0040084

L-132-06

KAISER ENGINEERS HANFORD	CALCULATION IDENTIFICATION AND INDEX	WO/Job No. CR1245/L-132 Date 4-28-94

This sheet shows the status and description of the attached Design Analysis sheets.

Discipline 22- Environmental Engineering

Project No. & Name

Calculation Item 2711-E effluent pump

These calculations apply to:

Dwg. No. H-2-817614, ~~H-2-817617~~ Rev. No. 1 (as-built)

~~Dwg. No.~~ ECN L-132- ~~Rev. No.~~

Other (Study, CDR) L-132-C1 Rev 1 (as-built)

Rev. No.

The status of these calculations is:

- ☐ Preliminary Calculations
- ☑ Final Calculations
- ☐ Check Calculations (On Calculation Dated _____)
- ☐ Void Calculation (Reason Voided _____)

Incorporated in Final Drawings? ☑ Yes ☐ No

This calculation verified by independent "check" calculations? ☐ Yes ☑ No

Original and Revised Calculation Approvals:

	Rev. 0 Signature / Date	Rev. 1 Signature / Date	Rev. 2 Signature / Date
Originator	[illegible] 4-28-94		
Checked by	[illegible] 4-28-94		
Approved by			
Checked Against Approved Vendor Data			

INDEX

Design Analysis Page No.	Description
1-2	Calculation
	Attachments: 1) Site plan
	2) Pump Curves

FEB 1995
RECEIVED
EDMC

KAISER ENGINEERS
HANFORD

Calc. No. L-132-06
Revision 0
Page No. 1 of 2

DESIGN ANALYSIS

Client WHC	WO/Job No. CR1245/L-132		
Subject 2711-E	Date 4.28.94	By Axford	
	Checked 4.28.94	By [signature]	
Location 200E	Revised	By	

OBJECTIVE: Detemine head losses and pump capacity requirements for pumping septic tank effluent from 2711-E to dosing tank at L-132.

REFERENCES:

1. *ICF KH Drawing H-2-817614 Rev 0*
2. *Standard Handbook for Civil Engineers, Third Edition, Ed. by F.S. Merritt, 1983*
3. *Handbook of PVC Pipe, Uni-bell Plastic Pipe Association, Dallas, Texas, Third Edition, 1991.*
4. *ICF KH Survey "2711-E Sanitary Sewer" Cad File 943187.*

PIPE DATA (Ref 3):

HAZEN-WILLIAMS' "C" (page 275): $c := 150$

2" PVC 90-degree elbow: $el90 := 5.5$

Pipe diameter:

use pressure rated 125 DR 32.5 (IPS-OD), per ASTM 2241: $id := 2.229$ *inches*

$$id := \frac{id}{12} \quad id = 0.19 \quad \text{feet}$$

CALCULATIONS

STATIC HEAD (sh):

elevation at 2711E (Ref 4):

$e1 := 709.82 - 5 \quad e1 = 704.82$

elevation e1 is derived by placing the pump invert approximately 5' below the liquid level.

elevation at L-132: $e2 := 718.7$ *(Ref 1, zone D-5)*

$sh := e2 - e1 \qquad sh = 13.88$

FRICTION LOSSES:

FLOWRATE, PER PUMP CYCLE: $f := 1..3$

$q_f :=$

10
25
50

gpm

convert from gpm to cfs

$Q_f := q_f \cdot 0.002228$

$$Q = \begin{pmatrix} 0 \\ 0.02 \\ 0.06 \\ 0.11 \end{pmatrix} \quad \text{cfs}$$

LINE LENGTH (Ref 4). Include 4 elbows and 50' (estimate) for field alignments) :

$$L := 308 + 205 + 1321 + 205 + 4 \cdot el90 + 50$$

$$L = 2111 \quad \text{feet}$$

KAISER ENGINEERS
HANFORD

Calc. No. L-132-06
Revision 0
Page No. 2 of 2

DESIGN ANALYSIS

Client CNHC	WO/Job No. CR1245 / L-132		
Subject 2711-E	Date 4.28.94	By [illegible]	
	Checked 4.28.94	By [illegible]	
Location 200-E	Revised	By	

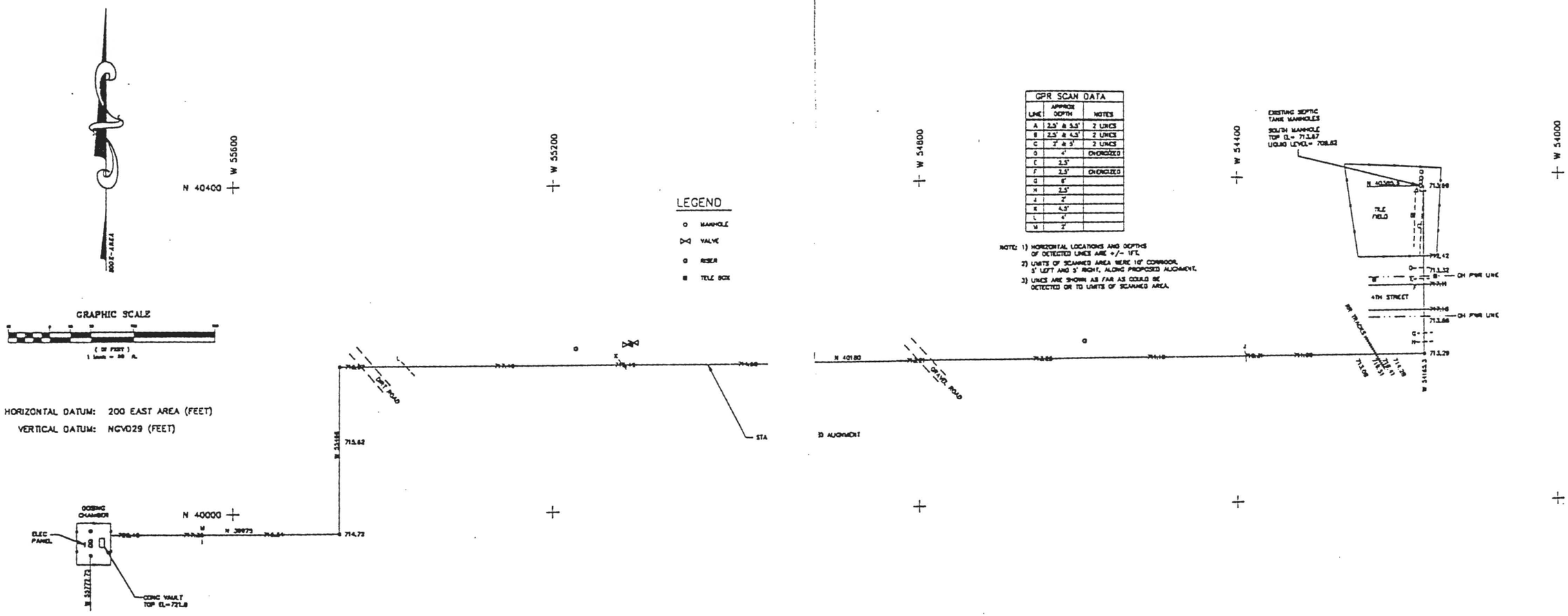
Use Hazen-Williams' equation (Ref 2, eq 21-34d) to determine TDH. Include static head:

$$h_f := \frac{4.727}{id^{4.87}} \cdot L \cdot \left(\frac{Q_f}{c}\right)^{1.85} + sh \qquad h = \begin{pmatrix} 0 \\ 16.88 \\ 30.23 \\ 72.81 \end{pmatrix}$$

Check velocity:

$$v_f := \frac{Q_f}{\left[\frac{(id)^2}{4}\right] \cdot \pi} \qquad v = \begin{pmatrix} 0 \\ 0.82 \\ 2.06 \\ 4.11 \end{pmatrix} \quad fps$$

SUMMARY: The above calculation shows that use of 2" PVC requires a pump delivering from 17 to 73 feet of head at flowrates ranging from 10 to 50 gpm. Flowrate shall be maintained above 25 gpm to keep velocity above 2 fps.



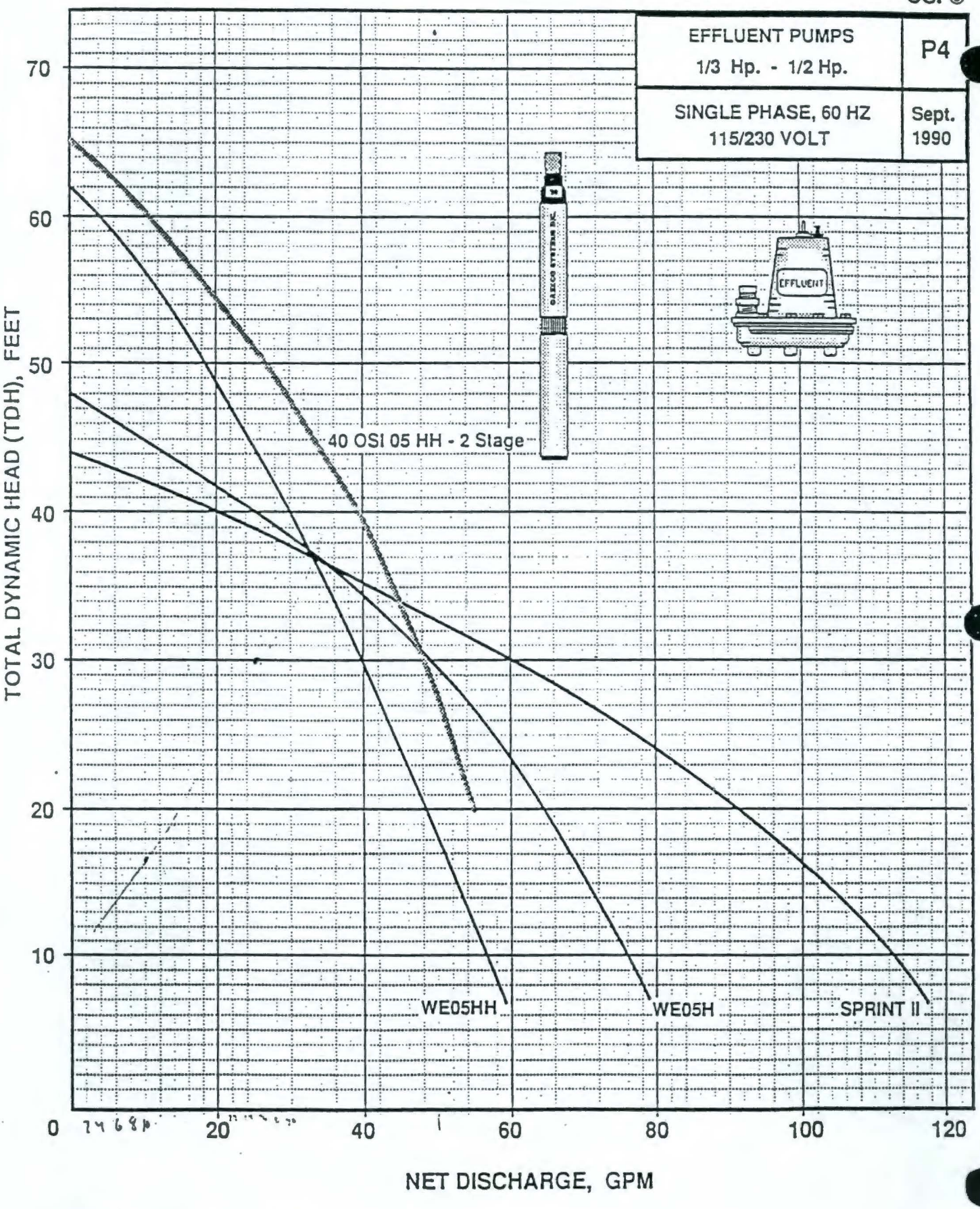
GPR SCAN DATA		
LINE	APPROX DEPTH	NOTES
A	2.5' & 5.5'	2 LINES
B	2.5' & 4.5'	2 LINES
C	2' & 5'	2 LINES
D	4'	OVERSIZED
E	2.5'	
F	2.5'	OVERSIZED
G	8'	
H	2.5'	
I	2'	
K	4.5'	
L	4'	
M	2'	

NOTE: 1) HORIZONTAL LOCATIONS AND DEPTHS OF DETECTED LINES ARE +/- 1FT.
2) LINES OF SCANNED AREA WERE 10' CORRIDOR, 5' LEFT AND 5' RIGHT, ALONG PROPOSED ALIGNMENT.
3) LINES ARE SHOWN AS FAR AS COULD BE DETECTED OR TO LIMITS OF SCANNED AREA.

U.S. DEPT. OF ENERGY	
KAISER ENGINEERS HANFORD	
2711-E SANITARY SEWER	
SCAN DATA & WPSC TOPO ALONG PROPOSED ALIGNMENT	
SHEET 1 OF 1	PROJECT: L-132
	DATE: 4/22/94
	DRAWN: N.P. FASTABEND

OSI ©

EFFLUENT PUMPS 1/3 Hp. - 1/2 Hp.	P4
SINGLE PHASE, 60 HZ 115/230 VOLT	Sept. 1990



ORENCO SYSTEMS, INC.
2826 Colonial Road
Roseburg ,OR 97470
503/673-0165

Department of Energy
Richland Field Office
P.O. Box 550
Richland, Washington 99352

OCT 04 1993

93-PMD-405

President
Westinghouse Hanford Company
Richland, Washington

Dear Sir:

PROJECT 93L-EWL-132, 2721EA EMERGENCY DRAINFIELD REPLACEMENT

You are hereby requested to add scope to the subject project within the limit of currently authorized funding. This is to install sanitary sewer lines and related utilities up to the five foot line of the following projects so that they may be connected to the new drainfield:

- L-100, 2711E Shop Expansion, 200 East
- L-200, 12-Wide Modular Facility, 200 East

Please address any questions to Fred Beard at 376-6630 or Chad Henderson at 376-8165.

Sincerely,

D. C. Williams, Director
Project Management Division

PMD:CSH

cc:
D. A. Danch, WHC
B. C. Harmon, WHC
R. L. Ingram, WHC
E. M. Koellermeier, WHC

KAISER ENGINEERS HANFORD

CALCULATION IDENTIFICATION AND INDEX

Page ____ of ____

Date

This sheet shows the status and description of the attached Design Analysis sheets.

Discipline Env. Engr WO/Job No. L-132 Calculation No. L-132-07

Project No. & Name L-132 - 2711E Effluent Pump

Calculation Item

These calculations apply to:

Dwg. No. H-2-817614 Rev. No.

Dwg. No. Rev. No.

Other (Study, CDR)

Rev. No.

The status of these calculations is:

- ☐ Preliminary Calculations
- ☒ Final Calculations
- ☐ Check Calculations (On Calculation Dated ____)
- ☐ Void Calculation (Reason Voided ____)

Incorporated in Final Drawings? ☐ Yes ☐ No

This calculation verified by independent "check" calculations? ☐ Yes ☐ No

Original and Revised Calculation Approvals:

	Rev. 0 Signature/Date	Rev. 1 Signature/Date	Rev. 2 Signature/Date
Originator	C.S. Martin 11/30/94		
Checked by	[illegible] 11-30-94		
Approved by			
Checked Against Approved Vendor Data			

INDEX

Design Analysis Page No.	Description
1-2	Calculation

KAISER ENGINEERS
HANFORD

Calc. No. 1-132-07
Revision
Page No. 1 of 2

DESIGN ANALYSIS

Client WHC	WO/Job No.		
Subject 2711E Septic System	Date	By	
	Checked	By	
Location 200E	Revised	By	

Objective: Confirm size of septic tank 2607-EO serving Building 2711-E
Confirm capability of drainfield 2607-EP to accept the effluent from tank 2607-EO

References:
1) Drawing H-2-93802
2) Drawing H-2-817614

Calculations:
Drawing H-2-93802 Note 6 gives the 2607-EO septic tank as a 1500 gallon primary tank & a 1000 gallon secondary tank.

PeopleCore lists the current occupancy of 2711-E as 25. This is a heavy duty maintenance shop. ∴ most of the occupants will shower.

Design capacity of the building & proposed additions is 50 persons. 38 may shower; 12 will likely not shower

38 x 30 gpd = 1140 gpd
12 x 15 gpd = 180 gpd
1320 gpd (design)

2500 gallon tanks ÷ 1.5 = 1667 gpd (capacity)

Septic tank capacity exceeds the design load. ∴ Existing septic tanks are O.K.

KAISER ENGINEERS
HANFORD

Calc. No. L-132-07
Revision
Page No. 2 of 2

DESIGN ANALYSIS

Client WHC
WO/Job No.
Subject 2711 E Septic System
Date By MJ
Checked By
Location 200E
Revised By

Spil absorption system 2607-EP was designed to dispose of 14,500 gpd.

It serves 3 existing septic tanks & 1 new septic tank.

Tank #	Building Served	Tank Size	Daily Max Flow	People Core Occupancy	Current Est. Flow
2607-EM	2721E	5000	3333	25	560
2607-EN	2727E	2500	1667	28	435
2607-EP	2721EA	2500	1667	22	900
	M0388			6	
2607-EL	M0286	5100	3333	200	To new
	M0294			(design)	to check
Totals			10,000		

Proposed addition of 2607-EO (Bldg 2711E) of 1667 gpd is well within the design of drainfield 2607-EP

Conclusion:
The addition of septic tank 2607-EO (Bldg 2711E) effluent to drainfield 2607 EP is within the design capacity.

ENGINEERING CHANGE NOTICE

Page 1 of 18

1. ECN ~~606227~~

Proj. ECN L-132-8

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date 4-28-94 ~~5-10-94~~ Sya 5/17/94
Supplemental [X] Direct Revision [] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	JD AXFORD, ICF KH, ENVR. ENGR. E6-31, 373-1277		
	5. Project Title/No./Work Order No. 2721EA & ADJACENT FACILITY EMERGENCY DRAINFIELD / L-132 / CR1245	6. Bldg./Sys./Fac. No. 2721E/2721EA/ 2727E/2711E	7. Impact Level NA /SC3
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) SEE BLOCK 12	9. Related ECN No(s). NA	10. Related PO No. NA

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	NA	NA Cog. Engineer Signature & Date	NA Cog. Engineer Signature & Date

12. Description of Change

SC-3

MODIFY DRAWINGS AND SPECIFICATIONS TO PROVIDE PUMP AND 2" LINE FROM 2711E TO THE L-132 DOSING CHAMBER.

ON ALL SHEETS, ADD "2711E" TO THE 'BLDG.NO.'SPACE IN THE TITLE BLOCK (ZONE A-1).

FOOTNOTES IN NEW L-132-C1 SECTIONS 02235, 02450, AND 02512 SHALL BE REVISED TO MATCH REMAINDER OF L-132-C1.

DOCUMENTS AFFECTED: L-132-C1 REV 4; H-2-817614 SH 1 REV 0, H-2-817615 SH 1 REV 0; H-2-817616 SH 1 REV 0; H-2-817617 SH 1 REV 0; H-2-817617 SH2 REV 0; H-2-817618 SH 1 REV 0.

CHARLES S. MORTIMER
STATE OF WASHINGTON
27653
REGISTERED PROFESSIONAL ENGINEER
5-12-94
EXPIRES 5/27/96

JDA/SYA 5/17/94

13a. Justification (mark one)							
		Criteria Change	[X]	Design Improvement	[]	Environmental	[]
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

Building 2711E connected in accordance with DOE request through B.C. Harmon, P.M.
See DOE letter 93-PMD-405, 10/04/93, D.C. Williams.

14. Distribution (include name, MSIN, and no. of copies)

ICF KH DISTRIBUTION		C. M. Monasmith	L4-90
Const Doc Cntl	S2-53	M. E. Riste	H5-60
WHC DISTRIBUTION		J. A. Thornock	S4-61
Project Files	R1-28	D. J. Tollefson	N1-30
C. L. Cooley	R3-01	K. S. Tollefson	H6-30
D. A. Danch	B4-40	R. A. Vanbaalen	S2-12
J. K. Epperley	R1-29	DOE/F. D. Beard	A5-18
		STA. 10	A3-87

RELEASE STAMP

OFFICIAL RELEASE BY WHC 5

DATE MAY 17 1994

Sta. 4

A-7900-013-2 (06/92) GEF095

A-7900-013-1 (06/92)

15. Design Verification Required	16. Cost Impact						17. Schedule Impact (days)	
	ENGINEERING			CONSTRUCTION				
[] Yes	Additional	[X]	$ 5K	Additional	[X]	$ 40K	Improvement	[] 30 Days.
[X] No	Savings	[]	$	Savings	[]	$	Delay	[X]

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.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement.	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

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

20. Approvals

	Signature	Date		Signature	Date
OPERATIONS AND ENGINEERING			ARCHITECT-ENGINEER		
Cog Engineer	Brian C Hanson	5/13/94.	PE	Brian C Hanson	5/13/94.
Cog. Mgr.	D J Tollefson	5/13/94	QA	K. C. Conrad	5-12-94
QA			Safety	[illegible]	5-12-94
Safety			Design	John D. Cox	5-12-94
Security			Environ.	John D. Cox	5-12-94
Environ.			Other		
Projects/Programs					
Tank Waste Remediation System					
Facilities Operations			DEPARTMENT OF ENERGY		
Restoration & Remediation			Signature or Letter No.		
Operations & Support Services					
IRM			ADDITIONAL		
Other			D.A. Rohl.	[illegible]	5/13/94

L-132-C1 Rev 1, Section 02745:

Add to Section 1.1.1.2 American Society for Testing and Materials:

A 106-92 Seamless Carbon Steel Pipe for High-Temperature Service.

Add to Section 1.1.1.8 Washington State Department of Transportation:

M-21-01-92 Standard Plans for Road, Bridge, and Municipal Construction

Add new subsections:

2.2.16 Direct-bury encasements: Corrugated pipe in accordance with WSDOT M41-10 Section 9.05.1(2), minimum 6 inches.

2.2.17 Augered encasements: ASTM A-106 grade B, with minimum 3/8" walls, minimum diameter of 6", minimum length of 20', centered beneath obstructions.

2.2.18 Pipe skids: support 2" piping within all encasements using corrosion-resistant clamp-on skids. Hardware shall be corrosion resistant. Skid height shall be sufficient to raise pipe joints above encasement interior wall. Skids shall be installed on minimum 10' spacing, and on either side of each pipe joint. Calpico Incorporated Model PX Casing Insulators or approved substitute.

3.3.4 Filter chamber: Minimum 48" diameter manhole as per WSDOT M21-01 standard plan B-23-C, with cover meeting WSDOT M21-01 standard plan B-25, Type I, and without the access ladder.

2.3.8 Pumping Chamber: 72" diameter manhole as per WSDOT M21-01 standard plan B-23-C, with the accessway modified as shown in the Drawing, and without the access ladder.

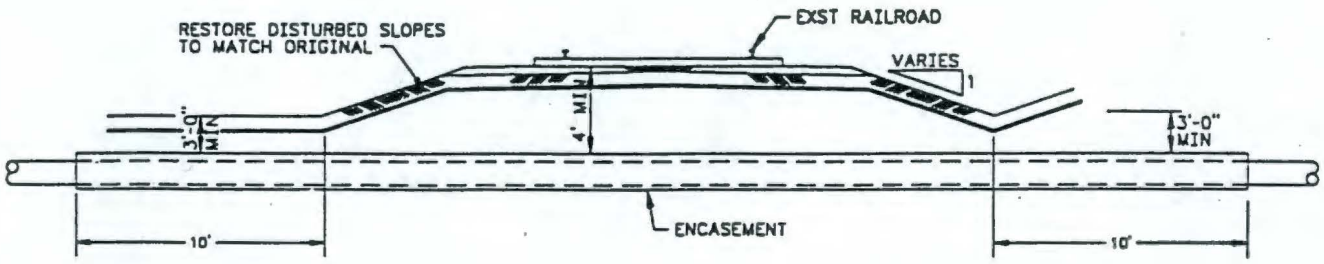
Revise subsection 2.3.6.2 to read as follows:

"...as shown on the Drawings. *Systems 2607EN and 2607EM shall use an Orenco Systems Incorporated Model EP0411 or approved substitutes. System 2607EO shall use an Orenco Systems Incorporated Model Sprint II-1/2, or approved substitute.* Each pump shall be...

Revise subsection 2.3.6.5 to read as follows:

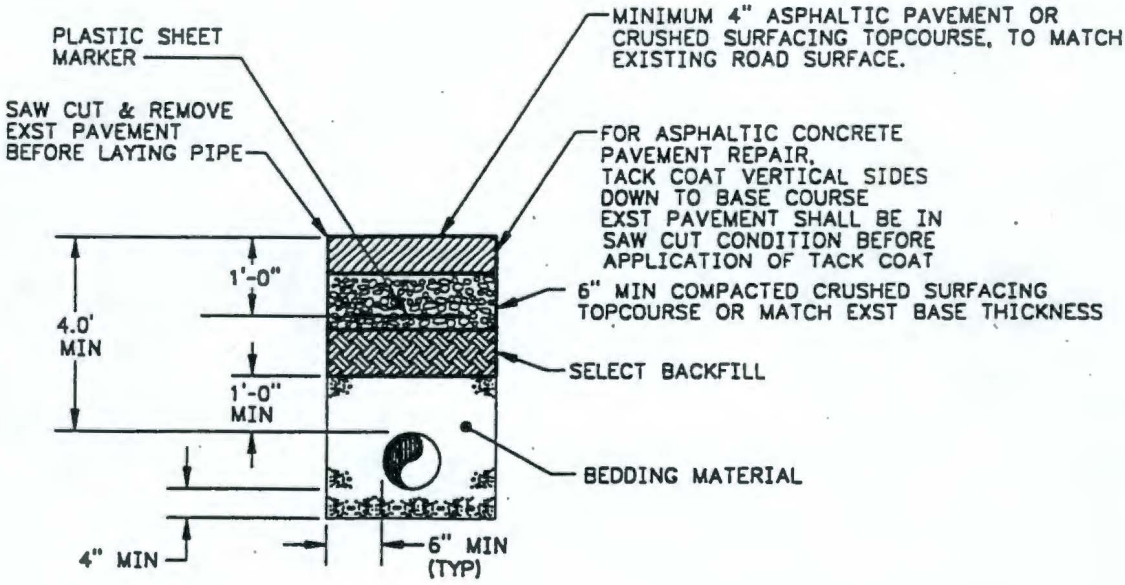
"*Level Control Float Assemblies: Assemblies shall consist of float switches mounted on PVC stems. On systems 2607-EM and 2607-EN, use Orenco Systems Incorporated Model MF-AB, on system 2607-EO, use a Model MF-AK set for a 20" drawdown, or approved substitutes.*"

KAISER ENGINEERS HANFORD	ENGINEERING CHANGE NOTICE SKETCH					
Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
1-2-817615	1	0	JD AXFORD	RHollenbeck 5-12-90	L-132-8	4/18



TYP RAILROAD CROSSING

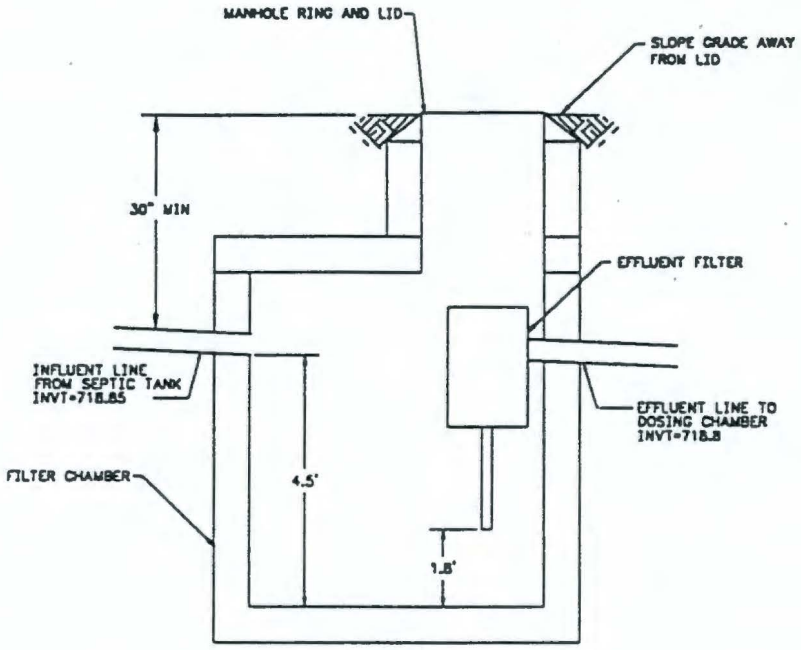
SCALE: NONE



TYP ROAD REPAIR DETAIL

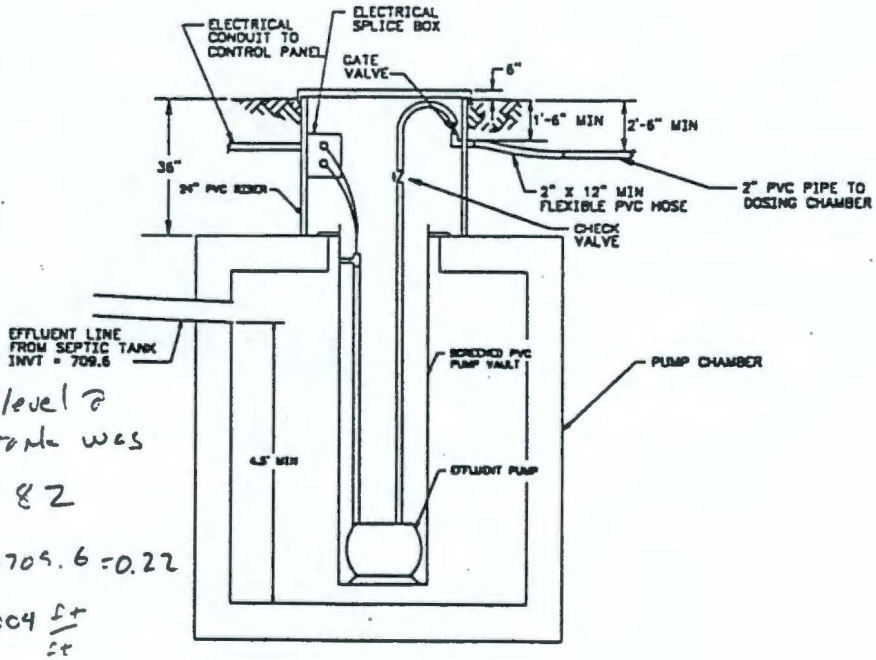
SCALE: NONE

KAISER ENGINEERS HANFORD	ENGINEERING CHANGE NOTICE SKETCH					
Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
1-2-817616	1	0	JD AXFORD	R Hollenbeck 5/12/94	L-132-8	5/18



2607EP FILTER INSTALLATION

DETAIL E
SCALE: NONE H-2-817614



Liquid level @ septic tank was 709.82

709.82 − 709.6 = 0.22

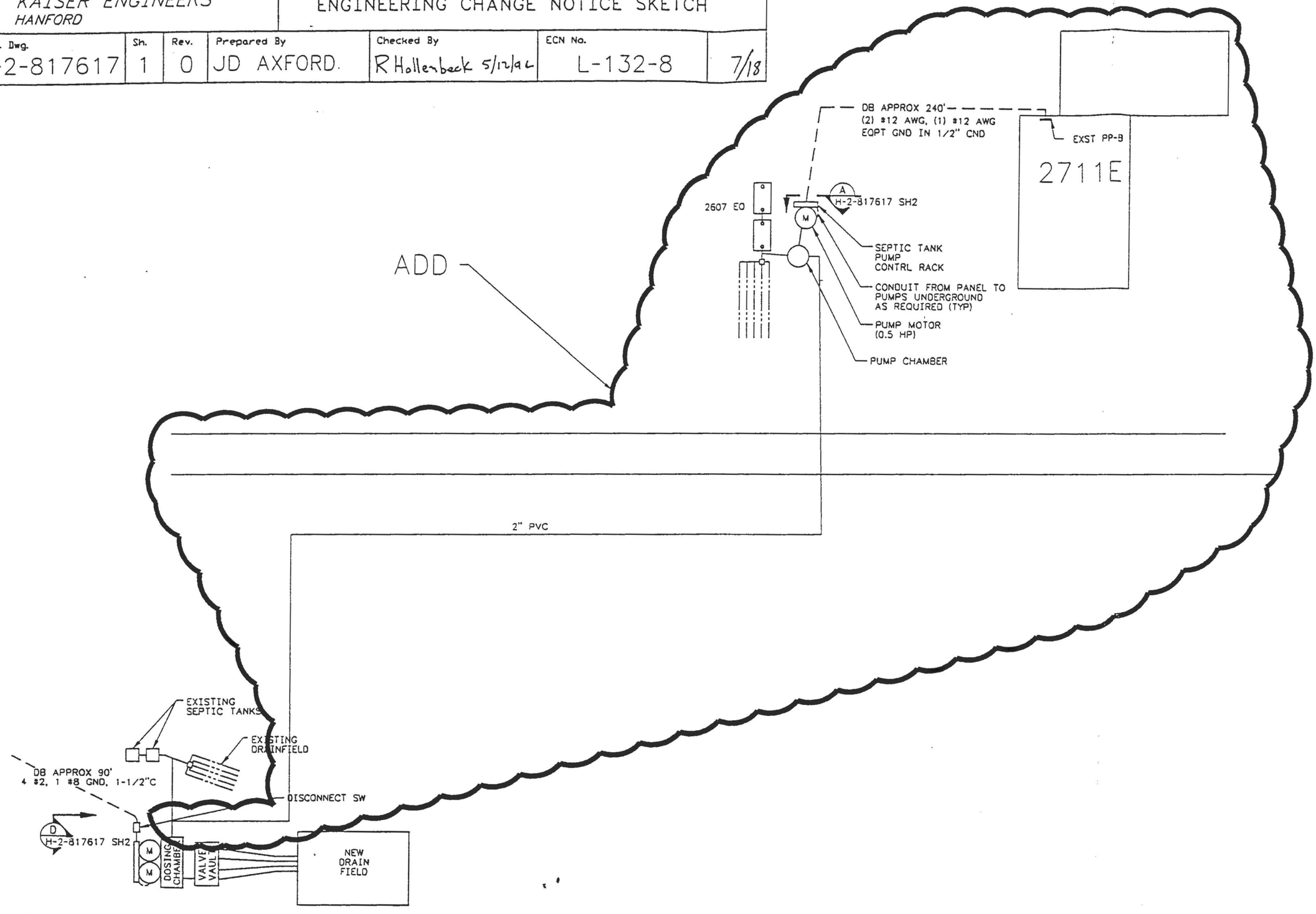
@ 0.004 ft/ft

w/i SS

2607EO PUMP INSTALLATION

DETAIL D
SCALE: NONE H-2-817614

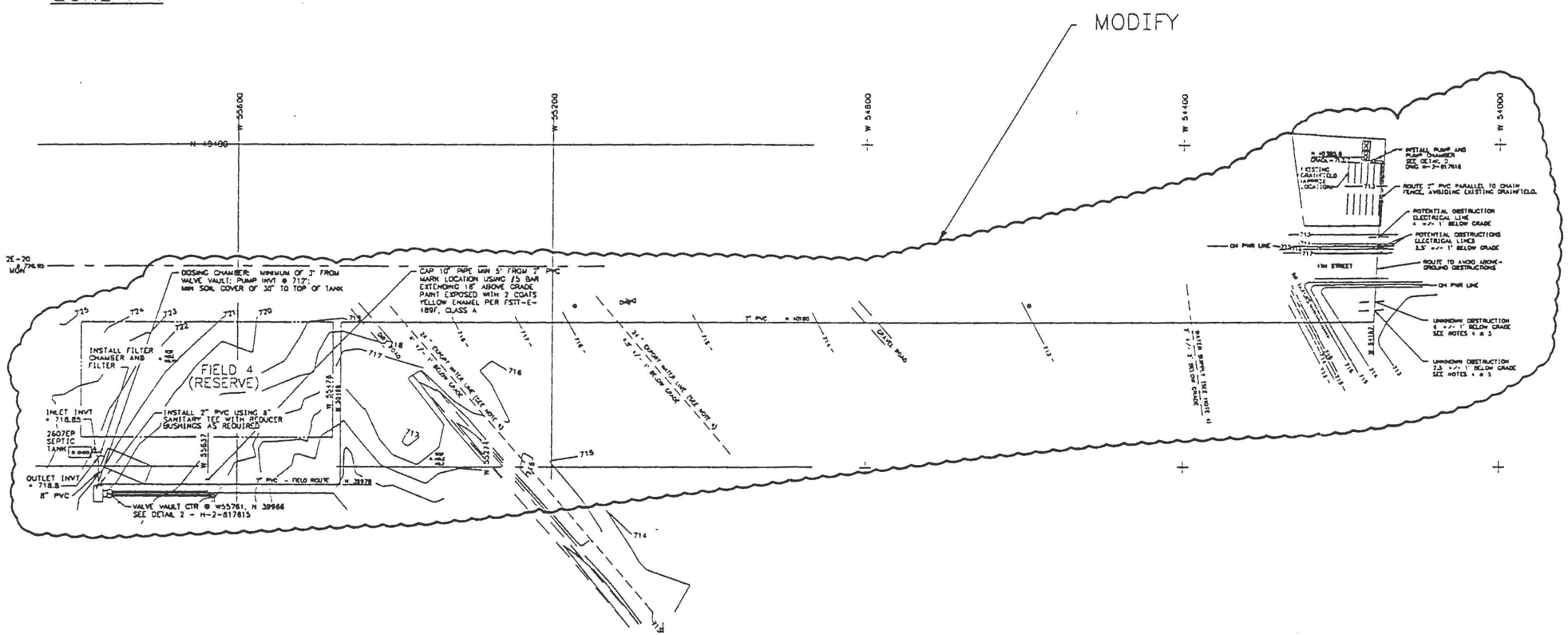
KAISER ENGINEERS HANFORD			ENGINEERING CHANGE NOTICE SKETCH			
Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	
H-2-817617	1	0	JD AXFORD.	R Hollenbeck 5/12/94	L-132-8	7/18



KAISER ENGINEERS HANFORD	ENGINEERING CHANGE NOTICE SKETCH					
Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	
H-2-817614	1	0	JD AXFORD	R Hollenbeck 5/12/94	L-132-8	6/18

NORTH

ZONE F-1



KAISER ENGINEERS HANFORD			ENGINEERING CHANGE NOTICE SKETCH			
Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-817614	1	0	JD AXFORD	R Hollenbeck 5/12/94	L-132-8	8/18

ZONE A-2

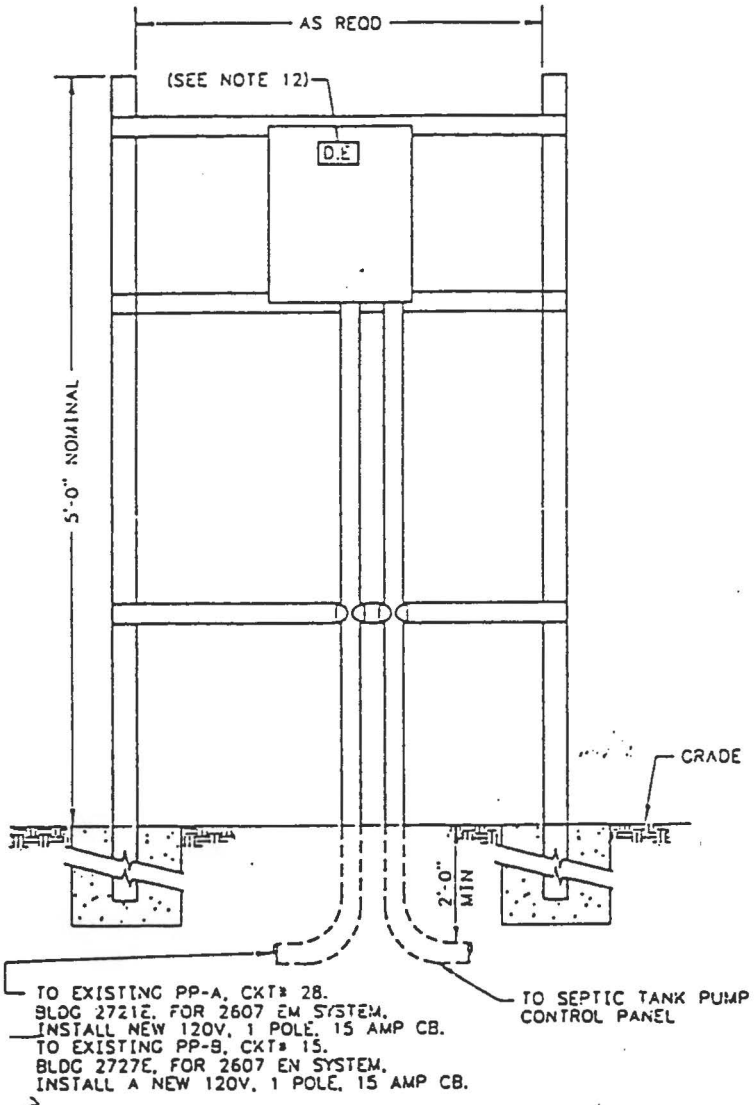
NOTES:

MODIFY

1. SEE DWG H-2-817618 FOR FIELD DETAILS.
2. MAINTAIN MINIMUM 20' ~~SEPARATION BETWEEN EXPORT WATERLINES~~ & ALL CONSTRUCTION ACTIVITY, EXCEPT AT THE 2" PVC CROSSING.
3. EXCESS EXCAVATED MATERIAL SHALL BE DISTRIBUTED & STABILIZED IMMEDIATELY SOUTH OF FIELDS 1 AND 2 AS DIRECTED BY KEH.
4. THE TOP OF THE 2" PVC SEWER SHALL PASS A MINIMUM OF 2' BELOW BOTTOM OF ALL WATER LINES
5. AT LEAST ONE OF THE TWO UNKNOWN OBSTRUCTIONS IS A WATER LINE.

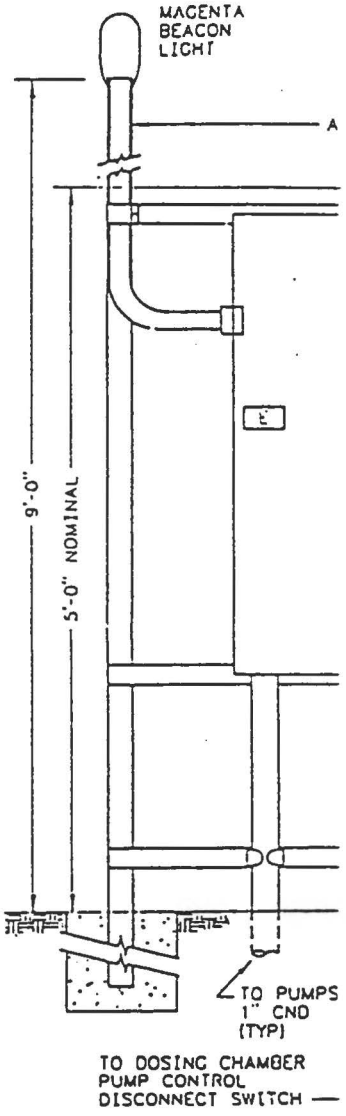
ADD

ECN No. L-132-8		Page 7/18	
Ref. Dwg. H-2-817617		Sh. 2	Rev. 0
Prep. By J.D. Axford	Chkd. By R Hollenbeck 5/12/92		



PUMP CONTROL RACK (SEE NOTE 11)

A ELEVATION
H-2-817617 SH1 NTS



PUMP C

B
H-2-

ADD:

TO EXISTING PP-13, BLDG 2711E.
FOR 2607EO SYSTEM, INSTALL
NEW 120V, 1 POLE, 20 AMP CB.

Ref. ~~Dwg.~~ C-132-C1	~~Sh.~~	Rev.
Prep. By JD Axford	Exd. By R Hollenbeck 5/12/9	

SECTION 02235

ROAD SUBGRADE AND GRANULAR BASE

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 The following documents, including others referenced therein, form part of this Section to the extent designated herein.

1.1.1.1 Washington State Department of Transportation (WSDOT)

M41-10-91	Road, Bridge, and Municipal Construction

1.2 SUBMITTALS: Not Used

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Subgrade Fill and Backfill

2.1.1.1 General: Obtain specified soils from excavation or other designated locations. Obtain onsite KEH approval for soils.

2.1.1.2 Fill or backfill: Well graded soil mixtures which may contain cobbles up to 6 inches in greatest dimension if uniformly distributed and not constituting more than 20% of volume of fill.

2.1.2 Granular Base

2.1.2.1 Base course: WSDOT M41-10, Section 9-03.9(3), Base Course Classification.

2.1.2.2 Top course: WSDOT M41-10, Section 9-03.9(3), Top Course and Keystone Classification.

PART 3 - EXECUTION

3.1 EXCAVATION

3.1.1 Before performing excavation, obtain an excavation permit. Excavation permits will be provided by KEH in accordance with Section 01065.

3.1.2 If over-excavation occurs, correct by placement of select backfill in accordance with Section ~~02225~~.

02200

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3.2 PLACEMENT

3.2.1 Subgrade Filling and Backfilling

3.2.1.1 Remove debris and organic matter from area to be filled or backfilled.

3.2.1.2 Use only specified materials for fill or backfill. Keep materials free of frozen particles, lumps, organic matter and trash.

3.2.1.3 Do not place fill or backfill on frozen ground.

3.2.1.4 Filling or backfilling by sluicing or flooding with water will not be permitted.

3.2.2 Fill or Backfill

3.2.2.1 Before placement of fill or backfill, demonstrate to KEH by physical test at the worksite, that the procedure proposed for placement and compaction of soils will provide the degree of compaction specified. Prepare "Soil Compaction Procedure," Form KEH-0382, in accordance with the instructions.

3.2.2.2 Place backfill under roads as shown on the Drawings and in accordance with Section ~~02225~~. 02200 JDA 5-12-94

3.2.3 Granular Base

3.2.3.1 Before placement of granular base, demonstrate to KEH by physical test at the worksite, that the procedure proposed for placement and compaction of base will provide the degree of compaction specified. Prepare "Soil Compaction Procedure," Form KEH-0382, in accordance with the instructions.

3.2.3.2 Construction Requirements: Construction shall be in accordance with following sections of WSDOT M41-10.

a. Subgrade: Section 2-06.3.

b. Equipment: Section 4-04.3(1).

c. Mixing: Section 4-04.3(3).

d. Placing and spreading: Section 4-04.3(4).

e. Miscellaneous requirements: Section 4-04.3(7).

f. Weather limitations: Section 4-04.3(8).

g. Hauling: Section 4-04.3(9).

3.2.3.3 Shaping and Compacting:

a. Final shaping before compacting shall be accomplished using approved equipment.

b. Compaction control tests will be in accordance with WSDOT M41-10, Section 2-03.3(14)D.

3.2.3.4 Shoulders: Restore shoulder to original line and grade. Stabilize using materials specified in subparagraph 2.1.2.2, unless otherwise directed by KEH.

3.2.4 Finish Grading and Stabilization: Rake area disturbed by work, remove surface stones larger than 6 inches and dispose of excess material and debris at area designated by KEH.

3.3 FIELD QUALITY CONTROL

3.3.1 Sampling and testing of compacted fill and backfill will be performed by KEH.

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SOIL COMPACTION PROCEDURE

A

Project Number	Project Title	Date

Contract Number	Procedure Number	Location of Demonstration

REQUIREMENTS	EQUIPMENT DEMONSTRATED
Applicable Spec./Dwg. _	Type
Compaction Required %	Manufacturer
Maximum Lift Size	Model

B

LABORATORY SOIL TEST RESULTS

☐ Non-granular Materials (WSDOT Test Method No. 609) Maximum Density _____ Moisture % _____	☐ Granular Materials (WSDOT Test Method No. 606-A) ☐ Density Chart Attached	☐ In-Situ Density _____

C

COMPACTION DEMONSTRATION TEST RESULTS

Formula for Percent Compaction: $\frac{\text{dry density}}{\text{max density}} \times 100 = \text{Percent Compaction}$

No. of Passes	Depth of Lift	Percent Moisture	Lbs/ft³ Dry	Maximum Density	Percent Compaction	Accept	Reject

Observations or Comments

SAMPLE

TEST METHOD USED FOR DEMONSTRATION ☐ Nuclear Gage (ASTM D2922 & D3017) ☐ Other _____

D

Contractor Representative		Date
Engineer/Constructor Inspector		Date

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INSTRUCTIONS

This Soil Compaction Procedure form, when approved by the Engineer/Constructor Inspector, documents witnessing and verifying the compaction procedure.

Section A is the responsibility of the Construction Contractor. It is to be completed at the time of backfill compaction demonstration and presented to the Engineer/Constructor Inspector.

Section B is completed by the Engineer/Constructor Inspector. Data entered is obtained from the agency or individual that performed testing.

Section C is completed by the Engineer/Constructor Inspector as the demonstration is performed. Using the applicable formula, the percent compaction achieved is determined and entered. Acceptance is based on the results as compared with the compaction percent required in Section A.

Section D is signed and dated by the Construction Contractor Representative acknowledging responsibility for this procedure and compliance thereto for applicable backfill operations. Section D is signed and dated by the Engineer/Constructor Inspector to signify witnessing and verification.

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END OF SECTION

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PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 DELIVERY, STORAGE, AND HANDLING: Not Used

PART 2 - PRODUCTS

2.1 SUBSTITUTES: See Section 01630 for substitution approvals.

2.2 MATERIALS

2.2.1 Subgrade Fill and Backfill

2.2.1.1 General: Obtain select soils from excavation or other designated locations. Obtain onsite KEH approval for soils.

2.2.1.2 Fill or backfill: Select fill or backfill as specified in Section ~~02225~~. 02200

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PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Notify KEH Construction Management 2 weeks in advance of work around railroad.

3.1.2 Rail and tie removal and restoration of rails, ballast, and ties will be by others.

3.1.3 Subgrade Filling and Backfilling: Place select backfill under railroad roadbed in accordance with Section ~~02225~~ to 7 inches below bottom of rails.

02200

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END OF SECTION

SECTION 02512

HOT-LAID ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 The following documents, including others referenced therein, form part of this Section to the extent designated herein.

1.1.1.1 Washington State Department of Transportation (WSDOT)

M 41-10-91	Road, Bridge, and Municipal Construction

1.2 SUBMITTALS

1.2.1 See Section 01300 for submittal procedures.

1.2.2 Approval Required

1.2.2.1 Laboratory reports: Before delivery, submit laboratory reports for the following.

a. Asphalt: Showing that asphalt used in mix meets the requirements of AR-4000W in accordance with WSDOT M 41-10, Section 9-02.1(4).

b. Sections 9-03.8(2) and 9-03.8(6). Include Rice density as established by WSDOT Method 705.

1.2.3 Approval Not Required: None

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Asphalt: In accordance with WSDOT M 41-10, Section 9-02.1(4). Grade shall be AR-4000W.

2.1.2 Tackcoat: In accordance with WSDOT M 41-10 Section 9-02.1(6), CM S-2.

2.1.3 Aggregate: Class "B" in accordance with WSDOT M 41-10, Section 9-03.8(1), (2), and (3)B.

2.1.4 Blending Sand: In accordance with WSDOT M 41-10, Section 9-03.8(4).

2.1.5 Mineral Filler: In accordance with WSDOT M 41-10, Section 9-03.8(5).

2.1.6 Crushed gravel shoulder: WSDOT M 41-10, Section 9-03.9(3). Top course and keystone classification.

2.2 MIXES

2.2.1 Proportioning of Asphalt Concrete Materials: In accordance with WSDOT M 41-10, Sections 9-03.8(2) and 9-03.8(6), Class "B" asphalt concrete.

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PART 3 - EXECUTION

3.1 APPLICATION

3.1.1 Perform work in accordance with the following sections of WSDOT M 41-10.

3.1.1.1 Asphalt mixing plants: Section 5-04.3(1).

3.1.1.2 Hauling equipment: Section 5-04.3(2).

3.1.1.3 Rollers: Section 5-04.3(4).

3.1.1.4 Asphalt material heating: Section 5-04.3(6).

3.1.1.5 Aggregate preparation: Section 5-04.3(7).

3.1.1.6 Mixing: Section 5-04.3(8).

3.1.1.7 Spreading and finishing: Section 5-04.3(9).

3.1.1.8 Compaction: Section 5-04.3(10).

3.1.1.9 Joints: Section 5-04.3(11).

3.1.1.10 Samples: Section 5-04.3(12).

3.1.1.11 Surface smoothness: Section 5-04.3(13).

3.1.1.12 Planing bituminous pavement: Section 5-04.3(14).

3.1.1.13 Weather limitations: Section 5-04.3(16).

3.1.1.14 Change in grade of asphalt: Section 5-04.3(18).

3.1.1.15 Sealing of driving surfaces: Section 5-04.3(19).

3.1.2 Permanent Signage: In accordance with ANSI D6.1, Section II and WSDOT M 41-10, Section 8-21.

3.1.3 Shoulders: Restore shoulders to original line and grade. Stabilize using material specified in subsection 2.1.6, unless otherwise directed by KEH.

3.2 FIELD QUALITY CONTROL

3.2.1 Testing of pavement will be performed by KEH.

3.3 PROTECTION

3.3.1 Traffic Control: Institute and maintain in accordance with WSDOT M 41-10, Section 1-07.23, Subsections (1) through (4).

END OF SECTION