

DOCKETED

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DRAFT FOR DISCUSSION AT MARCH 5, 2024, WORKSHOP

California Schools Healthy Air, Plumbing, and Efficiency Ventilation Program

HVAC Assessment and Maintenance Pathway

HVAC Assessment Report Worksheets

March 2024

1. System Overview
2. Filtration System
3. Minimum Outside Air
4. Ventilation System Operation
5. Operational Controls
6. General Maintenance

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.

DRAFT HVAC ASSESSMENT AND MAINTENANCE PATHWAY WORKSHEETS



March 2024

CALIFORNIA ENERGY COMMISSION

Worksheet #	Guidance and Worksheet Section	Qualified Testing Technician	Qualified Adjusting Technician
1	HVAC Equipment Details		
2	Filtration, Airflow Distribution, and Building Pressurization		
3	Minimum Outside Air		
4	Ventilation System Operation <ul style="list-style-type: none"> • Economizer • Demand Control Ventilation 		
5	Operational Controls		
6	General Maintenance		
7	CO₂ Sensor Installation		

1.1 Building and Site Information:**Building Address****CA Climate Zone****1.2 HVAC Equipment Details (Based on Nameplate)****HVAC Unit Name (District ID)****AHRI Unit Type**

SP - Single-Package Air-Conditioner
 RCU – Remote Condensing Unit (Split System)
 HSP – Single-Package Heat Pump
 HRCU – Heat Pump with Remote Condensing Unit (Split System)
 SPVA – Single Package Vertical Air Conditioner (Wall Mount)
 SPVHP – Single Package Vertical Heat Pump (Wall Mount)
 Other (Specify) –

Manufacturer

Aaon
 Amana
 Bard
 Bryant Heating & Cooling Systems
 Carrier Corporation
 Daikin
 Day & Night
 Friedrich

Fujitsu
 Johnson Controls
 Lennox
 Marvair
 Rheem
 Trane
 York
 Other (Specify) –

Model Number (outdoor unit)

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Serial Number (outdoor unit)	
Model Number (indoor unit) Required for split systems only	
Serial Number (indoor unit) Required for split systems only	
Heating type (select all that apply)	No heat Gas heat Heat pump Electric resistance heat
Cooling type (select all that apply)	No cooling Compressor air conditioning Evaporative cooling
Refrigerant type Required for compressor air conditioning systems only	R-22 R-410 Other (Specify) –
Heating Output Capacity (kBtuh) Required for heating systems only	
Heating Input Capacity (kBtuh) Required for gas heat systems only	
Cooling Output Capacity (kBtuh) Required for cooling systems only	

2.1 Filter Data

Document filters as the system was found (as-found) and as the system was adjusted (as-left). Enter MERV rating of "0" if the system was found with no existing filters.

Filter Length (in)	Filter Width (in)	Quantity	Filter Depth (in) As-found	Filter Depth (in) As-left	MERV As-found	MERV As-Left

2.2 Supply Fan Motor Nameplate Data

Variable Speed Drive on Motor	Yes No		
Drive Assembly	Belt Direct Drive		
Manufacturer		RPM	
HP		Phase	
Amps		Service Factor	
Volts		Frame Size	

2.3 Fan and Motor Sheave Data. Required for belt driven systems only.

Fan Sheave Model		Motor Sheave Model	
Shaft Diameter (in)		Shaft Diameter (in)	
Pitch Diameter (in)		Pitch Diameter (As-Found) (in)	
Shaft Centerline (in)		Pitch Diameter (As-Left) (in)	
Grooves (# Belts)			

2.4 Summary data for airflow, fan performance, and building pressurization at full airflow (if applicable, power exhaust disabled). Provide a complete TAB report as an attachment with the supporting data for as-found and as-left measurements. The TAB report must include individual register return and supply readings. If drawings specifying supply, return and outside air design rates are not available, see instructions for guidance. Outside air results are in form 3.

	As-Found	As-Left
Supply Airflow Design (CFM)		
Supply Airflow Tested (Sum Terminals) (CFM)		
Supply Airflow Tested (Pitot-Traverse) (CFM)		
Return Airflow Design (CFM)		
Return Airflow Tested (Sum Terminals) (CFM)		
Return Airflow Tested (Pitot-Traverse) (CFM)		
Measured Motor Speed (RPM)		
Measured Fan Speed (RPM)		
Measured Motor Input Power (BHP)		
Total Static Pressure (Fan) (inwc)		
External Static Pressure (Ductwork) (inwc)		
Building Pressurization (inwc)		

2.5 Summary Data for Powered Exhaust Test. Required only for systems with powered exhaust. Provide a complete TAB report as an attachment with the supporting data.

Powered Exhaust Present	Yes No		
		As-Found	As-Left
Supply Airflow (Sum Terminals) (CFM)			
Exhaust Airflow (Sum Terminals) (CFM)			
Building Pressurization (in WC)			

2.6 Minor Repairs and Adjustments. Select all types of adjustments and/or minor repairs that were made to the fan, motor, and airflow system (meaning, document what changed in the system between the "as found" and "as-left" condition).

Fan sheave replaced
 Motor sheave replaced
 Motor sheave adjusted
 Belt replaced
 Belt tension aligned or adjusted
 Variable frequency drive speed adjusted
 Supply air distribution adjusted
 Return air distribution adjusted
 Power exhaust repaired or adjusted
 Modifications to reduce filter bypass
 Other (Specify) –

2.7 Remaining Deficiencies. Select any deficiencies remaining.

Fan/motor system could not be adjusted to use MERV13 filtration
 Return duct leakage suspected (greater than 10% of flow)
 Supply duct leakage suspected (greater than 10% of flow)
 Airflow distribution problem needed major repair
 Building pressurization exceeds 0.05 inwc (insufficient exhaust)
 Building pressurization less than 0 inwc (insufficient outside air supply)
 Cooling coil exceeds 500 ft/min and may have moisture carry over
 Significant filter bypass that could not be corrected
 Other (Describe in remaining deficiencies)

2.8 Remaining Deficiencies Notes. If deficiencies remaining, describe and provide notes to inform future repairs and/or replacements. Lack of access to the building, rooftop, or control system is not an acceptable reason to leave the system with a deficiency.

2.9 Measurement Notes. Provide notes here for reasons that specific measurements could not be made. Lack of access to the building, rooftop, or control system is not an acceptable reason.

3.1 Minimum Required Outside Air (OSA) for HVAC System. Provide a complete TAB report as an attachment with the supporting data for as-found and as-left measurements. If drawings specifying outside air design rates are not available, see instructions for guidance.

Actual occupancy for space served by HVAC system (number of people)	
Floor area for space served by HVAC system (ft²)	
Primary Occupancy Category (use)	Classroom Office Assembly Food Service Other (Specify) –
Minimum Outside Air Requirement (CFM)	
System Type	Constant Air Volume (CAV) Variable Air Volume (VAV)

3.2 Outside Air Measurements

	As-found	Adjusted (As-Left)	Units
High Speed: Minimum damper position as a percent of full open. Mark physical damper position on unit.			%
High Speed: Measured outdoor airflow reading for CAV and high speed VAV (cfm).			CFM
High Speed: %OA _{FA} = Measured outdoor airflow reading/Required outdoor airflow (%).			%
VAV Low Speed: Minimum damper position as a percent of full open. VAV systems only. Mark physical damper position on unit.			%
VAV Low Speed: Measured outdoor airflow reading for low speed (30% airflow) VAV (cfm). VAV systems only.			CFM
VAV Low Speed: %OA _{FA} = Measured outdoor airflow reading/Required outdoor airflow (%).VAV systems only.			%

3.3 Minor Repairs and Adjustments. Select all types of adjustments and/or minor repairs that were made to the outdoor air system (meaning, document what changed in the system between the “as found” and “as-left” condition).

Adjusted manual outdoor air damper setting
Adjusted economizer minimum position setting
Clear or unblock outdoor air intake
Other (Specify) –

3.4 Outside Air Deficiencies. Select reason(s) that system can not be adjusted to meet the outside air requirement. Lack of access (to buildings, systems, control systems) is not a valid reason.

No outdoor air intake
Outdoor intake is at maximum setting, but outdoor air is still too low
Outdoor intake is at minimum setting, but outdoor air is still too high
Outdoor air damper assembly is broken
Outdoor air actuator is broken
Outdoor air controller is broken (no power or has fault)
Outdoor air controller is not communicating with BAS
Outside air intake has exhaust discharge outlets or vents that do not meet distance requirements
Outside air intake is covered or blocked by debris
Other (Describe in remaining deficiencies)

3.5 Remaining Deficiencies Notes. If deficiencies remaining, describe and provide notes to inform future repairs and/or replacements. Lack of access to the building, rooftop, or control system is not an acceptable reason to leave the system with a deficiency.

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SAMPLE

4.1 Economizer and DCV Information	
Economizer present in system	Yes No
Does the system use demand-controlled ventilation (DCV)?	Yes No
The 2013 Building Energy Efficiency Standards require an economizer for systems with cooling capacity greater than 54,000 btu/hr. For systems greater than 54,000 btu/hr without economizers, select the reason.	The system was installed before the 2013 Standards The system does not meet the 2013 Standards The system meets an exception to the Standards (rare)
4.2 Economizer Configuration and Testing (For systems with economizers)	
Model of the economizer controller (For systems with economizers)	Aeon VCCX2 Bard LC6000 Belimo ZIP Carrier ComfortLink Carrier i-Vu RTU-Open Daikin WattMaster OE377-26B-00001 Honeywell W7220 (Jade) Johnson Controls IPU Johnson Controls PK-ECO1011-0 (PEAK) Johnson Controls Simplicity SE Unit Controller Johnson Controls Smart Equipment OEM CTRL I/O Flex 6126 OEM CTRL I/O Pro 812u Pelican PEARL Prodigy Control System Siemens Climatix ECO, POL224.00 Trane Intellipak Trane ReliaTel Microprocessor Trane Symbio 700 Trane Symbio 800 Trane Tracer UC600 Other (Specify) -
California Climate Zone	
Economizer High Limit Type	Fixed Dry Bulb Differential Dry Bulb Fixed Enthalpy + Fixed Dry Bulb
Economizer High Limit Setting	
Economizer Minimum Damper Position (%)	
Economizer Passed all Functional Testing (As-Found)	Yes No
Economizer Passed all Functional Testing (As-Left)	Yes No

4.2 Demand Controlled Ventilation (For systems with DCV)

Carbon Dioxide (CO₂) Setpoint (ppm)	
DCV Passed all Functional Testing (As-Found)	Yes No
DCV Passed all Functional Testing (As-Left)	Yes No

4.3 Minor Repairs and Adjustments. Select all types of adjustments and/or minor repairs that were made to the economizer and/or DCV system (meaning, document what changed in the system between the "as found" and "as-left" condition).

Configured economizer settings
Configured DCV settings
Repaired or replaced temperature, humidity, or enthalpy sensor
Repaired or replaced carbon dioxide sensor
Repaired damaged or incorrect signal wiring
Repaired or adjusted outside air assembly
Other (Specify) –

4.4 Remaining Deficiencies. Select any deficiencies remaining.

Outdoor air economizer controller is broken
Outdoor air actuator is broken
Outdoor air damper assembly is broken
Outdoor air assembly does not achieve 100% outdoor air position
Outdoor air assembly does not achieve fully closed outdoor air position
Outdoor air assembly does not close when unit is turned off
DCV is present but it not working correctly
Other (specify) –

4.5 Remaining Deficiencies Notes. If deficiencies remaining, describe and provide notes to inform future repairs and/or replacements. Lack of access to the building, rooftop, or control system is not an acceptable reason to leave the system with a deficiency.

5.1 Operational Controls	
Control Type	Local Thermostat Building Automation System
Ventilation System Start Time (hh:mm) Typical occupied day	
Ventilation System End Time (hh:mm) Typical occupied day	
Occupied Cooling Setpoint (°F)	
Occupied Heating Setpoint (°F)	
Unoccupied Cooling Setpoint (°F)	
Unoccupied Heating Setpoint (°F)	
5.2 Minor Repairs and Adjustments. Select all types of adjustments and/or minor repairs that were made to the economizer (meaning, document what changed in the system between the "as found" and "as-left" condition).	
Reprogrammed thermostat Reprogrammed building automation system Replaced thermostat Other (specify) -	
5.3 Remaining Deficiencies. Select any deficiencies remaining.	
Existing controls do not support programming a ventilation schedule Existing controls do not support programming a setpoint schedule Existing controls are pneumatic and not working correctly Other (describe in remaining deficiencies) -	
5.4 Remaining Deficiencies Notes. If deficiencies remaining, describe and provide notes to inform future repairs and/or replacements. Lack of access to the building, rooftop, or control system is not an acceptable reason to leave the system with a deficiency.	

6.1 General Maintenance	
Outside Air Temperature During Testing (°F)	
Air Temperature Split – Cooling (°F)	
Air Temperature Split – Heating (°F)	
6.2 Minor Repairs and Adjustments. Select all types of adjustments and/or minor repairs that were made to the system for general maintenance (meaning, document what changed in the system between the “as found” and “as-left” condition).	
Cleared indoor coil Cleared outdoor coil Repaired or replaced condensate pump Repaired or replaced condensate drain Capped service ports (i.e. Shrader valves) to prevent leaks Other (specify) –	
6.3 Remaining Deficiencies. Select any deficiencies remaining.	
Air temperature split is lower than expected, possible refrigerant leak Standing water, mold or mildew on HVAC system Mechanical room shows unsanitary conditions, such as leaks and spills Other (describe in remaining deficiencies) –	
6.4 Remaining Deficiencies Notes. If deficiencies remaining, describe and provide notes to inform future repairs and/or replacements. Lack of access to the building, rooftop, or control system is not an acceptable reason to leave the system with a deficiency.	