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## ASHRAE Manual Focus: Hospital Design

### Health Care Facility Designers will Benefit from 'Good' Practices Guide

By Joanna R. Turpin

November 4, 2013 No Comments

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ASHRAE recently published the second edition of "HVAC Design Manual for Hospitals and Clinics," which is based on ASHRAE Standard 170. The guidelines were designed to help industry professionals gain insight into what it takes to design safe, reliable, and cost-effective hospital HVAC systems.



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In 2008, ASHRAE introduced Standard 170 – Ventilation of Health Care Facilities, which defined ventilation system design requirements for infection control. Considered a breakthrough in the industry, Standard 170-2008 was the first American National Standards Institute (ANSI) standard in the nation to specifically address ventilation in health care facilities.

Fast-forward five years and authorities in more than 40 states now use Standard 170 as a code or reference standard, which is why ASHRAE felt the need to update its “HVAC Design Manual for Hospitals and Clinics.” This newly published manual is based on the guidelines in Standard 170 and provides design recommendations for health care facilities with an emphasis on proven, cost-effective solutions that result in reduced infections, lower maintenance, and higher reliability.

**Good Design Principles**

Tasked with the challenge of updating the manual was Dan Koenigshofer, P.E., vice president of health care engineering at Dewberry Engineers, Chapel Hill, N.C. Koenigshofer spent three years working with his fellow members on [ASHRAE’s Technical Committee \(TC\) 9.6](#), Healthcare Facilities, to create a guide that focuses on quality practices that engineers, contractors, and other HVAC professionals should employ in health care facilities.

“This manual was not written in code language, it was not peer reviewed, and I would not even say it covers best practices. It includes good practices,” said Koenigshofer. “It is a guide for contractors, engineers, and inspectors on how to build good HVAC systems for hospitals. There are lots of handbooks available on how to design schools or hotels, but not hospitals. I really wanted to focus on what’s different and hopefully we accomplished that.”

With chapters ranging from infection control to room design to operations and maintenance, the 300-page manual covers a lot of ground. Also included in this edition is a chapter on the business of health care, which helps HVAC design professionals understand the business considerations facing facility owners and operators.

While ASHRAE TC 9.6 used the first edition of the manual as a starting point, much has changed since it was initially published in 2003. Namely, the introduction of Standard 170, which Koenigshofer, as the editor of the new edition, accepted as gospel for the purposes of writing this manual. “We didn’t question it; we accepted what it said and moved on from there.”

That included accepting Standard 170’s recommendation of 20 air changes per hour (ACH) in operating rooms to reduce the possibility of hospital-acquired (nosocomial) infections. But, as Koenigshofer noted, there is a desperate need for new research that correlates air change rates, ventilation, and infections.

“Right now, when an infection occurs in a hospital, it’s usually very difficult to determine whether it came from the instruments, the air, the patients themselves, or the staff. I think it’s accepted that very few nosocomial infections actually come from the HVAC system — probably on the order of 5-10 percent. We need more epidemiological studies done in hospitals that we can really rely upon to make this correlation — or not. Unfortunately, those studies are expensive, slow, and difficult to do.”

Another of the more controversial topics covered in the new edition of the manual concerns lined ductwork, which Koenigshofer said should simply be removed during renovations. “Don’t even think about coating it or cleaning it or anything else. And if you’re designing a new hospital, do not install lined ductwork.”

Some may argue that lined ductwork can be used safely in administrative areas of a facility, but after 35 years of designing hospitals, Koenigshofer is skeptical about that assertion. “I’ve seen every possible part of a hospital get converted to patient care, including storerooms, medical records areas, and even old mechanical rooms. We talked with various vendors who said their linings are better and that they won’t erode, but that’s what we were told 30 years ago, and they did erode. This is just

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good practice — don't put lined ductwork anywhere in a hospital.”

### Keep It Simple

It is obvious that Koenigshofer is passionate about hospital design, noting that he could have worked on this book for the rest of his life and still not included everything. In the end, he has five points that — in this order — are the most important concerns when it comes to designing an HVAC system for a high-performing hospital:

- 1) Systems must provide the proper temperature, air changes, pressurization, humidity, and filtration in order to mitigate airborne infections and keep patients and staff comfortable;
- 2) Mechanical systems must be reliable;
- 3) Maintenance costs must be kept low;
- 4) Energy efficiency is important, but beware that many energy conservation measures can jeopardize the more crucial factors listed in points one, two, and three; and
- 5) Sustainability.

“This is the world, according to Dan,” said Koenigshofer. “One of my basic engineering tenets is that reliability is inversely proportional to complexity. You often find engineers throwing a lot of things at a building, like hot water temperature reset, night set back, and enthalpy-based economizers. It gets so complex that no one can make it work. One of my missions is to try to get people to appreciate simplicity — to think about the implications and not just the energy.”

Koenigshofer hopes that contractors and engineers alike will read the new manual in order to gain insight into what it takes to design safe, reliable, and cost-effective hospital HVAC systems. “The manual covers it all — air handlers, ductwork, equipment, room design, you name it. It has a lot of value for anyone involved in the design of hospital HVAC systems.”

“HVAC Design Manual for Hospitals and Clinics,” second edition is available for \$115 (\$99 for ASHRAE members). To order, contact the ASHRAE customer contact center at 800-527-4723 (United States and Canada), 404-636-8400 (worldwide), or visit [www.ashrae.org/bookstore](http://www.ashrae.org/bookstore). Dan Koenigshofer will be teaching an ASHRAE Learning Institute Short Course on the five concepts for designing high-performing hospitals along with a professional development seminar on Health Care Facilities: Best Practice Design and Applications at ASHRAE's Winter Conference in New York in January 2014. For more information, visit [www.ashrae.org](http://www.ashrae.org).

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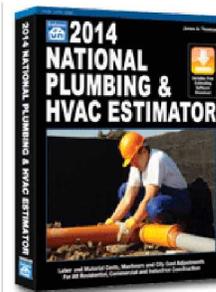
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Joanna Turpin is Contributing Editor. E-mail her at [JoannaTurpin@cox.net](mailto:JoannaTurpin@cox.net).

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