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Fire detection in guest rooms

Protection of people, business continuity and reputation

Typically the greatest proportion of a hotel's floor area is occupied by the guest rooms 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 guest rooms.

In the event of a fire, alerting and evacuating all parties at risk in good time has the highest priority. A fire protection system is needed that guarantees rapid, reliable fire detection and activates both the alarm devices and the relevant fire control installations.

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.

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Introduction

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 cannot rescue themselves. 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.
- The evacuation plan must take all the different hotel situations into account (e.g. low/high occupancy, functions and special events).

Highlights*

- Guest rooms are the primary origin of non-confined fires in hotels and motels (23%)
- These fires were responsible for 72% of civilian deaths
- Smoking products were the cause of the fire in 79% of civilian deaths
- One out of every 12 hotels reports a structural fire per year

* NFPA, U.S. Hotel and Motels Structure Fires; U.S. Fire Administration's (USFA's) , Hotel and Motel Fires

Basic conditions

Objective

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

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.
- Safe and orderly evacuation of all people at risk, as being in unfamiliar surroundings may lead to panic reactions.

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 guest rooms. For smaller guest rooms (< 15 m² and ceiling heights < 2.5 m) or in guest rooms with an integrated kitchenette, where strong deceptive phenomena can be expected, a more robust fire detector must be chosen.

Details	Comments/Notes
Detector for normal rooms: Smoke detector with sounder base	Low deceptive phenomena at the detector <ul style="list-style-type: none"> • Parameter set with standard sensitivity
Detector for small rooms: ASA neural fire detector with sounder base	Medium to extreme deceptive phenomena at the detector <ul style="list-style-type: none"> • Medium deceptive phenomena: parameter set with balanced detection behavior • Extreme deceptive phenomena: parameter set with a high immunity
Positioning of the detectors: (see Figure 1)	In the event of a fire, sufficient smoke concentration and minimal impact from deceptive phenomena <ul style="list-style-type: none"> • On the ceiling • At least 0.5 m from the wall • In the area of the bed • As far as possible from the bathroom door • Away from the airflow of the HVAC system
Related measures	
<ul style="list-style-type: none"> • Sprinkler system • Alarming by different means, e.g. sounders, beacons, telephone, vibrating pillows, TVs, etc. • Speaker system to help with an orderly evacuation 	

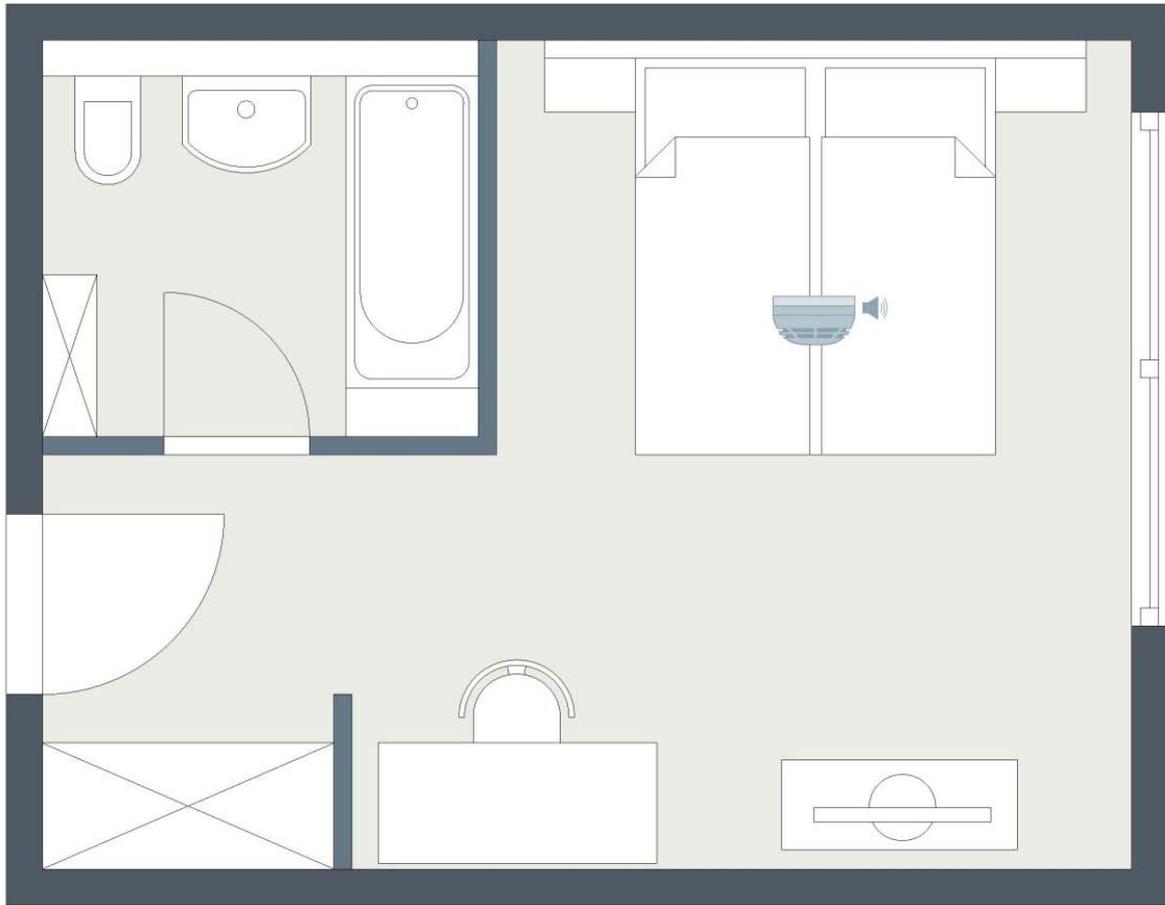


Figure 1 Positioning of the fire detectors



Smoke detector with sounder base

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 m² in rooms with a height of 12 m (max. volume of 960 m³). A guest room with a height of 2.5 m and an area of 20 m² has a volume of 50 m³. In this way, a smoke detector in a 20 m² room would be activated at approx. 5% of the smoke generation required for the 80 m² room. This comparison shows that approved and correctly positioned smoke detectors in a guest room trigger alarms very early, significantly before reaching a dangerous concentration of fumes.

Steam as a deceptive phenomenon

Most false alarms in guest rooms 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 guest rooms, 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 guest room, 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.

ASAtechnology – for intelligent, reliable fire detection with genuine alarm guarantee

ASAtechnology is a unique technology from Siemens that converts signals into mathematical data which are compared with programmed values in real time using intelligent algorithms. The special signal analysis process is very reliable in preventing false alarms caused by on-site 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 www.siemens.com/firesafety-markets or contact your local Siemens organization through [the online contact form](#).

Advantage Engineering – 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 www.siemens.com/advantage-engineering.

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