Indoor-Air Sampling
Olympia Commons
318 State Avenue NE
Olympia, WA 98501

Prepared for: Ms. Robin Amadon
Low Income Housing Institute, LIHI
2407 First Avenue
Seattle, WA 98121

Prepared by: G-Logics, Inc.
40 2nd Avenue SE
Issaquah, WA 98027

Telephone: (425) 391-6874
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March 31, 2017

G-Logics Project 01-1050-B

March 31, 2017
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Ms. Robin Amadon
Low Income Housing Institute, LIHI
2407 First Avenue
Seattle, WA 98121

Subject: Indoor-Air Sampling
Olympia Commons
318 State Avenue NE
Olympia, WA 98501

Dear Ms. Amadon:

Presented in this report are the results of G-Logics indoor-air sampling efforts performed at the subject property. This report documents the purpose, approach, and results of this work as well as G-Logics conclusions and recommendations.

We trust the information presented in this report meets your needs at this time. Should you require additional information or have any questions, please contact us at your convenience. Thank you again for this opportunity to be of service.

Sincerely,

G-Logics, Inc.

Rory L. Galloway, LG, LHG
Principal

Dan Hatch, PMP
Remediation Manager

G-Logics, Inc.
40 2nd Avenue SE
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TABLE OF CONTENTS

1.0 INTRODUCTION

At the request of Low Income Housing Institute, (LIHI), G-Logics has completed indoor-air sampling at the subject property (Property), located at 318 State Avenue NE, Olympia, WA (Figure 1). G-Logics understands that LIHI recently purchased and redeveloped the Property, constructing a multi-story apartment building. Previous to LIHI's purchase of the Property from the City of Olympia, the Property was known to have been contaminated with chlorinated solvents, specifically tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene, 1,2- cis-dichloroethene, 1,2- trans- dichloroethene, and vinyl chloride.

This report documents an indoor-air sampling designed to assess if chlorinated solvents are present in the indoor air of the new building. Based on the results of this sampling and a comparison to the Washington Model Toxic Control Act (MTCA) Cleanup Levels for indoor air (cleanup levels), recommendations can be made regarding the presence of chlorinated solvents. Specifically, recommendations can be made regarding the need for additional sampling and and/or mitigation measures to reduce contaminant concentrations to levels acceptable under MTCA. Our air-sampling work was performed in accordance with our workplan dated March 29, 2016.

2.0 BACKGROUND

In 2009, the City of Olympia conducted an independent remedial action (cleanup) on the Property and surrounding area. The cleanup involved the removal and offsite disposal of soil contaminated with chlorinated solvents, benzene, polycyclic aromatic hydrocarbons, arsenic, and lead. Conformation soil samples collected and analyzed after the cleanup work was completed confirmed that the concentrations of the contaminants (discussed above) were below Method A and B cleanup levels for soil.

In August 2015, one groundwater and four soil-gas samples were collected on the Property to assess for remaining chlorinated-solvent contaminants. Specifically, the effort was performed to evaluate the potential for vapor intrusion into indoor areas of the then proposed redevelopment/building (current structure).

The analytical results from the 2015 groundwater sample reported that PCE, TCE, 1,1-Dichloroethene, 1,2- cis-dichloroethene, and 1,2- trans- dichloroethene were not detected at laboratory reporting limits. However, vinyl chloride was detect at a concentration greater than groundwater cleanup levels.

Analytical results from the 2015 soil-gas samples reported that PCE, TCE, 1,2- cis-dichloroethene, and vinyl chloride were present in various samples. Two sample locations, SG-1 and SG-3, contained TCE and vinyl chloride at concentrations below Method B screening levels for soil-gas. The other two sampling locations, SG-2 and SG-4, contained PCE, TCE, 1,2- cis-dichloroethene, and vinyl chloride. At these locations, TCE was above Method B screening levels for soil gas, with PCE also above the screening level in SG-4. The location of these samples can be seen on Figure 2.

Based on the analytical results of the groundwater and soil-gas sampling, the Washington State Department of Ecology (Ecology) required engineering controls to support the conducted cleanup and No Further Action determination (NFA) request for the property and proposed building. These requirements were recorded in an Environmental Covenant for the Property, recorded June 17, 2015. Accordingly, LIHI included the installation of a vapor barrier and soil-vapor mitigation system into the building's design as engineering controls. In addition to engineering controls, Ecology required that indoor-air was to be assessed in the new building prior to occupancy. Per the instructions recorded in the Environmental Covenant, this report documents the indoor-air sampling intended to satisfy Ecology requirement.

3.0 AIR-SAMPLING ACTIVITIES

To provide information of possible soil-vapor intrusion, indoor air was sampled using 6-liter Summa canisters at three indoor and one outdoor location. The sampling included the collection of outdoor ambient air for comparison purposes to indoor-air results.

3.1 Summa Canister Placement

On March 4, 2017, G-Logics placed Summa canisters at the indoor and outdoor locations shown on Figure 2. Each canister was equipped with a 24-hour flow-regulator. The first canister (GL-IA-1) was placed in the northeastern portion of the building, specifically in the bedroom area of unit B1-b. The second canister (GL-IA-02) was placed in the southeast

portion of the building in the class/meeting room. The third canister (GL-IA-3) was placed in the outside, in the entrance area to the vestibule on the south side of the building to record ambient air conditions. The fourth canister (GL-IA-4) was placed in the southwest portion of the building in the common room.

The Summa canisters were placed at breathing level (approximately four to five-feet off the ground surface) and collected air samples for an approximate a 24-hour period. The Summa canisters initial and final pressures were recorded on the chain-of-custody. Summa canister pressures were allowed to depressurize to at least 3 inHg before collection (Table 1).

The Summa canisters were collected on March 5, 2017 and delivered to Fremont Analytical on March 6, 2017 for laboratory analysis via EPA Method TO-15 (SIM) for Volatile Organic Compounds. Specifically a targeted analysis for PCE, TCE, 1,1-dichloroethene, 1,2- cis-dichloroethene, 1,2- trans- dichloroethene, and vinyl chloride was performed.

3.2 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) included generally accepted procedures for sample collection, storage, tracking, documentation, and analysis. The Summa canisters were batch certified by Fremont Analytical (see Appendix A). All samples were labeled with a sample number, date, time, pressures, and sampler name. Appropriate chain-of-custody documentation was completed.

4.0 AIR-SAMPLING RESULTS

The findings of this air sampling are presented below. A summary of the analytical results is presented on Table 2. The analytical laboratory reports for the analyzed air samples are attached as Appendix A of this report. Chain-of custody forms are also included in Appendix A.

4.1 Air-Sampling Findings

Only one analyte, 1,2- trans- dichloroethene, was detected in all three indoor-air samples (GL-IA-1, GL-IA-2, and GL-IA-4). All detected concentrations of 1,2- trans- dichloroethene were below the MTCA Method B non-carcinogenic indoor-air cleanup level (Table 1). Non-carcinogenic cleanup levels are based on concentrations that could cause illness in humans.

Carcinogenic cleanup levels are based on concentrations that could cause cancer in humans and are typically more stringent than non-carcinogenic cleanup levels. Carcinogenic cleanup levels for 1,2- trans- dichloroethene have not been established by Ecology.

The analyte TCE was detected in the outdoor air sample (GL-IA-3) at a concentration above the MTCA Method B carcinogenic air cleanup level (Table 1). TCE was not detected in any of the indoor-air samples.

5.0 CONCLUSIONS

The groundwater and soil-gas sampling conducted 2015 suggested that PCE, TCE, and vinyl chloride were present at concentrations that could lead to vapor migration into indoor spaces, affecting indoor air quality (vapor intrusion). The 2015 sampling event also reported that 1,2- cis-dichloroethene was present in soil gas, but at low concentrations. The analytes 1,1-dichloroethene and 1,2- trans- dichloroethene were not detected in the 2015 soil-gas samples. Note, an indoor-air cleanup level and/or soil-gas screening level for 1,2- cis-dichloroethene has not been established by Ecology.

Analytical results from our March 2017 sampling effort reported that TCE was detected in the one sample collected outside at concentrations above the indoor-air cleanup level. The three samples collected inside the building reported that PCE, TCE, 1,1-dichloroethene, 1,2-cis-dichloroethene, and vinyl chloride were not present in the indoor air. However, the analyte 1,2- trans- dichloroethene was detected in the three indoor-air samples, but at concentrations below the published cleanup level.

At this time, the source of 1,2- trans- dichloroethene detected in the indoor air-samples is unknown. However, according to the National Center for Biotechnology Information, G-Logics understands that 1,2- trans- dichloroethene is a clear colorless liquid with a pleasant odor and is used in many commercial/retail products including propellants, solvents for cleaning and degreasing, antibacterial agents, and perfumes.

The source of TCE found in the sample collected outside is unknown. The source could be from residual contamination on the property or from some unknown other source. Further sampling and investigation efforts could be performed to assess the source of the TCE.

6.0 OPINIONS AND RECOMMENDATIONS

Based on the comparison of the March 2017 sampling results to the August 2015 results, the sub-slab vapor barrier that was installed in the new building is mitigating vapor intrusion into the new building. Specifically, the chemicals of concern that were reported with the August 2015 sample event were not detected in the indoor air samples G-Logics collected in March 2017.

Based on this information, it is G-Logics opinion that:

- The installed vapor barrier is mitigating soil-gas entry into the building.
- The startup and operation of an active sub-slab vapor mitigation system does not appear to be warranted at this time.
- The vapor barrier is meeting the Ecology engineering-control requirements established for the Property NFA.
- Based on these analytical results, additional indoor air sampling is not required by the NFA.

However, if LIHI wishes to further understand the source of 1,2-trans-dichloroethene or if LIHI's risk tolerances require additional data be collected, G-Logics can prepare a workplan to conduct additional air and soil-gas sampling.

7.0 LIMITATIONS

Sampling for indoor-air contaminants is non-comprehensive by nature and are unlikely to identify all environmental problems or eliminate all risk. This report is a qualitative assessment. G-Logics offers a range of environmental assessment services to suit the needs of our clients, including more quantitative assessments. Although risk can never be eliminated, more detailed and extensive assessments yield more information, which may help to better understand and manage site risks. Since such detailed services involve greater expense, we ask our clients to participate in identifying the level of service that will provide them with an acceptable level of risk. Please contact G-Logics if you would like to discuss this issue of risk further.

The scope of work on this project was presented in our identified workplan and subsequently approved by you as our client. Please be aware our scope of work was limited to those items specifically identified in the workplan. Other activities not specifically included in the presented scope of work (in a workplan, correspondence, or this report) are excluded and are therefore not part of our services.

G-Logics performed this environmental assessment in accordance with the guidelines set forth in the Washington Administrative Codes (WAC) 173-340-350, 173-340-720(1)(c), 173-340-720(1)(d)(iv), and 173-340-750.

Land use, site conditions (both on-site and off-site), and other factors will change over time. Since site activities and regulations beyond our control could change at any time after the completion of this report, our observations, findings, and opinions can be considered valid only as of the date of the site visit.

This report is prepared for the sole use of our client. The scope of services performed during this assessment may not be appropriate for the needs of other users. Re-use of this document or the findings, conclusions, or recommendations presented herein, are at the sole risk of said user(s). Our client and regulatory agencies also may make additional copies of this document for their internal and public use, or as required by law. All other users of this document must acknowledge our copyright and indicate that permission to use has been received from G-Logics and our Client. Any party other than our client who would like to use this report shall notify G-Logics of such intended use by executing the “Permission and Conditions for Use and Copying” contained in this document. Based on the intended use of the report, G-Logics may require that additional work be performed and that an updated

report be issued. Non-compliance with any of these requirements will release G-Logics from any liability resulting from the use of this report by any unauthorized party.

No warranty, either express or implied, is made.

REFERENCES

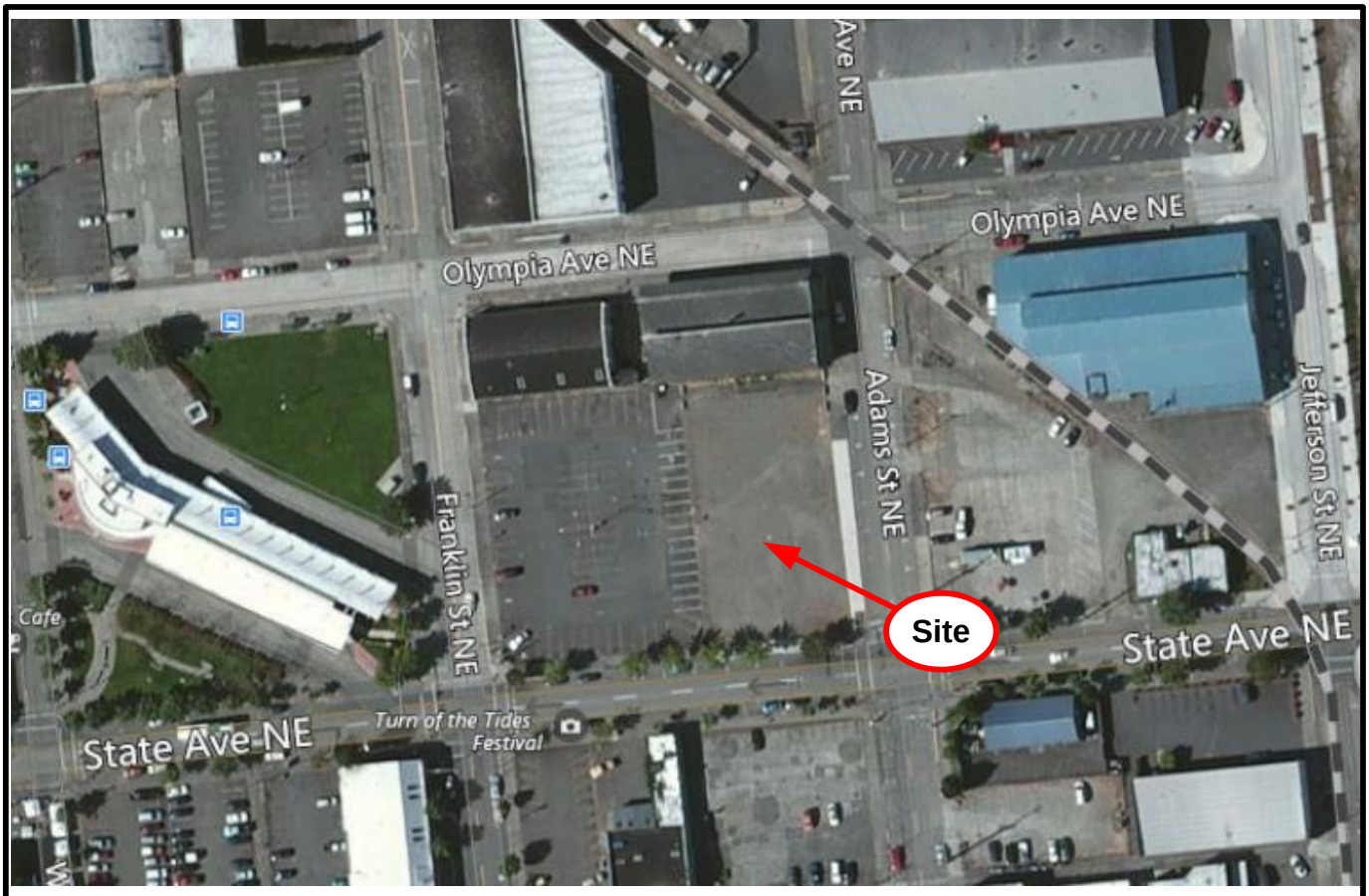
Washington Department of Ecology, *The Model Toxics Control Act (MTCA),* Revised 2013

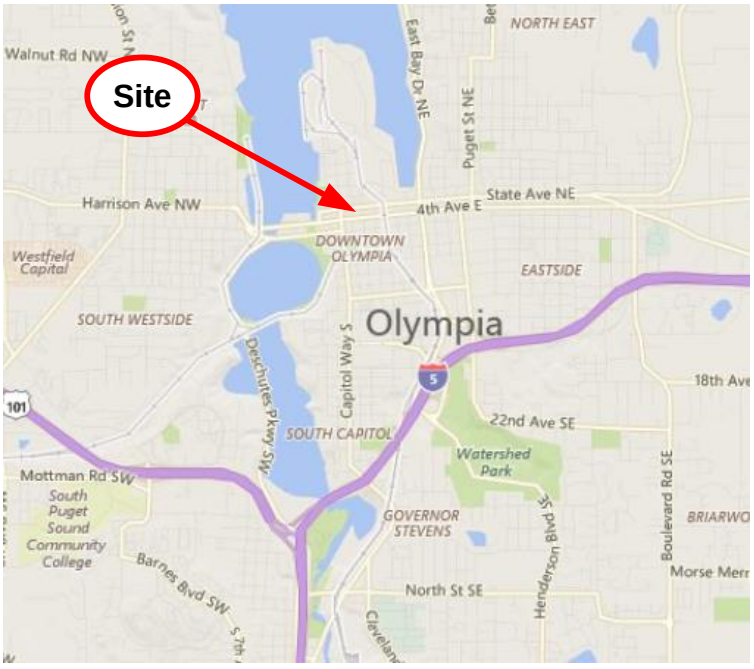
Washington Department of Ecology, *Guidance for Evaluating Soil Vapor Intrusion Washington State: Investigation and Remedial Action*, Publication No 09-09-047, Review Draft October, 2009, Revised February 2016

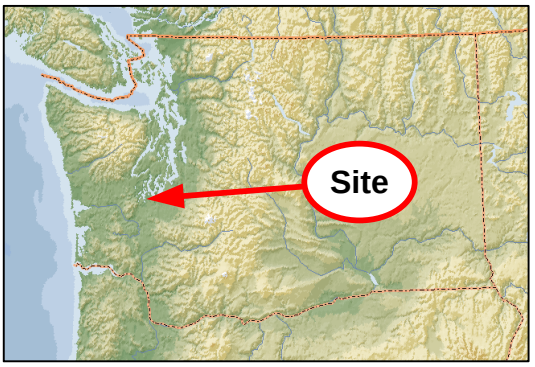
Washington Department of Ecology, *Environmental Covenant*, Dated June 17, 2015, Property Tax Parcel No. 78503200500.

Geo Engineers, *Supplemental Site Investigation Report – Soil Gas and Temporary Monitoring Well Sampling and Analysis,* Dated August 25, 2015.

FIGURES







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Site Location Maps

Olympia Commons

318 State Avenue NE

Olympia, Washington

Figure

1

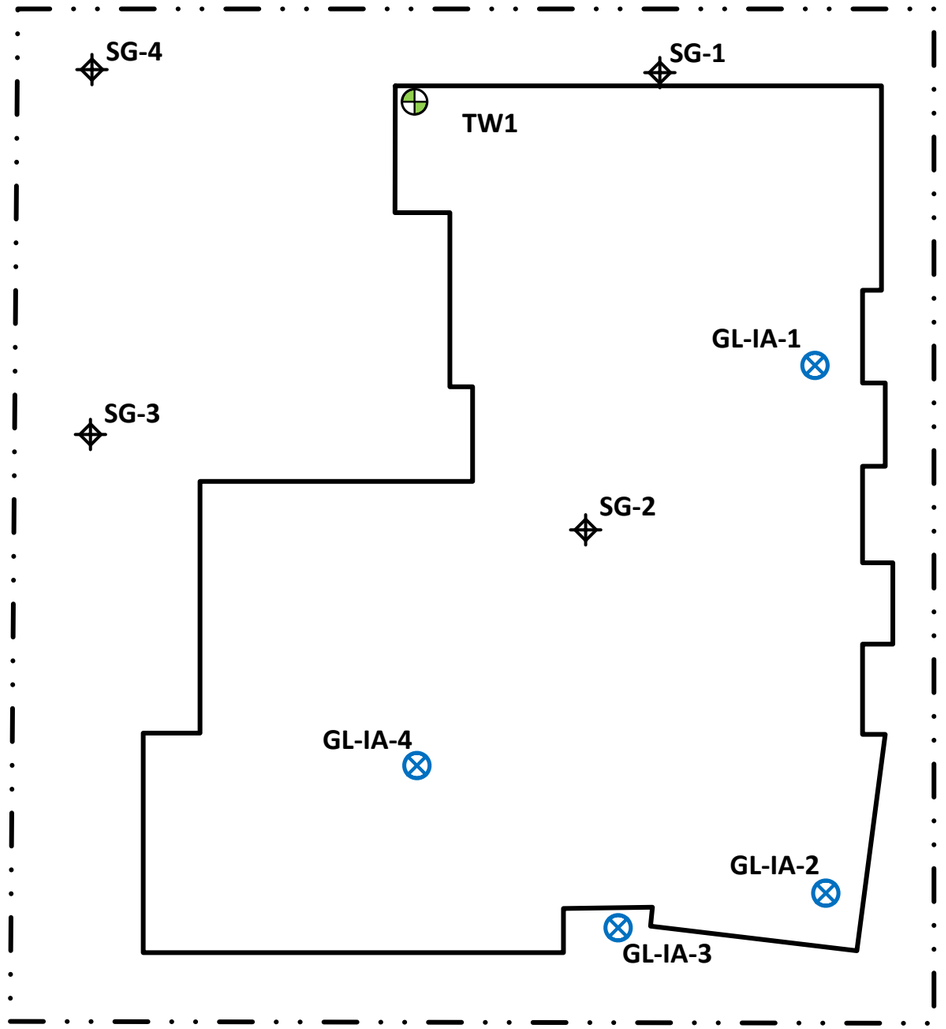
Project File: 01-1050-B F1.vsd

Mapping Reference: Delorme, Bing, and Google Maps

N

Legend

- Understood Property Boundary
- Approximate Building Footprint
- 2017 Air Sample/Summa Canister Location (G-Logics)
- 2015 Soil-Gas Sample Location (GeoEngineers)
- 2015 Groundwater Sample Location (GeoEngineers)



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Note: This figure contains information in color. Black & white photocopies may not be suitable for review.

Approximate Drawing Scale: 1" = 20'

0 ft. 12 ft. 20 ft. 40 ft.

Site Diagram, Sampling Locations

Olympia Commons

318 State Avenue, NE

Olympia, Washington

Figure 2

Project File: 01-1050-B F2.vsd

Mapping Reference: GeoEngineers, Hatton Godat Pantier, G-Logics Site Measurements

TABLES

Table 1
Indoor Air Sample Analysis (1)
Olympia Commons
318 State Avenue NE, Olympia, WA

Sampling Locations (units in ug/m3)	Sample Date	Sample Number	Initial Pressure (inHg)	Final Pressure (inHg)	Approximate Time Duration	Tetrachloroethylene (PCE)	Trichloroethylene (TCE)	1,1-Dichloroethylene (DCE)	1,2-cis-Dichloroethylene	1,2-trans-Dichloroethylene	Vinyl Chloride
Unit B1-b	3/5/2017	GL-IA-1	**30.0**	**2**	**24hr**	<0.339	<0.0914	<0.0357	<0.0793	**7.06**	<0.217
Class/Meeting Room	3/5/2017	GL-IA-2	**30.0**	**3**	**24hr**	<0.339	<0.0914	<0.0357	<0.0793	**15.1**	<0.217
Outside Main Entrance (Outdoors)†	3/5/2017	GL-IA-3	**30.0**	**3**	**24hr**	<0.339	**0.846**	<0.0357	<0.0793	<0.0238	<0.217
Common Room	3/5/2017	GL-IA-4	**28**	**3**	**24hr**	<0.339	<0.0914	<0.0357	<0.0793	**5.44**	<0.217
Ecology Indoor-Air Cleanup Levels (2), ug/m3						**9.62**	**0.37**	**NR**	**NR**	**NR**	**0.28**
						18.3	**0.914**	**91.4**	**NR**	**27.4***	**45.7**

Notes: Refer to site diagram(s) for sampling locations.

(1) EPA Method TO -15(SIM).

(2) Indoor Air Cleanup Levels, Method B, from Department of Ecology's *CLARC Values (Captured March 22, 2017).*

dup. Duplicate Sample for QA/QC.

27 Bold Number(s) Indicates Detection.

160 Bold Number(s) and Shading Indicates Concentration Exceeds Cleanup Levels.

NR Not Researched/Established, No Available Cleanup Levels

Air, Method B - Cancer Levels

Air, Method B - Non Cancer Levels

<50.0 Sample concentration below listed laboratory-reporting limit.

† Sample collected outside for outdoor air/background level comparison

***** Air Cleanup Levels, Method B, from Department of Ecology's CLARC Values (Captured March 22, 2017).

APPENDIX A

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

G-Logics
Dan Hatch
40 Second Ave. SE
Issaquah, WA 98027

RE: Olympia Commons
Work Order Number: 1703047

March 13, 2017

Attention Dan Hatch:

Fremont Analytical, Inc. received 4 sample(s) on 3/6/2017 for the analyses presented in the following report.

Volatile Organic Compounds-EPA Method TO-15 (SIM)

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway
Laboratory Director

Date: *03/13/2017*

CLIENT: G-Logics
Project: Olympia Commons
Work Order: 1703047

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1703047-001	GL-IA-2	03/04/2017 4:18 PM	03/06/2017 10:42 AM
1703047-002	GL-IA-1	03/04/2017 4:15 PM	03/06/2017 10:42 AM
1703047-003	GL-IA-3	03/04/2017 4:30 PM	03/06/2017 10:42 AM
1703047-004	GL-IA-4	03/04/2017 4:24 PM	03/06/2017 10:42 AM

Case Narrative

WO#: **1703047**
Date: **3/13/2017**

CLIENT: G-Logics
Project: Olympia Commons

WorkOrder Narrative:
I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Air samples are reported in ppbv and ug/m3.

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Standard temperature and pressure assumes 24.45 = (25C and 1 atm).

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Client: **G-Logics**
WorkOrder: 1703047
Project: Olympia Commons

Client Sample ID: GL-IA-2
Lab ID: 1703047-001A
Sample Type: Summa Canister

Date Sampled: 3/4/2017
Date Received: 3/6/2017

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
Volatile Organic Compounds-EPA Method TO-15 (SIM)								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
1,1-Dichloroethene (DCE)	<0.00900	<0.0357	0.00900	0.0357		EPA-TO-15SIM	03/10/2017	BC
cis-1,2-Dichloroethene	<0.0200	<0.0793	0.0200	0.0793		EPA-TO-15SIM	03/10/2017	BC
Tetrachloroethene (PCE)	<0.0500	<0.339	0.0500	0.339		EPA-TO-15SIM	03/10/2017	BC
trans-1,2-Dichloroethene	3.81	15.1	0.00600	0.0238		EPA-TO-15SIM	03/10/2017	BC
Trichloroethene (TCE)	<0.0170	<0.0914	0.0170	0.0914		EPA-TO-15SIM	03/10/2017	BC
Vinyl chloride	<0.0850	<0.217	0.0850	0.217		EPA-TO-15SIM	03/10/2017	BC
Surr: 4-Bromofluorobenzene	93.9 %Rec	--	70-130	--		EPA-TO-15SIM	03/10/2017	BC

Client: **G-Logics**
WorkOrder: 1703047
Project: Olympia Commons

Client Sample ID: GL-IA-1
Lab ID: 1703047-002A
Sample Type: Summa Canister

Date Sampled: 3/4/2017
Date Received: 3/6/2017

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
Volatile Organic Compounds-EPA Method TO-15 (SIM)								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
1,1-Dichloroethene (DCE)	<0.00900	<0.0357	0.00900	0.0357		EPA-TO-15SIM	03/10/2017	BC
cis-1,2-Dichloroethene	<0.0200	<0.0793	0.0200	0.0793		EPA-TO-15SIM	03/10/2017	BC
Tetrachloroethene (PCE)	<0.0500	<0.339	0.0500	0.339		EPA-TO-15SIM	03/10/2017	BC
trans-1,2-Dichloroethene	1.78	7.06	0.00600	0.0238		EPA-TO-15SIM	03/10/2017	BC
Trichloroethene (TCE)	<0.0170	<0.0914	0.0170	0.0914		EPA-TO-15SIM	03/10/2017	BC
Vinyl chloride	<0.0850	<0.217	0.0850	0.217		EPA-TO-15SIM	03/10/2017	BC
Surr: 4-Bromofluorobenzene	93.5 %Rec	--	70-130	--		EPA-TO-15SIM	03/10/2017	BC

Client: **G-Logics**
WorkOrder: 1703047
Project: Olympia Commons

Client Sample ID: GL-IA-3
Lab ID: 1703047-003A
Sample Type: Summa Canister

Date Sampled: 3/4/2017
Date Received: 3/6/2017

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
Volatile Organic Compounds-EPA Method TO-15 (SIM)								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
1,1-Dichloroethene (DCE)	<0.00900	<0.0357	0.00900	0.0357		EPA-TO-15SIM	03/10/2017	BC
cis-1,2-Dichloroethene	<0.0200	<0.0793	0.0200	0.0793		EPA-TO-15SIM	03/10/2017	BC
Tetrachloroethene (PCE)	<0.0500	<0.339	0.0500	0.339		EPA-TO-15SIM	03/10/2017	BC
trans-1,2-Dichloroethene	<0.00600	<0.0238	0.00600	0.0238		EPA-TO-15SIM	03/10/2017	BC
Trichloroethene (TCE)	0.157	0.846	0.0170	0.0914		EPA-TO-15SIM	03/10/2017	BC
Vinyl chloride	<0.0850	<0.217	0.0850	0.217		EPA-TO-15SIM	03/10/2017	BC
Surr: 4-Bromofluorobenzene	92.3 %Rec	--	70-130	--		EPA-TO-15SIM	03/10/2017	BC

Client: **G-Logics**
WorkOrder: 1703047
Project: Olympia Commons

Client Sample ID: GL-IA-4
Lab ID: 1703047-004A
Sample Type: Summa Canister

Date Sampled: 3/4/2017
Date Received: 3/6/2017

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
Volatile Organic Compounds-EPA Method TO-15 (SIM)								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
1,1-Dichloroethene (DCE)	<0.00900	<0.0357	0.00900	0.0357		EPA-TO-15SIM	03/10/2017	BC
cis-1,2-Dichloroethene	<0.0200	<0.0793	0.0200	0.0793		EPA-TO-15SIM	03/10/2017	BC
Tetrachloroethene (PCE)	<0.0500	<0.339	0.0500	0.339		EPA-TO-15SIM	03/10/2017	BC
trans-1,2-Dichloroethene	1.37	5.44	0.00600	0.0238		EPA-TO-15SIM	03/10/2017	BC
Trichloroethene (TCE)	<0.0170	<0.0914	0.0170	0.0914		EPA-TO-15SIM	03/10/2017	BC
Vinyl chloride	<0.0850	<0.217	0.0850	0.217		EPA-TO-15SIM	03/10/2017	BC
Surr: 4-Bromofluorobenzene	93.9 %Rec	--	70-130	--		EPA-TO-15SIM	03/10/2017	BC

Work Order: 1703047
CLIENT: G-Logics
Project: Olympia Commons

QC SUMMARY REPORT

Volatile Organic Compounds-EPA Method TO-15 (SIM)

Sample ID **LCS-R34887** SampType: **LCS** Units: **ppbv** Prep Date: **3/10/2017** RunNo: **34887**
Client ID: **LCSW** Batch ID: **R34887** Analysis Date: **3/10/2017** SeqNo: **666279**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Vinyl chloride	2.34	0.0850	2.500	0	93.6	70	130				
1,1-Dichloroethene (DCE)	2.84	0.00900	2.500	0	114	70	130				
trans-1,2-Dichloroethene	2.60	0.00600	2.500	0	104	70	130				
cis-1,2-Dichloroethene	2.72	0.0200	2.500	0	109	70	130				
Trichloroethene (TCE)	2.43	0.0170	2.500	0	97.0	70	130				
Tetrachloroethene (PCE)	2.59	0.0500	2.500	0	104	70	130				
Surr: 4-Bromofluorobenzene	9.78		10.00		97.8	70	130				

Sample ID **MB-R34887** SampType: **MBLK** Units: **ppbv** Prep Date: **3/10/2017** RunNo: **34887**
Client ID: **MBLKW** Batch ID: **R34887** Analysis Date: **3/10/2017** SeqNo: **666280**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Vinyl chloride	ND	0.0850									
1,1-Dichloroethene (DCE)	ND	0.00900									
trans-1,2-Dichloroethene	ND	0.00600									
cis-1,2-Dichloroethene	ND	0.0200									
Trichloroethene (TCE)	ND	0.0170									
Tetrachloroethene (PCE)	ND	0.0500									
Surr: 4-Bromofluorobenzene	9.09		10.00		90.9	70	130				

Sample ID **1703047-004AREP** SampType: **REP** Units: **ppbv** Prep Date: **3/11/2017** RunNo: **34887**
Client ID: **GL-IA-4** Batch ID: **R34887** Analysis Date: **3/11/2017** SeqNo: **666278**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Vinyl chloride	ND	0.0850						0		30	
1,1-Dichloroethene (DCE)	ND	0.00900						0		30	
trans-1,2-Dichloroethene	0.974	0.00600						1.371	33.9	30	R
cis-1,2-Dichloroethene	ND	0.0200						0		30	
Trichloroethene (TCE)	ND	0.0170						0		30	
Tetrachloroethene (PCE)	ND	0.0500						0		30	

Work Order: 1703047
CLIENT: G-Logics
Project: Olympia Commons

QC SUMMARY REPORT

Volatile Organic Compounds-EPA Method TO-15 (SIM)

Sample ID **1703047-004AREP** SampType: **REP** Units: **ppbv** Prep Date: **3/11/2017** RunNo: **34887**
Client ID: **GL-IA-4** Batch ID: **R34887** Analysis Date: **3/11/2017** SeqNo: **666278**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: 4-Bromofluorobenzene	9.47		10.00		94.7	70	130		0		

NOTES:
R - High RPD due to low analyte concentration. In this range, high RPD's may be expected.

Sample Log-In Check List

Client Name:	**GL**	Work Order Number:	**1703047**
Logged by:	**Erica Silva**	Date Received:	**3/6/2017 10:42:00 AM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☐	No ☑	NA ☐
		Air samples		
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☐	No ☐	NA ☑
7.	Were all items received at a temperature of >0°C to 10.0°C*	Yes ☐	No ☐	NA ☑
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Air Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Laboratory Project No (Internal): 1703047

Date: 3/15/17 Page: 1 of: 1

Client: G-Logics
Address: 40 2ND AVE SE ~~ISSAQUAH WA~~
City, State, Zip: ISSAQUAH WA
Telephone: Fax:

Project Name: OLYMPIA COMMONS
Project No:
Collected by: MARIS VANDEHEY
Location: 01-1050-13 / 318 STADIUM AVE NE OLYMPIA WA
Reports To (PM): DAN HATCH
Email (PM): DANH@G-LOGICS.COM

* Gas Matrix Codes: I = Indoor SS = Subslab L = Landfill SG = Soil Gas M = Plume Mapping Q = Fuel Gas Quality L = LEED (Consult Client Services)

** Container Codes: 6L = Six Liter Canister TB = Tedlar Bag BV = 1 Liter Bottle Vac MC = 1 Liter MiniCan HP = High Pressure Cylinder HJ = Glass Headspace Jar

	Sample Name	Canister / Flow Reg Serial #	Sample Date & Time	Gas Matrix Code *	Anticipated Fill Time	Sample Volume	Container Type **	Internal: Evacuation Pressure (mtorr)	Internal: Pressure at Time of Pick-up (" Hg)	Internal: Equipment Certificaton Code	Field Initial Sample Pressure (" Hg)	Field Final Sample Pressure (" Hg)	Analysis Requested	Internal: Receipt Date	Internal: Final Pressure ("Hg)
1	GL-IA-2	15896	3/14/17 START	1	24hr	6L	Canister	10 mTorr	30		30	~~23~~	TO-15 SIM	3/16	-3
		FR8-04						2/23/17 14:30	3/3/17 1206		1618	1522			
2	GL-IA-1	13986	3/14/17 START	1	24hr	6L	Canister	10 mTorr	30 1204		30	2	TO-15 SIM	3/16	-2
		FR8-08						2/23/17 14:30	3/3/17		1615	1523			
3	GL-IA-3	17241	3/14/17 START	1	24hr	6L	Canister	10 mTorr	30Hg		30Hg	3	TO-15 SIM	3/16	-2
		FR8-19						2/23/17 14:30	3/3/17 1155		1630	1526			
4	GL-IA-4	17237	3/14/17 START	1	24hr	6L	Canister	10 mTorr	28.5 Hg		28	~~23~~	TO-15-SIM	3/16	-2
		FR8-31						2/23/17 14:30	3/3/17 1150		1624	1520			
5															

Condition:

Seals Intact: Y N N/A

Turn-around times for samples received after 4:00pm will begin on the following business day.

Special Remarks:
TARGES SIX: PCE, TCE, VINYL CHLORIDE, CIS-1-2 DICHLOROETHYLENE, TRANS-1,2-DICHLOROETHYLENE, + THE SIXTH ONE.

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished	Date/Time	Received	Date/Time
x	3/16/17 1042	x	3/16/17 1042
Relinquished	Date/Time	Received	Date/Time
x		x	

TAT → (STD) Rush (specify)

ADDRESS
Fremont Analytical, Inc.
3600 Fremont Ave N.
Seattle, WA 98103
TEL: 206-352-3790
FAX: 206-352-7178
Website: www.fremontanalytical.com

Certificate of Analysis

Batch ID: 177 **Start Date:** 2/23/2017 2:11:59 PM
Comment: R34607

Cleaning Batch Members:

Canister ID	Lot# / Serial#	Canister Type	Volume (Liters)
13986	13986	Summa w/FR	6
15421	15421	Summa w/FR	6
15423	15423	Summa w/FR	6
15896	15896	Summa w/FR	6
17237	17237	Summa w/FR	6
17238	17238	Summa w/FR	6
17241	17241	Summa w/FR	6
17242	17242	Summa w/FR	6

Canisters from batch cleaning verification results:

Canister ID: 13986 **Test Code:** A-CNCL **SeqNo:** 660700
Expiration Date: **Method No:** EPA-TO-15 **Analysis Date:** 2/23/2017 5:16:54 AM

Analyte	Unit	Result	Analyte	Unit	Result	Analyte	Unit	Result
4-Bromofluorobenzene	%REC	9.30	Propylene	ppbv	< 0.500	Dichlorodifluoromethane	ppbv	< 0.300
Chloromethane	ppbv	< 0.500	Dichlorotetrafluoroethane	ppbv	< 0.500	Vinyl chloride	ppbv	< 0.200
1,3-Butadiene	ppbv	< 0.500	Bromomethane	ppbv	< 0.500	Trichlorofluoromethane	ppbv	< 0.300
Chloroethane	ppbv	< 0.500	Acrolein	ppbv	< 0.500	1,1-Dichloroethene	ppbv	< 0.200
Acetone	ppbv	< 1.00	2-Propanol	ppbv	< 1.00	Methylene chloride	ppbv	< 1.50
Carbon disulfide	ppbv	< 1.50	trans-1,2-Dichloroethene	ppbv	< 0.200	tert-Butyl Methyl Ether	ppbv	< 0.200
n-Hexane	ppbv	< 0.200	1,1-Dichloroethane	ppbv	< 0.200	Vinyl acetate	ppbv	< 1.00
cis-1,2-Dichloroethene	ppbv	< 0.200	2-Butanone	ppbv	< 0.500	Ethyl acetate	ppbv	< 1.00
Chloroform	ppbv	< 0.200	Tetrahydrofuran	ppbv	< 0.500	1,1,1-Trichloroethane	ppbv	< 0.200
Carbon tetrachloride	ppbv	< 0.200	1,2-Dichloroethane	ppbv	< 0.200	Benzene	ppbv	< 0.200
Cyclohexane	ppbv	< 0.200	Trichloroethene	ppbv	< 0.200	1,2-Dichloropropane	ppbv	< 0.500
Methyl methacrylate	ppbv	< 0.300	Bromodichloromethane	ppbv	< 0.300	1,4-Dioxane	ppbv	< 1.00
cis-1,3-dichloropropene	ppbv	< 0.500	Toluene	ppbv	< 0.200	trans-1,3-dichloropropene	ppbv	< 0.500
1,1,2-Trichloroethane	ppbv	< 0.500	Tetrachloroethene	ppbv	< 0.300	Chlorodibromomethane	ppbv	< 0.500
1,2-Dibromoethane	ppbv	< 0.200	Chlorobenzene	ppbv	< 0.200	Ethylbenzene	ppbv	< 0.300
m,p-Xylene	ppbv	< 0.200	o-Xylene	ppbv	< 0.200	Styrene	ppbv	< 0.300
Bromoform	ppbv	< 0.200	1,1,2,2-Tetrachloroethane	ppbv	< 0.300	1,3,5-Trimethylbenzene	ppbv	< 0.300
1,2,4-Trimethylbenzene	ppbv	< 0.300	Benzyl chloride	ppbv	< 0.500	p-Ethyltoluene	ppbv	< 0.300
1,3-Dichlorobenzene	ppbv	< 0.300	1,4-Dichlorobenzene	ppbv	< 0.300	1,2-Dichlorobenzene	ppbv	< 0.500
1,2,4-Trichlorobenzene	ppbv	< 0.300	Hexachlorobutadiene	ppbv	< 1.00	Naphthalene	ppbv	< 0.300
2-Hexanone	ppbv	< 1.00	4-Methyl-2-pentanone	ppbv	< 1.00	1,1,2-Trichloro-1,2,2-trifluoroethane	ppbv	< 0.500
Heptane	ppbv	< 0.500						

ATTACHMENTS

Permission and Conditions for Use and Copying Form

Indoor-Air Sampling Olympia Commons, 318 State Avenue NE
Olympia, WA 98501

G-Logics Project 01-1050-B
March 31, 2017

G-Logics prepared the above-identified Document only for our Client and/or other user(s), as identified in the Document, for the purposes stated and subject to any identified and contractual limitations. Regulatory agencies may make additional "fair use" copies for internal and public use based on state and federal laws that do not violate copyright laws.

All other Requestors must obtain permission from G-Logics and our Client in order to avoid copyright violations. To request authorization for a copy of the Document, please read our conditions listed below, complete the Requestor section, and fax to G-Logics at 425-313-3074 for approval review.

- I recognize that G-Logics has prepared this Document only for their Client and/or other user(s), only for the purposes stated in the Document and subject to any identified and contractual limitations.
- My intended use of the Document is for general informational purposes only.
- I understand and accept that there may be limitations to the reliability of the Document's findings due to circumstances beyond the control of G-Logics, the limited scope of funding, and/or limitations inherent in the nature of the performed services.
- I agree not to rely on the Document as being comprehensive or inclusive of all possible site hazards and agree to defend, indemnify, and hold G-Logics harmless from and against any and all claims, damages, or liability which arise from or which are alleged to arise from my use of the Document. I also will compensate G-Logics for any time spent or expenses incurred by G-Logics in defense of any such claim.
- I am advised that the Document is a qualitative evaluation of site conditions and should not be used to estimate site-remediation costs, if cleanup is necessary. Remediation cost estimates would require additional data beyond what is presented in the Document.
- I agree not to provide the Document to any other person or organizations without prior authorization from G-Logics and their Client.

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Requestor's Company _____

Mailing Address _____

City, State, Zip Code _____

Contact Name & Title _____

Signature & Date _____

Telephone & Fax Numbers _____

Planned Use of Document _____

_____

_____

_____

With your information and signature above, please fax to G-Logics (425-313-3074) for approval review. G-Logics will share your request with our Client for their approval.

Client Review and Acknowledgment of Use and Copying Request

Per the notification of G-Logics, I, the Client, have reviewed this request for copying/use of this Document, have discussed the request with G-Logics, and grant my consent as indicated by my signature below.

Client Company _____

Client Contact Name & Title _____

Signature & Date _____

Telephone & Fax Numbers _____

G-Logics review and Acknowledgment of Use and Copying Request

Based on your concurrence with the above-presented conditions, approval of our Client, and our review of the information, G-Logics allows the Requestor to copy/use the above referenced Document for purposes stated. Additional fees may apply.

G-Logics Signature _____

Title _____

Date _____

From: Dan Hatch
Sent: Friday, April 08, 2016 10:30 AM
To: Whitney Rearick
Cc: Eric Blank; Robin Amadon; Steve Holmes; Rory Galloway
Subject: RE: OC: G-Logics' site reviews
Attachments: P4072845.JPG; P4072854.JPG

Good Morning LIHI team,

My site visit yesterday went well. I would say that they are doing a good job to make sure the sub-slab piping is being installed so that the system can be effective. The loops of the system were in place, but other work project needs to be done before they can complete the solid pipe sections that will connect to the slotted pipe and stick up through the concrete.

Juan, the excavator, and I discussed at length the what and whys of the sub-slab components (of the mitigation system) and feel confident they will complete the solid section (beneath the slab) as needed. To save on multiple trips (for me) to the site, Juan will continue to take pictures and call me as they progress to make sure things are as they should. Juan and I also discussed what needs to happen above ground and what we are expecting for the indoor air sampling. Sounds like Juan and I will have a pretty good relationship by the time this is complete. ☺

Once the system is completed, I will write a letter/memo to document the installation of the system. The memo will of course have several photos documenting the installation process.

Let me know if you have any questions. Cheers and enjoy the beautiful weather.

Best Regards,

Dan Hatch, PMP, Remediation Manager
Cell: 253-389-5334 | Danh@G-Logics.com

Do justly, Love mercifully, Walk humbly, this is enough. - John Adams

G-Logics, Inc. | 40 2nd Avenue SE | Issaquah, WA 98027-3452
Office: 425-391-6874 | *Fax*: 425-313-3074 | www.G-Logics.com

From: Whitney Rearick [mailto:wrearick@lihi.org]
Sent: Thursday, April 07, 2016 9:27 AM

To: Dan Hatch
Cc: Eric Blank; Robin Amadon; Duane Wilson; Norman Ouellette; Juan Rivero; Shari Chin; Riley Tobin
Subject: Re: OC: G-Logics' site reviews

Dan -

We're going to stay in Seattle today and leave this one to you. If you could take plenty of pictures, that would be great.

Thanks -

Whitney

On Thu, Apr 7, 2016 at 8:59 AM, Dan Hatch <danh@g-logics.com> wrote:

Hi Eric,

All good, Juan and I have had several phone calls discussing the installation. I'm fine with what they have going, and will confirm that this afternoon. If I see a problem, they'll obviously need to correct it, but from my conversations with Juan I believe we are okay. We can talk more onsite this afternoon.

See you there, cheers.

Best Regards,

Dan Hatch, PMP, Remediation Manager
Cell: 253-389-5334 | Danh@G-Logics.com

Do justly, Love mercifully, Walk humbly, this is enough. - John Adams

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Office: 425-391-6874 | *Fax*: 425-313-3074 | www.G-Logics.com

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From: Eric Blank [mailto:eblank@lihi.org]
Sent: Thursday, April 07, 2016 8:49 AM
To: Dan Hatch
Cc: Whitney Rearick; Robin Amadon; Duane Wilson; Norman Ouellette; Juan Rivero; Shari Chin; Riley Tobin
Subject: RE: OC: G-Logics' site reviews
Importance: High

Hey Dan-

The photos that Norman emailed you yesterday showed the pipes being covered. Looking again at the email below from 3/15, we had requested that you inspect the pipes prior to them being covered.

Is this a problem? Do we need to ask Pavilion to re-expose the pipe prior to your site visit this afternoon?

Eric Blank AIA, LEED BD+C

Senior Architect and Design Manager

Low Income Housing Institute

206) 957-8057 direct

www.LIHI.org

A 501(c)3 non-profit organization

Celebrating 25 Years

Housing is a Human Right!

From: Eric Blank [mailto:eblank@lihi.org]
Sent: Tuesday, March 15, 2016 5:05 PM
To: 'Norman Ouellette'; 'Juan Rivero'; 'Shari Chin'
Cc: 'Dan Hatch'; Whitney Rearick; Robin Amadon; 'Duane Wilson'; 'Brian Kent'; 'Rodney Huschka'; 'Jeff Speert'
Subject: OC: G-Logics' site reviews

Hey guys-

Following up on our meeting this morning, I spoke with Dan Hatch and confirmed G-Logics' scope of work for reviews on our Olympia Commons project as follows:

1. Review a Shop Drawing showing the proposed layout of the underslab passive ventilation pipes prior to installation. G-Logics' report lists their recommended design parameters and included a simple sketch, but we requested that someone more familiar with the various pieces of the project coordinate the actual layout of the pipes. Per our conversation this morning, Black Hills agreed to prepare it. Regardless who ends up preparing the drawing, please let us know ASAP when G-Logics can expect to receive it so they can plan their review and return it to you ASAP. It can be a simple single-line drawing (PDF) overlaid on the level 1 slab plan, but it should include the critical dimensions per G-Logics' recommendations, and it should be formatted to include in our project as-builts.

2. Review the pipes installed on site before they are buried. As discussed, G-Logics has requested a week's notice if possible. We ask that you please give them as much notice as possible and confirm that you are ready for their review no later than 24 hours before their scheduled visit. G-Logics will confirm the pipe installation and the location of the vertical stub-up into the building.

3. Sample the indoor air quality as soon as possible after the building is sealed up. This will be a ways out, but it is critical to our obligations to the Department of Ecology. Pavilion will need to schedule a visit from G-Logics as soon as the windows and doors are taped in. They will sample 3 locations inside the building and 1 location outside the building.

Contrary to what I said on site this morning, G-Logics will not be inspecting the installation of the Vapor Barrier. JRS will be doing that.

If you have any questions or require additional information, please let me know.

Thanks,

Eric

--
Whitney Rearick
Housing Developer
Low Income Housing Institute
Celebrating 25 years
(o) 206.957.8055 (m) 208.863.9655

Final System Inspection:
Just after loop installation and during slab-on-grade preparation

From: Dan Hatch
Sent: Wednesday, May 18, 2016 3:33 PM
To: Bryan Butcher
Cc: Norman Ouellette; Duane Wilson; 'Eric Blank (eblank@lihi.org)'
Subject: RE: Olympia Commons Vapor Mitigation at Stark St.

Hi Bryan,

Just responding for the record…based on the photos you sent me yesterday (and previously), the completed installation of the subsurface, soil-vapor mitigation piping, appears acceptable. Specifically, the piping does not appear to be compromised or obstructed in a manner that would affect the intended remedial purposes of the passive soil-vapor mitigation system.

Thanks for your help in correcting the issues and documenting them in the photographs.

Cheers.

Best Regards,

Dan Hatch, PMP, Remediation Manager
Cell: 253-389-5334 | Danh@G-Logics.com

Do justly, Love mercifully, Walk humbly, this is enough. - John Adams

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Office: 425-391-6874 | *Fax*: 425-313-3074 | www.G-Logics.com

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From: Bryan Butcher [mailto:bryanbutcher@pavilionconstruction.com]
Sent: Tuesday, May 17, 2016 1:53 PM
To: Dan Hatch
Cc: Norman Ouellette; Duane Wilson; 'Eric Blank (eblank@lihi.org)'
Subject: RE: Olympia Commons Vapor Mitigation at Stark St.

Dan,

Attached are photos of the vapor mitigation piping along State St., located next to earth footing forms showing vapor barrier installed as a means to separate the concrete from the piping. We are scheduled to start adding rebar tomorrow, Wednesday 5/18/16. Earlier today we provided photos of the mitigation piping with ground shoring to meet your corrections. Please provide your approval or additional requirements while this area is easily accessible.

Thanks.

From: Bryan Butcher
Sent: Tuesday, May 17, 2016 7:14 AM
To: 'Dan Hatch' <danh@g-logics.com>
Cc: Norman Ouellette <nouellette@pavilionconstruction.com>; Duane Wilson <dwilson@pavilionconstruction.com>; Eric Blank (eblank@lihi.org) <eblank@lihi.org>
Subject: RE: Olympia Commons Vapor Mitigation at Stark St.

Good Morning Dan,

Attached are photos from yesterday showing the ground support provided to the exposed vapor mitigation piping along State St., located next to earth forms for footings. If this meets your satisfaction, today we will be providing the vapor barrier as a means to separate the concrete from the piping. Photos to be provided of course.

Thank you.

From: Dan Hatch [mailto:danh@g-logics.com]
Sent: Wednesday, May 11, 2016 3:22 PM
To: Bryan Butcher <bryanbutcher@pavilionconstruction.com>
Cc: Norman Ouellette <nouellette@pavilionconstruction.com>; Eric Blank (eblank@lihi.org) <eblank@lihi.org>
Subject: RE: Olympia Commons Vapor Mitigation at Stark St.

Hi Bryan,

We would rather not cap the pipe. If cut and capped, it affects the effectiveness of the air flow, afraid this would leave a dead zone in this area. Is there any way to shovel out material to move the pipe further in, or at least shore up the pipe and place plastic sheeting between/over the pipe to separate it physically from the concrete.

Thanks

Best Regards,

Dan Hatch, PMP, Remediation Manager
Cell: 253-389-5334 | Danh@G-Logics.com

Do justly, Love mercifully, Walk humbly, this is enough. - John Adams

G-Logics, Inc. | 40 2nd Avenue SE | Issaquah, WA 98027-3452
Office: 425-391-6874 | *Fax*: 425-313-3074 | www.G-Logics.com

Please consider the environment before printing this e-mail and/or attachments.

From: Bryan Butcher [mailto:bryanbutcher@pavilionconstruction.com]
Sent: Wednesday, May 11, 2016 11:43 AM
To: Dan Hatch
Cc: Norman Ouellette
Subject: Olympia Commons Vapor Mitigation at Stark St.

Dan,
This exposed vapor mitigation piping along State St. is located next to earth forms for footings. Looking at it a little more is it okay to cut that chunk of perf pipe out and cap the ends?

It physically appears that here is no other option due to the proximity of the huge footings.

Thanks.

From: Bryan Butcher
Sent: Wednesday, May 11, 2016 11:35 AM
To: Bryan Butcher <bryanbutcher@pavilionconstruction.com>
Subject:

Sent from my Verizon Wireless 4G LTE smartphone

PAVILION CONSTRUCTION

LIHI - OLYMPIA COMMONS
318 STATE AVENUE NORTHEAST
OLYMPIA, WA 98501

To: BUMGARDNER
Attn: MANCONG LIN
2111 3RD AVE
SEATTLE, WA 98121
CC'd:

Date: 03/30/2016

Contact Phone: 206-223-1361
Contact Email: mancongl@pavilionconstruction.com

SUBMITTAL TRANSMITTAL FOR APPROVAL

Submittal #: 96 Rev.#: 1 In Accordance with Specification Section #: **33 00 00**

This is a Complete submittal for **Passive Vapor Mitigation System** items per the table below as reviewed and noted by Pavilion Construction NW, LLC, and provided by BLACK HILLS EXCAVATING INC. Please provide a response to this submittal by **04/07/2016**.

Olympia Commons 1845.00 095.1

- ☐ NO EXCEPTIONS TAKEN
- ☑ MAKE CORRECTIONS NOTED
- ☐ REVISE AND RESUBMIT
- ☐ REJECTED
- ☐ SUBMIT SPECIFIED ITEM
- ☐ NOT REVIEWED

REVIEWED FOR CONFORMANCE WITH DESIGN CONCEPT AND CONTRACT DOCUMENTS. EXCEPTIONS MARKED ARE SUBJECT TO REQUIREMENTS OF PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING DIMENSIONS AND QUANTITIES, PROCESS PERTAINING TO FABRICATION AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF WORK OF ALL TRADES, SAFE AND SATISFACTORY PERFORMANCE OF HIS WORK.

BUMGARDNER architecture • interiors • planning

Checked By mancongl Date 4/5/2016

Pavilion Status: Sent
Notes:

Submitted By: Shari Chin
Email Address: schin@pavilionconstruction.com
Phone: 503-29
Fax:

SUBMITTAL RESPONSE

Architect's Response		Schedule Tracking	
Proceed	☐	Date Received from Sub/Sup	03/30/2016
Proceed, as noted	☐	Date **Requested** to be returned	04/07/2016
Revise and Resubmit	☐	Date Returned from Architect	
Material Return without Review	☐	Date Returned to Sup/Sup	

Comments:

PAVILION CONSTRUCTION LLC

☐ CONFORMS WITH SPECIFICATIONS ☐ NOT CONFORMING

☒ CONFORMS WITH NOTES ☐ PARTIAL SUBMITTAL

BY: Shari Chin DATED: 3/30/16

This submittal has been reviewed for general conformance with contract documents. This review does not relieve the supplier of responsibility for errors, omissions or any deviation from the requirements of the contract documents.

Submittal Review, Date of March 31, 2016
This review is for general conformance with the design of Passive Sub-Slab Vapor Mitigation System. Consultant review of submittal does not relieve contractor of responsibility to meet provided/project specifications.
G-Logics finds the provided drawing acceptable. **Note: the top of the sub-slab (horizontal) piping should be between 6 to 12 inches below the vapor-barrier/bottom of concrete slab. The vapor-barrier should be directly beneath the concrete slab. Also, large "sweeping bends" should be used at the corners of the loops (as noted on drawing).**
Reviewed by Dan Hatch

Pavilion Construction NW, LLC

4700 SW Macadam Ave. Portland, OR 97239
Phone: (503)290-5005 Fax: (503)244-1810
www.pavilionconstruction.com

PAVILION CONSTRUCTION

LIHI - OLYMPIA COMMONS
318 STATE AVENUE NORTHEAST
OLYMPIA, WA 98501

To: BUMGARDNER
Attn: MANCONG LIN
2111 3RD AVE
SEATTLE, WA 98121
CC'd:

Date: 03/30/2016

Contact Phone: 206-223-1361
Contact Email: mancongl@pavilionconstruction.com

SUBMITTAL TRANSMITTAL FOR APPROVAL

Submittal #: 96 Rev.#: 1 In Accordance with Specification Section #: **33 00 00**

This is a Complete submittal for **Passive Vapor Mitigation System** items per the table below as reviewed and noted by Pavilion Construction NW, LLC, and provided by BLACK HILLS EXCAVATING INC. Please provide a response to this submittal by **04/07/2016**.

Pavilion Status: Sent
Notes:

Submitted By: Shari Chin
Email Address: schin@pavilionconstruction.com
Phone: 503-290-5005
Fax:

SUBMITTAL RESPONSE

Architect's Response		Schedule Tracking	
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PAVILION CONSTRUCTION LLC

☐ CONFORMS WITH SPECIFICATIONS ☐ NOT CONFORMING

☒ CONFORMS WITH NOTES ☐ PARTIAL SUBMITTAL

BY: Shari Chin DATED: 3/30/16

This submittal has been reviewed for general conformance with contract documents. This review does not relieve the supplier of responsibility for errors, omissions or any deviation from the requirements of the contract documents.

JRS ENGINEERING
BUILDING ENVELOPE CONSULTANTS

PROJECT NUMBER: SE15030
RECEIVED DATE: 3-31-16

REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS AND GENERAL CONFORMANCE WITH THE DESIGN CONCEPT ONLY, AS IT RELATES TO THE MOISTURE, THERMAL, AND AIR BARRIER PERFORMANCE OF THE BUILDING ENVELOPE. JRS DID NOT REVIEW FOR STRUCTURAL OR ARCHITECTURAL, AND MARKINGS OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOR DEPARTURE THEREFROM. THE CONTRACTOR REMAINS RESPONSIBLE FOR THE SUBMISSION INCLUDING CORRECT DESIGN DETAILS, NOTES, DIMENSIONS, QUANTITIES, FABRICATION PROCESSES, TECHNIQUES OF ASSEMBLY, SITE CONDITIONS, AND FOR PERFORMING THEIR WORK IN A SAFE MANNER.

☒ REVIEWED ☐ REVISE RESUBMIT
☐ REVIEWED AS NOTED ☐ REJECTED
REVIEWED BY: JN DATE: 4-4-16

Pavilion Construction NW, LLC

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Phone: (503)290-5005 Fax: (503)244-1810
www.pavilionconstruction.com

December 30, 2015
G-Logics File 01-1050-A

Low Income Housing Institute
Ms. Robin Amadon
2407 First Avenue
Seattle, WA 98121

Subject: Technical Assistance, Vapor-Mitigation Piping
Olympia Commons
318 State Avenue NE
Olympia, WA

Dear Ms. Amadon:

G-Logics has created a conceptual schematic for the installation of a vapor-mitigation system for the Olympia Commons Project, a four-story residential structure. We understand this structure will be built by the Low Income Housing Institute (LIHI).

Previous to LIHI's purchase of the property, GeoEngineers was hired by the former property owner, City of Olympia, to conduct an environmental cleanup on the property and surrounding area. After the cleanup work was performed, residual soil-vapor contaminants were identified as remaining on the property. Accordingly, the Washington State Department of Ecology (Ecology) requires engineering controls to support the conducted cleanup. Specifically, engineering controls are necessary for Ecology to provide a No Further Action Determination for the property. Reports prepare by GeoEngineers were reviewed by G-Logics for this memo.

G-Logics, Inc.
40 2nd Avenue SE
Issaquah, WA 98027
T: 425-391-6874
F: 425-313-3074

Purpose of System

Because the residual soil-vapor contaminants are volatile, they could migrate into occupied spaces of the planned building. As such, it is the intent of LIHI to install a vapor barrier and soil-vapor mitigation system as engineering controls.

Based the GeoEngineers reports, G-Logics recommended that a subslab vapor barrier be incorporated and installed beneath the new building. The vapor barrier was previous discussed in the G-Logics *Technical Assistance Memo* dated December 18, 2015.

To support the Ecology requirements, this memo describes a conceptual schematic for the soil-vapor mitigation system.

System Concepts

The components for the vapor-mitigation system are presented in the attached schematics, with the additional comments:

1. The system includes the installation of perforated piping in the capillary-break material beneath the floor slab and vapor barrier. The subslab piping then can be vented to the roof of the planned building.
2. A general layout and spacing of the subslab-collection piping has been presented on the attached schematic (Figures A). If necessary to complete the illustrated loops, perforation sleeves can be installed in footings.
3. The solid subsurface pipes that connect the perforated pipes to the riser (exhaust) pipes should be sloped, in order to drain moisture back to the perforated sections of pipe.
4. The location of the riser pipes can be based on aesthetics, physical routing, and obstructions within the building. Accordingly, the locations of the riser pipes should be determined by LIHI. Suggested connections are shown on the attached schematic (Figure B).
5. The riser pipe should extend approximately 24 inches above the roof to improve dispersion of vapors. A wind turbine should be installed on top of the exhaust piping to enhance ventilation.
6. The riser pipe also should exhaust a minimum of 10 feet away from any window or air intake into the building.
7. If elements of the building prohibit the incorporation of this conceptual layout, G-Logics should be consulted for possible revisions.

Active System

The comments above provide conditions for a "Passive" system. If needed, the Passive system can be modified to be an "Active" system. Components for an Active system are presented in the attached schematics (highlighted in orange features), with the additional following notes.

1. 220 volt electrical power should be provided for the Active system. Electrical controls would consist of a simple timer for the blower operation. The timer should be capable of turning the blower on and off for a minimum of 2 cycles per 24-hour period.
2. A moisture-reduction tank is shown with a water-drain check valve. The check valve will open (when the vacuum drops during the off cycles) to allow for the drainage of collected water.
3. All work should conform to applicable plumbing, mechanical, and electrical codes.
4. The specifications for a regenerative blower will be reviewed if the Active system is determined to be needed.

G-Logics can assist LIHI with the selection and installation of the components for the Active system. It is understood that this equipment could be installed in the elevator/mechanical room located on the rooftop.

Duration

The vapor-mitigation system should be monitored for a period of five years, on a quarterly timetable. The monitoring will included a review of visually accessible components. Each review will note the condition of the components and will include the recommendations for maintenance and/or repairs.

Limitations

This memo and system schematics are non-comprehensive by nature and are unlikely to address all environmental problems or eliminate all risk. This memo does not include other services not specifically described and is based on available data. Our understanding of the property may change, as new data become available.

No warranty, express or implied, is made.

Closing

We appreciate this opportunity to provide our services to LIHI. Please contact us at your convenience with any questions regarding this memo or system schematics.

Sincerely,
G-Logics, Inc.

Rory L. Galloway, LG, LHG
Principal

Dan Hatch, PMP
Remediation Manager

Steve Holmes, PE
Project Environmental Engineer

Attachments Figure A – Subslab Schematic Diagram
Figure B – Vapor System Riser Schematic

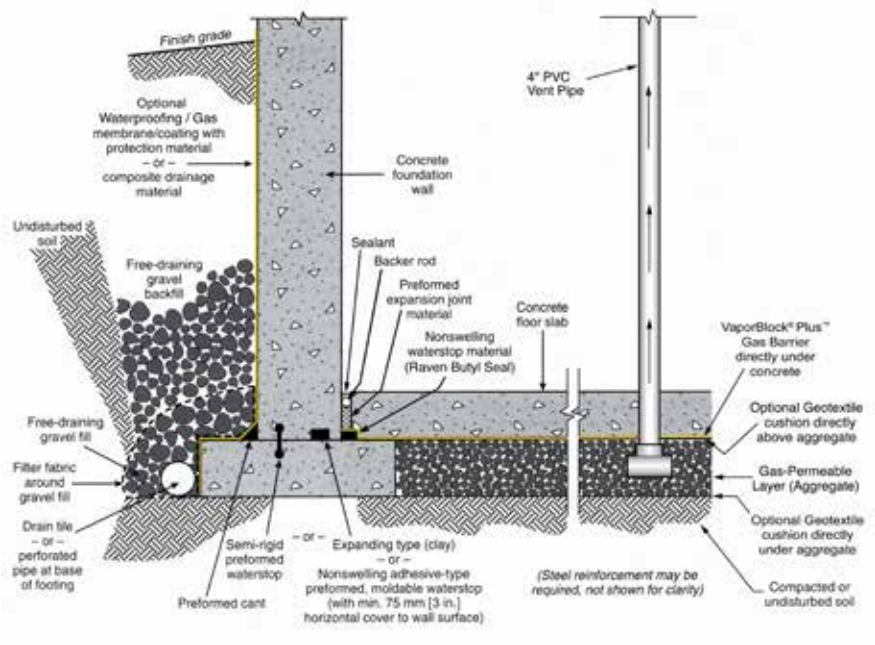
VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

INSTALLATION GUIDELINES

Please Note: *Read these instructions thoroughly before installation to ensure proper use of* ***VaporBlock® Plus™****. ASTM E 1465, ASTM E 2121 and, ASTM E 1643 also provide valuable information regarding the installation of vapor / gas barriers. When installing this product, contractors shall conform to all applicable local, state and federal regulations and laws pertaining to residential and commercial building construction.*

- **When VaporBlock Plus gas barrier is used as part of an active control system for radon or other gas, a ventilation system will be required.**
- **If designed as a passive system, it is recommended to install a ventilation system that could be converted to an active system if needed.**

Materials List:
VaporBlock® Plus™ Vapor / Gas Barrier
VaporBond Plus 4" Foil Seaming Tape
Butyl Seal 2-Sided Tape
VaporBoot Plus Pipe Boots 12/Box (recommended)
VaporBoot Tape (optional)



Elements of a moisture/gas-resistant floor system. General illustration only.
(Note: This example shows multiple options for waterstop placement.

VAPORBLOCK® PLUS™ PLACEMENT

1.1. Level and tamp or roll granular base as specified. A base for a gas-reduction system may require a 4" to 6" gas permeable layer of clean coarse aggregate as specified by your architectural or structural drawings after installation of the recommended gas collection system. In this situation, a cushion layer consisting of a non-woven geotextile fabric placed directly under **VaporBlock® Plus™** will help protect the barrier from damage due to possible sharp coarse aggregate.

1.2. Unroll **VaporBlock Plus** running the longest dimension parallel with the direction of the pour and pull open all folds to full width. (Fig. 1)

1.3. Lap **VaporBlock Plus** over the footings and seal with Raven Butyl Seal tape at the footing-wall connection. Prime concrete surfaces and assure they are dry and clean prior to applying Raven Butyl Seal Tape. Apply even and firm pressure with a rubber roller. Overlap joints a minimum of 6" and seal overlap with Raven VaporBond Tape. When used as a gas

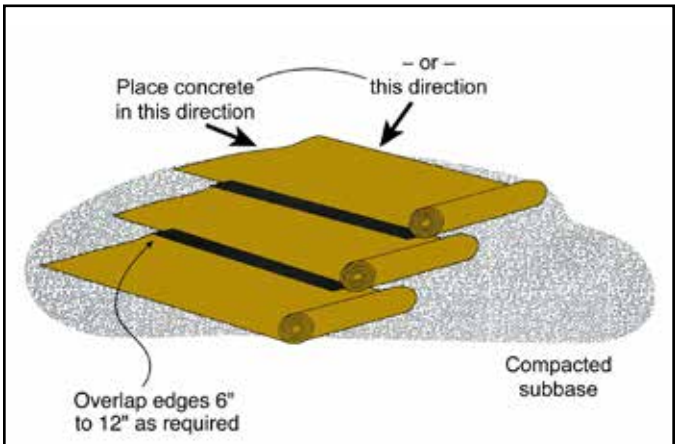


Fig. 1: VaporBlock Plus Overlaping Roll-out Method

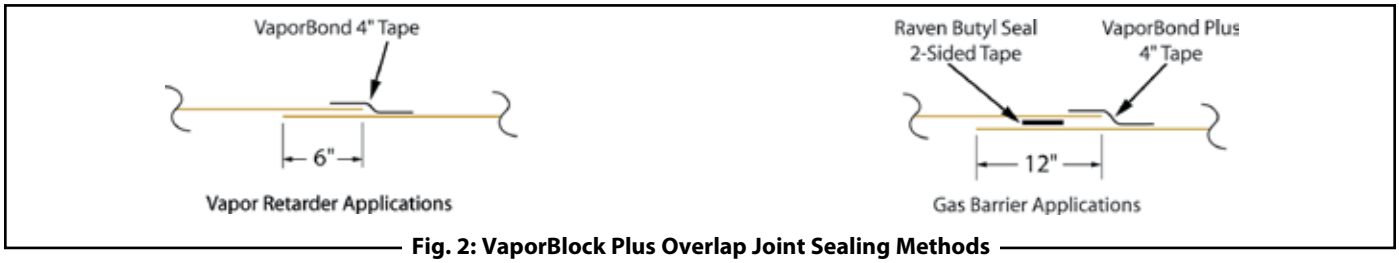


Fig. 2: VaporBlock Plus Overlap Joint Sealing Methods

SINGLE PENETRATION PIPE BOOT INSTALLATION

barrier, overlap joints a minimum of 12" and seal in-between overlap with 2-sided Raven Butyl Seal Tape. Then seal with VaporBond Plus Tape centered on the overlap seam. (Fig. 2)

1.4. Seal around all plumbing, conduit, support columns or other penetrations that come through the **VaporBlock Plus** membrane. Pipes four inches or smaller can be sealed with Raven VaporBoot Plus preformed pipe boots. VaporBoot Plus preformed pipe boots are formed in steps for 1", 2", 3" and 4" PVC pipe or IPS size and are sold in units of 12 per box (Fig. 3 & 5).

Pipe boots may also be fabricated from excess **VaporBlock Plus** membrane (Fig. 4 & 6) and sealed with VaporBoot Tape or VaporBond Plus Tape (sold separately).

Reminder Note: All holes or penetrations through the membrane will need a patch cut to a minimum of 12" from the opening in all directions.

To fabricate pipe boots from **VaporBlock Plus** excess material (see Fig. 4 & 6 for A-F):

A) Cut a square large enough to overlap 12" in all directions.

B) Mark where to cut opening on the center of the square and cut four to eight slices about 3/8" less than the diameter of the pipe.

C) Force the square over the pipe leaving the tightly stretched cut area around the bottom of the pipe with approximately a 1/2" of the boot material running vertically up the pipe. *(no more than a 1/2" of stretched boot material is recommended)*

D) Once boot is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in between the two layers. Secure boot down firmly over the membrane taking care not to have any large folds or creases.

E) Use VaporBoot Tape or VaporBond Plus Tape to secure the boot to the pipe.

VaporBoot Tape (option) – fold tape in half lengthwise, remove half of the release liner and wrap around the pipe allowing 1" extra for overlap sealing. Peel off the second half of the release liner and work the tape outward gradually forming a complete seal.

VaporBond Plus Tape (option) - Tape completely around pipe overlapping the to get a tight seal against the pipe.

F) Complete the process by taping over the boot perimeter edge with VaporBond Plus Tape to create a monolithic membrane between the surface of the slab and gas/ moisture sources below and at the slab perimeter. (Fig. 4 & 6)

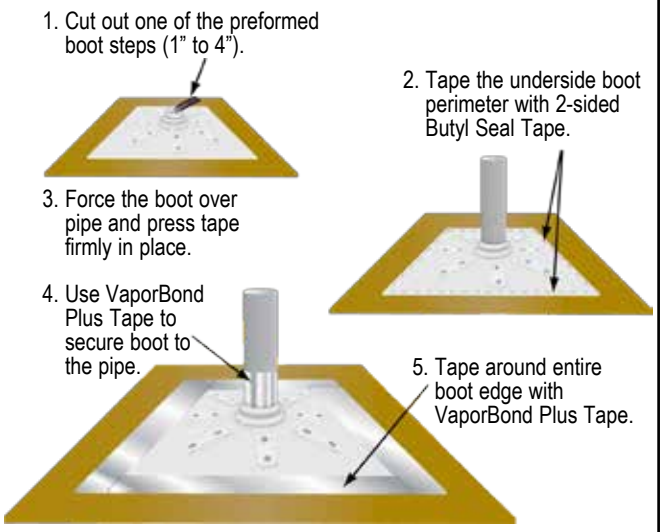


Fig. 3

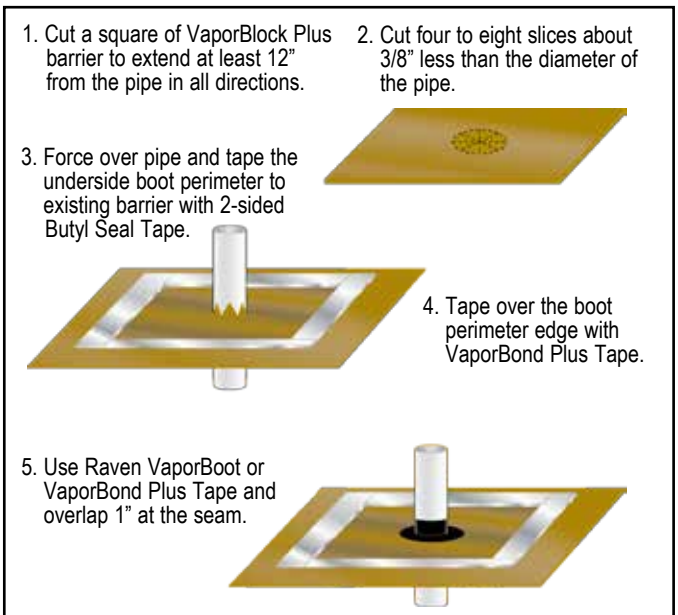


Fig. 4

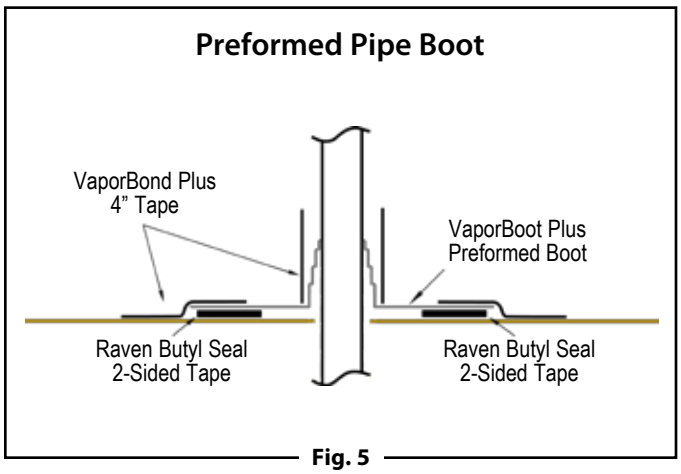


Fig. 5

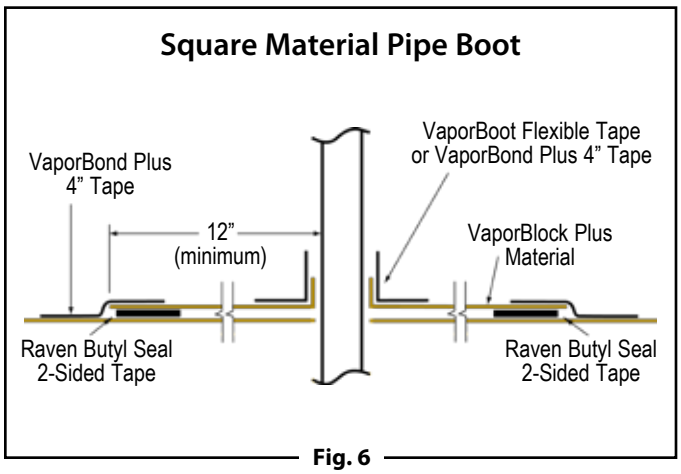


Fig. 6

MULTIPLE PENETRATION PIPE BOOT INSTALLATION

1.5. For side-by-side multiple penetrations;

A) Cut a patch large enough to overlap 12″ in all directions (Fig. 7) of penetrations.

B) Mark where to cut openings and cut four to eight slices about 3/8″ less than the diameter of the penetration for each.

C) Slide patch material over penetration to achieve a tight fit.

D) Once patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers. (Fig. 8)

E) After applying Raven Butyl Seal Tape between the patch and membrane, tape around each of the penetrations and the patch with VaporBond Plus 4″ foil tape. (Fig. 9) For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations. (Fig. 10)

1.6. Holes or openings through **VaporBlock Plus** are to be repaired by cutting a piece of **VaporBlock Plus** 12″ larger in all directions from the opening. Seal the patch to the barrier with 2-sided Raven Butyl Seal Tape and seal the edges of the patch with VaporBond Plus Tape.

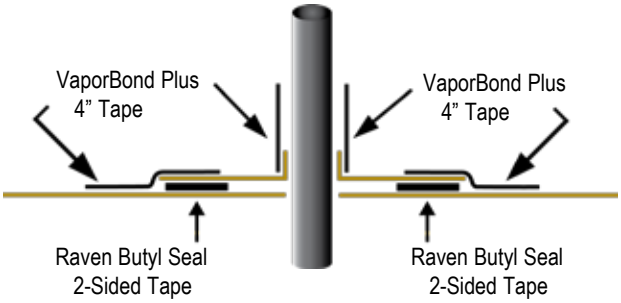


Fig. 6

Cut a patch large enough to overlap 12" in all directions and slide over penetrations (Make openings as tight as possible.)

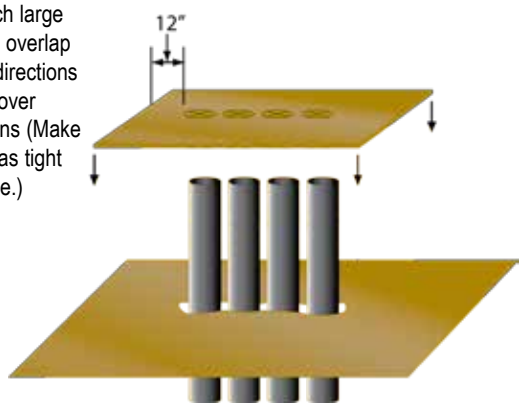


Fig. 7

Once the overlay patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers.

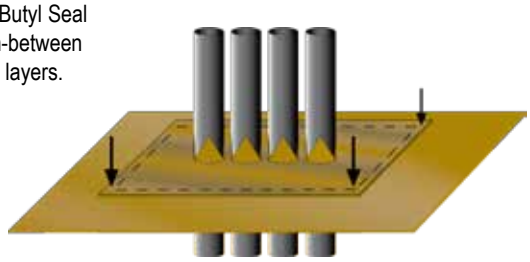


Fig. 8

After applying Raven Butyl Seal Tape between the patch and membrane, tape around the perimeter of the penetration and the patch with VaporBond Plus 4" foil Tape

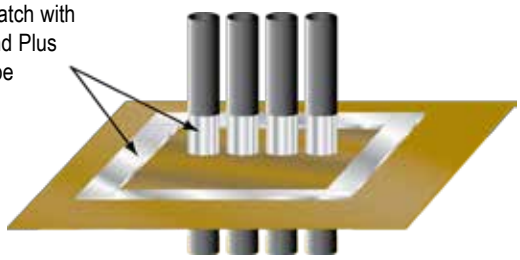


Fig. 9

For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations.

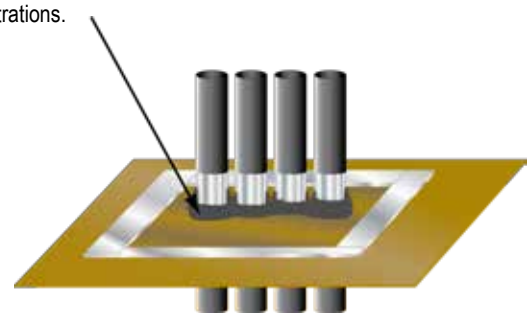


Fig. 10

VAPORBLOCK® PLUS™ PROTECTION

2.1. When installing reinforcing steel and utilities, in addition to the placement of concrete, take precaution to protect **VaporBlock Plus**. Carelessness during installation can damage the most puncture–resistant membrane. Sheets of plywood cushioned with geotextile fabric temporarily placed on **VaporBlock Plus** provide for additional protection in high traffic areas including concrete buggies.

2.2. Use only brick-type or chair-type reinforcing bar supports to protect **VaporBlock Plus** from puncture.

2.3. Avoid driving stakes through **VaporBlock Plus**. If this cannot be avoided, each individual hole must be repaired per section 1.6.

2.4. If a cushion or blotter layer is required in the design between **VaporBlock Plus** and the slab, additional care should be given if sharp crushed rock is used. Washed rock will provide less chance of damage during placement. Care must be taken to protect blotter layer from precipitation before concrete is placed.

VaporBlock® Plus™ Gas & Moisture Barrier can be identified on site as gold/white in color printed in black ink with the following logo and classification listing:

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER
MEETS ASTM E-1745 CLASS A

VaporBlock® Plus™
Gas & Moisture Barrier

ISO 9001:2008
CERTIFIED MANAGEMENT SYSTEM

Note: To the best of our knowledge, these are typical installation procedures and are intended as guidelines only. Architectural or structural drawings must be reviewed and followed as well as on a project basis. NO WARRANTIES ARE MADE AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS OR GUIDELINES REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and we disclaim all liability for resulting loss or damage.

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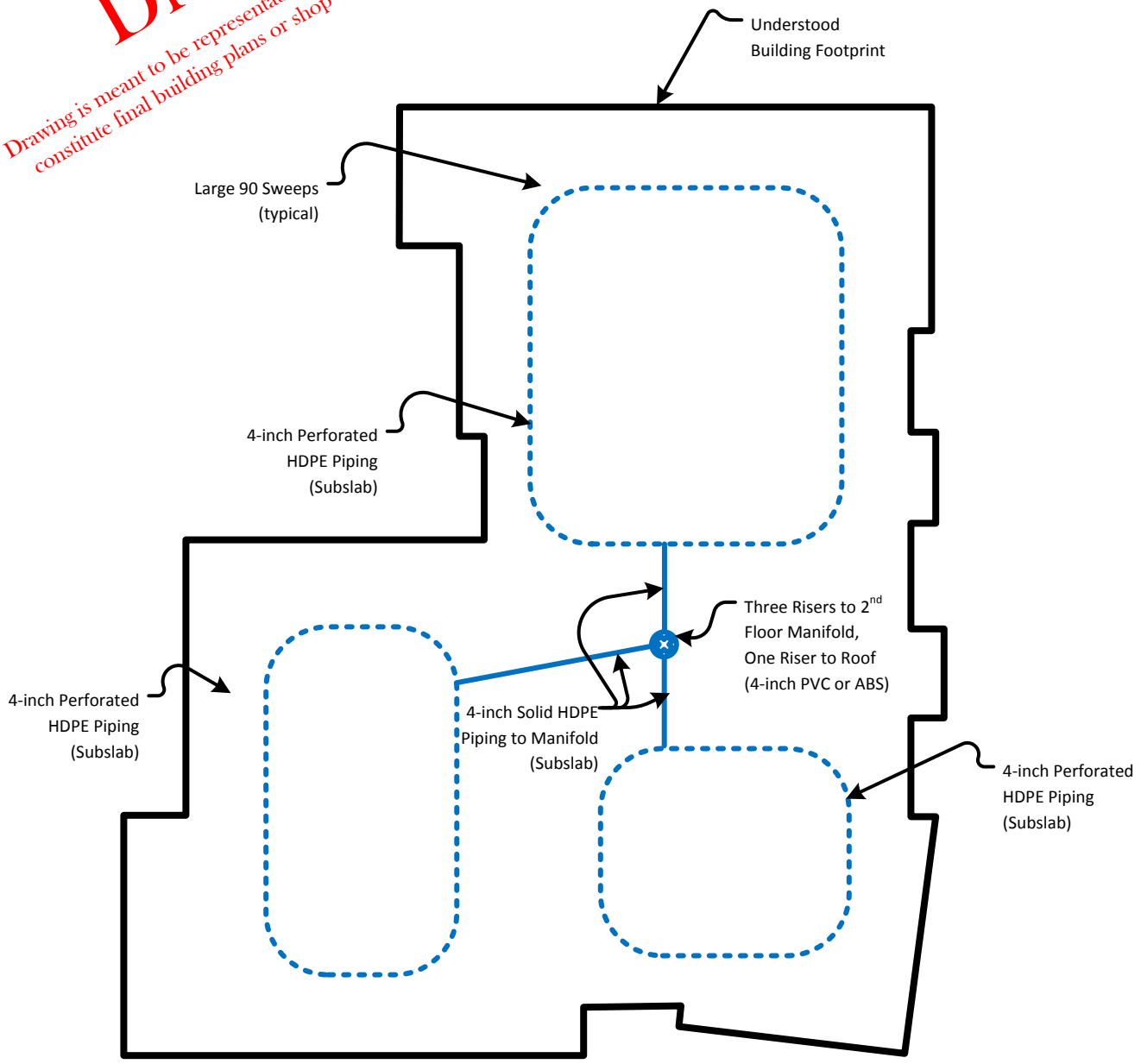
Toll Free: **800-635-3456**
Email: **efdsales@ravenind.com**
www.VaporBlockPlus.com

8/13 EFD 1127

FIGURES

Draft

Drawing is meant to be representative and does not constitute final building plans or shop drawings.



Approximate Drawing Scale: 1" = 20'

0 ft. 12 ft. 20 ft. 40 ft.

g-logics

Subslab Schematic Diagram

Subslab Collection Piping

LIHI, Olympia Commons

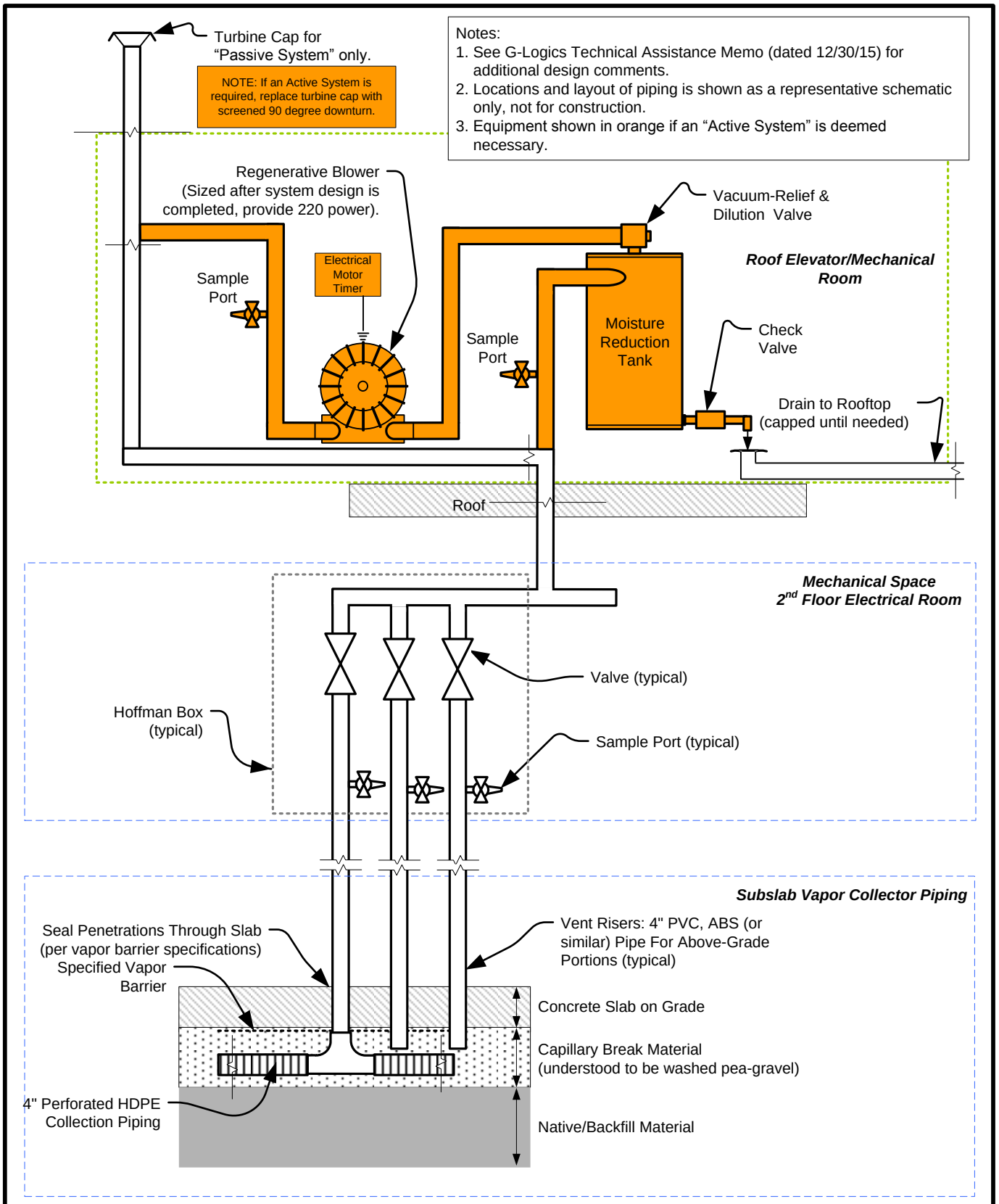
Olympia, WA

Figure

A

Project File: 01-1050-A-FA Subslab Piping Schematic.vsd

Mapping Reference: Hatton Godat Pantier, Bumgardner.



g-logics

Vapor System Riser Schematic

LIHI, Olympia Commons

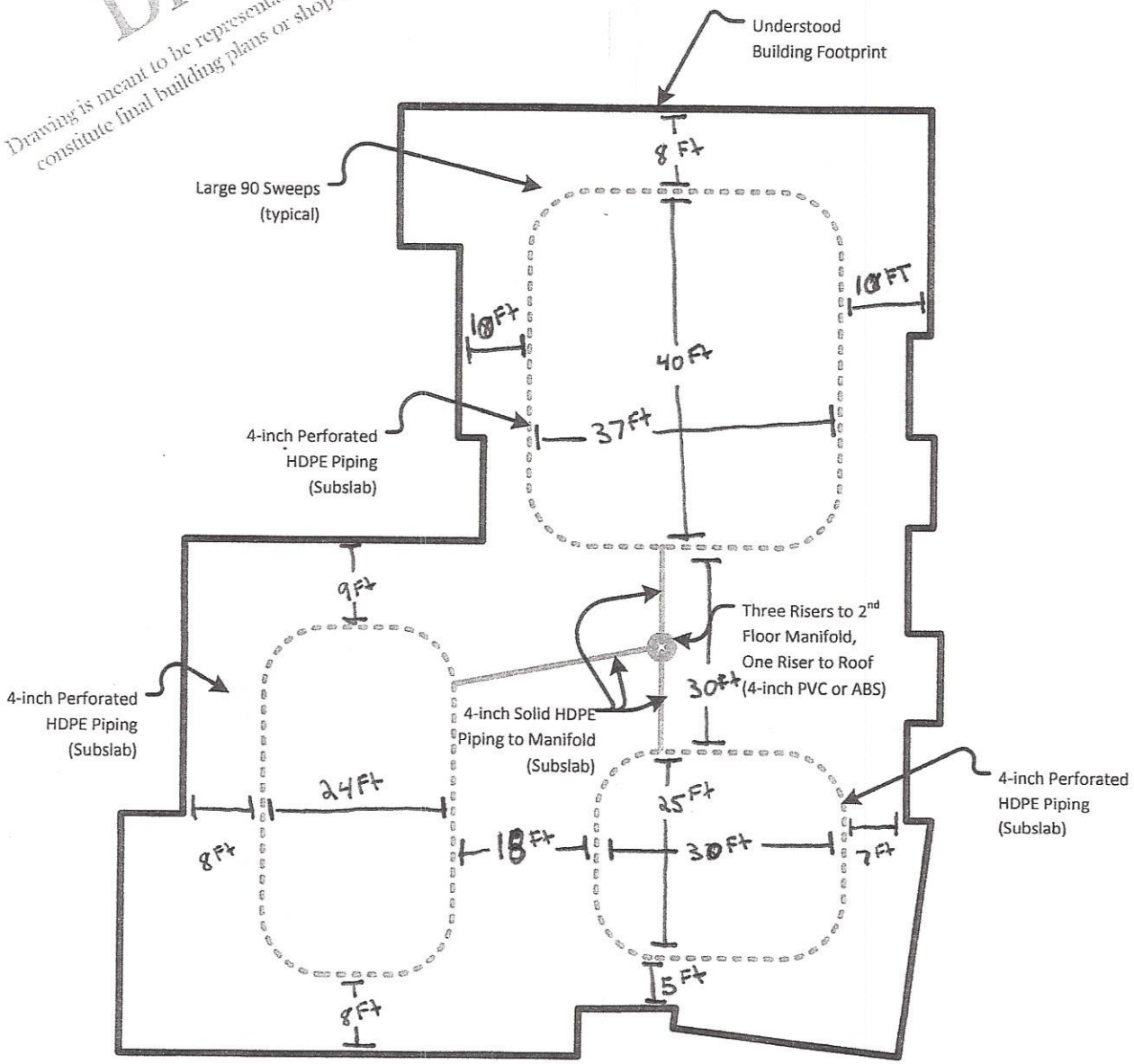
Olympia, Washington

Figure B

Project File: 01-1050-A-FB Riser Schematic.vsd

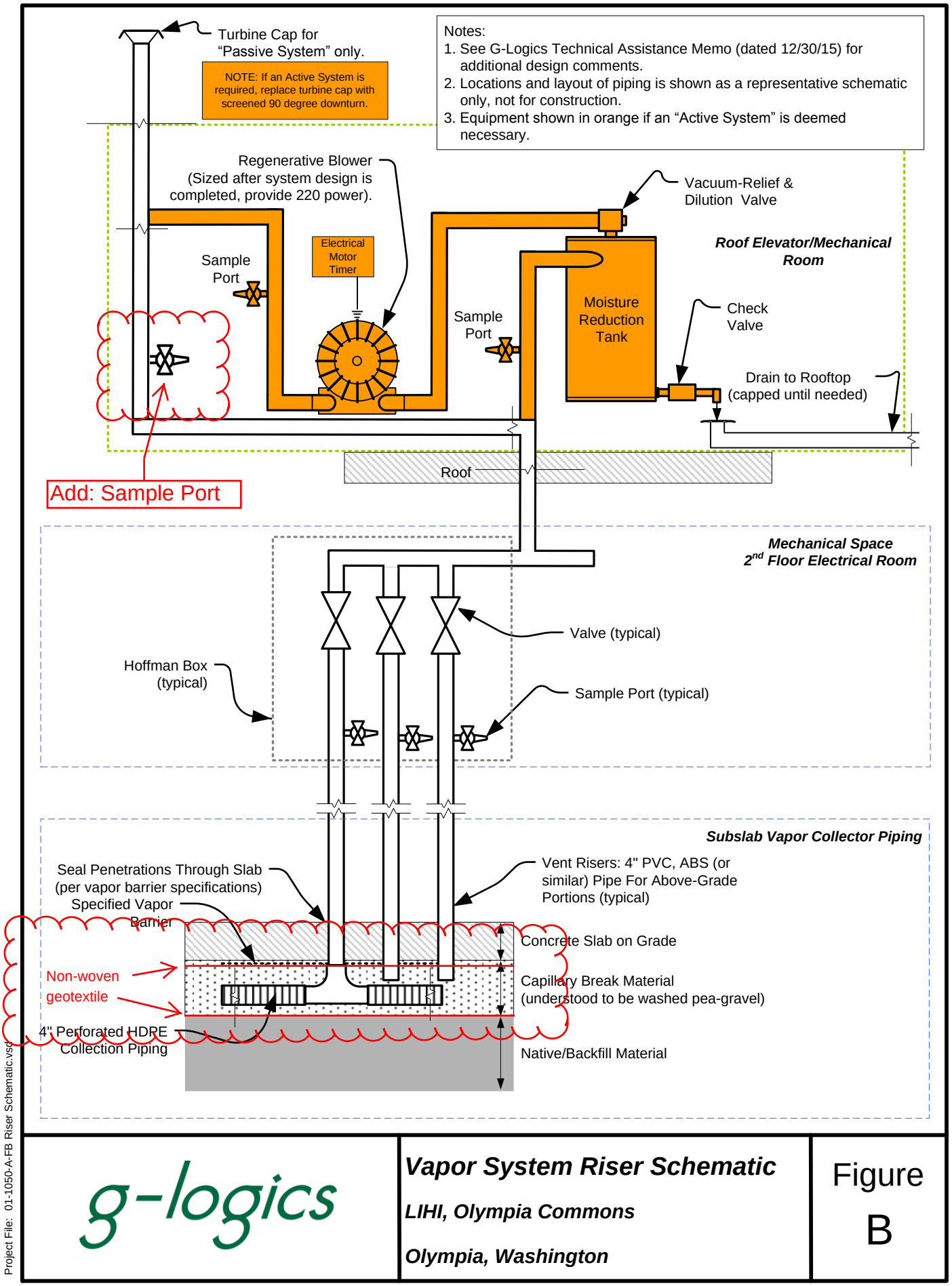
Shop Drawing

Black Hills Excavating Inc.



Approximate Drawing Scale: 1" = 20'

0 ft. 12 ft. 20 ft. 40 ft.



g-logics

Vapor System Riser Schematic

LIHI, Olympia Commons

Olympia, Washington

Figure B

Project File: 01-1050-A-FB Riser Schematic.vsd

HDPE Solid Pipe
HDPE Perforated Pipe

ADS SINGLE WALL HIGHWAY PIPE SPECIFICATION

Scope
This specification describes 3- through 24-inch (75 to 600 mm) single wall high density corrugated polyethylene highway pipe, for drainage applications.

Pipe Requirements
ADS single wall corrugated highway pipe shall have annular interior and exterior corrugations.
- 3- through 10-inch (75 to 250 mm) shall meet AASHTO M252, Type C or CP.
- 12- through 24-inch (300 to 600 mm) shall meet AASHTO M294, Type C or CP.

Joint Performance
Joints for 3- to 24- inch (75 – 600 mm) shall be made with split or snap couplings. Standard connection shall meet the soil-tightness requirements of AASHTO M252 or M294. Gasketed connections shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of ASTM D1056 Grade 2A2. Gaskets, when applicable, shall be installed by the pipe manufacturer.

Fittings
Fittings shall conform to AASHTO M252 or AASHTO M294.

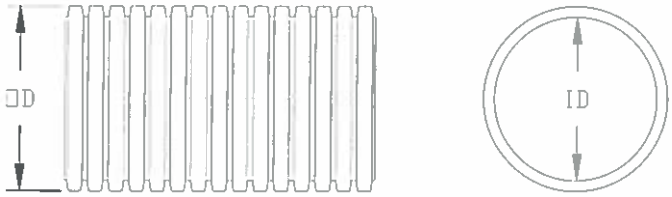
Material Properties
Pipe and fittings shall be made of virgin polyethylene compounds that comply with the cell classification 424420C for 4- through 10-inch (100 to 250mm) diameters, or 435400C for 12- through 24-inch (300 to 600mm) diameters, as defined and described in ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 24-inch (300 to 600mm) virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 of AASHTO M294.

Installation
Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines with the exception that minimum cover in trafficked areas shall be one foot (0.3 m). Contact your local ADS representative or visit our website at www.ads-pipe.com for a copy of the latest installation guidelines.

Pipe Dimensions

	Nominal Diameter, in (mm)									
Pipe I.D. in (mm)	3 (75)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)	12 (300)	15 (375)	18 (450)	24 (600)
Pipe O.D.* in (mm)	3.6 (91)	4.6 (117)	5.8 (147)	7 (178)	9.5 (241)	12 (305)	14.5 (368)	18 (457)	22 (559)	28 (711)
Perforations	All diameters available with or without perforations.									

*Pipe O.D. values are provided for reference purposes only, values stated for 3- through 24-inch are ± 0.5 inch. Contact a sales representative for exact values.



HDPE Solid Pipe
HDPE Perforated Pipe

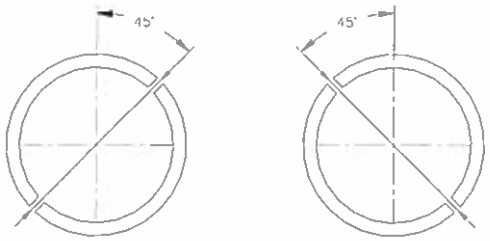
TECHNICAL NOTE

Single Wall HDPE Perforation Patterns

TN 1.02
October 2008

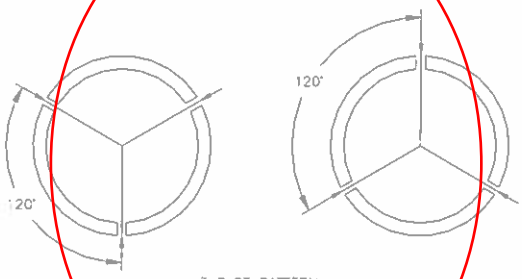
Nominal I.D.		Perforation Type	Maximum Slot Length or Diameter		Maximum Slot Width		Minimum Inlet Area		Pattern Type
in	mm		in	mm	in	mm	in^2/ft	cm^2/m	
3	75	Slot	0.875	22	0.120	3	1.0	21	A
4	100	Slot	0.875	22	0.120	3	1.0	21	B
5	125	Slot	0.875	22	0.120	3	1.0	21	B
6	150	Slot	0.875	22	0.120	3	1.0	21	B
8	200	Slot	1.18	30	0.120	3	1.0	21	B
10	250	Slot	1.18	30	0.120	3	1.0	21	B
12	300	Slot	1.50	38	0.118	3	1.5	32	B
12	300	Circular	0.313	8	-	-	1.5	32	C
15	375	Circular	0.313	8	-	-	1.5	32	C
18	450	Circular	0.313	8	-	-	1.5	32	C
24	600	Circular	0.313	8	-	-	2.0	42	D

TYPE A PATTERN



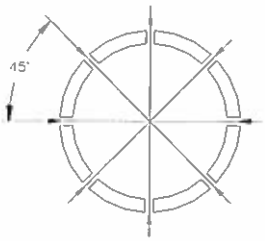
2 SLOT PATTERN
PERFORATIONS
ROTATED 90° EVERY
OTHER VALLEY

TYPE B PATTERN



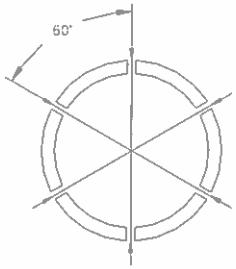
3 SLOT PATTERN
PERFORATIONS
ROTATED 60° EVERY
OTHER VALLEY

TYPE C PATTERN



8 HOLE PATTERN

TYPE D PATTERN



6 HOLE PATTERN

HDPE Solid Pipe

HDPE Perforated Pipe

HEAVY DUTY PIPE

With over 45 years experience, Advanced Drainage Systems, Inc. (ADS) has provided expert knowledge and innovative product solutions proven in a wide range of drainage applications. Our HDPE pipe delivers superior value while providing physical strength and structural design that just cannot be matched by metal or concrete.

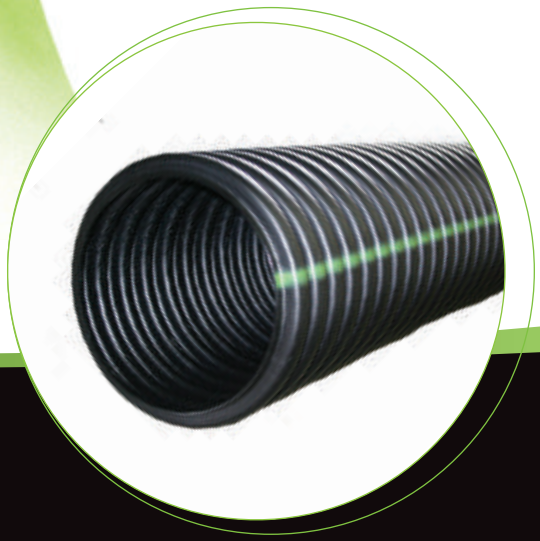
APPLICATIONS:

Culverts	Parking Lots
Paths & Walkway Drains	Field Drainage
Landscape/Subdrainage	Slope, Edge, Foundations
Golf Courses	Downspouts/Roof Drainage
Sports Playing Fields	Waterway Terracing
Grain Aeration	Land Reclamation
Pond Overflows & Dams	Irrigation Ditch Enclosures

FEATURES/BENEFITS:

- Available in varying stick and coil lengths depending on the diameter. Longer lengths result in fewer joints
- Easy-to-handle, safe, lightweight pipe requires less labor and equipment for faster installation and reduced costs
- AASHTO HS-25 (Highway traffic loads) rated with a minimum of 12” (300 mm) of cover for 3” - 8” (75 - 200 mm) diameters
- Provides superior resistance to chemicals, road salts, motor oil and gasoline - will not rust, deteriorate or crumble
- Withstands repeated freeze/thaw cycles and continuous sub-zero temperatures

ADS Service: ADS representatives are committed to providing you with the answers to all your questions, including specifications, and installation and more.



HDPE Solid Pipe

HDPE Perforated Pipe

ADS SINGLE WALL HEAVY DUTY PIPE

SCOPE

This specification describes 3- through 24-inch (75 to 600 mm) ADS single wall heavy duty corrugated polyethylene highway pipe for use in gravity-flow drainage applications.

PIPE REQUIREMENTS

ADS single wall corrugated heavy duty pipe shall have annular interior and exterior corrugations.

- 3- through 6-inch (75 to 150 mm) shall meet ASTM F405.
- 8- through 24-inch (200 to 600 mm) shall meet ASTM F667

JOINT PERFORMANCE

Joints for 3- to 24- inch (75 – 600 mm) shall be made with split or snap couplings. Standard connections shall meet the requirements of the ASTM F405 or ASTM F667. Gasketed connections shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of ASTM D1056 Grade 2A2. Gaskets, when applicable, shall be installed by the pipe manufacturer.

FITTINGS

Fittings shall conform to ASTM F405 or ASTM F667.

MATERIAL PROPERTIES

Pipe and fitting material shall be high density polyethylene conforming with the minimum requirements of cell classification 423410C as defined and described in the latest version of ASTM D3350; or ASTM D1248 Type III, Class C, Category 4, Grade P33.

INSTALLATION

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines with the exception that minimum cover in trafficked areas for 3- through 24-inch (75 to 600 mm) diameters shall be one foot (0.3 m). Contact your local ADS representative or visit our website at ***www.ads-pipe.com*** for a copy of the latest installation guidelines.

PIPE DIMENSIONS

Nominal Pipe I.D.* in. (mm)	3 (75)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)	12 (300)	15 (375)	18 (450)	24 (600)
Nominal Pipe O.D.** in. (mm)	3.6 (91)	4.6 (117)	5.8 (147)	7 (178)	9.5 (241)	12 (305)	14.5 (368)	18 (457)	22 (559)	28 (711)
Perforations	All diameters available with or without perforations.									

*Check with sales representative for availability by region.
**Pipe O.D. values are provided for reference purposes only, values stated for 3- through 24-inch are ±0.5 inch. Contact a sales representative for exact values.

3" - 24" Split Band Coupler

3" - 10" External Snap Coupler

3" - 8" Internal Snap Coupler

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Maximum test pressure: 4.3 PSI (29.6KPA)
Maximum operating temperature: 140° F nonconsistent

Fernco Flexible Couplings

The industry standard for sewer, drain, waste & vent piping.

Specially formulated PVC compound positively seals any sewer and drain connection.

Because of their quality and ease of installation, Fernco Flexible Couplings have found wide acceptance among sewer and plumbing contractors and municipalities. Fernco couplings are used for all types of in-house and sewer applications: drain waste, repairs, vent piping, house-to-main, cut-ins, conductor and roof drains and increasers-reducers.

Made of tough elastomeric polyvinyl chloride (PVC), they are strong, resilient and unaffected by soil conditions. They are also resistant to chemicals, ultraviolet rays, fungus growth, and normal sewer gases due to the inert nature and physical properties of the material. And they are leakproof, rootproof and seal against infiltration and exfiltration.

Tested designs backed by over
four decades of proven performance.

- Positive seal against infiltration and exfiltration
- Leakproof, rootproof and areresistant to chemicals, ultraviolet rays, fungus growth, and normal sewer gases
- Conforms to ASTM #D5926, C1173 and applicable portions of ASTM #C443, C425, C564, CSA B602 and D1869
- Connects pipes of same or different sizes and materials quickly and easily
- Stainless steel clamps are corrosion-resistant and rustproof

The dimensional flexibility of Fernco couplings ensures leakproof seals on virtually any pipe material: plastic, cast iron, asbestos cement, clay, concrete, steel, copper and ductile iron. All couplings are clearly marked with part number, size, and pipe materials that the coupling will connect. Fernco makes fast delivery of stock items with no minimum order required. For special applications, our custom design service can supply couplings to individual customer requirements.

Fernco® Inc.

Fernco, Inc. • Davison, MI • PH: 810-653-9626 • FAX: 810-653-8714 • **www.fernco.com**

SDR35 D 3034 / PS46 F 679 FITTING SPECIFICATIONS

1.0 **GPK PVC Sewer Fittings** shall be manufactured in accordance with either ASTM D 3034, F 1336 or F 679. The PVC material shall have a minimum cell classification of 12454, 13343 or 12364 as defined in ASTM D 1784.

2.0 The **purpose** of GPK in-line fittings is to convey municipal sanitary and industrial wastes, storm water runoff and many other related applications. They are designed to be used in gravity flow and low pressure applications not to exceed 10.8 psi (74.5 kPa).

3.0 **Injection Molded Fittings** are produced in sizes 4" (100mm) through 12" (300mm) diameter. **Fabricated Fittings** are produced in sizes 4" (100mm) through 36" (973mm) diameter. A fabricated fitting is considered any fitting made from pipe or a combination of pipe and molded components.

4.0 **Chemical Resistance.** GPK fittings resist attack from certain alcohols, alkalies, salt solutions, acids and other types of chemicals. Refer to chemical resistance chart for suitability.

5.0 **Marking.** GPK fittings shall be marked with applicable size, "PVC", company name or logo, PSM and the ASTM specification number (D 3034, F 1336 or F 679). The fittings and/or packaging shall include the manufacturer's date and shift code.

6.0 **Testing.** A test after installation of either low pressure air (Uni-B-6) or a water infiltration-exfiltration test is recommended.

7.0 **Deflection Test.** The maximum allowable pipe fitting deflection should be 7 1/2% of base ID as shown in Table X1.1 of D 3034, and X2.1 of F 679.

8.0 **Backfilling and Tamping.** Backfilling should follow closely after assembly of pipe and fittings.

8.1 **Backfilling** with proper material is important to achieve desired density in haunching area which enables pipe, fitting and soil to work together to meet designed load requirements. This eliminates excess deflection and shear breaks due to heavy loads. Approved material shall be used properly, compacted continuously above and around the pipe and fittings as well as between the fitting and trench wall. A cushion of approved material up to a minimum of 12" (305mm) over the fittings and between the trench walls shall be applied in accordance with the engineers' specifications.

8.2 **Tamping.** This shall be done by hand tamping of the embedment material between the trench wall of the service line fitting and riser connection. Tamping can also be done by mechanical tampers or by using water to consolidate the embedment material. **Extreme unstable ground conditions** may require wider trenches to enable you to compact a larger area around the pipe and fittings to the density consistent of the original ground surface conditions.

9.0 **Service Lines.** Normally, service lines from the property line to the collection sewer should be a minimum depth of 3 feet (1 meter) at the property line and should be laid in straight alignment and uniform slope of not less than 1/4" per foot (20.8mm/meter) for 4" (100mm) nominal pipe and 1/8" (10.4mm/meter) per foot for 6" (150mm) pipe. Where collection sewers are deeper than 7 feet (2 meters) a vertical standpipe or stack is permitted but not recommended, consult the project engineer for proper installation details. Deep sewer chimney and risers necessitate extreme care during backfilling. Where surface loading is anticipated the final backfill must be compacted to a density compatible with those surface loads to be encountered.

9.1 **Backfilling around pipe service laterals on slope.** Extra attention should be given on slopes to prevent the newly backfilled trench from becoming a "French Drain." Before backfilling completely there is a tendency for ground and surface water to follow the direction of the looser soil. This flow may wash out soil from under or around pipe and branch line fittings, reducing or eliminating the support needed. To avoid this problem the backfilling should be of greater compaction. Tamping should be done in 4" (100mm) layers and continued in this manner all the way up to ground or surface line of the trench. Concrete collars or other concrete poured around the fitting to stabilize unwanted movement is recommended to prevent water from undercutting the underside of the pipe and fittings.

SUMMARY: Due to various ground conditions and different situations, installation techniques vary widely. We warranty our products to be free of manufacturer's defects. We will not replace the products that are installed or used incorrectly. The design of the systems that our product is used in is a factor that cannot be overlooked.

GPK FITTING SUBMITTAL SHEET

Intro: GPK manufactures PVC sewer fittings in accordance with either ASTM D 3034, F 1336 or F 679 to be used in gravity flow or low pressure applications. Injection molded fittings are produced in sizes 4" (100mm) through 12" (300mm) diameter. Fabricated fittings are produced in sizes 4" (100mm) through 36" (973mm) diameter.

Material: Fabricated fittings are manufactured from PVC pipe and molded components meeting the requirements of either ASTM D 3034, F 1336 or F 679 for workmanship, extrusion quality, stiffness, impact resistance, dimensions and structural performance.

Extruded pipe components are made from PVC material with a minimum cell classification of 12454, 13343 or12364 as defined in ASTM D 1784.

Injection molded fittings are made from PVC material with a minimum cell classification of 12454 or 13343 as defined in ASTM D 1784.

Extrusion Quality: Extruded components are tested in accordance with and meet the requirements of ASTM D 2152 for properly fused PVC.

Impact Resistance: Extruded components are tested in accordance with ASTM D 2444 using a 20 lb (9.07kg). Tup A and a Flat Plate Holder B. The strength shall equal or exceed the values shown below:

4" - 5" 150 Ft-Lbs	6" - 8" 210 Ft-Lbs	10" - 36" 220 Ft-Lbs
(100mm - 125mm 203 J)	(150mm - 200mm 284 J)	(250mm - 973mm 299 J)

Impact Resistance: Injection molded fittings are tested in accordance with ASTM D 2444 using a 20 lb (9.07kg). Tup A and a Flat Plate Holder B. The strength shall equal or exceed the values shown below:

4" 50 Ft-Lbs	6" - 8" 75 Ft-Lbs	10"-12" 90 FT-Lbs
(100mm 68 J)	(150mm - 200mm 102 J)	(250mm - 300mm 122 J)

Pipe Stiffness: Extruded components are tested in accordance with ASTM D 2412. The stiffness equals or exceeds the requirements of ASTM D 3034 and F 679.

Pipe Flattening: Extruded components are flattened as described in ASTM D 3034 and F 679 until the distance between the plates is 40% of the outside diameter of the pipe. There shall be no splitting, cracking or breaking.

Pressure/Pressure Deflection: Gasketed joints are tested in accordance with ASTM D 3212.
Pressure: 10 minutes @ 10.8 psi (74.5 kPa) + 10 minutes deflected @ 10.8 psi (74.5 kPa).
Vacuum: 10 minutes @ 22 in. Hg (74 kPa) + 10 minutes deflected @ 22 in. Hg (74 kPa).

Branch Bending: The chemically fused areas around the fabricated branches of tee, wye and tee-wye fittings are tested to ASTM F 1336 to verify their strength and integrity.

Pipe Stop Support: Tee and tee-wye fittings are tested to requirements of ASTM F1336 for pipe stop load support. No cracking or splitting shall occur and pipe spigot shall not protrude into waterway of the fitting.

Joining Methods: Chemically Fused Solvent Weld Joints
Solvent cement is handled and tested in accordance with ASTM D 2564 and D 2855. The Lap Shear Strength shall equal or exceed 900 psi (6205 kPa) @ 72 hours.

Heat Fusion Welded Joints (Butt Fusion Welds)

Elastomeric Seals (Gaskets)
Must meet all requirements of ASTM F 477 and D 3212.

Saddles: Injection molded saddle tees and saddle wyes shall have skirts with a minimum of 80 square inches (516 square cm) surface area which can be bonded to pipe.

Fabricated saddle tees and saddle wyes shall have skirts with a minimum of 160 square inches (1032 square cm) surface area which can be bonded to pipe.

GPK does not recommend gasket skirts where air tests are required.

Epoxy Reinforced Welds.

Geo-tech Fabric Sock

ZODIAC FABRICS INC.

688 Sovereign Road London Ontario N5V 4K7 Canada

CARRIFF ENGINEERED FABRICS

3500 Fieldstone Trace, Midland North Carolina U.S.A.

September 7, 2007

Advanced Drainage Systems
4640 Trueman Blvd.
Hilliard, Ohio, USA,
43026

To Whom It May Concern:

Please be advised that the polyester knit ***"SOCK"*** filter products identified below, are manufactured to meet or exceed the physical and performance criteria of Type "A" and Type "H" fabrics as described in ASTM D6707 (Standard Specification for Circular Knit Geotextile Fabrics for Use in Sub-surface Drainage Applications) protocol.

ASTM D6707 Table of Values

Characteristic	Test Method	TYPE "A" FABRICS	TYPE "H" FABRICS
Water Permittivity	ASTM D4491	2.4 $^{s-1}$ min.	2.75 $^{s-1}$ min.
AOS	ASTM D 4751	0.600 mm max.	0.425 mm max.
Puncture Strength (N)	ASTM D6241	800 min	800 min

The products described below are manufactured and supplied by Carriff Engineered Fabrics Corporation, operating as Carriff Corporation Inc. of Midland North Carolina, and Zodiac Fabrics Company of London, Ontario, Canada.

TYPE "A" FABRICS

SKU #	DESCRIPTION
FL-04195	2" Reg White
FL-00511	3" Reg White
FL-04288	3" Reg Black
FL-00512	4" Reg White
FL-04175	4" Reg Black
FL-00513	6" Reg White
FL-04185	6" Reg Black
FL-00514	8" Reg White
FL-04185	8" Reg Black
FL-04249	10" Reg White
FL-04268	10" Reg Black
FL-00516	12" Reg White
FL-04269	12" Reg Black
FL-00517	15" Reg White
FL-00518	18" Reg White
FL-00519	24" Reg White
FL-00520	30" Reg White

TYPE "H" FABRICS

SKU #	DESCRIPTION
FL-00511	3" HWY White
FL-04289	4" HWY (Blue Stripe)
FL-04187	4" HD HWY (White / Blue)
FL-04190	5" HWY (Yellow Stripe)
FL-04188	6" HWY (Red Stripe)
FL-04189	6" HD HWY (Black Stripe)
FL-04250	18" HD HWY White

CARRIFF ENGINEERED FABRICS CORPORATION

Paul Mutter

Vice President, Sales and Marketing


Step 1
Vent Loop Trench for Piping


Step 2
Bedding Material filter wrap
Vent Loop Piping and filter Wrap

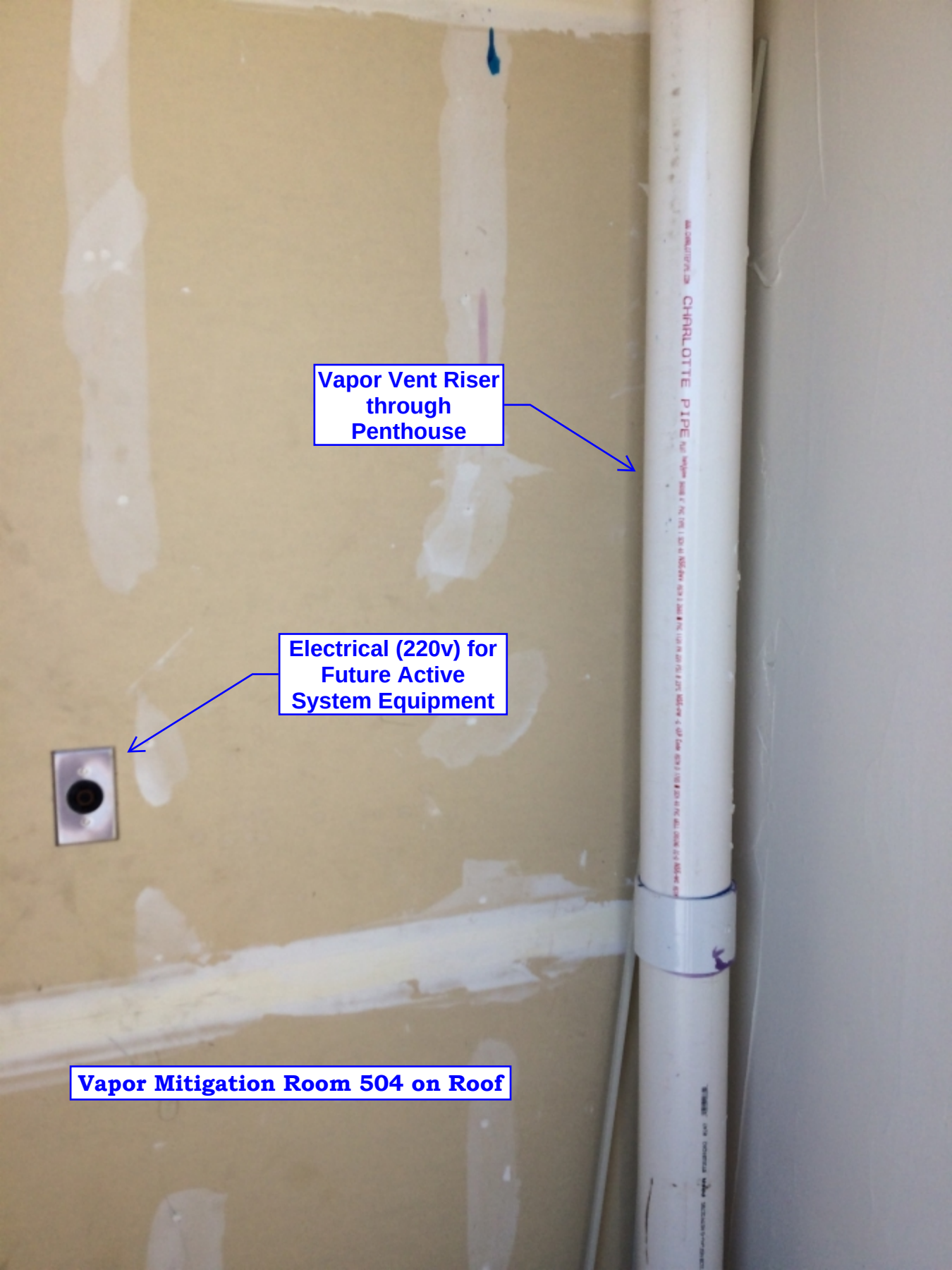

Step 3
Bedding Material filter wrap
Capillary Break Bedding Material
Vent Loop Piping and filter Wrap


Capillary Break
Bedding Material =
Washed Pea Gravel


Final Loop
Southwest Loop
South Loop
North Loop


Vapor Vent Risers from the three loops below slab-on-grade to Hoffman Box on Level 2


Sampling Port (typ)
Vapor Mitigation Sampling "Hoffman Box"
located on 2nd Floor Telcom Room #215


Vapor Vent Riser through Penthouse
Electrical (220v) for Future Active System Equipment
Vapor Mitigation Room 504 on Roof


Vent Riser Vent Stack at Elevator Penthouse


Underslab
Vapor Barrier
(North)
Plumbing penetration (typ)


Underslab
Vapor Barrier
(Northwest)


Underslab
Vapor Barrier
(Southwest)


Underslab Vapor Barrier beneath interior footing (typ)


Pinned to form
Underslab Vapor Barrier under perimeter footing (typ)


Vapor Vent Risers from the three loops below


Step 1
Vent Loop Trench for Piping


Step 2
Bedding Material filter wrap
Vent Loop Piping and filter Wrap

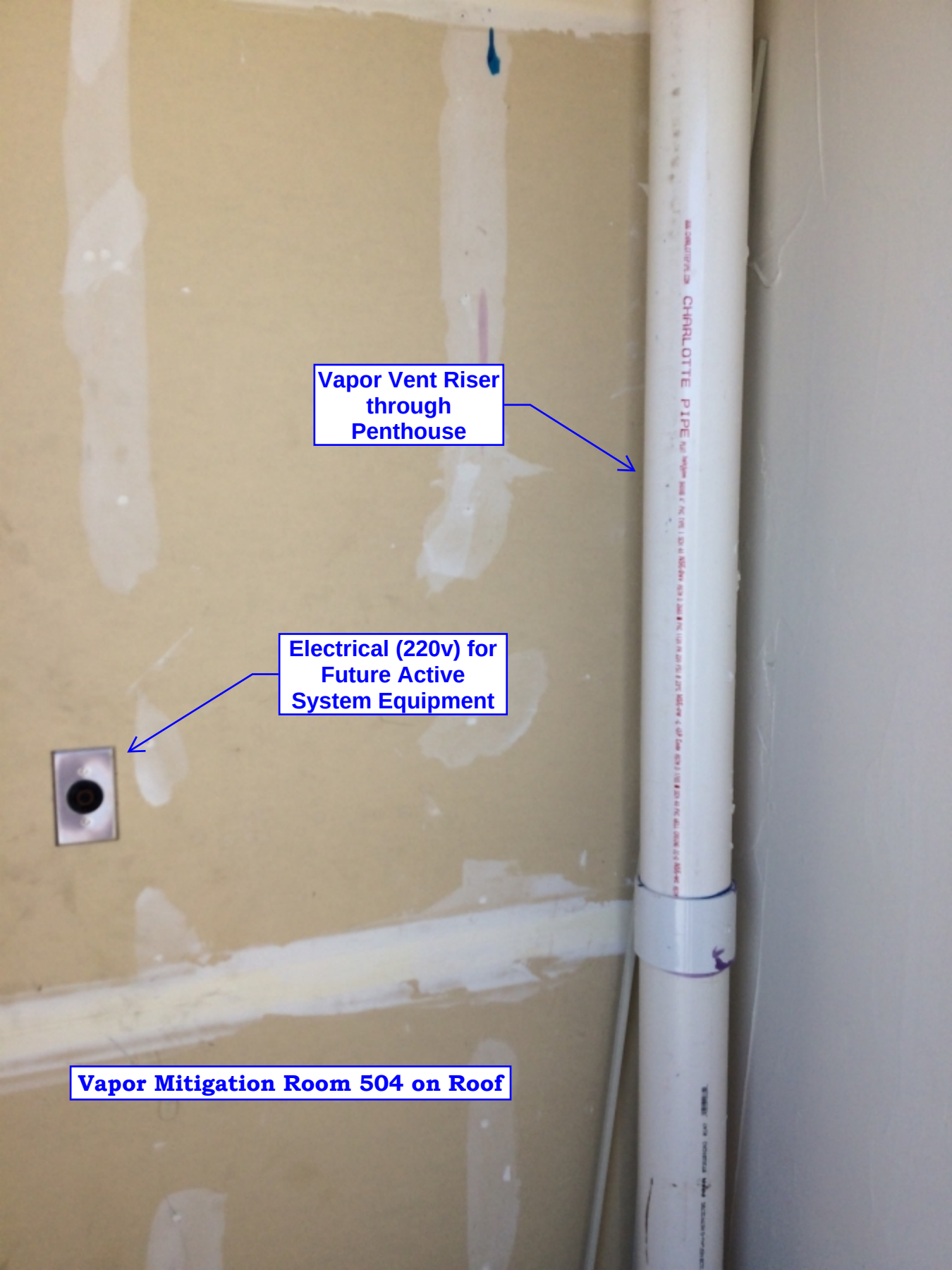

Step 3
Bedding Material filter wrap
Capillary Break Bedding Material
Vent Loop Piping and filter Wrap


Capillary Break
Bedding Material =
Washed Pea Gravel


Final Loop
Southwest Loop
South Loop
North Loop


Vapor Vent Risers from the three loops below slab-on-grade to Hoffman Box on Level 2


Sampling Port (typ)
Vapor Mitigation Sampling "Hoffman Box"
located on 2nd Floor Telcom Room #215


Vapor Vent Riser through Penthouse
Electrical (220v) for Future Active System Equipment
Vapor Mitigation Room 504 on Roof


Vent Riser Vent Stack at Elevator Penthouse

City of Olympia
Community Planning and Development

Certificate of Occupancy

Building Address : 318 STATE AVE NE

Use : Apartments

Owner :

Permit Number : 15-3450-CBPN-0

Code Edition : IBC 2012

Land Use Zone : DB

Parent Permit: 15-3450-MFY2

Structure Description	Occupancy Group	Occupant Load	Construction Type	Suppression	Alarm
OLYMPIA DEVELOPMENT LLC	B/R-2	222	VA	Yes	Yes

This certifies that the City of Olympia Building Official finds no violations of the provisions of the currently Adopted City of Olympia Building Codes or other laws that are enforced by the Department of Building Safety through the reports of inspections performed by qualified personnel.

07/18/2017

Date

Signature of Building Official or authorized representative

THIS CERTIFICATE MUST BE PERMANENTLY MAINTAINED IN THE BUILDING OR STRUCTURE REFERRED TO ABOVE

If this building or structure is used for any occupancy other than that listed, an application for change of occupancy shall first be made to the Community Development Department