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USACE / NAVFAC / AFCEC / NASA **UFGS-23 09 23.01 (February 2019)**
Change 1 - 02/20

Preparing Activity: USACE **Superseding**
UFGS-23 09 23.01 (November 2015)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 09 23.01

LONWORKS DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS

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SECTION 23 09 23.01

LONWORKS DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS
02/19, CHG 1: 02/20

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NOTE: This guide specification covers the requirements for LonWorks-based building control systems using the CEA-709.1-D-C communications protocol, including tailoring options for LNS-based and Niagara Framework-based LonWorks systems.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be as a Criteria Change Request (CCR). CCRs for this specification can be submitted through the Whole Building Design Guide page for this section:
http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufg

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The use of this UFGS, and the design of LonWorks Control Systems, must be in accordance with UFC 3-410-02, DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS. Use this specification in conjunction with UFGS 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC in order to specify a complete and functional system.

Edit this guide specification for project specific requirements ONLY by selecting appropriate tailoring options, choosing applicable items(s), or inserting

appropriate information in bracketed items. Do not make edits outside of bracketed items without prior approval as specified in UFC 3-410-02.

This specification covers installation of local (building-level) controls using LonWorks-based DDC. It is primarily intended for building level control systems which are to be integrated into a Utility Monitoring and Control System (UMCS) as specified in Section 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION (where Section 25 10 10 has also used the matching LonWorks or Niagara Framework tailoring option).

For projects that require the building system to provide UMCS functionality (without connection to a UMCS), the designer must include the necessary requirements from Section 25 10 10 in the project specification.

Template drawings in electronic format for use with this section are available online at the Whole Building Design Guide page for Section 23 09 00:
http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufg
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NOTE: This specification makes use of SpecsIntact Tailoring Options. This note describes these options and how to use them.

"TAILORING OPTION NOTES" Tailoring Option
Each time tailoring options are used there is an accompanying designer note describing the text that is tailored. As this Section makes heavy use of tailoring options there are many of these notes and they can distract from designer notes describing other decisions. The designer notes describing tailoring options are all in a "TAILORING OPTION NOTES" tailoring option which can be hidden (in specsintact select View-Tailoring Options and then deselect "TAILORING OPTION NOTES") once this section is tailored and the tailoring option notes are no longer needed.

"NIAGARA FRAMEWORK" and "LNS" Tailoring Options
This specification includes tailoring options for "NIAGARA FRAMEWORK" and for "LNS". Exactly ONE of these tailoring options must be chosen. You have currently selected the following options:

NIAGARA FRAMEWORK
LNS

If you don't see either the words "NIAGARA FRAMEWORK" or "LNS" between the dashes above, you have not selected a tailoring option and this specification is not valid. Select ONE of the tailoring options.

If you see both "NIAGARA FRAMEWORK" and "LNS" you have selected both tailoring options. Remove one of the tailoring options.

Service Tailoring Option
This specification also includes tailoring options for the Service (Air Force, Army, Navy) the specification is used for. There is a "Service Generic" tailoring option that can also be used. Only ONE of the four tailoring options related to the service should be use. You have currently selected the following options:

AIR FORCE
ARMY
NAVY
SERVICE GENERIC

If more than one item appears between the dashes above you have selected more than one services tailoring option and need to remove all but one of them.
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****
WARNING - Both the NIAGARA FRAMEWORK and LNS Tailoring Options have been selected. This will result in a specification that contains conflicts and cannot be met. DESELECT one of these tailoring options. See UFC 3-410-02.
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PART 1 GENERAL

1.1 SUMMARY

****
NOTE: Designer is to add location and site specific requirements.
****

Provide a complete Direct Digital Control (DDC) system, except for the Front End which is specified in Section 25 10 10 UTILITY MONITORING AND CONTROL (UMCS) FRONT END AND INTEGRATION, suitable for the control of the heating, ventilating and air conditioning (HVAC) and other building-level systems as specified and shown and in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

1.1.1 System Requirements

Provide a system meeting the requirements of both Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and this Section and with the following characteristics:

****
NOTE: The following list paragraph uses tailoring options:

1) The paragraph NOT referencing Niagara Framework is included only when the LNS tailoring option is selected.
2) The paragraph referencing Niagara Framework is included only when the NIAGARA FRAMEWORK tailoring option is selected.
****

a. The control system must be an open implementation of LonWorks technology using CEA-709.1-D as the communications protocol. The system must use LonMark Standard Network Variable Types as defined in LonMark SNVT List exclusively for communication over the network.

The control system must be an open implementation of LonWorks technology using CEA-709.1-D and Fox as the communications protocols. Except for communication between Niagara Framework components (between Niagara Framework Supervisory Gateways or between a Niagara Framework Supervisory Gateway and a Niagara Framework Front End) which must use the Fox Protocol, the system must use LonMark Standard Network Variable Types as defined in LonMark SNVT List exclusively for communication over the network.

****
NOTE: The following list paragraph uses tailoring options:
1) The paragraph referring to LNS is included only when the LNS tailoring option is selected.
2) The paragraph referring to Niagara Framework is included only when the NIAGARA FRAMEWORK tailoring option is selected.
****

b. Use LonWorks Network Services (LNS) for all network management including addressing and binding of network variables. As specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC, submit copies of the complete, fully-commissioned, valid, as-built Final LNS database, including all LNS credits, for the complete control system provided under this specification. All devices must be on-line and commissioned into the LNS database.

Use the Niagara Framework for all network management including addressing and binding of network variables. Each Niagara Framework Supervisory Gateway must contain a database for all controllers connected to its non-IP ports.

****
NOTE: The following list paragraph uses tailoring options for requirements specific to Niagara Framework systems. The requirements specific to Niagara Framework are included only when the NIAGARA FRAMEWORK tailoring option is selected
****

c. Install and configure control hardware, except as specified for Niagara Framework Supervisory Gateways, to provide all input and output Standard Network Variables (SNVTs) as indicated and as needed to meet the requirements of this specification. Points in Niagara Framework Supervisory Gateways which do not communicate with

non-Niagara Framework DDC Hardware may be exposed via Fox instead.

****

NOTE: The following list paragraph uses tailoring options for requirements specific to Niagara Framework systems. The requirements specific to Niagara Framework are included only when the NIAGARA FRAMEWORK tailoring option is selected

****

d. All DDC hardware installed under this specification must communicate via CEA-709.1-D, and Niagara Framework Supervisory Gateways must also communicate over the IP network via Fox. Install the control system such that a SNVT output from any node on the network can be bound to any other node in the same domain.

****

NOTE: Select Web Pages if a local (in the building) web interface is required.

The following TWO list paragraphs apply only to Niagara Framework systems and are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

e. Use Niagara Framework hardware and software exclusively for alarming, scheduling, trending, and communication with a front end (UMCS). Use the Fox protocol for all communication between Niagara Framework Supervisory Gateways; use the CEA-709.1-D protocol for all other building communication. [Niagara Framework Supervisory Gateway must serve web pages as specified.]

****

NOTE: Select the required version of the Niagara Framework. This choice must be carefully coordinated with the project site. Niagara Framework is currently (2015) in a transition between two releases: "AX" and "Version 4". A Version 4 UMCS front end (e.g. as specified in Section 25 10 10) will work with either an AX or Version 4 Niagara Framework Supervisory Gateway, but an AX front end will ONLY work with an AX Niagara Framework Supervisory Gateway.

If the site has an AX front end, select "AX".
If the site has a Version 4 front end, or does not have a front end:
1) if there are multiple vendors servicing the project site that support Version 4, select "Version 4"

2) otherwise, select "either AX or Version 4"

****

f. Use Niagara Framework [AX][Version 4.0 or later][either AX or Version 4.0 or later].

1.1.2 Verification of Specification Requirements

Review all specifications related to the control system installation and advise the Contracting Officer of any discrepancies before performing any work. If Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC or any other Section referenced in this specification is not included in the project specifications advise the Contracting Officer and either obtain the missing Section or obtain Contracting Officer approval before performing any work.

1.2 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

CONSUMER ELECTRONICS ASSOCIATION (CEA)

CEA-709.1-D	(2014) Control Network Protocol Specification
CEA-709.3	(1999; R 2015) Free-Topology Twisted-Pair Channel Specification
CEA-852-C	(2014) Tunneling Device Area Network Protocols Over Internet Protocol Channels

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 802.3	(2018) Ethernet

INTERNET ENGINEERING TASK FORCE (IETF)

IETF RFC 4361	(2006) Node-specific Client Identifiers for Dynamic Host Configuration Protocol Version Four (DHCPv4)
IETF RFC 7465	(2015) Prohibiting RC4 Cipher Suites

LONMARK INTERNATIONAL (LonMark)

LonMark Interoperability Guide	(2005) LonMark Application-Layer Interoperability Guide and LonMark Layer 1-6 Interoperability Guide; Version 3.4
LonMark SCPT List	(2014) LonMark SCPT Master List; Version 15
LonMark SNVT List	(2014) LonMark SNVT Master List; Version 15
LonMark XIF Guide	(2001) LonMark External Interface File Reference Guide; Revision 4.402

TRIDIUM, INC (TRIDIUM)

Niagara Framework	(2012) NiagaraAX User's Guide
Tridium Open NiCS	(2005) Understanding the NiagaraAX Compatibility Statement (NiCS)

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 916	(2015) Standard for Energy Management Equipment

1.3 DEFINITIONS

For definitions related to this section, see Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

1.4 SUBMITTALS

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NOTE: Submittals related to this section are specified in UFGS 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. UFGS 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC MUST be used with this specification to have a complete specification.

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Submittals related to this Section are specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

PART 2 PRODUCTS

All products used to meet this specification must meet the specified requirements, but not all products specified here will be required by every project. Provide products which meet the requirements of both Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and this Section.

2.1 NETWORK HARDWARE

2.1.1 CEA-709.1-D Routers

CEA-709.1-D Routers must meet the requirements of CEA-709.1-D and must provide connection between two or more CEA-709.3 TP/FT-10 channels, or between one or more CEA-709.3 TP/FT-10 channels and a LonMark Interoperability Guide TP/XF-1250 channel.

2.1.2 CEA-709.1-D Repeaters

CEA-709.1-D Repeaters must be CEA-709.1-D Routers configured as repeaters. Physical layer repeaters are prohibited.

2.1.3 CEA-709.1-D Gateways

****

NOTE: This subpart uses tailoring options for requirements specific to Niagara Framework systems. The requirements specific to Niagara Framework are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

In addition to the requirements for DDC Hardware, CEA-709.1-D gateways must be a Niagara Framework Supervisory Gateway or must:

a. Allow bi-directional mapping of data between the non-CEA-709.1-D protocol and SNVTs

b. Incorporate a network connection to a TP/FT-10 network in accordance with CEA-709.3 and a separate connection appropriate for the a non-CEA-709.1-D network

Although Gateways must meet DDC Hardware requirements, except for Niagara Framework Supervisory Gateways, they are not DDC Hardware and must not be used when DDC Hardware is required. (Niagara Framework Supervisory Gateways are both Gateways and DDC Hardware.)

2.1.4 CEA-852-C Router

****

NOTE: This subpart applies only to LNS-based systems and is only included when the LNS tailoring option is selected.

****

CEA-852-C Routers must perform layer 3 routing of CEA-709.1-D packets over an IP network in accordance with CEA-852-C. The router must provide the appropriate connection to the IP network and connections to the CEA-709.3 TP/FT-10 or LonMark Interoperability Guide TP/XF-1250 network. CEA-852-C Routers must support the Dynamic Host Configuration Protocol (DHCP; IETF RFC 4361 for IP configuration and the use of an CEA-852-C Configuration Server (for CEA-852-C configuration), but must not rely on these services for configuration. CEA-852-C Routers must be capable of manual configuration via a console RS-232 or USB port.

2.1.5 Ethernet Switch

****

NOTE: Select whether Ethernet Switches must be managed. In general, do NOT require managed switches unless there is a specific project requirement for managed switches. Managed switches add cost to the system, and require that they be managed by the project site following installation. Some sites are equipped to handle such management, but for some (many) sites this will be an unacceptable O&M burden.

****

Ethernet Switches [must be managed switches and]must autoconfigure between 10,100 and 1000 megabits per second (MBPS).

2.2 CONTROL NETWORK WIRING

a. Provide TP/FT-10 control wiring in accordance with CEA-709.3.

b. Provide TP/XF-1250 control wiring in accordance with the LonMark Interoperability Guide.

****

NOTE: Although the controls contractor installs the building control system backbone, which is an IP network, this system will later be integrated into the basewide network via the FPOC. To ensure no issues arise during this later integration, obtain additional Ethernet media requirements (if any) from the project site NEC.

****

c. For the Building Control Network IP Network provide media that is CAT-5e Ethernet media at a minimum and meets all requirements of IEEE 802.3 [and [_____]].

2.3 DIRECT DIGITAL CONTROL (DDC) HARDWARE

All DDC Hardware must meet the following general requirements:

****

NOTE: The following paragraph uses tailoring options. The phrase "Except for Niagara Framework Supervisory Gateways, it" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

a. Except for Niagara Framework Supervisory Gateways, it It must incorporate a "service pin" which, when pressed will cause the DDC Hardware to broadcast its 48-bit NodeID and its ProgramID over the network. The service pin must be distinguishable and accessible.

b. It must incorporate a light to indicate the device is receiving power.

****

NOTE: The following paragraph uses tailoring options: 1) The phrase "Except for Niagara Framework

Supervisory Gateways, it" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

2) Transceiver requirements related to Niagara Framework Supervisory Gateways are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

c. Except for Niagara Framework Supervisory Gateways, it must It must incorporate a TP/FT-10 transceiver in accordance with CEA-709.3 and connections for TP/FT-10 control network wiring. Niagara Framework Supervisory Gateways must incorporate an IP connection and at least one other transceiver. These other transceivers must be either a TP/FT-10 transceiver in accordance with CEA-709.3 or a TP/XF-1250 transceiver in accordance with LonMark Interoperability Guide. Niagara Framework Supervisory gateways must have connection of the appropriate type for each transceiver.

****

NOTE: The following paragraph uses tailoring options - "or the Fox protocol" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

d. It must communicate on the network using only the CEA-709.1-D protocol or the Fox protocol.

****

NOTE: The following paragraph uses tailoring options
1) "LNS" is only included when the LNS tailoring option is selected.

2) "the Niagara Framework" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

e. It must be capable of having network communications configured via LNS the Niagara Framework.

****

NOTE: FYI, a link powered device gets it's power from the communication cable as opposed to from a separate power source.

****

f. It must be locally powered; link powered devices are not acceptable.

****

NOTE: The following paragraph uses tailoring options for requirements specific to Niagara Framework systems:
"except Niagara Framework Supervisory Gateways" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

g. LonMark external interface files (XIF files), as defined in the

LonMark XIF Guide, must be submitted for each type of DDC Hardware except Niagara Framework Supervisory Gateways.

h. Application programs and configuration settings must be stored in a manner such that a loss of power does not result in a loss of the application program or configuration settings:

(1) Loss of power must never result in the loss of application programs, regardless of the length of time power is lost.

(2) Loss of power for less than 2,500 hours must not result in the loss of configured settings.

i. It must have all functionality specified and required to support the application (Sequence of Operation or portion thereof) in which it is used, including but not limited to:

****

NOTE: The following paragraph uses tailoring options for requirements specific to Niagara Framework systems. The phrases "or Niagara Framework Points", and "and Niagara Framework Points" are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

(1) It must provide input and output SNVTs or Niagara Framework Points as specified, as indicated on the Points Schedule, and as otherwise required to support the sequence and application in which it is used. All SNVTs and Niagara Framework Points must have meaningful names identifying the value represented by the SNVT or Niagara Framework Points . Unless a standard network variable type of an appropriate engineering type is not available, all network variables must be of a standard network variable type with engineering units appropriate to the value the variable represents.

****

NOTE: The following paragraph uses tailoring options for requirements specific to Niagara Framework systems. The sentence referring to Niagara Framework is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

(2) All settings and parameters used by the application in which the DDC hardware is used must be configurable via one of the following: standard configuration properties (SCPTs) as defined in the LonMark SCPT List, user-defined configuration properties (UCPTs), network configuration inputs (*nci*s) of a SNVT type as defined in the LonMark SNVT List, network configuration inputs (*nci*s) of a user defined network variable type, or hardware settings on the controller itself. Niagara Framework Supervisory Gateways may instead be configurable via the Niagara Framework.

j. It must meet FCC Part 15 requirements and have UL 916 or equivalent safety listing.

****

NOTE: FYI - The following requires that contractors with hardware that could be submitted under several categories to choose which requirements they must meet. This ensures that the device is evaluated according to its actual use.
****

****
NOTE: The following paragraph uses tailoring options for requirements specific to Niagara Framework systems. "Niagara Framework Supervisory Gateway" is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

k. In addition to these general requirements and the DDC Hardware Input-Output (I/O) Function requirements, all DDC Hardware must also meet the requirements of a Niagara Framework Supervisory Gateway, a Local Display Panel (LDP), Application Specific Controller (ASC), General Purpose Programmable Controller (GPPC), or an Application Generic Controller (AGC). All pieces of DDC Hardware must have their DDC Hardware Type identified as part of the Manufacturer's Product Data submittal as specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. Except for Local Display Panels provided as part of another controller, where a single device meets the requirements of multiple types, select a single type for that specific device based on it's use. Where a Local Display Panel is provided as part of another device, indicate both the controller type and local display panel. One model of DDC hardware may be submitted as different DDC Hardware types when used in multiple applications.

l. The user interface on all DDC Hardware with a user interface which allows for modification of a value must be password protected.

m. Clocks in DDC Hardware incorporating a Clock must continue to function for 120 hours upon loss of power to the DDC Hardware.

2.3.1 Hardware Input-Output (I/O) Functions

DDC Hardware incorporating hardware input-output (I/O) functions must meet the following requirements:

2.3.1.1 Analog Inputs

DDC Hardware analog inputs (AIs) must perform analog to digital (A-to-D) conversion with a minimum resolution of 8 bits plus sign or better as needed to meet the accuracy requirements specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. Signal conditioning including transient rejection must be provided for each analog input. Analog inputs must be capable of being individually calibrated for zero and span. Calibration via software scaling performed as part of point configuration is acceptable. The AI must incorporate common mode noise rejection of at least 50 dB from 0 to 100 Hz for differential inputs, and normal mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10,000 ohms.

2.3.1.2 Analog Outputs

****

NOTE: PART 3 of this section and the Points Schedules may require that points have an H-O-A switch. For analog outputs these switches may be "full on, full off" overrides or may have a knob allowing for override to any value (0-100 percent). Unless the project site specifically requires that analog outputs be fully adjustable through the range 0-100 percent, keep the bracketed text allowing either option (i.e. keep "to 0 percent and to 100 percent". Requiring fully adjustable overrides (i.e. "through the range of 0 percent to 100 percent") will likely raise the cost of the system.

****

DDC Hardware analog outputs (AOs) must perform digital to analog (D-to-A) conversion with a minimum resolution of 8 bits plus sign, and output a signal with a range of 4-20 mAdc or 0-10 Vdc. Analog outputs must be capable of being individually calibrated for zero and span. Calibration via software scaling performed as part of point configuration is acceptable. DDC Hardware with Hand-Off-Auto (H-O-A) switches for analog outputs must provide for overriding the output [to 0 percent and to 100 percent][through the range of 0 percent to 100 percent]

2.3.1.3 Binary Inputs

DDC Hardware binary inputs (BIs) must accept contact closures and must ignore transients of less than 5 milli-second duration. Protection against a transient of 50 Vac must be provided.

2.3.1.4 Binary Outputs

DDC Hardware binary outputs (BOs) must provide relay contact closures or triac outputs for momentary and maintained operation of output devices. DDC Hardware with H-O-A switches for binary outputs must provide for overriding the output open or closed.

2.3.1.4.1 Relay Contact Closures

Closures must have a minimum duration of 0.1 second. Relays must provide at least 180V of isolation. Electromagnetic interference suppression must be provided on all output lines to limit transients to 50 Vac. Minimum contact rating must be 0.5 amperes at 24 Vac.

2.3.1.4.2 Triac Outputs

Triac outputs must provide at least 180 V of isolation. Minimum contact rating must be 0.5 amperes at 24 Vac.

2.3.1.5 Pulse Accumulator

DDC Hardware pulse accumulators must have the same characteristics as the BI. In addition, a buffer must be provided to totalize pulses. The pulse accumulator must accept rates of at least 20 pulses per second. The totalized value must be resettable via a configurable parameter.

[2.3.1.6 Integrated H-O-A Switches

****

NOTE: Even if H-O-A switches are implemented,

Requiring feedback of H-O-A status may seriously limit competition and raise project costs. Unless there is a specific project requirement for H-O-A feedback, remove the bracketed text.
****

****
NOTE: This subpart uses tailoring options for requirements specific to Niagara Framework systems. "Niagara Framework of via" is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

Where integrated H-O-A switches are provided on hardware outputs, controller must provide means of monitoring position or status of H-O-A switch. This feedback may be provided via the Niagara Framework or via network variable.

]2.3.2 Local Display Panel (LDP)

****
NOTE: This subpart uses tailoring options for requirements specific to Niagara Framework systems. "Niagara Framework points" is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

The Local Display Panels (LDPs) must be DDC Hardware with a display and navigation buttons or a touch screen display, and must provide display and adjustment of Niagara Framework points or network variables as indicated on the Points Schedule and as specified. LDPs must be provided as stand-alone DDC Hardware or as an integral part of another piece of DDC Hardware. LDPs must come factory installed with all applications necessary for the device to function as an LDP.

The adjustment of values using display and navigation buttons must be password protected.

2.3.3 Application Specific Controller (ASC)

Application Specific Controllers (ASCs) have a fixed factory-installed application program (i.e. ProgramID) with configurable settings and do not have the ability to be programmed for custom applications. ASCs must meet the following requirements in addition to the General DDC Hardware and DDC Hardware Input-Output (I/O) Function requirements:

a. ASCs must be LonMark Certified.

****
NOTE: The following list paragraph uses tailoring options:
1) The paragraph referring to Niagara Framework and Niagara Framework Wizards is included only when the NIAGARA FRAMEWORK tailoring option is selected.

2) The paragraph referring to LNS and LNS Plug-ins is included only when the NIAGARA FRAMEWORK tailoring option is selected.
****

b. Unless otherwise approved, all necessary Configuration Properties and network configuration inputs (*nci*s) for the sequence and application in which the ASC is used must be fully configurable through the Niagara Framework. Application Specific Controller configurable via a Niagara Framework Wizard is preferred. Wizards must be submitted for each type (manufacturer and model) of Application Specific Controller which has a Wizard available for configuration. Wizards distributed under a license must be licensed to the project site. (Note: configuration accomplished via hardware settings does not require configuration via Niagara Framework Wizard.){/NIAGARA FRAMEWORK}

Unless otherwise approved, all necessary Configuration Properties and network configuration inputs (*nci*s) for the sequence and application in which the ASC is used must be fully configurable through an LNS plug-in. LNS Plug-ins must be submitted for each type (manufacturer and model) of Application Specific Controller. LNS Plug-ins distributed under a license must be licensed to the project site. (Note: configuration accomplished via hardware settings does not require configuration via plug-in)

c. ASCs may include an integral or tethered Local Display Panel

2.3.4 General Purpose Programmable Controller (GPPC)

A General Purpose Programmable Controller (GPPC) must be programmed for the application. GPPCs must meet the following requirements in addition to the general DDC Hardware requirements and Hardware Input-Output (I/O) Functions:

a. The programmed GPPC must conform to the LonMark Interoperability Guide.

b. All programming software required to program the GPPC must be delivered to and licensed to the project site in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. Submit the most recent version of the Programming software for each type (manufacturer and model) of General Purpose Programmable Controller (GPPC).

****

NOTE: The requirement to submit source code is vital to allow the Government to maintain the system and modify or reprogram devices if needed. The intent is that the Government can both:

1) modify the source code and re-download to the controller to change the sequence

2) buy an unprogrammed identical replacement controller and download the program into it in order to replace the controller

****

c. Submit copies of the installed GPPC application programs (all software that is not common to every controller of the same manufacturer and model) as source code compatible with the supplied programming software in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The submitted GPPC application program must be the complete application necessary for the GPPC to function as installed

and be sufficient to allow replacement of the installed controller with a GPPC of the same type.

d. GPPCs may be include an integral or tethered Local Display Panel

2.3.5 Application Generic Controller (AGC)

An Application Generic Controller (AGC) has a fixed application program which includes the ability to be programmed for custom applications. AGCs must meet the following requirements in addition to the general DDC Hardware requirements and Hardware Input-Output (I/O) Functions:

a. The programmed AGC must conform to the LonMark Interoperability Guide.

b. The AGC must have a fixed ProgramID and fixed XIF file.

****

NOTE: The following TWO list paragraphs use tailoring options:
1) Requirements for LNS plug-ins are included only when the LNS tailoring option is selected.

2) Requirements for Niagara Framework Wizards are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

c. Unless otherwise approved, the ACG must be fully configurable and programmable for the application using one or more LNS plug-ins Niagara Framework Wizards, all of which must be submitted as specified for each type of AGC (manufacturer and model).

d. Submit copies of the installed AGC application programs as source code compatible with the supplied LNS plug-in Niagara Framework Wizard used for programming the device in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The submitted AGC application program must be the complete application program necessary for the AGC to function as installed and be sufficient to allow replacement of the installed controller with an AGC of the same type.

****

NOTE: The requirement to submit source code is vital to allow the Government to maintain the system and modify or reprogram devices if needed. The intent is that the Government can both:

1) modify the source code and re-download to the controller to change the sequence

2) buy an unprogrammed identical replacement controller and download the program into it in order to replace the controller

****

e. AGCs may be include an integral or tethered Local Display Panel

2.3.6 Niagara Framework Supervisory Gateway

****

NOTE: This subpart applies only to Niagara Framework systems and is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

****
NOTE: FYI - The Niagara Framework Supervisory Gateway is known by many names within industry, and this specification uses the name "Niagara Framework Supervisory Gateway" in order to remain vendor neutral. Probably the most common term used for this device in industry is a "Java Application Control Engine", or JACE.
****

Any device implementing the Niagara Framework is a Niagara Framework Supervisory Gateway and must meet these requirements. In addition to the general requirements for all DDC Hardware, Niagara Framework Supervisory Gateway Hardware must:

a. Be direct digital control hardware.

b. Have an unrestricted interoperability license and its Niagara Comparability Statement (NiCS) must follow the Tridium Open NiCS Specification.

c. Manage communications between a field control network and the Niagara Framework Monitoring and Control Software, and between itself and other Niagara Framework Supervisory Gateways. Niagara Framework Supervisory Gateway Hardware must use Fox protocol for communication with other Niagara Framework Components, regardless of the manufacturer of the other components.

d. Be fully programmable using the Niagara Framework Engineering Tool and must support the following:

(1) Time synchronization, Calendar, and Scheduling using Niagara Scheduling Objects

(2) Alarm generation and routing using the Niagara Alarm Service

(3) Trending using the Niagara History Service and Niagara Trend Log Objects

(4) Integration of field control networks using the Niagara Framework Engineering Tool

(5) Configuration of integrated field control system using the Niagara Framework Engineering Tool when supported by the field control system

e. Meet the following minimum hardware requirements:

(1) [One][Two] 10/100/1000 Mbps Ethernet Port(s)

[(3) Central Processing Unit of 600 Mhz or higher.][

(4) Embedded operating system.]

f. provide access to field control network data and supervisory functions via web interface and support a minimum of 16 simultaneous users. Note: implementation of this capability may not be required on this project; see requirements in PART 3, EXECUTION of this Section.

g. Submit a backup of each Niagara Framework Supervisory Gateway as specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The backup must be sufficient to restore a Niagara Framework Supervisory Gateway to the final as-built condition such that a new Niagara Framework Supervisory Gateway loaded with the backup is indistinguishable in functionality from the original.

2.4 NIAGARA FRAMEWORK ENGINEERING TOOL

****

NOTE: This subpart applies only to Niagara Framework systems and is only included when the NIAGARA FRAMEWORK tailoring option is selected.

****

The Niagara Framework Engineering Tool must be Niagara Workbench or an equivalent Niagara Framework engineering tool software must:

a. have an unrestricted interoperability license and its Niagara Compatibility Statement (NiCS) must follow the Tridium Open NiCS Specification.

b. be capable of performing network configuration for Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.

c. be capable of programming and configuring of Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.

d. be capable of discovery of Niagara Framework Supervisory Gateways and all points mapped into each Niagara Framework Supervisory Gateway and making these points accessible to Niagara Framework Monitoring and Control Software.

Monitoring and Control Software is specified in Section 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION.

PART 3 EXECUTION

3.1 CONTROL SYSTEM INSTALLATION

3.1.1 Niagara Framework Engineering Tool

****

NOTE: This subpart applies only to Niagara Framework systems and is only included when the NIAGARA FRAMEWORK tailoring option is selected.

****

****

NOTE: If the installation has a Niagara Framework Engineering Tool keep the first bracketed text and provide the software name and version number in the

space provided. If the installation does not have a Niagara Framework Engineering Tool keep the second bracketed text.
****

[The project site currently has the [_____] Niagara Framework Engineering Tool. If this software is not adequate for programming the Niagara Framework Supervisory Gateways provided under this project, provide a Niagara Framework Engineering Tool as specified.][Provide a Niagara Framework Engineering Tool as specified.]

3.1.2 Building Control Network (BCN)

****
NOTE: This subpart uses tailoring options:
1) "Niagara Framework Supervisory Gateways" is included only when the NIAGARA FRAMEWORK tailoring option is selected.

2) "CEA-852-C Routers" is included only when the LNS tailoring option is selected.
****

Provide a Building Control Network (BCN) connecting all DDC hardware as specified. The Building Control Network (BCN) must consist of an IP Network, one or more Niagara Framework Supervisory Gateways CEA-852-C Routers, and one or more Non-IP Building Control Network Channels:

3.1.2.1 Building Control Network (BCN) Installation

****
NOTE: This subpart uses tailoring options:
1) "Niagara Framework Supervisory Gateways" is included throughout this subpart only when the NIAGARA FRAMEWORK tailoring option is selected.

2) "CEA-852-C Routers" is included throughout this subpart only when the LNS tailoring option is selected.
****

Provide building control networks meeting the following requirements:

a. Provide a Building Control Network IP Network, Non-IP Building Control Network Channels and Niagara Framework Supervisory Gateways CEA-852-C Routers to a create a single building control network connecting all DDC Hardware.

b. In addition to the connection to the Niagara Framework Supervisory Gateway CEA-852-C Router, each Non-IP Building Control Network (BCN) Channel directly connected to a Niagara Framework Supervisory Gateway CEA-852-C Router must be directly connected to either DDC Hardware or to CEA-709.1-D Routers, but not to both. A channel containing only CEA-709.1-D Routers is a backbone channel and a channel containing DDC Hardware is a non-backbone channel.

c. When only a single Niagara Framework Supervisory Gateway CEA-852-C Router is required, the IP network consists of only the Niagara Framework Supervisory Gateway CEA-852-C Router. When multiple Niagara

Framework Supervisory Gateways CEA-852-C Routers are required, provide an IP Network connecting all Niagara Framework Supervisory Gateways CEA-852-C Routers.

****
NOTE: The following list paragraph uses tailoring options. The text "other than Niagara Framework Supervisory Gateways" and the text "Connect all Niagara Framework Supervisory Gateways to the Building Control Network (BCN) IP Network." are only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

d. Connect all DDC Hardware other than Niagara Framework Supervisory Gateways to a non-backbone BCN Channel. Connect all Niagara Framework Supervisory Gateways to the Building Control Network (BCN) IP Network.

e. Install components such that there is no more than than one CEA-709.1-D Router between any DDC Hardware and a Niagara Framework Supervisory Gateway CEA-852-C Router

f. Install the network such that the peak expected bandwidth usage for each and every channel is less than 70 percent, including device-to-device traffic and traffic to the Utility Monitoring and Control System (UMCS) as indicated on the Points Schedule.

****
NOTE: The following list paragraph uses tailoring options. The text "other than a Niagara Framework Supervisory Gateway" is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

g. Where multiple pieces of DDC Hardware are used in the execution of a single sequence of operation, directly connect all DDC Hardware used to execute the sequence to the same channel and do not install other DDC Hardware, other than a Niagara Framework Supervisory Gateway, to that channel.

3.1.2.2 Non-IP Building Control Network (BCN) Channel

Provide Non-IP Building Control Network (BCN) Channels meeting the following requirements:

a. For each non-backbone channel, provide a TP/FT-10 channel in doubly terminated bus topology in accordance with CEA-709.3. For each backbone channel, provide either a TP/FT-10 channel in doubly terminated bus topology in accordance with CEA-709.3 or a TP/XF-1250 channel in accordance with the LonMark Interoperability Guide.

b. Connect no more than 2/3 the maximum number of devices permitted by CEA-709.3 to each TP/FT-10 channel. Connect no more than 2/3 the maximum number of devices permitted by LonMark Interoperability Guide to TP/XF-1250 channel.

c. Connect no more than 2/3 the maximum number of devices permitted by the manufacturer of the device transceivers to each channel. When more than one type of transceiver is used on the same channel, use the

transceiver with the lowest maximum number of devices to calculate the 2/3 limit.

3.1.2.3 Building Control Network (BCN) IP Network

Install IP Network Cabling in conduit. Install Ethernet Switches in lockable enclosures. Install the Building Control Network (BCN) IP Network so that it is available at the Facility Point of Connection (FPOC) location [as specified][_____]. When the FPOC location is a room number, provide sufficient additional media to ensure that the Building Control Network (BCN) IP Network can be extended to any location in the room.

3.1.3 DDC Hardware

****

NOTE: Select bracketed text for requirements when no Application Specific controller exists for the application. This selection must be made in coordination with the project site, as they may have a specific requirement related to their O&M capabilities or preferences.

One option for systems using the Niagara Framework is to require the use of a Niagara Framework Supervisory Gateway whenever an Application Specific Controller isn't available for the application (essentially allowing only Niagara Framework Supervisory Gateways and Application Specific Controllers and prohibiting Application Generic Controllers and General Purpose Programmable Controllers). Remove the bracketed text (from "or Application Generic " through the end of the paragraph) to require the use of Niagara Framework Supervisory Gateways when Application Specific Controllers aren't available for the application in question. Otherwise, keep this bracketed text and then select the appropriate bracketed text.

Select appropriate bracketed text to indicate requirement for programmable controllers or multiple application specific controllers in cases where a single application specific controller for the application is not available.

The first option ("Application Generic Controllers, General Purpose Programmable Controllers or multiple Application Specific Controllers") is most permissive and should be used when the project site does not have a specific requirement.

If the third option ("multiple Application Specific Controllers") is selected, requirements related only to General Purpose Programmable Controllers and Application Generic Controllers may be removed from this Section. Great caution must be exercised in removing these requirements to ensure that requirements related to Application Specific Controllers are not affected by the removal of text.

****

****

NOTE: This subpart uses tailoring options:
1) "Niagara Framework Supervisory Gateways","via the Niagara Framework" and "a Niagara Framework Supervisory Gateway [or " are included only when the NIAGARA FRAMEWORK tailoring option is selected.

2) "CEA-852-C Routers" and "via LNS using an LNS-based Network Configuration Tool" are included only when the LNS tailoring option is selected.

****

Install Niagara Framework Supervisory Gateways CEA-852-C Routers in lockable enclosures. Install other DDC Hardware which is not is suspended ceilings in [lockable]enclosures.

Configure and commission all DDC Hardware on the Building Control Network via the Niagara Frameworkvia LNS using an LNS-based Network Configuration Tool. Use Application Specific Controllers whenever an Application Specific Controller suitable for the application exists. When an Application Specific Controller suitable for the application does not exist use a Niagara Framework Supervisory Gateway [or [Application Generic Controllers, General Purpose Programmable Controllers or multiple Application Specific Controllers][Application Generic Controllers or General Purpose Programmable Controllers][multiple Application Specific Controllers]].

3.1.3.1 Hand-Off-Auto (H-O-A) Switches

****

NOTE: See also DDC Hardware in PART 2.

The bracketed text is a general requirement for H-O-A switches and should only be included if such a requirement is absolutely necessary. It is best practice to use overrides in lieu of H-O-A switches. If H-O-A switches are specifically required by the project site it is best to remove the bracketed text and indicate which points require H-O-A switches on the Points Schedules.

Note that many sequences already have H-O-A switch requirements for motors independent of any other H-O-A requirements.

Select the desired capability for external switches for analog outputs

****

Provide Hand-Off-Auto (H-O-A) switches [for all DDC Hardware analog outputs and binary outputs used for control of systems other than terminal units,]as specified and as indicated on the Points Schedule. H-O-A switches must be integral to the controller hardware, an external device co-located with (in the same enclosure as) the controller, integral to the controlled equipment, or an external device co-located with (in the same enclosure as) the controlled equipment.

a. For H-O-A switches integral to DDC Hardware, meet the requirements specified in paragraph DIRECT DIGITAL CONTROL (DDC) HARDWARE.

b. For external H-O-A switches for binary outputs, provide switches capable of overriding the output open or closed.

c. For external H-O-A switches for analog outputs, provide switches capable of overriding [to 0 percent or 100 percent][through the range of 0 percent to 100 percent].

3.1.3.2 Local Display Panels

****
NOTE: This subpart uses tailoring option: The text "points in a Niagara Framework Supervisory Gateway or" is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

****
NOTE: Indicate on each Points Schedule which points, if any, are to be displayed or overridable from an LDP.

Coordinate with the project site to determine number and location of LDPs needed and show on them on the drawings.
****

Provide LDPs to display and override values of points in a Niagara Framework Supervisory Gateway or Network Variables as indicated on the Points Schedule. Install LDPs displaying points for anything other than a terminal unit in the same room as the equipment. Install LDPs displaying points for only terminal units [in a mechanical room central to the group of terminal units it serves][_____].

[3.1.3.3 Graphics and Web Pages

****
NOTE: This subpart applies only to Niagara Framework systems and is only included when the NIAGARA FRAMEWORK tailoring option is selected.
****

****
NOTE: Only include this requirement if requiring web pages served from the Niagara Framework Supervisory Gateway. Select options based on project requirements.

Note that serving web pages from the Niagara Framework Supervisory Gateway is normally not necessary as web pages will typically be served from a Niagara Framework front end.

The contractor will require a certificate for the Web Server (in order to use HTTPS as required here). Coordinate with the project site IT organization

{ARMY}(NEC){/ARMY} to obtain this certificate.

****

Configure Niagara Framework Supervisory Gateways to use web pages to provide a graphical user interface including System Displays[using the project site sample displays], including overrides, as indicated on the Points Schedule and as specified. Label all points on displays with [full English language descriptions][the point name as indicated on the Points Schedule][the point description as indicated on the Points Schedule][_____]. Configure user permissions for access to and executions of action using graphic pages. Coordinate user permissions with [the [Controls] [HVAC] [Electrical] shop supervisor][_____]. Configure the web server to use HTTPS based on the Transport Layer Security (TLS) protocol in accordance with IETF RFC 7465 using a Government furnished certificate.

]3.1.3.4 Overrides for GPPCs and AGCs

****

NOTE: The following methods of implementing overrides are intended to be used for overriding setpoints and outputs. They will also work to override inputs, but the use of overrides on inputs is strongly discouraged since the operator loses all indication of the actual state of the system (e.g. The operator overrides zone temperature to 65 to force heating, zone heats up to 85 and operator has no indication that it's hot in the zone).

****

Provide the capability to override points for all General Purpose Programmable Controllers and Application Generic Controllers as specified and as indicated on the Points Schedule using one of the following methods:

a. Override SNVT of Same SNVT Type method:

(1) Use this method for all setpoint overrides and for overrides of inputs and outputs whenever practical.

(2) Provide a SNVT input to the DDC hardware containing the point to be overridden of the same SNVT type as the point to be overridden.

(3) Program and configure the DDC hardware such that:

(a) If the value of the SNVT on the override input is the *Invalid Value* defined for that SNVT by the LonMark SNVT List, then the point is not overridden (its value is determined from the sequence).

(b) If the value of the SNVT on the override input is not the *Invalid Value* defined for that SNVT by the LonMark SNVT List then set the value of the point to be overridden to the value of the SNVT on the override input.

b. HVAC Override SNVT method:

(1) Use this method for override of inputs and outputs when the "Override SNVT Shares SNVT Type" method is impractical.

(2) Provide a SNVT input to the DDC hardware containing the point to be overridden of SNVT type *SNVT hvac overid*. Show on the Points Schedule how to perform the specified override using this SNVT.

3.1.3.5 Overrides for ASCs

Whenever possible use the methods specified for General Purpose Programmable Controllers and Application Generic Controllers to perform overrides for all Application Specific Controllers. If neither the "Override SNVT of Same SNVT Type" method or "HVAC Override SNVT" method are supported by the Application Specific Controller show this on the Points Schedule and perform overrides as follows:

a. Provide one or more SNVT input(s) to the DDC hardware containing the point to be overridden. Document the number and type of each SNVT provided on the Points Schedule.

b. Configure the Application Specific Controller such that:

(1) For some specific combination or combinations of values at the SNVT override input(s) the point is not overridden, and its value is determined from the sequence as usual. Show on the Points Schedule the values required at the SNVT override input(s) to not override the point.

(2) For other specific combinations of SNVT override input(s), the value of the point to be overridden is determined from the value of the override input(s). Show on the Points Schedule the correlation between the SNVT override input(s) and the resulting value of the overridden point.

3.1.4 Scheduling, Alarming, Trending and Overrides

3.1.4.1 Scheduling

****

NOTE: The following paragraph applies only to Niagara Framework systems and is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

Configure schedules in Niagara Framework Supervisory Gateway using Niagara Schedule Objects as indicated on the Points Schedule and as specified. When the schedule is controlling occupancy modes in DDC Hardware other than a Niagara Framework Supervisory Gateway use a network variable of type SNVT_Occupancy.

****

NOTE: The following paragraph applies only to LNS-based systems and is included only when the LNS tailoring option is selected.

****

Provide DDC Hardware with LonMark Objects meeting the Simple Scheduler Functional Profile and configure schedules as specified on the Points Schedule and as specified.

3.1.4.1.1 Schedule Groupings

****

NOTE: Indicate if a common schedule may be used for multiple Terminal Units (TUs).

If allowing a common schedule for multiple TUs: keep the 'group of' bracketed text, and decide if TU groupings will be included on the drawings (keep the 'as indicated' bracketed text) or if the Contractor should decide on groupings (remove the 'as indicated' bracketed text).

****

Provide a separate schedule for each AHU including it's associated Terminal Units and for each stand-alone Terminal Unit (those not dependent upon AHU service)[or group of stand-alone Terminal Units acting according to a common schedule[as indicated]].

3.1.4.1.2 Occupancy Mode Mapping to SNVT Values

Use the following mapping between SNVT_Occupancy enumerations and occupancy modes:

a. OCCUPIED mode: Enumeration value of OC_OCCUPIED
b. UNOCCUPIED mode: Enumeration value of OC_UNOCCUPIED
c. WARM-UP/COOL-DOWN (PRE-OCCUPANCY) mode: Enumeration value of OC_STANDBY

3.1.4.2 Alarming

****

NOTE: The following paragraph applies only to LNS-based systems and is included only when the LNS tailoring option is selected.

****

For each point which is shown on the Points Schedule with an alarm condition, provide a SNVT output for the point to be used for alarm generation by the UMCS Front End

****

NOTE: The following paragraph applies only to Niagara Framework systems and is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

For each point not in a Niagara Framework Supervisory Gateway which is shown on the Points Schedule with an alarm condition, provide a SNVT output for the point to be used for alarm generation. For each point which is shown on the Points Schedule with an alarm condition, configure alarms in Niagara Framework Supervisory Gateway using Niagara Alarm Extensions and Alarm Services.

3.1.4.3 Trending

****

NOTE: The following paragraph applies only to LNS-based systems and is included only when the LNS tailoring option is selected.

****

For each point which is shown on the Points Schedule as requiring a trend,

provide a SNVT output for the point to be used for trending by the UMCS Front End.

****

NOTE: The following paragraph applies only to Niagara Framework systems and is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

For each point not in a Niagara Framework Supervisory Gateway which is shown on the Points Schedule as requiring a trend, provide a SNVT output for the point to be used for trending. For each point which is shown on the Points Schedule as requiring a trend, configure a trend in a Niagara Framework Supervisory Gateway using Niagara Framework History Extensions and the Niagara Framework History Service.

3.1.4.4 Overrides

****

NOTE: The following paragraph applies only to LNS-based systems and is included only when the LNS tailoring option is selected.

****

For each point shown on the Points Schedule as requiring an override, provide an override as specified in paragraphs "Overrides for GPPCs and AGCs" and "Overrides for ASCs".

****

NOTE: The following paragraph applies only to Niagara Framework systems and is included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

Provide overrides for points as indicated on the Points Schedule. For overrides to points in Niagara Framework Supervisory Gateways, use the Niagara Framework. For overrides to other points, provide an override to a point in a Niagara Framework Supervisory Gateway via the Niagara Framework where the Niagara Framework Supervisory Gateway overrides the other point as specified in paragraphs "Overrides for GPPCs and AGCs" and "Overrides for ASCs"

3.1.5 Gateways

****

NOTE: This subpart uses tailoring options for requirements specific to Niagara Framework systems. The phrases "or to Niagara Framework Points" and "(Note: A Niagara Framework Supervisory Gateway is CEA-709.1-D control hardware.)" are included only when the NIAGARA FRAMEWORK tailoring option is selected.

****

****

NOTE: The intent of this is to allow the use of gateways to packaged equipment controllers not procured under the scope of the project this specification is used for and, to not allow the

installation of a non-BACnet network connected to a BACnet network via a gateway.
****

The requirements in this paragraph do not themselves permit the installation of hardware not meeting the other requirements of this section. Except for proprietary systems specifically indicated in Section 23 09 00, all control hardware installed under this project must meet the requirements of this specification, including the control hardware providing the network interface for a package unit or split system specified under this Section or another Section. Only use gateways to connect to pre-existing control devices and to proprietary systems specifically permitted by Section 23 09 00.

Provide Gateways to connect non-CEA-709.1-D control hardware in accordance with the following:

a. Configure gateway to map writeable data points in the controlled equipment to Network Variable Inputs of Standard Network Variable Types as defined by the LonMark SNVT List, or to Niagara Framework points, as indicated in the Points Schedule and as specified.

b. Configure gateway to map readable data points in the controlled equipment to Network Variable Outputs of Standard Network Variable Types as defined by the LonMark SNVT List, or to Niagara Framework points, as indicated in the Points Schedule and as specified.

c. Do not use non-CEA-709.1-D control hardware for controlling built-up units or any other equipment that was not furnished with factory-installed controls. (Note: A Niagara Framework Supervisory Gateway is CEA-709.1-D control hardware.)

d. Do not use non-CEA-709.1-D control hardware for system scheduling functions.

e. Each gateway must communicate with and perform protocol translation for non-CEA-709.1-D control hardware controlling one and only one package unit or a single non-CEA-709.1-D system specifically permitted by Section 23 09 00.

f. Connect one network port on the gateway to the Building Control Network and the other port to the single piece of controlled equipment or the non-CEA-709.1-D network specifically permitted by Section 23 09 00.

g. For gateways to existing package units or simple split systems, non-CEA-709.1-D network wiring connecting the gateway to the package unit or split system interface must not exceed 3 m 10 feet in length and must connect to exactly two devices: the controlled equipment or split system interface and the gateway.

3.1.6 Network Interface Jack

****
NOTE: Choose the preferred location for network interface jacks by controllers with thermostats (coordinate with the project site to determine preference of O&M Staff).

Choose the number of interface cables to be furnished by the Contractor.
****

Provide standard network interface jacks such that each node on the control network is within 3 m 10 ft of an interface jack. For terminal unit controllers with hardwired thermostats this network interface jack may instead be located at the thermostat. Locating the interface jack [at the thermostat][near the controller] is preferred. If the network interface jack is other than a 3 mm 1/8 inch phone jack, provide an interface cable with a standard 3 mm 1/8 inch phone jack on one end and a connector suitable for mating with installed network interface jack on the other. No more than one type of interface cable must be required to access all network interface jacks. Furnish [one] [_____] interface cable(s).

-- End of Section --