

Beecher Road School



# **RetroCommissioning**

**for**

**Beecher Road Elementary School  
40 Beecher Road - South  
Woodbridge, CT 06525**

**Prepared for:**

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Superintendent

Woodbridge School District

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Van Zelm Project #: 2018137.03





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## Executive Summary

In June of 2021, van Zelm Heywood & Shadford, Inc. (van Zelm) was hired to provide Engineering Consultation Services for evaluating the HVAC equipment and measuring airflows for the non-classroom areas of the school.

van Zelm performed site visits and system testing in both the cooling and heating seasons.

### Scope of Work

The scope of work included the following HVAC systems:

Air Handling Units (AHU 1 thru AHU 6)

Rooftop Units (RTU 1 thru RTU 5)

VAV Boxes associated with RTU 2 & RTU 5

Fan Coil Units (PTAC units 1 thru 4) District Office Area

Central Heating Equipment

Central Cooling Equipment

### Work Performed

Work performed included:

1. Initial review of HVAC System
  - a. Review plans and specs to become familiar with the Engineers original design intent.
  - b. Review Testing, Adjusting and Balancing (TAB) Report.
  - c. Perform review of Building Automation System as-built drawings, points list, sequences of operations, etc.
2. HVAC System Site Evaluation
  - a. Conduct field visits to review the actual installation of the HVAC systems.
  - b. Review operation of the HVAC System via BAS and field observation.
  - c. Met with Facilities Personnel to discuss any ongoing comfort issues.
3. Functional Performance Testing
  - a. The HVAC Systems were tested in the cooling and heating seasons and issues or deficiencies were documented.

#### 4. Reporting/Implementation

- a. Included findings and recommendations based on our investigation.
- b. We will provide a summary of any work performed related to the implementation of corrective measures.
- c. Met with School personnel to present final report and review options for next steps.

### Statement of Findings

The temperatures are generally being controlled close to the temperature setpoints without problems.

Relative humidity is higher than desired which has been typical for this building.

Based on the scheduled values found in the design documentation, the outside air ventilation volumes are lower than design.

There are many opportunities to improve the operation and efficiency of the rooftop and air handling units. Deficiencies we found are indicated in the Functional Test portion of this report.

The HVAC unit sequence of operations appears to differ from the sequence of operations found in the Building Automation Drawings. We tested the units based on the current operating conditions. The current sequence needs to be confirmed and updated.

The Honeywell Building Automation System had issues throughout this project which limited our ability to use it. We were able to perform our testing using a borrowed school laptop which allowed us to perform the work, seasonally, as needed but we could not monitor the system remotely as we had planned.

The Honeywell JACE has since been relaced and the system performs much better but we were unable to utilize the new functionality during the course of the project.

### Reporting/Implementation

We met with the Facility Director and the BAS contractor to discuss the deficiencies on February 8, 2022. The issues were explained and discussed at this meeting.

## Functional Testing Results

### AHU 1

#### Music

9-28-2021

OAT 69.1°F

OA RH 73.9%

Chilled Water Setpoint is 46°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	71.8°F	None	32.4%	None	72.6°F	73.4°F
Measured	69.7°F	70.2%	None	60.6°F	70.1°F	69.5°F

Setpoints Cooling/Heating 72°F/72°F

Room is controlling to 72°F as measured by BAS temperature sensor.

Occupied cooling and heating setpoints are both 72°F.

Room smells musty.

This should be rechecked when unit is operating correctly.

Relative Humidity high.

This should be rechecked when unit is operating correctly.

Measured total airflow and outside air volume is well below the scheduled values. See the Appendix A Air Flow Schedule.

The supply and return fans should be checked. The fan operation should be corrected and the damper set to provide the required air flow.

Demand Controlled Ventilation (DCV) is not part of the provided sequence but the unit is operating with a DCV program. Unable to see setpoints.

The setpoints should be determined and all associated points displayed on the graphic.

Outside air damper minimum position setpoint is 10% and the CO2 level is 411 PPM but the damper is open beyond minimum at 28% for some reason. The DCV CO2 setpoint is not shown on the graphic.

The damper program should be investigated and corrected.

Blew on the CO2 sensor. The CO2 reading increased, the damper position increased, the chilled water valve position increased, the discharge air temperature decreased. The DCV response was good.

The sequence calls for comparative enthalpy. A dry bulb changeover setpoint of 68°F is shown on the graphic. Lowered the setpoint to 60°F with the outside air temperature at 68.9°F. The damper remained at 28%. This is an issue.

The sequence should be verified and confirmed to be operating. The setpoints and associated points should be displayed on the graphic.

**AHU 1**

**Music**

12-28-2021

OAT 44.3°F

OA RH 72.7%

HWST is 146°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	68.3°F	None	12%	None	112°F	79°F
Measured	68.5°F	29.3%	None	35.3°F	107°F	69.5°F

Setpoints Cooling/Heating 72°F/68°F

RH sensor low

Sensor should be calibrated or replaced

Room at setpoint

Heating valve 100%

Damper at 28%

CO2 not changing when blowing on sensor DCV not changing damper position.

Sensor should be checked and replaced in needed.

Changed economizer changeover setpoint no response.

Occupied cooling setpoint is 72°F. Occupied heating setpoint is 68°F.

Room is controlling to the occupied heating setpoint.



**AHU 4**  
**Auditorium**  
9-28-2021

OAT 68.9°F  
OA RH 74.8%  
Chilled Water Setpoint is 46°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	71.1°F	None	32.4%	None	69.5°F	72.8°F
Measured	72.1°F	76.7%	None	62.7°F	69.4°F	69.5°F

Setpoints Cooling/Heating 72°F/70°F

Outside air volume is below scheduled air volume. See Appendix A Air Flow Schedule.

The fan speed and damper position should be set for the required volume of outside air.

Supply fan has a VFD. 100% is 69.9 Hz.

Return fan is constant volume.

There is no way to balance or control outside air under this scenario.

This is a mechanical deficiency. Further engineering/design work would be required but the return fan should be modified to variable speed and set up to track the supply fan.

Relative Humidity high

This should be checked when unit is operating correctly.

Setpoint page on graphic wont display. Can't change anything.

This should be corrected.

Damper at minimum position of 20%.

No economizer or DCV screen.

All associated setpoints and points should be displayed on the graphic.

Graphic has separate summer/winter SAT setpoints. Not sure how they are controlled.

Controlling to summer setpoint. No mode displayed.

All associated setpoints and points should be displayed on the graphic.

**AHU 4**  
**Auditorium**  
12-28-2021

OAT 44.3°F  
OA RH 72.7%  
HWST is 146°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	68.6°F	None	12%	None	79.8°F	70.8°F
Measured	69.4°F	31.7%	None	38.1°F	74.5°F	

Setpoints Cooling/Heating 74°F/68°F

Unit is controlling to heating setpoint.

Blew on the CO2 sensor. The CO2 reading increased, the damper position increased, the discharge air temperature decreased, the heating valve responded by opening. The DCV response was good.

**AHU 2**  
**North Gym**  
8-17-2021

OAT 77.2°F  
OA RH 67.7%  
CHWST 45°F

Setpoints Cooling/Heating 72°F/68°F  
The room temperature was 71.7°F with a setpoint of 72°F

Measured total airflow and outside air volume is well below the scheduled values. See the Appendix A Air Flow Schedule. There is zero to negative outside air at the present settings.

The fan speed was overridden to 65%.  
We found a note in the TAB report dated 11-1-2016 that the school requested the gym units be turned down to 60 Hz due to extreme noise. They had been tested at 77 Hz.

The fan speed and proper damper position should be set correctly to achieve the required outside air volume.

The outside air damper was 100% open on a warm and humid day (65.7°F Dewpoint).  
The chilled water valve was 100% open.  
The economizer programming should be checked and corrected. All associated setpoints and points should be displayed on the graphic.

The CO2 sensor was incorrectly reading -226 PPM  
The sensor should be investigated and corrected.

No response from economizer changeover setpoint. Not sure how economizer is programmed.  
No DCV setpoints.  
The economizer and demand controlled ventilation programming should be verified and corrected as needed. All associated setpoints and points should be displayed on the graphic.

The exhaust fans were not operating per the sequence of operations. Unable to find exhaust fan logic.  
The exhaust fans and the controls need to be investigated and corrected. All associated setpoints and points should be displayed on the graphic.

**AHU 2**  
**North Gym**  
12-28-2021

OAT 51.2°F  
OA RH 61.8%  
HWST 146°F

Setpoints Cooling/Heating 72°F/69°F  
Controlling to room setpoint of 69°F

CO2 sensor reading negative value  
Outside air damper at 24%  
No response to economizer changeover setpoint.  
Heating valve is at 100% with a discharge air temperature of 102°F

Note: AHU 2 & AHU 3 both serve the same Gym

**AHU 3**  
**North Gym**  
8-17-2021

OAT 77.2°F  
OA RH 67.7%  
CHWST 45°F

Setpoints Cooling/Heating 72°F/68°F  
The room temperature was 71.7°F with a setpoint of 72°F

Measured total airflow and outside air volume is well below the scheduled values. See the Appendix A Air Flow Schedule. There is zero to negative outside air at the present settings.

The fan speed was overridden to 25%.

We found a note in the TAB report dated 11-1-2016 that the school requested the gym units be turned down to 60 Hz due to extreme noise. They had been tested at 77 Hz.

The fan speed and proper damper position should be set correctly to achieve the required outside air volume.

The outside air damper was 100% open on a warm and humid day (65.7°F Dewpoint).

The chilled water valve was 100% open.

The economizer programming should be checked and corrected. All associated setpoints and points should be displayed on the graphic.

The CO2 sensor was incorrectly reading -226 PPM  
The sensor should be investigated and corrected.

No response from economizer changeover setpoint. Not sure how economizer is programmed.  
No DCV setpoints.

The economizer and demand controlled ventilation programming should be verified and corrected as needed. All associated setpoints and points should be displayed on the graphic.

The exhaust fans were not operating per the sequence of operations. Unable to find exhaust fan logic. The exhaust fans and the controls need to be investigated and corrected. All associated setpoints and points should be displayed on the graphic.

**AHU 3**  
**North Gym**  
12-28-2021

OAT 51.2°F  
OA RH 61.8%  
HWST 146°F

Setpoints Cooling/Heating 72°F/69°F  
Controlling to room setpoint of 69°F

CO2 sensor reading a negative value  
Controlling to room temperature setpoint of 69°F.  
Heating valve is at 0% with a discharge air temperature of 71.4°F

Note: AHU 2 and AHU 3 both serve the same North Gym.  
The units should be set up to operate in similar fashion. Having one unit supply 102°F air and the other 71.4°F air is not efficient. Unable to see programming to determine how units are controlled.

**AHU 5**  
**South Gym & Locker Rooms**  
8-17-2021

OAT 77.2°F  
OA RH 67.7%  
CHWST 45°F

This unit serves three zones. There is a duct mounted reheat coil for each zone.

Measured outside air volume is well below the scheduled values. See the Appendix A Air Flow Schedule.

The supply fan is variable speed but the return fan is constant volume.  
There is no good way to control the outside air volume.  
There is no way to balance or control outside air under this scenario.  
This is a mechanical deficiency. Further engineering/design work would be required but the return fan should be modified to variable speed and set up to track the supply fan.

The supply air was close to the scheduled value but the outside air volume was nowhere near the scheduled value. See Appendix A Air Flow Schedule.

Outside air damper was fully closed at 20%. The relief damper was open.  
The dampers should be checked mechanically and the programming verified.

Unit discharge air temperature setpoint was 55°F with a 57.6°F discharge air temperature.  
The unit serves multiple zones.

The Gym setpoint was 70°F. The temperature was 69.5°F with the relative humidity at 71.3% which is high.

The Boys Locker Room setpoint was 70°F. The temperature was 73.3°F with the relative humidity at 57.6%

The Girls Locker Room setpoint was 70°F. The temperature was 74°F with the relative humidity at 58.6%

All three zones had the reheat heating valves opening, raising the discharge air temperature up to 100°F

Not sure how these areas are programmed. Better control of supply air temperature should be looked into to prevent simultaneous heating and cooling.

Summer and Winter supply air temperature setpoints were both 55°F.

The supply air did not appear to be reset, the fan speed remained constant.

Not sure how the supply air temperature, dampers are fan speed are controlled.  
All setpoints and associated points should be displayed on the graphic.  
There was a BAS communication issue with the system which made monitoring difficult at times.  
This has since been corrected.

**AHU 5**  
**South Gym & Locker Rooms**  
 12-28-2021

OAT 43.4°F  
 OA RH 74%  
 HWST 146°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	70.4°F	None	33.5%	None	69.8°F	73.5°F
Measured	70.5°F	31.5%	None	38.9°F	69.5°F	70.1°F

The Gym temperature was controlling to the 70°F setpoint. The locker rooms were both above the 70°F setpoint with the reheat valves closed.

The discharge air temperature was 72.5°F. The winter setpoint was 55°F and the summer setpoint was 70°F. Perhaps this is an error on the graphic. It is unknown how the unit is programmed.

The mixed air and supply air temperatures were both high. The dampers were at 20% and the heating valve was closed.

Blew on CO2 sensor and damper opened beyond minimum. MAT decreased to 59°F and the damper returned to minimum. The damper then opened again to 100% with the MAT at 56°F. The MAT then went to 50°F at 86% with the SAT at 54°F.

At a SAT of 50°F, the heating valve started to open and the damper returned to minimum.

Unsure what the DCV setpoints are.  
 Unsure about the economizer enable setpoint/logic

**AHU 6**  
**Multi-Purpose Room**  
 8-17-2021

OAT 78.9°F  
 OA RH 59.4%  
 CHWST 45°F

Setpoints Cooling/Heating 72°F/69°F  
 The room is controlling to the setpoint of 72°F.

Lowered setpoint from 72°F to 68°F and confirmed chilled water valve opened.  
 SAT went down to 52.3°F.  
 OAD remained at 25%

The CO2 sensor is reading a negative value.  
 The sensor should be investigated and the problem corrected.

12-28-2021

OAT 48.9°F  
 OA RH 66.8%  
 HWST 146°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	70°F	None	28.4%	None	58.8°F	74°F
Measured	68°F	26.7%	None	38.9°F	62°F	68°F

Setpoints Cooling/Heating 72°F/70°F  
 The room is controlling to the setpoint of 70°F

The economizer did not respond to a change of the setpoint.  
 The economizer controls should be investigated and corrected as needed. All setpoints and associated points should be displayed on the graphic.

Access to this unit is limited and the airflow measurements were not obtained.  
 Airflows should be measured and set correctly during the implementation phase.



**RTU 1**  
**District Offices**  
9-28-2021

OAT 69.7°F  
OA RH 72%  
CHWST 45°F

The unit is controlling to the occupied cooling setpoint of 74°F.  
The relative humidity was 60.3%.

Measured total airflow and outside air volume is below the scheduled values. See the Appendix A Air Flow Schedule. There is zero to negative outside air at the present settings.  
The fan speed and damper should be investigated and set to achieve the required airflow values.

The damper was at minimum of 15%, the cooling valve was open 64% and the SAT was 66.4°F.

This unit has the heating and cooling coils mis piped. The chilled water is piped the hot water coil and the hot water is piped to the chilled water coil. Improved cooling and dehumidification could be achieved by correcting this. Before any piping changes are made, recommend trying only a control change first by rewiring the valve control signals.

12-28-2021

OAT 49.7°F  
OA RH 66.3%  
HWST 148°F

Room temperature of 70.8°F is above the setpoint of 68°F.  
The heating valve is at 0% and the DAT is 67.5°F  
The damper is at the minimum position of 15%.

Not sure about economizer enable. Not shown on graphic.  
Unable to change the CO2 setpoint.

The damper controls should be investigated and corrected as needed. All setpoints and associated points should be displayed on the graphic.

**Fan Coil Units**  
**District Offices**  
 9-28-2021

OAT 68.2°F  
 OA RH 79.5%  
 CHWST 45°F

There are four PTAC units (Packaged Terminal Air Conditioner) in this area which serve the Superintendent Office, Superintendent Secretary, Kitchenette and Business Manager Office (Recreational Director).

The units have very small two position outside air dampers. The outside air flow is not able to be measured.

There are wall thermostats for each unit.  
 Found the Business Manager thermostat set up for French.

The Relative Humidity was high.  
 Raising the cooling setpoints may help with the humidity.  
 Operating on low fan speed, if possible, will also help with dehumidification.

PTAC	Temp	RH%	HTG/CLG	Clg SP	HTG SP	Fan
Superintendent	70.1°F	74%	Off	71°F	68°F	On
Secretary	72.3°F	66%	Off	77°F	74°F	On
Kitchenette	70.3°F	75%	Cooling	70°F	67°F	On
Business Mgr.	73.5°F	55%	Off	73°F	70°F	On

**RTU 3**  
**Cafeteria**  
 9-28-2021

OAT 69.4°F  
 OA RH 73.6%  
 CHWST 45°F

	Room T	Room RH	RAT RH	DP	SAT
BAS	71.7°F	None			70.2°F
Measured	71.3°F	74.8%	None	62.9°F	69.9°F

Setpoints Cooling/Heating 74°F/68°F

Measured total airflow and outside air volume is below the scheduled values. See the Appendix A Air Flow Schedule.

The fan speed and dampers should be investigated and set to provide the required airflow.

The Relative humidity is high.

This should be rechecked after corrections are made.

The room cooling setpoint was 74°F but the cooling discharge air temperature setpoint was 70°F so the space was overcooling to 71°F.

The setpoint should be better coordinated with the load in the room to minimize overcooling.

The SAT was 69°F with the cooling valve at 19% open.

The damper was at the minimum setpoint of 25%.

Not sure how the economizer is controlled.

The damper controls should be verified. All setpoints and associated points should be displayed on the graphic.

Lowered room setpoint from 74°F to 70°F. The SAT setpoint went to 55°F and the cooling valve opened. The SAT was under 60°F.

**RTU 3**

**Cafeteria**

12-28-2021

OAT 50.7°F

OA RH 64%

HWST 145°F

	Room T	Room RH	RAT RH	DP	SAT	RAT
BAS	70°F				64.9°F	69.3
Measured	68°F				65°F	66.7

Setpoints Cooling/Heating 74°F/68°F

Room controlling to the room temperature setpoint of 68°F.

DAT setpoint was 69.6°F and the DAT was 69°F.

The heating valve was open 8.26%.

Raised heating setpoint from 68°F to 70°F, perimeter baseboard radiation valve opened. (Not on graphic)

Not sure about economizer enable.

**RTU 4**  
**Library**  
 9-28-2021

OAT 69.4°F  
 OA RH 73.6%  
 CHWST 45°F

	Room T	Room RH	RAT RH	DP	SAT	SAT SP
BAS	71.3°F	None			66.6°F	67.4°F
Measured	70.5°F	68.5%		60°F	66.6°F	

Setpoints Cooling/Heating 72°F/70°F  
 Room controlling to setpoint.

Measured total airflow and outside air volume is below the scheduled values. See the Appendix A Air Flow Schedule.

Fan speed and damper position should be investigated and set to provide the required airflows.

Not sure about economizer control

The damper control should be investigated and corrected as needed. All setpoints and associated points should be displayed on the graphic.

12-28-2021

OAT 69.4°F  
 OA RH 73.6%  
 HWST 145°F

This system has two hot water duct coils. It is unknown what controls the heating valves for these coils. There is only one visible temperature sensor in the interior of the library. The coils serve the perimeter on the east exposure. There is one for the south east and one for the north east. The valves are active and seem to modulate from the same signal.

Control of the coils should be confirmed. All associated points should be displayed on the graphic.

Room temperature at BAS sensor controlling to setpoint but measured temperature was about 3°F cooler. Sensor calibration should be investigated.

Discharge air temperature of 72°F was higher than the setpoint of 67°F.

CO2 setpoint change had no effect.

Not sure of economizer control.

The damper control should be investigated and corrected as needed. All setpoints and associated points should be displayed on the graphic.

**RTU 5**  
**Tech Center**

This is a VAV system with three VAV boxes serving the Tech office, computer lab north and computer lab south. The VAVs are standard shutoff boxes with hot water reheat coils.

The VAV airflow setpoints are not consistent with the scheduled values. In some cases, they are set considerably below the scheduled values. See Appendix A - Air Flow Schedule

Measured total airflow is below the scheduled values but is higher than the connected load of the system. The measured outside air volume is higher than the scheduled outside air volume. See the Appendix A - Air Flow Schedule.

The required outside air volume should be confirmed for this system. The VAV setpoints are below what was scheduled. It is not known why this was done but it may have been an effort to increase the dehumidification in these rooms. Once the required volume of outside air is determined and implemented, the most effective VAV airflow setpoints should be confirmed by adjusting and monitoring the temperature and relative humidity.

9-28-2021

OAT 69.4°F  
OA RH 73.7%  
CHWST 45°F

RTU static pressure is at the setpoint of 1" with a fan speed of 60.5%.  
Supply air temperature is 61.7°F with a setpoint of 61.8°F and the chilled water valve at 51.6%.  
Damper is at minimum position of 25%.

There is space CO2 shown on the graphic. What does this represent? Return Air? VAV values?  
There is space temperature shown on the graphic. What does this represent? Return Air? VAV values?  
How is the RTU controlled? Does it look at the VAVs?  
Is it controlled like a VAV unit or a zoned system?  
The method of control for this unit needs to be confirmed defined on the graphic.

Lowered occupied cooling setpoint from 71°F to 70°F. Calculated SAT setpoint dropped to 55°F, the chilled water valve opened and the supply air temperature dropped.

Adjusted CO2 setpoint. No response.  
Unsure of economizer control.  
The damper controls need to be verified and corrected as needed. All associated points should be displayed on the graphic.

**RTU 5  
Tech Center**

VAV Boxes	Room T	Room Setpoint	CF M	CFM Setpoint	Damper	Box Mode	Reheat Valve
5-3 North Lab	70.9°F	71°F	355	349	100%	Heat	100%
5-2 South Lab	71.3°F	71°F	84	350	100%	Heat	100%
5-1 Office	71.1°F	71°F	50	51	13.3%	Cool	0%

VAV temperatures are controlling to setpoint.

5-2 CFM low

5-2 CFM setpoint is at Cooling Max of 350 and not heating CFM of 300

VAV operation needs to be investigated.

VAVs have no discharge air temperature sensors.

12-28-2021

OAT 50.7°F

OA RH 62.9%

CHWST 145°F

RTU static pressure is at the setpoint of 1" with a fan speed of 59.5%.

Supply air temperature is 61.2°F with a setpoint of 60°F and the heating valve at 0%.

Damper is at minimum position of 25%.

VAV Boxes	Room T	Room Setpoint	CF M	CFM Setpoint	Damper	Box Mode	Reheat Valve
5-3 North Lab	69.6°F	71°F	340	349	82.1%	Heat	100%
5-2 South Lab	70.8°F	71°F	64	350	100%	Heat	6.4%
5-1 Office	70°F	70°F	121	121	20.5%	Heat	28.4%

VAV temperatures are controlling close to setpoint.

5-2 CFM low

5-2 CFM setpoint is at Cooling Max of 350 and not heating CFM of 300

**RTU 2**  
**Administration**

This is a VAV system with six VAV boxes serving the Package Room, Principle, Vice Principle, Main Office Area, Waiting Area and Conference Room. The VAVs are standard shutoff boxes with hot water reheat coils.

The VAV airflow setpoints are not shown on a schedule. There are design values shown in the TAB report dated November 1, 2016. They differ slightly from the current setpoints and the connected load. See Appendix A - Air Flow Schedule

Measured total airflow is slightly below the scheduled value but matches the connected load of the system. The measured outside air volume is higher than the scheduled outside air volume. See the Appendix A - Air Flow Schedule.

The required outside air volume should be confirmed for this system. The VAV setpoints are below what was scheduled. It is not known why this was done but it may have been an effort to increase the dehumidification in these rooms. Once the require volume of outside air is determined and implemented, the most effective VAV airflow setpoints should be confirmed by adjusting and monitoring the temperature and relative humidity.

9-28-2021

OAT 69.4°F  
OA RH 73.7%  
CHWST 45°F

RTU static pressure is at the setpoint of 1" with a fan speed of 17.5%.  
Supply air temperature is 71.3°F with a setpoint of 67.5°F and the chilled water valve at 10%.  
Damper is at minimum position of 15%.

There is space CO2 shown on the graphic. What does this represent? Return Air? VAV values?  
There is space temperature shown on the graphic. What does this represent? Return Air? VAV values?  
How is the RTU controlled? Does it look at the VAVs?  
Is it controlled like a VAV unit or a zoned system?  
The method of control for this unit needs to be confirmed defined on the graphic.

Lowered occupied cooling setpoint from 72°F to 70°F. Calculated SAT setpoint dropped to 55°F, the chilled water valve opened and the supply air temperature dropped.

Adjusted CO2 setpoint. No response.  
Unsure of economizer control.  
The damper controls need to be verified and corrected as needed. All associated points should be displayed on the graphic.



**RTU 2  
Administration**

VAV Boxes	Room T	Room Setpoint	CF M	CFM Setpoint	Damper	Box Mode	Reheat Valve
Package Room	70.8°F	72°F	63	60	36%	Cool	0%
Principle	71.4°F	70°F	52	50	34%	Heat	0%
Vice Principle	70.6°F	70°F	61	60	36%	Heat	0%
Waiting	70.4°F	70°F	63	50	36.3%	Heat	0%
Conference	69.6°F	74°F	93	50	31%	Cool	0%
Main Office	71.2°F	72°F	78	75	37.4%	Cool	0%

Conference Room airflow was not as stable as the other boxes.

Measured in Conference Room

71.6°F, 74.2% RH, 62.9°F Dewpoint

The setpoints are low and the temperatures generally too cool.

Cooling setpoints should be increased and the CFM reduced if possible to promote dehumidification and over cooling.

12-28-2021

OAT 51.7°F

OA RH 61%

HWST 145°F

RTU static pressure is at the setpoint of 1" with a fan speed of 36.7%.

Supply air temperature is 70.2°F. The heating and cooling valves were both closed. The calculated heating setpoint was 60°F and the calculated cooling setpoint was 70°F. The displayed space temperature was between the heating and cooling occupied setpoints.

Damper is at minimum position of 15%.

VAV Boxes	Room T	Room Setpoint	CF M	CFM Setpoint	Damper	Box Mode	Reheat Valve
Package Room	68°F	68°F	56	60	34.8%	Heat	0%
Principle	69.6°F	70°F	352	350	80.9%	Heat	100%
Vice Principle	69.6°F	70°F	262	300	100%	Heat	100%
Waiting	69.5°F	70°F	300	300	52.9%	Heat	100%
Conference	68.6°F	68°F	0	50	32.5%	Heat	0%
Main Office	70.3°F	68°F	79	75	39%	Heat	0%

Rooms mostly controlling to setpoint.

## Dual Temperature Loop

8-17-2021

OAT 78.9°F  
OA RH 59.4%  
CHWST 45°F

The chiller does an excellent job of controlling to the setpoint. We have found the setpoint at 46°F. We recommend operating at a setpoint of 48°F for the chilled water supply temperature. This had been previously implemented with good results in the classroom areas and we did not see evidence of units not able to cool effectively at the elevated setpoint.

12-28-2021

OAT 51.7°F  
OA RH 61%  
HWST 145°F

The hot water loop is maintaining the temperature setpoint and the pump differential setpoint.

# **Appendix A**

## **Air Flow Schedule**

Appendix A		Beecher Road School HVAC Unit Air Flow Schedule										
Date	8/26-9/2/2021	Scheduled			Measured/Calculated							
Unit	Area Served	CFM	OA CFM	DCV CFM	CFM	OA CFM	Fan Speed	Min DPR Pos	DWG	Bld Area	Notes	
AHU 1	Music	4,350	1,600	N/A	975	114/545	On	10%/28%	M204	South	1, 4, 6	
AHU 2	North Gym	5,300	1,700	530	3,562	0-negative	65%	10%	M200	North	1, 4	
AHU 3	North Gym	5,300	1,700	530	1,939	0-negative	25%	10%	M200	North	1, 4	
AHU 4	Auditorium	6,700	3,400*	670	6,773	1,929	100% 69.9Hz	20%	M204	South	2, 4	
AHU 5	South Gym	9,700	4,300	2,200	10,229	937	100% 67.9Hz	20%	M204	South	2, 4	
AHU 6	Multipurpose	3,500	775	N/A	See Note	See Note	On	25%	M203	South Wing	5	
RTU 1	District Offices	800	200	N/A	590	-35	On	15%	M204	South	1, 4	
RTU 2	Admin Offices	3,000	600	N/A	2,664	751	100%/79.9%	15%	M200	North	1, 3, 4	
RTU 3	Café	10,560	5,800	1,060	7,910	2,157	On	25%	M201	North	1, 4	
RTU 4	Media/Library	7,400	2,100	N/A	6,503	226	On	10%	M201	North	1, 4	
RTU 5	Tech Center	3,600	700	N/A	2,588	1,273	100%/66.6%	25%	M201	North	1, 3, 4	
		CFM Setpoints			Connected	Scheduled CFM						
RTU 2		Max	Min	Heat	Load	Max	Min					
VAV 2-1	Package Room	350	60	350	300	300						
VAV 2-2	Principle	350	50	350	250	300						
VAV 2-3	Vice Principle	350	60	300	225	300			No Schedule. Values are from TAB			
VAV 2-4	Main Office	500	75	400	875	850						
VAV 2-5	Waiting Area	350	50	300	500	450						
VAV 2-6	Conference	350	50	300	500	450						
RTU 5	Totals	2250	345	2000	2650	2650						
VAV 5-3	North	350	348	349	2,075	1,175	590					
VAV 5-2	South	350	350	300	700	700	350		From M-500 Schedule			
VAV 5-1	Office	350	50	300	300	500	250					
	Totals	1050	748	949	3075	2375	1190					
Notes:	<ol style="list-style-type: none"> <li>1. Measured at outside air louver with Velgrid.</li> <li>2. Static pressure measured in OA Plenum and compared to TAB report 11,1,2016.</li> <li>3. Total measured with all VAVs at Max CFM. OA with VAVs at Min CFM.</li> <li>4. Damper settings and Fan speeds are "As-Found"</li> <li>5. AHU 6 is minimally accessible. No readings were obtained.</li> <li>6. Damper is always at 28% for no appearant reason.</li> </ol>											