## Chapter 1 : HVAC Design Manual for Hospitals and Clinics (2nd Edition) - Knovel

*When designing health care HVAC, expert guidance is essential. The updated second edition of HVAC Design Manual for Hospitals and Clinics provides those involved in the design, installation, and commissioning of HVAC systems for hospitals with a comprehensive reference source for their work.*

Chapter 3 Dewberry Engineers, Inc. Glossary Dewberry Engineers, Inc. Chapters 2, 8 Coffman Engineers, Inc. Chapters 1, 2, 5 U. Chapter 7 Dewberry Engineers, Inc. Chapters 8, 9, 12, 13 Erdman Frank Mills, C. Chapter 11 Seneca Construction Management Corp. Printed in the United States of America. The appearance of any technical data or editorial material in this publication does not constitute endorsement, warranty, or guaranty by ASHRAE of any product, service, process, procedure, design, or the like. The entire risk of the use of any information in this publication is assumed by the user. No part of this book may be reproduced without permission in writing from ASHRAE, except by a reviewer who may quote brief passages or reproduce illustrations in a review with appropriate credit; nor may any part of this book be reproduced, stored in a retrieval system, or transmitted in any way for or by any meansâ€" electronic, photocopying, recording, or otherâ€"without permission in writing from ASHRAE. Requests for permission should be submitted at www. Hospital buildingsâ€"United Statesâ€"Design and constructionâ€"Handbooks, manuals, etc. Clinicsâ€"United Statesâ€"Design and constructionâ€"Handbooks, manuals, etc. Hospital buildingsâ€"Heating and ventilationâ€"United Statesâ€"Handbooks, manuals, etc. Clinicsâ€"Heating and ventilationâ€"United Statesâ€"Handbooks, manuals, etc. Hospital buildingsâ€"Air conditioningâ€"United Statesâ€"Handbooks, manuals, etc. Clinicsâ€"Air conditioningâ€"United Statesâ€"Handbooks, manuals, etc. Our intent is that this edition of the manual focuses specifically on heating, ventilating, and air-conditioning HVAC system design for health care facilities, omitting general system descriptions that are readily available in other ASHRAE publications. Citations of the standard throughout this book should be understood to include its Addenda a to t and v. This edition is the result of a concerted effort by a fine group of volunteers whose job was made immensely easier by having the first edition to build upon. By intent, the authoring committee was composed primarily of consulting engineers with long experience in the design and construction of health care facilities. Jeff Hardin and John Kramer worked hard on both editions. Hospital engineers John Kramer, Heather Platt, and Ron Westbrook also wrote chapters and provided invaluable input to the entire book. Engineering editorial assistance was provided by John Murphy, and Walter Grondzik was technical editor. Kelly Short and Kelsey Grondzik assisted with tables and illustrations. Finally, I want to thank Layle Thomas for her fantastic organizational and editorial expertise, which was invaluable in coordinating the efforts of over 32 volunteers. It has been my honor to chair this committee. Health care HVAC systems must be installed, operated, and maintained in spatial and functional conjunction with a host of other essential building services, including emergency and normal power, plumbing and medical-gas systems, automatic transport, fire protection, and myriad IT systems, all within a constrained building envelope. Health care facilities and services are characterized by high rates of modification because of the continuously evolving science and economics of health care, and consume large quantities of energy and potable water. The often unique environmental conditions associated with these facilities, and the critical performance, reliability, and maintainability of the HVAC systems necessary to their success, demand a specialized set of engineering practices and design criteria established by model codes and standards and enforced by authorities having jurisdiction. As a rule, environmental control requirements and 1. This manual is primarily intended to address HVAC systems for inpatient hospitals, except where otherwise indicated. Staff and patient comfort, and the provision of therapeutic space conditions, facilitate optimum patient treatment outcomes. Environmental conditioning for electronic data storage, supporting IT systems, and special imaging and other medical equipment is critical to the operation of these essential services. Through containment, dilution, and removal of pathogens and toxins, the HVAC system is a key component of facility safety and infection control. In inpatient and many ambulatory treatment facilities, the inability or reduced ability of patients to respond properly to fire emergencies requires the HVAC system to support vital smoke exhaust and building compartmentation features of the life safety system. Finally, the HVAC system should interact with the architectural building envelope to control the entry of unconditioned air, together with outdoor contaminants and moisture. As in any facility, the comfort of building occupants is fundamental to overall well-being and productivity. In the health care facility, a comfortable environment has a significant role in facilitating healing and recovery. At the same time, a health care provider stressed by an uncomfortable environment may not function at peak performance levels. Patients clothed in a simple gown in an examination room, for example, or orthopedic surgical staff heavily garbed in scrub suits during an hours-long, complex, and stressful procedure, require special room temperature and humidity levels and controls. Similarly, room airflow patterns and air change rates influence thermal comfort. For these reasons, health care codes and criteria establish specific requirements for space temperature, relative humidity, and total air change rates. Operating rooms and nursery units, for example, often require a range of room temperatures spanning several degrees, regardless of the season, to best facilitate a given procedure or patient condition. Criteria call for long-term in-patient spaces to be humidified to minimum levels to avoid the dry skin and mucous membranes associated with very low RH levels that add to discomfort and possibly impede respiratory immune function. As of the date of this publication, however, there is no scientific evidence to firmly establish that extended exposure to very low humidity contributes to poorer patient outcomes. With few exceptions such as free-standing behavioral health, sports medicine, or maternity care centers , medical facilities are places where relatively high levels of pathogenic disease-causing microorganisms are generated and concentrated by an infected patient population or by procedures that handle or manipulate infected human tissues and bodily fluids. These pathogens are spread by a number of contact and, to a lesser extent, noncontact airborne causes, which are dealt with in detail in Chapter 2. To some degree, the entire building population is at elevated risk of exposure to these pathogens. Sick and injured patients, having suppressed or compromised immune function, are highly susceptible to new infections. Visitors often accompany sick or injured friends or loved ones to high-exposure areas such as clinical waiting rooms and emergency departments. By the nature of their profession, health care staff work in proximity to infectious agents on a daily basis. Health care facilities therefore require stringent operational practices and engineering controls to safeguard the building population. The HVAC system is one of several tools and processes used in the control of infection. Examples include laboratories where aerosolizing chemicals are used to fix slide specimens, preserve tissues, or perform other processes; orthopedic appliance and artificial limb shops involving adhesives and other aerosolizing agents; and anesthetizing locations, in which long-term exposure to even trace concentrations of anesthetizing gases can have harmful consequences. In such applications, HVAC equipment operates in conjunction with primary containment equipment, such as fume hoods, radioisotope hoods, laminar flow benches, and waste anesthesia evacuation systems, to contain and exhaust these contaminants or dilute them to safe levels. Laboratory culturing procedures, and certain pharmaceutical handling and compounding procedures, are examples where the HVAC system functions in conjunction with containment equipment to protect the product. Containment is facilitated by the application of smoke and fire dampers and, in some cases, by restricting HVAC system cross-over between smoke zones. HVAC systems contribute to the detection and containment of fire and smoke and may be called upon to evacuate or exclude smoke from atria or exit enclosures. Engineered smoke control systems may be required to provide complex zoned pressurization control. Condensation of humid outdoor air within building envelope assemblies is conducive to mold colonization, which, in addition to causing expensive material damage, poses a risk of deadly infection from Aspergillus and other so-called opportunistic mold genera. No envelope is perfect, and abundant evidence shows that even well-designed and constructed envelopes allow some degree of infiltration from building pressurization differentials caused by wind, stack effect, and operation of the HVAC system. Generally, with the exception of very cold climates where neutral pressurization may be called for, it is desirable to positively pressurize the building interior to minimize infiltration. Some HVAC designs approach controlled, continuous, positive pressurization by maintaining a controlled offset between outdoor ventilation air and exhaust. These systems are simple and reliable. More complex pressure-control approaches are now being suggested by some design engineers. HVAC designers should be aware, and make the building architect aware, that the deliberate depressurization of spaces on the building perimeter, including disease isolation rooms and patient toilets, and the depressurization of plenums and exterior wall cavities by plenum return systems, poorly balanced ducted return systems, and central exhaust systems can exacerbate the passage of moisture and unconditioned, unfiltered air across the building envelope in those locations. Codes and standards provide minimum sound transmission class STC , or other acoustical performance criteria, for the architectural enclosure elements of critical spaces such as provider office and exam rooms, and may address recommendations for background noise, and for minimizing sound transmission through connecting ductwork. Most state and federal government agencies, and many local governments, establish criteria for the design of health care facilities within their jurisdictions. A jurisdiction may utilize its own criteria and codes or cite model, national, or international building codes or design standards. Some private health care institutions and corporations also establish their own design criteria that go beyond jurisdictional requirements. Frequently adopted or cited codes, standards, and design guidelines relating to health care facility HVAC systems include the following: Other criteria that influence the HVAC design may involve envelope configuration and thermal performance, environmental requirements for special equipment and processes, operation and maintenance considerations, and clearance and conditioning requirements for electrical and electronic equipment. Every jurisdiction can be expected to have its own design criteria, more or less supplemented by that of the building owner, which must be understood by the designer at project initiation. These criteria normally include much of the information in the previously listed sources, but may include only certain elements of these documents, or involve modifications of the published requirements. With rare exceptions, a designer can never safely assume appropriate criteria. Authorities having jurisdiction and building owners must be consulted. Authorities and owners should also be consulted as to design preferences, which often dictate specific system and equipment types, configurations, redundancies, and operating and maintenance considerations; such project-specific preferences may also involve building and space design conditions that deviate from standard criteria. Eligibility requires a certification of compliance with the CMS conditions of participation, which is typically provided by a national accrediting organization providing and enforcing standards recognized by CMS as meeting or exceeding its own. The CMS conducts random validation surveys of health care facilities certified by deeming authorities. The Joint Commission in an independent, not-for-profit organization governed by a board of commissioners that includes clinicians, facility administrators, health plan leaders, educators, and a variety of other professionals experienced in health care practice, administration, and public policy. The Joint Commission has a survey staff of approximately inspectors who conduct the random facility surveys required for a facility to maintain its accreditation status. Considering that health care facilities in general are serious energy and water consumers, and their user populations are physiologically and psychologically sensitive, sustainable design approaches can uniquely impact the efficiency and effectiveness of health care delivery. Environmental design guidelines published by the U. Green Building Council USGBC and ASHRAE establish target design outcomes that encourage building owners and designers to minimize utility costs, improve building flexibility and maintainability, and maximize the application of building features that improve the comfort and sense of well being of the building occupants. Each rating system establishes minimum rating point values necessary to achieve a range of certification levels. Some owners may not choose to pursue LEED or other certifications; when pursued, however, the HVAC designer should consider payback, performance, and reliability in determining which features and strategies to implement. Three important categories of design considerations addressed in LEED are discussed in the following sections. The main thrust of this category is to encourage selection of a building site that will have minimal impact on the natural environment. Two credits within this category in LEED for Healthcare , however, directly affect the well being of patients, staff, and visitors: These credits address the advantages of human contact with nature in reducing stress and depression, through the provision of interior places of respite, healing gardens, exposure to daylight, views to the outdoors, ready accessibility to the outdoors, and walking paths, among other approaches. Sustainable design guidelines are a valuable tool for education and encouragement regarding water conservation practices that can substantially reduce water consumption and the considerable costs associated with metered water and sewage utilities. Department of Energy DOE reports that hospitals have more than 2. To qualify for the U. Given these statistics, the cost savings potential in HVAC energy and the corresponding environmental benefits of reducing the carbon footprint of a facility give building owners a powerful incentive to pursue energy-conserving features and equipment. In some cases, it may be necessary to establish and maintain a range of room conditions, with different setpoints for summer or winter operation or for differing patient requirements. The HVAC design must provide for the required room conditions under the most stringent operational or weather conditions defined by applicable design criteria. Maximum cooling load can occur at peak WB conditions when outdoor air demands are high; for this reason, and for sizing evaporative and dehumidification equipment, designers should consider peak total load latent plus sensible climatic conditions for each project.

## Chapter 2 : HVAC Design Manual for Hospitals and Clinics

*HVAC Design Manual for Hospitals and Clinics, 2nd Edition. This new edition of HVAC Design Manual for Hospitals and Clinics provides in-depth, up-to-date design recommendations based on best practices from consulting and hospital engineers with decades of experience in the design, construction, and operation of health care facilities.*

## Chapter 3 : blog.quintoapp.com: Customer reviews: HVAC Design Manual for Hospitals and Clinics

*ASHRAE () HVAC Design Manual for Hospital and Clinics, 2.*

## Chapter 4 : HVAC Design Manual for Hospitals and Clinics, 2nd Edition

*This new edition of HVAC Design Manual for Hospitals and Clinics provides in-depth, up-to-date design recommendations based on best practices from consulting and hospital engineers with decades of experience in the design, construction, and operation of health care facilities. It presents solutions that are proven, cost effective, and reliable.*

## Chapter 5 : ASHRAE HVAC Design Manual for Hospitals & Clinics - pdf - PDF Free Download

*This comprehensive reference HVAC Design Manual for Hospitals and Clinics 1st Edition source is for all involved in hospital design and installation of HVAC system commissioning. It covers environmental comfort, infection control, energy conservation, life safety, and operation/ maintenance.*

## Chapter 6 : ASHRAE - HVAC Design Manual for Hospitals and Clinics | Construction Book Express

*HVAC Design Manual for Hospitals and Clinics (2nd Edition) Details This new edition provides in-depth, up-to-date design recommendations based on best practices from consulting and hospital engineers with decades of experience in the design, construction, and operation of health care facilities.*

## Chapter 7 : HVAC Design Manual for Hospitals and Clinics 1st Edition

*This manual is intended to serve as a guide to the selection of HVAC systems for hospitals, clinics, and other health care facilities and to fill a gap left by current resources related to HVAC design for health care facilities.*

## Chapter 8 : Health Care Facilities Resources

*This comprehensive reference source is for all involved in hospital design and installation of HVAC system commissioning. It covers environmental comfort, infection control, energy conservation, life safety, and operation/ maintenance.*