City of Phoenix

FIRE DEPARTMENT
FIRE PREVENTION DIVISION

PHOENIX FIRE DEPARTMENT	Policy 907.5.2.1.1 Audibility Levels

SUBJECT: Acceptable differential levels for fire alarm audibility testing	**EFFECTIVE DATE:** August 30, 2013
REFERENCES: 2013 NFPA 72 Table A.18.4.3.1, Occupancy levels, 18.4.5.1 Sleep Area Requirements 2013 IFC 907.8.1, Engineering Interpretation 907.5.2.1.1 Tochtecknik- Rechner Sound Level Conversion Ratios	**SUPERSEDES:** None **REVIEW DATE:** July 31, 2015
NOTICE: Policies are established by the Phoenix Fire Prevention Code, Section 104.1.	**APPROVED:** Jack Ballentine, Fire Marshal

Scope:

Acceptable Decibel Ratios for Fire Alarm Testing

Sections 907.5.2.1 and 907.8.1 of the 2012 IFC, and Section 18.4.3.1 of the 2013 edition of NFPA 72 require audible alarm notification appliances provide and maintain a sound pressure level of 15 decibels (dBA) above ambient sound levels or 5 dBA above the maximum sound level having duration of at least 60 seconds.

This is the code accepted minimum for alerting normal to moderately hearing impaired occupants that the fire alarm is activated. Using this guideline in most occupied structures, a 15 dBA differential will be acceptable.

Most occupied structures are tested before or after business hours to avoid business interruption. Allowances shall be made for the expected differential between business operation noise and ambient conditions when the building is not in use.

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The differential during non-business hours shall be 20 dBA to account for the expected increase in ambient noise levels during regular operations. This gives an acoustically significant safety margin of a factor of 3.1 times when 5 dBA over the required 15 dBA code minimum is present, due to the nature of sound pressure increase in ratio with audible acoustic intensity.

In common areas that require visual notification, the visible notification helps augment the sound requirements. In these areas a minimum 15 dBA differential will be acceptable. The most common issue is offices without notification devices. For readings taken in an individual office with no device; the meter should be pointed at the entry door into the office.

NFPA 72 18.4.5.1 requires a minimum 75 dBA at the pillow level of all sleeping areas including residential or staff sleeping rooms in hospitals but **not** in patient rooms where nursing care is provided. With no furnishings in the room this may be assessed at 80 dBA to account for the dampening effect of bedding and furnishings. Audibility is not required in patient or prisoner rooms with trained staff response.

Buildings under construction seeking a new or renewed Certificate of Occupancy shall have the doors, floor finishes, and ceiling arrangements in place prior to sound level testing. The acoustic characteristics that will absorb the sound will not be present without these in place.

Sound level differentials are to be measured at approximately 5 feet above the ground using a meter with an A-weighted scale, for readings taken in an individual office with no device; the meter should be pointed at the entry door into the office.

The preliminary notes to the NFPA 72 Table A.18.4.3 indicate that if you can establish actual ambient sound level during times of operation the 70 dBA should not be used. Sound differential measurement shall use the 15 dBA above existing actual ambient. Occupied offices doing tenant improvements should use ambient sound levels not levels in Table A.18.4.3.

In areas that are not occupied, ambient sound levels cannot be established. NFPA 72 Table A.18.4.3 has various ambient sound conditions for specific occupancies. Therefore if you added the required 15 dBA above ambient 70 dBA would be a target level for offices, 65 dBA for institutional etc.

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Table A.18.4.3
Average Ambient Sound Level According to Location

Location	Average Ambient Sound Level (dBA)
Business occupancies	55
Educational occupancies	45
Industrial occupancies	80
Institutional occupancies	50
Mercantile occupancies	40
Mechanical rooms	85
Piers and water-surrounded structures	40
Places of assembly	55
Residential occupancies	35
Storage occupancies	30
Thoroughfares, high-density urban	70
Thoroughfares, medium-density urban	55
Thoroughfares, rural and suburban	40
Tower occupancies	35
Underground structures and windowless buildings	40
Vehicles and vessels	50

In areas with ambient noise over 90 dBA visuals devices shall be used in accordance with NFPA 72.

Differentials greater than 25 dBA should be avoided by designers as a sudden increase of 30 dBA over 0.5 seconds is considered to cause sudden and potentially dangerous fright. The exception is sleeping areas.

Audible levels over 105 dBA shall be avoided as 5 minutes at the 105 dBA sound level can cause permanent hearing damage and is painful to most occupants.

The voice instructions (live or prerecorded) need not meet the 15 dBA differential criteria, but should be preceded by a tone of adequate audibility to get attention and prepare the target audience for voice instructions. The actual voice message (live or pre-recorded) should be delivered in a well-enunciated, clear, calm, and deliberate manner, using respectful language.

Private mode annunciation of 10 dBA differential is subject to appeal to the Fire Marshal supported by a sound study in accordance with **3.3.29 Average Ambient Sound Level.**

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