

# Gas leak detection & fire suppression for high rise buildings - household & commercial applications

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## 1. Introduction

In India high rise buildings are becoming very common in Mumbai and other developed cities. It is not easy to access various residences hotels or offices inside the buildings in case of accidents. So Safety, Security, Surveillance & Automation are basic requirements of such buildings.

Use of LPG (Liquefied Petroleum Gas) or PNG (Piped Natural Gas) has been widespread in India. Even rural houses use LPG as a fuel for daily cooking. The recent discovery of gas in the Godavari basin has made the natural gas available in abundant in India. Gas pipelines are being led across our country to take this to homes and factories. Gas works out to be much cheaper fuel than electricity for cooking & heating applications. Gas Geysers are much cheaper than electrical geysers.

At the same time fuel gas poses a risk of fire and explosion if it is not handled properly. High number of incidences of gas leaks and subsequent accidents have caused great amount of loss to the property and life.

Insufficient burning of the fuel gas is a cause of Carbon Monoxide generation. Carbon Monoxide (CO) is one of the most hazardous gas for human being. It is odourless and affects directly the nervous system. In case of the Gas Geysers, for some reason if fuel gas does not burn properly due to lack of Oxygen, it will contaminate air inside bathrooms with CO causing unconsciousness and subsequent deaths.

To avoid such accidents it is important to warn the user of possible accidents. "Vignaharta Security" is an indigenous manufacturer of various types of gas leak detectors for domestic use.



Improving the quality of air is also requirement of modern home. Advanced building management systems monitor level of CO<sub>2</sub> and VOC (Volatile Organic Compounds) in the air. Sensors play a major role in improving quality of air.

There are also other causes of fires. One of them is electrical fires due to short circuits in electrical distribution panels. Effective fire suppression system needs to be installed to sense and curb such fires.

There is another very interesting product which is used by high rise buildings to save electricity. "Vignaharta A3S" manufactures ecoLuz. It is sensor light switch. It switches ON the lights when needed and puts off when not required.

## 2. Recent incidences of accidents caused due to Gas Leak in homes.

Several accidents have been reported in western part of India in last few years. Since the author resides in this part references are mostly from the Mumbai and Pune region. However since use of LPG & PNG is pan India, they are generic in nature.

On 5th June 2010, in the wee hours of the morning, rocked the neighborhood of Tarade Colony of Pune with a loud explosion. Walls of two flats came down crashing. In this mishap three people died. In one of these flats gas leak filled the gas throughout the night. When the electrical switch was made ON early morning, it caused sparking and subsequent explosion. This was so powerful that wall between two flats and outer walls were destroyed.

Similar incidence took place in Mumbai at Dadar on 26th Aug 2009. Senior Lady who

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returned home early morning from her daughter's place tried to lit the gas stove. She had a piped gas connection which had turned faulty. It leaked the gas over the night and filled the gas. Piped gas uses methane which is odourless. Explosion had the same effect as the case in Pune. Lady died and lot of damage to neighbouring property happened.

There are several such incidences reported all over India.

Sometimes back another story hit the newspapers. A newly married NRI who was visiting Punjab fail unconscious and subsequently died in the bathroom when Carbon Monoxide (CO) was generated by insufficient burning of LPG in the LPG Geyser. Many cases have been reported of falling unconscious due to excess exposure to CO.

### 3. Problem Analysis & Solutions

LPG can leak due to various reasons. Faulty coupling, faulty gas stove or rubber tube can cause the same. Sometimes people (especially senior citizens) can turn ON the gas stove knob and forget to light it. Since LPG is heavier than air it settles down and fills the surrounding like a liquid. In case of PNG, it goes up in the air as it is lighter. It is also odourless. When the gas concentration rises above approx. 2% in the air, it becomes explosive. This level is called as Lower Explosive Limit (LEL). It is important to sense and issue warning well in advance. It is highly recommended that such warning level should be about 10% of LEL.

The warning can be issued in form of loud sound or visual indication. Modern devices like GSM auto dialer can also send warning on mobile phones in form of voice message or SMS. Gas detectors can send signal to videodoor phones, home automation

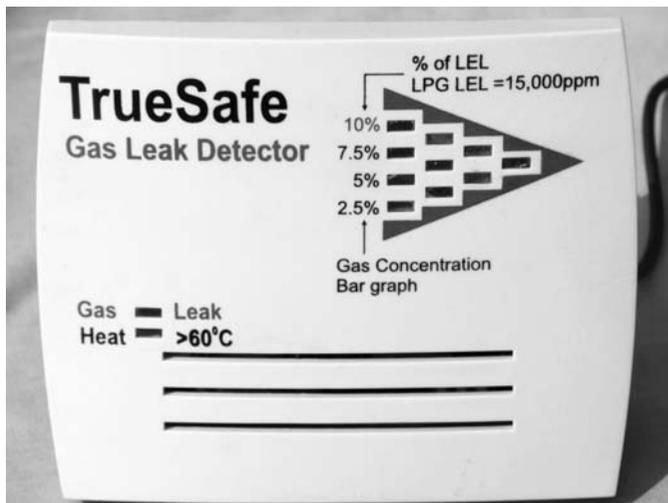
systems etc. They can also turn off the gas valve to cut off the gas supply.

Commercial grade or Industrial grade



detectors are installed near LPG Cylinder Banks which are used to supply piped gas inside high rise buildings.

Usually cylinder banks or large LPG bullets are installed at the basement or terrace of the high rise building. If gas leak happens it could be extremely dangerous. The explosion can cause serious damage to the building and also become source for fire. Due to life safety hazards, Industrial Grade Gas Leak Detectors are housed in Explosion proof housing. They are typically used where large amount of LPG is stored. They are interfaced with Gas Detection Panels. Whenever



leak is detected Gas Detection Panel sounds an alarm which can enable safety officers to take

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necessary action.

There are two types of Gas Detection Panels, Conventional type and addressable type. Conventional type panels divide detectors in separate zones. E.g. 2, 4, 8 etc. Whereas Addressable type of panels have usually single loop. Each loop can be connected with about 240 addressable detectors.

In high-rise buildings it is necessary to identify which flat has got a gas leak from a central monitoring station (CMS). Such application requires each flat to be fitted with addressable household grade gas leak detectors with the addressable panel fitted in CMS.

In case of CO, since it is odourless human being keeps on inhaling until he fails unconscious. Advance dosage i.e. about 150ppm for couple of hours can affect nervous system. CO detectors issue warning well in advance before this can happen.

In India hazards of CO are experienced in parking and bathrooms fitted with Gas Geysers. It is also required in homes using firewood or oil for heating, usually in North India, Himalayan Regions.

Again carbon monoxide detectors are of three types, Household, Commercial and Industrial Grade. Usually parking of high rise building is fitted with Commercial Grade Detectors with Gas Detection Panel. Advanced panel have facility to display PPM level.

Modern homes are air-conditioned. It is possible that CO<sub>2</sub> level rises above prescribed healthy level and cause discomfort to inmates. Foul

smells caused by VOCs (due to rotting of vegetables, dead animals like rats etc) also affect the quality of air. CO<sub>2</sub> and VOC detectors send the level of contamination to Building Management System which then takes action to correct the same.

All above sensors and panels could be connected to the BMS which can alert the facility management staff.

#### 4. Case Study

Vighnaharta Security has installed their detectors in several high rise buildings constructed by reputed builders like Shapoorji Pallonji, Raheja, Lodha, Kalpataru, Paranjape Schemes and several others.

We installed household gas leak detectors in every home in India's two tallest buildings on this date, Imperial Towers at Tardeo. We have also won orders from the new project in Lower Parel where 80 storey High Rise is being constructed. Paranjape Schemes' Blue Ridge & Avinash Bhosale Construction's tower in Koregaon Park also use our detectors. Several five star hotels like Hayat, Marriot, Rodas etc. use such detectors.

#### 5. Fire Suppression in Electrical Distribution Panels & Transformer Rooms

High Rise buildings are like townships. They use heavy electrical load and hence large power distribution panels are necessary in large nos. Though lot of care is taken while designing such panels, as they age, chances of short circuit are eminent.

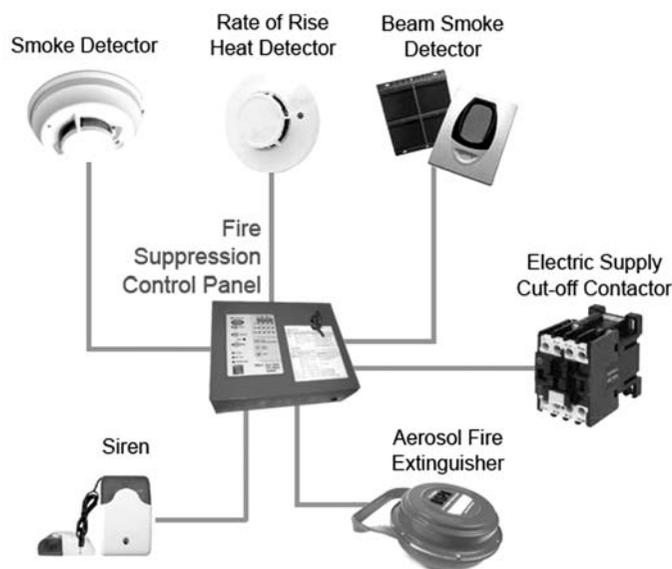
To prevent such fires, convenient and effective fire suppression system is required. DSPA (Dry Sprinkler Powder Aerosol) based systems prove to be quite effective. Such systems use heat sensing cable to sense short circuits or flashovers. The control panel triggers DSPA. DSPA agent consists of nano particles of Potassium Compound. They attack chemical reaction of fires and absorb heat to curtail fire in couple of seconds. It can be applied for A, B, C and F type fires. DSPA is manufactured in accordance with ISO 9001:2000 standards and is certified by UL/ULC, RINA, ISO, BRE, TNO, NFPA 2010.

DSPA can be conveniently installed in transformer rooms, electrical distribution panel rooms, Electrical Meter Rooms, airconditioning plants.

The advantages of DSPA over gas based or water mist based system are convenience of installation and maintenance and applicability to all types of fires.

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**Fire Detection & Suppression System**





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They are listed as under...

**More effective than Halon**

- Cost effective
- Non-toxic, non-corrosive
- Certified

**No pressurized storage**

- No leaks, no refills
- Safe to transport and install
- Suitable for hard-to-reach areas

**No mechanical moving parts**

- High reliability
- Minimum maintenance
- Stand-alone or integrated systems

**No pipe work nor nozzles, manifolds or distribution hardware**

- Easily installed, can be retro-fitted
- Discrete

**Realty Automation & Security Systems Pvt. Ltd. Manufacturers various types of gas leak detectors for household, commercial and industrial use.**



**6. Energy Saving in Buildings**

Typically all high-rise buildings have two staircases. Lights in both the staircases are left ON throughout the nights. But staircases are hardly used as residents are normally using elevators. There is huge amount of wastage of energy due to such practices. Similarly lights in parking and passages are not required all the time. The excellent solution which saves great amount of energy is use of Sensor Light Switches.

**General Functioning of Sensor Light Switch:**

It starts functioning only when ambient light is below preset level. It switches ON lights on sensing motion. Also it keeps lights ON till the motion is detected. Once the motion stops it turns off the lights after the set time.

**Applications in High Rise Buildings :**

Use with Tubelights, CFL, Incandescent Lamps, LED, Halogen Use in passages, parking, cabins, toilets, staircases, elevators etc. Use for gardens & surroundings etc. Use for Air Conditioners Electrical Substations

**Benefits :**

It can save nearly 80-95% energy. (depending upon usage). It provides ROI in 4 months (with 6 TL load). It helps to get green building norm because of less greenhouse gas emissions and better environment for us.

ecoLuz has been widely used by towers constructed by Kalpataru Constructions and few hotels.

**Conclusion**

Various technologies could be used to detect various gases in order to provide safety and save energy. Modern techniques of fire suppression could be used to put out fires near the possible cause. Energy could be save by using simple lighting automation device.

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