



GAS HAZARD MITIGATION POLICY AND STANDARDS

Implementation Policy and Standards for
Sections 110.3, 110.4, and 110.5

of
TITLE 26
of the Los Angeles County Code
As amended by Ordinance No. 2019-0056
Effective January 1, 2020

CALIFORNIA BUILDING CODE
VOLUME 1
Title 26
Los Angeles County Code
Effective: January 1, 2020

110.3 Fills Containing Decomposable Material. Permits shall not be issued for new buildings or enclosed structures, additions, or conversions of a building or structure to habitable or occupiable space regulated by this Code within 1,000 feet (304.8 m) of fills containing rubbish or other decomposable material unless the fill is isolated by approved natural or artificial protective systems or unless designed according to the recommendation containing in a report prepared by a registered design professional, such as a licensed civil engineer or a licensed petroleum engineer. Such report shall contain a description of the investigation, study and recommendation to minimize the possible intrusion, and to prevent the accumulation of explosive concentrations of decomposition gases within or under enclosed portions of such building or structure. At the time of the final inspection, the registered design professional shall furnish a signed statement attesting that the building or structure has been constructed in accordance with the design professional's recommendations as to decomposition gases required herein.

Exception: When approved by the Building Official, mitigation of decomposition gases shall not be required for additions to single-family dwellings not exceeding 400 square feet (37.2 m²) in gross floor area and/or alterations to single-family dwellings.

Buildings or structures regulated by this Code shall not be constructed on fills containing rubbish or other decomposable material unless provision is made to prevent damage to structure, floors, underground piping and utilities due to uneven settlement of the fill. One-story light-frame accessory structures not exceeding 400 square feet (37.2 m²) in area or 12 feet (3658 mm) in height may be constructed without special provision for foundation stability.

110.4 Methane Gas Hazards. Permits shall not be issued for new buildings or enclosed structures, additions, or conversions of a building or structure to habitable or occupiable space regulated by this Code on, adjacent to, or within 300 feet (91.44 m) of active, abandoned or idle oil or gas well(s) unless designed according to recommendations contained in a report prepared by a registered design professional, such as a licensed civil engineer and/or licensed petroleum engineer, to evaluate whether such wells are being properly operated or maintained, or are abandoned. No permits shall be issued until documentation of proper operation, maintenance, abandonment, or reabandonment is submitted to and approved by the Building Official.

Exception:

1. When approved by the Building Official, mitigation of methane gas hazards shall not be required for additions or alterations to existing buildings or structures located no closer than 200 feet (60.96 m) to active, abandoned, or idle oil or gas well(s).
2. Grading permits may be issued when the proposed work is necessary to mitigate the methane gas hazard.

As used in this section, “well” shall mean any well as defined by Section 3008, of the California Public Resources Code.

110.5 Contaminated Soil Hazards. Permits shall not be issued for new buildings or enclosed structures, additions, or conversions of a building or structure to habitable or occupiable space regulated by this Code on contaminated soil unless designed according to recommendations contained in a report prepared by a registered design professional, such as a licensed civil engineer or licensed petroleum engineer. Such report shall contain a description of the design professional’s investigation and recommendation to prevent the accumulation of hazardous concentrations of organic and inorganic compounds, gases, or other accumulation of hazardous materials caused by contaminated soil within or under enclosed portions of such building or structure. At the time of the final inspection, the registered design professional shall furnish a signed statement attesting that the building or structure has been constructed in accordance with the engineer’s recommendations to address the contaminated soil conditions.

As used in this Section, “contaminated soil” shall mean contaminated soil as defined by Title 14 of California Code Regulations Section 17361(b). “Contaminated soil” shall also include soil containing harmful concentrations of any additional organic or inorganic compounds that the Building Official determines to be hazardous or potentially hazardous.

**SOIL GAS ASSESSMENT AND MITIGATION
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
GAS HAZARD MITIGATION POLICY AND STANDARDS**

Background

Decades ago, most citizens in Los Angeles County used backyard incinerators to get rid of their trash. Open burning was also considered an acceptable practice at a majority of the landfills. With the deterioration of air quality in the Los Angeles Basin during 1950s, the County Board of Supervisors adopted an ordinance prohibiting backyard burners and open burning at all landfills. As a result of this prohibition, the County was faced with a shortage of landfill capacity. During the same period, many depleted gravel pits were left open with no ultimate use as a result of sand quarry operation. In order to utilize these pits and provide for landfill capacity, it was decided that these pits should be used for disposal of municipal solid waste.

The first indication of possible problems surfaced around 1965 when residents adjacent to these pits complained of odor. The problem was brought home when children were injured while playing with matches and the trapped air exploded near one of these pits.

In order to address these problems and to formulate construction criteria for sanitary landfills and improvements which would lead to optimum land development and maximum use, in 1967, the County received a grant from the U.S. Environmental Protection Agency (formerly the Department of Health, Education and Welfare) to conduct a three-year study. Among other things, the information gathered during the three-year period was used to develop criteria for the safe construction of buildings on, in, or adjacent to sanitary landfills.

The study found the presence of methane gas as far away as several hundred feet. As such, it became obvious that there is a need to prevent the migration of methane gas into structures and that the issue be addressed prior to the issuance of any building permits. Accordingly, the County Building Code was revised in 1975 to prohibit construction of any structure on or within 1,000 feet of a landfill containing decomposable material unless the fill is isolated by an approved natural or man-made protection system or designed according to the recommendations contained in a report prepared by a California Registered Civil Engineer.

This report shall contain a description of the site investigation of methane gas hazards, as well as recommendations to minimize any possible intrusion of gases and to prevent the accumulation of explosive concentrations of decomposition gases within or under enclosed portions of the building or structure.

The County Building Code has expanded the requirement to similarly prohibit construction of any structure, on or within 300 feet of an oil or gas well and on any site containing contaminated soils. The County Building Code applies to each type of gas hazard.

The Los Angeles County Department of Public Works is the Building Official for the unincorporated areas of the County and 19 contract cities. Our Department is therefore responsible for ensuring the safety of the buildings and their occupants. This policy is applicable to the requirements stated in the Los Angeles County Building Code Sections 110.3, 110.4, and 110.5.

I. GAS PROTECTION SYSTEM

Should a soil survey sampling result and/or determination be made that potential gas generation/migration exists at a site and a methane gas protection system becomes necessary, the following is required:

- a. A gas control system,
- b. A gas monitoring system,
- c. A gas monitoring program,
- d. A contingency plan, and
- e. A covenant and agreement.

A. GAS CONTROL SYSTEM

In general, there are two types of gas control systems: passive or active.

1. Passive system

A passive system consists of two components. First there is the membrane sheeting which is placed beneath the structures slab and foundation and is to totally encapsulate the underground portions of the building. The purpose of the membrane is to prevent intrusion of gases into the building. In addition, there is the gravel filled ventilation trench system to collect and remove the gases. This system mainly applies to structures constructed adjacent to or within a 1,000-foot (304.8 m) radius from a landfill or within 300 feet (91.44 m) of active, abandoned or idle oil or gas well(s). **(Figure No. 1)**

2. Active system

The active system is a mechanical system which may consist of a series of extraction wells, injection wells, or cut off trenches that either removes gases or directs gases away from the structures.

- a. Gas Extraction Well System - this system is typically used to remove gases from a landfill. This system consists of a series of extraction wells, each generally of 24 inches in diameter, with a minimum depth equivalent to the lowest elevation of the refuse, a header pipe system and a vacuum pump/blower. Collected gases are either burned at a flare station or used at a resource recovery facility. **(Figure Nos. 2 and 3)**
- b. Air Injection Well System - this system consists of a series of air injection wells, a header pipe system, and a blower to push gases away from the building. The system is constructed in natural ground to provide a barrier system between the building and the landfill. **(Figure Nos. 4 and 5)**

- c. Cut off trenches - the cut off trenches are trenches dug as deep as the depth of the landfill. These are located in natural ground adjacent to the building. They are filled with gravel and are connected by a series of pipes to a blower or a vacuum pump. The system is maintained under pressure to either remove the collected gases or to push them away from the building. **(Figure No. 5)**

In general, except for single-family residential development, all three types of active systems can be used as control systems for buildings adjacent to a landfill, but only the extraction well system is acceptable for protection of structures built directly on a landfill. (Note: Structures built on a landfill must also be provided with a membrane sheeting.)

B. GAS MONITORING SYSTEM

Except for single-family residential development, the County requires a monitoring system to be installed to substantiate the adequacy of the gas control system throughout the life of the project.

Depending on the type and location of a structure, a monitoring system may consist of a series of subslab monitoring probes, monitoring wells, automatic methane gas sensing devices or a combination of two or more of these systems.

In general, subslab monitoring probes are used in conjunction with a membrane. These probes are required to be installed both above and beneath the membrane to monitor the intrusion of gases into the building as well as to verify the adequacy of the installed barrier system. **(Figure Nos. 1 and 6)**

Monitoring wells are used in conjunction with an active system and are required to be installed inside and outside of the building. A monitoring well may consist of one or several probes installed at various depths. Depending on the location, a monitoring well may be five feet (minimum) or may go as deep as 150 percent of a landfill's depth. **(Figure Nos. 5, 6, and 7)**

The interior monitoring wells generally are for the detection of methane gas only, whereas the exterior monitoring wells may be used for the detection of methane gas and its rate of generation, temperature, oxygen, pressure, carbon dioxide/monoxide, etc.

The purpose of a monitoring well system is to ensure the effectiveness of the gas control system as well as its proper operation and maintenance.

The automatic methane gas sensing devices are generally installed inside the structure and are used in conjunction with an active system. The system may consist of one detector or several and is generally set to be activated when it detects methane gas in excess of 20 percent Lower Explosive Limit (LEL) in the atmosphere.

In general, the type of monitoring system selected will depend on the type of gas control system used. This will, in turn, determine the type of monitoring program that would be best suited to measure the effectiveness of the gas protection system and would also permit an evaluation of the system so as to enable the needed adjustments to be made.

C. GAS MONITORING PROGRAM

The gas monitoring program consists of two elements. One is to ensure the effectiveness of the gas control system in preventing methane gas intrusion into the structure. Two, in conjunction with the active system, is to ensure that the system is operating properly and maintained adequately.

1. Methane Gas Monitoring Program

The purpose of the methane gas monitoring program is to test for the presence of methane gas and the effectiveness of the gas protection system. The monitoring schedule required by the County is as follows:

- Test all monitoring probes prior to occupancy (All developments)
- Test monthly for three months after the building occupancy (except for single-family residential developments)
- Test quarterly thereafter (except single-family residential developments)

In addition, the initial test results must be submitted prior to granting occupancy to the building.

The frequency of monitoring for the gas control system and its proper operation depends on the type of active gas control system employed. Parameters to be checked and frequency of monitoring are to be specified in the Operation and Maintenance Plan submitted by the design engineer, and as approved by the County.

D. CONTINGENCY PLAN

In general, the County requires a contingency plan should the gas protection system fail to effectively prevent intrusion of landfill gases into a structure or fail to effectively serve its purpose. The type of contingency plan required depends on the type of gas control system, building type, type of occupancy, and the site location. In general, the contingency plan is initiated when one or more of the following happens:

- Methane gas in excess of a preestablished concentration is detected in a probe above the membrane or in an interior monitoring well.
- Methane gas in excess of 20 percent LEL is detected in the interior room atmosphere.
- There is an indication of possible underground landfill fire.

- Air and/or landfill gas movement is detected beyond the site property line in conjunction with an air injection system.

There are other parameters which may trigger the implementation of a contingency plan. However, this will depend on the type of gas control system used and is beyond the scope of this paper.

E. COVENANT AND AGREEMENT

In order to alert future owners of potential methane gas problems, prior to the approval of the building occupancy, the County requires that the property owner sign a Covenant and Agreement for himself/herself, future successor and heirs, for each detached dwelling unit and/or building unit and record the said agreement with the County Recorder Office. For a single building with non-detached units sharing common walls, roof, and other features, a Covenant and Agreement must be recorded for each building unit. Depending on the site location and the type of gas control system used, the Covenant and Agreement will include the following:

1. A legal description of the property.
2. An acknowledgment that the building is constructed on or within 1,000 feet of a landfill containing decomposable materials/wastes. **OR** An acknowledgment that the building is constructed on or within 300 feet of an oil or gas well.
3. A statement that a methane gas protection system has been installed in accordance with plans and specifications approved by the Building Official of the County of Los Angeles.
4. A statement that the said system must be monitored, operated, and maintained in accordance with the approved plans and specifications.
5. A statement that gives its irrevocable permission to the County of Los Angeles or its authorized agent to enter the said premises during business hours for the purpose of methane gas monitoring.

A copy of the Covenant and Agreement must be submitted to Public Works.

II. **DESIGN ENGINEER AND HIS/HER RESPONSIBILITIES**

A methane gas protection system must be designed by a design professional such as a California registered civil engineer who is knowledgeable in this field. The system must be constructed and installed under his/her direct supervision.

Prior to the construction and installation of the system, plans and specifications must be approved by the County. However, the County does not inspect the construction and installation of the system; this responsibility is vested in the design engineer. As a result of this policy, the engineer is required to submit a certification to the County prior to approval of the building occupancy stating the following:

- A. I am a registered civil engineer in the State of California and that I am knowledgeable in the field of landfill gas control protection system.
- B. The methane gas control facilities have been constructed and installed under my direct supervision and in accordance with the approved plans and specifications (a copy of the As-Built plans must be enclosed).
- C. The building is free from methane gas and can be safely occupied (a copy of the test results must be enclosed).

III. GENERAL CONSTRUCTION REQUIREMENTS

- A. Design and construction plans must inform the construction workers that they may be subject to exposure to gases including landfill gases. Specific details and precautionary instructions must be provided on the plans to eliminate/reduce the possibility of explosion and to reduce workers exposure to toxic gases so that their health and safety are protected at all times.
- B. Design and construction plans must be sufficiently detailed so that no decision is left to the contractor or his/her workers.
- C. Materials specifications must be clearly called out on the design plans and specifications.

IV. MEMBRANE INSTALLATION

The proper installation of the membrane is of the utmost importance. A membrane system is effective only if it is installed properly. As a result, it is essential for the construction worker to recognize the importance of the system and the fact that the membrane's function is not to serve as a moisture barrier system. The following are some tips as to how to ensure its proper installation **(Figures Nos. 1, 8, and 9)**:

- A. The design and construction plans must specify that all membrane installation shall be performed by a qualified firm with extensive experience in the installation of the membrane specified. (This should be verified by the design engineer.)
- B. The design plans and specifications must show all requirements for ground preparation prior to the installation of the membrane. This is to ensure protection of the membrane during the construction phase.
- C. The number of field joints must be kept to a minimum. In order to accomplish this, it is recommended that prefabricated sections be used under the footings (or wherever else that can be utilized). **(Figure No. 8)**

In general, all jointing between membrane layers must overlap a minimum of three inches and must provide a chemical bond. Jointing between membrane and other surfaces of different materials must provide for physical bond and must have contact surface of six inches minimum.

- D. The number of penetrations due to utility piping, etc., must be kept to a minimum and all penetrations must be sealed with a prefabricated boot. When possible, utility piping should be of the same material as the membrane. **(Figure No. 9)**
- E. The membrane (HDPE or approved equal) must be a minimum of 80 mil in thickness and must be suitable for the purpose and compatible with the environment it is being exposed to. The membrane manufacturer must verify and certify the permeability, tensile strength and compatibility of the material with common constituents of landfill gases.
- F. The County requires placement of clean sand both above and beneath the membrane. The sand layer must be a minimum of two inches in thickness. The purpose of the sand layer is 1) to protect the membrane against physical damage during construction, and 2) to provide a media where landfill gas movement can be detected. **(Figure No. 1)**
- G. The plans and specifications must show sufficient detail of how the membrane is to be installed below the foundations and how the membrane is to be protected during construction of foundation frame, placement of reinforcing bars, and the pouring of concrete.
- H. Lastly, plans and specifications must provide for the installation of signs inside the building informing the occupants that the building is provided with a subslab methane gas barrier system and that no floor penetration is allowed without written approval of the County Building Official.

V. MONITORING PROBE REQUIREMENTS

A methane gas monitoring system must incorporate the following:

Probes must be placed both above and below membrane (except for structures located directly on the landfill) and must be located in sand layers terminating at a monitoring station. **(Figure No. 1)**

The probe's monitoring end must be 12 inches in length, 2 inch in diameter, perforated and wrapped with burlap, fiber glass or similar material to prevent the holes from clogging. **(Figure No. 6)**

The sampling end of each probe at the monitoring station must be provided with a valve and a 1/4-inch rubber hose connection. The valves must be identified as to their locations/depth and must be numbered. **(Figure Nos. 1 and 7)**

When applicable, a sign must be posted adjacent to each monitoring station stating: **“Methane Gas Monitoring Station - Do Not Block”**. The words are to be in white letters, a minimum of 3/4 inch high and placed on a red background, a minimum of five feet above the floor.

The construction details for probes within a monitoring well are similar to those discussed above.

The number and location of monitoring probes/wells depends on the type of gas control system, the size of the building, type of occupancy and foundation. However, in the case of buildings, for each area beneath the slab that has been isolated by a continuous footing, the area must be provided with one probe above and one below the membrane.

VI. VENTILATION TRENCHES FOR A PASSIVE GAS CONTROL SYSTEM

Ventilation trenches must be no further than 50 feet apart or 25 feet from the building foundation and should be provided for each area isolated by a continuous footing. These trenches are to be a minimum of 12 x 12 inches. **(Figure No. 1)**

All ventilation trenches must be provided with a perforated pipe, minimum of 2 inches in diameter with a minimum of 2 percent of the pipe surface area. In addition, no perforation is allowed within 12 inches of any foundation.

All perforated pipe must be connected to vertical ventilation pipe. Vertical ventilation pipes must be provided for every 400 feet of ventilation trench or at each end of the trench, whichever is least. However, in no case will there be less than two vertical ventilation pipes for each building. **(Figure No. 1)**

All vertical pipes must be protected against physical and chemical damage and must be of metal type when it is used inside a wall. All vertical ventilation pipes must also be terminated at a minimum of two feet above the highest point on the roof within a 10-foot radius of the vent pipe and away from sources of ignition. **(Figure No. 1)**

The top end of the venting pipe must be provided with a tee or other approved device that will prevent rainwater from entering the pipe.

VII. ACTIVE SYSTEM: EXTRACTION WELLS, AIR INJECTION WELLS OR CUT OFF TRENCHES

- A. The engineer must submit design calculations, soil analyses and boring logs to the County for review and approval. These calculations must show that the system will provide a continuous curtain to prevent the migration of landfill gases beyond it.
- B. In case of an Air Injection System or positive pressure cut off trench, the engineer must show sufficient data, verified by field testing, that no air is entering into the landfill and that no differential pressure is detected at the site property lines. **(Figure No. 5)**

- C. With an Active System, the County will not issue a building occupancy permit until such time as the system is put into operation and is serving its purpose as designed, verified by field testing.
- D. With an Extraction Well System, gas condensation may not be returned to the landfill unless approved otherwise by the State Water Resources Control Board.
- E. An operation and maintenance manual must be provided to the County for review and approval prior to acceptance of the installed system by the County.

VIII. WAIVER OF METHANE GAS MITIGATION STANDARDS AND REQUIREMENTS

For consideration of a waiver of the Methane Gas Mitigation Standards and Requirements, a request must be submitted in writing to the County. A report accompanying the request shall provide at minimum 5 years of recorded sampling history, on a quarterly basis, exhibiting methane gas concentrations consistently below 5,000 ppmv.

The justification for a waiver shall consider the following: seasonal variations in gas concentrations, ambient temperature, atmospheric conditions, monitoring time of day, the absence of other VOCs at detectable levels, historical groundwater levels, gas monitoring equipment details, and gas monitoring probe depths and details.

In addition to the aforementioned considerations, the justification for a waiver for sites nearby a solid waste landfill shall also consider the landfill classification, waste type, quantity of waste disposed, and age of the waste mass, and steady state landfill gas production,

IX. TERMINATION OF EXISTING METHANE GAS MONITORING PROGRAM

For consideration to terminate an existing Methane Gas Monitoring Program and waiver of the Methane Gas Mitigation Standards and Requirements, a request must be submitted in writing to the County. A report accompanying the request shall provide at minimum 5 years of recorded sampling history, on a quarterly basis, exhibiting methane gas concentrations consistently below 5,000 ppmv.

X. REPORT SUBMITTAL AND STANDARDS

Reports submitted to the County shall be prepared by a design professional registered in the state of California, such as a licensed civil engineer or licensed petroleum engineer. The reports shall be stamped by the design professional of record. The design professional shall provide a certification that he/she is knowledgeable in the field of gas control systems and that the report has been conducted under his/her direct supervision.

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**COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
ENVIRONMENTAL PROGRAMS DIVISION**

**Gas Hazard Mitigation Plan Submittal Requirements
Checklist**

Effective January 1, 2019, the following items must be submitted to this office **electronically** for all plan check reviews:

- All document submittals and communications must be submitted via email to METHANE@PW.LACOUNTY.GOV.

- Plans shall be uploaded to: <https://www.dropbox.com/request/1pC0nos2AIZEHkEuKC9X>

After clicking the link, users will be given instructions for uploading a file and providing their name and email address.

- Copy of methane gas mitigation plans, wet stamped and signed by a California licensed Engineering or Design professional, shall be submitted digitally for review and approval.
- A copy of the paid Building and Safety fees must be submitted for the review process to commence. Lastly, any electrical plans for the project must be included with the submittal to our division and will also be reviewed by the Building and Safety Division, Electrical Section.
- Additionally, a copy of wet stamped architectural and structural plans must be submitted online jointly with methane gas plans. This requires only the submittal of the cover sheet of the architectural and structural plans, with a note referencing to the methane gas plans, acknowledging the presence of a gas control system. This note should be easily detected (i.e. - bold print, cap lettering, bigger font, etc.) The following notes should be stated on the respective plans:

"The undersigned project structural engineer acknowledges the presence of a methane gas protection system under the structure. Said system has been designed by "enter structural firm name here" and reviewed and approved by the County of Los Angeles. No coring, cutting, drilling or other penetrations of the structure shall be done without the prior written approval of the Building Official of the County of Los Angeles."

"The undersigned project architect acknowledges the presence of a methane gas protection system under the structure. Said system has been designed by "enter architect firm name here" and reviewed and approved by the County of Los Angeles. No coring, cutting, drilling or other penetrations of the structure shall be done without the prior written approval of the Building Official of the County of Los Angeles."

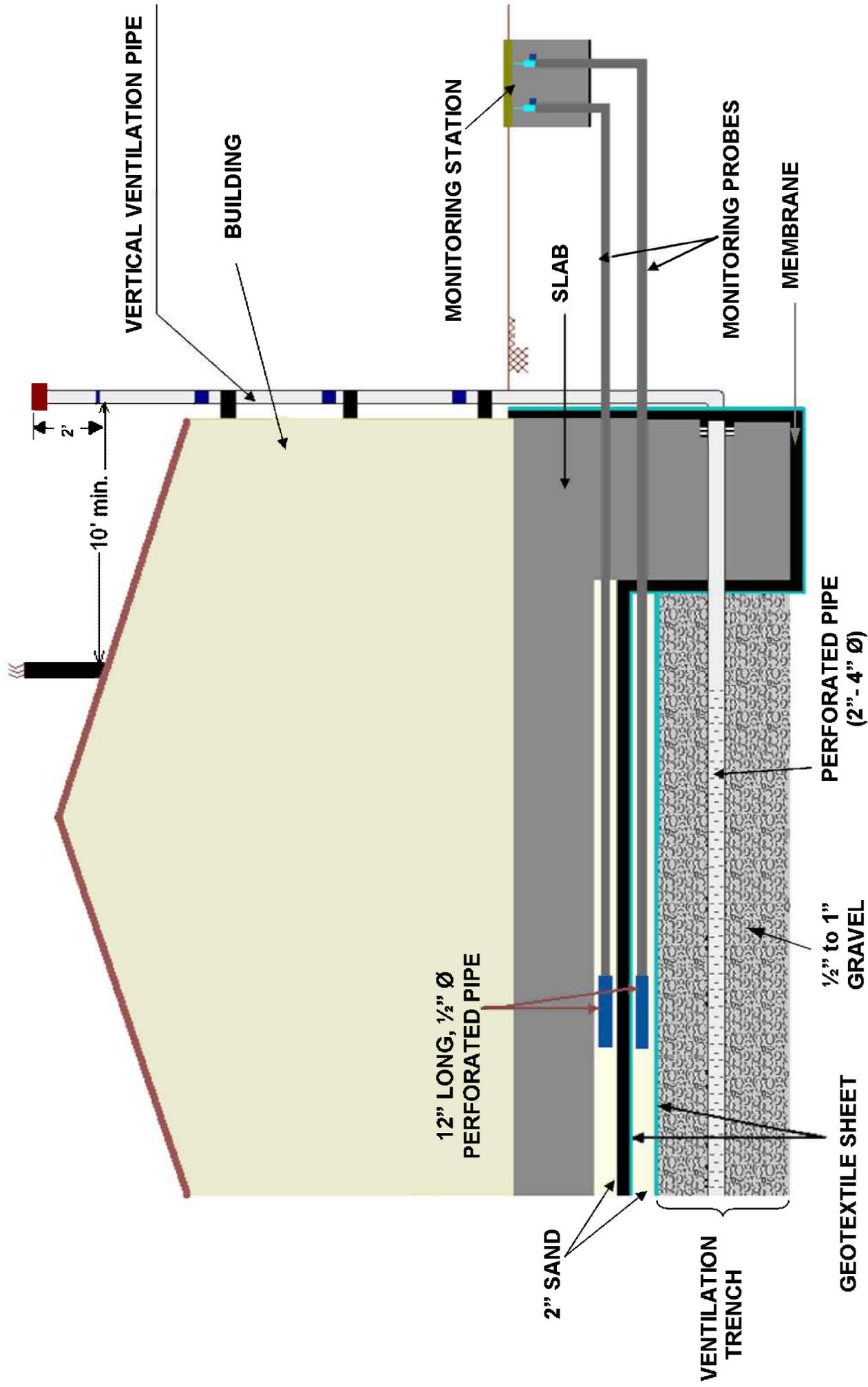
- Upon approval of the design plans, a recorded covenant and agreement must be filed with County of Los Angeles Registrar-Recorder's Office for each detached dwelling unit and/or building unit. A copy of such document must be submitted to Public Works.

For all methane gas protection systems, final approval will be granted by the Environmental Programs Division. For all electrical installations, including soil classification, the Building and Safety Division, Electrical Section will grant final approval.

The County of Los Angeles has approved the following methane gas protection membrane barrier materials:

- **Liquid Boot (100 dry mils)**
- **Liquid Boot PLUS (60 dry mils plus 20 mils LLDPE, 80 mils total)**
- **Geo-Seal (80 dry mils)**
- **HDPE (80 dry mils)**
- **Tremco Vapor Lock-M**
- **EPRO**

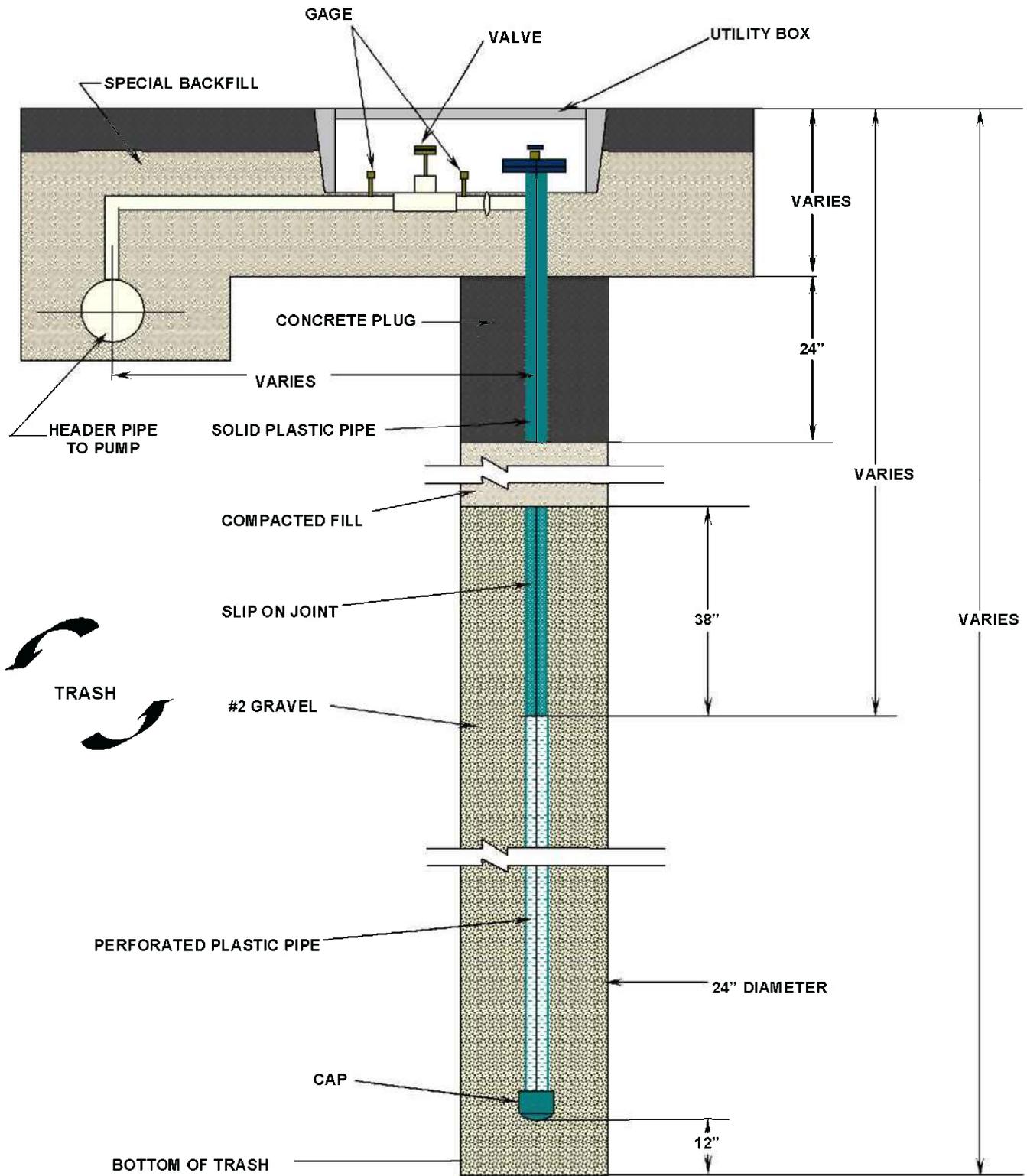
If you have any questions on this matter, please contact Mr. Gerald Ley at (626) 458-3546, Mr. Hossein Torabzadeh at (626) 458-2193 or Mr. Iheanacho Ofo at (626) 458-3512.



METHANE GAS CONTROL SYSTEM PASSIVE SYSTEM

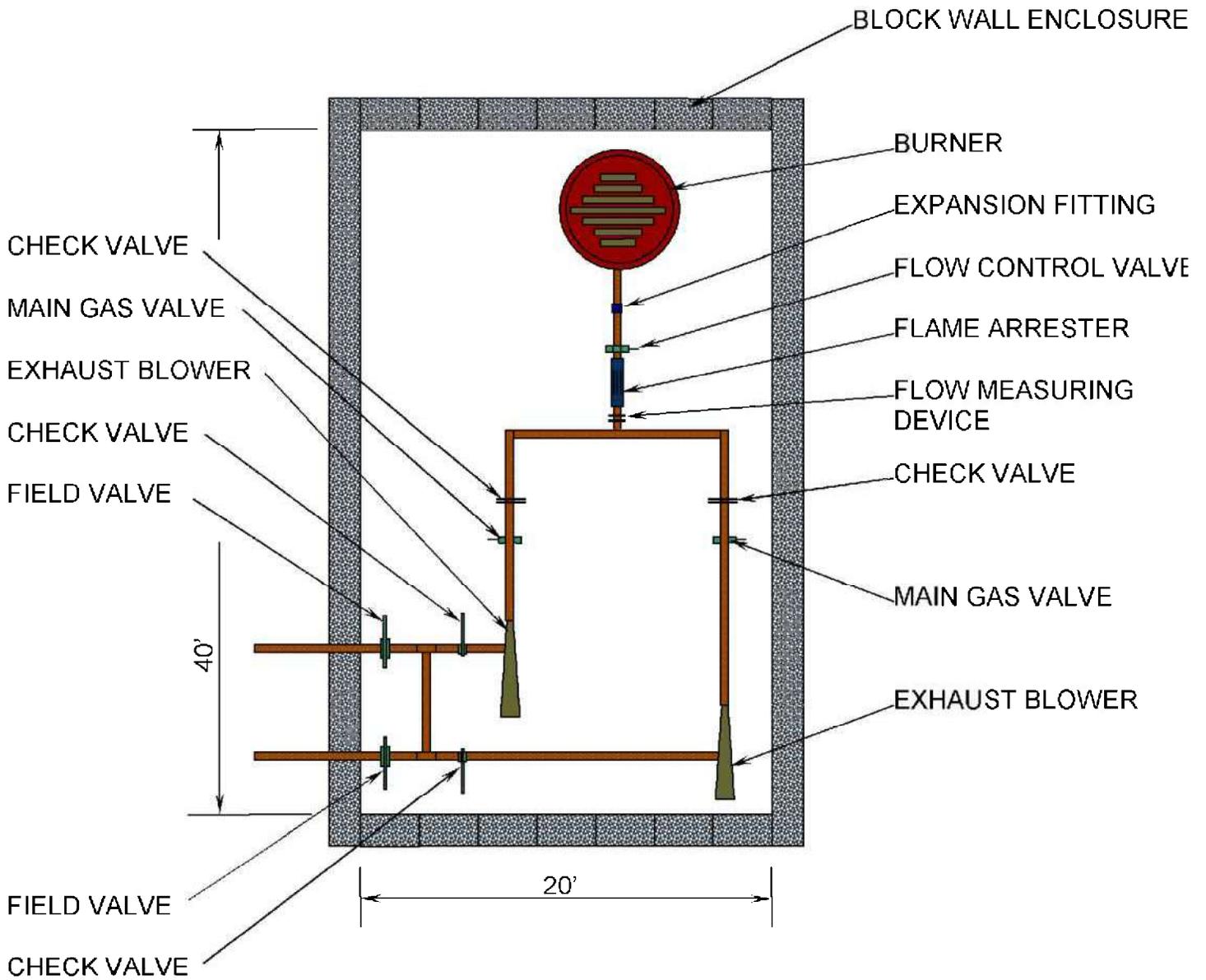
NTS

FIGURE 1



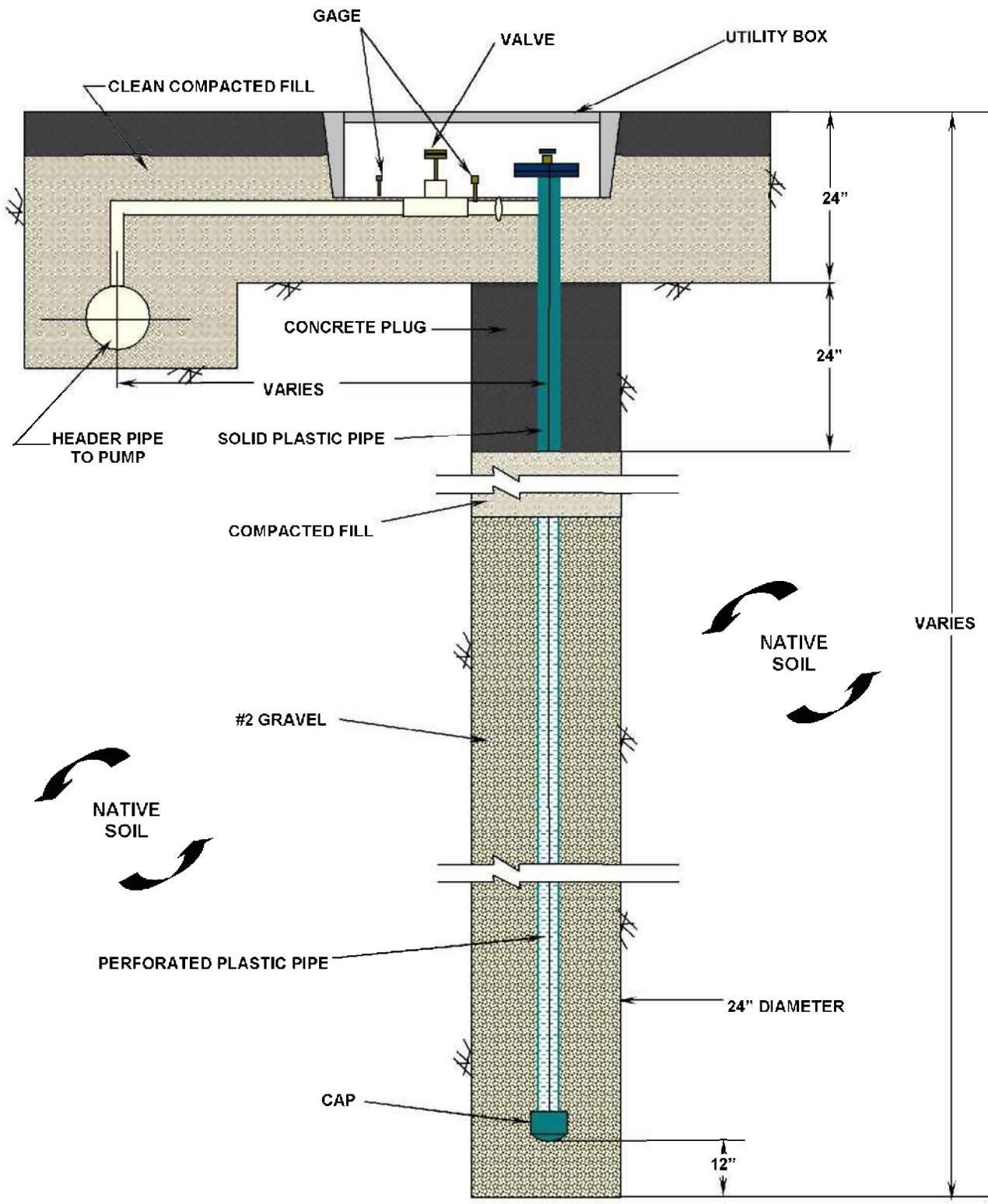
GAS EXTRACTION WELL
(NOT TO SCALE)

FIGURE 2



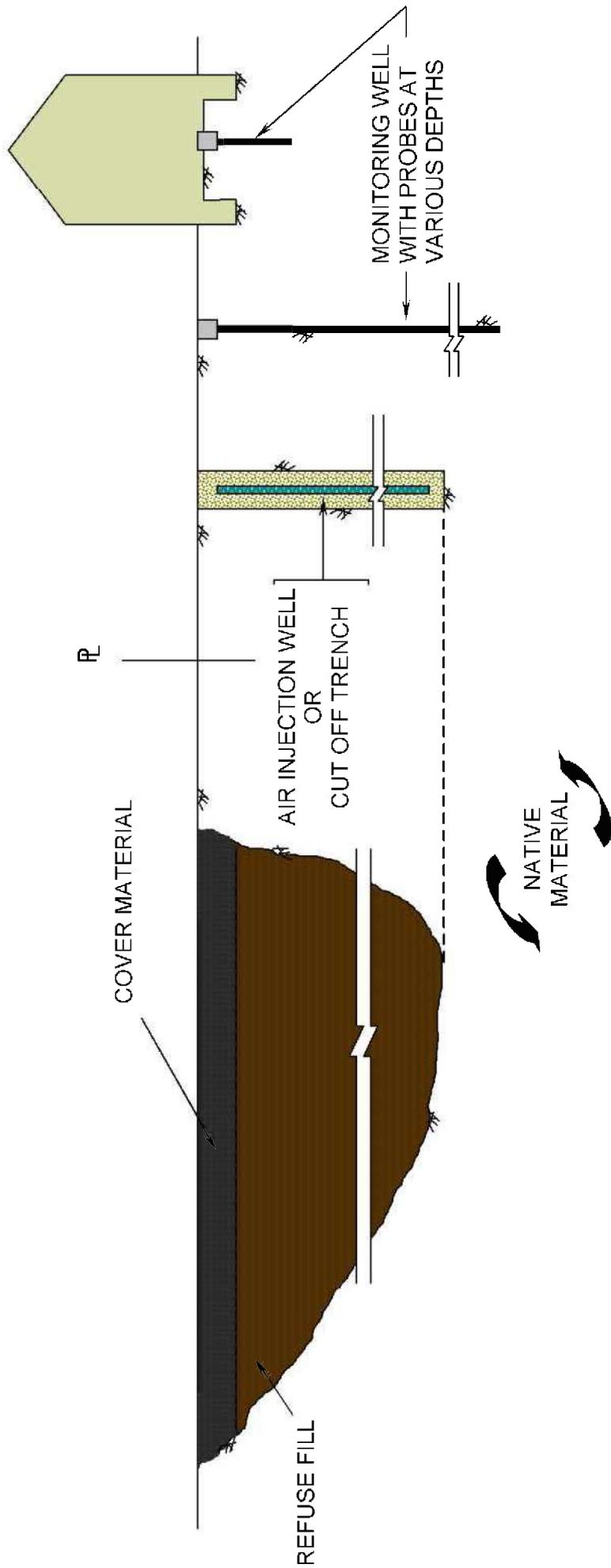
**EXTRACTION SYSTEM BURNER
STATION**
(NOT TO SCALE)

FIGURE 3



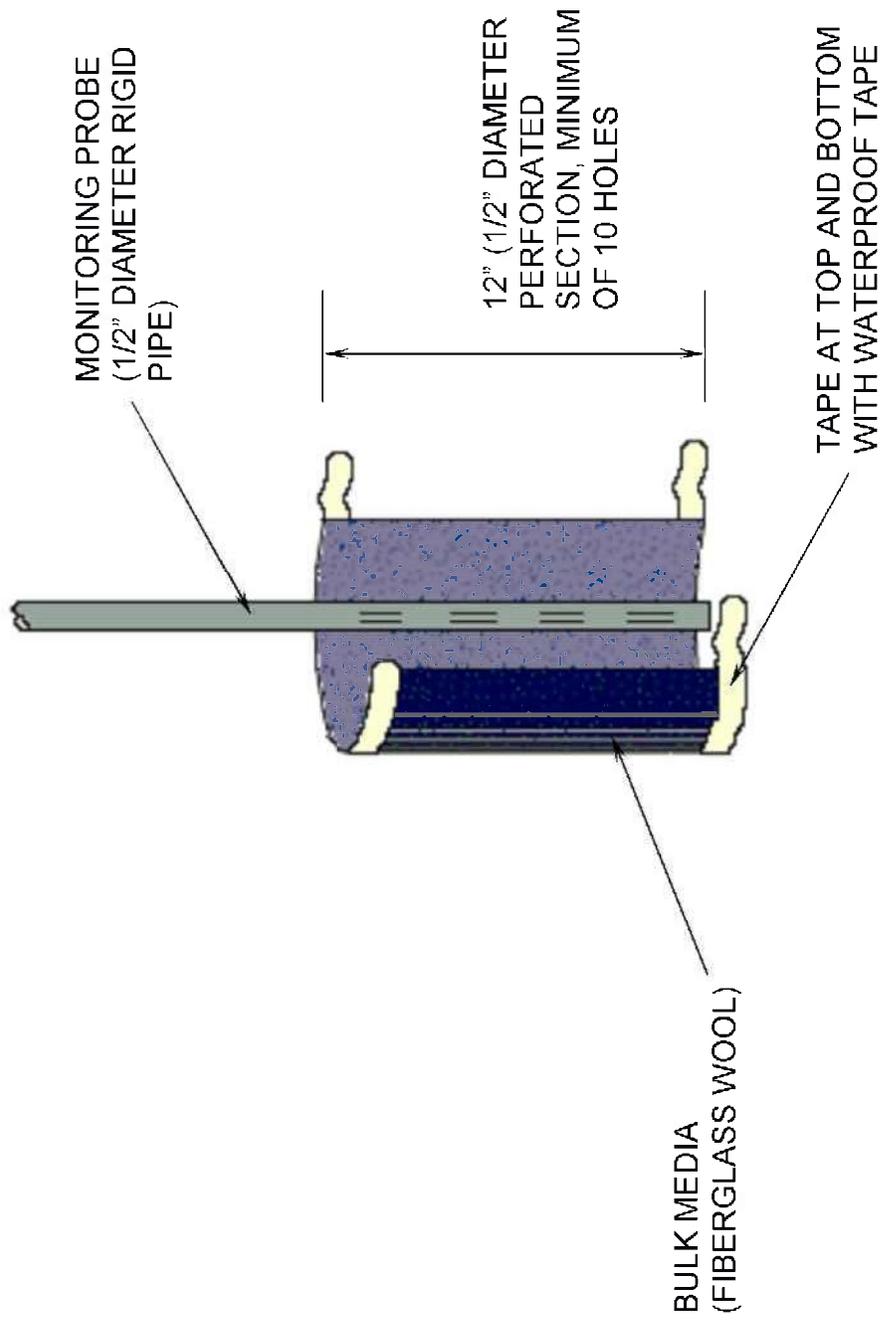
AIR INJECTION WELL
(NOT TO SCALE)

FIGURE 4



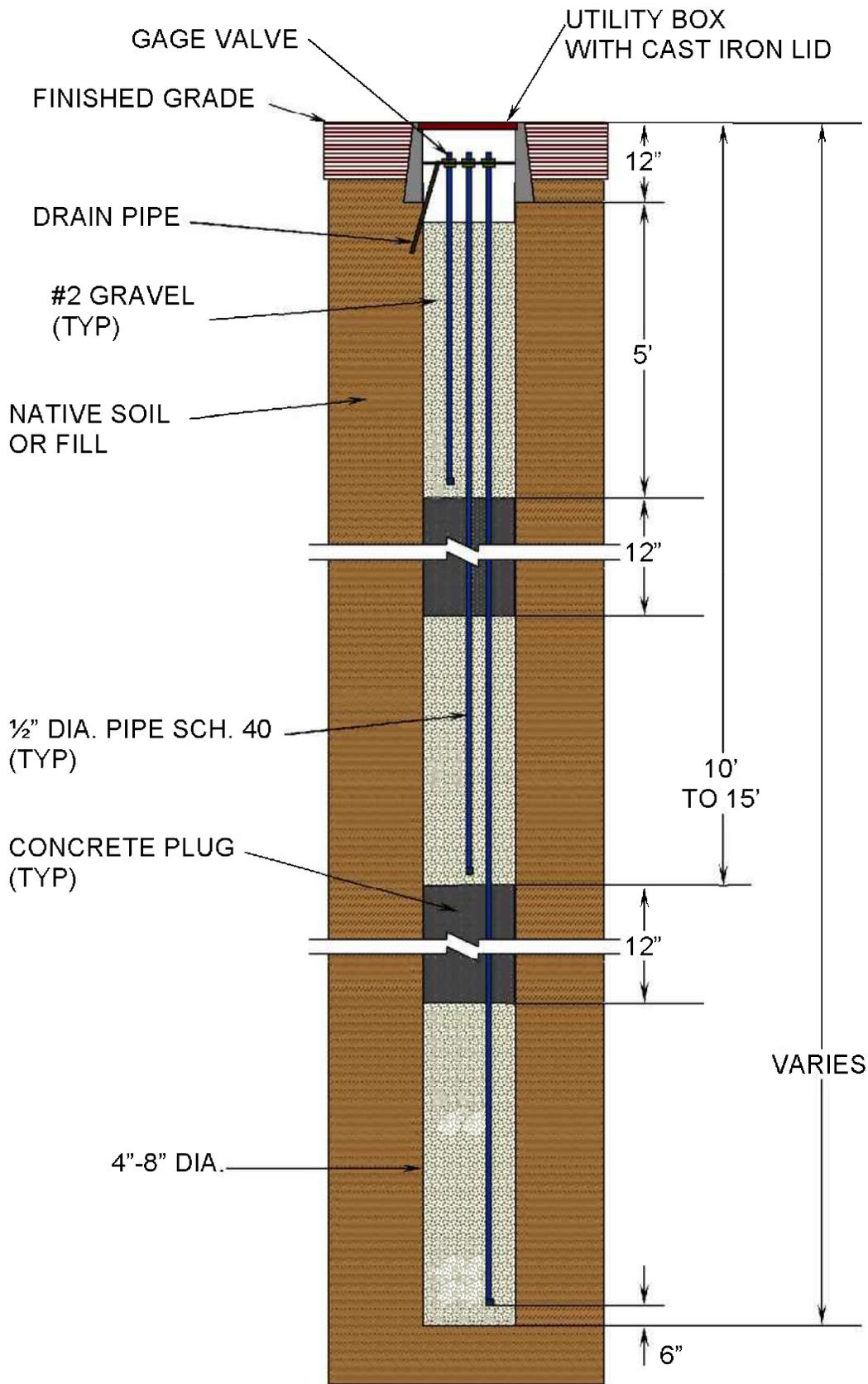
AIR INJECTION OR CUT OFF TRENCH SYSTEM

FIGURE 5



TYPICAL PROBE AND DETAIL
(NOT TO SCALE)

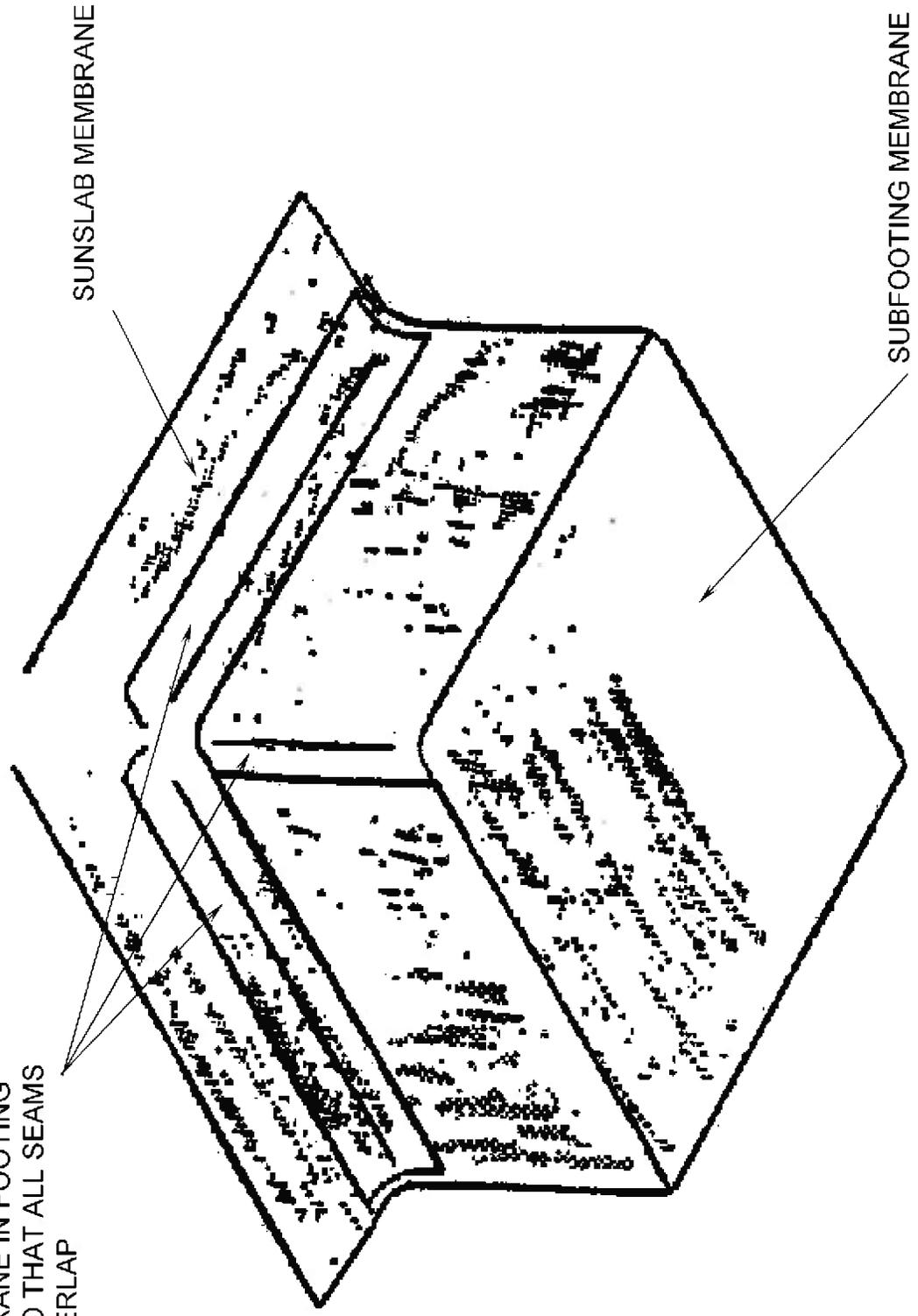
FIGURE 6



MONITORING WELL
(NOT TO SCALE)

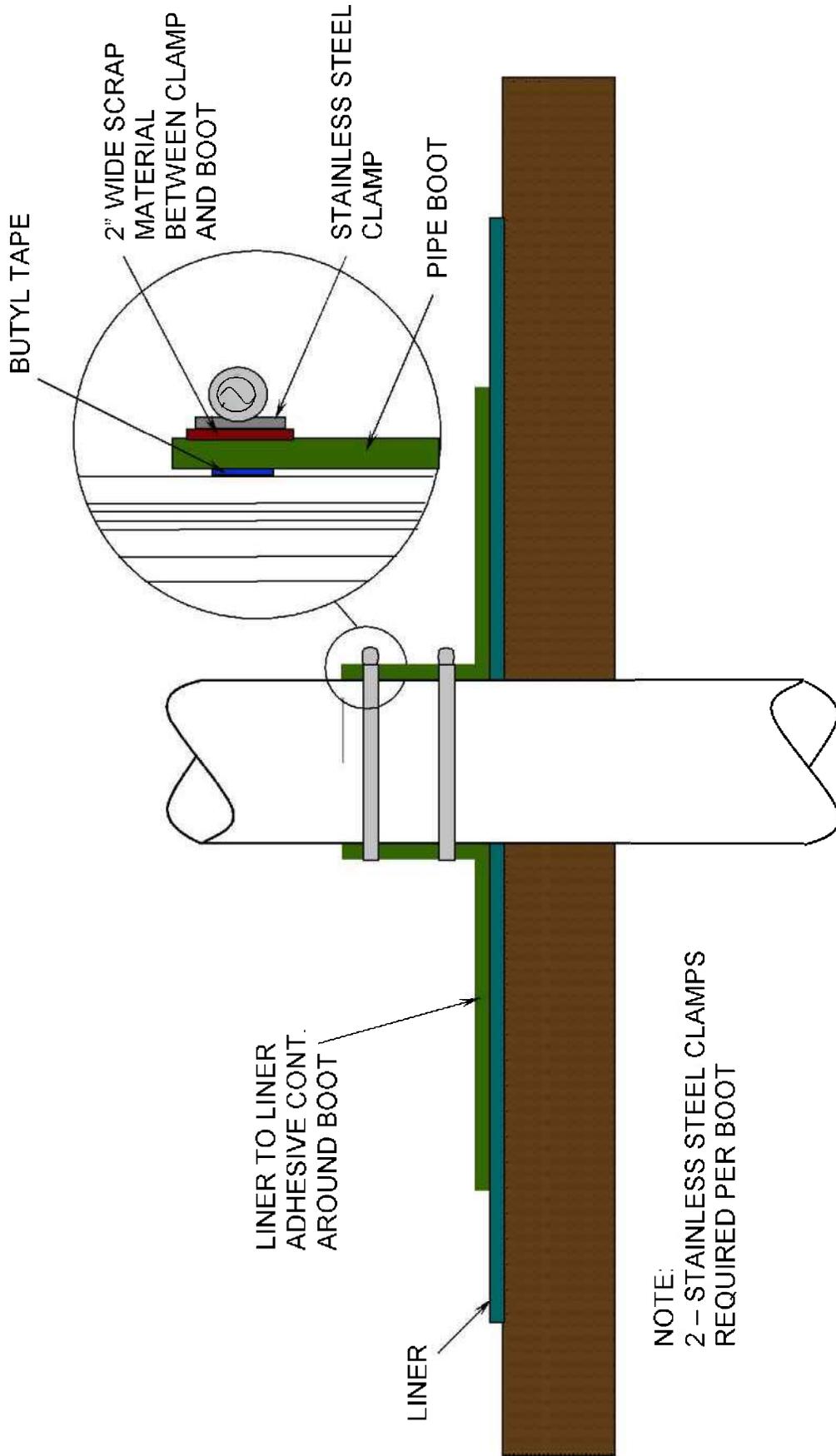
FIGURE 7

INSTALL MEMBRANE IN FOOTING
EXCAVATION SO THAT ALL SEAMS
ARE 6" MIN. OVERLAP



MEMBRANE

FIGURE 8



NOTE:
2 - STAINLESS STEEL CLAMPS
REQUIRED PER BOOT

PREFABRICATED PIPE BOOT

(NOT TO SCALE)

COLLAR WIDTH = PIPE O.D. + 12" (MIN.)
RISER 6" (MIN.)

FIGURE 9

APPENDIX A

COVENANT AND AGREEMENT FOR A PASSIVE SYSTEM

1. The owner of the property described below acknowledges for himself, his heirs, successors in interest or assigns the following:
 - a. That the building is constructed within 1,000 feet of a landfill containing decomposable material and is subject to methane gas intrusion from the underlying soil. **OR** That the building is constructed within 300 feet of a oil or gas well and is subject to methane gas intrusion from the underlying soil.
 - b. That a methane gas control system, approved and on file with the Building Official of the County of Los Angeles/City of _____ has been installed on the property.
 - c. To give irrevocable consent to the County of Los Angeles/City of _____ to permit its authorized representatives to enter onto the said premises during regular business hours for the purpose of inspecting and testing for landfill gas intrusion.

2. Legal description of the property.

APPENDIX B

COVENANT AND AGREEMENT FOR AN ACTIVE SYSTEM

1. The owner of the property described below acknowledges for himself, his heirs, successors in interest or assigns the following:
 - a. That the building is constructed within 1,000 feet of a landfill containing decomposable material and is subject to methane gas intrusion from the underlying soil. **OR** That the building is constructed within 300 feet of a oil or gas well and is subject to methane gas intrusion from the underlying soil.
 - b. That a methane gas control system, approved and on file with the Building Official of the County of Los Angeles/City of _____ has been installed on the property.
 - c. That the property owner will maintain and operate the system in accordance with requirements specified in the plans and Operation and Maintenance Manual, all as approved by the Building Official of the County of Los Angeles/City of _____
 - d. To give irrevocable consent to the County of Los Angeles/City of _____ to permit its authorized representatives to enter onto the said premises during regular business hours for the purpose of inspecting and testing for landfill gas intrusion.

2. Legal description of the property.

APPENDIX C

METHANE GAS CONTROL SYSTEM PLAN GENERAL NOTES

General Notes for All Methane Gas Control System Plans :

1. For commercial and industrial structures, indicate by general notes that:

a. A monitoring program shall be established as follows:

- Test priority to occupancy
- Test monthly for three months
- Test quarterly thereafter

b. The initial test results shall be submitted prior to the granting of occupancy for the building.

All test results shall be signed by a Civil Engineer registered in the State of California. Copies of all test results shall be provided to the County of Los Angeles Department of Public Works, Environmental Programs Division, and Building and Safety Division.

2. Prior approval of the installed methane gas control facilities or release of utilities by the inspecting authority, the Department of Public Works, Environmental Programs Division, and Building and Safety Division shall be provided with was-built plans and a written certification stating:

a. The methane gas control facilities have been installed in accordance with the approved drawings.

b. The building is free from methane gas and can be safely occupied.

The certification and the as-built plans shall be signed by a Civil Engineer registered in the State of California.

3. Any trenching, excavation, or other work below grade is subject to methane gas infiltration from the soil which could create a potential hazard to personnel. Special safety precautions as outlined in the report/plans are to be employed during this work.

4. All necessary permits from regulatory agencies, including Federal, State, regional, and local, must be obtained prior to start of any construction work. If, as a result of any agency's requirements, changes are made to these plans and specifications, then approval must be obtained from the County of Los Angeles/City of _____ Building Official.

5. The contractor should notify the Los Angeles County Department of Public Works, Environmental Programs Division, at (626) 458-3517, two working days prior to the installation of the membrane.

APPENDIX D

CONSTRUCTION NOTES FOR MEMBRANE INSTALLATION

Membrane Installation:

1. All membrane installation shall be performed by a qualified firm with extensive experience in the installation of membrane specified.
2. Unless shown or noted otherwise, method of membrane installation, including jointing, seaming, and all other physical connections, shall be in accordance with the membrane manufacturer's recommendations.
3. All membrane field joints shall be overlapped and sealed a minimum of 3 inches. Unless shown otherwise, contact surface between membrane and any other surface shall not be less than 6 inches. All field joints shall be prepared over a smooth and hard surface.

All penetrations through membrane shall be sealed per details shown on plans using prefabricated boot(s).

4. All surfaces shall be trimmed smooth to the exact contours and elevations shown on the drawings. All loose earth, cobbles, wire tracks, and other foreign matter shall be completely removed.
5. Any necessary repairs to the membrane shall be patched with the lining material itself, lap-jointed as specified herein.
6. Any future work that will result in penetration of the membrane will require a permit from the Building Official prior to final approval of the plans.
7. A warning sign shall be installed in a prominent location within the building. The sign shall include such information as follows:

"Warning: A membrane is installed beneath the building floor slab to prevent methane gas intrusion from the soil. Any proposed penetration or alteration of the floor slab requires a permit to be obtained from the County of Los Angeles/City of _____ Building Official. It is illegal to remove this sign."

The word "Warning" shall be in white letters, a minimum of 3/4 inch high, with the remainder 3/8 inch high and placed on red background.

8. All Federal, State, and local safety requirements shall be complied with.

9. All necessary permits from regulatory agencies, including Federal, State, regional, and local, must be obtained prior to start of any construction work. If, as a result of any agency's requirements, changes are made to these plans and specifications, then approval must also be obtained from the County of Los Angeles/City of _____ Building Official.
10. The contractor shall notify the Los Angeles Department of Public Works, Environmental Programs Division, at (626) 458-3517, two working days prior to the installation of the membrane.

APPENDIX E

MONITORING PROBE REQUIREMENTS

Gas Monitoring System

A methane gas monitoring system must incorporate the following:

1. Probes must be placed both above and below the membrane. Probes must be located in the sand layers and must terminate at the monitoring station.
2. The monitoring probe must be 12 inches in length, 1/2 inch diameter, perforated, wrapped with burlap or similar materials, and connected to a 1/4 inch outside diameter tubing/piping which terminates at a monitoring station.
3. The sampling end of each probe (at the monitoring station) must be provided with a 1/4 inch cock valve with a 1/4 inch outside diameter, 1 inch long stub and should be located inside of a valve box or approved equal.
4. Each valve box should be of concrete body with cast-iron frame and cover. Each cock valve must be labeled accordingly as to its location, probe number, etc.
5. The word "Methane" must be cast on the valve box cover.
6. A sign must be posted adjacent to each monitoring station "Methane Gas Monitoring Station — Do Not Block". The words must be in white letters, a minimum of 3/4 inch high and placed on a red background. The sign must be posted to the wall, a minimum of 5 feet above the floor and as close to the monitoring station as possible.
7. A probe must be provided for approximately every 625 feet of floor area.

APPENDIX F

VENTILATION SYSTEM REQUIREMENTS FOR A PASSIVE GAS CONTROL SYSTEM

1. Ventilation trenches must be no further than 50 feet apart or 25 feet from the building foundation. Ventilation trenches must be provided for each area isolated by a continuous footing.
2. The gravel trench is to be a minimum of 12 x 12 inches, ventilation pipe sizes varies from 2 to 4 inches.
3. Pipe perforations — Minimum of 5 percent of the surface area of the pipe. Perforations must be symmetrical around the pipe. Ends of the pipe are to be capped.
4. All horizontal ventilation pipes are to be located at the highest point of the vent trenches.
5. There must be 30 lb. roofing felt, or similar material, placed over the ventilation trench separating the sand layer and the gravel. The roofing felt must be extended a minimum of 6 inches on both sides over the width of the trench.
6. Vertical ventilation pipes must be provided for every 400 feet of ventilation trench or at each end of a trench, whichever is least.
7. All vertical ventilation pipes must be terminated at a minimum of two feet above the highest point on the roof within a 10 foot radius of the vent pipe and away from source(s) of ignition.
8. The top end of the venting pipe must be provided with a tee or other approved device that will prevent rainwater from entering the pipe.
9. Exterior vent pipes must be constructed of cast iron, ductile iron, or similar material, to protect against ultraviolet sunlight.

**SPECIFICATIONS FOR THE USE OF LIQUID BOOT PRODUCT AS METHANE GAS
PROTECTION BARRIER IN PROJECTS UNDER THE JURISDICTION OF THE COUNTY OF
LOS ANGELES**

At a minimum, all development projects where Liquid Boot application is proposed, shall be subject to the following installation and quality assurance/quality control conditions:

1. The chloroprene modified asphaltic emulsion and catalyst (Liquid Boot) shall be supplied in clearly marked containers bearing the brand name and product identification. Both components shall be supplied by the same source manufacturer.
2. Liquid Boot must be spray-applied onto geotextile to a minimum thickness of 100 dry mils in accordance with the manufacturer's specifications.
3. The membrane must completely encapsulate the foundation, footings, and exterior walls located below grade.
4. The membrane must be sprayed by a manufacturer-approved applicator/contractor. A written statement or a certificate issued by the manufacturer stating that the applicator is an approved applicator is required prior to use of the product.
5. The following field tests must be performed in accordance with the Liquid Boot Field Installation and Repair Procedure specified by the manufacturer:
 - a) Thickness Sample Test at every 500 square feet.
 - b) Smoke Test for each single-family dwelling.
6. All surfaces where the membrane is to be applied must be free of laitance, sharp projections, oil, dirt, or other contaminants. All such surfaces must be prepared in accordance with the manufacturer's instructions.
7. Prior to placing the concrete slab over the membrane, the membrane installer shall certify the membrane to be installed and tested in accordance with the manufacturer's specifications and to be free of leaks.
8. Under the concrete slab, the membrane must be overlaid with a minimum of two inches of clean sand or other similar protective material as approved by this office.
9. A copy of the inspection log for the project must be submitted with the as-built plans to the Los Angeles County Department of Public Works, Building and Safety and Environmental Programs Divisions, including signature by a manufacturer-approved inspector.
10. A note must be added to all plans indicating that the consulting engineer must supervise the barrier's installation. Additionally, in the as-built plans, the consulting engineer must indicate with proper wet-ink signature and stamp that Liquid Boot was installed under his/her supervision.
11. The manufacturer's specifications and quality assurance/quality control recommendations must be included as General Notes in all design/construction plans proposing Liquid Boot as a methane gas barrier.

The plans must be prepared and submitted in accordance with the requirements of the County of Los Angeles Department of Public Works, Environmental Programs Division.

**SPECIFICATIONS FOR THE USE OF VAPORLOCK-M APPLICATION AS METHANE
GAS PROTECTION BARRIER IN PROJECTS UNDER THE JURISDICTION OF THE
COUNTY OF LOS ANGELES**

At a minimum, all development projects where VaporLock-m application is proposed shall be subject to the following installation and quality assurance/quality control conditions:

1. The polymer modified asphalt emulsion shall be supplied in clearly marked containers bearing the brand name and product identification.
2. VaporLock-m must be spray-applied onto geotextile to a minimum thickness of 80 dry Mils in accordance with the manufacturer's specifications.
3. The membrane must completely encapsulate the foundation, footings, and exterior walls located below grade.
4. The membrane must be sprayed by a manufacturer-approved applicator/contractor. A written statement or a certificate issued by the manufacturer stating that the applicator is an approved applicator is required prior to use of the product.
5. The following field tests must be performed in accordance with the VaporLock-m Field installation and Repair Procedure specified by the manufacturer:
 - a) Thickness Sample Test at every 500 square feet
 - b) Smoke Test for each isolated area.
6. All surfaces where the membrane is to be applied must be free of laitance, sharp projections, oil, dirt, or other contaminants. All such surfaces must be prepared in accordance with the manufacturer's instructions.
7. Prior to placing the concrete slab over the membrane, the membrane installer shall certify the membrane to be installed and tested in accordance with the manufacturer's specifications and to be free of leaks.
8. Under the concrete slab, the membrane must be overlaid with a minimum of two inches of clean sand or other similar material as approved by this office.
9. A copy of the inspection log for the project must be submitted with the as-built plans to the County of Los Angeles Department of Public Works, Building and Safety and Environmental Programs Divisions, including signature by a manufacturer-approved inspector.
10. A note must be added to all plans indicating that the consulting engineer must supervise the barrier's installation. Additionally, in the as-built plans, the consulting engineer must indicate with proper wet-ink signature and stamp that VaporLock-m was installed under his/her supervision.
11. The manufacturer's specifications and quality assurance/quality control recommendations must be included as General Notes in all design/construction plans proposing VaporLock-m as a methane gas barrier.

The plans must be prepared and submitted in accordance with the requirements of the County of Los Angeles Department of Public Works, Environmental Programs Division.

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