City of Fort Collins Residential Mechanical Systems Performance Report

This form is a record of testing targets and results, with Pass/Fail outcomes. For information on measurement tools and testing techniques, see the "Residential New Construction Mechanical Systems Testing Guide." The guide and this form may be periodically updated; check the Building Services web site for the current version.

City of Fort Collins Utilities

This form must be completed and signed by an "Approved Agency," and submitted to Building Services as a requirement for receiving a C.O.

Color key	Target or limit	Measured value to compare with target or limit	Pass	Fail	Caution	Other data

ADCF

ADCF = Air Density Correction Factor, based on tool, altitude (5000'), air temperature through tool

Volumetric flow (CFM 5000') = ADCF x Indicated flow (CFM)

1. House Data

Address:

Builder:

HVAC contractor:

Date of "Residential Mechanical Systems Design Submittal" information referenced by testing technicians:

As-built changes vs mech design submittal:

Testing date(s):

2. Local Exhaust (Spot Ventilation)

Bath exhaust

Testing tech (initials):

Flow tool: __ Flow box   __ Pitot tube duct traverse   __ Passive flow hood   __ Other (note below)

Air temp through tool (F):

ADCF:

Exhaust Pickup Location	Design Airflow (CFM 5000')	Minimum Airflow Requirement (CFM 5000') + Type of Operation	Measured Airflow		Pass	Fail
			Indicated Flow (CFM)	Volumetric Flow (CFM 5000')		
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐
		__ **50** Intermittent __ **20** Continuous			☐	☐

Testing notes:

Kitchen exhaust

N/A - hood does not vent to outside: ☐

Testing tech (initials):

Oven fuel: __ Gas   __ Electric

Minimum airflow requirement (CFM 5000') + operation: __ **100** Intermittent   __ **25** Continuous

Measured airflow

Flow tool: __ Flow box   __ Pitot tube traverse   __ Passive flow hood   __ Flow grid   __ Powered flow hood   __ Other (note below)

Tool location: __ Interior grille   __ Exhaust duct (Exterior termination not OK)

Air temp through tool (F):

ADCF:

Indicated flow: _____ CFM

Volumetric flow: _____ CFM 5000'

☐ Pass   ☐ Fail

Testing notes:

3. Whole-House Ventilation

Systems other than sub-structural floor exhaust

Testing tech (initials) [ ]

Code-minimum ventilation airflow (based on CFA and # of BR) [ ] CFM 5000'

Design ventilation airflow [ ] CFM 5000'

System type [ ]
__ Exhaust-only
__ Supply-only
__ Balanced

Target ventilation airflow range [to] CFM 5000'
(code-minimum)   (120% of design flow)

| Measurement Method | Tool Location | Air Temp Through Tool (F) | ADCF | Measured Airflow | | Pass | Fail |
				Indicated Flow (CFM)	Volumetric Flow (CFM 5000')		
Total exhaust airflow __ N/A __ Passive flow hood __ Flow box __ Pitot tube traverse __ Flow collar __ Other (note below)						☐	☐
Total supply airflow __ N/A __ Passive flow hood __ Flow box __ Pitot tube traverse __ Flow collar __ Other (note below)						☐	☐

When supply airflow is circulated by air handler fan, fan speed for measurement __ Heating __ Cooling __ Continuous fan

Balanced airflow in balanced systems

Average of measured supply + exhaust flows [ ] CFM 5000'

Target flow range (average +/- 15%) [to] CFM 5000'

☐ Pass ☐ Fail

Testing notes [ ]

Sub-structural floor exhaust

☐ N/A -- no sub-structural floor exhaust system

Testing tech (initials) [ ]

Design exhaust airflow (based on approved design) [ ] CFM 5000'

Target airflow limits (design +/- 15%) [to] CFM 5000'

Measured airflow

Flow tool
__ Flow box __ Pitot tube traverse
__ Passive flow hood __ Flow collar
__ Powered flow hood __ Other (note below)

Tool location [ ]

Air temp through tool (F) [ ]

ADCF [ ]

Indicated flow [ ] CFM

Volumetric flow [ ] CFM 5000'

☐ Pass ☐ Fail

Testing notes [ ]

4. Heating + Cooling Duct Leakage

N/A
__ No ductwork
__ No ductwork outside conditioned space

Testing notes (incl multiple sys) [ ]

Duct leakage data source
__ Testing tech (initials):
__ Energy rater (name, company, testing date):
[ ]

House conditioned floor area (include full basement) [ ] sf

Air temp through tool (F) [ ]

ADCF [ ]

| Test Parameter and Conditions | | | Maximum Allowed Duct Leakage | | Measured Duct Leakage | | System #1 | | System #2 | |
Leakage Type	Timing	Air Handler	Normalized (CFM25 5000' / 100 sf)	Absolute (CFM25 5000')	Indicated (CFM25)	Volumetric (CFM25 5000')	Pass	Fail	Pass	Fail
Total leakage	Rough-in	Excluded	3				☐	☐	☐	☐
Total leakage	Rough-in	Included	4				☐	☐	☐	☐
Total leakage	Complete	Included	4				☐	☐	☐	☐

5. Heating + Cooling Equipment

For multiple systems, attach one page per system

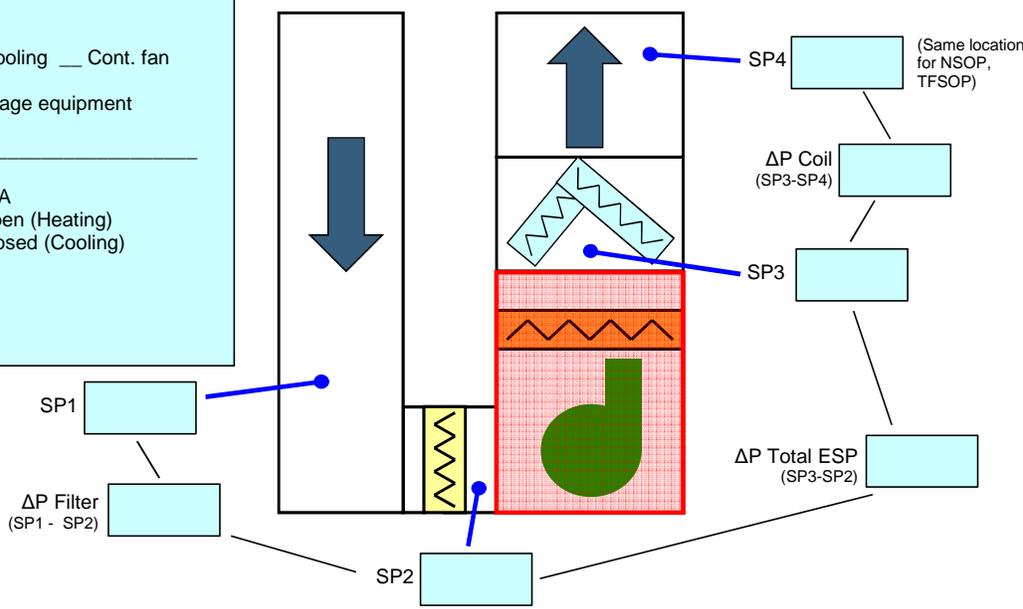System # [ ]   Which parts of house does it serve? [ ]

Installed equipment   (Be clear about which AC components are installed at time of testing)   Testing tech (initials) [ ]

	Furnace or Boiler	AC or Heat Pump Condenser	AC or Heat Pump Coil
Manufacturer			
Model #			

Filter brand [ ]   Type: __ Basic fiberglass __ Electrostatic __ Basic pleated __ Other: ___ __ High-effic pleated   Thickness (inches) [ ]   MERV (optional) [ ]

Static pressures   Testing tech (initials) [ ]

Setup

Speed: __ Heating __ Cooling __ Cont. fan

__ High-stage for multi-stage equipment

Blower speed tap: _____

Humidifier damper: __ N/A
                   __ Open (Heating)
                   __ Closed (Cooling)

___ All registers open

___ Zone dampers open

SP4 [ ] (Same location for NSOP, TFSOP)

ΔP Coil (SP3-SP4) [ ]

SP3 [ ]

SP1 [ ]

ΔP Filter (SP1 - SP2) [ ]

ΔP Total ESP (SP3-SP2) [ ]

SP2 [ ]

Cooling: Measured air flow through indoor coil   ☐ N/A -- no AC installed   Testing tech (initials) [ ]

Design cooling airflow (high stage) [ ] CFM 5000'   Target airflow limits (design +/- 15%) [to] CFM 5000'

Measured airflow

Flow grid plate size __ 14 __ 20   Air temp through tool (F) [ ]   ADCF [ ]   NSOP [ ]   TFSOP [ ]   Flow Resistance Correction Factor [ ]

Measured airflow, no adjustment/correction [ ] CFM   Indicated airflow, Measured AF x FRCF [ ] CFM   Volumetric airflow, Indicated AF x ADCF [ ] CFM 5000'   ☐ Pass ☐ Fail

Testing notes [ ]

Heating: Gas manifold pressure   (high stage)   Testing tech (initials) [ ]

Manifold pressure OEM spec @ 5000' [ ] IWC   Target manifold P limits (spec +/- 5%) [to] IWC   Measured pressure [ ] IWC   ☐ Pass ☐ Fail

Heating: Temperature rise   Testing tech (initials) [ ]

OEM temperature rise limits (high stage) [to] F

Measured temps (F):   Supply air [ ] – Return air [ ] = Temp rise [ ]   ☐ Pass ☐ Fail ☐ Caution: within 10F of top of range

6. Refrigerant Charge

Testing tech (initials) [ ]

Testing approach and targets

☐ N/A: No complete AC system   ☐ N/A: House completed November - April (installing contractor responsible for testing in warm weather)

☐ TXV: Subcooling + SH check   ☐ Non-TXV: Superheat   ☐ OEM-specific: Approach   ☐ Other OEM-specific (documentation required)

Temperatures (F):   Condenser entering air temp [ ]   Non-TXV: Return air wet-bulb temp [ ]   Target superheat [ ]   Target subcooling [ ]   Target approach [ ]

Subcooling

Discharge pressure (PSI) [ ]   Condenser saturation T (5000' chart) [ ] F   Liquid line temp [ ] F   Actual subcooling (Cond T - liq line T) [ ] F   ☐ TXV Pass: Actual SC within +/- 3 F of target SC, 2 F min   ☐ TXV Fail

Superheat

Suction pressure (PSI) [ ]   Evaporator saturation T (5000' chart) [ ] F   Suction line temp [ ] F   Actual superheat (Suct line T - evap T) [ ] F   ☐ Non-TXV Pass: Actual SH within +/- 5 F of target SH   ☐ Non-TXV Fail

TXV checks: ☐ Pass: Field-installed TXV installed in accordance with OEM instructions   ☐ Caution: Actual SH outside mfgr range

Approach

Liquid line temp [ ] F   Actual approach (Liq line T - condenser EAT) [ ] F   ☐ Approach Pass: Actual approach within +/- 1 F of target approach   ☐ Approach Fail

Testing notes [ ]

7. Room Air Flow + Pressure Balance

Register air flows

Testing tech (initials) [ ]

All registers are cut through finish materials and moving air   ☐ Pass   ☐ Fail

(Remainder of register air flow section under development, not yet being enforced)

Pressure balance

Testing tech (initials) [ ]

Room (match names on plans, include basement if there is a door)	Room-to-Core Pressure Drop Target Range (Pa)	Measured Pressure Drop (Pa)	Pass	Fail
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐
	-3 to +3		☐	☐

8. Combustion Safety

☐ Combustion safety testing N/A -- no natural-draft combustion appliances
(Appliance Types table must be completed for every home)

Testing tech (initials) ☐

Appliance types

Appliance	Combustion Type						
	N/A	Draft-hood (Natural-draft)	Induced-draft (Natural-draft)	Power-vent	Direct-vent	Powered sealed-combustion	Electric
Furnace #1	☐	☐	☐	☐	☐	☐	☐
Furnace #2	☐	☐	☐	☐	☐	☐	☐
Boiler #1	☐	☐	☐	☐	☐	☐	☐
Boiler #2	☐	☐	☐	☐	☐	☐	☐
Water heater #1	☐	☐	☐	☐	☐	☐	☐
Water heater #2	☐	☐	☐	☐	☐	☐	☐
Fireplace #1	☐	☐	☐	☐	☐	☐	☐
Fireplace #2	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐

Worst-case depressurization performance

House setup

____ # of bath fans on
____ Vented range hood on
____ Clothes dryer on
____ Air handler on

These doors are closed:

Other fans on:

Other setup notes:

Outdoor temperature ☐ F

Tested appliances

Appliance			
Location			

CAZ pressure

BPI depressurization limit	(Pa wrt outside)			
Measured net CAZ depressurization	(Pa wrt outside)			
OK (less negative) | Caution (more negative)		☐ OK ☐ Caution	☐ OK ☐ Caution	☐ OK ☐ Caution

Spillage

BPI maximum limit	(seconds)	**60**	**60**	**60**
Measured spillage duration	(seconds)			
Pass = duration not exceeding limit		☐ Pass ☐ Fail	☐ Pass ☐ Fail	☐ Pass ☐ Fail

Draft pressure

BPI limit	(Pa wrt CAZ)			
Measured	(Pa wrt CAZ)			
Pass = pressure more negative than limit		☐ Pass ☐ Fail	☐ Pass ☐ Fail	☐ Pass ☐ Fail

CO concentration in undiluted flue gas

BPI maximum limit	(ppm)	**100**	**100**	**100**
Measured CO	(ppm)			
Pass = CO level not exceeding limit		☐ Pass ☐ Fail	☐ Pass ☐ Fail	☐ Pass ☐ Fail
Caution = CO level 25 to 100 ppm		☐ Caution	☐ Caution	☐ Caution

Testing notes

9. System Controls

Testing tech (initials) [ ]

System	Controls Operating Per Design Intent						Testing Notes
Local exhaust (all fans)	☐	N/A	☐	Pass	☐	Fail	
Whole-house ventilation	☐	N/A	☐	Pass	☐	Fail	
Sub-structural floor exhaust	☐	N/A	☐	Pass	☐	Fail	
Heating (all systems)	☐	N/A	☐	Pass	☐	Fail	
Cooling (all systems)	☐	N/A	☐	Pass	☐	Fail	

Signatures

Technician #1 performing inspection and testing documented on this report (Approved Agency)

I certify that the tests referenced above, in sections bearing my initials, were performed in accordance with protocols specified by the City of Fort Collins Building Services Department, and that the reported results are accurate to the best of my knowledge.

Name (print)	
Phone/email	
Company	
Signature and Date	

Technician #2 performing inspection and testing documented on this report (Approved Agency)

I certify that the tests referenced above, in sections bearing my initials, were performed in accordance with protocols specified by the City of Fort Collins Building Services Department, and that the reported results are accurate to the best of my knowledge.

Name (print)	
Phone/email	
Company	
Signature and Date	

HVAC Contractor (City of Fort Collins license holder)

I certify that I have reviewed this report and that the test results are an accurate representation of the performance of the installed mechanical systems.

Name (print)	
Phone/email	
Company	
Signature and Date	