



**SIEMENS**

*Ingenuity for life*

## Fire protection in guestrooms

Protection of people, business continuity  
and reputation

Typically, the greatest proportion of a hotel's floor area is occupied by the guestrooms themselves. These are also the least controllable areas since guests cannot be included in the organizational fire protection measures.

The wide variety of ignition sources, such as overheated electrical appliances (fridge, TV, hairdryer) or careless handling of smoking products (cigarettes, cigars, etc.) or candles, put hotel guests in great danger, especially when a fire starts during the night.

Depending on the room dimensions, a smoke detector or an ASA neural fire detector with the combination smoke/heat is recommended for monitoring guestrooms.

Early warning of a fire is essential; not only for protecting people, but also for ensuring business continuity and the reputation of the hotel. However, unnecessary evacuation activities due to false alarms must be avoided.

In the event of a fire, however, alerting and evacuating all persons at risk and in good time has the highest priority. People in hotel guestrooms are very likely to be asleep and may also be wearing earplugs to help them sleep. Others may be hearing-impaired and asleep without their hearing aids etc. All possible means should be used to maximize the probability of alerting such persons. These include:

- Sounder beacons
- Voice sounders
- Vibrating pillows
- Controlling room lighting

A fire protection system is needed that guarantees early, reliable fire detection and activates both the alarm devices and the relevant hotel automation systems (e.g. air conditioning, lighting, blinds and the in-house entertainment systems).

# Content

- Content.....2
- Introduction .....3
- Basic conditions.....3
- Solution .....4
- Practical experience.....6
- ASAtechnology.....8
- Everything you need for comprehensive fire protection.....8
- Share the experience.....8



# Introduction

## Highlights<sup>1</sup>

- Guestrooms are the primary origin of non-confined fires in hotels and motels (>20 %)
- These fires were responsible for more than 70 % of civilian deaths
- Smoking products were the cause of the fire in over 75 % of civilian deaths
- One out of every 12 hotels reports a structural fire per year
- Ensuring rapid and efficient evacuation when this becomes unavoidable can save lives

Hotel rooms are generally occupied by people who can easily rescue themselves in case of fire. However, hotel rooms are also occupied by people who may panic and those who are disabled and therefore unable to rescue themselves. Some people may also be hearing-impaired or be wearing earplugs to help them sleep. These circumstances must be taken into consideration in the assessment of individual risks and in choosing the appropriate fire protection measures.

### Careful attention must be paid to the following:

- Possible ignition sources must be kept to a minimum.
- Hotel guest regulations must include clear guidelines on smoking and on open flames (candles)
- Electrical equipment must be carefully cleaned, checked and maintained on a regular basis
- An evacuation plan must be mounted on each hotel room door and be clearly visible
- Automatic fire detectors should be selected and installed in such a manner that they give the earliest possible warning of a fire, while excluding false alarms due to deceptive phenomena
- The alarm system must be designed so that in an emergency all affected hotel guests will be alerted immediately
- The hotel staff must know exactly in which rooms there are hotel guests who cannot save themselves or would have difficulties in doing so
- Hearing-impaired guests should be provided with a vibrating alarm device (e.g. vibrating pillow)
- The evacuation plan must take all the different hotel situations into account (e.g. low/high occupancy, functions and special events)
- The efficiency of an evacuation can be considerably improved by the presence of a voice alarm system or voice sounder beacons

# Basic conditions

## Objective

- Alerting people in the affected rooms before hazardous fumes create a dangerous situation
- Timely evacuation of all people at risk
- Preventing false alarms and unnecessary fire brigade callouts

## Typical fire hazards

- An overload or short circuit of an electrical appliance (fridge, TV, kettle, iron)
- Careless handling of smoking products or candles (e.g. throwing away smoking products into containers with flammable materials)
- Flammable materials on a hotplate (in hotel rooms with a kitchenette)
- Propagation of smoke and fire via the HVAC system (heating, ventilation, air conditioning)

## Typical development of a fire

The majority of fires in hotel rooms start with a smoldering phase and progressively generate increasing quantities of visible smoke. If such an incipient fire is detected at an early stage, it can be dealt with easily (e.g. by disconnecting the power supply or extinguishing a smoldering trash can with water or a fire extinguisher).

## Critical Points

- Preventing delayed fire detection
  - E.g. by the fire aerosols being diluted by the airflow from the HVAC system
- Preventing false alarms due to deceptive phenomena. For example:
  - Steam from the shower or from a boiling kettle
  - Cigarette smoke from smoking in the room
  - Rapid increase in temperature caused by an electric heater
- Providing multiple alerting mechanisms to ensure all guests are made aware of an emergency situation
  - Voice sounder beacons (or a public address and voice alarm system in larger hotels)
  - Vibrating pillows for hearing-impaired guests
  - Controlling room lighting and hospitality TVs
- People in unfamiliar surroundings may also be susceptible to panic in emergency situations.



<sup>1</sup> NFPA, U.S. Hotel and Motels Structure Fires; U.S. Fire Administration's (USFA's), Hotel and Motel Fires

## Solution

Selecting the type, setting and position of fire detectors is based on estimating the possible deceptive phenomena in the room. The following generally applies

- The bigger and the higher the room, the lower the impact of deceptive phenomena (distribution of aerosols in larger volumes/greater distance from heat sources).
- The smaller and lower the room, the greater the impact of deceptive phenomena.

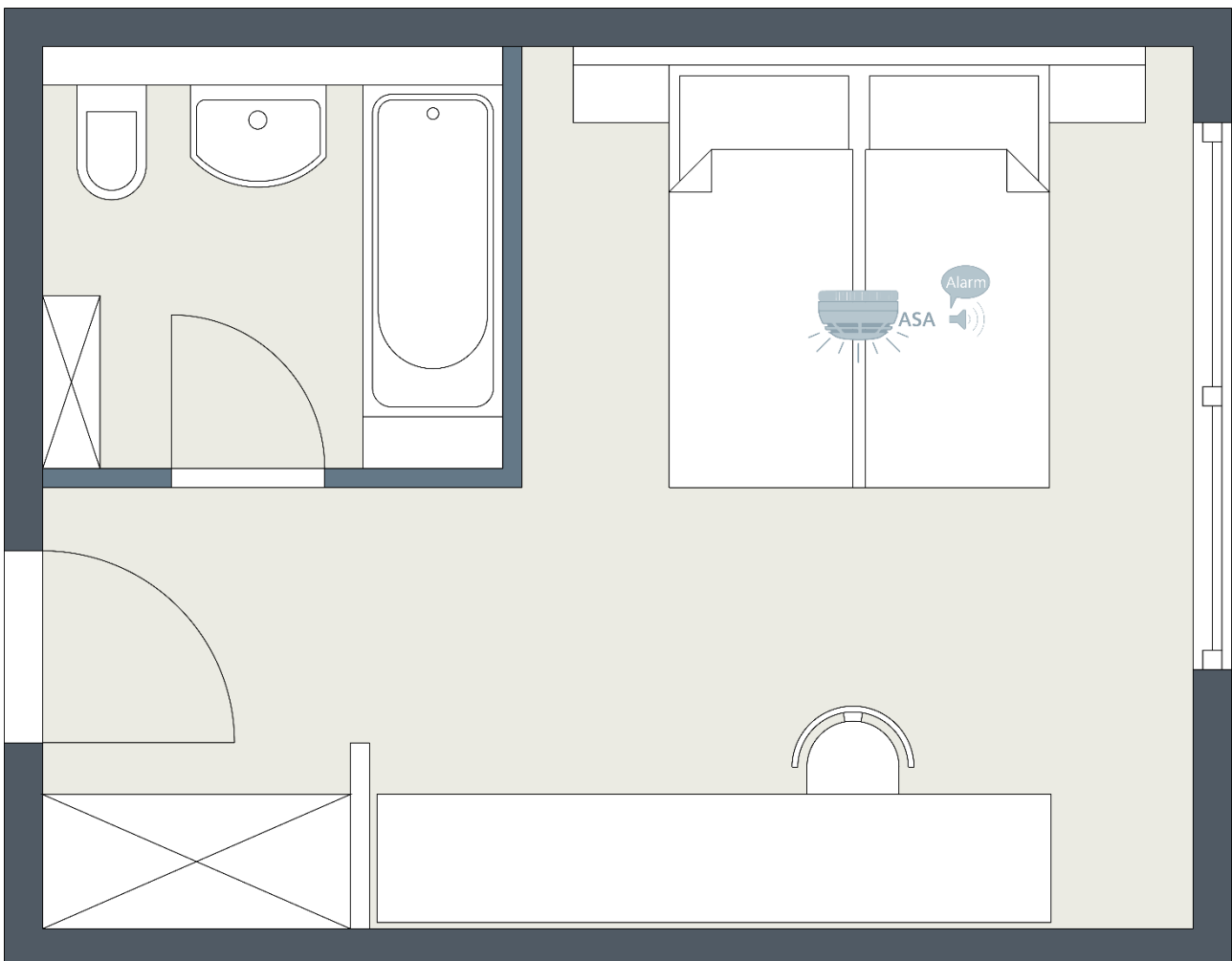
A smoke detector can be used in most guestrooms. For smaller guestrooms (<15 m<sup>2</sup> and ceiling heights <2.5 m) or in guestrooms with an integrated kitchenette, where strong deceptive phenomena can be expected, a more robust fire detector must be chosen.

In the event of a fire alarm, the fire protection system shall activate the following alarming devices in all guestrooms:

- Voice sounder (in accordance with EN 54-3)
- Beacon (in accordance with EN 54-23)

The integrated voice sounder beacon detector-base provides the optimal solution.

It is essential to convey the evacuation message via more than one channel and via different senses e.g. sounders, beacons, telephone, vibrating pillows, TVs, etc. This is especially true in a hotel environment, where people may have hearing difficulties or may be asleep while wearing earplugs.



Details	Comments/Notes
<b>Detector for normal rooms</b> Smoke detector with voice sounder beacon base	Low deceptive phenomena at the detector <ul style="list-style-type: none"> <li>▪ Parameter set with standard sensitivity</li> </ul>
<b>Detector for small rooms</b> ASA neural fire detector with voice sounder beacon base	Medium to extreme deceptive phenomena at the detector <ul style="list-style-type: none"> <li>▪ Medium deceptive phenomena: Parameter set with balanced detection behavior</li> <li>▪ Extreme deceptive phenomena: Parameter set with a high immunity</li> </ul>
<b>Positioning of the detectors</b> (see Figure 1)	<ul style="list-style-type: none"> <li>▪ On the ceiling</li> <li>▪ At least 0.5 m from the wall</li> <li>▪ In the area of the bed</li> <li>▪ As far as possible from the bathroom door</li> <li>▪ Away from the airflow of the HVAC system</li> </ul>
Related measures	Comments/Notes
<b>Sprinkler system</b>	In a number of countries local regulations require that a sprinkler system should be installed in hotels and guesthouses.
<b>Fire extinguishers</b>	An adequate number of hand-held (foam) fire extinguishers should be installed on corridors, landings, escape routes and public areas throughout the hotel.

## Practical experience

### Fire detection

In accordance with VDE 0833-2, point-type smoke detectors (that comply with DIN EN 54-7) may be used to monitor a maximum area of 80 m<sup>2</sup> in rooms with a height of 12 m (max. volume of 960 m<sup>3</sup>). A guestroom with a height of 2.5 m and an area of 20 m<sup>2</sup> has a volume of 50 m<sup>3</sup>. In this way, a smoke detector in a 20 m<sup>2</sup> room would be activated at approx. 5 % of the smoke generation required for the 80 m<sup>2</sup> room. This comparison shows that approved and correctly positioned smoke detectors in a guestroom trigger alarms very early, significantly before reaching a dangerous concentration of fumes.

### Steam as a deceptive phenomenon

Most false alarms in guestrooms are triggered by steam from the shower. In a few cases, this is steam which is generated by showering with warm water of about 45 °C. Significantly more false alarms are caused by steam generated from warm water of more than 50 °C (above 55 °C there is a risk of scalding). This particularly occurs where the guest uses very hot steam for several minutes for steaming clothes and then opens the door to the shower.

To prevent false alarms, the fire detector should be mounted in an area where little steam is expected. If such a position cannot be found, particularly in small guestrooms, a reduction in water temperature must be considered. However, the hot water generation should not be reduced to below 60 °C because of the risk of legionellae (bacteria).

### Tobacco smoke as a deceptive phenomenon

Tests have shown that in a room with a height of 2.5 m, a smoke detector can be triggered by cigarette smoke. This only happens, however, if the smoker stands directly underneath the detector and blows the smoke toward the detector. If the distance between the smoker and the detector is increased by as little as 0.5 m (e.g. when the smoker is sitting on a chair), the smoke concentration is not enough to trigger a false alarm.

To prevent false alarms due to smokers in rooms with a ceiling height of under 3 m, the smoke detector should be installed in a position that ensures sufficient distance between the smoker and the detector (e.g. above the bed). If, for some reason, it is not possible to position the detector above the bed, then an ASA neural fire detector with increased robustness must be used.

### Interference from the HVAC system

To guarantee reliable fire detection, the fire detector must be mounted away from the airflow of the HVAC system so that, in the case of fire, smoke is not diluted in the vicinity of the detector.

If a smoke detector with a temperature sensor (ASA neural fire detector) is used in a guestroom, the detector must not be mounted in the airflow of the heating unit. Otherwise, there is a risk of false alarms due to a rapid, significant temperature rise, caused by the warm airflow with which the room is heated.



## Alarming and evacuation

It is essential that all guests are made aware of any emergency situation. The minimum requirement is that the fire protection system shall activate a sounder and a beacon in all guestrooms. It has also been proven that people react far more readily to spoken messages. The voice sounder beacon detector-base provides the perfect solution for international clientele as the alarm messages can also be broadcast in two languages.

### Sounder beacons in hotels

The local CoP (Code of Practice) specifies the application and the position of sounders and beacons.

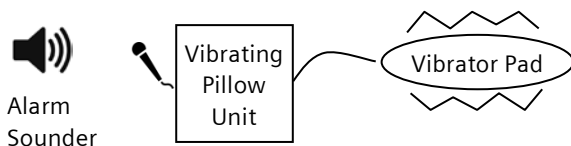
For non-regulated areas the following can be used as a guideline:

- Rooms where hearing-impaired persons may be alone (e.g. guestrooms, toilets, etc.) use a sounder with beacon in accordance with EN 54-23
- For other rooms (e.g. lobby, restaurant, corridor, staircase, etc.) where hearing-impaired persons are not alone, use a sounder with supplementary optical indication

### Bedrooms for hearing-impaired persons

In particular, it is very difficult to alert hearing-impaired persons during the night when they are asleep.

Although beacons provide a strong optical warning signal, awareness can be greatly improved by the use of a vibrating pillow. Several such products are available, which are based on the following principle:



The vibrating pillow listens continuously for the alarm tone emitted by the fire alarm sounder. As soon as there is an alarm, the vibrating pillow recognizes the signal and immediately activates the vibrator pad. This functional design requires no additional installation. The device is portable and depends solely on the room occupant.

## Room automation

If an evacuation becomes necessary, the following actions should be initiated automatically:

- Room lighting should be restored to full brightness (entrance, bedroom and toilet)
- Window blinds should be opened, letting external light into the room and allowing the fire brigade to investigate from outside and gain access to the room (if this becomes necessary)
- The air-conditioning system should be switched off and smoke-dampers between fire-compartments closed, preventing the spread of smoke via the air ducts

Numerous factors must be taken into consideration when planning a fire protection system in hotels and guest houses. This process requires close collaboration with the different disciplines for fire detection, room automation and the in-house entertainment system.

### Interconnection to entertainment system

In case of an alarm, the hospitality TV system can be used to inform guests about the situation and provide instructions regarding escape routes etc. Guestroom TVs can be automatically activated, with the screens displaying the relevant floorplans and the appropriate escape routes.

### Danger management systems

In larger hotels a danger management system may be installed, which can provide valuable assistance in the case of a fire alarm:

- Verification actions can be initialized quickly, helping to avoid unnecessary evacuations
- The source of an alarm can be displayed graphically on the relevant floor plan
- Instructions can be transmitted to technical personnel via email, pager or text message
- Floor plans with relevant access routes can be printed automatically to provide guidance for intervention forces
- Automatic actions can be triggered that can reduce response times

### CCTV

It is becoming increasingly more common to find security CCTV cameras installed in hotel corridors and stairwells.

In the event of a fire the associated video data would enable front-desk personnel to determine the presence and spread of smoke, providing useful information when marshalling an evacuation procedure.

In conjunction with the DMS event history, the recorded CCTV data would enable security personnel to investigate the initial cause of a fire.

## ASAtechnology

**For intelligent, reliable fire detection with genuine alarm guarantee**

ASAtechnology is a unique technology from Siemens that converts signals into mathematical data which is compared with programmed values in real time using intelligent algorithms. The special signal analysis process is very reliable in preventing false alarms caused by deceptive phenomena, such as steam, tobacco smoke or exhaust emissions. Find out more about **Sinteso** or **Cerberus PRO** fire detectors with ASAtechnology.

## Everything you need for comprehensive fire protection

Incorporated in a concept tailored to your customers' requirements, Siemens and its Solution Partner network provide:

- Early and reliable fire detection solutions, offering an unrivalled financially backed "Genuine Alarm Guarantee".
- Fully forwards and backwards compatible systems, to ensure any system provided is equipped to integrate the latest technology Siemens has to offer.
- Clear and fast alerting and evacuation processes.

All these aspects are at the core of comprehensive fire protection. Only when these are fulfilled can you be assured that people in your buildings are safe and assets and business operations are protected.

In order to offer your customers peace of mind, Siemens and its Solution Partner network have a variety of service and solution offerings that can be tailored to an individual client's needs. To find out more about this, please visit our Web site at [siemens.com/firesafety-markets](https://www.siemens.com/firesafety-markets) or contact your local Siemens organization through the [online contact form](#).

## Share the experience

With our dedicated program for consulting engineers, you can benefit from our extensive application know-how and complete portfolio.

With Siemens, you can offer your customers comprehensive fire safety for any application and environmental condition. Your customers will appreciate this as it enables them to reliably protect people, assets and business processes from fire.

Backed by more than 160 years of experience in the field, our offerings for early detection, reliable alarming, orderly evacuation and safe extinguishing are based on innovative and unique technologies. They provide you with convincing arguments like maximized life safety or environmental friendliness, and open the door to strong, long-term customer relationships. And with Siemens, you gain a reliable partner at your side and benefit from our smart tools, in-depth trainings and personal support – wherever you are, wherever you go.

For more information please visit our dedicated [consultant page](#).



Smart Infrastructure intelligently connects energy systems, buildings and industries to adapt and evolve the way we live and work.

We work together with customers and partners to create an ecosystem that intuitively responds to the needs of people and helps customers to better use resources.

It helps our customers to thrive, communities to progress and supports sustainable development.

Creating environments that care.  
[siemens.com/smart-infrastructure](https://www.siemens.com/smart-infrastructure)

Article no. BT\_0058\_EN (Status 09/2019)

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

© Siemens 2019