INFORMATION BULLETIN

IB-055 (BU-055)

Methane Gas Mitigation

This Bulletin is developed to clarify City regulations related to construction on private property (not within the public right-of-way) requiring implementation of methane gas mitigation measures. Construction in the vicinity of oil and gas wells and in areas near landfills can trigger methane gas mitigation requirements in accordance with Chapter 18.79 of the Long Beach Municipal Code (LBMC).

Permit Applicants (Applicants) are advised to review the City’s methane gas zone GIS map (Attachment 1) and the standards set forth in this Bulletin prior to submitting a project to the City. Based on the result of site soil investigations and, levels of methane gas concentration and pressure detected in the soil, three (3) different levels of methane gas mitigation will be required.

Due to the complex nature of required mitigation measures, additional City staff review, and inspection work should be anticipated. Applicant shall hire Qualified Professional/s who will be responsible for the required mitigation, soil testing, membrane leak testing, and other mitigation as deemed necessary for projects involving methane gas.

The City has developed a prescriptive set of standard details for methane gas mitigation (Attachment 2), for Applicants to use, however, if an Applicant wishes to deviate from the City prescriptive standards, then Applicant shall submit their proposed system for the City’s review through a code modification (Peer review) in accordance with LBMC.

Process to obtain grading/building approval on projects within the methane gas zone:

Project Entitlement/Pre-plan check Submittal Phase:

Applicants should check the City’s methane gas zone GIS map ([https://www.arcgis.com/apps/webappviewer/index.html?id=18d6b7027f8f4e99b0173eed3886a9b0](https://www.arcgis.com/apps/webappviewer/index.html?id=18d6b7027f8f4e99b0173eed3886a9b0)), review this Bulletin, and Chapter 18.79 of the LBMC to determine if a project requires methane mitigation. Applicant should consider whether the methane testing requirements are waived per Section 18.79.030 of the LBMC, or project is exempt from methane mitigation per Section 18.79.40 due the type and size of the project. If a project is not exempt, then the project Applicant is required to retain the services of a Qualified Professional (QP) to conduct a soil gas investigation. The QP shall be a California Registered Professional Civil Engineer, Petroleum Engineer, or Geologist. The QP is required to conduct the investigation in accordance with general engineering practices and is required to complete a Certificate of Compliance for Methane Test Data (Attachment 3). This document certifies site methane gas testing and the detected concentration and pressure of methane gas on the site. The QP shall also prepare the project methane mitigation plan/report. A Certificate of Compliance for Methane Test Data shall be printed on the methane mitigation plan.

If no methane gas is detected on the site, no mitigation will be necessary, and shall be noted on the project plans by the Applicant. If methane mitigation is necessary in accordance with Table 1, then
Applicant can submit a methane mitigation plan in accordance with the City prescriptive standards in conjunction with the project grading or building plans to plan check. The submittal shall include any and all components of the proposed active or passive methane mitigation system (membrane barrier, piping, probes, vents, gas detection system, pumps, and signage). A membrane installation contractor manufacturer’s approval letter shall also be submitted with the methane mitigation plans.

Should the Applicant wish to deviate from the City’s prescriptive standards, a code modification must be submitted to the Building Official. Building Official and Fire Marshal review of proposed code modifications will also be required for the active methane systems, integrating sensors, and alarm systems. A City application (BFFS) will be submitted for the code modification by the applicant.

Project plan review phase:

Applicant submits the project plans and the site methane gas test results for the project that require methane gas mitigation to plan check and will receive a project number (BGRD, BADD, BRMD, BNEW). Other permits (BMEC, BELE or Fire) may be required based on level of methane gas detection.

Plan check staff reviews the project for compliance with the City prescriptive methane gas standards during project grading or building plan submittal.

If a code modification is requested and the City prescriptive standards are deviated from, the code modification shall be approved prior to final approval of plans or permit issuance. A peer review service may be required based on the complexity of the deviation, as determined by the Building Official.

Fire Department plan check, and inspection of active methane systems integrating sensors and alarm systems is required with the exception of single family and duplex projects (R3 Occupancies). The alarm and sensor mitigation plans can be provided as a deferred submittal for fire plan review to confirm supervisory and alarm level activation, wiring, response relay, and battery backup calculations. The methane sensors shall report low- and high-level alarms to the methane panel. A low-level alarm shall indicate a supervisory response to the on-site engineering office and a high-level alarm shall sound a local alarm in the area of methane detection and cause evacuation of the area.

Project construction/inspection phase:

Following the completion of plan review and issuance of project grading or building permits, a preconstruction meeting shall be requested by the Applicant. City inspection staff will attend the meeting to establish requirements for the project, such as membrane installation, smoke testing of the membrane, and other inactive or active methane system/s inspection requirements. Methane active systems require contacting Fire Department staff for an inspection after alarm plans are approved.
• The project Applicant will proceed with the methane mitigation installation and calls for inspection. City inspection staff will provide the necessary inspections, including a methane barrier leak test inspection.

• Project Applicant will submit a recorded covenant (Attachment 4) to the City prior to grading/building final inspection, whichever occurs first. The City inspector will attach the covenant to the project in Hansen prior to project final.

Project post-construction phase:

• The Applicant or project owner will be responsible for all post-construction monitoring of methane gas on site.

• An Operation, Monitoring, and Maintenance (OMM) Plan is required. The monitoring and maintenance of all methane mitigation systems shall remain the responsibility of the property owner. The Applicant or project owner is ultimately and solely responsible for the subsequent tenancies and maintaining the integrity of the methane gas mitigation system. The City of Long Beach does not conduct property maintenance type services on private property.

• Methane detection systems inspection and testing of methane gas detection systems shall be conducted not less than annually. Sensor calibration shall be confirmed at the time of sensor installation and calibration shall be performed at the frequency specified by the sensor manufacturer.” After the initial acceptance test, the annual tests are required to be conducted by the Applicant or project owner.

• The QP shall be responsible for evaluating other agencies permit requirements, such as the County of Los Angeles Health Department and South Coast Air Quality Management District (SCAQMD). For more information regarding SCAQMD permit requirements and possible exemptions, contact the permitting staff at http://www.aqmd.gov/nav/contact/permitting-staff. The typical exemption from this requirement is as follows:

  Rule 219(c)(10) – Passive and intermittently operated active venting systems used at and around residential structures to prevent the accumulation of naturally occurring methane and associated gases in enclosed spaces.

  Rule 219(c)(11) – Sub-slab ventilation systems including associated air pollution control equipment with an aggregate flow rate of less than 200 standard cubic feet per minute (scfm) where vacuum suction pits do not penetrate more than 18 inches below the bottom of the slab, provided the inlet total organic compounds concentration does not exceed 15 parts per million by volume (ppmv), measured as hexane, and provided the ventilation system is connected to air pollution control equipment consisting of a carbon absorber sized to handle at least 200 scfm, or equivalent air pollution control.

Testing, Design, and other technical provisions of Methane Gas Mitigation:

  Site soil testing – (Referenced in LBMC Section 18.79.030)
Initial, Shallow Soil Testing:

- Minimum of two (2) tests per site or one (1) per ten thousand (10,000) square feet of site area, or portion thereof. Probes shall be installed no less than four (4) feet below ground surface (ft bgs). Where groundwater is less than four (4) ft bgs, probes shall be installed above the ground water level.

- Probes shall be constructed in accordance with the California Department of Toxic Substances Control (DTSC) Advisory – Active Soil Gas Investigations dated July 2015 (DTSC Active Soil Gas Investigation Advisory), or any subsequent applicable Advisory.

- Probes shall be sampled a minimum of once, two (2) to forty-eight (48) hours after installation, depending on installation methods in accordance with the DTSC Active Soil Gas Investigation Advisory.

- Methane and pressure shall be recorded for each sample location during each sampling event.

Soil Gas Probe Test:

- Minimum of two (2) tests per Site or one (1) per twenty thousand (20,000) square feet of site area, or portion thereof, installed in the locations with the highest concentration of soil gas that was reported in shallow soil testing.

- Probes shall be installed at depths of five (5), ten (10), and twenty (20) feet below the lowest building slab or footing elevation. Probes shall be a minimum of twelve (12) inches above the groundwater level; probes are not required to be installed within groundwater areas.

- Probes shall be constructed in accordance with the DTSC Active Soil Gas Investigation Advisory.

- Probes shall be sampled a minimum of two (2) times. The first sampling event shall be no sooner than two (2) to forty-eight (48) hours after installation depending on installation methods in accordance with the DTSC Active Soil Gas Investigation Advisory. The second sampling event shall be a minimum of twenty-four (24) hours after the first. Samples shall not be collected during increasing barometric pressure from a pre-frontal weather condition.

- Methane and pressure shall be recorded for each sample location during each sampling event.

- Reporting: results of shallow and soil gas probe tests shall be recorded on methane mitigation plans with corresponding site design levels indicated. Depth to groundwater, if encountered, shall be included in the report. The test results shall be stamped and signed by a Qualified Professional. Included with the test results shall be a site plan indicating the locations of shallow and soil gas tests, as well as the location(s) and dimension(s) of proposed and existing buildings or structures.
Exemptions – (Referenced in LBMC Section 18.79.040)

The following activities and uses are exempt from the provisions of this Chapter:

- Open parking garage structures with permanent natural ventilation as defined by the California Building Code, Title 24, Section 406.5.2, or any successor section; however, on- or below-grade, enclosed building features, such as elevator pits, stairwells, storage rooms, and/or elevator lobbies shall be equipped with methane mitigation features/measures as set forth in this Chapter; or

- Addition or change of use to existing buildings or structures that are less than fifty (50) percent of the existing structure area.

Methane mitigation design requirements – (Reference in LBMC Section 18.79.050)

Methane mitigation design requirements shall be based upon the results of the site soil gas investigation as prescribed in Section 18.79.030, and as contained in this Bulletin.

Projects that are located within one thousand (1,000) feet from the refuse footprint of any existing or new landfill or disposal site shall obtain an approval pursuant to Title 27, California Code of Regulations from the Local Enforcement Agency (LEA); i.e., Los Angeles County Department of Public Health. The City of Long Beach Building and Safety Bureau or the City of Long Beach Health Department may require methane mitigation measures, regardless of the review or recommendation of the LEA. All oversight documentation shall be provided to the City of Long Beach within thirty (30) days of receipt by the Applicant.

Methane mitigation design requirements are required in accordance with the following methane concentration levels (see Table 1):

1. No Action: Concentrations of methane gas less than one thousand (1,000) parts per million by volume (ppmv), and pressure less than or equal to zero

2. Level I: Concentrations of methane gas less than fifty-thousand (50,000) ppmv, and measured pressure less than two (2) inches of water column (2” WC)

3. Level II: Concentrations of methane gas up to fifty-thousand (50,000) ppmv with pressure greater than two (2” WC), or concentrations of methane gas between fifty-thousand (50,000) ppmv and three-hundred thousand (300,000) ppmv, at all pressures

4. Level III: Concentrations of methane greater than three hundred thousand (300,000) ppmv. Structures which are developed over or within proximity (as defined in Chapter 18.78) to abandoned oil wells shall comply with Level III methane mitigation requirements.
### TABLE 1
SITE DESIGN LEVEL AND MITIGATION FEATURES

<table>
<thead>
<tr>
<th>SITE DESIGN LEVEL</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHANE CONCENTRATION</td>
<td>&lt;50,000 PPMV</td>
<td>&lt;50,000 PPMV</td>
<td>≥50,000 PPMV</td>
</tr>
<tr>
<td>PRESSURE</td>
<td>&lt;2” WC</td>
<td>≥2” WC</td>
<td>ALL PRESSURES</td>
</tr>
</tbody>
</table>

**MITIGATION REQUIREMENTS**

- **Gas Membrane Barrier** (18.79.060 C)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Perforated Horizontal Pipes** (18.79.060B.E.2)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Vent Risers** (18.79.060.E.4)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Gas Detection System (in-room and vent risers)** (18.79.060.F)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Alarm System** (18.79.060.F)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Control Panel** (18.79.060.F)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Mechanical Ventilation** (18.79.060.G)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Mechanical Sub Slab Extraction** (18.79.060.H)
  - LEVEL I: X
- **Pavement Venting** (18.79.060.I.1)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Signs** (18.79.060.I.2)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Conduit or Cable Seal Fittings** (18.79.060B.J.1)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X
- **Trench Dam** (18.79.060B.J.3)
  - LEVEL I: X
  - LEVEL II: X
  - LEVEL III: X

**Methane mitigation components – (Referenced in LBMC 18.79.060)**

- The methane gas mitigation system shall be designed by a Qualified Professional

During Construction, a special inspection for the methane mitigation measures shall be conducted by the project Qualified Professional in order to certify the project’s final inspection. The City of Long Beach will perform inspections of methane mitigation components in accordance with Section 18.79.090 of the LBMC

**Gas membrane barrier:**

- A gas membrane barrier shall be continuous beneath the slab and foundations and vertically along subterranean building elements, except beneath footings and grade beams
- Penetrations through the gas membrane barrier shall be booted to prevent gas migration

**Gas membrane barrier protection:**
- A protection layer shall be placed above and below the gas membrane barrier
- Protection layers shall consist of one of the following:
  - A two (2) inch minimum sand layer
  - A two (2) inch minimum mud slab
  - A sixteen (16) oz/sq yard non-woven geotextile suitable for cushion application
  - Alternative non-woven geotextiles supported by analyses performed by a Qualified Professional

**Subslab ventilation:**

**Subslab venting layer:**
- Placement shall be between the gas membrane barrier protection layer, subgrade, and pipe trenches;
- Venting layer may consist of one of the following:
  - Gravel Blanket: A minimum thickness of two (2) inches of gas collection aggregate or a thickness equal to two (2) times the largest particle size, whichever is greater, shall be placed above the subgrade and pipe trenches
  - A two hundred (200) mil (minimum) thickness double-sided geocomposite;

**Subslab vent piping:**
- Subslab vent piping shall be embedded in a pipe trench and backfilled with aggregate meeting the requirements of Gas Collection Aggregate. Aggregate shall surround the pipe with a minimum of four (4) inches of coverage in all directions
- Vent piping shall be placed such that no portion of the foundation is more than twenty-five (25) feet from a horizontal, perforated vent pipe
- Vent piping with a diameter of three (3) inches shall not be spaced greater than fifty (50) feet apart horizontally on center (OC)
- Vent piping with a diameter of four (4) inches shall not be spaced greater than one hundred (100) feet apart horizontally on center (OC)
- The total length of solid horizontal piping shall not exceed one hundred (100) feet
- Solid horizontal vent piping shall maintain a minimum of one (1) percent positive slope toward the vent riser
- Where piping transitions through building foundations, the penetration shall be accomplished in accordance with the California Building Code
- Subslab venting shall be connected to vertical vent risers
- Vertical risers shall always be equal to, or larger, in diameter than the horizontal pipes;
Groundwater:
The methane mitigation design shall account for groundwater in the design by one of the following methods:

- Provide a combined gas collection and dewatering system by sloping subslab vent piping and collecting discharge water in accordance with Public Works permitting requirements, such as industrial waste or stormwater based on characterization and permit requirements
- Eliminate subslab vent piping and trenches and provide mat slab with under slab sloping one (1) percent toward the perimeter landscaping

Vertical Vent Riser:

- Vent risers shall be connected to horizontal ventilation piping and be provided at a frequency in accordance with Table 2
- Riser length shall be a maximum of one hundred (100) feet measured along solid pipe (including bends) for design levels I and II
- Vent Risers max spacing shall be one hundred (100) feet measured between vent risers for design levels I and II
- When the application of the spacing and location requirement of Table 2 results in a fractional number of Vent Risers, any fraction thereof shall be construed as one Vent Riser
- Building Footprint shall be defined as the area in square feet contained within the exterior walls, at or below the grade level
- Perforated pipe shall be connected to the vertical vent riser pipe with a California Plumbing Code approved transition/adapter and contain no more than five (5) feet of solid pipe from the outside edge of the footing to the perforated pipe transition under the building/structure. Exceptions may be made by the Development Coordinator for the specific structural conditions of a building
- Transition to vertical riser pipe material shall occur no less than six (6) inches above grade
- Solid, horizontal vent piping in trenches shall maintain a positive slope towards the vent riser

Vent riser pipes shall be located on the exterior of a structure except in Level I and II designs where structures are wider than two hundred (200) feet. Vent risers may be located within a structure for Level III mitigation if fans/blowers are located at the termination of the vent riser and fans are exterior to the structure. If within a structure, vent risers shall be within a sealed chase that does not communicate with other parts of the structure
  a. Vent riser pipe shall not be installed within five (5) feet of electrical panels, water heaters, fireplaces or other sources of heat or ignition
  b. Riser pipes shall be protected from damage

Terminations:

a. Riser pipes shall terminate at a minimum of ten (10) feet above surrounding grade or not less than six (6) inches. above the adjacent roof level;
  b. Riser pipe terminations shall be located at least one (1) foot away from a parapet wall;
c. Riser pipe shall terminate at a minimum of ten (10) feet from, and three (3) feet above, any building opening or air intake and within the property line;

d. The termination of all vent riser pipes shall be provided with a “T” connection or other approved rain cap to prevent the intrusion of rainwater. The rain cap shall be non-restricting to flow;

Shut-off valve:

a. A valve shall be provided within the first three (3) feet of the vent riser to isolate the vent riser from the horizontal vent piping

b. Valves shall be chained or otherwise locked open unless vent risers are being tested or replaced

Sampling Port:

a. A sampling port shall be designed and installed in the vent riser pipe

b. The sampling port shall be accessible and in the exterior wall surface near ground level for the purpose of testing the vent system

c. The port shall be provided with a threaded plug or cap. No flush plugs are allowed

d. A square metal brass tag or rigid plastic engraved sign identifying the tee as a methane collection system vent shall be installed adjacent to the test tee

e. The vertical riser shall be pressure tested in accordance with Section 712.0 of the California Plumbing Code (CPC), or any successor section, using the sampling port.

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>VENT RISER FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN. VENT RISER PIPE DIAMETER (inches)</td>
<td>NUMBER OF VENT RISERS PER BUILDING FOOTPRINT AREA (square feet)</td>
</tr>
<tr>
<td>3</td>
<td>1/7,500 (min of 2 risers)</td>
</tr>
<tr>
<td>4</td>
<td>1/10,000 (min of 2 risers)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>FREQUENCY OF AUTOMATIC SENSORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROOM FLOOR AREA OR CONCEALED SPACE AREA (SF)</td>
<td>NUMBER OF SENSORS</td>
</tr>
<tr>
<td>10,000 and More</td>
<td>Minimum of 3 Sensors plus one for every 20,000 and fraction thereof in excess of 10,000</td>
</tr>
</tbody>
</table>
More than 5,000 and less than 10,000 | 3 Sensors
More than 1,000 and Up to 5,000 | 2 Sensors
0 and Up to 1,000 | 1 Sensor
Elevator Shafts and Enclosed Stairwells | 1 Sensor
Vent Risers | 1 Sensor per Vent Riser (Level III Only)

Methane Gas Detection and Alarm System (Level II and III)

Location: Sensors shall be installed in the lowest occupied spaces of the building to detect the possible presence of methane gas in the air as well as within vent risers for a Level III design. Sensors shall be placed at the ceiling line of the lowest building level. A minimum of one (1) sensor shall be required per room of the lowest level. Sensors shall be provided at the frequency shown in (Table 3)

1. The sensors shall be able to detect explosive gas at concentrations between zero (0) and one hundred (100) percent of the lower explosive limit (LEL) for methane five (5) percent methane by volume with a sensitivity of one (1) percent of the LEL and a detection limit of five (5) percent of the LEL;

2. Detectors and wiring shall be immune to radio frequency and infrared remote-transmitter frequency interfaces;

3. Control Panel: The sensors shall be connected to a compatible control panel. The control panel shall issue an alarm, HVAC response, and/or autodial response following detection of methane. An auto dialer shall be required to allow a message alerting building maintenance of the alarm conditions, including gas alarms and fault conditions;

4. Backup Power: Backup power for the control panel shall be provided for a minimum of twenty-four (24) hours for standby mode plus five (5) minutes of alarm under full load conditions; backup should be available within sixty (60) seconds of power loss;

5. Detection and Response: The methane gas detection sensors shall detect methane in the air as well as within the vent riser:
   a. The interior low-level alarm shall be for methane concentrations at or greater than ten (10) percent of the LEL. The low-level alarm shall trigger HVAC system activation to flush accumulated methane in the lowest level of the building. A warning (supervisory signal) annunciator shall illuminate on the control panel, and a notification shall be sent to building maintenance, the building owner, and/or engineering consultant to investigate the source of the alarm for the purpose of implementing an engineering solution to resolve the condition;
   b. The interior high-level alarm should be for methane concentrations at or greater than twenty-five (25) percent of the LEL. The high-level alarm shall sound an audible/visible alarm, trigger an evacuation of the affected building, and alert
building maintenance and a central station monitoring company. Building HVAC ventilation shall continue operation;

c. The vent riser sensor shall activate vent riser blowers upon detection of methane at seventy-five (75) percent of the LEL and not activate the alarm system;

6. Alarms:

a. Visual and audible alarms shall be required to be provided at a minimum frequency of one (1) per ten thousand (10,000) square feet of building space and one (1) per business unit in multi-unit commercial structures. Visual alarms shall meet NFPA 72 (adopted edition) standards;

b. Audible alarms shall be a minimum of fifteen (15) decibels (db) above ambient noise;

c. Visual alarms shall be minimum of fifteen (15) candelas;

7. Single-Station Gas Detection Sensor(s):

a. Single family and up to four (4) unit multi-unit residential structures may install single-station methane gas detection sensors with battery backup in the lowest occupied space of the structure;

b. The battery should be sized to operate the single-station gas detector at least twenty (20) hours in standby mode and five (5) minutes in alarm mode;

c. The location of the detector shall be provided on the plans, reviewed, and approved by the Building Dept;

d. Hard-wired sensors with a central control panel may be installed in lieu of single-station gas sensors;

**Mechanical Ventilation:**

Building Department is responsible for methane mitigation in mechanical systems and sub slab or outside the building.

1. In the event of an in-room sensor gas alarm activation, an automated mechanical ventilation system for the building shall be set to activate using one hundred (100) percent outdoor air makeup. The system may be designed to one of the following levels:

a. Ten (10) percent LEL detection of in-room sensor triggers ventilation that can achieve a minimum of four (4) air exchanges per hour (ACH). No battery backup is required for this mechanical system. Parts of fans in this option shall be of nonferrous or non-sparking materials, or their casings shall be lined or constructed of such materials;

b. Continuous operation of the mechanical ventilation system without connection to in-room sensors that can provide a minimum of one (1) ACH. Twenty-four (24) hour back up power is required for mechanical ventilation systems when sensors
and alarms are not provided;

\( c. \) Mechanical ventilation systems that start up at least once every six (6) hours to provide a minimum of twenty-four (24) air exchanges per day. Twenty-four (24) hour back up power is required for mechanical ventilation systems when sensors and alarms are not provided;

2. In the event of concurrent fire alarm systems, the fire alarm shall override the methane alarm HVAC response.

A. Active Sub-Slab Ventilation Systems.

1. Automatic gas sensors shall be installed to measure gas in the vent riser;
2. Location: Sensors shall be installed within the vent risers;
3. The forced sub-slab air venting system shall provide a minimum of three (3) air changes per hour of the vent piping and the gravel trench;
4. The vent riser sensor shall not activate interior alarms;
5. Unless the porosity of the gravel is established by a test prepared by a Qualified Professional, the porosity of the gravel shall be taken as twenty-five (25) percent;

B. Miscellaneous Systems.

1. Pavement Venting: Hardscapes covering five-thousand (5,000) square feet or more and located within fifteen (15) feet of any structures requiring methane mitigation shall also be vented with pavement vents, or by installing landscaped areas immediately adjacent to the building exterior walls at least two (2) feet wide covering at least eighty (80) percent of the building perimeter;
2. Signs: Vent pipe shall be clearly marked with signage to indicate that the pipe may contain combustible gas. A warning sign shall be placed at the main building entrance

o Utilities and Trench Dams.

1. All underground electrical conduit penetrating the slab or foundation of the building shall be provided with a seal-off device
2. Manholes, tanks, or other intermediately occupied structures shall be mitigated in accordance with the following requirements
3. Trench Dams: Utilities entering a structure shall have a trench dam constructed.
4. Electrical Classifications: For determining the appropriate electrical wiring method and equipment required, boundaries of the outdoor hazardous area classifications are set forth in Tables 4, 5, and 6
### TABLE 4
OUTDOOR HAZARDOUS AREA CLASSIFICATIONS

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>MEASURED SOIL GAS CONCENTRATIONS (PPMv)</th>
<th>HAZARDOUS AREA CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below finished grade</td>
<td>&lt;12,500/12,500</td>
<td>Unclassified</td>
</tr>
<tr>
<td>Sumps</td>
<td>Total submerged/Partially submerged</td>
<td>Unclassified</td>
</tr>
<tr>
<td>Above grade</td>
<td>NA</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>

### TABLE 5
BUILDING HAZARDOUS AREA CLASSIFICATIONS

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>MEASURED SOIL GAS CONCENTRATIONS (PPMv)</th>
<th>HAZARDOUS AREA CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Membrane</td>
<td>&lt;1,000/1,000</td>
<td>Unclassified</td>
</tr>
<tr>
<td>Below grade within the raised floor foundation or lowest building slab without gas barrier membrane</td>
<td>NA</td>
<td>Class I, Div 1</td>
</tr>
<tr>
<td>Above grade within the raised floor foundation footing without gas barrier membrane but with adequate ventilation</td>
<td>&lt;12,500/12,500</td>
<td>Unclassified</td>
</tr>
<tr>
<td>Above membrane but below lowest building slab or raised floor foundation</td>
<td>&lt;12,500/12,500</td>
<td>Unclassified</td>
</tr>
<tr>
<td>Within building</td>
<td>NA</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>
### TABLE 6

**VENT RISER HAZARDOUS AREA CLASSIFICATIONS**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>MEASURED SOIL GAS CONCENTRATIONS (PPMV)</th>
<th>HAZARDOUS AREA CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumps</td>
<td>Totally Submerged</td>
<td>Unclassified</td>
</tr>
<tr>
<td></td>
<td>Partially Submerged</td>
<td>Class I, Div 1</td>
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</table>

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DISTANCE</th>
<th>HAZARDOUS AREA CLASSIFICATION</th>
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</thead>
<tbody>
<tr>
<td>Passive System Vent Outlet</td>
<td>0 to 3 feet</td>
<td>Class I, Div 1</td>
</tr>
<tr>
<td></td>
<td>3 to 5 feet</td>
<td>Class I, Div 2</td>
</tr>
<tr>
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<td>&gt;5 feet</td>
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<tr>
<td>Active System Vent Outlet</td>
<td>0 to 5 feet</td>
<td>Class I, Div 1</td>
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<td></td>
<td>5 to 10 feet</td>
<td>Class I, Div 2</td>
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<tr>
<td></td>
<td>&gt;10 feet</td>
<td>Unclassified</td>
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<tr>
<td>Joints and fittings not enclosed within wall spaces*</td>
<td>0 to 3 feet</td>
<td>Class I, Div 2</td>
</tr>
<tr>
<td></td>
<td>&gt;3 feet</td>
<td>Unclassified</td>
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<tr>
<td>Joints and fittings in framed walls*</td>
<td>Any distance within the frame stud bay</td>
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</tr>
<tr>
<td>In the vent system</td>
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<td>Class I, Div 1</td>
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<tr>
<td>Gas sampling port</td>
<td>0 to 3 feet</td>
<td>Class I, Div 2</td>
</tr>
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<td></td>
<td>&gt;3 feet</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>

* The hazardous area designation for these areas is considered as unclassified under the following conditions:

1. All joints and fittings are welded in an approved manner,
2. Approved double walled vent risers are provided, or
3. Approved four (4) inch or smaller threaded steel pipe venting system, or equivalent approved piping system is installed.
Methane Mitigation Plan Requirements:

- Projects with methane mitigation shall submit the results of soil gas testing in accordance with Section 18.79.030 of the LBMC, together with foundation plans.

- Methane mitigation design plans signed and stamped by a Qualified Professional shall be submitted to the City of Long Beach for Design Levels I, II, and III, and shall include, at a minimum, the following:
  - Plan view layout(s) of:
    1. Horizontal venting pipes with solid and perforated pipes
    2. Locations of vent riser pipes
    3. Vent riser termination
    4. Pavement venting
    5. Mat slab sloping direction(s), if applicable
    6. Signage
    7. Sensors
    8. Alarms

- Plan view layouts shall be provided with structural (horizontal and vertical vent riser pipes) or architectural backgrounds (pavement venting signage, sensors, alarms, and vent riser terminations);

- Landscaping shall be indicated on plans incorporating landscaping into the mitigation design (e.g., in lieu of pavement venting and/or if mat slab sloping is utilized)
  - Details shall be provided that show the following:
    1. Typical horizontal and vertical cross-sections
    2. Typical grade beam and footing tie-ins
    3. Geo-composite overlaps and seaming, if applicable
    4. Typical boots
    5. Overlaps and repairs
    6. Vertical terminations (if applicable)
    7. Future slab and membrane penetration repairs (post-slab pours)
    8. Mat slab sloping
    9. Utility trench dams
   10. Utility conduit seals
   11. Vent riser signage, sampling port, shut off valve, and termination
   12. Aggregate gradation
   13. Typical sensor height and mounting
   14. Typical alarm height and mounting
   15. Typical signage with lettering height and color

- Notes. Notes shall be included which indicate:
  - Results of methane site testing
  - Material specifications (geomembrane gas barrier, geo-composite, piping strip composite)
  - Gas Collection Aggregate gradation
  - Calculations, if applicable (e.g., puncture, head loss)
  - Headloss calculation for subslab blower sizing
vi. Battery backup calculations for sensors and alarms
vii. Fan specifications, including fan curves
viii. Geomembrane Gas Barrier smoke testing requirements and frequency including a note indicating:

“All systems shall be final smoke tested under the observation of the project inspector or specialty inspector approved by the Building Official prior to covering.”

o Methane gas detection System:

The methane detection system for a building consists of sensors that are installed in the mechanical system including the duct work, and in the building. These sensors generally send signal to a single methane control panel that triggers activation of alarm. The mechanical system and associated methane sensors will be reviewed and inspected by the City mechanical staff versus the methane sensors and alarm devices in the building will be reviewed and inspected by the City fire staff. As such if one set of plans is submitted for the methane mitigation, the design documents shall be separate: 1). one set of drawings showing methane detection and associated mechanical equipment for mechanical staff and 2). one set of drawings showing the alarm and detection devices for fire staff. These are two separate submittals and will need to be indicated within their respective scope of work.

Operations and Maintenance – (Referenced in LBMC Section 18.79.070)

• Emergency/Contingency Plan.
  • A plan shall be prepared by a Qualified Professional indicating emergency response procedures, location of the control panel, and automatic sensors
  • Specifications for repair of the membrane shall be included, as well as “as-built” information for the sub slab system
  • The Emergency/Contingency Plan shall be included in the building’s final Commissioning Report
• Methane gas detection sensor and alarm testing shall be performed annually, and the results shall be maintained by the owner for a minimum period of five (5) years and shall be made available to the City Building and Safety and Fire Department upon request. Additional testing may be required by Long Beach Fire Department
• All methane gas detection and alarm system testing shall be submitted to the Long Beach Fire Department electronically, via a method approved by the Fire Code Official

Inspections – (Referenced in LBMC Section 18.79.090)

All methane mitigation components shall be inspected by the City’s inspection staff. The Contractor shall provide a minimum of twenty-four (24) hours advance notice, and shall provide access for inspections, including the following construction activities:

Foundation - Before placement of the methane barrier, an integrity check of the vent collector and inspection of the sub-slab vent pipe routing shall be conducted. The elbow connecting perforated pipe to solid pipe beneath the riser pipe shall be left unconnected for this inspection and connected after the inspection and prior to backfill
• Methane Barrier - Smoke testing of the methane barrier shall be performed before placement of the concrete slab or protection layer above the methane barrier. The installer shall provide certification of installation and, where applicable, membrane thickness documentation or proof (e.g., membrane coupons)

• Exterior Wall Vent Riser (Prior to Screening) - A visual inspection of vent pipe joint integrity and routing shall be conducted

• Final Inspections before building occupancy shall be conducted to verify the following:
  • Caution Sign - Caution signs shall be located on the vent riser at each floor level and above the roofline
  • Warning Sign - A warning sign shall be located at the main building entry
  • Rain Caps - shall be fitted to the top of the vent risers
  • Test Tee - A two (2) inch diameter test tee with plug (no flush plugs) shall be installed and painted red
  • Test Tee Signage - A permanent metal or rigid plastic placard shall be installed to the wall immediately above or adjacent to the test tee plug or cap. Signage shall be red with white letters and shall read "Methane Vent Test Location;"
  • Testing of sensors/alarms/auto dialer/HVAC, and venting relay. Certification that the system is installed per plans and operates as designed will be acceptable. The Long Beach Fire Department shall observe testing of methane detection sensors, alarms, dialer, and HVAC response.

Qualified professional project certification – (Referenced in LBMC Section 18.79.100)

The Qualified Professional is required to submit a certification to the City inspector prior to final approval of the grading/building Certificate of Occupancy stating the following:

• I am a Qualified Engineer/Geologist in the State of California, and that I am knowledgeable in the field of methane gas mitigation systems
• The methane gas mitigation system has been constructed and installed under my direct supervision and in accordance with the approved plans (a copy of the “as-built” plans shall be provided)
• The structure is free from methane gas and can be safely occupied (a copy of the test results must be provided).
Attachment 1

Long Beach Methane Zone Map
https://www.arcgis.com/apps/webappviewer/index.html?id=18d6b7027f8f4e99b0173eed3886a9b0
Attachment 2

Standard - Details

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>TITLE</th>
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<tr>
<td>#1</td>
<td>Attachment #1</td>
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<td>Sub-Slab Vent System</td>
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<tr>
<td>#3</td>
<td>Membrane Termination at Exterior</td>
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<tr>
<td>#4</td>
<td>Combination De-Watering and Vent Pipe</td>
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<tr>
<td>#5</td>
<td>Vent Pipe AT Interior Footing</td>
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<tr>
<td>#6</td>
<td>Methane Alarm Device – Horn and Strobe Combination</td>
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<td>#7</td>
<td>Methane Alarm Device Mount</td>
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<tr>
<td>#8</td>
<td>Conduit Seal</td>
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<tr>
<td>#9</td>
<td>Methane Detection System</td>
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<td>#10</td>
<td>Membrane Termination at interior Footing</td>
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<td>#11</td>
<td>Vent Riser</td>
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<tr>
<td>#12</td>
<td>Paved Areas Venting</td>
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<td>#13</td>
<td>Gas Membrane Notification Placard</td>
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<tr>
<td>#14</td>
<td>Conduit or Cable Seal Fitting for Building Service and DWP Pull Boxes</td>
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<tr>
<td>#15</td>
<td>Large Underground Electrical Equipment Enclosures</td>
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<td>Trench Dam</td>
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<tr>
<td>#17</td>
<td>Optional Passive Pipe Termination</td>
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<td>#18</td>
<td>Optional Passive Riser Pipe Termination</td>
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<tr>
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<td>Vertical Membrane</td>
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<td>#20</td>
<td>Strip Composite to Vent Riser Transition</td>
</tr>
<tr>
<td>#21</td>
<td>Manual Monitoring Probe Vault</td>
</tr>
</tbody>
</table>
Alternative A: No Groundwater

Alternative B: Groundwater

NOTE:
1. THE STANDARD DETAILS SHOWN ON THIS FIGURE ARE TYPICAL MINIMUM DETAILS. ACTUAL MATERIAL DIMENSIONS TYPES AND SPECIFICATIONS ARE TO BE PREPARED BY THE DESIGN ENGINEER IN GENERAL ACCORDANCE WITH THE CITY OF LONG BEACH METHANE MITIGATION STANDARDS.
FIGURE #3

Membrane Termination at Exterior

Cold joint
Membrane attachment shall be as per manufacturer's recommendations
Protection layer
Membrane
Gas extraction aggregate

Strike concrete smooth at cold joint with 6" metal trowel to accommodate membrane (typ.)
FIGURE #4 Combination De-Watering and Vent Pipe

Notes:
1. Perforated Horizontal Pipe used as combination De-Watering and Vent Pipe shall be sized one full plumbing pipe size larger than required by spacing.
2. Piping and conduit shall be protected from corrosion and structural settlement as follows:
   a. Tape shall be applied on conduit and piping encased in cement slurry or concrete.
   b. Tape shall be PS-37-90 Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventive Tape.
3. The standard details shown on this figure are typical minimum details. Actual material dimensions, types, and specifications are to be prepared by the design engineer in general accordance with the City of Long Beach Methane Mitigation Standards.

NOT TO SCALE
STANDARD - DETAILS
COMBINATION DE-WATERING AND VENT PIPE
METHANE MITIGATION
LONG BEACH, CALIFORNIA
JANUARY 2020
FIGURE #5  Vent Pipe AT Interior Footing

Conduit or pipe penetration
Polypropylene cable tie 2" min. above base penetration as per manufacturer's specifications
Membrane
Protection layer
Concrete Slab
Subgrade
3" min. collar extends into concrete
Gas light boot
3" min.
Gas extraction aggregate

Membrane Boot

Cold joint
Perforated Horizontal Vent Pipe
Prepared Subgrade
Provide adequate support for Vent Piping during concrete pour
Sleeve through footing

NOT TO SCALE
STANDARD - DETAILS
VENT PIPE AT INTERIOR FOOTING
METHANE MITIGATION
LONG BEACH, CALIFORNIA
JANUARY 2020
FIGURE 5
FIGURE #6

Methane Alarm Device – Horn and Strobe Combination

NOT TO SCALE
STANDARD - DETAILS
METHANE ALARM DEVICE - HORN AND STROBE COMBINATION
METHANE MITIGATION
LONG BEACH, CALIFORNIA

JANUARY 2020

FIGURE 6
FIGURE 7

Methane Alarm Device Mount

Note:
All methane Audio/Visual Alarms shall be installed above the floor at a standard height between 80 and 96 inches with a blue light and adjacent signage (as shown) unless otherwise noted.
FIGURE #8

Conduit Seal

NOTE:
1. THE STANDARD DETAILS SHOWN ON THIS FIGURE ARE TYPICAL MINIMUM DETAILS. ACTUAL MATERIAL DIMENSIONS, TYPES AND SPECIFICATIONS ARE TO BE PREPARED BY THE DESIGN ENGINEER IN GENERAL ACCORDANCE WITH THE CITY OF LONG BEACH METHANE MITIGATION STANDARDS.

NOT TO SCALE

STANDARD - DETAILS
CONDUIT SEAL
METHANE MITIGATION
LONG BEACH, CALIFORNIA
JANUARY 2020
FIGURE 8
In addition to Note #4 above, standby power shall also provide for 5 minutes of alarm.
#10 Membrane Termination at Interior Footing

NOTE:
1. THE STANDARD DETAILS SHOWN ON THIS FIGURE ARE TYPICAL MINIMUM DETAILS. ACTUAL MATERIAL DIMENSIONS TYPES AND SPECIFICATIONS ARE TO BE PREPARED BY THE DESIGN ENGINEER IN GENERAL ACCORDANCE WITH THE CITY OF LONG BEACH METHANE MITIGATION STANDARDS.
FIGURE #11

Vent Riser

Notes:
1. Termination of Passive Vent Riser shall be as follows:
   a. 10' min. away from, or at least 3' above any openable window, door, opening or air intake or vent shaft.
   b. 3' min. in every direction from any lot line, alley, and street.
   c. Extend through the vent casing, 5' min. above the roof, and 1' min. from any parapet or building wall.
   d. 10' above grade
   e. 3' above roof line
2. Wrap all piping with approved material through concrete slab or floor.
3. Support all piping in accordance with City of Long Beach Plumbing Code.
4. The piping of the venting system shall be tested with air.
5. Vent riser penetrations through fire rated walls, ceilings, floors, and roof assemblies shall be protected.
6. All exposed PVC shall be protected from UV light.

CAUTION
METHANE GAS IN PIPE
NO SMOKING
OR ELECTRICAL
EQUIPMENT WITHIN 16'

Notes for placard sign:
1. 3' high x 4' wide.
2. Plastic with adhesive backing, and
3. 1/4' high black letters on white background

STANDARD - DETAILS
VENT RISER
METHANE MITIGATION
LONG BEACH, CALIFORNIA
JANUARY 2020

Page 29 of 45
Notes:
1. 12 square inches Paving Vent shall be constructed on cast iron.
2. 12 square inches Paving Vent shall be installed at the same rate as the vent risers.
3. 12 square inches Paving Vent shall be spaced a maximum of 100' apart.
4. Net area of openings in each Paving Vent shall be 12 square inches.
WARNING

THIS BUILDING IS PROTECTED WITH A METHANE GAS CONTROL BARRIER. ANY PROPOSED PENETRATION OR ALTERATION OF FLOOR SLAB REQUIRES NOTIFICATION OF CITY OF LONG BEACH OIL CODE ENFORCEMENT SECTION (OCES) AND INSPECTION BY AN ENGINEER

Notes:
1. This notification is to be permanently stamped or etched in the surface of the garage slab, near main building entrance, or other location approved by the OCES at the time of construction.
2. All letters 1/2" (min.) in height.
3. At least one required per building.
4. This notification shall be posted and maintained at the front entrance of the building, except residential buildings.
#14 Conduit or Cable Seal Fitting for Building Service and DWP Pull Boxes

**Note:**

1. Piping and conduit shall be protected from corrosion and structural settlement as follows:
   a. Tape shall be applied on conduit and piping encased in cement slurry or concrete.
   b. Tape shall be PS-37-90, Black Plastic PVC or PE Pressure - Sensitive Corrosion Preventive Tape.
FIGURE #15

Large Underground Electrical Equipment Enclosures

Flat nylon sling length of sling = L + 28" (4 total). Nylon sling has to be standard flat eye and eye web sling, rated 20,000 lbs vertical with 3 to 1 safety factor and shall be provided with 1" diameter shackles. Length of sling has to be adjusted as shown with additional 1" diameter shackles (up to 3" tolerance).

NOT TO SCALE

STANDARD - DETAILS
LARGE UNDERGROUND ELECTRICAL EQUIPMENT ENCLOSURES
METHANE MITIGATION
LONG BEACH, CALIFORNIA

JANUARY 2020

FIGURE 15
Notes: Trench Dams

1. All Trench Dams shall be installed in trenches containing piping and conduit that connects directly from the utility lines in the street.
2. The width of a Trench Dam shall be one half the length.
3. Trench Dams shall be constructed of one of the following:
   a. Bentonite Cement Slurry: three feet long; A mixture of 4% Type II Cement; and 2% Powdered Bentonite.
   b. Compacted Native Soils: Backfill five feet long; Native soils shall be compacted at least 90% relative compaction in accordance with ASTM D-1557 Testing Procedures.
   c. Concrete mixes other than Bentonite Cement Slurry may be used provided conduit or piping is wrapped with High Density PVC Foam Tape, Closed Cells, Adhesive Backed, 1/4" thick by 1/2" wide shall be applied to clear surface with ends butted together at most visible locations in Trench Dam.
4. Piping and conduit shall be protected from corrosion and structural settlement as follows:
   a. Tape shall be applied on conduit and piping encased in cement slurry or concrete.
   b. Tape shall be PS-37-90, Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventive Tape.
FIGURE TITLE

#17 Optional Passive Pipe Termination

10' MINIMUM TO OPENING

1/4" SCREEN AT OPENING

3 MIN.

ROOFLINE

NOT TO SCALE
STANDARD - DETAILS
OPTIONAL PASSIVE PIPE TERMINATION
METHANE MITIGATION
LONG BEACH, CALIFORNIA
JANUARY 2020
FIGURE #18
Optional Passive Riser Pipe Termination

WIND DRIVEN TURBINE VENTILATOR

10' MINIMUM TO OPENING

3 MIN.

ROOFLINE

NOT TO SCALE

STANDARD - DETAILS
OPTIONAL PASSIVE RISER PIPE TERMINATION
METHANE MITIGATION
LONG BEACH, CALIFORNIA

JANUARY 2020

FIGURE 18
FIGURE #19

Vertical Membrane

1. PREPARED EARTH SUBGRADE
2. APPROVED GEOSYNTHETIC IF NEEDED
3. GEOMEMBRANE PER SPEC
4. APPROVED GEOSYNTHETIC IF NEEDED
5. CONCRETE

NOT TO SCALE

STANDARD - DETAILS
VERTICAL MEMBRANE
METHANE MITIGATION
LONG BEACH, CALIFORNIA

JANUARY 2020
FIGURE 19
#20 Strip Composite to Vent Riser Transition

![Diagram of Strip Composite to Vent Riser Transition]

**NOTE:**
1. THE STANDARD DETAILS SHOWN ON THIS FIGURE ARE TYPICAL MINIMUM DETAILS. ACTUAL MATERIAL DIMENSIONS TYPES AND SPECIFICATIONS ARE TO BE PREPARED BY THE DESIGN ENGINEER IN GENERAL ACCORDANCE WITH THE CITY OF LONG BEACH METHANE MITIGATION STANDARDS.
FIGURE #21
Manual Monitoring Probe Vault
Attachment 3

Certificate of Compliance for Methane Test Data
CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 1: Certification Sheet
Site Address: __________________________________________________________
Legal Description: Tract: __________________________ Lot: __________________ Block: __________________
Building Use: __________________________________________________________

I hereby certify that I have tested the above site for methane mitigation and that all procedures were conducted in conformity with the requirements of the LBMC 18.79. Where the inspection and testing of all or part of the work above is delegated, full responsibility shall be assumed by the architect, engineer, or geologist whose signature is affixed thereon.

Signed: ________________________________________________ Date: ________________________________

Required Data:
• Depth of ground water observed during testing: __________feet below the Impervious Membrane.
• Depth of Historical High Ground Water Table Elevation*: __________feet below the Impervious Membrane.
• Design Methane Concentration**: __________parts per million in volume (ppmv).
• Design Methane Pressure***: __________inches of water column.
• Site Design Level: (Level 1, Level II, Level III) with __________inches of water column.

De-watering:
• De-watering (is) (is not) required.
• Pump discharge rate __________cubic feet per minute per reference geology or soil report: ___________________ dated ____________________

Additional Investigation:
• Additional investigation (was) (was not) more than 30 days before Site Testing.
• See attached explanation of the effect on soil gas survey results by grading operations.

Notes:
* Historical High Ground Water Table Elevation shall mean the highest recorded elevation of ground water table based on historical records and field investigations as determined by the engineer for the methane mitigation system.
** Design Methane Concentration shall mean the highest recorded measured methane concentration from either Shallow Soil Gas Test or any Gas Probe Set on the site.
*** Design Methane Pressure shall mean the highest total pressure measured from any Gas Probe Set on the site.
**Part 2: Test Data – Shallow Soil Gas Test and Gas Probe Test**

Site Address: ________________________________________________________________

Description of Gas Analysis instrument(s):
Instrument Name and Model: ___________________________ Instrument Accuracy: ± __________ppmv.
Test Lab License #: ______

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<th>Time</th>
<th>Probe Set #</th>
<th>Concentration (ppmv)</th>
<th>Pressure (inches water column)</th>
<th>Probe Depth (feet)</th>
<th>Description / Probe Location</th>
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Attachment 4

Covenant and Agreement
RECORDING REQUESTED BY:

WHEN RECORDED MAIL TO:

NAME

MAILING ADDRESS

CITY, STATE and ZIP CODE

SPACED ABOVE THIS LINE FOR COUNTY RECORDER’S USE

COVENANT AND AGREEMENT REGARDING METHANE MITIGATION

(Pre-printed text shall not be changed except when done by an authorized Building and Safety Bureau employee.)

The undersigned hereby certify that (I am) (we are) the owner(s) of real property located in the City of Long Beach, State of California that is hereinafter legally described (as follows) (on the attached exhibit(s) __________________________):

LEGAL DESCRIPTION:

LOT_________ BLOCK_________ TRACT_________________

as recorded in BOOK______ PAGE___________________, Records of Los Angeles County.

This property is located and known as the following ADDRESS:

And, in consideration by the City of Long Beach for allowing development on the property in the methane zone, the undersigned hereby acknowledges the following for applicable methane mitigation design levels in accordance with the City of Long Beach municipal code:

□ Design Levels I and II - The Owner of the property acknowledges for himself, his heirs, successors in interest or assigns the following:

- The building is constructed within the City of Long Beach Methane Zone and/or within 100-ft of an active or abandoned oil well and is subject to methane gas intrusion from the underlying soil.
- The methane mitigation system, approved and on file with the Building Official of the City of Long Beach has been installed on the property.
- An irrevocable consent to the City of Long Beach to permit its authorized representatives to enter onto the said premises during regular business hours for inspecting and testing for methane intrusion.

□ Design Level III - The Owner of the property acknowledges for himself, his heirs, successors in interest or assigns the following:

- The building is constructed within the City of Long Beach Methane Zone and/or within 100-ft of an active or abandoned oil well and is subject to methane gas intrusion from the underlying soil.
- The methane mitigation system, approved and on file with the Building Official of the City of Long Beach has been installed on the property.
- I, the property owner, will maintain and operate the system in accordance with the requirements specified in the plans, all as approved under jurisdiction of the Building Official of the City of Long Beach.
- An irrevocable consent to the City of Long Beach to permit its authorized representatives to enter onto the said premises during regular business hours for inspecting and testing for methane intrusion.

This covenant and agreement shall run with all of the above-described land and shall be binding upon ourselves, and future owners, encumbrances, their successors, heirs or assigns and shall continue in effect until released by the authority of the Building Official of the City of Long Beach upon submittal of request, applicable fees and evidence that this covenant and agreement is no longer required by law.
<table>
<thead>
<tr>
<th>Owner’s Name</th>
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<tr>
<td>Signature of Owner</td>
<td>(Signature)</td>
</tr>
<tr>
<td>Two Officers’ Signatures Required for Corporation</td>
<td>(Signature)</td>
</tr>
<tr>
<td>Name of Corporation</td>
<td>(Please type or print)</td>
</tr>
<tr>
<td>Dated this day of</td>
<td>, 20</td>
</tr>
</tbody>
</table>

Notary acknowledgements for each signature must be attached to this document

FOR DEPARTMENT USE ONLY:
MUST BE APPROVED BY LONG BEACH DEVELOPMENT COORDINATOR PRIOR TO RECORDING.

APPROVED BY ____________________________ DATE ____________
(Print Name) (Signature)