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TASK FORCE REPORT

on the

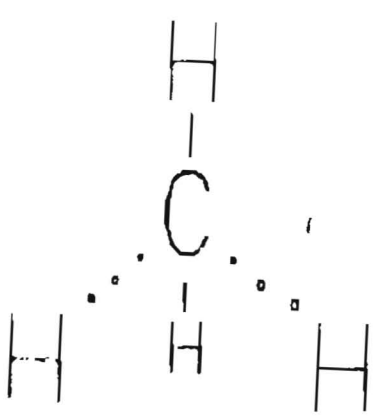
March 24, 1985

METHANE GAS EXPLOSION and FIRE

in the

Fairfax Area,

City of Los Angeles



TASK FORCE REPORT
ON THE MARCH 24, 1985
METHANE GAS EXPLOSION AND FIRE
IN FAIRFAX AREA
JUNE 10, 1985

TASK FORCE REPORT
ON THE MARCH 24, 1985
METHANE GAS EXPLOSION AND FIRE
IN FAIRFAX AREA

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ACKNOWLEDGEMENTS

The City of Los Angeles would like to thank those individuals and organizations who contributed their time, information and resources to this study. The problems encountered by the Task Force were numerous and no one individual possessed the information on or the understanding of the physical events that led to the methane gas seepage into the Ross Dress-For-Less Department Store. However, through the efforts of the Task Force Members the study was successfully completed and this report prepared. The City would like to especially thank Joseph W. Cobarrubias for his efforts in assembling the information gathered by the Task Force and authoring this report.

TASK FORCE
ON THE MARCH 24, 1985 METHANE GAS EXPLOSION AND FIRE IN FAIRFAX AREA

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Los Angeles City Fire Department Report, dated April 2, 1985

Methane Gas Explosion and Fire
in the Fairfax Area
May 31, 1985

CF85-0563-53

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Background

On March 24, 1985 a methane gas explosion and fire occurred at the Ross "Dress-For-Less" Department Store at 6298 West Third Street. On March 27, 1985 the City Council adopted a motion by Councilman Yaroslavsky and Councilman Ferraro to create a Task Force to investigate the explosion and fire and to determine the cause of the accident, why it took place at this location and what measures could be adopted to avoid such incidents in the future.

The Department of Building and Safety was designated by the motion to chair the Task Force. Other City Departments represented on the Task Force were the Fire Department, the Office of the City Adminstrative Officer, the Office of the City Attorney and the Bureau of Sanitation of the Department of Public Works. The Division of Oil and Gas of the State of California and the Southern California Gas Company were also represented on the Task Force. In addition, to assist the Task Force in conducting its study, two committees, the Geologic Technical Committee and the Methane Control Technical Committee, were formed.

The Task Force's study included a review of available geologic information on the Fairfax area, discussions with experts in the field of geophysics, chemical analysis of the methane found at the

explosion site; and a review of other pertinent information on the Fairfax area.

Cause of Explosion and Fire

The study determined the explosion and fire were caused by the ignition of methane gas in the building. This almost pure methane had entered the building through small openings between the floor slab and the foundation walls of the building. Once inside, the gas was contained in a room without ventilation and with a source of ignition.

A vent well drilled at the site encountered a pocket of methane at approximately 40 feet below the ground surface. The gas pocket is believed to have been the source of the gas which entered the building and caused the explosion and fire.

Why the Fire and Explosion Took Place at this Site

Oil and gas seepage have been a common occurrence in this area for thousands of years. Methane and oil now exist at or near the surface in parts of this area, notably the Rancho La Brea Tar Pits.

The Ross site is located on a portion of an old abandoned oil field, the Salt Lake Oil Field. Standards for abandoning oil wells did not exist at the time these wells were abandoned and the wells could

have been a source of both oil and gas seepage. However, available information indicates the more probable source of methane gas was not from an oil well, but decomposing organic matter nearer the surface.

Until 1976 the City of Beverly Hills pumped the ground water in this area for municipal uses. This was discontinued when the water was found to be unhealthful. This discontinuance, together with higher than average rainfalls in the Southern California area since 1976, have resulted in a rising ground water table in the area.

Naturally occurring methane can be trapped in gas pockets below the surface. The rising ground water level can increase the gas pressure in these pockets. As the pressure in a gas pocket increases, the gas will reach a "threshold" pressure at which time it will then find a "path of least resistance" to the surface. The gas pocket encountered at 40 feet is believed to have exceeded its threshold limit and the Ross "Dress-For-Less" Department Store was located in the "path of least resistance" the gas followed to reach the surface. Also compounding the situation was the extensive paving throughout the commercial and multiple residential areas which act as a cap to prevent the natural venting of the gas at the surface.

Measures to Avoid Such an Incident In the Future

Gas pockets and the seepage of gas to the surface in this area occur in a random manner. Furthermore, this random movement of gas to the surface has occurred for tens of thousands of years and will, in all likelihood, continue to occur indefinitely into the future. Therefore, to reduce the possibility of another incident such as that which occurred at the Ross Department Store, steps should be taken to help prevent gas from entering into a building or, if the gas does enter a building, detecting it before an explosive gas level is reached. The alternative of venting the entire oil field was considered and rejected because of the high cost and unreliability of insuring that all gas sources would be properly vented.

TASK FORCE RECOMMENDATIONS

In order to accomplish the goal of helping prevent gas from entering into a building or, if the gas does enter a building, helping to detect it before an explosive level is reached, the Task Force recommends the following:

1. That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance establishing two zones--one of high potential risk (HPR) and one of potential risk (PR)--to include all of the inadequately abandoned wells in the Salt Lake Field and adjoining areas which have evidenced gas and oil seepage as delineated on the attached map.

2. That the Department of Public Works report back to the City Council with a proposed program to monitor areas in the public ways in both zones described in Item 1 for the presence of methane gas. Further, that the proposed program also include provisions for permanent venting in areas which will receive public improvements (i.e., storm drains, street widening).

3. Proposed New Construction

   That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to

implement the following on proposed new construction in the zones described in Item 1:

a. High Potential Risk Zone (HPR)

i. All commercial and multiple residential construction shall be shielded between the building and the earth by sealed plastic sheeting (approved reinforced chlorinated polyethylene (RCPE) material) or equivalent.

ii. All commercial and multiple residential construction over 50 feet in width shall be provided with a system located under the sheeting (in "i" above) as to provide venting to the perimeters of the building.

iii. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

iv. Paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

v. All commercial and multiple residential buildings covering over 50,000 square feet of lot area or with over one level of basement shall be independently analyzed by a consultant, who is an expert in gas control, hired by the owner. The consultant's recommendations shall be in addition to the other items listed in this section and shall be subject to Building and Safety Department approval.

vi. All dwellings with concrete slab floors shall be shielded between the building and the earth by sealed plastic sheeting or equivalent.

vii. All dwellings with basements shall have gas detectors installed in the basement.

viii. Owners of all proposed swimming pools shall hire a consultant to insure that the pool will be above the upper ground water level (water table).

b. Potential Risk Zone (PR)

i. All commercial and multiple residential construction shall be shielded between the building and the earth by sealed plastic sheeting or equivalent.

ii. When gas is detected during soil exploration or foundation preparation, all commercial and multiple residential construction over 50 feet in width shall be provided with a system located under the sheeting so as to provide venting to the perimeters of the building.

iii. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

iv. When gas is detected during soil exploration or site preparation, paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

v. All commercial and multiple residential buildings covering over 50,000 square feet of lot area or with over one level of basement shall be independently analyzed by a consultant, who is an expert in gas control, hired by the owner. The consultant's recommendations shall be in addition to the other

items listed in this section and shall be subject to Building and Safety Department approval.

vi. All dwellings owners shall be advised of the potential risk in the area and advised of shielding and venting and detector options.

vii. All dwellings with basements shall have gas detectors installed in the basement.

4. Existing Construction

That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to implement the following on existing construction in the zones described in Item 1:

a. High Potential Risk Zone (HPR)

i. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition shall have gas detectors installed in those areas.

ii. Paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple

residential buildings and paved areas over 5,000 square feet in area shall be vented.

iii. All dwelling owners shall be advised of the potential risk in the area and advised of venting and detector options.

iv. All dwellings with basements shall have gas detectors installed in the basement.

b. Potential Risk Zone (PR)

i. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

ii. When gas is detected on a site, paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

iii. All dwelling owners shall be advised of the potential risk in the area and advised of shielding, venting and detector options.

iv. All dwellings with basements shall have gas detectors installed in the basement.

5. That the Fire Department with the cooperation of the City Attorney prepare and present an ordinance to implement the following:

   a. Require owners of commercial and multi-residential buildings in the High Potential Risk Zone to prepare emergency response plans to be activated in the event methane gas levels at or near the lower explosive limit are discovered.

6. That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to implement the following on all properties in the zones described in Item 1:

   a. In the event methane gas levels at or near the lower explosive limit are discovered, the owner be required to hire a consultant, with expertise in gas control, to investigate and recommend mitigating measures subject to Building and Safety approval.

b. Any abandoned oil well encountered during construction be reabandoned in accordance with the rules and regulations of the Division of Oil and Gas of the State of California.

7. That the Bureau of Engineering perform periodic surveys on La Cienega Boulevard between Sunset Boulevard and Olympic Boulevard to monitor any changes in elevations along the street.

8. That the Bureau of Engineering in cooperation with the Department of Water and Power be instructed to perform a ground water study to determine the feasibility of lowering the upper ground water table in the southerly portion of the risk zones.

9. The City support state or federal legislation requiring proper reabandoment of inadequately abandoned oil wells, provided funding is made availabe.

10. That the Fire Department with the cooperation of the Police Department and the Department of Building and Safety conduct a study and make recommendations for a plan which establishes response procedures for the following types of methane gas emergencies:

a. Methane gas incursion into a building

b. A major earthquake - (network methane gas surveillance response)

c. Methane gas incursion, fire, or explosion at a construction site.

11. That the Methane Gas Task Force be instructed by the City Council to forward to the United States Geological Survey and the California State Division of Mines and Geology all pertinent information relating to seismic activities, elevation changes and methane gas analysis for their information and consideration.

I. GEOLOGIC SETTING OF THE FAIRFAX AREA

The geologic structure underlying the subject area is represented by folded and faulted sediments of the Repetto and Pico formations. Overlying these formations is a southerly-dipping sequence of recent Pleistocene alluvial deposits varying from 50 to 100 feet thick. These overlying sediments are unconsolidated and contain braided coarse-grained channel deposits originally laid down in buried southwesterly-flowing stream beds. The perched or upper ground-water levels are known to fluctuate within these sediments from 20 feet or less below ground level. The ground water level is at an approximate depth of 200 feet.

A. Oil and Gas Occurrences

Oil and gas seeps have been active in this area for thousands of years. Evidence of swamps lying northerly of the Sixth Street Fault alignment are clearly seen in the geological record and still exist as the Rancho La Brea Tar Pits. As the hydrocarbons are transported to the surface, gas is expelled resulting in a layer of heavy tar or asphaltum which has accumulated at the bottom of the swamps. The presence of these pits was a hazard to the

animal population, but a useful commodity to early man. (Reference: Plate 1, Appendix A).

The fact that surface gas and tar seeps occur at the southerly end of the field led to the very early (1902) discovery of the oil bearing formations of the "Salt Lake Field". As the Salt Lake Field developed, oil well operations expanded to approximately 574 wells over an area of about 1200 acres. (Reference: Plate 3, Appendix A). The oil zone, from 150 to 500 feet thick occurs in four separate and distinct oil zones ranging from 650 to 4800 feet in depth. The largest yield of oil was extracted from the third zone. The oil was described as of good quality, ranging from 9 degrees to 22 degrees API and with considerable methane gas. The Salt Lake Field was, in its prime, the highest producing field in California.

By 1937, almost all of the old cable-tool wells had ceased operation. Abandonment procedures were completed virtually without regulation and in most cases the wells were severed 6 to 8 feet below grade level and plugged with wooden posts or backfilled with waste debris. Some of these wells encountered during later construction contained oil and methane gas.

B. Stratigraphy of Fairfax District

Wells drilled in the Salt Lake Field have encountered a 50 to 100 foot deep section of alluvial deposits consisting of clay, course sand and gravel. Below these Pleistocene San Pedro Sands lies the oil bearing Repetto and Pico interbedded sands and shales.

C. Bedrock Structure and Faulting Matrix

The orientation of the bedrock and the location and character of the faulting can yield valuable information on geologic forces which have acted in the past. The type of deformation resulting from these past forces, in turn, controls the manner in which fluids and gases will migrate through the bedrock.

Within the Fairfax District, the bedrock is overlain by a thick sequence of flood plain deposits which conceal bedrock structure. However, subsurface information from previous excavations and test hole borings along with oil well logs from the Salt Lake Field indicate that the bedrock is folded and faulted along a general east-west trend. This type of deformation has created folded traps in which oil and gas have accumulated in four distinct layers, separated by more impermeable strata. (Reference:

Plate 2, Appendix A). Almost all production of oil and gas has been taken from the third oil bearing zone, lying about 3600 feet below the surface. As these structural folds extend easterly from the Salt Lake Field, they may join a part of similar flexures noted within the Los Angeles City Oil Field to the east. The surface occurrence of oil and gas at the Rancho La Brea Tar Pits lies at the southern extent of the Salt Lake Field and may be derived from the uppermost oil bearing zone, Zone A.

Faulting has been observed within the subsurface of the Salt Lake Field. Fault sets occupy the northern and southern limits of the field. The southerly set composed of the Sixth and Third Street Faults is known to breach the folded sediments creating structural traps for gas and oil within the oil bearing zones. However, this entrapment more than likely is caused by the juxtaposition of oil bearing sediments against impermeable ones, thereby restricting the flow of gas and oil beyond the fault plane. (Reference: Plate 2, Appendix A).

A known fact about the Fairfax District is the occurrence of swamps, oil seepage, and gas in the area between the Sixth Street and Third Street Faults. Virtually all of the fossil finds at Rancho La Brea are located northerly

of the Sixth Street Fault thereby indicating the location of swamps and tar pits of the past.

Today, occurrences of oil and gas are found in abundance northerly of the Sixth Street Fault. The other paralleling fault, the Third Street Fault, is located such that the Ross Store is located just northerly of that fault. The fault locations within the Fairfax District appear to have an effect on the occurrence of oil and gas at the surface.

D. Ground Water Regimen

All available information indicated that since 1978 ground water levels within the Fairfax District have been rising. As this may have an important effect on the oil and gas migration within the oil field, some discussion on the subject appears warranted.

The total amount of ground water flowing beneath the Fairfax District is determined by the amount of inflow, the outflow, and the consumption. The City of Beverly Hills drew upon this water supply for its municipal use. Between 1975 and 1976, however, the quality of the ground water was deemed unhealthful and pumping was terminated. Since this time, the City of Los Angeles has experienced a

period of record rainfalls which have increased runoff and infiltration into the recharge areas of this portion of the basin. These occurrences are believed to be the main reason for increased inflow and the rising water tables within the Fairfax-Wilshire District. At the present time, the perched or upper water table generally lies between 12 to 20 feet below the central part of the District, but above ground near Wilshire Boulevard. The main ground water table lies at an approximate depth of 200 feet.

A rising ground water table would probably have little significant effects on the deep oil production zone pressures. The normal repressurization of the production zones will slowly occur with or without a rising water table condition. It is the rising water table within the near-surface environment that could cause increased pressures in confined aquifers and, in turn, increase pressures on any accumulating oil and gas trapped within the system. Where oil and gas were once in equilibrium with its location, increased pressures could allow the oil to migrate upwards along fault planes, bedrock fractures, permeable zones or abandoned wells to a higher elevation. Oil and gas within the production zones are at hydrostatic

pressures of about 1500± psi. As the oil ascends, pressures decrease and dissolved gases can emerge from solution to become free gas, to be added to the existing gas inventory within the area. One effect of ground water recharge may be to potentially increase the likelihood of future occurrence and the amount of available oil and gas at the surface in the form of gas excursions and oil seeps.

E. Ground Motion Activity

The location of faults within the Salt Lake Field has been previously discussed. There is a possible correlation between the location of the Sixth and Third Street Faults and the occurrances of oil and gas seeps.

Recent ground-level information from the Bureau of Engineering, Survey Section, defines two local anomalies caused by ground elevation changes within the Fairfax-Wilshire District. The survey seems to define minor elevation changes with an elongation in the east-west direction at approximately the intersection of La Cienega and Beverly Boulevards. The second is a broad asymetrical depression oriented in an east-west direction and located

just south of Wilshire Boulevard, between La Cienega Boulevard and Fairfax Avenue.

These anomalies cannot be explained by field depressurization and regional settlement above the oil field, nor by increased water table levels within the District. The area of increased elevation is separated from the area of settlement by the Santa Monica Fault Zone, a fault not considered by the State Geologist as being sufficiently active and well defined to be zoned under the Alquist-Priolo Act. According to Dr. Ta-Ling Teng of the University of Southern California, seismic activity has been regionally monitored in this portion of the Los Angeles Basin. Seismic activity levels within the District are measurably less than that found in other portions of the Basin.

Earthquakes within the Fairfax District have been recorded on an average of 3 to 4 per year at magnitudes of 2 to 3. The recorded depths of those earthquakes (focus points) are reported to be in the 5 kilometer range, or below the lowest production zone of the Salt Lake Field. On March 24, 1985, the day of the Ross Store explosion and fire, no measurable earthquake was recorded.

Exactly what these data represent cannot be precisely determined. Settlement caused by withdrawal of fluids from the oil production zones would neither explain the changes in elevation, nor the deep-seated seismic activity recorded within the area. It is equally doubtful that a rising water table could influence ground level changes of this magnitude. Typically, ground-level changes and ground motion could be the result of continuous slippage or creep along the faults. This should not be construed, however, to suggest that seismic activity is imminent, as slow continuous movement also typically serves to relieve strain and prevent major bedrock deformation.

Additional instrumentation would be desirable to futher define ground motion activity here, but at great expense. The installation of modern ground motion equipment would cost approximately $20,000 per instrument, with a $10,000 to $15,000 per year cost to monitor and maintain. The number and location of instruments needed to provide the required information cannot be determined at this time. Such an investment would carry no guarantee that conclusive results will be obtained on the fault activity of the District.

It is recommended, however, that the data collected on the District's ground motion activity be transmitted to the United States Geological Survey and the State of California where staff geologists working on the Alquist-Priolo, Special Studies Zones can be made aware of this information. The methane gas analyses showing hydrogen gas as a free agent should be included with the ground motion data.

II. THE METHANE PROBLEM

A. Chemistry

Methane is a simple hydrocarbon formed as the by-product of organic decomposition. It is colorless and odorless when free of impurities. Due to its gaseous nature and a lighter than air density, methane has the ability to diffuse rapidly upwards through rock fractures and permeable materials to reach the surface. The upwards diffusion, however, may be stopped by confining layers of impermeable clays or impeded by water-saturated sands. Once methane leaves its place of origin, its upward migration is affected by bedrock structure, faulting and fracturing within the rock, and the ground water regimen. To some extent, the environment of the travel path can

alter the chemical composition of the gas and, therefore, yield clues to the place of origin and some insight into the directness of the migration route. The ability to interpret these data is directly proportional to one's knowledge of these influences and the amount of data collected.

A chemical analyses of the methane found within the Fairfax District reflects on its place of origin. The accepted fact pertaining to the methane gas is that the deep-production zone gas (C, D and E Oil Zones) is high in heavy hydrocarbons and carbon dioxide, but contains little hydrogen sulfide and no nitrogen, oxygen, helium or free hydrogen. However, the chemical constituents of the gas samples taken at the vent-head at the Ross Store is very pure methane with only small amounts of heavy hydrocarbons and traces of nitrogen, oxygen, and free hydrogen. No hydrogen sulfide was found at the Ross vent well which could account for the lack of smell and early detection. The smell of sewage reported at the K-Mart Store may have been caused by impurities in the water seeping into the store, rather than in the gas itself. What is not clearly understood is the differences in chemistry between the deep oil-field gas and that which caused the explosion and

fire at the surface. The addition of gases such as carbon dioxide, nitrogen, and hydrogen and the reduction of the heavier hydrocarbons cannot be explained with a deep-gas origin. However, it could be hypothesized that the gas at the Ross Store was not deep oil-field gas but youthful methane formed at higher elevations where less heat and pressures are encountered. This would be termed biogenic methane such as that formed in shallow, buried peat bogs less than 200 feet in depth. If this is the case, the gas could have slowly formed within or below the buried braided stream channels and then transported southerly by the underground flowage of ground water to a point of entrapment, such as against a fault or impermeable zone. The presence of hydrogen, nitrogen, and oxygen are presently unexplained unless they were introduced as contaminants at the time of sampling.

B. Gas Pressures

The vent well located in the Ross Store parking lot was drilled to a depth of 80 feet. A gas bubble was encountered directly below a local clay bed at 40 feet and above the ground water level at 45 feet. Based upon on-site calculations, the gas was estimated to be under a pressure of at least 25 to 27 psi at the time of

encounter. However, this initial pressure quickly dissipated and by the time the casing and vent head were installed, the gas pressures were down to the normal field pressures of 4 to 5 psi. The high maximum values originally obtained were never repeated.

The reason for the high gas pressures encountered in the Ross Vent can only be speculated upon. One hypothesis would require the gas to be within a stratigraphic trap with the rising ground water confined within that aquifer. As the gas particles have no avenue of escape, the rising ground water could force the gas into a bubble of decreasing volume and increasing pressure. When the threshold limit of the hypothetical trap was exceeded by the gas pressure, 25+ psi in the Ross case, the gas could have burst through to find its way to the surface. The main elements of this hypothesis include gas migration to an area of entrapment and insitu pressurization by rising ground water or increased piezometric levels until the threshold level of the trap is reached. However, there is serious doubt that ground water pressures could exert this much pressure without artesian flow to the surface. Another suggested hypothesis involves pressurized gas rapidly moving from a deeper gas reservoir onto a trap in

overlying sediments isolated from the reservoir, and then deformation of the trap that would allow the passage of gas under pressure to the surface. Whatever the cause of high pressures, once gas flowage has been established to the surface, the flow will continue until the gas pressure is reduced by depletion.

C. Incident Reoccurrence Rate

All evidence suggests that oil and gas seepage has increased steadily in the past few years. How often and at what location a gas bubble can come to the surface cannot be predicted. The rising ground water table may be the instigating factor, but another associated factor would be the relation of gas seeps with the Third and Sixth Street Faults. If the methane is biogenic in origin, then its relationship with the Salt Lake Oil Field is only secondary and it could occur elsewhere throughout the Los Angeles basin area. The only ingredients needed for reoccurrence of the Ross Event are an organic mass for bacteria to feed upon and a means whereby the produced gas could reach the surface.

D. Field Gas Vs. Pipeline Gas

The differences between field gas and the gas distributed by the Southern California Gas Company can be readily detected by a chemical analysis of the gas sample. As the natural gas used for domestic purposes is imported from Oklahoma and Texas, it has different chemical constituents, most notably, the presence of helium which is absent from the methane produced in the Los Angeles Basin. Another more easily detected differrence is the chemical additive "mercaptan" used to impart a strong odor to the methane for detection and safety reasons. The methane sampled at the Ross Store contains no helium or mercaptan, thereby indicating that pipeline gas was not the source of methane gas found at the Ross Dress-For-Less Store.

III. CONTROL SYSTEMS

In any methane charged substrata, the control of gas would be simplified if we were dealing with a uniform gas bubble within highly-transmissible soils. This would be tantamount to pricking a balloon with a pin. A less simple, but still easily accomplished system can be designed and used efficiently to vent sanitary landfills of their accumulating methane gas.

In the case of Fairfax, however, no such simple regional venting system can be devised because the bedrock is heterogeneous, the gas bubbles are moving and discontinuous, and from the surface the location of gas stratigraphic traps and migration routes are undistinguishable and unpredictable.

A. Regional Controls - Future Programs Requiring Funding

The question of what can be done on a regional basis depends directly upon the availability of funds for exploration and development. On a local or site-specific basis, the methane controls would be predicated on the assumption that, within the identified risk zones, methane gas has a high probability of accumulation around or under the structure within the lifetime of the structure. It appears that the most practical and indeed the most direct method of methane control is at the structure itself. This is not as satisfying an approach as finding the regional solution and removing the gas before it can emerge at the surface.

If the funds for a regional solution can be made available, the exploration drilling program within and southerly of the Salt Lake Field would be the minimum data base needed to initiate the gas venting system. Depths to

100 feet would probably be required for both the exploration and the later venting. A company experienced in methane control could direct both the investigative studies and gas dispersal programs. A rough estimate indicates a high cost of a regional venting program and, once implemented, no guarantees could be made that the chance of reoccurrence of the Ross event will be eliminated.

B. Regional Controls - For Immediate Action

A number of methane control systems are presently in use or are suggested herein. A brief discussion of each is as follows:

1. Street Oil Sumps

The incidental occurrences of oil seeps onto the sidewalks and streets has been responded to by the Department of Public Works. According to the Department, the City has installed eight oil sumps within the Fairfax Area southerly of Third Street. Oil, gas, and water accumulate in the street device with the oil and water drawn off by private contract vacuum trucks when City inspectors find the sumps to be full. The gas that may accumulate is vented by 10 foot high vent pipes. Similar oil sumps have been used successfully at an apartment location where oil and water seepage had occurred. This program appears effective and should continue.

2. Oil Field Pressure Reduction

Fluid pressures within oil-bearing zones are principally controlled by hydrostatic pressures exerted by the ground water system. As oil production and fluid withdrawal proceeds, the field pressures are reduced by the amount removed from the confined reservoirs. In common practice, a portion of the field pressure may be restored as produced

oil-field brine and carbon dioxide gas are injected back into the producing zones.

An idle oil field has the tendency to repressurize with time, but not because new oil and gas oil are being generated. Repressurization is caused by ground-water circulating into the field from nearby aquifers, thereby restoring original field pressures within the oil-bearing strata. Currently, there is oil production at two sites within the field with production levels at 3,000(±) feet below the surface and probably at insufficient volumes to affect field pressures.

The foregoing discussion may appear academic and unrelated to the problem. But, it does appear that if oil and gas are problems within abandoned fields, then the continued withdrawal of these hydrocarbons would eliminate the threat at the surface by reducing the field pressures at depth. However, in the Fairfax situation, the proposal to reduce field pressures by extraction of hydrocarbons would probably have little or no effect on the surface seepage of methane. This opinion is based on the chemical analysis of the methane sampled at the Ross

Store and the probability of its origin at or above the A-horizon or upper (non-commercial) oil zone. Depressurization within the deep production zones would have a doubtful significance on the upper zones.

3. Ground Water Level Reduction

Ground water levels within the Fairfax-Wilshire area are monitored by the Los Angeles County Flood Control District. According to their records, ground water levels have been rising since 1978. Since flowing ground water can both confine and transport methane and oil within the substrata, the increased water levels have been a major point of interest to our investigation.

The most probable cause of the water table increase is the abnormally heavy rainfall experienced in Los Angeles between 1977 and 1980. In addition to precipitation and infiltration within the watershed area, the City of Beverly Hills terminated their long-term municipal use of the ground water in 1977. As a result of this action, up to 10,954 acre feet of water or 8,571 million gallons a year have not been

withdrawn from the already burgeoning ground water supply. The cessation of ground water withdrawal was Beverly Hill's solution to a water-quality problem that made purchasing of water from others more cost effective than continued pumping and quality treatment.

If the methane gas is controlled to some degree by the ground water regimen, then how effective would a dewatering program be as a solution? In response it can be assumed that an effective dewatering program would ease, but not eliminate, the potential for oil and gas occurrances at the surface. The cost of extraction would include ground water studies, subsurface exploration, the drilling of at least 15 water wells, fitting of the wells and analysis and preparation of the report. The cost has been estimated at $138,000. The water bearing formation would not yield water freely and the water pumped from the wells could conceivably contain oil and lack minimum quality permitted for human consumption. In the event the ground water contains oil, then continual cleanout maintenance or redrilling of wells will be required. The elimination of hydrocarbons

will require the continual use of a seperator and crew in order to dispose this ground water into the storm drain system. If funds can be secured, a regional approach could be given consideration.

4. Reabandonment of Oil Wells

The number of abandoned oil wells within the Salt Lake Field has been estimated at 528, with 46 still active. Precise locations for many of these wells are unkown, and most are buried by soil and rubble at depths ranging from 6 to 10 feet. The problems, therefore, in reabandonment are as follows:

a. Inaccurately located wells are difficult, if not impossible to find, especially within a densely developed area such as the Fairfax District.

b. The wells are reported to be without continuous casing and methane could still leak into the country rock at depths below any new surface seals or plugs.

c. Legal and physical access to the wells may not be available even if the wells could be accurately located.

5. Senate Bill 1458 (Roberti - March 28, 1985)

The Bill directs the State Gas and Oil Supervisor to make a study of the location of all abandoned oil and gas wells within the State of California. The Bill also provides for the development of a plan to extract methane gas accumulations in wells. (Reference: Appendix C).

C. On-site Controls

Methane gas control measures which can be implemented at the site to either prevent the entry of gas into the confines of the building or to vent the gas from the ground around the building are termed on-site controls. This type of gas protection has been developed by Sanitary Landfill Engineers and represents the only gas-control technology found by the Task Force to be applicable to the Fairfax District.

1. Methane Gas Detectors

Continuous-monitoring methane gas detectors consist of a remote sensor connected to a central control box. In practice, the gas sensors are placed in locations of most probable hazard or near the

building's ventilation system where they are exposed to maximum air circulation and volume. These devices are commercially available and do require technical expertise in their installation. Available units cost between $600 to $2500 and most are Underwriter's Laboratory (UL) or Factory Mutual (FM) approved. The advantages of a detector are as follows:

a. The device provides continuous monitoring of methane gas and sounds an alarm for building evacuation prior to the accumulation of explosive levels of gas. The system does not rely on knowledge of methane origin or migration paths.

b. Buildings equipped with security systems coupled with an off-site alarm-monitoring center could be monitored on a 24-hour basis for hazardous levels of methane gas.

2. Perimeter Venting

Venting the perimeter of an existing or proposed building with various types of vent pipes or trenches serves to provide the gas with a negative pressure zone that represents the path of least resistance.

Once the gas enters the vent system, passive or dynamic venting to an approved air outlet, automatic flaring device, or methane holding tank can be provided. These systems can vary on a building-to-building basis, but examples are as follows:

a. Foundation vents are trenches excavated against the exterior walls of buildings with a slotted 4-inch PVC pipe and coarse-gravel backfill placed on and against the foundation footings (Reference: Plate 5, Appendix B). The estimated costs of foundation vents varies with the accessibility of equipment to the site. The costs would range from $20 to $30 per foot of length for new construction and probably double that for existing buildings.

b. Vertical perimeter vent pipes spaced along the outside footings can be either "driven" perforated metal pipes or PVC slotted pipes placed in predrilled small diameter borings of 10 feet or more in depth below foundation footings. It is estimated that an equipped vent pipe would cost approximately $50 to $300 each.

3. Parking Lot Venting

One of the major obstacles of natural gas diffusion to the atmosphere appears to be pavement. Major concentrations of methane are reported below parking lot pavement and, where the pavement abuts a building, concentrations of methane and possible incursions can occur. The venting of significant paved parking areas appears prudent and feasible.

Many varieties of venting systems can be employed, but basically, the Task Force would recommend a 2 foot wide by 2 foot deep trench at intervals determined by the porosity of the soil. The trench is backfilled with a 4 inch slotted PVC pipe and gravel. In the event the pavement is to be restored over the top of the trench, passive stand-pipe vent outlets would be appropriate to relieve accumulations of methane gas.

Cost estimates for these devices may be approximately $0.75 per foot.

4. Pressure Relief Wells

Methane seepage under pressures in excess of 4 psi may be connected to a larger reservoir of gas (bubble). The depths to the methane resevoir will vary with the local substata, but will probably not vary horizontally by more than 50 to 200 feet from the surface point of seepage.

With each occurrence of methane, a test drilling grid should be established based upon the probability that the point of gas seepage will be approximately 50 to 200 feet horizontally from the main gas concentration at depth. The upstream side of the ground water gradient would be a likely direction to follow. These conditions hold true in the Fairfax case, but may not be true in every case. In the absence of other data, these suggestions should give the most optimum location for encountering the gas bubble.

In the case of the pressure relief well located at the Ross Store, the bubble was contacted at a depth of 42 feet in a boring located northerly or upstream of the main concentration of seepage. Methane bubbles appear to be discontinuous, with possibly

more than one bubble present. Additional concentrations of methane may prevail within the area which may be handled in the manner described above until all concentrations of gas have been thus eliminated. (Refernce: Plate 6, Appendix B).

It is estimated that pressure relief wells at a depth of about 100 feet would cost between $3,000 to $7,000 each. This cost estimate should include all well fittings, outlet vents and guard rails.

5. Shielding or Building Barrier Techniques

Shielding of new buildings during their construction will probably offer the best protection for occupants and structure. This procedure involves the placement of layers of reinforced chlorinated polyethylene (RCPE) sheeting such as Hypalon (TM) or its equivalent below the concrete slab-on-grade. A blanket of sand with slotted venting pipes below the RCPE sheeting will provide for a methane monitoring system and protection for the shielding material. It is of utmost importance that the technology involved with this system be observed. Attention must be given to the air-tight sealing of sheet overlaps and at contact points with foundation footings and conduits. Prior to pouring the concrete, the space blocks used to raise the steel rebars or wire-mesh fabric must not puncture and damage the sheeting fabric. An inspection check for imperfect seals should be performed prior to the pouring of concrete. (Reference: Plate 7, Appendix B).

The estimated cost of shielding a building varies from $1.00 to $1.50 per square foot of floor area.

This price would include materials, labor, sealing of overlaps, and sealing inspection by the manufacturer.

6. Vent Outlets

The purpose of the perimeter and foundation vent systems is to collect encountered methane and vent the combustible gas to a safe location. The outside venting of gas to the atmosphere has its potential hazards and some design precautions must be observed. (Reference: Plate 8, Appendix B).

7. Utility Trench Cut-Off Walls

Subsurface conduits entering through slabs or foundation walls can provide a flow path for gas to enter into buildings. This hazard can be eliminated in both existing and new construction by available design methods, including the sleeved entry which seals the space around the conduit in conformance with appropriate sections of Article 500 of the National Electrical Code for Class 1, Division 1, Group D locations.

A Similar procedure is also applicable to the shielding or barrier techniques where conduits pass through the RCPE sheeting. (Reference: Plate 9, Appendix B).

The cost of this method of control depends upon the accessibility of the underground conduit and the ability to locate it. However, costs should not exceed $300 per conduit.

8. Reabandonment of Oil Wells at the Site

In general, the Salt Lake Field Wells are "cable-tool" wells with loose-joint casing. As a standard procedure used at the time in the abandonment process, the well casing was severed 6 to 8 feet below surface grade and the well plugged with redwood posts or waste rubble. As these wells were never accurately located, the positions shown on the oil field maps are approximate, and no suggested method of locating them, such as metal detectors or methane gas probes, has been found to be successful.

In the event an abandoned oil well is encountered during site preparation or basement excavation, reabandonment of the well should be performed under

the State Regulations of the California Division of Oil and Gas. (Reference: Reabandonment Code, Appendix C).

IV. TASK FORCE FINDINGS

A. The Problem

The explosion at the Ross Store was caused by high-pressured incursion of naturally-occurring, almost-pure methane gas through small openings between the floor slab and foundation walls. Knowledge of the gas entry went without detection because nearly pure methane has no color or smell. This makes evident the fact that smell alone cannot be relied upon as an indicator of combustible gas.

The origin of the gas is the next area of concern. The Task Force investigation was impeded by incomplete data on gas origin and the diffusion route from origin to the surface. With this as a limitation to the report, certain assumptions have been made based upon the chemical analyses of gas from various locations and depths. Based upon this data, the methane gas is believed to have been formed from the decomposition of buried plant materials at no deeper than 100 to 200 feet below ground level or

within bedrock above the upper oil zones. This biogenic gas could rise and flow through the multitude of buried, braided channels in the shallow unconsolidated sediments to place of entrapment about 42(±) feet below the surface.

As the gas accumulated and the rising pressures within the confined aquifer system increased, the threshold limit of the trapped pocket was exceeded at about 25 psi pressure, when the gas had sufficient energy to rise to the surface. The length of time this gas bubble existed at depth is unknown. However, the journey to the surface could have been very rapid once threshold pressures were attained. Therefore, monitoring attempts at the Ross Store would probably not have detected methane gas concentrations unless it was monitored on a continuous basis.

The possibilities of regional venting of methane gas has been considered to be impractical as the gas appears to be formed in isolated pockets or bubbles which yield no indication of their presence until threshold limit of the gas trap are exceeded and gas seepage appears at the surface.

B. The Risk

In determining whether another episode of methane seepage, explosion, and fire can occur within the Fairfax District, one factor must be considered: This episode at the Ross Store appears to be unprecedented in the 60 years since field abandonment. Hundreds of buildings, even those within the area of recent gas seepage have not had gas accumulation within the structure. Then the question to be asked is: Why here and why now? The answer may lie in those physical changes brought about by urban development, (i.e., buildings and pavement). Where open fields once provided an easy route for natural gas to be diffused through the soil, now paved parking lots, buildings, and streets exist. It is believed that these pavement areas retard gas flow and cause accumulation of gas. If a building is located in the vicinity of the gas accumulations it will be subject to gas seepage, provided the building represents the easiest escape route for the methane. The other point to consider is the rising ground water table which may have the ability to apply hydrostatic pressures to entrapped gas.

Considering the physical changes that have and are, occurring within the Fairfax-Wilshire area the possibility of a reoccurrence of a Ross-type event is increasing.

C. The Solution .

There is no simple solution to the Fairfax-Wilshire methane problem. Gas bubbles will, from time to time rise to the surface. The best protection relies upon methane surveillance detection and precautionary measures to either remove the gas or to prevent the incursion of the gas into the building.

The first phase of the solution is to identify existing or future structures located within the potential methane risk areas and then to prescribe the method of protection depending upon the type of structure, use, and degree of risk ascribed to the building location.

Major paved parking lots located within the high potential risk areas should be vented to retard methane accumulation beneath the pavement. Paved lots within the "potential risk" areas are advisable to vent, but will not be recommended for such until or unless high methane concentrations are detected.

The final phase in the solution considers an emergency response plan and the procedures to follow in the event of future gas incursions or a major earthquake. This element should be designed with the cooperation of the departments, agencies, and firms represented on the Task Force and Technical Committees.

TASK FORCE RECOMMENDATIONS

In order to accomplish the goal of helping prevent gas from entering into a building or, if the gas does enter a building, helping to detect it before an explosive level is reached, the Task Force recommends the following:

1. That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance establishing two zones--one of high potential risk (HPR) and one of potential risk (PR)--to include all of the inadequately abandoned wells in the Salt Lake Field and adjoining areas which have evidenced gas and oil seepage as delineated on the attached map.

2. That the Department of Public Works report back to the City Council with a proposed program to monitor areas in the public ways in both zones described in Item 1 for the presence of methane gas. Further, that the proposed program also include provisions for permanent venting in areas which will receive public improvements (i.e., storm drains, street widening).

3. Proposed New Construction

That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to implement the following on proposed new construction in the zones described in Item 1:

a. High Potential Risk Zone (HPR)

i. All commercial and multiple residential construction shall be shielded between the building and the earth by sealed plastic sheeting (approved reinforced chlorinated polyethylene (RCPE) material) or equivalent.

ii. All commercial and multiple residential construction over 50 feet in width shall be provided with a system located under the sheeting (in "i" above) as to provide venting to the perimeters of the building.

iii. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

iv. Paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple

residential buildings and paved areas over 5,000 square feet in area shall be vented.

v. All commercial and multiple residential buildings covering over 50,000 square feet of lot area or with over one level of basement shall be independently analyzed by a consultant, who is an expert in gas control, hired by the owner. The consultant's recommendations shall be in addition to the other items listed in this section and shall be subject to Building and Safety Department approval.

vi. All dwellings with concrete slab floors shall be shielded between the building and the earth by sealed plastic sheeting or equivalent.

vii. All dwellings with basements shall have gas detectors installed in the basement.

viii. Owners of all proposed swimming pools shall hire a consultant to insure that the pool will be above the upper ground water level (water table).

b. Potential Risk Zone (PR)

i. All commercial and multiple residential construction shall be shielded between the building and the earth by sealed plastic sheeting or equivalent.

ii. When gas is detected during soil exploration or foundation preparation, all commercial and multiple residential construction over 50 feet in width shall be provided with a system located under the sheeting so as to provide venting to the perimeters of the building.

iii. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

iv. When gas is detected during soil exploration or site preparation, paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

v. All commercial and multiple residential buildings covering over 50,000 square feet of lot area or with

over one level of basement shall be independently analyzed by a consultant, who is an expert in gas control, hired by the owner. The consultant's recommendations shall be in addition to the other items listed in this section and shall be subject to Building and Safety Department approval.

vi. All dwelling owners shall be advised of the potential risk in the area and advised of shielding, venting and detector options.

vii. All dwellings with basements shall have gas detectors installed in the basement.

4. Existing Construction

That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to implement the following on existing construction in the zones described in Item 1:

a. High Potential Risk Zone (HPR)

i. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition shall have gas detectors installed in those areas.

ii. Paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

iii. All dwelling owners shall be advised of the potential risk in the area and advised of venting and detector options.

iv. All dwellings with basements shall have gas detectors installed in the basement.

b. Potential Risk Zone (PR)

i. All commercial and multiple residential basements and first floors without adequate ventilation and/or with a source of ignition, shall have gas detectors installed in those areas.

ii. When gas is detected on a site, paved areas on the same property and within 15 feet of the exterior wall of all commercial and multiple residential buildings and paved areas over 5,000 square feet in area shall be vented.

iii. All dwelling owners shall be advised of the potential risk in the area and advised of venting and detector options.

iv. All dwellings with basements shall have gas detectors installed in the basement.

5. That the Fire Department with the cooperation of the City Attorney prepare and present an ordinance to implement the following:

a. Require owners of commercial and multi-residential buildings in the High Potential Risk Zone to prepare emergency response plans to be activated in the event methane gas levels at or near the lower explosive limit are discovered.

6. That the Department of Building and Safety with the cooperation of the City Attorney prepare and present an ordinance to

implement the following on all properties in the zones described in Item 1:

a. In the event methane gas levels at or near the lower explosive limit are discovered, the owner be required to hire a consultant, with expertise in gas control, to investigate and recommend mitigating measures subject to Building and Safety approval

b. Any abandoned oil well encountered during construction be reabandoned in accordance with the rules and regulations of the Division of Oil and Gas of the State of California.

7. That the Bureau of Engineering perform periodic surveys on La Cienega Boulevard between Sunset Boulevard and Olympic Boulevard to monitor any changes in elevations along the street.

8. That the Bureau of Engineering in cooperation with the Department of Water and Power be instructed to perform a ground water study to determine the feasibility of lowering the upper ground water table in the southerly portion of the risk zones.

9. The City support state or federal legislation requiring proper reabandoment of inadequately abandoned oil wells, provided funding is made availabe.

10. That the Fire Department with the cooperation of the Police Department and the Department of Building and Safety conduct a study and make recommendations for a plan which establishes response procedures for the following types of methane gas emergencies:

    a. Methane gas incursion into a building

    b. A major earthquake - (network methane gas surveillance response)

    c. Methane gas incursion, fire, or explosion at a construction site.

11. That the Methane Gas Task Force be instructed by the City Council to forward to the United States Geological Survey and the California State Division of Mines and Geology all pertinent information relating to seismic activities, elevation changes and methane gas analysis for their information and consideration.

(GR051385WFT:93)
R6.19.85

APPENDIX A

Location Map

Salt Lake Field

Methane Potential Risk Zones

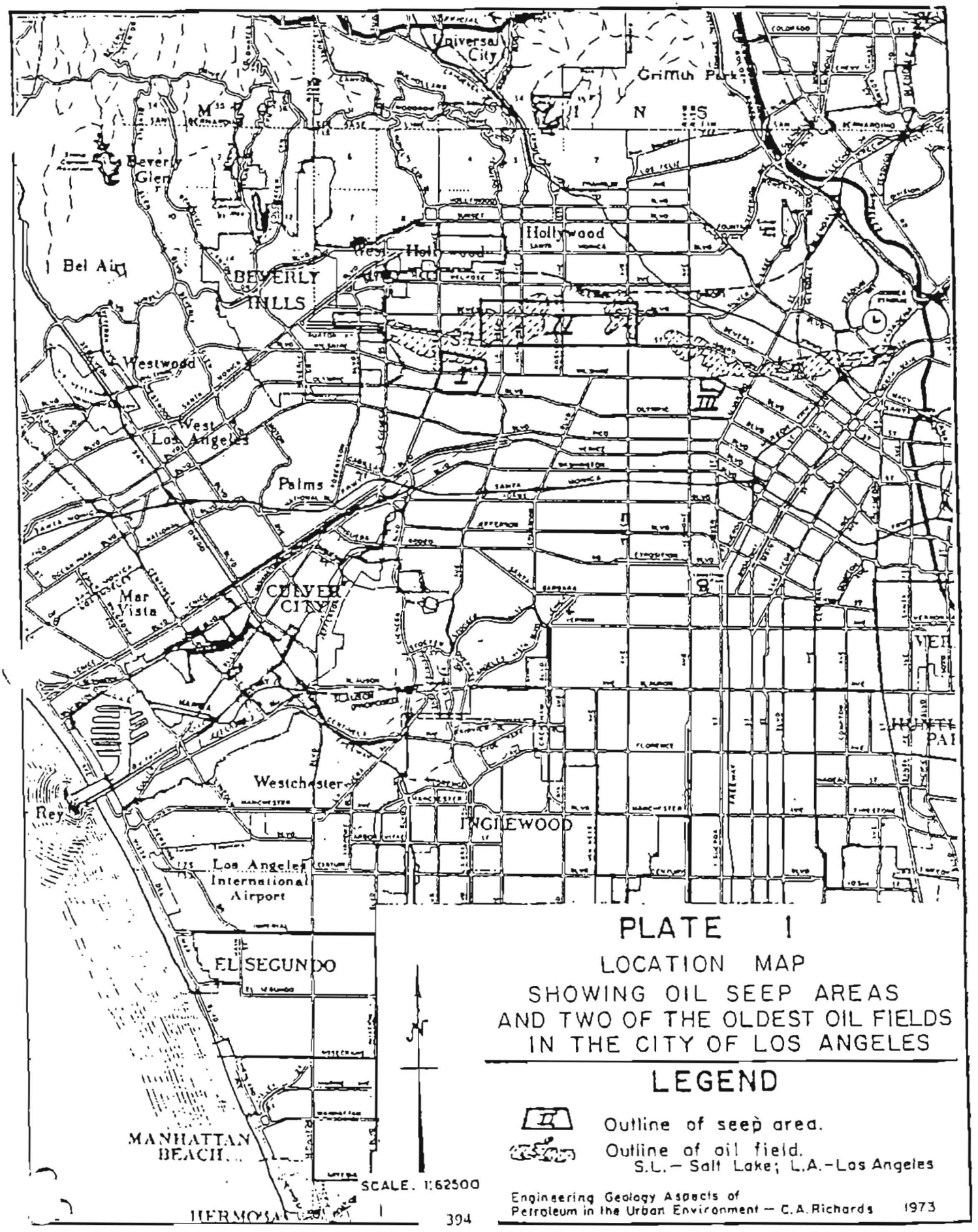


PLATE 1

LOCATION MAP SHOWING OIL SEEP AREAS AND TWO OF THE OLDEST OIL FIELDS IN THE CITY OF LOS ANGELES

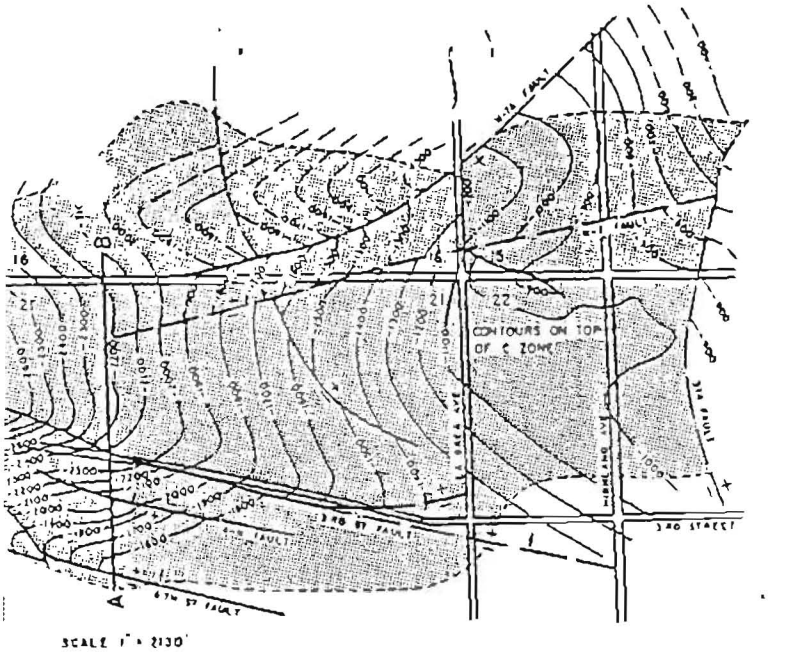
LEGEND

Outline of seep area.

Outline of oil field.
S.L.– Salt Lake; L.A.–Los Angeles

Engineering Geology Aspects of Petroleum in the Urban Environment – C.A. Richards 1973

LAKE OIL FIELD



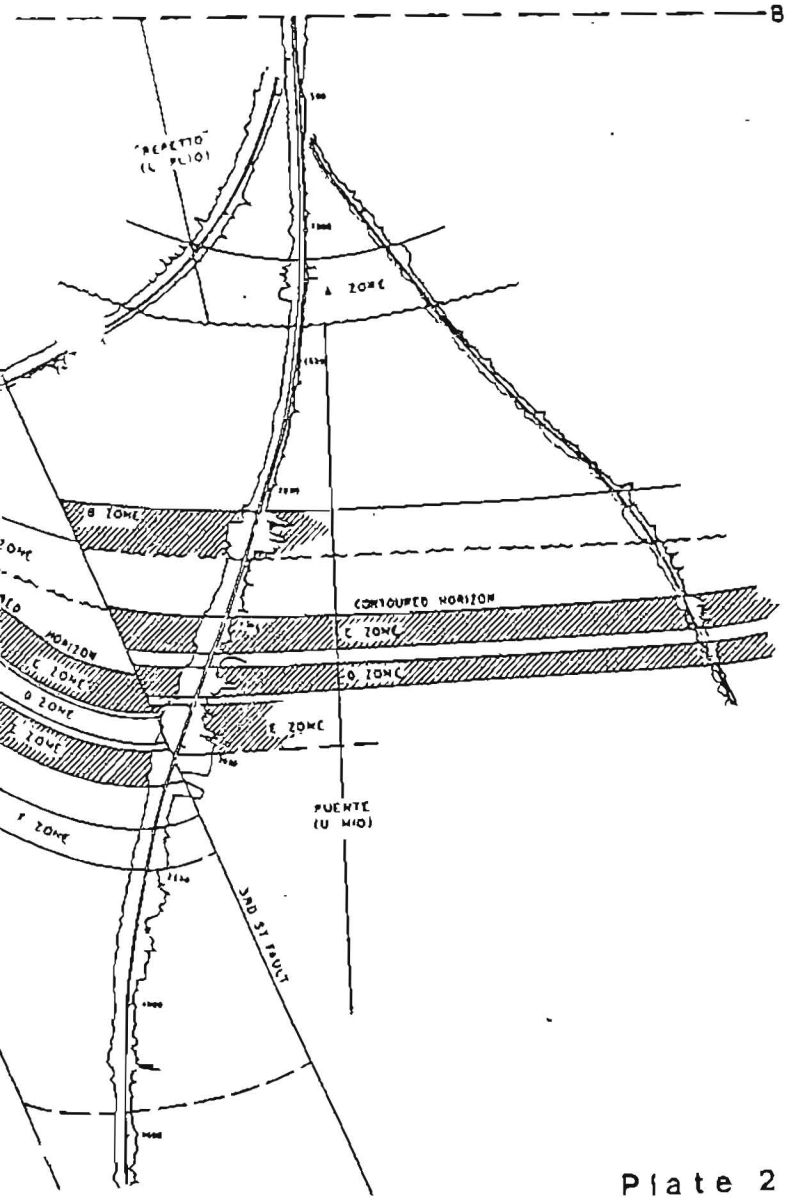
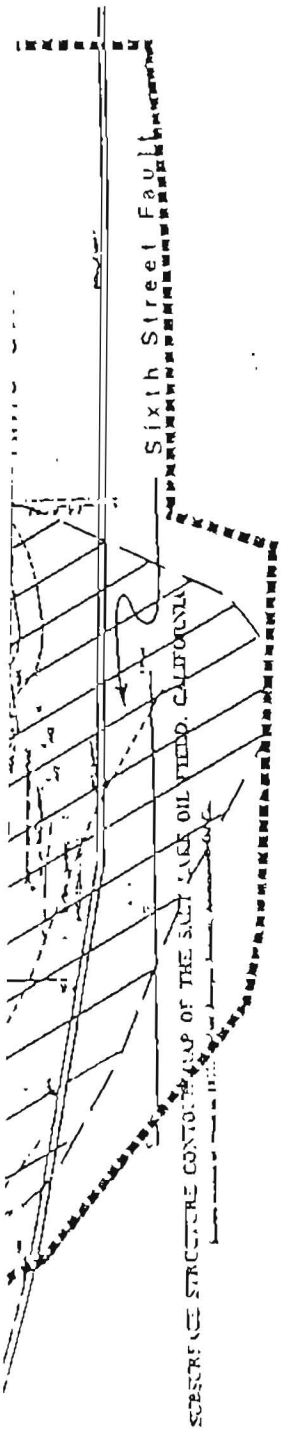


Plate 2



Methane Potential Risk Zones

Plate 3

APPENDIX B

Tables

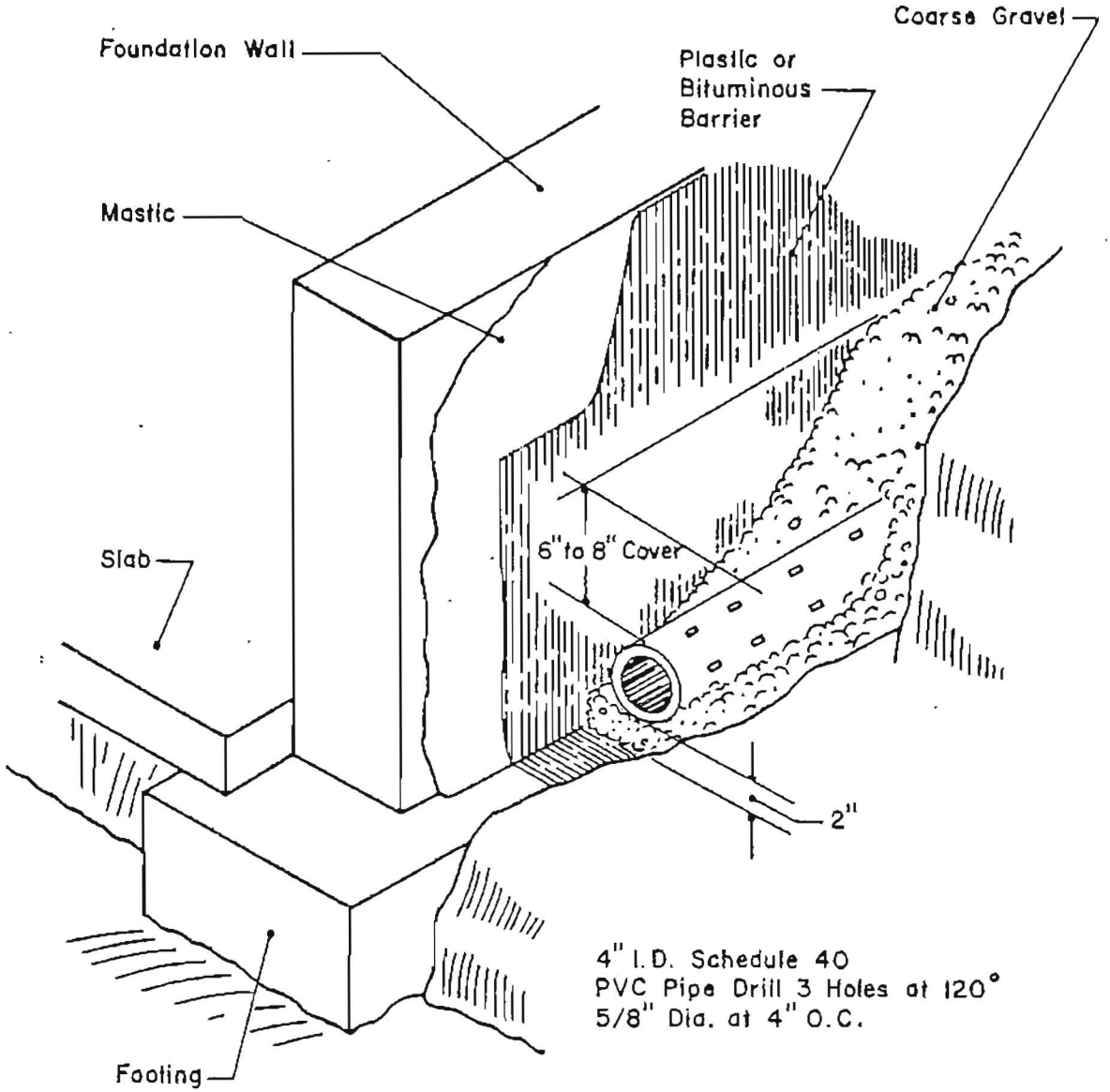
And

Illustrations

ZONES	TYPE STRUCTURE		REQUIRED SYSTEMS				
			COMBUSTIBLE GAS DETECTORS	SHIELDING / EXT. PROBE	AREA & FOUNDATION VENTS	UTILITY TRENCH CUT-OFF	GAS CONSULTANT
HIGH POTENTIAL RISK ZONE	NEW	COMMERCIAL	YES (WITH BASEMENT)	YES / 50 FT. > WIDE	MAY BE INTERCHANGED		YES
					YES	5% CH_4	>50,000 FT^2 / 1+BASEMENT
		MULTIPLE RESIDENTIAL	"	"	YES	"	YES >50,000 FT^2 / 1+BASEMENT
		SINGLE FAMILY	"	YES (W/SLABS)	5% CH_4	"	5% CH_4
	EXISTING	COMMERCIAL	"	NO	"	"	"
		MULTIPLE RESIDENTIAL	"	NO	"	"	"
		SINGLE FAMILY	"	NO	"	"	"
	PAVED AREAS > 5000 FT.				YES (EXCEPT SIN. FAM.)		
POTENTIAL RISK ZONE	NEW	COMMERCIAL	YES (WITH BASEMENT)	YES / NO	5% CH_4	5% CH_4	YES (>50,000 FT^2 OR BASEMENT)
		MULTIPLE RESIDENTIAL	"	"	"	"	"
		SINGLE FAMILY	"	"	"	"	5% CH_4
	EXISTING	COMMERCIAL	"	NO	"	"	"
		MULTIPLE RESIDENTIAL	"	NO	"	"	"
		SINGLE FAMILY	"	NO	"	"	"
	PAVED AREAS > 5000 FT^2				5% CH_4 (EXCEPT SIN. FAM.)		

TABLE 1

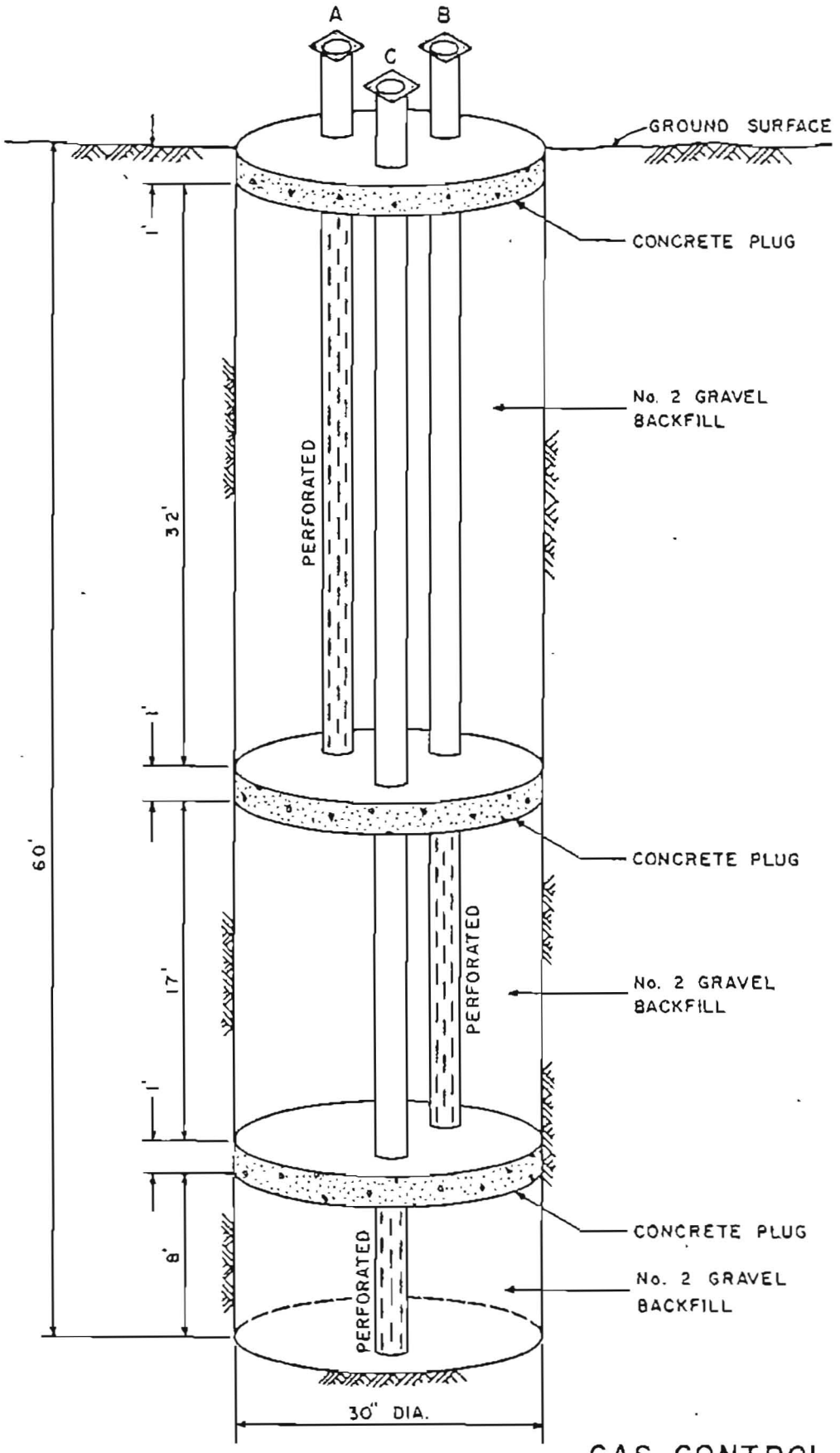
METHANE CONTROL SYSTEMS
TYPE STRUCTURE / METHANE RISK ZONES



Vent outside the building to ten feet above grade or 2 feet above building if within 10 feet of building.

DESIGN EXAMPLE
FOUNDATION VENT

Plate 5



GAS CONTROL SYSTEM
TYPICAL VENT WELL
SITE I

(No Scale)

Plate 6

ENGINEERING-SCIENCE, INC

TYPICAL BARRIER

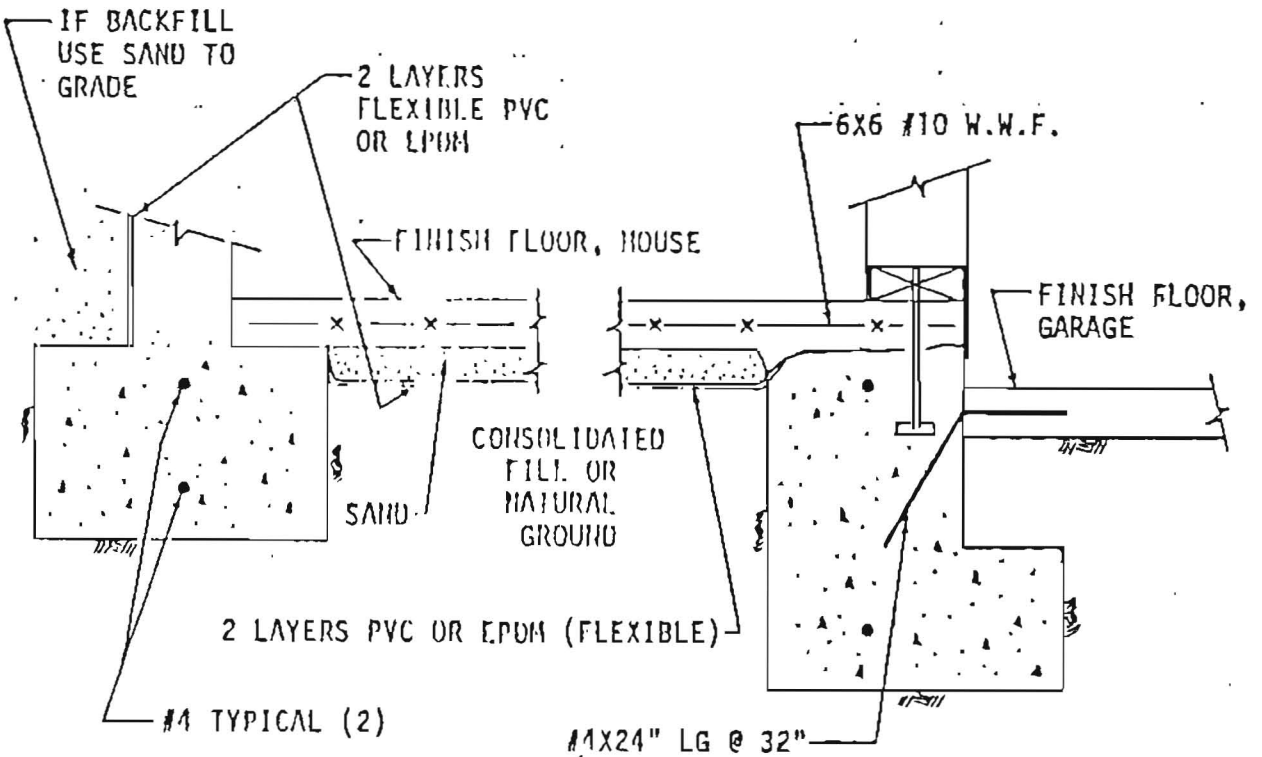
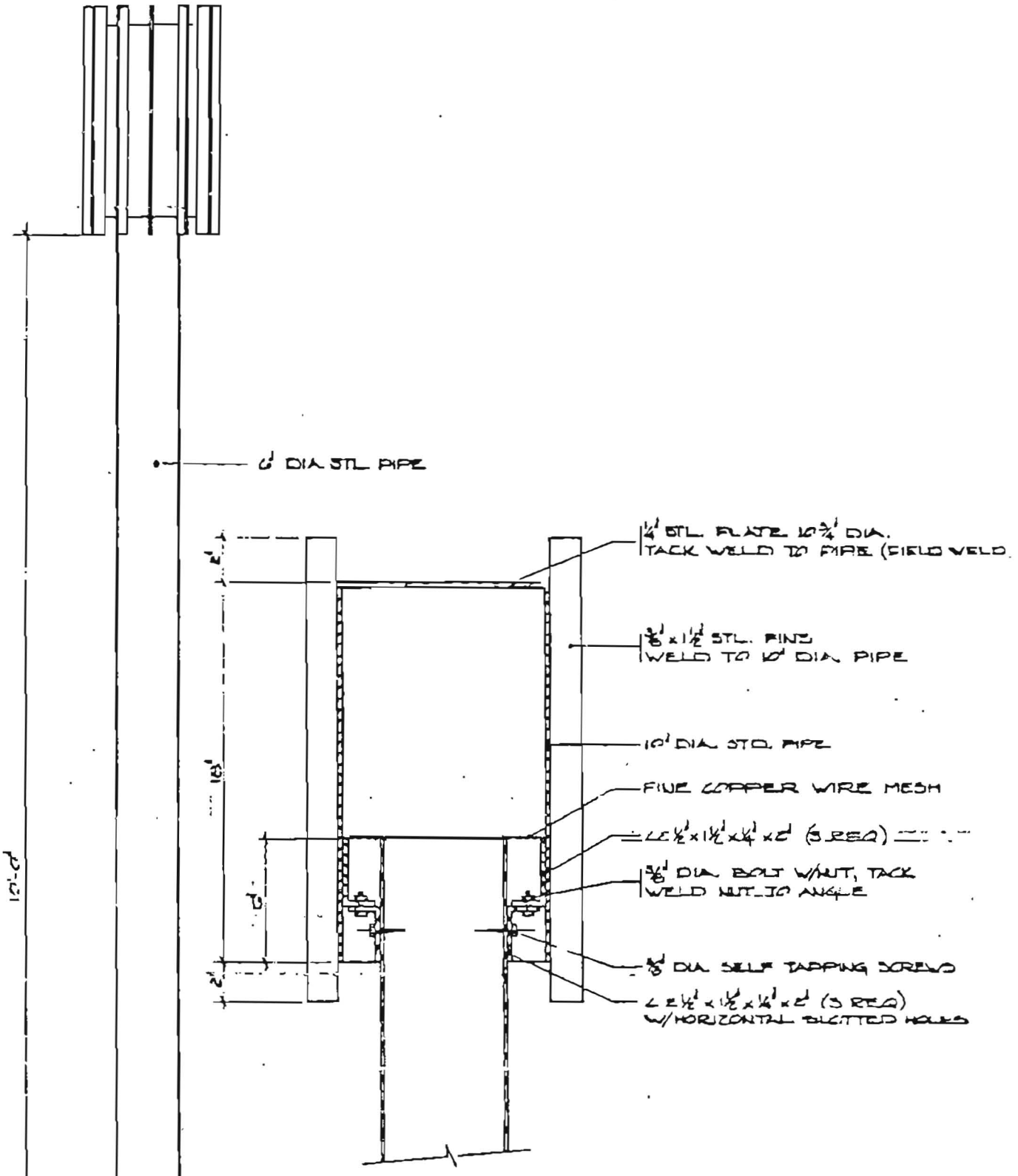


Plate 7



Vent Outlet

Plate 8

APPENDIX C

Codes

And

Documents

STATE OF CALIFORNIA - RESOURCES AGENCY
GEORGE DEUKMEJIAN, Governor
DEPARTMENT OF CONSERVATION
DIVISION OF OIL AND GAS
245 WEST BROADWAY, SUITE 425
LONG BEACH, CA 90802-4455
(213) 590-5311

April 9, 1985

J. W. Cobarrubias
Department of Building and Safety
Room 460A, City Hall
Los Angeles, CA 90012

As a member of the Fairfax Technical Committee, I wish, through you, to make a recommendation to the City Council for a proposed ordinance.

This Division recommends that an ordinance be passed requiring that all future permits within prescribed oilfield limits be routed through the Division for comment and approval.

The State Oil and Gas Supervisor has the authority to order the reabandonment of any previously abandoned well when future construction of any structure over or in proximity of the well could result in a hazard. The cost of such reabandonment is the responsibility of the landowner.

The routing of such building permits through this office will facilitate our timely recognition and identification of possible problems. We are endeavoring to convince other cities and building departments to pass similar ordinances.

Sincerely,

D Lande

D. Lande
Technical Support Supervisor

DL:ee

cc: E. R. Wilkinson

(b) Tests of the drilling fluid to determine viscosity, water loss, weight, and gel strength shall be performed at least once daily while circulating, and the results of such tests shall be recorded on the driller's log. Equipment for measuring viscosity and fluid weight shall be maintained at the drill site. Exceptions to the test requirements may be granted for special cases, such as shallow development wells in low pressure fields, through the field rule process.

(c) Disposal of drilling fluids shall be done in accordance with Section 1775, Subchapter 2 of these regulations.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3219 and 3220, Public Resources Code.

HISTORY:

1. New section filed 2-17-78; effective thirtieth day thereafter (Register 78, No. 7).
2. Editorial correction of NOTE filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723. Plugging and Abandonment—General Requirements.

(a) Cement Plugs. In general, cement plugs will be placed across specified intervals to protect oil and gas zones, to prevent degradation of usable waters, to protect surface conditions, and for public health and safety purposes. At the discretion of the district deputy, cement may be mixed with or replaced by other substances with adequate physical properties.

(b) Hole Fluid. Mud fluid having the proper weight and consistency to prevent movement of other fluids into the well bore shall be placed across all intervals not plugged with cement, and shall be surface poured into all open annuli.

(c) Plugging by Bailer. Placing of a cement plug by bailer shall not be permitted at a depth greater than 3,000 feet. Water is the only permissible hole fluid in which a cement plug shall be placed by bailer.

(d) Surface Pours. A surface cement-pour shall be permitted in an empty hole with a diameter of not less than 5 inches. Depth limitations shall be determined on an individual well basis by the district deputy.

(e) Blowout Prevention Equipment. Blowout prevention equipment may be required during plugging and abandonment operations. Any blowout prevention equipment and inspection requirements determined necessary by the district deputy shall appear on the approval to abandon issued by the division.

(f) Junk in Hole. Diligent effort shall be made to recover junk when such junk may prevent proper abandonment either in open hole or inside casing. In the event that junk cannot be removed from the hole and fresh-saltwater contacts or oil or gas zones penetrated below cannot therefore be properly abandoned, cement shall be downsqueezed through or past the junk and a 100-foot cement plug shall be placed on top of the junk. If it is not possible to downsqueeze through the junk, a 100-foot cement plug shall be placed on top of the junk.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3219 and 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. New NOTE filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.1. Plugging of Oil or Gas Zones.

(a) Plugging in an Open Hole. A cement plug shall be placed to extend from the total depth of the well or from at least 100 feet below the bottom of each oil or gas zone, to at least 100 feet above the top of each oil or gas zone.

(b) Plugging in a Cased Hole. All perforations shall be plugged with cement, and the plug shall extend at least 100 feet above the top of a landed liner, the uppermost perforations, the casing cementing point, the water shut-off holes, or the oil or gas zone, whichever is highest.

(c) Special Requirements. Special requirements may be made for particular types of hydrocarbon zones, such as:

(1) Fractured shale or schist;

(2) Massive sand intervals, particularly those with good vertical permeability; or

(3) Any depleted productive interval more than 100 feet thick.

As a minimum for an open-hole abandonment, the special requirement shall consist of a cement plug extending from at least 100 feet below the top of the oil or gas zone to at least 100 feet above the top of the zone.

As a minimum for a cased-hole abandonment, the special requirement shall consist of a cement plug extending from at least 100 feet below the top of the zone to at least 100 feet above the top of the perforations, the top of the landed liner, the casing cementing point, the water shutoff holes, or the zone, whichever is highest.

(d) Bridge Plug. A bridge plug above the lowermost zone in a multiple-zone completion may be allowed in lieu of cement through that zone if the zone is isolated from the upper zones by cement behind the casing.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Section 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.2. Plugging for Freshwater Protection.

(a) Plugging in Open Hole.

(1) A minimum 200-foot cement plug shall be placed across all fresh-saltwater interfaces.

(2) An interface plug may be placed wholly within a thick shale if such shale separates the freshwater sands from the brackish or saltwater sands.

(b) Plugging in a Cased Hole.

(1) If there is cement behind the casing across the fresh-saltwater interface, a 100-foot cement plug shall be placed inside the casing across the interface.

(2) If the top of the cement behind the casing is below the top of the highest saltwater sands, squeeze-cementing shall be required through perforations to protect the freshwater deposits. In addition, a 100-foot cement plug shall be placed inside the casing across the fresh-saltwater interface.

(3) Notwithstanding other provisions of this section, the district deputy may require or allow a cavity shot immediately below the base of the freshwater sands. In such cases, the hole shall be cleaned out to the estimated bottom of the cavity and a 100-foot cement plug shall be placed in the casing from the cleanout point

(c) Special Plugging Requirements. Where geologic or groundwater conditions dictate, special plugging procedures shall be required to prevent contamination of usable waters by downward percolation of poor quality surface waters, to separate water zones of varying quality, and to isolate dry sands that are in hydraulic continuity with groundwater aquifers.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3106 and 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.3. Plugging in at a Casing Shoe.

If the hole is open below a shoe, a cement plug shall extend from at least 50 feet below to at least 50 feet above the shoe. If the hole cannot be cleaned out to 50 feet below the shoe, a 100-foot cement plug shall be placed as deep as possible.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3106 and 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.4. Plugging at the Casing Stub.

When casing is recovered from inside another casing string (or strings), and the outer string (or strings) is cemented opposite the casing stub, a 100-foot cement plug shall be required on the casing stub. A plug on the casing stub will generally not be required when casing is recovered in open hole or from inside another casing string that is not cemented opposite the casing stub.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3106 and 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment of section heading and new NOTE filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.5. Surface Plugging.

The hole and all annuli shall be plugged at the surface with at least a 25-foot cement plug. The district deputy may require that inner strings of uncemented casing be removed to at least the base of the surface plug prior to placement of the plug.

All well casing shall be cut off at least 5 feet below the surface of the ground. In urban areas, as defined in Section 1760(e), a steel plate at least as thick as the outer well casing shall be welded around the circumference of the outer casing at the top of the casing, after division approval of the surface plug.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Section 3106, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment filed 6-30-80; effective thirtieth day thereafter (Register 80, No. 27).
3. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.6. Recovery of Casing.

(a) Approval to recover all casing possible will be given in the abandonment of wells where subsurface plugging can be done to the satisfaction of the district deputy.

(b) The hole shall be full of fluid prior to the detonation of any explosives in the hole. Such explosives shall be utilized only by a licensed handler with the required permits.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Sections 3106 and 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. New NOTE filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.7. Inspection of Plugging and Abandonment Operations.

Plugging and abandonment operations that require witnessing by the division shall be witnessed and approved by a division employee. When discretion is indicated by these regulations, the district deputy shall determine which operations are to be witnessed.

(a) Blowout prevention equipment—may inspect and witness testing of equipment and installation.

(b) Oil and gas zone plug—may witness placing and shall witness location and hardness.

(c) Mudding of hole—may witness mudding operations and determine that specified physical characteristics of mud fluid are met.

(d) Freshwater protection:

(1) Plug in open hole—may witness placing and shall witness location and hardness. Plug in cased hole—shall witness placing or location and hardness.

(2) Cementing through perforations—shall witness cementing operation.

(3) Cavity shot—may witness shooting and shall witness placing or location and hardness of required plug.

(e) Casing shoe plug—shall witness placing or location and hardness.

(f) Casing stub plug—shall witness placing or location and hardness.

(g) Surface plug—may witness emplacement and shall witness or verify location.

(h) Environmental inspection (after completion of plugging operations)—shall determine that division environmental regulations (California Administrative Code, Title 14, Subchapter 2) have been adhered to.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Section 3228, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. Amendment of subsection (d)(1) filed 10-11-79; effective thirtieth day thereafter (Register 79, No. 41).
3. Amendment of subsections (a) and (h) filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1723.8. Special Requirements.

The supervisor, in special cases, may set forth other plugging and abandonment requirements or may establish field rules for the plugging and abandonment of wells. Such cases include, but are not limited to:

(a) The plugging of a high-pressure saltwater zone.

(b) Perforating and squeeze-cementing previously uncemented casing within and above a hydrocarbon zone.

NOTE: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Section 3106, Public Resources Code.

HISTORY:

1. Amendment filed 9-21-76; effective thirtieth day thereafter (Register 76, No. 39).
2. New NOTE filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1724. Required Well Records.

The operator of any well drilled, redrilled, deepened, or reworked shall keep, or cause to be kept, an accurate record of each operation on each well including, but not limited to, the following, when applicable:

(a) Log and history showing chronologically the following data:

(1) Character and depth of all formations, water-bearing strata, oil- and gas-bearing zones, lost circulation zones, and abnormal pressure zones encountered.

(2) Casing size, weight, grade, type, condition (new or used), top, bottom, and perforations; and any equipment attached to the casing.

(3) Tubing size and depth, type and location of packers, safety devices, and other tubing equipment.

(4) Hole sizes.

(5) Cementing and plugging operations, including date, depth, slurry volume and composition, fluid displacement, pressures, fill, and downhole equipment.

(6) Drill-stem or other formation tests, including date, duration, depth, pressures, and recovery (volume and description).

(7) BOPE installation, inspections, and pressure tests.

(8) Shutoff, pressure, and lap tests of casing, including date, duration, depth, and results.

(9) Sidetracked casing, tools, or other material.

(10) Depth and type of all electrical, physical, or chemical logs, tests, or surveys made.

(11) Production or injection method and equipment.

(b) Core record showing the depth, character, and fluid content, so far as determined, of all cores, including sidewall samples.

(c) Such other information as the supervisor may require for the performance of his statutory duties.

NOTE: Authority cited: Sections 3013, 3106 and 3107, Public Resources Code. Reference: Sections 3107, 3203, 3210 and 3214, Public Resources Code.

HISTORY:

1. New section filed 2-17-78; effective thirtieth day thereafter (Register 78, No. 7). For history of former section, see Register 76, No. 39.
2. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

1724.1. Records to be Filed With the Division.

Two true and reproducible copies of the well summary, core record, and history, and all electrical, physical and chemical logs, tests and surveys run, including mud logs shall be filed with the division within 60 days after the completion, abandonment, or suspension of operations of a well. Dipmeter surveys shall be submitted in a form indicating the computed direction and amount of dip.

NOTE: Authority cited: Sections 3013, 3106 and 3107, Public Resources Code. Reference: Sections 3107, 3215 and 3216, Public Resources Code.

HISTORY:

1. New section filed 2-17-78; effective thirtieth day thereafter (Register 78, No. 7).
2. Amendment filed 12-28-84; effective thirtieth day thereafter (Register 84, No. 52).

SENATE BILL No. 1458

Introduced by Senator Roberti

March 28, 1985

An act to add Article 4.1 (commencing with Section 3240) to Chapter 1 of Division 3 of the Public Resources Code, relating to abandoned wells, and declaring the urgency thereof, to take effect immediately.

LEGISLATIVE COUNSEL'S DIGEST

SB 1458, as introduced, Roberti. Abandoned wells: methane gas accumulations: City of Los Angeles.

(1) Existing law requires the State Oil and Gas Supervisor to carry out duties relating to hazardous oil and gas wells and other oil and gas activities.

This bill would require the supervisor, in cooperation with appropriate state and local agencies to conduct a study of all abandoned oil and gas wells located in the City of Los Angeles in order to determine the location and extent of methane gas accumulations from the wells. The bill would require the supervisor, in cooperation with appropriate state and local agencies, to develop a strategy for extracting methane gas accumulations from the wells and for management of methane gas from the wells to prevent future methane gas accumulations.

(2) The bill would take effect immediately as an urgency statute.

Vote: ⅔. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Article 4.1 (commencing with Section 3240) is added to Chapter 1 of Division 3 of the Public Resources Code, to read:

exceed 25 percent of the floor area of the major use when not related to Group H, Division 1 and Group H, Division 2 Occupancies.

SEC. 91.0504. LOCATION ON PROPERTY

Sec. 504. (a) General. Buildings shall adjoin or have access to a public space, yard or street on not less than one side. Required yards shall be permanently maintained.

For the purpose of this section, the center line of an adjoining street or alley shall be considered an adjacent property line.

Eaves over required windows shall be not less than 30 inches from the side and rear property lines. For eaves, see Section 1710.

(b) Fire Resistance of Walls. Exterior walls shall have fire resistance and opening protection as set forth in Table No. 5-A, Part III, and in accordance with such additional provisions as are set forth in Part IV and Part VII. Distance shall be measured at right angles from the property line. The above provisions shall not apply to walls at right angles to the property line.

Projections beyond the exterior wall shall not extend beyond:

1. A point one third the distance to the property line from an exterior wall; or
2. A point one third the distance from an assumed vertical plane located where fire-resistive protection of openings is first required due to location on property, whichever is the least restrictive.

When openings in exterior walls are required to be protected due to distance from property line, the sum of the area of such openings shall not exceed 50 percent of the total area of the wall in each story.

(c) Buildings on Same Property and Buildings Containing Courts. For the purposes of determining the required wall and opening protection and roof-covering requirements, buildings on the same property and court walls of buildings over one story in height shall be assumed to have a property line between them.

When a new building is to be erected on the same property with an existing building, the assumed property line from the existing building shall be the distance to the property line for each occupancy as set forth in Table No. 5-A and Part IV.

EXCEPTION: Two or more buildings on the same property may be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Section 505 for a single building.

When the buildings so considered house different occupancies or are of different types of construction, the area shall be that allowed for the most restricted occupancy or construction.

(d) Fire Districts. Buildings located in a fire district shall have exterior wall protection as specified in Division 16 in addition to the general requirements of this section.

(e) Separation from Oil Wells. No building more than 400 square feet in area and less than 36 feet in height shall be erected within 50 feet from the center of an oil well casing and no building 36 feet or more in height shall be erected closer to

the center of an oil well casing than a horizontal distance equal to one and one-half times the height of the building, provided, however, that such distance need not exceed 200 feet. Said building shall be measured vertically from the adjacent ground elevation adjoining such building to the ceiling of the top story.

EXCEPTIONS: The distance separation between a building and an oil well may be reduced to:

1. 35 feet if a solid masonry wall not less than 6 feet high and 6 inches thick is constructed between the oil well and all portions of said buildings which are less than 50 feet from the wall.
2. 25 feet if all walls of the building which are located less than 50 feet from the oil well are of one-hour fire-resistive construction, have no openings, and are surmounted by a 3-foot-high parapet.
3. 15 feet if all walls of the building which are located less than 50 feet from the oil well are of two-hour fire-resistive construction, have no openings, and are surmounted by a 3-foot-high parapet.

No building used for the housing of human beings located on any premises where there is a school, hospital, sanitarium, theater or motion picture theater shall be within 200 feet from the center of an oil well casing, nor shall any public utility fuel manufacturing plant, or public utility electrical generating, receiving or distribution plant be located closer than 200 feet from the center of the oil well casing.

Allowable Floor Areas

Sec. 505. (a) One-story Areas. The area of a one-story building shall not exceed the limits set forth in Table No. 5-C except as provided in Section 506.

(b) Areas of Buildings Over One Story. The total combined floor area for multistory buildings may be twice that permitted by Table No. 5-C for one-story buildings, and the floor area of any single story shall not exceed that permitted for a one-story building.

(c) Mezzanines. Unless considered as a separate story, the floor area of all mezzanines shall be included in calculating the allowable floor area of the stories in which the mezzanines are located.

(d) Basements. A basement need not be included in the total allowable area, provided such basement does not qualify as a story nor exceed the area permitted for a one-story building.

(e) Area Separation Walls. Each portion of a building separated by one or more area separation walls may be considered a separate building, provided the area separation walls meet the following requirements:

1. Area separation walls shall be not less than four-hour fire-resistive construction in Types I, II-F.R., III and IV buildings and two-hour fire-resistive construction in Types II One-hour, II-N or V buildings. The total width of all openings in such walls shall not exceed 25 percent of the length of the wall in each story. All openings shall be protected by a fire assembly having a three-hour fire-protection rating in four-hour fire-resistive walls and one and one-half-hour fire-protection rating in two-hour fire-resistive walls.

2. Area separation walls shall extend to the outer edges of horizontal projecting

City of Los Angeles
DEPARTMENT OF FIRE

ANALYSIS OF EMERGENCY OPERATIONS

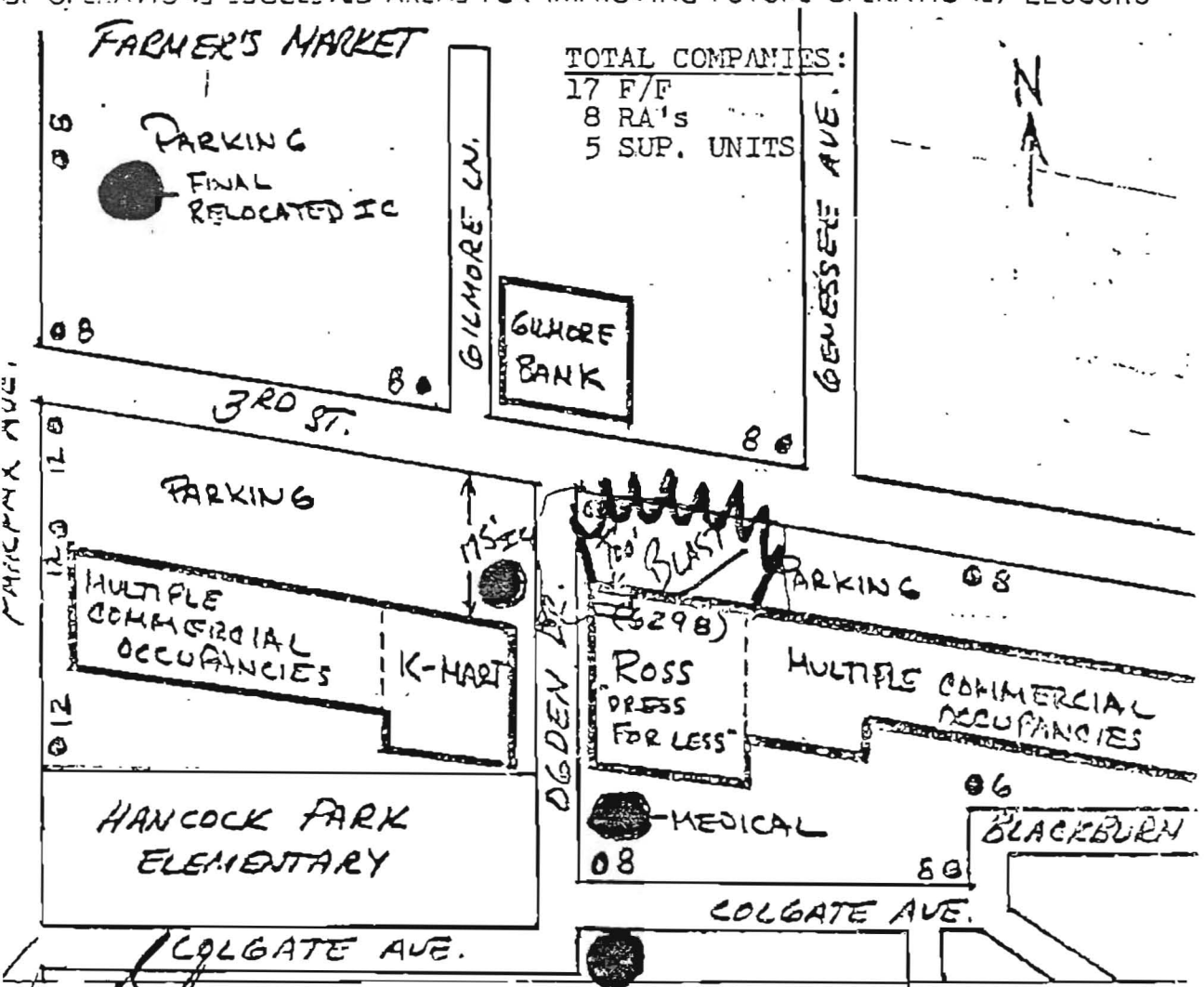
	DATE	TIME	PLATOON
W. 3RD STREET	3/24/85	1647 HRS	☐ A ☒ B ☐ C

OCCUPANCY	OCCUPANCY CODE	ESTIMATED LOSS
HIGH, ONE-STORY, BRICK & M. BLDG. W/FLAT ROOF: FRONTAGE .), 155' DEPTH (OGDEN DR.)	521	S-$250,000.00 C-$150,000.00 T-$400,000.00

ND CHIEF OFFICERS RESPONDING 1ST ALARM E-41, T&E-61, TF-58, SQ-27,
ED ENROUTE BY CCD: RA's 68&27, EMS-5 ADDITIONAL: TF-29, LF-27, E-4
, TF-14, E-13 & 213, LF-10, DIV 1, BATT's 18, 3 & 11, CH. DRUMMOND
IAL: EMS-1, RA's 20, 13, 10, 34, 37, 11, CH. PARAMEDIC FASANA, DR.
TUAL AID: L.A. CO. BATT 1 (CH. RYLAND), STATION 8 & HAZ-MAT UNIT
T UNITS: MOBILE LAB, LT. UTILITY (3's), SERV-U (60's), HU-3 & TRAC

BRUSH	OTHER	MORE THAN 10 COMPANIES	CODE 20	FORMAL CRITIQUE	INFORMAL CRITIQUE	UNIT
☐	☐	☒	☐	☐	☐	☒

OF OPERATIONS SUGGESTED AREAS FOR IMPROVING FUTURE OPERATIONS/ LESSONS



RANK. ASSIGN. DATE

W. Baker
BAKER BATTALION CHIEF

BATTALION 5 "B" 4-2-85

DER — BUREAU OF FIRE SUPPRESSION, THROUGH CHANNELS ORIGINAL
DER — BUREAU OF FIRE PREVENTION, THROUGH CHANNELS DUPLICATE
DER — TRAINING DIVISION, THROUGH CHANNELS DUPLICATE

ment of Sanitation. Upon exiting at street level, Battalion 5 paused to examine the street and exterior wall of the building along Ogden Drive. Finding no evidence of recent excavation or water, he returned to quarters.

THE EXPLOSION AND FIRE

As Battalion 5 responded from quarters to the reported "explosion and fire at 6285 West 3rd Street" (this address was incorrect and was later corrected to 6298 West 3rd Street; the address of the "Ross - Dress For Less" store) he immediately related to the prior response and requested the emergency dispatch of the Department's "Mobile Lab". As Battalion 5 responded he was advised by OCD that two Rescue Ambulances and an EMS Supervisor had been added to the incident, based on the numerous calls they were receiving. As Battalion 5 turned South on La Brea Ave. he observed a large "loomup" and so advised OCD, requesting the dispatch of the LAPD into the area for traffic control.

BATTALION CHIEF DISPATCH

At this point, it should be noted that Battalion 5 was not the "Administrative Chief" for this area, with the address lying well within Battalion 18. In fact, Battalion 5 is 3.4 miles distant from the address and Battalion 18's quarters is only .8 miles away. More significant, Battalion 18 was in quarters during both responses. (The water investigation and the explosion). OCD is currently researching the reason why this occurred, with an answer expected soon.

FIRST ARRIVING UNITS

The first alarm assignment to this incident consisted of Engine 41, Truck and Engine 61 (9 men), Task Force 58, Squad 27, and Battalion 5; with two ambulances, Rescue Ambulance 68 and 27, and an EMS Supervisor added by OCD while companies were enroute.

Engine 41 and Truck 61 arrived on scene almost simultaneously. Truck 61 had responded from the East, coming Westbound on 3rd Street. As they approached the scene Truck-61 requested OCD to dispatch two additional Task Forces. Truck 61 then turned South on Ogden Drive, parking on the North side of the fire-involved West portion of the building. Truck 61 laddered the West side, ascended and noted the collapse of this section of roof, then assisted with hand lines.

Engine 41 responded from the West, coming Eastbound on 3rd Street, and laid a line from the North side of 3rd Street at Gilmore Lane. They then laid across 3rd Street, coming South on Ogden Drive and stopping adjacent to the fire at the West side of Ogden Drive. AT the same time, Engine 61 had arrived from the East and they laid from the South/East corner of 3rd Street and Ogden Drive, heading South; coming to a stop adjacent to Pump 41 at the East side of Ogden Drive.

Both Pump 41 and Engine 61 were now in positions immediately adjacent to the fire involved West portion of the "Ross Building". Pump 61 being on the nearest side to the fire, a 2½" line was led from it to the side door at the West side of the building. The Captain of Engine 41, seeing injured civilians in the

area, requested OCD to dispatch two ambulances. He was advised by OCD that two units were already enroute. Engine 41 then stretched a 1½" line to back up 61's 2½", and coordinated with units from L.A. County Fire Station 8 who had arrived on scene to begin search and rescue operations.

L.A. COUNTY FIRE DEPARTMENT RESPONSE

Units from L.A. County Fire station 8 responded to this incident on sighting the "Loomup" Southwest of their quarters and arrived just behind Engine 41 and Truck and Engine 61. These units were comprised of Engine 8 (4 men), Engine 208 (2 men), Truck 8 (4 men) and Squad 8 (Paramedic, 2 men). They were later joined by L.A. County Battalion 1 (Battalion Chief Ryland) who requested the dispatch of the L.A. County Fire Departments "Hazardous Materials Response Unit," Squad 87, who arrived later and assisted with monitoring gas levels.

Upon the initial arrival of County units, Engine 8 Pumped to engine 41's 3½" supply line at 3rd Street and Gilmore Lane and their personnel coordinated with 41's with search and rescue within the interior of the building. Truck 8 personnel assisted with firefighting and search and rescue on the West side off Ogden Drive. Squad 8 established a medical treatment and triage area on 3rd Street in front of the "Ross Building", assisting later arriving LAFD units in the treatment of 14 patients. Later in the incident Engine and Truck 8 personnel assisted in the evacuation of the shopping complex West of Ogden Drive to Fairfax Avenue.

ARRIVAL OF FIRST RESCUE AMBULANCE

Returning to the incident sequence; Rescue 68 was next to arrive and was directed by LAPD officers, now on scene, to Ogden Drive, at the West side of the incident. Here they found 4 patients and began assessment and treatment, initiating the "Hear and MAC" Networks to alert area hospitals. Later, with the arrival of EMS-5, it would be determined that the majority of patients had exited to the 3rd street side at the front of the building and the medical command post would be relocated to that position at 3rd Street East of Ogden Drive.

ARRIVAL OF BATTALION 5

The above sequence of events had already taken place when Battalion 5 arrived on scene and set up the Incident Command Post in the K-Mart parking lot off Ogden Drive, North/West of the involved West portion of the Ross Building. Battalion 5 declared the incident a "Code - 20" at this point and then conferred with the P-III from Rescue 27, who had just arrived at the Command Post. Battalion 5 directed Rescue 27 to report to Rescue 68's location, South on Ogden Drive and assist with the establishment of a Medical Division pending the arrival of EMS 5.

NEXT ARRIVING UNITS, FIRST ALARM

Task Force 58 arrived next and requested instructions from the "IC". Battalion 5 directed 58's to work with 61's at the West side off Ogden Drive and secure the utilities to the building. At this time Battalion 5 directed the TFC of 61's to become "Operations" and notified OCD that the incident was now under the direction of the "3rd Street IC".

Squad 27 had also arrived at approximately the same time as TF-58 and they assisted with Search and Rescue operations at the front of the Ross building.

ARRIVAL OF DIVISION COMMANDER

Division 1 Commander arrived next and set up adjacent to Battalion 5 in the K-Mart parking lot. Incident Command was then transitioned to the hood of Division I's sedan, with Division I taking over the "IC" and Battalion 5 becoming the "Plans Chief".

ARRIVAL OF ADDITIONAL RESOURCES ("GREATER ALARM")

TF-29 was the first of the two additional Task Forces requested by 61's to arrive and they were directed by the "IC" to assist the Medical Division set up at the West side of Ogden Drive. Initially they worked at Ogden Drive, South of the fire; but, when the bulk of the victims were found to be on the 3rd Street side, they relocated to that side of the incident.

STAGING AREA

E-45 arrived next and was directed by the "IC" to set up a staging area for incoming units at Colgate Ave. and Ogden Drive, South of the incident.

MEDICAL DIVISION

Battalion 18 next arrived and was directed to assume command of the Medical Division. He conferred with EMS 5 (who was then on scene) and additional Rescue Ambulance units were requested. The Medical Division was relocated to the 3rd Street side at this time. Ultimately eight LAFD Rescue Units were dispatched (Rescue's 68, 27, 20, 13, 10, 34, 37, 11; EMS 5 and 1). Chief Paramedic Fasana and the Medical Director, Dr. Palmer, also responded as part of the Medical Division later in the incident. A more detailed account of the Medical Division at this incident is contained in the report of EMS 5 as an attachment to this account. 14 patients were treated and transported from the scene with 8 "walk-ins" at Cedars-Sinai Hospital; accounting for a total of 22 injured. (Initially 5 were listed as "critical". As of this writing, all are expected to survive.)

FIRE CONTROL

Battalion 3 arrived and was assigned to take over the "Fire-fighting Operations" by the "IC". By now, the fire, which had been confined to the West side "annex portion" of the Ross Building, was coming under control and a "knockdown" was declared at 1719 hours; 32 minutes after dispatch. Although the fire was knocked down, flammable vapor fires did continue to burn at the foundation of the Ross Building at the Northwest portion and along cracks in surface locations adjacent to this area. These fires were intentionally allowed to burn, as they were obviously being fed by an unknown vapor source.

At this time, Battalion 5 as "Plans Chief" communicated his concerns to the IC relative to the potential for a wider area of hazard based on his prior response to the K-Mart occupancy on a "water investigation", previous to the explosion.

HEAVY UTILITY COMPANY AND TRACTOR UNIT
The dispatch of a Department heavy utility company was also requested at this time to assist in a completion of the search of the collapsed West portion of the Ross Building. Subsequently, the tractor unit was also requested to assist in this effort and arrived on scene with Engine 88 at approximately 1900 hours.

EVACUATION
Based on the information received from Battalion 5, the IC determined to initiate evacuation of the commercial occupancies East and West of Ogden Drive, South of 3rd Street and to begin gas level monitoring of the occupancies.

BATTALION 3 was reassigned to direct the evacuation of the commercial occupancies East of the Ross Building, South of 3rd Street.

LIGHT FORCE - 27 had arrived at this time and was directed to assist Battalion 3 in this evacuation and cordon off that area with fire line tape. At this point, anticipating the need for additional resources to manage the incident, the IC requested additional companies from OCD; and staging (Engine 45) was directed to maintain two Task Forces in staging, available for deployment.

BATTALION 11 arrived and he was directed to manage the evacuation of the occupancies West of Ogden Drive to Fairfax Avenue, South of 3rd Street.

TASK FORCE 14 arrived and was assigned to work under Battalion 11 in effecting evacuation of the West side occupancies.

GAS MONITORING
The earliest attempt at the monitoring of gas levels after the explosion was later learned to have been performed by a representative of the Southern California Gas Company who had responded to the scene. (Gas Company recorded on scene at 1719 hours) He recorded explosive levels in the basement of the K-Mart store, located across Ogden Drive from the Ross Building. This reading was communicated to firefighters in the vicinity and independent readings were taken by L.A. City Squad 27 and L.A. County Squad 87. The hazardous levels in the K-Mart were confirmed and firefighters began to expand their perimeter of "Monitoring " outward from the K-Mart store.

RELOCATION OF COMMAND POST
When apprised of the confirmation of hazardous vapor levels within the K-Mart , the IC determined that the Command Post location should be moved Northward to a position on the North side of 3rd Street, just West of the Gilmore Bank. (at Gilmore Lane) Evacuation was also expedited and the LAPD was employed to assist firefighters in evacuating all persons within the area bounded by 3rd Street on the North, Colgate Avenue on the South, Genessee Avenue to the East and Fairfax Avenue to the West.

ARRIVAL OF MOBILE LAB
At this point, sometime after the relocation of the Command Post

to the North side of 3rd Street, the Departments' "Mobile Lab Unit" arrived with one inspector. Records of this units arrival are imprecise, but it was approximately one to one and one half hours after Battalion 5 requested its' dispatch on the initial alarm.

ARRIVAL OF DEPUTY CHIEF

DEPUTY CHIEF DRUMMOND also arrived at approximately this point and conferred with the IC and surveyed the area.

ADDITIONAL RESOURCES DISPATCHED

Additional LAFD Units dispatched during this initial phase of the incident, in addition to those already accounted for, were LF-92, E-68, E-13 and E-213, LF-10, the "Emergency Light" Utility from FS-3, the "Service" Utility from FS-60 and the Mobile Command Post through OCD. The additional firefighting units either assisted in evacuation or were held in reserve, prior to their release.

The total companies employed during the "Active Phase" of abating this emergency were 17 firefighting companies, 8 Rescue Ambulances, and 6 support units (Mobile Lab, Emergency Light, Service Utility, Heavy Utility, Mobile Command Post, and Tractor Unit).

OUTSIDE AGENCIES

Given the nature of this emergency, many outside agencies would become involved. A partial list of those responding is as follow:

LAPD - with mobile command post and full "Support Group"
SOUTHERN CALIFORNIA GAS COMPANY - Field Crew and "Rep," R. W. Greenland
L.A. COUNTY DEPARTMENT OF SANITATION - Chief Industrial Waste Inspector, Norman Cotter
A.Q.M.D. - Carol Coy, "Hazardous Materials Unit"
DEPARTMENT OF WATER AND POWER - Gerald Garfine
L. A. COUNTY FLOOD CONTROL - Felismino Marques
ARCO PIPELINE - J. Fisher
DEPUTY CITY ATTORNEY - Keith Pritsker
CHEVRON - Ed Rothenay
N.T.S.B. - Dave Watson
McFARLAND ENGINEERING (OIL FIELD) - Jack Horton
4 CORNERS PIPELINE COMPANY - P. V. Julien
4th COUNCILMATIC DISTRICT - Tom LaBonge, Field Deputy
STATE FIRE MARSHALL - Charles Samo, Associate Engineer
PACIFIC BELL - P. J. Walker
L.A. CITY SCHOOLS - Kathryn Lee, Assistant Superintendent
SENATOR DAVID ROBERTI - J. J. Kaplan, Assistant
PARK LA BREA TOWERS - Don Hall
L.A. COUNTY HEALTH - Richard Gillaspy
FARMER'S MARKET - John Gostovich, President
K-MART - Bob Enlow, Manager

EXPANDED VAPOR MONITORING AND RELOCATION OF COMMAND POST

At approximately 1730 hours, vapor monitoring detected hazardous levels of gas on the North Side of 3rd Street across from Ogden Drive and in the Gilmore Bank, adjacent to the Command Post. Once more the decision was made to relocate the Command Post,

this time to the North East corner of 3rd Street and Fairfax Avenue, in the Farmer's Market Parking Lot. This area was monitored prior to relocation and recorded no levels of gas concentration. After this relocation, at approximately 1800 hours, there was an extension and ignition of flammable vapors out into the South side of 3rd Street at Ogden Drive and East along the parkway at the South side of 3rd Street. These vapors were burning through surface cracks and along the curbline at a height of 12" to 18".

VAPOR IDENTIFICATION

After the relocation of the Command Post to a vapor free location, the IC began to focus more intently on the identification and source of the flammable vapors and to consult with the resources then available on scene.

GAS COMPANY

Representatives of the Gas Company were consulted and they agreed to shut down all commercial flow of natural gas into the area. Plans were made to begin excavation East and West of the incident on 3rd Street to shut down the pipeline at the North side of 3rd Street, which fed gas to the area. The Gas Company also drew samples of the vapors for testing by their laboratory.

A.Q.M.D.

A representative of the Hazardous Materials unit of the A.Q.M.D. on scene, volunteered to draw samples for testing in their lab in El Monte.

McFARLAND ENERGY INCORPORATED

A representative of the McFarland Company arrived on scene and volunteered to shut down their oil producing facility, North East of the incident. This facility has 34 oil producing wells in active production. This representative provided valuable insight into the geologic history of the area, describing the many oil wells that had ceased production and been capped through the years and that lay beneath the surface of this area of the city.

COMMERCIAL NATURAL GAS VERSUS "NATURAL" METHANE

With the expanding information available at the Command Post, it was becoming apparent to the IC that the potential now existed that the source of the vapors might be related to the former oil field lying beneath the surface; and, that naturally occurring methane, rather than commercially produced pipeline natural gas, might be the cause.

Requests were made to OCD to respond LAFD Fire Prevention Personnel with former oil field maps of the area and any other pertinent documentation that could be obtained.

The "Key" to the problem now lay in the chemical analysis of the vapors and the Command Post continued to press for the resolution of these tests.

VAPOR ANALYSIS AND IDENTIFICATION

The most sophisticated vapor analysis equipment on scene belonged to the Hazardous Materials Unit from the L.A. County Fire Department, Squad 87. However, this equipment could not positively identify the gas or differentiate between natural methane and

commercially produced natural gas.

CHEMICAL COMPOSITION
Since both gases are extremely similar in chemical composition, only sophisticated laboratory analysis, which can detect the mercaptans (odorizers) and trace elements of helium in commercially produced natural gas, can differentiate between them.

LABORATORY TESTS
The laboratory tests performed by the AQMD laboratory had to be performed twice due to a poorly drawn first sample, and ultimately their tests proved inconclusive. Finally, at some time after midnight the gas companies laboratory produced conclusive tests that identified the vapors as "naturally occurring methane gas".

COMMERCIAL GAS SHUT DOWN
At approximately 0300 hours on 3-25-85, field crews from the Southern California Gas Company secured the flow of natural gas into the area. There was no discernible diminishment in the rate of burning vapors at the incident.
It was now obvious that an unknown source of natural methane below 3rd Street and Ogden Drive was responsible for the flow of gas.

RELIEF COMPANIES
By 1900 hours on 3-24-85, approximately 4 hours after the explosion, all companies initially involved in the incident had been relieved and 3 Task Forces and a relief Squad Company had been brought in for relief.

EXPANDED PERIMETER
The "Exclusionary Perimeter" for this incident (no unauthorized vehicular or pedestrian traffic) had by now been expanded to 1st Street on the North, Colgate Ave. on the South, Fairfax on the West, and Gardner Street on the East. This included all commercial occupancies in the area, including Farmer's Market and the Hancock Elementary School. The area included no residential type occupancies, although it bordered on the "Park La Brea Towers" complex at the South/East perimeter.

AFTERMATH
Relief crews continued to rotate into the incident and a "monitoring circuit" was established that provided for testing of flammable vapors at pre-selected locations on a regularly scheduled basis.

PLANNING MEETING
A "Planning and Strategy Meeting" was held at 1000 hours on 3-25-85, at Fire Station 27 where all interested parties met to determine an immediate course of action, under the direction of Deputy Chief D. Anthony, Bureau Commander, Bureau of Fire Suppression and Rescue, LAFD.
As a result of this meeting, drilling operations were begun in front of the Ross store to relieve the gas, using personnel from the County Flood Control and drilling equipment loaned by McFarland Engineering, Inc.

This procedure was successful and by Thursday, 3-28-85, the area

was re-occupied, although monitoring of the area continues and vehicular traffic on 3rd Street between Gardner Street and Fairfax Ave. continues closed as of this writing (3-31-85).

INCIDENT COMMAND SYSTEM

This incident progressed very rapidly through multiple stages of "explosion and fire", "multi-casualty" and "hazardous materials" incidents.

The incident command system was implemented early, but was not broadly expanded in any of it's phases as the demands of the incident did not require it.

A Medical Division was established early also, and was just building in momentum when it ran out of patients. A total of 14 patients were treated and transported within the first half hour of the incident. While a search of the partially collapsed portion of the building continued for several hours, no additional victims were found.

LESSONS LEARNED

This incident was unique as to it's cause; and, the specific source of the methane gas that precipitated the explosion is still not known with certainty.

The impact of this incident reaches far beyond the destruction and injuries associated with it and has stimulated an investigation of all similar locations where former oil fields lie beneath the surface of developed and built upon areas.

Given the nature of this incident, and the potential for widespread destruction, it is truly fortunate that no lives were lost. The actions of the first arriving companies were swift and effective and quickly addressed the needs of the injured and the containment and control of the associated fire, The following comments are offered constructively with regard to this incident's initial operations:

1. PRIOR KNOWLEDGE OF UNIQUE GEOLOGIC CHARACTERISTICS

Sometime after this incident was well under control, Battalion 5 had the opportunity to discuss the recent history of the affected area with the first-in officer. The Task Force Commander of Truck and Engine 61, in whose first-in district the incident lay, shared his recent knowledge of the area with regard to geologic disturbances. This officer, who had been assigned to this district for almost 5 years, recounted a history of responses to "water seepages", "odors of gas" and related incidents in the area. None had produced an incident of any significance; but, taken in their totality, they constituted a pattern of recent geologic disturbance. None of this recent experience was known to Battalion 5, prior to this incident.

The point to be made here is that, throughout our city of over 464 square miles, there exists many geologic and geographic manifestations which are known only to those members who have worked in the districts wherein they are located. Many of these areas do not meet the criteria for the "Building Inventory

Program" nor are they made known generally throughout the Department in other ways.

An example of this would be the "Bronson Rock Quarry" in my own Battalion. In recent years there has been an increase in hikers stranded on the rocky cliffs surrounding this unique man-made geologic formation, which lies just North of Fire Station 82 in Griffith Park. While Department units unfamiliar with this area could undoubtedly "handle" a rescue in this location; assigned units are advantaged by prior knowledge of this area and it's unique accesses, and have developed pre-planned techniques to deal with these incidents.

There are certainly many other examples of "unique locations" throughout the city. A general sharing of knowledge regarding these locations, though special bulletins or other forms of communication could enhance the service our department provides the public.

One last comment in this regard; the "incident response modifications" currently under study at the Bureau level call for replacing the Battalion Chief with the "first-in Light Force" on flood investigations. Had this policy been in place at the time of the flood investigation at the K-Mart store, prior to the explosion, the officer in charge would have had background information he could have related to the incident and which was not known to Battalion 5.
Because of the prior response to the K-Mart store, the IC did react more swiftly to the widening area of hazard than would probably have occurred otherwise. This incident was never assumed to be just a "localized piped-gas explosion" and steps were taken very early in the incident to monitor and evacuate the surrounding areas.

2. COMMAND POST LOCATION
The Command Post location selected for this incident was an appropriate one had this been a "normal" incident. However, with the benefit of hindsight, it can be said that the Command Post would have been better located on the North side of 3rd Street. Had this been done, the Command Post would have only been relocated once more, rather than twice.

In fact, the Command Post was established initially in the K-Mart parking lot on the West side of Ogden Drive, just Northwest of the incident. This location gave the IC good line of sight to both the front (3rd Street) and West side (Ogden Drive) of the Fire. Unfortunately, it also placed the Command Post directly within the area of a hazardous methane gas concentration. This, of course, was not known at the time. This location also placed the Command Post in the vicinity of many "walking wounded", concerned shoppers and store managers who attempted verbal communications with the Incident Commander.

I would hope that given another similar incident, the Command Post would be located more remote from the major field of activity.

3. "DOCUMENTATION" OF INCIDENT

Many of the chronological events described in the above narrative are approximate relative to time. This is particularly true of the "active" phase of the incident. However, it also applies to the "aftermath", which saw relief companies rotated through the scene for a period of days. Where time intervals are considered "critical" some can be documented from the "tapes" at OCD. This is, however, time consuming and a more efficient approach would be to emphasize with Chief's Aides the desirability of "logging" times with regard to arriving companies, requests for resources and other significant events or occurrences relative to an incident.

Also, at one time members of the Training Section were available to respond to major incidents as a "documentation unit". There was no such member assigned to this incident with this function.

4. RESPONSE OF MOBILE LAB

The Mobile Lab, although requested by Battalion 5 on the initial dispatch, did not arrive on scene until approximately one and one half hours later. Given that this was a weekend (Sunday) and the assigned inspector had to respond from his home in the West Valley, this response time was probably not unreasonable. Nonetheless, as a prompt emergency resource this time frame of response is less than ideal.

The Los Angles County Fire Department's "Hazardous Material Response Unit" (Squad 87) was called to this incident by the County Battalion Chief on scene (Battalion Chief Ryland, Battalion 1 "B") and arrived well before the Mobile Lab and provided valuable assistance in the monitoring of gas levels. In my judgement, this unit is, in many ways, superior to the resources our Department currently deploys in this area; i.e., staffing level, sophistication of equipment and degree of training and expertise.

I am advised that plans have been developed to expand and improve the services provided by the Mobile Lab and hope that they may be implemented soon to provide a more timely and efficient resource in incidents of this type.

Richard W. Baker, Commander
Battalion 5, "B" Platoon

City of Los Angeles

FT-113 (12-80) DEPARTMENT OF FIRE

ANALYSIS OF EMERGENCY OPERATIONS

LOCATION	DATE:	TIME:	PLATOON
Third Street and Ogden	032485	1649	☐ A ☒ B ☐ C
TYPE OF OCCUPANCY	**OCCUPANCY CODE**		**ESTIMATED LOSS**
Commercial	521		$400,000.00

COMPANIES AND CHIEF OFFICERS RESPONDING

SUPPLEMENTARY REPORT - MEDICAL DIVISION ANALYSIS

STRUCTURE ☒	BRUSH ☐	OTHER ☐	MORE THAN 10 COMPANIES WORKING ☒	CODE 20 ☒	FORMAL CRITIQUE ☐	INFORMAL CRITIQUE ☒

EVALUATION OF OPERATIONS SUGGESTED AREAS FOR IMPROVING FUTURE OPERATIONS/LESSONS LEARNED.

ACTIONS TAKEN:

At 1649 hours, EMS 5 was dispatched to a reported explosion at 3rd. and Ogden. Upon my arrival at the command post, I was assigned the Medical Division with Battalion 18, Chief Varney. Our initial command post was established on Ogden, South of 3rd. street. The command post was subsequenly moved to 3rd. Street in front of the Ross Department Store. A total of 14 patients were treated and transported to various hospitals. An additional 7 walked into Cedars on their own, not having been treated on the scene. The Chief Paramedic, a Battalion Commander, 2 Senior Paramedics, 1 Task Force, 8 Fire Department Rescue Ambulances, 2 Private ambulances, and a County Fire Department Squad comprised the Medical Division.

Upon my arrival at the Division I command post, I was directed to establish a Medical Division with Battalion 18 on Ogden, South of 3rd. where Rescues 27 and 68 were on scene. Rescue 68 advised me that they had established radio communications with the Medical Alert Centre, and were obtaining hospital status. I was also informed that the total number of patients was was unknown at this time. Rescue 27 had one critical burn in their apparatus and transported at this time.

At this time, the Chief Paramedic arrived at the command post and informed me that a large number of patients were presenting on 3rd. Street in front of the involved structure. The medical command post was then moved to the 3rd. Street location.

Upon my arrival at 3rd. Street, I discovered that County Squad 8 and Rescue 13 were on scene communicating with M.A.C.. Paramedic III Terrazas, Rescue 13, gave me a brief size-up, indicating that hospital bed status had been confirmed. He and the Paramedic Fireman from County Squad 8 indicated

(SEE PAGE 2)

NAME:	RANK:	ASSIGN:	DATE
A.N. NORMAN	Senior Paramedic I	EMS 5 "B"	040485

DIST: COMMANDER — BUREAU OF FIRE SUPPRESSION, THROUGH CHANNELS (ORIGINAL)
COMMANDER — BUREAU OF FIRE PREVENTION, THROUGH CHANNELS (DUPLICATE)
COMMANDER — TRAINING SECTION, THROUGH CHANNELS (TRIPLICATE)

F-113 (12-80)

City of Los Angeles
DEPARTMENT OF FIRE

ANALYSIS OF EMERGENCY OPERATIONS

LOCATION	DATE	TIME	PLATOON
6298 W. 3rd St. Los Angeles, Ca. 90036	032485	1647 hrs	☐ A ☒ B ☐ C

TYPE OF OCCUPANCY	OCCUPANCY CODE	ESTIMATED LOSS
Retail Clothing Store	521	$400,000.00

COMPANIES AND CHIEF OFFICERS RESPONDING

SUPPLEMENTARY REPORT - FIRE PREVENTION ANALYSIS

STRUCTURE	BRUSH	OTHER	MORE THAN 10 COMPANIES	CODE 20	FORMAL CRITIQUE	INFORMAL CRITIQUE
☒	☐	☐	☒	☒	☐	☒

EVALUATION OF OPERATIONS SUGGESTED AREAS FOR IMPROVING FUTURE OPERATIONS/ LESSONS LEARNED.

1. The last inspection noted on the F-173 card was on August 15, 1983. According to the F-173 card, this occupancy was still the "Market Basket" grocery store. This is currently in the "C" Platoon area of fire prevention responsibility. The "B" Platoon engine company responded to a rescue call inside the building in the employee lounge in early 1984. This building was known as "Plumbs" at that time (also a discount clothing store). The "B" Platoon has not been in the building since it became the "Ross Dress For Less" store during the summer of 1984.
2. Having no recent inspection, it is not possible to say whether or not there were any fire code violations at the time of this incident Given the nature of this incident however, fire code violations, if any existed, were not likely a factor.
3. No notices were written.
4. There were no outstanding notices.
5. No Fire Code violations contributed to this fire.
6. No fires had occurred at this location in the past.
7. With the information on hand at the present time, this fire could not have been prevented.
8. Fire or smoke detectors would have had no effect on the extension of this explosion and fire.

NAME	RANK	ASSIGN	DATE
Donald S. Dodd	Firefighter II	FS 61, "B"	032685

DIST: COMMANDER — BUREAU OF FIRE SUPPRESSION THROUGH CHANNELS ORIGINAL
COMMANDER — BUREAU OF FIRE PREVENTION THROUGH CHANNELS DUPLICATE
[illegible] — TRAINING SECTION THROUGH CHANNELS DUPLICATE

that Shaeffer's 43 and 48 had transported 3 critical burn victims prior to my arrival.

Task Force 29 was assigned to the Medical Division and assisted in patient treatment. EMS I arrived on scene and was assigned the Transportation Control Officer posistion. Rescue 13 remained as Communications Leader, and Rescue 10 was designated as Treatment Control Officer.

The following EMS Units transported from the scene.

EMS UNIT	HOSPITAL	PATIENTS AND COMPLAINT
RA 27	Cedars	Female Critical Burn
RA 68	Hwd. Pres.	Female Chest Pain Male Facial Lacs.
RA 20	Cedars	2 Female Back Pain Male Knee Pain Female Abdom. Pain
RA 11	Brotman	Female Minor Burns
SHAEFFER 43	Brotman	Female Critical Burn
SHAEFFER 48	Brotman	Male, Female Crit. Burn
RA 37	UCLA	Female Hip Pain, Male With Eye Debris
RA 34	Cedars	Male Head Lacs.

PROBLEMS ENCOUNTERED:

1. It was not communicated that a Medical Division had been established on Ogden, South of 3rd.

2. It was not initially communicated to Battalion 18 and EMS 5 that a great number of casualties were presenting on 3rd Street in front of the building.

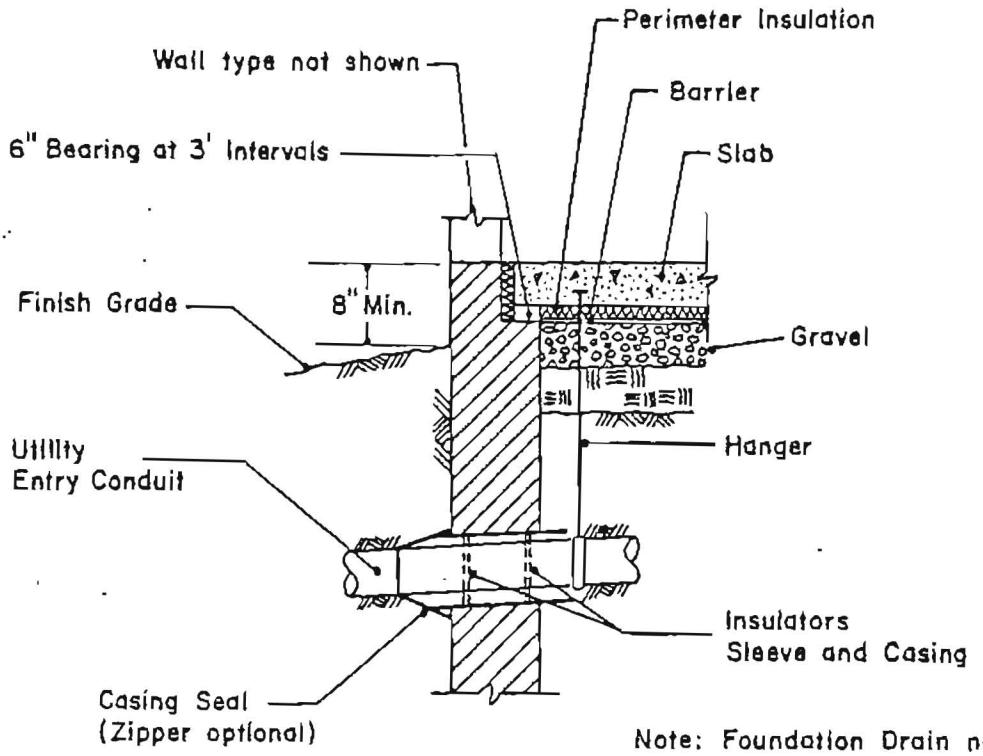
LESSONS LEARNED/ PLAN FOR IMPROVEMENT:

1. All medical operations must be directed through 1 Transportation Control Officer.

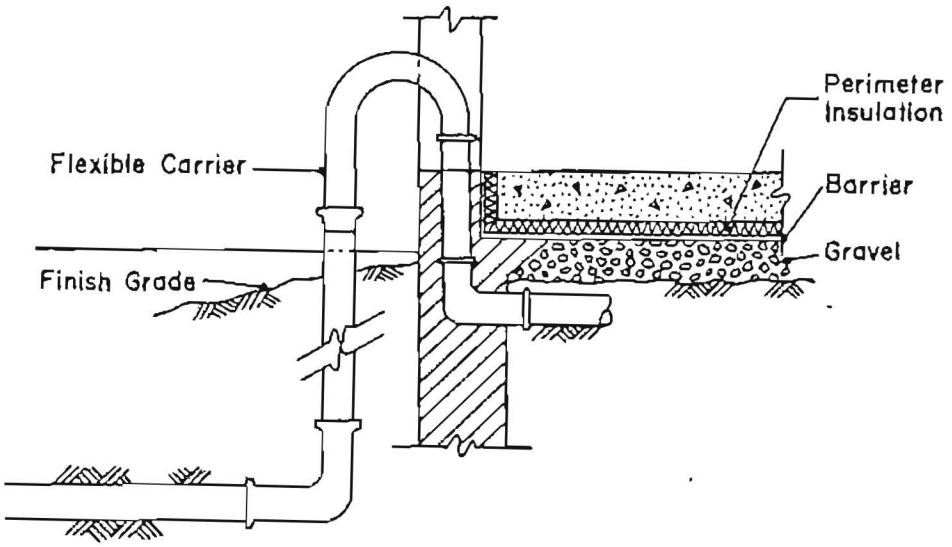
2. All incoming Rescues should be directed to report to Ambulance staging.

3. EMS members must wear their helmets for I.D. and safety.

4. If the injuries were of a greater magnitude, it would have been necessary to designate a Medical Supply Officer to insure that members had sufficient resources.



SLEEVED ENTRY



FLEXIBLE ENTRY

DESIGN EXAMPLE
ENTRY CONDUITS

Plate 9

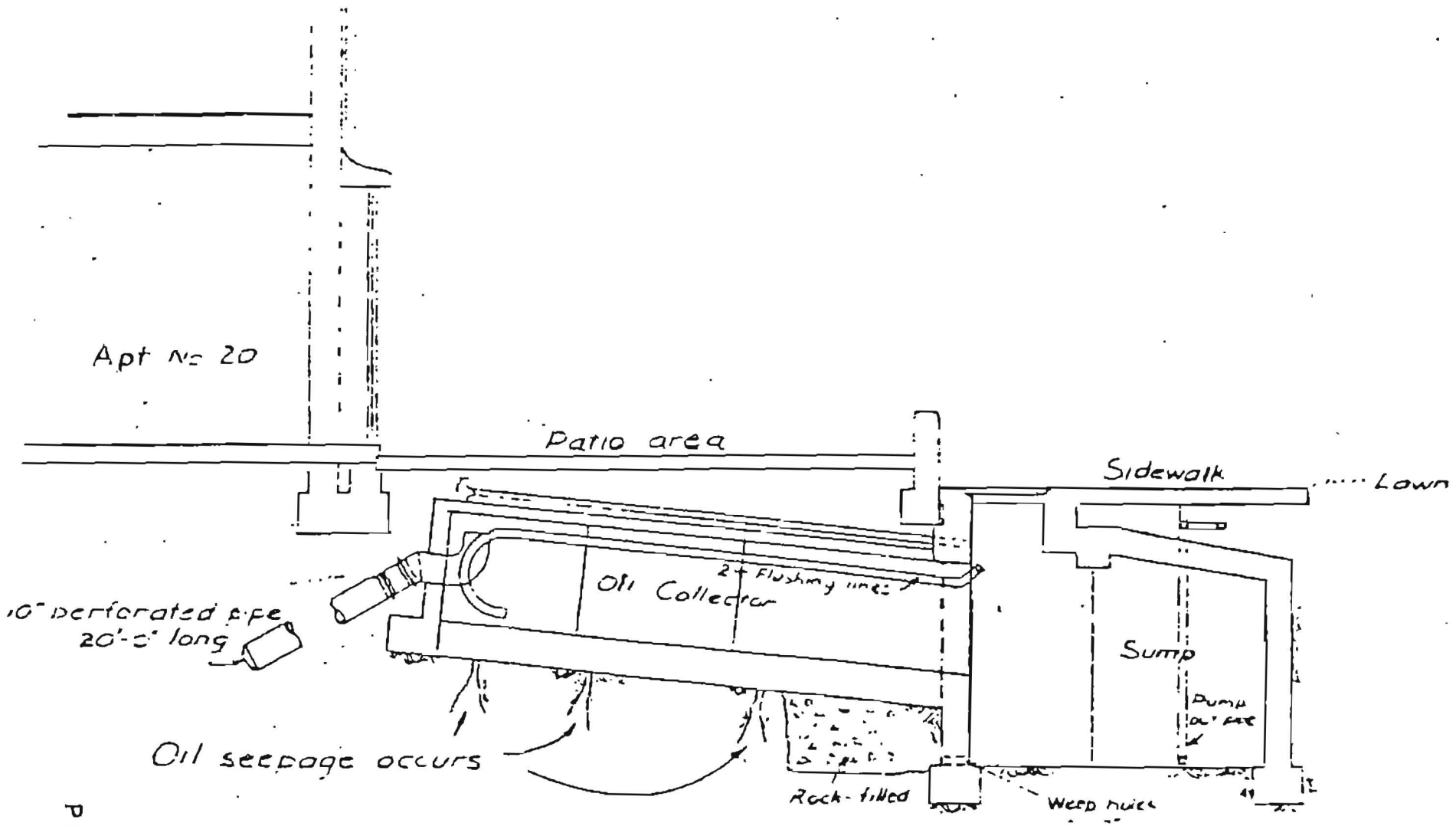


Plate 10

Oil Sump Device