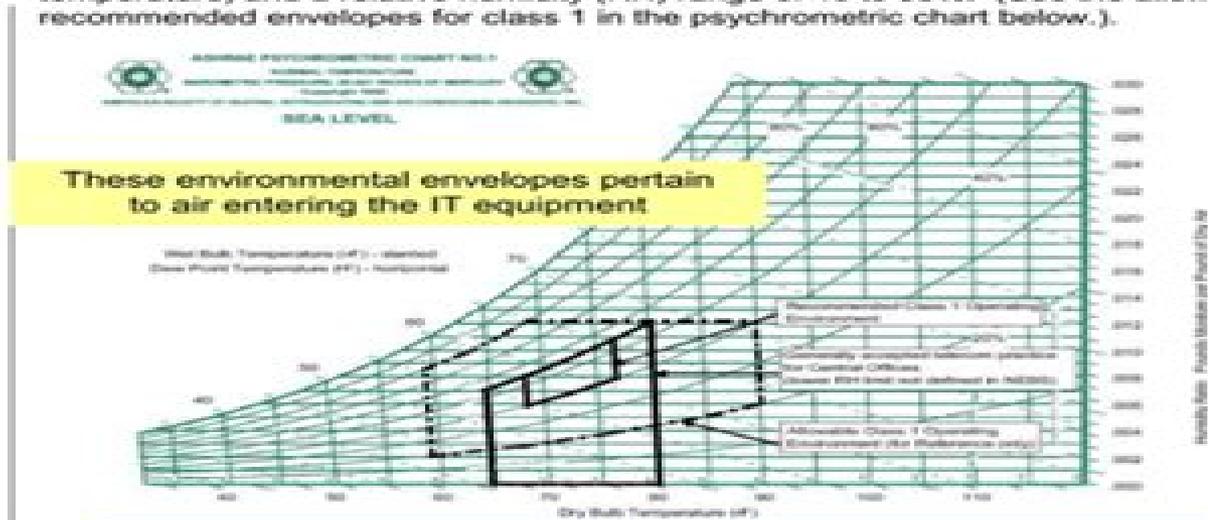# 2008 ASHRAE Environmental Guidelines for Datacom Equipment
-Expanding the Recommended Environmental Envelope-

Overview:

The current recommended environmental envelope for IT Equipment is listed in Table 2.1 of the 2004 referenced ASHRAE Datacom book [1]. These recommended conditions as well as the allowable conditions refer to the underlined air entering the datacom equipment. Specifically, it lists for data centers in ASHRAE classes 1 and 2 (refer to the referenced ASHRAE book for details on data center type, altitude, recommended vs allowable, etc.) a recommended environment range of 20 to 25 °C (68 to 77 °F) (dry bulb temperature) and a relative humidity (RH) range of 40 to 55%. (See the allowable and recommended envelopes for class 1 in the psychrometric chart below.).

To provide greater flexibility in facility operations, particularly with the goal of reduced energy consumption in data centers, TC 9.9 has undergone an effort to revisit these recommended Equipment Environmental Specifications, specifically the recommended envelope for classes 1 and 2 (the recommended envelope is the same for both of these environmental classes). The result of this effort, detailed below, is to expand the recommended operating environment envelope. The purpose of the recommended envelope is to give guidance to data center operators on maintaining high reliability and also operating their data centers in the most energy efficient manner. The allowable envelope is where IT manufacturers test their equipment in order to verify that the equipment will function within those environmental boundaries. Typically manufacturers will perform a number of tests prior to announcement of a product to verify that their product meets all the functionality requirements within this environmental envelope. This is not a statement of reliability but one of functionality of the IT equipment. However, the recommended envelope **is** a statement on reliability. For extended periods of time, the IT manufacturers recommend that data center operators maintain

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Data Center Handbook Hwaiyu Geng,2014-12-22 Provides the fundamentals technologies and best practices in designing constructing and managing mission critical energy efficient data centers Organizations in need of high speed connectivity and nonstop systems operations depend upon data centers for a range of deployment solutions A data center is a facility used to house computer systems and associated components such as telecommunications and storage systems It generally includes multiple power sources redundant data communications connections environmental controls e g air conditioning fire suppression and security devices With contributions from an international list of experts The Data Center Handbook instructs readers to Prepare strategic plan that includes location plan site selection roadmap and capacity planning Design and build green data centers with mission critical and energy efficient infrastructure Apply best practices to reduce energy consumption and carbon emissions Apply IT technologies such as cloud and virtualization Manage data centers in order to sustain operations with minimum costs Prepare and practice disaster reovery and business continuity plan The book imparts essential knowledge needed to implement data center design and construction apply IT technologies and continually improve data center operations **Optimum Cooling of Data Centers** Jun Dai,Michael M. Ohadi,Diganta Das,Michael G. Pecht,2013-11-20 This book describes the use of free air cooling to improve the efficiency of and cooling of equipment for use in telecom infrastructures Discussed at length is the cooling of communication installation rooms such as data centers or base stations and this is intended as a valuable tool for the people designing and manufacturing key parts of communication networks This book provides an introduction to current cooling methods used for energy reduction and also compares present cooling methods in use in the field The qualification methods and standard reliability assessments are reviewed and their inability to assess the risks of free air cooling is discussed The method of identifying the risks associated with free air cooling on equipment performance and reliability is introduced A novel method of assessment for free air cooling is also proposed that utilizes prognostics and health management PHM This book also Describes how the implementation of free air cooling can save energy for cooling within the telecommunications infrastructure Analyzes the potential risks and failures of mechanisms possible in the implementation of free air cooling which benefits manufacturers and equipment designers Presents prognostics based assessments to identify and mitigate the risks of telecommunications equipment under free air cooling conditions which can provide the early warning of equipment failures at operation stage without disturbing the data centers service Optimum Cooling for Data Centers is an ideal book for researchers and engineers interested in designing and manufacturing equipment for use in telecom infrastructures *Handbook of Energy-Aware and Green Computing - Two Volume Set* Ishfaq Ahmad,Sanjay Ranka,2016-02-03 Implementing energy efficient CPUs and peripherals as well as reducing resource consumption have become emerging trends in computing As computers increase in speed and power their energy issues become more and more prevalent The need to develop and promote environmentally

friendly computer technologies and systems has also come to the forefront <u>Handbook of Energy-Aware and Green Computing, Volume 2</u> Ishfaq Ahmad,Sanjay Ranka,2013-01-31 This book provides basic and fundamental knowledge of various aspects of energy aware computing at the component software and system level It provides a broad range of topics dealing with power energy and temperature related research areas for individuals from industry and academia

<u>Encyclopedia Of Thermal Packaging, Set 2: Thermal Packaging Tools (A 4-volume Set)</u> ,2014-10-23 remove This Encyclopedia comes in 3 sets To check out Set 1 and Set 3 please visit Set 1 Thermal Packaging Techniques and Set 3 Thermal Packaging Applications remove Thermal and mechanical packaging the enabling technologies for the physical implementation of electronic systems are responsible for much of the progress in miniaturization reliability and functional density achieved by electronic microelectronic and nanoelectronic products during the past 50 years The inherent inefficiency of electronic devices and their sensitivity to heat have placed thermal packaging on the critical path of nearly every product development effort in traditional as well as emerging electronic product categories Successful thermal packaging is the key differentiator in electronic products as diverse as supercomputers and cell phones and continues to be of pivotal importance in the refinement of traditional products and in the development of products for new applications The Encyclopedia of Thermal Packaging compiled in four multi volume sets Set 1 Thermal Packaging Techniques Set 2 Thermal Packaging Tools Set 3 Thermal Packaging Applications and Set 4 Thermal Packaging Configurations will provide a comprehensive one stop treatment of the techniques tools applications and configurations of electronic thermal packaging Each of the author written sets presents the accumulated wisdom and shared perspectives of a few luminaries in the thermal management of electronics Set 2 Thermal Packaging ToolsThe second set in the encyclopedia Thermal Packaging Tools includes volumes dedicated to thermal design of data centers techniques and models for the design and optimization of heat sinks the development and use of reduced order compact thermal models of electronic components a database of critical material thermal properties and a comprehensive exploration of thermally informed electronic design The numerical and analytical techniques described in these volumes are among the primary tools used by thermal packaging practitioners and researchers to accelerate product and system development and achieve correct by design thermal packaging solutions The four sets in the Encyclopedia of Thermal Packaging will provide the novice and student with a complete reference for a quick ascent on the thermal packaging learning curve the practitioner with a validated set of techniques and tools to face every challenge and researchers with a clear definition of the state of the art and emerging needs to guide their future efforts This encyclopedia will thus be of great interest to packaging engineers electronic product development engineers and product managers as well as to researchers in thermal management of electronic and photonic components and systems and most beneficial to undergraduate and graduate students studying mechanical electrical and electronic engineering *Future Trends and Challenges for ICT Standardization* Ramjee Prasad,2025-01-13 This book comes in response to the Future Trends

and Challenges for ICT Standardization The technological areas covered are the need importance and management of radio spectrum the development of future radio access technologies the convergence of telecommunications and broadcasting the possibilities and challenges brought by the Internet of Things IoT the environment sustainability through the use of Green ICT The book aims at identifying the importance of ICT standardization for strengthening the Indian industrial and business sector through Global ICT Standardization Forum for India GISFI www gisfi org Further it outlines the major challenges and trends in the ICT development worldwide while mapping the Indian efforts on the background of the overall progress The motivation behind this book is that a more informed context is made available to ensure sustainable scientific and economic growth Finally the book puts forward the best research roadmaps strategies and challenges contributed by engineers from the industry academia and Government It addresses the benefits to the entire society resulting from standardization

International Conference on Digital Libraries (ICDL) 2013 Shantanu Ganguly,P. K. Bhattacharya,2013-11-29 ICDL conferences are recognized on of the most important platform in the world where noted expert share their experiences Many DL experts have contributed thought provoking papers in ICDL 2013 These important papers are reviewed and conceptualized into ICDL on different areas of DL proceedings The Proceedings have two volumes and has over 1100 pages

Recovery Act: Federspiel Controls (now Vigilent) and State of California Department of General Services Data Center Energy Efficient Cooling Control Demonstration Clifford Federspiel,2012 **Consulting-specifying Engineer** ,2009 Thermal Guidelines for Data Processing Environments ,2021 *Thermal Guidelines for Data Processing Environments* American Society of Heating, Refrigerating and Air-Conditioning Engineers,2004 Recent trends toward increased equipment power density in data centers can result in significant thermal design and operation issues with the potentially undesirable side effects of decreased equipment availability wasted floor space and inefficient cooling system operation There is often a mismatch of IT equipment environmental requirements with adjacent equipment requirements or with facility operating conditions and thus a strong need to find common solutions and standard practices that facilitate IT equipment interchangeability while preserving industry innovation Thermal Guidelines for Data Processing Environments provides a framework for improved alignment between IT equipment hardware manufacturers including manufacturers of computers servers and storage products data center designers and facility operators and managers This guide covers four primary areas equipment operating environment specifications four classes are defined facility temperature and humidity measurement to evaluate data center health equipment placement and airflow patterns a hot aisle cold aisle layout is recommended and equipment manufacturers heat load and airflow requirements reporting The primary changes for this second edition center on the updated thermal envelope and relate to the recommended temperatures at the inlets of the equipment operating in datacom facilities This book is the first in the ASHRAE Datacom Series authored by ASHRAE Technical Committee 9 9 Mission Critical Facilities Technology Spaces and Electronic Equipment This series provides

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