Smoke Alarms

This brochure explains the requirements for smoke alarms in new or renovated buildings. It provides information to homeowners and landlords who wish to install smoke alarms in existing buildings.

"This information is provided for convenience only and is not in substitution of applicable City Bylaws or Provincial or Federal Codes or laws. You must satisfy yourself that any existing or proposed construction or other works complies with such Bylaws, Codes or other laws."

Other Brochures Related to This Topic

- *Carbon Monoxide Alarms*
- *Smoke and Carbon Alarms Upgrade Requirements for Single and Two Family Dwellings*

A good fire escape plan will only be successful if we know early enough that a fire has started. Fire may build rapidly and spread toxic gases and blinding smoke throughout your home or it may start small and smolder slowly, all the while emitting deadly toxic gases.

Most fatalities in house fires occur at night and are caused by breathing smoke and toxic fumes, rather than by burns. Smoke and fumes can quickly overcome residents, particularly if they are asleep.

Your nose goes to sleep when you do. By detecting smoke, a smoke alarm gives an early warning of fires and sounds the alarm to wake you up.

Ninety-five per cent (95%) of Canadian homes have at least one smoke alarm. This explains why far fewer Canadians die in house fires now than back in the 1970's.

Residential dwelling units that were built prior to 1979 were not required to have smoke alarms since such requirement was not introduced into the BC Building Code until 1979. All subsequent revisions to the BC Building Code have retained this requirement.

On 2010 May 01 the BC Fire Code was amended to retroactively require smoke alarms in all homes built prior to 1979 March 31.

Terminology

There are essentially three different types of devices used for the detection of heat and/or smoke.

The following definitions are intended to provide a brief explanation of the application of each device within the context of residential development.

1) Heat detector

This refers to a device designed to operate at a pre-determined temperature or rate of temperature rise. These devices are required within suites and other specific locations throughout a multi-family residential (apartment) building. The purpose of the device is to alert the residents of both the suite and the building of a fire occurrence. This device is activated by heat only and is connected to the building's fire alarm system.

2) Smoke detector

This refers to a device designed to operate when the concentration of airborne combustion products exceeds a pre-determined level. These devices actuate more quickly than heat detectors and are required in areas of multi-family residential (apartment) buildings where hazardous materials may be stored or used. They may also be used as a substitute for heat detectors under specific circumstances. Like the heat detector, the purpose of this device is to alert the residents of the building of a fire occurrence through connection to the building fire alarm system.

3) Smoke alarm

This refers to a device which is actually a combined smoke detector and audible alarm. It is designed to sound an alarm within the room or suite in which it is located upon the detection of smoke/fire within that room or suite. These alarms are activated when smoke either interferes with the ability of ionized air to conduct an electrical current or scatters light in a way which affects a photo-sensitive plate. This causes an alarm within the device to sound. With early detection, very small fires can be extinguished before they spread and residents are given enough time to escape from larger ones.

This device is required in all residential units, including single family and two family dwellings. With the alarm built into the device, it is intended to alert only the occupants of the suite in a multi-family building or all occupants in a dwelling unit.

Types of smoke alarms

What type should you buy?

There are basically two types of smoke alarms. The first type is photoelectric. This type uses a Light Emitting Diode (LED) and a light sensitive sensor in the sensing chamber. The presence of suspended smoke particles in the chamber scatters the light beam. This scattered light is detected and sets off the alarm.

The second and more popular type are the ionization detectors. They use a small amount of radioactive material to ionize the air in the sensing chamber. This allows the air to become conductive and allow electric current to pass between two charged electrodes. When smoke is present in the air in the chamber this conductivity decreases. When the conductivity level is reduced to a set level, the alarm goes off.

Some smoke alarms are equipped with a lamp that turns on when the alarm activates. This is an added benefit for persons who are hearing impaired.

Which type is better?

Unfortunately there is no simple answer. They both work on different principles and as such they respond differently to conditions. Ionization detector for example, responds faster to flaming fires, whereas photoelectric detector responds faster to slow, smoldering fires.

A flaming fire burns combustibles quickly, spreads rapidly and generates a lot of heat but only a little smoke. Cooking fat or grease, flammable liquids, newspapers, paint, and cleaning solutions all burn quickly and create more flames than smoke. *Ionization* type smoke alarms typically respond first to fast flaming fires. They are best suited for rooms which contain highly combustible materials.

A smouldering fire produces a lot of smoke but little heat. It may smoulder for hours before bursting into flame. Large pieces of furniture, such as sofas, chairs, mattresses and counter tops, burn slowly and create more smoke than flames. *Photoelectric* type smoke alarms typically respond first to slow smouldering fires and are less prone to nuisance alarms near the kitchen area. These models are best suited for living rooms, bedrooms and near kitchens.

Photoelectric detectors also are less prone to nuisance alarms from cooking. However, both are tested to the same standard (CAN/ULC-S531) and you cannot predict which type of fire is going to strike. For maximum protection, install at least one ionization type and one photoelectric type smoke alarm on each level of your home.

Interconnecting smoke alarms

Residential smoke alarms are available as “stand alone” and/or interconnected alarms. Interconnected alarms simultaneously alert all occupants to the fire, providing more time to respond, time to evacuate and time to summon the Fire Authority.

It is required that interconnected smoke alarms be installed in all homes except those were built prior to 1979 March 31; however, when those homes are renovated interconnected smoke alarms may be required. For more information please refer to our *Smoke and Carbon Monoxide Alarms Upgrade* bulletin.

If a single family home contains a secondary suite, in addition to the required smoke alarms mentioned above, there shall be one photoelectric smoke alarm in the principal dwelling and one in the secondary suite and they shall be interconnected if the fire separations between the principal dwelling and the secondary suite only have 30 minutes fire-resistance rating.

The current BC Building Code also requires that all smoke alarms must be incorporated within the circuitry a manually operated device (hush button) so that the signal emitted by the smoke alarm can be silenced for a period of not more than 10 minutes, after which the smoke alarm will reset and sound again if the level of smoke in the vicinity is sufficient to re-actuate it.
If the smoke continues to build from a real fire while the alarm is in hush mode, the smoke will override the silence feature and the smoke alarm will resound. This is a convenient way to deal with nuisance alarms, such as those caused by burning toast or opening smoky ovens, and avoid having to disabling the alarm by disconnecting the power source.

Power source

The other difference of these two types of alarms is their power source. The first is battery powered, usually by a small 9-volt battery, that can be installed almost anywhere.

The second type is hardwired into your household wiring. This type of smoke alarm must be installed by a licensed electrician. Some models of this type have battery back-up as well, to continue protection when the power goes out.

Wired-in-place smoke alarms with battery back-up are required by the current BC Building Code. In homes built prior to 1979 March 31 smoke alarms are permitted to be battery operated. Whenever such homes are renovated wire-in-place with battery back-up smoke alarms may be required. For more information please refer to our *Smoke and Carbon Monoxide Alarms Upgrade* bulletin.

Location of Smoke Alarms

The current B.C. Building Code requires that at least one smoke alarm shall be installed:

- on each floor level without sleeping room
- inside each sleeping room
- between sleeping room and the remainder of the storey
- in a hallway serving sleeping rooms

Place your smoke alarm on a ceiling in the center of the hallway or room. If you are using a combination smoke and carbon monoxide alarm it shall be placed in a hallway within 5 m. of a bedroom door. Please refer to our *Carbon Monoxide Alarms* brochure for more information.

Locations to be avoided when installing your alarms include dead air spaces where ceilings and walls meet, near air supply registers, and near ceiling fans. While false alarms from smoke alarms can be irritating, they can be minimized by avoiding installations near kitchens, bathrooms, furnaces, fireplaces and wood burning stoves. There are smoke alarms available that are specifically designed for these areas and have a special feature that temporarily silences the alarm.

- Never locate an alarm on a wall unless there is no other alternative; then install on a wall at least 100mm and not more than 300mm from the ceiling.

- Never install alarms within 300mm of adjoining heating/cooling ducts, 300mm of a light fitting (1 metre from fluorescent light); 900mm off the tip of a ceiling fan's rotating blades.

- Never disconnect the battery to overcome nuisance alarms from cooking, or smoke from an open fire or wood heater, instead, install the correct type of alarm or relocate the alarm. In the case of 240 volt, an electrician should be used.

- Never install an alarm in a corner where smoke and hot gases cannot accumulate (dead air space). Dead air space exists in corners between the area 100mm across the ceiling and 100mm down the wall.

- The smoke alarm should be installed at least 100mm from the wall when it is installed on a ceiling.

The proper placement of smoke alarms is very important to achieve the best results and maximum protection. You should always refer to the manufacturer's instructions.

Test and maintenance

Smoke alarms are important life safety devices and as such must be maintained in operating condition at all times. They generally become inoperative when the power source (either battery or AC power supply) is disconnected. Disconnected power supply, missing batteries, dead batteries and improperly installed batteries are the most common reasons for smoke alarm failure during a fire emergency.

In rental residential units, the landlord is considered to be the "owner" for purposes of the smoke alarm maintenance requirements. However, any person (including a tenant or other occupant) can be held responsible for intentionally disabling a smoke alarm so as to make it inoperable.

Schedule for testing smoke alarms

On AC powered smoke alarms, the "power on" indicator on the smoke alarm should be checked regularly to ensure that it is working. When the circuit breaker is turned off, or the fuse is removed from the smoke alarm circuit to carry out servicing, the power should be restored to the circuit immediately on completion of the work. In the event that the circuit cannot be restored the same day, battery operated smoke alarms should be installed to provide protection on a temporary basis.

Battery operated smoke alarms normally provide an intermittent warning signal for up to seven days when the battery is nearing the end of its life. When this occurs, the correct battery type should be installed immediately to ensure the continued operation of the smoke alarm.

The following test and maintenance procedures are recommended to ensure the safe operation of smoke alarms.

Frequency of smoke alarm testing and maintenance

Smoke alarms should be tested as described above under the following conditions:

- During a change of tenancy in rental units.
- In the case of battery operated smoke alarms, when the occupants have been absent for seven or more days (such as for vacation) to ensure that the battery is still operational. (Note: In rental units, it is the responsibility of the tenant to inform the landlord of the absence and request a test of the smoke alarm.)
- Following installation of a new battery for battery operated smoke alarms.

- Following electrical renovations or servicing when smoke alarms are AC powered, to ensure that the smoke alarm circuit has not been disconnected.

Routine test and maintenance

The smoke alarm should be tested using the test device located on the smoke alarm or another test method recommended by the manufacturer. The alarm signal should sound during this test. If interconnected smoke alarms are installed, all smoke alarms should sound the alarm when any one of the smoke alarms is tested.

- Do a visual check to ensure that the smoke alarm is securely fastened to the ceiling or wall.

- Do a visual check to ensure that the smoke alarm is not obstructed/installed in a manner that would prevent smoke from reaching or entering the smoke alarm (i.e. the ventilation holes of the smoke alarm must be kept clean and unobstructed, any ceiling fans are not close enough to prevent air flow from reaching the smoke alarm, etc.).

Annual test and maintenance

- Unless otherwise recommended by the manufacturer of the smoke alarm (such as for 10 year battery units), replace the battery in each battery operated smoke alarm and ensure that it is securely connected to the battery clips.

  CAUTION*: Check to ensure that the battery is of the type recommended by the manufacturer. Smoke alarms identified by the manufacturer as requiring alkaline batteries should have only alkaline batteries installed; otherwise the smoke alarm may fail to operate. Rechargeable batteries should not be used in smoke alarms unless the manufacturer has specifically recommended such use.*

- Smoke alarms should be checked to ensure that battery terminals have not corroded and batteries have not leaked. Where batteries show evidence of leakage or corrosion, the smoke alarm should be replaced.

- Vacuum the exterior of the smoke alarm with a household vacuum cleaner. A brush attachment may assist in removing accumulated dust on the cover of the device. If specifically recommended by the manufacturer, open the battery cover on battery operated smoke alarms and gently vacuum the circuit board.

  CAUTION*: For smoke alarms that are AC powered, some manufacturer's specify that the power supply to the smoke alarm circuit be disconnected (normally a separate breaker or fuse at the main panel) before vacuuming. AC powered smoke alarms should only be vacuumed externally and no attempt should be made to open the case. Be sure to follow the manufacturer's instructions at all times.* ***Remember to restore the power supply*** *when the cleaning is completed.*

- Do a visual check to ensure that the smoke alarm is securely fastened to the ceiling or wall.

- After vacuuming, test the smoke alarm using smoke from an incense stick, punk stick, or a cotton string placed in an ashtray or other suitable noncombustible container.

***CAUTION**: Smouldering materials used in this test should be disposed of in a manner that does not create a fire hazard. Direct open flames from matches, lighters or candles should not be used to test smoke alarms.*

Replacement of smoke alarms

Smoke alarms should be replaced if:

- The smoke alarm does not sound an alarm during the test (after it is confirmed that the battery is fully charged or the AC power supply is not disconnected).
- The exterior of the case is physically damaged.
- The exterior case is painted.
- The unit is covered with smoke stains, heavy grease or dirt accumulations.
- The smoke alarm causes frequent false alarms that are not the result of cooking or steam.
- Batteries show evidence of leakage or corrosion.
- The smoke alarm is more than 10 years old or has exceeded the manufacturer's recommended life cycle.

Responsibility of the landlord in rental units

As indicated previously, the landlord is responsible for smoke alarm maintenance in rental residential units. This includes the obligation to take action when a tenant or occupant reports a problem or files a complaint respecting operation of smoke alarms. The testing and maintenance schedule identified above is also the landlord's responsibility. Such testing can only be carried out with the full co-operation of the tenant or occupant since access to the smoke alarm must be available. The lease agreement should therefore include provisions for access to carry out the necessary testing and maintenance.

It is in the landlord's interest to keep written records as they will help to demonstrate due diligence in maintaining the smoke alarms in operating condition. The checklist attached to this guideline can be used for this purpose.

In addition, the landlord should provide a copy of the smoke alarm manufacturer's maintenance instructions or approved alternative to the occupant in each rental unit. Once again, it is in the landlord's interest to keep a written record to demonstrate that this information has been provided to the occupant of each rental unit.

Responsibility of the tenant or occupant in rental units

Tenants or occupants are encouraged to take active participation in ensuring that the smoke alarms are maintained in operating condition and co-operate with the landlord in carrying out the necessary testing and maintenance. Take the following actions to ensure the proper operation of the smoke alarms:

- Advise the landlord when the low battery signal is activated on battery operated smoke alarms and make arrangements for replacement of the battery.

- Advise the landlord if the "power on" indicator goes out on AC powered smoke alarms and arrange for appropriate repairs.

- Advise the landlord if the smoke alarm is damaged and make arrangements for repair/replacement of the unit.

- Following an absence of seven or more days (such as vacation), arrange for battery operated smoke alarms to be tested to ensure that the devices are operational.

- Advise the landlord of any electrical problems that may affect the operability of AC powered smoke alarms.

- Contact your local Fire Department if you have serious concerns about the operability of your smoke alarm or any other fire safety matters in your building.

Most fatal fires start at night. Smoke alone won't necessarily wake you up. In fact, the fumes could put you into an even deeper sleep. Often, victims never wake up. Only a working smoke alarm can save your life!

Further Information

If you have any further questions please contact the Building Department at 604-294-7130.

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