

# Risk Control

Fire safety in the construction and use of saunas

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## ➤ SCOPE

These recommendations outline the property protection measures applicable to the provision and use of saunas using electric heating units in health clubs, leisure centres, hotels and similar facilities.

There are two main types of saunas: wet and dry. Wet saunas are sometimes called steam rooms. Because their hazards and methods of construction are different from those of dry saunas, they are outside the scope of this document.

Although not specifically aimed at saunas in domestic premises, many of the recommendations, particularly those to do with safe use, may be relevant to installations in the home.

## ➤ SYNOPSIS

Saunas should be classified as high fire hazard areas due to the presence of combustible construction and finishes, together with potential ignition sources. They should be located in enclosures that will provide at least 60 minutes' fire resistance.

Suitable separation from adjacent areas is essential and effective management procedures and emergency plans, backed up by staff training and rehearsal of the procedures, are crucial.

The electric heaters are the principal fire hazard and these should be maintained regularly and managed effectively to prevent abuse by the users of the facility.

## ➤ INTRODUCTION

A sauna is a small room designed to be heated to very high temperatures, with well-controlled humidity. Saunas are used both for recreational and therapeutic purposes, with most people utilising them as a form of relaxation that provides additional health benefits. The majority of saunas are built of wood, often aromatic wood that releases pleasing aromas when heated.

With their origins believed to be in Finland, saunas have evolved from pits dug in sloping ground that were primarily used as dwellings to dedicated heated and insulated rooms. Heating methods have developed over many years from rocks heated by fire to infrared heaters and electric heaters.

Modern saunas are thus usually electrically heated with humidity (steam) provided by the automatic injection of water. Maximum operating temperatures are normally limited to about 95°C.

Various types of specially designed electrical heating units are available for use in saunas. These include both floor- and wall-mounted units with stones and wall-mounted units that can be concealed behind removable benches.

There have been a number of fires originating in saunas which have resulted in loss of life, significant property losses and disruption to business continuity. The latter has been a particular problem following fires in hotels, fitness and leisure centres.

Many saunas are key integral features of health centres, hotels and similar premises and a fire in a sauna can not only present a threat to life but also result in significant property damage. Because of the quantities of wood used in their construction, fires in saunas can spread and intensify rapidly, producing high temperatures and copious quantities of smoke and noxious gases.

The spread of the smoke is a serious hazard to life and also has severe implications for the continued smooth running of the business, with parts, or all, of the property having to remain

closed for a protracted period while cleaning, refurbishment or rebuilding takes place.

Potential causes of fire within saunas include:

- poor housekeeping, particularly the accumulation of combustible items;
- defective electrical equipment or faults involving circuits and equipment such as light fittings, heating units, thermostats and timers;
- failure of control measures resulting in elevated temperatures can lead to thermal degradation of the timber cladding;
- poor facility management such as:
  - leaving heaters on and unattended for long periods;
  - failure to turn the power off at the close of business;
  - incorrect or insufficient stones, or packing of stones too tightly;
  - a lack of periodic inspection and maintenance, resulting in undetected wear and tear;
  - using undiluted flammable/combustible essence on the heated stones;
  - using chlorinated or other unsuitable water, such as water from a swimming pool, on the heated stones (this can cause a thermal shock effect on heating elements);
- not installing heating units in accordance with manufacturers' instructions; and
- inappropriate actions by users, such as interfering with thermostats to achieve higher bathing temperatures and the introduction of combustible materials such as towels, newspapers and plastic cups, which may be left in close proximity to heating units.

A fire risk assessment of all premises containing saunas should be undertaken in compliance with the Regulatory Reform (Fire Safety) Order 2005 (ref. 1) or the equivalent legislation in Scotland and Northern Ireland (refs. 2 to 4). The level of risk from fire should be ascertained and measures put in place to eliminate, reduce or manage the hazards as far as possible. This document considers property protection requirements as well as the life safety issues that are addressed in the legislation.

The approach to fire safety in saunas is essentially similar to the approach to other high hazard areas.

This involves taking into consideration:

- the type of construction;
- the need for fire-rated separation between the sauna and adjacent areas;
- the type, design and installation of heating units;
- the need to ensure that adequate fire safety measures are in place to manage ignition sources, flammable liquids, and combustible materials;
- the need for inspection and maintenance regimes, particularly for heating and electrical equipment; and
- the need for regular inspections of the facility while in use.

The fire risk assessment should also take into account probable drowsiness of users, their state of undress and possible acoustic isolation.

Emergency evacuation plans should address these issues, making appropriate provision for the welfare, as well the safety, of the users.

## Sauna heaters

Today's saunas may be heated by electricity, gas or infrared heaters as well as the traditional wood burning stoves. Heaters may be floor standing or wall mounted, but provide heating via stones which are in direct contact with the electrical heating elements or burners. Modern units have water introduced by controlled injection whereas older saunas relied on the manual application of water by users.

Electric heaters are most commonly used; in the case of wall mounted units, the thermostat is usually mounted near the bottom of the heater so does not measure the temperature of the air in the sauna with a great deal of accuracy. The thermostats for floor mounted heaters, however, are located on the wall about 30cm below ceiling level and so tend to provide more effective control.

Although floor-mounted heaters are preferable in this respect, seating should not be provided directly above these heaters unless they have been specifically designed for use beneath benches.

Gas (propane) heaters and wood burning stoves introduce added complexity into the design of the sauna due to the necessary flues and ventilation required.

The capacity of the heater is critical to an effective sauna; it needs to bring the sauna to the correct working temperature quickly and subsequently maintain the temperature of the stones and the air correctly. The number of users present and the number of times the door is opened when users enter or leave have a marked effect on the efficiency of the heater. Commercial sauna heaters therefore often have multiple sets of heating elements, one set being permanently energised while others operate when additional heating is required. Other commercial heaters maintain the optimum temperature by systems of moving lids and fans.

Other features that affect the performance of the heater are the capacity (weight) of the rocks and the air flow. Large rock capacity provides a 'buffer' to control the temperature more evenly while increased air flow will provide faster heating and can allow the sauna to be ready for use some 30 minutes after being turned on.

Energy usage considerations indicate that heaters with higher outputs have lower energy consumption than lower power units, especially in log saunas and those with glazed walls.

Infrared heaters are most common in domestic, rather than commercial, facilities and provide heat directly to the skin; they are not used with stones and water in the traditional manner.

## RECOMMENDATIONS

### 1. Construction

- 1.1 The construction of the building in which the sauna is located should be undertaken in accordance with the **FPA Design Guide for the Fire Protection of Buildings: Essential Principles** (ref. 5).
- 1.2 The area of the premises where the sauna is located should be regarded as a high fire hazard area and thus the sauna should be in a room or enclosure that can provide at least 60 minutes' fire resistance.
- 1.3 Any openings around service penetrations in the fire-rated construction should be fire stopped with a suitable proprietary material affording a minimum of 60 minutes' fire resistance.

- 1.4 Any ventilation duct from the sauna that passes through a fire-rated separating element should be fitted with an automatically-operated fire damper linked to the fire detection and alarm installation, or the entire length of the ducting from the sauna to the open air should offer a minimum fire resistance of 60 minutes.

- 1.5 The use of surface coatings such as stains and varnishes should be avoided.

- 1.6 If the sauna is run at too high a temperature for prolonged periods, this can result in the drying out of the timber linings of the sauna cabin, particularly around the heater and of the ceiling directly above it.

To prevent this, the wall behind and to the side of the heater and the ceiling above it should be lined with suitably treated timber or a Class 0 material (as referred to in Appendix A of Approved Document B to the Building Regulations 2000, ref. 6) rather than timber. Ideally, the whole ceiling should be lined in this way, but if it is not, a high temperature limit switch linked to the heater should be fixed to the timber ceiling in the area closest to the rising plume of hot air. This switch should be set to operate at 120°C and should be resistant to tampering.

- 1.7 The sauna heater should be correctly sited within the cabin. The minimum clearances between the heater and any timber cladding or furnishings indicated by the manufacturer must be observed.

- 1.8 The use of heaters located beneath the seating should be avoided unless purpose-designed for this location.

### 2. Heating and electrical installations

- 2.1 All electrical installations and equipment should be installed, inspected and tested periodically by competent electricians in accordance with BS 7671: 2008: **Requirements for electrical installations** (ref. 7). These regulations include provisions specifically applicable to sauna installations, such as the classification of temperature zones.

- 2.2 All electrical equipment and heating units should be designed, manufactured and approved for use in a sauna environment.

- 2.3 A high temperature limit switch should be installed to isolate the heater in the event of thermostat failure.

- 2.4 Thermostats and high temperature limit switches should be sited in accordance with the manufacturers' instructions.

- 2.5 Consideration should also be given to providing a remote on/off master switch with a lockable safety cover.

- 2.6 The practice of automatically switching sauna heaters on when the facility is unoccupied should be avoided.

- 2.7 All electrical sauna equipment should be protected with residual current devices (RCDs).

- 2.8 For concealed heaters, consideration should be given to providing suitable sloping guards to prevent combustible materials from dropping down the back of the benches and coming into contact with the heater units.

- 2.9 Electrical heaters in saunas should be serviced as recommended by the manufacturer. The recommended servicing intervals are likely to vary depending on how often the facility is used. For regularly used facilities every

**Table 1: Potential fire hazards**

CATEGORY	HAZARD	PROBABILITY / CONSEQUENCES
<b>Ignition sources</b>	Electrical equipment faults and failures	May vary from <b>low</b> to <b>high</b> depending on: <ul style="list-style-type: none"> <li>the suitability of equipment in relation to the environment (high temperatures and humidity);</li> <li>the standard of installation;</li> <li>the effectiveness of periodic inspections and maintenance of the equipment;</li> <li>the effectiveness of facility management, including the implementation (or otherwise) of measures such as not leaving the facility unattended and turning electrical equipment off when not in use; and</li> <li>the effectiveness of regular inspections of the sauna while it is in operation.</li> </ul>
	Heater units	May vary from <b>low</b> to <b>high</b> depending on the variables listed under electrical faults and failures', plus: <ul style="list-style-type: none"> <li>the quality of the units (they should carry approval by a recognised standards authority);</li> <li>the quality of the installation, particularly separation distances between units and combustible construction; and</li> <li>any deviations from the manufacturers' recommendations.</li> </ul>
	Deliberate ignition	May vary from <b>low</b> to <b>high</b> depending on location of facility and security arrangements, including access control.
<b>Flammable and combustible liquids</b>	Concentrated flammable or combustible essence	May vary from <b>low</b> to <b>high</b> depending on the flashpoint of the product; the quantity; the adequacy of storage; and the procedures in place to ensure that the product is handled and used as recommended by the supplier.
<b>Combustible materials</b>	Combustible construction	May vary from <b>low</b> to <b>high</b> depending on the nature of the construction and insulation and how it is managed.  May vary from <b>low</b> to <b>high</b> depending on regular inspections, housekeeping and control of users.
<b>Fire spread</b>	Within sauna compartment	May vary from <b>moderate</b> to <b>high</b> depending on quantity and distribution of combustible construction, insulation and benches; and whether fire detection or fixed fire suppression has been provided.
	From or to adjacent areas	May vary from <b>low</b> to <b>high</b> depending on whether the sauna compartment is separated from the adjacent areas by fire-resisting construction and how well the separating elements have been maintained, particularly the protection of any openings.

	six months may be appropriate, while for seldom-used facilities, annually may be sufficient.		party certificated engineer in accordance with BS 5839-1 (ref. 10).
2.10	Inspection and testing should be undertaken by a competent contractor and should include: <ul style="list-style-type: none"> <li>all elements of the heating system, including thermostats, high temperature limit switches, timers and RCDs; and</li> <li>a check on the general wear and tear of the equipment, with parts being replaced as necessary.</li> </ul>		The installation should be monitored by an alarm receiving centre in accordance with BS 5979 (ref. 11).
2.11	At the time that the heater is serviced, the stones should be inspected and any broken or damaged stones should be replaced as necessary.	3.3	The fire detection and alarm system for the sauna should be integrated into the system for the remainder of the premises where appropriate.
		3.4	Serious consideration should be given to the provision of remote monitoring of the automatic fire detection and alarm system by an alarm receiving centre.
		3.5	Consideration should be given to providing an automatic fire suppression system where the fire risk assessment indicates that this would be a valid control measure. Where the premises are fitted with a sprinkler system, this can be extended to the sauna area using suitable high-temperature-rated heads that are suitable for use in a potentially corrosive atmosphere.
<b>3. Fire protection</b>			
3.1	A portable fire extinguisher, approved and certified by an independent third-party certification body, should be provided for use by trained staff. Provision and maintenance should be in accordance with BS 5306 Parts 3 and 8 respectively (refs. 8 and 9).		
3.2	Suitable fire detection and alarm facilities, such as fixed temperature heat detectors, should be installed by a third		Extensions to sprinkler systems should be in accordance with the standard to which the system was designed and

installed, while new systems should be in accordance with BS EN 12845 and the associated **LPC Sprinkler Rules** (ref. 12).

- 3.6 There are alternative fire suppression systems available that may be suitable for use in saunas. These include high-pressure water mist, using droplets typically in the range of 60 to 100 microns (about one tenth of the size of the drops from a conventional water sprinkler system).

When considering their use, specialist advice should be sought and it should be confirmed that the system has been tested and listed as suitable for use in saunas.

- 3.7 All fire suppression systems should be designed, installed, commissioned and maintained by a third party certificated installer in accordance with recognised standards.

#### 4. Fire safety management

- 4.1 A fire action plan should be produced for staff indicating the actions that they should take in the event of a fire or other emergency. This should include details of:

- who is to call the fire brigade;
- the actions to be taken by staff with specific allocated duties;
- the means of isolating the electrical power to the sauna cabin; and
- how to assist users with a disability to reach a place of safety away from the premises.

- 4.2 It should be ensured that the procedures are rehearsed periodically in accordance with the findings of the fire risk assessment for the premises.

- 4.3 Users should be made aware of fire safety instructions as part of the usual briefing for safe use of the sauna.

- 4.4 Anyone who has recently consumed alcohol should not be permitted to visit the sauna.

- 4.5 Instructions regarding the correct and safe use of the facility should be given to users on arrival and should be displayed prominently. These should include information on the heater controls, the safe use of any additives and how to raise the alarm in an emergency.

- 4.6 Instructions to users should also include a prohibition on taking plastic cups and other combustible materials into the sauna.

- 4.7 Periodic inspections of the sauna should be carried out at frequent intervals (at least every two hours) during every period of operation. These inspections should be recorded in writing by the duty manager or nominated senior member of staff. The records should be checked weekly by the management in order to identify any insipient problems.

- 4.8 Staff should receive fire safety training on induction and follow-up training at regular intervals as indicated by the fire risk assessment for the facility.

- 4.9 Staff should also be trained to ensure that they are competent to conduct and record any regular fire safety inspections, such as those indicated in the checklist in section 5.

- 4.10 The correct stones, as specified by the supplier, must be used with the heater. Incorrect stones, packing the stones too tightly or insufficient stones can all lead to overheating.

- 4.11 Neat essence should not be used on the stones.

- 4.12 A high standard of housekeeping, including the removal of waste and litter at two-hour intervals, should be maintained at all times.

- 4.13 All heating units should be physically switched off at the power source at the close of business or at the end of the period of operation during which the facility has been available.

- 4.14 Regular fire safety checks should be conducted by persons supervising the facility. These should include checks prior to start up, at regular intervals during the day, and at the end of the day after shut down (see section 5).

#### 5. Checklist (see p.7).

### ➤ REFERENCES

1. Regulatory Reform (Fire Safety) Order 2005, SI 2005 No. 1541, The Stationery Office.
2. Fire (Scotland) Act 2005, 2005 asp 5, The Stationery Office.
3. Fire Safety (Scotland) Regulations 2006, Scottish SI 2006 No. 456, The Stationery Office.
4. Fire and Rescue Services (Northern Ireland) Order 2006, SI 2006 No. 1254 (NI9), The Stationery Office.
5. **FPA Design Guide for the Fire Protection of Buildings: Essential Principles**, Fire Protection Association for InFiReS, 2007.
6. **Approved Document B to the Building Regulations 2000: Fire Safety: Volume 2: Buildings other than dwelling houses**, Communities and Local Government, NBS (RIBA Enterprises Ltd), 2007.
7. BS 7671: 2008: **Requirements for electrical installations, IEE Wiring Regulations, 17th edition**, British Standards Institution.
8. BS 5306-3: 2003: **Fire extinguishing installations and equipment on premises. Code of practice for the inspection and maintenance of portable fire extinguishers**, British Standards Institution.
9. BS 5306-8: 2000: **Fire extinguishing installations and equipment on premises. Selection and installation of portable fire extinguishers. Code of practice**, British Standards Institution.
10. BS 5839-1: 2002: **Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance**, British Standards Institution.
11. BS 5979: 2007: **Remote centres receiving signals from fire and security systems. Code of Practice**. British Standards Institution.
12. **LPC Rules for Automatic Sprinkler Installations Incorporating BS EN 12845**, Fire Protection Association, 2003.

### ➤ FURTHER READING

**Fire safety risk assessment: Sleeping accommodation**, Department for Communities and Local Government, 2006.

## 5 Checklist

5.1 Prior to start up	Yes	No	N/A	Action required	Due date	Sign on completion
5.1.1 Is the sauna free from combustible materials, such as towels, newspapers and cups, particularly in the vicinity of the heating unit?						
5.1.2 Is the timber in the vicinity of the heater and the light fittings free from signs of scorching and other evidence of overheating?						
5.1.3 Is the heating unit guard, where fitted, in place and secure?						
5.1.4 Are the thermostat units secure and free from signs of tampering?						
5.1.5 Are the high temperature limit switches free from signs of tampering?						
5.1.6 Are all movable benches and duckboards correctly positioned and clear of the heater?						
<b>5.2 During the day</b>						
5.2.1 Is the sauna free from combustible materials, such as towels, plastic drinking bottles, newspapers and cups, particularly in the vicinity of the heating unit?						
5.2.2 Are the thermostat units free from signs of tampering?						
5.2.3 Are benches and duckboards correctly positioned and clear of the heater?						
5.2.4 Are inspections of the sauna carried out at frequent intervals (at least every two hours) during every period of operation?						
5.2.5 Are the periodic inspections recorded in writing by the duty manager or nominated senior member of staff with the records being checked weekly by the management?						
<b>5.3 At the end of the day</b>						
5.3.1 Is the sauna free from combustible materials, such as towels, plastic drinking bottles, newspapers and cups, particularly in the vicinity of the heating unit?						
5.3.2 Are the thermostat units secure and free from signs of tampering?						
5.3.3 Are benches and duckboards correctly positioned and clear of the heater?						
5.3.4 Is the timber in the vicinity of the heater and the light fittings free from signs of scorching and other evidence of overheating?						
5.3.5 Is the power supply switched off?						
5.3.6 Is the heater timer set to the off position?						
5.3.7 Has the sauna door been left open?						
5.3.8 Have the fire doors in the fire-rated separating walls between the sauna and the adjacent areas been left closed?						



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