

6. Tech Tip: eQUEST Modeling – Ventilation Approaches

ENERGY STAR MFHR Guidelines

Section 3.14.1 (aligned with 90.1 Section G3.1.2.9):

- Baseline Systems 1 & 2 fan **electrical power for supply, return, exhaust, and relief fans** shall be 0.3 W/CFM

Section 3.14.2 (aligned with 90.1 Table G3.1 Section 4)

- Baseline System 1 & 2 fans must be **modeled as running continuously**

MFHR Guidelines Section 3.14 includes 3 examples of typical designs; in all cases, the baseline PTAC fans run continuously.

Modeling Baseline PTAC Fans in eQUEST

Component Tree

- Project: 'Multifamily Fan Pow'
 - Global Parameters
 - Extra UWall Insulation
 - Apartment PTAC
 - EL1 ESE Perim Zn (G.ES)
 - EL1 East Perim Zn (G.E)
 - EL1 East Perim Zn (G.E)
 - EL1 WSW Perim Zn (G.)
 - EL1 West Perim Zn (G.)
 - EL1 West Perim Zn (G.)
 - EL1 WNW Perim Zn (G.)
 - EL1 ESE Perim Zn (M.E)
 - EL1 East Perim Zn (M.E)
 - EL1 East Perim Zn (M.E)
 - EL1 ENE Perim Zn (M.E)
 - EL1 WSW Perim Zn (M.)
 - EL1 West Perim Zn (M.)
 - EL1 West Perim Zn (M.)
 - EL1 WNW Perim Zn (M.)
 - EL1 ESE Perim Zn (T.ES)
 - EL1 East Perim Zn (T.E2)
 - EL1 East Perim Zn (T.E2)
 - EL1 ENE Perim Zn (T.E)
 - EL1 WSW Perim Zn (T.V)
 - EL1 West Perim Zn (T.V)

Air-Side HVAC System Parameters

Currently Active System: Apartment PTAC

Basics | Fans | Outdoor Air | Cooling | Heating | Preconditioner | Meters | R

Fan Power and Control | Flow Parameters | Night Cycle Control

Fan Power Parameters for single-duct systems

	Design kW/cfm	Delta T °F	Static in WG	Tot Eff Frac	Mech Eff Frac
Supply:	0.000300	0.93		n/a	n/a
Unused:	n/a	n/a	n/a	n/a	n/a
Return:	n/a	n/a	n/a	n/a	n/a

Fan Control and Placement

	Fan Schedules	Fan Control	Fan Pla
Cooling:	- undefined -	Constant Volume	n/a
Unused:	n/a	n/a	n/a
Return:		n/a	n/a
Exhaust:	- undefined -		

Modeling Baseline PTAC Fans in eQUEST

Project: Multifamily Fan Pow

Component Tree: Apartment PTAC

Display Mode: Outside Air & Exhaust

	Zone Name	Parent System	OA Flow/Person (cfm)	OA Air Flow (cfm)	OA Changes	OA Flow (cfm)
1	EL1 ESE Perim Zn (G.ESE1)	Apartment PTAC	n/a	63.33	n/a	No Air
2	EL1 East Perim Zn (G.E2)	Apartment PTAC	n/a	63.33	n/a	No Air
3	EL1 East Perim Zn (G.E3)	Apartment PTAC	n/a	63.33	n/a	No Air
4	EL1 WSW Perim Zn (G.WSW4)	Apartment PTAC	n/a	63.33	n/a	No Air
5	EL1 West Perim Zn (G.W7)	Apartment PTAC	n/a	63.33	n/a	No Air
6	EL1 West Perim Zn (G.W8)	Apartment PTAC	n/a	63.33	n/a	No Air
7	EL1 WNW Perim Zn (G.WNW5)	Apartment PTAC	n/a	63.33	n/a	No Air
8	EL1 ESE Perim Zn (M.ESE10)	Apartment PTAC	n/a	63.33	n/a	No Air
9	EL1 East Perim Zn (M.E11)	Apartment PTAC	n/a	63.33	n/a	No Air
10	EL1 East Perim Zn (M.E12)	Apartment PTAC	n/a	63.33	n/a	No Air
11	EL1 ENE Perim Zn (M.ENE13)	Apartment PTAC	n/a	63.33	n/a	No Air
12	EL1 WSW Perim Zn (M.WSW)	Apartment PTAC	n/a	63.33	n/a	No Air
13	EL1 West Perim Zn (M.W16)	Apartment PTAC	n/a	63.33	n/a	No Air
14	EL1 West Perim Zn (M.W17)	Apartment PTAC	n/a	63.33	n/a	No Air
15	EL1 WNW Perim Zn (M.WNW)	Apartment PTAC	n/a	63.33	n/a	No Air
16	EL1 ESE Perim Zn (T.ESE19)	Apartment PTAC	n/a	63.33	n/a	No Air
17	EL1 East Perim Zn (T.E20)	Apartment PTAC	n/a	63.33	n/a	No Air
18	EL1 East Perim Zn (T.E21)	Apartment PTAC	n/a	63.33	n/a	No Air
19	EL1 ENE Perim Zn (T.ENE22)	Apartment PTAC	n/a	63.33	n/a	No Air
20	EL1 WSW Perim Zn (T.WSW)	Apartment PTAC	n/a	63.33	n/a	No Air
21	EL1 West Perim Zn (T.W25)	Apartment PTAC	n/a	63.33	n/a	No Air
22	EL1 West Perim Zn (T.W26)	Apartment PTAC	n/a	63.33	n/a	No Air
23	EL1 WNW Perim Zn (T.WNW)	Apartment PTAC	n/a	63.33	n/a	No Air

- Enter OA flow on zone level to have PTACs running continuously instead of cycling with load

- Ventilation rate must be based on Section 3.12.2 of HRMF Guidelines

Example 1: Proposed Design w/Cycling PTACs and Exhaust Ventilation

Parametric Run Definitions

Existing Parametric Runs

- 1 - Ventilation via exhaust fans
 - Parameter #1
- 2 - Baseboards
 - Parameter #1
 - Parameter #2

Name: Parameter #1

Type: BDL Command

Component Type: Thermal Zone Sort Component Type

References:

- EL1 ESE Perim Zn (G.ESE1)
- EL1 East Perim Zn (G.E2)
- EL1 East Perim Zn (G.E3)
- EL1 WSW Perim Zn (G.WSW6)
- EL1 West Perim Zn (G.W7)
- EL1 West Perim Zn (G.W8)
- EL1 WNW Perim Zn (G.WNW9)
- EL1 ESE Perim Zn (M.ESE10)
- EL1 East Perim Zn (M.E11)
- EL1 East Perim Zn (M.E12)
- EL1 ENE Perim Zn (M.ENE13)

Select All

Clear All

Data Modifications:

	Category	Keyword	Value	Units
1	Outside Air & Exhaust	OA Air Flow	0.0000	cfm
2	Outside Air & Exhaust	Exhaust Flow	63.0000	cfm
3	Outside Air & Exhaust	Source	Balanced Infiltration	
4	Outside Air & Exhaust	Exhaust kW/Flow	0.0004	kW/cfm

Create Parametric Run

- 1: PTACs no longer provide ventilation, and cycle with heating/cooling load
- 2&3: Exhaust flow equal to baseline OA CFM or as specified, whichever is greater; make-up via infiltration (e.g. trickle vents)
- 4: Exhaust fan power as specified

Example 2: Proposed Design with HW Baseboards and Exhaust Ventilation

Parametric Run Definitions

Existing Parametric Runs

- 1 - Ventilation via exhaust fans
 - Exhaust fans & cycling PTACs
- 2 - Baseboards
 - Added HW Baseboards
 - Baseboards controlled by space Thermostat

Label: 2 Name: Baseboards

Run Based On: Ventilation via exhaust fans

Run Based On Separate Building Description (DOE)

Added HW Baseboards

Name: Added HW Baseboards

Type: BDL Command

Component Type: HVAC System Sort Component Type

References:

- Apartment PTAC
- Corridor PTAC

Select All

Clear All

Data Modifications:

Category	Keyword	Value
Heating - Coil Capacity	Heat Source	Not Installed
Heating - Baseboard	Baseboard Source	Hot Water Loop

Baseboards controlled by space Thermostat

Name: Baseboards controlled by space Thermostat

Type: BDL Command

Component Type: Thermal Zone Sort Component Type

References:

- EL1 ESE Perim Zn (G.ESE1)
- EL1 East Perim Zn (G.E2)
- EL1 East Perim Zn (G.E3)
- EL1 WSW Perim Zn (G.WSW6)
- EL1 West Perim Zn (G.W7)
- EL1 West Perim Zn (G.W8)
- EL1 WNW Perim Zn (G.WNW9)
- EL1 ESE Perim Zn (M.ESE10)
- EL1 East Perim Zn (M.E11)
- EL1 East Perim Zn (M.E12)
- EL1 ENE Perim Zn (M.ENE13)

Select All

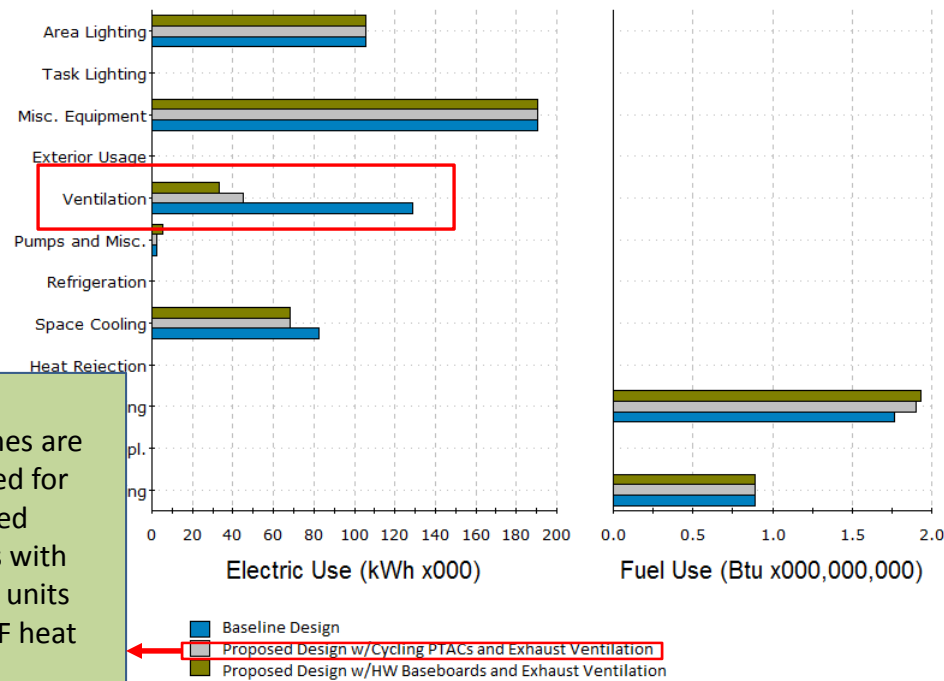
Clear All

Data Modifications:

Category	Keyword	Value
Heating	Baseboard Control	Thermostatic
Heating	Baseboard Coil DT	20.0000

Impact on Fan Energy May be Significant

Annual Energy Consumption by Enduse



Similar outcomes are expected for proposed designs with fan coil units and VRF heat pumps

Easy Baseline Fan Energy QC Check

Internal Loads		Water-Side HVAC		Air-Side HVAC		Utility & Economics	
Air-Side HVAC System		Spreadsheet		Summary			
...	EL1 Core Zn (G.C5)	Corridor	C	836	199	0.24	100%
...	EL1 Core Zn (M.C14)	Corridor	C	6,688	1,671	0.25	100%
...	EL1 Core Zn (T.C23)	Corridor	C	836	347	0.42	100%
Sum of Zones				..	2,817	..	..
Sum of Zones / System Total				..	100%	..	..
Project Totals							
System & Zone Name		System Type Principal Zone Activity		Type*	Design Flow		Design V
				Ret Zn	Area sqft	Supply cfm	Supply cfm/sf
Sum of SYSTEMs		..		..	84,360	49,446	0.59
Sum of ZONES		..		..	..	49,446	0.59
Sum of Zones / System Total		..		..	..	100%	..

50,000 [CFM] X 0.3 [W/CFM] X 8760 [hr/yr] ~ 130,000 kWh

REPORT- BEPU Building Utility Performance

WEATHER FILE- New York CityNY TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FAN	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	105806.	0.	190456.	0.	82603.	0.	2613.	128626.	0.	0.	0.	0.	510104.
FM1 NATURAL-GAS THERM													
	0.	0.	0.	17627.	0.	0.	0.	0.	0.	0.	8871.	0.	26498.



Common Mistakes

Modeling continuously running exhaust fans in addition to 0.3 W/CFM baseline PTAC fan power allowance

Electric Meter Properties

Currently Active Electric Meter: Type: Utility

Basic Specifications | Building and/or Submeters | Direct Loads

Interior Direct Loads

	Load (kW)	Schedule	Enduse
1	0.19	LT_ON_Yrly	Task Lighting
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	n/a	n/a	n/a

Exterior Direct Loads

	Load (kW)	Schedule	Enduse
1	2.00	LT_ON_Yrly	Exterior Usage
2	0.15	LT_ON_Yrly	Ventilation Fans
3	0.17	LT_ON_Yrly	Ventilation Fans
4	1.14	LT_ON_Yrly	Ventilation Fans

Common Mistakes

Exaggerated baseline design flow due to Design Day sizing and
incorrect Design Day settings

TABLE D-1 U.S. and U.S. Territory Climatic Data (Continued)

State/City	Latitude	Longitude	Elev., ft	HDD65	CDD50	Heating Design Temperature	Cooling Design Temperature	
							Dry-Bulb	Wet-Bulb
						99.6%	1.0%	1.0%
(New York cont.)								
NY Central Pk WSO City	40.78 N	73.97 W	132	4805	3634	NA	NA	NA
NY Kennedy WSO AP	40.65 N	73.78 W	16	5027	3342	11	88	72
NY La Guardia WSO AP	40.77 N	73.90 W	11	4910	3547	13	89	73



Common Mistakes

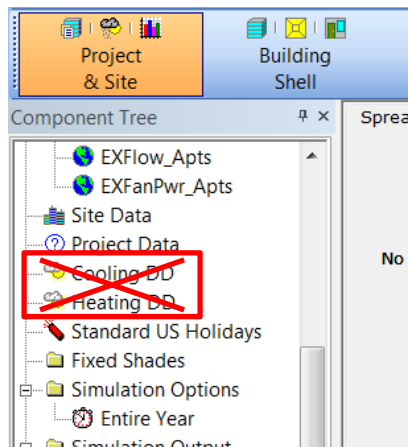
Exaggerated baseline design flow due to Design Day sizing and
...modeling internal loads at 100% during Cooling Design Day

The screenshot shows the 'Schedule Properties' dialog box with the following settings:

- Currently Active Week Schedule: **LT_APT_Wk**
- Week Schedule Name: **LT_APT_Wk**
- Type: **Fraction**
- Daily Schedule Assignments:
 - Monday: **LT_APT_Daily**
 - Tuesday: **LT_APT_Daily**
 - Wednesday: **LT_APT_Daily**
 - Thursday: **LT_APT_Daily**
 - Friday: **LT_APT_Daily**
 - Saturday: **LT_APT_Daily**
 - Sunday: **LT_APT_Daily**
 - Holidays: **LT_APT_Daily**
 - Heating Design Day: **LT_OFF_Daily**
 - Cooling Design Day: **LT_ON_Daily** (highlighted with a red box)

Baseline Fan Flow Sizing Tip 1

- DO NOT enter Cooling DD / Heating DD, to have eQUEST size the flow based on the annual peak load



Baseline Fan Flow Sizing Tip 2

Baseline system design supply airflow rates must be based on a supply-air-to-room-air temperature difference of 20°F (**G3.1.2.9.1**)

Air-Side HVAC System Parameters

Currently Active System: **PTAC_Apt_North** System Type: Pkgd Terminal AC

Basics | Fans | Outdoor Air | Cooling | Heating | Preconditioner | Meters | Refrigeration

Coil Capacity / Control | Unitary Power | Condenser | Capacity Curves | Evaporative Cooling | Economizer | Staged-Volume

Cooling Capacity

Cool Source: n/a

Cooling Control and Reset

Zone Entering Min Supply Temp: **55.0** °F

Cold Deck Min Leaving Temp: n/a °F

Internal Loads | Water-Side HVAC | **Air-Side HVAC** | Utility & Economics

75F-55F=20F

Display Mode: Basic Specifications

	Zone Name	Parent System	Space	Zone Type	Floor Multiplier (ratio)	Multiplier (ratio)	Cool Design T (°F)
1	FL2_AptA_2br_Zn	PTAC_Apt_North	FL2_AptA_2br	Conditioned	1	1	75.0
2	FL3_AptA_2br_Zn	PTAC_Apt_North	FL3_AptA_2br	Conditioned	1	1	75.0
3	FL3_AptF_1br_Zn	PTAC_Apt_North	FL3_AptF_1br	Conditioned	1	1	75.0
4	FL4_AptA_2br_Zn	PTAC_Apt_North	FL4_AptA_2br	Conditioned	1	1	75.0
5	FL4_AptB_1br_Zn	PTAC_Apt_North	FL4_AptB_1br	Conditioned	1	1	75.0
6	FL4_AptC_0br_Zn	PTAC_Apt_North	FL4_AptC_0br	Conditioned	1	1	75.0
7	FL4_AptE_1br_Zn	PTAC_Apt_North	FL4_AptE_1br	Conditioned	1	1	75.0

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