

Environmental Considerations

by Dean K. Wilson, P.E.

As operators of a small, family-owned fire alarm and burglar alarm installation company in the Southwestern U.S., we have installed several thousand smoke detectors over the years. On a recent installation for a new public elementary school, the Authority Having Jurisdiction has refused to approve our installation. She claims we have placed smoke detectors into what she calls “an inappropriate environment.” She claims the smoke detectors we use have not been tested for the temperature and humidity of the room in which we have installed them. Now we realize that this young lady has come into this job following four years of fire protection engineering school and three years of service working under a fire marshal in the Midwestern U.S. But, how come she is questioning something we have done for years?you help us?

I will try to help you understand what has happened. At least as best as I can not knowing either you or the Authority Having Jurisdiction (AHJ) in question.

A few interesting, even amazing, things have happened over the years, as more and more young people decide to pursue careers in fire protection engineering and seek degrees from those few reputable and rigorous institutions that offer a degree in fire protection engineering. During the course of their study, these young engineers actually take the time, or make the time, to read,

digest, and develop a basic understanding of the text of the various codes and standards. In the case of fire alarm systems, this reading mainly consists of NFPA 72-2002, *National Fire Alarm Code*.

As the new engineers read the *Code*, they begin to understand that the regulations and requirements contained in the *Code* actually have the intent of guiding a designer and installer in how to select and apply the various types of fire detection devices. Each type of device has some very specific factors that one must consider before installing that type of device in a space that requires detection. Some of these factors relate directly to the type of fire that one might expect to occur in that space. Other factors relate directly to the environment the space presents to the detection device.

NFPA 72-2002, offers the following environmental requirements for smoke detectors:

5.7.1.8* Unless specifically designed and listed for the expected conditions, smoke detectors shall not be installed if any of the following ambient conditions exist:

- (1) Temperature below 0°C (32°F)
- (2) Temperature above 38°C (100°F)
- (3) Relative humidity above 93 percent
- (4) Air velocity greater than 1.5 m/sec (300 ft/min)

The Annex of the *Code* offers these additional explanatory words:

A.5.7.1.8 Product-listing standards include tests for temporary excursions beyond normal limits. In addition to temperature, humidity, and velocity variations, smoke detectors should operate reliably under such common environmental conditions as mechanical vibration, electrical interference, and other environmental influences. Tests for these conditions are also conducted by the testing laboratories in their listing program. In those cases in which environmental conditions approach the limits shown in Table A.5.7.1.8, the detector manufacturer should be consulted for additional information and recommendations.

Table A.5.7.1.8 Environmental Conditions that Influence Smoke

Detection Protection	Air Velocity >91.44 m/min (>300 ft/min)	Altitude >914.4 m (>3000 ft)	Humidity >93% RH
Ion	X	X	X
Photo	O	O	X
Beam	O	O	X
Air sampling	O	O	X

X = Can affect detector response.
 O = Generally does not affect detector response.

Notice that the requirement in Section 5.7.1.8 limits the installation of smoke detectors to those locations where the ambient temperature remains between 32° F. and 100° F, where the relative humidity remains below 93%, and where the air velocity remains below 300 ft/min. Unless a smoke detector has received a special listing from either Underwriters Laboratories Inc. or FM Approvals for ambient conditions in excess of these limits, then an installer must not place smoke detectors in spaces where the ambient environment exceeds these limits.

In your particular part of the country, you may often have temperatures that exceed the 100° F. limit where the design of the building does not provide the particular space with air conditioning. Perhaps the AHJ found such a location at the elementary school. Even though your company may have installed many detectors in such locations in the past, the thorough reading of the *Code* by your new AHJ has prompted her to enforce the requirement as stated in NFPA 72-2002, Section 5.7.1.8.

In order to satisfy the requirement of the *Code*, you must select another type of fire detection device that can operate properly in the particular environment.

As annoying as this change in past behavior may seem to you at this point, later you may well learn to appreciate the thoroughness this new AHJ brings to the table. Her careful reading of the *Code* may prove a valuable ally in the future. You will find this particularly true if you work hard to cultivate a relationship with this AHJ. You should base that relationship on trust and on your determination to provide code-complying fire alarm systems.

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