

5 September 2014

Stephanie K.J. Cushing, MSPH, CHMM, REHS
Principal Environmental Health Inspector
San Francisco Department of Public Health
1390 Market Street, Suite 210
San Francisco, CA 94102

**Subject: Methane Mitigation System
801 Brannan Street
San Francisco, California
SMED 985
Langan Project: 731615201**

Dear Ms. Cushing,

On behalf of Equity Residential, Langan Treadwell Rollo (Langan) submits for your review this letter regarding the engineering design for mitigating methane migration into the proposed commercial/residential development located at 801 Brannan Street, San Francisco, California (Site). Included are a project overview, a summary of Site conditions, and a description of the proposed sub-slab methane mitigation system (MMS).

1.0 PROJECT OVERVIEW

The approximately 5.21-acre, rectangular-shaped Site is located on the south side of Brannan Street, between 7th Street and 8th Street, and has plan dimensions of approximately 300 feet by 725 feet. Approximately 0.87 acres of land at the northeast corner of the Site will be dedicated to the City of San Francisco. The remainder of the proposed development will mainly consist of a 6-story residential structure with commercial spaces, residential units, and parking garages on the ground floor, as well as publically accessible open space. The eastern and western portions of the building will be separated at the ground level by publically accessible open space called the "Market Mews". There are no basements planned, so the proposed excavation will primarily consist of what is needed for elevator pits, pile caps, and/or utilities. The maximum anticipated excavation from existing Site conditions is about 5 feet below ground surface (bgs). This letter addresses the engineering design for mitigating methane in soil gas at the proposed development.

Per a recently passed City and County of San Francisco Ordinance (Ordinance No. 155-13, approved 25 July 2013, and effective as of 24 August 2013), the Site is located in an area that is subject to the requirements of the San Francisco Public Health Code Article 22A (Maher Ordinance) and is therefore subject to oversight by the San Francisco Department of Public Health (SFDPH).

2.0 SITE ENVIRONMENTAL CONDITIONS

In 2011, Stellar conducted a Phase I and Phase II Environmental Site Assessment (ESA) for the Site. Based on information obtained during the Phase I, previous occupants at the Site have included Pacific Woodenware and Cooperage and several small buildings (1887); a drayage company, box factory, bottle yard, and hay and unspecified warehouse (1899); Western Pacific Railroad Freight Depot and multiple railroad spurs (1913 to 1980); and Concourse Exhibition Center (1980s to 2000s). In order to assess the potential for soil gas impacts resulting from past and/or present Site activities and nearby off-site operations, Langan conducted a soil gas investigation in June 2013. The work included collecting soil gas samples at five locations at depths of about 5 to 8 feet bgs (TR-SG-1 through TR-SG-5, see Attachment A). Soil gas samples were analyzed for:

- Total petroleum hydrocarbons as gasoline (TPHg) by EPA Method TO-3;
- Volatile organic compounds (VOCs) by EPA Method TO-15; and
- Methane and helium by American Society for Testing and Materials (ASTM) Method D-1946.

Laboratory analytical results did not detect TPHg or VOCs in soil gas above their respective residential Environmental Screening Levels (ESLs) or residential California Human Health Screening Levels (CHSSLs). However, an elevated methane condition (12.3 percent by volume [%v]) exists in soil gas at a localized area on the western portion of the Site (TR-SG-1; see Attachment A). The elevated methane concentration may be attributable to the degradation of TPHs previously detected in soil and groundwater. Though no action level for methane has been formally established for the expanded Maher zone areas, the elevated methane concentration at TR-SG-4 exceeds the 1.25%v criterion previously established for Mission Bay, which is currently used as a guideline by SFDPH.

3.0 DESIGN ELEMENTS

Given the elevated concentrations of methane in excess of their respective threshold criterion, a MMS was selected to be installed at the western portion of the building, which is separated from the remainder of the building foundation as well as the ground level by publically accessible open space. The design of the system has been closely coordinated by Langan with representatives of the design team, with David Baker Architects as lead architect. A set of the MMS drawings, 65% Construction Documents (65% CD) dated 15 July 2014, is attached to this letter (Attachment B).

The VMS will consist of a continuous, spray-applied vapor barrier membrane (Liquid Boot™) beneath the structural building slab, combined with a horizontal collection and venting system consisting of 3-inch diameter perforated PVC pipe embedded in a 4-inch gravel layer installed below the vapor barrier to allow methane that may otherwise collect beneath the slab to instead migrate and vent to the atmosphere outside the building. A series of risers fitted with wind-assisted turbines will vent the vapors to the atmosphere at the roof level. All below-grade

electrical conduits entering the building will be sealed to prevent methane migration beneath the building slab from outside the building along the conduits. These features are described in greater detail in the attached drawings. These system features are comparable to those previously designed by Langan for numerous projects with similar Site conditions throughout San Francisco.

In summary, it is Langan's opinion that the proposed MMS design shown in the attached drawings is a conservative design that is consistent with designs for such systems for nearby parcels that have similar site conditions and redevelopment plans. Having a vapor barrier and a collection and ventilation system provides for engineering redundancy in the mitigation system.

We will issue a formal completion letter to you after we have performed the final Site walk-through and are satisfied that the methane mitigation measures have been installed in conformance with the intent of the design.

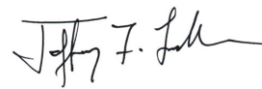
We look forward to receiving your formal approval of the design. In the meantime, if you have any questions or comments regarding the information contained in this submittal, please feel free to contact us at (415) 955-5200.

Sincerely,

Langan Treadwell Rollo



Veronica Tiglao, PE
Senior Project Engineer



Jeffrey F. Ludlow, PG
Principal



Attachments:

- | | |
|--------------|--|
| Attachment A | Figures and Table from <i>Soil Gas Investigation Report, 801 Brannan Street</i> , by Treadwell & Rollo, A Langan Company, dated 18 November 2013 |
| Attachment B | Methane Mitigation System Drawings, by Langan Treadwell Rollo, dated 15 July 2014 |

cc: Peter Solar, Steve Nelson, Becky Setzman Becker - Equity Residential Inc.

731615201.05 VT

Attachment A

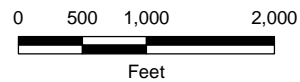
**Figures and Table from *Soil Gas Investigation Report, 801 Brannan Street*, by Treadwell & Rollo, A Langan Company,
dated 18 November 2013**



Project Site

Notes:

1. Aerial source: Orthophoto mosaic of San Francisco proper (2012), provided by the County and City of San Francisco.
2. Map displayed in California State Plane Coordinate System , Zone III, North American Datum of 1983 (NAD83) , US Survey Feet.



801 BRANNAN STREET
San Francisco, California

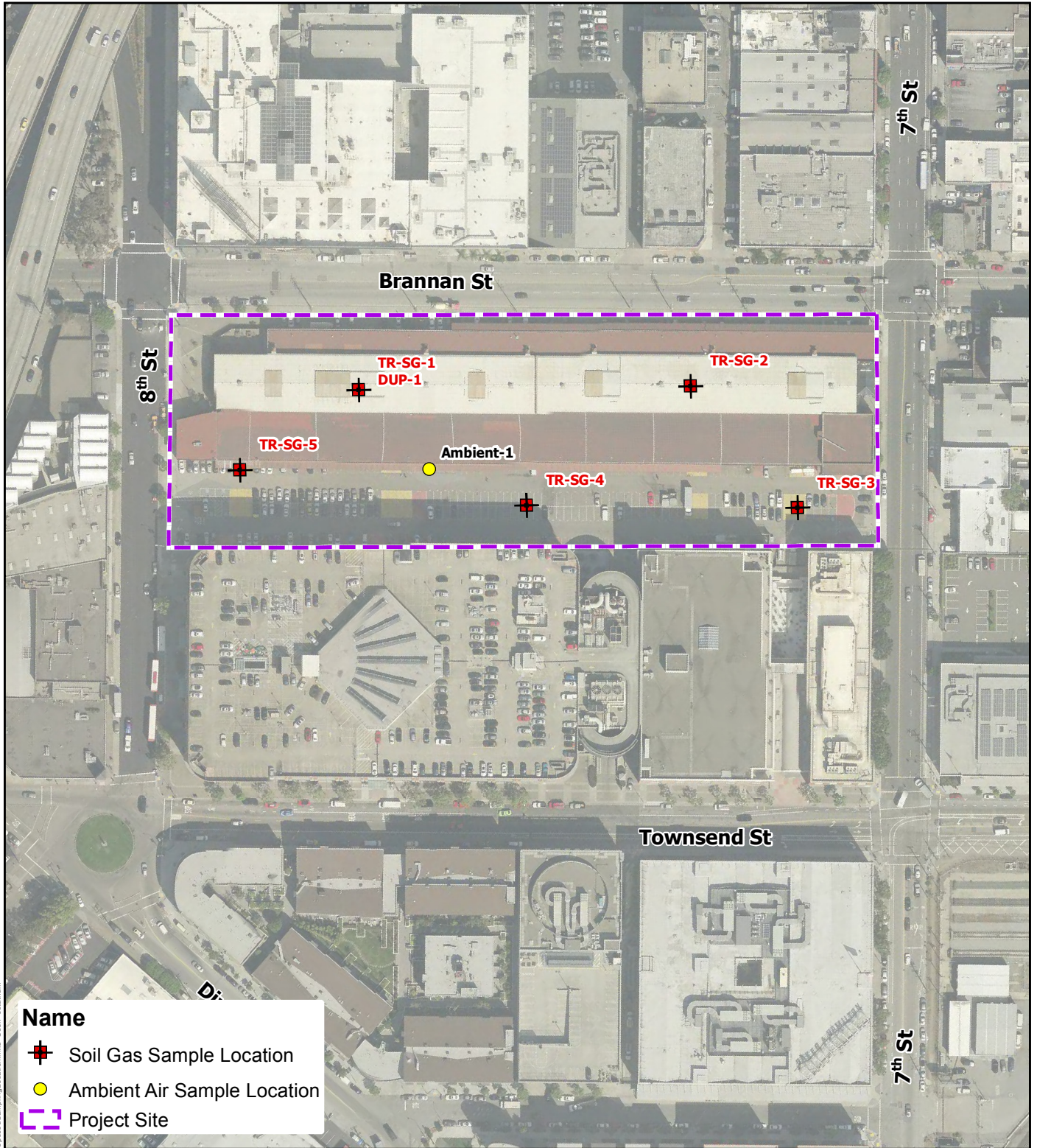
VICINITY MAP

Treadwell & Rollo
A LANGAN COMPANY

Date 6/20/2013

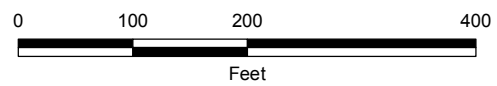
Project 731615201

Figure 1



Notes:

1. Aerial source: Orthophoto mosaic of San Francisco proper (2012), provided by the County and City of San Francisco.
2. Map displayed in California State Plane Coordinate System , Zone III, North American Datum of 1983 (NAD83), US Survey Feet.



801 BRANNAN STREET
San Francisco, California

SAMPLE LOCATION MAP

Treadwell & Rollo
A LANGAN COMPANY

Date 6/21/2013

Project 731615201

Figure 2

Table 1
Soil Gas and Ambient Air Analytical Results
801 Brannan Street
San Francisco, California

Sample ID	Purge Volumes	Sample Depth (feet below ground surface)	Date Sampled	TPH	VOCs																					Tracer Gas	
				TPHg	Acetone	Benzene	2-Butanone	Carbon Disulfide	Carbon Tetra-chloride	Chloroform	Chloro-methane	Dichloro-difluoro-methane	1,1-Dichloro-ethane	Ethyl-benzene	Methyl-tert-butyl-ether	Methylene Chloride	o-Xylene	p/m-Xylene	Tetrachloro-ethene	Toluene	Trichloro-fluoro-methane	1,1,1-Trichloro-ethane	1,1,2-Trichloro-1,2,2-Trifluoro-ethane	1,2,4-Trimethyl-benzene	All Other VOCs	Methane	Helium
				µg/m³																							(%v)
TR-SG-1*	3	5.0	06/17/13	<7,000	63	<1.7	8.1	<6.6	<3.3	<2.6	<1.1	<2.6	160	<2.3	<7.6	<18	<2.3	<9.1	<3.6	<2.0	<6.0	58	<12	<7.8	ND	12.3	<0.01
Dup-1 *	3	5.0	06/17/13	<7,000	100	<1.8	9.1	<6.9	<3.5	<2.7	<1.1	<2.7	160	<2.4	<8.0	<19	<2.4	<9.6	<3.8	<2.1	<6.2	60	<13	<8.2	ND	13.0	<0.01
TR-SG-2*	3	5.0	06/17/13	<7,000	130	8.3	39	<6.2	<3.1	<2.4	<1.0	<2.5	<2.0	3.2	130	<17	6.3	11	<3.4	17	<5.6	<2.7	<11	<7.4	ND	0.732	<0.01
TR-SG-3	3	5.0	06/17/13	<7,000	110	30	23	<7.2	6.9	<2.8	<1.2	<2.9	<2.3	6.9	<8.4	<20	9.1	21	5.2	40	6.8	210	<13	<8.6	ND	<0.5	<0.01
TR-SG-4	3	5.0	06/17/13	<7,000	26	4.8	<5.8	<8.2	<4.1	7.8	<1.4	<3.2	<2.7	<2.8	<9.4	<23	3.8	<11	<4.4	10	<7.4	35	<15	<9.7	ND	<0.5	<0.01
TR-SG-5	3	5.0	06/17/13	<7,000	55	7.6	13	13	<3.5	<2.7	<1.1	<2.7	<2.2	5.1	<8.0	<19	9.5	20	<3.8	17	<6.2	18	<13	<8.2	ND	<0.5	<0.01
Ambient-1	3	5.0	06/17/13	<7,000	7.3	0.41	<1.5	<1.6	0.62	<0.12	1.2	2.6	<0.10	0.2	<0.09	0.53	0.23	0.65	<0.17	1.3	1.5	0.56	0.64	0.2	ND	<0.5	<0.01
ESL - Residential Land Use				150,000	16,000,000	42	2,600,000	NE	29	230	47,000	NE	760	490	4,700	NE	52,000	52,000	210	160,000	NE	2,600,000	NE	NE	NE	NE	NE
HHSL - Residential Land Use				NE	NE	36.2	NE	NE	25.1	NE	NE	NE	NE	NE	4,000	NE	315,000	317,000	180	135,000	NE	991,000	NE	NE	NE	NE	NE

Notes:
* Sample collected at on-site building, which is about 3 feet above grade. Sample collected at about 8 feet below concrete slab, translating to about 5 feet below ground surface.
µg/m³ - micrograms per cubic meter
%v - percent volume
TPH - Total Petroleum Hydrocarbons
TPHg - Total Petroleum Hydrocarbons as Gasoline
VOCs - Volatile Organic Compounds
< - Analyte was not detected at or above the laboratory reporting limit
ND - Not detected at or above the laboratory reporting limit
NE - Not established

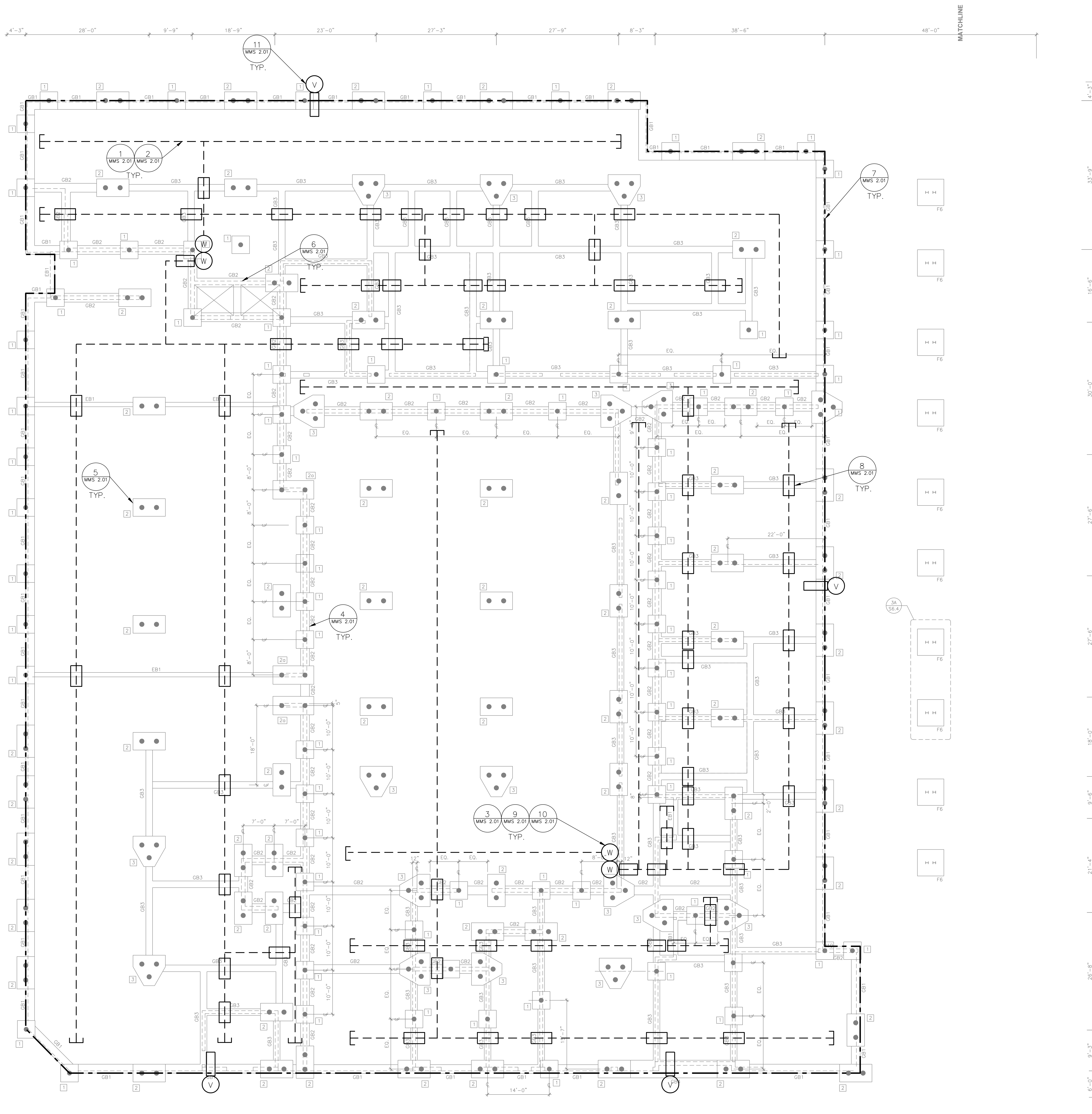
Environmental Screening Levels (ESL) values cited are from Summary Table E, Indoor Air and Soil Gas (Vapor Intrusion Concerns), from the 2013 Tier 1 ESLs, by the California Regional Water Quality Control Board, San Francisco Bay Region, dated May 2013.

California Human Health Screening Levels (CHHSL) values cited are from Summary Table 2, California Human Health Screening Levels for Indoor Air and Soil Gas, from the *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties*, by the California Environmemntal Protection Agency, dated January 2005.

Attachment B

**Methane Mitigation System Drawings,
by Langan Treadwell Rollo, dated 15 July 2014**

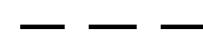
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LEGEND



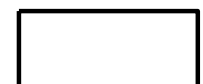
APPROXIMATE LATERAL EXTENT OF METHANE MITIGATION SYSTEM



3" DIAMETER SCHEDULE 40 PERFORATED PVC PIPE BELOW SLAB (SEE NOTE 3 ON SHEET MMS 2.01 FOR REQUIRED PERFORATION PATTERN)



SCHEDULE 40 PVC END CAP



4" DIAMETER PVC PIPE SLEEVE



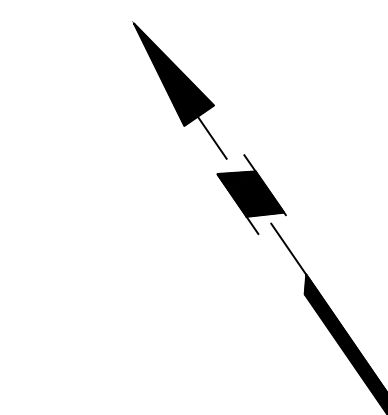
RISER PIPE TO ROOF (SEE DETAILS ON SHEET MMS 2.01)



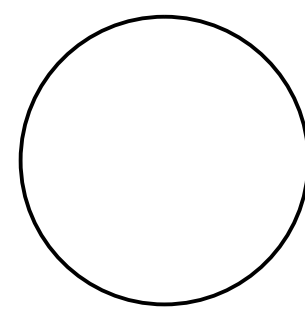
3" DIAMETER SCHEDULE 40 PVC VENT PIPE (SEE DETAILS ON SHEET MMS 2.01)



SEE DETAIL 1, SHEET MMS 2.01



david baker architects
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DRAWING RELEASE STATUS	DATE
SITE PERMIT	2013-09-03
60% DESIGN DEVELOPMENT	2013-10-15
100% DESIGN DEVELOPMENT	2013-12-20
80% CONSTRUCTION DOCUMENTS	2014-02-28
SITE PERMIT RESUBMITTAL	2014-03-11
90% OF 65% COORDINATION SET	2014-04-16
STRUCTURAL ADDENDUM 1	2014-06-02
65% CONSTRUCTION DOCUMENTS	2014-07-15

ADDENDA	DATE
1	
2	
3	
4	
5	
6	
7	
8	
9	

SHEET TITLE

METHANE MITIGATION SYSTEM LAYOUT

SCALE

1/8" = 1'

JOB NUMBER

731815201

DRAWN BY

VMT

RELEASE DATE

05/23/2014

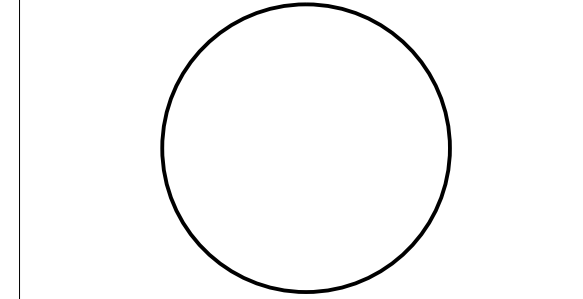
CHECKED BY

MMS 1.01

1 OF 2 SHEETS



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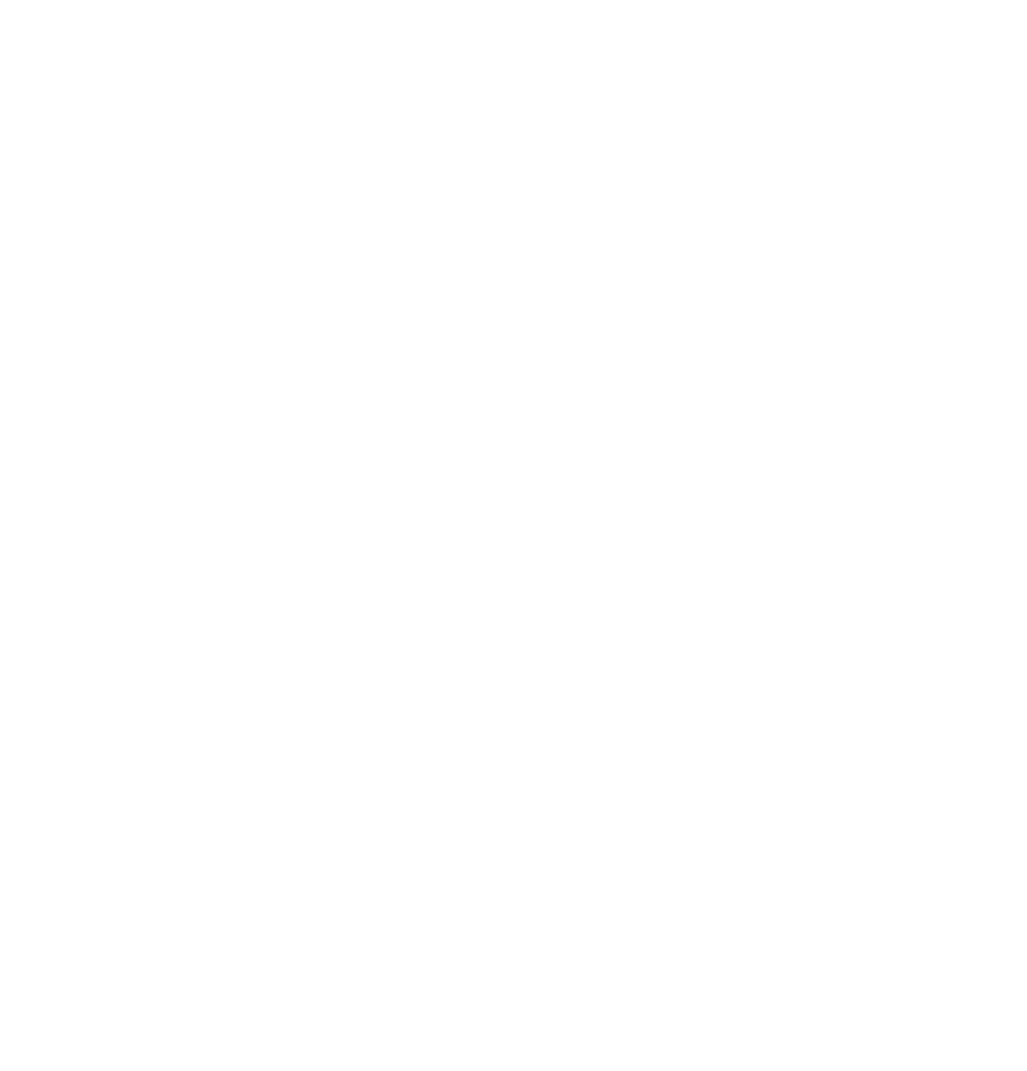
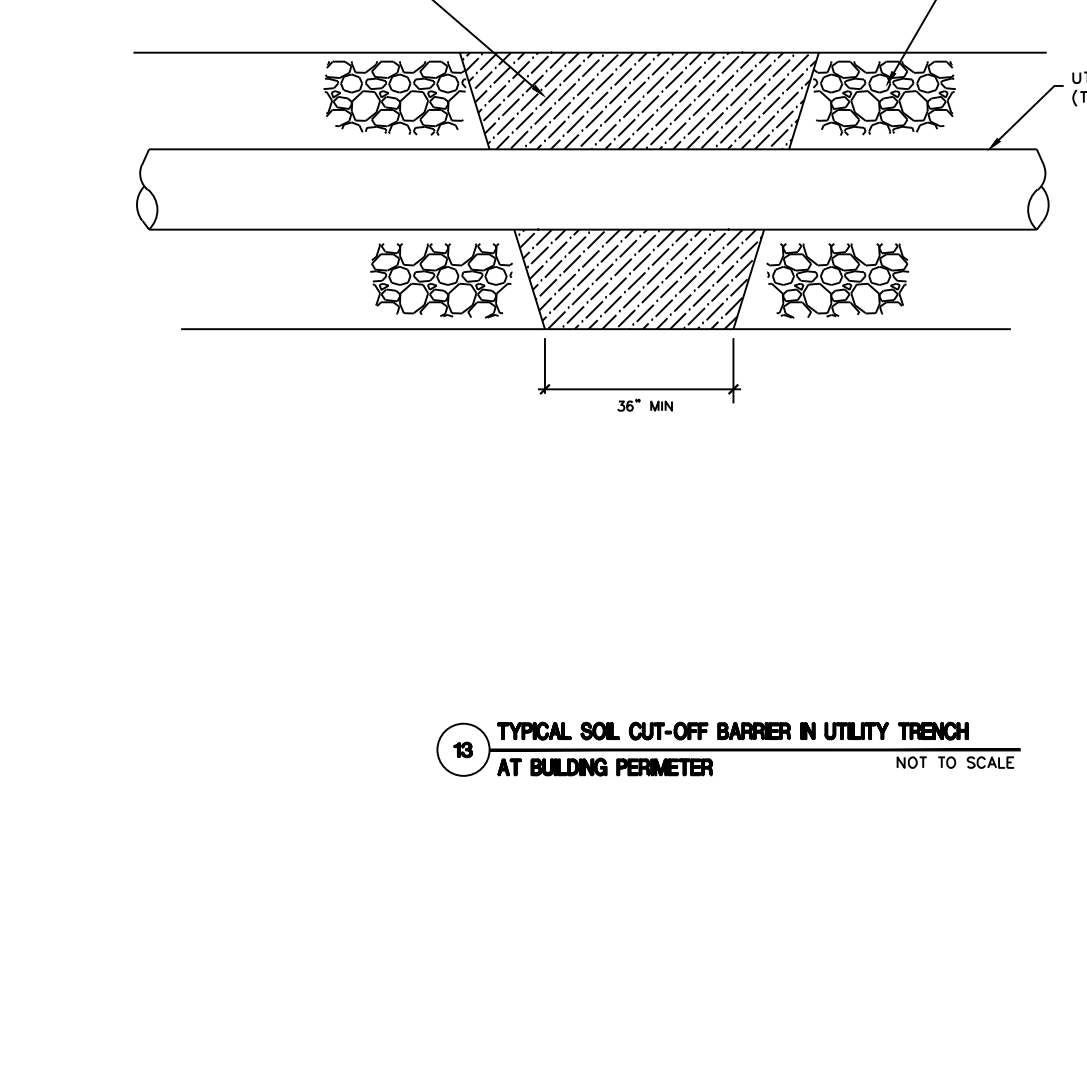
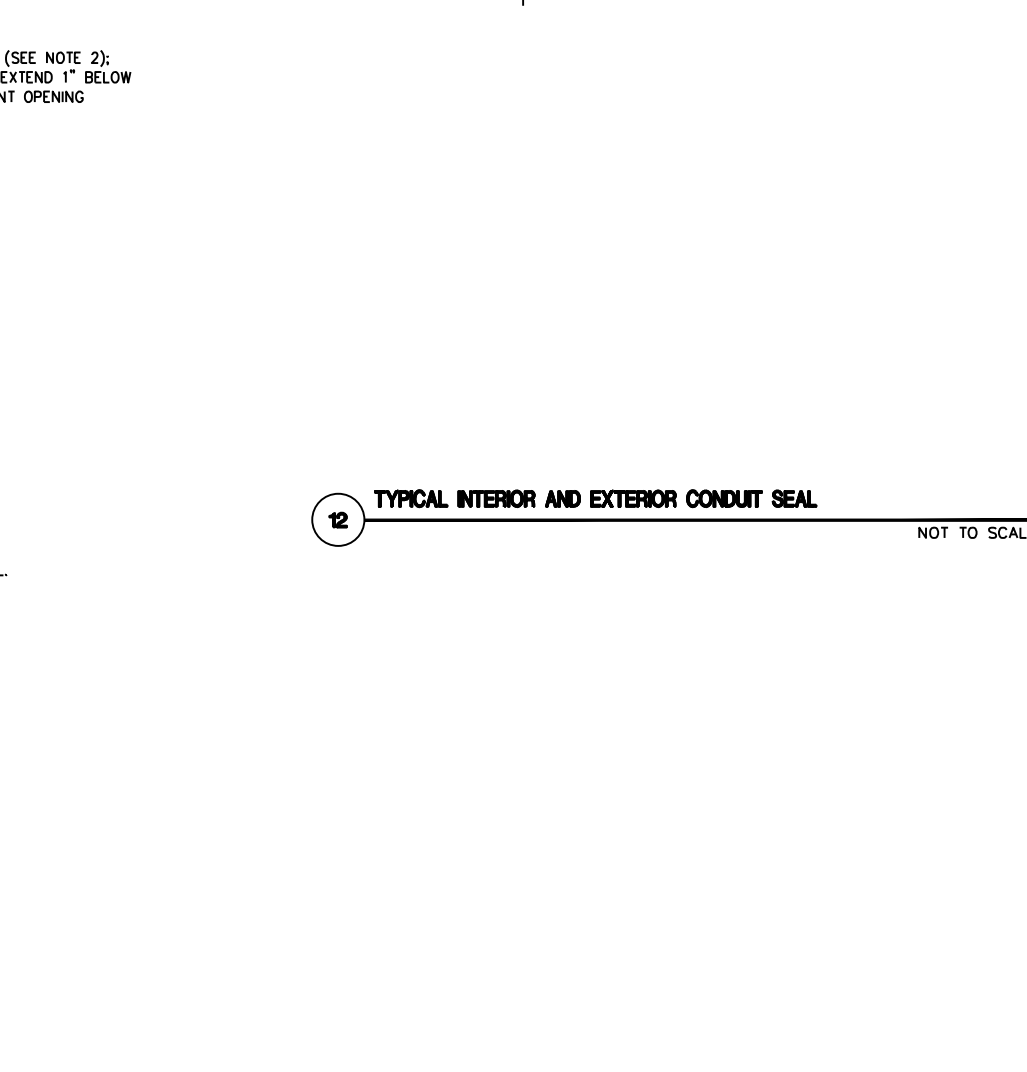
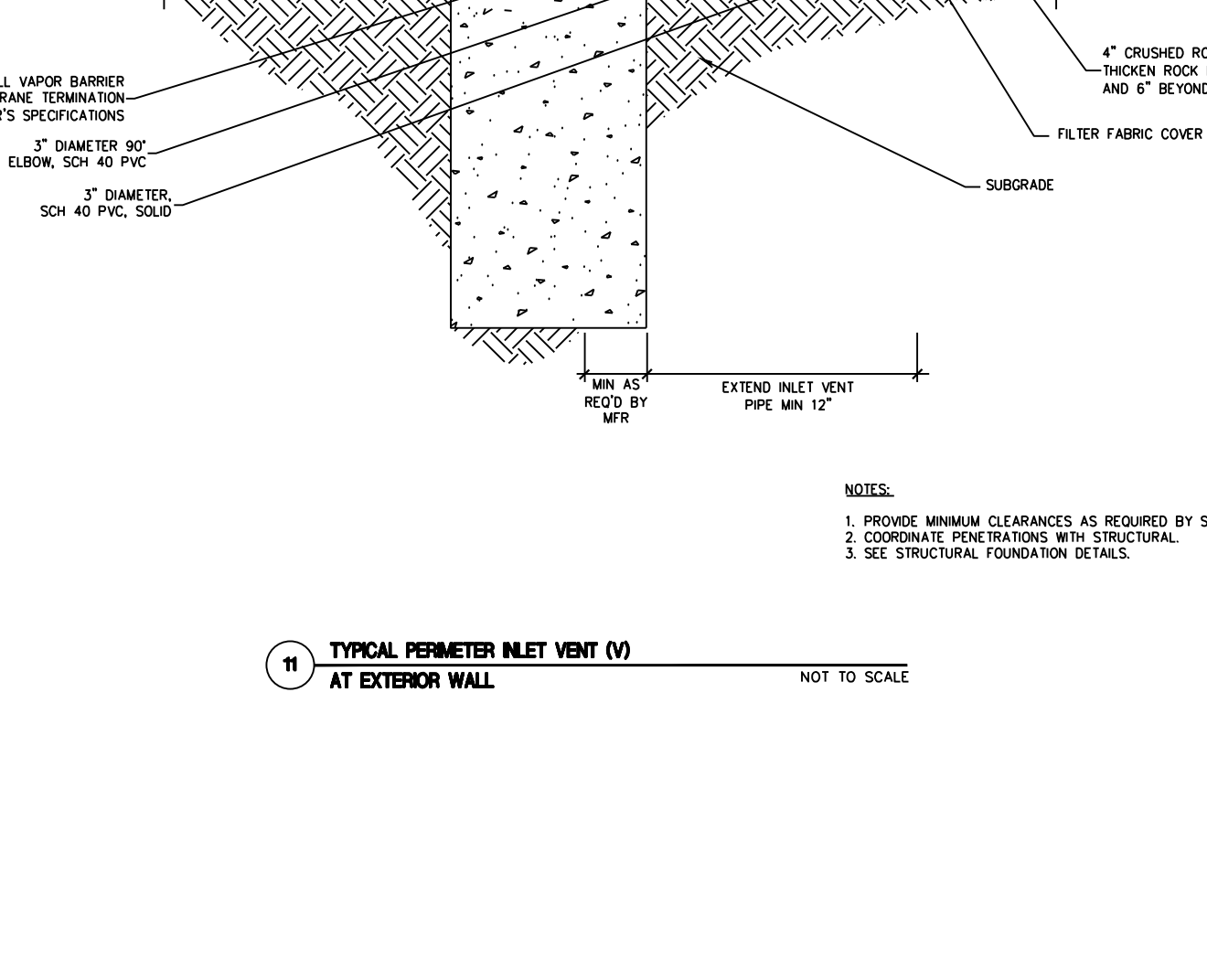
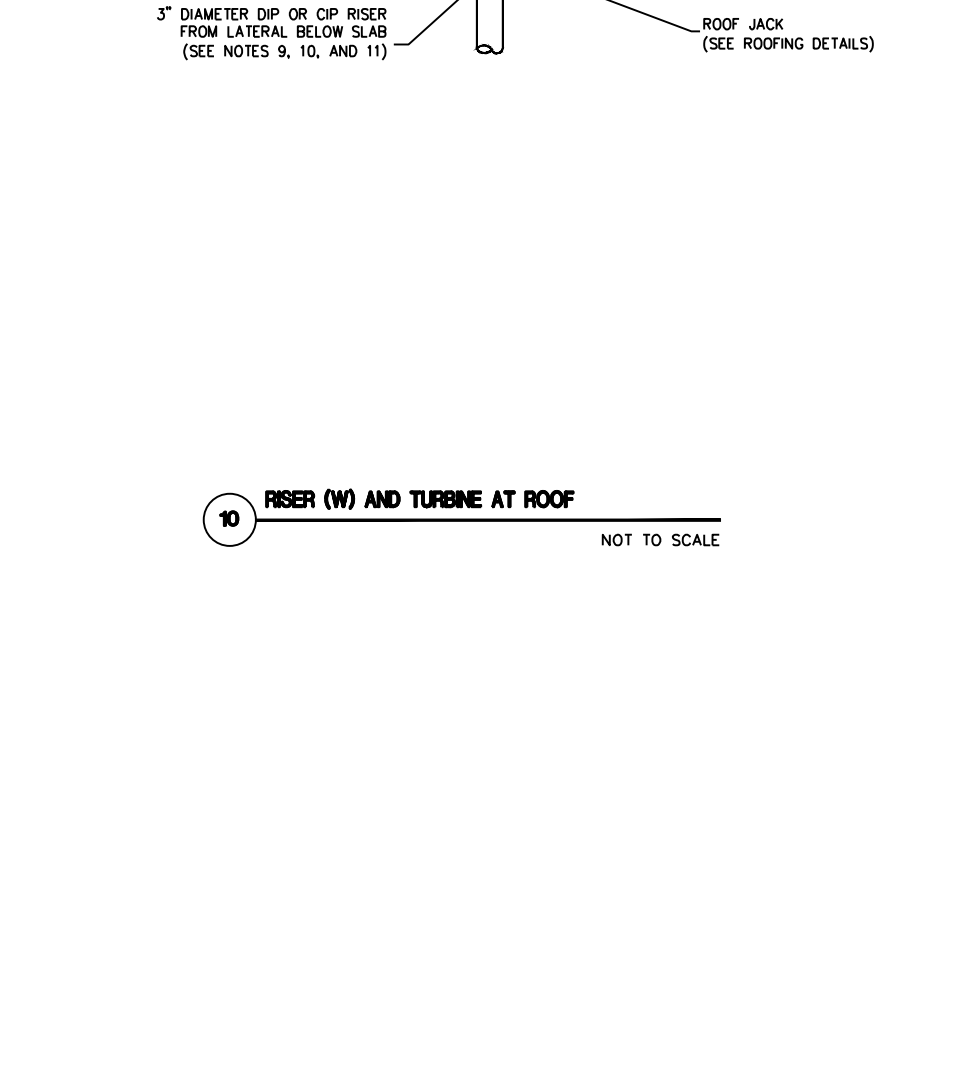
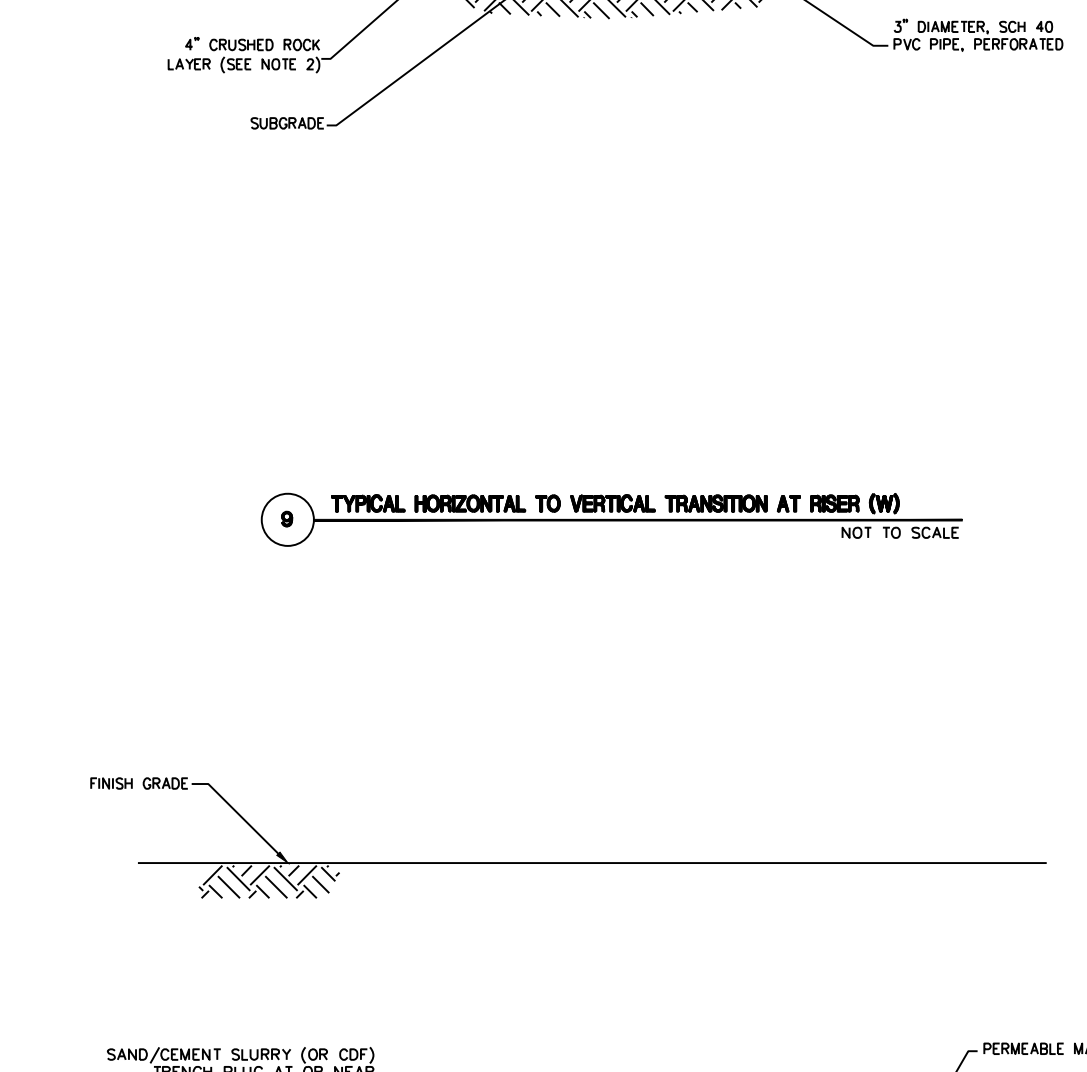
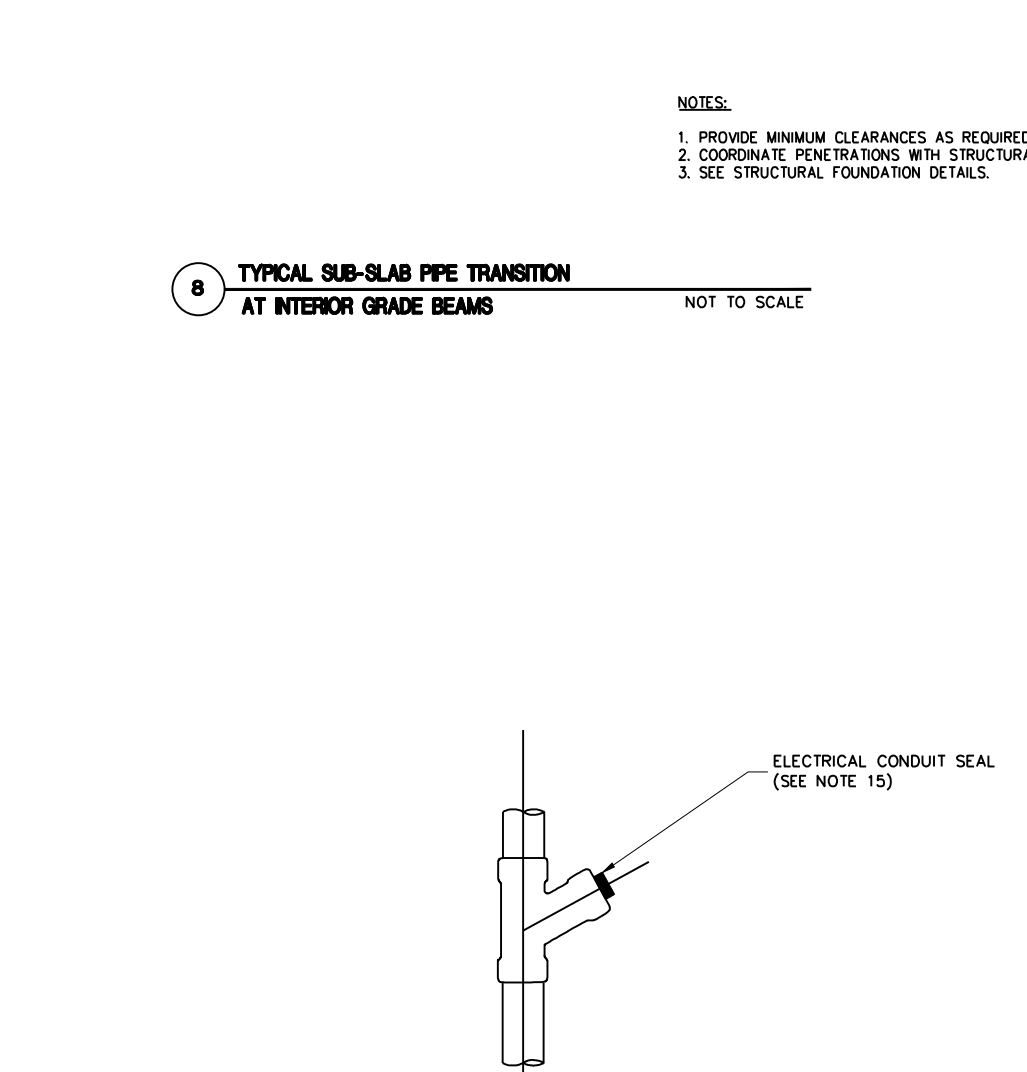
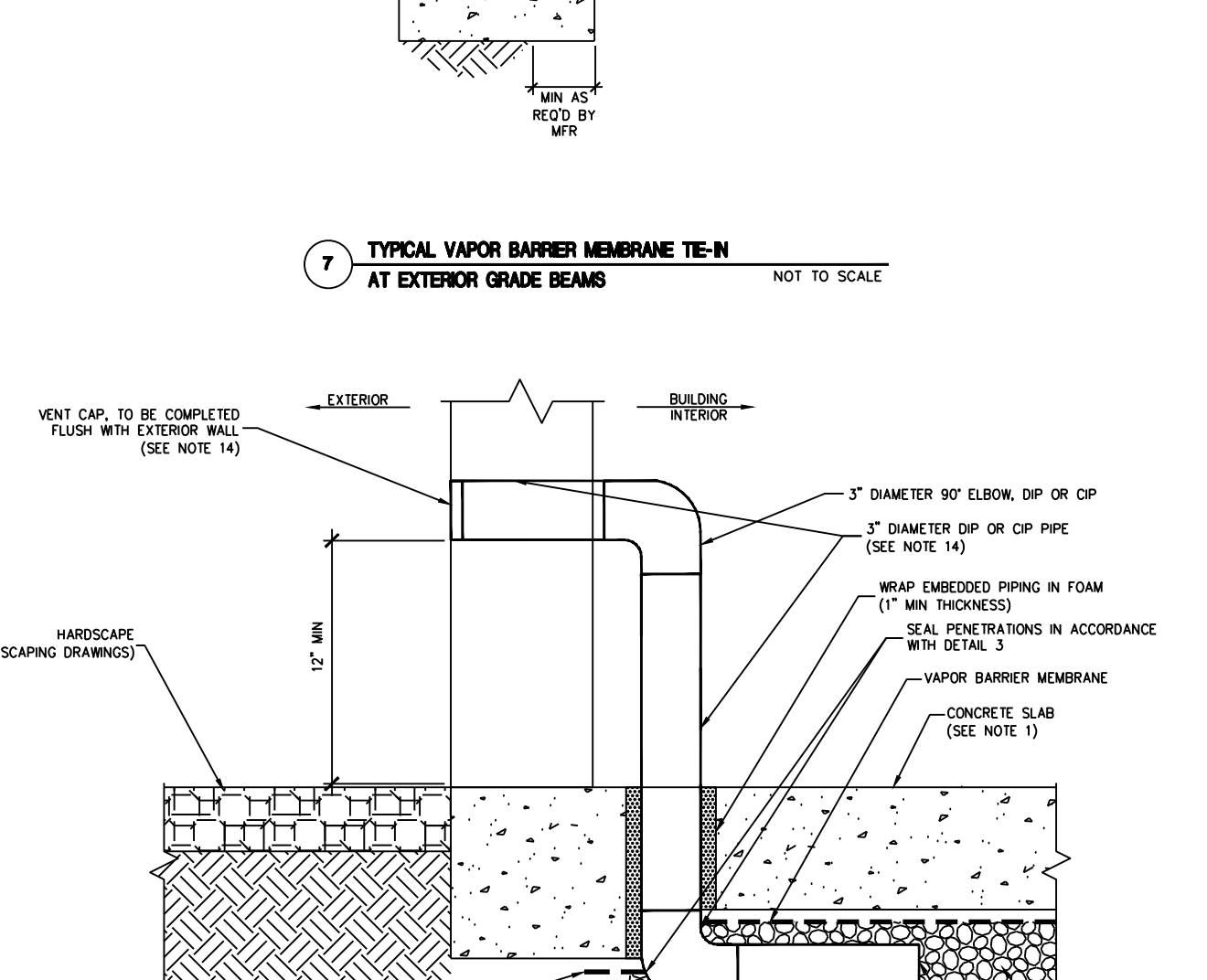
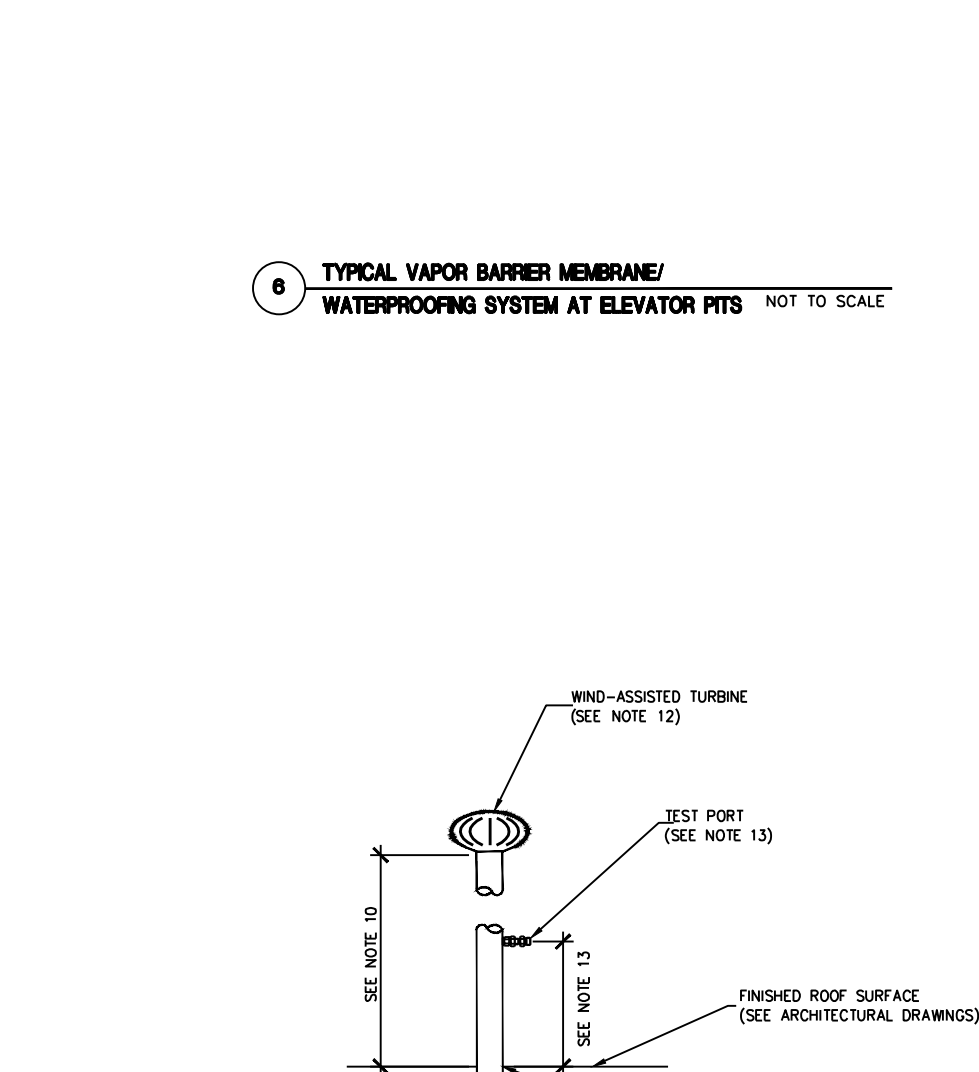
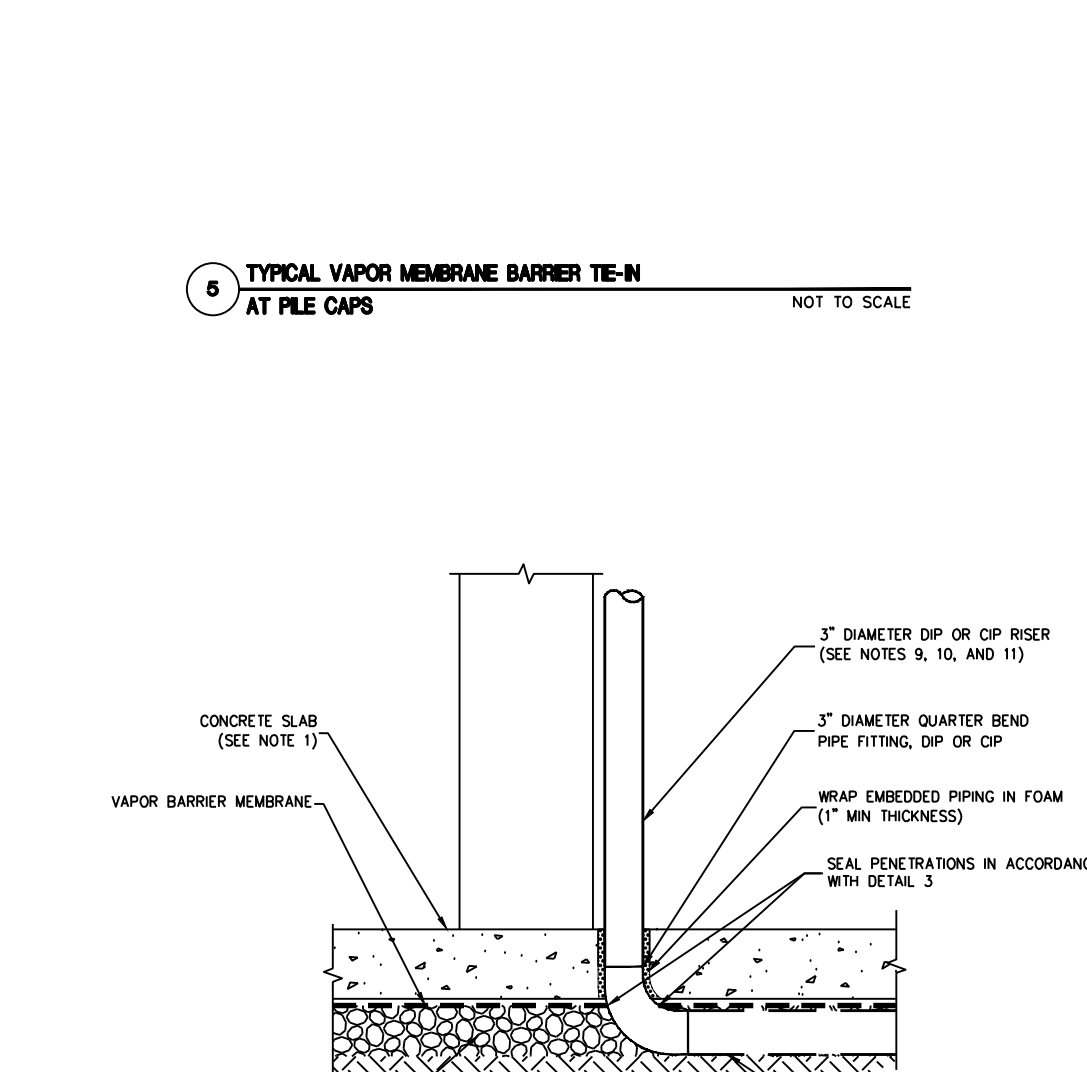
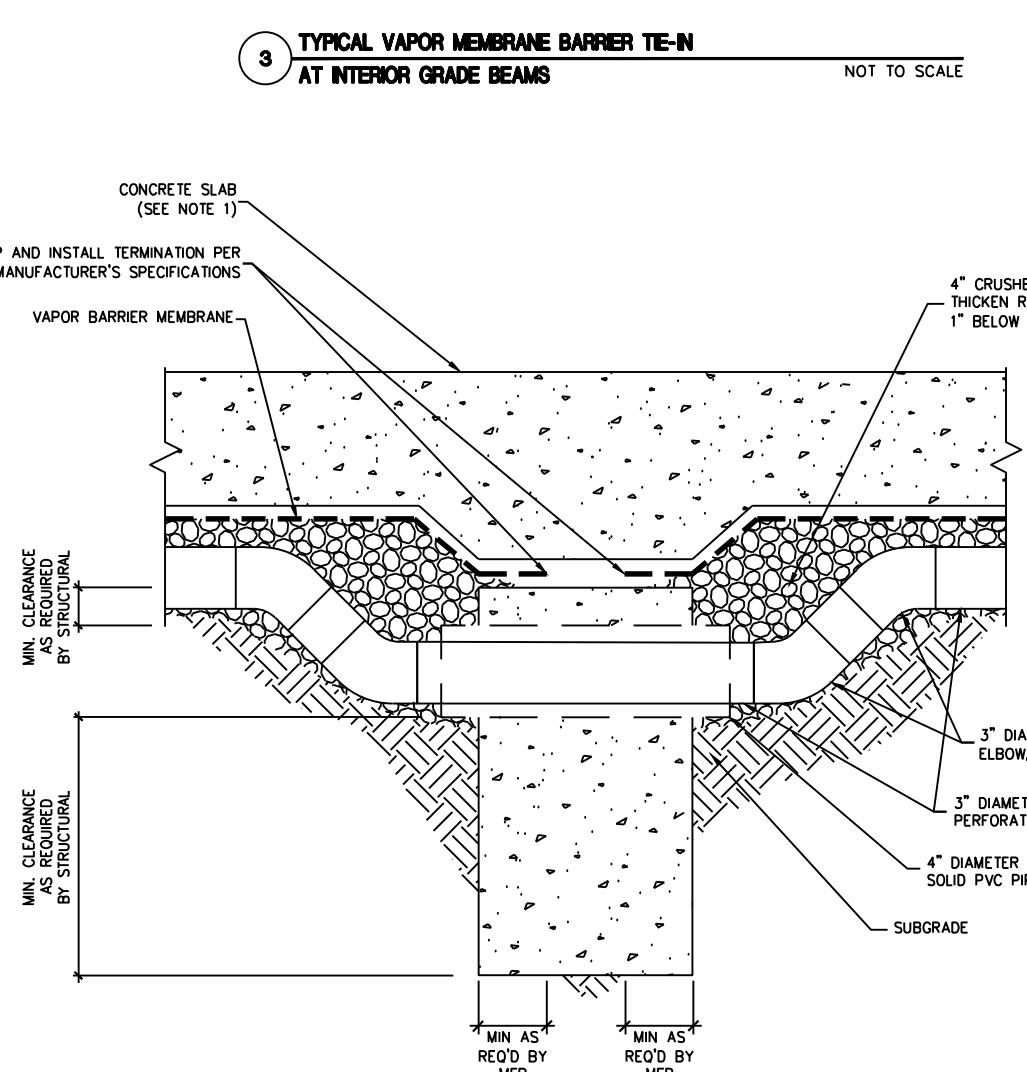
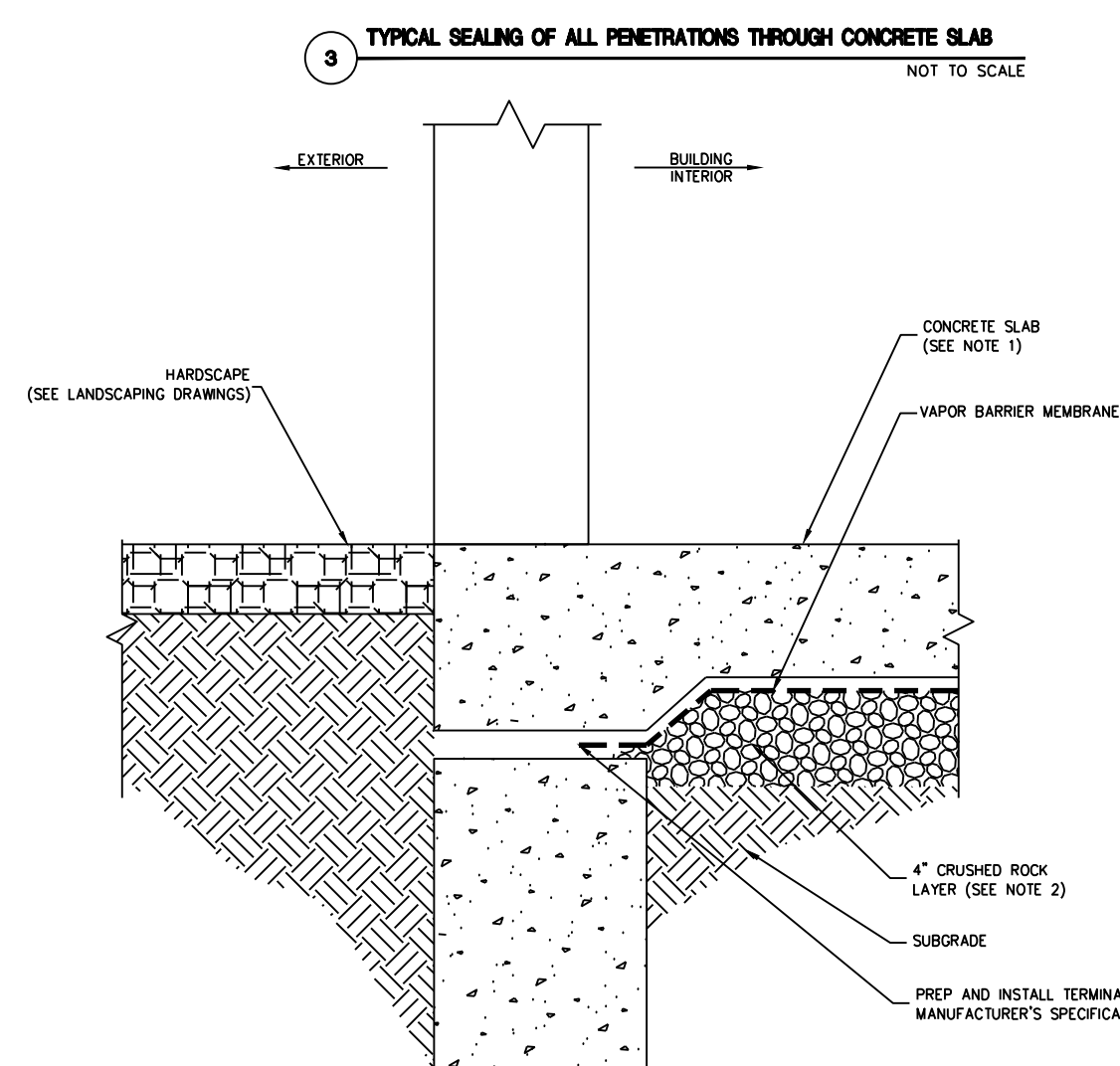
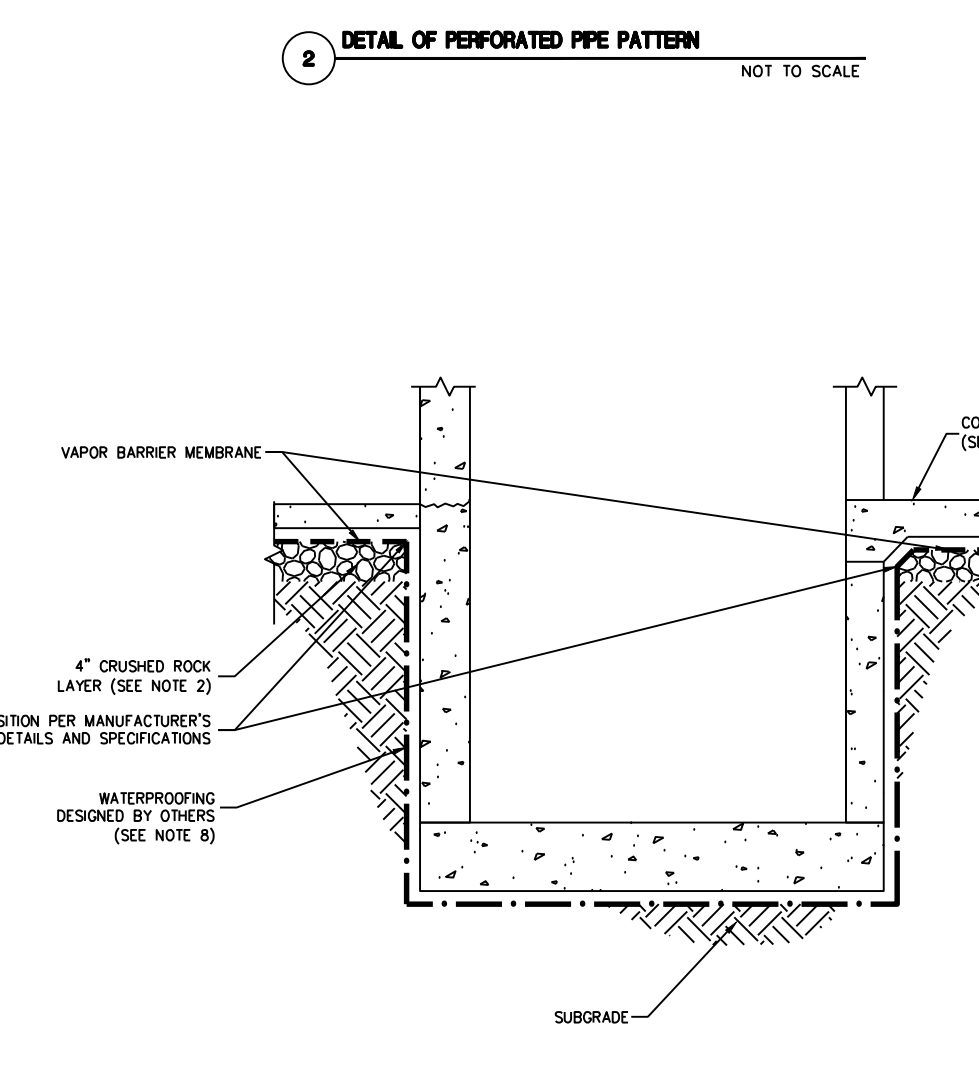
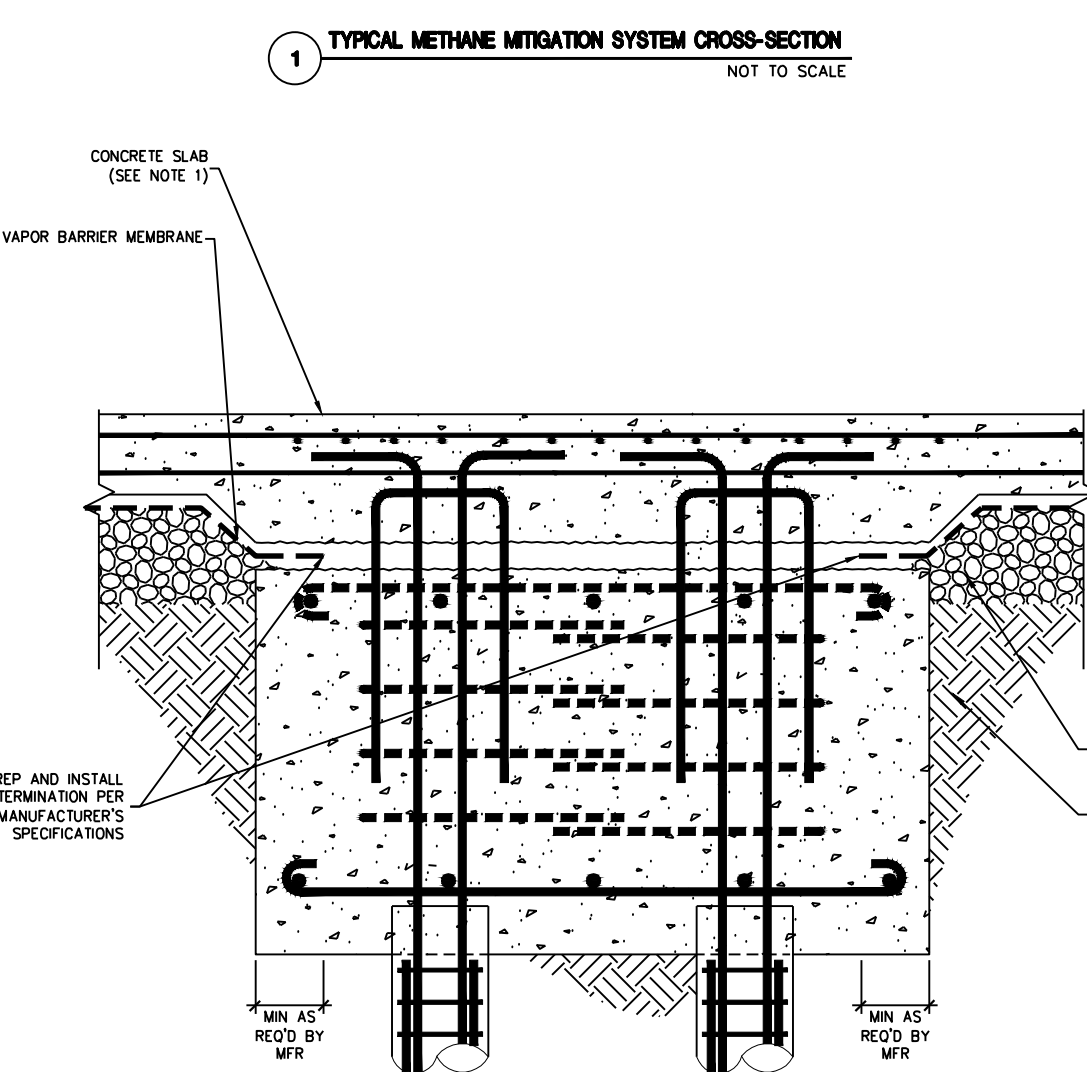
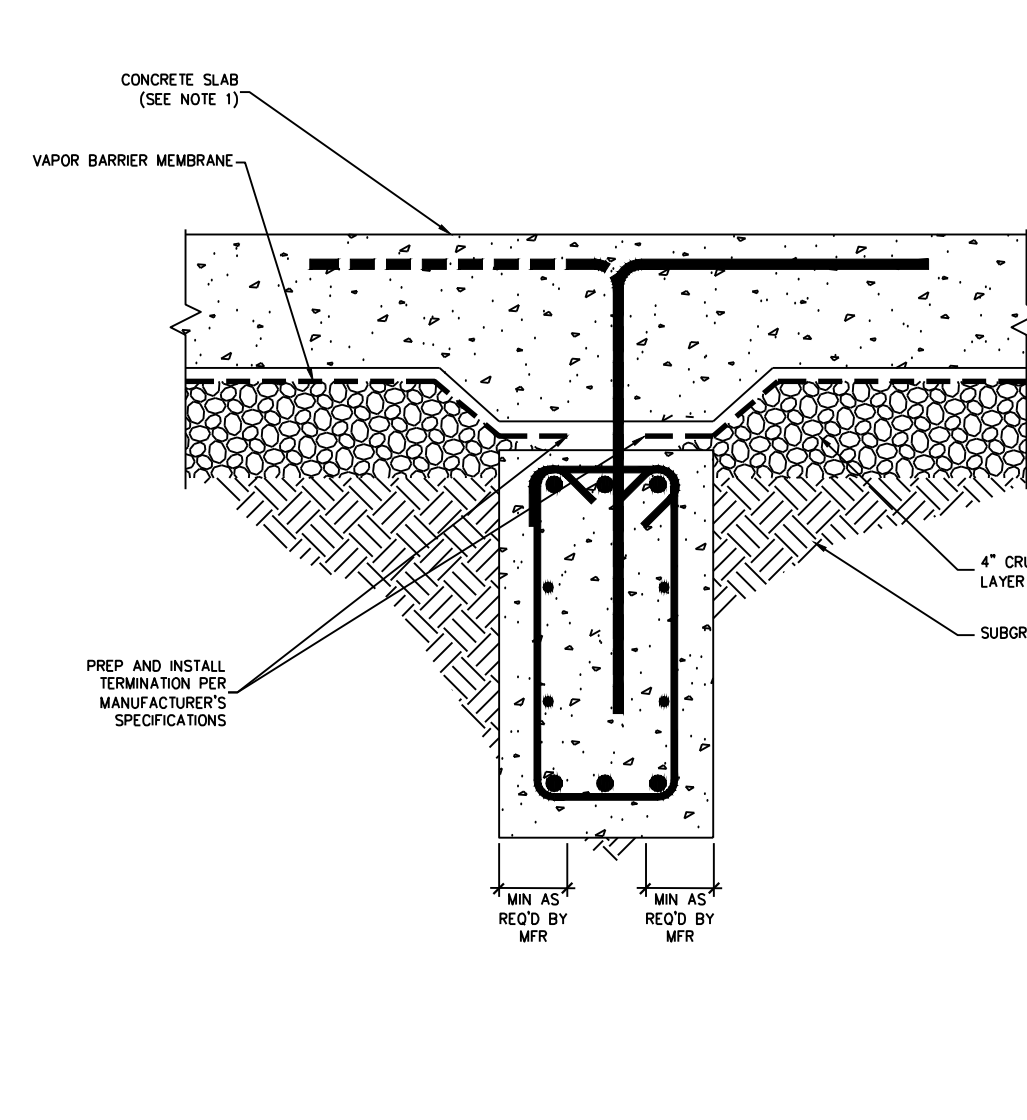
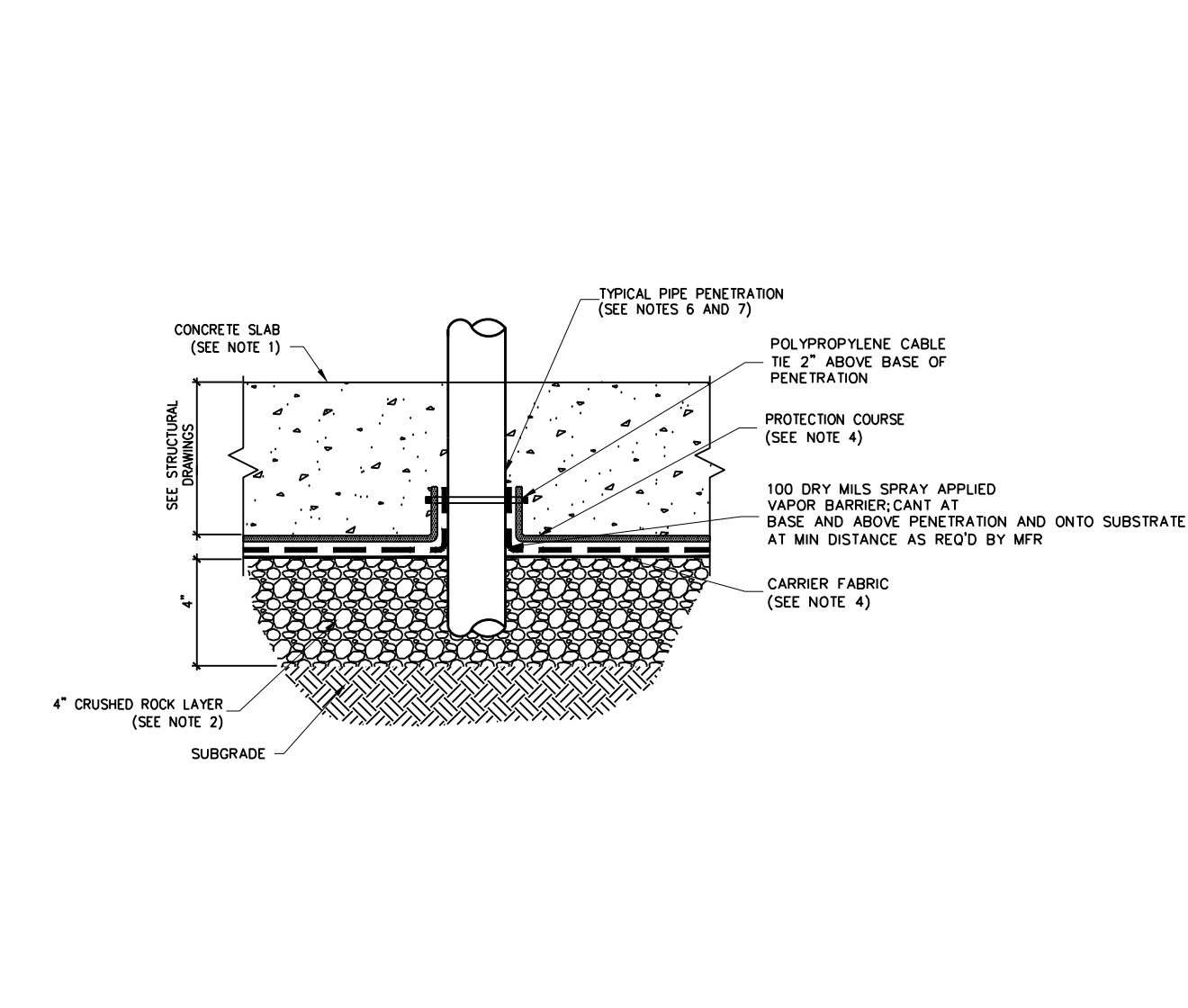
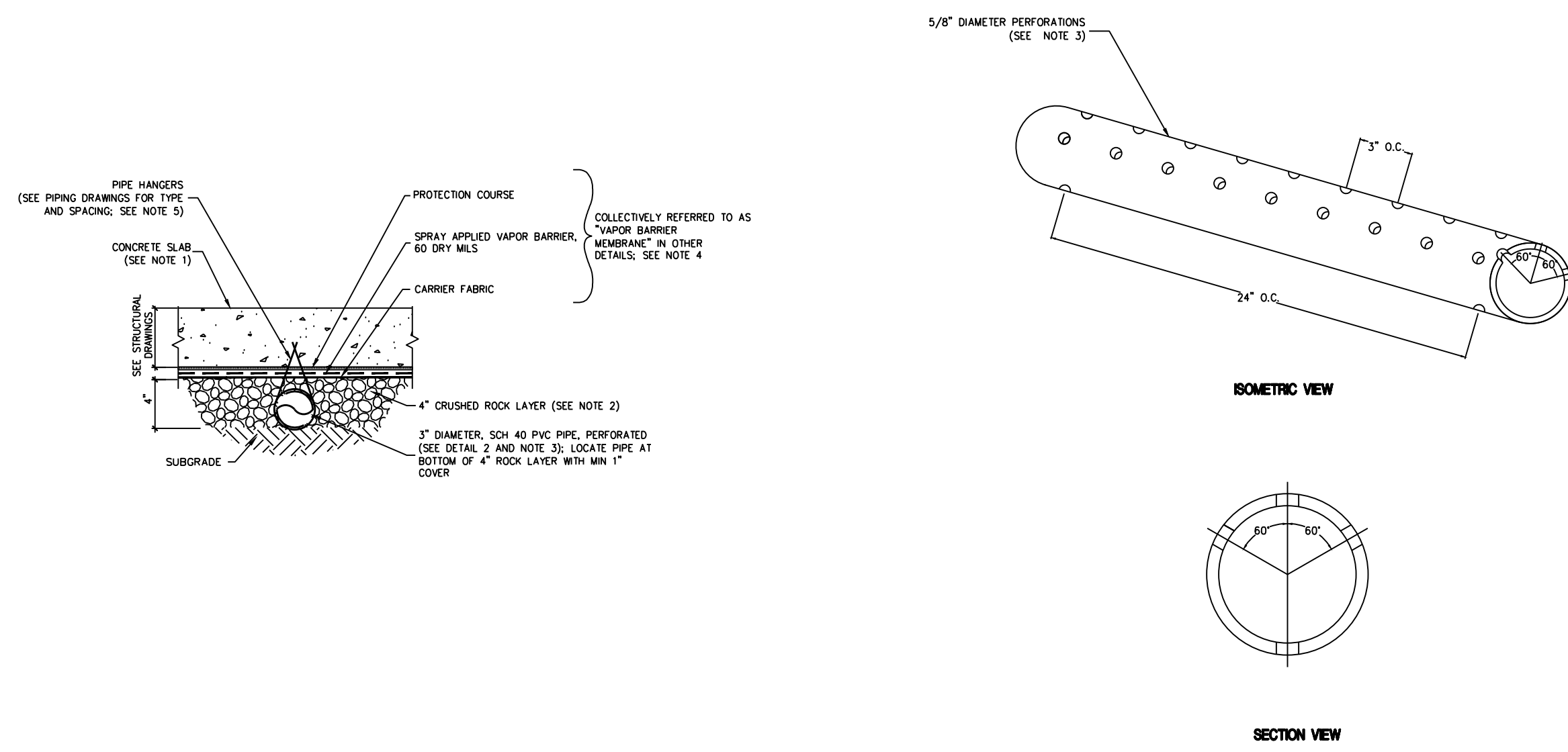


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NOTES:

- ALL LOCATIONS AND DIMENSIONS OF BUILDING SLABS, FOOTINGS, GRADE BEAMS, PILE CAPS, AND OTHER FOUNDATION ELEMENTS TO BE CONFIRMED WITH STRUCTURAL DETAILS.
- CRUSHED ROCK (GRAVEL) LAYER SHALL BE CLEAN, COARSE, 1/4-INCH BY 3/4-INCH AGGREGATE (100% PASSING 1-INCH; 90% PASSING 3/4-INCH; 5% MAXIMUM PASSING #4). SURFACE OF CRUSHED ROCK LAYER SHALL BE SMOOTH-ROLLED PRIOR TO APPLICATION OF THE CARRIER FABRIC.
- THE HORIZONTAL PERFORATED PIPE SHALL BE SCHEDULE (SCH) 40 POLY VINYL CHLORIDE (PVC), OR SIMILAR QUALITY PLASTIC PIPE. INDICATED SECTIONS OF HORIZONTAL PIPE SHALL BE PERFORATED WITH 5/8 INCH DIAMETER HOLES. THREE HOLES ACROSS THE UPPER ONE-THIRD OF THE PIPE, EVERY 3 INCHES ALONG THE PERFORATED SECTION; AN ADDITIONAL 5/8 INCH DIAMETER HOLE SHALL BE DRILLED ON THE UNDERSIDE OF THE PIPE AT LEAST EVERY 2 LINEAR FEET ALONG THE PERFORATED SECTION TO ALLOW WATER, IF ANY, TO DRAIN FROM THE PIPE.
- THE VAPOR BARRIER MEMBRANE, INCLUDING WATERPROOFING SYSTEM, SHALL UNDERLIE THE ENTIRE BUILDING PAD FOOTPRINT. THE VAPOR BARRIER MEMBRANE SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND QA/QC REQUIREMENTS (INCLUDING COUPON AND SMOKE TESTING) BY A MANUFACTURER APPROVED APPLICATOR. CARRIER FABRIC AND PROTECTION COURSE FABRIC SHALL BE PER MEMBRANE MANUFACTURER'S SPECIFICATIONS. APPLICATION SEQUENCE AND TRANSITIONS FROM VERTICAL TO HORIZONTAL SURFACES SHALL BE COORDINATED BETWEEN APPLICATOR(S) AND GENERAL CONTRACTOR.
- ALL UTILITY HANGERS SHALL BE KEPT PLUMB AND VERTICAL WHEN VAPOR BARRIER MEMBRANE IS APPLIED.
- SLAB PENETRATIONS WILL BE PREPARED AND STUBBED PRIOR TO MEMBRANE INSTALLATION. ALL PENETRATIONS SHALL BE CLEANED PER SPECIFICATIONS BEFORE MEMBRANE IS APPLIED.
- SLAB PENETRATION SHALL NOT BE IN CONTACT WITH ADJACENT PENETRATIONS OR STEEL COLUMNS TO ALLOW ROLLER GRADE MEMBRANE APPLICATION IF NEEDED, FOR PROPER SEALING OF THE ENTIRE PENETRATION CIRCUMFERENCE.
- WATERPROOFING SYSTEM IS ONLY SHOWN ON SURFACES WHERE IT IS NEEDED TO MITIGATE AGAINST METHANE INTRUSION INTO INDOOR AIR. WATERPROOFING SYSTEM SHALL BE MADE BY THE SAME MANUFACTURER AND BE COMPATIBLE WITH THE VAPOR BARRIER MEMBRANE; REFER TO ARCHITECTURAL DRAWINGS FOR WATERPROOFING DETAILS. APPLICATION SEQUENCE AND TRANSITIONS FROM VERTICAL TO HORIZONTAL SURFACES AND FROM VAPOR BARRIER MEMBRANE AND WATERPROOFING SYSTEM SHALL BE COORDINATED BETWEEN APPLICATOR(S) AND GENERAL CONTRACTOR. WATERPROOFING MEMBRANE MAY ALSO BE REQUIRED ON OTHER SURFACES.
- THE VERTICAL RISER PIPES (W) TO THE WIND TURBINES SHALL BE 3-INCH DIAMETER DUCTILE IRON PIPE (DIP) OR CAST IRON PIPE (CIP). THE RISER SHALL BE FULLY SUPPORTED THROUGH THE ENTIRE HEIGHT OF THE BUILDING, SUCH THAT NO DOWNWARD FORCE (DUE TO WEIGHT OF RISER) IS EXERTED ON THE PVC ASSEMBLY LOCATED BENEATH THE SLAB.
- THE RISER PIPES (W) SHALL BE AFFIXED TO THE STRUCTURE PER DETAILS PROVIDED BY THE PLUMBING CONTRACTOR AS A DESIGN-BUILD ITEM. ATTACHMENT METHODS MAY INCLUDE STRAPS, BRACES, OR OTHER MECHANISMS TO FULLY SUPPORT THE WEIGHT OF THE PIPE. THE TOP OF THE RISER PIPE SHALL EXTEND TO AN ELEVATION OF 1 FOOT ABOVE THE TOP OF WIND SCREEN, ROOF PARAPET, OR TOP EDGE OF ROOF LEVEL. BE LOCATED A MINIMUM OF 15 FEET AWAY FROM FRESH AIR INTAKES FOR BUILDING'S HVAC SYSTEM OR OTHER OPENINGS (WINDOWS, DOORS, ETC.), AND SHALL BE SUPPORTED BY UNISTRUTS ATTACHED TO AN ADJACENT COLUMN OR STABILIZED WITH GUY WIRES THAT ARE ATTACHED TO THE ROOF.
- THE VERTICAL RISER PIPES (W) TO THE WIND TURBINE SHALL BE PROMINENTLY LABELED AS "CONTAINS COMBUSTIBLE GAS; DO NOT BREAK OR CUT." AT A MINIMUM OF ONCE PER FLOOR LEVEL. RISER PIPE MATERIAL WITHIN THE BUILDING ENVELOPE SHALL BE DIP OR CIP; TRANSITIONS FROM/TO PVC, AS APPLICABLE, SHALL OCCUR WITHIN OR BELOW THE FLOOR SLAB OR ABOVE FINISHED ROOF. RISERS SHALL BE FIRE CAULKED AT THE PENETRATION THROUGH THE FOUNDATION FLOOR SLAB.
- THE WIND-ASSISTED TURBINE VENT ON TOP OF THE VERTICAL RISER PIPES SHALL BE 12-INCH DIAMETER, 680 CFM, TYPE 304 STAINLESS STEEL (McMASTER-CARR CATALOG NO. 1992K48) AND SHALL BE SECURELY ATTACHED TO TOP OF RISER. TURBINE SHALL BE ADAPTED TO FIT A 3-INCH PIPE. TURBINE SHALL BE INSTALLED TO RESIST WIND, SEISMIC, AND OTHER LOADS, AS NEEDED.
- A TEST PORT SHALL BE INSTALLED AT THE RISER PIPES (W) TO SAMPLE AIR FROM THE COLLECTION PIPE AT AN ACCESSIBLE LOCATION AT THE ROOF LEVEL. TEST PORT SHALL BE BRASS TUBE FITTING, BORED-THROUGH MALE CONNECTOR WITH 1/4-INCH TUBE OD AND 1/4-INCH MALE NPT (SWAGELOCK® B-400-1-48T OR EQUIVALENT). TEST PORT CAP SHALL BE BRASS CAP FOR 1/4-INCH OD TUBING (SWAGELOCK® B-400-C OR EQUIVALENT). IF THE VERTICAL RISER IS AT LEAST 40 INCHES ABOVE THE TOP OF ROOF LEVEL, THE TEST PORT SHALL BE 36 INCHES ABOVE THE ROOF. IF THE VERTICAL RISER IS LESS THAN 40 INCHES ABOVE THE TOP OF ROOF LEVEL, THE TEST PORT SHALL BE 6 INCHES BELOW THE TOP OF RISER.
- PERIMETER INLET VENT MATERIAL (V) WITHIN THE BUILDING ENVELOPE SHALL BE DIP OR CIP; TRANSITIONS FROM/TO PVC, AS APPLICABLE, SHALL OCCUR WITHIN OR BELOW THE FLOOR SLAB. PERIMETER INLET VENTS SHALL BE FIRE CAULKED AT THE PENETRATION THROUGH THE FOUNDATION FLOOR SLAB. THE VENT PIPE CAP SHALL KEEP OUT DEBRIS BUT ALLOW AIR TO ENTER THE PIPE. VENTS SHALL BE LOCATED A MINIMUM OF 36 INCHES AWAY FROM OPERABLE WINDOWS AND DOOR JAMS. VENT CAP TO BE COORDINATED WITH ARCHITECT. VENT CAP SHALL BE FABRICATED OF METAL AND INCLUDE A MESH DEBRIS SCREEN. VENT CAP SHALL BE FINISHED FLUSH WITH THE EXTERIOR WALL.
- SEE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR CONDUIT SEAL LOCATIONS AND SEALING PRODUCT.
- ELECTRICAL SERVICE SHALL BE PROVIDED AT THE ROOF LEVEL. IN THE EVENT VERTICAL RISER PIPES ARE RETROFITTED WITH ACTIVE BLOWERS.



DRAWING RELEASE STATUS	DATE
SITE PERMIT	2013-09-03
50% DESIGN DEVELOPMENT	2013-10-15
100% DESIGN DEVELOPMENT	2013-12-20
30% CONSTRUCTION DOCUMENTS	2014-02-28
SITE PERMIT RESUBMITTAL	2014-03-11
50% of 55% CD COORDINATION SET	2014-04-16
STRUCTURAL ADDENDUM 1	2014-06-02
65% CONSTRUCTION DOCUMENTS	2014-07-15

ADDENDA	DATE
1	
2	
3	
4	
5	
6	
7	
8	
9	

SHEET TITLE

METHANE MITIGATION SYSTEM DETAILS

SCALE	
NOT TO SCALE	
JOB NUMBER	RELEASE DATE
731615201	07/02/2014
DRAWN BY	CHECKED BY
VMT	

MMS 2.01

2 OF 2 SHEETS