Specifying Communications in Intelligent Buildings for Seamless Integration

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This Session

End Users are looking for the Building Management System to be the Facilities “Universal Remote” for all the Building Systems

• Gain an understanding of complexity for the number and diversity of different systems that can integrate in the intelligent building
• Understand how the main tool in commercial building specification can be used for seamless integration
• Show the importance of integration coordination in the DESIGN and not just the construction process
A Little Background

Centralized control Building Automation Systems has been historically HVAC focused

Traditionally Building Management Systems has been under the Mechanical Engineer for design and the HVAC contractor for installation and service.
A Little Background

Today the Building Management System can encompass Lighting Systems, Fenestration Systems (window), Alarm and Security, Measurement and Verification (metering), and YES even Elevators along with HVAC, plus so many others.

This means the design and installation of each system is the responsibility of many different specifiers and installers. Not always communicating between one another.
The Objective

"Standardize the method of communication between all systems in a commercial building to make integration seamless"
CSI Is Key

CSI MasterFormat is the specifications-writing standard for most commercial building design and construction projects in North America.

Kind of the "Dewey Decimal System" of building construction.
CSI Is Key

The 2004 version has 50 divisions containing each part of a commercial building.

Each division contains a number of sections.
Each section is divided into three parts:

- general
- products
- execution
CSI Covers All Systems
Each system under the control of a Building Management System is listed under a different Division

CSI MasterFormat 2004
Division 8 — Openings (windows)
Division 12 — Furnishings (shades)
Division 14 — Conveying Equipment (elevators)
Division 21 — Fire Suppression (fire detection and pumps)
Division 22 — Plumbing (pumps)
Division 23 — Heating Ventilating and Air Conditioning (HVAC)
Division 26 — Electrical (lighting)
Division 28 — Electronic Safety and Security (alarms and monitors)
Division 48 — Electrical Power Generation (Solar and wind)
Coordination Issues

Design and installation of each system is the separate responsibility of many different specifiers and installers. Not always communicating between one another.

Example; Division 23 specified by the Mechanical Engineer given to the HVAC contractor while Division 26 is specified by the Electrical Engineer and given to the Electrical contractor.
Coordination Issues

Traditionally Building Management Systems has been under the Mechanical Engineer sometimes putting all the integration specifications under Division 23 (HVAC). What you will find is other trades may never see it.

23 09 23 Direct-Digital Control System for HVAC

3.2 Communications

A. Control products, communication media, connectors, repeaters, links, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

3.7 Communication Wiring

I. BACnet MSTP communications wiring shall be installed in accordance with ANSI/IEEE Standard 135. This includes but is not limited to:

1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Dielectric separation between conductors shall be less than 100 μF per meter (30 μF per foot).

2. The maximum length of an MSTP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of BACnet.

3. The maximum number of nodes per segment shall be 32, as specified in the BACnet 4.0 standard. Additional nodes may be accommodated by the use of repeaters.

4. An MSTP BACnet 4.0 network shall have no T connections.
Coordination Issues

Specifiers and installers will care about and understand the functionality and workings of systems they are responsible for but may not be invested in or understand what is involved in the integration to the BMS

Leading to general statements in CSI Specs like

“Building integrator shall provide integration of the lighting control system with Building Automation Systems.”
So Many Ways to Integrate

“Building integrator shall provide integration of the lighting control system with Building Automation Systems.”

BUT HOW?

All types of ways to integrate systems leads to so many question????

Do you want a High Level Protocol like BACnet?
Wires and connectors are what, Cat5, Twisted Pair, RJ45, DB9?
How about a simple integration like Contact Closures?
If you run a network are you using the corporate intranet?
Do you need IP addresses?

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So Many Ways to Integrate

“Building integrator shall provide integration of the lighting control system with Building Automation Systems.”

BUT WHAT?

What features/commands/information do you want to or can you exchange ????

What functions do you want to Control and/or Monitor and does the other system have that capability?

What data do you want to collect and does the other system give that data?

Can you sharing redundant information and eliminate devices?

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Integration Specialist is essential to the Design Team

Someone brought in at time of DESIGN (time of construction is too late) with responsibility of coordinating all BMS specifications, installation, and integration components.

This could be:

- BMS Integrator
- BMS Consultant
- Specifying Engineer
- Facility Manager
CSI Recommendations

Use Division 25 - Integrated Automation !!!!
Added in the 2004 CSI Master Spec as a "place holder" for integration but not used today (or used VERY little)

A central place for all Integration and communication specifications between systems

25 13 00 Integrated Automation Control and Monitoring Network
All control systems to be integrated with the Building Management System (BMS) shall conform to ANSI/ASHRAE Standard 135, BACnet standard.
CSI Recommendations

Add all common protocol requirements to all relevant Divisions

Like

**ETHERNET**
- CAT5

**ARCNET**

Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet/IP Annex J standard

**MSTP**

**ZIGBEE**

**SERIAL**

**Twisted Pair**

**Fiber**

**23 09 23 Communication (Division 23 HVAC)**

Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet/IP Annex J standard

**26 09 43 System Integration (Division 26 Lighting)**

Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet/IP Annex J standard
CSI Recommendations

It’s OK to point

DIVISION 25 - Integrated Automation
25 13 00 Integrated Automation Control and Monitoring Network
All control systems to be integrated with the Building Management System (BMS) shall conform to ANSI/ASHRAE Standard 135, BACnet standard.

DIVISION 23 - HVAC
23 09 23 Communication
Refer to 25 13 00 for control systems building communications protocol requirements.

DIVISION 26 - Lighting
26 09 43 System Integration
Refer to 25 13 00 for control systems building communications protocol requirements.
CSI Recommendations

Advanced BMS communications between systems across the building, campus, or world probably requires the use of the Corporate IT Infrastructure.

Use Division 27 - Communications for Network Physical Architecture

Added in the 2004 CSI Master Spec as a "place holder" for IT
CSI Recommendations

Division 27 helps the Integration Specialist work with the IT Consultant/Group/Department

Example: BMS systems to use the building IT Ethernet infrastructure.

27 51 23 Commercial Intercommunications and Program Systems (Division 27 IT)
All control systems to be integrated with the Building Management System (BMS) use the Ethernet IEEE 802.3 standard

23 09 23 Communication (Division 23 HVAC)
Physical connection to the Building Management System (BMS) to use the Ethernet IEEE 802.3 standard. Refer to 27 51 23 for IT requirements

26 09 43 System Integration. (Division 26 Lighting)
Physical connection to the Building Management System (BMS) to use the Ethernet IEEE 802.3 standard. Refer to 27 51 23 for IT requirements

It’s still OK to point
CSI Recommendations

Each system should have a Sequence of Operation for Integration

The Building Management systems can only control the functions other systems allow.

Just some of the items to list in the specification

• System Scheduling?
• Data Archiving and Analysis?
• Energy Management with Demand Response?
• Building Diagnostics?
• What energy information and how to show to the public?
CSI Recommendations

Specify expected data exchanged for Savings

Example: Occupancy sensors are used in HVAC, Lighting, Security. Use one sensor and share information

Use CSI Divisions and Sections

25 96 00 Integrated Automation control Sequence for Electrical Systems

Place similar instructions in Division 23 for HVAC, 26 for Lighting, and 28 for Security
Conclusion

• Integration Specialist identified at the time of DESIGN to coordinate and facilitate all BMS specifications, installation, and integration components.

• Identify BMS Communication requirements in each CSI Division for every individual system to be integrated.

• Use as Division 25- Integrated Automation and Division 27- Communications for Network Physical Architecture designed for integration and infrastructure coordination.

• Use Pointers between the Divisions used for coordination and system specifications.

• Use the CSI Division “execution” section to spell out the Integration Sequence of Operations for what features, commands, and information is expected to be exchanged.
Questions?

Additional Questions
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THANK YOU

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