

METHANE HAZARD MITIGATION STANDARD PLAN

I. PURPOSE

This Methane Hazard Mitigation Standard Plan provides standard details and specifications that may be used to comply with the requirements of the Methane Seepage Regulations of Division 71 of the Los Angeles Building Code. The intent of methane mitigation systems described in this plan is to promote public safety and welfare by controlling methane intrusion emanating from geologic formations. These systems are not intended to regulate flammable vapors that may originate in and propagate from other sources, which include, but are not limited to, ruptured hazardous material transmission lines, underground atmospheric tanks, or similar installations.

II. HOW TO USE THIS STANDARD PLAN

To use this Standard Plan select either of the following:

- 1. Avoid Methane Soils Gas Site Testing and construct components for Site Design Level V shown on Tables 1A (Methane Zone) or 1B (Methane Buffer Zone) on Sheet 4.
- 2. Avoid Methane Soil Gas Site Testing by designing the building using one of the exceptions to Table 1A or 1B under Section IV B 1, 2 or 3 of this Standard Plan.
- 3. Conduct Methane Soils gas testing, complete Form 1 on sheet 3, and construct components listed in Tables 1A or 1B on Sheet 4.

III. GENERAL REQUIREMENTS

CODES:
All work shall be in compliance with the current version of the Los Angeles Building Code and policies of the Department of Building and Safety, and all applicable County, State, and Federal Codes.

INSPECTION:

All work, requiring inspection by the Department of Building and Safety, shall be available to the inspector prior to being covered by subsequent work.

IV. MITIGATION REQUIREMENTS

A. NEW BUILDINGS

All new buildings and paved areas located in a Methane Zone or Methane Buffer Zone shall comply with this Standard Plan and Division 71 of the Building Code.

B. EXCEPTIONS TO TABLE 1A and 1B

The provisions of the Building Code, Section 7104.3 are exceptions to the construction requirements of Table 1A and 1B based on the configuration of the building construction. The following exceptions may be used in lieu of full compliance with Tables 1A and 1B. For further information regarding the design of methane mitigation components, see Section V of this Standard Plan.

1. Buildings with Raised Floor Construction.

Provide all of the following methane mitigation components in lieu of the requirements in Table 1A and 1B.

- a. The utilities shall be installed with Trench Dams, Detail 16 on Sheet 8, and Cable or Conduit Seal Fittings, Detail 8 on Sheet 7.
- b. Four inch (4") thick gravel blanket shall be installed under and around the elevator pits, when there is an elevator pit constructed in the building.
- c. In lieu of the underfloor ventilation requirements of The Building Code, Section 7104.3.2, the underfloor ventilation shall be provided using all of the following:
 - i. An approved mechanical ventilation system which is equivalent to providing one complete air change in the underfloor space once every 20 minutes, or
 - ii. An under-floor system with a clear height above grade of at least 12 inches to girder, 18 inches to floor joist, and 24 inches to structural floors.
 - iii. Openings for underfloor area or crawl space ventilation shall be located less than 6 inches below the bottom of the floor joists. The openings shall be located to provide cross ventilation and shall be the larger of:
 - Openings of not less than 1.5 square feet for each 25 linear feet of exterior wall, or
 - Openings shall be 1% of underfloor area.
- iv. Openings for underfloor area or crawl space ventilation shall be approximately equally distributed along the length of at least two opposite sides of the building. They shall be covered with corrosion-resistant wire mesh with mesh openings not less than 1/4 inch nor greater than 3/4 inch in dimension.

2. Buildings with Natural Ventilation

a. Buildings with Natural Ventilation are buildings with Unobstructed Openings or an opening with a wind-assisted system in exterior walls. Unobstructed Openings for Natural Ventilation shall be evenly spaced to prevent the accumulation of methane gases within the building and shall be constructed as follows:

- i. Unobstructed Openings shall be permanently affixed in the open position.
- ii. Unobstructed Openings shall be free of obstructions, except for screens of wire mesh with not less than 1/4", or wind driven turbines.

C. NOTIFICATION PLACARD

- iii. The aggregate size of Unobstructed Openings providing Natural Ventilation for an enclosed space shall be the larger of:
 - 25% of total floor area of the lowest level of the building, or
 - 25% of the total perimeter wall area of the lowest level of the building.
- iv. Unobstructed Openings shall be located in walls or roofs to facilitate natural venting of methane gas to the atmosphere.
- v. Locate uniformly distributed Unobstructed Openings on two or more exterior sides to provide cross ventilation as close to corners as practical.

vi. Unobstructed Openings shall comply with the provisions of the Los Angeles Building Code including location on property, openings adjacent to stairways and courts.

- a maximum of 6 inches below roof or ceiling joists in the space to be ventilated,
- no more than 50 feet from any point within the building and
- to provide cross ventilation utilizing either of the following:
 - 1. two opposing sides of the building or space to provide cross ventilation.
 - 2. two adjacent sides where at least 50% of the required area of vents are centered a distance of one half the diagonal of the space being ventilated.

vii. Unobstructed Openings in walls shall be located:

- to remove gases from the highest point in the room or enclosed space,
- at a minimum of two positions a maximum of 50 feet on center and
- evenly distributed throughout the enclosed space.

b. In lieu of the requirements of Table 1A and 1B, buildings with Natural Ventilation, such as, restaurants, gazebos, barns, attendant stations and other similar accessory buildings located in parts or buildings with lowest levels closest to grade having Group S, Division 2 occupancy, or detached buildings of Group U and Enclosed Buildings shall be constructed with utilities installed with Trench Dams and either Conduit Seal Fittings or Cable Seals Fittings.

3. Enclosed Rooms or Spaces within Building.

Individual enclosed rooms or enclosed spaces with floor area less than 2,000 square feet may be exempt from providing the Active System as required by Table 1A and 1B, provided the vent openings comply with all of the following:

- a. Vent openings are Unobstructed Openings, except screens of wire mesh at least 1/4 inch or wind driven turbines on the roof shall be permitted.
- b. The appropriate size of vent openings shall be the larger of either five percent of the total floor area of the room or the area of enclosed spaces, or ten percent of the area of walls on the perimeter of the room or enclosed space.
- c. The vent openings shall be located to prevent the accumulation of methane gases within the room or enclosed space.
- d. The top of the vent opening shall be located not more than 12 inches below roof joists or ceiling joists if located in a wall of a building.
- e. The vent openings shall be located on either two opposite walls or two adjacent walls of the room or enclosed space if located in a wall of a building.
- f. The vent openings shall be located no more than 50 feet from any point within the room or enclosed space.
- g. When using wind driven turbine, the area of the vent opening shall be calculated by the area of the opening at the attachment of the wind driven turbine at the roof.
- h. When the vent opening is located in a wall of an adjoining room, then the adjoining room shall be constructed of either an Active System, or have Natural Ventilation as described in Subsection 2 above (Buildings with Natural Ventilation.)

4. Single Family Dwellings and Buildings Accessory to Single Family Dwellings, some or all of the following may be used in lieu of the requirements of Table 1A and 1B:

- a. Single-Station Gas Detectors with battery-back up may be installed in lieu of an Alarm System and Gas Detection System. The battery shall be sized to operate the Single-Station Gas Detectors at least 20 hours in standby mode and 5 minutes in the alarm mode.
- b. 6-inch thick Visqueen may be used in lieu of an Impervious Membrane, when the site is located in the Methane Zone with Site Design Levels I or II.
- c. Additional Vent Risers or Mechanical Ventilation may be omitted for buildings with a width less than 50 feet and footprints less than 6,000 square feet in area.
- d. Vent Risers provided at a rate twice shown in Table 2 on Sheet 4 may be provided in lieu of a Mechanical Extraction System.

5. Buildings Located in the First Phase Playa Vista Project. The First Phase Playa Vista project, as approved by the City on September 21, 1993 and December 8, 1995, shall comply with the methane mitigation program as required by the Department pursuant to the Methane Prevention, Detection and Monitoring Program approved by the Department on January 31, 2001, in lieu of the requirements of the Building Code, Division 71.

V. DESIGN CRITERIA

A. PASSIVE SYSTEM

1. De-Watering System

a. De-Watering System is required when the Historical High Ground Water Table Elevation is within twelve (12) inches from the lowest Perforated Horizontal Piping.

- b. De-Watering system is not required for either of the following: (1) if during the Site Testing, the groundwater level is deeper than 10 feet below the Perforated Horizontal Pipes, or (2) if the soil investigation or analysis, as approved by the Department, reveals the groundwater level is more than 12 inches below the bottom of the Perforated Horizontal Pipes.
- c. De-Watering rates shall be noted on the methane mitigation plans. The engineer or geologist responsible for determining the dewatering rates shall approve the plans.

d. Applications for water discharge location shall be approved and permitted by the Department of Public Works:

- i. Bureau of Sanitation, Industrial Waste and
- ii. Bureau of Engineering, Storm Water Management.
- e. The de-watering pipe shall be minimum Schedule 40, sloped or perforated Polyvinyl Chloride (PVC) pipe or other materials approved under LARR for the intended use.

f. De-watering pipes shall be installed as follows:

- i. De-watering pipes shall be sloped at 1/4 inch vertical to 12 inch horizontal (2% slope). The slope may be reduced to 1% if the pipe size is increased one full size in pipe diameter.
- ii. Combination de-watering and Sub-Slab vent piping system may be used when installed with a minimum nominal 4 inch diameter pipes.

g. Each sump pump pit shall contain a primary pump and a back-up pump.

2. Sub-Slab Vent System

Sub-Slab Vent System shall consist of Perforated Horizontal Pipes, Gravel Blanket Under Impervious Membrane, Gravel Around Perforated Horizontal Pipes and Vent Risers.

a. Perforated Horizontal Pipes:

- i. Perforated Horizontal Pipes shall be approved and listed, minimum Schedule 40, sloped or perforated PVC pipe or other materials approved by a LARR for the intended use.

ii. Perforated Horizontal Pipe shall be installed as follows:

- Spacing and location of Perforated Horizontal Pipes shall be per Table 2 on Sheet 4.
- Pipes used only as vents may be installed in the horizontal position.
- Combination vent/dewatering pipes shall be sloped at 1/4 inch vertical to 12 inch horizontal (2% slope) and
- Undulations in the Perforated Horizontal Pipes, which may impede the passage of gas, shall be avoided (e.g. Perforated Horizontal Pipes shall not be deformed to pass below interior footings).

b. Gravel Blanket Thickness Under Impervious Membrane:

- i. The thickness of the Gravel Blanket under Impervious Membrane shall be per Table 1A and 1B shown on Sheet 4.
- ii. The composition of gravel shall be washed particles that have no more than one fractured face.
- iii. The gradations of gravel shall conform to Table 3 shown on Sheet 4.
- iv. The gradations of sand shall conform to Table 4 shown on Sheet 4.

c. Gravel Thickness Around Perforated Horizontal Pipes:

i. Gravel thickness around Perforated Horizontal Pipes shall be per Table 1A and 1B shown on Sheet 4.

- ii. When sand is used as the Gravel Blanket a geo-fabric to prevent sand from entering the Perforated Horizontal Pipes shall be placed around the Perforated Horizontal Pipes.
- iii. Gravel shall be composed entirely of particles that have no more than one fractured face.

d. Vent Risers:

- i. Vent Risers shall be connected to Perforated Horizontal Pipes and constructed of cast iron. Exception:
 - Acrylonitrile Butadiene Styrene (ABS) pipes may be allowed for residential buildings up to two (2) stories, or
 - Any other material approved by a LARR for the intended use as methane Vent Riser.
- ii. Vent Risers shall be spaced and located as per Table 2 on Sheet 4.
- iii. Vent Riser outlets shall be located as shown in Detail 12 on Sheet 8.
- iv. If rain guards are provided, they shall be non-restricting.

3. Impervious Membrane

a. Impervious Membrane Installation:

Impervious Membrane shall be a product approved by the LABS Engineering Research Section with a valid Los Angeles Research Report (LARR) Number. Installation shall comply with the conditions of approval specified in a LARR and manufacturer's specification of the Impervious Membrane.

ii. Impervious Membrane shall be installed at the following locations:

- Below the building slab surrounded by the inner face of the exterior footings
- On the exterior surface of walls from the finished grade level to a minimum of 6 inches below the bottom of the adjoining building slab
- Around sides of pile caps and caisson caps

Exception:

- Impervious Membrane shall not be installed under exterior or interior footings.
- iii. Impervious Membranes at elevator and sump pits shall be installed as follows:
 - Two layers of Impervious Membrane below slabs and footings of all elevator pits, sump pits and hoisting tanks.
 - Impervious Membrane does not need to be placed below elevator pistons.

• Impervious Membrane shall be attached to the elevator piston cylinder casing or at the sump pit floor slab to prevent methane intrusion.

iv. The individual certified by the manufacturer of the Impervious Membrane shall certify on the Impervious Membrane Installation Certificate (see Sheet 3) that the Impervious Membrane was installed per approved plans.

v. The completed Form 3 shall be given to the inspector prior to placement of pars or the whole concrete floor slab.

b. Seals at Impervious Membrane Penetrations:

- i. Where footings, plumbing pipes, electrical conduits and other materials penetrate the Impervious Membrane, the penetrations shall be sealed by using sleeves or boots composed of the same material or other approved materials and methods in accordance with the specifications of the manufacturer for the Impervious Membrane
- ii. A gas tight seal shall be provided where the Impervious Membrane is attached to all interior footings and exterior wall footings.

iii. All elevator piston casing shall be constructed of a material allowed by the elevator code and sealed at the elevator pit floor slab level in accordance with the specifications of the Impervious Membrane manufacturer.

iv. The bottom of the elevator piston casing shall be sealed to prevent gas migration into the building.

c. Impervious Membrane Protection Prior to Floor Slab Placement

i. Installation Sequence for Protection Material Below the Impervious Membrane:

- Finish the Gravel Blanket smooth using mechanical means (e.g. roller).
- Place geotextile filter fabric over the Gravel Blanket to protect the smooth finish of the Gravel Blanket and prevent sand migration into the Gravel Blanket.
- Prepare protective course for Impervious Membrane.

Option A: If Sand is used as Gravel Blanket, then the Impervious Membrane may be placed directly on the geotextile, or

Option B: If Gravel is used as for the Gravel Blanket, then place a minimum 1-inch thick Sand layer directly over the geotextile.

Option C: If Gravel is used as for the Gravel Blanket, then place a geotextile with a minimum weight of 16 ounces per square yard.

ii. Installation Sequence for Protection Material Above the Impervious Membrane:

- Place 2-inch thick sand directly over the Impervious Membrane, or a minimum 1-inch thick lean concrete mix (slurry as specified in the Standard Specifications for Public Works Construction, Green Book)
- Place geotextile fabric if sand is used in the prior step. If lean concrete mix is used, geotextile is not required.
- Place concrete, reinforcing steel, piping and other forms so as not to be supported directly on the Impervious Membrane. Equipment shall not be driven over the Impervious Membrane or its protective covering.

B. ACTIVE SYSTEM

The Active System consists of the Sub-Slab System, Lowest Occupied Space System and Control Panel.

1. Sub-Slab System

The Mechanical Extraction System shall consist of Detectors in Vent Risers, Gas Detection and Gas extraction powered devices and shall be designed in consideration for the migration of subsurface gas from adjacent properties.

i. Vent Risers for the Active System shall be located as follows:

- 10 feet above grade,
- 10 feet away from any window, doors, roof hatch, opening or air intake into the building,
- 3 feet above highest point of roof within a 10' radius of outlet,
- 3 feet away from any parapet,
- 4 feet away from the property line and
- 5 feet away from any electrical device.

ii. Detectors in Vent Risers

- Detectors and associated transmitters shall be listed by a recognized testing laboratory for the intended use.
- Detectors and associated wiring shall be immune to radio frequency and infrared remote-transmitters frequency interference.
- Detector shall be fitted within the vent pipe so that no gas may leak through the fittings
- The associated wiring and associated raceways shall be:
 - Mounted to a secure surface independent of detectors and their associated transmitter.
 - Protected from physical damage.

iii. Gas Extraction Powered Devices

- Gas extraction powered devices shall consist of fans, blowers, or other powered devices to exhaust or provide make-up air into the space below the impervious Membrane and shall be capable of ventilating the Gravel Blanket and Perforated Horizontal Pipes spaces at a rate of 3 air changes per hour.
- The total volume Gravel Blanket used to size the Gas Extraction Powered Devices shall include the volume of air (pore space) in the Gravel Blanket.

• Unless porosity of the gravel blanket material is established by a test report prepared by a licensed engineer or registered geologist, porosity of the gravel blanket material may be taken as 25%.

2. Lowest Occupied Space System

The Lowest Occupied Space System shall consist of Gas Detection System, Mechanical Ventilation System and Alarm System.

a. Gas Detection System

- i. The specifications for Detectors shall be the same as specified for Detectors in Vent Risers except as modified in Table 5 - Activator Thresholds for Active System.
- ii. Detectors in lowest occupied spaces shall be installed in accordance with manufacturer's requirements and listing agency approvals.
 - Detectors shall be located with respect to airflow in rooms, location of probable gas leaks and the recommendations of the manufacturer.
 - The number of required Detectors shall be based on Table 6 - Detector Spacing.



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Date: 06/16/06

Scale: Not to Scale

Drawn:

Job:

Sheet:

SITE ADDRESS:

LEGAL DESCRIPTION:
OWNER: