



2753 West 31st Street | Chicago, IL 60608  
Tel: 773-722-9200 | Fax: 773-722-9201 | pioneerEES.com

Transmitted via Electronic Mail

January 14, 2022

Ms. Tena Seeds  
Washington State Department of Ecology  
Toxics Cleanup Program  
15700 Dayton Ave N., Shoreline, WA 98133

RE: **Quarterly Progress Report: October 1 through December 31, 2021**  
**Time Oil Bulk Terminal Site, Cleanup Site ID #14604**  
**Prospective Purchaser Consent Decree No. 20-2-15215-3 SEA**

Dear Ms. Seeds:

Pioneer Engineering & Environmental Services, LLC on behalf of TOC Seattle Terminal 1, LLC submits the attached Quarterly Progress Report for the Time Oil Bulk Terminal Site per Section XII of the Prospective Purchaser Consent Decree between the Washington State Department of Ecology and TOC Seattle Terminal 1, LLC. The quarterly progress report consists of a brief narrative summary of notable activities that occurred during the reporting period and that are anticipated for the upcoming reporting period.

If you have any questions about this report, please contact me at 773-722-9200.

Sincerely,

A handwritten signature in black ink that reads "Kim Hempel". The signature is written in a cursive, flowing style.

Kim Hempel  
Project Coordinator  
Pioneer Engineering & Environmental Services, LLC

Distribution List:  
Doug Ciserella and Mike Ciserella, TOC Seattle Terminal 1, LLC  
Bill Joyce, Joyce Ziker Partners PLLC  
Reid Carscadden and Jamie Stevens, CRETE Consulting

**TIME OIL BULK TERMINAL SITE  
PROSPECTIVE PURCHASER CONSENT DECREE NO. 20-2-15215-3 SEA  
QUARTERLY PROGRESS REPORT: OCTOBER 1 THROUGH DECEMBER 31, 2021**

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This report has been prepared in accordance with the requirements of the Time Oil Bulk Terminal Site Prospective Purchaser Consent Decree (PPCD) between the Washington State Department of Ecology (Ecology) and TOC Seattle Terminal 1, LLC. This progress report provides details on the following: 1) all on site activities; 2) any deviations from required tasks; 3) anticipated problems in meeting schedule or objectives and associated solutions 4) sampling, testing, or other data received; 5) work planned for the upcoming 3-month period; and, 6) deliverables planned for the upcoming 3-month period.

**Summary of On-Site Activities Performed During the Reporting Period (PPCD Section XII.A)**

Activities completed during this reporting period included the following:

**Cleanup Action Construction**

On-site cleanup action construction activities continued this quarter and were completed on December 13, 2021 in accordance with the Ecology-approved June 2021 Engineering Design Report (EDR). During this reporting period, cleanup action construction activities included the following:

- Completed excavation and off-site disposal of contaminated soils from the following Cleanup Action Areas (CAAs), in order of completion: CAA-2b and CAA-3. Please note that light non-aqueous phase liquid (LNAPL) was not observed during remediation of CAA-2b; conditions were similar to those observed at CAA-1a, which was previously documented in email correspondence with Ecology between August 9 and 16, 2021.
- Completed in-situ solidification and stabilization (ISS) in CAA-4 (includes CAA-4a and CAA-4b) and placement and compaction of ISS swell material in the swell management area (SMA). ISS performance physical soil samples were collected during the ISS mixing work; laboratory test results for this reporting period are included in Attachment 1 and discussed below.
- Collected confirmation soil samples from each excavation in accordance with the EDR to document the completion of remedial excavations in completed CAAs. A summary of all performance soil samples and copies of laboratory test results will be included in the Remedial Action Completion Report. Laboratory test results for this reporting period are included in Attachment 1 and discussed below.
- Decommissioned well 01MW60 by a licensed driller (ESN Northwest) on November 11, 2021. This well, located within the side slope of the CAA-4 mixing footprint, was decommissioned because the well was inadvertently damaged by the Contractor during ISS mixing.
- Completed the in-situ groundwater treatment injections along the northern boundary of the ASKO parcel, generally north of CAA-5.
- Placed ORC Advanced dry amendments in the northeast and northwest corner of CAA-2b.
- Completed the installation of a groundwater interceptor trench at the ASKO/BNSF property boundary (CAA-4) to capture and treat impacted groundwater migrating within the perched water-bearing zone from the BNSF parcel.
- A small diesel spill occurred on September 3, 2021 adjacent to the southeast edge of CAA-2a when an empty haul truck clipped a concrete vault and punctured the fuel tank. The haul truck immediately stopped and spill response measures were deployed, which included the use of sorbent pads and bins/buckets to capture the leaking diesel fuel. The entire spill area was confined to an area no larger than 6ft by 4ft and no fuel migrated outside of the property. CRETE provided a notice to Ecology (ERTS, tracking 21-3523) on September 3, 2021. All visual impacted soil was excavated on Monday, September 13, 2021. Laboratory

test results for soil samples analyzed following removal of visually impacted soil in this area are included in Attachment 1.

- After cleanup actions were completed in each CAA and the SMA, the areas were returned to a stabilized condition to prepare the site for future development.

### **Deliverables**

Cleanup action construction deliverables included the following:

- Completed cleanup action construction reporting in accordance with city and county permits:
  - Submitted Discharge Monitoring Reports (DMRs) under the Construction Stormwater General Permit (CSGP) WAR 310049 on October 14, 2021 (covering the reporting period of September 2021), November 15, 2021 (covering the reporting period of October 2021), December 15, 2021 (covering the reporting period of November 2021), and January 13, 2022 (covering the reporting period of December 2021).
  - Completed Self-Monitoring Reports (SMRs) under King County Industrial Waste (KCIW) Discharge Authorization 1145-01 on October 7, 2021 (covering the reporting period of September 2021), November 3, 2021 (covering the reporting period of October 2021), December 14, 2021 (covering the reporting period of November 2021), and January 13, 2022 (covering the reporting period of December 2021).

### **Deviations from Required Tasks (PPCD Section XII.B)**

- None.

### **Anticipated Problems in Meeting Schedule or Objectives and Associated Solutions (PPCD Section XII.C and XII.D)**

- There are no anticipated problems in meeting the schedule of deliverables specified in Exhibit D of the PPCD. The schedule of deliverables and activities specified in Table 8.1 of the Cleanup Action Plan (Exhibit C of the PPCD) are currently on track or ahead of schedule.

### **Sampling, Testing, or Other Data Received (PPCD Section XII.E)**

Laboratory data for confirmation samples collected for the remedial excavations, ISS mixing, and stormwater discharge samples were received between September 17 and December 2, 2021. In accordance with Section XII.E, copies of laboratory data packages are provided in Attachment 1 and include the following:

- CAA-2b: Sample delivery groups (SDGs) 110205, 110129, 110112, 110063
- CAA-3: SDGs 111201, 111149, 111170
- CAA-6a: SDG 107507 (amended report from what was submitted in previous progress report)
- Haul Truck Diesel Spill Area: SDG 109219
- King County Stormwater Discharge Sample: SDG 111097
- ISS performance physical sampling from CAA-2a and CAA-4

A summary of these data, and their application to cleanup action implementation, will also be provided in the Remedial Action Completion Report (in preparation). Analytical data for the samples remaining in place after construction completion (e.g., excavation sidewall and base samples) will be uploaded to Ecology's Environmental Information Management system, as required by the PPCD.

### **Work Planned During the Upcoming Reporting Period (PPCD Section XII.F)**

The following work is planned for the 1<sup>st</sup> Quarter 2022:

- Preparation of the Remedial Action Completion Report and Long Term Compliance Monitoring Plan.

### **Deliverables Planned During the Upcoming Reporting Period (PPCD Section XII.G)**

The following deliverables are anticipated to be completed during the next quarterly reporting period of January through March 2022:

- Submittal of the Remedial Action Completion Report
- Submittal of the draft Long Term Compliance Monitoring Plan
- Reporting required per the construction permits, including SMRs under the KCIW Discharge Authorization and DMRs under the Ecology CSGP will continue to be submitted on a monthly basis until the permits are closed out.

### **Other Pertinent Information, Including Changes in Key Personnel**

- On December 20, 2021, Ecology was notified of the change of designated project coordinator. The new project coordinator is Kim Hempel, effective January 1, 2022.

### **Attachments**

- Attachment 1 - Laboratory Data Reports

**END QUARTERLY PROGRESS REPORT**

**ATTACHMENT 1**

**Laboratory Analytical Reports**

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

December 2, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the amended results from the testing of material submitted on July 30, 2021 from the TOC Seattle Terminal 1, F&BI 107507 project. The NWTPH-Gx sample and duplicate results were updated to reflect the reanalysis for inhomogeneity.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures

c: Time Oil Terminal 1  
CTC0803R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

August 3, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on July 30, 2021 from the TOC Seattle Terminal 1, F&BI 107507 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: Time Oil Terminal 1  
CTC0803R.DOC

FRIEDMAN & BRUYA, INC.

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ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on July 30, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 107507 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
107507 -01	CAA6A-Base-04

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 08/03/21  
Date Received: 07/30/21  
Project: TOC Seattle Terminal 1, F&BI 107507  
Date Extracted: 07/30/21  
Date Analyzed: 07/30/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR BENZENE AND TPH AS GASOLINE  
USING EPA METHOD 8021B AND NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Benzene</u>	<u>Gasoline</u> <u>Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> Limit 50-150)
CAA6A-Base-04 107507-01	<0.02	<5	94
Method Blank 01-1663 MB2	<0.02	<5	102

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 08/03/21  
Date Received: 07/30/21  
Project: TOC Seattle Terminal 1, F&BI 107507  
Date Extracted: 07/30/21  
Date Analyzed: 07/30/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-Dx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
CAA6A-Base-04 107507-01	<50	<250	95
Method Blank 01-1757 MB	<50	<250	97

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 08/03/21

Date Received: 07/30/21

Project: TOC Seattle Terminal 1, F&BI 107507

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR BENZENE AND TPH AS GASOLINE  
USING EPA METHOD 8021B AND NWTPH-Gx**

Laboratory Code: 107474-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Gasoline	mg/kg (ppm)	40	41	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	0.5	92	69-120
Gasoline	mg/kg (ppm)	20	90	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 08/03/21

Date Received: 07/30/21

Project: TOC Seattle Terminal 1, F&BI 107507

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 107500-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	106	104	64-133	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	58-147

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

September 17, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on September 13, 2021 from the TOC Seattle Terminal 1, F&BI 109219 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC0917R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on September 13, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 109219 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
109219 -01	Northeast
109219 -02	South

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 09/17/21  
Date Received: 09/13/21  
Project: TOC Seattle Terminal 1, F&BI 109219  
Date Extracted: 09/15/21  
Date Analyzed: 09/15/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-Dx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 48-168)
Northeast 109219-01	<50	<250	97
South 109219-02	<50	<250	102
Method Blank 01-2108 MB	<50	<250	98

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 09/17/21

Date Received: 09/13/21

Project: TOC Seattle Terminal 1, F&BI 109219

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 109219-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	118	124	73-135	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	118	74-139

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

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lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

109219

SAMPLE CHAIN OF CUSTODY

04-13-21

A01

Page # 1 of 1

Report To R. Jones, J. Stevens, K. Hempel

Company TOP Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

SAMPLERS (signature) R. Jones

PROJECT NAME Rusty Jones

PO # \_\_\_\_\_

REMARKS TOP Seattle Terminal 1

INVOICE TO \_\_\_\_\_

Project specific RLS? - Yes / No \_\_\_\_\_

TURNAROUND TIME

Standard turnaround

RUSH

Rush charges authorized by: \_\_\_\_\_

SAMPLE DISPOSAL

Archive samples

Other \_\_\_\_\_

Default: Dispose after 30 days

ANALYSES REQUESTED

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED							Notes		
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082			
Northwest	01	09.13.21	0740	Soil	1	X									
South	02	↓	0745	Soil	1	X									

Samples received at 4 °C

Friedman & Bruya, Inc.  
 3012 16th Avenue West  
 Seattle, WA 98119-2029  
 Ph. (206) 285-8282

SIGNATURE		PRINT NAME		COMPANY		DATE	TIME
Relinquished by: <u>R. Jones</u>		<u>Rusty Jones</u>				<u>9.13.21</u>	<u>1607</u>
Received by: <u>W.D. W.B.</u>		<u>Liz Webber-Bruya</u>				<u>9/13/21</u>	<u>1607</u>
Relinquished by:							
Received by:							

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
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www.friedmanandbruya.com

October 7, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on October 4, 2021 from the TOC Seattle Terminal 1, F&BI 110063 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1007R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 4, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 110063 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
110063 -01	CAA2B-Base-04
110063 -02	CAA2B-Base-04-0.5
110063 -03	CAA2B-Base-04-1

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

Date Extracted: 10/05/21 and 10/06/21

Date Analyzed: 10/05/21 and 10/06/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 58-139)
CAA2B-Base-04 110063-01 1/10	2,100	ip
CAA2B-Base-04-0.5 110063-02 1/10	410	108
Method Blank 01-1971 MB	<5	98
Method Blank 01-1975 MB	<5	87

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

Date Extracted: 10/05/21 and 10/06/21

Date Analyzed: 10/05/21 and 10/06/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-D<sub>x</sub>**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
CAA2B-Base-04 110063-01	11,000	<250	ip
CAA2B-Base-04-0.5 110063-02	3,400	<250	98
Method Blank 01-2272 MB	<50	<250	89
Method Blank 01-2285 MB	<50	<250	96



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-Gx**

Laboratory Code: 110053-02 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	100	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 110058-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	56	95	97	64-133	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	88	58-147

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-G<sub>x</sub>**

Laboratory Code: 110080-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	95	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/07/21

Date Received: 10/04/21

Project: TOC Seattle Terminal 1, F&BI 110063

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 110063-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	9,400	97	89	73-135	9

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	100	74-139

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

110063

SAMPLE CHAIN OF CUSTODY

ME 10/4/21

Page # 001 of 1

Report To R. Jones, T. Stevens, K. Heppel

Company TEC Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

SAMPLERS (signature) <u>R. Jones</u>	PROJECT NAME <u>TEC Seattle Terminal 1</u>	PO # _____
REMARKS	INVOICE TO	

TURNAROUND TIME

Standard Turnaround  
 RUSH 24 Hour  
 Rush charges authorized by: \_\_\_\_\_

SAMPLE DISPOSAL

Dispose after 30 days  
 Archive Samples  
 Other \_\_\_\_\_

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED							Notes
						TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	
CA285-BA5E-04	01 A-E	10.4.2021	1355	Soil	5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>Hold</u>
CA285-BA5E-04-0.5	02 1		1400		5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>Hold</u>
CA285-BA5E-04-1	03 1		1410		5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>Hold</u>

Friedman & Bruya, Inc.  
 3012 16th Avenue West  
 Seattle, WA 98119-2029  
 Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
<u>R. Jones</u>	<u>Rusty Jones</u>	<u>CRETE Consulting</u>	<u>10.4.2021</u>	<u>1501</u>
<u>M. Jones</u>	<u>Phan Phan</u>	<u>FEBI</u>	<u>10/4/21</u>	<u>1501</u>
Received by:				
Relinquished by:				

Samples received at 400

24 hr. TAT per 35 10/12/21 Notes mlt

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

October 11, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on October 6, 2021 from the TOC Seattle Terminal 1, F&BI 110112 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1011R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 6, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 110112 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
110112 -01	CAA2B-BASE-03
110112 -02	CAA2B-BASE-03-0.5
110112 -03	CAA2B-BASE-03-1

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21  
Date Received: 10/06/21  
Project: TOC Seattle Terminal 1, F&BI 110112  
Date Extracted: 10/06/21  
Date Analyzed: 10/07/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 50-150)
CAA2B-BASE-03 110112-01	48	93
Method Blank 01-1973 MB	<5	97

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21  
Date Received: 10/06/21  
Project: TOC Seattle Terminal 1, F&BI 110112  
Date Extracted: 10/06/21  
Date Analyzed: 10/06/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-D<sub>x</sub>**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 56-165)
CAA2B-BASE-03 110112-01	120	<250	84
Method Blank 01-2284 MB	<50	<250	87

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21

Date Received: 10/06/21

Project: TOC Seattle Terminal 1, F&BI 110112

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-G<sub>x</sub>**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Gasoline	mg/kg (ppm)	20	100	95	60-120	5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21

Date Received: 10/06/21

Project: TOC Seattle Terminal 1, F&BI 110112

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 110082-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	90	92	63-146	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	88	79-144

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

110112

SAMPLE CHAIN OF CUSTODY ME 10/06/21

CD1 V51

Report To R. Jones, J. Stevens, K. Hempel

Company TEL Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_

Email \_\_\_\_\_

Page # \_\_\_\_\_ of \_\_\_\_\_

SAMPLERS (signature) R. Jones  
 PROJECT NAME Rusty Jones  
 PROJECT NAME TEL Seattle Terminal 1  
 PO # \_\_\_\_\_

REMARKS \_\_\_\_\_  
 INVOICE TO \_\_\_\_\_  
 Project specific RI-? - Yes / No \_\_\_\_\_

TURNAROUND TIME \_\_\_\_\_  
 Standard turnaround  
 RUSH 24-Hour  
 Rush charges authorized by: \_\_\_\_\_  
 SAMPLE DISPOSAL  
 Archive samples  
 Other \_\_\_\_\_  
 Default: Dispose after 30 days

ANALYSES REQUESTED

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED							Notes	
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082		
CA23-BKSE-03	01A-E	10/6/2021	0945	SOIL	5	X	X							Hold
CA23-BKSE-03-0.5	02	↓	0855	↓	5									Hold
CA23-BKSE-03-1	03	↓	0905	↓	5									Hold

Samples received at 4°C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: <u>R. Jones</u>	<u>Rusty Jones</u>	<u>CEERE Consulting</u>	<u>10/6/2021</u>	<u>1003</u>
Received by: <u>M. Jones</u>	<u>Dawn Dawn</u>	<u>FEBI</u>	<u>10/6/21</u>	<u>1003</u>
Relinquished by: _____				
Received by: _____				

Friedman & Bruya, Inc.  
 3012 16th Avenue West  
 Seattle, WA 98119-2029  
 Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

October 11, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on October 6, 2021 from the TOC Seattle Terminal 1, F&BI 110129 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1011R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 6, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 110129 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
110129 -01	CAA2B-Base-02
110129 -02	CAA2B-Base-02-0.5
110129 -03	CAA2B-Base-02-0.7

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21  
Date Received: 10/06/21  
Project: TOC Seattle Terminal 1, F&BI 110129  
Date Extracted: 10/07/21  
Date Analyzed: 10/07/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 50-150)
CAA2B-Base-02 110129-01 1/5	570	ip
Method Blank 01-2289 MB2	<5	101

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21  
Date Received: 10/06/21  
Project: TOC Seattle Terminal 1, F&BI 110129  
Date Extracted: 10/07/21  
Date Analyzed: 10/07/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-Dx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 48-168)
CAA2B-Base-02 110129-01	1,700	<250	98
Method Blank 01-2288 MB2	<50	<250	97

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21

Date Received: 10/06/21

Project: TOC Seattle Terminal 1, F&BI 110129

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-Gx**

Laboratory Code: 110119-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	110	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/11/21

Date Received: 10/06/21

Project: TOC Seattle Terminal 1, F&BI 110129

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 110042-46 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	64	91	99	64-133	8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	90	58-147

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

October 14, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on October 11, 2021 from the TOC Seattle Terminal 1, F&BI 110205 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1014R.DOC

FRIEDMAN & BRUYA, INC.

---

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 11, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 110205 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
110205 -01	CAA2B-BASE-01
110205 -02	CAA2B-BASE-01-0.5

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/14/21  
Date Received: 10/11/21  
Project: TOC Seattle Terminal 1, F&BI 110205  
Date Extracted: 10/12/21  
Date Analyzed: 10/12/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	Surrogate (% Recovery) (Limit 58-139)
CAA2B-BASE-01 110205-01	54	118
Method Blank 01-2297 MB	<5	101

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/14/21  
Date Received: 10/11/21  
Project: TOC Seattle Terminal 1, F&BI 110205  
Date Extracted: 10/11/21  
Date Analyzed: 10/11/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-D<sub>x</sub>**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 48-168)
CAA2B-BASE-01 110205-01	250	<250	105
Method Blank 01-2346 MB	<50	<250	93

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/14/21

Date Received: 10/11/21

Project: TOC Seattle Terminal 1, F&BI 110205

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-G<sub>x</sub>**

Laboratory Code: 110202-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	95	61-153

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/14/21

Date Received: 10/11/21

Project: TOC Seattle Terminal 1, F&BI 110205

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 110180-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	102	104	73-135	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	74-139

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

110205

SAMPLE CHAIN OF CUSTODY

WA E 10-11-21

Page # 1 of 1 081 US1

Report To R. Jones / Rusty Jones / K. Hempel

Company TOC Seattle Terminal 1

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones  
PROJECT NAME TOC Seattle Terminal 1  
PO #

SIGNATURE R. Jones

REMARKS

Project specific RI? - Yes / No

INVOICE TO

Standard turnaround  
 RUSH Results by 10/11/21  
Rush charges authorized by:

SAMPLE DISPOSAL  
 Archive samples  
 Other  
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED							Notes				
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082					
CAAB-BASE-01	01	10/11/2021	1315	Soil	5	X	X										
CAAB-BASE-01-0.5	02	↓	1325	↓	5												Hold

Samples received at 5 °C

Friedman & Bruya, Inc.  
3012 16th Avenue West  
Seattle, WA 98119-2029  
Ph. (206) 285-8282

SIGNATURE		PRINT NAME		COMPANY		DATE	TIME
Retinquished by:	<u>R. Jones</u>	<u>Rusty Jones</u>		<u>CFE Consulting</u>		10/11/21	1408
Received by:	<u>R. WMA</u>	<u>R. WMA</u>		<u>FFXB</u>		10/11/21	1408
Retinquished by:							
Received by:							

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

November 10, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on November 5, 2021 from the TOC Seattle Terminal 1, F&BI 111097 project. There are 14 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1110R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 5, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 111097 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID  
111097 -01

Crete Consulting  
SW-110521

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

Date Extracted: NA

Date Analyzed: 11/05/21

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR pH  
USING EPA METHOD 150.2**

Sample ID

Laboratory ID

pH

SW-110521

111097-01

9.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21  
Date Received: 11/05/21  
Project: TOC Seattle Terminal 1, F&BI 111097  
Date Extracted: NA  
Date Analyzed: 11/05/21

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES  
FOR TURBIDITY  
USING EPA METHOD 180.1  
Results Reported as NTU**

<u>Sample ID</u> Laboratory ID	<u>Date</u> <u>Sampled</u>	<u>Time</u> <u>Sampled</u>	<u>Turbidity</u>
SW-110521 111097-01	11/05/21	10:25	65
Method Blank			<0.5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	SW-110521	Client:	Crete Consulting
Date Received:	11/05/21	Project:	TOC Seattle Terminal 1, F&BI 111097
Date Extracted:	11/05/21	Lab ID:	111097-01
Date Analyzed:	11/05/21	Data File:	110513.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	85	117
Toluene-d8	100	88	112
4-Bromofluorobenzene	95	90	111

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	<0.02
Benzene	1.5
Toluene	4.3
1,1,2-Trichloroethane	<0.5
Ethylbenzene	3.8
m,p-Xylene	9.9
o-Xylene	7.1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	TOC Seattle Terminal 1, F&BI 111097
Date Extracted:	11/05/21	Lab ID:	01-2495 mb
Date Analyzed:	11/05/21	Data File:	110507.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	106	85	117
Toluene-d8	97	88	112
4-Bromofluorobenzene	100	90	111

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	<0.02
Benzene	<0.35
Toluene	<1
1,1,2-Trichloroethane	<0.5
Ethylbenzene	<1
m,p-Xylene	<2
o-Xylene	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	SW-110521	Client:	Crete Consulting
Date Received:	11/05/21	Project:	TOC Seattle Terminal 1, F&BI 111097
Date Extracted:	11/05/21	Lab ID:	111097-01
Date Analyzed:	11/05/21	Data File:	110507.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	28 vo	50	150
Phenol-d6	18 vo	50	150
2,4,6-Tribromophenol	115	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	0.32

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	TOC Seattle Terminal 1, F&BI 111097
Date Extracted:	11/05/21	Lab ID:	01-2561 mb
Date Analyzed:	11/05/21	Data File:	110506.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	33 vo	50	150
Phenol-d6	18 vo	50	150
2,4,6-Tribromophenol	90	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.2

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21  
Date Received: 11/05/21  
Project: TOC Seattle Terminal 1, F&BI 111097  
Date Extracted: 11/05/21  
Date Analyzed: 11/08/21

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES  
FOR OIL AND GREASE USING EPA METHOD 1664**

Results Reported as mg/L (ppm)

<u>Sample ID</u> Laboratory ID	<u>Oil and Grease</u>
SW-110521 111097-01	<3
Method Blank	<3

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

**QUALITY ASSURANCE RESULTS  
FROM THE ANALYSIS OF WATER SAMPLES  
FOR pH BY METHOD 150.2**

Laboratory Code: 111097-01 (Duplicate)

Analyte	Sample Result	Duplicate Result	Relative Percent Difference	Acceptance Criteria
pH	9.4	9.4	0	0-20



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

**QUALITY ASSURANCE RESULTS  
FROM THE ANALYSIS OF WATER SAMPLES FOR TURBIDITY  
USING EPA METHOD 180.1**

Laboratory Code: 111097-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	Relative Percent Difference	Acceptance Criteria
Turbidity	NTU	65	65	0	0-20

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER  
SAMPLES FOR VOLATILES BY EPA METHOD 8260D**

Laboratory Code: 111097-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent	Acceptance
				Recovery MS	Criteria
Vinyl chloride	ug/L (ppb)	10	<0.02	102	16-176
Benzene	ug/L (ppb)	10	1.5	95	50-150
Toluene	ug/L (ppb)	10	4.3	107 b	50-150
1,1,2-Trichloroethane	ug/L (ppb)	10	<0.5	95	50-150
Ethylbenzene	ug/L (ppb)	10	3.8	100 b	50-150
m,p-Xylene	ug/L (ppb)	20	9.9	106 b	50-150
o-Xylene	ug/L (ppb)	10	7.1	110 b	50-150

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent	Percent	Acceptance Criteria	RPD (Limit 20)
			Recovery LCS	Recovery LCSD		
Vinyl chloride	ug/L (ppb)	10	97	93	70-130	4
Benzene	ug/L (ppb)	10	96	92	70-130	4
Toluene	ug/L (ppb)	10	104	101	70-130	3
1,1,2-Trichloroethane	ug/L (ppb)	10	96	94	70-130	2
Ethylbenzene	ug/L (ppb)	10	96	93	70-130	3
m,p-Xylene	ug/L (ppb)	20	100	97	70-130	3
o-Xylene	ug/L (ppb)	10	97	95	70-130	2

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER  
SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	2.5	97	101	70-130	4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/10/21

Date Received: 11/05/21

Project: TOC Seattle Terminal 1, F&BI 111097

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER  
SAMPLES FOR OIL AND GREASE  
USING EPA METHOD 1664**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 11)
Oil and Grease	mg/L (ppm)	40	107	93	78-114	14 vo

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

- a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.
- c - The presence of the analyte may be due to carryover from previous sample injections.
- cf - The sample was centrifuged prior to analysis.
- d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.
- dv - Insufficient sample volume was available to achieve normal reporting limits.
- f - The sample was laboratory filtered prior to analysis.
- fb - The analyte was detected in the method blank.
- fc - The analyte is a common laboratory and field contaminant.
- hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.
- hs - Headspace was present in the container used for analysis.
- ht - The analysis was performed outside the method or client-specified holding time requirement.
- ip - Recovery fell outside of control limits due to sample matrix effects.
- j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.
- J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.
- js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc - The presence of the analyte is likely due to laboratory contamination.
- L - The reported concentration was generated from a library search.
- nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.
- ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.
- vo - The value reported fell outside the control limits established for this analyte.
- x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

November 12, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on November 9, 2021 from the TOC Seattle Terminal 1, F&BI 111149 project. There are 10 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1112R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 9, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 111149 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
111149 -01	CAA3-SS-04
111149 -02	CAA3-BASE-03

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21  
Date Received: 11/09/21  
Project: TOC Seattle Terminal 1, F&BI 111149  
Date Extracted: 11/10/21  
Date Analyzed: 11/10/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	Surrogate (% Recovery) (Limit 58-139)
CAA3-SS-04 111149-01	21	108
CAA3-BASE-03 111149-02	<5	102
Method Blank 01-2534 MB	<5	100

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21  
Date Received: 11/09/21  
Project: TOC Seattle Terminal 1, F&BI 111149  
Date Extracted: 11/10/21  
Date Analyzed: 11/10/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-Dx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
CAA3-SS-04 111149-01	67 x	<250	91
CAA3-BASE-03 111149-02	<50	<250	91
Method Blank 01-2611 MB2	<50	<250	91

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	CAA3-SS-04	Client:	Crete Consulting
Date Received:	11/09/21	Project:	TOC Seattle Terminal 1, F&BI 111149
Date Extracted:	11/09/21	Lab ID:	111149-01
Date Analyzed:	11/10/21	Data File:	111011.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	90	109
Toluene-d8	103	89	112
4-Bromofluorobenzene	99	84	115

Compounds:	Concentration mg/kg (ppm)
Trichloroethene	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	CAA3-BASE-03	Client:	Crete Consulting
Date Received:	11/09/21	Project:	TOC Seattle Terminal 1, F&BI 111149
Date Extracted:	11/09/21	Lab ID:	111149-02
Date Analyzed:	11/10/21	Data File:	111012.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	90	109
Toluene-d8	106	89	112
4-Bromofluorobenzene	98	84	115

Compounds:	Concentration mg/kg (ppm)
Trichloroethene	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	TOC Seattle Terminal 1, F&BI 111149
Date Extracted:	11/09/21	Lab ID:	01-2571 mb
Date Analyzed:	11/09/21	Data File:	110919.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	93	90	109
Toluene-d8	104	89	112
4-Bromofluorobenzene	98	84	115

Compounds:	Concentration mg/kg (ppm)
Trichloroethene	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOC Seattle Terminal 1, F&BI 111149

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-Gx**

Laboratory Code: 111177-03 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	105	61-153

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOC Seattle Terminal 1, F&BI 111149

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 111155-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	8,000	76	65	64-133	16

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	100	58-147

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOC Seattle Terminal 1, F&BI 111149

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR VOLATILES BY EPA METHOD 8260D**

Laboratory Code: 111035-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	mg/kg (ppm)	1	<0.02	77	75	21-139	3

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	mg/kg (ppm)	1	101	63-121



# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

111149

SAMPLE CHAIN OF CUSTODY

ME 11-09-21 051 / AD1  
 Page # 1 of 1

Report To R. Jones / I. Stevens / K. Hempel

Company Too Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

SAMPLERS (signature) R. Jones  
 PROJECT NAME Rusty Towers

REMARKS Too Seattle Terminal 1

PO # \_\_\_\_\_

INVOICE TO \_\_\_\_\_

Project Specific RIs - Yes / No \_\_\_\_\_

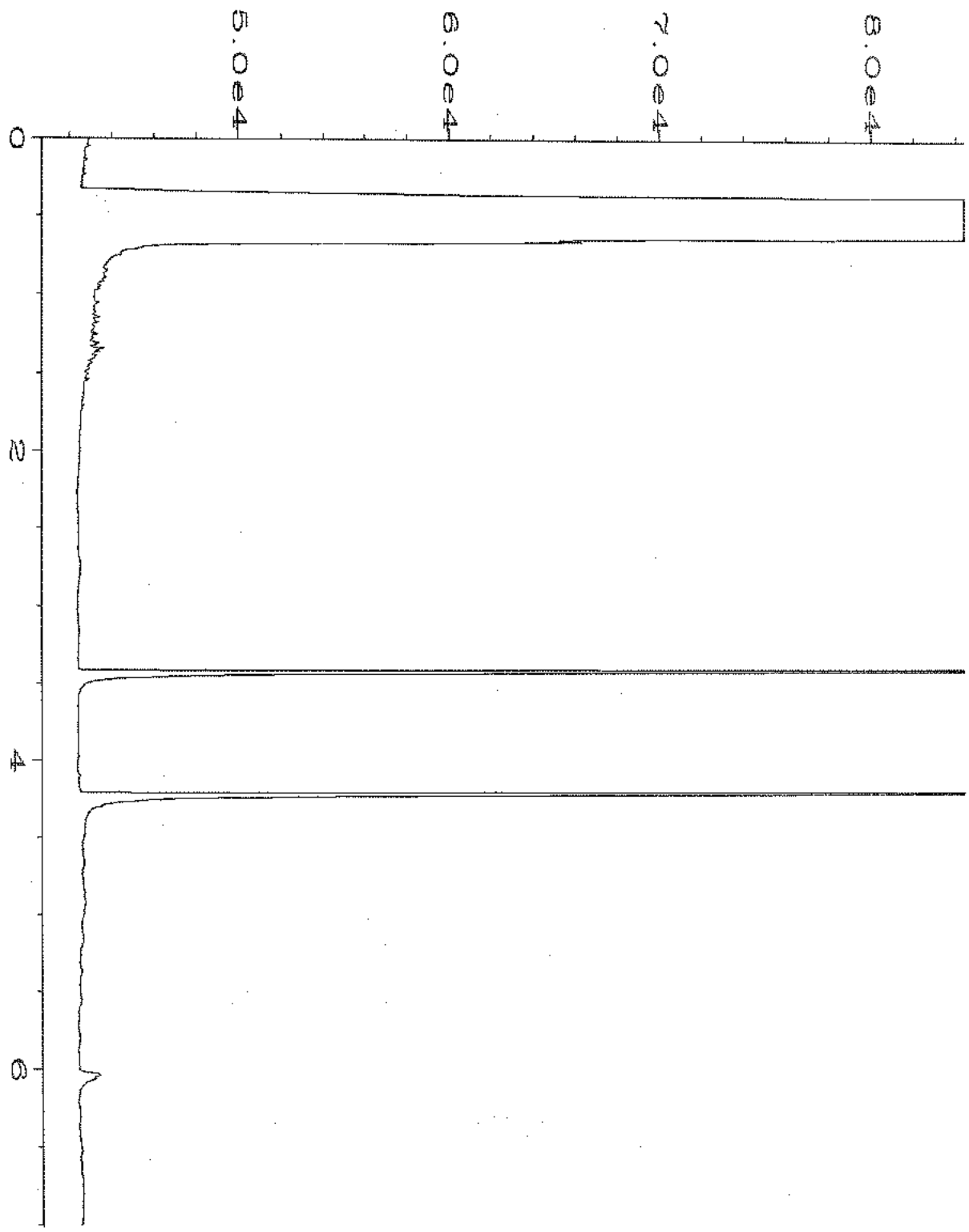
TURNAROUND TIME  
 Standard Turnaround  
 RUSH 24-Hour  
 Rush charges authorized by: \_\_\_\_\_

SAMPLE DISPOSAL  
 Dispose after 30 days  
 Archive Samples  
 Other \_\_\_\_\_

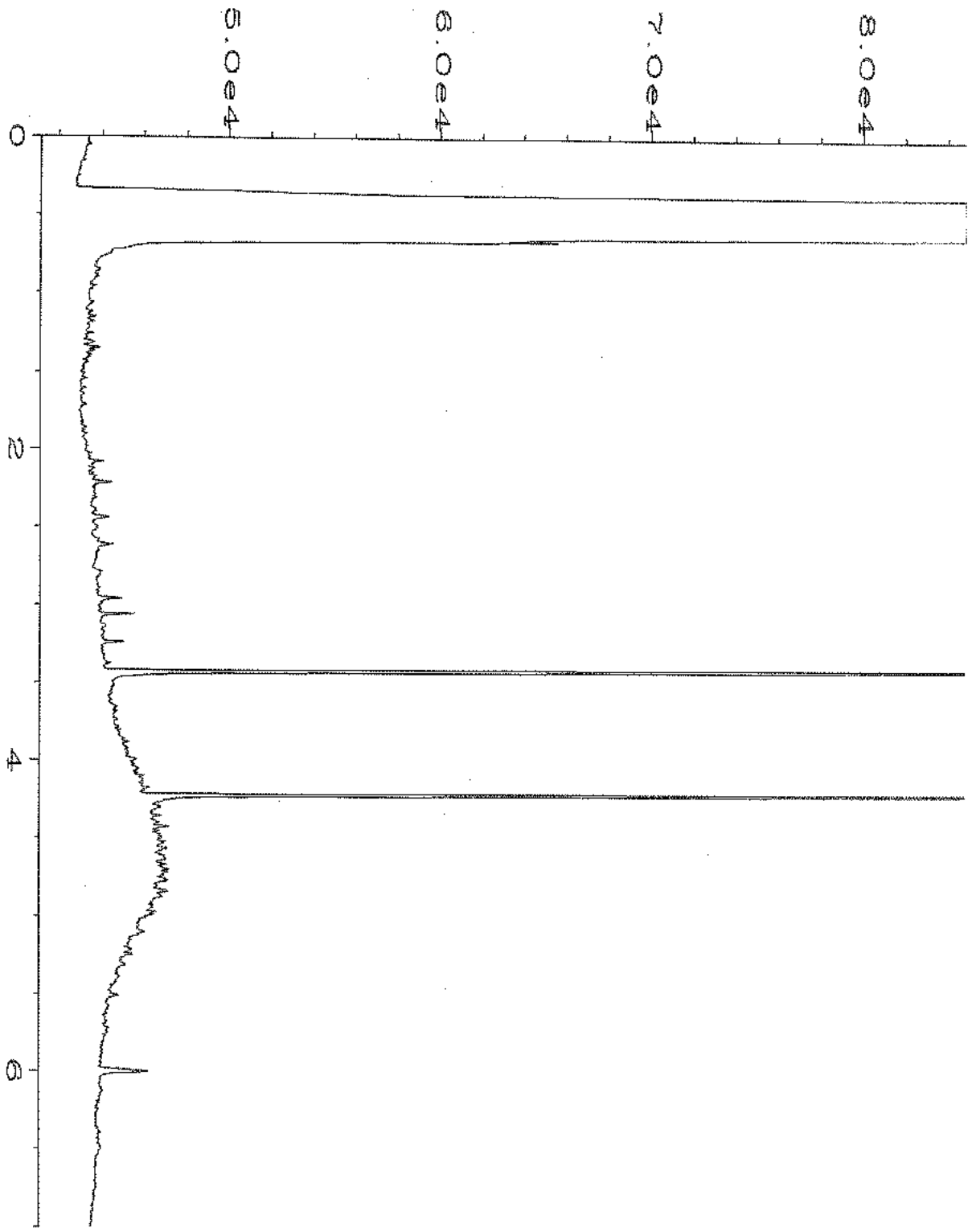
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED										Notes			
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE							
CM3-98-04	01 A-I	11/9/2021	1010	SOIL	9	X	X							X					
CM3-BASE-03	02 A-I	↓	1020	↓	9	X	X												

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Reinquired by: <u>R. Jones</u>	<u>Rusty Towers</u>	<u>RETE CONSULTING</u>	<u>11-9-21</u>	<u>1113</u>
Received by: <u>mbay</u>	<u>NHAN PHAN</u>	<u>TEBI</u>	<u>11-9-21</u>	<u>1113</u>
Reinquired by: _____	_____	_____	_____	_____
Received by: _____	_____	_____	_____	_____

Friedman & Bruya, Inc.  
 3013 16th Avenue West  
 Seattle, WA 98119-2029  
 Ph. (206) 285-8282



Data File Name	: C:\HPCHEM\6\DATA\11-10-21\010F0301.D	Page Number	: 1
Operator	: TL	Vial Number	: 10
Instrument	: GC6	Injection Number	: 1
Sample Name	: 111149-02	Sequence Line	: 3
Run Time Bar Code:		Instrument Method:	DX.MTH
Acquired on	: 10 Nov 21 09:32 AM	Analysis Method	: DEFAULT.MTH
Report Created on:	10 Nov 21 10:45 AM		



Data File Name	: C:\HPCHEM\6\DATA\11-10-21\009F0301.D	Page Number	: 1
Operator	: TL	Vial Number	: 9
Instrument	: GC6	Injection Number	: 1
Sample Name	: 111149-01	Sequence Line	: 3
Run Time Bar Code:		Instrument Method:	DX.MTH
Acquired on	: 10 Nov 21 09:21 AM	Analysis Method	: DEFAULT.MTH
Report Created on:	10 Nov 21 10:45 AM		

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

November 16, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on November 10, 2021 from the TOC Seattle Terminal 1, F&BI 111201 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1116R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 10, 2020 by Friedman & Bruya, Inc. from the Crete Consulting TOC Seattle Terminal 1, F&BI 111201 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
111201 -01	CAA3-DUP-01
111201 -02	CAA3-SS-01
111201 -03	CAA3-BASE-01
111201 -04	CAA3-DUP-02
111201 -05	CAA3-SS-02
111201 -06	CAA3-BASE-02

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21  
Date Received: 11/10/21  
Project: TOC Seattle Terminal 1, F&BI 111201  
Date Extracted: 11/11/21  
Date Analyzed: 11/11/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 58-139)
CAA3-DUP-01 111201-01	<5	100
CAA3-SS-01 111201-02	9.8	104
CAA3-BASE-01 111201-03	66	111
CAA3-DUP-02 111201-04	38	104
CAA3-SS-02 111201-05 1/5	220	107
CAA3-BASE-02 111201-06 1/5	130	103
Method Blank 01-2536 MB	<5	100

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21  
Date Received: 11/10/21  
Project: TOC Seattle Terminal 1, F&BI 111201  
Date Extracted: 11/11/21  
Date Analyzed: 11/11/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-D<sub>x</sub>**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
CAA3-DUP-01 111201-01	<50	<250	95
CAA3-SS-01 111201-02	<50	<250	93
CAA3-BASE-01 111201-03	170	<250	96
CAA3-DUP-02 111201-04	160	<250	92
CAA3-SS-02 111201-05	92	<250	93
CAA3-BASE-02 111201-06	370	<250	92
Method Blank 01-2619 MB	<50	<250	94



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21

Date Received: 11/10/21

Project: TOC Seattle Terminal 1, F&BI 111201

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-Gx**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Gasoline	mg/kg (ppm)	20	105	105	61-153	0

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21

Date Received: 11/10/21

Project: TOC Seattle Terminal 1, F&BI 111201

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 111201-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	90	90	64-133	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	90	58-147

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

111901

SAMPLE CHAIN OF CUSTODY ME 11/10/21 A03/VS2

Report To R. Jones / J. Stevens / K. Hempel

Company Tec Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

SAMPLERS (signature) R. Jones

PROJECT NAME Tec Seattle Terminal 1

REMARKS \_\_\_\_\_

INVOICE TO \_\_\_\_\_

Protect Specific RIAs - Yes / No \_\_\_\_\_

TURNAROUND TIME \_\_\_\_\_

PO # \_\_\_\_\_

Standard Turnaround

RUSH 24-Hour

Rush charges authorized by: \_\_\_\_\_

SAMPLE DISPOSAL

Dispose after 30 days

Archive Samples

Other

ANALYSES REQUESTED

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Notes
CA13-DUP-01	01A-E	11.10.2021	1000	Soil	5	X	X					
CA13-55-01	02		1100		5	X	X					
CA13-BASE-01	03		1115		5	X	X					
CA13-DUP-02	04		1200		5	X	X					
CA13-55-02	05		1400		5	X	X					
CA13-BASE-02	06		1430		5	X	X					

Samples received at 4 °C

SIGNATURE

Relinquished by: R. Jones

Received by: [Signature]

PRINT NAME

Rusty Jones

Ava W. Bruger

COMPANY

CRETE Consulting

CRB

DATE

11.10.21

11/10

TIME

1458

1458

Friedman & Bruya, Inc.

3012 16th Avenue West

Seattle, WA 98119-2029

Ph. (206) 285-8282

Received by:

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

3012 16th Avenue West  
Seattle, WA 98119-2029  
(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

November 12, 2021

Rusty Jones, Project Manager  
Crete Consulting  
16300 Christensen Road, Suite 214  
Tukwila, WA 98188

Dear Mr Jones:

Included are the results from the testing of material submitted on November 9, 2021 from the TOCST 1, F&BI 111170 project. There are 9 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
c: TOC Seattle Terminal 1  
CTC1112R.DOC

FRIEDMAN & BRUYA, INC.

---

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 9, 2021 by Friedman & Bruya, Inc. from the Crete Consulting TOCST 1, F&BI 111170 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Crete Consulting</u>
111170 -01	CAA3-SS-03

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21  
Date Received: 11/09/21  
Project: TOCST 1, F&BI 111170  
Date Extracted: 11/09/21  
Date Analyzed: 11/10/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE  
USING METHOD NWTPH-Gx**

Results Reported on a Dry Weight Basis  
Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	Surrogate (% Recovery) (Limit 58-139)
CAA3-SS-03 111170-01 1/10	270	107
Method Blank 01-2531 MB	<5	112

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21  
Date Received: 11/09/21  
Project: TOCST 1, F&BI 111170  
Date Extracted: 11/10/21  
Date Analyzed: 11/10/21

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL AND MOTOR OIL  
USING METHOD NWTPH-D<sub>x</sub>**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	<u>Motor Oil Range</u> (C <sub>25</sub> -C <sub>36</sub> )	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
CAA3-SS-03 111170-01	<50	<250	94
Method Blank 01-2611 MB2	<50	<250	91



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	CAA3-SS-03	Client:	Crete Consulting
Date Received:	11/09/21	Project:	TOCST 1, F&BI 111170
Date Extracted:	11/09/21	Lab ID:	111170-01
Date Analyzed:	11/10/21	Data File:	111019.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	90	109
Toluene-d8	108	89	112
4-Bromofluorobenzene	100	84	115

Compounds:	Concentration mg/kg (ppm)
Trichloroethene	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	TOCST 1, F&BI 111170
Date Extracted:	11/09/21	Lab ID:	01-2571 mb
Date Analyzed:	11/09/21	Data File:	110919.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	WE

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	93	90	109
Toluene-d8	104	89	112
4-Bromofluorobenzene	98	84	115

Compounds:	Concentration mg/kg (ppm)
Trichloroethene	<0.02

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOCST 1, F&BI 111170

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR TPH AS GASOLINE  
USING METHOD NWTPH-Gx**

Laboratory Code: 111051-11 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	85	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOCST 1, F&BI 111170

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES  
FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: 111155-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	8,000	76	65	64-133	16

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	100	58-147

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/12/21

Date Received: 11/09/21

Project: TOCST 1, F&BI 111170

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES  
FOR VOLATILES BY EPA METHOD 8260D**

Laboratory Code: 111035-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	mg/kg (ppm)	1	<0.02	77	75	21-139	3

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	mg/kg (ppm)	1	101	63-121

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

11117D

SAMPLE CHAIN OF CUSTODY

11-09-24

401/US1

Report To K. Jones / J. Stevens / K. Hengel

Company Tox Seattle Terminal 1

Address \_\_\_\_\_

City, State, ZIP \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

SAMPLERS (signature) Rusty Jones

PROJECT NAME TOXST 1

PO # \_\_\_\_\_

REMARKS

INVOICE TO

Project Specific RIs - Yes / No

Page # 1 of 1

TURNAROUND TIME

Standard Turnaround

RUSH 24-Hour

Rush charges authorized by: \_\_\_\_\_

SAMPLE DISPOSAL

Dispose after 30 days

Archive Samples

Other

ANALYSES REQUESTED

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED							Notes		
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE			
CAA3-SS-03	OIA-E	11.9.2024	1340	Soil	5	X	X					X			

Samples received at 4 oc

SIGNATURE

Reinquished by: [Signature]

PRINT NAME

Received by: [Signature]

Rusty Jones

COMPANY

Reinquished by: [Signature]

MWH Group

DATE

11/9/24

TIME

1423

Friedman & Bruya, Inc.  
3012 16th Avenue West  
Seattle, WA 98119-2029  
Ph. (206) 285-8282



**TIMELY  
ENGINEERING  
SOIL  
TESTS, LLC**

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: [www.test-llc.com](http://www.test-llc.com)



**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **10/07/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39047/2-20	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/27/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.633
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.21
Mass of Sample, g	1187.9
Wet Density, pcf	115.4
Dry Density, pcf	87.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1485.6
Mass of Dry Sample and Tare, g	1203.4
Mass of Tare, g	299.2
Moisture, %	31.2

**TEST DATA**

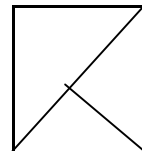
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	896
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	129
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>129</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/25/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39047/2-20	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/27/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.594
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.02
Mass of Sample, g	1175.7
Wet Density, pcf	114.8
Dry Density, pcf	87.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1472.7
Mass of Dry Sample and Tare, g	1191.5
Mass of Tare, g	302.0
Moisture, %	31.6

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2742
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	393
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>393</b>

Failure Code 3

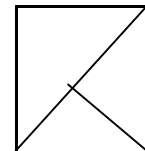
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 10/07/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39047/2-20	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/27/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.005 in	7.63 cm	Speed	10	Average Height of Sample	3.006 in	7.64 cm				
Diameter	2.969 in	7.54 cm	Board Number	9	Average Diameter of Sample	2.970 in	7.54 cm				
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	41	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>				
Volume	340.92 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	2A	Volume	341.27 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	629.4 g	1.39 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	642.7 g	1.42 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density		87.6 pcf				
Dry Density	87.7 pcf		Cell Pressure	95.0 psi	Vol. of Voids		163.80 cm <sup>3</sup>				
			Back Pressure	90.0 psi	Vol. of Solids		177.46 cm <sup>3</sup>				
			Confining (Effective) Pressure	5.0 psi	Void Ratio		0.92				
			Max Head	17.59 cm	Saturation		99.8 %				
			Min Head	16.88 cm							
			Maximum Gradient	2.30							
			Minimum Gradient	2.21							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/07/21	8	5	-	0.25	17.59	2.30	23.1	-	-	-
10/07/21	8	15	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	25	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	35	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	45	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	55	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	9	5	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.1E-06	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	571
Syringe ID #	245			Pore Pressure Meter ID #	29

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/25/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39047/2-20	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/27/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.035 in	7.71 cm	Speed	10	Average Height of Sample	3.036 in	7.71 cm	Dry Density	87.4 pcf		
Diameter	2.967 in	7.54 cm	Board Number	14	Average Diameter of Sample	2.968 in	7.54 cm	Vol. of Voids	165.74 cm <sup>3</sup>		
Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>	Cell Number	14	Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Vol. of Solids	178.47 cm <sup>3</sup>		
Volume	343.86 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2a	Volume	344.21 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.93		
Mass	635.1 g	1.40 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	645.4 g	1.42 lb	Saturation	98.7 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	87.4 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	725.8 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	562.3 g				
Mass of wet sample & tare	635.1 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	80.5 g					
Mass of dry sample & tare	481.8 g		Max Head	205.39 cm	% Moisture	33.9					
Mass of tare	0.0 g		Min Head	203.99 cm							
% Moisture	31.8		Maximum Gradient	26.63							
			Minimum Gradient	26.45							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/25/21	7	0	-	2.91	204.69	26.54	24.7	-	-	-
10/25/21	7	10	600	2.90	203.99	26.45	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	20	600	2.92	205.39	26.63	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	30	600	2.92	205.39	26.63	24.7	1.88E-07	0.895	1.69E-07
10/25/21	7	40	600	2.90	203.99	26.45	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	50	600	2.92	205.39	26.63	24.7	1.89E-07	0.895	1.69E-07
10/25/21	8	0	600	2.91	204.69	26.54	24.7	1.89E-07	0.895	1.69E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.7E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	245			Pore Pressure Meter ID #	372

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **10/08/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39092/2-27	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/28/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.677
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.60
Mass of Sample, g	1206.6
Wet Density, pcf	116.1
Dry Density, pcf	87.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1541.2
Mass of Dry Sample and Tare, g	1245.3
Mass of Tare, g	336.9
Moisture, %	32.6

**TEST DATA**

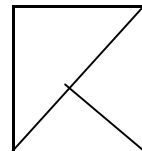
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	489
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	70
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>70</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By KP/IH

Date 10/26/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39092/2-27	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/28/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.662
Initial Diameter, in	2.973
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.31
Mass of Sample, g	1196.0
Wet Density, pcf	115.9
Dry Density, pcf	87.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1493.5
Mass of Dry Sample and Tare, g	1199.2
Mass of Tare, g	299.7
Moisture, %	32.7

**TEST DATA**

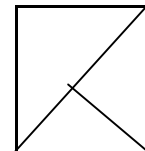
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3126
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	450
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>450</b>

Failure Code 3

Failure Sketch



Failure Type:

Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/09/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39092/2-27	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/28/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	11	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.066 in	7.79 cm	Speed	9	Average Height of Sample	3.067 in	7.79 cm	Dry Density	88.0 pcf		
Diameter	2.954 in	7.50 cm	Board Number	7	Average Diameter of Sample	2.954 in	7.50 cm	Vol. of Voids	164.59 cm <sup>3</sup>		
Area	6.85 in <sup>2</sup>	44.22 cm <sup>2</sup>	Cell Number	14	Area	6.85 in <sup>2</sup>	44.22 cm <sup>2</sup>	Vol. of Solids	179.86 cm <sup>3</sup>		
Volume	344.34 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	4B	Volume	344.45 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.92		
Mass	643.1 g	1.42 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	651.5 g	1.44 lb	Saturation	100.8 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	88.0 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	734.5 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	568.6 g				
Mass of wet sample & tare	643.1 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	82.9 g					
Mass of dry sample & tare	485.7 g		Max Head	21.81 cm	% Moisture	34.2					
Mass of tare	0.0 g		Min Head	21.10 cm							
% Moisture	32.4		Maximum Gradient	2.80							
			Minimum Gradient	2.71							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/09/21	6	20	-	0.30	21.10	2.71	23.2	-	-	-
10/09/21	6	30	600	0.31	21.81	2.80	23.2	3.68E-06	0.927	3.41E-06
10/09/21	6	40	600	0.31	21.81	2.80	23.2	3.62E-06	0.927	3.35E-06
10/09/21	6	50	600	0.30	21.10	2.71	23.2	3.68E-06	0.927	3.41E-06
10/09/21	7	0	600	0.30	21.10	2.71	23.2	3.74E-06	0.927	3.47E-06
10/09/21	7	10	600	0.31	21.81	2.80	23.2	3.68E-06	0.927	3.41E-06
10/09/21	7	20	600	0.30	21.10	2.71	23.2	3.68E-06	0.927	3.41E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.4E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1046			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/26/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39092/2-27	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/28/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.032 in	7.70 cm	Speed	10	Average Height of Sample	3.031 in	7.70 cm	Dry Density	86.3 pcf		
Diameter	2.976 in	7.56 cm	Board Number	3	Average Diameter of Sample	2.977 in	7.56 cm	Vol. of Voids	168.58 cm <sup>3</sup>		
Area	6.96 in <sup>2</sup>	44.88 cm <sup>2</sup>	Cell Number	55	Area	6.96 in <sup>2</sup>	44.91 cm <sup>2</sup>	Vol. of Solids	177.15 cm <sup>3</sup>		
Volume	345.61 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	4B	Volume	345.73 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.95		
Mass	634.5 g	1.40 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	645.2 g	1.42 lb	Saturation	99.0 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	86.4 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	718.1 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	551.2 g				
Mass of wet sample & tare	634.5 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	72.9 g					
Mass of dry sample & tare	478.3 g		Max Head	116.76 cm	% Moisture	34.9					
Mass of tare	0.0 g		Min Head	115.36 cm							
% Moisture	32.7		Maximum Gradient	15.17							
			Minimum Gradient	14.98							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/26/21	7	5	-	1.65	116.06	15.08	24.5	-	-	-
10/26/21	7	15	600	1.66	116.76	15.17	24.5	3.30E-07	0.899	2.97E-07
10/26/21	7	25	600	1.64	115.36	14.98	24.5	3.31E-07	0.899	2.98E-07
10/26/21	7	35	600	1.64	115.36	14.98	24.5	3.33E-07	0.899	2.99E-07
10/26/21	7	45	600	1.65	116.06	15.08	24.5	3.32E-07	0.899	2.99E-07
10/26/21	7	55	600	1.66	116.76	15.17	24.5	3.30E-07	0.899	2.97E-07
10/26/21	8	5	600	1.65	116.06	15.08	24.5	3.30E-07	0.899	2.97E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.0E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	1046			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 10/08/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39093/CAA-4 Ex-Situ (5)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/28/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.672
Initial Diameter, in	2.978
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.51
Mass of Sample, g	1166.0
Wet Density, pcf	112.4
Dry Density, pcf	81.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1530.3
Mass of Dry Sample and Tare, g	1207.2
Mass of Tare, g	365.7
Moisture, %	38.4

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1952
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	280
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>280</b>

Failure Code 3

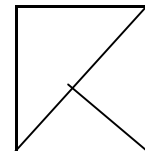
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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Date **10/26/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39093/CAA-4 Ex-Situ (5)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/28/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.722
Initial Diameter, in	2.981
Height-to-Diameter Ratio	1.92
Area, in <sup>2</sup>	6.98
Volume, in <sup>3</sup>	39.94
Mass of Sample, g	1176.7
Wet Density, pcf	112.2
Dry Density, pcf	81.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.87

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1471.5
Mass of Dry Sample and Tare, g	1148.2
Mass of Tare, g	299.1
Moisture, %	38.1

**TEST DATA**

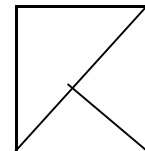
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	5363
Specimen Cross-sectional Area, in <sup>2</sup>	6.98
Compressive Strength at Failure, psi	768
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>768</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/09/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39093/CAA-4 Ex-Situ (5)	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/28/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	11	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.036 in	7.71 cm	Speed	9	Average Height of Sample	3.038 in	7.72 cm	Dry Density	81.5 pcf		
Diameter	2.962 in	7.52 cm	Board Number	8	Average Diameter of Sample	2.963 in	7.53 cm	Vol. of Voids	177.21 cm <sup>3</sup>		
Area	6.89 in <sup>2</sup>	44.46 cm <sup>2</sup>	Cell Number	33	Area	6.90 in <sup>2</sup>	44.49 cm <sup>2</sup>	Vol. of Solids	166.06 cm <sup>3</sup>		
Volume	342.82 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	4A	Volume	343.27 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	1.07		
Mass	618.8 g	1.36 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	624.0 g	1.38 lb	Saturation	99.1 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b> Mass of wet sample & tare 707.9 g Mass of dry sample & tare 532.3 g Mass of tare 84.0 g % Moisture 39.2						
Dry Density	81.6 pcf		Cell Pressure	95.0 psi							
<b>Moisture Content</b>			Back Pressure	90.0 psi							
Mass of wet sample & tare	618.8 g		Confining (Effective) Pressure	5.0 psi							
Mass of dry sample & tare	448.3 g		Max Head	95.66 cm							
Mass of tare	0.0 g		Min Head	94.26 cm							
% Moisture	38.0		Maximum Gradient	12.40							
			Minimum Gradient	12.21							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/09/21	6	20	-	1.35	94.96	12.31	23.2	-	-	-
10/09/21	6	30	600	1.36	95.66	12.40	23.2	8.15E-07	0.927	7.56E-07
10/09/21	6	40	600	1.36	95.66	12.40	23.2	8.12E-07	0.927	7.53E-07
10/09/21	6	50	600	1.34	94.26	12.21	23.2	8.18E-07	0.927	7.58E-07
10/09/21	7	0	600	1.36	95.66	12.40	23.2	8.18E-07	0.927	7.58E-07
10/09/21	7	10	600	1.36	95.66	12.40	23.2	8.12E-07	0.927	7.53E-07
10/09/21	7	20	600	1.35	94.96	12.31	23.2	8.15E-07	0.927	7.56E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				7.6E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Date **10/09/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39094/4-72	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/29/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.671
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.42
Mass of Sample, g	1152.0
Wet Density, pcf	111.3
Dry Density, pcf	78.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1457.8
Mass of Dry Sample and Tare, g	1130.0
Mass of Tare, g	331.9
Moisture, %	41.1

**TEST DATA**

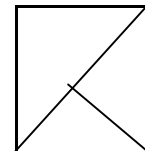
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	610
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	88
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>88</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39094/4-72	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/29/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.706
Initial Diameter, in	2.978
Height-to-Diameter Ratio	1.92
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.74
Mass of Sample, g	1158.9
Wet Density, pcf	111.1
Dry Density, pcf	78.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1460.8
Mass of Dry Sample and Tare, g	1123.5
Mass of Tare, g	305.5
Moisture, %	41.2

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2334
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	335
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>335</b>

Failure Code 3

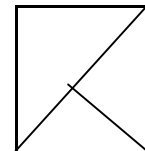
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 10/09/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39094/4-72	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/29/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	10	Average Height of Sample	3.017 in	7.66 cm	Dry Density	78.7 pcf		
Diameter	2.965 in	7.53 cm	Board Number	5	Average Diameter of Sample	2.955 in	7.51 cm	Vol. of Voids	180.59 cm <sup>3</sup>		
Area	6.90 in <sup>2</sup>	44.55 cm <sup>2</sup>	Cell Number	55	Area	6.86 in <sup>2</sup>	44.25 cm <sup>2</sup>	Vol. of Solids	158.47 cm <sup>3</sup>		
Volume	340.91 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	4B	Volume	339.06 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Void Ratio	1.14		
Mass	604.4 g	1.33 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	611.0 g	1.35 lb	Saturation	101.4 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	78.3 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	693.3 g					
			Back Pressure	90.0 psi	Mass of dry sample & tare	510.2 g					
			Confining (Effective) Pressure	5.0 psi	Mass of tare	82.4 g					
			Max Head	97.77 cm	% Moisture	42.8					
			Min Head	95.66 cm							
			Maximum Gradient	12.76							
			Minimum Gradient	12.48							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/09/21	7	55	-	1.38	97.07	12.67	23.2	-	-	-
10/09/21	8	5	600	1.36	95.66	12.48	23.2	4.03E-07	0.927	3.73E-07
10/09/21	8	15	600	1.39	97.77	12.76	23.2	4.01E-07	0.927	3.72E-07
10/09/21	8	25	600	1.37	96.37	12.58	23.2	4.00E-07	0.927	3.70E-07
10/09/21	8	35	600	1.38	97.07	12.67	23.2	4.01E-07	0.927	3.72E-07
10/09/21	8	45	600	1.36	95.66	12.48	23.2	4.03E-07	0.927	3.73E-07
10/09/21	8	55	600	1.37	96.37	12.58	23.2	4.04E-07	0.927	3.74E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.7E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	1046			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **10/28/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39095/CAA-4 SP	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/30/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.678
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.39
Mass of Sample, g	1158.3
Wet Density, pcf	112.0
Dry Density, pcf	80.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1456.0
Mass of Dry Sample and Tare, g	1127.6
Mass of Tare, g	299.1
Moisture, %	39.6

**TEST DATA**

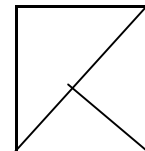
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	4004
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	577
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>577</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**







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Tested By **KP/IH**

Date **10/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39130/4-9	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/02/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.656
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	39.16
Mass of Sample, g	1154.2
Wet Density, pcf	112.3
Dry Density, pcf	79.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1511.7
Mass of Dry Sample and Tare, g	1179.3
Mass of Tare, g	358.9
Moisture, %	40.5

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	913
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	132
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>132</b>

Failure Code 3

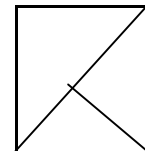
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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ACCREDITED**

Tested By **KP/IH**

Date **11/01/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39131/4-73	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/04/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.555
Initial Diameter, in	2.941
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.79
Volume, in <sup>3</sup>	37.74
Mass of Sample, g	1179.6
Wet Density, pcf	119.1
Dry Density, pcf	91.1
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1438.8
Mass of Dry Sample and Tare, g	1162.9
Mass of Tare, g	261.8
Moisture, %	30.6

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	52
Specimen Cross-sectional Area, in <sup>2</sup>	6.79
Compressive Strength at Failure, psi	8
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>8</b>

Failure Code 3

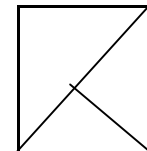
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

**Failure Sketch**



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 11/01/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39131/4-73	Subsample ID	4
Add. Info	-	Mixing/Molding Date	10/04/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.005 in	7.63 cm	Speed	8	Average Height of Sample	3.006 in	7.64 cm	Dry Density	90.3 pcf		
Diameter	2.931 in	7.44 cm	Board Number	18	Average Diameter of Sample	2.932 in	7.45 cm	Vol. of Voids	154.29 cm <sup>3</sup>		
Area	6.75 in <sup>2</sup>	43.53 cm <sup>2</sup>	Cell Number	4	Area	6.75 in <sup>2</sup>	43.56 cm <sup>2</sup>	Vol. of Solids	178.30 cm <sup>3</sup>		
Volume	332.25 cm <sup>3</sup>	0.0117 ft <sup>3</sup>	Flow Pump Number	2A	Volume	332.59 cm <sup>3</sup>	0.0117 ft <sup>3</sup>	Void Ratio	0.87		
Mass	627.3 g	1.38 lb	Flow Pump Rate*	8.96E-04 cm <sup>3</sup> /sec	Mass	630.3 g	1.39 lb	Saturation	96.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b> Mass of wet sample & tare 710.4 g Mass of dry sample & tare 561.5 g Mass of tare 80.1 g % Moisture 30.9						
Dry Density	90.4 pcf		Cell Pressure	95.0 psi							
<b>Moisture Content</b>			Back Pressure	90.0 psi							
Mass of wet sample & tare	627.3 g		Confining (Effective) Pressure	5.0 psi							
Mass of dry sample & tare	481.4 g		Max Head	25.32 cm							
Mass of tare	0.0 g		Min Head	23.92 cm							
% Moisture	30.3		Maximum Gradient	3.32							
			Minimum Gradient	3.13							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/01/21	7	5	-	0.35	24.62	3.22	21.5	-	-	-
11/01/21	7	15	600	0.34	23.92	3.13	21.5	6.47E-06	0.965	6.24E-06
11/01/21	7	25	600	0.35	24.62	3.22	21.5	6.47E-06	0.965	6.24E-06
11/01/21	7	35	600	0.35	24.62	3.22	21.5	6.38E-06	0.965	6.15E-06 *
11/01/21	7	45	600	0.36	25.32	3.32	21.5	6.29E-06	0.965	6.07E-06 *
11/01/21	7	55	600	0.35	24.62	3.22	21.5	6.29E-06	0.965	6.07E-06 *
11/01/21	8	5	600	0.34	23.92	3.13	21.5	6.47E-06	0.965	6.24E-06 *

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				6.1E-06 cm/sec	
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	245			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/06/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39486/4-12	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/09/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.604
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	38.95
Mass of Sample, g	1166.7
Wet Density, pcf	114.1
Dry Density, pcf	83.1
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1527.6
Mass of Dry Sample and Tare, g	1211.3
Mass of Tare, g	363.4
Moisture, %	37.3

**TEST DATA**

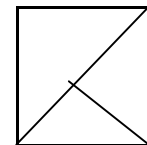
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	868
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	125
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>125</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **11/08/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39487/4-2	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/11/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.581
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	38.64
Mass of Sample, g	1199.2
Wet Density, pcf	118.2
Dry Density, pcf	89.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1496.1
Mass of Dry Sample and Tare, g	1210.0
Mass of Tare, g	298.8
Moisture, %	31.4

**TEST DATA**

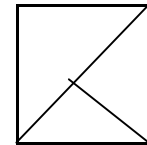
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	521
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	75
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>75</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By EB/KP  
Date 11/08/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39487/4-2	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/11/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.056 in	7.76 cm		Speed	9			Average Height of Sample	3.057 in	7.76 cm	
Diameter	2.960 in	7.52 cm		Board Number	3			Average Diameter of Sample	2.961 in	7.52 cm	
Area	6.88 in <sup>2</sup>	44.40 cm <sup>2</sup>		Cell Number	11			Area	6.89 in <sup>2</sup>	44.43 cm <sup>2</sup>	
Volume	344.61 cm <sup>3</sup>	0.0122 ft <sup>3</sup>		Flow Pump Number	1B			Volume	344.96 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	
Mass	653.5 g	1.44 lb		Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec			Mass	659.8 g	1.45 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	89.7 pcf		
Dry Density	89.7 pcf			Cell Pressure	95.0 psi			Vol. of Voids	161.40 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	183.56 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.88		
				Max Head	44.31 cm			Saturation	101.7 %		
				Min Head	43.61 cm						
				Maximum Gradient	5.71						
				Minimum Gradient	5.62						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/08/21	6	40	-	0.62	43.61	5.62	21.2	-	-	-
11/08/21	6	50	600	0.63	44.31	5.71	21.2	1.78E-06	0.972	1.73E-06
11/08/21	7	0	600	0.62	43.61	5.62	21.2	1.78E-06	0.972	1.73E-06
11/08/21	7	10	600	0.63	44.31	5.71	21.2	1.78E-06	0.972	1.73E-06
11/08/21	7	20	600	0.62	43.61	5.62	21.2	1.78E-06	0.972	1.73E-06
11/08/21	7	30	600	0.63	44.31	5.71	21.2	1.78E-06	0.972	1.73E-06
11/08/21	7	40	600	0.62	43.61	5.62	21.2	1.78E-06	0.972	1.73E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.7E-06 cm/sec	
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	942
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	141			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 11/22/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-4					
Pr. Name	Time Oil Terminal						S. Type	Mold	Depth/Elevation	-
Sample ID	39487/4-2		Subsample ID	4		Location	Seattle, WA			
Add. Info	-	Mixing/Molding Date	10/11/21		Curing Age, Days	42				

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.035 in	7.71 cm	Speed	10			Average Height of Sample	3.036 in	7.71 cm		
Diameter	2.966 in	7.53 cm	Board Number	6			Average Diameter of Sample	2.967 in	7.54 cm		
Area	6.91 in <sup>2</sup>	44.58 cm <sup>2</sup>	Cell Number	2			Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>		
Volume	343.63 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3B			Volume	343.98 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Dry Density	88.8 pcf
Mass	642.6 g	1.42 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	652.3 g	1.44 lb	Vol. of Voids	162.72 cm <sup>3</sup>
Specific Gravity	2.700 (Assumed)		B - Value	0.95						Vol. of Solids	181.26 cm <sup>3</sup>
Dry Density	88.9 pcf		Cell Pressure	95.0 psi						Void Ratio	0.90
			Back Pressure	90.0 psi						Saturation	100.1 %
			Confining (Effective) Pressure	5.0 psi							
			Max Head	63.31 cm							
			Min Head	62.60 cm							
			Maximum Gradient	8.21							
			Minimum Gradient	8.12							
Moisture Content							Moisture Content				
Mass of wet sample & tare	642.6 g						Mass of wet sample & tare	734.8 g			
Mass of dry sample & tare	489.4 g						Mass of dry sample & tare	571.9 g			
Mass of tare	0.0 g						Mass of tare	82.5 g			
% Moisture	31.3						% Moisture	33.3			

TIME FUNCTION			Δ t	READING	Head	Gradient	Temp.	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN	(sec)	DP, (psi)	(cm)		T <sub>x</sub> (°C)	@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/22/21	7	5	-	0.90	63.31	8.21	18.3	-	-	-
11/22/21	7	15	600	0.89	62.60	8.12	18.3	6.15E-07	1.043	6.42E-07
11/22/21	7	25	600	0.90	63.31	8.21	18.3	6.15E-07	1.043	6.42E-07
11/22/21	7	35	600	0.89	62.60	8.12	18.3	6.15E-07	1.043	6.42E-07
11/22/21	7	45	600	0.90	63.31	8.21	18.3	6.15E-07	1.043	6.42E-07
11/22/21	7	55	600	0.89	62.60	8.12	18.3	6.15E-07	1.043	6.42E-07
11/22/21	8	5	600	0.90	63.31	8.21	18.3	6.15E-07	1.043	6.42E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS

Bottom Half of the mold was used for testing.

Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	490			Pore Pressure Meter ID #	779/780

Reported Average Hydraulic Conductivity\* 6.4E-07 cm/sec

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/09/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39488/4-7	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/12/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.654
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.22
Mass of Sample, g	1177.5
Wet Density, pcf	114.4
Dry Density, pcf	83.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1474.4
Mass of Dry Sample and Tare, g	1158.3
Mass of Tare, g	298.3
Moisture, %	36.8

**TEST DATA**

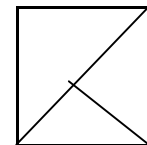
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	455
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	66
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>66</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Web: [www.test-llc.com](http://www.test-llc.com)



Tested By EB/KP  
Date 11/09/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39488/4-7	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/12/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.079 in	7.82 cm	Speed	10			Average Height of Sample	3.080 in	7.82 cm		
Diameter	2.957 in	7.51 cm	Board Number	4			Average Diameter of Sample	2.958 in	7.51 cm		
Area	6.87 in <sup>2</sup>	44.31 cm <sup>2</sup>	Cell Number	4			Area	6.87 in <sup>2</sup>	44.34 cm <sup>2</sup>		
Volume	346.50 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	3A			Volume	346.85 cm <sup>3</sup>	0.0122 ft <sup>3</sup>		
Mass	635.6 g	1.40 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	642.0 g	1.42 lb		
Specific Gravity	2.700 (Assumed)		B - Value	0.95			Dry Density	83.5 pcf			
Dry Density	83.6 pcf		Cell Pressure	95.0 psi			Vol. of Voids	174.86 cm <sup>3</sup>			
			Back Pressure	90.0 psi			Vol. of Solids	171.99 cm <sup>3</sup>			
			Confining (Effective) Pressure	5.0 psi			Void Ratio	1.02			
			Max Head	42.20 cm			Saturation	101.6 %			
			Min Head	41.50 cm							
			Maximum Gradient	5.39							
			Minimum Gradient	5.30							
Moisture Content				Moisture Content							
Mass of wet sample & tare	635.6 g		Mass of wet sample & tare	727.4 g							
Mass of dry sample & tare	464.3 g		Mass of dry sample & tare	549.8 g							
Mass of tare	0.0 g		Mass of tare	85.5 g							
% Moisture	36.9		% Moisture	38.3							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/09/21	8	5	-	0.60	42.20	5.39	20.5	-	-	-
11/09/21	8	15	600	0.59	41.50	5.30	20.5	9.44E-07	0.988	9.33E-07
11/09/21	8	25	600	0.60	42.20	5.39	20.5	9.44E-07	0.988	9.33E-07
11/09/21	8	35	600	0.59	41.50	5.30	20.5	9.44E-07	0.988	9.33E-07
11/09/21	8	45	600	0.60	42.20	5.39	20.5	9.44E-07	0.988	9.33E-07
11/09/21	8	55	600	0.59	41.50	5.30	20.5	9.44E-07	0.988	9.33E-07
11/09/21	9	5	600	0.60	42.20	5.39	20.5	9.44E-07	0.988	9.33E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				9.3E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	491			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **11/10/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39489/4-1	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/13/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.570
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	38.64
Mass of Sample, g	1145.9
Wet Density, pcf	113.0
Dry Density, pcf	79.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1443.5
Mass of Dry Sample and Tare, g	1104.5
Mass of Tare, g	299.3
Moisture, %	42.1

**TEST DATA**

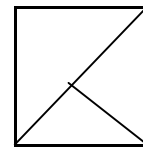
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	236
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	34
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>34</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

[Empty box for description]

USCS (ASTM D2487: D2488)

[Empty box]

**REMARKS**

[Empty box for remarks]



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Tested By **KP/IH**

Date **11/24/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39489/4-1	Subsample	3	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/13/21	Curing Age, Days	42	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.557
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	38.47
Mass of Sample, g	1139.8
Wet Density, pcf	112.9
Dry Density, pcf	79.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1436.8
Mass of Dry Sample and Tare, g	1098.0
Mass of Tare, g	298.4
Moisture, %	42.4

**TEST DATA**

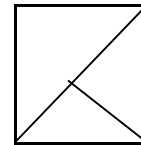
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	505
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	73
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>73</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

[Empty box for description]

USCS (ASTM D2487: D2488)

[Empty box for USCS classification]

**REMARKS**

[Empty box for remarks]



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Tested By	EB/KP
Date	11/10/21
Checked By	<i>EB</i>

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39489/4-1	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/13/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)				
Height	3.020	in	7.67	cm	Speed	8	Average Height of Sample	3.021	in	7.67	cm	
Diameter	2.962	in	7.52	cm	Board Number	2	Average Diameter of Sample	2.963	in	7.53	cm	
Area	6.89	in <sup>2</sup>	44.46	cm <sup>2</sup>	Cell Number	17	Area	6.90	in <sup>2</sup>	44.49	cm <sup>2</sup>	
Volume	341.01	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	1B	Volume	341.35	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	618.8	g	1.36	lb	Flow Pump Rate*	8.96E-04	cm <sup>3</sup> /sec	Mass	623.4	g	1.37	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95		Dry Density	79.7	pcf		
Dry Density	79.7	pcf			Cell Pressure	95.0	psi	Vol. of Voids	179.93	cm <sup>3</sup>		
					Back Pressure	90.0	psi	Vol. of Solids	161.42	cm <sup>3</sup>		
					Confining (Effective) Pressure	5.0	psi	Void Ratio	1.11			
					Max Head	26.73	cm	Saturation	104.2	%		
					Min Head	26.03	cm					
					Maximum Gradient	3.48						
					Minimum Gradient	3.39						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/10/21	6	40	-	0.38	26.73	3.48	20.3	-	-	-
11/10/21	6	50	600	0.37	26.03	3.39	20.3	5.86E-06	0.993	5.82E-06
11/10/21	7	0	600	0.38	26.73	3.48	20.3	5.86E-06	0.993	5.82E-06
11/10/21	7	10	600	0.38	26.73	3.48	20.3	5.78E-06	0.993	5.74E-06
11/10/21	7	20	600	0.37	26.03	3.39	20.3	5.86E-06	0.993	5.82E-06
11/10/21	7	30	600	0.38	26.73	3.48	20.3	5.86E-06	0.993	5.82E-06
11/10/21	7	40	600	0.37	26.03	3.39	20.3	5.86E-06	0.993	5.82E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA

REMARKS

Bottom Half of the mold was used for testing.

Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	942
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	64
Syringe ID #	141			Pore Pressure Meter ID #	26/27

Reported Average Hydraulic Conductivity\* 5.8E-06 cm/sec

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By

EB/KP

Date

11/24/21

Checked By

*EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39489/4-1	Subsample ID	4
Add. Info	-	Mixing/Molding Date	10/13/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	42	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.100	in	7.87	cm	Speed	10			Average Height of Sample	3.103	in	7.88	cm	
Diameter	2.970	in	7.54	cm	Board Number	20			Average Diameter of Sample	2.972	in	7.55	cm	
Area	6.93	in <sup>2</sup>	44.70	cm <sup>2</sup>	Cell Number	13			Area	6.94	in <sup>2</sup>	44.76	cm <sup>2</sup>	
Volume	351.94	cm <sup>3</sup>	0.0124	ft <sup>3</sup>	Flow Pump Number	3B			Volume	352.75	cm <sup>3</sup>	0.0125	ft <sup>3</sup>	
Mass	636.4	g	1.40	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	641.5	g	1.41	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95			Dry Density	78.9	pcf			
Dry Density	79.1	pcf			Cell Pressure	95.0			psi	Vol. of Voids	187.57	cm <sup>3</sup>		
					Back Pressure	90.0			psi	Vol. of Solids	165.19	cm <sup>3</sup>		
					Confining (Effective) Pressure	5.0			psi	Void Ratio	1.14			
					Max Head	45.02			cm	Saturation	104.2	%		
					Min Head	40.80			cm					
					Maximum Gradient	5.71								
					Minimum Gradient	5.18								
<b>Moisture Content</b>									<b>Moisture Content</b>					
Mass of wet sample & tare	636.4	g							Mass of wet sample & tare	762.0	g			
Mass of dry sample & tare	446.0	g							Mass of dry sample & tare	566.5	g			
Mass of tare	0.0	g							Mass of tare	120.5	g			
% Moisture	42.7								% Moisture	43.8				

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/24/21	8	45	-	0.62	43.61	5.53	18.3	-	-	-
11/24/21	8	55	600	0.60	42.20	5.35	18.3	9.19E-07	1.043	9.59E-07
11/24/21	9	5	600	0.64	45.02	5.71	18.3	9.05E-07	1.043	9.44E-07
11/24/21	9	15	600	0.58	40.80	5.18	18.3	9.19E-07	1.043	9.59E-07
11/24/21	9	25	600	0.60	42.20	5.35	18.3	9.51E-07	1.043	9.92E-07
11/24/21	9	35	600	0.59	41.50	5.27	18.3	9.43E-07	1.043	9.83E-07
11/24/21	9	45	600	0.59	41.50	5.27	18.3	9.51E-07	1.043	9.92E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*			9.8E-07	cm/sec	
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	783
Syringe ID #	490			Pore Pressure Meter ID #	1054

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **11/11/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39490/4-63	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/14/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.577
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	38.82
Mass of Sample, g	1202.1
Wet Density, pcf	118.0
Dry Density, pcf	90.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1560.9
Mass of Dry Sample and Tare, g	1280.3
Mass of Tare, g	360.1
Moisture, %	30.5

**TEST DATA**

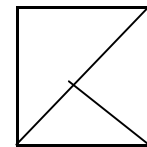
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	551
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	79
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>79</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/11/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39490/4-63	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/14/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.070 in	7.80 cm	Speed	10	Average Height of Sample	3.071 in	7.80 cm				
Diameter	2.954 in	7.50 cm	Board Number	5	Average Diameter of Sample	2.955 in	7.51 cm				
Area	6.85 in <sup>2</sup>	44.22 cm <sup>2</sup>	Cell Number	2	Area	6.86 in <sup>2</sup>	44.25 cm <sup>2</sup>				
Volume	344.79 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	3A	Volume	345.13 cm <sup>3</sup>	0.0122 ft <sup>3</sup>				
Mass	658.8 g	1.45 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	669.5 g	1.48 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	91.4 pcf					
Dry Density	91.5 pcf		Cell Pressure	95.0 psi	Vol. of Voids	157.82 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	187.32 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.84					
			Max Head	59.79 cm	Saturation	103.8 %					
			Min Head	59.09 cm							
			Maximum Gradient	7.66							
			Minimum Gradient	7.57							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/11/21	9	5	-	0.85	59.79	7.66	20.3	-	-	-
11/11/21	9	15	600	0.84	59.09	7.57	20.3	6.64E-07	0.993	6.60E-07
11/11/21	9	25	600	0.85	59.79	7.66	20.3	6.64E-07	0.993	6.60E-07
11/11/21	9	35	600	0.84	59.09	7.57	20.3	6.64E-07	0.993	6.60E-07
11/11/21	9	45	600	0.85	59.79	7.66	20.3	6.64E-07	0.993	6.60E-07
11/11/21	9	55	600	0.84	59.09	7.57	20.3	6.64E-07	0.993	6.60E-07
11/11/21	10	5	600	0.85	59.79	7.66	20.3	6.64E-07	0.993	6.60E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				6.6E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	491			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Date **11/12/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39491/4-58	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/15/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.673
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.57
Mass of Sample, g	1231.5
Wet Density, pcf	118.6
Dry Density, pcf	90.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1591.1
Mass of Dry Sample and Tare, g	1302.9
Mass of Tare, g	361.5
Moisture, %	30.6

**TEST DATA**

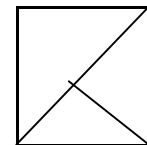
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	641
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	92
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>92</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Date **11/13/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39492/4-44	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/16/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.604
Initial Diameter, in	2.970
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	38.82
Mass of Sample, g	1211.3
Wet Density, pcf	118.9
Dry Density, pcf	90.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1544.1
Mass of Dry Sample and Tare, g	1255.3
Mass of Tare, g	334.5
Moisture, %	31.4

**TEST DATA**

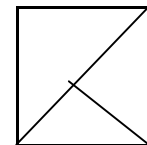
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	365
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	53
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>53</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Date **11/15/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39493/4-60	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/18/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.658
Initial Diameter, in	2.970
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	39.20
Mass of Sample, g	1201.4
Wet Density, pcf	116.8
Dry Density, pcf	88.1
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1502.7
Mass of Dry Sample and Tare, g	1208.3
Mass of Tare, g	303.6
Moisture, %	32.5

**TEST DATA**

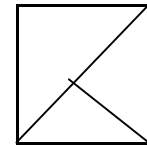
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	531
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	77
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>77</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**







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Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39494/4-53	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/19/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.588
Initial Diameter, in	2.973
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	38.79
Mass of Sample, g	1179.7
Wet Density, pcf	115.9
Dry Density, pcf	87.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1484.3
Mass of Dry Sample and Tare, g	1193.3
Mass of Tare, g	307.0
Moisture, %	32.8

**TEST DATA**

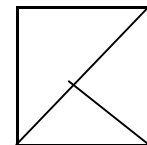
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	820
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	118
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>118</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date 11/16/21  
Checked By *LB*

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39494/4-53	Subsample ID	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/19/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.005	in	7.63	cm	Speed	10			Average Height of Sample	3.006	in	7.64	cm	
Diameter	2.957	in	7.51	cm	Board Number	3			Average Diameter of Sample	2.958	in	7.51	cm	
Area	6.87	in <sup>2</sup>	44.31	cm <sup>2</sup>	Cell Number	17			Area	6.87	in <sup>2</sup>	44.34	cm <sup>2</sup>	
Volume	338.17	cm <sup>3</sup>	0.0119	ft <sup>3</sup>	Flow Pump Number	2A			Volume	338.51	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	
Mass	632.4	g	1.39	lb	Flow Pump Rate*	2.24E-04			Mass	643.1	g	1.42	lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	88.1			pcf		
Dry Density	88.1			pcf	Cell Pressure	95.0			psi	Vol. of Voids	161.58			cm <sup>3</sup>
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	176.93			cm <sup>3</sup>	
Mass of wet sample & tare	632.4	g	Confining (Effective) Pressure	5.0			psi	Void Ratio	0.91					
Mass of dry sample & tare	477.5	g	Max Head	49.94			cm	Saturation	102.4			%		
Mass of tare	0.0	g	Min Head	49.24			cm	Mass of wet sample & tare	727.1			g		
% Moisture	32.4			Maximum Gradient	6.54			Mass of dry sample & tare	561.8			g		
				Minimum Gradient	6.45			Mass of tare	84.3			g		
								% Moisture	34.6					

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/16/21	8	5	-	0.70	49.24	6.45	19.6	-	-	-
11/16/21	8	15	600	0.71	49.94	6.54	19.6	7.78E-07	1.010	7.86E-07
11/16/21	8	25	600	0.70	49.24	6.45	19.6	7.78E-07	1.010	7.86E-07
11/16/21	8	35	600	0.71	49.94	6.54	19.6	7.78E-07	1.010	7.86E-07
11/16/21	8	45	600	0.70	49.24	6.45	19.6	7.78E-07	1.010	7.86E-07
11/16/21	8	55	600	0.71	49.94	6.54	19.6	7.78E-07	1.010	7.86E-07
11/16/21	9	5	600	0.70	49.24	6.45	19.6	7.78E-07	1.010	7.86E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*						7.9E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346		
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041		
Syringe ID #	245			Pore Pressure Meter ID #	26/27		

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39560/4-46	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/20/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.658
Initial Diameter, in	2.968
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	39.15
Mass of Sample, g	1226.4
Wet Density, pcf	119.3
Dry Density, pcf	93.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1527.5
Mass of Dry Sample and Tare, g	1262.5
Mass of Tare, g	302.9
Moisture, %	27.6

**TEST DATA**

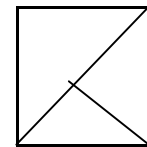
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	683
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	99
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>99</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/17/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-5		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39560/4-46	Subsample ID	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/20/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.010 in	7.65 cm	Speed	10	Average Height of Sample	3.011 in	7.65 cm	Dry Density	92.9 pcf		
Diameter	2.965 in	7.53 cm	Board Number	4	Average Diameter of Sample	2.966 in	7.53 cm	Vol. of Voids	152.85 cm <sup>3</sup>		
Area	6.90 in <sup>2</sup>	44.55 cm <sup>2</sup>	Cell Number	41	Area	6.91 in <sup>2</sup>	44.58 cm <sup>2</sup>	Vol. of Solids	188.07 cm <sup>3</sup>		
Volume	340.57 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	2B	Volume	340.91 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Void Ratio	0.81		
Mass	648.1 g	1.43 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	661.7 g	1.46 lb	Saturation	100.7 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95							
Dry Density	93.0 pcf		Cell Pressure	95.0 psi							
<b>Moisture Content</b>				Back Pressure	90.0 psi						
Mass of wet sample & tare	648.1 g		Confining (Effective) Pressure	5.0 psi							
Mass of dry sample & tare	507.4 g		Max Head	82.30 cm							
Mass of tare	0.0 g		Min Head	81.59 cm							
% Moisture	27.7		Maximum Gradient	10.76							
				Minimum Gradient	10.67						
								<b>Moisture Content</b>			
								Mass of wet sample & tare	744.0 g		
								Mass of dry sample & tare	590.2 g		
								Mass of tare	82.8 g		
								% Moisture	30.3		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/17/21	8	5	-	1.17	82.30	10.76	19.6	-	-	-
11/17/21	8	15	600	1.16	81.59	10.67	19.6	4.69E-07	1.010	4.74E-07
11/17/21	8	25	600	1.17	82.30	10.76	19.6	4.69E-07	1.010	4.74E-07
11/17/21	8	35	600	1.16	81.59	10.67	19.6	4.69E-07	1.010	4.74E-07
11/17/21	8	45	600	1.17	82.30	10.76	19.6	4.69E-07	1.010	4.74E-07
11/17/21	8	55	600	1.16	81.59	10.67	19.6	4.69E-07	1.010	4.74E-07
11/17/21	9	5	600	1.17	82.30	10.76	19.6	4.69E-07	1.010	4.74E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				4.7E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	246			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Date **11/18/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39561/4-20	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/21/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.611
Initial Diameter, in	2.981
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.98
Volume, in <sup>3</sup>	39.16
Mass of Sample, g	1179.2
Wet Density, pcf	114.7
Dry Density, pcf	85.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1438.0
Mass of Dry Sample and Tare, g	1135.9
Mass of Tare, g	259.9
Moisture, %	34.5

**TEST DATA**

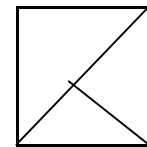
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1602
Specimen Cross-sectional Area, in <sup>2</sup>	6.98
Compressive Strength at Failure, psi	230
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>230</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/18/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39561/4-20	Subsample ID	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/21/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)				
Height	3.065 in	7.79 cm	Speed	12	Average Height of Sample	3.066 in	7.79 cm	Area	6.90 in <sup>2</sup>	44.52 cm <sup>2</sup>	Dry Density	85.9 pcf
Diameter	2.963 in	7.53 cm	Board Number	12	Average Diameter of Sample	2.964 in	7.53 cm	Volume	346.67 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Vol. of Voids	169.88 cm <sup>3</sup>
Area	6.90 in <sup>2</sup>	44.49 cm <sup>2</sup>	Cell Number	13	Area	6.90 in <sup>2</sup>	44.52 cm <sup>2</sup>	Vol. of Solids	176.80 cm <sup>3</sup>	Void Ratio	0.96	
Volume	346.33 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	2A	Volume	346.67 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Saturation	101.3 %			
Mass	642.5 g	1.42 lb	Flow Pump Rate*	5.60E-05 cm <sup>3</sup> /sec	Mass	649.5 g	1.43 lb					
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Mass of wet sample & tare	731.9 g						
Dry Density	86.0 pcf		Cell Pressure	95.0 psi	Mass of dry sample & tare	559.8 g						
			Back Pressure	90.0 psi	Mass of tare	82.6 g						
			Confining (Effective) Pressure	5.0 psi	% Moisture	36.1						
			Max Head	52.76 cm								
			Min Head	52.05 cm								
			Maximum Gradient	6.77								
			Minimum Gradient	6.68								

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/18/21	9	5	-	0.74	52.05	6.68	20.0	-	-	-
11/18/21	9	15	600	0.75	52.76	6.77	20.0	1.87E-07	1.000	1.87E-07
11/18/21	9	25	600	0.74	52.05	6.68	20.0	1.87E-07	1.000	1.87E-07
11/18/21	9	35	600	0.75	52.76	6.77	20.0	1.87E-07	1.000	1.87E-07
11/18/21	9	45	600	0.74	52.05	6.68	20.0	1.87E-07	1.000	1.87E-07
11/18/21	9	55	600	0.75	52.76	6.77	20.0	1.87E-07	1.000	1.87E-07
11/18/21	10	5	600	0.74	52.05	6.68	20.0	1.87E-07	1.000	1.87E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	776
Syringe ID #	245			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/19/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39562/4-22	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/22/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.674
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.36
Mass of Sample, g	1202.2
Wet Density, pcf	116.4
Dry Density, pcf	87.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1408.8
Mass of Dry Sample and Tare, g	1108.6
Mass of Tare, g	208.6
Moisture, %	33.4

**TEST DATA**

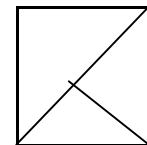
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2332
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	336
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>336</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 11/19/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39562/4-22	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/22/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)					
Height	2.964	in	7.53	cm	Speed	10			Average Height of Sample	2.965	in	7.53	cm
Diameter	2.963	in	7.53	cm	Board Number	4			Average Diameter of Sample	2.964	in	7.53	cm
Area	6.90	in <sup>2</sup>	44.49	cm <sup>2</sup>	Cell Number	2			Area	6.90	in <sup>2</sup>	44.52	cm <sup>2</sup>
Volume	334.91	cm <sup>3</sup>	0.0118	ft <sup>3</sup>	Flow Pump Number	4A			Volume	335.25	cm <sup>3</sup>	0.0118	ft <sup>3</sup>
Mass	625.1	g	1.38	lb	Flow Pump Rate*	2.24E-04			Mass	632.6	g	1.39	lb
Specific Gravity	2.700 (Assumed)				B - Value	0.95			Dry Density	87.0			pcf
Dry Density	87.1			pcf	Cell Pressure	95.0			Vol. of Voids	162.17			cm <sup>3</sup>
					Back Pressure	90.0			Vol. of Solids	173.08			cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			Void Ratio	0.94			
					Max Head	182.88			Saturation	101.9			%
					Min Head	181.48							
					Maximum Gradient	24.28							
					Minimum Gradient	24.10							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/19/21	9	50	-	2.59	182.18	24.19	22.1	-	-	-
11/19/21	10	0	600	2.60	182.88	24.28	22.1	2.08E-07	0.951	1.97E-07
11/19/21	10	10	600	2.60	182.88	24.28	22.1	2.07E-07	0.951	1.97E-07
11/19/21	10	20	600	2.59	182.18	24.19	22.1	2.08E-07	0.951	1.97E-07
11/19/21	10	30	600	2.58	181.48	24.10	22.1	2.08E-07	0.951	1.98E-07
11/19/21	10	40	600	2.59	182.18	24.19	22.1	2.08E-07	0.951	1.98E-07
11/19/21	10	50	600	2.59	182.18	24.19	22.1	2.08E-07	0.951	1.98E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*			2.0E-07			cm/sec		
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048				
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041				
Syringe ID #	1047			Pore Pressure Meter ID #	26/27				

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **11/20/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39563/4-24	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/23/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.628
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.15
Mass of Sample, g	1177.9
Wet Density, pcf	114.6
Dry Density, pcf	86.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1473.6
Mass of Dry Sample and Tare, g	1188.2
Mass of Tare, g	298.4
Moisture, %	32.1

**TEST DATA**

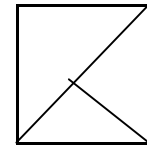
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2797
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	402
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>402</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

[Empty box for description]

USCS (ASTM D2487: D2488)

[Empty box]

**REMARKS**

[Empty box for remarks]



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Tested By	EB/KP
Date	11/20/21
Checked By	<i>EB</i>

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39563/4-24	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/23/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.026 in	7.69 cm	Speed	11	Average Height of Sample	3.027 in	7.69 cm				
Diameter	2.967 in	7.54 cm	Board Number	18	Average Diameter of Sample	2.968 in	7.54 cm				
Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>	Cell Number	55	Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>				
Volume	342.84 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3A	Volume	343.19 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	632.1 g	1.39 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	644.0 g	1.42 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	87.0 pcf					
Dry Density	87.1 pcf		Cell Pressure	95.0 psi	Vol. of Voids	166.01 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	177.18 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.94					
			Max Head	184.29 cm	Saturation	99.8 %					
			Min Head	183.59 cm							
			Maximum Gradient	23.97							
			Minimum Gradient	23.88							
Moisture Content				Moisture Content							
Mass of wet sample & tare	632.1 g		Mass of wet sample & tare	725.6 g							
Mass of dry sample & tare	478.3 g		Mass of dry sample & tare	560.0 g							
Mass of tare	0.0 g		Mass of tare	81.7 g							
% Moisture	32.2		% Moisture	34.6							

TIME FUNCTION			$\Delta t$ (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. $T_x$ (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ $T_x$	$R_T$	@ 20 °C
11/20/21	8	5	-	2.62	184.29	23.97	21.1	-	-	-
11/20/21	8	15	600	2.61	183.59	23.88	21.1	1.05E-07	0.974	1.02E-07
11/20/21	8	25	600	2.62	184.29	23.97	21.1	1.05E-07	0.974	1.02E-07
11/20/21	8	35	600	2.61	183.59	23.88	21.1	1.05E-07	0.974	1.02E-07
11/20/21	8	45	600	2.62	184.29	23.97	21.1	1.05E-07	0.974	1.02E-07
11/20/21	8	55	600	2.61	183.59	23.88	21.1	1.05E-07	0.974	1.02E-07
11/20/21	9	5	600	2.62	184.29	23.97	21.1	1.05E-07	0.974	1.02E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA

REMARKS

Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.0E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	491			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/22/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39564/4-26	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/25/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.637
Initial Diameter, in	2.971
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	39.08
Mass of Sample, g	1201.4
Wet Density, pcf	117.1
Dry Density, pcf	88.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1500.8
Mass of Dry Sample and Tare, g	1211.6
Mass of Tare, g	301.0
Moisture, %	31.8

**TEST DATA**

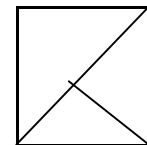
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2367
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	341
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>341</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.=.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/22/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-5		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39564/4-26	Subsample ID	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/25/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)									
Height	3.039	in	7.72	cm	Speed	10			Average Height of Sample	3.040	in	7.72	cm				
Diameter	2.963	in	7.53	cm	Board Number	19			Average Diameter of Sample	2.964	in	7.53	cm				
Area	6.90	in <sup>2</sup>	44.49	cm <sup>2</sup>	Cell Number	41			Area	6.90	in <sup>2</sup>	44.52	cm <sup>2</sup>				
Volume	343.39	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	Flow Pump Number	3B			Volume	343.73	cm <sup>3</sup>	0.0121	ft <sup>3</sup>				
Mass	639.2	g	1.41	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	651.1	g	1.44	lb			
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	88.4			pcf					
Dry Density	88.5			pcf	Cell Pressure	95.0			psi	Vol. of Voids	163.31			cm <sup>3</sup>			
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	180.43			cm <sup>3</sup>				
Mass of wet sample & tare	639.2	g	Max Head	145.60			cm	Void Ratio	0.91								
Mass of dry sample & tare	487.0	g	Min Head	144.90			cm	Saturation	100.4			%					
Mass of tare	0.0	g	Maximum Gradient	18.86													
% Moisture	31.3																
Mass of wet sample & tare	736.3	g	Minimum Gradient	18.77			Mass of wet sample & tare	736.3	g	Mass of dry sample & tare	572.4	g	Mass of tare	85.4	g	% Moisture	33.7

TIME FUNCTION			$\Delta t$ (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. $T_x$ (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ $T_x$	$R_T$	@ 20 °C
11/22/21	8	5	-	2.07	145.60	18.86	19.6	-	-	-
11/22/21	8	15	600	2.06	144.90	18.77	19.6	2.67E-07	1.010	2.70E-07
11/22/21	8	25	600	2.07	145.60	18.86	19.6	2.67E-07	1.010	2.70E-07
11/22/21	8	35	600	2.06	144.90	18.77	19.6	2.67E-07	1.010	2.70E-07
11/22/21	8	45	600	2.07	145.60	18.86	19.6	2.67E-07	1.010	2.70E-07
11/22/21	8	55	600	2.06	144.90	18.77	19.6	2.67E-07	1.010	2.70E-07
11/22/21	9	5	600	2.07	145.60	18.86	19.6	2.67E-07	1.010	2.70E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA
REMARKS	
Bottom Half of the mold was used for testing.	

Reported Average Hydraulic Conductivity*				2.7E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	490			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **11/23/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39565/4-29	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/26/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.608
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.01
Mass of Sample, g	1199.6
Wet Density, pcf	117.2
Dry Density, pcf	88.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1495.6
Mass of Dry Sample and Tare, g	1200.0
Mass of Tare, g	298.5
Moisture, %	32.8

**TEST DATA**

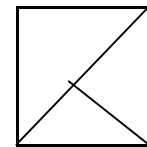
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1408
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	202
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>202</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 11/23/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39565/4-29	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/26/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.988 in	7.59 cm		Speed	10			Average Height of Sample	2.989 in	7.59 cm	
Diameter	2.962 in	7.52 cm		Board Number	8			Average Diameter of Sample	2.963 in	7.53 cm	
Area	6.89 in <sup>2</sup>	44.46 cm <sup>2</sup>		Cell Number	15			Area	6.90 in <sup>2</sup>	44.49 cm <sup>2</sup>	
Volume	337.40 cm <sup>3</sup>	0.0119 ft <sup>3</sup>		Flow Pump Number	4A			Volume	337.74 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	
Mass	633.4 g	1.40 lb		Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	640.0 g	1.41 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	88.4 pcf		
Dry Density	88.5 pcf			Cell Pressure	95.0 psi			Vol. of Voids	160.44 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	177.30 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.90		
				Max Head	147.01 cm			Saturation	100.5 %		
				Min Head	146.31 cm						
				Maximum Gradient	19.36						
				Minimum Gradient	19.27						
Moisture Content				Moisture Content				Moisture Content			
Mass of wet sample & tare	633.4 g			Mass of wet sample & tare	734.2 g			Mass of wet sample & tare	734.2 g		
Mass of dry sample & tare	478.7 g			Mass of dry sample & tare	572.9 g			Mass of dry sample & tare	572.9 g		
Mass of tare	0.0 g			Mass of tare	94.2 g			Mass of tare	94.2 g		
% Moisture	32.3			% Moisture	33.7			% Moisture	33.7		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/23/21	7	30	-	2.09	147.01	19.36	18.3	-	-	-
11/23/21	7	40	600	2.08	146.31	19.27	18.3	2.61E-07	1.043	2.72E-07
11/23/21	7	50	600	2.09	147.01	19.36	18.3	2.61E-07	1.043	2.72E-07
11/23/21	8	0	600	2.08	146.31	19.27	18.3	2.61E-07	1.043	2.72E-07
11/23/21	8	10	600	2.09	147.01	19.36	18.3	2.61E-07	1.043	2.72E-07
11/23/21	8	20	600	2.08	146.31	19.27	18.3	2.61E-07	1.043	2.72E-07
11/23/21	8	30	600	2.09	147.01	19.36	18.3	2.61E-07	1.043	2.72E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.7E-07 cm/sec	
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/24/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39566/4-33	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/27/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.618
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.16
Mass of Sample, g	1181.7
Wet Density, pcf	115.0
Dry Density, pcf	85.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1486.4
Mass of Dry Sample and Tare, g	1188.5
Mass of Tare, g	305.7
Moisture, %	33.7

**TEST DATA**

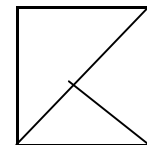
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1807
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	259
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>259</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By	EB/KP
Date	11/24/21
Checked By	<i>EB</i>

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39566/4-33	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/27/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.958 in	7.51 cm		Speed	10			Average Height of Sample	2.959 in	7.52 cm	
Diameter	2.969 in	7.54 cm		Board Number	3			Average Diameter of Sample	2.970 in	7.54 cm	
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>		Cell Number	37			Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	
Volume	335.59 cm <sup>3</sup>	0.0119 ft <sup>3</sup>		Flow Pump Number	2B			Volume	335.93 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	
Mass	616.2 g	1.36 lb		Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	625.5 g	1.38 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	85.5 pcf		
Dry Density	85.6 pcf			Cell Pressure	95.0 psi			Vol. of Voids	165.38 cm <sup>3</sup>		
<b>Moisture Content</b>				Back Pressure	90.0 psi			Vol. of Solids	170.55 cm <sup>3</sup>		
Mass of wet sample & tare	616.2 g			Confining (Effective) Pressure	5.0 psi			Void Ratio	0.97		
Mass of dry sample & tare	460.4 g			Max Head	166.71 cm			Saturation	99.8 %		
Mass of tare	0.0 g			Min Head	166.00 cm						
% Moisture	33.8			Maximum Gradient	22.18			Mass of wet sample & tare	705.5 g		
				Minimum Gradient	22.09			Mass of dry sample & tare	540.5 g		
								Mass of tare	80.1 g		
								% Moisture	35.8		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/24/21	9	40	-	2.37	166.71	22.18	18.3	-	-	-
11/24/21	9	50	600	2.36	166.00	22.09	18.3	2.26E-07	1.043	2.36E-07
11/24/21	10	0	600	2.37	166.71	22.18	18.3	2.26E-07	1.043	2.36E-07
11/24/21	10	10	600	2.36	166.00	22.09	18.3	2.26E-07	1.043	2.36E-07
11/24/21	10	20	600	2.36	166.00	22.09	18.3	2.27E-07	1.043	2.37E-07
11/24/21	10	30	600	2.37	166.71	22.18	18.3	2.26E-07	1.043	2.36E-07
11/24/21	10	40	600	2.36	166.00	22.09	18.3	2.26E-07	1.043	2.36E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	
NA	USCS (ASTM D2487;2488) NA

REMARKS	
Bottom Half of the mold was used for testing.	

Reported Average Hydraulic Conductivity*				2.4E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	246			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **11/25/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39567/4-42	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/28/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** **B**

**SAMPLE DATA**

Initial Height, in	5.589
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	38.85
Mass of Sample, g	1191.4
Wet Density, pcf	116.8
Dry Density, pcf	89.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1492.6
Mass of Dry Sample and Tare, g	1214.8
Mass of Tare, g	303.4
Moisture, %	30.5

**TEST DATA**

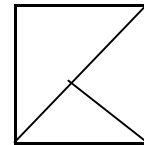
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	629
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	90
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>90</b>

Failure Code **3**

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

[Empty box for description]

USCS (ASTM D2487: D2488)

[Empty box for USCS classification]

**REMARKS**

[Empty box for remarks]



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Tested By: EB/KP  
Date: 11/25/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39567/4-42	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/28/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)					
Height	2.958	in	7.51	cm	Speed	9			Average Height of Sample	2.959	in	7.52	cm
Diameter	2.959	in	7.52	cm	Board Number	4			Average Diameter of Sample	2.960	in	7.52	cm
Area	6.88	in <sup>2</sup>	44.37	cm <sup>2</sup>	Cell Number	15			Area	6.88	in <sup>2</sup>	44.40	cm <sup>2</sup>
Volume	333.33	cm <sup>3</sup>	0.0118	ft <sup>3</sup>	Flow Pump Number	4A			Volume	333.67	cm <sup>3</sup>	0.0118	ft <sup>3</sup>
Mass	624.8	g	1.38	lb	Flow Pump Rate*	4.48E-04			Mass	635.9	g	1.40	lb
Specific Gravity	2.700 (Assumed)				B - Value	0.95			Dry Density	89.7			pcf
Dry Density	89.8			pcf	Cell Pressure	95.0			Vol. of Voids	155.99			cm <sup>3</sup>
					Back Pressure	90.0			Vol. of Solids	177.69			cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			Void Ratio	0.88			
					Max Head	14.77			Saturation	100.1			%
					Min Head	14.07							
					Maximum Gradient	1.97							
					Minimum Gradient	1.87							
Moisture Content					Moisture Content								
Mass of wet sample & tare	624.8	g			Mass of wet sample & tare	709.4			g				
Mass of dry sample & tare	479.6	g			Mass of dry sample & tare	553.3			g				
Mass of tare	0.0	g			Mass of tare	73.7			g				
% Moisture	30.3				% Moisture	32.5							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/25/21	5	30	-	0.20	14.07	1.87	18.8	-	-	-
11/25/21	5	40	600	0.20	14.07	1.87	18.8	5.39E-06	1.030	5.55E-06
11/25/21	5	50	600	0.21	14.77	1.97	18.8	5.26E-06	1.030	5.42E-06
11/25/21	6	0	600	0.21	14.77	1.97	18.8	5.13E-06	1.030	5.29E-06
11/25/21	6	10	600	0.20	14.07	1.87	18.8	5.26E-06	1.030	5.42E-06
11/25/21	6	20	600	0.20	14.07	1.87	18.8	5.39E-06	1.030	5.55E-06
11/25/21	6	30	600	0.20	14.07	1.87	18.8	5.39E-06	1.030	5.55E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				5.5E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	1047			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 11/26/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-4	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39568/4-32	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	10/29/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.558
Initial Diameter, in	2.948
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.83
Volume, in <sup>3</sup>	37.94
Mass of Sample, g	1163.0
Wet Density, pcf	116.8
Dry Density, pcf	87.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1444.2
Mass of Dry Sample and Tare, g	1152.3
Mass of Tare, g	283.2
Moisture, %	33.6

**TEST DATA**

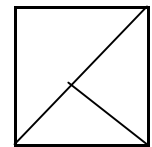
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	236
Specimen Cross-sectional Area, in <sup>2</sup>	6.83
Compressive Strength at Failure, psi	35
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>35</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **11/27/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-4		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39569/4-31	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	10/30/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.669
Initial Diameter, in	2.965
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.90
Volume, in <sup>3</sup>	39.14
Mass of Sample, g	1207.5
Wet Density, pcf	117.5
Dry Density, pcf	89.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1480.1
Mass of Dry Sample and Tare, g	1190.7
Mass of Tare, g	275.0
Moisture, %	31.6

**TEST DATA**

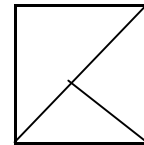
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	923
Specimen Cross-sectional Area, in <sup>2</sup>	6.90
Compressive Strength at Failure, psi	134
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>134</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/27/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39569/4-31	Subsample ID	2
Add. Info	-	Mixing/Molding Date	10/30/21

Lab. PR. #	21136-02-4		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.932 in	7.45 cm	Speed	8	Average Height of Sample	2.933 in	7.45 cm				
Diameter	2.952 in	7.50 cm	Board Number	8	Average Diameter of Sample	2.953 in	7.50 cm				
Area	6.84 in <sup>2</sup>	44.16 cm <sup>2</sup>	Cell Number	37	Area	6.85 in <sup>2</sup>	44.19 cm <sup>2</sup>				
Volume	328.84 cm <sup>3</sup>	0.0116 ft <sup>3</sup>	Flow Pump Number	4A	Volume	329.18 cm <sup>3</sup>	0.0116 ft <sup>3</sup>				
Mass	622.8 g	1.37 lb	Flow Pump Rate*	8.96E-04 cm <sup>3</sup> /sec	Mass	633.5 g	1.40 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	89.8 pcf					
Dry Density	89.8 pcf		Cell Pressure	95.0 psi	Vol. of Voids	153.75 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	175.43 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.88					
			Max Head	92.15 cm	Saturation	104.0 %					
			Min Head	91.44 cm							
			Maximum Gradient	12.37							
			Minimum Gradient	12.27							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/26/21	9	5	-	1.31	92.15	12.37	18.5	-	-	-
11/26/21	9	15	600	1.30	91.44	12.27	18.5	1.65E-06	1.038	1.71E-06
11/26/21	9	25	600	1.31	92.15	12.37	18.5	1.65E-06	1.038	1.71E-06
11/26/21	9	35	600	1.31	92.15	12.37	18.5	1.64E-06	1.038	1.70E-06
11/26/21	9	45	600	1.30	91.44	12.27	18.5	1.65E-06	1.038	1.71E-06
11/26/21	9	55	600	1.31	92.15	12.37	18.5	1.65E-06	1.038	1.71E-06
11/26/21	10	5	600	1.30	91.44	12.27	18.5	1.65E-06	1.038	1.71E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.7E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/29/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39570/4-35	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	11/01/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.637
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.24
Mass of Sample, g	1213.9
Wet Density, pcf	117.9
Dry Density, pcf	91.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1517.6
Mass of Dry Sample and Tare, g	1241.6
Mass of Tare, g	305.4
Moisture, %	29.5

**TEST DATA**

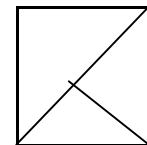
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1130
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	162
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>162</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 11/29/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39570/4-35	Subsample ID	2
Add. Info	-	Mixing/Molding Date	11/01/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.995 in	7.61 cm		Speed	10			Average Height of Sample	2.996 in	7.61 cm	
Diameter	2.960 in	7.52 cm		Board Number	7			Average Diameter of Sample	2.961 in	7.52 cm	
Area	6.88 in <sup>2</sup>	44.40 cm <sup>2</sup>		Cell Number	2			Area	6.89 in <sup>2</sup>	44.43 cm <sup>2</sup>	
Volume	337.73 cm <sup>3</sup>	0.0119 ft <sup>3</sup>		Flow Pump Number	4A			Volume	338.07 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	
Mass	641.0 g	1.41 lb		Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	657.0 g	1.45 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	92.0 pcf		
Dry Density	91.4 pcf			Cell Pressure	95.0 psi			Vol. of Voids	153.49 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	184.58 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.83		
				Max Head	124.50 cm			Saturation	103.3 %		
				Min Head	123.80 cm						
				Maximum Gradient	16.36						
				Minimum Gradient	16.27						
<b>Moisture Content</b>				<b>Moisture Content</b>				<b>Moisture Content</b>			
Mass of wet sample & tare	641.0 g			Mass of wet sample & tare	726.2 g			Mass of wet sample & tare	726.2 g		
Mass of dry sample & tare	494.5 g			Mass of dry sample & tare	568.8 g			Mass of dry sample & tare	568.8 g		
Mass of tare	0.0 g			Mass of tare	74.3 g			Mass of tare	74.3 g		
% Moisture	29.6			% Moisture	31.8			% Moisture	31.8		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/29/21	7	5	-	1.77	124.50	16.36	18.5	-	-	-
11/29/21	7	15	600	1.76	123.80	16.27	18.5	3.09E-07	1.038	3.21E-07
11/29/21	7	25	600	1.77	124.50	16.36	18.5	3.09E-07	1.038	3.21E-07
11/29/21	7	35	600	1.76	123.80	16.27	18.5	3.09E-07	1.038	3.21E-07
11/29/21	7	45	600	1.77	124.50	16.36	18.5	3.09E-07	1.038	3.21E-07
11/29/21	7	55	600	1.76	123.80	16.27	18.5	3.09E-07	1.038	3.21E-07
11/29/21	8	5	600	1.77	124.50	16.36	18.5	3.09E-07	1.038	3.21E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION		USCS
NA		(ASTM D2487;2488)
		NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.2E-07 cm/sec	
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **11/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39571/4-38	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	11/02/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.992
Initial Diameter, in	2.966
Height-to-Diameter Ratio	2.02
Area, in <sup>2</sup>	6.91
Volume, in <sup>3</sup>	41.40
Mass of Sample, g	1179.6
Wet Density, pcf	108.5
Dry Density, pcf	81.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.83

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1458.1
Mass of Dry Sample and Tare, g	1161.3
Mass of Tare, g	280.0
Moisture, %	33.7

**TEST DATA**

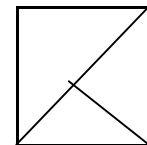
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	427
Specimen Cross-sectional Area, in <sup>2</sup>	6.91
Compressive Strength at Failure, psi	62
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>62</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 11/30/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39571/4-38	Subsample ID	2
Add. Info	-	Mixing/Molding Date	11/02/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.969 in	7.54 cm	Speed	10			Average Height of Sample	2.970 in	7.54 cm		
Diameter	2.957 in	7.51 cm	Board Number	7			Average Diameter of Sample	2.958 in	7.51 cm		
Area	6.87 in <sup>2</sup>	44.31 cm <sup>2</sup>	Cell Number	15			Area	6.87 in <sup>2</sup>	44.34 cm <sup>2</sup>		
Volume	334.12 cm <sup>3</sup>	0.0118 ft <sup>3</sup>	Flow Pump Number	3A			Volume	334.46 cm <sup>3</sup>	0.0118 ft <sup>3</sup>		
Mass	620.1 g	1.37 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	625.7 g	1.38 lb		
Specific Gravity	2.700 (Assumed)		B - Value	0.95			Dry Density	86.8 pcf			
Dry Density	86.9 pcf		Cell Pressure	95.0 psi			Vol. of Voids	162.07 cm <sup>3</sup>			
			Back Pressure	90.0 psi			Vol. of Solids	172.39 cm <sup>3</sup>			
			Confining (Effective) Pressure	5.0 psi			Void Ratio	0.94			
			Max Head	47.13 cm			Saturation	98.9 %			
			Min Head	45.72 cm							
			Maximum Gradient	6.25							
			Minimum Gradient	6.06							
Moisture Content				Moisture Content				Moisture Content			
Mass of wet sample & tare	620.1 g			Mass of wet sample & tare	699.8 g			Mass of wet sample & tare	699.8 g		
Mass of dry sample & tare	465.3 g			Mass of dry sample & tare	539.6 g			Mass of dry sample & tare	539.6 g		
Mass of tare	0.0 g			Mass of tare	74.3 g			Mass of tare	74.3 g		
% Moisture	33.3			% Moisture	34.4			% Moisture	34.4		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/30/21	7	5	-	0.66	46.42	6.15	18.8	-	-	-
11/30/21	7	15	600	0.65	45.72	6.06	18.8	8.27E-07	1.030	8.52E-07
11/30/21	7	25	600	0.67	47.13	6.25	18.8	8.21E-07	1.030	8.46E-07
11/30/21	7	35	600	0.66	46.42	6.15	18.8	8.15E-07	1.030	8.40E-07
11/30/21	7	45	600	0.66	46.42	6.15	18.8	8.21E-07	1.030	8.46E-07
11/30/21	7	55	600	0.65	45.72	6.06	18.8	8.27E-07	1.030	8.52E-07
11/30/21	8	5	600	0.66	46.42	6.15	18.8	8.27E-07	1.030	8.52E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				8.5E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	491			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **11/12/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39572/4-73 Re-Mix	Subsample	1	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	11/02/21	Curing Age, Days	10	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.645
Initial Diameter, in	2.961
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.89
Volume, in <sup>3</sup>	38.87
Mass of Sample, g	1125.2
Wet Density, pcf	110.3
Dry Density, pcf	77.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1483.3
Mass of Dry Sample and Tare, g	1153.5
Mass of Tare, g	359.7
Moisture, %	41.5

**TEST DATA**

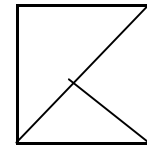
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	273
Specimen Cross-sectional Area, in <sup>2</sup>	6.89
Compressive Strength at Failure, psi	40
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>40</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **11/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-5	
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev. -
Sample ID	39572/4-73 Re-Mix	Subsample	2	Location	Seattle, WA	
Add. Info	-	Mixing/Molding Date	11/02/21	Curing Age, Days	28	

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.600
Initial Diameter, in	2.962
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.89
Volume, in <sup>3</sup>	38.59
Mass of Sample, g	1116.7
Wet Density, pcf	110.2
Dry Density, pcf	77.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1395.9
Mass of Dry Sample and Tare, g	1067.0
Mass of Tare, g	280.9
Moisture, %	41.8

**TEST DATA**

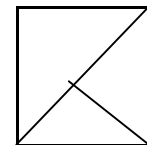
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	680
Specimen Cross-sectional Area, in <sup>2</sup>	6.89
Compressive Strength at Failure, psi	99
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>99</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 11/12/21  
Checked By *LB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39572/4-73 Re-Mix	Subsample ID	3
Add. Info	-	Mixing/Molding Date	11/02/21

Lab. PR. #	21136-02-5		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.016 in	7.66 cm	Speed	10	Average Height of Sample	3.017 in	7.66 cm				
Diameter	2.966 in	7.53 cm	Board Number	3	Average Diameter of Sample	2.967 in	7.54 cm				
Area	6.91 in <sup>2</sup>	44.58 cm <sup>2</sup>	Cell Number	41	Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>				
Volume	341.48 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2A	Volume	341.82 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	596.9 g	1.32 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	604.7 g	1.33 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	77.0 pcf					
Dry Density	77.1 pcf		Cell Pressure	95.0 psi	Vol. of Voids	185.61 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	156.21 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	1.19					
			Max Head	14.77 cm	Saturation	98.6 %					
			Min Head	14.07 cm							
			Maximum Gradient	1.93							
			Minimum Gradient	1.84							

Moisture Content			
Mass of wet sample & tare	596.9 g		
Mass of dry sample & tare	421.7 g		
Mass of tare	0.0 g		
% Moisture	41.5		

Moisture Content			
Mass of wet sample & tare	675.2 g		
Mass of dry sample & tare	492.3 g		
Mass of tare	70.6 g		
% Moisture	43.4		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/12/21	7	5	-	0.20	14.07	1.84	20.6	-	-	-
11/12/21	7	15	600	0.21	14.77	1.93	20.6	2.67E-06	0.986	2.63E-06
11/12/21	7	25	600	0.20	14.07	1.84	20.6	2.67E-06	0.986	2.63E-06
11/12/21	7	35	600	0.21	14.77	1.93	20.6	2.67E-06	0.986	2.63E-06
11/12/21	7	45	600	0.20	14.07	1.84	20.6	2.67E-06	0.986	2.63E-06
11/12/21	7	55	600	0.21	14.77	1.93	20.6	2.67E-06	0.986	2.63E-06
11/12/21	8	5	600	0.20	14.07	1.84	20.6	2.67E-06	0.986	2.63E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	245			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 11/30/21  
Checked By *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-5		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39572/4-73 Re-Mix	Subsample ID	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	11/02/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.065 in	7.79 cm		Speed	10			Average Height of Sample	3.066 in	7.79 cm	
Diameter	2.958 in	7.51 cm		Board Number	8			Average Diameter of Sample	2.959 in	7.52 cm	
Area	6.87 in <sup>2</sup>	44.34 cm <sup>2</sup>		Cell Number	4			Area	6.88 in <sup>2</sup>	44.37 cm <sup>2</sup>	
Volume	345.16 cm <sup>3</sup>	0.0122 ft <sup>3</sup>		Flow Pump Number	3B			Volume	345.50 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	
Mass	608.2 g	1.34 lb		Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	616.6 g	1.36 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	77.8 pcf		
Dry Density	77.8 pcf			Cell Pressure	95.0 psi			Vol. of Voids	186.06 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	159.45 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	1.17		
				Max Head	60.49 cm			Saturation	100.0 %		
				Min Head	59.79 cm						
				Maximum Gradient	7.77						
				Minimum Gradient	7.68						
Moisture Content				Moisture Content				Moisture Content			
Mass of wet sample & tare	608.2 g			Mass of wet sample & tare	699.5 g			Mass of wet sample & tare	699.5 g		
Mass of dry sample & tare	430.3 g			Mass of dry sample & tare	513.5 g			Mass of dry sample & tare	513.5 g		
Mass of tare	0.0 g			Mass of tare	83.2 g			Mass of tare	83.2 g		
% Moisture	41.3			% Moisture	43.2			% Moisture	43.2		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
11/30/21	7	5	-	0.86	60.49	7.77	18.8	-	-	-
11/30/21	7	15	600	0.85	59.79	7.68	18.8	6.54E-07	1.030	6.74E-07
11/30/21	7	25	600	0.86	60.49	7.77	18.8	6.54E-07	1.030	6.74E-07
11/30/21	7	35	600	0.85	59.79	7.68	18.8	6.54E-07	1.030	6.74E-07
11/30/21	7	45	600	0.85	59.79	7.68	18.8	6.58E-07	1.030	6.78E-07
11/30/21	7	55	600	0.86	60.49	7.77	18.8	6.54E-07	1.030	6.74E-07
11/30/21	8	5	600	0.85	59.79	7.68	18.8	6.54E-07	1.030	6.74E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*		6.7E-07 cm/sec	
Flow pump ID #	475	Balance ID #	1035/1036
Thermometer ID #	796/985	Oven ID #	496/758
Syringe ID #	490	Differential Pressure Meter ID #	262
		Board Pressure Meter ID #	290
		Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate is used for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **08/24/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38586/2-42	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/18/21	Curing Age, Days	6		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.518
Initial Diameter, in	3.025
Height-to-Diameter Ratio	1.82
Area, in <sup>2</sup>	7.19
Volume, in <sup>3</sup>	39.66
Mass of Sample, g	1224.6
Wet Density, pcf	117.6
Dry Density, pcf	91.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.91

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1520.5
Mass of Dry Sample and Tare, g	1250.4
Mass of Tare, g	299.1
Moisture, %	28.4

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	411
Specimen Cross-sectional Area, in <sup>2</sup>	7.19
Compressive Strength at Failure, psi	57
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>57</b>

Failure Code 3

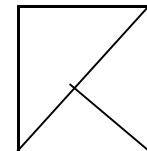
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

**Failure Sketch**



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **08/28/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38586/2-42	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/18/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.566
Initial Diameter, in	3.009
Height-to-Diameter Ratio	1.85
Area, in <sup>2</sup>	7.11
Volume, in <sup>3</sup>	39.58
Mass of Sample, g	1231.5
Wet Density, pcf	118.5
Dry Density, pcf	92.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1534.7
Mass of Dry Sample and Tare, g	1264.3
Mass of Tare, g	305.2
Moisture, %	28.2

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	776
Specimen Cross-sectional Area, in <sup>2</sup>	7.11
Compressive Strength at Failure, psi	109
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>109</b>

Failure Code 3

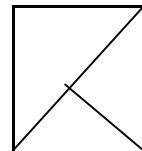
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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Tested By **KP/IH**

Date **09/08/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38586/2-42	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/18/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.489
Initial Diameter, in	3.014
Height-to-Diameter Ratio	1.82
Area, in <sup>2</sup>	7.13
Volume, in <sup>3</sup>	39.16
Mass of Sample, g	1221.5
Wet Density, pcf	118.8
Dry Density, pcf	92.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.91

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1517.7
Mass of Dry Sample and Tare, g	1247.1
Mass of Tare, g	298.8
Moisture, %	28.5

**TEST DATA**

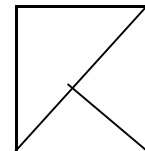
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1377
Specimen Cross-sectional Area, in <sup>2</sup>	7.13
Compressive Strength at Failure, psi	193
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>193</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By KP/IH

Date 09/15/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38586/2-42	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/18/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.601
Initial Diameter, in	3.012
Height-to-Diameter Ratio	1.86
Area, in <sup>2</sup>	7.13
Volume, in <sup>3</sup>	39.91
Mass of Sample, g	1244.0
Wet Density, pcf	118.7
Dry Density, pcf	92.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1547.2
Mass of Dry Sample and Tare, g	1271.8
Mass of Tare, g	305.3
Moisture, %	28.5

**TEST DATA**

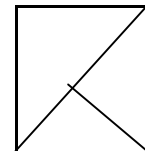
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1596
Specimen Cross-sectional Area, in <sup>2</sup>	7.13
Compressive Strength at Failure, psi	224
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>224</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **EB/KP**  
Date **08/28/21**  
Checked By **EB**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	38586/2-42	Subsample ID	5	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/18/21	Curing Age, Days	10		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)					
Height	3.027	in	7.69	cm	Speed	10			Average Height of Sample	3.028	in	7.69	cm
Diameter	3.017	in	7.66	cm	Board Number	9			Average Diameter of Sample	3.018	in	7.67	cm
Area	7.15	in <sup>2</sup>	46.12	cm <sup>2</sup>	Cell Number	13			Area	7.15	in <sup>2</sup>	46.15	cm <sup>2</sup>
Volume	354.61	cm <sup>3</sup>	0.0125	ft <sup>3</sup>	Flow Pump Number	4A			Volume	354.96	cm <sup>3</sup>	0.0125	ft <sup>3</sup>
Mass	670.0	g	1.48	lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	677.6	g	1.49	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	91.5 pcf				
Dry Density	91.6 pcf			Cell Pressure	95.0 psi			Vol. of Voids	162.22 cm <sup>3</sup>				
<b>Moisture Content</b>				Back Pressure	90.0 psi			Vol. of Solids	192.74 cm <sup>3</sup>				
Mass of wet sample & tare	670.0 g			Confining (Effective) Pressure	5.0 psi			Void Ratio	0.84				
Mass of dry sample & tare	520.4 g			Max Head	36.58 cm			Saturation	96.9 %				
Mass of tare	0.0 g			Min Head	35.87 cm			<b>Moisture Content</b>					
% Moisture	28.7			Maximum Gradient	4.76			Mass of wet sample & tare	760.2 g				
				Minimum Gradient	4.66			Mass of dry sample & tare	603.0 g				
								Mass of tare	82.6 g				
								% Moisture	30.2				

TIME FUNCTION			$\Delta t$ (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. $T_x$ (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ $T_x$	$R_T$	@ 20 °C
08/28/21	7	30	-	0.51	35.87	4.66	25.6	-	-	-
08/28/21	7	40	600	0.52	36.58	4.76	25.6	1.03E-06	0.877	9.04E-07
08/28/21	7	50	600	0.51	35.87	4.66	25.6	1.03E-06	0.877	9.04E-07
08/28/21	8	0	600	0.52	36.58	4.76	25.6	1.03E-06	0.877	9.04E-07
08/28/21	8	10	600	0.52	36.58	4.76	25.6	1.02E-06	0.877	8.95E-07
08/28/21	8	20	600	0.51	35.87	4.66	25.6	1.03E-06	0.877	9.04E-07
08/28/21	8	30	600	0.52	36.58	4.76	25.6	1.03E-06	0.877	9.04E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA
REMARKS	
Bottom Half of the mold was used for testing.	

Reported Average Hydraulic Conductivity*				9.0E-07 cm/sec			
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048		
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	571		
Syringe ID #	1047			Pore Pressure Meter ID #	29		

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/15/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38586/2-42	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/18/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	2.978	in	7.56	cm	Speed	12			Average Height of Sample	2.979	in	7.57	cm	
Diameter	3.009	in	7.64	cm	Board Number	5			Average Diameter of Sample	3.010	in	7.65	cm	
Area	7.11	in <sup>2</sup>	45.88	cm <sup>2</sup>	Cell Number	2			Area	7.12	in <sup>2</sup>	45.91	cm <sup>2</sup>	
Volume	347.02	cm <sup>3</sup>	0.0123	ft <sup>3</sup>	Flow Pump Number	4A			Volume	347.37	cm <sup>3</sup>	0.0123	ft <sup>3</sup>	
Mass	658.7	g	1.45	lb	Flow Pump Rate*	5.60E-05			cm <sup>3</sup> /sec	Mass	673.4	g	1.48	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Cell Pressure	95.0				psi	
Dry Density	92.4			pcf	Back Pressure	90.0			psi	Dry Density	92.3			pcf
<b>Moisture Content</b>				Confining (Effective) Pressure	5.0			psi	Vol. of Voids	157.04			cm <sup>3</sup>	
Mass of wet sample & tare	658.7			g	Max Head	52.76			cm	Mass of wet sample & tare	747.0			g
Mass of dry sample & tare	513.6			g	Min Head	52.05			cm	Mass of dry sample & tare	587.6			g
Mass of tare	0.0			g	Maximum Gradient	6.97			% Moisture	31.0				
% Moisture	28.3			Cell Pressure	95.0				psi	Vol. of Solids	190.34			cm <sup>3</sup>
				Back Pressure	90.0				psi	Void Ratio	0.83			
				Confining (Effective) Pressure	5.0				psi	Saturation	101.6			%

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/15/21	8	5	-	0.75	52.76	6.97	24.8	-	-	-
09/15/21	8	15	600	0.74	52.05	6.88	24.8	1.76E-07	0.893	1.57E-07
09/15/21	8	25	600	0.75	52.76	6.97	24.8	1.76E-07	0.893	1.57E-07
09/15/21	8	35	600	0.74	52.05	6.88	24.8	1.76E-07	0.893	1.57E-07
09/15/21	8	45	600	0.75	52.76	6.97	24.8	1.76E-07	0.893	1.57E-07
09/15/21	8	55	600	0.74	52.05	6.88	24.8	1.76E-07	0.893	1.57E-07
09/15/21	9	5	600	0.75	52.76	6.97	24.8	1.76E-07	0.893	1.57E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.6E-07		cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042	
Syringe ID #	1047			Pore Pressure Meter ID #	779/780	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **08/26/21**

Checked By **IB**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38622/2-23	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/20/21	Curing Age, Days	6		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.590
Initial Diameter, in	2.970
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	38.73
Mass of Sample, g	1213.5
Wet Density, pcf	119.4
Dry Density, pcf	93.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1511.7
Mass of Dry Sample and Tare, g	1248.5
Mass of Tare, g	299.3
Moisture, %	27.7

**TEST DATA**

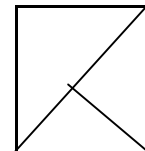
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	373
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	54
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>54</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **08/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38622/2-23	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/20/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.632
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.15
Mass of Sample, g	1216.8
Wet Density, pcf	118.4
Dry Density, pcf	92.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1518.6
Mass of Dry Sample and Tare, g	1256.4
Mass of Tare, g	304.1
Moisture, %	27.5

**TEST DATA**

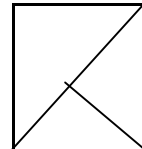
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	862
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	124
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>124</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **09/10/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38622/2-23	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/20/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.603
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.00
Mass of Sample, g	1212.4
Wet Density, pcf	118.4
Dry Density, pcf	92.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1509.9
Mass of Dry Sample and Tare, g	1247.8
Mass of Tare, g	299.8
Moisture, %	27.6

**TEST DATA**

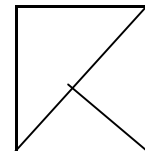
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2298
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	330
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>330</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/17/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38622/2-23	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/20/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.654
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.22
Mass of Sample, g	1224.1
Wet Density, pcf	118.9
Dry Density, pcf	93.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1519.5
Mass of Dry Sample and Tare, g	1259.3
Mass of Tare, g	300.9
Moisture, %	27.1

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3159
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	455
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>455</b>

Failure Code 3

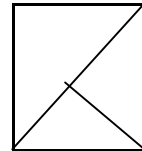
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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Tested By: EB/KP  
Date: 08/30/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	38622/2-23	Subsample ID	5	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/20/21	Curing Age, Days	10		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.004 in	7.63 cm	Speed	9	Average Height of Sample	3.005 in	7.63 cm				
Diameter	2.969 in	7.54 cm	Board Number	7	Average Diameter of Sample	2.970 in	7.54 cm				
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	14	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>				
Volume	340.81 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	4A	Volume	341.15 cm <sup>3</sup>	0.0120 ft <sup>3</sup>				
Mass	639.2 g	1.41 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	653.7 g	1.44 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	91.8 pcf					
Dry Density	91.8 pcf		Cell Pressure	95.0 psi	Vol. of Voids	155.34 cm <sup>3</sup>					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Vol. of Solids	185.81 cm <sup>3</sup>				
Mass of wet sample & tare	639.2 g		Confining (Effective) Pressure	5.0 psi	Void Ratio	0.84					
Mass of dry sample & tare	501.3 g		Max Head	23.92 cm	Saturation	97.9 %					
Mass of tare	0.0 g		Min Head	23.21 cm	Mass of wet sample & tare	734.7 g					
% Moisture	27.5		Maximum Gradient	3.13	Mass of dry sample & tare	582.8 g					
			Minimum Gradient	3.04	Mass of tare	81.5 g					
					% Moisture	30.3					

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
08/30/21	9	5	-	0.33	23.21	3.04	27.5	-	-	-
08/30/21	9	15	600	0.34	23.92	3.13	27.5	3.25E-06	0.841	2.73E-06
08/30/21	9	25	600	0.33	23.21	3.04	27.5	3.25E-06	0.841	2.73E-06
08/30/21	9	35	600	0.34	23.92	3.13	27.5	3.25E-06	0.841	2.73E-06
08/30/21	9	45	600	0.33	23.21	3.04	27.5	3.25E-06	0.841	2.73E-06
08/30/21	9	55	600	0.34	23.92	3.13	27.5	3.25E-06	0.841	2.73E-06
08/30/21	10	5	600	0.33	23.21	3.04	27.5	3.25E-06	0.841	2.73E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.7E-06 cm/sec	
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/17/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38622/2-23	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/20/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.022 in	7.68 cm	Speed	11	Average Height of Sample	3.023 in	7.68 cm	Dry Density	92.7 pcf		
Diameter	2.968 in	7.54 cm	Board Number	1	Average Diameter of Sample	2.969 in	7.54 cm	Vol. of Voids	154.18 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Cell Number	11	Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Vol. of Solids	188.78 cm <sup>3</sup>		
Volume	342.62 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	1A	Volume	342.96 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.82		
Mass	649.2 g	1.43 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	664.5 g	1.46 lb	Saturation	100.4 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	92.8 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	738.3 g					
			Back Pressure	90.0 psi	Mass of dry sample & tare	583.6 g					
			Confining (Effective) Pressure	5.0 psi	Mass of tare	74.2 g					
			Max Head	95.66 cm	% Moisture	30.4					
			Min Head	94.96 cm							
			Maximum Gradient	12.46							
			Minimum Gradient	12.37							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/17/21	11	5	-	1.36	95.66	12.46	25.1	-	-	-
09/17/21	11	15	600	1.35	94.96	12.37	25.1	2.02E-07	0.887	1.79E-07
09/17/21	11	25	600	1.36	95.66	12.46	25.1	2.02E-07	0.887	1.79E-07
09/17/21	11	35	600	1.35	94.96	12.37	25.1	2.02E-07	0.887	1.79E-07
09/17/21	11	45	600	1.35	94.96	12.37	25.1	2.03E-07	0.887	1.80E-07
09/17/21	11	55	600	1.36	95.66	12.46	25.1	2.02E-07	0.887	1.79E-07
09/17/21	12	5	600	1.35	94.96	12.37	25.1	2.02E-07	0.887	1.79E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.8E-07	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	1107
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	64
Syringe ID #	140			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **08/28/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38623/2-15	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/23/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.608
Initial Diameter, in	2.985
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	7.00
Volume, in <sup>3</sup>	39.25
Mass of Sample, g	1216.5
Wet Density, pcf	118.1
Dry Density, pcf	92.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1519.9
Mass of Dry Sample and Tare, g	1258.6
Mass of Tare, g	305.8
Moisture, %	27.4

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	220
Specimen Cross-sectional Area, in <sup>2</sup>	7.00
Compressive Strength at Failure, psi	31
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>31</b>

Failure Code 3

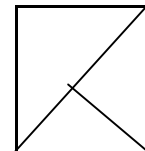
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **09/02/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38623/2-15	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/23/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.589
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	38.88
Mass of Sample, g	1215.9
Wet Density, pcf	119.1
Dry Density, pcf	93.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1510.0
Mass of Dry Sample and Tare, g	1247.7
Mass of Tare, g	296.8
Moisture, %	27.6

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	785
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	113
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>113</b>

Failure Code 3

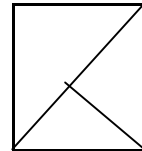
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Date **09/13/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38623/2-15	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/23/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.596
Initial Diameter, in	2.984
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.99
Volume, in <sup>3</sup>	39.13
Mass of Sample, g	1215.2
Wet Density, pcf	118.3
Dry Density, pcf	92.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1515.8
Mass of Dry Sample and Tare, g	1254.3
Mass of Tare, g	303.7
Moisture, %	27.5

**TEST DATA**

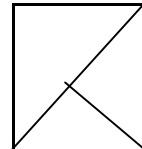
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1891
Specimen Cross-sectional Area, in <sup>2</sup>	6.99
Compressive Strength at Failure, psi	270
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>270</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **09/20/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38623/2-15	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/23/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.583
Initial Diameter, in	2.984
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.99
Volume, in <sup>3</sup>	39.04
Mass of Sample, g	1213.3
Wet Density, pcf	118.4
Dry Density, pcf	92.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1513.9
Mass of Dry Sample and Tare, g	1250.5
Mass of Tare, g	301.8
Moisture, %	27.8

**TEST DATA**

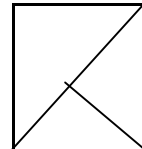
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2503
Specimen Cross-sectional Area, in <sup>2</sup>	6.99
Compressive Strength at Failure, psi	358
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>358</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By	EB/KP
Date	09/02/21
Checked By	<i>EB</i>

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38623/2-15	Subsample ID	5
Add. Info	-	Mixing/Molding Date	08/23/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)				
Height	3.009	in	7.64	cm	Speed	10	Average Height of Sample	3.010	in	7.65	cm	
Diameter	2.967	in	7.54	cm	Board Number	1	Average Diameter of Sample	2.968	in	7.54	cm	
Area	6.91	in <sup>2</sup>	44.61	cm <sup>2</sup>	Cell Number	37	Area	6.92	in <sup>2</sup>	44.64	cm <sup>2</sup>	
Volume	340.92	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	1B	Volume	341.26	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	651.2	g	1.44	lb	Flow Pump Rate*	2.24E-04	cm <sup>3</sup> /sec	Mass	659.9	g	1.45	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95		Dry Density	93.5	pcf		
Dry Density	93.5	pcf			Cell Pressure	95.0	psi	Vol. of Voids	151.93	cm <sup>3</sup>		
					Back Pressure	90.0	psi	Vol. of Solids	189.32	cm <sup>3</sup>		
					Confining (Effective) Pressure	5.0	psi	Void Ratio	0.80			
					Max Head	51.35	cm	Saturation	97.9	%		
					Min Head	50.64	cm					
					Maximum Gradient	6.72						
					Minimum Gradient	6.62						
<b>Moisture Content</b>				<b>Moisture Content</b>				<b>Moisture Content</b>				
Mass of wet sample & tare	651.2	g			Mass of wet sample & tare	738.0	g					
Mass of dry sample & tare	511.1	g			Mass of dry sample & tare	589.3	g					
Mass of tare	0.0	g			Mass of tare	78.2	g					
% Moisture	27.4				% Moisture	29.1						

TIME FUNCTION			$\Delta t$ (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/02/21	7	20	-	0.72	50.64	6.62	25.2	-	-	-
09/02/21	7	30	600	0.73	51.35	6.72	25.2	7.52E-07	0.885	6.66E-07
09/02/21	7	40	600	0.72	50.64	6.62	25.2	7.52E-07	0.885	6.66E-07
09/02/21	7	50	600	0.72	50.64	6.62	25.2	7.58E-07	0.885	6.71E-07
09/02/21	8	0	600	0.73	51.35	6.72	25.2	7.52E-07	0.885	6.66E-07
09/02/21	8	10	600	0.73	51.35	6.72	25.2	7.47E-07	0.885	6.61E-07
09/02/21	8	20	600	0.72	50.64	6.62	25.2	7.52E-07	0.885	6.66E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA
REMARKS	
Bottom Half of the mold was used for testing.	

Reported Average Hydraulic Conductivity*				6.7E-07	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	942
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	64
Syringe ID #	141			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/20/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38623/2-15	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/23/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.980 in	7.57 cm	Speed	11	Average Height of Sample	2.981 in	7.57 cm	Dry Density	93.4 pcf		
Diameter	2.968 in	7.54 cm	Board Number	5	Average Diameter of Sample	2.969 in	7.54 cm	Vol. of Voids	150.75 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Cell Number	13	Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Vol. of Solids	187.45 cm <sup>3</sup>		
Volume	337.86 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Flow Pump Number	4A	Volume	338.20 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Void Ratio	0.80		
Mass	643.0 g	1.42 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	654.8 g	1.44 lb	Saturation	98.6 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	93.4 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	718.9 g					
			Back Pressure	90.0 psi	Mass of dry sample & tare	570.3 g					
			Confining (Effective) Pressure	5.0 psi	Mass of tare	64.5 g					
			Max Head	141.38 cm	% Moisture	29.4					
			Min Head	140.68 cm							
			Maximum Gradient	18.67							
			Minimum Gradient	18.58							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/20/21	8	5	-	2.01	141.38	18.67	25.5	-	-	-
09/20/21	8	15	600	2.00	140.68	18.58	25.5	1.35E-07	0.879	1.18E-07
09/20/21	8	25	600	2.01	141.38	18.67	25.5	1.35E-07	0.879	1.18E-07
09/20/21	8	35	600	2.00	140.68	18.58	25.5	1.35E-07	0.879	1.18E-07
09/20/21	8	45	600	2.01	141.38	18.67	25.5	1.35E-07	0.879	1.18E-07
09/20/21	8	55	600	2.00	140.68	18.58	25.5	1.35E-07	0.879	1.18E-07
09/20/21	9	5	600	2.01	141.38	18.67	25.5	1.35E-07	0.879	1.18E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.2E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	1047			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **08/29/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38624/2-40	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/24/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.584
Initial Diameter, in	2.950
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.83
Volume, in <sup>3</sup>	38.17
Mass of Sample, g	1179.1
Wet Density, pcf	117.7
Dry Density, pcf	89.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1480.3
Mass of Dry Sample and Tare, g	1198.2
Mass of Tare, g	303.4
Moisture, %	31.5

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	412
Specimen Cross-sectional Area, in <sup>2</sup>	6.83
Compressive Strength at Failure, psi	60
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>60</b>

Failure Code 3

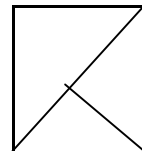
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **09/03/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38624/2-40	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/24/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.619
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.03
Mass of Sample, g	1193.3
Wet Density, pcf	116.5
Dry Density, pcf	88.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1527.3
Mass of Dry Sample and Tare, g	1243.9
Mass of Tare, g	336.3
Moisture, %	31.2

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	804
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	116
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>116</b>

Failure Code 3

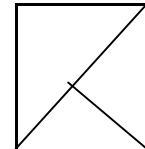
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

**Failure Sketch**



Failure Type:

Cone and Shear



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Tested By KP/IH

Date 09/14/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38624/2-40	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/24/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.552
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	38.59
Mass of Sample, g	1170.5
Wet Density, pcf	115.5
Dry Density, pcf	87.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1467.2
Mass of Dry Sample and Tare, g	1186.4
Mass of Tare, g	306.0
Moisture, %	31.9

**TEST DATA**

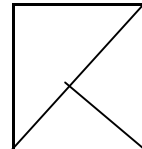
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1541
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	222
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>222</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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SOIL  
TESTS, LLC**

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: [www.test-llc.com](http://www.test-llc.com)



**AASHTO  
ACCREDITED**

Tested By **KP/IH**

Date **09/21/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38624/2-40	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/24/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.611
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.13
Mass of Sample, g	1189.9
Wet Density, pcf	115.8
Dry Density, pcf	87.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1605.1
Mass of Dry Sample and Tare, g	1319.4
Mass of Tare, g	416.5
Moisture, %	31.6

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2068
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	297
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>297</b>

Failure Code 3

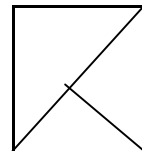
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 09/03/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38624/2-40	Subsample ID	5
Add. Info	-	Mixing/Molding Date	08/24/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	10	Average Height of Sample	3.014 in	7.66 cm	Dry Density	88.0 pcf		
Diameter	2.960 in	7.52 cm	Board Number	4	Average Diameter of Sample	2.961 in	7.52 cm	Vol. of Voids	162.36 cm <sup>3</sup>		
Area	6.88 in <sup>2</sup>	44.40 cm <sup>2</sup>	Cell Number	43	Area	6.89 in <sup>2</sup>	44.43 cm <sup>2</sup>	Vol. of Solids	177.74 cm <sup>3</sup>		
Volume	339.76 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	3B	Volume	340.10 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Void Ratio	0.91		
Mass	632.2 g	1.39 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	638.0 g	1.41 lb	Saturation	97.4 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	88.1 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	713.5 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	555.5 g				
Mass of wet sample & tare	632.2 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	75.9 g					
Mass of dry sample & tare	479.6 g		Max Head	48.53 cm	% Moisture	32.9					
Mass of tare	0.0 g		Min Head	47.83 cm							
% Moisture	31.8		Maximum Gradient	6.34							
			Minimum Gradient	6.25							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/03/21	11	5	-	0.69	48.53	6.34	25.1	-	-	-
09/03/21	11	15	600	0.68	47.83	6.25	25.1	8.01E-07	0.887	7.11E-07
09/03/21	11	25	600	0.69	48.53	6.34	25.1	8.01E-07	0.887	7.11E-07
09/03/21	11	35	600	0.68	47.83	6.25	25.1	8.01E-07	0.887	7.11E-07
09/03/21	11	45	600	0.69	48.53	6.34	25.1	8.01E-07	0.887	7.11E-07
09/03/21	11	55	600	0.68	47.83	6.25	25.1	8.01E-07	0.887	7.11E-07
09/03/21	12	5	600	0.69	48.53	6.34	25.1	8.01E-07	0.887	7.11E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				7.1E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	490			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **EB/KP**  
Date **09/21/21**  
Checked By **EB**

Client Pr. # 200016  
Pr. Name Time Oil Terminal  
Sample ID 38624/2-40 Subsample ID 6  
Add. Info - Mixing/Molding Date 08/24/21

Lab. PR. # 21136-02-1  
S. Type Mold Depth/Elevation -  
Location Seattle, WA  
Curing Age, Days 28

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)			Test Data			Final Data (After Test)		
Height	3.010 in	7.65 cm	Speed	11		Average Height of Sample	3.011 in	7.65 cm
Diameter	2.971 in	7.55 cm	Board Number	18		Average Diameter of Sample	2.972 in	7.55 cm
Area	6.93 in <sup>2</sup>	44.73 cm <sup>2</sup>	Cell Number	37		Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>
Volume	341.95 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3A		Volume	342.29 cm <sup>3</sup>	0.0121 ft <sup>3</sup>
Mass	632.1 g	1.39 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec		Mass	638.4 g	1.41 lb
Specific Gravity	2.700 (Assumed)		B - Value	0.95		Dry Density	87.5 pcf	
Dry Density	87.6 pcf		Cell Pressure	95.0 psi		Vol. of Voids	164.53 cm <sup>3</sup>	
			Back Pressure	90.0 psi		Vol. of Solids	177.77 cm <sup>3</sup>	
			Confining (Effective) Pressure	5.0 psi		Void Ratio	0.93	
			Max Head	126.61 cm		Saturation	96.3 %	
			Min Head	125.21 cm				
			Maximum Gradient	16.56				
			Minimum Gradient	16.37				

Moisture Content		
Mass of wet sample & tare	632.1 g	
Mass of dry sample & tare	479.9 g	
Mass of tare	0.0 g	
% Moisture	31.7	

Moisture Content		
Mass of wet sample & tare	711.7 g	
Mass of dry sample & tare	553.3 g	
Mass of tare	73.4 g	
% Moisture	33.0	

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/21/21	8	40	-	1.79	125.91	16.46	25.7	-	-	-
09/21/21	8	50	600	1.79	125.91	16.46	25.7	1.52E-07	0.875	1.33E-07
09/21/21	9	0	600	1.78	125.21	16.37	25.7	1.52E-07	0.875	1.33E-07
09/21/21	9	10	600	1.80	126.61	16.56	25.7	1.52E-07	0.875	1.33E-07
09/21/21	9	20	600	1.79	125.91	16.46	25.7	1.52E-07	0.875	1.33E-07
09/21/21	9	30	600	1.80	126.61	16.56	25.7	1.52E-07	0.875	1.33E-07
09/21/21	9	40	600	1.79	125.91	16.46	25.7	1.52E-07	0.875	1.33E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity\* 1.3E-07 cm/sec

Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	491			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **08/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38690/2-45	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/25/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.586
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	38.88
Mass of Sample, g	1178.9
Wet Density, pcf	115.5
Dry Density, pcf	87.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1474.0
Mass of Dry Sample and Tare, g	1184.8
Mass of Tare, g	299.5
Moisture, %	32.7

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	373
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	54
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>54</b>

Failure Code 3

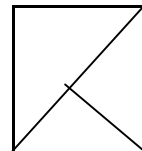
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **09/04/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38690/2-45	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/25/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.628
Initial Diameter, in	2.982
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.98
Volume, in <sup>3</sup>	39.31
Mass of Sample, g	1182.0
Wet Density, pcf	114.6
Dry Density, pcf	86.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1539.2
Mass of Dry Sample and Tare, g	1249.2
Mass of Tare, g	360.1
Moisture, %	32.6

**TEST DATA**

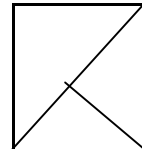
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	815
Specimen Cross-sectional Area, in <sup>2</sup>	6.98
Compressive Strength at Failure, psi	117
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>117</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **09/15/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38690/2-45	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/25/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.617
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.02
Mass of Sample, g	1184.7
Wet Density, pcf	115.7
Dry Density, pcf	87.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1486.6
Mass of Dry Sample and Tare, g	1196.2
Mass of Tare, g	303.8
Moisture, %	32.5

**TEST DATA**

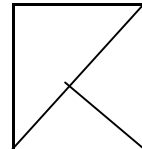
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1555
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	224
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>224</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/22/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38690/2-45	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/25/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.752
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.93
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.96
Mass of Sample, g	1204.3
Wet Density, pcf	114.8
Dry Density, pcf	86.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.87

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1516.0
Mass of Dry Sample and Tare, g	1218.4
Mass of Tare, g	313.2
Moisture, %	32.9

**TEST DATA**

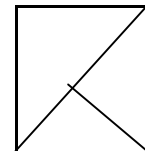
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2299
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	331
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>331</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 09/04/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38690/2-45	Subsample ID	5
Add. Info	-	Mixing/Molding Date	08/25/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.031 in	7.70 cm	Speed	10	Average Height of Sample	3.032 in	7.70 cm	Dry Density	85.8 pcf		
Diameter	2.969 in	7.54 cm	Board Number	6	Average Diameter of Sample	2.970 in	7.54 cm	Vol. of Voids	168.99 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	33	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Vol. of Solids	175.23 cm <sup>3</sup>		
Volume	343.87 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3A	Volume	344.22 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.96		
Mass	628.3 g	1.39 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	634.1 g	1.40 lb	Saturation	95.3 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	85.8 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	715.2 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	554.3 g				
Mass of wet sample & tare	628.3 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.4 g					
Mass of dry sample & tare	472.9 g		Max Head	31.65 cm	% Moisture	34.0					
Mass of tare	0.0 g		Min Head	30.95 cm							
% Moisture	32.9		Maximum Gradient	4.11							
			Minimum Gradient	4.02							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/04/21	10	5	-	0.44	30.95	4.02	25.3	-	-	-
09/04/21	10	15	600	0.45	31.65	4.11	25.3	1.23E-06	0.883	1.09E-06
09/04/21	10	25	600	0.44	30.95	4.02	25.3	1.23E-06	0.883	1.09E-06
09/04/21	10	35	600	0.45	31.65	4.11	25.3	1.23E-06	0.883	1.09E-06
09/04/21	10	45	600	0.44	30.95	4.02	25.3	1.23E-06	0.883	1.09E-06
09/04/21	10	55	600	0.45	31.65	4.11	25.3	1.23E-06	0.883	1.09E-06
09/04/21	11	5	600	0.44	30.95	4.02	25.3	1.23E-06	0.883	1.09E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.1E-06	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	491			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/22/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38690/2-45	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/25/21

Lab. PR. #	21136-02-1		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)					
Height	2.998 in	7.61 cm	Speed	11	Average Height of Sample	2.999 in	7.62 cm	Diameter	2.971 in	7.55 cm	Average Diameter of Sample	2.972 in	7.55 cm
Area	6.93 in <sup>2</sup>	44.73 cm <sup>2</sup>	Board Number	4	Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>	Volume	340.59 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Volume	340.93 cm <sup>3</sup>	0.0120 ft <sup>3</sup>
Volume	340.59 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Cell Number	17	Mass	626.1 g	1.38 lb	Mass	638.2 g	1.41 lb	Dry Density	86.7 pcf	165.41 cm <sup>3</sup>
Mass	626.1 g	1.38 lb	Flow Pump Number	2A	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec		Vol. of Voids	2.700 (Assumed)		Vol. of Solids	175.52 cm <sup>3</sup>	
Specific Gravity	2.700 (Assumed)		Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	B - Value	0.95		Void Ratio	86.8 pcf		Saturation	99.3 %	
Dry Density	86.8 pcf		Cell Pressure	95.0 psi	Back Pressure	90.0 psi		Moisture Content					
			Back Pressure	90.0 psi	Confining (Effective) Pressure	5.0 psi		Mass of wet sample & tare	626.1 g	723.6 g	Mass of dry sample & tare	559.3 g	85.4 g
			Max Head	136.46 cm	Min Head	135.76 cm		Mass of tare	0.0 g	34.7 g	% Moisture	32.1 %	
			Minimum Gradient	17.82									

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/22/21	10	20	-	1.94	136.46	17.91	25.5	-	-	-
09/22/21	10	30	600	1.93	135.76	17.82	25.5	1.40E-07	0.879	1.23E-07
09/22/21	10	40	600	1.94	136.46	17.91	25.5	1.40E-07	0.879	1.23E-07
09/22/21	10	50	600	1.93	135.76	17.82	25.5	1.40E-07	0.879	1.23E-07
09/22/21	11	0	600	1.94	136.46	17.91	25.5	1.40E-07	0.879	1.23E-07
09/22/21	11	10	600	1.93	135.76	17.82	25.5	1.40E-07	0.879	1.23E-07
09/22/21	11	20	600	1.94	136.46	17.91	25.5	1.40E-07	0.879	1.23E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.2E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	245			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **08/31/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38697/2-7	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/26/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.595
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	38.94
Mass of Sample, g	1237.2
Wet Density, pcf	121.0
Dry Density, pcf	90.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1542.4
Mass of Dry Sample and Tare, g	1225.5
Mass of Tare, g	305.7
Moisture, %	34.5

**TEST DATA**

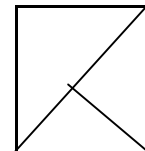
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	249
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	36
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>36</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date 09/05/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38697/2-7	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/26/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.673
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.43
Mass of Sample, g	1253.3
Wet Density, pcf	121.1
Dry Density, pcf	90.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1583.7
Mass of Dry Sample and Tare, g	1265.0
Mass of Tare, g	331.4
Moisture, %	34.1

**TEST DATA**

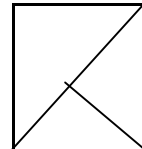
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1086
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	156
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>156</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **09/16/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38697/2-7	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/26/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.686
Initial Diameter, in	2.987
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	7.01
Volume, in <sup>3</sup>	39.84
Mass of Sample, g	1272.7
Wet Density, pcf	121.7
Dry Density, pcf	90.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1576.4
Mass of Dry Sample and Tare, g	1250.5
Mass of Tare, g	306.9
Moisture, %	34.5

**TEST DATA**

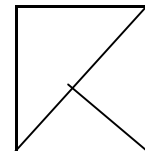
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2933
Specimen Cross-sectional Area, in <sup>2</sup>	7.01
Compressive Strength at Failure, psi	419
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>419</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **09/23/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38697/2-7	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/26/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.748
Initial Diameter, in	2.983
Height-to-Diameter Ratio	1.93
Area, in <sup>2</sup>	6.99
Volume, in <sup>3</sup>	40.17
Mass of Sample, g	1286.8
Wet Density, pcf	122.0
Dry Density, pcf	90.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.87

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1583.3
Mass of Dry Sample and Tare, g	1255.3
Mass of Tare, g	299.6
Moisture, %	34.3

**TEST DATA**

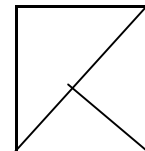
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3385
Specimen Cross-sectional Area, in <sup>2</sup>	6.99
Compressive Strength at Failure, psi	484
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>484</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**







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Tested By: EB/KP  
Date: 09/23/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-1		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	38697/2-7	Subsample ID	6	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/26/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.024 in	7.68 cm	Speed	11	Average Height of Sample	3.025 in	7.68 cm				
Diameter	2.969 in	7.54 cm	Board Number	3	Average Diameter of Sample	2.970 in	7.54 cm				
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	55	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>				
Volume	343.08 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2B	Volume	343.42 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	655.3 g	1.44 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	655.3 g	1.44 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	88.5 pcf					
Dry Density	88.6 pcf		Cell Pressure	95.0 psi	Vol. of Voids	163.00 cm <sup>3</sup>					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Vol. of Solids	180.43 cm <sup>3</sup>				
Mass of wet sample & tare	655.3 g		Confining (Effective) Pressure	5.0 psi	Void Ratio	0.90					
Mass of dry sample & tare	487.3 g		Max Head	114.65 cm	Saturation	103.2 %					
Mass of tare	0.0 g		Min Head	113.95 cm	Mass of wet sample & tare	740.5 g					
% Moisture	34.5		Maximum Gradient	14.92	Mass of dry sample & tare	572.3 g					
			Minimum Gradient	14.83	Mass of tare	85.0 g					
					% Moisture	34.5					

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/23/21	10	20	-	1.63	114.65	14.92	25.4	-	-	-
09/23/21	10	30	600	1.62	113.95	14.83	25.4	1.68E-07	0.881	1.48E-07
09/23/21	10	40	600	1.63	114.65	14.92	25.4	1.68E-07	0.881	1.48E-07
09/23/21	10	50	600	1.62	113.95	14.83	25.4	1.68E-07	0.881	1.48E-07
09/23/21	11	0	600	1.63	114.65	14.92	25.4	1.68E-07	0.881	1.48E-07
09/23/21	11	10	600	1.63	114.65	14.92	25.4	1.68E-07	0.881	1.48E-07
09/23/21	11	20	600	1.62	113.95	14.83	25.4	1.68E-07	0.881	1.48E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA

REMARKS  
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.5E-07 cm/sec	
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	246			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/04/21**

Checked By **IB**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38731/2-1	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/30/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.699
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.92
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.54
Mass of Sample, g	1177.3
Wet Density, pcf	113.4
Dry Density, pcf	88.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1477.4
Mass of Dry Sample and Tare, g	1214.5
Mass of Tare, g	303.0
Moisture, %	28.8

**TEST DATA**

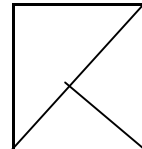
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	73
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	11
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>11</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/09/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38731/2-1	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/30/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.634
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.16
Mass of Sample, g	1201.3
Wet Density, pcf	116.9
Dry Density, pcf	90.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1502.1
Mass of Dry Sample and Tare, g	1234.5
Mass of Tare, g	303.0
Moisture, %	28.7

**TEST DATA**

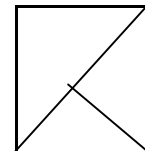
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	324
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	47
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>47</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By KP/IH

Date 09/20/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38731/2-1	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/30/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.603
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.05
Mass of Sample, g	1191.7
Wet Density, pcf	116.2
Dry Density, pcf	90.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1549.8
Mass of Dry Sample and Tare, g	1284.3
Mass of Tare, g	359.9
Moisture, %	28.7

**TEST DATA**

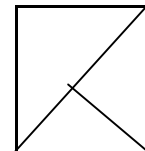
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	674
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	97
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>97</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By KP/IH

Date 09/27/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38731/2-1	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/30/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.641
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.24
Mass of Sample, g	1204.1
Wet Density, pcf	116.9
Dry Density, pcf	90.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1503.5
Mass of Dry Sample and Tare, g	1235.5
Mass of Tare, g	302.0
Moisture, %	28.7

**TEST DATA**

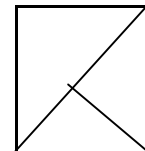
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	950
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	137
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>137</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By: EB/KP  
Date: 09/27/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38731/2-1	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/30/21

Lab. PR. #	21136-02-2		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.009 in	7.64 cm	Speed	11	Average Height of Sample	3.010 in	7.65 cm				
Diameter	2.975 in	7.56 cm	Board Number	18	Average Diameter of Sample	2.976 in	7.56 cm				
Area	6.95 in <sup>2</sup>	44.85 cm <sup>2</sup>	Cell Number	14	Area	6.96 in <sup>2</sup>	44.88 cm <sup>2</sup>				
Volume	342.76 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2B	Volume	343.10 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	634.2 g	1.40 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	644.3 g	1.42 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	89.3 pcf					
Dry Density	89.8 pcf		Cell Pressure	95.0 psi	Vol. of Voids	161.15 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	181.95 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.89					
			Max Head	57.68 cm	Saturation	95.0 %					
			Min Head	56.98 cm							
			Maximum Gradient	7.54							
			Minimum Gradient	7.45							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/27/21	8	30	-	0.81	56.98	7.45	24.5	-	-	-
09/27/21	8	40	600	0.82	57.68	7.54	24.5	3.33E-07	0.899	2.99E-07
09/27/21	8	50	600	0.81	56.98	7.45	24.5	3.33E-07	0.899	2.99E-07
09/27/21	9	0	600	0.82	57.68	7.54	24.5	3.33E-07	0.899	2.99E-07
09/27/21	9	10	600	0.81	56.98	7.45	24.5	3.33E-07	0.899	2.99E-07
09/27/21	9	20	600	0.82	57.68	7.54	24.5	3.33E-07	0.899	2.99E-07
09/27/21	9	30	600	0.81	56.98	7.45	24.5	3.33E-07	0.899	2.99E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.0E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	246			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By KP/IH

Date 09/05/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38732/2-43	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/31/21	Curing Age, Days	5		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.614
Initial Diameter, in	2.973
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	38.97
Mass of Sample, g	1171.1
Wet Density, pcf	114.5
Dry Density, pcf	86.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1480.6
Mass of Dry Sample and Tare, g	1195.3
Mass of Tare, g	310.1
Moisture, %	32.2

**TEST DATA**

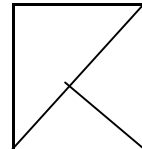
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	522
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	75
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>75</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/10/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38732/2-43	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/31/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.616
Initial Diameter, in	2.968
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	38.85
Mass of Sample, g	1171.4
Wet Density, pcf	114.9
Dry Density, pcf	86.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1465.5
Mass of Dry Sample and Tare, g	1178.2
Mass of Tare, g	297.1
Moisture, %	32.6

**TEST DATA**

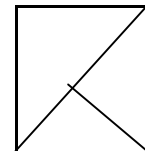
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	858
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	124
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>124</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **09/21/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38732/2-43	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/31/21	Curing Age, Days	21		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.622
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.05
Mass of Sample, g	1176.2
Wet Density, pcf	114.7
Dry Density, pcf	86.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1525.1
Mass of Dry Sample and Tare, g	1238.3
Mass of Tare, g	360.1
Moisture, %	32.7

**TEST DATA**

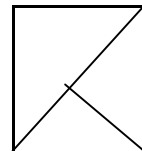
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2102
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	303
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>303</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/28/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38732/2-43	Subsample	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/31/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.554
Initial Diameter, in	2.983
Height-to-Diameter Ratio	1.86
Area, in <sup>2</sup>	6.99
Volume, in <sup>3</sup>	38.82
Mass of Sample, g	1158.3
Wet Density, pcf	113.7
Dry Density, pcf	85.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1515.8
Mass of Dry Sample and Tare, g	1229.7
Mass of Tare, g	359.8
Moisture, %	32.9

**TEST DATA**

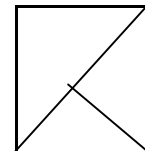
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2207
Specimen Cross-sectional Area, in <sup>2</sup>	6.99
Compressive Strength at Failure, psi	316
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>316</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/10/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	38732/2-43	Subsample ID	5	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	08/31/21	Curing Age, Days	10		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.073 in	7.81 cm	Speed	10	Average Height of Sample	3.074 in	7.81 cm	Dry Density	86.4 pcf		
Diameter	2.959 in	7.52 cm	Board Number	19	Average Diameter of Sample	2.960 in	7.52 cm	Vol. of Voids	168.83 cm <sup>3</sup>		
Area	6.88 in <sup>2</sup>	44.37 cm <sup>2</sup>	Cell Number	13	Area	6.88 in <sup>2</sup>	44.40 cm <sup>2</sup>	Vol. of Solids	177.81 cm <sup>3</sup>		
Volume	346.29 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	2B	Volume	346.64 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.95		
Mass	635.0 g	1.40 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	648.9 g	1.43 lb	Saturation	100.0 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	86.5 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	735.6 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	566.8 g				
Mass of wet sample & tare	635.0 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	86.7 g					
Mass of dry sample & tare	480.1 g		Max Head	102.70 cm	% Moisture	35.2					
Mass of tare	0.0 g		Min Head	101.99 cm							
% Moisture	32.3		Maximum Gradient	13.15							
			Minimum Gradient	13.06							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/10/21	8	5	-	1.46	102.70	13.15	25.7	-	-	-
09/10/21	8	15	600	1.45	101.99	13.06	25.7	3.85E-07	0.875	3.37E-07
09/10/21	8	25	600	1.46	102.70	13.15	25.7	3.85E-07	0.875	3.37E-07
09/10/21	8	35	600	1.45	101.99	13.06	25.7	3.85E-07	0.875	3.37E-07
09/10/21	8	45	600	1.46	102.70	13.15	25.7	3.85E-07	0.875	3.37E-07
09/10/21	8	55	600	1.45	101.99	13.06	25.7	3.85E-07	0.875	3.37E-07
09/10/21	9	5	600	1.46	102.70	13.15	25.7	3.85E-07	0.875	3.37E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.4E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	246			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/28/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38732/2-43	Subsample ID	6
Add. Info	-	Mixing/Molding Date	08/31/21

Lab. PR. #	21136-02-2		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.022 in	7.68 cm	Speed	12	Average Height of Sample	3.023 in	7.68 cm	Dry Density	84.5 pcf		
Diameter	2.972 in	7.55 cm	Board Number	11	Average Diameter of Sample	2.973 in	7.55 cm	Vol. of Voids	171.38 cm <sup>3</sup>		
Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>	Cell Number	2	Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	Vol. of Solids	172.50 cm <sup>3</sup>		
Volume	343.54 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	1A	Volume	343.89 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.99		
Mass	625.8 g	1.38 lb	Flow Pump Rate*	5.60E-05 cm <sup>3</sup> /sec	Mass	630.8 g	1.39 lb	Saturation	96.3 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	85.6 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	702.8 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	535.8 g				
Mass of wet sample & tare	625.8 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	64.5 g					
Mass of dry sample & tare	471.3 g		Max Head	167.41 cm	% Moisture	35.4					
Mass of tare	0.0 g		Min Head	166.71 cm							
% Moisture	32.8		Maximum Gradient	21.80							
			Minimum Gradient	21.71							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/29/21	7	5	-	2.38	167.41	21.80	26.1	-	-	-
09/29/21	7	15	600	2.37	166.71	21.71	26.1	5.75E-08	0.867	4.99E-08
09/29/21	7	25	600	2.38	167.41	21.80	26.1	5.75E-08	0.867	4.99E-08
09/29/21	7	35	600	2.37	166.71	21.71	26.1	5.75E-08	0.867	4.99E-08
09/29/21	7	45	600	2.38	167.41	21.80	26.1	5.75E-08	0.867	4.99E-08
09/29/21	7	55	600	2.37	166.71	21.71	26.1	5.75E-08	0.867	4.99E-08
09/29/21	8	5	600	2.38	167.41	21.80	26.1	5.75E-08	0.867	4.99E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				5.0E-08	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	1107
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	776
Syringe ID #	140			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/11/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38741/2-41	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/01/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.555
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	38.59
Mass of Sample, g	1164.3
Wet Density, pcf	114.9
Dry Density, pcf	81.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1464.5
Mass of Dry Sample and Tare, g	1125.3
Mass of Tare, g	303.4
Moisture, %	41.3

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	646
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	93
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>93</b>

Failure Code 3

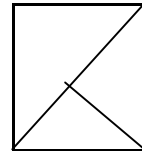
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Date **09/29/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38741/2-41	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/01/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.660
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.45
Mass of Sample, g	1188.8
Wet Density, pcf	114.8
Dry Density, pcf	81.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1485.7
Mass of Dry Sample and Tare, g	1136.3
Mass of Tare, g	298.5
Moisture, %	41.7

**TEST DATA**

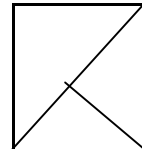
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2280
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	327
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>327</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By: EB/KP  
Date: 09/11/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38741/2-41	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/01/21

Lab. PR. #	21136-02-2		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.029 in	7.69 cm	Speed	9	Average Height of Sample	3.030 in	7.70 cm				
Diameter	2.968 in	7.54 cm	Board Number	5	Average Diameter of Sample	2.969 in	7.54 cm				
Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Cell Number	13	Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>				
Volume	343.41 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	4B	Volume	343.76 cm <sup>3</sup>	0.0121 ft <sup>3</sup>				
Mass	625.0 g	1.38 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	628.0 g	1.38 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	80.3 pcf					
Dry Density	80.4 pcf		Cell Pressure	95.0 psi	Vol. of Voids	179.83 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	163.93 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	1.10					
			Max Head	15.47 cm	Saturation	103.1 %					
			Min Head	14.07 cm							
			Maximum Gradient	2.01							
			Minimum Gradient	1.83							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/11/21	7	10	-	0.20	14.07	1.83	23.6	-	-	-
09/11/21	7	20	600	0.21	14.77	1.92	23.6	5.35E-06	0.918	4.92E-06
09/11/21	7	30	600	0.21	14.77	1.92	23.6	5.23E-06	0.918	4.80E-06
09/11/21	7	40	600	0.22	15.47	2.01	23.6	5.10E-06	0.918	4.69E-06
09/11/21	7	50	600	0.21	14.77	1.92	23.6	5.10E-06	0.918	4.69E-06
09/11/21	8	0	600	0.22	15.47	2.01	23.6	5.10E-06	0.918	4.69E-06
09/11/21	8	10	600	0.21	14.77	1.92	23.6	5.10E-06	0.918	4.69E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				4.7E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	1046			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 09/29/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38741/2-41	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/01/21

Lab. PR. #	21136-02-2		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)					
Height	2.921 in	7.42 cm	Speed	11	Average Height of Sample	2.922 in	7.42 cm	Diameter	2.969 in	7.54 cm	Average Diameter of Sample	2.970 in	7.54 cm
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Board Number	8	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Volume	331.39 cm <sup>3</sup>	0.0117 ft <sup>3</sup>	Volume	331.73 cm <sup>3</sup>	0.0117 ft <sup>3</sup>
Volume	331.39 cm <sup>3</sup>	0.0117 ft <sup>3</sup>	Cell Number	5	Mass	612.6 g	1.35 lb	Mass	613.0 g	1.35 lb	Dry Density	81.5 pcf	
Mass	612.6 g	1.35 lb	Flow Pump Number	4A	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec		Vol. of Voids	171.21 cm <sup>3</sup>		Vol. of Solids	160.52 cm <sup>3</sup>	
Specific Gravity	2.700 (Assumed)		Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	B - Value	0.95		Void Ratio	1.07		Saturation	104.9 %	
Dry Density	81.6 pcf		Cell Pressure	95.0 psi	Back Pressure	90.0 psi		Moisture Content					
<b>Moisture Content</b>				<b>Moisture Content</b>				<b>Moisture Content</b>					
Mass of wet sample & tare	612.6 g		Back Pressure	90.0 psi	Confining (Effective) Pressure	5.0 psi		Mass of wet sample & tare	695.6 g				
Mass of dry sample & tare	433.4 g		Max Head	113.95 cm	Max Head	113.95 cm		Mass of dry sample & tare	516.0 g				
Mass of tare	0.0 g		Min Head	112.54 cm	Min Head	112.54 cm		Mass of tare	82.6 g				
% Moisture	41.3		Maximum Gradient	15.35	Maximum Gradient	15.35		% Moisture	41.4				
			Minimum Gradient	15.16	Minimum Gradient	15.16							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/29/21	7	5	-	1.62	113.95	15.35	25.2	-	-	-
09/29/21	7	15	600	1.61	113.25	15.26	25.2	1.64E-07	0.885	1.45E-07
09/29/21	7	25	600	1.62	113.95	15.35	25.2	1.64E-07	0.885	1.45E-07
09/29/21	7	35	600	1.61	113.25	15.26	25.2	1.64E-07	0.885	1.45E-07
09/29/21	7	45	600	1.62	113.95	15.35	25.2	1.64E-07	0.885	1.45E-07
09/29/21	7	55	600	1.61	113.25	15.26	25.2	1.64E-07	0.885	1.45E-07
09/29/21	8	5	600	1.60	112.54	15.16	25.2	1.65E-07	0.885	1.46E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.5E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 09/09/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38742/2-36	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	7		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.645
Initial Diameter, in	2.965
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.90
Volume, in <sup>3</sup>	38.98
Mass of Sample, g	1179.2
Wet Density, pcf	115.3
Dry Density, pcf	87.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1481.5
Mass of Dry Sample and Tare, g	1202.3
Mass of Tare, g	304.0
Moisture, %	31.1

**TEST DATA**

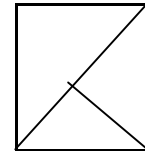
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	729
Specimen Cross-sectional Area, in <sup>2</sup>	6.90
Compressive Strength at Failure, psi	106
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>106</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/12/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38742/2-36	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.678
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.58
Mass of Sample, g	1186.9
Wet Density, pcf	114.3
Dry Density, pcf	86.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1489.2
Mass of Dry Sample and Tare, g	1205.0
Mass of Tare, g	305.7
Moisture, %	31.6

**TEST DATA**

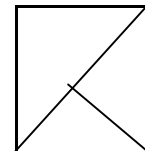
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1302
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	187
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>187</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **09/30/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38742/2-36	Subsample	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.675
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.47
Mass of Sample, g	1178.4
Wet Density, pcf	113.7
Dry Density, pcf	86.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1481.1
Mass of Dry Sample and Tare, g	1200.0
Mass of Tare, g	305.3
Moisture, %	31.4

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2603
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	374
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>374</b>

Failure Code 3

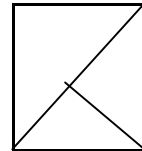
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By: EB/KP  
Date: 09/12/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38742/2-36	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/02/21

Lab. PR. #	21136-02-2		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.992 in	7.60 cm	Speed	9	Average Height of Sample	2.993 in	7.60 cm	Dry Density	87.6 pcf		
Diameter	2.961 in	7.52 cm	Board Number	6	Average Diameter of Sample	2.962 in	7.52 cm	Vol. of Voids	162.30 cm <sup>3</sup>		
Area	6.89 in <sup>2</sup>	44.43 cm <sup>2</sup>	Cell Number	37	Area	6.89 in <sup>2</sup>	44.46 cm <sup>2</sup>	Vol. of Solids	175.67 cm <sup>3</sup>		
Volume	337.62 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Flow Pump Number	4A	Volume	337.96 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Void Ratio	0.92		
Mass	621.6 g	1.37 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	630.3 g	1.39 lb	Saturation	96.1 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	87.7 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	711.1 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	555.1 g				
Mass of wet sample & tare	621.6 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	80.8 g					
Mass of dry sample & tare	474.3 g		Max Head	42.91 cm	% Moisture	32.9					
Mass of tare	0.0 g		Min Head	42.20 cm							
% Moisture	31.1		Maximum Gradient	5.64							
			Minimum Gradient	5.55							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/12/21	8	5	-	0.60	42.20	5.55	24.1	-	-	-
09/12/21	8	15	600	0.61	42.91	5.64	24.1	1.80E-06	0.908	1.63E-06
09/12/21	8	25	600	0.60	42.20	5.55	24.1	1.80E-06	0.908	1.63E-06
09/12/21	8	35	600	0.61	42.91	5.64	24.1	1.80E-06	0.908	1.63E-06
09/12/21	8	45	600	0.60	42.20	5.55	24.1	1.80E-06	0.908	1.63E-06
09/12/21	8	55	600	0.61	42.91	5.64	24.1	1.80E-06	0.908	1.63E-06
09/12/21	9	5	600	0.60	42.20	5.55	24.1	1.80E-06	0.908	1.63E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.6E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	1047			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 09/30/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-2		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	38742/2-36	Subsample ID	5	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.922 in	7.42 cm	Speed	10	Average Height of Sample	2.923 in	7.42 cm	Dry Density	87.7 pcf		
Diameter	2.976 in	7.56 cm	Board Number	11	Average Diameter of Sample	2.937 in	7.46 cm	Vol. of Voids	155.67 cm <sup>3</sup>		
Area	6.96 in <sup>2</sup>	44.88 cm <sup>2</sup>	Cell Number	13	Area	6.77 in <sup>2</sup>	43.71 cm <sup>2</sup>	Vol. of Solids	168.84 cm <sup>3</sup>		
Volume	333.07 cm <sup>3</sup>	0.0118 ft <sup>3</sup>	Flow Pump Number	1B	Volume	324.51 cm <sup>3</sup>	0.0115 ft <sup>3</sup>	Void Ratio	0.92		
Mass	599.4 g	1.32 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	615.4 g	1.36 lb	Saturation	102.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95							
Dry Density	85.4 pcf		Cell Pressure	95.0 psi							
			Back Pressure	90.0 psi							
			Confining (Effective) Pressure	5.0 psi							
			Max Head	66.82 cm							
			Min Head	66.12 cm							
			Maximum Gradient	9.00							
			Minimum Gradient	8.91							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/30/21	7	20	-	0.95	66.82	9.00	24.1	-	-	-
09/30/21	7	30	600	0.94	66.12	8.91	24.1	5.72E-07	0.908	5.20E-07
09/30/21	7	40	600	0.95	66.82	9.00	24.1	5.72E-07	0.908	5.20E-07
09/30/21	7	50	600	0.94	66.12	8.91	24.1	5.72E-07	0.908	5.20E-07
09/30/21	8	0	600	0.95	66.82	9.00	24.1	5.72E-07	0.908	5.20E-07
09/30/21	8	10	600	0.94	66.12	8.91	24.1	5.72E-07	0.908	5.20E-07
09/30/21	8	20	600	0.95	66.82	9.00	24.1	5.72E-07	0.908	5.20E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	942
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	776
Syringe ID #	141			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/12/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38765/2-4	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.560
Initial Diameter, in	2.967
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.91
Volume, in <sup>3</sup>	38.44
Mass of Sample, g	1182.7
Wet Density, pcf	117.2
Dry Density, pcf	89.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1483.0
Mass of Dry Sample and Tare, g	1205.3
Mass of Tare, g	305.1
Moisture, %	30.8

**TEST DATA**

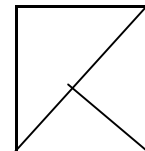
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	121
Specimen Cross-sectional Area, in <sup>2</sup>	6.91
Compressive Strength at Failure, psi	18
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>18</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Date **09/30/21**

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Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38765/2-4	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/02/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.698
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.71
Mass of Sample, g	1205.0
Wet Density, pcf	115.6
Dry Density, pcf	88.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1502.3
Mass of Dry Sample and Tare, g	1221.0
Mass of Tare, g	299.6
Moisture, %	30.5

**TEST DATA**

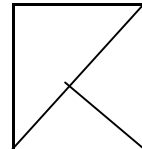
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	616
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	88
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>88</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/12/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38765/2-4	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/02/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.992 in	7.60 cm	Speed	10	Average Height of Sample	2.993 in	7.60 cm				
Diameter	2.925 in	7.43 cm	Board Number	3	Average Diameter of Sample	2.926 in	7.43 cm				
Area	6.72 in <sup>2</sup>	43.35 cm <sup>2</sup>	Cell Number	55	Area	6.72 in <sup>2</sup>	43.38 cm <sup>2</sup>				
Volume	329.46 cm <sup>3</sup>	0.0116 ft <sup>3</sup>	Flow Pump Number	1B	Volume	329.80 cm <sup>3</sup>	0.0116 ft <sup>3</sup>				
Mass	632.4 g	1.39 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	629.6 g	1.39 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	91.5 pcf					
Dry Density	91.6 pcf		Cell Pressure	95.0 psi	Vol. of Voids	150.68 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	179.12 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.84					
			Max Head	45.72 cm	Saturation	96.9 %					
			Min Head	45.02 cm							
			Maximum Gradient	6.01							
			Minimum Gradient	5.92							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/12/21	7	20	-	0.65	45.72	6.01	23.8	-	-	-
09/12/21	7	30	600	0.64	45.02	5.92	23.8	8.65E-07	0.914	7.91E-07
09/12/21	7	40	600	0.65	45.72	6.01	23.8	8.65E-07	0.914	7.91E-07
09/12/21	7	50	600	0.64	45.02	5.92	23.8	8.65E-07	0.914	7.91E-07
09/12/21	8	0	600	0.65	45.72	6.01	23.8	8.65E-07	0.914	7.91E-07
09/12/21	8	10	600	0.64	45.02	5.92	23.8	8.65E-07	0.914	7.91E-07
09/12/21	8	20	600	0.65	45.72	6.01	23.8	8.65E-07	0.914	7.91E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				7.9E-07	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	942
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	141			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **09/13/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38766/2-46	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/03/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.610
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.10
Mass of Sample, g	1187.0
Wet Density, pcf	115.6
Dry Density, pcf	88.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1490.2
Mass of Dry Sample and Tare, g	1207.0
Mass of Tare, g	305.9
Moisture, %	31.4

**TEST DATA**

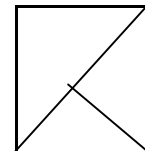
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	487
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	70
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>70</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/01/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38766/2-46	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/03/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.588
Initial Diameter, in	2.971
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	38.74
Mass of Sample, g	1180.6
Wet Density, pcf	116.1
Dry Density, pcf	88.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1484.0
Mass of Dry Sample and Tare, g	1203.3
Mass of Tare, g	305.8
Moisture, %	31.3

**TEST DATA**

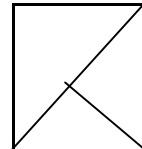
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1501
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	217
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>217</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/13/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38766/2-46	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/03/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.038 in	7.72 cm	Speed	10	Average Height of Sample	3.039 in	7.72 cm	Dry Density	87.1 pcf		
Diameter	2.975 in	7.56 cm	Board Number	4	Average Diameter of Sample	2.976 in	7.56 cm	Vol. of Voids	167.29 cm <sup>3</sup>		
Area	6.95 in <sup>2</sup>	44.85 cm <sup>2</sup>	Cell Number	33	Area	6.96 in <sup>2</sup>	44.88 cm <sup>2</sup>	Vol. of Solids	179.12 cm <sup>3</sup>		
Volume	346.06 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	2B	Volume	346.41 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.93		
Mass	634.7 g	1.40 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	645.0 g	1.42 lb	Saturation	96.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	87.2 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	729.7 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	568.3 g				
Mass of wet sample & tare	634.7 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	84.6 g					
Mass of dry sample & tare	483.7 g		Max Head	28.84 cm	% Moisture	33.4					
Mass of tare	0.0 g		Min Head	27.43 cm							
% Moisture	31.2		Maximum Gradient	3.74							
			Minimum Gradient	3.55							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/13/21	7	40	-	0.40	28.14	3.65	23.3	-	-	-
09/13/21	7	50	600	0.39	27.43	3.55	23.3	1.39E-06	0.925	1.28E-06
09/13/21	8	0	600	0.40	28.14	3.65	23.3	1.39E-06	0.925	1.28E-06
09/13/21	8	10	600	0.39	27.43	3.55	23.3	1.39E-06	0.925	1.28E-06
09/13/21	8	20	600	0.41	28.84	3.74	23.3	1.37E-06	0.925	1.27E-06
09/13/21	8	30	600	0.40	28.14	3.65	23.3	1.35E-06	0.925	1.25E-06
09/13/21	8	40	600	0.41	28.84	3.74	23.3	1.35E-06	0.925	1.25E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.3E-06 cm/sec	
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	246			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/01/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38766/2-46	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/03/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.958 in	7.51 cm		Speed	11			Average Height of Sample	2.959 in	7.52 cm	
Diameter	2.966 in	7.53 cm		Board Number	14			Average Diameter of Sample	2.967 in	7.54 cm	
Area	6.91 in <sup>2</sup>	44.58 cm <sup>2</sup>		Cell Number	2			Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>	
Volume	334.91 cm <sup>3</sup>	0.0118 ft <sup>3</sup>		Flow Pump Number	3A			Volume	335.25 cm <sup>3</sup>	0.0118 ft <sup>3</sup>	
Mass	624.5 g	1.38 lb		Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec			Mass	631.4 g	1.39 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	88.4 pcf		
Dry Density	88.4 pcf			Cell Pressure	95.0 psi			Vol. of Voids	159.35 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	175.90 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.91		
				Max Head	81.59 cm			Saturation	98.2 %		
				Min Head	80.89 cm						
				Maximum Gradient	10.86						
				Minimum Gradient	10.76						
<b>Moisture Content</b>				<b>Moisture Content</b>				<b>Moisture Content</b>			
Mass of wet sample & tare	624.5 g			Mass of wet sample & tare	702.7 g			Mass of wet sample & tare	702.7 g		
Mass of dry sample & tare	474.7 g			Mass of dry sample & tare	546.3 g			Mass of dry sample & tare	546.3 g		
Mass of tare	0.0 g			Mass of tare	71.6 g			Mass of tare	71.6 g		
% Moisture	31.6			% Moisture	32.9			% Moisture	32.9		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/01/21	10	50	-	1.15	80.89	10.76	24.2	-	-	-
10/01/21	11	0	600	1.16	81.59	10.86	24.2	2.32E-07	0.906	2.10E-07
10/01/21	11	10	600	1.15	80.89	10.76	24.2	2.32E-07	0.906	2.10E-07
10/01/21	11	20	600	1.16	81.59	10.86	24.2	2.32E-07	0.906	2.10E-07
10/01/21	11	30	600	1.15	80.89	10.76	24.2	2.32E-07	0.906	2.10E-07
10/01/21	11	40	600	1.16	81.59	10.86	24.2	2.32E-07	0.906	2.10E-07
10/01/21	11	50	600	1.15	80.89	10.76	24.2	2.32E-07	0.906	2.10E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.1E-07 cm/sec	
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	491			Pore Pressure Meter ID #	372

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/17/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38789/2-47	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/07/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.657
Initial Diameter, in	2.967
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.91
Volume, in <sup>3</sup>	39.11
Mass of Sample, g	1194.4
Wet Density, pcf	116.3
Dry Density, pcf	88.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1497.0
Mass of Dry Sample and Tare, g	1216.5
Mass of Tare, g	304.9
Moisture, %	30.8

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	485
Specimen Cross-sectional Area, in <sup>2</sup>	6.91
Compressive Strength at Failure, psi	70
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>70</b>

Failure Code 3

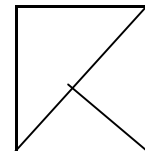
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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Date **10/05/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38789/2-47	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/07/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.651
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	39.12
Mass of Sample, g	1190.4
Wet Density, pcf	115.9
Dry Density, pcf	88.8
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1548.5
Mass of Dry Sample and Tare, g	1271.3
Mass of Tare, g	359.9
Moisture, %	30.4

**TEST DATA**

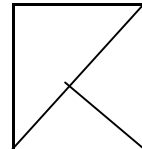
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1180
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	170
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>170</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 09/17/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38789/2-47	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/07/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.019 in	7.67 cm	Speed	9	Average Height of Sample	3.020 in	7.67 cm	Dry Density	87.8 pcf		
Diameter	2.972 in	7.55 cm	Board Number	16	Average Diameter of Sample	2.973 in	7.55 cm	Vol. of Voids	164.60 cm <sup>3</sup>		
Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>	Cell Number	55	Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	Vol. of Solids	178.94 cm <sup>3</sup>		
Volume	343.20 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2A	Volume	343.55 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.92		
Mass	631.1 g	1.39 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	639.5 g	1.41 lb	Saturation	95.0 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	87.8 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	720.3 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	564.0 g				
Mass of wet sample & tare	631.1 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.0 g					
Mass of dry sample & tare	483.0 g		Max Head	28.84 cm	% Moisture	32.4					
Mass of tare	0.0 g		Min Head	28.14 cm							
% Moisture	30.7		Maximum Gradient	3.76							
			Minimum Gradient	3.67							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/17/21	8	5	-	0.41	28.84	3.76	25.1	-	-	-
09/17/21	8	15	600	0.40	28.14	3.67	25.1	2.69E-06	0.887	2.39E-06
09/17/21	8	25	600	0.41	28.84	3.76	25.1	2.69E-06	0.887	2.39E-06
09/17/21	8	35	600	0.40	28.14	3.67	25.1	2.69E-06	0.887	2.39E-06
09/17/21	8	45	600	0.41	28.84	3.76	25.1	2.69E-06	0.887	2.39E-06
09/17/21	8	55	600	0.40	28.14	3.67	25.1	2.69E-06	0.887	2.39E-06
09/17/21	9	5	600	0.41	28.84	3.76	25.1	2.69E-06	0.887	2.39E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.4E-06	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	245			Pore Pressure Meter ID #	1104

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **09/18/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38790/2-24	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/08/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.629
Initial Diameter, in	2.971
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	39.02
Mass of Sample, g	1195.1
Wet Density, pcf	116.7
Dry Density, pcf	89.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1495.9
Mass of Dry Sample and Tare, g	1218.2
Mass of Tare, g	305.8
Moisture, %	30.4

**TEST DATA**

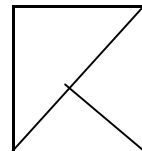
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	639
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	92
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>92</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/06/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38790/2-24	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/08/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.653
Initial Diameter, in	2.981
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.98
Volume, in <sup>3</sup>	39.45
Mass of Sample, g	1207.4
Wet Density, pcf	116.6
Dry Density, pcf	89.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1511.9
Mass of Dry Sample and Tare, g	1230.4
Mass of Tare, g	305.8
Moisture, %	30.4

**TEST DATA**

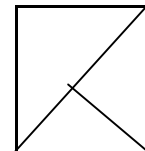
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2744
Specimen Cross-sectional Area, in <sup>2</sup>	6.98
Compressive Strength at Failure, psi	393
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>393</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/18/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38790/2-24	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/08/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	9	Average Height of Sample	3.014 in	7.66 cm				
Diameter	2.962 in	7.52 cm	Board Number	15	Average Diameter of Sample	2.963 in	7.53 cm				
Area	6.89 in <sup>2</sup>	44.46 cm <sup>2</sup>	Cell Number	17	Area	6.90 in <sup>2</sup>	44.49 cm <sup>2</sup>				
Volume	340.22 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	2B	Volume	340.56 cm <sup>3</sup>	0.0120 ft <sup>3</sup>				
Mass	631.3 g	1.39 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	641.6 g	1.41 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density	88.8 pcf					
Dry Density	88.8 pcf		Cell Pressure	95.0 psi	Vol. of Voids	161.13 cm <sup>3</sup>					
			Back Pressure	90.0 psi	Vol. of Solids	179.44 cm <sup>3</sup>					
			Confining (Effective) Pressure	5.0 psi	Void Ratio	0.90					
			Max Head	46.42 cm	Saturation	97.5 %					
			Min Head	45.72 cm							
			Maximum Gradient	6.06							
			Minimum Gradient	5.97							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/18/21	8	10	-	0.65	45.72	5.97	25.3	-	-	-
09/18/21	8	20	600	0.66	46.42	6.06	25.3	1.67E-06	0.883	1.48E-06
09/18/21	8	30	600	0.65	45.72	5.97	25.3	1.67E-06	0.883	1.48E-06
09/18/21	8	40	600	0.66	46.42	6.06	25.3	1.67E-06	0.883	1.48E-06
09/18/21	8	50	600	0.65	45.72	5.97	25.3	1.67E-06	0.883	1.48E-06
09/18/21	9	0	600	0.66	46.42	6.06	25.3	1.67E-06	0.883	1.48E-06
09/18/21	9	10	600	0.65	45.72	5.97	25.3	1.67E-06	0.883	1.48E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.5E-06	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	246			Pore Pressure Meter ID #	372

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/06/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38790/2-24	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/08/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	11	Average Height of Sample	3.014 in	7.66 cm	Dry Density	88.5 pcf		
Diameter	2.969 in	7.54 cm	Board Number	7	Average Diameter of Sample	2.970 in	7.54 cm	Vol. of Voids	162.43 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	33	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Vol. of Solids	179.74 cm <sup>3</sup>		
Volume	341.83 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2A	Volume	342.17 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.90		
Mass	631.9 g	1.39 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	643.9 g	1.42 lb	Saturation	97.6 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	88.6 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	725.8 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	567.2 g				
Mass of wet sample & tare	631.9 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.9 g					
Mass of dry sample & tare	485.3 g		Max Head	185.70 cm	% Moisture	32.7					
Mass of tare	0.0 g		Min Head	184.99 cm							
% Moisture	30.2		Maximum Gradient	24.26							
			Minimum Gradient	24.16							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/06/21	8	5	-	2.64	185.70	24.26	23.1	-	-	-
10/06/21	8	15	600	2.63	184.99	24.16	23.1	1.04E-07	0.929	9.62E-08
10/06/21	8	25	600	2.64	185.70	24.26	23.1	1.04E-07	0.929	9.62E-08
10/06/21	8	35	600	2.63	184.99	24.16	23.1	1.04E-07	0.929	9.62E-08
10/06/21	8	45	600	2.64	185.70	24.26	23.1	1.04E-07	0.929	9.62E-08
10/06/21	8	55	600	2.63	184.99	24.16	23.1	1.04E-07	0.929	9.62E-08
10/06/21	9	5	600	2.64	185.70	24.26	23.1	1.04E-07	0.929	9.62E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				9.6E-08	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	245			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 09/19/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38854/2-32	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/09/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.567
Initial Diameter, in	2.962
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.89
Volume, in <sup>3</sup>	38.36
Mass of Sample, g	1151.0
Wet Density, pcf	114.3
Dry Density, pcf	84.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1507.2
Mass of Dry Sample and Tare, g	1209.3
Mass of Tare, g	358.6
Moisture, %	35.0

**TEST DATA**

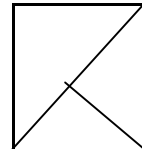
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	560
Specimen Cross-sectional Area, in <sup>2</sup>	6.89
Compressive Strength at Failure, psi	81
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>81</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/07/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38854/2-32	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/09/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.635
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.17
Mass of Sample, g	1160.3
Wet Density, pcf	112.8
Dry Density, pcf	83.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1457.3
Mass of Dry Sample and Tare, g	1155.9
Mass of Tare, g	298.6
Moisture, %	35.2

**TEST DATA**

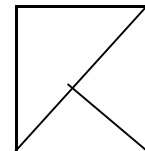
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2866
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	412
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>412</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/19/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38854/2-32	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/09/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.992 in	7.60 cm	Speed	9	Average Height of Sample	2.993 in	7.60 cm	Dry Density	83.0 pcf		
Diameter	2.971 in	7.55 cm	Board Number	3	Average Diameter of Sample	2.972 in	7.55 cm	Vol. of Voids	172.58 cm <sup>3</sup>		
Area	6.93 in <sup>2</sup>	44.73 cm <sup>2</sup>	Cell Number	2	Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>	Vol. of Solids	167.67 cm <sup>3</sup>		
Volume	339.91 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	2A	Volume	340.25 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Void Ratio	1.03		
Mass	612.2 g	1.35 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	617.7 g	1.36 lb	Saturation	95.6 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	83.1 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	699.5 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	534.5 g				
Mass of wet sample & tare	612.2 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.8 g					
Mass of dry sample & tare	452.7 g		Max Head	41.50 cm	% Moisture	36.4					
Mass of tare	0.0 g		Min Head	40.09 cm							
% Moisture	35.2		Maximum Gradient	5.46							
			Minimum Gradient	5.27							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/19/21	8	5	-	0.58	40.80	5.37	25.1	-	-	-
09/19/21	8	15	600	0.57	40.09	5.27	25.1	1.88E-06	0.887	1.67E-06
09/19/21	8	25	600	0.59	41.50	5.46	25.1	1.87E-06	0.887	1.65E-06
09/19/21	8	35	600	0.58	40.80	5.37	25.1	1.85E-06	0.887	1.64E-06
09/19/21	8	45	600	0.59	41.50	5.46	25.1	1.85E-06	0.887	1.64E-06
09/19/21	8	55	600	0.58	40.80	5.37	25.1	1.85E-06	0.887	1.64E-06
09/19/21	9	5	600	0.59	41.50	5.46	25.1	1.85E-06	0.887	1.64E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.6E-06	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	245			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By KP/IH

Date 09/20/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38855/2-32(2)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/10/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.541
Initial Diameter, in	2.960
Height-to-Diameter Ratio	1.87
Area, in <sup>2</sup>	6.88
Volume, in <sup>3</sup>	38.13
Mass of Sample, g	1197.3
Wet Density, pcf	119.6
Dry Density, pcf	93.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1456.1
Mass of Dry Sample and Tare, g	1190.3
Mass of Tare, g	261.7
Moisture, %	28.6

**TEST DATA**

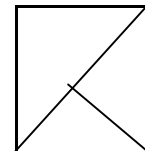
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	224
Specimen Cross-sectional Area, in <sup>2</sup>	6.88
Compressive Strength at Failure, psi	33
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>33</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/08/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38855/2-32(2)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/10/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.641
Initial Diameter, in	2.970
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.93
Volume, in <sup>3</sup>	39.08
Mass of Sample, g	1206.5
Wet Density, pcf	117.6
Dry Density, pcf	91.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1511.9
Mass of Dry Sample and Tare, g	1242.6
Mass of Tare, g	306.9
Moisture, %	28.8

**TEST DATA**

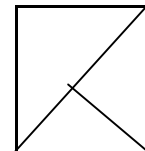
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1124
Specimen Cross-sectional Area, in <sup>2</sup>	6.93
Compressive Strength at Failure, psi	162
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>162</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**







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Tested By **KP/IH**

Date **09/21/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38873/2-25	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/11/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.697
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.71
Mass of Sample, g	1222.0
Wet Density, pcf	117.2
Dry Density, pcf	90.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1519.7
Mass of Dry Sample and Tare, g	1240.3
Mass of Tare, g	299.0
Moisture, %	29.7

**TEST DATA**

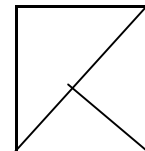
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	740
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	106
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>106</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/09/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38873/2-25	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/11/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.636
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.18
Mass of Sample, g	1206.6
Wet Density, pcf	117.3
Dry Density, pcf	90.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1506.4
Mass of Dry Sample and Tare, g	1231.5
Mass of Tare, g	304.0
Moisture, %	29.6

**TEST DATA**

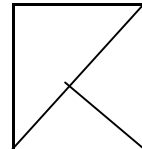
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2580
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	371
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>371</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**







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Tested By **KP/IH**

Date **09/23/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38874/2-16	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/13/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.660
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.45
Mass of Sample, g	1246.7
Wet Density, pcf	120.4
Dry Density, pcf	94.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1541.2
Mass of Dry Sample and Tare, g	1276.6
Mass of Tare, g	297.0
Moisture, %	27.0

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	895
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	128
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>128</b>

Failure Code 3

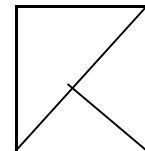
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **10/11/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38874/2-16	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/13/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.661
Initial Diameter, in	2.974
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.32
Mass of Sample, g	1239.5
Wet Density, pcf	120.1
Dry Density, pcf	94.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1534.1
Mass of Dry Sample and Tare, g	1270.5
Mass of Tare, g	297.2
Moisture, %	27.1

**TEST DATA**

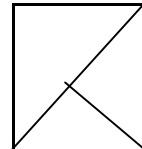
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2589
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	373
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>373</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 09/23/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38874/2-16	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/13/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.008	in	7.64	cm	Speed	9			Average Height of Sample	3.009	in	7.64	cm	
Diameter	2.968	in	7.54	cm	Board Number	18			Average Diameter of Sample	2.969	in	7.54	cm	
Area	6.92	in <sup>2</sup>	44.64	cm <sup>2</sup>	Cell Number	5			Area	6.92	in <sup>2</sup>	44.67	cm <sup>2</sup>	
Volume	341.03	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	4B			Volume	341.38	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	652.1	g	1.44	lb	Flow Pump Rate*	4.48E-04			cm <sup>3</sup> /sec	Mass	659.2	g	1.45	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95			Dry Density	93.7	pcf			
Dry Density	93.8	pcf			Cell Pressure	95.0			psi	Vol. of Voids	151.42	cm <sup>3</sup>		
					Back Pressure	90.0			psi	Vol. of Solids	189.95	cm <sup>3</sup>		
					Confining (Effective) Pressure	5.0			psi	Void Ratio	0.80			
					Max Head	21.10			cm	Saturation	96.6	%		
					Min Head	20.40			cm					
					Maximum Gradient	2.76								
					Minimum Gradient	2.67								

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/23/21	8	5	-	0.29	20.40	2.67	25.4	-	-	-
09/23/21	8	15	600	0.30	21.10	2.76	25.4	3.69E-06	0.881	3.26E-06
09/23/21	8	25	600	0.29	20.40	2.67	25.4	3.69E-06	0.881	3.26E-06
09/23/21	8	35	600	0.30	21.10	2.76	25.4	3.69E-06	0.881	3.26E-06
09/23/21	8	45	600	0.29	20.40	2.67	25.4	3.69E-06	0.881	3.26E-06
09/23/21	8	55	600	0.30	21.10	2.76	25.4	3.69E-06	0.881	3.26E-06
09/23/21	9	5	600	0.29	20.40	2.67	25.4	3.69E-06	0.881	3.26E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.3E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	1046			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/11/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38874/2-16	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/13/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.037 in	7.71 cm	Speed	12	Average Height of Sample	3.038 in	7.72 cm	Dry Density	93.6 pcf		
Diameter	2.973 in	7.55 cm	Board Number	8	Average Diameter of Sample	2.974 in	7.55 cm	Vol. of Voids	153.75 cm <sup>3</sup>		
Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	Cell Number	55	Area	6.95 in <sup>2</sup>	44.82 cm <sup>2</sup>	Vol. of Solids	192.07 cm <sup>3</sup>		
Volume	345.48 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	2B	Volume	345.83 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.80		
Mass	659.2 g	1.45 lb	Flow Pump Rate*	5.60E-05 cm <sup>3</sup> /sec	Mass	671.4 g	1.48 lb	Saturation	99.4 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	93.7 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	752.8 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	600.0 g				
Mass of wet sample & tare	659.2 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.4 g					
Mass of dry sample & tare	518.6 g		Max Head	186.40 cm	% Moisture	29.5					
Mass of tare	0.0 g		Min Head	185.70 cm							
% Moisture	27.1		Maximum Gradient	24.16							
			Minimum Gradient	24.06							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/11/21	6	30	-	2.64	185.70	24.06	22.1	-	-	-
10/11/21	6	40	600	2.65	186.40	24.16	22.1	5.18E-08	0.951	4.93E-08
10/11/21	6	50	600	2.64	185.70	24.06	22.1	5.18E-08	0.951	4.93E-08
10/11/21	7	0	600	2.65	186.40	24.16	22.1	5.18E-08	0.951	4.93E-08
10/11/21	7	10	600	2.65	186.40	24.16	22.1	5.17E-08	0.951	4.92E-08
10/11/21	7	20	600	2.64	185.70	24.06	22.1	5.18E-08	0.951	4.93E-08
10/11/21	7	30	600	2.65	186.40	24.16	22.1	5.18E-08	0.951	4.93E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				4.9E-08	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	246			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/24/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38893/2-2	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/14/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.633
Initial Diameter, in	2.960
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.88
Volume, in <sup>3</sup>	38.76
Mass of Sample, g	1211.7
Wet Density, pcf	119.1
Dry Density, pcf	91.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1506.5
Mass of Dry Sample and Tare, g	1222.4
Mass of Tare, g	299.0
Moisture, %	30.8

**TEST DATA**

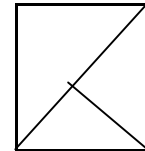
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	333
Specimen Cross-sectional Area, in <sup>2</sup>	6.88
Compressive Strength at Failure, psi	48
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>48</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By KP/IH

Date 10/12/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38893/2-2	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/14/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.675
Initial Diameter, in	2.973
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	39.40
Mass of Sample, g	1223.8
Wet Density, pcf	118.3
Dry Density, pcf	90.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1482.3
Mass of Dry Sample and Tare, g	1197.5
Mass of Tare, g	261.8
Moisture, %	30.4

**TEST DATA**

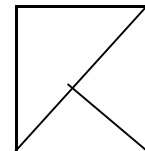
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2131
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	307
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>307</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 09/24/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38893/2-2	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/14/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.027	in	7.69	cm	Speed	9			Average Height of Sample	3.028	in	7.69	cm	
Diameter	2.964	in	7.53	cm	Board Number	7			Average Diameter of Sample	2.965	in	7.53	cm	
Area	6.90	in <sup>2</sup>	44.52	cm <sup>2</sup>	Cell Number	15			Area	6.90	in <sup>2</sup>	44.55	cm <sup>2</sup>	
Volume	342.26	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	Flow Pump Number	4B			Volume	342.61	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	644.9	g	1.42	lb	Flow Pump Rate*	4.48E-04			cm <sup>3</sup> /sec	Mass	648.9	g	1.43	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			psi	Dry Density	90.0			pcf	
Dry Density	90.1			pcf	Cell Pressure	95.0			psi	Vol. of Voids	159.57			cm <sup>3</sup>
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	183.04			cm <sup>3</sup>	
Mass of wet sample & tare	644.9			g	Confining (Effective) Pressure	5.0			psi	Void Ratio	0.87			
Mass of dry sample & tare	494.2			g	Max Head	20.40			cm	Saturation	96.9			%
Mass of tare	0.0			g	Min Head	18.99			cm	Mass of wet sample & tare	730.6			g
% Moisture	30.5				Maximum Gradient	2.65				Mass of dry sample & tare	575.9			g
					Minimum Gradient	2.47				Mass of tare	81.7			g
										% Moisture	31.3			

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/24/21	7	5	-	0.28	19.70	2.56	24.5	-	-	-
09/24/21	7	15	600	0.27	18.99	2.47	24.5	4.00E-06	0.899	3.60E-06
09/24/21	7	25	600	0.29	20.40	2.65	24.5	3.93E-06	0.899	3.53E-06
09/24/21	7	35	600	0.28	19.70	2.56	24.5	3.86E-06	0.899	3.47E-06
09/24/21	7	45	600	0.28	19.70	2.56	24.5	3.93E-06	0.899	3.53E-06
09/24/21	7	55	600	0.27	18.99	2.47	24.5	4.00E-06	0.899	3.60E-06
09/24/21	8	5	600	0.28	19.70	2.56	24.5	4.00E-06	0.899	3.60E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.5E-06		cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290	
Syringe ID #	1046			Pore Pressure Meter ID #	216	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/12/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38893/2-2	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/14/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.019 in	7.67 cm	Speed	11	Average Height of Sample	3.019 in	7.67 cm	Dry Density	90.0 pcf		
Diameter	2.969 in	7.54 cm	Board Number	18	Average Diameter of Sample	2.970 in	7.54 cm	Vol. of Voids	159.62 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	14	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Vol. of Solids	183.12 cm <sup>3</sup>		
Volume	342.51 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	4B	Volume	342.74 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.87		
Mass	643.9 g	1.42 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	650.2 g	1.43 lb	Saturation	97.6 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	90.1 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	732.7 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	576.9 g				
Mass of wet sample & tare	643.9 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	82.4 g					
Mass of dry sample & tare	494.5 g		Max Head	166.00 cm	% Moisture	31.5					
Mass of tare	0.0 g		Min Head	164.60 cm							
% Moisture	30.2		Maximum Gradient	21.65							
			Minimum Gradient	21.46							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/12/21	7	20	-	2.35	165.30	21.56	21.6	-	-	-
10/12/21	7	30	600	2.36	166.00	21.65	21.6	1.16E-07	0.962	1.12E-07
10/12/21	7	40	600	2.34	164.60	21.46	21.6	1.16E-07	0.962	1.12E-07
10/12/21	7	50	600	2.35	165.30	21.56	21.6	1.16E-07	0.962	1.12E-07
10/12/21	8	0	600	2.35	165.30	21.56	21.6	1.16E-07	0.962	1.12E-07
10/12/21	8	10	600	2.34	164.60	21.46	21.6	1.16E-07	0.962	1.12E-07
10/12/21	8	20	600	2.36	166.00	21.65	21.6	1.16E-07	0.962	1.12E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.1E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	1046			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 09/25/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38894/2-17	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/15/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.661
Initial Diameter, in	2.985
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	7.00
Volume, in <sup>3</sup>	39.62
Mass of Sample, g	1238.1
Wet Density, pcf	119.1
Dry Density, pcf	93.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1541.0
Mass of Dry Sample and Tare, g	1273.4
Mass of Tare, g	305.6
Moisture, %	27.7

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	528
Specimen Cross-sectional Area, in <sup>2</sup>	7.00
Compressive Strength at Failure, psi	75
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>75</b>

Failure Code 3

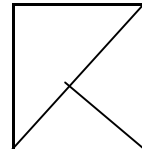
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By KP/IH

Date 10/13/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38894/2-17	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/15/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.641
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.32
Mass of Sample, g	1228.0
Wet Density, pcf	119.0
Dry Density, pcf	93.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1532.0
Mass of Dry Sample and Tare, g	1265.0
Mass of Tare, g	306.9
Moisture, %	27.9

**TEST DATA**

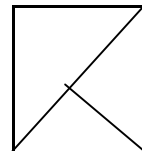
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2557
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	367
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>367</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 09/25/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38894/2-17	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/15/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	2.984	in	7.58	cm	Speed	9			Average Height of Sample	2.985	in	7.58	cm	
Diameter	2.973	in	7.55	cm	Board Number	5			Average Diameter of Sample	2.974	in	7.55	cm	
Area	6.94	in <sup>2</sup>	44.79	cm <sup>2</sup>	Cell Number	5			Area	6.95	in <sup>2</sup>	44.82	cm <sup>2</sup>	
Volume	339.45	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	3B			Volume	339.79	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	
Mass	644.0	g	1.42	lb	Flow Pump Rate*	4.48E-04			cm <sup>3</sup> /sec	Mass	655.5	g	1.45	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	92.8			pcf		
Dry Density	92.9			pcf	Cell Pressure	95.0			psi	Vol. of Voids	152.59			cm <sup>3</sup>
					Back Pressure	90.0			psi	Vol. of Solids	187.21			cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			psi	Void Ratio	0.82			
					Max Head	21.10			cm	Saturation	98.3			%
					Min Head	20.40			cm					
					Maximum Gradient	2.78								
					Minimum Gradient	2.69								

TIME FUNCTION			$\Delta t$ (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. $T_x$ (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ $T_x$	$R_T$	@ 20 °C
09/25/21	8	5	-	0.30	21.10	2.78	24.8	-	-	-
09/25/21	8	15	600	0.29	20.40	2.69	24.8	3.65E-06	0.893	3.26E-06
09/25/21	8	25	600	0.30	21.10	2.78	24.8	3.65E-06	0.893	3.26E-06
09/25/21	8	35	600	0.29	20.40	2.69	24.8	3.65E-06	0.893	3.26E-06
09/25/21	8	45	600	0.30	21.10	2.78	24.8	3.65E-06	0.893	3.26E-06
09/25/21	8	55	600	0.30	21.10	2.78	24.8	3.59E-06	0.893	3.21E-06
09/25/21	9	5	600	0.29	20.40	2.69	24.8	3.65E-06	0.893	3.26E-06

Note: Deaired Water Used for Permeability Test.	
DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA
REMARKS	
Bottom Half of the mold was used for testing.	

Reported Average Hydraulic Conductivity*			3.2E-06	cm/sec	
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	490			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/13/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38894/2-17	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/15/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.992 in	7.60 cm	Speed	11	Average Height of Sample	2.993 in	7.60 cm	Dry Density	93.5 pcf		
Diameter	2.968 in	7.54 cm	Board Number	18	Average Diameter of Sample	2.969 in	7.54 cm	Vol. of Voids	151.09 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Cell Number	17	Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Vol. of Solids	188.47 cm <sup>3</sup>		
Volume	339.22 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	1A	Volume	339.56 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Void Ratio	0.80		
Mass	646.6 g	1.43 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	654.2 g	1.44 lb	Saturation	96.2 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	93.5 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	730.8 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	585.6 g				
Mass of wet sample & tare	646.6 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	77.1 g					
Mass of dry sample & tare	508.5 g		Max Head	121.69 cm	% Moisture	28.6					
Mass of tare	0.0 g		Min Head	120.98 cm							
% Moisture	27.2		Maximum Gradient	16.01							
			Minimum Gradient	15.91							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/13/21	7	5	-	1.73	121.69	16.01	21.7	-	-	-
10/13/21	7	15	600	1.72	120.98	15.91	21.7	1.57E-07	0.960	1.51E-07
10/13/21	7	25	600	1.73	121.69	16.01	21.7	1.57E-07	0.960	1.51E-07
10/13/21	7	35	600	1.72	120.98	15.91	21.7	1.57E-07	0.960	1.51E-07
10/13/21	7	45	600	1.73	121.69	16.01	21.7	1.57E-07	0.960	1.51E-07
10/13/21	7	55	600	1.72	120.98	15.91	21.7	1.57E-07	0.960	1.51E-07
10/13/21	8	5	600	1.73	121.69	16.01	21.7	1.57E-07	0.960	1.51E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.5E-07	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	1107
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	140			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/26/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38895/2-5	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/16/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.694
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.58
Mass of Sample, g	1210.2
Wet Density, pcf	116.5
Dry Density, pcf	87.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1506.1
Mass of Dry Sample and Tare, g	1209.8
Mass of Tare, g	298.4
Moisture, %	32.5

**TEST DATA**

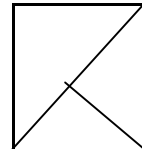
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	727
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	105
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>105</b>

Failure Code 3

Failure Sketch



Failure Type:

Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By KP/IH

Date 10/14/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38895/2-5	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/16/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.659
Initial Diameter, in	2.978
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.42
Mass of Sample, g	1198.6
Wet Density, pcf	115.8
Dry Density, pcf	87.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1501.8
Mass of Dry Sample and Tare, g	1207.5
Mass of Tare, g	305.2
Moisture, %	32.6

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3146
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	452
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>452</b>

Failure Code 3

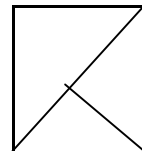
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 09/26/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38895/2-5	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/16/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.009 in	7.64 cm	Speed	9	Average Height of Sample	3.010 in	7.65 cm				
Diameter	2.962 in	7.52 cm	Board Number	8	Average Diameter of Sample	2.963 in	7.53 cm				
Area	6.89 in <sup>2</sup>	44.46 cm <sup>2</sup>	Cell Number	2	Area	6.90 in <sup>2</sup>	44.49 cm <sup>2</sup>				
Volume	339.77 cm <sup>3</sup>	0.0120 ft <sup>3</sup>	Flow Pump Number	4B	Volume	340.11 cm <sup>3</sup>	0.0120 ft <sup>3</sup>				
Mass	632.6 g	1.39 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	641.5 g	1.41 lb				
Specific Gravity	2.700 (Assumed)		B - Value	0.95	Dry Density		87.8 pcf				
Dry Density	87.9 pcf		Cell Pressure	95.0 psi	Vol. of Voids		162.79 cm <sup>3</sup>				
			Back Pressure	90.0 psi	Vol. of Solids		177.32 cm <sup>3</sup>				
			Confining (Effective) Pressure	5.0 psi	Void Ratio		0.92				
			Max Head	29.54 cm	Saturation		100.0 %				
			Min Head	28.84 cm							
			Maximum Gradient	3.86							
			Minimum Gradient	3.77							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/26/21	7	5	-	0.42	29.54	3.86	25.0	-	-	-
09/26/21	7	15	600	0.41	28.84	3.77	25.0	2.64E-06	0.889	2.35E-06
09/26/21	7	25	600	0.42	29.54	3.86	25.0	2.64E-06	0.889	2.35E-06
09/26/21	7	35	600	0.41	28.84	3.77	25.0	2.64E-06	0.889	2.35E-06
09/26/21	7	45	600	0.42	29.54	3.86	25.0	2.64E-06	0.889	2.35E-06
09/26/21	7	55	600	0.41	28.84	3.77	25.0	2.64E-06	0.889	2.35E-06
09/26/21	8	5	600	0.42	29.54	3.86	25.0	2.64E-06	0.889	2.35E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.3E-06	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1046			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/14/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38895/2-5	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/16/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.034 in	7.71 cm	Speed	11	Average Height of Sample	3.035 in	7.71 cm	Dry Density	87.1 pcf		
Diameter	2.974 in	7.55 cm	Board Number	12	Average Diameter of Sample	2.975 in	7.56 cm	Vol. of Voids	167.03 cm <sup>3</sup>		
Area	6.95 in <sup>2</sup>	44.82 cm <sup>2</sup>	Cell Number	41	Area	6.95 in <sup>2</sup>	44.85 cm <sup>2</sup>	Vol. of Solids	178.68 cm <sup>3</sup>		
Volume	345.37 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	3B	Volume	345.72 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.93		
Mass	638.0 g	1.41 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	645.5 g	1.42 lb	Saturation	97.6 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	87.1 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	719.6 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	556.6 g				
Mass of wet sample & tare	638.0 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	74.3 g					
Mass of dry sample & tare	482.3 g		Max Head	155.45 cm	% Moisture	33.8					
Mass of tare	0.0 g		Min Head	153.34 cm							
% Moisture	32.3		Maximum Gradient	20.17							
			Minimum Gradient	19.89							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/14/21	9	5	-	2.20	154.75	20.07	21.4	-	-	-
10/14/21	9	15	600	2.19	154.04	19.98	21.4	1.25E-07	0.967	1.21E-07
10/14/21	9	25	600	2.20	154.75	20.07	21.4	1.25E-07	0.967	1.21E-07
10/14/21	9	35	600	2.18	153.34	19.89	21.4	1.25E-07	0.967	1.21E-07
10/14/21	9	45	600	2.19	154.04	19.98	21.4	1.25E-07	0.967	1.21E-07
10/14/21	9	55	600	2.20	154.75	20.07	21.4	1.25E-07	0.967	1.21E-07
10/14/21	10	5	600	2.21	155.45	20.17	21.4	1.24E-07	0.967	1.20E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.2E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	776
Syringe ID #	490			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **09/27/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38896/2-9	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/17/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.593
Initial Diameter, in	2.963
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.90
Volume, in <sup>3</sup>	38.57
Mass of Sample, g	1218.9
Wet Density, pcf	120.4
Dry Density, pcf	93.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1516.3
Mass of Dry Sample and Tare, g	1245.6
Mass of Tare, g	299.8
Moisture, %	28.6

**TEST DATA**

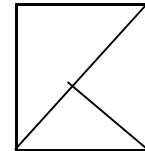
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	639
Specimen Cross-sectional Area, in <sup>2</sup>	6.90
Compressive Strength at Failure, psi	93
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>93</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/15/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	38896/2-9	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/17/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.623
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	38.93
Mass of Sample, g	1222.6
Wet Density, pcf	119.6
Dry Density, pcf	93.0
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1519.1
Mass of Dry Sample and Tare, g	1248.0
Mass of Tare, g	298.8
Moisture, %	28.6

**TEST DATA**

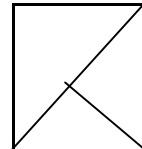
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2206
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	319
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>319</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 09/27/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38896/2-9	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/17/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.056	in	7.76	cm	Speed	9			Average Height of Sample	3.057	in	7.76	cm	
Diameter	2.955	in	7.51	cm	Board Number	7			Average Diameter of Sample	2.956	in	7.51	cm	
Area	6.86	in <sup>2</sup>	44.25	cm <sup>2</sup>	Cell Number	33			Area	6.86	in <sup>2</sup>	44.28	cm <sup>2</sup>	
Volume	343.45	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	Flow Pump Number	3B			Volume	343.79	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	657.3	g	1.45	lb	Flow Pump Rate*	4.48E-04			cm <sup>3</sup> /sec	Mass	663.0	g	1.46	lb
Specific Gravity	2.700 (Assumed)				B - Value	0.95				Dry Density	92.6			pcf
Dry Density	92.6			pcf	Cell Pressure	95.0			psi	Vol. of Voids	154.83			cm <sup>3</sup>
					Back Pressure	90.0			psi	Vol. of Solids	188.97			cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			psi	Void Ratio	0.82			
					Max Head	22.51			cm	Saturation	98.7			%
					Min Head	21.10			cm					
					Maximum Gradient	2.90								
					Minimum Gradient	2.72								
<b>Moisture Content</b>										<b>Moisture Content</b>				
Mass of wet sample & tare	657.3			g	Mass of wet sample & tare	726.7			g	Mass of wet sample & tare	726.7			g
Mass of dry sample & tare	509.9			g	Mass of dry sample & tare	574.0			g	Mass of dry sample & tare	574.0			g
Mass of tare	0.0			g	Mass of tare	64.1			g	Mass of tare	64.1			g
% Moisture	28.9				% Moisture	29.9				% Moisture	29.9			

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
09/27/21	7	5	-	0.31	21.81	2.81	24.5	-	-	-
09/27/21	7	15	600	0.32	22.51	2.90	24.5	3.55E-06	0.899	3.19E-06
09/27/21	7	25	600	0.31	21.81	2.81	24.5	3.55E-06	0.899	3.19E-06
09/27/21	7	35	600	0.32	22.51	2.90	24.5	3.55E-06	0.899	3.19E-06
09/27/21	7	45	600	0.30	21.10	2.72	24.5	3.60E-06	0.899	3.24E-06
09/27/21	7	55	600	0.31	21.81	2.81	24.5	3.66E-06	0.899	3.29E-06
09/27/21	8	5	600	0.32	22.51	2.90	24.5	3.55E-06	0.899	3.19E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				3.2E-06		cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290	
Syringe ID #	490			Pore Pressure Meter ID #	216	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/15/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	38896/2-9	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/17/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.047 in	7.74 cm	Speed	12	Average Height of Sample	3.048 in	7.74 cm	Dry Density	93.2 pcf		
Diameter	2.956 in	7.51 cm	Board Number	3	Average Diameter of Sample	2.957 in	7.51 cm	Vol. of Voids	153.27 cm <sup>3</sup>		
Area	6.86 in <sup>2</sup>	44.28 cm <sup>2</sup>	Cell Number	33	Area	6.87 in <sup>2</sup>	44.31 cm <sup>2</sup>	Vol. of Solids	189.74 cm <sup>3</sup>		
Volume	342.67 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3B	Volume	343.01 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.81		
Mass	657.9 g	1.45 lb	Flow Pump Rate*	5.60E-05 cm <sup>3</sup> /sec	Mass	670.0 g	1.48 lb	Saturation	102.9 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	93.3 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	754.1 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	596.4 g				
Mass of wet sample & tare	657.9 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	84.1 g					
Mass of dry sample & tare	512.3 g		Max Head	115.36 cm	% Moisture	30.8					
Mass of tare	0.0 g		Min Head	114.65 cm							
% Moisture	28.4		Maximum Gradient	14.90							
			Minimum Gradient	14.81							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/15/21	9	5	-	1.64	115.36	14.90	22.7	-	-	-
10/15/21	9	15	600	1.63	114.65	14.81	22.7	8.51E-08	0.938	7.98E-08
10/15/21	9	25	600	1.64	115.36	14.90	22.7	8.51E-08	0.938	7.98E-08
10/15/21	9	35	600	1.63	114.65	14.81	22.7	8.51E-08	0.938	7.98E-08
10/15/21	9	45	600	1.64	115.36	14.90	22.7	8.51E-08	0.938	7.98E-08
10/15/21	9	55	600	1.64	115.36	14.90	22.7	8.48E-08	0.938	7.95E-08
10/15/21	10	5	600	1.63	114.65	14.81	22.7	8.51E-08	0.938	7.98E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				8.0E-08	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	490			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **10/01/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39007/2-33	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/21/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.684
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.64
Mass of Sample, g	1199.2
Wet Density, pcf	115.2
Dry Density, pcf	86.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1498.5
Mass of Dry Sample and Tare, g	1198.9
Mass of Tare, g	301.3
Moisture, %	33.4

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1110
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	159
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>159</b>

Failure Code 3

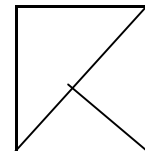
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear





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Tested By KP/IH

Date 10/19/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39007/2-33	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/21/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.702
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.92
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.64
Mass of Sample, g	1201.0
Wet Density, pcf	115.4
Dry Density, pcf	86.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1507.5
Mass of Dry Sample and Tare, g	1208.0
Mass of Tare, g	309.4
Moisture, %	33.3

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3746
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	539
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>539</b>

Failure Code 3

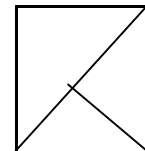
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 10/01/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39007/2-33	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/21/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.051 in	7.75 cm	Speed	10	Average Height of Sample	3.052 in	7.75 cm	Dry Density	86.2 pcf		
Diameter	2.971 in	7.55 cm	Board Number	7	Average Diameter of Sample	2.972 in	7.55 cm	Vol. of Voids	169.46 cm <sup>3</sup>		
Area	6.93 in <sup>2</sup>	44.73 cm <sup>2</sup>	Cell Number	15	Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>	Vol. of Solids	177.49 cm <sup>3</sup>		
Volume	346.61 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Flow Pump Number	4A	Volume	346.95 cm <sup>3</sup>	0.0123 ft <sup>3</sup>	Void Ratio	0.95		
Mass	637.4 g	1.41 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	644.4 g	1.42 lb	Saturation	97.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	86.2 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	728.6 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	563.5 g				
Mass of wet sample & tare	637.4 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	84.5 g					
Mass of dry sample & tare	479.0 g		Max Head	74.56 cm	% Moisture	34.5					
Mass of tare	0.0 g		Min Head	73.86 cm							
% Moisture	33.1		Maximum Gradient	9.62							
			Minimum Gradient	9.53							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/01/21	7	5	-	1.05	73.86	9.53	24.6	-	-	-
10/01/21	7	15	600	1.06	74.56	9.62	24.6	5.23E-07	0.897	4.69E-07
10/01/21	7	20	300	1.05	73.86	9.53	24.6	5.23E-07	0.897	4.69E-07
10/01/21	7	25	300	1.06	74.56	9.62	24.6	5.23E-07	0.897	4.69E-07
10/01/21	7	30	300	1.05	73.86	9.53	24.6	5.23E-07	0.897	4.69E-07
10/01/21	7	35	300	1.06	74.56	9.62	24.6	5.23E-07	0.897	4.69E-07
10/01/21	7	40	300	1.05	73.86	9.53	24.6	5.23E-07	0.897	4.69E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				4.7E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290
Syringe ID #	1047			Pore Pressure Meter ID #	216

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/19/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39007/2-33	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/21/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.019 in	7.67 cm	Speed	11	Average Height of Sample	3.020 in	7.67 cm	Dry Density	86.1 pcf		
Diameter	2.973 in	7.55 cm	Board Number	5	Average Diameter of Sample	2.974 in	7.55 cm	Vol. of Voids	168.18 cm <sup>3</sup>		
Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	Cell Number	41	Area	6.95 in <sup>2</sup>	44.82 cm <sup>2</sup>	Vol. of Solids	175.60 cm <sup>3</sup>		
Volume	343.43 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	4A	Volume	343.78 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.96		
Mass	631.3 g	1.39 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	636.4 g	1.40 lb	Saturation	96.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95							
Dry Density	86.2 pcf		Cell Pressure	95.0 psi							
			Back Pressure	90.0 psi							
			Confining (Effective) Pressure	5.0 psi							
			Max Head	51.35 cm							
			Min Head	49.94 cm							
			Maximum Gradient	6.69							
			Minimum Gradient	6.51							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/19/21	7	10	-	0.72	50.64	6.60	22.6	-	-	-
10/19/21	7	20	600	0.72	50.64	6.60	22.6	3.79E-07	0.940	3.56E-07
10/19/21	7	30	600	0.73	51.35	6.69	22.6	3.76E-07	0.940	3.53E-07
10/19/21	7	40	600	0.71	49.94	6.51	22.6	3.79E-07	0.940	3.56E-07
10/19/21	7	50	600	0.72	50.64	6.60	22.6	3.81E-07	0.940	3.58E-07
10/19/21	8	0	600	0.71	49.94	6.51	22.6	3.81E-07	0.940	3.58E-07
10/19/21	8	10	600	0.73	51.35	6.69	22.6	3.79E-07	0.940	3.56E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS  
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*				3.6E-07 cm/sec	
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042	
Syringe ID #	1047			Pore Pressure Meter ID #	779/780	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **10/02/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39008/2-13	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/22/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.658
Initial Diameter, in	2.978
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.41
Mass of Sample, g	1225.8
Wet Density, pcf	118.5
Dry Density, pcf	91.1
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1522.7
Mass of Dry Sample and Tare, g	1239.8
Mass of Tare, g	298.9
Moisture, %	30.1

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	884
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	127
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>127</b>

Failure Code 3

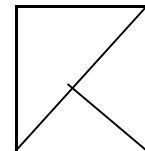
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By **KP/IH**

Date **10/20/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39008/2-13	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/22/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.653
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.32
Mass of Sample, g	1218.8
Wet Density, pcf	118.1
Dry Density, pcf	90.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1514.3
Mass of Dry Sample and Tare, g	1232.5
Mass of Tare, g	298.6
Moisture, %	30.2

**TEST DATA**

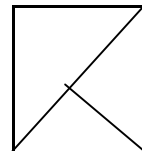
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2604
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	374
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>374</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/02/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39008/2-13	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/22/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	2.957	in	7.51	cm	Speed	10			Average Height of Sample	2.958	in	7.51	cm	
Diameter	2.969	in	7.54	cm	Board Number	8			Average Diameter of Sample	2.970	in	7.54	cm	
Area	6.92	in <sup>2</sup>	44.67	cm <sup>2</sup>	Cell Number	55			Area	6.93	in <sup>2</sup>	44.70	cm <sup>2</sup>	
Volume	335.48	cm <sup>3</sup>	0.0118	ft <sup>3</sup>	Flow Pump Number	4B			Volume	335.82	cm <sup>3</sup>	0.0119	ft <sup>3</sup>	
Mass	633.6	g	1.40	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	640.9	g	1.41	lb
Specific Gravity	2.700	(Assumed)		B - Value	0.95			Dry Density	90.6	pcf				
Dry Density	90.7	pcf		Cell Pressure	95.0			psi	Vol. of Voids	155.33	cm <sup>3</sup>			
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	180.49	cm <sup>3</sup>			
Mass of wet sample & tare	633.6	g		Confining (Effective) Pressure	5.0			psi	Void Ratio	0.86				
Mass of dry sample & tare	487.4	g		Max Head	49.24			cm	Saturation	98.9	%			
Mass of tare	0.0	g		Min Head	48.53			cm	<b>Moisture Content</b>					
% Moisture	30.0			Maximum Gradient	6.55			Mass of wet sample & tare	723.9	g				
				Minimum Gradient	6.46			Mass of dry sample & tare	570.3	g				
								Mass of tare	82.9	g				
								% Moisture	31.5					

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/02/21	8	5	-	0.70	49.24	6.55	24.6	-	-	-
10/02/21	8	15	600	0.69	48.53	6.46	24.6	7.70E-07	0.897	6.91E-07
10/02/21	8	25	600	0.70	49.24	6.55	24.6	7.70E-07	0.897	6.91E-07
10/02/21	8	35	600	0.69	48.53	6.46	24.6	7.70E-07	0.897	6.91E-07
10/02/21	8	45	600	0.70	49.24	6.55	24.6	7.70E-07	0.897	6.91E-07
10/02/21	8	55	600	0.69	48.53	6.46	24.6	7.70E-07	0.897	6.91E-07
10/02/21	9	5	600	0.70	49.24	6.55	24.6	7.70E-07	0.897	6.91E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*						6.9E-07	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049		
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	290		
Syringe ID #	1046			Pore Pressure Meter ID #	216		

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Web: [www.test-llc.com](http://www.test-llc.com)



Tested By EB/KP  
Date 10/20/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39008/2-13	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/22/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.030 in	7.70 cm	Speed	11	Average Height of Sample	3.031 in	7.70 cm	Dry Density	90.0 pcf		
Diameter	2.969 in	7.54 cm	Board Number	15	Average Diameter of Sample	2.970 in	7.54 cm	Vol. of Voids	160.38 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	55	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Vol. of Solids	183.72 cm <sup>3</sup>		
Volume	343.76 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2B	Volume	344.10 cm <sup>3</sup>	0.0122 ft <sup>3</sup>	Void Ratio	0.87		
Mass	646.9 g	1.43 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	658.8 g	1.45 lb	Saturation	101.5 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	90.0 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	741.2 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	578.5 g				
Mass of wet sample & tare	646.9 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	82.6 g					
Mass of dry sample & tare	495.9 g		Max Head	139.27 cm	% Moisture	32.8					
Mass of tare	0.0 g		Min Head	137.16 cm							
% Moisture	30.4		Maximum Gradient	18.09							
			Minimum Gradient	17.82							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/20/21	7	10	-	1.97	138.57	18.00	22.5	-	-	-
10/20/21	7	20	600	1.95	137.16	17.82	22.5	1.40E-07	0.942	1.32E-07
10/20/21	7	30	600	1.98	139.27	18.09	22.5	1.40E-07	0.942	1.31E-07
10/20/21	7	40	600	1.96	137.87	17.91	22.5	1.39E-07	0.942	1.31E-07
10/20/21	7	50	600	1.97	138.57	18.00	22.5	1.40E-07	0.942	1.31E-07
10/20/21	8	0	600	1.95	137.16	17.82	22.5	1.40E-07	0.942	1.32E-07
10/20/21	8	10	600	1.98	139.27	18.09	22.5	1.40E-07	0.942	1.31E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.3E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	246			Pore Pressure Meter ID #	372

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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ACCREDITED**

Tested By **KP/IH**

Date **10/02/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39009/CAA-4 Ex-Situ (1)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/22/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.622
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.13
Mass of Sample, g	1184.5
Wet Density, pcf	115.3
Dry Density, pcf	86.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1482.2
Mass of Dry Sample and Tare, g	1191.3
Mass of Tare, g	299.7
Moisture, %	32.6

**TEST DATA**

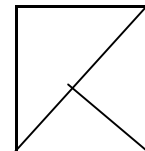
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1086
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	156
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>156</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/20/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39009/CAA-4 Ex-Situ (1)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/22/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.683
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.61
Mass of Sample, g	1191.8
Wet Density, pcf	114.6
Dry Density, pcf	86.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1495.5
Mass of Dry Sample and Tare, g	1205.0
Mass of Tare, g	305.6
Moisture, %	32.3

**TEST DATA**

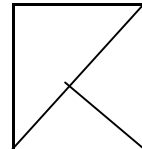
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2684
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	385
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>385</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/02/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39009/CAA-4 Ex-Situ (1)	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/22/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	2.988	in	7.59	cm	Speed	10			Average Height of Sample	2.989	in	7.59	cm	
Diameter	2.970	in	7.54	cm	Board Number	18			Average Diameter of Sample	2.971	in	7.55	cm	
Area	6.93	in <sup>2</sup>	44.70	cm <sup>2</sup>	Cell Number	37			Area	6.93	in <sup>2</sup>	44.73	cm <sup>2</sup>	
Volume	339.22	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	4A			Volume	339.56	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	
Mass	623.4	g	1.37	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	634.6	g	1.40	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	86.7			pcf		
Dry Density	86.7			pcf	Cell Pressure	95.0			psi	Vol. of Voids	164.91			cm <sup>3</sup>
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	174.66			cm <sup>3</sup>	
Mass of wet sample & tare	623.4	g	Mass of dry sample & tare	471.5	g	Confining (Effective) Pressure	5.0			psi	Void Ratio	0.94		
Mass of tare	0.0	g	% Moisture	32.2	Max Head	188.51			cm	Saturation	98.9			%
				Min Head	187.81			cm	<b>Moisture Content</b>					
				Maximum Gradient	24.83			Mass of wet sample & tare	717.3	g	Mass of dry sample & tare	554.3	g	
				Minimum Gradient	24.74			Mass of tare	82.8	g	% Moisture	34.6		

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/02/21	8	5	-	2.68	188.51	24.83	24.6	-	-	-
10/02/21	8	15	600	2.67	187.81	24.74	24.6	2.02E-07	0.897	1.81E-07
10/02/21	8	25	600	2.68	188.51	24.83	24.6	2.02E-07	0.897	1.81E-07
10/02/21	8	35	600	2.68	188.51	24.83	24.6	2.02E-07	0.897	1.81E-07
10/02/21	8	45	600	2.67	187.81	24.74	24.6	2.02E-07	0.897	1.81E-07
10/02/21	8	55	600	2.67	187.81	24.74	24.6	2.02E-07	0.897	1.82E-07
10/02/21	9	5	600	2.68	188.51	24.83	24.6	2.02E-07	0.897	1.81E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.8E-07		cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570	
Syringe ID #	1047			Pore Pressure Meter ID #	779/780	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/20/21  
Checked By *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39009/CAA-4 Ex-Situ (1)	Subsample ID	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/22/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	11	Average Height of Sample	3.014 in	7.66 cm	Dry Density	85.3 pcf		
Diameter	2.973 in	7.55 cm	Board Number	16	Average Diameter of Sample	2.974 in	7.55 cm	Vol. of Voids	169.49 cm <sup>3</sup>		
Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	Cell Number	4	Area	6.95 in <sup>2</sup>	44.82 cm <sup>2</sup>	Vol. of Solids	173.61 cm <sup>3</sup>		
Volume	342.75 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	2A	Volume	343.10 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.98		
Mass	621.6 g	1.37 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	633.2 g	1.40 lb	Saturation	97.0 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	85.3 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	712.4 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	548.0 g				
Mass of wet sample & tare	621.6 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	79.4 g					
Mass of dry sample & tare	468.6 g		Max Head	156.86 cm	% Moisture	35.1					
Mass of tare	0.0 g		Min Head	154.75 cm							
% Moisture	32.7		Maximum Gradient	20.49							
			Minimum Gradient	20.21							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/20/21	7	10	-	2.22	156.15	20.40	22.5	-	-	-
10/20/21	7	20	600	2.20	154.75	20.21	22.5	1.23E-07	0.942	1.16E-07
10/20/21	7	30	600	2.23	156.86	20.49	22.5	1.23E-07	0.942	1.16E-07
10/20/21	7	40	600	2.21	155.45	20.31	22.5	1.23E-07	0.942	1.15E-07
10/20/21	7	50	600	2.22	156.15	20.40	22.5	1.23E-07	0.942	1.16E-07
10/20/21	8	0	600	2.20	154.75	20.21	22.5	1.23E-07	0.942	1.16E-07
10/20/21	8	10	600	2.23	156.86	20.49	22.5	1.23E-07	0.942	1.16E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				1.2E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	245			Pore Pressure Meter ID #	1104

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **10/03/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39010/CAA-4 Ex-Situ (2)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/23/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.634
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	39.01
Mass of Sample, g	1161.6
Wet Density, pcf	113.4
Dry Density, pcf	83.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1578.5
Mass of Dry Sample and Tare, g	1270.6
Mass of Tare, g	419.9
Moisture, %	36.2

**TEST DATA**

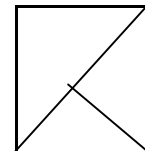
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1392
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	201
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>201</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Date **10/21/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39010/CAA-4 Ex-Situ (2)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/23/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.656
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.37
Mass of Sample, g	1163.5
Wet Density, pcf	112.6
Dry Density, pcf	82.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1453.4
Mass of Dry Sample and Tare, g	1145.7
Mass of Tare, g	297.1
Moisture, %	36.3

**TEST DATA**

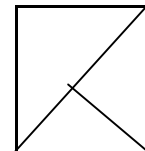
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	3313
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	476
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>476</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
Date: 10/03/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39010/CAA-4 Ex-Situ (2)	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/23/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.995 in	7.61 cm		Speed	10			Average Height of Sample	2.996 in	7.61 cm	
Diameter	2.957 in	7.51 cm		Board Number	19			Average Diameter of Sample	2.958 in	7.51 cm	
Area	6.87 in <sup>2</sup>	44.31 cm <sup>2</sup>		Cell Number	12			Area	6.87 in <sup>2</sup>	44.34 cm <sup>2</sup>	
Volume	337.05 cm <sup>3</sup>	0.0119 ft <sup>3</sup>		Flow Pump Number	2B			Volume	337.39 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	
Mass	609.3 g	1.34 lb		Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec			Mass	620.9 g	1.37 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	82.8 pcf		
Dry Density	82.9 pcf			Cell Pressure	95.0 psi			Vol. of Voids	171.48 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	165.91 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	1.03		
				Max Head	45.72 cm			Saturation	100.9 %		
				Min Head	45.02 cm						
				Maximum Gradient	6.01						
				Minimum Gradient	5.92						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/03/21	7	5	-	0.65	45.72	6.01	25.1	-	-	-
10/03/21	7	15	600	0.64	45.02	5.92	25.1	8.47E-07	0.887	7.52E-07
10/03/21	7	25	600	0.65	45.72	6.01	25.1	8.47E-07	0.887	7.52E-07
10/03/21	7	35	600	0.65	45.72	6.01	25.1	8.41E-07	0.887	7.46E-07
10/03/21	7	45	600	0.64	45.02	5.92	25.1	8.47E-07	0.887	7.52E-07
10/03/21	7	55	600	0.64	45.02	5.92	25.1	8.54E-07	0.887	7.58E-07
10/03/21	8	5	600	0.65	45.72	6.01	25.1	8.47E-07	0.887	7.52E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*		7.5E-07 cm/sec		
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	246			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By KP/IH

Date 10/03/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39011/2-10	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/23/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.651
Initial Diameter, in	2.969
Height-to-Diameter Ratio	1.90
Area, in <sup>2</sup>	6.92
Volume, in <sup>3</sup>	39.12
Mass of Sample, g	1207.4
Wet Density, pcf	117.6
Dry Density, pcf	88.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1564.1
Mass of Dry Sample and Tare, g	1270.3
Mass of Tare, g	359.1
Moisture, %	32.2

**TEST DATA**

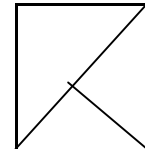
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	642
Specimen Cross-sectional Area, in <sup>2</sup>	6.92
Compressive Strength at Failure, psi	93
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>93</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/21/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39011/2-10	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/23/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.627
Initial Diameter, in	2.976
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.14
Mass of Sample, g	1193.2
Wet Density, pcf	116.1
Dry Density, pcf	87.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1491.4
Mass of Dry Sample and Tare, g	1199.4
Mass of Tare, g	300.9
Moisture, %	32.5

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1384
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	199
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>199</b>

Failure Code 3

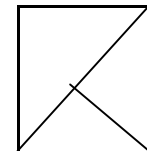
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

Failure Sketch



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 10/03/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39011/2-10	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/23/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.973 in	7.55 cm	Speed	9	Average Height of Sample	2.974 in	7.55 cm	Dry Density	87.9 pcf		
Diameter	2.969 in	7.54 cm	Board Number	5	Average Diameter of Sample	2.970 in	7.54 cm	Vol. of Voids	161.42 cm <sup>3</sup>		
Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	Cell Number	5	Area	6.93 in <sup>2</sup>	44.70 cm <sup>2</sup>	Vol. of Solids	176.21 cm <sup>3</sup>		
Volume	337.29 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Flow Pump Number	3B	Volume	337.63 cm <sup>3</sup>	0.0119 ft <sup>3</sup>	Void Ratio	0.92		
Mass	629.2 g	1.39 lb	Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec	Mass	635.2 g	1.40 lb	Saturation	98.8 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	88.0 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	708.5 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	549.1 g				
Mass of wet sample & tare	629.2 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	73.4 g					
Mass of dry sample & tare	475.7 g		Max Head	28.84 cm	% Moisture	33.5					
Mass of tare	0.0 g		Min Head	28.14 cm							
% Moisture	32.3		Maximum Gradient	3.82							
			Minimum Gradient	3.72							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/03/21	7	20	-	0.40	28.14	3.72	24.1	-	-	-
10/03/21	7	30	600	0.41	28.84	3.82	24.1	2.66E-06	0.908	2.41E-06
10/03/21	7	40	600	0.41	28.84	3.82	24.1	2.63E-06	0.908	2.38E-06
10/03/21	7	50	600	0.40	28.14	3.72	24.1	2.66E-06	0.908	2.41E-06
10/03/21	8	0	600	0.40	28.14	3.72	24.1	2.69E-06	0.908	2.44E-06
10/03/21	8	10	600	0.41	28.84	3.82	24.1	2.66E-06	0.908	2.41E-06
10/03/21	8	20	600	0.41	28.84	3.82	24.1	2.63E-06	0.908	2.38E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.4E-06	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	490			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/21/21  
Checked By: *EB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39011/2-10	Subsample ID	4	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/23/21	Curing Age, Days	28		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)				
Height	3.008	in	7.64	cm	Speed	11	Average Height of Sample	3.009	in	7.64	cm	
Diameter	2.965	in	7.53	cm	Board Number	4	Average Diameter of Sample	2.966	in	7.53	cm	
Area	6.90	in <sup>2</sup>	44.55	cm <sup>2</sup>	Cell Number	2	Area	6.91	in <sup>2</sup>	44.58	cm <sup>2</sup>	
Volume	340.34	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	4A	Volume	340.69	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	
Mass	635.1	g	1.40	lb	Flow Pump Rate*	1.12E-04	cm <sup>3</sup> /sec	Mass	642.6	g	1.42	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95		Dry Density	88.0	pcf		
Dry Density	88.1	pcf			Cell Pressure	95.0	psi	Vol. of Voids	162.76	cm <sup>3</sup>		
					Back Pressure	90.0	psi	Vol. of Solids	177.93	cm <sup>3</sup>		
					Confining (Effective) Pressure	5.0	psi	Void Ratio	0.91			
					Max Head	82.30	cm	Saturation	99.7	%		
					Min Head	80.89	cm					
					Maximum Gradient	10.77						
					Minimum Gradient	10.58						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/21/21	7	20	-	1.16	81.59	10.68	23.4	-	-	-
10/21/21	7	30	600	1.17	82.30	10.77	23.4	2.34E-07	0.923	2.16E-07
10/21/21	7	40	600	1.15	80.89	10.58	23.4	2.35E-07	0.923	2.17E-07
10/21/21	7	50	600	1.15	80.89	10.58	23.4	2.37E-07	0.923	2.19E-07
10/21/21	8	0	600	1.17	82.30	10.77	23.4	2.35E-07	0.923	2.17E-07
10/21/21	8	10	600	1.16	81.59	10.68	23.4	2.34E-07	0.923	2.16E-07
10/21/21	8	20	600	1.17	82.30	10.77	23.4	2.34E-07	0.923	2.16E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	1047			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 10/04/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39012/2-22	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/24/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.611
Initial Diameter, in	2.972
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.94
Volume, in <sup>3</sup>	38.92
Mass of Sample, g	1205.5
Wet Density, pcf	118.0
Dry Density, pcf	90.4
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1619.7
Mass of Dry Sample and Tare, g	1339.3
Mass of Tare, g	416.4
Moisture, %	30.4

**TEST DATA**

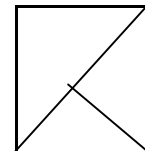
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	720
Specimen Cross-sectional Area, in <sup>2</sup>	6.94
Compressive Strength at Failure, psi	104
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>104</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/22/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39012/2-22	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/24/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.544
Initial Diameter, in	2.982
Height-to-Diameter Ratio	1.86
Area, in <sup>2</sup>	6.98
Volume, in <sup>3</sup>	38.72
Mass of Sample, g	1190.6
Wet Density, pcf	117.1
Dry Density, pcf	89.5
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1493.2
Mass of Dry Sample and Tare, g	1213.0
Mass of Tare, g	304.2
Moisture, %	30.8

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1451
Specimen Cross-sectional Area, in <sup>2</sup>	6.98
Compressive Strength at Failure, psi	208
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>208</b>

Failure Code 3

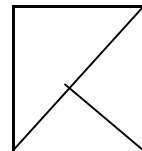
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

**Failure Sketch**



Failure Type:

Cone and Shear



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Tested By EB/KP  
Date 10/04/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39012/2-22	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/24/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.002 in	7.63 cm		Speed	9			Average Height of Sample	3.003 in	7.63 cm	
Diameter	2.972 in	7.55 cm		Board Number	6			Average Diameter of Sample	2.973 in	7.55 cm	
Area	6.94 in <sup>2</sup>	44.76 cm <sup>2</sup>		Cell Number	11			Area	6.94 in <sup>2</sup>	44.79 cm <sup>2</sup>	
Volume	341.27 cm <sup>3</sup>	0.0121 ft <sup>3</sup>		Flow Pump Number	4A			Volume	341.61 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	
Mass	637.7 g	1.41 lb		Flow Pump Rate*	4.48E-04 cm <sup>3</sup> /sec			Mass	645.7 g	1.42 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	89.5 pcf		
Dry Density	89.6 pcf			Cell Pressure	95.0 psi			Vol. of Voids	160.06 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	181.56 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.88		
				Max Head	21.81 cm			Saturation	97.2 %		
				Min Head	21.10 cm						
				Maximum Gradient	2.86						
				Minimum Gradient	2.77						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/04/21	7	40	-	0.30	21.10	2.77	24.7	-	-	-
10/04/21	7	50	600	0.31	21.81	2.86	24.7	3.56E-06	0.895	3.18E-06
10/04/21	8	0	600	0.31	21.81	2.86	24.7	3.50E-06	0.895	3.13E-06
10/04/21	8	10	600	0.30	21.10	2.77	24.7	3.56E-06	0.895	3.18E-06
10/04/21	8	20	600	0.30	21.10	2.77	24.7	3.62E-06	0.895	3.24E-06
10/04/21	8	30	600	0.31	21.81	2.86	24.7	3.56E-06	0.895	3.18E-06
10/04/21	8	40	600	0.30	21.10	2.77	24.7	3.56E-06	0.895	3.18E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*		3.2E-06 cm/sec		
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1044/1048
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	1047			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/22/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39012/2-22	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/24/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.066 in	7.79 cm		Speed	12			Average Height of Sample	3.067 in	7.79 cm	
Diameter	2.965 in	7.53 cm		Board Number	18			Average Diameter of Sample	2.966 in	7.53 cm	
Area	6.90 in <sup>2</sup>	44.55 cm <sup>2</sup>		Cell Number	15			Area	6.91 in <sup>2</sup>	44.58 cm <sup>2</sup>	
Volume	346.91 cm <sup>3</sup>	0.0123 ft <sup>3</sup>		Flow Pump Number	4B			Volume	347.25 cm <sup>3</sup>	0.0123 ft <sup>3</sup>	
Mass	653.9 g	1.44 lb		Flow Pump Rate*	5.60E-05 cm <sup>3</sup> /sec			Mass	664.5 g	1.46 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	90.2 pcf		
Dry Density	90.3 pcf			Cell Pressure	95.0 psi			Vol. of Voids	161.37 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	185.88 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	0.87		
				Max Head	104.10 cm			Saturation	100.8 %		
				Min Head	102.70 cm						
				Maximum Gradient	13.36						
				Minimum Gradient	13.18						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/22/21	8	35	-	1.47	103.40	13.27	21.3	-	-	-
10/22/21	8	45	600	1.48	104.10	13.36	21.3	9.43E-08	0.969	9.14E-08
10/22/21	8	55	600	1.46	102.70	13.18	21.3	9.46E-08	0.969	9.17E-08
10/22/21	8	5	-3000	1.48	104.10	13.36	21.3	9.46E-08	0.969	9.17E-08
10/22/21	9	15	4200	1.47	103.40	13.27	21.3	9.43E-08	0.969	9.14E-08
10/22/21	9	25	600	1.48	104.10	13.36	21.3	9.43E-08	0.969	9.14E-08
10/22/21	9	35	600	1.46	102.70	13.18	21.3	9.46E-08	0.969	9.17E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*		9.2E-08	cm/sec	
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	570
Syringe ID #	1046			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By KP/IH

Date 10/04/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39044/CAA-4 Ex-Situ (3)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/24/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.747
Initial Diameter, in	2.975
Height-to-Diameter Ratio	1.93
Area, in <sup>2</sup>	6.95
Volume, in <sup>3</sup>	39.95
Mass of Sample, g	1153.2
Wet Density, pcf	110.0
Dry Density, pcf	77.6
Machine Speed, in/min	0.050
Strain rate, % / min	0.87

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1409.4
Mass of Dry Sample and Tare, g	1070.6
Mass of Tare, g	258.3
Moisture, %	41.7

**TEST DATA**

Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2083
Specimen Cross-sectional Area, in <sup>2</sup>	6.95
Compressive Strength at Failure, psi	300
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>300</b>

Failure Code 3

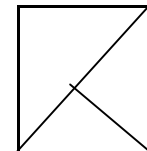
Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**

**Failure Sketch**



Failure Type:

Cone and Shear





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Tested By **KP/IH**

Date **10/22/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39044/CAA-4 Ex-Situ (3)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/24/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.681
Initial Diameter, in	2.979
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.60
Mass of Sample, g	1142.5
Wet Density, pcf	109.9
Dry Density, pcf	77.7
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1445.0
Mass of Dry Sample and Tare, g	1110.8
Mass of Tare, g	303.7
Moisture, %	41.4

**TEST DATA**

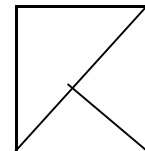
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	4268
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	612
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>612</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/05/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39044/CAA-4 Ex-Situ (3)	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/24/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	11	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.013 in	7.65 cm	Speed	10	Average Height of Sample	3.014 in	7.66 cm	Dry Density	76.8 pcf		
Diameter	2.974 in	7.55 cm	Board Number	4	Average Diameter of Sample	2.975 in	7.56 cm	Vol. of Voids	186.80 cm <sup>3</sup>		
Area	6.95 in <sup>2</sup>	44.82 cm <sup>2</sup>	Cell Number	2	Area	6.95 in <sup>2</sup>	44.85 cm <sup>2</sup>	Vol. of Solids	156.53 cm <sup>3</sup>		
Volume	342.98 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	3B	Volume	343.33 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	1.19		
Mass	597.6 g	1.32 lb	Flow Pump Rate*	2.24E-04 cm <sup>3</sup> /sec	Mass	608.2 g	1.34 lb	Saturation	99.3 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b> Mass of wet sample & tare 677.2 g Mass of dry sample & tare 491.6 g Mass of tare 68.9 g % Moisture 43.9						
Dry Density	76.9 pcf		Cell Pressure	95.0 psi							
<b>Moisture Content</b>			Back Pressure	90.0 psi							
Mass of wet sample & tare	597.6 g		Confining (Effective) Pressure	5.0 psi							
Mass of dry sample & tare	422.7 g		Max Head	139.27 cm							
Mass of tare	0.0 g		Min Head	138.57 cm							
% Moisture	41.4		Maximum Gradient	18.19							
			Minimum Gradient	18.10							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/05/21	9	20	-	1.98	139.27	18.19	23.5	-	-	-
10/05/21	9	30	600	1.97	138.57	18.10	23.5	2.75E-07	0.920	2.53E-07
10/05/21	9	40	600	1.98	139.27	18.19	23.5	2.75E-07	0.920	2.53E-07
10/05/21	9	50	600	1.97	138.57	18.10	23.5	2.75E-07	0.920	2.53E-07
10/05/21	10	0	600	1.98	139.27	18.19	23.5	2.75E-07	0.920	2.53E-07
10/05/21	10	10	600	1.97	138.57	18.10	23.5	2.75E-07	0.920	2.53E-07
10/05/21	10	20	600	1.98	139.27	18.19	23.5	2.75E-07	0.920	2.53E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.5E-07	cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	262
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041
Syringe ID #	490			Pore Pressure Meter ID #	26/27

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.





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Tested By **KP/IH**

Date **10/05/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39045/CAA-4 Ex-Situ (4)	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/25/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.682
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.55
Mass of Sample, g	1162.0
Wet Density, pcf	111.9
Dry Density, pcf	81.1
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1451.5
Mass of Dry Sample and Tare, g	1150.8
Mass of Tare, g	360.0
Moisture, %	38.0

**TEST DATA**

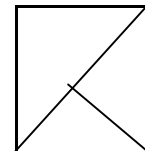
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1642
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	236
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>236</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **KP/IH**

Date **10/23/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39045/CAA-4 Ex-Situ (4)	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/25/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.689
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.60
Mass of Sample, g	1162.5
Wet Density, pcf	111.8
Dry Density, pcf	80.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1460.6
Mass of Dry Sample and Tare, g	1139.2
Mass of Tare, g	299.0
Moisture, %	38.3

**TEST DATA**

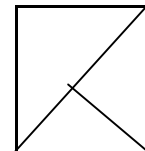
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	4685
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	673
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>673</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By **EB/KP**  
Date **10/05/21**  
Checked By **EB**

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39045/CAA-4 Ex-Situ (4)	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/25/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	2.930 in	7.44 cm		Speed	11			Average Height of Sample	2.931 in	7.44 cm	
Diameter	2.968 in	7.54 cm		Board Number	12			Average Diameter of Sample	2.969 in	7.54 cm	
Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>		Cell Number	14			Area	6.92 in <sup>2</sup>	44.67 cm <sup>2</sup>	
Volume	332.19 cm <sup>3</sup>	0.0117 ft <sup>3</sup>		Flow Pump Number	2B			Volume	332.53 cm <sup>3</sup>	0.0117 ft <sup>3</sup>	
Mass	592.7 g	1.31 lb		Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec			Mass	603.5 g	1.33 lb	
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	80.6 pcf		
Dry Density	80.7 pcf			Cell Pressure	95.0 psi			Vol. of Voids	173.45 cm <sup>3</sup>		
				Back Pressure	90.0 psi			Vol. of Solids	159.07 cm <sup>3</sup>		
				Confining (Effective) Pressure	5.0 psi			Void Ratio	1.09		
				Max Head	150.53 cm			Saturation	100.3 %		
				Min Head	149.82 cm						
				Maximum Gradient	20.22						
				Minimum Gradient	20.12						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/05/21	10	5	-	2.14	150.53	20.22	23.5	-	-	-
10/05/21	10	15	600	2.13	149.82	20.12	23.5	1.24E-07	0.920	1.14E-07
10/05/21	10	25	600	2.14	150.53	20.22	23.5	1.24E-07	0.920	1.14E-07
10/05/21	10	35	600	2.13	149.82	20.12	23.5	1.24E-07	0.920	1.14E-07
10/05/21	10	45	600	2.14	150.53	20.22	23.5	1.24E-07	0.920	1.14E-07
10/05/21	10	55	600	2.13	149.82	20.12	23.5	1.24E-07	0.920	1.14E-07
10/05/21	11	5	600	2.14	150.53	20.22	23.5	1.24E-07	0.920	1.14E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS (ASTM D2487;2488)
NA	NA
REMARKS	
Bottom Half of the mold was used for testing.	

	Reported Average Hydraulic Conductivity*				1.1E-07	cm/sec
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	587	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	776	
Syringe ID #	246			Pore Pressure Meter ID #	26/27	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/23/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39045/CAA-4 Ex-Situ (4)	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/25/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.009	in	7.64	cm	Speed	12			Average Height of Sample	3.010	in	7.65	cm	
Diameter	2.973	in	7.55	cm	Board Number	5			Average Diameter of Sample	2.974	in	7.55	cm	
Area	6.94	in <sup>2</sup>	44.79	cm <sup>2</sup>	Cell Number	15			Area	6.95	in <sup>2</sup>	44.82	cm <sup>2</sup>	
Volume	342.30	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	Flow Pump Number	4B			Volume	342.64	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	
Mass	612.1	g	1.35	lb	Flow Pump Rate*	5.60E-05			cm <sup>3</sup> /sec	Mass	622.8	g	1.37	lb
Specific Gravity	2.700	(Assumed)			B - Value	0.95			Dry Density	80.7			pcf	
Dry Density	80.7			pcf	Cell Pressure	95.0			psi	Vol. of Voids	178.61			cm <sup>3</sup>
					Back Pressure	90.0			psi	Vol. of Solids	164.03			cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			psi	Void Ratio	1.09			
					Max Head	187.81			cm	Saturation	100.7			%
					Min Head	185.70			cm					
					Maximum Gradient	24.56								
					Minimum Gradient	24.29								

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/23/21	7	20	-	2.65	186.40	24.38	23.3	-	-	-
10/23/21	7	30	600	2.64	185.70	24.29	23.3	5.13E-08	0.925	4.75E-08
10/23/21	7	40	600	2.67	187.81	24.56	23.3	5.12E-08	0.925	4.73E-08
10/23/21	7	50	600	2.66	187.10	24.47	23.3	5.10E-08	0.925	4.71E-08
10/23/21	8	0	600	2.66	187.10	24.47	23.3	5.11E-08	0.925	4.72E-08
10/23/21	8	10	600	2.67	187.81	24.56	23.3	5.10E-08	0.925	4.71E-08
10/23/21	8	20	600	2.65	186.40	24.38	23.3	5.11E-08	0.925	4.72E-08

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

	Reported Average Hydraulic Conductivity*				4.7E-08	cm/sec
Flow pump ID #	1043	Balance ID #	1035/1036	Differential Pressure Meter ID #	1045/1049	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042	
Syringe ID #	1046			Pore Pressure Meter ID #	779/780	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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ACCREDITED**

Tested By **KP/IH**

Date **10/05/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39046/2-21	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/25/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.585
Initial Diameter, in	2.965
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.90
Volume, in <sup>3</sup>	38.56
Mass of Sample, g	1202.2
Wet Density, pcf	118.8
Dry Density, pcf	92.3
Machine Speed, in/min	0.050
Strain rate, % / min	0.90

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1502.3
Mass of Dry Sample and Tare, g	1235.2
Mass of Tare, g	301.8
Moisture, %	28.6

**TEST DATA**

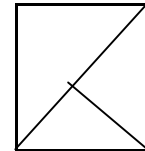
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	385
Specimen Cross-sectional Area, in <sup>2</sup>	6.90
Compressive Strength at Failure, psi	56
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>56</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**





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Tested By **KP/IH**

Date **10/23/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39046/2-21	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/25/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.676
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.91
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.51
Mass of Sample, g	1216.3
Wet Density, pcf	117.3
Dry Density, pcf	91.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.88

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1513.4
Mass of Dry Sample and Tare, g	1243.3
Mass of Tare, g	298.4
Moisture, %	28.6

**TEST DATA**

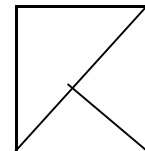
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	1600
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	230
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>230</b>

Failure Code 3

Failure Sketch



Failure Type: **Cone and Shear**

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By EB/KP  
Date 10/05/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39046/2-21	Subsample ID	3
Add. Info	-	Mixing/Molding Date	09/25/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	10	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	2.987	in	7.59	cm	Speed	10			Average Height of Sample	2.988	in	7.59	cm	
Diameter	2.968	in	7.54	cm	Board Number	3			Average Diameter of Sample	2.969	in	7.54	cm	
Area	6.92	in <sup>2</sup>	44.64	cm <sup>2</sup>	Cell Number	41			Area	6.92	in <sup>2</sup>	44.67	cm <sup>2</sup>	
Volume	338.65	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	3A			Volume	338.99	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	
Mass	636.9	g	1.40	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	646.1	g	1.42	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	91.0			pcf		
Dry Density	91.1			pcf	Cell Pressure	95.0			psi	Vol. of Voids	155.84			cm <sup>3</sup>
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	183.16			cm <sup>3</sup>	
Mass of wet sample & tare	636.9			g	Confining (Effective) Pressure	5.0			psi	Void Ratio	0.85			
Mass of dry sample & tare	494.6			g	Max Head	15.47			cm	Saturation	97.3			%
Mass of tare	0.0			g	Min Head	14.77			cm	<b>Moisture Content</b>				
% Moisture	28.8			Maximum Gradient	2.04			Mass of wet sample & tare	727.7			g		
				Minimum Gradient	1.95			Mass of dry sample & tare	576.1			g		
								Mass of tare	81.5			g		
								% Moisture	30.7					

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/05/21	9	20	-	0.21	14.77	1.95	23.5	-	-	-
10/05/21	9	30	600	0.22	15.47	2.04	23.5	2.52E-06	0.920	2.32E-06
10/05/21	9	40	600	0.21	14.77	1.95	23.5	2.52E-06	0.920	2.32E-06
10/05/21	9	50	600	0.22	15.47	2.04	23.5	2.52E-06	0.920	2.32E-06
10/05/21	10	0	600	0.21	14.77	1.95	23.5	2.52E-06	0.920	2.32E-06
10/05/21	10	10	600	0.22	15.47	2.04	23.5	2.52E-06	0.920	2.32E-06
10/05/21	10	20	600	0.21	14.77	1.95	23.5	2.52E-06	0.920	2.32E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.3E-06		cm/sec
Flow pump ID #	475	Balance ID #	1035/1036	Differential Pressure Meter ID #	469	
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1041	
Syringe ID #	491			Pore Pressure Meter ID #	26/27	

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By EB/KP  
Date 10/23/21  
Checked By *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39046/2-21	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/25/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous  
Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)			
Height	3.031 in	7.70 cm	Speed	11	Average Height of Sample	3.032 in	7.70 cm	Dry Density	90.6 pcf		
Diameter	2.967 in	7.54 cm	Board Number	6	Average Diameter of Sample	2.968 in	7.54 cm	Vol. of Voids	158.91 cm <sup>3</sup>		
Area	6.91 in <sup>2</sup>	44.61 cm <sup>2</sup>	Cell Number	5	Area	6.92 in <sup>2</sup>	44.64 cm <sup>2</sup>	Vol. of Solids	184.84 cm <sup>3</sup>		
Volume	343.41 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Flow Pump Number	1A	Volume	343.75 cm <sup>3</sup>	0.0121 ft <sup>3</sup>	Void Ratio	0.86		
Mass	641.0 g	1.41 lb	Flow Pump Rate*	1.12E-04 cm <sup>3</sup> /sec	Mass	650.6 g	1.43 lb	Saturation	95.4 %		
Specific Gravity	2.700 (Assumed)		B - Value	0.95	<b>Moisture Content</b>						
Dry Density	90.7 pcf		Cell Pressure	95.0 psi	Mass of wet sample & tare	731.6 g					
<b>Moisture Content</b>				Back Pressure	90.0 psi	Mass of dry sample & tare	580.1 g				
Mass of wet sample & tare	641.0 g		Confining (Effective) Pressure	5.0 psi	Mass of tare	81.1 g					
Mass of dry sample & tare	499.0 g		Max Head	68.93 cm	% Moisture	30.4					
Mass of tare	0.0 g		Min Head	66.12 cm							
% Moisture	28.5		Maximum Gradient	8.95							
			Minimum Gradient	8.59							

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/23/21	6	40	-	0.94	66.12	8.59	23.3	-	-	-
10/23/21	6	50	600	0.98	68.93	8.95	23.3	2.86E-07	0.925	2.65E-07
10/23/21	7	0	600	0.97	68.23	8.86	23.3	2.82E-07	0.925	2.61E-07
10/23/21	7	10	600	0.97	68.23	8.86	23.3	2.83E-07	0.925	2.62E-07
10/23/21	7	20	600	0.95	66.82	8.68	23.3	2.86E-07	0.925	2.65E-07
10/23/21	7	30	600	0.97	68.23	8.86	23.3	2.86E-07	0.925	2.65E-07
10/23/21	7	40	600	0.96	67.53	8.77	23.3	2.85E-07	0.925	2.63E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*				2.6E-07	cm/sec
Flow pump ID #	22	Balance ID #	1035/1036	Differential Pressure Meter ID #	1107
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	1042
Syringe ID #	140			Pore Pressure Meter ID #	779/780

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By **KP/IH**

Date **10/07/21**

Checked By **[Signature]**

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39047/2-20	Subsample	1	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/27/21	Curing Age, Days	10		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.633
Initial Diameter, in	2.977
Height-to-Diameter Ratio	1.89
Area, in <sup>2</sup>	6.96
Volume, in <sup>3</sup>	39.21
Mass of Sample, g	1187.9
Wet Density, pcf	115.4
Dry Density, pcf	87.9
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1485.6
Mass of Dry Sample and Tare, g	1203.4
Mass of Tare, g	299.2
Moisture, %	31.2

**TEST DATA**

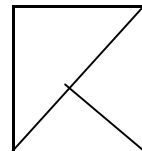
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	896
Specimen Cross-sectional Area, in <sup>2</sup>	6.96
Compressive Strength at Failure, psi	129
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>129</b>

Failure Code 3

Failure Sketch



Failure Type:

Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By KP/IH

Date 10/25/21

Checked By *IB*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elev.	-
Sample ID	39047/2-20	Subsample	2	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/27/21	Curing Age, Days	28		

**ASTM D 1633: Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders**

**METHOD** B

**SAMPLE DATA**

Initial Height, in	5.594
Initial Diameter, in	2.980
Height-to-Diameter Ratio	1.88
Area, in <sup>2</sup>	6.97
Volume, in <sup>3</sup>	39.02
Mass of Sample, g	1175.7
Wet Density, pcf	114.8
Dry Density, pcf	87.2
Machine Speed, in/min	0.050
Strain rate, % / min	0.89

**WATER CONTENT DETERMINATION**

Mass of Wet Sample and Tare, g	1472.7
Mass of Dry Sample and Tare, g	1191.5
Mass of Tare, g	302.0
Moisture, %	31.6

**TEST DATA**

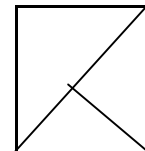
Load Cell ID #	11/1015
Compression Device ID #	10/1014
Balance ID #	1036/1037

Digital Caliper ID #	17/583
Readout Device ID #	10/1016
Oven ID #	758/496

Maximum Load at Failure, lbf	2742
Specimen Cross-sectional Area, in <sup>2</sup>	6.97
Compressive Strength at Failure, psi	393
Conversion Factor for Height to Diameter Ratio	1.00
<b>Reported Compressive Strength at Failure, psi</b>	<b>393</b>

Failure Code 3

Failure Sketch



Failure Type: Cone and Shear

Note 2: \* - A conversion factor based on H/D=1.15 (C.F.-.908 as 100% and add. correction per ASTM C42)

**DESCRIPTION**

USCS (ASTM D2487: D2488)

**REMARKS**



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Tested By: EB/KP  
 Date: 10/07/21  
 Checked By: *[Signature]*

Client Pr. #	200016			Lab. PR. #	21136-02-3		
Pr. Name	Time Oil Terminal			S. Type	Mold	Depth/Elevation	-
Sample ID	39047/2-20	Subsample ID	3	Location	Seattle, WA		
Add. Info	-	Mixing/Molding Date	09/27/21	Curing Age, Days	10		

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)							
Height	3.005	in	7.63	cm	Speed	10			Average Height of Sample	3.006	in	7.64	cm		
Diameter	2.969	in	7.54	cm	Board Number	9			Average Diameter of Sample	2.970	in	7.54	cm		
Area	6.92	in <sup>2</sup>	44.67	cm <sup>2</sup>	Cell Number	41			Area	6.93	in <sup>2</sup>	44.70	cm <sup>2</sup>		
Volume	340.92	cm <sup>3</sup>	0.0120	ft <sup>3</sup>	Flow Pump Number	2A			Volume	341.27	cm <sup>3</sup>	0.0121	ft <sup>3</sup>		
Mass	629.4	g	1.39	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	642.7	g	1.42	lb	
Specific Gravity	2.700	(Assumed)			B - Value	0.95			Dry Density	87.6				pcf	
Dry Density	87.7	pcf			Cell Pressure	95.0			psi	Vol. of Voids	163.80				cm <sup>3</sup>
					Back Pressure	90.0			psi	Vol. of Solids	177.46				cm <sup>3</sup>
					Confining (Effective) Pressure	5.0			psi	Void Ratio	0.92				
					Max Head	17.59			cm	Saturation	99.8				%
					Min Head	16.88			cm						
					Maximum Gradient	2.30									
					Minimum Gradient	2.21									
<b>Moisture Content</b>								<b>Moisture Content</b>							
Mass of wet sample & tare	629.4	g		Mass of wet sample & tare	724.0	g		Mass of wet sample & tare	724.0	g					
Mass of dry sample & tare	479.0	g		Mass of dry sample & tare	560.5	g		Mass of dry sample & tare	560.5	g					
Mass of tare	0.0	g		Mass of tare	81.5	g		Mass of tare	81.5	g					
% Moisture	31.4			% Moisture	34.1			% Moisture	34.1						

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> ( °C )	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/07/21	8	5	-	0.25	17.59	2.30	23.1	-	-	-
10/07/21	8	15	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	25	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	35	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	45	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06
10/07/21	8	55	600	0.24	16.88	2.21	23.1	2.22E-06	0.929	2.06E-06
10/07/21	9	5	600	0.25	17.59	2.30	23.1	2.22E-06	0.929	2.06E-06

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA
REMARKS	
Bottom Half of the mold was used for testing.	

	Reported Average Hydraulic Conductivity*			2.1E-06			cm/sec		
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346				
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	571				
Syringe ID #	245			Pore Pressure Meter ID #	29				

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.



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Tested By: EB/KP  
Date: 10/25/21  
Checked By: *EB*

Client Pr. #	200016		
Pr. Name	Time Oil Terminal		
Sample ID	39047/2-20	Subsample ID	4
Add. Info	-	Mixing/Molding Date	09/27/21

Lab. PR. #	21136-02-3		
S. Type	Mold	Depth/Elevation	-
Location	Seattle, WA		
	Curing Age, Days	28	

**ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)**

Initial Sample Data (Before Test)				Test Data				Final Data (After Test)						
Height	3.035	in	7.71	cm	Speed	10			Average Height of Sample	3.036	in	7.71	cm	
Diameter	2.967	in	7.54	cm	Board Number	14			Average Diameter of Sample	2.968	in	7.54	cm	
Area	6.91	in <sup>2</sup>	44.61	cm <sup>2</sup>	Cell Number	14			Area	6.92	in <sup>2</sup>	44.64	cm <sup>2</sup>	
Volume	343.86	cm <sup>3</sup>	0.0121	ft <sup>3</sup>	Flow Pump Number	2a			Volume	344.21	cm <sup>3</sup>	0.0122	ft <sup>3</sup>	
Mass	635.1	g	1.40	lb	Flow Pump Rate*	2.24E-04			cm <sup>3</sup> /sec	Mass	645.4	g	1.42	lb
Specific Gravity	2.700 (Assumed)			B - Value	0.95			Dry Density	87.4			pcf		
Dry Density	87.4			pcf	Cell Pressure	95.0			psi	Vol. of Voids	165.74			cm <sup>3</sup>
<b>Moisture Content</b>				Back Pressure	90.0			psi	Vol. of Solids	178.47			cm <sup>3</sup>	
Mass of wet sample & tare	635.1	g	Mass of dry sample & tare	481.8	g	Confining (Effective) Pressure	5.0			psi	Void Ratio	0.93		
Mass of tare	0.0	g	% Moisture	31.8	Max Head	205.39			cm	Saturation	98.7			%
				Min Head	203.99			cm	Mass of wet sample & tare	725.8	g	Mass of dry sample & tare	562.3	g
				Maximum Gradient	26.63			% Moisture	33.9			Mass of tare	80.5	g
				Minimum Gradient	26.45									

TIME FUNCTION			Δ t (sec)	READING DP, (psi)	Head (cm)	Gradient	Temp. T <sub>x</sub> (°C)	PERMEABILITY (cm/sec)		
DATE	HOUR	MIN						@ T <sub>x</sub>	R <sub>T</sub>	@ 20 °C
10/25/21	7	0	-	2.91	204.69	26.54	24.7	-	-	-
10/25/21	7	10	600	2.90	203.99	26.45	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	20	600	2.92	205.39	26.63	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	30	600	2.92	205.39	26.63	24.7	1.88E-07	0.895	1.69E-07
10/25/21	7	40	600	2.90	203.99	26.45	24.7	1.89E-07	0.895	1.69E-07
10/25/21	7	50	600	2.92	205.39	26.63	24.7	1.89E-07	0.895	1.69E-07
10/25/21	8	0	600	2.91	204.69	26.54	24.7	1.89E-07	0.895	1.69E-07

Note: Deaired Water Used for Permeability Test.

DESCRIPTION	USCS
NA	(ASTM D2487;2488)
	NA

REMARKS
Bottom Half of the mold was used for testing.

Reported Average Hydraulic Conductivity*		1.7E-07		cm/sec	
Flow pump ID #	244	Balance ID #	1035/1036	Differential Pressure Meter ID #	346
Thermometer ID #	796/985	Oven ID #	496/758	Board Pressure Meter ID #	694/459
Syringe ID #	245			Pore Pressure Meter ID #	372

\*Constant Rate of Flow System (Flow Pump with Calibrated Syringe for Inflow and Calibrated Graduated Pipette for outflow) is capable to maintain a constant rate of inflow & outflow through the fully saturated sample with accuracy +/-5%. Flow Pump Rate issued for calculations of HC (ASTM STP 977) results at steady Differential Pressure (DP) Readings at the range of +/-5%. Permeation was stopped after HC versus Time (see table above) showed no significant upward or downward trend.