



Critical
Environment
Technologies™

GAS DETECTION

PRESENTED BY YOUR NAME

Location and Date

AGENDA



1. Why Gas Detection
2. Gas Sensors
3. How It Works
4. 3 Step Approach
5. Applications
6. Q & A

WHY GAS DETECTION

WHY MONITOR GAS?



Protect Lives



Protect Property

WHY MONITOR GAS?

Additional Advantages:

Run ventilation fans only when required

Control fan run time and speed to avoid wear and tear

Use minimal heating / cooling makeup air

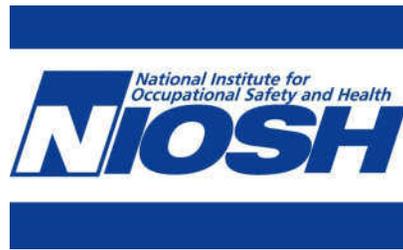


Protect the
environment



Save
Money

REGULATORY AUTHORITIES



NIOSH Pocket Guide to Chemical Hazards

[NPG Home](#) | [Introduction](#) | [Names, Synonyms and Trade Names](#) | [Chemical Names](#) | [CAS Numbers](#) | [RTECS Numbers](#) | [Appendices](#)

Nitrogen dioxide		CAS 10102-44-0
NO₂		RTECS QW9800000
Synonyms & Trade Names Dinitrogen tetroxide (N ₂ O ₄), Nitrogen peroxide		DOT ID & Guide 1067 / 124
Exposure Limits	NIOSH REL: ST 1 ppm (1.8 mg/m ³)	
	OSHA PEL †: C 5 ppm (9 mg/m ³)	
IDLH 20 ppm See: 10102440	Conversion 1 ppm = 1.88 mg/m ³	

TLV - THRESHOLD LIMIT VALUES



TLV of a chemical substance is the level to which it is believed a worker can be exposed day after day for a working lifetime without adverse health effects. TLV levels are the model for many other air quality limits such as OSHA's Permissible Exposure Limits (PELs).

TLV-TWA Time Weighted Average - averaged over the normal 8 hour day / 40 hour work week

TLV-STEL Short Term Exposure Limit - the maximum concentration to which a worker may be exposed

TLV-C Ceiling - the concentration that should not be exceeded during any part of the working exposure

NOTE: TLV should be used as an exposure guide rather than an absolute

TYPES OF HAZARDOUS GASES

Toxic



(ppm/ppb)

Carbon Monoxide,
Nitrogen Dioxide,
Ammonia, Chlorine
etc.

Combustible



(%LEL)

Methane
Propane
Hydrogen

Refrigerants



(ppm)

R22, R123,
R134A, R410A,
R438A, HFCs
etc.

Asphyxiants



(%Vol)

Oxygen
Depletion

TVOCs



(ppm)

Volatile
Organic
Compounds

Particulates



($\mu\text{g}/\text{m}^3$)

Dust, Smoke,
Pollen, Spores,
etc.

GAS SENSORS

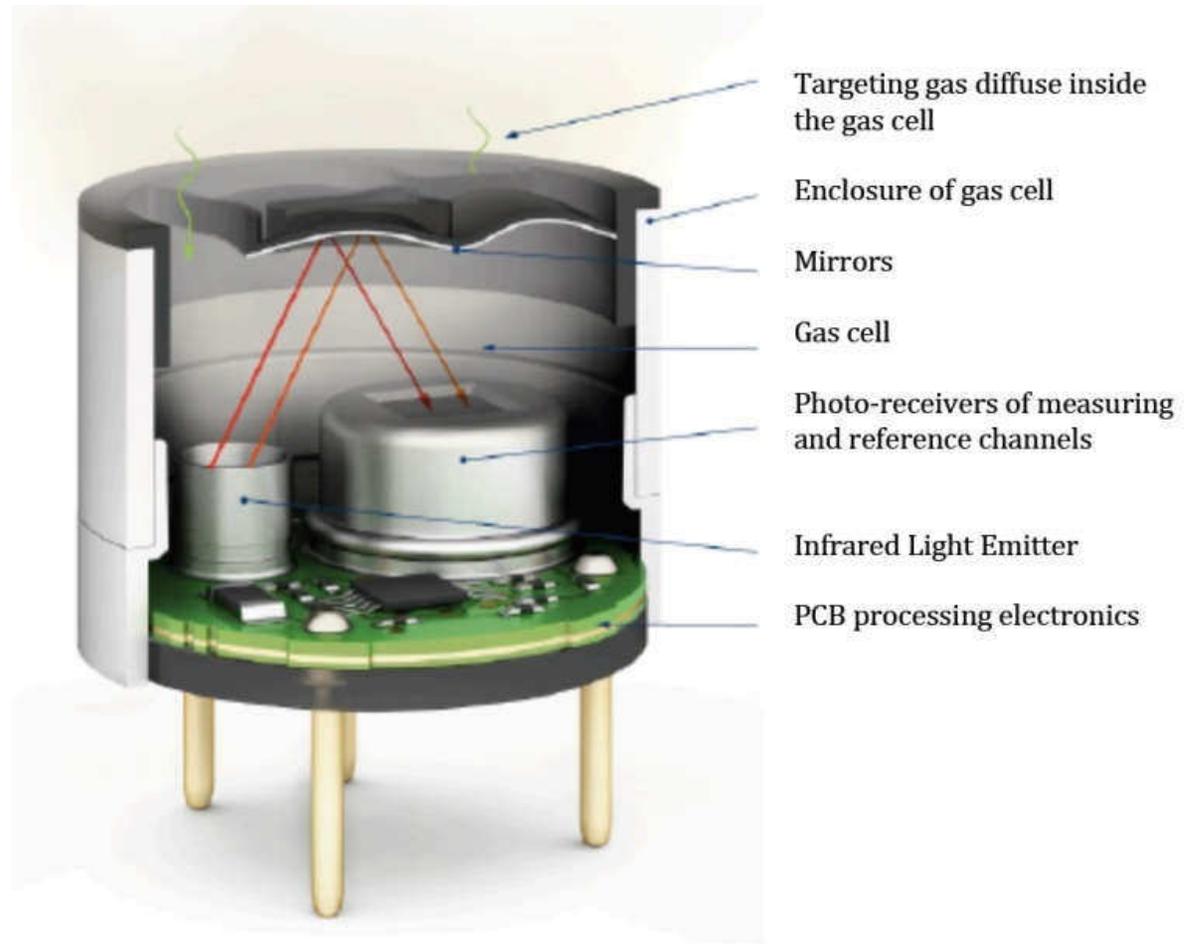
WHAT IS A GAS SENSOR



Inside a gas detector is a sensor that responds to the concentration of target gas(es) in the air and outputs a small current

The produced current is typically in micro amps and is amplified in several stages within the circuit design

WHAT IS A GAS SENSOR



TYPES OF GAS SENSORS



	Gases	Advantages	Disadvantages
Electrochemical Cells	Toxic Oxygen	<ul style="list-style-type: none"> • More accurate • More gas specific • Defined cross-sensitivities 	<ul style="list-style-type: none"> • Slightly more expensive • Frequent calibration • Shorter lifespan • Can be poisoned • Sensitive to EMI/RFI
Solid State	Combustible gases Refrigerants	<ul style="list-style-type: none"> • Long lifespan • Calibrate annually • Resistant to poisoning 	<ul style="list-style-type: none"> • Less accurate • Less gas specific • Sensitive to temperature/RH changes
Catalytic Pellister	Combustible gases	<ul style="list-style-type: none"> • High accuracy • For explosive classified areas • Usually in explosion proof housing 	<ul style="list-style-type: none"> • Measures in %LEL only • Sensor's catalyst can be coated or corroded by silicones, plasticizers and sulfur compounds

TYPES OF GAS SENSORS



	Gases	Advantages	Disadvantages
NDIR - Nondispersive Infrared	Refrigerants Combustible gases CO ₂	<ul style="list-style-type: none">• Extremely gas specific• Very accurate• Very stable• Long lifespan• Cannot be poisoned	<ul style="list-style-type: none">• Expensive
PID - Photo Ionization Device	Toxic gases TVOCs	<ul style="list-style-type: none">• Extremely accurate• Very low detection level	<ul style="list-style-type: none">• Most expensive• Limited UV lamp life ~2yrs• Sensitive to RH

SENSORS HAVE...



...a Shelf Life

Sensors don't last forever. They need to be put to use in the field.

...a Lifespan

Toxic sensors must be kept cool and Solid State and Catalytic sensors must be kept in their packaging until ready to use.

...a Calibration Frequency

Sensors need to be readjusted so they continue working as expected.

SENSOR MOUNTING HEIGHT

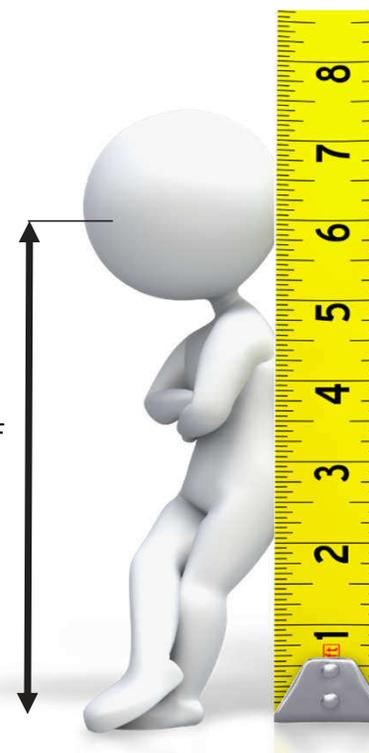
Air molecular weight = (28.97 g/mol)

Gases that have a molecular weight close to that of air should have sensors installed in the breathing zone

The breathing zone refers to the area 4 – 6 ft / 1.2 – 1.8 m above the finished floor, where most human breathing takes place

- Carbon monoxide
- Carbon dioxide
- Oxygen
- Nitric oxide
- Nitrogen dioxide

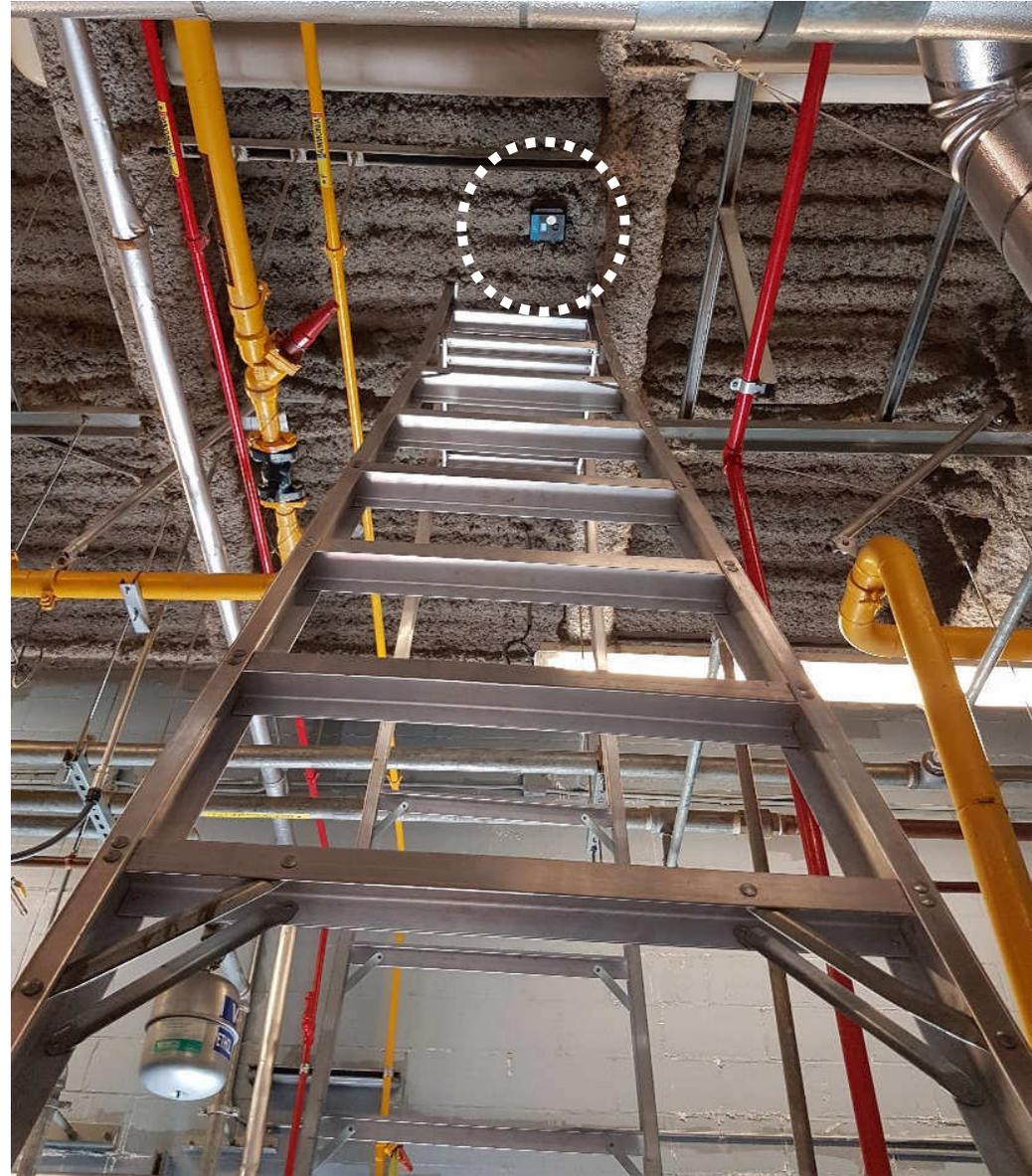
Breathing height 4-6' AFF



SENSOR MOUNTING HEIGHT

Lighter than air gas sensors should be placed on or near the ceiling

- Ammonia
- Methane (natural gas)
- Hydrogen



SENSOR MOUNTING HEIGHT



Heavier than air gas sensors should be placed 6 – 12 in / 15 – 30 cm from the floor

- Ethanol
- Chlorine
- Ozone
- Propane
- Refrigerants

SENSOR MOUNTING LOCATION



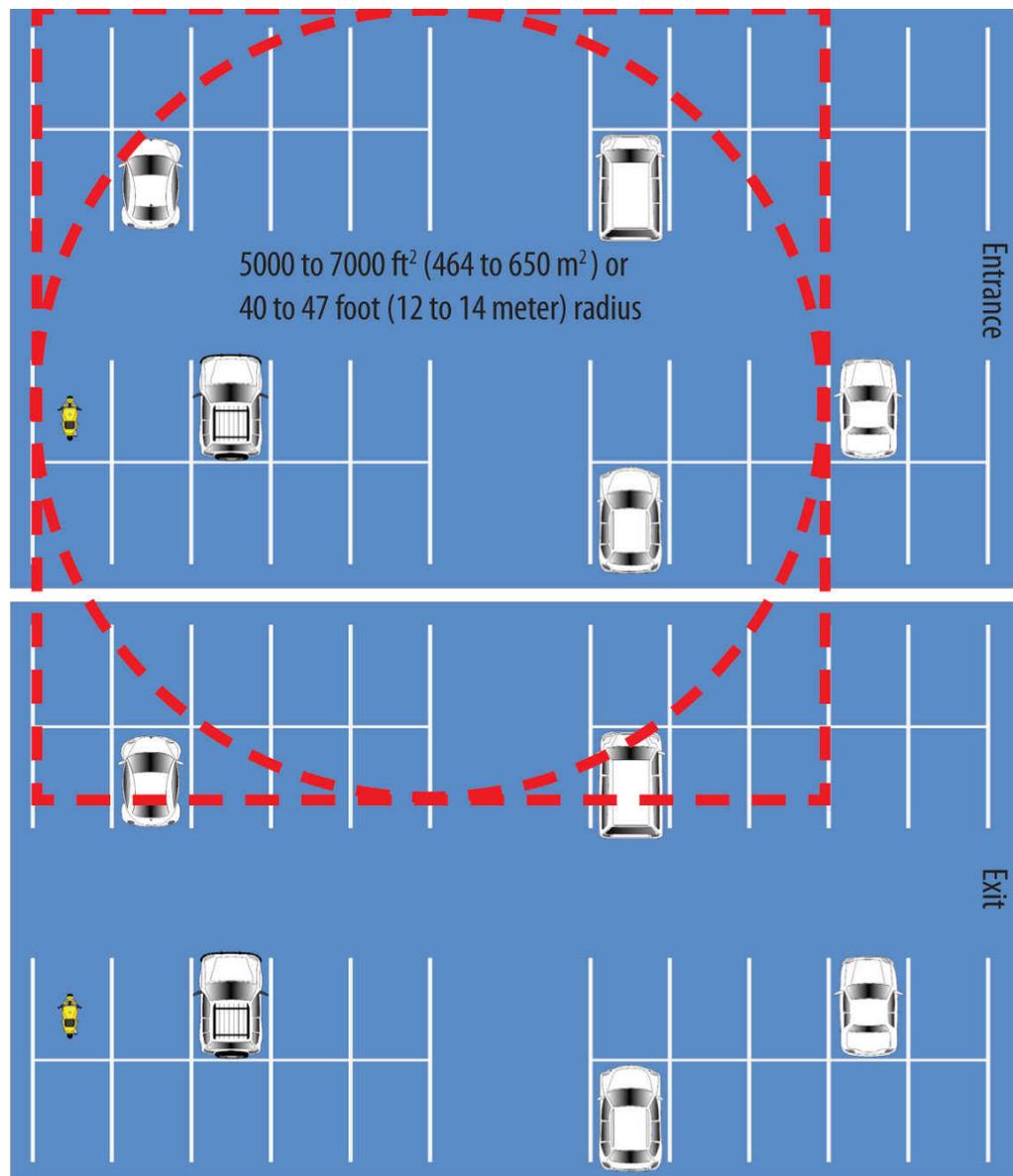
Place sensor where the potential leak may occur

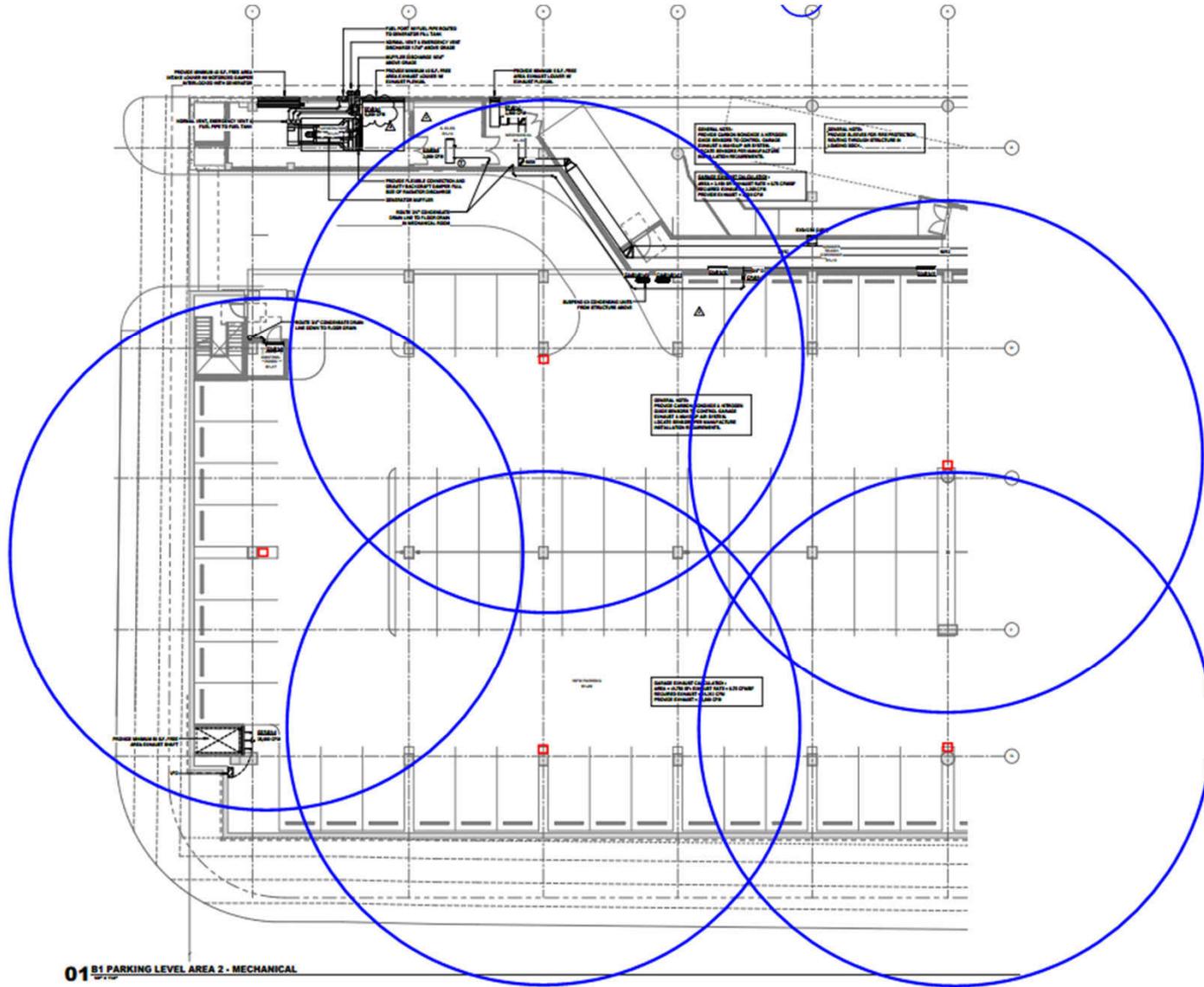
Do not place near ventilation fans, openings to outside or in the path of rapidly moving air

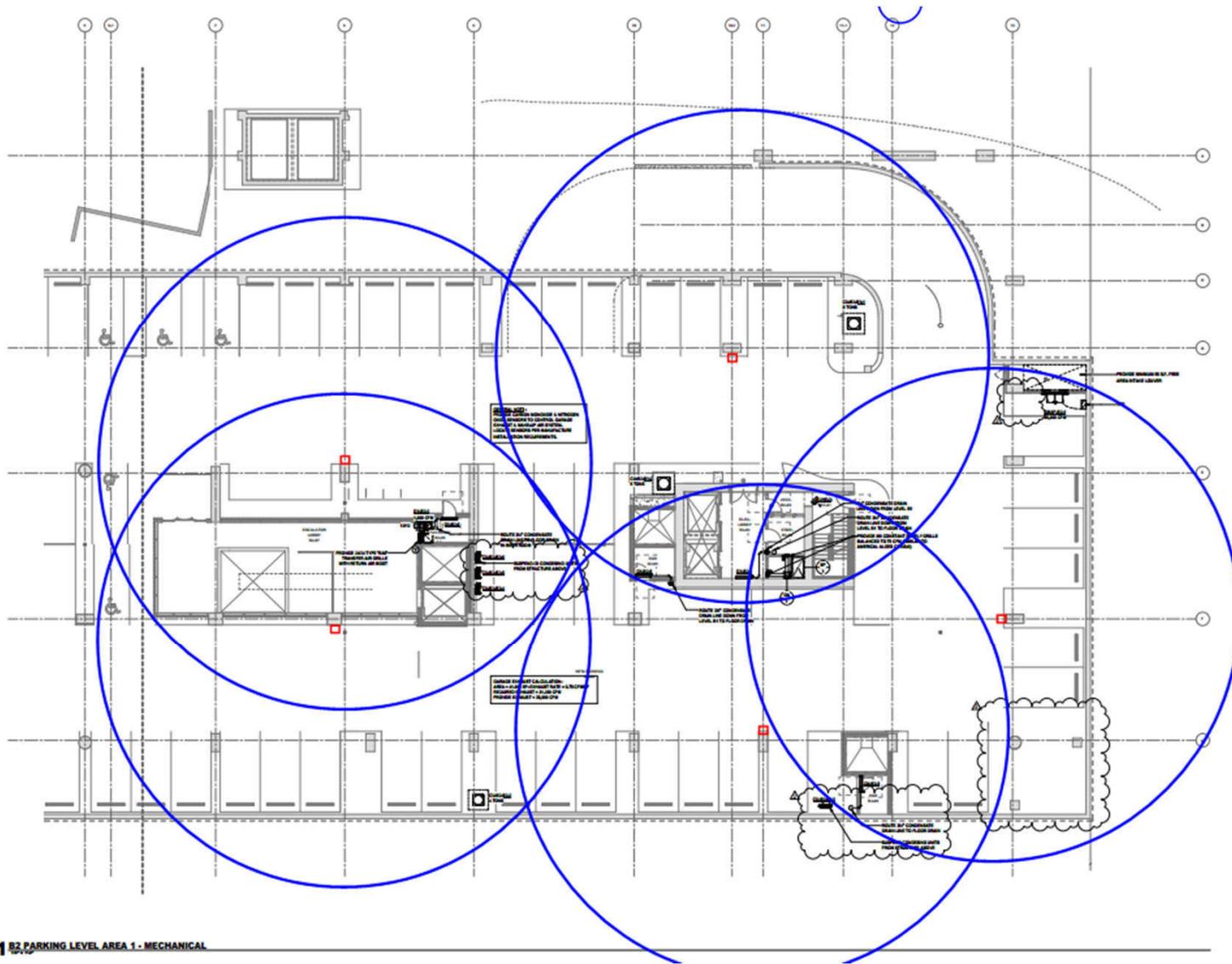
Remember the device will require access for re-calibration and sensor replacement

SENSOR COVERAGE

5000 to 10,000 ft²
(open space)







HOW IT WORKS

HOW DOES IT WORK?

As gas detectors detect a rising amount of gas, and gas concentrations rise, the ambient atmosphere activates audible/visual alarm indicators to notify personnel.



Controller

Gas detector



Gas detector



Gas detector



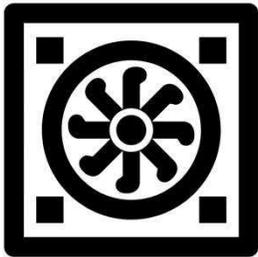
Gas detector



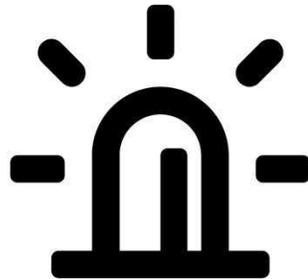
Signal



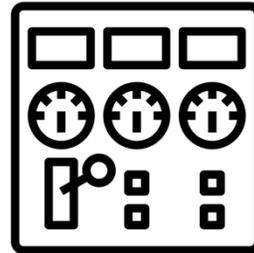
WHAT CAN BE CONTROLLED?



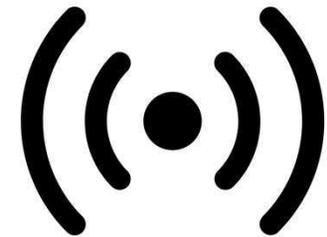
Activate exhaust
ventilation fans



Activate audible
and visual alarms



Report to BAS / DDC



Send a signal to an
external monitoring
station such as the Fire
Department

3 STEP APPROACH

3 STEP APPROACH



01 Understand the application

02 Identify target gas

03 Recommend the appropriate product

01. UNDERSTAND THE APPLICATION



How large is the facility in ft² / m²? How many sensing locations are there? Is zoning required?

What is the fan schedule?

Is it a classified area?

Is it a standalone system or monitored by a BMS / BAS?

Is it a wet environment, are there regular wash downs?

Is there an expectation of extreme temperatures?



02. IDENTIFY TARGET GAS

What is the target gas? Is there more than one target gas?

Does the monitoring environment have non target gases present? ie. paints, solvents or cleaning supplies in the same area?

Possible Target Gases

Swimming Pools

Chlorine, Ozone, Carbon Dioxide

Ice Arenas

Ammonia, Carbon Monoxide, Nitrogen Dioxide, Propane, Methane

Refrigeration Rooms

Refrigerants, Ammonia, Carbon Dioxide

03. CHOOSE THE APPROPRIATE PRODUCTS

Transmitters



Controllers



Self-Contained Controllers



Remote & Peripheral Devices

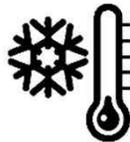


APPLICATIONS

WHERE SHOULD HAZARDOUS GASES BE MONITORED?



Parking
Garages



Chiller Rooms



Greenhouses



Ice Rinks



MRI Rooms



Commercial
Kitchens



Swimming
Pools



Wastewater
Treatment



Ferries



Wineries &
Breweries



Schools



Welding Shops



Hospitality



Hotels



Laboratories

ENCLOSED PARKING

Possible Target Gases

CO, NO₂ and/or combustible gases

Types of Facilities

Parking Garages
Bus Barns
Vehicle Repair Shops
Ambulance Stations
Fire Halls



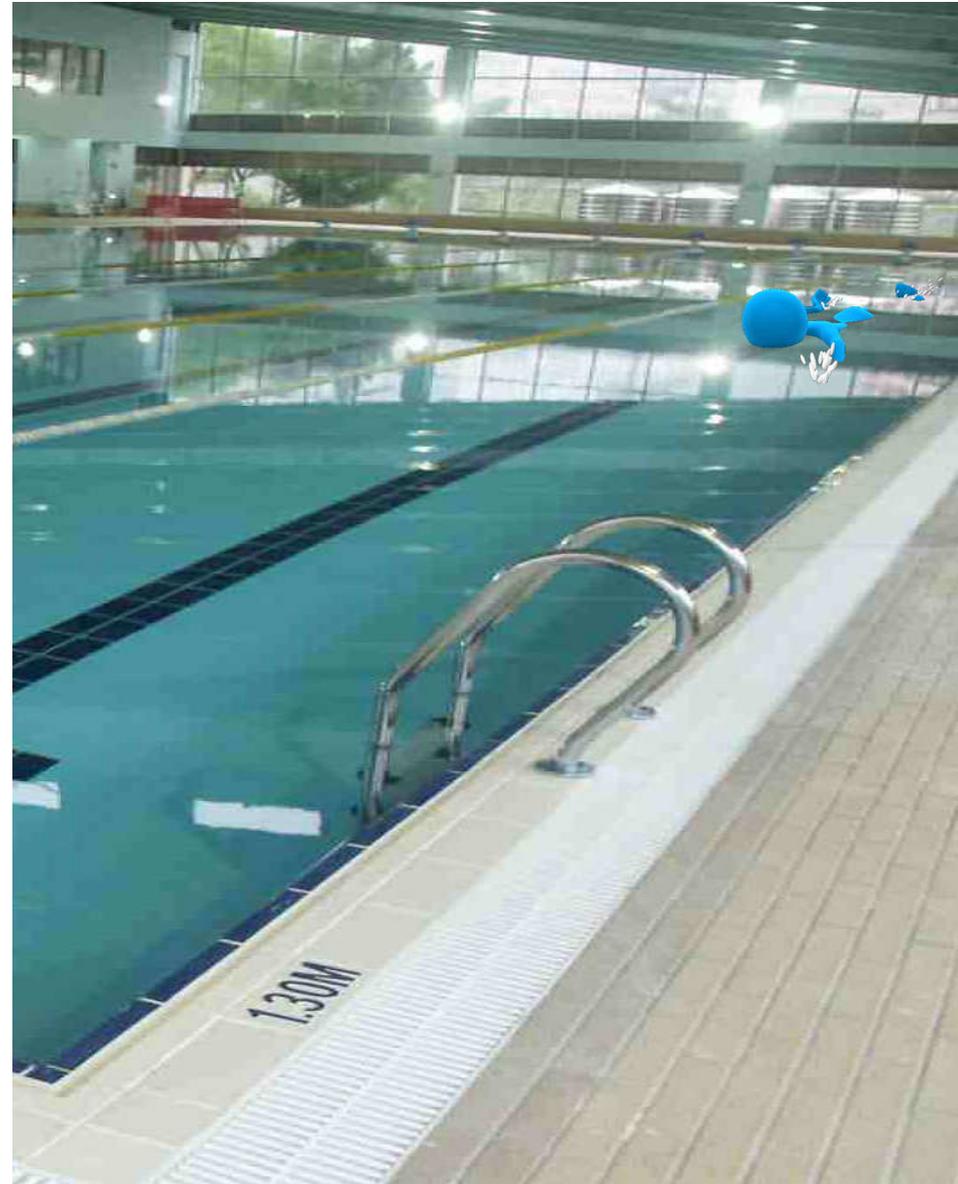
RECREATION FACILITIES - POOLS

Possible Target Gases

Ozone (O_3)

Chlorine (Cl_2)

Carbon Dioxide (CO_2)



RECREATION FACILITIES - ARENAS

Possible Target Gases

Methane (CH_3)

Carbon Monoxide (CO)

Nitrogen Dioxide (NO_2)

Propane (C_3H_8)



REFRIGERATION ROOMS

Possible Target Gases

Refrigerant

Ammonia (NH_3)

Carbon Dioxide (CO_2)



CHILLER ROOMS

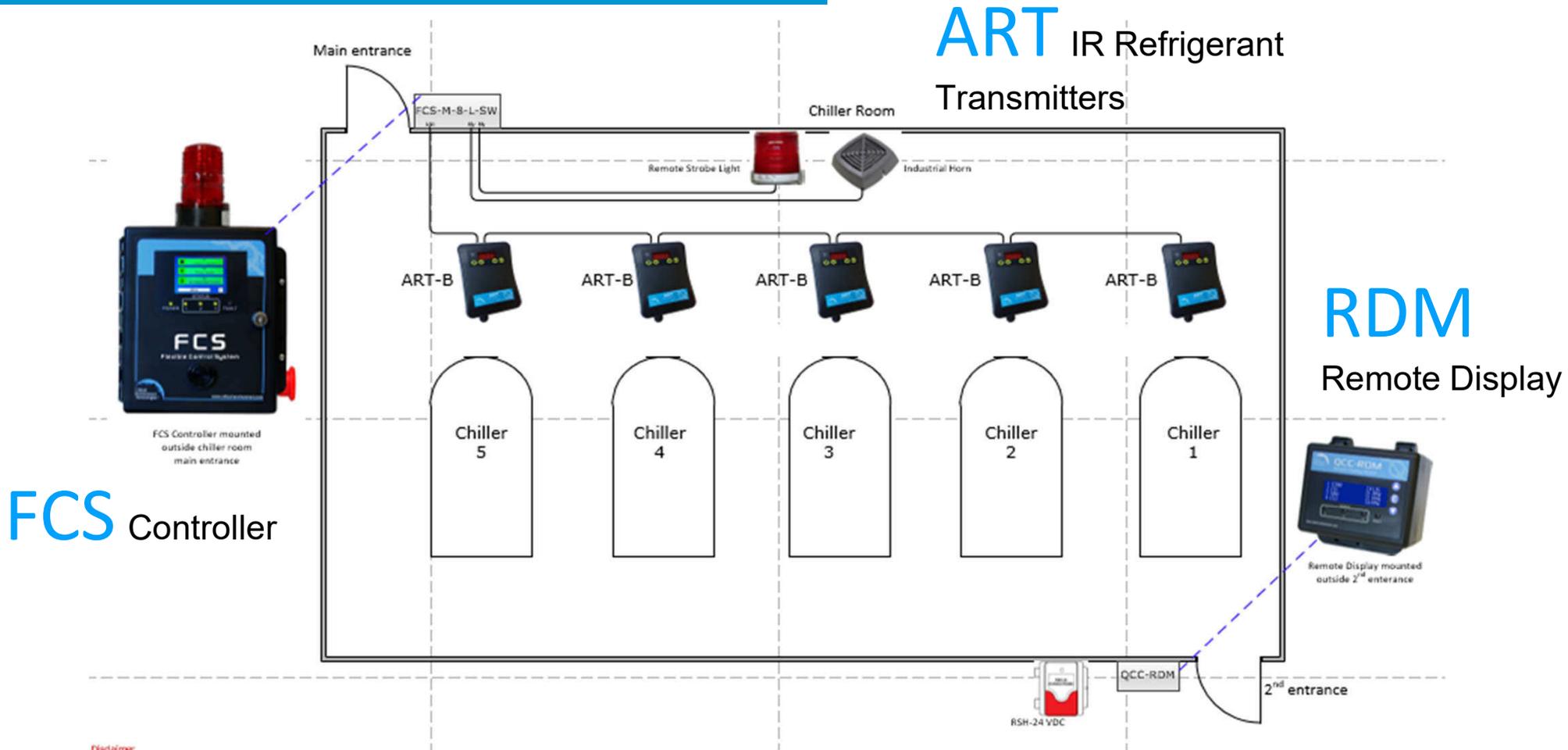
Possible Target Gases

Refrigerant

Ammonia (NH_3)



MECHANICAL / CHILLER ROOMS



WINERIES / DISTILLERIES

Possible Target Gases

Ethanol (C_2H_6O)

Carbon Dioxide (CO_2)

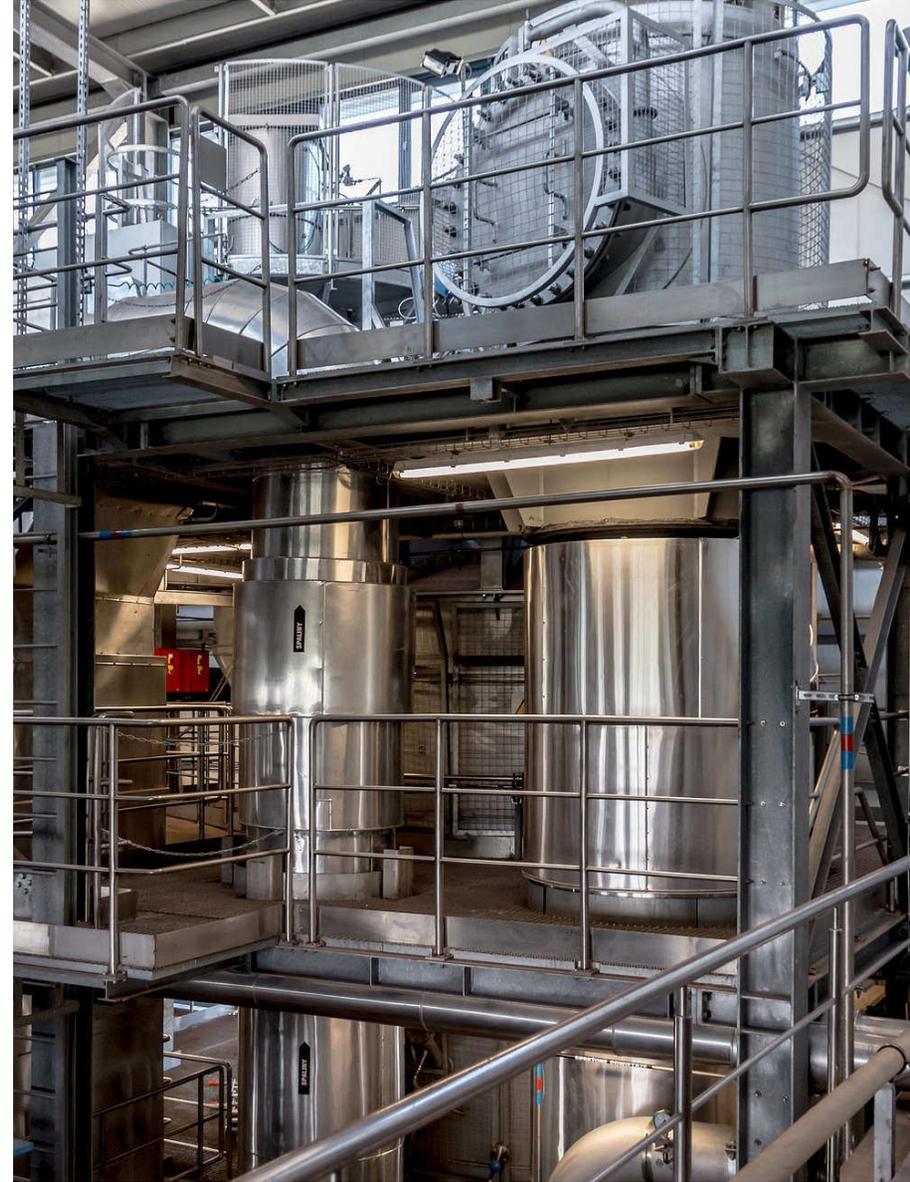


BOILER ROOMS

Possible Target Gases

Carbon Monoxide (CO)

Natural Gas / Methane (CH₄)



JAN

June //

OCT

OCTOBER // 17 // 2017

NEW NEWS NEW NEWSPAPER

35 children taken
monoxide le

Six McDonal
after gas le

Three arena wo
from catastr

Carbon monoxide poisoning
kills 1, sickens 3 in East TX

JANITOR STATES: NO



QUESTIONS & ANSWERS



Thank You!