



ASHRAE GUIDELINE

Specifying Direct Digital Control Systems

Approved by the ASHRAE Standards Committee on June 25, 2005, and by the ASHRAE Board of Directors on June 30, 2005.

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. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada).

©Copyright 2005 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

ASHRAE Standing Guideline Project Committee 13
Cognizant TC: TC 1.4, Control Theory and Application
SPLS Liaison: Donald B. Bivens

Steven T. Taylor, *Chair**

Chariti A. Young, *Vice-Chair**

David L. Brooks*

Paul W. Ehrlich*

John A. Hendrix, Jr.*

David B. Kahn*

James R. Kelley*

Christopher L. Mellen*

John J. Santos*

Gideon Shavit*

Grant N. Wichenko*

James R. Winston*

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

ASHRAE STANDARDS COMMITTEE 2004-2005

Dean S. Borges, *Chair*

Richard D. Hermans, *Vice-Chair*

Donald B. Bivens

Paul W. Cabot

Hugh F. Crowther

Brian P. Dougherty

Hakim Elmahdy

Matt R. Hargan

Roger L. Hedrick

John F. Hogan

Frank E. Jakob

Stephen D. Kennedy

David E. Knebel

James D. Lutz

Merle F. McBride

Mark P. Modera

Cyrus H. Nasser

Davor Novosel

John Sabelli

Stephen V. Santoro

Gideon Shavit

David R. Tree

Bede Wellford

James E. Woods

Michael F. Beda, *BOD ExO*

William A. Harrison, *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 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) an 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.

[This foreword is not part of the guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.]

FOREWORD

This addendum modifies sample specification Section 1.10 (Section 7.10 of guideline) to update AutoCAD version and to change formats and media of shop drawings. It also adds a requirement for riser diagrams as part of shop drawings.

In this addendum, changes to the current guideline are indicated in the text by underlined blue type (for additions) and ~~strike through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum g to ASHRAE Guideline 13-2000

Change text in specification Section 1.10 (Section 7.10 of guideline) as indicated.

1.10 SUBMITTALS

A. Product Data and Shop Drawings: Meet requirements of Section 01xxx on Shop Drawings, Product Data, and Samples. In addition, Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been successfully reviewed for conformity with the design intent. Six copies are required. ~~All drawings shall be prepared on a CAD system that produces drawing files compatible with AutoCAD Release 12 or higher and be provided~~ drawings as AutoCAD 2004 (or newer) compatible files on magnetic/optical disk (file format: .dwg, .dxf, .vsd, or comparable) and as full-size mylar drawings with three 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. Direct Digital Control System Hardware:

- a. A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data.
- b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
 1. Direct Digital Controller (controller panels)

2. Transducers/Transmitters
 3. Sensors (including accuracy data)
 4. Actuators
 5. Valves
 6. Relays/Switches
 7. Control Panels
 8. Power Supply
 9. Batteries
 10. Operator Interface Equipment
 11. Wiring
- c. Wiring diagrams and layouts for each control panel. Show all termination numbers.
 - d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.
2. Central System Hardware and Software:
- a. A complete bill of material of equipment used, indicating quantity, manufacturer, model number, and other relevant technical data.
 - b. Manufacturer's description and technical data, such as product specification sheets and installation/maintenance instructions for the items listed below and other relevant items not listed below:
 1. Central Processing Unit
 2. Monitors
 3. Printers
 4. Keyboard
 5. Power Supply
 6. Battery Backup
 7. Interface Equipment Between CPU and Control Panels
 8. Operating System Software
 9. Operator Interface Software
 10. Color Graphic Software
 11. Third-Party Software
 - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
 - d. Riser diagrams of wiring between central control unit and all control panels.
 - e. A list of the color graphic screens to be provided. For each screen, provide a conceptual layout of pictures and data and show or explain which other screens can be directly accessed.
3. Controlled Systems:
- a. Riser diagrams showing control network layout, communication protocol, and wire types.
 - b. A schematic diagram of each controlled system. The schematics shall have all

control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.

- b.c. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, it shall be labeled with the same name. All terminals shall be labeled.
- ed. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
- ed. A mounting, wiring, and routing plan-view drawing. The drawing shall be done in ¼ in. scale. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
- fe. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
- gf. A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm

points, etc.

- 4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
- 5. A description of the proposed process along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."
- 6. A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal.

B. Schedules:

- 1. Within one month of contract award, provide a schedule of the work indicating the following:
 - a. Intended sequence of work items.
 - b. Start dates of individual work items.
 - c. Duration of individual work items.
 - d. Planned delivery dates for major material and equipment and expected lead times.
 - e. Milestones indicating possible restraints on work by other trades or situations.
- 2. Provide monthly written status reports indicating work completed, revisions to expected delivery dates, etc. An updated project schedule shall be included.

C. Project Record Documents: Upon completion of installation, submit three copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:

- 1. Project Record Drawings. ~~These shall be a~~ As-built versions of the submittal shop drawings provided as AutoCAD 2004 (or newer) compatible files on optical media and as 11" x 17" prints. ~~One set of magnetic media including CAD, .DWG, or .DXF drawing files also shall be provided.~~

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.