



# ASHRAE GUIDELINE

## Specifying Direct Digital Control Systems

Approved by the ASHRAE Standards Committee on June 28, 2000, and by the ASHRAE Board of Directors on June 29, 2000.

This guideline is under continuous maintenance by a Standing Guideline Project Committee (SGPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the guideline. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site, <http://www.ashrae.org>, or in paper form from the Manager of Standards. The latest edition of an ASHRAE Guideline may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: [orders@ashrae.org](mailto:orders@ashrae.org). Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada).

©Copyright 2000 ASHRAE, Inc.

ISSN 1049-894X

**American Society of Heating, Refrigerating  
and Air-Conditioning Engineers, Inc.**

1791 Tullie Circle NE, Atlanta, GA 30329

[www.ashrae.org](http://www.ashrae.org)

**ASHRAE Standing Guideline Project Committee 13**  
**Cognizant TC: TC 1.4, Control Theory and Application**  
**SPLS Liaison: James K. Vallort**

Ofer Pittel, *Chair\**  
Daniel M. Agne\*  
Gil Avery  
Bruce T. Baars\*  
Paul W. Ehrlich\*  
Ira G. Goldschmidt\*  
John A. Hendrix, Jr.\*  
Dale L. Herron

David B. Kahn\*  
Gerald J. Kettler\*  
John P. Kettler  
Aaron Nahale\*  
Kim E. Shinn\*  
Grant N. Wichenko\*  
James R. Winston\*

*\*Denotes members of voting status when the document was approved for publication*

---

**ASHRAE STANDARDS COMMITTEE 1999-2000**

Arthur E. McIvor, Chair  
Martha J. Hewett, Vice-Chair  
Dean S. Borges  
Waller S. Clements  
Piotr A. Domanski  
Richard A. Evans  
Mark C. Hegberg  
John F. Hogan  
David E. Knebel  
Frederick H. Kohloss  
William J. Landman  
Neil P. Leslie  
Rodney H. Lewis

Nance C. Lovvorn  
Amanda K. Meitz  
Davor Novosel  
Joseph A. Pietsch  
James A. Ranfone  
Terry E. Townsend  
James K. Vallort  
Thomas E. Watson  
Bruce A. Wilcox  
J. Richard Wright  
Samuel D. Cummings, Jr., BOD ExO  
Raymond E. Patenaude, CO

Claire B. Ramspeck, *Manager of Standards*

---

**SPECIAL NOTE**

This Guideline was developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). ASHRAE Guidelines are developed under a review process, identifying a guideline for the design, testing, application, or evaluation of a specific product, concept, or practice. As a guideline it is not definitive but encompasses areas where there may be a variety of approaches, none of which must be precisely correct. ASHRAE Guidelines are written to assist professionals in the area of concern and expertise of ASHRAE's Technical Committees and Task Groups.

ASHRAE Guidelines are prepared by project committees appointed specifically for the purpose of writing Guidelines. The project committee chair and vice-chair must be members of the ASHRAE; while other members of the project committee may or may not be ASHRAE members, all must be technically qualified in the subject area of the Guideline.

Development of ASHRAE Guidelines follows procedures similar to those for ASHRAE Standards except that (a) committee balance is desired but not required, (b) and effort is made to achieve consensus but consensus is not required, (c) guidelines are not appealable, and (d) guidelines are not submitted to ANSI for approval.

The Manager of Standards of ASHRAE should be contacted for:

- a. interpretation of the contents of this Guideline,
- b. participation in the next review of the Guideline,
- c. offering constructive criticism for improving the Guideline,
- d. permission to reprint portions of the Guideline.

---

**DISCLAIMER**

ASHRAE publishes Guidelines in order to provide assistance to interested parties on issues that relate to the design, testing, application, and/or evaluation of products, concepts, and practices where there may be more than one acceptable approach. Guidelines are not mandatory and only provide one source of information that may be helpful in any given situation.

---

**ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS**

**ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.**

**In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.**

## CONTENTS

### ASHRAE Guideline 13-2000 Specifying Direct Digital Control Systems

SECTION	PAGE
Foreword.....	2
1 Purpose .....	2
2 Scope .....	2
3 Preamble .....	2
4 Direct Digital Control (DDC) Overview .....	3
5 Design and Construction of DDC Systems.....	8
6 About Clauses 7, 8, and 9 .....	12
7 Specification Part 1: General.....	13
8 Specification Part 2: Products .....	23
9 Specification Part 3: Execution .....	62
10 Instructions to Other Contractors.....	82
11 Valves and Dampers.....	87
12 References .....	88
Annex A: Sample Specification Outline .....	89
Annex B: BACnet.....	89
Annex C: Interoperability Case Studies .....	91
Index .....	93

(This foreword is not part of this standard but is included for information purposes only.)

## FOREWORD

*This guideline is intended to provide a designer of DDC systems with background information, recommendations of good practice, project considerations, and detailed discussion of options with respect to the design of a DDC system.*

*The reader should be aware that the technologies available in DDC products change more rapidly than those in the rest of the HVAC industry. A careful review of suppliers' offerings should be done before proceeding with creation of any DDC system design. The creation of a DDC specification is a process similar to the one used to design the rest of a facility's systems. This guideline attempts to guide the reader through this process.*

*This guideline includes an example specification, presented as excerpted parts and embedded throughout the document. Its function is to illustrate the concepts described in the body of the text. The example should be used as it was intended—as an example only. The example is not a guide specification; it does not include exhaustive options for every conceivable project system architecture, requirement, or configuration. It does not fit all applications, nor is it the best way to proceed on every job.*

*The example deals with, among other things, how to specify interoperability. It is limited to a single communication protocol. The reader should be aware that there are other viable protocol options.*

*The excerpted parts of the example are presented in a typeface different from the text of the guideline, with lines above and below.*

*An outline of the example specification is included as an annex to this guideline to allow the reader to see how its sections fit together.*

## 1. PURPOSE

The purpose of this guideline is to provide recommendations for developing specifications for direct digital control (DDC) systems in heating, ventilating, and air-conditioning (HVAC) control applications.

## 2. SCOPE

This guideline covers DDC for HVAC control, monitoring, and management functions. This guideline specifies hardware performance, installation, and training. It also addresses system architecture, input/output structure, communication, program configuration, system testing, and documentation. *The guideline does not include fire, life safety, or facility management functions.*

## 3. PREAMBLE

### 3.1 Intent of This Document

This guideline provides specifiers of DDC systems with a tool to help them create and edit specifications for projects of virtually any size, scope, or complexity. It is the result of industry consensus obtained from the controls and equipment manufacturers, consulting engineers, installation contractors,

and testing contractors who composed ASHRAE Guideline Project Committee (GPC) 13P.

This guideline discusses the options, considerations, perceived benefits, and concerns associated with each part of an installed system. The writers chose specific configurations, components, and methodology. One such selection decision was the architecture or topology of the system. These selections are not the only way to build a system nor necessarily the best for each project. The information provided should assist the reader in understanding why these selections were made and how to make these decisions for his/her project.

This guideline represents a standardization of approach to the design, documentation, and specification of DDC systems for HVAC control and energy management applications. This standardization should improve both the quality and value of DDC systems for building owners and users. *The guideline should not be used as a statutory standard for compliance.* The examples are not an exhaustive representation of all types and features of DDC systems. This guideline and its annexes require substantial editing and customization for the particular requirements of any given project.

### 3.2 Use of This Guideline

This guideline is to be used when preparing written and drawn specifications of DDC HVAC control and energy management systems and can be a reference for the design of these DDC systems as well.

The terms *engineer*, *contractor*, *subcontractor*, and *owner* are used throughout this document. These terms are used for clarity—they are not intended to define contractual or legal requirements of any party.

**Engineer:** This is the specifier of the work; the author of the specification. This document does not imply a requirement that the engineer be a consulting engineer or a licensed professional engineer.

**Contractor:** The performer of the work defined in the specification; the person or company who enters into contractual agreement to execute the work and the entity responsible for its completion in accordance with the contract documents.

**Subcontractor:** The performer of the work defined in the specification. This person or company is contracted by the contractor—not the owner—to perform some or all of the work defined by the specification in accordance with the contract documents.

**Owner:** The person or company that executes the contract for the work. This entity will assume ownership of the completed work in accordance with the contract documents.

### 3.3 Organization of the Guideline

This guideline is organized into 12 chapters, called *clauses*, each with a main heading. Also, appendices, called *annexes*, are attached. The document is divided into five major parts:

- A general introduction of the principles of DDC system design and documentation (Clauses 4-5).
- An article-by-article discussion of the content of a written specification for a DDC system. Explanation of each specification article has been included to help the specifier (Clauses 6-9).