

AAA-06-08-2016

RFI ID: RFI078

RFI STATUS: SUBMITTED TO COUNTY

PREPARED BY: [REDACTED]

DATE: 6/7/2016

OUTSIDE AIR COMPLIANCE - AHUS 16, 21, 22, 23, 24

RFI Line Items

ECPU: ESTIMATED COST PU/UNIT PMP: POTENTIAL MINIMUM PURCHASE PAP: POTENTIAL ANNUAL PURCHASE PF: PURCHASE FREQUENCY ETD: ESTIMATED DELIVERY TIME

ITEM	MFR	MFR PART # SKU	ECPU	MIN QTY	PMP	PAP	PF	ETD	DETAILS
FURNISH MATERIAL AND LABOR TO MEET OUTSIDE AIR SPECIFICATION PROVIDED BY OWNER ON AIR HANDLING UNITS #16, 21, 22, 23 & 24			[REDACTED]	1	[REDACTED]	[REDACTED]	1	56	DETAILED SPEC SHEET ATTACHED
Totals									

Building: **System Tag/Name:** **Operating Condition Description:**
Units (select from pull-down list)

Inputs for System:
 Floor area served by system
 Population of area served by system (including diversity)
 Design primary supply fan airflow rate
 OA req'd per unit area for system (Weighted average)
 OA req'd per person for system area (Weighted average)
Inputs for Potentially Critical Zones:

Zone Name	Name	Units	System
Zone Tag	AS	SF	1,265
Space type	P3	P	0
Floor Area of zone	Vpzd	cfm	10,612
Design population of zone	Ras	cfm/drip	0.0
Design total supply to zone (primary plus local recirculated)			
Innaction: Terminal Unit, Dual Fan Dual Duct or Transfer-Fan?			
Local recirc. air % representative of ave system return air?			

Inputs for Operating Condition Analyzed:
 Percent of total design airflow rate at conditioned analyzed
 Air distribution type at conditioned analyzed
 Zone air distribution effectiveness at conditioned analyzed
 Primary air fraction of supply air at conditioned analyzed

Results:
 Ventilation System Efficiency
 Outdoor air intake required for system
 Outdoor air per unit floor area
 Outdoor air per person served by system (including diversity)
 Outdoor air as a % of design primary supply air

Detailed Calculations for the System as a whole:
 Primary supply air flow to system at conditioned analyzed
 Uncorrected OA requirement for system
 Uncorrected OA req'd as a fraction of primary SA

Initial Calculations for Individual Zones:
 OA rate per unit area for zone
 OA rate per person
 Total supply air to zone (at condition being analyzed)
 Unused OA req'd to breathing zone
 Unused OA requirement for zone
 Fraction of zone supply not directly recirc. from zone
 Fraction of zone supply from fully mixed primary air
 Fraction of zone OA not directly recirc. from zone
 Unused OA fraction required in supply air to zone
 Unused OA fraction required in primary air to zone

System Ventilation Efficiency:
 Zone Ventilation Efficiency (App A Method)
 System Ventilation Efficiency (App A Method)
 Ventilation System Efficiency (Table 6.3 Method)
 Minimum outdoor air intake airflow
 Outdoor Air Intake Flow required to System
 OA intake req'd as a fraction of primary SA
 Outdoor Air Intake Flow required to System (Table 6.3 Method)
 OA intake req'd as a fraction of primary SA (Table 6.3 Method)
 OA Temp at which Min OA provides all cooling
 OAT below which OA intake flow is @ minimum

Zone Name	Units	System	Potentially Critical Zones
AS	SF	1,265	ELECTRICAL SUB STATION
P3	P	0	ROOM DIRECT
Vpzd	cfm	10,612	Electrical equipment
Ras	cfm/drip	0.0	Corridors

Variable	Value	Variable	Value
Ev	1.00	VolPs	6.96
Vol	76	Vol/Vps	400W/01
VolPs	6.96	Ypd	1%
Vol/Vps	400W/01		
Ypd	1%		

Variable	Value	Variable	Value
Vps	10612	Raz	0.06
Vol	76	Roz	0.00
Xs	0.01	Voz	10612
		Voz	75.9
		Voz	76
		Fa	1.00
		Fb	1.00
		Fc	1.00
		Fd	0.01
		Fz	0.00
		Zp	0.01
		Evz	1.00
		Ev	1.14
		Vol	76
		Vol/Ev	0.01
		Vol/Vps	66
		Vol/Vps	0.01
		Deg F	0.12

$$\text{Deg F} = (T_{p-d} - T_{r-p}) / (1 - \gamma) \cdot T_{r-d} + T_{r-p}$$

Building: **CHU 23**
 System Tag/Name: **CS**
 Operating Condition Description:
 Units (select from pull-down list)

Name	Units	System
As	sf	9692
Ps	cfm	175
Vpsd	cfm	33 879
Ras	cfm/sf	0.06
Rps	cfm/sf	5.0

Inputs for System
 Floor area served by system
 Population of area served by system (including diversity)
 Design primary supply fan airflow rate
 OA req'd per unit area for system (Weighted average)
 OA req'd per person for system area (Weighted average)
 Inputs for Potentially Critical Zones
 Zone Name
 Zone Tag
 Space type
 Floor area of zone
 Design population of zone
 Design total supply to zone (primary plus local recirculated)
 Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?
 Local recirc. air, % representative of ave. system return air

Name	Units	Value	Potentially Critical Zones
As	sf	9692	WEST MAIN
Ps	cfm	175	ENTRY
Vpsd	cfm	33 879	DIRECT
Ras	cfm/sf	0.06	Main entry
Rps	cfm/sf	5.0	lobbies

Inputs for Operating Condition Analyzed
 Percent of total design airflow rate at conditioned analyzed
 Air distribution type at conditioned analyzed
 Zone air distribution effectiveness at conditioned analyzed
 Primary air fraction of supply air at conditioned analyzed

Label	Value	Unit
Ds	100%	%
Ez	CS	
Ep	1.00	

Results
 Ventilation System Efficiency
 Outdoor air intake required for system
 Outdoor air per unit floor area
 Outdoor air per person served by system (including diversity)
 Outdoor air as a % of design primary supply air

Label	Value	Unit
Ev	1.00	
Vol	1457	cfm
Vol/As	0.15	cfm/sf
Vol/Ps	8.3	cfm
Vpd	4%	

Detailed Calculations
 Initial Calculations for the System as a whole
 Primary supply air flow to system at conditioned analyzed
 Unconnected OA requirement for system
 Unconnected OA req'd as a fraction of primary SA
 Initial Calculations for Individual Zones
 OA rate per unit area for zones
 OA rate per person
 Total supply air to zone (at condition being analyzed)
 Unused OA req'd to breathing zone
 Unused OA requirement for zone
 Fraction of zone supply not directly recirc. from zone
 Fraction of zone supply from fully mixed primary air
 Fraction of zone OA not directly recirc. from zone
 Unused OA fraction required in supply air to zone
 Unused OA fraction required in primary air to zone

Label	Value	Unit	Equation	Value	Unit
Vps	33879	cfm	$Vps = VpsDs$	33879	cfm
Vou	1457	cfm	$Vou = Rps Ps + Ras As$	1457	cfm
Xs	0.04		$Xs = Vou / Vps$	0.04	
Raz	0.06	cfm/sf		0.06	cfm/sf
Rpz	5.00	cfm/sf		5.00	cfm/sf
Vbz	33879	cfm		33879	cfm
Voz	1456.5	cfm	$Voz = Vbz - Raz Az$	1456.5	cfm
Voz	0.0	cfm	$Voz = Vbz - Raz Az$	0	cfm
Fa	1.00		$Fa = Vbz / Ez$	1.00	
Fb	1.00		$Fb = Ep + (1 - Ep)F$	1.00	
Fc	1.00		$Fc = 1 - (1 - Ez)(1 - Ep)(1 - E)$	1.00	
Zd	0.04		$Zd = Voz / Vbz$	0.04	
Zp	0.00		$Zp = Voz / Vps$	0.00	
Ez	1.00		$Ez = (Fa + FbXs + Fcz) / Fa$	1.00	
Ev	1.11		$Ev = min(Ez)$	1.11	
Vol	1457	cfm	$Vol = Vou / Ev$	1457	cfm
Vol	0.04	cfm	$Vol = Vou / Vps$	0.04	cfm
Vol	1346	cfm	$Vol = Vou / Ev$	1346	cfm
Vol	0.04	cfm	$Vol = Vou / Vps$	0.04	cfm
Doq F	-323		$Doq F = (Tp - dTsh) - (1 - V)TT + dTl$	-323	

Building: AHU 24
System Tag/Name: CS
Operating Condition Description: Units (select from pull-down list)
 Units (select from pull-down list)

Name	Units	System
Aa	sf	8524
Pa	P	155
VPzd	cfm	27,446
Ras	cfm/sf	0.05
Rps	cfm/psf	5.0

Inputs for System
 Floor area served by system (including diversity)
 Population of area served by system (including diversity) diversity
 Design primary supply fan airflow rate
 DA req'd per unit area for system (Weighted average)
 OA req'd per person for system area (Weighted average)
Inputs for Potentially Critical Zones
 Zone Name
 Zone Tag
 Space type
 Floor Area of zone
 Design population of zone
 Design total supply to zone (primary plus local recirculated)
 Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?
 Local recirc. air % representative of ave system return air

Zone title turns purple (date for critical zones)	Potentially Critical Zones
Az	EAST WC
Pz	CORRIDOR
VPzd	DIRECT
VPzd	Main entry
VPzd	lobbies
VPzd	Corridors

Inputs for Operating Condition Analysis
 Percent of total design airflow rate at conditioned analyzed
 Air distribution type at conditioned analyzed
 Zone air distribution effectiveness at conditioned analyzed
 Primary air fraction of supply air at conditioned analyzed
Results
 Ventilation System Efficiency
 Outdoor air intake required for system
 Outdoor air per unit floor area
 Outdoor air per person served by system (including diversity)
 Outdoor air as a % of design primary supply air

Ds	%	100%	100%
Ez	Selected from pull-down list	CS	CS
Ep		1.00	1.00
Ev		1.00	1.00
Vol	cfm	1286	0.15
Vol/As	cfm/sf	0.15	8.3
Vol/ps	cfm/psf	8.3	5%
Vol/ps	cfm	5%	

Detailed Calculations for the System as a whole
 Primary supply air flow to system at conditioned analyzed
 Uncorrected OA requirement for system
 Uncorrected OA req'd as a fraction of primary SA
Initial Calculations for Individual Zones
 OA rate per unit area for zone
 OA rate per person
 Total supply air to zone (at condition being analyzed)
 Unused OA req'd to breathing zone
 Unused OA requirement for zone
 Fraction of zone supply not directly recirc. from zone
 Fraction of zone supply from fully mixed primary air
 Fraction of zone OA not directly recirc. from zone
 Unused OA fraction required in primary air to zone
 Unused OA fraction required in primary air to zone

Vps	cfm	=	Vol/Ds	=	27446
Vou	cfm	=	Rps Ps + Ras As	=	1286
Xs		=	Vol/Vps	=	0.05
Raz	cfm/sf				0.06
Rpz	cfm/psf				5.00
Vdz	cfm	=	Rpz Pz + Raz Az	=	27446
Vbz	cfm	=	Vdz/Ez	=	1286.4
Voz	cfm	=	Vdz/Ez	=	1286
Fa		=	Ep + (1-Ep)Er	=	1.00
Fb		=	Ep	=	1.00
Fc		=	1/(1-Ez)(1-Ep)(1-Er)	=	1.00
Zd		=	Voz/Vbz	=	0.05
Zp		=	Voz/Vbz	=	0.05
Ez		=	(Fa + Fb)Xs - FcZd / Fa	=	1.00
Ey		=	min(Euz)	=	1.00
Ev		=	Value from Table 6.3	=	1.10
Vol	cfm	=	Vol / Ev	=	1286
Vol/Vps	cfm	=	Vol / Vps	=	0.05
Vol/Ev	cfm	=	Vol / Ev	=	1165
Vol/Vps	cfm	=	Vol / Vps	=	0.04
Deg F		=	((Pz-DTSp)-(1-Y)TTr+dtF)	=	-291

RFI# 1078 - OUTSIDE AIR COMPLIANCE - AHUs 16, 21, 22, 24

Furnish material and labor to meet outside air (OA) specifications provided by owner on Air Handling Units (AHUs) #16, 21, 22, 23, & 24.

SCOPE OF WORK:

- Supply labor and materials to install (5) new OA mixing boxes with dampers and controls
- Supply labor to install (2) stainless steel dampers with 24/volt actuator per unit for a total of (10) dampers
- Supply labor to install (5) new mixing boxes for dampers and insulate as needed
- Supply labor to install all new galvanized duct work for each unit as needed to connect to new mixing boxes
- Supply all electrical to connect new actuators and run new control wiring as needed to connect to existing controls system
- Supply labor to start up and check for proper operations
- Supply labor to perform Testing & Balance and make adjustments as per OA Calculations supplied by customer (see attached)
- Supply Engineering Drawings and Permits

WARRANTY:

- Contractor must provide one year warranty on parts and labor

TIMELINE:

- Lead time on dampers is anticipated at four (4) to six (6) weeks with anticipated install within two (2) weeks of receipt of materials
- Contractor must submit a schedule of anticipated work days to Director of Operations for approval and must account for events as follows:
 - Event Days – crews allowed onsite from 7am – 3pm when the event occurs in the evening
 - Crews will not be allowed onsite when an event occurs in the morning and/or afternoon
 - Non-Event Days – crews allowed onsite for extended hours as needed