

**ENGINEERING REPORT
FOR SUBMISSION TO
THE WASHINGTON STATE DEPARTMENT OF HEALTH**

**SANITARY WASTE WATER DISPOSAL SYSTEM
FOR THE PROCESS CONDENSATE TREATMENT FACILITY
PROJECT C-018H**

Prepared for

**Kaiser Engineers Hanford Company
Richland, Washington**

Prepared by

**JGC Corporation
Herndon, Virginia**



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FOR THE PROCESS CONDENSATE TREATMENT FACILITY
PROJECT C-018H**



Contract No. E.P.U. - 4252

JGC Job Code: 8-6286-01

Delivery Order No. 6, Rev. 1

TABLE OF CONTENTS

1.0	GENERAL REQUIREMENTS	1
1.1	Project Description	1
1.2	Ownership	2
1.3	Domestic Sanitary Water Source	3
1.4	Waste Water System	3
1.5	Area Land Use - Present and Anticipated	4
2.0	SANITARY WASTE WATER DISPOSAL SITE	4
2.1	Location	4
2.2	Selection Criteria	4
2.3	Geology/Groundwater	5
2.4	Soils	5
3.0	DESIGN CRITERIA	7
3.1	Scope	7
3.2	Drain Field/Trench Design	8
3.3	Septic Tank and Dosing Chamber	10
4.0	REQUEST FOR WAIVER	12
5.0	PROJECT SCHEDULE	13
6.0	OPERATION AND MAINTENANCE	14
7.0	QUALITY ASSURANCE	15
8.0	REFERENCES	16
	Appendix A - AREA MAPS	A - 1
	Appendix B - SEWER COLLECTION SYSTEM	B - 1
	Appendix C - SUBSURFACE DISPOSAL SYSTEM	C - 1
	Appendix D - MISCELLANEOUS DRAWINGS	D - 1
	Appendix E - CONSTRUCTION SPECIFICATION (Selected Sections)	E - 1
	Appendix F - SEPTIC SYSTEM DESIGN CALCULATION	F - 1
	Appendix G - ENGINEERING CHANGE NOTICES (ECN)	G - 1

1.0 GENERAL REQUIREMENTS

1.1 Project Description

The new sanitary waste water disposal system proposed for the Process Condensate Treatment Facility will be located in the northeast quadrant of the 200-East Area of the U.S. Department of Energy's Hanford Reservation. (See Appendix A - AREA MAPS.) For brevity the facility is more commonly referred to as the Effluent Treatment Facility (ETF). The ETF will be located approximately 30 road miles northwest of Richland, Washington.

The purpose of the ETF is to provide for collection, treatment, and disposal of low-level mixed waste water discharges from the 242-A Evaporator and low-level waste water from the Plutonium-Uranium Extractor (PUREX) Plant located on the Hanford Site. The facility will remove hazardous and radioactive solid waste from liquid, namely water, resulting in a reduced volume of waste, bringing the Hanford Site into compliance with state and federal environmental regulations.

The ETF will be staffed 24 hours per day using three shifts consisting of a maximum of 14 personnel. Since most facilities at the Hanford Site are located in remote areas, subsurface sanitary waste water disposal systems are commonly utilized. The proposed waste treatment system is new and does not involve interfacing with existing sewer or treatment systems.

1.2 Ownership

Owner: Department of Energy Field Office, Richland (RL)
P.O. Box 550
Richland, Washington 99352

Operating

Contractor: Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington, 99352

Engineer: Kaiser Engineers Hanford Company
P.O. Box 888
Richland, Washington 99352
Attn: Karl D. Rickenbach Ph. (509) 376-5505

Project Prime

Contractor: JGC Corporation
2411 Dulles Corner Park
Suite 520
Herndon, Virginia 22071
Attn: Ed Holton Ph. (703) 713-9000

1.3 Domestic Sanitary Water Source

The sanitary (potable) water and the fire suppression water supply will be piped to the ETF site from the water treatment plant located within the 200-West Area. The water treatment plant is operated by the on site Operating Contractor. Water is piped from the Columbia River near the 100-D Area, to the 200-West Area, where it is filtered and treated. There are no water production wells within 5 miles of the ETF site.

1.4 Waste Water System

Sanitary waste effluent from the ETF complex will be collected and transported by gravity flow to the septic tank from all sanitary facilities. All sanitary waste will be generated within the ETF, as there are no support buildings associated with the complex. Since no expansion of the ETF is planned, the sanitary waste collection system will not include additional capacity.

The sanitary waste effluent will originate from two locker room facilities, three small bathrooms, two janitors closets, two water coolers, and one lunchroom sink. The lunchroom sink does not include a garbage disposal. The proposed treatment and disposal system is designed to treat 1,440 gallons per day of sanitary waste. The system will include a 3,000 gallon septic tank, a 2,000 gallon dosing chamber, and three disposal beds of 990 ft² each.

1.5 Area Land Use - Present and Anticipated

Currently the site is undisturbed and is covered in sage brush, several types of small cactuses, a variety of grasses, and other species of arid climate plant life. No developments adjacent to the ETF subsurface sanitary waste water disposal system are planned or anticipated.

2.0 SANITARY WASTE WATER DISPOSAL SITE

2.1 Location

The subsurface waste water disposal system will be located adjacent to the southwest corner of the ETF complex. The septic tank will be located approximately 10 feet south of the ETF foundation, north of the adjacent service road. The dosing chamber will be located directly south and adjacent to the septic tank, with the subsurface soil absorption system (SSAS) located south of the service road, in the open field. The SSAS trenches will run parallel to the service road with one bed draining towards the east and the remaining two beds towards the west. A fourth SSAS drainfield area will be reserved and located adjacent to the proposed drainfield area.

(See Appendix - C.)

2.2 Selection Criteria

Since the ETF is relatively small and compact, the site for the septic tank, dosing chamber, and the subsurface drain field system was designed into the layout for the complex. After

configuring the location of support equipment, access driveways, and parking lots, the disposal system could only be located on the south side of the facility. There is, however, adequate land area for the ETF waste disposal system despite limitations on its location adjacent to the ETF.

2.3 Geology/Groundwater

Results of a geotechnical investigation performed at the site between July 8, 1992 and July 16, 1992, by Dames & Moore, show a thin surface deposit exists of wind-blown sand. (See Reference 1.) The layer of sand is approximately one to two feet thick overlaying a dense composite of coarse gravel and cobbles. Below 2 feet, the soil becomes more dense with the gravel and cobbles mixed with silty, fine sand. As indicated in the Soils Report, from well documented sources, the sand and gravel mixture continues for approximately 220 feet before reaching basalt bedrock. The bedrock is more than 10,000 feet thick. The ground water table at the ETF site is approximately 190 feet below the surface.

The ETF site is located near the top of the 200-East plateau. The site is at an elevation of approximately 590 feet, and about 8 miles southwest of the Columbia River. No surface water or drainage avenues exist that could result in a flood condition at or near the drain field. The nearest drainage avenue would be Cold Creek, lying approximately 9 miles south-southeast, which discharges into the Yakima River.

2.4 Soils

A soils investigation was performed near the proposed waste water disposal field in July 1992. Subsurface soil investigations, pertinent to this report, involved two (2) test pits dug to a depth of 8 feet each. Jeff Faunce, KEH, and Kevin Lamb, Dames & Moore, were present to witness the excavations, log the data, and obtain soil samples for laboratory analysis.

The location of Test Pit No. 1 (TP-1) is approximately 110 ft. south and 78 ft. east of the southwest corner of the ETF building. Test Pit No. 2 (TP-2) is approximately 15 ft. north, and 124 ft east of TP-1. Each pit reached a depth of 8 ft. with conditions found at each pit being virtually identical. The first 2 or 3 ft. layer of soil was found to be a fine sand containing roots and other organic matter, mixed with occasional gravel. From this point to the bottom of the test pits, the soil was a gravel with cobbles in a matrix of fine sand. The soil grade became coarser with depth. There were some pockets which were less coarse, and occasional small boulders were also encountered. The sandy gravel soil found throughout the depth of the test pits was readily classified as USDA Type I soil, which is common on the Hanford Site.

3.0 DESIGN CRITERIA

3.1 Scope

Occupancy and facility requirements were established by the Hanford Site Operating Contractor. Since the ETF will be highly automated, only 14 persons are projected as the maximum occupancy on the day shift, and 11 persons per shift are anticipated for the swing and graveyard shifts. Thus, a total of 36 people is the maximum daily occupancy anticipated for the ETF. These figures were converted to daily flow rates, based on 1991 Uniform Plumbing Code data. The proposed waste disposal system has enough capacity to handle the sanitary waste produced by the ETF under current facility plans. No future, additional capacity was considered. The production of sanitary waste is shown in Table 1.

FACILITY	IMMEDIATE OCCUPANCY (All Shifts)	FUTURE OCCUPANCY (Per Shift)	WASTE FLOW (gpd/person)	TOTAL NUMBER OF SHIFTS	TOTAL WASTE EFFLUENT (gpd)
Effluent Treatment Facility	36	N/A	40	3	1,440

Table 1 - ETF Sanitary Waste Production

There are no additional facilities or equipment, (e.g. dishwashers, laboratory equipment, etc.), which would produce further sanitary waste effluent. Furthermore, there are no special waste properties or effluent stream quality considerations in the design of the disposal system. Samples taken from sanitary sewer systems of facilities similar to the ETF indicated that the 5-day Biochemical Oxygen Demand (BOD5) averages will be below the 230mg/l limit and

therefore did not require additional consideration in the design. Since there are no storm sewer systems planned for the ETF, there is no storm sewer flow in to the sanitary sewer system.

3.2 Drain Field/Trench Design

From the Soils Report it was determined that the proposed waste disposal system will be constructed in USDA Type I soil. The application rate is therefore established as 0.727 gallons/ft²/day. The drain field size and configuration, as determined in the Septic System Design Calculation (Appendix F), is summarized below:

- Minimum Septic Tank Size: 2,160 gallons. Use a 3,000 gallon tank.
- Minimum Dosing Chamber Size: 1,440 gallons. Use a 2,000 gallon tank.
- Total Drain Field Absorption Area: 1,981 ft².
- Trench/Drain Field Usage: Use three (3) Drain Field Beds, each with a 50% capacity.
- Single Drain Field Bed Configuration:
 - Trench Lengths: 55 ft.,
 - Trench Widths: 3 ft.,
 - Trench Spacing: 10 ft. on center,
 - Total Trenches per Bed: 6, and
 - Total Absorption Area: 990 ft².
- Doses Per Day: 4.
- Dose Volume: 360 gallons.

Three alternating disposal beds will be installed, each with a 50% design capacity consisting of 990 ft² of trenches. (An adjacent area is reserved for an additional 50% disposal bed which may be installed if the original system cannot absorb all the sewage.) Each bed will consist of six (6) trenches 55 ft. long and 3 ft. wide, with a separation between trenches of 10 ft. center to center. The separation distance between beds are a minimum of 15 ft. from the edge of one absorption bed to the next absorption bed. Each drain field trench will be over-excavated two (2) feet to a leveled depth of five (5) feet below grade. A two (2) foot layer of medium sand will then be applied to facilitate transportation and absorption of sanitary waste effluent.

Next, a 14 inch layer of clean, washed stone or gravel of uniform size between 3/4 inch and 1-1/2 inch will be placed in each trench. One and one quarter (1-1/4) inch diameter, schedule 40, perforated PVC pipe laterals will then be placed centered in each trench. The perforations in the PVC pipe will be 3/16 inch diameter, spaced 3 feet apart, oriented downward in the 6 o'clock position. The ends of each lateral will be securely capped.

The perforated PVC laterals will then be covered with the same washed gravel to a depth of 18 inches below grade. The gravel will then be covered with a spunbound synthetic construction fabric to prevent closure of the gravel absorption bed by backfill material. The original excavated soil will then be backfilled into each trench.

The piping system to each disposal bed will consist of a four (4) inch diameter Schedule 40 PVC transport pipe. Schedule 80 PVC pipe will be used under the adjacent roadway. The 4 inch

diameter transport piping will then be joined to a four (4) inch diameter solid PVC pipe serving as the riser and header for each drain field bed. The header piping will then be joined to the perforated PVC laterals. Three monitoring ports will be installed in each bed; two at a location halfway from each end and within each trench that is second from the outside of the disposal bed. The third monitoring port will be located, in each bed, at the end of the trench which is furthest from the septic tank. The monitoring ports will consist of 4 inch diameter PVC pipe extending from the bottom of the trench, (i.e. 5 ft. below grade), to a distance 6 inches above grade with a removable PVC cap. The pipe will be perforated from the top of the gravel layer to the bottom of the trench with four (4) 1/2 inch diameter orifices located 90 degrees apart with a vertical spacing between orifices of 6 inches. The pipe will be wrapped in synthetic fabric and be banded, with a stainless steel strap, to the same fabric used to cover the gravel.

3.3 Septic Tank and Dosing Chamber

A dual-chamber precast concrete septic tank with a 3,000 gallon capacity will provide the first stage of treatment of the sanitary waste produced by the ETF. Effluent will be transported by gravity from the septic tank to a 2,000 gallon dosing chamber where a single pump will distribute, or dose, under pressure, 360 gallons of liquid, four times a day, to the disposal bed system. The 2,000 gallon dosing chamber provides a reserve storage capacity of over two times the dosing volume, or a total volume of one day of effluent. The pump discharges effluent to the drain fields through a valve vault that directs and alternates flow to any two of the three disposal beds during a dosing period. The valve vault will have the capacity to add a fourth

drain field if necessary.

4.0 REQUEST FOR WAIVER

Soil Investigation

It is requested, based on this engineering report, that the Washington State Department of Ecology and/or Washington State Department of Health give conditional approval of the design of the ETF sanitary waste disposal system and allow construction to begin. The verification of the soil classification by a Washington State agency staff member would be performed at the initial excavation of the drain fields. Upon the State's concurrence with the soil classification and design values used, the conditional approval would then be changed to a full approval.

This request is made under the provisions of Washington Administrative Code, WAC 246-272-210.

5.0 PROJECT SCHEDULE

Figure 1 provides a Gantt chart showing the ETF Project Milestone Schedule. The specific schedule for installing the sewer collection and waste disposal system is in the May 1993 time frame.

6.0 OPERATION AND MAINTENANCE

The Hanford Site Operating Contractor has a maintenance program in place which requires annual inspection of the septic tanks, and dosing chambers. Pumping and/or cleaning of septic tanks are prescribed in their preventive maintenance procedures. Since the sanitary waste design flow for the ETF is sufficiently low, a second detailed Operation and Maintenance procedure is not provided here. Please contact the Operating Contractor for details on their maintenance program already in place.

7.0 QUALITY ASSURANCE

JGC is responsible for the design, and construction management of the sanitary waste water disposal system and will subcontract various tasks within the project. JGC activities, subcontractor selection, contract placement shall follow the provisions in the Project Quality Assurance Plan (S-1510-010) established for the ETF project and approved by Kaiser Engineers Hanford.

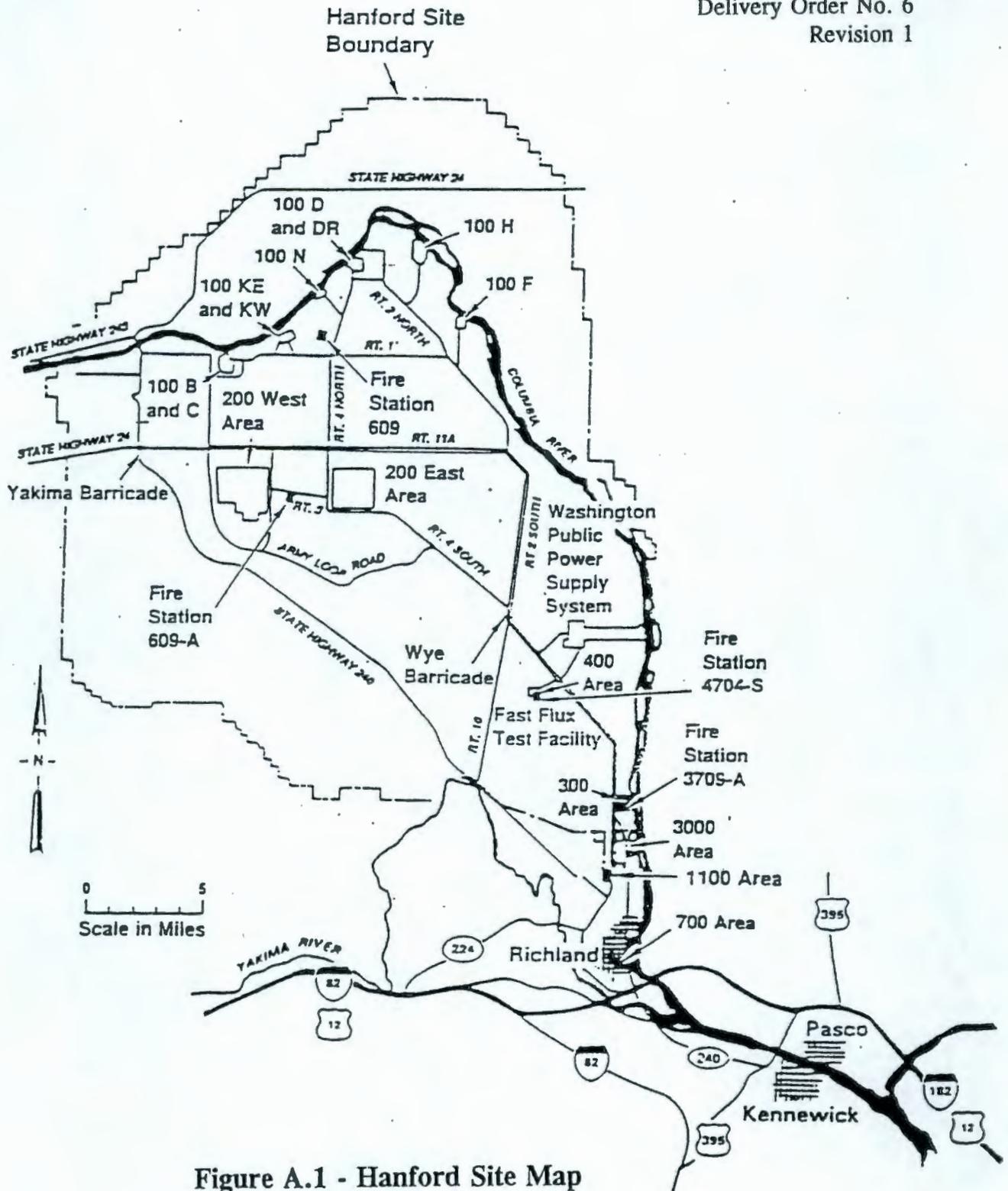
Subcontracted tasks will be controlled by contracts and specifications (See Appendix F) which will follow applicable sections of the KEH Design Construction Specification (V-C018HC1-001). Contract documents shall specify the scope of the activity, technical requirements, and Quality System requirements that pertain to the specific subcontractor.

8.0 REFERENCES

1. "Report Of Geotechnical Investigation/Consulting Services - Effluent Treatment Facility," Dames & Moore, Seattle, WA, July 1992.
2. "On-Site Sewage Disposal System Standards for Construction and Design," Benton-Franklin District Health Department, Pasco, WA, Jan. 1986.
3. "Design Construction Specification Project C-018H 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility," Westinghouse Hanford Company, Richland, WA, May 1991, Rev. 0E.
4. "Wastewater Disposal System For The Waste Sampling And Characterization Facility," D.L. Fort, Kaiser Engineers Hanford Company, Richland, WA, Nov. 1991.
5. "Design Guidelines For Larger On-Site Sewage Systems With Design Flows Greater Than 3,500 Gallons Per Day," State of Washington Department of Social and Health Services / Department of Ecology, Spokane, WA, 1987.
6. "Uniform Plumbing Code," International Association of Plumbing and Mechanical Officials, Walnut, CA, 1991.
7. "Design Manual: Onsite Wastewater Treatment and Disposal Systems," U.S. Environmental Protection Agency, Washington, D.C., Oct. 1980.
8. "Guidelines for Alternating and Dosing Systems," Washington State Department of Social and Health Services, Jan. 1985.
9. "Guidelines for the Use of Pressure Distribution Systems," Washington State Department of Social and Health Services, Sep. 1984.

Pg. No. A - 1
Delivery Order No. 6
Revision 1

Appendix A - AREA MAPS



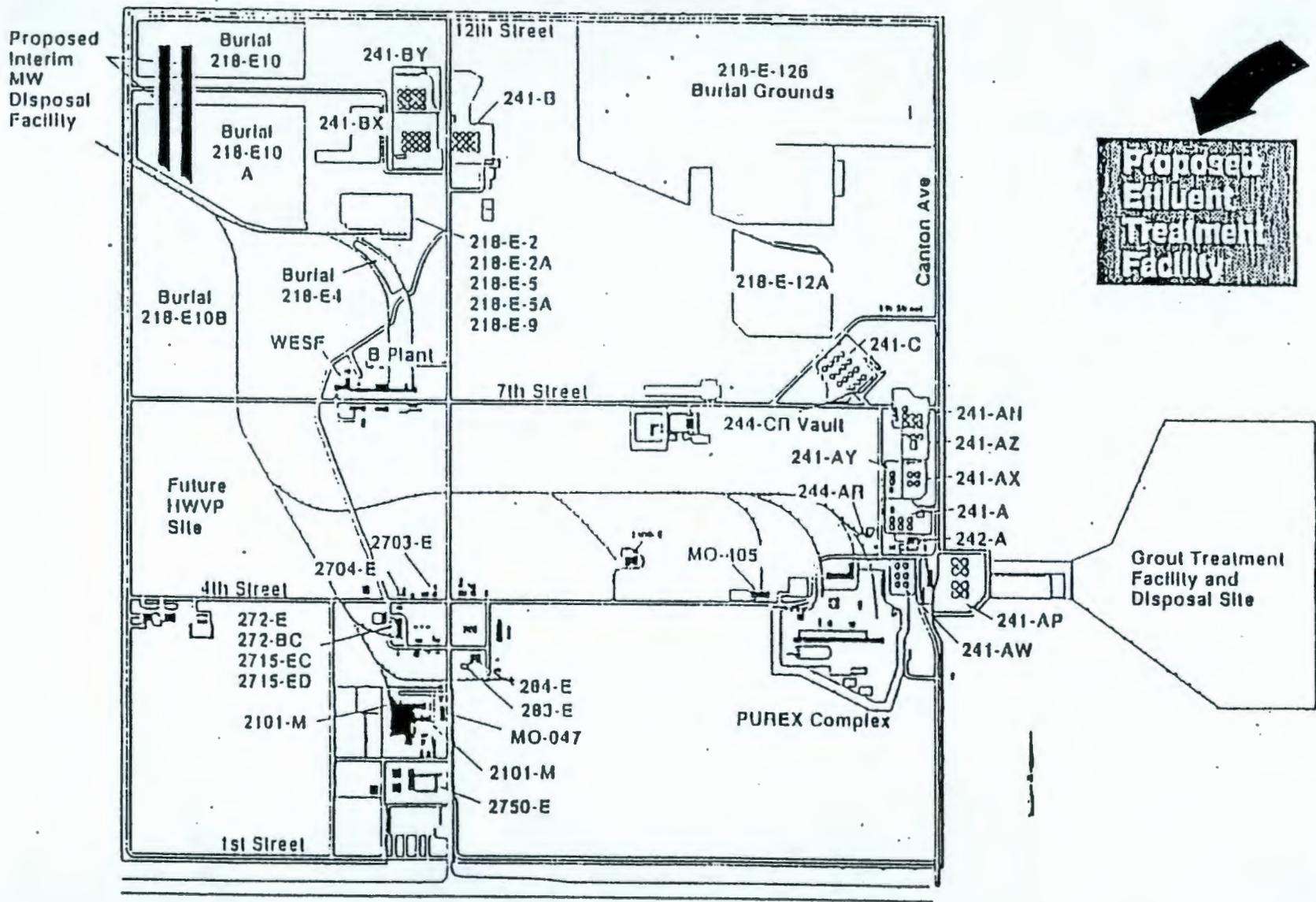
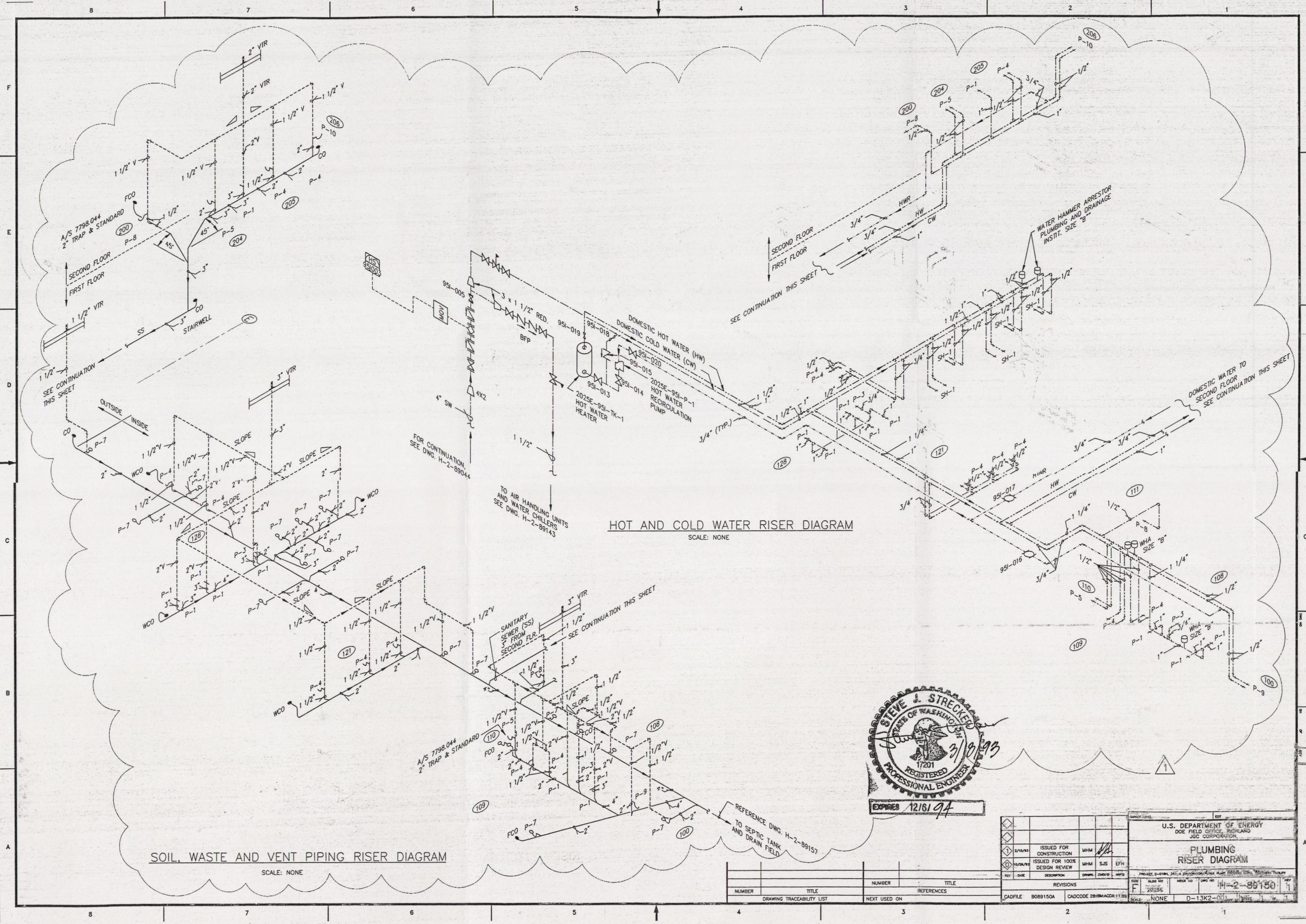


Figure A.2 - 200-East Area Map

Pg. No. B - 1
Delivery Order No. 6
Revision 1

Appendix B - SEWER COLLECTION SYSTEM



HOT AND COLD WATER RISER DIAGRAM

SCALE: NONE

SOIL, WASTE AND VENT PIPING RISER DIAGRAM

SCALE: NONE



U.S. DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHMOND JGC CORPORATION	
PLUMBING RISER DIAGRAM	
ISSUED FOR CONSTRUCTION	MHM
ISSUED FOR 100% DESIGN REVIEW	MHM SJS EPH
PROJECT NO.	8089150A
DRAWING NO.	2818M-ACD-1153
SCALE	NONE
DATE	11-2-89

NUMBER	TITLE	NUMBER	TITLE
1	DRAWING TRACEABILITY LIST	2	REFERENCES

REFERENCE DWG. H-2-89157
TO SEPTIC TANK AND DRAIN FIELD

SANITARY SEWER (SS) FROM SECOND FLR.

TO AIR HANDLING UNITS AND WATER CHILLERS SEE DWG. H-2-89143

FOR CONTINUATION, SEE DWG. H-2-89044

SEE CONTINUATION THIS SHEET

DOMESTIC WATER TO SECOND FLOOR SEE CONTINUATION THIS SHEET

SECOND FLOOR
FIRST FLOOR

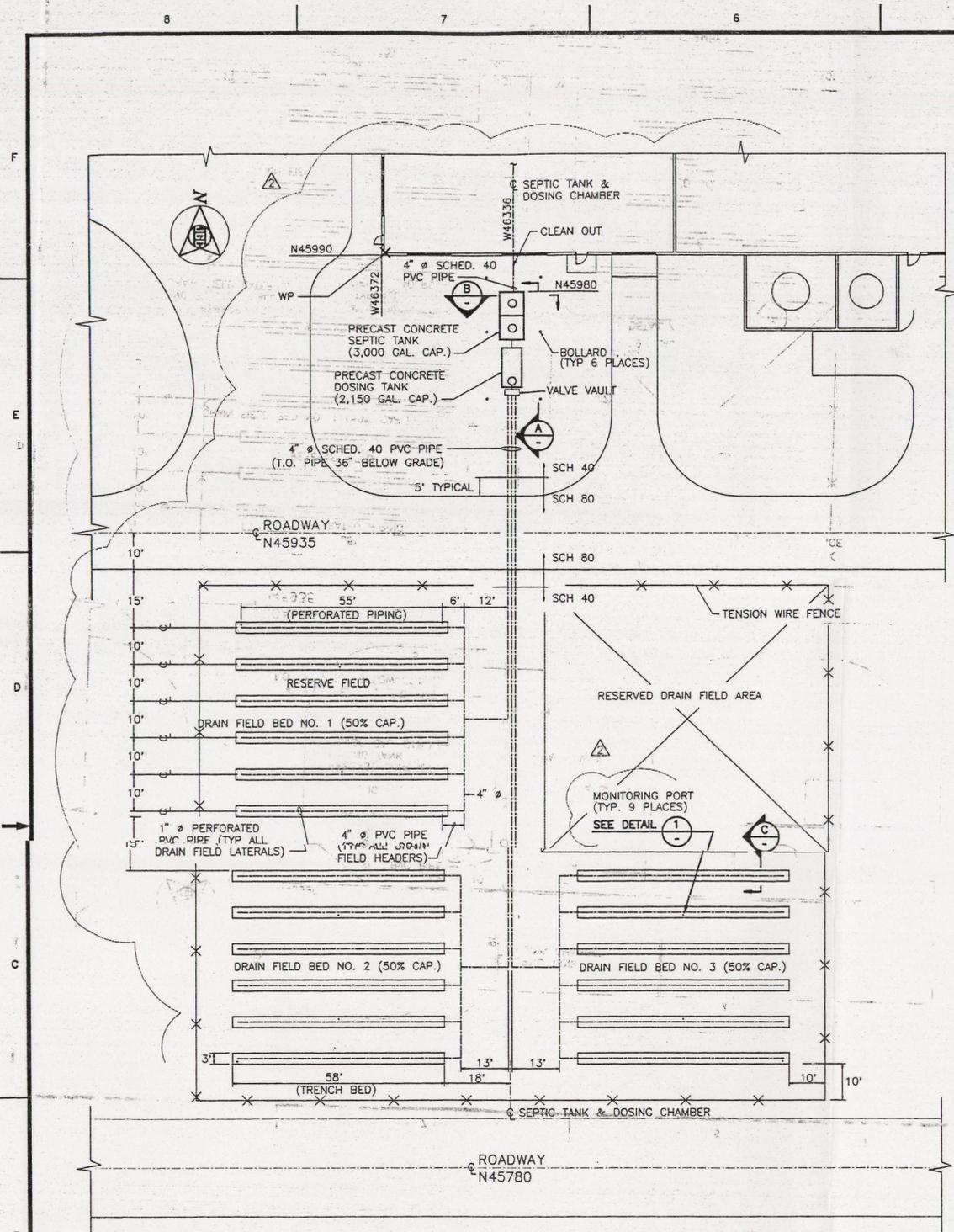
SEE CONTINUATION THIS SHEET

SEE CONTINUATION THIS SHEET

SCALE: NONE

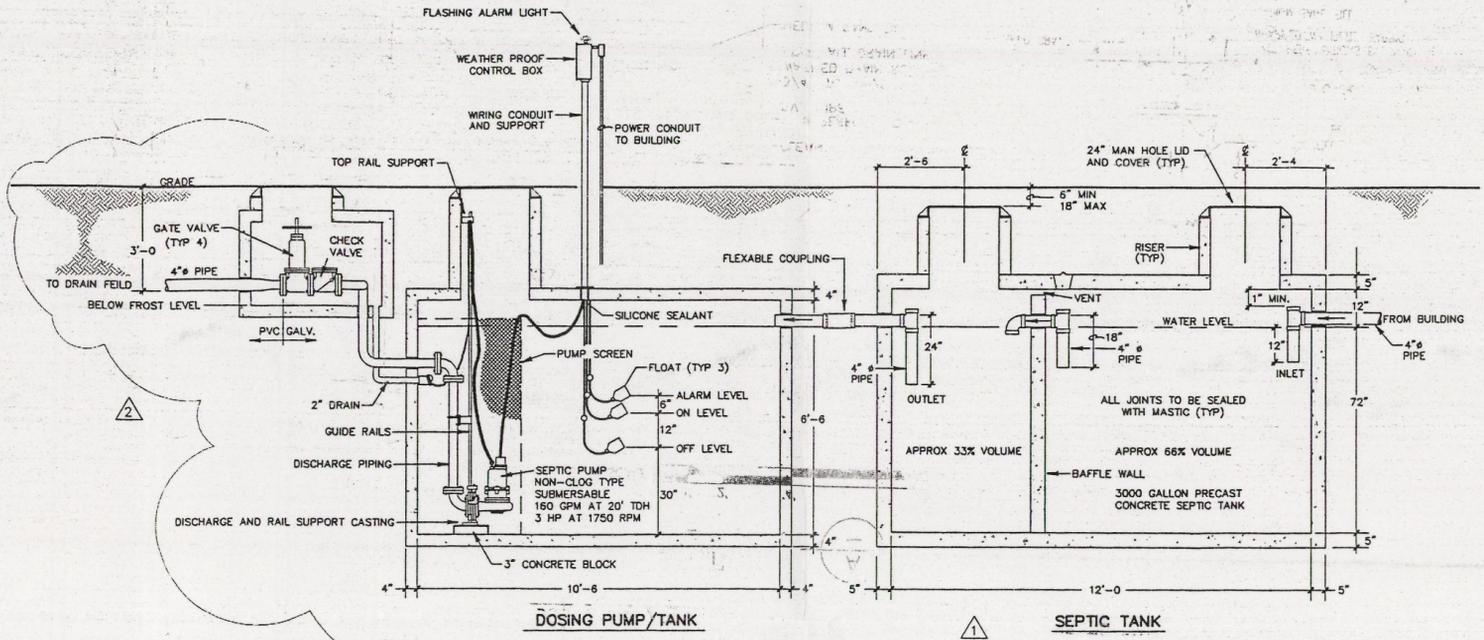
Pg. No. C - 1
Delivery Order No. 6
Revision 1

Appendix C - SUBSURFACE DISPOSAL SYSTEM



SEPTIC TANK AND DRAIN FIELD - PLAN

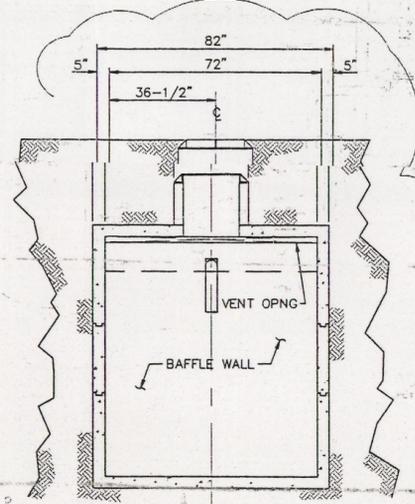
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SECTION A

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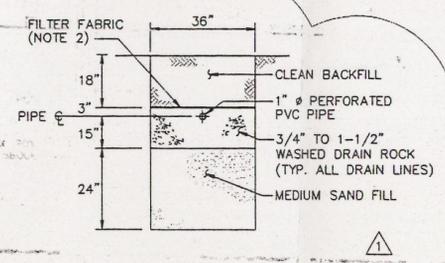
0 1' 2' 4' 8'



SECTION B

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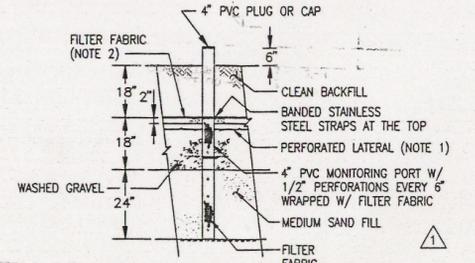
0 1' 2' 4' 8'



SECTION C

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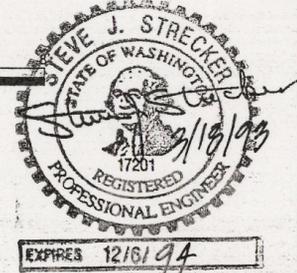


DETAIL 1

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

0 1' 2' 4' 8'

- NOTES:
- DRAIN FIELD LATERALS SHALL HAVE 3/16" DIAMETER PERFORATIONS ORIENTED IN THE 6 O'CLOCK POSITION AND SPACED TWO (2) FEET APART.
 - THE FILTER FABRIC SHALL BE A SPUNBOUND SYNTHETIC FABRIC. USE FIBRETEX, MIRAFI, TYPAR, OR APPROVED EQUAL.



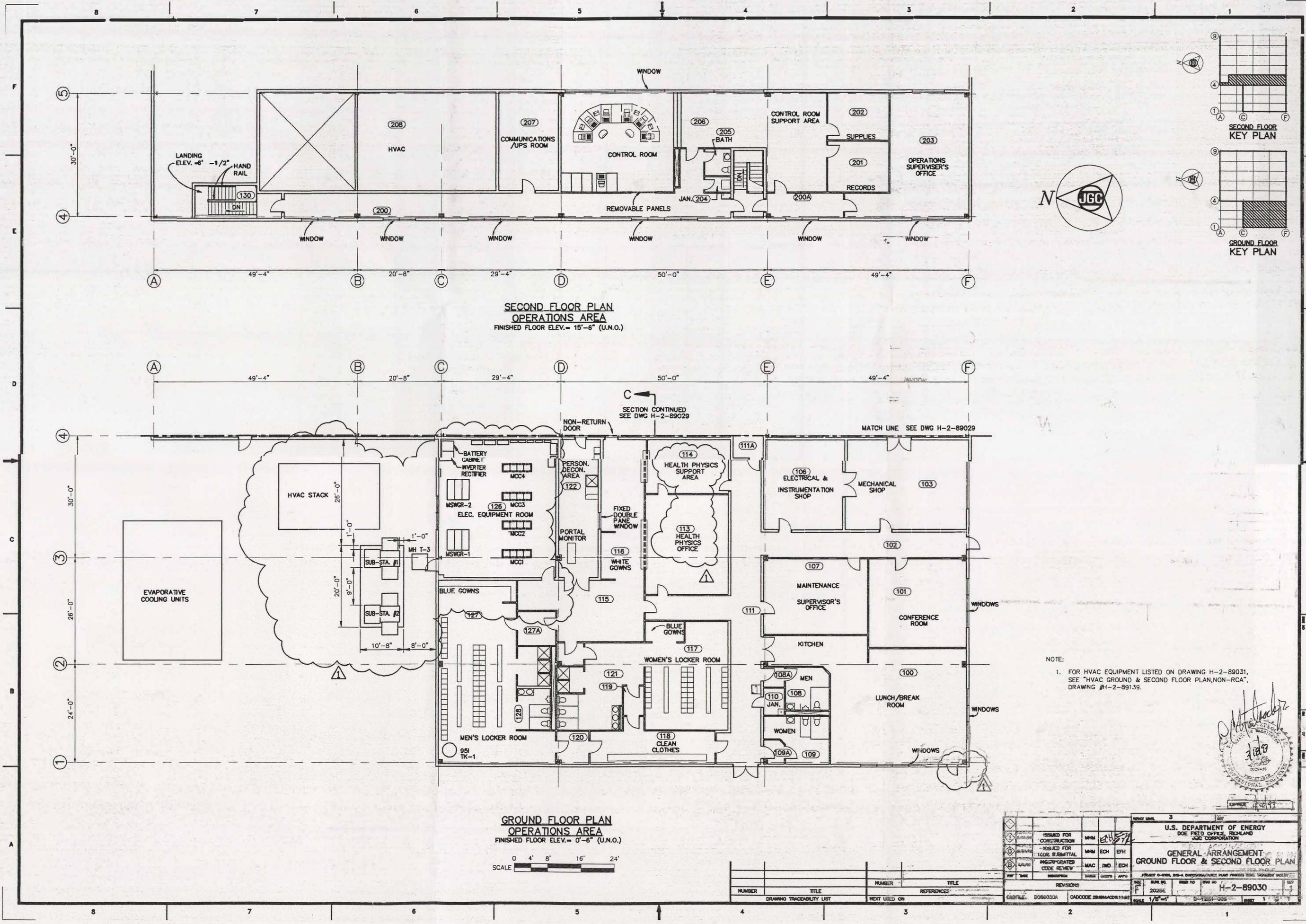
NO.	DATE	DESCRIPTION	DESIGNED	CHECKED	APPROVED
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2	11/11/93	DELIVERY ORDER & GENERAL REVISION	GFD	SJS	EFH
3	11/29/93	ISSUED FOR 100% DESIGN SUBMITTAL	ROP	SJS	EFH

NO.	TITLE	NO.	TITLE

PROJECT NO.	20225E	SHEET NO.	H-2-89157	REV.	2
SCALE	NOTED	D-1363-002	SHEET 1 OF 1		

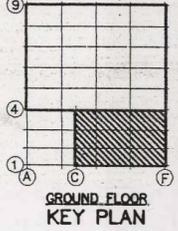
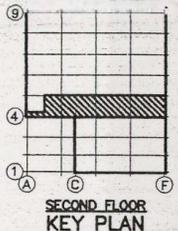
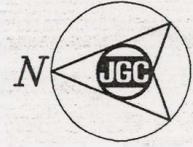
Pg. No. D - 1
Delivery Order No. 6
Revision 1

Appendix D - MISCELLANEOUS DRAWINGS

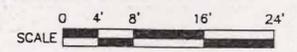


**SECOND FLOOR PLAN
OPERATIONS AREA**
FINISHED FLOOR ELEV. = 15'-6" (U.N.O.)

**GROUND FLOOR PLAN
OPERATIONS AREA**
FINISHED FLOOR ELEV. = 0'-6" (U.N.O.)



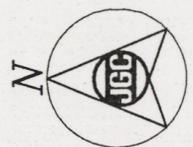
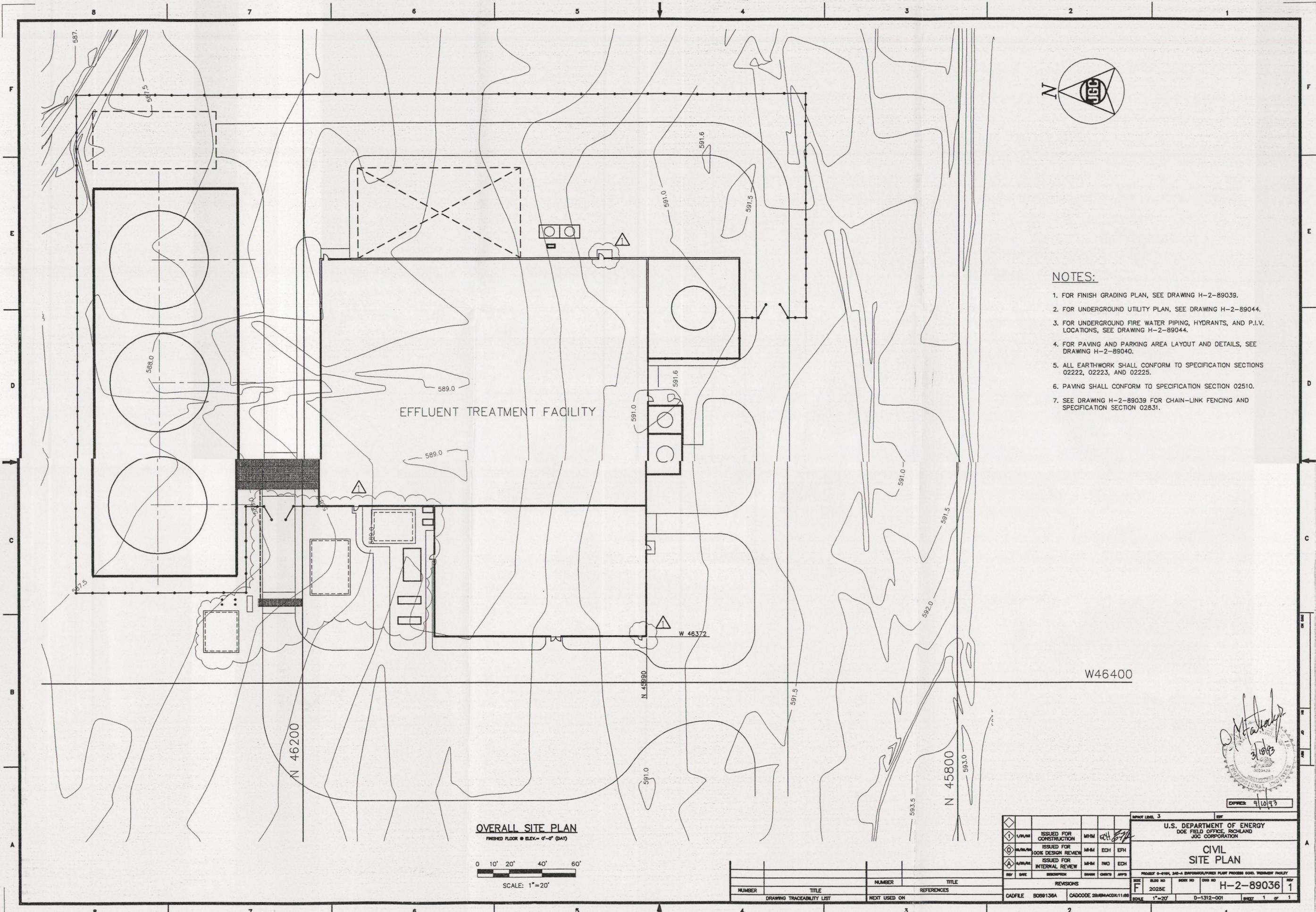
NOTE:
1. FOR HVAC EQUIPMENT LISTED ON DRAWING H-2-89031, SEE "HVAC GROUND & SECOND FLOOR PLAN, NON-RCA", DRAWING #H-2-89139.



NUMBER	TITLE	NUMBER	TITLE

REVISIONS	DATE	BY	CHKD	APPV

U.S. DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHMOND JGC CORPORATION	
GENERAL ARRANGEMENT GROUND FLOOR & SECOND FLOOR PLAN	
PROJECT: O-9504, 300-A RADIATION/PLASMA PROCESS FACILITY, RICHMOND, CALIF.	SCALE: 1/8"=1'
DATE: 2025E	NO. H-2-89030
CADFILE: 8086030A	CADCODE: 2888A/CAD04/11-95

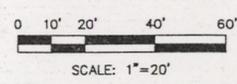


NOTES:

1. FOR FINISH GRADING PLAN, SEE DRAWING H-2-89039.
2. FOR UNDERGROUND UTILITY PLAN, SEE DRAWING H-2-89044.
3. FOR UNDERGROUND FIRE WATER PIPING, HYDRANTS, AND P.I.V. LOCATIONS, SEE DRAWING H-2-89044.
4. FOR PAVING AND PARKING AREA LAYOUT AND DETAILS, SEE DRAWING H-2-89040.
5. ALL EARTHWORK SHALL CONFORM TO SPECIFICATION SECTIONS 02222, 02223, AND 02225.
6. PAVING SHALL CONFORM TO SPECIFICATION SECTION 02510.
7. SEE DRAWING H-2-89039 FOR CHAIN-LINK FENCING AND SPECIFICATION SECTION 02831.

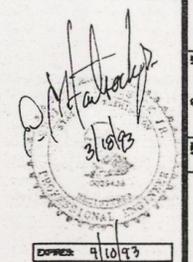
OVERALL SITE PLAN

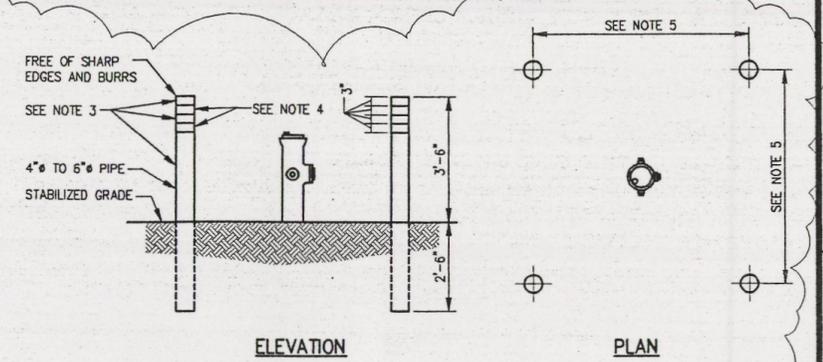
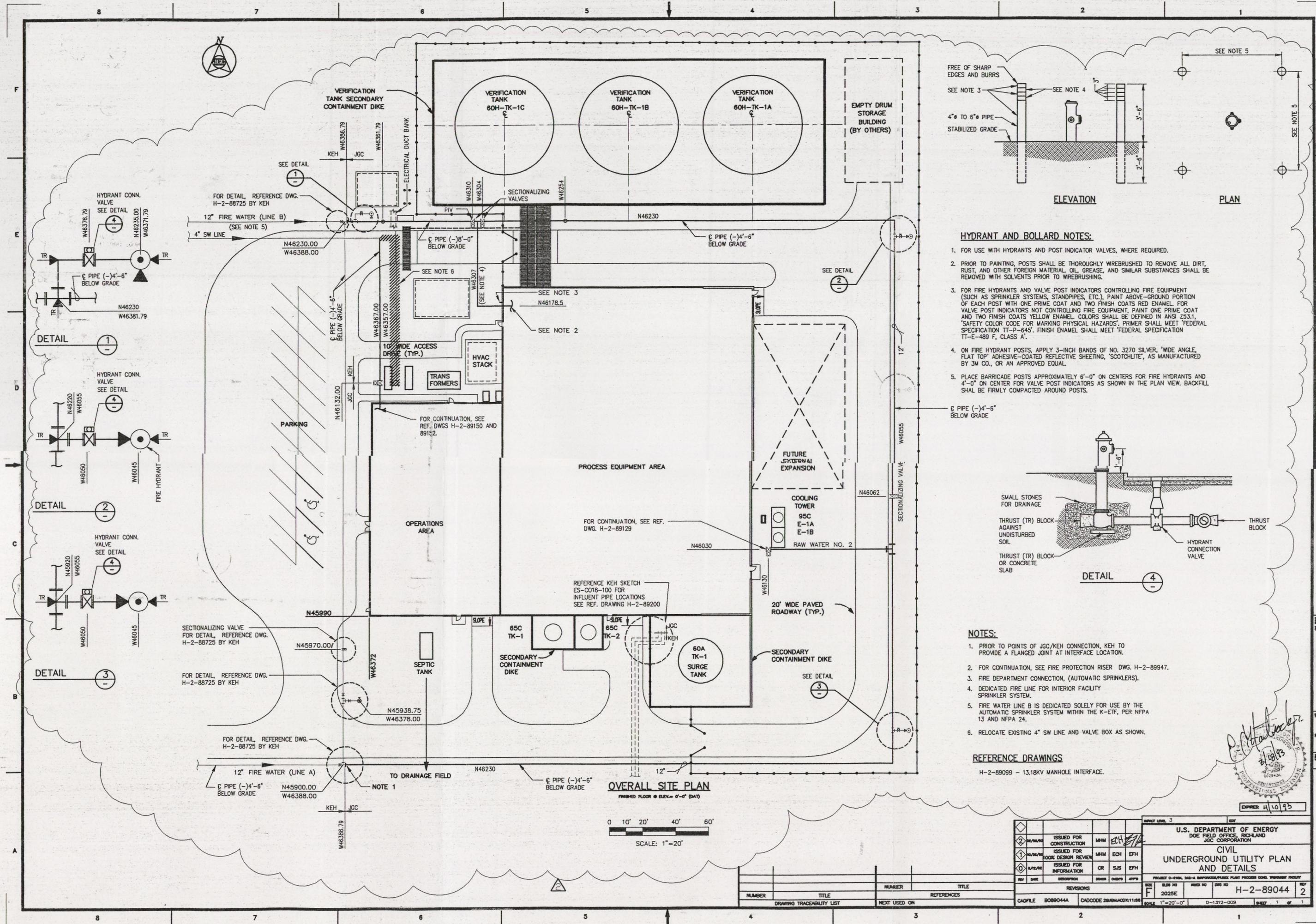
FINISHED FLOOR @ ELEV. = 0'-0" (DAT)



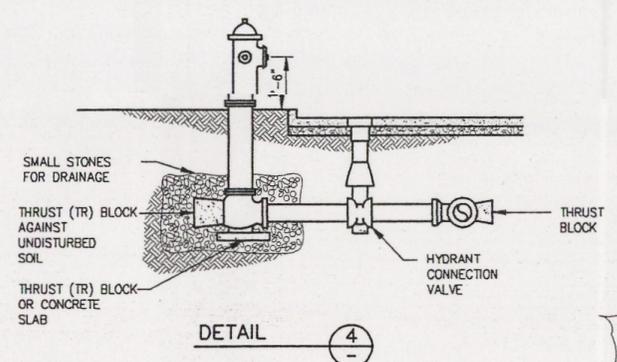
NUMBER	TITLE	NUMBER	TITLE

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REVISIONS REV. DATE DESCRIPTION 1 11/14/92					
PROJECT: 0-1514, 240-A EMPLOYER/PURCHASER PLANT PROCESS COOL. TREATMENT FACILITY					
U.S. DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND JGC CORPORATION		CIVIL SITE PLAN			
SIZE: F SHEET NO: 2025E SCALE: 1"=20'	DRAW NO: H-2-89036 SHEET: 1 OF 1	DATE: 9/10/93			



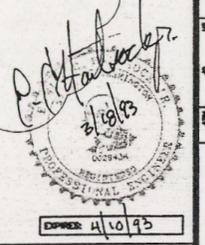


- HYDRANT AND BOLLARD NOTES:**
- FOR USE WITH HYDRANTS AND POST INDICATOR VALVES, WHERE REQUIRED.
 - PRIOR TO PAINTING, POSTS SHALL BE THOROUGHLY WIREBRUSHED TO REMOVE ALL DIRT, RUST, AND OTHER FOREIGN MATERIAL, OIL, GREASE, AND SIMILAR SUBSTANCES SHALL BE REMOVED WITH SOLVENTS PRIOR TO WIREBRUSHING.
 - FOR FIRE HYDRANTS AND VALVE POST INDICATORS CONTROLLING FIRE EQUIPMENT (SUCH AS SPRINKLER SYSTEMS, STANDPIPES, ETC.), PAINT ABOVE-GROUND PORTION OF EACH POST WITH ONE PRIME COAT AND TWO FINISH COATS RED ENAMEL. FOR VALVE POST INDICATORS NOT CONTROLLING FIRE EQUIPMENT, PAINT ONE PRIME COAT AND TWO FINISH COATS YELLOW ENAMEL. COLORS SHALL BE DEFINED IN ANSI Z53.1, "SAFETY COLOR CODE FOR MARKING PHYSICAL HAZARDS", PRIMER SHALL MEET FEDERAL SPECIFICATION TT-P-645, FINISH ENAMEL SHALL MEET FEDERAL SPECIFICATION TT-E-489 F, CLASS A.
 - ON FIRE HYDRANT POSTS, APPLY 3-INCH BANDS OF NO. 3270 SILVER, WIDE ANGLE, FLAT TOP ADHESIVE-COATED REFLECTIVE SHEETING, "SCOTCHLITE", AS MANUFACTURED BY 3M CO., OR AN APPROVED EQUAL.
 - PLACE BARRICADE POSTS APPROXIMATELY 6'-0" ON CENTERS FOR FIRE HYDRANTS AND 4'-0" ON CENTER FOR VALVE POST INDICATORS AS SHOWN IN THE PLAN VIEW. BACKFILL SHALL BE FIRMLY COMPACTED AROUND POSTS.



- NOTES:**
- PRIOR TO POINTS OF JGC/KEH CONNECTION, KEH TO PROVIDE A FLANGED JOINT AT INTERFACE LOCATION.
 - FOR CONTINUATION, SEE FIRE PROTECTION RISER DWG. H-2-89947.
 - FIRE DEPARTMENT CONNECTION, (AUTOMATIC SPRINKLERS).
 - DEDICATED FIRE LINE FOR INTERIOR FACILITY SPRINKLER SYSTEM.
 - FIRE WATER LINE B IS DEDICATED SOLELY FOR USE BY THE AUTOMATIC SPRINKLER SYSTEM WITHIN THE K-ETP, PER NFPA 13 AND NFPA 24.
 - RELOCATE EXISTING 4" SW LINE AND VALVE BOX AS SHOWN.

REFERENCE DRAWINGS
H-2-89099 - 13.18KV MANHOLE INTERFACE.



DRAWING TRACEABILITY LIST		REVISIONS		PROJECT INFORMATION	
NUMBER	TITLE	NUMBER	DESCRIPTION	DATE	BY

U.S. DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND JGC CORPORATION					
CIVIL UNDERGROUND UTILITY PLAN AND DETAILS					
PROJECT	PROJECT C-974, 343-A BARRONVILLE PLANT PROCESS COOL. WASTEWATER FACILITY				
REV	DATE	BY	CHKD	APP'D	
F	2025E				H-2-89044
SCALE: 1" = 20'-0"		D-1312-009		REV 2	

Pg. No. E - 1
Delivery Order No. 6
Revision 1

Appendix E - CONSTRUCTION SPECIFICATION (Selected Sections)

SECTION 02222

EXCAVATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating for building foundations.
- B. Excavating for slabs-on-grade and paving.
- C. Excavating for site structures.

1.2 RELATED SECTIONS

- A. Geotechnical report for ETF, Dames & Moore, 07/24/92.
- B. Section 01400 - Quality Control: Inspection of bearing surfaces.
- C. Section 01500 - Construction Facilities and Temporary Controls.
- D. Section 02223 - Backfilling.
- E. Section 02225 - Trenching: Excavation for utility trenches.

1.3 QUALITY ASSURANCE

- A. Product and installation services including inspections and test shall be furnished in accordance with Quality Assurance program meeting the requirements in Section 01400.
- B. Contractor shall supply a certificate of conformance certifying that all products and services rendered meet requirements of this section.
- C. Unless otherwise noted, inspections and tests require by this section shall be performed or witnessed by the contractors certified inspector.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Locate, identify, and protect utilities that remain, from damage. Expose utilities with hand tools. Use of heavy equipment is subject to approval by JGC & KEH.
- C. Protect bench marks, existing structures, fences, and paving from excavation equipment and vehicular traffic.

3.2 EXCAVATION

Prior to beginning excavation, obtain a excavation permit specified in Sub-Section 50.9 of the Contract General Conditions. Permit will be issued by KEH to JGC and is for the duration of the work.

- A. Underpin adjacent structures which may be damaged by excavation work.
- B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures.
- C. Make bottom of excavations compact, level, true, and free of loose material.
- D. Slope side of excavation or trenches more than 4 feet deep in accordance with WAC 296-155, Part N, Table N-1, by Washington Industries Safety and Health Administration (WISHA).
- E. If over-excavation occurs, correct at time of placing concrete by extending concrete down to undisturbed earth or by backfilling in accordance with Section 02223.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. Hand trim excavation. Remove loose matter.
- H. Remove lumped subsoil, boulders, and rock.
- I. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- J. Correct areas over-excavated in accordance with Section 02223.

- K. Stockpile excavated material in area designated on site and remove excess material not being reused, from site. Do not store excavated or other material closer than 2 feet from edge of excavation unless a barrier is erected to retain excavated materials. Store and maintain materials in such a manner that they are prevented from sliding into excavation.
- L. Wherever slopes of excavations will intersect existing underground lines, underground piping, electrical ducts, or direct-buried electrical lines, install shoring or other means of support to prevent interrupting service to existing buildings.

3.3 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01400.
- B. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building perimeter and site structure backfilling to subgrade elevations.
- B. Site filling and backfilling.
- C. Fill under slabs-on-grade paving.
- D. Fill under paving.
- E. Sand fill at outdoor tanks.
- F. Consolidation and compaction.
- G. Fill for over-excavation.

1.2 RELATED SECTIONS

- A. Geotechnical report for ETF, Dames & Moore, 07/24/92.
- B. Section 02222 - Excavating.
- C. Section 02225 - Trenching: Backfilling of utility trenches.
- D. Section 02712 - Foundation Drainage System: Filter aggregate, filter fabric, and high density polyethelene.
- E. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.3 REFERENCES

- A. Washington State Department of Transportation (WSDOT) M41-10-88, Standard Specifications for Road, Bridge, and Municipal Construction.
- B. KEH Form KEH-0382, "Soil Compaction Procedure".

1.4 QUALITY ASSURANCE

- A. Product and installation services including inspections and test shall be furnished in accordance with Quality Assurance program meeting the requirements in Section 01400.
- B. Contractor shall supply a certificate of conformance certifying that all products and services rendered meet requirements of this section.
- C. Unless otherwise noted, inspections and tests require by this section shall be performed or witnessed by the contractors certified inspector.

PART 2 PRODUCTS

2.1 FILL MATERIALS

Obtain select soil fill (types A & B below) from excavation or other locations designated by the owner. Obtain on-site approval from KEH for all soils.

- A. Structural Fill shall be a well-graded soil mixture free of organic material and containing cobbles up to 3 inches in greatest dimension which constitute not more than 20% by volume.
- B. Common Fill shall be a well-graded soil mixture free of organic material and containing cobbles up to 8 inches in greatest dimension which constitute not more than 40% by volume.
- C. Lean concrete shall be Structural concrete conforming to Section 03300 with a compressive strength of 2000 psi.
- D. Stabilization Material shall be crushed rock, maximum size particles of 3/4 inch for walkways and less than 2 inches for other areas.
- E. Sand Fill inside outdoor tank ring beams shall be as defined in ASTM D-653-90 or excavated sandy material having less than 20 percent gravel particles with a maximum dimension of 1/2 inch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify subdrainage, dampproofing or waterproofing installation has been completed in accordance with their respective specification sections.

3.2 PREPARATION

- A. A permit from KEH must be obtained for each element of Fill and Backfill. The permit is good for a period of 5 days or for the duration of the work element, provided work does not stop for 5 consecutive days. KEH furnished permit forms must be completed and approved prior to starting work. See Section 01065 for further information.
- B. Remove debris and organic matter from area to be filled or backfilled.
- C. Compact subgrade to density requirements for subsequent backfill materials stated in paragraph E. or F Below.
- D. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type A fill and compact to density equal to or greater than requirements for subsequent fill material.
- E. Scarify subgrade surface to a depth of 3 inches to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials, free of lumps, organic material and trash.
- B. Do not intermix backfill material with random excavation.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- D. Place geotextile fabric, if required by contract drawings, prior to placing next lift of fill.
- E. Structural Fill (Type A)
 - 1. Before placement of fill or backfill, demonstrate to JGC design engineer by physical test at site, that the procedure proposed for installation and compacting of soils will provide degree of compaction specified.

Prepare "Soil Compaction Procedure", Form KEH-0382. Forms will be furnished by KEH.

2. Place backfill in accordance with WSDOT M41-10-88, Section 2-03.3(14)C, and approved procedure as follows:
 - a) Use Method C under foundations, slabs, and pipelines.
 - b) Use Method B under pavements and roads, and within 5 feet of buildings, fences, other structures, or poles supporting electric lines or pipe.
3. Compaction control tests will be in accordance with WSDOT M41-10-88, Section 2-03.3(14)D.

F. Common Fill (Type B)

1. Place fill or backfill in layers not more than 12 inches thick, loose measurement.
 2. Compact each layer, full width, by at least one pass of vibratory or rammer-type compactor, pneumatic-tired roller, loaded scraper wheel, grader wheel, or power roller. Compaction shall be to 90 percent of maximum density in accordance with WSDOT M41-10-88, Section 2-03.3(14)D.
 3. Mound over top layer of backfill to depth of 1 inch for each 12 inches of trench depth to a maximum mound height of 6 inches.
- G. Employ a placement method that does not disturb or damage other work. Filling or backfilling by sluicing or flooding with water will not be permitted.
- H. Maintain optimum moisture content of backfill materials to attain required compaction density. Backfill against supported structure. Do not backfill against unsupported structures.
- I. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- J. Slope grade away from building as indicated on the finish grading plan unless noted otherwise.

- K. Make gradual grade changes. Blend slope into level areas.
- L. The contractor shall dispose of surplus backfill materials in a location designated by KEH.
- M. Leave fill material stockpile areas free of excess fill materials.
- N. Do not place fill or backfill against concrete structures or foundation walls less than 14 days after placement of concrete unless written approval is obtained from the JGC design engineer.
- O. Prevent discharge of sediment or fill material from site to adjacent areas because of rainfall.
- P. Backfill and compaction of sand fill at outdoor tanks shall be as per paragraph E above.
- Q. Final subgrade under slabs should be achieved with 6" of well graded granular soils compacted as per paragraph E above.

3.4 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 1400.
- B. Compaction testing will be performed by the contractor in accordance with WSDOT M41-10-88, Section 2-03.3(14)D.
- C. If tests indicate Work does not meet specified requirements, rework or remove Work, replace and retest.
- D. Frequency of Tests: 1 per compacted lift.
- E. Proof roll compacted fill surfaces under slabs-on-grade.
- F. Moisture-density curves for fill materials will be provided by the owner.

3.6 PROTECTION OF FINISHED WORK

- A. Protect finished Work from damage from construction

activities.

- B. Reshape and re-compact fills damaged by vehicular traffic.

3.7 PLASTIC SHEET MARKER

- A. Place continuous plastic sheet marker over buried utility lines. Place marker tape directly over line and 1 foot below finish grade. Place marker over each outside pipe of multiple lines. Place intermediate markers at maximum of 4 feet apart.
- B. Sheet marker shall be a non-detectable tape that is 6 inches wide similar to terra tape manufactured by the Griffolyn Company, Inc. Tape shall be imprinted with a warning such as "Caution Buried Installation Below" at intervals of not more than 4'0".

3.8 FINISH GRADING AND STABILIZATION

- A. Rake area disturbed by work, remove surface stones larger than 6 inches, and dispose of excess material and debris at area designated by KEH.
- B. Stabilize area disturbed by work with a 3 inch course of gravel fill (Type D). Finish stabilization course to elevations shown on the finish grading plan.

END OF SECTION

SECTION 02225

TRENCHING FOR UNDERGROUND UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating trenches for utilities, both interior & exterior, from point of use to point of interface tie-in.
- B. Installation and compaction of pipe bedding.
- C. Compacted fill from top of utility bedding to subgrade elevations.
- D. Backfilling and compaction.

1.2 RELATED SECTIONS

- A. Geotechnical report for ETF, Dames & Moore, 07/24/92.
- B. Section 01500 - Construction Facilities and Temporary Controls: Water control in excavations.
- C. Section 02222 - Excavating: General building excavation.
- D. Section 02223 - Backfilling: General backfilling.
- E. Section 02712 - Foundation Drainage System: filter aggregate, filter fabric, and high density polyethelene.
- F. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.3 REFERENCES

- A. Washington State Department of Transportation (WSDOT) M41-10-88, Standard Specifications for Road, Bridge, and Municipal Construction.
- B. KEH form KEH-0382 - "Soil Compaction Procedure".
- C. ASTM D 653-90 - Standard Terminology Relating to Soil, Rock, and Contained Fluids.

1.4 DEFINITIONS

- A. Utility: Any buried pipe, conduit, or cable.

1.5 FIELD MEASUREMENTS

- A. Verify that survey bench mark and intended elevations for the Work are as shown on drawings.

1.6 COORDINATION

- A. Coordinate work with others under the direction of the construction manager.
- B. Verify work associated with lower elevation utilities are complete before placing higher elevation utilities.

1.7 QUALITY ASSURANCE

- A. Product and installation services including inspections and test shall be furnished in accordance with Quality Assurance program meeting the requirements in Section 01400.
- B. Contractor shall supply a certificate of conformance certifying that all products and services rendered meet requirements of this section.
- C. Unless otherwise noted, inspections and tests require by this section shall be performed or witnessed by the contractors certified inspector.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Structural fill as specified in Section 02223 paragraph 2.1-A.
- B. Pipe bedding shall be sand as defined in ASTM-D-653-90 or excavated sandy material having less than 20 percent gravel particles with a maximum dimension of ½ inch.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.

- B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- C. Maintain and protect above and below grade utilities which are to remain.
- D. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Fill Type A and compact to density equal to or greater than requirements for subsequent backfill material.

3.2 EXCAVATION AND BACKFILL

- A. Make excavations wide enough to permit handling of pipe and accessories and making connections. Excavate with near vertical sides from bottom of trench up to 1 foot above utility lines. Excavate trench deep enough to permit placement of compacted sand bedding, 4 inches minimum thickness, beneath lines except where excavation is in undisturbed sand that will serve as bedding or where lines are to be encased in concrete. pare holes in trench bottoms for pipe couplings so pipe will bear full length of barrel or section.
- B. Install shoring to hold materials and surcharge pressure for full depth of trench.
- C. Keep trenches free of standing water when laying is in progress.
- D. If over-excavation occurs, correct by placement of structural backfill.
- E. Bedding placed beneath utility lines in trenches shall be as specified in paragraph 2.1-B.
- F. Place and compact bedding in trench prepared according to paragraph A before laying utility lines. Compact bedding as specified for structural backfill, in Section 02223.
- G. Place backfill over joints in underground pipes only after pressure testing of line has been completed.
- H. Backfill under conduit and haunches of pipe, around sides, and up to 1 foot above top of pipe or conduit with bedding material. Place and compact material same as specified for structural backfill. Compact with care to avoid misalignment

of pipe and provide uniform bearing along barrel of pipe.

- I. Backfill utility trenches from elevation 1 foot above top as follows:
 - 1. For locations specified in Section 02223, paragraph 3.3-E, use structural backfill.
 - 2. For other locations, use common backfill in accordance with Section 02223, paragraph 3.3-F.
- J. Do not allow heavy construction equipment to pass over buried lines until at least 2 feet of backfill has been placed over line or until bridging has been placed across trenching and approved.
- K. Where stabilization is required in accordance with Section 02223, paragraph 3.8, finish subgrade 3 inches below landscaping.

3.3 TOLERANCES

- A. Top Surface of Backfilling shall be plus or minus 1 inch from required elevations.

3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Compaction testing will be performed in accordance with WSDOT M41-10-88 and Specification Section 02223, paragraphs 3.3-E & F as applicable.
- C. If tests indicate Work does not meet specified requirements, rework or remove Work, replace, compact, and retest.
- D. Frequency of Tests: 1 test per 100 LF of trench.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work from damage from construction activities.
- B. Reshape and re-compact fills damaged by vehicular traffic during construction.

3.6 PLASTIC SHEET MARKER

- A. Install plastic sheet marker over all buried utility lines in accordance with Section 02223, paragraph 3.7. |

END OF SECTION

SECTION 02667
SITE WATER LINES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and fittings for site water line including sanitary water line and fire water lines.
- B. Valves and fire hydrants.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Supply of connection devices to building water main piping for placement by this Section.

1.3 RELATED SECTIONS

- A. Section 02222 - Excavating.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching.
- D. Section 15410 - Plumbing Piping.

1.4 REFERENCES

- A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.
- B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- E. ANSI/AWS A5.8 - Brazing Filler Metal.
- F. ANSI/AWWA C111- Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

- G. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
 - H. ANSI/AWWA C500 - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.
 - I. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.
 - J. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.
 - K. ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.
 - L. ANSI/AWWA C606 - Grooved and Shouldered Type Joints.
 - M. ASTM D1785 - Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - N. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
 - O. UL 246 - Hydrants for Fire - Protection Service.
 - P. NFPA-24 - Standard for installation of Private Fire Service Mains and their Appurtenances, 1987 edition.
 - Q. AWWA C600-87 - Standard for installation of Ductile Iron Water Mains and their Appurtenances.
 - R. Uniform Plumbing Code.
 - S. WS-DOT 41-10-88 Standard for road, bridges and municipal construction.
 - T. HPS-112M Specification for Disinfecting Sanitary Water System.
- 1.5 SUBMITTALS
- A. Submit under provisions of Section 01300.
 - B. Product Data: Provide physical properties data on pipe materials, pipe fittings, valves and accessories.
 - C. Submit leak test procedures.
 - D. Submit Q.A information as shown in paragraph 1.10.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

1.7 QUALITY ASSURANCE

- A. Products and installation services including inspections and test shall be furnished in accordance with Q.A Program meeting the requirements of Section 01400.
- B. Valves: Manufacturer's name and pressure rating shall be marked on valve body.
- C. Water mains and appurtenances shall be in accordance with Quality Assurance requirements of AWWA C600-87 and WS DOT M-41-10.

1.8 QA RECORDS

- A. Test Procedures
- B. Inspection and Test Reports.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01610.
- B. Deliver and store valves in shipping containers with labelling in place.

PART 2 PRODUCTS

2.1 SANITARY - WATER PIPE, EQUIPMENT AND ACCESSORIES

Refer to Section 15410-Plumbing Piping.

2.2 FIRE WATER PIPE, AND ACCESSORIES

- A. Manufacturers: None Suggested.
- B. PVC Pipe: ASTM D1785, for 100 psig rating SDR-21 for 200 psig rating.
- C. Fittings: ANSI/ASTM D2466, PVC.

D. Joints: ASTM D2855, solvent weld.

2.3 For Fire Water Systems use devices and materials meeting the requirements of NFPA 13 and the following table:

DEVICE	TYPE	MAKE/MODEL
Waterflow Detectors	Wet-pipe systems. Pressure switch for deluge, preaction, or dry-pipe system. Vane-type switches for wet-pipe systems.	Potter Model WFSRC Potter Model PS10 Potter Model VSR-F
Valve Position Switch	Not Specified.	Potter Model PIVSU-A, GVS, or OSYSU-A
Control Valve	Small valves with built-in supervisory switch. Underground valves and control valves for deluge, preaction, and alarm check valves.	Milwaukee Butterfly Valve Kennedy
Trim and Drain Valves	Ball, plug, butterfly, angle or globe type shutoff valves for use in air or water supply piping in conjunction with dry-pipe, deluge or alarm valves on sprinkler system.	Watts Regulatory Company and United Brass Works, Inc. Underwriter Laboratories, Inc.- Listed or Factory Manual System- Approved Products are standard.
Deluge, Dry-pipe, Alarm Check Valves	Not Specified.	Reliable
Fire Hydrants	Medallion	Clow

DEVICE	TYPE	MAKE/MODEL
Backflow Preventers	Double-check type for low hazard. Reduce-pressure type for high hazard.	Ames
Tapping Sleeve and Valve	Not Specified.	Clow

2.4 BEDDING MATERIALS

- A. Bedding: Fill Type as specified in Section 02223.

2.5 ACCESSORIES

- A. Concrete for Thrust Blocks: Concrete type specified in Section 03300.
- B. Backflow Preventer: AWWA Tested & Certified.
- C. Meter: Verify with municipality
- D. Manholes and Covers: Refer to section 02607.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that building service connection and existing/provided utility water main size, location and invert are as indicated on the construction drawings.

3.2 PREPARATION

- A. Ream pipe and tube ends and remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.
- D. Perform Work in accordance with this specification and applicable codes and standards. Tie-In permits shall be obtained in accordance with Section 01065.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02225 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Compact per the structural fill requirements of Section 02223.
- C. Backfill around sides and to top of pipe in accordance with WS-DOT-41-10-88 and Section 02223 with fill, tamped in place and compacted.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Group piping with other site piping work whenever practical.
- B. Install pipe to indicated elevation to within tolerance of 5/8 inches.
- C. Install grooved and shouldered pipe joints to ANSI/AWWA C606.
- D. Route pipe in straight line.
- E. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- F. Install access fittings to permit disinfection of water system performed in accordance with para. 3.6 A.
- G. Slope water pipe and position drain at low points.
- H. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main. (Ref. Drawing H-2-89044 for location)
- I. Establish elevations of buried piping to ensure not less than 5 ft of cover.
- J. Backfill trench in accordance with Section 02223.

3.5 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.

- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Set hydrants plumb and locate pumper nozzle perpendicular to roadway.
- D. Set hydrants to grade, with nozzles at least 20 inches above ground.
- E. Locate control valve 4 inches away from hydrant.
- F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening.
- G. Paint hydrants in accordance with Section 09900.

3.6 TESTING

- A. Perform test after lines have been flushed and before backfilling or application of exterior protection protective coating.
- B. Flush and disinfect system in accordance with HPS-112M, specification for Disinfecting Sanitary Water Systems.
- C. Document leak/pressure testing of each piping system on the "Leak/Pressure Test Configuration form KEH-1757 furnished by KEH. Tests shall be witnessed by JGC and KEH.

3.7 SERVICE CONNECTIONS

- A. Provide water service per applicable codes and standards requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.
- B. Anchor service main to interior surface of foundation wall. Provide 18 gage galvanized sheet metal sleeve surrounding service main to 6 inch above floor and 5 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.

- B. Compaction control testing will be performed in accordance with WS DOT M41-10-88.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner. Nonconformance shall be dispositioned in accordance with Section 01400.
- D. Underground fire water mains shall be documented on NFPA-24, Contractor Material of Test Report.
- E. Inspection and Testing shall be performed or witnessed by Contractor's Certified Inspector and documented.

END OF SECTION

SECTION 02732

SITE SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, accessories and bedding.
- B. Connection of building sanitary drainage system to septic tank.
- C. Cleanout access.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Supply of connection devices to building and septic sewer piping for placement by this Section.

1.3 RELATED SECTIONS

- A. Section 02222 - Excavating: Excavating subsoil for sewer system piping.
- B. Section 02223 - Backfilling: Backfilling over piping up to subgrade elevation underside of fill under paving.
- C. Section 03300 - Cast-in-Place Concrete: Concrete type for cleanout base pad construction.

1.4 REFERENCES

- A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- C. ANSI/ASTM D2729 - Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
- D. Uniform Plumbing Code. |
- E. WS DOT M41-10-88. |

1.5 DEFINITIONS |

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300, Submittals. |
- B. Product Data: Provide physical property data indicating pipe, and pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Provide Certificate of Conformance that products meet or exceed specified requirements. |
- E. Submit QA information as listed in paragraph. |

1.7 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01300.
- B. Record location of pipe runs, connections, cleanouts, and invert elevations.

1.8 QUALITY ASSURANCE

- A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.
- B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the requirements of this Section.
- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector. |

1.9 QA RECORDS

- A. Test Procedures. |
- B. Inspection and Test Reports. |

1.10 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements and elevations are as indicated.

1.12 COORDINATION

- A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to septic system, and trenching.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

Refer to Section 15410-Plumbing Piping. |

2.2 PIPE ACCESSORIES

A. Pipe Joints: Refer to Section 15410-Plumbing Piping. |

B. Fittings: Refer to Section 15410-Plumbing Piping. |

2.3 CLEANOUTS

A. Refer to Section 15430-Plumbing Specialties. |

2.4 BEDDING MATERIALS

A. Bedding: As specified in Section 02223 - Backfilling. |

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with course aggregate.

- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02225 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM C12 and manufacturer's instructions. Seal joints watertight.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch.
- C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches compacted to 95 percent.
- D. Refer to Section 02225 for trenching requirements. Do not displace or damage pipe when compacting.
- E. Connect to building sanitary sewer outlet through installed sleeves.

3.5 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.6 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed and documented under provisions of Section 01400.
- B. Request inspection prior to and immediately after placing bedding.
- C. Compaction testing will be performed in accordance with WS DOT M41-10-88 Section 2-03.3 3(14)D.
- D. If tests indicate Work does not meet specified requirements, remove Work rework/replace and retest at no cost to Owner. Refer to Section 01400 Quality Assurance for non-conformance.
- E. Leak Test in accordance with UPC, Appendix I, Paragraph 10(b) after lines have been flushed and before backfilling or application of exterior protective coating. Tests shall be witnessed by JGC and KEH.

3.7 PROTECTION

- A. Protect finished installation under provisions of Section 01500.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.8 SCHEDULE

- A. Sanitary Sewer Main: As note on drawings.
- B. Cleanout: As noted on drawings.

END OF SECTION

SECTION 02745
SEPTIC TANK SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Septic tank, dosing chamber, distribution box, valve box, connecting piping, and filter drainage field system.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Supply of connection devices to building sewage piping for placement by this Section.

1.3 RELATED SECTIONS

- A. Section 02222 - Excavating.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching for Underground Utilities.
- D. Section 02510 - Asphaltic Concrete Paving.
- E. Section 02732 - Sanitary Sewerage Systems: Effluent discharge.
- F. Section 15410 - Plumbing Piping.

1.4 REFERENCES

- A. ANSI/ASTM D2729 - Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
- B. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- C. Uniform Plumbing Code.
- D. HS 20-44-1983 America Association of State Highway and Transportation Officials (AASHTO), load criteria.
- E. Benton - Franklin District Health Department "On-Site Sewage Disposal System Standards for Construction and Design," Rev. 1-1986.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300, submittals.

- B. Shop Drawings: Indicate plan, location and inverts of filter field, inverts of connecting piping.
- C. Product Data: Provide data on tank accessories.
- D. Manufacturer's Installation Instructions: Indicate special procedures for septic tank installation.
- E. Manufacturer's Certificate: Provide Certificate of Conformance that product meets or exceeds specified requirements.
- F. WS DOT M41-10 for installation requirements where structure backfill is required.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations and inverts of buried pipe, components, and connections.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code and regulations for work of this Section.
- B. Provide certificate of compliance from Benton-Franklin District Health Department having jurisdiction indicating approval of systems.

1.8 QUALITY ASSURANCE

- A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.
- B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the requirements of this Section.
- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector.

1.9 COORDINATION

- A. Coordinate the work with connections to building sanitary sewer piping outlet.

1.10 QA RECORD

- A. Test Procedures.
- B. Inspection and Test Reports.

PART 2 PRODUCTS

2.1 MANUFACTURERS - SEPTIC TANK AND DISTRIBUTION BOX

2.2 SEPTIC TANK

- A. Two compartment precast concrete tank meeting the requirements of UPC, (Appendix I).
- B. Inlet compartment shall be at least two-thirds the total tank capacity.
- C. Tank Capacity: 2000 gallons.
- D. Tank shall be designed to withstand American Association of State Highway and Transportation Officials (AASHTO), HS 20-44-1983 load criteria given in figure 3.7.6B and 3.7.7A, and constructed in accordance with UPC, Appendix I.

2.3 DOSING CHAMBER

- A. Single compartment precast concrete tank meeting the requirements of UPC, (Appendix I), WAC 246-272, and "On-Site Sewage Disposal System Standards for Construction and Design, "(Benton Franklin District Health Department).
- B. Tank Capacity: 1260 gallons, minimum.
- C. Tank shall be designed to withstand American Association of State Highway and Transportation Officials (AASHTO), HS 20-44-1983 load criteria given in figure 3.7.6B and 3.7.7A, and constructed in accordance with UPC, Appendix I.

2.4 DISTRIBUTION BOX

- A. Polypropylene with a minimum of five (5) ports similar to that manufactured by Hancor.

2.5 VALVE BOX

- A. Polypropylene with a minimum of four (4) ports.
- B. Capable of directing flow to two out of three drains fields. Capacity to connect a fourth drain field to the valve box.

2.6 SUBMERSIBLE SEWAGE PUMPS

Refer to Section 15450-Plumbing Equipment.

2.7 CONNECTING PIPE MATERIALS

A. Septic Pump to Valve Box.

1. Pipe: Galvanized steel, seamless or welded, ASTM A 53-89a.
2. Schedule: 40.
3. Fittings: Class 150 malleable iron, galvanized, threaded, in accordance with ANSI B16.3-1985.
4. Union: Galvanized malleable iron, threaded, federal specification (FS) WW-U-531F, Type B, Class 2.
5. Valves
 - a) Ball: NIBCO T-590-W, or approved equal.
 - b) Gate: NIBCO T-124, or approved equal.
 - c) Check: NIBCO T-413-B, or approve equal.

B. Solid Piping from Valve Box to Drain Filed Headers

1. Pipe: Polyvinyl chloride (PVC) meeting the requirements of ASTM D 2729-89.
2. Schedule.
 - a) Under roadways: Schedule 80.
 - b) All other locations: Schedule 40.
 - c) Refer to project drawings for exact locations.
3. Fittings: ANSI/ASTM D2466, PVC.
4. Joints: ASTM D2855, Solvent weld.

C. Perforated Piping from Drain Field Headers to End of Drain Fields

1. Pipe: Polyvinyl chloride (PVC) meeting the requirements of ASTM D 2729-89.
2. Schedule: 40.

2.8 BEDDING MATERIALS

- A. Aggregate Bedding Material: Fill type in accordance with the requirements of WS DOT M41-10-88 Section 9-03.8(1), (2), 3B.

2.9 FILTER AGGREGATE

- A. Filter Aggregate Materials: Fill type in accordance 3. with the requirements of WS DOT M41-10-88 Section 9-03.8(1), (2), 3B.
- B. Filter Sand Materials: Fill type in accordance with the requirements of WS DOT M41-10-88 Section 9-03.8(4).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the existing building sanitary sewer connection, size, location and invert are as indicated.

3.2 PREPARATION

- A. Ream pipe ends and remove burrs.
- B. Remove scale and dirt from components before assembly.
- C. Establish invert elevations for all components in the system.
- D. Hand trim excavation to suit septic tank, distribution box and field tile arrangement. Remove stones, roots or other obstructions.

3.3 TANK AND TANK BEDDING

- A. Install septic and dosing tanks in accordance with UPC, Appendix I.
- B. Excavate in accordance with Section 02225 for work of this Section. Hand trim excavation for accurate placement of tank to elevations indicated.
- C. Place bedding material level in one continuous layer not exceeding 8 inches compacted depth, compact to 95 percent.
- D. Backfill around sides of tank, tamped in place and compacted to 95 percent.
- E. Maintain optimum moisture content of bedding material to attain required compaction density.

- F. Install septic tank, dosing tank, and valve box and related components on bedding in accordance with manufacturer's instructions.

3.4 CONNECTING PIPING

- A. Place pipe and fittings on clean excavated subsoil.
- B. Slope piping to each successive component, minimum of 1/4 inch / foot.
- C. Cover pipe with aggregate, sides and top.

3.5 INSTALLATION - FILTER FIELD

- A. Install drain field per Benton-Franklin District Health Department guidelines.
- B. Place field pipe header at constant elevation sloping down from header inlet, 1/8 inch / foot.
- C. Place 3/4" to 1-1/2" washed drain rock absorption bed (refer to drawing H-2-89157) 15 inch thick, tamp compact firm. Establish slope of bed to suit established invert elevations.
- D. Place pipe sloping away from header minimum of 1/16 inch / foot, with perforations facing down.
- E. Wrap pipe joints with paper, cover with aggregate, sides and top. Place geotextile filter fabric over cover prior to backfilling to preclude the closure of the absorption bed.
- F. Cover entire field with clean backfill (refer to drawing H-2-89157) 18 inches, lightly compact. Level prior to placement of subsoil cover as specified in Section 02223.

3.6 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Inspector by contractor's Certified Inspectors shall occur prior to placing aggregate cover over piping. Document results and report nonconformance in accordance with Section 01400.
- C. Compaction testing will be performed in accordance with Section 02223, paragraph 3.3.F.

- D. Inspect and test Septic and Dosing Tanks in accordance with UPC, Appendix I.
 - E. Inspect and test valves box and drain field per Benton Franklin District Health Department guidelines.
 - F. If tests indicate work does not meet specified requirements, remove Work, rework/replace and retest. Refer to Section 01400 for documentation requirements.
- 3.7 PROTECTION OF FINISHED WORK
- A. Protect finished Work under provisions of Section 01540.
 - B. Do not permit vehicular traffic over drainage field.

END OF SECTION

SECTION 15010

MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 Section Includes

- A. Scope - Provisions specified in this section apply to sections of Division 15.
- B. Code requirements - Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction. The applicable revision of the code referenced herein shall be as listed in S-1222-005, Applicable Codes and Standards. Revisions of codes not specifically listed in this document shall be the version in effect as of Dec. 2, 1991.
- C. Drawings - Drawings are diagrammatic, and do not give fully dimensioned locations of various elements of work. Establish exact locations from field measurements.
- D. Obstruction - Drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available records. This information is not guaranteed, however, as to accuracy of location or completeness.
- E. Openings -
 - 1) Layout work required to establish exact size and location of openings for ductwork, piping, and equipment is part of the work to be performed under Division 15.
 - 2) Firestopping is specified in individual sections of Division 15.
- F. Definition of concealed and exposed - Where the work concealed or exposed is used in connection with insulating, painting, piping, ducts, and other items of work the words are defined as follows:
 - 1) Concealed: Hidden from sight as in

chases, furred spaces,
suspended ceilings, or under
grating; and

2) Exposed: Open to view.

G. Order of precedence - Plan mechanical work as follows:

- 1) Lay out mechanical work sufficiently in advance to avoid conflicts or interferences with other work in progress so that in case of interference the mechanical layout may be altered to suit the conditions, prior to the installation of work.
- 2) Establish the exact location of mechanical equipment based on the actual dimensions of equipment furnished.
- 3) HVAC and electrical work shall proceed according to the following sequence:
 - a) Air handling equipment placement;
 - b) Duct routing
 - c) Locating smoke detectors;
 - d) Locating lighting fixtures;
 - e) Pipe routing; and
 - f) Conduit routing

1.2 Related Sections and JGC Specifications:

- A. Section 01400 - Quality Assurance.
- B. Refer to Paragraph 1.4 for JGC Specifications.

1.3 Materials -

- A. General - Consider space limitations imposed by adjacent work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.
- B. Lubricants - Provide proper quantity of correct lubricant for each item of equipment requiring lubrication. See paragraph 1.4 for equipment provided by JGC and installed by contractor.

- C. Identification of equipment and piping - Refer to Section 15190 for piping labels, valve tags, HVAC system markers, equipment nameplates, and chart frames. Coordinate identification of HVAC piping with identification of plumbing piping to avoid duplication of color or letter designation.

1.4 Installation

- A. Equipment - Install equipment, accessories, support systems and appurtenances in accordance with the manufacturers installation instructions, erection drawings, and as indicated.
- B. Equipment provided by JGC and installed by contractor. The following equipment will be received, stored, assembled and rigged by contractor:

JGC EQUIPMENT NUMBER	DESCRIPTION	JGC DOCUMENT NUMBER
2025E-45A-F-1A	Exhaust Fan, RCA	S-13K1-008
2025E-45A-F-1B	Exhaust Fan, RCA	S-13K1-008
2025E-45A-F-1C	Exhaust Fan, RCA, (Standby)	S-13K1-008
2025E-45A-F-2	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45A-F-3	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45A-F-4	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45A-F-5	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45A-F-6	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45A-F-7	Exhaust Fan, Non-RCA	S-13K1-006
2025E-45B-EVU-1A	Central Station AHU	S-13K1-004
2025E-45B-EVU-1B	Central Station AHU, (Standby)	S-13K1-004
2025E-45B-EVU-2A	Water Chiller, Air Cooled	S-13K1-002
2025E-45B-EVU-2B	Water Chiller, Air Cooled	S-13K1-002

JGC EQUIPMENT NUMBER	DESCRIPTION	JGC DOCUMENT NUMBER
2025E-45B-EVU-3A	Heat Pump, Non-RCA	S-13K1-007
2025E-45B-EVU-3B	Heat Pump, Non-RCA	S-13K1-007
2025E-45B-EVU-4	Heat Pump, Elec Eqp. Rm.	S-13K1-007
2025E-45B-EVU-5	Heat Pump, Control Room	S-13K1-007
2025E-45B-EVU-6	Fan Coil Unit, Non-RCA	S-13K1-007
2025E-45B-EVU-7	Fan Coil Unit, Elec. Eqp. Rm.	S-13K1-007
2025E-45B-EVU-8	Fan Coil Unit, Control Room	S-13K1-007
2025E-45B-EVU-9	Air Handling Unit, Room 132	S-13K1-004
2025E-45B-EVU-10	Air Handling Unit, Room 139	S-13K1-004
2025E-45B-P-1A	Pump, Chilled Water	S-13K1-003
2025E-45B-P-1B	Pump, Chilled Water (Standby)	S-13K1-003
2025E-45C-FL-2A	HEPA Filter Unit	S-13K1-005
2025E-45C-FL-2B	HEPA Filter Unit	S-13K1-005
2025E-45C-FL-2C	HEPA Filter Unit (Standby)	S-13K1-005

- C. Coordination, design, and installation of control system wiring, instrumentation, and interfaces with the Monitor and Control System (MCS) for equipment in Division 15 shall be provided in other Divisions of this specification and other JGC specifications.
- D. Air filters and pipe strainers:
- Immediately prior to final acceptance, inspect, clean, and service air filters and strainers.
 - Replace disposable type air filters after construction and testing has been completed.
 - Deliver and store filters in a location approved by JGC. These filters are in addition to the final sets installed following testing procedures.

1.5 QUALITY ASSURANCE

- A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.
- B. Contractor shall supply a Certificate of Conformance certifying that all products and services meet the requirements of the various Sections of Division 15.
- C. Unless otherwise noted, inspections and tests required by the various Sections of Division 15 shall be performed or witnessed by contractors' certified inspector.
- D. Submittals. Conform to the procedures specified.
 - 1) Shop drawings. Submit shop drawings for the following items specified in Division 15:
 - a) HVAC ductwork; and
 - b) HVAC exhaust stack.
 - 2) Test reports. Submit test reports documenting results of field tests.
 - a) Tests. After HVAC systems have been completed and put in the operation, subject each system to an operating test under design conditions to ensure proper sequence and performance throughout the operating range. Make adjustments as required to ensure proper functioning of systems. Special testing of individual systems is specified under the appropriate Sections of Division 15.
 - b) Training. After final tests and adjustments to the HVAC system have been completed, instruct JGC, KEH, and WHC personnel in the details of operation of equipment. Provide qualified personnel to demonstrate the operation of equipment to ensure personnel are properly trained to operate and maintain the equipment.

1.6 QUALITY ASSURANCE RECORDS

- A. Submittals. Conform to the requirements of the various

Sections of Division 15.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION.

NOT USED

END OF SECTION

SECTION 15410
PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Domestic water piping system.

1.2 RELATED SECTIONS

- A. Section 02222 - Excavating.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching for underground utilities. |
- D. Section 09900 - Painting.
- E. Section 15140 - Supports and Anchors.
- F. Section 15190 - Mechanical Identification.
- G. Section 15245 - Vibration Isolation. |
- H. Section 15260 - Piping Insulation.
- I. Section 15430 - Plumbing Specialties.
- J. Section 15440 - Plumbing Fixtures.
- K. Section 15450 - Plumbing Equipment.

1.3 REFERENCES

- A. ANSI B31.1 - Power Piping.
- B. ANSI B31.9 - Building Service Piping.
- C. ASME - Boiler and Pressure Vessel Code.

- D. ASME Sec. IX - Welding and Brazing Qualifications. |
- E. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- F. ASME B16.3 - Malleable Iron Threaded Fittings.
- G. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
- H. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- I. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
- J. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
- K. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- L. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- M. ASME B16.32 - Cast Copper Alloy Solder-Joint Fittings for Sovent Drainage Systems.
- N. ASTM A47 - Ferritic Malleable Iron Castings.
- O. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- P. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- Q. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- R. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- S. ASTM B32 - Solder Metal.
- T. ASTM B42 - Seamless Copper Pipe.
- U. ASTM B43 - Seamless Red Brass Pipe.
- V. ASTM B75 - Seamless Copper Tube.
- W. ASTM B88 - Seamless Copper Water Tube.

- X. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
- Y. ASTM B302 - Threadless Copper Pipe (TP).
- Z. ASTM B306 - Copper Drainage Tube (DWV).
- AA. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- AB. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- AC. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- AD. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AE. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- AF. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- AG. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- AH. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- AI. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- AJ. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
- AK. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- AL. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
- AM. ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe.
- AN. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AO. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe

and Fittings.

- AP. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.
- AQ. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- AR. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AS. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AT. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.
- AU. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- AV. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- AW. ASTM F845 - Plastic Insert Fittings for Polybutylene (PB) Pipe.
- AX. AWS A5.8 - Brazing Filler Metal.
- AY. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- AZ. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- BA. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- BB. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- BC. AWWA C651 - Disinfecting Water Mains.
- BD. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- BE. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

- BF. CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components.
- BG. NCPWB - Procedure Specifications for Pipe Welding.
- BH. NFPA 54 - National Fuel Gas Code.
- BI. NFPA 58 - Storage and Handling of Liquified Petroleum Gases.
- BJ. UPC - Uniform Plumbing Coded - 1991.
- BK. Federal Specifications (FS) WW-U-531F.
- BL. HPS-112-M Hanford Plant Standard, Specification for Dis-
Infecting Sanitary Water System

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Record actual locations of valves.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with local plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Accept valves on site in shipping containers with labelling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- F. Preserve identity of pipe from time of receipt onsite until installation is complete. Store pipe of different material specifications and grades separately.
- G. When pipe is removed from bundle and cut, return remaining pieces to bundle or clearly and permanently mark. Do not remove manufacturer's identifying tags from bundles of pipe.
- H. When pipe type identifying mark is cut from length of pipe, remark remaining section clearly and permanently. Use either original marking or field code symbol for each grade of pipe.

1.10 QUALITY ASSURANCE

- A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.
- B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the requirements of this Section.

- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector.
- D. Valves: Manufacturer's name and pressure rating marked on valve.
- E. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- F. Inspection and Testing Requirements:
 - 1. Adhere to all inspections requirements of Section 318(a) of the 1991 Uniform Plumbing Code.
 - 2. Adhere to all testing requirements of Section 318(b) of the 1991 Uniform Plumbing Code.

1.11 QUALITY ASSURANCE RECORDS

- A. Conform to the submittal requirements of this Section.
- B. Submittal requirements:
 - 1. Welder qualifications and weld procedures.
 - 2. Certificate of Approval issued by Administration Authority.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING

- A. Adhere to the requirements of the Following table:

SANITARY SEWER PIPING			
Service	Maximum Operating Pressure	Maximum Operation Temperature	Test Pressure
Sanitary Sewer (SNS) Sanitary Sewer Vent (V)	Atmospheric Atmospheric	In Accordance with UPC 160 °F	Underground: All sizes

Size	Aboveground: 2 inch and smaller	Aboveground: 2-1/2 inch and larger.	
Pipe	Standard weight galvanized steel, ASTM A 53-89a. OR Hubless cast iron sanitary system in accordance with CISPI Designation 301-82.	Hubless cast iron sanitary system in accordance with CISPI Designation 301-82.	Service weight cast iron solid pipe in accordance with ASTM A74-87.
Joints	Threaded, sealed with specified sealant tape. Apply tape to male threads only.	Sealing sleeve with shield clamp assembly in accordance with CISPI Designation 301-82.	Hubless cast iron soil fittings in accordance with ASTM A-74-87.
Fittings	Waste Piping: Black cast iron, ANSI B16.12-1983. Vent Piping: Class 125 cast iron threaded in accordance with ANSI B16.4-1985.	Hubless cast iron in accordance with CISPI Designation 301-82.	Service weight cast iron soil fittings in accordance with ASTM a 74-87.

ANSI = American National Standards Institute.
 ASTM = American Society of Testing and Materials.
 CISPI = Cast Iron Soil Pipe Institute
 UPC = Uniform Plumbing Code.

2.2 SANITARY WATER PIPING, BURIED WITHIN 10 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: AWWA C151.
 1. Fittings: Ductile iron, standard thickness.
 2. Joints: AWWA C111, rubber basket with 3/4 inch (19 mm) diameter rods.

2.3 SANITARY WATER PIPING, ABOVE GRADE

- A. Adhere to the requirements of the following table:

SANITARY WATER PIPING			
Service	Maximum Operating Pressure (psi)	Maximum Operation Temperature (°F)	Test Pressure (psig)
Cold Sanitary Water (CSW)	100	70	175
Hot Sanitary Water (HSW)	100	160	175
Size	3/4 inch through 2-1/2 inch		
Pipe	Galvanized steel, Seamless or welded, ASTM A 53-89a.		
Wall Thickness	Standard weight		
Fittings	Class 150 malleable iron, galvanized, threaded, in accordance with ANSI B16.3-1985.		
Cleaning	Flush with water in accordance with this section.		
Disinfect	Disinfect sanitary water lines in accordance with this section.		

psig = pounds per square inch (gage).

B. Sealant for the Threaded Piping Joints.

1. Teflon-type, similar to scotch brand pipe sealant tape No. 547; Chemtrol Dri-Seal No. 5; or Crane packing Company Threaded-Tape.

2.4 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2-1/2 Inches (50 mm) and Under:
 1. Galvanized malleable iron, threaded, federal Specifications (FS) WW-U-531f, Type B, Class 2.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.5 GATE VALVES

- A. Up to and including 2-1/2 Inches (50 mm): NIBCO T-124, or approved equal.

2.6 GLOBE VALVES

- A. Up to and including 2-1/2 Inches (50 mm): Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, solder or screwed ends, with back seating capacity (repackable under pressure).

2.7 BALL VALVES

- A. Up to and including 2-1/2 Inches (50 mm): NIBCO T-530-w, or approved equal.

2.8 PLUG VALVES

- A. Up to and including 2-1/2 Inches (50 mm): Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.

2.9 BUTTERFLY VALVES

- A. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat, wafer or lug ends, extended neck, infinite position lever handle with memory stop.

2.10 FLOW CONTROLS

- A. Construction: Brass or bronze body with union on inlet.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psig.

2.11 CHECK VALVES

- A. Up to and including 2-1/2 Inches (50 mm): NIBCO T-413-B, or approved equal.

2.12 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches (50 mm): Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union ends.
- B. Over 2 Inches (50 mm): Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.13 RELIEF VALVES

- A. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.14 STRAINERS

- A. Size 2 inch (50 mm) and Under: Screwed brass or iron body for 175 psig (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- B. Size 2-1/2 inch (65 mm) to 4 inch (100 mm): Flanged iron body for 175 psig (1200 kPa) working pressure, Y pattern with 3/64 inch (1.2 mm) stainless steel perforated screen.
- C. Size 5 inch (125 mm) and Larger: Flanged iron body for 175 psig (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavations under provisions of Section 02222.
- B. Verify that excavations are to required grade, dry, and not

over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with applicable codes, standards, and manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance for installation of insulation and access to valves and fittings. Refer to Section 15140.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section

09900.

- M. Excavate in accordance with Sections 02222 and 02225 and for work of this Section.
- N. Backfill in accordance with Sections 02223 and 02225 for work of this Section.
- O. Install bell and spigot pipe with bell end upstream.
- P. Install valves with stems upright or horizontal, not inverted.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- E. Provide spring loaded check valves on discharge of water pumps.
- F. Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

- A. Establish invert elevation, slopes for drainage to 1/4 inch per foot. Maintain gradients.
- B. slope water piping and arrange to drain at low point.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Before disinfecting, remove equipment parts that could be damaged by disinfecting solution, and disinfect removed parts before reinstallation of these parts in accordance with the standards in part B. below.
- B. Following flushing and hydrostatic testing, disinfect

Specification S-1131-103
Section 15410
Revision 1
Page 14 of 14

sanitary water lines in accordance with AWWA C651-86 or HPS-112-M.

END OF SECTION

SECTION 15430
PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Floor drains.
- B. Cleanouts.
- C. Hose bibs.
- D. Hydrants.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Interceptors.
- H. Thermostatic mixing valves.

1.2 RELATED SECTIONS

- A. Section 15410 - Plumbing Piping.
- B. Section 15440 - Plumbing Fixtures.
- C. Section 15450 - Plumbing Equipment.

1.3 REFERENCES

- A. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- B. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
- C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- E. ANSI A112.21.1 - Floor Drains.
- F. ANSI A112.26.1 - Water Hammer Arrestors.

G. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

H. PDI WH-201 Water Hammer Arresters.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Record actual locations of equipment, cleanouts, and backflow preventers.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Accept specialties on site in original factory packaging. Inspect for damage.

1.8 QUALITY ASSURANCE

A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.

B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the

requirements of this Section.

- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector.

1.9 QUALITY ASSURANCE RECORDS

- A. Conform to the submittal requirements of this Section.
- B. Submittal requirements
 - 1. Certificate of Conformance
 - 2. Project Record Documents (Paragraph 1.5)

Part 2 Products

2.1 FLOOR DRAINS

- A. Manufacturers:
 - 1. J.R. Smith Manufacturing Company
 - 2. Other acceptable manufacturers offering equivalent products.
 - a) Zurn
 - b) Josam
- B. P-7: Use J.R. Smith Manufacturing Company, Figure 2010-A, for inside caulk, size 2-inch with 5-inch polished bronze strainer, or approved equal.

2.2 CLEANOUTS

- A. Exterior Unsurfaced Areas (CO): Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- B. Interior Finished Floor Areas (FCO): Galvanized cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze strainer, round with scoriated cover in service areas and square with depressed cover to accept floor finish in finished floor areas.
- C. Interior Finished Wall Areas (WCO): Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

- D. Interior Unfinished Accessible Areas (CO-Stairwell): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.3 HOSE BIBS

- A. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lockshield and removable key, integral vacuum breaker in conformance with ANSI/ASSE 1011.

2.4 HYDRANTS

- A. Manufacturers:

1. J.R. Smith Manufacturing Company
2. Other acceptable manufacturers offering equivalent products.
 - a) Josam
 - b) Zurn

- B. Wall Hydrant: Use nonfreeze type, similar to J.R. Smith 5610, 3/4 inch, with loose key and 3/4 inch hose threads and chrome face.

2.5 BACK WATER VALVES

- A. ANSI A112.21.2; galvanized cast iron body and cover, brass valve, access cover, extension sleeve and cover.

2.6 BACKFLOW PREVENTERS

- A. Use a Reduced Pressure Principle Backflow Device (RPBD) consisting of two shutoff valves, and incorporates two check valves and a relief valve to automatically maintain zone between check valves at pressure less than supply pressure.
- B. Failure of any working part shall result in continuous discharge.
- C. Backflow Prevention Device shall be Washington State Approved.

2.7 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psig (1700 kPa) working pressure.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of floor construction to receive drains to required invert elevations.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Pipe relief from back flow preventer to nearest drain.
- E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, and washing machine outlets.

END OF SECTION

SECTION 15440
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Mop sinks.
- F. Showers.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 11400 - Food Services Equipment: Supply of Electric Water Coolers, Stainless Steel, Steel Kitchen Sink and Shower Bases and Enclosures for placement by this Section.

1.3 RELATED SECTIONS

- A. Section 06410 - Custom Casework: Preparation of counters for sinks.
- B. Section 06410 - Custom Casework: Lavatory tops.
- C. Section 07900 - Joint Sealers: Seal fixtures to walls and floors.
- D. Section 11400 - Food Services Equipment.
- E. Section 15140 - Supports and Anchors.
- F. Section 15410 - Plumbing Piping.
- G. Section 15430 - Plumbing Specialties.
- H. Section 15450 - Plumbing Equipment.

1.4 REFERENCES

- A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

- B. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
 - C. ANSI/ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
 - D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.
 - E. ANSI/ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
 - F. ANSI/ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
 - G. ANSI/ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).
 - H. IAPMO/ANSI Z124.1 - Plastic Bathtub Units.
 - I. IAPMO/ANSI Z124.2 - Plastic Shower Receptors and Shower Stalls.
 - J. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.
 - K. ANSI/ARI 1010 - Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers.
- 1.5 SUBMITTALS
- A. Submit under provisions of Section 01300.
 - B. Product Data: Provide catalogue illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
 - C. Manufacturer's Installation Instructions.
- 1.6 OPERATION AND MAINTENANCE DATA
- A. Submit under provisions of Section 01700.
 - B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
 - B. Accept fixtures on site in factory packaging. Inspect for damage.
 - C. Protect installed fixtures from damage by securing areas and

by leaving factory packaging in place to protect fixtures and prevent use.

1.8 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated.
- B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

1.9 WARRANTY

- A. Provide one year warranty under provisions of Section 01700.

1.10 QUALITY ASSURANCE

- A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.
- B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the requirements of this Section.
- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector.

1.11 QUALITY ASSURANCE RECORDS

- A. Conform to the submittal requirements of this Section.
- B. Submittal requirements
 - 1. Certificate of Conformance

PART 2 PRODUCTS

2.1 WATER CLOSET (P-1)

- A. Wall-mounted, vitreous china, elongated siphon jet action bowls. Similar to American Standard, Inc., Glenco No. 2502.011 with No. 5320.114 white open front seat, Royal No. 10 flush valve, and floor-mounted adjustable supporting chair carrier.
- B. Quantity: 7. Refer to project drawings for installation location.

2.2 WATER CLOSET For Handicapped (P-1)

A. Wall-mounted, vitreous china elongated siphon jet action bowls. Similar to American Standard, Inc., Glencoe No. 2502.011 with No. 5320.114 white open front seat, Royal No.110 flush valve, and JR Smith Hi-Set floor-mounted adjustable supporting chair carrier.

B. Quantity: 2. Refer to project drawings for installation location.

2.3 URINAL (P-3)

A. Urinals. Wall-mounted, vitreous china, flushing rim siphon jet. Similar to Jetbrook No. 6570.014, with Royal No. 180 flush valve.

2.4 LAVATORY

A. Lavatories (P-4). Similar to American Standard, Inc., Roxylyn No. 0195.073, 20 by 18 inches flat slab lavatory for concealed arm support, with centerset supply fitting with spray face nozzle and integral flow restrictor, PO plug with perforated grid strainer, 1-1/4-inch cast body adjustable "P" trap with cast escutcheon with set screw, angle supplies with wheel handle stops with stuffing box and flexible risers, and floor mounted fixture support with concealed arms.

B. Quantity: 6. Refer to project drawings for installation location.

2.5 LAVATORY FOR HANDICAPPED (P-4)

A. Lavatories for Handicapped. Similar to American Standard, Inc., No. 9141.011, 20 by 27 inches wheelchair lavatory with concealed arm support and centerset gooseneck faucet with wrist handles, PO plug with perforated grid strainer, 1-1/4-inch cast body adjustable "P" trap with cast escutcheon with set screw, angle supplies with wheel handle stops with stuffing box and flexible risers, and floor mounted fixture support with concealed arms.

B. Quantity: 2. Refer to project drawings for installation location.

2.6 Service Sink

A. Service Sink. Similar to Akron No. 7695.018, 24 by 20 inches, acid-resisting enameled iron for through-back faucet with No. 8379.026 rim guard, No. 7798.176 acid-resisting inside "P" trap standard and cast brass drain plug, back mounted combination faucet with short spout with hose end, pail hook, vacuum breaker, and angle supplies with stops and flexible risers.

2.7 SHOWER

A. Shower Receptor (SH-1)

1. Manufacturer: Florestone
2. Florestone, Model No. Custom 200, 36"x36", metal tiling flange 1" above ledge on three sides, with center drain, or approved equal.
3. Provide integral 2" diameter drain molded into receptor and provided with Florestone WEDGE-LOK seal, or approved equal.

B. Trim

1. Manufacturer: Moen.
2. Moen, Model No. 8375, Posi-temp mixing valve with stops, vandal resistant HAF-CC, or approved equal.

C. Shower Heads

1. Manufacturer: Moen.
2. Moen, Model No: 12894, Chrome finish, Easy Clean Delux head, arms, and flange, with vandal resistant features, 2.5 gpm flow control, or approved equal.

2.8 WATER FOUNTAINS

A. Electric Water Cooler (P-8)

1. Wall-mounted, air-cooled, self-contained refrigerated type with a one-piece stainless steel top, a bubbler, adjustable temperature control and automatic regulator.
2. Capacity of 8 gallons per hour of 50° F water from 80° F entering water and in ambient of 90° F.
3. Unit suitable for 120-volt, one-phase, 60-cycle electric power; similar to Elkay Manufacturing Company No. EWA-8.
4. KEH to select unit color.

B. Electric Water Cooler for Handicapped.

1. Wall-mounted, air-cooled, self-contained refrigerated type with a one-piece stainless steel top, a bubbler with two wrist-blade operating handles, adjustable temperature control, and automatic stream regulator.
2. Capacity of 8 gallons per hour of 50° F water from 80° F entering water and in ambient of 90° F.
3. Unit suitable for 120-volt, one-phase, 60-cycle electric power; similar to Elkay Manufacturing Company No. EHL-8.
4. KEH to select unit color.

2.9 SINKS

A. Double Kitchen Sink (P-9)

1. Bowl
 - a) Manufacturer: Moen.
 - b) Moen, Model No. 22115, 2-14"x16"x7-1/2", or approved equal.
2. Trim
 - a) Manufacturer: Moen
 - b) Moen, Model NO. 8123, deck mount, 8" centers, dual control, 4" wrist blade handles with spout, or approved equal.
 - c) Moen, Model No. 22201, Sealtite drain assembly, 3-1/2", or approved equal.

B. Single Kitchen Sink (P-10)

1. Bowl
 - a) Manufacturer: Moen.
 - b) Moen, Model No. 22118, 2-21"x16"x7-1/2", or approved equal.
2. Trim
 - a) Manufacturer: Moen
 - b) Moen, Model NO. 8123, deck mount, 8" centers, dual control, 4" wrist blade handles with spout, or approved equal.
 - c) Moen, Model No. 22201, Sealtite drain assembly, 3-1/2", or approved equal.

2.10 MOP RECEPTORS (P-5)

A. Manufacturer:

1. Florestone, or
2. Approved equal.

- B. Florestone, Model No. 90, square, 24"x24"x12", with 3 tiling flanges, 2" waste pipe, and standard "P" trap, or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install each fixture with trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall supports wall carriers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

- A. Clean work under provisions of 01700.
- B. At completion clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit use of fixtures.

END OF SECTION

SECTION 15450
PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water Heaters.

1.2 RELATED SECTIONS

- A. Section 15140 - Supports and Anchors.
B. Section 15242 - Vibration Isolation.
C. Section 16180 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES

- A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.
B. ANSI/NFPA 70 - National Electrical Code.
C. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.
D. ANSI/UL 174 - Household Electric Storage Tank Water Heaters.
E. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 Volts Maximum).

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
B. Shop Drawings:
1. Include heat exchanger dimensions, size of tappings, and performance data.
2. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
C. Product Data:
1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

2.1 Provide electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.6 REGULATORY REQUIREMENTS

A. Conform to ANSI/UL 174 and ANSI/UL 1453 requirements for water heaters.

B. Conform to ASME Section VIIIID for manufacture of pressure vessels for heat exchangers.

C. Conform to ASME Section VIIIID for tanks.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

A. Provide one year warranty under provisions of Section 01700.

B. Warranty: Include coverage of domestic water heaters and in-line circulator.

1.9 QUALITY ASSURANCE

A. Products and installation services including inspections and tests shall be furnished in accordance with a Quality Assurance program meeting the requirements of Section 01400.

B. Contractor shall supply a Certificate of Conformance (COC) certifying that all products and services rendered meet the requirements of this Section.

- C. Unless otherwise noted, inspections and tests required by this Section shall be performed or witnessed by the contractors certified inspector.
- D. Perform Work in accordance with State of Washington standards.
- E. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. National Sanitation Foundation (NSF).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 4. National Electrical Manufacturers' Association (NEMA).
 - 5. Underwriters Laboratories (UL).

1.10 QUALITY ASSURANCE RECORDS

- A. Conform to the submittal requirements of this Section.
- B. Submittal requirements
 - 1. Certificate of Conformance

PART 2 PRODUCTS

2.1 COMMERCIAL ELECTRIC WATER HEATERS

- A. Manufacturers:
 - 1. A.O. Smith
 - 2. Other acceptable manufacturers offering equivalent products.
 - a) Rheem Water Heater
 - b) PVI Industries
 - c) Lochinvar Water Heater
- B. Type: Factory-assembled and wired, electric, vertical storage, RHEEM Model No. EG45-50, or approved equal.
- C. Performance:
 - 1. Storage: 80 gal.
 - 2. Input: 54 kW.
 - 3. Minimum recovery rate: 220 gph with 100 degrees F temperature rise.
 - 4. Maximum working pressure: 150 psig (1000 kPa)
- D. Electrical Characteristics:

1. 480 volts, three phase, 60 Hz.
 2. 65 amperes maximum circuit breaker size.
- E. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- F. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
- G. Accessories: Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.
- H. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gages.
- I. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.
- 2.2 IN-LINE CIRCULATOR PUMPS
- A. Manufacturers:
1. Bell & Gossett
 2. Other acceptable manufacturers offering equivalent products.
 - a) GRUNDFOS Pumps Corporation.
 - b) Approved Equal
- B. Performance:
1. Flow: 2 gpm at 20 feet head.
 2. Electrical Characteristics:
 - a) 1/4 hp
 - b) 120 volts, single phase, 60 Hz.
- C. Casing: Bronze, rated for 125 psig (860 kPa) working pressure.

- D. Impeller: Bronze.
- E. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- F. Seal: Carbon rotating against a stationary ceramic seat.
- G. Drive: Flexible coupling.

2.3 SUBMERSIBLE SEWAGE PUMPS

- A. Manufacturers:
 - 1. Zoeller Co. Model No. M163.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a) Approved Equal.
- B. Performance:
 - 1. Flow: 50gpm, at 35 feet lift.
 - 2. Motor: 1/2hp, 120 volt, single phase, 60 Hz.
- C. Type: Completely submersible vertical centrifugal.
- D. Casing: Cast iron pump body and oil filled motor chamber.
- E. Impeller: Bronze; open non-clog, corrosion resistant alloy steel shaft.
- F. Bearing: Ball bearings.
- G. Accessories: Oil resistant 6 foot cord and plug with three-prong connector for connection to electric wiring system including grounding connector.
- H. Servicing: Slide-away coupling consisting of discharge elbow secure to sump floor, movable bracket, guide pipe system, lifting chain and chain hooks.
- I. Controls: Integral mercury switch type level controls with separate liquid level control high level alarm.

PART 3 EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to UL requirements.

- B. Coordinate with plumbing piping and related electrical work to achieve operating system.

3.2 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Ensure shaft length allows sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.
- C. Provide air cock and drain connection on horizontal pump casings.
- D. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
- E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches (100 mm) and over.
- F. Ensure pumps operate at specified system fluid temperatures with vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- G. Align and verify alignment of base mounted pumps prior to start-up.

3.3 SCHEDULES

Refer to project drawing H-2-89148, SHT.2. Sizes and capacities shall be those specified in this Section.

END OF SECTION

Pg. No. F - 1
Delivery Order No. 6
Revision 1

Appendix F - SEPTIC SYSTEM DESIGN CALCULATION

PROJECT: 1483

DESCRIPTION: ADTECHS CORPORATION *ETC* BUILDING

DATE: 17-Mar-83

DESIGNED ACCORDING TO THE "GUIDELINES FOR THE USE OF PRESSURE DISTRIBUTION SYSTEMS", AS PUBLISHED BY THE DEPARTMENT OF SOCIAL AND HEALTH SERVICES, OFFICE OF ENVIRONMENTAL HEALTH PROGRAMS, WATER SUPPLY & WASTE SECTION

REQUIRED SEPTIC FIELD CALCULATIONS:

NUMBER OF PERSONS (DAYS):	35
NUMBER OF PERSONS (SWING):	36
NUMBER OF PERSONS (NIGHT):	0

TOTAL BUILDING CAPACITY 71 PERSONS

SOIL TYPE: 2 FROM TABLE 2*
MEDIUM SAND

MAX GALLONS PER BUILDING TYPE: (Q) 1440 GPD, FROM BUILDING LOAD CALCULATION
 36 PERSONS AT 40 GPD

SEPTIC TANK SIZE (MIN) 2,160 GALLONS (Q x 1.5)

DOSING TANK SIZE (MIN) 1,440 GALLONS (Q x 1.0)

LOADING (PERCULATION) RATE: (LR) 0.73 GALLONS/FT²/DAY FROM TABLE 2 *

REQUIRED ABSORPTION AREA: (A) 1,981 FT² (Q/LR)**

METHOD II: Minimum land area requirement		WAC-248-96-090	
1 UNIT VOLUME =	450 GPD	TOTAL UNITS:	3.2 (Q / UNIT VOLUME)
MIN AREA/UNIT =	12500 FT ²	AREA REQUIRED:	40,000 FT ² (TOTAL UNITS x MAX AREA PER UNIT)
		OR	0.9 ACRES (FT ² /43,560)

WIDTH OF SEPTIC TRENCH: (W) 3 FT (ALLOWABLE: 1 TO 3 FEET)

REQUIRED LENGTH OF TRENCH: (L) 660.24 LF (A/W)

LENGTH OF EACH TRENCH: (L_e) 55 LF TABLE A1-1 **

NUMBER OF TRENCHES: (T) 12.00 (L / L_e)

Approximate area required: 150.0 FT BY 85 FT

REQUIRED BACK UP AREA: (100%) 660.24 LF (L x PERCENT BACK-UP REQUIRED = L_b)
 NUMBER OF TRENCHES: 12.004 (L_b / L_e)

DOSES PER DAY: (D_s) 4 EA ALLOWED BY SOILS, TABLE 2 **
 NUMBER OF ALTERNATING SYSTEMS (S) 1

DAILY DOSE VOLUME: (DDV = Q/D_s/S) 360 GALLONS

DOSAGE/PIPE VOLUME RATIO: (DVR) 8 (7 MINIMUM) SECTION C.2 **

PIPE VOLUME: (PV = DDV/DVR/L) 0.0681 GAL/FT
 PIPE SIZE: INSIDE DIAMETER 1.25 INCH < OR = TO 2" MAX) SEE TABLE 3

PIPE SCHEDULE/CLASS 40

**MEIER ASSOCIATES
ENGINEERS & CONSULTANTS**

1350 Grandridge Blvd., Suite 101-A
Kennewick, WA 99336

**COMMERCIAL - PRESSURE
DISTRIBUTION SYSTEMS**

PROJECT: 1483

DESCRIPTION: ADTECHS CORPORATION *E/F* BUILDING

DATE: 17-Mar-93

DESIGNED ACCORDING TO THE "GUIDELINES FOR THE USE OF PRESSURE DISTRIBUTION SYSTEMS", AS PUBLISHED BY THE DEPARTMENT OF SOCIAL AND HEALTH SERVICES, OFFICE OF ENVIRONMENTAL HEALTH PROGRAMS, WATER SUPPLY & WASTE SECTION

REQUIRED SEPTIC FIELD CALCULATIONS CONTINUED:

ORIFICE DIAMETER: (Od)	<input type="text" value="3/16"/> <input type="text" value="0.188"/>	INCHES	TO BE DETERMINED IN CONJUNCTION WITH TABLE A1-1
RESIDUAL PRESSURE IN PIPE (Pred)	<input type="text" value="3"/>	FT OF H2O	
ORIFICE SPACING: (Y)	<input type="text" value="3"/>	FT	
ORIFICE DISCHARGE, EACH: (ODC)	0.71840 GPM	$11.7 \times (Od)^{2.2} \times SQRT(Pred)$	FROM APPENDIX 2 **
NUMBER OF ORIFICES: (O#)	18.3333 EA	(Ls / Y)	
LATERAL DISCHARGE RATE: (LDR)	13.1708 GPM	$(ODC \times O\#)$	

THE FOLLOWING MANIFOLD CALCULATIONS ARE FOR 4 INCH PIPE AND SPACING BETWEEN BEDS OF 10'0 ONLY (TABLE 1)

ENTER TYPE OF MANIFOLD (CENTER=1, END=2):	<input type="text" value="2"/>	END
ENTER LENGTH OF MANIFOLD DESIRED: (Lm)	<input type="text" value="50"/>	FT
NUMBER OF LATERALS PER HEADER: (Lh)	6 EA	$(Lm/10' - 0) + 1$
NUMBER OF HEADERS: (Ht)	2 EA	(T/Lh)

NUMBER OF HEADERS PER DOSE (Hd)	2.0 EA	$(T/S / Lh)$
SYSTEM DISCHARGE TIME:	2.2777 MIN	$DDV / (LDR \times Lh \times Hd)$

END PAGE 2

MEIER ASSOCIATES
ENGINEERS & CONSULTANTS

1350 Grandridge Blvd., Suite 101-A
 Kennewick, WA 99336

COMMERCAIL – PRESSURE
DISTRIBUTION SYSTEMS

PROJECT: 1483

DESCRIPTION: ADTECHS CORPORATION *ETC* BUILDING

DATE: 17-Mar-93

DESIGNED ACCORDING TO THE "GUIDELINES FOR THE USE OF PRESSURE DISTRIBUTION SYSTEMS", AS PUBLISHED BY THE DEPARTMENT OF SOCIAL AND HEALTH SERVICES, OFFICE OF ENVIRONMENTAL HEALTH PROGRAMS, WATER SUPPLY & WASTE SECTION

SEPTIC FIELD PUMP CALCULATIONS:

K CONSTANT:	47.8	(SEE TABLE A3.1) **
FRICITION LOSS (Fp) (PERFORATED PIPE ONLY)	5.07 FT	(L _e x LDR/K ~ 1.85)
CHANGE IN ELEVATION PUMP TO TRENCH PIPE (E)	7.5	FT FROM DRAWINGS

DATA FOR "PIPINGDP" PROGRAM:

PUMP FLOW RATE 158.0 GPM per dose
 (LDR x L_h x Hd)

SEE ATTACHED FOR SEPTIC FIELD LAYOUT
 SEE ATTACHED FOR SYSTEM FRICTION LOSS

FROM "PIPINGDP" PROGRAM

HEADER FITTING LOSS TO LATERAL ONLY (Tp)	2.36	PSI 5.428 FT
---	------	-----------------

Note:

Pump flow rate for a 4" feeder pipe should be approximately 300 gpm for best results

PUMP HEAD REQUIRMENTS:

RESIDUAL PRESSURE: (Pred)	3.00 FT
TRANSPORT PIPE FRICTION LOSS (Tp):	5.43 FT
LATERAL FRICTION LOSSES (Fp):	5.07 FT
TOTAL ELEVATION LIFT (E):	7.50 FT

TOTAL DYNAMIC HEAD: 20.99 FT (TDH)

NOTES:

* = DESIGN GUIDLINES FOR LARGER ON-SITE SEWAGE SYSTEMS
 WITH DESIGN FLOWS OF GREATER THAN 3,500 GALLONS PER DAY

** = GUIDLINES FOR THE USE OF PRESSURE DISTRIBUTION SYSTEMS

DOSING TANK Calculation and data:

LENGTH (L)	8	FT	CAPACITY =	2184.0 GALLONS (Wx6' - 0xLx7.48)
WIDTH (W)	6.083	FT	CAPACITY PER FT =	364.00 GALLONS (WxLx7.48)
HIGHT (H)	8	FT	DOSE VOLUME =	360 GALLONS (DDV)

FLOAT TREE CONTROL HEIGHTS

Centerline of pump from base:	7.75	INCHES
PUMP OFF =	18.5 INCHES	(3" CONC. BLOCK + (2 * CENTER LINE OF PUMP HIGHT))
PUMP ON =	30.36 INCHES	(DDV/CAPACITY PER FT x 12 + PUMP 'OFF' HEIGHT)
ALARM ON =	36.36 INCHES	(6" ABOVE PUMP 'ON' HEIGHT)

PROJECT: ADTECHS CORPORATION EDL BUILDING
 BY: MWP

03-17-1993

WATER	LINE FLOW	SP.	TEMP	VISC	PIPE	TOTAL	ELEV.	FRICT.+	CUMUL.	BAR.PRES=	PIPE	PUMP
Q.	GPM	GR.	degF	cp	IDin	LG-FT	+,- FT	PSIperLG	PSI	psi	MATL	BHP @ EFF

EQUIVALENT LENGTHS OF PIPE FITTINGS:
 FOR 4.000" I.D. GPM

	QUANT	EQUIV. LENGTH	TOT.EQ. LENGTH	CUMUL. LENGTH
STRAIGHT PIPE LENGTH (IN FEET)	181			181
THREADED STANDARD 90 deg ELL	2	10	20	201
FLANGED OR WELDING 90 deg ELL (r/d=8)	1	8	8	209
THREADED STANDARD TEE SIDE FLOW	1	20	20	229
COUPLINGS, UNIONS	1	1	1	230
PIPE ENTRANCE, ROUNDED	1	1	1	231
ABRUPT CONTRACTION, d/D=1/4	1	5	5	236

EQUIVALENT LENGTHS OF PLUMBING TYPE VALVES:
 FOR 4.000" I.D. GPM

	QUANT	EQUIV. LENGTH	TOT.EQ. LENGTH	CUMUL. LENGTH
GLOBE VALVE FULL OPEN	1	113	113	349
SWING CHECK VALVE FULL OPEN	1	33	33	382

WATER	LINE FLOW	SP.	TEMP	VISC	PIPE	TOTAL	ELEV.	FRICT.+	CUMUL.	BAR.PRES=	PIPE	PUMP
Q.	GPM	GR.	degF	cp	IDin	LG-FT	+,- FT	PSIperLG	PSI	psi	MATL	BHP @ EFF
	160.0	1.00	60	1.12	4.00	382	+0	2.36	2.36	4.08	PLST	0.26 @ 85%

Pg. No. G - 1
Delivery Order No. 6
Revision 1

Appendix G - ENGINEERING CHANGE NOTICES (ECN)

2. ECN Category (mark one) Cancel/Void <input type="checkbox"/>		Supplemental <input checked="" type="checkbox"/>	Change ECN <input type="checkbox"/>	Supersedure <input type="checkbox"/>
		Direct Revision <input type="checkbox"/>	Temporary <input type="checkbox"/>	Discovery <input type="checkbox"/>
3. Originator's Name, Organization, MSIN, and Telephone No. GC CORPORATION, KEH-5232 CONTRACT C-018H				4. Date 3/31/93
5. Project Title/No./Work Order No. 242-A EVAPORATOR/PUREX PLANT PROCESS CONDENSATE FACILITY, C-018H		6. Bldg./Sys./Fac. No. 2025E		7. Impact Level MINOR
8. Document Number Affected (include rev. and sheet no.) H-2-89039, Rev.1, Sht. 1 of 1		9. Related ECN No(s). N/A		10. Related PO No. N/A
11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11b, 11c, 11d)	11b. Work Package Doc. No. N/A	11c. Complete Installation Work N/A _____ Cog. Engineer Signature & Date	11d. Complete Restoration (Temp. ECN only) N/A _____ Cog. Engineer Signature & Date	
12. Description of Change This ECN revises the affected document in accordance with the attached. The finished grading plan is revised to balance cut and fill earthwork quantities and to eliminate superfluous mass excavation and excess disposal of material. Also, positive drainage paths and limits of excavation have been defined.				
13a. Justification (mark one) Design <input type="checkbox"/> Error/Omission <input type="checkbox"/>		Criteria Change <input type="checkbox"/> Design Improvement <input checked="" type="checkbox"/>	Environmenta <input type="checkbox"/> 1 As-Found <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/> Const. Error/Omission <input type="checkbox"/>
13b. Justification Details Substantial construction savings can be realized by increasing the process area floor elevation by 1'-0" to elevation 591 and by lowering the finish grade of the verification tank dike area to approximately 590. Further, decreasing the difference in elevation between the process floor and the verification tanks simplifies the interconnecting piping at the dike wall.				
14. Distribution (include name, MSIN, and no. of copies) KAISER ENGINEERS HANFORD COMPANY (KEH)			RELEASE STAMP	

ENGINEERING CHANGE NOTICE

15. Design

16. Cost Impact

17. Schedule Impact (days)

Verification Required
 [NA] Yes
 [NA] No

ENGINEERING
 Additional [NA] \$
 Savings [NA] \$

CONSTRUCTION
 Additional [NA] \$
 Savings [NA] \$

Improvement [NA]
 Delay [NA]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

N/A

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below

indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision

Document Number/Revision

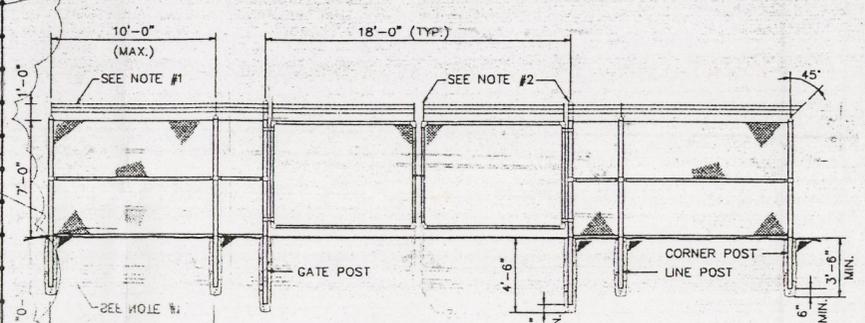
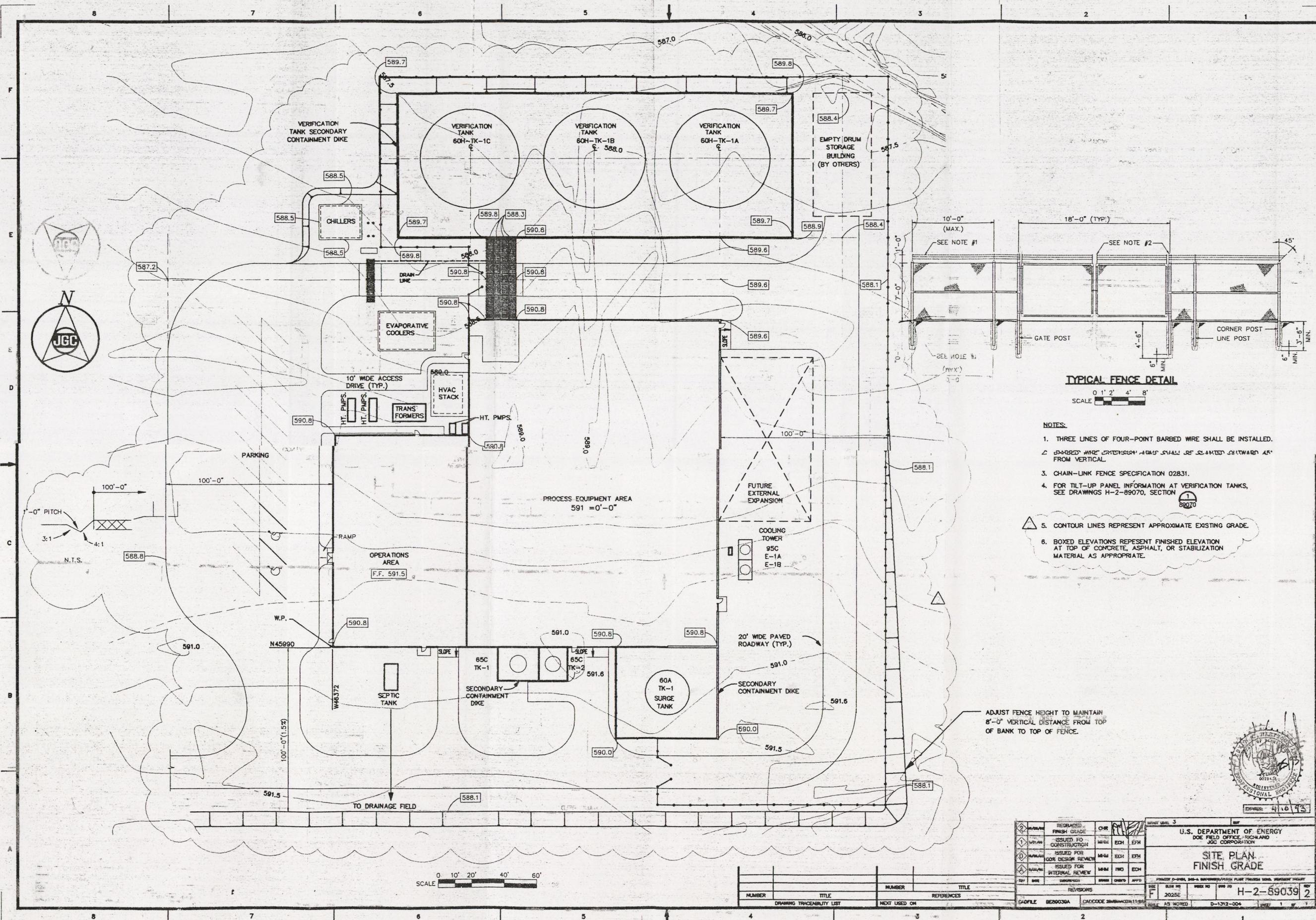
Document Number Revision

N/A

20. Approvals

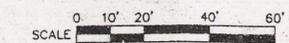
Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog./Project Engineer	_____	*PROJECT MGR. <i>Robert C. Taylor</i>	<u>3/31/93</u>
Cog./Project Engr. Mgr.	_____	*QA MANAGER <i>M. Goshin</i>	<u>3/31/93</u>
QA	_____	PROCESS PIPING ENGINEER	_____
Safety	_____	MECHANICAL ENGINEER	_____
Security	_____	HVAC ENGINEER	_____
Proj. Prog./Dept. Mgr.	_____	ELECTRICAL ENGINEER	_____
Def. React. Div.	_____	*ARCH/CIVIL/STRUCTURAL ENGR. <i>P. J. Patrick</i>	<u>3/31/93</u>
Chem. Proc. Div.	_____	KEH CONSTRUCTION MANAGEMENT	_____
Def. Wst. Mgmt. Div.	_____	*ENGINEERING MANAGER <i>K. Sander</i>	<u>5/31/93</u>
Adv. React. Dev. Div.	_____	DEPARTMENT OF ENERGY	_____
Proj. Dept.	_____		_____
Environ. Div.	_____		_____
IRM Dept.	_____	WASHINGTON DEPARTMENT OF ECOLOGY	_____
Facility Rep. (Ops.)	_____		_____
Other	_____		_____

*Required Discipline Signatures



- NOTES:**
- THREE LINES OF FOUR-POINT BARBED WIRE SHALL BE INSTALLED.
 - BARBED WIRE EXTENSION ARMS SHALL BE SEAMLESS BENTWARD AWAY FROM VERTICAL.
 - CHAIN-LINK FENCE SPECIFICATION 02831.
 - FOR TILT-UP PANEL INFORMATION AT VERIFICATION TANKS, SEE DRAWINGS H-2-89070, SECTION 1/89070.
 - CONTOUR LINES REPRESENT APPROXIMATE EXISTING GRADE.
 - BOXED ELEVATIONS REPRESENT FINISHED ELEVATION AT TOP OF CONCRETE, ASPHALT, OR STABILIZATION MATERIAL AS APPROPRIATE.

ADJUST FENCE HEIGHT TO MAINTAIN 8'-0" VERTICAL DISTANCE FROM TOP OF BANK TO TOP OF FENCE.



NUMBER	TITLE	NUMBER	TITLE

<table border="1"> <tr> <td>ISSUED FOR CONSTRUCTION</td> <td>MM/4</td> <td>ECH</td> <td>EPH</td> </tr> <tr> <td>ISSUED FOR CONSTRUCTION</td> <td>MM/4</td> <td>ECH</td> <td>EPH</td> </tr> <tr> <td>ISSUED FOR CONSTRUCTION</td> <td>MM/4</td> <td>ECH</td> <td>EPH</td> </tr> <tr> <td>ISSUED FOR INTERNAL REVIEW</td> <td>MM/4</td> <td>TWO</td> <td>ECH</td> </tr> </table>	ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH	ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH	ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH	ISSUED FOR INTERNAL REVIEW	MM/4	TWO	ECH	<p>U.S. DEPARTMENT OF ENERGY DOE FIELD OFFICE - RICHLAND JGC CORPORATION</p> <p>SITE PLAN - FINISH GRADE</p> <p>PROJECT: D-001A, 200-A BURNING/PIPING PLANT PROCESS UOOL, RICHLAND TIGHTLY</p> <p>DATE: 2023E</p> <p>NO. H-2-89039 2</p> <p>SCALE AS NOTED D-1312-004</p>
ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH														
ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH														
ISSUED FOR CONSTRUCTION	MM/4	ECH	EPH														
ISSUED FOR INTERNAL REVIEW	MM/4	TWO	ECH														

2. ECN Category (mark one) Cancel/Void <input type="checkbox"/>		Supplemental <input checked="" type="checkbox"/>		Change ECN <input type="checkbox"/> [N/A]		Supersedure <input type="checkbox"/> [N/A]	
		Direct Revision <input type="checkbox"/> [N/A]		Temporary <input type="checkbox"/> [N/A]		Discovery <input type="checkbox"/> [N/A]	
3. Originator's Name, Organization, MSIN, and Telephone No. JGC CORPORATION, KEH-5232 CONTRACT C-018H						4. Date 4/21/93	
5. Project Title/No./Work Order No. 242-A EVAPORATOR/PUREX PLANT PROCESS CONDENSATE FACILITY, C-018H				6. Bldg./Sys./Fac. No. 2025E		7. Impact Level ^{per 4/23-93} MAJOR	
8. Document Number Affected (include rev. and sheet no.) H-2-89157, REV.2 (D-13K3-002) - PLUMBING - SAN. SEPTIC TANK & DRAIN FIELD PLAN				9. Related ECN No(s). N/A		10. Related PO No. N/A	
11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11b, 11c, 11d)		11b. Work Package Doc. No. N/A		11c. Complete Installation Work N/A Cog. Engineer Signature & Date		11d. Complete Restoration (Temp. ECN only) N/A Cog. Engineer Signature & Date	
12. Description of Change A) IN NOTE 1, DELETE "TWO (2)" AND INSERT "THREE (3)". B) IN SECTION C, CHANGE THE CALL OUT TO THE DRAIN FIELD LATERAL TO READ AS FOLLOWS: "1-1/4" DIA. PERFORATED SCHEDULE 40 PVC PIPE."							
13a. Justification (mark one) Design Error/Omission <input checked="" type="checkbox"/>		Criteria Change <input type="checkbox"/>		Environmental <input type="checkbox"/>		Facilitate Const. <input type="checkbox"/>	
		Design Improvement <input type="checkbox"/>		As-Found <input type="checkbox"/>		Const. Error/Omission <input type="checkbox"/>	
13b. Justification Details. SPACING OF ORIFICES DOES NOT CORRELATE WITH SEPTIC SYSTEM DESIGN CALCULATION (C-13K3-001) AND WASHINGTON STATE REGULATIONS.							
14. Distribution (include name, MSIN, and no. of copies) KAISER ENGINEERS HANFORD COMPANY (KEH)						RELEASE STAMP	

ENGINEERING CHANGE NOTICE

15. Design Verification Required [NA] Yes [NA] No	16. Cost Impact <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%; text-align: center;">ENGINEERING</th> <th style="width: 50%; text-align: center;">CONSTRUCTION</th> </tr> <tr> <td style="vertical-align: top;"> Additional [NA] \$ Savings [NA] \$ </td> <td style="vertical-align: top;"> Additional [NA] \$ Savings [NA] \$ </td> </tr> </table>	ENGINEERING	CONSTRUCTION	Additional [NA] \$ Savings [NA] \$	Additional [NA] \$ Savings [NA] \$	17. Schedule Impact (days) Improvement [NA] Delay [NA]
ENGINEERING	CONSTRUCTION					
Additional [NA] \$ Savings [NA] \$	Additional [NA] \$ Savings [NA] \$					

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

N/A

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

N/A

20. Approvals

Signature	Date
OPERATIONS AND ENGINEERING	
Cog./Project Engineer	_____
Cog./Project Engr. Mgr.	_____
QA	_____
Safety	_____
Security	_____
Proj. Prog./Dept. Mgr.	_____
Def. React. Div.	_____
Chem. Proc. Div.	_____

Def. Wst. Mgmt. Div.	_____
Adv. React. Dev. Div.	_____
Proj. Dept.	_____

Environ. Div.	_____
IRM Dept.	_____
Facility Rep. (Ops.)	_____
Other	_____

Signature	Date
ARCHITECT-ENGINEER	
X PROJECT MGR./ENGINEERING MGR. <i>[Signature]</i>	<u>4/22/93</u>
X QA MANAGER <i>[Signature]</i>	<u>4/22/93</u>
X ASSOCIATE PROJECT MANAGER <i>[Signature]</i>	<u>4/22/93</u>
X ASSOCIATE ENGINEERING MGR. <i>[Signature]</i>	<u>4/22/93</u>
X HVAC ENGINEER <i>[Signature]</i>	<u>4-21-93</u>
X MECHANICAL ENGINEER <i>[Signature]</i>	<u>4/22/93</u>
PROCESS ENGINEER	_____
PROCESS PIPING ENGINEER	_____
X ARCH/CIVIL/STRUCT. ENGINEER <i>[Signature]</i>	<u>4/22/93</u>
X I&C ENGINEER <i>[Signature]</i>	<u>4/22/93</u>
X ELECTRICAL ENGINEER <i>[Signature]</i>	<u>4/23/93</u>
DEPARTMENT OF ENERGY <i>[Signature]</i>	<u>4-23-93</u>
KEH CONSTRUCTION MGMT	_____
WASHINGTON DEPT. OF ECOLOGY	_____

*Required Signatures

- OR APPR -

1. ECI Category (mark one) Cancel/Void <input type="checkbox"/>	Supplemental <input checked="" type="checkbox"/>	Change ECI <input type="checkbox"/>	Supersecede <input type="checkbox"/>
	Direct Revision <input type="checkbox"/>	Temporary <input type="checkbox"/>	Discovery <input type="checkbox"/>
2. Originator's Name, Organization, MSIN, and Telephone No. JGC CORPORATION, KEH-5232 CONTRACT C-013H			4. Date 5/4/93
5. Project Title/No./Work Order No. 342-A EVAPORATOR/PUREX PLANT PROCESS CONDENSATE FACILITY, C-013H		6. Bldg./Sys./Fac. No. 2025E	7. Impact Level MINOR ⁵⁻¹⁵⁻⁹³ KOR
8. Document Number Affected (include rev. and sheet no.) H-2-89157, REV.2 (D-13K3-002) - PLUMBING - SAN. SEPTIC TANK & DRAIN FIELD PLAN		9. Related ECI No(s) ECI 037	10. Related PO No. N/A
11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11c, 11d)	11b. Work Package Doc. No. N/A	11c. Complete Installation Work N/A <hr/> Cog. Engineer Signature & Date	11d. Complete Restoration (Temp. ECI only) N/A <hr/> Cog. Engineer Signature & Date
12. Description of Change SET THE DEPTH OF BURIAL FOR THE BOTTOM OF THE SEWER PIPE, AT THE INLET TO THE SEPTIC TANK, AT (-)4'-0" BELOW GRADE (591'-0"). (SEE ATTACHED SKETCH, PAGE 3).			
13a. Justification (mark one) Design Error/Omission <input checked="" type="checkbox"/>	Criteria Change <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>
	Design Improvement <input type="checkbox"/>	As-Found <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>
13b. Justification Details CLARIFY THE DEPTH OF BURIAL FOR THE SEWER PIPE AT THE INLET TO THE SEPTIC TANK.			
14. Distribution (include name, MSIN, and no. of copies) KAISER ENGINEERS HANFORD COMPANY (KEH)			RELEASE STAMP

ENGINEERING CHANGE NOTICE

13. Design Verification Required [NA] Yes [NA] No	16. Cost Impact ENGINEERING Additional [NA] \$ Savings [NA] \$	CONSTRUCTION Additional [NA] \$ Savings [NA] \$	17. Schedule Impact (days) Improvement [NA] Delay [NA]
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18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

N/A

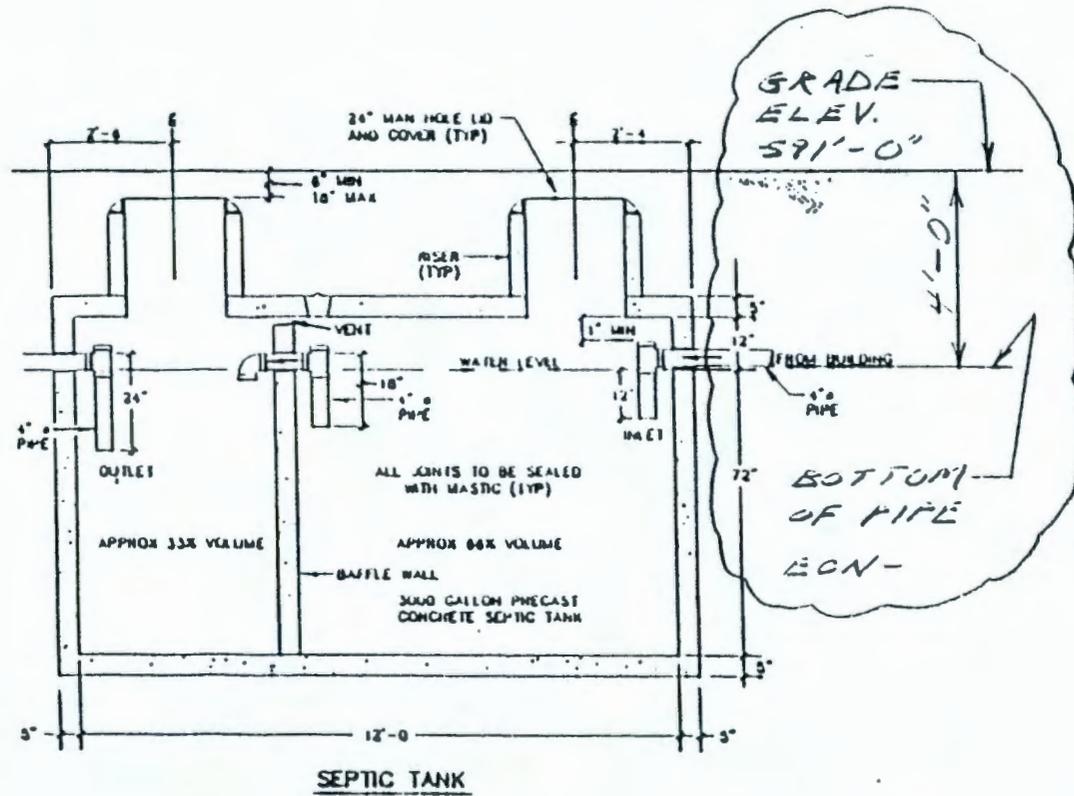
19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

N/A

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Coq./Project Engineer	_____	✓ ENGINEERING MGR. <i>ESher</i>	<u>5/11/93</u>
Coq./Project Engr. Mgr.	_____	✓ QA MANAGER <i>W.H.</i>	<u>5/6/93</u>
QA	_____	✓ PROJECT MANAGER <i>STH</i>	<u>5/11/93</u>
Safety	_____	✓ ASSOCIATE ENGINEERING MGR. <i>Ken Sando</i>	<u>5/7/93</u>
Security	_____	✓ EVAC/PLUMBING ENGINEER <i>W. Sullivan</i>	<u>5-4-93</u>
Proj. Prog./Dept. Mgr.	_____	✓ MECHANICAL ENGINEER <i>W. Bunker</i>	<u>5/6/93</u>
Def. React. Div.	_____	PROCESS ENGINEER	_____
Chem. Proc. Div.	_____	PROCESS PIPING ENGINEER	_____
Def. Wsc. Mgmt. Div.	_____	✓ ARCH/CIVIL/STRUCT. ENGINEER <i>Van W. Chin</i>	<u>5/7/93</u>
Adv. React. Dev. Div.	_____	✓ I&C ENGINEER <i>PHR</i>	<u>5-10-93</u>
Proj. Dept.	_____	✓ ELECTRICAL ENGINEER <i>W. D. Agnew</i>	<u>5/6/93</u>
Environ. Div.	_____	DEPARTMENT OF ENERGY	_____
IRM Dept.	_____	KEE CONSTRUCTION MGMT.	_____
Facility Rep. (Ops.)	_____	WASHINGTON DEPT. OF ECOLOGY	_____
Other	_____		

*Required Signatures



FOR APPROVAL

1. ECN Category (mark one) Cancel/Void <input type="checkbox"/>		Supplemental <input checked="" type="checkbox"/>	Change ECN <input type="checkbox"/> [N/A]	Supercedure <input type="checkbox"/> [N/A]
		Direct Revision <input type="checkbox"/> [N/A]	Temporary <input type="checkbox"/> [N/A]	Discovery <input type="checkbox"/> [N/A]
3. Originator's Name, Organization, MSIN, and Telephone No. JGC CORPORATION, KEH-5232 CONTRACT C-018H				4. Date 5/5/93
5. Project Title/No./Work Order No. 242-A EVAPORATOR/PUREX PLANT PROCESS CONDENSATE FACILITY, C-018H		6. Bldg./Sys./Fac. No. 2025E		7. Impact Level 5-13-93 KMC MINOR
8. Document Number Affected (include rev. and sheet no.) H-2-89157, REV.2 (D-13K3-002) - PLUMBING- SAN. SEPTIC TANK & DRAIN FIELD PLAN		9. Related ECN No(s). N/A		10. Related PO No. N/A
11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11c, 11d)	11b. Work Package Doc. No. N/A	11c. Complete Installation Work N/A _____ Cog. Engineer Signature & Date		11d. Complete Restoration (Temp. ECN only) N/A _____ Cog. Engineer Signature & Date
12. Description of Change				
1) REVISE THE WESTERLY COORDINATE OF THE CENTERLINE OF THE SANITARY WASTE DISPOSAL SYSTEM FROM W46336 TO W46354. (REFER TO SKETCH ON PAGE 3).				
2) REVISE THE SIZE OF THE DOSING CHAMBER FROM 2,150 GALLONS TO 2,000 GALLONS. (SEE ATTACHED SKETCH, PAGE 3).				
13a. Justification (mark one)				
Criteria Change <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>		
Design Error/Omission <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	As-Found <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	
13b. Justification Details				
1) SIMPLIFY DESIGN BY PROVIDING A STRAIGHT ROUTING OF THE SEWAGE COLLECTION PIPING, UNDER THE SLAB, INTO THE SEPTIC TANK. (REFERENCE DRAWING H-2-89152, REV.1).				
2) REVISE TO MATCH DESIGN CALCULATION (C-13K3-001, REV.0).				
14. Distribution (include name, MSIN, and no. of copies) KAISER ENGINEERS HANFORD COMPANY (KEH)				RELEASE STAMP

ENGINEERING CHANGE NOTICE

13. Revision	16. Cost Impact	17. Schedule Impact (days)			
Verification Required	ENGINEERING		CONSTRUCTION		
[NA] Yes	Additional	[NA] \$	Additional	[NA] \$	Improvement [NA]
[NA] No	Savings	[NA] \$	Savings	[NA] \$	Delay [NA]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Page 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 13.

N/A

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

N/A

20. Approvals			
Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Sup./Project Engineer	_____	* ENGINEERING MGR. <i>ES/ho</i>	<i>5/11/93</i>
Sup./Project Engr. Mgr.	_____	* QA MANAGER <i>6/24</i>	<i>5/11/93</i>
QA	_____	* PROJECT MANAGER <i>6/24</i>	<i>5/11/93</i>
Safety	_____	* ASSOCIATE ENGINEERING MGR. <i>Ken Sando</i>	<i>5/6/93</i>
Utility	_____	* HVAC/PLUMBING ENGINEER <i>Ed Sullivan</i>	<i>5-6-93</i>
Obj. Prog./Dept. Mgr.	_____	* MECHANICAL ENGINEER <i>P Burke</i>	<i>5/9/93</i>
Def. React. Div.	_____	PROCESS ENGINEER	_____
Chem. Proc. Div.	_____	PROCESS PIPING ENGINEER	_____
Def. Wst. Mgmt. Div.	_____	* ARCH/CIVIL/STRUCT. ENGINEER <i>John W. O'Brien</i>	<i>5-6-93</i>
Adv. React. Dev. Div.	_____	* I&C ENGINEER <i>PTR</i>	<i>5-10-93</i>
Proj. Dept.	_____	* ELECTRICAL ENGINEER <i>W. D. Quinn</i>	<i>5-10-93</i>
Environ. Div.	_____	DEPARTMENT OF ENERGY	_____
IRM Dept.	_____	KEH CONSTRUCTION MGMT.	_____
Facility Rep. (Ops.)	_____	WASHINGTON DEPT. OF ECOLOGY	_____
Other	_____		

*Required Signatures

