Appendix A

Building Automation System (BAS) Sample Documents

1 Purpose and Instructions

The purpose of this document is to provide samples of building documents that represent the expectations of the FAS group. Please use these documents for reference and guidance.

2 Table of Contents

REVISION:	REVISION DATE:
0	
1	
2	
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Standard Drawing Set

Building Renovation

As Prepared By:

Vendor Information

Street Address

City, State Zip Code

Phone Number:

Designer:	Designer
Project Number:	xx-xxxxx.xx
Job Number:	xxxxxxxx
Drawing Stage	Preliminary Design

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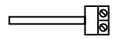
Symbol Legend

Supply Fan

DX Cooling Coil



Duct Temperature Sensor

Exhaust Fan

Electric Heating Coil

Averaging Duct Temperature Sensor

Return Fan

Gas Heating

Duct Humidity Sensor

Fan w/ Inlet Vane Control

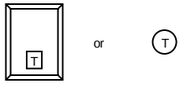
Hot Water Heating Coil

Immersion Temperature Sensor w/ Well

Pump

Chilled Water Cooling Coil

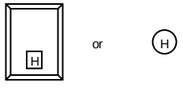
Pressure Sensor



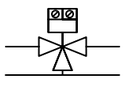
Room Temperature Sensor

Steam Heating Coil

Filter

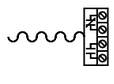


Room Humidity Sensor

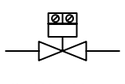


3 - Way Valve

Air Flow Station

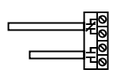


FreezeStat

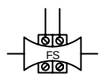


2 - Way Valve

Damper



Smoke Detector



Flow Sensor

ARCnet 156	
Solid Green	Network 0
Green/Brown Stripe	Network 1
Green/Red Stripe	Network 2
Green/Orange Stripe	Network 3
Green/Yellow Stripe	Network 4
Green/Blue Stripe	Network 5
Green/Purple Stripe	Network 6
Green/Grey Stripe	Network 7
Green/White Stripe	Network 8
Green/Gold Stripe	Network 9
Green/Black Stripe	Network 10

MODBUS/MSTP	
Solid Purple	Network 0
Purple/Brown Stripe	Network 1
Purple/Red Stripe	Network 2
Purple/Orange Stripe	Network 3
Purple/Yellow Stripe	Network 4
Purple/Blue Stripe	Network 5
Purple/Purple Stripe	Network 6
Purple/Grey Stripe	Network 7
Purple/White Stripe	Network 8
Purple/Gold Stripe	Network 9
Purple/Black Stripe	Network 10

CAT6	
Solid Green	

Cable Identification/Wire Labels

M & S-Line Point Notation

0 TAB LABEL TEXT - SPARE
DA-EN-PL

DA - Device Address
EN - Expander Number
PL - Point Location

Monitoring and control points for remote equipment are identified by the Module Point representation shown above. The System and Service Provider's electrical contractor or installer must label both ends of each control or monitoring point cable using the following format : (DA-EN-PL) . Adherence to this identification system is mandatory and must be followed using an approved tagging system comparable to the Brady I.D.Pro Plus electronic labeling system or equivalent.

These tags are intended for the wiring for all Analog Inputs (AI's), Digital Inputs (DI's), Analog Outputs (AO's), and Digital Outputs (DO's) except VAV's and terminal equipment where the wire runs are short and the field termination point is seen, or is easily identified. Points using pneumatic tubing follow the same convention.

All communication cable, terminations "in" an "out" of a field module panel, terminal equipment or VAV's must be labeled with "from (equipment name)" and "to (equipment name)" locations. **See Figure 1 below.**

All ARC156 or UNet communication, serial interface, control, and monitoring wiring must be terminated at the locations designated and must be free of splices.

When stripping multi-conductor cables, use only strippers specifically designed for removal of outer sheath insulation so as not to damage the shielding or insulation of the conductors. Use Ideal Catalog #45-514 or #45-165 data cable strippers or equivalent.

When shielded cable is used, do not strip back sheath more than 1" in order to keep twisted pair from separating. Do not ground shield to the panel or chassis ground. The shield should only be connected to the 'Optional Shield' connection at a module. Ungrounded shields must be cut back and taped to prevent contact with with metal surfaces (heat shrink is preferred). **See figure 2 below.**

Multi-conductor cabling other than specified or pre-approved by the System and Service Provider (SSP) is unacceptable.

Electrical installation shall be in accordance with the project specifications, national, state, and local electrical codes along with ALC standards as outlined in this and other documents.

LogiStat Plus and LogiStat Pro room temperature sensors shall be mounted 48 inches above the finished floor per the Americans with Disabilities Act.

All pneumatic tubing that exceeds ten feet in length must be rigid copper or poly tubing installed in conduit. All poly tubing in exposed areas must be installed in conduit. Use plenum rated poly tubing for runs made in hung ceilings. Short lengths of less than 16 inches are permitted to be exposed for connection to field devices.

All field module panels (FMPs) will have a dedicated 120vac circuit.

Standard Drawing Set
Building Renovation
PSU OPP Facility Automation Services Design Team
Symbol Legend

REV: 0	Preliminary Design	07/23/21	JOB NO:
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PennState Physical Plant

Summary Bill of Materials

Standard Drawing Set			
Building Renovation			
PSU OPP Facility Automation Services Design Team			
Summary Bill of Materials			
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Individual Equipment Pages

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Individual Equipment Pages			
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Communication Riser Arcnet Diagram

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Communication Riser Arcnet Diagram			
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Communication Riser MS/TP Diagram

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Communication Riser MS/TP Diagram			
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Floor Plans

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Floor Plans			
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Installers Checklist

Building Automation Systems Projects								
Job Closing Checklist								
Project No:		Job No:						
Building Name:								
Project Description:								
Date of Punch list:								
Date of Substantial Completion:								
File Location:								
Analyst Assigned, Name:		Contact:		CCX:		Level:	In House	3rd Party

Installer's Initials:		Installer's Checklist Items
Date Completed	Item #	
	1	Generate a locked values report and unlock or note reason it is still locked.
	2	Generate a network I/O report and check for network errors. (Run report specific to project prior to project)
	3	Check for nuisance alarms and make corrections.
	4	Check all control cabinets for proper tagging. (Label maker or standard signages)
	5	Mark up a set of drawings for as-builts, and turn in to superintendent for project.
	6	On property pane, I/O Points, fill out "checkout notes" for each point with initials after each point is verified.
	7	Verify point to point checkout of "all" hard wired I/O points, sensor calibration, sensor resolution and COV rate.
	8	Setup trending for all hardwired points. For assistance, contact an analyst. *SEE: Trending guidelines in the BAS Guide Spec.*
	9	Check that Program I/O matches the Graphic I/O.
	10	Check all graphics for completeness and accuracy. Does the AHU graphic mirror the actual fan and duct connections?
	11	Compare building summary graphic page to floor plans.
	12	Check PID's and tune as needed (i.e. Trending must be setup before tuning PID's.) *SEE: Trending guidelines in the BAS Guide Spec.*
	13	Link "all" network points to their proper locations (i.e. OAT, humidity, enthalpy, viewpoint, etc.).
	14	Final checkout with tech, designer, analyst.

Supervisor's Initials:		Supervisor Work Flow
Date Completed	Item #	
	1	Tech to turn over as-builts
	2	Supervisor to review for completeness, move to analyst, designer and project folder

Designer's Initials:		Designer Checklist Items
Date Completed	Item #	
	1	All outgoing requests to run must be linked by designers (i.e. (ACF/AHU/SFN's to HWSY/CWSY Systems)(VAV's to associated supply fan)).
	2	Total heat requests need to be entered for each job.
	3	Threshold values for PICC Valves need to be entered for each VAV with reheat, FCU's, and CUH's.
	4	Check all alarms and verify if they are correctly set to General, Maintenance or Critical.
	5	Scheduling of building. (Default 6am-6pm) *Work with Bldg. FC and possibly Eng. of Record to come up with occupancy schedule.
	6	Check graphic links to see if they all work.
	7	Check all graphics for completeness and accuracy. Does the AHU graphic mirror the actual fan and duct connections?
	8	Verify BACnet Device Information page is accurate throughout the networks within the project. (ie: Device Instance Numbering and network verification.)
	9	Once As_Built prints are turned in and completed then give back to Tech for Review.
	10	When all Prints are updated to the Library notify Analyst to Conduct a Project Training Session with the associated Area Technicians.

CCS Operator's Initials:		CCS Operator's Checklist Items
Date Completed	Item #	
	1	Check the alarm messages to verify if they are accurate.

BAS Analyst's Initials:		BAS Analyst's Checklist Items
Date Completed	Item #	
	1	Review Sequence of Operation to see if it conforms to BAS Standards.
	2	Review Trend Reports to see if all equipment, PIDs, etc. look OK.
	3	Generate a point list report for all equipment.
	4	Generate a Cx equipment check out report.
	5	Generate a VAV Cx T&B Report.
	6	Disable the locked I/O module generator alarm in each module.
	7	Verify that System is on Production Server.
	8	Verify that system was deleted from Construction Server and network drivers changed to third party.
	9	Check graphic links to see if they all work.
	10	Conduct a Project Training Session with the associated Area Technicians.

Standard Drawing Set

Building Renovation

PSU OPP Facility Automation Services Design Team

Installers Checklist

REV: 0	Preliminary Design	07/23/21	JOB NO:
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PennState Physical Plant