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ENVIRONMENTAL OPERATIONS AND MONITORING PLAN

**BAY CENTER OFFICES
6425-6475 CHRISTIE AVENUE
EMERYVILLE, CALIFORNIA**

Prepared for:

BAY CENTER INVESTOR LLC

October 2007

ENVIRONMENTAL OPERATIONS AND MONITORING PLAN

**BAY CENTER OFFICES
6425-6475 CHRISTIE AVENUE
EMERYVILLE, CALIFORNIA**

Prepared for:

**BAY CENTER INVESTOR LLC
C/O 2200 POWELL STREET, SUITE 210
EMERYVILLE, CALIFORNIA 94608**

Prepared by:

**STELLAR ENVIRONMENTAL SOLUTIONS, INC.
2198 SIXTH STREET
BERKELEY, CALIFORNIA 94710**

October 9, 2007

October 9, 2007

Ms. Sarah Irving
Bay Center Investor LLC
2200 Powell Street, Suite 210
Emeryville, CA 94608

Subject: Environmental Documentation, Monitoring and Operations Plan
6425-6475 Christie Avenue, Emeryville, California

Dear Ms. Irving:

This report is being provided to Bay Center Investor LLC and Harvest Properties as a summary of the current environmental monitoring and remediation activities at the Bay Center Offices and Emeryville Bay Apartment parking garage. The report provides an overview of environmental issues for prospective tenants, and documents current restrictions and future monitoring requirements to assist building maintenance and engineering personnel. Information is presented on air, soil, and groundwater restrictions; monitoring; and equipment maintenance (where applicable). The report also contains a brief assessment of the current potential pathways of exposure. Information summarized in this report is from previous historical environmental documents that have been approved by the historic lead regulatory agency (Alameda County Health Care Services Agency, Hazardous Materials Unit) and the current lead agency (Alameda County Department of Environmental Health).

We declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of our knowledge. Please call the undersigned at (510) 644-3123 if you have any questions.

Sincerely,



Teal Glass, R.E.A.
Senior Environmental Scientist



Richard Makdisi, R.G., R.E.A.
Principal



TABLE OF CONTENTS

Section	Page
1.0 INTRODUCTION.....	1
Project Description.....	1
Purpose and Scope of Work.....	1
2.0 SUBJECT PROPERTY DESCRIPTION AND HISTORY.....	3
Subject Property Description	3
Subject Property Environmental History	7
Regulatory History.....	8
3.0 METHANE AIR QUALITY MONITORING.....	10
Introduction.....	10
Methane Monitoring Locations.....	10
System Design and Maintenance	12
Current Methane Monitoring Schedule.....	13
4.0 EARTHWORK RESTRICTIONS AND MONITORING.....	14
Introduction.....	14
Subgrade Construction or Maintenance	14
Asphalt Cap Maintenance	15
5.0 GROUNDWATER MONITORING AND REMEDIATION	17
Introduction and Background.....	17
Monitoring Schedule and Maintenance	19
6.0 EXPOSURE PATHWAYS AND RISK CRITERIA.....	20
Lead in soil.....	20
Methane in air	20
Petroleum Hydrocarbons in groundwater	22
7.0 LIMITATIONS	23
8.0 REFERENCES.....	24

APPENDICES

Appendix A	Environmental Deed Restriction
Appendix B	Monitoring Schedule
Appendix C	Soil Safety and Operations Plan
Appendix D	Quarterly Cap Maintenance Logs and Annual Inspection Reports
Appendix E	Methane System Operations Manuals, Monitoring Locations, and Monitoring Reports
Appendix F	Groundwater Monitoring Well Diagram
Appendix G	Contacts

TABLES AND FIGURES

Table		Page
Table 1	Exposure Pathways and Risk Criteria.....	21

Figure		Page
Figure 1	Site Location Map.....	4
Figure 2	Site Plan and Adjacent Land Use.....	5
Figure 3	Subject Property Boundary	6
Figure 4	Monitoring Locations.....	11
Figure 5	Petroleum Plume Location.....	18

1.0 INTRODUCTION

PROJECT DESCRIPTION

Stellar Environmental Solutions, Inc. (SES) was retained by Bay Center Investor LLC to complete this report summarizing environmental issues for prospective tenants and documenting current restrictions and future monitoring activities to assist building maintenance and engineering personnel. This report includes information on air, soil and groundwater restrictions; monitoring; and equipment maintenance (where applicable). This report also covers all of the elements of environmental monitoring currently being conducted on site. The foundation document for the monitoring requirements was designed and codified in the deed restriction before the office building was constructed in 1987.

During a broad-based site investigation in 1985/1986, several potential chemicals of concern were identified: methane in soil-gas, heavy metals in soil, and petroleum hydrocarbons in groundwater. The remedies and post-remedy monitoring were designed to address these concerns and all remedial actions were approved by the regulatory agencies. Several updated reports on monitoring and maintenance, prepared since the construction of the building, outline maintenance, health and safety, and construction issues on various areas of the subject property site. This report summarizes those documents to create one guidance document for use by prospective tenants and building maintenance personnel.

PURPOSE AND SCOPE OF WORK

The objective of this report is to synthesize into one comprehensive guidance document, information on all of the onsite environmental monitoring activities currently being conducted. At this time, three elements of environmental monitoring/maintenance activities are operating at the Bay Center Offices and Bay Center Apartments parking garage. These include: 1) methane monitoring in stairwell, electrical rooms, and elevator pits in the Bay Center Offices; 2) earthwork restrictions and capping of contaminated soil by means of the asphalt parking lot at the Bay Center Offices; and 3) groundwater monitoring and free product extraction in the Bay Center Apartments parking garage.

This guidance document outlines the maintenance procedures, sampling/maintenance schedules, emergency protocols, and tenant requirements agreed on by the subject property owner, in conjunction with the lead regulatory agency for the site, the Alameda County Department of Environmental Health (ACEH).

This report is organized as follows:

- Section 1.0: Project Description and Purpose
- Section 2.0: Environmental Background History and Regulatory Involvement
- Section 3.0: Methane Air Quality System Maintenance and Monitoring
- Section 4.0: Earthwork Restrictions and Monitoring Requirements
- Section 5.0: Groundwater Monitoring and Remediation at the Adjacent Garage
- Section 6.0: Exposure Pathways and Risk Criteria
- Section 7.0: Limitation
- Section 8.0: References

2.0 SUBJECT PROPERTY DESCRIPTION AND HISTORY

This section describes the subject property and discusses the current and historical environmental issues. The subject property description and history are based on a previous April 2007 Phase I completed (SES, 2007) and several historical environmental documents (a complete listing is included in Section 8.0).

SUBJECT PROPERTY DESCRIPTION

Figure 1 is an aerial photograph showing the general location of the subject property. Figure 2 shows the subject property and adjacent land uses. Figure 3 presents the subject property site layout.

The property is located at 6425-6475 Christie Avenue (Assessor Parcel Numbers 049-1491-004, 049-1491-007, 049-1491-008, and 049-1491-011), on the west side of the street, with parking fronting Interstate Highway 80 (I-80), in Emeryville, Alameda County, California. The property encompasses approximately 7.6 acres, and is improved by three office buildings (with a total area of 327,750 square feet). The remainder of the subject property is covered with asphalt parking lots, hardscape, and landscaping.

The subject property is located adjacent to San Francisco Bay in western Emeryville, and the Bay Center office buildings are located on a historical shellmound above the relatively flat area to the immediate east and south. As Emeryville expanded, the tidal flats adjacent to the San Francisco Bay were filled, often with construction-type debris. The current I-80 that fronts the subject property to the west is on fill that sits over original tidal flats. The Bay Center Offices and the adjacent Bay Center Apartments were developed in approximately 1987 and 1989 respectively. The site gradient is relatively flat, with a gently sloping east and west region. The mean elevation of the property is about 13 feet above mean sea level (amsl). The site is on partial fill and alluvial sediments (silt, sand, and clay) overlying bedrock at an uncertain depth. The site is located approximately 700 feet east of the San Francisco Bay, and about 2.5 miles west of the Oakland hills that rise to approximately 1,000 feet amsl. Rainwater runoff drains onto the asphalt parking lot, from where it is conveyed to the municipal storm sewer system, and subsequently discharged untreated into San Francisco Bay.



Image courtesy of the U.S. Geological Survey



SITE LOCATION ON AERIAL PHOTO

6425-6475 Christie Ave.
Emeryville, CA

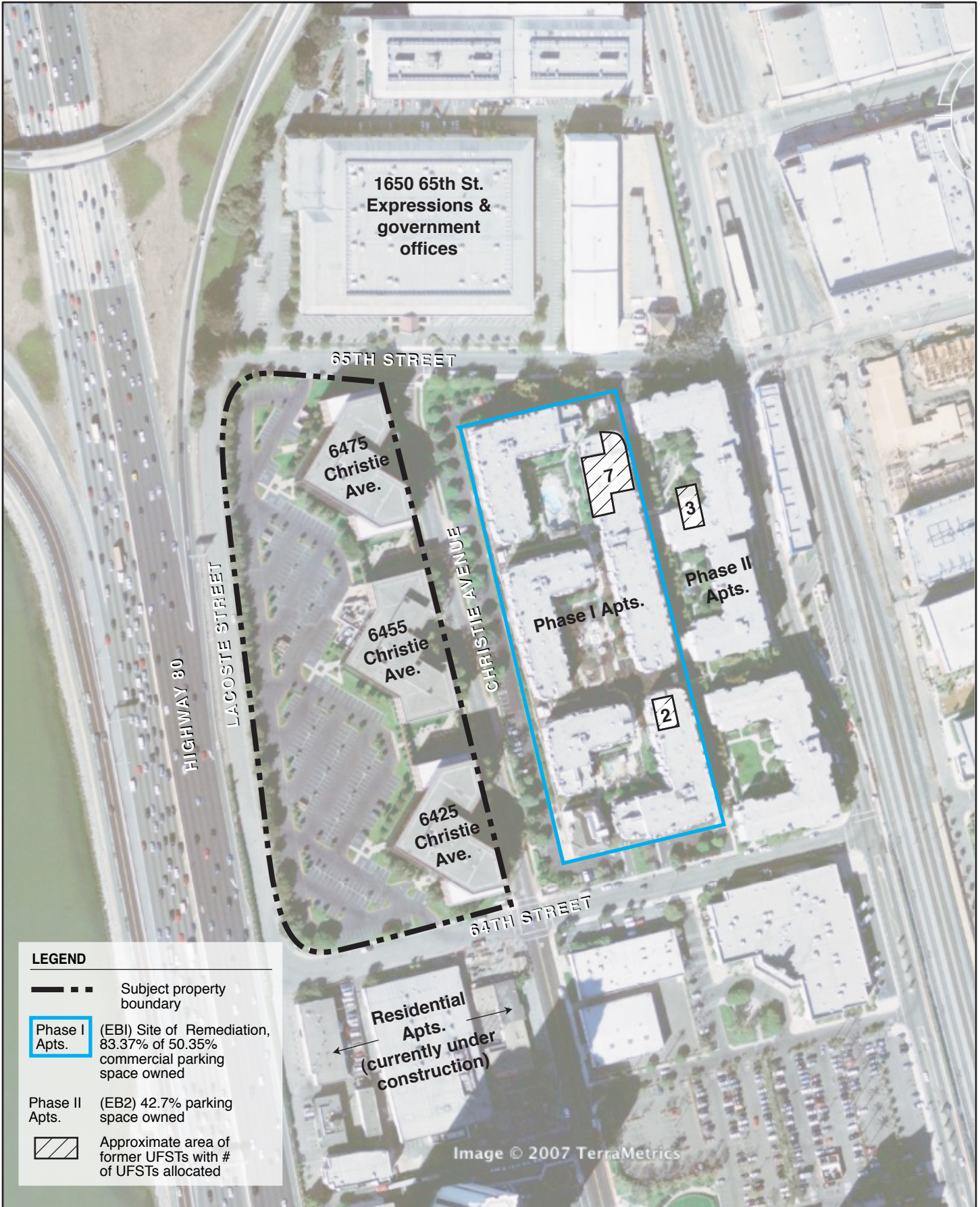
By: MJC

APRIL 2007

Figure 1



2007-19-01



SITE MAP AND ADJACENT LAND USE

6425-6475 Christie Ave.
Emeryville, CA

By: MJC

APRIL 2007

Figure 2





SITE MAP AND ADJACENT LAND USE

6425-6475 Christie Ave.
Emeryville, CA

By: MJC

APRIL 2007

Figure 3



2007-19-03

The Bay Center Offices property also utilizes the adjacent parking structure and retains 83.3 percent ownership of 50.35 percent of the commercial section of the ground-floor garage (and 42 percent of the joint parking area not under remediation). These percentages correspond to the share in the fiscal responsibility to complete site cleanup activities associated with an active underground fuel storage tank (UFST) site in the parking structure area. The lead regulatory agency providing oversight of the active cleanup and monitoring project is ACEH.

SUBJECT PROPERTY ENVIRONMENTAL HISTORY

The subject property parcel was developed as early as 1958 with the Motor Freight Station associated with Delta Lines, Inc. The Delta Lines, Inc. company complex contained another structure, the “Oil and Gas” building, at the location of the present-day Phase I Apartment complexes across Christie Avenue and to the east. This building continued to occupy the subject property when the Garrett Freight Lines Company’s building was constructed on the southern end of the subject property in approximately 1967. The two buildings remained on the property until 1986, when they were demolished to build the present-day structures. Twelve UFSTs containing diesel and gasoline were removed from the Phase I Emeryville Bay Apartment complex parcel in 1987. Contaminated soil and groundwater was discovered during the UFST excavation. Remediation began in 1991, and the system is currently operating toward full remediation. Surrounding areas were in industrial use from the 1900s to the late 1980s. Land use in the area has changed, and continues to change, from industrial to commercial and residential.

The Bay Center Offices utilizes the adjacent parking structure and retains part ownership of the commercial section of the ground-floor of the garage. Subsurface contamination beneath the garage, discovered during construction activities, originated from the trucking terminal that was operated by the Garrett Freight Lines Company and Delta Lines, Inc. and existed at the site of the Bay Center Apartments before its development in the late 1980s. In response to the contamination, a groundwater pump and treat system was installed in 1990 and replaced in 2006. Several monitoring wells were subsequently installed to monitor contaminant concentrations in groundwater. Remediation is currently ongoing. Monitoring well locations, extraction systems, and sampling schedules are discussed in Section 5.0; and Figure 5 (in Section 5.0) shows the location of the petroleum plume. Exposure pathways, symptoms, and toxicity levels for petroleum hydrocarbons and daughter products are addressed in Section 6.0.

In the late 1980s, high concentrations of lead were discovered in soil during construction activities of the Bay Center Offices. To remedy the problem, all exposed soil was covered with an asphalt cap. Landscaped areas were not to be in direct contact with the contaminated soil at ground level, and were placed in raised beds or planters using uncontaminated loam fill. An

earthwork safety plan was developed concerning construction activities around the contaminated soil (Earth Metrics, 1987a); this plan was reviewed and placed on file with the ACEH, and is considered the basic protocol for all subsurface activity on the subject property. In 2007, the safety plan was also utilized by PES Environmental, Inc. (PES) to address the encroachment of the cap during recent construction activities. Cap maintenance protocols, as well as earthwork management, are discussed in Section 4.0. Exposure pathways, symptoms, and toxicity levels for lead are addressed in Section 6.0.

Relatively high levels of methane gas (often associated with areas of landfilling of organic waste) were found—on both the Bay Center Office Complex site and the Emeryville Bay Apartment sites. Based on the elevated methane levels, ACEH required active methane monitoring systems and venting mechanisms for any subgrade “pits.” Such pits are required to be sealed off from contaminated soil if these systems are not in place. Both the Phase I and Phase II Apartment complexes contain methane alert systems in the elevator pit areas of the parking garage; however, these pits are not a part of the required monitoring for the Bay Center Offices. Each of the three Bay Center Offices office buildings has a methane monitoring device in the elevator pit, electrical room, north stairs, and south stairs. Both of these buildings have active ventilation systems to support the methane systems. Maintenance, alert systems, and inspection schedules are discussed in Section 3.0. Exposure pathways, symptoms, and toxicity levels for methane are addressed in Section 6.0.

REGULATORY HISTORY

A letter from Alameda County Health Care Services, Hazardous Materials Division to the Martin Company (i.e., the historical owner) indicates that this agency was involved from the beginning of construction on the Bay Center Offices site (Alameda County Health, 1986). This letter requested further soil characterization, health and safety plans for contaminated soil, gas well installation to monitor methane levels, and remedial options for characterized contamination. Subsequent letters from the Martin Company to Alameda County Health Care Services Agency, Hazardous Materials Division indicate that workplans were developed for contaminated soil, and that methane systems were installed due to high accumulations of methane in gas wells (Martin Company, 1986a and 1986b). The parking area was covered with 18 inches of fill soil and asphalt to encapsulate contaminated soil (Martin Company, 1987a). A deed restriction was recorded in 1990 for both the Bay Center Offices Complex and the Emeryville Bay Apartments.

Twelve UFSTs were removed from the Emeryville Bay Apartments site in the late 1980s. Treatment systems and monitoring wells were originally installed at the Emeryville Bay Apartments in 1990 to satisfy requirements for wastewater and air discharge permits by the East Bay Municipal Utilities District (EBMUD) and Bay Area Air Quality Management District. Subsequent monitoring event reports were submitted to EBMUD as a condition of the permit

until construction was complete in approximately 1992. Groundwater monitoring and extraction resumed in 2004 after it was recommended in a 2004 Phase I Site Assessment (LFR, 2004).

There is a lack of documented correspondence regarding the 1990 deed restriction between owners and the Alameda County Health Care Services, Hazardous Materials Division—until a 2007 letter notifying ACEH of the subsurface work for the Jamba Juice Pit (PES, 2007b). In 2007, SES contacted Mr. Barney Chang, the then current case officer with ACEH, regarding the possibility of modifying the deed restriction to exclude the Emeryville Bay Apartments. (As of the date of this report, the case manager for the subject property is currently being reassigned). However, more information (including an upload of all technical environmental documentation to the State Water Resources Control Board's GeoTracker website) was requested by ACEH in June 2007. The Bay Center Offices and Emeryville Bay Apartments are currently combined, with one site identification number—RO0002799 and Global ID SLT2O05561 under the Garrett Freight Lines/Bay Center, 64th & Lacoste, Emeryville, CA 94608. As of August 2007 Mr. Barney Chang of ACEH is no longer the case officer for the subject property and the subject property is to be reassigned to another case officer.

3.0 METHANE AIR QUALITY MONITORING

INTRODUCTION

As discussed in Section 2.0, the subject property is located on an area that had been filled to increase the shoreline. Fill materials often consisted of off-site soils, wood, refuse, and construction debris.

As such materials naturally degrade, methane is produced, sometimes at levels considered harmful for humans or that pose a potential for ignition. Methane enters the body through inhalation, and can therefore be mitigated through engineering controls such as asphalt parking lots and building slabs.

To ensure that levels of methane do not reach a level of concern at the subject property, methane monitoring systems were installed in below-ground areas or areas that have access to below-ground systems (such as electrical rooms). Section 6.0 discusses toxic exposure levels and pathways of exposure for methane.

METHANE MONITORING LOCATIONS

As discussed in Section 2.0, four monitoring locations were established for each of the Bay Center Offices: the north stairs, south stairs, elevator pit, and electrical room. See the deed restriction, attached in Appendix A, for the original drawing of monitoring locations (Earth Metrics, 1987b). Appendix E contains the Methane Monitoring descriptions. Each elevator pit in the Phase I and Phase II Emeryville Bay Apartment complexes contains methane monitors; however, the monitoring for these systems is being completed by the owner of the Bay Center Apartment building, and is not the responsibility of the Bay Center Offices or Bay Center Investor LLC.

SES verified each of the Bay Center Office monitoring locations during the site inspection. Figure 4 shows their approximate locations.



2007-53-02



MONITORING LOCATIONS

6425-6475 Christie Ave.
Emeryville, CA

By: MJC

AUGUST 2007

Figure 4



SYSTEM DESIGN AND MAINTENANCE

System Design

The Solvent Vapor Alarm is a warning system for toxic or flammable gases or vapors in a work space. The ambient atmosphere is monitored and, if vapor concentrations exceed a preset level, audible and visual signals are activated. The multi-channel dual level alarm has a provision for up to six independent points of detection, each of which may be independently calibrated for a high- and low-alarm level. All channels maintain the same audible signal and two common alarm relays (for the high and low concentrations), and have a common trouble relay. Appendix E contains system schematics, recommended settings, and instruction manuals per specific model. Currently, the monitors are calibrated to set off the alarm when 10 percent of the lower explosive limit (LEL) for methane is reached, and again if 20 percent of the LEL is reached. The LEL for methane occurs when 5 percent (or 50,000 parts per million [ppm]) of the ambient air is composed of methane gas. This system was approved by the Emeryville Fire Department prior to installation in 1986.

Although the models themselves do not require routine maintenance, such maintenance is recommended to ensure the machines and alarms are working properly. The following is a list of routine tasks and schedules to ensure proper alarm functioning.

Daily

- Verify that amber light is visible (if the amber light is out, the system is not functioning)
- Verify recorder operation

Weekly

- Check for meter reading on zero

Quarterly (recommended by trained staff or personnel)

- With a known calibration gas sample, recheck and reset sensitivity
- Expose detector to combustible gas, and confirm operability of indication and alarm systems

As Required (recommended by trained staff or personnel)

- Readjust zero whenever meter drifts more than 5 percent
- Replace detector whenever it becomes impossible to complete zero or calibration steps

CURRENT METHANE MONITORING SCHEDULE

The onsite engineering staff is conducting methane maintenance on a daily and weekly basis. Quarterly monitoring and system upkeep is being conducted by Thermo Environmental Systems, Inc. Appendix E contains the quarterly monitoring reports. Subsequent monitoring event reports should be added to Appendix E as they are provided. A list of contact names is included in Appendix G.

No methane has been detected above the LEL since the installation of the system.

4.0 EARTHWORK RESTRICTIONS AND MONITORING

High levels of lead were discovered in soil stockpiles during the construction of the Bay Center Offices. The origin of the contamination is unclear, but is most likely due to the historic activities from the Garrett Freight Lines and fill at the site. At the time of the historic activities, the appropriate method of control recommended by the then lead agency, the Alameda County Hazardous Materials Unit, was to cap the soil and prevent exposure. Humans are exposed to toxic levels of lead through digestion and sometimes inhalation. By covering the contaminated soil with at least 18 inches of clean soil fill, and then asphalt, there is no direct contact between the contaminated soils and human interaction. The lead agency also required that native soil not be used in landscaped areas, and that landscape beds (containing clean soil fill) be placed above the asphalt surface. A 1990 deed restriction specifically addressed the high levels of heavy metals, and stated that any future subsurface work first be approved by ACEH. A copy of the deed restriction is included in Appendix A.

INTRODUCTION

A detailed Safety Plan was developed in 1987 (Earth Metrics, 1987a), and approved by the Alameda County Hazardous Materials Unit, to address any future construction work at the Bay Center Offices. The levels of lead in soil are not hazardous with regard to casual encounters; however, they would be hazardous with prolonged exposures (which would occur during maintenance or construction activities). Therefore, the Safety Plan is to be kept onsite by the “responsible person,” which is defined as the building owner or manager, and must be provided to any workers involved in subgrade construction or maintenance activities. A copy of the Safety Plan is included in Appendix C, and its key points are summarized below.

SUBGRADE CONSTRUCTION OR MAINTENANCE

The purpose of the 1987 Safety Plan was to prevent prolonged exposure by maintenance, construction, or inspection workers to lead contaminated soil. Therefore, it is specifically stated that no regulated work may be completed without a review of the Safety Plan by those workers involved. The following activities are considered regulated work:

- **Subsurface Construction or Repair.** This refers to any activity that occurs below grade level of the existing pavement, concrete, or Christie Street.

- **Landscaping Deep Work.** This refers to any landscaping activity below the level of the 18 inches of clean fill.
- **Utility Line Work.** This refers to any subterranean inspection, excavation, or repair of electrical, telephone, water, sanitary sewer, or storm drains that occurs outside the existing vaults.
- **Sub Slab Work.** This refers to any work that takes place beneath the slab of the Bay Center offices, apartments, or parking garage.
- **Major Subsurface Construction.** This refers to any construction or maintenance involving the subgrade level beneath the asphalt, building slab, or concrete walkway, and that continues for 1 month or longer.
- **Other.** This refers to other subgrade activities not expressly listed above—e.g., groundwater well installation.
- **Exemptions.** Exemptions from the Safety Plan include routine landscaping maintenance not involving tree planting or removal of loam.

After determining the applicability of the activity by the responsible person, the following must be completed by the responsible person prior to any regulated activity:

- Per written notification, notify ACEH of the construction activity;
- Per written and oral briefing, notify any contractors or utility workers concerning necessary precautions; and
- At the conclusion of the work, provide written notice of Regulated Work Completion to ACEH.

Each construction activity shall maintain its own Health and Safety Plan (such as that written for the Jamba Juice pit installation in 2006) to specifically address the planned activity. Stockpiled soils should be covered and maintained on site, until sampling may be conducted to assess disposal criteria. The air should be monitored, and dust control methods used to prevent exposure. Appendix B contains a list of activity specific required safety gear and sanitation controls.

ASPHALT CAP MAINTANANCE

Assuming that the existing cap is in good condition, and no cracks are observed, the following maintenance tasks should be followed to ensure the integrity of the cap. All of these activities should be documented in a cap maintenance log, a copy of which is included in Appendix D.

Quarterly

- Maintenance staff should conduct a general walk-through of the Bay Center offices parking area, to ensure that no breaches or cracking have occurred in the asphalt cap; such faults may cause permeation through the cap and inadequate drainage.
- Breaches or cracking should be immediately reported to the responsible person, and repairs should be immediately addressed using the procedures listed above.

Yearly

- Landscaped areas should be topped with clean fill soil.
- The cap should be inspected by trained personnel, and should include documentation of cracking and breaching, as well as the integrity of sloping and grading to ensure proper drainage.

5.0 GROUNDWATER MONITORING AND REMEDIATION

INTRODUCTION AND BACKGROUND

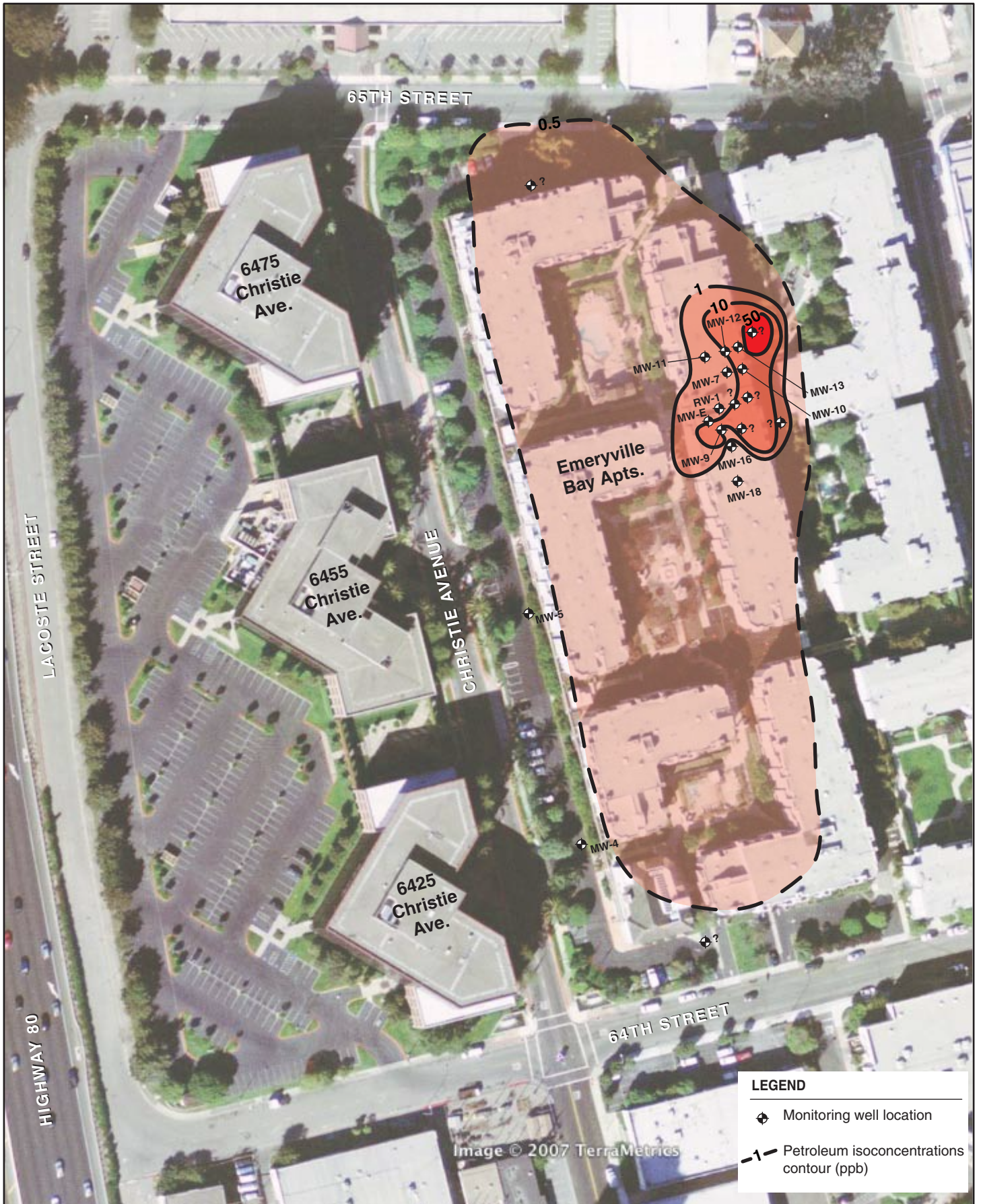
The subsurface contamination underneath the Emeryville Bay Apartment parking garage originated from the operations at a trucking terminal operated by two trucking companies that existed at the site of the Bay Center Apartments before its current development in 1986. Site investigations identified UFSTs in three areas of the trucking terminal. These UFST areas were referred to as Tank Pits A and B (each of which contained one 10,000-gallon diesel tank) and Tank Pit TC-1 (which contained four 12,000-gallon diesel tanks, two 10,000-gallon diesel tanks, and one 6,000-gallon gasoline tank). Seven tanks were originally located on the northern portion of the Phase I Apartment complex property; two tanks were originally located on the southern portion. Three tanks were located on the northern portion of the Phase II Apartment complex property. A total of 12 tanks were removed from the Phase I and Phase II complexes.

Figure 4 presents the approximate locations of the UFSTs. Figure 5 shows the generalized location of the petroleum plume based on the most recent 2006 monitoring data.

In response to the contamination, in 1990, a light non-aqueous phase liquid (LNAPL) groundwater pump and treat system was installed by Groundwater Technology, Inc. However, corrosion and other mechanical problems in 1990 caused the system to fail. Recovery of LNAPL continued manually on RW-1 until 1991; in 1994, the original system was removed.

Subsequently, PES began conducting regularly scheduled manual product removal on the recovery well the same year. PES completed the installation of a new LNAPL system (including three trench areas) from April 18 to May 2, 2006 to enhance the remediation process (PES, 2007a).

In 2004, PES installed an additional 10 groundwater monitoring wells, bringing the current total to 19 monitoring wells and 1 extraction well in the Phase I parking garage area.



2007-553-03



GROUNDWATER PETROLEUM HYDROCARBON PLUME

6425-6475 Christie Ave.
Emeryville, CA

By: MJC

AUGUST 2007

Figure 5



MONITORING SCHEDULE AND MAINTENANCE

The 20 monitoring wells are currently being sampled on a biannual basis per agreement with ACEH. Annual groundwater monitoring reports are required to be uploaded to the State GeoTracker database and are available for public viewing. The monitoring wells themselves do not require maintenance, but are evaluated during each sampling event as to their overall condition.

The LNAPL system is operated approximately every 3 to 4 weeks as needed (PES, 2007a). Any product removed is sampled and properly disposed of in accordance with landfill requirements. The LNAPL system does not require routine maintenance, but its condition is evaluated on a biannual basis.

6.0 EXPOSURE PATHWAYS AND RISK CRITERIA

The primary contaminants of concern at the Bay Center Offices and Emeryville Bay Parking Structure are:

- lead in soil
- methane in ambient air
- total petroleum hydrocarbons as gasoline (TPHg); total petroleum hydrocarbons as diesel (TPHd); total petroleum hydrocarbons as motor oil (TPHmo); methyl tertiary-butyl ether (MTBE); and benzene, toluene, ethyl benzene, and total xylenes (BTEX); all in groundwater

Each of these chemicals and metals exhibit different exposure pathways and have unique toxicity levels based on their inherent characteristics. Table 1 contains a list of these chemicals/metals, along with their primary routes of exposure, exposure characteristics, and toxicity levels. The contaminants are discussed in detail below.

LEAD IN SOIL

The primary routes of exposure to lead—and zinc to a lesser degree—are through the skin and/or by ingestion of particulates. There is little effect from short-term exposure to lead; however, long-term particulate exposure (such as that exhibited during subgrade construction activities) may pose a significant health risk. According to the U.S. Environmental Protection Agency (EPA), ambient air should not exceed 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in an average month. According to the Occupational Safety and Health Administration (OSHA), work place lead levels in air should not exceed 50 $\mu\text{g}/\text{m}^3$, or 30 $\mu\text{g}/\text{m}^3$ in an 8-hour period as the recommended action level. There has been no indication that particulate levels of lead in ambient air have exceeded the recommended levels during construction activities at the subject property.

METHANE IN AIR

Methane levels in soil at the Bay Center Offices site originally were at concentrations of 2,700 to 4,700 ppm, or 10 percent of the LEL. The LEL for methane is 5 percent in ambient air, or 50,000 ppm. Subsequent investigations at the subject property found little material that could create

Table 1
Exposure Pathways and Risk Criteria

Contaminant Name	Exposure Pathways	Exposure Symptoms	Toxicity
Lead	inhalation, ingestion, and dermal contact	decreased libido, depression/mood changes, headache, diminished cognitive performance, diminished hand dexterity, diminished reaction time, dizziness, fatigue, forgetfulness	400 ppm by weight and 1,200 ppm for non-play areas for lead in soil
Methane	inhalation	nausea, vomiting, difficulty breathing, irregular heartbeat, headache, drowsiness, fatigue, dizziness, disorientation, mood swings, tingling sensation, loss of coordination, suffocation, convulsions, unconsciousness, coma	50,000 ppm or 5% of LEL; asphyxiation at 500,000 ppm
TPHd, TPHg, TPHmo	inhalation, ingestion, skin absorption, eye contact	dizziness, drowsiness, headache, nausea, eye irritation	430 mg/L for groundwater
MTBE	inhalation, ingestion, skin and/or eye contact	irritation to nasal passages, vertigo, nausea, headache, dyspnea	1.5 mg/L for groundwater
Xylenes	inhalation, ingestion, skin absorption, skin and/or eye contact	dizziness, excitement, drowsiness, incoordination, staggering gait, eye irritation, nose irritation, throat irritation, corneal vascularization, anorexia, nausea, vomiting, abdominal pain, dermatitis	31 mg/L for groundwater
Ethyl Benzene	inhalation, ingestion, skin and/or eye contact	eye irritation, mucous membrane irritation, headache, dermatitis, narcosis, coma	14 mg/L for groundwater
Toluene	inhalation, skin absorption ingestion, skin and/or eye contact	fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis, photophobia	4.4 mg/L for groundwater
Benzene	inhalation, skin absorption, ingestion, skin and/or eye contact	eye irritation, nose irritation, respiratory system irritation, giddiness, headache, nausea, staggered gait, fatigue, anorexia, lassitude, dermatitis, depression, abdominal pain	6.7 mg/L for groundwater

Notes:

MTBE = methyl tertiary-butyl ether; TPHd = total petroleum hydrocarbons as diesel; TPHg = total petroleum hydrocarbons as gasoline; TPHmo = total petroleum hydrocarbons as motor oil

LEL = lower explosive limit

mg/L = milligrams per liter; ppm = parts per million

Toxicity levels were obtained from the U.S. Environmental Protection Agency.

landfill gas, and emissions were deemed most likely due to petroleum hydrocarbons (see the Petroleum Hydrocarbon and Daughter Product subsection below). However, because the subject property is constructed on known fill material, the gas monitoring and ventilation system was installed as an extra precaution to protect occupants from dangerous accumulations that could create explosion or fire. OSHA has no Permissible Exposure Limit (PEL) for methane because ignition is considered the driving risk factor.

The risk of explosion or fire is considered very unlikely; however, the current ventilation system (located in areas of foundation penetration) circulates the air at a rate of five exchanges per hour. This is sufficient to keep gas accumulation well below 20 percent of the LEL.

PETROLEUM HYDROCARBONS IN GROUNDWATER

A large part of the contaminated soil found beneath the Emeryville Bay Apartments was extracted and disposed of during construction; however, some levels of contamination remain in subsurface groundwater. Figure 5 shows the location of the petroleum plume. The toxicity levels for the chemicals of concern (TPHg, TPHd, TPHmo, MTBE, and BTEX) are applicable for direct contact with the contaminant. The groundwater is located approximately 6 to 11 feet below ground surface, covered by soil and the concrete slab of the building. Direct contact with groundwater will only be applicable for environmental consultant personnel actually sampling the wells and removing free product. Any environmental firm working with groundwater onsite should have their own Health and Safety Plan that discusses the appropriate health and safety measures necessary for working with these contaminants.

The EPA has published Environmental Screening Level (ESL), which are guidelines for indoor air intrusion by chemical vapors. The ESLs determine a level at which further testing of indoor air is required in relation to the contaminants present in groundwater. According to the latest groundwater monitoring data for December 2006, the highest concentrations found for xylenes (3,500 µg/L), ethyl benzene (480 µg/L), toluene (1,100 µg/L), and MTBE (<400) were well below their respective ESLs of 160,000 µg/L, 170,000 µg/L, 380,000 µg/L, and 80,000 µg/L, respectively.

The concentration of benzene in groundwater measuring 18,000 µg/L was above the ESL of 1,800 µg/L; however, this does not pose an issue to the tenants of the Bay Center Offices. The parking area is open air; therefore, the rate of air exchange is much higher than it would be in an interior space. Based on the quantity of time a tenant would spend in the garage area (presumably less than 8 hours), the elevated concentration would not be a concern. There are no levels published comparing petroleum hydrocarbon contamination in groundwater to indoor air intrusion (levels are compared only for soil-gas samples); however, elevated levels should not be a concern for the reasons stated above.

7.0 LIMITATIONS

This report has been prepared for the use of Bay Center Investor LLC and its members, property manager, tenants, and all of their authorized representatives. This summary document did not include any sampling or monitoring of the systems described.

The summaries and documentation presented in this report are based on a review of site-specific documents provided by the property owner and its agents such as historical environmental assessments, monitoring, and communication with regulatory agencies. This report has been prepared in accordance with generally accepted methodologies and standards of practice of the area. The personnel performing this assessment are qualified to perform such investigations and have accurately reported the information available, but cannot attest to the validity of that information. No warranty, expressed or implied, is made as to the findings included in the report.

The findings of this report are valid as of the date of this report. Subject property conditions may change with the passage of time, natural processes, or human intervention, which can invalidate the findings and conclusions presented in this report. As such, this report should be updated as needed with monitoring reports, inspection reports, contact information, and monitoring schedules.

8.0 REFERENCES

- Alameda County Health Care Services Agency (Alameda County Health), 1986. Letter to the Martin Company requesting further site characterization, health and safety plans, and remedial options. May 1.
- Earth Metrics, Inc., 1987a. Safety Plan for Bay Center Offices and Apartments in Emeryville, CA. September 15.
- Earth Metrics, Inc., 1987b. Gas Detection, Alarm, and Ventilation System Safety Manual for Bay Center, Emeryville. December 1.
- Levine-Fricke Recon, Inc. (LFR), 2004. Limited Phase I Environmental Site Assessment, 6400-6475 Christie Avenue, Emeryville, CA. April 20.
- Martin Company, 1986a. Letter to Lowell Miller of Alameda County Health Care Services Agency documenting agreements for the construction workplan involving contaminated soil. June 5.
- Martin Company, 1986b. Letter to Tom Owens of Emeryville Community Developers, Inc. documenting recognized contamination issues. May 21.
- Martin Company, 1986c. Letter to Alameda County Health Care Services Agency, Hazardous Materials Unit regarding agreement to install methane venting systems and detectors. November 3.
- Martin Company, 1987a. Letter to Alameda County Health Care Services Agency, Hazardous Materials Unit asserting that all exposed soil will be covered with asphalt, and that landscaped areas will be covered with 16 to 18 inches of clean soil. March 23.
- Martin Company, 1987b. Letter to Department of Health Services, Toxic Substances Control Division stating that lead-contaminated soil will remain underneath the parking garages, and an environmental restriction will be placed on the property. March 26.

Martin Company, 1987c. Letter to Department of Health Services, Toxic Substances Control Division agreeing to methane ventilation systems, pit liners, and asphalt capping with a deed restriction. March 30.

PES Environmental, Inc. (PES), 2007a. Construction Implementation and Semi-Annual Operations Report. Free-Phase Hydrocarbon Product Remediation System. EmeryBay Commercial Association, Christie Avenue and 64th Street, Emeryville, CA. March 30.

PES Environmental, Inc. (PES), 2007b. Letter notifying Alameda County Department of Environmental Health of the intention to conduct subgrade soil digging for the Jamba Juice Pit. April 10.

Stellar Environmental Solutions, Inc. (SES), 2007. Phase I Environmental Site Assessment, Bay Center Offices, 6425-6575 Christie Avenue, Emeryville, California

APPENDIX A

Environmental Deed Restriction

RECORDED AT THE REQUEST OF:

JS BAY CENTER ASSOCIATES

WHEN RECORDED, RETURN TO:

JS Bay Center Associates
c/o The Martin Group
6475 Christie Avenue, Suite 500
Emeryville, CA 94608

2614/02

NOTICE OF
ENVIRONMENTAL DEVELOPMENT RESTRICTION

The undersigned is the owner of the following described real property in the City of Emeryville, California, County of Alameda, State of California:

Tract One: Parcels 1 and 2 shown on Parcel Map No. 4664, filed December 30, 1985, in Book 159 of Parcel Maps, at Pages 16 and 17, Alameda County Records.

Tract Two: Parcel A as shown on Parcel Map No. 4947, filed February 26, 1987, in Book 165 of Parcel Maps, at Pages 96 and 97, Alameda County Records.

Tract Three: Lot 3 as shown on Tract 5781, filed September 18, 1987, in Map Book 171, at Pages 65 through 79, inclusive, Alameda County Records.

Tract Four:

Sub-Parcel A: Commercial Unit 1, as such unit is defined in and shown on that certain "Condominium Plan for Tract 5781" ("Condominium Plan") attached as Exhibit "A" to and being a part of that certain "Declaration of Covenants, Conditions and Restrictions establishing a plan of condominium ownership for Bay Center" ("Declaration"), executed by Bay Center Associates, a California limited partnership ("Declarant"), recorded October 1, 1987, as Series No. 87-270768, Official Records of Alameda County.

Reserving therefrom a non-exclusive easement, appurtenant to and being part of the residential common area, as such common area is defined in the Declaration and the Condominium Plan, for ingress and egress over, along and across those two portions thereof designated "Non-Exclusive Easement for Ingress and Egress" on the Condominium Plan as shown thereon.

Sub-Parcel B: An undivided 1/6th interest in common in and to the common property, as such property is defined in the Declaration and the Condominium Plan, being portions of Lot 1 of Tract 5781, filed September 18, 1987, in Map Book 171, at Pages 65 through 79, inclusive, Alameda County Records.

Reserving therefrom all easements appurtenant to condominium units, as defined in the Declaration, and in favor of Declarant as provided for and contained in the Declaration.

Sub-Parcel C: Non-Exclusive Easement, appurtenant to Sub-Parcels A and B hereinabove, for ingress and egress and utilities over, under, along, across and through a strip of land described as follows:

All of Lot 3 as shown on Tract 5781, filed September 18, 1987, in Map Book 171, at Pages 65 through 71, inclusive, Alameda County Records

the undersigned hereby declares the title to said real property is hereby made subject to the following terms and provisions:

"By direction of Alameda County, the types of future development of the property are restricted to similar types of projects as currently exist at the property without prejudice to the filing of an application with Alameda County for other permissible uses. The

property has a history of prior industrial use and contains certain residual levels of heavy metals and other contaminants at subgrade in specific locations which are appropriately contained under the review and approval of the County. A safety plan is on file at the property owner's or property manager's office and the Alameda County Department of Environmental Health. The safety plan should be followed during the excavation of sub-surface soil. Additionally, prior to the start of construction which entails any significant excavation of sub-surface soil, one week prior notice should be given to the Alameda County Department of Environmental Health."

The foregoing shall run with said real property or any portion thereof; shall be both binding upon and benefit said real property or any portion thereof; and each and every successor or assign of the undersigned to said real property or any portion thereof shall be bound thereby for the benefit of every other owner thereof or portion thereof.

The current address of the office of the undersigned is 6475 Christie Avenue, Suite 500, Emeryville, California 94608, and the current address of the property manager's office is c/o The Martin Group, 6475 Christie Avenue, Suite 500, Emeryville, California 94608.

28th IN WITNESS WHEREOF, the undersigned has executed this Notice this day of March, 1990.

JS Bay Center Associates,
a California limited partnership

By: Bay Center/DICO Associates,
a California limited partnership

By: 
J. David Martin,
General Partner

RECORDED AT THE REQUEST OF:

BAY CENTER APARTMENT ASSOCIATES

WHEN RECORDED, RETURN TO:

Bay Center Apartment Associates
c/o The Martin Group
6475 Christie Avenue, Suite 500
Emeryville, CA 94608

NOTICE OF

ENVIRONMENTAL DEVELOPMENT RESTRICTION

The undersigned is the owner of the following described real property in the City of Emeryville, California, County of Alameda, State of California:

Parcel One:

Residential Units 1101 through 1113, inclusive; 1201 through 1213, inclusive; 1301 through 1313, inclusive; 1401 through 1411, inclusive; 2101 through 2121, inclusive; 2201 through 2221, inclusive; 2301 through 2321, inclusive; 2401 through 2421, inclusive; 3101 through 3123, inclusive; 3201 through 3223, inclusive; 3301 through 3323, inclusive; 3401 through 3421, inclusive; 4101 through 4127, inclusive; 4201 through 4227, inclusive; 4301 through 4329, inclusive; 4401 through 4427, inclusive; 5101 through 5123, inclusive; 5201 through 5223, inclusive; 5301 through 5323, inclusive; and 5401 through 5421, inclusive, as such units are defined and described in that certain "Declaration of Covenants, Conditions and Restrictions establishing a plan of Condominium ownership for Bay Center" ("Declaration"), executed by Bay Center Associates, a California Limited Partnership ("Declarant"), recorded October 1, 1987, as Series No. 87-270768, Official Records of Alameda County, and as shown on that certain "Condominium Plan for Tract 5781" ("Condominium Plan") attached as Exhibit "A" to and being a part of said Declaration.

Parcel Two:

Pursuant to Section 2.1.D of the Declaration, each of the undivided 1/424th interest in common appurtenant to each of the residential units described in Parcel One hereinabove in and to the residential common area, as defined in the Declaration and shown on the Condominium Plan, such residential common area being portions of Lot 1 as shown on Tract 5781, filed September 18, 1987, in Map Book 171, at Pages 65 through 79, inclusive, Alameda County Records, together with the following easement appurtenant to and part of such residential common area:

A Non-Exclusive Easement for ingress and egress over, along and across those two portions of Commercial Unit 1, as shown on the Condominium Plan, designated "Non-Exclusive Easement for Ingress and Egress" as shown thereon.

Parcel Three:

Pursuant to Section 2.1.E of the Declaration, each of the undivided 1/848th interests in common appurtenant to each of the residential units described in Parcel One hereinabove in and to the common property, as defined in the Declaration and shown on the Condominium Plan, such common property being portions of Lot 1 as shown on Tract 5781, filed September 18, 1987, in Map Book 171, at Pages 65 through 79, inclusive, Alameda County Records.

the undersigned hereby declares the title to said real property is hereby made subject to the following terms and provisions:

"By direction of Alameda County, the types of future development of the property are restricted to similar types of projects as currently exist at the property without prejudice to the filing of an application with Alameda County for other permissible uses. The property has a history of prior industrial use and contains certain

APPENDIX B

Monitoring Schedule

Maintenance Schedule

Monitoring Event	Scheduled Maintenance				
	Daily	Weekly	Quarterly	Biannually	Annually
Methane Monitoring	Check amber lights are on.	Check for meter reading on zero. Collect LEL recordings.	Re-calibrate methane gas and trouble-check systems. Replace any defective parts. Record any alarms for the previous quarter and attach to Appendix E.	NA	NA
Asphalt Cap	NA	NA	Check cap for cracks, breaches, or ponding. Complete log and include in Appendix D.	NA	Cap inspection report. Include in Appendix D.
Groundwater Monitoring	NA	NA	Free-product removal. Check free product thickness. LNAPL Report and Geotracker Upload Required.	Groundwater monitoring event. Schedule sampling of monitoring wells and water level documentation. Complete Biannual Groundwater Monitoring Report and Geotracker Upload.	NA

Notes:

Quarterly methane monitoring, free product extraction and reporting, groundwater monitoring and reporting, and the annual cap inspection are to be completed by a certified environmental professional.

If problems are encountered during the daily or weekly maintenance, contact the responsible person listed in Appendix G: Contacts.

APPENDIX C

Soil Safety and Operations Plan



file
earth metrics incorporated

OK

SAFETY PLAN
FOR
BAY CENTER OFFICES
AND
APARTMENTS
IN EMERYVILLE, CALIFORNIA

Prepared for:
County of Alameda

September 15, 1987

RECEIVED
SEP 23 1987
THE MARTIN CO.

**SAFETY PLAN
FOR
BAY CENTER OFFICES
AND
APARTMENTS
IN EMERYVILLE, CALIFORNIA**

**Prepared for:
County of Alameda**

September 15, 1987

**Prepared by:
EARTH METRICS INCORPORATED
859 Cowan Road
Burlingame, CA 94010
(415) 697-7103**

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. INTRODUCTION	1-1
2. PLAN ELEMENTS, CONTINGENCIES, AND PROCEDURES	2-1
3. SAFETY CHECKLIST	3-1
4. EXPLANATIONS OF SAFETY PRECAUTIONS	4-1
5. REPORTAGE TO ALAMEDA COUNTY	5-1
APPENDICES	

1. INTRODUCTION

BACKGROUND. This report is a postconstruction safety plan for Bay Center, Emeryville. Preparation of this report is in satisfaction of a County of Alameda requirement of the Bay Center offices and apartments.

The postconstruction safety plan addresses known subsurface soils contamination at the Bay Center site. The objective of the safety plan is to protect the safety of any persons who, subsequent to construction of the Bay Center offices and apartments, may engage in subsurface repair maintenance or inspection work.

Soils contamination is the subject of previous reports prepared for the Alameda County Hazardous Materials Unit. These previous reports are: Draft Work Plan for Soils Contamination Characterization of Bay Center Site (May 19, 1986) and Soils and Groundwater Contamination Characterization of Bay Center Site (August 20, 1986).

Construction phase Worker Safety and Hygiene is the subject of another report administered by Earth Metrics Incorporated. The latter report also was prepared for the Alameda County Hazardous Materials Unit.

AREAS OF CONCERN. Lead contamination is a primary factor to be considered in any subterranean activity at Bay Center. Lead levels in soil are known to range from 50 ppm to over 10,000 ppm. Lead contamination does not occur at the surface in the parking lots or landscaped areas, but is confined to the areas beneath the parking garage, Christie Street, building slab, parking lots, and landscaping areas.

At the level of 1,000 ppm to 10,000 ppm, casual contact with Bay Center soil is not an immediate concern. Rather, prolonged exposures, infiltration of lead-bearing dust, or repeated occupational exposures are potential concerns.

Lead facts from the State of California Department of Health Services are provided for information in Appendix A. The lead fact sheet addresses primarily handling of lead containing compounds used in manufacturing environments. The facts concerning effects of long term occupational exposure to lead are relevant.

2. PLAN ELEMENTS, CONTINGENCIES, AND PROCEDURES

The following definitions and procedures shall apply.

2.1 RESPONSIBLE PERSON

The "Responsible Persons" charged with administering the postconstruction safety plan are defined herein to be the Building Owners and Managers of the Bay Center offices or apartments. These "Responsible Persons" shall keep available a copy of the postconstruction safety plan and shall implement the plan as directed in this section.

2.2 SCOPE/INTENT

It is the intent of the postconstruction safety plan to protect the public and workers involved in potential subgrade maintenance, repair, and inspection or other activity involving subgrade work. No work order shall be given or work authorized involving the above subgrade activities, without prior review of the applicability of this safety plan.

2.3 APPLICABILITY DETERMINATION

Applicability can be determined by the "Responsible Persons". In the event that applicability cannot be ascertained or determined by the Responsible Persons -- owing to ambiguity, questions, or unavailability of the Responsible Persons -- then the regulated work shall be deferred until a determination can be made by the Responsible Persons or County of Alameda Hazardous Materials Unit.

2.4 REGULATED WORK

The following subgrade activities constitute regulated work under this postconstruction safety plan.

2.4.1. SUBSURFACE CONSTRUCTION OR REPAIR. Refers to any activity occurring beneath the grade level of existing pavement, concrete, or Christie Street grade.

2.4.2. LANDSCAPING DEEP WORK. Refers to any activity related to landscaping lower than 18 inches beneath existing grade.

2.4.3. UTILITY LINE WORK. Refers to any subterranean inspection, excavation, or repair of electrical, telephone, water, sanitary sewer, or storm drains occurring outside of existing vaults.

2.4.4. SUB SLAB WORK. Refers to any working occurring beneath the slab of Bay Center offices, apartments, or parking garage.

2.4.5. MAJOR SUBSURFACE CONSTRUCTION. Refers to any construction or maintenance involving the subgrade level beneath asphalt, building slab, concrete walkway and enduring for one (1) month or longer.

2.4.6. OTHER. Other subgrade activities not expressly listed above, such as, for example, groundwater well installation.

2.4.7. EXEMPTIONS. Routine landscape maintenance not involving tree planting or removal of loam shall be expressly exempt from this Safety Plan.

2.5 PROCEDURES

The Responsible Persons shall, after determining the applicability of the Safety Plan to a regulated work activity, assure implementation of necessary safety precautions outlined in Section 3. Implementation of the Safety Plan shall consist of i) Written Notification of Alameda County Hazardous Materials Unit of Intended Subgrade Activity and Precautionary Measures and ii) Written and Oral Briefing of Contractors or Utilities Workings Concerning Necessary Precautions. At the conclusion of regulated work, the Responsible Persons shall iii) provide Written Notice of Regulated Work Completion to the Alameda County Hazardous Materials Unit.

If, during the performance of any regulated work, odorous smell, buried drums, or other suspicious materials are encountered, these observations shall be telephoned immediately to the County of Alameda at (415) 874-7237. The County of Alameda then may, at its discretion, send an inspector to respond to the call and make a field inspection.

3. SAFETY PRECAUTION CHECKLIST

The following checklist is provided to assist the "Responsible Persons" with their written and oral briefing of contractors prior to start of regulated work. In the event of major subsurface construction, the adopted Worker Hygiene and Safety Plan appended to Soils and Groundwater Contamination Characterization of Bay Center Site (August 20, 1986).

SAFETY PRECAUTION CHECKLIST

	LANDSCAPING DEEP WORK	SUB SLAB OR SLAB REPAIR	SUB GRADE UTILITY WORK	SUB-SURFACE CONSTRUCTION OR REPAIR	MAJOR SUB-SURFACE ACTIVITY *	OTHER
All personnel will be made aware of the possible health related problems associated with unmitigated exposure to lead.	X	X	X	X	X	X
All field personnel will be instructed to thoroughly wash their hands and face upon leaving the work area.	X	X	X	X	X	X
No materials/debris are to be removed from the site without prior approval of the Alameda County Hazardous Materials Unit unless said materials have been found not to be above any state threshold values.	X	X	X	X	X	X
Personnel will be required to report to the "Responsible Person" odorous or strange appearing materials if any are encountered.	X	X	X	X	X	X
Workers will be required to report any unexpected or irregular occurrences which may be encountered during work to the "Responsible Party."	X	X	X	X	X	X
A first aid kit, eye wash kit, 20 pound ABC fire extinguisher, stretcher and blanket, and potable water will be available at the work site.	X	X	X	X	X	X
Coveralls, rubber boots, gloves and, where necessary, chemical-resistant Tyvek-type clothing, or equivalent will be worn by personnel as conditions require.	NA	NA	NA	NA	X	X
Where necessary, air purifying respirators approved by NIOSH for toxic dusts and mists will be worn by personnel in immediate work vicinity, subject to determination by an on site Industrial Hygienist.	NA	NA	NA	NA	X	X
NA Not Applicable						
X Required Safety Precaution						
* Of one month duration or more; work should be performed according to the adopted construction Hygiene and Safety Plan (see Appendix B).						

5. REPORTAGE TO THE COUNTY OF ALAMEDA

The following form letters could be used by the "Responsible Persons" to notify Alameda County of subterranean work regulated by the Postconstruction Safety Plan.

[date]

Mr. Rafat Shahid
Hazardous Materials Unit
Alameda County Health Care Services
470 27th Street, Third Floor
Oakland, CA 94612

Subject: Notice of Intent to Perform Subterranean Work, Bay Center Project,
Emeryville, California

Dear Mr. Shahid:

This letter is to notify your unit of intended subterranean work beginning on [date]. Work will be performed in accordance with the Postconstruction Safety Plan dated September 11, 1987.

The nature of this work is [description] and is expected to conclude by [date]. Please call me at (415) - , if you have any questions about this proposed work.

Sincerely,

[date]

Mr. Rafat Shahid
Hazardous Materials Unit
Alameda County Health Care Services
470 27th Street, Third Floor
Oakland, CA 94612

Subject: Subterranean Work Termination Notice, Bay Center Project, Emeryville,
California

Dear Mr. Shahid:

This letter is to notify you of completion of subterranean work at Bay Center
on [date].

Sincerely,

STATE OF CALIFORNIA
 DEPARTMENT OF HEALTH SERVICES
 DEPARTMENT OF INDUSTRIAL RELATIONS / CAL/OSHA

HESIS

2151 Berkeley Way
 Berkeley, California 94704

FACT SHEET #4



HAZARD EVALUATION SYSTEM AND INFORMATION SERVICE

PHM
 JS
 MP
 PH

Lead

Health Hazard Summary: The most common effects of lead poisoning are damage to the nervous system, blood-forming system, digestive system, kidneys and reproductive system.

HOW TO FIND OUT IF YOU ARE WORKING WITH LEAD

Lead Compounds: Lead and lead compounds have many industrial uses. Workers are exposed to lead fumes and dusts in smelting, battery manufacture, radiator repair, soldering and foundry work, ink manufacture, electronics, and manufacture of cans. Since lead has been widely used as a pigment, exposure may also result from the sanding, stripping, cutting, welding, or demolition of objects covered with lead-based paint. In addition, artists involved in stained glass, pottery, or painting with lead-based materials may be exposed.

Under California Law (General Industry Safety Orders [GISO] 5194), your employer must tell you if you are working with any hazardous substances, including lead, and train you to use such substances safely. If you think you may be exposed to lead, ask to see the Material Safety Data Sheets (MSDSs) for the products you are using.

An MSDS lists the chemical contents of a product, its health and safety hazards, and methods for its safe use, storage and disposal. It should also include information on fire and explosion hazards, reactivity, first aid, and procedures in case of leaks and spills. Your employer is required to have an MSDS for any workplace product that contains a hazardous substance, and must make the MSDS available to employees on request.

This fact sheet is an aid for worker training programs. It is not intended to take the place of a Material Safety Data Sheet. Some of the information in this fact sheet, and in MSDSs, is technical in nature. The HESIS booklet, Understanding Toxic Substances, is intended to help you better understand this technical information (see Resources, page 5).

HOW LEAD ENTERS AND AFFECTS YOUR BODY

Lead enters your body when you breathe it as dust, fume or mist present in the air. You can inhale lead fumes when you smoke a cigarette contaminated with lead dust, and you can swallow lead when you consume food or drink contaminated with lead particles. For this reason it is important to keep food and cigarettes out of the work area and to wash your hands before eating or smoking if you are working with lead or other toxic substances. When lead gets into your body, only part of it is eliminated in urine. The majority is stored in your bones and other tissues, and the total amount in your body gradually increases. Consequently, exposure to low-levels of lead over time can cause lead to accumulate in the body and lead poisoning may result. Lead interferes with the chemical balance of the body; therefore, it affects many organ systems.

The main health effects of lead poisoning are damage to the nervous system, blood-forming system, digestive system, kidneys, and reproductive system as described below.

Nervous System: The most important effects of lead occur in the nervous system. The blood lead level (BLL), at which these effects occur, varies widely from person to person but generally is in the range of 40 to 60 micrograms of lead per 100 grams of blood (also written 40 to 60 $\mu\text{g}/100\text{ g} = \mu\text{g}/\text{dl} = \mu\text{g}/\%$) (see Legal Exposure Limits). Common symptoms of overexposure are fatigue, headache, irritability, sleeplessness, anxiety, slowed reaction time, and hearing difficulties. Lead may affect your peripheral nervous system, the nerves reaching your arms and legs. If your blood lead level is in the 40 to 60 $\mu\text{g}/\text{dl}$ range, you might feel decreased hand-grip strength, fine tremors, or weakness in the wrists or ankles. A very high blood lead level (120 $\mu\text{g}/\text{dl}$) due to a long period of exposure or a short period of high-level exposure may cause vomiting and poor short-term memory. Extreme overexposure may lead to seizure, coma, and even death. The effects of lead on the nervous system may not be reversible even after the blood lead level drops.

Blood-Forming System: One of the first indications of damage due to lead overexposure (BLL above 30-40 $\mu\text{g}/\text{dl}$) is a decrease in your body's ability to form red blood cells. These changes do not have noticeable symptoms. Your physician can conduct several tests to measure these effects. At blood lead levels above 60 $\mu\text{g}/\text{dl}$, your body may not produce enough red blood cells to supply your muscles, brain and other tissues with the oxygen they need (anemia). Symptoms of anemia include fatigue, lack of energy and weakness.

Kidneys: Long-term overexposure to lead may cause irreversible damage to the kidneys. Because you show no symptoms until the damage is substantial, detection of kidney damage is done by urine and blood analysis.

Skin, Eyes, Nose, Throat: Some forms of lead can irritate the eyes and skin. Exposure over a long period may cause a blue line to form on the gums.

Gastro-intestinal Tract: High blood lead levels can cause sharp pains in the stomach or intestines, called lead colic. You may also experience constipation, loss of appetite, nausea or diarrhea. These effects generally do not occur at blood levels below 50 $\mu\text{g}/\text{dl}$.

Reproduction: Lead affects the reproductive systems of both men and women. In men, overexposure can cause impotence, decreased sex drive and sterility. Also, lead is reported to alter the structure of sperm cells. This effect has occurred at blood lead levels below those which cause other symptoms.

Lead overexposure in women may result in abnormal menstrual cycles, decreased sex drive, and decreased fertility. There is evidence that stillbirth and miscarriage may be more likely if either the woman or the man is exposed to lead before or during pregnancy. Children born of parents exposed to excess lead levels are more likely to have abnormalities in mental development. They are also more likely to die during the first year of childhood. Although lead has been shown to cause birth defects in animals, there is insufficient evidence to say whether lead causes birth defects in humans.

Cancer: Several laboratory tests have shown that soluble lead compounds, such as lead phosphate, cause changes in genetic material. In addition, some soluble lead compounds cause cancer in animals. Chemicals which cause genetic changes in test systems and cancer in animals are thought to pose a cancer risk to humans.

Most workers are exposed to metallic lead or lead oxides. No animal tests for cancer have been conducted on these compounds. Studies of cancer in exposed workers have been inconclusive. If metallic lead does cause cancer in humans, it is not a potent (strong) cancer-causing agent. This means that extremely large doses would be required to cause cancer.

LEGAL EXPOSURE LIMITS AND MEDICAL MONITORING

The California Division of Occupational Safety and Health (Cal/OSHA) sets and enforces workplace exposure limits. If you have any of the symptoms described on page 2 while you are working with lead, you may be exposed to lead at more than the legal limit. Talk to your supervisor and/or your union. If lead is present in any quantity in your workplace, your employer must measure the amount of lead in the air in the work area. You have the right to see the results of such monitoring (Cal/OSHA regulation GISO 3204).

You and your union representative have the right to see and copy your medical records and records of your exposure to toxic substances. These records are important in determining whether your health has been affected by your work. If your employer has such records, he/she must keep them and make them available for at least 30 years after the end of your employment.

The Cal/OSHA Lead Standard (GISO 5216) contains a number of important provisions which are summarized in Appendix B of the Standard (see Resources, page 5). The Lead Standard sets the Permissible Exposure Limit (PEL) for the amount of lead measured in your breathing zone. The PEL for lead in most workplaces is 50 micrograms of lead per cubic meter of air ($50 \mu\text{g}/\text{m}^3$).

Your exposure may legally be above $50 \mu\text{g}/\text{m}^3$ at times, but only if it is below $50 \mu\text{g}/\text{m}^3$ at other times, so that your average exposure for any 8-hour workshift is $50 \mu\text{g}/\text{m}^3$ or less.

Respirators may be used to supplement engineering and work practices, bringing exposure levels within the PEL. Even so, airborne lead must not exceed 100 ug/m in smelting and battery manufacture and 50 ug/m in all other industries. In addition, Cal/OSHA requires that workplaces covered by the Standard be monitored for at least one full shift for each lead job classification in each work area. If measured levels are at or above what is termed the "action level" of 30 ug/m, air monitoring must be repeated.

Although lead is eventually stored in the bones, making it difficult to measure, blood lead levels (BLL) can be used to get a fairly accurate measure of recent exposure. Therefore, Cal/OSHA also requires that workers, who are exposed to lead at or above the action level for more than 30 days per year, have regularly scheduled medical examinations, including measurement of blood lead levels. Zinc protoporphyrin (ZPP), a substance involved in the formation of blood cells, must also be measured. Other tests for lead exposure and health effects should be selected by a health practitioner on a case by case basis (see Appendix C - Medical Surveillance Guideline - of the lead standard).

If your BLL is above 40 ug/dl, you must be notified and blood sampling must be repeated every two months until your BLL drops. The following conditions require that you be removed from the workplace with full protection of earnings, seniority, and benefits until your BLL returns to an acceptable level: 1) a BLL of 60 ug/dl or greater is obtained and confirmed or 2) the average of your last three blood samples (or the average of all blood sampling tests conducted over the previous six months, whichever is longer) indicates that your BLL is 50 ug/dl or greater. However, if your most recent sample indicates a BLL at or below 40 ug/dl, you are not required to leave the workplace.

Where exposure exceeds the PEL, Cal/OSHA requires employers to furnish protective work clothing and equipment and clean change rooms, lunchrooms, and end-of-shift shower facilities at no cost to the worker. In addition, employers must assure that food, beverage, tobacco products and cosmetics are not present or used except in the proper facilities provided, and that workers wash their hands and face before such use.

REDUCING YOUR EXPOSURE

Employers are required to use control methods to reduce exposures that are above the PEL.

Engineering Controls: Primary control methods include changing work practices, changing the work process, and installing ventilation. Containers and vats should be tightly covered to prevent evaporation. Some work processes can be isolated, enclosed or automated to reduce exposures.

Local exhaust ventilation systems are the most effective type of ventilation control. These systems "capture" or draw contaminated air from its source before it spreads into the air and your breathing zone.

The proper work practice for removing lead dust accumulation from floors is vacuuming the floor rather than dry sweeping or blowing the dust away with compressed air. The vacuum must be fitted with a high efficiency particulate filter to prevent fine lead dust particles from re-entering the work room air in the vacuum cleaner's exhaust stream.

Personal Protective Equipment: When engineering controls are not possible or do not sufficiently reduce exposures, a respirator must be worn, and a respiratory protection program as outlined by Cal/OSHA regulations (GISO 5144 and 5126) must be developed. Additional protective clothing may also be required. An industrial hygienist or other knowledgeable person (e.g., Cal/OSHA Consultation) should be consulted to ensure that the equipment is appropriate and is used correctly.

If lead dust is brought home on your clothes, your children may also be exposed. A child's nervous system can be damaged at even lower levels than yours; so, take special care in your personal hygiene.

Substitution: Another way to control hazardous exposures is to substitute safer chemicals for more toxic ones. This control method may not be feasible for many uses of lead. The physical and health hazards of substitutes must also be carefully considered, however, to ensure that they truly are safer. As an example, iron oxide pigment has been substituted for lead chromate pigment in some paints, since the former is less toxic.

RESOURCES

This Fact Sheet is available in Spanish. Also available from HESIS are A Guide to Industrial Solvents, in English and Spanish, and Understanding Toxic Substances: An Introduction to Chemical Hazards in the Workplace. These publications may be obtained at no charge by calling 415/540-3138.

- For information about the health effects of lead or other workplace chemicals contact HESIS at 415/540-3014 (call collect from within California).

- Employees who need information or assistance concerning workplace health and safety regulations, or who want to file a complaint may contact:

Cal/OSHA Division of Occupational Safety and Health. See your local phone book under "California, State of, Industrial Relations."

- Employers who want free assistance on evaluating and improving workplace health and safety may contact:

The Cal/OSHA Consultation Service. See your local phone book under "California, State of, Industrial Relations" or call 800/652-1476.

- To obtain a copy of the Cal/OSHA lead standard (GISO 5216) contact:

The Cal/OSHA Communications and Publications Unit at 415/557-2237.

- In a medical emergency, contact:

Your regional Poison Control Center. See your local phone book under "Other Emergency Phone Numbers" listed on the inside front cover.

APPENDIX B

HYGIENE AND SAFETY PLAN BAY CENTER SITE, EMERYVILLE

INTRODUCTION

This Hygiene and Safety Plan has been prepared for use during the soil Excavation Phase of the construction project for The Martin Company Bay Center Site in Emeryville. The Plan represents an effort of the sub contractor, Thermo Analytical, Inc. (EAL). The Plan describes the procedures to be implemented to protect the health and safety of the employees performing the work.

In general, preliminary investigations have indicated that the hazard potential at the site is low and primarily associated with potential contact with lead containing dust. Personal and area air samples for lead and organic vapors will be collected during the different construction processes and locations to insure safe working conditions. Personal air samples will be collected during excavation of a "worst case" area to determine whether or not respirators are necessary.

The purpose of the Plan is to provide construction personnel with adequate protection against possible contamination in the area of Emeryville, California, located in the northeast quadrant of 64th Street/Lacoste Street.

The types of exposure hazards that may potentially be encountered during this investigation are: lead dust and organic vapor exposures. The safety plan will address these two types of hazards.

The prime contractor will assign an Industrial Hygienist to implement the Plan. The Industrial Hygienist is trained in appropriate industrial hygiene and safety information. Training includes, but is not limited to: safety awareness and response, use of respiratory protection equipment, qualitative fit testing of respiratory protection equipment, explosive conditions and lower explosive limits, confined space entry, eye and head protection, skin protection, and use of impervious clothing. Before work at the site begins, the Industrial Hygienist will review the Hygiene and Safety Plan to become

acquainted with the Draft Work Plan and contingency emergency response, requisite for safe work at the site. The Industrial Hygienist will remain on-site during soil excavation activities in order to assess changing exposure conditions and to initiate emergency response plans, if required.

MEDICAL INFORMATION

The preliminary investigation of probable airborne lead levels indicates that levels are not expected to exceed the 30 microgram per cubic meter 8 hour time weighted average, 30 days per year, CAL/OSHA "action level." However, the owner and Industrial Hygienist have agreed that, as a precaution, before and after blood lead tests will be made available to affected workers, if desired, at the owners expense.

In the event that unusual circumstances arise during the performance of field work, the Industrial Hygienist will interview involved employees at the site to determine whether any exposure may have occurred and if the employees are experiencing any symptoms which may be related to contaminant exposure. If the employees indicate any adverse effects or, in the judgement of the Industrial Hygienist, such adverse effects are apparent or probable, the Industrial Hygienist will require each of the involved employees to be evaluated by competent medical personnel. Such evaluation will be noted in the Industrial Hygienist's daily log. Emergency care will be provided.

EDUCATION AND TRAINING PROGRAM

Each employee involved in the plan will be trained in the necessary hygiene and safety precautions. The safety requirements for this type of work are largely dependent upon the professional judgement of the Industrial Hygienist. Two different types of potential hazards are associated with the plan. These are: potential lead exposure and potential exposure to unknown hazardous wastes that are associated with the disposal sites within the general Emeryville area. An Industrial Hygienist, trained in conducting this type of field work, will be responsible for instructing each of the affected construction personnel in the appropriate health and safety measures for corresponding job functions.

All personnel involved in excavation of contaminated soil will be trained in the following aspects:

- ° Health Hazards - All personnel will be made aware of the possible health related problems associated with unmitigated exposure to lead.
- ° All employees who will wear personal protective equipment will be instructed in the use, care and fitting of personal protective equipment and of the necessity for wearing the equipment, its effectiveness and limitation.
- ° The Industrial Hygienist will also be responsible for training affected construction personnel concerning the necessity for protection from the adverse effects of hazards associated with contaminated areas. Affected personnel will be advised of the potential hazards and precautions which are to be taken in the event such materials are encountered.
- ° Proper hygiene, which will include use of wash facilities as appropriate.

The Industrial Hygienist will be responsible for training construction personnel. Personnel will be advised of the notification procedures which are to be followed in the event that odorous or strange appearing materials are encountered.

The Industrial Hygienist will be on-site to oversee all operations and to ensure that proper hygiene and safety measures are being maintained. Construction workers will be required to report any unexpected or irregular occurrences which may be encountered during the field work to the Industrial Hygienist. Such occurrence include, for example, unearthing of drums, pockets of darkened or wet soil, and odors.

In this former landfill site, the fill materials are generally below the surface of the existing asphalt soil. If the activities at the site cause considerable disturbance, the Industrial Hygienist will adjust procedures and protection levels accordingly, making notes of any such changes in the daily log. This procedure will provide continued safety to all personnel on-site.

Since the identities and extent of potential chemical contamination other than lead are not well known, avoidance procedures, monitoring, and personal protection will be required. Added safety precautions will be taken for the inherent hazards of groundwater monitor well drilling and of other drilling procedures.

Specific Hazards and Risks

There is a potential hazard associated with lead-containing dust inhaled during subsurface soil excavation. The greatest risk of inhalation will occur with those activities which disturb surface soil in contaminated area causing airborne dust. There are secondary exposure routes of skin absorption and ingestion. Skin absorption will be reduced or eliminated by the use of gloves and coveralls.

Site Entry Procedures

Eating, drinking, smoking and any other practice which increases the probability of hand-to-mouth transfer is prohibited in the work zones. All field personnel will be instructed to thoroughly wash their hands and face upon leaving the work area. The Industrial Hygienist will be responsible for designating a wash area at each work site.

A first aid kit, eye wash kit, 20 pound ABC fire extinguisher, stretcher and blanket, and potable water will be available at the work site.

Levels of Protection

The site will be considered a Zone D work area. Level D Personal Protection will be required. This designation is based upon the existing knowledge that airborne concentrations of lead are expected to be below the present permissible exposure limit (PEL) of 50 microgram/cubic meter of air time-weight average established by CAL/OSHA. The Zone D designation will exist at all operations.

Zone D safe guards will include:

- ° Where necessary, air purifying respirators approved by NIOSH for toxic dusts, and mists.
- ° Coveralls and gloves and, where necessary, chemical-resistant Tyvek-type clothing, or equivalent.

- ° Rubber boots with steel toes, or equivalent.
- ° Hard hat.

All drilling activities will start at Level D protection (Level D protection is described in the U.S. EPA Standard Operating Safety Guides, November 1984) with continuous organic vapor monitoring. Disposable latex gloves, hard hat, and eye protection will be used to minimize injury from engine-driven drilling equipment and to minimize illnesses from skin contact of chemicals. The ground around drilling activities will be wetted to prevent entrainment of airborne dust.

The level of protection will be upgraded to Level C if the drilling encounters irregular materials or, if organic vapor levels exceed 0.5 ppm above background levels continuously for more than five minutes. Personal protective equipment at Level C will include, at a minimum, the following:

- ° Double cartridge respirator for organic vapors
- ° Escape masks
- ° Underwear - cotton
- ° Coveralls - chemical resistant
- ° Apron - PVC, butyl rubber, or other material impervious to chemicals
- ° Gloves - PVC, butyl rubber, or other material impervious to chemicals
- ° Safety boots - neoprene or other material impervious to chemicals
- ° Boots - chemical resistant, steel toes and shank
- ° Hard hat with face shield
- ° Safety glasses when face shield not used

CONTAMINATION REDUCTION

All disposable protective clothing will be put into plastic bags, sealed, and provided with a label describing the contents before field personnel leave the sampling area. The plastic bags will be retained on-site until chemical analyses are performed on the field samples. Disposable clothing shall not be re-used from day to day.

PERSONAL MONITORING

Lead Monitoring

Air samples will be taken in the breathing zone for peak exposures during digging and soil handling operations and long-term exposures in high activity operations. All samples will be taken as personal samples worn by the individuals.

Site perimeter samples will be taken in a similar fashion, except that the samples will be collected as fixed source area samples. The monitors will be set at approximately 5-feet above the ground at the site boundary. These samples will be analyzed by NIOSH Method P & Cam 173.

Organic Vapor Monitoring

The Industrial Hygienist will monitor for ambient levels of organic vapors using a Century Organic Vapor Analyzer (GC/FID). The Industrial Hygienist will be notified if organic vapor levels exceed ambient levels. Drilling will cease, equipment will be shut down, and personnel will withdraw from the area if any of the following conditions occur:

- ° The organic vapor concentrations in the operator's breathing zone exceeds 5 ppm
- ° The organic vapor concentration 2-feet above the bore hole exceeds 5,000 ppm or 50% of the lower explosive limit

The Industrial Hygienist will determine when personnel may return to the work area.

In the event low levels of organic vapors are detected, personnel will wear appropriate respirators until construction activities at the location are completed and the Industrial Hygienist determines that respirators are not needed. The Industrial Hygienist will attempt to identify the nature and source of the vapors. If industrial debris is apparent in the boring, drilling at the locations will be terminated.

CONTINGENCY PLAN

The Industrial Hygienist designated by the contractor will be present at sampling sites during all drilling and environmental sampling operations. The

Industrial Hygienist will be knowledgeable of expected contaminants, hazards, and risks, and will be responsible for coordinating emergency responses. It will also be the responsibility of the Industrial Hygienist to inform and train the work party members before the work begins at each site. Training will include information on the risks that may be encountered, and techniques to minimize exposures from these hazardous materials. The Industrial Hygienist will also implement the safety plan, hold safety meetings with employees, evaluate employees understanding of risks and preventive measures, inform all employees of designated escape routes and locations of all emergency medical aid.

Before site work begins, the Industrial Hygienist will notify emergency response personnel who may be called upon to respond to emergency situations if they occur, and will brief them on the nature of anticipated hazard and potential emergency scenarios. The groups to be notified will include local clinics and/or hospitals, and fire personnel. The name of the clinics and/or hospitals which have been designated to serve construction personnel shall be posted on-site and made available to construction personnel.

The Industrial Hygienist's primary responsibility in the event of an accident will be evacuation, first aid, and decontamination of injured team members. The Industrial Hygienist will determine safe evacuation areas and begin first aid, and decontamination of injured team members. Injured parties will be taken through decontamination procedures, if possible. However, the procedure will be omitted when it may aggravate or cause more harm to the injured party. A qualified member of the work team will accompany the injured party to the medical facility to advise on matters concerning contamination. A specific evacuation route will be selected based on traffic congestion at the time of the emergency.

Emergency Procedures

In the event of a medical emergency, the injured party will be taken through decontamination procedures, if necessary and possible. However, the procedure will be omitted when it may aggravate or cause more harm to the injured party. A qualified member of the work team will accompany the injured party to the medical facility to advise on matters concerning potential contamination.

RECORD KEEPING

The Industrial Hygienist will maintain a record of all health and safety related matters in a daily log. Air monitoring data and any unusual field data will be recorded in the daily log. In addition, the Industrial Hygienist will maintain pertinent medical records of all field personnel, safety and health documentation, contingency plans, and communications and contracts on-site. These records will be available to all employees upon request.

HYGIENE AND SAFETY PLAN
ADDENDUM

This addendum has been prepared to respond to several questions about hygiene practices and to provide additional background information about the site's history and testing program. The addendum also explains certain terms used in the Hygiene and Safety Plan.

SITE HISTORY. Originally, the construction site was part of the San Francisco Bay. During the period 1935 to 1955 several bay sites, including this site, were filled by the City of Emeryville Public Works Department. The fill consisted of a variety of materials including soil, rock, building debris, and refuse items such as bottles, batteries, wood and wire.

The whole site was covered with asphalt sometime in the late 1950s, and two truck terminal buildings were built. The first was Delta Truck and the second was Garrett Freight lines.

TEST PROGRAM. Samples of the site beneath the asphalt cap were collected by a geotechnical firm retained by the owners as early as March 1985. Additional samples of surface and subsurface materials have been collected and analyzed during January 1986 to June 1986. The test program has identified the following materials:

- A variety of metals (including lead, zinc, and iron) throughout the site.
- A low level herbicide (weed killer) just beneath the asphalt cap.
- A low level of elemental chlorine which may originate from a variety of sources such as battery acid.

Test results have not indicated the presence of toxic pesticides or herbicides, aldrin, PCBs, DDT or harmful hydrocarbon vapors. The test program is continuing, so that additional tests of subsurface material will continue to demonstrate the presence or absence of potential hazards. The continuing test program will address both subsurface soils and airborne particles.

Test results have demonstrated the presence of lead in excess of the State of California Department of Health Services (DOHS) criterion level of 1,000 ppm. Airborne lead levels have been measured to be far below the CAL/OSHA permissible exposure limit. Avoidance of contact with and/or ingestion of soil containing lead, therefore, is an important objective of the Hygiene and Safety Plan.

HYGIENE AND SAFETY PLAN. The following information is provided to amplify and clarify several questions about the plan:

1. What are the objectives of the plan?

Answer. The plan is designed to minimize worker contact with lead to an acceptable level and to monitor construction site conditions.

2. Will wash facilities be provided?

Answer. Yes, by The Martin Company (Owner) and DEVCON (General Contractor). These are operative now.

3. What is a "worst case" area?

Answer. The hazard potential is low throughout the site.

Tests four feet below the surface along the Christie Street alignment demonstrated the absence of volatile organics and permissible levels of airborne lead. Tests were performed by the Industrial Hygienist and scientists before street construction began.

Based upon these tests, it was determined by the Industrial Hygienist that respirators are not necessary. Work site monitoring will continue, so that new test results will be available as work progresses.

4. What is "emergency response" or "contingency planning"?

Answer. Past tests cannot predict unexpected, unknown events. Therefore, the Hygiene and Safety Plan includes measures for proper response to unexpected conditions (e.g., encountering any material of unusual appearance) and work-related accidents.

5. What about work site presence by the Industrial Hygienist?

Answer. The Industrial Hygienist will be present during sampling of airborne dust levels and during drilling operations. Presence of the Industrial Hygienist after initial grading, trenching, or other underground activity will be at the discretion of the Industrial Hygienist. At all times, the Industrial Hygienist will be available on call from either of two offices in Emeryville and Richmond, California.

6. Will "adjusted" procedures be given in writing?

Answer. Generally, procedures in the Hygiene and Safety Plan and Addendum will not be adjusted. Procedures will be subject to the interpretation of the Industrial Hygienist, who may decide upon such matters as appropriate levels of protection, appropriate times of his work place monitoring, and environmental sampling (e.g., sampling for airborne lead levels).

7. What is the basis of the procedures?

Answer. Again, the Hygiene and Safety Plan and Addendum have been prepared by the Industrial Hygienist. The plan is in compliance with CAL/OSHA requirements and was prepared with due regard for known or potential conditions at the site.

8. Are blood tests to be given to each employee?

Answer. No. Blood tests are being offered to each employee, if desired, at the owner's expense. However, the tests are optional and are not required based upon the CAL/OSHA regulations.

9. Who will provide, distribute, and collect disposable protective clothing?

Answer. This clothing will be provided by The Martin Company and distributed on the work site by DEVCON. DEVCON will also provide a disposal receptacle.

10. What is the contingency measure if groundwater is encountered?

Answer. If groundwater is encountered, work should be stopped in the immediate vicinity by those workers who would otherwise contact the groundwater. The Industrial Hygienist will be called to sample the water and test it on a "fast turnaround" basis, before the water is discharged to the storm drain system.

11. Who is the "prime contractor" mentioned in the Hygiene and Safety Plan?

Answer. "Prime Contractor" here refers to the firm of Earth Metrics Incorporated, which has been retained by The Martin Company. Earth Metrics Incorporated is under contract to The Martin Company to perform tests of subsurface and excavated soils, in the context of a hazardous materials characterization study for the County of Alameda. The county has received a copy of this Hygiene and Safety Plan.

Thermo Analytical, Inc. is the subcontractor to Earth Metrics Incorporated, which has been retained by Earth Metrics Incorporated to prepare the Hygiene and Safety Plan and provide the services of an Industrial Hygienist. Thermo Analytical, Inc. has offices in Richmond and Emeryville, California.

Certified Industrial Hygienist
THERMO ANALYTICAL

Date

APPENDIX D

Quarterly Cap Maintenance Logs and Annual Inspection Reports

APPENDIX E

Methane System Operations Manuals, Monitoring Locations, and Monitoring Reports



earth metrics incorporated

GAS DETECTION, ALARM, AND
VENTILATION SYSTEM SAFETY MANUAL
FOR
BAY CENTER, EMERYVILLE

Prepared for:
Alameda County Hazardous Materials Unit
and
Emeryville Fire Department

December 1, 1987
Revised January 28, 1988

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Prepared by:
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Mark Papadimitriou

I. INTRODUCTION

The Model 1565 Solvent Vapor Alarm is a warning system for toxic or flammable gases or vapors in a workspace. It monitors the ambient atmosphere and actuates audible and visual signals if the gas or vapor concentration exceeds a preset level. The multi-channel, dual level alarm Model 1565 has provision for up to six independent points of detection, each of which may be independently calibrated and set for a high and a low alarm level. All channels actuate one common audible alarm signal, two common alarm relays (one for each level of alarm), and also share a common trouble relay.

I. DESCRIPTION

The Model 1565 utilizes a solid-state metallic-oxide semiconductor detecting element which undergoes a drastic change in resistance when exposed to solvent vapors. This change in resistance is used to produce a DC voltage signal, and to actuate an alarm at a preset level.

The multi-channel instrument is housed in a surface-mounting molded fiberglass case with mounting flanges at top and bottom. It is normally secured to a wall at an appropriate height by means of four screws. The sensing element is connected to a cable or conduit which enters the housing through holes provided by the factory, unless otherwise specified by the customer.

On the front of housing, visible through a transparent window, will be noted the following components:

- a) Pilot light, amber, to show that power is on and that channel is in operation.
- b) Alarm lights, red, two per channel, to show that instrument is in alarm condition.

These lights are mounted on the edge of the circuit card for each channel, so are present only for active channels.

The following will be noted in lower portion of front door, set flush in an opening in door:

- c) Buzzer, solid state, to produce a pulsating signal whenever the instrument is in alarm condition.

When housing is opened, by releasing latch and swinging door open, the following further components will be seen:

- d) Main circuit board, which includes the power and alarm components, the sockets and terminals including the six circuit card sockets into which the channel circuit boards plug. These components include:
 - 1) Channel sockets, edge-type circuit card connectors, one for each channel. They mount the circuit cards in position so that the lights are visible through window when cover is closed. All sockets are prewired for the maximum number of channels.
 - 2) Transformer, which provides low voltage for operation of the six detection channels.
 - 3) Terminals, for connection of external alarm circuits, power and sensors.
 - 4) Three relays, plug-in double-throw type. One relay is activated whenever any one of the six channels is in alarm #1 condition. The second relay is activated whenever any one of the six channels is in alarm #2 condition. The third relay is normally activated, and will de-activate to indicate any trouble in the system, such as a power failure or a disconnected sensor.
- e) Channel Circuit Card, one per channel, is a plug-in module which includes all necessary electronic elements to provide regulated power to the detector, respond to signals from the detector and actuate the alarm circuits if gas is detected. Principal components of interest from the standpoint of operation and maintenance are:

- 1) Pilot light, amber, an LED-type angle-mounted indicator that comes on when the channel is energized and in operation.
- 2) Alarm lights, red, two per channel, similar indicator lights that come on whenever the channel is in alarm condition. Just one (#1) alarm light on indicates the gas level has exceeded its low alarm preset value and both red lights on (#1 plus #2) means it has exceeded its high alarm preset value. All three lights are mounted at edge of board for good visibility from the front of housing.
- 3) Alarm adjust potentiometers, angle-mounted controls positioned at edge of board for easy adjustment when the housing is opened. These are the primary operating controls and are used to set the alarm to be actuated at preset levels of gas concentration.
- 4) Sensitivity adjust, factory set, used to set basic amplifier gain corresponding to gas to be detected. This is factory set, and is normally left in original position. It can be adjusted by use of a long narrow screwdriver to reach the lower edge of board.
- 5) Voltage adjust, a multi-turn potentiometer in the power supply circuit, is used to set the operating voltage of sensor. This control is just below pilot light.
- 6) Test jacks, + and -, into which voltmeter test prods can be plugged for checking output during calibration, are also provided along outer edge of circuit card, where they are accessible while housing cover is removed.

III. INSTALLATION

A. Control Housing

1. Mount the housing to a vertical surface, using screws through holes in mounting flanges, as shown in Fig. A. Mount housing at approximately eye level in the most central convenient location, preferably in a reasonably clean, sheltered area. However, housing is dust- and weather-resistant, so can safely be installed in any suitable instrument location. If housing does not already have conduit or cable openings in the bottom, these should be drilled prior to mounting the housing.

B. Detectors

1. Detectors are of the plug-in type, and install in an MS 3106A-14S-6S socket, supplied.
Socket can be mounted to a junction box cover or to a similar flat surface. Please refer to Figure D at the end of this manual for mounting dimensions.

2. Mount the detector to a vertical or horizontal surface, using screws provided. Choose a detector location that is representative of the area to be monitored, and where the detector is protected from water spray and from mechanical damage.
3. As supplied, detector is furnished connected to a socket with short wires which are color-coded to indicate required connection. A 4-point screw terminal block is attached, for convenient connection to interconnecting wiring.

C. Wiring (See Fig. 2)

1. Bring AC power wiring into housing and connect to AC power terminals H and N, with grounded neutral to N. Verify that voltage matches nameplate, 115 or 230 volts 50/60 Hz.
2. Run four wires to each remote detector, using minimum wire size as follows, for various maximum distances.

<u>Terminal</u>	<u>Color</u>	<u>20'</u>	<u>50'</u>	<u>100'</u>	<u>500'</u>
A	Red	20	18	16	14
B	White	20	20	20	18
C	Green	20	20	20	18
D	Black	20	18	16	14

Larger wires can always be used without difficulty. Wires can be run in conduit or cable, and shielding is not required.

3. Connect external alarm circuits as desired, using NC-NO-C terminals of ALARM and TROUBLE (FAILURE) relays. These terminals serve all circuit cards in common. Alarm relays are normally de-energized, and energize in case of alarm at any point. Thus an external circuit connected through NO and C will be turned on in alarm; a circuit connected through NC and C will be energized except on alarm. If an external trouble alarm is desired, connect it in the same way. However, remember that the trouble relay is energized in normal operation, so NO and C are connected except during malfunction conditions.

IV. PLACING IN OPERATION

- A. If they have been removed, plug circuit cards into corresponding sockets. Note that detectors and circuit cards are tested and calibrated in sets, so should be kept together for best results.
- B. Connect AC power. For each circuit card, amber pilot will come on, and soon the red light and the buzzer will come on. This alarm condition is a normal warmup reaction, and may continue for several minutes.
- C. Check heater voltage for each detector, at the detector, by measuring between A and D (red and black wires). The desired voltage is marked on front page. It is adjustable by turning the VOLT ADJ Potentiometer (see Fig. B). Turn counter clockwise to increase.
- D. Temporarily disconnect the red or black wire leading to one detector; note that pilot light goes out after a moment, and Trouble relay is de-energized. This shows the action in case of sensor failure or a break in wiring to detector.
- E. Instrument is now ready to operate, and will monitor continuously without attention.
- F. Expose small sample of vapor to open end of each detector. Verify that alarm comes on.

V. MAINTENANCE

The Model 1565 requires no normal maintenance.

Output may be checked by plugging a 5 V. meter into the test jacks. Normal reading on fresh air is less than 2 volts.

Alarm setting may be changed as desired, but do not change it unless a test gas sample is available. Calibration gas kits and cylinders are available from GasTech, Inc. Kit includes an adapter and a humidifier, since compressed gas samples must be humidified for normal response.

Allow sample to flow at a low rate (0.5 scfh) through humidifier and then over porous metal surface of sensing element. Watch meter and observe when meter reading stabilizes. Then turn ALARM potentiometer clockwise until alarm just comes on. See Fig. B for location of Alarm #1 and Alarm #2 potentiometers.

Recommended alarm #1 setting is about 3.0 volts. Alarm #2 voltage setting will depend on the gas concentration that it is calibrated to, but will always be higher than Alarm #1 voltage. Output at the alarm level can be adjusted by use of the sensitivity potentiometer. This should only be changed after careful tests with a calibration sample.

Sensor normally will last for many years. If replacement is necessary, however, all that should be required is to connect new sensor, check heater voltage as described in part C section IV, allow to stabilize for a day or two, and recalibrate using a test gas sample as described above.

For problem with any one channel, it should be possible to isolate the trouble to that channel by switching circuit cards from one position to another. A defective card can be sent back for repair. Since cards and sensors are calibrated together, they should be kept together whenever possible, and the card and detector should be returned together for repair and calibration.

Note: The pilot light in the Model 1565 comes on only when the instrument is in normal operation, with the sensor connected. Thus an unplugged, disconnected or burned-out sensor will cause the pilot light to go out. Do not attempt to use or rely on instrument unless the amber pilot light is showing.

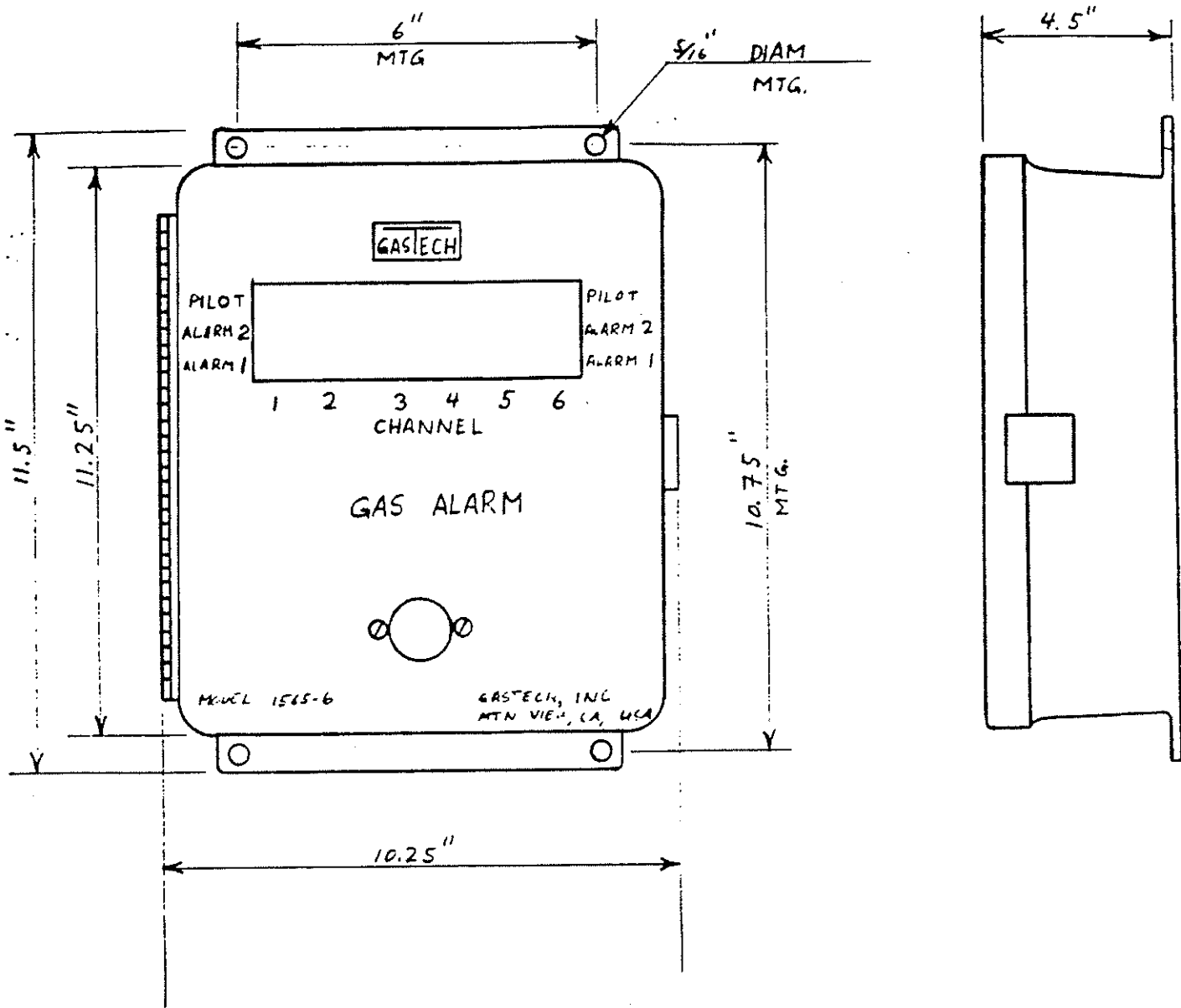


FIG. A

REVISIONS	GASTECH INC. JOHNSON INSTRUMENT DIV. MOUNTAIN VIEW, CALIFORNIA
	TITLE 1565-6 DUAL ALARM OUTLINE & MTG. DI

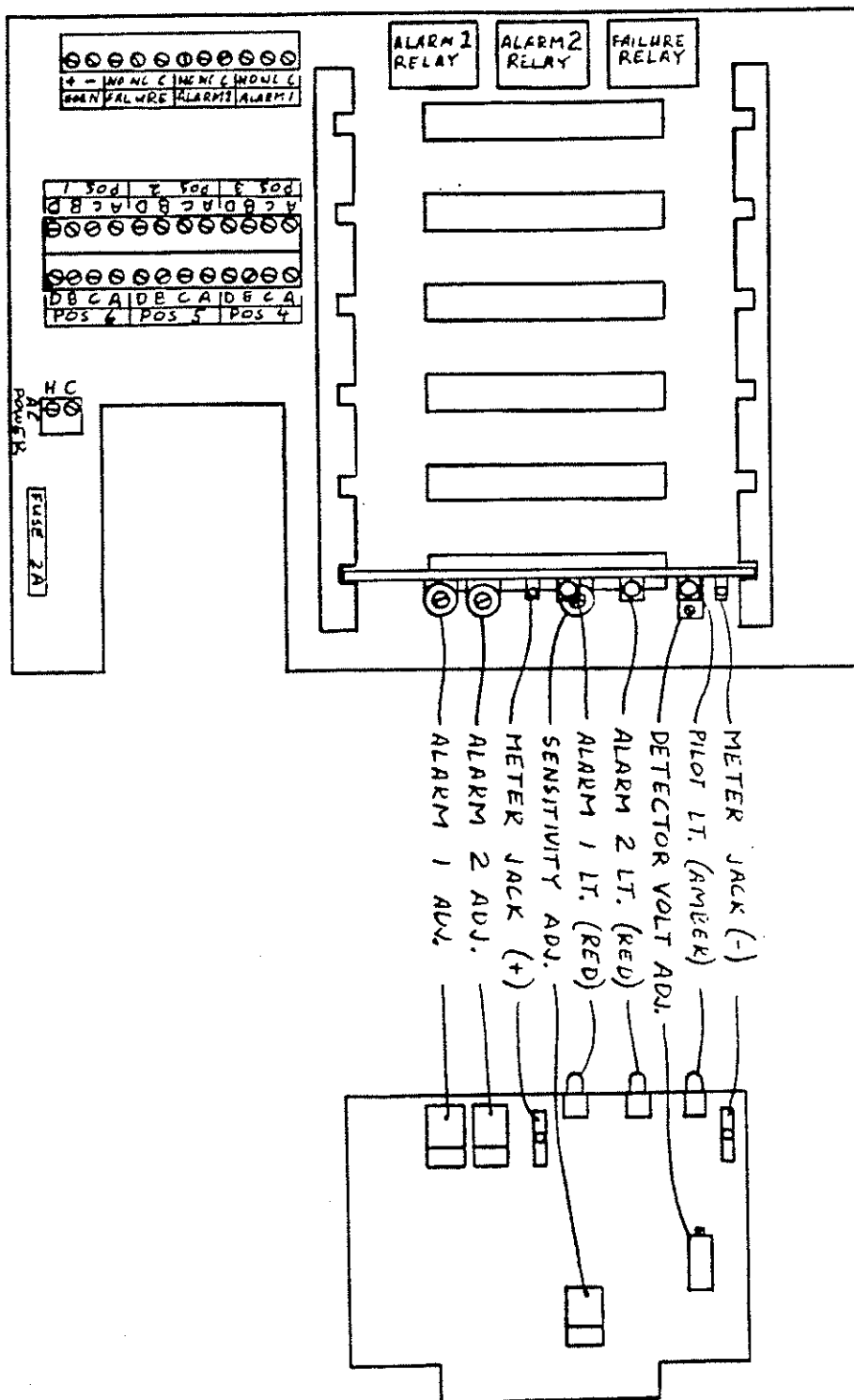


FIG. B

REVISIONS	GASTECH INC. JOHNSON INSTRUMENT DIV. MOUNTAIN VIEW, CALIFORNIA
	TITLE CONTROLS LAYOUT

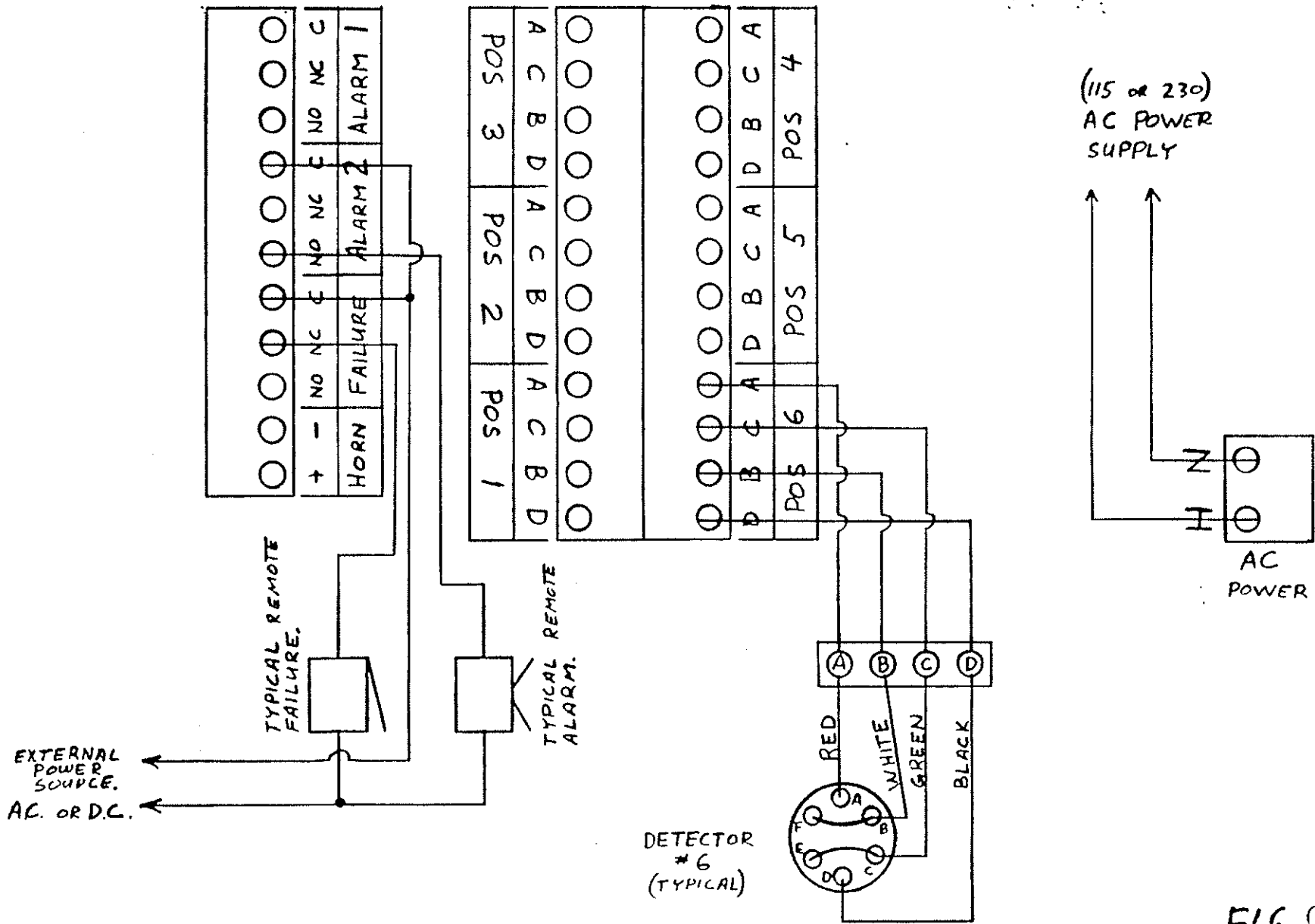
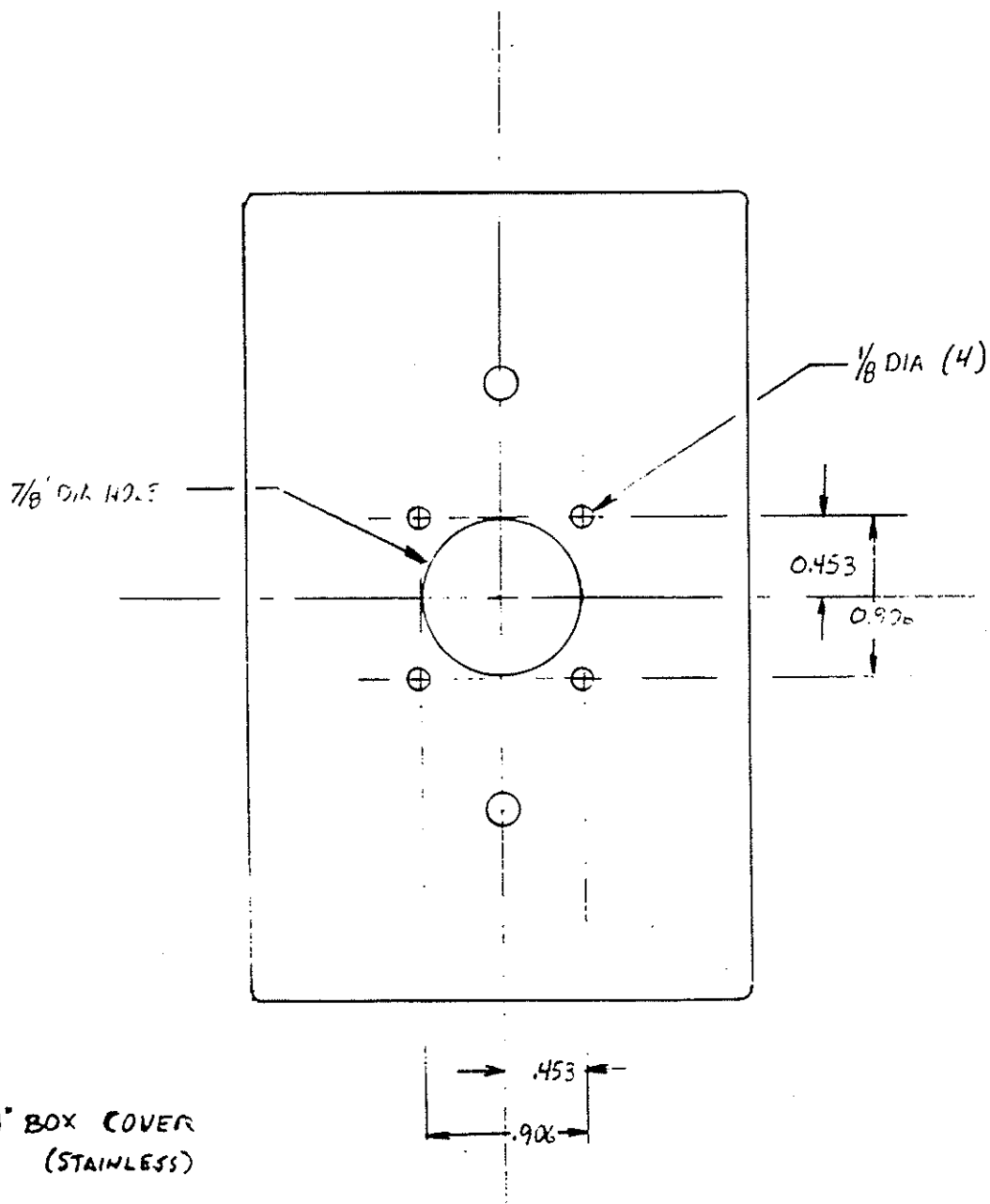


FIG. C

REVISIONS		GASTECH INC.	
		JOHNSON INSTRUMENT DIV.	
		MOUNTAIN VIEW, CALIFORNIA	
		TITLE	
		1565-6 EXTERNAL WIRING	
		SCALE NONE	DR. BY BP
			DRAWING NO.



MATERIAL: "J" BOX COVER
(STAINLESS)

FINISH: PRESERVE EXISTING

DIMENSIONS PERTAIN TO
SOCKET MOUNTING ONLY

FIG. D

STOCK NO. 18-0327

REVISIONS	GASTECH INC.		
	JOHNSON INSTRUMENT DIV.		
	MOUNTAIN VIEW, CALIFORNIA		
	TITLE DETECTOR MOUNT PLATE DRILLING		
	SCALE FULL	DR. BY DML	DRAWING NO.
			1732-A11

SERVICE POLICY

GasTech Inc. maintains an instrument service facility at the factory. Some GasTech distributors also have repair facilities; however, GasTech assumes no liability for service performed by other than GasTech personnel. Should your instrument require non-warranty repair, you may contact the distributor from which it was purchased, or you may contact GasTech directly.

If GasTech is to do the repair work for you, you may send the instrument, prepaid, to GasTech Inc., 8445 Central Avenue, Newark, CA 94560, Attn: Service Department. Always include your address, purchase order number, shipping and billing information and a description of the defect as you perceive it. If you wish to set a limit to the authorized repair cost, state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. GasTech's policy is to perform all needed repairs to restore the instrument to full operating condition, including reactivation of all out-of-warranty electrochemical cells.

To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by Gas Tech.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. PRECAUTIONARY GAS MONITORING AND VENTILATION	1-1
2. GAS INVESTIGATION FINDINGS	2-1
3. GAS DETECTION AND ALARM SYSTEMS	3-1
4. HARDWARE SPECIFICATIONS	4-1
5. GAS MONITORING AND VENTILATION MAINTENANCE RECOMMENDATIONS	5-1
APPENDIX	

1. PRECAUTIONARY GAS MONITORING AND VENTILATION

The Bay Center apartments and offices have been designed for subsurface methane gas monitoring and ventilation of low enclosed spaces (e.g., elevator shafts, PG&E boxes, electrical rooms). The subject monitoring and ventilation is an extra level of precaution, to protect building occupants from the risk of explosion and fire in the unlikely event of gas migration and potential accumulation beneath the concrete foundations.

Such an event is considered extremely unlikely in view of the most recent gas investigations that indicate near absence of subsurface soil gas and precursor materials that could form such gas. These recent gas investigation findings are summarized in Section 2. Subsequent sections of this report describe the methane gas detection hardware, installations, and functions.

The risk of fire in the elevator shafts or other confined areas is unlikely, even in the event of subsurface gas migration and penetration through the foundation. The ventilation system is continuous and designed to provide outdoor air in the shaft bottom at the rate of five air changes per hour. This ventilation is sufficient to keep gas accumulation well below 20 percent of the lower explosive limit (LEL). The most gas that was measured in pilot pile holes was ten percent of the LEL, in unventilated eight foot deep holes. Furthermore, every indication is that gas production on site has ceased (refer to Section 2.)

2. GAS INVESTIGATION FINDINGS

Preliminary methane gas and volatiles measurements were performed by the Certified Industrial Hygienist in the context of worker protection at the Bay Center Office construction site. Gas concentrations in pilot pile holes were found in the range of 2,700 to 4,700 ppm, or 10 percent of the Lower Explosive Limit (LEL).

Subsequent gas investigations were performed by GSF, Inc. The subsequent gas investigations concluded that soil gas constituents originated from petroleum fuels including gasoline and diesel fuel. Soil gas constituents did not originate from decomposing organic material. Soil gas was found at very low concentrations, and is expected to be dissipating since the sources of petroleum fuels have been excavated and removed. GSF stated its opinion that gas emissions at the site are negligible.

In support of this above opinion, GSF measurements of site excavation spoils indicate little material that could create landfill (methane) gas. Cellulose precursors were not detected at the 0.2 percent detection limit. Volatiles were less than 1.4 percent.

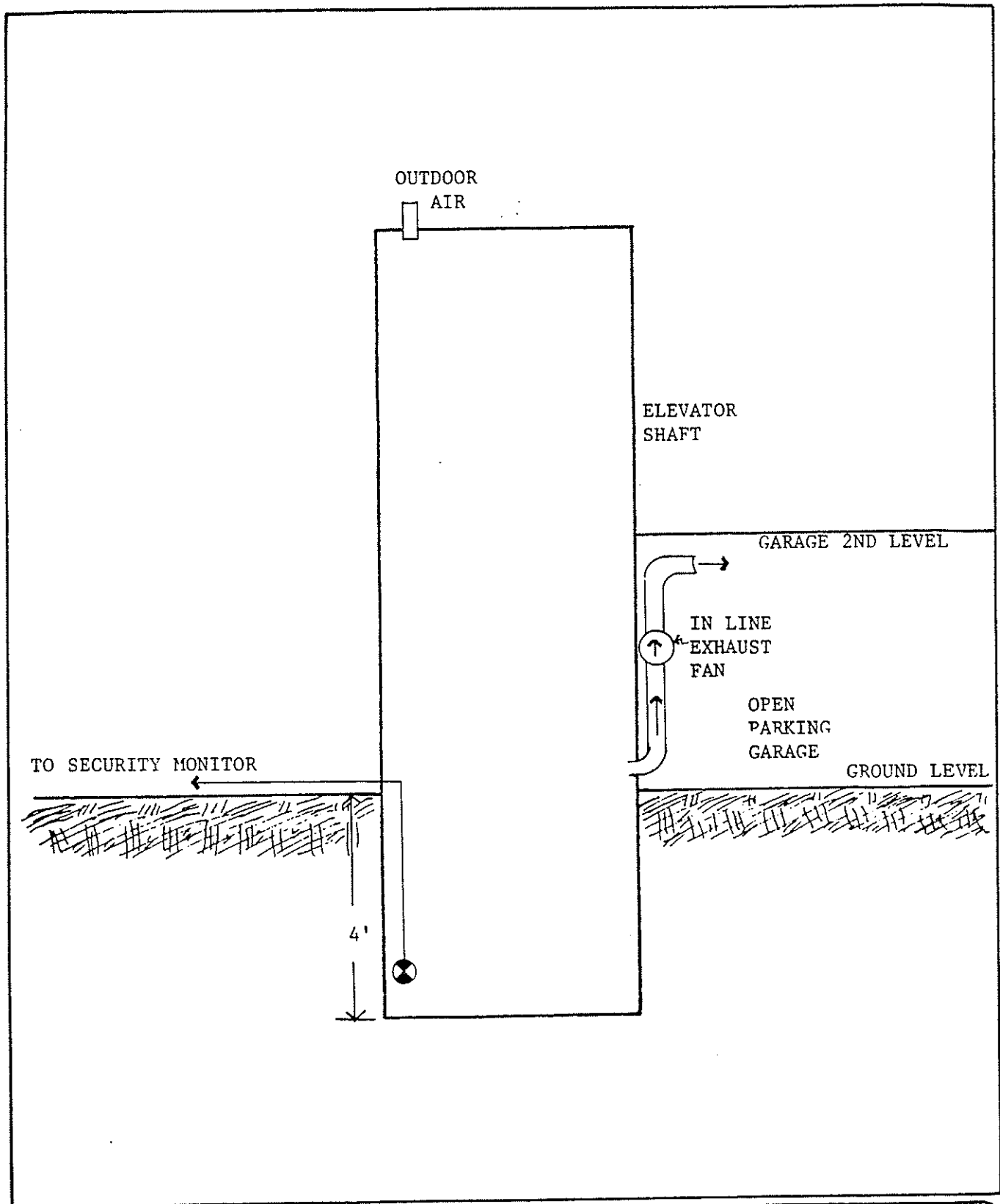


FIGURE 1. SCHEMATIC DRAWING OF SHAFT VENTILATION AND GAS DETECTION AT BAY CENTER APARTMENTS

The control panel is placed in the security office that is located in the main lobby. Details of the gas detection and alarm hardware are provided in Section 4.

Seven (7) 50 cfm fans, one for each of seven (7) shafts, are installed to ventilate all elevator shafts to minimize potential gas buildup during off hours/weekends when the HVAC is not functioning. The fans are capable of providing approximately five (5) airchange per hour in each shaft. This exhaust system removes any potential methane gas from the elevator pits, as described above.

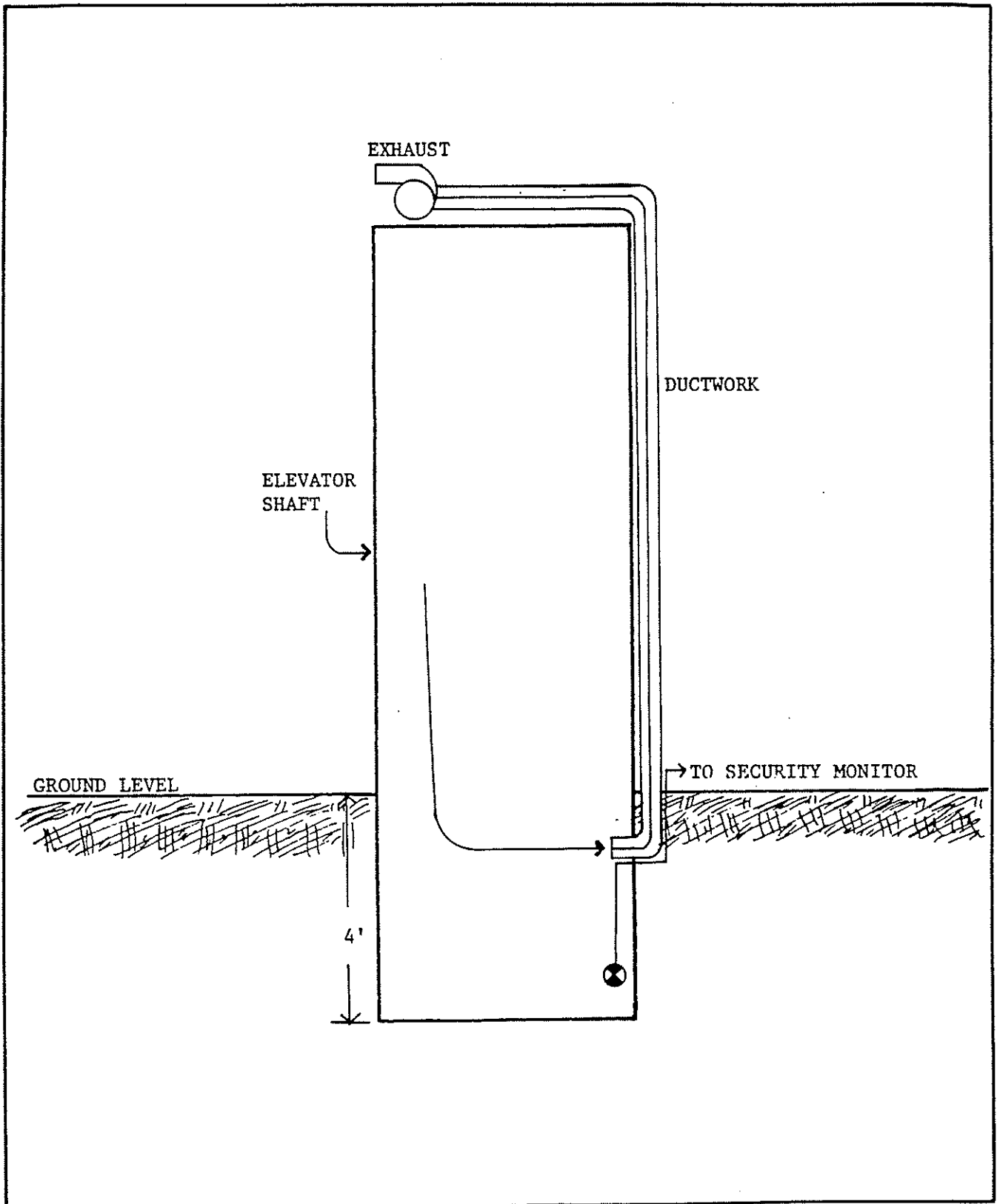
BAY CENTER OFFICES

The unlikely event of methane gas accumulation in low enclosed areas of the Bay Center offices also is controlled and monitored continuously. Ventilation is in the form of infiltration air which is mechanically pulled by a fan, one for each building, up the ductwork on the outside of the shaft and toward the roof from the ground floor level. There is one penetration in the shaft at approximately four feet above the pit bottom, through which the duct enters into the shaft space. At the bottom of each shaft there is a methane gas probe (see Figures 2 and 3).

Ventilation air from each shaft is exhausted to the rooftop through the explosion proof fans. There will be no hazard of accumulation at the rooftops, as dispersal from the roof will rapidly dilute the exhausts.

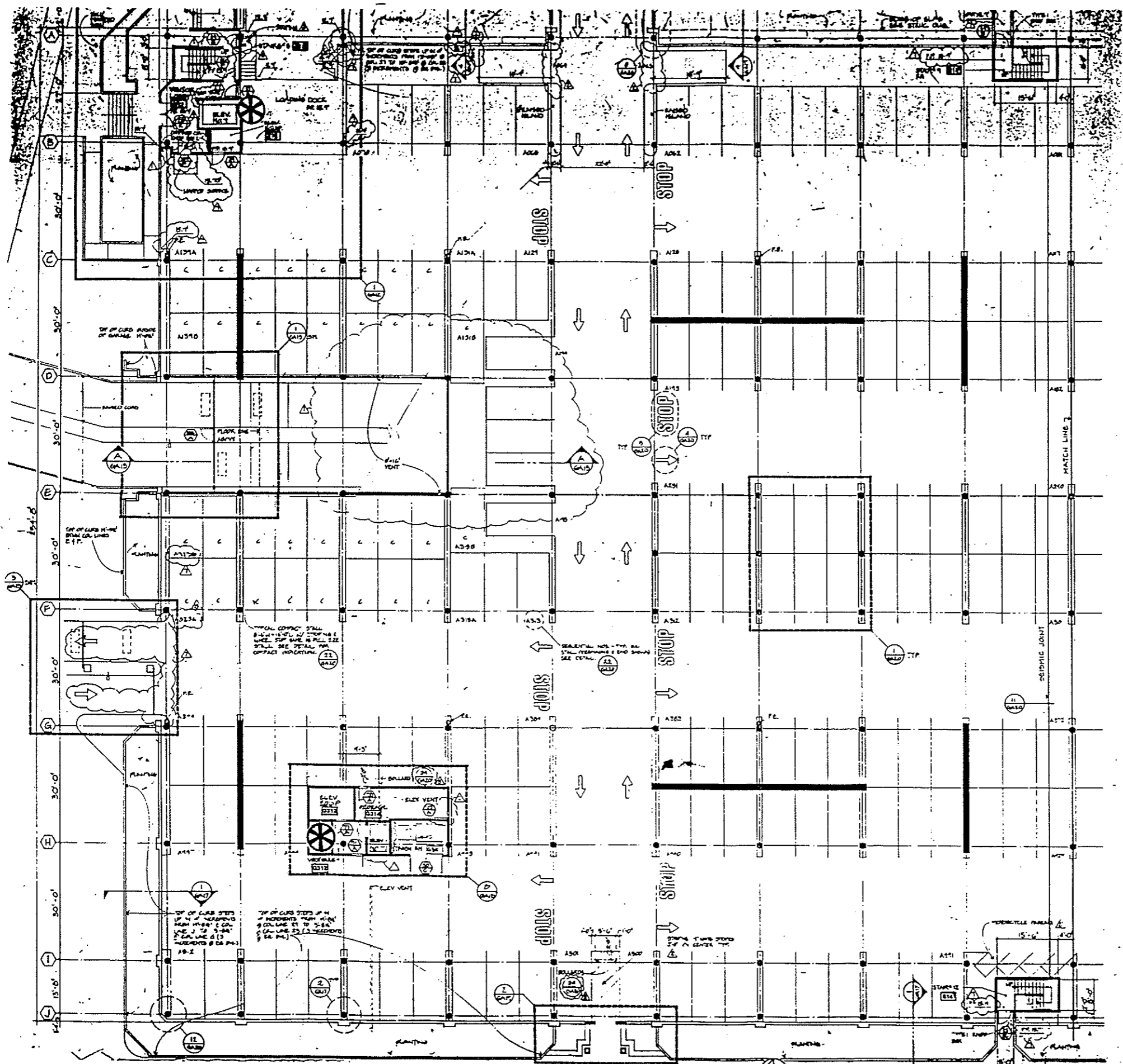
Control panels that monitor the elevator pits are located in the electrical room on the ground floor of each office building (Building A and Building B). Details of the gas detection and alarm hardware are provided in Section 4.

Two (2) one sixth horsepower motors have been installed in Building A and Building B. The roof mounted fan on Building A is rated at 375 cfm. The roof mounted fan on Building B is rated at 250 cfm. Building A has three elevators in one common shaft, and Building B has two elevators in one common shaft. Each fan is capable of providing approximately five (5) air changes per hour.





earth metrics

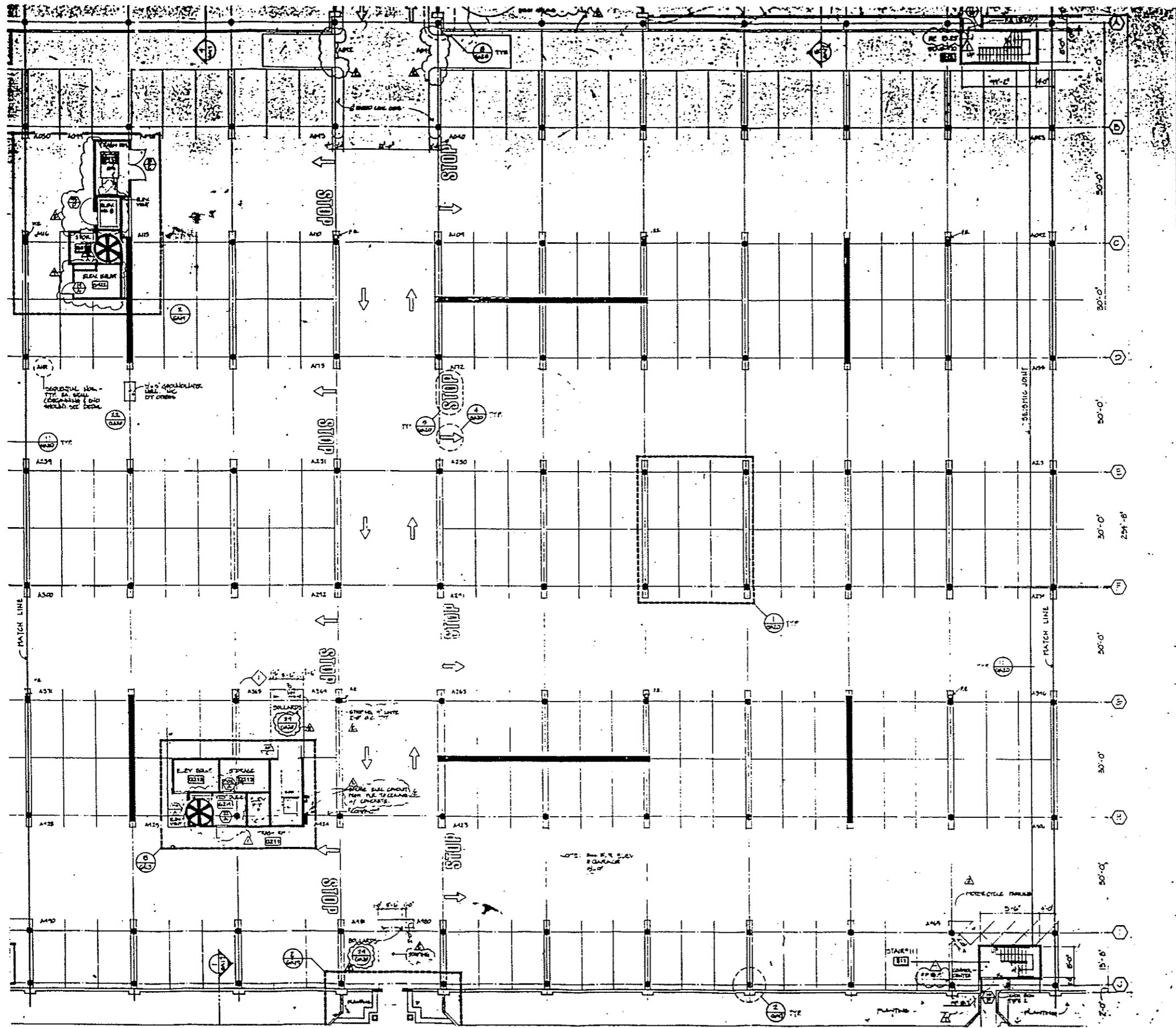
FIGURE 2. SCHEMATIC DRAWING OF SHAFT VENTILATION AND GAS DETECTION AT BAY CENTER OFFICES, EMERYVILLE



 GAS DETECTOR PROBE



FIGURE 4.
 DETECTOR PROBE LOCATIONS AT
 BAY CENTER APARTMENTS' GROUND
 FLOOR GARAGE PLAN NORTH

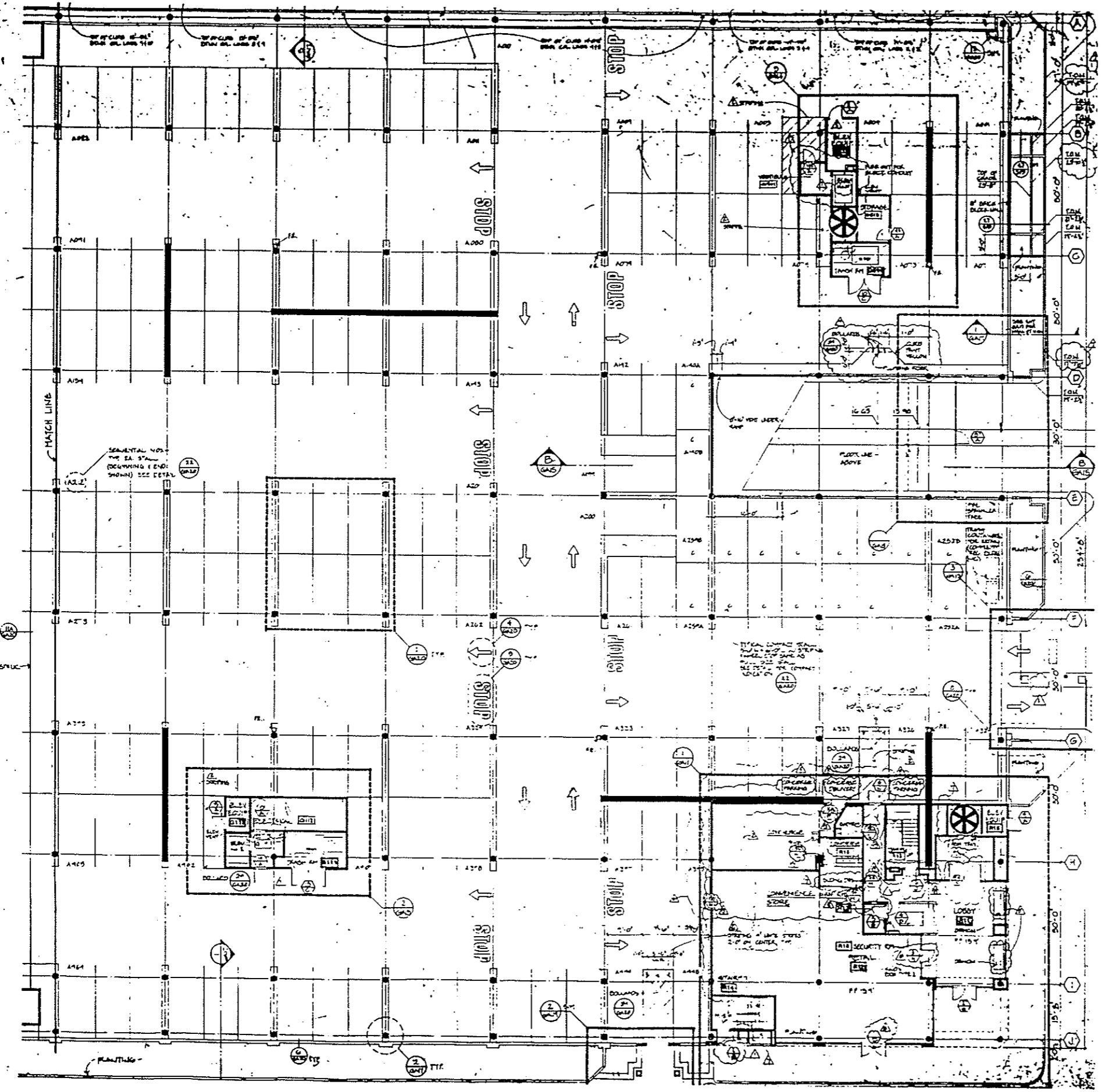
  NO SCALE



 GAS DETECTOR PROBE

FIGURE 5.
 GAS DETECTOR PROBE LOCATIONS
 AT BAY CENTER APARTMENTS GROUND
 FLOOR GARAGE PLAN CENTER

  NO SCALE






 GAS DETECTOR PROBE

FIGURE 6.
 GAS DETECTOR PROBE LOCATIONS
 AT BAY CENTER APARTMENTS GROUND
 FLOOR GARAGE PLAN SOUTH

  NO SCALE

4. HARDWARE SPECIFICATIONS

The system hardware is manufactured and serviced by Gas Tech Inc. in Newark, California. Two (2) Model 1220B gas detection and alarm systems are installed at the Bay Center offices, Buildings A and B. A third will be installed in Building C. Six (6) Model 1565-6 gas detection and alarm systems are being installed at the Bay Center apartments. Instruction manuals and schematic installation drawings are provided for the Gas Tech Inc. detection/alarm systems in the Appendix.

DATA RECORDING

Detectors in the elevator pits will employ recorders to record potential methane gas discharge.

MAINTENANCE REQUIREMENTS

The gas detection unit housing itself requires no normal maintenance. The metallic oxide sensor(s) will normally last for many years. If a replacement is necessary, then a new sensor is substituted, heater voltage is checked and unit is allowed to stabilize for a day or two. It is then necessary to recalibrate using a test gas sample.

The hardware installed at the Bay Center offices and apartments has undergone the initial calibration procedure. Recalibration is recommended according to the maintenance schedule described in Section 5.

TROUBLE SHOOTING

The systems employ a self-activating fail safe protection system. If the pilot light goes out, this provides a visual indication that i) the unit is unplugged, ii) power failure, or iii) one of the sensors has burned out. The amber light can easily be checked daily to assure proper functioning.

Should a problem occur with an individual channel, the trouble can be isolated by switching circuit cards from one position to another. A defective card can be sent to the factory for repairs. Since cards and sensors are calibrated together, both should be sent together if repair is needed.

5. GAS MONITORING AND VENTILATION MAINTENANCE RECOMMENDATIONS

GAS DETECTION/ALARM SYSTEM

The Routine Maintenance/Quality Assurance Program will include periodic checks to insure that the system remains on zero and is responsive to gas. The following schedule is recommended:

1. Daily
 - a) Verify pilot light operation. (If the amber light is out, the system is not functioning.)
 - b) Verify recorder operation.
2. Weekly
 - a) Check for meter reading on zero.
3. Quarterly (Recommended to be performed by Gas Tech or other trained personnel.)
 - a) With a known calibration gas sample, recheck and reset sensitivity.
 - b) Expose detector to combustible gas and confirm operability of indication and alarm systems.
4. As required (Recommended to be performed by Gas Tech or other trained personnel.)
 - a) Readjust zero whenever meter drifts more than 5 percent.
 - b) Replace detector whenever it becomes impossible to complete zero or calibration steps.

The gas monitoring system is factory calibrated for the gas or gases that are to be detected. However, the calibration should be checked periodically by trained personnel using a known gas mixture. The procedure is as follows:

1. Zero the meter carefully.
2. Expose detector to calibrating sample and note reading.
3. If reading is not correct, adjust the SPAN potentiometer to give the known reading.

The accessibility of parts through Gas Tech, Inc. should not present any problems. Replacement sensors and chart paper could optionally be kept on site to provide immediate replacement capability.

VENTILATION SYSTEM

Fans and fan connections should be checked monthly to assure proper function. Maintenance should follow the manufacturer's specification. A spare fan or fans could optionally be kept on site to provide immediate replacement capability.

A P P E N D I X

INSTRUCTION MANUAL

GASTECH GAS ALARM SYSTEM

MODEL 1220B-130263

WALL-MOUNTING TYPE WITH ONE

COMBUSTIBLE GAS DETECTION CIRCUIT

DUAL ALARM WITH LOCK-IN ALARM CIRCUIT

TROUBLE RELAY AND LIGHT

WALL-MOUNTING RECORDER ACCESSORY

SERIAL : 87573 and 87574
VOLTAGE : 115 V 60 Hz
CALIBRATED ON : Methane
ALARM SETTINGS : 5% LEL (Warning)
 : 20% LEL (High)
DETECTOR VOLTAGE : 6.0V DC

MADE BY:

GASTECH INC.
8445 CENTRAL AVENUE
NEWARK, CA 94560
PHONE: (415) 794-6200
FAX: (415) 794-6210
TELEX: 334-462

OPTIONAL FEATURES

The following optional features are available in the Model 1220B. See the checked boxes for identification of the features included in the specific instrument supplied with this manual, serial 87573 and 87574.

<u>Feature</u>	<u>Included</u>	<u>Page Ref.</u>
115/230V AC Power	[X]	1
Standby Power 18-32V DC	[]	2
LEL Circuit, Single Alarm	[]	3
LEL Circuit, Dual Alarm	[X]	3
Meter illumination	[]	
Recorder output (4-20 mA)	[]	2
High alarm relay	[X]	2
Warning alarm relay	[X]	2
Trouble relay	[X]	4
Trouble light	[X]	4
Lock-in alarm	[X]	3
Silence feature	[X]	4
Junction box, detector	[]	5
Sample-drawing adapter	[]	
Recorder accessory	[X]	Supplement

CONTENTS

I. GENERAL DESCRIPTION	1
II. INSTALLATION	5
III. PLACING IN OPERATION	7
IV. MAINTENANCE, LEL SECTION	8
V. PARTS LIST	9

SUPPLEMENTARY INSTRUCTIONS

MODEL 1220B SERIAL NOS. 87573 and 87574

RECORDER OUTPUT

This instrument is a standard Model 1220B which has been modified to provide a 0-1 mA signal at Recorder Output terminals for connection of an external 0-1 mA recorder (See Figure B). Output is in series with meter and 0-1.0 mA signal correspond to the full-scale meter display.

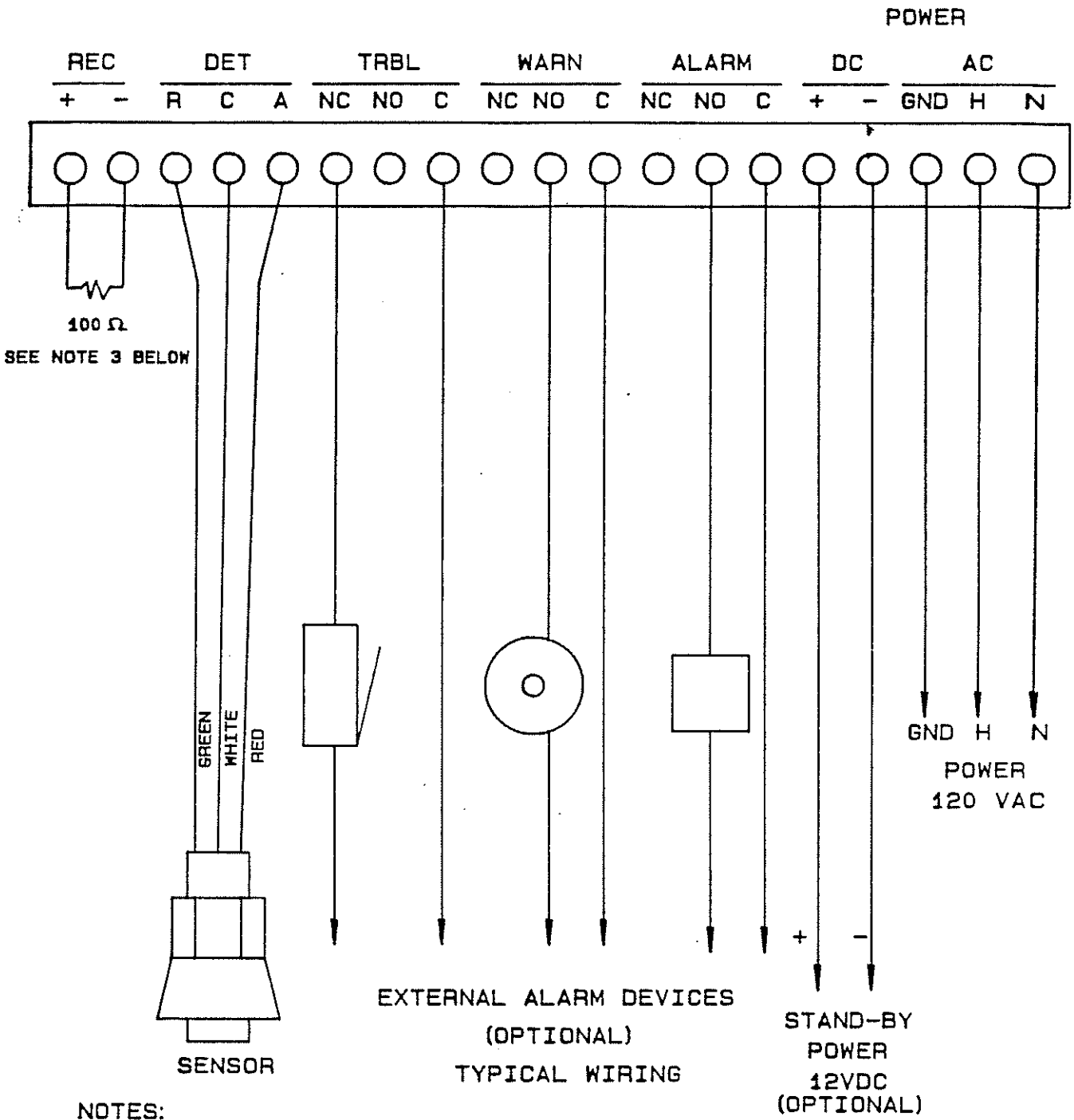
When recorder is connected to its terminals, the entire meter current flows through and is repeated in the recorder. The Rustrak Model 288 Recorder (0-1mA) supplied with this instrument should be connected in this way, with the resistor removed. Full scale of the recorder will track with full scale of the meter.

If recorder is not to be used, then connect a 100 ohm resistor between the recorder terminals to serve as a dummy load. For convenience, a 100 ohm resistor is installed at this point prior to shipment, and must be removed when the recorder is connected.

If preferred, a high-impedance DC millivolt recorder may be used. In this case, a 0-100 millivolt output is produced across the resistor, with the resistor left in place.

In all other respects, this instrument remains as described in accompanying Model 1220 Instruction Manual.

'14-A30



LTR.	REVISION	DO NOT SCALE DRAWING		GASTECH	GASTECH INC. NEWARK, CALIFORNIA 94560
		DEBURR	BREAK EDGES ± .015 R		
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		TITLE 1220B EXTERNAL WIRING WITH 100 RESISTOR ACROSS RECORDER OUTPUT	
		.XX ± .010	ANGLES ± 0°30'	SCALE NONE	DR. BY MJS
		.XXX ± .005	CONC. .010 TIR	DRAWING NO. 2414-A30	
		FRACTIONS ± .015	FINISH 125 ✓	R	
		FINISH FOR 'O' RING GROOVES.			

INSTRUCTIONS
GASTECH MODEL 4609
EXTERNAL RECORDER ACCESSORY

I. INTRODUCTION

The Model 4609 external recorder accessory consists of a Rustrak Model 288 Strip-Chart Recorder installed in a wall-mounting enclosure complete with terminals for power connection and wiring to the recorder output terminals of a GasTech analyzer.

Full scale of the recorder corresponds to a 0-1 mA signal at the 1mA + and - terminals in the recorder housing. If a resistor has been added in series with the + 1mA terminal, then the range is converted to a voltage dependent upon the resistance. See Section III. B.2: Wiring.

II. DESCRIPTION

A. Housing

The recorder housing is a weather- and corrosion-resistant NEMA 4X case with a hinged, gasketed door and an over-center door latch. It has flanges top and bottom for mounting and a 1/2" conduit hub on bottom for wire entry.

B. When the housing door is unlatched and swung open, the following components can be found:

1. Rustrak Model 288 Recorder, mounted by means of four slotted screws to the back of the housing. See Rustrak Model 288 Recorder Instruction Manual supplied, for further information regarding this recorder.
2. Terminal strip, five point, for connection of 115V AC power and positive (+) and negative (-) recorder output signal lines from the GasTech analyzer. Strip is located directly below the recorder and is covered by a plexiglass shield, mounted on standoffs, to avoid inadvertent contact with high voltage.

III. INSTALLATION

A. Housing (See Figure A)

Mount housing by means of 1/4" screws, through mounting holes, or hang on hooks, on a flat, vertical surface adjacent to the analyzer. Be sure to leave room at the sides for opening door and at bottom for wire entry.

B. Wiring (See Figure B)

1. Connect 115V AC power supply to H (hot) and N (neutral) terminals on the recorder terminal strip.
2. Run two wires from Recorder Output + and - terminals on the analyzer to SIGNAL + and - terminals, respectively, on the recorder terminal strip. Recorder must be supplied with a 0-1 mA signal, corresponding to zero to full scale on the analyzer meter. For GasTech instruments with a standard recorder output of 0-100 mV, a 0-1 mA signal can be produced by removing the 100 ohm resistor connected between the 0-100mV Recorder + and - terminals in the analyzer. This will cause the entire meter current to flow through and be repeated in the recorder.
3. For GasTech instruments having a 0-1 volt output, the recorder is converted to a 0-1 volt range by addition of a 900 ohm resistor in series with the + SIGNAL lead. If supplied with this conversion, the range "0-1 VOLT" will be marked adjacent to terminal strip. However, any 0-1 mA recorder can be converted to 0-1 volt by addition of a 900 ohm resistor.

IV. OPERATION

Supply power to the recorder housing. Full scale of the Recorder will track with full scale of the instrument meter and chart output can be read using meter dial supplied on the recorder, or if chart is removed from recorder, using meter card, a hand-held reproduction of the recorder meter scale.

For full operation of the recorder, see the Rustrak Model 288 Instruction Manual.

V. REPLACEMENT PARTS LIST

<u>Stock Number</u>	<u>Description</u>
82-5053	Model 288 Rustrak Recorder
82-5055	Model 4609 Wall-Mounting Recorder
82-5101	Recorder Chart Paper, style WA

1...A...

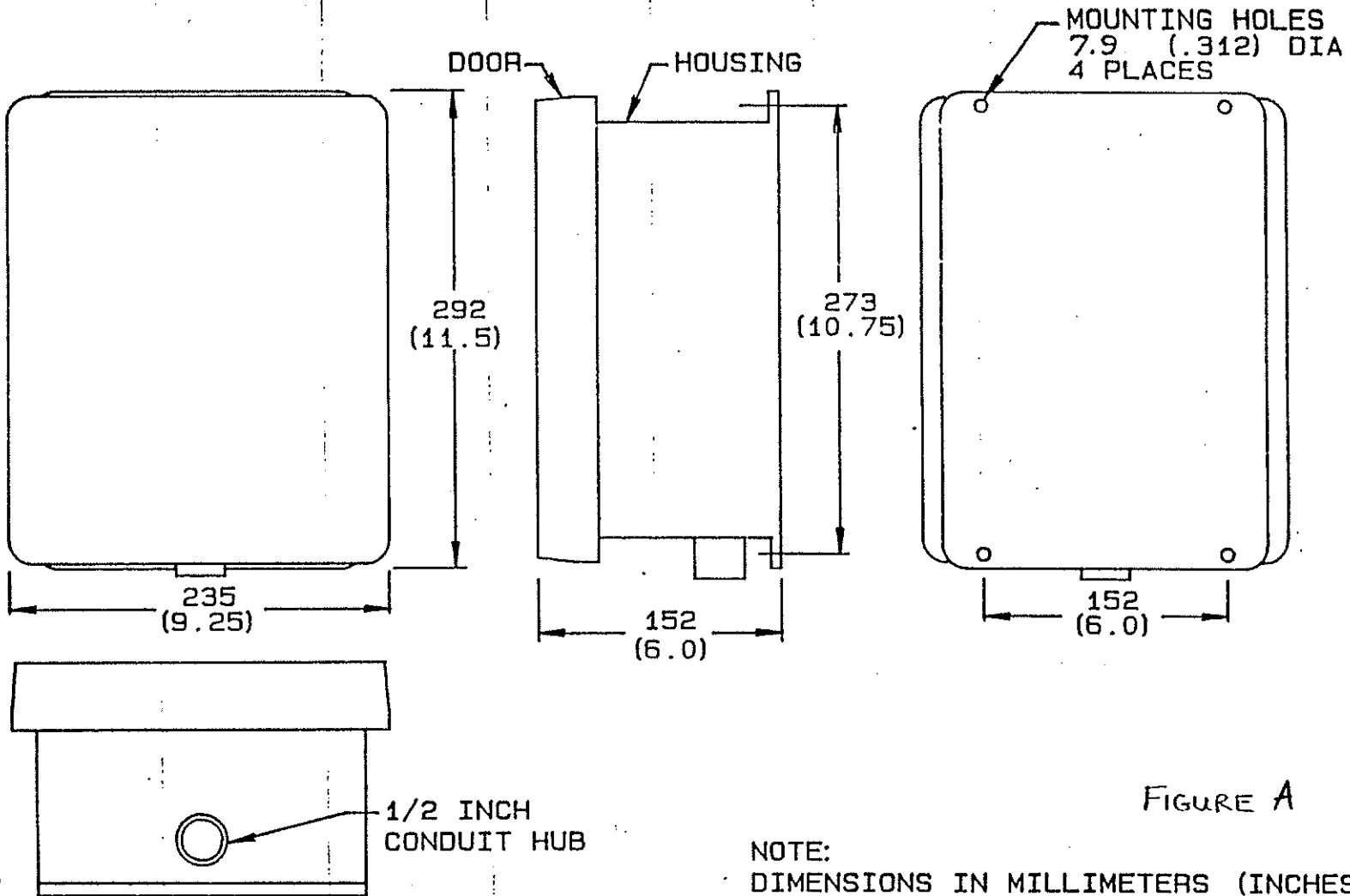



FIGURE A

LTR.	REVISION	DO NOT SCALE DRAWING			GASTECH INC. NEWARK, CALIFORNIA 94560	
		DEBURR	BREAK EDGES ± .015 R			
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:				
		.XX ± .010	ANGLES ± 0°30'			
		.XXX ± .005	CONC. .010 TIR			
		FRACTIONS ± .015	FINISH #25 ✓	TITLE <u>RECORDER HOUSING</u>		
		FINISH FOR 'O' RING GROOVES.		SCALE 1/4	DR. BY <u>KRG</u>	DRAWING NO. <u>44194-A</u>
					REV.	

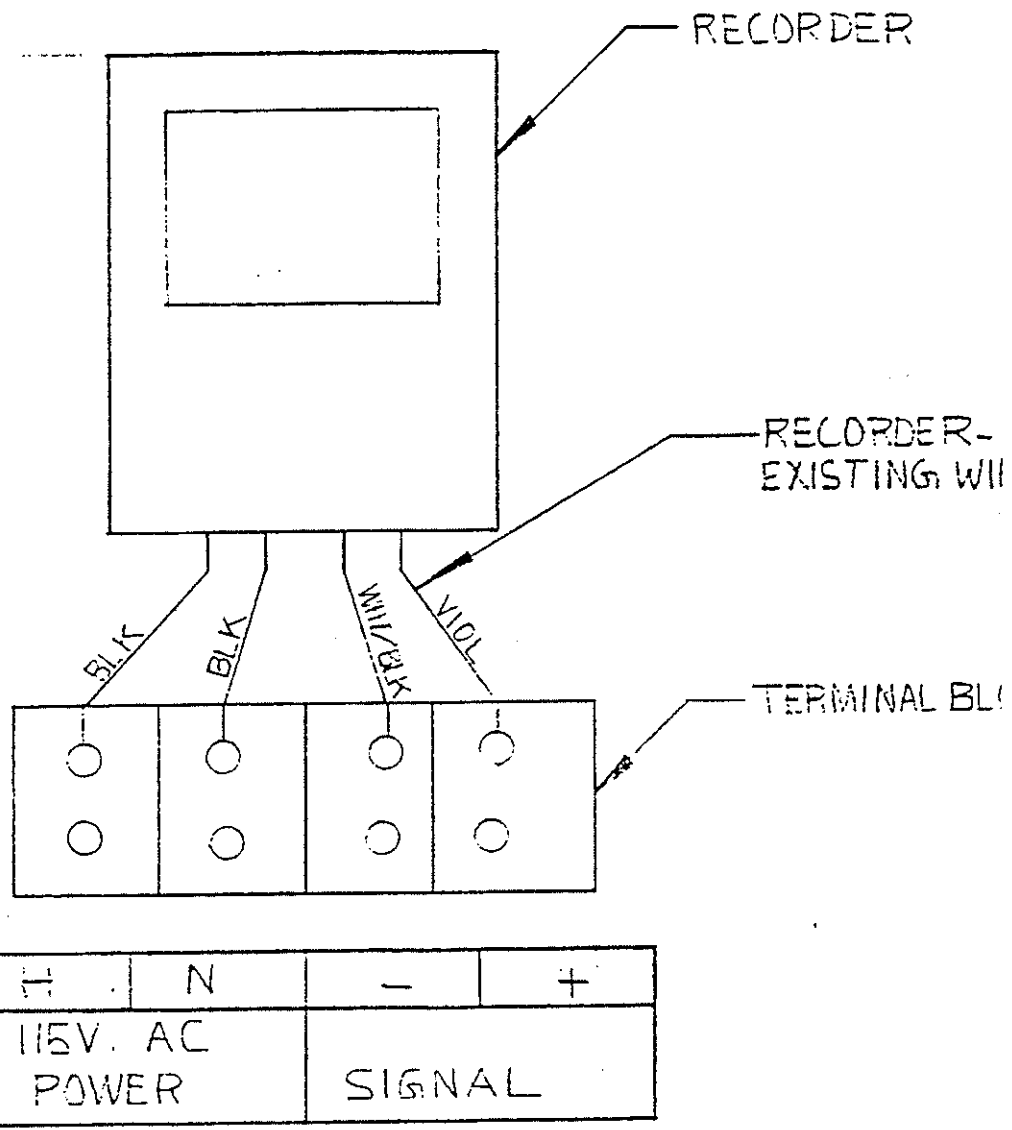



FIGURE B

LTR.	REVISION	DO NOT SCALE DRAWING			GASTECH INC. NEWARK, CALIFORNIA 94560	
		DEBURR	BREAK EDGES ± .015 R			
		TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:				
		XX ± .010	ANGLES ± 0°30'			
		XXX ± .005	CONC. .010 TIR			
		FRACTIONS ± .015	FINISH ¹²⁵ ✓	TITLE	WIRING DIAGRAM, RECORDER	
		FINISH FOR O' RING GROOVES, 3 SIDES ³² ✓		SCALE NONE	DR. BY M.A	DRAWING NO.
				DATE 1/30/27	CKD. BY P.P	4494-A9

I. GENERAL DESCRIPTION

The Model 1220B Gas Alarm System is a versatile series of diffusion-sampling instruments for detection of combustible gas. Use of modern integrated circuits and a master printed circuit board pre-etched for all possible combinations provides all needed indication, alarm and fail-safe functions with simplicity of operation, durability of construction and low cost.

The following instruction pages relate both to the basic instrument and to those specific circuit functions found in the instrument corresponding to the serial number on the front cover of this manual. See summary on Contents page for listing of the features applicable to this instrument. Additional features not included originally can be added at low cost upon return of the instrument for modification.

A. Basic Instrument

The Model 1220B is a wall-mounting instrument, assembled into a dust-resistant fiberglass case with hinged gasketed door. As generally supplied, the meter, the indicator lights, the reset switch and the alarm buzzer are mounted on the front door.

Indicator lights are of the light indicating diode (LED) type, for long life, ruggedness and low power consumption. Buzzer is a solid-state device with no arcing contacts.

All components except those mentioned above are assembled to the instrument circuit board, which is a heavy-weight epoxy-glass two-sided etched board. Principal circuit components, arranged in groups and with slotted shaft potentiometers identified by etched lettering, are:

1. Power Supply

The basic power supply uses a three-pin voltage regulator integrated circuit to reduce the voltage from a nominal 12 volts DC to a regulated value which may be set between 5.5 and 8.0 volts, to suit the specific detector application. A voltage adjustment potentiometer is used to make the final adjustment at installation.

Generally, the Model 1220B operates from the AC power line, and a step-down transformer and rectifier are included to permit operation from either a 115 or a 230 volt AC power source. Jumpers are soldered to marked terminals to select the input voltage, whether 115 or 230.

When operating from the AC power line, a 12V DC standby power source may also be connected to the DC terminals. This will automatically pick up the load in case the line power fails.

Two fuses are used in the Model 1220B. The AC fuse is a cartridge type, mounted in clips just below the transformer. It protects the AC power circuits. A second fuse of the same type serves the DC circuits, and is mounted just above the power terminal strip.

An optional switching regulator is available to allow DC input voltages in the 18 to 32 volt range. This option allows a standby power of 24V DC to be used instead of the nominal 12V DC.

2. Alarm Relays

Sockets are provided into which relays may be plugged, for control of external alarm circuits. Normally closed and normally open terminals are provided on terminal strip. One socket is included for each level of alarm.

Relays are furnished only when specified, as the basic Model 1220B may be used without auxiliary alarm circuit, since it has light and buzzer indication of combustible gas.

Alarm circuits may be supplied either in self-resetting or in lock-in forms. In the lock-in version, a pushbutton switch is supplied on the front door, which must be pressed to release the alarm circuit after the gas concentration has been reduced below the alarm setting.

See following pages for details of alarm functions as supplied with this specific instrument.

3. Detection Circuit

For details of the detection circuit provided in this specific instrument, see following pages.

4. Recorder Output

Terminals are provided for connection of a separate DC recorder. Standard connection gives an output of 0-100 millivolts corresponding to the meter range of 0-100% LEL.

As an option, the output can be converted to 4-20 mA DC, by an internal change.

B. Detection Circuit

1. Detection Principle

Detection is by catalytic oxidation on a heated platinum element. The element, installed at the point where gas is to be detected, is connected as one leg of a balanced Wheatstone bridge. A second, non-catalytic, element is installed in the same environment for thermal compensation, and the two elements are surrounded by a sintered stainless steel flame arrestor to form a complete detector assembly. The detector connects to marked terminals on the circuit board.

Two fixed precision resistors and a Zero Adjust potentiometer on the circuit board complete the Wheatstone bridge circuit. Output is fed to an operational amplifier which steps the voltage up to the 0-0.5 volt range, for actuation of the meter and the alarm circuits. A Span potentiometer is provided to set the sensitivity to a correct value, using a known calibrating sample.

2. Alarm Circuits

Electronic switching circuits are available, as follows:

- a) High LEL alarm, which can be set to actuate the alarm buzzer (and relay if used) at a preset gas concentration such as 50% LEL. When the alarm level is reached, the HIGH alarm light comes on and the buzzer produces a pulsating sound, which continues as long as the concentration remains above the set point. The relay also pulls in and holds on as long as the alarm condition exists.

If the lock-in feature is included, the alarm circuit holds in until the RESET button is pressed. If concentration remains above the alarm setting, the circuit cannot be reset.

- b) Warning (Low) alarm, which can also be set to actuate the buzzer (and a separate relay, if desired) at a lower gas concentration such as 20% LEL. When this level is reached, the Warn light comes on, and buzzer sounds in the pulsating mode. Also, relay pulls in.

If Silence feature is provided, with lock-in alarm, this is put into effect by pressing the RESET button. This will cause the buzzer to stop sounding, and the relay will be de-energized. However, the WARN light will commence blinking, and stay in this condition until the concentration drops below the alarm setting.

Alarm levels are initially set as shown on the cover page of this manual. However, they are field-adjustable using the corresponding Alarm Set potentiometers.

c) Trouble alarm, is indicated by a steady tone from the buzzer, and by steady illumination of the yellow TROUBLE light, if included. Trouble alarm is put into effect in several ways:

- 1) If circuit is unbalanced in the downscale direction by 10% or more,
- 2) If a break occurs in any of the wires leading to the detector, or within the detector itself,
- 3) In the event of power supply failure, the trouble relay (if used) will be de-energized.

If a trouble relay is included, it will become de-energized, and thus can be used to actuate a remote trouble signal.

2. Meter Indication

The alarm circuits are independent of the meter, and the meter is provided as a convenience in zero and calibration adjustment, as well as a means of evaluating gas concentrations below or above the alarm setting. Meter scale reads 0-100% LEL, with 100% representing the lower explosive limit, the least concentration that will support a self-propagating flame, or explosion, if ignited.

2. DC Power

For DC-powered systems, and for installations where stand-by power is needed, connect a 12V DC battery to the 12V DC terminals + and -. Polarity must be correct for proper operation; however, circuit is protected by a diode against damage due to a wrong connection.

3. External Alarms (Optional)

If any external alarm functions are desired, instrument must be equipped with relays. For each alarm function (High, Warning LEL or Trouble) connect through the relay terminals NO, NC, C. NO and C are normally open, connected on alarm. NC and C are normally connected, open on alarm. Trouble relay is energized in normal operation, so NO and C are connected during normal operation. Relays must be installed in sockets for external alarm terminals to be active. If no relay was included in original purchase, it may be ordered from the description on Parts List, Section V.

4. Detector (LEL)

Run three wires from each remote detector to the corresponding terminals in control box, using the following color code (referring to the three wires on detector):

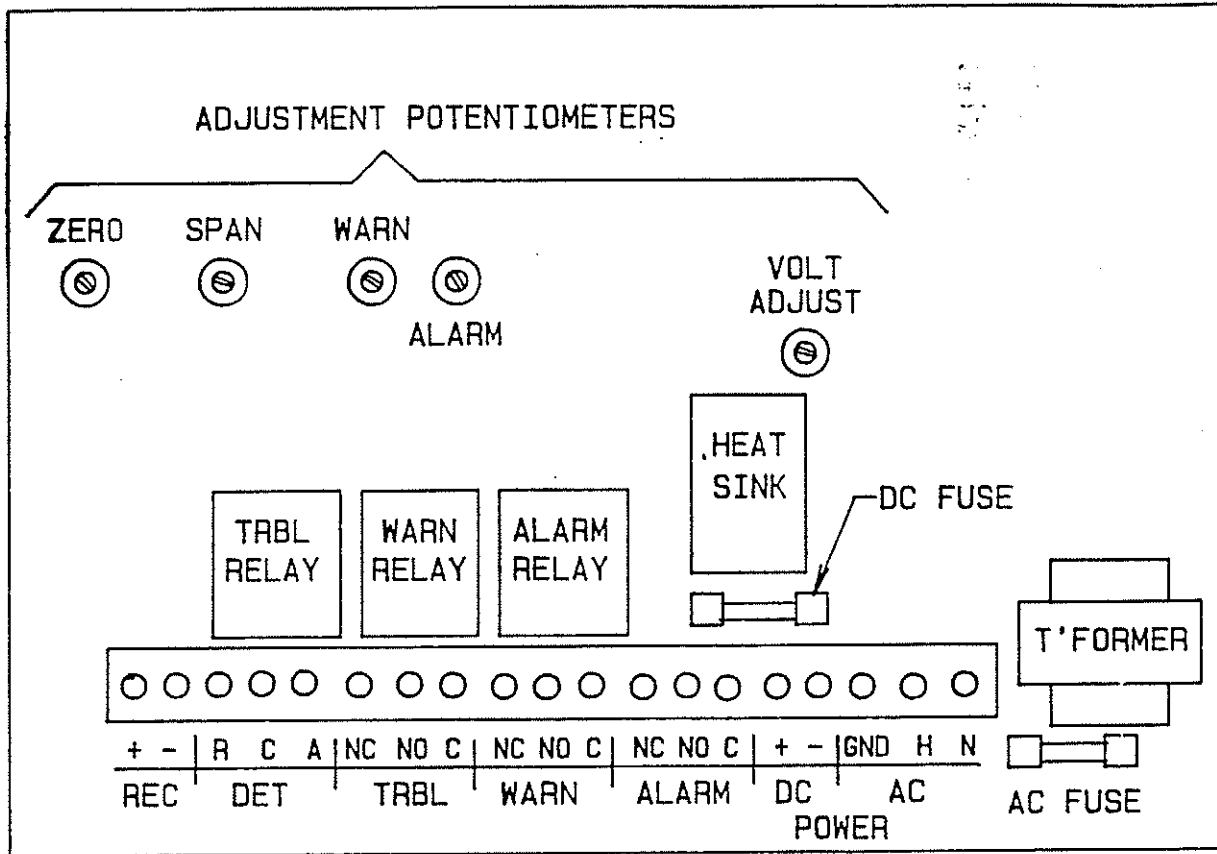
<u>Terminal</u>	<u>Color Code</u>
A	Red
C	White
R	Green

Recommended minimum wire sizes are as follows, for red and green wires:

0 - 200'	-	#16
200 - 500'	-	#14
500 - 1000'	-	#12

The third (white) wire can be as small as #18, for any distance.

When making connections, be sure to use a firm clamp-type connector, or solder the joints. If the #18-0205 junction box is purchased, a suitable terminal block is included.

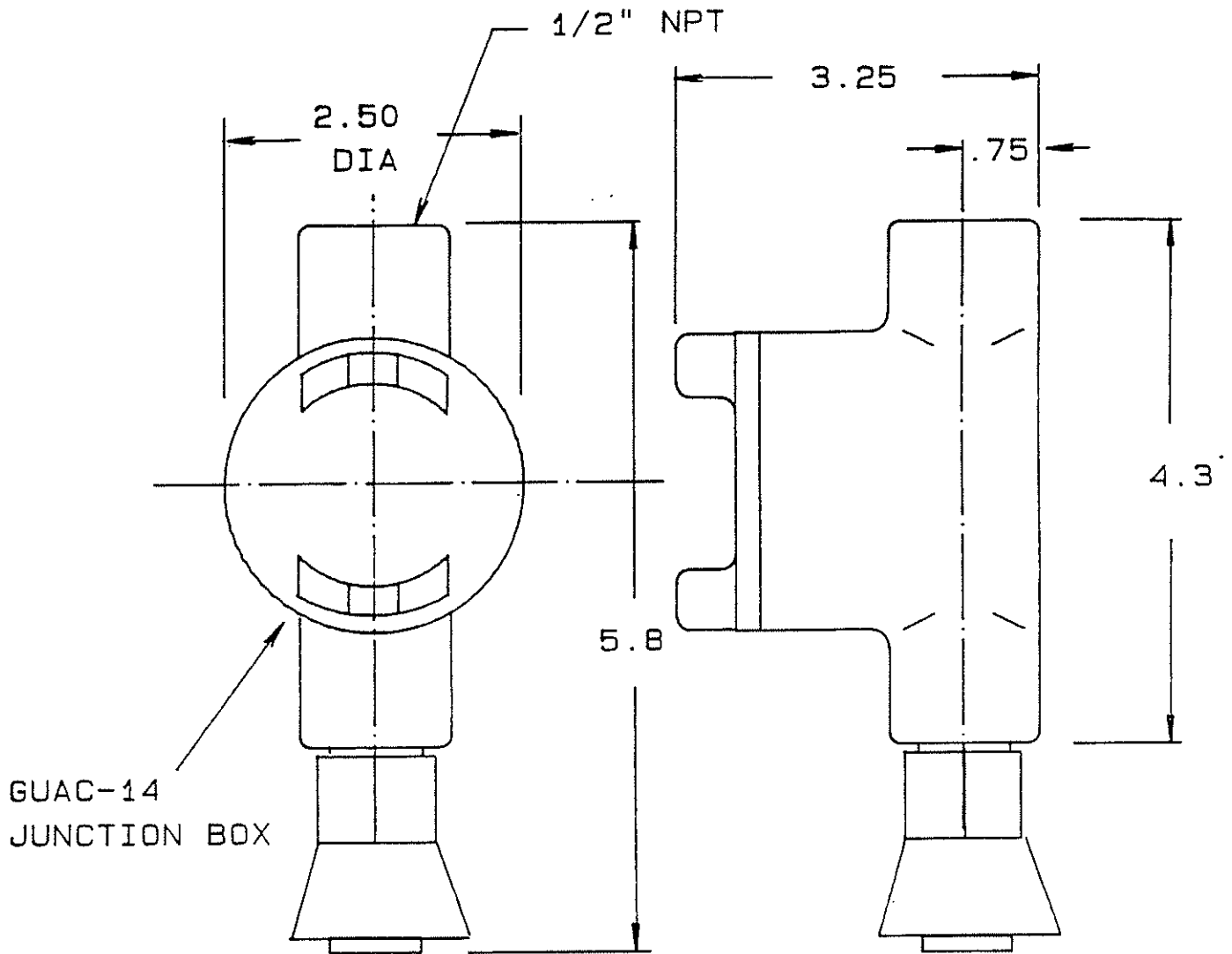


NOTE:

1. RELAY CONTACTS ARE FORM "C" ISOLATED
RATED AT 3 AMPS INDUCTIVE LOAD
2. TROUBLE RELAY IS ENERGIZED DURING NORMAL OPERATION

FIGURE C

.TR.	REVISION	DO NOT SCALE DRAWING	GASTECH			GASTECH INC.							
		DEBURR BREAK EDGES ± .015 R	NEWARK, CALIFORNIA 94560			TITLE MODEL 1220 B COMPONENT LOCATION							
A	MISSING 2-13-87 BP RE-DRAWN 5-8-87 KBG	TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:							SCALE NONE	DR. BY FM	DRAWING NO.	REV	
		.XX ± .010 ANGLES ± 0°30'							DATE 9-19-84	CKD. BY BP	3414-A3	A	
		.XXX ± .005 CONC. .010 TR FRACTIONS ± .015 FINISH 125 ✓											
		FINISH FOR 'O' RING GROOVES, 3 SIDES 32 ✓											



NOTES:

1. MOUNT ASSEMBLY IN POSITION SHOWN USING CLAMPS ON 1/2" CONDUIT.
2. ALL DIMENSIONS IN INCHES

WEIGHT:

1.75 LBS.
0.8 KILO

FIGURE D

REVISION	DO NOT SCALE DRAWING		GASTECH	GASTECH INC. NEWARK, CALIFORNIA 94560	
	DEBURR	BREAK EDGES ± .015 R			
B REDRAWN TO CORRECT OUTLINE 9/1/87 KBG	TOLERANCES & FINISHES UNLESS OTHERWISE NOTED:		TITLE OUTLINE AND MTG. DIMENSIONS DETECTOR / J-BOX CLASS I GRP. C/D		
	JX ± .010	ANGLES ± 0°30'			
	XXX ± .005	CONC. .010 TIR	SCALE 0.7	DR. BY KBG	DRAWING NO.
	FRACTIONS ± .015	FINISH 125 ✓	DATE 9.1.87	CKD. BY BP	1295-A20
	FINISH FOR 'O' RING GROOVES. 3 SIDES 32/				REV. B

SERVICE POLICY

GasTech Inc. maintains an instrument service facility at the factory. Some GasTech distributors also have repair facilities; however, GasTech assumes no liability for service performed by other than GasTech personnel. Should your instrument require non-warranty repair, you may contact the distributor from which it was purchased, or you may contact GasTech directly.

If GasTech is to do the repair work for you, you may send the instrument, prepaid, to GasTech Inc., 8445 Central Avenue, Newark, CA 94560, Attn: Service Department. Always include your address, purchase order number, shipping and billing information and a description of the defect as you perceive it. If you wish to set a limit to the authorized repair cost, state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. GasTech's policy is to perform all needed repairs to restore the instrument to full operating condition, including reactivation of all out-of-warranty electrochemical cells.

To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by Gas Tech.

1994-091686

INSTRUCTION MANUAL
MODEL 1565-6
GASTECH MULTICHANNEL SOLVENT VAPOR ALARM
WITH DUAL LEVEL ALARM

SERIAL : 86886

POWER : 115V AC 60 Hz

<u>Channel</u>	<u>Calibrated for</u>	<u>Alarm #1 Setting</u>	<u>Alarm #2 Setting</u>	<u>Sensor Type/No.</u>	<u>Sensor Voltage</u>
1	Methane	5% LEL	20% LEL	813/2098	5.0
2	"	"	"	813/2102	"
3	"	"	"	813/2103	"
4	"	"	"	813/2104	"
5	"	"	"	813/2107	"
6	Not Furnished				

GASTECH, INC.
8445 CENTRAL AVENUE
NEWARK, CALIFORNIA 94560
PHONE (415) 794-6200

I. INTRODUCTION

The Model 1565 Solvent Vapor Alarm is a warning system for toxic or flammable gases or vapors in a workspace. It monitors the ambient atmosphere and actuates audible and visual signals if the gas or vapor concentration exceeds a preset level. The multi-channel, dual level alarm Model 1565 has provision for up to six independent points of detection, each of which may be independently calibrated and set for a high and a low alarm level. All channels actuate one common audible alarm signal, two common alarm relays (one for each level of alarm), and also share a common trouble relay.

I. DESCRIPTION

The Model 1565 utilizes a solid-state metallic-oxide semiconductor detecting element which undergoes a drastic change in resistance when exposed to solvent vapors. This change in resistance is used to produce a DC voltage signal, and to actuate an alarm at a preset level.

The multi-channel instrument is housed in a surface-mounting molded fiberglass case with mounting flanges at top and bottom. It is normally secured to a wall at an appropriate height by means of four screws. The sensing element is connected to a cable or conduit which enters the housing through holes provided by the factory, unless otherwise specified by the customer.

On the front of housing, visible through a transparent window, will be noted the following components:

- 1) Pilot light, amber, an LED-type angle-mounted indicator that comes on when the channel is energized and in operation.
- 2) Alarm lights, red, two per channel, similar indicator lights that come on whenever the channel is in alarm condition. Just one (#1) alarm light on indicates the gas level has exceeded its low alarm preset value and both red lights on (#1 plus #2) means it has exceeded its high alarm preset value. All three lights are mounted at edge of board for good visibility from the front of housing.
- 3) Alarm adjust potentiometers, angle-mounted controls positioned at edge of board for easy adjustment when the housing is opened. These are the primary operating controls and are used to set the alarm to be actuated at preset levels of gas concentration.
- 4) Sensitivity adjust, factory set, used to set basic amplifier gain corresponding to gas to be detected. This is factory set, and is normally left in original position. It can be adjusted by use of a long narrow screwdriver to reach the lower edge of board.
- 5) Voltage adjust, a multi-turn potentiometer in the power supply circuit, is used to set the operating voltage of sensor. This control is just below pilot light.
- 6) Test jacks, + and -, into which voltmeter test prods can be plugged for checking output during calibration, are also provided along outer edge of circuit card, where they are accessible while housing cover is removed.

III. INSTALLATION

A. Control Housing

1. Mount the housing to a vertical surface, using screws through holes in mounting flanges, as shown in Fig. A. Mount housing at approximately eye level in the most central convenient location, preferably in a reasonably clean, sheltered area. However, housing is dust- and weather-resistant, so can safely be installed in any suitable instrument location. If housing does not already have conduit or cable openings in the bottom, these should be drilled prior to mounting the housing.

B. Detectors

1. Detectors are of the plug-in type, and install in an MS 3106A-14S-6S socket, supplied.
Socket can be mounted to a junction box cover or to a similar flat surface. Please refer to Figure D at the end of this manual for mounting dimensions.

- a) Pilot light, amber, to show that power is on and that channel is in operation.
- b) Alarm lights, red, two per channel, to show that instrument is in alarm condition.

These lights are mounted on the edge of the circuit card for each channel, so are present only for active channels.

The following will be noted in lower portion of front door, set flush in an opening in door:

- c) Buzzer, solid state, to produce a pulsating signal whenever the instrument is in alarm condition.

When housing is opened, by releasing latch and swinging door open, the following further components will be seen:

- d) Main circuit board, which includes the power and alarm components, the sockets and terminals including the six circuit card sockets into which the channel circuit boards plug. These components include:
 - 1) Channel sockets, edge-type circuit card connectors, one for each channel. They mount the circuit cards in position so that the lights are visible through window when cover is closed. All sockets are prewired for the maximum number of channels.
 - 2) Transformer, which provides low voltage for operation of the six detection channels.
 - 3) Terminals, for connection of external alarm circuits, power and sensors.
 - 4) Three relays, plug-in double-throw type. One relay is activated whenever any one of the six channels is in alarm #1 condition. The second relay is activated whenever any one of the six channels is in alarm #2 condition. The third relay is normally activated, and will de-activate to indicate any trouble in the system, such as a power failure or a disconnected sensor.
- e) Channel Circuit Card, one per channel, is a plug-in module which includes all necessary electronic elements to provide regulated power to the detector, respond to signals from the detector and actuate the alarm circuits if gas is detected. Principal components of interest from the standpoint of operation and maintenance are:

2. Mount the detector to a vertical or horizontal surface, using screws provided. Choose a detector location that is representative of the area to be monitored, and where the detector is protected from water spray and from mechanical damage.
3. As supplied, detector is furnished connected to a socket with short wires which are color-coded to indicate required connection. A 4-point screw terminal block is attached, for convenient connection to interconnecting wiring.

C. Wiring (See Fig. 2)

1. Bring AC power wiring into housing and connect to AC power terminals H and N, with grounded neutral to N. Verify that voltage matches nameplate, 115 or 230 volts 50/60 Hz.
2. Run four wires to each remote detector, using minimum wire size as follows, for various maximum distances.

<u>Terminal</u>	<u>Color</u>	<u>20'</u>	<u>50'</u>	<u>100'</u>	<u>500'</u>
A	Red	20	18	16	14
B	White	20	20	20	18
C	Green	20	20	20	18
D	Black	20	18	16	14

Larger wires can always be used without difficulty. Wires can be run in conduit or cable, and shielding is not required.

3. Connect external alarm circuits as desired, using NC-NO-C terminals of ALARM and TROUBLE (FAILURE) relays. These terminals serve all circuit cards in common. Alarm relays are normally de-energized, and energize in case of alarm at any point. Thus an external circuit connected through NO and C will be turned on in alarm; a circuit connected through NC and C will be energized except on alarm. If an external trouble alarm is desired, connect it in the same way. However, remember that the trouble relay is energized in normal operation, so NO and C are connected except during malfunction conditions.

IV. PLACING IN OPERATION

- A. If they have been removed, plug circuit cards into corresponding sockets. Note that detectors and circuit cards are tested and calibrated in sets, so should be kept together for best results.
- B. Connect AC power. For each circuit card, amber pilot will come on, and soon the red light and the buzzer will come on. This alarm condition is a normal warmup reaction, and may continue for several minutes.
- C. Check heater voltage for each detector, at the detector, by measuring between A and D (red and black wires). The desired voltage is marked on front page. It is adjustable by turning the VOLT ADJ Potentiometer (see Fig. B). Turn counter clockwise to increase.
- D. Temporarily disconnect the red or black wire leading to one detector; note that pilot light goes out after a moment, and Trouble relay is de-energized. This shows the action in case of sensor failure or a break in wiring to detector.
- E. Instrument is now ready to operate, and will monitor continuously without attention.
- F. Expose small sample of vapor to open end of each detector. Verify that alarm comes on.

V. MAINTENANCE

The Model 1565 requires no normal maintenance.

Output may be checked by plugging a 5 V. meter into the test jacks. Normal reading on fresh air is less than 2 volts.

Alarm setting may be changed as desired, but do not change it unless a test gas sample is available. Calibration gas kits and cylinders are available from GasTech, Inc. Kit includes an adapter and a humidifier, since compressed gas samples must be humidified for normal response.

Allow sample to flow at a low rate (0.5 scfh) through humidifier and then over porous metal surface of sensing element. Watch meter and observe when meter reading stabilizes. Then turn ALARM potentiometer clockwise until alarm just comes on. See Fig. B for location of Alarm #1 and Alarm #2 potentiometers.

Recommended alarm #1 setting is about 3.0 volts. Alarm #2 voltage setting will depend on the gas concentration that it is calibrated to, but will always be higher than Alarm #1 voltage. Output at the alarm level can be adjusted by use of the sensitivity potentiometer. This should only be changed after careful tests with a calibration sample.

Sensor normally will last for many years. If replacement is necessary, however, all that should be required is to connect new sensor, check heater voltage as described in part C section IV, allow to stabilize for a day or two, and recalibrate using a test gas sample as described above.

For problem with any one channel, it should be possible to isolate the trouble to that channel by switching circuit cards from one position to another. A defective card can be sent back for repair. Since cards and sensors are calibrated together, they should be kept together whenever possible, and the card and detector should be returned together for repair and calibration.

Note: The pilot light in the Model 1565 comes on only when the instrument is in normal operation, with the sensor connected. Thus an unplugged, disconnected or burned-out sensor will cause the pilot light to go out. Do not attempt to use or rely on instrument unless the amber pilot light is showing.

VI. PARTS LIST

<u>STOCK NO.</u>	<u>DESCRIPTION</u>
61-1121	Detector, plug-in (specify required calibration)
44-0100	Relay, plug-in
44-0101	Relay, plug-in, sealed
72-1565	Circuit card
81-1565	Calibration Kit (specify gas and desired alarm point.)

When ordering parts or accessories, always specify model and serial number of instrument.

VI. PARTS LIST

<u>STOCK NO.</u>	<u>DESCRIPTION</u>
61-1121	Detector, plug-in (specify required calibration)
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44-0101	Relay, plug-in, sealed
72-1565	Circuit card
81-1565	Calibration Kit (specify gas and desired alarm point.)

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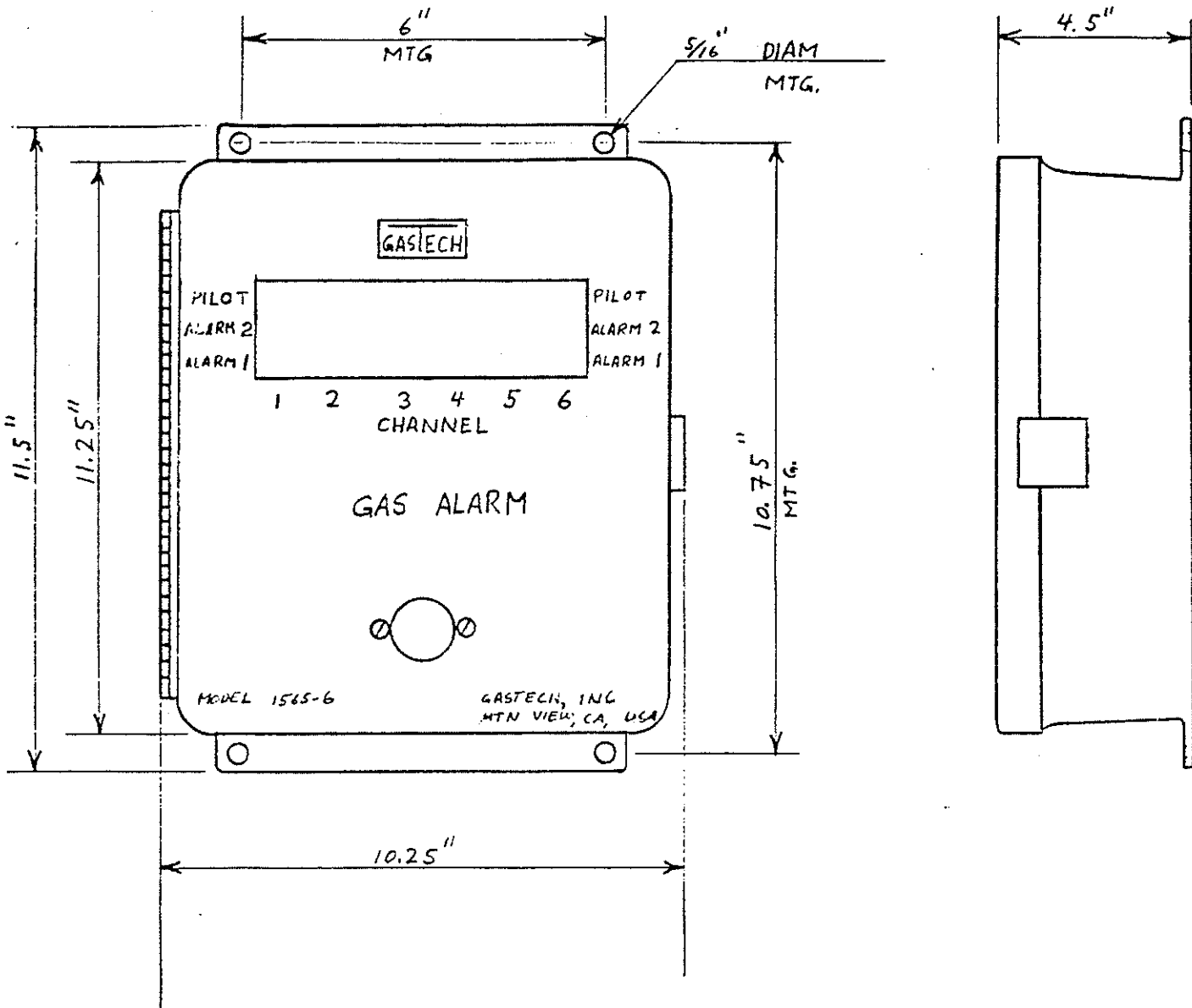


FIG. A

REVISIONS	GASTECH INC. JOHNSON INSTRUMENT DIV. MOUNTAIN VIEW, CALIFORNIA		
	TITLE 1565-6 DUAL ALARM OUTLINE & MTG. DIA		
	SCALE	DATE	DRAWING NO.

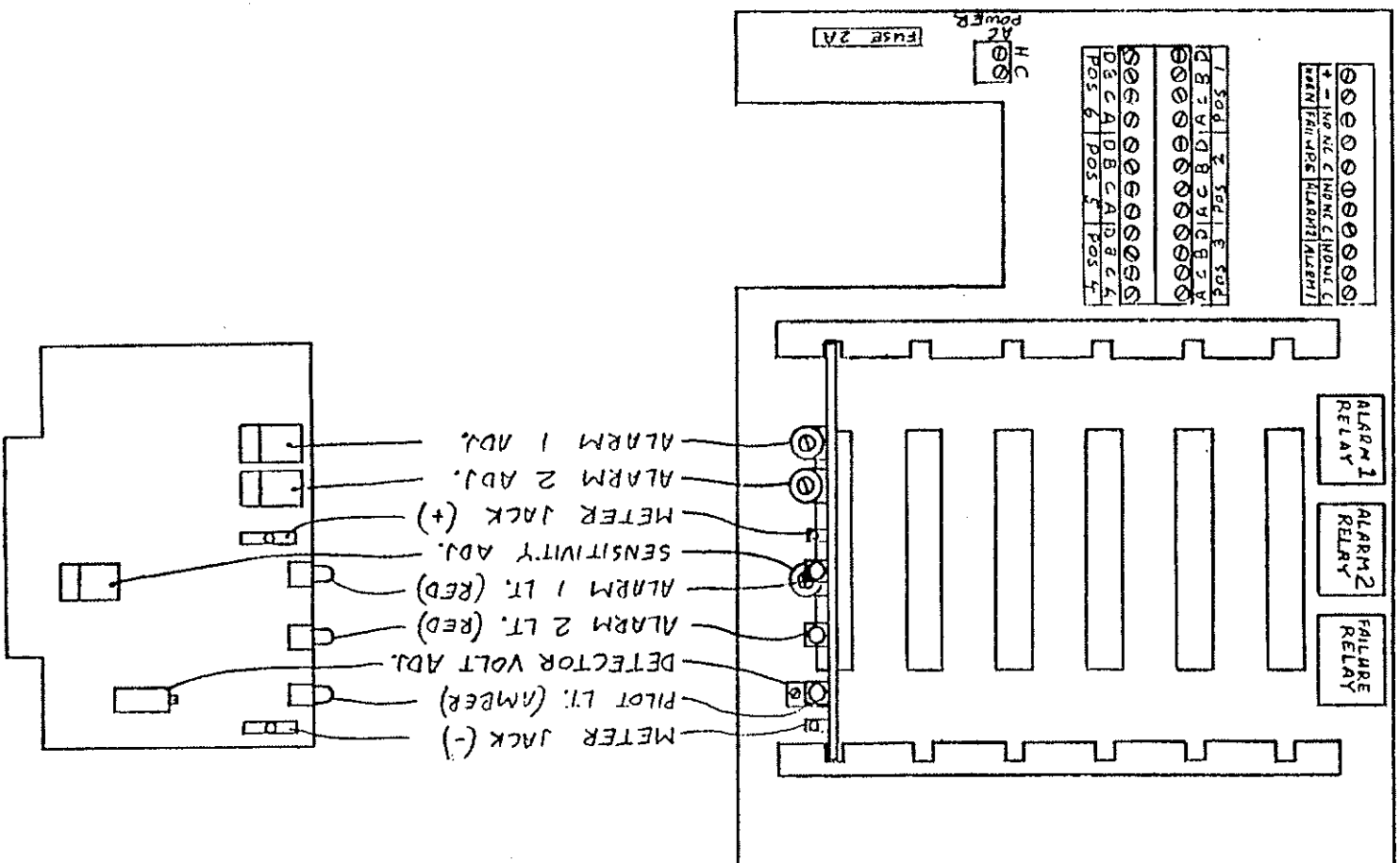
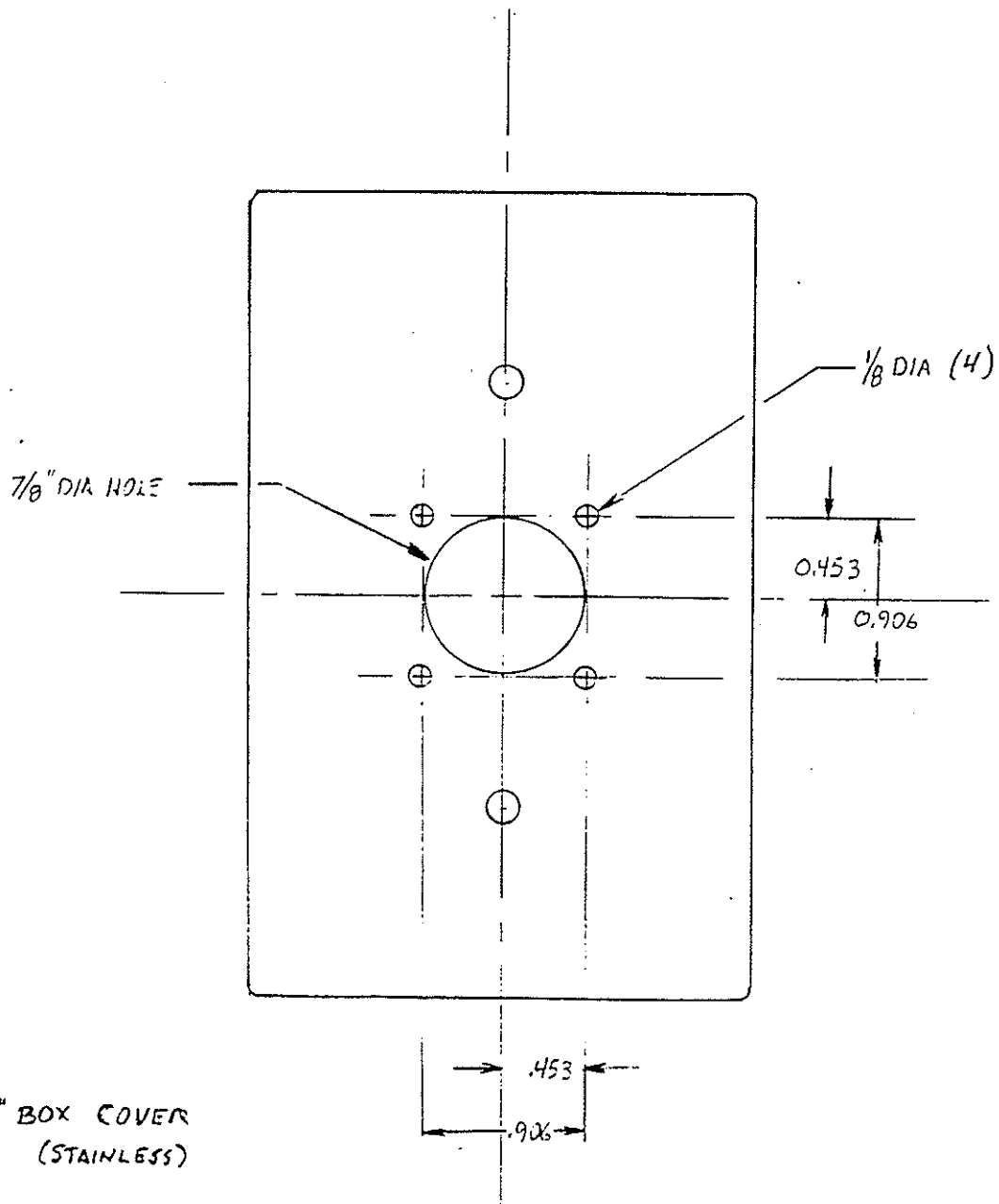


FIG. B

REVISIONS	
TITLE	GASTECH INC.
	JOHNSON INSTRUMENT DIV.
	MOUNTAIN VIEW, CALIFORNIA
	CONTROLS LAYOUT

DRAWING NO.



MATERIAL: "J" BOX COVER
(STAINLESS)

FINISH: PRESERVE EXISTING

DIMENSIONS PERTAIN TO
SOCKET MOUNTING ONLY

FIG. D

STOCK NO. 18-0327

REVISIONS	GASTECH INC. JOHNSON INSTRUMENT DIV. MOUNTAIN VIEW, CALIFORNIA TITLE DETECTOR MOUNT PLATE DRILLING SCALE 5/16" (DR BY O.C.) DRAWING NO

SERVICE POLICY

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To expedite the repairs operation, it is preferable to call in advance to GasTech Customer Service, (415)794-6200, obtain a Return Authorization Number (RA#), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RA#, and any special instructions.

GasTech Inc.

Standard Warranty

Gas Detection Instruments

We warrant gas alarm equipment manufactured and sold by us to be free from defects in materials, workmanship and performance for a period of one year from date of shipment to ultimate user. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 6, 12, or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs or contingent expenses incurred without our prior approval.

GasTech Inc.'s obligation under this warranty shall be limited to repairing or replacing any product which GasTech Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to GasTech Inc. at its manufacturing facilities with transportation charges prepaid.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of GasTech Inc. including but not limited to, the warranty of fitness for a particular purpose. In no event shall GasTech Inc. be liable for direct, incidental or consequential loss or damage of any kind connected with the use of its products or failure of its product to function or operate properly.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by GasTech.

1994-091686

INSTRUCTION MANUAL
MODEL 1565-6
GASTECH MULTICHANNEL SOLVENT VAPOR ALARM
WITH DUAL LEVEL ALARM

SERIAL : 86885

POWER : 115V AC 60 Hz

<u>Channel</u>	<u>Calibrated for</u>	<u>Alarm #1 Setting</u>	<u>Alarm #2 Setting</u>	<u>Sensor Type/No.</u>	<u>Sensor Voltage</u>
1	Methane	5% LEL	20% LEL	813/2108	5.0
2	"	"	"	813/2109	"
3	"	"	"	813/2110	"
4	"	"	"	813/2112	"
5	"	"	"	813/2115	"
6	Not Furnished				

GASTECH, INC.
8445 CENTRAL AVENUE
NEWARK, CALIFORNIA 94560
PHONE (415) 794-6200

THE MARTIN GROUP

August 9, 1994

Lieutenant Gill Jackson
EMERYVILLE FIRE DEPARTMENT
6303 Hollis Street
Emeryville, CA 94608

RE: Gas Detection Equipment

Dear Lieutenant Gill:

Enclosed are the fact sheets on the gas detection equipment for the EmeryBay Office Complex. These devices are located at 6425, 6455 and 6475 Christie Avenue in Emeryville.

Also enclosed is the fact sheet for the hand held portable combustible gas and oxygen indicator. The model we have on site is the GP-204 General Combustible Gas Indicator. Again, this hand held portable is calibrated by Gas Tech on a quarterly basis along with the equipment in the buildings.

If you need any further information, please feel free to contact me at the office.

Sincerely,

CHRISTIE AVENUE PARTNERS - JS
By: The Martin Group, Agent

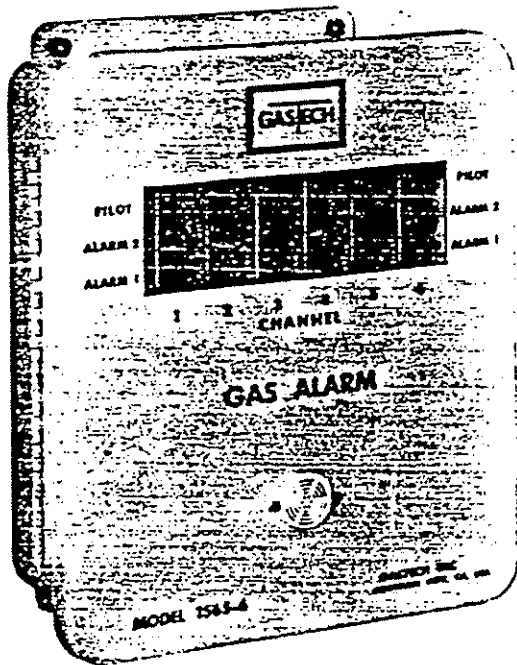


Suzanne Jones
Property Manager

Enclosures

MULTI-POINT GAS DETECTION AND ALARM SYSTEM MODEL 1565-6

GASTECH



FEATURES

- Six-point diffusion monitoring
- Toxic or explosive gas monitoring
- Modular expandability
- Two alarm levels
- Audible and visual alarms
- Reliable solid-state circuitry
- Fail-safe protection
- Remote alarm capability
- Low maintenance
- Long life metallic oxide sensor
- Simplicity of operation
- GasTech's proven dependability

DESCRIPTION

The GasTech Model 1565-6 gas detection and alarm system is a multi-point instrument capable of continuous monitoring at up to six locations for toxic or explosive gas levels. Each 1565-6 master control cabinet will accept one to six plug-in detection modules, so that monitoring capability may be changed or expanded with the addition of module/detector sets.

It is a fixed location system designed primarily to monitor for high ambient gas conditions in an otherwise clean environment. The 1565-6 is well suited for sterilization areas or clean rooms. It is a go/no-go type of instrument which will alarm at adjustable, preset thresholds and therefore it has no meter.

MASTER CONTROL CABINET

The Model 1565-6 is available in either a rack-mounting housing or a wall-mounting fiberglass cabinet. The rack-mounting version is a standard 19" wide x 7" high x 5" deep. The wall-mounting enclosure is 11½" high x 10¼" wide x 4½" deep. A hinged, gasketed door effectively seals this enclosure against dust, moisture, and other contaminants.

The master control housing contains all circuitry required to power the individual detection modules and to receive signals from the modules to actuate the audible alarm and relays. Terminal strips are provided for connection of power, relays, and remote detectors. Isolated relays provide the user with normally open and normally closed contacts for signaling low alarm, high alarm, or malfunction. Relay contacts are typically used to actuate remote alarms, increase ventilation, shut off a gas supply, or shut down a process.

DETECTION METHOD

Each module has a corresponding detector, a gas sensing element of the metallic oxide semiconductor type. The detector is placed either close by or remote (up to 50 feet from the control cabinet) and samples the atmosphere at that location by diffusion. The sensor responds to the presence of gas, toxic or explosive, with a proportionate reduction in electrical resistance. The change in current is amplified and at preset thresholds used to actuate an electronic switching circuit.

When used under normal conditions in non-corrosive environments, the detectors are guaranteed for one year. Typically, detectors will last for several years.

Operating from either 115 or 230 VAC, the Model 1565-6 continuously monitors the level of toxic or explosive gases in the atmosphere surrounding each sensor, wherever located. It will respond to parts per million levels of most hydrocarbons and many halogenated vapors (for example, ethylene oxide or Freon 22). Each detector/module circuit is internally adjusted to alarm at preset thresholds—for example, at a low threshold of 100 ppm of trichloroethylene and a high threshold of 300 ppm of trichloroethylene.

When any one of the six sensors detects a concentration above the lowest preset level, it will actuate an audible alarm and a relay common to all of them. A second relay is

energized if the high alarm gas level is exceeded. In addition, under alarm conditions, each channel will activate its own red LED alarm lights, one light for each of the two levels of alarm. Through this arrangement, the user can readily distinguish which monitored area is harboring high gas concentration and, within limits, how high concentration.

The 1565 models have been particularly useful for toxic gas monitoring in clean rooms. Ideally, they should be used in gas free areas where there is a minimum of interference. The 1565 is also useful in parking garages to detect carbon monoxide or in areas where an inexpensive go/no-go combustibles monitor is needed.

		Alarms	Per channel indication by LED display: Low: red #1 High: red #2 Malfunction: amber pilot indicator Per master control: Audible for low/high threshold
Sampling Method	Diffusion at sensor location		
Sensor Principle	Metallic oxide semiconductor		
Temperature Range	32° to 120° F		
Sensitivity	Nonspecific sensor will respond to parts per million levels of most hydrocarbons and halogenated vapors		
Range	Calibration possible at TLV levels for many gases	Power source	115 or 230 volt AC
Readout	LED display differentiated for low and high levels on each separate channel	Housing & Dimensions	Wall-mounted: fiberglass case with hinged, gasketed door 11½" high x 10½" wide x 4½" deep Rack-mounted: standard 19" wide x 7" high x 5" deep
Remote Indication	Isolated relays (low alarm, high alarm, malfunction) Form C contacts rated @ 3 amps	Warranty	One year material and workmanship

MODEL 1565 SINGLE POINT SYSTEM

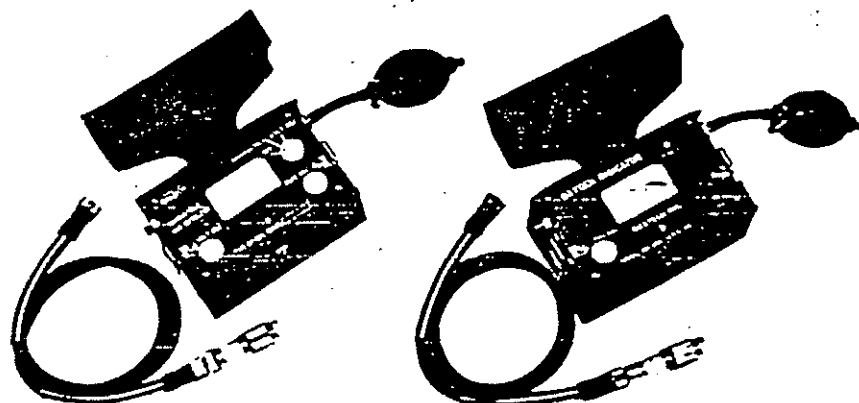


The economical single-point Model 1565 is also available. Its operation is the same as that of the 1565-6 except it has provision for just one sensor and one level of alarm. The sensor is located directly at the bottom of the housing or, optionally, at the end of an extender cable. The Model 1565 is housed in an aluminum wall-mounted case measuring 4.7" wide x 8.9" high x 2.3" deep. An optional alarm relay may either energize a 115 volt AC socket on the bottom of the cabinet or exit the instrument as a 3' three-wire cord supplying normally open and normally closed connections. A malfunction relay is also available as an option.

Distributed by:

HAND HELD PORTABLE COMBUSTIBLE GAS AND OXYGEN INDICATORS P-200 SERIES

GAS|TECH



FEATURES

- Fast Response
- Light Weight
- Rugged Construction
- Simplicity of Operation
- Low Cost
- Gas Tech's Proven Dependability

DESCRIPTION

Series P200, five lightweight, handheld portables for detecting combustible gases/vapors and monitoring atmospheric oxygen content, represent the broadest line of common design instruments available. Engineered to serve the demanding field requirements of industry, public works and public utilities, these instruments share many common features and offer the user distinct advantages in terms of economy, dependability, maintainability and ease of operation. Built to withstand rough field environments, all Series P200 instruments are constructed with rugged cast aluminum housings, and incorporate highly reliable advanced electrical design characteristics. All active and passive components are mounted on easy-to-get-at, high quality, printed circuit boards. In operation, all P200 instruments are not only easy to use, sharing common functional characteristics, but they are extraordinarily fast in providing accurate readings. For gas indicators, the response time is no more than 4 seconds, and for oxygen indicators an accurate reading is attained within 6 seconds.

By maximizing the use of common components and operating characteristics, GasTech offers not only high quality field instruments, but has greatly simplified and expedited other very important considerations, such as field service, personnel training and accessory interchangeability. And finally, and perhaps most importantly, the commonality of components can save valuable time when field service becomes necessary. Fundamental operating features are easy to understand and all components are very accessible for checkout, replacement or repair.

* GP-204 GENERAL COMBUSTIBLE GAS INDICATOR

A general-purpose instrument for measuring or testing any area where combustible gases or vapors may accumulate. Having a range of 0 to 100% LEL, and providing a reading within 4 seconds of sample draw with standard hose length, this instrument utilizes a closely-matched two-filament bridge detection circuit that features inherent electrical compensation characteristics. In addition to having a very fast response time this circuit

exhibits outstanding zero stability, even as the level of the battery voltage decreases. Another important feature of GP-204 is its span adjust capability, allowing for increased accuracy, especially in situations where different gases are being tested. Compact, easy to hold in one hand, and weighing but 5 pounds, the GP-204 is powered by either two D size rechargeable nickel-cadmium batteries, or two D size flashlight batteries. The instrument has an illuminated meter which together with the basic rugged construction makes it suitable for almost any work situation. Calibration is performed on methane, but other calibrations may be requested when ordering. As with all Series P200 instruments, necessary accessories are provided in the standard package include 3-foot Teflon-lined hose, end-of-line probe with interchangeable removable dust filter, leather carrying case with strap, and batteries (charger included if required).

NP-204 NATURAL GAS LEAK DETECTOR

A dual-range instrument designed primarily for locating natural gas leaks. Normally calibrated on natural gas, the instrument has two ranges, 0 to 5% natural gas by volume, and 0 to 100% which are displayed on the graduated illuminated scale. In addition to all of the design characteristics of the GP-204, this leak detector has a second complete Wheatstone bridge utilizing thermal conductivity filaments. When testing for gas leaks, the second range is selected by an additional position on the selector switch marked "100% GAS". NP-204 operates from two D dry cell or rechargeable-type batteries and comes complete with carrying case and all necessary accessories. Rechargeable batteries substantially improve the accuracy of this version of the NP-204 in comparison to any dry-cell type instrument on the 100% range where the reading at a given gas concentration is directly proportional to the detector circuit voltage. Especially useful in the gas distribution industry for bar-hole readings when searching for leaks in underground mains, NP-204 is a versatile instrument also suitable for testing hazardous work spaces such as manholes, sewers and other confined areas. Calibration on other gases with thermal conductivity substantially different from air, may be requested when ordered.

EP-204 DUAL-RANGE INDICATOR

A dual-range version of the GP-204, with a second more sensitive detection circuit for determining the toxic concentrations of certain hydrocarbon gases or vapors. This additional circuit has a range of from 0 to 10% LEL and is selected by an additional switch position. The advantage of this instrument is the fundamental practicality provided by the two ranges. With the EP-204, an industrial hygienist/safety officer can accomplish essential tests for leakage or accumulation of combustibles, as well as perform tests for low level concentration of toxic hydrocarbon vapors resulting from industrial processes. Circuit is powered by two D size rechargeable nickel-cadmium batteries. The optional pump described below is a very attractive addition to the Model EP-204, enhancing accuracy when testing for toxic concentrations. All necessary accessories are provided.

XP-204 OXYGEN DEFICIENCY INDICATOR

This very lightweight instrument, weighing only 3 pounds, is for use by workers who periodically need to enter work spaces where the atmosphere may be deficient in oxygen content. Model XP-204 enables the user to determine if the tested atmosphere is above the OSHA limit of 19.5% oxygen. Built-in, easy-to-read meter displays an accurate reading of atmospheric oxygen content within 6 seconds after sample draw on a graduated scale of from 0 to 25%. Detection method is with an electrochemical cell

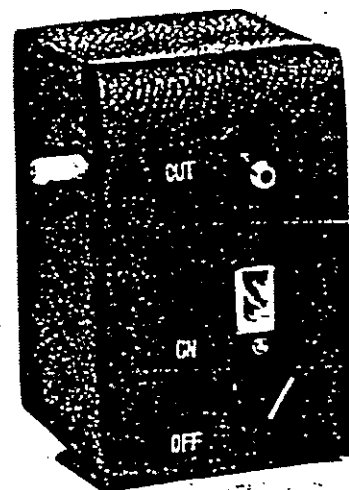
that is not only very accurate in relative response time, but will operate at temperatures down to +15°F and is not affected by angle or position of the instrument. This cell is guaranteed for six months from date of shipment, and may be reactivated indefinitely at a nominal cost. Amplification is through a highly stable integrated circuit amplifier that matches cell output to meter. Amplification circuit also enables the user to zero Model XP-204 on oxygen-free gas providing a true zero reading. This feature, combined with routine calibration on atmospheric air (21% oxygen), results in dependable accuracy at all points on the scale. Power is through two 8.4V transistor-type batteries. All other necessary accessories are included.

IP-204 INERTING INDICATOR

Dual-range indicator especially suited for utility and industrial inerting operations where purged atmospheres need to be tested for residual contents of oxygen. Typical applications of the IP-204 include periodic testing of transformer housings, testing of gas handling equipment for initiation of service, testing for leakage into purged petrochemical process equipment, and testing purged electrical and telephone conduit for leakage. In addition to having all the features of the XP-204 described above, this instrument has a second, more sensitive range that provides readings in the 0-5% range. This second range, also responsive within 6 seconds of sample draw, is selected by a two-position range switch.

SPECIFICATIONS

MODEL NO.		GP-204 COMBUSTIBLE INDICATOR		NP-204 NATURAL GAS DETECTOR		EP-204 EXPANDED SCALE INDICATOR		XP-204 OXYGEN DEFICIENCY		IP-204 INERTING INDICATOR	
STOCK NO.		72-0110	72-0100	72-0121	72-0120	72-0116		72-0051	72-0052		
PARAMETERS											
BATTERIES	1.5 V Alkaline D-Size	2	—	2	—	—		—	—		
	1.2 V Ni-Cad D-size	—	2	—	2	2		—	—		
	8.4 V NEDA 1604M	—	—	—	—	—		2	2		
Operating Hours		3	4	3	4	4		30	30		
Calibration		Methane		Methane		Toluene		Oxygen	Oxygen		
Range(s)		0-100% LEL		0-5% Gas 0-100% Gas		0-100% LEL 0-10% LEL		0-25%	0-25% 0-5%		
Detection Method		Catalytic Combustion		Catalytic: Thermal Cond.		Catalytic Combustion		Electrochemical Cell	Electrochemical Cell		
Operating Temp.		0-120° F (-15 + 50° C)		0-120° F (-15 + 50° C)		0-120° F (-15 + 50° C)		10-110° F (-12 + 45° C)	10-110° F (-12 + 45° C)		
Meter Light		Std		Std (2)		Std		NA	NA		
Speed of Response		4 Sec.		4 Sec.		4 Sec.		6 Sec.	6 Sec.		
Weight		5#		5#		5#		3#	3#		
Size		6-1/2" x 5-1/4" x 4"									
Sampling Method		Hand Aspirated with Detachable Pump Optional									
Sample Time		One Second Lag Per Five Feet of Sample Line									
Accessories Included		Batteries, End of Line Probe, 3 Foot Sample Hose W/Fittings Both Ends, Instruction Book, Leather Case and Strap, Recharger When Applicable									



80-0101—Minipump

A self-powered (rechargeable battery) pump useful as an access to all instruments in the P200 series. Use of the pump eases the effort involved in sampling from dead tanks with the GP-204, allows for determination of leakage rate, bar-hole testing with the NP-204, and allows sampling of exhaust streams during purging operations for testing with the XP or IP-204. Unit is lightweight (20 oz.) and comes complete with leather carrying case, charger cord and adapter hose. It can be supported by instrument carrying straps.

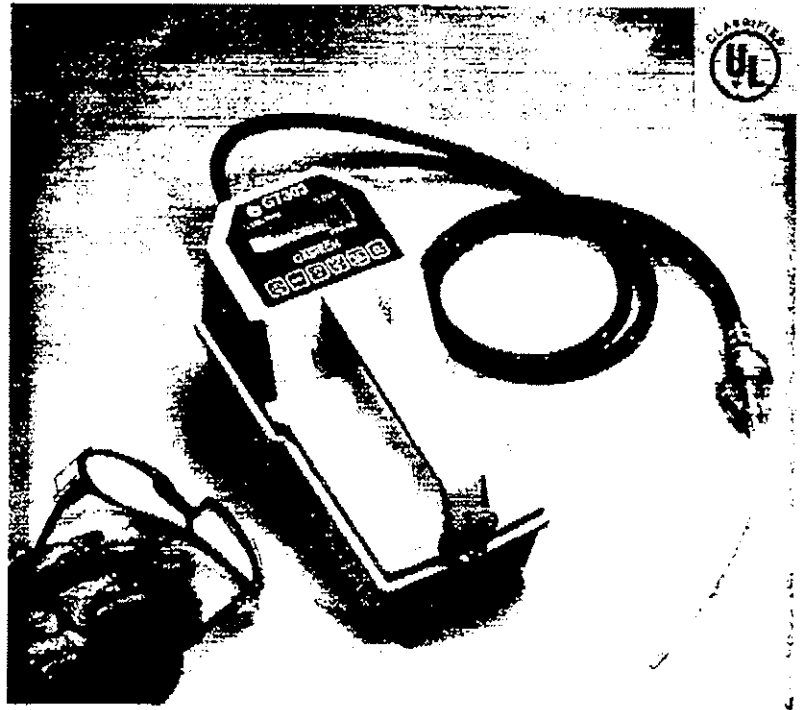
Ordering—Specify Quantity, Model Number, Stock Number, Non-Standard Calibration, (Single Combustible No Charge, For Multiple Calibrations Check Factory), and any desired accessories

GasTech Inc./8445 Central Avenue/Newark, California 94560/(415) 794-6200/Telex: 334-462

GT Series

Portable Gas Monitors for One, Two, Three or Four Gases

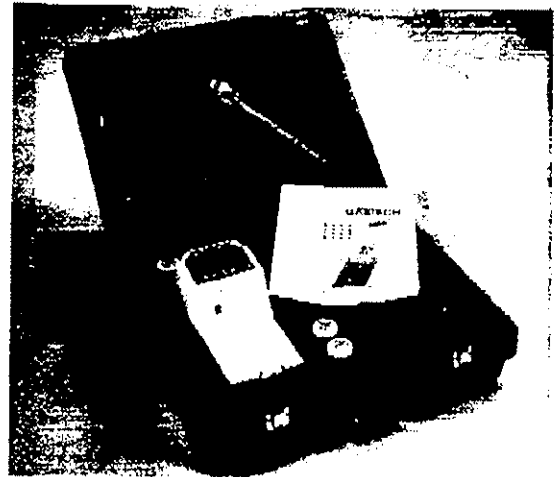
Gas Tech's GT Series of portable gas monitors are designed to protect workers from hazardous gases in confined spaces and other industrial work sites. The monitors are available in seven different gas combinations for the detection of hydrocarbons in the LEL/ppm range, oxygen deficiency, carbon monoxide, hydrogen sulfide and other gases.



- Exclusive LIP™ (*Liquid Inhibiting Probe*) attachment prevents damage to the sample system by automatically shutting the unit off & sounding a low flow alarm if liquid or water is aspirated
- Built in pump meets federal regulation compliance for pre-testing of confined spaces & other remote areas
- LCD backlight display shows:
 - real-time gas concentrations
 - date & time
 - battery capacity
 - alarm set points
 - diagnostics
 - log remaining hours;
 - TWA, STEL, minimum, & maximum readings can be called to the display
- Monitoring of hydrocarbons in the LEL/ppm range is standard for all models
- Built-in datalogger
- Weighs only five pounds
- Microprocessor electronics & convenient top-mounted switches make operation & calibration simple
- Four D size batteries—either alkaline or Ni-Cd
- Battery & sensor replacement are easily performed in the field, as is basic calibration of the instrument
- Alarm points
 - user defined, programmable alarm levels
 - two levels of alarm with audible & visual indications to warn of unsafe gas levels
 - latching or self resetting modes
 - trigger if a low battery, low flow, or sensor failure should occur in the field
- Unique "float probe" available for monitoring underground storage tanks
- Designed to meet the requirements of Class I, Div. 1, Groups A, B, C & D

GT SERIES SPECIFICATIONS

Range of Gases Detected		Dimensions	254 mm (10 in.) L x 152 mm (6 in.) H x 127 mm (5 in.) W
Hydrocarbons	0 to 100% LEL in 1% increments 0 to 10,000 ppm in 20 ppm increments	Weight	Approximately 5 pounds (2.25 kg)
Oxygen (O ₂)	0 to 30.0 % Vol in 0.1% increments	Case Material	High impact, chemical & RF resistant, polycarbonate-polyester plastic
Carbon Monoxide (CO)	0 to 300 ppm in 1 ppm increments	Intrinsic Safety Rating	Designed to meet the requirements of Class I, Div. 1, Groups A, B, C, & D
Hydrogen Sulfide (H ₂ S)	0 to 200 ppm in 1 ppm increments	Warranty	One year materials & workmanship
Sensor			
Hydrocarbons	Catalytic compensated		
O ₂ , H ₂ S, CO	Electrochemical		
Sampling Method	Sample-draw, internal pump		
Response Time	90% in 20 seconds		
Accuracy	LEL: ±5% of reading O ₂ : ±0.5% Vol ppm, CO, H ₂ S: ±10% of reading (when calibrated & maintained in accordance to instruction manual recommendations)		
Repeatability	ppm & LEL: ±2% of reading O ₂ : ±0.2% Vol CO, H ₂ S: ±5% of reading (when calibrated & maintained in accordance to instruction manual recommendations)		
Operating Temperature	-4F to 113°F (-20°C to 45°C)		
Humidity Range	0 to 95% RH non-condensing		
Alarms	Audible & visual alarms		
Display	LCD, back light on demand		
Power Source	Four D alkaline or Ni-Cd batteries		
Battery Life	10 hours @ 68°F (20°C) Due to the nature of alkaline cells, battery life is greatly reduced at low temperatures Ni-Cd batteries are recommended for low temperature applications		
Controls	Six top-mounted buttons		



GT Series confined space kit.



8407 Central Avenue • Newark, CA 94560-3431

PH (510) 745-8700 • FAX (510) 794-6201 • TIX 334-462

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Emeryville Fire Department

2333 POWELL STREET, EMERYVILLE, CALIFORNIA 94608

RAMON VITTORI, FIRE CHIEF

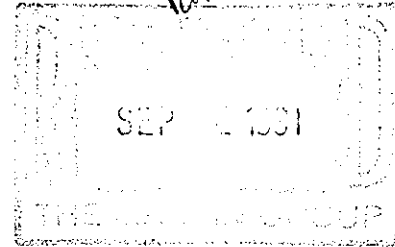
TELEPHONE: 596-3750

FAX: 420-1785

FRANK ALHINO
FIRE MARSHAL

GERALD ANTHONY
TRAINING OFFICER

August 28, 1991



ATTENTION: SECURITY DEPARTMENT

This is to advise you that the emergency number for the Emeryville Fire Department is 596-3771.

Please be sure that this number is on any automatic dialing alarm(s) at your facility and that all security department or other responsible personnel call 596-3771 to make any report to the Emeryville Fire Department, including informing the fire department when systems will be down for repairs, maintenance, etc.

In case of a medical emergency, it is recommended that you call on 9-1-1.

Thank you for your cooperation in this matter.

Sincerely,

A handwritten signature in cursive script that reads "Ramon Vittori".

RAMON VITTORI
Fire Chief

A handwritten note in cursive script that reads "Notified PSS".

RV:nf

Emeryville Fire Department

4331 SAN PABLO AVENUE, EMERYVILLE, CALIFORNIA 94608

RAMON VITTORI, FIRE CHIEF

TELEPHONE: (415) 658-0068

FIRE PREVENTION
TRAINING DIVISION

(415) 655-7678

RECEIVED

JUL 22 1986

THE MARTIN CO.

July 11, 1986

J. David Martin and
Toby Taylor
The Martin Company
391 Diablo Road
Danville, CA 94526

Re: Bay Center Project - Phase I


Gentlemen:

Enclosed is the finalized agreement and memorandum of understanding; would both of you please sign the first page, initial all attached pages, and return to me within 10 days of the date of this letter.

This agreement and MOU incorporates items we agreed to; and will answer some of the questions raised during your construction period.

If you have any questions, please give me a call. For your information, this same process needs to apply when you start getting serious about Phase II (the 500 unit apartment complex).

Sincerely,



RAMON VITTORI
Fire Chief

RV:nf
Encl.



July 8, 1986

MEMORANDUM

TO : All Concerned Personnel

SUBJECT : Phase I: Two 5-story Office Buildings with 125,000 sq. ft. of space in each. One 3-story office building with 75,000 sq. ft.

Property located generally between 64th and 65th Streets and LaCosta Avenue, Emeryville, California, within the boundaries of the Emeryville Redevelopment Project Area.

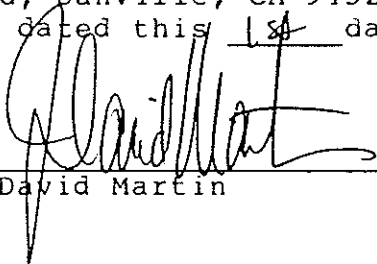
Because the Fire Chief has required certain special items for this building, it is necessary to enter into a memorandum of understanding to clarify to all parties these requirements.

Attached are 3 pages of these requirements and the initials of all participants on each page which by this reference becomes a part of this memorandum of understanding.

This memorandum of understanding is binding and agreed to by all parties and a condition of construction and uses of the subject properties.

No part of this memorandum of understanding may be altered without the consent of all signature parties or their authorized designee.

We, J. David Martin and Toby Taylor, of The Martin Company, 391 Diablo Road, Danville, CA 94526, do hereby agree to this memorandum of understanding dated this 18 day of December, 1986.



J. David Martin

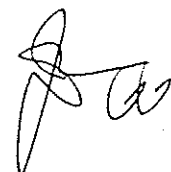


Toby Taylor


I, Ramon Vittori, Fire Chief, City of Emeryville, agree to this memorandum of understanding dated this _____ day of _____, 1986.

Ramon Vittori, Fire Chief

1. Elevators:
 - a. Provide key control for each elevator.
 - b. The floor location of each elevator shall be indicated in the building ground floor lobby.
 - c. The elevators are to be recalled to the first floor in the event of all alarms of fire, not trouble or tamper, or first floor lobby detector.
 - d. Any alarm of fire is to call elevators to the ground floor and activate closing of elevator lobby/vestibule smoke doors.
2. No emergency generator, fire pump or auxiliary water supply will be required.
3. Fire Alarm: (FAAP = Fire Alarm Annunciator)
 - a. Local reset boxes to be provided on eastern building exterior for Emeryville Fire Department access. Frank Electric to coordinate details and locations. These are to be master boxes tied into the Fire Department alarm system.
 - b. Master box to be initiated by water flow or smoke (no trouble or tamper).
 - c. Fire alarm annunciator incorporated with alarm panel to be flush mounted adjacent to ground floor pay telephone alcove next to Cart Room.
 - d. FAAP to indicate alarms via red zone lamp, water flow by floor and elevator lobby smoke detection by floor.
 - e. FAAP to be equipped with keyed SPDT "center off" system control switches to facilitate "On-Off-Auto" Emeryville Fire Department override control of HVAC system for smoke purging. In "auto" mode, Penthouse duct detector shuts down supply fans to prevent smoke recirculation; "On" mode enables 100% supply and relief fan operation, closes Economizer damper 100%, opens outside air intake and relief dampers 100%. Frank Electric to provide red and green FAAP status lights to indicate "off" or "on" system operation.



- f. FAAP to indicate smoke detector by floor and north or south general and lobbies individually and machine rooms individually and electrical rooms individually and special fire extinguishing systems individually.
 - g. North and south general smoke detectors may be deleted if the sprinkler system is divided and annunciated individually north or south by floor.
 - h. FAAP to be equipped with spare alarm zones for monitoring special Tenant areas or extinguishing system. Special areas and systems to be individually annunciated.
4. Knox Box to be provided at east side of building exterior keyed to Emeryville Fire Department requirements. Gensler to coordinate location and specifications.
5. Sprinkler System:
- a. Each sprinkler system to have a 5" snap type quick connection in addition to the regular 2-1/2" connections.
 - b. There shall be a standpipe in each stair (3 per floor) with a single 2-1/2" connection at each upper floor and the connection to the standpipe in the center stair shall be accessible from the elevator lobby. The standpipe at the end stairs should be extended to the roof with two 2-1/2" connections.
 - c. No hose cabinets will be required but a 3A20BC Minimum fire extinguisher should be located at each stair (3 per floor).
 - d. Emeryville Fire Department stated need for possible additional ground floor standpipe outlets pending final design and need for fire extinguishers located near each stairwell at corridor (3 per floor).
6. A firefighting equipment cart shall be provided and stored on the first floor of each building near the lobby, at a cost of \$8,000 each.
7. One on-site fire hydrant will be needed on the west side of the drive between the north building and the center building. The location of this hydrant and the building sprinkler connections should be coordinated with the Emeryville Fire Department.

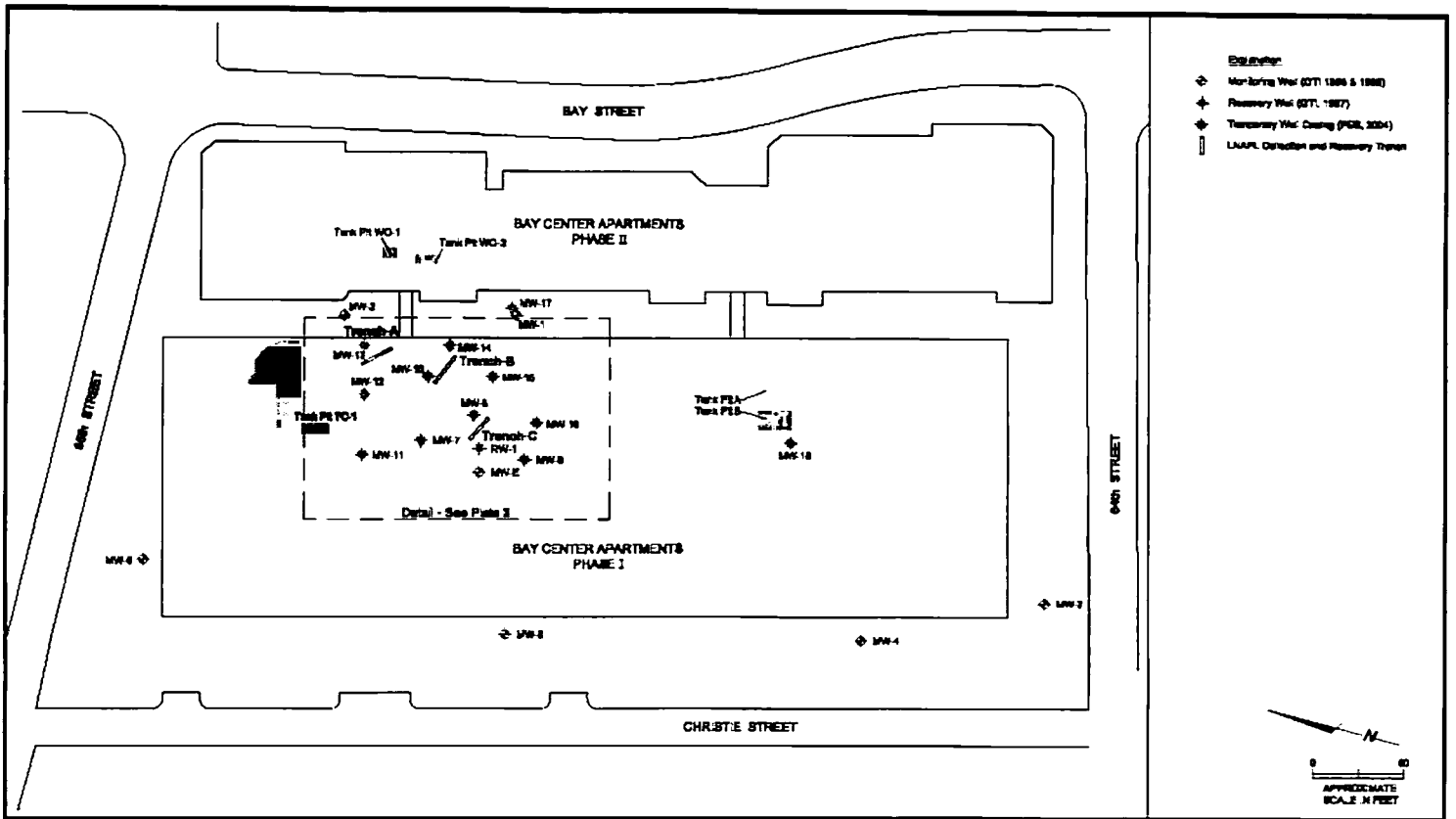
A handwritten signature in black ink, consisting of a stylized, cursive name followed by a large, sweeping flourish.

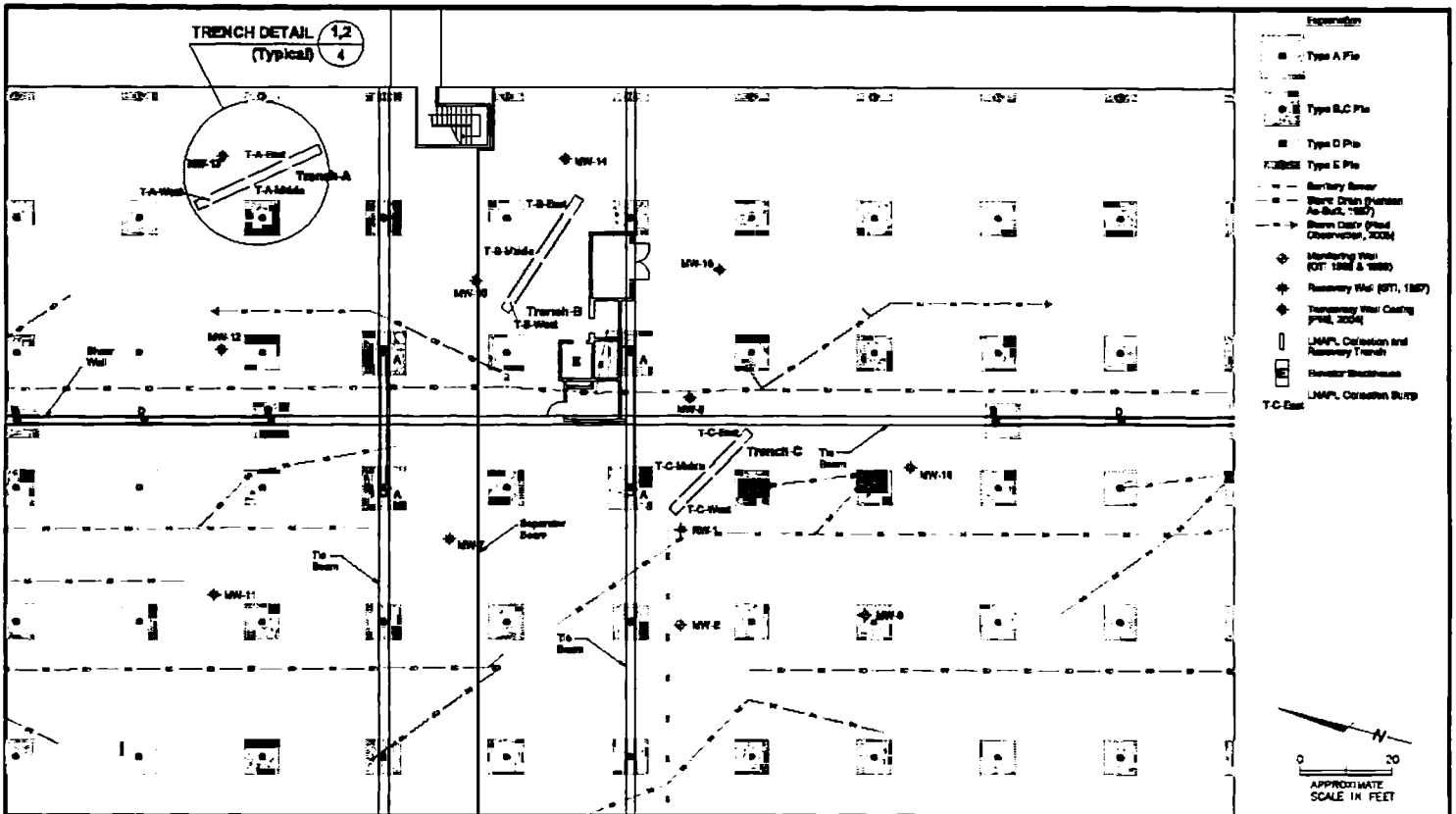
8. Provide a single duplex 120V outlet in each elevator lobby on common circuit (1 CT per building) as proposed by Frank Electric.
9. Trouble lights are to be yellow.

A handwritten signature in black ink, appearing to be the initials 'FW' or similar, located in the bottom right corner of the page.

APPENDIX F

Groundwater Monitoring Well Diagram





APPENDIX G

Contacts

Contact List

(Add contacts as needed)

Responsible Person

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