Building 600 Subslab Depressurization System Basis of Design

Parcel 40
Port of Tacoma

Project Number: 013-006 TO6

Prepared for:
Port of Tacoma
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Tacoma, WA 98421

June 7, 2021

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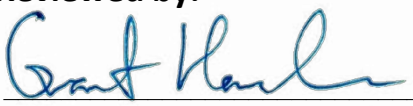

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1 Introduction

CRETE Consulting Incorporated, PC (CRETE) has prepared this draft Basis of Design Report for the Port of Tacoma Parcel 40 Site located at 1675 Lincoln Avenue in Tacoma, Washington. This report documents the design objectives and approach for the installation of a subslab depressurization system (SSDS) for Building 600 located at the site. The SSDS is being installed to mitigate potential vapor intrusion into the building by maintaining a negative pressure across the building's subslab floor at all times. This design has been developed based on the following data collected:

- Results of indoor air samples collected in the summer of 2020 and summarized in the August 26, 2020 Indoor and Ambient Air Sampling Report (EMB 2020), included in Appendix A
- Negative Pressure Extension Field and Air Flow Measurements - October 24-25, December 19, 2020; Advanced Radon Technologies (ART) 2020 included in Appendix B provides initial readings from October 24-25 that have been superseded by work performed on December 19.
- Sub Slab vapor samples collected by CRETE on October 27, 2020; laboratory data is included in Appendix B
- Soil and Groundwater Investigation Report, Parcel 40. Draft report dated December 28, 2020 prepared by CRETE.

1.1 Property Summary

Parcel 40 consists of an asphalt-paved lot with a 38,000 square foot maintenance garage (Building 600), shown on Drawing 1. The building foundation is slab on grade with a steel frame structure, concrete walls, and a sheet metal roof. The building has single-level open bays on its east and west ends, with a two-level office/storage area between. The building is currently occupied by SSA Marine and is used for marine terminal equipment maintenance.

The maintenance garage contains chemical products typically used for vehicle and heavy equipment maintenance including oils, greases, adhesives, solvents, and degreasers. In addition, there is a paint booth on the west end of Building 600.

A fueling shed is located on the east side of Parcel 40, approximately 70 feet from the east end of the building. Otherwise, the maintenance garage is surrounded by paved road and parking areas. The 11th Street viaduct borders the north side of Parcel 40.

The property is currently listed (Facility Site ID 66987611) with the Washington State Department of Ecology (Ecology) due to a documented petroleum release discovered in 1998. An investigation and remedial actions were taken to address the release including the installation of a monitoring well network and free product recovery, however, the release was

not fully characterized or remediated. Groundwater sampling of the old monitoring well network in August 2019 identified the presence of benzene at a concentration exceeding the vapor intrusion groundwater screening level at monitoring well GEI-MW-1. Follow-up groundwater sampling in March 2020 confirmed the August 2019 benzene result. This sampling also confirmed the presence of dissolved petroleum in groundwater, and that no additional volatile organic compounds (VOCs; other than benzene) were present in groundwater above the vapor intrusion screening levels (Crete 2020).

Additional soil and groundwater testing was performed in June through November 2020 around the perimeter of the building. Benzene exceeded the vapor intrusion screening level in one other location toward the northeast corner of the building. Elevated gasoline-, diesel- and oil-range organics were also identified in soil and groundwater around the perimeter of the building with the exception of the west side and about the western 150 feet of the north side. Details of this work are included in the draft Soil and Groundwater Investigation Report (CRETE 2020).

1.2 Vapor Intrusion Evaluation

Based on the environmental data available and collected in 2020 by CRETE, an indoor air sampling event was conducted on July 4 to July 5 by EMB Consulting (EMB). The work included collecting five air samples inside Building 600 and two ambient outdoor air samples upwind and downwind of the building. Ambient outdoor air samples were collected to provide data on background levels of the COCs in the project area. Sample locations and results are summarized below and are detailed in Appendix A.

Subslab vapor samples were collected in October 2020 to assess subslab conditions in targeted areas of the buildings. Two samples were collected by CRETE at the sample locations shown on Drawing 3 and results are summarized below and on Table 1.

1.2.1 Indoor and Ambient Air Sampling

In July 2020, EMB performed indoor and ambient air sampling. A brief summary of the results is presented below. The full report is provided in Appendix A.

The ambient air sample results from the east and west sides of Parcel 40 did not have detectable concentrations of the VOCs, with the exception of naphthalene, which was detected in both samples.

For the indoor air samples, VOCs were detected above laboratory reporting limits (RLs) in all indoor samples, but none were detected at concentrations above the MTCA Method C cleanup level (CUL). VOCs commonly found in paint (toluene, ethylbenzene, and xylenes) were identified in higher concentrations in the West Bay sample, which is close to the paint booth.

Air-Phase Petroleum Hydrocarbons (APH) EC9-10 aromatics were not identified in any indoor air sample above the laboratory RL. APH EC5-8 aliphatic and APH EC9-12 had detectable levels in all indoor samples. The APH EC5-8 aliphatic concentrations are higher in the west portion of the warehouse than the east portion; APH EC9-12 aliphatics are higher in the east portion of the warehouse than the west portion. The reason for this difference cannot be determined based on the available data. There were chemicals present in east and west building bays, but not in the central areas sampled (offices). Many of the chemical products onsite are petroleum based, but considering the types and volumes of products observed, these chemical products are not likely to generate concentrations of APH aliphatics identified across the building space. It appears likely that the APH EC9-12 aliphatics are at least partially associated with soil and groundwater contamination beneath the building.

1.2.2 **Subslab Vapor Sampling**

Two subslab vapor samples were collected from below the concrete slab of Building 600 (Drawing 3). One sample was collected in the Parts Room (SSV-Parts) and one sample was collected in the East Bay (SSV-E Bay). These data are provided in Appendix B. APH EC5-8 aliphatics were detected beneath the East Bay while APH EC9-12 aliphatics were detected below the Parts Room. Both samples were below subslab vapor screening levels (Table 1).

Table 1: Summary of Indoor Air and Subslab Sample Results - Parcel 40, Building 600

Sample Location/Type	Screening Level (Indoor Air) Method B	Screening Level (Indoor Air) Method C	Ambient West	Ambient East	Indoor - West Bay 13	Indoor - Parts Office	Indoor - NW Office	Indoor - East	Indoor - East (Dup)	Subslab	
Sample ID			AW040720	AE040720	IWB13	IPO040720	INWOFF040720	IE040720	IE100040720	SSV-E-Bay	SSV-Parts
Sample Date			7/4/20	7/4/20	7/4/20	7/4/20	7/4/20	7/4/20	7/4/20	10/27/20	10/27/20
Compounds	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Benzene	0.321	3.2	<0.32	<0.38	0.58	**0.74**	**0.51**	**0.79**	**0.78**	< 2.6	<1
Toluene	2286	5000	<19	<23	**39**	<23	<19	<19	<19	<150	<60
Ethylbenzene	457	1000	<0.43	<0.52	**14**	**6.3**	**5.1**	**1.3**	**1.3**	<3.6	<1.4
m,p-Xylene	46	100	<0.87	<1	**63**	**30**	**25**	**5.5**	**5.3**	<7.1	<2.8
o-Xylene	46	100	<0.43	<0.52	**19**	**9.8**	**8.3**	**2.1**	**1.7**	<3.6	<1.4
Naphthalene	0.074	0.740	**0.16**	0.12j	**0.39**	**0.36**	**0.34**	**0.32**	**0.36**	<2.1	<0.84
Aliphatics EC>5-8	NV	NV	<30	<36	**240**	**160**	**110**	**130**	**130**	**1,900**	<130
APH EC9-12 aliphatics	NV	NV	<35	<42	**1500 ve**	**1200 ve**	**1100 ve**	**2600 ve**	**2700 ve**	< 410	**230**
APH EC9-10 aromatics	NV	NV	<25	<30	<25	<30	<25	<25	<25	< 200	<80
Total TPH (based on full RL) [1]	142	310	90	108	**1765**	**1390**	**1235**	**2755**	**2855**	**1,900**	**440**

Notes:
shade = detection exceeds indoor air screening level based on Method B
ug/m3 = micrograms per cubic meter
ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.
1. Total TPH is based on Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings Implementation Memorandum No. 18, dated January 10, 2018
Full reporting limit was used for total TPH.

Table 1b: Estimate of Maximum Annual Emissions (lbs/year)

	Maximum Conc'n Indoor and Subslab	Average Conc'n (Detects only)	Flow Rate (cfm)							
	ug/m3	ug/m3	20	40	60	80	100	120	Estimated Maximum Emissions at 120 cfm	PSCAA Regulation Limits
Benzene	0.79	0.68	0.001	0.001	0.002	0.002	0.003	0.003		
Toluene	39	39	0.026	0.051	0.077	0.102	0.128	0.153		
Ethylbenzene	14	5.6	0.009	0.018	0.028	0.037	0.046	0.055		
m,p-Xylene	63	25.76	0.041	0.083	0.124	0.165	0.207	0.248		
o-Xylene	19	8.18	0.012	0.025	0.037	0.050	0.062	0.075		
Naphthalene	0.39	0.354	0.000	0.001	0.001	0.001	0.001	0.002		
Aliphatics EC>5-8	1,900	445	1.246	2.493	3.739	4.985	6.232	7.478		
APH EC9-12 aliphatics	2,700	1,820	1.771	3.542	5.313	7.084	8.855	10.626		
APH EC9-10 aromatics	200	0	0.131	0.263	0.394	0.525	0.657	0.787		
Total VOC (lbs/year)			0.089	0.179	0.268	0.357	0.447	0.536	**0.54**	< 15
Total TPH (lbs/year)			3.149	6.297	9.446	12.595	15.744	18.891	**18.9**	
Benzene (lbs/year)			0.001	0.001	0.002	0.002	0.003	0.003	**0.003**	< 15
Total Toxic Air Contaminants			3.239	6.477	9.716	12.954	16.193	19.430	**19.4**	< 1,000

PSCAA Regulations Exemptions: Soil and groundwater remediation projects involving <15 pounds per year of benzene or vinyl chloride, <500 pounds per year of perchloroethylene, and <1,000 pounds per year of toxic air contaminants.

2 Basis of Design

Subslab depressurization systems (SSDSs) are widely considered the most practical vapor intrusion mitigation strategy for most existing structures (ITRC 2007). The SSDS decreases the pressure below the building slab by drawing air from the subsurface. Negative subsurface pressure pulls air and VOCs downward, through the slab, and into the subsurface. An exhaust blower draws the air and VOCs from the subsurface and vents them to the ambient air via an exhaust stack typically located above the roof of the building away from air supply intakes. Negative pressure is applied to the subsurface at sumps installed through the building floor. Pipes are installed at the sumps and then manifolded together and connected to the exhaust fan, which draws soil gas from the subslab through the piping and vents it outdoors.

SSDSs are most commonly used for radon mitigation. An adequate negative pressure field for radon mitigation systems is generally defined by achieving a minimum vacuum of 0.005 inches water column (WC) as measured at individual points through the building slab while earlier guidance documents suggested a minimum vacuum of 0.002 inches WC for each monitoring point (USEPA 1994). For VOC mitigation using SSDS, EPA applies a more conservative minimum subslab vacuum of 0.02 inches WC (USEPA 2008). For Building 600, the goal is to achieve 0.02 inches WC in the Office Area and Parts Room and 0.005 inches WC in the work bays (West Bay and East Bay). The work bays are two stories tall and bay doors are usually open during work hours increasing the natural ventilation.

This section describes the diagnostic testing, design of the proposed SSDS, and permitting requirements. The diagnostic testing was performed.

2.1 Diagnostic Testing

Diagnostic testing was performed October 24-25 and December 19, 2020. The diagnostic testing was completed for the five sump locations indicated on Figure 1 by Advanced Radon Technologies (ART) with oversight by CRETE Consulting. Diagnostic testing included:

- Initial sump installation and pressure field extension (PFE) testing
- Final sump installation and PFE testing
- Individual sump vacuum and flow testing

2.1.1 Initial Sump Installation

Initial sump installation and testing was performed October 24 and 25, 2020. The results are summarized in this section and in the ART Diagnostic Testing Results Sump W1 (Hole #1 in ART report) was the first sump installed to assess soil conditions beneath the slab and to provide initial information regarding the vacuum and flow characteristics of the subslab soil. The subslab soil was compacted sand and gravel that appeared to be consistent with imported gravel borrow consisting of gravel up to about 3-inches in diameter. Five (5) ½-inch diameter holes were drilled through the slab to measure subslab vacuum.

A test fan was placed at Sump W1 and a vacuum of 10 inches WC was applied. The flow was less than the minimum 15 standard cubic feet per minute (scfm) flow that could be measured by the test fan. Vacuum was measured at 3 locations as shown on Table 2.

Table 2 Sump W1 Test Fan Results

Distance from Sump W1 (ft)	Measured Vacuum (inches WC)
23	0.225
61	0.020
103	None measured

Based on these initial readings Sump E2 (Hole #2) and Sump E1 (Sump #3) were installed to provide adequate coverage in the Office Area and Parts Room and in the East Bay above the source of soil and groundwater contamination. A test fan was placed at Sump E2 and a vacuum of 10 inches WC was applied. The flow was less than the minimum 15 scfm flow that could be measured and no subslab vacuum was measured at a distance of 45 feet from Sump E2. Sump E1 was placed between Sumps W1 and E2 to provide better coverage in this area.

Negative PFE testing was then performed will all 3 sumps operating as assess whether the PFE would be adequate. With all 3 sumps operating at 10 inches WC (and <15 scfm per sump), subslab vacuum readings of 0.045 inches WC and 0.014 inches WC were achieved in the Parts Office and the middle of the East Bay, respectively. Sumps E1 and E2 were then both increased to 15 inches WC and a subslab vacuum of 0.022 inches WC was achieved in the middle of the East Bay. This result suggested that the PFE would include the entire East Bay.

Based on these initial results, it was estimated that an additional 2 to 3 sumps would provide an adequate PFE for the entire building.

2.1.2 Final Sump Installation

Sumps W2 and W3 were installed on December 19, 2020 and additional PFE testing was performed. The existing sumps were accessed and deepened such that 10 to 20 gallons of soil had been removed from each sump down to the bottom of the gravel borrow fill (34 to 40 inches deep). Additional ½-inch diameter holes were drilled through the slab to measure subslab vacuum for a total of 11 measuring points.

Negative PFE testing was performed in 2 phases since only 3 test fans were used. Of those 3 fans, 1 fan had a maximum vacuum of 10 inches WC. Figure 2 shows the results of the PFE testing in the West Bay with Sumps W2 and W3 operating at 20 inches WC and Sump W1 operating at 10 inches WC. The PFE was adequate beneath most of the West Bay, except in the very middle where 2 locations were at or slightly below the target vacuum of 0.005 inches WC. A suitable location for an additional sump could not be located near the middle of the West Bay

due to tenant operations, subslab utilities, and subslab thickness. Due to the limited size of the area and the location near the edge or outside of the area of groundwater contamination the vacuum goal may be achieved by increasing the design vacuum and using valves at each sump to control vacuum in lieu of installing another sump in this area.

Figure 3 shows the results of the PFE testing in the East Bay with Sumps E1 and E2 operating at 20 inches WC and Sump W1 operating at 10 inches WC. The PFE was adequate beneath the Office Area, Parts Office, and the East Bay, with a minimum vacuum reading of 0.027 inches WC near the south edge of the East Bay.

2.1.3 **Sump Vacuum and Flow Readings**

All sumps were tested for flow at incremental vacuums using a test fan. A summary of the flows recorded for each sump is provided in Table 3. These measurements will be used for blower sizing based on the design vacuum and the total flow estimate at that vacuum.

After testing, each sump was capped with a short section of 4-inch ABS pipe and an ABS end cap. The caps are temporary as these locations shall become part of the final system.

Table 3 SSDS Sump Vacuum-Flow Data

Vacuum (inches water column)	Flow Estimate (standard cubic feet per minute)				
	Sump W1	Sump W2	Sump W3	Sump E1	Sump E2
10	12	12	9	8	6
15	16	16	16	12	9
20	23	20	23	16	13
25	26	23	30	21	23
30	32	28	not measured	24	32

2.2 Design Elements

The design objective for the subslab depressurization system (SSDS) is to mitigate potential vapor migration into Building 600 by maintaining an adequate PFE in the subslab at all times, regardless of heating, ventilation, and air conditioning (HVAC), or variation in barometric conditions. As noted previously, the system has been designed to achieve a negative pressure of 0.02 inches WC in the subslab beneath the Office Area and Parts Room and 0.005 inches WC in the subslab beneath the work bays.

During diagnostic testing, the concrete slab was inspected throughout the building. No significant cracking was observed and no short-circuiting of flow through cracks was identified during diagnostic testing. During installation of the SSDS, additional inspection will be performed to confirm that no significant cracks exist. Any significant cracks that are identified will be sealed prior to system start-up.

2.2.1 **Sumps**

Sumps provide the interface between the subsurface and the suction applied by the exhaust blower. As described in section 2.1, five sumps were installed at locations shown on Figure 1. These locations were installed during PFE testing events on October 24 to 25 (locations W1, E1, and E2) and December 19 (locations W2 and W3). Holes were cored through the concrete slab (average 12-inches thick) and 10 to 20 gallons of soil was removed to make a sump using a wet/dry vacuum cleaner and digging bar. Each sump was tested as described in Section 2.1. Testing indicated that an adequate PFE will be achieved with relatively low flow rates, with between 13 and 23 scfm extracted from each sump at 20 inches WC vacuum, for a total flow rate of 95 scfm.

Each sump shall consist of a 4-inch-diameter 40 polyvinyl chloride (PVC) pressure-rated water pipe connected to a 4-inch slip coupling that has been placed in the concrete core. The pipe penetration will be sealed with urethane caulk as identified in the Drawings (Appendix C). Piping shall neck down to 3-inch-diameter Schedule 40 PVC at about 3 to 5 feet above the floor grade. As the piping transitions to 3-inch-diameter a flow control valve and a sample port shall be installed at each sump. All vertical piping shall be Schedule 40 PVC pressure rated water pipe (ASTM D1785). Sump E1 shall have a permanent magnehelic vacuum gauge installed for quick assessment of system performance and integrity, discussed below in Section 2.2.5.

2.2.2 **Risers and Piping**

Risers and piping shall provide the conduit from the sumps to the exhaust blower which shall be mounted on the south side of Building 600. All horizontal piping shall be sewer drain pipe (cellular core) Schedule 40 PVC ASTM D4396 (as this is lighter pipe and has greater curve radius, allowing more unrestricted air flow). All vertical piping shall be heavy duty water pipe schedule 40 PVC water pipe (ASTM D1785).

The 3-inch riser shall continue vertically upward until the riser elbows or tees into the lateral. Laterals conveying vapors from 1 sump shall be 3-inch diameter and laterals conveying vapors from 2 or more sumps shall be 4-inch diameter. Laterals shall either be supported by pipe hangers suspended from the building rafters or affixed to building walls with unistrut and clamps.

The point at which the piping network penetrates the wall of the Building 600 shall be sealed with flashing and waterproof sealant, as appropriate. Fire collars are required by code for some internal wall penetrations and sealant is required for penetrations of the Smoke Curtain Wall

Risers and pipe network shall be securely fastened to walls with pipe supports to provide the pipe network structural support. Piping and risers shall be labeled “Depressurization System Pipe for Indoor Air Protection” at least once in every room, and next to the exhaust blower.

All of the piping shall connect to form one network, and shall be sloped so that the connection to the exhaust blower is at the highest point or that highest points are planned in the middle of the ceiling network and the connection to each sump riser is at the lowest point. Piping shall be sloped at 2% when water flows against the direction of the air flow, and 1% when water flows with the direction of air flow. Piping shall be sloped to prevent low spots where water vapor could condense into pools.

All vertical piping shall be securely fastened every 10 feet. All horizontal piping shall be securely fastened every 6 feet. These support spacing requirements are intended to be consistent with the International Mechanical Code and ANSI/MSS SP-58-2018 Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

Protection is required for risers that may be subject to impact due to normal operations in the building. Protection should extend 3 to 4 feet above the floor surface and be resistant to damage from forklifts or vehicles. The details of the piping projection are provided in the Technical Specifications (Appendix C).

All risers shall include a permeant label that provides the following warning, or similar text as approved by the Engineer:

“NOTICE FOUNDATION VENTILATION SYSTEM IS OPERATING.
DO NOT ALTER OR DISCOUNT. FAN OPERATION MUST BE CONTINUOUS.”
Provide a point of contact and phone number with notice.

Table 4 includes a quantity estimate for key piping components.

Table 4 Quantities for Select Piping Products

Quantity Take Off	ASTM Ref. /Possible Product	Linear Feet (rounded, approximate based drawings)
Schedule 40 PVC Pipe - 4 inch Horizontal (Drain Sewer Pipe)	ASTM D4396	150
Schedule 40 PVC Pipe - 4 inch	ASTM D1785	25
Schedule 40 PVC Pipe - 3 inch Horizontal (Drain Sewer Pipe)	ASTM D4396	420
Schedule 40 PVC Pipe - 3 inch Vertical	ASTM D1785	40
PVC Fittings - 4 inch/3inch reducer	ASTM D2466	5 each
PVC Fittings – 3/4 inch elbows (various)	ASTM D2665	10 each
PVC Fittings – 3/4 inch Tees	ASTM D2665	3 each
Purlin Clamps	PHD Manufacturing Model No. 290	52 each (6 foot spacing)
Pipe Clamps (steel straps)	Kindorf C 105 4EG Unit No. 7TAA005270R0017	44 each
Ceiling Hangers (NFPA Swivel Ring Hanger)	PHD Manufacturing Model No. 145	52 each (6 foot spacing)

Notes: This is provided for reference only. This is not a complete list of piping and fittings.

2.2.3 Exhaust Blower

The exhaust blower shall provide the suction to the sumps via the risers and piping of the SSDS. The exhaust blower will be mounted on a raised platform on the south side of Building 600.

The project requires a City of Tacoma mechanical permit. Commercial Mechanical Permit #MECHC21-0055 is provided in Appendix D. The design of a platform to support the blower on the side of the building is provided in the Drawings (Appendix C). The designs assume a maximum weight for the blower, filter, electrical, enclosure, and piping of 250 pounds.

Vibration isolators shall be used between the exhaust blower platform and the building to prevent vibration and excess noise. The exhaust blower shall be connected to piping and the exhaust stack. A bleed valve shall be included on the inlet side of the blower.

Based on the initial diagnostic testing, an explosion -resistant regenerative blower was selected for the project with a 2 horse power/three phase-60 hertz/230/460 voltage blower. A Rotron EN 505 or equivalent would be appropriately sized for this project. Overall, the blower will need to deliver about 100 scfm at 23 inches WC to provide 20 inches WC vacuum at each sump. Details regarding the equipment skid are included in vendor quotes provided in Appendix B.

2.2.4 **Exhaust Stack**

The exhaust stack shall discharge the VOCs/air emissions to the ambient air at a height that does not pose a threat to human health or the environment. Constructed of PVC, the exhaust stack shall effectively extend the exhaust blower outlet to a height approximately 4 feet above the building roof line. The exhaust stack shall attach to the exhaust blower, be routed up the side of the building or directly up from the blower, and discharge 4 feet above the roof line. The exhaust stack shall be angled 45 degrees off vertical from approximately 4 feet above roof level, and the outlet shall be cut on the vertical to prevent precipitation from entering the exhaust stack while continuing to exhaust VOC vapors/air. The exhaust stack discharge point shall be at least 10 feet from any window, door, or other opening into an occupied space, and from any HVAC/ventilation inlet.

2.2.5 **Monitoring Ports and Vacuum Gauges**

A monitoring port shall be installed at each riser to measure and confirm that negative pressure is being applied throughout the SSDS. Monitoring ports consist of a tapped one-quarter-inch hole with a plastic plug that can be removed to gauge vacuum and flow to each sump or to collect vapor samples. The tapped one quarter-inch hole shall be perpendicular to the pipe to accurately gauge flow. An additional pipe layer may be attached at the location of the tap to prevent damage to the PVC.

At sump E1, a manometer shall be used to measure the vacuum of the system using a Dwyer Magnehelic or equivalent that shall be permanently installed into the 3-inch-diameter PVC piping to measure and confirm that negative pressure is being applied throughout the SSDS. The Dwyer Magnehelic gauge and valve system shall be mounted to the riser with solid or flexible tubing. Mounted location shall be based in relation to preventing possible impact from facility operations. The Magnehelic vacuum range shall be 0 to 30 inches WC. The Magnehelic vacuum gauge shall be labeled “Vacuum to be 20-inches WC or stronger at all times”.

The valve system, installed to protect the Magnehelic from failure, consists of a main valve and a relief valve. The main valve shall be installed between the riser and the vacuum gauge that will connect/disconnect vacuum applied to the gauge from the riser. The relief valve will open the vacuum gauge to the ambient air pressure during non-monitoring events and relieve the vacuum within the tubing after the main valve is closed. The main valve will remain closed and the relief valve will remain open when system monitoring is not in progress. During system monitoring events, the main valve will be opened and the relief valve will be closed to engage the vacuum gauge. The vacuum gauge will provide confirmation that adequate negative pressure is being applied by the exhaust blower to the subsurface via the common riser.

2.2.6 **Subslab Monitoring Ports**

Vacuum measuring points (1/2-inch diameter) were installed during the October and December diagnostic testing. These are shown on Figures 2 through 3. The locations have been sealed

with urethane caulking that can be drilled out. Future monitoring may utilize these locations by drilling out the caulk, collecting readings or samples, and re -sealing the locations with new urethane caulk for future use.

2.3 Permitting

Based on the details of the SSDS details the following permits are required:

- City of Tacoma Mechanical Permit – Commercial Mechanical Permit #MECHC21-0055 is provided in Appendix D.
- City of Tacoma Electrical permit – Port Maintenance will obtain the electrical permit as required to connect the blower to the main building power.

A Puget Sound Clean Air Agency (PSCAA) permit is not needed based on PSCAA Regulation 1, Water Treatment section 94 which states the following:

> *(94) Soil and groundwater remediation projects involving less than 15 pounds per year of benzene or vinyl chloride, less than 500 pounds per year of perchloroethylene, and less than 1,000 pounds per year of toxic air contaminants.*

Table 1 includes estimated emissions based on sub slab and indoor air samples collected in the building. Assuming maximum concentrations and maximum flow rates, projected emissions are well below the PSCAA thresholds. These values should be verified with exhaust stack sampling completed after installation and start-up of the full system. Results also confirm that no vapor treatment is needed prior to discharge.

3 Inspection, Monitoring and Maintenance of the SSDS

Periodic inspection and monitoring will be conducted during operation of the vapor intrusion mitigation system to confirm that the Building 600 SSDS is operating effectively. The inspections and monitoring will be conducted by the Port and monitoring of the SSDS will include the following:

- System Startup
- Monthly System Inspections
- Annual system inspection
- Annual negative PFE monitoring

3.1 System Startup

During system startup, negative PFE monitoring will be conducted at Building 600 to measure the pressure differential across the building slab while the SSDS is operating. The results from the PFE monitoring will be used to confirm that the negative pressure field extends to points far removed from the sump locations. Based on these initial readings, the system may need to be modified such as altering flow to individual sumps.

Existing subslab monitoring ports were drilled and sealed during the diagnostic testing. These locations (or new ones installed) will be used for PFE monitoring to determine whether a negative subslab pressure exits. Measurements will be taken manually at each monitoring port using a micromanometer with the capability to measure as low as 0.001 inches WC. The tubing between the micromanometers will be reused at each location and will be sealed at the concrete slab surface using plumber's putty.

A subslab exhaust sample should be collected to confirm the data used to comply with the PSCAA permitting. This sample should be collected just prior to the blower. Samples should be a grab sample collected with a Summa canister and samples should be analyzed for APH and VOCs using EPA Method TO-15.

3.2 Monthly Inspections

Monthly inspections will be completed to ensure that the SSDS is operating properly and that no accidental damage has occurred to system piping. During inspections, the Port will check the SSDS pressure gauges and provide a visual inspection of all piping.

A monthly inspection sheet is included in Appendix E. The Port project manager will maintain copies of these monthly sheets.

3.3 Annual Inspections

Annual inspections will be conducted to observe and document the condition of the SSDS and to record changes to Building 600 and surrounding area that could affect SSDS performance. To the extent feasible, annual inspections will be conducted close to the same date each year. The Subslab Depressurization System Inspection Form provided in Appendix E will be used to document the annual inspections.

The annual inspection will consist of observing and documenting the condition of SSDS components and any structural changes or modifications to Building 600 or adjacent buildings or structures, and recording the SSDS vacuum gauge measurement. The vacuum gauge measurements previously documented on the Subslab Depressurization System Inspection Form will be used for comparison during the inspection. Photographs will be taken during the inspection to document any deterioration of materials (e.g., cracks in piping, mounting damage) or other pertinent changes in the condition of the SSDS, the building structure, or other factors that could impact system operation or effectiveness.

3.4 Annual Negative PFE Monitoring

PFE monitoring will be conducted at Building 600 on an annual basis during the heating season to measure the pressure differential across the building slab while the SSDS is operating. The results from the PFE monitoring will be used to confirm that the negative pressure field extends to points far removed from the sump locations. PFE monitoring will in conducted in conjunction with annual system inspections.

Existing subslab monitoring ports were drilled and sealed during the diagnostic testing. These locations (or new ones installed) will be used for PFE monitoring to determine whether a negative subslab pressure exits. A negative pressure of at least 0.02 inches WC in the Office Area and Parts Room and 0.005 inches WC in the West Bay and East Bay at each of the subslab monitoring ports is considered to be acceptable

3.5 SSDS maintenance

SSDS maintenance will be performed on an as-needed basis following the first year of operation, and will be based on conditions observed during the annual inspections or on reports from the building tenants. Components that may require maintenance include the exhaust blower, vacuum gauge, and piping. The exhaust blower is not amenable to periodic maintenance and is relatively easy to replace. Therefore, the blower will be operated until excessive noise, vibration, or significantly reduced pressure gauge readings are noted, at which point the blower will be repaired or replaced. An operational failure of the blower would be indicated by the vacuum gauge, which will be checked during monthly and annual inspections. Vacuum gauges are less robust than manometers over continued use and may fail after prolonged use. An additional monitoring port may be installed at the blower to monitor SSDS vacuum and flow during annual inspections.

SSDS vacuum measurements collected during annual inspections will be compared to the SSDS vacuum gauge. A failed vacuum gauge will be identified when the vacuum gauge is 75 percent of the annually monitored SSDS pressure. If vacuum gauge failure is confirmed, a replacement gauge will be installed and tested. Replacement of cracked or otherwise damaged system piping observed during annual inspections or identified by the building tenant may be required.

4 References

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EMB 2020. Indoor and Ambient Air Sampling Port of Tacoma Parcel 40 Maintenance Garage, Tacoma Washington. EMB Consulting. August 26, 2020.

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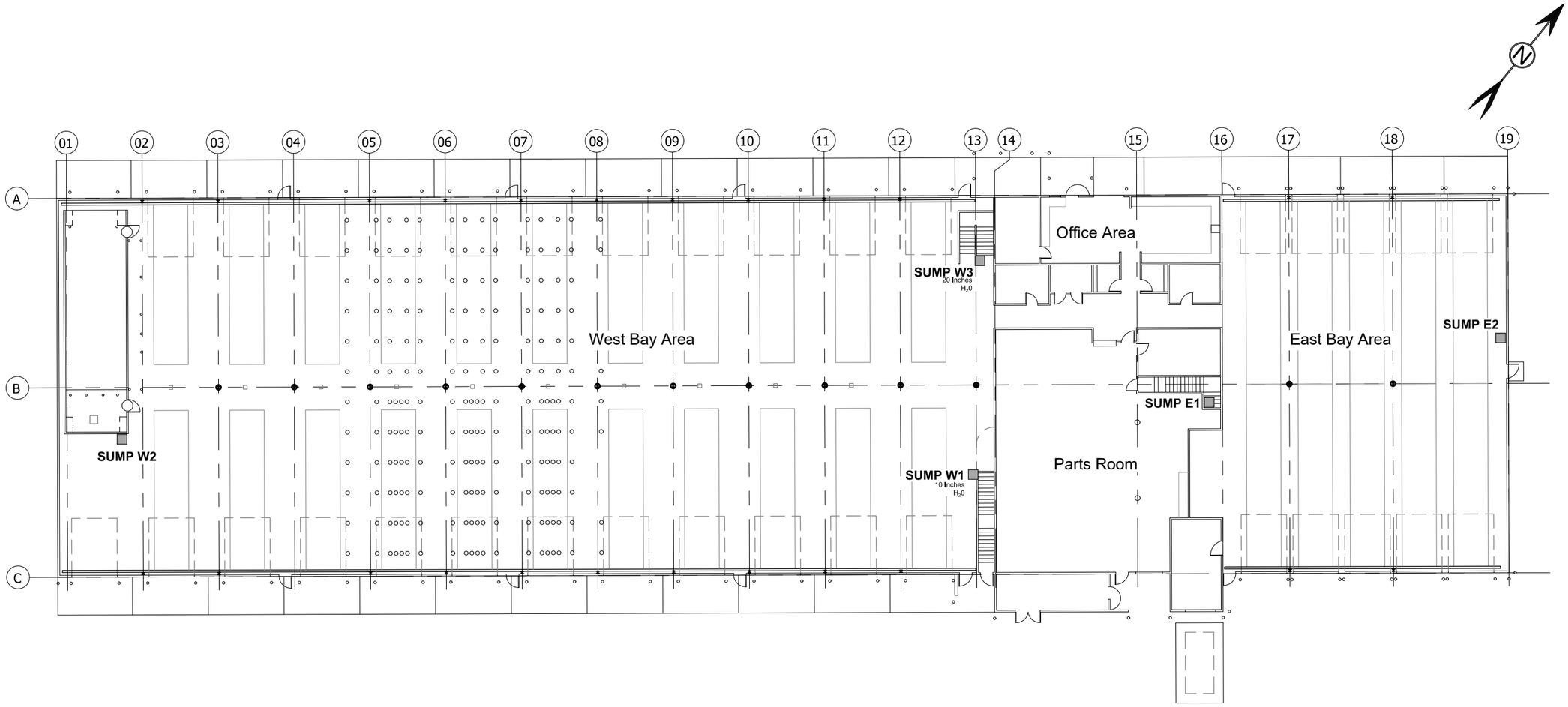
U.S. Environmental Protection Agency (USEPA) 1994. Radon Prevention in the Design and Construction of Schools and Other Large Buildings. EPA/625/R-92-016. Third Printing with Addendum June 1994.

U.S. Environmental Protection Agency (USEPA) 2008. Engineering Issue: Indoor Air Vapor Intrusion Mitigation Approaches. EPA/600/R-08-115. October 2008.

Figures



LEGEND

Sump Location

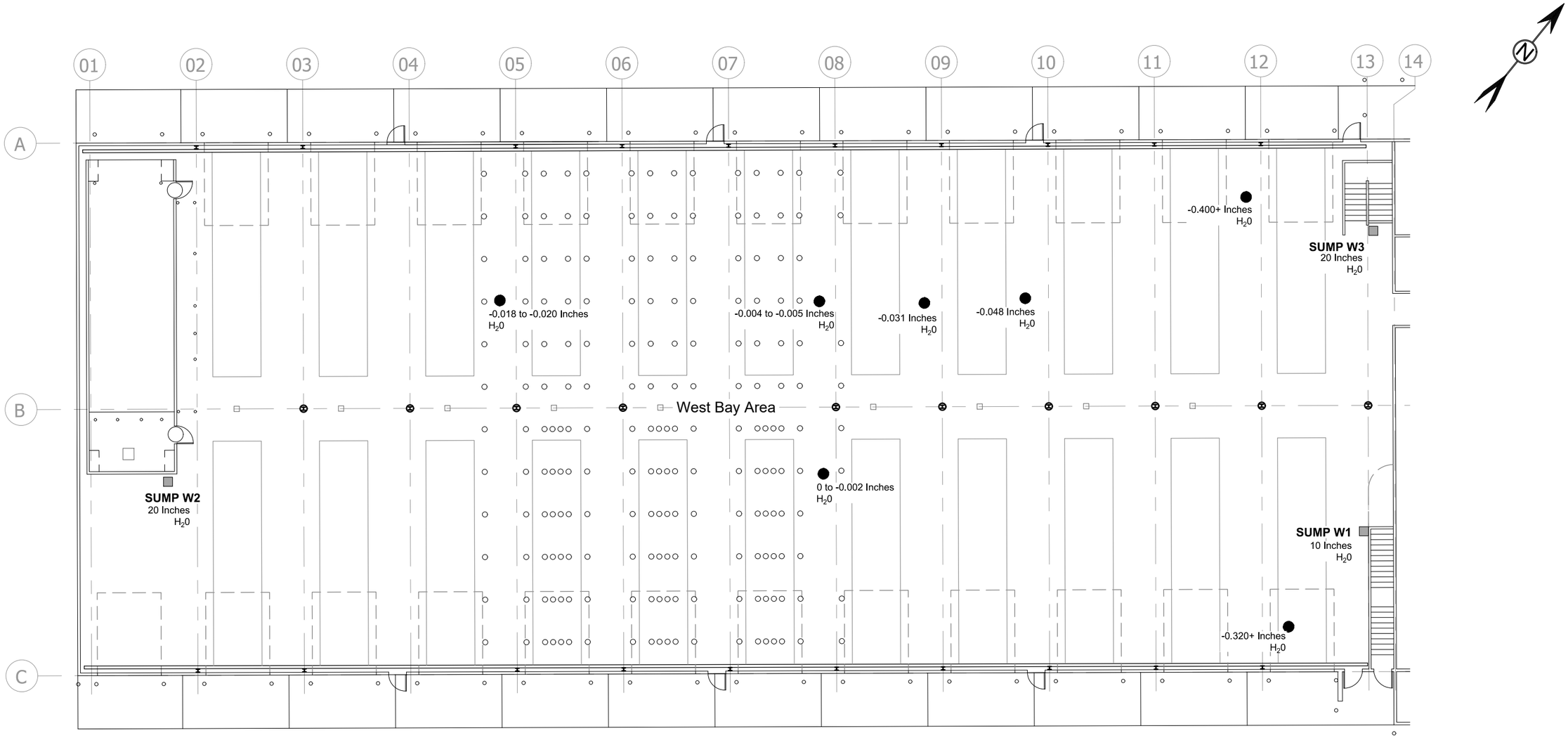
0 30 60

SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40, Building 600
Tacoma, Washington
June 2, 2021

Figure 1
Subslab Depressurization System
Sump Locations



LEGEND

- Pressure Field Extension (PFE) Test Location
- Sump Location

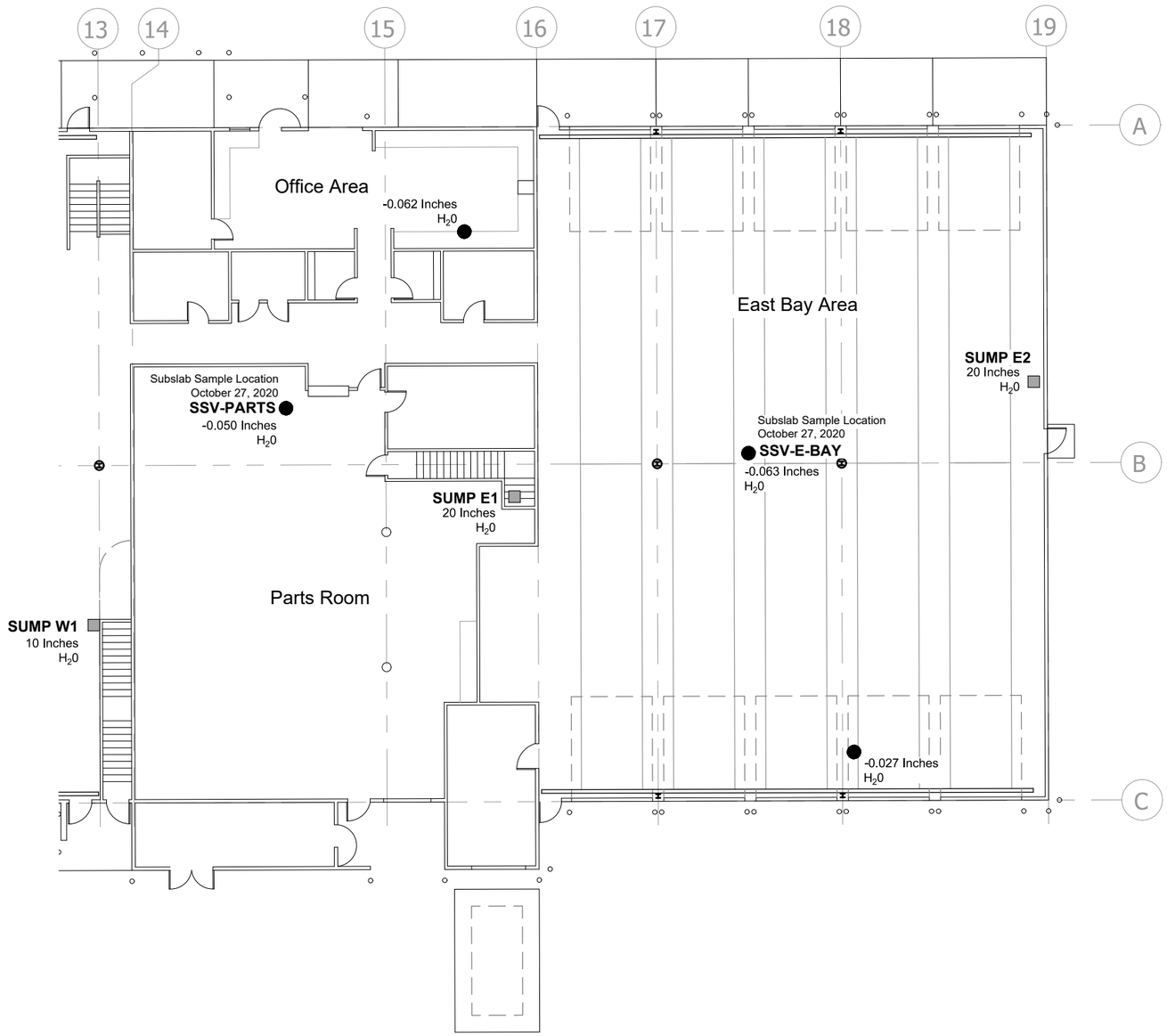
0 20 40

SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40, Building 600
Tacoma, Washington
June 2, 2021

Figure 2
Subslab Depressurization System
West Bay Diagnostic Test Results



CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40, Building 600
Tacoma, Washington
June 2, 2021

Figure 3
Subslab Depressurization System
East Bay Diagnostic Test Results

Appendix A

Indoor and Ambient Air Sampling Results, EMB Consulting

INDOOR AND AMBIENT AIR SAMPLING

PORT OF TACOMA
PARCEL 40
MAINTENANCE GARAGE
TACOMA, WASHINGTON

Project Number: 013-006 TO3

August 26, 2020

Prepared for:

Crete Consulting Incorporated, PC
and
The Port of Tacoma

Prepared by:

EMB Consulting, LLC

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Project Title:	Indoor and Ambient Air Sampling Port of Tacoma Parcel 40 Maintenance Building Tacoma, Washington
Prepared For:	Crete Consulting Incorporated, PC 108 South Washington Street, Suite 300 Seattle, Washington 98104
EMB Consulting Project Number:	1563

Elisabeth Black, CIH
Certified Industrial Hygienist
EMB Consulting LLC

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TABLE OF CONTENTS

ACRONYMS

µg/m^3	micrograms per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists
APH	Air-Phase Petroleum Hydrocarbons
Building	Parcel 40 Maintenance Garage
CLARC	Cleanup Levels and Risk Calculations
COCs	contaminants of concern
Crete	Crete Consulting Incorporated, PC
CUL	Cleanup Level
DOSH	Washington State Division of Occupational Safety and Health
Ecology	Washington State Department of Ecology
EMB	EMB Consulting LLC
EPA	Environmental Protection Agency
FBI	Friedman & Bruya, Inc.
GC/MS	Gas Chromatography/Mass Spectrophotometry
GVVs	Group Guidance Values
HVAC	Heating Ventilation and Air Conditioning
SDSs	Safety Data Sheets
MTCA	Model Toxics Control Act
OEL	Occupational Exposure Limit
PEL	Permissible Exposure Limit
Port	Port of Tacoma
RL	Reporting Limit
TPH	Total Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds

1.0 Introduction

This document presents the results of indoor and ambient air sampling conducted in July 2020 for the Port of Tacoma (Port) Parcel 40 Warehouse Building (Building). The sampling was conducted based on the recent discovery by Crete Consulting Incorporated, PC (Crete) of petroleum hydrocarbons in soil and groundwater beneath the Building. The objective of the indoor and ambient air sampling was to determine if potential vapor intrusion from contaminants beneath the Building could impact indoor air for the Building.

The following sections of this report describe Building background, sampling methods, results, conclusions, and recommendations. Attachments to this report include summary tables of air monitoring data, figures of Parcel 40 and the Building with sample locations, and the laboratory analytical report. Data on ambient weather during sampling is also included.

2.0 Background

2.1 Site Description

Parcel 40 consists of an asphalt-paved lot with a 38,000 square foot maintenance garage. The Building foundation is slab on grade with a steel frame structure and sheet metal walls and roof. The Building has single-level open bays on its east and west ends, with a two-level office/storage area between. The Building is currently occupied by SSA Marine and is used for marine terminal equipment maintenance.

The maintenance garage contains chemical products typically used for vehicle and heavy equipment maintenance, to include oils, greases, adhesives, solvents, and degreasers. In addition, there is a paint booth on the west end of the Building, which appears to be in use.

A fueling shed is located on the east side of Parcel 40, approximately 70 feet from the east end of the Building. Otherwise, the maintenance garage is surrounded by paved road and parking areas. The 11th Street bridge borders the north side of Parcel 40.

2.2 Site Environmental Data

Benzene was initially identified as exceeding the vapor intrusion groundwater screening level in a sample from monitoring well GEI-MW-1 collected in August 2019. Follow-up monitoring well sampling in March 2020 confirmed the August 2019 benzene result, confirmed elevated groundwater TPH results, and indicated that no additional VOCs were present in groundwater above the vapor intrusion screening levels (Crete 2020).

Additional soil and groundwater testing was performed in June 2020 around the perimeter of the Building. Benzene exceeded the vapor intrusion screening level in one other location toward the northeast corner of the Building. Elevated gasoline and diesel range organics were also identified in soil and groundwater around the majority of the perimeter of the Building with the exception of the west side and about the western 150 feet of the north side.

3.0 Methods

This section provides a summary of the scope of work required to perform the indoor and ambient air sampling for the Building.

Prior to mobilizing to the Building for sampling, EMB Consulting, LLC (EMB) reviewed Safety Data Sheets (SDSs) provided by SSA Marine to determine if chemical products resemble those being assessed for vapor intrusion.

Based on the Crete environmental sampling data, the Air-Phase Petroleum Hydrocarbon (APH) analysis and Environmental Protection Agency (EPA) Method TO-15 were selected as the sampling and analytical method to evaluate indoor and ambient air. The APH method is applied for evaluation of gasoline and the volatile fraction of diesel fuel oil. The TO-15 method is applied for volatile organic compounds (VOCs). The APH method provides concentration data in air for the following contaminants of concern (COCs).

- volatile aliphatic hydrocarbons in the range of C5 through C8 (APH EC5-8 aliphatics); aliphatic hydrocarbons in the range of C9 through C12 (APH EC9-12 aliphatics); and aromatic hydrocarbons in the range of C9 through C10 (APH C9-10 aromatics).

The TO-15 method provides concentration data in air for the following COCs.

- Volatile organic compounds (VOCs) benzene, toluene, ethylbenzene, xylenes, naphthalene; and

Samples were collected in accordance with EPA Method TO-15 for volatile organic compounds (VOCs) and the APH Method using six-liter summa-type evacuated cylinders with regulators calibrated to collect samples over 24 hours. Sample collection methods are explained in greater detail in the work plan (Crete 2020). The APH/TO-15 method uses evacuated cylinders to draw an air sample over a specified period of time to be analyzed in a laboratory by gas chromatography/mass spectrometry (GC/MS). The analytical laboratory selected for this project is Friedman & Bruya, Inc (FBI).

The field sampling program was carried out during a 24-hour period, over two consecutive days to account for fluctuations in temperature, ambient pressure, surrounding traffic and Port activities, and other environmental conditions. Changes in these conditions can affect the flow of soil gas into the indoor space.

Weather data for the Tacoma area for July 4 through 5, 2020 are provided with this report in Attachment B and summarized in the Results section.

Beginning on the morning of Saturday July 4, 2020, EMB initiated five samples inside the Building. At the same time, EMB collected two ambient outdoor air samples on Parcel 40. The outdoor samples were collected from presumed upwind and downwind locations to provide data on background levels of the COCs in the project area. Figure 1 shows the location of the two ambient samples. Figure 2 shows the location of the indoor samples on the east side of the warehouse. Figure 3 provided with this report shows the location of the indoor samples on the west side of the warehouse.

The samples collected are described below. In addition, shop equipment or chemicals identified nearby that could impact results are also described. The Building was vacant during periods when samples were placed on July 4, 2020 and when picked up on July 5, 2020. It is not known if SSA employees entered the Building between those two periods. Exterior and interior doors, including garage doors, were closed for the duration of sampling. There is no central ventilation system in the building.

- **Sample AW040720** is an ambient outdoor air sample attached to the fence on the west side of Parcel 40.

- **Sample AE040720** is an ambient outdoor air sample attached to the fence on the east side of Parcel 40.

- **Sample IWB13040720** is an indoor sample collected from the west side of the Maintenance Building. The sampling equipment was located on portable stairs in Bay 13 at approximately 4.5 feet above the floor. There was a hydraulic lift located within 10 feet of the sample, but SSA Marine reported that the lift does not contain hydraulic fluid. In addition, the paint booth is located on the west end of the warehouse, approximately 80 feet west of the sample location.

- **Sample IPO040720** is an indoor sample collected from the Parts Office in the central area of the Maintenance Building on the ground floor. The sampling equipment was located on a stool at approximately three feet above the floor. The door to the Parts Office was closed during sampling. There were no chemical products observed in the Parts Office.

- **Sample INWOFF040720** is an indoor sample collected from the northwest office in the central area of the Maintenance Building on the ground floor. The sampling equipment was located on a ladder at approximately four feet above the floor. The door to the room was closed during sampling. There were no chemical products observed in the northwest office.

- **Sample IE040720** is an indoor sample collected from the east side of the Maintenance Building. The sampling equipment was located on a work

bench at approximately four feet above the floor. There was a solvent degreaser located near the sample, approximately 20 feet away. In addition, workbench chemicals in small quantity containers were located throughout the area. These included spray paint, caulks and adhesives, and lubrication oils.

- **Sample IE100040720** is a duplicate sample collocated with Sample IE040720**.**

At the completion of sampling on July 5, 2020, the seven samples were retrieved. On Monday July 6, 2020 the samples were hand delivered to FBI in Seattle, Washington for analysis.

The analytical results are summarized in Table 1 attached to this report. Each of the individual VOCs and hydrocarbon ranges identified by the APH/TO-15 analysis were compared with Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculations (CLARC) Method C cleanup levels (CULs) for indoor air on industrial properties. A Total TPH CUL was calculated using the method demonstrated in Table 2 attached to this report. Outdoor ambient air values are considered background for comparison with indoor air samples.

The Washington State Division of Occupational Safety and Health (DOSH) Permissible Exposure Limits (PELs) are also listed in Table 1 for comparison with the MTCA CULs. These levels are three to five times higher than MTCA CULs. The PELs are applicable to the potential chemical exposure created by the work conducted by SSA Marine activities or by chemical products stored by SSA Marine at the site. They do not apply to any contribution to workplace VOCs resulting from contamination beneath the building.

Finally, the American Conference of Governmental Industrial Hygienists (ACGIH) has developed Group Guidance Values (GGVs) for certain refined hydrocarbon solvent mixtures. There are GGVs for specific petroleum compound groups similar to the ranges reported in the APH Method. The ACGIH has developed the GGVs based on similar chemical and toxicological characteristics. GGVs may be used as occupational exposure limits (OELs) when the mixture does not contain a compound for which specific OELs have been established. The ACGIH GGVs for Hydrocarbon Solvent Vapor Mixtures are included in Table 1. The GGVs are applicable to the potential chemical exposure created by the work conducted by SSA Marine activities or by chemical products stored by SSA Marine at the site. They do not apply to any contribution to workplace VOCs resulting from contamination beneath the building.

4.0 Results

The results of sampling for indoor air and ambient outdoor air at the Parcel 40 on July 4 and 5, 2020 are described below. Analytical results for indoor air and

outdoor ambient air are summarized in Table 1 attached to this report. The FBI laboratory report is provided in Attachment A.

4.1 Indoor Air and Outdoor Ambient Air

The ambient air sample results from the east and west sides of Parcel 40 did not have detectable concentrations of the VOCs, with the exception of naphthalene, which was detected in both samples. Naphthalene was detected at 0.12 micrograms per cubic meter of air (µg/m^3) in the east sample (AE040720). The western ambient sample (AW040720) result was reported at 0.16 µg/m^3. The analytes represented by the three APH ranges were not detected at or above laboratory reporting limits (RLs) in either ambient sample. The TPH CUL was derived assuming compounds not detected are present at the full reporting limit.

For the indoor air samples, the VOCs were detected above laboratory RLs in all indoor samples, but none were detected in concentrations above the MTCA Method C CUL. VOCs commonly found in paint (toluene, ethylbenzene, and xylenes) are identified in higher concentrations in the West Bay sample (IWB13040720), which is close to the paint booth. This appears to demonstrate impacts to indoor air for the COCs from SSA Marine operations.

APH EC9-10 aromatics were not identified in any indoor air sample above the laboratory RL. APH EC5-8 aliphatic and APH EC9-12 had detectable levels in all indoor samples. The APH EC5-8 aliphatic concentrations are higher in the west portion of the warehouse than the east portion; APH EC9-12 aliphatics are higher in the east portion of the warehouse than the west portion. The reason for this difference cannot be determined based on the available data.

It appears likely that the APH EC9-12 aliphatics are at least partially associated with soil and groundwater contamination beneath the Building. The Total APH concentrations are higher in the areas where a subsurface source has been identified (Indoor-East) and chemical product use in that area does not differ substantially from the use on the other side of the building (Indoor-West Bay 13). The addition of the APH ranges plus detectable VOCs exceed the regulatory criteria for total petroleum hydrocarbons (TPH) for this project of 310 µg/m^3 in all five indoor samples.

All COCs detected in indoor sample results were well below DOSH PELs, where they exist.

All hydrocarbon ranges detected in indoor sample results were well below ACGIH GVVs, where they exist.

4.2 Atmospheric Conditions

The influence of barometric pressure and ambient conditions on the potential release of soil vapor to ambient and indoor air was also evaluated in this

assessment. Changes in atmospheric pressure may create a “piston-like” force on soil vapor, possibly causing a cyclic up and down flow of contaminant vapors into and out of the building. Soil vapor compression and expansion in response to barometric pressure fluctuations may alternately enhance or inhibit vapor intrusion. Vapor intrusion into buildings is typically higher during periods of low barometric pressure.

The barometric pressure readings were consistent during the sampling event conducted between July 4 and July 5, 2020. There was a high pressure system in place during sampling with minor fluctuation between 30.08 to 30.13 inches of mercury. Temperature fluctuated between 57 and 68 degrees Fahrenheit. Wind was from the north-northwest for most of the sampling duration. Weather data for the two days on which sampling occurred are included with this report in Attachment B.

4.3 Building Conditions

According to Building drawings, there is a Heating, Ventilation, Air Conditioning (HVAC) system in the building. The system was not operating during this sampling event. SSA has characterized the system as “shop exhaust fans”, noting that they are not used for HVAC or as vehicle exhaust extraction systems. SSA noted that they run continuously in the winter, but not during warmer months.

The paint booth may create an east-to-west draw during operation, but it was not in operation during sampling.

There were chemicals present in the east and west building bays, but not in the central areas sampled (Parts Office, Northwest Office). Many of the chemical products on site are petroleum based, but considering the types and volume of products observed, these chemical products are not likely to generate the concentrations of APH aliphatics identified across the Building space.

5.0 Conclusions and Recommendations

Based on the results of this assessment, it appears likely that petroleum hydrocarbons in soil and groundwater beneath the building are impacting indoor air through vapor intrusion. In the short term, the Port should encourage the tenant to continuously run the shop exhaust fans and keep bay doors open to dilute indoor air with fresh air as much as possible. Portable fans may also be used to increase circulation between indoor and outdoor spaces. The Port should plan for a more proactive solution to minimize vapor intrusion, such as a subslab vapor extraction system or interior ventilation system to dilute indoor air.

6.0 References

ACGIH. 2019 Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices - Appendix H.

Crete Consulting, Inc. Direct Push Soil, Groundwater and Tier II Vapor Intrusion Assessment Work Plan, Port of Tacoma's Parcel 40 Maintenance Building Project Number: 013PT-006 TO3. June 10, 2020.

Tables

Table 1 - Summary of Indoor and Ambient Air Sample Results
Port of Tacoma
Parcel 40 Warehouse Building
July 4 to July 5, 2020

				Sample Location Sample ID Sample Duration						
	MTCA Screening Level (indoor air) Method C	DOSH PEL (8hr TWA)[a]	ACGIH GGVs for Hydrocarbons	Ambient West AW040720 09:54 to 09:54	Ambient East AE040720 10:04 to 10:04	Indoor - West Bay 13 IWB13040720 10:13 to 10:13	Indoor - Parts Office IPO040720 10:23 to 10:23	Indoor - NW Office INWOFF040720 10:31 to 10:31	Indoor - East IE040720 10:37 to 10:37	Indoor - East (duplicate) IE100040720 10:37 to 10:38
Analytes				*all values in units of µg/m^3*						
Analysis for Volatile Compounds By EPA Method TO-15										
Benzene	**3.20**	**3,190**		<0.32	<0.38	0.58	0.74	0.51	0.79	0.78
Toluene	**5000**	**376,810**		<19	<23	39	<23	<19	<19	<19
Ethylbenzene	**1000**	**434,190**		<0.43	<0.52	14	6.3	5.1	1.3	1.3
m,p-Xylene	**100**	**434,190**		<0.87	<1	63	30	25	5.5	5.3
o-Xylene	**100**	**434,190**		<0.43	<0.52	19	9.8	8.3	2.1	1.7
Naphthalene	**0.74**	**52,430**		0.16	0.12	0.39	0.36	0.34	0.32	0.36
Analysis For Volatile Compounds By Method MA-APH										
APH EC5-8 aliphatics				<30	<36	240	160	110	130	130
ACGIH C5-8 aliphatics			**1,500,000**							
APH EC9-12 aliphatics				<35	<42	1,500[c]	1,200[c]	1,100[c]	2,600[c]	2,700[c]
ACGIH C9-15 aliphatics			**1,200,000**							
APH EC9-10 aromatics				<25	<30	<25	<30	<25	<25	<25
ACGIH C9-15 aromatics			**1,200,000**							
TPH[d]	**310.00**			111.21	129.54	**1,900.97**	**1,460.20**	**1,293.25**	**2,784.01**	**2,883.44**

Table 1 - Summary of Indoor and Ambient Air Sample Results
Port of Tacoma
Parcel 40 Warehouse Building
July 4 to July 5, 2020

MTCA = Model Toxics Control Act

DOSH = Washington State Division of Occupational Safety and Health

PEL = Permissible Exposure Limit

8hr TWA = 8 hour Time-Weighted Average

ACGIH = American Conference of Governmental Industrial Hygienists

GGVs - Group Guidance Values

$\mu g/m^3$ = micrograms per cubic meter

EPA = Environmental Protection Agency

MA-APH = Massachusetts Department of Environmental Protection Method for the Determination of Air-Phase Petroleum Hydrocarbons

APH = Air-Phase Petroleum Hydrocarbons

TPH = Total Petroleum Hydrocarbons

[a] DOSH PELs are cited in units of parts per million for the analytes listed. The PELs have been converted to units of $\mu g/m^3$ for the purpose of this report.

[b] The GGVs listed in Table 1 are reproduced from Column B of the ACGIH Table 1 Group Guidance Values found in Appendix H of the ACGIH publication, 2019 Threshold Limit Values and Biological Exposure Indices.

[c] The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

[d] TPH is based on Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings Implementation Memorandum No. 18, dated January 10, 2018. This TPH limit assumes compounds not detected are present at the full reporting limit.

Table 2 - Derivation of Total TPH Cleanup Level for Indoor Air
Port of Tacoma
Parcel 40 Warehouse Building

The Total TPH Cleanup Level for indoor air for the Parcel 40 Building was derived by the following method.

Step 1. Determine which Cleanup method criteria are appropriate for the project. Industrial standards were selected for this project - MTCA Method C.
Step 2. Select air samples with high TPH concentrations for fractionation. For these data, the derivation was conducted for Indoor-West Bay 13 and Indoor-East.
Step 3. Use the fractionated results in the equation below to calculate a Method C air CUL.
Step 4. Compare the TPH concentrations in compliance air samples with the Method C air CUL.

Individual petroleum component: $CUL_i = \frac{RfDi_i \; x \; ABW \; x \; UCF \; x \; HQ \; x \; AT}{BR \; x \; ABS_i \; x \; ED \; x \; EF}$

(WAC 173-340-750, Equation 750-1)

TPH cleanup level: $CUL_{TPH} = \frac{1}{\sum_{i=1}^{i=n} \frac{F_i}{CUL_i}}$

source: https://fortress.wa.gov/ecy/publications/documents/1709043.pdf

Indoor - West Bay 13

Petroleum Fraction or Compound	Measured Concentration ($\mu g/m^3$)	Fraction of Total Concentration (Fi)	METHOD C Total TPH Non-Carcinogenic CULi ($\mu g/m^3$)	Fi / CULi
Aliphatics EC>5-8	240	0.126	5.95E+03	2.12E-05
Aliphatics EC>9-12	1,500	0.789	2.98E+02	2.65E-03
Aromatics EC>9-10	25	0.013	3.98E+02	3.30E-05
Benzene	0.58	0.000	3.00E+01	1.02E-05
Toluene	39	0.021	4.90E+03	4.19E-06
Ethylbenzene	14	0.007	1.00E+03	7.35E-06
Xylenes	82	0.043	1.02E+02	4.25E-04
Naphthalene	0.39	0.000	3.02E+00	6.80E-05
Total TPH	***1900.97***	1		***310.44***

The Total TPH Non-carcinogenic CUL = 1 / Σ (Fi / CULi)

Total TPH limit assumes compounds not detected are present at the full reporting limit.

Indoor - East

Petroleum Fraction or Compound	Measured Concentration Site-Specific Sample ($\mu g/m^3$)	Fraction of Total Concentration (Fi)	METHOD C Total TPH Non-carcinogenic CULi ($\mu g/m^3$)	Fi / CULi
Aliphatics EC>5-8	130	0.047	5.95E+03	7.85E-06
Aliphatics EC>9-12	2,600	0.934	2.98E+02	3.14E-03
Aromatics EC>9-10	25	0.000	3.98E+02	0.00E+00
Benzene	0.79	0.000	3.00E+01	9.47E-06
Toluene	19	0.000	4.90E+03	0.00E+00
Ethylbenzene	1.3	0.000	1.00E+03	4.66E-07
Xylenes	7.6	0.003	1.02E+02	2.69E-05
Naphthalene	0.32	0.000	3.02E+00	3.81E-05
Total TPH	***2784.01***	0.984195459		***310.37***

The Total TPH Non-carcinogenic CUL = 1 / Σ (Fi / CULi)

Total TPH limit assumes compounds not detected are present at the full reporting limit.

Figures


Figure 1
Port of Tacoma
Parcel 40
Ambient Sample Location Plan
July 4 to July 5, 2020
AE040720
AW040720
STOP
STOP
© 2020 Google

Figure 2
Port of Tacoma
Parcel 40 Building - East
Indoor Sample Location Plan
July 4 to July 5, 2020

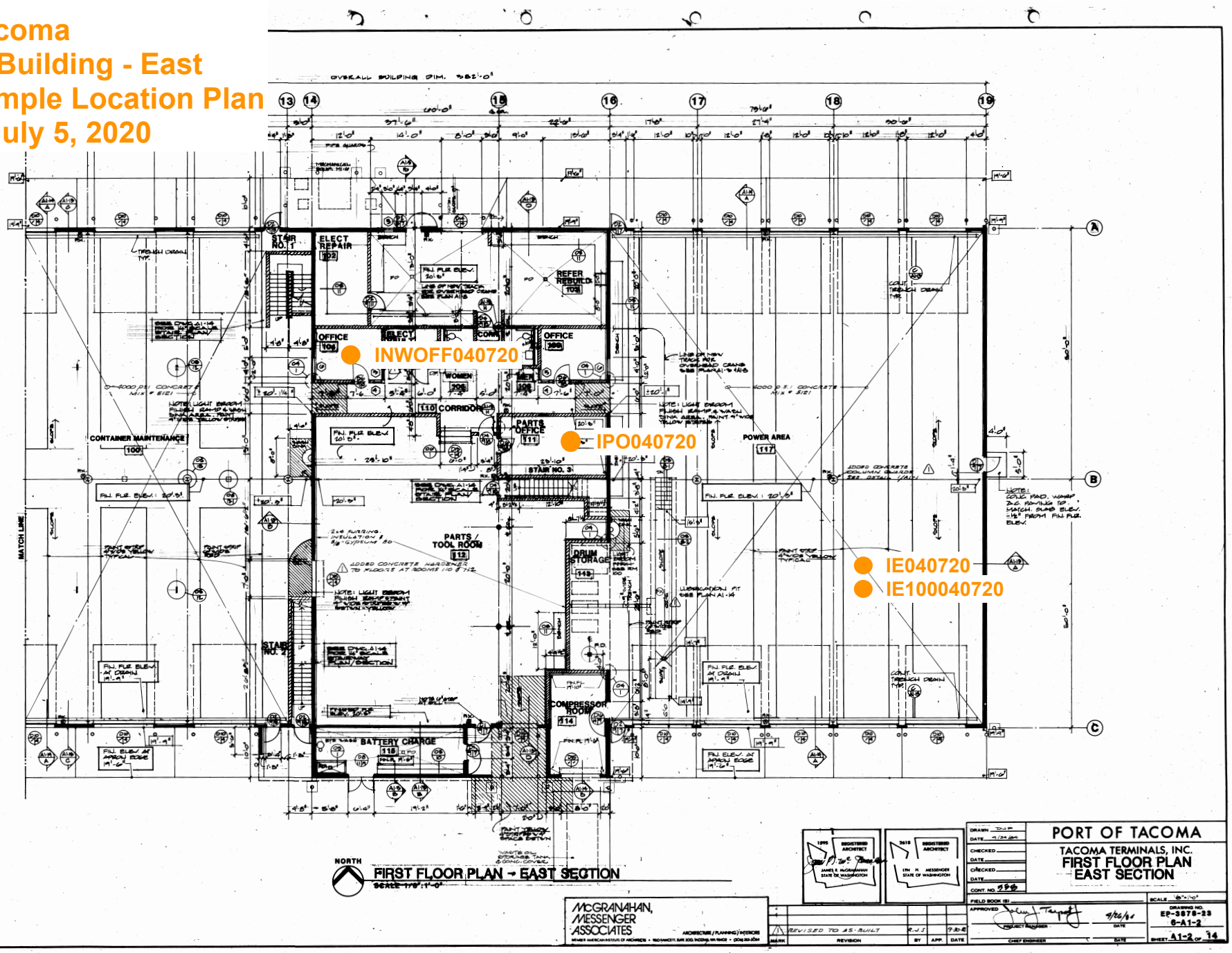
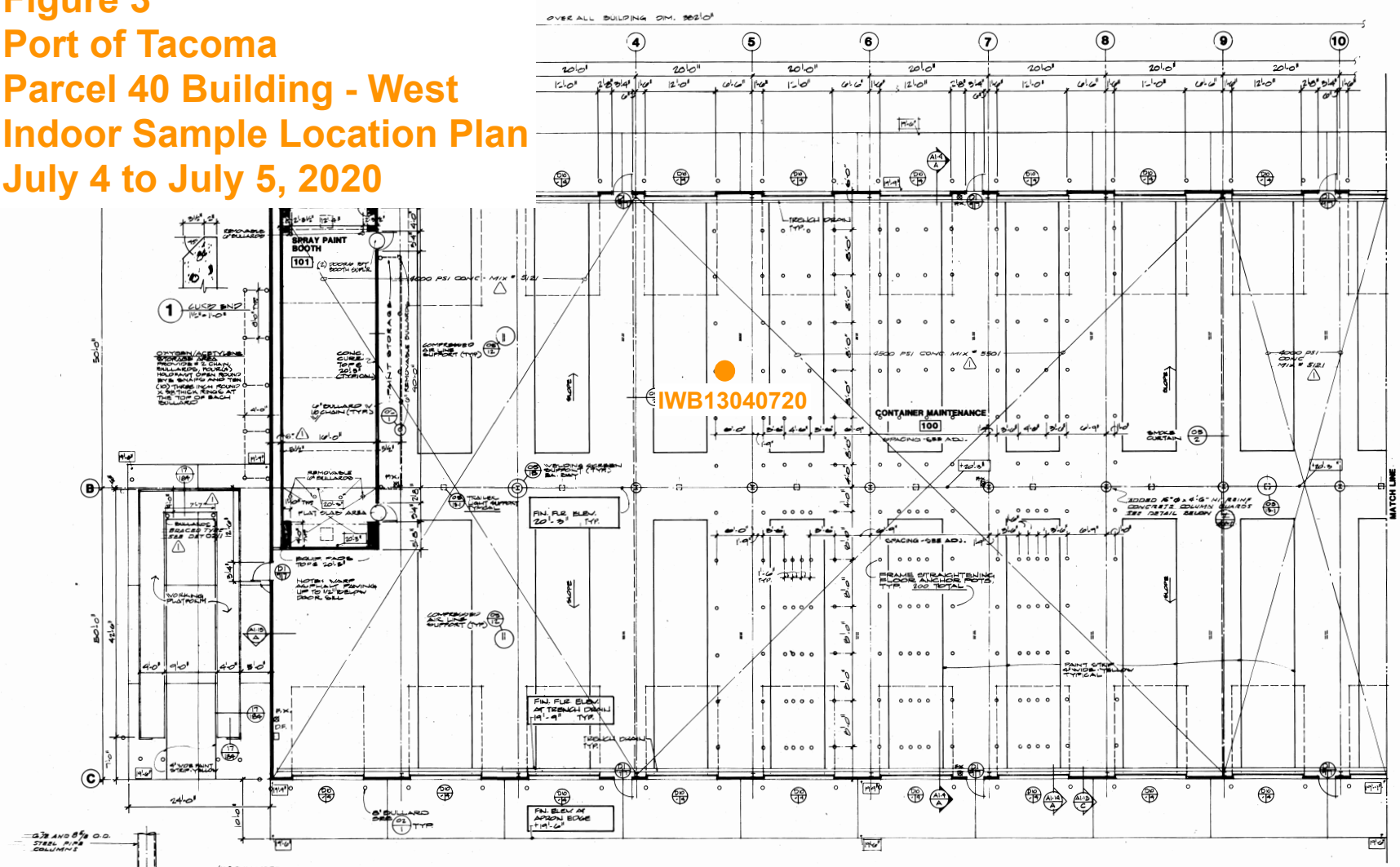


Figure 3
Port of Tacoma
Parcel 40 Building - West
Indoor Sample Location Plan
July 4 to July 5, 2020



ATTACHMENT A
Friedman & Bruya, Inc.
Laboratory Analytical Reports

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

July 10, 2020

Elisabeth Black
EMB Consulting, LLC
22725 44th Ave W
Mountlake Terrace, WA 98043

Dear Ms Black:

Included are the results from the testing of material submitted on July 6, 2020 from the Parcel 40, F&BI 007054 project. There are 20 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Jamie Stevens, Grant Hainsworth
NAA0710R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 6, 2020 by Friedman & Bruya, Inc. from the EMB Consulting, LLC Parcel 40, F&BI 007054 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	EMB Consulting, LLC
007054 -01	AW040720
007054 -02	AE040720
007054 -03	IWB13-040720
007054 -04	IPO040720
007054 -05	INWOFF040720
007054 -06	IE040720
007054 -07	IE100040720

Non-petroleum compounds identified in the air phase hydrocarbon (APH) ranges were subtracted per the MA-APH method.

The APH EC9-12 aliphatics concentration in several samples exceeded the calibration range of the instrument. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	AW040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-01
Date Analyzed:	07/07/20	Data File:	070711.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<30
APH EC9-12 aliphatics	<35
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	AE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-02 1/1.2
Date Analyzed:	07/07/20	Data File:	070712.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<36
APH EC9-12 aliphatics	<42
APH EC9-10 aromatics	<30

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IWB13-040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-03
Date Analyzed:	07/07/20	Data File:	070713.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	87	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	240
APH EC9-12 aliphatics	1,500 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IPO040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-04 1/1.2
Date Analyzed:	07/08/20	Data File:	070714.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	160
APH EC9-12 aliphatics	1,200 ve
APH EC9-10 aromatics	<30

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	INWOFF040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-05
Date Analyzed:	07/08/20	Data File:	070715.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	108	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	110
APH EC9-12 aliphatics	1,100 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-06
Date Analyzed:	07/08/20	Data File:	070716.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	130
APH EC9-12 aliphatics	2,600 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IE100040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-07
Date Analyzed:	07/08/20	Data File:	070717.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	130
APH EC9-12 aliphatics	2,700 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	EMB Consulting, LLC
Date Received:	Not Applicable	Project:	Parcel 40, F&BI 007054
Date Collected:	Not Applicable	Lab ID:	00-1504 mb
Date Analyzed:	07/07/20	Data File:	070710.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<30
APH EC9-12 aliphatics	<35
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AW040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-01
Date Analyzed:	07/07/20	Data File:	070711.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	0.16	0.031

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-02 1/1.2
Date Analyzed:	07/07/20	Data File:	070712.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.38	<0.12
Toluene	<23	<6
Ethylbenzene	<0.52	<0.12
m,p-Xylene	<1	<0.24
o-Xylene	<0.52	<0.12
Naphthalene	0.12 j	0.023 j

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IWB13-040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-03
Date Analyzed:	07/07/20	Data File:	070713.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	88	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.58	0.18
Toluene	39	10
Ethylbenzene	14	3.3
m,p-Xylene	63	14
o-Xylene	19	4.3
Naphthalene	0.39	0.074

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IPO040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-04 1/1.2
Date Analyzed:	07/08/20	Data File:	070714.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	92	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.74	0.23
Toluene	<23	<6
Ethylbenzene	6.3	1.4
m,p-Xylene	30	6.9
o-Xylene	9.8	2.3
Naphthalene	0.36	0.068

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	INWOFF040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-05
Date Analyzed:	07/08/20	Data File:	070715.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	109	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.51	0.16
Toluene	<19	<5
Ethylbenzene	5.1	1.2
m,p-Xylene	25	5.7
o-Xylene	8.3	1.9
Naphthalene	0.34	0.064

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-06
Date Analyzed:	07/08/20	Data File:	070716.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.79	0.25
Toluene	<19	<5
Ethylbenzene	1.3	0.30
m,p-Xylene	5.5	1.3
o-Xylene	2.1	0.47
Naphthalene	0.32	0.061

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IE100040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-07
Date Analyzed:	07/08/20	Data File:	070717.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.78	0.24
Toluene	<19	<5
Ethylbenzene	1.3	0.29
m,p-Xylene	5.3	1.2
o-Xylene	1.7	0.39
Naphthalene	0.36	0.068

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	EMB Consulting, LLC
Date Received:	Not Applicable	Project:	Parcel 40, F&BI 007054
Date Collected:	Not Applicable	Lab ID:	00-1504 mb
Date Analyzed:	07/07/20	Data File:	070710.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.057 j	<0.011 j

Date of Report: 07/10/20
Date Received: 07/06/20
Project: Parcel 40, F&BI 007054

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 007060-02 1/8.3 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	<250	<250	nm
APH EC9-12 aliphatics	ug/m3	380	350	8
APH EC9-10 aromatics	ug/m3	<210	<210	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	81	70-130
APH EC9-12 aliphatics	ug/m3	67	109	70-130
APH EC9-10 aromatics	ug/m3	67	107	70-130

Date of Report: 07/10/20
Date Received: 07/06/20
Project: Parcel 40, F&BI 007054

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 007060-02 1/8.3 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Benzene	ug/m3	<2.7	<2.7	nm
Toluene	ug/m3	<160	<160	nm
Ethylbenzene	ug/m3	<3.6	<3.6	nm
m,p-Xylene	ug/m3	<7.2	<7.2	nm
o-Xylene	ug/m3	<3.6	<3.6	nm
Naphthalene	ug/m3	<2.2	<2.2	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/m3	43	87	70-130
Toluene	ug/m3	51	96	70-130
Ethylbenzene	ug/m3	59	86	70-130
m,p-Xylene	ug/m3	120	92	70-130
o-Xylene	ug/m3	59	89	70-130
Naphthalene	ug/m3	71	83	70-130

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SAMPLE CHAIN OF CUSTODY

007054 ME 07/06/20

Page # 1 of 1

Report To Elisabeth Black
Company EMB Consulting, LLC
Address 22725 - 44th Ave W
City, State, ZIP Mountlake Terrace, WA
Phone 206-915-2395 Email emblackconsult@gmail.

SAMPLERS (signature) E. Black

PROJECT NAME & ADDRESS: Parcel 40

PO #:

NOTES: cc: Jamie Stevens

INVOICE TO: Crete

TURNAROUND TIME
☑ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Default: Clean after 3 days
☐ Archive (Fee may apply)

SAMPLE INFORMATION / ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium		Notes
AW040720	01	20545	05349	(IA) / SG	7/4.5	29.75	9:54	8.5	9:54		X		X			X-per EB/GH 7/6/20 ME
AE040720	02	18561	05348	(IA) / SG	7/4.5	>30.0	10:04	10.0	10:04		X		X			
IWB13-040720	03	35331	05347	(IA) / SG	7/4.5	>30.0	10:13	9.75	10:13		X		X			
IP0040720	04	20549	05335	(IA) / SG	7/4.5	>30.0	10:23	10.75	10:23		X		X			
INWOFF040720	05	21442	07846	(IA) / SG	7/4.5	>30.0	10:31	8.00	10:31		X		X			
IE040720	06	18577	06602	(IA) / SG	7/4.5	29.75	10:37	8.5	10:37		X		X			
IE10040720	07	35338	05350	(IA) / SG	7/4.5	28	10:37	7.75	10:38		X		X			
				IA / SG												

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: E. Black	Elisabeth Black	EMB Consulting	07/06/20	11:35
Received by: [signature]	Michael E. Hall	FedEx	7/6/20	↓
Relinquished by:				
Received by:		Samples received at 21 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

ATTACHMENT B
Weather Data
Tacoma, Washington
July 4 to 5, 2020

Weather History for KWATACOM280

Previous | Daily Mode | July | 4 | 2020 | View | Next

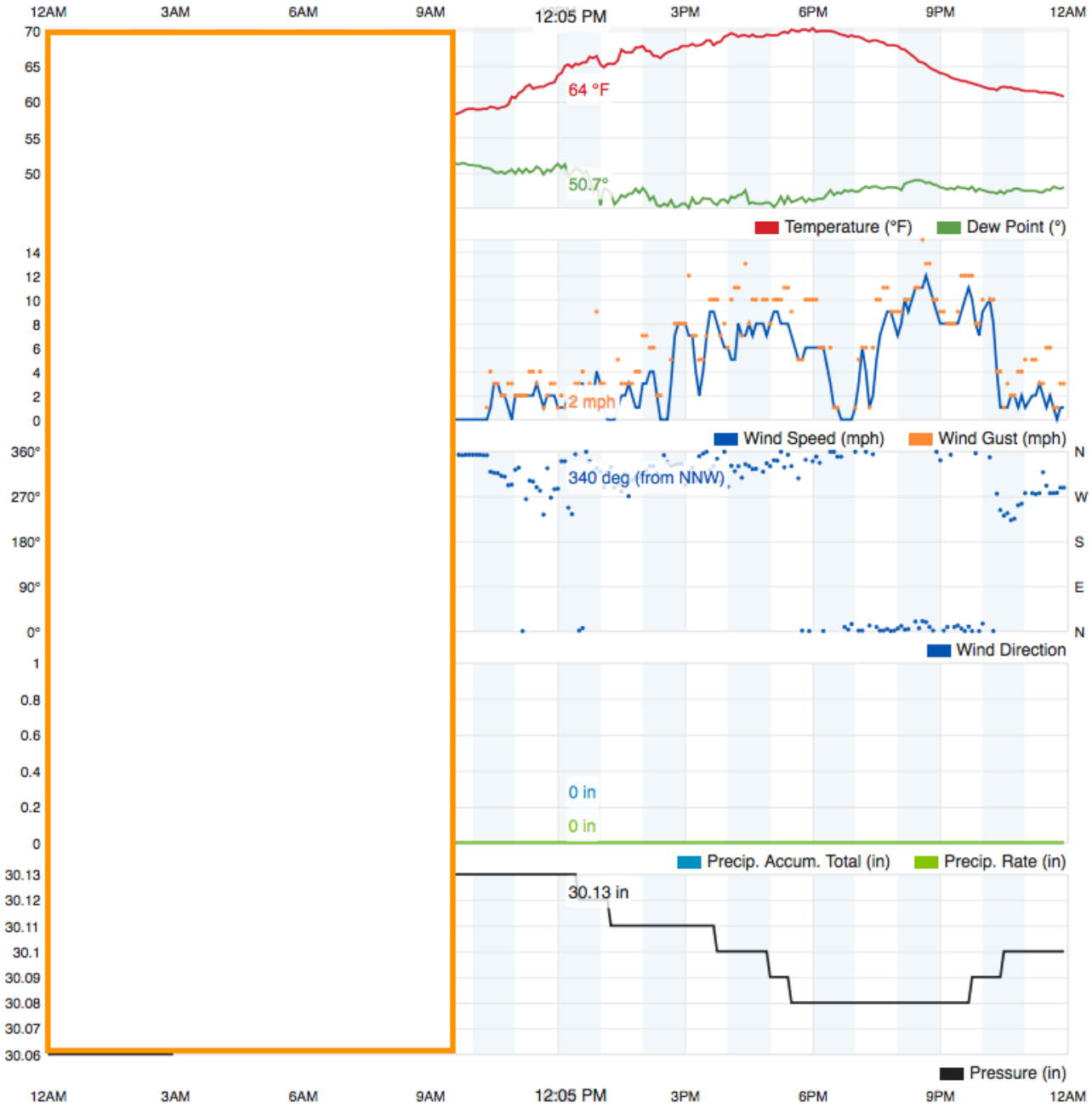
Summary
July 4, 2020

	High	Low	Average
Temperature	70.3 °F	53.8 °F	61.5 °F
Dew Point	51.8 °F	45.1 °F	49.0 °F
Humidity	89 %	41 %	66 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	12.0 mph	0.0 mph	2.7 mph
Wind Gust	15.0 mph	--	3.8 mph
Wind Direction	--	--	NNW
Pressure	30.13 in	30.06 in	--

Graph | Table

July 4, 2020



Weather History for KWATACOM280

Previous | Daily Mode | July | 5 | 2020 | View | Next

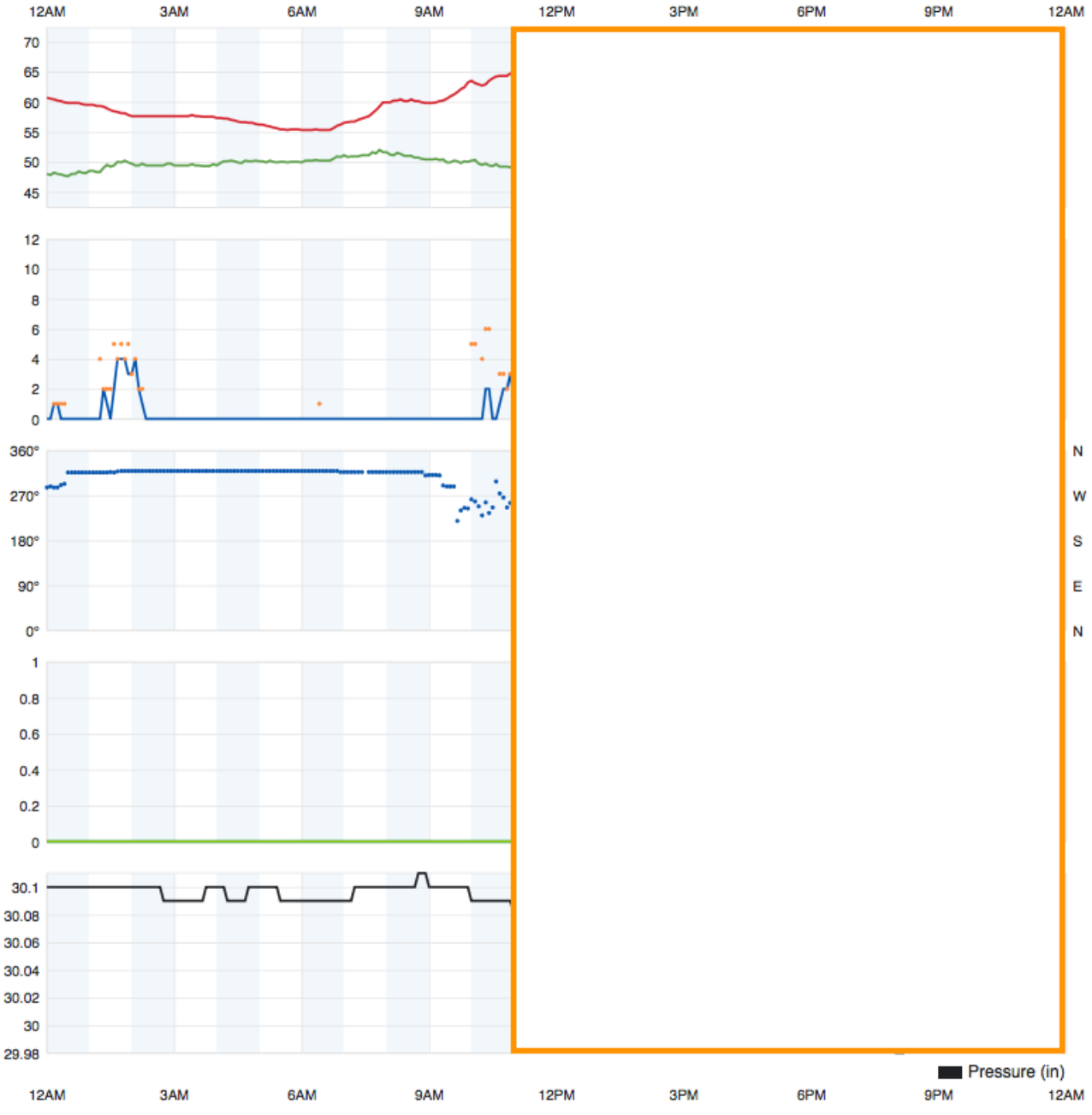
Summary
July 5, 2020

	High	Low	Average
Temperature	72.3 °F	55.3 °F	64.1 °F
Dew Point	52.0 °F	42.4 °F	48.3 °F
Humidity	83 %	37 %	58 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	11.0 mph	0.0 mph	2.6 mph
Wind Gust	12.0 mph	--	3.5 mph
Wind Direction	--	--	NW
Pressure	30.11 in	29.98 in	--

Graph | Table

July 5, 2020



Appendix B

Diagnostic Testing Results, Subslab Sampling Laboratory Reports and References

Advanced Radon Technologies
Radon Testing / Radon & VOC Mitigation
Serving the Northwest Since 1991
Washington State Contractor's License #:ADVANRT06402

Web Site: Advancedradontech.net
E-Mail advancedradontech@gmail.com

631 N Hogan St • Spokane, WA 99202 • Telephone No: (509) 326-5127 • Fax No: (509) 328-2927

Advanced Radon Technologies (ART) conducted a Negative Pressure Extension field (NPE) and Air flow measurement at Parcel 40 Port of Tacoma on 10/24 and 10/25. David Gerard of ART and Grant Hainsworth of Crete Consulting were present during all procedures conducted on site.

Three 5" holes were cored though the slab (average 12" thick) and 10 to 12 gallons of fill was removed from the area below the 5" coring. The fill material was a mixture of sands to rocks form 1" to 3" in diameter. The fill in the "Shop" slab was far more compacted than the fill under the "office" slab, but did not seem to play much of a role in Air volumes and NPE.

This test included Air Flow measurements and Static pressure readings and NPE will as well. The diagnostic testing machine used to simulate the potential fan curves was designed and built by ART and was granted a Patent # 5,388,444. (See attached sheet) The NPE was measured with Infiltec DM1 Micro-manometer at the various locations throughout the building slab. The diagnostic testing machine was placed on top of the 5" Cored hole and the speed of the machine was increased to measure air flow in CFM at given static pressures. Then was set at 10" and 15" wc to measure NPE and the max extent of influence under the slab. This information tells us the likely number of risers, there best location and the most likely fan type. This process must be competed as part of the final design as exact air flows and static pressure from every floor penetration as precise measurements are required for blower selection.

The Air flow was very low and more difficult to maintain accuracy, but also minimizes the likely requirement for any additional filtration of the exhaust (see included chart). An explosion resistant regenerative blower will be the best suited for this project to properly extend negative pressure under the entire slab and minimize the exhaust air volume and potential of exceeding the Puget Sound Clean Air Agency requirements.

ART proposes at least 3 more risers like the 3 already installed with the 3 risers (one existing and two new) on the trailer repair side and the facility. They should be routed inside the building till they reach the office and then extend through the roof. 3 (two existing and one new) on the truck repair and office side should be routed together on the opposite side of the office and routed through the roof. The two separate runs should be routed to the higher roof of the office and tied together and extended to the regenerative blower on the roof. There will be electrical requirements to wire the blower and electrical permit will be required.

Please reach out to me if you require any additional information.

David Gerard

David Gerard
President

AARST Member · Professional · Multifamily Measurement · Multifamily Mitigation · New Construction · Measurement & Mitigation · Member RT/RMT

Advanced Radon Technologies
Radon Testing / Radon & VOC Mitigation
Serving the Northwest Since 1991
Washington State Contractor's License #: ADVANRT06402 ID PWC-C-11174-C-4

Web Site: Advancedradontech.net
E-Mail:advancedradontech@yahoo.com

631 N. Hogan St • Spokane, WA 99202 • Tel: (509) 326-5127 • Fax: (509) 328-2927

Parcel 40 Port of Tacoma

	A	B	C
1	Trailer Side - Hole #1	Truck Side - Hole #2	Office Under Stairs - Hole #3
2			
3	15" WC 25 CFM	0	6 CFM (estimate)
4	20" WC 35 CFM	5 CFM (estimate)	12 CFM (estimate)
5	25" WC 47 CFM	10 CFM (estimate)	20 CFM
6	30" WC 53 CFM	15 CFM (estimate)	28 CFM

PROCESS PIPING - AIR LINES - VACUUM HEAD LOSS IN LONGEST LINE

20 inches H20 Vacuum (13.97 psia) at Sump W2

Atmospheric Pressure Standard	14.7	psia	407.2 in H2O	29.92 in Hg
Atmospheric Temperature Standard	68	deg F		
	528	deg Rankine		
Density of air	0.075	lb/ft3	(sea level, temperatures <100 deg F)	

NOTES: Neglect effect of relative humidity in SCFM to ACFM conversion (Seattle average relative humidity is 73%)

																						Air @STP					for Re>5000				
	SERVICE			PIPE DIA	MAX FLOW	TEMP	INLET PRESS.	INLET VAC (in. Hg gage)	ACFM at INLET	INLET VEL	FEET of PIPE	NUMBER OF FITTINGS									TOTAL EQ. FEET	Kinematic Viscosity	Reynolds Number	Pipe	Plastic Pipe Rghness	f	PRESS. DROP (psi)	OUTLET PRESS (psia)	INLET VAC (in. Hg gage)	INLET VAC (in. H20 gage)
LINE NUMBER	FLUID	FROM	TO	(in.)	(scfm)	(deg F)	(psia)			(fps)		Ell	Side Tee	Thru Tee	Sdden Enlr	Sdden Contr	Gate Vlve	Btrfly Vlve	Globe Vlve	Chck Vlve		(ft2/s)							
Sump W2	Air	Sump	Riser	4	20	55	13.97	1.49	20.53	3.92	4					1					10.7	0.000164	7.97E+03	Plastic	5.00E-06	3.30E-02	0.000	13.97	1.49	
		Riser	W3 tee	3	20	55	13.97	1.49	20.53	6.97	260	2	1		1			1			302.5	0.000164	1.06E+04	Plastic	5.00E-06	3.05E-02	0.015	13.96	1.52	
		W3 tee	W1 tee	4	43	55	13.96	1.52	44.18	8.44	10			1							16.7	0.000164	1.72E+04	Plastic	5.00E-06	2.69E-02	0.001	13.95	1.52	
		W3 tee	E Tee	4	66	55	13.95	1.52	67.81	12.96	75	1		1	1	1					108.3	0.000164	2.63E+04	Plastic	5.00E-06	2.42E-02	0.011	13.94	1.54	
		E Tee	Blower	4	95	55	13.95	1.52	97.61	18.65	4		1	1							30.7	0.000164	3.79E+04	Plastic	5.00E-06	2.22E-02	0.006	13.95	1.53	20.81

ADD loss in filter

combustible dust or combustible refuse or stock that produces combustible dusts in such a manner that the concentration and conditions could create a fire or explosion hazard. Determination of concentrations or conditions that are deemed to not create a fire or explosion hazard shall be based on a Dust Hazard Analysis prepared in accordance with Section 2203.2 of the *International Fire Code*.

511.1.5.1 Screens. Where a screen is installed in a safety relief vent, the screen shall be attached so as to permit ready release under the explosion pressure.

511.1.5.2 Hoods. The relief vent shall be provided with an *approved* noncombustible cowl or hood, or with a counterbalanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.

511.2 Exhaust outlets. Outlets for exhaust that exceed 600°F (315°C) shall be designed as a *chimney* in accordance with Table 511.2.

SECTION 512
SUBSLAB SOIL EXHAUST SYSTEMS

512.1 General. Where a subslab soil exhaust system is provided, the duct shall conform to the requirements of this section.

512.2 Materials. Subslab soil exhaust system duct material shall be air duct material *listed* and *labeled* to the requirements of UL 181 for Class 0 air ducts, or any of the following piping materials that comply with the *International Plumbing Code* as building sanitary drainage and vent pipe: cast iron; galvanized steel; copper or copper-alloy pipe and tube of a weight not less than type DWV; and plastic piping.

512.3 Grade. Exhaust system ducts shall not be trapped and shall have a minimum slope of one-eighth unit vertical in 12 units horizontal (1-percent slope).

512.4 Termination. Subslab soil exhaust system ducts shall extend through the roof and terminate not less than 6 inches (152 mm) above the roof and not less than 10 feet (3048 mm) from any operable openings or air intake.

512.5 Identification. Subslab soil exhaust ducts shall be permanently identified within each floor level by means of a tag, stencil or other *approved* marking.

SECTION 513
SMOKE CONTROL SYSTEMS

[F] 513.1 Scope and purpose. This section applies to mechanical and passive smoke control systems that are required by the *International Building Code* or the *International Fire Code*. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations, or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke and heat removal provisions found in Section 910 of the *International Building Code* or the *International Fire Code*.

[F] 513.2 General design requirements. Buildings, structures, or parts thereof required by the *International Building Code* or the *International Fire Code* to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 of the *International Building Code* and the generally accepted and well-established principles of engineering relevant to the design. The *construction documents* shall include sufficient information and detail to describe adequately the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied with sufficient information and analysis to demonstrate compliance with these provisions.

TABLE 511.2
CONSTRUCTION, CLEARANCE AND TERMINATION REQUIREMENTS FOR SINGLE-WALL METAL CHIMNEYS

CHIMNEYS SERVING	MINIMUM THICKNESS		TERMINATION				CLEARANCE			
	Walls (inch)	Lining	Above roof opening (feet)	Above any part of building within (feet)			Combustible construction (inches)		Noncombustible construction	
				10	25	50	Interior inst.	Exterior inst.	Interior inst.	Exterior inst.
High-heat appliances (Over 2,000°F)[a]	0.127 (No. 10 MSG)	$4^1/_2$″ laid on $4^1/_2$″ bed	20	—	—	20	See Note c			
Low-heat appliances (1,000°F normal operation)	0.127 (No. 10 MSG)	None	3	2	—	—	18	6	Up to 18″ diameter, 2″ Over 18″ diameter, 4″	
Medium-heat appliances (2,000°F maximum)[b]	0.127 (No. 10 MSG)	Up to 18″ dia.—$2^1/_2$″ Over 18″—$4^1/_2$″ on $4^1/_2$″ bed	10	—	10	—	36	24		

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, °C = [(°F) – 32]/1.8.
a. Lining shall extend from bottom to top of outlet.
b. Lining shall extend from 24 inches below connector to 24 feet above.
c. Clearance shall be as specified by the design engineer and shall have sufficient clearance from buildings and structures to avoid overheating combustible materials (maximum 160°F).

Parcel 40 – Building 600 Photograph Log From October 24-25 and December 19-20, 2020 Sump Installation and Testing
Sump Installation – completed by Advance Radon Technologies with oversight from CRETE Consulting

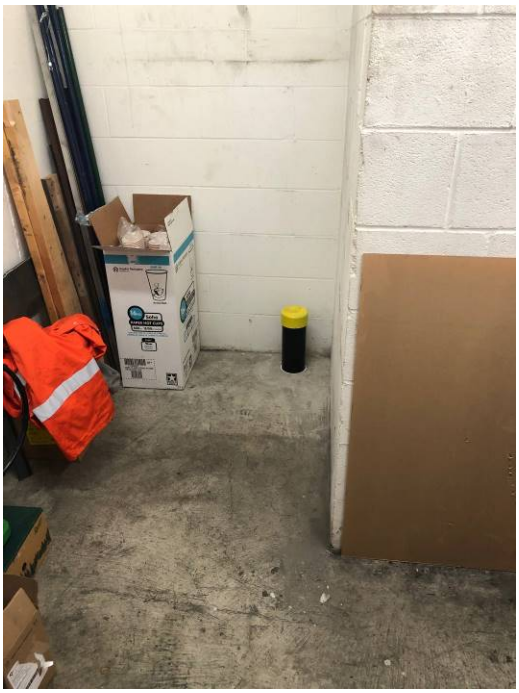


Photo 1 – Sump E1 – Parts Room Closet Sump

Photo 2 – Sump E2 – East Side of East Bay

Parcel 40 – Building 600 Photograph Log From October 24-25 and December 19-20, 2020 Sump Installation and Testing
Sump Installation – completed by Advance Radon Technologies with oversight from CRETE Consulting

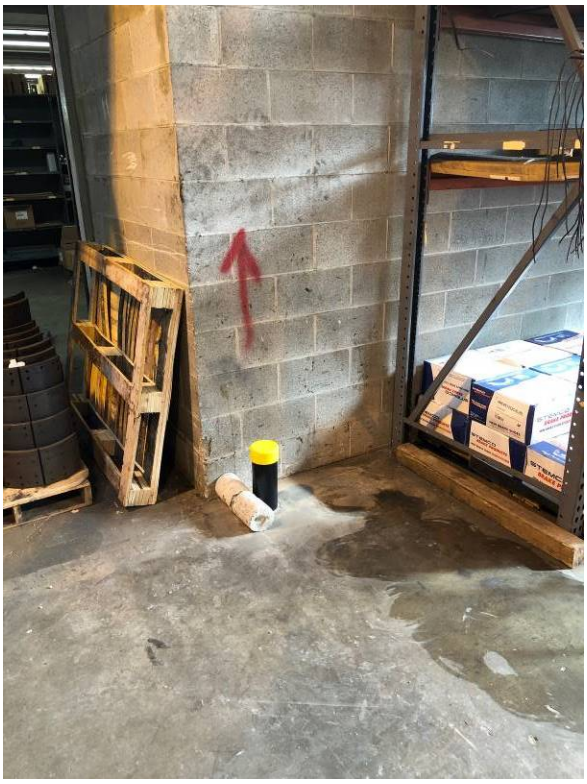


Photo 3 – Sump W1 – West Side of Offices

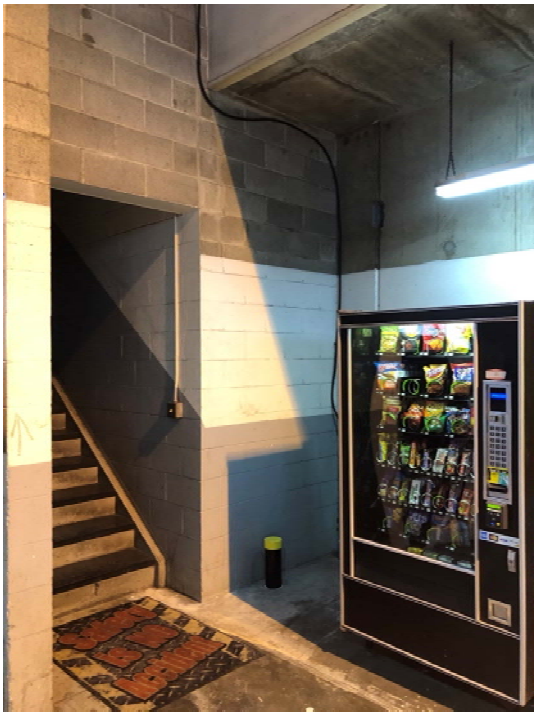


Photo 4 – Sump W3

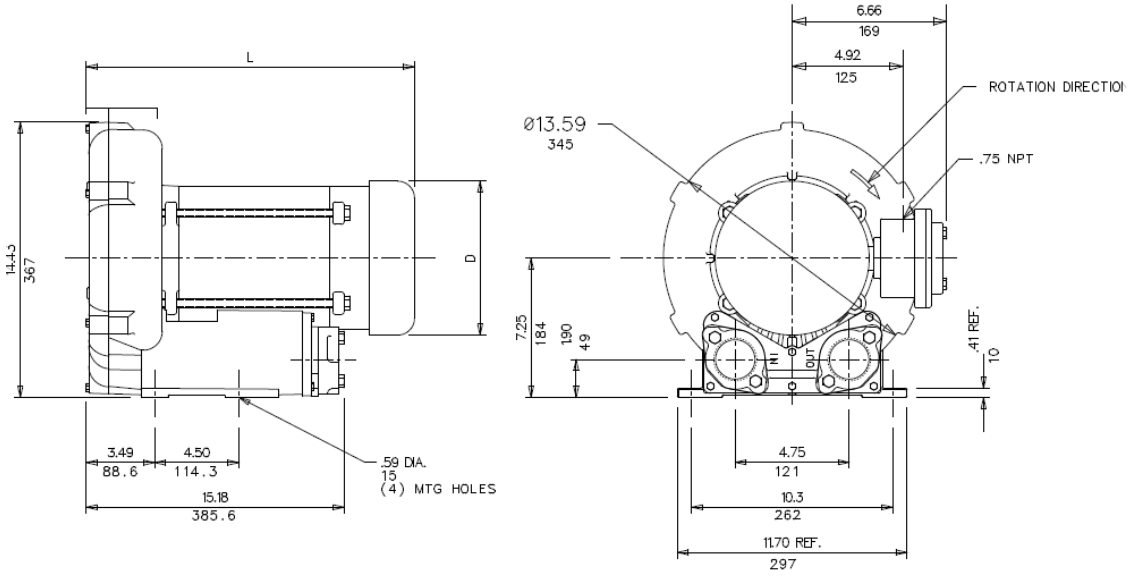
Parcel 40 – Building 600 Photograph Log From October 24-25 and December 19-20, 2020 Sump Installation and Testing
Sump Installation – completed by Advance Radon Technologies with oversight from CRETE Consulting

Photo 5 – Sump W2

EN 505 & CP 505

ROTRON®

2.0 / 2.5 HP Sealed Regenerative w/Explosion-Proof Motor



IN
MM

NOTES
1. TERMINAL BOX CONNECTOR HOLE 3/4" NPT.
2. DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3. CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

		Part/Model Number			
		EN505AX58ML	EN505AX72ML	CP505FS58MLR	CP505FS72MLR
Specification	Units	038177	038178	080655	038962
Motor Enclosure - Shaft Mtl.	-	Explosion-proof-CS	Explosion-proof-CS	CHEM XP-SS	CHEM XP-SS
Horsepower	-	2.0	2.0	2.0	2.0
Phase - Frequency	-	Single-60 hz	Three-60 hz	Single-60 hz	Three-60 hz
Voltage	AC	115/230	230/460	115/230	230/460
Motor Nameplate Amps	Amps (A)	22/11	5.8/2.9	22/11	5.8/2.9
Max. Blower Amps	Amps (A)	24/12	6.4/3.2	24/12	6.4/3.2
Locked Rotor Amps	Amps (A)	112/56	56/28	112/56	56/28
Service Factor	-	1/0	0/0	1/0	0/0
Starter Size	-	1.0	1.0	1.0	1.0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	92	84	92	84
	Kg	41.7	38.1	41.7	38.1

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

XP Motor Class - Group - See Explosive Atmosphere Classification Chart in Section I

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DYNAMIC FLUID SOLUTIONS

Environmental / Chemical Processing Blowers

EN 505 & CP 505

ROTRON®

2.0 / 2.5 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 150 SCFM
- Maximum pressure: 75 IWG
- Maximum vacuum: 70 IWG
- Standard motor: 2.0 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

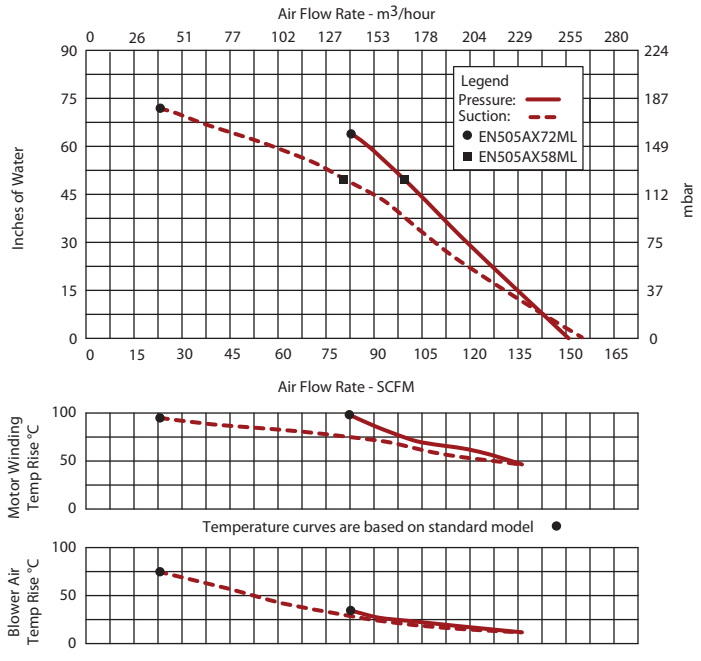
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

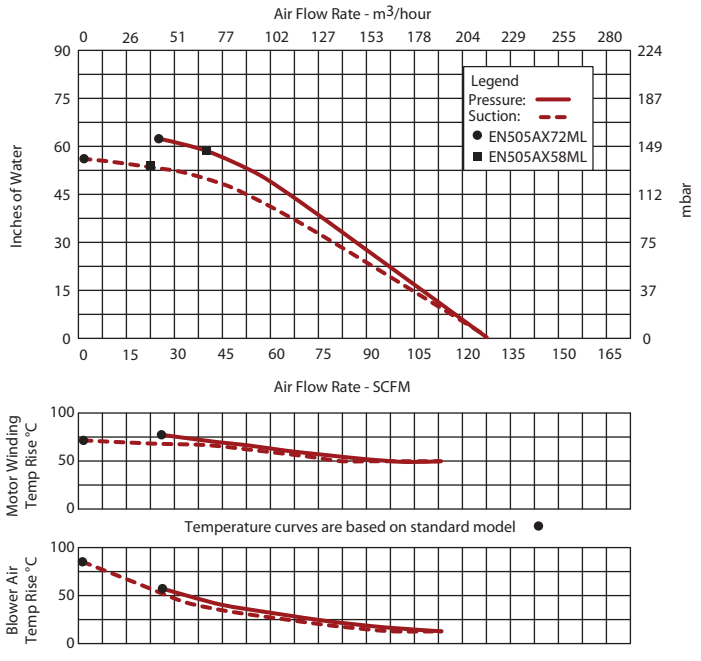
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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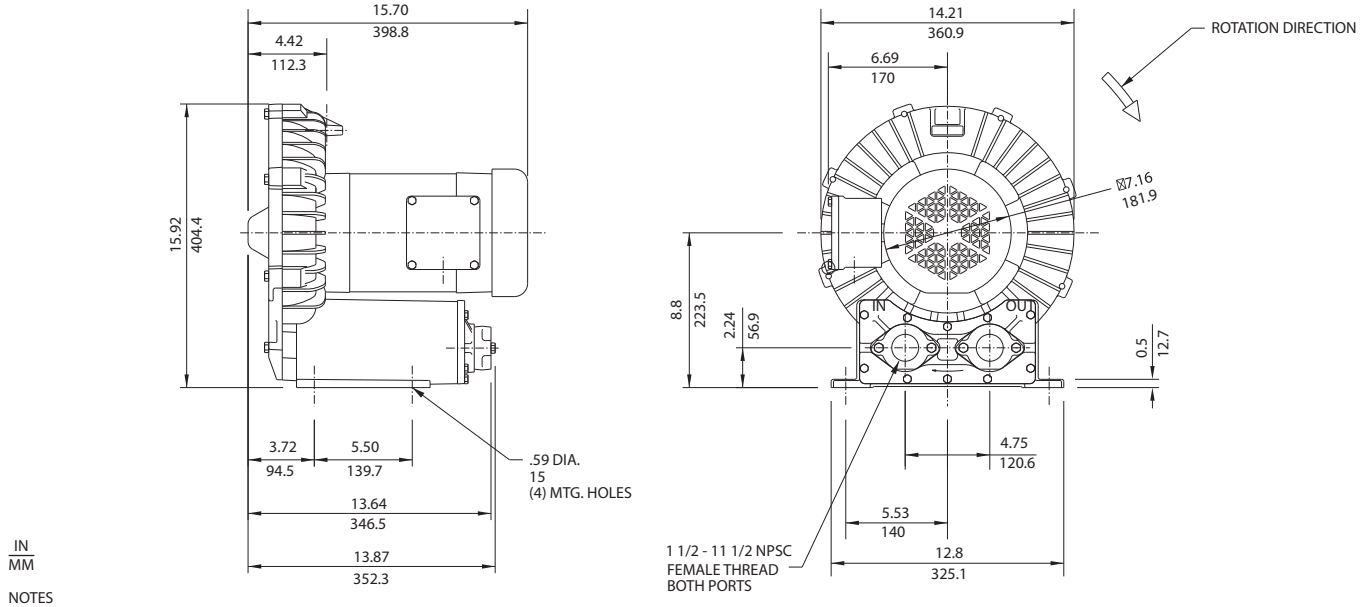
ROTRON®

EN 513 & CP 513

1.5 HP Sealed Regenerative w/Explosion-Proof Motor



NOTES
1 DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
2 CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

		Part/Model Number			
		EN513W58L	EN513W72L	CP513FR58LR	CP513FR72LR
Specification	Units	038183	038037		038966
Motor Enclosure - Shaft Mtl.	-	Explosion-proof-CS	Explosion-proof-CS	CHEM XP-SS	CHEM XP-SS
Horsepower	-	1.5	1.5	1.5	1.5
Phase - Frequency Voltage	-	Single-60 hz	Three-60 hz	Single-60 hz	Three-60 hz
Motor Nameplate Amps	AC	115/208-230	230/460	115/208-230	230/460
Max. Blower Amps	Amps (A)	15/7.9-7.5	4.6/2.3	15/7.9-7.5	4.6/2.3
Inrush Amps	Amps (A)	19.4/9.7-9.0	5.4/2.7	19.4/9.7-9.0	5.4/2.7
Service Factor	Amps (A)	84-42	32/16	84-42	32/16
Starter Size	-	1/0	00/00	1/0	00/00
Thermal Protection	-	1.0	1.0	1.0	1.0
XP Motor Class - Group	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	99	93	99	93
	Kg	44.9	42.2	44.9	42.2

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

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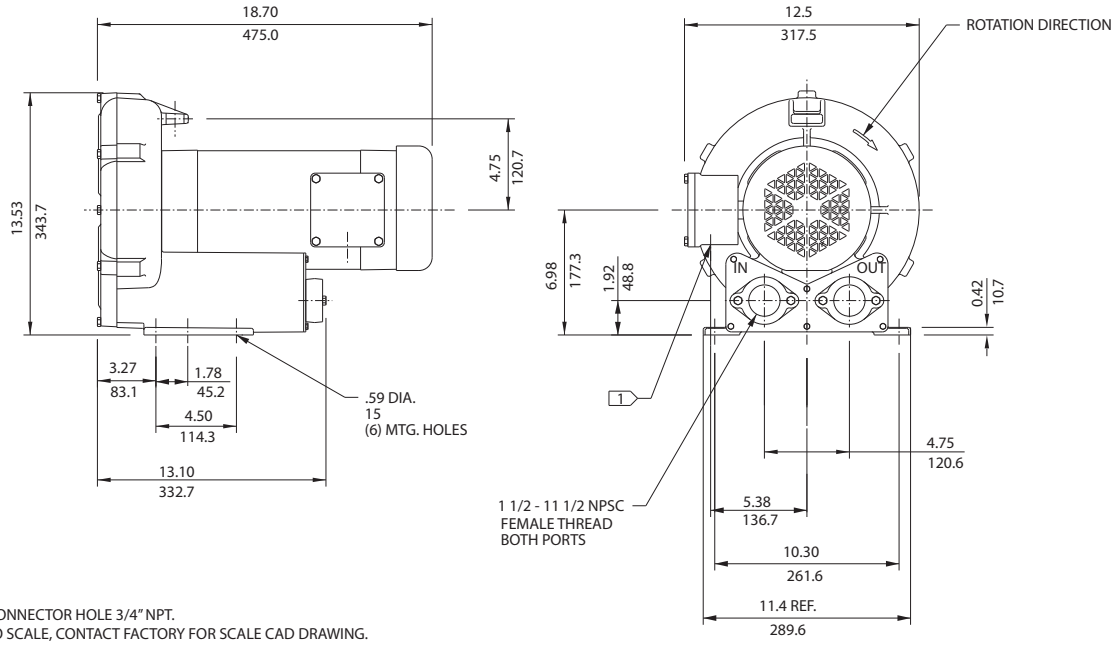

IN
MM

NOTES
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3. CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

		Part/Model Number			
		EN454W58ML	EN454W72ML	CP454W72MLR	CP454FR72MLR
Specification	Units	080487	080488	080490	080494
Motor Enclosure - Shaft Mtl.	-	Explosion-proof-CS	Explosion-proof-CS	CHEM XP-CS	CHEM XP-SS
Horsepower	-	1.5	1.5	1.5	1.5
Phase - Frequency	-	Single-60 hz	Three-60 hz	Three-60 hz	Three-60 hz
Voltage	AC	115/208-230	230/460	230/460	230/460
Motor Nameplate Amps	Amps (A)	15/7.9-7.5	4.6/2.3	4.5/2.3	4.6/2.3
Max. Blower Amps	Amps (A)	19/10.9-9.5	5.6/2.8	5.6/2.8	5.6/2.8
Locked Rotor Amps	Amps (A)	96-48	32/16	32/16	32/16
Service Factor	-	1/0	00/00	00/00	00/00
Starter Size	-	1.0	1.0	1.0	1.0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	90	84	84	84
	Kg	40.8	38.1	38.1	38.1

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

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Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

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EN 454 & CP 454

ROTRON®

1.5 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 120 SCFM
- Maximum pressure: 65 IWG
- Maximum vacuum: 59 IWG
- Standard motor: 1.5 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

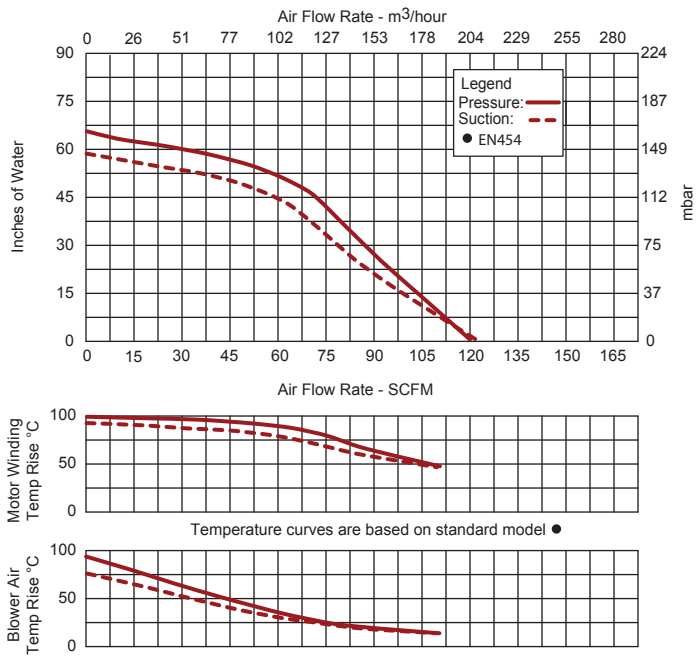
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

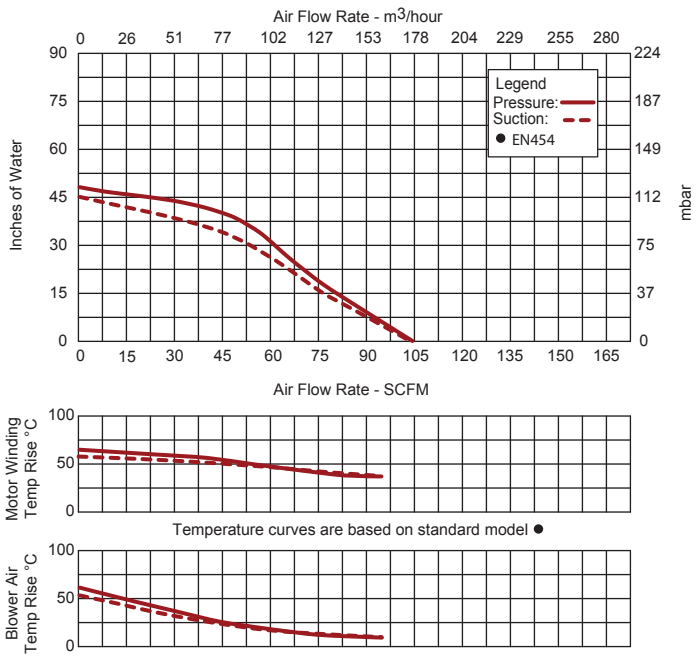
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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Fax: 763-746-9903
www.H2Ktech.com

December 23, 2020

To: Grant Hainsworth
Crete Consulting
253-797-6323
Grant.hainsworth@creteconsulting.com

Project Name: Sub-slab blower package
Project Location: Seattle, WA
Quote Number: 5749

Dear Grant,
Below is a quote you requested for the above referenced project. We appreciate the opportunity to bid on this project, please call or email with any questions.

Equipment Summary

Sub-slab vent blower system

(1) H2K model VLS-082 moisture separator, to include:
- Welded steel construction with enamel external finish
- Tangential inlet and demister for 99%+ moisture removal
- Dimensions of 23" diameter x 48" height
- 4" NPT inlet and outlet
- 100 gallon total volume, 40 gallon holding capacity
- Vacuum rated to 17 "Hg
- Polypropylene Demister Element
- PVC site glass with ss high-high level switch and union for easy removal
- 1" Drain valve
- Vacuum gage on separator inlet
- Vacuum relief valve, mounted on separator

knock out tank not needed if mounted on side of building or roof

(1) 1.5" inlet filter/silencer, Solberg model CSL-840-150 with 10 micron replaceable element
- Differential pressure gauge across filter

(1) H2K model RGN DR454 blower system
- Blower, Rotron model EN454
- Flexible couplings for vibration isolation on blower inlet and outlet
- 1 ½ HP, 220 VAC, 1Ø, TEFC motor
- ¾" air bleed with silencer
- Vacuum gage on blower inlet
- Vacuum switch for blower inlet

(1) Blower sound enclosure system
- **Includes equipment installation and wiring to the extent possible**
- Insulated sound louver covers
- NEMA 4 painted steel enclosure with sound insulation
- Inlet and outlet 3" NPT connections on outside of enclosure

(1) Control System
For operation on 220 VAC, single phase 3 wire incoming electrical service. To control 1.5 HP vent blower. Furnished mounted and wired on the sound enclosure exterior. To include:

QTY	DESCRIPTION
1	Enclosure, NEMA 4, for switches and indicators
1	Power distribution terminal block (65-335A) 3 pole; L1, L2, L3
1	Power distribution terminal block, 1 pole; Neutral
1	Motor starter: Contactor 18 FLA/Overload relay 10-15A, 1Ø; SVE blower

1 Hour run time meter for blower
1 Circuit breaker 120V 1P10A 10K; control power
1 Circuit breaker 208V 2P15A 10K; blower
1 Switch; three position; Hand-Off-Auto with integral Run (green/LED) indication
1 Light (red/LED); alarms
1 Pushbutton (red/NO); alarm Reset
Relay logic and timers as required
Engraved laminated legends for all door mounted devices
Terminal blocks for external connections and fusing as required
Color-coded wiring with wire markers at all terminations
Fully documented, assembled, wired, programmed and pre-shipment test
1 UL 508 serialized label

Pricing Summary

Price for SSDS system, w/ knockout and controls		**$ 16,300.00**
Freight to Seattle, WA – LTL freight		**$ 1,200.00**
OPTION – Non-XP DR-454 blower	**Deduct**	**$ 3,200.00**

General Conditions

1. Terms of payment to be 30% upon order, 30% received before shipment, balance Net 30 days. Terms including site acceptance beyond 30 days from shipment, or paid when paid, are not acceptable to H2K Technologies, Inc. Past due invoices charged APR of 18% (1.5% monthly).

2. Proposal and pricing valid for 120 days from the date of this proposal.

3. This proposal and pricing are based on our interpretation of the specifications & P&ID's provided at the time of bid only. We reserve the right to review any and all additional written specifications and drawings that may apply to this equipment before accepting or stating that the equipment meets specifications at time of order, otherwise equipment is bid as quoted only.

4. H2K Technologies will not initiate work without a fully executed contract or purchase order. Fabrication will not be initiated until complete submittal approvals have been received.

5. Submittals will be provided within two weeks of receipt of a fully executed contract or P.O.

6. Equipment can generally be shipped within 4-6 weeks after receipt of completely approved submittals. Lead time will be updated at the time of order execution.

7. Shipping charges are not included in the prices quoted unless explicitly stated in the proposal. Actual freight costs will be pre-paid and added to the invoice.

8. The process quoted does not include sales tax. State and local sales and use tax will be added to the invoice, unless a valid sales/use tax exemption certificate is supplied with the contract or purchase order for this project. Exemption certificates must be supplied at the time of order.

If you have any questions or comments concerning this information, please feel free to give me a call at 763-746-9900. Thank you for the opportunity to bid on this project.

Sincerely,

Joe Udvari

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

November 4, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on October 28, 2020 from the Port of Tacoma Parcel 40, F&BI 010494 project. There are 10 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Jamie Stevens
CTC1104R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 28, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma Parcel 40, F&BI 010494 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
010494 -01	SSV-Parts
010494 -02	SSV-E Bay

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	SSV-Parts	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-01 1/3.2
Date Analyzed:	10/30/20	Data File:	102927.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	104	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<130
APH EC9-12 aliphatics	230
APH EC9-10 aromatics	<80

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	SSV-E Bay	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-02 1/8.2
Date Analyzed:	10/30/20	Data File:	102929.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	86	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	1,900
APH EC9-12 aliphatics	<410
APH EC9-10 aromatics	<200

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Port of Tacoma Parcel 40
Date Collected:	Not Applicable	Lab ID:	00-2642 MB
Date Analyzed:	10/29/20	Data File:	102911.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	97	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<40
APH EC9-12 aliphatics	<50
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SSV-Parts	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-01 1/3.2
Date Analyzed:	10/30/20	Data File:	102927.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	106	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<1	<0.32
Toluene	<60	<16
Ethylbenzene	<1.4	<0.32
m,p-Xylene	<2.8	<0.64
o-Xylene	<1.4	<0.32
Naphthalene	<0.84	<0.16

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SSV-E Bay	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-02 1/8.2
Date Analyzed:	10/30/20	Data File:	102929.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	88	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<2.6	<0.82
Toluene	<150	<41
Ethylbenzene	<3.6	<0.82
m,p-Xylene	<7.1	<1.6
o-Xylene	<3.6	<0.82
Naphthalene	<2.1	<0.41

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Port of Tacoma Parcel 40
Date Collected:	Not Applicable	Lab ID:	00-2642 MB
Date Analyzed:	10/29/20	Data File:	102911.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.26	<0.05

Date of Report: 11/04/20
Date Received: 10/28/20
Project: Port of Tacoma Parcel 40, F&BI 010494

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 010494-01 1/3.2 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	<130	<130	nm
APH EC9-12 aliphatics	ug/m3	230	230	0
APH EC9-10 aromatics	ug/m3	<80	<80	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	72	70-130
APH EC9-12 aliphatics	ug/m3	67	91	70-130
APH EC9-10 aromatics	ug/m3	67	104	70-130

Date of Report: 11/04/20
Date Received: 10/28/20
Project: Port of Tacoma Parcel 40, F&BI 010494

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 010494-01 1/3.2 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Benzene	ug/m3	<1	<1	nm
Toluene	ug/m3	<60	<60	nm
Ethylbenzene	ug/m3	<1.4	<1.4	nm
m,p-Xylene	ug/m3	<2.8	<2.8	nm
o-Xylene	ug/m3	<1.4	<1.4	nm
Naphthalene	ug/m3	<0.84	<0.84	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/m3	43	94	70-130
Toluene	ug/m3	51	107	70-130
Ethylbenzene	ug/m3	59	107	70-130
m,p-Xylene	ug/m3	120	103	70-130
o-Xylene	ug/m3	59	101	70-130
Naphthalene	ug/m3	71	98	70-130

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

0104944

SAMPLE CHAIN OF CUSTODY MG 10-28-20

Page # 1 of 1

Report To Grant Hainsworth (& Jamie)
Company CRETE
Address 108 S. Washington St., #300
City, State, ZIP Seattle, WA 98104
Phone 253-797-6322 Email grant.hainsworth@crete consulting.com

SAMPLERS (signature) Grant Hainsworth

PROJECT NAME & ADDRESS: Port of Tacoma Parcel 40

PO #

NOTES:

INVOICE TO

TURNAROUND TIME
☒ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Default: Clean after 3 days
☐ Archive (Fee may apply)

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium		Notes
SSV-Parts	01	3312	255	IA / (SG)	10/27/20	30+	1648	4	1653		X		X			
SSV-E Bay	02	2435	256	IA / (SG)	10/27/20	30	1717	5	1722		X		X			
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Grant Hainsworth	Grant Hainsworth	CRETE	10/28/20	823
Received by: Ann Wessbecher	Ann Wessbecher Bruya	FLB	10/28	823
Relinquished by:				
Received by:		Samples received at 9 °C		

Appendix C

Drawings and Technical Specifications

PORT OF TACOMA

PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PROJECT NO. 101486.02
CONTRACT NO. 071522

PORT COMMISSIONERS:

RICHARD P. MARZANO
DON MEYER
JOHN MCCARTHY
KRISTIN ANG
DEANNA KELLER

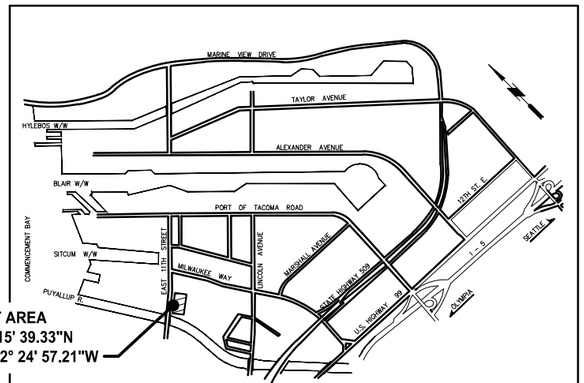
PORT STAFF:

JOHN WOLFE
NWSA Chief Executive Officer

ERIC JOHNSON
Port of Tacoma Executive Director

THAIS HOWARD, P.E.
Director of Engineering

ELLY BULEGA, PE
Project Manager



CONSULTANT:

moffatt & nichol
600 UNIVERSITY STREET, SUITE# 610
SEATTLE, WA 98101
(206) 622-0222

CRETE CONSULTING, INC.
108 SOUTH WASHINGTON STREET, SUITE 300
SEATTLE, WA 98104

DRAWING LIST

SHEET DESIGNATION	SHEET #	SHEET TITLE	REVISION
G1.0	1	COVER SHEET	0
G1.1	2	GENERAL NOTES	0
G1.2	3	LAYDOWN AREA AND PARKING	0
C1.1	4	PIPING LAYOUT - WEST SECTION	0
C1.2	5	PIPING LAYOUT - EAST SECTION	0
C1.3	6	PIPING LAYOUT - SECOND FLOOR	0
C1.4	7	PIPING LAYOUT RELATIVE TO CEILING FEATURES - WEST SECTION	0
C1.5	8	PIPING LAYOUT RELATIVE TO CEILING FEATURES - EAST SECTION	0
C2.1	9	PIPING PROFILE - EAST WALL OF WEST BAY	0
C2.2	10	PIPING PROFILE - WEST WALL OF EAST BAY	0
C2.3	11	PIPING PROFILE - EAST WALL OF EAST BAY	0
C2.4	12	PIPING PROFILE AND BLOWER - SOUTH EXTERIOR WALL	0
C3.1	13	DETAILS	0
C3.2	14	DETAILS	0

Port of Tacoma — P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841

CRETE CONSULTING, INC. | moffatt & nichol

MARK:	REVISION:	BY:	APPR:	DATE:

GRANT HAINSWORTH — STATE OF WASHINGTON — 23192 — REGISTERED PROFESSIONAL ENGINEER — 12/2/21

APPROVED:
DIRECTOR ENG. DATE

CHECKED BY DATE
PROJ. ENGR DATE Apr. 12, 2021

PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
COVER SHEET

PRINTED BY: Cobryn
PORT ADDRESS: ONE SITCUM PLAZA
TACOMA, WA 98401-1837

G1.0
SH # 1 OF # 14

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' ● Tide 22 1933	
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED	

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\CreteIPoTac Bldg 600\101486.02 - G1.0 (Cover Sheet).dwg

BINDING EDGE

GENERAL NOTES

1. ALL WORK SHALL COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL RULES AND REGULATIONS.
2. CONTRACTOR SHALL COMPLY WITH THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (OSHA) AND THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT (WISHA).
3. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE ENGINEER.
4. CONTRACTOR SHALL FIELD FIT AROUND EXISTING UTILITIES AND OTHER OBSTRUCTIONS. PRIOR TO WORK, CONTRACTOR SHALL FIELD VERIFY OBSTRUCTIONS AND SHALL NOTIFY ENGINEER OF ANY CONFLICTS WITH CONSTRUCTION PLANS. ALL POSSIBLE OBSTRUCTIONS HAVE NOT BEEN IDENTIFIED BY ENGINEER.
5. THE CONTRACTOR SHALL COORDINATE THE WORK OF ALL TRADES. CONTRACTOR SHALL PROVIDE TIMELY NOTIFICATION TO ENGINEER FOR ALL WORK ITEMS REQUIRING COORDINATION.
6. ALL DEVIATIONS FROM THESE PLANS SHALL BE RECORDED ON A SET OF "AS-BUILT" DRAWINGS.
7. EXISTING UTILITIES THAT ARE DAMAGED DUE TO CONSTRUCTION SHALL BE REPAIRED.

SUMP AND RISER NOTES

1. SUMP INSTALLATION WAS PERFORMED BY OTHERS. SUMPS ARE TEMPORARILY COMPLETED WITH A 4-INCH SCHEDULE 40 PVC SLIP COUPLING AND A 4-INCH ABS RISER AND END CAP.
2. SUMPS SHALL REMAIN CAPPED DURING PIPING INSTALLATION. PIPING SHALL NOT BE CONNECTED TO SUMPS UNTIL ALL OTHER PIPING HAS BEEN CONNECTED.
3. SUMPS AND RISERS SHALL BE PRESSURE-RATED SCHEDULE 40 PVC WATER PIPE (ASTM D 1785). ALL PVC PIPE CONNECTIONS SHALL BE SOLVENT WELDED.
4. PROTECTION OF THE RISER PIPE FROM IMPACT SHALL BE INSTALLED AT ALL SUMPS, EXCEPT SUMP E1.
5. VERTICAL PIPES SHALL BE SECURED WITH STRUT CHANNEL AND PIPE CLAMPS A MINIMUM OF EVERY 10 FEET TO COMPLY WITH THE INTERNATIONAL MECHANICAL CODE. PIPE CLAMPS SHALL BE THOMAS & BETTS KINDORF SUPERSTRUT®, OR APPROVED EQUIVALENT.
6. DETAIL 2 PROVIDES A CONCEPT FOR SECURING THE RISER TO THE PAINT BOOTH AT SUMP W2.
7. PVC PIPE SHALL BE PROTECTED FROM DAMAGE DURING TAPPING.
8. THE BUTTERFLY VALVE SHOWN IN DETAIL 1 SHALL BE A FLANGED 3-INCH PVC WAFER BUTTERFLY VALVE WITH EPDM SEAT, POLYPROPYLENE DISC, AND STAINLESS STEEL STEM, OR APPROVED EQUIVALENT.

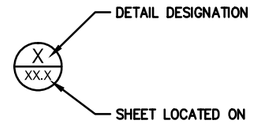
PIPING NOTES

1. ALL PIPING WILL BE FIELD FITTED AROUND OBSTRUCTIONS, AS APPROVED BY ENGINEER.
2. BEGINNING AT THE ELBOW OR TEE AT THE TOP OF EACH RISER AND CONTINUING TO THE BLOWER, ALL PIPE AND FITTINGS SHALL BE SCHEDULE 40 PVC DRAIN/WASTE/VENT (DWV; CELLULAR CORE) SCHEDULE 40 PVC (ASTM D4396). ALL PVC PIPE CONNECTIONS SHALL BE SOLVENT WELDED. AT GRADE BREAKS (SEE NOTE 4), PVC HOSE MAY BE USED, KANAFLEX CORPORATION STANDARD SUCTION AND DELIVERY HOSE, OR APPROVED EQUIVALENT.
3. LATERALS (HORIZONTAL PIPES) CONVEYING VAPORS FROM 1 SUMP SHALL BE 3-INCH DIAMETER AND LATERALS CONVEYING VAPORS FROM 2 OR MORE SUMPS SHALL BE 4-INCH DIAMETER.
4. LATERALS SHALL BE SLOPED TO DRAIN WATER TO SUMP LOCATIONS. LATERALS SHALL BE SLOPED A MINIMUM OF 2% WHEN THE WATER WILL DRAIN AGAINST THE DIRECTION OF AIR FLOW AND A MINIMUM OF 1% WHEN THE WATER WILL DRAIN IN THE SAME DIRECTION AS THE AIR FLOW.
5. ALL LATERAL PIPES SHALL BE SECURED A MINIMUM OF EVERY 6 FEET TO COMPLY WITH THE INTERNATIONAL MECHANICAL CODE AND ANSI/MSS SP-58-2018.
6. ALL LATERALS SHOULD BE PLACED AT HEIGHTS TO PREVENT DAMAGE FROM TRUCKS, TRAILERS, AND ASSOCIATED MAINTENANCE ACTIVITIES PERFORMED BY TENANT.
7. LATERAL PIPES SHALL BE SECURED TO WALLS USING STRUT CHANNEL AND PIPE CLAMPS OR SUSPENDED FROM THE RAFTERS USING PURLIN CLAMPS AND CEILING HANGERS. PIPE CLAMPS SHALL BE KINDORF SUPERSTRUT®, OR APPROVED EQUIVALENT. PURLIN CLAMPS SHALL BE PHD MANUFACTURING MODEL 290, OR APPROVED EQUIVALENT. CEILING HANGERS SHALL BE NFPA SWIVEL RING HANGERS, PHD MANUFACTURING MODEL 145, OR APPROVED EQUIVALENT. RAFTERS ARE 8Z14 PER AS-BUILT REFERENCE DRAWINGS. CONTRACTOR SHALL FIELD VERIFY RAFTER DIMENSIONS.

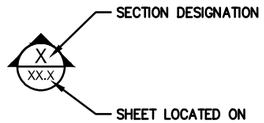
WALL AND FLOOR PENETRATION NOTES

1. ALL CORES THROUGH INTERIOR AND EXTERIOR WALLS SHALL BE PERFORMED AFTER REINFORCING STEEL HAS BEEN LOCATED TO PREVENT DAMAGE TO THE REINFORCING STEEL.
2. CORES THROUGH EXTERIOR WALLS SHALL BE WEATHER-SEALED TO PREVENT MOISTURE FROM ENTERING THE BUILDING.
3. CORES THROUGH INTERIOR WALLS SHALL BE SEALED AND SHALL HAVE FIRE COLLARS INSTALLED WHERE REQUIRED.

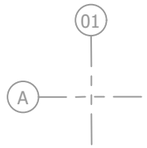
SHEET SYMBOLS



DETAIL



SECTION



HISTORICAL REFERENCE DRAWING GRID

ABBREVIATIONS

ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
DIA	DIAMETER
FT	FOOT/FEET
GALV	GALVANIZED
HVAC	HEATING, VENTILATION, AND AIR CONDITIONING
ID	INSIDE DIAMETER
MAX	MAXIMUM
MIN	MINIMUM
NPT	NATIONAL PIPE THREAD
PVC	POLYVINYL CHLORIDE
SCH	SCHEDULE
SSDS	SUBSLAB DEPRESSURIZATION SYSTEM
T.O.	TOP OF
TYP	TYPICAL

Port of Tacoma
P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841

CRETE CONSULTING, INC.
moffatt & nichol

MARK:	REVISION:	BY:	APPR:	DATE:

GRANT HAINSWORTH WASHINGTON 31792 REGISTERED PROFESSIONAL ENGINEER
12/21

APPROVED:

CHECKED BY DATE

DIRECTOR ENG. DATE | PROJ. ENGR DATE

PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
GENERAL NOTES

PRINTED BY: Cabryn Apr 12, 2021
PORT ADDRESS:ONE SITCUM PLAZA
TACOMA, WA 98401-1837

G1.1
SH # 2 OF # 14

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933	PORT ADDRESS:ONE SITCUM PLAZA
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED	TACOMA, WA 98401-1837

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - G1.1 (General Notes).dwg

G1.2

SH # 3 OF # 14

PARCEL 40 - BUILDING 600

SUBSLAB DEPRESSURIZATION SYSTEM

LAYDOWN AREA AND PARKING

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933	
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED	

APPROVED: _____ CHECKED BY DATE

DIRECTOR ENG. DATE PROJ. ENGR DATE

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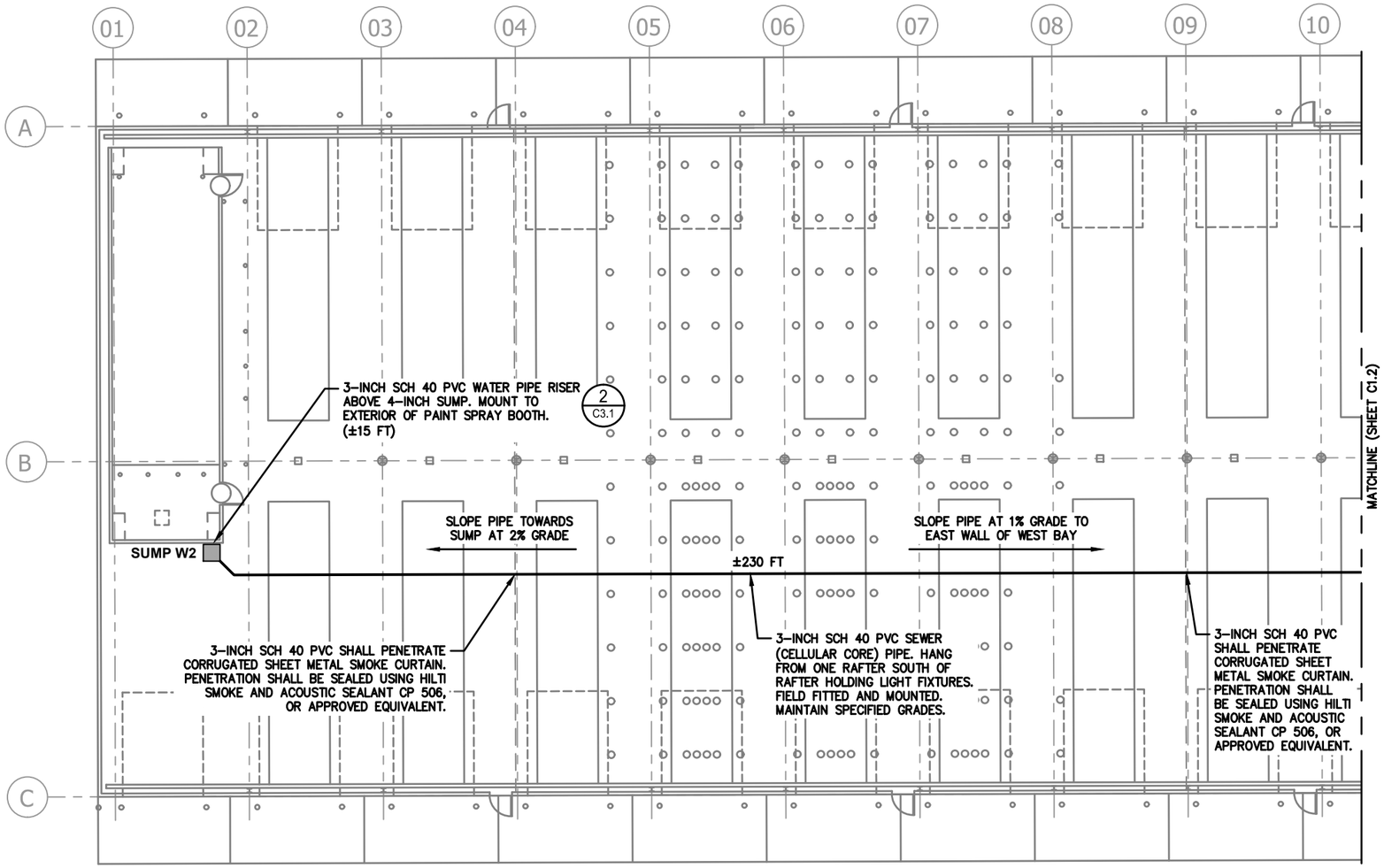

WEST SECTION
FIRST FLOOR PLAN
SCALE: 1"=10'

1"=10'-0" 10 0 10 20
Scale Feet

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - C1 (Piping Layouts).dwg

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PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING LAYOUT - WEST SECTION

C1.1
SH # 4 OF # 14

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933	
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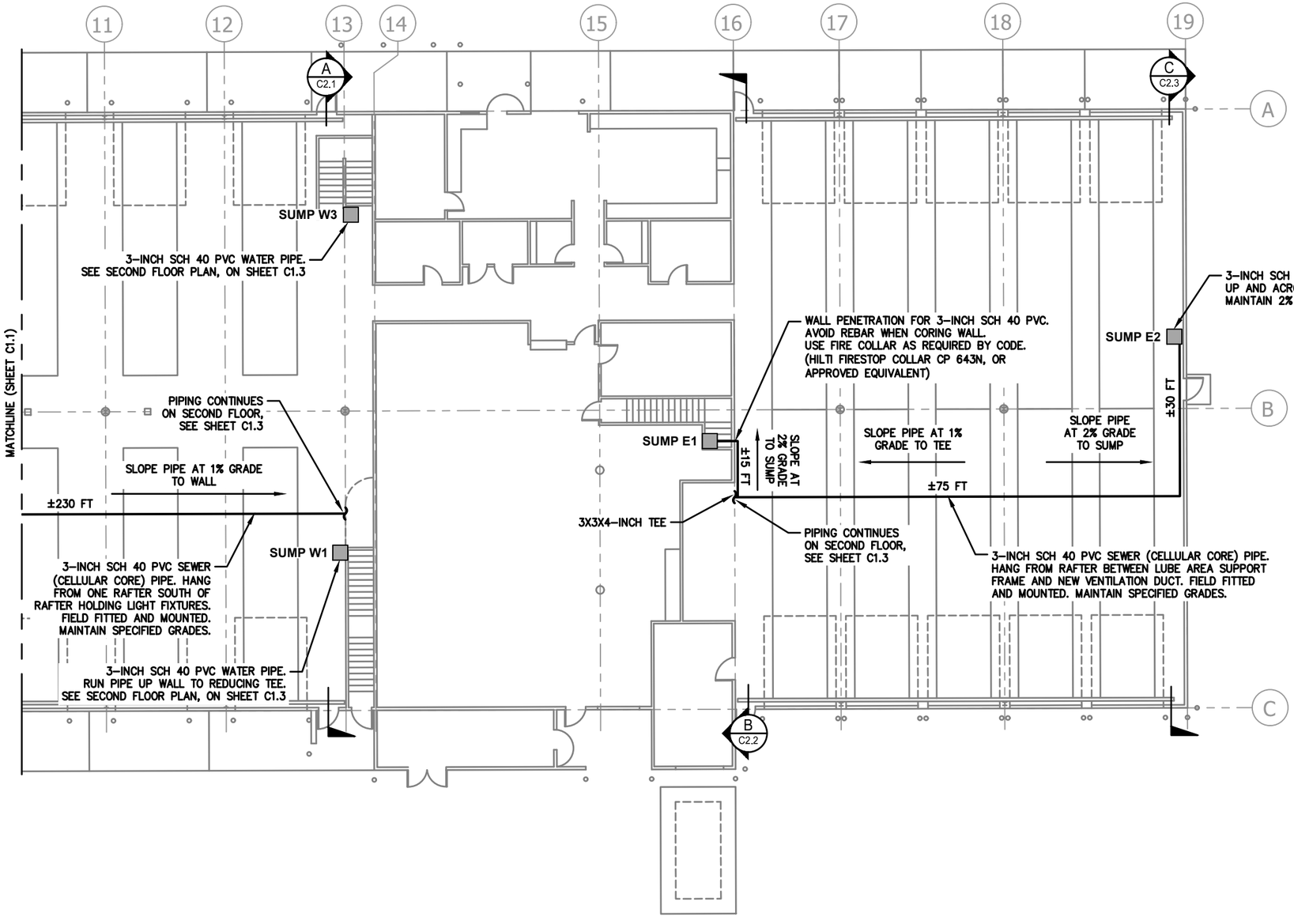

EAST SECTION
FIRST FLOOR PLAN

SCALE: 1"=10'

1"=10'-0" 10 0 10 20
Scale Feet

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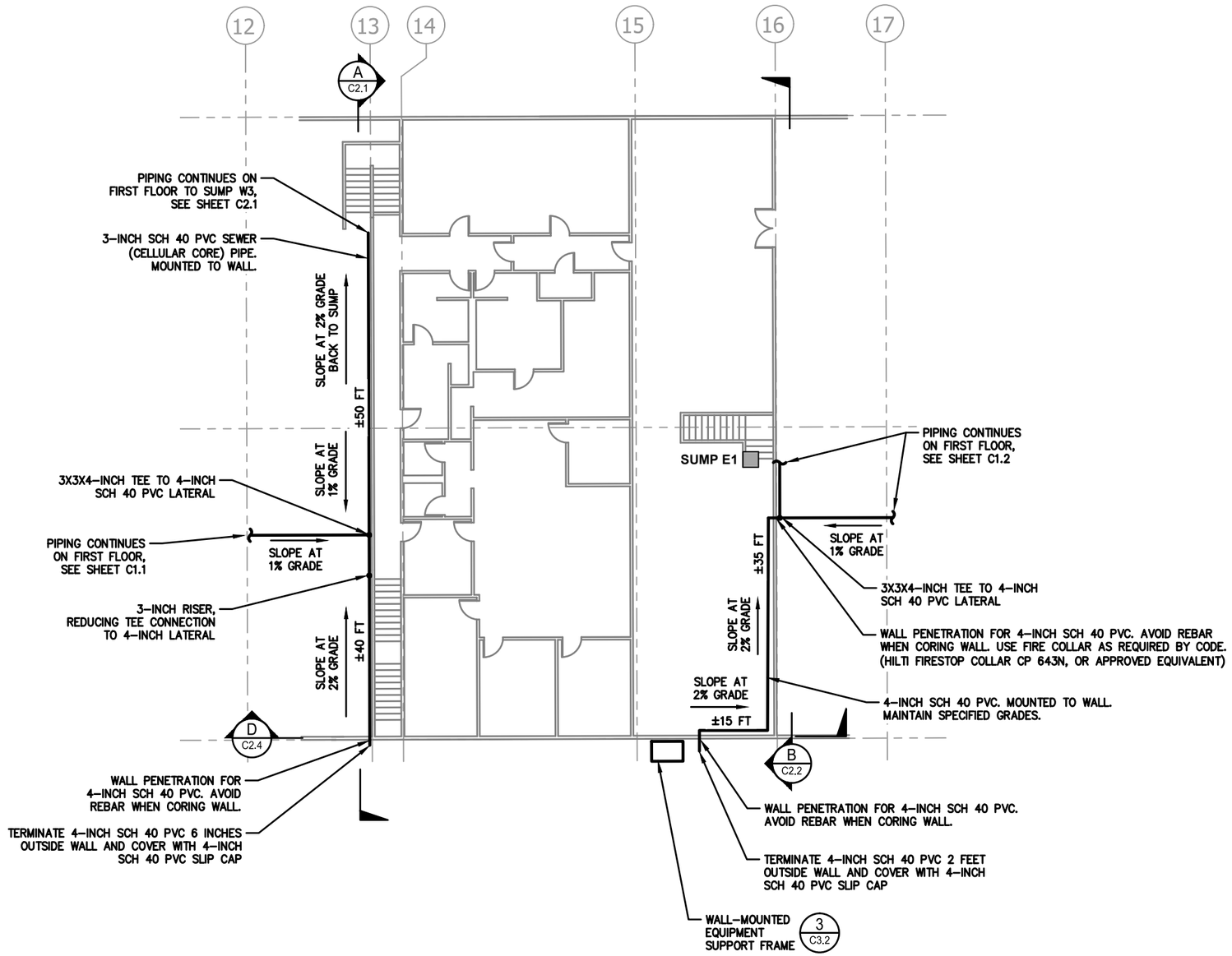
PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING LAYOUT - EAST SECTION

C1.2
SH # 5 OF # 14

CONT/CONS:	071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27	PRINTED BY: Cabryn Apr 12, 2021
M. ID:	101486.02	DAT–HRZ: WA83–SF	VERT: MLLW 19.39' ● Tide 22 1933		PORT ADDRESS: ONE SITCUM PLAZA
PHASE:	BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED		TACOMA, WA 98401–1837



SECOND FLOOR PLAN

SCALE: 1"=10'

1"=10'-0" 10 0 10 20 Scale Feet

BINDING EDGE

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DRAWING SCALE: AS NOTED

PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING LAYOUT - SECOND FLOOR

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
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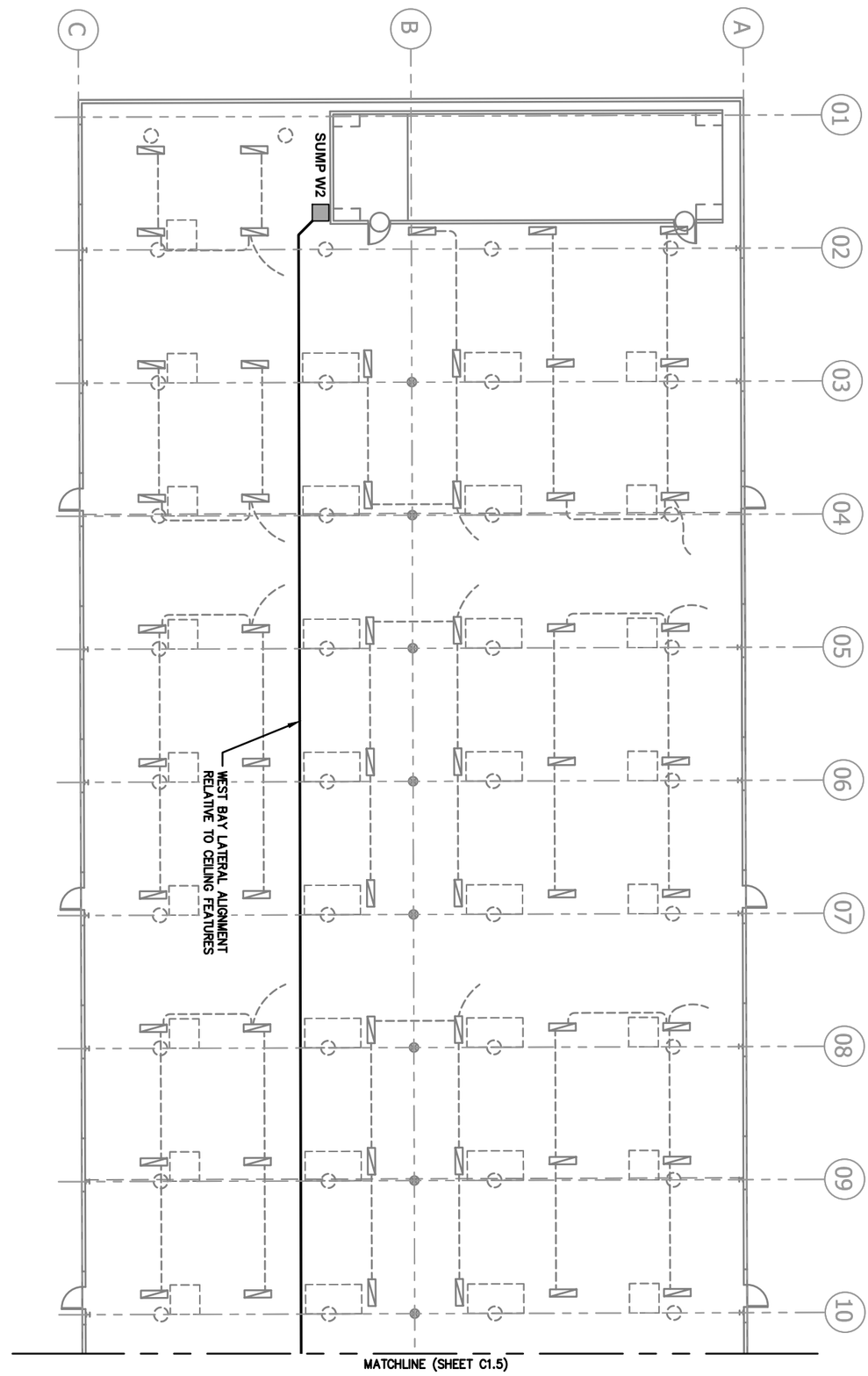
C1.3
SH # 6 OF # 14



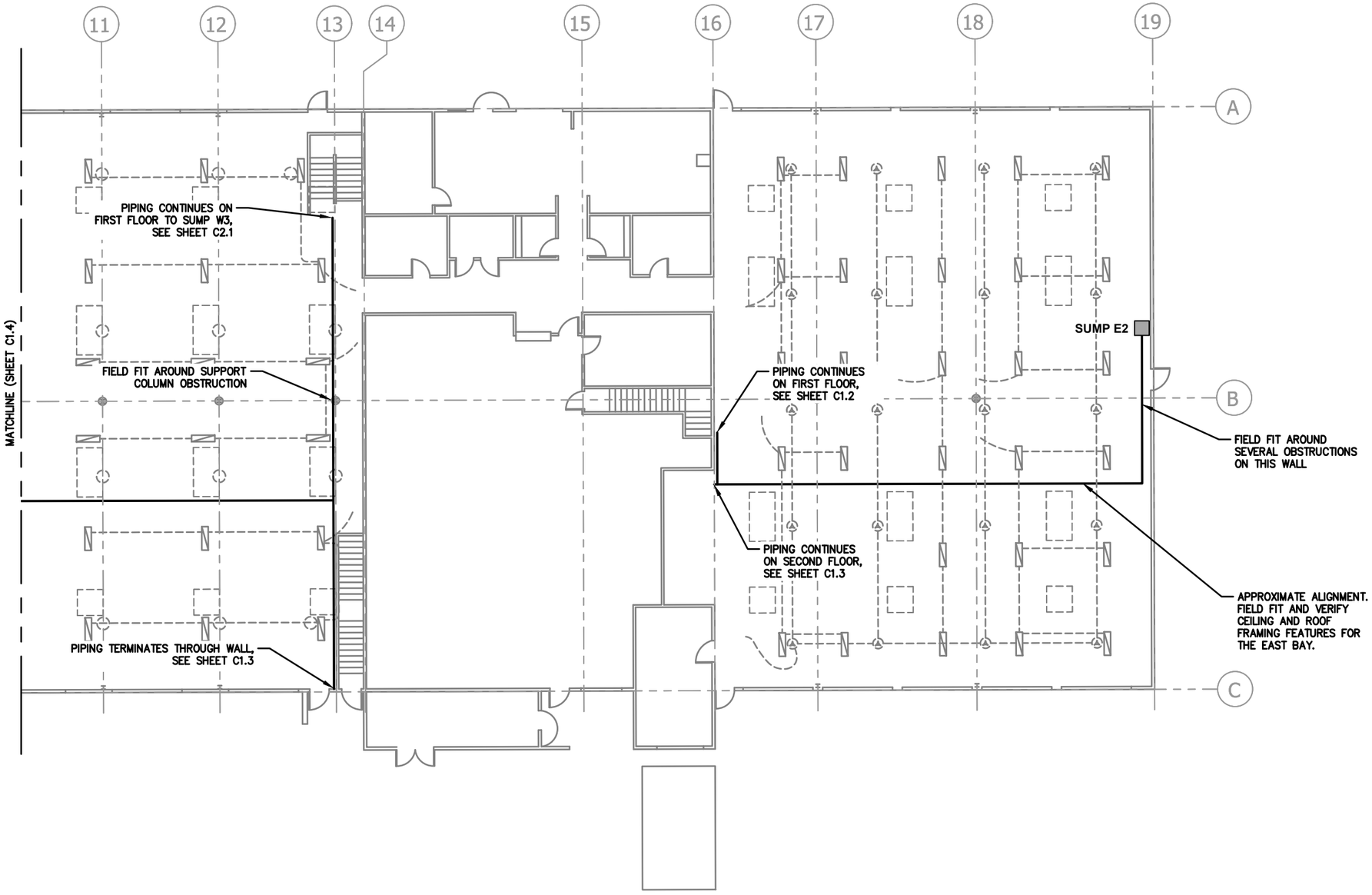
WEST SECTION CEILING PLAN

SCALE: 1"=10'

1"=10'-0"
Scale
10 0 10 20
Feet

C1.4 SH # 7 OF # 14	**PARCEL 40 - BUILDING 600** **SUBSLAB DEPRESSURIZATION SYSTEM** PIPING LAYOUT RELATIVE TO CEILING FEATURES - WEST SECTION			APPROVED:	CHECKED BY DATE	GRANT HAINSWORTH STATE OF WASHINGTON 33192 REGISTERED PROFESSIONAL ENGINEER 4/12/21	CRETE CONSULTING, INC. moffatt & nichol	Port of Tacoma P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841	
				DIRECTOR ENG. DATE	PROJ. ENGR DATE				
CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27	PRINTED BY: Cabryn Apr 12, 2021			MARK:	REVISION:	BY: APPR: DATE:
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933		PORT ADDRESS: ONE SITCUM PLAZA					
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED		TACOMA, WA 98401-1837					

BINDING EDGE



EAST SECTION
CEILING PLAN
SCALE: 1"=10'

1"=10'-0" 10 0 10 20
Scale Feet

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PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING LAYOUT AND CEILING FEATURES - EAST SECTION

TOWNSHIP: 21N	RANGE: 3E	SECTION: 27	
DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933		
PARCEL: 40	DRAWING SCALE: AS NOTED		

C1.5
SH # 8 OF # 14

CONT./CONS: 071522
M. ID: 101486.02
PHASE: BID SET

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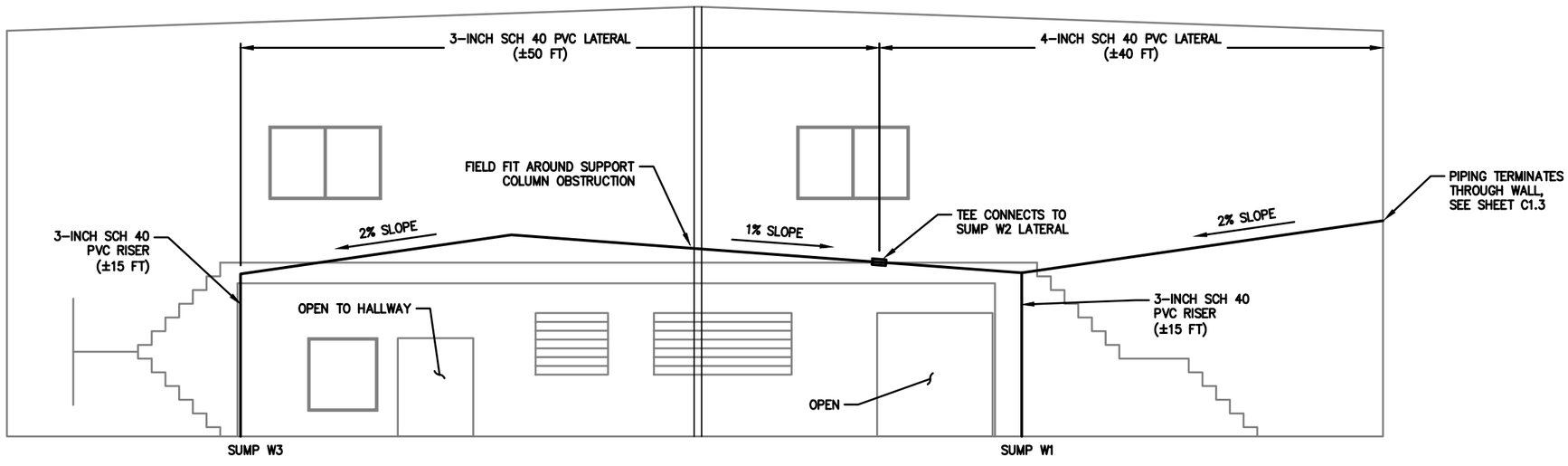

INTERIOR VIEW

EAST WALL OF WEST BAY ELEVATION

A / C1.3

SCALE: 1"=5'

1"=5'-0" 5 0 5 10
Scale Feet

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - C1 (Piping Layouts).dwg

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PARCEL 40 - BUILDING 600

SUBSLAB DEPRESSURIZATION SYSTEM

PIPING PROFILE -
EAST WALL OF WEST BAY

C2.1
SH # 9 OF # 14

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' ● Tide 22 1933	
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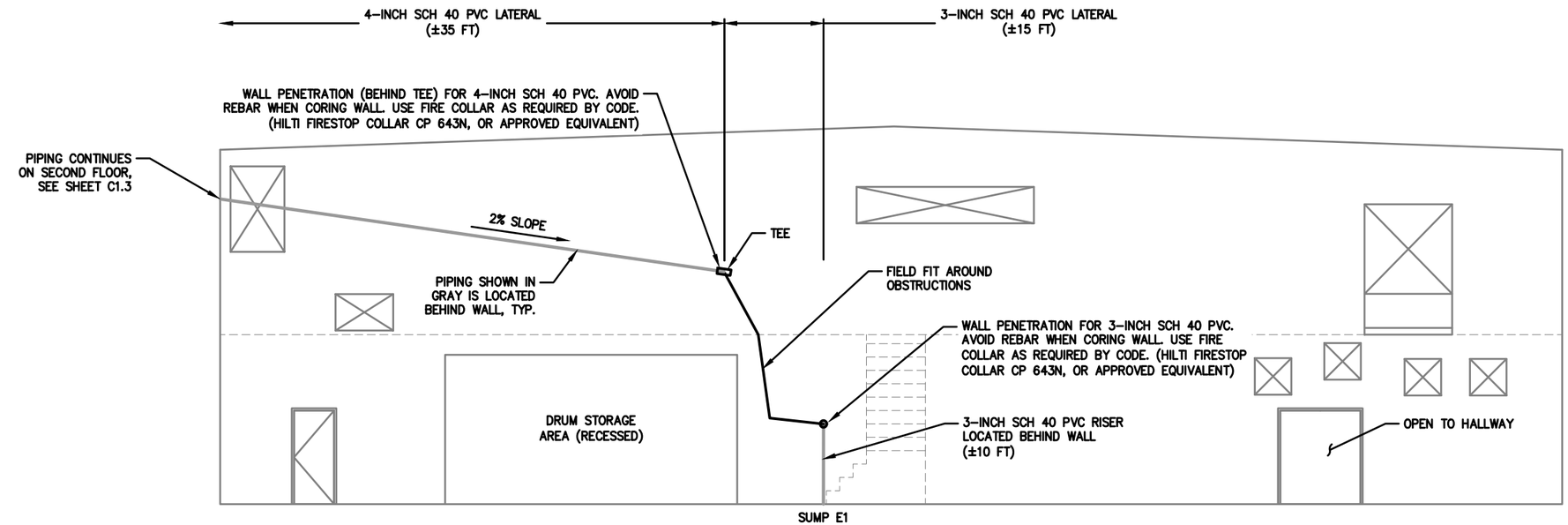

INTERIOR VIEW

WEST WALL OF EAST BAY ELEVATION

B / C1.2

SCALE: 1"=5'

1"=5'-0" 5 0 5 10 Scale Feet

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - C1 (Piping Layouts).dwg

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PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING PROFILE - WEST WALL OF EAST BAY

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CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' ● Tide 22 1933	
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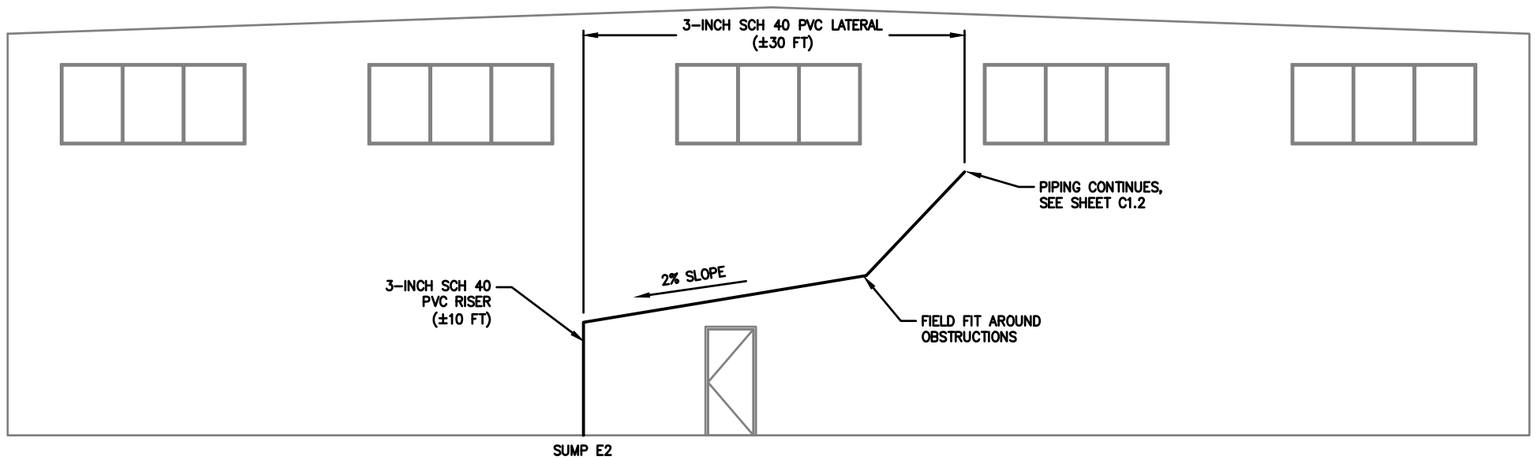
C2.2
SH # 10 OF # 14



INTERIOR VIEW

EAST WALL OF EAST BAY ELEVATION

C1.2

SCALE: 1"=5'

1"=5'-0" 5 0 5 10
Scale Feet

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - C1 (Piping Layouts).dwg

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DRAWING SCALE: AS NOTED

PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
- PIPING PROFILE -
EAST WALL OF EAST BAY

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
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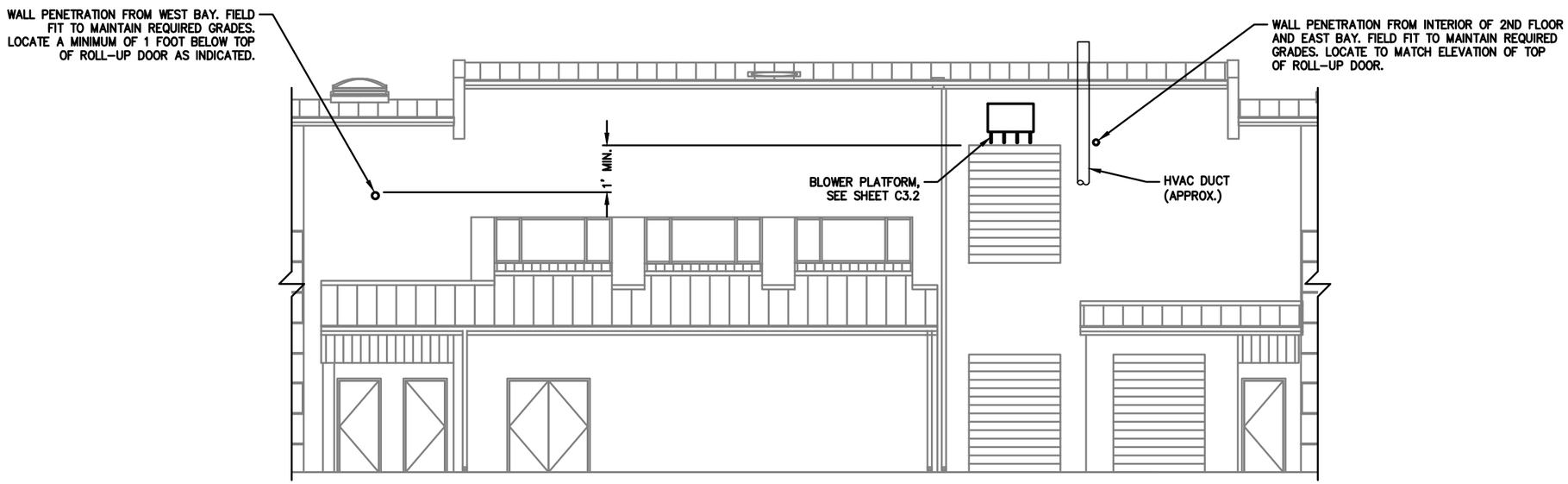
C2.3
SH # 11 OF # 14



D C1.3 SOUTH - ELEVATION
SCALE: 1"=5'

1"=5'-0" 5 0 5 10
Scale Feet

BINDING EDGE

PORT OF TACOMA FILE: D:_Projects\Crete\PoTac Bldg 600\101486.02 - C1 (Piping Layouts).dwg

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PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
PIPING PROFILE AND BLOWER -
SOUTH EXTERIOR WALL

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' ● Tide 22 1933	
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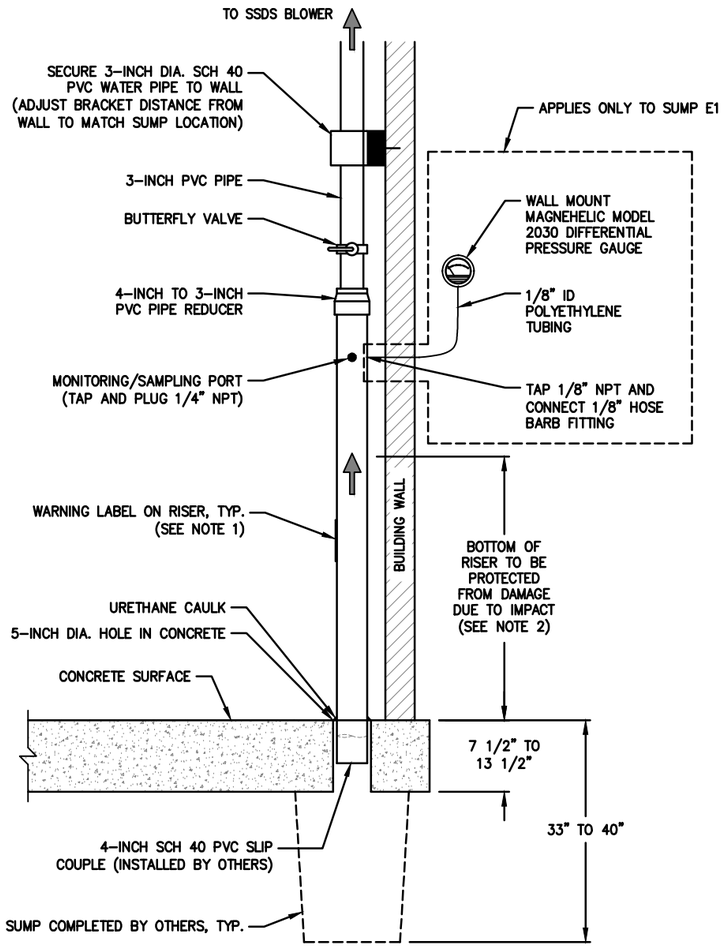
C2.4
SH # 12 OF # 14



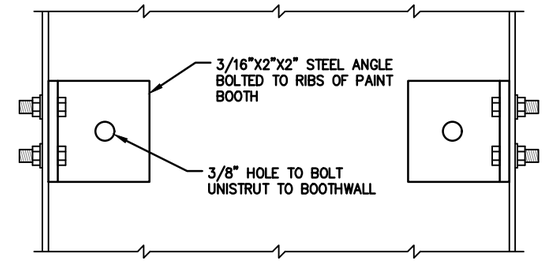
1 / - SUMP AND RISER DETAIL - TYPICAL
SCALE: NTS

NOTES

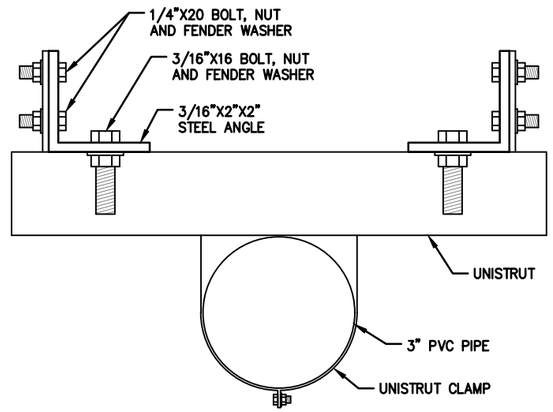
1. ALL RISERS SHALL INCLUDE A PERMANENT LABEL THAT PROVIDES THE FOLLOWING WARNING, OR SIMILAR TEXT, AS APPROVED BY THE ENGINEER:

   NOTICE
   FOUNDATION VENTILATION SYSTEM IS OPERATING. DO NOT ALTER OR DISCOUNT. FAN OPERATION MUST BE CONTINUOUS.

2. RISER PROTECTION SHALL BE PROVIDED AS FOLLOWS:
   - A. FOR SUMP LOCATION W1, INSTALL A 3 FOOT TALL HEAVY DUTY WALL-MOUNTED PIPE AND DOWNSPOUT PROTECTOR, OMEGA INDUSTRIAL PRODUCTS OM3310, OR APPROVED EQUIVALENT.
   - B. FOR SUMP LOCATION W3, INSTALL A 3 FOOT TALL WALL-MOUNTED PIPE AND DOWNSPOUT PROTECTOR, OMEGA INDUSTRIAL PRODUCTS OM3306, OR APPROVED EQUIVALENT.
   - C. FOR SUMP LOCATIONS W2 AND E2, INSTALL A 3 FOOT TALL FLOOR-MOUNTED PIPE AND DOWNSPOUT OR CORNER PROTECTOR, OMEGA INDUSTRIAL PRODUCTS HEAVY DUTY CORNER GUARD, OR APPROVED EQUIVALENT.
   - D. FOR SUMP LOCATION E1, A RISER PROTECTOR IS NOT REQUIRED.
   - E. RISER PROTECTORS SHALL BE HIGH VISIBILITY TRAFFIC SAFETY YELLOW.



PLAN



SECTION

2 / C1.1 PAINT BOOTH RISER CLAMP
SCALE: NTS

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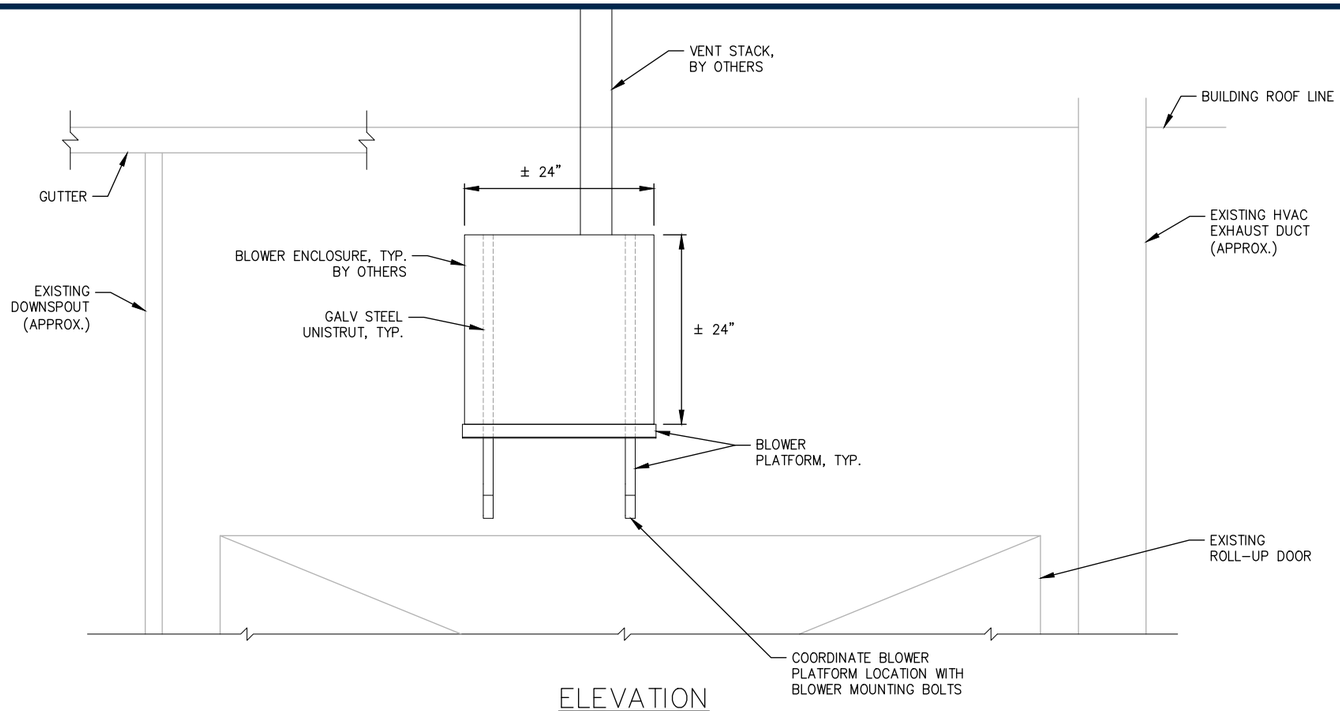
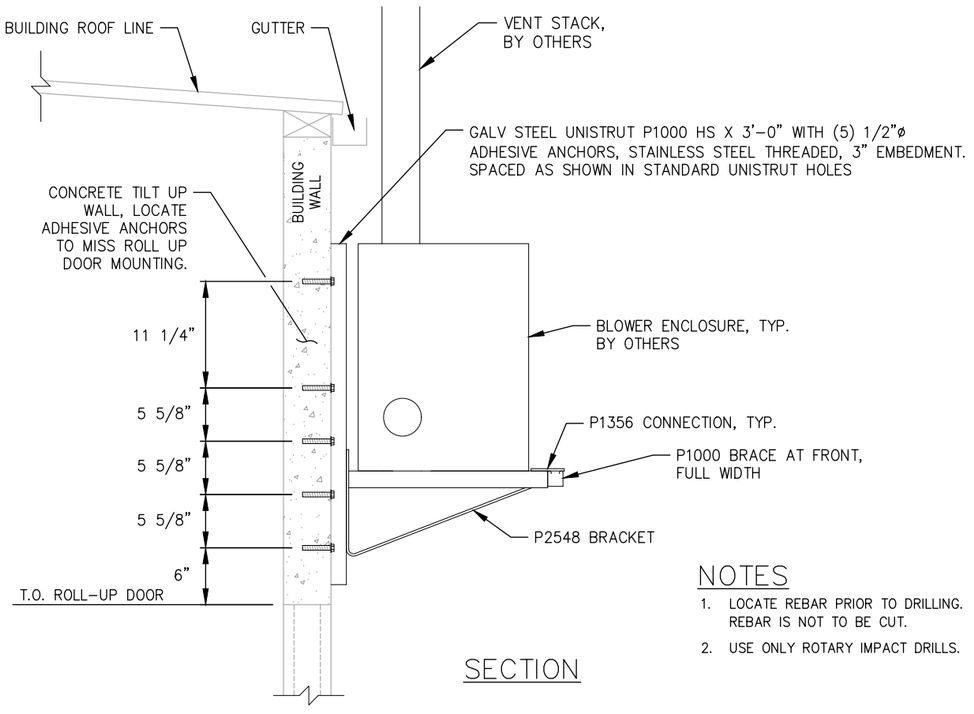
PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
DETAILS

C3.1
SH # 12 OF # 14

CONT/CONS: 071522	TOWNSHIP: 21N	RANGE: 3E	SECTION: 27
M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933	PORT ADDRESS:ONE SITCUM PLAZA
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED	TACOMA, WA 98401-1837



ELEVATION



NOTES

1. LOCATE REBAR PRIOR TO DRILLING. REBAR IS NOT TO BE CUT.
2. USE ONLY ROTARY IMPACT DRILLS.

SECTION

3 / C1.3 BLOWER PLATFORM

SCALE: NTS

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CRAIG J. CRETE
STATE OF WASHINGTON
23142

2021.04.12

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PARCEL 40 - BUILDING 600
SUBSLAB DEPRESSURIZATION SYSTEM
DETAILS

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M. ID: 101486.02	DAT-HRZ: WA83-SF	VERT: MLLW 19.39' @ Tide 22 1933	
PHASE: BID SET	PARCEL: 40	DRAWING SCALE: AS NOTED	

C3.2
SH# 14 OF # 14

PORT OF TACOMA

TACOMA, WASHINGTON

PARCEL 40 - BUILDING 600 SUBSLAB DEPRESSURIZATION SYSTEM

PROJECT NO. 101486.02

CONTRACT NO. 071522

Thais Howard, PE

Director, Engineering

Elly Bulega, PE

Project Manager

END OF SECTION

The undersigned Engineer of Record hereby certifies that the Technical Specifications for the following portions of this project were written by me, or under my direct supervision, and that I am duly registered under the laws of the State of Washington, and hereby affix my Professional Seal and signature.

Those Sections prepared under my direct supervision and being certified by my seal and signature below are as follows:

SEAL & SIGNATURE	SECTION(S)
 2021/04/12	Division 2- Existing Conditions • Section 02 41 13 - Selective Demolition • Section 02 87 00 - Fugitive and Silica Dust Control Procedures Division 7 - Thermal and Moisture Protection • Section 07 84 00 - Firestopping Division 33 - Utilities • Section 33 90 90 - Subslab Depressurization System Piping
 2021/04/12	Division 5 - Metals • Section 05 50 00 - Metal Fabrications

END OF SECTION

PROCUREMENT AND CONTRACTING REQUIREMENTS

Only Division 02-33 included in this appendix.

SPECIFICATIONS

Only Division 02-33 included in this appendix.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Field locate utilities and scan concrete walls for reinforcing steel.

B. Core concrete walls at four (4) locations indicated on the drawings.

C. Dispose of debris generated.

1.02 RELATED SECTIONS

A. Section 01 33 00 - Submittals

B. Section 02 87 00 - Fugitive and Silica Dust Control Procedures

C. Section 33 90 90 – Subslab Depressurization System Piping

1.03 SUBMITTALS

A. Submit to the Port a demolition plan that includes and addresses, at a minimum, the following:

1. Worker and public safety,

2. Protection of the environment,

3. Protection of workers or other persons in areas surrounding, above, below, or nearby the demolition activities,

4. Means and methods for non-destructive scanning of concrete walls,

5. Means and methods of demolition including specific types of equipment and machinery to be employed for selective demolition.

1.04 DUST AND DEBRIS CONTROL

A. The amount of dust and debris resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the site and to avoid creation of a nuisance in the surrounding area.

PART 2 MATERIALS – NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. Equipment used in coring operations shall meet all OSHA standards and specifications.

B. Inspect core drill bits for damage, including the hub area.

C. Confirm that drill bits are of proper specification for materials being cut.

D. Never operate a core drill assembly unattended unless the equipment has been designed specifically for this purpose.

E. The core drilling equipment shall be operated in accordance with manufacturer’s specifications.

F. Place partitions, barricades, or caution tape around work area, as needed, to prevent unauthorized personnel from accessing the work area.

3.02 PREPARATION

A. The drawings define the approximate limits of demolition.

B. Contractor shall locate existing utilities in the immediate vicinity of demolition locations on both sides of the concrete walls.

C. The specific locations for demolition shall be determined by Contractor, as approved by Engineer, to allow installation of piping at the required grades, to protect existing utilities and appurtenances, and to prevent damage to reinforcing steel in concrete walls.

D. Non-destructive scanning (e.g. pacometer or ground penetrating radar) of the approved demolition locations shall be performed to locate reinforcing steel in concrete walls.

3.03 CONCRETE CORING

A. Adjust coring location as needed to avoid utilities and reinforcing steel.

B. Implement dust control measures.

C. Core shall penetrate wall completely, be smooth and free of obstructions, and be of adequate diameter to allow pipe installation, and fire collar, if needed.

3.04 DISPOSAL

A. Collect and transport demolition waste to a licensed recycling or disposal facility.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The Contractor shall furnish all labor, materials, facilities, equipment, services, employee training and testing, and agreements necessary to perform the work required for potential silica dust control activities in accordance with these specifications and the latest worker protection regulations from the Washington State Department of Labor and Industries Division of Occupational Safety and Health (DOSH), and for fugitive dust control in accordance with these specifications and the latest regulations from the Puget Sound Clean Air Agency (PSCAA) and any other applicable federal, state, and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.

B. The work specified herein shall be performed by competent persons, trained, knowledgeable and qualified in both fugitive and silica dust evaluation and control methods.

C. Activities with potential for exposure include, but are not limited to:

1. Activities where exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the permissible exposure limit (PEL) or action level (AL), and

2. Activities listed in WAC 296-840, Safety Standards for Respirable Silica, Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica.

D. If visible fugitive dust emissions are observed beyond the perimeter of the work area, the Contractor must stop work. The Contractor shall perform all necessary corrective actions to eliminate visible dust before resuming work. Engineer may visually monitor for fugitive dust and collect air samples for silica at any time.

1.02 DEFINITIONS

A. Definitions relevant to silica:

1. Action Level (AL): A concentration of airborne respirable silica of 25 micrograms per cubic meter (µg/m3), calculated as an 8-hour time-weighted average (TWA8).

2. Competent person: An individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in the Contractor’s written Silica Exposure Control Plan.

3. Permissible Exposure Limit (PEL): A concentration of airborne respirable silica of 50 µg/m3, calculated as an 8-hour time-weighted average (TWA8).

4. Regulated area: An area, demarcated by the Contractor, where exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the PEL or AL.

5. WAC Silica Table 1: WAC 296-840, Safety Standards for Respirable Crystalline Silica, Table 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica.

1.03 GOVERNING CODES, STANDARDS, AND REFERENCES

A. Washington State Department of Labor and Industries

1. WAC 296-840 – Safety Standards for Respirable Crystalline Silica

2. WAC 296-62-136 – Ventilation
3. WAC 296-901 – Global Harmonized System for Hazard Communication

B. Puget Sound Clean Air Agency
1. Regulation I, Article 9, Section 9.15 – Fugitive Dust Control Measures

C. S. Occupational Safety and Health Administration
1. 29 CFR 1926.1153 – Respirable Crystalline Silica
2. 29 CFR 1926.57 – Ventilation

D. Associated General Contractors of Washington Education Foundation
1. Guide to Handling Fugitive Dust from Construction Projects, Seattle, Washington, 1997

1.04 SCOPE OF WORK

A. Fugitive Dust: All Construction work will potentially generate fugitive dust. It is the responsibility of the Contractor to control the release of fugitive dust by using a combination of reasonable precautions and best work practices.

B. Silica: Construction work that requires control of silica shall include but not be limited to the activities listed in WAC 296-840, Safety Standards for Respirable Crystalline Silica, Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica.

C. Work activities shall include the following, as applicable:
1. Provision of site security to assure that no member of the public is able to gain access to the construction work area at any time. The Contractor shall maintain access and egress routes at all times.
2. In accordance with WAC 296-840, the Contractor is responsible for determining if the activities being performed may reasonably be expected to release respirable silica at or above the PEL and AL. The Contractor shall use, but not be limited to, the following criteria to determine if the work being performed may reach or exceed the PEL or AL:
a. Determine if the activity is listed in WAC 296-840, Safety Standards for Respirable Silica, Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica.
b. Type of work being performed. It is estimated that the work being performed resembles “dowel drilling rigs for concrete”.
c. Duration of work.
d. Work practices and engineering controls being used.
e. Previous air monitoring data from within the last 12 months on projects that were “essentially identical”.
f. Standard or site-specific written operating procedures.
g. Citation history regarding silica.
3. In the case of work that may generate silica dust at or above the PEL or AL, or that is listed in WAC Silica Table 1, the Contractor shall designate a Competent Person who shall:
a. Establish a regulated area of at least 10 feet around each coring site.

b. Provide personal protective equipment and engineering controls as required by WAC 296-840.

c. Ensure that exposure controls are being put in place and evaluated for effectiveness.

4. Provision of best work practices to prevent the release of fugitive and silica dust outside of the work area, as described in the execution portion of this section, Part 3.

5. Provisions for worker and equipment decontamination. Worker decontamination and equipment areas shall be cleaned daily or as required more frequently to prevent fugitive dust emissions.

6. Protection of security, life safety, and energy management systems, including associated wiring, which shall remain operational throughout the work activities.

7. Decontamination of work area(s). Concrete dust shall be cleaned from the work area using wet methods and HEPA vacuuming equipment at the completion of demolition activities, before barriers are removed.

8. Water used for dust suppression or decontamination (provided it does not contain additional chemical contaminants) shall be controlled and disposed of as follows:

a. Slurry and residual dust shall be vacuumed during dust-generating operations.

b. Slurry and residual dust shall not remain on permanent concrete or asphalt pavement overnight.

c. Slurry and residual dust shall not drain to Storm Drain System (SDS), Industrial Waste System (IWS), or any other natural or constructed drainage conveyance.

d. Collected slurry residual dust and debris are the responsibility of the Contractor and shall be disposed of off-site in a manner that does not violate groundwater or surface water quality standards.

1.05 PERSONAL PROTECTION

A. Respiratory Protection

1. Workers shall be provided, at a minimum, with personally issued respirators equipped with high efficiency particulate air (HEPA) filters approved by NIOSH (99.97% efficient) that meet the assigned protection factor (APF) of 10. Sufficient filters shall be provided for replacement as required by the workers or applicable regulations. Disposable respirators shall not be used.

2. The Contractor shall comply with OSHA 29 CFR Part 1910.134 (Respiratory Protection), WAC 296-841-200 (Evaluate and control employee exposures to Airborne Contaminants), WAC 296-842 (Respirators), and ANSI/AIHA/ASSE Z88 (Respirator Package).

3. The Contractor shall maintain daily inspection(s) of all respirators to verify cleanliness and to replace damaged, worn or missing parts.

4. Where respirators are used (in most cases a half-face respirator equipped with HEPA filters), a complete Respirator Program must be put in place in accordance with WAC 296-842. Such a program includes proper selection, fit-testing, cleaning and maintenance, supervision, training, and a written procedure.

B. Protective Clothing:

1. Workers shall be provided with sufficient sets of protective full-body clothing to be worn in the regulated work area whenever a potential exposure to respirable crystalline silica

concentrations above the PEL or AL exists. Such clothing shall include, but not be limited to, coveralls and eye protection.

2. Protective clothing shall not be worn outside the work area. Non-disposable-type protective clothing and footwear shall be left in the work area.

3. Eye protection shall be provided and worn as required by applicable safety regulations. Equipment shall conform to ANSI Z87.1-2015.

4. Head Protection: Hard hats or other head protection shall be provided as required by applicable safety regulations. Hard hats shall conform to ANSI Z89.1-2014, Type I or Type II.

5. Foot Protection: Nonskid footwear shall be provided to all workers. Footwear shall conform to ANSI F2412/2413-05.

6. Workers shall not eat, drink, smoke, or chew gum or tobacco in or near the respirable silica work areas.

1.06 SUBMITTALS

A. The Contractor shall provide complete submittals in accordance with Section 01 33 00 - Submittals and as specified below.

B. Preconstruction Submittals: Prior to conducting any work which is listed in WAC Silica Table 1 or may result in any exposure to silica above the PEL or AL, provide a site-specific Silica Exposure Control Plan which demonstrates the methods by which this work will be performed. At a minimum, the Silica Exposure Control Plan shall include:

1. A description of the tasks in the workplace that involve exposure to respirable crystalline silica.

2. A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to respirable crystalline silica for each task.

3. A description of the housekeeping measures used to limit employee exposure to respirable crystalline silica.

4. A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica and their level of exposure, including exposures generated by other employers or sole proprietors.

PART 2 MATERIALS AND EQUIPMENT

2.01 EQUIPMENT

A. Provide suitable tools for dust collection and water-jet dust suppression systems.

B. Provide sufficient number of HEPA-filtered vacuum cleaners to clean-up visible dust residues.

C. Air filtration devices shall utilize high efficiency particulate absolute (HEPA) filtration systems bearing a UL 586 label indicating its ability to perform under specified conditions. Provide filters marked with the name of the manufacturer, serial number, airflow ratting, efficiency and resistance, and the direction of the test airflow. Units shall have two stages of pre-filtering, as follows:

1. The first stage pre-filter shall be a low efficiency type for particle sizes 100 micrometers and larger.

2. The second stage pre-filter shall be a medium efficiency type effective for particle sizes down to 5 micrometers.

3. Pre-filters shall be installed either on or in the intake grid to the exhaust unit and shall be held in place with special housings or clamps provided by the manufacturer.

D. Air filtration devices shall also include:

1. An elapsed time meter showing the total accumulated hours of operation.
2. An electrical interlock preventing operation of the unit without a HEPA filter.
3. An automatic shutdown system to stop the fan in case of a rupture in the HEPA filter or a blocked air discharge.
4. Warning lights to indicate normal operation (green); moderately high pressure drop across the filters, such as due to filter overloading (yellow); and too high of a pressure drop due to an overloaded or ruptured HEPA filter or obstructed discharge (red).
5. An audible alarm if the unit shuts down due to operation of the safety systems.
6. Electrical components approved by the National Electrical Manufacturers Association (NEMA) and the Underwriter's Laboratories (UL). Each unit shall be equipped with overload protection sized for the equipment. The motor, fan, fan housing, and cabinet shall be properly grounded.

PART 3 EXECUTION

3.01 CONTROL METHODS

A. Options for the control of fugitive and silica concentrations are given in the following paragraphs. The specific method(s) used shall be detailed in the submittals and approved by the Engineer.

B. Wet Method

1. Use best management practices for the control of fugitive dust. This may include but is not limited to the following:
   a. The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds.
2. For activities that may generate airborne silica or fugitive dust, use “wet” systems that eliminate or reduce dust generated and tools that include dust control features where possible. Clean up sludge and/or waste immediately following its generation.

3.02 OVERSIGHT

A. Engineer will stop work if in the course of performing their monitoring duties, they observe an instance of substantial nonconformance with the Contract Documents and/or a situation presenting a nuisance to the public or a health hazard to workers, Port employees, or the public. Work shall not resume until corrective measures have been enforced. Instances of substantial non-conformance shall include but not be limited to the following:

1. Visible dust emissions outside of the work area barriers.
2. Loss of negative pressurization (where negative pressure is used).
3. Activities or misconduct affecting worker or building occupant safety.
4. Breaches of containment that could substantially damage building life safety systems.

B. If poor work practices are observed, Engineer will direct the Contractor to make the necessary corrections. If appropriate corrections are not made, or if an immediate threat that silica or

fugitive dust could be released outside the work area exists, work shall be stopped. The decision to stop work shall be made by the Engineer.

C. The Consultant's role in advising the Port on environmental health matters does not relieve the Contractor's obligation to comply with all applicable health and safety regulations promulgated by the federal, state, or local governments. Air monitoring results generated by the Consultant shall not be used by the Contractor to represent compliance with regulatory agency requirements for monitoring of workers exposure to airborne silica, nor shall any other activity on the part of the Consultant represent the Contractor's compliance with applicable health and safety regulations.

3.03 WORK AREA ISOLATION AND CLEANUP

A. The Contractor shall continuously endeavor to eliminate the release of fugitive dust and silica into adjacent building spaces.

B. The work areas will be considered clean when all visible dust and debris has been removed.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

A. Miscellaneous metal items not specified elsewhere are included in this section.

B. Metal strut framing.

C. All metal fabrications are to be steel, unless noted otherwise on the Drawings.

D. Furnish all materials, labor, and equipment for fabricating and/or repairing, galvanizing, painting, and erecting metal fabrications, in accordance with the Drawings. Anchorage of items is included in this section.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals

B. Section 33 90 90 – Subslab Depressurization System Piping

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise indicated, the most recent edition of the publication, including any revisions, shall be used.

C. American Institute of Steel Construction (AISC)

1. AISC - Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings.

2. AISC - Code of Standard Practice for Steel Buildings and Bridges.

D. American Society for Testing and Materials (ASTM)

1. ASTM A 36 - Standard Specification for Carbon Structural Steel.

2. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

3. ASTM A 153/A 153M – Standard Specification for Zinc Coating (hot-dip) on Iron and Steel Hardware

4. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs.

5. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.

6. ASTM A 575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades

7. ASTM A 576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

8. ASTM A 635 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for

9. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

10. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

11. ASTM A 1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability,

and Ultra-High Strength

12. ASTM F 436 - Standard Specification for Hardened Steel Washers.

E. Washington State Department of Transportation (WSDOT)

1. Standard Specifications for Road, Bridge and Municipal Construction, M 41 10.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures:

1. Catalogue cuts for the intended metal strut and fittings.

2. Manufacturer’s information including installation and inspection instructions for post installed anchors.

B. Do not start installation until the relevant submittals have been reviewed by the Engineer.

1.05 QUALITY ASSURANCE

A. Conform to manufacturers' specifications, directions, and recommendations for best results in the use of each of their products for each condition. If results are at variance with these specifications, report the discrepancy to the Engineer for decision.

B. Qualification of Installer: The installer shall be experienced in the fabrication and installation of metal strut assemblies, including cutting, adjusting, connecting.

1.06 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials before, during, and after fabrication and installation and protect the materials and installed work of other trades.

B. Storage: Store in a manner to prevent fouling with dirt, grease, and other damage.

C. Replacements: Repair or replace damaged work, if any, as necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. Unless otherwise noted or specified, all products shall be new, free from oxidation or corrosion, and the "best" quality for the intended use.

2.02 BOLTS AND NUTS

A. Bolts, nuts, and washers: ASTM A 307, ASTM A 563, and ASTM A 436 except as specifically indicated on the Drawings.

2.03 METAL STRUT SYSTEMS

A. The design presented is based on products manufactured by Unistrut. Any substitutions of product or manufacturer must be approved in writing by engineer of record. Alternative brands are subject to engineer’s approval.

B. All strut system components must be supplied by a single manufacturer.

C. Materials

1. All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications: A 1011 SS GR 33, A 653 GR 33.

2. All fittings shall be fabricated from steel conforming to one of the following ASTM specifications: A 575, A 576, A 36 or A 635.

D. Finish: hot-dipped galvanized (HDG) zinc coated after all manufacturing operations are complete. Coating shall conform to ASTM A 123 or A 153 as appropriate.

E. All material is to be delivered to the work site in original factory packaging to avoid damage to the finish.

F. Upon delivery to the work site, all components shall be protected from the elements by a shelter or other covering.

G. Installation: anchor material firmly in place. Tighten all connections to their recommended torques.

2.04 POST INSTALLED CONCRETE ANCHORS

A. All post installed concrete anchors for exterior applications shall be adhesive type. All post installed concrete anchors for interior applications shall be expansion type. Post installed anchors shall be installed a minimum of 12 bolt diameters from the nearest panel edge.

B. Adhesive anchors in concrete: Adhesive anchors shall be tested and approved for use in cracked or uncracked concrete and for prolonged tension loads. Acceptable products are HIT-HY200 by Hilti, SET-XP by Simpson Strongtie Inc., or Engineer-approved equivalent. Use 10 diameters embedment depth unless noted otherwise on the drawings.

C. Adhesive anchors shall be installed in holes drilled with a rotary impact type drill.

D. Expansion anchors in concrete: Expansion anchors shall be tested and approved for use in cracked or uncracked concrete and for prolonged tension loads. Acceptable products are KWIK BOLT-TZ2 by Hilti, Wedge-All by Simpson Strongtie, or Engineer-approved equivalent.

E. All post installed concrete anchor bolts for exterior applications shall be stainless steel type 304 unless noted otherwise. Post installed concrete anchors for interior use shall be galvanized.

F. For stainless steel fasteners use anti-seize thread compound: JET-LUBE “NIKAL”, JOHN CRANE “THRED GARD NICKEL”, NEVER-SEEZ “PURE NICKEL SPECIAL” PERMATEX “NICKEL ANTI-SEIZE”, OR APPROVED EQUAL.

G. Locate rebar by non-destructive means before drilling holes for concrete anchor installation. Do not cut rebar when drilling holes for post installed anchors. Notify Engineer of conflicts.

H. Follow all manufacturer’s installation and inspection procedures including installer certification where required.

2.05 MASONRY ANCHORS

A. Masonry anchors shall be galvanized.

B. Masonry anchors in solid grouted masonry shall be KWIK BOLT-3 by Hilti, Dynabolt Sleeve Anchors by ITW Red Head, or Engineer-approved equivalent.

C. Masonry anchors in hollow masonry units shall be HLC sleeve anchor by Hilti, Dynabolt Sleeve Anchors by ITW Red Head, or Engineer-approved equivalent.

D. Follow all manufacturer’s installation and inspection procedures including spacing, edge distance, and installer certification where required.

2.06 OTHER MATERIALS

A. All other materials not specifically described but required for a complete and proper installation, shall be new, free from rust, best quality of their respective kinds, and subject to the approval of the Engineer.

B. Non-shrink grout for base plates: Five Star Grout, CG-86 non-shrink grout by W.R. Meadows, or approved equivalent.

2.07 FINISHES

A. All steel fabrications that are not galvanized shall be coated with a coating system including a zinc rich primer and urethane top coat. Color shall be per owner direction.

B. All steel bolts, nuts, and washers shall be hot dip galvanized per ASTM A153.

PART 3 - EXECUTION

3.01 PREPARATORY EXAMINATION

A. Prior to all work of this section, inspect the installed work of all other trades affecting this work and verify that all such work is complete to the point where this installation may properly commence.

3.02 PREPARATION

A. Protection: Work shall comply with all municipal, state, and federal regulations regarding safety, including all applicable portions of OSHA and State safety standards for construction work.

3.03 FABRICATION

A. Fabricate all metal fabrications in accordance with the approved Shop Drawings and reference standards.

B. Insofar as practicable, shop prefabricate all items complete and ready for installation.

C. All joints shall be tightly fitting, securely fastened, square, plumb, straight, and true.

D. Drill or punch all holes required for the attachment of work of other trades and for bolted connections. Burned holes are not acceptable.

3.04 FIELD QUALITY CONTROL

A. The Contractor shall provide access to the Engineer at all times while the work is being performed.

3.05 SCHEDULING

A. Coordinate the work with the Engineer. Provide the Engineer with a proposed work schedule and coordinate the work to meet the contract delivery schedule.

3.06 REPAIR

A. Repair all galvanizing removed or damaged during construction per ASTM A780.

B. Repair coated or galvanized surfaces as directed by the Engineer, or replace damaged items at no additional cost to Owner.

3.07 INSTALLATION

A. Erect and install all metal fabrications in strict accordance with the design drawings, shop drawings, and AISC reference standards.

B. Repair or replace damaged or defective factory-applied finishes as directed by the Engineer.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The approximate extent and location of “Firestopping” Work is shown in the Drawings.

B. Firestopping of all penetrations through fire barriers, including voids around pipes, ducts, conduit, and other openings, as required by authorities having jurisdiction.

1.02 GOVERNING CODES, STANDARDS, AND REFERENCES

A. ANSI/UL 1479 "Fire Tests of Through-Penetration Firestops" firestop testing

B. ANSI/UL 1479 firestop testing

C. ANSI/UL 1479 fire resistance and hose stream tests

D. ASTM E84 flame spread

E. ASTM E84 smoke development

F. ASTM E136 combustibility

G. ASTM E814 "Standard Method of Fire Tests of Through-Penetration Fire Stops" firestop testing

H. ASTM E814 firestop testing

I. ASTM E814 fire resistance and hose stream tests

1.03 SUBMITTALS

A. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Include firestopping composition, performance characteristics, and installation procedures.

2. Shop Drawings: Shop drawings showing material installation details including reinforcement, anchorage, and fastenings.

3. Certificates of Compliance: Manufacturer's certificates of compliance that the materials meet the requirements specified.

1.04 QUALITY ASSURANCE

A. Firestops shall have been tested in accordance with ASTM E814 "Standard Method of Fire Tests of Through-Penetration Fire Stops" or ANSI/UL 1479 "Fire Tests of Through-Penetration Firestops". The firestopping material shall remain securely installed and capable of maintaining its integrity when subjected to such tests.

B. For mechanical and electrical penetrations which have characteristics (e.g., pipe material and diameter, pipe insulation type and thickness, type of wall that is penetrated) that have not been tested in accordance with ASTM E814 or ANSI/UL 1479 by any firestop manufacturer, provide a written certification stating that the manufacturer's firestop material will meet the requirements for successfully passing the tests in ASTM E814 or ANSI/UL 1479. The certification shall also contain firestop installation procedures (e.g., sleeve material and size, annular space requirements, quantity of firestop material required). This certification shall be submitted to the local fire authority, with approval of the firestop by that local authority required before ordering.

1.05 DELIVERY AND STORAGE

A. Deliver materials to the project site in the original unopened containers or packages bearing the manufacturers' names, brand designations, and product descriptions. Store materials under cover and protect from damage. Do not use damaged materials.

PART 2 PRODUCTS

2.01 FIRESTOPPING MATERIALS

A. Firestopping material shall be asbestos-free and capable of maintaining an effective barrier against flame and gases in compliance with the following requirements:

1. Flame Spread: 25 or less, ASTM E84.
2. Smoke Development: 50 or less, ASTM E84.
3. Fire Resistance and Hose Stream Tests: Firestopping materials shall be rated "F" and "T" in accordance with ASTM E814 or ANSI/UL 1479. Rating periods shall match hour rating of assembly in which firestop material is installed.
4. Combustibility: Non-combustible, ASTM E136.

2.02 SMOKESTOPPING MATERIAL

A. Smokestopping material shall be mold resistant acrylic sealant capable of maintaining an effective barrier against smoke in compliance with the following requirements:

1. Flame Spread: 25 or less, ASTM E84.
2. Smoke Development: 25 or less, ASTM E84.

PART 3 EXECUTION

3.01 INSTALLATION

A. Firestopping

1. Locations: Provide firestopping material for non-insulated pipe penetrations of time-rated fire walls.
2. Surface Preparation: Surfaces to be in contact with firestopping materials shall be free of dirt, grease, oil, loose material, rust, or other substances that may affect proper fitting or the required fire resistance.
3. Install firestopping materials in accordance with the manufacturer's instructions.
4. Examine firestopped areas to ensure proper installation. Seal and correct deficiencies prior to concealing or enclosing the areas.

B. Smokestopping

1. Locations: Provide smokestopping material for non-insulated pipe penetrations of smoke curtain walls.
2. Surface Preparation: Surfaces to be in contact with smokestopping material shall be free of dirt, grease, oil, loose material, rust, or other substances that may affect proper adherence and sealing of the penetration.
3. Install smokestopping materials in accordance with the manufacturer's instructions.
4. Examine smokestopped areas to ensure proper installation. Seal and correct deficiencies.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Pipe all sumps to the external building walls as indicated in the drawings.

B. Mount piping to the roof structure and walls.

C. Install sump riser valves, instrumentation, and protection.

D. Coordinate work schedule with Engineer

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals

B. Section 02 41 13 – Selective Demolition

C. Section 05 50 00 – Metal Fabrications

1.03 GOVERNING CODES, STANDARDS, AND REFERENCES

A. ASTM D1785-15 (Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120))

B. ASTM D2466-15 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

C. ASTM D4396-15 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Nonpressure Applications

D. ASTM F1417-11A(2019)e Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

E. 2021 International Mechanical Code

F. ANSI/MSS SP-58-2018 Pipe Hangers And Supports - Materials, Design, Manufacture, Selection, Application, And Installation

1.04 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.

B. Submit a piping plan, including:

1. Pipe support plan for hanging pipes from the roof structure and mounting pipe to walls to maintain minimum required pipe grades

2. Proposed pipe field quality control test procedure

PART 2 PRODUCTS

2.01 GENERAL

A. Materials shall be of the quality herein specified, new, free from defects, of the best commercial grade and approved by a nationally recognized testing laboratory for the purpose used, if such approval is granted to the equipment in question. Each type of material shall be of the same make and quality throughout the Project.

2.02 RISER PIPE AND FITTINGS

A. Pipe: 3- and 4-inch Schedule 40 PVC pressure rated water pipe (ASTM D1785)

B. Fittings: Schedule 40 PVC pressure rated fittings (ASTM D2466)

C. Strut Channel and Pipe Clamps: Thomas & Betts Kindorf Superstrut®, or approved equivalent

D. Butterfly Valve: Flanged 3-inch PVC wafer-type valve with EPDM seat, polypropylene disc, and stainless steel stem, or approved equivalent

E. Vacuum Gauge: Dwyer Magnehelic Model 2030 differential pressure gauge

2.03 LATERAL PIPE AND FITTINGS

A. Pipe and Fittings: 3- and 4-inch Schedule 40 PVC drain/sewer pipe (ASTM D4396).

B. Wall Support:

1. Strut Channel and Pipe Clamps: Thomas & Betts Kindorf Superstrut®, or approved equivalent

C. Roof Structure Support:

1. Purlin Clamps: PHD Manufacturing Model No. 290, or approved equivalent.

2. Ceiling Hangers: NFPA swivel ring hanger, PHD Manufacturing Model No. 145, or approved equivalent.

3. Pipe Clamps: Kindorf C 105 4EG Unit No. 7TAA005270R0017, or approved equivalent.

D. PVC Hose: 3- and 4-inch Kanaflex Corporation suction and delivery hose, or approved equivalent.

2.04 RISER PROTECTION

A. Riser Protectors:

1. For sump location W1, 3 foot tall heavy duty wall-mounted pipe and downspout protector, Omega Industrial Products OM3310, or approved equivalent.

2. For sump location W3, 3 foot tall wall-mounted pipe and downspout protector, Omega Industrial Products OM3306, or approved equivalent.

3. For sump locations W2 and E2, 3 foot tall floor-mounted pipe and downspout or corner protector, Omega Industrial Products heavy duty corner guard, or approved equivalent.

B. Riser protectors shall be high visibility traffic safety yellow.

PART 3 EXECUTION

3.01 GENERAL

A. Sump installation was performed by others. Sumps are temporarily completed with a 4-inch Schedule 40 PVC slip coupling and a 4-inch ABS riser and slip cap.

B. Sumps shall remain capped until pipe installation is complete. Piping shall not be connected to sumps until all other piping has been connected to prevent sub-slab vapors from entering the building.

C. All PVC connections shall be solvent welded.

D. All piping will be field fitted to maintain required grades and avoid obstructions.

3.02 RISER PIPING

A. Vertical pipes shall be secured with strut channel and pipe clamps a minimum of every 10 feet to comply with the International Mechanical Code and the Uniform Plumbing Code.

B. At Sump W2, the vertical riser pipe shall be secured to the paint booth without causing damage to the function of the booth.

C. PVC pipe shall be protected from damage during tapping.

3.03 RISER PROTECTION

A. For sump locations W1, W2, W3, and E2, install riser protection at location approved by Engineer

B. Select and install anchors in accordance with manufacturer’s recommendations.

3.04 LATERAL PIPING

A. Laterals (horizontal pipes) conveying vapors from 1 sump shall be 3-inch diameter and laterals conveying vapors from 2 or more sumps shall be 4-inch diameter.

B. Laterals shall be sloped to drain water to sump locations. Laterals shall be sloped a minimum of 2% when the water will drain against the direction of air flow and a minimum of 1% when the water will drain in the same direction as the air flow.

C. PVC hose can be used at pipe grade transitions.

D. All lateral pipes shall be secured a minimum of every 6 feet to comply with the International Mechanical Code, ANSI/MSS SP-58-2018 and manufacturer’s recommendations.

E. All laterals should be placed at heights to prevent damage from trucks, trailers, and associated maintenance activities performed by tenant.

F. Lateral pipes shall be secured to walls using strut channel and pipe clamps or suspended from the rafters using purlin clamps and ceiling hangers. Purlin clamps shall be placed o the bottom flange and be tightened per manufacturer’s recommendations to avoid structural damage. At the beginning of the project, Contractor shall demonstrate to Engineer that manufacturer’s tightening recommendations are not causing damage to the flange.

3.05 FIELD QUALITY CONTROL TESTING

A. Contractor shall perform low pressure air testing of all PVC pipe. Contractor shall submit recommended quality control test procedures to Engineer for review and approval.

B. Any leaks shall be repaired and pressure tests repeated until a successful test has been performed

C. Records of all pressure testing shall be submitted to the Engineer prior to Substantial Completion.

3.06 CONSTRUCTION REQUIREMENTS

A. Temporary Piping/Plugs and Connections: The Contractor may install temporary piping plugs, caps etc. to accommodate the Work. At the completion of the Work, temporary piping features shall all be removed to conform and comply with the Drawings.

END OF SECTION

Appendix D

Mechanical Permit

CITY OF TACOMA

Planning and Development Services

(253) 591-5030

747 Market St. 3rd Floor
Tacoma, WA 98402
Inspections (253) 573-2587

Commercial Mechanical Permit #MECHC21-0055

Issued Date: 04/02/2021 **Expiration Date:** 09/29/2021

SITE INFORMATION

Address: 1679 LINCOLN AVE **Parcel:** 8950000221

PERMIT ISSUED TO	LICENSED CONTRACTOR	PROPERTY OWNER
PORT OF TACOMA PO BOX 1837 TACOMA, WA 98401	NO CONTRACTOR ADDRESS FOUND	PORT OF TACOMA PO BOX 1837 TACOMA, WA 98401

PERMIT INFORMATION

Project Description: Connection of 5 subslab sumps via Schedule 40 PVC piping to an exterior wall-mounted regenerative blower to depressurize beneath the concrete building slab and mitigate the potential for vapor intrusion. The blower will be a 1.5 to 2 HP regenerative blower (Ametek Rotron 505, or equivalent) capable of extracting 95 scfm at 23 inches water column at the blower. The blower will be exterior wall-mounted on a unistrut platform with a 250 pound weight capacity in Commercial building at the Port of Tacoma.

Permit Fee: $617.27

Project Coordinator: N/A

Related Site Record: N/A

Related Land Use Record: N/A

CONDITIONS OF APPROVAL

Effective immediately until further notice, Governor Inslee's COVID-19 proclamations affect construction activities, and all applicants must review and adhere to the Proclamation 20-25, which is attached to this permit document.

To schedule or manage inspections by phone (253) 573-2587 or online at aca-prod.accela.com/TACOMA/

PRINTED PERMIT AND APPROVED PLANS MUST BE KEPT ON SITE DURING CONSTRUCTION

All plumbing, heating, and electrical work will be performed by either the home owner or by a contractor licensed to do the same. Separate permits are required for other work, including but not limited to, sanitary and storm sewer, sidewalk, curb and gutter, driveways, parking lot paving, street improvements, fire protection, and signs. Plumbing and mechanical permits can be incorporated into some permits.

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CITY OF TACOMA

Planning and Development Services

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Tacoma, WA 98402
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Commercial Mechanical Permit #MECHC21-0055

Issued Date: 04/02/2021 **Expiration Date:** 09/29/2021

VALUATIONS

Estimated Valuation:

$20,000

PROJECT DETAILS

Company Job ID Number:

101486.02

Type of Work:

Remodel

CITY OF TACOMA

Planning and Development Services

(253) 591-5030

747 Market St. 3rd Floor
Tacoma, WA 98402
Inspections (253) 573-2587

Commercial Mechanical Permit #MECHC21-0055

Issued Date: 04/02/2021 **Expiration Date:** 09/29/2021

APPROVED REVIEWERS

Category	Approved By	Email	Phone Number
Flood Hazard Review	Joel Rasmussen	jrasmussen@cityoftacoma.org	253-363-2241
Flood Hazard Review	Quyen Thai	qthai@cityoftacoma.org	253-254-8796
Mechanical Review	Joel Rasmussen	jrasmussen@cityoftacoma.org	253-363-2241

GENERAL:

PERMISSION IS HEREBY GIVEN TO DO THE DESCRIBED WORK, AS NOTED ON THE REVERSE SIDE, ACCORDING TO THE CONDITIONS HEREON AND ACCORDING TO THE APPROVED PLANS AND SPECIFICATIONS PERTAINING THERETO, SUBJECT TO COMPLIANCE WITH THE ORDINANCES OF THE CITY OF TACOMA.,

YOUR ATTENTION IS CALLED TO THE FACT THAT IT SHALL BE THE DUTY OF THE PERMITEE (General Contractor) to assure that all necessary inspections are called for and approved by the City Inspectors.

YOUR ATTENTION IS CALLED to the fact that in addition to the called for inspections specified by the applicable codes, the Building Official may make or require any other inspections of any construction work necessary to ascertain compliance with the provisions of City Codes and other laws which are enforced by the City of Tacoma.

YOUR ATTENTION IS CALLED to the fact that in addition to regularly scheduled inspections during construction there shall be a final inspection and approval on all buildings or structures when completed and ready for occupancy. AU required off-site improvements (curbs, sidewalks, storm sewers, etc.) must be completed at time a final inspection and prior to occupancy of building. Construction of off-site improvements requires scheduled inspections during construction in addition to the final inspection.

SPECIAL PERMITS

The holder of Special Permits agrees to the following stipulations:

1. To complete the work encompassed by the Special Permit in accordance with the current edition of the WSDOTIAFWA Standard Specifications as amended by the City of Tacoma General Special Provisions and in accordance with any special provisions or conditions set forth before final acceptance as required by the provisions of the Street Obstruction Bond.
2. To indemnify and hold the City of Tacoma harmless from any and all damages done to any person or property which may arise from the construction encompassed by the Special Permit.
3. To submit for review and approval to the Traffic Engineer a traffic control plan developed in accordance with the "Manual on Uniform Traffic Control Devices" {MUTCD). The traffic control plan shall show pedestrian access through the work zone.
4. To protect the public by placing adequate barricades, signs, cones, lights or other traffic control devices in accordance with the approved traffic control plan. It is understood that traffic lane closures and or sidewalk closures are limited to that which is specifically permitted herein. No other closures will be allowed without prior written approval of the City Engineer.
5. To provide and maintain protected pedestrian and ADA compliant disability access on walkways at all times.
6. The City of Tacoma does not guarantee sewer location or depth information. It shall be the permittee's responsibility to verify sewer and sewer stub locations and depths.
7. To restore Rights-of-Way in accordance with the City's Rights-of-Way Restoration Policy and City of Tacoma Standard Plans
8. Trench backfill within all improved streets or streets proposed for improvement shall be full depth bank run gravel or approved equal by the Construction Division.
9. All cuts in arterial streets shall be patched and maintained with Hot Mix Asphalt until permanent repairs are completed. All cuts in residential streets or alleys shall be patched and maintained with cold mix asphalt until permanent repairs are made. Permanent repairs shall be per current City of Tacoma Standard Plans. Streets and alleys shall be permanently repaired within 30 days.

1O. To be responsible for the preservation of any utilities within the construction area.

CALL TOLL FREE BEFORE YOU DIG -1-800-424-5555 (Utilities Underground Location Center)

11. 24 Hour notice is required prior to any inspection. Construction Division 253-591-5760, Traffic SignaVStreetlight 253-591-5287.
12. The Special Permit Expiration date is 30 days from the issue date unless otherwise noted.

Reinspections for Building, Plumbing, and Mechanical Permits

Reinspections are considered additional effort by the City's Planning and Development Services staff that have not been included in the original permit cost. City inspectors have limited time at each site and therefore, must have all necessary information as well as clear access to the completed work at the time of their arrival. **The approved plans and permit card must also be immediately available to the inspector upon his/her arrival.** Cancellation of inspections must occur by 6:00 AM on the day of the inspection. City inspectors may arrive at the site as early as 8:00 AM; therefore, it should be planned to have all work completed and ready for inspection by 8:00 AM on the day of the inspection.

Reinspection fees will be charged per authorized fee code Title 2.09 under the following circumstances:

1. Work for which the inspection has been scheduled is not completed when the inspector arrives on site.
2. Clear access to the inspection area has not been provided at the time of the inspector's arrival.

This policy applies to reinspections for building, plumbing and mechanical permits issued by the department of Planning and Development Services.

Appeal of a reinspection fee?

If you were issued a re-inspection fee that you believe was un-warranted, you may appeal the fee by submitting a written explanation of the circumstances. The appeal must be submitted to our office at: Planning & Development Services, 747 Market St Rm 345, Tacoma WA, 98402 or via e-mail at: pdsinspection@cityoftacoma.org

The appeal must include the following items:

1. Written explanation for appeal submitted in writing
2. Include owner/contractor name
3. Include contact phone and email address
4. Include Permit number and address

A Decision will be rendered within three (3) business days

JAY INSLEE
Governor

STATE OF WASHINGTON
Office of the Governor

MEMORANDUM

TO: Interested Stakeholders

FROM: Governor Jay Inslee

DATE: March 25, 2020

SUBJECT: Construction Guidance - Stay Home, Stay Healthy Proclamation (20-25)

In general, commercial and residential construction is not authorized under the Proclamation because construction is not considered to be an essential activity.

However, an exception to the order allows for construction in the following limited circumstances:

a) Construction related to essential activities as described in the order;
b) To further a public purpose related to a public entity or governmental function or facility, including but not limited to publicly financed low-income housing; or
c) To prevent spoliation and avoid damage or unsafe conditions, and address emergency repairs at both non-essential businesses and residential structures.

To that end, it is permissible for workers who are building, construction superintendents, tradesmen, or tradeswomen, or other trades including, but not limited to, plumbers, electricians, carpenters, laborers, sheet metal, iron workers, masonry, pipe trades, fabricators, heavy equipment and crane operators, finishers, exterminators, pesticide applicators, cleaning and janitorial staff for commercial and governmental properties, security staff, operating engineers, HVAC technicians, painting, moving and relocation services, forestry and arborists, and other service providers to provide services consistent with this guidance.

All construction activity must meet social distancing and appropriate health and worker protection measures before proceeding.

Appendix E

Example Inspection Log

SUBSLAB DEPRESSURIZATION SYSTEM INSPECTION FORM

Date and Time: _____

Location: _____

Inspector: _____

PART 1 - DOCUMENTATION OF CONDITION OF SYSTEM COMPONENTS

Table 1: Manometer/Pressure Gauge Readings

Location	Pressure (“ of WC)
Sump-xxxx	
Sump-xxxx	
Sump-xxxx	
Sump-xxxx	
Sump-xxxx	

Table 2: System Components Check

Exterior Pipe Free of Cracks	Yes	No	N/A
Blower Running Appropriately (no excess vibration or noise)	Yes	No	N/A
Manometer in Good Condition	Yes	No	N/A
Significant Floor Cracks or Penetrations Observed	Yes	No	N/A
Subslab Monitoring Ports Cap Secured	Yes	No	N/A
Caulking on Floor Penetrations in Good Condition	Yes	No	N/A

PART 2 - DOCUMENTATION OF STRUCTURAL CHANGES

Table 3: Structural Components Check

Any Significant Changes to the Building's HVAC System?	Yes	No	N/A
Any new buildings near the mitigated building close enough that stack gasses could contaminate indoor air?	Yes	No	N/A
Manometer in Good Condition	Yes	No	N/A
Any new vents or openings in the roof/walls less than 10' away from the stack?	Yes	No	N/A
Have there been any significant earthquake events?	Yes	No	N/A

PART 3 - OTHER OBSERVATIONS/COMMENTS

Comments:

_____

_____

_____

_____