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PROPERTY-SPECIFIC VAPOR INTRUSION CONTROL SYSTEM REMEDIAL DESIGN
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

by Haley & Aldrich, Inc.
San Jose, California

File No. 36067-070
April 2016

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25 April 2016
File No. 36067-070

United States Environmental Protection Agency, Region 9
75 Hawthorne Street, SFD-7-3
San Francisco, California 94105

Attention: Ms. Alana Lee
Project Manager, Superfund Division

Subject: Property-specific Vapor Intrusion Control System Remedial Design
277 Fairchild Drive
Mountain View, California

Dear Ms. Lee:

Haley & Aldrich, Inc. prepared this Property-specific Vapor Intrusion Control System Remedial Design (Remedial Design) for the buildings to be constructed on the property located at 277 Fairchild Drive, Mountain View, California. The Remedial Design was prepared in accordance with the 16 September 2011 United States Environmental Protection Agency Statement of Work, Section 2.4.1.

Please contact the undersigned with questions or comments you may have regarding this document.

Sincerely yours,
HALEY & ALDRICH, INC.

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Haley & Aldrich, Inc.; Attn: Mr. Elie Haddad
Raytheon Company; Attn: Mr. Greg Taylor
Schlumberger Technology Corporation; Attn: Mr. Virgilio Cocianni
Warmington Residential; Attn: Mr. Don Babbitt

G:\36067_STC_MEW_VI\277 Fairchild Dr\Redevelopment\04-Engineering\06-Design Reports\2016-0425_HAI Design Report\2016_0425_HAI_277_Fairchild_Remedial_Design_Final_vF.docx

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1	Site Location
2	Location of 277 Fairchild Drive

List of Acronyms and Abbreviations

BAAQMD	Bay Area Air Quality Management District
City	City of Mountain View
COC	chemical of concern
EPA	United States Environmental Protection Agency
Haley & Aldrich	Haley & Aldrich, Inc.
ICIP	Institutional Controls Implementation Plan
inH_2O	inches of water column
MEW	Middlefield-Ellis-Whisman
OM&M	operations, maintenance, and monitoring
OM&M Plan	Property-specific Long-term Vapor Intrusion Operations, Maintenance, and Monitoring (OM&M) Plan
Property	277 Fairchild Drive, Mountain View, California
PVC	polyvinyl chloride
RAO	remedial action objective
Remedial Design	Property-specific Vapor Intrusion Control System Remedial Design
RGRP	Regional Groundwater Remediation Program
ROD	Record of Decision Amendment for the Vapor Intrusion Pathway
SCFM	standard cubic feet per minute
SIM	selective ion monitoring mode
SOW	EPA's Vapor Intrusion Statement of Work
SSD	sub-slab depressurization
TCE	trichloroethene
Trigger Levels	BAAQMD's Toxic Air Contaminant Trigger Levels
VI	vapor intrusion
VGAC	vapor-phase granular activated carbon
VOC	volatile organic compound
Warmington	Warmington Residential

1. Introduction

On behalf of the Regional Groundwater Remediation Program (RGRP), Haley & Aldrich, Inc., (Haley & Aldrich) prepared this Property-specific Vapor Intrusion (VI) Control System Remedial Design (Remedial Design) for the buildings to be constructed on the property located at 277 Fairchild Drive, (the Property), within the Middlefield-Ellis-Whisman (MEW) Superfund VI Study Area in Mountain View, California (Figure 1). This Remedial Design was prepared in accordance with the 16 September 2011 United States Environmental Protection Agency (EPA) Statement of Work (SOW), Section 2.4.1.

1.1 SITE BACKGROUND

The Property is located within the MEW VI Study Area as shown in Figure 2. The Property was formerly occupied by two single-family residences, two multi-family residences, and a small convenience store, each underlain by an earthen-floor crawlspace.

Warmington Residential (Warmington) purchased the Property on 18 September 2015. Warmington provided EPA and the RGRP with conceptual development plans that include four single homes, and four multi-unit structures. This vapor barrier and sub-slab depressurization (SSD) system design has been prepared to meet the requirements of the EPA's 16 August 2010 VI Record of Decision Amendment (ROD) and the SOW.

1.2 DESCRIPTION OF WORK

This Remedial Design provides plans and specifications for installing an active VI control system, which consists of a vapor barrier and an SSD system, in each of the proposed buildings. Vacuum applied to vent pipes and a gravel layer under the building slabs induces a negative pressure, and the soil vapor is preferentially collected in the vent pipes. The soil vapor is conveyed to treatment units to remove or reduce the MEW chemicals of concern (COCs)[1] concentrations prior to discharge to the atmosphere. A geomembrane vapor barrier will also be installed between the bottom of the slabs and the gravel layer. SSD systems are further described in the 2011 California Department of Toxic Substances Control's "Vapor Intrusion Mitigation Advisory."

[1] EPA's 16 August 2010 ROD Amendment identifies seven chemicals of concern for the MEW VI Study Area: PCE, TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethene, 1,1-dichloroethane, and vinyl chloride. The MEW VI Study area is the area where TCE concentrations in shallow groundwater are greater than 5 micrograms per liter (µg/L).

1.3 EPA STATEMENT OF WORK

Section 2.4.1 of the SOW specifies items to be included in the Remedial Design. These items and where they are addressed in this document are included in the table below.

TASK ITEM	LOCATION IN REPORT
(a) Description of the work to be performed.	Section 1.2
(b) Description and documentation of any interim vapor intrusion mitigation measures performed or in-place.	Not Applicable
(c) Description of access requirements for the work to be performed, existing access conditions, and expected additional tasks necessary and scheduled to obtain access.	Section 4.3
(d) Design basis, including the results of the pilot test and other specific data relied upon for the design.	Appendix A
(e) Design analysis and permitting plan necessary to satisfy permitting requirements.	Sections 2
(f) Building plan and detailed design plans, drawings, and specifications.	Appendix A and B
(g) Site preparation requirements.	Appendix A and B
(h) List of materials, equipment, and recommended vendors.	Section 3 and Appendix A and B
(i) Design criteria, including a detailed description of compliance with performance criteria and 2010 ROD Amendment.	Section 2.2
(j) Design drawings, including site and construction plans and drawings, utility lines, piping, and instrument drawings.	Appendix A
(k) Construction quality assurance/quality control plan.	Appendix C
(l) Contingency plan.	Section 5
(m) Proposed Property-specific Operations, Maintenance, and Monitoring (OM&M) Plan.	Section 4.2
(n) Building-specific or Property-specific Institutional Controls Implementation Plan.	Section 4.3
(o) Task list and schedule for implementation.	Section 6

2. Design Requirements

2.1 REGULATORY REQUIREMENTS

EPA is the lead agency for oversight of the implementation of vapor mitigation on the Property. The Remedial Design is prepared in accordance with the requirements of Section 2.4.1 of the SOW (EPA, 2011) and a 22 April 2015 EPA letter (EPA, 2015) and will be implemented upon EPA's approval. The Property is exempt from permits from agencies such as the City of Mountain View (City) and the Bay Area Air Quality Management District (BAAQMD) because it is in the Superfund program; however the SSD systems are designed to comply with the substantive requirements of the City and BAAQMD.

2.1.1 City of Mountain View

Warmington will provide the City this design as part of their construction submittal. The contractor will obtain necessary construction permits and schedule inspections, as needed.

2.1.2 Bay Area Air Quality Management District

The BAAQMD regulations applicable to the SSD systems are:

- Regulation 2, Rule 5 (New Source Review of Toxic Air Contaminants), which presents Toxic Air Contaminant Trigger Levels (Trigger Levels) for acute and chronic exposures; and
- Regulation 8, Rule 47 (Air Stripping and Soil Vapor Extraction Operations), which specifies that abatement devices shall reduce volatile organic compound (VOC) emissions by at least 90 percent by weight.

Haley & Aldrich will notify BAAQMD of the planned SSD system operation in the buildings 30 days prior to startup. In addition, and as described in Section 4, SSD system emission monitoring will be performed in accordance with the "Property-specific Long-term VI Operations, Maintenance, and Monitoring (OM&M) Plan" (OM&M Plan) that will be submitted to EPA 60 days after final construction of the vapor barrier and SSD system in all of the buildings.

2.2 DESIGN CRITERIA

The following design criteria were established for the SSD system to be installed under each building:

- The SSD system, in combination with the vapor barrier, will create a negative pressure differential across the slab of at least -0.02 inches of water column (inH_2O);
- Exhaust air will be treated to remove or reduce COC concentrations prior to discharge to the atmosphere;
- The SSD system will operate continuously with minor disruptions to replace certain system components when needed;
- The treatment units and discharge points will be located away from the new residences, secured, and be congruent with the visual appearance of the development,
- Open common areas within the development are not available for locating the treatment units,

- Noise from the treatment units should not disturb residents,
- Discharge points should be at least 10 feet horizontally away from windows, vents, or openings into occupied interior spaces,
- Electrical service will be provided from the main panels on the buildings,
- Utility trenches extending beneath the building slabs will include a 3-foot long plug or dam of low permeability material to prevent preferential pathways for soil gas vapors that may travel within trench backfill material.
- The SSD system will have minimal impact to occupants and visitors; and
- The SSD system is designed to comply with substantive local permitting agency requirements.

3. Remedial System Design

To mitigate potential VI, a vapor barrier and SSD system will be installed beneath each building as shown in the remedial system design drawings (Appendix A). A sub-slab vent pipe will be installed beneath each building (Lots 1, 2, 3, and 4; and Buildings C, D, E, and F). The vapor extraction blowers, vapor abatement units, and telemetry systems will be housed in satellite equipment enclosures located in landscaped areas along the eastern property boundary. Lots 1 and 2 will share an equipment enclosure, as will Lots 3 and 4. Buildings C, D, E, and F will each have a dedicated equipment enclosure. Treated soil vapor will be discharged to the atmosphere through two false light poles.

The SSD plan set in Appendix A contains:

- Title sheet and drawing list (Sheet G-100);
- General construction notes and specifications (Sheet G-101);
- Process and instrumentation diagram and process flow diagram for the SSD system (Sheets P-100, P-101, and P-102);
- General and specific layouts and profiles of the vent and conveyance piping and equipment enclosure locations (Sheets C-100 through C-106);
- Construction details for equipment enclosures and exhaust pipe details (Sheets C-107 and C-108);
- Construction details for trenches and system components (Sheets C-109 and C-110);
- Structural details for the discharge stacks (false light poles) (Sheet S-100); and
- Electrical design drawings (Sheets 1000, 1000-A, 1010, 1011, 1012, and 1020).

A summary of the SSD system components is provided below. Specifications for construction of the vapor barrier and SSD systems are included in Appendix B. The SSD system installations will be monitored in accordance with the Construction Quality Assurance Plan included in Appendix C.

3.1 VAPOR BARRIER

A vapor barrier will be installed to provide a physical barrier between the bottom of the slabs and the indoor air space in the buildings. The vapor barrier is comprised of a base layer (VI-20 geomembrane or equivalent), a 60-mil-thick continuous spray-applied liquid membrane (Liquid Boot® or equivalent), and a protection layer (Ultrashield G-1000 or equivalent). The base layer is made of an ethyl vinyl alcohol resin and provides low diffusion coefficients, and will be installed as described in Appendix A on Sheets C-109 and C-110 and in the specifications provided in Appendix B. Once the spray-applied liquid membrane has cured, a smoke test to detect leaks will be performed on the cured geomembrane as per the specifications provided in Appendix B.

3.2 SSD SYSTEM COMPONENTS

The SSD system for each of the buildings on the Property will include the following major components:

1. Sub-slab vapor vent piping consisting of a low-profile composite vent system (GeoVent™ or equivalent) surrounded with permeable subgrade material (i.e., 3/4-inch crushed stone);
2. Exterior pressure monitoring points;
3. Vapor conveyance pipe network;
4. Free-standing cabinets with noise abatement material to house the blowers, moisture separators, vapor-phase granular activated carbon (VGAC) units, and electrical controls;
5. Vapor extraction blowers (Cincinnati Blower PB-10A);
6. Moisture knockouts in the influent piping to remove potentially entrained moisture in the air stream;
7. Remote automated monitoring systems; and
8. Low-permeability utility trench dams.

A general layout of the sub-slab pipes, exterior pressure monitoring points, proposed conveyance piping routes, and equipment enclosure locations are included in Sheet C-100 of Appendix A.

3.2.1 Sub-slab Vent Pipe

The sub-slab vapor vent pipes will consist of low-profile GeoVent™ system, manufactured by CETCO®, or equivalent, installed horizontally within the gravel subgrade under the building slabs, as shown on Appendix A, Sheet C-110. The vent pipes will connect to solid 3-inch diameter Schedule 80 polyvinyl chloride (PVC) pipes at the exterior foundation wall of each building. The 3-inch diameter vent pipes will be encased within a 5-inch diameter PVC sleeve through all interior footings and the exterior foundation wall. The vent pipe penetrations will be sealed with pipe sealant at the building exterior foundation walls as shown on Appendix A, Sheet C-110.

3.2.2 Exterior Pressure Monitoring Points

Exterior pressure monitoring points will be included at each residence and unit to provide a conduit where the sub slab pressure differential can be measured. The exterior pressure monitoring points will consist of 1-inch diameter Schedule 80 PVC pipe and will be installed horizontally within the gravel subgrade through the building exterior foundation walls. The pipe will extend from the sub slab gravel layer and terminate below grade in landscape areas or the concrete driveway aprons and be secured within a traffic rated box and fitted with a ball valve and sample port. The location and construction methods for the exterior pressure monitoring points are shown on Sheets C-100 through C-106 of Appendix A.

3.2.3 Vapor Conveyance Pipe Network

Field conveyance piping will consist of 3-inch diameter Schedule 80 PVC. The conveyance piping will extend from the foundation pipe penetrations, run generally with the streets right-of-way and terminate in equipment enclosures located in landscaped areas along the eastern boundary of the Property. The

conveyance pipe connects to subsurface moisture knockout then enters the equipment enclosure above grade and connects to a moisture separator.

Due to site topography and the elevation of the building pads, the conveyance piping is sloped slightly downward towards the equipment enclosures for collection of potential condensate. In the landscaped area along the eastern side of the Property, the conveyance piping connects to subsurface 12-inch diameter Schedule 80 PVC moisture knockouts (see Appendix A, Sheets C-107 and 108). If moisture accumulates in the moisture knockout or moisture separator, it will be pumped out of the knockout by removing the vacuum-rated well plug and inserting a portable vacuum pump (e.g., Shop-Vac® or similar device). If needed, the removed moisture will be placed in appropriately labeled containers and treated through the RGRP groundwater treatment system located at 644 National Avenue.

As a construction quality assurance/quality control measure, and once the installation is complete, the contractor will pressure test the conveyance piping network in accordance with pneumatic pressure testing protocol developed by the manufacturer or American Society for Testing and Materials, whichever is most stringent.

3.2.4 Equipment Enclosure

The equipment enclosure locations (in landscaped areas in the eastern side of the Property) were chosen to minimize noise and disruption to occupants and preclude the use of open common areas within the development for system components. The equipment enclosures will consist of a free-standing 3 ft. x 4 ft. x 6 ft. tall, powder-coated, steel cabinet atop a reinforced cast-in-place concrete slab, and will include one vapor extraction blower; process control valves; a moisture separator; a control panel; process monitoring ports for measuring vacuum and flow rate and collecting air samples; and connection piping. Details of the equipment enclosures are presented on Sheet C-107 of Appendix A.

The moisture separator in each cabinet consists of a vertically-mounted 6-inch diameter Schedule 80 PVC pipe section with inlet and outlet connection points and a drain valve. Soil vapors are conveyed from the moisture separator via 2-inch diameter flexible hose to a 200-pound capacity VGAC unit on the intake side of the vapor extraction blower. The vapor extraction blower (Cincinnati Blower PB-10A) is capable of a maximum vacuum of 10.7 inH_2O and a maximum flow rate of 105 standard cubic feet per minute (SCFM). Each SSD system is anticipated to operate with a vacuum of approximately 8 to 10 inH_2O and a flow rate up to approximately 65 SCFM. The blower exhaust is conveyed in 3-inch diameter Schedule 80 PVC piping to the outside of the cabinet, then underground to the discharge stacks located within false light poles in the landscaped area. Exhaust piping details and connections from the equipment enclosures to discharge locations are shown on Sheets C-100 and C-108 of Appendix A.

Treated air from the eight buildings will be discharged through a vertical stack at two locations. Each exhaust pipe will be 3-inch diameter Schedule 80 PVC and will be enclosed within a false light pole, as shown on Sheet S-100 in Appendix A. Each discharge stack will be fitted with an in-line silencer and located at least 10 feet off the ground and at least 10 feet horizontally from building openings (such as windows and doors) into occupied space at the Property.

The blower control panel, electrical use meter, and remote monitoring system are mounted on the back interior wall of the cabinets. Electrical power feed is via underground conduits from each building's main electrical panel to the cabinets.

Each SSD system was designed to reduce operating noise levels. As part of the design, an absorptive noise abatement material (Sonocon Softwall Barrier or equivalent), will be installed in each equipment enclosure to reduce noise outside the enclosure to meet the intent of the noise limit established in City of Mountain View Code Section 21.26.

3.3 SSD SYSTEM MONITORING

The vapor extraction blower in each equipment enclosure will operate continuously. If the vapor extraction blower is not operating, the remote monitoring system installed in the control panel in the equipment enclosure will make an automated call out to the system operators.

3.4 UTILITY TRENCH DAMS

Utility trenches will include plugs or dams of low permeability material to prevent potential soil vapor migration within trench backfill materials into the sub-slab areas. The utility trench dams will be a minimum 3-feet in length along the trench and consist of cement slurry with 2 percent bentonite. The trench dams will be located where any utility trench extends beneath the building slab, as close to the exterior wall of the building as practical. The top of the slurry backfill will be at least 6 inches higher in elevation than the bottom of the nearest exterior footing for the building (see Appendix A, Sheet C-110).

4. Operations, Maintenance, and Monitoring

This section includes the startup monitoring activities that will be conducted to confirm the system operates as designed and as a preliminary OM&M Plan for the systems.

4.1 STARTUP MONITORING

Startup monitoring will be performed for one week following startup and monthly for the first three months of operation and will include the following:

- Check the equipment for operability and check the telemetry system for functionality;
- Measure pressure differentials at all exterior pressure monitoring points;
- Measure the vacuum in the vapor extraction blower inlets;
- Screen the influent and effluent air with a photoionization detector capable of detecting VOCs in the parts per billion range;
- Collect influent and effluent air samples for each of the six treatment units with a 1-liter SUMMA® canisters as described below; and
- Check the moisture separator and moisture knockout for accumulated moisture. If moisture does accumulate, it will be pumped out of the moisture separator and moisture knockout, appropriately labeled, and treated through the RGRP groundwater treatment system.

The frequency of monitoring may be modified based on the observations during the previous monitoring event. For example, additional or more frequent visits may be required during the winter to check for accumulated moisture.

To comply with the intent of substantive requirements of BAAQMD regulations, influent and effluent air samples will be collected from each of the six treatment units. The influent air samples will be used to assess the loading to the VGAC; effluent air samples will be collected to verify that air emissions from the treatment systems do not exceed the established BAAQMD Trigger Levels and that the VGAC unit provides a minimum of 90 percent removal of VOCs contained in the influent soil vapors. The grab samples will be collected in clean, batch certified, 1-liter SUMMA® canisters and analyzed using EPA Method TO-15 for the full list of VOCs.

After exterior building construction is complete, and prior to occupancy, in coordination with the building owner, a walkthrough of each building will be conducted with EPA to identify indoor air sample locations. Proposed sample location will be transmitted to EPA for approval.

One round of indoor air samples will be collected in each of the eight buildings with mechanical ventilation systems not operating. . The samples will be collected over 24 hours in clean selective ion monitoring (SIM) mode, individually certified, 6-liter SUMMA® canisters and analyzed using EPA Method TO-15 SIM for the MEW COCs. The pre-occupancy indoor air sampling data will be provided to EPA and Warmington after data validation.

4.2 PROPERTY-SPECIFIC LONG-TERM VAPOR INTRUSION OPERATION, MAINTENANCE, AND MONITORING PLAN

An OM&M Plan will be submitted to EPA within 60 days after the completion of construction of the SSD systems and vapor barriers in all buildings. In accordance with Section 2.4.2 of the SOW, the OM&M Plan will include the following:

- A description of the vapor intrusion control system(s) used;
- A description and schedule of normal operation and maintenance tasks, including equipment and material requirements, VGAC changeout procedures, anticipated equipment replacement for significant components, availability of spare parts, operator training and certification requirements, staffing needs, and where appropriate, provisions for remote monitoring and control and other related requirements;
- A description of record keeping and reporting requirements, including operation and inspection logs, maintenance records, and checklists;
- A description and analysis of potential operating problems and contingency plans (e.g., equipment failure, higher than expected contaminant concentrations), including response activities (including notification of property owner) and relevant health and safety information;
- A description of the types of monitoring data to be collected, including sampling and data gathering methods;
- The recommended frequency and sampling methodology, sampling types, and performance monitoring;
- A description of how the performance data will be analyzed, interpreted, and reported to evaluate system performance;
- A description of air emission monitoring to verify that air emissions from treatment operations do not exceed established BAAQMD requirements, if applicable;
- Quality assurance/quality control activities;
- Project organization and responsibility;
- An overall OM&M schedule;
- A description of notifications to and coordination with EPA and the property owner, building manager, or tenants for collecting monitoring data;
- A description of the building-specific institutional control monitoring, management, and implementation plan;
- The proposed decision-making process and criteria for determining whether the VI control system is no longer necessary as a VI remedy (i.e., shutdown criteria); and
- A description of the contents, format, and frequency of progress reporting.

4.3 PROPERTY-SPECIFIC INSTITUTIONAL CONTROLS IMPLEMENTATION PLAN

An access agreement between the RGRP and Warmington was executed, and recorded in the land records with the Clerk-Recorder of Santa Clara County on 6 August 2015. The agreement includes the following provisions:

- Provide access to perform follow-up OM&M of each SSD system as necessary or required by EPA;
- Require that the property owner notify the RGRP and EPA before making any substantial improvements or substantial modifications to the slab, sub-slab, or foundation of each building that could impact the operation of the SSD system;
- Require that the property owner maintain the integrity of the vapor barrier under the buildings and not interfere with the SSD systems and enclosures; and
- Is intended to be binding on all future owners of the Property.

5. Contingency Plan

This contingency plan was prepared in accordance with the requirement of Section 2.4.1 of the SOW and describes actions that will be taken in the event of a blower shutdown or detection of COCs in indoor air above their respective ROD residential indoor air cleanup levels. Elements of this contingency plan will be implemented as needed.

5.1 VAPOR EXTRACTION BLOWER OPERATIONS

The following contingency measures will be implemented if a vapor extraction blower shutdown message is communicated by the automated remote monitoring system:

- Designated, trained maintenance personnel will visit the Property within 24 business hours to inspect and document the cause of the shutdown, attempt a field repair of the appropriate equipment, and restart the repaired vapor extraction blower; or
- The damaged vapor extraction blower will be replaced within 48 business hours with a backup blower stored onsite in an equipment enclosure.

5.2 INDOOR AIR

If pre-occupancy indoor air COC concentrations are measured above their respective ROD residential indoor air cleanup levels and the exceedance is attributed to the VI pathway, one or a combination of the following actions can be implemented with the concurrence of EPA:

- **Modify Equipment:** Vapor extraction blowers can be replaced with models capable of applying a higher vacuum and/or flow rate (i.e., greater than 10 inH_2O and 100 SCFM, respectively).
- **Connect Contingency Vent Piping:** Because of their size, Buildings E and F will have a contingency ventilation pipe installed parallel to the main ventilation pipe beneath the slab. The contingency pipe will only include a vented section across the 3 or 4 end units farthest from the SSD blower. The remainder of the contingency piping will be solid 3-inch diameter Schedule 80 PVC. The solid contingency conveyance piping will extend to the exterior of the Building E or F equipment cabinets and be capped underground. If adequate vacuum propagation is not measured at the far ends of these buildings, the capped end of the contingency pipes can be exposed and manifolded to the primary inlet pipe at the cabinets. Both sets of ventilation pipes would be operated or the contingency pipes can be configured as air inlet pipes.

After these modifications are made, confirmation air samples will be collected from the same locations and in the same manner (i.e., over 24 hours in clean, SIM individually certified, 6-liter SUMMA® canisters and analyzed using EPA Method TO-15 SIM for the MEW COCs) as the initial pre-occupancy sampling event.

6. Schedule

EPA will be provided with written notice of the anticipated schedule for the construction of the vapor barrier and SSD systems. A "Property-specific VI Response Action Implementation Report" will be submitted to EPA within 60 days of receiving pre-occupancy validated indoor air sampling data from all buildings.

The OM&M Plan will be submitted to EPA 60 days after final construction of the vapor barrier and SSD system of all buildings.

This schedule is contingent on the timing of the following:

- EPA approval of this Remedial Design;
- Completion of building construction;
- Access provided by the Property owner;
- Equipment procurement lead time; and
- Weather conditions.

References

1. California Environmental Protection Agency, Department of Toxic Substances Control, 2011, "Vapor Intrusion Mitigation Advisory, Final Revision 1," October.

2. Haley & Aldrich, Inc., 2012, "Building-specific Vapor Intrusion Response Action Implementation Report, 277 Fairchild Drive, Mountain View, California," 9 October.

3. Haley & Aldrich, Inc., 2013a, "Residence 44 Vapor Intrusion Activities, January 2013 to May 2013, Mountain View California," 10 July.

4. Haley & Aldrich, Inc., 2013b, "Residence 49 Vapor Intrusion Activities, May 2013 to July 2013, Mountain View California," 9 September.

5. United States Environmental Protection Agency, 2010, "Record of Decision Amendment for Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California," 16 August.

6. United States Environmental Protection Agency, 2011. "Statement of Work, Remedial Design and Remedial Action to Address the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California," 16 September.

7. United States Environmental Protection Agency, 2015. "EPA Request for Remedial Design of Active Sub-Slab Vapor Intrusion Control Systems, 277 Fairchild Drive Residential Project, Mountain View, California, Middlefield-Ellis-Whisman (MEW) Superfund Study Area," 22 April.

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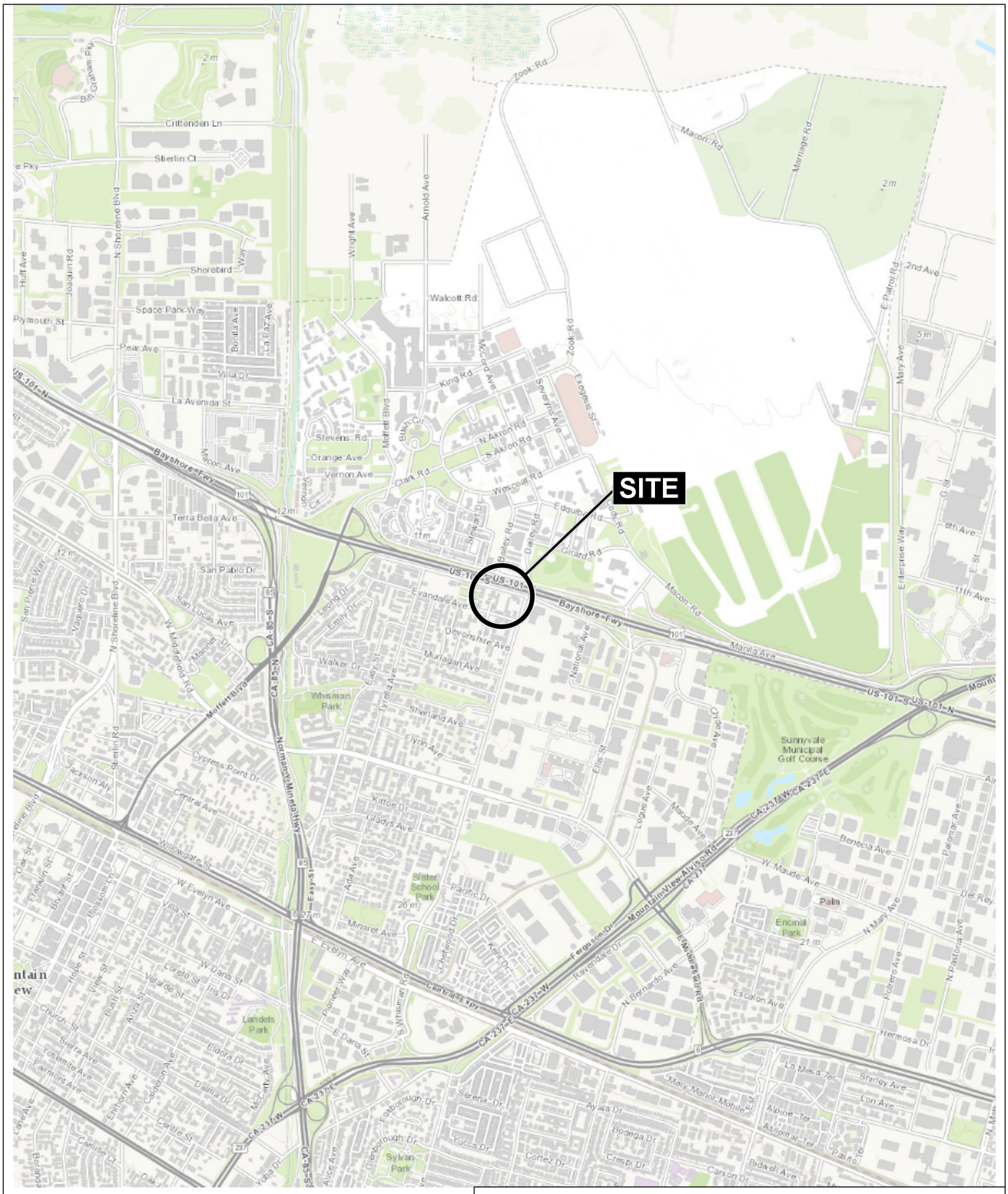
FIGURES



MAP SOURCE: ESRI

SITE COORDINATES: 37°24'19"N, 122°3'28"W

HALEY ALDRICH

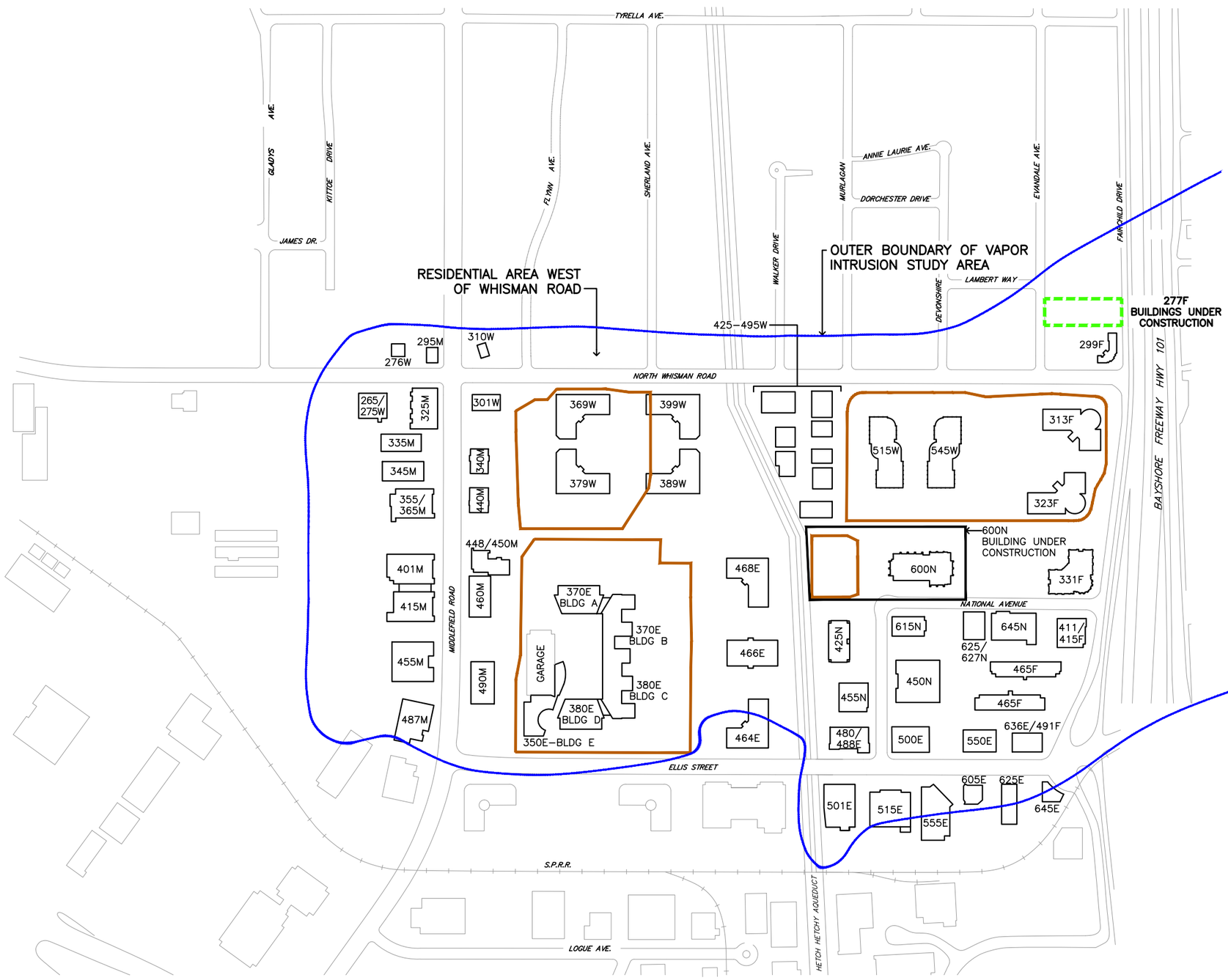
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE LOCATION

APPROXIMATE SCALE: 1 IN = 2000 FT
APRIL 2016

FIGURE 1

36067-062_1_LOCUS.PDF



LEGEND:

- SLURRY WALL
- OUTER BOUNDARY OF VAPOR INTRUSION STUDY AREA
- SUBJECT SITE
- E ELLIS STREET
- M EAST MIDDLEFIELD ROAD
- F FAIRCHILD DRIVE
- W NORTH WHISMAN ROAD
- N NATIONAL AVENUE

NOTES:

1. BOUNDARY OF MEW STUDY AREA IS DEFINED BY THE 5 MICROGRAMS PER LITER (µg/L) TRICHLOROETHENE CONTOUR AS PRESENTED BY EPA IN DECEMBER 2011 AND AUGUST 2014.
2. BUILDINGS IN RESIDENTIAL AREA WEST OF WHISMAN ROAD ARE NOT SHOWN

0 500 1,000
APPROXIMATE SCALE IN FEET

HALEY ALDRICH

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

LOCATION OF
277 FAIRCHILD DRIVE

SCALE: AS SHOWN
APRIL 2016

FIGURE 2

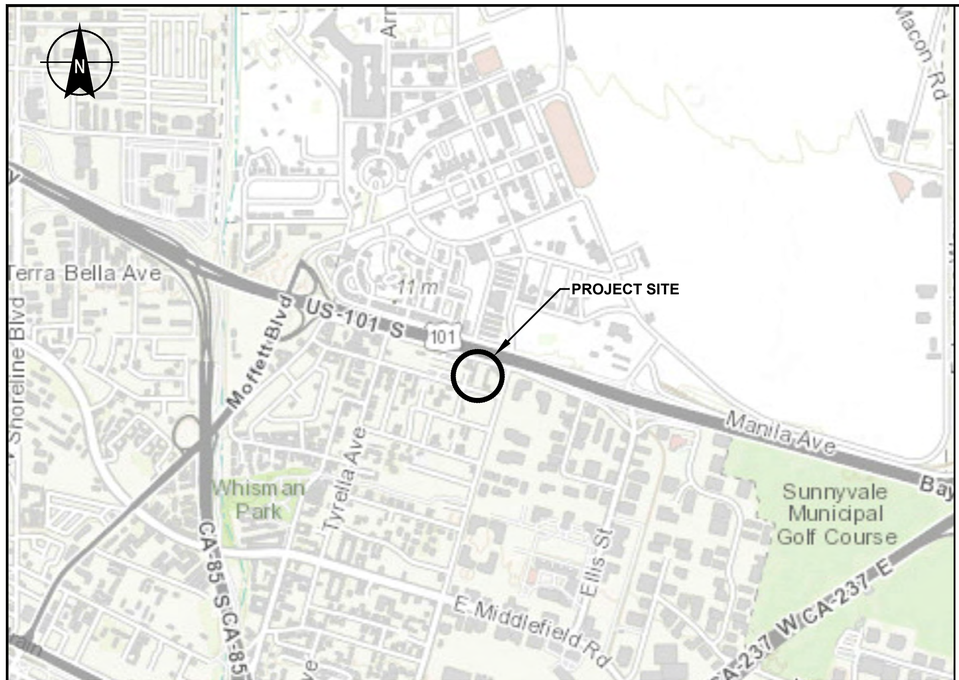
MOBINI, GITA Printed: 4/20/2016 8:55 AM Layout: 277_FAIRCHILD_DR
G:\36067_STC_MEW_VI\GLOBAL\CAD\36067-062-0002-277_FAIRCHILD-SITE_LOCATION.DWG

APPENDIX A

Design Drawings

277 FAIRCHILD DRIVE
SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM DESIGN

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA



SITE LOCUS
TOPO SOURCE: ESRI TOPOGRAPHIC MAP (2009).

0 5000 10000 15000 20000
SCALE IN FEET

SITE AERIAL
MAP SOURCE: IMAGE DATED 2012 TAKEN ELECTRONICALLY FROM PICTOMETRY.

0 100 200 300 400
SCALE IN FEET

DRAWING INDEX

SHEET NO.	DRAWING NO.	SHEET TITLE
PROCESS/CIVIL		
1	G-100	TITLE SHEET & DRAWING LIST
2	G-101	GENERAL NOTES & SPECIFICATIONS
3	P-100	PROCESS & INSTRUMENTATION LEGEND & PROCESS FLOW DIAGRAM
4	P-101	PROCESS & INSTRUMENTATION DIAGRAM (SHEET 1 OF 2)
5	P-102	PROCESS & INSTRUMENTATION DIAGRAM (SHEET 2 OF 2)
6	C-100	OVERALL SITE PLAN
7	C-101	SITE PLAN AND PROFILE - BUILDING C
8	C-102	SITE PLAN AND PROFILE - BUILDING D
9	C-103	SITE PLAN AND PROFILE - BUILDING E
10	C-104	SITE PLAN AND PROFILE - BUILDING F
11	C-105	SITE PLAN AND PROFILE - LOT 1 AND 2
12	C-106	SITE PLAN AND PROFILE - LOT 3 AND 4
13	C-107	EQUIPMENT ENCLOSURES AND CONSTRUCTION DETAILS
14	C-108	EQUIPMENT ENCLOSURE EXHAUST INSTALLATION
15	C-109	CONSTRUCTION DETAILS (SHEET 1 OF 2)
16	C-110	CONSTRUCTION DETAILS (SHEET 2 OF 2)
17	S-100	FALSE LIGHT POLE STRUCTURAL DESIGN
ELECTRICAL		
1	1000	SHEET INDEX
2	1000-A	ELECTRICAL SYMBOLS AND ABBREVIATIONS
3	1010	CONTROL SYSTEM LAYOUT
4	1011	CONTROL PANEL ENCLOSURE LAYOUT
5	1012	CONTROL PANEL BACKPLATE LAYOUT
6	1020	SINGLE LINE DIAGRAM / POWER DISTRIBUTION

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ELECTRICAL

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San Ramon, California 94583
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Fax: 925.277.9647

STRUCTURAL

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2000 Powell Street, Suite 1650
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Project No.:	36067-070
Scale:	AS SHOWN
Date:	MARCH 2016
Drawn By:	PHK
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF

Stamp:

REGISTERED PROFESSIONAL ENGINEER
RICHARD M. FARRO
17289
EXPIRES 12/31/17
CIVIL
STATE OF CALIFORNIA

Rev.	Description	By	Date
D	ISSUE FOR PERMIT	H&A	04/21/16
C	ISSUE TO PRPs	H&A	04/06/16
B	ISSUED FOR REVIEW	H&A	03/22/16
A	FOR INTERNAL REVIEW	H&A	03/11/16

SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

TITLE SHEET & DRAWING LIST

G-100

Sheet: 1 of 17

MOBINI, GITA
\\SJC\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 G-100.DWG
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GENERAL

1. NOTES AND SPECIFICATIONS PROVIDED ON THE DRAWINGS TAKE PRECEDENCE OVER GENERAL NOTES.
2. WORK SHALL COMPLY WITH ALL NATIONAL, STATE, AND LOCAL LAWS, REGULATIONS, CODES, REQUIREMENTS AND STANDARDS, INCLUDING REVISIONS TO DATE OF CONTRACT OR REVISIONS TO THE CONTRACT.
3. DETAILS TAKE PRECEDENCE OVER GENERAL DRAWINGS. WHERE NOTES CONFLICT WITH ANY DRAWING, THE MOST RESTRICTIVE SHALL APPLY. WHERE CONFLICTS OR QUESTIONS EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING. NO CHANGES OR ADDITIONS TO THE SCOPE OF WORK DEPICTED HEREIN SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND LOCATIONS SHOWN PRIOR TO COMMENCING WORK. ANY CONFLICTS WITH DETAILS AND NOTES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER IN WRITING.
5. BEFORE COMMENCING WORK, THE CONTRACTOR SHALL DOCUMENT THE QUANTITY, SIZE, DIMENSIONS AND LOCATION OF ALL PRE-EXISTING LANDSCAPING, HARDSCAPE, CONCRETE SIDEWALK CRACKS, CONCRETE CULVERT CRACKS, CONDITION OF ASPHALT, ASPHALT DIMENSIONS, STRIPING, SIGN POST LOCATIONS, FENCING, PIPING, UTILITY LINES, CURBS AND PAINTING, IRRIGATION SPRINKLER HEAD LOCATIONS, VALVE BOX LIDS AND ANY OTHER EXISTING CONDITIONS WHICH THE CONTRACTOR SHALL BE REQUIRED TO RESTORE TO THEIR PRE-EXISTING CONDITION. DOCUMENTATION SHALL BE PROVIDED IN A MEMORANDUM FORMAT. USE OF TABLES AND PHOTOGRAPHS ARE ACCEPTABLE. FOR UTILITY LINES ON PRIVATE PROPERTY, CONTRACTOR MAY ELECT TO RETAIN A PRIVATE UTILITY LOCATOR AT HIS OWN EXPENSE.
6. CONTRACTOR SHALL OBTAIN ANY/ALL NECESSARY CONSTRUCTION PERMITS, INCLUDING ELECTRICAL AND PLUMBING PERMITS, AND SCHEDULE ANY REQUIRED INSPECTIONS. THE CONTRACTOR SHALL MAINTAIN COPIES OF ANY PERMITS AT THE JOB SITE FOR AGENCY INSPECTION AND PROVIDE A COPY TO THE ENGINEER PRIOR TO BEGINNING WORK. THE DEVELOPER WILL SUBMIT DRAWINGS TO THE CITY OF MOUNTAIN VIEW FOR PLAN CHECK.
7. THE CONTRACTOR'S LAYDOWN AREA FOR MATERIALS SHALL BE COORDINATED WITH THE ENGINEER, OTHER ON-SITE CONTRACTORS, AND DEVELOPER REPRESENTATIVE. SECURITY FOR CONTRACTOR'S EQUIPMENT AND MATERIALS IS THE RESPONSIBILITY OF THE CONTRACTOR.
8. THE CONTRACTOR SHALL MAINTAIN AN ORDERLY AND CLEAN JOB SITE. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL CONSTRUCTION RELATED TRASH, DEBRIS, AND EXCESS MATERIALS AT THE END OF EACH WORK SHIFT.
9. THE CONTRACTOR MUST MAINTAIN UNOBSTRUCTED ACCESS TO ENTRANCES AND EXITS, INCLUDING EMERGENCY EXITS.
10. PLUMBING WORK SHALL BE PERFORMED BY A LICENSED PLUMBER IN ACCORDANCE WITH LOCAL CODES.
11. ELECTRICAL WORK SHALL BE PERFORMED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH LOCAL CODES.
12. DAMAGE TO NEW CONSTRUCTION DURING WORK SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
13. THESE PLANS AND SPECIFICATIONS ARE SUBJECT TO MODIFICATIONS DURING CONSTRUCTION IF CONDITIONS ARISE THAT WERE NOT APPARENT DURING DESIGN. ANY SUCH MODIFICATION MUST BE REQUESTED IN WRITING AND APPROVED BY THE ENGINEER PRIOR TO IMPLEMENTATION.
14. ALL MATERIALS AND WORKMANSHIP SHALL FULLY CONFORM TO THE SPECIFICATIONS, STANDARDS, AND ORDINANCES OF THE CITY OF MOUNTAIN VIEW BUILDING DIVISION (CMVBD). SPECIFICATIONS AND DETAILS ARE AVAILABLE IN THE OFFICE OF THE CMVBD ENGINEER, OR CAN BE ACCESSED ON THE CITY OF MOUNTAIN VIEW WEBSITE AT HTTP://WWW.MOUNTAINVIEW.GOV/CITY_HALL/PUBLIC_WORKS/STANDARD_PROVISIONS.ASP.
15. ONLY THE ENGINEER OR CLIENT MAY AUTHORIZE A CONTRACT "CHANGE ORDER". SHOULD THE CONTRACTOR BELIEVE A CHANGE ORDER IS WARRANTED, HE SHOULD IMMEDIATELY COMMUNICATE WITH ENGINEER AND BE PREPARED TO QUOTE A FIRM PRICE OR A "NOT TO EXCEED" PRICE. ALL CHANGE ORDERS SHALL BE AUTHORIZED IN WRITING BEFORE CHANGE ORDER WORK IS PERFORMED.
16. CONTRACTOR SHALL ATTEND CMVBD INSPECTIONS AS NECESSARY. CMVBD INSPECTIONS SHALL BE ARRANGED AND SCHEDULED BY THE CONTRACTOR.
17. PAD GRADE AND GRAVEL LAYERS FOR NEW BUILDINGS SHALL BE COMPLETED BY OTHERS.

UTILITIES

1. THE CONTRACTOR SHALL NOTIFY UTILITY COMPANIES WITHIN 48 HOURS (2 FULL BUSINESS DAYS) IN ADVANCE OF CONSTRUCTION TO FIELD LOCATE UTILITIES. THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT OF NORTHERN CALIFORNIA AND NEVADA (USA NORTH) (1-800-227-2600).
2. CONTRACTOR SHALL LOCATE ALL UTILITIES AND PROTECT THEM FROM DAMAGE. THE CONTRACTOR SHALL REPAIR AND/OR REPLACE ANY UTILITIES DAMAGED BY THE CONTRACTOR, AND PROVIDE AT HIS EXPENSE FOR SERVICE CONTINUATION DURING REPAIRS.
3. UTILITY CROSSINGS DEPICTED WITHIN THE PROJECT BOUNDARIES ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE UTILITY LOCATIONS AND DEPTHS, AND IDENTIFYING UNDOCUMENTED UTILITIES PRIOR TO CONSTRUCTION.

EXCAVATION AND TRENCHING

1. ALL OPEN EXCAVATIONS SHALL BE SUPPORTED IN ACCORDANCE WITH APPLICABLE OSHA REQUIREMENTS.
2. DURING TRENCH EXCAVATION THE CONTRACTOR SHALL BE RESPONSIBLE FOR AVOIDING EXISTING SUBSURFACE PIPING. AT A MINIMUM THE CONTRACTOR IS RESPONSIBLE FOR PERFORMING HIS OWN GEOPHYSICAL UTILITY SUBSURFACE INVESTIGATION TO DETERMINE LOCATION OF SUBSURFACE FEATURES, AND REVIEWING CONSTRUCTION AND UTILITY DRAWINGS TO IDENTIFY POTENTIAL SUBSURFACE FEATURES.
3. CONTRACTOR SHALL PROVIDE AND MAINTAIN TRENCH PLATES OR PLYWOOD AS APPLICABLE; FENCING, BARRICADES, SIGNAGE, FLAGMEN AND ANY OTHER SAFETY RELATED REQUIREMENTS. OPEN TRENCHES IN TRAFFIC AREAS WHERE ACTIVE CONSTRUCTION IS NOT OCCURRING SHALL BE COVERED WITH TRENCH PLATES (CONFIGURED TO ALIGN UNIFORMLY) TO ALLOW FOR NORMAL VEHICLE TRAFFIC AND SHALL BE MAINTAINED SO AS NOT TO PRESENT TRIP HAZARDS FOR PEDESTRIANS.
4. SAFETY FENCING AND/OR STEEL PLATES OR PLYWOOD AS APPLICABLE SHALL BE MAINTAINED UNTIL THE TRENCHES ARE BACKFILLED AND COMPACTED TO MATCH EXISTING GRADE.
5. THE CONTRACTOR SHALL NOT BACKFILL THE TRENCHES UNLESS APPROVAL IS PROVIDED BY THE ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PIPE DURING BEDDING AND BACKFILL PLACEMENT. PIPING SHALL BE BEDDED USING CLEAN SAND FREE OF DEBRIS. BACKFILL ABOVE PIPES SHALL BE NATIVE OR IMPORTED SOIL COMPACTED TO MINIMUM RELATIVE COMPACTION OF 95%.
7. THE CONTRACTOR SHALL LOAD, PROFILE, TRANSPORT, AND DISPOSE OF ALL WASTE AND DEBRIS, INCLUDING ASPHALT AND CONCRETE DEBRIS, EXCAVATION WASTE SOIL, AND OTHER CONSTRUCTION DEBRIS AT A MEW COMPANIES APPROVED FACILITY.
8. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRENCH LOCATOR TAPE AND WIRE (BELOW GROUND).

CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF A.C.I. 318-LATEST EDITION "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS", EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS CONTAINED HEREIN OR SHOWN ON THE DRAWINGS.
2. ALL CONCRETE SHALL BE 150 P.C.F. HARDROCK, AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 P.S.I. AT 28 DAYS.
3. READY MIX CONCRETE SHALL CONFORM TO (ASTM C-94).
4. PLACEMENT OF CONCRETE SHALL CONFORM TO ACI 304. CLEAN AND ROUGHEN TO ¼" AMPLITUDE FOR ALL CONCRETE SURFACES AGAINST WHICH CONCRETE IS TO PLACED.
5. ALL EXPOSED CONCRETE SHALL HAVE A SMOOTH FORM FINISH USING B-B PLYFORM, CLASS I, EXT-A.P.A. PLYWOOD.
6. ALL SLABS SHALL HAVE A TROWELED FINISH EXCEPT AS NOTED ON THE DRAWINGS.
7. ALL REINFORCING STEEL ANCHOR BOLTS, DOWELS AND INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
8. IF THE CONTRACTOR DESIRES TO MAKE ANY CONSTRUCTION JOINTS OTHER THAN THOSE SHOWN ON THESE DRAWINGS, HE SHALL SUBMIT DETAILS OF CHANGES TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL BEFORE STARTING WORK.

REINFORCING

1. ALL REINFORCING STEEL SHALL BE PLACED IN CONFORMANCE WITH THE CALIFORNIA BUILDING CODE (C.B.C.), AND THE "MANUAL OF STANDARD PRACTICE" BY THE C.R.S.I. OR AS MODIFIED BY THE CONSTRUCTION DOCUMENTS.
2. REINFORCING BARS SHALL CONFORM TO ASTM A-615, DEFORMED GRADE 60, EXCEPT #3 BARS MAY BE GRADE 40. REINFORCING BARS THAT ARE TO BE WELDED SHALL CONFORM TO ASTM A-706, DEFORMED GRADE 60.
3. ALL REINFORCING BAR BENDS SHALL BE MADE COLD, UNLESS OTHERWISE PERMITTED BY THE BUILDING OFFICIAL.
4. REINFORCING SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS.

CONCRETE SLABS-ON-GRADE

1. THE AT-GRADE CONCRETE SLABS OF THE PROPOSED EQUIPMENT CABINETS SHOULD BE CONSTRUCTED ON AT LEAST 3 INCHES OF COMPACTED CLASS II AGGREGATE BASE.

ELECTRICAL

1. ALL ELECTRICAL DESIGN AND INSTALLATION SPECIFICATIONS ARE PROVIDED BY CALCON ELECTRIC.
2. ELECTRICAL CONNECTIONS AND GROUNDING OF THE ELECTRICAL SYSTEM(S) SHALL BE PERFORMED ACCORDING TO NATIONAL ELECTRICAL CODE (NEC) REQUIREMENTS EXCEPT WHERE DRAWINGS AND/OR SPECIFICATIONS EXCEED NEC REQUIREMENTS.

GEOVENT AND VAPOR MEMBRANE

1. INSTALLATION OF GEOVENT PIPING, VAPOR MEMBRANE AND ASSOCIATED APPURTENANCES SHALL BE INSTALLED BY A CERTIFIED GEOSYNTHETIC INSTALLER.

SCOPE OF WORK

THE CONSTRUCTION CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL EQUIPMENT, LABOR, AND MATERIALS FOR CONSTRUCTION AS DESCRIBED BELOW AND SHOWN ON THE DRAWINGS. CONTRACTOR SHALL PERFORM ACTIVITIES AS DETAILED IN THIS SCOPE OF WORK. NOTE: NO VARIANCES WILL BE GRANTED UNLESS APPROVED BY THE ENGINEER.

A. PROCUREMENT AND INSTALLATION OF THE NEW EQUIPMENT INCLUDING BUT NOT LIMITED TO: SSD CABINETS, GRANULAR ACTIVATED CARBON UNITS, CINCINNATI FANS, ELECTRICAL WIRING AND GFCI OUTLETS, CONNECTION PIPING/FLEX HOSES, ALL VALVES, MONITORING POINTS, SEISMIC RESTRAINTS, GAUGES, CONVEYANCE PIPING, TRENCH WORK (INCLUDING ANY SHORING), FOUNDATION SLABS, DRAINAGE VAULTS, DRAINAGE VAULT EQUIPMENT, CONTROL PANELS, AND CONTROLS APPURTENANCES AS SHOWN ON THE DRAWINGS.

B. PROCUREMENT AND INSTALLATION OF TELEMETRY EQUIPMENT ELECTRICAL WIRING AND CONDUITS, SUB-PANELS, SUBMETERS, AND GFCI OUTLETS.

C. TELEMETRY SHALL BE PROVIDED FOR IMMEDIATE NOTIFICATION VIA TEXT MESSAGE AND PHONE CALL OF ANY OPERATION INTERRUPTION FOR EACH FAN.

EXECUTION

QUALITY ASSURANCE

1. CONTRACTOR SHALL CONDUCT A KICK-OFF MEETING, PRIOR TO CONSTRUCTION, TO ASSURE CONTRACTOR UNDERSTANDING OF GENERAL AND DETAIL DRAWINGS AND WRITTEN SPECIFICATIONS. CONTRACTOR DESIGNATED SITE SUPERINTENDENT, OWNER'S REPRESENTATIVE, DESIGNATED PROPERTY OWNER AND TENANT REPRESENTATIVES AS APPLICABLE, AND ENGINEER SHOULD BE PRESENT AT THE KICK-OFF MEETING.
2. CONTRACTOR SHALL CONTACT THE ENGINEER A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO ANY INSPECTION AND/OR TESTING ACTIVITIES.
3. THE CONVEYANCE PIPING NETWORK SHALL BE PRESSURE TESTED BY THE CONTRACTOR AT THE COMPLETION OF THE INSTALLATION AND IN ACCORDANCE WITH PNEUMATIC PRESSURE TESTING PROTOCOL DEVELOPED BY THE MANUFACTURER OR ASTM, WHICHEVER IS MOST STRINGENT. ANY LEAKS WHICH ARE IDENTIFIED SHALL BE REPAIRED AND THE CONVEYANCE PIPING NETWORK SHALL BE RE-TESTED UNTIL THE OBSERVED LEAKS ARE ELIMINATED.

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Project No.:	36067-070
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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

GENERAL NOTES & SPECIFICATIONS

G-101

MOBINI, GITA Printed: 4/21/2016 7:56 AM Layout: G-101
\\SJC\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 G-101.DWG

LEGEND:

- PROCESS LINE
- EXISTING PIPE
- ELECTRICAL SIGNAL
- BALL VALVE
- CHECK VALVE
- PRESSURE RELIEF OR SAFETY VALVE
- UNION
- REDUCER/BUSHING
- END CAP
- RAIN CAP
- MUFFLER
- BLIND FLANGE
- THREADED PLUG
- FILTER
- CENTRIFUGAL BLOWER
- PI 101 — FIELD-MOUNTED INSTRUMENT

PIPING IDENTIFICATION

LINE SIZE (1/100 INCH)
PIPING MATERIAL
WALL THICKNESS
SERVICE
INSULATION

400-PVC-40-VR-N

PIPING MATERIAL ABBREVIATIONS

CPR	COPPER
CS	CARBON STEEL
CI	CAST IRON
FLX	FLEX HOSE
GALV	GALVANIZED STEEL
GV	GEO VENT
HDPE	HIGH DENSITY POLYETHYLENE
PVC	POLY VINYL CHLORIDE
SS304	304 STAINLESS STEEL
SS316	316 STAINLESS STEEL
SPC	SPECIALIZED MATERIAL

WALL THICKNESS ABBREVIATIONS

10	SCHEDULE 10
40	SCHEDULE 40
80	SCHEDULE 80
TUBE	METAL TUBING

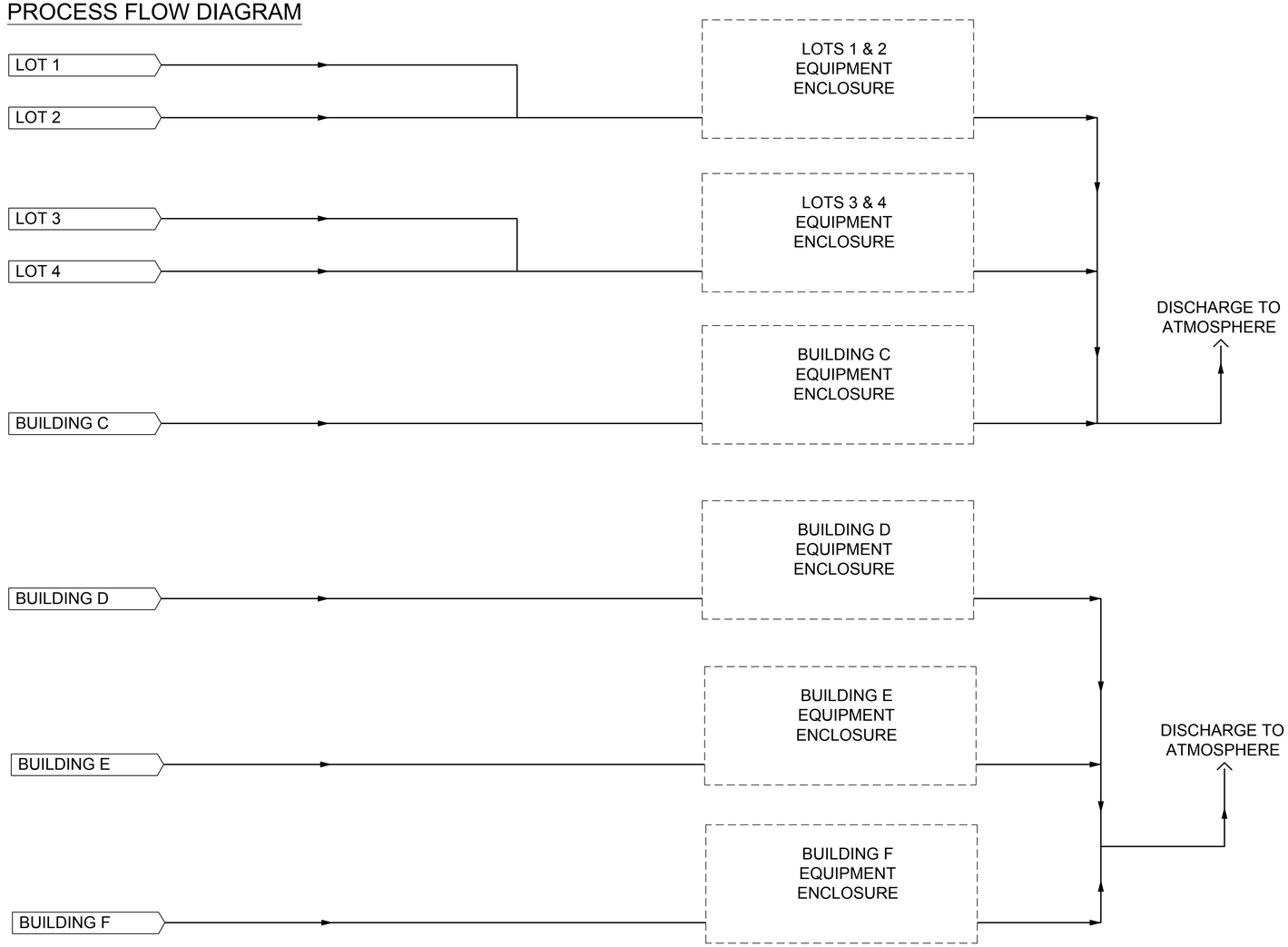
SERVICE ABBREVIATIONS

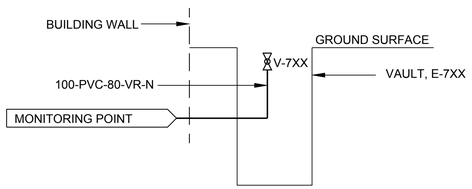
VR	RAW VAPOR
VT	TREATED VAPOR

INSULATION ABBREVIATIONS

N	NONE
I	INSULATED

PROCESS FLOW DIAGRAM





EXTERIOR PRESSURE MONITORING POINT
TYP. OF 26

NOTES

1. TAG NUMBERS SHALL BE COORDINATED SUCH THAT ALL COMPONENTS (I.E. E-701 & V-701) ARE IN THE SAME LOCATION.

LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
EXTERIOR PRESSURE MONITORING POINT (TYP. 26)	E-7XX	VAULT	OLDCASTLE	CHRISTY G03, TRAFFIC RATED CONCRETE BOX WITH STEEL FRAME AND CAST IRON COVER, 10" DIA X 12" DEEP
	V-7XX	SAMPLE PORT	MCMASTER CARR	45975K73, PVC HIGH-FLOW BALL VALVE, ELBOW, 1/4" NPT MALE X 3/8" TO 5/8" BARB

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Stamp: REGISTERED PROFESSIONAL ENGINEER MICHAEL M. FARSHCHI 17269 EXPIRES 12/31/16 CIVIL STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

PROCESS & INSTRUMENTATION LEGEND & PROCESS FLOW DIAGRAM

P-100

Sheet: 3 of 17

MOBINI, GITA
\\SJ\C\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 P-100.DWG
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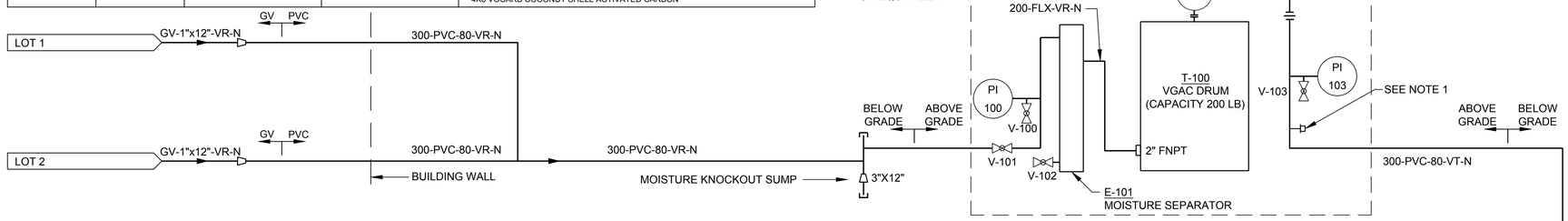
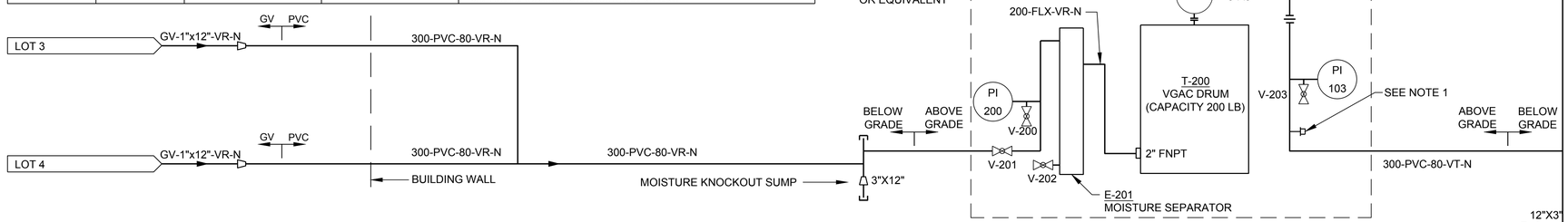
Layout: P-100

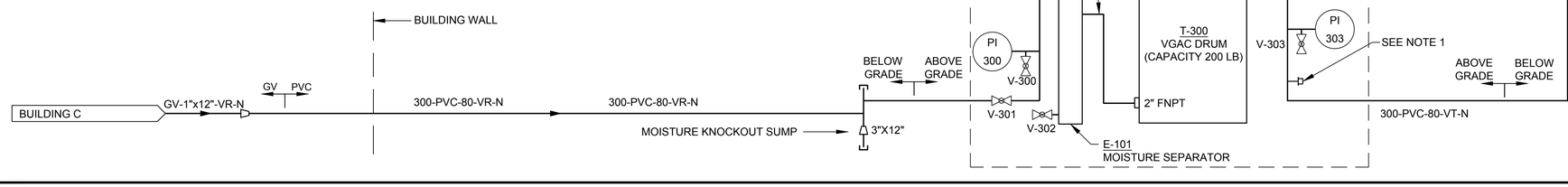
LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
LOTS 1 & 2	V-101	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-100, V-102 AND V-103	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-100	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	P-103	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-100	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-101	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	E-102	SILENCER	MCMASTER CARR	9835K48, 2" COMPACT HIGH FLOW MUFFLER
	B-100	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-100	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
LOTS 3 & 4	V-201	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-200, V-202 AND V-203	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-200	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	PI-203	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-200	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-201	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	B-200	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-200	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
BUILDING C	V-301	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-300, V-302 AND V-303	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-300	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	PI-303	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-300	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-301	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	B-300	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-300	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



NOTES

1. 1/2" THREADED PLUG TO USE FOR FLOW MEASUREMENT BY HAND DEVICE.
2. SILENCER TO BE INSTALLED IN LINE WITH 3" PVC PIPE WITHIN FALSE LIGHT POLE AND LOCATED AT THE TOP OF THE FALSE LIGHT POLE.
3. REMOVE ELECTRICAL PLUG FROM BLOWER CORD AND WIRE PER ELECTRICAL DRAWINGS.

HALEY ALDRICH

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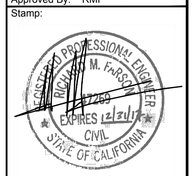
Project No.:	36067-070
Scale:	AS SHOWN
Date:	MARCH 2016
Drawn By:	PHK
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF
Stamp:	



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B	ISSUED FOR REVIEW	H&A	03/22/16
A	FOR INTERNAL REVIEW	H&A	03/11/16

SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

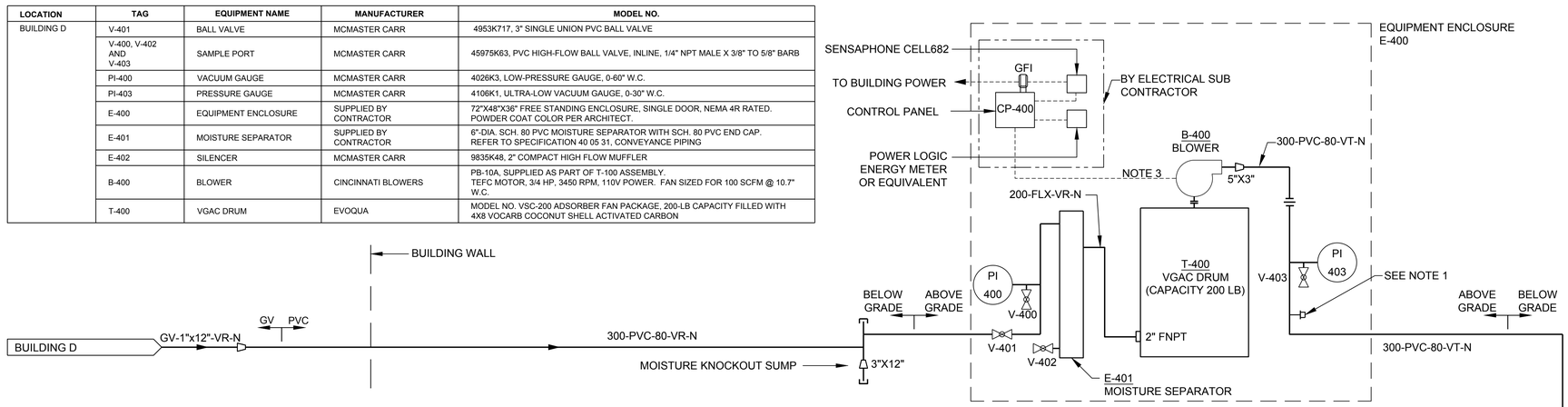
PROCESS & INSTRUMENTATION DIAGRAM (SHEET 1 OF 2)

P-101

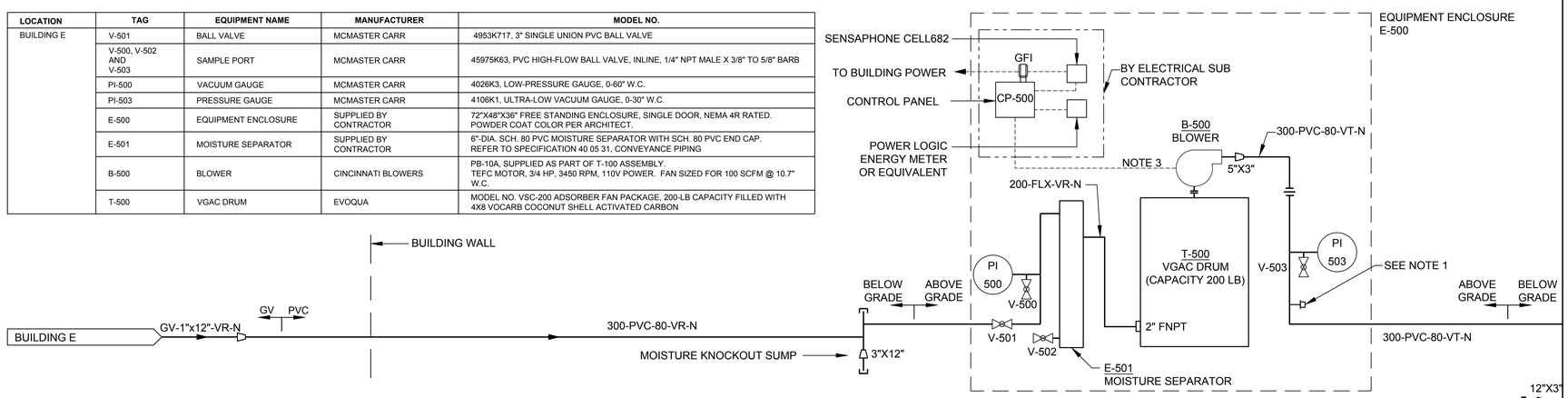
Sheet: 4 of 17

MOBINI, GITA
\\SJCCOMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 P-101.DWG
Printed: 4/21/2016 8:09 AM Layout: P-101

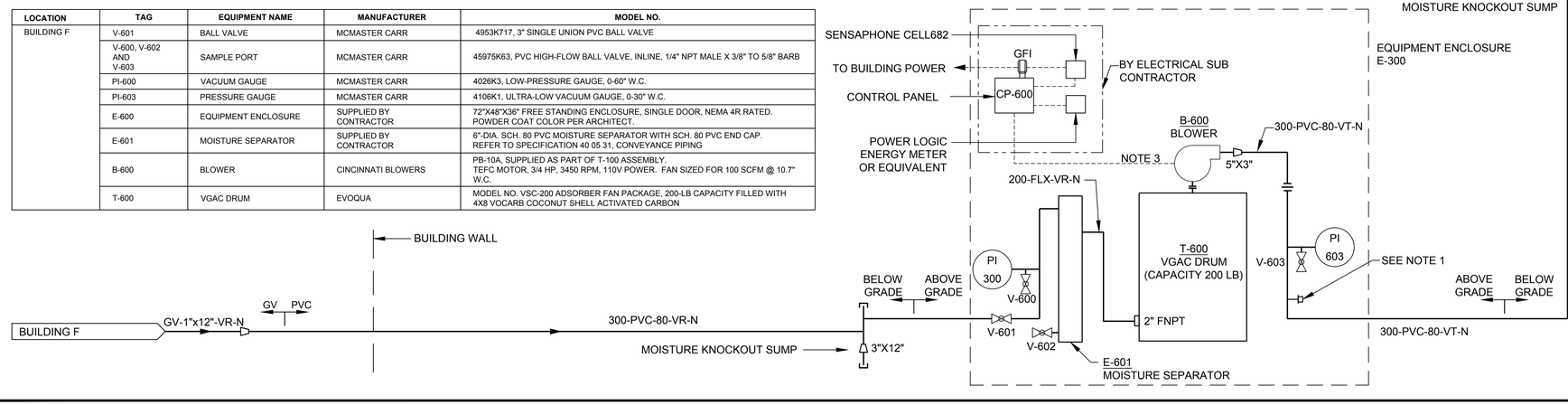
LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
BUILDING D	V-401	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-400, V-402 AND V-403	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-400	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	PI-403	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-400	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-401	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	E-402	SILENCER	MCMASTER CARR	9835K48, 2" COMPACT HIGH FLOW MUFFLER
	B-400	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-400	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
BUILDING E	V-501	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-500, V-502 AND V-503	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-500	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	PI-503	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-500	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-501	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	B-500	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-500	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



LOCATION	TAG	EQUIPMENT NAME	MANUFACTURER	MODEL NO.
BUILDING F	V-601	BALL VALVE	MCMASTER CARR	4953K717, 3" SINGLE UNION PVC BALL VALVE
	V-600, V-602 AND V-603	SAMPLE PORT	MCMASTER CARR	45975K63, PVC HIGH-FLOW BALL VALVE, INLINE, 1/4" NPT MALE X 3/8" TO 5/8" BARB
	PI-600	VACUUM GAUGE	MCMASTER CARR	4026K3, LOW-PRESSURE GAUGE, 0-60" W.C.
	PI-603	PRESSURE GAUGE	MCMASTER CARR	4106K1, ULTRA-LOW VACUUM GAUGE, 0-30" W.C.
	E-600	EQUIPMENT ENCLOSURE	SUPPLIED BY CONTRACTOR	72"X48"X36" FREE STANDING ENCLOSURE, SINGLE DOOR, NEMA 4R RATED. POWDER COAT COLOR PER ARCHITECT.
	E-601	MOISTURE SEPARATOR	SUPPLIED BY CONTRACTOR	6"-DIA. SCH. 80 PVC MOISTURE SEPARATOR WITH SCH. 80 PVC END CAP. REFER TO SPECIFICATION 40 05 31, CONVEYANCE PIPING
	B-600	BLOWER	CINCINNATI BLOWERS	PB-10A, SUPPLIED AS PART OF T-100 ASSEMBLY. TEFC MOTOR, 3/4 HP, 3450 RPM, 110V POWER. FAN SIZED FOR 100 SCFM @ 10.7" W.C.
	T-600	VGAC DRUM	EVOQUA	MODEL NO. VSC-200 ADSORBER FAN PACKAGE, 200-LB CAPACITY FILLED WITH 4X8 VOCARB COCONUT SHELL ACTIVATED CARBON



NOTES

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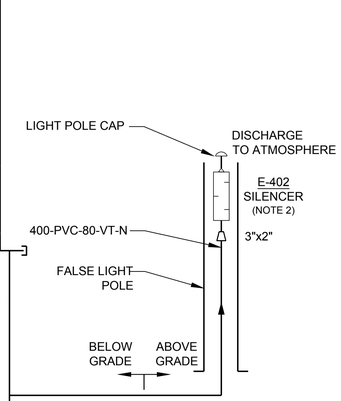
2. SILENCER TO BE INSTALLED IN LINE WITH 3" PVC PIPE WITHIN FALSE LIGHT POLE AND LOCATED AT THE TOP OF THE FALSE LIGHT POLE.
3. REMOVE ELECTRICAL PLUG FROM BLOWER CORD AND WIRE PER ELECTRICAL DRAWINGS.



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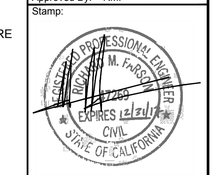
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF

Stamp:



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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

PROCESS & INSTRUMENTATION DIAGRAM (SHEET 2 OF 2)

P-102

Sheet: 5 of 17

MOBINI, GITA
\\SJ\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 P-102.DWG
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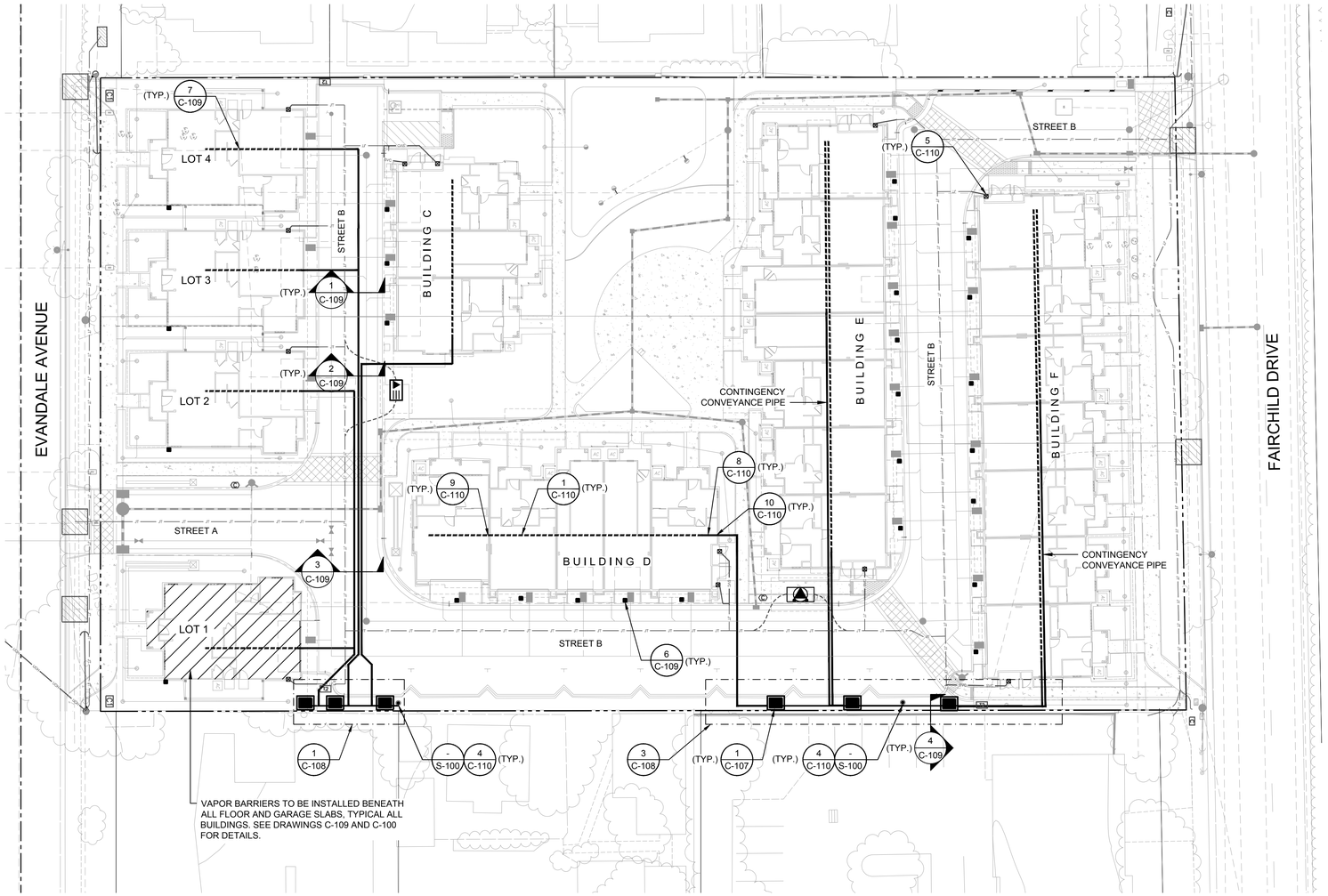

LEGEND

- SITE BOUNDARY
- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX (BY OTHERS)
- UTILITY TRENCH DAM LOCATION

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ALL EQUIPMENT IN THIS PACKAGE IS NEW UNLESS OTHERWISE INDICATED.

0 20 40 60 80
SCALE IN FEET

HALEY ALDRICH
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Approved By:	RMF

Stamp:

REGISTERED PROFESSIONAL ENGINEER
RICHARD M. FARSCHI
17259
EXPIRES 12/31/17
CIVIL
STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

OVERALL SITE PLAN

C-100

Sheet: 6 of 17

MOBINI, GITA
\\SJ\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-100.DWG
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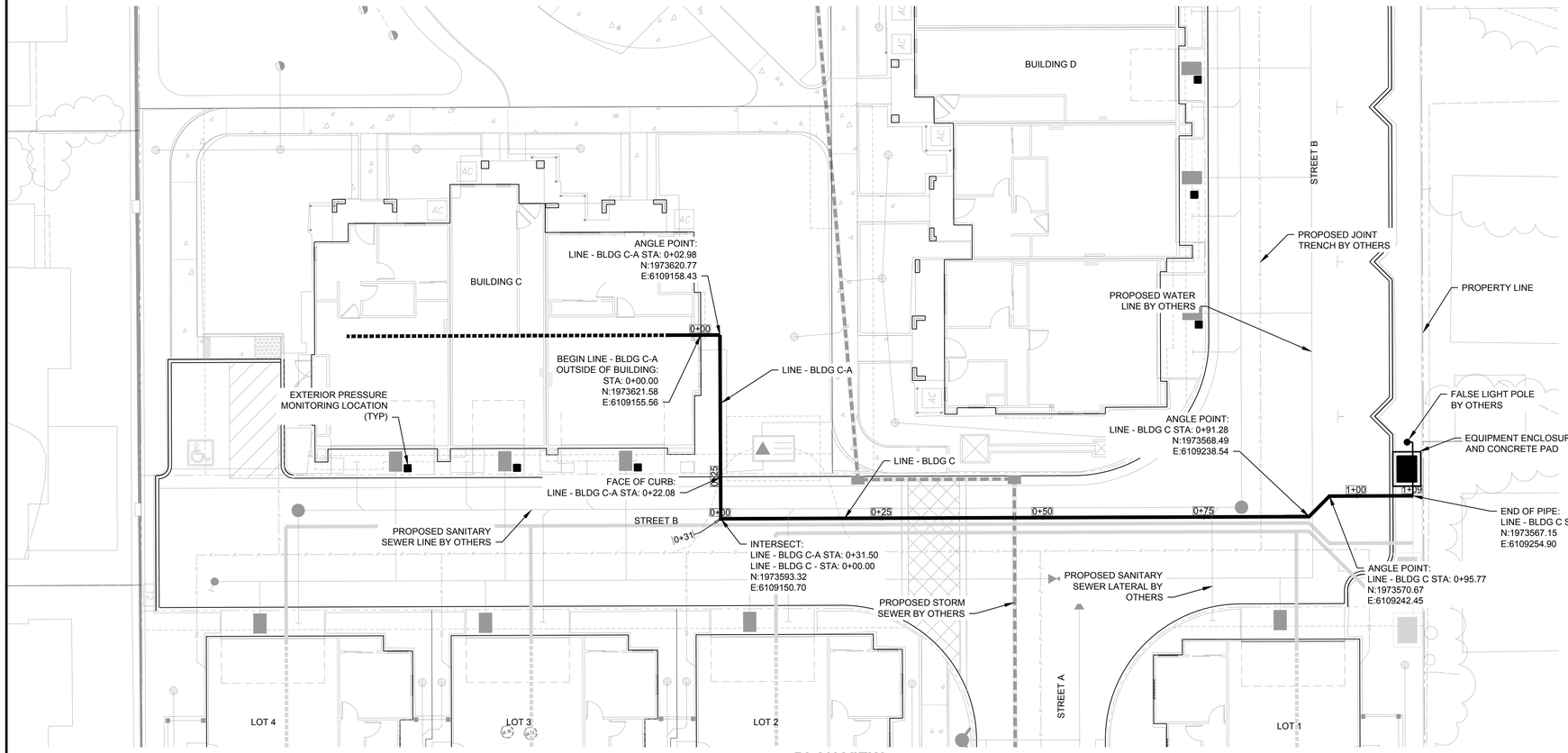
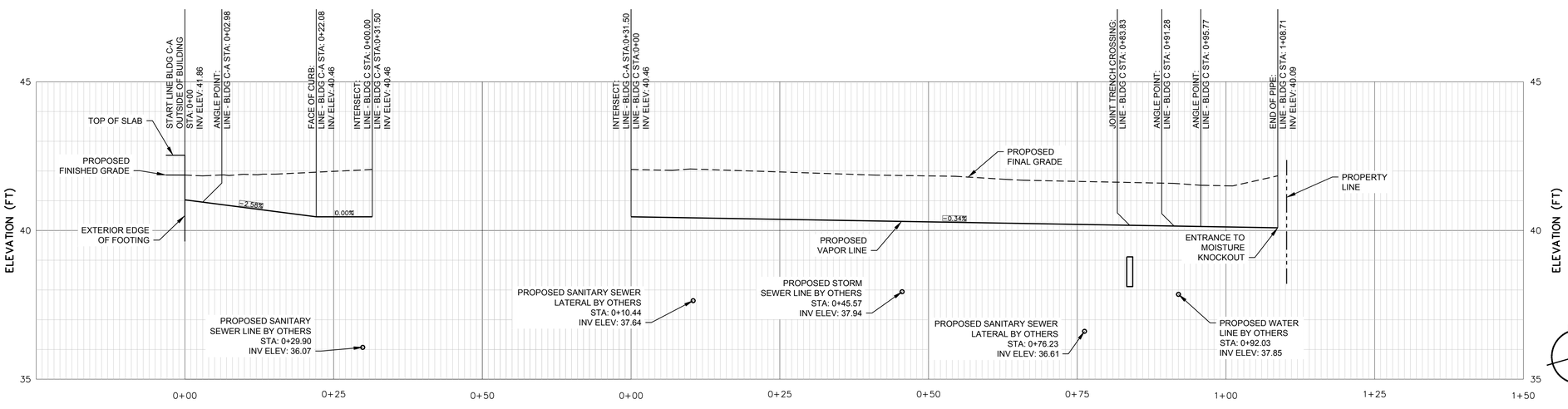


PLAN VIEW

AS SHOWN



PROFILE VIEW - LINE - BLDG C-A

AS SHOWN

STREET B
PROFILE VIEW - LINE - BLDG C

AS SHOWN

HORIZ. 0 10 20 30 40
VERT. 0 2 4 6 8
SCALE IN FEET

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

NOTES

1. CONTRACTOR TO VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES.
2. CONTRACTOR TO MAINTAIN A MINIMUM OF 18" OF COVER FROM TOP OF PIPE WHEN PIPE IS LOCATED IN THE STREET.
3. ALL EQUIPMENT IN THIS PACKAGE IS NEW UNLESS OTHERWISE INDICATED.
4. TOP OF JOINT UTILITY TRENCH IS A MINIMUM OF 30" BELOW PROPOSED FINAL GRADE. REFER TO JOINT TRENCH DRAWINGS BY TARRAR UTILITY CONSULTANTS FOR TRENCH INFORMATION.
5. UTILITY PIPE SIZES SHOWN IN PROFILES ARE NOT TO SCALE. REFER TO CIVIL DRAWINGS BY RUGGERI JENSEN AZAR FOR UTILITY PIPE SIZES.
6. MAINTAIN 1 FOOT OF VERTICAL CLEARANCE BETWEEN ALL UTILITIES.

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Approved By:	RMF

Stamp:

REGISTERED PROFESSIONAL ENGINEER
RICHARD M. FRASER
17269
EXPIRES 12/31/16
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STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - BUILDING C

C-101

Sheet: 7 of 17

MOBINI, GITA
G:\PROJECTS\36067-STC MEW VI\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-101.DWG
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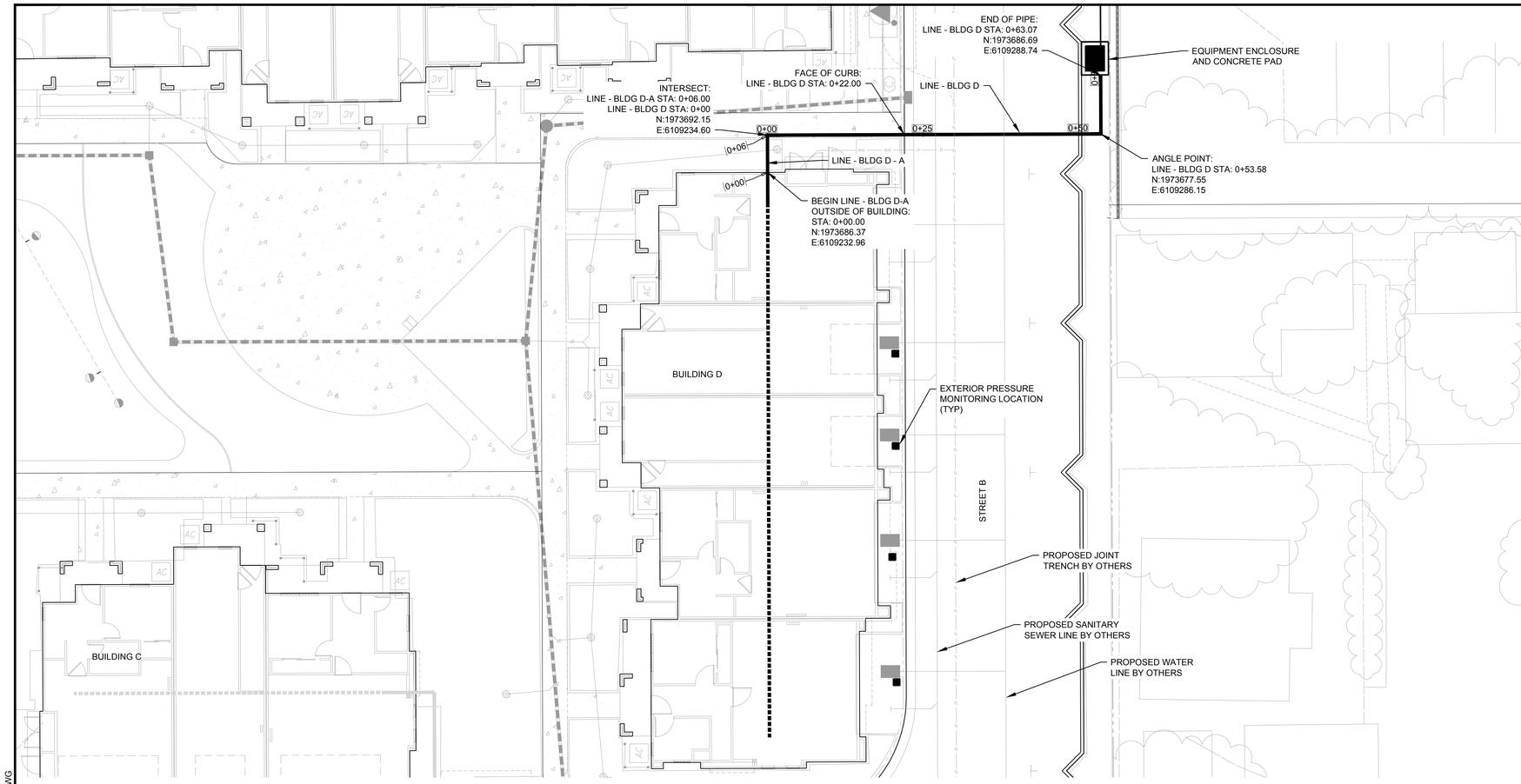

PLAN VIEW

AS SHOWN

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

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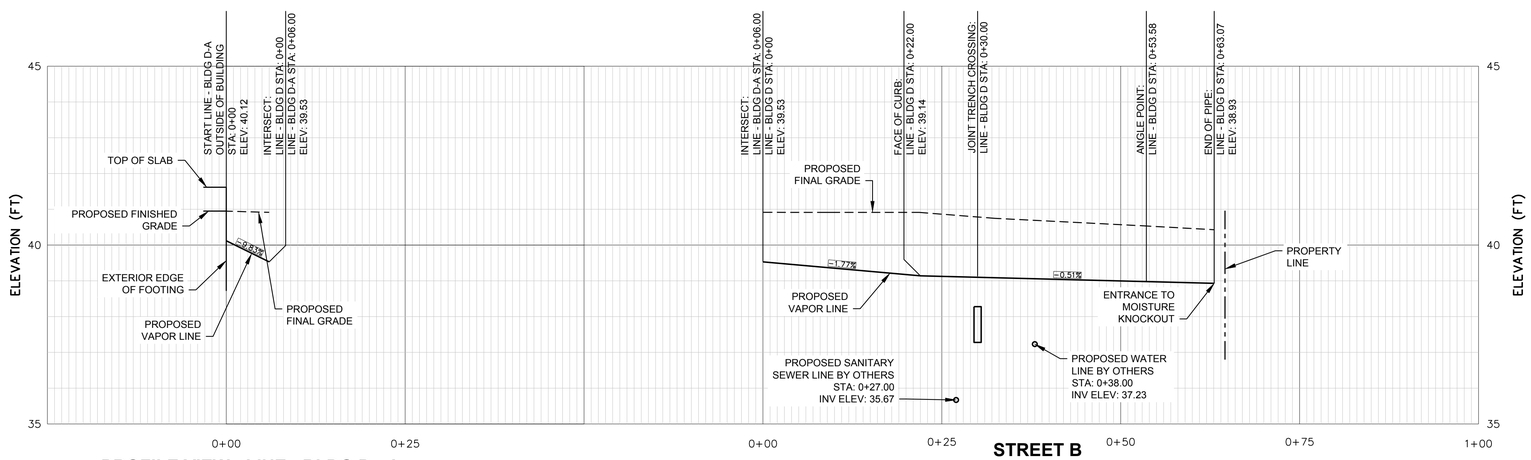

PROFILE VIEW - LINE - BLDG D - A

AS SHOWN

STREET B
PROFILE VIEW - LINE - BLDG D

AS SHOWN

HORIZ. 0 10 20 30 40
VERT. 0 2 4 6 8
SCALE IN FEET

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Checked By:	BKB/JCP
Approved By:	RMF

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REGISTERED PROFESSIONAL ENGINEER RICHARD M. FARROW 47269 EXPIRES 12/31/17 CIVIL STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

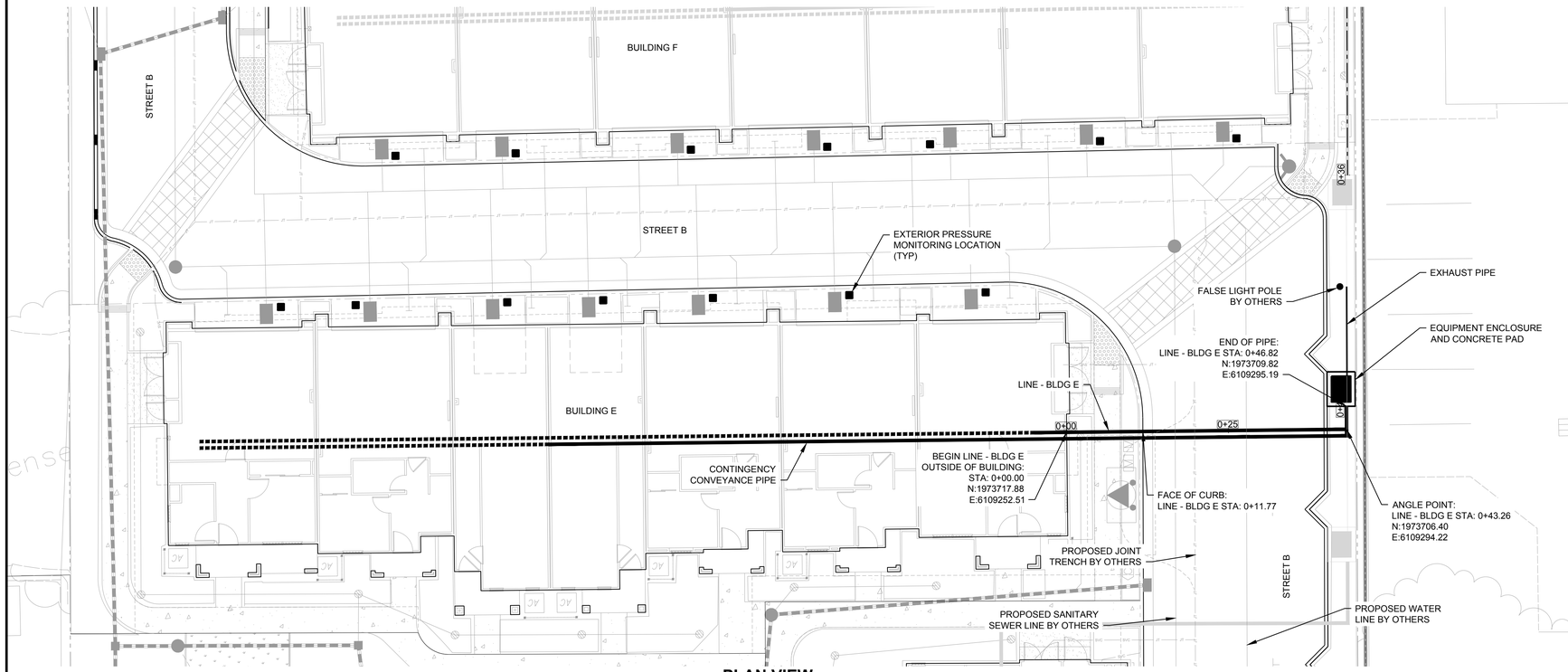
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - BUILDING D

C-102

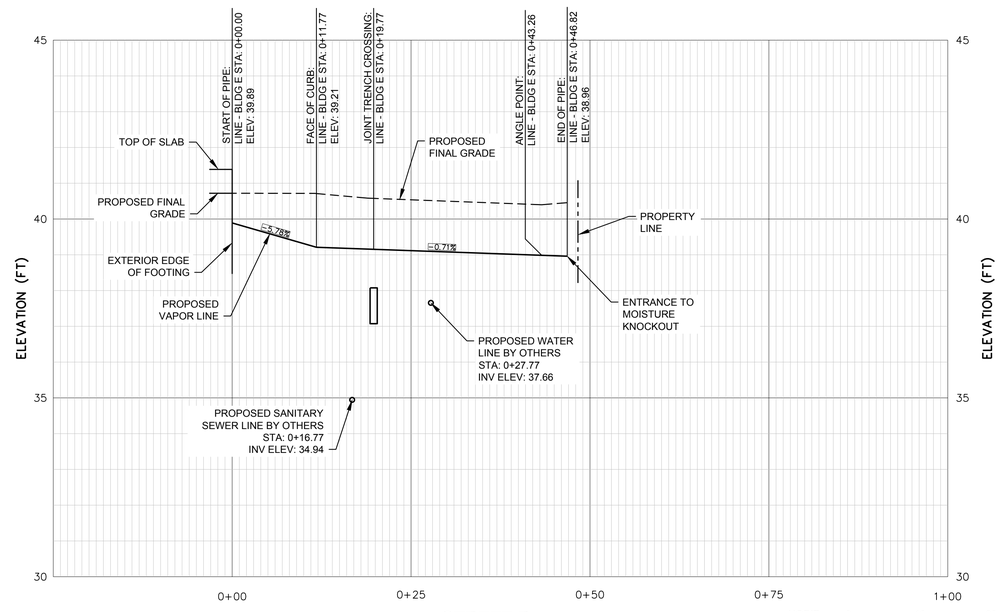
Sheet: 8 of 17

MOBINI, GITA
G:\PROJECTS\36067-STC MEW VI\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-102.DWG
Printed: 4/21/2016 7:44 AM Layout: C-102



PLAN VIEW

AS SHOWN



STREET B
PROFILE VIEW - LINE - BLDG E

AS SHOWN

HORIZ. 0 10 20 30 40

VERT. 0 2 4 6 8

SCALE IN FEET

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

NOTES

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6. MAINTAIN 1 FOOT OF VERTICAL CLEARANCE BETWEEN ALL UTILITIES.
7. INSTALL CONTINGENCY VAPOR VENT PIPE 1' FROM ADJACENT VAPOR VENT PIPE WHEN UNDERNEATH BUILDING SLAB. PVC CONVEYANCE PIPE SHALL BE LOCATED IN THE SAME TRENCH AS PROPOSED VAPOR LINE. CAP CONTINGENCY CONVEYANCE PIPE AT EQUIPMENT ENCLOSURE.

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Approved By:	RMF

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REGISTERED PROFESSIONAL ENGINEER RICHARD M. FARSHIDI 47269 EXPIRES 12/31/17 CIVIL STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

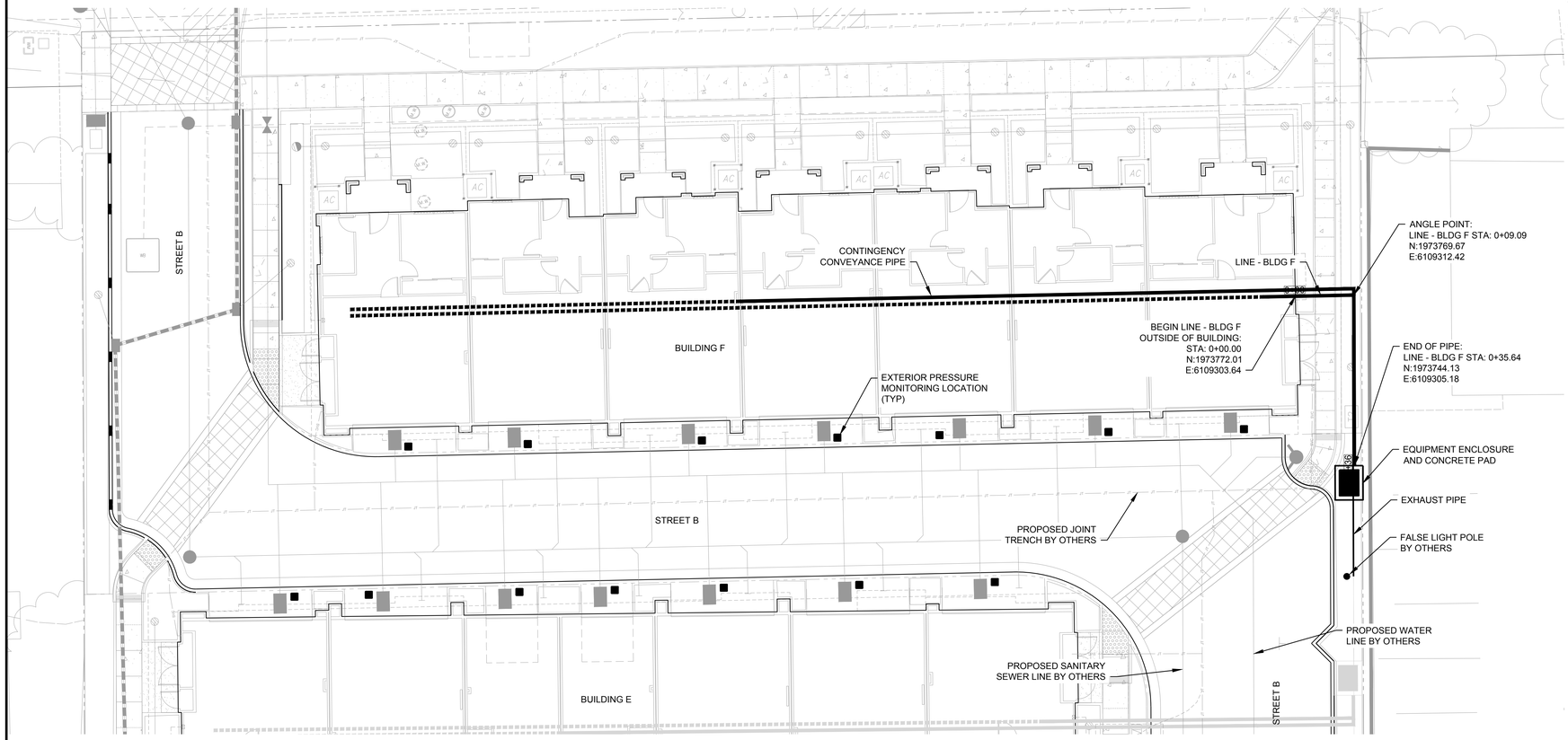
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - BUILDING E

C-103

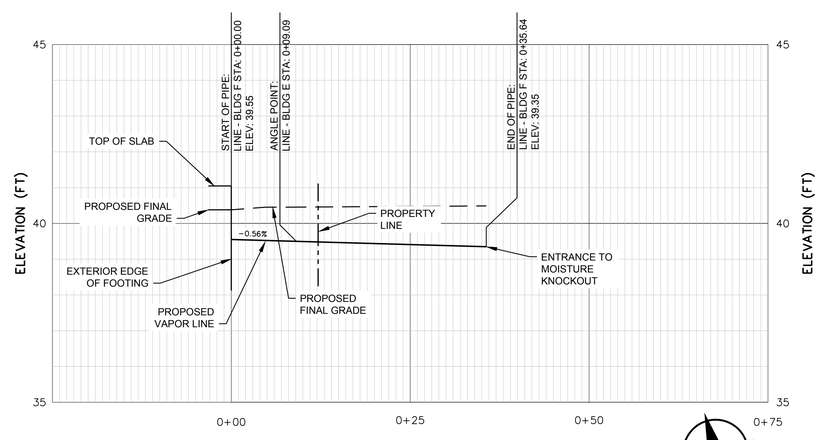
Sheet: 9 of 17

MOBINI, GITA
G:\PROJECTS\36067-STC MEW VI\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-103.DWG
Printed: 4/21/2016 7:43 AM Layout: C-103



PLAN VIEW

AS SHOWN



PROFILE VIEW - LINE - BLDG F

AS SHOWN

HORIZ. 0 10 20 30 40

VERT. 0 2 4 6 8

SCALE IN FEET

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

NOTES

1. CONTRACTOR TO VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES.
2. CONTRACTOR TO MAINTAIN A MINIMUM OF 18" OF COVER FROM TOP OF PIPE WHEN PIPE IS LOCATED IN THE STREET.
3. ALL EQUIPMENT IN THIS PACKAGE IS NEW UNLESS OTHERWISE INDICATED.
4. TOP OF JOINT UTILITY TRENCH IS A MINIMUM OF 30" BELOW PROPOSED FINAL GRADE. REFER TO JOINT TRENCH DRAWINGS BY TARRAR UTILITY CONSULTANTS FOR TRENCH INFORMATION.
5. UTILITY PIPE SIZES SHOWN IN PROFILES ARE NOT TO SCALE. REFER TO CIVIL DRAWINGS BY RUGGERI JENSEN AZAR FOR UTILITY PIPE SIZES.
6. MAINTAIN 1 FOOT OF VERTICAL CLEARANCE BETWEEN ALL UTILITIES.
7. INSTALL CONTINGENCY VAPOR VENT PIPE 1' FROM ADJACENT VAPOR VENT PIPE WHEN UNDERNEATH BUILDING SLAB. PVC CONVEYANCE PIPE SHALL BE LOCATED IN THE SAME TRENCH AS PROPOSED VAPOR LINE. CAP CONTINGENCY CONVEYANCE PIPE AT EQUIPMENT ENCLOSURE.

HALEY ALDRICH

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Project No.:	36067-070
Scale:	AS SHOWN
Date:	MARCH 2016
Drawn By:	PHK
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF
Stamp:	

REGISTERED PROFESSIONAL ENGINEER RICHARD M. FARSCHI 47269 EXPIRES 12/31/17 CIVIL STATE OF CALIFORNIA

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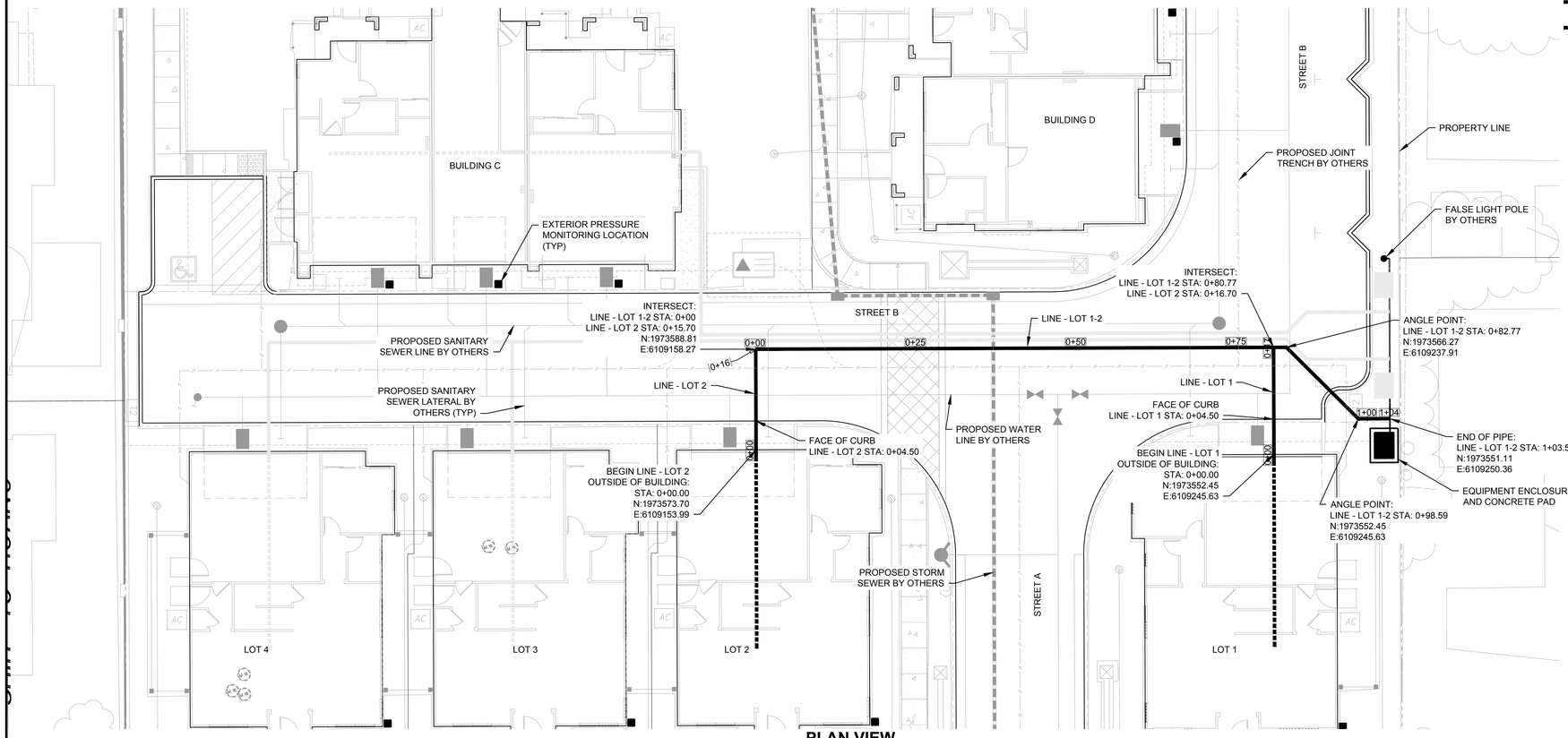
SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - BUILDING F

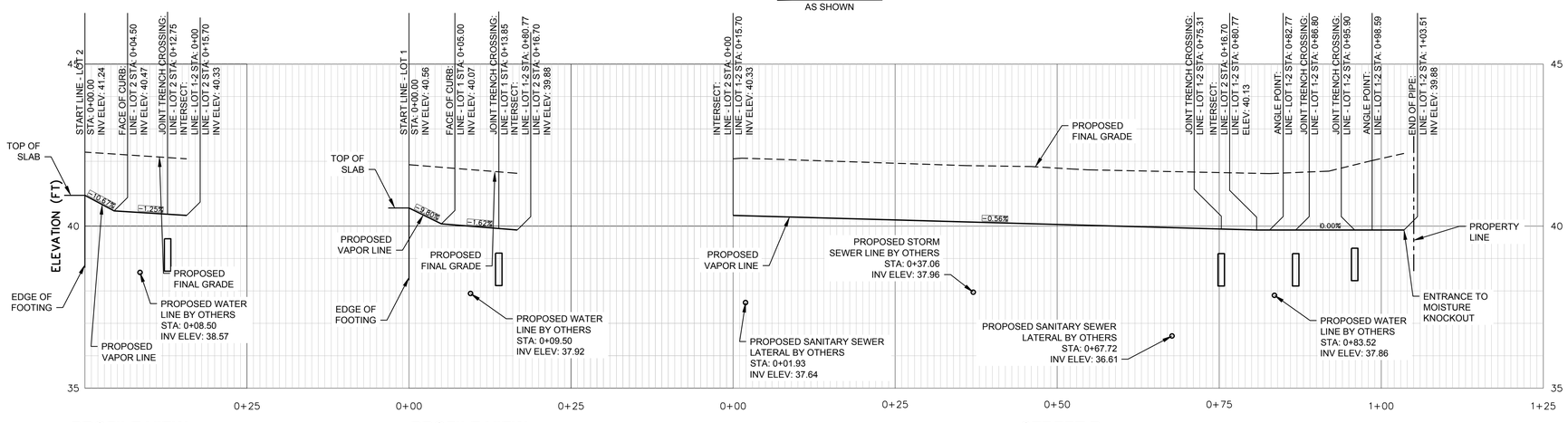
C-104

MOBINI, GITA
G:\PROJECTS\36067-STC MEW V\\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-104.DWG
Printed: 4/21/2016 7:43 AM Layout: C-104



PLAN VIEW

AS SHOWN



PROFILE VIEW - LINE - LOT 2

AS SHOWN

PROFILE VIEW - LINE - LOT 1

AS SHOWN

STREET B PROFILE VIEW - LINE - LOT 1-2

AS SHOWN

HORIZ. 0 10 20 30 40

VERT. 0 2 4 6 8

SCALE IN FEET

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

NOTES

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5. UTILITY PIPE SIZES SHOWN IN PROFILES ARE NOT TO SCALE. REFER TO CIVIL DRAWINGS BY RUGGERI JENSEN AZAR FOR UTILITY PIPE SIZES.
6. MAINTAIN 1 FOOT OF VERTICAL CLEARANCE BETWEEN ALL UTILITIES.

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

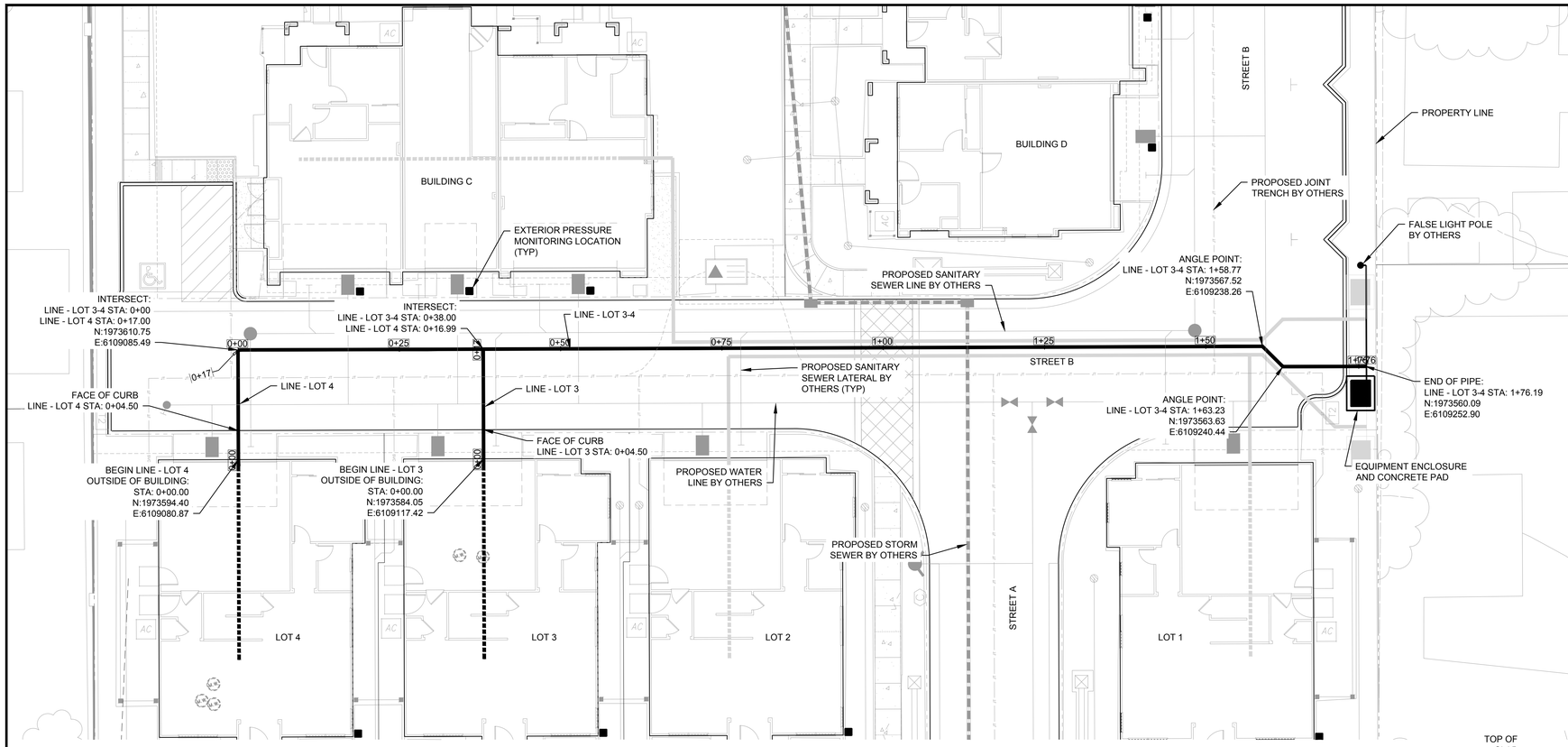
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - LOT 1 AND 2

C-105

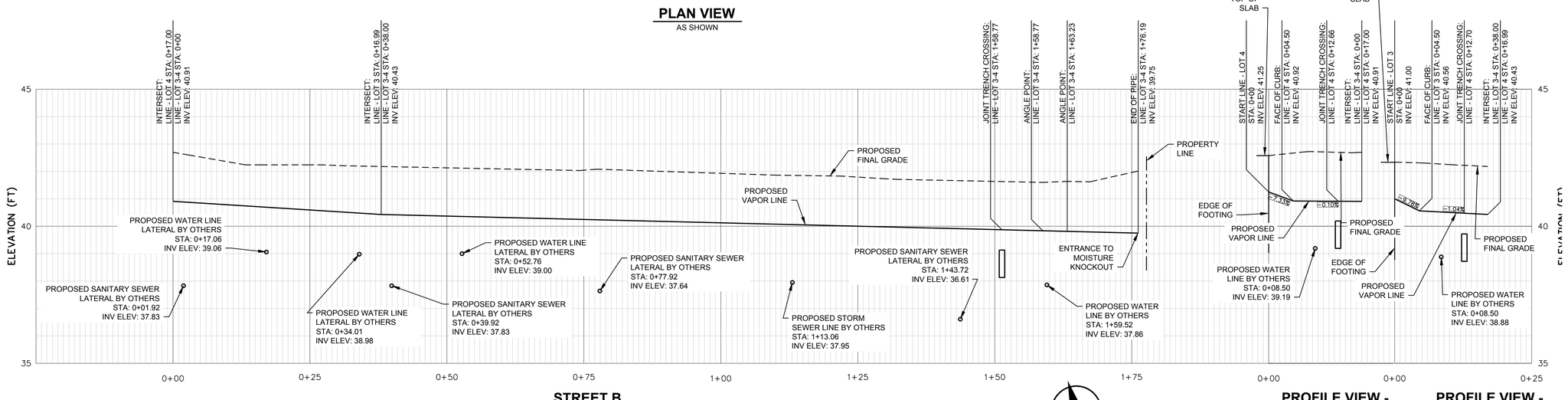
Sheet: 11 of 17

MOBINI, GITA
G:\PROJECTS\36067-STC MEW VI\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-105.DWG
Printed: 4/21/2016 7:42 AM Layout: C-105



PLAN VIEW

AS SHOWN



STREET B
PROFILE VIEW - LINE - LOT 3-4

AS SHOWN

PROFILE VIEW - LINE - LOT 4

AS SHOWN

PROFILE VIEW - LINE - LOT 3

AS SHOWN

HORIZ. 0 10 20 30 40

VERT. 0 2 4 6 8

SCALE IN FEET

LEGEND

- VAPOR VENT PIPE
- 3" SCH80 PVC CONVEYANCE PIPE
- EXTERIOR PRESSURE MONITORING LOCATION
- EQUIPMENT ENCLOSURE AND CONCRETE PAD
- WATER LATERAL WITH METER BOX BY OTHERS

NOTES

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5. UTILITY PIPE SIZES SHOWN IN PROFILES ARE NOT TO SCALE. REFER TO CIVIL DRAWINGS BY RUGGERI JENSEN AZAR FOR UTILITY PIPE SIZES.
6. MAINTAIN 1 FOOT OF VERTICAL CLEARANCE BETWEEN ALL UTILITIES.

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Approved By:	RMF

Stamp: REGISTERED PROFESSIONAL ENGINEER RICHARD M. FARSETH 17269 EXPIRES 12/31/17 CIVIL STATE OF CALIFORNIA

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

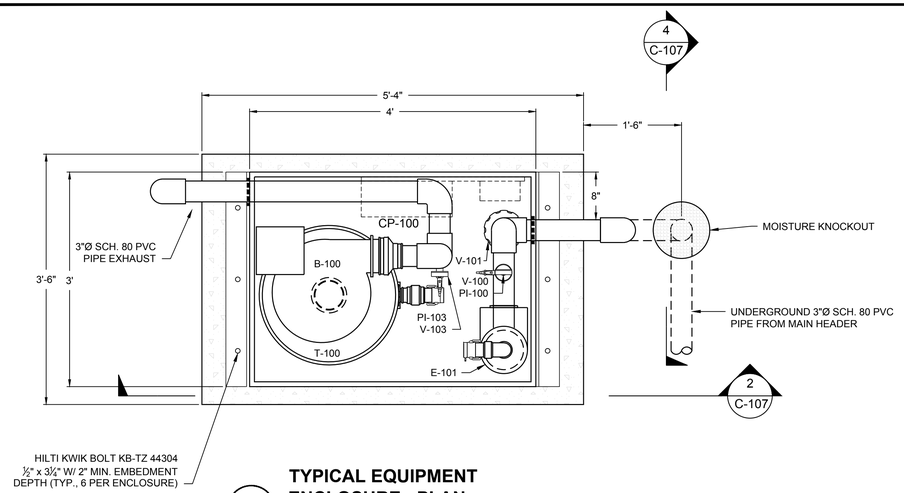
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN AND PROFILE - LOT 3 AND 4

C-106

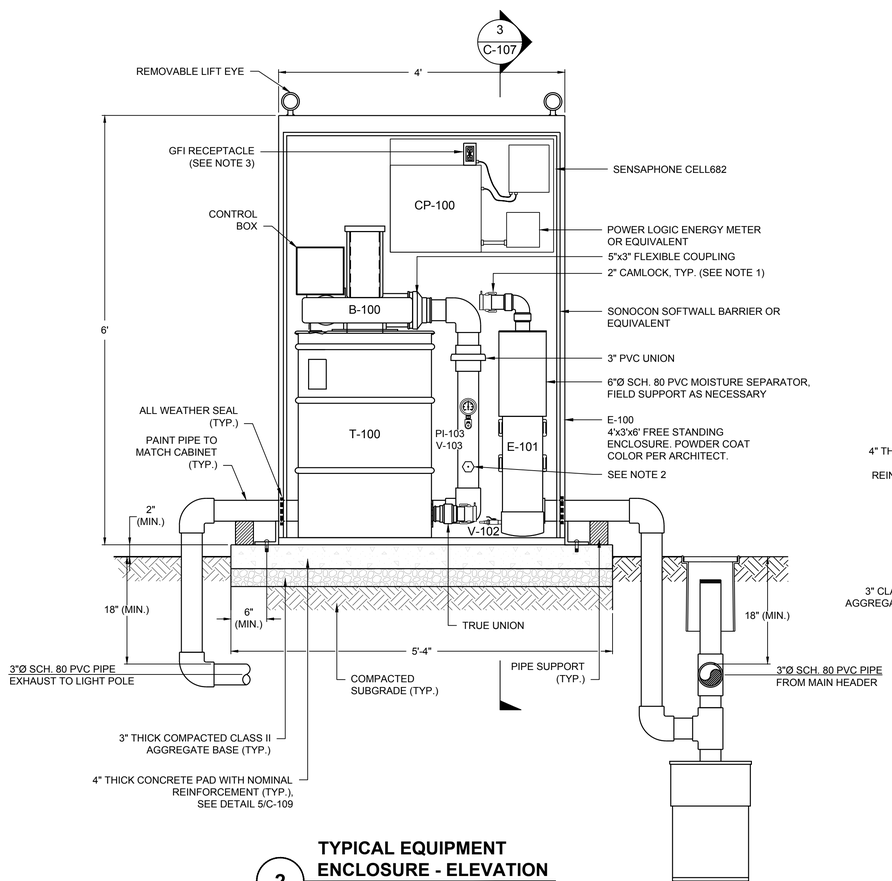
Sheet: 12 of 17

MOBINI, GITA
G:\PROJECTS\36067-STC MEW V\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-106.DWG
Printed: 4/21/2016 7:41 AM
Layout: C-106



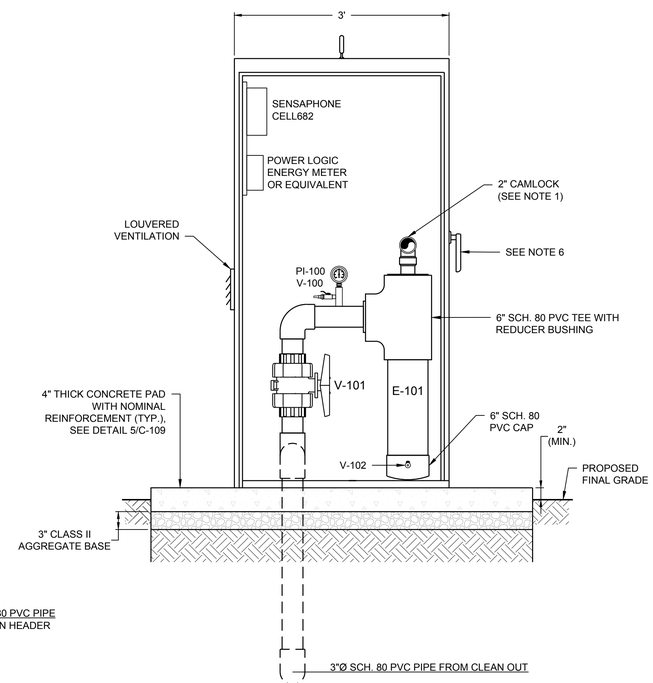
1 TYPICAL EQUIPMENT ENCLOSURE - PLAN

SCALE: 1" = 1'



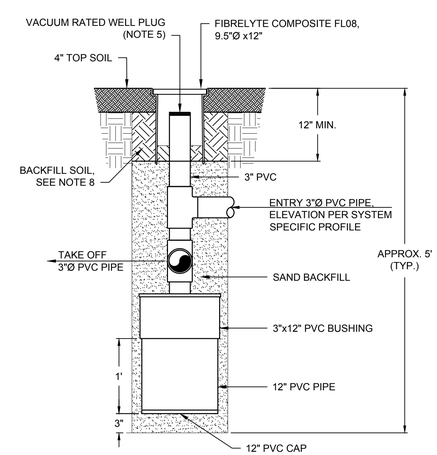
2 TYPICAL EQUIPMENT ENCLOSURE - ELEVATION

SCALE: 1" = 1'



3 TYPICAL EQUIPMENT ENCLOSURE - ELEVATION

SCALE: 1" = 1'



4 TYPICAL MOISTURE KNOCKOUT DETAIL

SCALE: 1" = 1'

NOTES

1. 2" FLEXIBLE HOSE FROM E-100 TO T-100.
2. ½" THREADED PLUG TO USE FOR FLOW MEASUREMENT BY HAND DEVICE.
3. PROVIDE UNISTRUT AT APPROPRIATE LOCATIONS FOR PROPER SUPPORT OF ALL PIPES AND EQUIPMENT. NO PIPING OR EQUIPMENT CAN BE SUPPORTED FROM BLOWER OUTLET. LOCATIONS TO BE DETERMINED IN THE FIELD BY CONTRACTOR.
4. ELECTRICAL CONDUIT ROUTING AND CONNECTIONS NOT SHOWN. REFER TO ELECTRICAL DRAWINGS.
5. WELL PLUG SHALL TO BE SUITED FOR FULL VACUUM.
6. CABINET DOOR MUST PROVIDE ACCESS FOR MAJOR EQUIPMENT REMOVAL AND MAINTENANCE.
7. EQUIPMENT TAGS SHOWN ARE FOR LOTS 1 & 2 EQUIPMENT ENCLOSURE. REFER TO SHEETS P-101 AND P-102 FOR OTHER LOCATION SPECIFIC TAGS.
8. BACKFILLED NATIVE OR IMPORTED SOIL, COMPACTED TO MINIMUM RELATIVE COMPACTION OF 95%.

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Approved By:	RMF

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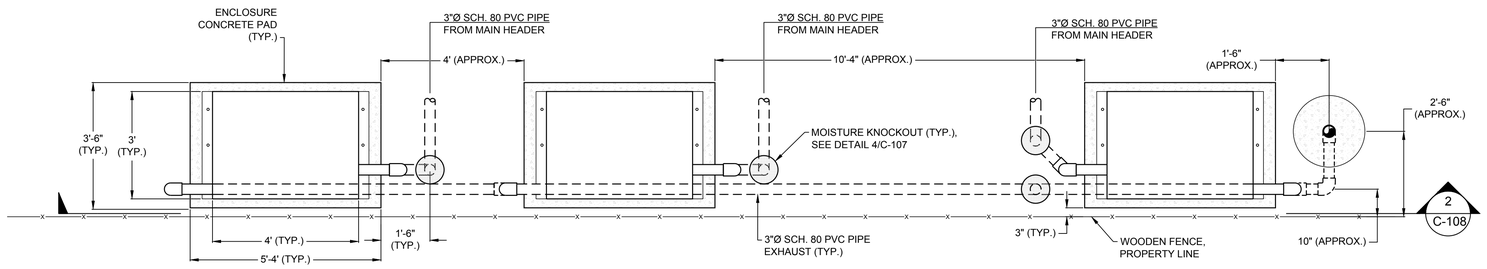
SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE
MOUNTAIN VIEW,
CALIFORNIA

EQUIPMENT ENCLOSURES AND CONSTRUCTION DETAILS

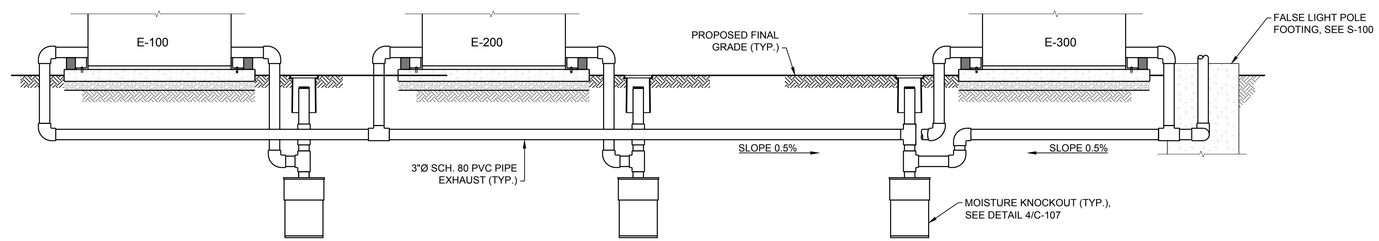
C-107

MOBINI, GITA
\\SJC\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-107.DWG
Printed: 4/21/2016 7:59 AM Layout: C-107



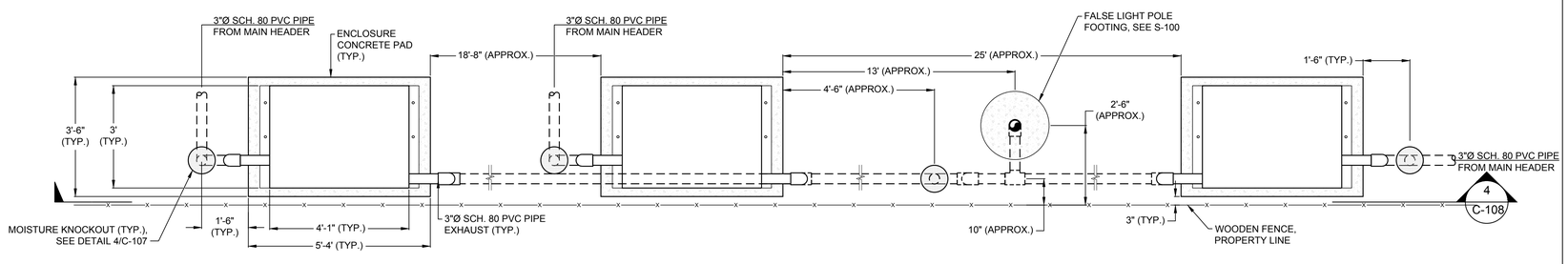
1 VAPOR EXHAUST PLAN

SCALE: 1" = 2'



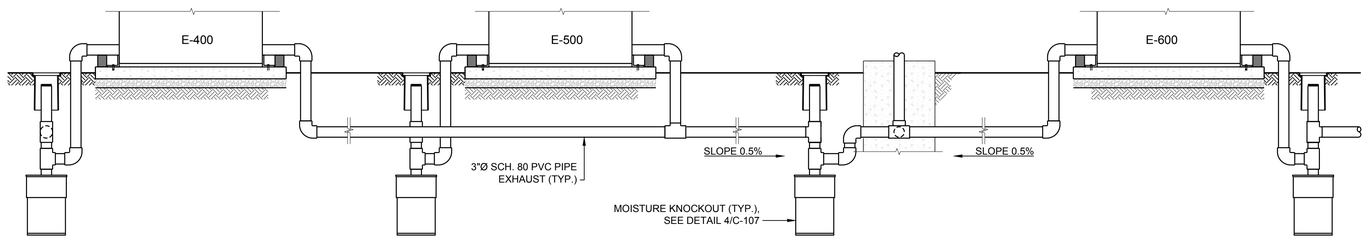
2 VAPOR EXHAUST ELEVATION

SCALE: 1" = 2'



3 VAPOR EXHAUST PLAN

SCALE: 1" = 2'



4 VAPOR EXHAUST ELEVATION

SCALE: 1" = 2'

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

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Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF

Stamp:

REGISTERED PROFESSIONAL ENGINEER
RICHARD M. FARGO
C 47289
EXPIRES 12/31/17
CIVIL
STATE OF CALIFORNIA

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SUB-SLAB
DEPRESSURIZATION
(SSD) SYSTEM

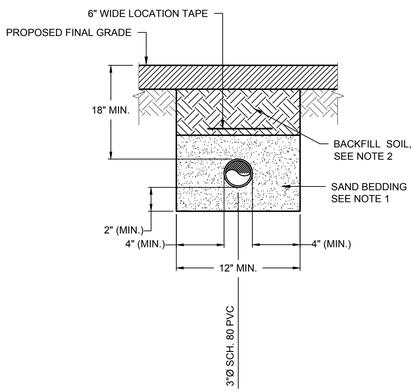
277 FAIRCHILD DRIVE
MOUNTAIN VIEW,
CALIFORNIA

EQUIPMENT
ENCLOSURE
EXHAUST
INSTALLATION

C-108

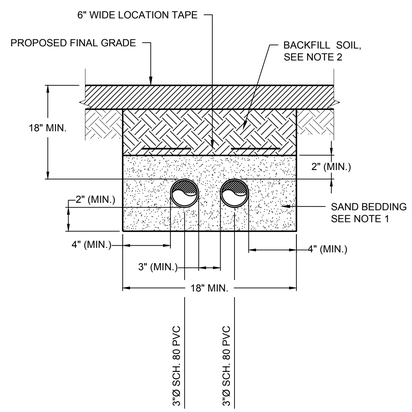
Sheet: 14 of 17

MOBINI, GITA
\\SJC\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-108.DWG
Printed: 4/21/2016 8:01 AM Layout: C-108



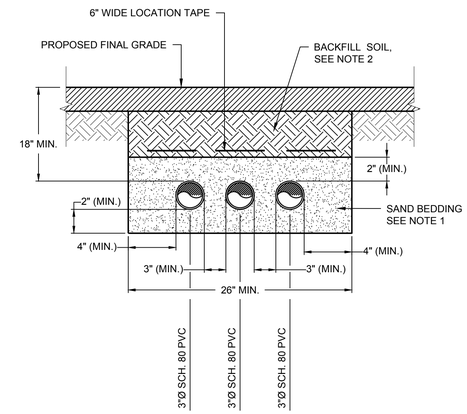
CONVEYANCE PIPE TRENCH (TYP.)

1 SCALE: NTS



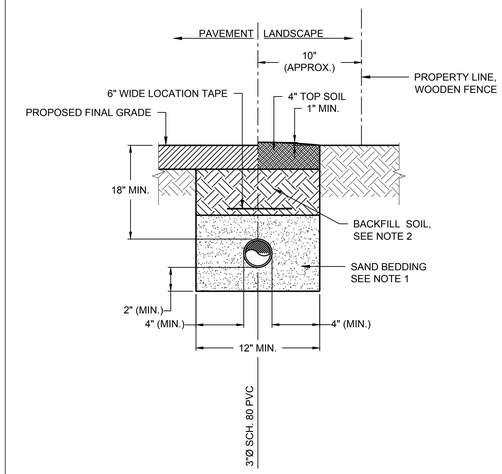
CONVEYANCE PIPE TRENCH (TYP.)

2 SCALE: NTS



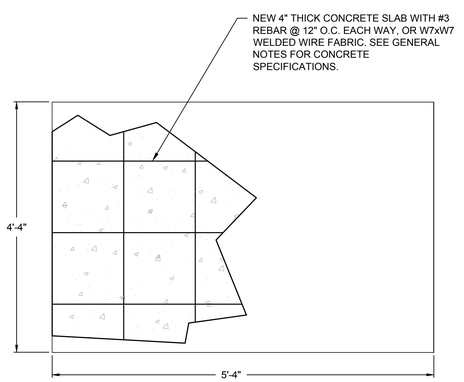
CONVEYANCE PIPE TRENCH (TYP.)

3 SCALE: NTS



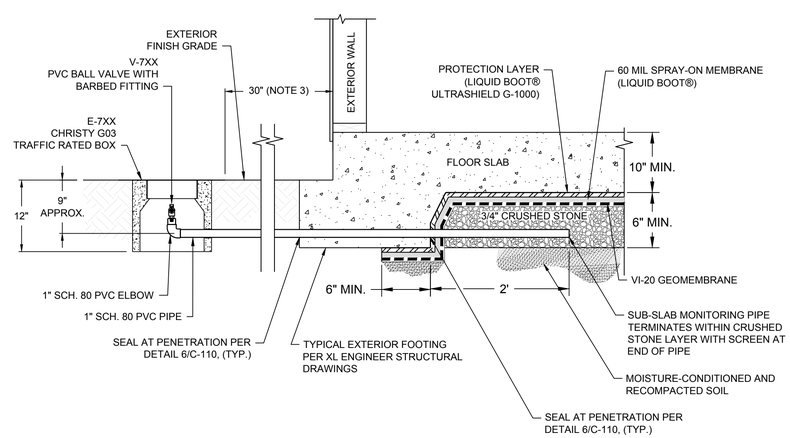
EXHAUST PIPE TRENCH (TYP.)

4 SCALE: NTS



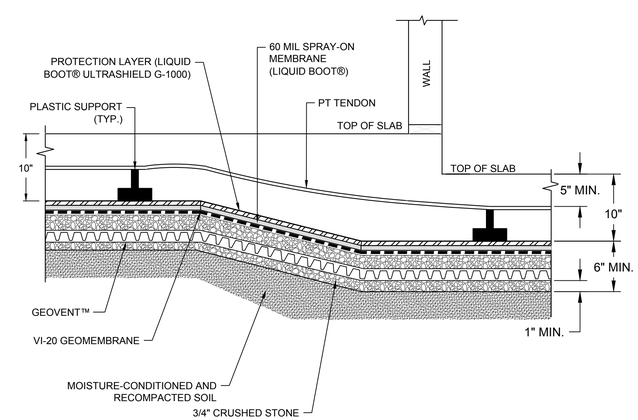
NEW CONCRETE PAD DETAIL (TYP.)

5 SCALE: NTS



NEW EXTERIOR PRESSURE MONITORING POINT DETAIL (TYP.)

6 SCALE: NTS



SLAB AT INTERIOR GARAGE WALL (TYP.)

7 SCALE: NTS

NOTES:

1. COMPACT SAND BEDDING TO MINIMUM RELATIVE COMPACTION OF 90%.
2. BACKFILLED NATIVE OR IMPORTED SOIL, COMPACTED TO MINIMUM RELATIVE COMPACTION OF 95%.
3. DIMENSION VARIES AT EACH EXTERIOR PRESSURE MONITORING POINT LOCATION.
4. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

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SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

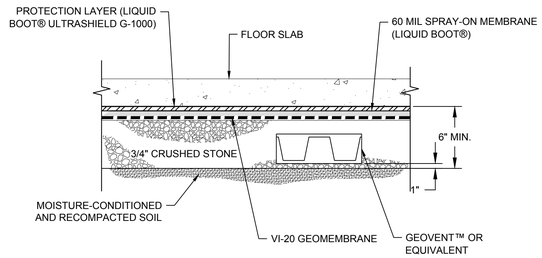
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

CONSTRUCTION DETAILS (SHEET 1 OF 2)

C-109

Sheet: 15 of 17

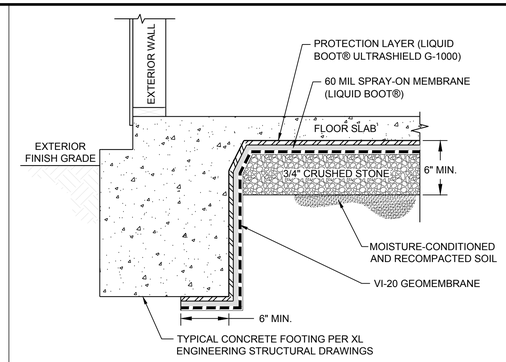
MOBINI, GITA
\\SJ\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-109.DWG
Printed: 4/21/2016 8:01 AM Layout: C-109



NOTE:

1. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

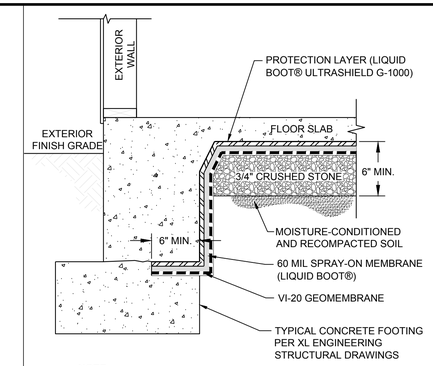
1 VAPOR BARRIER AND VENTING BELOW SLAB ON GRADE - TYPICAL CROSS-SECTION
SCALE: NTS



NOTE:

1. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

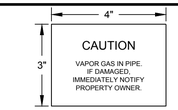
2 VAPOR BARRIER AT EXTERIOR FOOTINGS - MONOLITHIC POUR
SCALE: NTS



NOTE:

1. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

3 VAPOR BARRIER AT EXTERIOR FOOTINGS - TWO-STAGE POUR
SCALE: NTS



NOTES:

1. SIGNS: WEATHER AND FADE RESISTANT MATERIAL WITH ADHESIVE BACKING. LARGE LETTERS MIN. 1/2" HIGH RED LETTERS ON WHITE BACKGROUND.
2. POST SIGN ON EACH FALSE LIGHT POLE, 4 FEET ABOVE GROUND SURFACE.

FALSE LIGHT POLE
NOT TO SCALE

WARNING

A VAPOR CONTROL BARRIER UNDERLIES THIS STRUCTURE. NOTIFY THE HOMEOWNERS ASSOCIATION BEFORE PENETRATING THE BUILDING SLAB.

NOTES:

1. THIS NOTIFICATION IS TO BE PERMANENTLY STAMPED OR ETCHED IN THE SURFACE OF THE FLOOR SLAB AT THE TIME IT IS POURED OR A PLACECARD PERMANENTLY ADHERED TO COMPLETED SLAB.
2. LOCATION OF NOTIFICATION TO BE DETERMINED BY PROJECT SUPERINTENDENT.
3. ALL LETTERS 1/2" (MIN.) IN HEIGHT
4. ONE REQUIRED IN EACH GARAGE.

ON SLAB
NOT TO SCALE

4 CAUTION SIGNAGE
SCALE: NTS

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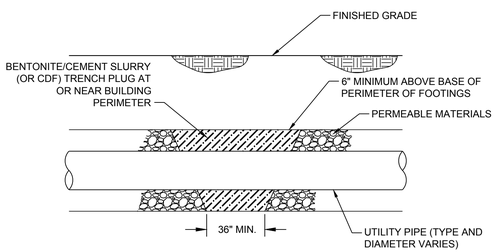
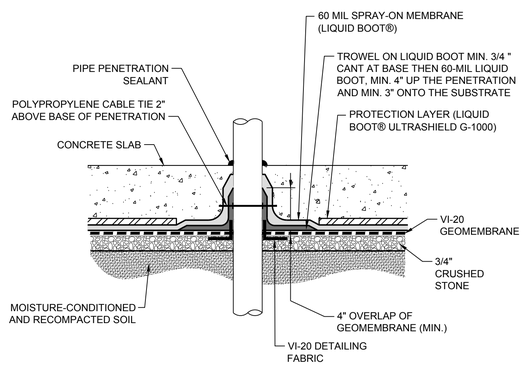
Haley & Aldrich, Inc.
2107 North 1st Street
San Jose, CA 95131-2028
Tel: 408.961.4805
Fax: 408.453.8708
www.haleyaldrich.com



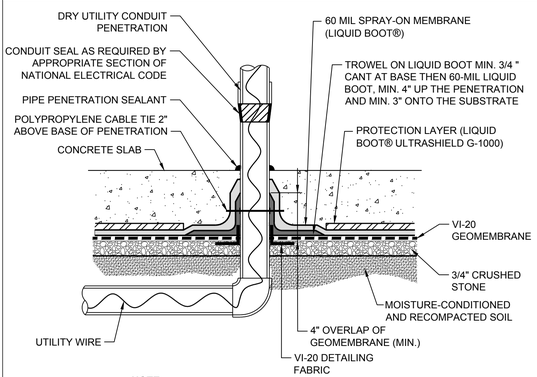
5 TYPICAL SOIL CUT-OFF BARRIER IN UTILITY TRENCH AT BUILDING PERIMETER
SCALE: NTS



NOTE:

1. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

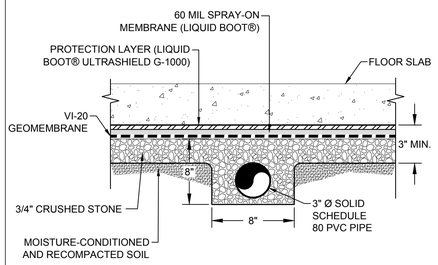
6 GEOMEMBRANE PENETRATION DETAIL
SCALE: NTS



NOTE:

1. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

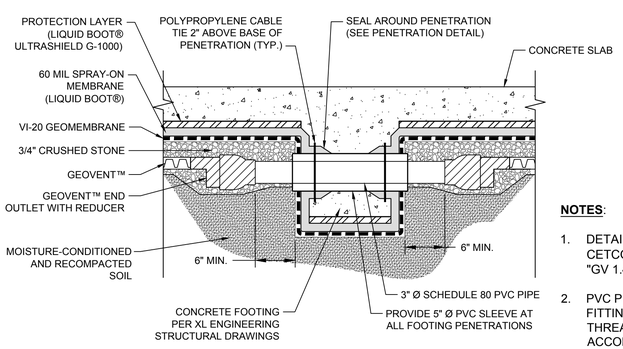
7 DRY UTILITY SLAB PENETRATION DETAIL
SCALE: NTS



NOTES:

1. PVC PIPING JOINTS AND FITTINGS SHALL BE THREADED OR WELDED IN ACCORDANCE WITH ASTM D2855. PRODUCTS WILL NOT CONTAIN THE CHEMICALS OF CONCERN.
2. PRODUCT SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

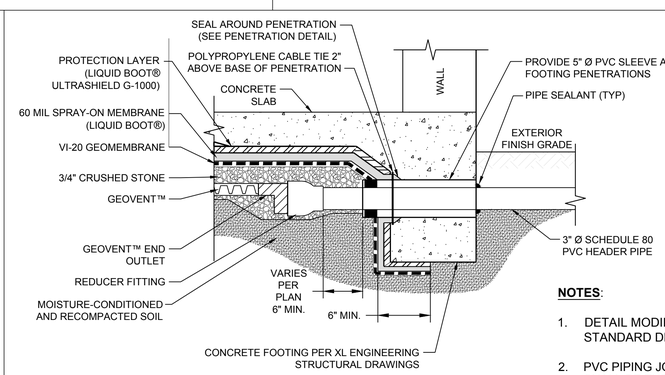
8 SUB-SLAB HEADER PIPE CROSS SECTION
SCALE: NTS



NOTES:

1. DETAIL MODIFIED FROM CETCO® STANDARD DETAIL "GV 1.4".
2. PVC PIPING JOINTS AND FITTINGS SHALL BE THREADED OR WELDED IN ACCORDANCE WITH ASTM D2855. PRODUCTS SHALL NOT CONTAIN THE CHEMICALS OF CONCERN.
3. PRODUCTS SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

9 SUB-SLAB VENT THROUGH INTERIOR FOOTING
SCALE: NTS



NOTES:

1. DETAIL MODIFIED FROM CETCO® STANDARD DETAIL "GV 1.2".
2. PVC PIPING JOINTS AND FITTINGS SHALL BE THREADED OR WELDED IN ACCORDANCE WITH ASTM D2855. PRODUCTS SHALL NOT CONTAIN THE CHEMICALS OF CONCERN.
3. PRODUCTS SUBSTITUTIONS MUST BE APPROVED IN ADVANCE BY ENGINEER.

10 SUB-SLAB VENT CONNECTION TO PVC HEADER PIPE (TYP.)
SCALE: NTS

Project No.:	36067-070
Scale:	AS SHOWN
Date:	MARCH 2016
Drawn By:	PHK
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF

Stamp:

Rev.	Description	By	Date
D	ISSUE FOR PERMIT	H&A	04/21/16
C	ISSUE TO PRPs	H&A	04/06/16
B	ISSUED FOR REVIEW	H&A	03/22/16
A	FOR INTERNAL REVIEW	H&A	03/11/16

SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

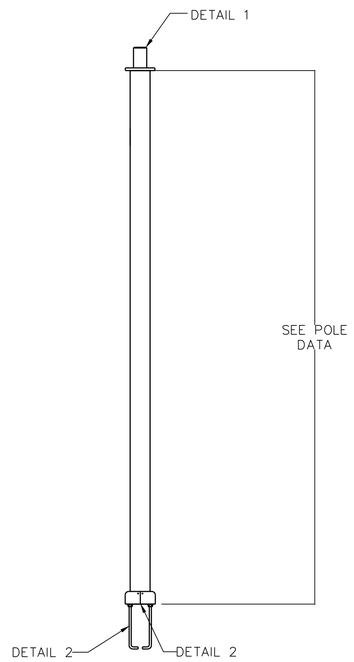
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

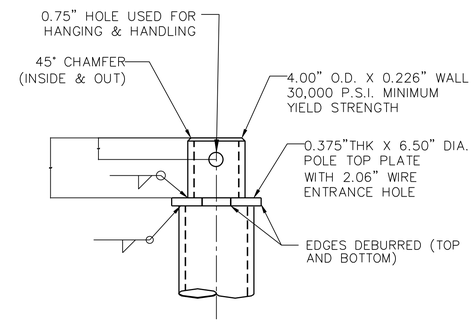
CONSTRUCTION DETAILS (SHEET 2 OF 2)

C-110

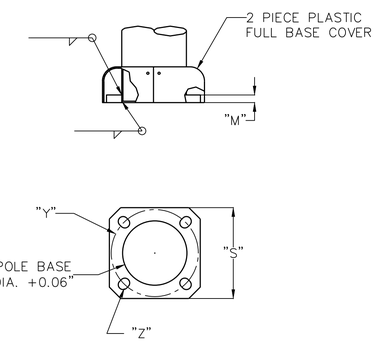
Sheet: 16 of 17

MOBINI, GITA
\\SJ\COMMON\36067_STC_MEW_VI\277 FAIRCHILD DR\600 - DESIGN\04 - DESIGN PLANS\CAD\36067-070 C-110.DWG
Printed: 4/21/2016 8:02 AM Layout: C-110

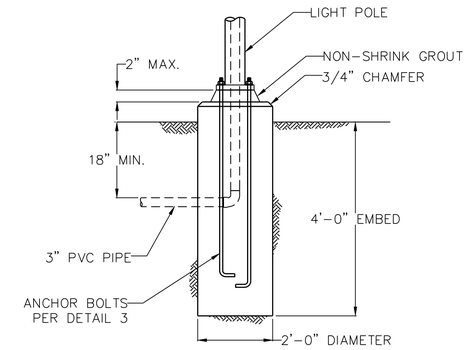




DETAIL 1 — POLE TOP TENON



DETAIL 2 — POLE BASE



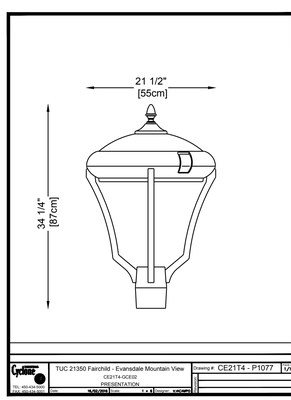
NOTES:

1. UPPER NUT OF ANCHOR BOLTS SHALL BE TENSIONED TO 70% OF ULTIMATE.
2. WELD MATERIAL SHALL BE E70XX.
3. WELDS SHALL BE 3/16" UNLESS NOTED OTHERWISE.
4. INSTALL POLE PLUMB USING LEVELING NUTS ON ANCHOR BOLTS.
5. CONTRACTOR SHALL PROVIDE HEX HEAD ASTM F 1554 GR. 55 1 HILTI ANCHOR BOL; TS.

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS
Wiss, Janney, Elstner Associates, Inc.

LIGHT POLE FOOTING

BY WJE, SEE NOTE 2



BY CYCLONE LIGHTING, SEE NOTE 3

BY VALMONT, SEE NOTE 1

MATERIAL DATA

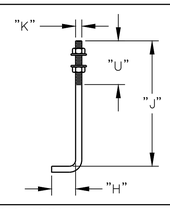
COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
POLE SHAFT	A500 GR B	42
POLE BASE	A36	36
ANCHOR BOLTS	F1554 GR.55	55
HARDWARE COATING	HOT DIP ZINC	

FINISH DATA

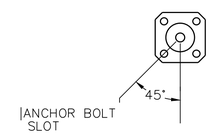
SYSTEM: FINISH PAINTED (FP)
BASE COAT: NONE
PRIME COAT: NONE
FINISH COAT: TGIC OR URETHANE POLYESTER POWDER
COLOR: BLCK
SPEC: F-264A

QTY.	POLE DESCRIPTION	POLE TUBE				POLE BASE				ANCHOR BOLT			
		BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	GAUGE OR THK. (IN)	SQUARE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	SLOT "Z" (IN)	DIA. "K" (IN)	LENGTH "J" (IN)	HOOK "H" (IN)	THREAD LENGTH "U" (IN)
2	DS340-6006120-P9-FP-FBC-AB-NO HH	6.00	6.00	12.00	0.188	9.50	9.00	1.000	1.13 X 1.69	1.00	36.00	4.00	6.00

(4)-ANCHOR BOLTS WITH (2) HEX NUTS AND (2) WASHERS PER BOLT WITH THREADED END GALVANIZED AT LEAST 12.00".



DETAIL 3 — ANCHOR BOLT



ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

RADIAL INDEX

ALTHOUGH RARE, VIBRATIONS SEVERE ENOUGH TO CAUSE DAMAGE CAN OCCASIONALLY OCCUR IN STRUCTURES OF ALL TYPES. BECAUSE THEY ARE INFLUENCED BY MANY INTERACTING VARIABLES, VIBRATIONS ARE GENERALLY UNPREDICTABLE. THE USER'S MAINTENANCE PROGRAM SHOULD INCLUDE OBSERVATION FOR EXCESSIVE VIBRATION AND EXAMINATION FOR ANY STRUCTURAL DAMAGE OR BOLT LOOSENING. THE VALMONT WARRANTY SPECIFICALLY EXCLUDES FATIGUE FAILURE OR SIMILAR PHENOMENA RESULTING FROM INDUCED VIBRATION, HARMONIC OSCILLATION OR RESONANCE ASSOCIATED WITH MOVEMENT OF AIR CURRENTS AROUND THE PRODUCT.

VIBRATION DISCLAIMER

NOTES

1. LIGHT POLE DESIGN BY VALMONT, DRAWING CA320802P1, DATED 02/19/2016.
2. LIGHT POLE FOOTING DESIGNED BY WJE.
3. LIGHT FIXTURE BY CYCLONE LIGHTING, DRAWING CE21T4-GCE02, DATED 02/15/2016.

HALEY & ALDRICH
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San Jose, CA 95131-2028
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www.haleyaldrich.com

Project No.:	36067-070
Scale:	AS SHOWN
Date:	MARCH 2016
Drawn By:	PHK
Designed By:	AJC
Checked By:	BKB/JCP
Approved By:	RMF

Stamp: LICENSED PROFESSIONAL ENGINEER JEFFREY M. RAUTENBERG No. C81634 Exp. 9/30/2017 CIVIL STATE OF CALIFORNIA

Rev.	Description	By	Date
D	ISSUE FOR PERMIT	H&A	04/21/16
C	ISSUE TO PRPs	H&A	04/06/16
B	ISSUED FOR REVIEW	H&A	03/22/16
A	FOR INTERNAL REVIEW	H&A	03/11/16

SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM

277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

FALSE LIGHT POLE STRUCTURAL DESIGN

S-100

Sheet: 17 of 17

MOBINI, GITA
G:\36067_STC_MEW_VII\277 FAIRCHILD DR\600 SERIES - DESIGN\04 - DESIGN PLANS\CAD\36067-070 S-100.DWG
Printed: 4/20/2016 12:39 PM Layout: S-100

Sub-Slab Depressurization Electrical System

277 Fairchild Road, Mountain View, California

DRAWING INDEX

SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM

1000	SHEET INDEX
1000-A	ELECTRICAL SYMBOLS AND ABBREVIATIONS
1010	CONTROL SYSTEM LAYOUT
1011	CONTROL PANEL ENCLOSURE LAYOUT
1012	CONTROL PANEL BACKPLATE LAYOUT
1020	SINGLE LINE DIAGRAM / POWER DISTRIBUTION

REV	DESCRIPTION	DATE	NAME
D	ISSUE TO EPA	H&A	04/21/16
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A	FOR INTERNAL REVIEW	H&A	03/11/16

PROFESSIONAL ENGINEER SHAWN FERRON E 20687 03-31-2018 ELECTRICAL STATE OF CALIFORNIA

CALCON SYSTEMS
Automation & Process Control Specialists

CALCON SYSTEMS, INC.
12919 ALCOSTA BLVD, SUITE 9
SAN RAMON, CA 94583
TEL: 925-277-0665
WWW.CALCON.COM

DRAWN	JU	03/14/16
DESIGN	RY	03/14/16
CHECKED	RY	03/14/16
APPROVED	RY	03/14/16

FILE: 11671_1000.DWG

CLIENT: HALEY & ALDRICH

JOB: 11671

LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM SHEET INDEX

DRAWING NO. 1000 | REV D | SHEET 1 OF 6

Z:\CUSTOMERS\H_CUSTOMERS\HALEY & ALDRICH\11671_SCHLUMBERGER SSDS DESIGN\DRAWINGS\CALCON DWG FILES\11671_1000.DWG

- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- NORMALLY OPEN LIMIT SWITCH
- NORMALLY CLOSED LIMIT SWITCH
- NORMALLY OPEN FLOAT SWITCH
- NORMALLY CLOSED FLOAT SWITCH
- NORMALLY OPEN PRESSURE SWITCH
- NORMALLY CLOSED PRESSURE SWITCH
- NORMALLY OPEN TEMPERATURE SWITCH
- NORMALLY CLOSED TEMPERATURE SWITCH
- NORMALLY CLOSED FLOW SWITCH (AIR OR FLUID)
- NORMALLY OPEN FLOW SWITCH (AIR OR FLUID)
- NORMALLY OPEN PUSHBUTTON (MOMENTARY CONTACT)
- NORMALLY CLOSED PUSHBUTTON (MOMENTARY CONTACT)
- NORMALLY OPEN MUSHROOM PUSHBUTTON
- NORMALLY CLOSED MUSHROOM PUSHBUTTON, MOMENTARY OPEN.
- SWITCH 2 POSITION NORMALLY OPEN
- SWITCH 2 POSITION NORMALLY CLOSED
- SWITCH 3 POSITION HAND-OFF-AUTO
- SINGLE POLE TOGGLE SWITCH ("ON-OFF",ETC.)
- GROUND CONNECTION.
- NORMALLY OPEN SWITCH WITH TIME DELAY CLOSING.
- NORMALLY CLOSED SWITCH WITH TIME DELAY OPENING.
- NORMALLY OPEN SWITCH WITH TIME DELAY OPENING
- NORMALLY CLOSED WITH TIME DELAY CLOSING
- HEATER
- CURRENT TRANSFORMER
- COIL/INDUCTOR
- TRANSFORMER
- 1 — TERMINAL BLOCK
- #A F1 — FUSED TERMINAL BLOCK
- 1 — GROUNDED TERMINAL BLOCK
- CIRCUIT BREAKER

- WHM — WATT HOUR METER AND SOCKET
- PF — POWER FAILURE RELAY
- M — METER & CURRENT TRANSFORMER
- R — RELAY
- LR — LATCHING RELAY
- TD — TIME DELAY RELAY
- ISR — INTRINSICALLY SAFE RELAY
- DUPLEX RECEPTACLE
- SIMPLEX RECEPTACLE
- BATTERY
- ELECTROLYTIC CAPACITOR
- SOLENOID
- RESISTOR
- DIODE
- MOTOR OVERLOAD
- CROSSING OF CONDUCTORS NOT CONNECTED.
- CONNECTION OF CONDUCTORS CONNECTED
- C — INDICATOR LIGHT COLOR AS INDICATED
- LA — LIGHTNING ARRESTOR
- EQUIPMENT TAG REFERENCE
- I/O POINT REFERENCE PLC, I/O RACK, OR ANNUNCIATOR PANEL
- DRAWING REFERENCE
- LOCATION SYMBOL
- M — MOTOR STARTER CONTACTOR COIL
- 1 — SHEET NOTE TAG
- E-1 — EDGE CONNECTOR
- INSTRUMENT (SEE IDENTIFICATION TABLE)
- PANEL WIRE
- BOUNDARY LINE
- FIELD WIRING
- INTERNALLY CONNECTED

SUCCEEDING LETTERS
FIRST LETTER
UNIT PROCESS NUMBER
LOOP NUMBER

FC
A-B

- FC / A-B — FIELD MOUNTED INSTRUMENT
- AIT / A-B — FACE MOUNTED INSTRUMENT MAIN PANEL, OPERATOR ACCESSIBLE
- AIT / A-B — PANEL MOUNTED INSTRUMENT OPERATOR INACCESSIBLE
- AIT / A-B — FACE MOUNTED INSTRUMENT FIELD PANEL, OPERATOR ACCESSIBLE
- AIT / A-B — MULTIFUNCTION INSTRUMENT
- QUICK DISCONNECT COUPLER
- EXPANSION JOINT OR RUBBER BOOT
- FLEX HOSE
- S — SOLENOID VALVE
- M — 3-WAY VALVE (MOTOR ACTUATED)
- PRESSURE REGULATOR, SELF-CONTAINED, WITH HANDWHEEL ADJUSTABLE SET POINT
- AIR ACTUATED VALVE
- MANUAL VALVE
- SAMPLE PORT
- CHECK VALVE
- NEEDLE VALVE
- METERING PUMP

	First Letter		Succeeding letters		
	Measured or Initiating Variable	Modifier	Readout or Passive Function	Output Function	Modifier
A	Analysis, Amperage		Alarm		
B	Burner, Combustion				
C	Contactor			Control	
D		Differential			
E	Voltage		Sensor		
F	Flow Rate	Ratio			
G			Glass		
H	Hand				High
I	Current (Electrical)		Indicate		
J	Power	Scan			
K	Time, Schedule	Time, Rate of Change		Control Station	
L	Level		Light		Low
M		Momentary			Middle, Intermediate
N					
O			Orifice, Restriction		
P	Pressure	Integrate	Point Connection		
Q	Quantity				
R	Radiation		Record		
S	Speed, Frequency	Safety		Switch	
T	Temperature			Transmit	
U	MultiVariable		Multifunction	Multifunction	Multifunction
V	Vibration			Valve, Damper, Louver	
W	Weight, Force		Well		
X		X Axis			
Y	Even, State, Presence	Y Axis		Relay, Compute, Convert	
Z	Position, Dimension	Z Axis		Driver, Actuator	

Abbreviations

A	AMPERES	DPST	DOUBLE POLE SINGLE THROW	M	MOTOR	SPDT	SINGLE POLE DOUBLE THROW
AC	ALTERNATING CURRENT	DWG	DRAWING	MOV	MOTOR OPERATED VALVE	SPST	SINGLE POLE SINGLE THROW
ATS	AUTOMATIC TRANSFER SWITCH	E	EXISTING	N	NEUTRAL	STL	STEEL
AUX	AUXILIARY	FDR	FEEDER	NC	NORMALLY CLOSED	STP	SHIELDED TIWSTED PAIR
AUTO	AUTOMATIC	FIN	FINISHED	NEC	NATIOAL ELECTRIC CODE	SOV	SOLENOID VALVE
AWG	AMERICAN WIRE GAUGE	FLA	FULL LOAD AMPS	NO	NORMALLY OPEN	SW	SWITCH
BC	BARE COPPER	GFI	GROUND FAULT INTERRUPT	NTS	NOT TO SCALE	TB	TERMINAL BLOCK
BKR	BREAKER	GND	GROUND	NV	NEEDLE VALVE	TD	TIME DELAY
C	CONTACTOR	HOA	HAND-OFF-AUTO	OT	OVERTEMP	TEMP	TEMPERATURE
CB	CIRCUIT BREAKER	HS	HAND SWITCH	PR	PRESSURE REGULATOR	TERM	TERMINAL
COND	CONDUCTOR	IN	INCHES	PLC	PROGRAMMABLE CONTROLLER	T	TEMPERATURE SWITCH
CONTD	CONTINUED	JB	JUNCTION BOX	PNL	PANEL	TYP	TYPICAL
CP	CONTROL PANEL	KVA	KILOVOLT-AMPERES	POS	POSITION	UG	UNDERGROUND
CT	CURRENT TRANSFORMER	KW	KILOWATT	REC	RECEPTACLE	V	VOLTS
CR	CONTROL RELAY	LM	LIMIT	RTU	REMOTE TERMINAL UNIT	VFD	VARIABLE FREQUENCY DRIVE
CV	CHECK VALVE	MA	MILLIAMPERES	SEL	SELECTOR	W	WATTS
DC	DIRECT CURRENT	MCC	MOTOR CONTROL CENTER	SPEC	SPECIFICATION	W/	WITH
DPDT	DOUBLE POLE SINGLE THROW	MIN	MINUTES OR MINIMUM	SS	STAINLESS STEEL	W/O	WITHOUT

REV	DESCRIPTION	DATE	NAME
D	ISSUE TO EPA	04/21/16	H&A
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PROFESSIONAL ENGINEER SHAWN FERRON E 20687 03-31-2018 ELECTRICAL STATE OF CALIFORNIA

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DRAWN	JU	03/14/16
DESIGN	RY	03/14/16
CHECKED	RY	03/14/16
APPROVED	RY	03/14/16

FILE: 11671_1000-A.DWG

CLIENT: HALEY & ALDRICH
JOB: 11671
LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM
ELECTRICAL SYMBOLS AND ABBREVIATIONS

DRAWING NO. 1000-A | REV D | SHEET 2 OF 6

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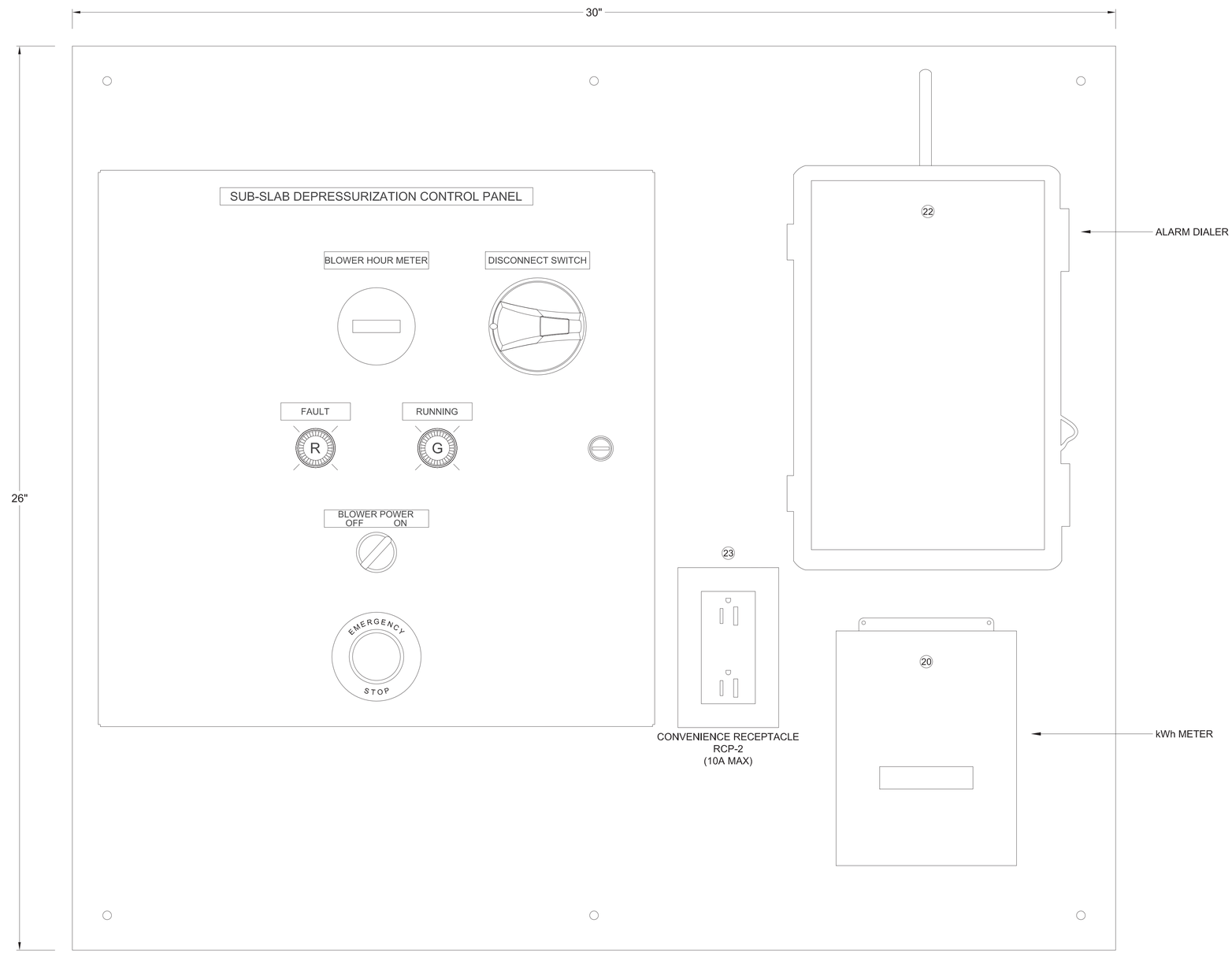
CONTROL SYSTEM LAYOUT



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DESIGN	RY	03/14/16
CHECKED	RY	03/14/16
APPROVED	RY	03/14/16

FILE: 11671_1010.DWG

CLIENT: HALEY & ALDRICH
JOB: 11671
LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

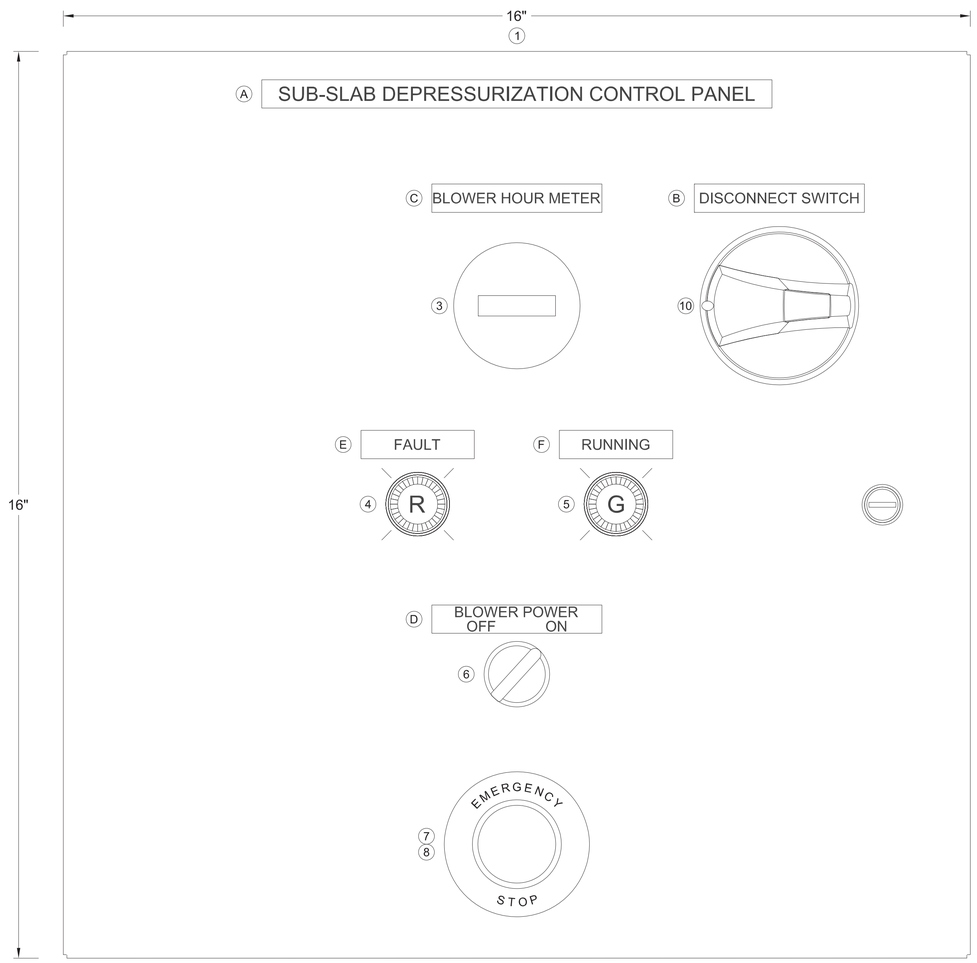
TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM
CONTROL SYSTEM LAYOUT

DRAWING NO. 1010 | REV D | SHEET 3 OF 6

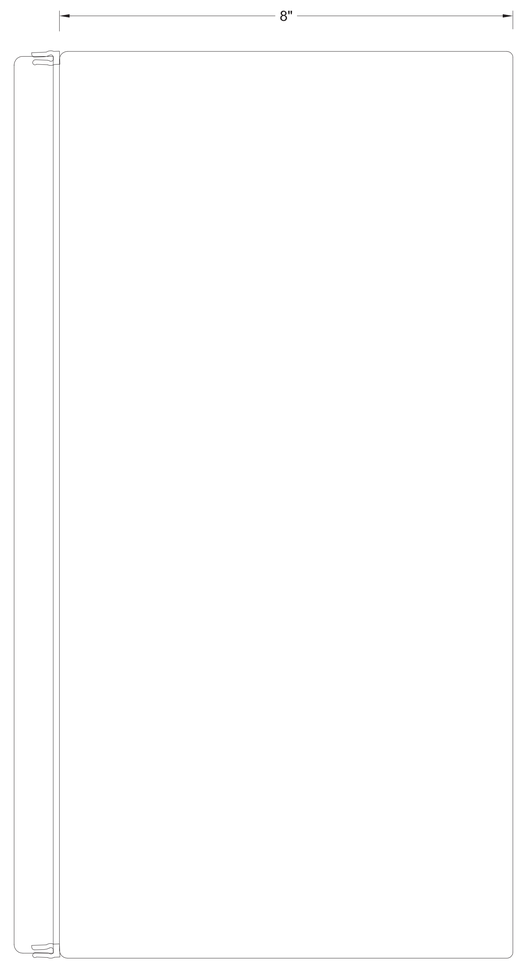
Z:\CUSTOMERS\H_CUSTOMERS\HALEY & ALDRICH\11671_SCHLUMBERGER SSDS DESIGN\DRAWINGS\CALCON DWG FILES\11671_1010.DWG

NOTES:

1. WALL MOUNT ENCLOSURE, NEMA 4/12
2. POWDER COATED ANSI 61 GREY



SUB-SLAB DEPRESSURIZATION SYSTEM CONTROL PANEL ENCLOSURE ELEVATION - FRONT VIEW



SUB-SLAB DEPRESSURIZATION SYSTEM CONTROL PANEL ENCLOSURE ELEVATION - SIDE VIEW

LEGEND PLATE LIST

P1 = 0.50" x 9.00" Plate
P2 = 0.50" x 3.00" Plate
P3 = 0.50" x 2.00" Plate

WHITE TEXT/BLACK BACKGROUD

Tag #	Qty	Type	Engraving	Letter Size
A	1	P1	SUB-SLAB DEPRESSURIZATION CONTROL PANEL	1/4"
B	1	P2	DISCONNECT SWITCH	3/16"
C	1	P2	BLOWER HOUR METER	3/16"
D	1	P2	BLOWER POWER ON OFF	3/16"
E	1	P3	FAULT	3/16"
F	1	P3	RUNNING	3/16"

REV	DESCRIPTION	DATE	NAME
D	ISSUE TO EPA	H&A	04/21/16
C	ISSUE TO PRPs	H&A	04/06/16
B	ISSUED FOR REVIEW	H&A	03/22/16
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DRAWN	JU	03/14/16
DESIGN	RY	03/14/16
CHECKED	RY	03/14/16
APPROVED	RY	03/14/16

FILE: 11671_1010.DWG

CLIENT: HALEY & ALDRICH
JOB: 11671
LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM
CONTROL PANEL ENCLOSURE LAYOUT

DRAWING NO. 1011 | REV D | SHEET 4 OF 6

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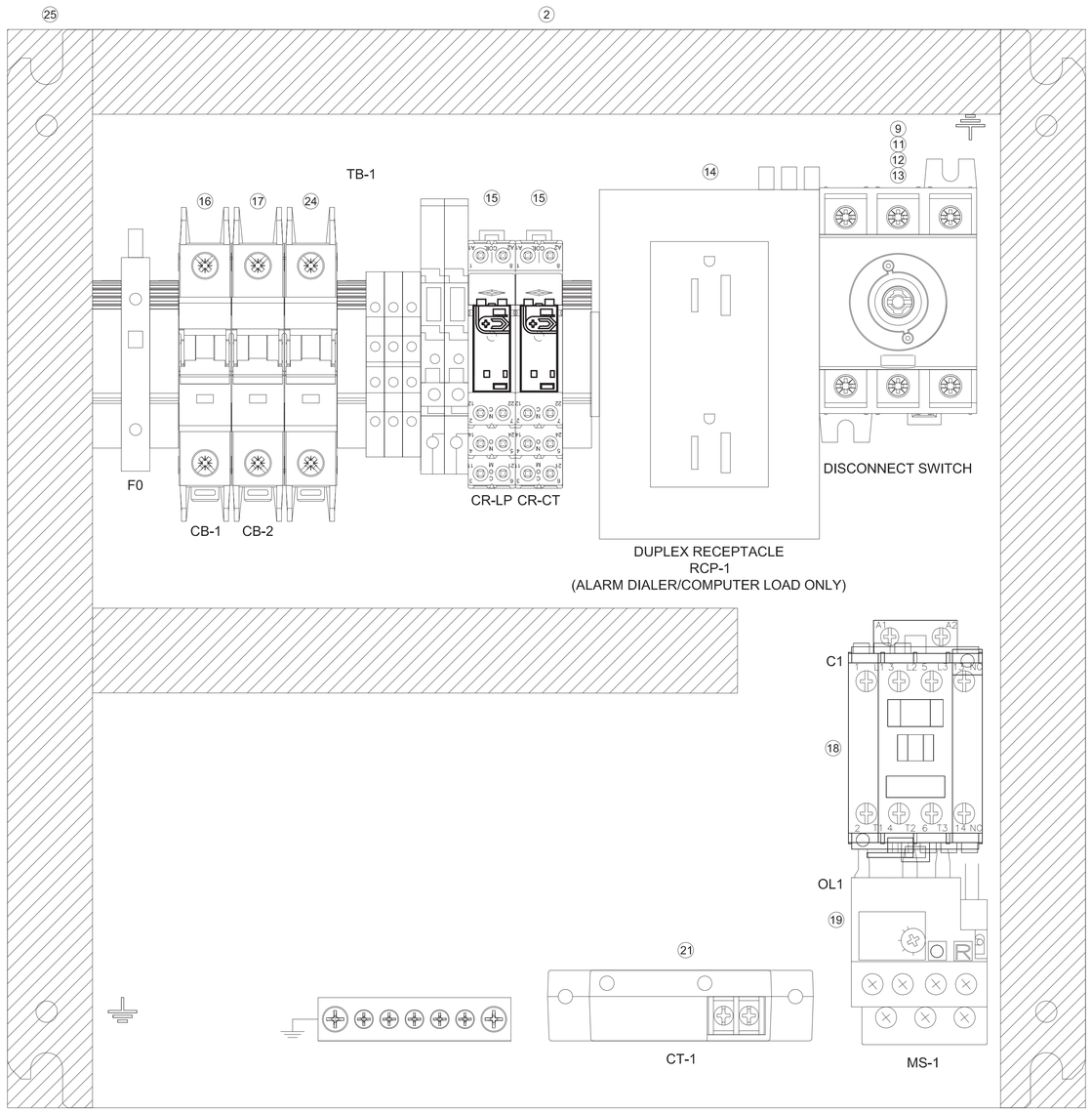

SUB-SLAB DEPRESSURIZATION SYSTEM CONTROL PANEL ELEVATION - BACKPLATE VIEW

BILL OF MATERIALS

ITEM #	QTY	PART NO.	MANUFACTURER	DESCRIPTION	SHOWN ON DWG. #
1	1	CSD16168	HOFFMAN	WALL MOUNT ENCLOSURE, 16"(H) x 16"(W) x 8"(D), MILD STEEL, NEMA 4/12	1010, 1011
2	1	CP1616	HOFFMAN	ENCLOSURE BACKPLATE, 14.2" (H) x 14.2" (W), WHITE	1012
3	1	T1160EB	ENM	HOUR METER, 2" ROUND, 120VAC INPUT POWER	1010, 1011
4	1	GCX1231-120L	AUTOMATION DIRECT	INDICATOR LIGHT, RED, LED, 120VAC/DC, 22MM	1010, 1011
5	1	GCX1232-120L	AUTOMATION DIRECT	INDICATOR LIGHT, GREEN, LED, 120VAC/DC, 22MM	1010, 1011
6	1	GCX1300	AUTOMATION DIRECT	SELECTOR SWITCH, 2-POSITION, MAINTAINED, 22MM, 1 N.O.	1010, 1011
7	1	GCX1131	AUTOMATION DIRECT	EMERGENCY STOP PUSHBUTTON, 22MM, RED, TWIST RELEASE	1010, 1011
8	1	ECX1651	AUTOMATION DIRECT	EMERGENCY STOP LEGEND PLATE, YEL/BLK	1010, 1011
9	1	22003003-UL	AUTOMATION DIRECT	DISCONNECT SWITCH, NON-FUSIBLE, ROTARY, 3 POLE, 32A, 600VAC	1012
10	1	147E1111	AUTOMATION DIRECT	DISCONNECT HANDLE, RED/YEL, DEFEATABLE, LOCKABLE, TYPE 4/4X	1010, 1011
11	1	14070532	AUTOMATION DIRECT	DISCONNECT HANDLE SHAFT, 12.6"	1012
12	1	14190000	AUTOMATION DIRECT	SHAFT GUIDE FOR DISCONNECT HANDLE	1012
13	1	22943009	AUTOMATION DIRECT	DISCONNECT TERMINAL SHROUD	1012
14	1	6720005421	WEIDMULLER	RECEPTACLE, DUPLEX, 15A, 120VAC INPUT POWER	1012
15	2	4C.02.8.120.0060	FINDER	4C SERIES RELAY, DPDT, 120VAC COIL	1012
16	1	FAZ-D15-1-NA-SP	EATON	CIRCUIT BREAKER, 15A, 1-POLE, D-CURVE	1012
17	1	FAZ-D5-1-NA-SP	EATON	CIRCUIT BREAKER, 5A, 1-POLE, D-CURVE	1012
18	1	100-C16D10	ALLEN-BRADLEY	CONTACTOR, IEC, 16A, 110/120VAC COIL	1012
19	1	193-ED1EB	ALLEN-BRADLEY	OVERLOAD RELAY, SOLID STATE, 5.4-27A	1012
20	1	E10-212025JKIT	E-MON D-MON	SINGLE-PHASE kWh METER, CLASS 1000, 120V, 1-PHASE, 2W	1010
21	1	ACS150-AE-F	AUTOMATION DIRECT	AC CURRENT SWITCH, FIXED CORE, 1-150A TRIP RANGE, N.O. 0.15A @ 240VAC/DC	1012
22	1	CELL682	SENSAPHONE	CELLULAR ALARM DIALER	1010
23	1	122017	BELL	CONVENIENCE RECEPTACLE, 10A	1010
24	1	FAZ-D10-1-NA-SP	IBOCO	CIRCUIT BREAKER, 10A, 1-POLE, D-CURVE	1012
25	LOT	T1E-1030W	IBOCO	WIREWAY, 1.0"(W) X 3.0"(D), WHITE	1012

REV	DESCRIPTION	DATE	NAME
D	ISSUE TO EPA	H&A	04/21/16
C	ISSUE TO PRPs	H&A	04/06/16
B	ISSUED FOR REVIEW	H&A	03/22/16
A	FOR INTERNAL REVIEW	H&A	03/11/16

PROFESSIONAL ENGINEER SHAWN FERRON E 20687 03-31-2018 ELECTRICAL STATE OF CALIFORNIA

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12919 ALCOSTA BLVD, SUITE 9
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APPROVED	RY	03/14/16

FILE: 11671_1010.DWG

CLIENT: HALEY & ALDRICH
JOB: 11671
LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM
CONTROL PANEL BACKPLATE LAYOUT

DRAWING NO. 1012 | REV D | SHEET 5 OF 6

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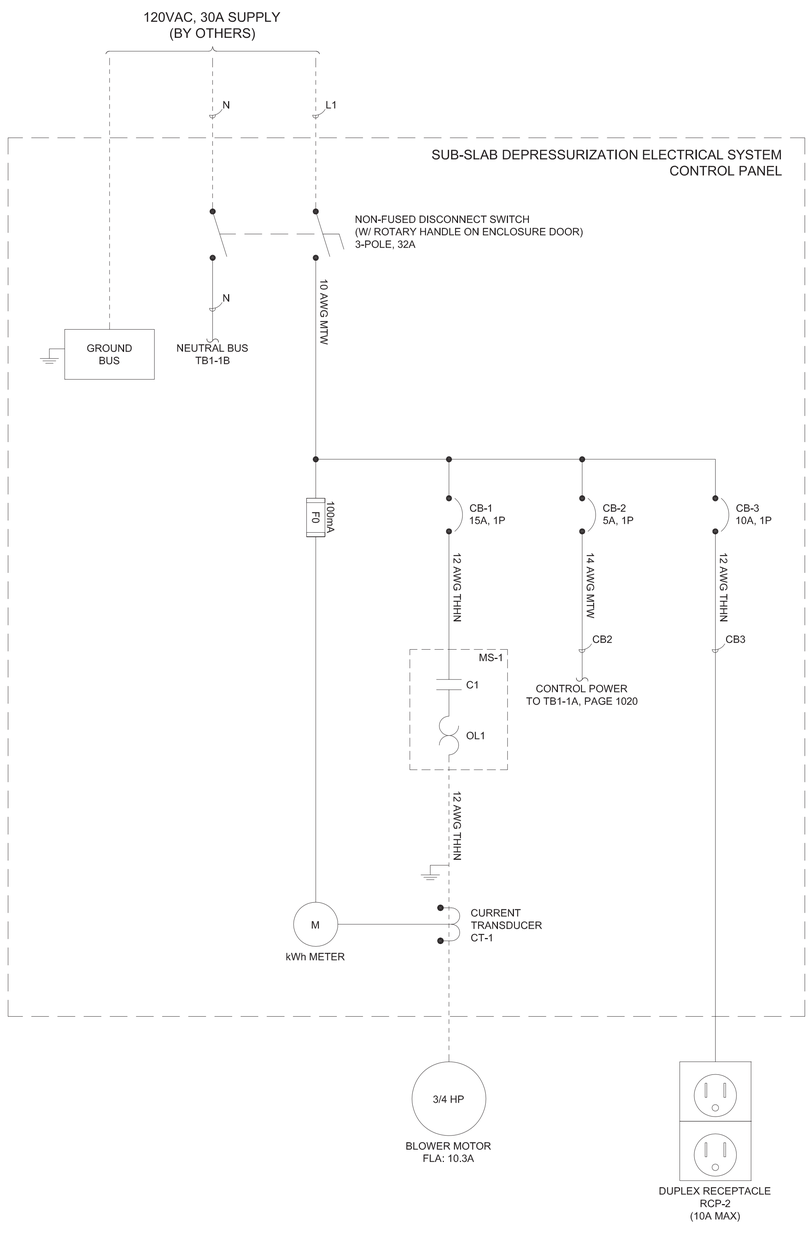
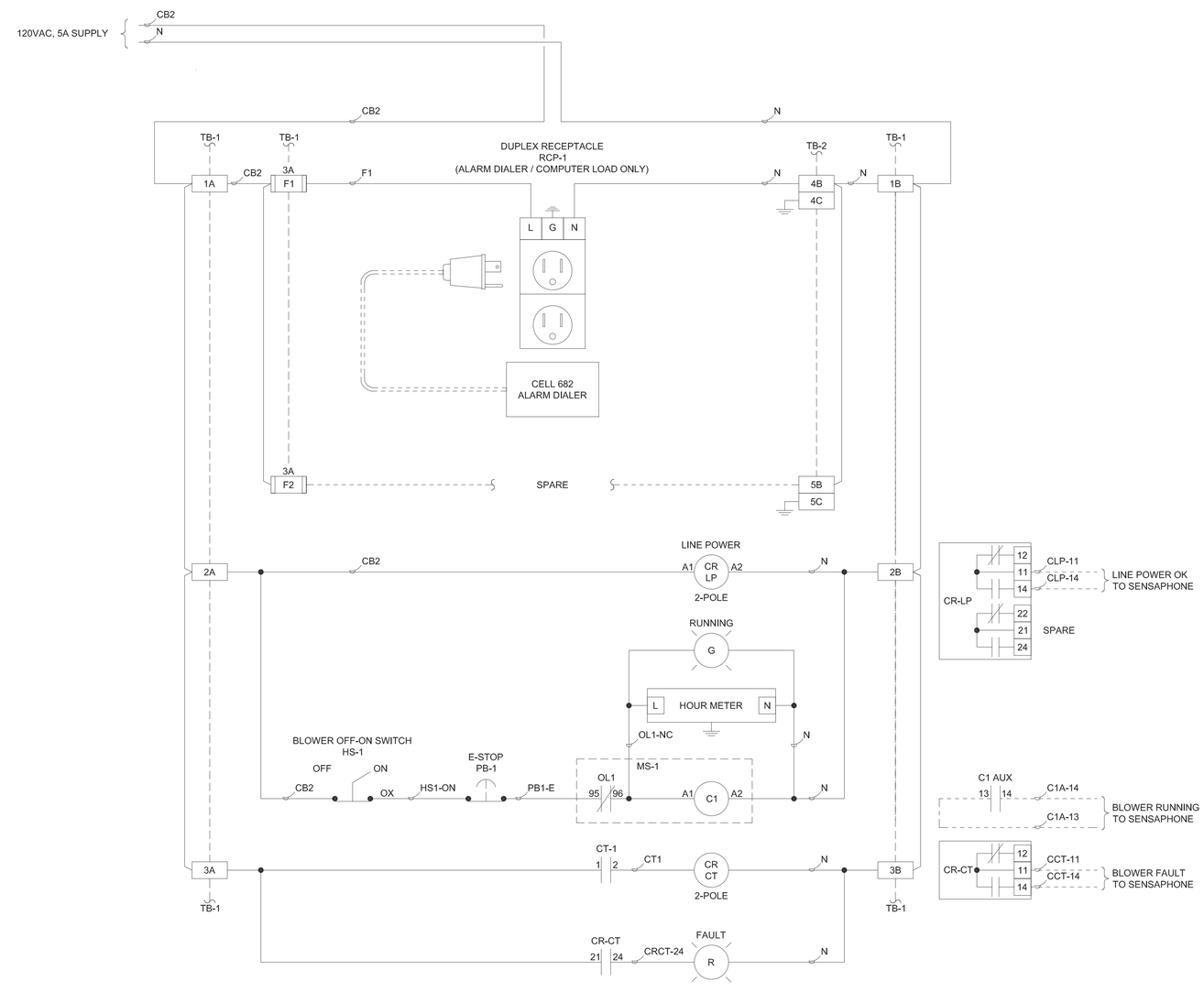
SINGLE LINE DIAGRAM



POWER DISTRIBUTION



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C	ISSUE TO PRPs	04/06/16	H&A
B	ISSUED FOR REVIEW	03/22/16	H&A
A	FOR INTERNAL REVIEW	03/11/16	H&A

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DRAWN	JU	03/14/16
DESIGN	RY	03/14/16
CHECKED	RY	03/14/16
APPROVED	RY	03/14/16

FILE: 11671_1020.DWG

CLIENT: HALEY & ALDRICH

JOB: 11671

LOCATION: 277 FAIRCHILD DRIVE MOUNTAIN VIEW, CALIFORNIA

TITLE: SUB-SLAB DEPRESSURIZATION ELECTRICAL SYSTEM
SINGLE LINE DIAGRAM / POWER DISTRIBUTION

DRAWING NO. 1020 | REV D | SHEET 6 OF 6

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APPENDIX B

Specifications for Construction of Vapor Intrusion Control System

www.haleyaldrich.com

SPECIFICATIONS FOR CONSTRUCTION OF VAPOR INTRUSION CONTROL SYSTEM
277 FAIRCHILD DRIVE
MOUNTAIN VIEW, CALIFORNIA

By

Haley & Aldrich, Inc.
San Jose, California

Richard M. Farson
California P.E. (Civil Engineering) No. 47269

File No. 36067-070
April 2016

SECTION 00 01 10

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SECTION 07 26 16

GEOMEMBRANE VAPOR BARRIER SYSTEM
04/2016

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of the geomembrane vapor barrier system as shown on the Drawings. The work shall be carried out as specified herein and in accordance with the Drawings.

B. The work shall include, but not be limited to, delivery, storage, placement, anchorage, seaming of the geomembrane vapor barrier system, and testing to verify compliance and performance as described herein.

1.2 SYSTEM DESCRIPTION

Contractor shall provide a geomembrane vapor barrier system to mitigate the passage of gas or vapor and install without defects, damage, or failure. Geomembrane vapor barrier system shall include geomembrane carrier, geomembrane, geomembrane protection course, and applicable accessory products as specified herein.

1.3 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C297/C297M	(2004; R 2010) Flatwise Tensile Strength of Sandwich Constructions
ASTM D1434	(2009) Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting
ASTM D1693	(2013) Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
ASTM D1709	(2015) Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method
ASTM D4068	(2009) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane

ASTM D4355/D4355M	(2014) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D4491	(1999a; R 2014; E 2014) Water Permeability of Geotextiles by Permittivity
ASTM D4533	(2011) Trapezoid Tearing Strength of Geotextiles
ASTM D4632/D4632M	(2015) Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	(2012) Determining Apparent Opening Size of a Geotextile
ASTM D5199	(2012) Measuring Nominal Thickness of Geosynthetics
ASTM D5261	(2010) Measuring Mass Per Unit Area of Geotextiles
ASTM D543	(2014) Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D6241	(2014) Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
ASTM D6392	(2012) Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
ASTM E154/E154M	(2008a; R 2013; E 2013) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

1.4 SUBMITTALS

Submit the following:

SD-01 Preconstruction Submittals
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
- Installer License or Letter of Approval by the Geomembrane Manufacturer
- Installer Capabilities
- Geomembrane vapor barrier system installation instructions

SD-03 Product Data
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
- Geomembrane Carrier
- Geomembrane Vapor Barrier

Geomembrane Protection Course
Geomembrane Detailing Fabric
Vapor Stake™, if used

SD-06 Test Reports
Testing reports will be prepared by a representative of the Engineer based upon testing performed by the Contractor and witnessed by a representative of the Engineer:
Vapor Barrier Coupon Thickness
Smoke Testing Results

SD-11 Closeout Submittals
Submit the following within 14 days of completion of field work for Engineer review and approval:
Material Warranty
Workmanship Warranty

1.5 QUALIFICATIONS

1.5.1 Manufacturer

The Geomembrane vapor barrier manufacturer shall be responsible for the production of the components of the geomembrane vapor barrier materials and shall provide material meeting the requirements of this Section and the construction documents for this project. Qualified manufacturers are:

1. CETCO Liquid Boot Company, Inc.; 1001 S. Linwood Avenue; Santa Ana, California 92705; (714) 384-0111

2. Engineer-approved equal.

1.5.2 Installer

1. The Geosynthetics Installer, which may be subcontracted to the Contractor, shall be responsible and shall provide sufficient resources for field handling, deploying, seaming, temporarily restraining (against wind), and other aspects of the deployment and installation of the geomembrane vapor barrier materials and other geosynthetic components of the project.

2. The Geosynthetics Installer shall have successfully completed a training course provided by the geomembrane vapor barrier manufacturer.

3. The Geosynthetics Installer shall have at least three (3) years experience in the work of the type required by this section, who can comply with the warranty requirements as indicated in Section 1.8 of this specification.

4. Contractor shall submit for Engineer review and approval at least 14 days prior to mobilization documentation of installer capabilities, certificates and project plan including:
    a. certification that the installer has Installer License or Letter of Approval by the Geomembrane Manufacturer

b. quality control procedures

1.6 QUALITY ASSURANCE

1.6.1 Geomembrane Vapor Barrier System

Geomembrane vapor barrier system components, including geomembranes and all accessory products shall be provided by a single manufacturer. Product data and manufacturer's installation instructions for each system component shall be submitted prior to construction as described in Section 1.4 of this specification.

1.6.2 Geosynthetic Installer

The Geosynthetic Installer shall ensure that the materials and methods used for installation of the geomembrane vapor barrier meet the requirements of the Drawings and of this Section. Any material or method that does not conform to these documents, or to alternatives approved in writing by the Engineer, will be rejected and shall be repaired or replaced by the Geosynthetic Installer at the installer's cost.

The Geosynthetic Installer shall be aware of and accommodate all monitoring and conformance testing by the Engineer or Geosynthetics Installer as indicated in Section 3.7 of this specification. If nonconformances or other deficiencies are found in the Geosynthetic Installer's materials or completed work, the Geosynthetic Installer will be required to repair the deficiency or replace the deficient materials at the installer's cost.

1.7 DELIVERY, STORAGE, AND HANDLING

Delivery and Handling: Deliver materials in factory sealed and labeled packaging. Contractor shall sequence deliveries to avoid delays, while minimizing on-site storage. Contractor shall handle and store per manufacturer's instructions, recommendations and material safety data sheets. Protect from construction operation related damage, as well as, damage from weather, excessive temperatures and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations. Do not allow material to freeze in containers. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.8 WARRANTY

1. Material Warranty: The Geosynthetic Installer shall furnish the Engineer with a 10-year written material warranty.

2. Workmanship Warranty: The Geosynthetic Installer shall furnish the Engineer with a 1-year written warranty against defects in workmanship.

1.9 COORDINATION

Contractor will coordinate application of geomembrane vapor barrier system with other construction activities.

1. Positively secure plumbing, electrical, mechanical, and structural items to be under or passing through the geomembrane vapor barrier system in their proper positions and appropriately protected prior to membrane application.

2. Install geomembrane vapor barrier system before placement of reinforcing steel. When not possible, mask all exposed reinforcing steel prior to membrane application.

PART 2 PRODUCTS

2.1 GEOMEMBRANE CARRIER

Geomembrane carrier shall be provided by geomembrane vapor barrier system manufacturer. Geomembrane carrier shall be an extruded membrane with ethylene vinyl alcohol and polyethylene components. Geomembrane carrier shall inhibit volatile organic compound vapor mitigation through concrete. Geomembrane carrier shall meet the following requirements:

REQUIRED GEOMEMBRANE CARRIER PROPERTIES		
Property	**Specified Values**	**Test Method**
Thickness, nominal	20 mil	ASTM D5199
Puncture Resistance	2,600 g	ASTM D1709
Tensile Strength	58 psi	ASTM E154/E154M
Methane Permeability	<5x10^-10 m2/d*atm	ASTM D1434
Water Vapor Transmission	0.0025 US Perms	ASTM E154/E154M, ASTM E96/E96M
Radon Diffusion Coefficient	<0.25x10^-12 m2/s	EPA Method 8260

Geomembrane carrier shall be CETCO Liquid Boot VI-20 or Engineer-approved equal.

2.2 GEOMEMBRANE VAPOR BARRIER

Geomembrane vapor barrier shall be a single-course high builds polymer modified asphaltic emulsion, and shall be suitable for horizontal and vertical applications. Vapor barrier shall meet the following requirements:

REQUIRED GEOMEMBRANE VAPOR BARRIER PROPERTIES		
Property	**Specified Values**	**Test Method**
Dry Thickness	60 mil	ASTM D5199
Tensile Strength	58 psi	ASTM E154/E154M Section 9
Puncture Resistance	2,600 g	ASTM D1709

REQUIRED GEOMEMBRANE VAPOR BARRIER PROPERTIES		
Property	**Specified Values**	**Test Method**
Bonded Seam Strength Test	Pass	ASTM D6392
Dead Load Seam Strength	Pass	N/A
Oil-Resistance Test (Note 2)	Pass	ASTM D543-87
Heat Aging (Note 3)	Pass	ASTM D4068-88
Environmental Stress Cracking	Pass	ASTM D1693-78
Water Vapor Transmission	0.10 grains/h-ft^2	ASTM E96/E96M
Radon Diffusion Coefficient	1.1 x 10-13 m2/s	K 124/02/95
Micro-Organism Resistance (Soil Burial)	Pass	ASTM D4068-88
Methane Permeability	Pass	ASTM D1434-82
Benzene Diffusion Coefficient	4.5 x 10-15 m2/s	EPA Method 8260
Ethylbenzene Diffusion Coefficient	4.0 x 10-15 m2/s	EPA Method 8260
m&p-Xylene Diffusion Coefficient	3.7 x 10-15 m2/s	EPA Method 8260
o-Xylene Diffusion Coefficient	3.7 x 10-15 m2/s	EPA Method 8260
Toluene Diffusion Coefficient	4.2 x 10-15 m2/s	EPA Method 8260
Trichloroethylene (TCE) Diffusion Coefficient	8.04 x 10-14 m2/s	EPA Method 8260
Tetrachloroethylene (PCE) Diffusion Coefficient	2.74 x 10-14 m2/s	EPA Method 8260

Notes:

1. Includes average weight change, average tensile strength change, average tensile stress change, average elongation change, bonded seams, methane permeability.
2. Includes average tensile strength change, average tensile stress change, average elongation change, bonded seams.

Geomembrane vapor barrier shall be CETCO Liquid Boot or Engineer-approved equal.

2.3 GEOMEMBRANE PROTECTION COURSE

Geomembrane protection course shall be provided by geomembrane vapor barrier system manufacturer. Geomembrane protection course shall be a polypropylene, needle-punched, non-

woven geotextile and shall be resistant to ultraviolet degradation and biological and chemical environments. Geomembrane protection course shall be designed for use as an underslab-adhesion protection course.

Geomembrane carrier shall meet the following requirements:

REQUIRED GEOMEMBRANE PROTECTION COURSE PROPERTIES		
Property	**Specified Values**	**Test Method**
Thickness, nominal	105 mils	ASTM D5199
CBR Puncture Strength	725 lbs	ASTM D6241
Tensile Strength	270 lbs	ASTM D4632/D4632M
Permeability	0.30 cm/sec	ASTM D4491
Tensile Bond Strength to Concrete	7 psi	ASTM C297/C297M
Mass per unit area	10.0 oz/yd^2	ASTM D5261
Elongation	50%	ASTM D5261
Trapezoid Tear	105 lbs	ASTM D4533
UV Resistance	70%	ASTM D4355/D4355M
A.O.S. (Note 1)	100 U.S. Sieve	ASTM D4751
Permittivity	1.2 sec^-1	ASTM D4491
Water Flow Rate	85 gpm/ft^2	ASTM D4491

Geomembrane protection course shall be CETCO Ultrashield G-1000 or Engineer-approved equal.

2.4 DETAILING FABRIC

Geomembrane detailing fabric shall be provided by geomembrane vapor barrier system manufacturer. Geomembrane detailing fabric will only be used in the immediate area surrounding penetrations and shall meet the following requirements:

REQUIRED GEOMEMBRANE CARRIER PROPERTIES		
Property	**Specified Values**	**Test Method**
Thickness, nominal	15 mil	ASTM D5199
Tensile Strength	29 lbf	ASTM D882
Puncture Strength	50 lbf	ASTM D4833

REQUIRED GEOMEMBRANE CARRIER PROPERTIES		
Property	**Specified Values**	**Test Method**
Impact Resistance	1.9 lbf	ASTM D1709 Method A

Geomembrane carrier shall be CETCO Liquid Boot VI-20 detailing fabric or Engineer-approved equal.

2.5 ACCESSORY GEOMEMBRANE VAPOR BARRIER SYSTEM PRODUCTS

All accessory geomembrane vapor barrier system products shall be provided by the manufacturer or shall have manufacturer's written approval for substitution.

PART 3 EXECUTION

3.1 FAMILIARIZATION

Prior to implementing any of the work described in this Section, the Contractor and Geosynthetic Installer shall become thoroughly familiar with all portions of the work falling within this Section.

3.1.1 Inspection

The Geosynthetic Installer shall carefully inspect the installed work of all other trades and verify that all work is complete to the point where the work of this Section may properly commence without adverse effect.

If the Geosynthetic Installer has any concerns regarding the installed work of other trades, he shall notify the Engineer in writing prior to the start of the work of this Section. Failure to inform the Engineer in writing or installation of the geomembrane will be construed as the Geosynthetic Installer’s acceptance of the related work of all other trades.

3.1.2 Pre-Installation Meeting

A pre-installation conference shall be held with the Contractor-designated superintendent, Geosynthetic installer, and Engineer at the site prior to commencement of field installation to establish procedures to maintain required working conditions and to coordinate this work with related and adjacent work. Engineer to verify that final geomembrane vapor barrier system components and system details comply with geomembrane vapor barrier system manufacturer's current installation requirements and recommendations.

3.2 JOB CONDITIONS

Installation in manufacturer-recommended environmental conditions is preferred when possible. Manufacturer-recommended installation conditions are as follows:

1. Do not apply geomembrane vapor barrier system to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 45 degrees Fahrenheit.

2. Do not apply geomembrane vapor barrier system in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

3. Maintain adequate ventilation during application and curing of geomembrane vapor barrier system materials.

4. Ambient temperature shall exceed 45 degrees Fahrenheit or greater for installation. If cooler ambient conditions exist, temperature can be increased with the use of space heaters and necessary cover (i.e. visqueen) to bring the ambient temperature to at least 45 degrees Fahrenheit until the protection course and structural slab rebar or a mudslab protection course has been placed.

3.3 PREPARATION

3.3.1 Substrates

Comply with Contract Drawings and manufacturer specifications.

3.3.2 Wood Timber Shoring

Wood lagging shoring should extend to the lowest level of the gas vapor membrane installation with any voids or cavities exterior of the lagging timbers filled with compacted soil or cementitious grout. Interior surface of lagging boards should be planar and tight together with gaps less than 1" (25 mm). Gaps in excess of 1" should be filled with cementitious grout, compacted soil, wood, and extruded polystyrene (40 psi min.) Do not use plywood or other surface treatment over large lagging gaps that leave the cavity void.

3.3.3 Mechanical or Other Penetrations

Mechanical, structural, or architectural materials that will pass through the plane of the geomembrane vapor barrier membrane shall be properly installed and secured in their final position prior to installation of the geomembrane vapor barrier system.

3.3.4 Concrete

Concrete to be gas vapor proof shall be properly placed and consolidated.

1. At cast in place concrete surfaces, provide a light broom finish or smoother, free of any dirt, debris, loose material, release agents or curing compounds. Fill voids more than 1/4 inch deep and 1/4 inch wide.

2. At masonry joints, cold joints, and form joints, provide a struck smooth surface. Prepare penetrations in accordance with manufacturer's specifications.

3. Provide a ¾ inch minimum bead of geomembrane material at all horizontal to vertical transitions and other inside corners. Allow this material to cure for a minimum of 24 hours prior to spray applying geomembrane vapor barrier.

4. Completely grout all cracks or cold joints greater than 1/16 inch with non-shrink grout. Install Hardcast reinforcing tape over all cold joints, cracks and form tie holes (after holes and cracks are grouted).

3.3.5 Surface Preparation

1. Provide 24 inch minimum clearance out from surfaces to receive the geomembrane vapor barrier system. The application surface shall be prepared and provided to the applicator in accordance with manufacturer's specifications.

2. Remove dirt, debris, oil, grease, cement laitance, or other foreign matter which will impair or negatively affect the performance of the geomembrane vapor barrier system.

3. Protect adjacent work areas and finish surfaces from damage or over spraying-during product applications.

3.4 GEOMEMBRANE VAPOR BARRIER INSTALLATION

1. Geomembrane carrier shall be rolled out on base material with minimum of 6-inches overlap at seams. Lay geomembrane tight at all inside corners. Apply a thin 20 mil liquid geomembrane spray applied within the seam overlap. Line trenches with geomembrane extending at least six inches onto adjoining sub-grade if slab and footings are to be sprayed separately.

2. Minimize the use of nails to secure the geomembrane carrier to the subgrade. Remove all nails before spraying liquid geomembrane, if possible. Nails that cannot be removed from the subgrade are to be patched with geomembrane detailing fabric or Hardcast reinforcing tape overlapping the nail head by a minimum of two inches (2"). Apply a 20 mil liquid geomembrane spray under the geomembrane patch, when patching with geomembrane.

3. Seal around penetrations as described in Section 3.6.

4. Apply liquid geomembrane. Geomembrane vapor barrier shall be applied to a minimum dry thickness of 60-mils, in a continuous, uniform layer. Increase thickness to 100 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required after performing the destructive testing described in Section 3.7.2, remove any standing water from the membrane before proceeding with the second application.

5. Geomembrane vapor barrier shall be overlapped a minimum of 12 inches when application process is interrupted for more than 8 hours. The overlap area shall be cleaned of dust, dirt and other materials that may affect the quality of the geomembrane vapor barrier.

6. If the concrete slab-on-grade is placed in more than one pour, the geomembrane vapor barrier shall be extended a minimum of 12 inches beyond the edge of the first pour so that a minimum 12-inch overlap of the geomembrane vapor barrier may be installed where the geomembrane vapor barrier sections meet.

7. The geomembrane vapor barrier shall be sealed to foundation elements (i.e., exterior/interior/perimeter footings, columns, moment frames, and grade beams) via overlaps

into the concrete slab or between the concrete slab and foundation elements, as detailed in the Drawings.

8. After membrane has cured, check for proper thickness and flaws. Fix flaws observed and perform all testing or inspection prior to placing protection course. Quality control testing will be performed as described in Section 3.7.

9. Following a passing smoke test, install protection course directly over geomembrane vapor barrier. Install protection course so as to lay flat without any wrinkles, fish mouths, tears, or punctures. Overlap adjacent rolls of protection course a minimum of four inches.

3.5 BEDDING AND BACKFILLING

The geomembrane vapor barrier system will be placed between the crushed rock base and the concrete slab as indicated on the Drawings.

3.6 SEALING AROUND PENETRATIONS

1. Clean all penetrations. Sand metal penetrations clean with emery cloth.

2. Roll out geomembrane on base material, overlapping seams a minimum of six inches. Cut the geomembrane around penetrations so that it lays flat on the sub-grade. Lay geotextile tight at all inside corners. Apply a thin (20 mil) layer of liquid geomembrane within the seam overlap then lap geomembrane detailing fabric around penetrations extending 3 inches around the base of penetration.

3. Spray apply liquid geomembrane to a 60 mils minimum dry thickness around the penetration, completely encapsulating the collar assembly and to a height of four inches (4") minimum above the membrane. Spray-apply liquid geomembrane to surrounding areas as specified for the particular application (refer to Drawings).

4. Allow liquid geomembrane to cure overnight (Section 3.7).

5. Wrap penetration with polypropylene cable tie at a point 2 inches above the base of the penetration. Tighten the cable tie firmly so as to squeeze, but not cut, the cured membrane collar.

3.7 GEOMEMBRANE VAPOR BARRIER QUALITY CONTROL TESTING

The membrane must be cured at least overnight before inspecting for dry-thickness, holes, shadow shrinkage, and any other membrane damage.

3.7.1 Smoke Testing

Smoke testing shall be performed on the cured geomembrane. A Colt 4 device, manufactured by Concept Engineering Technologies, Inc, or equivalent, should be used to generate a glycerin-based smoke for the test. The smoke shall be passed through an electric blower beneath the geomembrane through a leaf blower nozzle, or equivalent. A single smoke test shall be performed on areas no

greater than 2,000 square feet. Locations of smoke leakage should be observed and marked for subsequent repairs. This testing will be the responsibility of the Geosynthetic installer and will be witnessed by the Engineer.

3.7.2 Destructive Testing

Destructive testing shall consist of obtaining one (1) 2-inch square sample of cured geomembrane vapor barrier for every 2,000 square feet installed. In the case of single family homes less than 2,000 square feet, one destructive test shall be performed per home. This sample shall be tested for overall thickness (i.e. including the thickness of the carrier). The thickness of the carrier will then be deducted to confirm that the geomembrane vapor barrier has been installed to a minimum dry thickness of 60-mils. Geosynthetic installer shall obtain samples as directed by the Engineer. Destructive testing and reporting will be performed by the Engineer.

3.7.3 Installation Monitoring

Installation monitoring shall include substrate examination and monitoring during the beginning of gas vapor membrane installation, at periodic intervals thereafter, and a final inspection prior to concrete or backfill placement. Installation monitoring and reporting shall be performed by the Engineer.

3.8 GEOMEMBRANE VAPOR BARRIER REPAIR

Voids in the geomembrane vapor barrier left by sampling or other damage shall be repaired with geomembrane carrier underlay beneath the existing membrane and a minimum of 2 inches overlap. Apply a thin tack coat of liquid geomembrane under the geomembrane patch. Then spray or trowel-apply liquid geomembrane to a 60 mils minimum dry thickness, extending at least three inches (3") beyond geomembrane patch.

3.9 MATERIALS IN CONTACT WITH THE GEOMEMBRANE VAPOR BARRIER

1. The Contractor shall take all necessary precautions to ensure that the geomembrane vapor barrier is not damaged during its installation or during the installation of overlying materials.

2. All attempts shall be made to minimize wrinkles in the geomembrane.

3. Equipment shall not be driven directly on the geomembrane.

4. Stakes for forming of concrete for foundations and slab-on-grade shall not be driven through the geomembrane vapor barrier. If stakes are required, they shall be product designed for this application such as Vapor-Stake™ or Engineered approved equivalent, and the geomembrane vapor barrier shall be sealed at each stake location as a penetration seal.

3.10 GEOMEMBRANE VAPOR BARRIER ACCEPTANCE

1. The Contractor shall retain all ownership and responsibility for the geomembrane vapor barrier until accepted by the Engineer.

2. The geomembrane shall be accepted by the Engineer when:
    a. The installation is completed;
    b. All documentation is submitted;
    c. The associated testing is complete; and
    d. All warranties are submitted.

3.11 PROTECTION OF WORK

The Contractor shall use all means necessary to protect all work of this Section, including implementation of the following restrictions:

1. Equipment used shall not damage the geomembrane vapor barrier by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;

2. The prepared subgrade surface underlying the geomembrane vapor barrier shall be acceptable immediately prior to geomembrane vapor barrier installation;

3. Geosynthetic elements immediately underlying the geomembrane vapor barrier shall be clean and free of debris;

4. Personnel working on the geomembrane vapor barrier shall not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane vapor barrier; and

5. Direct contact with the geomembrane vapor barrier shall be minimized (i.e., the geomembrane vapor barrier is protected by geotextiles, or other suitable materials), in areas where excessive traffic may be expected.

In the event of damage, the Contractor shall make all repairs and replacements necessary, to the satisfaction of the Engineer.

-- End of Section --

SECTION 07 26 17

VAPOR MITIGATION SYSTEM PIPING
04/2016

PART 1 GENERAL

1.1 DESCRIPTION

A. The Vapor Mitigation System Piping Installer shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of the vapor mitigation system piping as shown on the Drawings. The work shall be carried out as specified herein and in accordance with the Drawings.

B. Vapor mitigation system piping shall include composite venting system, solid wall polyvinyl chloride (PVC) transition and riser piping, and applicable accessory products and transition fittings as specified herein.

C. The composite venting system piping shall be installed beneath the Geomembrane Vapor Barrier System, which is specified in Section 07 26 16. Composite venting system shall be installed by the Geosynthetics Installer that meets the requirements of this Section.

D. Solid wall piping may be installed by the Vapor Mitigation System Piping Installer.

1.2 SYSTEM DESCRIPTION

Vapor Mitigation System Piping Installer shall provide vapor mitigation system piping for the collection and venting of subslab vapors without defects, damage, or failure. Vapor mitigation system piping shall include composite venting system, solid wall PVC transition and riser piping, and applicable accessory products and transition fittings as specified herein.

1.3 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D1621	(2010) Compressive Properties of Rigid Cellular Plastics
ASTM D1777	(1996; E 2011; R 2011) Thickness of Textile Materials
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120

ASTM D2466	(2013) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D4355/D4355M	(2014) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D4491	(1999a; R 2014; E 2014) Water Permeability of Geotextiles by Permittivity
ASTM D4632/D4632M	(2015) Grab Breaking Load and Elongation of Geotextiles
ASTM D4716/D4716M	(2008; R 2013) Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM D4751	(2012) Determining Apparent Opening Size of a Geotextile
ASTM D4833/D4833M	(2007; E 2013; R 2013) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D5261	(2010) Measuring Mass Per Unit Area of Geotextiles
ASTM D5926	(2011) Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems

1.4 SUBMITTALS

Submit the following:

SD-01 Preconstruction Submittals
Submit the following at least 14 days prior to mobilization for engineer review and approval:
- Installer License or Letter of Approval by the Composite Venting System Manufacturer
- Installer Capabilities
- Composite venting system installation instructions

SD-03 Product Data
Submit the following at least 14 days prior to mobilization for engineer review and approval:
- Composite Venting System

SD-11 Closeout Submittals
Submit the following within 14 days of completion of field work for engineer review and approval:
- Material Warranty
- Workmanship Warranty
- Record Drawings

1.5 QUALIFICATIONS

1.5.1 Composite Venting System

1.5.1.1 Manufacturer

The composite venting system manufacturer shall be responsible for the production of the components of the composite venting system materials and shall provide material meeting the requirements of this Section and the construction documents for this project. Qualified manufacturers are:

1. CETCO Liquid Boot Company, Inc.; 1001 S. Linwood Avenue; Santa Ana, California 92705; (714) 384-0111

2. Engineer-approved equal.

1.5.1.2 Vapor Mitigation System Piping Installer

1. The Vapor Mitigation System Piping Installer, which may be subcontracted to the Contractor, shall be responsible and shall provide sufficient resources for field handling, deploying, and other aspects of the installation of the composite venting system and other geosynthetic components of the project as detailed in specification Section 07 26 16.

2. The Vapor Mitigation System Piping Installer shall have successfully completed a training course provided by the geomembrane vapor barrier manufacturer.

3. The Vapor Mitigation System Piping Installer shall have at least three (3) years experience in the work of the type required by this section, who can comply with the warranty requirements as indicated in Section 1.8 of this specification.

4. Contractor shall submit documentation of installer capabilities, certificates and project plan including:

    a. certification that the installer has Installer License or Letter of Approval by the Geomembrane Manufacturer
    b. quality control procedures

1.6 QUALITY ASSURANCE

1.6.1 Composite Venting System

Composite venting system components, including vent core and all accessory products shall be provided by a single manufacturer which shall be the same manufacturer as the geomembrane vapor barrier system specified in Section 07 26 16, unless different manufacturers are approved by the Engineer.

Product data and manufacturer's installation instructions for system components shall be submitted prior to construction as described in Section 1.4 of this specification.

1.6.2 Vapor Mitigation System Material

The Vapor Mitigation System Piping Installer shall ensure that the materials and methods used for installation of the composite venting system meet the requirements of the Drawings and of this Section. Any material or method that does not conform to these documents, or to alternatives approved in writing by the Engineer, will be rejected and shall be repaired or replaced by the Vapor Mitigation System Piping Installer.

The Vapor Mitigation System Piping Installer shall be aware of and accommodate all monitoring by the Engineer as indicated in Section 3.5 of this specification. If nonconformances or other deficiencies are found in the Vapor Mitigation System Piping Installer's materials or completed work, the Vapor Mitigation System Piping Installer will be required to repair the deficiency or replace the deficient materials.

1.6.3 PVC Piping and Fittings

The Vapor Mitigation System Piping Installer shall ensure that the materials and methods used for PVC pipe and fittings installation meet the requirements of the Drawings and Section 40 05 13 Process Piping. Any material or method that does not conform to these documents, or to the alternatives approved in writing by the Engineer will be rejected and shall be repaired or replaced by the Vapor Mitigation System Piping Installer at the Vapor Mitigation System Piping Installer's expense.

1.7 DELIVERY, STORAGE, AND HANDLING

Delivery and Handling: Deliver materials in factory sealed and labeled packaging. Vapor Mitigation System Piping Installer shall sequence deliveries to avoid delays, while minimizing on-site storage. Handle and store per manufacturer's instructions, recommendations and material safety data sheets. Protect from construction operation related damage, as well as, damage from weather, excessive temperatures and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations.

1.8 WARRANTY

1. Material Warranty: The Vapor Mitigation System Piping Installer shall furnish the Engineer with a 10-year written material warranty.

2. Workmanship Warranty: The Vapor Mitigation System Piping Installer shall furnish the Engineer with a 1-year written warranty against defects in workmanship.

1.9 COORDINATION

Vapor Mitigation System Piping Installer will coordinate application of vapor mitigation system piping with other construction activities.

1. Positively secure plumbing, electrical, mechanical, and structural items to be under or near the vapor mitigation system piping in their proper positions and appropriately protected prior to vapor mitigation system piping installation.

2. Install vapor mitigation system piping before placement of geomembrane vapor barrier system.

PART 2 PRODUCTS

2.1 COMPOSITE VENTING SYSTEM

Composite venting system and accessory products shall be provided by geomembrane vapor barrier system manufacturer (Refer to 07 26 16). Composite venting system shall consist of a 3-dimensional vent core wrapped in a non-woven needle punched filter fabric.

Composite Venting system shall meet the following requirements:

REQUIRED COMPOSITE VENTING SYSTEM PROPERTIES		
Property	**Specified Values**	**Test Method**
Core - Compressive Strength	9,500 psf	ASTM D1621
Core - Thickness	1.0 in	ASTM D1777
Core - Flow Rate (Hydraulic gradient = 0.1)	30 gpm/ft width	ASTM D4716/D4716M
Fabric - Puncture Strength	65 lbs	ASTM D4833/D4833M
Fabric - Apparent Opening Size	70 US Sieve	ASTM D4751
Fabric - Grab Tensile Strength	100 lbs	ASTM D4632/D4632M
Fabric - Permeability	0.21 cm/sec	ASTM D4491
Fabric - Flow Rate	140 GPM/ft^2	ASTM D4491
Fabric - Mass per Unit Area	4.0 oz/yd^2	ASTM D5261
Fabric - UV Resistance	70%	ASTM D4355/D4355M

Composite venting system shall be CETCO Liquid Boot GeoVent™ or engineer-approved equal.

2.2 PVC PIPING

A. PVC product requirements are specified in Section 40 05 13.

2.3 ACCESSORY VAPOR MITIGATION SYSTEM PIPING PRODUCTS

All accessory vapor mitigation system piping products and transition fittings shall be provided by the manufacturer or shall have manufacturer's written approval for substitution. Accessory products and transition fittings supplied by the vapor mitigation system piping manufacturer shall include the following:

1. Geovent™ End Outlet (transition from composite venting system core piping to PVC piping)

2. Interior Footing Sleeves

3. Fabric Reinforcing Tape

2.4 REDUCING PIPE SLEEVE SEALS

Reducing pipe sleeve seals shall be used to provide positive, mechanical seals when transitioning from composite venting system end outlet to PVC piping.

Reducing pipe sleeve seals shall be made of elastomeric PVC and shall conform to ASTM D5926 and ASTM C1123, and shall utilize 300 series stainless steel clamps.
Reducing pipe sleeve seals shall be manufactured by Fernco or approved equal.

PART 3 EXECUTION

3.1 FAMILIARIZATION

Prior to implementing any of the work described in this Section, the Vapor Mitigation System Piping Installer and Geosynthetic Installer shall become thoroughly familiar with all portions of the work falling within this Section.

3.1.1 Inspection

The Vapor Mitigation System Piping Installer shall carefully inspect the installed work of all other trades and verify that all work is complete to the point where the work of this Section may properly commence without adverse effect.

If the Vapor Mitigation System Piping Installer has any concerns regarding the installed work of other trades, he shall notify the Engineer in writing prior to the start of the work of this Section. Failure to inform the Engineer in writing or installation of the vapor mitigation system piping will be construed as the Vapor Mitigation System Piping Installer's acceptance of the related work of all other trades.

3.2 PREPARATION

3.2.1 Substrates

Comply with Contract Drawings and manufacturer specifications.

3.2.2 Mechanical or Other Penetrations

Mechanical, structural, or architectural materials that will pass through the plane of the vapor mitigation system piping shall be properly installed and secured in their final position prior to installation of the vapor mitigation system.

3.3 VAPOR MITIGATION SYSTEM PIPING INSTALLATION

The portion of the work underlying the building slab, including the preparation and installation of the composite vapor system and transition fittings, shall be performed by the Vapor Mitigation

System Piping Installer. The remaining portions of work, including the transition fittings to hard piping, building slab penetrations, vapor mitigation piping within the building walls, roof penetrations, and final termination may be performed by the Contractor.

3.3.1 Installation Scope by Vapor Mitigation System Piping Installer

1. Composite vapor system shall be rolled out on base material as shown on Contract Drawings.

2. PVC pipe sleeves shall be used where venting is to penetrate footings.

3. At points of intersection, cut away geotextile to produce rectangular flaps. Interlock exposed dimple board in a Lego-like fashion. Fold flaps of geotextile in a manner so that the dimple board is covered completely. Secure geotextile folds with fabric reinforced tape so that geotextile is impermeable to fill.

4. End outlet transition fittings shall be used to attach composite venting system to solid PVC piping at penetration through building foundation.

5. Geomembrane vapor barrier system shall be installed over the composite venting system base material in accordance with the Drawings and 07 26 16.

3.3.2 Installation Scope by Contractor

Seal/grout piping at penetrations through foundation as shown on the Contract Drawings.

3.4 BEDDING AND BACKFILLING

The composite venting system will be placed in a layer of 3/4" crushed stone as indicated on the Drawings.

3.5 VAPOR MITIGATION SYSTEM PIPING INSTALLATION MONITORING

Installation monitoring shall include substrate examination, beginning of vapor mitigation system piping installation, periodic intervals, and final inspection prior to installation of the geomembrane vapor barrier system. Installation monitoring and reporting shall be performed by the Engineer.

No piping joints shall be installed within occupied spaces or vertical walls unless a leak test is proposed by the Vapor Mitigation System Piping Installer and approved by the Engineer.

3.6 MATERIALS IN CONTACT WITH THE VAPOR MITIGATION SYSTEM PIPING

1. The Contractor shall take all necessary precautions to ensure that the vapor mitigation system piping is not damaged during its installation or during the installation of overlying materials.

2. All attempts shall be made to minimize wrinkles in the composite venting system.

3. Equipment shall not be driven directly on the vapor mitigation system piping.

3.7 RECORD DRAWINGS

The Contractor shall submit record drawings of the installed vapor mitigation system piping including, but not limited to: sub-slab composite venting system layout, locations of transition fittings, PVC pipe routing through structures, and termination locations. Record drawings shall be submitted within 7 days of completion of the record survey.

3.8 VAPOR MITIGATION SYSTEM PIPING ACCEPTANCE

1. The Contractor shall retain all ownership and responsibility for the vapor mitigation system piping until accepted by the Engineer.

2. The vapor mitigation system piping shall be accepted by the Engineer when:

    a. The installation is completed;
    b. All documentation is submitted and accepted; and
    c. All warranties are submitted.

3.9 PROTECTION OF WORK

The Contractor shall use all means necessary to protect all work of this Section, including implementation of the following restrictions:

1. Equipment used shall not damage the vapor mitigation system piping by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;

2. Personnel working on the vapor mitigation system piping shall not smoke, wear damaging shoes, or engage in other activities which could damage the composite venting system or transition fittings; and

3. Direct contact with the vapor mitigation system piping shall be minimized in areas where excessive traffic may be expected.

In the event of damage, the Contractor shall make all repairs and replacements necessary, at the Contractor's cost, to the satisfaction of the Engineer.

-- End of Section --

SECTION 26 00 00

ELECTRICAL AND CONTROL SYSTEMS
04/2016

PART 1 - GENERAL

1.01 CONTRACT PROVISIONS

1.01.A The requirements of this Section are in addition to the requirements of Division 1, General Conditions, and Supplementary Conditions bound herewith.

1.01.B The Project Drawings are hereby made a part of these specifications.

1.02 SUMMARY

1.02.A This section includes: Electrical, Control System, and Instrumentation requirements.

1.03 OVERVIEW OF ELECTRICAL WORK

1.03.A Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Section of the Specifications to provide a complete and functional system. This work includes but is not limited to: all material and labor required for installation of power, grounding, controls, instrumentation, telemetry, and connections to electrical equipment, including electrical equipment furnished by others.

1.03.B Provide and install a Control System for each SSD (Sub-Slab Depressurization) System station as shown in the Drawings and as specified herein, including Electrical/Controls Backplate (mounting plate), Control Panel, Motor Controls, Motor Current Switch, Alarm Dialer, and Utility Power kWh Meter.

1.03.C The Supply Power feeder and conduit to the SSD System Enclosure shall be provided by others unless otherwise noted. Supply Power conduit will stub-up at SSD System enclosure pad and wiring shall be provided coiled-up. Contractor shall be responsible for finishing conduit run from stub-up to the Control Panel and for completing wiring and terminations to the Control Panel. Contractor shall coordinate work with those providing supply power feeder and Owner.

1.03.D Provide and install electrical conduit and wiring for SSD blower motor and other circuits as indicated in the Drawings.

1.03.E Test and startup the SSD System to ensure proper and intended operation.

1.04 SYSTEM FUNCTIONAL DESCRIPTION

1.04.A The following is a description of the intended operational functions of the SSD System Electrical/Controls:

1. The SSD blower is intended to run continuously, 24-hours per day.
2. When the Blower Off/On Switch is placed in the "On" position, the blower shall start. During normal operation, the blower will run continuously until the Blower Off/On Switch is manually placed into the "Off" position by an operator.
3. If a blower Motor Fault condition occurs, the motor starter shall automatically shutoff power to the motor until manually reset by an operator, a red "Fault" light shall illuminate on the control panel, and the Alarm Dialer shall send notification to an operator.
4. If the blower motor is operating below the current (Amps) set point, the current switch shall trigger an alarm on the Alarm Dialer, and the Alarm Dialer shall send notification to an operator.
5. If a Power Failure occurs to the SSD System, an alarm notification shall be sent by the Alarm Dialer to an operator. When power is restored, unless a motor fault condition occurs or circuit breaker trips, the blower motor shall automatically resume operation.
6. The Utility Power kWh Meter shall monitor energy usage of the SSD system and provide a running total reading of kWh.

1.05 GENERAL ELECTRICAL REQUIREMENTS

1.05.A Provide a tested and working electrical system as indicated in Specifications and on the Drawings. The system shall include items which may not be mentioned in the Specifications and on the Drawings, but which are necessary to make a complete and working installation.

1.05.B Immediately notify the Owner or Engineer of discrepancies within the Contract Documents and between Contract Documents and actual field conditions if such discrepancies may be of material impact.

1.05.C The Drawings are diagrammatic in nature, but the locations of devices, raceways, equipment, and fixtures are shown approximately where they are intended to be installed. The Contractor shall not make significant deviations from either the Drawings or Specifications without prior approval of the Engineer.

1.05.D Make minor variations to alignment of equipment and/or installation of raceway systems to avoid conflict with other portions of the Work, and coordinate with other trades.

1.06 SUBMITTALS

1.06.A Submit to the Engineer for approval at least 14 days prior to mobilization:

1. Bill of Materials of components to be provided;
2. Product Catalog Data;

3. Shop Drawings and other data as required to indicate methods of installation;
4. Operation and Maintenance Data: Seven days following completion of construction, a comprehensive operations and maintenance (O&M) manual for the system shall be provided, including
   a. A complete "As built" set of approved shop drawings;
   b. A complete list of the equipment supplied, including model numbers, ranges, and set points;
   c. Catalog data for each component;
   d. Detailed service, maintenance and operation instructions for each component;
   e. Schematic diagrams, parts lists, vendors list, and warranty information.

1.07 QUALITY ASSURANCE

1.07.A RULES, CODES, AND REGULATIONS:

1. All work and materials shall be in full accordance with the latest published rules, codes, and/or regulations of the following organizations, agencies and codes:
   a. California Building Code (CBC);
   b. NFPA Bulletins;
   c. California Electrical code (CEC);
   d. Utility rules and regulations;
   e. all other applicable regulatory rules, codes, regulations and documents.
2. Materials and equipment provided in performance of the electrical work shall be Listed or Recognized by Underwriters Laboratories (UL) for the class of service intended.
3. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
4. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.07.B WORKMANSHIP

1. The National Electrical Contractors Association's "Standard of Installation" shall be used as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.07.C GUARANTEE

1. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of one (1) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

2.01.A All devices and components of a similar type or function (i.e., pilot devices, control relays, utility meters, timers) shall match and be the product of one and the same manufacturer.

2.01.B All products provided shall be new and with manufacturer's standard warranty.

2.02 CONTROL PANEL

2.02.A One complete, factory tested and UL Listed Control Panel shall be provided for each SSD System station.

2.02.B The Control Panel shall be manufactured by a UL 508 "Industrial Control Panels" Listed firm and the completed assembly shall bear the UL Listed mark.

2.02.C Control Panel dimensions shall be as indicated on the Drawings.

2.02.D Control Panel components and materials shall be as indicated on the Drawings and as shown on the Bill of Materials therein.

2.02.E Control Panel shall be mounted with the Alarm Dialer and Utility Power kWh Meter to a backplate of painted 12-gauge steel with minimum dimensions as shown on the Drawings. The complete assembly shall be wired and integrated at the Control Panel manufacturer's shop and tested before installation in the field.

2.03 INSTRUMENTS

2.03.A UTILITY POWER kWh METER

1. Meter shall be fully electronic with 2-line alpha-numeric LCD display for kilowatt-hour readings. Meter shall provide rate of consumption indication and also a test sequence to ensure integrity of the display.
2. Meter shall provide a load indicator to indicate real-time consumption levels for field testing and certification.
3. Meter shall provide current sensor installation diagnostics indicator.
4. Meter shall use 0-2 volt output current sensors to allow paralleling and/or mounting up to 2,000 feet from the meter. Sensors shall be of split-core configuration to allow installation without powering down. Sensors shall be available from 25 amp to 200 amp. Sensors shall be optionally available in solid-core configuration (100 & 200 amp.)
5. Meter shall be enclosed in a heavy-duty JIC steel enclosure suitable for indoor installation. Meter enclosure provides a method of locking to prevent unauthorized access.
6. Meter shall be optionally available in an outdoor NEMA 4X polycarbonate enclosure with padlocking hasp & mounting flanges for indoor installation.

7. Meter shall be optionally available in MMU (Multiple Meter Configuration) enclosures containing up to 24 meters in one compact enclosure.
8. Meter shall be UL Listed/CUL Listed to latest applicable standards for safety.
9. Meter shall be certified by a nationally recognized independent test facility to ANSI C12.20 (+/- 0.2% from 1% to 100% of rated load) specifications.
10. Meter shall be California CTEP approved for use with solid-core current sensors, listed by the California Energy Commission, New York City approved and Con Edison approved for RSP program.
11. Meter shall be provided with a non-volatile memory to maintain reading during power outages.
12. Meter shall be Class 1000 Single Phase kWh Meter 120V, 1-Phase, 2W (Supplied with (1) split-core current sensor) model no. E10-212025JKIT manufactured by E-Mon D-Mon.

2.03.B ALARM DIALER

1. Alarm Dialer shall be provide remote monitoring and alarming capability with alarm notifications to the System Operator via email, text message or voice calls.
2. Alarm Dialer shall include web service to program, adjust, and monitor the status of the sensors.
3. Alarm Dialer shall be provided with a NEMA 4X enclosure.
4. Alarm Dialer shall be provided with enough inputs to monitor all required alarm points as indicated in the Specifications and on the Drawings.
5. Alarm Dialer shall be mode Cell682 manufactured by Sensaphone.
6. Alarm Dialer shall be provided by the contractor with the first year of cellular service included and shall be activated and configured by the Contractor, and tested during system startup.

2.04 FASTENERS

2.04.A Fasteners and anchors for securing equipment to walls and floors shall be either hot dip galvanized or stainless steel unless noted otherwise. Fasteners shall be sized appropriately for the anticipated loads and within manufacturer's specifications.

2.05 CONDUIT

2.05.A INSTALLATION

1. All raceways shall be as shown on the Drawings or as dictated by construction conditions at the site.
2. Minimum conduit size shall be 1/2" trade size.
3. Ream and remove all burrs in conduit installation to prevent damage to conductor insulation. Seal conduit ends until time for pulling wires.
4. Raceways shall not touch each other or other pipes except where directed and for a specific purpose other than support.

5. Wall or ceiling penetrations shall be sealed as indicated elsewhere in these Specifications. Grout raceway penetration suitable for the specific conditions of each penetration and finish to match adjacent surfaces.

2.05.B Electrical Metallic Tubing (EMT) – Galvanized steel thinwall. All couplings and connectors shall be steel (not die cast) raintight compression type. EMT shall be suitable for power and instrumentation signals within the SSD System enclosure.

2.05.C Liquid-Tight Flexible Metal Conduit – Galvanized steel with factory applied PVC jacket – shall be suitable for vibrating loads or moving equipment, motors and instruments, and maximum length of no more than six (6) feet or as limited by code.

2.05.D Rigid Non-Metallic Conduit – Schedule 40 or 80 PVC, as shown on the Drawings – approved for direct burial and sunlight resistant (U.V. stabilized) where exposed – shall be suitable for the power feeder circuit to the Control Panel and for underground installation. All joints in PVC systems shall be cemented watertight with bonding adhesive as recommended by the conduit manufacturer.

2.06 WIRE

2.06.A Except where noted otherwise, all conductors are to be copper. All grounding and bonding conductors must be copper.

2.06.B For AC wiring 120V and above, run in conduits and raceways, insulation shall be rated for 600 volts, type THHN or XHHW unless noted otherwise.

2.06.C For AC wiring 120V and above, within control panels or control devices, insulation shall be rated for 300 volts and be type MTW unless noted otherwise.

2.06.D For DC wiring 32V and below, insulation shall be rated for 300 volts.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

3.01.A The Contractor shall be responsible for coordinating the equipment, performing the installation, and start-up in a timely manner; and assuring a fully operable and function-tested system.

3.01.B Field-Verify dimensions indicated on Drawings. Actual locations, distances, and levels shall be governed by actual field conditions.

3.01.C Use screw-type conductor fasteners in terminal boxes, control panels, and motor control centers.

3.01.D Provide channels and associated hardware as required for support of raceways, device enclosures, and other electrical equipment.

3.01.E Provide grounding bushings at each end of metallic conduit runs. Grounding bushings shall be bonded to the grounding electrode system.'

3.01.F Provide continuous circuit conductors from source to load, without splices or terminations in intermediate pullboxes unless specifically noted on the Drawings.

3.01.G Install conduit runs in accordance with the schematic representations indicated on the Drawings.

3.01.H Install power conductors and terminate on equipment provided by others. Verify specific power requirements.

3.02 EQUIPMENT IDENTIFICATION

3.02.A COLOR CODING OF CONDUCTORS

1. The guidelines of the CEC shall be followed when selecting wire colors.
2. Generally, all phase wires for power conductors of the same system may be the same color. Colors may be the conductor insulation colors or the colors may be applied using indicating tape manufactured for the purpose.
3. The grounded circuit conductor (neutral) shall be white for 208-240/120 volt systems.
4. The grounding conductors shall be green or bare where allowed. Isolated equipment grounding conductors shall be green with yellow stripe.

3.02.B Provide unique wire tagging at each conductor termination endpoint.

3.02.C NAMEPLATES

1. Provide identification nameplates for all electrical and instrumentation equipment provided under this Contract. Provide nameplate designations as shown on the Drawings and as specified herein.
2. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick, 3/4-in by 2-in with 3/16-in high white letters on a black background.
3. Nameplates shall be stick-on or screw mounted to control panel electrical enclosures. Nameplates shall be bonded to all other enclosure types using a two-sided foam adhesive tape. Where the equipment size does not have space for mounting a nameplate the nameplate shall be fastened to the equipment using stainless steel wire or jack chain or permanently fastened to an adjacent mounting surface.

3.03 STARTUP AND TESTING

3.03.A Startup and test the complete SSD System at each building for witnessing by the Engineer or Engineer's representative and verify complete functionality in all operating modes. Repair or replace all defective work or equipment at no additional cost to the Owner. Instruct the Owner's personnel in the proper operation of the systems.

3.03.B Test alarm notifications and verify each alarm point is triggered and verify with the Engineer or Owner that notifications have been received.

-- End of Section --

SECTION 31 23 00

TRENCHING AND BACKFILLING
04/2016

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of the sub-slab depressurization system as shown on the Drawings. The work shall be carried out as specified herein and in accordance with the Drawings.

B. Contractor shall following requirements and standards for trenching backfilling, and bedding of environmental piping and conduit.

1.2 REFERENCES

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.

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D1140	(2014) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D1556/D1556M	(2015) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2487	(2011) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4318	(2010; E 2014) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D6938	(2015) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.3 DEFINITIONS

1.3.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698, for general soil types, abbreviated as percent laboratory maximum density.

1.4 SUBMITTALS

Submit the following at least 14 days prior to mobilization for Engineer review and approval:

SD-06 Test Reports:
- Borrow Site Chemical Analysis
- Fill and backfill test
- Compaction tests
  - (Maximum dry density and optimum moisture content for backfill materials)
- Moisture Content Tests

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.5 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.6 REQUIREMENTS FOR OFF SITE SOIL

Soils brought in from off site for use as backfill shall be tested for petroleum hydrocarbons, volatile organic carbons (VOC), polychlorinated biphenyls (PCBs) and Title 22 metals. Backfill shall not contain concentrations of these analytes above the appropriate State and/or EPA criteria, and shall pass the tests for hazardous waste (HW) characteristics. Determine petroleum hydrocarbon concentrations by using appropriate State protocols. Determine VOC concentrations by using EPA SW-846.3-3 Method 8260B. Perform complete toxicity characteristic leaching procedure in accordance with EPA SW-846.3-3 Method 1311. Perform HW characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in

accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site chemical analysis for VOCs, PCBs, metals, petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylenes from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. For each borrow site, provide borrow site testing for HW characteristics from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring material onsite until tests results have been received and approved by the Engineer.

1.7 QUALITY ASSURANCE

1.7.1 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Engineer. Report damage to utility lines or subsurface construction immediately to the Engineer. Repairs will be made at the Contractor’s expense.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Backfill and Fill Material

Backfill materials shall be onsite material. Bedding material shall be sand meeting ASTM D2487, classification GW, GP, GM, SW, SP, and SM with a maximum ASTM D4318 liquid limit of 35, maximum ASTM D4318 plasticity index of 12, and a maximum of 25 percent by weight passing ASTM D1140, No. 200 sieve.

Sand used for bedding and backfilling pipe shall have the following graduation:

Sieve Size	Percent Passing by Weight
2 inches	100
No. 4	70 – 100
No. 10	35 – 75
No. 40	10 – 40
No. 200	0 – 10

2.1.2 Topsoil

Topsoil to be provided by landscape general contractor. The topsoil must meet EPA criteria for clean soil.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

Metallic core warning tape manufactured specifically for warning and identification of buried pipe lines. Provide tape with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED VAPOR CONVEYANCE LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.1.1 Drainage

So that construction operations progress successfully, completely drain work site during periods of construction to keep soil materials sufficiently dry. Any groundwater removed from the site will be placed in appropriately labeled containers and treated through the Regional Groundwater Remediation Program groundwater treatment system. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Trench excavation and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.2 Underground Utilities

Location of the newly installed utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the utilities indicated prior to starting construction.

3.1.3 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with backfill and fill material and compact to 95 percent of ASTM D698 maximum density. Unless specified otherwise, refill excavations cut below indicated depth with backfill and fill material and compact to 95 percent of ASTM D698 maximum density. Compaction will be verified by the Contractor and witnessed by Haley & Aldrich. Compaction testing will be performed once every 50 linear feet, or as required by the City of Mountain View building permit, whichever is more conservative. Satisfactory material removed below the depths indicated, without specific direction of the Engineer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Engineer.

3.2.1 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

.2.2 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.3.1 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Compact trench backfill to 95 percent of ASTM D698 in paved areas, and compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D698. Place and compact backfill under structures and paved areas in 6 inch lifts to top of trench and in 6 inch lifts to one foot over pipe outside structures and paved areas.

3.4 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.5 COMPACTION

3.5.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D698.

3.5.2 Structures, Spread Footings, and Concrete Slabs

Compact trench backfill to 95 percent of ASTM D698. Compact fill and backfill material to 95 percent of ASTM D698.

3.5.3 Paved Areas

Compact trench backfill to 95 percent of ASTM D698. Compact fill and backfill materials to 95 percent of ASTM D698.

3.6 FINISH OPERATIONS

3.6.1 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes at the cost of the Contractor. All repairs must be approved by the Engineer.

3.7 FIELD QUALITY CONTROL

3.7.1 Sampling

Take the number and size of samples required to perform the following tests.

3.7.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.7.2.1 Fill and Backfill Material Testing

Test fill and backfill material in accordance with ASTM C136/C136M for conformance to ASTM D2487 gradation limits; ASTM D698 or ASTM D1557 for moisture density relations, as applicable. Submit test reports for maximum dry density and optimum moisture content for backfill materials.

3.7.2.2 Compaction Tests

Test density in accordance with ASTM D1556/D1556M, or ASTM D6938. When ASTM D6938 density tests are used, verify density test results by performing an ASTM D1556/D1556M density test at a location already ASTM D6938 tested as specified herein. Include density test results in daily report.

Bedding and backfill in trenches: One test per 50 linear feet in each lift.

3.7.2.3 Moisture Content Tests

During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D2216. Include moisture content test results in daily report

-- End of Section --

SECTION 40 05 13

CONVEYANCE PIPING
04/2016

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of the sub-slab depressurization system as shown on the Drawings. The work shall be carried out as specified herein and in accordance with the Drawings.

B. The work shall include, but not be limited to, delivery, storage, placement, anchorage, installation of the sub-slab depressurization system, and testing to verify compliance and performance as described herein.

C. Sub-slab depressurization system piping shall include composite venting system, solid wall polyvinyl chloride (PVC) transition and conveyance piping, and applicable accessory products and transition fittings as specified herein.

D. The composite venting system piping shall be installed beneath the Geomembrane Vapor Barrier System, which is specified in Section 07 26 16. Composite venting system shall be installed by the Geosynthetics Installer that meets the requirements of that Section.

1.2 SYSTEM DESCRIPTION

Contractor shall provide vapor mitigation system piping for the collection and venting of subslab vapors without defects, damage, or failure. Vapor mitigation system piping shall include composite venting system, solid wall polyvinyl chloride (PVC) transition and riser piping, and applicable accessory products and transition fittings as specified herein.

1.3 REFERENCES

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

ASME INTERNATIONAL (ASME)

ASME B31.3	(2014) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2467	(2015) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2774	(2012) Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	(1996; R 2010) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D3892	(1993; R 2009) Packaging/Packing of Plastics
ASTM F402	(2005; R 2012) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F656	(2010) Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 704	(2012) Standard System for the Identification of the Hazards of Materials for Emergency Response

PLASTICS PIPE INSTITUTE (PPI)

PPI TR-21	(2001) Thermal Expansion and Contraction in Plastic Piping Systems

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2013) Seismic Design for Buildings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards

1.4 SUBMITTALS

SD-02 Shop Drawings
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
Materials and Equipment

SD-03 Product Data
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
Qualifications
Manufacturer's Field Services
Delivery, Storage and Handling
Materials and Equipment

SD-06 Test Reports
Submit the following within 24 hours of completing the tests:
Pneumatic Tests
Pressure Relief Device
Valve Testing

SD-07 Certificates
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
Plastic Piping System
Plastic Pipe Installation

SD-10 Operation and Maintenance Data
Submit the following at least 14 days prior to mobilization for Engineer review and approval:
Piping and Appurtenances

1.5 QUALIFICATIONS

Submit a statement certifying that the Contractor has the specified experience. Contractor shall have successfully completed at least three projects of the same scope and size or larger within the last six years. Demonstrate specific experience in regard to the system installation to be performed.

1.6 DELIVERY, STORAGE, AND HANDLING

Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F402. Storage facilities shall be classified and marked in accordance with NFPA 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation damage, or other damage. Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendation. Plastic pipe shall be packed, packaged and marked in accordance with ASTM D3892.

1.7 SEQUENCING AND SCHEDULING

For slab, floor, wall, and roof penetrations, keep on site pertinent wall pipes and sleeves before they are required for placement in concrete forms. Verify and coordinate the size and location of building and structure pipe penetrations before forming and placing concrete.

1.8 MAINTENANCE

Submit the manufacturer's installation recommendations or instructions for each material or procedure to be utilized, including materials preparation.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

This specification covers the requirements for above and below grade conveyance pipe, pipe supports, fittings, equipment and accessories located both inside and outside of treatment plants.

2.1.1 Design Requirements

Support systems shall be selected and designed in accordance with MSS SP-58 within the specified spans and component requirements. The absence of pipe supports and details on the contract drawings does not relieve the Contractor of responsibility for sizing and providing supports throughout equipment enclosure. The structural design, selection, fabrication and erection of piping support system components shall satisfy the seismic requirements in accordance with UFC 3-310-04.

2.1.2 Performance Requirements

The pressure ratings and materials specified represent minimum acceptable standards for piping systems. The piping systems shall be suitable for the services specified and intended. Each piping system shall be coordinated to function as a unit. Flanges, valves, fittings and appurtenances shall have a pressure rating no less than that required for the system in which they are installed.

2.2 MATERIALS AND EQUIPMENT

Submit manufacturer's descriptive and technical literature for each piping system, including design recommendations; pressure and temperature ratings; dimensions, type, grade and strength of pipe and fittings; thermal characteristics (coefficient of expansion and thermal conductivity); and chemical resistance to each chemical and chemical mixture in the liquid stream. Provide piping materials and appurtenances as specified and as shown on the drawings, and suitable for the service intended. Piping materials, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting pipe, new and unused except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. The general materials to be used for the piping systems shall be in accordance with the contract drawings. Submit a list of piping systems, pressure ratings and source of supply for each piping system broken out by material, size and application as indicated on the contract drawings. Pipe fittings shall be compatible with the applicable pipe materials.

2.3 PLASTIC PIPING SYSTEM

Submit documentation certifying that the manufacturer of each thermoplastic piping system is listed with the Plastic Pipe Institute as meeting the recipe and mixing requirements of the resin manufacturer for the resin used to manufacture each of the respective thermoplastic pipe systems.

2.3.1 PVC Pipe

PVC, ASTM D1784, minimum cell classification 12545-C, pipe shall be Schedule 80 conforming to ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785.

2.3.2 PVC Joints

The piping system shall be joined by socket-weld connections except where connecting to unions, valves, and equipment with threaded connections that may require future disassembly. Tubing connections shall use compression fittings.

2.3.3 PVC Fittings

The schedule rating for the fittings shall not be less than that for the associated pipe. Fittings shall be ASTM D1784, minimum cell classification 12545-C, PVC conforming to the requirements of ASTM D2467, socket type.

2.3.4 PVC Solvent Cement

Socket connections shall be joined with PVC solvent cement conforming to ASTM D2564. Manufacture and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility. Joints shall be prepared with primers conforming to ASTM F656 prior to cementing and assembly. Solvent cement shall not contain any of the chemicals of concern at the site, specifically TCE.

2.4 RUBBER/ELASTOMER PIPING SYSTEM

2.4.1 Elastomeric Hose

Elastomeric hose shall consist of a heavy weight PVC hose reinforced with a coated spring steel wire helix. Hose shall have operating temperature of 20-160 degrees F and rated to full vacuum.

2.4.2 Fittings for Elastomeric System

All fittings shall be supplied by the same manufacturer. Fittings shall join to the hose assembly as specified. Fittings shall be manufactured by Camlock and constructed of stainless steel. Interconnections shall be accomplished through integral couplers configured as quick connect interlocking.

2.5 PVC CLEAN-OUTS

The PVC clean-out depth shall vary based on the entry pipe invert elevation. Clean-outs shall be made of PVC material. Minimum depth of 6" PVC pipe section shall be 1 foot per Contract Drawings. Well plug located at the top of the clean-out shall be rated for full vacuum. Fiberlyte Composite box, model number FL08, shall be located such that the box cover is at ground surface with the clean-out well plug positioned in the middle of the box.

2.6 SAMPLE PORTS

Sample ports shall be provided as indicated in the piping and instrument diagrams to complete the piping systems for the use intended. The sample ports shall be located in easily accessible locations, have a threaded connection on the conveyance pipe and shall avoid potential stagnant points and/or areas where material could collect.

2.7 PIPE SUPPORTS AND PENETRATIONS

Provide auxiliary steel where the support of piping systems and equipment is required between building structural elements. Light gauge and structural steel shapes shall conform to the requirements of ASTM A36/A36M. The Contractor has the option to use pre-engineered support systems of electrogalvanized steel products. However, a mixture of support system manufacturer's products is not permitted.

2.7.1 Pipe Supports

Pipe supports shall conform to the requirements of MSS SP-58. Where pipe supports contact bare piping or in-line devices, provide supports of compatible material so that neither shall have a deteriorating action on the other.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Engineer of any discrepancy before performing the work.

3.2 PREPARATION

3.2.1 Protection

Pipe and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.

3.2.2 Pipe and Fitting Preparation

Pipe and fittings shall be inspected before exposed piping is installed or buried piping is lowered into the trench. Clean the ends of pipes thoroughly, remove foreign matter and dirt from inside of pipes, and keep piping clean during and after laying.

3.3 EXPOSED PIPING INSTALLATION

Exposed piping shall be run as straight as practical along the alignment shown on the contract drawings and with a minimum of joints. Piping and appurtenances shall be installed in conformance with reviewed shop drawings, manufacturer's instructions and ASME B31.3. Piping shall be installed without springing or forcing the pipe.

3.3.1 Piping Flexibility Provisions

Flexible couplings and expansion joints shall be installed at connections to equipment, and where shown on the contract drawings. Additional pipe anchors and flexible couplings beyond those shown on the contract drawings shall be provided to facilitate piping installation, in accordance with reviewed shop drawings.

3.3.2 Piping Equipment/Component Installation

3.3.2.1 Local Indicators

All direct-reading indicator devices, thermometers, and pressure gauges shall be installed so that they can be easily read from floor level, and are readily accessible for maintenance and service. Pressure gauges and thermometers shall be installed where indicated in the contract drawings.

3.3.3 Valve Locations

Valves shall be located in accordance with the contract drawings where actuators are shown. Where actuators are not shown, valves shall be located and oriented to permit easy access to the valve operator, and to avoid interferences.

3.3.4 Plastic Pipe Installation

Submit a statement signed by the plastic pipe manufacturer's representative certifying that the Contractor's personnel are capable of properly installing the piping system on the project. All plastic pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations.

A. Schedule 80 threaded nipples shall be used where necessary to connect to threaded valves or fittings. Strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to over tighten these fittings.

B. Pipe shall not be laid when the temperature is below 40.1 degrees F, nor above 90 degrees F when exposed to direct sunlight. Any plastic pipe installed above grade and outdoors shall be ultraviolet (UV) protected or UV resistant.

C. The pipe ends that are to be joined shall be shielded from direct sunlight prior to and during the laying operation. Adequate ventilation shall be provided when working with pipe joint solvent cement and the handling of solvent cements, primers and cleaners shall be in accordance with ASTM F402.

D. Solvent-cemented joints shall be constructed in accordance with ASTM D2855.

3.4 BURIED PIPE PLACEMENT

Thermoplastic piping systems shall be installed underground in accordance with ASTM D2774.

3.4.1 Excavation and Backfilling

Earthwork shall be performed as specified in Section 31 23 00 TRENCHING AND BACKFILLING. Backfilling shall be accomplished after inspection by the Engineer. Exercise care when lowering pipe into the trench to prevent damage or twisting of the pipe.

3.4.2 Fittings

Press connections shall be made in accordance with manufacturer's installation instructions using tools approved by the manufacturer. The tubing shall be fully inserted into the fitting and then marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to ensure the tubing is fully inserted before the joint is pressed. At valves and connections, the trench bottom shall be dug out with sufficient length, width, and depth to ensure clearance between the undisturbed trench bottom and the valves and such connections.

3.4.3 Marking Tape

Pipe marking tape shall be provided and installed in accordance with the requirements Contract Drawings.

3.4.4 Plastic Pipe Installation

Plastic pipe shall be cut, fabricated, and installed in strict conformance with the pipe manufacturer's recommendations. Design for installation of plastic pipe exposed to ambient conditions or in which the temperature variation of the contents is substantial shall have provisions for movement due to thermal expansion and contraction documented to be in accordance with PPI TR-21. Flexible plastic pipe connected to heavy fittings, manholes, and rigid structures shall be supported in such a manner that no subsequent relative movement between the plastic pipe at the flanged joint and the rigid structures is possible. The piping shall be designed and installed to withstand the compression and expansion forces imposed by the trench conditions.

3.5 VALVE INSTALLATION

Flanged valve bolt holes shall be installed so as to straddle the vertical centerline of pipe. Flanged faces shall be cleaned prior to inserting the gasket and bolts, and then the nuts shall be tightened progressively and uniformly. Threaded ends shall have the threads cleaned by wire brushing or swabbing prior to installation.

3.6 PIPING SUPPORT SYSTEMS INSTALLATION

The absence of pipe supports and details on the contract drawings shall not relieve the Contractor of responsibility for sizing and providing supports throughout plant. Pipe support systems shall meet the requirements of MSS SP-58. Contractor-designed and selected support systems shall be installed in accordance with MSS SP-58, and as specified herein. Piping connections to equipment shall be supported by pipe supports and not off the equipment. Large or heavy valves, fittings,

and/or equipment shall be supported independently of associated piping. Pipes shall not be supported off other pipes. Supports shall be provided at piping changes in direction or in elevation, adjacent to flexible joints and couplings, and where otherwise shown on the contract drawings.

3.7 PIPE IDENTIFICATION, PAINTING AND COLOR CODING

Color and coating for exposed piping shall be per Architect requirements.

3.8 FIELD QUALITY CONTROL

3.8.1 Pneumatic Tests

Pneumatic testing shall be prepared for and conducted in accordance with the requirements of ASME B31.3. Care must be taken to minimize the chance of a brittle fracture or failure during a pneumatic leak test. Only non-toxic, nonflammable, inert gases or air shall be used.

3.8.1.1 Pressure Relief Device

During pneumatic testing, a pressure relief device shall be provided for each piping section being tested. The device shall have a set pressure not higher than 110 percent of the test pressure.

3.8.1.2 Pneumatic Testing Procedures

The test fluid shall be air and the test pressure shall be 10 psig. The test pressure shall be incrementally increased until the gage pressure reaches 50 percent of test pressure. Examine piping joints for leakage. If no leakage is occurring, continue to increase the pressure incrementally, while maintaining each incremental increase long enough to equalize pipe strains, until the test pressure is reached. The test pressure shall then be reduced to the design pressure and maintained for 10 minutes without additional energy expenditure. If the pneumatic pressure remains steady, then no leakage is indicated. Inspect for and repair leaks, and retest if necessary.

3.8.2 Testing New to Existing Connections

New piping connected to existing pipe, existing equipment, existing treatment systems, or tanks and treatment systems furnished under other Sections shall be tested. Isolate the new piping with pipe caps, spectacle blinds, or blind flanges. The joint between new piping and existing piping shall be tested by methods that do not place the entire existing system under the test load. Proceed then, with the testing of new piping systems as specified herein.

3.8.3 Valve Testing

Submit copies of all field test reports to the Engineer for approval within 24 hours of the completion of the test. Valves may either be tested while testing pipelines, or as a separate step. It shall be demonstrated that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other, and in both directions for two-way valve applications. Count and record the number of turns required to open and close each valve, and account for any discrepancies with manufacturer's data.

3.9 FINAL CLEANING

3.9.1 Interim Cleaning

Prevent the accumulation of pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping sections during fabrication. The piping shall be examined to assure removal of these and other foreign objects prior to assembly and installation.

3.9.2 Flushing

Following assembly and testing, and prior to final acceptance, piping systems shall be flushed with compressed air to remove accumulated construction debris and other foreign matter. The piping shall be flushed until all foreign matter is removed from the pipeline. Provide all hoses, temporary pipes, ditches, and other items as required to properly dispose of flushing water without damage to adjacent properties. Accumulated debris shall be removed through clean-outs or by removing spools or valves.

3.10 MANUFACTURER'S FIELD SERVICES

Submit a signed statement certifying that the installation is satisfactory and in accordance with the contract drawings and specifications and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance. Obtain manufacturer's technical assistance for Contractor training, installation inspection, start up, and owner operating and maintenance training. Follow manufacturer's instructions for installation.

-- End of Section --

TITLE: 277 Fairchild Drive
JOB NAME: 36067-070
LOCATION: Mountain View, CA
CONTRACT NO:
CONTRACTOR:

SUBMITTAL REGISTER

									CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
	(a)	(b)	(c)	(d)			(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
Line	Activity #	Trans-mittal #	Specification Section	SD #	Submittal Description	Item Submitted	Paragraph #	Classification: GOVT or A/E Revwr	Submit	Approval Needed By	Material Needed By	Action Code	Date Of Action	Date FWD to APPR / Auth Date RCD From CONTR	Date FWD To Other Revwr	Date RCD From Other Revwr	Action Code	Date Of Action	Mailed To CONTR/ Date RCD From APPR Authority	Remarks
1			07 26 16	01	Preconstruction Submittals	Installer License	1.5.2													
2			07 26 16	01	Preconstruction Submittals	Installer Capabilities	1.5.2													
3			07 26 16	01	Preconstruction Submittals	installation instructions	1.6.1													
4			07 26 16	03	Product Data	Geomembrane Carrier	2.1													
5			07 26 16	03	Product Data	Geomembrane Vapor Barrier	2.2													
6			07 26 16	03	Product Data	Geomembrane Protection Course	2.3													
7			07 26 16	03	Product Data	Geomembrane Detailing Fabric	2.4													
8			07 26 16	06	Test Reports	Smoke Testing	3.7.1													
9			07 26 16	11	Closeout Submittals	Material Warranty	1.8													
10			07 26 16	11	Closeout Submittals	Workmanship Warranty	1.8													
11			07 26 17	01	Preconstruction Submittals	Installer License	1.5.1.2													
12			07 26 17	01	Preconstruction Submittals	Installer Capabilities	1.5.1.2													
13			07 26 17	01	Preconstruction Submittals	installation instructions	1.6.1													
14			07 26 17	03	Product Data	Composite Venting System	2.1													
15			07 26 17	11	Closeout Submittals	Material Warranty	1.8													
16			07 26 17	11	Closeout Submittals	Workmanship Warranty	1.8													
17			07 26 17	11	Closeout Submittals	Record Drawings	3.7													
18			26 00 00	03	Product Data	Electrical Components Catalog	1.06A													
19			26 00 00	02	Shop Drawings	Electrical Installation	1.06A													
20			26 00 00	10	Operation and Maintenance Data	System Manual	1.06A													
21			31 23 00	06	Test Reports	Borrow Site Chemical Analysis	1.6													
22			31 23 00	06	Test Reports	Fill and backfill test	3.7.2.1													
23			31 23 00	06	Test Reports	Compaction tests	3.7.2.2													
24			31 23 00	06	Test Reports	Moisture Content Tests	3.7.2.3													
25			40 05 13	02	Shop Drawings	Materials and Equipment	2.2													
26			40 05 13	03	Product Data	Qualifications	1.5													
27			40 05 13	03	Product Data	Manufacturer's Field Services	3.10													
28			40 05 13	03	Product Data	Delivery, Storage and Handling	1.6													
29			40 05 13	03	Product Data	Materials and Equipment	2.2													
30			40 05 13	06	Test Reports	Pneumatic Tests	3.8.1													
31			40 05 13	06	Test Reports	Pressure Relief Device	3.8.1.1													
32			40 05 13	06	Test Reports	Valve Testing	3.8.3													
33			40 05 13	07	Certificates	Plastic Piping System	2.3													
34			40 05 13	07	Certificates	Plastic Pipe Installation	3.3.4													
35			40 05 13	10	Operation and Maintenance Data	Piping and Appurtenances	3.3													

APPENDIX C

Construction Quality Assurance Plan

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1. General Information

1.1 PURPOSE

Haley & Aldrich, Inc., (Haley & Aldrich) prepared this Construction Quality Assurance Plan (CQAP) as part of the vapor intrusion (VI) control system design for the proposed construction at the property located at 277 Fairchild Drive, in Mountain View, California (the Property). This CQAP describes the proposed quality assurance/quality control (QA/QC) program for implementing the various construction phases needed to construct the VI control system. The proposed QA/QC program that will be implemented during VI control system construction will include a pre-construction meeting and routine meetings during construction of the system; observation of construction activities and testing activities; and observation of system startup activities.

Once the construction is complete, the Engineer of Record will compare the installed VI control systems with the intent of the design drawings (Appendix A of the Remedial Design) and engineering specifications (Appendix B) for this project.

1.2 SUMMARY OF DESIGN APPROACH

As reported in the Property-specific Vapor Intrusion Control System Remedial Design and shown in the remedial system design drawings (Appendix A), each VI control system consists of a vapor barrier and sub-slab depressurization (SSD) system. The vapor barrier is comprised of a substrate (VI-20 geomembrane®) or equivalent, a 60-mil-thick continuous spray-applied liquid membrane (Liquid Boot®) or equivalent, and a protection layer (Ultrashield G-1000®) or equivalent.

Each SSD system will use blower-assisted venting to produce a negative pressure differential across the slab of at least -0.02 inches of water column beneath each building and will include the following major components:

- Sub-slab vapor vent piping consisting of a low-profile composite vent system (GeoVent™) or equivalent surrounded with permeable subgrade material (i.e., 3/4- inch crushed stone);
- Exterior pressure monitoring points;
- Vapor conveyance pipe network;
- Free-standing equipment enclosure with noise abatement material to house the blowers, moisture separators, vapor-phase granulated activated carbon (VGAC) units, and electrical controls;
- Vapor extraction blower (Cincinnati Blower PB-10A);
- Moisture knockouts in the influent piping to remove potentially entrained moisture in the air stream;
- VGAC units for vapor abatement prior to discharge to the atmosphere; and
- Low-permeability utility trench dams.

2. Construction Quality Assurance Plan

The following personnel are involved in the SSD system construction:

- Project Owner: Raytheon Company; Schlumberger Technology Corporation;
- Property Owner/Tenant: Warmington Residential;
- Design Engineer and Quality Assurance Manager: Haley & Aldrich;
- General Contractor: To be determined;
- Construction Subcontractor: To be determined; and
- Electrical Subcontractor: To be determined.

The following measures will be implemented to assure the proper construction of the SSD system:

- Routine construction meetings;
- Construction quality assurance (CQA) observations and testing;
- A performance monitoring observation; and
- Record keeping.

2.1 CONSTRUCTION MEETINGS

Pre-Construction Meetings:

A pre-construction meeting will be coordinated with Haley & Aldrich, the General Contractor, and all subcontractors to review and coordinate their respective roles and discuss the following topics:

- Scheduling and Coordination: Review and discuss the proposed construction scheduling and sequence the installation of the vapor barrier and the SSD system and applicable testing in each building, including but not limited to vapor barrier smoke testing and pneumatic leak testing, with a focus on identifying potential situations or conflict(s). Evaluate material delivery lead times and activity durations with all trades to qualify and confirm the final project schedule.
- Material Approval Process: Review and discuss the process for submitting, reviewing, and approving proposed construction materials. All material product data and submitted specifications will be reviewed and approved by the Engineer of Record prior to delivery to the Property.
- Health and Safety Considerations: Review and discuss Property-specific health and safety requirements and considerations to protect workers and the public during construction. The discussion will specify protocols for communicating hazards, reporting requirements, health and safety documentation, meeting schedules, and emergency response preparation.

Daily Tailgate Health and Safety Meetings:

Before the start of each day's field work, Haley and Aldrich's health and safety officer will review necessary health and safety requirements associated with that day's planned activities.

2.2 CONSTRUCTION QUALITY ASSURANCE OBSERVATION AND TESTING

The following CQA measures will be performed during the various construction phases as described below. The design drawings, equipment cut sheets, and specifications describe the installation of the SSD system and with the Scope of Work, comprise the Contract Documents.

- Material Receiving: All materials incorporated into each vapor barrier and the SSD system must adhere to the requirements of the construction specifications in the design documents. On-site construction managers will visually observe and document that all delivered material is either the same material submitted to and approved by the Engineer of Record, or that it meets or exceeds the specifications of the design documents.
- Pipe Trench Observation: Trenching to install the SSD system piping from the buildings and the vapor exhaust piping from the equipment enclosures to the false light pole will be conducted in accordance with the construction details (see Sheets C-107 through C-109 provided in Appendix A of the Remedial Design document) and specification (Appendix B). Pipes trenches will follow the alignment detailed on Sheet C-101 through C-106 provided in Appendix A of the Remedial Design document. The General Contractor shall install the piping in accordance with the Contract documents. Observation activities conducted by Haley & Aldrich will include the following:
  - Observation of piping connections and fittings, including witnessing pneumatic leak testing performed by the Contractor; and
  - Observation of the trench backfill and review of compaction test results (as specified in the design drawings provided in Appendix A of the Remedial Design document).
- Concrete Observation: The Engineer of Record (or designee) will review the concrete mix design, observe the subgrade preparation, review concrete compressive strength test results, and observe the rebar size and placement.
- Exterior Pressure Monitoring Point Observation: The Engineer of Record (or designee) shall observe the piping connections, fittings, and monitoring ports to check whether they are installed in accordance with applicable general and detail drawings and engineering specifications.
- Equipment Enclosure Installation Observation: The Engineer of Record (or designee) shall observe the installation of the electrical equipment within each equipment enclosure by the electrical subcontractor. Inspection and testing activities by the Contractor will demonstrate that the electrical equipment was installed in accordance with the Contract Documents.
- Vapor Barrier Installation Observation: The Engineer of Record (or designee) shall observe the installation of the vapor barrier by the geosynthetic installer.
  - Smoke testing shall be performed on areas no greater than 2,000 square feet of the cured geomembrane vapor barrier by the geosynthetic installer and will be observed by Haley & Aldrich. Smoke tests procedures are further described in the specifications (Appendix B).

- Destructive testing shall consist of one 2-inch square sample of the cured geomembrane vapor barrier for every 2,000 square feet, or one per home, whichever is more conservative. The Engineer (or designee) will chose the sample locations and measured to confirm that the geomembrane vapor barrier was installed to a minimum thickness of 60 mils.

2.3 SYSTEM STARTUP

The General Contractor will perform a system startup to verify:

- Proper operation of all blowers;
- The integrity of the pipes and connections;
- That acceptable noise levels are obtained when all systems are operational;
- That field devices are calibrated and functioning as intended; and
- That telemetry systems are operating and providing notifications as needed to the proper persons.

2.4 RECORD KEEPING

The CQA observation documentation and testing results will be recorded daily and maintained in the project file. Property activities, inspections, and material field testing will be recorded during each Site visit, along with any concerns regarding observed deficiencies and their associated corrective actions. Detailed inspection observations, photographic documentation, requests for information, and written approvals of the SSD system components will be provided to the Engineer of Record.

2.5 REPORTING

Once the field activities associated with all SSD systems are complete, a CQA report will be submitted to EPA within 60 days after the SSD system's startup in a document entitled "Property-specific Vapor Intrusion Response Action Implementation Report."

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