MANN ENGINEERING
A LEADER IN RENEWABLE STRATEGIES.

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Building Automation System Case Study and Sample Documents

Exhibit 1: Energy Savings Report for Electrically Heated Building:

Electrically heated buildings tend to have the highest energy costs per unit area compared to other methods of heating. However, heating system retrofits are expensive and may not be feasible for many reasons. Mann Engineering has installed dozens of Building Automation Systems (BAS) to manage and mitigate electric heating losses in electrically heated buildings. The BAS will utilize demand control algorithms developed by Mann Engineering to significantly reduce the electrical energy consumption by controlling the electric baseboard heating based on the outdoor air temperature. This strategy has been shown to provide electricity savings between 20-30% in addition to natural gas savings resulting from managing the consumption of natural gas appliances.

Energy Savings reports for 2017 and 2020 are shown below. The electricity bills were sent to Mann from the Client for evaluation. The electricity consumption of the two evaluated years are compared to the pre-retrofit baseline year of 2014. The monthly consumption in KWh is adjusted for variations in annual weather by using heating degree days (HDD) provided by Environment Canada.

The building address has been redacted.

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Electrical Consumption
***Baseline Period - Year 2014 (Pre Retrofit)**
****Evaluation Period - Year 2020**

Baseline Period*	HDD (18 C), Baseline Period*	Baseline Period* Consumption (kWh)	Evaluation Period**	HDD (18 C), Evaluation Period**	Evaluation Period Consumption (kWh)	Weather Adjusted Evaluation Period Consumption (kWh)	Savings Compared to Baseline (kWh)	Savings Compared to Baseline%
Jan-14	604	137,440	Jan-20	641	87,520	83,063	54,377	39.6%
Feb-14	508	111,840	Feb-20	616	76,480	64,878	46,962	42.0%
Mar-14	571	96,000	Mar-20	586	63,959	62,586	33,414	34.8%
Apr-14	265	60,480	Apr-20	351	52,661	42,283	18,197	30.1%
May-14	194	12,960	May-20	209	17,339	16,834	-3,874	-29.9%
Jun-14	35	5,920	Jun-20	24	8,144	10,305	-4,385	-74.1%
Jul-14	6	7,200	Jul-20	0	6,603	10,305	-3,105	-43.1%
Aug-14	2	6,080	Aug-20	1	6,886	10,305	-4,225	-69.5%
Sep-14	53	14,560	Sep-20	69	10,305	10,305	4,255	29.2%
Oct-14	194	40,000	Oct-20	271	23,182	19,523	20,477	51.2%
Nov-14	337	72,320	Nov-20	336	55,243	55,377	16,943	23.4%
Dec-14	601	113,120	Dec-20	568	77,582	81,491	31,629	28.0%
Total	***3,370***	***677,920***		***3,672***	***485,904***	***467,254***	***210,666***	***31.1%***

Results: The total annual weather adjusted electricity savings between the baseline year of 2014 and 2020 is 31.1
Note: This analysis is for electricity only, total savings includes additional gas savings.

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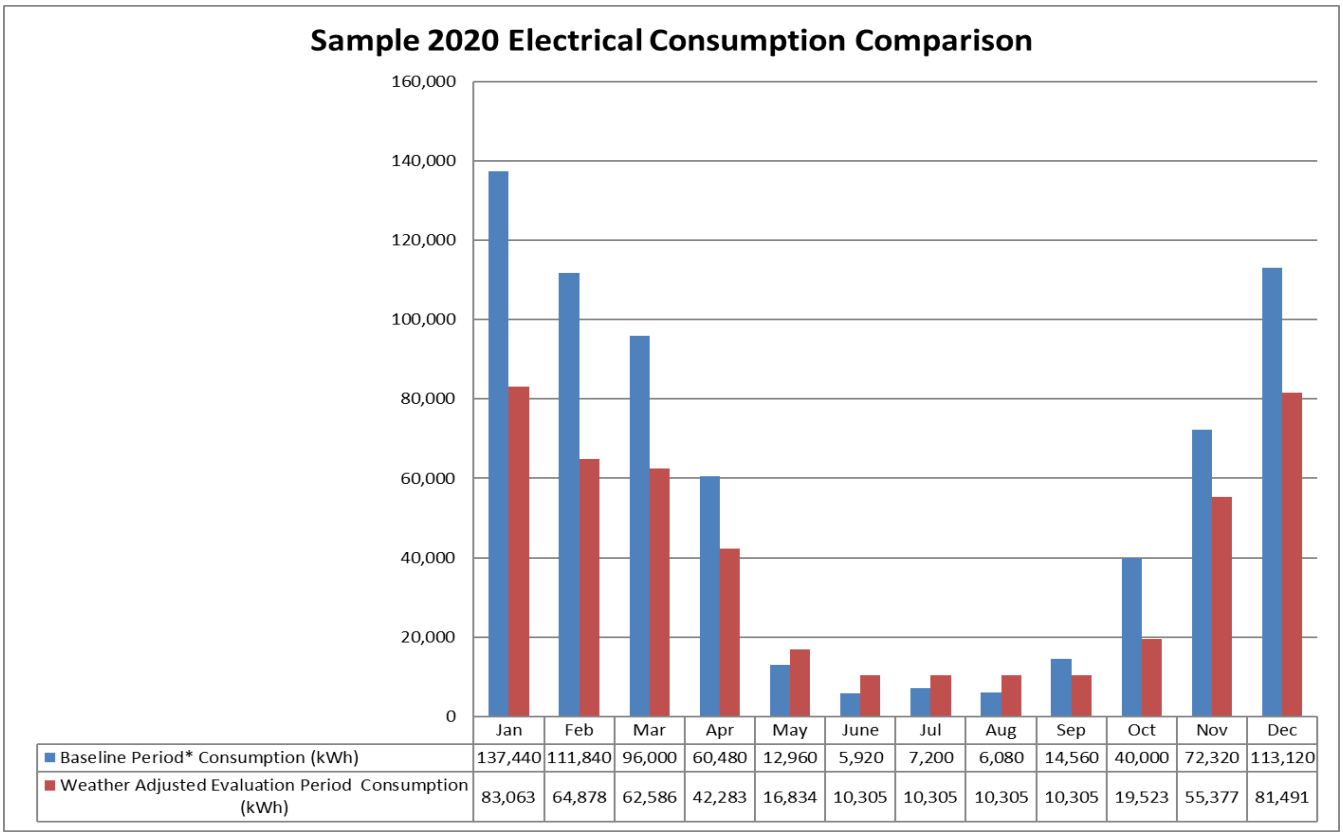

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Baseline Period* Consumption (kWh)	137,440	111,840	96,000	60,480	12,960	5,920	7,200	6,080	14,560	40,000	72,320	113,120
Weather Adjusted Evaluation Period Consumption (kWh)	83,063	64,878	62,586	42,283	16,834	10,305	10,305	10,305	10,305	19,523	55,377	81,491

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Electrical Consumption
***Baseline Period - Year 2014 (Pre Retrofit)**
****Evaluation Period - Year 2017**

Baseline Period*	HDD (18 C), Baseline Period*	Baseline Period* Consumption (kWh)	Evaluation Period**	HDD (18 C), Evaluation Period**	Evaluation Period Consumption (kWh)	Weather Adjusted Evaluation Period Consumption (kWh)	Savings Compared to Baseline (kWh)	Savings Compared to Baseline%
Jan-14	604	137,440	Jan-17	683.1	99,680	89,175	48,265	35.1%
Feb-14	508	111,840	Feb-17	554.4	93,600	86,516	25,324	22.6%
Mar-14	571	96,000	Mar-17	527.4	61,120	65,432	30,568	31.8%
Apr-14	265	60,480	Apr-17	315.9	40,800	35,670	24,810	41.0%
May-14	194	12,960	May-17	175.5	18,400	19,395	-6,435	-49.7%
Jun-14	35	5,920	Jun-17	40.5	6,560	8,960	-3,040	-51.4%
Jul-14	6	7,200	Jul-17	2.7	6,400	8,960	-1,760	-24.4%
Aug-14	2	6,080	Aug-17	9	7,200	8,960	-2,880	-47.4%
Sep-14	36	14,560	Sep-17	44.1	8,960	8,960	5,600	38.5%
Oct-14	194	40,000	Oct-17	200.7	35,840	34,943	5,057	12.6%
Nov-14	337	72,320	Nov-17	457.2	65,120	50,355	21,965	30.4%
Dec-14	601	113,120	Dec-17	520.2	114,880	131,332	-18,212	-16.1%
Total	***3,353***	***677,920***		***3,531***	***558,560***	***548,658***	***129,262***	***19.1%***

Results: The total annual weather adjusted electricity savings between the baseline year of 2014 and 2017 is 19.1%
Note: This analysis is for electricity only, total savings includes additional gas savings.

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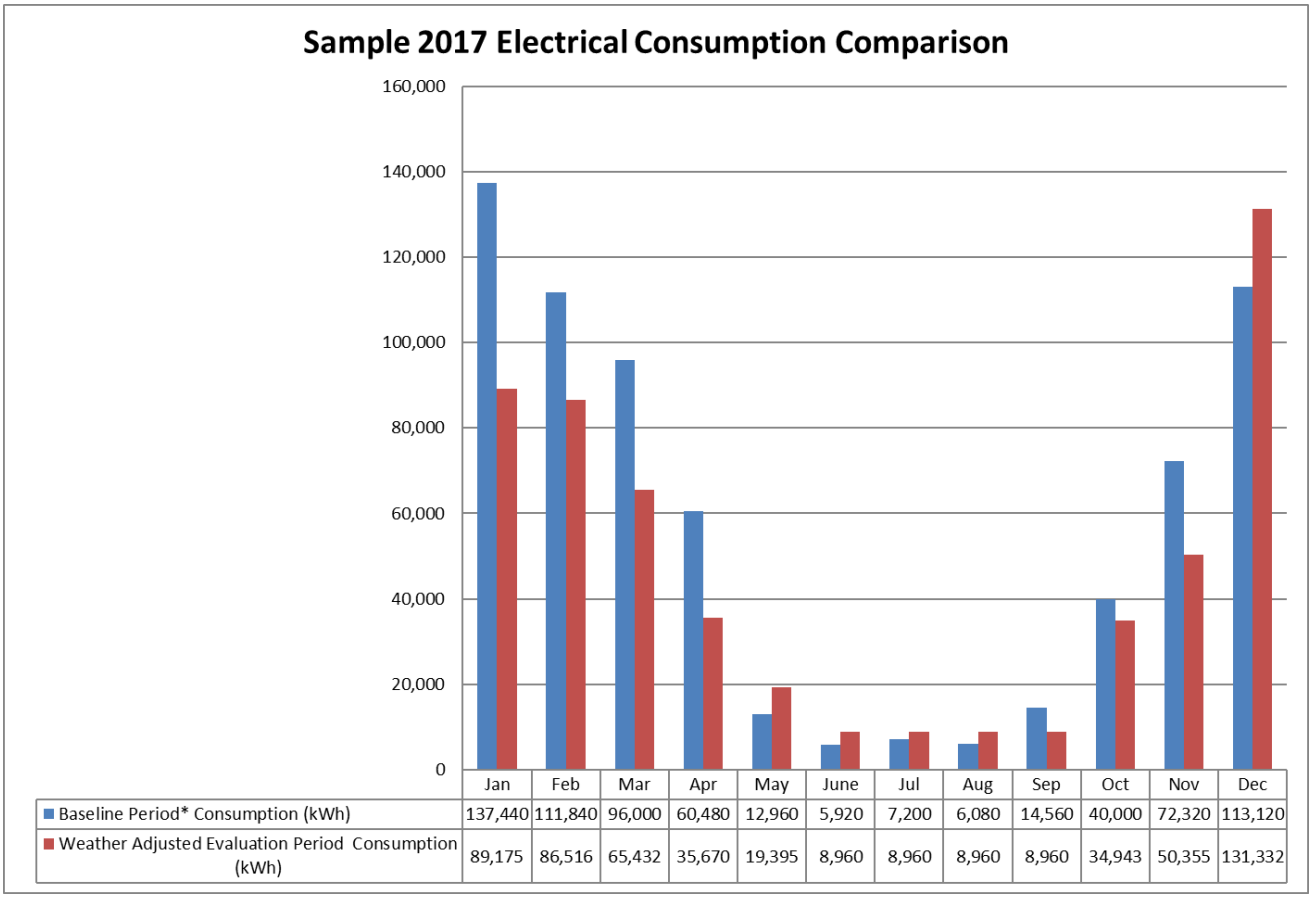

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Baseline Period* Consumption (kWh)	137,440	111,840	96,000	60,480	12,960	5,920	7,200	6,080	14,560	40,000	72,320	113,120
Weather Adjusted Evaluation Period Consumption (kWh)	89,175	86,516	65,432	35,670	19,395	8,960	8,960	8,960	8,960	34,943	50,355	131,332

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Exhibit 2: Sample Mann Control Panel Installation

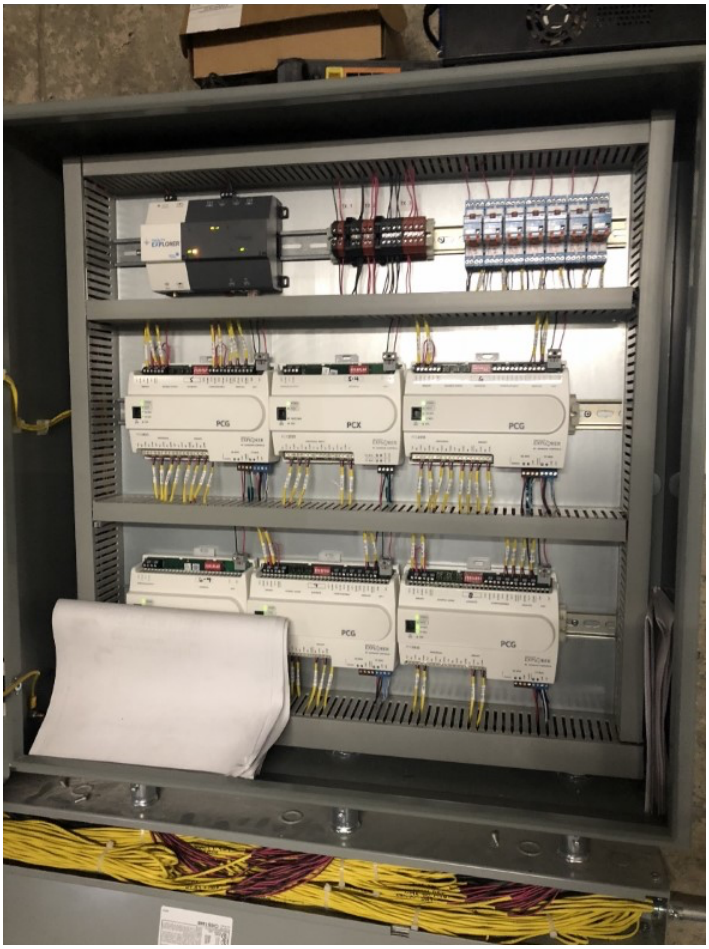

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Exhibit 3: Sample Mann Staff Training Document

Mann provides on-site training to building staff along with a training manual, a sample of which is provided below. The building automation graphical user interface (GUI) is easy to use and understand. The building address has been redacted.

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Operations Manual

****Please note that BAS can only be viewed while you are connected to the network as the BAS****

Logging onto the BAS:

Double-click on your browser (Firefox or Chrome), we do not recommend Edge or Internet Explorer due to compatibility issues and lower browsing speeds.

Once the browser is opened, type the following IP address in the address bar:

http://192.168.0.5

You will be prompted with a login screen like Figure 1.

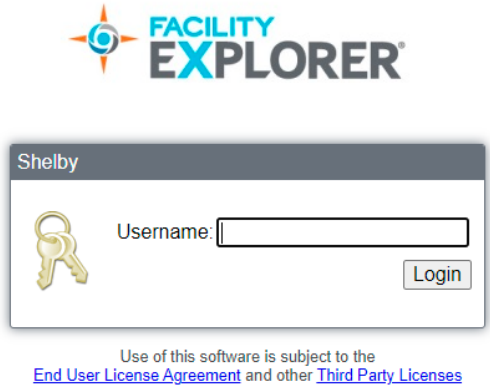

Figure 1: Login prompt

Login into the system with the username and password given to the operator. You can write down the username and password for future reference:

Username…… Password: ……

Navigating the Home Page

Once the login is authenticated, the system will bring the user to the "Home Page" that should look like Figure 2. On this screen, the operator can view all system that are under the BAS controls, along with an alarm console (later discussed). The system includes:

1. Primary Heating System
2. Heat Pump Loop
3. Domestic Hot Water
4. North Unit
5. Centre Unit
6. South Unit
7. Ramp Heater
8. CO System
9. Pool Equipment

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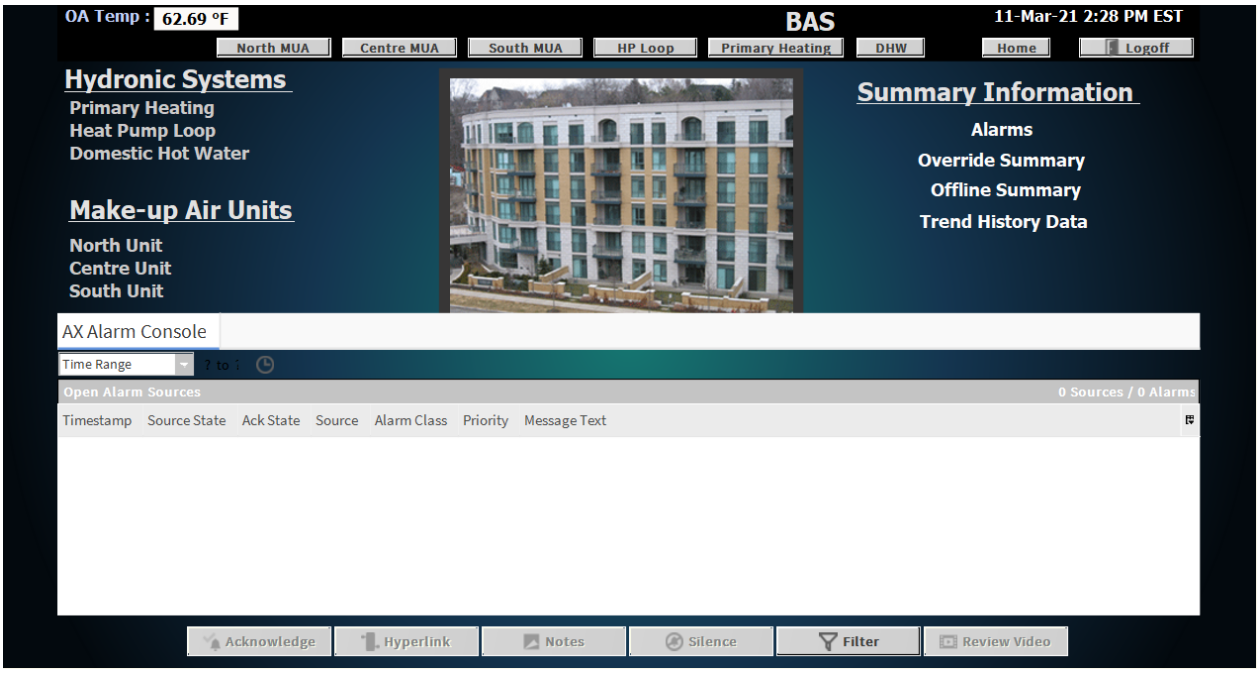

Figure 2: Home Page view

At the bottom half, the operator can see an Alarm Console. In this console, the operator will see any aspects of the systems that are in alarm. *The alarm is depicted with a red alarm bell, and it turns green once the system in normal.* Time Range can be changed to find any previous alarms that were triggered.
Note: The Mann 24/7 monitoring team receives a copy of the alarm in an email format, which is then investigated by the monitoring specialist. The specialist will advise the relevant personnel whether any equipment should be investigated based off the priority level of the alarm.
The operator must not clear any alarms, as that will prove to be a hindrance while investigating any alarms. Also, if the operator is actively checking alarms, and if they remove the alarms before the email is sent out to the monitoring team, the alarm will never reach the monitoring team. Therefore, alarms will never be investigated.

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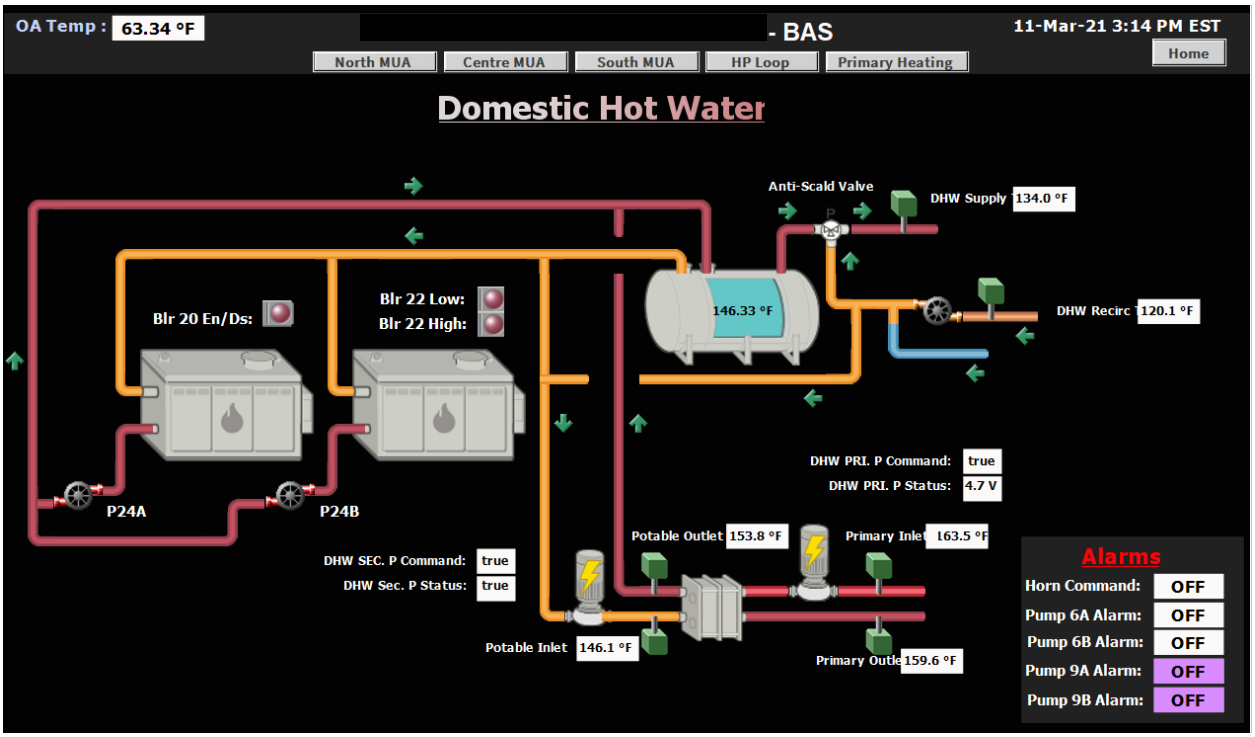

Figure 3: Domestic Hot Water graphics

Each system is laid out on the graphics to roughly depict the actual plant. Equipment enable/disable, or command values can be changed by moving the cursor over to the point and right clicking on the point to change its value. Changing values without cause can break a system and can result in a service call. The operator must ensure they do not change the state of any equipment without consultation or instructions from the mechanical contractor.

BAS Control Capabilities:

The operator can control various equipment, as listed earlier, through a variable point. These points can control by the means of Start/Stop or Enable/Disable, Speed or Modulation. The system is capable to receive feedback from the equipment in response to the command. For example, when the speed of the pump is raised to 50% the status/feedback from the pump should read approximately 50%. This shows that an equipment is within the control of the BAS.

Note: Command/Speed/Modulation controls are called Outputs. Status/Feedback are called Inputs.

The outputs can be controlled via graphics should it be necessary. There are several ways to control an output, these include: Emergency Auto, Emergency Override, Auto, Override, Set.

Emergency Auto: The is used to change back from Emergency Override. Doing this puts the output back into programming sequence, or Automatic mode. This should only be used in case of an emergency; therefore, operator should not use the emergency override feature. If the output is in Emergency Override, the system will not take a simple Override or Set commands, since Emergency commands are highest level commands.

Emergency Override: This should not be used, as doing this feature overrides the BAS Programming, Override and Set feature. In case an Emergency Override is in place, only way to reverse it would be to select Emergency Auto.

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Auto: This choice reverts to the BAS programming and runs in automatic mode. This is done when the Override feature is used, and the Operator's intention is to leave the system running in BAS programming.
Override: Much similar to Emergency Override but the priority level of this override is lower than that of Emergency Override. In an override, the operator can set a timer to run a Pump during maintenance, but this should not be done without consulting the mechanical contractor, as this is equally dangerous action as Emergency Override.
Set: Can be used to change, for example a temperature setpoint in a heating loop or a domestic hot water tank temperature set-point. This should not be used without consulting the mechanical contractor. Using set erases the previous value, therefore, there is no way to revert from this change without changing the set to the original value. Should any of the above features are required to be used, the Operator should contact the Mann Monitoring Team. Our team will make sure that changing a state of an equipment or the setpoints will not harm the integrity of the system.

History Trends:

On the home page, under "Summary Information", by clicking on "Trend History Data". The operator will see the screen, as in Figure 4.

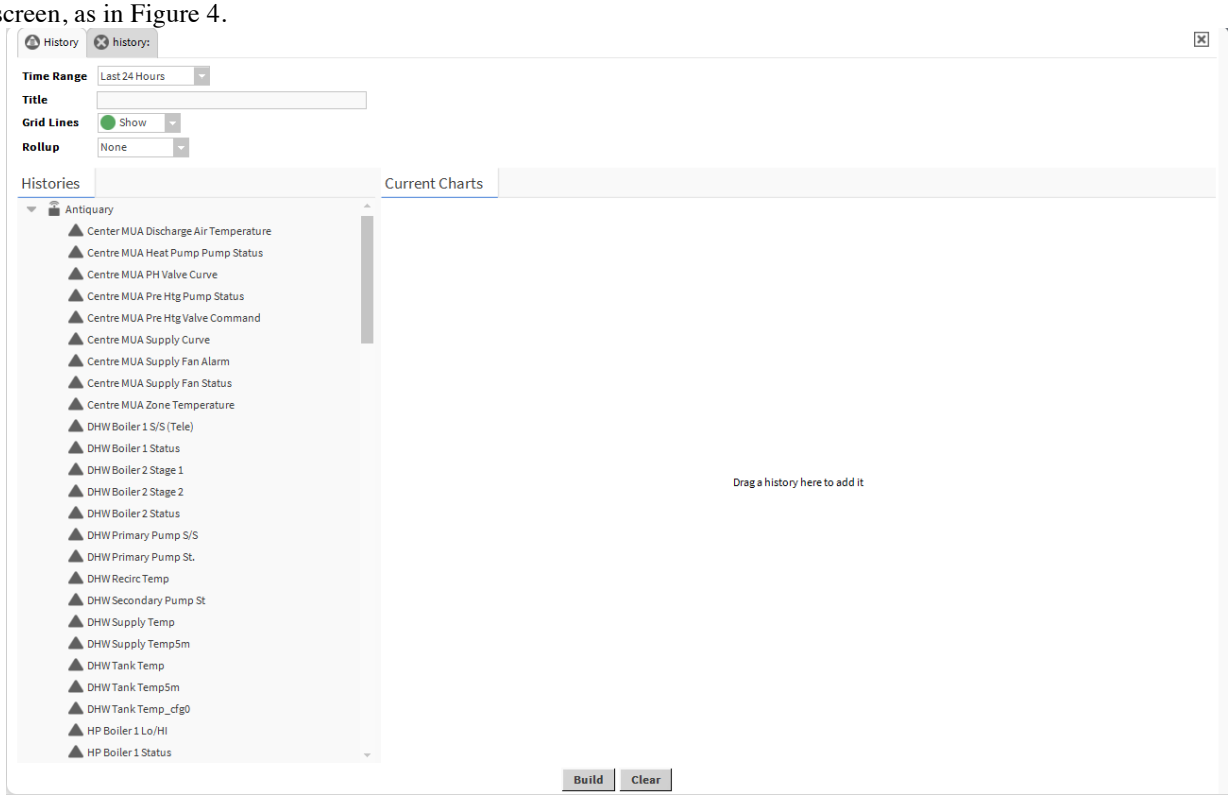

Figure 4: Trend Logs Builder

All trends were set up for all the new equipment that was added and replaced. Any other trends that the operator needs, can be discusses with engineers to make amendments. Trends are taken every 15 minutes, and up to 5000 times. Therefore, trends are only available for a limited period.

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Currently the BAS Manufacturer is working on saving the older trends on the cloud server, once that is available, the system can be upgraded to allow access to the archives.
The operator can add multiple points to the trend-builder and view them together, for analyses.

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While the operator is using the graphics, they can also view a group of trend data specific to the system viewable on the graphic, in order to gain surface-level information about a particular system. In Figure 5, time circled and labelled **1** show various tabs the operator can navigate through. Each tab has another set of tabs at the bottom, mainly to navigate between the graphics or the Trend Graphs. To access the group of trend data, previously discussed, the operator should click on item circled and labelled **2.**

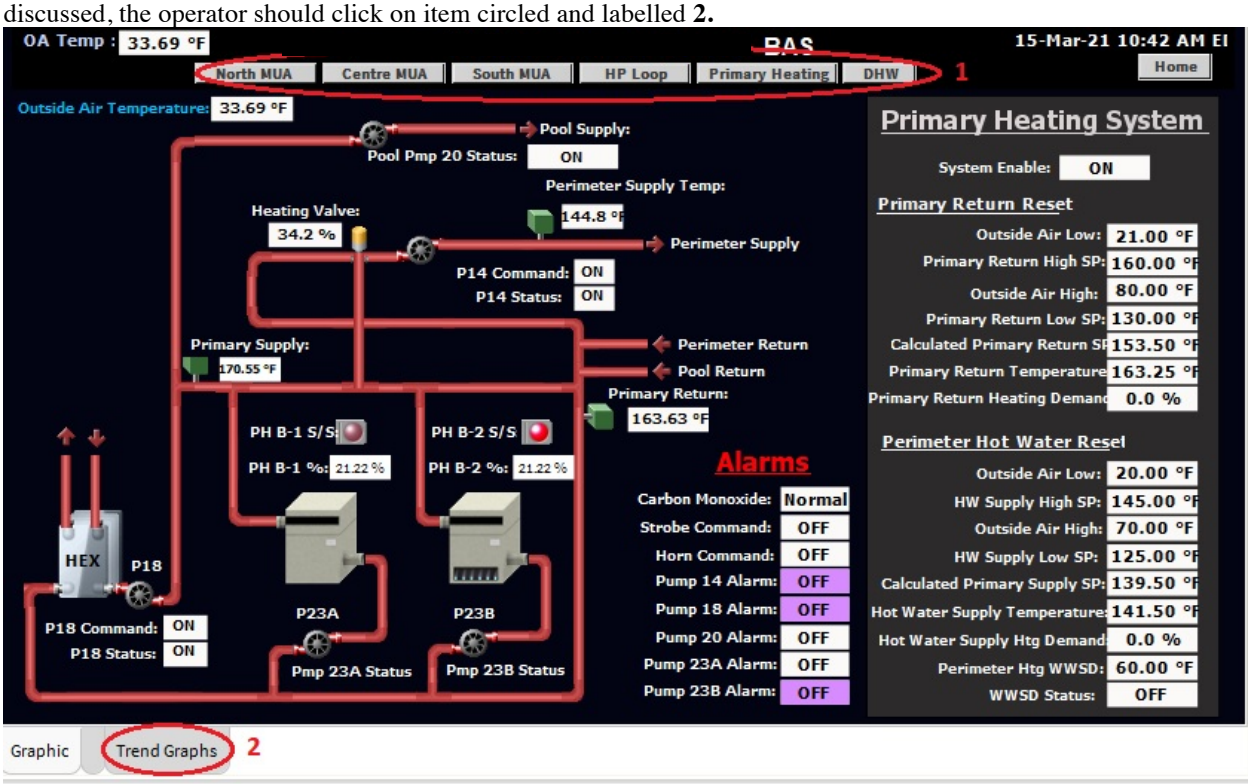

Figure 5: Graphics Reference for Trend logs

Once the operator clicks on the Trend Graphs, they can view the trends similar to Figure 6.
Notes: By clicking on the drop down circled and labelled **1** in Figure 6, the operator can change the time range they wish to view the trend information for.

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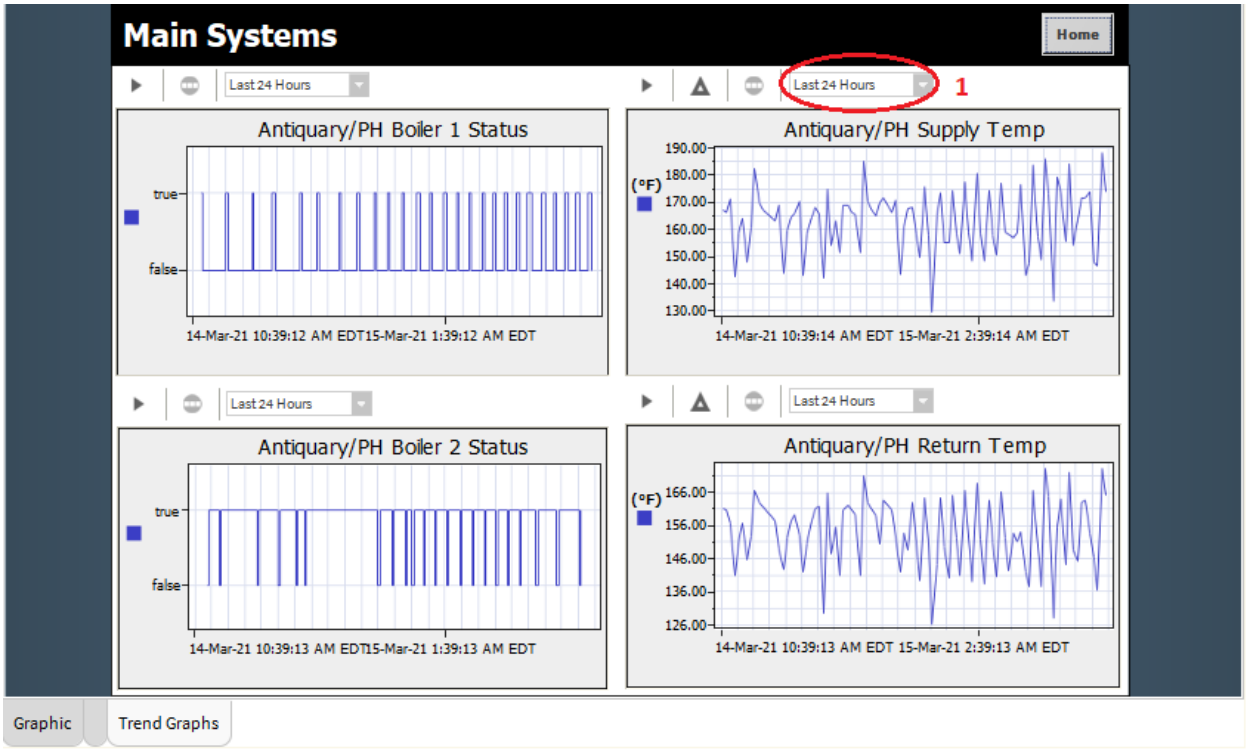

Figure 6: Group Trend

Various Helpful Abbreviations:
St. = Status
Stat = Status
% St. = 0-100% Status
S/S = Start/Stop = On/Off
En/Ds = Enable/Disable = On/Off
Mod = Modulation = Speed
5m = Trend Data taken at 5-minute interval (typical is 15 minute)
PH = Primary Heating
HP = Heat Pump
MUA = Make-up Air Unit
DHW = Domestic Hot Water
Recic = Recirculation
HX = Heat Exchanger

***** END OF TRAINING DOCUMENT *****

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Exhibit 4: Sample Mann Recommissioning Report

Mann provides annual recommissioning reports as part of our monitoring service. The recommissioning involves a comprehensive review of the system to ensure that all sensors, hardware, end devices, algorithms and equipment are functioning as intended. Any deficiencies are reported and improvements are recommended.

The below recommissioning report is from an electrically heated building with a KMC controls system installed by Mann over 15 years ago. Mann has continued to provide monitoring services to the Client and is recommending that the system be upgraded to a modern control system.

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Address:	[redacted]
Location ID:	[redacted]
Controls	KMC Controls
Client	[redacted]
Contact	[redacted]
Technician	Hassan Raza
Engineer	James Mann
Programmer	Hassan Raza
Inspection Date	May, 2021
Report Date	May, 2021

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System Description:

In this facility there are controls for a domestic hot water loop system. This loop system is heated by two domestic hot water boilers. Both of these boilers are single staged, and the boilers rotate on the first day of every month. There is a sensor for the domestic hot water supply temperature. This system also monitors the domestic hot water recirculation pump as well as the domestic hot water recirculation temperature. Lastly, the hot water is stored inside of two domestic hot water tanks when not in use.

The suites are heated using electrical baseboard heaters. There are semi-functional thermostats in each suite, that are typically set to a high setpoint during cold weather by the tenants. The building operator has the ability to override the heat controls through this Building Automation System (BAS), that uses an advance algorithm to optimize the heating system. The BAS controls the maximum runtime in minutes per 20-minutes that is based on the Outside Air Temperature (OAT). The BAS yields high energy savings by controlling the demand.

This facility's BAS also controls the make-up air fans and the exhaust fan units. Exhaust fans are run based off carbon monoxide sensors in the garage, and the make-up air fan is run based off of a weekly schedule. There are sensors in place for the make-up air supply air temperature, two corridor temperatures, and the outdoor air temperature.

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Domestic Hot Water

Inspected the start/stop operation of the domestic hot water boilers and verified the status. Upon inspection, the DHW boilers responded properly to the system. We found that the domestic hot water recirculation pump appears to be in working order at this time.

Recommendations

- Approve quotation to replace the fault Tank 2 thermistor to avoid DHW Supply fluctuations.

1	DHW BLR 1 RBI.63 ST	☐	0.01	Amps (Table 5)	☐	DHWB1S
2	DHW BLR 2 LAARS.56ST	☐	0.01	Amps (Table 5)	☐	DHWB2S
3	DHW TANK 1 TEMP	☐	125.67	Deg. F	☐	DHWT1
4	DHW TANK 2 TEMP	☐	-45.45	Deg. F	☒	DHWT2
5	DHW RECIRC TEMP	☐	120.10	Deg. F	☐	DHWR
6	DHW RECIRC PUMP STAT	☐	1.92	Amps (Table 5)	☐	DHWRPS
7	DHW SUPPLY TEMP	☐	121.79	Deg. F	☐	DHWS

Figure 7: DHW Input List

Checked each input sensor value to confirm their accuracy. As mentioned, few days ago, the DHW Tank 2 temperature sensor has been disconnected.

#	Point	On Time	Start Date	Length	Starts Total	Starts Today
1	DHWB1S1	12416:33	Oct 26 2010	150	38485	0
2	DHWB1SS	16272:56	Aug 26 2010	150	51754	0
3	DHWB2S1	9182:27	Oct 26 2010	150	38692	44
4	DHWB2SS	11516:17	Aug 26 2010	150	55555	44

Figure 8: DHW Runtime Log

We found that the runtime logs confirmed that the domestic hot water boiler responded perfectly to the system commands. The standby boiler's runtime was also checked to ensure the number of start/stops equal the number of statuses.

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Figure 9: DHW Trendlog

Blue	Green	Red	Magenta
Set point	Tank 1	Tank2	Supply

We also found that the domestic hot water temperatures are maintaining set point with accuracy.

Note: Temperatures are maintaining a set point value of 125.0 degrees Fahrenheit.

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Electric Baseboard Heating

Inspected the start/stop operation of the baseboards and compared them to the statuses. At the time of inspection, several status sensors had been claimed to be faulty. A quote to replace these sensors was provided pending approval. For alarms and monitoring purposes, these sensors should be replacing as soon as possible.

Recommendations

- Replace the CT sensors on the baseboard trunks.

Trend Logs have been for only floors 2, 6 and 11 have been taken for the purpose of this report, Figure 4 to 6. As the algorithm is consistent throughout this building the system behavior is similar. The statuses for each floor's baseboard heater trunk have been responding well to controls. There are several status sensors that have failed for various floor that need to be replace as soon as possible.

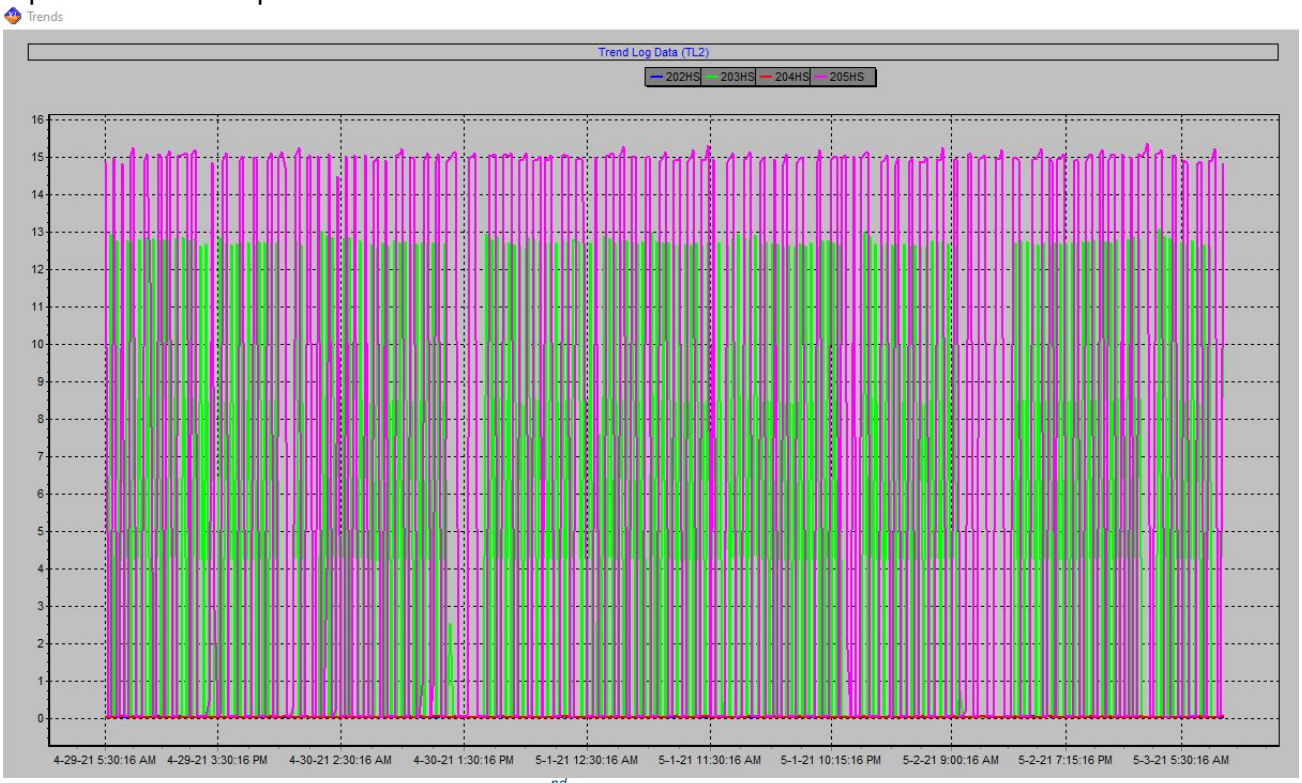

Figure 10: Baseboard 2nd Floor Heaters Amps Status Trend log

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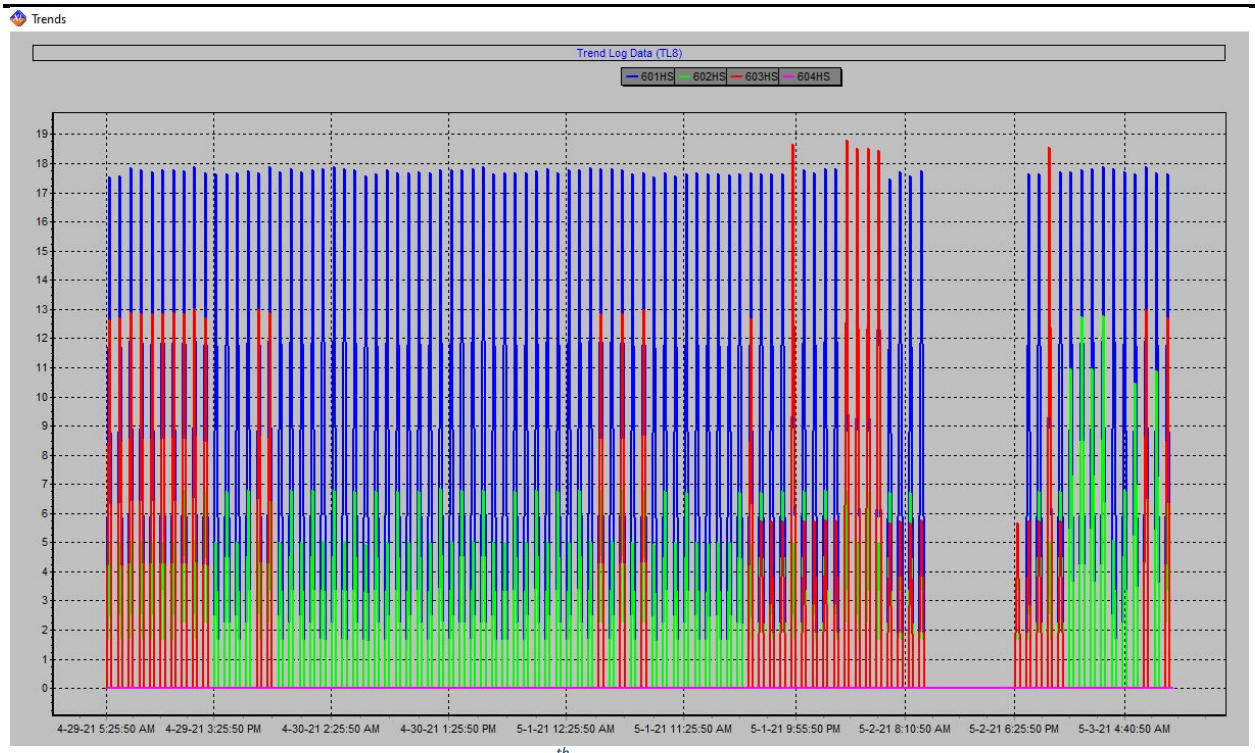

Figure 11: Baseboard 6th Floor Heaters Amps Status Trend log

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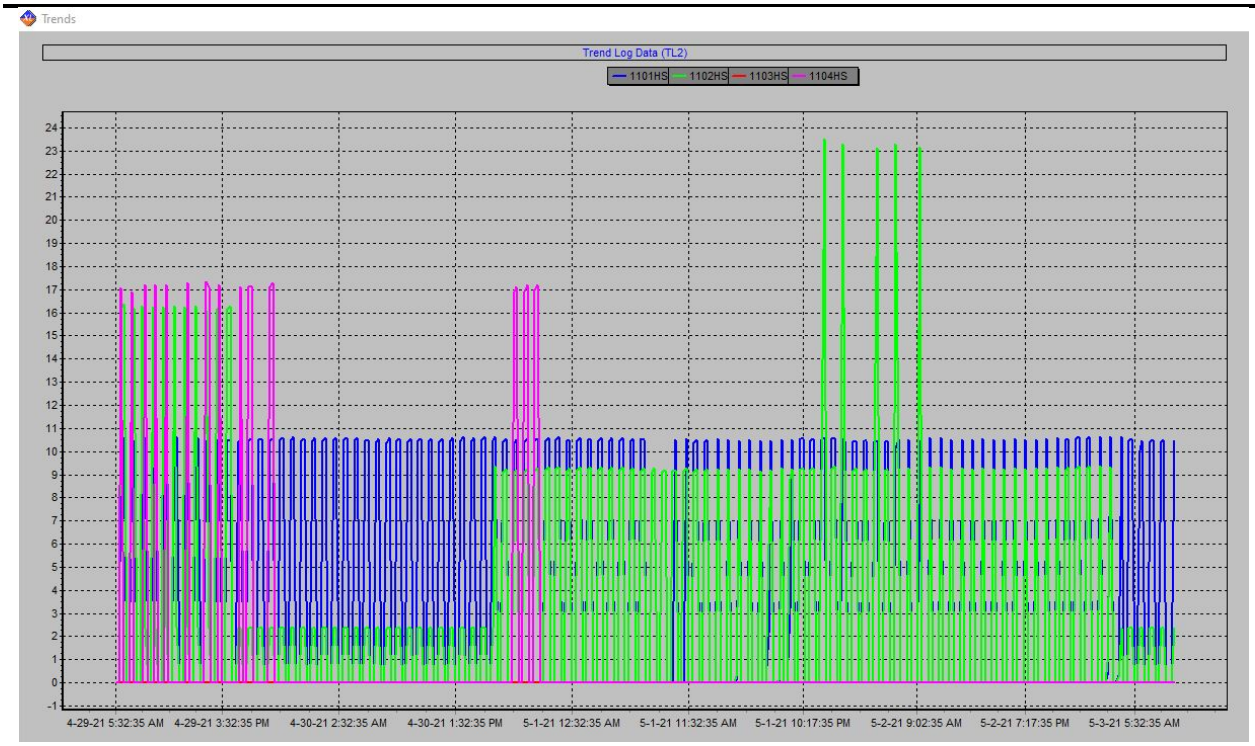

Figure 12: Baseboard 11th Floor Heaters Amps Status Trend Log

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Runtime Data (201HSS)

#	On Time	Off Time
50	5-3-21 12:52:52 AM	5-3-21 12:57:27 AM
51	5-3-21 1:12:52 AM	5-3-21 1:17:29 AM
52	5-3-21 1:32:53 AM	5-3-21 1:37:15 AM
53	5-3-21 1:52:53 AM	5-3-21 1:56:54 AM
54	5-3-21 2:12:52 AM	5-3-21 2:17:00 AM
55	5-3-21 2:32:52 AM	5-3-21 2:37:05 AM
56	5-3-21 2:52:53 AM	5-3-21 2:57:11 AM
57	5-3-21 3:12:52 AM	5-3-21 3:17:12 AM
58	5-3-21 3:32:52 AM	5-3-21 3:37:10 AM
59	5-3-21 3:52:52 AM	5-3-21 3:57:11 AM
60	5-3-21 4:12:53 AM	5-3-21 4:17:15 AM
61	5-3-21 4:32:52 AM	5-3-21 4:37:18 AM
62	5-3-21 4:52:53 AM	5-3-21 4:57:22 AM
63	5-3-21 5:12:53 AM	5-3-21 5:17:25 AM
64	5-3-21 5:32:51 AM	5-3-21 5:37:21 AM
65	5-3-21 5:52:51 AM	5-3-21 5:57:18 AM
66	5-3-21 6:12:52 AM	5-3-21 6:17:27 AM
67	5-3-21 6:32:53 AM	5-3-21 6:37:34 AM
68	5-3-21 6:52:52 AM	5-3-21 6:57:35 AM
69	5-3-21 7:12:54 AM	5-3-21 7:17:38 AM
70	5-3-21 7:32:54 AM	5-3-21 7:37:36 AM
71	5-3-21 7:52:52 AM	5-3-21 7:57:38 AM
72	5-3-21 8:12:53 AM	5-3-21 8:17:30 AM
73	5-3-21 8:32:52 AM	5-3-21 8:37:13 AM
74	5-3-21 8:52:53 AM	5-3-21 8:56:57 AM
75	5-3-21 9:12:52 AM	5-3-21 9:17:03 AM

Runtime Data (601HSS)

#	On Time	Off Time
50	5-3-21 12:56:32 AM	5-3-21 1:02:14 AM
51	5-3-21 1:16:31 AM	5-3-21 1:22:12 AM
52	5-3-21 1:36:31 AM	5-3-21 1:41:54 AM
53	5-3-21 1:56:32 AM	5-3-21 2:01:37 AM
54	5-3-21 2:16:32 AM	5-3-21 2:21:47 AM
55	5-3-21 2:36:32 AM	5-3-21 2:41:51 AM
56	5-3-21 2:56:32 AM	5-3-21 3:01:55 AM
57	5-3-21 3:16:33 AM	5-3-21 3:21:57 AM
58	5-3-21 3:36:31 AM	5-3-21 3:41:54 AM
59	5-3-21 3:56:31 AM	5-3-21 4:01:55 AM
60	5-3-21 4:16:31 AM	5-3-21 4:21:59 AM
61	5-3-21 4:36:32 AM	5-3-21 4:42:04 AM
62	5-3-21 4:56:31 AM	5-3-21 5:02:08 AM
63	5-3-21 5:16:31 AM	5-3-21 5:22:09 AM
64	5-3-21 5:36:32 AM	5-3-21 5:42:05 AM
65	5-3-21 5:56:31 AM	5-3-21 6:02:04 AM
66	5-3-21 6:16:32 AM	5-3-21 6:22:14 AM
67	5-3-21 6:36:31 AM	5-3-21 6:42:19 AM
68	5-3-21 6:56:32 AM	5-3-21 7:02:21 AM
69	5-3-21 7:16:32 AM	5-3-21 7:22:23 AM
70	5-3-21 7:36:32 AM	5-3-21 7:42:21 AM
71	5-3-21 7:56:33 AM	5-3-21 8:02:25 AM
72	5-3-21 8:16:32 AM	5-3-21 8:22:09 AM
73	5-3-21 8:36:32 AM	5-3-21 8:41:54 AM
74	5-3-21 8:56:32 AM	5-3-21 9:01:43 AM
75	5-3-21 9:16:31 AM	5-3-21 9:21:43 AM

Runtime Data (1101HSS)

#	On Time	Off Time
50	5-3-21 12:56:19 AM	5-3-21 1:02:42 AM
51	5-3-21 1:16:19 AM	5-3-21 1:22:39 AM
52	5-3-21 1:36:19 AM	5-3-21 1:42:22 AM
53	5-3-21 1:56:20 AM	5-3-21 2:02:10 AM
54	5-3-21 2:16:19 AM	5-3-21 2:22:20 AM
55	5-3-21 2:36:19 AM	5-3-21 2:42:22 AM
56	5-3-21 2:56:19 AM	5-3-21 3:02:26 AM
57	5-3-21 3:16:20 AM	5-3-21 3:22:27 AM
58	5-3-21 3:36:19 AM	5-3-21 3:42:26 AM
59	5-3-21 3:56:19 AM	5-3-21 4:02:26 AM
60	5-3-21 4:16:19 AM	5-3-21 4:22:30 AM
61	5-3-21 4:36:19 AM	5-3-21 4:42:35 AM
62	5-3-21 4:56:19 AM	5-3-21 5:02:37 AM
63	5-3-21 5:16:19 AM	5-3-21 5:22:38 AM
64	5-3-21 5:36:19 AM	5-3-21 5:42:35 AM
65	5-3-21 5:56:19 AM	5-3-21 6:02:35 AM
66	5-3-21 6:16:19 AM	5-3-21 6:22:41 AM
67	5-3-21 6:36:19 AM	5-3-21 6:42:48 AM
68	5-3-21 6:56:19 AM	5-3-21 7:02:49 AM
69	5-3-21 7:16:20 AM	5-3-21 7:22:50 AM
70	5-3-21 7:36:20 AM	5-3-21 7:42:49 AM
71	5-3-21 7:56:20 AM	5-3-21 8:02:53 AM
72	5-3-21 8:16:20 AM	5-3-21 8:22:37 AM
73	5-3-21 8:36:19 AM	5-3-21 8:42:23 AM
74	5-3-21 8:56:19 AM	5-3-21 9:02:16 AM
75	5-3-21 9:16:19 AM	5-3-21 9:22:16 AM

Figure 13: Runtime Logs for Floor 2, 6 and 11

As seen on the runtime log, Figure 7, the baseboard heater's demand has been controlled several times, just on the day of this report. For reference the OAT at the time of this report was 52F and the baseboard was only turned on approximately 18 out of 60 minutes per hour.

Miscellaneous

Inspected the start/stop operation of the make-up air and exhaust fans and verified the status. At the time of inspection, both the MUA fan and garage exhaust fan responded to the BAS commands.

Recommendations

- Put MUAs back into auto controls.
- On-site calibration of the CO sensor.

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#	Description	Manual	Value	Units	Decom.	Label
8	MUA FAN STATUS	☐	3.08	Amps (Table 5)	☐	MUAFS
9	MUA SUPPLY AIR TEMP	☐	53.87	Deg. F	☐	MUASAT
10	CORRIDOR TEMP 1	☐	76.51	Deg. F	☐	CT1
11	CORRIDOR TEMP 2	☐	75.00	Deg. F	☐	CT2
12	OUTDOOR AIR TEMP N	☐	56.91	Deg. F	☐	OATN
13	CO SENSOR	☐	5.37	PPM (Table 3)	☒	CO
14	GARAGE EXH FAN STAT	☐	0.01	Amps (Table 5)	☐	GEFS
15	SNOW SENSOR	☐	Off	Off/On	☐	SNOW
16	RAMP HEATER STATUS	☐	0.05	Amps (Table 6)	☒	RAMPS

Figure 14: Miscellaneous Input Sensor Values

Checked each input sensor value to confirm their accuracy. Upon inspection, each sensor input value appears to be correct.

#	Point	On Time	Start Date	Length	Starts Total	Starts Today
5	MUAFS1	62395:59	Oct 26 2010	150	7497	0
6	MUAHS1SS	14764:38	Aug 26 2010	150	27521	0
7	MUAHS2SS	5924:17	Aug 26 2010	150	23005	0

Figure 15: Miscellaneous Runtime Logs

The runtime for the Make-up Air Units has not been changed for a while as the MUAs have been locked on as per the building operators' request.

System Remarks

The current BAS is approaching its service life and is much outdated. We highly recommend installing a state-of-the-Art Building Automation System, which utilizes advance function and algorithms, to maximize energy savings whilst maintaining tenant confort.

Recommendations

1. Upgrade building automation system to an advanced building controller.

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