



# **California Schools Healthy Air, Plumbing, and Efficiency Ventilation Program**

## **HVAC Assessment and Maintenance Pathway**

HVAC Assessment Report Worksheets  
October 2021

1. System Overview
2. Filtration System
3. Ventilation Rate
4. Economizer Operation
5. Demand Control Ventilation
6. Air Distribution and Building Pressure
7. General Maintenance
8. Operational Controls
9. CO2 Monitoring

These worksheets are made available to help Program participants gather information for an HVAC Assessment Report as part of the California Schools Healthy Air, Plumbing, and Efficiency (CalSHAPE) Ventilation Program Assessment and Maintenance Grant. These worksheets are intended to be used for optional information gathering purposes only since completion of these worksheets does not constitute an HVAC Assessment Report. To comply with grant requirements and be eligible for funding, participants must submit an HVAC Assessment Report electronically by entering the required information through the CalSHAPE Online System as set forth in the most recent CalSHAPE Ventilation Program Guidelines.

These worksheets were designed and offered with a technician in mind that may not always have an electronic device to use when recording data. These worksheets can be printed out and then written on in the field. The information can later be typed into the required HVAC Assessment Report submitted electronically to the CalSHAPE Online System.

The CalSHAPE Ventilation Program Guidelines, these worksheets, and other program requirements such as a data reporting and processes are subject to change by the California Energy Commission, including but not limited to any changes to data reporting requirements from the California Public Utilities Commission. It is the participant's responsibility to use the most recent version of these worksheets and otherwise comply with the current requirements of the CalSHAPE Ventilation Program.

# HVAC ASSESSMENT REPORT WORKSHEET 1

## OVERVIEW

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<b>Building and Site Information:</b>			
<b>Building Address:</b>			
<b>Building Age:</b>	<b>Building Type:</b>	<b>Approximate Square Footage of Conditioned Space</b>	
<b>Climate Zone:</b>	<b>Utility Account Number:</b>	<b>Utility Meter Information:</b>	
<b>HVAC Equipment Details:</b>			
<b>Unit:</b>			
<b>Model Number:</b>			
<b>Serial Number:</b>			
<b>SEER Rating: Seasonal Energy Efficiency Ratio</b>			
<b>Refrigerant:</b>			
<b>HVAC User Inputs and Set Points:</b>			
<b>Typical Weekly Occupancy Schedule:</b>			
<b>Typical Weekly HVAC Thermostat Heating Setpoint:</b>		<b>Typical Weekly HVAC Thermostat Cooling Setpoint:</b>	
<b>Typical Weekly Fan Operation Schedule:</b>			
<b>Holiday/Break Weekly HVAC Thermostat Heating Setpoint:</b>		<b>Holiday/Break Weekly HVAC Thermostat Cooling Setpoint:</b>	
<b>Holiday/Break Weekly Fan Operation Schedule:</b>			
<b>Typical Annual Term Schedule: (Dates of Terms)</b>			

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HVAC Equipment Capacities:			
<b>HVAC System Heating Input Capacity (kBtuh) Based on Nameplate:</b>		<b>HVAC System Heating Output Capacity (kBtuh) Based on Nameplate:</b>	
<b>HVAC System Cooling Capacity: (kBtuh Output)</b>			
<b>HVAC System Supply Fan Types: (Direct Drive, Variable Speed, Pulleys/Belts)</b>		<b>HVAC System Return Fan Types: (Direct Drive, Variable Speed, Pulleys/Belts)</b>	
<b>HVAC System Exhaust Fan Types: (Direct Drive, Variable Speed, Pulleys/Belts)</b>			
<b>HVAC System Supply Fan Motor Horsepower Ratings (hp) Based on Nameplate:</b>		<b>HVAC System Exhaust Fan Motor Horsepower Ratings (hp) Based on Nameplate:</b>	
<b>HVAC System Return Fan Motor Horsepower Ratings (hp) Based on Nameplate:</b>			
Walkthrough Checklist:			
<input type="checkbox"/>	<b>Filtration</b> - Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.		
<input type="checkbox"/>	<b>Ventilation Rate</b> - Calculation of the required outside air rates for each occupied area based on the anticipated occupancy and physical verification that the ventilation rate meets or exceeds the minimum ventilation set forth by the local jurisdiction in all modes of operation. <ul style="list-style-type: none"> <li>• Outside Air</li> <li>• Exhaust Air</li> </ul>		

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<input type="checkbox"/>	<p><b>Ventilation System Operation</b> - Physically test all ventilation components for proper operation.</p> <ul style="list-style-type: none"> <li>• Economizer</li> <li>• Demand Control Ventilation</li> </ul>
<input type="checkbox"/>	<p><b>Air Distribution</b> - Verify all ventilation is reaching the served zone, how air is distributed, and that there is adequate distribution.</p> <ul style="list-style-type: none"> <li>• Inlet Total</li> <li>• Outlet Total</li> </ul>
<input type="checkbox"/>	<p><b>Building Pressure</b> - Verify a slight positive building pressure and a negative pressure for contaminant rooms temporarily occupied by sick patrons.</p>
<input type="checkbox"/>	<p><b>General Maintenance.</b> Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), heat exchanger operation, and drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report</p>
<input type="checkbox"/>	<p><b>Operational Controls</b> - Review of HVAC control sequences to verify systems will maintain intended ventilation, temperature, and humidity conditions during operation. Verify ventilation systems are programmed to flush the building for 2 hours prior and following occupancy.</p>
<input type="checkbox"/>	<p><b>CO<sub>2</sub> Monitoring</b> - To ensure proper ventilation is maintained during building operation, at least one CO<sub>2</sub> monitor shall be installed in each zone of the building.</p>
<input type="checkbox"/>	<p><b>HVAC Assessment Report</b> - Preparation of an HVAC Assessment Report that includes documentation of all verifications and deficiencies.</p>
<input type="checkbox"/>	<p><b>Energy and Ventilation Upgrades</b> - Upon completion of the HVAC Assessment Report, a Mechanical Engineer shall review and determine if upgrades can be made to the HVAC system to increase energy efficiency, filtration, disinfection, and ventilation.</p>

# HVAC ASSESSMENT REPORT WORKSHEET 2

## FILTRATION

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<b>Existing Filter Data</b>			
Document rating of existing filters.			
Document filters size/depth/quantity.			
Size:	Depth:	Quantity:	MERV:
Size:	Depth:	Quantity:	MERV:
<ul style="list-style-type: none"> <li>Is the filter installed correctly? (Yes or No) <i>If not document the deficiency and take any measurements required to make the repair.</i></li> </ul>			
<ul style="list-style-type: none"> <li>Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? (Yes or No) <i>If not document the deficiency and take any measurements required to make the repair.</i></li> </ul>			
<ul style="list-style-type: none"> <li>Determine type of motor and control (ECM, VFD, Belt, Direct).               <ul style="list-style-type: none"> <li>Document nameplate and installed components as applicable.</li> </ul> </li> </ul>			
<b>Motor</b>			
Manufacturer =		Model =	Phase =
HP =		Frame =	RPM =
HZ =		Service Factor =	Amps =
Volts =		ECM = (Y/N)	
<b>Drive Assembly</b>		Belt Driven <input type="checkbox"/>	Direct Drive <input type="checkbox"/>
Belt(s) Number=		Belt Type=	Belt Length:
Center to Center =			
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

# HVAC ASSESSMENT REPORT WORKSHEET 2

## FILTRATION

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<b>Variable Frequency Drive (VFD)</b> (Yes or No)		
Manufacturer =	Model =	Operating Hz: • Full cooling or High Fan Speed
<input type="checkbox"/>	• With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. w.c.
<input type="checkbox"/>	<b>MERV 13 Verification</b>	
	• MERV 13 or better filtration is installed. (Yes or No)	
	• If MERV 13 or better filtration is not installed, perform the following steps to determine the highest Minimum Efficiency Reporting Value (MERV) filtration that can be installed without adversely impacting equipment.	
	• Obtain the existing filters new and final pressure drop from the manufacturer.	
	• Posture the unit to provide full cooling, or high fan speed, and disable the economizer.	
	• With the existing filters installed, perform, and document a static pressure profile, temperature profile, fan RPM, Motor RPM, voltage, and amps.	
ESP Δ =	TSP Δ =	Filter SP Δ =
Fan RPM =	Motor RPM =	Mixed Air (RA+OSA) Temp =
Supply Temp =	Voltage =	Amps =
Hertz (Hz) =		
	<ul style="list-style-type: none"> <li>Using the previously recorded data as a baseline, determine the maximum filter pressure drop, without adversely impacting equipment, by adding material to the filter until the measured or calculated airflow drops by no more than 5%.<sup>1</sup></li> <li>Primary Method to verify airflow - Directly measure the change in airflow if accessible and efficient.</li> <li>Secondary Method – Calculate the change in airflow <ul style="list-style-type: none"> <li><math>CFM_N = CFM_O \times \frac{\sqrt{SP_N}}{SP_O}</math></li> </ul> </li> </ul>	In. w.c.
	• With the maximum pressure drop achieved, document static pressure profile, temperature profile, fan RPM, Motor RPM, voltage amps, and note the ability to increase fan speed if needed.	
ESP Δ =	TSP Δ =	Filter SP Δ =
Fan RPM =	Motor RPM =	Mixed Air (RA+OSA) Temp =
Supply Temp =	Voltage =	Amps =

<sup>1</sup> 5% recommendation and maximum pressure drop determination steps derived from: ASHRAE, ASHRAE Epidemic Task Force: Building Readiness (updated May 22, 2020) (<https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-building-readiness.pdf>)

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Hertz (Hz) =		
<ul style="list-style-type: none"> <li>• Verify air volume, under maximum pressure drop condition, is within manufacturers specifications. Commonly specified as:</li> <li>• Minimum CFM per ton (or)</li> <li>• Minimum Supply Air Temperature</li> </ul>		<input type="checkbox"/>
<ul style="list-style-type: none"> <li>• If applicable, document and take any measurements required to increase the filter frames to accommodate deeper filters.</li> </ul>		<input type="checkbox"/>
<ul style="list-style-type: none"> <li>• Remove added material and provide documentation in the assessment report so a licensed professional can determine the highest MERV filtration that can be installed with the existing equipment.</li> </ul>		<input type="checkbox"/>
<ul style="list-style-type: none"> <li>• Return the unit to normal operation and enable the economizer.</li> </ul>		
<ul style="list-style-type: none"> <li>• Include relevant photographic documentation</li> </ul>		
<b>Ultraviolet Germicidal Irradiation</b>		
Replacement Lamp Wattage:		
Replacement Lamp Quantity:		

# HVAC ASSESSMENT REPORT WORKSHEET 3

## VENTILATION RATE

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<input type="checkbox"/>	<b>Determine Minimum Required Outside Air (OSA)</b>		
	<ul style="list-style-type: none"> <li>If available, obtain the design documents and obtain the minimum required OSA</li> </ul>		CFM
	<ul style="list-style-type: none"> <li>Determine if the zones actual use and occupancy matches the designs expected use and occupancy (Yes or No)</li> </ul>		
	Original Occupancy (Design):	Occupancy Category (Use):	Occupancy:
	How was original occupancy determined?		
	Actual Occupancy	Occupancy Category (Use):	Occupancy:
	How was actual occupancy determined?		
	<ul style="list-style-type: none"> <li>If Yes, proceed to outside air measurements.</li> </ul>		
	<ul style="list-style-type: none"> <li>If No, calculate the new minimum outside air rate based on ASHRAE 62.1 or Table 120.1-A of the 2019 Title 24 California Building Energy Efficiency Standards, as required by your local jurisdiction</li> <li>See Example at end of document</li> </ul>		
			CFM

<input type="checkbox"/>	<b>Verify Minimum Required Outside Air (OSA)</b>			
<b>Steps</b>			<b>CAV</b>	<b>VAV</b>
1	Disable demand control ventilation (if applicable)	<input type="checkbox"/> Check if NA	<input type="checkbox"/>	<input type="checkbox"/>
2	Verify unit is not in economizer mode during test (economizer disabled)		<input type="checkbox"/>	<input type="checkbox"/>
3	CAV and VAV testing at full supply airflow			
a.	Adjust supply air to achieve design airflow or maximum airflow at full cooling			<input type="checkbox"/>
b.	Measured outdoor airflow reading (cfm)		cfm	cfm
c.	Required outdoor airflow (cfm)		cfm	cfm
d.	Time for outside air damper to stabilize after full supply airflow is achieved (minutes):			min
4	VAV testing at reduced supply airflow			
a.	Adjust supply airflow to either the sum of the minimum zone airflows, full heating, or 30% of the total design airflow			<input type="checkbox"/>
b.	Measured outdoor airflow reading (cfm)			cfm
c.	Required outdoor airflow (cfm)			cfm
d.	Time for outside air damper to stabilize after reduced supply airflow is achieved (minutes):			min
5	Return to initial conditions		<input type="checkbox"/>	<input type="checkbox"/>
6	Calculations			
Determine Percent Outside Air at full supply airflow (%OA <sub>FA</sub> ) for Step 3.				
a.	%OA <sub>FA</sub> = Measured outdoor airflow reading / Required outdoor airflow. 100 x (Step3b/Step3c)		%	%



# HVAC ASSESSMENT REPORT WORKSHEET 3

## VENTILATION RATE

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b.	%OA <sub>FA</sub> is within 10% of design Outside Air. ( $90\% \leq \%OA_{FA} \leq 110\%$ ) (Pass or Fail)		
c.	Outside air damper position stabilizes within 5 minutes. (Step 3d < 5 minutes) (Pass or Fail)		
<b>VAV only:</b> Determine Percent Outside Air at reduced supply airflow (%OA <sub>RA</sub> ) for Step 4.			
a.	%OA <sub>RA</sub> = Measured outdoor airflow reading / Required outdoor airflow reading. $100 \times (\text{Step4b}/\text{Step4c})$		%
b.	%OA <sub>RA</sub> is within 10% of design Outside Air. ( $90\% \leq OA_{RA} \leq 110\%$ ) (Pass or Fail)		
c.	Outside air damper position stabilizes within 5 minutes. (Step 4d < 5 minutes) (Pass or Fail)		

<input type="checkbox"/>	<b>Increased Outside Air</b>	
	<ul style="list-style-type: none"> <li>Document if the ventilation components can provide increased outside air if recommended.</li> </ul>	
	<ul style="list-style-type: none"> <li>Document unit model and serial number</li> </ul>	
	<ul style="list-style-type: none"> <li>Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.</li> </ul>	

Sample calculation of a new minimum outside air rate based on ASHRAE 62.1 or Table 120.1-A of the 2019 Title 24 California Building Energy Efficiency Standards, as required by your local jurisdiction.

- Sample requirement for a 900 square foot meeting room or assembly area.

Standard	Method	15 People	25 People	35 People
ASHRAE 62.1 2019	$10 \text{ CFM/person} + 0.12 \text{ CFM/ft}^2$	258 CFM	358 CFM	458 CFM
California T24 (2019)	$15 \text{ CFM/person}$	225 CFM	375 CFM	525 CFM
California Title 24 (2019)	$0.38 \text{ CFM/ft}^2$	342 CFM	342 CFM	342 CFM


**Use Larger**

## HVAC ASSESSMENT REPORT WORKSHEET 4

## ECONOMIZER OPERATION

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<b>Economizer Information:</b>			
<b>Economizer Temperature:</b>		<b>Economizer Enthalpy:</b>	
<b>Single or Differential:</b>		<b>Demand Control Ventilation: (Yes or No)</b>	
<b>Economizer Control Type:</b>		<b>Economizer Changeover Setpoint:</b>	
<b>Economizer Minimum Damper Position:</b>			
<input type="checkbox"/> <b>Verify Economizer Operation</b>			
Step	Passing this test verifies the DCV and associated CO <sub>2</sub> sensor operates as designed.		Results (Pass, Fail, NA)
Step 1:	Disable demand control ventilation systems (if applicable)		
Step 2:	Enable the economizer and simulate a cooling demand large enough to drive the economizer fully open (record all of the following):		
	a.	Economizer damper modulates 100% open and that the return air damper modulates 100% closed.	
	b.	All applicable fans and dampers operate as intended to maintain building pressure.	
	c.	The unit heating is disabled (if applicable).	
Step 3:	Disable the economizer and simulate a cooling demand (record all of the following):		
	a.	Economizer damper closes to its minimum position.	
	b.	All applicable fans and dampers operate as intended to maintain building pressure.	
	c.	The unit heating is disabled (if unit has heating capability).	
Step 4:	If unit has heating capability, simulate a heating demand and set economizer so that it is capable of operating (i.e., actual outdoor air conditions are below lockout setpoint). (record all of the following):		
	a.	Economizer is at minimum position.	
	b.	Return air damper opens.	
Step 5:	Turn off the unit. Record if the Economizer damper closes completely.		
Step 6:	Restore demand control ventilation systems (if applicable) and remove all system overrides initiated.		
Step 7:	Economizer functions as designed (Yes or No)		
<input type="checkbox"/>	If economizer does not function as designed and requires adjustment or repairs: <ul style="list-style-type: none"> <li>• Document Required Repairs and Adjustments</li> <li>• Document information required for a repair or adjustment (i.e. measurements, model, serial, etc.)</li> </ul>		
	• Include relevant photographic documentation		<input type="checkbox"/>

# HVAC ASSESSMENT REPORT WORKSHEET 5

## DEMAND CONTROL VENTILATION OPERATION

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<input type="checkbox"/> <b>Verify DCV Operation</b>		
Step	Passing this test verifies the DCV and associated CO <sub>2</sub> sensor operates as designed.	Results
1	Prior to functional testing, record the following:	
a.	Disable economizer controls.	
b.	Set CO <sub>2</sub> concentration setpoint at 800 ppm or less. <sup>1</sup>	ppm
2	Simulate a signal at or slightly above the CO <sub>2</sub> concentration setpoint required (Step 1b).	
a.	Apply CO <sub>2</sub> calibration gas at a concentration at or slightly above the setpoint to the sensor.	ppm
b.	For single zone units, verify that the outdoor air damper modulates open to satisfy the total required ventilation air called for in the Mechanical Schedule. (P/F/NA)	
c.	For multiple zone units, the zone damper (or outdoor air damper when applicable) modulates open to satisfy the zone ventilation requirements. (P/F/NA)	
3	Simulate signal well below the CO <sub>2</sub> setpoint.	
a.	Apply CO <sub>2</sub> calibration gas at a concentration well below the setpoint to the sensor or ventilate the sensor as necessary.	ppm
b.	For single zone units, outdoor air damper modulates to the design minimum value. (P/F/NA)	
c.	For multiple zone units, the zone damper (or outdoor air damper when applicable) modulates to satisfy the reduced zone ventilation requirements. (P/F/NA)	
4	Verify DCV operation with economizer	
a.	Restore economizer controls and remove all system overrides initiated during the test.	
b.	Apply CO <sub>2</sub> calibration gas at a concentration slightly above the setpoint to the sensor.	ppm
c.	Verify that the outdoor air damper modulates open to satisfy the total ventilation required air. (P/F)	
5	Remove all system overrides initiated during the test and return system to normal operation.	
Y/N	<b>DCV functions as designed with a setpoint of 800 ppm<sup>1</sup></b>	
<input type="checkbox"/>	<b>If No, and the DCV requires adjustment or repairs:</b> <ul style="list-style-type: none"> <li>• Document Required Repairs and Adjustments</li> <li>• Document information required for a repair or adjustment (i.e. measurements, model, serial, etc.)</li> <li>• Include relevant photographic documentation</li> </ul>	
If the demand control ventilation system does not maintain average daily maximum CO <sub>2</sub> levels below 1,100 ppm, it shall be disabled until such time as the LEA determines that the COVID-19 crisis has passed, unless disabling the control would adversely affect operation of the overall system.		

<sup>1</sup> The CO<sub>2</sub> set point of 800 ppm is recommended by the UC Davis Western Cooling Efficiency Center. The purpose of the 800 ppm set point for demand control ventilation systems is to prevent the automated control system from overshooting a maximum 1,100 ppm CO<sub>2</sub> concentration.

# HVAC ASSESSMENT REPORT WORKSHEET 6

## AIR DISTRIBUTION AND BUILDING PRESSURE

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<b>Verify Air Distribution and Building Pressurization</b>			
<input type="checkbox"/>	<b>Supply Outlets</b> – Measure and document supply air volume (CFM). <ul style="list-style-type: none"> <li>• Include individual outlet test report</li> <li>• Include duct pitot traverse report (if available)</li> </ul>		
	<b>Return Inlets</b> – Measure and document return air volume (CFM). <ul style="list-style-type: none"> <li>• Include individual inlet test report</li> <li>• Include duct pitot traverse report (if available)</li> </ul>		
<input type="checkbox"/>	<b>Exhaust Inlets</b> – Measure and document return air volume (CFM). <ul style="list-style-type: none"> <li>• Include individual inlet test report</li> <li>• Include duct pitot traverse report (if available)</li> </ul>		
<input type="checkbox"/>	<b>With Power Exhaust disabled (if applicable), determine if Measured Supply Air = Measured Outside Air + Measured Return Air</b> <ul style="list-style-type: none"> <li>• Document any discrepancies and determine the cause of significant discrepancies (i.e. leakage, ductwork serving other zones, inaccurate measurement location).</li> <li>• Document Building Pressure - Verify a slight positive building pressure and a negative pressure for contaminant rooms temporarily occupied by sick patrons.</li> </ul>		
	<b>Supply Air</b>	<b>Outside Air</b>	<b>Return Air</b>
	=		+
<b>Building or Zone Pressure</b>	<b>In w.c.</b>	<b>In relation to:</b>	
<input type="checkbox"/>	<b>With Power Exhaust enabled (if applicable), determine if Measured Supply Air slightly greater than Measured Return Air</b> <ul style="list-style-type: none"> <li>• Document any discrepancies that do not match design intent. Determine the cause of significant discrepancies (i.e. leakage, ductwork serving other zones, inaccurate measurement location, power exhaust requires adjustment).</li> <li>• Document Building Pressure - Verify a slight positive building pressure and a negative pressure for contaminant rooms temporarily occupied by sick patrons.</li> </ul>		
	<b>Supply Air</b>	<b>Outside Air</b>	<b>Return &amp; Powered Exhaust Air</b>
	=		+
<b>Building or Zone Pressure</b>	<b>In w.c.</b>	<b>In relation to:</b>	
(Y/N)	<b>Air Distribution</b> - Verify that inlets and outlets are balanced within tolerance of the system design as listed within design documents. <ul style="list-style-type: none"> <li>• If the original system design values are not available, document available information and note unavailability of system design values in the HVAC Assessment Report.</li> </ul>		
<input type="checkbox"/>	<b>Air Distribution Notes.</b> – Note how the air moves from supply to return.		
<input type="checkbox"/>	<b>Repairs and Adjustment.</b> <ul style="list-style-type: none"> <li>• Document Required Repairs and Adjustments</li> </ul>		
<input type="checkbox"/>	Include relevant photographic documentation		

# HVAC ASSESSMENT REPORT WORKSHEET 7

## GENERAL MAINTENANCE

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<b>Verify General Maintenance</b>			
<input type="checkbox"/>	<b>Verify coil condition</b> - Note downstream and upstream condition		
<input type="checkbox"/>	<b>Verify condensate drainage</b>		
<input type="checkbox"/>	<b>Temperature Differential</b> - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) <ul style="list-style-type: none"> <li>If applicable, measure GPM</li> </ul>		
<input type="checkbox"/>	<b>Verify heat exchanger operation – Measure and document</b> air temperature differential (entering and leaving dry bulb) <ul style="list-style-type: none"> <li>If applicable, measure GPM</li> </ul>		
<input type="checkbox"/>	<b>Verify condition of drive assembly.</b> (if applicable)		
<input type="checkbox"/>	<b>Deficiencies</b> - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement, or upgrades.		
<input type="checkbox"/>	<b>Repairs and Adjustment.</b> <ul style="list-style-type: none"> <li>Document Required Repairs and Adjustments</li> </ul>		
<input type="checkbox"/>	Include relevant photographic documentation		
<b>Conditioning Unit Details:</b>			
<b>Pre-Modification</b>			
Pre-Modification Unit Airflow:		Pre-Modification Unit Supply Fan Power:	
Pre-Modification Unit Return Fan Power:		Pre-Modification Unit Exhaust Fan Power:	
<b>Post-Modification</b>			
Post-Modification Unit Airflow:		Post-Modification Unit Supply Fan Power:	
Post-Modification Unit Return Fan Power:		Post-Modification Unit Exhaust Fan Power:	

# HVAC ASSESSMENT REPORT WORKSHEET 8

## OPERATIONAL CONTROLS



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<b>Review control sequences to verify systems will maintain intended conditions during building operation.</b>	
<input type="checkbox"/>	<b>Temperature</b> – Setpoints match design.
<b>Setpoint</b>	<b>Design</b>
<input type="checkbox"/>	<b>Humidity (if applicable)</b> – Setpoints match design. <ul style="list-style-type: none"> <li>Licensed professional to determine if setpoint should be adjusted to maintain a relative humidity between 40% and 60%.</li> </ul>
<b>Setpoint</b>	<b>Design</b>
<b>Ventilation Schedule Operation</b>	
<input type="checkbox"/>	<b>Ventilation operates continuously during occupied hours.</b> <ul style="list-style-type: none"> <li>Occupied hours to include <b>all</b> hours building is occupied by staff or patrons (i.e. teachers, security, janitorial staff, night shift, etc.).</li> <li>Includes all exhaust fans and fans used to distribute outside air.</li> </ul>
<input type="checkbox"/>	<b>Daily Flush</b> <ul style="list-style-type: none"> <li>Verify a daily flush is scheduled for 2 hours before and after scheduled occupancy <b>(or)</b></li> <li>Demonstrate calculation of time for 3 air changes to reduce concentration of airborne infectious particles by 95% per ASHRAE Guidance for Building Readiness<sup>1</sup> or otherwise applicable local or state guidance</li> </ul> <p style="text-align: center;"><b>Calculated Flush Time =</b></p>
<input type="checkbox"/>	<b>Deficiencies</b> - Document deficiencies, options for adjustment (i.e. Humidity) and recommendations for additional maintenance, replacement or upgrades.
<input type="checkbox"/>	Include relevant screenshots and photographic documentation

<sup>1</sup> ASHRAE, ASHRAE Epidemic Task Force: Building Readiness (updated May 22, 2020)  
(<https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-building-readiness.pdf>)

**HVAC ASSESSMENT REPORT WORKSHEET 9****CO2 MONITORING**

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<input type="checkbox"/>	<b>Verify installation or install a CO<sub>2</sub> monitor.</b> <ul style="list-style-type: none"> <li>All classrooms shall be equipped with a CO<sub>2</sub> monitor.</li> </ul> <b>CO<sub>2</sub> monitors shall:</b>
<input type="checkbox"/>	Be hard-wired or plugged-in and mounted to the wall between 3 – 6 feet above the floor and at least 5 feet away from the door and operable windows.
<input type="checkbox"/>	Display the CO <sub>2</sub> readings to the occupants through a display on the device or other means such as a web-based application or cell-phone application.
<input type="checkbox"/>	Notify the building operator through visual indicator on the monitor (e.g. indicator light) or other alert such as e-mail, text, or cell phone application, when the CO <sub>2</sub> levels have exceeded 1,100 ppm.
<input type="checkbox"/>	Maintain a record of previous data which includes at least the maximum CO <sub>2</sub> concentration measured.
<input type="checkbox"/>	Have a range of 400 ppm to 2000 ppm or greater.
<input type="checkbox"/>	Be certified by the manufacturer to be accurate within 75 ppm at 1,000 ppm CO <sub>2</sub> concentration and is certified by the manufacturer to require calibration no more frequently than once every five years.
	<b>Is a CO<sub>2</sub> monitor installed that meets the required features listed above?</b> (Yes or No)
<input type="checkbox"/>	If installed but lacking required features, what features are missing?
<input type="checkbox"/>	If installed, document CO <sub>2</sub> monitor nameplate data.
Manufacturer:	
Model:	
Serial:	
<input type="checkbox"/>	Include relevant photographic documentation
<b>Fan Output Verification:</b>	
<b>Pre-Modification Fan Power:</b>	<b>Post-Modification Fan Power:</b>