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August 22, 2005

Avenue of the Stars, LLC
c/o Mr. Jim Sinsheimer
Vice President
The Related Companies
18201 Von Karman Avenue, Suite 900
Irvine, California 92612

Subject: **Report of Methane Soil Gas Testing
Proposed Condominiums
2055 Avenue of the Stars
Century City District of Los Angeles, California
MACTEC Project 4953-05-1852**

Ladies and Gentlemen:

We are pleased to submit this report of methane soil gas testing for the proposed condominium development at 2055 Avenue of the Stars in the Century City District of Los Angeles, California. The project site is shown on the attached Figure 1, Site Location Map. As shown on Figure 2, Methane and Methane Buffer Zones, the project is located within a City of Los Angeles designated Methane Zone.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for Avenue of the Stars Associates and their design consultants to be used solely for the design of the proposed project. This report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties or other uses.

PROJECT INFORMATION

The project site is currently occupied by a 32-story building with three basement levels. The ground level of the existing building is at Elevation +317 feet above Mean Seal Level (MSL) underlain by basement levels at +303, +291 and +279 feet MSL respectively.

We understand that the existing 32-story hotel tower at the site will be demolished for the construction of a 40-story concrete tower housing 145 condominium units with an enlarged foot print area. Excavations of up to 40 feet are anticipated. The lowest basement level of the existing building will be abandoned and backfilled and the new tower will be underlain by two basement levels.

We have prepared a Health and Safety Plan (HSP) prior to the commencement of the field work, addressing site-specific conditions including the proposed scope of field work, site-specific environmental concerns, and mitigation of hazards. The HSP outlines the monitoring requirements and action levels for protective equipment and measures.

SOIL GAS PROBE INSTALLATIONS

The methane soil gas testing at the site was performed based on the procedures conforming to the Los Angeles Department of Building and Safety (LADBS) Methane Mitigation Standards. Based on the site area of roughly 40,000 square feet, a total of 4 gas probe locations were selected.

Two shallow probes were installed in hand-augered excavations at the locations shown on Figure 3, Plot Plan, at an approximate depth of 5 feet below the lowest existing basement floor slab. Each shallow probe consists of a 6-inch-long, $\frac{3}{8}$ -inch-diameter stainless steel screen attached to a $\frac{1}{4}$ -inch-diameter polyethylene tubing. The screen is encased within a 1-foot-thick layer of clean sand sealed at the top and bottom with 6 inches of hydrated bentonite. The tubing extends to the ground surface where it terminates at a gas-tight, quick-connect fitting housed inside a flush-mounted 12-inch-diameter well casing. These shallow gas probes were installed to screen the near-surface methane gas concentration in the soil.

To screen methane gas concentrations at depth, two nested gas probes capable of screening three depth intervals were installed within 8-inch-diameter hollow-stem auger borings at the locations shown on Figure 3. Ground water was not encountered within the depths explored. The nested probes were installed at 45, 50 and 65 feet intervals below the ground surface which correspond to 5, 10 and 20 feet below the lowest future basement slab level of the proposed building. The installation of the nested probes is similar to the shallow probes discussed above except for the longer length of tubing and the joint housing of three tube terminals within each flush-mounted well casing.

TEST RESULTS

Soil gas samples were collected twice from both the shallow probes and the deep nested probes. The current investigation was performed in general accordance with the City of Los Angeles – Department of Building and Safety (LADBS) protocol. Soil gas concentrations were collected in the field using a portable infrared gas analyzer (Landtec GA-90). The barometric pressure was also measured with the Landtec GA 90 gas analyzer. The probe pressure was measured with a Dwyer Model 2005 Magnehelic® Differential Pressure Gage having a range of 0 to 5 inches of water and a minimum scale division of 0.1 inch of water (H₂O). Each sampling period was separated by approximately 24 hours. The results of soil gas testing are presented in the attached Table 1 and Form 1 – Certificate of Compliance for Methane Test Data.

Results of Shallow Gas Probes

The shallow gas probes installed underneath the lowest basement slab at a depth of 5 feet have indicated design methane concentration values to the order of 160,000 and 270,000 parts per million by volume (ppmv) at locations B3 and B4 respectively. The corresponding gas pressures measured in inches of H₂O indicate values of 0.62 and 0.16 inch respectively.

Results of Deep Nested Gas Probes

The methane readings at the nested probes at all measured depths indicated design methane concentrations close to 408,000 ppmv at boring location B1, and 250,000 ppmv at boring location B2.

CONCLUSIONS

We performed testing on a total of 16 soil-gas samples. All of the soil-gas samples were tested for methane concentration and methane gas pressure values. The methane design concentration, as defined above, is 408,000 ppmv, and the design methane pressure is 0.7 inches of water. According to Table 71 of Division 71, if the design methane concentration is more than 12,500 ppmv, then “Level V” mitigation would be required. Since all of the results were over 12,500 ppmv, it is likely, that the City of Los Angeles will require “Level V” mitigation. The Department of Building and Safety has issued “Methane Mitigation Standards”, which provide detailed specifications for each of these requirements. We have attached the site-specific plans and specifications for methane mitigation in the appendix for your reference.


In conclusion, high methane concentrations were recorded in all the samples tested. Based on the available test results, special provisions to mitigate potentially hazardous conditions related to methane or hydrogen sulfide will be required for the proposed development.




We trust that the preliminary information presented above satisfies your current needs. Please contact us if you have any questions.

Sincerely,

MACTEC Engineering and Consulting, Inc.


Venkat Bhadriraju
Staff Engineer


Carl Kim, GE 2620
Principal Engineer/Project Manager



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(6 copies submitted)

Attachments: Table
Figures
Appendix

TABLES

Table 1. Analytical Results of Soil Gas Samples (August 2005)
2055 Avenue of the Stars, Centruy City District of Los Angeles, CA

Boring Location	Depth (feet)	Date	Vapor Sampling Time	Barometric Pressure (in. Hg)	Gas Pressure (in. H ₂ O)	Field* Methane (%) [ppmv]	Field* Carbon Dioxide (%)	Field* Oxygen (%)
B1	45	8/12/2005	15:41	29.30	0.61	39.1 [391,000]	13.5	0.0
		8/13/2005	15:45	29.30	0.50	39.7 [397,000]	13.5	0.0
	50	8/12/2005	15:48	29.30	0.60	39.2 [392,000]	13.2	0.0
		8/13/2005	15:55	29.30	0.54	39.7 [397,000]	13.3	0.0
	60	8/12/2005	15:55	29.30	0.45	40.5 [405,000]	10.2	0.1
		8/13/2005	16:02	29.30	0.42	40.8 [408,000]	10.2	0.3
B2	45	8/12/2005	15:11	29.40	0.54	22.6 [226,000]	15.1	0.3
		8/13/2005	15:18	29.40	0.48	22.9 [229,000]	15.4	0.3
	50	8/12/2005	15:19	29.40	0.63	23.7 [237,000]	15.7	0.0
		8/13/2005	15:25	29.40	0.54	23.9 [239,000]	15.7	0.0
	60	8/12/2005	15:30	29.40	0.70	24.9 [249,000]	15.7	0.0
		8/13/2005	15:35	29.40	0.52	25.1 [251,000]	15.6	0.0
B3	5	8/12/2005	16:03	29.30	0.62	15.9 [159,000]	15.8	0.0
		8/13/2005	16:12	29.30	0.52	16 [160,000]	15.8	0.0
B4	5	8/12/2005	16:10	29.30	0.20	25.6 [256,000]	12.4	0.0
		8/13/2005	16:18	29.30	0.16	26.5 [265,000]	12.6	0.0

*Field results obtained using the portable gas sampling instrument Landtec GA- 90

Input by VB Date 08/16/05

Reviewed by ck Date 8/22/05

FORM 1 - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 1: Certification Sheet

Site Address: 2055 Avenue of the Stars, Century City, CA

Legal Description: Tract: _____ Lot: _____ Block: _____

Building Use: Residential

Architect's, Engineer's or Geologist's Stamp:

Name: Former St. Regis Hotel
Mailing Address: 2055 Avenue of the Stars Century City, CA
Telephone:
Name of Testing Laboratory: MACTEC Engineering and Consulting, Inc.
Telephone: (323) 889-5300



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

Signed: CAW date 8/22/05

Required Data:

- Depth of ground water: _____ feet below the Impervious Membrane.
- Design Methane Concentration: **408,000** parts per million in volume (ppmv)
- Design Methane Pressure: **0.7** inch of water column.

De-watering:

- De-watering (is) (is not) required.
- Pump discharge rate N/A cubic feet per minute.
- Reference geology or soil report: N/A dated N/A

Additional Investigation:

- Additional investigation (was) (was not) conducted.

Latest Grading on Site:

- Date of last grading on site was 1984
- See Attached explanation of the effect on soil gas survey results by grading operations:

NONE

FORM 1 (CONTINUED) - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 2: Test Data

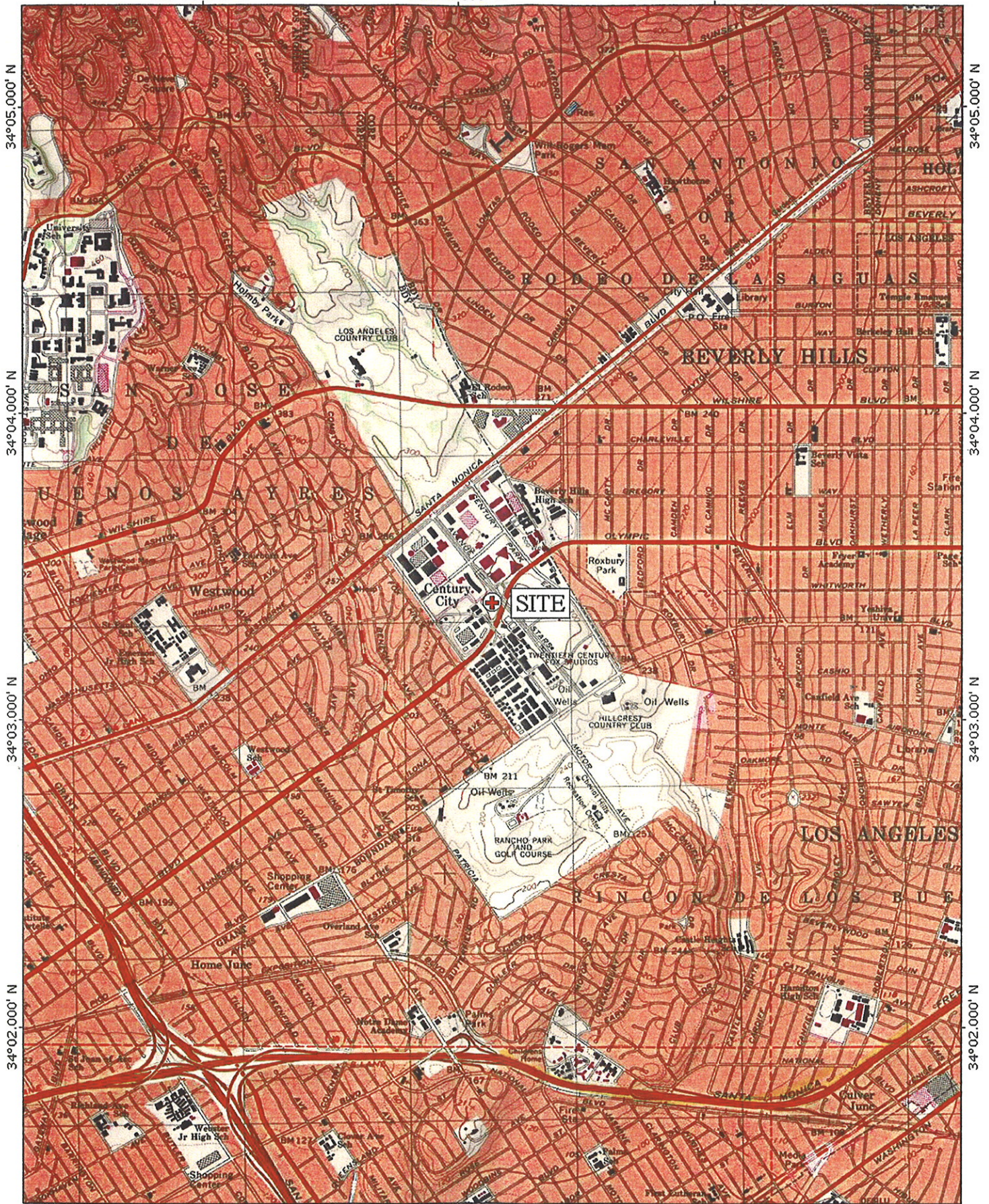
Description of Gas Analysis Instrument(s): **Portable infrared gas analyzer**

Instrument Name and Model: **Landtec GA-90**

Date	Time	Probe Set #	Concentration (ppmv)	Pressure (inches water column)	Sensor depth (feet)	Description / Sensor Location
8/12/05	15:41	1	391,000	0.61	45	45
8/13/05	15:45	1	397,000	0.50	45	45
8/12/05	15:48	2	392,000	0.60	50	50
8/13/05	15:55	2	397,000	0.54	50	50
8/12/05	15:55	3	405,000	0.45	65	65
8/13/05	16:02	3	408,000	0.42	65	65
8/12/05	15:11	1	226,000	0.54	45	45
8/13/05	15:18	1	229,000	0.48	45	45
8/12/05	15:19	2	237,000	0.63	50	50
8/13/05	15:25	2	239,000	0.54	50	50
8/12/05	15:30	3	249,000	0.70	65	65
8/13/05	15:35	3	251,000	0.52	65	65
8/12/05	16:03	1	159,000	0.62	5	5
8/13/05	16:12	1	160,000	0.52	5	5
8/12/05	16:10	2	256,000	0.20	5	5
8/13/05	16:18	2	265,000	0.16	5	5

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request, will provide reasonable accommodation to ensure equal access to its programs, services and activities. For efficient handling of information internally and in the internet, conversion to this new format of code related and administrative information bulletins including MGD and RGA that were previously issued will also allow flexibility and timely distribution of information to the public.

Proposed 2055 Avenue of the Stars Condominiums [34°03.377' N, 118°24.866' W WGS84]
118°26.000' W 118°25.000' W WGS84 118°24.000' W

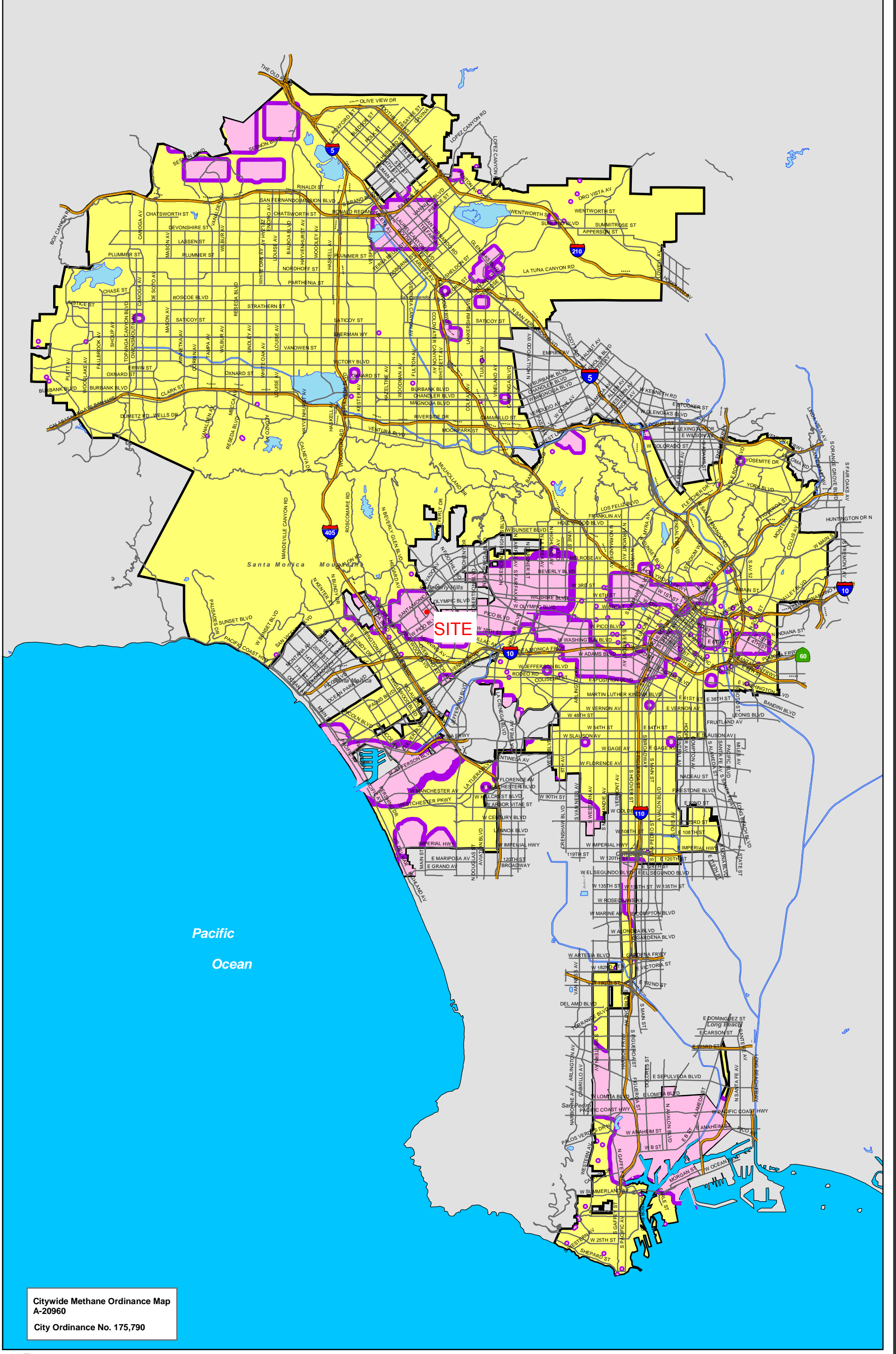


TN * / MN
13 1/2°

118°26.000' W 118°25.000' W WGS84 118°24.000' W



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Citywide Methane Ordinance Map
A-20960
City Ordinance No. 175,790

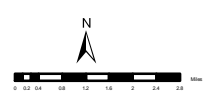
METHANE AND METHANE BUFFER ZONES

CITY OF LOS ANGELES

Prepared by GIS Mapping, Bureau of Engineering, Dept. of Public Works - 05/28/04



Methane Zone
 Methane Buffer Zone



GARY LEE MOORE, P.E.
2014 04/08/04

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 2, 3 or 4 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.

NOTE: Identify the required Methane Hazard Mitigation components with a "circle" around the appropriate exception under Section IV B (Sheet 1) or the respective column in Tables 1A or 1B (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. Narrow Buildings.

Narrow Building is a building that has a width less than 50 feet, a footprint of less than 50,000 square feet and having a minimum 2-foot wide landscaped area immediately adjacent to the exterior wall for at least 50 percent of the perimeter of the building.

Narrow Buildings are still required to provide the methane mitigation requirements of Table 1A and 1B, except that if Pressure Sensors below the Impervious Membrane are not required per Table 1A and 1B, then they may be installed in lieu of a Gas Detection System and Mechanical Ventilation. A minimum of 2 feet wide landscaped area shall be used to free any subsurface methane gas trapped underneath the building into the atmosphere.

2. 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 1/2 inch in dimension.

3. 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 1/2", or wind driven turbines.
 - 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, restrooms, gazebos, barns, attendant stations and other similar accessory buildings located in parks or buildings with lowest levels closest to grade having Group S, Division 2, 3 or 4 occupancy, or detached buildings of Group U, Division 1 occupancy and Unenclosed Buildings shall be constructed with utilities installed with Trench Dams and either Conduit Seal Fittings or Cable Seal Fittings.
4. Enclosed Rooms or Spaces within Building.

Individual enclosed rooms or enclosed spaces with floor area less than 2,000 square feet maybe 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 aggregate 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 space, 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 3 above (Buildings with Natural Ventilation.)
5. 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. When Pressure Sensors below the Impervious Membrane are not required by Table 1A and 1B, Pressure Sensors below the Impervious Membrane may be installed in lieu of Gas Detection System and Mechanical Ventilation.

C. PAVED AREAS

The requirements for venting paved areas over 5,000 square feet in area and within 15 feet of the exterior wall of a commercial, industrial, institutional or residential building may be accomplished with either of the following:

1. If the site is located in the Methane Buffer Zone, then venting is not required for paved areas that qualify for Site Design Levels I, II, or III, or
2. Install vents in accordance with Detail 13 on Sheet 8, or
3. Install landscaping areas immediately adjacent to the building exterior walls at least two feet wide covering at least 80% of the building perimeter.

D. EXISTING BUILDINGS

Additions, alterations, repairs, change of use or change of occupancy to existing buildings shall comply with the methane mitigation requirements of the Building Code, Sections 7104.1 and 7104.2, when required by Division 34, 81, or 82 of the Building Code.

Approved methane mitigation systems in existing buildings shall be maintained in accordance with Building Code, Section 7106.

E. MAINTENANCE OF MITIGATION SYSTEMS

All gas detection and mechanical ventilation systems shall be maintained and serviced in proper working condition and meet all requirements of the Los Angeles Electrical and Mechanical Code. The testing, maintenance and service procedure for gas detection and mechanical ventilation systems shall be performed in accordance with the manufacturer's current written instructions and the following:

1. The manufacturer's instructions shall be approved by the Fire Department. A person certified by the Fire Department shall perform testing and servicing of each system.
2. A permanent notification placard shall be posted and maintained at the front entrance of the building indicating that the building is constructed with an Impervious Membrane, except in residential buildings. The placard shall indicate the presence of the Impervious Membrane. The location of the placard shall be such that it is legible from 10 feet away and when cast in floors shall remain uncovered and in a conspicuous location. The letters should be at least 1 inch high.

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-wating 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, slotted 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 minimum Schedule 40, slotted 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 at least:
 - 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.
 - iv. If rain guards are provided, they shall be non-restricting.

3. Impervious Membrane

- a. Impervious Membrane Installation:
 - i. 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 capsException:
 - 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 holding 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 parts 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 shaft 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 (sturry 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

Sub-Slab System shall consist of Pressure Sensors and a Mechanical Extraction System.

a. Pressure Sensors

- i. All devices and wiring shall be listed by a recognized testing laboratory and suitable for the intended use in the classified hazardous or corrosive environments.
- ii. Pressure Sensors shall receive power, report gas pressures and be calibrated by signals from the Gas Detection and Pressure Sensor Control Panel.
- iii. Probes for Pressure Sensors shall be installed within the Gravel Blanket a minimum of 2 inches below the Impervious Membrane.
- iv. A minimum of two Pressure Sensors shall be installed in buildings with footprint less than or equal to 20,000 square feet. For buildings with footprint more than 20,000 square feet, install Pressure Sensors at a rate of one per 20,000 square feet or portion thereof.
- v. Pressure sensor devices shall be located to accurately measure gas pressure below the Impervious Membrane relative to the ambient pressure of lowest occupied spaces.
- vi. Methane Vent Risers and Perforated Horizontal Pipes shall not be used to run wires to the Pressure Sensors.

b. Mechanical Extraction System

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

i. 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.

ii. 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%.

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Los Angeles, CA 90067

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

MACTEC Engineering and Consulting, Inc.
200 Citadel Drive, Los Angeles, CA 90040

Rev.:
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Drawn:
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Sheet 1 of 8

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 - Activation Thresholds for Active System.
ii. Detectors in lowest occupied spaces shall be installed in accordance with manufacturers' 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.
• Number of required Detectors shall be based on Table 6 - Detector Spacing.

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.
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.
Option #3: Scheduled Start-up Ventilation - Mechanical Ventilation System shall start-up at least once every (5) six hours to provide a minimum of 24 air changes per day.
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 and Pressure Sensors, 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.
• 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 1 5/16 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.
- 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 where 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 test, maintenance and service procedure for Gas Detection System and Mechanical Ventilation System shall be performed in accordance with the manufacturer's instructions. These instructions shall be approved and filed with the LAFD. A person approved by the LAFD, shall perform testing and servicing of the Gas Detection System and Mechanical Ventilation System.

B. SCHEDULE

Notwithstanding the recommendations of the manufacturer, testing, maintaining and servicing of each system shall be performed at least once annually.

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.

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STANDARD PLAN:
METHANE HAZARD MITIGATION
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Table with 2 columns: Field (Rev., Date, Scale, Drawn, Job, Sheet) and Value (06/22/2005, Not to Scale, 4953-05-1852)

Table 1A - MITIGATION REQUIREMENTS FOR METHANE ZONE (See note 1)

Site Design Level		Level I	Level II	Level III	Level IV	Level V	
Design Methane Concentration (ppmv)		0 - 100	101 - 1,000	1,001 - 5,000	5,001 - 12,500	> 12,500	
Design Methane Pressure (inches of water column)		≤ 2"	> 2"	≤ 2"	> 2"	All Pressure	
PASSIVE SYSTEM	De-watering System	X	X	X	X	X	
	Sub-Slab Vent System	Perforated Horizontal Pipes	X	X	X	X	X
		Gravel Blanket Thickness Under Impervious Membrane	2"	2"	3"	2"	4"
		Gravel Thickness Surrounding Perforated Horizontal Pipes	2"	2"	3"	2"	4"
	Vent Risers	X	X	X	X	X	
Impervious Membrane	X	X	X	X	X		
ACTIVE SYSTEM	Sub-Slab Vent System	Pressure Sensors Below Impervious Membrane				X	
		Mechanical Extraction System				X	
	Lowest Occupied Space System	Gas Detection System	X	X	X	X	X
		Mechanical Ventilation	X	X	X	X	X
		Alarm System	X	X	X	X	X
Control Panel	X	X	X	X	X		
MISC. SYSTEM (See note 4)	Trench Dam	X	X	X	X	X	
	Conduit or Cable Seal Fitting	X	X	X	X	X	
	Additional Vent Risers					X	

Table 1B - MITIGATION REQUIREMENTS FOR METHANE BUFFER ZONE (See note 1)

Site Design Level		Level I	Level II	Level III	Level IV	Level V	
Design Methane Concentration (ppmv)		0 - 100	101 - 1,000	1,001 - 5,000	5,001 - 12,500	> 12,500	
Design Methane Pressure (inches of water column)		≤ 2"	> 2"	≤ 2"	> 2"	All Pressure	
PASSIVE SYSTEM	De-watering System (See note 1)	X	X	X	X	X	
	Sub-Slab Vent System	Perforated Horizontal Pipes	X	X	X	X	X
		Gravel Blanket Thickness Under Impervious Membrane	2"	3"	3"	2"	4"
		Gravel Thickness Surrounding Perforated Horizontal Pipes	2"	3"	3"	2"	4"
	Vent Risers	X	X	X	X	X	
Impervious Membrane	X	X	X	X	X		
ACTIVE SYSTEM	Sub-Slab Vent System	Pressure Sensors Below Impervious Membrane				X	
		Mechanical Extraction System				X	
	Lowest Occupied Space System	Gas Detection System	X	X	X	X	X
		Mechanical Ventilation	X	X	X	X	X
		Alarm System	X	X	X	X	X
Control Panel	X	X	X	X	X		
MISC. SYSTEM (See note 4)	Trench Dam	X	X	X	X	X	
	Conduit or Cable Seal Fitting	X	X	X	X	X	
	Additional Vent Risers					X	

NOTES FOR TABLES 1A AND 1B:

- Components required for this project are identified by an "X" in the column circled.
- Table 1A - Mitigation Requirements for Methane Zone and Table 1B - Mitigation Requirements for Methane Buffer Zone are based on Table 71 and Chapter 71 of the Los Angeles Building Code.
- De-watering not required when the maximum Historical High Ground Water Table Elevation, or projected post-construction ground water level, is more than 12 inches below the bottom of the Perforated Horizontal Pipes.
- The total quantity of installed Vent Risers shall be increased to double the rate for the Passive System.

Table 2 - SPACING OF PERFORATED HORIZONTAL PIPES AND NUMBER OF VENT RISERS

VENT RISER PIPE DIAMETER (inches)	MAX. SUB-SLAB PERFORATED HORIZONTAL PIPE SPACING (feet)	MAX. SUB-SLAB COMBINATION PERFORATED HORIZONTAL PIPE FOR DEWATERING AND VENT SPACING (feet)	NUMBER OF VENT RISER PER BUILDING FOOTPRINT AREA (square feet)
1 1/2	12.5	Not allowed	1/1,250 (min of 2 risers)
2	25	Not allowed	1/2,500 (min of 2 risers)
2 1/2	50	Not allowed	1/5,000 (min of 3 risers)
3	75	Not allowed	1/7,500 (min of 4 risers)
4	100	50	1/10,000 (min of 4 risers)

NOTE:

- Riser length shall be a maximum of 100' measured along pipe (including bends).
- Vent Risers max spacing shall be 100' measured along horizontal pipes.
- When the application of the spacing and location requirement of this table results in the requirement of a fractional number of Vent Risers, any fraction shall be construed as one Vent Riser.
- Horizontal pipes shall always be equal or larger in diameter than the vertical risers.
- Building Footprint shall be defined as the area in square feet contained within the exterior walls at or below the grade level.
- Vent Risers shall be located as per the above table for buildings with footprint areas covering up to 100,000 square feet.
- Vent Risers in buildings with footprint area covering over 100,000 square feet may use the minimum standards in the above table or an alternate method justified by engineering calculations approved by the LADBS.

Table 3 - SPECIFICATIONS FOR GRAVEL

SIEVE SIZE	PERCENTAGE PASSING SIEVE	
	3/4" Gravel	3/8" Gravel
1-1/2" (37.5 mm)	100	-
1" (25.0 mm)	90-100	-
3/4" (19.0 mm)	55-85	100
3/8" (9.5 mm)	8-20	85-100
No. 4 (4.75 mm)	0-5	0-30
No. 8 (2.36 mm)	0-5	0-10
No. 200 (75um)	0-2	0-2
ASTM C 131 TEST GRADING	B	C

Table 4 - SPECIFICATIONS FOR SAND

SIEVE SIZE	PERCENTAGE PASSING SIEVE
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	90-100
No. 8 (2.36 mm)	75-90
No. 16 (1.18 mm)	55-75
No. 30 (600 um)	30-50
No. 50 (300 um)	10-25
No. 100 (150 um)	2-10
No. 200 (75 um)	0-5

Table 5 - ACTIVATION THRESHOLDS FOR ACTIVE SYSTEM

		SYSTEM COMPONENT TRIGGERED BY PRESSURE SENSORS, DETECTORS AND GAS SENSORS			
		Pressure Sensor Below Impervious Membrane	Detector in the Lowest Occupied Space		Gas Sensor in Vent Risers
System Name	System Component	More Than 3" Water Pressure	More Than 10% LEL	More Than 25% LEL	More Than 75% LEL
Below Impervious Membrane System	Warning Annunciator	X			
	Mechanical Extraction Fan				X
Lowest Occupied Space System	Mechanical Ventilation		X	X	
	Alarm (audible and visible)			X	
	Warning Annunciator	X	X	X	X

NOTE:

- Gas Detection Control Panels as part of the Lowest Occupied Space Systems and Below Impervious Membrane Systems, shall determine the gas concentration using a time weighted average of 10 minutes.

Table 6 - DETECTOR SPACING

ROOM FLOOR AREA OR CONCEALED SPACE AREA (square feet)	NUMBER OF DETECTORS *	
	WITH HEATING, VENTILATION AND AIR CONDITIONING	WITHOUT HEATING, VENTILATION AND AIR CONDITIONING
10,000 and More	Minimum of 3 Detectors plus one for every 20,000 and fraction thereof in excess of 10,000	Minimum of 6 Detectors plus one for every 2,500 and fraction thereof
More Than 5,000 and Less Than 10,000	3 Detectors	Minimum of 2 Detectors plus one for every 2,500 and fraction thereof
More Than 1,000 and Up to 5,000	2 Detectors	Minimum of 1 Detector plus one for every 2,500 and fraction thereof
0 and Up to 1,000	1 Detector	1 Detector

NOTE:

- In addition to the required number of Detectors in this table, there shall be at least one Detector in each elevator shaft and enclosed stairway.

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STANDARD PLAN:
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Table 7 - OUTDOOR HAZARDOUS AREA CLASSIFICATION *

LOCATION	PAVEMENT SIZE	METHANE DESIGN LEVEL	MEASURED SOIL GAS CONCENTRATION (ppmv)	MEASURED SOIL GAS PRESSURE (inches of water)	HAZARDOUS AREA CLASSIFICATION
Below finished grade	None	I, II, III or IV	Less than 12,500	Less than 2	Unclassified
		I, II, III or IV	Less than 12,500	Greater than 2	5' or less depth; Unclassified 5' to 10' depth; Class I, Division 2 Over 10' depth; Class I, Division 1
		V	Greater than 12,500	N/A	
Below finished grade with pavement greater than 15' from the outside wall of a building or structure *	Less than 5,000 sq. ft. or Greater than 5,000 sq. ft. & Less than 25' in width	I, II, III or IV	Less than 12,500	Less than 2	Unclassified
		I, II, III or IV	Less than 12,500	Greater than 2	5' or less depth; Unclassified 5' to 10' depth; Class I, Division 2 Over 10' depth; Class I, Division 1
		V	Greater than 12,500	N/A	
Below finished grade with pavement greater than 15' from the outside wall of a building or structure *	Greater than 5,000 sq. ft.	I, II or III	Less than 5,000	Less than 2	Unclassified
		IV	Less than 12,500 but more than 5,000	Less than 2	2.5' or less depth; Unclassified 2.5' to 10' depth; Class I, Division 2 Over 10' depth; Class I, Division 1
		I, II, III or IV	Less than 12,500	Greater than 2	10' or less depth; Class I, Division 2 Over 10' depth; Class I, Division 1
Below finished grade with pavement less than or equal to 15' from the outside wall of a building or structure	Greater than 5,000 sq. ft.	V	Greater than 12,500	N/A	
		I, II, III or IV	Less than 5,000	Less than 2	2.5' or less depth; Unclassified 2.5' to 10' depth; Class I, Division 2 Over 10' depth; Class I, Division 1
		IV	Less than 12,500 but more than 5,000	Less than 2	10' or less depth; Class I, Division 2 Over 10' depth; Class I, Division 1
Below finished grade with pavement less than or equal to 15' from the outside wall of a building or structure	Less than 5,000 sq. ft.	I, II, III or IV	Less than 12,500	Greater than 2	Class I, Division 1
		V	Greater than 12,500	N/A	
		I, II, III or IV	Less than 12,500	Less than 2	Unclassified
Sump Pump Pit	N/A	N/A	N/A	N/A	Unclassified
					Class I, Division 2
					Class I, Division 1
Above Grade	Regardless	N/A	N/A	N/A	Unclassified

NOTE:

* Unpaved open areas, such as planters or landscaping not less than 3' x 3' spaced at less than or equal to 50' from each others edge, the area in between them shall be treated as an area that is less than 5,000 sq. ft., if the space in between them exceeds 50', that area can be construed as less than 5,000 sq. ft. provided that the conduit or cable is installed in a trench and back filled with 3/4-inch aggregate or gravel up to the grade.

Table 8 - VENT RISER HAZARDOUS AREA CLASSIFICATION

LOCATION	POWER VENTILATED	HEMISPHERICAL DISTANCE FROM THE RIM OF THE VENT, A JOINT OR A FITTING	HAZARDOUS AREA CLASSIFICATION
Vent Outlet	No	Within 0 to 3 feet	Class I, Division 1
		Within 3 feet to 5 feet	Class I, Division 2
		Over 5 feet	Unclassified
	Yes	Within 0 to 5 feet	Class I, Division 1
		Within 5 feet to 10 feet	Class I, Division 2
		Over 10 feet	Unclassified
Joints and fittings not enclosed within wall spaces*	N/A	Within 0 to 3 feet	Class I, Division 2
		Over 3 feet	Unclassified
Joints and fittings in framed walls*	N/A	Any distance within the frame stud bay	Class I, Division 1
In the Vent System	N/A	N/A	Class I, Division 1
Gas Sampling Port	N/A	Within 0 to 3 feet	Class I, Division 2
Mechanical extraction vent with direct drive blade motor with a mechanical check valve in the outlet of the motor duct.	Yes	N/A	Unclassified
Mechanical extraction vent with direct drive blade motor without a check valve in the outlet of the motor duct.	Yes	Within 0 to 3 feet	Class I, Division 2

NOTE:

* The hazardous area designation for these areas is considered as unclassified under any one of the following conditions:
a. All joints and fittings are welded in approved manner.
b. Approved double walled vent risers are provided, or
c. Approved four inch or smaller threaded steel pipe venting system or equivalent approved piping system is installed.

Table 9 - BUILDING HAZARDOUS AREA CLASSIFICATION

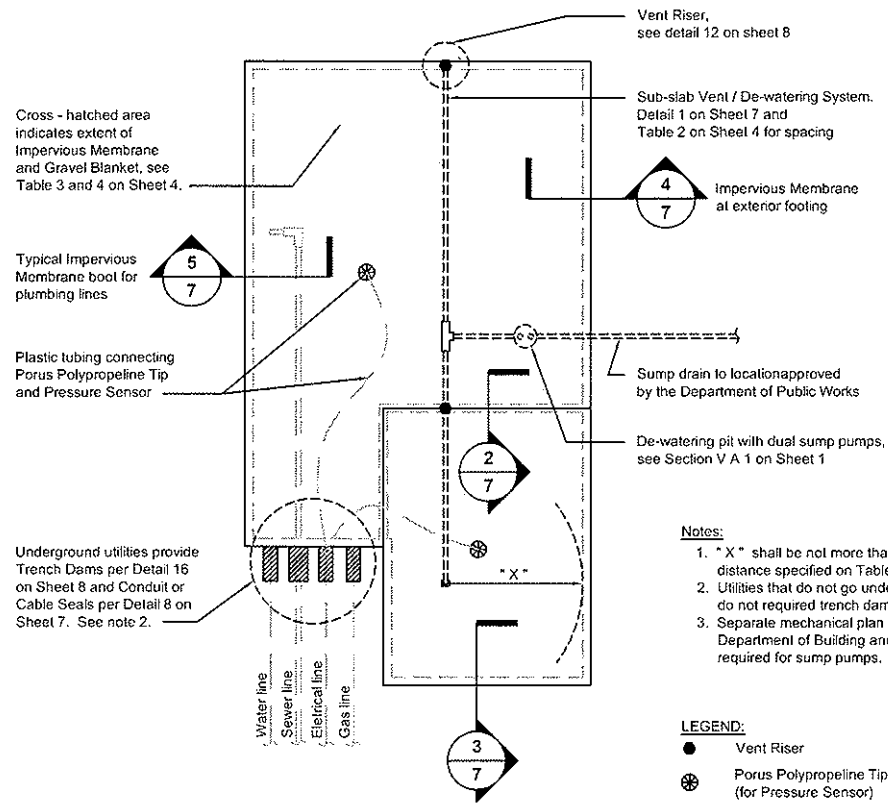
LOCATION	METHANE DESIGN LEVEL	MEASURED SOIL GAS CONCENTRATION (ppmv)	MEASURED SOIL GAS PRESSURE (inches of water)	HAZARDOUS AREA CLASSIFICATION
Below Impervious Membrane	I or II	Less than 1,000	Less than 2	Unclassified
	III or IV	Less than 12,500 but more than 1,000	Less than 2	10' or less depth; Class I, Division 2 Over 10' depth; Class I, Division 1
	I, II, III or IV	Less than 12,500	Greater than 2	Class I, Division 1
	V	Greater than 12,500	N/A	
Below grade within the raised floor foundation or lowest building slab without an Impervious Membrane	I, II, III or IV	Less than 12,500	Less than 2	10' or less depth; Class I, Division 2 Over 10' depth; Class I, Division 1
	I, II, III or IV	Less than 12,500	Greater than 2	Class I, Division 1
	V	Greater than 12,500	N/A	
Above grade within the raised floor foundation footing without an Impervious Membrane but with adequate ventilation per Standard Plan	I, II, III or IV	Less than 12,500	Less than 2	Unclassified
	I, II, III or IV	Less than 12,500	Greater than 2	Class I, Division 2
	V	Greater than 12,500	N/A	
Above Impervious Membrane, but below the lowest building slab or raised floor foundation	I, II, III or IV	Below Impervious Membrane Less than 12,500	Below Impervious Membrane Greater than 2	Unclassified
	I, II, III or IV	Below Impervious Membrane Less than 12,500	Below Impervious Membrane Less than 2	
	V	Below Impervious Membrane Greater than 12,500	N/A	Class I, Division 2
Above Impervious Membrane, through the lowest building slab or Above slab	N/A	N/A	N/A	Unclassified
Sump Pump Pit	N/A	N/A	N/A	Unclassified
				Class I, Division 2
				Class I, Division 1

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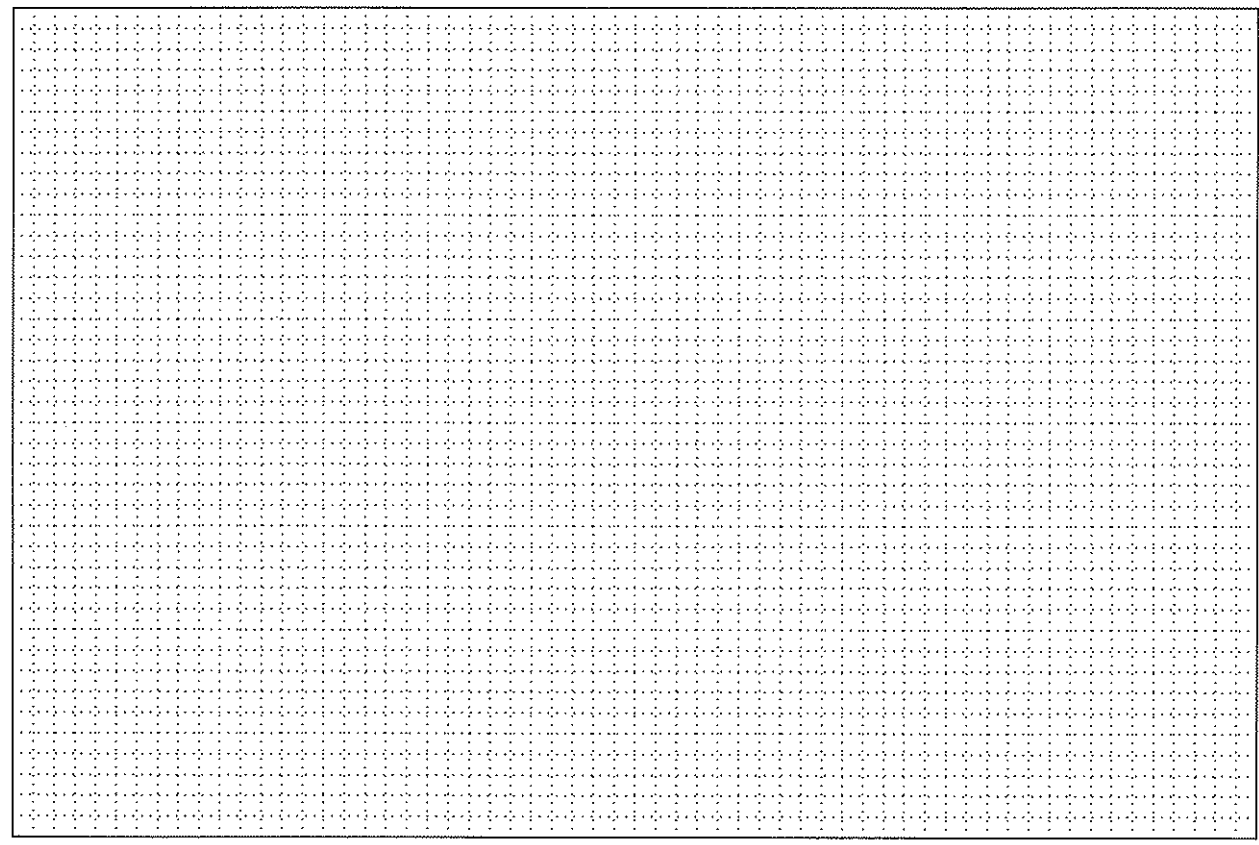
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STANDARD PLAN:
METHANE HAZARD MITIGATION
Not to be used for Playa Vista Projects

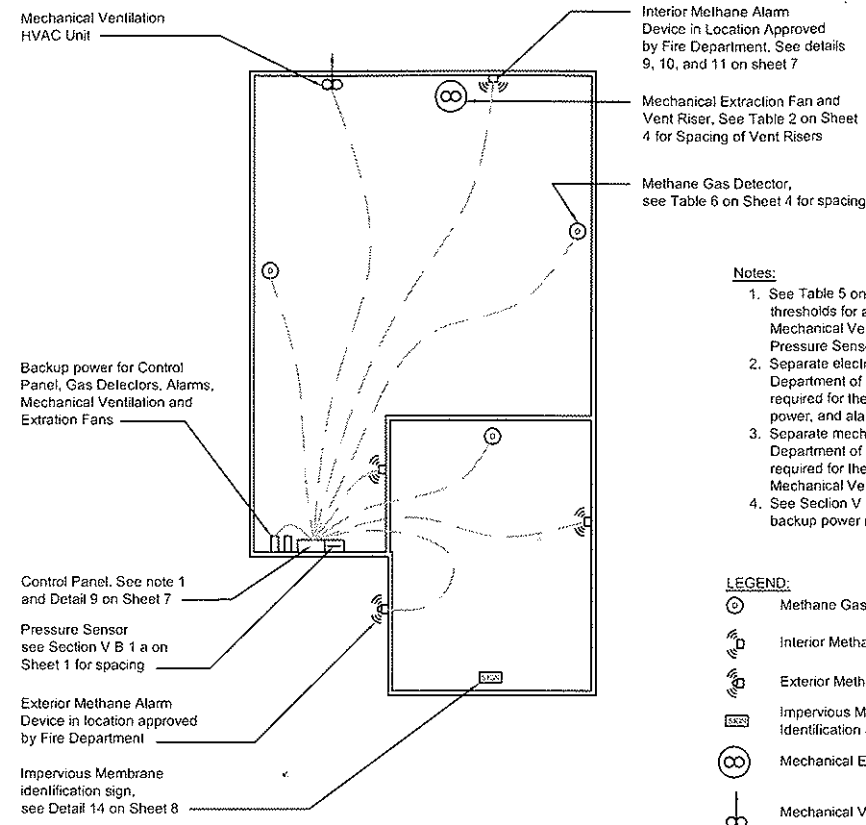
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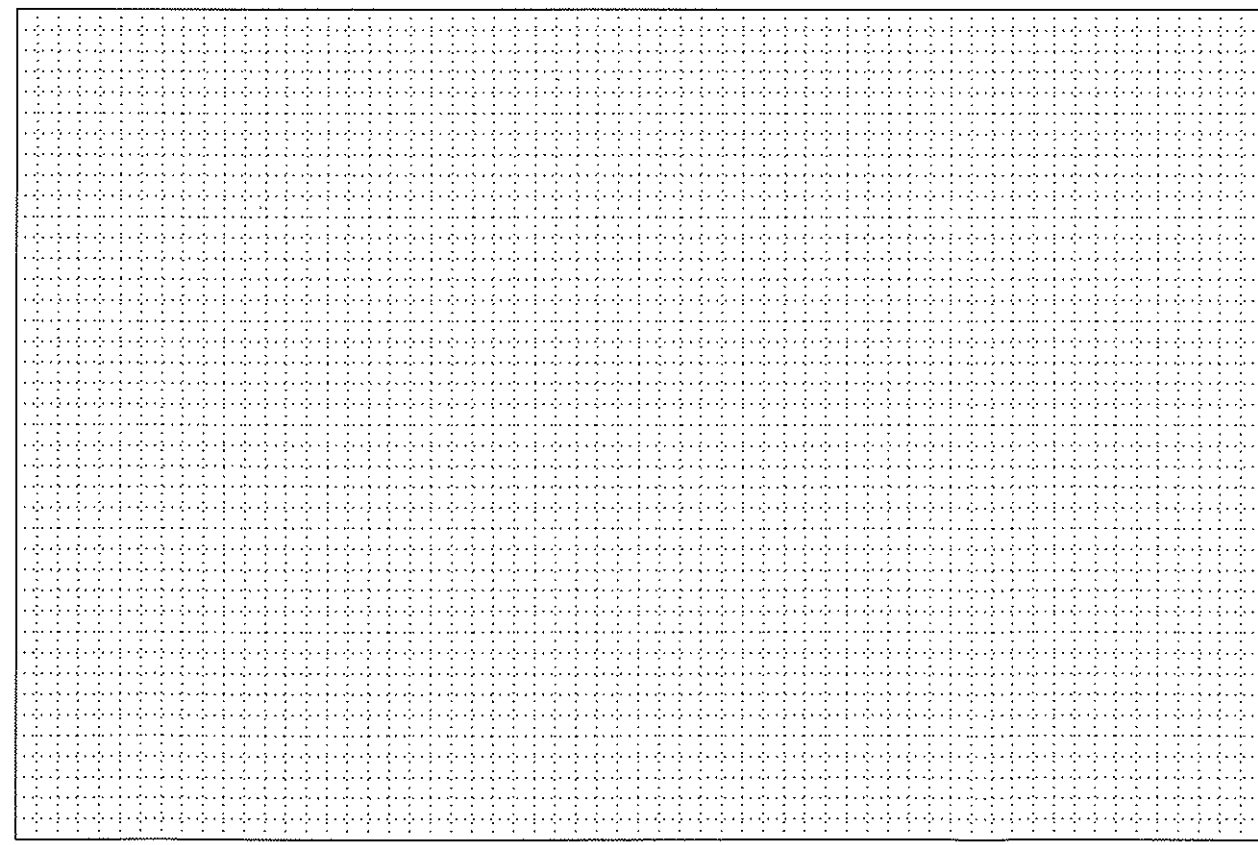
Sample Plan For Below Slab Methane Mitigation Components



Below Slab Methane Mitigation Components



Sample Plan For Above Slab Methane Mitigation Components



Above Slab Methane Mitigation Components

- Notes:**
1. See Table 5 on Sheet 4 for activation thresholds for active system (Alarms, Mechanical Ventilation, Extraction Fan and Pressure Sensor).
 2. Separate electrical plan check by the Department of Building and Safety is required for the control panel, back-up power, and alarms.
 3. Separate mechanical plan check by the Department of Building and Safety is required for the Extraction Fan, and Mechanical Ventilation.
 4. See Section V B on Sheet 1 and 2 for the backup power requirements.

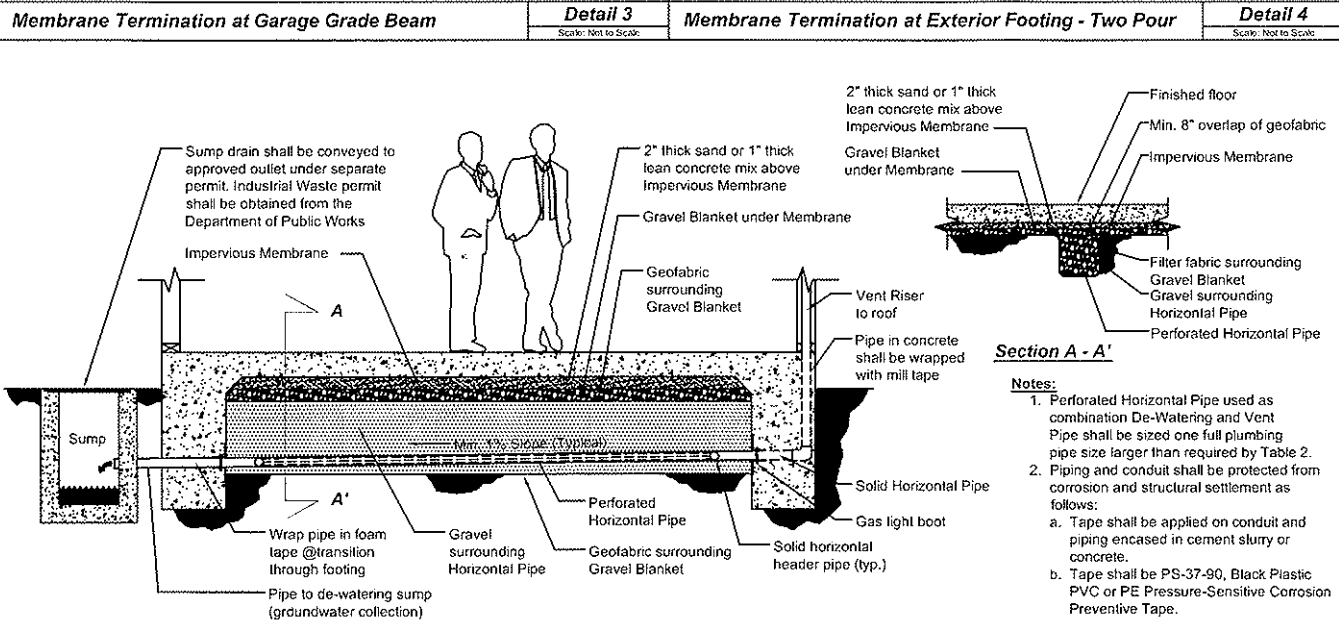
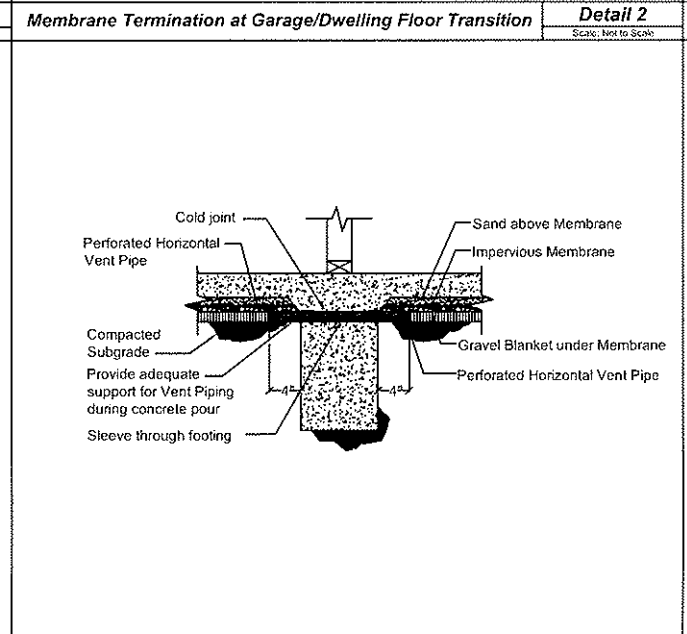
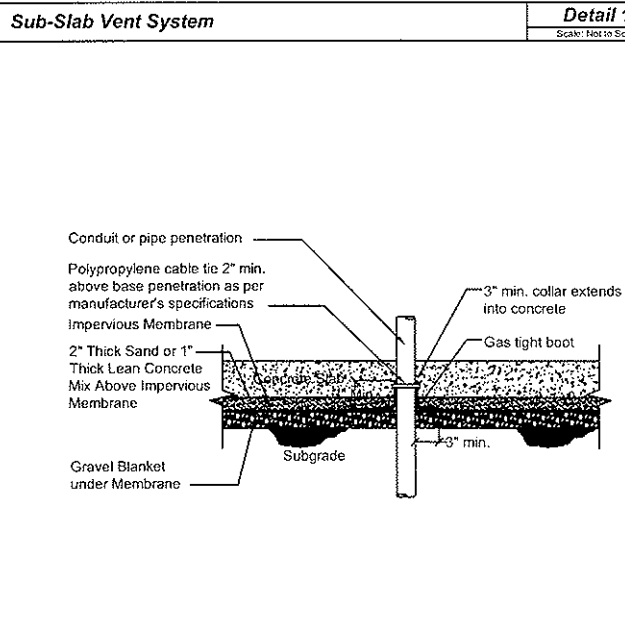
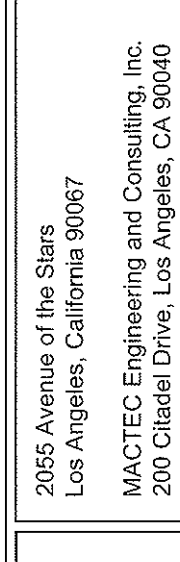
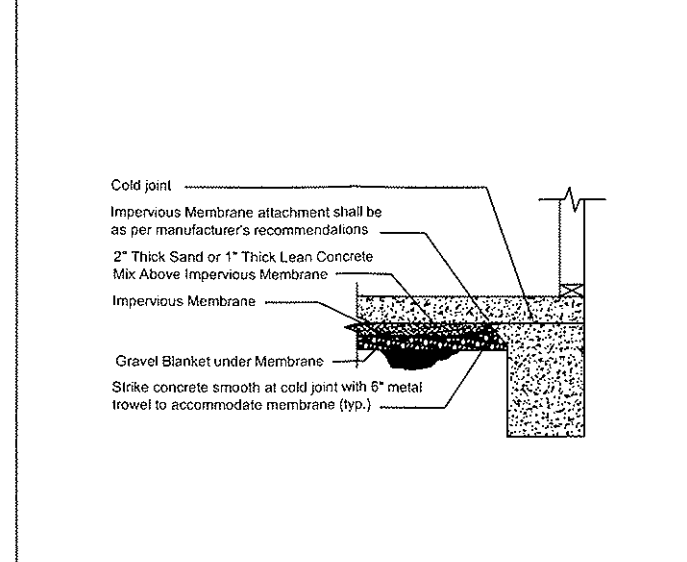
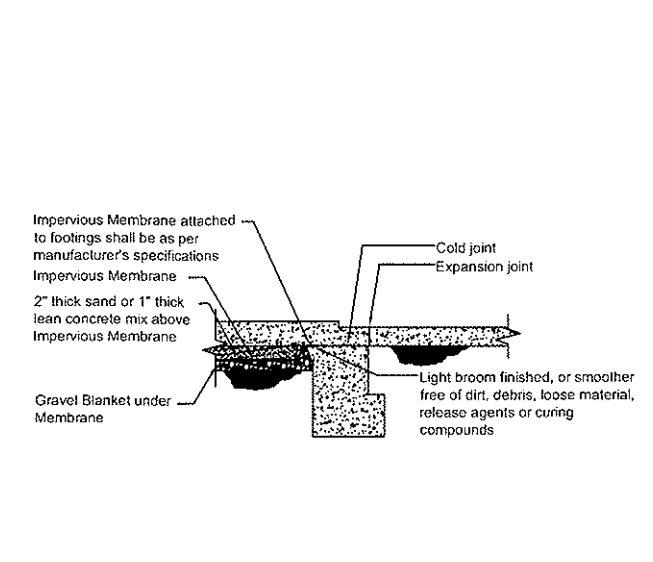
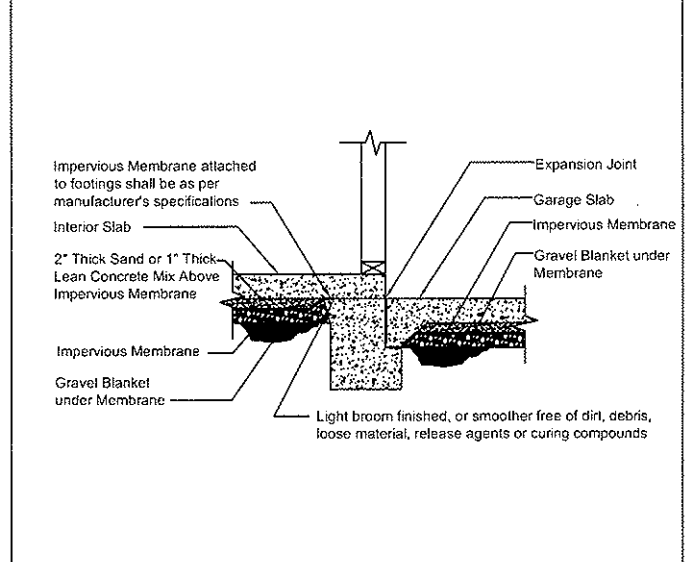
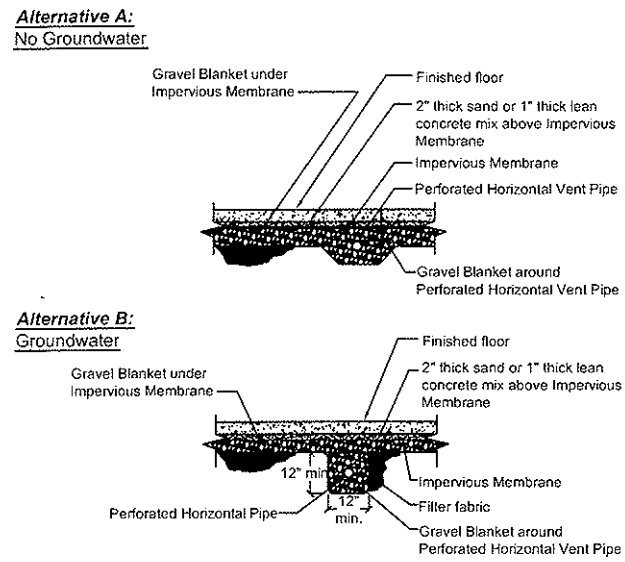
- LEGEND:**
- ⊙ Methane Gas Detector
 - ⊙ Interior Methane Alarm
 - ⊙ Exterior Methane Alarm
 - ⊙ Impervious Membrane Identification Sign
 - ⊙ Mechanical Extraction Fan
 - ⊙ Mechanical Ventilation Fan

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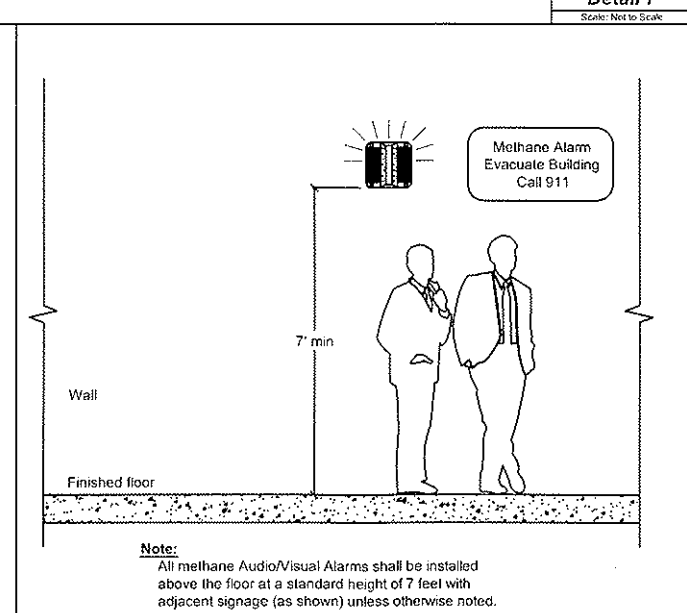
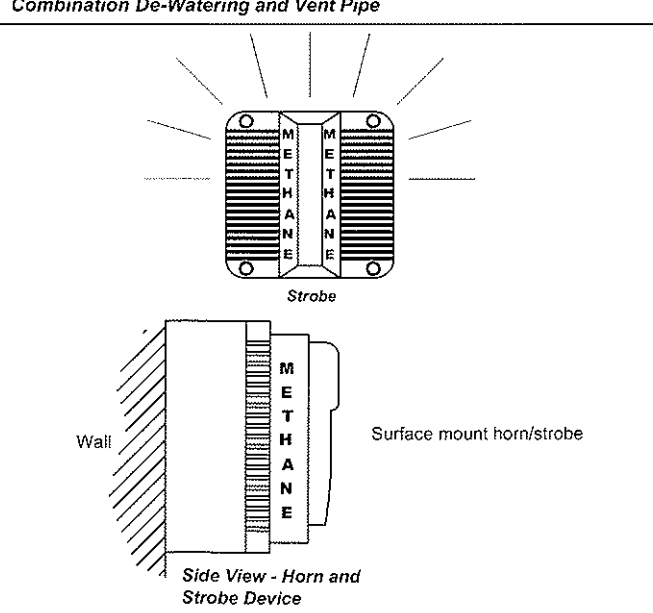
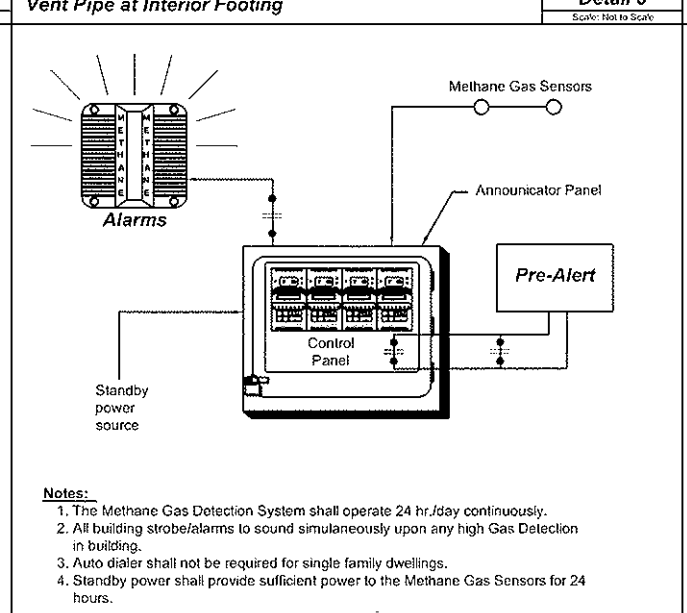
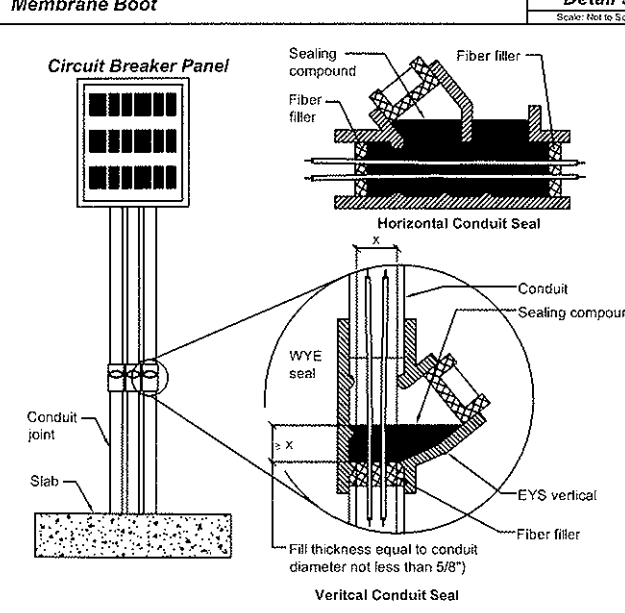
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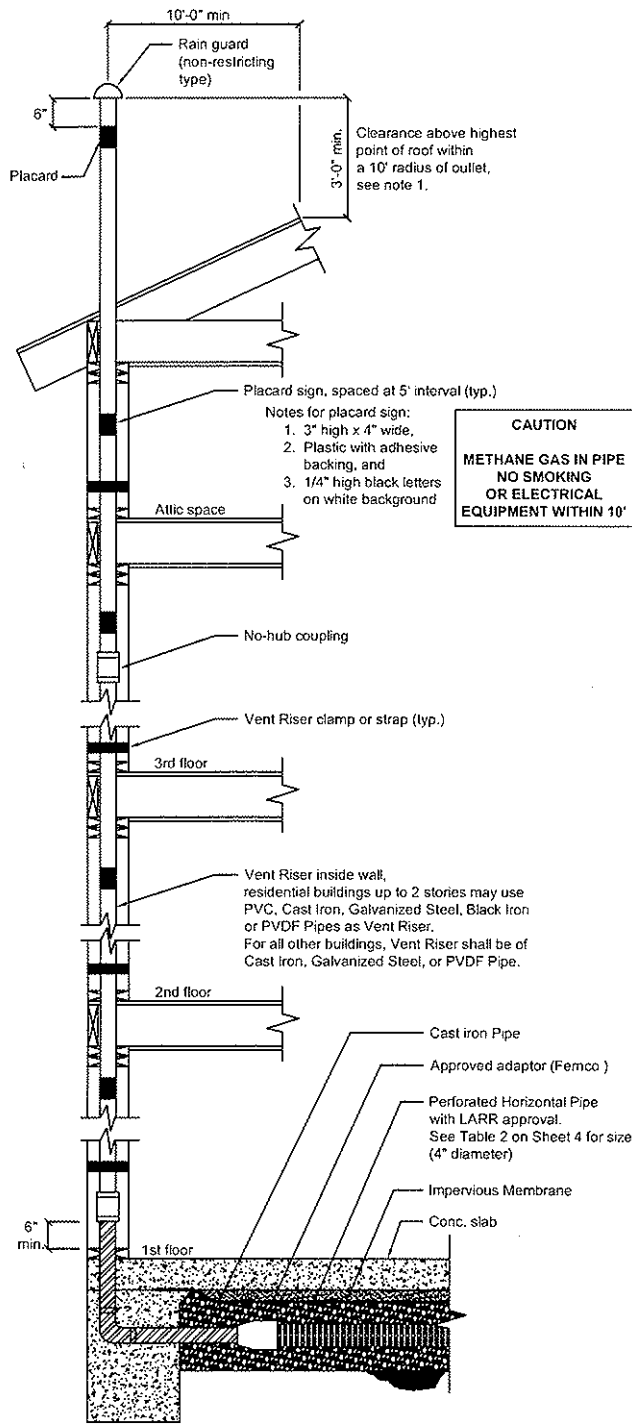


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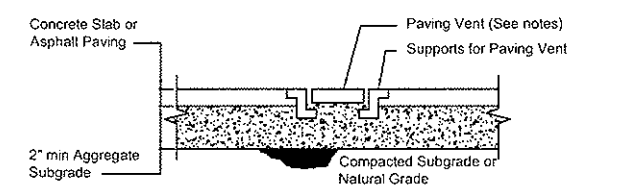
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CAUTION
METHANE GAS IN PIPE
NO SMOKING
OR ELECTRICAL
EQUIPMENT WITHIN 10'

- Notes:**
- Termination of Vent Riser shall be as follows:
 - 10' min. above grade,
 - 10' min. away from any window, door, door hatch, opening or air intake into the building,
 - 3' min. above highest point of roof within a 10' radius of outlet,
 - 4' min away from property line, and
 - 5' min. away from electrical devices.
 - Wrap and protect all piping through concrete slab or floor.
 - Support all piping per Table 3-2 of Los Angeles Plumbing Code.

Vent Riser **Detail 12**
Scale: Not to Scale



- Notes:**
- Paving Vent shall be constructed on cast iron.
 - Paving Vent shall be installed at the same rate as the vent risers shown in Table 2 for corresponding openings.
 - Paving Vent shall be spaced a maximum of 100' apart.
 - Net area of openings in each Paving Vent shall be 12 square inches.

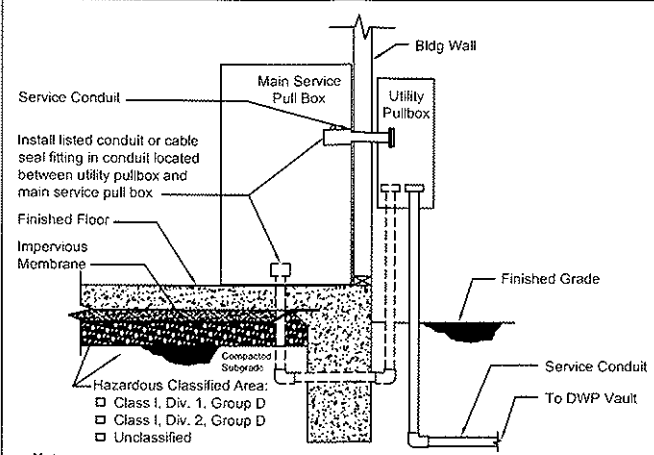
Paved Areas Venting **Detail 13**
Scale: Not to Scale

WARNING

THIS BUILDING IS PROTECTED WITH A METHANE GAS CONTROL BARRIER. ANY PROPOSED PENETRATION OR ALTERATION OF FLOOR SLAB REQUIRES NOTIFICATION OF THE BUILDING OFFICIAL AND INSPECTION BY AN ENGINEER

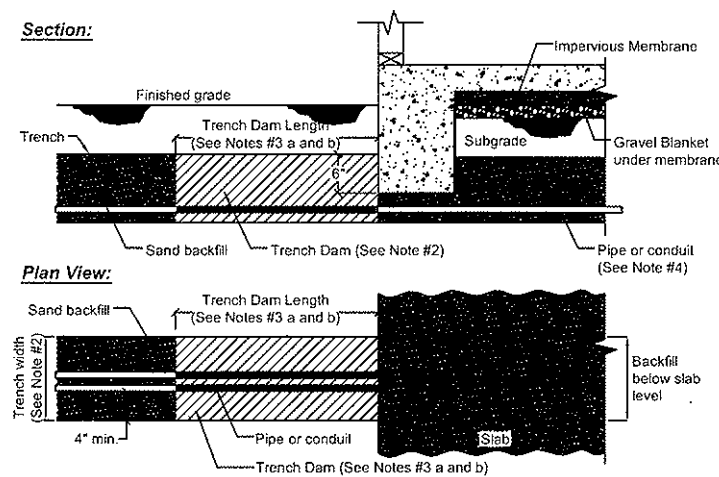
- Notes:**
- This notification is to be permanently stamped or etched in the surface of the garage slab or other location approved by the Building Inspector at the time of construction.
 - All letters 1/2" (min.) in height.
 - At least one required per building.
 - This notification shall be posted and maintained at the front entrance of the building, except residential buildings.

Gas Membrane notification placard **Detail 14**
Scale: Not to Scale



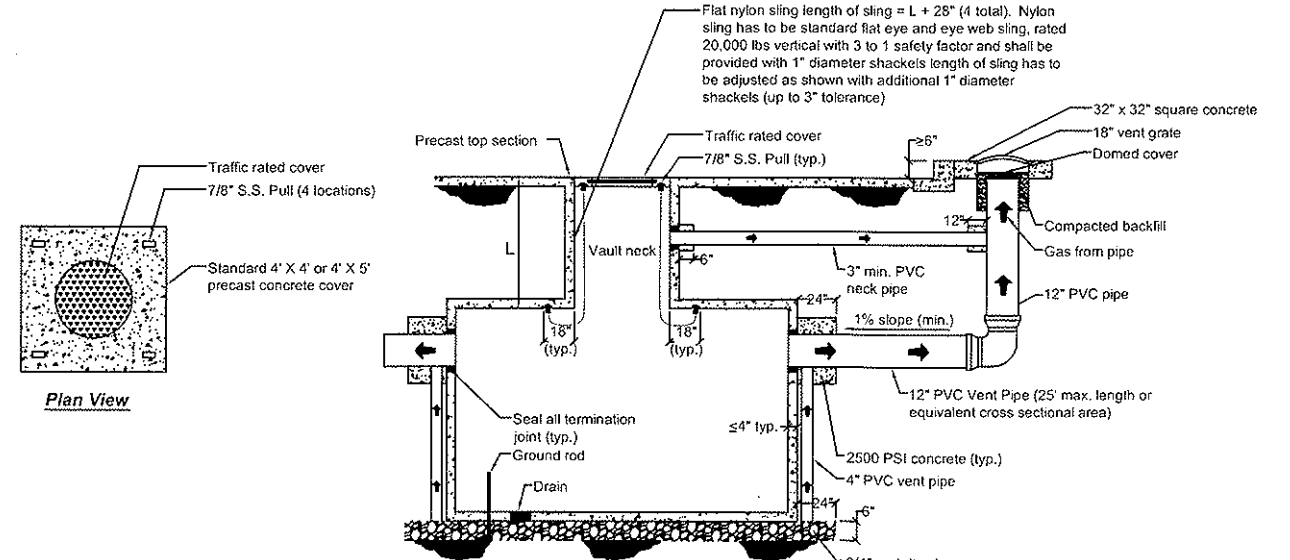
- Note:**
- Piping and conduit shall be protected from corrosion and structural settlement as follows:
 - Tape shall be applied on conduit and piping encased in cement slurry or concrete.
 - Tape shall be PS-37-90, Black Plastic PVC or PE Pressure - Sensitive Corrosion Preventive Tape.

Conduit or Cable Seal Fittings for Building Service and DWP Pull Boxes **Detail 15**
Scale: Not to Scale



- Notes: Trench Dams**
- All Trench Dams shall be installed in trenches containing piping and conduit that connects directly from the utility lines in the street.
 - The width of a Trench Dam shall be one half the length.
 - Trench Dams shall be constructed of one of the following:
 - Bentonite Cement Slurry three feet long: A mixture of 4% Type II Cement, and 2% Powdered Bentonite.
 - 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.
 - 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.
 - Piping and conduit shall be protected from corrosion and structural settlement as follows:
 - Tape shall be applied on conduit and piping encased in cement slurry or concrete.
 - Tape shall be PS-37-90, Black Plastic PVC or PE Pressure-Sensitive Corrosion Preventive Tape.

Trench Dam **Detail 16**
Scale: Not to Scale



Large Underground Electrical Equipment Enclosures **Detail 17**
Scale: Not to Scale

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