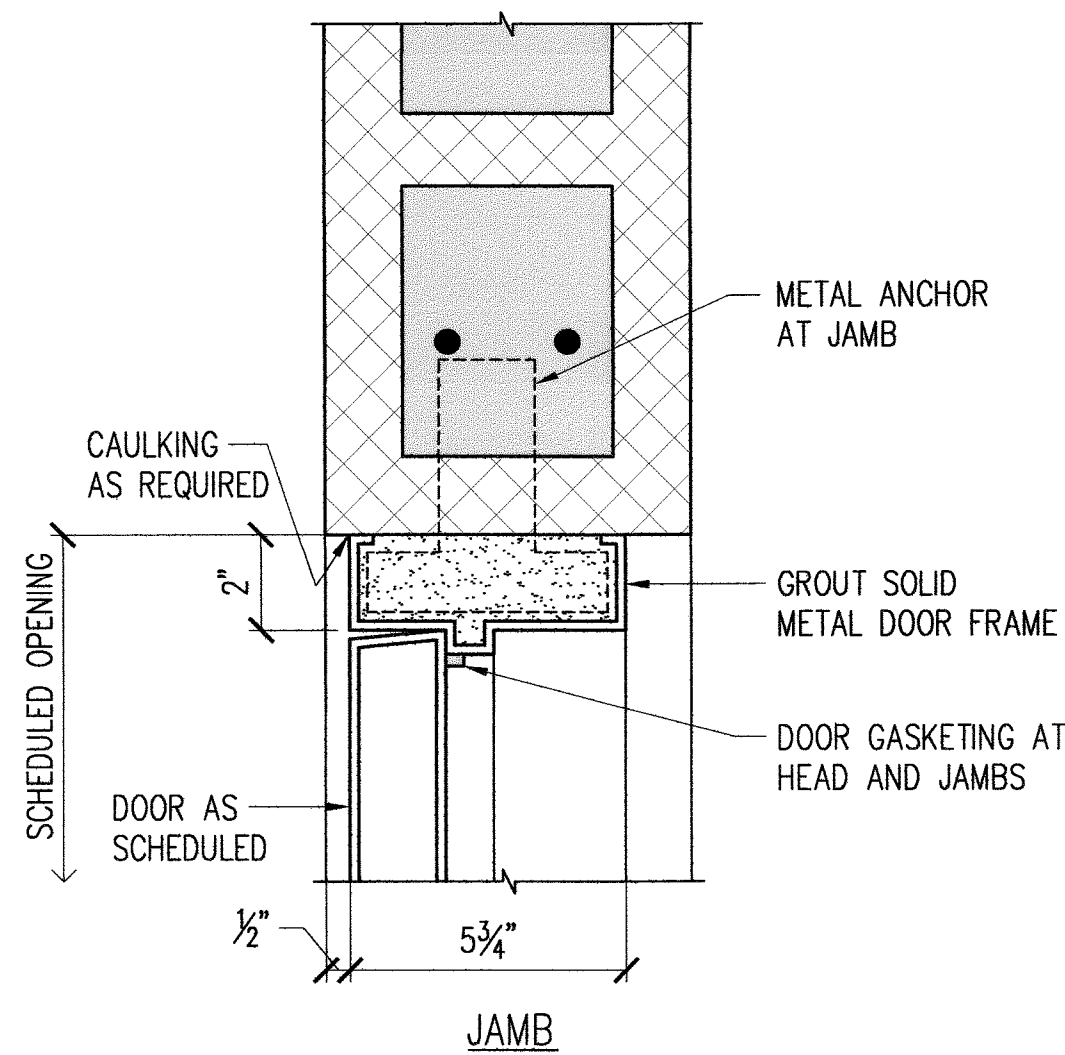
**CONTROL BUILDING INTERIOR  
ELEVATIONS AND SCHEDULES**





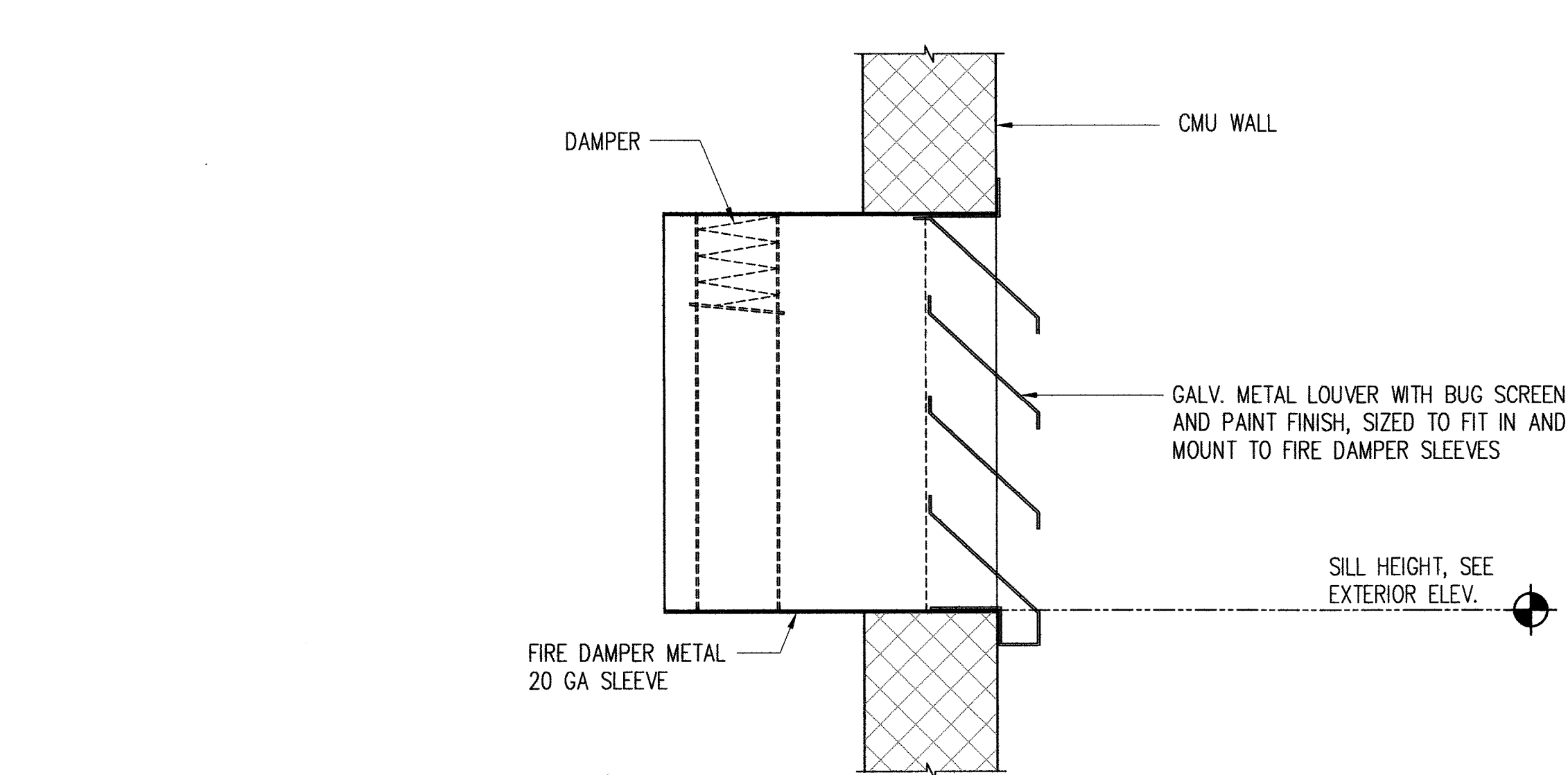
DOUBLE DOOR DETAIL

SCALE: 3" = 1'-0"

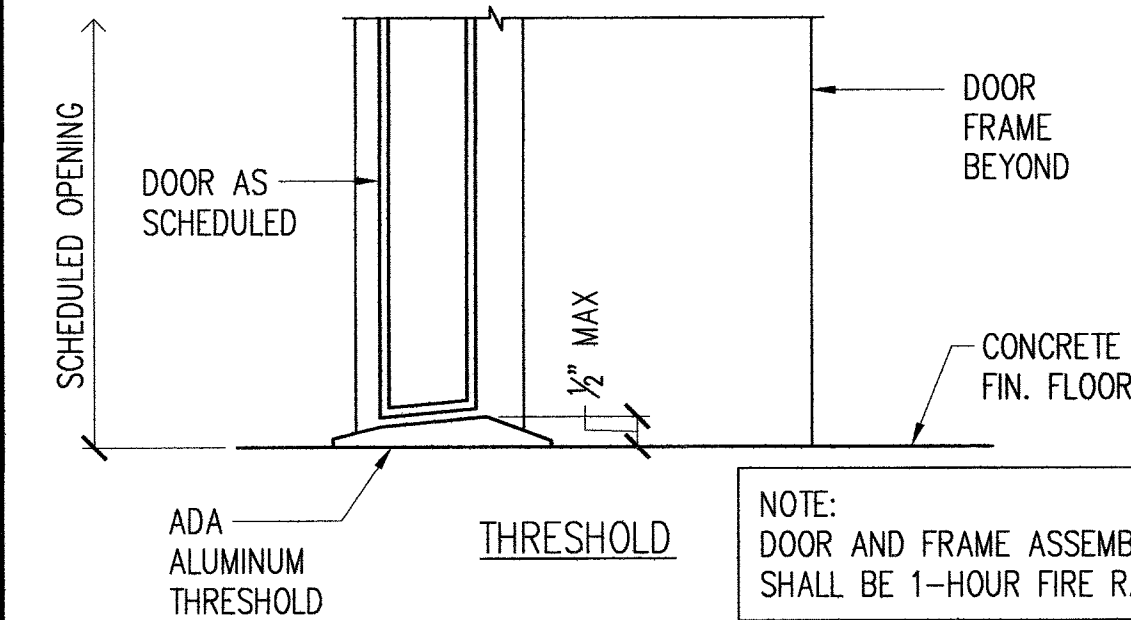
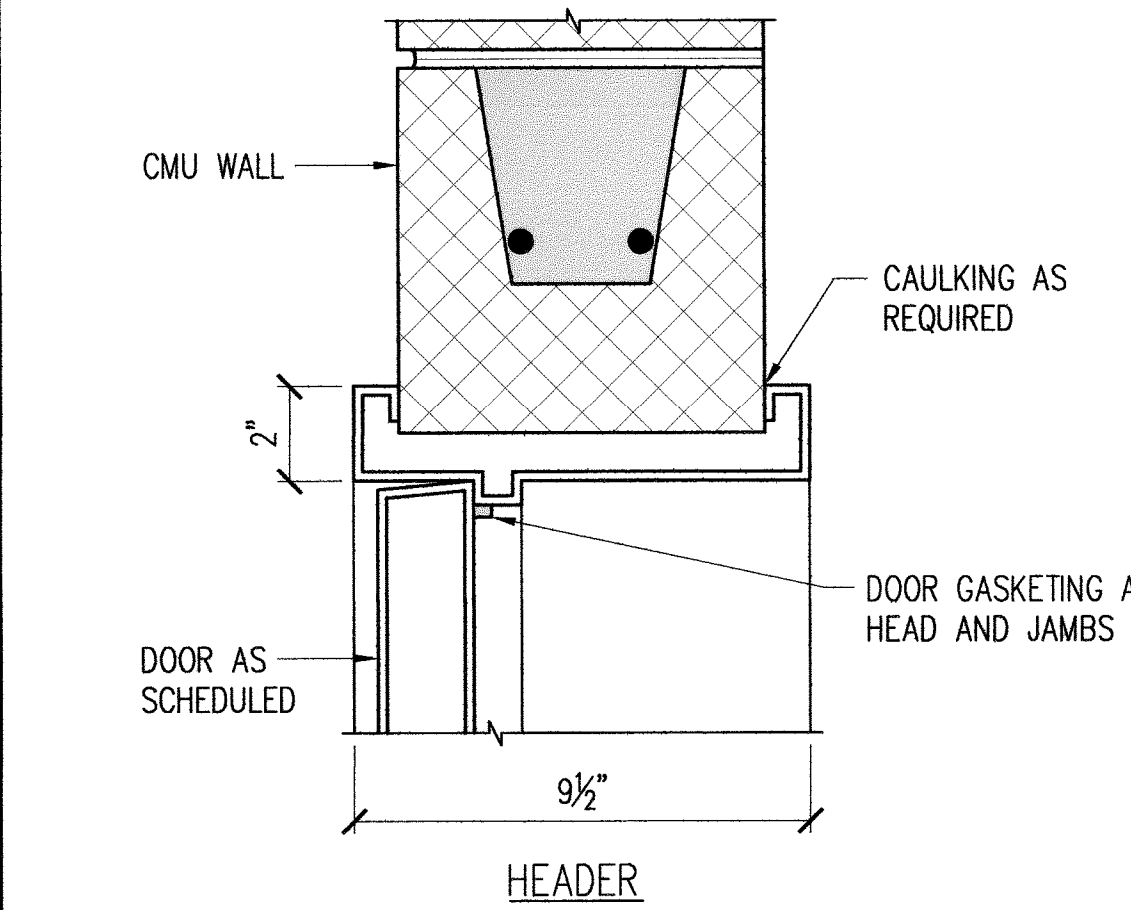
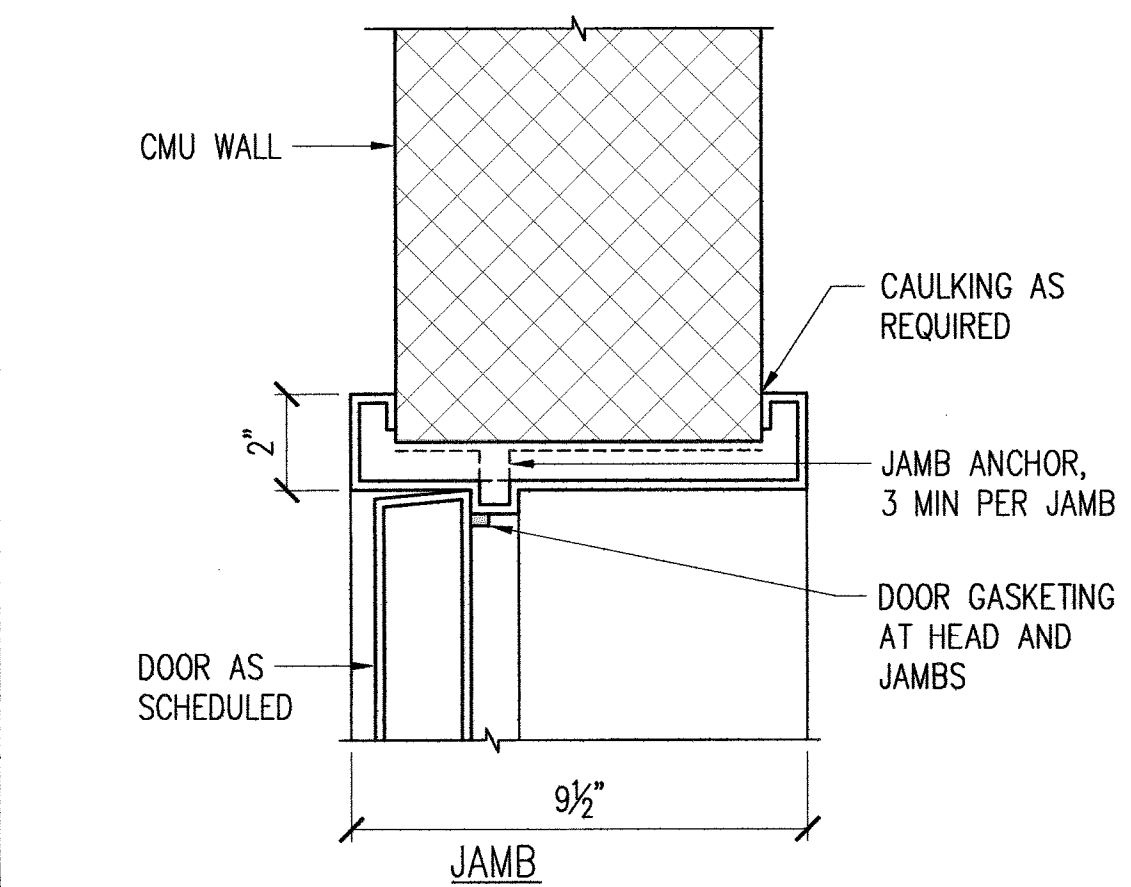


SINGLE H.M. DOOR DETAIL

SCALE: 3" = 1'-0"



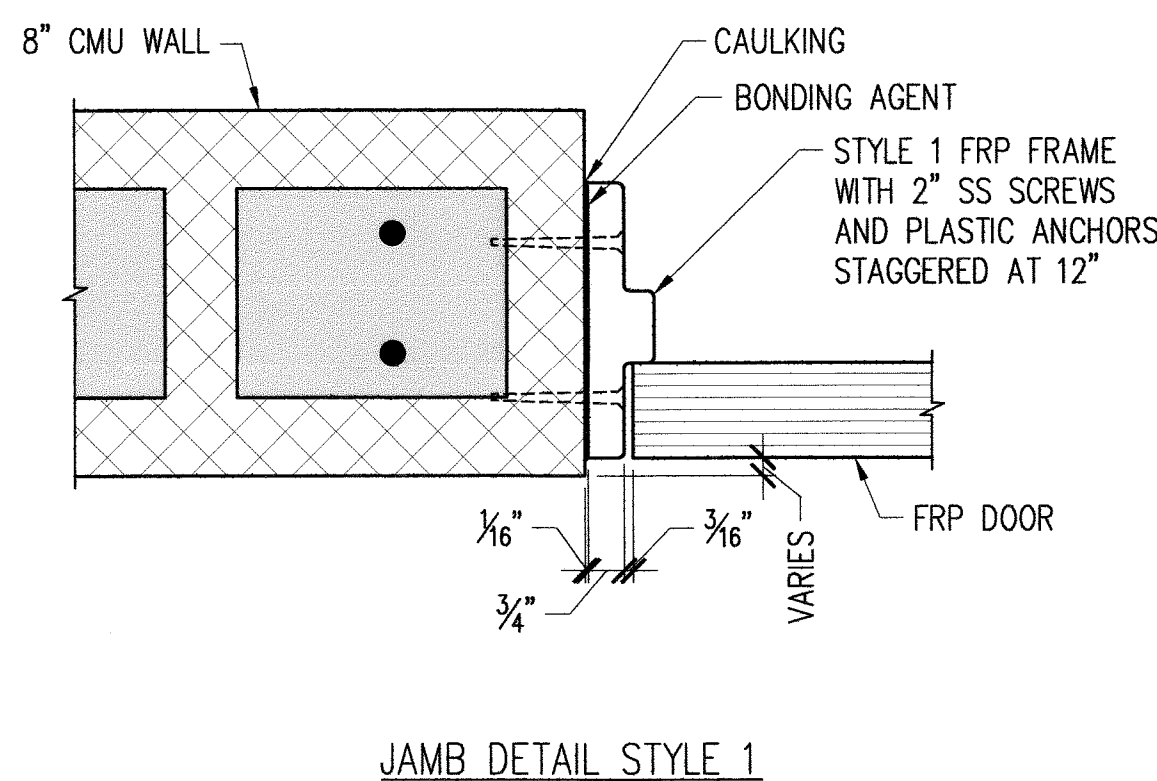
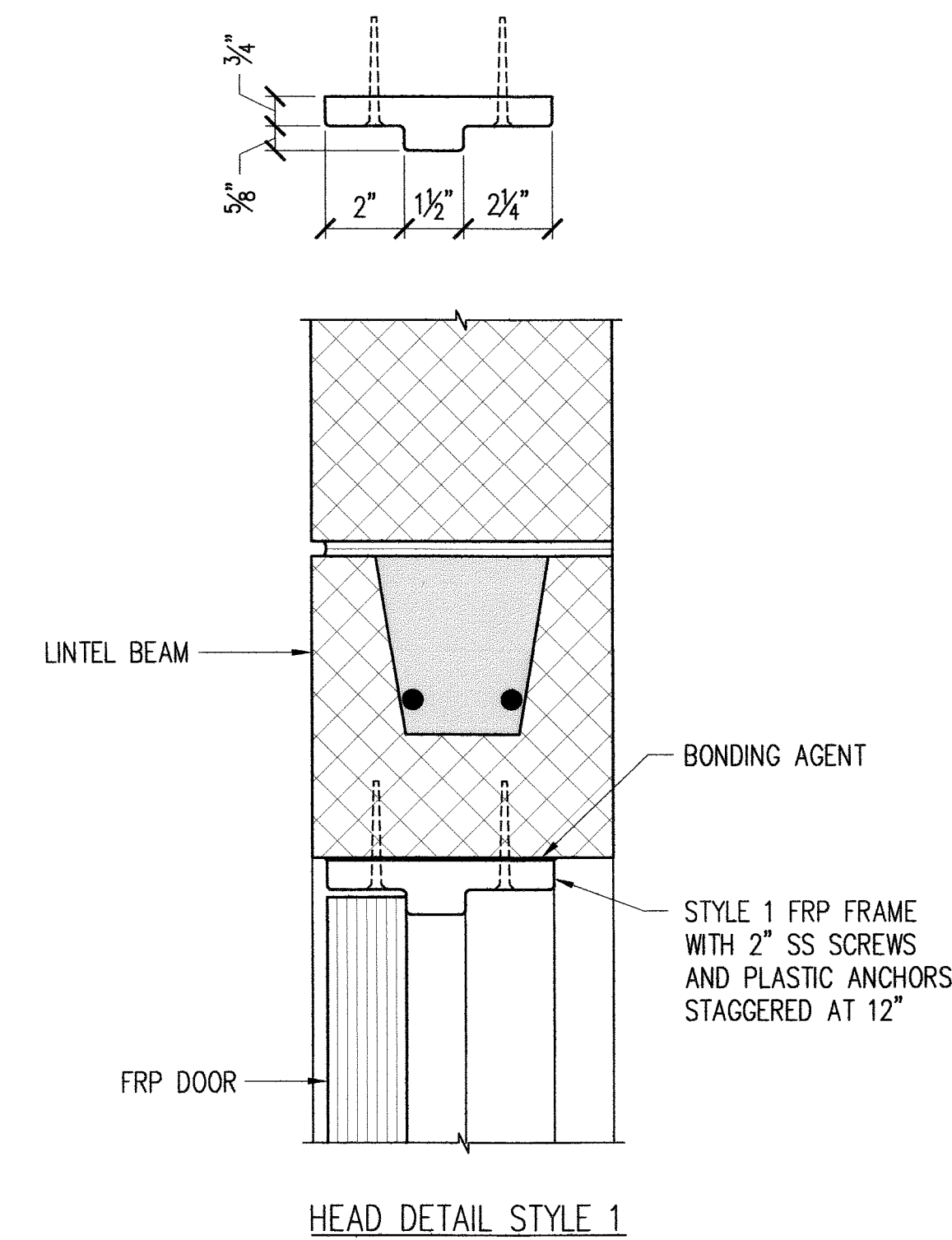
1  
A-2 | A-4  
LOUVER/FIRE DAMPER DETAIL  
NOT TO SCALE



INTERIOR S.C. WOOD DOOR DETAIL

SCALE: 3" = 1'-0"

NOTE:  
DOOR AND FRAME ASSEMBLY  
SHALL BE 1-HOUR FIRE RATED



FIBERGLASS DOOR

SCALE: 3" = 1'-0"

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

JERRY S. FUJITA  
LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, U.S.A.

*Jerry S. Fujita*  
EXPIRATION DATE OF THE LICENSE 4/30/2014  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFF-SITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

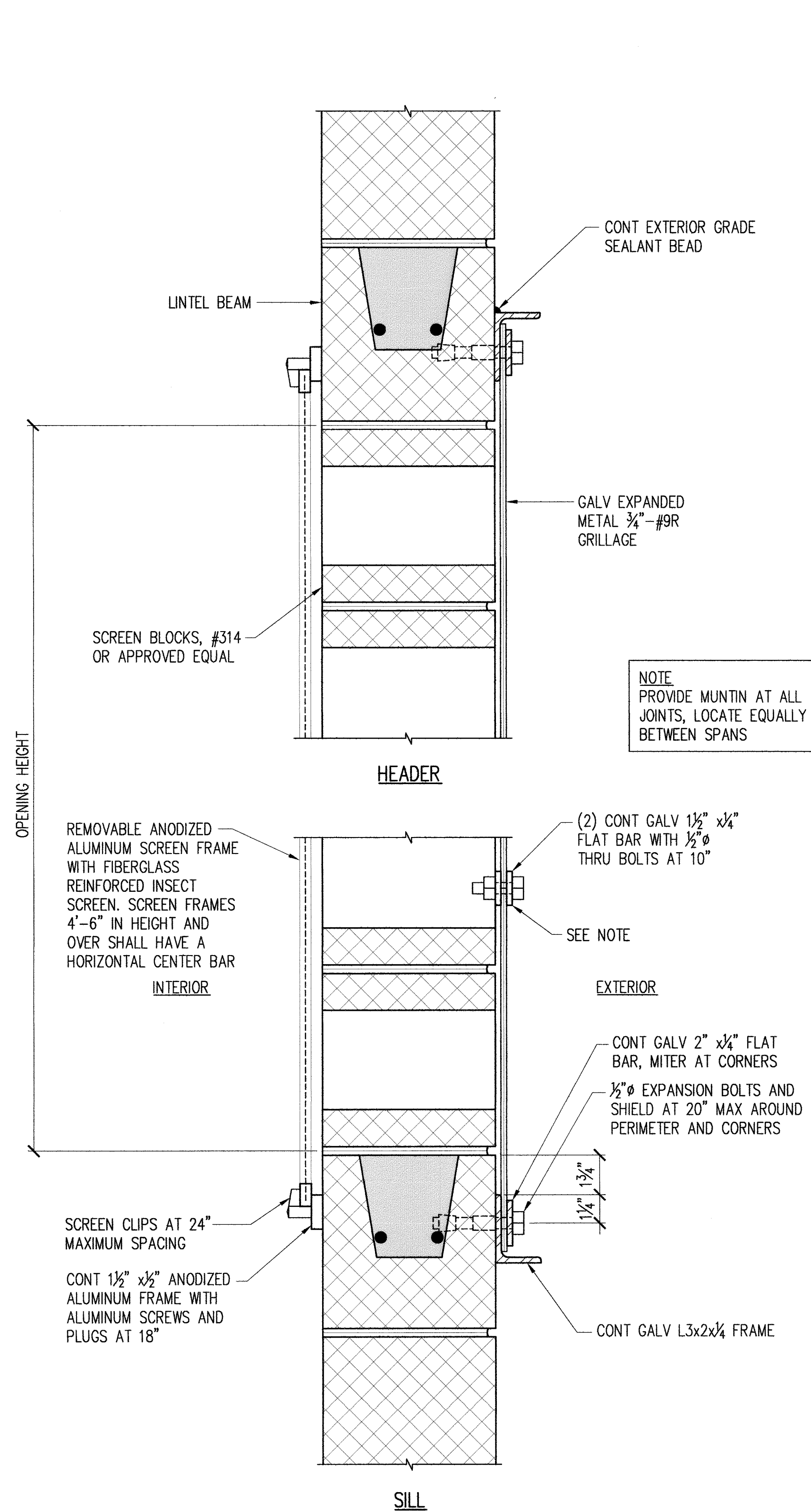
**DOOR DETAILS**

FILE

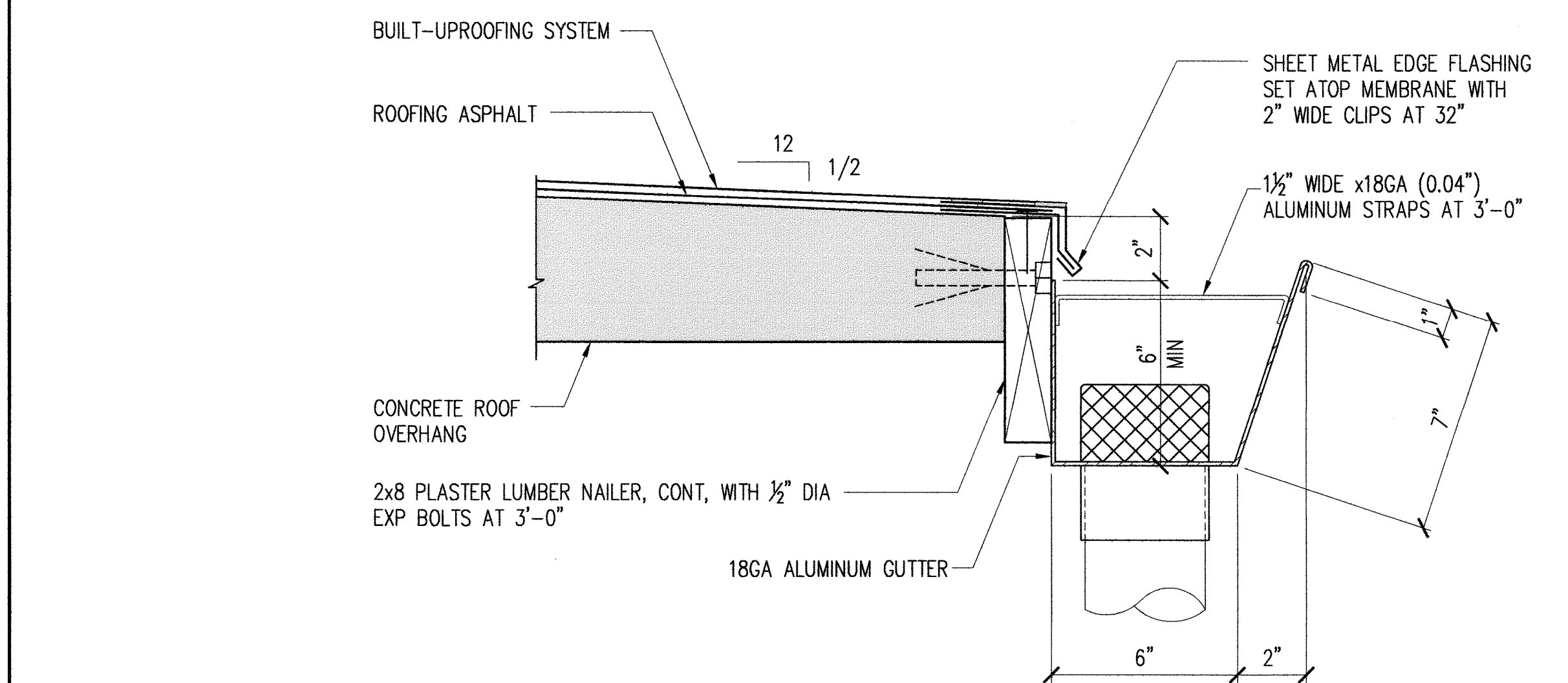
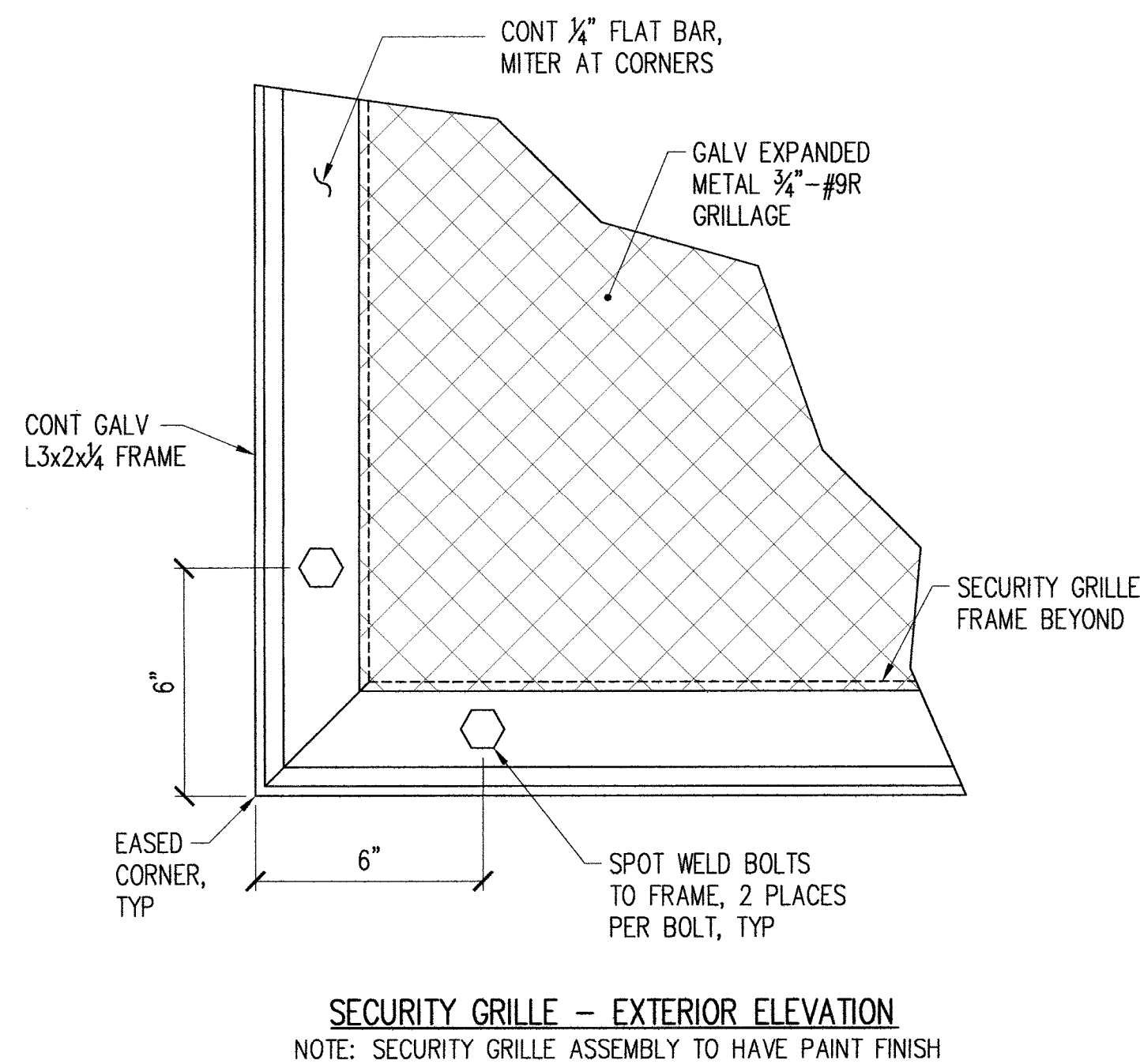
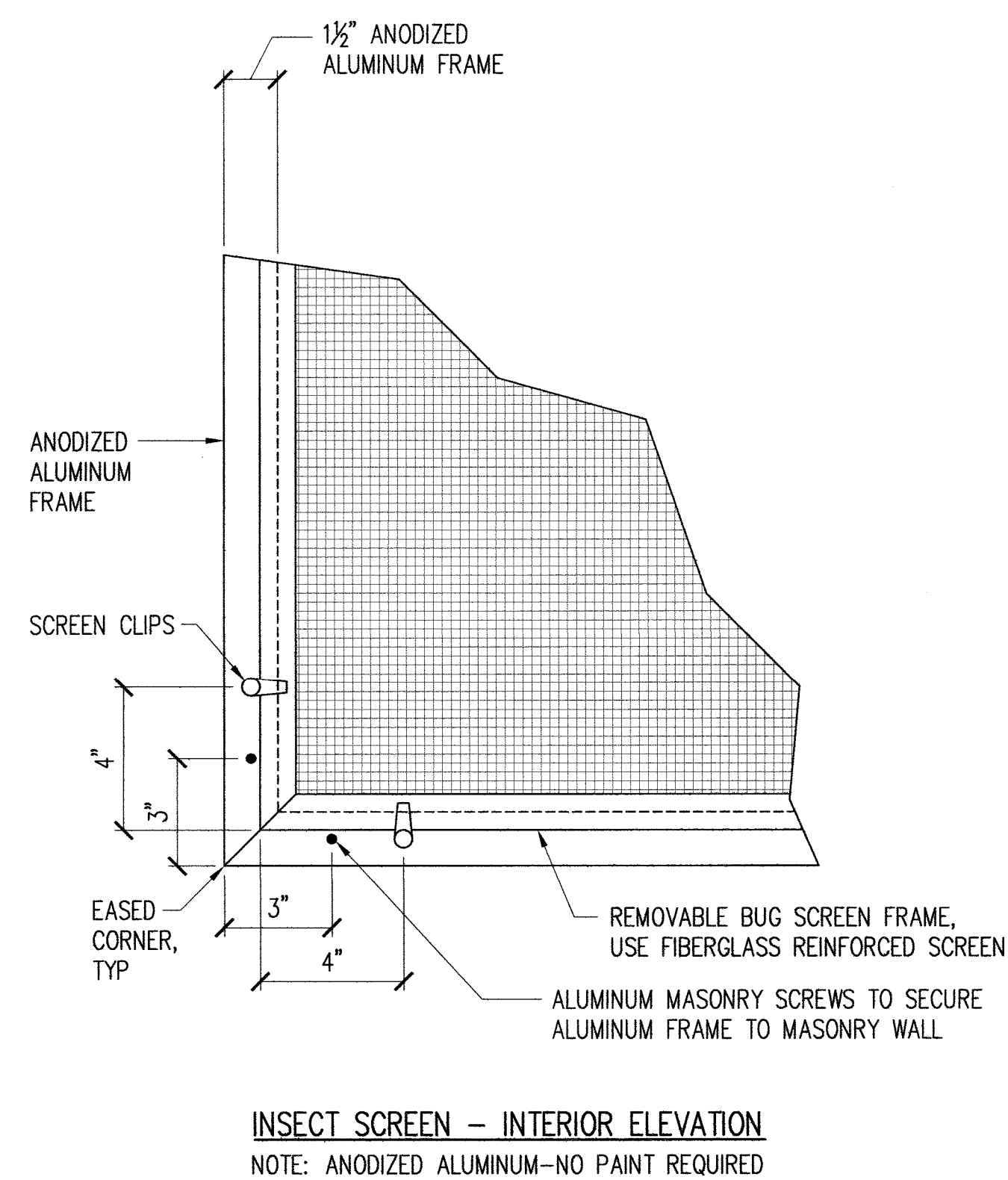
POCKET

FOLDER

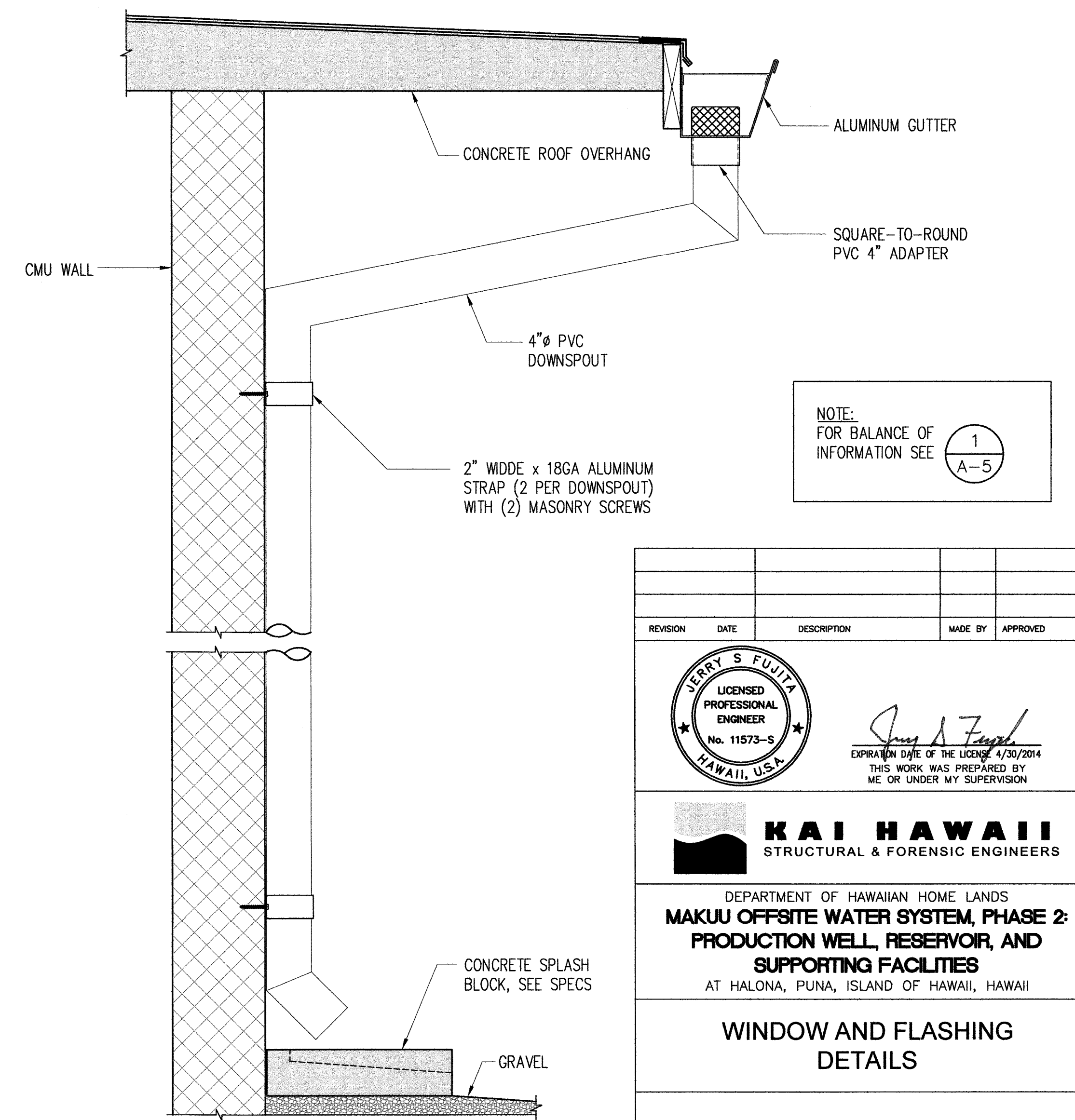
NO.



**SCREEN BLOCK WINDOW WITH SECURITY GRILLE**  
SCALE: 3" = 1'-0"



**FLASHING GUTTER DETAIL**  
SCALE: 3" = 1'-0"



**GUTTER AND DOWNSPOUT DETAIL**  
SCALE: 3" = 1'-0"

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

**JERRY S. FUJITA**  
LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, U.S.A.

*James A. Zepher*  
EXPIRATION DATE OF THE LICENSE 4/30/2014  
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**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:**  
**PRODUCTION WELL, RESERVOIR, AND**  
**SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**WINDOW AND FLASHING**  
**DETAILS**

**1**  
A-5

**2**  
A-5

FILE	POCKET	FOLDER	NO.



BUILDING GENERAL NOTES:

1. FOUNDATION PREPARATION

- A. STRUCTURAL EXCAVATION FOR THE CONTROL BUILDING FOUNDATION SHALL BE TAKEN TO UNDISTURBED BASALT MATERIAL. ANY LOOSE SPOTS SHALL BE EXCAVATED AND COMPACTED TO A MINIMUM 90 PERCENT COMPACTION AS DETERMINED BY ASTM D1557. ANY OVER-EXCAVATIONS SHALL BE FILLED WITH DWS 2500 CONCRETE.
- B. THE CONTROL BUILDING FLOOR SLAB AREAS SHALL BE UNDERLAIN BY 6 INCHES THICKNESS OF AGGREGATE FOR UNTREATED BASE COURSE MATERIAL. THE BASE COURSE SHALL BE COMPACTED TO A MINIMUM 95 PERCENT COMPACTION AS DETERMINED BY ASTM D1557. THE FLOOR SLAB SHALL ALSO BE PROTECTED BY A MINIMUM 6 MILS PLASTIC MOISTURE BARRIER.

2. DESIGN DATA

ROOF LOAD (LIVE LOAD) — 20 PSF  
CONCRETE — 3000 PSI (28 DAY COMPRESSIVE STRENGTH)  
(DESIGN BASED ON 2500 PSI COMPRESSIVE STRENGTH)  
FOUNDATION — 8000 PSF (ALLOWABLE SOIL BEARING PRESSURE)  
REINFORCING STEEL — DEFORM GRADE 60

3. CONSTRUCTION NOTES

- A. ALL WOOD SHALL BE WOLMANIZED S4S AS SPECIFIED. LUMBER GRADE NO. 1 OR BETTER. ISOLATE ALL WOOD FROM MASONRY WITH ASPHALT FELT. TRUSS SHALL BE BRACED UNTIL ROOF SHEATHING IS INSTALLED

4. REINFORCED CONCRETE

- CONCRETE REINFORCING COVER (MIN)  
A. FOOTING AND SLAB ON GRADE — 3"  
B. FOR ALL OTHER LOCATIONS — 1 1/2"

SPLICES IN REINFORCEMENT

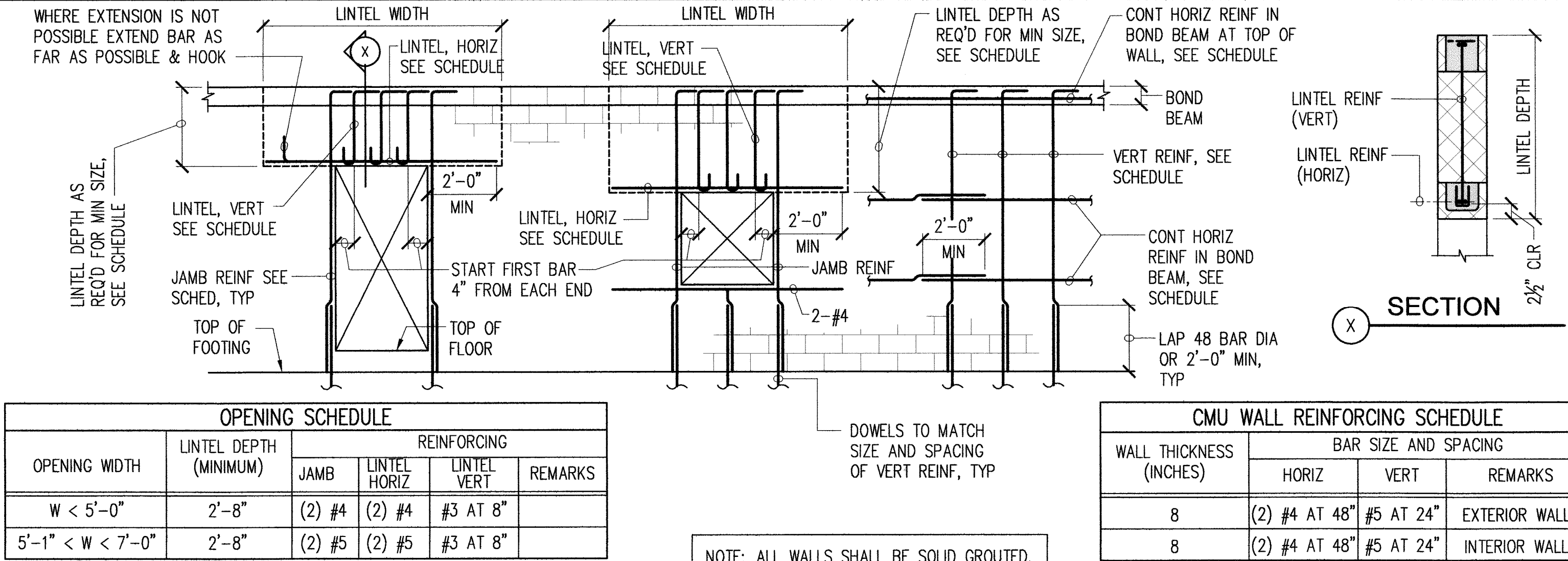
- A. LAPPED SPLICES SHALL BE STAGGERED WHERE POSSIBLE.  
B. MINIMUM LAP UNLESS OTHERWISE NOTED:  
1. BEAM AND SLABS—40 BAR DIAMETERS BUT NOT LESS THAN 15 INCHES.  
2. COLUMNS AND WALLS—35 BAR DIAMETERS BUT NOT LESS THAN 12 INCHES.  
C. SPLICES SHALL BE ALLOWED ONLY IN COMPRESSIVE AREA—TOP BARS AT MIDSPAN OR BOTTOM BARS OVER SUPPORTS.

5. CONCRETE MASONRY UNITS (CMU)

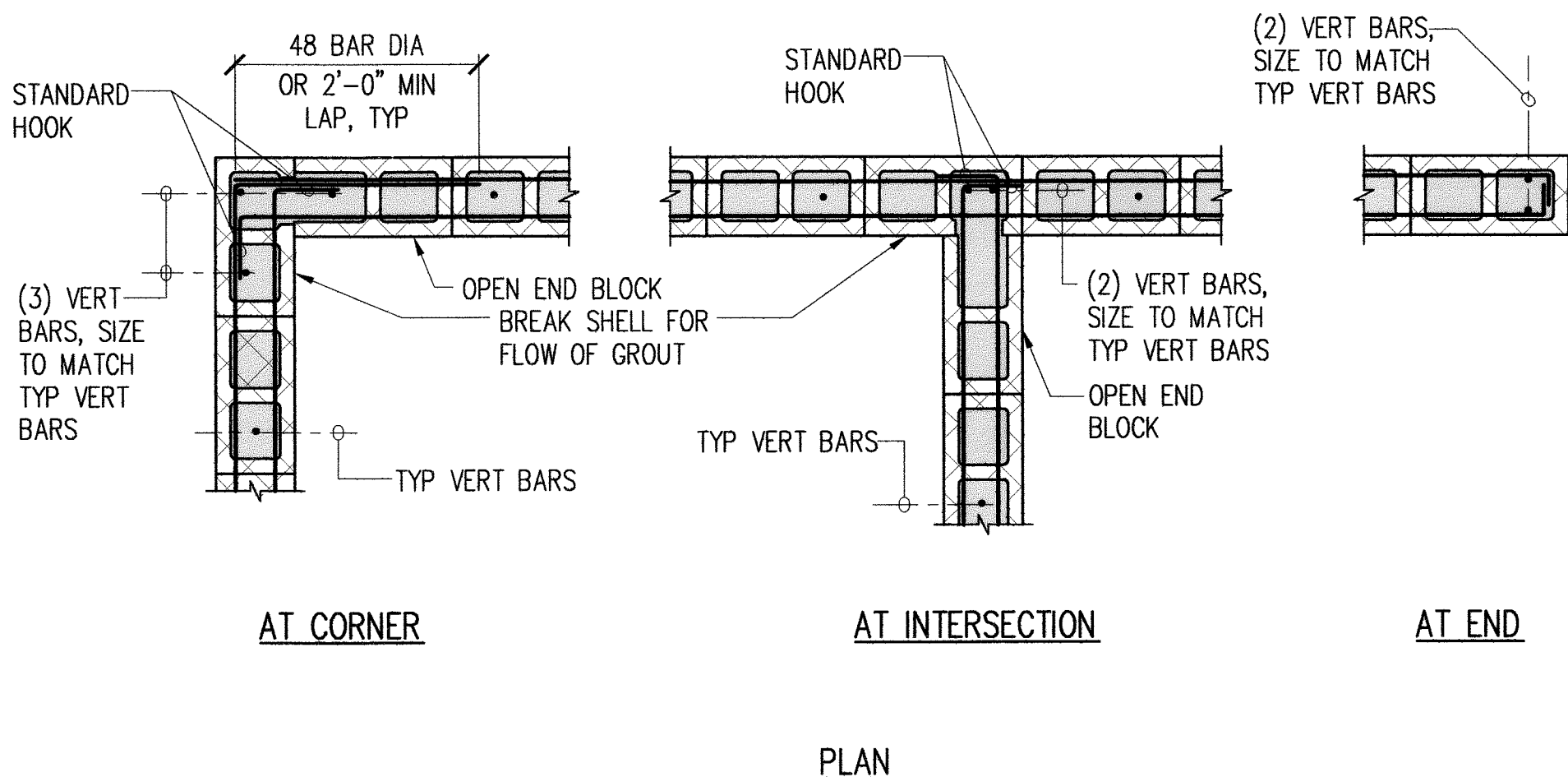
- A. UNLESS OTHERWISE SHOWN ON PLANS, CMU SHALL BE TWO (2) CELLED TYPE AND SHALL BE REINFORCED WITH ONE #5 VERTICAL AT 24 INCHES ON CENTER. ALL CELLS SHALL BE GROUTED WITH 2500 PSI GROUT. SHOULD GROUTING BE STOPPED IN EXCESS OF ONE HOUR, GROUT SHALL BE STOPPED 1 1/2 INCHES BELOW THE TOP OF CELLS.
- B. GROUT ALL CELLS SOLID.
- C. IN ADDITION TO THE REINFORCEMENT SCHEDULE DESCRIBED ABOVE, ADD TWO (2) #5 AT ALL WALL INTERSECTIONS, JAMBS AND DISCONTINUOUS ENDS.
- D. CONCRETE BLOCKS MASONRY UNITS: ASTM C90, GRADE N, TYPE H, NORMAL WEIGHT UNITS WITH A MINIMUM COMPRESSIVE STRENGTH OF 1,500 PSI.
- E. MORTAR: TYPE M, 2,000 PSI MINIMUM COMPRESSIVE STRENGTH AT TWENTY EIGHT (28) DAYS.
- F. GROUT: 2,500 PSI MINIMUM COMPRESSIVE STRENGTH AT TWENTY EIGHT (28) DAYS.
- G. CONSTRUCTION SHALL COMPLY WITH SECTION 2104 OF THE 2003 IBC AND ACI 530.1-05/ASCE 6-05/TMS 402-5, UNLESS NOTED OTHERWISE.
- H. PERIODIC SPECIAL INSPECTION OF MASONRY CONSTRUCTION REQUIRED.

6. SPECIAL INSPECTION FOR CONTROL BUILDING:

- A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT SPECIAL INSPECTION OF PORTIONS OF THE WORK AS REQUIRED BY THE BUILDING CODE IS MADE AT THE APPROPRIATE TIME. THE CONTRACTOR SHALL GIVE TIMELY NOTICE OF WHEN AND WHERE INSPECTIONS ARE TO BE MADE AND PROVIDE ACCESS FOR THE INSPECTOR. THE CONTRACTOR SHALL CORRECT DEFECTIVE WORK AT NO ADDITIONAL COST TO THE OWNER AND PAY FOR RE-INSPECTION.
- B. THE SPECIAL INSPECTOR SHALL KEEP RECORDS OF SPECIAL INSPECTIONS AND FURNISH SPECIAL INSPECTION REPORTS TO THE OWNER. REPORTS SHALL INDICATE WHAT WORK WAS INSPECTED AND LIST DISCREPANCIES OBSERVED. DISCREPANCIES ARE TO BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION.
- C. THE FOLLOWING TYPE OF WORK LISTED UNDER THE BUILDING CODE AND IBC 2003, SECTION 1704 REQUIRES SPECIAL INSPECTION:  
1. CONCRETE CONSTRUCTION FOR ROOF SLAB (SECTION 1704.4 AND TABLE 1704.4)  
a. REINFORCING STEEL PLACEMENT  
b. BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE  
c. CONCRETE PLACEMENT  
d. MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES  
2. MASONRY CONSTRUCTION (TABLE 1704.5.3)  
a. PERIODIC INSPECTION OF PLACEMENT OF MASONRY UNITS AND CONSTRUCTION OF MORTAR JOINTS  
b. REINFORCEMENT SIZE AND PLACEMENT PRIOR TO GROUT PLACEMENT  
c. CONTINUOUS INSPECTION OF GROUT SPACES AND PLACEMENT OF GROUT  
3. SEISMIC RESISTANCE OF MECHANICAL AND ELECTRICAL COMPONENTS  
4. POST INSTALLED ADHESIVE ANCHORS IN CONCRETE OR MASONRY  
5. SEE DRAWINGS FROM OTHER DISCIPLINES FOR NON-STRUCTURAL SPECIAL INSPECTION REQUIREMENTS
- D. SPECIAL INSPECTION IS NOT REQUIRED DUE TO CODE EXEMPTIONS FOR FOUNDATION CONCRETE (IT HAS BEEN DESIGNED TO A COMPRESSIVE STRESS OF 2,500 PSI) OR NON-STRUCTURAL SLABS SUPPORTED DIRECTLY ON GROUND.



1 TYPICAL CMU WALL ELEVATION DETAIL  
S-1 NOT TO SCALE

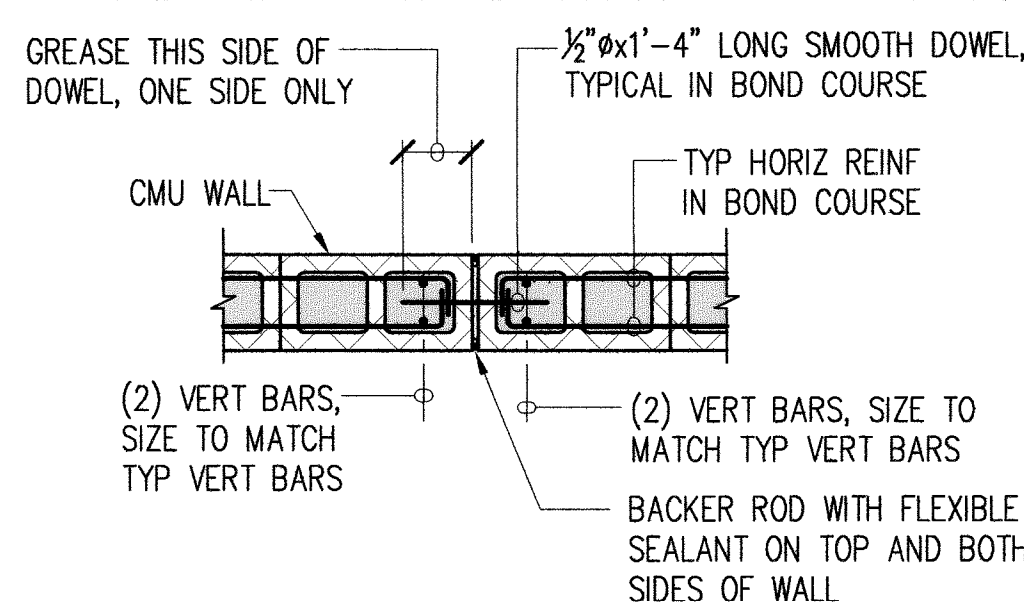


3 CMU WALL REINFORCING AT BOND BEAMS  
S-1 NOT TO SCALE

MINIMUM SPLICE & EMBEDMENT LENGTHS										
BAR SIZE	CONCRETE STRENGTH = 3,000 PSI					CONCRETE STRENGTH = 4,000 PSI				
	LAP SPLICE		EMBEDMENT			LAP SPLICE		EMBEDMENT		
	BOT BAR OR WALL BAR	TOP BAR	BOT BAR OR WALL BAR	TOP BAR	W/ STD HOOK	BOT BAR OR WALL BAR	TOP BAR	BOT BAR OR WALL BAR	TOP BAR	W/ STD HOOK
#3, #4	24"	30"	18"	24"	12"	20"	26"	16"	20"	10"
#5	30"	38"	22"	30"	14"	26"	34"	20"	26"	12"
#6	36"	46"	28"	36"	18"	30"	40"	24"	30"	16"
#7	50"	66"	40"	50"	20"	44"	58"	34"	44"	18"
#8	58"	76"	44"	58"	22"	50"	66"	38"	50"	20"
#9	66"	84"	50"	66"	26"	56"	74"	44"	56"	22"
#10	74"	96"	56"	74"	28"	64"	82"	50"	64"	26"
#11	80"	106"	62"	80"	32"	70"	92"	54"	70"	28"

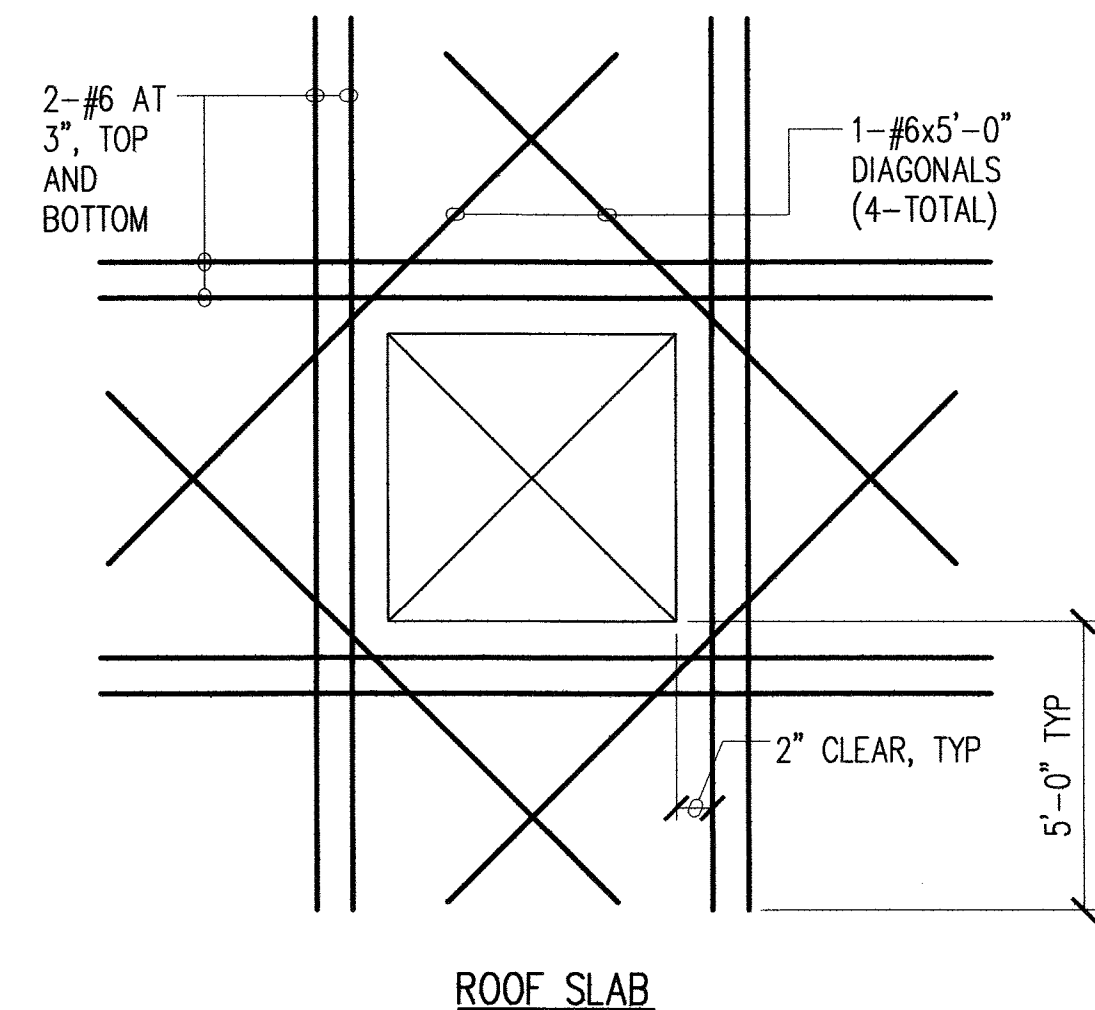
- NOTES:
1. LENGTHS ARE FOR CONCRETE WITH REBAR SPACE 6 BAR DIAMETERS MINIMUM. INCREASE 25% FOR BARS SPACED LESS THAN 6 BAR DIAMETERS.
2. "TOP BARS" ARE HORIZONTAL BARS WITH 12" OR MORE OF CONCRETE CAST BELOW.

5 TYPICAL REBAR SPLICE AND EMBEDMENT LENGTH SCHEDULE  
S-1 NOT TO SCALE

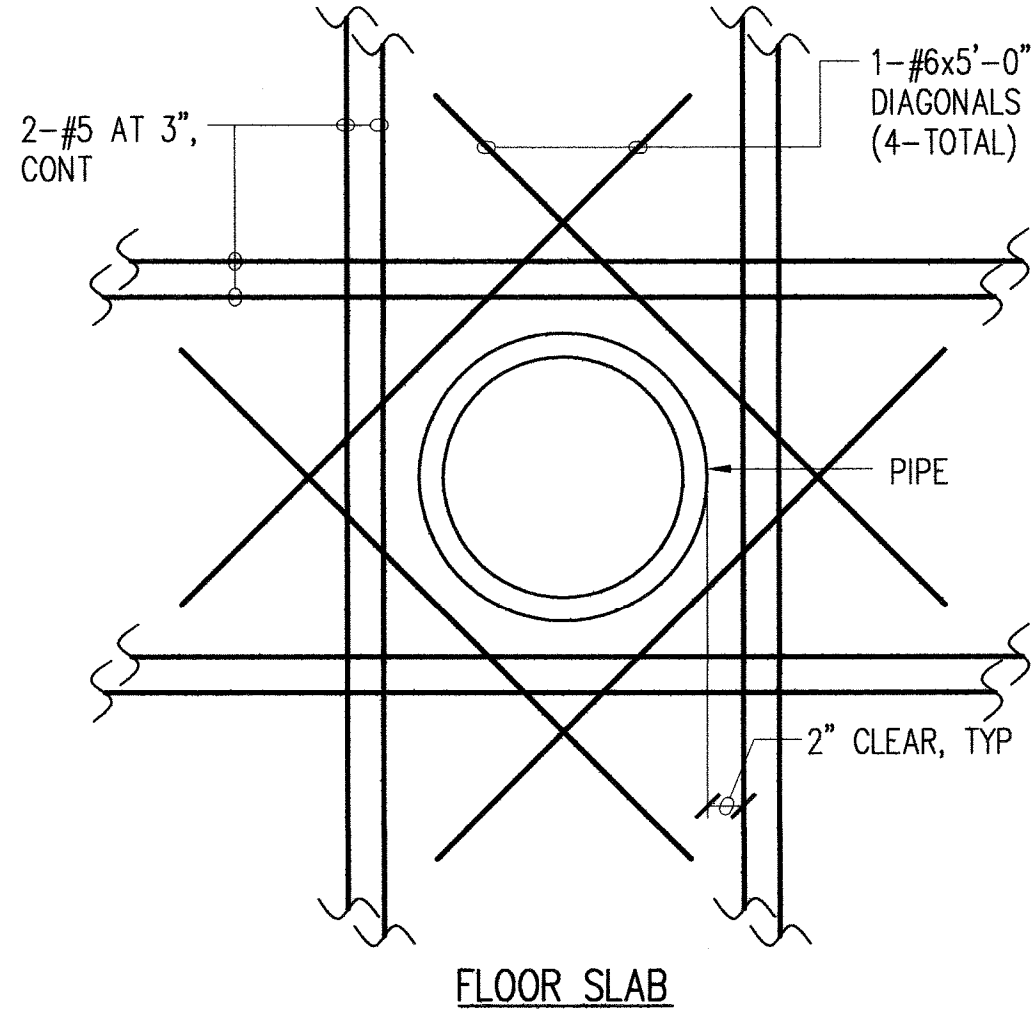


- NOTES:
1. CONTROL JOINTS SHALL BE A MAXIMUM OF 25'-0" APART AND 10'-0" MINIMUM FROM CORNER, OR AS SHOWN ON PLANS.
2. CONTROL JOINT SHALL BE CONTINUOUS VERTICAL LINE FROM TOP OF FOOTING TO TOP OF WALL.
3. ALL HORIZONTAL REINFORCING SHALL BE DISCONTINUOUS ACROSS CONTROL JOINTS, EXCEPT BOND COURSE AT THE TOP OF ALL WALLS.

2 TYPICAL CMU WALL CONTROL JOINT  
S-1 NOT TO SCALE



4 TYPICAL ADDED REINFORCING AT FLOOR AND ROOF SLAB OPENINGS  
S-1 NOT TO SCALE



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

EXPIRATION DATE OF THE LICENSE 6/30/2014  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFF-SITE WATER SYSTEM, PHASE 2:**  
**PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

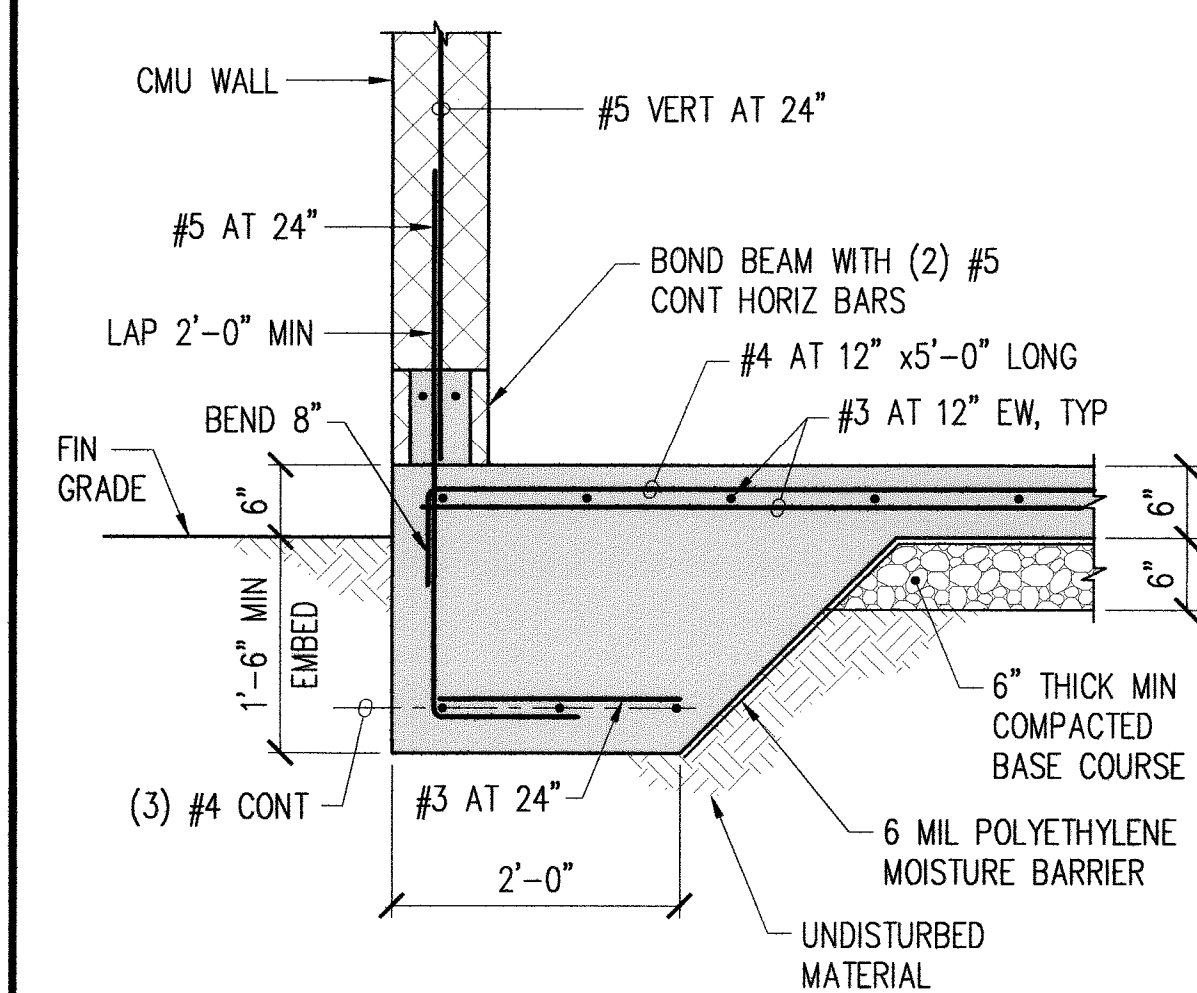
**BUILDING GENERAL NOTES AND TYPICAL DETAILS**

SHEET S-1 OF SHEETS

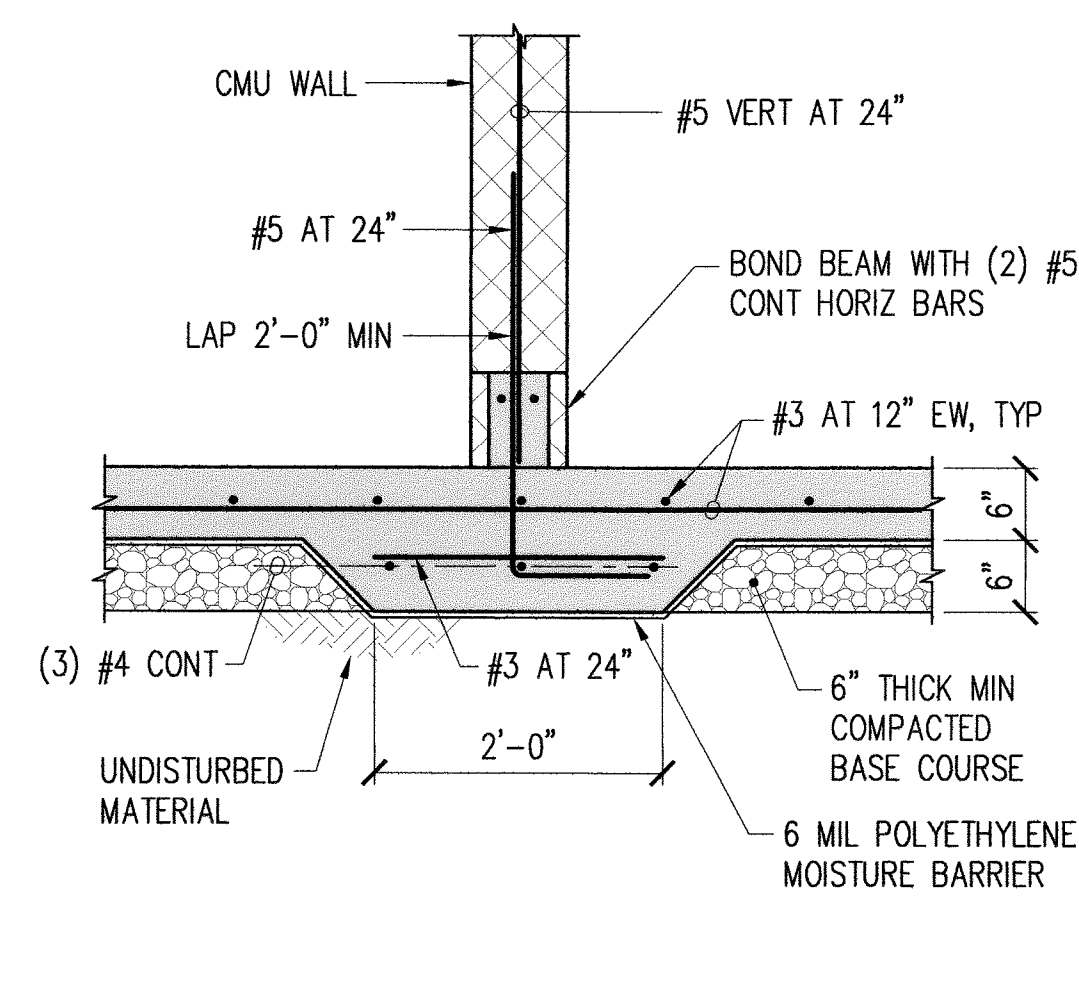
FILE	POCKET	FOLDER	NO.

S-1

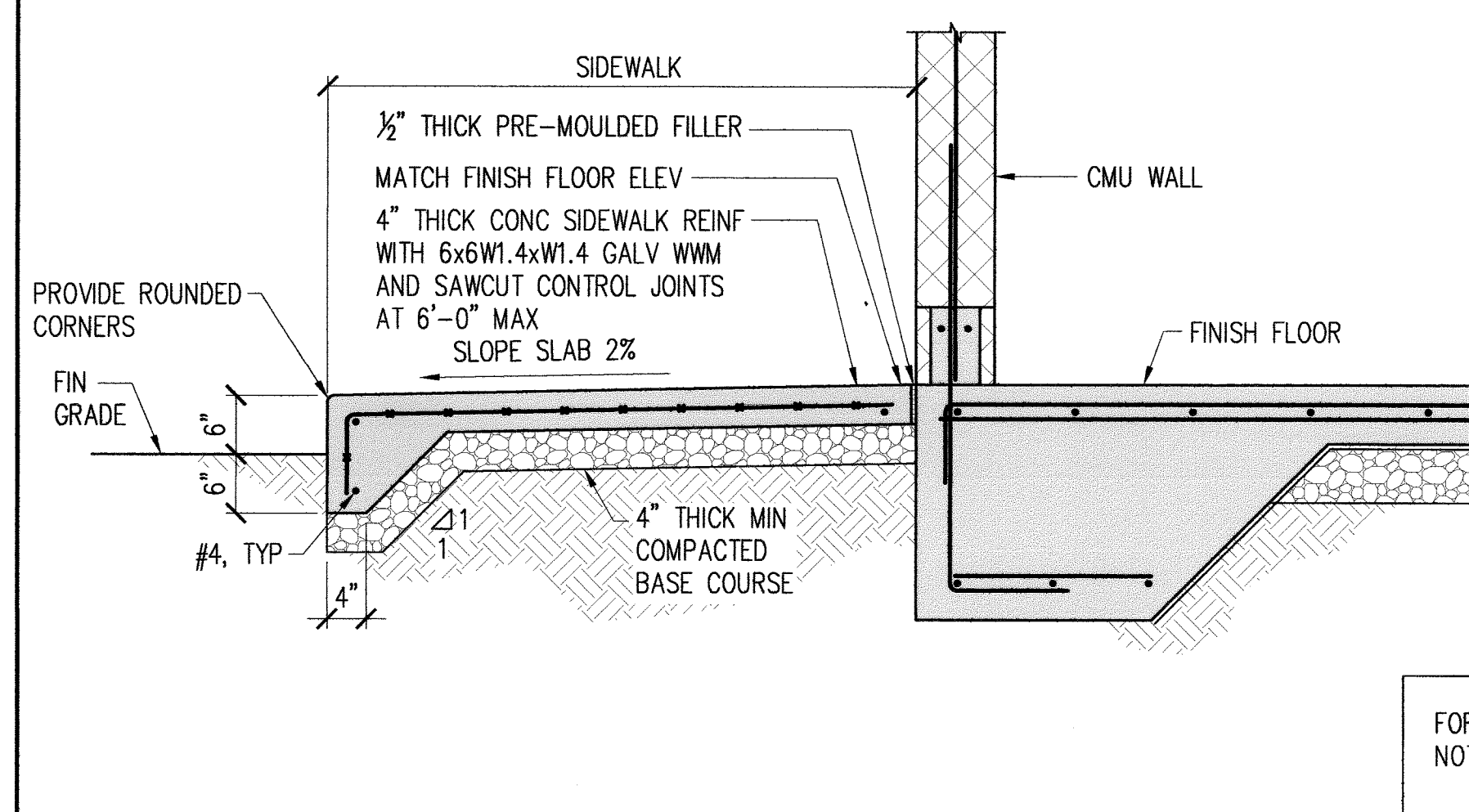




1 SECTION (WF-1)  
S-2 SCALE: 3/4" = 1'-0"

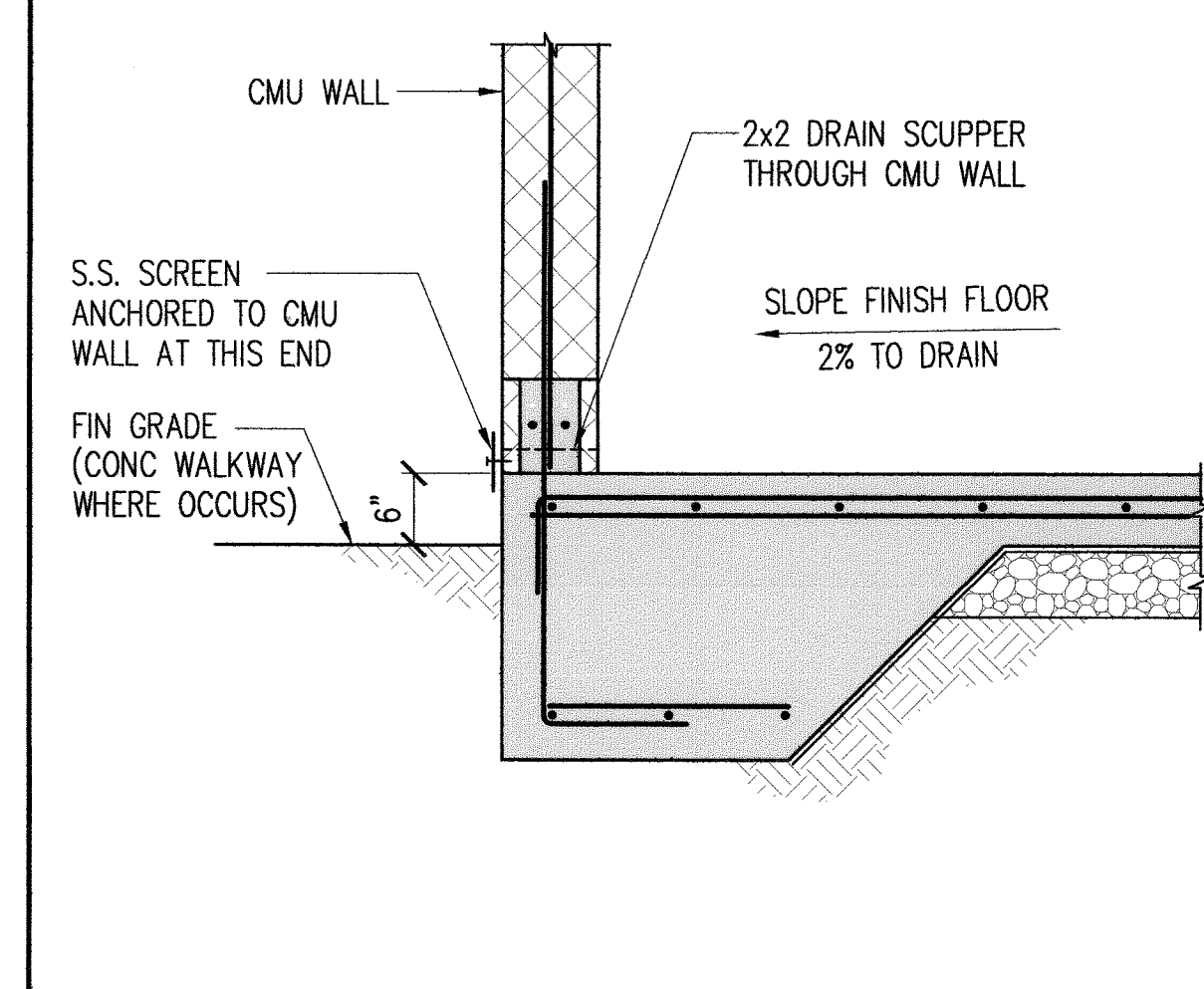


2 SECTION (WF-2)  
S-2 SCALE: 3/4" = 1'-0"

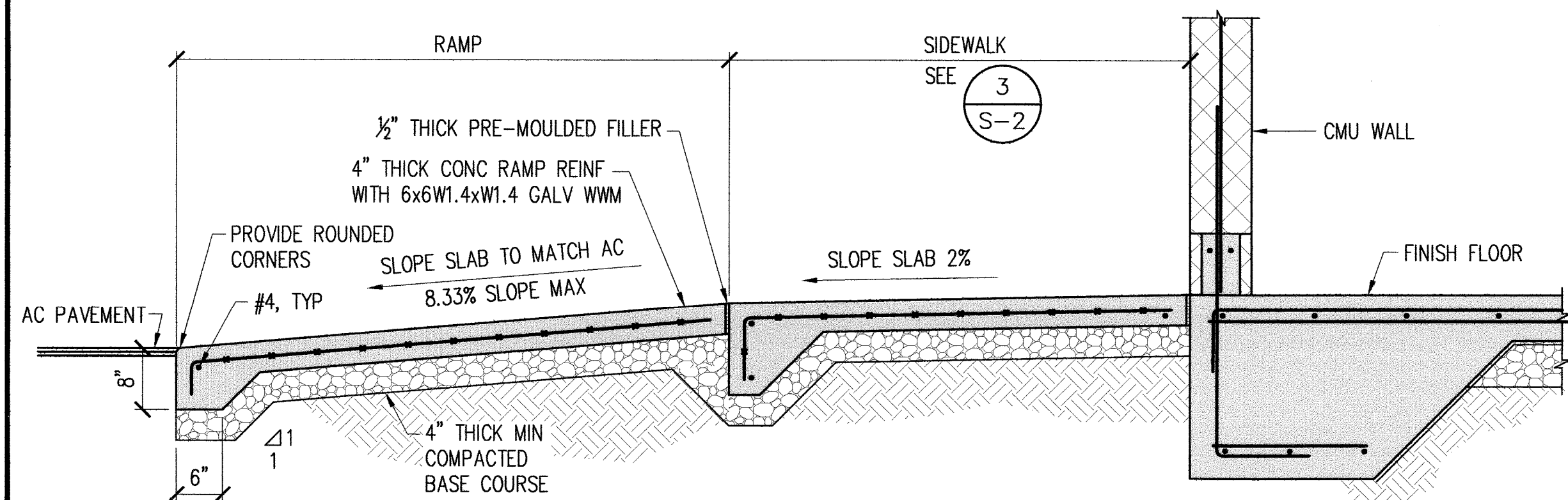


3 SECTION  
S-2 SCALE: 3/4" = 1'-0"

FOR BALANCE OF INFORMATION  
NOT NOTED, SEE 1  
S-2

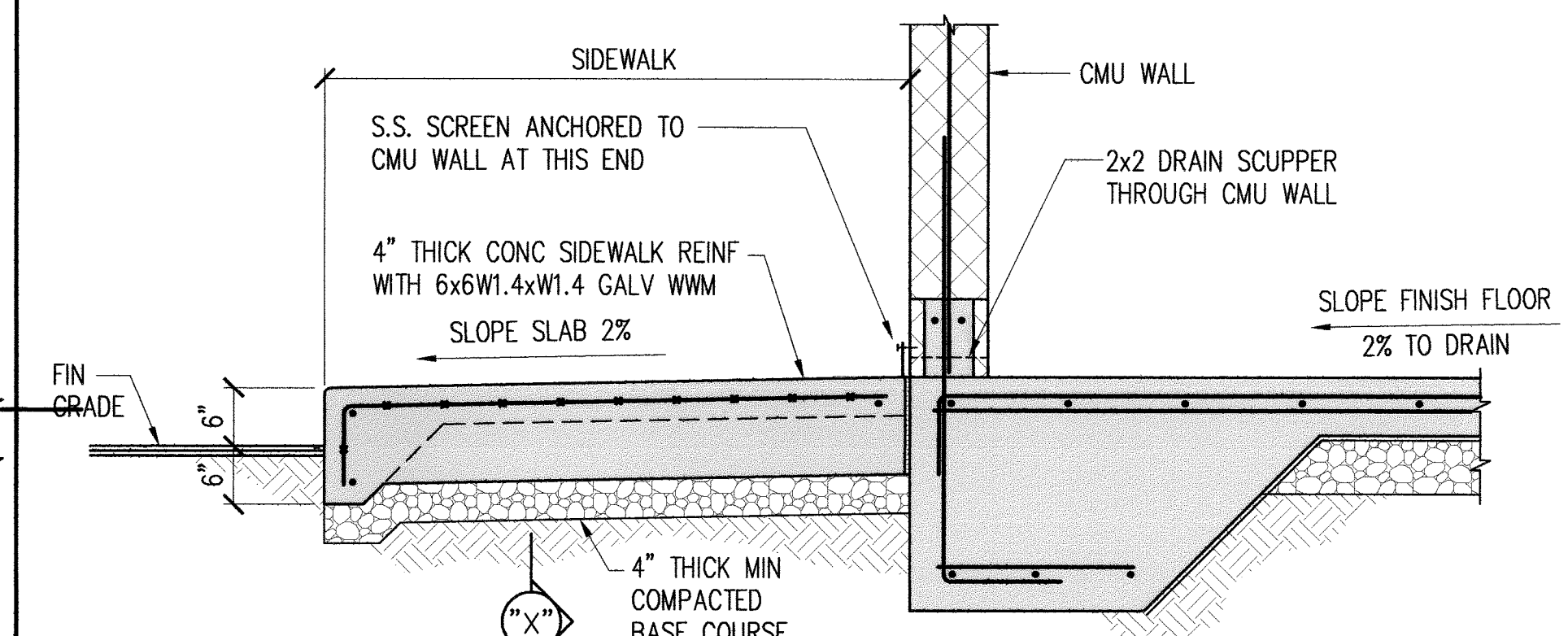


4 DRAIN DETAIL  
S-2 SCALE: 3/4" = 1'-0"

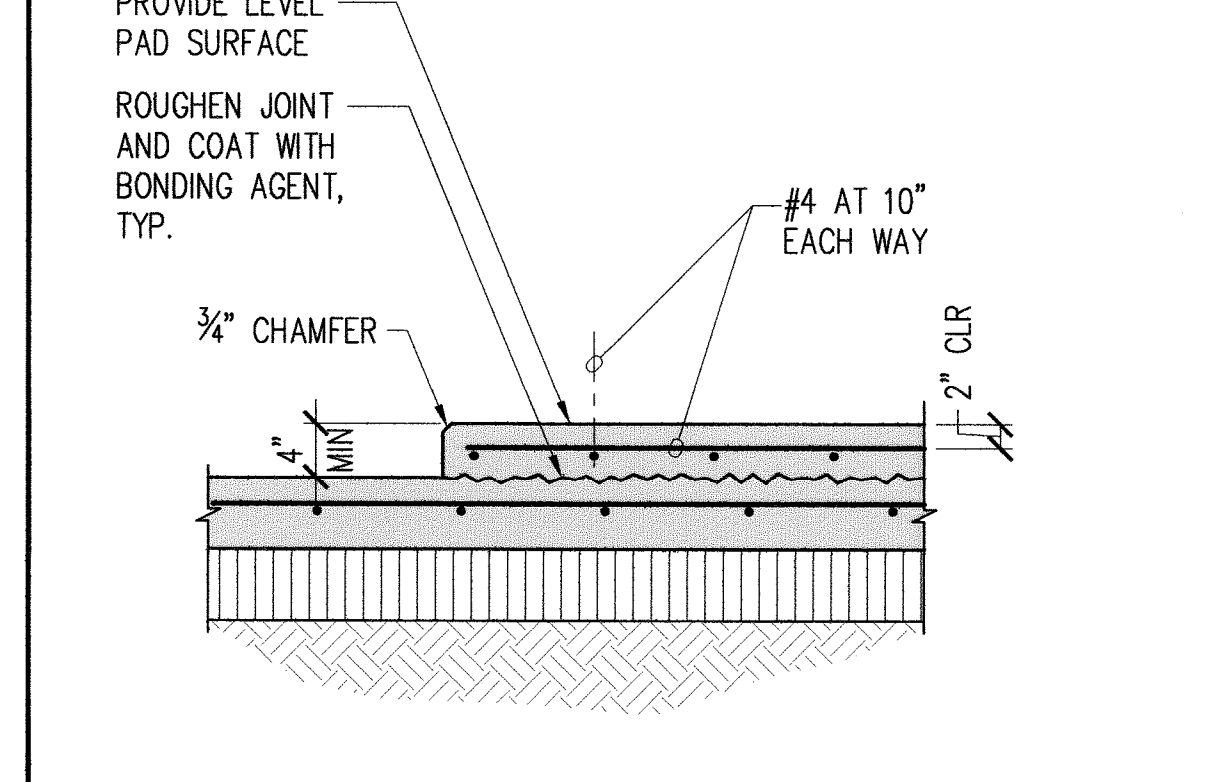


5 SECTION  
S-2 SCALE: 3/4" = 1'-0"

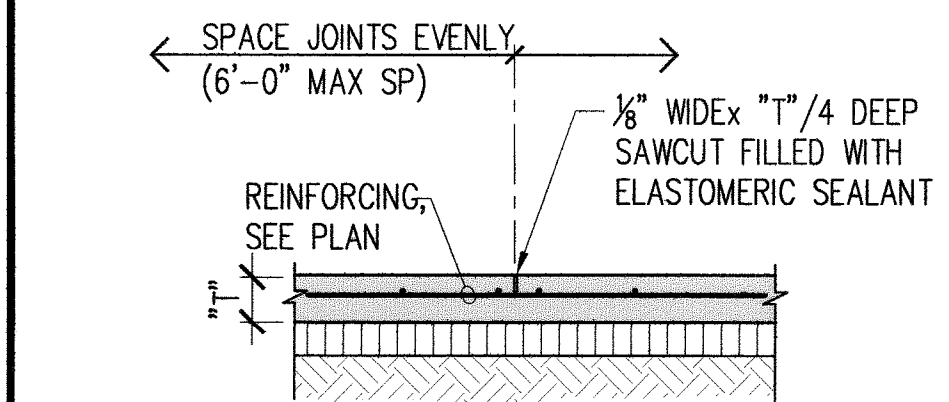
FOR BALANCE OF INFORMATION  
NOT NOTED, SEE 1  
S-2



6 DRAIN DETAIL (TYPICAL OF 6)  
S-2 SCALE: 3/4" = 1'-0"



7 EQUIPMENT PAD  
S-2 SCALE: 3/4" = 1'-0"



8 TYPICAL SAWCUT JOINT  
S-2 SCALE: 3/4" = 1'-0"

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

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LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, USA

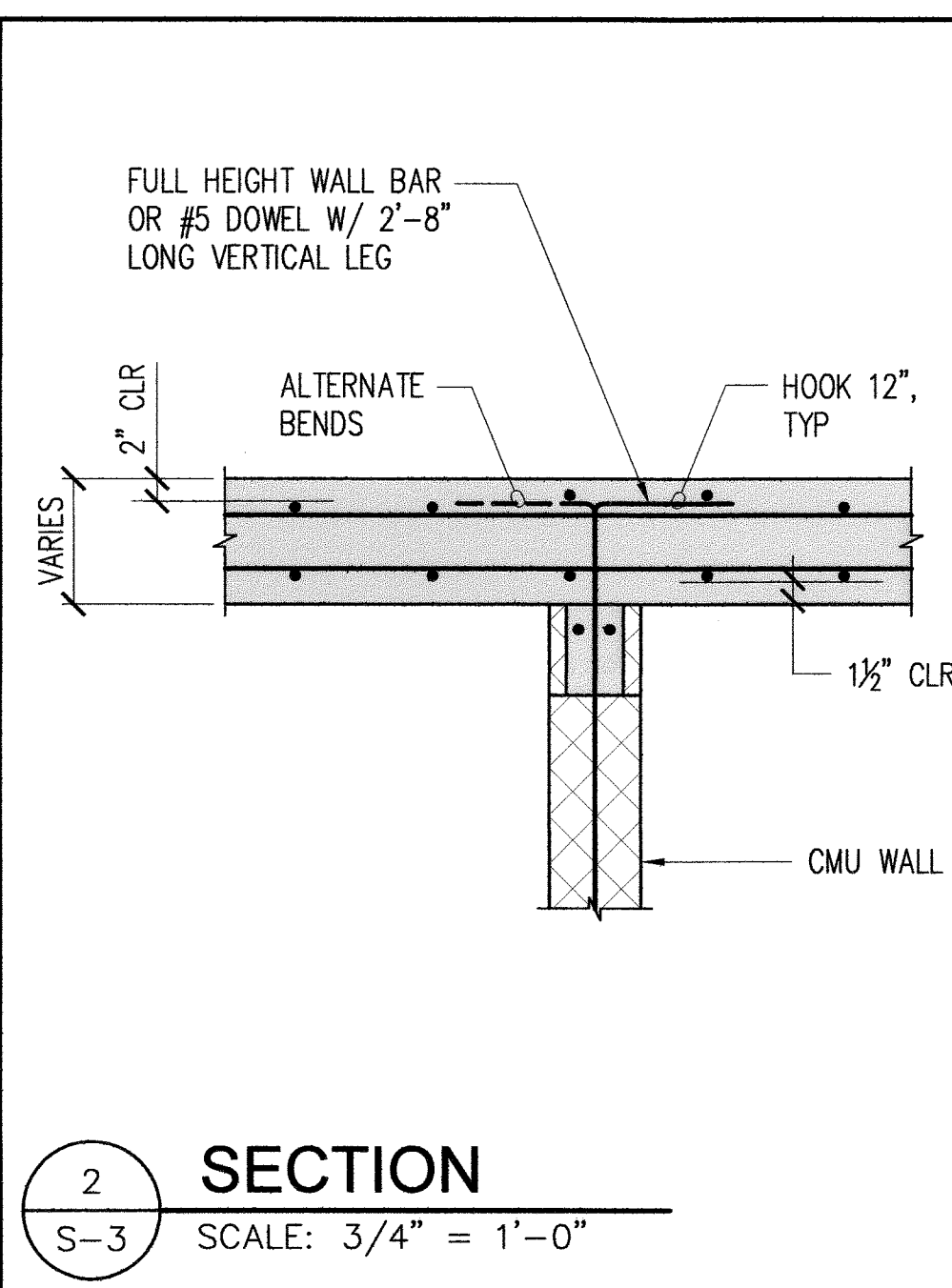
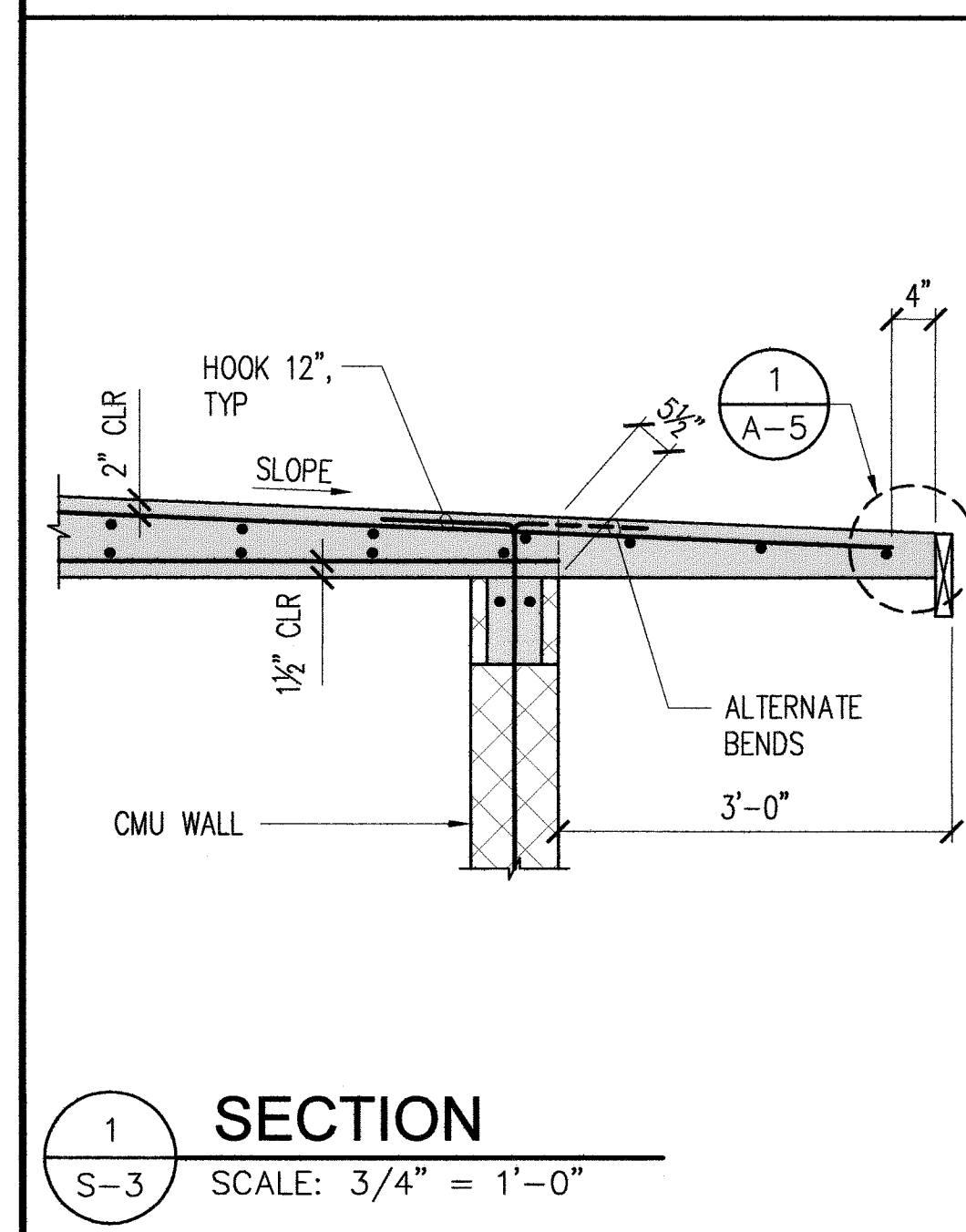
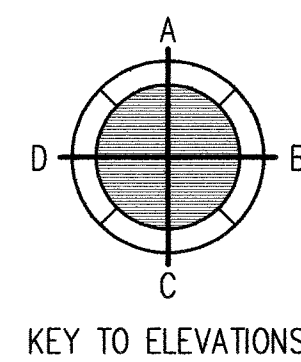
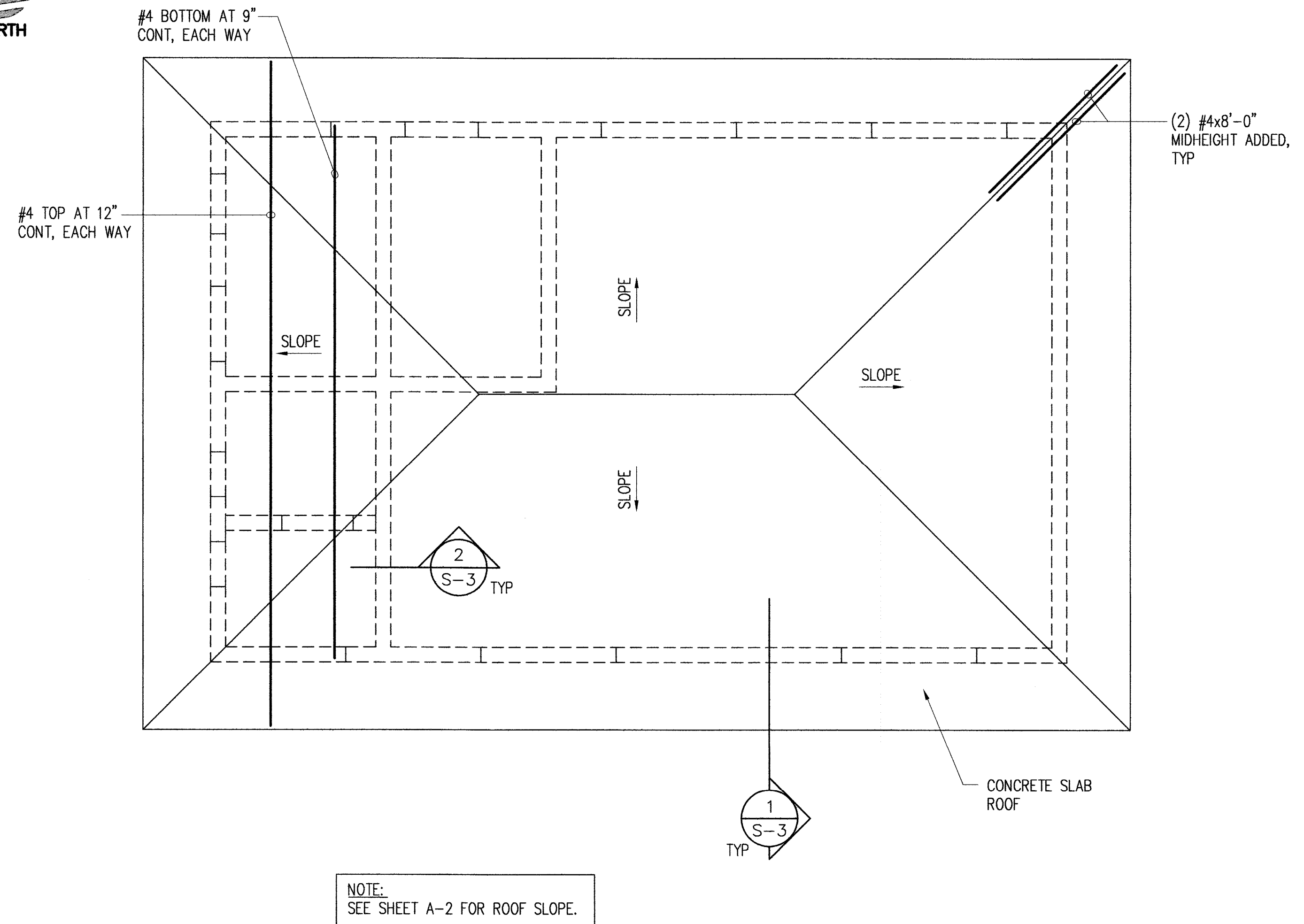
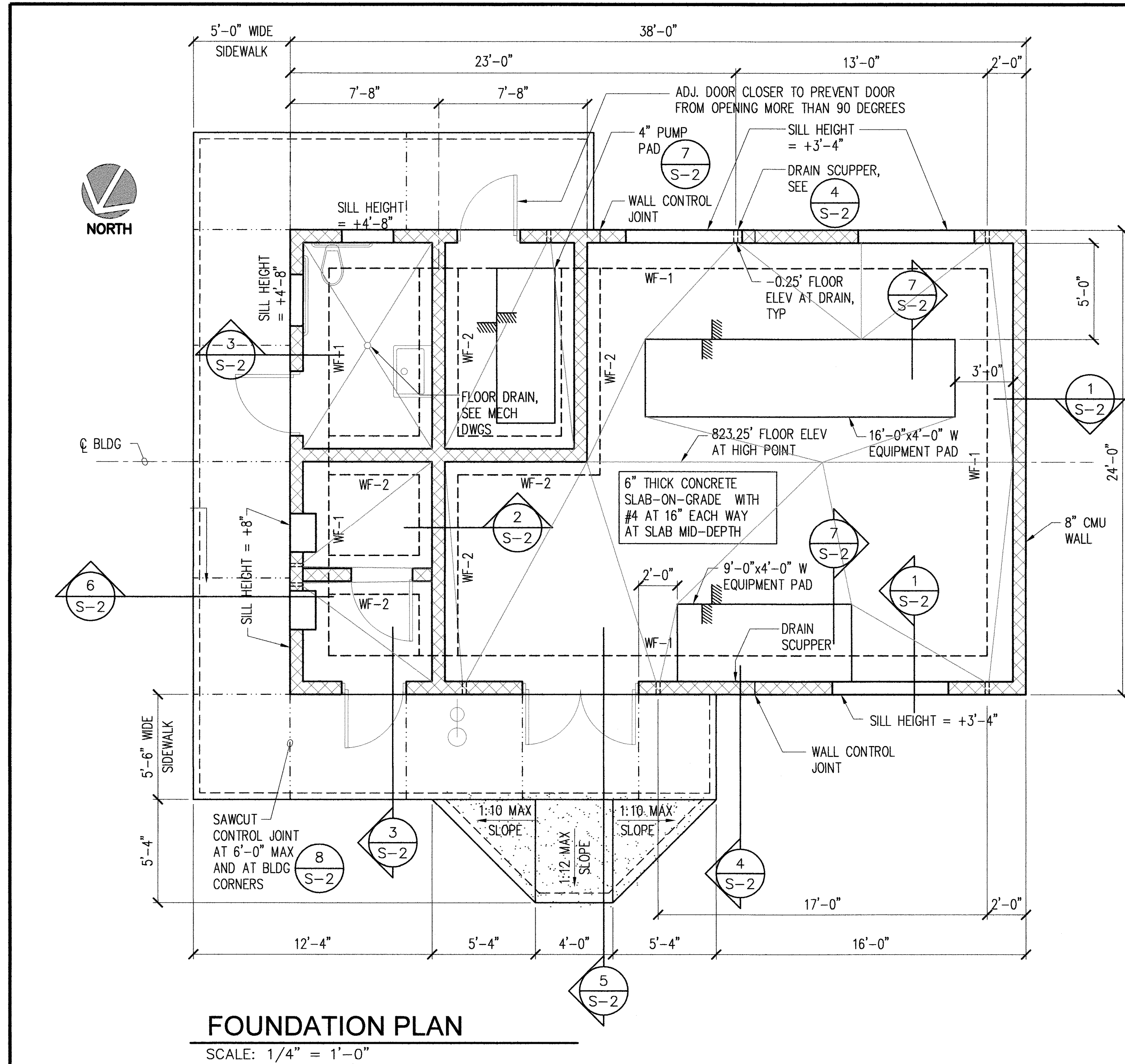
*Jerry S. Fujita*  
EXPIRATION DATE OF THE LICENSE 4/30/2014  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**CONTROL BUILDING  
FOUNDATION DETAILS**





REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

**JERRY S. FUJITA**  
LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, USA

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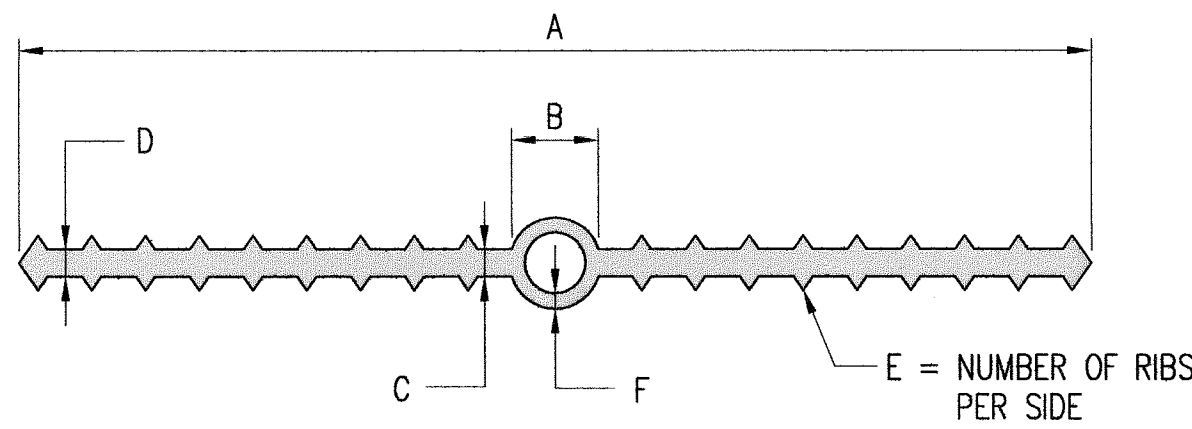
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**CONTROL BUILDING  
FOUNDATION AND ROOF  
SLAB PLANS**

**S-3**







TYPE	LOCATION	A	B	C	D	E	F	VNYLEX	GREENSTREAK
I	WALL TO WALL FOOTING	9"	1"	3/8"	3/8"	8	1/2"	RLB9-38	735
II	VERTICAL WALL, FLOOR AND ROOF SLAB JOINTS*	6"	-	3/8"	7/16" OR 3/8"	7	-	R6-38	679
III	FLOOR TO PIPE BLOCKS	6"	1" OR 7/8"	3/8"	3/8"	7 OR 8	1/4" OR 3/32"	RB6-38H	732

\* SEE NOTE 1 BELOW

NOTES:

1 NO CENTER BULB ALLOWED IN THE WATER STOP FOR VERTICAL JOINTS AND FLOOR AND ROOF JOINTS.

2. SEE SPECIFICATIONS FOR MATERIAL REQUIREMENTS.

3. ALL SPLICES SHALL BE MADE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

PVC WATER STOP SCHEDULE

1

S-5

NOT TO SCALE

WATERSTOP NOTES:

A. SEE SPECIFICATION FOR MATERIAL REQUIREMENTS.

B. WATERSTOPS SHALL BE HELD IN PLACE IN THE FORMS BY THE USE OF A SPLIT FORM OR OTHER APPROVED METHOD.

C. 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.

D. 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.

E. 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.

MINIMUM SPLICE & EMBEDMENT LENGTHS

BAR SIZE	CONCRETE STRENGTH = 4,500 PSI						CONCRETE STRENGTH = 4,000 PSI				
	LAP SPLICE			EMBEDMENT			LAP SPLICE			EMBEDMENT	
	BOT BAR OR WALL BAR	TOP BAR	W/ STD HOOK	STRAIGHT		W/ STD HOOK	BOT BAR OR WALL BAR	TOP BAR	W/ STD HOOK	STRAIGHT	
				BOT BAR OR WALL BAR	TOP BAR					BOT BAR OR WALL BAR	TOP BAR
#3, #4	24"	32"	18"	24"	8"	25"	33"	19"	25"	8"	
#5	32	42"	24"	32"	9"	32"	42"	24"	32"	10"	
#6	36"	47"	27"	36"	11"	38"	50"	29"	38"	12"	
#7	52"	68"	40"	52"	13"	55"	72"	42"	55"	14"	
#8	59"	77"	45"	59"	15"	63"	82"	48"	63"	16"	
#9	67"	88"	51"	67"	17"	71"	93"	54"	71"	18"	
#10	73"	95"	56"	73"	18"	78"	102"	60"	78"	19"	
#11	81"	106"	62"	81"	20"	86"	112"	66"	86"	21"	

NOTES:

1. LENGTHS ARE FOR CONCRETE WITH REBAR SPACE 6 BAR DIAMETERS MINIMUM. INCREASE 25% FOR BARS SPACED LESS THAN 6 BAR DIAMETERS.

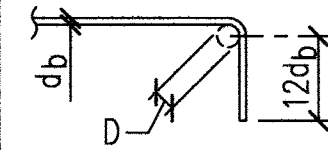
2. "TOP BARS" ARE HORIZONTAL BARS WITH 12" OR MORE OF CONCRETE CAST BELOW.

TYPICAL REBAR SPLICE AND EMBEDMENT LENGTH SCHEDULE

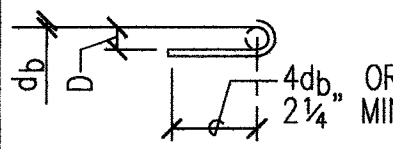
2

S-5

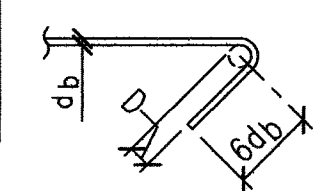
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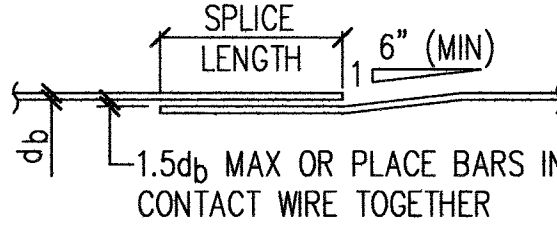
90° BEND



180° BEND

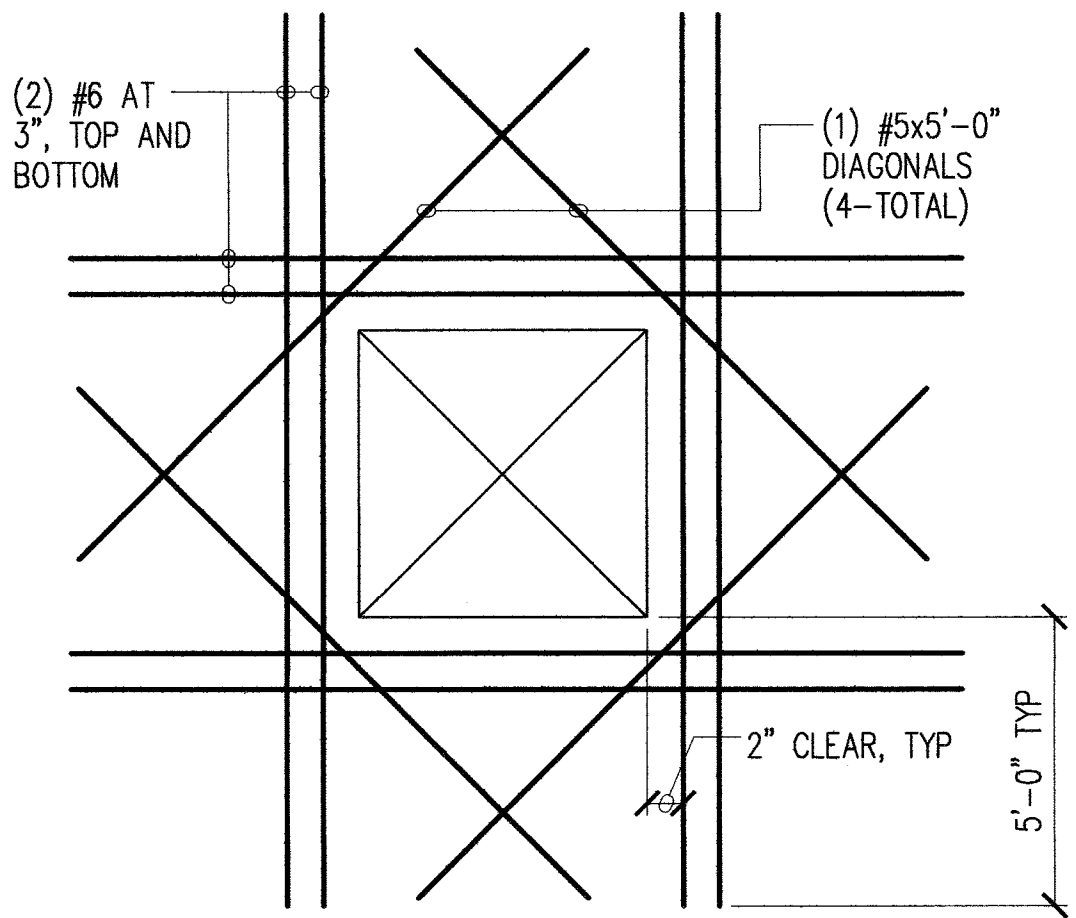


135° BEND

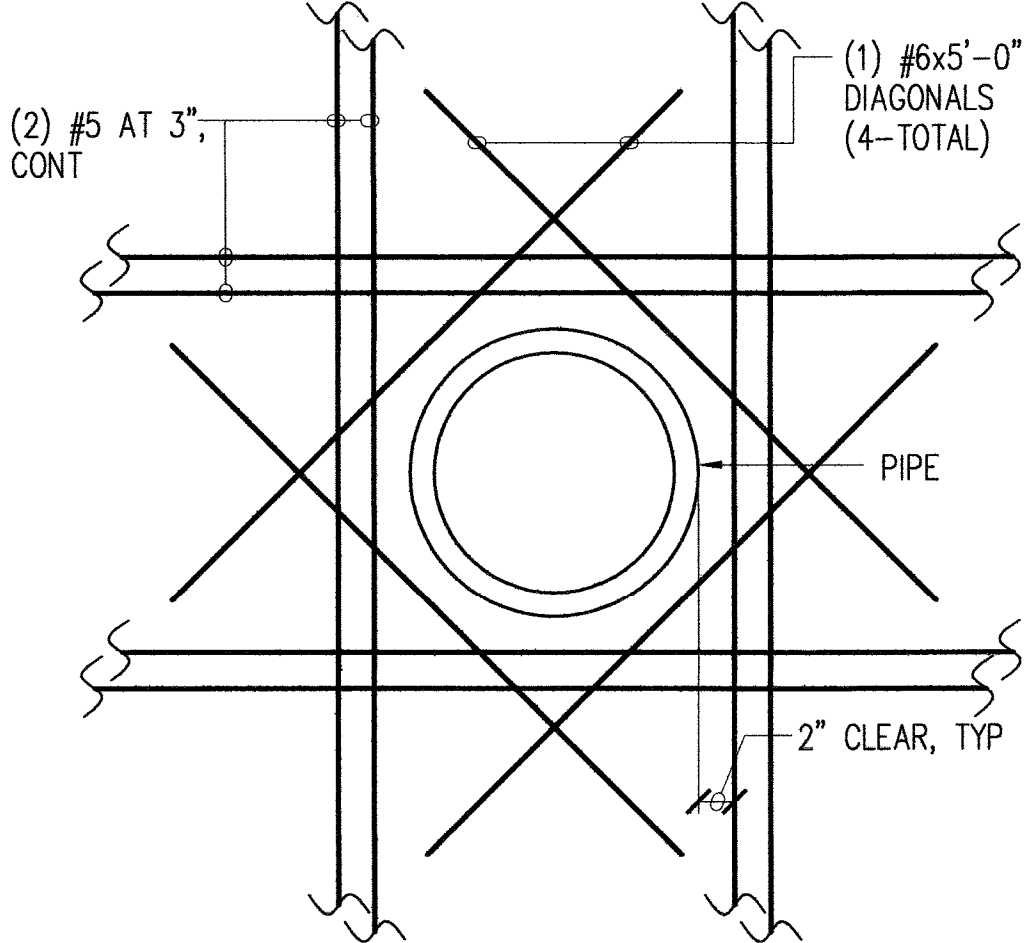


BAR LAP

D = 6db FOR #8 AND SMALLER  
D = 8db FOR #9 TO #11



ROOF SLAB



FLOOR SLAB

TYPICAL ADDED REINFORCING AT FLOOR AND ROOF OPENINGS

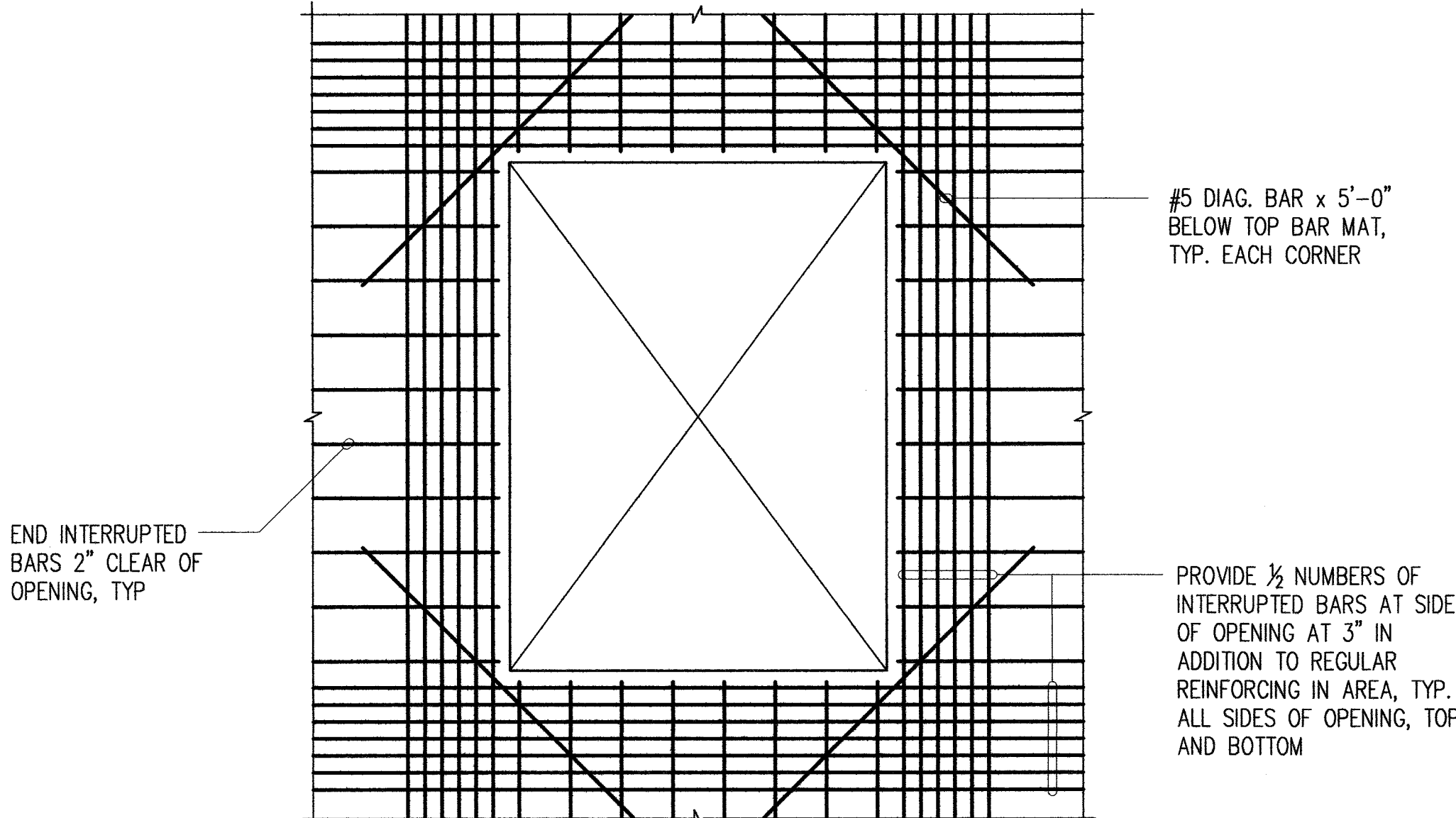
3

S-5

NOT TO SCALE

NOTES:

BEND REINFORCEMENT WHERE REQUIRED.



4

S-5

TYPICAL REINFORCING AT LARGE SLAB OPENING

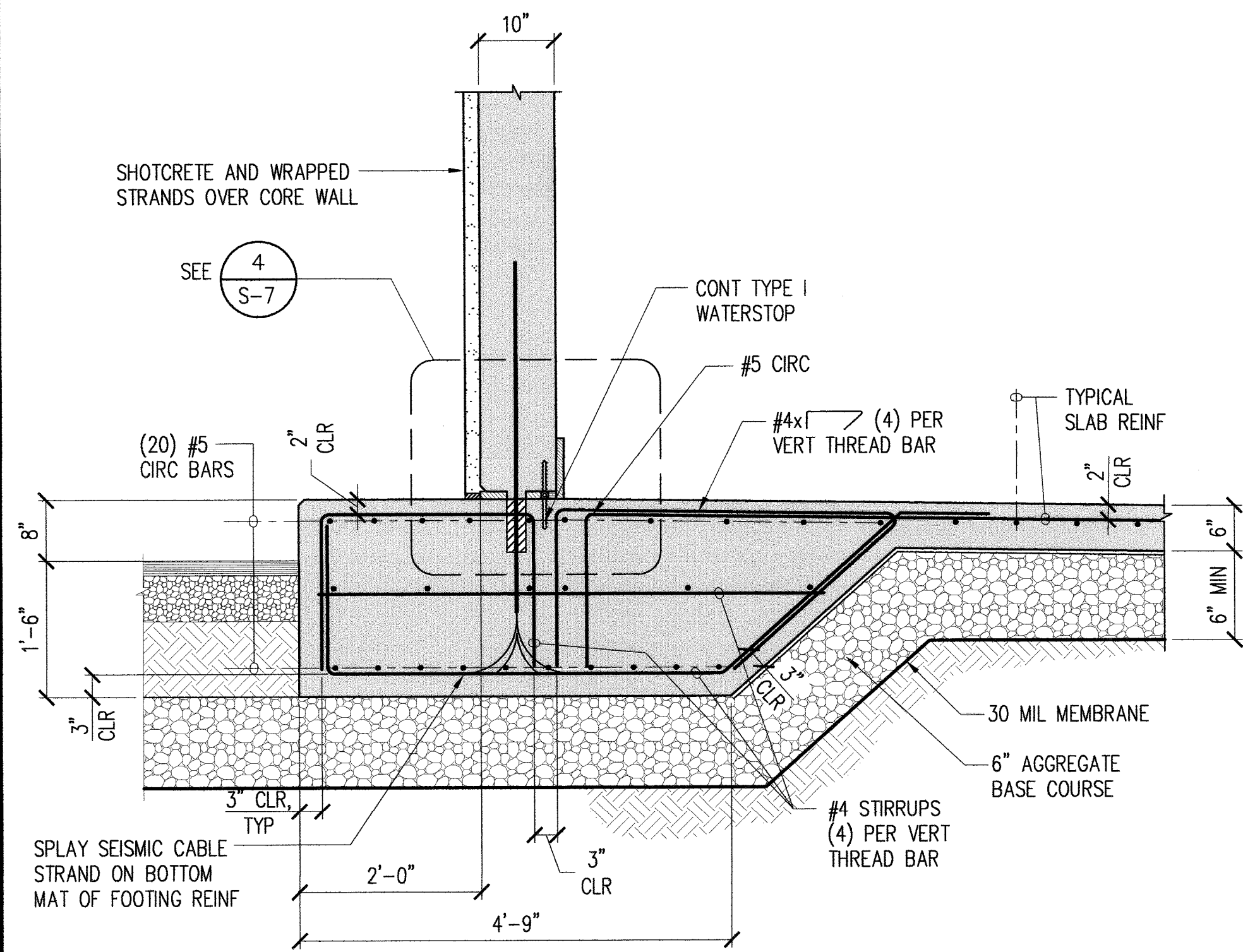
NOT TO SCALE

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<div><b>KAI HAWAII</b> STRUCTURAL &amp; FORENSIC ENGINEERS</div>				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
RESERVOIR TYPICAL DETAILS				

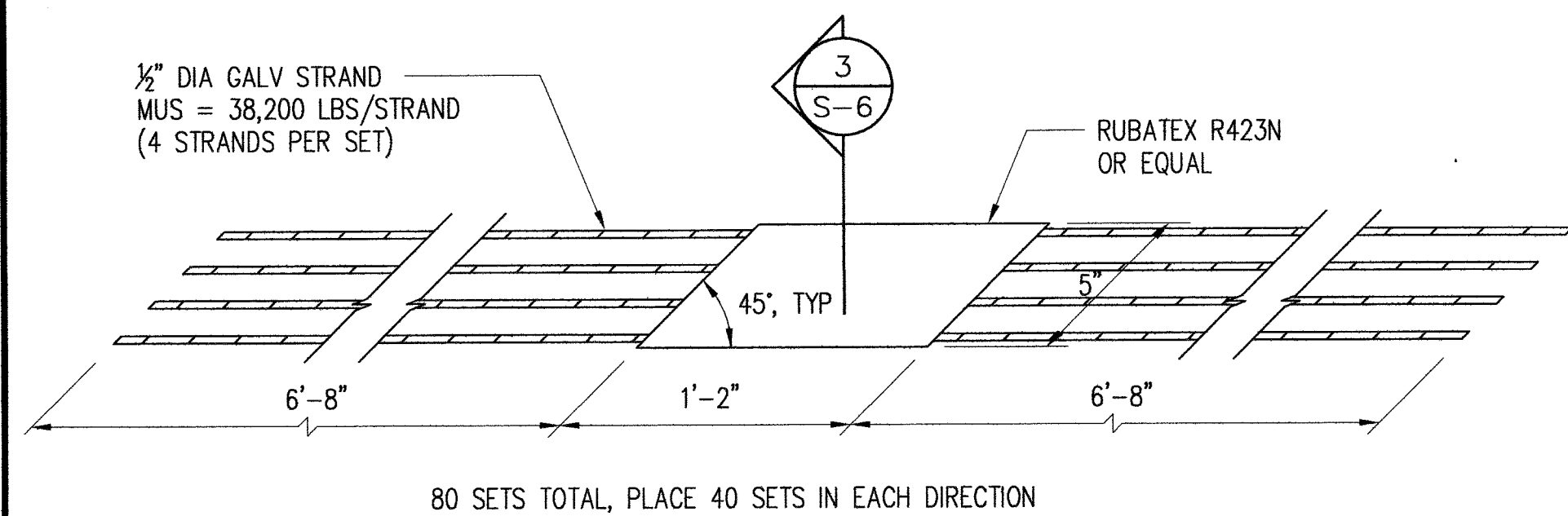
S-5

FILE	POCKET	FOLDER	NO.

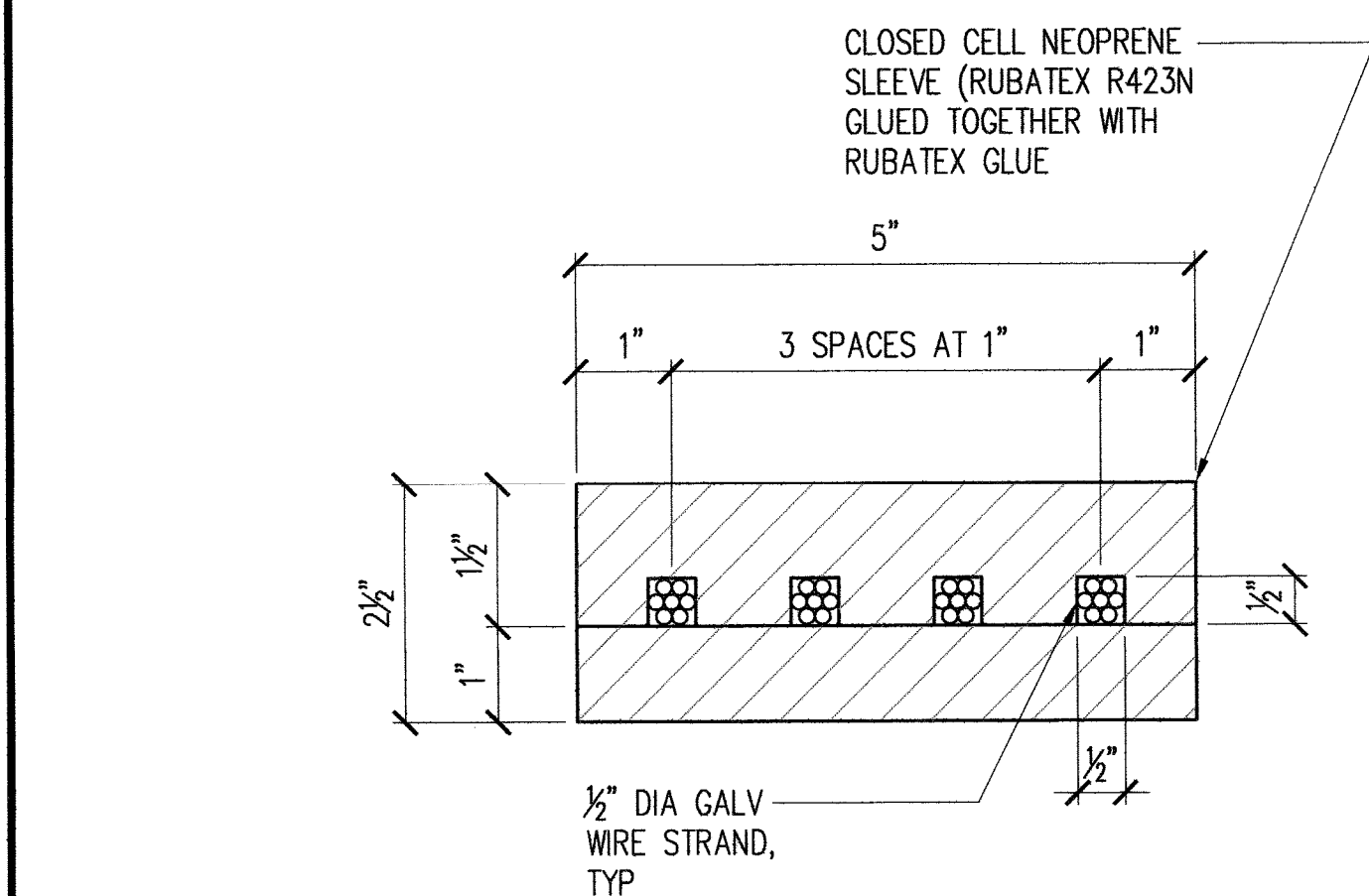




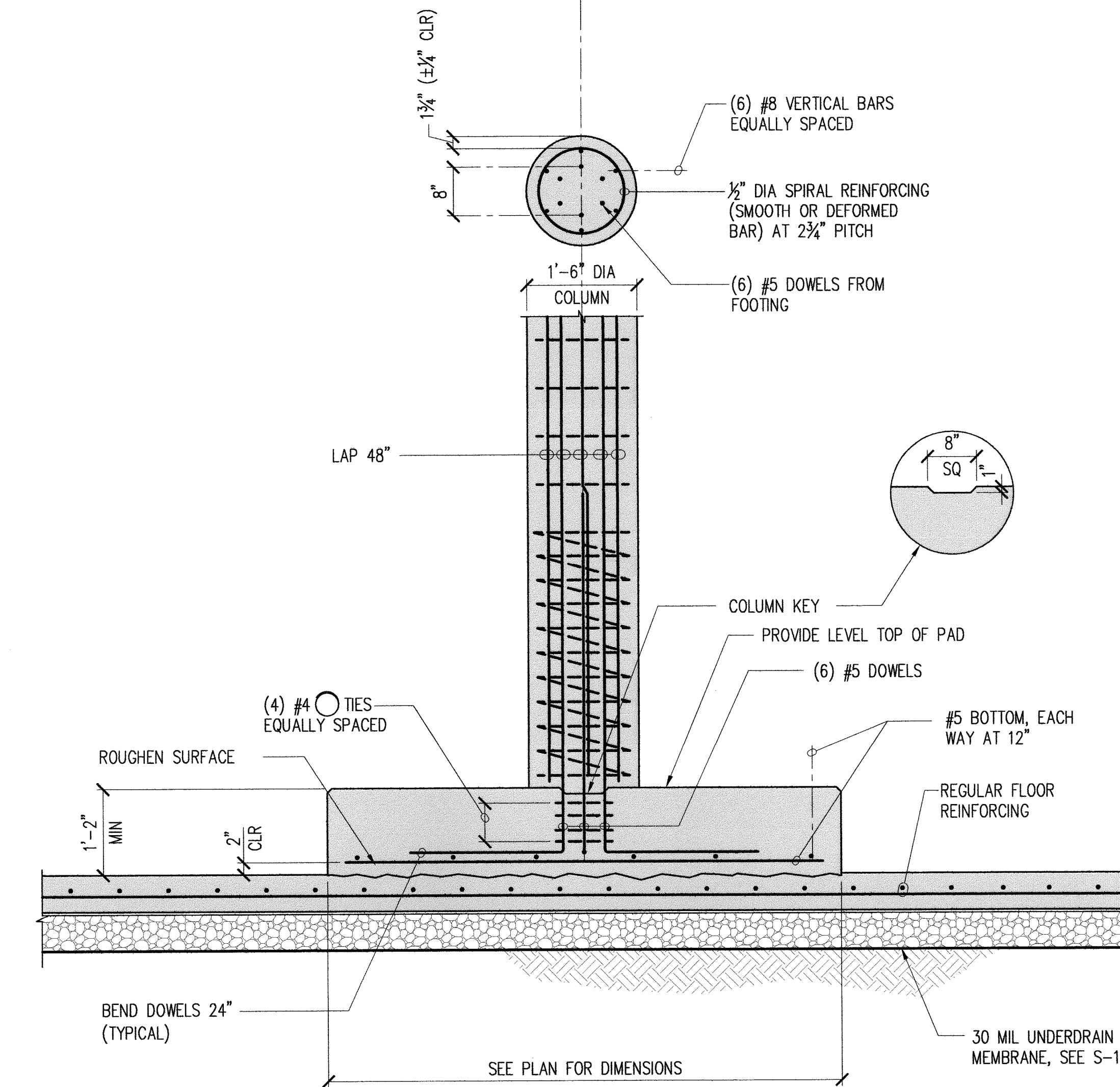
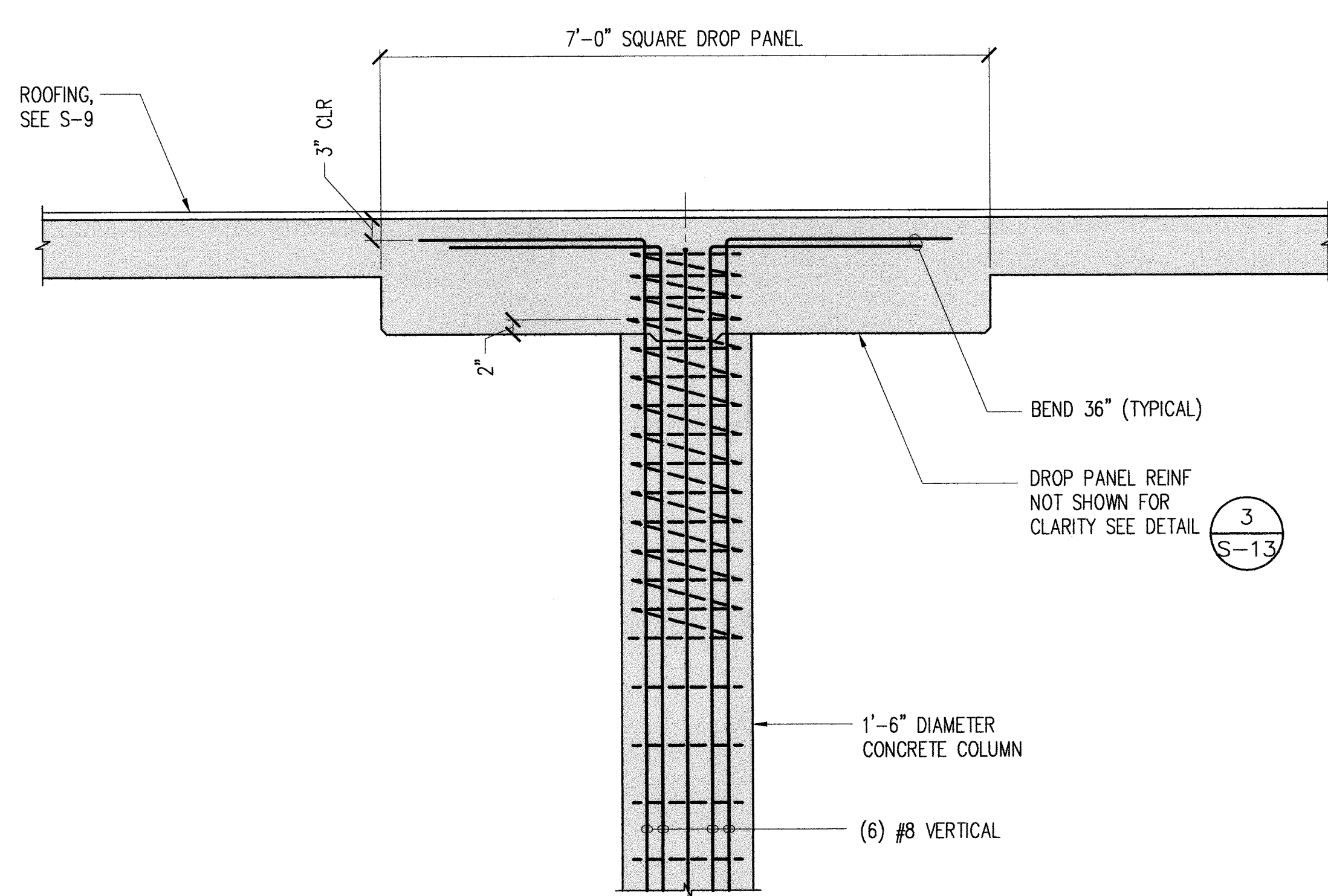
1 RADIAL SECTION OF WALL AND WALL FOOTING  
S-6 SCALE: 3/4" = 1'-0"



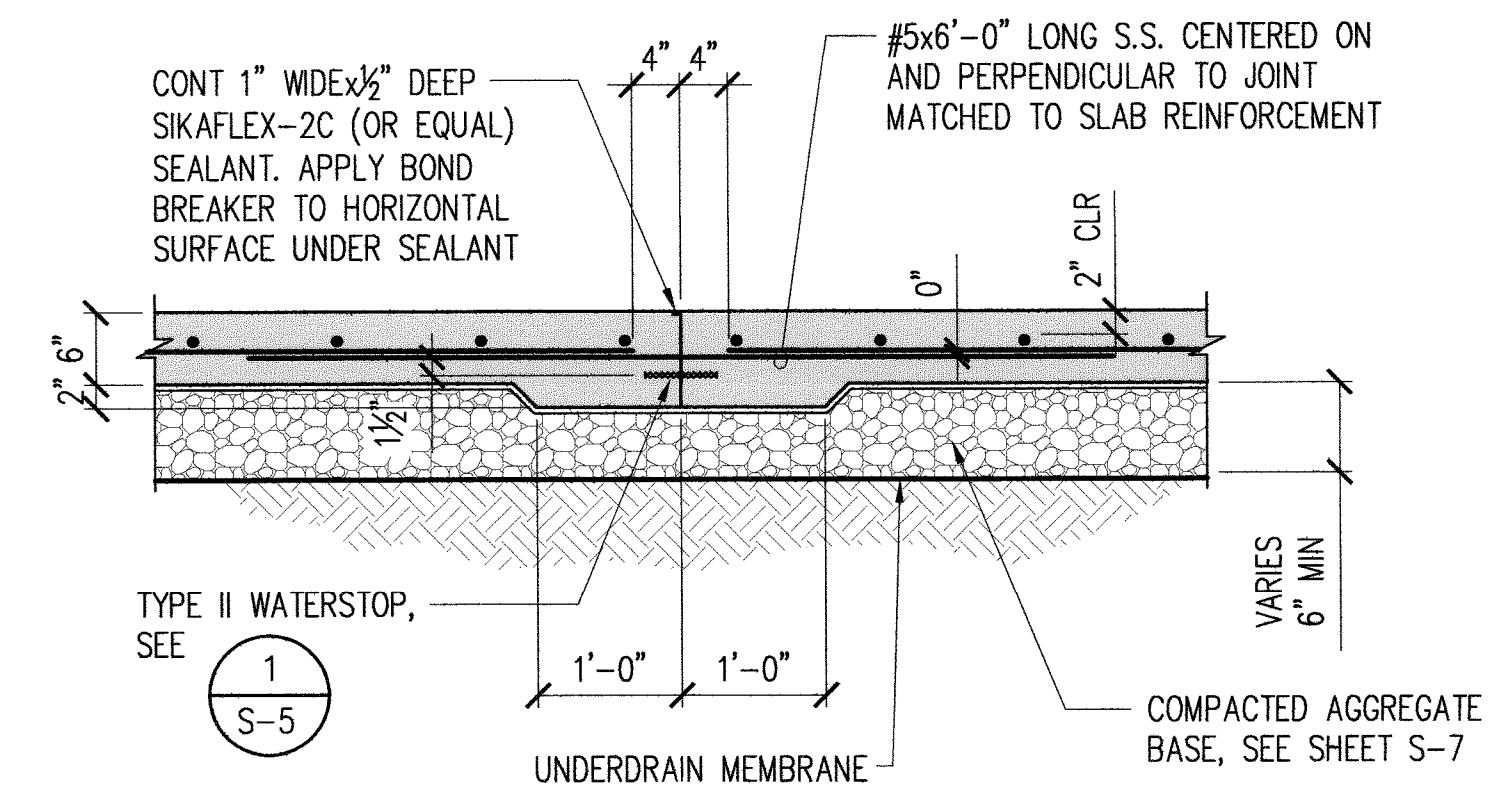
2 PLAN OF SEISMIC CABLE SET  
S-6 NOT TO SCALE



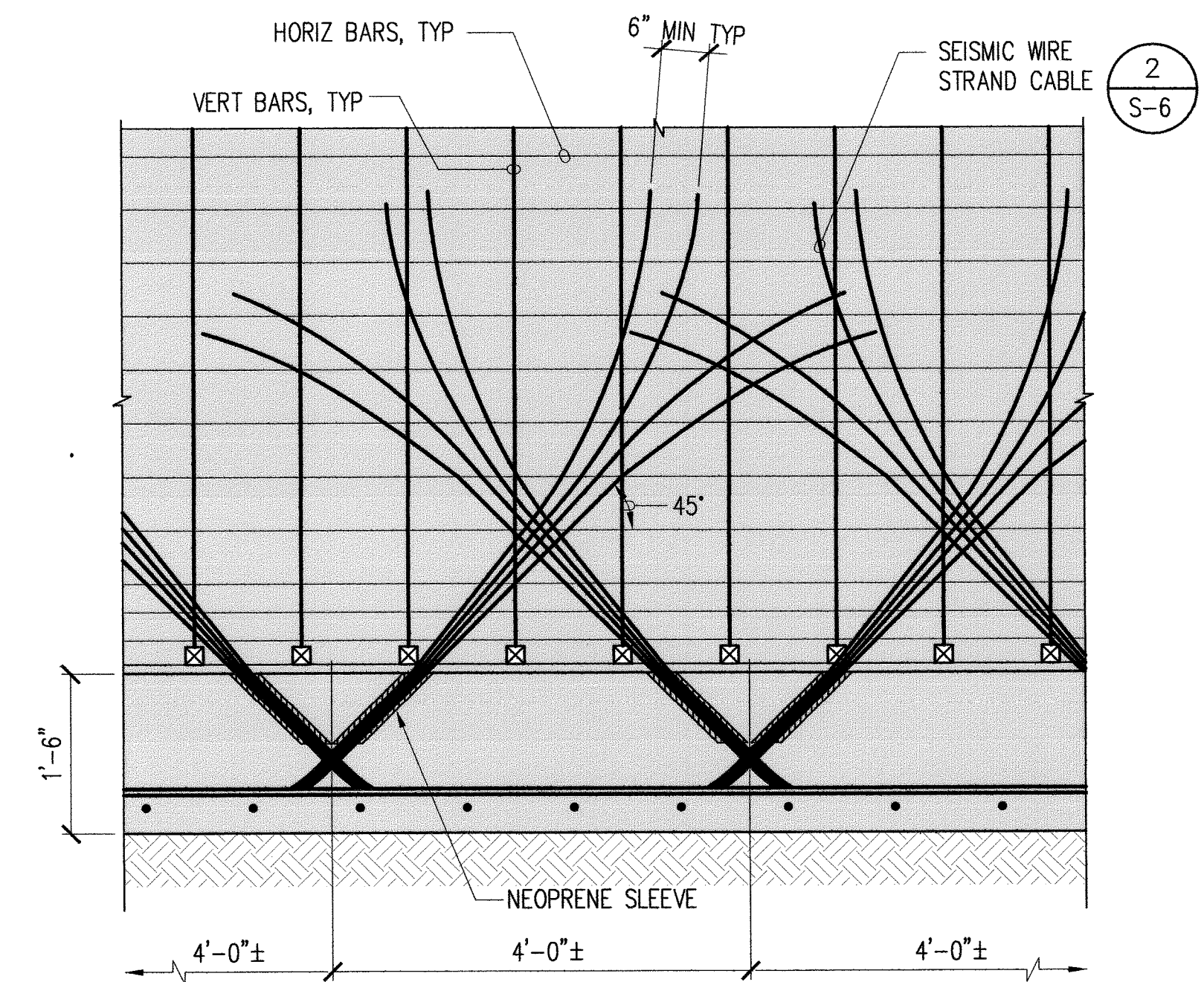
3 SEISMIC CABLE SET SECTION  
S-6 NOT TO SCALE



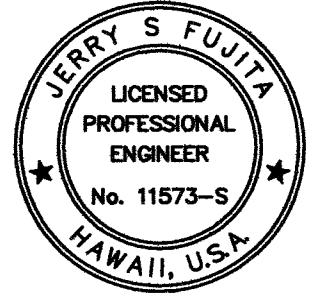

4 TYPICAL COLUMN DETAILS  
S-6 NOT TO SCALE



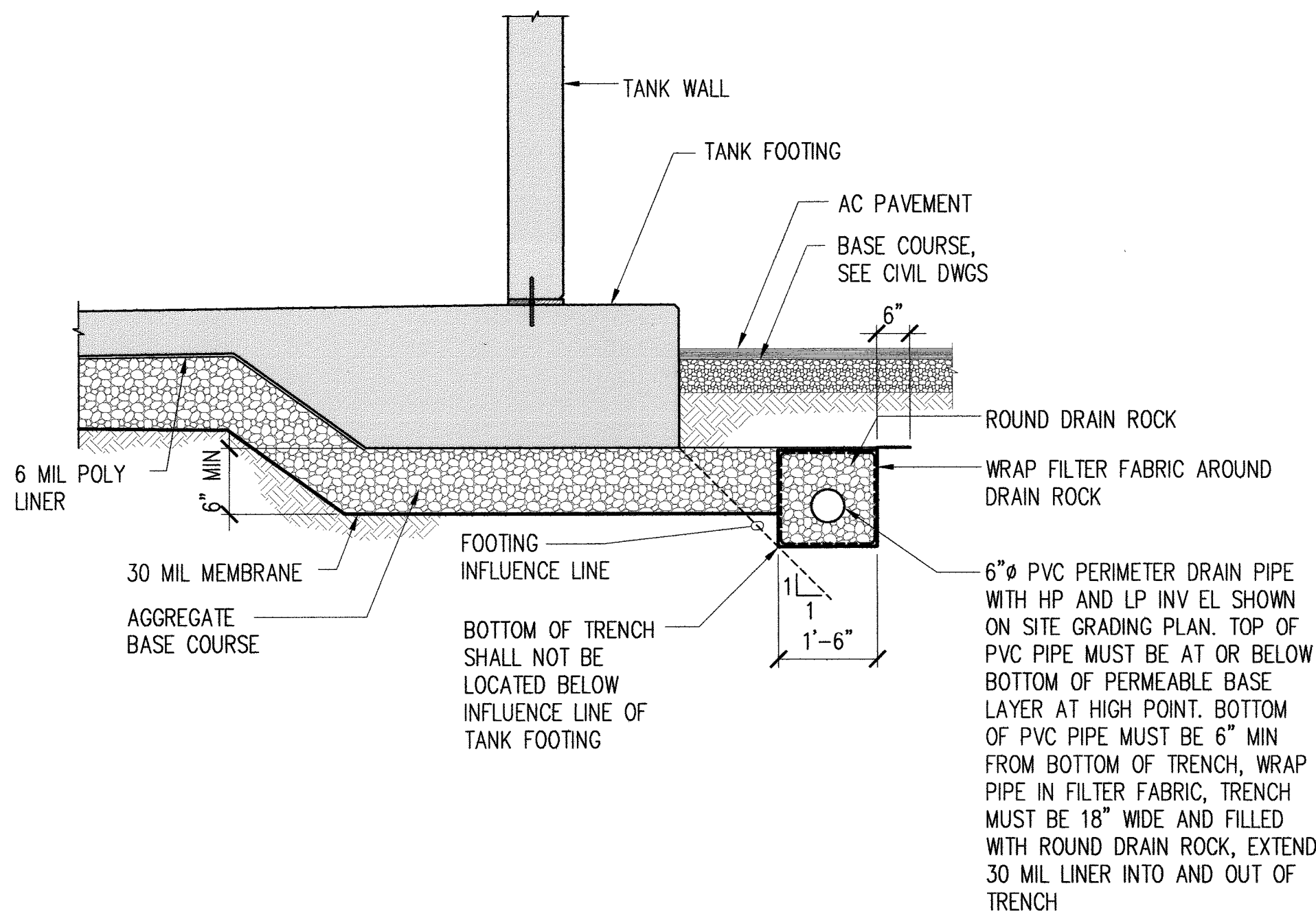
5 TYPICAL FLOOR SLAB CONSTRUCTION JOINT  
S-6 SCALE: 3/4" = 1'-0"



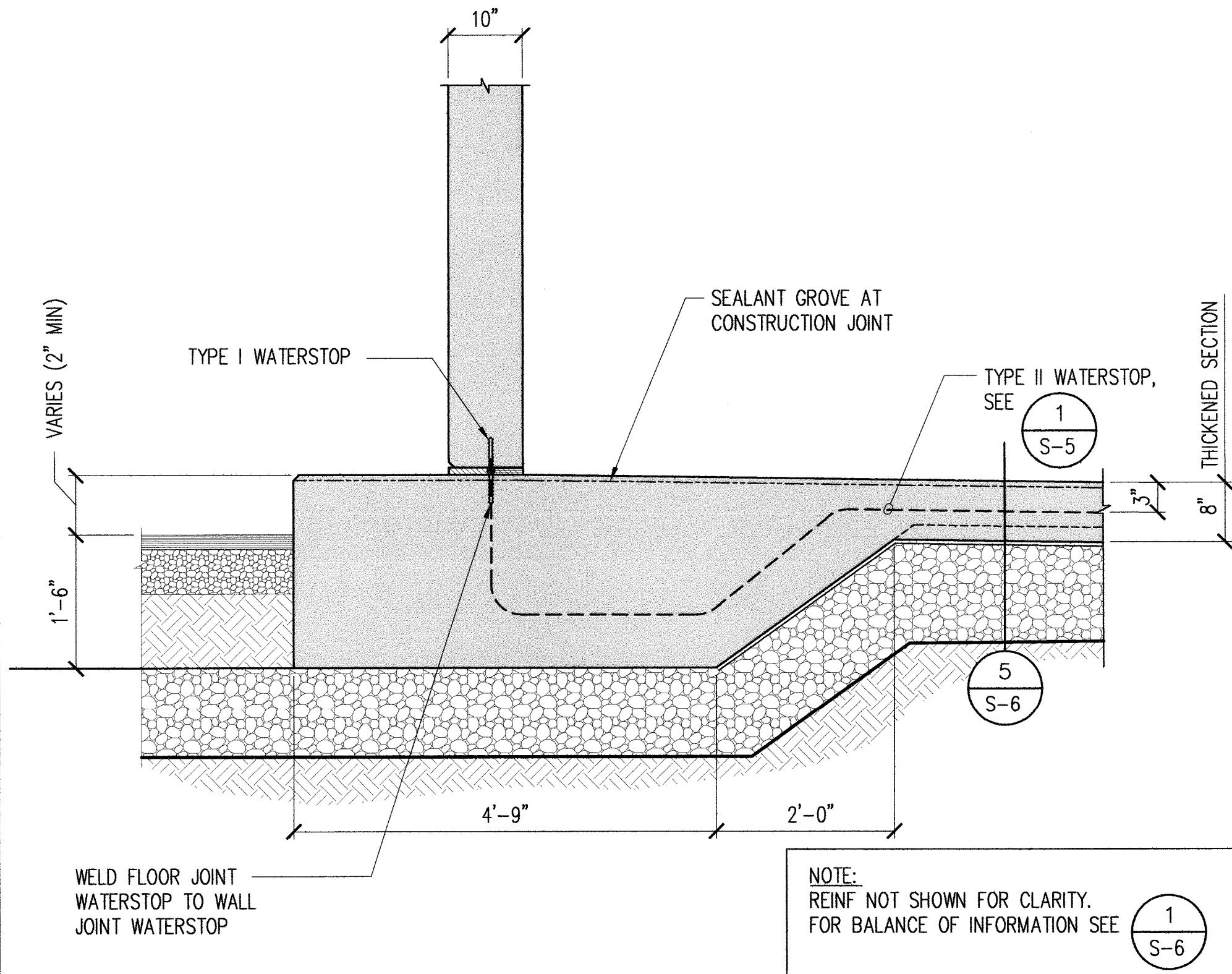
6 SECTION  
S-6 SCALE: 3/4" = 1'-0"

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>JERRY S. FUJITA LICENSED PROFESSIONAL ENGINEER No. 11573-S HAWAII, U.S.A.</p> </div> <div style="text-align: center;"> <p><i>Jerry S. Fujita</i></p> <p>EXPIRATION DATE OF THE LICENSE 4/30/2014 THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION</p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p><b>KAI HAWAII</b> STRUCTURAL &amp; FORENSIC ENGINEERS</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p> </div> <div style="text-align: center; margin-top: 10px;"> <p><b>RESERVOIR FOUNDATION SECTION AND DETAILS</b></p> </div>				

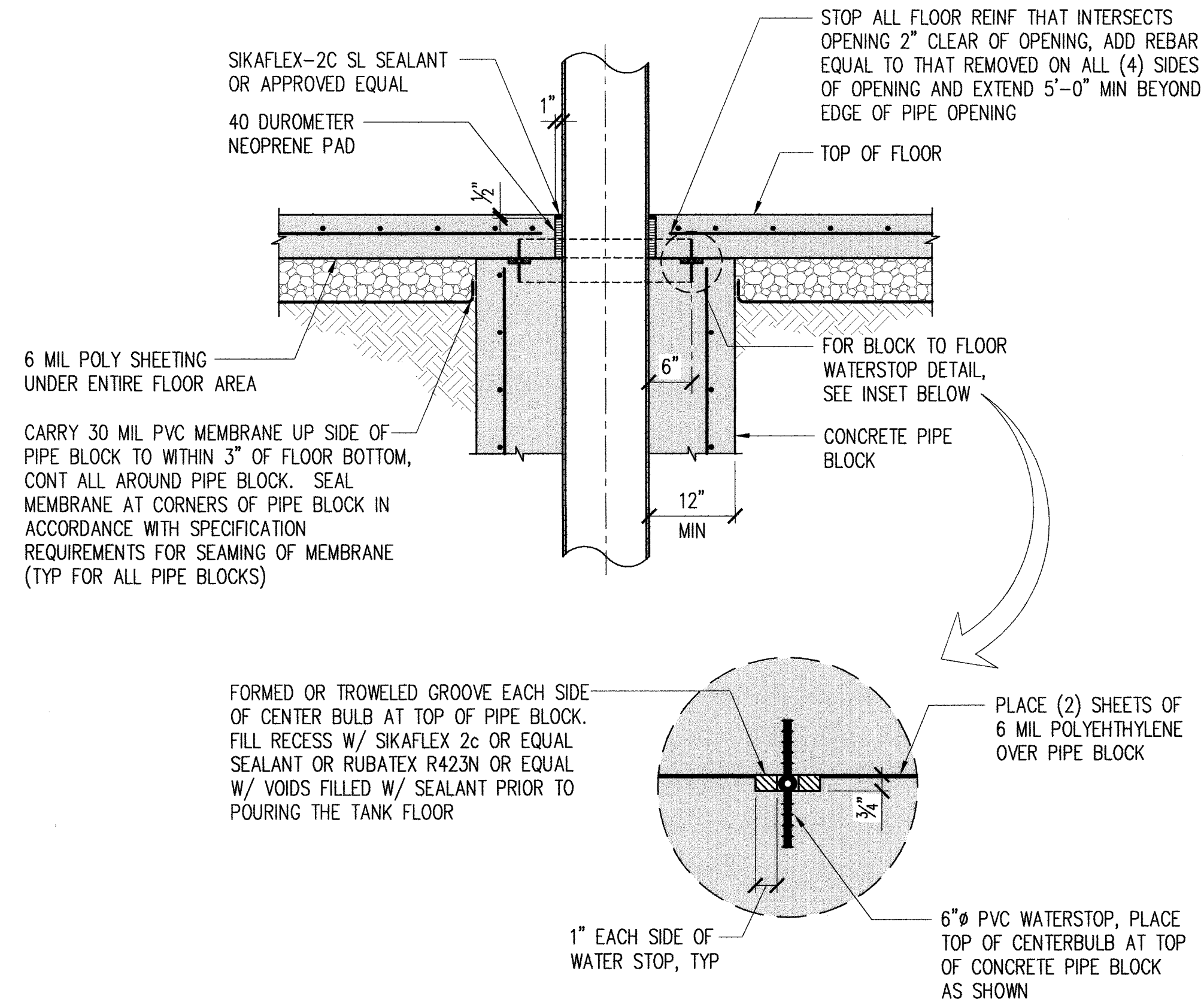




1  
S-7 PERIMETER DRAIN DETAIL  
SCALE: 1/2" = 1'-0"

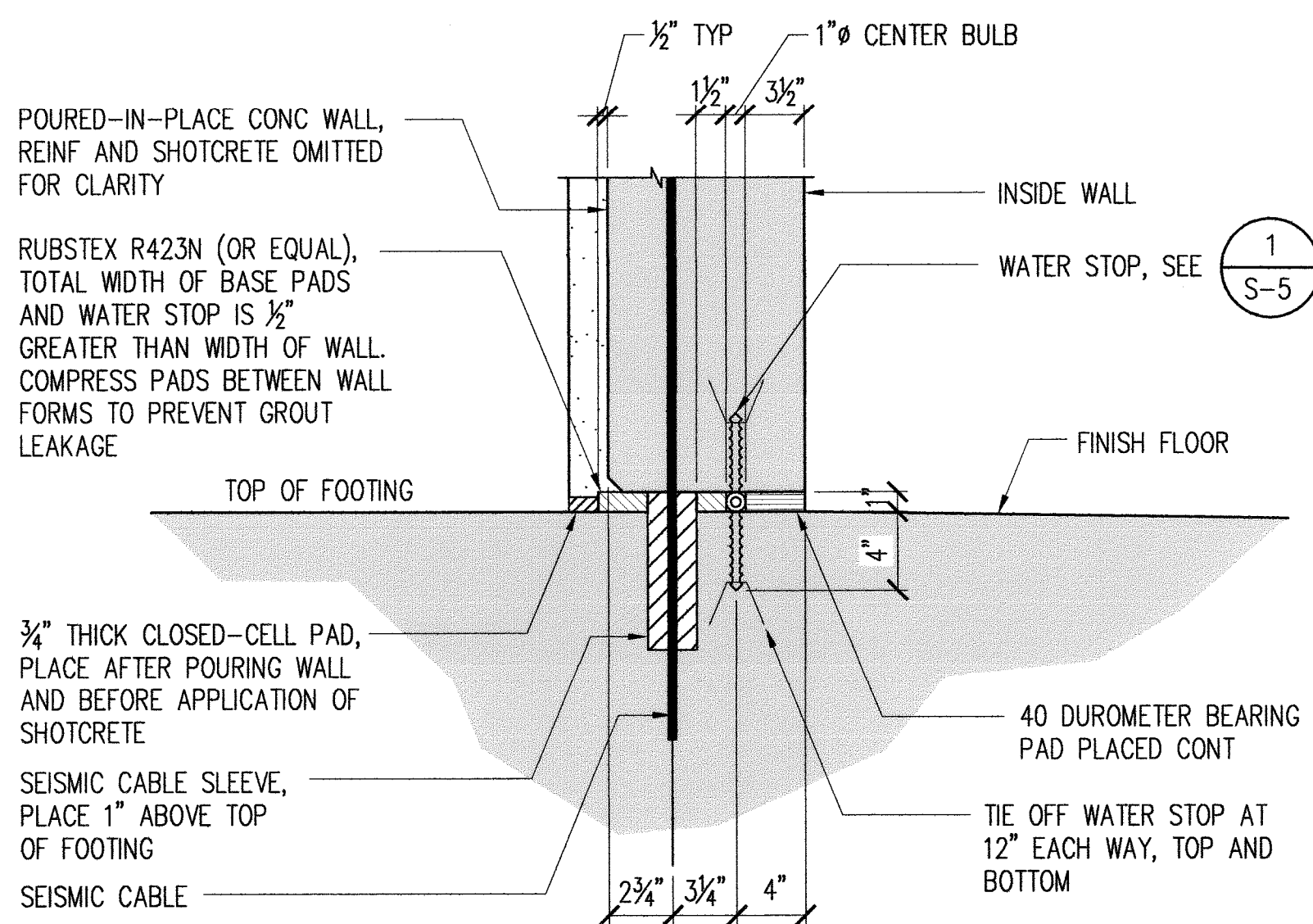


2  
S-7 TYPICAL WATERSTOP CONNECTION AT WALL/FOOTING  
SCALE: 3/4" = 1'-0"



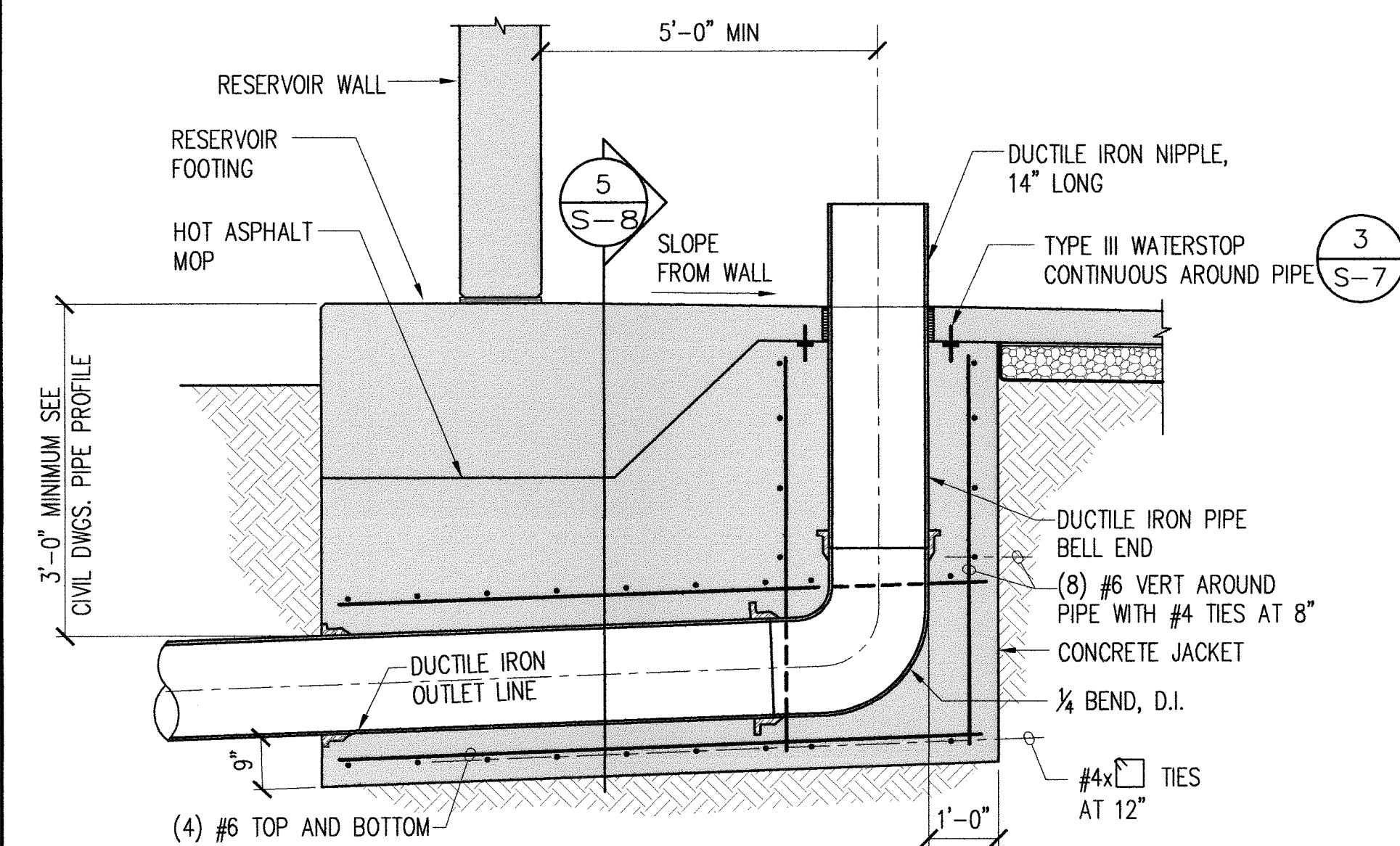
3  
S-7 TYPICAL PIPE ENTRANCE THROUGH FLOOR DETAILS  
SCALE: 3/4" = 1'-0"

WALL BASE JOINT NOTES:  
1. GLUE ALL PADS TO TOP OF WALL FOOTING.  
2. FILL ALL VOIDS BETWEEN BASE PADS, SEISMIC CABLE SLEEVE AND WATER STOP WITH A SOFT MASTIC.

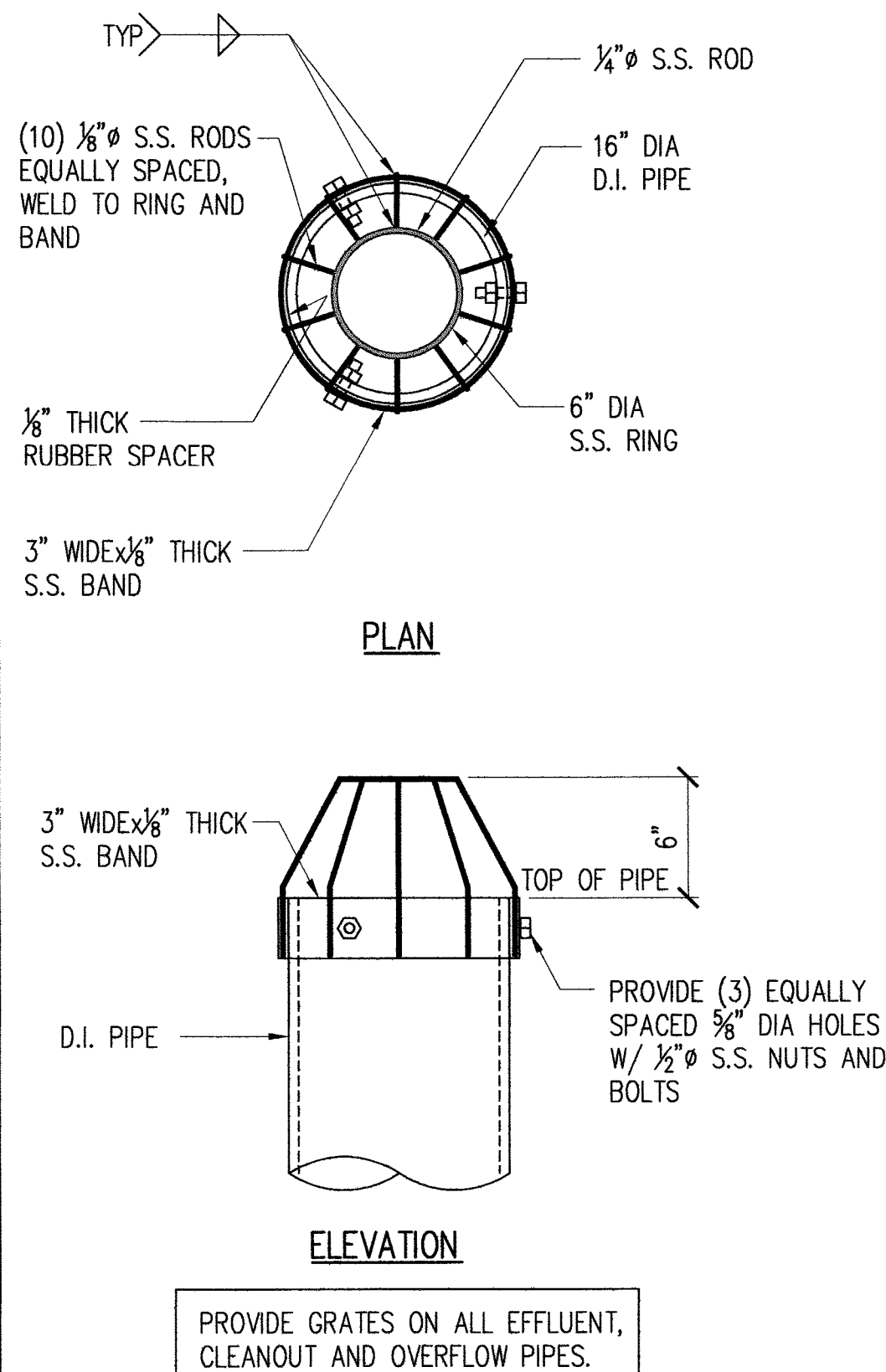


4  
S-7 WALL BASE JOINT DETAIL  
NOT TO SCALE

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



3  
S-8 EFFLUENT LINE  
SCALE: 1/2" = 1'-0"



6  
S-7 PIPE GRATE DETAIL  
NOT TO SCALE

NOTES:  
1. ADJUST DIMENSIONS ACCORDINGLY TO FIT PIPE SIZE.  
2. USE S.S. 316 FOR ALL NUTS AND BOLTS NOT FULLY ENCASED IN CONCRETE UNLESS NOTED OTHERWISE.  
3. WHERE S.S. BOLTS ARE IN CONTACT WITH DISSIMILAR METALS, USE INSULATING SLEEVES AND PHENOLIC WASHERS TO ELECTRICALLY ISOLATE THE BOLTS.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

**JERRY S. FUJITA**  
LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, U.S.A.  
EXPIRATION DATE OF THE LICENSE 4/30/2014  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFF-SITE WATER SYSTEM, PHASE 2:**  
**PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

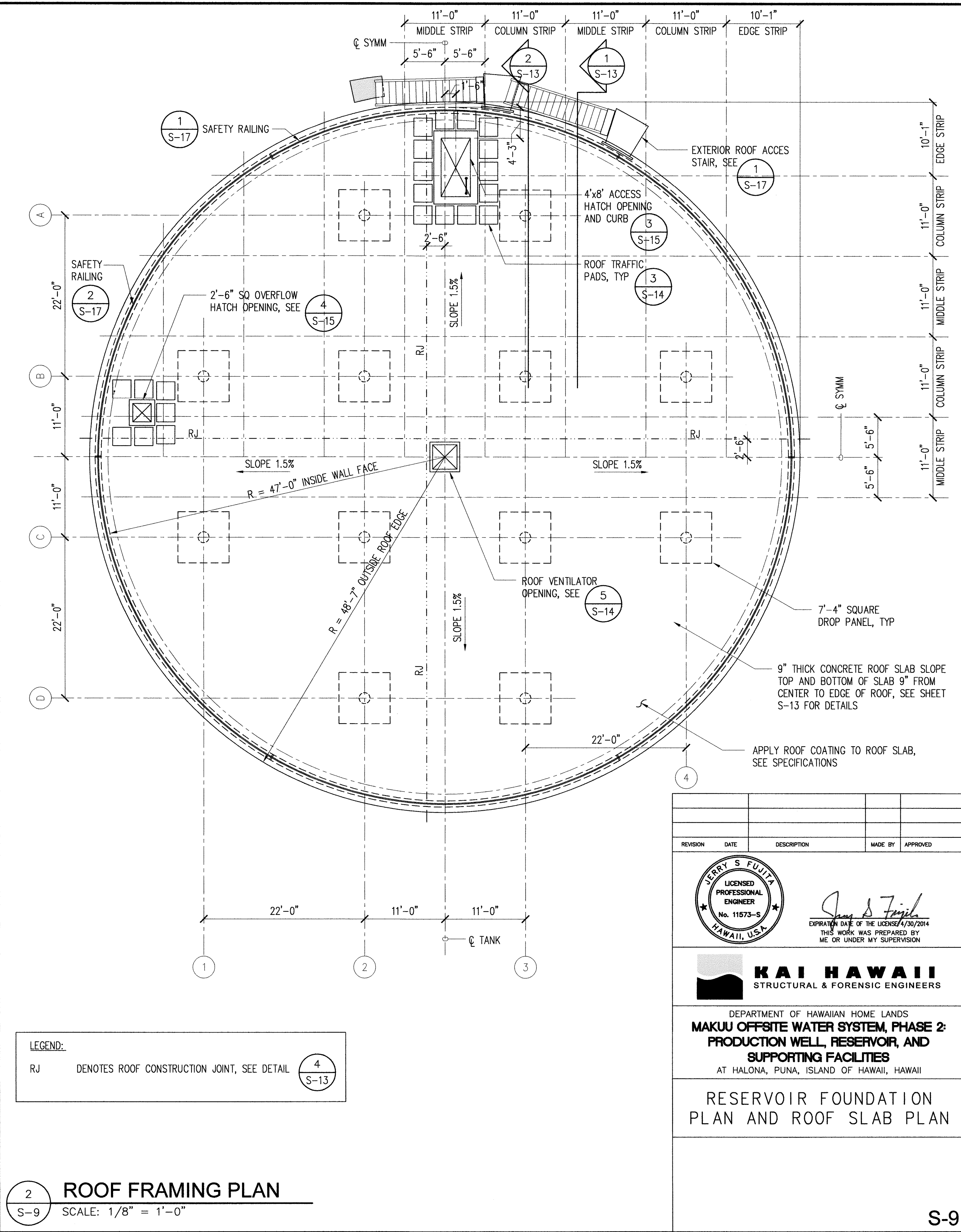
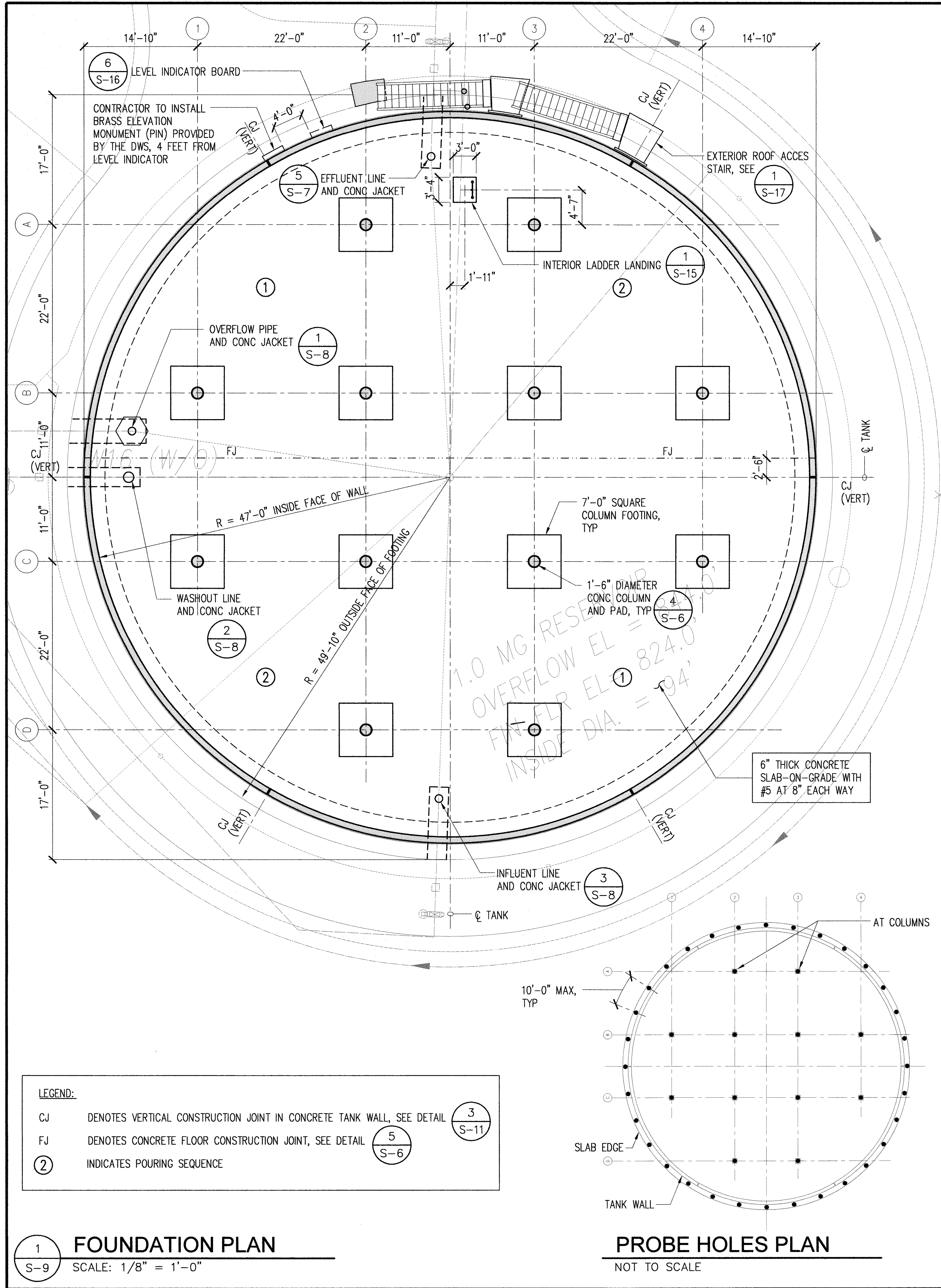
**RESERVOIR FOUNDATION DETAILS**

FILE	POCKET	FOLDER	NO.









REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

**JERRY S. FUJITA**  
LICENSED PROFESSIONAL ENGINEER  
No. 11573-S  
HAWAII, U.S.A.

*James S. Fujita*  
EXPIRATION DATE OF THE LICENSE: 4/30/2014  
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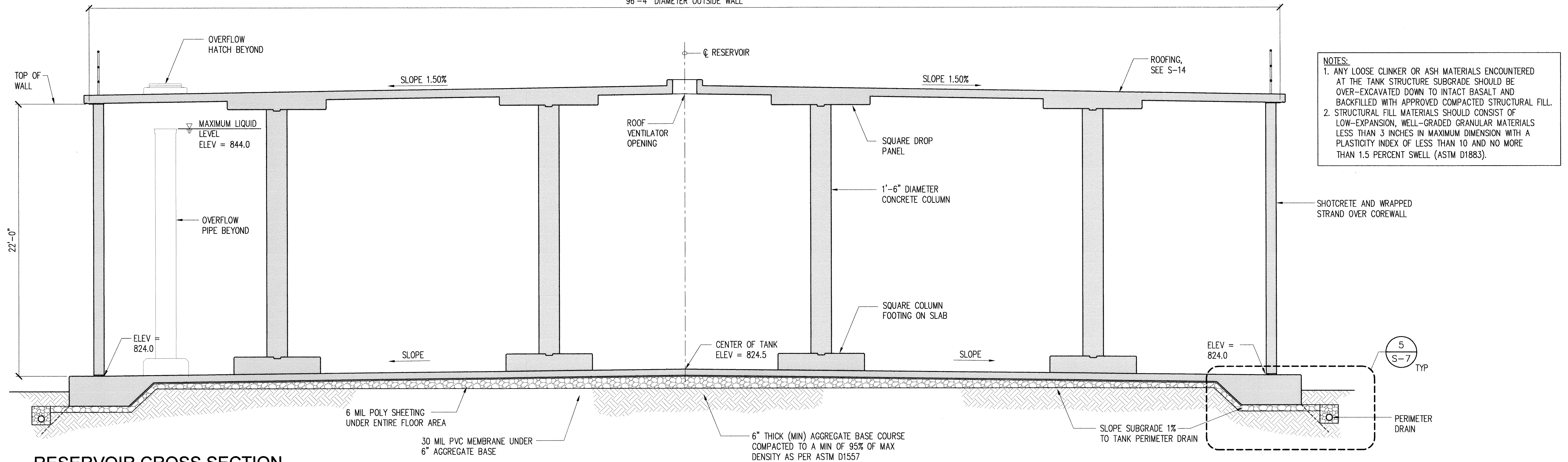
**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**RESERVOIR FOUNDATION  
PLAN AND ROOF SLAB PLAN**

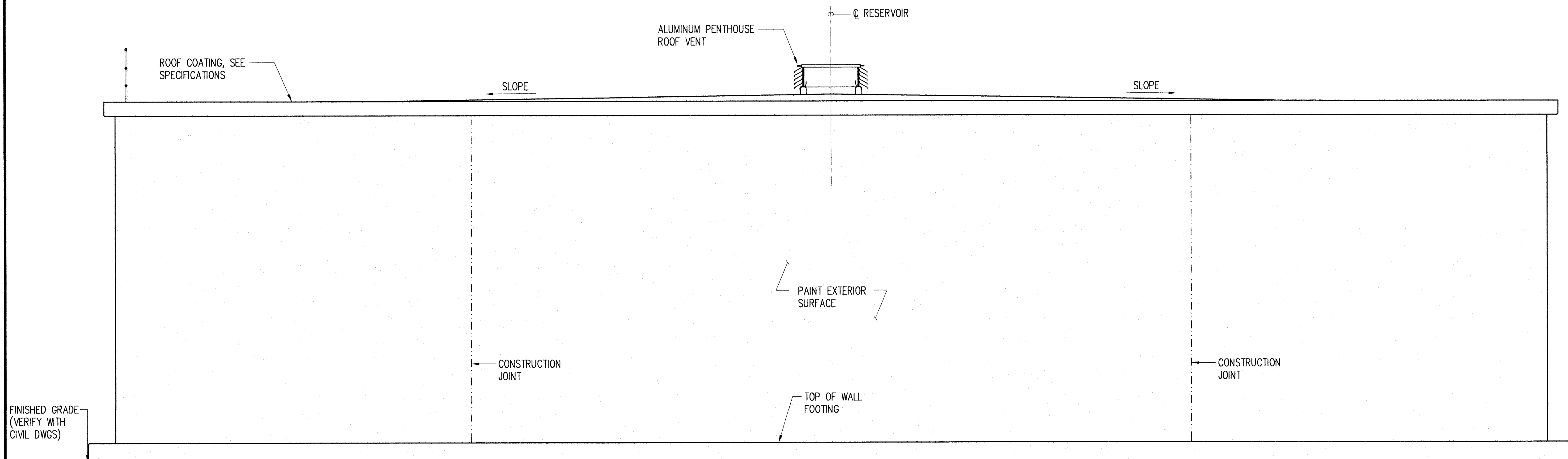
**S-9**

96'-4" DIAMETER OUTSIDE WALL



## RESERVOIR CROSS SECTION

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



## RESERVOIR ELEVATION

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

### PAINTING NOTES:

#### A. EXTERIOR WALL SURFACE

- PRIME: ICI DEVOC COATING 4030 TRU-GLAZE-WB WATERBORNE EPOXY PRIMER AT 200-270 SF/GAL (4.0-8.0 MILS WET; 2.0-4.0 MILS DFT)
- FINISH: (2 COATS) 2406 DULUX PROFESSIONAL EXTERIOR 100% ACRYLIC SEMI-GLOSS FINISH AT 300-400 SF/GAL (4.1-5.4 WET; 1.5-2.0 MILS DFT PER COAT.

- NOTES:
- ANY LOOSE CLINKER OR ASH MATERIALS ENCOUNTERED AT THE TANK STRUCTURE SUBGRADE SHOULD BE OVER-EXCAVATED DOWN TO INTACT BASALT AND BACKFILLED WITH APPROVED COMPACTED STRUCTURAL FILL.
  - STRUCTURAL FILL MATERIALS SHOULD CONSIST OF LOW-EXPANSION, WELL-GRADED GRANULAR MATERIALS LESS THAN 3 INCHES IN MAXIMUM DIMENSION WITH A PLASTICITY INDEX OF LESS THAN 10 AND NO MORE THAN 1.5 PERCENT SWELL (ASTM D1883).

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HAWAII, U.S.A.

*Jerry S. Fujita*  
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**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

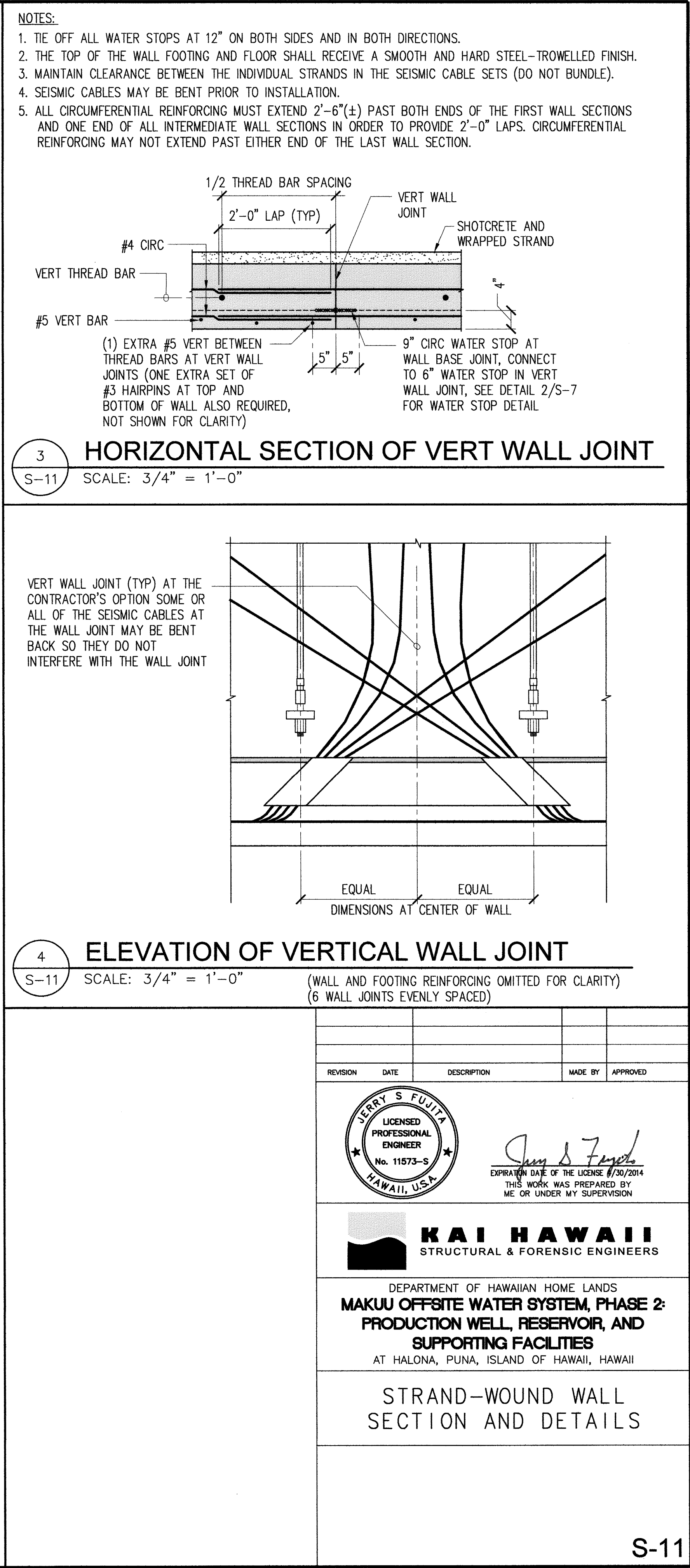
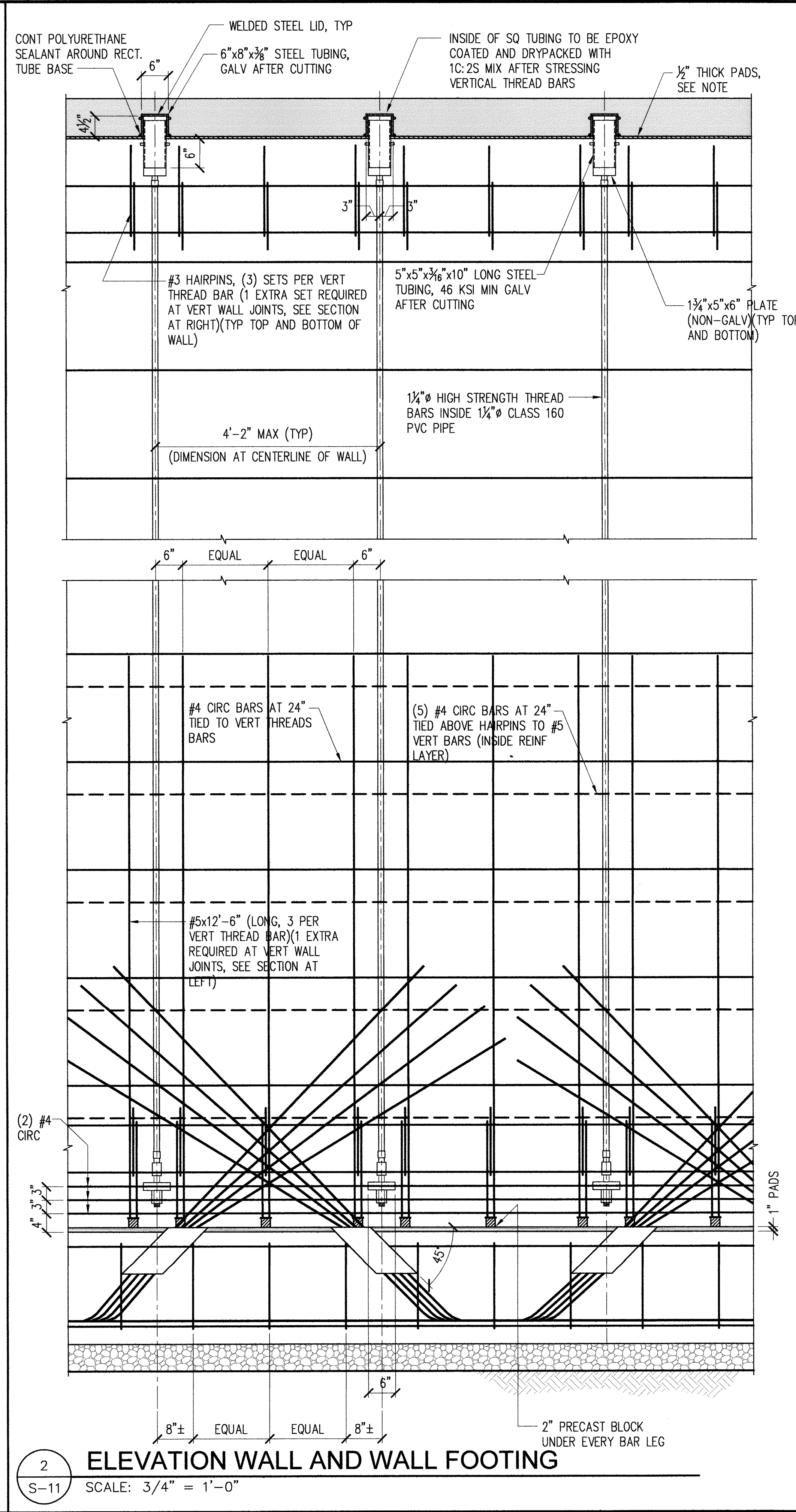
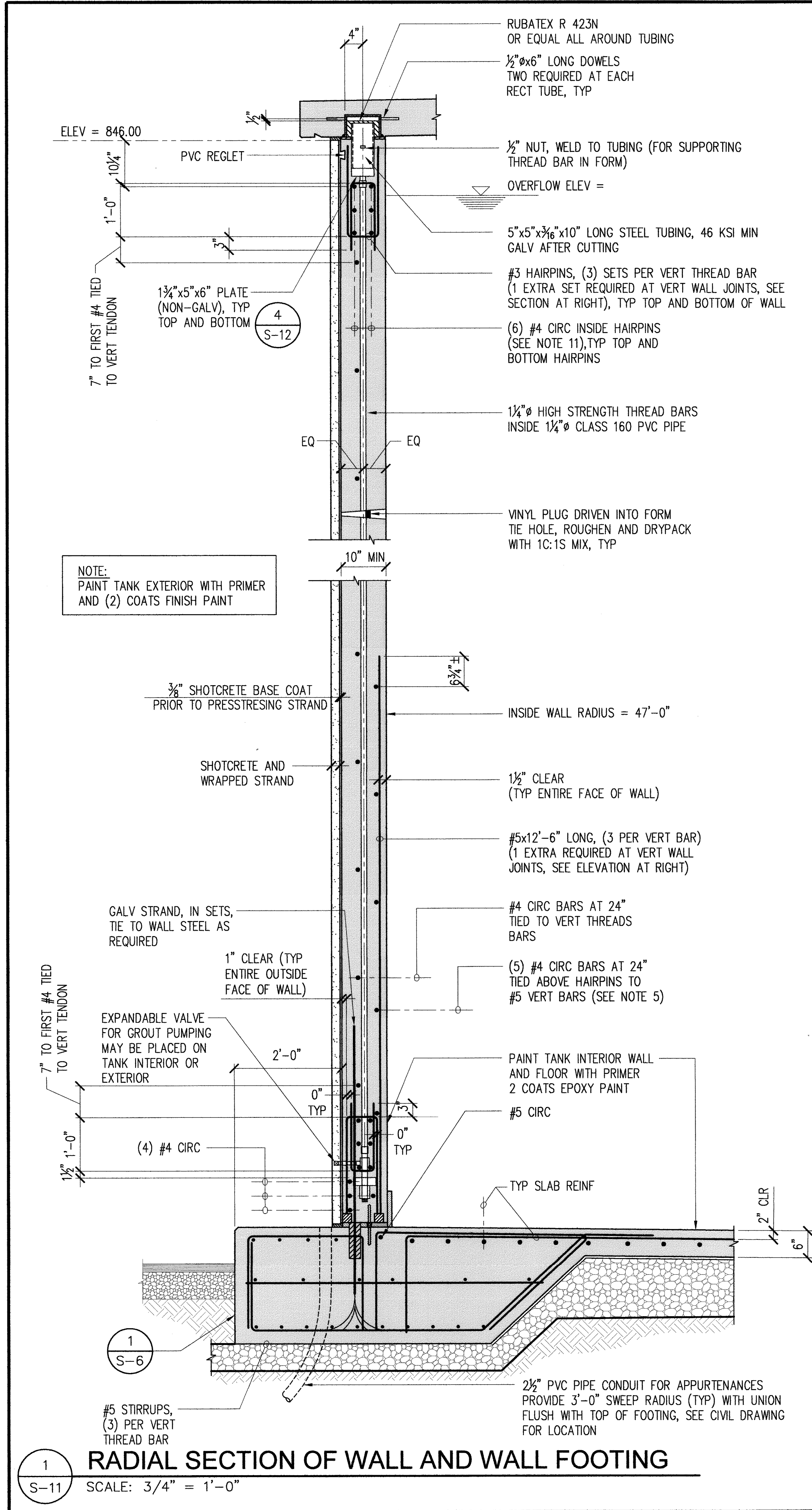
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**RESERVOIR ELEVATION AND  
SECTION**

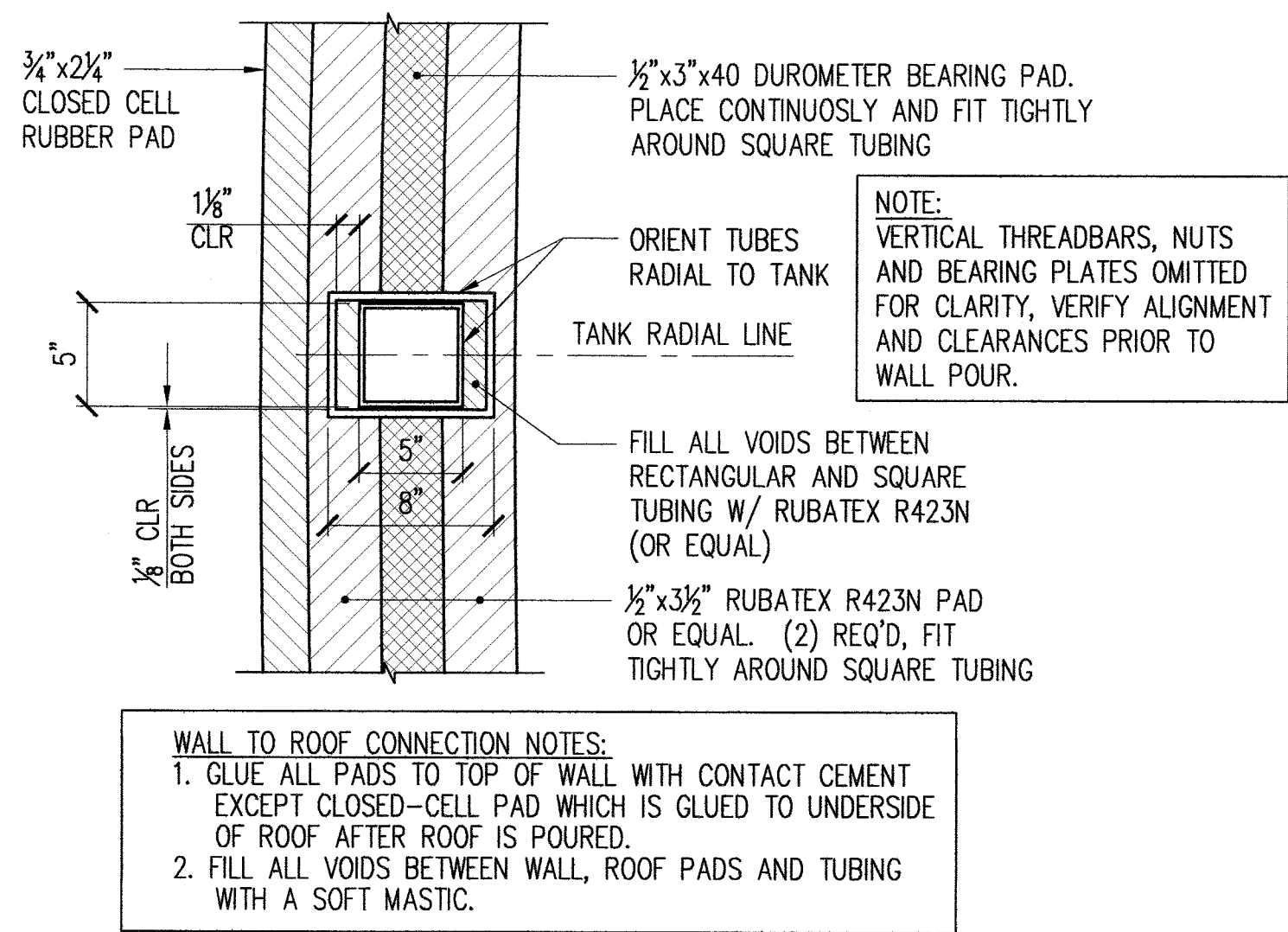
**S-10**

FILE	POCKET	FOLDER	NO.

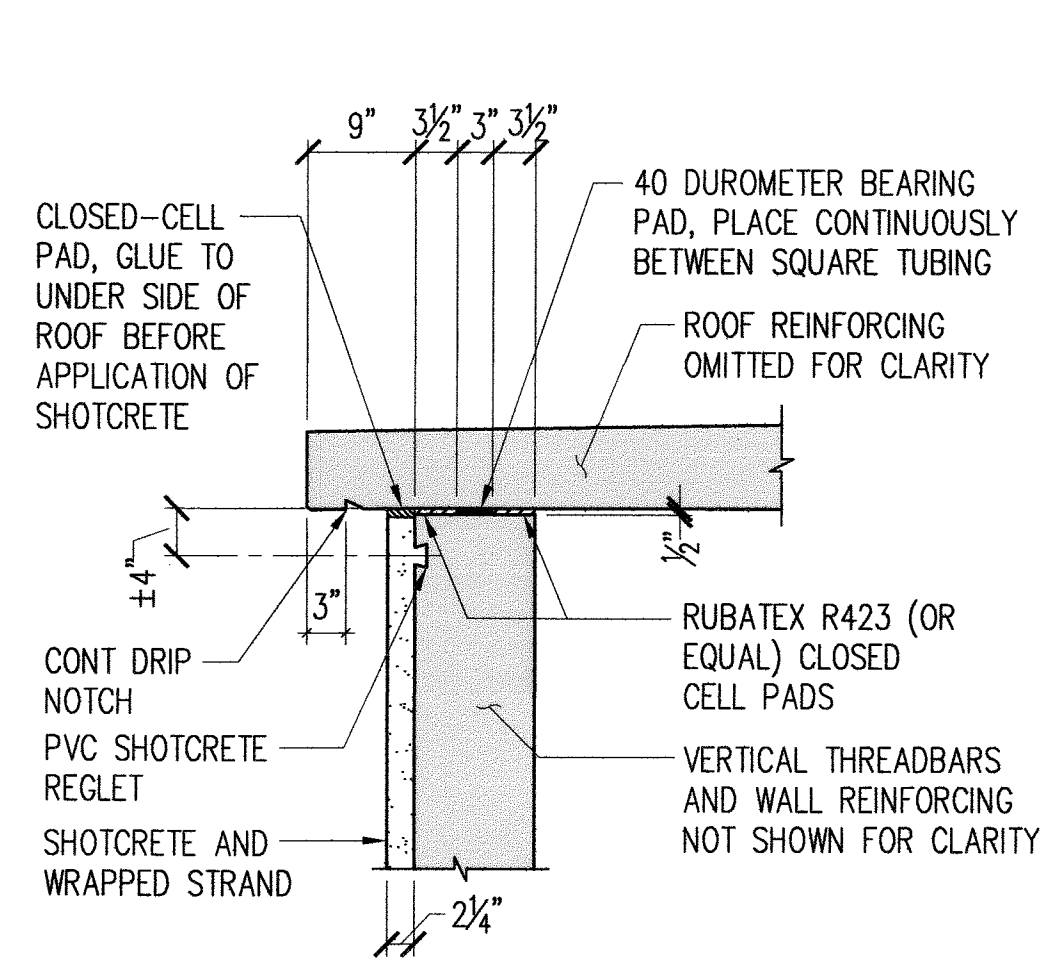




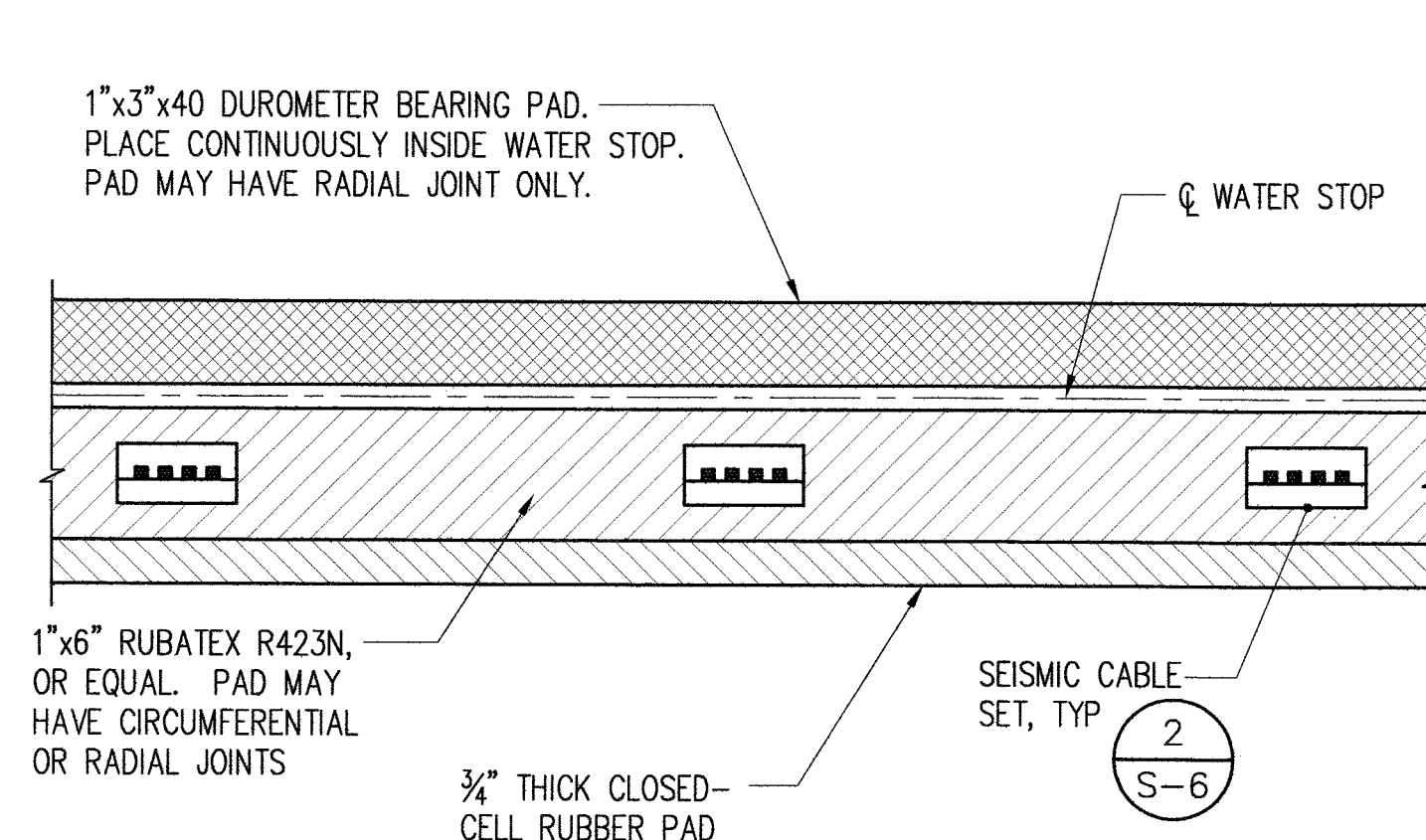




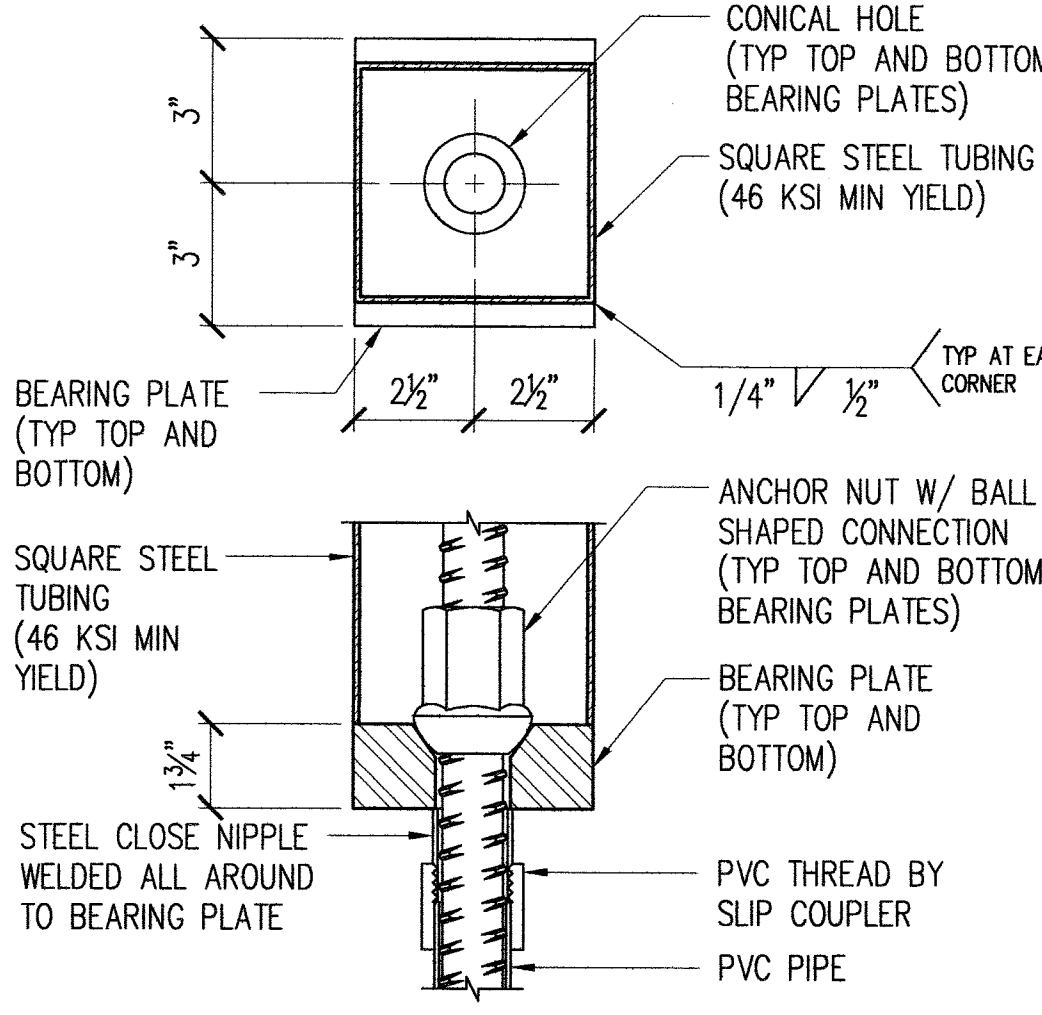
1 PLAN - WALL TO ROOF CONNECTION  
S-12 NOT TO SCALE



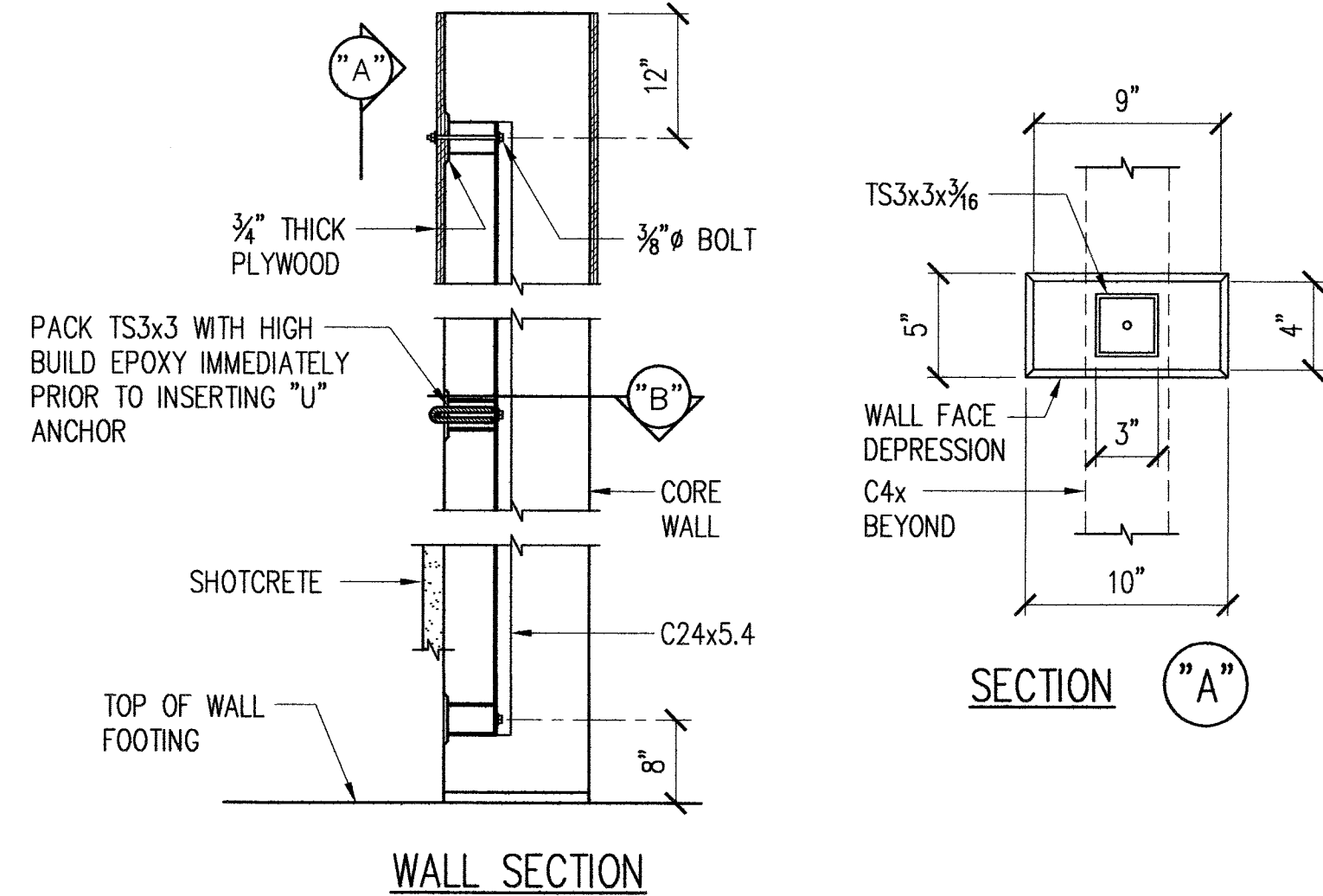
2 WALL TO ROOF CONNECTION DETAIL  
S-12 SCALE: 3/4" = 1'-0"



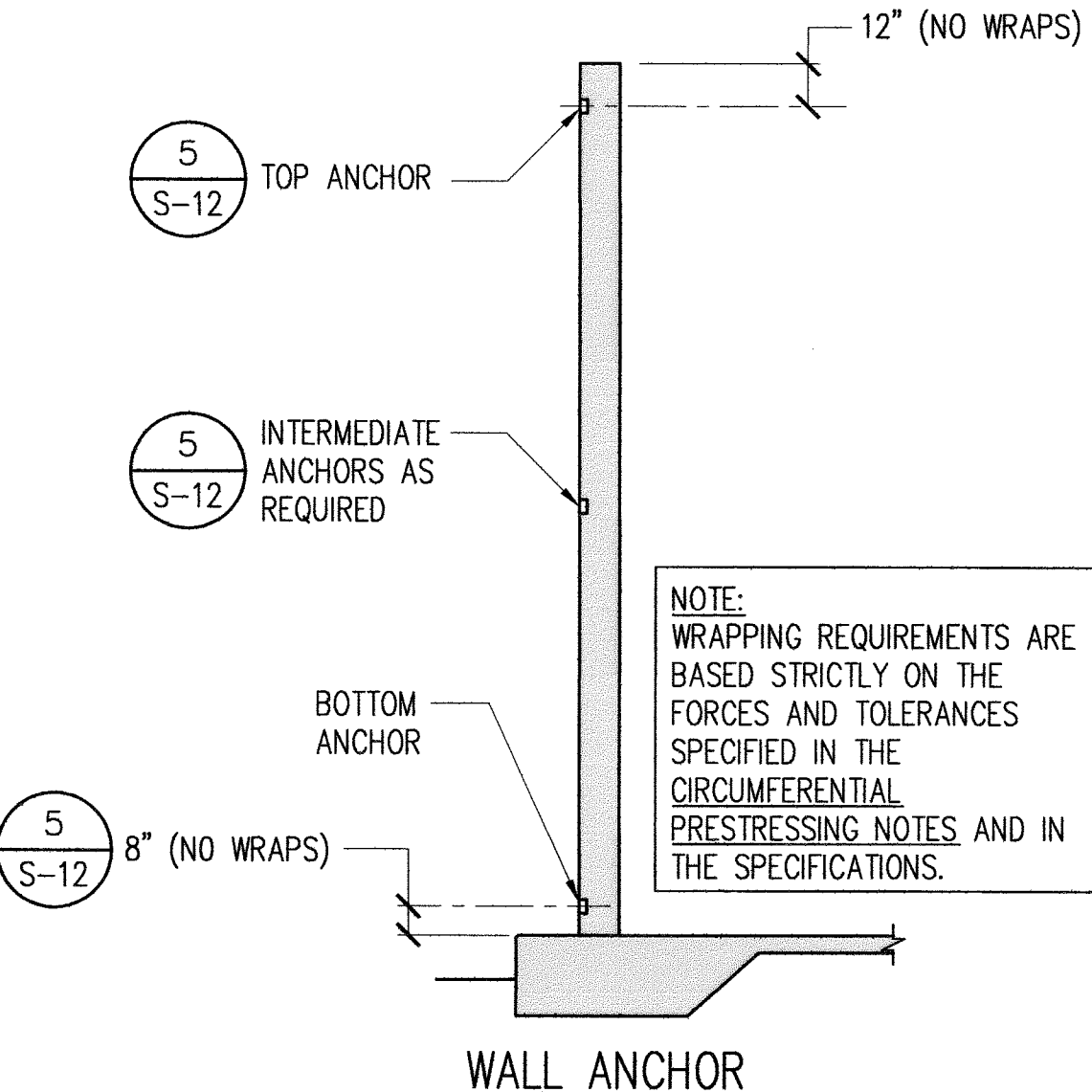
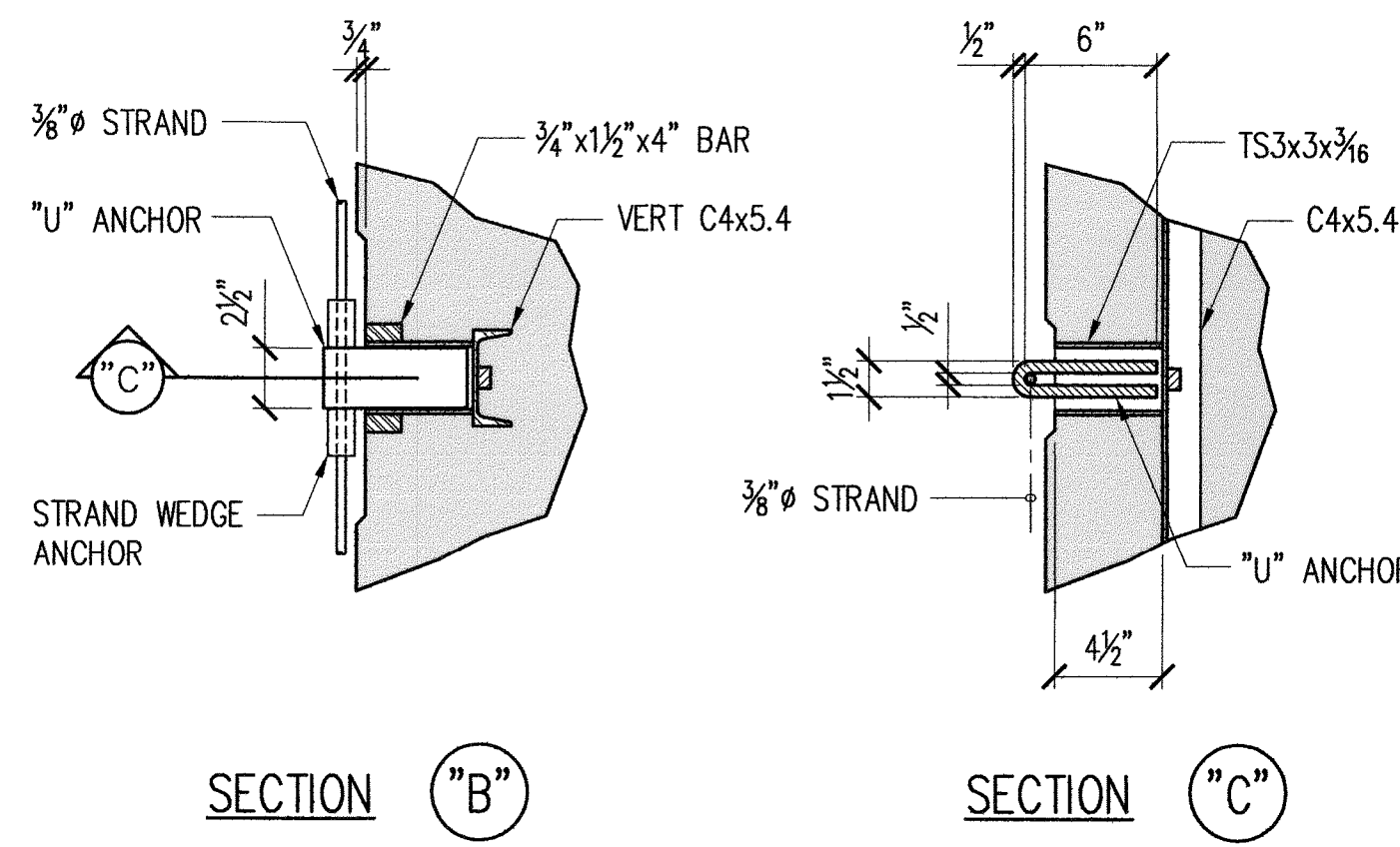
3 PLAN - PADS AT WALL BASE JOINT  
S-12 NOT TO SCALE



4 THREADBAR, NUT AND BEARING PLATE DETAIL  
S-12 NOT TO SCALE



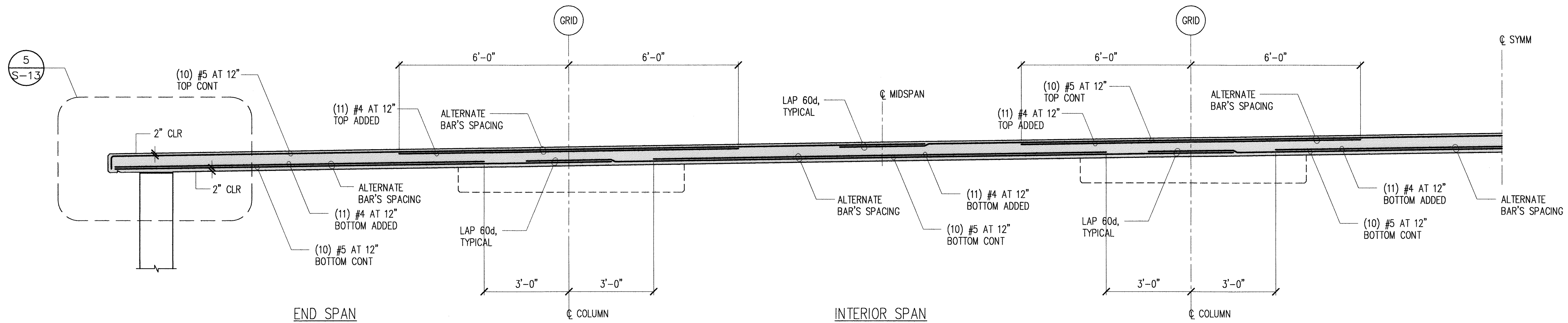
5 STRAND ANCHOR DETAILS  
S-12 NOT TO SCALE



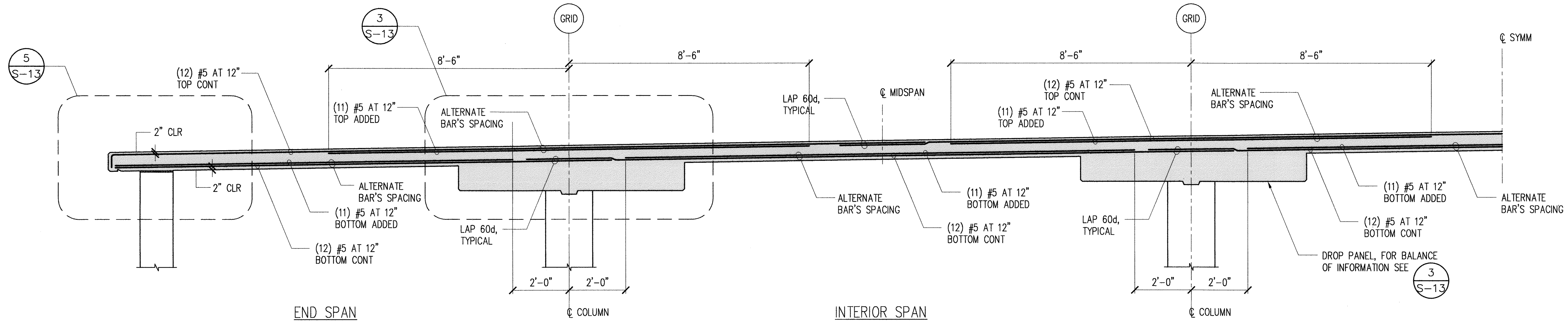
6 WRAPPING LIMITS  
S-12 NOT TO SCALE

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<div style="display: flex; justify-content: space-between;"> <div> </div> <div> <p>DEPARTMENT OF HAWAIIAN HOME LANDS  <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:          PRODUCTION WELL, RESERVOIR, AND          SUPPORTING FACILITIES</b>          AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p> </div> </div>				
<p><b>RESERVOIR WALL DETAILS</b></p>				

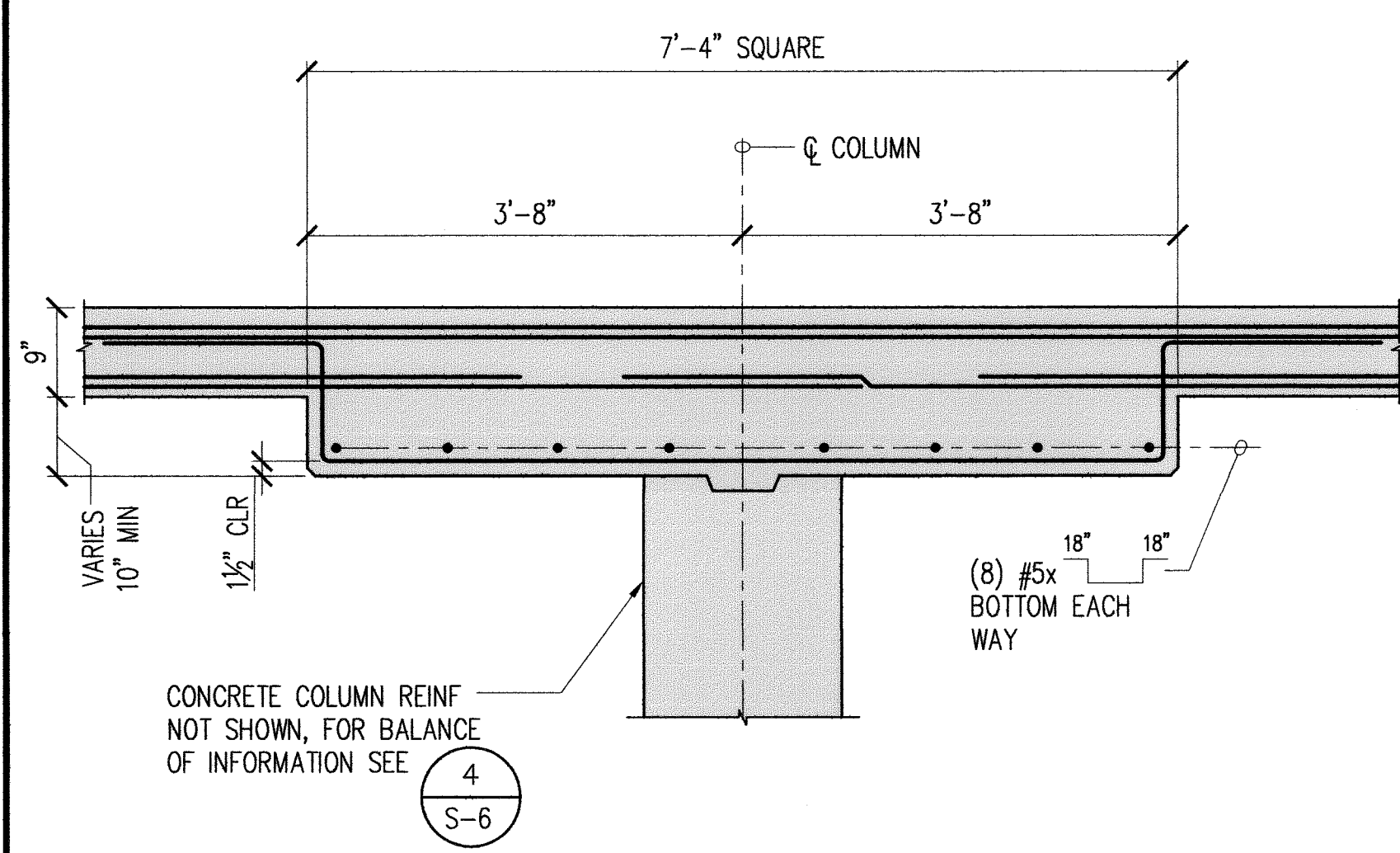




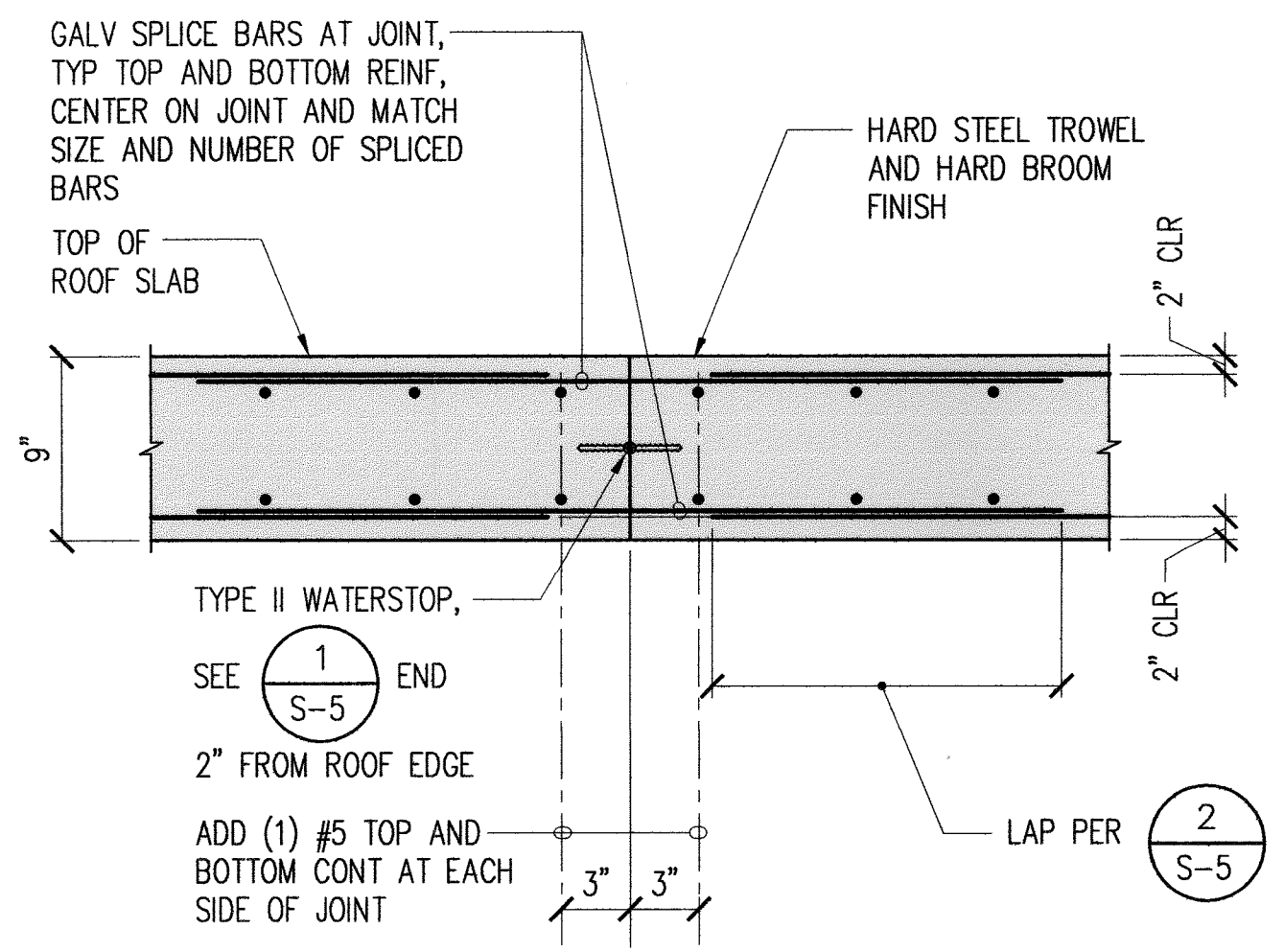
1 **TYPICAL MIDDLE STRIP REINFORCING**  
S-13 NOT TO SCALE



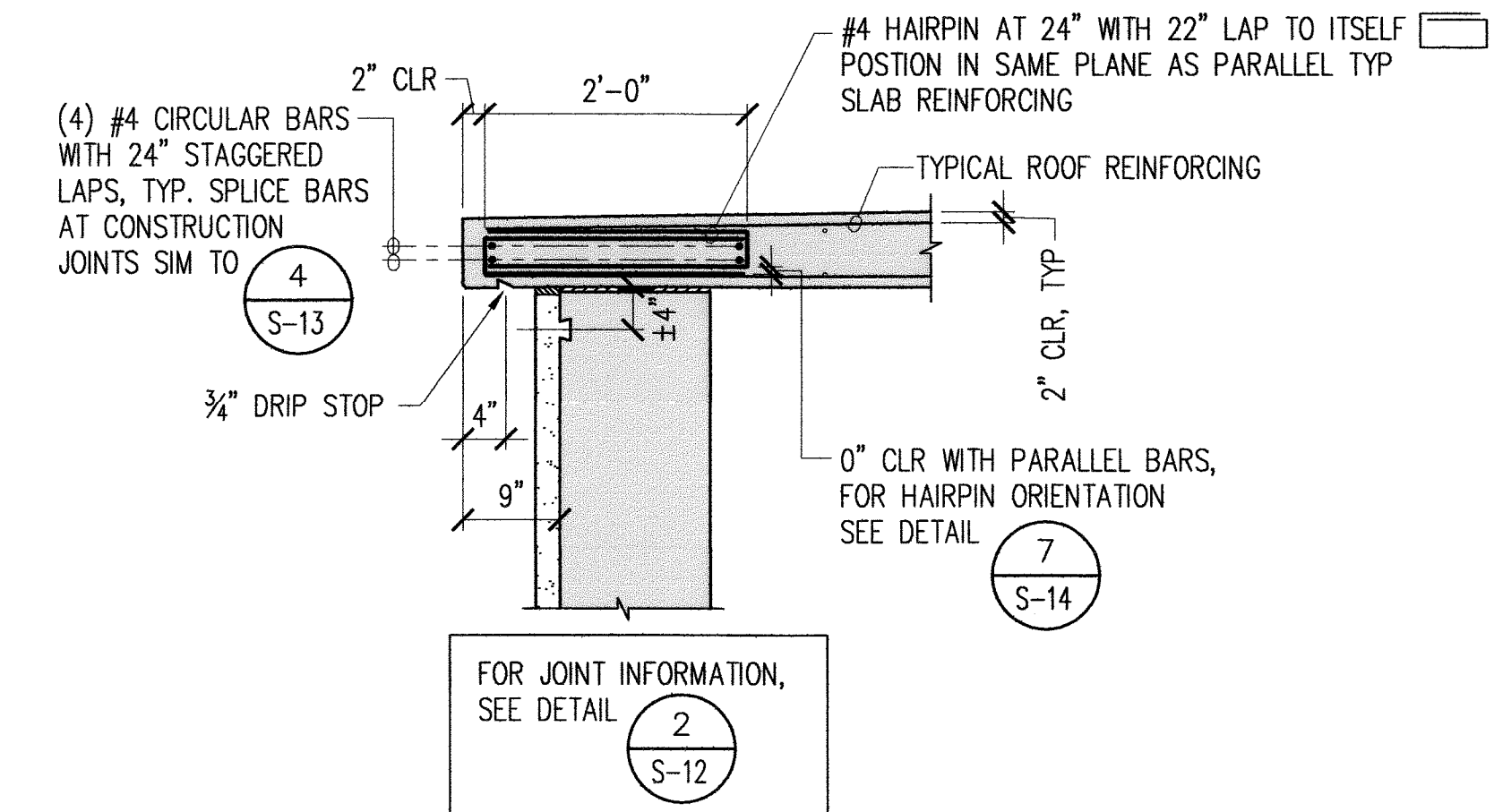
2 **TYPICAL COLUMN STRIP REINFORCING**  
S-13 NOT TO SCALE



3 **TYPICAL DROP PANEL DETAIL**  
S-13 SCALE: 3/4\"/>



4 **TYPICAL ROOF SLAB CONSTRUCTION JOINT DETAIL**  
S-13 NOT TO SCALE



5 **ROOF EDGE REINFORCING**  
S-13 SCALE: 3/4\"/>

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

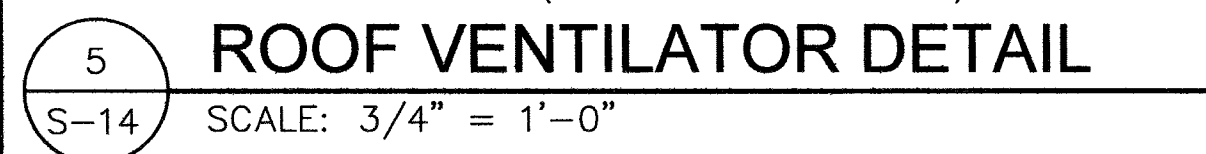
**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
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**RESERVOIR ROOF SLAB  
SECTIONS AND DETAILS**

**S-13**

FILE	POCKET	FOLDER	NO.



5. PROVIDE PADLOCK SYSTEM. BOARD OF WATER SUPPLY WILL PROVIDE PADLOCK. SUBMIT 6-SETS OF SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION.

4 NOT TO USED  
S-14 NOT TO SCALE



6 NOT USED  
S-14 SCALE: 1 1/2" = 1'-0"

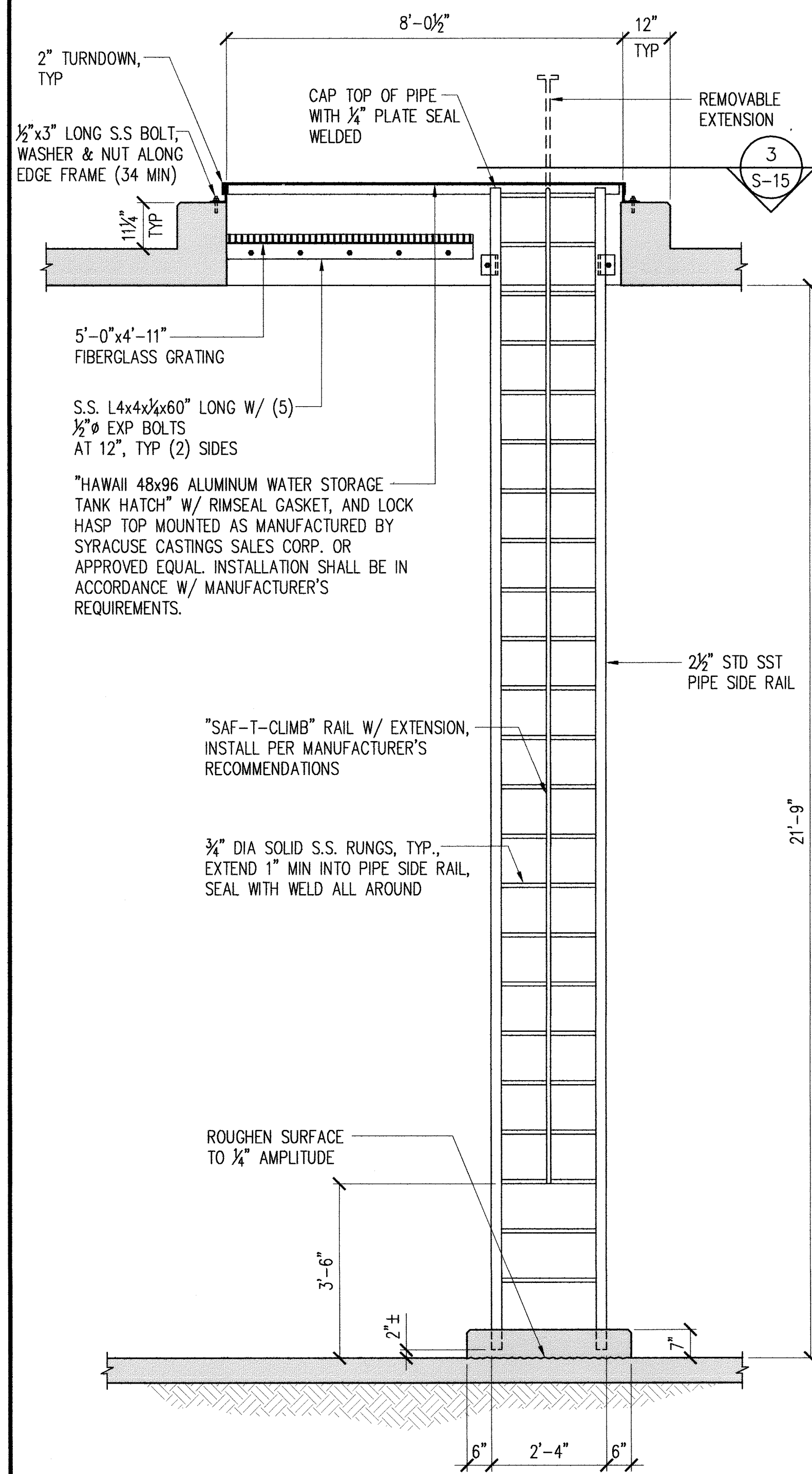
Figure 10.10 shows two graphical scales. The top scale is labeled "SCALE: 1" = 1'-0\"", with markings at 1', 0, 1', and 2'. The bottom scale is labeled "SCALE: 3" = 1'-0\"", with markings at 0, 4", 8", and 1'.

## RESERVOIR ROOFING SECTIONS AND DETAILS

S-14

FILE	POCKET	FOLDER	NO.



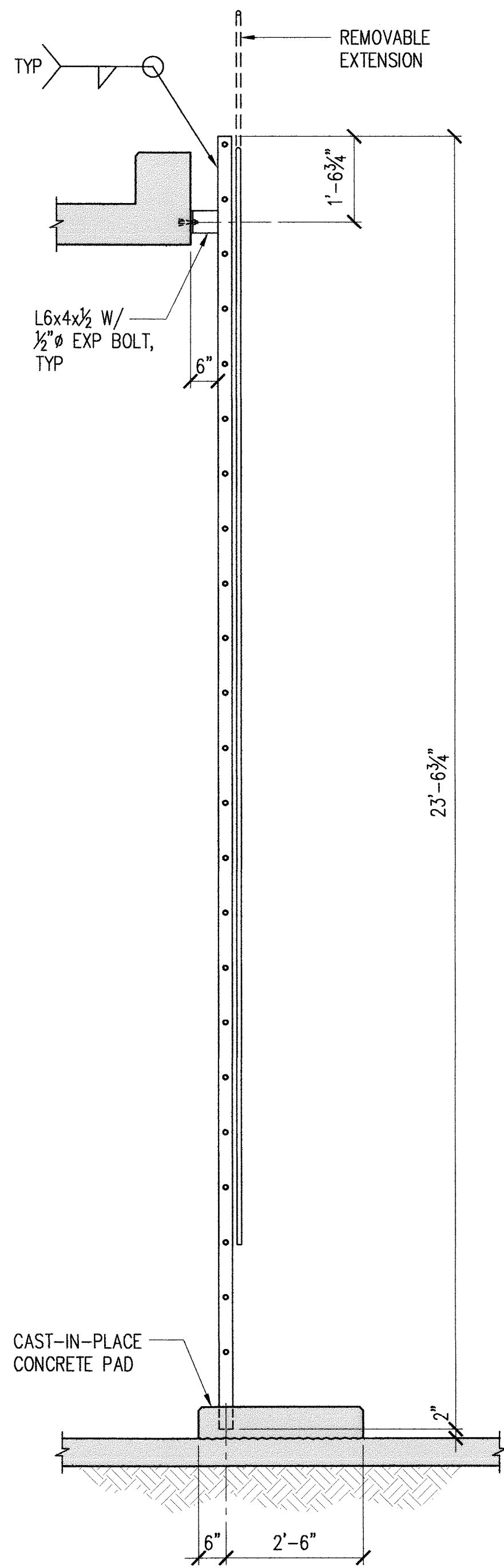


**INTERIOR LADDER AND ROOF HATCH**

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

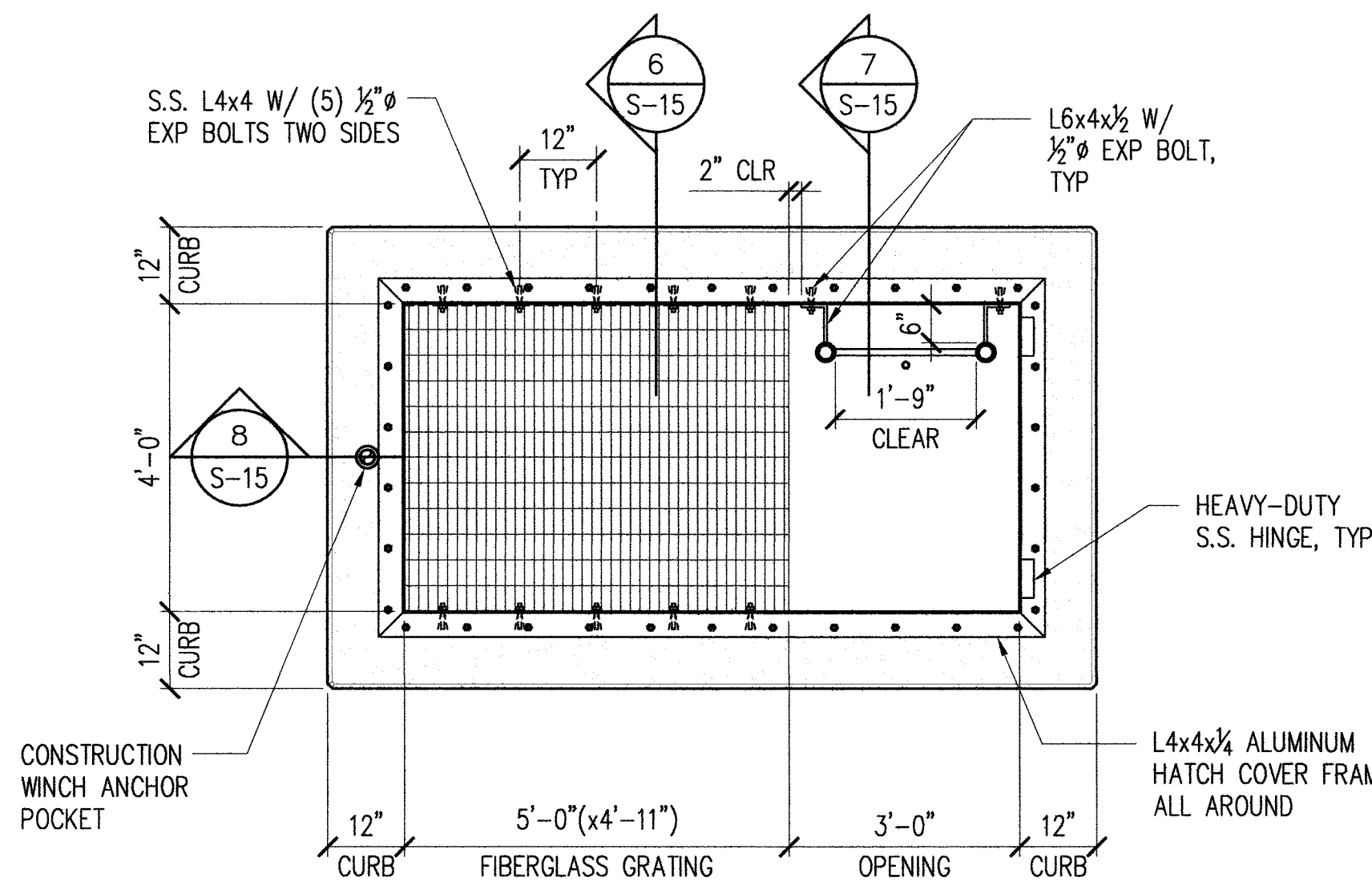
**INTERIOR LADDER NOTES:**

1. ALL MATERIALS FOR INTERIOR LADDERS PIPE, SIDE RAILS, RUNGS, BRACKETS AND "SAF-T-CLIMB" TO BE SST 316.
2. ROOF HATCH GRATING TO BE FIBERGLASS.
3. HATCH GRATING SHALL HAVE A MINIMUM 100 PSF LOAD RATING FOR THE SPECIFIED SPAN.
4. LADDER BARS TO BE SOLID BARS.
5. ALL WELDS TO BE 1/4" MINIMUM.
6. ROOF HATCH TO BE MANUFACTURED OF ALUMINUM.
7. ALL ALUMINUM IN CONTACT WITH CONCRETE MUST BE COATED WITH A HEAVY BITUMASTIC COATING OR EPOXY PAINT.
8. ALL BOLTS SST 316 UNLESS NOTED OTHERWISE.
9. WHERE SST BOLTS ARE IN CONTACT WITH DISSIMILAR METALS, USE INSULATING SLEEVES AND PHENOLIC WASHERS TO ELECTRICALLY ISOLATE THE BOLTS.



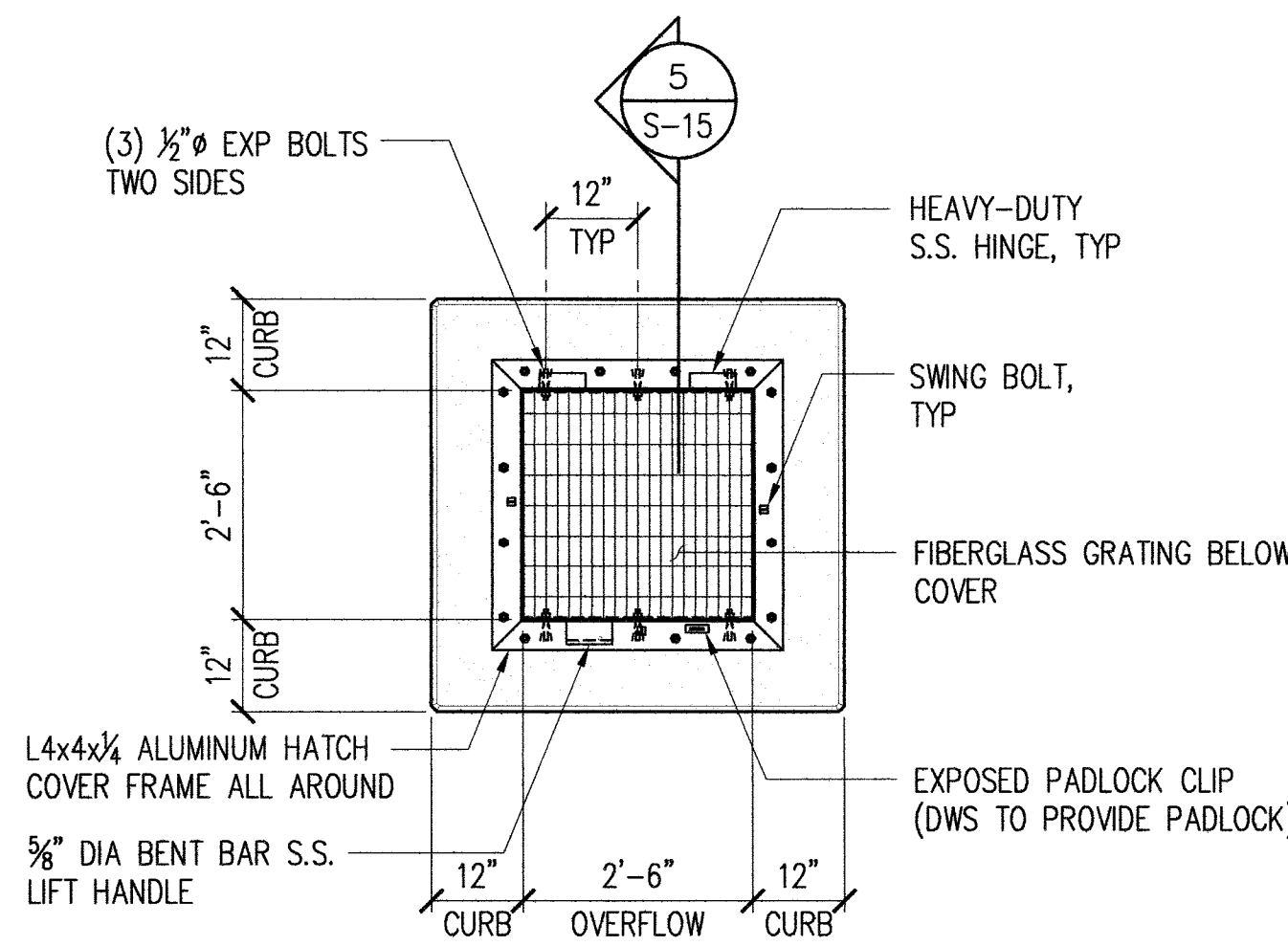
**ELEVATION OF INTERIOR LADDER**

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



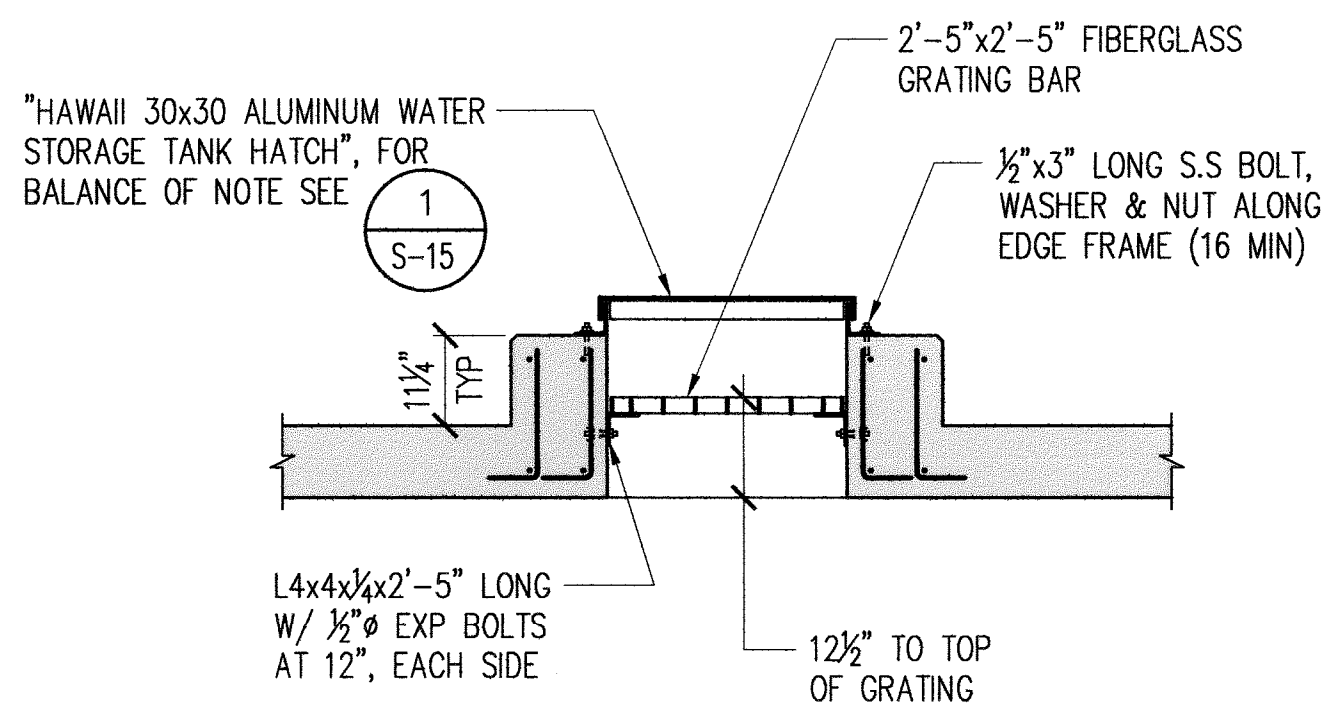
**PLAN - ROOF HATCH**

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



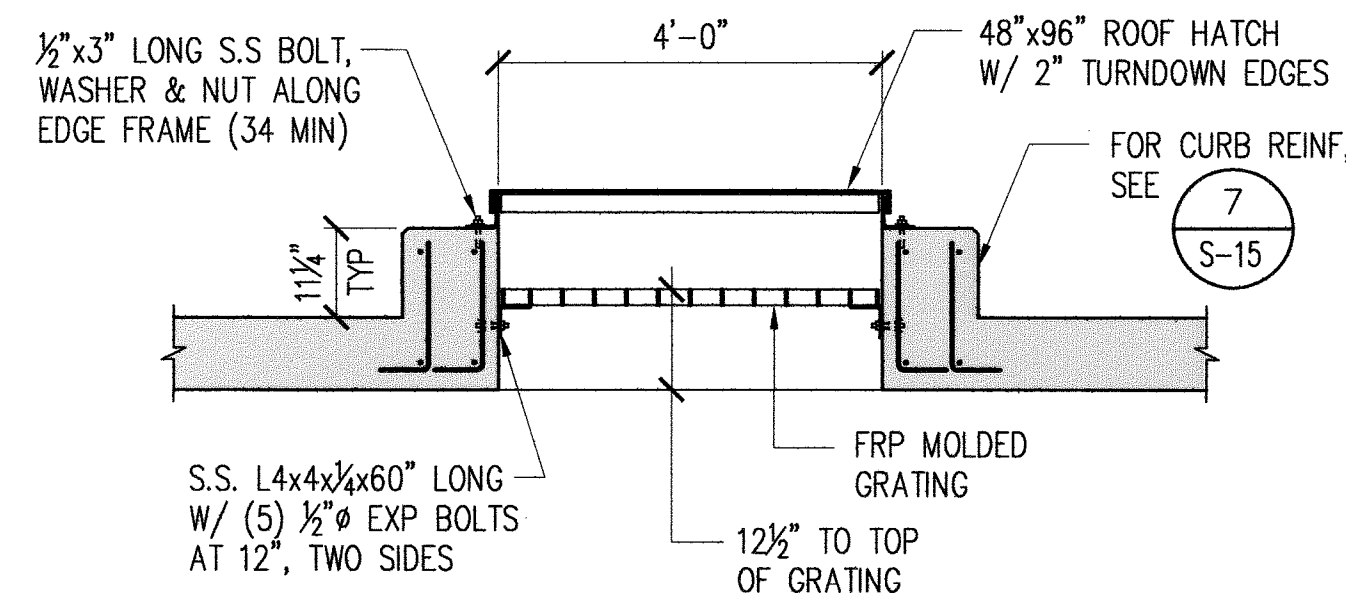
**PLAN - 2'-6" SQ OBSERVATION HATCH**

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



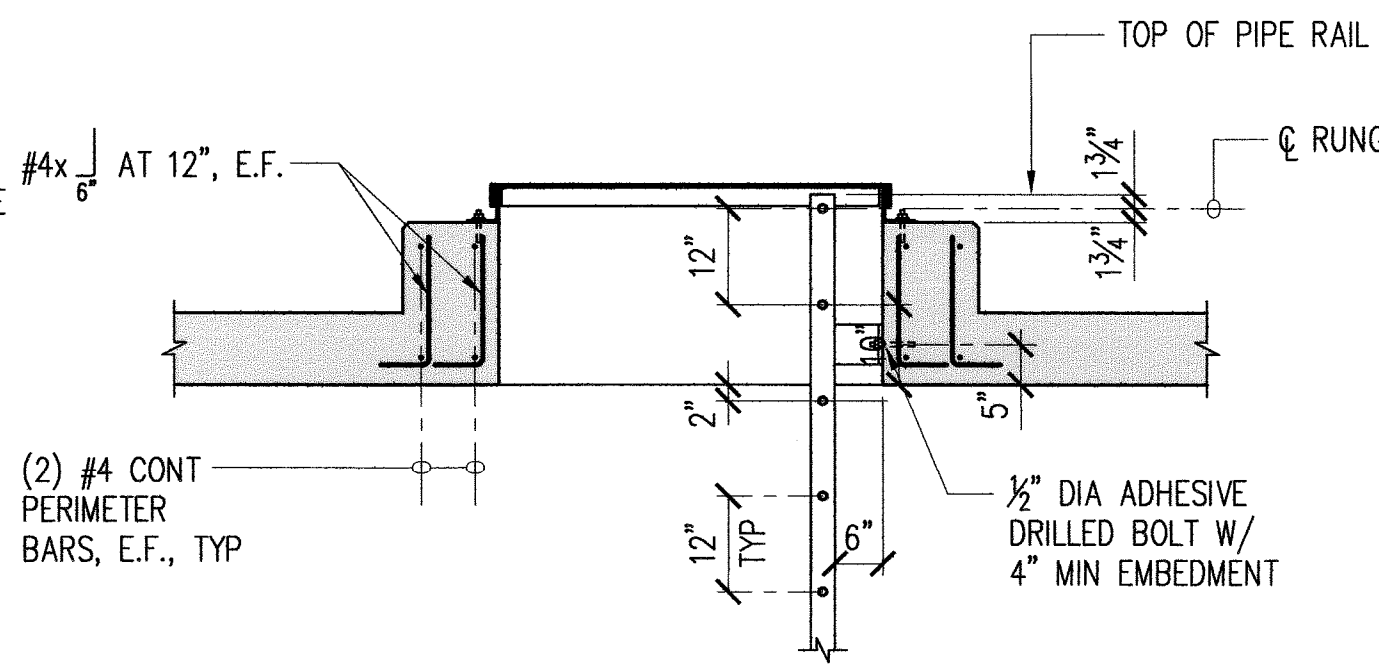
**SECTION**

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



**SECTION**

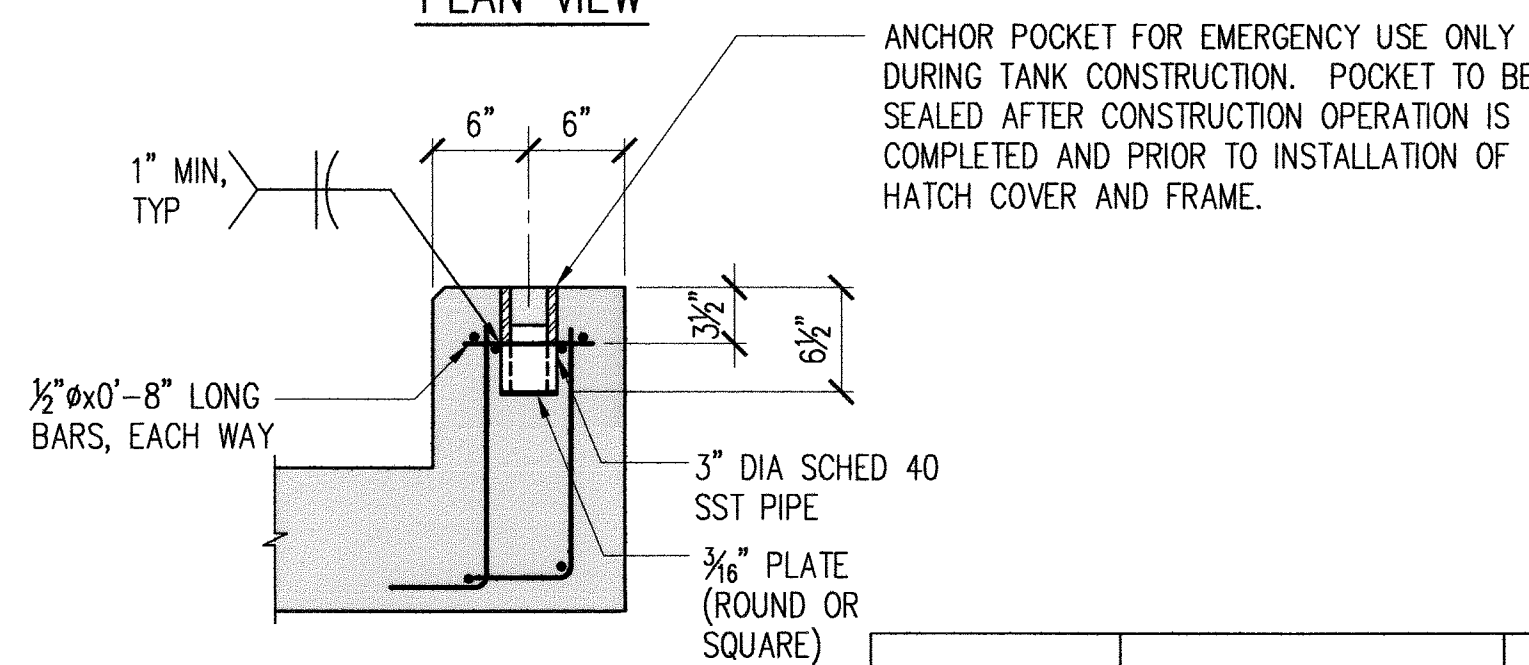
SCALE: 1/2" = 1'-0"



**SECTION**

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

**PLAN VIEW**



**SECTION - WINCH ANCHOR**

SCALE: 1" = 1'-0"

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**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

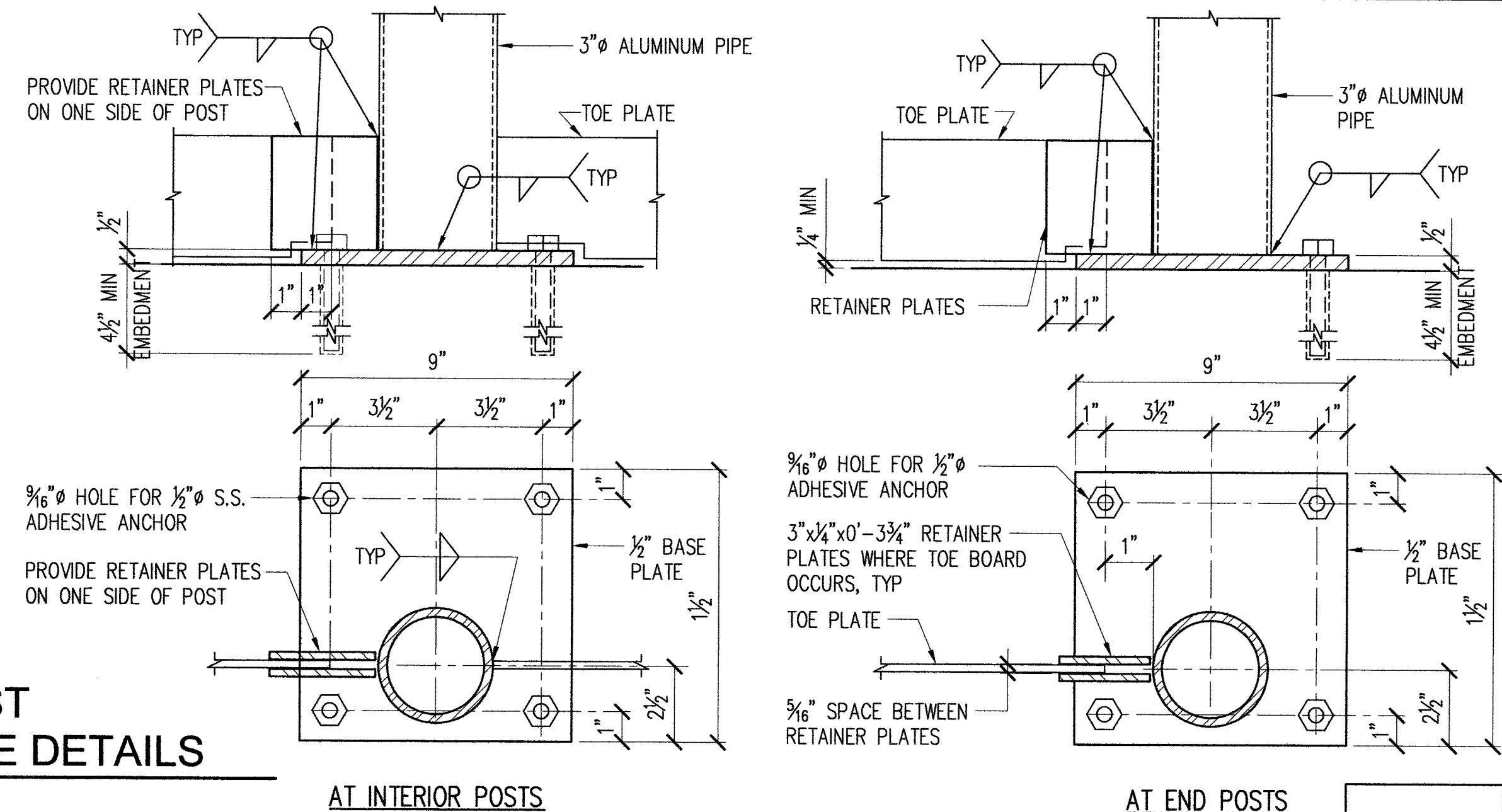
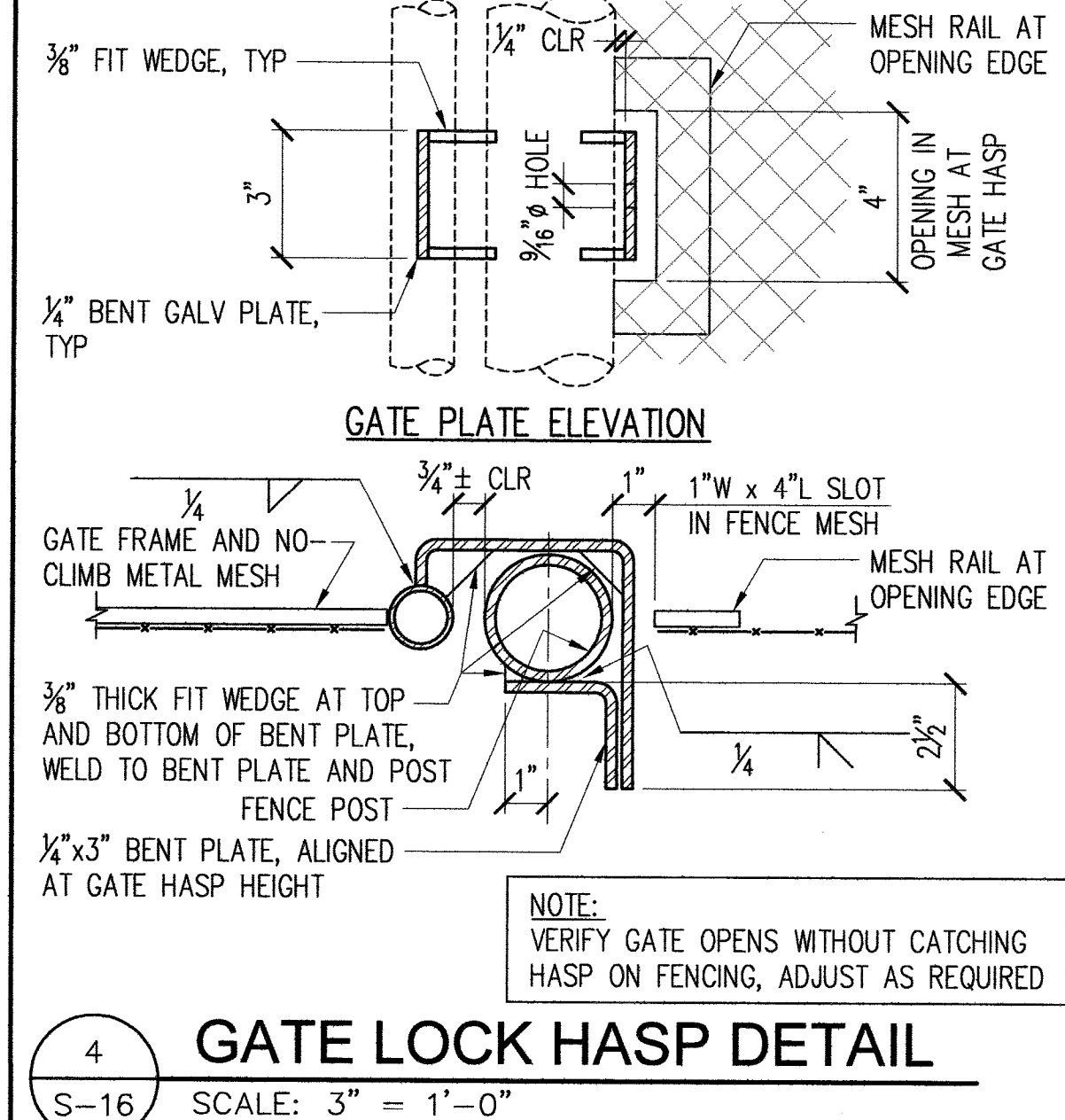
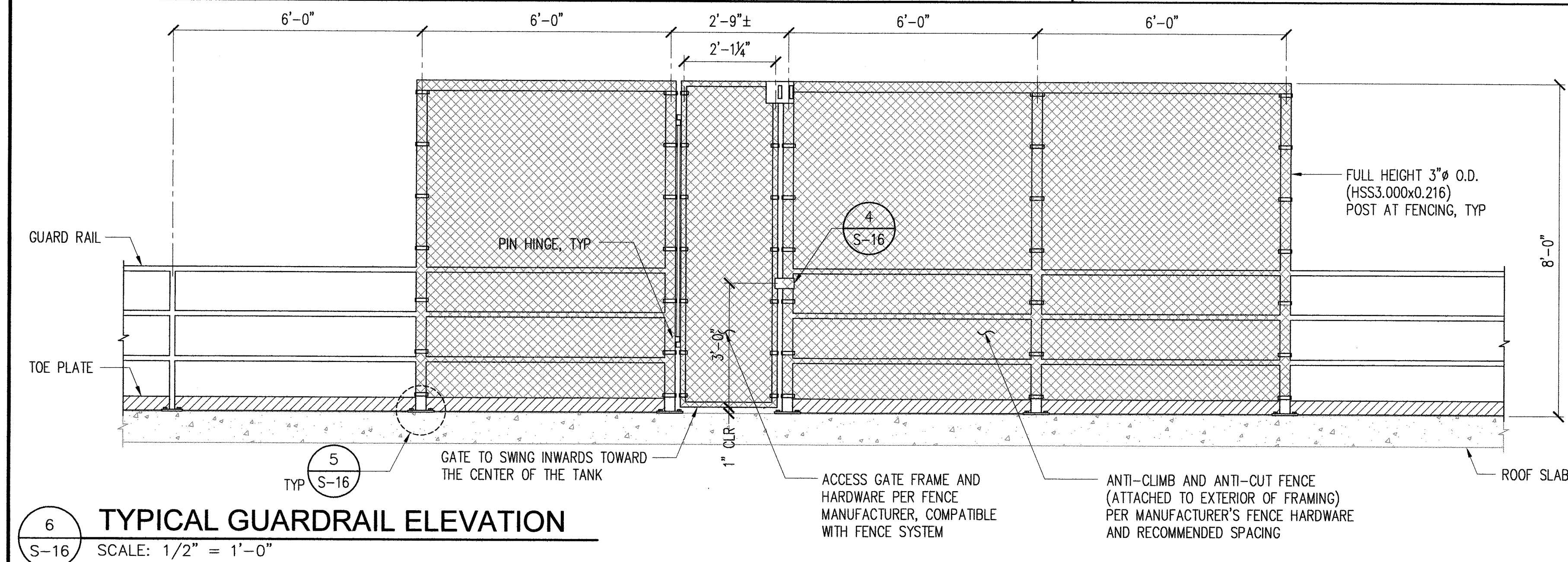
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
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AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

LADDER AND HATCH DETAILS

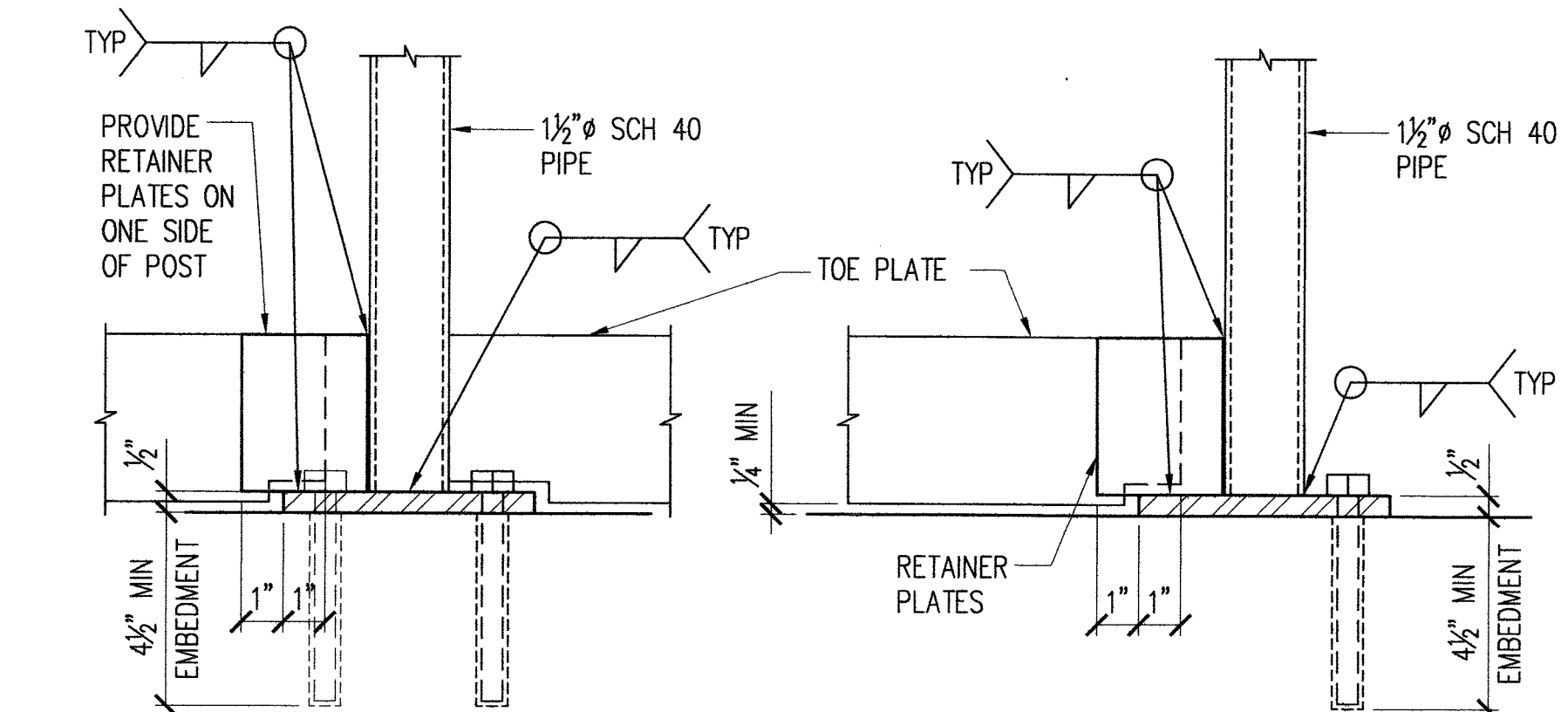
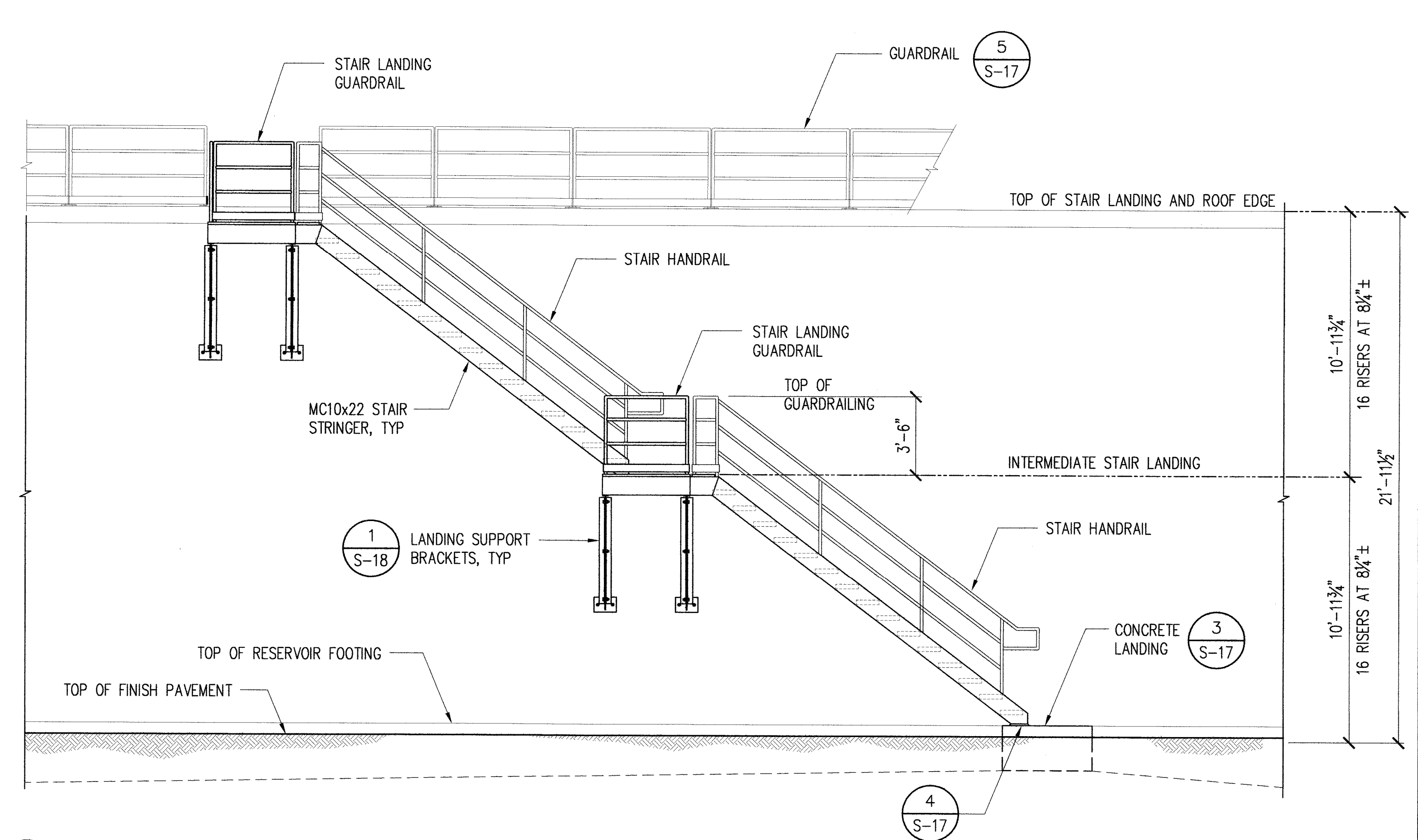
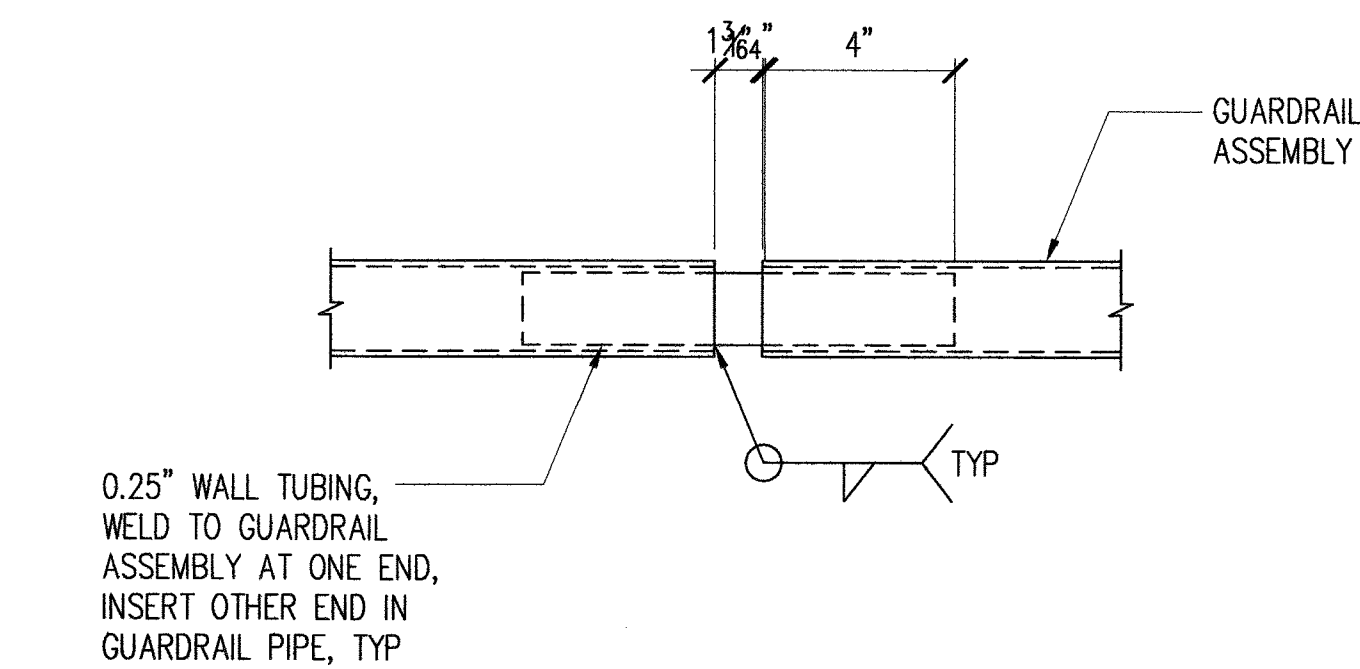
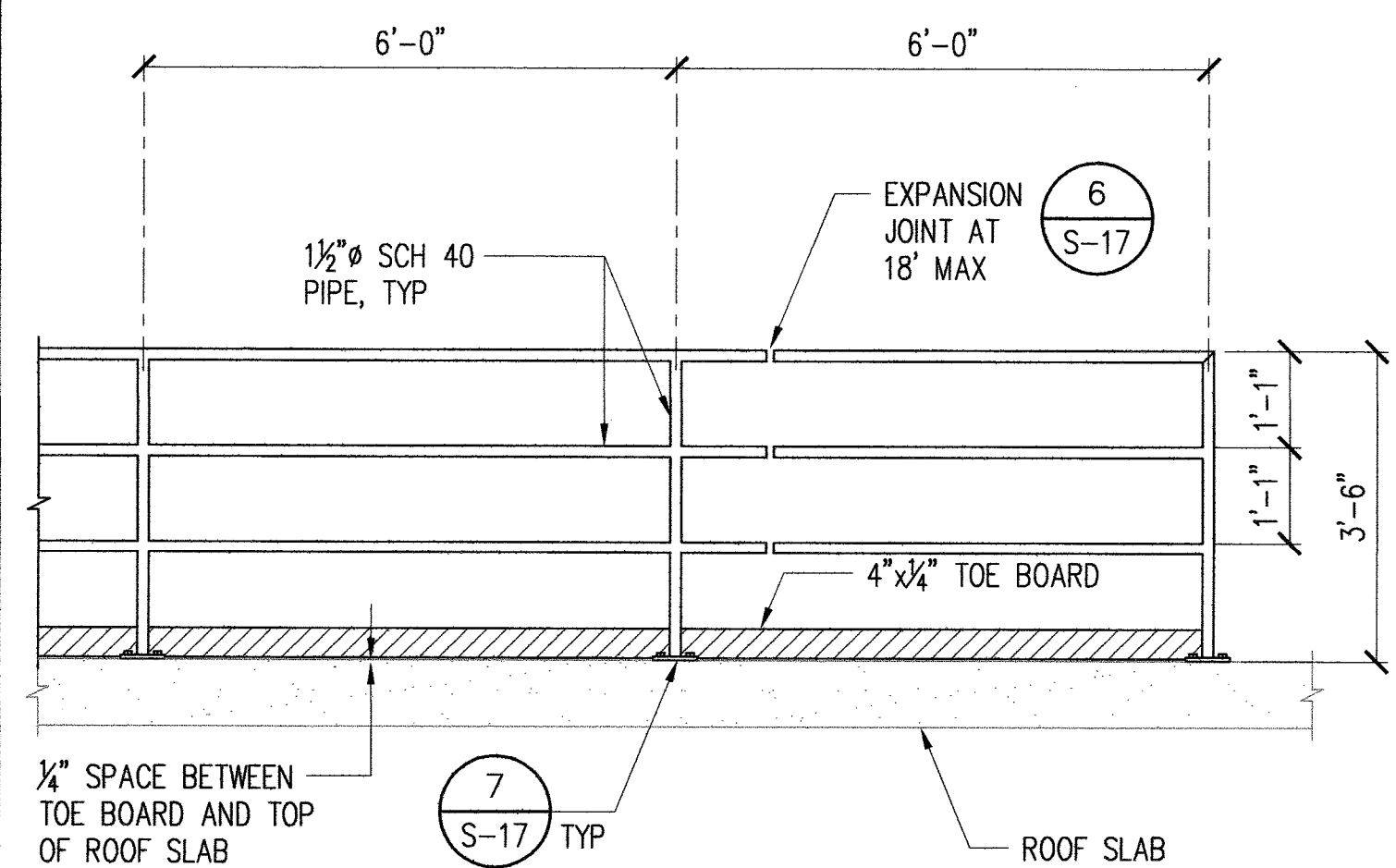
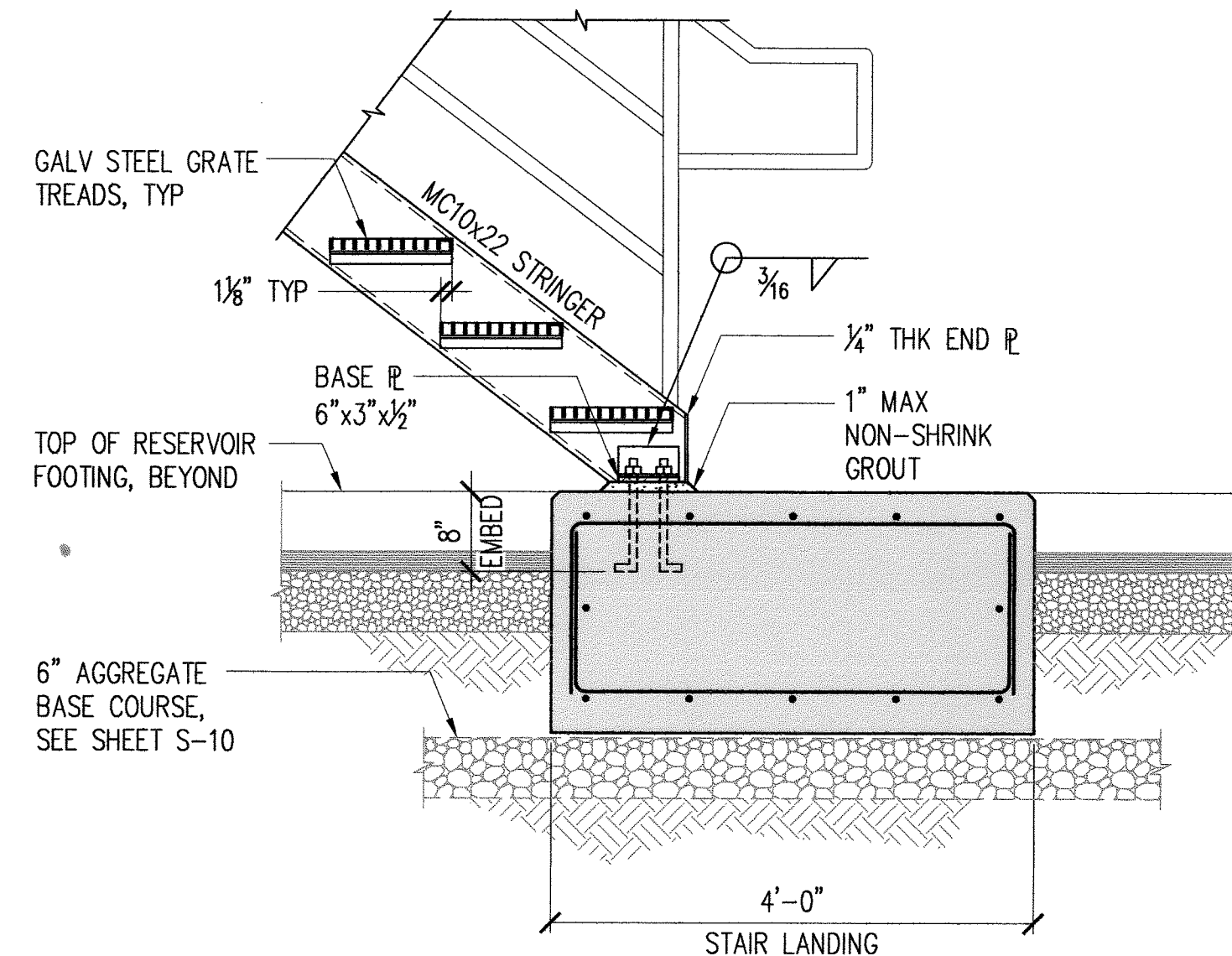
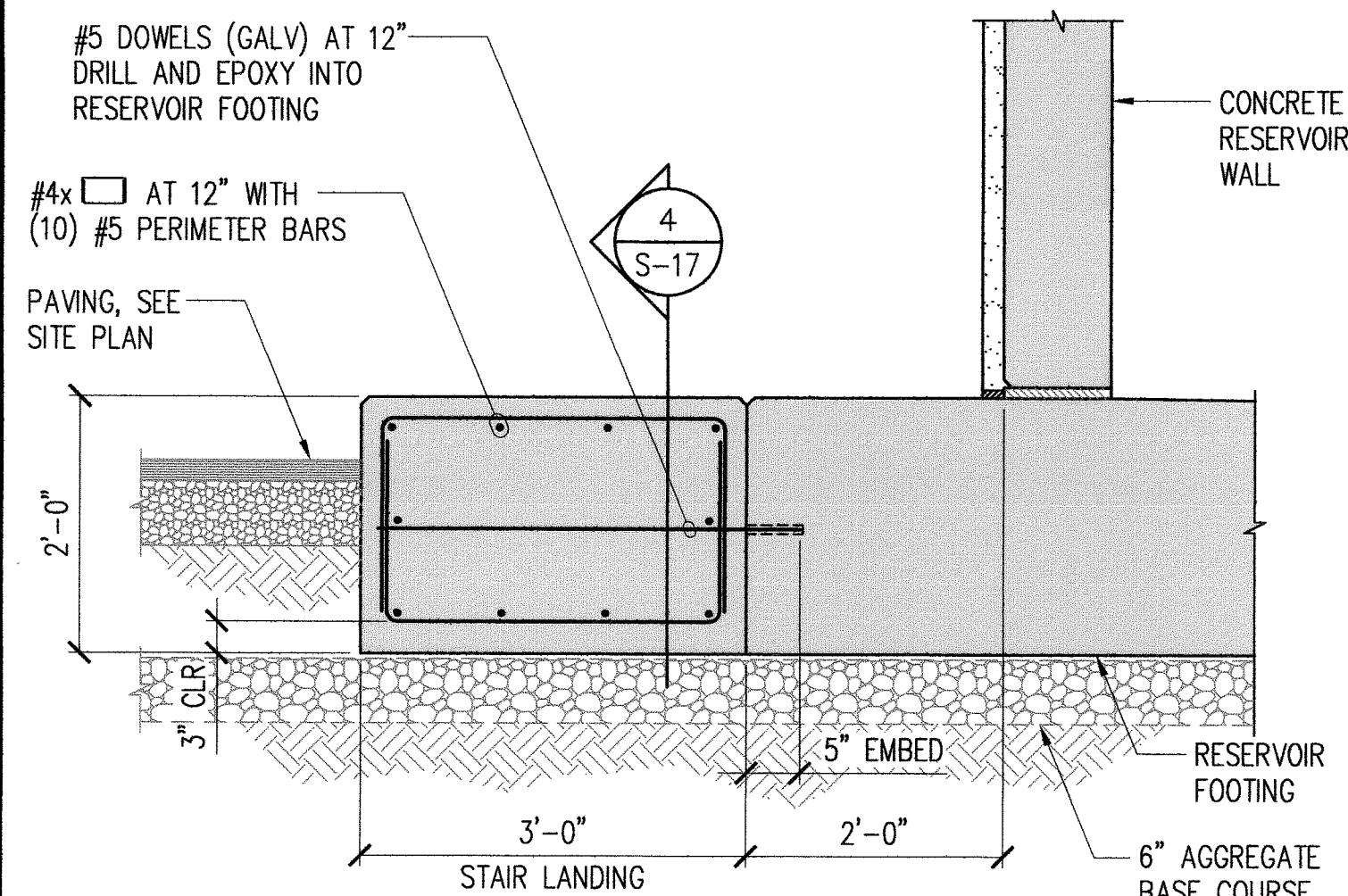
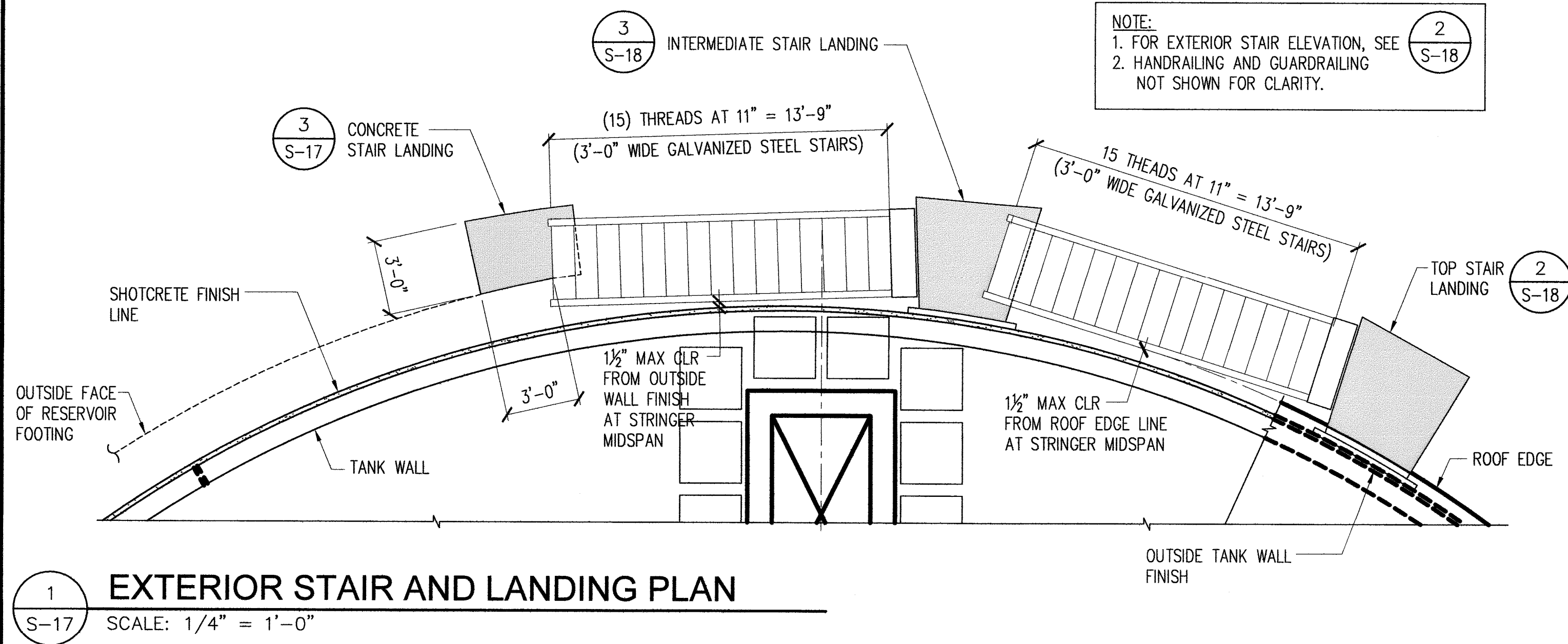
S-15

FILE	POCKET	FOLDER	NO.



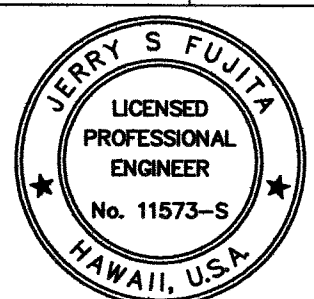






- STAIR AND GUARDRAIL NOTES:**
1. ALL MATERIAL FOR STAIRS AND GUARDRAILS, BASE PLATES AND TOE PLATES TO BE GALVANIZED STEEL WITH A PAINT FINISH.
  2. ALL WELDS TO BE 1/4" MINIMUM, UNLESS NOTED OTHERWISE.
  3. ALL ALUMINUM IN CONTACT WITH CONCRETE MUST BE COATED WITH A HEAVY BITUMASTIC COATING OR EPOXY PAINT.
  4. USE GALV. STEEL FOR ALL BOLTS UNLESS NOTED OTHERWISE.

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**KAI HAWAII**  
STRUCTURAL & FORENSIC ENGINEERS

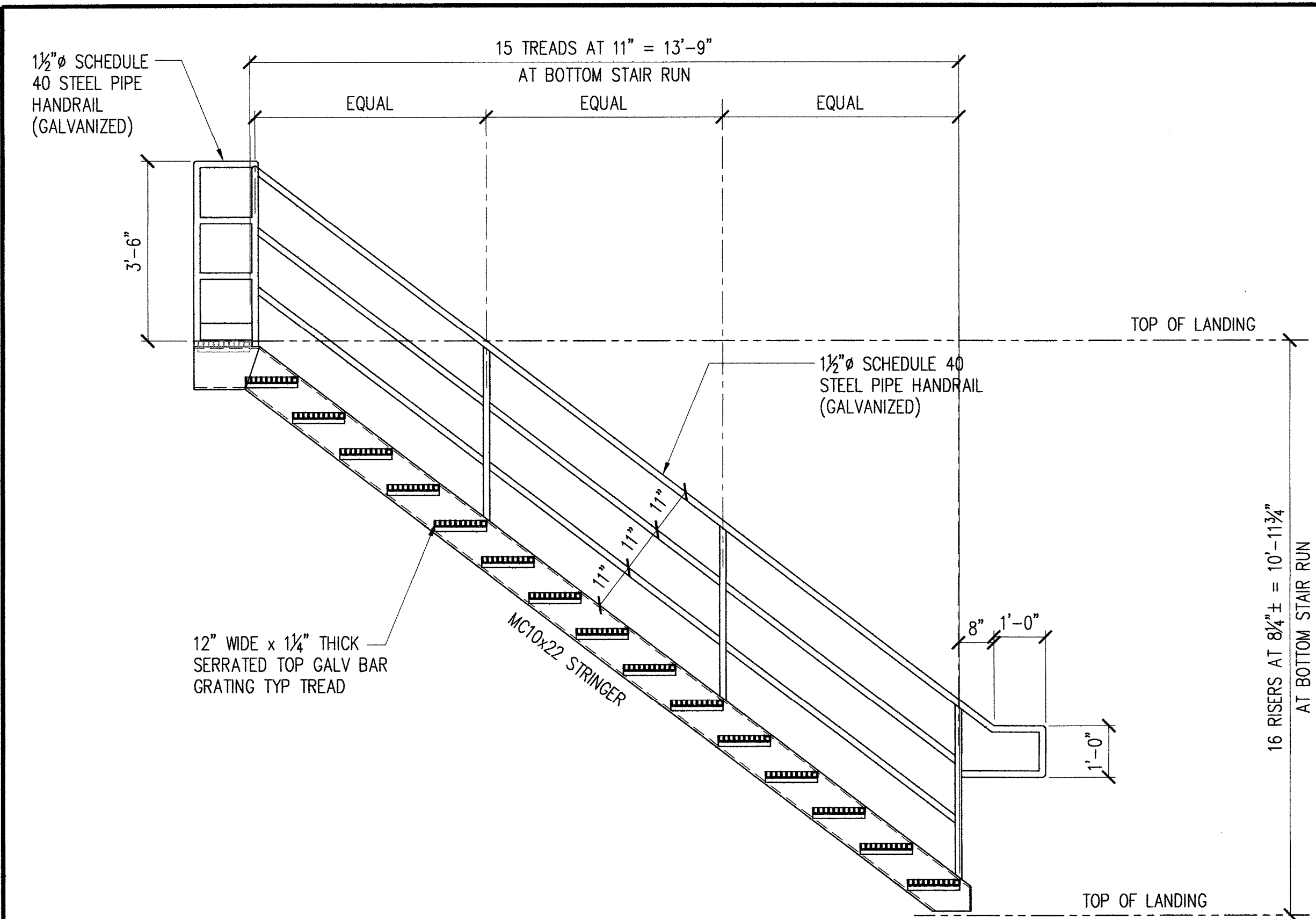
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
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AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**EXTERIOR STAIR PLAN,  
ELEVATION AND DETAILS**

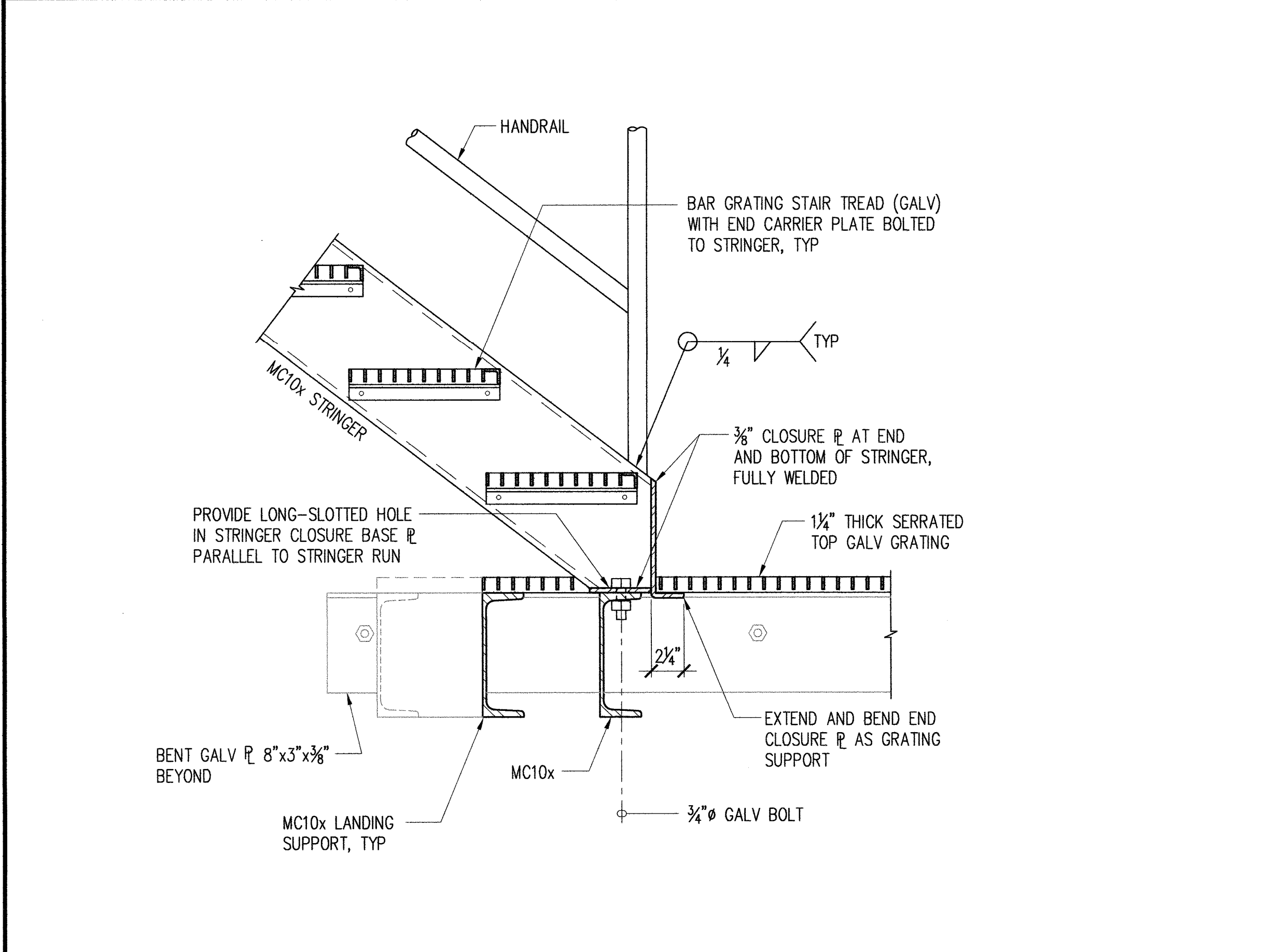




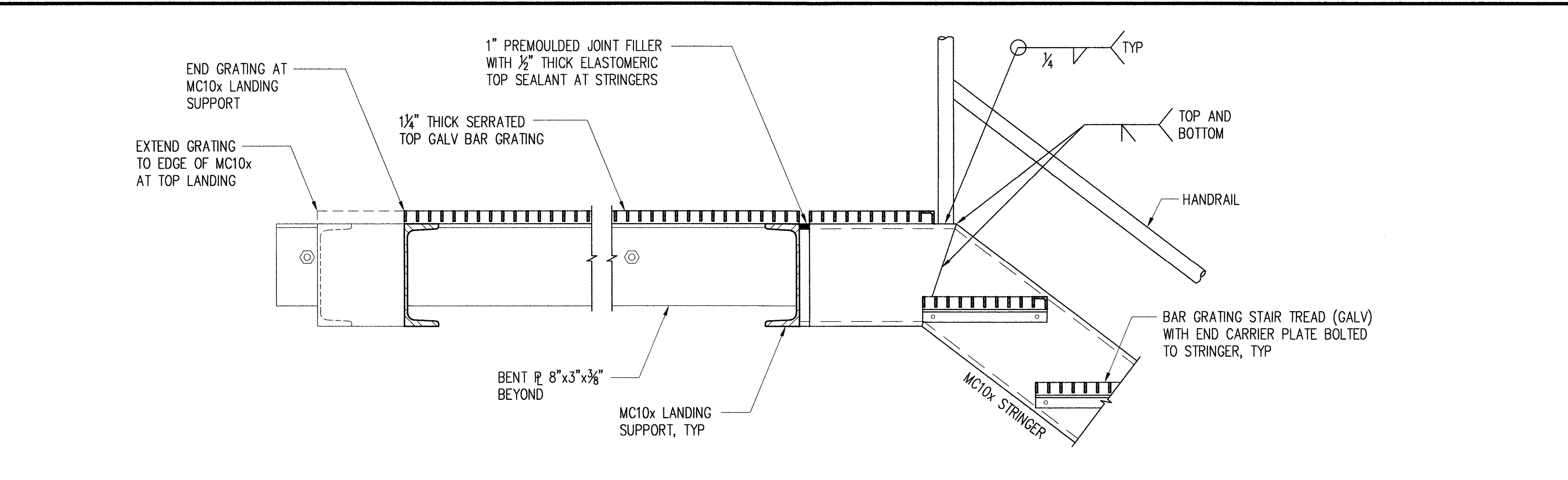




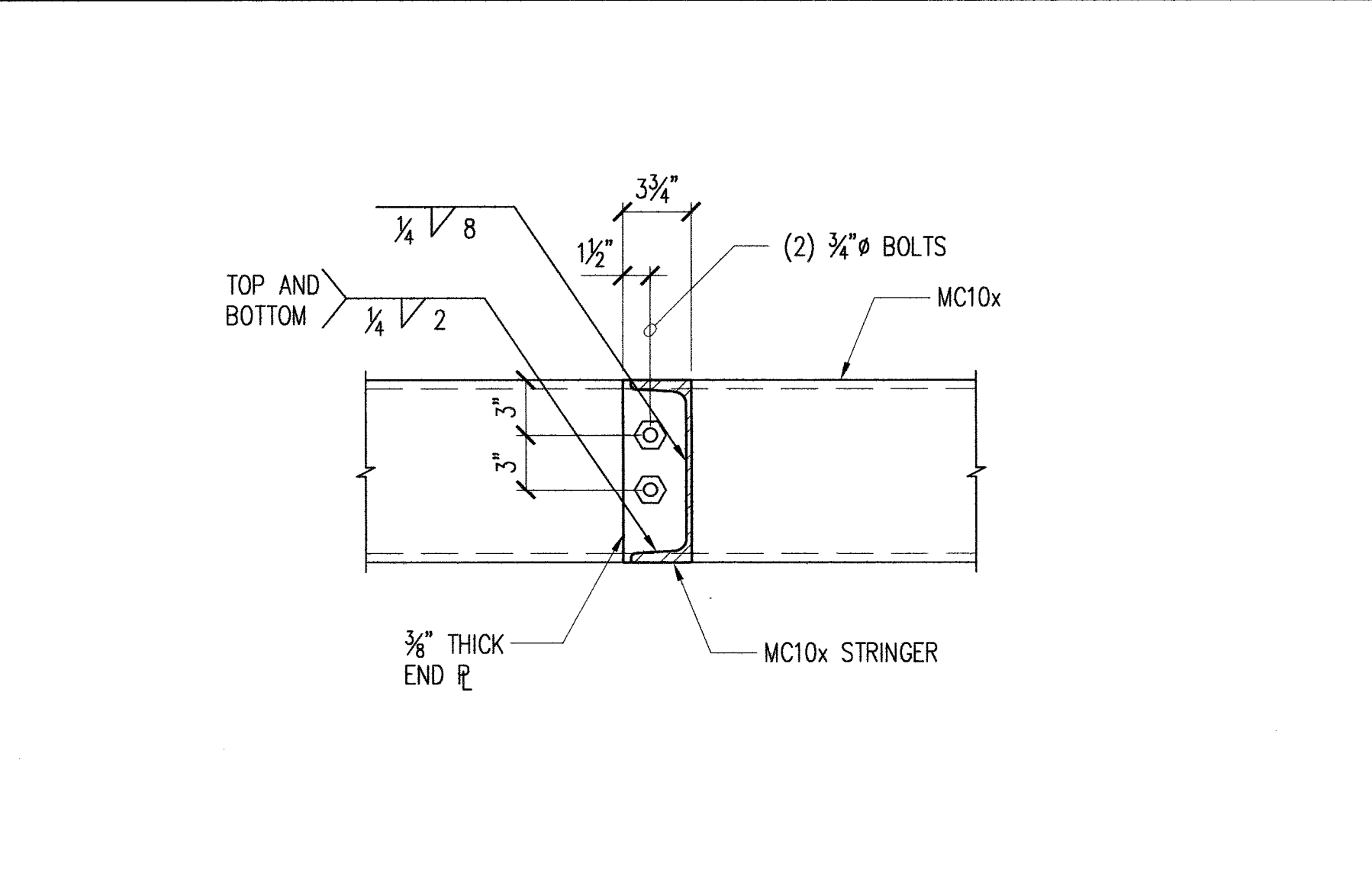
1  
S-19  
**TYPICAL STAIR HANDRAIL AND STRINGER ELEVATION**  
SCALE: 1/2" = 1'-0"



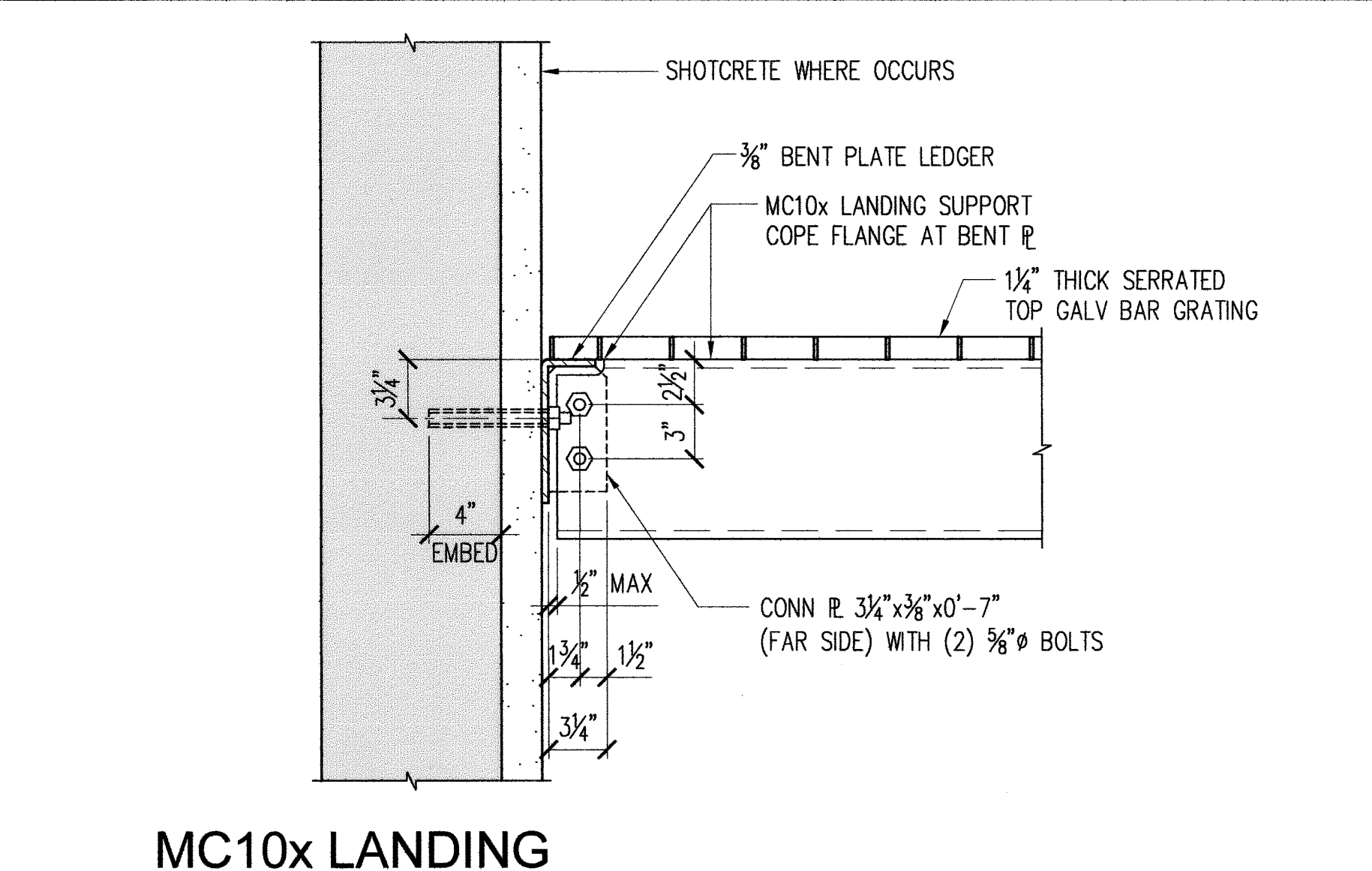
3  
S-19  
**BOTTOM OF STRINGER AT LANDING**  
SCALE: 1 1/2" = 1'-0"



2  
S-19  
**TOP OF STRINGER AT LANDING**  
SCALE: 1 1/2" = 1'-0"

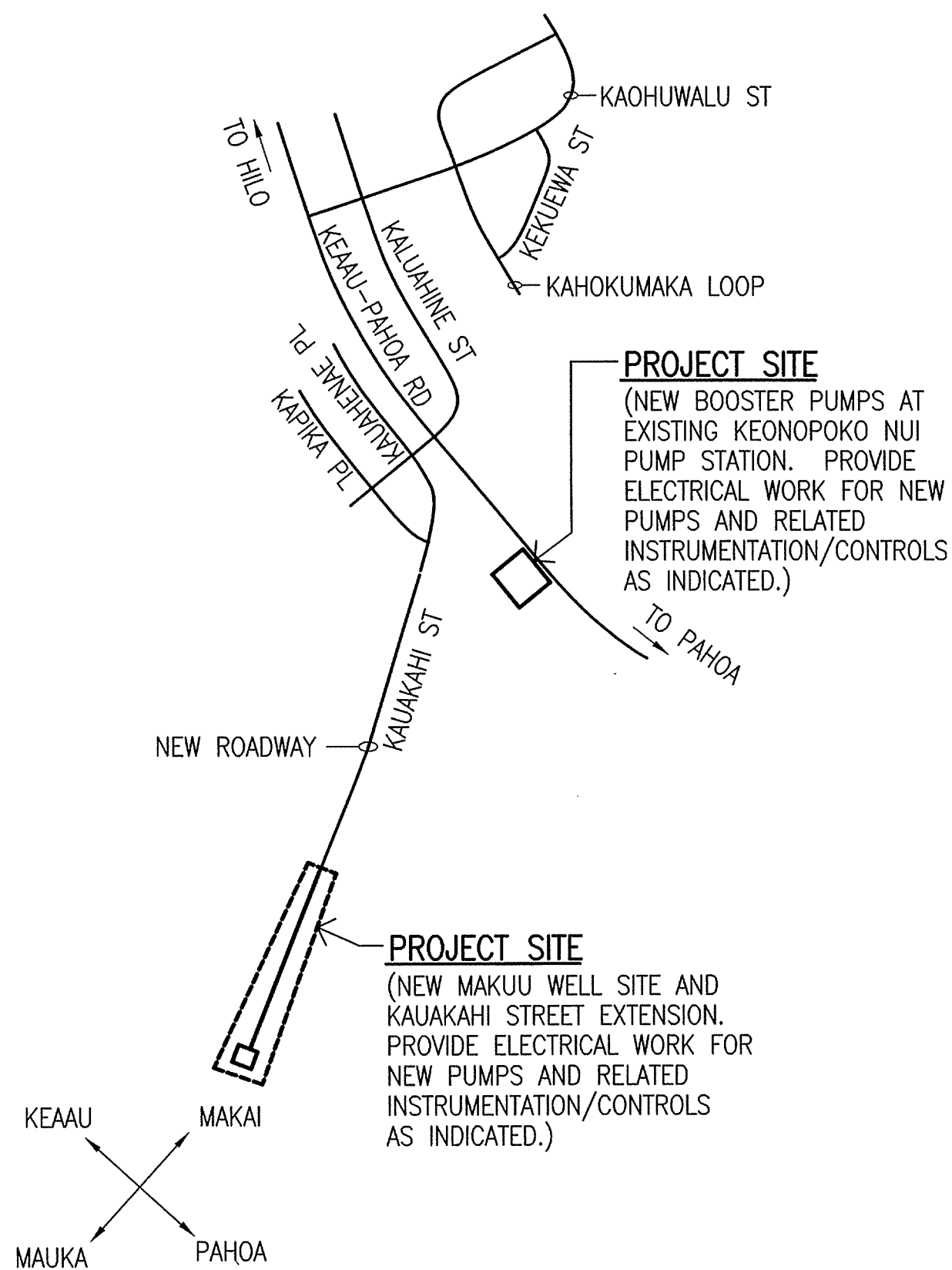


4  
S-19  
**STAIR STRINGER TOP CONNECTION**  
SCALE: 1 1/2" = 1'-0"



5  
S-19  
**MC10x LANDING SUPPORT TO LEDGER**  
SCALE: 1 1/2" = 1'-0"

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<p>DEPARTMENT OF HAWAIIAN HOME LANDS</p> <p><b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b></p> <p><b>PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b></p> <p>AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p>				
<p>EXTERIOR STAIR PLAN, ELEVATION AND DETAILS</p>				



NOT TO SCALE

7/18/12	BID ISSUE
5/24/12	FINAL REVIEW(FsPdf),HELCO-1,PF2
DATE	ISSUE

HAWAII COUNTY CODE – CHAPTER 5 – BUILDING  
2006 IECC & ORDINANCES 09-48 & 10-68  
BUILDING ENERGY EFFICIENCY STANDARDS

License No.: 3539-E

AI(*), AI(*)-	ANALOG INPUT
AO(*), AO(*)-	ANALOG OUTPUT
DI(*), DI(*)-	DIGITAL INPUT
RO(*), RO(*)	RELAY(DIGITAL) OUTPUT

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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION			
WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070 688 KINOOLE ST., STE. 115B HILLO, HI. 96720 PH:961-9666/FAX:935-2549			
WTO REF NO. 102011418			

**ENGINEERS SURVEYORS  
HAWAII, INC.**  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
91-8116 HON. 885-4590 KAMUELA

ELECTRICAL WORK



ELECTRICAL PLAN NOTES

1. ALL PLANS ARE DIAGRAMMATIC AND INDICATE LOCATIONS AND GENERAL REQUIREMENTS ONLY. ALL FINAL LOCATIONS SHALL BE DETERMINED BY THE CONTRACTOR SUBJECT TO ACCEPTANCE BY THE ENGINEER. ALL ROUTINGS FOR WIRING SHALL BE SELECTED AND DETERMINED BY THE CONTRACTOR COMPLYING WITH ALL REQUIREMENTS OF THE NEC.
2. ALL PLANS ARE DIAGRAMMATIC AND SHOWS CIRCUITING AND HOMERUN REQUIREMENTS ONLY. WHERE A "HR" IS INDICATED, THE CONTRACTOR SHALL INSTALL THE HOMERUN CIRCUIT WIRING AS INDICATED. WHERE NO "HR" IS INDICATED, THE CONTRACTOR SHALL FIELD ARRANGE ALL HOMERUNS. CONDUITS AND CONDUCTORS SHALL BE SIZED PROPERLY PER NEC REQUIREMENTS DEPENDING ON THE HOMERUN GROUPINGS SELECTED BY THE CONTRACTOR.
3. ALL PANELBOARDS SHALL BE CIRCUITED AS INDICATED ON THE DRAWINGS. DO NOT CHANGE WITHOUT THE APPROVAL OF THE ENGINEER.
4. ALL PANELBOARDS SHALL HAVE TYPEWRITTEN DIRECTORIES AND IN THE FORMAT AS INDICATED ON THE SCHEDULES, I.E., SAME PHYSICAL ARRANGEMENT AS PANELBOARD.
5. ALL 120 VOLT BRANCH CIRCUITS LESS THAN 100 FEET MAY USE #12 CONDUCTORS. ALL CIRCUITS LONGER THAN 100 FEET SHALL USE #10 CONDUCTORS FOR THE FIRST 100 FEET. NO. 12 CONDUCTORS MAY BE USED FOR THE LAST 25 TO 50 FEET OF ANY CIRCUIT LONGER THAN 150 FEET.
6. PROVIDE A NEUTRAL CONDUCTOR FOR EACH SET OF PHASE CONDUCTORS. CONTRACTOR SHALL PLAN TO LIMIT HOMERUNS TO 2 SETS OF PHASE CONDUCTORS AND 2 NEUTRALS WHEREVER PRACTICAL.
7. PROVIDE A GROUNDING CONDUCTOR FOR ALL CIRCUITS. DO NOT USE CONDUIT OR RACEWAY FOR CIRCUIT GROUNDING. WHERE INDICATED OR REQUIRED, A DEDICATED AND/OR ISOLATED GROUND CONDUCTOR/SYSTEM SHALL BE PROVIDED.
8. PLANS MAY NOT ALWAYS INDICATE QUANTITY OF CONDUCTORS BY HASH MARKS. PROVIDE CONDUCTORS BASED ON CIRCUITING REQUIREMENTS AND GUIDELINES STATED ABOVE.
9. DRAWINGS ARE INTENDED TO BE COMPLETE AS TO GENERAL INTENT AND REQUIREMENTS BUT NOT TO ACTUAL DETAILS OF CONSTRUCTION, INSTALLATION, AND LOCATIONS.

MOUNTING HEIGHTS

(UNLESS OTHERWISE INDICATED)

1. RECEPTACLE OUTLET:  
+24 INCHES ABOVE FINISH FLOOR, CENTERLINE, HORIZONTAL, GROUND LEFT  
+8 INCHES ABOVE COUNTER TOPS, BASINS, ETC., CENTERLINE, HORIZONTAL, GROUND LEFT OR +44 INCHES MAXIMUM FROM FLOOR FOR COUNTER TOP DEPTH OF 20 TO 25 INCHES, AND +48 INCHES MAXIMUM FROM FLOOR FOR COUNTER TOP DEPTH OF LESS THAN 20 INCHES.
2. SWITCH OUTLET:  
+46 INCHES ABOVE FINISH FLOOR, TO TOP OF OPERABLE PART, VERTICAL
3. DISCONNECTING MEANS:  
6'-6" MAX ABOVE FINISH FLOOR OR FINISH GRADE TO OPERATING HANDLE
4. PANELBOARDS, CABINETS:  
+5'-6" ABOVE FINISH FLOOR OR FINISH GRADE TO TOP

DEFINITIONS

PROVIDE - FURNISH AND INSTALL.

INSTALL - INCLUDES INSTALLATION, WIRING CONNECTIONS, START-UP/ TESTING, AND PLACING INTO OPERATION.

REPLACE - REMOVE EXISTING AND PROVIDE NEW.

RESTORE - MATCH EXISTING TYPES, RATING, FUNCTIONS AT NEW LOCATION. RE-USE EXISTING WIRING IF CAN BE RELOCATED WITHOUT SPLICING. PROVIDE ADDITIONAL NEW WIRING AND SPLICE TO EXISTING AND EXTEND TO NEW LOCATION WHERE APPLICABLE.

RELOCATE - DISCONNECT, REMOVE, STORE, REINSTALL, RECONNECT AND PLACE INTO CORRECT OPERATION ALL WITHOUT CAUSING ANY DAMAGE TO AFFECTED ITEMS.

WIRING - PROVIDE ALL CONDUITS, RACEWAYS, CONDUCTORS, FITTINGS, PULLBOXES, JUNCTION BOXES, OUTLET BOXES, DEVICES, AND OTHER MATERIALS OR ITEMS AS NECESSARY FOR A COMPLETED AND OPERATIONAL ELECTRICAL CIRCUIT OR SYSTEM; OR THAT WHICH COMPRISES AN ELECTRICAL CIRCUIT OR SYSTEM.

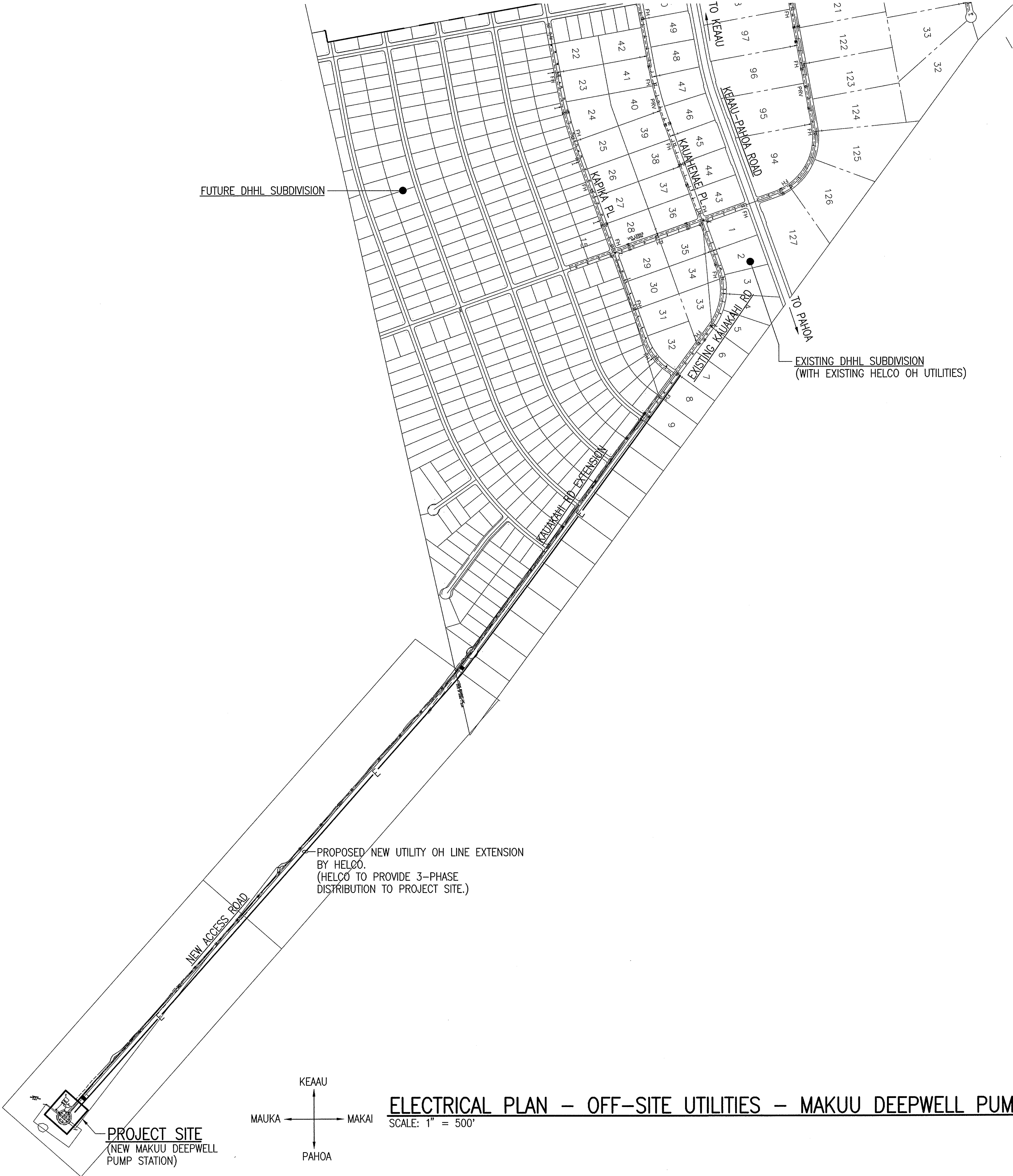
OUTLET - IN ADDITION TO DEFINITION IN THE NEC, OUTLET SHALL MEAN THE REQUIRED OUTLET BOXES, CONDUCTORS, TERMINATIONS, WIRING DEVICES, AND COVER PLATES, TO PROVIDE FOR THE INTENDED USE, APPLICATION, OR UTILIZATION EQUIPMENT.

FIELD LOCATE - FINAL LOCATION ADJUSTED TO SUIT EXISTING FIELD CONDITIONS TO ACCOMMODATE CONTRACTOR'S CONSTRUCTION METHODS, WHILE COMPLYING WITH MINIMUM REQUIREMENTS OF NEC AND AS ACCEPTABLE TO ENGINEER. ALLOW FOR MINIMUM 10 FEET HORIZONTAL ADJUSTMENT WITHOUT ADDITIONAL COSTS AND/OR PROVIDE FOR THE ADDITIONAL ADJUSTMENTS NOTED.

FIELD ROUTE - FINAL CONDUIT ROUTING SELECTED BY CONTRACTOR WITH ACCEPTANCE BY ENGINEER TO SUIT EXISTING SITE CONDITIONS AVOIDING INTERFERENCES WITH OTHER EQUIPMENT, PIPING, STRUCTURAL STEEL, STRUCTURAL WALLS, ETC. AND TO MATCH CONSTRUCTION METHODS DESIRED BY CONTRACTOR.

PROPRIETARY NOTE

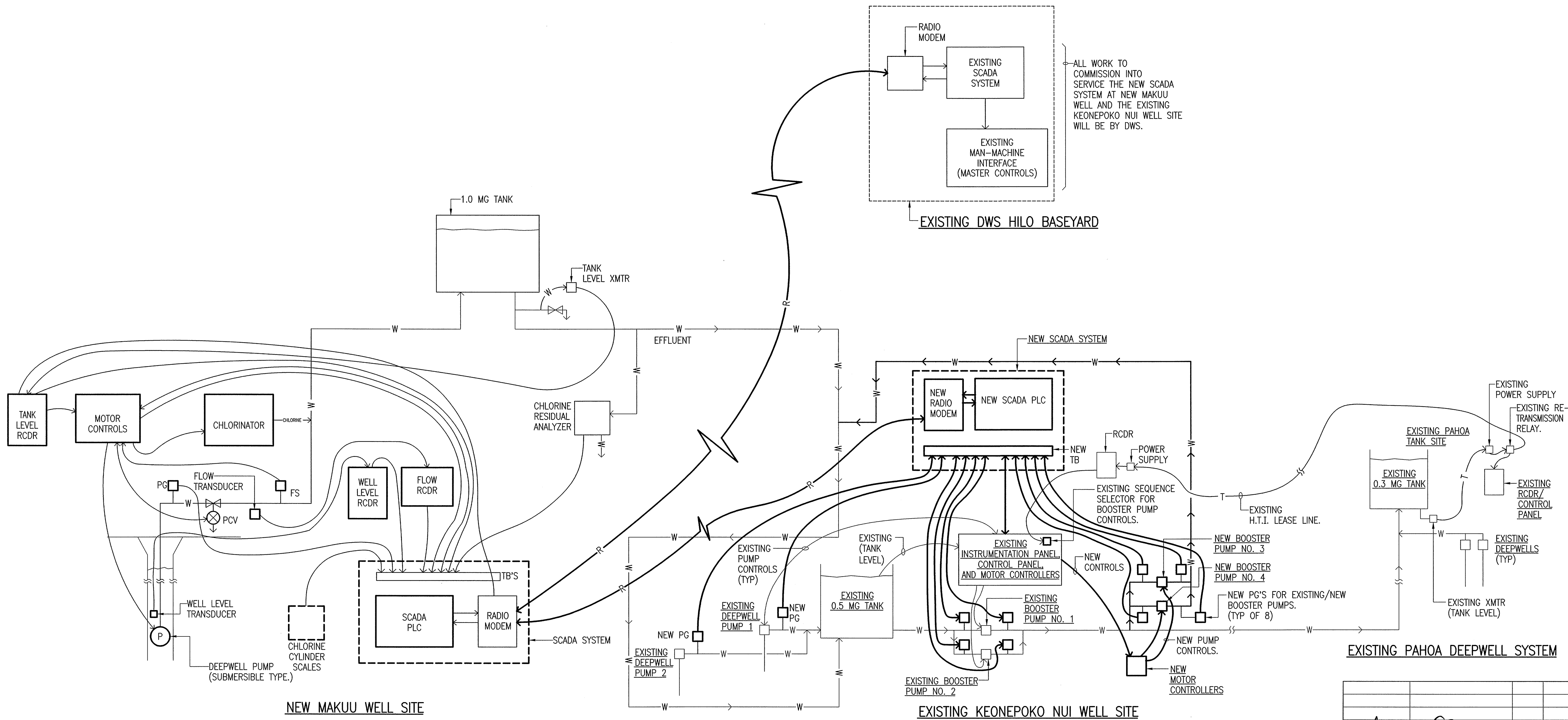
THESE PLANS SHALL NOT BE COPIED, REPRODUCED, OR USED IN ANY FORM OR MANNER WITHOUT THE WRITTEN AUTHORIZATION OF THE ENGINEER. ANY USE OF MATERIAL ON THE PLANS BY MINOR ALTERATIONS, RE-WORDING, OR REVISIONS TO OBTAIN ORIGINALLY INTENDED MEANINGS OR RESULTS SHALL BE PROHIBITED.



ELECTRICAL PLAN - OFF-SITE UTILITIES - MAKUU DEEPWELL PUMP

SCALE: 1" = 500'

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION				
WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST. STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549			WALLACE T. OKI LICENSED PROFESSIONAL ENGINEER 3539-E HAWAII, U.S.A.	
WTO REF NO. 102011418				
ESH ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				
E-2				

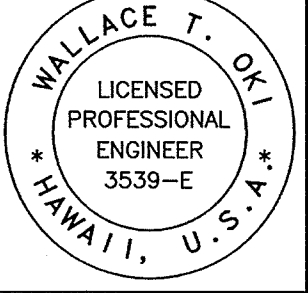


**BLOCK DIAGRAM – FLOW/CONTROL DIAGRAM**

NOT TO SCALE  
NOTE: ONLY APPLICABLE ITEMS INDICATED.

- LEGEND**
- CONTROLS
  - R-→ RADIO COMMUNICATION
  - W-→ WATER LINE

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION				
WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549				
WTO REF NO. 102011418				

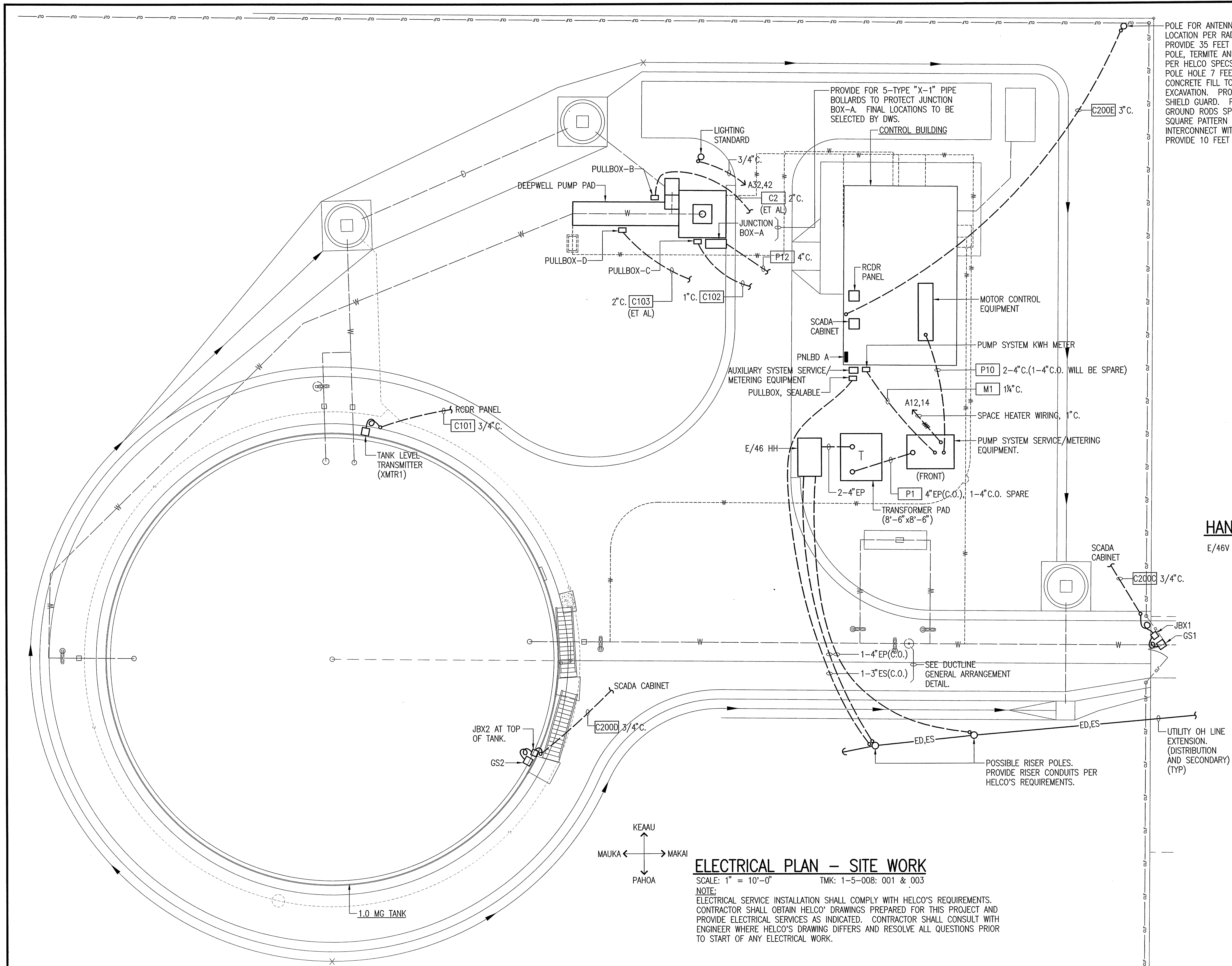


**ESH** ENGINEERS SURVEYORS  
HAWAII, INC.  
900 HALEKAUWILA ST.,  
HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:  
PRODUCTION WELL, RESERVOIR, AND  
SUPPORTING FACILITIES**  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

ELECTRICAL WORK

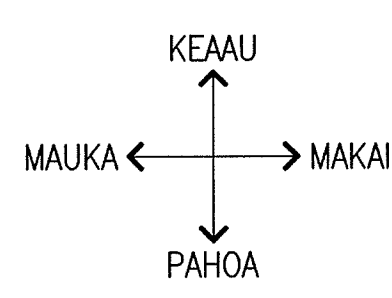




POLE FOR ANTENNA. CONFIRM FINAL LOCATION PER RADIO PATH STUDY. PROVIDE 35 FEET CLASS 3 UTILITY POLE, TERMITE AND ROT TREATED PER HELCO SPECS. SET IN DRILLED POLE HOLE 7 FEET DEEP WITH CONCRETE FILL TO LIMITS OF EXCAVATION. PROVIDE STEEL TERMITE SHIELD GUARD. PROVIDE 4-1"x10'-0" GROUND RODS SPACED 10 FEET SQUARE PATTERN AROUND POLE. INTERCONNECT WITH #2 SDBC AND PROVIDE 10 FEET TAIL AT BASE OF POLE.

**HANDHOLE NOTE**

E/46V = 4'x6' HANDHOLE, TYPE 46V., STD. DWG. 892001, 5'-0" DEEP.



**ELECTRICAL PLAN - SITE WORK**

SCALE: 1" = 10'-0" TMK: 1-5-008: 001 & 003

NOTE:  
ELECTRICAL SERVICE INSTALLATION SHALL COMPLY WITH HELCO'S REQUIREMENTS. CONTRACTOR SHALL OBTAIN HELCO'S DRAWINGS PREPARED FOR THIS PROJECT AND PROVIDE ELECTRICAL SERVICES AS INDICATED. CONTRACTOR SHALL CONSULT WITH ENGINEER WHERE HELCO'S DRAWING DIFFERS AND RESOLVE ALL QUESTIONS PRIOR TO START OF ANY ELECTRICAL WORK.

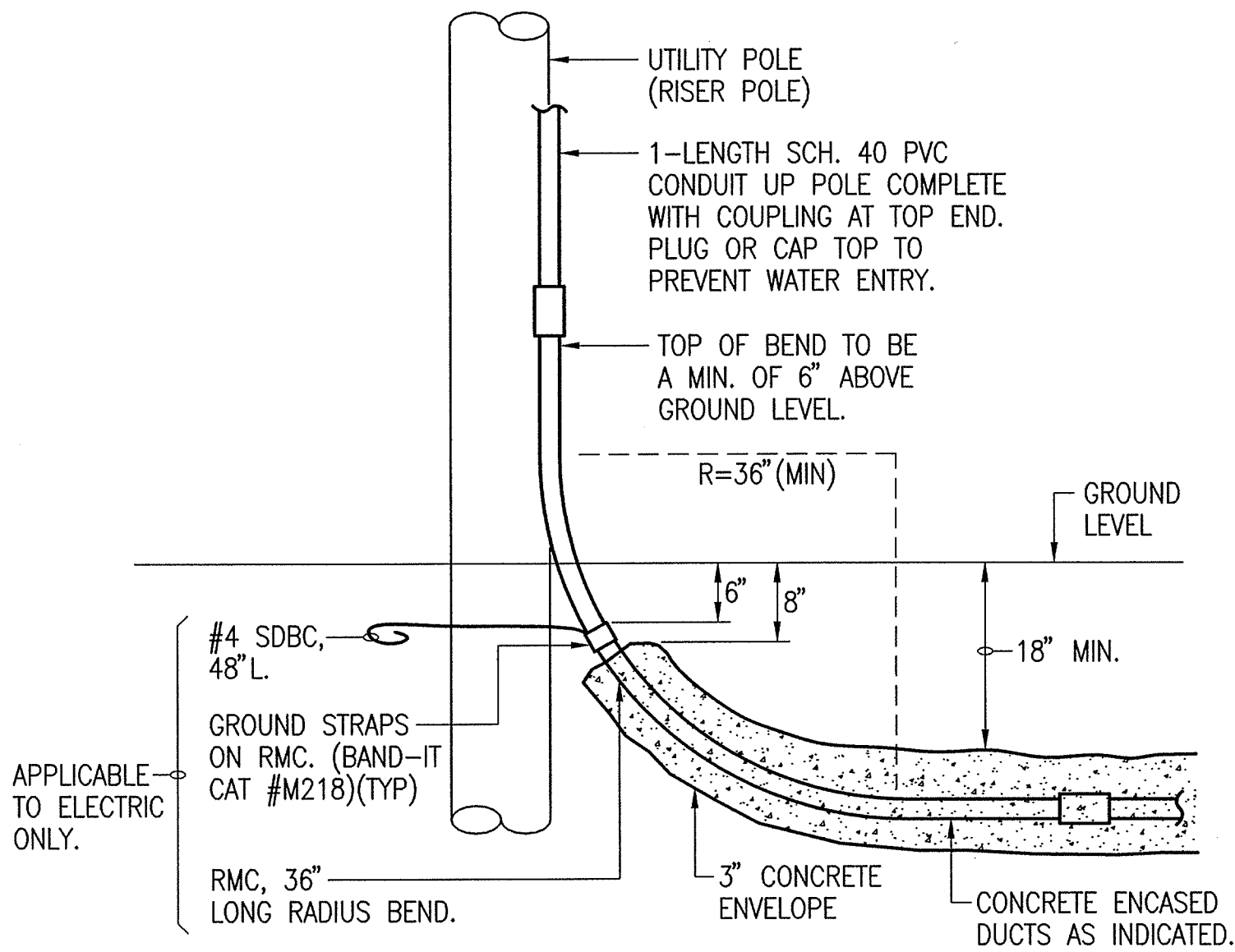
REVISION		DATE	DESCRIPTION	MADE BY	APPROVED
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WALLACE T. OKI, P.E., INC.					
ELECTRICAL ENGINEERING					
P.O. BOX 4070/688 KINOOLE ST., STE. 115B					
HILO, HI. 96720 PH:961-9666/FAX:935-2549					
WTO REF NO. 102011418					
ENGINEERS SURVEYORS HAWAII, INC.					
900 HALEKAUWILA ST., HONOLULU, HAWAII 96814					
591-8116 HON. 885-4590 KAMUELA					
DEPARTMENT OF HAWAIIAN HOME LANDS					
MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES					
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII					
ELECTRICAL WORK					

NOTES TO CONTRACTOR – HELCO REQUIREMENTS:

- 1. ALL WORK SHALL COMPLY WITH THE SERVING UTILITY COMPANY’S REQUIREMENTS, SERVICE INSTALLATION MANUALS, AND RULES AND REGULATIONS.
- 2. RESOLVE ANY DISCREPANCY OR QUESTION WITH THE ENGINEER PRIOR TO START OF ANY WORK.
- 3. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED STANDARD DRAWINGS AND INSTALLATION DETAILS FROM THE SERVING UTILITY COMPANIES. THE CONTRACT DRAWINGS DO NOT IN ANY WAY DUPLICATE THE STANDARDS OF THE UTILITY COMPANIES.
- 4. DO ALL NECESSARY EXCAVATION AND BACKFILLING OF DUCTLINES AS PER THE HELCO SPECIFICATION NO. CS-7001 AND CS-7004. PROVIDE WARNING TAPE PER HAWAIIAN TELCOM STANDARD DRAWING 34028.
- 5. PREPARE ALL VAULT SITES AS SPECIFIED BY HELCO SPECIFICATION DRAWING NO. 30-5001 (2-SHEETS).
- 6. FURNISH AND INSTALL SCH 40 PVC DUCTS AS INDICATED ON THE DRAWINGS WITH 3” CONCRETE ENCASEMENT AS INDICATED.
- 7. FURNISH AND INSTALL ALL PULLBOXES AND HANDHOLES AS NOTED ON THE DRAWINGS.
- 8. AS THE DESIGN OF THIS DISTRIBUTION SYSTEM WAS MADE FROM PRELIMINARY PROJECT DRAWINGS, ANY ADDITIONAL PULLBOXES OR HANDHOLES REQUIRED DUE TO CHANGES IN GRADE SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
- 9. ALL ELECTRIC DUCT LINES SHALL CONTAIN A POLYOLEFIN PULL LINE (JET LINE CAT. NO. 232 OR EQUIVALENT). (200 LB. MINIMUM TEST STRENGTH)
- 10. ALL WORK SHALL BE SUBJECT TO HELCO INSPECTION. CONTRACTOR SHALL GIVE HELCO 3 WORKING DAYS INSPECTION NOTICE PRIOR TO POURING OF CONCRETE, OR FOR ANY OTHER INSPECTION SERVICES.
- 11. ALL ELECTRIC CONDUITS SHALL BE REAMED WITH A MANDREL 1/2” SMALLER IN DIAMETER THAN THE CONDUIT, DUCTS SHALL BE SWABBED AND CLEARED OF ALL BURRS AND FOREIGN MATERIAL.
- 12. REFER TO HELCO SERVICE DRAWINGS FOR SPECIFIC AND STANDARD DETAIL DRAWINGS.
- 13. ALL BENDS DUE TO CHANGE IN GRADE SHALL HAVE A RADIUS BEND OF NOT LESS THAN 20’-0” (HORIZONTAL OR VERTICAL CHANGE).
- 14. ANY QUESTIONS AS TO THE RESPONSIBILITY OF ANY WORK NOT SPECIFICALLY COVERED IN THESE NOTES AND ON THE DRAWINGS SHALL BE CLARIFIED WITH HELCO’S AND OTWCC’S ENGINEERING DEPARTMENT.
- 15. ELECTRICAL SERVICE INSTALLATION SHALL COMPLY WITH HELCO’S REQUIREMENTS. CONTRACTOR SHALL OBTAIN HELCO’S DRAWING FOR THIS PROJECT AND PROVIDE ELECTRICAL SERVICES AS INDICATED. CONTRACTOR SHALL CONSULT WITH ENGINEER WHERE HELCO’S DRAWING DIFFERS AND RESOLVE ALL QUESTIONS PRIOR TO START OF ANY ELECTRICAL SERVICE WORK.

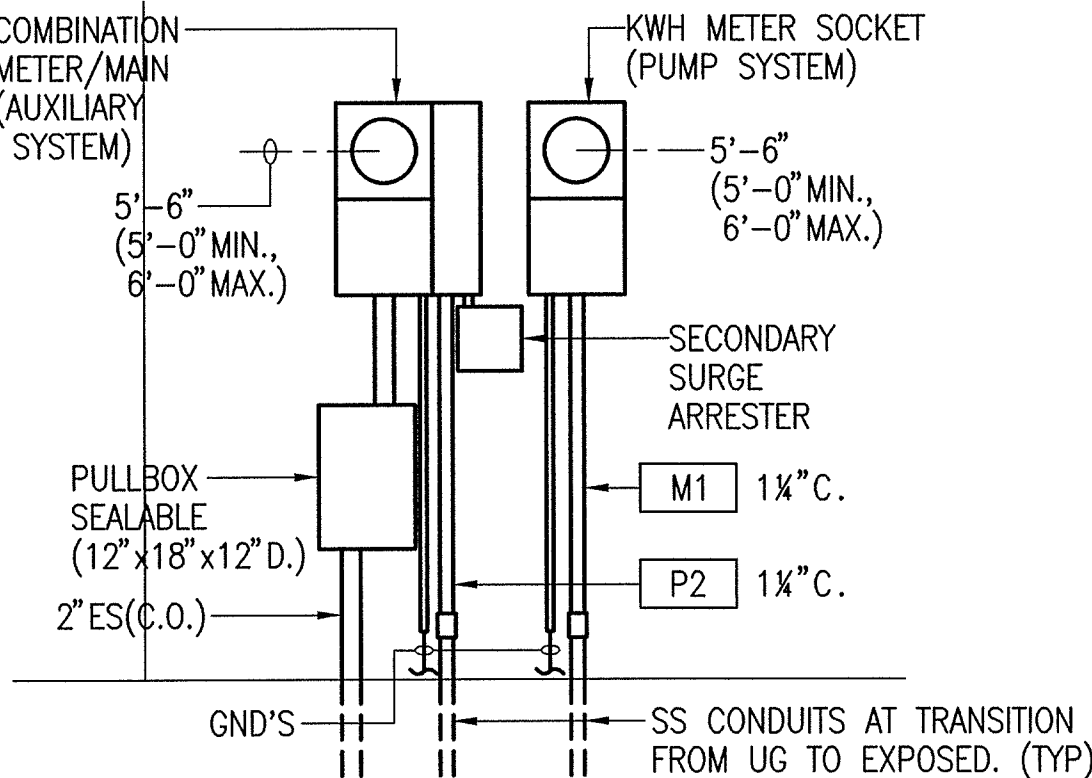
COORDINATION WITH WATER AND SEWER LINES

- 1. ALL ELECTRIC UTILITY DUCTLINES SHALL BE ROUTED BELOW OR UNDERNEATH ALL WATER LINES AT ALL TIMES IF MINIMUM BURIED DEPTH ABOVE CONCRETE JACKET CANNOT BE ACHIEVED WHILE PROVIDING FOR THE MINIMUM VERTICAL CLEARANCES. MINIMUM VERTICAL CLEARANCE AT CROSSINGS BETWEEN WATER LINES AND UTILITY DUCTLINES SHALL BE 12 INCHES IF ENCASED IN CONCRETE JACKETS AND 18 INCHES IF NOT CONCRETE ENCASED.



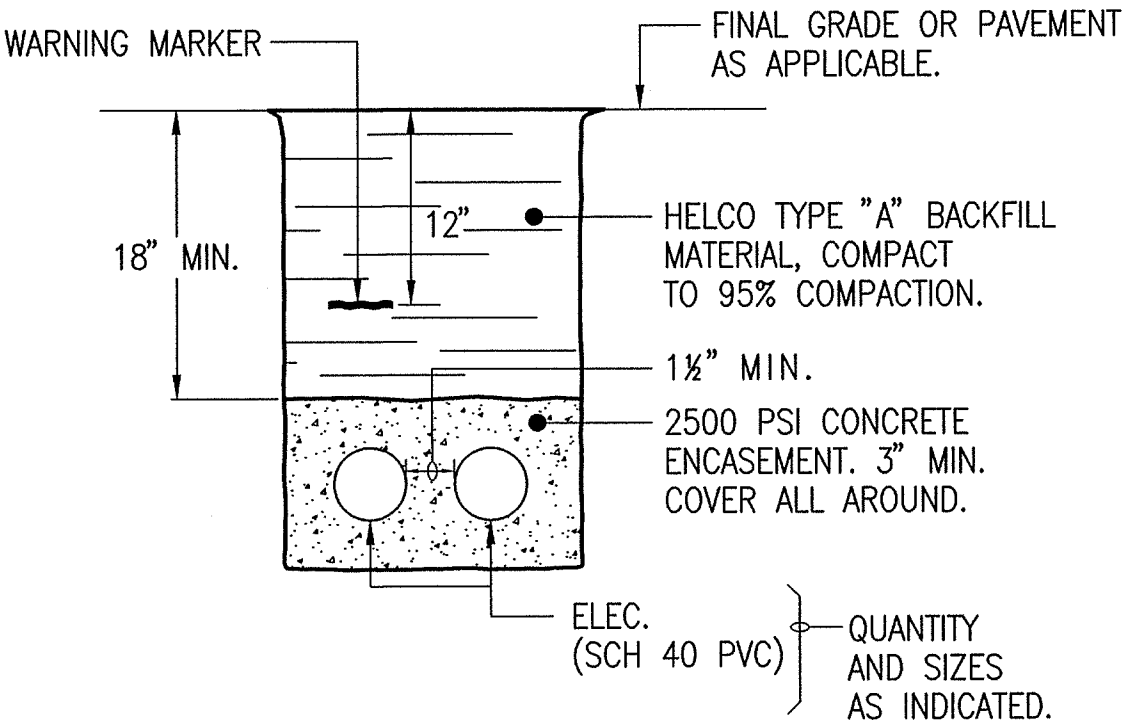
GENERAL ARRANGEMENT (TYP)- RISER CONDUIT DETAIL

NOT TO SCALE  
NOTE: PROVIDE QUANTITY AND SIZES AS INDICATED ON THE DRAWINGS.  
REFER TO HELCO'S DRAWINGS FOR ADDITIONAL RISER DETAIL REQUIREMENTS.



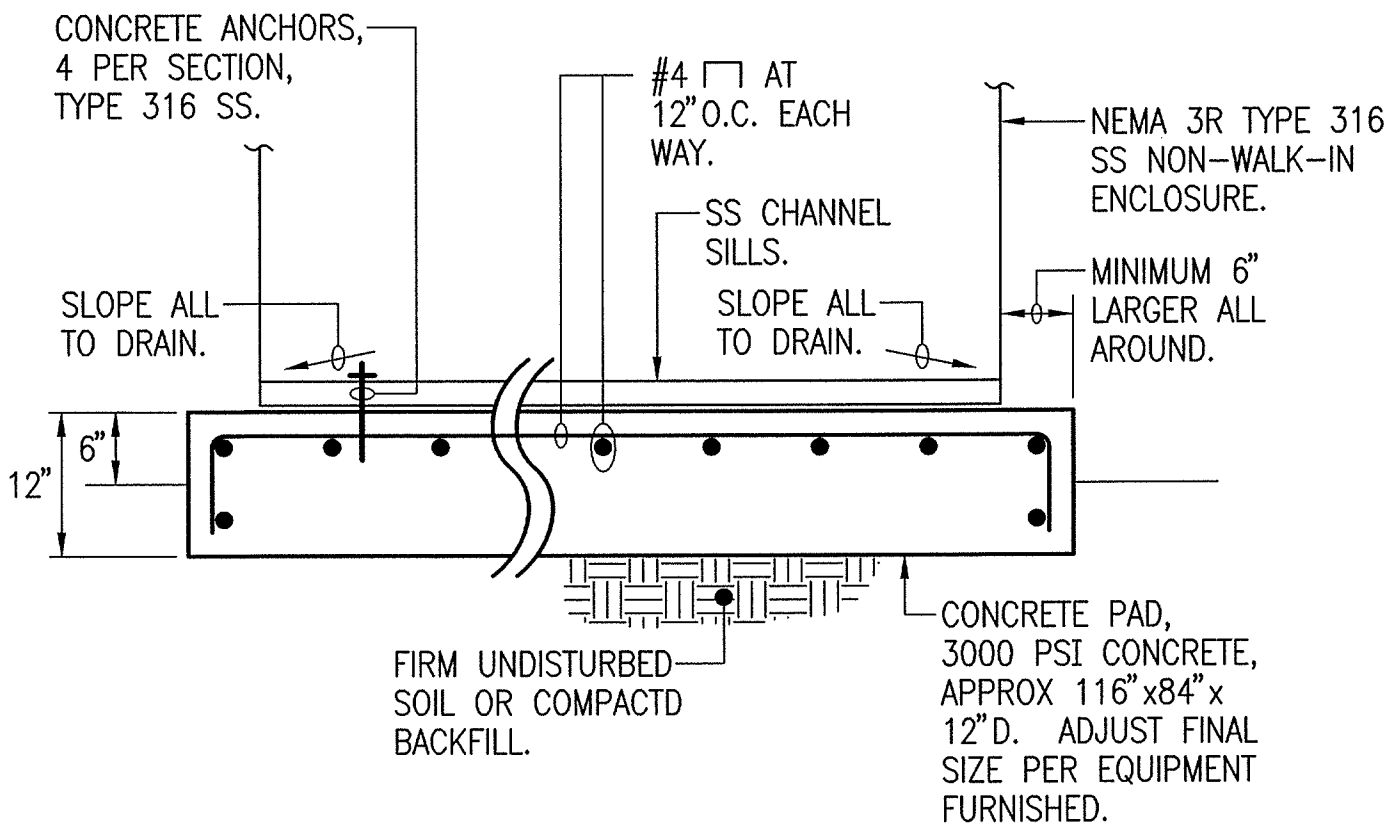
GENERAL ARRANGEMENT (TYP) – AUXILIARY SYSTEM SERVICE/METERING EQUIPMENT AND PUMP SYSTEM KWH METER SOCKET

NOT TO SCALE  
NOTE: ALL EQUIPMENT ENCLOSURES SHALL BE SUITABLE FOR OUTDOOR USE AND HAVE NEMA 3R TYPE 316 SS ENCLOSURES AS A MINIMUM REQUIREMENT. PAINT ALL METALLIC CONDUITS WITH CORROSION PROTECTION PAINT.



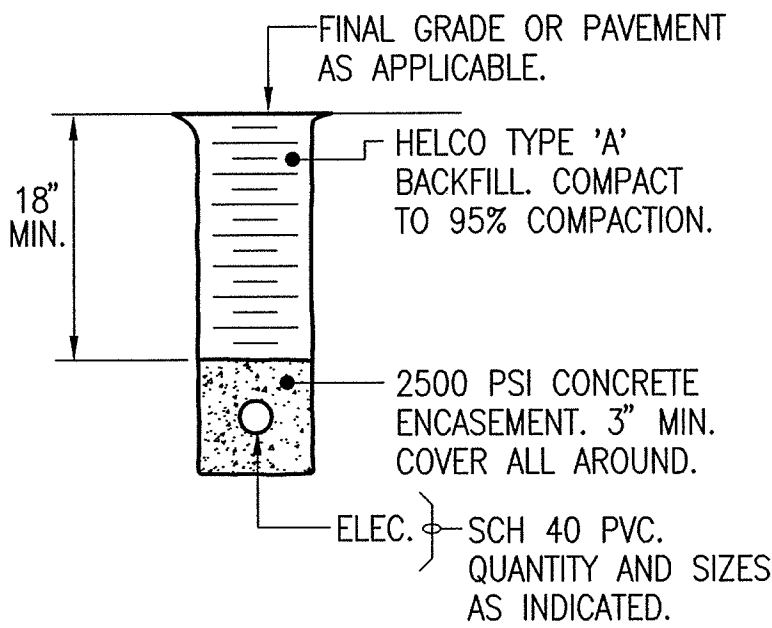
GENERAL ARRANGEMENT (TYP) – DUCTLINE DETAIL

NOT TO SCALE  
NOTE  
ALL ELECTRIC DUCT LINES SHALL CONTAIN A POLYOLEFIN PULL LINE (JET LINE CAT. NO. 232 OR EQUIVALENT). (200 LB. MINIMUM TEST STRENGTH)  
(APPLIES TO UTILITY/SERVICE DUCTLINES ONLY.)



GENERAL ARRANGEMENT (TYP) – CONCRETE PAD FOR PUMP SYSTEM SERVICE/METERING EQUIPMENT

NOT TO SCALE

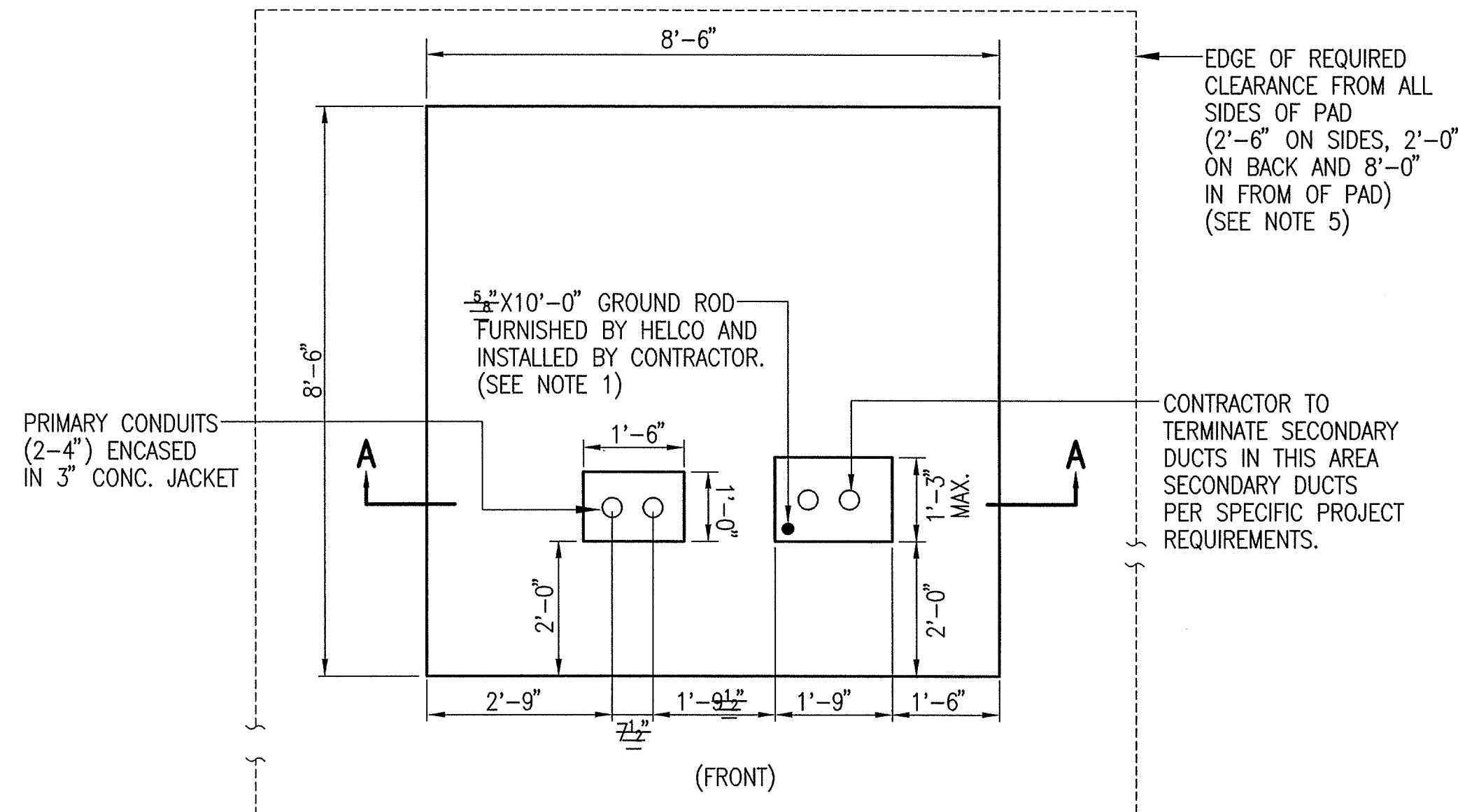


GENERAL ARRANGEMENT (TYP) – DUCTLINE DETAIL (NON-UTILITY)

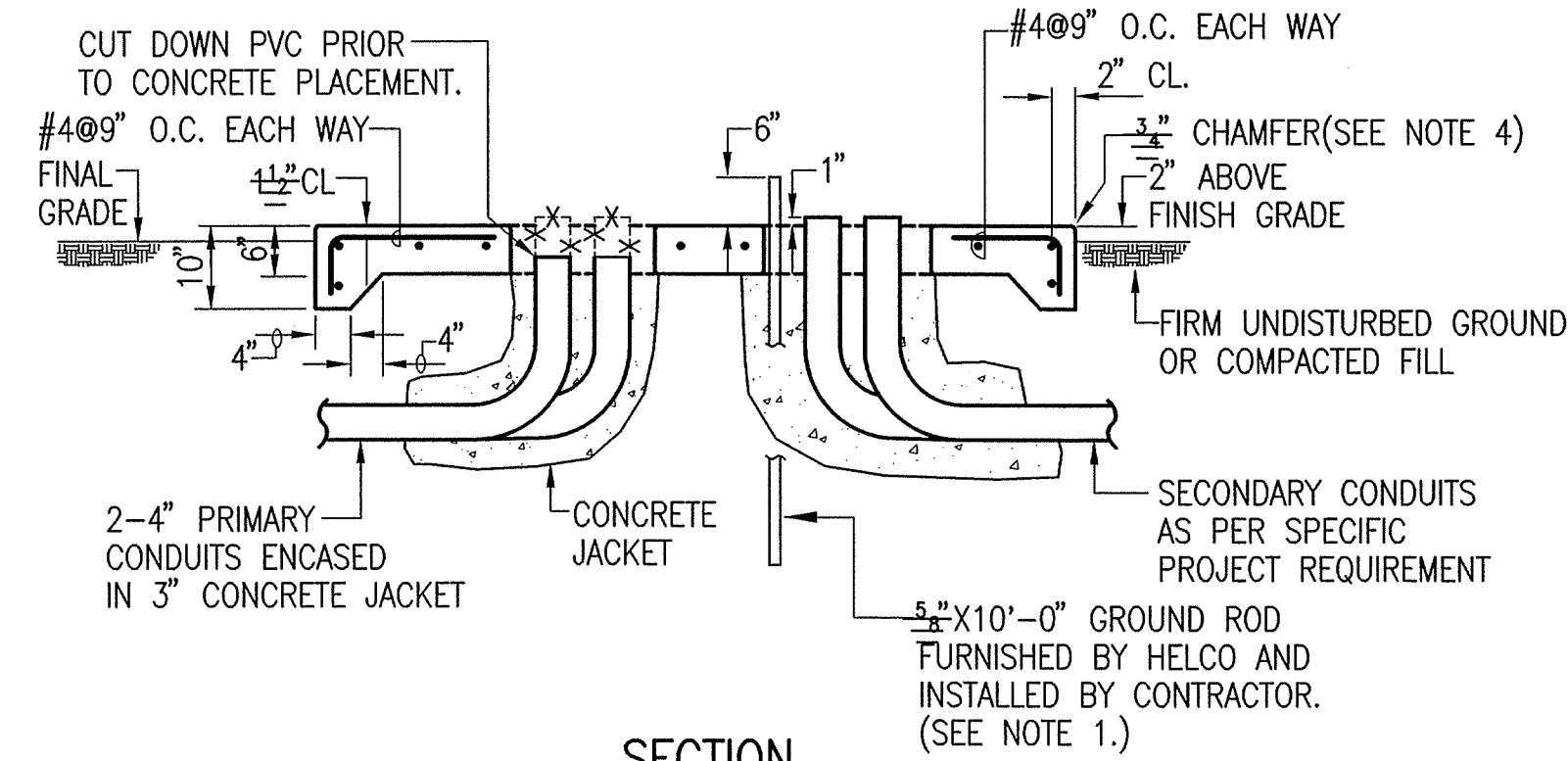
NOT TO SCALE  
NOTE  
ALL ELECTRIC DUCT LINES SHALL CONTAIN A POLYOLEFIN PULL LINE (JET LINE CAT. NO. 232 OR EQUIVALENT). (200 LB. MINIMUM TEST STRENGTH)

REVISION		DATE		DESCRIPTION		MADE BY		APPROVED	
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION						WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549			
WTO REF NO. 102011418									
						ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA			
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII									
ELECTRICAL WORK									
E-5									





PLAN



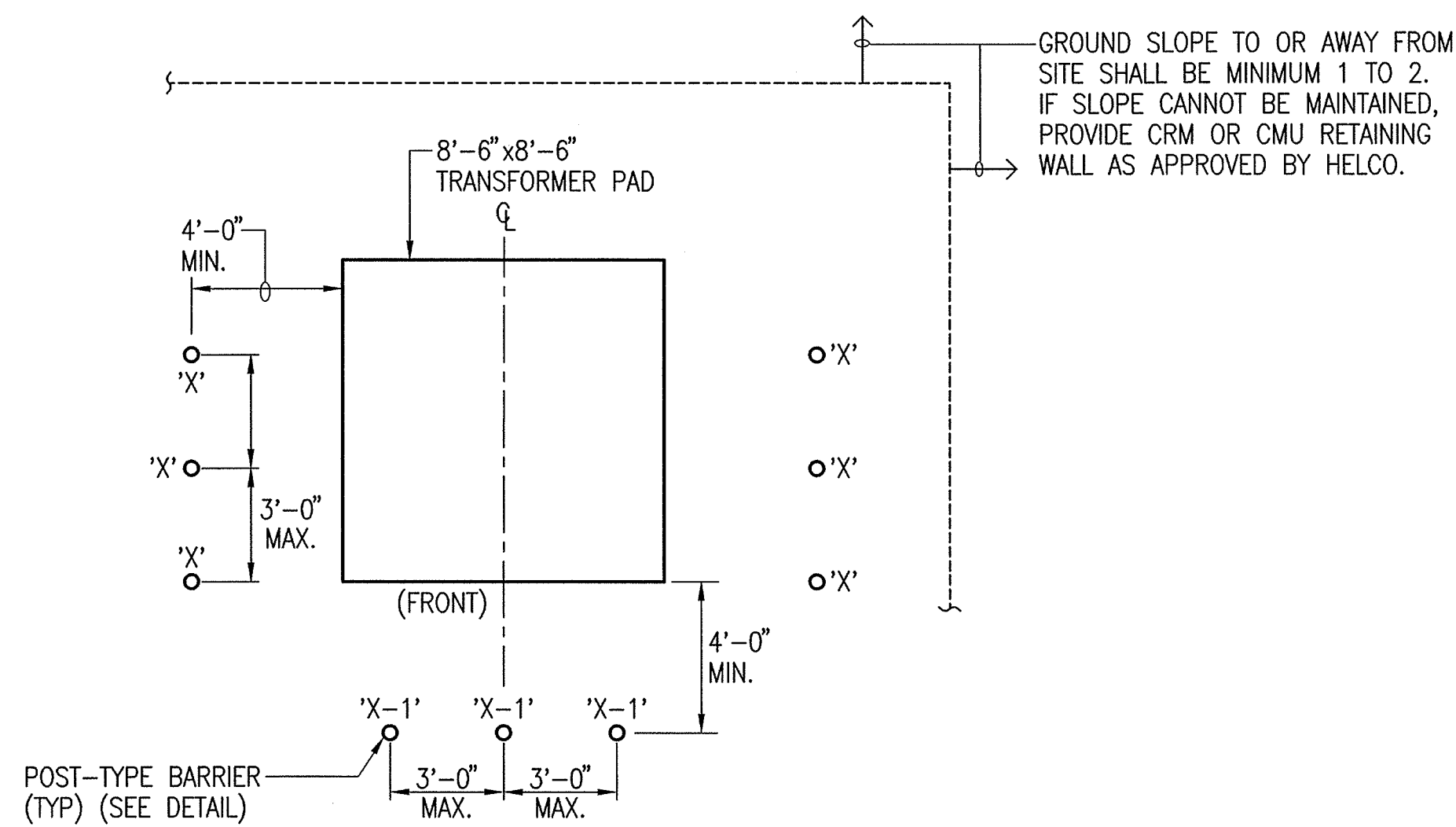
SECTION

### GENERAL ARRANGEMENT (TYP) - 8'-6" x 8'-6" CONCRETE PAD (500-750 KVA TRANSFORMER)

NOT TO SCALE

NOTES:

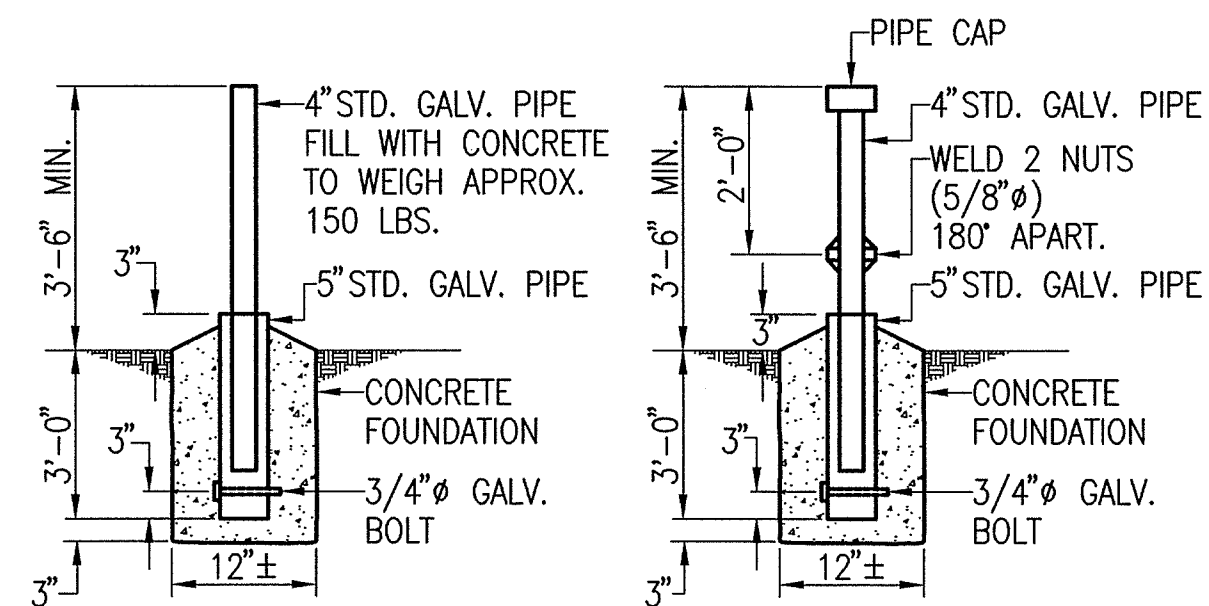
- ONE (1) 5/8" DIAMETER x 10'-0" GROUND ROD FURNISHED BY HELCO AND INSTALLED BY CONTRACTOR. PROVIDE ADDITIONAL 5/8" DIAMETER x 10'-0" GROUND ROD AND CONNECT #4/0 BARE COPPER GROUND WIRE BETWEEN GROUND RODS. A MINIMUM OF 6'-0" SHALL BE MAINTAINED BETWEEN THE DRIVEN GROUND RODS.
- CONCRETE 3000 PSI COMPRESSIVE STRENGTH IN 28 DAYS. MOISTURE CURE CONCRETE PAD A MINIMUM OF 7 DAYS. DO NOT INSTALL TRANSFORMER UNTIL CONCRETE COMPRESSIVE STRENGTH REACHES 1500 PSI MINIMUM OR AFTER 14 DAYS.
- REINFORCING: ASTM A615, GRADE 40 MINIMUM.
- LOCATE, SECURE, AND CAP ALL CONDUITS BEFORE POURING PAD. TOP OF CONCRETE TO BE SMOOTH AND TRUE, WOOD FLOAT FINISH, FREE OF DEFECTS, AS PER COUNTY OF HAWAII SPECIFICATIONS, ROUND ALL EXPOSED EDGES TO 3/4" CHAMFER.
- MAINTAIN A RELATIVELY LEVEL, MINIMUM CLEARANCE OF 2'-6" FROM SIDES OF THE PAD, 2'-0" FROM THE BACK OF PAD, AND 8'-0" IN FRONT OF PAD. EXTEND CONCRETE PAD AN ADDITIONAL 8'-0" IN FRONT IF LOCATED IN PLANTING AREA.



### GENERAL ARRANGEMENT (TYP) - PAD-MOUNTED TRANSFORMER PAD

NOT TO SCALE

NOTE: GRADE SUFFICIENTLY BEYOND THE PAD SITE TO PREVENT FUTURE BUILD-UP OR EROSION OF THE SITE. CONSTRUCT A RETAINING WALL OF SUITABLE MATERIAL TO PREVENT BUILD-UP OR EROSION OF THE SITE.



DETAIL 'X'

DETAIL 'X-1'

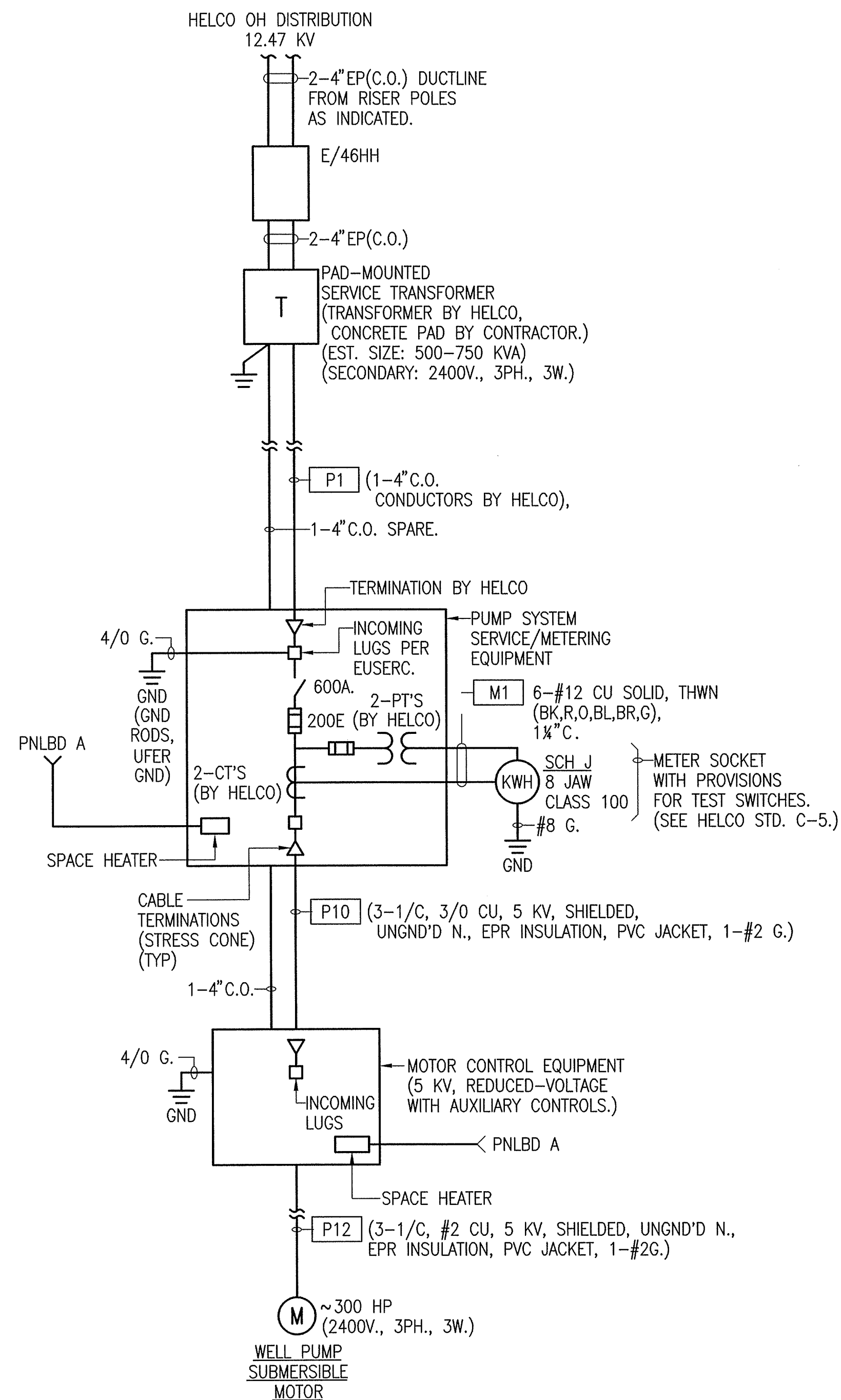
### GENERAL ARRANGEMENT (TYP) - POST-TYPE BARRIERS

NOT TO SCALE

NOTE: ALL INSTALLATION SHALL COMPLY WITH HELCO STD. 30-5000. POSTS SHALL BE PAINTED YELLOW PER ANSI Z53.1 PROVIDE QUANTITY/LOCATIONS REQUIRED BY HELCO.

ALLOW FOR 3 TYPE "X-1" AND 6 TYPE "X". FINAL QTY/ LOCATIONS AS SPECIFIED BY HELCO.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				

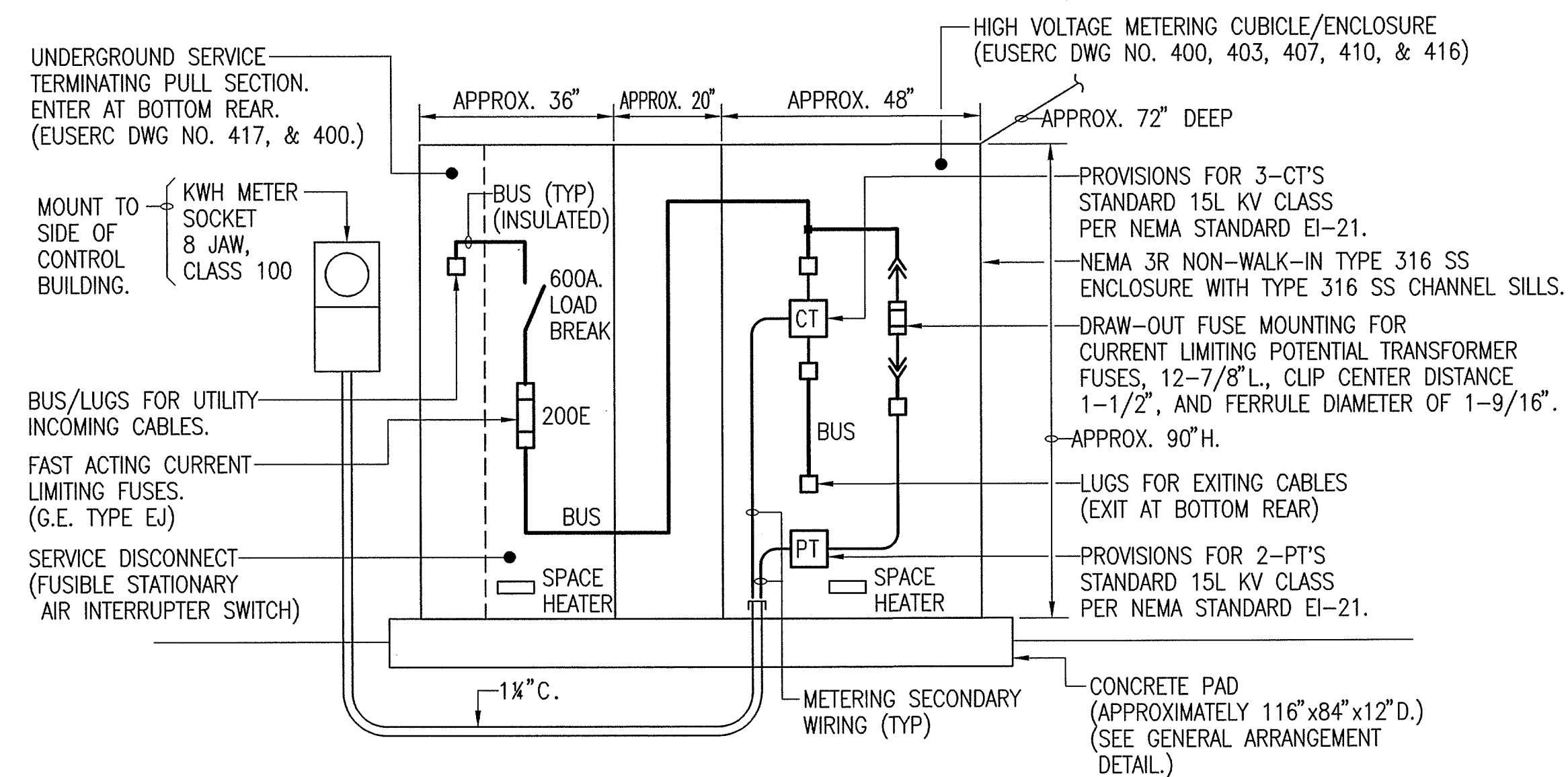
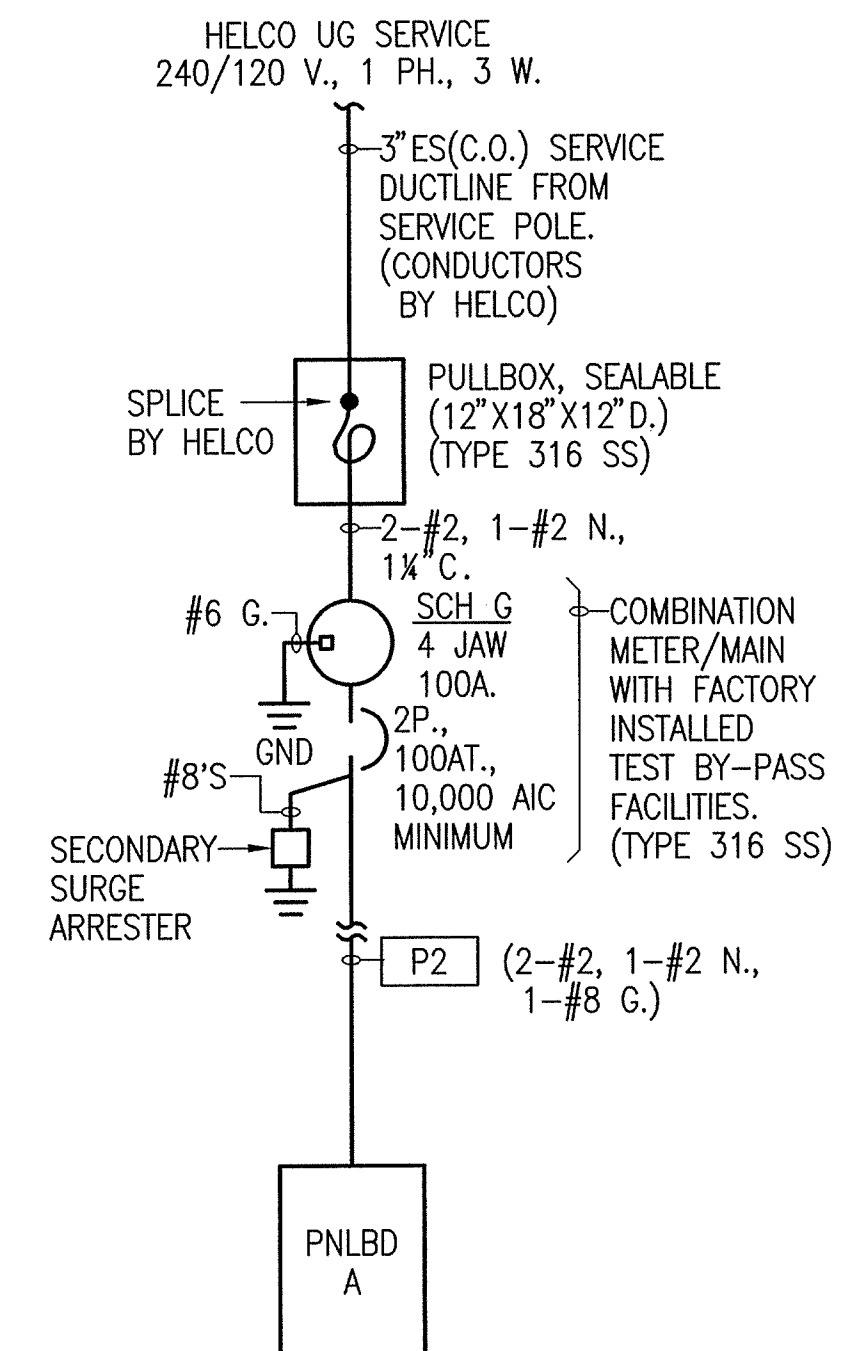


### SERVICE/LOAD DATA

## PUMP SYSTEM

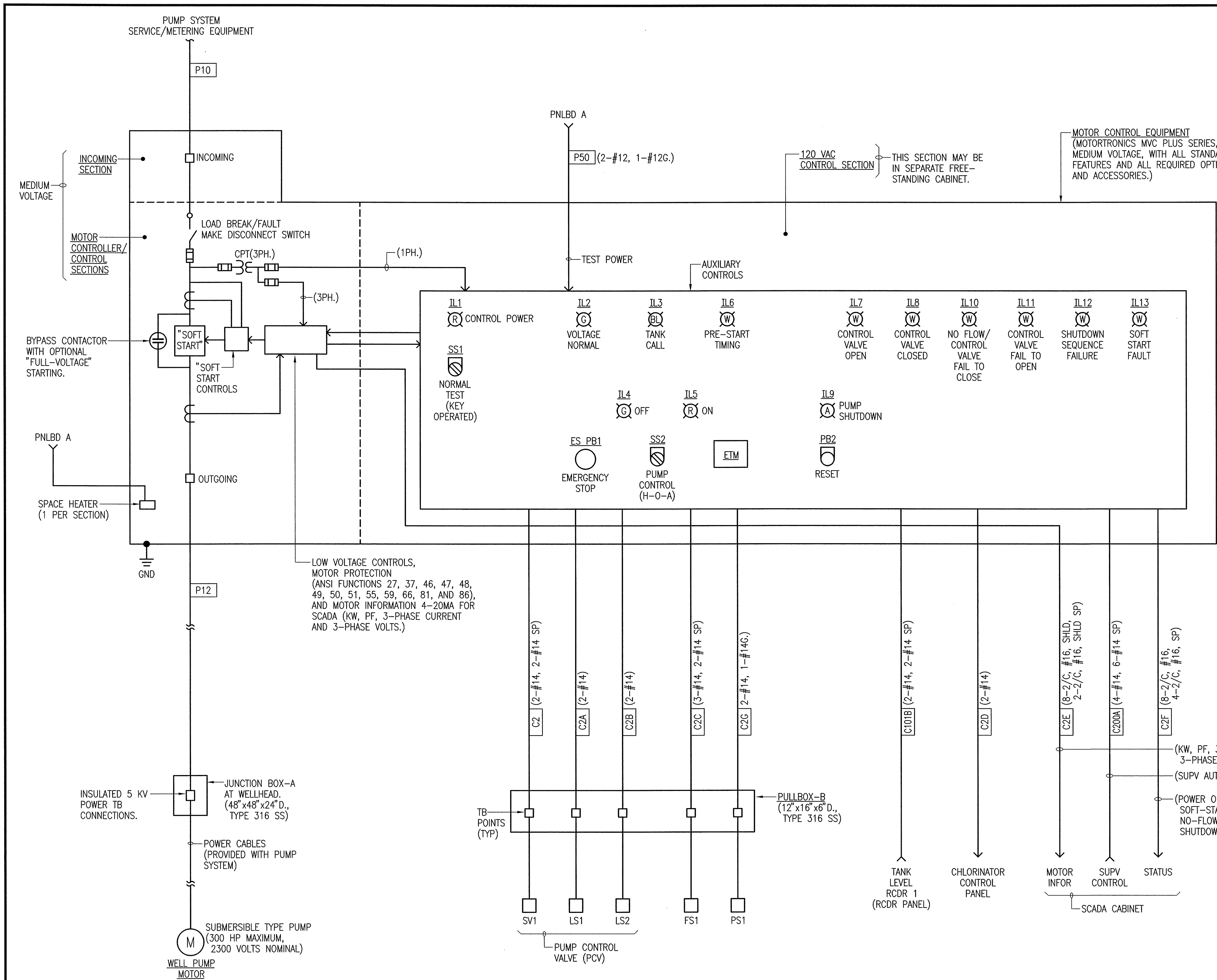
1. SERVICE VOLTAGE: 2.4 KV, 3PH., 3W.
2. ESTIMATED CONNECTED KVA:                      ESTIMATED DEMAND KVA:  
1-300 HP PUMP MOTOR                      300.0                      300.0  
MISC. POWER/CONTROL                      10.0                      5.0  
TOTALS                      310.0                      305.0
3. DESIGN SERVICE CAPACITY: 200 AMPERES AT 2.4 KV  
SERVICE CONDUCTORS: 3/0
4. METERING: RATE SCH J (INITIAL ONLY)  
                  HELCO STD. C-5 (SINGLE METER ONLY)  
                  (8 JAW, 100 A. METER SOCKET)
5. NOTES: PUMP MOTOR CONTROLLER SHALL BE  
                  REDUCED VOLTAGE, SOLID STATE
6. BILLING ADDRESS: (TBD)  
                  (TO BE TRANSFERED TO DEPARTMENT OF WATER SUPPLY  
                  UPON ACCEPTANCE OF PROJECT.)

### AUXILIARY SYSTEM

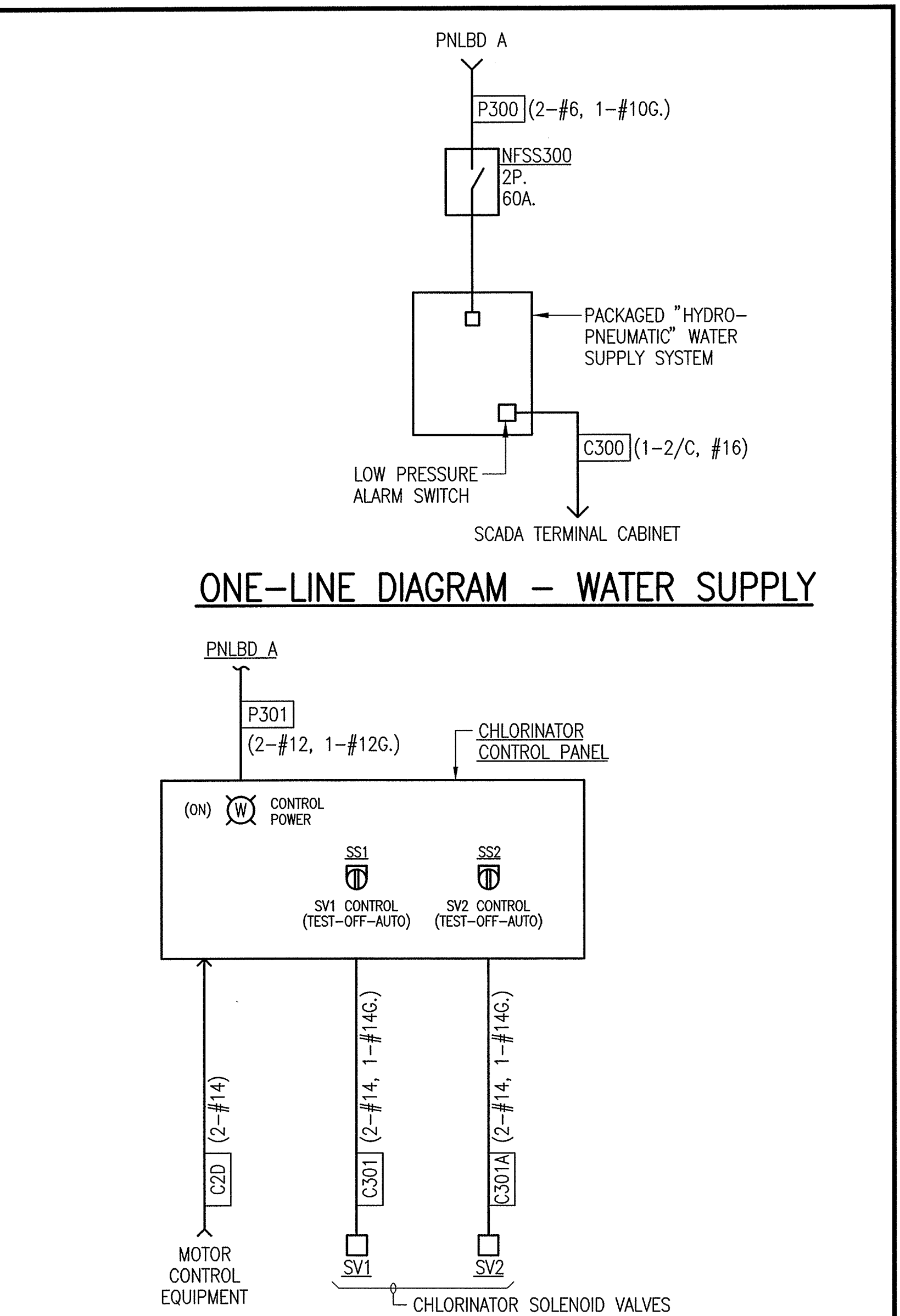


GENERAL ARRANGEMENT (TYP) –  
PUMP SYSTEM SERVICE/METERING EQUIPMENT



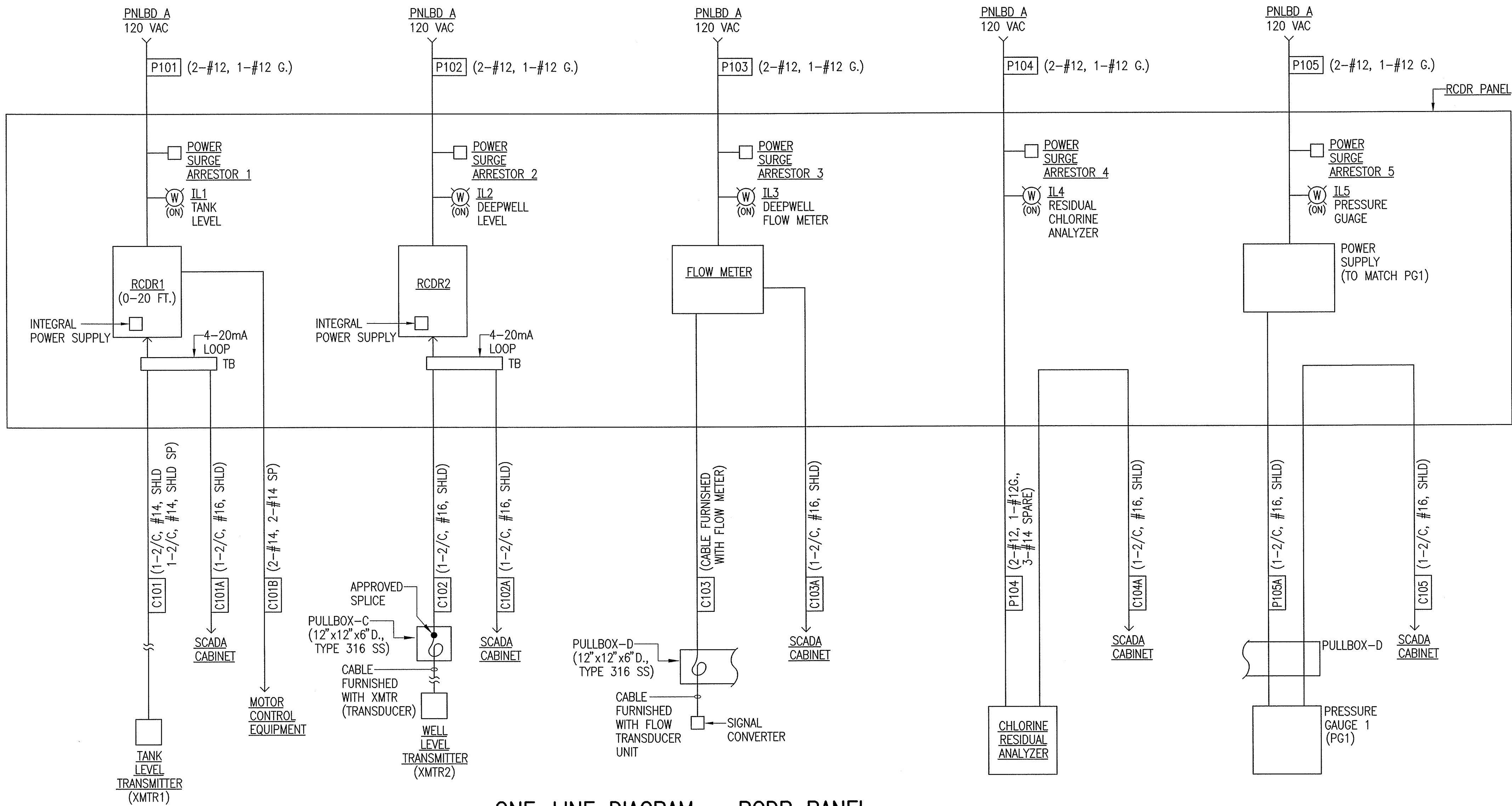


ONE-LINE DIAGRAM - PUMP SYSTEM

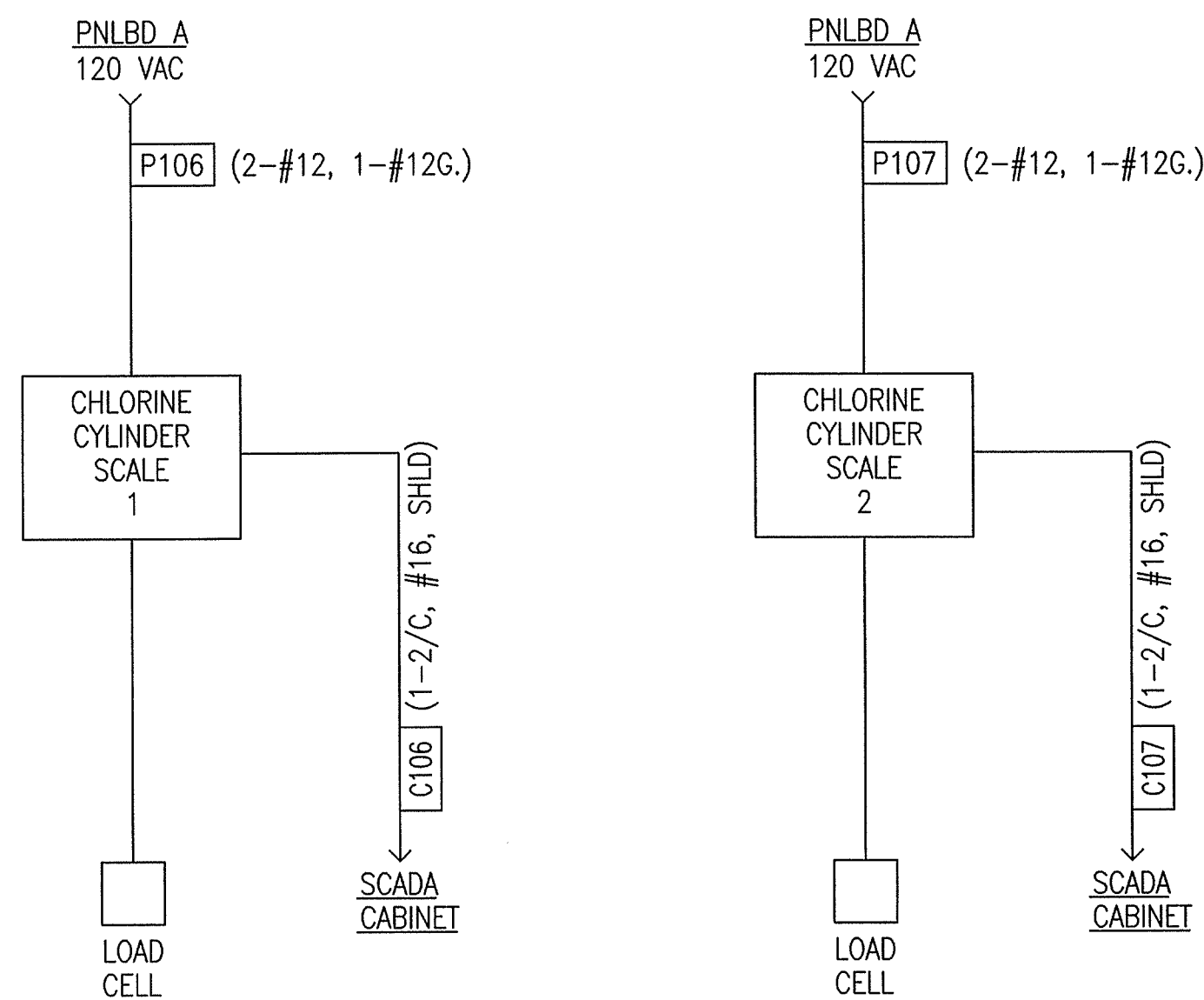


ONE-LINE DIAGRAM - CHLORINATOR CONTROL PANEL

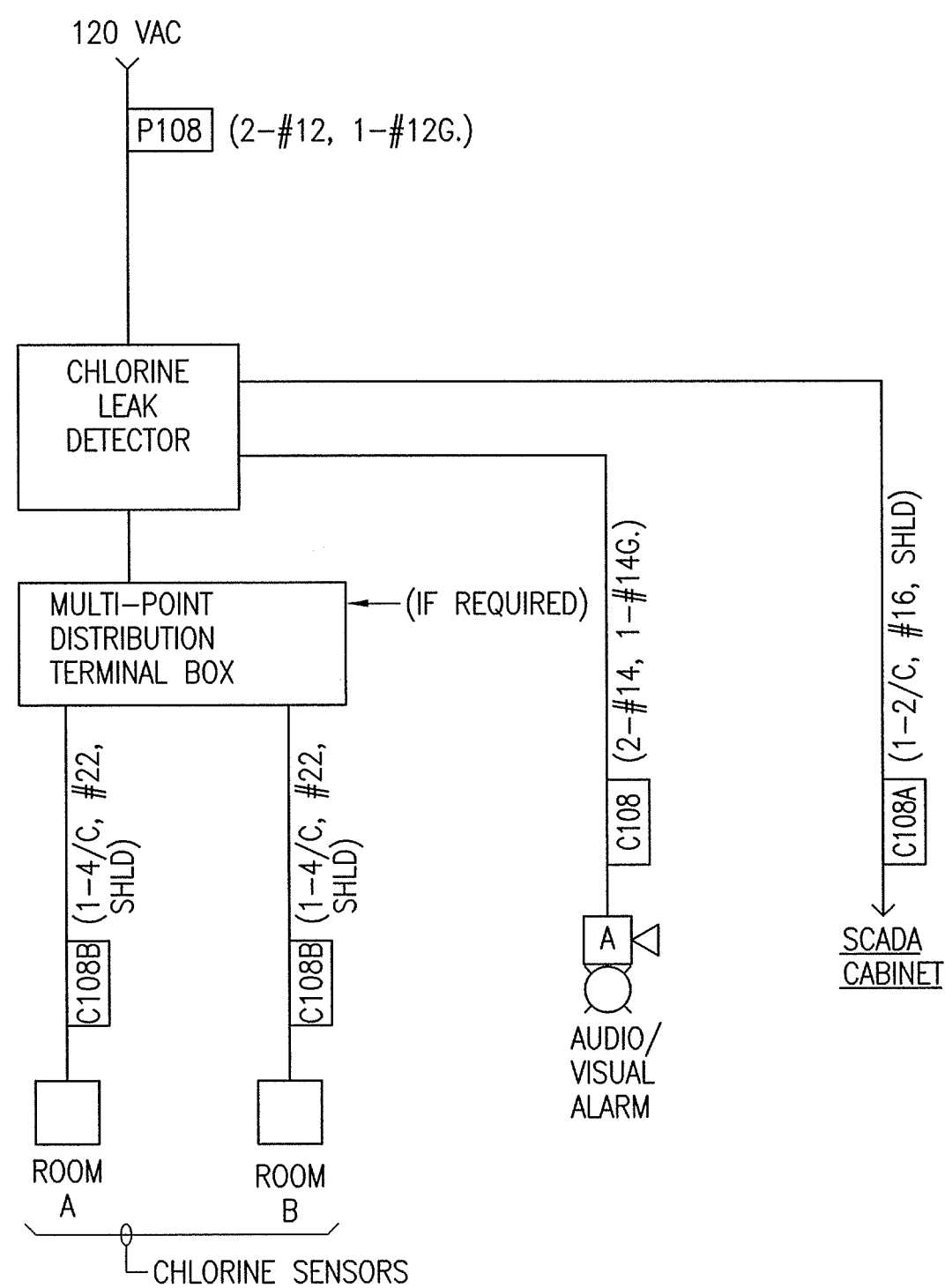
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
1	01/12/12	WTO REF NO. 102011418		
<p>THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION</p> <p><b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549</p>				
<p><b>WTO REF NO. 102011418</b></p> <p><b>ENGINEERS SURVEYORS HAWAII, INC.</b> 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA</p>				
<p>DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII</p>				
ELECTRICAL WORK				



ONE-LINE DIAGRAM - RCDR PANEL



ONE-LINE DIAGRAM - CHLORINE CYLINDER SCALES

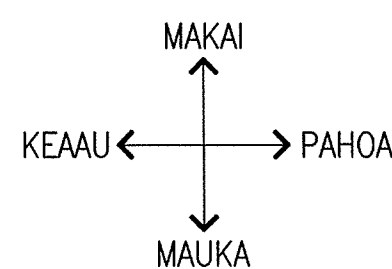
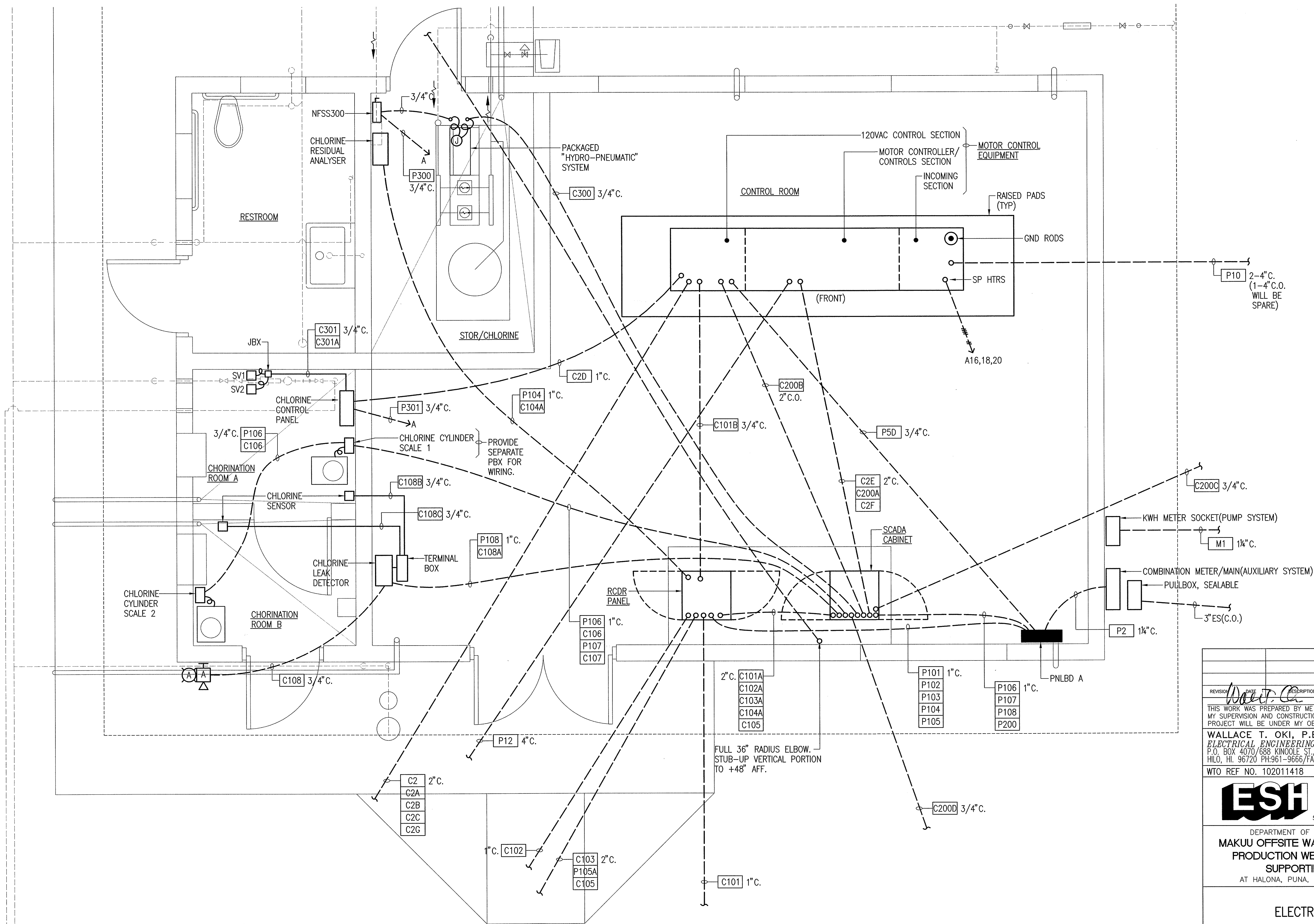


ONE-LINE DIAGRAM - CHLORINE LEAK DETECTOR


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ELECTRICAL WORK				
E-9 MAKUU SITE				



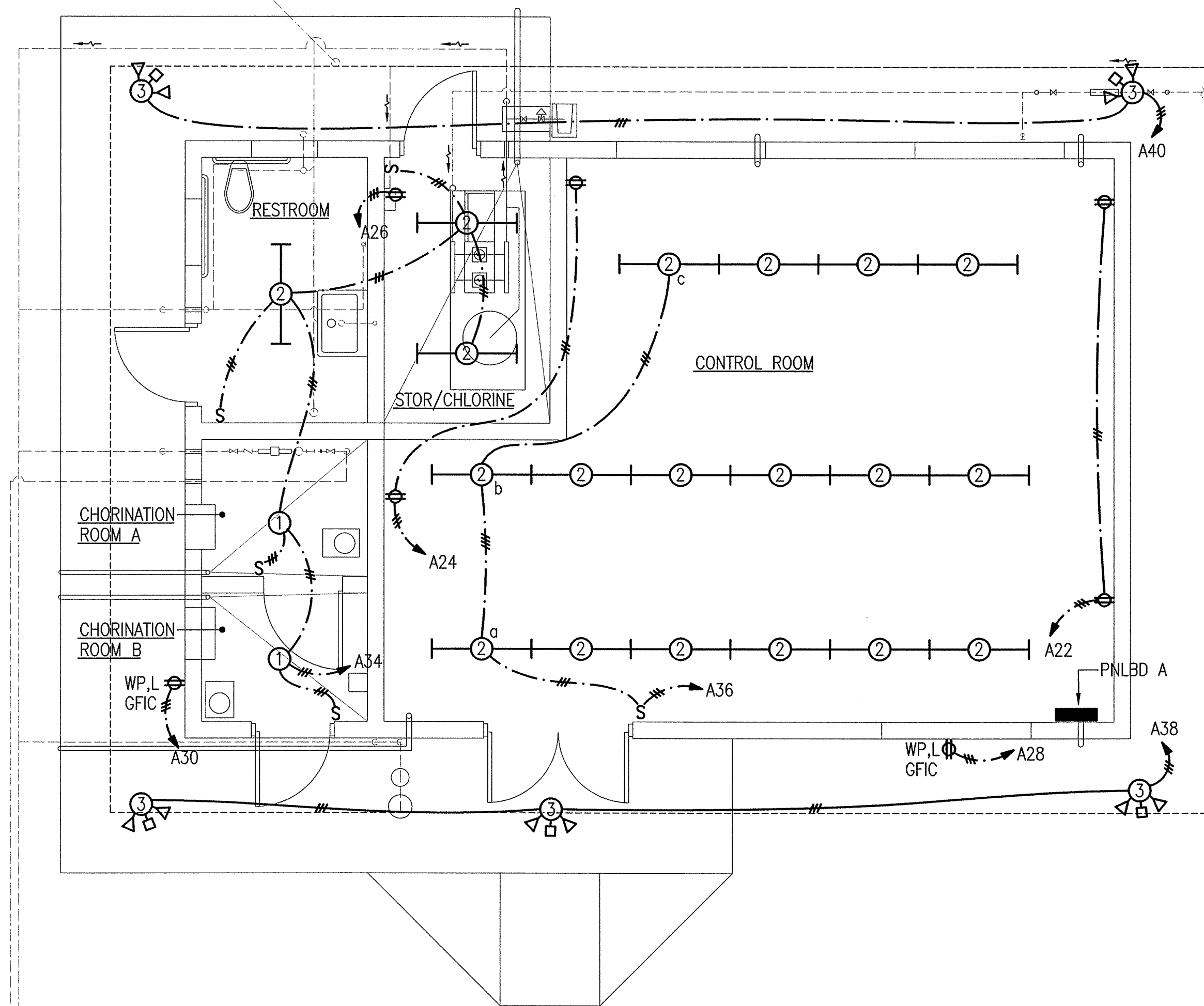




**ELECTRICAL PLAN – CONTROL BUILDING – POWER/CONTROLS**  
SCALE: 1/2" = 1'-0"

REVISION		DATE	DESCRIPTION	MADE BY	APPROVED
1		01/15/20	WALLACE T. OKI		
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION					
<b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418					
 <b>ENGINEERS SURVEYORS HAWAII, INC.</b> 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA					
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII					
<b>ELECTRICAL WORK</b>					





ELECTRICAL PLAN – CONTROL BUILDING – GENERAL POWER/RECEPTACLE//LIGHTING

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

### LIGHTING FIXTURE SCHEDULE

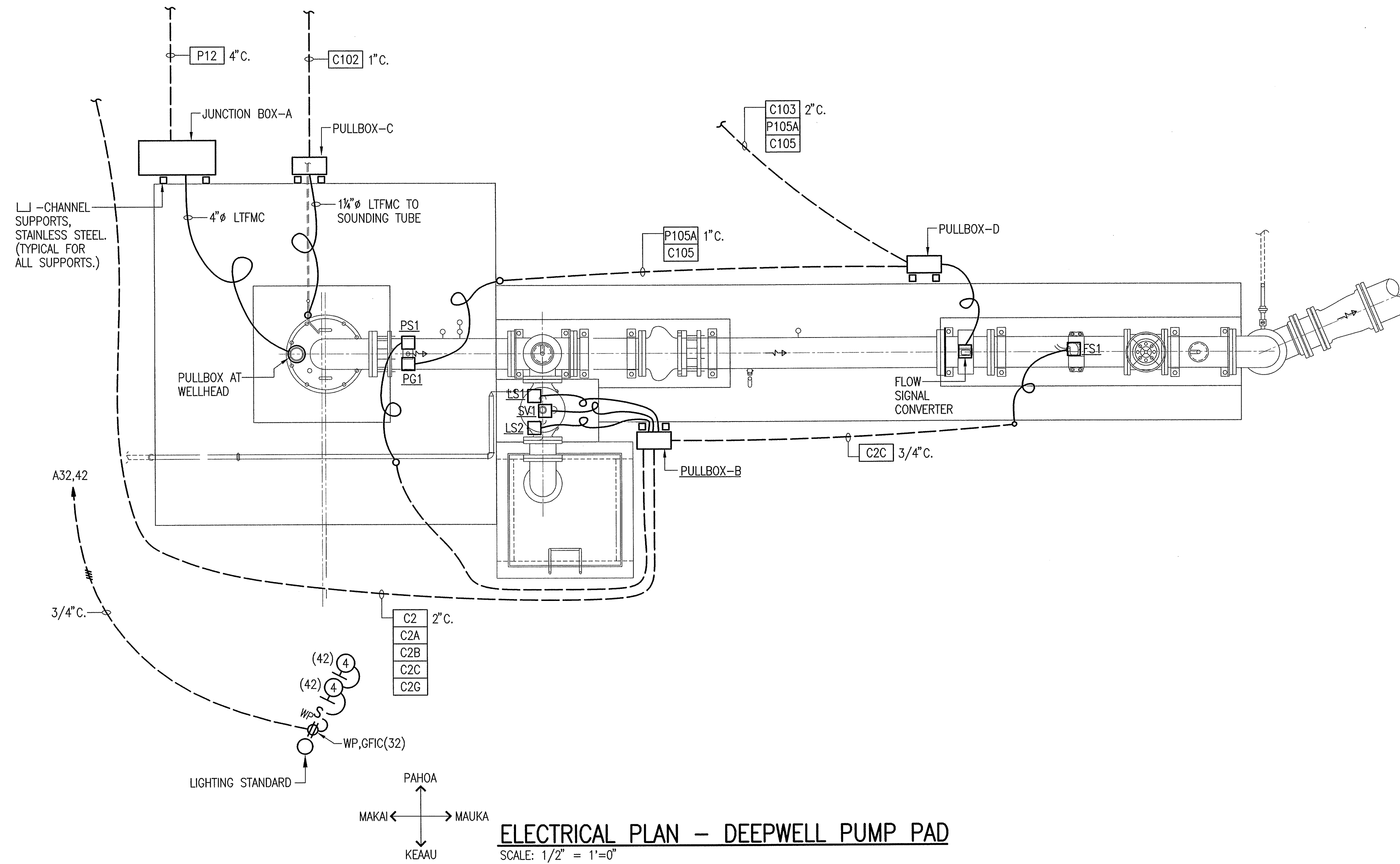
SYMBOL/TYPE	MOUNTING	LAMP	DESCRIPTION
①	CEILING SURFACE	100W. A-19 130V. ROUGH SERVICE	DIE CAST CEILING BRACKET, SATIN ALUMINUM, PORCELAIN SOCKET, CLEAR GLASS GLOBE, VAPOR TIGHT, NEOPRENE GASKETED.
②	CEILING SURFACE	2-F32/T8 4100K	4 FEET, FLUORESCENT LAMPHOLDER, BARE LAMP, WHITE METAL FRAME, ENCLOSED BALLAST HOUSING, CHANNEL TYPE, SNAP-ON END PLATES, ELECTRONIC SOLID STATE ENERGY EFFICIENT BALLAST SUITABLE FOR USE WITH LAMP TUBE GUARDS. FURNISH WITH LAMP TUBE GUARDS.
③	CEILING SURFACE	2-COMPACT FLUORESCENT OR LED OUTDOOR FLOODLIGHTS (100W. INCAND EQUIVALENT MINIMUM)	OUTDOOR LAMPHOLDER WITH MOTION ACTIVATED SENSOR, P.E. CONTROLLED, ADJUSTABLE SENSITIVITY AND DELAY.
④	POLE MOUNTED	500W. QUARTZ HALOGEN	EXTERIOR USE FLOODLIGHT, DIE CAST ALUMINUM HOUSING WITH CAST-IN FINS FOR HEAT DISSIPATION, "ANODAL" REFLECTOR OR EQUIVALENT, THERMAL SHOCK AND IMPACT RESISTANT TEMPERED GLASS LENS IN A DIE CAST ALUMINUM FRAME, SPRING LOADED STAINLESS STEEL LATCHES FOR POSITIVE SEALING, MEDIUM BEAM SPREAD, ADJUSTABLE AIM, THREADED BASE. USE WITH THREADED HUB COVER AND OUTLET BOX.

### CALCULATIONS FOR IECC 2006 AND ORDINANCES 09-48 & 10-68



INTERIOR (SYSTEM PERFORMANCE CRITERIA)									
AREA/ACTIVITY	AREA SQ.FT.	AREA FACTOR	UNIT POWER DENSITY, W./SQ.FT.	NEEDER LIGHTING ALLOWANCE, WATTS	CONTROL POINTS REQUIRED	CONTROL POINTS ACTUAL	NEEDER LIGHTING ALLOWANCE, WATTS	CONTROL POINTS REQUIRED	CONTROL POINTS ACTUAL
RESTROOM	71	1.8	0.5	64	1	1	64	1	1
STOR/CHLORINE	71	1.8	1.0	128	1	1	128	1	1
CHLORINATION RM A	40	1.8	1.4	101	1	1	101	1	1
CHLORINATION RM B	40	1.8	1.4	101	1	1	101	1	1
CONTROL RM	582	1.2	1.8	1257	2	1	1187	2	1
TOTALS							1581		1416
EXTERIOR									
AREA/ACTIVITY	AREA SQ.FT.	AREA FACTOR	UNIT POWER DENSITY, W./SQ.FT.	NEEDER LIGHTING ALLOWANCE, WATTS	CONTROL POINTS REQUIRED	CONTROL POINTS ACTUAL	NEEDER LIGHTING ALLOWANCE, WATTS	CONTROL POINTS REQUIRED	CONTROL POINTS ACTUAL
WALKWAY/ENTRANCE	460 SF.		4W./SF.	1840			1840		
DEEPWELL PUMP AREA	250 SF.		4W./SF.	1000			1000		
TOTALS				2840			2840		

PNLBD		240/120 VOLTS, 1 PHASE, 3 WIRE, NEUTRAL BUS, GROUND BUS, SURFACE MOUNTING, 225 A. MAIN BUS ONLY, COPPER, BOLT-ON BRANCH BREAKERS, FULL SIZE BREAKERS ONLY, 10,000 AIC, TYPEWRITTEN DIRECTORY									
A											
WIRE SIZE	SERVICE	CIR. BKR. AMP	CIR. BKR. POLE	CIR. L1	CIR. L2	CIR. L3	CIR. BKR. AMP	CIR. BKR. POLE	CIR. L1	CIR. L2	CIR. L3
P50	#12 TEST PWR/MCE	20	1	1	L1	2	1	20	1	1	L1
P101	#12 RCDR 1/RCDR PNL	20	1	3	L2	4	1	20	1	3	L2
P102	#12 RCDR 2/RCDR PNL	20	1	5	L1	6	1	20	1	5	L1
P103	#12 FLOW METER/RCDR PNL	20	1	7	L2	8	1	20	1	7	L2
P104	#12 CHLORINE ANALYZER/RCDR PNL	20	1	9	L1	10	1	20	1	9	L1
P200	#12 SCADA TERM CAB	20	1	11	L2	12	1	20	1	11	L2
P300	#6 HYDRO-PNEU SYSTEM	60	2	13	L1	14	1	20	1	13	L1
	#6			15	L2	16	1	20	1	15	L2
P301	#12 CHLORINATOR CONTROL PANEL	20	1	17	L1	18	1	20	1	17	L1
	#12 EF1	20	2	19	L2	20	1	20	1	19	L2
				21	L1	22	1	20	1	21	L1
				23	L2	24	1	20	1	23	L2
				25	L1	26	1	20	1	25	L1
				27	L2	28	1	20	1	27	L2
				29	L1	30	1	20	1	29	L1
				31	L2	32	1	20	1	31	L2
				33	L1	34	1	20	1	33	L1
				35	L2	36	1	20	1	35	L2
				37	L1	38	1	20	1	37	L1
				39	L2	40	1	20	1	39	L2
				41	L1	42	1	20	1	41	L1

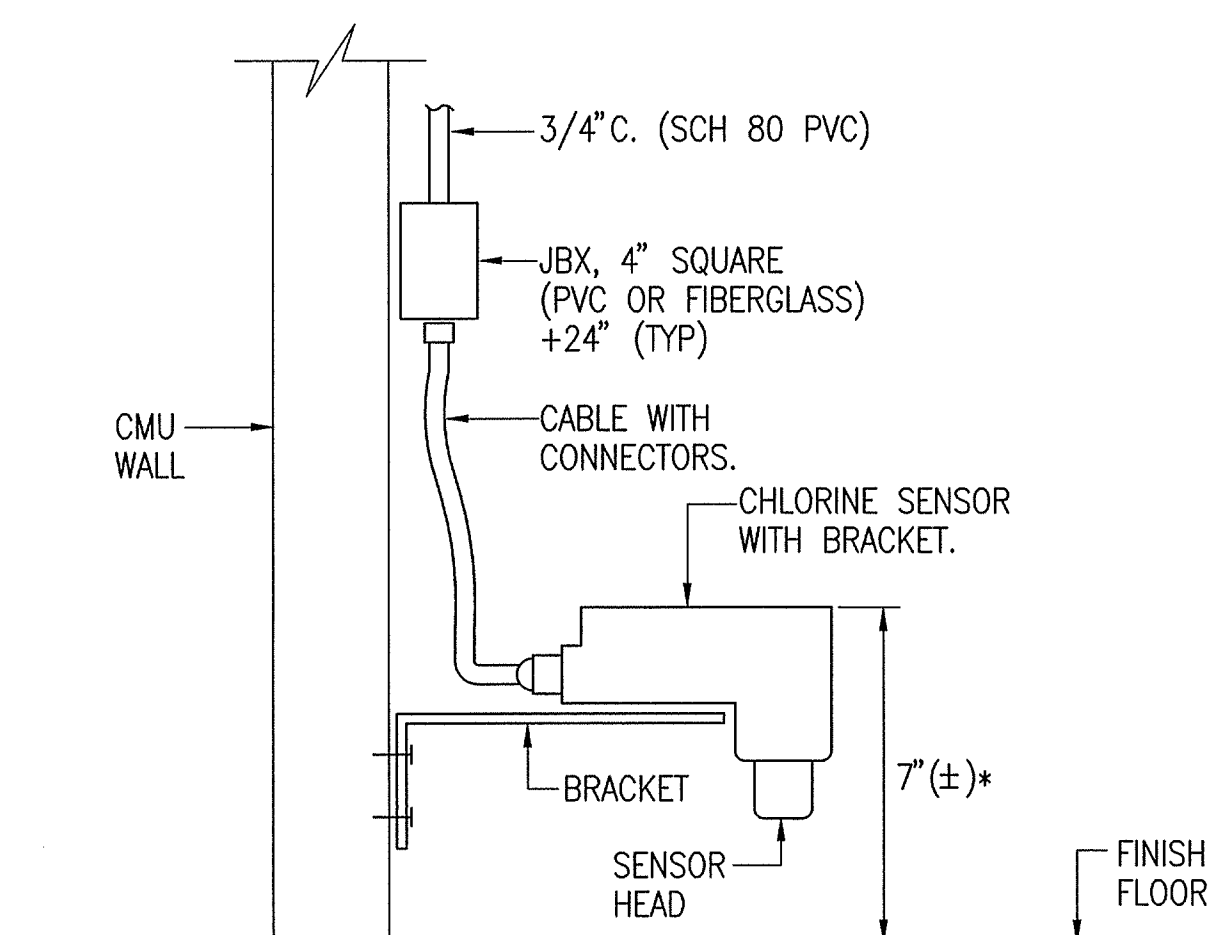
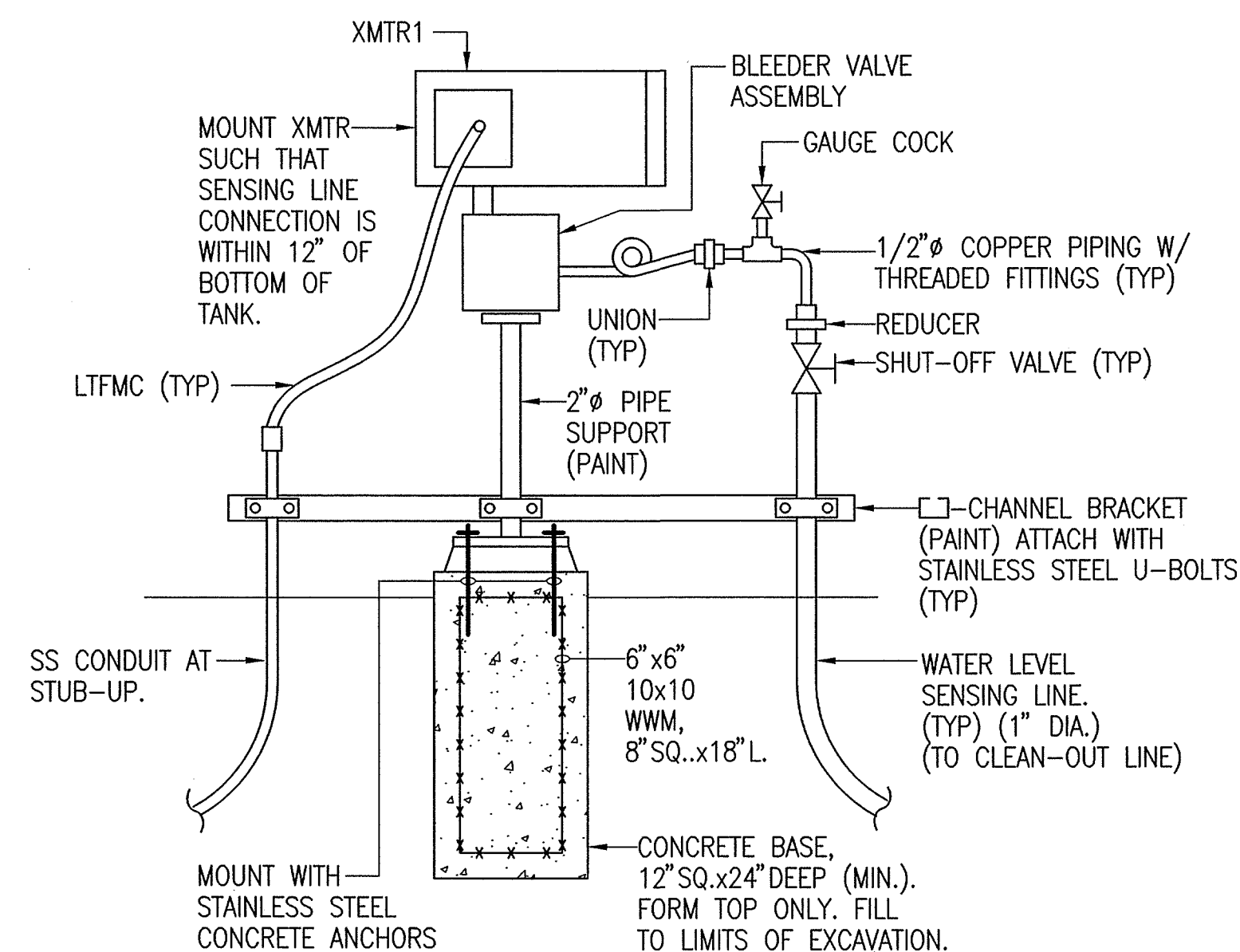
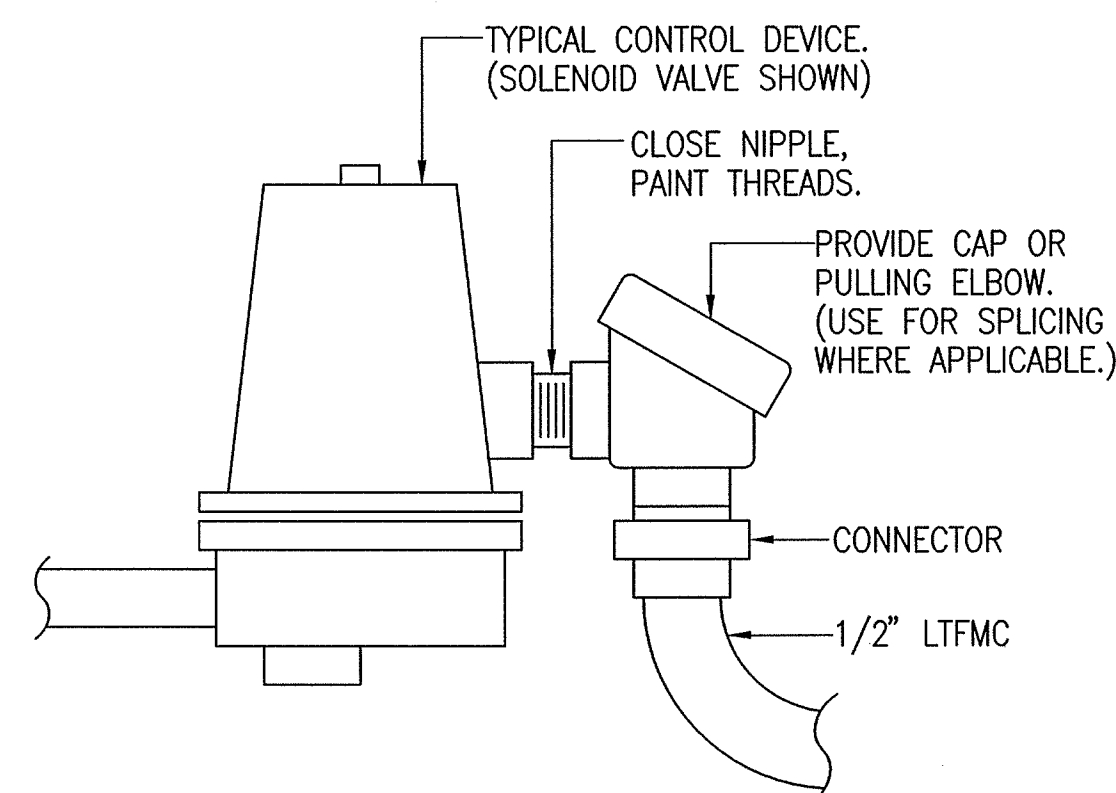
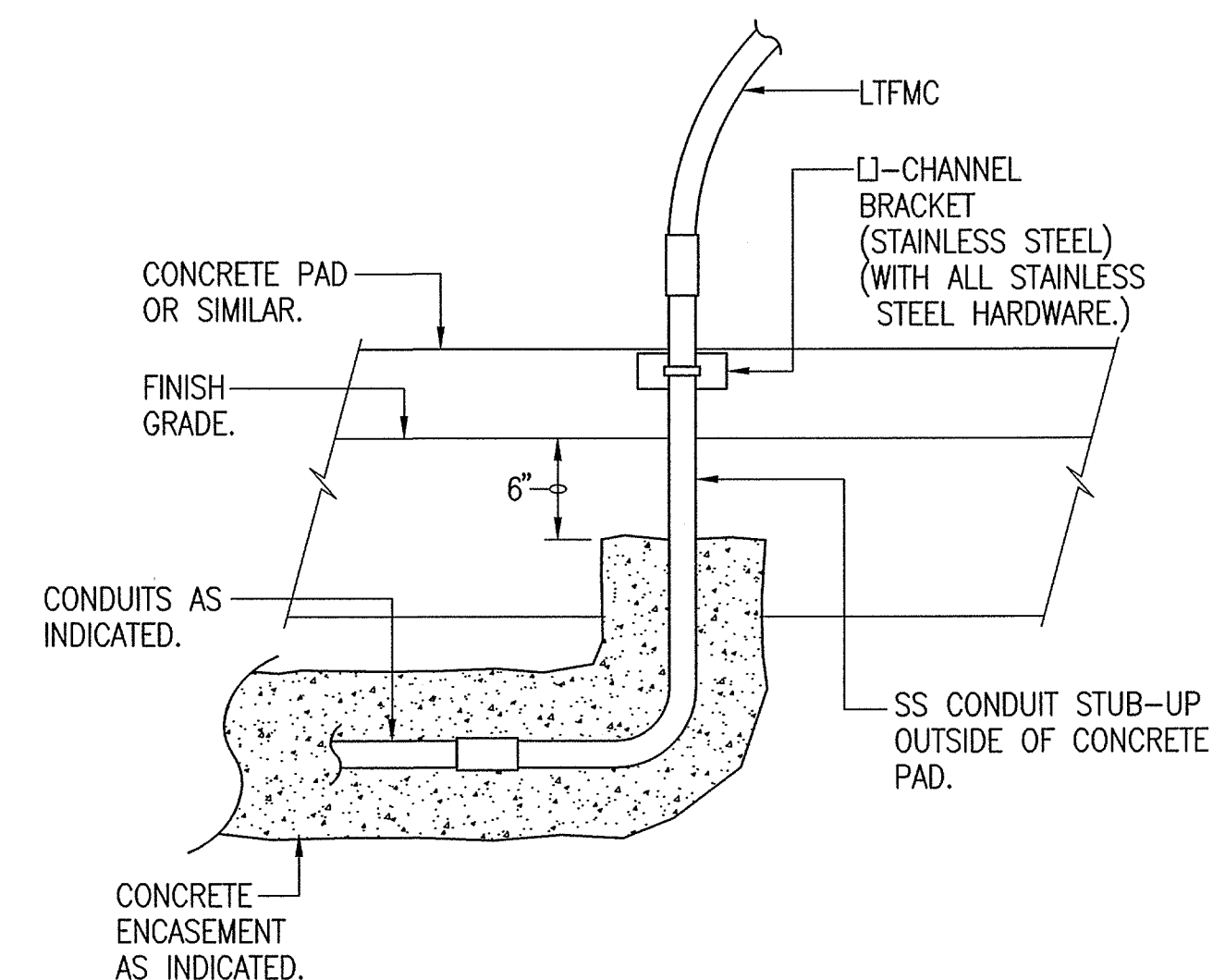
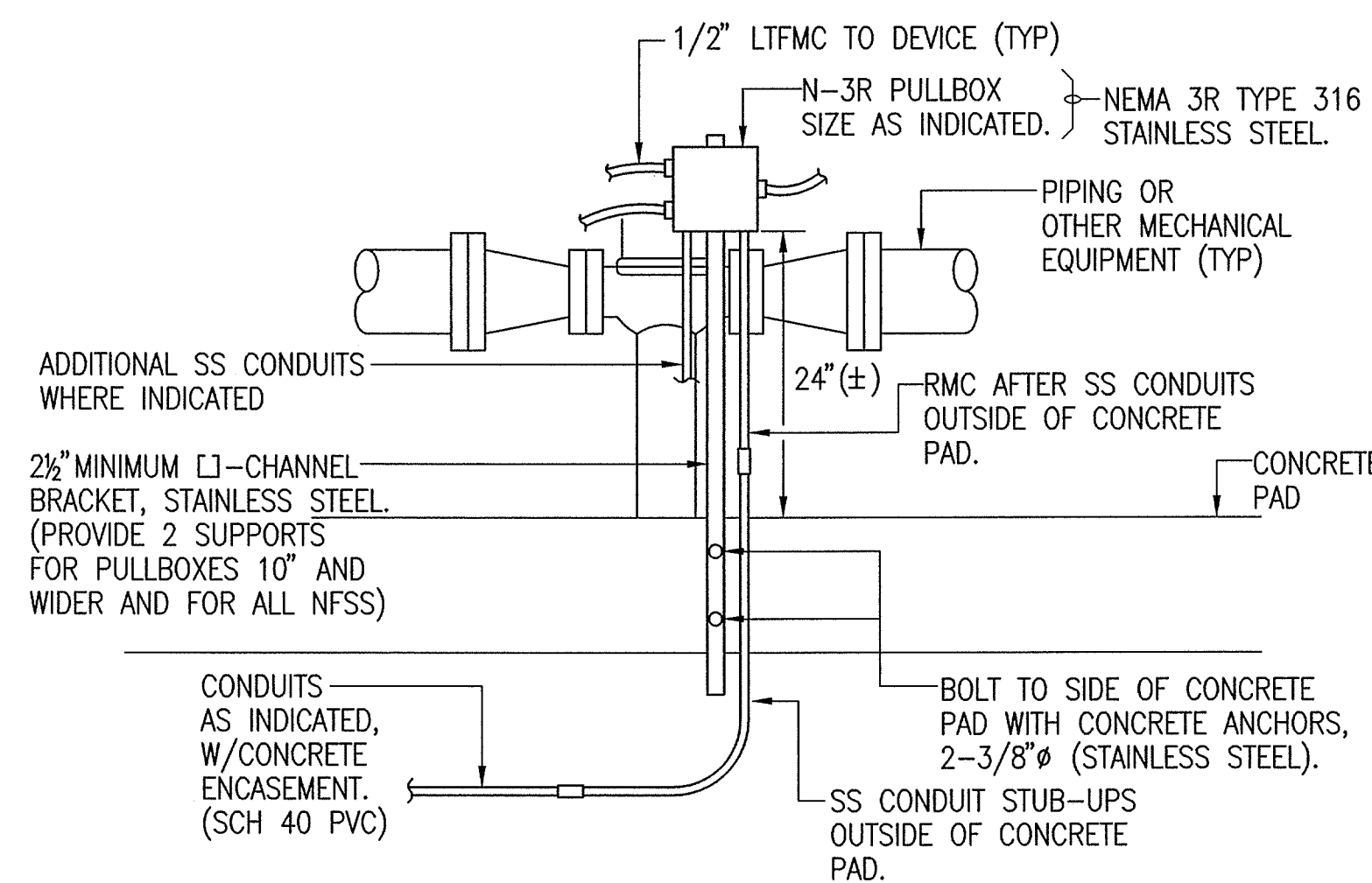
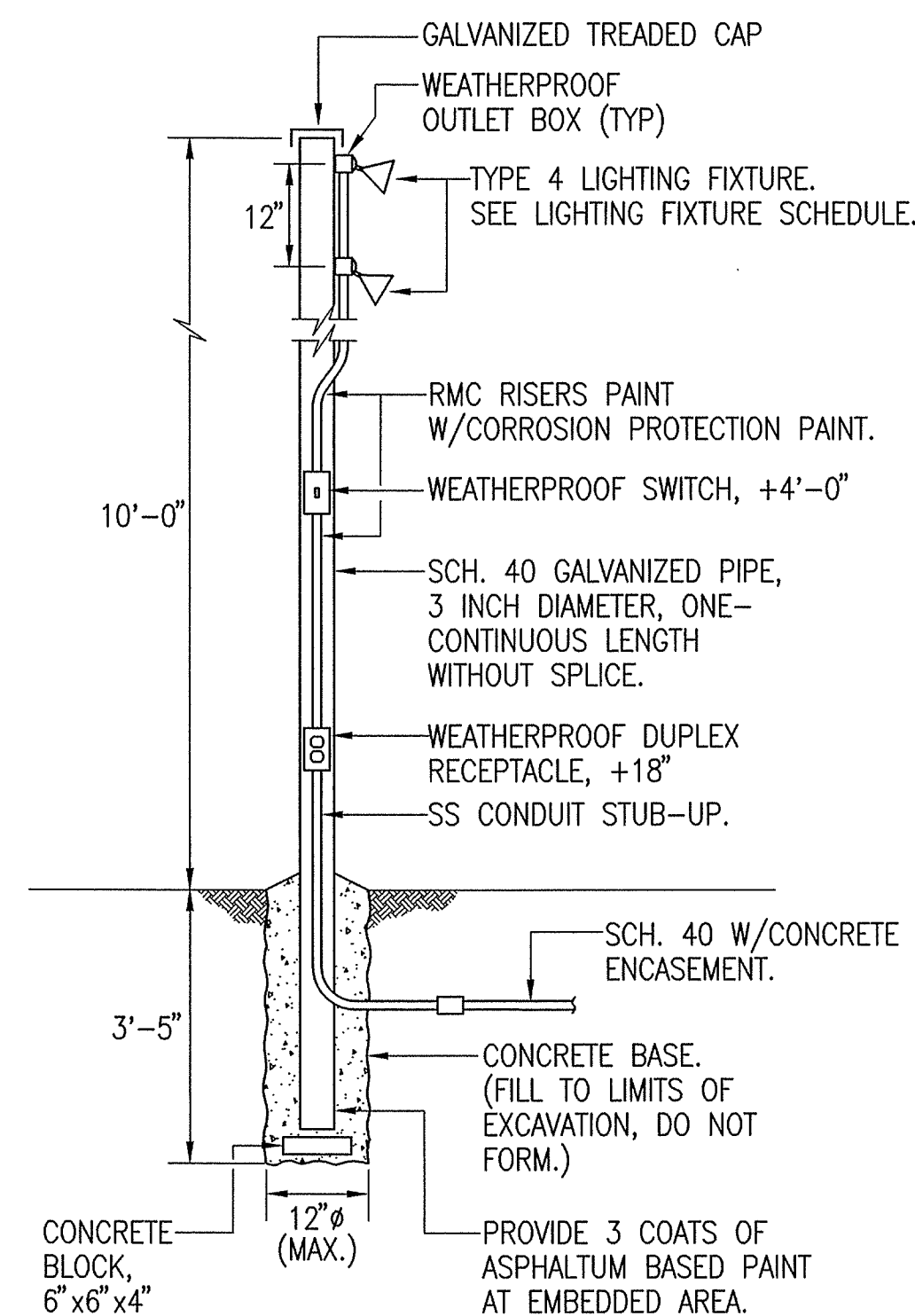
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549				
WTO REF NO. 102011418				
ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				



**ELECTRICAL PLAN - DEEPWELL PUMP PAD**  
 SCALE: 1/2" = 1'-0"

REVISION			DATE	DESCRIPTION	MADE BY      APPROVED
1			01/11/18	W.T.O.	
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WALLACE T. OKI, P.E., INC.					
ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST. STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549					
WTO REF NO. 102011418					
					ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON.      885-4590 KAMUELA
DEPARTMENT OF HAWAIIAN HOME LANDS					
MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII					
ELECTRICAL WORK					
E-13 MAKUU SITE					



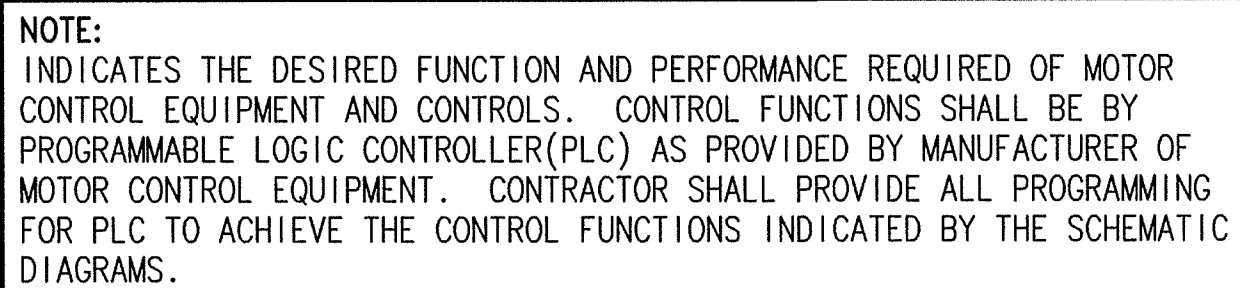


\* = COMPLY WITH MANUFACTURER'S REQUIREMENTS.

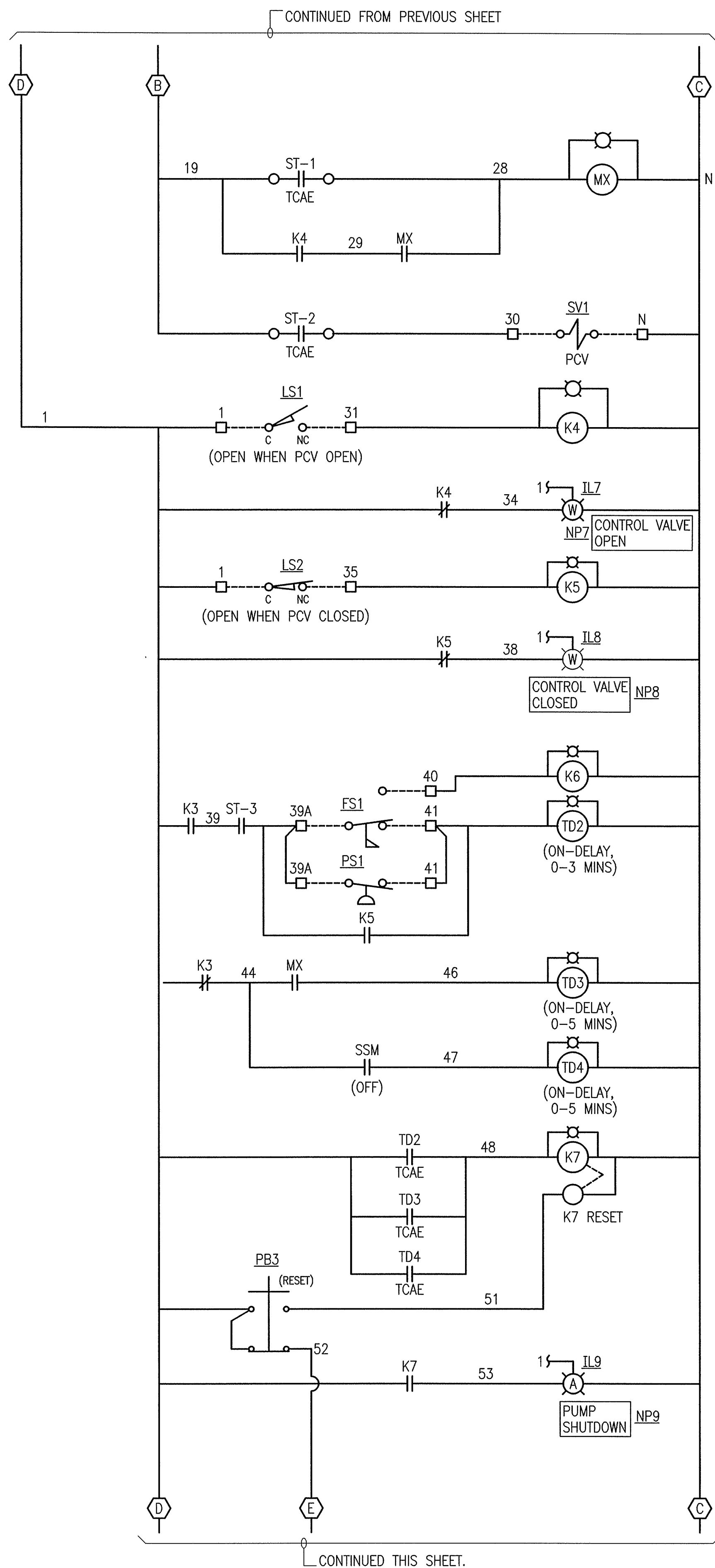
CORROSION PROTECTION PAINT

1. AMERON "AMERLOCK 400" EPOXY COATING OR APPROVED EQUIVALENT.
2. ALUMINUM
3. APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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<b>WALLACE T. OKI, P.E., INC.</b> <b>ELECTRICAL ENGINEERING</b> P.O. BOX 4070/688 KINOOLE ST. STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549				
WTO REF NO. 102011418				
			<b>ENGINEERS SURVEYORS</b> <b>HAWAII, INC.</b> 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA	
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
<b>ELECTRICAL WORK</b>				







32 □  
K4  
33 □

36 □  
K5  
37 □

42 □  
K5  
43 □

1  
2

CHLORINATOR  
CONTROL  
PANEL

TD2: SET AT 20 SECONDS MORE  
THAN TIME FOR PCV  
TO CLOSE.

TD3: SET AT 10 SECONDS MORE  
THAN TIME FOR PCV  
TO OPEN.

TD4: SET AT 5 SECONDS MORE  
THAN TD3.

49 □  
K7  
50 □

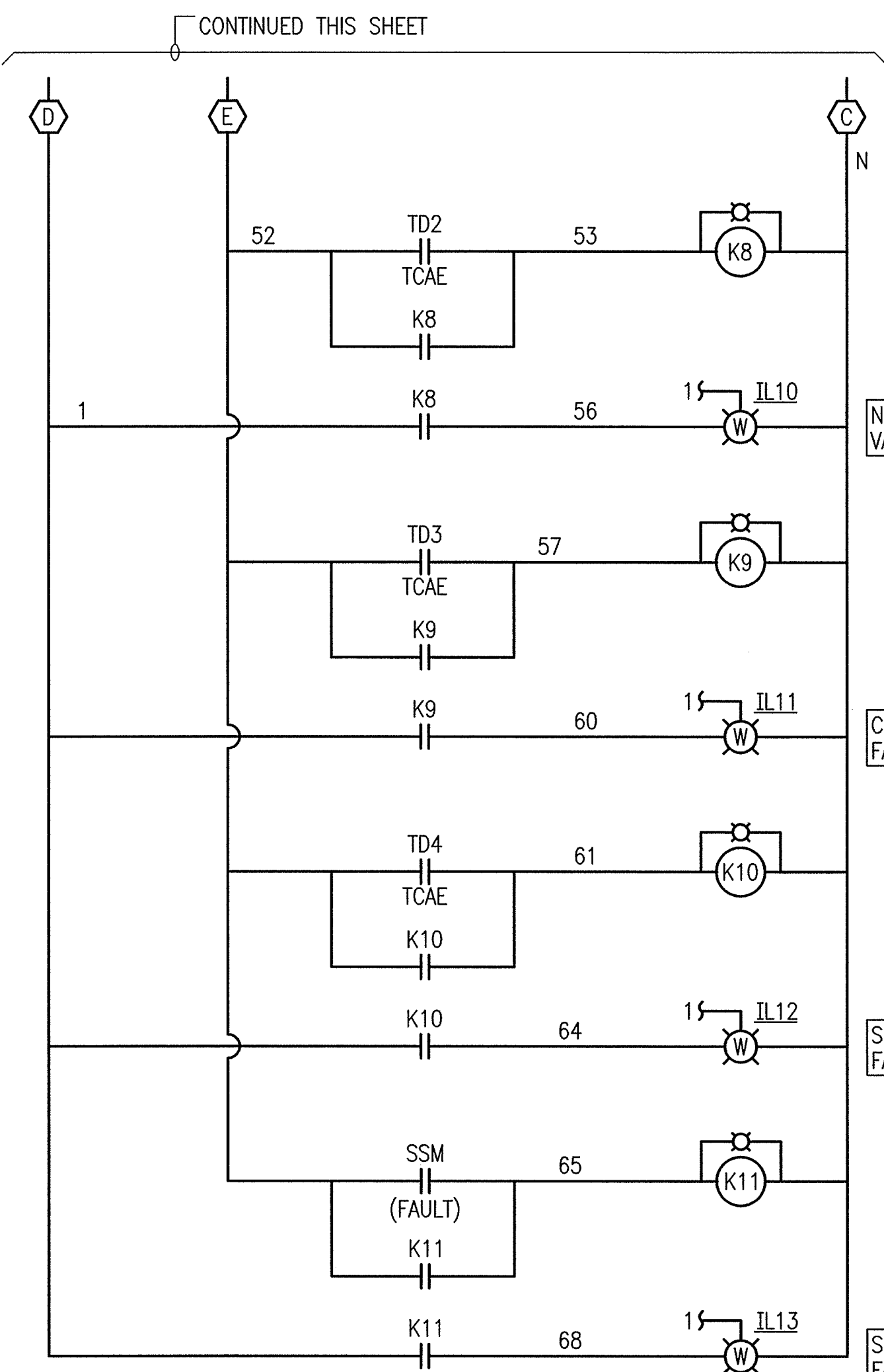
DI4+  
DI4-

SC  
(SCADA PLC/  
PUMP SHUTDOWN)

**NOTE:**  
INDICATES THE DESIRED FUNCTION AND PERFORMANCE REQUIRED OF MOTOR  
CONTROL EQUIPMENT AND CONTROLS. CONTROL FUNCTIONS SHALL BE BY  
PROGRAMMABLE LOGIC CONTROLLER(PLC) AS PROVIDED BY MANUFACTURER OF  
MOTOR CONTROL EQUIPMENT. CONTRACTOR SHALL PROVIDE ALL PROGRAMMING  
FOR PLC TO ACHIEVE THE CONTROL FUNCTIONS INDICATED BY THE SCHEMATIC  
DIAGRAMS.

### SCHEMATIC DIAGRAM – (TYPICAL) MOTOR CONTROL EQUIPMENT

LEGEND: ----- = FIELD WIRING EXTERNAL TO MOTOR CONTROL EQUIPMENT.  
□ = TB POINT IN MOTOR CONTROL EQUIPMENT 120 VAC CONTROL SECTION.  
⊠ = TB POINT IN RCDR PANEL.  
○ = TB POINT IN CHLORINATOR CONTROL PANEL  
⊗ = TB POINT IN SCADA CABINET(SC).  
(\*) = ITEMS ON DOOR PANEL OF MOTOR CONTROL EQUIPMENT.  
△ = ITEMS ON DOOR PANEL OF MOTOR CONTROL EQUIPMENT 120 VAC CONTROL SECTION.



54 □  
K8  
55 □

DI5+  
DI5-

SC  
(SCADA PLC/  
NO FLOW)

NO FLOW/CONTROL  
VALVE FAIL TO CLOSE NP10

58 □  
K9  
59 □

DI6+  
DI6-

SC  
(SCADA PLC/PCV  
FAIL TO OPEN)

CONTROL VALVE  
FAIL TO OPEN NP11

62 □  
K10  
63 □

DI7+  
DI7-

SC  
(SCADA PLC/SHUTDOWN  
SEQUENCE FAILURE)

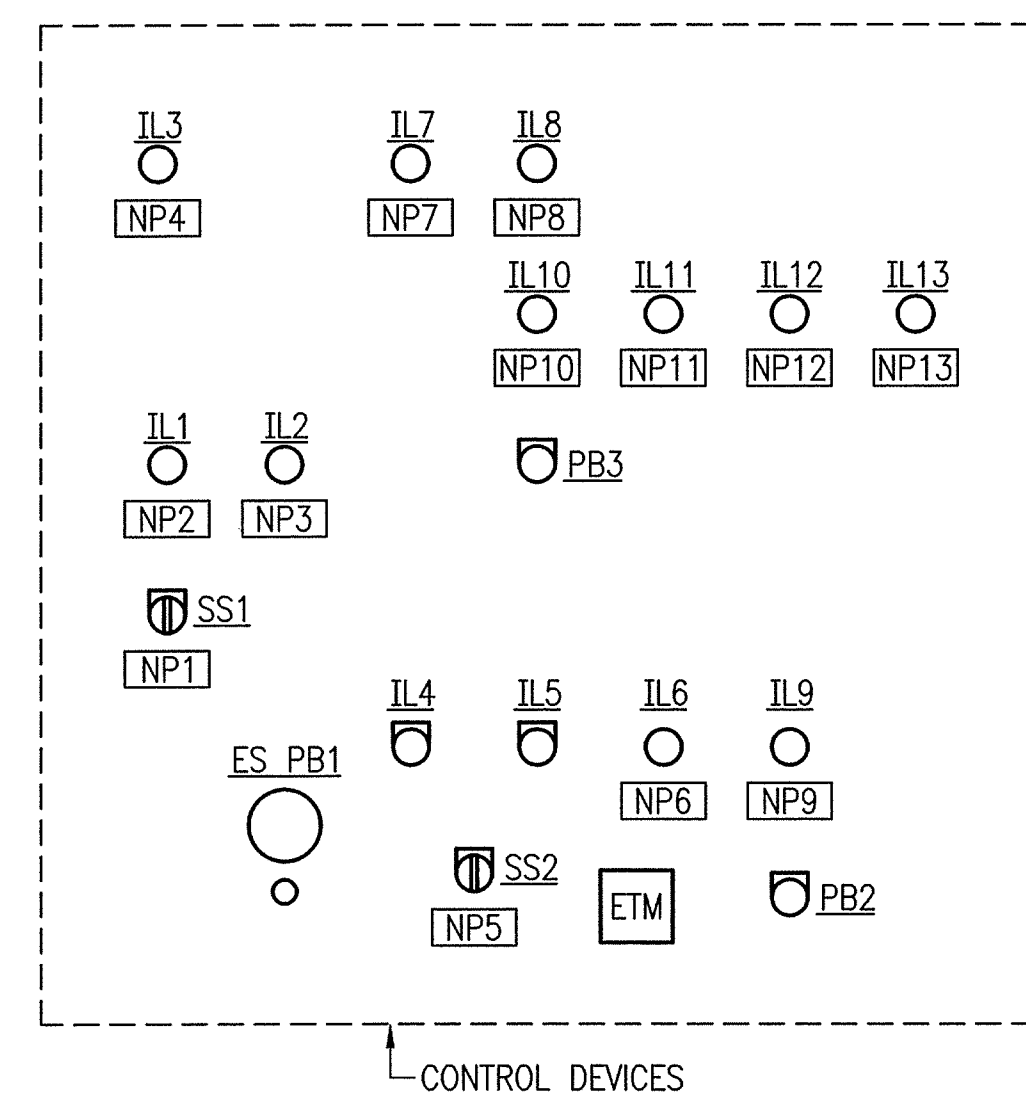
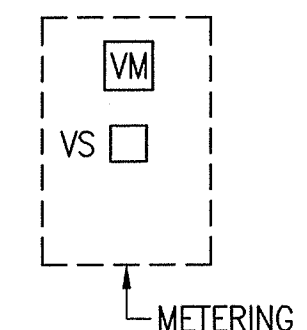
SHUTDOWN SEQUENCE  
FAILURE NP12

66 □  
K11  
67 □

DI8+  
DI8-

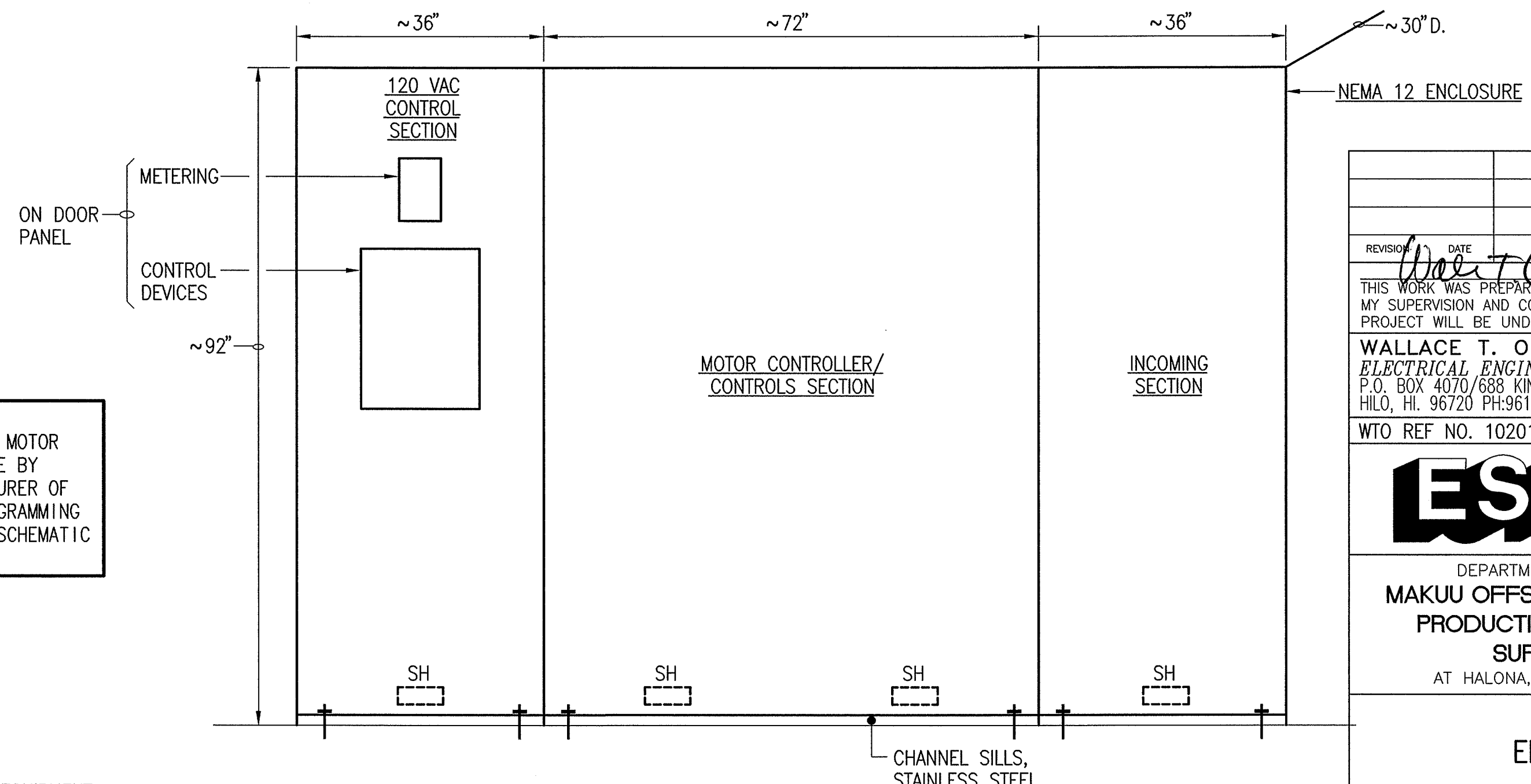
SC  
(SCADA PLC/  
SOFT-START FAULT)

SOFT-START  
FAULT NP13



### DOOR PANEL ARRANGEMENTS (TYP) – 120 VAC CONTROL SECTION

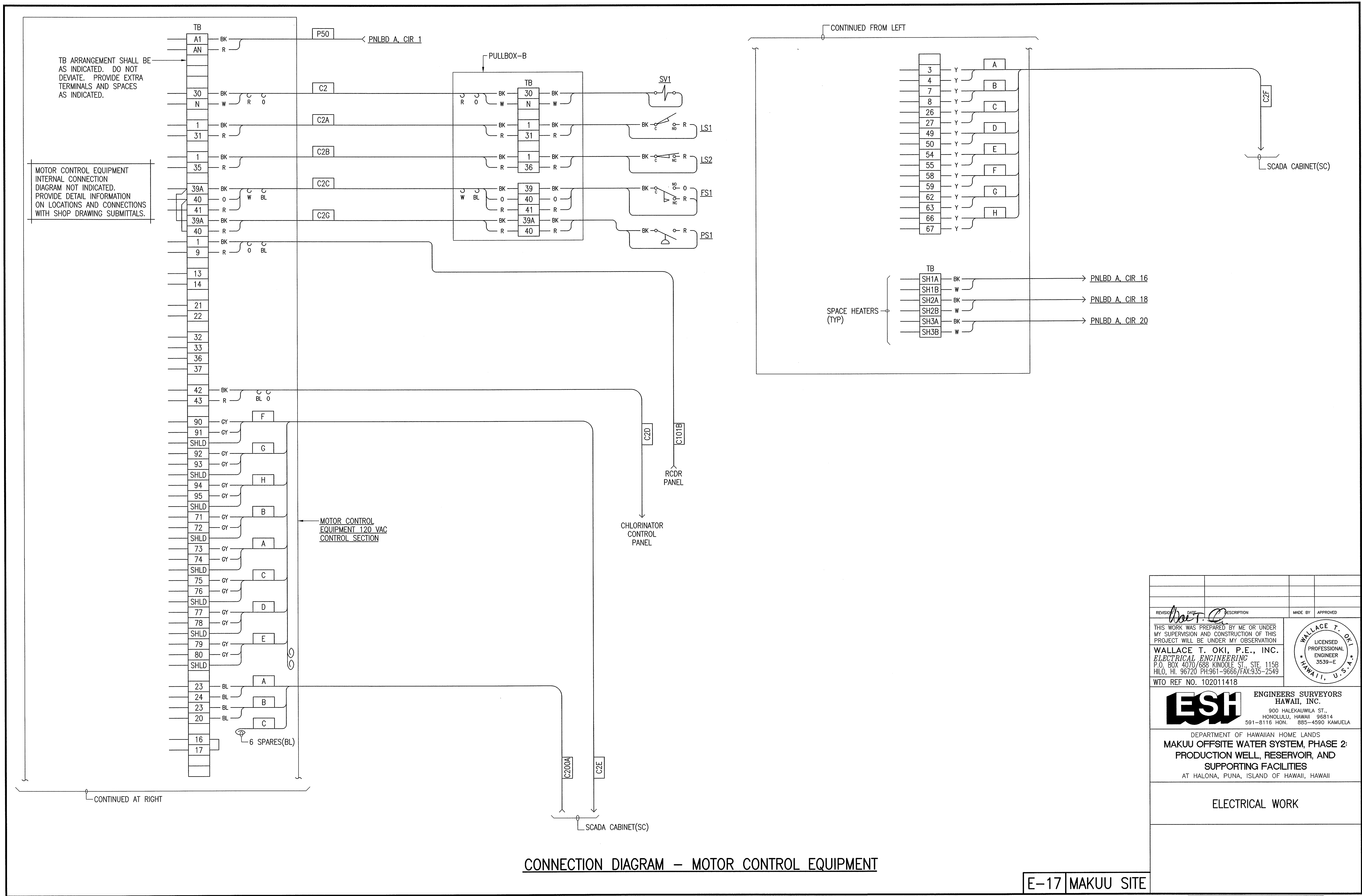
NOT TO SCALE  
NOTE: PROVIDE DETAILED/DIMENSIONED PLANS WITH SHOP DRAWING SUBMITTAL.  
ALL CONTROL DEVICES SHALL BE OPERABLE AND READABLE FROM A NORMAL  
STANDING POSITION.



### GENERAL ARRANGEMENT (TYP) – MEDIUM VOLTAGE MOTOR CONTROL EQUIPMENT

NOT TO SCALE

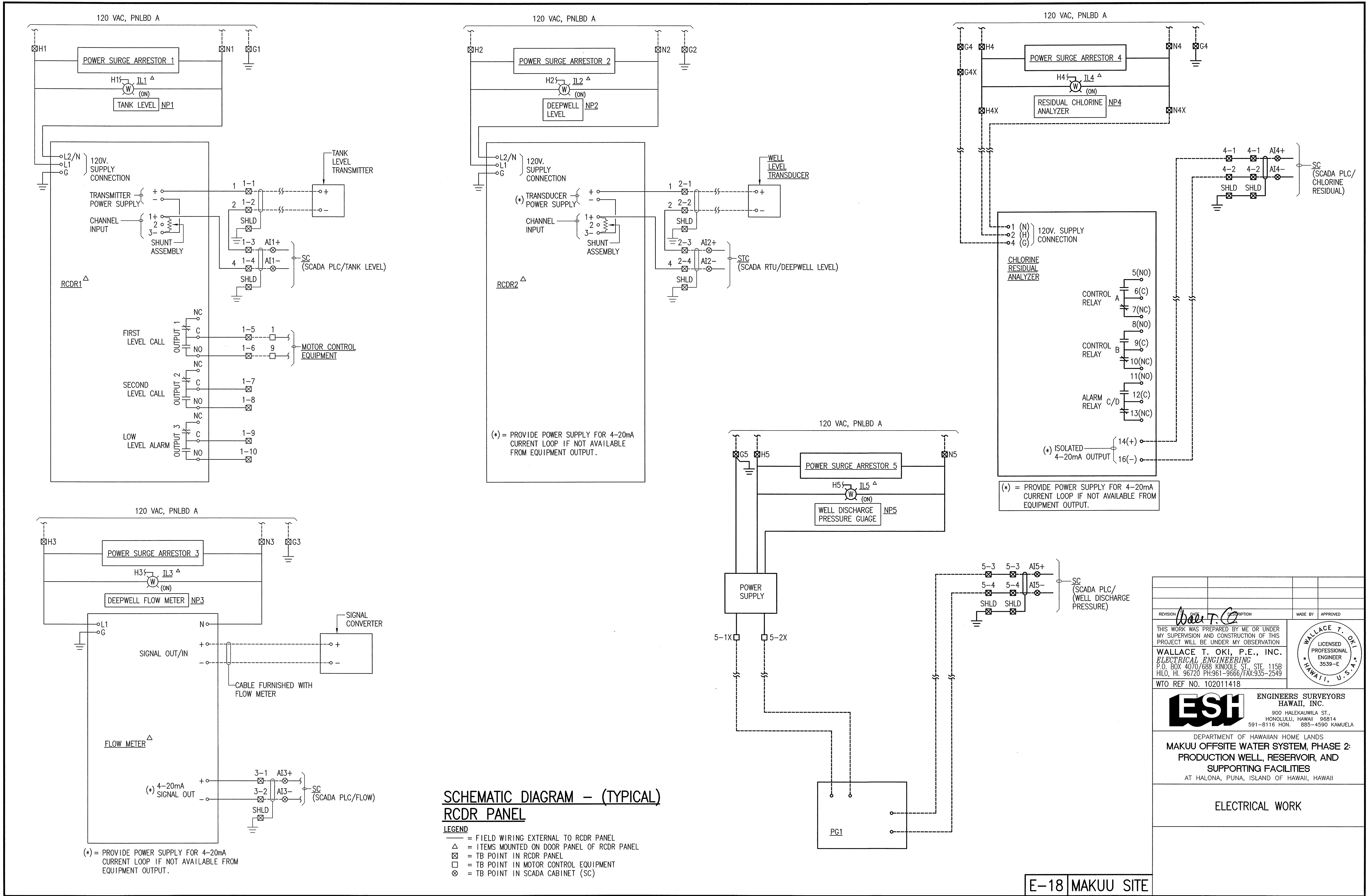
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1	01/11/20	WTO		
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION				
WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549				
WTO REF NO. 102011418				
<div> <div>ESH</div> <div>ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA</div> </div>				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				

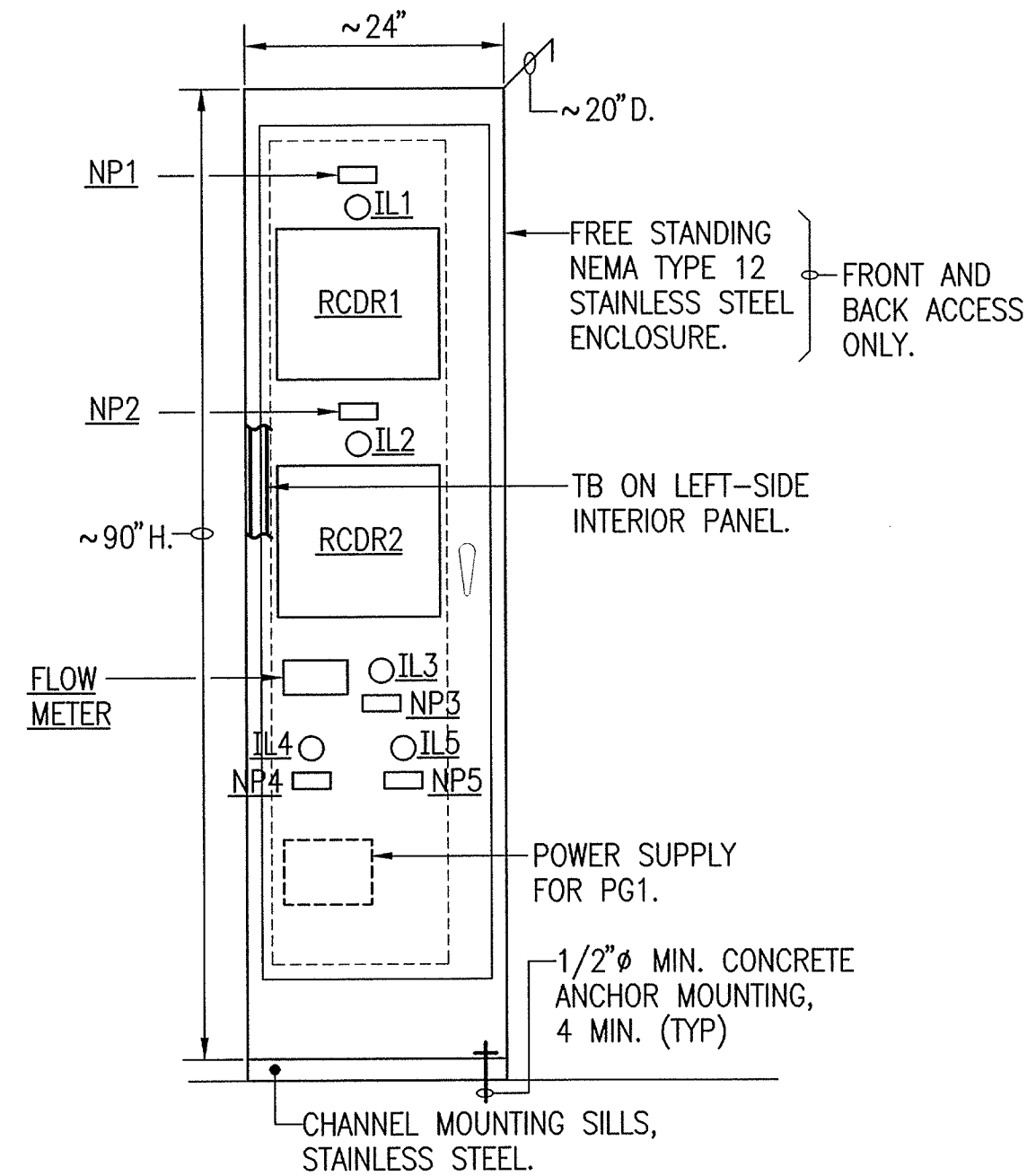
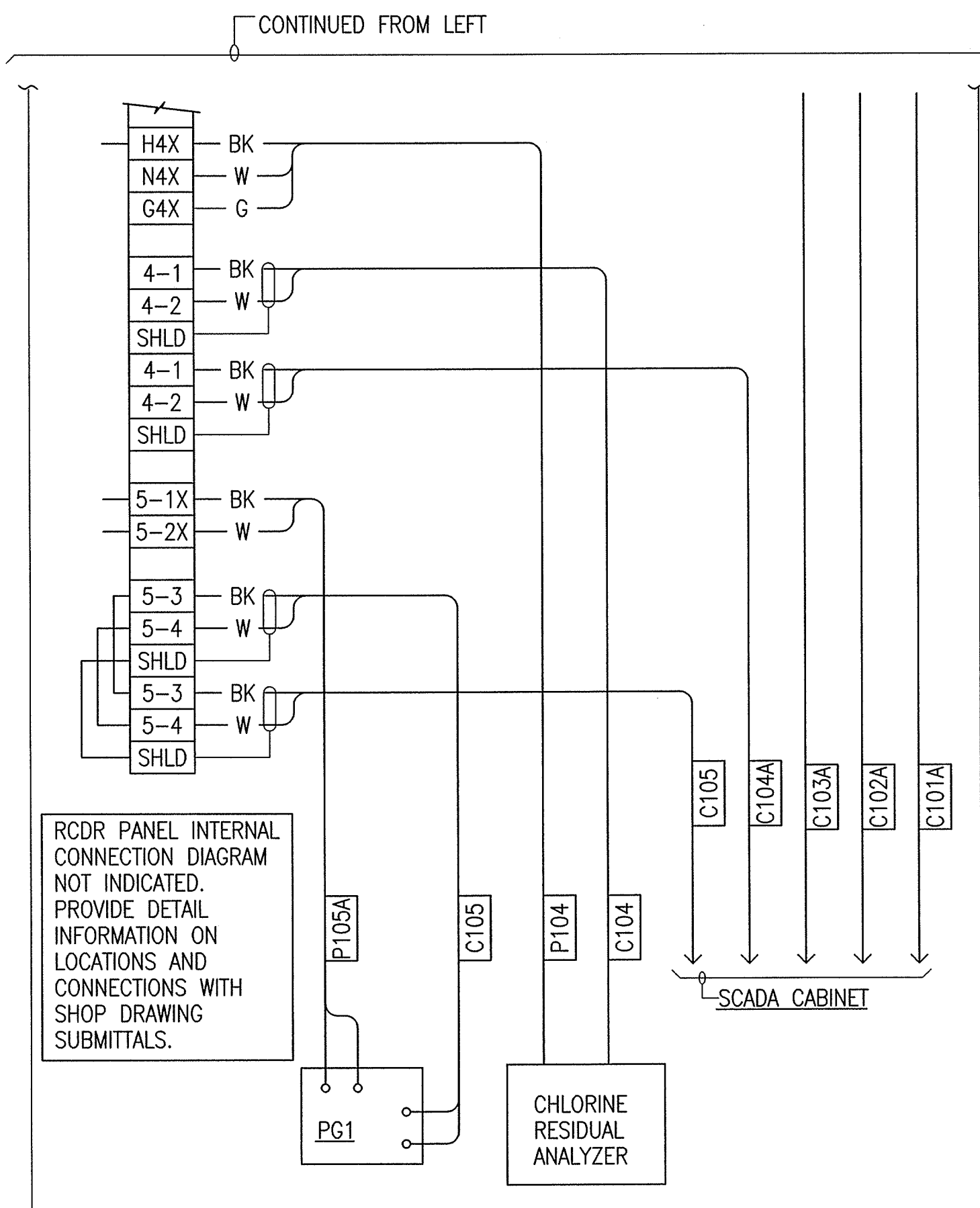
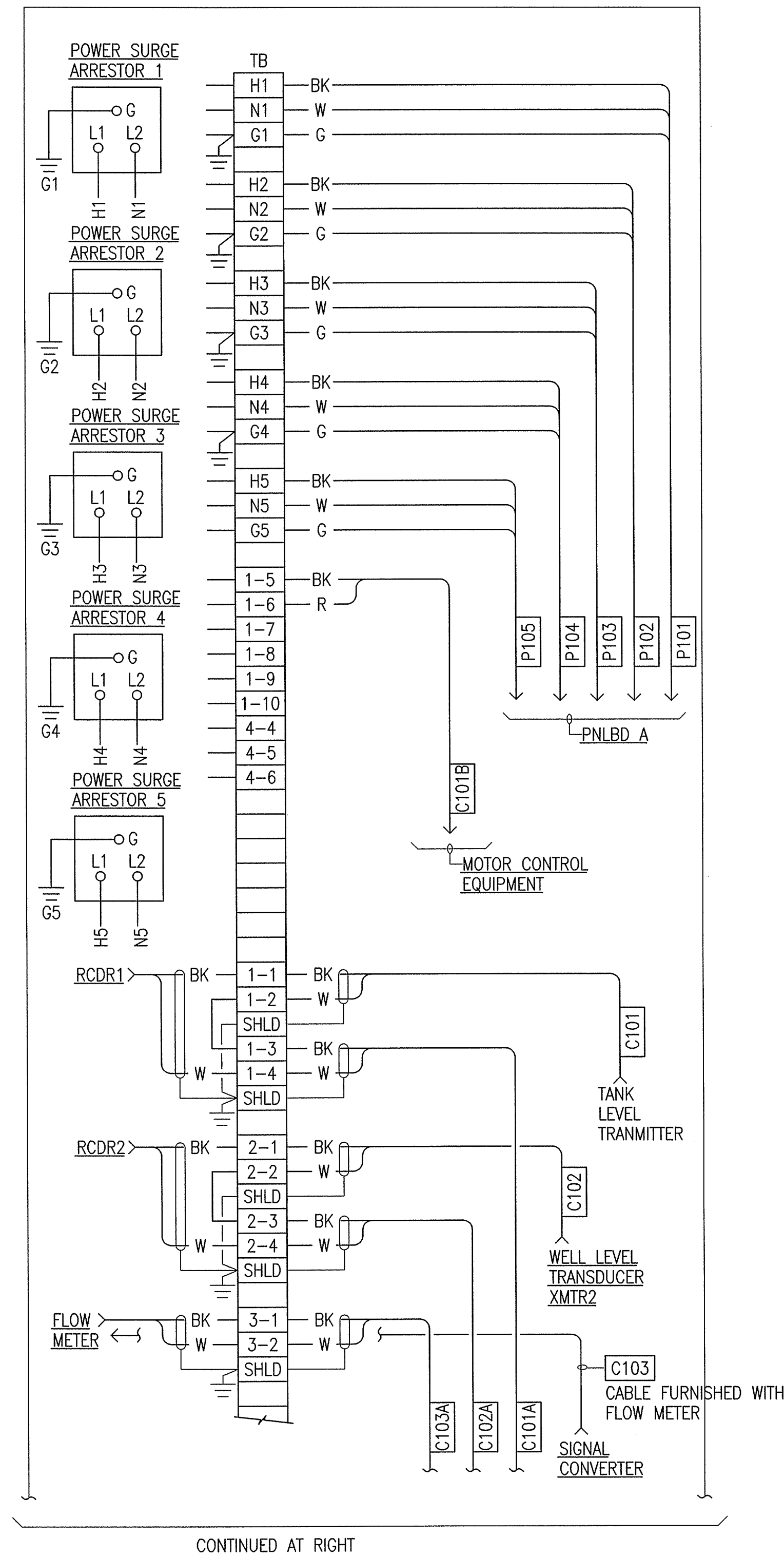


CONNECTION DIAGRAM – MOTOR CONTROL EQUIPMENT

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
1	10/20/11	WTO REF NO. 102011418		
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WTO REF NO. 102011418				
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS MAKU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				

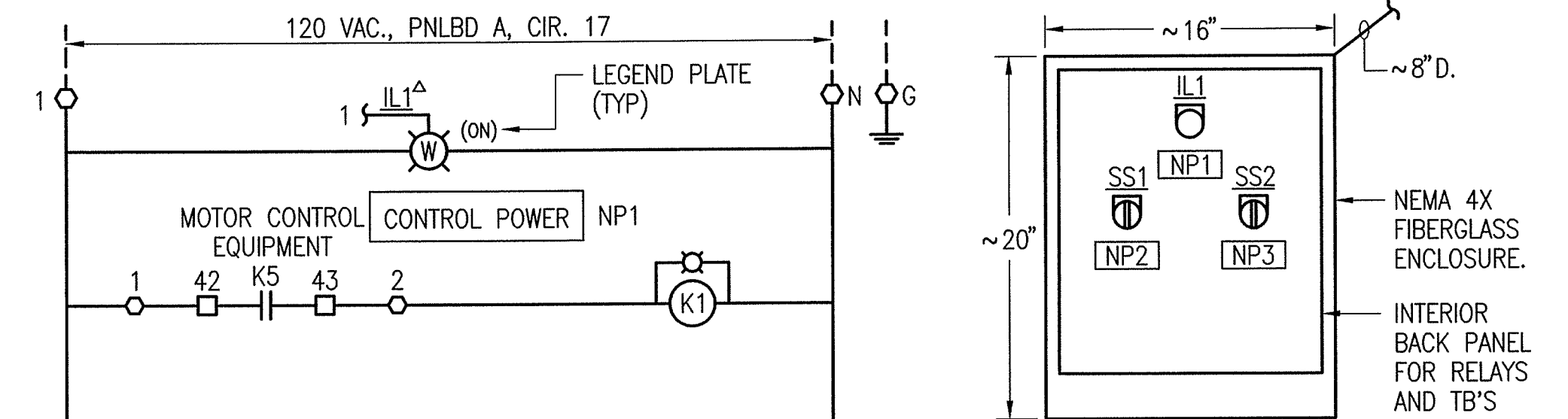






GENERAL ARRANGEMENT (TYP)  
RCDR PANEL  
NOT TO SCALE

CONNECTION DIAGRAM - TYPICAL - RCDR PANEL

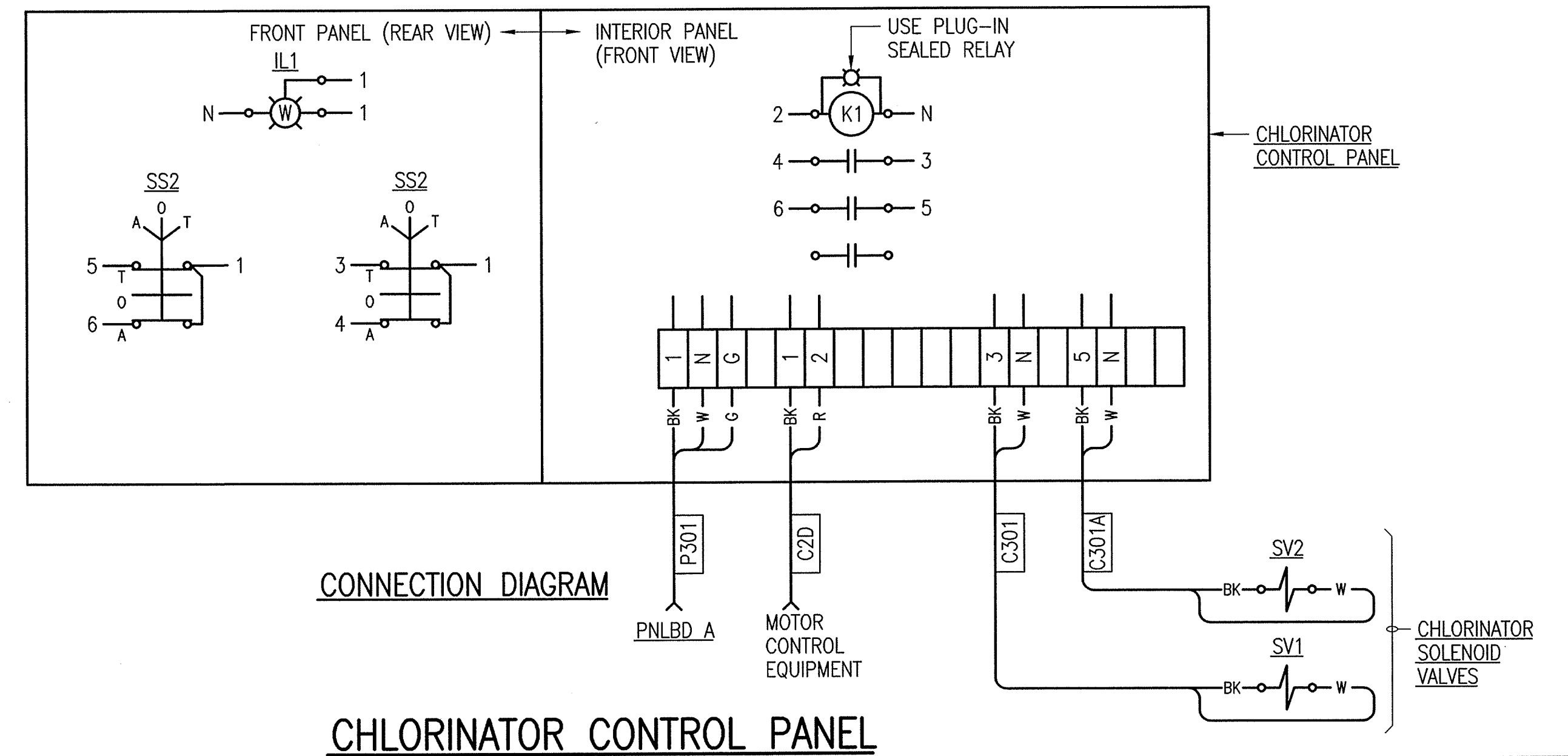


FRONT PANEL ARRANGEMENT  
NOTE: SUBMIT DETAILED/DIMENSIONED LAYOUT FOR REVIEW BY ENGINEER.

### SCHEMATIC DIAGRAM

#### LEGEND:

- = FIELD WIRING EXTERNAL TO CHLOR. CONTROL PANEL
- Δ = ITEMS MOUNTED ON FRONT PANEL OF CHLORINATOR CONTROL PANEL
- = TB POINT IN CHLORINATOR CONTROL PANEL
- = TB POINT IN MOTOR CONTROL EQUIPMENT



CONNECTION DIAGRAM

CHLORINATOR CONTROL PANEL

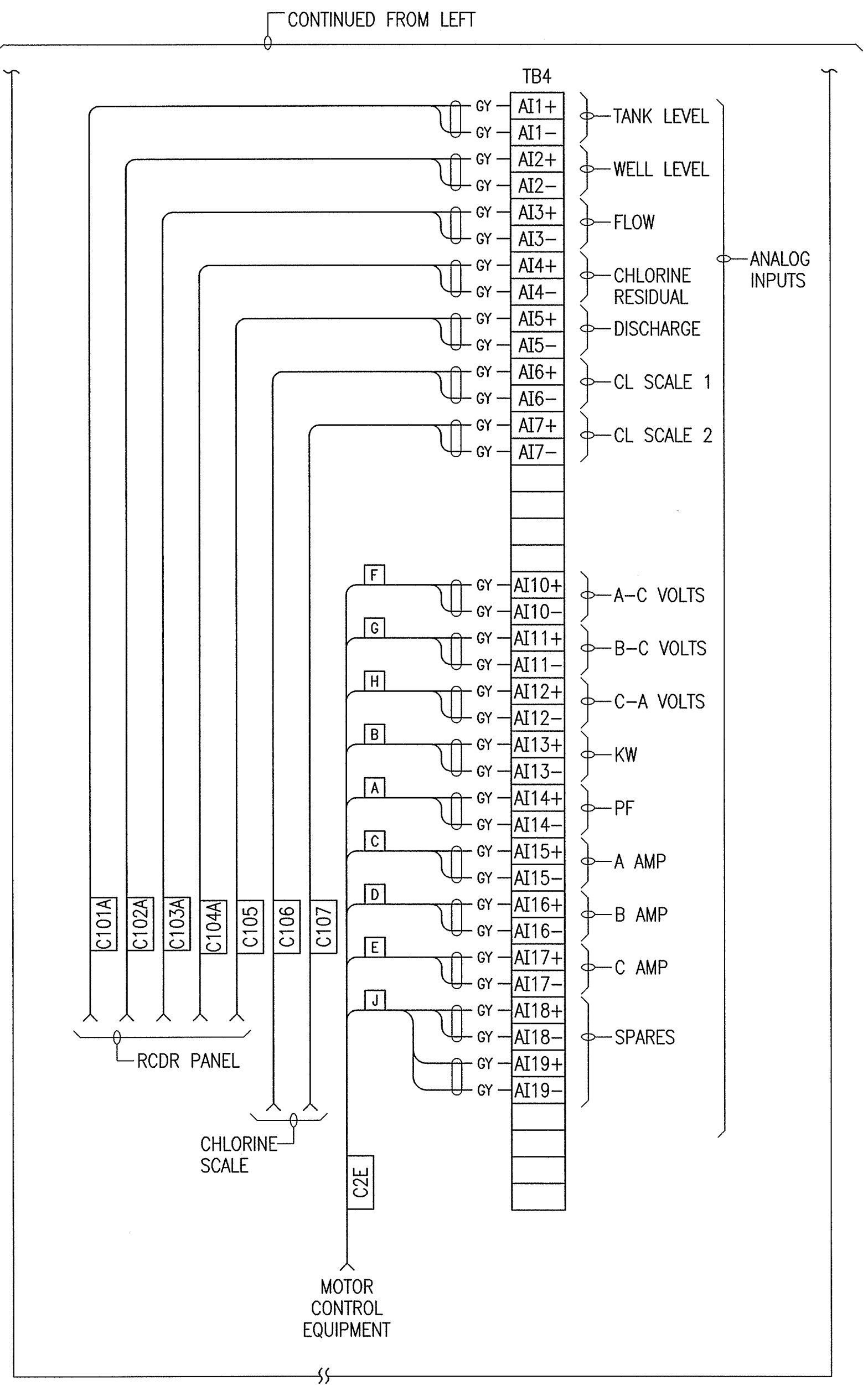
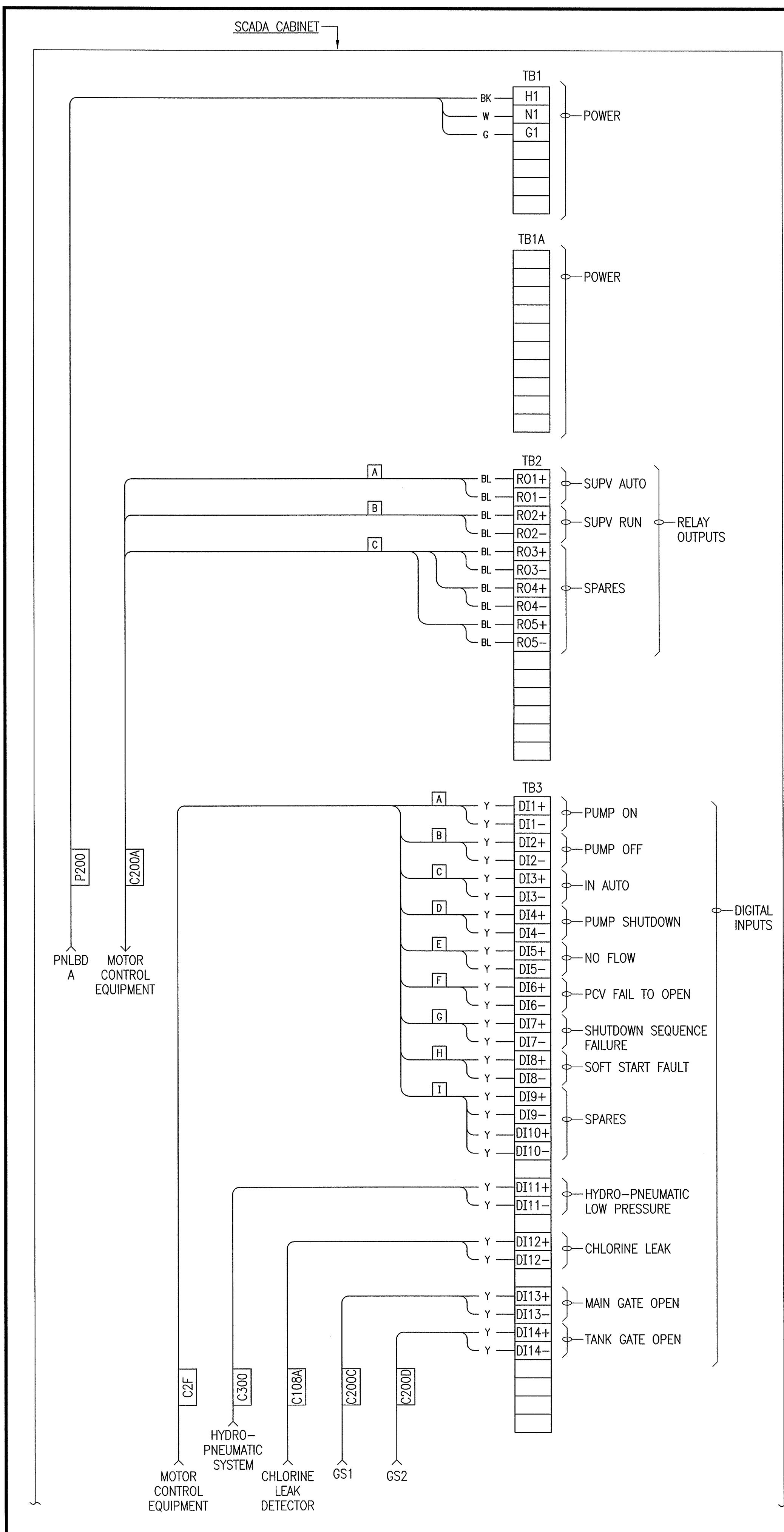
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
1	10/20/14	WTO REF NO. 102011418		
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WALLACE T. OKI, P.E., INC. LICENSED PROFESSIONAL ENGINEER HAWAII, U.S.A.				

**ESH** ENGINEERS SURVEYORS HAWAII, INC.  
900 HALEKAUWILA ST., HONOLULU, HAWAII 96814  
591-8116 HON. 885-4590 KAMUELA

DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:**  
PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES  
AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

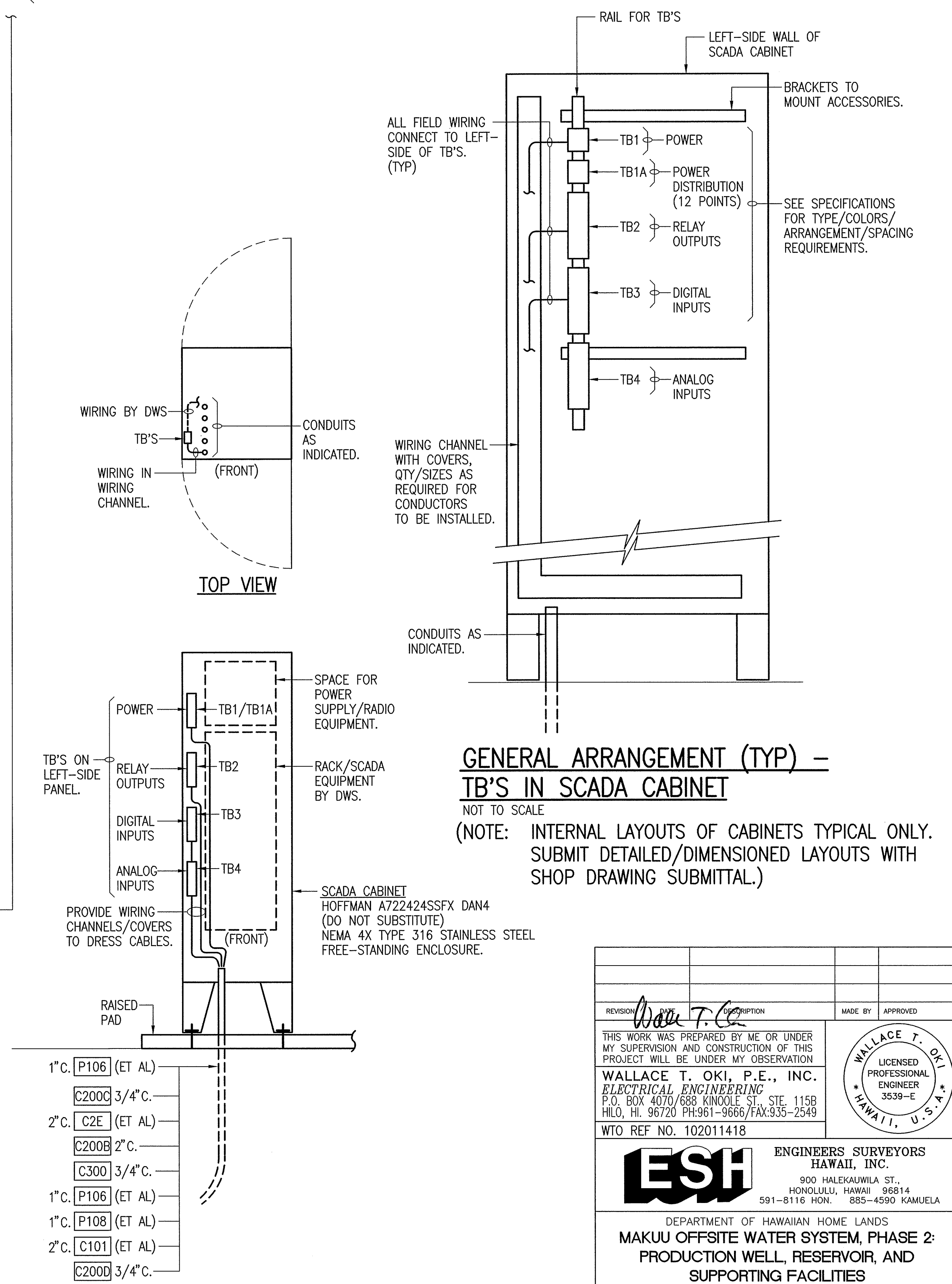
ELECTRICAL WORK





CONNECTION DIAGRAM

SCADA CABINET

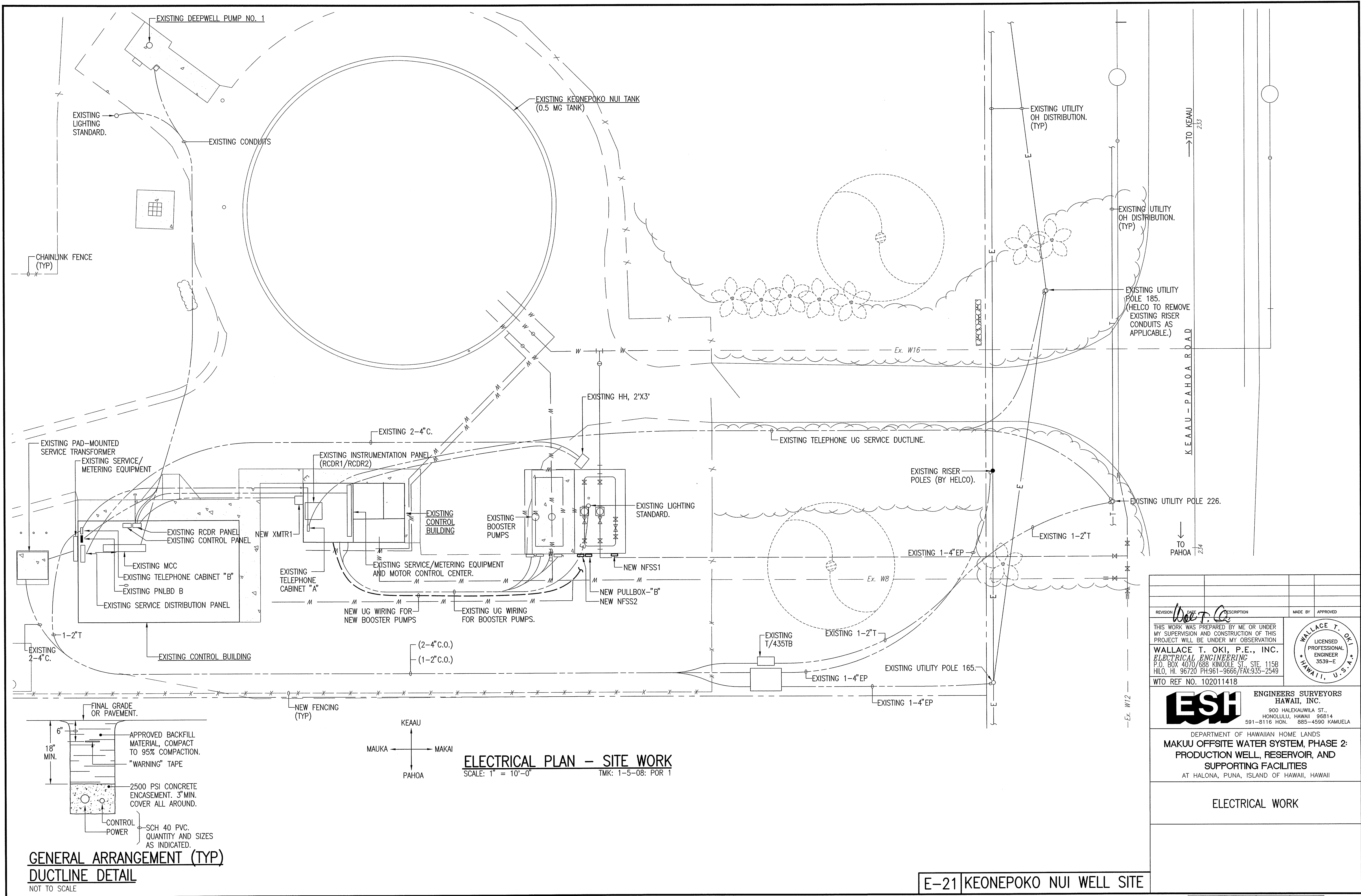


GENERAL ARRANGEMENT (TYP) - SCADA CABINET

NOT TO SCALE

(NOTE: INTERNAL LAYOUTS OF CABINETS TYPICAL ONLY. SUBMIT DETAILED/DIMENSIONED LAYOUTS WITH SHOP DRAWING SUBMITTAL.)

REVISION	DESCRIPTION	MADE BY	APPROVED
1	WALLACE T. OKI, P.E., INC.		
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION <b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418			
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA			
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII			
ELECTRICAL WORK			



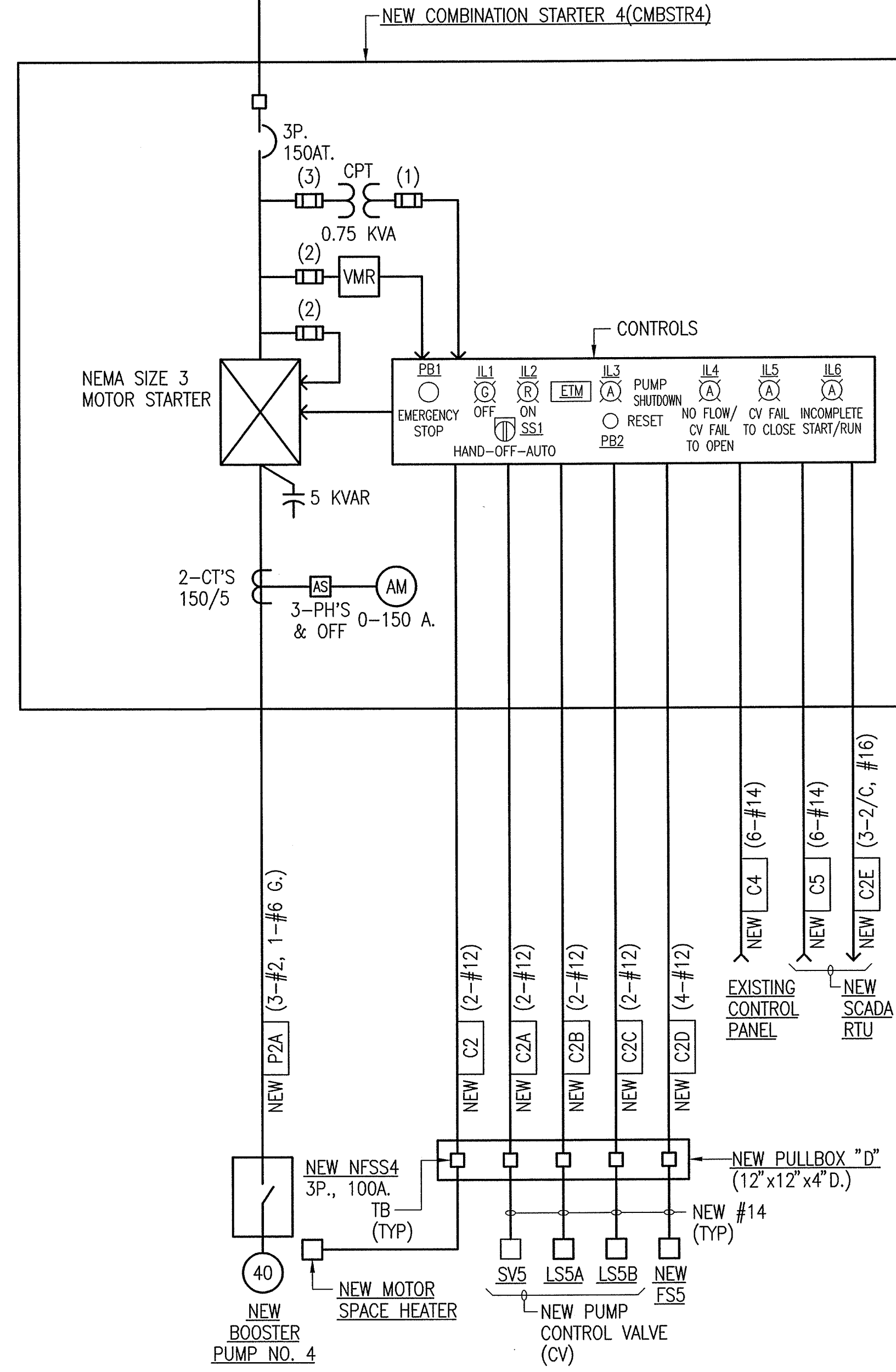
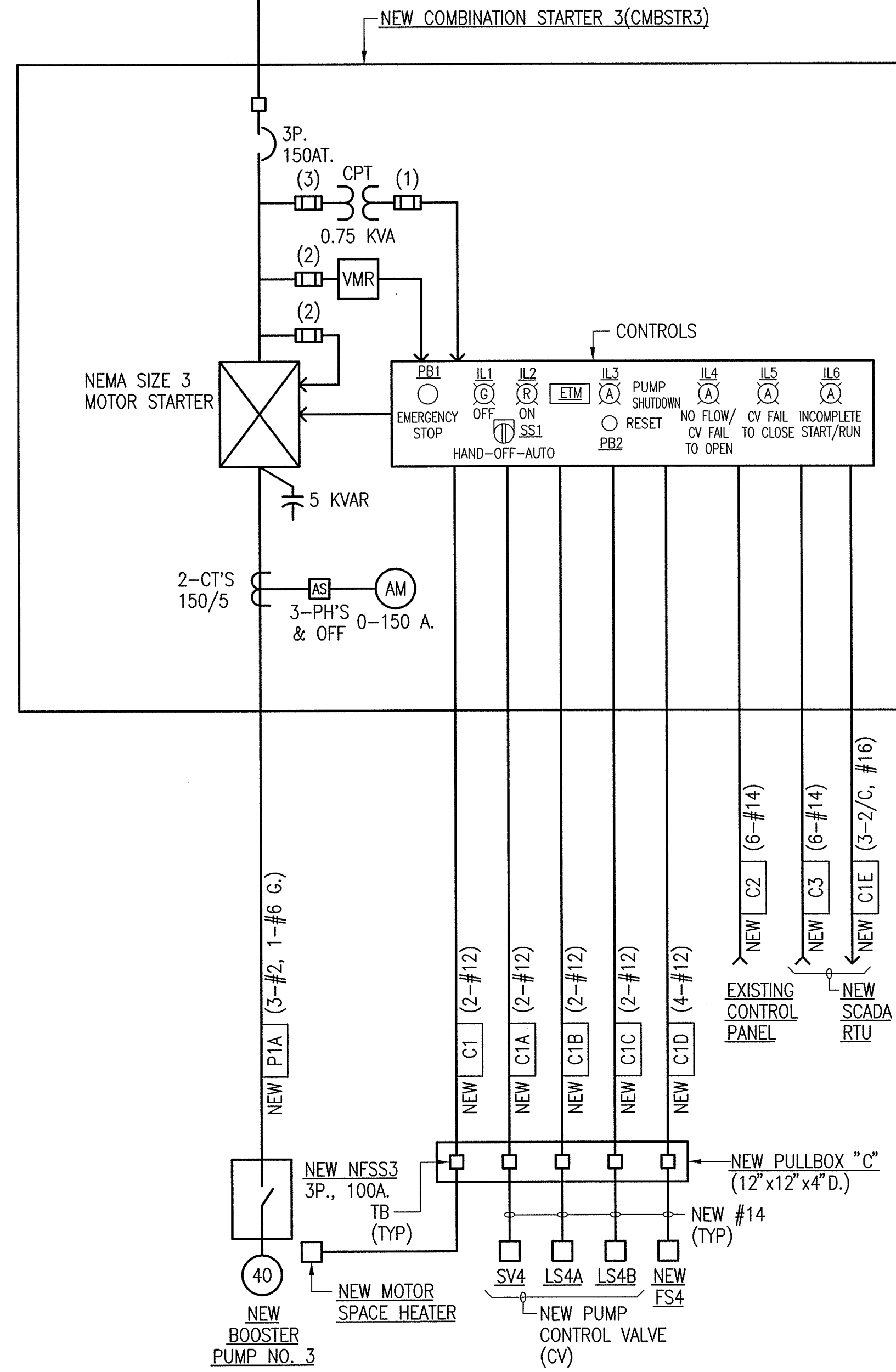
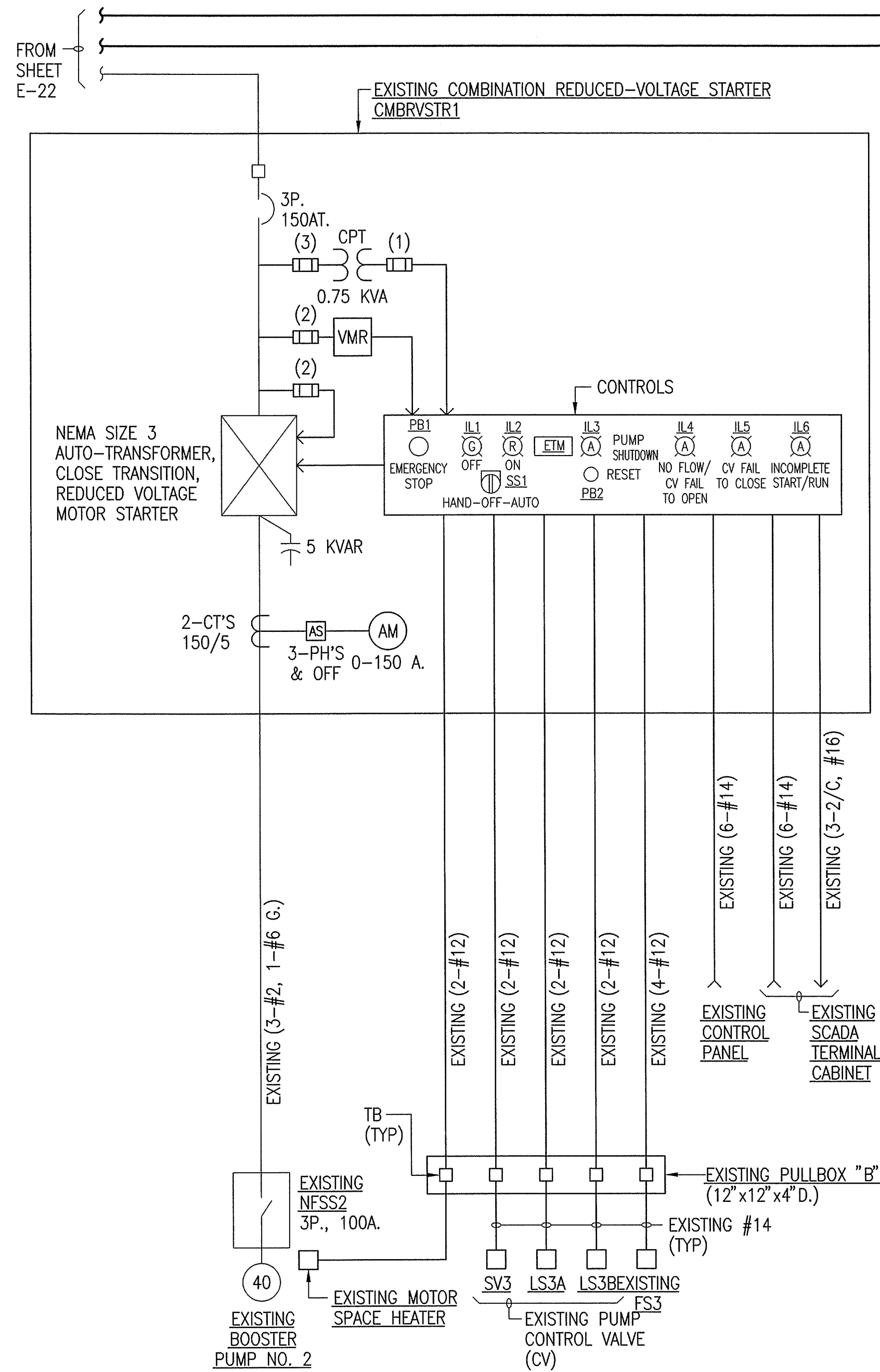
GENERAL ARRANGEMENT (TYP)  
DUCTLINE DETAIL  
NOT TO SCALE

ELECTRICAL PLAN - SITE WORK  
SCALE: 1" = 10'-0" TMK: 1-5-08: POR 1


REVISION		DATE	DESCRIPTION	MADE BY	APPROVED
1		08/11/20	WTO REF NO. 102011418		
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WALLACE T. OKI, P.E., INC. ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549					
WTO REF NO. 102011418					
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA					
DEPARTMENT OF HAWAIIAN HOME LANDS MAKUU OFFSITE WATER SYSTEM, PHASE 2: PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII					
ELECTRICAL WORK					



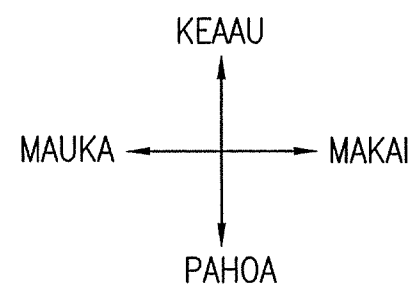
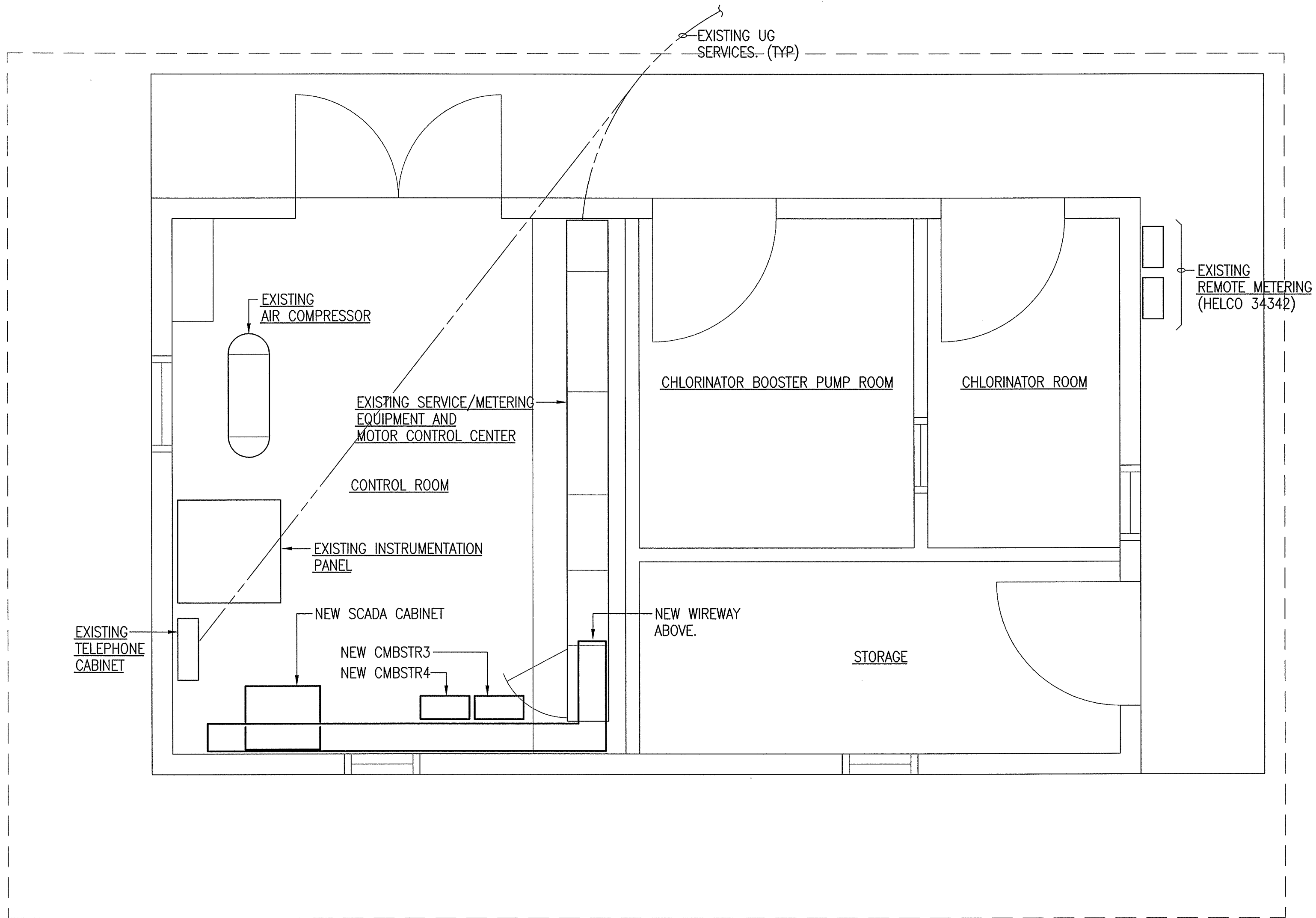




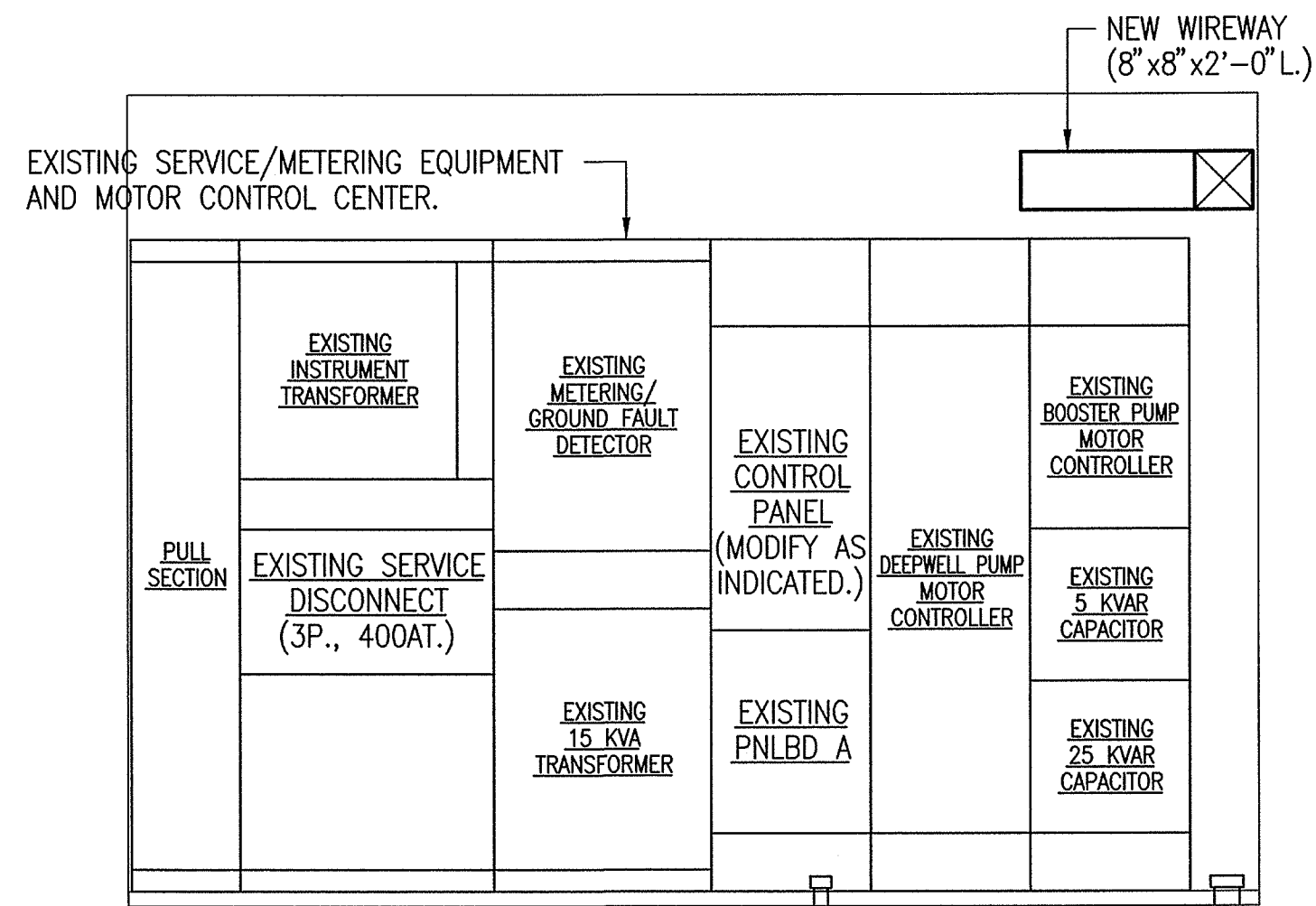
ONE-LINE DIAGRAM (CON'T)

REVISION	DESCRIPTION	MADE BY	APPROVED
1	WALLACE T. OKI		
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION <b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418			
 <b>ENGINEERS SURVEYORS HAWAII, INC.</b> 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA			
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:          PRODUCTION WELL, RESERVOIR, AND          SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII			
ELECTRICAL WORK			

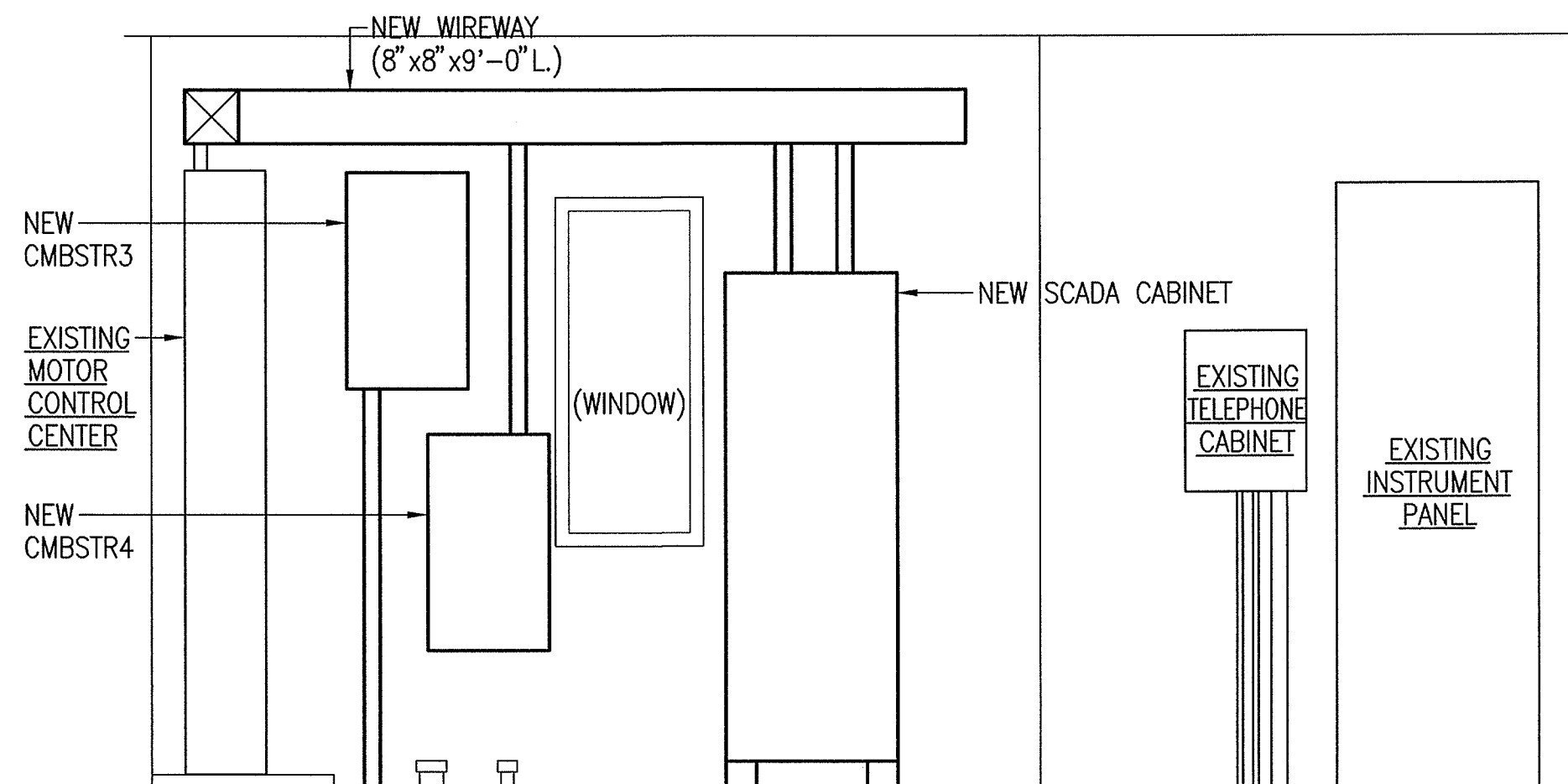




**ELECTRICAL PLAN - CONTROL BUILDING**  
SCALE: 1/2" = 1'-0"

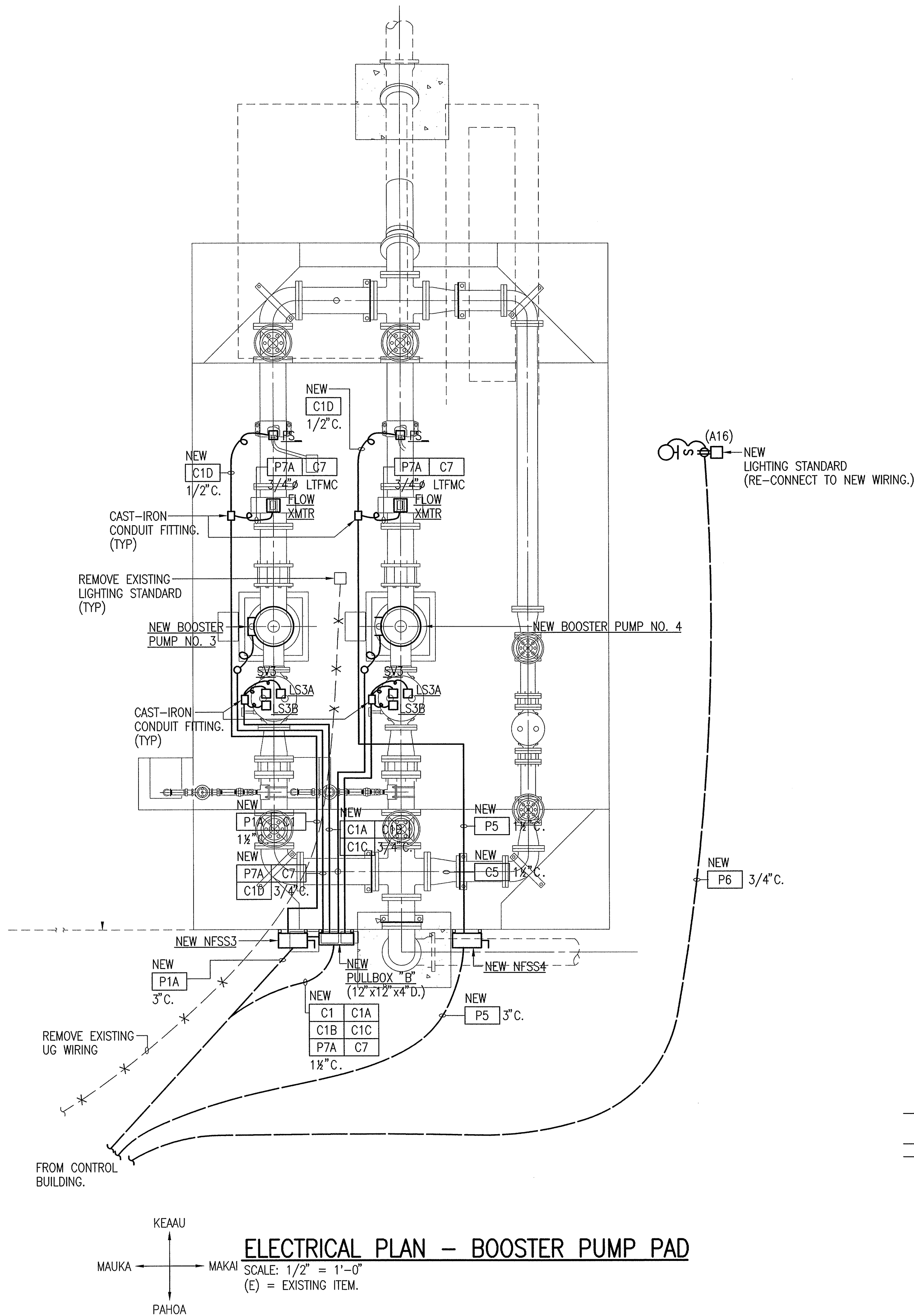


**GENERAL ARRANGEMENT (TYP) - EXISTING SERVICE/METERING EQUIPMENT AND MOTOR CONTROL CENTER**  
SCALE: 1/2" = 1'-0"

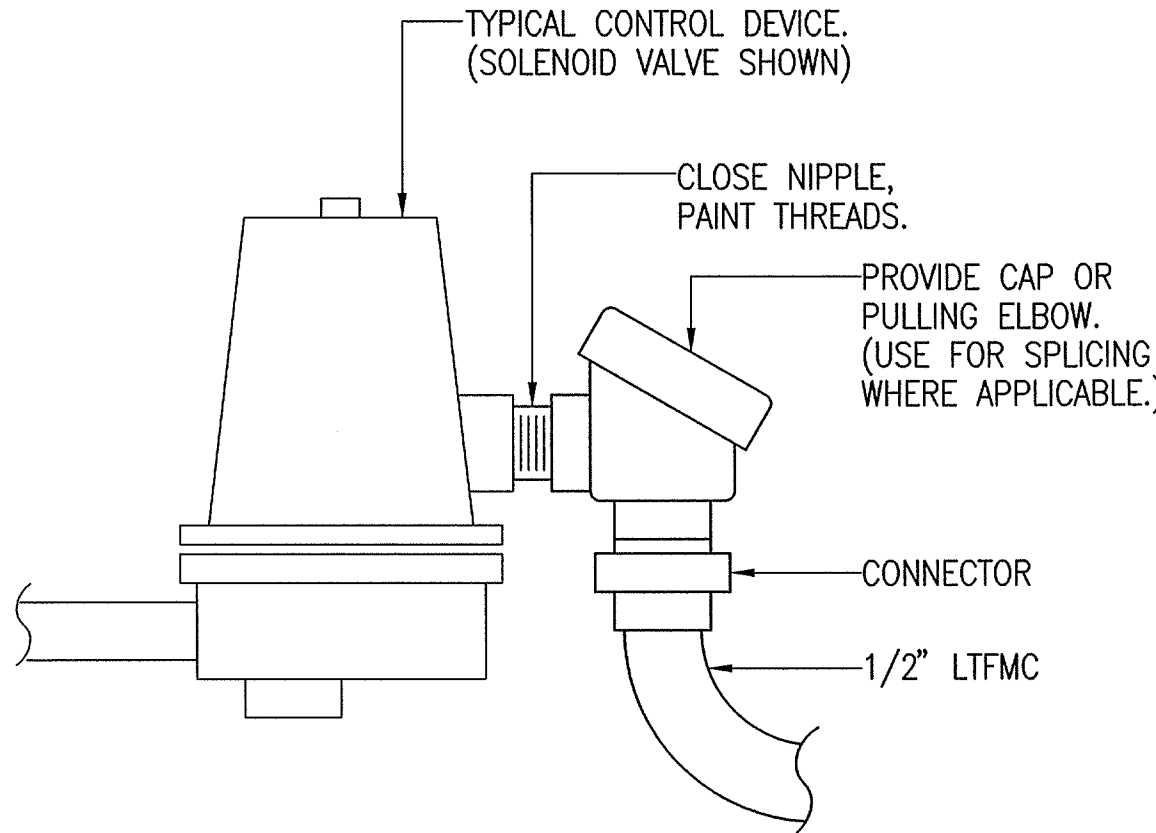
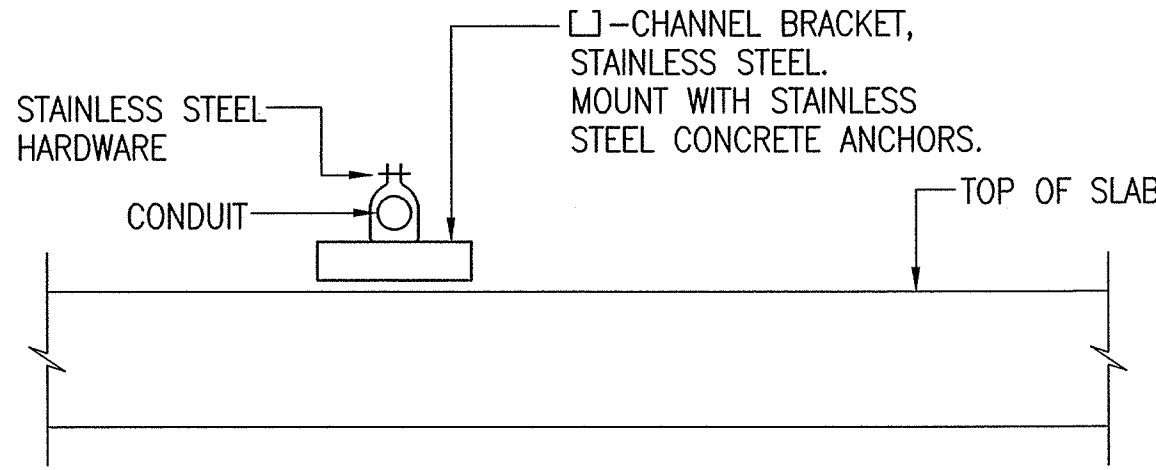


**GENERAL ARRANGEMENT (TYP) - NEW CMBSTR3/NEW CMBSTR4/NEW SCADA RTU/RADIO MODEM**  
SCALE: 1/2" = 1'-0"

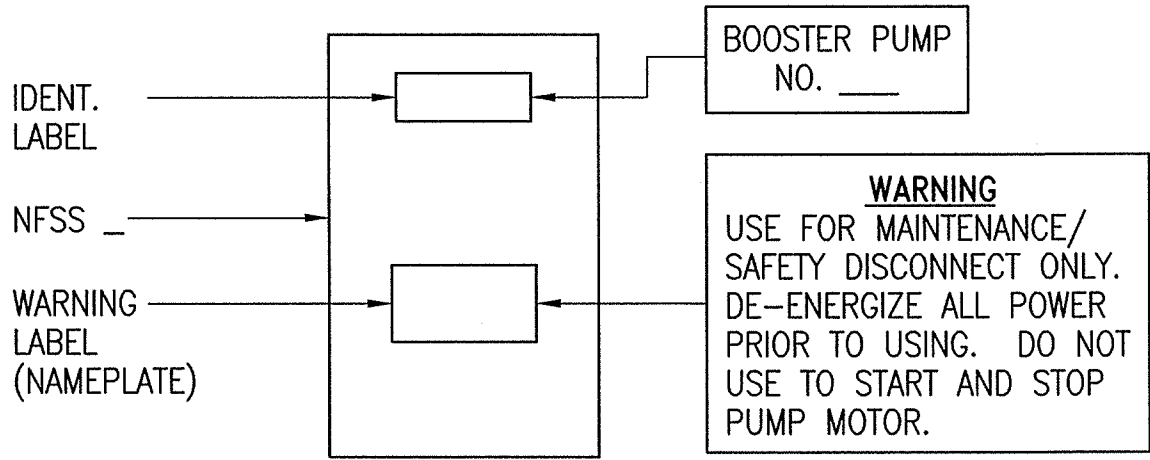
REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION <b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418				
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA				
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII				
ELECTRICAL WORK				
E-24 KEONEPOKO NUI WELL SITE				



**GENERAL ARRANGEMENT (TYP)**  
**CONDUIT SPACER/SUPPORT ON CONCRETE PAD**  
 NOT TO SCALE



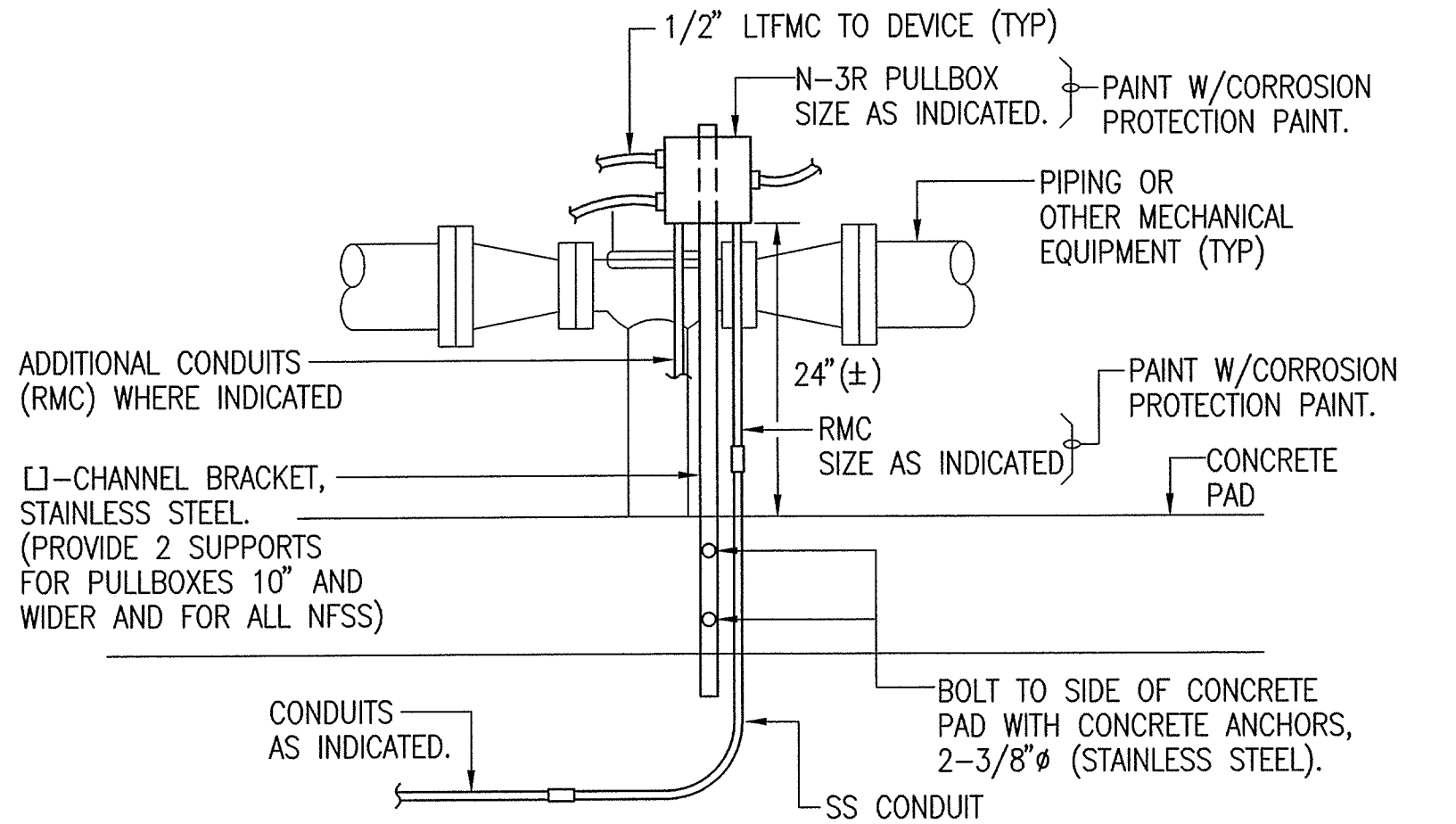
**GENERAL ARRANGEMENT (TYP)**  
**CONTROL DEVICE TERMINATION**  
 NOT TO SCALE



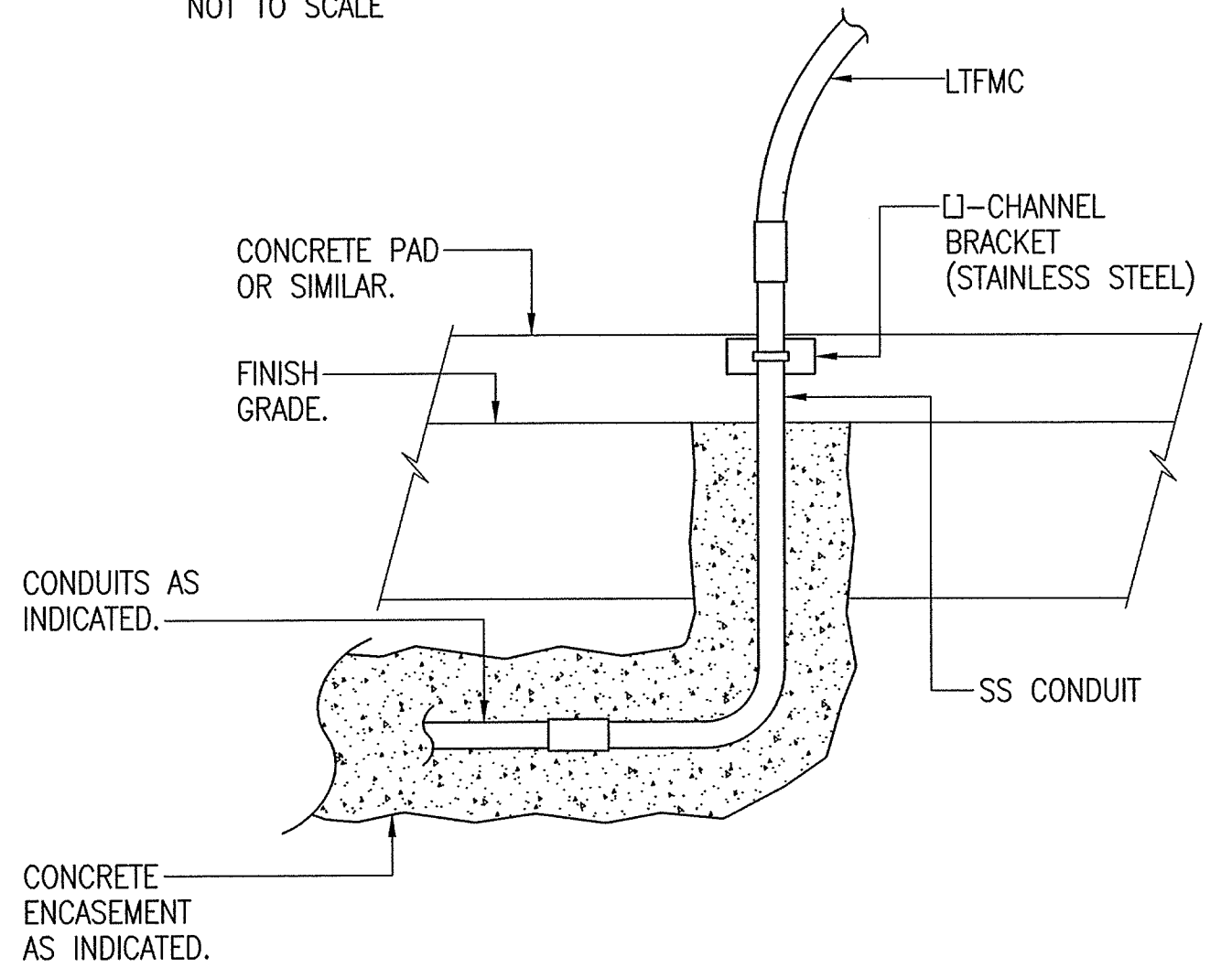
**GENERAL ARRANGEMENT (TYP) - NFSS'S**  
 NOT TO SCALE

- CORROSION PROTECTION PAINT**
1. AMERON "AMERLOCK 400" EPOXY COATING OR APPROVED EQUIVALENT.
  2. ALUMINUM
  3. APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

LIGHTING FIXTURE SCHEDULE			
SYMBOL/TYPE	MOUNTING	LAMP	DESCRIPTION
	POST MOUNTED	500W. QUARTZ HALOGEN	EXTERIOR USE FLOODLIGHT, DIE CAST ALUMINUM HOUSING WITH CAST-IN FINS FOR HEAT DISSIPATION, "ANODAL" REFLECTOR OR EQUIVALENT, THERMAL SHOCK AND IMPACT RESISTANT TEMPERED GLASS LENS IN A DIE CAST ALUMINUM FRAME, SPRING LOADED STAINLESS STEEL LATCHES FOR POSITIVE SEALING, MEDIUM BEAM SPREAD, ADJUSTABLE AIM, THREADED BASE. USE WITH THREADED HUB COVER AND OUTLET BOX.



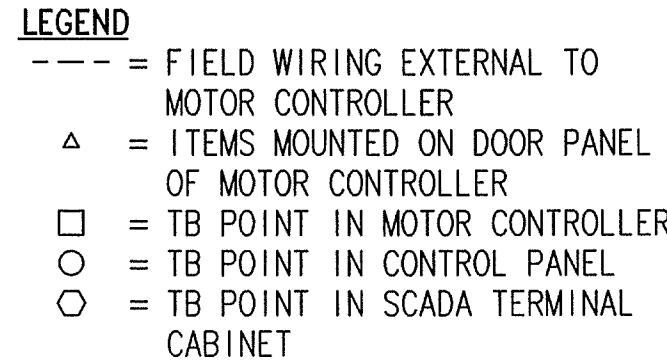
**GENERAL ARRANGEMENT (TYP)**  
**PULLBOX FOR CONTROL WIRING**  
 NOT TO SCALE

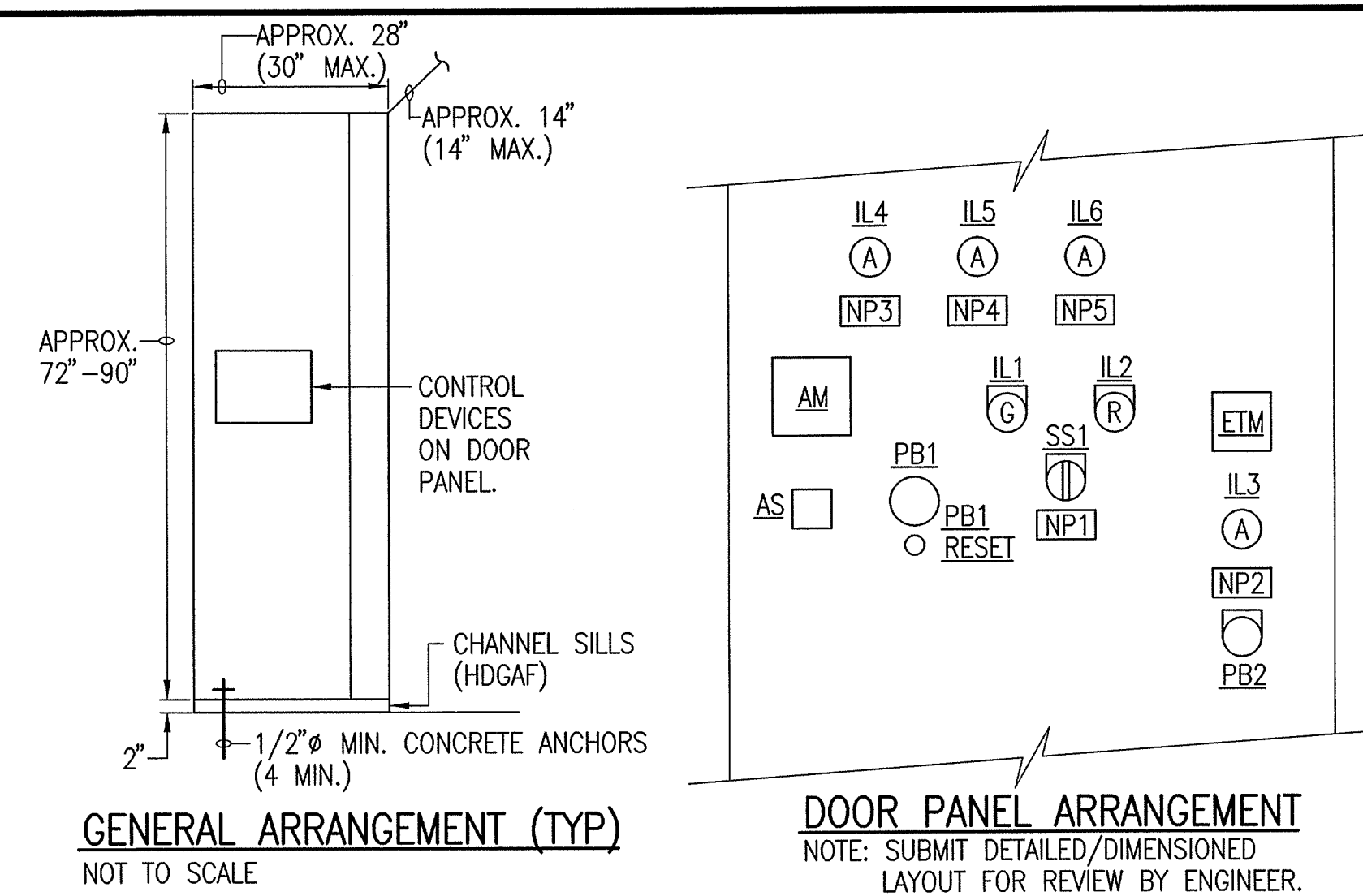


**GENERAL ARRANGEMENT (TYP)**  
**CONDUIT STUB-UPS AT CONCRETE PAD AREA**  
 NOT TO SCALE

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1	THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION		
<b>WALLACE T. OKI, P.E., INC.</b> <b>ELECTRICAL ENGINEERING</b> P.O. BOX 4070/688 KINOOLE ST., STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418			
<b>ESH</b> ENGINEERS SURVEYORS HAWAII, INC. 900 HALEKAUWILA ST., HONOLULU, HAWAII 96814 591-8116 HON. 885-4590 KAMUELA			
DEPARTMENT OF HAWAIIAN HOME LANDS <b>MAKUU OFFSITE WATER SYSTEM, PHASE 2:</b> <b>PRODUCTION WELL, RESERVOIR, AND</b> <b>SUPPORTING FACILITIES</b> AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII			
ELECTRICAL WORK			

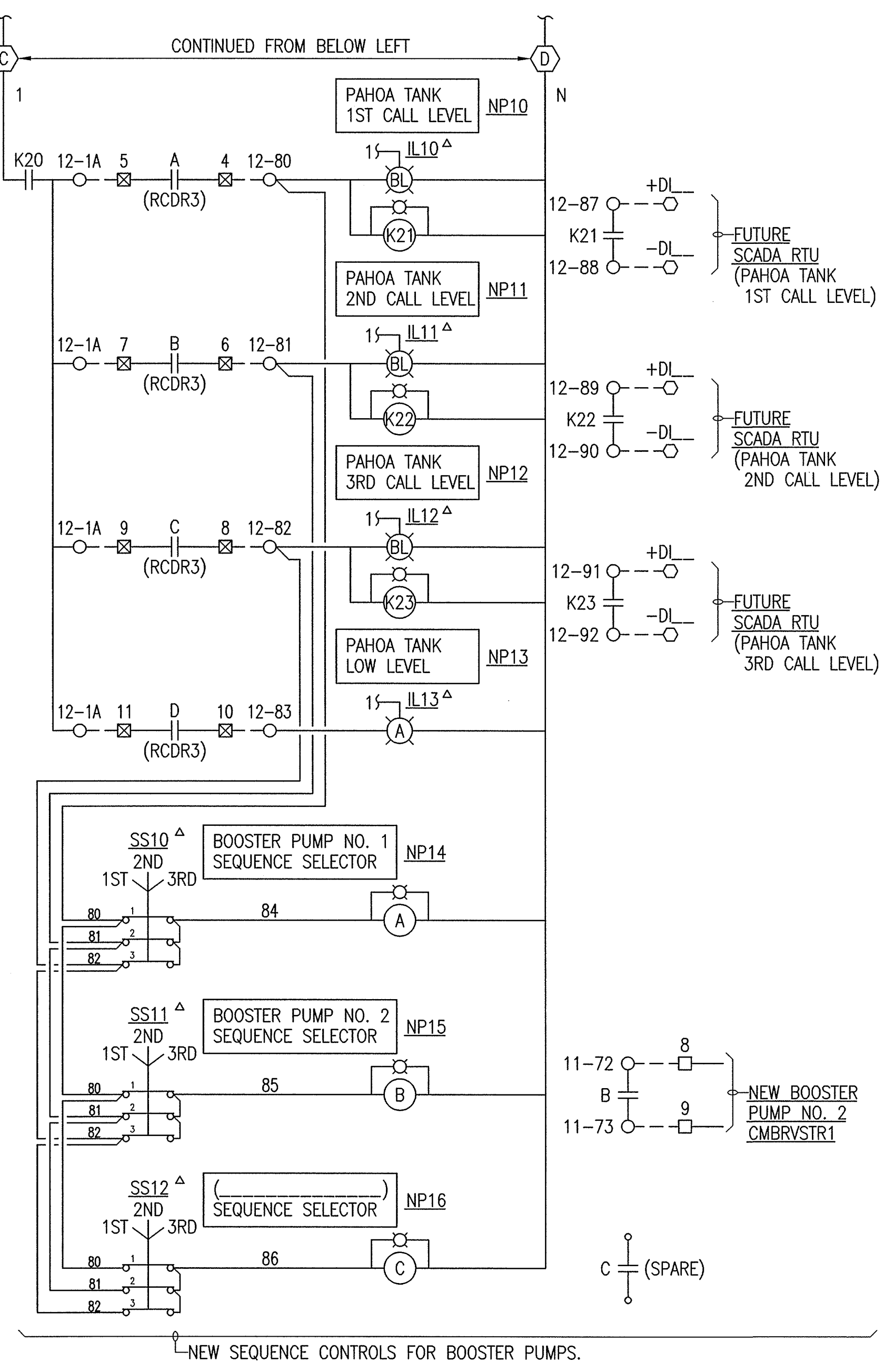
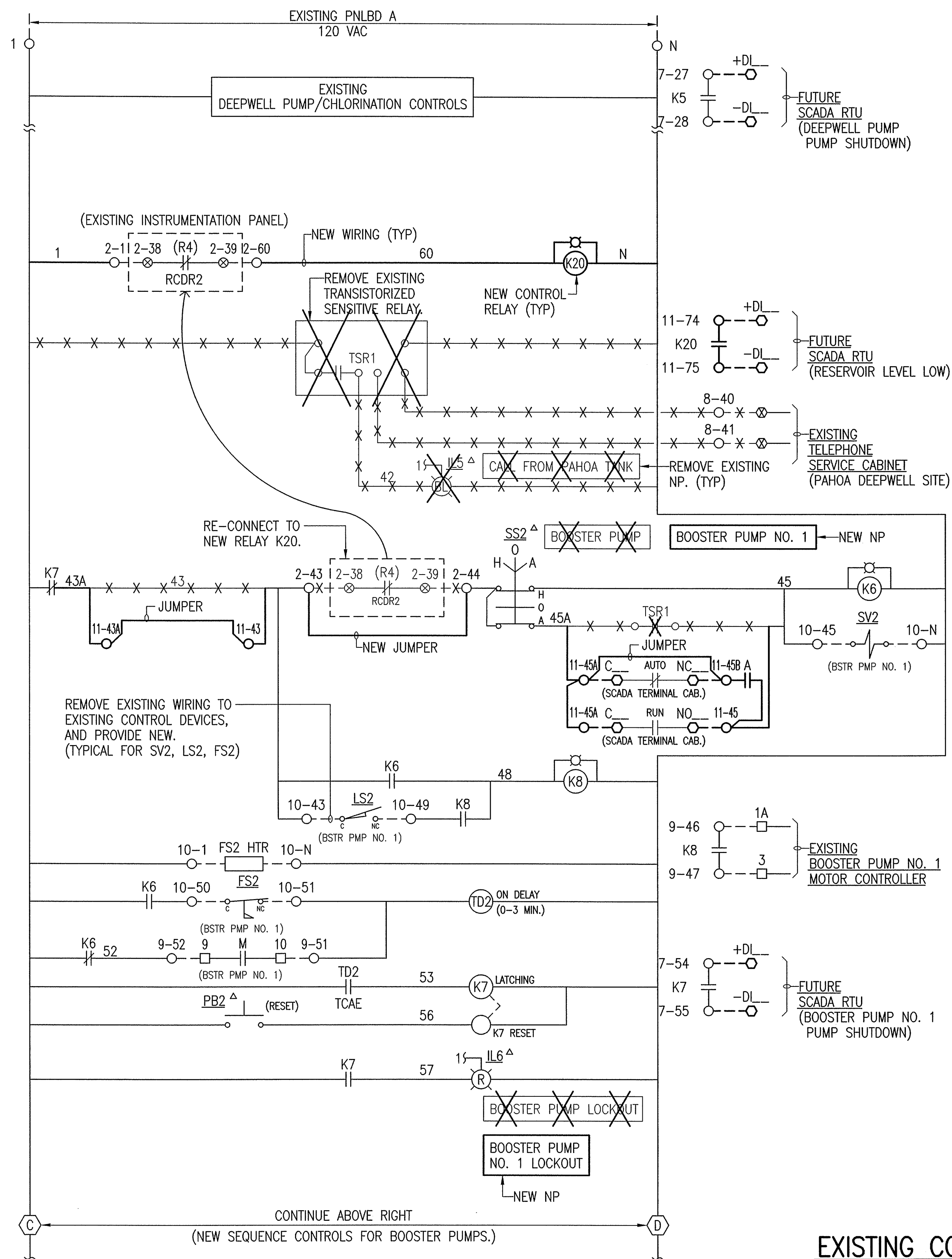






NEW BOOSTER PUMP NO. 3 MOTOR CONTROLLER –  
(CMBSTR3)  
(TYPICAL FOR CMBSTR4)





**SCHEMATIC DIAGRAM (PARTIAL) (TYPICAL)**  
**LEGEND**  
 --- = FIELD WIRING EXTERNAL TO EXISTING CONTROL PANEL  
 Δ = ITEMS MOUNTED ON DOOR OF EXISTING CONTROL PANEL  
 ○ = TB POINT IN EXISTING CONTROL PANEL  
 □ = TB POINT IN MOTOR CONTROLLERS  
 ⊗ = TB POINT IN EXISTING INSTRUMENTATION PANEL  
 ⊙ = TB POINT IN EXISTING TELEPHONE CABINET  
 ○ = TB POINT IN NEW SCADA TERMINAL CABINET  
 ⊠ = TB POINT IN NEW RCDR PANEL

### EXISTING CONTROL PANEL

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
1	01/11/18	WTO		

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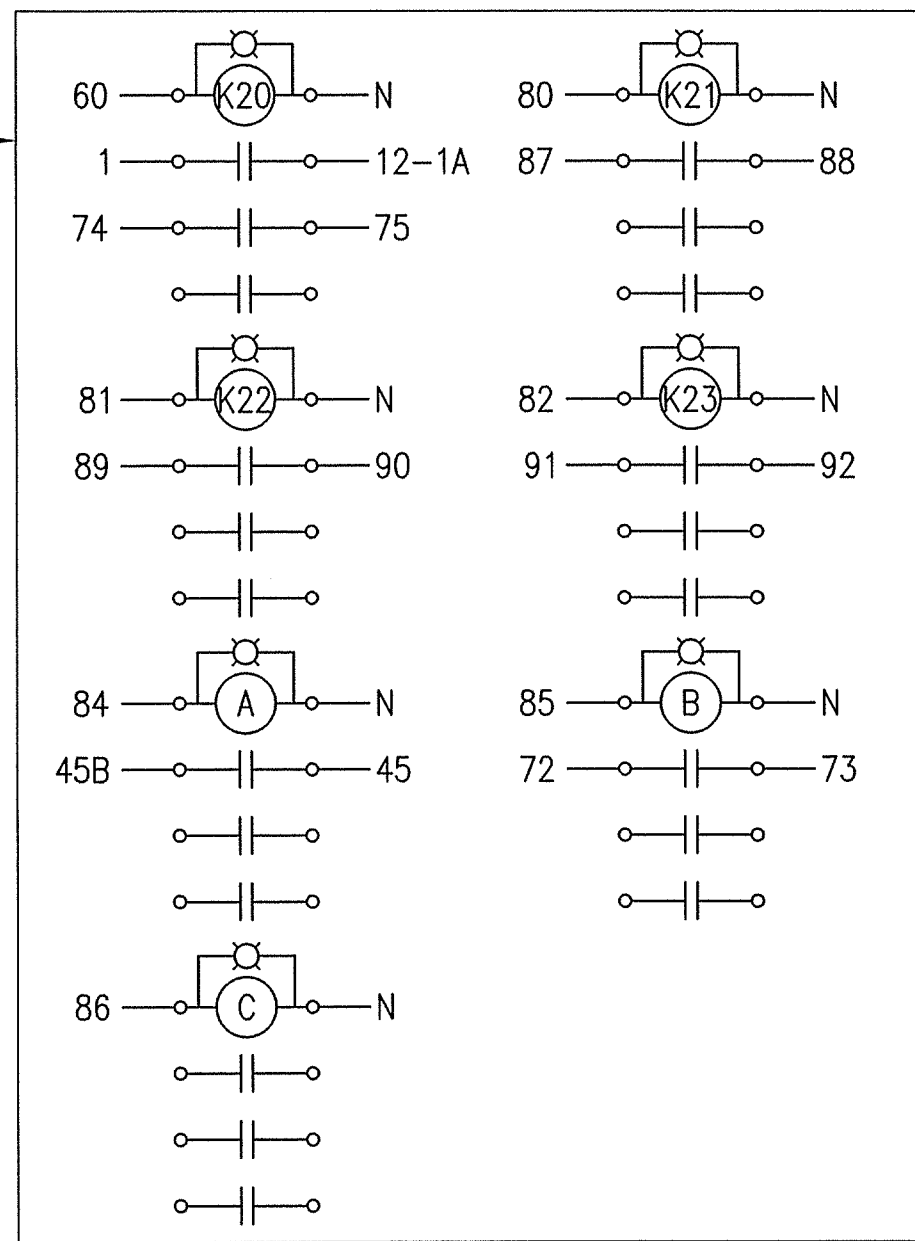
**WALLACE T. OKI, P.E., INC.**  
 ELECTRICAL ENGINEERING  
 P.O. BOX 4070/688 KINOOLE ST., STE. 115B  
 HILO, HI. 96720 PH:961-9666/FAX:935-2549  
 WTO REF NO. 102011418

**ESH** ENGINEERS SURVEYORS HAWAII, INC.  
 900 HALEKAUWILA ST.,  
 HONOLULU, HAWAII 96814  
 591-8116 HON. 885-4590 KAMUELA

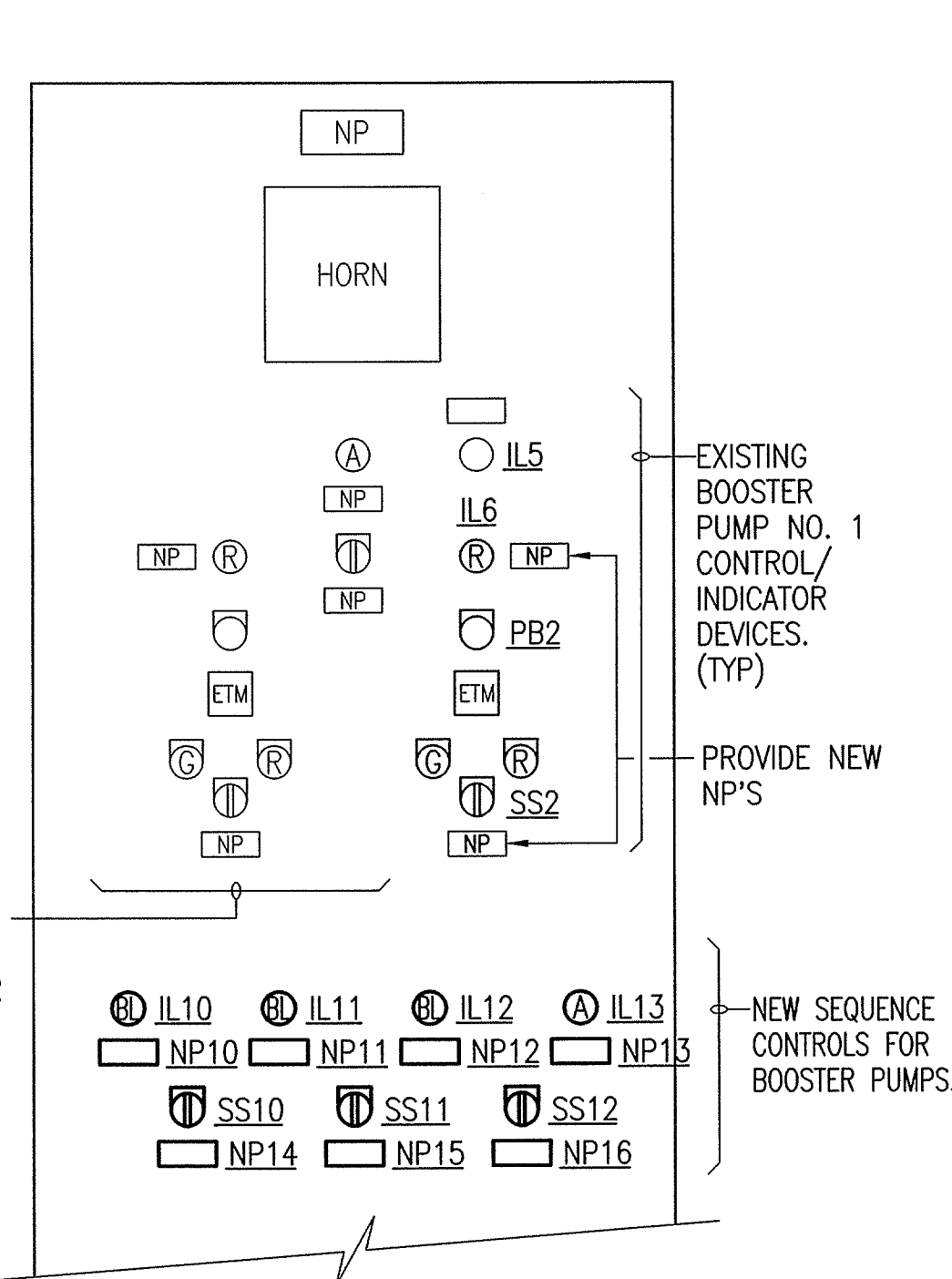
DEPARTMENT OF HAWAIIAN HOME LANDS  
**MAKUU OFFSITE WATER SYSTEM, PHASE 2:**  
**PRODUCTION WELL, RESERVOIR, AND**  
**SUPPORTING FACILITIES**  
 AT HALONA, PUNA, ISLAND OF HAWAII, HAWAII

**ELECTRICAL WORK**

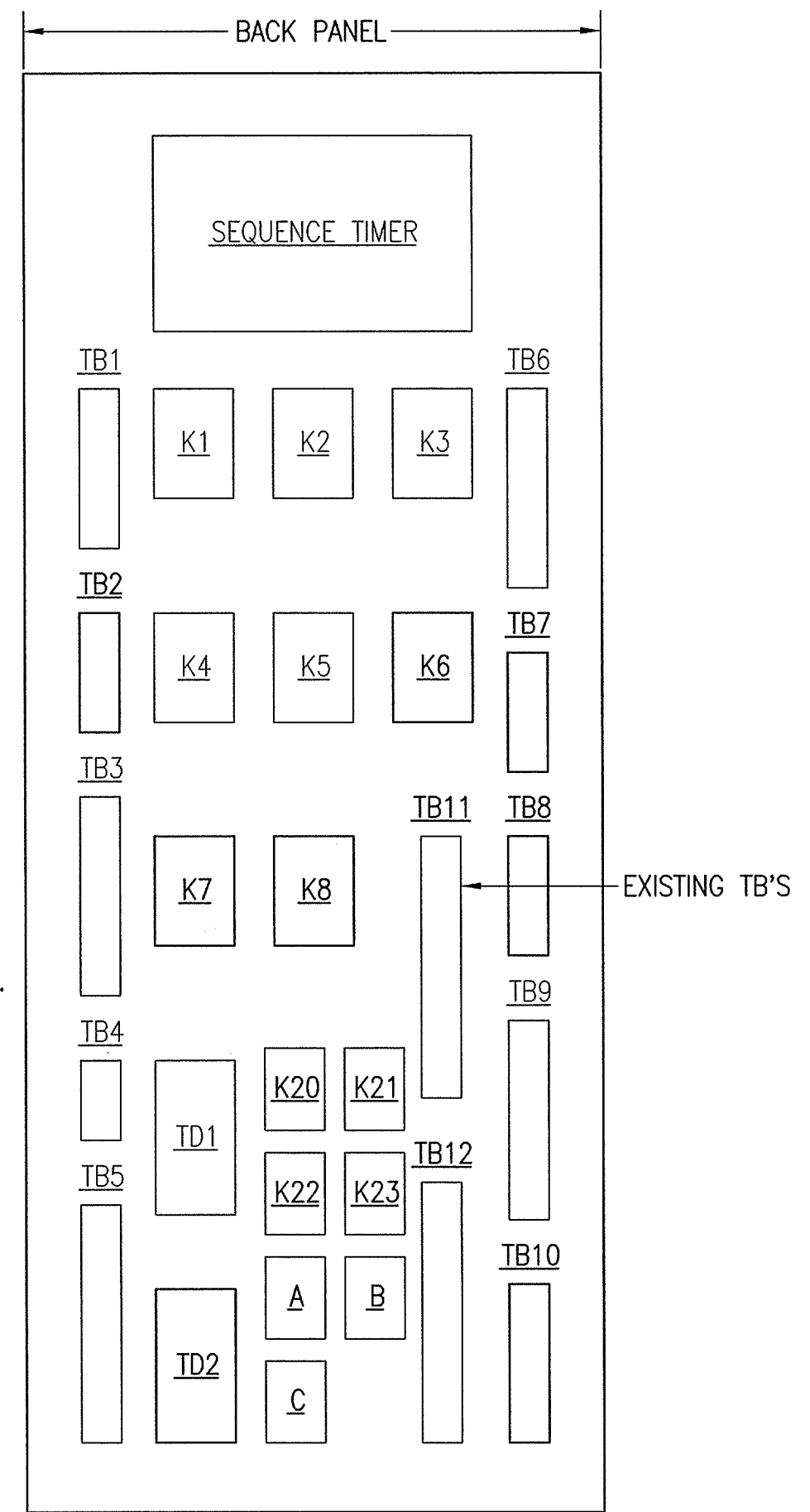
NEW CONTROL  
RELAYS ON  
INTERIOR PANEL.



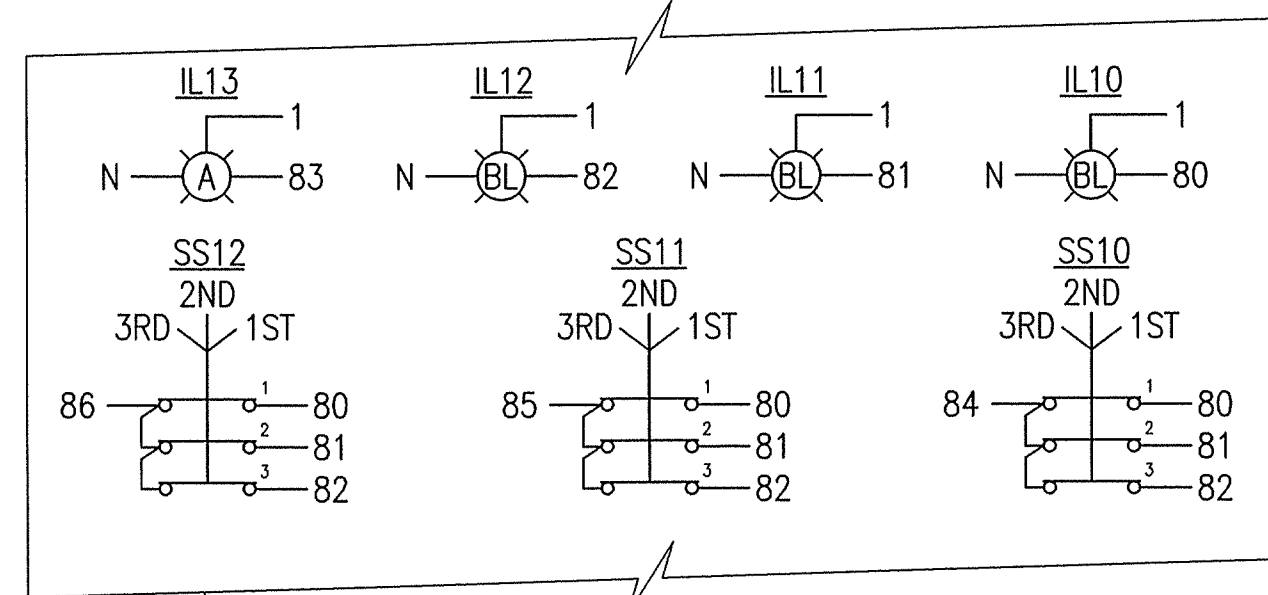
EXISTING DEEPWELL  
PUMP/STATION  
CONTROL/INDICATOR  
DEVICES. (TYP)



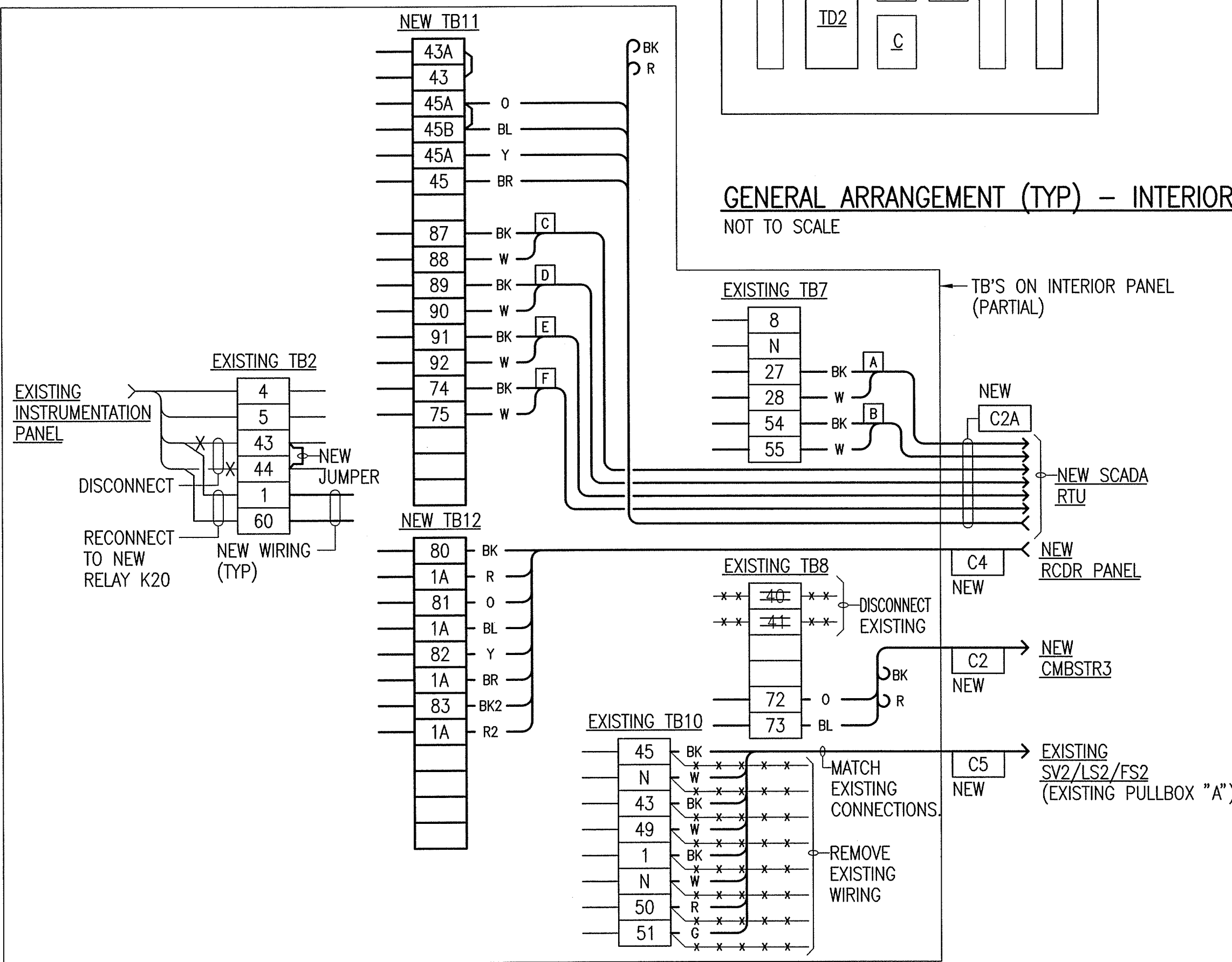
GENERAL ARRANGEMENT (TYP) - DOOR PANEL  
NOT TO SCALE



GENERAL ARRANGEMENT (TYP) - INTERIOR  
NOT TO SCALE

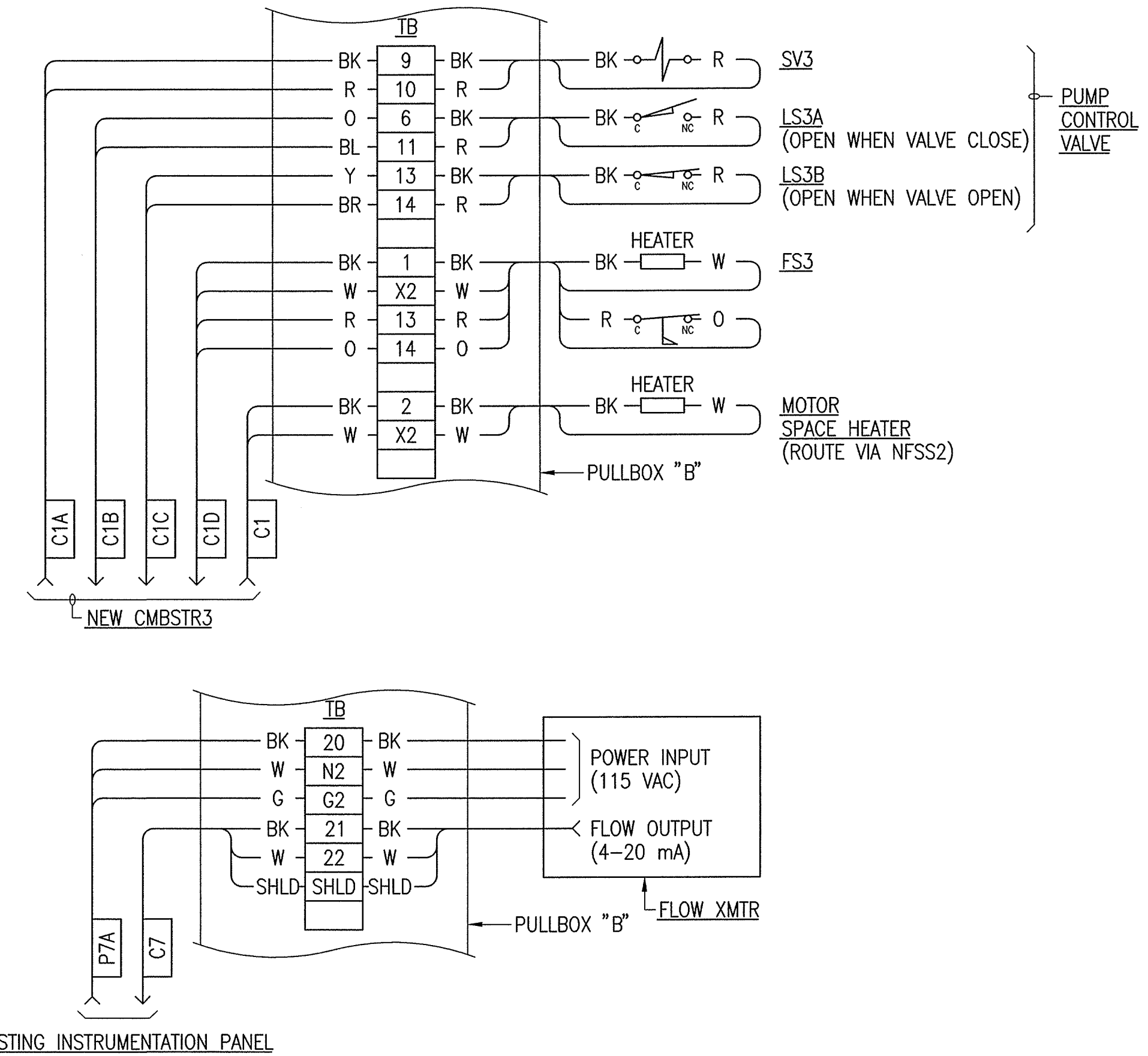
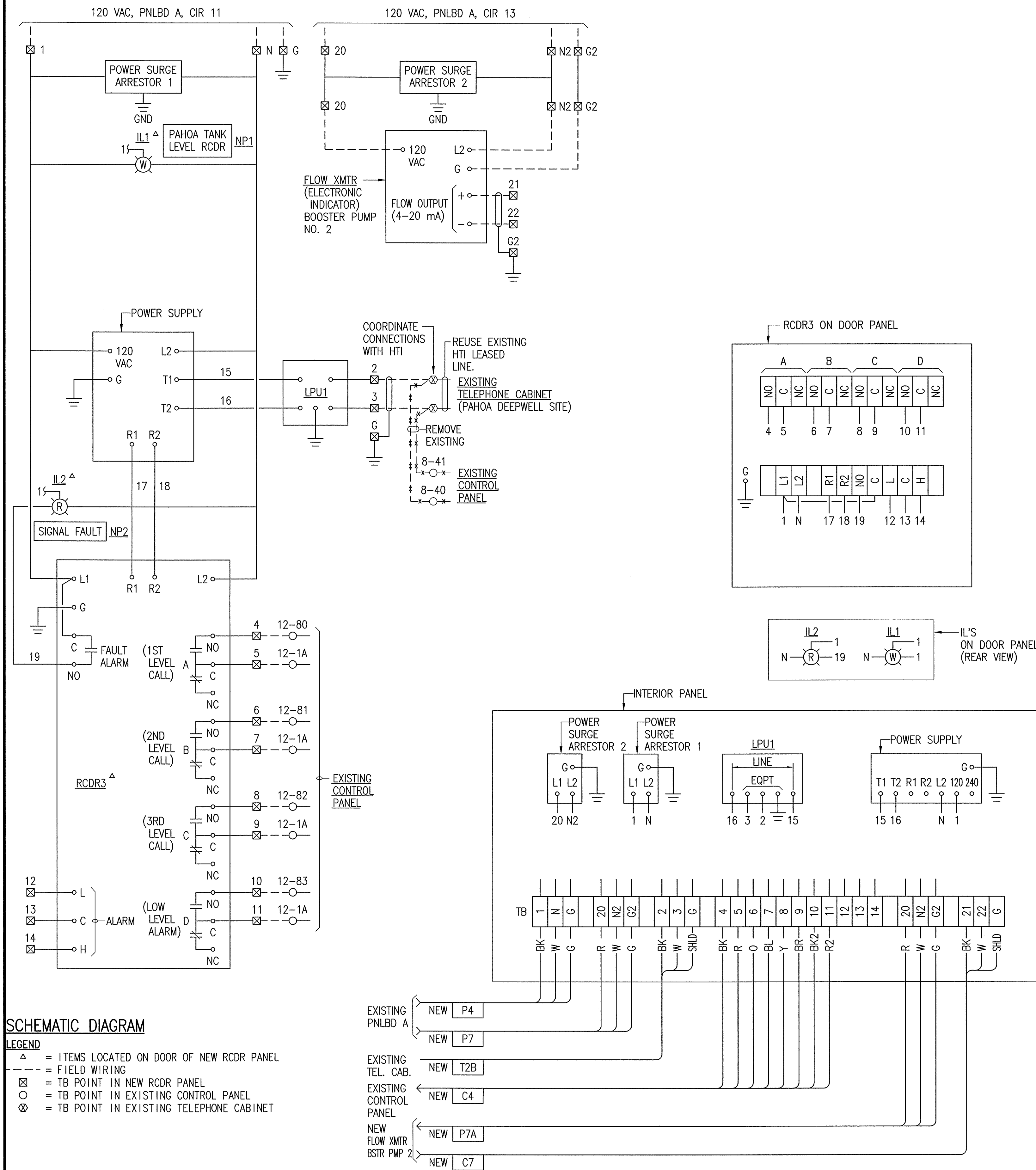


CONNECTION DIAGRAM (PARTIAL) (TYPICAL)

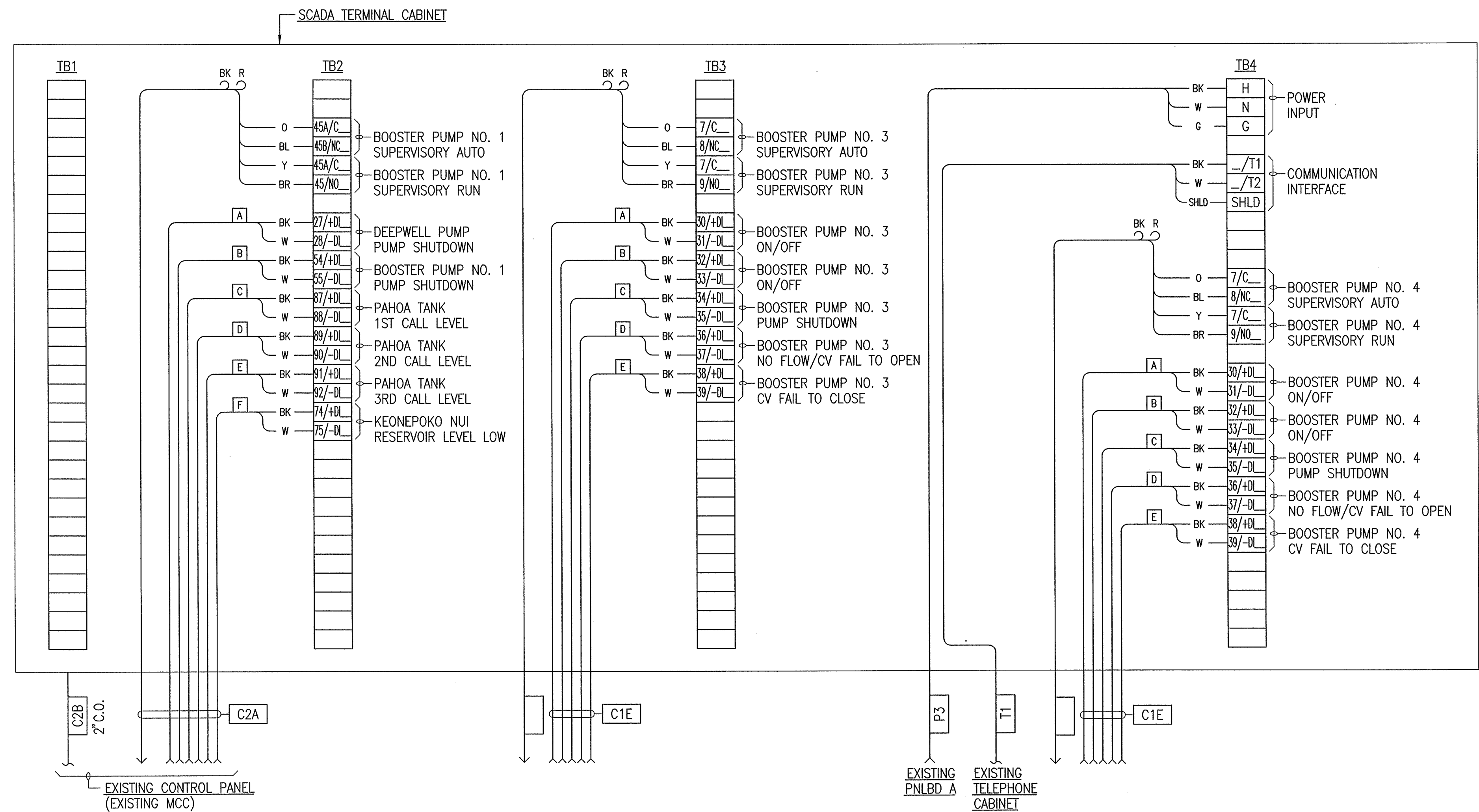


EXISTING CONTROL PANEL

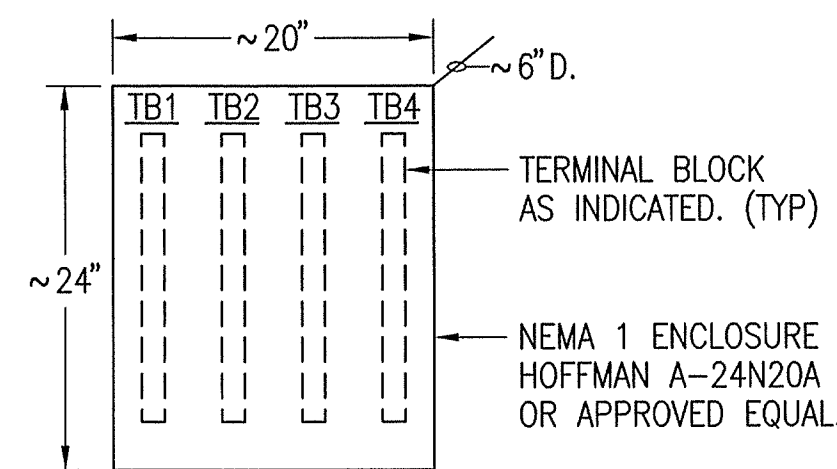




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1	WALLACE T. OKI, P.E., INC.		
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ELECTRICAL WORK			
E-30 KEONEPOKO NUI WELL SITE			



CONNECTION DIAGRAM

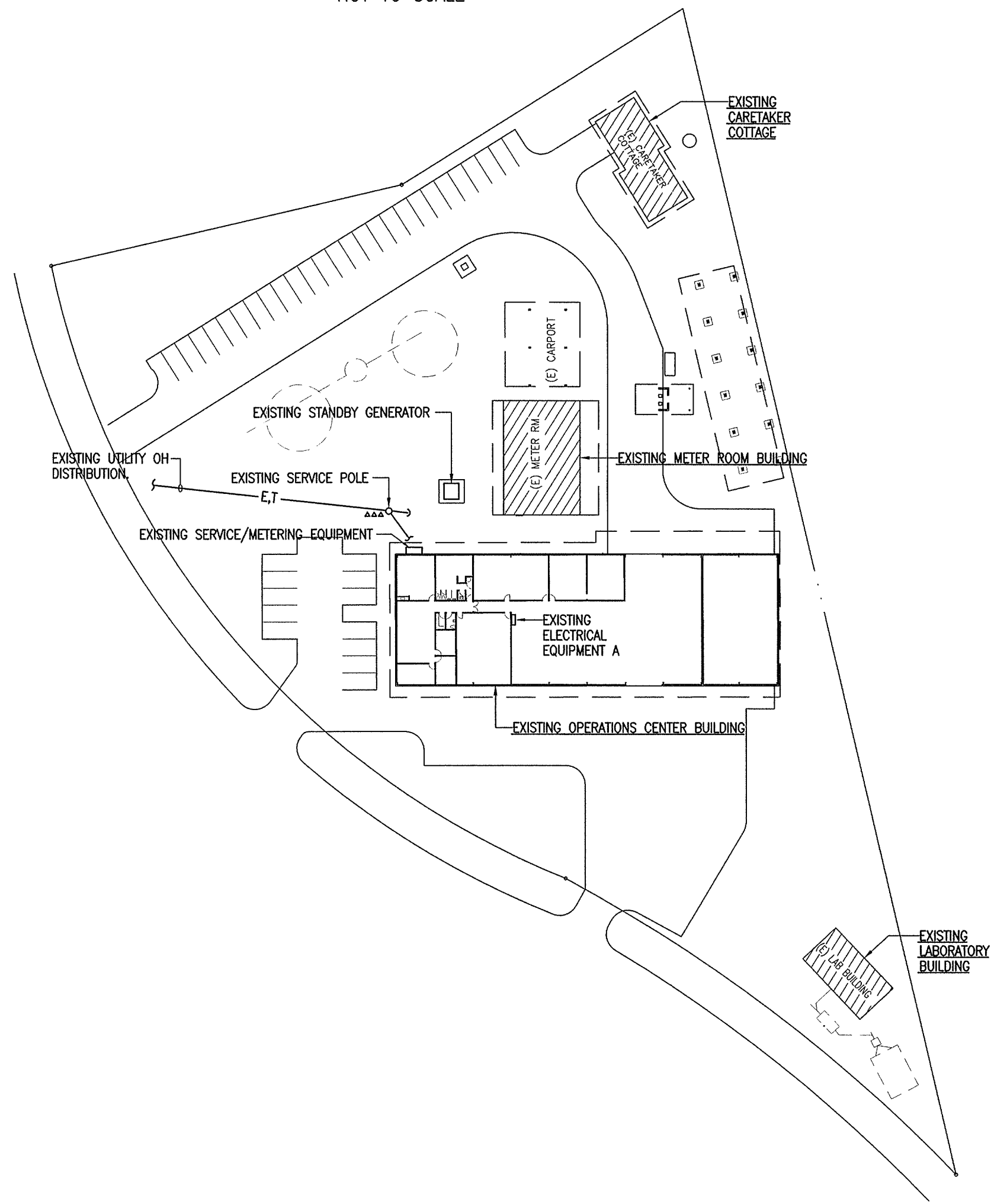
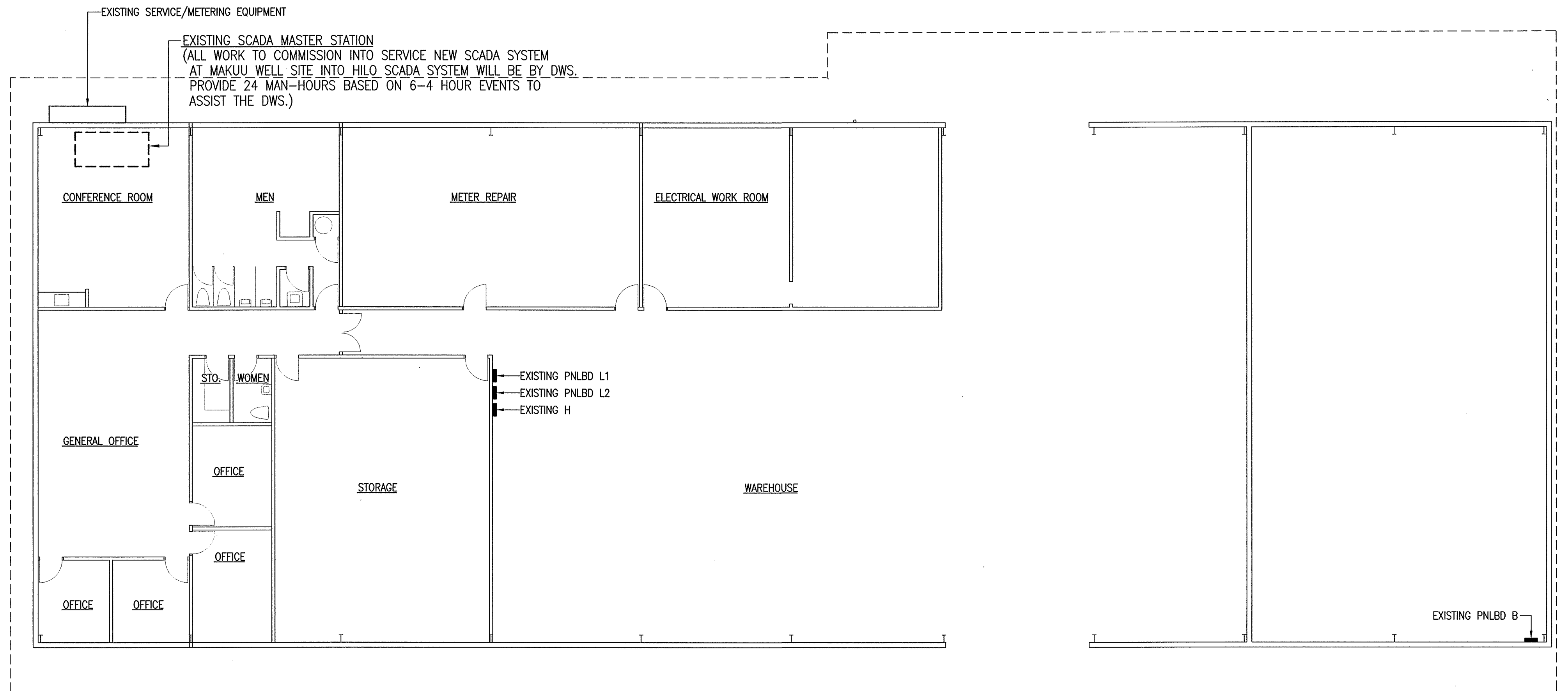
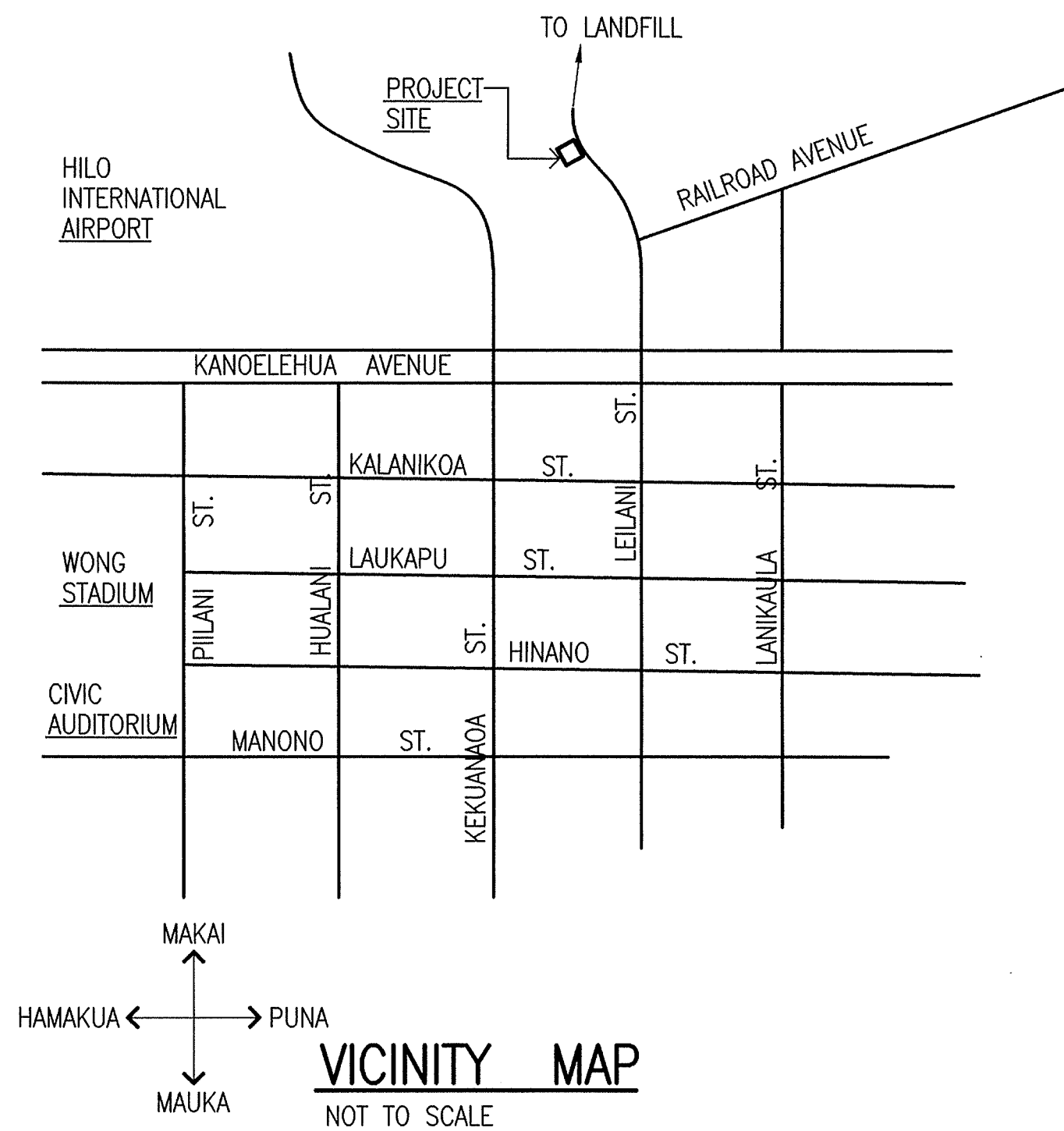


GENERAL ARRANGEMENT  
NOT TO SCALE

SCADA TERMINAL CABINET

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
1	01/11/18	WALLACE T. OKI, P.E., INC.		
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ELECTRICAL WORK				





## ELECTRICAL PLAN – LOCATION/GENERAL WORK SCOPE – HILO OPERATIONS CENTER & OFFICE BUILDING

SCALE: 1" = 10'

REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
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<b>WALLACE T. OKI, P.E., INC.</b> ELECTRICAL ENGINEERING P.O. BOX 4070/688 KINOOLE ST. STE. 115B HILO, HI. 96720 PH:961-9666/FAX:935-2549 WTO REF NO. 102011418				
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ELECTRICAL WORK				
<div style="display: flex; justify-content: space-between;"> <span>E-32</span> <span>HILO BASEYARD</span> </div>				