b. Mechanical Ventilation System

i. Mechanical Ventilation System shall consist of blowers, fans or other powered devices for exhaust or make-up air as approved by Mechanical Plan Check Section.

ii. The make-up air shall be 100% outside air.

iii. Mechanical Ventilation System shall be provided using one of the following options for garage lowest occupied and unoccupied spaces:

Option #1: Activated Mechanical Ventilation - Mechanical Ventilation System shall be capable of removing methane gas at a rate of 4 air changes per hour when activated by the Gas Detection and Control Panel, at 10% LEL (5,000 ppmv). Back-up power is not needed for mechanical ventilation in this option. Parts of fans in this Option shall be of nonferrous or non-sparking materials or their casing shall be lined or constructed of such material.

Option #2: Continuous Ventilation - Mechanical Ventilation System sized to ventilate the building spaces at a rate of one (1) air change per hour on a continuous basis. Mechanical ventilation in this option shall be provided with 24 hours of back-up power when Detectors are not provided.

Option #3: Scheduled Start-up Ventilation - Mechanical Ventilation System shall start-up at least once every (6) six hours to provide a minimum of 24 air changes per day. Mechanical ventilation in this option shall be provided with 24 hours of back-up power when Detectors and are not provided.

Option #4: Alternate Natural Ventilation - Alternate method of ventilation may be utilized in lieu of mechanical ventilation in Options #1, #2 and #3 when designed in accordance with the Natural Ventilation requirements of this Standard Plan.

c. Alarm Systems

i. Alarm Systems shall consist of audible and visual signals to notify occupants of significant levels of methane intrusion into the building and shall be designed with the Sequence of Operation shown in Table 5 of this Standard Plan.

ii. Audible alarms shall be at least 15dB above ambient noise level in all areas subject to methane gas intrusion.

iii. Visual alarms shall be a minimum of 15-candela output and be located at each audible device.

iv. The audible signal warning building occupants of significant levels of methane gas shall be distinctively different from the fire alarm system.

v. Signs shall be posted adjacent to each alarm signaling device indicating, "Methane Alarm-Evacuate Building."

3. Control Panel

a. General Installation

i. Control Panel shall be listed by a recognized testing laboratory.

ii. Control Panel shall have the following characteristics:

- Designed not to override the building fire alarm, smoke control and ventilation systems.
- A manual shall be provided with the Control Panel describing the installation, wiring, operation, maintenance and testing.

b. Power Source

i. Primary Power Source

- Control Panel shall be hard wired to the building normal power.
- The circuits supplying power to the Control Panel shall be lockable in the open position.

ii. Back-Up Power Supply

- Control Panel shall monitor the power to Detectors, annunciator and associated components.
- Back-Up battery or emergency power shall be rated for a minimum of 24 hours for standby mode plus 5 minutes of alarm under full load condition.
- This Back-Up power shall be available within 60 seconds of primary power loss.

c. Panel Operation

i. Device Activation

- Control Panel shall recognize alarm conditions, and then activate required audible devices, visual devices and Gas Extraction Powered Devices.
- Components of the Active System shall be activated as shown in the Table 5 on Sheet 4 - Activation Thresholds For Active Systems.

ii. Trouble Annunciation

- Control Panel or annunciator shall indicate each trouble or alarm condition by a visual alarm.
- Control Panel shall supervise and identify fault and trouble conditions with the following:
  - Main supply circuits,
  - Rechargeable battery circuits,
  - Initiating device circuits,
  - Alarm device circuits,
  - Supplementary or auxiliary signaling circuits and,
  - Signaling line circuits.

C. MISCELLANEOUS SYSTEMS

1. Trench Dam

Trench dams are intended to prevent travel of underground gas into buildings or structures along the trench backfill.

a. A Trench Dam shall be installed in all electrical, plumbing, gas, or other trenches beneath the building foundation.

b. If piping and conduits are placed before certified compacted soil as part of the site preparation for the building pad, then trench dams will not be required.

c. Trench dams shall be installed in the trench immediately adjacent to the exterior perimeter of the building foundation.

d. A Trench Dam shall have a minimum length of twice the width of the trench or a minimum of 36 inches in length.

e. Trench dams may be of the following:

i. Bentonite Cement Slurry - A mixture of 4% Type II Cement, and 2% Powdered Bentonite, or

ii. Compacted Native Soil Backfill - Native soil shall be compacted to at least 90% relative compaction in accordance with ASTM D-1557 Testing Procedures.

f. The entire cross section of trenches shall be backfilled to provide a minimum of 6 inches of trench dam material around all conduits and pipes.

2. Hazardous Area Classification

For the purpose of determining the appropriate electrical wiring method and equipment, boundaries of the hazardous area classification are specified in Tables 7, 8 and 9. The Hazardous Area Classification, except as noted below, is based on the measured gas concentration and pressure as indicated in Site Investigation report:

a. In the absence of pressure reading in a site investigation report, the area classification shall be based on soil gas pressure that is greater than 2 inches of water.

b. In the absence of a site investigation report, the area classification shall be based on Methane Design Level V.

3. Wiring

The wiring system shall be in accordance with the Los Angeles Electrical Code and as required herein.

a. Depressurization Enclosure

i. Wiring system between a classified area and a non-classified area shall be supplemented by a Depressurization Enclosure when the Design Methane Pressure is greater than 6 in. of water.

- Depressurization enclosure is not required when each continuous underground wiring duct bank system supplied from an approved vented manhole is less than 500 linear ft. (152.4 m.) from a termination point and the total load does not exceed 80% of the rating of the conductors. Longer duct bank run may be permitted when justified by engineering analysis.
- Depressurization enclosure is not required when the maximum-recorded pressure does not exceed the rating of a listed and approved seal fitting.

ii. The wiring system supplied from the Depressurization Enclosure shall be installed above ground.

iii. The Depressurization Enclosure shall be suitable for the location and shall contain only electrical wiring. The depressurizing enclosure shall be located outdoors and shall comply with one of the following options:

- A standard pull box fitted with a breather suitable for Class I, Group D locations where:
  - The breather shall be located on the side of the enclosure within 2 inches from the top of the pull box.
  - The breather shall have minimum dimensions of 1.5 inches long and 15/16 inch diameter; or
- A standard pull box fitted with louvered ventilation where:
  - The louvered openings shall be within 2 inches from the top of the box.
  - The minimum total enclosure ventilation opening shall be 1.41 square inches. A louvered pull box shall be installed in a non-classified area.

b. Outdoor Enclosures

All outdoor enclosures with open bottoms, when installed on grade or finished floors, shall be mounted on a minimum 2-in. (5.08 cm.) thick concrete pad over a 30 mil (0.076 cm.) High Density Polyethylene (HDPE) or equivalent approved impervious membrane. All membrane penetrations shall be suitably sealed against transmission of gas into the enclosure.

c. Conduit Seal Fittings and Cable Seal Fittings

Conduit Seal Fittings and Cable Seal Fittings are designed to prevent the passage of gases, vapors, or flames inside the electrical conduits.

i. Conduit or Cable Seal Fittings are required where conduits or cables pass through a classified hazardous area per the Los Angeles Electrical Code and as required in this Standard Plan.

ii. Any conduit or cable that penetrates the Impervious Membrane shall be provided with a conduit or cable seal.

iii. Conduit Seal Fittings shall be installed in the vertical portion of conduit where the PVC conduit emerges from a classified location. Rigid material shall be rigid metal that has the same trade size as conduit runs.

d. Grounding Electrical Systems

Electrical systems required by the Los Angeles Electrical Code to be grounded shall be connected to earth using the prescriptive or performance (Soil Resistance) method.

i. Prescriptive Method

When a Ground Ring is not used as part of the Grounding Electrical Systems required by the Los Angeles Electrical Code at least one of the following supplemental grounding electrodes shall be used:

- Rod and Pipe Electrodes
- Plate Electrodes

The supplemental grounding electrode conductor shall not be reduced in size.

ii. Soil Resistance Method

Grounding systems other than specified in the Prescriptive Method shall be based on Soil Electrical Resistivity Test as follows:

- Soil Electrical Resistance
  - The soil resistivity shall be measured by the four-point method as described in IEEE Standard 81-1983.
  - The measurement of soil resistance shall take into account the geological features of the soil as determined by the engineer.
  - Whenever driven ground rods are to be used, the soil resistivity measurement shall correlate with the installed effective depth of the ground electrodes.
  - The engineering analysis of the data shall take into account the expected soil temperature, moisture and gas or soluble chemical contents.tion
  - The engineering analysis shall reflect the uniformity of soil resistivity using not less than ten readings based on the test pin electrode spacing.
  - The soil resistivity measurement shall be based on embedment of the electrodes below the permanent moisture level, when such installation is possible.
- Measurement
  - For installations of multiple rod and pipe or plate electrodes in a single row, measurement shall be in a straight line at the location were these electrode(s) are intended to be installed.
  - For installations of ground ring (circular or square), grids, grid beds, radial, etc, the area that is to be used for grounding shall be divided into rows. Each row shall be equally spaced apart. The measurement shall be started at the corner of the first row and then continued through each pre-determined point in the row. This measurement is then repeated through the last row. The measurement shall be performed until all pre-determined points are covered.
  - These measurements shall account for water table, soil layers, corrosion, etc. when applicable.
- Soil Electrical Resistance Design:
  - For multiple rod and pipe or plate electrodes installed in a straight line, the measured current and voltage shall be used to calculate the average soil resistivity.
  - For an area, the measured current and voltage shall be used to calculate the average soil resistivity for each row. The highest calculated average soil resistivity of any row shall be used to calculate the soil resistivity.
  - In the event the soil in the area or location under consideration is found to be non-uniform, the soil shall be modified and the test(s) shall be repeated. Ground Resistance (Impedance) Limitation - The overall ground resistance (Impedance) of a grounding electrode system shall not exceed 25 ohms for 600 volts or less low voltage systems and not to exceed 5 ohms for over 600 volts high voltage systems.

4. Manholes and Other Underground Electric Enclosures Intended for Personnel Entry

The provisions of this section are applicable to all manholes and other underground electric enclosures that are intended for personnel entry. These enclosures herewith will be referred to as underground electrical enclosures.

a. Vent System

i. Underground electrical enclosures shall be naturally ventilated at all time to open air in an approved manner to prevent the build-up of methane.

ii. Mechanical ventilation in lieu may be used when back-up power sufficient to run the system for 24 hours is provided and a visual and audible main power failure alarm at a readily accessible location.

b. Enclosure Exterior

i. Approved seals shall be used to prevent water and methane gas from entering the sides of the underground electrical enclosures.

ii. Underground electrical enclosures personnel entry access cover shall be provided with an approved restraining system.

iii. Soil gases under the underground electrical enclosures shall be vented in a manner shown in the Standard Plan Details.

c. Enclosure Interior

i. All wiring terminations, equipment and insulating materials within the enclosure shall be suitable for wet location.

ii. Approved duct seals shall be used to prevent water from the conduits entering or leaving the manholes and other underground electrical enclosures intended for personnel entry. The seal shall have a depth of not less than the diameter of the conduit.

5. Additional Vent Risers

The total quantity of installed Vent Risers shall be increased to double the rate for the Passive System.

VI. SYSTEMS MAINTENANCE

A. PROCEDURES

The maintenance and service procedures for each gas detection and mechanical ventilation systems shall be in accordance with the manufacturers written instructions and the Fire Prevention Bureau (F.P.B.) Requirment No. 71 Fire Cheif's Regulation 4, Section 4J.

B. SCHEDULE

1. The maintenance schedule shall be as recommended by the manufacturer of each gas detection and mechanical ventilation system component.
2. Notwithstanding the recommendations of the manufacturer, testing, maintaining, and servicing of each system shall be in accordance with the schedule required by the Fire Department.

C. REPAIRS

All components required to mitigate methane hazards shall be repaired or replaced to the manufacturer's original specification.

D. OCCUPANT NOTIFICATION

A permanent notification shall be provided at each building indicating the presence of the methane Impervious Membrane. This notification shall be at the front entrance, be visible and be legible as approved by the Engineer and LADBS. See Detail 14 on Sheet 8.

VII. EMERGENCY PLAN

An emergency plan outlining emergency procedures shall be established for all buildings with a gas-detection system, with the exception of buildings with R3 or U Occupancies. The procedures shall include, but not limited to, the identification of the responsible person assigned to manage the contingency plan, posting of the contingency plan and the approval process of the contingency plan.

A. RESPONSIBLE PERSON

The assigned responsible person shall work with the Fire Department in the establishment, implementation and maintenance of an emergency plan.

B. POSTING

A sign shall be posted in a conspicuous location designated by the Fire Department with the Fire Department's telephone number.

C. APPROVAL

All contingency plans for emergency procedures shall be approved by the Fire Department.

SITE ADDRESS:

LEGAL DESCRIPTION:
OWNER:

STANDARD PLAN:
METHANE HAZARD MITIGATION
Not to be used for Playa Vista Phase I Projects

CITY LADBS DEPARTMENT OF BUILDING AND SAFETY

Rev.:	02/10/10
Date:	02/01/06
Scale:	Not to Scale
Drawn:	
Job:	
Sheet:	

Sheet 2 of 8