

TG-02-2016

# FIRE ALARM AUDIBILITY IN EXISTING RESIDENTIAL OCCUPANCIES

Office of the Fire Marshal and  
Emergency Management



## **Preface**

This guideline updates TG-02-1998 published in June 1998. Portions of the guideline have been changed to reflect the current requirements in the Fire Code, O. Reg. 213/07, as amended.

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## TABLE OF CONTENTS

<b>Abstract</b> .....	<b>2</b>
<b>1.0 SCOPE</b> .....	<b>3</b>
<b>2.0 BACKGROUND</b> .....	<b>3</b>
<b>3.0 AUDIBILITY CRITERIA</b> .....	<b>3</b>
Option 1: The Fire Alarm Signal Provides At Least 60 dBA.....	4
Option 2: The Fire Alarm Signal Provides 55 - 59 dBA.....	4
Option 3: In-Suite Fire Alarm Signal Devices.....	4
Option 4: Conduct An Acoustical Evaluation .....	5
<b>4.0 CORRECTIVE ACTION</b> .....	<b>5</b>
<b>5.0 ADDITIONAL INFORMATION</b> .....	<b>6</b>
<b>Appendix A – Sound Level Measurement</b> .....	<b>A1</b>

## **Abstract**

The Building Code includes a requirement that the sound pressure level for a fire alarm system in residential sleeping rooms be not less than 75 dBA. Although the Fire Code does not prescribe specific sound pressure levels for fire alarm systems in existing buildings, fire safety plan requirements are based on the premise that occupants will be alerted to a fire alarm condition in the building. This document was developed to provide guidance to fire departments and building owners in achieving fire alarm audibility levels consistent with fire safety plan objectives, provide for consistency of application and ensure compatibility with the provisions of the Building Code. The guideline describes the methodology and criteria for the evaluation of existing fire alarm signal levels and the necessary upgrades.

## 1.0 SCOPE

This guideline has been established for the assessment of fire alarm audibility in **existing buildings of residential occupancy** where there is concern that the signal from the fire alarm system may not be heard intelligibly throughout the floor area in which the audible devices are installed. The guideline provides consistent methodology and criteria for the evaluation of existing alarm signal levels and the necessary upgrades.

This guideline does not apply to fire alarm system installations in new construction. Reference should be made to the Building Code for appropriate requirements.

## 2.0 BACKGROUND

The Building Code applies to new construction (including additions), renovations and change of use. The 1997 Building Code adopted a requirement that the sound pressure level in a sleeping room of residential occupancy shall be not less than 75 dBA when any intervening doors between the audible signal device and the sleeping room are closed. The 75 dBA provision is based on measurements taken in an unfurnished and unoccupied suite. The Building Code also requires that the sound pressure level not exceed 100 dBA beyond a prescribed distance from the audible signal device.

The Fire Code applies to existing buildings. Currently, the Fire Code does not prescribe specific sound pressure levels in existing buildings with respect to fire alarm audibility. However, Section 2.8 of Division B of the Fire Code requires that a fire safety plan be prepared, approved and implemented in every residential building where the occupant load exceeds 10 persons. The fire safety plan must include procedures that occupants are expected to follow upon hearing the fire alarm. Fire alarm audibility is therefore an inherent component of fire safety planning and evacuation.

This document was developed to provide guidance to fire departments and building owners in achieving the intended objective of the Fire Code with respect to fire alarm audibility, provide for consistency of application and ensure compatibility with the provisions of the Building Code.

## 3.0 AUDIBILITY CRITERIA

Compliance with any one of the following four options is deemed to provide an acceptable audibility level in an existing building of residential occupancy:

### **Option 1: The Fire Alarm Signal Provides At Least 60 dBA**

The fire alarm signal measurements in the furnished and occupied building are at or above 60 dBA when measurements are taken in accordance with the procedures described in Appendix A of this guideline.

### **Option 2: The Fire Alarm Signal Provides 55 - 59 dBA**

Where fire alarm signal measurements in the occupied building provide 55-59 dBA, ambient sound level measurements must also be taken. Both the fire alarm signal measurements and the ambient sound level measurements shall be taken in accordance with the procedures described in Appendix A. The fire alarm audibility level is considered acceptable provided:

- a) the fire alarm signal and ambient sound level measurements satisfy the values in Table 1, and
- b) the fire safety plan includes enhanced fire safety procedures to ensure that all occupants are alerted to an alarm condition in the building.

For example, the plan may include provisions for voice messages, floor wardens, a buddy system or telephone network to supplement the fire alarm signals. In no case should the procedures involve actions that would expose occupants to unnecessary risk in the event of a fire. The fire safety plan should also include regular educational programs for the occupants and training for supervisory staff to reinforce the special procedures that have been identified.

**Table 1**

Fire Alarm Signal Sound Level (dBA)	Maximum Ambient Sound Level (dBA)
55	40
56	42
57	44
58	46
59	48

### **Option 3: In-Suite Fire Alarm Signal Devices**

Sound pressure level measurements are not required to be taken in any suite where an in-suite audible signal device is installed in conformance with the following conditions:

- the device is positioned within the suite to allow optimum sound transmission towards the furthest bedroom area from the device and is not more than 6 m (20 ft.) from any bedroom door;

- there are no intervening doors between the device and the bedroom except the bedroom door;
- the device is listed as a “fire alarm audible signal”;
- the device acoustical output rating (check the label or instruction sheet) is at least 85 dBA;
- the wiring complies with the Ontario Electrical Safety Code;
- the device is installed in accordance with standard CAN/ULC-S524 “Installation of Fire Alarm Systems”;
- the device is electrically supervised such that disconnection of the device will cause a trouble condition on the fire alarm system OR provisions are made under the fire safety plan that ensure the in-suite device is inspected to confirm operability prior to occupancy of new tenants.
- the connection to the fire alarm system is such that disconnection of, or damage to, the in-suite device will not interfere with the operability of devices in other suites or the devices in common areas; and,
- where the in-suite device is equipped with a silencing switch, it shall be timed to silence the alarm signal in the suite for not more than 10 minutes. (Note: where the device is also used as part of an integrated voice communication system, use of the voice communication shall over ride the silencing feature.)

#### **Option 4: Conduct An Acoustical Evaluation**

A professional engineer specializing in acoustical evaluation shall evaluate the fire alarm signal audibility using octave band measurements of the fire alarm and ambient sound levels. The report must conclude whether or not the fire alarm signals can be heard intelligibly throughout the building with all supporting data and rationalization provided. Alarm sound pressure levels of less than 55 dBA should only be permitted where compensating measures are present and are fully documented and acceptable to the Chief Fire Official.

## **4.0 CORRECTIVE ACTION**

Where there are residential suites in the building that do not meet the fire alarm audibility acceptability criteria established in this guideline, the owner should take the following corrective actions:

- Undertake partial upgrading of the fire alarm system to ensure that the audibility in every suite and other portion of the building satisfies one of the options in this guideline. For example, where existing audibility levels in specific suites are inadequate, in-suite devices may be installed only in the

affected suites. The owner is advised to discuss proposed changes with the municipal fire and building departments before initiating any partial upgrading.

- Where the upgrading necessitates replacement of the fire alarm control panel, it is recommended that the audibility levels be upgraded to meet the standard of the Ontario Building Code in force at the time. (Refer also to the explanatory notes in the Appendix to the Ontario Building Code.)

Audible signal devices installed to comply with this guideline must not exceed the sound pressure level as prescribed in the Building Code.

Where the owner has not taken corrective action to achieve compliance with this guideline and the fire alarm audibility poses a risk to the safety of the occupants, the fire department may issue an order under the *Fire Protection and Prevention Act, 1997*.

## **5.0 ADDITIONAL INFORMATION**

For additional information on this guideline, please contact your local fire department or the Office of the Fire Marshal and Emergency Management at 647-329-1100.



# Appendix A

## Sound Level Measurement

### A.1 Sound Level Measuring Devices

The sound level meter shall have a measurement range that permits readings as low as 35 dBA and shall be calibrated immediately before and after the audibility measurements are taken. The use of a quality meter is important to minimize any measurement errors. ANSI/ASA S1.4-2014/Part 2 / IEC 61672:2-2013 - “Sound Level Meters - Part 2: Pattern Evaluation Tests” is one standard that can provide guidance on the subject.

### A.2 Measurement Method

The meter is to be held approximately 1.5 metres above the floor and at least 0.5 metres away from hard reflecting surfaces. The meter should also be held as far away as practical from the body of the person taking the measurement.

The meter is to be set to the “A” weighted measurement scale and to the fast response setting. The measurement is to be made in the approximate centre of the most acoustically remote bedroom of the residential suite. The suite door, bedroom door and any intervening doors are to be closed. The bedroom windows are to be closed. The measurements in the bedroom are to be made within a one metre radius of the centre of the room.

Sound meters must be used per the manufacturer’s instructions. The number and type of measurements taken may vary. Two common methods are described below.

#### ***Integrating Type Meter***

An integrating type sound level meter provides calculated Equivalent Sound Level (Leq) readings. The meter takes sample measurements once per second and over a 20 second sample period. Ensure that intermittent noises do not occur during the sample period.

#### ***Non-Integrating Type Meter***

A non-integrating type sound level meter requires a series of separate measurements to be taken. It is recommended that four measurements be obtained. The average of the three closest readings should be recorded. Visual averaging of meter readings may be performed in lieu of the above.

### **A.3 Selecting The Test Suite**

The suite selected for the sound measurements should be representative of the lowest fire alarm system audibility. This will generally be the suite with the greatest number of bedrooms, the one located at the far end of a corridor, or the one located in the far corner of the building. Wall to wall carpeting may also significantly reduce fire alarm audibility. It may be necessary to conduct exploratory measurements to identify the suite or suites that represent the lowest audibility levels in the building. The selected suite or suites should be fully furnished at the time of the tests.

### **A.4 Ambient Sound Level Measurements**

Precautions are necessary to achieve consistent ambient sound level measurements. Temporary or intermittent sound sources such as a flushing toilet, running shower, stereo, television, traffic or exterior construction noise may cause peaks and valleys in sound levels. Ambient sound level measurements should be recorded when these sounds are absent or are at their lowest level. The building HVAC system should be running during the test with the fan speed set on high. Portable air conditioners installed within the suite should be in the off position during the tests. Occupants of the suite under test should refrain from talking or from other activities that may affect the readings. Measurements should be taken during a normal workday period.