

STANDARDS

an American National Standard

ANSI/BICSI 007-2017

**Information Communication
Technology Design and
Implementation Practices for
Intelligent Buildings and Premises**



Bicsi[®]

ANSI/BICSI 007-2017

Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises

**Committee Approval: June 2017
ANSI Final Action: June 29, 2017
First Published: August 2017**



BICSI International Standards

BICSI international standards contain information deemed to be of technical value to the industry and are published at the request of the originating committee. The BICSI International Standards Program subjects all of its draft standards to a rigorous public review and comment resolution process, which is a part of the full development and approval process for any BICSI international standard.

The BICSI International Standards Program reviews its standards at regular intervals. By the end of the fifth year after a standard's publication, the standard will be reaffirmed, rescinded, or revised according to the submitted updates and comments from all interested parties.

Suggestions for revision should be directed to the BICSI International Standards Program, care of BICSI.

Copyright

This BICSI document is a standard and is copyright protected. Except as permitted under the applicable laws of the user's country, neither this BICSI standard nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording, or otherwise, without prior written permission from BICSI being secured.

Requests for permission to reproduce this document should be addressed to BICSI.

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

Published by:



BICSI
8610 Hidden River Parkway
Tampa, FL 33637-1000 USA

Copyright © 2016 BICSI
All rights reserved
Printed in U.S.A.

Notice of Disclaimer and Limitation of Liability

BICSI standards and publications are designed to serve the public interest by offering information communication and technology systems design guidelines and best practices. Existence of such standards and publications shall not in any respect preclude any member or nonmember of BICSI from manufacturing or selling products not conforming to such standards and publications, nor shall the existence of such standards and publications preclude their voluntary use, whether the standard is to be used either domestically or internationally.

By publication of this standard, BICSI takes no position respecting the validity of any patent rights or copyrights asserted in connection with any item mentioned in this standard. Additionally, BICSI does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the standard or publication. Users of this standard are expressly advised that determination of any such patent rights or copyrights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard does not purport to address all safety issues or applicable regulatory requirements associated with its use. It is the responsibility of the user of this standard to review any existing codes and other regulations recognized by the national, regional, local, and other recognized authorities having jurisdiction (AHJ) in conjunction with the use of this standard. Where differences occur, those items listed within the codes or regulations of the AHJ supersede any requirement or recommendation of this standard.

All warranties, express or implied, are disclaimed, including without limitation, any and all warranties concerning the accuracy of the contents, its fitness or appropriateness for a particular purpose or use, its merchantability and its non-infringement of any third party's intellectual property rights. BICSI expressly disclaims any and all responsibilities for the accuracy of the contents and makes no representations or warranties regarding the content's compliance with any applicable statute, rule, or regulation.

BICSI shall not be liable for any and all damages, direct or indirect, arising from or relating to any use of the contents contained herein, including without limitation any and all indirect, special, incidental, or consequential damages (including damages for loss of business, loss of profits, litigation, or the like), whether based upon breach of contract, breach of warranty, tort (including negligence), product liability or otherwise, even if advised of the possibility of such damages. The foregoing negation of damages is a fundamental element of the use of the contents hereof, and these contents would not be published by BICSI without such limitations.

TABLE OF CONTENTS

PREFACE	xiii
1 Introduction	1
1.1 General	1
1.2 Purpose	1
1.3 Categories of Criteria	1
2 Scope	1
3 Required Standards and Documents	3
4 Definitions, Acronyms, Abbreviations, and Units of Measurement	5
4.1 Definitions	5
4.2 Acronyms and Abbreviations	9
4.3 Units of Measurement	9
5 Communications Infrastructure	11
5.1 Overview	11
5.2 Topology	11
5.2.1 Requirements	11
5.2.2 Recommendations	11
5.3 Spaces	11
5.3.1 Equipment Rooms	11
5.3.2 Telecommunications Rooms and Telecommunications Enclosures	14
5.4 Cabling	17
5.4.1 Backbone Cabling	17
5.4.2 Horizontal Cabling	18
5.4.3 Additional Cabling Considerations	20
5.5 Cabling Pathways	20
5.5.1 Overview	20
5.5.2 Requirements	20
5.5.3 Recommendations	21
5.5.4 Pathway Separation from Power and EMI Sources	21
5.5.5 Pathway Bonding and Grounding	22
5.5.6 Enclosures, Pull Boxes and Splice Boxes	22
5.5.7 Special Considerations	22
5.5.8 Secure Areas	23
5.6 Outlets and Connectors	24
5.6.1 Overview	24
5.6.2 Requirements	24
5.6.3 Recommendations	24
5.7 Horizontal Connection Point (HCP)	25
5.7.1 Introduction	25
5.7.2 Requirements	25
5.7.3 Recommendations	25
5.8 Direct Connections	26
5.8.1 Introduction	26
5.8.2 Recommendations	26

5.9	Cabling Installation Requirements	26
5.9.1	Overview	26
5.9.2	Bonding and Grounding Considerations	27
5.9.3	Transmission Performance Field Testing	27
5.10	Administration	28
5.10.1	Requirements	28
5.10.2	Recommendations	28
5.11	Other Transmission Architectures	29
5.11.1	Wireless	29
5.11.2	Passive Optical Networks	29
5.12	General Site Conditions	29
6	Design Considerations for Building Systems	31
6.1	Zone Cabling	31
6.1.1	Overview	31
6.1.2	Service Outlet Coverage Areas	31
6.1.3	Service Outlet Coverage Area Zones	32
6.1.4	Device Density	32
6.1.5	Device Connections	33
6.2	Electrical Power	33
6.2.1	Overview	33
6.2.2	Power Supply Units	33
6.2.3	Uninterruptible Power Supplies	34
6.2.4	Electrical Conductors	35
6.3	Simultaneous Data and Power Transmission	35
6.3.1	Introduction	35
6.3.2	Power Injectors	35
6.3.3	Cabling and Installation	36
6.4	Device Mounting Heights	37
6.4.1	Requirements	37
6.4.2	Recommendations	37
6.5	Special Building Areas	37
6.5.1	Water and Wet Areas Requirements	37
6.5.2	Hazardous Areas Requirements	37
6.6	Building Systems Equipment	38
6.6.1	Introduction	38
6.6.2	Recommendations	38
6.7	Network Convergence	39
6.7.1	Overview	39
6.7.2	Network Protocols And Gateways	39
6.7.3	Network Convergence Challenges	39
7	Building Monitoring Systems	41
7.1	Utility Metering	41
7.1.1	Introduction	41
7.1.2	Utility Provider Metering	41
7.1.3	Owner Metering	41
7.2	Building Automation System (BAS)	41
7.2.1	Introduction	41
7.2.2	BAS Hardware	42
7.2.3	BAS Software	43

7.3	Designing and Planning Building Management Systems.....	45
7.3.1	Planning.....	45
7.3.2	General Requirements and Recommendations	45
7.3.3	Requirements.....	45
7.3.4	Resiliency	45
7.3.5	Power.....	46
7.3.6	Controllers and Devices.....	46
7.3.7	Structured Cabling Infrastructure	46
8	Lighting	49
8.1	Overview	49
8.2	Lighting Control Systems	49
8.2.1	Overview	49
8.2.2	Topologies	49
8.3	Task Tuning / Fixed Power Reduction	51
8.3.2	Multilevel Lighting.....	52
8.3.3	Scheduling or Occupancy-Based, Time of Day, and On/Off Control	52
8.3.4	Vacancy-Based On/Off Control	52
8.3.5	Daylight Harvesting.....	52
8.3.6	Demand Limiting or Load Shed	52
8.3.7	Trimming or Lumen Depreciation Compensation	53
8.4	Controller Connectivity and Cabling Infrastructure.....	53
8.4.1	Introduction	53
8.4.2	Requirements	53
8.4.3	Recommendations	53
8.5	Energy Reduction and Lighting Guidelines.....	54
8.5.1	Recommendations	54
9	Other Building Systems	55
9.1	Digital Signage and Wayfinding.....	55
9.1.1	Overview	55
9.1.2	Digital Displays	55
9.1.3	Usage Conditions.....	56
9.1.4	Design Considerations.....	56
9.1.5	Wayfinding Recommendations	57
9.2	Sound and Acoustical Systems	57
9.2.1	Purposes of Sound Systems:	57
9.2.2	Sound Systems.....	57
9.2.3	Sound System Design Conditions:	58
9.2.4	Integration.....	58
9.2.5	Code and AHJ Requirements.....	58
9.3	Intercom System.....	58
9.3.1	Overview	58
9.3.2	Components.....	58
9.3.3	Operation	59
9.3.4	Integration.....	59
9.4	Electronic Safety and Security Systems.....	59
9.4.1	Overview	59
9.4.2	Requirements	59
9.5	Real Time Location Systems (RTLS)	59
9.5.1	Overview	59
9.5.2	Active and Passive Systems.....	60
9.5.3	Common Methods of Transmission.....	60
9.5.4	Uses	60

10	System Integration	61
10.1	Overview.....	61
10.2	Integrated Services, Design and Integration	62
10.2.1	Public Network Services.....	62
10.2.2	Design and Selection of Components	63
10.2.3	Integration.....	63
10.3	Building Automation Systems (BAS) Interfaces with Other Systems.....	63
10.3.1	Fire Alarm Systems	63
10.3.2	Electronic Access Control System.....	64
10.3.3	Video Surveillance.....	64
10.4	Energy Management System (EMS).....	64
10.5	Integrated Energy Management and Heating, Ventilation, and Air-Conditioning (HVAC) Systems..	65
10.6	Automated Infrastructure Management (AIM) with Other Building Systems.....	66
10.6.1	Recommendations.....	66
10.7	Vertical Transportation Interfaces In Intelligent Building.....	66
10.7.1	Building Management.....	66
10.7.2	Changes in Operational Movement.....	67
10.7.3	Fire Detection and Alarm System.....	67
10.7.4	Security and Passenger Communications Systems	68
10.8	A/V Room Automation.....	69
10.8.1	Overview.....	69
10.8.2	Building Management Systems	70
10.8.3	Strategies.....	70
10.9	Global Positioning System	70
10.9.1	Overview.....	70
10.9.2	Requirements	70
10.10	Software.....	70
10.10.1	Overview.....	70
10.10.2	Databases	71
10.10.3	Control and Monitoring	71
10.10.4	Scalability, Resiliency, and Reliability	71
10.11	System Configuration and Expandability	71
10.11.1	Overview.....	71
10.11.2	Input/Output Matrix	72
10.11.3	Maps and Icons	72
10.11.4	System Response Times	72
11	Commissioning.....	73
11.1	Overview.....	73
11.2	Plans.....	73
11.2.1	Commissioning Plan	73
11.2.2	Preliminary Testing and Calibration Plan	73
11.2.3	Acceptance Testing Plan.....	73
11.3	Documentation	74
11.3.1	Overview.....	74
11.3.2	Requirements	74
11.3.3	Record Drawings	74
11.3.4	Operation and Maintenance Manuals.....	74

11.4	System Testing	74
11.4.1	General	74
11.4.2	Preinstallation Testing	75
11.4.3	Preliminary Testing and Calibration.....	75
11.4.4	Burn-in Period	75
11.4.5	Acceptance Testing.....	75
11.4.6	Retesting Equipment and Systems.....	76
11.5	Additional Commissioning Tasks	76
11.5.1	Cleaning.....	77
11.5.2	Labeling Components.....	77
11.5.3	Training	77
Appendix A Commissioning Fundamentals (Informative)		79
A.1	Overview	79
A.2	Terminology	79
A.3	Personnel and Responsibilities	81
A.4	Commissioning Process Stages	84
A.5	Commissioning Process Documentation	89
Appendix B System Training (Informative)		97
B.1	Overview	97
B.2	Sessions	97
B.3	Position or Task Training	97
B.4	Training Schedules	99
Appendix C Data Center Integrated Management (DCIM) (Informative)		101
C.1	Introduction	101
C.2	Components	101
C.3	Communication Protocols, Media and Hardware	103
C.4	Reporting	104
C.5	Recommendations and Conclusion	104
Appendix D Related Documents (Informative)		105