Addendum # 2
Bid Opportunity: 26-7849-RFT
Galt Collegiate Institute
Exterior/ Interior Upgrades to Tassie Hall
Closing Date: Wednesday, March 11, 2026 2:00 PM

The following issued by the Board shall form part of the Bid/ Proposal Solicitation document. The revisions and additions noted herein along with any attachments shall be read in conjunction with all other related documents. This Addendum shall take precedence over the previously issued documents where differences occur. Receipt of this addendum must be acknowledged in the Bidding System, bids&tenders.

If you have already submitted a Bid/ Proposal, it will be automatically withdrawn as a result of this addendum. You must resubmit the Bid/ Proposal acknowledging all addenda and revising your Bid/ Proposal to comply with all addenda.

2.1 QUESTIONS/ ANSWERS

Question 1:

Is there a particular or prequalified contractor we are to use for the Integrated Automation?

Answer 1:

Based on recent pilot project initiatives at board school sites, the following suppliers are deemed qualified for this project.

- Energy Controls and Mechanical Services
  Contact - Jasmin McCaskie jasmin@energycontrols.ca
  519-893-2638
  http://energycontrols.ca/

- Ingenuity Controls
  Contact - Peter Rochus prochus@ingenuitycontrols.com
  226-599-0470
  https://ingenuitycontrols.com/

- Touchstone Building Technologies
  Contact - Brent Divell bdivell@touchstonebti.ca
  519 997-2792
  http://www.touchstonebti.ca/

Question 2:

Could I request another walkthrough?

Answer 2:

A second, optional site walkthrough has been arranged for bidders who wish to conduct an additional review of the project site. Please note that this will be the final walkthrough opportunity prior to the bid closing date. We strongly encourage all bidders and sub-trade to attend in order to ensure they have all the necessary information for preparing their proposals.

See below schedule:
Wednesday, March 4th, 8:30 a.m. to 10:00 a.m.

2.2 MECHANICAL/ ELECTRICAL

.1 REFER TO THE ATTACHED MECHANICAL & ELECTRICAL ADDENDUM 02 (PART OF THIS ADDENDUM NO. 2) PREPARED BY MNE ENGINEERING LTD. DATED MARCH 2, 2026 (29 PAGES).

.2 THIS ADDENDUM CONSISTS OF:

- **.1 M&E SUMMARY OF CHANGES (3 PAGES)**
- **.2 REVISED MECHANICAL DRAWING (1 PAGE)**
- **.5 SPECIFICATION SECTION 25 90 00 CONTROL SEQUENCES (25 PAGES).**

END OF ADDENDUM #2

+ Mechanical/ Electrical Addendum (29 pages)

MNE Engineering Inc.
22 Kevco Place - Box A
Kitchener, Ontario N2C 2G5
519 894 9408
www.mneengineering.ca

ADDENDUM 02

To:	**Cornerstone Architecture**	**Date:**	March 2, 2026
		Project:	Galt Collegiate Institute Tassie Hall Upgrades
cc:		**WRDSB No.** **MNE Project No:**	26-7849-RFT 25067

This addendum forms part of the contract documents and amends the drawings and specifications.

Mechanical

1. Reference drawing M1.2

    a. Revise Domestic Hot Water Heater Connection Detail according to attached sketch SK-M01.

2. Reference drawing M3.2

    a. Provide heat tracing for domestic cold water piping in attic. Refer to electrical drawings / specifications for heat trace cable requirements. Insulate according to mechanical specifications.
    b. Provide grooved fittings, joints, connections, etc. for attic piping for pipe sizes 2" (50 mm) NPS and larger to mitigate pipe welding within attic. Refer to mechanical specifications for grooved fitting requirements.

3. Reference drawing M4.1

    a. Revise Section E according to attached sketch SK-M01.
    b. Provide duct offsets around beam below stage where indicated.
    c. Provide BAS Push Button Override switch at on wall at Grid-1 and immediately to the east of the westmost interior double door from Corridor 8202 to the auditorium. Mount at barrier free height.

4. Reference specification section 20 05 00 clause 1.17.2 and append the following sentence:

    "Do not make openings in plaster construction elements without written permission from the Architect."

5. Reference specification section 23 05 00 article 2.15.2 and insert the following:

    e. Wilo

6. Reference specification section 25 05 00 article 2.1 and insert the following:

    .6 Approved vendors:

        a. Energy Controls and Mechanical Services

i. Contact - Jasmin McCaskie jasmin@energycontrols.ca
ii. 519-893-2638
iii. http://energycontrols.ca

b. Ingenuity Controls
i. Contact - Peter Rochus prochus@ingenuitycontrols.com
ii. 226-599-0470
iii. https://ingenuitycontrols.com

c. Touchstone Building Technologies
i. Contact - Brent Divell bdivell@touchstonebti.ca
ii. 519 997-2792
iii. http://www.touchstonebti.ca

7. Insert attached specification section 25 90 00 Control Sequences.

Electrical

1. Reference Drawings 2/E2.1 and 1/E2.2

    a. To accommodate mechanical sequence of operations, provide ceiling mounted occupancy sensors:
        i Sensorswitch CM 6R at the following locations.
            - One in Stage 251. Provide black cover.
            - One in Tassie Hall Auditorium 250 centred between the mezzanine and Stage 251
            - One in Tassie Hall Auditorium 250 centred above the mezzanine.
        ii Sensorswitch CM 10R in Tassie Hall Auditorium 250 centred below the mezzanine.
    b. Provide Sensorswitch PP20 power packs.
    c. Provide branch wiring from a 15A-1P breaker in 32B73 to power packs.
    d. Division 25 shall provide low voltage cabling from the sensor relays to the BAS.

2. Reference Drawing 2/E3.1

    a. Luminaire types KC and CG in Stair 901 shall be controlled together by occupancy switches.
    b. Dimmer D_2 at the north entrance to Stage 251 shall separately control type SA and type HFG.
    c. Sensor OF at Lift 953 shall control existing pot lights.

3. Reference Drawing E2.2

    a. Provide heat trace cable for the domestic cold water piping in the Attic. Refer to mechanical drawings for layout.
        i Provide branch wiring from a 20A-1P, Class B GFCI breaker in 32C39.
        ii Provide power relay and BAS relay BFC of Projection Booth 351A.

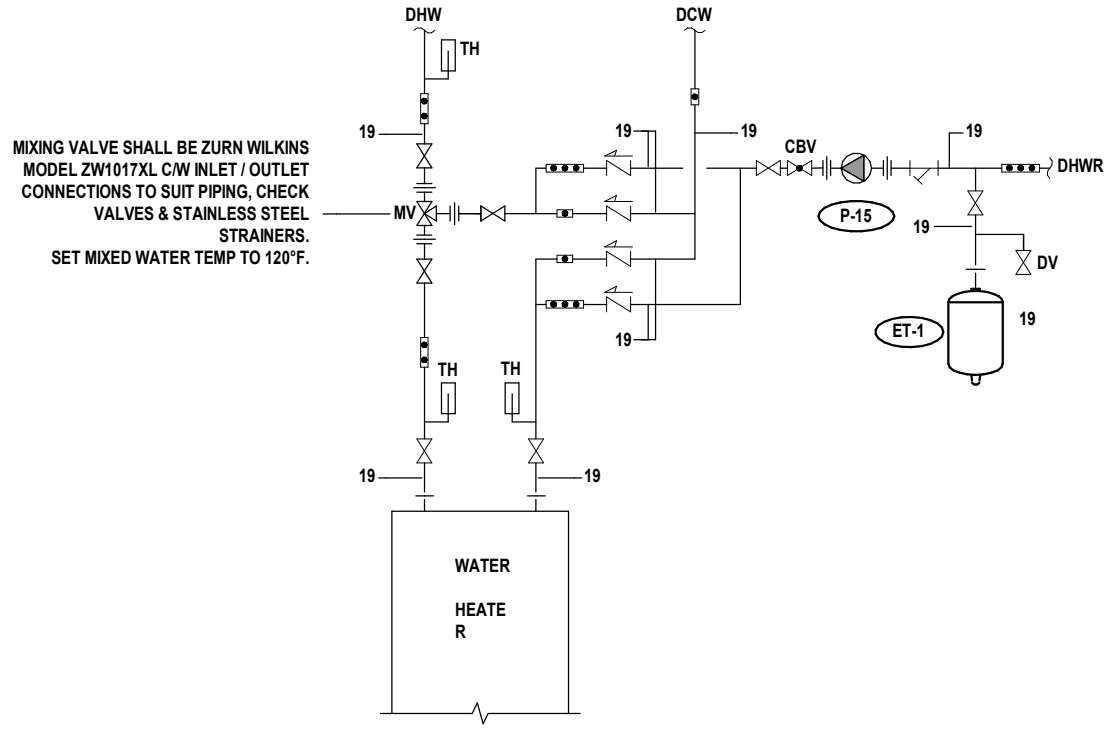
4. Reference Lighting Fixture Schedule

    a. Add type SB and apply Note *4.
    b. Revise type KC Model No. to WL4 40L EZ1 LP840.

5. Clarification to MNE Addendum 01, Item 2.c.

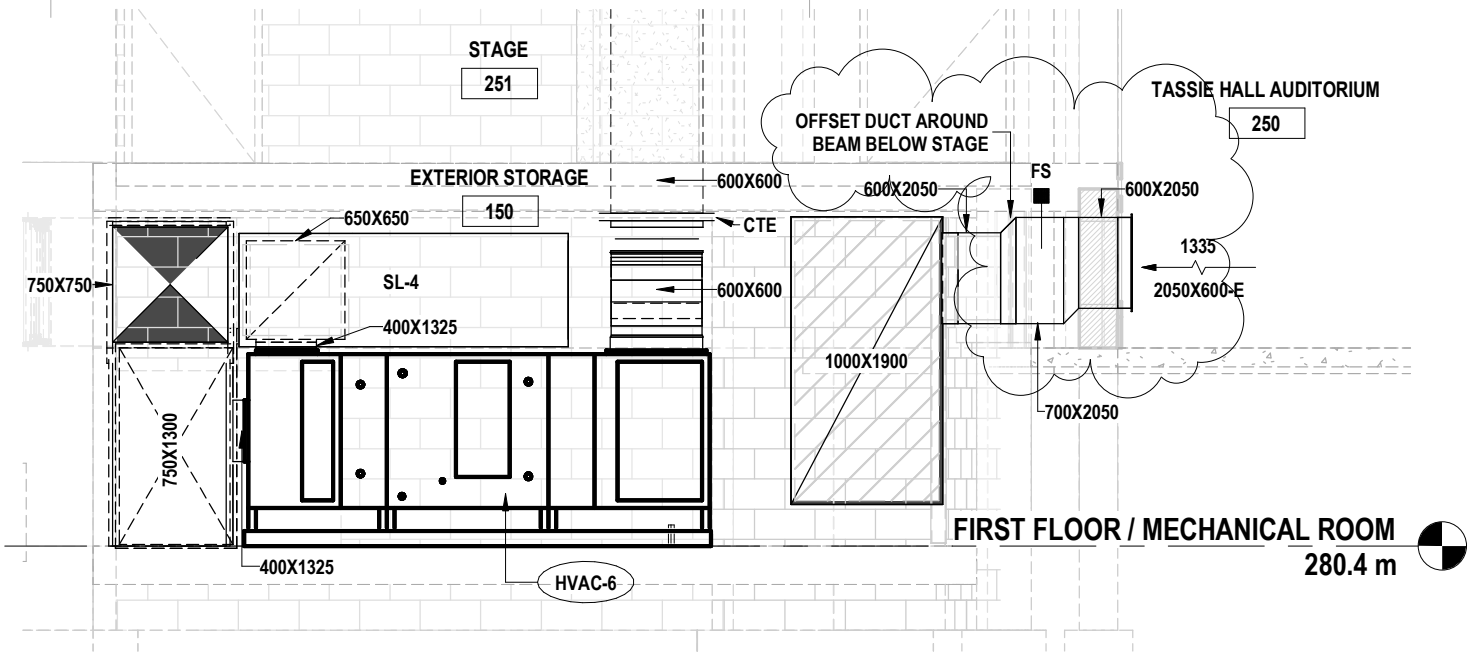
    a. Delete ‘LP-SG’ on Stage 251 with feeders back to ‘PP-CCC’.

End of Addendum



DOMESTIC WATER HEATER CONNECTION DETAIL

SCALE: NTS



SECTION E: HVAC-6 CONNECTION DUCTWORK SECTION

SCALE: N.T.S

MNE EngineeringInc.
22 Kevco Place - Box A
Kitchener, Ontario N2C2G5
(519) 894-9408
www.mneengineering.ca

PROJECT: TASSIE HALL UPGRADES			
DRAWING: WH CONNECTIONS AND UNDER STAGE DUCTWORK			
DWG NO: SK-M01	JOB NO: 25067		
SCALE: AS NOTED	DRAWING BY: M.R.C.		
DATE: 02/26/26	CHECKED BY: C.J.C		

03	
02	
01	ISSUED FOR ADDENDUM 02
REV #	REVISION

1. GENERAL

1.1 General Requirements

.1 Refer to the following related sections:

a. Division 20 – Mechanical.
b. Division 22 – Plumbing.
c. Division 23 – HVAC.
d. Section 25 05 00 – INTEGRATED AUTOMATION.

.2 Comply with the conditions of Division 0 and 1.

1.2 Sequence of Operations

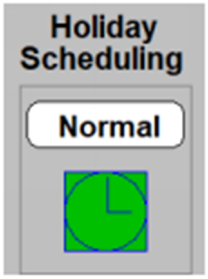
.1 General:

a. All setpoints shall be adjustable.
b. Provide BAS sensors for temperature, flow, pressure, electrical current, etc. where indicated on the drawings and where required to perform the sequences specified in this Division.
c. Provide control schematics and points list based on sequences in this Division.
d. Control description provides intent for BAS controls. Provide programming and control parameters to achieve specified intent.
e. Field measure setpoints for air and water systems, where design setpoint is dependent on the field balanced condition.
f. Display controlled variables, monitored dependent variables and fixed parameters on relevant equipment graphics.
g. Where sensors or other field control devices are indicated on the drawings, provide monitoring points, including feedback for controlled devices, and display on the relevant equipment graphics.
h. Monitor status of all controlled equipment and display on equipment graphics. Provide current sensors where status is not available through equipment control interface.

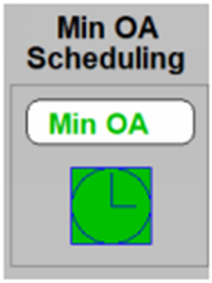
.2 Integration Requirements – General Sequence of Global and Local Operation

a. Holiday Schedule:

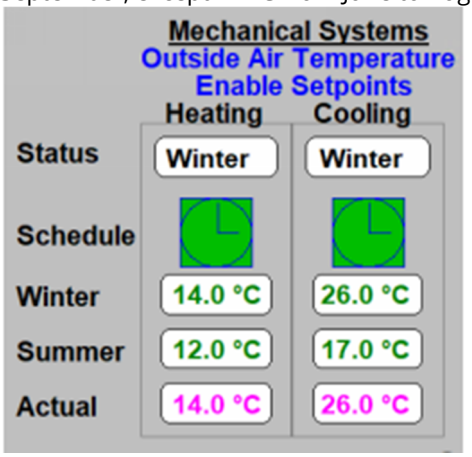
A calendar based schedule that is user adjustable at a global (board wide) or local (site specific) level. Typical entries include the standard board and statutory holidays that apply to the school board: New Year's Day, Christmas Day, Boxing Day, Christmas Holidays, Canada Day, etc. and are pre-defined at the front end Server Dashboard.



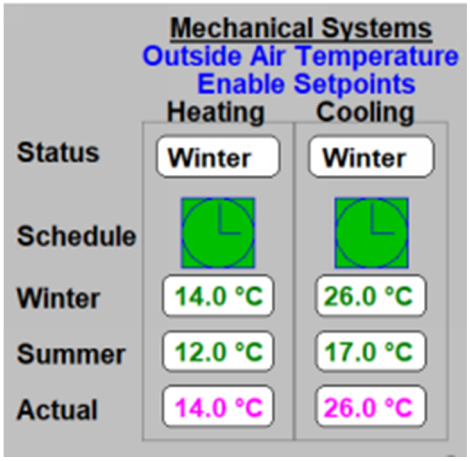
b. Global Ventilation Schedule:
   i. A time of day schedule that is user adjustable at global (board wide) or local (site specific) level. Typical entries include: 7:00 a.m. to 4:00 p.m. Monday to Friday. Outside of this schedule all outdoor air dampers are maintained (spring return / fail) closed when Global Ventilation is disabled.



c. Cooling Enabled Mode:
   i. A set of thresholds that are user adjustable at a global (board wide) or local (site specific) level, triggers the cooling enable mode based on the outdoor air temperature exceeding the threshold. The threshold is further adjusted by a calendar schedule. Typical default values are: 18 °C from May to September, except 21 °C from June to August.



d. Heating Enabled Mode:
   i. A set of thresholds that are user adjustable at a global (board wide) or local (site specific) level, triggers the heating enable mode based on the outdoor air temperature below the threshold. The threshold is further adjusted by a calendar schedule.Typical default values are: 16°C from September to May, except 5°C from June to August.



e. Free Cooling Setpoint Calculation:

i. The average outdoor air relative humidity is sent from the Niagara Server to the Global Input for all schools / Ed Centre where the Free Cooling Setpoint is calculated. Free cool is enabled when OAT < minimum (23.5°C, 29.4°C - Φ/7.43) where Φ is the average relative humidity in %RH.

ii. The free cooling signal is 100% when the OAT is more than 2°C below the free cooling setpoint. The free cooling signal decreases towards zero linearly as the outdoor air temperature increases from 2 °C below the free cooling setpoint to 0 % at the setpoint. This free cooling signal is used in each mixed air damper controller as the maximum the outdoor air dampers can open. Minimum outdoor air damper position signal may exceed the free cooling signal. The free cooling signal is still subject to the mixed damper safeties that would keep minimum position during occupied mode. Also the free cooling signal will be at a lower priority than the CO2 demand ventilation (where applicable) up to 40% outside damper position.

f. Sample Calculation Tables:

i. Humidity-Limited Free Cooling

1) The table in Appendix 'A' serve to illustrate the net result of the Free Cooling Setpoint Calculation formula for a given dataset of Outdoor Air Humidity (average relative humidity in %RH) and Outdoor Air Temperatures (OAT in °C).

ii. Outside Air Temperature Limit Free Cooling

1) This table in Appendix 'B' serve to illustrate the net result of the Outdoor Low Limit Calculation formula for a given dataset of Outdoor Air Temperatures (OAT in °C).

2) The Outdoor Low Limit Calculation is used to restrict the maximum outdoor damper position when the outdoor air temperature is too

cold for the proper operation of the mechanical equipment as an additional preventative level of freeze protection.

g. Minimum Outdoor Air Enable Time Schedule:

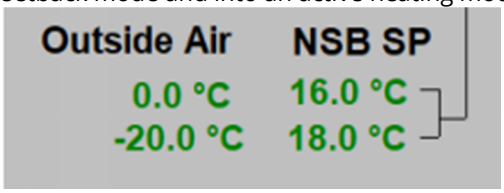
i. A set of time schedules, one for each of the 4 school board areas are configured (typically from 7:00 a.m. to 4:00 p.m., to send an enable flag to each site to allow outside air mixing dampers to open to minimum position, economizer operation (for required cooling demand) or return air CO2 (for required ventilation demand).

h. Minimum Outdoor Air Mixing Damper Position Setpoint:

i. A set of Minimum Outdoor Air Position, one for each of the 4 school board areas are configured to send to each of the sites to send the outdoor air mixing dampers to open to minimum position when the Minimum Outdoor Air Enable Time Schedule is enabled and there are no additional demands for cooling or ventilation are called.

i. Night Setback Heating Setpoint:

i. Reset from outdoor air temperature. The setpoint is used as a threshold to determine if the system is to be automatically brought out of an idle night setback mode and into an active heating mode.



j. BAS Designations – System Point Nomenclature:

i. Each of the system components are to be named or referenced in the BAS system as per the following table. Consultants / designers / contractors are to use the same reference designation in schedules / specifications and equipment labels to ensure conformity with control operations, future warranty and maintenance and associated work order systems.

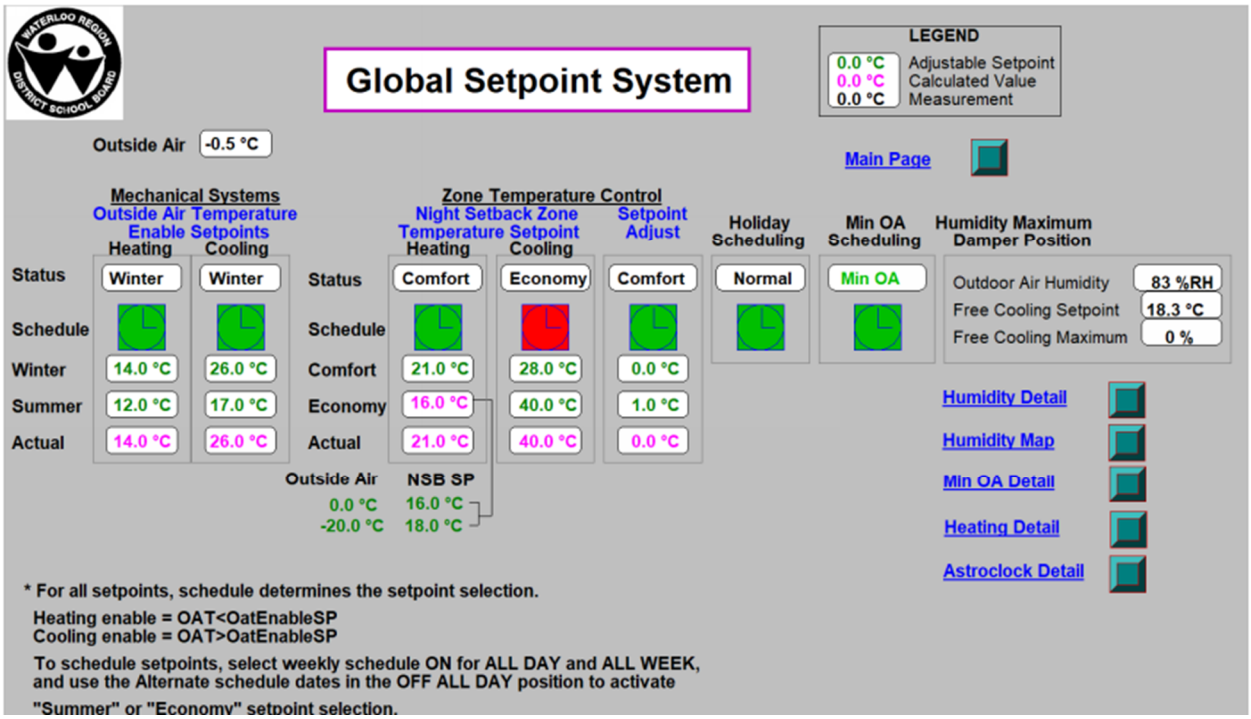
Component Description	**BAS Designation**
Air Handling Unit	AHU
Boiler	B
Bypass Damper	BD
Bypass Box (Dump Box)	BB
Cabinet Heater	CH
Chiller	CHR
Condensing Units / Heat Pump Unit	CU

Cooling Tower	CT
Domestic Hot Water Heater	DHW
Ductless Split	DS
Electric Heater	EH
Energy Recovery Ventilator	ERV
Exhaust Fan	EF
Fan Coil	FC
Gas Fired Heat Pump	GHP
Heat Pumps'HP	
Variable Refrigerant Flow Unit	VRF
Heat Recovery Ventilator	HRV
Heating & Ventilation Unit	HV
Heating Ventilation & Air Conditioning Unit	HVAC
Make Up Air Unit	MUA
Multizone Unit	MZ
Outside Lighting	Outside Lighting
Package Cooling Only Unit	AC
Packaged Terminal Air Conditioner	PTAC
Pump or Circulator (Domestic, Storm/Sanitary, Chilled, Heating Water)	P
Radiator	RAD
Radiant Floor Heat	RFH
Radiant Panel	RP
Reheat Coil	RHC
Return Fan	RF
Supply Fan	SF
Unit Heater	UH
Unit Ventilator	UV
Variable Air Volume Damper	VAV
Variable Volume Temperature Damper	VVT
Water Main Auto Flush	WM Auto Flush

.3 Definitions

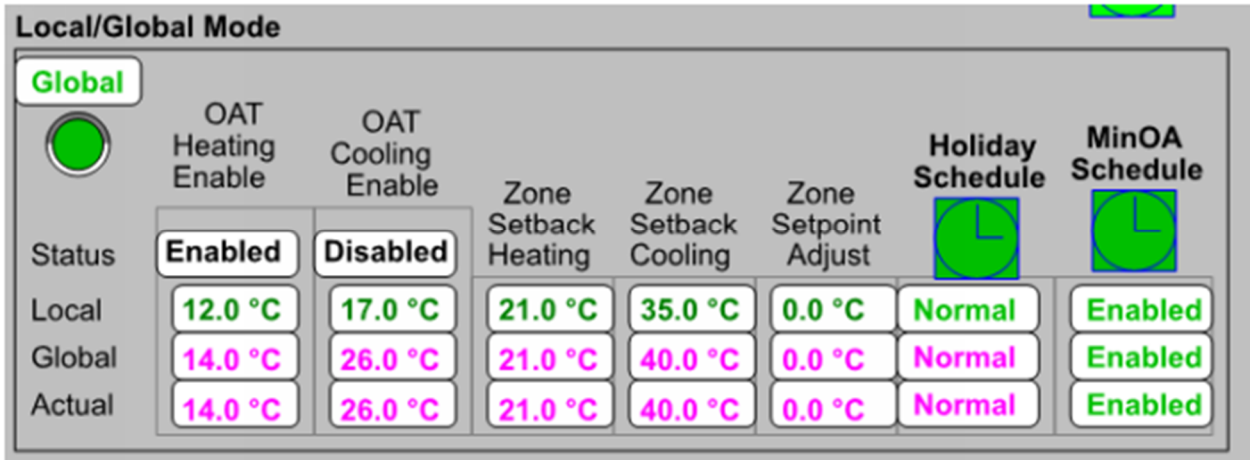
a. Global Functions:

i. A set of setpoints and schedules managed by the high level operator from a central server dashboard.



b. Local Functions:

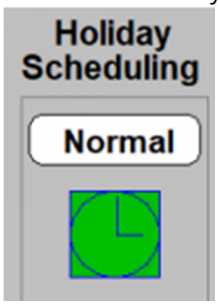
i. A set of setpoints and schedules managed by the high level operator from a site specific dashboard graphic.



c. Local Mode of Operation:
   i. When the local/global flag is set to Local mode, the global setpoints and schedules are ignored and the local setpoints and schedules are used to determine the various enable/disable modes of operation.

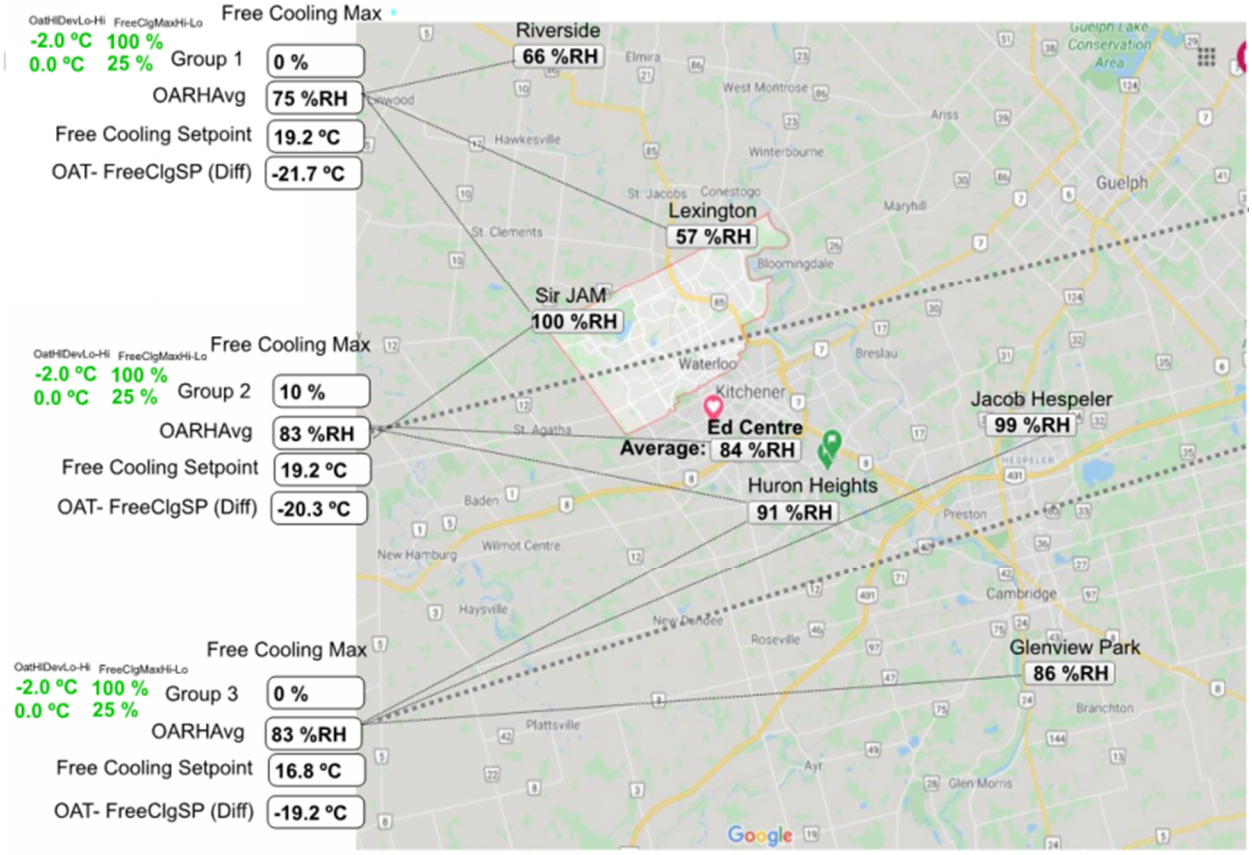
d. Global Mode of Operation:
   i. When the local/global flag is set to Global mode, the local setpoints and schedules are ignored and the global setpoints and schedules are used to determine the various enable/disable modes of operation.

e. Server Based Holiday Scheduling:
   i. A central master holiday calendar-based schedule overrides the regular time schedule of each system unless exempted on a system-by-system basis.



f. Server Based Humidity:

i. Each school is placed into one of three humidity zones when the nearest three outdoor humidity sensors are averaged at the server level and then distributed to each of the three humidity zones.

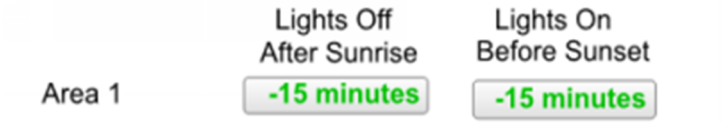


g. Server Based Heating Reset Setpoints:

i. Each school with hot water systems will have a set of outdoor heating reset parameters sent to it based on one of four area locations. These reset parameters are managed by a high level operator from a central server dashboard.

h. Server Based Astroclock:

i. Each school with outdoor lighting will have a set of lighting offset parameters sent to it based on one of four area locations. These parameters will provide an offset (in minutes, typically -15 minutes) to direct the lights off after sunrise and the lights on before sunset.

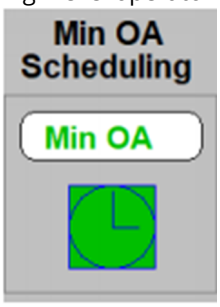


i. Fire Alarm Sequence of Operation:

i. On a fire alarm condition, an alarm is generated at the BAS and all supply fans stop (except exhaust fans stay under automatic control) in order to alleviate smoke movement. This is not intended as a safety interlock - only to avoid unnecessary alarms at the BAS. Unless otherwise directed by the local authority having jurisdiction.

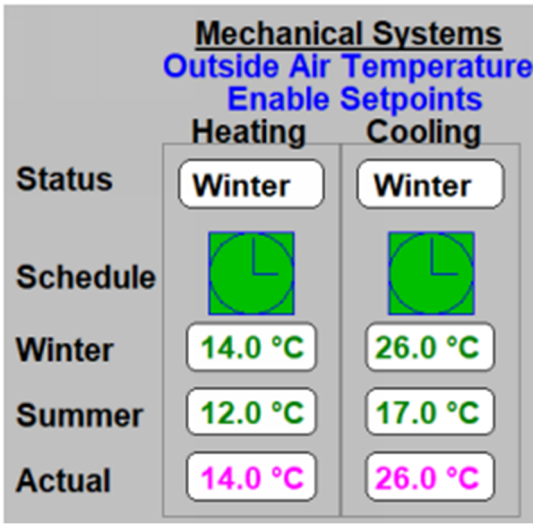
j. Server Based Minimum Outdoor Air Damper Position Setpoint:

i. Each school will have an minimum outdoor damper position setpoint sent to it based on one of four area locations. These parameters are managed by a high level operator from a central server dashboard.



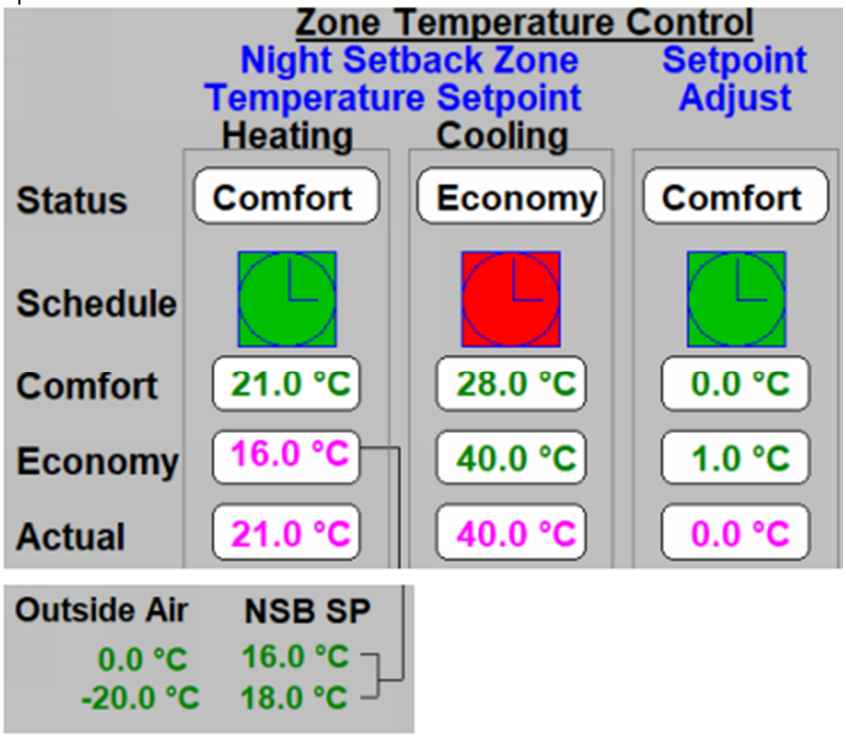
k. Server Based Mechanical Systems Outdoor Air Temperature Enable Setpoints:

i. Each school will have a threshold for enabling mechanical heating or cooling based on outdoor air temperature thresholds. These parameters are managed by a high level operator from a central server dashboard.



l. Server Based Zone Temperature Control for Night Setback Heating Setpoints and Setpoint Adjusts:

i. Each school will have a threshold for enabling the night setback mode when the calculated lowest zone for a particular system falls below threshold. Also the default setpoint can be adjusted to allow for a higher setpoint for the cooling season and holidays. These parameters are managed by a high level operator from a central server dashboard.



m. Local System-Based Default Room (Heating) Setpoint:

i. Each air handler and rooftop HVAC system will have an independently adjustable setpoint (in °C) from the system graphic for the user with custodial-level security privileges.

n. Local System-Based Time Schedule:

i. Each exhaust fan, outdoor lighting, air handler and rooftop HVAC system will have an independently adjustable time schedule (with hours of the day repeating weekly) from the system graphic for the user with at least custodial-level security privileges and above.

o. Outdoor Air Temperature:

i. Each site will have its own dedicated outdoor air temperature sensor wired to an input of a controller. The controller will share the outdoor air temperature with all the other controllers on site for use in various functions which include determining temperature setpoints and enable/disable thresholds for equipment operation.

p. Optimized Start Program:

i. Each HVAC system with a time of day schedule will utilize the controller's internal Optimized Start Program to determine the actual start time for the Morning Warm-Up Mode of operation. The controller's Optimized Start Program parameters and inputs are to be configured as follows:

1) Inputs:
   - I Outdoor Air Temperature
   - II Room Temperature or Lowest Zone Temperature (where applicable)
   - III Local System-Based Time Schedule
   - IV Local System-Based Default Room Heating Setpoint
   - V Local System-Based Unoccupied Room Heating Setpoint (Distech)
2) Parameters:
   - I Maximum Start time offset 105 minutes
   - II Maximum Temperature offset 2 °C

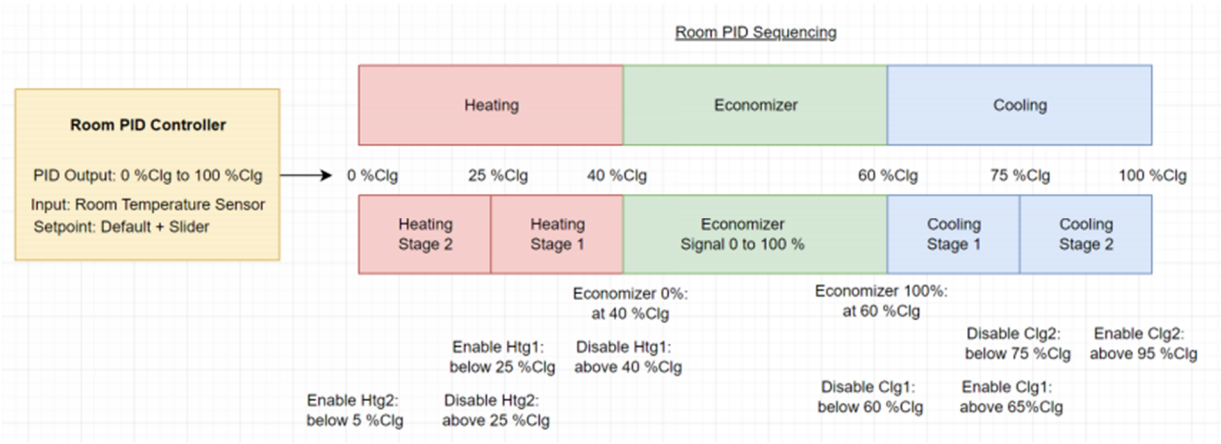
ii. The Optimized Start Program functions with an algorithm that keeps an internal history of the inputs and its calculated start times that is self-adjusting based on the past performance of the system's Morning Warm up Mode.

q. Morning Warm-up Mode:
   i. An optimized start, based on the time of day schedule, outdoor air temperature and the lowest indoor zone temperature is provided for heating.
   ii. The Global Ventilation Schedule is disabled. The supply fan is on, the return fan is on (where applicable), the outdoor air mixing dampers are in the 0 % outdoor air position, heating is enabled at full capacity and the cooling is disabled.

r. HVAC Unit Heating Stage Sequencing:
   i. Room Controller PID, (generates a signal based on the room temperature and room setpoint from 0 %Clg to 100 %Clg), typically stage 1 heating is enabled at 25 %Clg PID signal and disabled at 50 %Clg PID signal and stage 2 heating is enabled at 5 %Clg PID signal and disabled at 25 %Clg PID signal.

s. HVAC Unit Economizer Sequencing:
   i. The economizer signal goes from 0 % to 100 % as the Room Controller PID goes from 40 %Clg to 60 %Clg.

t. HVAC Unit Mechanical DX Cooling Stage Sequencing:
   i. Room Controller PID, typically stage 1 cooling is enabled at 75 %Clg PID signal and disabled at 60 %Clg PID signal and stage 2 cooling is enabled at 95 %Clg PID signal and disabled at 60 %Clg PID signal).



.4 Equipment Specific Sequence of Operations:

a. Hydronic Heating Control Valves and Equipment:
   i. The space sensor PID controller modulates the perimeter heat control valve as a first stage of heating for each applicable zone to maintain setpoint.
   ii. The space sensor PID controller energizes the hydronic unit heater as second stage of heating for applicable zone to maintain setpoint.
   iii. Hot Water Wallfin / Convectors:
      1) Non adjustable room temperature plate sensor or room temperature sensor with local setpoint adjust and pushbutton override is provided where indicated.
      2) Perimeter Convector Heaters:
         I Room sensor modulates the valve for heating to maintain room temperature setpoint, which is reduced during unoccupied hours.
         II Room sensor is used as low temperature alarm
   iv. Unit Heaters:
      1) Space sensor cycles unit heater for heating to maintain setpoint.
      2) Space sensor is used as low temperature alarm
   v. Limits and Safeties:
      1) Hydronic heating control valves are to fail open to heat.
   vi. Alarms:
      1) The space temperature is too low alarm (triggered below 14 °C and restored above 16 °C)
      2) The space temperature is too high alarm (triggered above 38 °C and restored below 36 °C)
      3) Low temperature alarm to be integrated through security to On-Call Response

b. Indoor Air Handling (HVAC) Units and Associated Condensing Units
   i. Note: both air handling units serving the auditorium will be controlled in conjunction to act as a single HVAC system for Tassie Hall.
   ii. Discretionary Fire Alarm Shutdown Mode:
      1) The supply fan is off, the outdoor air mixing dampers are in the 0 % outdoor air position, heating is disabled and cooling is disabled. This is not intended to replace the hard-wired fan shutdown provided by others when required by Code. Normal AHU functions are auto restored on relay signal from the fire alarm panel reset.
   iii. Freeze-stat Shutdown Mode:
      1) Software
         I The duct/unit mounted supply air temperature sensor acts as a software freeze-stat (triggered below 1 °C after 3 minutes, restored above 5 °C after 3 minutes, and auto reset after 5 minute delay).
      2) Hard-Wired
         I BAS monitors the status of the duct mounted hard wired freeze-stat (provided by others, where applicable) that shuts down the AHU fan(s) and spring closes the outside air damper(s) if the air temperature leaving the heating coil falls below the freeze-stat setpoint.
   iv. Unoccupied Mode:

1) Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday.
2) The system will be in Unoccupied Mode when not in Morning Warmup, Occupied or Standby modes.
3) The system will cycle between Idle State, Heating State or Pushbutton Override States to meet the demands from each state and return to the Idle State when the demands from each state are satisfied.
4) Idle State:
   - I The supply fan is off, associated return fan is off, the Global Ventilation Mode is disabled, the outdoor air mixing dampers are in the 0 % outdoor air position and the cooling is disabled.
   - II For hydronic heated AHU, when outdoor air temperature is below 3 °C, the heating valve modulates to maintain a supply air plenum temperature of 15 °C. When outdoor air temperature is 3 °C or above, the heating valve is closed to the coil. The heating coil circulating pump runs continuously in Winter Mode.
5) Heating State:
   - I System cycles on a call for unoccupied heating. A full call for (all stages or full heat modulation where applicable) heating until setpoint is reached.
   - II Heating temperature nominally 16.0°C space temperature setpoint with an increased space temperature setpoint to 17.0 °C at -10.0 °C OAT or lower and 18.0 °C at -20.0 °C OAT or lower (each adjustable)
   - III Free Cooling: Disabled
   - IV Global Ventilation Schedule: Disabled
6) Push Button Override State:
   - I If the override pushbutton is pressed, at any associated room sensor, the associated system will switch to the Occupied Mode for 2 hours (adjustable). With outdoor air ventilation enabled.

v. Morning Warmup Mode:
1) An optimized start, based on the time of day schedule, outdoor air temperature and the indoor zone temperature is provided for heating.
2) The global Global Ventilation Schedule is disabled. The supply fan is on, the outdoor air mixing dampers are in the 0 % outdoor air position and heating is enabled at full capacity.
3) The optimized start program is to begin up to 105 minutes (adjustable) before the occupancy schedule to allow for morning warm up to bring the lowest space temperature up to occupancy setpoint.

vi. Occupied Mode:
1) Time of day schedule, which starts the unit along with an Optimum Start program usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule, Standby Occupancy Mode or Unoccupied Mode.
2) Global Ventilation Schedule is enabled.

3) Air handler fan status confirmed by current sensing device(s) or VFD feedback.
4) Fan operation: The supply fan run continuously.
5) Room heating temperature nominal: 21.5 °C +/- 1.0 °C (adjustable)
6) Room Free Cooling Enabled temperature setpoint nominal 22.5 °C +/-1.0 °C
7) Room Mechanical Cooling temperature setpoint nominal 24.5 °C +/- 1.0 °C (adjustable)

vii. Standby Occupancy Mode:
1) Time of day schedule starts the unit(s) usually between 4:00 p.m. and 11:00 p.m. Monday to Friday. Minimum Outdoor Air is set to zero when the Global Ventilation Schedule is off. Supply fan runs on a call from heating or cooling. Ventilation normally set to zero (with a future provision to adjust).
2) Room heating temperature nominal: 21.5 °C +/- 1.0°C
3) Room Free Cooling: Disabled
4) Mechanical Cooling: Enabled upon sensing occupancy. Cooling will remain enabled until 30 minutes have elapsed since occupancy was last sensed.
   I Quantity of input points shall equal quantity of occupancy sensors. Refer to electrical drawings for occupancy sensor locations.
   II If one or more sensors senses occupancy, enable cooling.
5) Global Ventilation Schedule: Disabled

viii. Ventilation Lockout Sequence:
1) When the ventilation lockout switch, usually located in the Custodial Office, is engaged, all outdoor air dampers close, free cooling is disabled, and the system switches to Standby Occupancy Mode of operation.

ix. Heating Sequence:
1) Outdoor Air Temperature used to determine Heating Enabled Mode:
   I A set of thresholds that are user adjustable at a Global (board wide) or Local (site specific) level, triggers the heating enable mode based on the outdoor air temperature below the threshold. The threshold is further adjusted by a calendar schedule.
   II Typical default values are: 16 °C from September to May and 5 °C from June to August.
2) Default Setpoint:
   I When the Heating Mode is active, the default room temperature setpoint remains unchanged.
3) Call for Heating:
   I Heating is used until the heating calls (from room controller PID or unoccupied heating thresholds) are satisfied.
   II Modulate VRF heat pump system via BACnet MS/TP gateway to provide heat when outdoor air temperature is 5°C (adjustable) or greater.
   III For hydronic back-up heat using three-way valves, 0 % signal (10 Volts) diverts flow 100% flow away from the coil. A 100% signal (2 Volts) directs 100% flow through the coil. (Note: The heating valve is reverse acting to the controller

output signal and is to fail safe with 100%). Three-way valve shall divert 100% flow away from coil when VRF heat pump is operating.

IV The heating coil circulating pump runs continuously in Winter Mode.

V The room temperature sensor with the lowest temperature regulates heating output to maintain the occupied heating setpoint. Local setpoint adjustment is provided. The relief (roof-mounted exhaust) fan modulates speed based on the rooftop economizer position.

VI The AHU heating systems (heat pump or hydronic coil) will modulate to maintain the discharge air temperature setpoint. The supply air temperature setpoint shall be reset upwards to maintain the space temperature setpoint. The supply air temperature reset control loop shall be tuned during project commissioning with participation of WRDSB to achieve satisfactory performance. The default supply air temperature shall be 21°C and the maximum shall be 30°C.

VII Where there is a zone served by radiation, the radiation valve opens as the first stage of heating prior to resetting the supply air temperature.

x. Mechanical Cooling Sequence:

1) Default Setpoint:

I When the Mechanical Cooling Mode is active, the default room temperature cooling setpoint is 24.5 °C +/- 1°C and will not go below 23.5 °C.

II Provide default room dew point setpoint of 13°C with deadband range of +/- 1.5°C. The measured room dew point will be computed by the BAS using psychrometric relationships based on the measured room temperature and measured room relative humidity.

2) Call for Cooling:

I Mechanical cooling, provided by VRF DX cooling system, will be modulated via BACnet MS/TP gateway until the cooling calls (from room controller PID) are satisfied.

3) Call for Dehumidification:

I When the measured space temperature is within the cooling setpoint deadband range, but space dew point is above the high-end of its setpoint deadband range, modulate VRF DX cooling system and divert hot refrigerant gas to hot gas reheat coil utilizing VRF heat recovery functionality via BACnet MS/TP gateway.

II Modulate DX cooling coil to until dehumidification call (From room controller PID) is satisfied.

III Modulate hot gas reheat coil to maintain 24°C discharge supply air temperature.

xi. Free Cooling Sequence:

1) Outdoor Air Temperature used to determine cooling enable mode:

I (Free cooling enabled) A set of thresholds that are user adjustable at a global (board wide) or local (site specific) level, triggers the cooling enable mode based on the

outdoor air temperature exceeding the threshold. The threshold is further adjusted by a calendar schedule.

II Typical default values are: 18 °C from September to May and 21 °C from June to August.

2) Default Setpoint:

I When the cooling enable mode is active, the default room temperature setpoint is raised by 2 °C higher than the heating setpoint and will not go below 23.5 ℃

3) Call for Cooling:

I When free cooling is available, and a demand for cooling is in place, free cooling will be used, until the cooling calls (from room controller PID) are satisfied.

II The room temperature sensor also modulates the mixing dampers (for free cooling) to maintain the occupied free cooling setpoint.

xii. Economizer Operation (and CO2 Demand Control Ventilation):

1) During Occupied Mode, economizer operation will be substituted for first stage mechanical cooling when the outdoor air temperature and relative humidity are below the Free Cooling Setpoint Sequence of Operation. If the outdoor air temperature is below this free cooling setpoint the mixing dampers will be modulated open on a call for cooling to provide 'free' cooling.

2) Minimum Outdoor Air Damper Position:

I Minimum outdoor air damper position shall be set to achieve minimum ventilation rate specified in the equipment schedule on the drawings or 5%, whichever is greater.

II Minimum outdoor air damper position signal may exceed the economizer signal.

3) Economizer Operation:

I The outdoor air mixing dampers will be set to the minimum outdoor air position.

II If Free Cooling is enabled during Occupied Mode, economizer operation will be substituted for first stage mechanical cooling, the mixing dampers will be modulated open on a call for cooling to provide 'free' cooling.

III During morning warm-up, the outdoor air minimum position is set to zero.

IV During Unoccupied Mode and Standby Occupancy Mode, free cooling is unavailable.

V Each return air duct-mounted or space mounted CO2 sensor acts as a high limit and will increase the amount of minimum outdoor air, to a maximum damper position that achieves the design ventilation airflow indicated in the equipment schedules as the CO2 level increases from 1000 ppm to 1200 ppm over a ramped 15 minute period).

VI CO2 levels are automatically logged at 10 minute intervals

xiii. Limits and Safeties:

1) The maximum outdoor air damper position is limited based on the outdoor air temperature to prevent excessively low supply air temperature during startup. At -20 °C outdoor air temperature, and

below, the maximum outdoor air damper position will be 0 % open and at 10 °C outdoor air temperature the maximum outdoor air damper position will be 100 %.

2) The mixed air temperature sensor acts as a low limit to ensure temperature does not fall below setpoint (typically 11 °C). In applications where the mixed air sensor is located after the DX cooling coil, the setpoint is reduced (to typically 5 °C) when DX cooling is enabled.
3) The supply air temperature sensor acts as a high limit for each stage of heating (stage 1 heating disabled above 60 °C and enabled below 50 °C, stage 2 heating disabled above 55 °C and enabled below 45 °C) and a low limit for each stage of cooling (stage 1 disabled below 5 °C and enabled above 13 °C, stage 2 disabled below 8 °C and enabled above 18 °C).
4) The supply air temperature sensor acts as a software freezestat (triggered below 1 °C for 1 minute and restored above 5 °C after a 5 minute delay).
5) The supply fan has a delay-off time of 90 seconds.
6) The DX cooling has a minimum-off time of 5 minutes.
7) DX cooling is disabled when the outdoor air temperature is below global DX disable setpoint (typically 18 °C) or when fan is off.
8) Minimum outdoor air is provided when enabled by the global minimum outdoor air time schedule. The minimum outdoor air is adjustable from the graphic and is typically a default of 10 % open outdoor damper position.
9) Cooling cannot turn on until heating has been off for a minimum of 5 minutes.
10) During Occupied Mode, and the outdoor air temperature is above -1 °C, heating stage 2 (where applicable) has a delay-on time of 15 minutes, except when the outdoor air temperature is below -3 °C with a +2 °C deadband.
11) The default room temperature cooling setpoint is 2 °C above the heating setpoint when mechanical cooling is enabled. The standard mechanical cooling room setpoint will be limited to a minimum of 23.5 °C.
12) When the ventilation lockout switch (usually located at the custodial office) is engaged, the outdoor air dampers close, free cooling is disabled, and the system switches to standby mode of operation.
13) Minimum outdoor air is set to zero when the global ventilation schedule is off.
14) Supply disabled if the hydronic heating coil pump status is not running when required.
15) Discretionary Fire Alarm Shutdown Mode to be enabled on the fire alarm status.
16) The heating coil pump turns off when the outside air temperature exceeds the heating disable setpoint (60 second delay-off time)

xiv. Alarms:

1) Supply Fan status does not match the start/stop signal.
2) Mixed air temperature too high alarm (triggered above 50 °C and restored below 48 °C) or too low alarm (triggered below 5 °C and restored above 7 °C). Low mixed air temperature alarm set to lower

thresholds when Mixed Air Temperature sensor is installed after the DX or cooling coil.

3) Supply air temperature too high alarm (triggered above 65 °C and restored below 63 °C) or too low alarm (triggered below 5 °C and restored above 7 °C)
4) Space temperature too high alarm (triggered above 42 °C and restored below 40 °C) for non-cooling systems, (triggered above 38 °C and restored below 36 °C) for cooling systems.
5) Space temperature too low alarm (triggered below 14 °C and restored above 16 °C).
6) Weekly fan runtime limit exceeded.
7) Return air carbon dioxide too high alarm (triggered above 1700 ppm and restored below 1650 ppm) or too low alarm (triggered below 250 ppm and restored above 300 ppm) with a 15 minute delay.
8) Software freezestat tripped.
9) Low mixed air temperature alarm (triggered below 5 °C and restored above 7 °C).
10) Low return air carbon dioxide alarm (triggered below 250 ppm and restored above 275 ppm) or high return air CO2 alarm (triggered above 1200 ppm and restored below 1100 ppm).
11) High supply air temperature alarm (triggered above 40 °C and restored below 38°C) or low supply air temperature alarm (triggered below 8 °C and restored above 10°C).
12) Low return air temperature alarm (triggered below 14 °C and restored above 15°C) or high return air temperature alarm (triggered above 40 °C and restored below 38 °C).
13) Freezestat or differential pressure limit switch tripped.
14) Hydronic heating coil pump status in wrong mode
15) Software freezestat tripped.

c. New Roof-Mounted Exhaust Fans (EF-1 and -2)
   i. Discretionary Fire Alarm Shutdown Mode:
      1) The Exhaust Fan is off. Normal Exhaust Fan functions are auto restored on relay signal from the fire alarm panel reset.
   ii. Unoccupied Mode:
      1) Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday.
      2) The system will be in Unoccupied Mode when not in Occupied by modes.
      3) Idle State:
         I The exhaust fan is off position.
   iii. Occupied Mode:
      1) Time of day schedule, which starts the Exhaust Fan unit(s) usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule or Unoccupied Mode.
      2) Exhaust Fan status confirmed by current sensing device(s) or VFD feedback.
      3) Fan operation:
         I When the auditorium air handling units outdoor air damper position exceeds 30%, energize exhaust fans and set VFD speed to 20 Hz.

II Modulate exhaust fan speed from 20 Hz to 60 Hz linearly as the air handling unit outdoor air damper position modulates from 30% to 100%.
III Exhaust fans shall be de-energized when air handling unit outdoor air damper position is less than 30%.

4) Limits and Safeties:
I The Exhaust fan has a delay-off time of 90 seconds.
II The start times are staggered across a group of Exhaust Fans.

5) Alarms:
I Fan status does not match the start/stop signal.
II Weekly fan runtime limit exceeded.

d. Existing Roof-Mounted Exhaust Fan (Attic Tempering)

i. Discretionary Fire Alarm Shutdown Mode:
1) The Exhaust Fan is off. Normal Exhaust Fan functions are auto restored on relay signal from the fire alarm panel reset.

ii. Unoccupied Mode:
1) Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday.
2) The system will be in Unoccupied Mode when not in Occupied by modes.
3) Idle State:
I The exhaust fan is off position.

iii. Occupied Mode:
1) Time of day schedule, which starts the Exhaust Fan unit(s) usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule or Unoccupied Mode.
2) Exhaust Fan status confirmed by current sensing device(s) or VFD feedback.
3) Fan operation:
I Fan will be energized in cooling mode when there is a call for cooling from either of the attic temperature sensors.
II Default attic temperature setpoint shall be 30°C.
4) Limits and Safeties:
I The Exhaust fan has a delay-off time of 90 seconds.
5) Alarms:
I Fan status does not match the start/stop signal.
II Weekly fan runtime limit exceeded.

e. Attic Ceiling Fans

i. Discretionary Fire Alarm Shutdown Mode:
1) The Fan is off. Normal Fan functions are auto restored on relay signal from the fire alarm panel reset.

ii. Unoccupied Mode:
1) Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday.
2) The system will be in Unoccupied Mode when not in Occupied by modes.
3) Idle State:
I The exhaust fan is off position.
4) Heating Mode:

I Fans will run continuously when in Winter mode or if outdoor air temperature is less than 5°C.

iii. Occupied Mode:

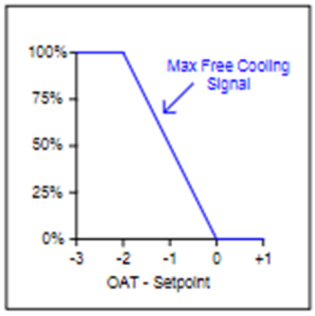
1) Time of day schedule, which starts the Fan usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule or Unoccupied Mode.
2) Fan status confirmed by current sensing device(s) or VFD feedback.
3) Fan operation:
   I Fans will be energized in cooling mode when there is a call for cooling from the adjacent attic temperature sensor.
   II Fans will run continuously when in Winter mode or if outdoor air temperature is less than 5°C.
4) Limits and Safeties:
   I The fan has a delay-off time of 90 seconds.
   II The start times are staggered across a group of Fans.
5) Alarms:
   I Fan status does not match the start/stop signal.

f. Domestic Hot Water Recirculating Pump (P-15)

i. Provide enable / disable control based on time-of-day schedule.

g. Free Cooling Setpoint Sequence of Operation

i. The average outdoor air relative humidity is sent from the Vista Server to the Global Input for all schools where the Free Cooling Setpoint is calculated.
ii. Free cool when OAT < minimum (23 °C, 29.4 °C - **Φ**/7.43) where **Φ** is the average relative humidity in %RH.
iii. The free cooling signal is 100 % when the outdoor air temperature is more than 2 °C less than the free cooling setpoint.
iv. The free cooling signal decreases towards zero linearly as the outdoor air temperature increases from 2 °C less than the free cooling setpoint to 0 % at the setpoint. See also detail 1 below.



Detail 1

v. This free cooling signal is used in each mixed air damper controller as the maximum the outdoor air dampers can open.
vi. Minimum outdoor air damper position signal may exceed the free cooling signal.
vii. The free cooling signal is still subject to the mixed damper safeties that would keep minimum position during occupied mode.
viii. Also the free cooling signal will be at a lower priority than the CO2 demand ventilation.

h. Miscellaneous Monitoring

i. VFD Fault

1) Provide a dry contact input to sense if VFD is in fault mode.

2) Produce an alarm at the BAS.

ii. VRF System Fault

1) Provide a dry contact input to sense if the VRF system is in fault mode.

2) Produce an alarm at the BAS.

i. Low Temperature Alarm Sequence of Operation

i. If any space temperature falls below 14 °C (adjustable), after 30 minutes, a local “heat loss” alarm will be activated through the security system.

j. Energy Conservation Measures

i. Demand Limiting Control

1) Energy conservation measure to strategically curtail the use of certain equipment (i.e. chillers, VFD drives) in order to not trigger excess electricity demands at peak load times.

ii. Orderly Shutdown

1) Energy conservation measure to strategically curtail the runtime of stages of heating and cooling by a variable amount of time before the end of occupancy.

iii. Weekly fan runtime monitoring

1) A monitoring tool to track the amount of Fan Runtime on a weekly basis. A report quickly identifies the fans that ran an excessive amount of time.

iv. Trend generation

1) Trends Logs are collected at the BAS server level for charting and exporting for analysis.

v. Trend Archival operations

1) Export logs and charts for future reference.

vi. Trend Data Analysis Support

1) Trends Logs are collected at the BAS server level for charting and exporting for analysis.

vii. Reporting Requirements

1) Keep consistent point naming conventions to allow for searches of logs and trends into reports across a system, site and multiple sites.

k. Setpoints and Schedules

i. Default Occupied Room Heating Setpoint

1) Typically 21 °C.

ii. Default Occupied Room Cooling Setpoint

1) Typically +3 °C above Default Occupied Room Heating Setpoint, limited to a minimum of 23.5 °C.

iii. Default Standby Room Heating Setpoint

1) Typically 20 °C.

iv. Default Standby Room Cooling Setpoint

1) Typically +3 °C above Default Occupied Room Heating Setpoint, limited to a minimum of 23.5 °C.

v. Default Unoccupied Room Heating Setpoint

1) Typically 19 °C.

vi. Default Unoccupied Room Cooling Setpoint

1) Not used at WRDSB. (No mechanical cooling during unoccupied hours).

vii. Default Occupied Schedule

1) Typically 6 a.m. to 6 p.m. Monday to Friday.

viii. Default Standby Schedule

1) Typically 6 p.m. to 11 p.m.

ix. Holiday Calendar Schedule

1) Board Holidays:

I January 1st - New Year's Day
II Family Day - Varies
III March Break - Varies
IV July 1st - Canada Day
V Labour Day - Varies
VI Thanksgiving - Varies
VII Winter Break - Varies
VIII December 25 - Christmas Day
IX December 26 - Boxing Day

l. Alarm Handling

i. Alarms in Xenta are generated and pushed into the BAS.
ii. Alarms in Distech can be programmed into the EC-BOS (JACE 8000) as a point extension and reported to the EC-BOS alarm console.

m. Outside Air Temperature

i. Provide outside air temperature sensor for facility if existing sensor does not exist.
ii. Located on the north face of the building with a sun and wind shield.
iii. Wired to a dedicated input, typically on a boiler controller (where applicable) or a master BAS controller and is shared across the BAS network to all the controllers in the building.
iv. Used to reset setpoints and to enable/disable equipment for energy savings.

n. Outside Air Humidity

i. Provide outside air humidity sensor for facility if existing sensor does not exist.
ii. Located on the north face of the building with a sun and wind shield.
iii. Wired to a dedicated input, typically on a rooftop controller (where applicable) or a master BAS controller and is shared across the BAS network to all the controllers in the building.
iv. Used to restrict free cooling if outdoor air conditions are not appropriate.

o. Carbon Dioxide Sensor

i. Provide carbon dioxide sensors for air handling systems.
ii. Located in the return air duct or room sensor or as otherwise indicated on the drawings.
iii. Used to reset the minimum damper position.

p. Static Pressure Sensor (not applicable to this project)

i. Located in the supply air duct typically in VAV and VVT systems.
ii. Used to control system pressure via the bypass damper for VVT or VFD fan speed in VAV systems.

q. Graphics

i. Navigation

1) Central menu displaying all systems made available with hyperlinks.

ii. Structure

1) Points folders are grouped under their physical controllers.
2) System folders containing the relevant points are grouped together.

iii. Symbols

1) Two dimensional symbols and line based ductwork and piping diagrams.

iv. Colours

1) Green text for user adjustable setpoints
2) Magenta text for calculated setpoints
3) Black text for sensors, statuses, inputs in general.
4) Red text for binary output commands in the Stop state.
5) Green text for binary output commands in the Start state.
6) Black text for analog control points like valves and dampers.

v. Legend
1) Indicate the meaning of the text colours.

vi. Floor Plan
1) Scan from architectural drawings, simplify and format to convey the building envelope and room locations with current room names.
2) Zone temperatures with colour coded inks to zones and systems from the graphic.

vii. Systems
1) Two dimensional symbols and line based ductwork and piping diagrams.
2) Access to setpoints and schedules.

viii. Setpoint
1) Green text for user adjustable setpoints
2) Magenta text for calculated setpoints

ix. Levels of Access
1) Casual user: read only
2) Technical user: read/write access to setpoints and schedules, override access to points.

r. Security:

i. Levels of Access
1) Casual user: read only
2) Technical user: read/write access to setpoints and schedules, override access to points.

.5 Appendices

a. Appendix A: Humidity-Limited Free Cooling Table:

OAH		**FreeClgSp**		**OAT**		**Difference**		**FreeClgMax**	
85	%RH	17.96	°C	0	°C	-2	°C	100	%OA
99	%RH	16.08	°C	0	°C	-2	°C	100	%OA
45	%RH	23.34	°C	0	°C	-2	°C	100	%OA
60	%RH	21.32	°C	10	°C	-2	°C	100	%OA
70	%RH	19.98	°C	11	°C	-2	°C	100	%OA
80	%RH	18.63	°C	12	°C	-2	°C	100	%OA
60	%RH	21.32	°C	13	°C	-2	°C	100	%OA
100	%RH	15.94	°C	13	°C	-2	°C	100	%OA
95	%RH	16.61	°C	14	°C	-2	°C	100	%OA
100	%RH	15.94	°C	14	°C	-1.94	°C	97.05	%OA
85	%RH	17.96	°C	15	°C	-2	°C	100	%OA
95	%RH	16.61	°C	15	°C	-1.61	°C	80.7	%OA
100	%RH	15.94	°C	15	°C	-0.94	°C	47.05	%OA

80	%RH	18.63	°C	16	°C	-2	°C	100	%OA
85	%RH	17.96	°C	16	°C	-1.96	°C	97.99	%OA
90	%RH	17.29	°C	16	°C	-1.29	°C	64.35	%OA
95	%RH	16.61	°C	16	°C	-0.61	°C	30.7	%OA
100	%RH	15.94	°C	16	°C	0	°C	0	%OA
70	%RH	19.98	°C	17	°C	-2	°C	100	%OA
80	%RH	18.63	°C	17	°C	-1.63	°C	81.64	%OA
90	%RH	17.29	°C	17	°C	-0.29	°C	14.35	%OA
70	%RH	19.98	°C	18	°C	-1.98	°C	98.94	%OA
80	%RH	18.63	°C	18	°C	-0.63	°C	31.64	%OA
90	%RH	17.29	°C	18	°C	0	°C	0	%OA
70	%RH	19.98	°C	19	°C	-0.98	°C	48.94	%OA
80	%RH	18.63	°C	19	°C	0	°C	0	%OA
90	%RH	17.29	°C	19	°C	0	°C	0	%OA
70	%RH	19.98	°C	20	°C	0	°C	0	%OA
80	%RH	18.63	°C	20	°C	0	°C	0	%OA
90	%RH	17.29	°C	20	°C	0	°C	0	%OA
70	%RH	19.98	°C	21	°C	0	°C	0	%OA
80	%RH	18.63	°C	21	°C	0	°C	0	%OA
90	%RH	17.29	°C	21	°C	0	°C	0	%OA
70	%RH	19.98	°C	22	°C	0	°C	0	%OA
80	%RH	18.63	°C	22	°C	0	°C	0	%OA
Inputs – Difference Limited to 0 and -2 °C				Outputs – Limited to 0 to 100 %OA					
Inputs Difference = FreeClgSp-OAT (°C)		Outputs %Outside Air Damper Position (%OA)							
-2	°C	100	%OA						
0	°C	0	%OA						

b. Appendix B: Outside Air Temperature Limited Free Cooling Table

Outside Air Temperature (OAT)		Outside Air Temperature Limited (OAT Limited)		Final Damper Position High Limit (OatLL)	
-30	°C	-20	°C	0	%OA
-25	°C	-20	°C	0	%OA
-20	°C	-20	°C	0	%OA
-19	°C	-19	°C	3.33	%OA
-18	°C	-18	°C	6.67	%OA
-17	°C	-17	°C	10	%OA
-16	°C	-16	°C	13.33	%OA

-15	°C	-15	°C	16.67	%OA
-14	°C	-14	°C	20	%OA
-13	°C	-13	°C	23.33	%OA
-12	°C	-12	°C	26.67	%OA
-11	°C	-11	°C	30	%OA
-10	°C	-10	°C	33.33	%OA
-9	°C	-9	°C	36.67	%OA
-8	°C	-8	°C	40	%OA
-7	°C	-7	°C	43.33	%OA
-6	°C	-6	°C	46.67	%OA
-5	°C	-5	°C	50	%OA
-4	°C	-4	°C	53.33	%OA
-3	°C	-3	°C	56.67	%OA
-2	°C	-2	°C	60	%OA
-1	°C	-1	°C	63.33	%OA
0	°C	0	°C	66.67	%OA
1	°C	1	°C	70	%OA
2	°C	2	°C	73.33	%OA
3	°C	3	°C	76.67	%OA
4	°C	4	°C	80	%OA
5	°C	5	°C	83.33	%OA
6	°C	6	°C	86.67	%OA
7	°C	7	°C	90	%OA
8	°C	8	°C	93.33	%OA
9	°C	9	°C	96.67	%OA
10	°C	10	°C	100	%OA
20	°C	10	°C	100	%OA
25	°C	10	°C	100	%OA
				Oat	OatLL
				-20	0
				10	100

END OF SECTION