

2010|2011

Technical Report 1

ASHRAE Std. 62.1 & 90.1 Analysis



Duval County Unified Courthouse Facility

Jacksonville, Florida

Zach Polovchik

Mechanical

Advisor: Dr. Freihaut

Table of Contents

Executive Summary	3
Building Summary	3
Systems	4
ASHRAE Std. 62.1	4
Section 5 Analysis – Systems & Equipment	4
Section 6 Analysis – Procedures	6
Zone Calculations Procedure	7
Assumptions.....	7
Section 6 Findings.....	8
62.1 Conclusion	8
ASHRAE Std. 90.1	9
Section 5 Analysis – Building Envelope.....	9
Section 6 Analysis – Heating, Ventilation, and Air Conditioning.....	11
Section 7 Analysis – Service Water Heating	13
Section 9 Analysis – Lighting	14
90.1 Conclusion	15
References.....	17
Appendix A – Fan Power Compliance	18
Appendix B – Ventilation Calculations.....	21

Executive Summary

The purpose of this report is to determine the compliance or noncompliance of The Duval County Unified Courthouse Facility of Jacksonville, Florida with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) Standards 62.1 and 90.1

The ASHRAE Standard 62.1 Analysis done on the facility showed that the building is largely compliant with Section 5 based on Indoor Air Quality. The facility meets or exceeds all requirements of this section. Section 6 was completed by calculating the air flow rates for three AHU's that serve the west side of the facility. The three AHU's chosen were based on building symmetry, spaces served, and space repetition on other levels. AHU 1W-1 was chosen to represent the majority of the west side of the first level being predominantly office space. AHU 2W-1 was chosen to represent the west side courtrooms on the other levels. AHU 7W-3 was chosen as it serves the auxiliary spaces around the courtrooms that are repeated on other levels. The calculations show that each space receives adequate ventilation.

The ASHRAE Standard 90.1 Analysis for The Duval County Unified Courthouse Facility confirmed that the facility is mostly compliant with the standard. The analysis followed the Mandatory Provisions and Prescriptive Path Methods of determining compliance. Section 5 – Building Envelope, did not fully comply by having a higher than allowed ratio of fenestration to gross wall area for three of the four sides. This was compensated, however, by using very efficient glazing that exceeded the requirements of U-Value and SHGC. All equipment was analyzed in Section 6 – HVAC, and met the requirements, except for some supply air fans when calculating the Fan Power Limitations. Some fans used a slightly larger horsepower than the standard allows most likely due to filters and large, separated areas. The lighting power density just meets the requirement and could be altered to make it more efficient.

Building Summary

The Duval County Unified Courthouse Facility is a 798,000 square feet, 7 level government building. The facility houses 51 total courtrooms, judicial offices, hearing spaces, and conference areas. It also includes parking areas, a detention zone, and building support areas on the first floor.

Its façade is predominantly precast limestone aggregate concrete panels and vertical spanning aluminum curtain wall vision glazing. Three large aluminum curtain walls with spandrel glazing also exist under the roofs to allow natural lighting into the front lobby and central atrium. The roof system is primarily a flat composite concrete insulated roof. Two sloped roofs exist over the lobby and central core of the building which use an insulated standing seam metal roof deck system.

Systems

Airside:

The Duval County Unified Courthouse Facility utilizes 25 Air Handling Units (AHU's) to distribute air throughout the building. The 51 courtrooms are served by 14 AHU's while the other 11 AHU's serve the remainder of the building. All AHU's are served with outdoor air by three Makeup Air Units (MAU's), two of which are heat recovery units from exhaust air. Most units are located on the interior of the building in mechanical rooms or penthouses with the exception of two AHU's and two MAU's which are all located on the second floor roof.

Zone Conditioning:

Most areas are served by Variable Air Volume (VAV) AHU's with VAV boxes in the zones. The VAV boxes also utilize terminal reheat coils. The exceptions to VAV systems are the four courtrooms on the third and fourth floors at the northern side of the building. Each of these four courtrooms is served by its own Constant Air Volume (CAV) unit. Fan Coil Units (FCU) are also utilized in some corridors for additional conditioning.

Waterside:

Heating hot water used by AHU heating coils, terminal VAV boxes, and FCU's is generated by two natural gas boilers in a first floor mechanical room. Each boiler has an output of 13,390 MBH. Chilled water is supplied by J.E.A. Public Utility Company. The chilled water is pumped from a central pumping room to the AHU cooling coils and FCU's.

ASHRAE Std. 62.1

Section 5 Analysis – Systems & Equipment

Section 5.1 Natural Ventilation

No windows in The Duval County Unified Courthouse Facility are operable, hence, Natural Ventilation is not used in the building and this subsection does not apply.

Section 5.2 Ventilation Air Distribution

Assuming that all VAV terminal boxes are calibrated correctly to allow proper minimum outdoor air flow, then each space meets the necessary air flow requirements.

Section 5.3 Exhaust Duct Location

All exhaust ducts that may convey potentially harmful contaminants such as those from toilet rooms, locker rooms, and holding cells are negatively pressurized with respect to areas that they pass.

Section 5.4 Ventilation System Controls

All AHU's run on a set schedule to operate at optimum start based on the building schedule. CO₂ sensors are used on return air ducts to verify that adequate ventilation air is being maintained. The MAU's operate 24 hours per day, seven days per week to constantly bring in outdoor ventilation air to dilute the space air.

Section 5.5 Airstream Surfaces

Most airstream surfaces used in ductwork and other equipment are sheet metal surfaces and metal fasteners. Some ducts utilize a 1" interior duct liner, however. These liners comply with ASTM C 1071, are coated with an antimicrobial coating, and covered with a film that complies with UL 181.

Section 5.6 Outdoor Air Intakes

All three outdoor air intakes for the three MAU's are at least the minimum distance away from any specific outdoor contaminant source as mentioned in Table 5-1 in section 5.6.1. All intakes are capable of managing rain entrainment and intrusion through the use of rain hoods. All intakes utilize insect and bird screens compliant with section 5.6.5.

Section 5.7 Local Capture of Contaminants

All exhaust from parking areas, toilet rooms, and holding cells are ducted to exhaust fans and expelled from the building.

Section 5.8 Combustion Air

All combustion air from the two boilers is ducted separately through an exhaust flue up through the seventh floor roof and out of the building.

Section 5.9: Particulate Matter Removal

All AHU's utilize air filters that are rated at either MERV 8 or MERV 13, both of which are compliant with section 5.9.

Section 5.10 Dehumidification System

The facility uses the AHU's cooling coils as a means of dehumidification and sensors in return air ducts measure relative humidity of the spaces. The controls do not allow the relative humidity to go above 60%. The building's outdoor air intake is greater than the exhaust air flow.

Section 5.11 Drain Pans

All drain pans have a 2% slope in at least two planes are two inches deep. The drain is located at the lowest point and is sealed. The drain pan extends at least one foot past the coil.

Section 5.12 Finned-Tube Coils and Heat Exchangers

Drain pans are provided beneath all coils and all coils have adequate space provided for cleaning and replacement.

Section 5.13 Humidifiers and Water-Spray Systems

The Duval County Unified Courthouse Facility does not use any separate humidifiers or water-spray systems.

Section 5.14 Access for Inspection, Cleaning and Maintenance

All access doors are at least 24" wide by unit casing height (with a maximum of 60" tall) to allow unobstructed access for cleaning and replacement of equipment.

Section 5.15 Building Envelope and Interior Surfaces

All building envelope walls utilize a weather barrier to prevent water entering the building. A vapor barrier is provided inside the wall construction to limit water vapor transfer. All chilled water pipes are insulated to protect against surface condensation.

Section 5.16 Buildings with Attached Parking Garages

All interior parking areas on the first level are negatively pressurized compared to adjacent occupant spaces to restrict vehicular exhaust transfer to those spaces. The garages open into vestibules or separated corridors and directly exhaust air outside of the building.

Section 5.17 Air Classification and Recirculation

Most of the building's return air is classified as Class 1 from the majority of office, courtroom, and assembly spaces. Toilet room and holding cell is considered Class 2, and may be recirculated within those zones but is directly exhausted outside of the building.

Section 5.18 Requirements for Buildings Containing ETS Areas & ETS-Free Areas

The Duval County Unified Courthouse Facility is a non-smoking facility, therefore it is only classified as an ETS-Free Area. The facility does not apply to this sections requirements.

Section 6 Analysis – Procedures

For the purpose of calculating ventilation rates for The Duval County Unified Courthouse Facility, three typical AHU's have been selected. This is due to the symmetry of the building, the repetition of the spaces and how the AHU's serve the spaces. The AHU's being analyzed are 1W-1, 2W-1, and 7W-3.

Zone Calculations Procedure

Breathing Zone Outdoor Airflow (V_{bz}):

$$V_{bz} = R_p * P_z * + R_a * A_z \quad \text{(Equation 6-1)}$$

Where: A_z=Zone Floor Area (ft²)

P_z=Zone Population, The largest number of people to occupy the space [Estimated from values in Table 6-1 of Std. 62.1]

R_p=Outdoor Airflow Rate per Person (cfm/person) [Defined in Table 6-1 of Std. 62.1]

R_a=Outdoor Airflow Rate per Unit Area (cfm/ft²) [Defined in Table 6-1 of Std. 62.1]

Zone Air Distribution Effectiveness (E_z)

E_z=1 [Defined in Table 6-2 of Std. 62.1]

Zone Air Outdoor Airflow (V_{oz})

$$V_{oz} = V_{bz} / E_z \quad \text{(Equation 6-2)}$$

Primary Outdoor Air Fraction (Z_p)

$$Z_p = V_{oz} / V_{pz} \quad \text{(Equation 6-5)}$$

System Ventilation Efficiency (E_v)

E_v is found using the maximum Z_p value [Defined in Table 6-3 of Std. 62.1]

Uncorrected Outdoor Air Intake (V_{ou})

$$V_{ou} = D \sum_{\text{all zones}} (R_p * P_z) + \sum_{\text{all zones}} (R_a * A_z) \quad \text{(Equation 6-6)}$$

Where: D=Occupant Diversity=P_s/∑_{all zones}P_z (Equation 6-7)

P_s=System Population, The total population in the area served by the system

Outdoor Air Intake (V_{ot})

$$V_{ot} = V_{ou} / E_v \quad \text{(Equation 6-7)}$$

Assumptions

Only AHU's 2W-1, 1W-1, and 7W-3 are being calculated because they serve the west half of an extremely symmetrical building. These AHU's have been selected because they serve the different spaces of this side of the courthouse that are repeated on other floors. AHU 2W-1 serves the west courtrooms on level two, which is similar to all other levels. AHU 1W-1 serves the majority of the office space on the west side of the first level. AHU 7W-3 serves the auxiliary areas around the

courtrooms on every floor with courtrooms. This is acceptable due to the similarity and repetition of spaces and symmetrical layout.

Special file rooms such as secure files, file vaults, etc. were analyzed as storage spaces. Vestibules to courtrooms were analyzed as additional corridors due to no major need for people ventilation.

Section 6 Findings

The Spreadsheets in Appendix B show the airflow of each space analyzed along with the calculation spreadsheet.

From the spreadsheet for AHU 1W-1, it is noted that the highest value of Z_p is in an interior lobby and has a value of 27%. This seems quite high and upon further inspection it should be noted that it assumed a large volume of people to be in this space at once. It is a relatively small lobby for a small office area in the facility and will never have that amount of people. It is averaged at 1.26 cfm/sf, which seems a little on the high side. This is perhaps due to incorrect people density assumptions in the program.

From the spreadsheet for AHU 2W-1, the Z_p value is the same for all spaces at 27%. This is because all of these spaces are courtrooms similar in size. The value may seem high, but it is because it assumes a large amount of people to be in the courtrooms. Based on the size and layout of the courtroom, this value may not be too far off and it may fit that many people. It is averaged at 1.53 cfm/sf, but this should only be due to the large volume of people assumed.

From the spreadsheet for AHU 7W-3, the largest Z_p value is of 48% and for multiple corridors. It is uncertain why these corridors are requiring such a large volume of outside air, though. It is averaged at 0.98 cfm/sf.

62.1 Conclusion

The Duval County Unified Courthouse Facility's HVAC system is well designed to meet all requirements based on Section 5 of Standard 62.1. This effort to meet and exceed these standards helps achieve the goal of increased indoor air quality. Careful placement and design of outdoor air intakes as well as the filtering and precautions taken on airstream surfaces all help to improve the indoor air quality. By meeting the requirements of this section, The Duval County Unified Courthouse Facility has taken the steps to earn LEED points in the Indoor Environmental Quality Category.

Calculations were also performed to be sure that enough outdoor air is being brought in for ventilation rates. Some areas' outdoor air fractions are possibly over estimated based on their large people density based on ASHRAE's assumptions. Through adjustments of real population amounts, these values could be corrected.

ASHRAE Std. 90.1

ASHRAE Standard 90.1 is an energy standard for buildings that focuses on the energy usage and the efficiency of the Building Envelope, HVAC systems, Service Water Heating, Power & Lighting, and other auxiliary equipment.

Section 5 Analysis – Building Envelope

Section 5.1.4 Climate

The Duval County Unified Courthouse Facility in Jacksonville, Florida is located in Climate Zone 2A. See Figure 1 below.

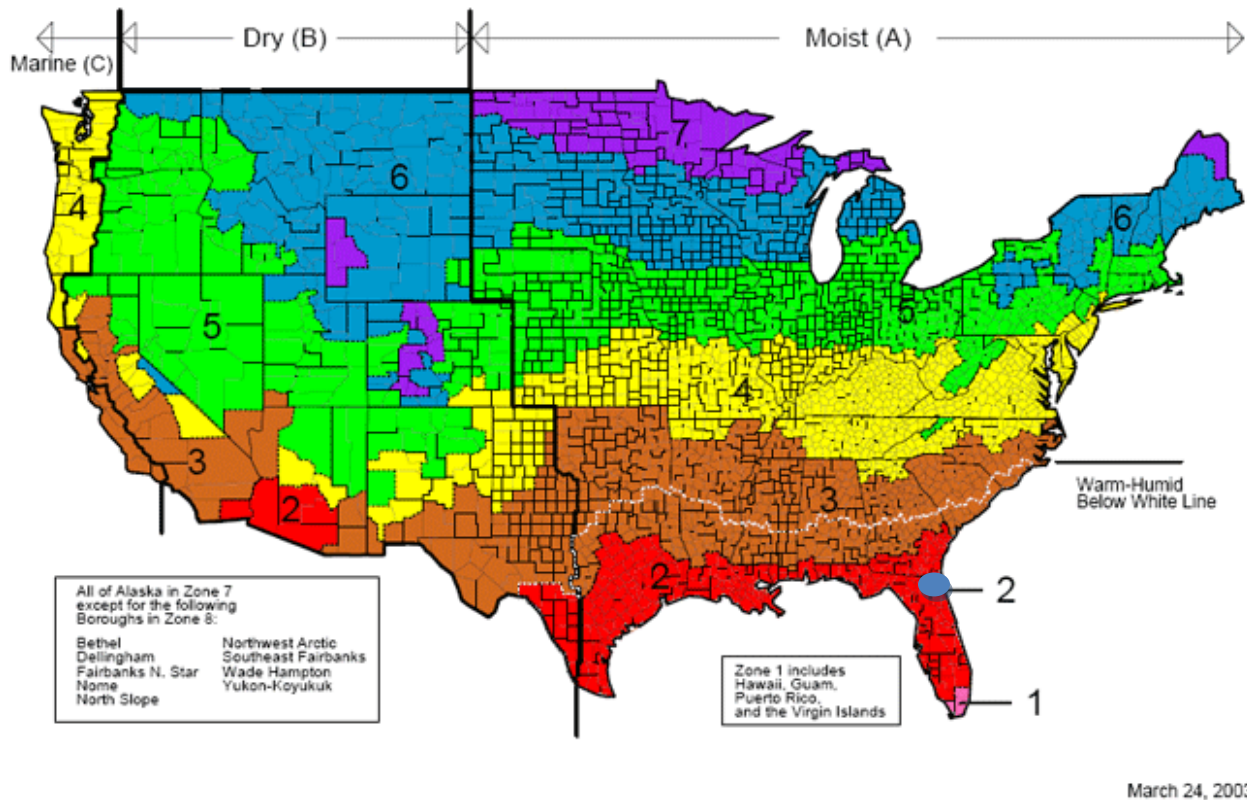


Figure 1

Section 5.4 Mandatory Provisions

All joints around fenestration, doors, and between walls are sealed as well as any openings in the roof for equipment or shafts. Loading dock weatherseals are not required in Climate Zone 2A. Vestibules in Climate Zone 2A are exempt from section 5.4.3.4, but the Duval County Unified Courthouse Facility has entrance and emergency exit vestibules that do comply with this section.

Section 5.5 Prescriptive Building Envelope Option

Section 5.2 of the standard lists two compliance paths, the Prescriptive Building Envelope Option and the Building Envelope Trade-Off Option. The Prescriptive Building Envelope Option is used provided that the building’s vertical fenestration area does not exceed 40% of the gross wall area and skylight fenestration does not exceed 5% of the gross roof area. Only the northern façade wall was compliant with this fenestration area. The other three façade walls were over the limit by 5-6%. The southern façade has two large glazed curtain walls to accentuate it as the main entrance. The east and west facades are dominated by the vertical strips of glazing because of peripheral offices and courtrooms, but could be adjusted to comply with the 40% requirement.. The areas are summarized in Table 1. No skylights exist for the facility.

Fenestration Areas				
Façade	Area of Glazing (SF)	Gross Wall Area (SF)	Percentage Glazing	Compliance
North	31,059	80,965	38%	YES
South	38,778	86,370	45%	NO
East	17,181	37,150	46%	NO
West	17,131	37,150	46%	NO

Table 1

The building envelope materials were compared to Table 5.5-2 for Climate Zone 2A to examine the individual materials’ compliance with Standard 90.1 even though three out of the four façade walls are out of compliance due to their fenestration area. Table 2 summarizes the values of the envelope materials for The Duval County Unified Courthouse Facility and the applicable Standard 90.1 values.

Building Envelope Values						
Opaque Element	Description	90.1 Requirements		Specified Values		Compliance
		Assembly Maximum U-Value	Insulation Minimum R-Value	Assembly U-Value	Insulation R-Value	
Roof	Insulation Entirely Above Deck	0.048	20.0	0.048	20	Yes
Roof	Metal Roof Deck	0.065	19.0	0.063	20	Yes
Walls, Above Grade	Mass	0.151	5.7	0.168	11	No

Floors	Mass	0.107	6.3	0.322	None	No
Slab-On-Grade Floor	Unheated	0.730	NR	0.730	None	Yes
Opaque Doors	Swinging	0.700		0.500		Yes
Fenestration	Description	Assembly Maximum U-Value	Assembly Max SHGC	Assembly U-Value	SHGC	Compliance
Metal Framing	Curtainwall/Storefront	0.70	0.25	.62	.14	Yes
Metal Framing	Entrance Doors	1.10	0.25	.62	.14	Yes
Metal Framing	All Other	0.75	0.25	.39	.14	Yes

Table 2

Through this Prescriptive Approach, most building envelope elements were found to be in compliance with the section. Above grade walls have a slightly higher Assembly U-Value due to the non-continuous insulation because of metal stud framing on the interior side of the wall. Floors slabs are not insulated because the temperature of the above and below levels is assumed to be the same.

Section 6 Analysis – Heating, Ventilation, and Air Conditioning

Section 6.2 Compliance Path

Two compliance paths are available in this section, the Simplified Approach Option or the Mandatory Provisions and Prescriptive Path. The Mandatory Provisions and Prescriptive Path has been selected in order to accurately compare the energy efficiencies of the HVAC equipment

Section 6.4 Mandatory Provisions

Zones are equipped with thermostats that will control supply air temperature by directly regulating the chilled water valve. If additional heating energy is required, terminal reheat activates in the zones VAV boxes.

Controls are based on a day-to-day occupied and unoccupied time schedule. During unoccupied times, the system has the capability to setback down to 55°F for heating or 85°F for cooling. Optimum start is used on the AHU's in order to get space temperature to an adequate level before regular occupancy hours.

The MAU’s fans are controlled by the need for ventilation air based upon the control on the regular AHU’s operation. MAU supply fans will only operate when a connected AHU is in operation. If an MAU supply fan is not operating, its respected outdoor air dampers will be closed.

All ducts and chilled water piping have been insulated to prevent thermal transfer through the material. Ducts and plenums have been sealed to prevent leakage to meet Class C requirements in Section 6.4.4.2.

Section 6.5 Prescriptive Path

No economizer control has been found in the control descriptions. Section 6.5.1 lists that there is no economizer requirement for Climate Zone 2A.

All fan motors were analyzed based on their design air flow rate in CFM and their maximum nameplate HP. The equations from Section 6.5 used to find the prescribed HP ratings are as follows:

$$HP \leq CFM * 0.0011 \quad (\text{For Constant Volume Fans})$$

$$HP \leq CFM * 0.0015 \quad (\text{For Variable Volume Fans})$$

Most of the fans are compliant with the standard with the exception of the four CAV AHUs that serve the four individual north side courtrooms and the large air handlers that serve the seventh level. A detailed summary of each fan and its compliance is included in Appendix B.

All VAV fan systems are controlled with a Variable Frequency Drive (VFD), including those over 10HP. Control static pressure setpoints of VAV boxes are reset based on the zone requiring the most pressure.

All water pumps that have a pump head exceeding 100 feet and also use a motor exceeding 50 HP utilize a VFD to vary the flow.

No heat rejection equipment is specified for The Duval County Unified Courthouse Facility because it does not have a central cooling plant. Therefore, no requirements in Section 6.5.5 are applicable to this facility.

Two of the three MAU’s are equipped with air-to-air cross flow enthalpy wheels of effectiveness roughly equal to 74%. Each MAU is capable of bringing in 40,000 CFM of outdoor air, and the two heat recovery units exhaust 25,000 CFM. The third MAU, located in a penthouse above the seventh level, that supplies outdoor air to the six AHU’s on the seventh level is not equipped with an exhaust fan or energy recovery unit. All air from the spaces served by this unit is exhausted individually through other exhaust fans.

Section 6.8 Minimum Equipment Efficiencies

Two Computer Room Air Conditioning (CRAC) units are used for the computer spaces in the building. No submittals were made available for these units, but the HVAC specifications require

they meet the requirements of Section 6.8 in the standard. The required values for these CRAC units is summarized in Table 3.

CRAC Unit Efficiency Requirements						
Type	Size Category	Heating Section	Sub-Category	Specified Size	Minimum EER	Compliance
Air Conditioners, Water Cooled	≥135,000 BTU/hr and <240,000 BTU/hr	Electric Resistance	Split System	193,800 BTU/hr	11.0	YES
	180,000 BTU/hr			11.0	YES	

Table 3

The heating system utilizes two natural gas boilers that are each rated above the minimum efficiency as stated in Section 6.8. The required and specified values are included in Table 4.

Boiler Efficiency Requirements						
Type	Fuel Category	Input Size Category	Minimum Efficiency	Specified Input Size	Rated Efficiency	Compliance
Hot Water Boiler	Gas-Fired	>2,500,000 BTU/hr	80%	16,330,000 BTU/hr	82%	YES
Hot Water Boiler	Gas-Fired	>2,500,000 BTU/hr	80%	16,330,000 BTU/hr	82%	YES

Table 4

All combined heating and cooling supply ducts utilize insulation of R-8 and all return ducts use insulation of R-4. Both of these insulation R-Values are compliant with Zone 2A. All hydronic piping is insulated with the adequate thickness of insulation as per the requirements of Table 6.8.3 in Section 6.8.

Section 7 Analysis – Service Water Heating

The Duval County Unified Courthouse Facility uses five Instantaneous Electric Water Heaters (IEW) to serve its domestic hot water needs.

Section 7.2 Compliance Paths

There are two paths to follow compliance for Section 7, the Mandatory Provisions and Prescriptive Path or the Energy Cost Budget Method Path. The Mandatory Provisions and Prescriptive Path has been selected in order to analyze the efficiency of the water heaters specified for the facility.

Section 7.4 Mandatory Provisions

All necessary hot water pipes are insulated as per Section 7.4.3. All water heaters have the ability to heat up to a maximum of 125 °F and are circulated with a 550 GPM Booster Pump.

Section 7.5 Prescriptive Path

No service hot water produced by the IEW’s is used for additional space heating.

Section 7.8 Performance Requirements for Water Heating Equipment

No submittals have been made available for the efficiency rates of the domestic hot water heaters, but the Plumbing Specifications require that all IEW’s be compliant with Section 7 of Standard 90.1.

Section 9 Analysis – Lighting

Section 9.2 Compliance Paths

This section has two methods of determining compliance for lighting fixtures, the Building Area Method or the Space-By-Space Method. The Building Area Method has been chosen for The Duval County Unified Courthouse Facility because it has the typical spaces of a courthouse and “Courthouse” is a possible Building Area Type as per Table 9.5.1 in Section 9.

Section 9.4 Mandatory Provisions

The interior lighting is automatically controlled based a time-of-day schedule on occupancy hours or connected to an occupancy sensor.

Section 9.5 Building Area Method Compliance Path

Each floor’s lighting was inventoried separately and then summed into a total wattage for the entire usable space of the facility. The analysis is summarized in Table 5 below. The total watts/sf of the facility was calculated to be 1.21, which is only 0.01 watt/sf over the requirement listed for the Courthouse Building Area Type mentioned in the section.

Building Area Method Lighting Power Density Analysis									
Fixture	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Watts/ Fixture	Total Watts
A2	245	91	27	27	38	38	0	64	29824
A3	42	0	0	0	0	0	0	96	4032
A4	59	0	0	0	0	0	0	216	12744
A5	27	38	51	51	43	43	0	96	24288
B2	230	664	72	72	151	151	320	64	106240
B3	419	257	0	0	20	22	8	96	69696

C2	69	106	85	85	80	80	27	64	34048
D2	75	310	215	215	160	250	397	64	103808
D3	0	71	48	48	48	48	0	96	25248
F2	2	31	44	44	41	41	2	64	13120
J2	251	53	48	48	50	50	42	64	34688
J2E	22	0	0	0	0	0	0	64	1408
M	0	50	14	14	12	12	346	50	22400
N1	0	280	378	378	320	320	0	54	90504
N2	67	262	13	13	16	16	619	54	54324
P1	0	0	0	0	4	4	0	100	800
R1	20	54	92	92	82	82	55	39	18603
R2	38	0	0	0	0	0	0	56	2128
U	20	0	0	0	0	0	0	64	1280
W	44	42	40	40	32	32	14	64	15616
X	101	118	70	70	75	75	55	20	11280
ZP1	0	42	98	98	58	58	0	336	118944
ZP2	43	83	53	53	61	61	212	104	58864
ZP4	13	20	25	25	16	16	6	416	50336
Level SF	165858	157508	86990	81571	81511	87404	87048		
								Total Area	747890
								Total Wattage	904223
								Watts/SF	1.209
								90.1 Required Watts/SF	1.2
								Compliance	YES

Table 5

90.1 Conclusion

After the preceding calculations and analyses based on the prescriptive methods have been performed, it has been determined that The Duval County Unified Courthouse Facility is mostly compliant with Standard 90.1. The area of the building that is least compliant is Section 6 – Building Envelope. The building sacrifices compliance with fenestration ratios for aesthetic appeal.

Three out of four perimeter walls exceed the 40% maximum fenestration value. The designers seem to have made up for this, however, by using much more efficient glazing with lower U-Values and lower SHGC. The exterior mass walls, however, did not comply with the U-Value requirement. This is due to the metal stud framing on the interior creating non-continuous insulation. The other area that the facility does not fully comply with is the Fan Power Limitations. The AHU fans that serve the CAV zoned courtrooms are slightly over the HP requirement. The other noncompliant fans are in the large AHU's that serve the auxiliary spaces on levels 2-7. These are possibly out of compliance due to the large pressure needed to transfer air around the large spaces on multiple floors.

Most aspects of the facility just met the requirements of the standard and may have room for some improvement. The lighting power density is barely adequate when compared to the requirements of the section (1.21 actual Watts/sf versus 1.20 required Watts/sf). Even with nearly the entire facility being equipped with fluorescents, there are more efficient energy-saver fluorescent lamps available that can be used to decrease the facilities lighting power density. The glazing however exceeds the requirements very well. The specified U-Values are 11% to 48% better than those required. The SHGC is rated at 44% better than the required value.

References

ASHRAE Standard 62.1 – 2007

ASHRAE Standard 90.1 – 2007

ASHRAE Handbook of Fundamentals

ASHRAE Handbook of HVAC Systems & Equipment

Appendix A – Fan Power Compliance

Fan Power Limitation Requirements					
Fan	Specified HP	CFM	Type	Prescribed HP	Compliance
AHU-2E-1	15	11000	VAV	16.5	YES
AHU-3E-1	20	14100	VAV	21.15	YES
AHU-3E-2	7.5	3300	CAV	3.63	NO
AHU-4E-1	20	14100	VAV	21.15	YES
AHU-4E-2	7.5	4300	CAV	4.73	NO
AHU-5E-1	20	14100	VAV	21.15	YES
AHU-6E-1	20	14100	VAV	21.15	YES
AHU-2W-1	15	11000	VAV	16.5	YES
AHU-3W-1	20	14100	VAV	21.15	YES
AHU-3W-2	7.5	3300	CAV	3.63	NO
AHU-4W-1	20	14100	VAV	21.15	YES
AHU-4W-2	7.5	4300	CAV	4.73	NO
AHU-5W-1	20	14100	VAV	21.15	YES
AHU-6W-1	20	14100	VAV	21.15	YES
AHU-2E-2	30	24300	VAV	36.45	YES
AHU-2E-3	75	50000	VAV	75	YES
AHU-7E-1	75	46000	VAV	69	NO
AHU-7E-2	75	46000	VAV	69	NO
AHU-7E-3	75	46000	VAV	69	NO
AHU-1W-1	75	50000	VAV	75	YES
AHU-2W-2	25	18800	VAV	28.2	YES
AHU-2W-3	20	16000	VAV	24	YES
AHU-7W-1	75	46000	VAV	69	NO
AHU-7W-2	75	46000	VAV	69	NO
AHU-7W-3	75	46000	VAV	69	NO
MAU-2E-1S	60	40000	VAV	60	YES

MAU-2E-1E	25	25000	VAV	37.5	YES
MAU-2W-1S	60	40000	VAV	60	YES
MAU-2W-1E	25	25000	VAV	37.5	YES
MAU-7-1	60	40000	VAV	60	YES
EF-1E-1	2	11250	VAV	16.875	YES
EF-1E-2	1	3030	VAV	4.545	YES
EF-1E-3	0.33	1310	VAV	1.965	YES
EF-1E-4	5	18770	VAV	28.155	YES
EF-2E-1	5	10050	VAV	15.075	YES
EF-5E-1	0.75	3300	CAV	3.63	YES
EF-7E-1	3	5000	VAV	7.5	YES
EF-7E-2	3	20000	VAV	30	YES
EF-S2E-1	15	20000	VAV	30	YES
EF-S2E-2	5	10000	VAV	15	YES
EF-S2E-3	5	15000	VAV	22.5	YES
EF-S7E-1	25	40000	VAV	60	YES
SPF-E-1	0.75	1440	VAV	2.16	YES
SPF-E-2	1.5	3900	VAV	5.85	YES
SPF-E-3	1.5	2900	VAV	4.35	YES
SPF-E-4	2	4000	VAV	6	YES
SPF-E-5	3	7200	VAV	10.8	YES
SPF-E-6	3	6000	VAV	9	YES
SPF-E-7	5	10000	VAV	15	YES
EPF-E-1	0.75	2250	VAV	3.375	YES
EPF-E-2	0.75	2250	VAV	3.375	YES
EPF-E-3	1	2500	VAV	3.75	YES
EPF-E-4	1.5	5000	VAV	7.5	YES
SF-E-1	1.5	8000	CAV	8.8	YES
EF-1W-1	5	18770	VAV	28.155	YES
EF-1W-2	0.5	1900	VAV	2.85	YES

EF-1W-3	1	3200	VAV	4.8	YES
EF-2W-1	3	9085	VAV	13.6275	YES
EF-2W-2	0.75	2000	CAV	2.2	YES
EF-7W-1	3	5000	VAV	7.5	YES
EF-S2W-1	15	20000	VAV	30	YES
EF-S2W-2	20	30000	VAV	45	YES
EF-S2W-3	15	20000	VAV	30	YES
SPF-W-1	0.75	1440	VAV	2.16	YES
SPF-W-2	1.5	3600	VAV	5.4	YES
SPF-W-3	1.5	2900	VAV	4.35	YES
SPF-W-4	2	4000	VAV	6	YES
SPF-W-5	3	6700	VAV	10.05	YES
SPF-W-6	3	6000	VAV	9	YES
SPF-W-7	5	10000	VAV	15	YES
EPF-W-1	0.75	2250	VAV	3.375	YES
EPF-W-2	0.75	2250	VAV	3.375	YES
EPF-W-3	1	2500	VAV	3.75	YES
EPF-W-4	1.5	5000	VAV	7.5	YES
EPF-W-5	2	9000	VAV	13.5	YES
EPF-W-6	1	5000	VAV	7.5	YES

Appendix B – Ventilation Calculations

Zone Tag	Space	Area (SF)	CFM
AHU 1W-1			
14	Office Space	1410	1480
13	Breakroom	284	480
13	Storage	177	480
15	Evidence	1169	715
16	Open Office	4231	3240
17	Secure Files	1641	800
18	Office Space	813	1480
18	Lobby	501	1480
19	Secure Storage	299	2185
19	Office Space	2638	2185
20	Tellers Offices	1497	880
21	Closet	47	400
22	Security/Lobby	7535	6300
8	Office Space	516	350
11	Electrical Closet	96	1000
9	Comm. Closet	89	400
10	Corridor	1102	710
7	Corridor	717	1670
7	Breakroom	145	1670
7	Office Space	571	1670
6	Electrical Closet	118	1000
5	Comm. Closet	110	450
4	Office Space	3282	2160
4	Lobby	449	2160
4	Breakroom	205	2160
4	File Storage	1850	2160
1	Office Space	166	160
AHU 2W-1			
1	Courtroom	1794	2750
2	Courtroom	1795	2750
3	Courtroom	1799	2750
4	Courtroom	1805	2750
AHU 7W-3			
70	Deposition	320	400
69	Meeting Rooms	198	200

69	Vestibule	55	50
74	Jury Room	273	250
	Corridor	390	50
71	Jury Room	262	250
68	Storage	92	50
68	Comm. Closet	101	400
66	Meeting Rooms	191	200
66	Vestibule	56	50
64	Meeting Rooms	189	200
64	Vestibule	56	50
58	Electrical Closet	111	1000
57	Storage	84	200
59	Jury Room	268	250
	Corridor	378	50
61	Jury Room	270	250
55	Meeting Rooms	197	200
55	Vestibule	54	50
53	Vestibule	58	50
53	Meeting Rooms	196	200
65	Deposition	255	515
54	Deposition	121	565
50	Comm. Closet	161	400
49	Security Office	119	50
76	Jury Room	325	350
	Corridor	391	100
79	Evidence	69	50
79	AV	26	150
77	Meeting Rooms	217	225
77	Vestibule	41	50
62	Meeting Rooms	251	225
62	Vestibule	66	50
60	AV	26	200
	Corridor	223	100
63	Evidence	79	50
63	Meeting Rooms	273	225
63	Vestibule	66	50
73	Vestibule	60	50
73	Meeting Rooms	279	225
72	Evidence	67	50
72	AV	35	200

	Corridor	222	100
75	Meeting Rooms	257	225
75	Vestibule	68	50
	Corridor	1958	350

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	1W-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	31658
Population of area served by system (including diversity)	Ps	P	309
Design primary supply fan airflow rate	Vpsd	cfm	39,825
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

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	Office space	Breakroom	Storage	Evidence	Open Office	Secure Case File	Office space
				Az	Pz	Vdzd	Er		1W1-14	1W1-13	1W1-13	1W1-15	1W1-16	1W1-17	1W1-18
									Office space	Break rooms	Storage rooms	Storage rooms	Office space	Storage rooms	Office space
				1,410	7.05	1,480			1,410	284	177	1169	4231	1641	813
				7.05	7.1	480			7.05	7.1	0	0	21.155	0	4.065
				1,480	480	480			1,480	480	480	715	3240	800	1480

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	Ds	Ez	Ep	100%	100%	100%	100%	100%	100%	100%	100%
									CS	CS	CS	CS	CS	CS	CS
									1.00	1.00	1.00	1.00	1.00	1.00	1.00

Results	Ev	Vot	Vot/As	Vot/Ps	Ypd	0.82	4568	0.14	14.8	11%
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										
Initial Calculations for the System as a whole										
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	39825				
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	3745				
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.09				
Initial Calculations for individual zones										
OA rate per unit area for zone	Raz	cfm/sf				0.06	0.06	0.12	0.12	0.06
OA rate per person	Rpz	cfm/p				5.00	5.00	0.00	0.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				1480	480	480	715	3240
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	119.9	52.5	21.2	140.3	359.6
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	120	53	21	140	360
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.08	0.11	0.04	0.20	0.11
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.08	0.11	0.04	0.20	0.11
System Ventilation Efficiency										
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.01	0.98	1.05	0.90	0.98
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	0.82				
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.88				
Minimum outdoor air intake airflow										
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	4568				
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.11				
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	4276	291.88			
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.11	0.06			
OA Temp at which Min OA provides all cooling										
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	-76				

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	1W-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	31658
Population of area served by system (including diversity)	Ps	P	309
Design primary supply fan airflow rate	Vpsd	cfm	39,825
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones		Potentially Critical 2						
Zone Name	Zone title turns purple italic for critical zone(s)	Lobby	Secure Storage	Office space	Tellers Offices	Closet	Security/Lobby	Office space
Zone Tag		1W1-18	1W1-19	1W1-19	1W1-20	1W1-21	1W1-22	1W1-8
Space type	Select from pull-down list	Lobbies	Storage rooms	Office space	Office space	Storage rooms	Main entry lobbies	Office space
Floor Area of zone	Az sf	501	299	2638	1497	47	7535	516
Design population of zone	Pz P (default value listed; may be overridden)	75.15	0	13.19	7.485	0	75.35	2.58
Design total supply to zone (primary plus local recirculated)	Vdzd cfm	1480	2185	2185	880	400	6300	350
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Er Select from pull-down list or leave blank if N/A							
Local recirc. air % representative of ave system return air	Er							

Inputs for Operating Condition Analyzed	Units	100%	100%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed	Ds %	100%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed	Select from pull-down list	CS	CS	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep								

Results	Units	0.82	4568	0.14	14.8	11%
Ventilation System Efficiency	Ev	0.82				
Outdoor air intake required for system	Vot cfm		4568			
Outdoor air per unit floor area	Vot/As cfm/sf			0.14		
Outdoor air per person served by system (including diversity)	Vot/Ps cfm/p				14.8	
Outdoor air as a % of design primary supply air	Ypd cfm					11%

Detailed Calculations									
Initial Calculations for the System as a whole									
Primary supply air flow to system at conditioned analyzed	Vps cfm	=	VpdDs	=	39825				
UncorrectedOA requirement for system	Vou cfm	=	Rps Ps + Ras As	=	3745				
Uncorrected OA req'd as a fraction of primary SA	Xs	=	Vou / Vps	=	0.09				
Initial Calculations for individual zones									
OA rate per unit area for zone	Raz cfm/sf		0.06	0.12	0.06	0.06	0.12	0.06	0.06
OA rate per person	Rpz cfm/p		5.00	0.00	5.00	5.00	0.00	5.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz cfm		1480	2185	2185	880	400	6300	350
Unused OA req'd to breathing zone	Vbz cfm	=	Rpz Pz + Raz Az	=	405.8	35.9	224.2	127.2	5.6
Unused OA requirement for zone	Voz cfm	=	Vbz/Ez	=	406	36	224	127	6
Fraction of zone supply not directly recirc. from zone	Fa	=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb	=	Ep	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc	=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd	=	Voz / Vdz	=	0.27	0.02	0.10	0.14	0.01
Unused OA fraction required in primary air to zone	Zp	=	Voz / Vpz	=	0.27	0.02	0.10	0.14	0.01
System Ventilation Efficiency									
Zone Ventilation Efficiency (App A Method)	Evz	=	(Fa + FbXs - FcZ) / Fa	=	0.82	1.08	0.99	0.95	1.08
System Ventilation Efficiency (App A Method)	Ev	=	min (Evz)	=	0.82				
Ventilation System Efficiency (Table 6.3 Method)	Ev	=	Value from Table 6.3	=	0.88				
Minimum outdoor air intake airflow									
Outdoor Air Intake Flow required to System	Vot cfm	=	Vou / Ev	=	4568				
OA intake req'd as a fraction of primary SA	Y	=	Vot / Vps	=	0.11				
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot cfm	=	Vou / Ev	=	4276				
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y	=	Vot / Vps	=	0.11				
OA Temp at which Min OA provides all cooling									
OAT below which OA Intake flow is @ minimum	Deg F	=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	-76				

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	1W-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	31658
Population of area served by system (including diversity)	Ps	P	309
Design primary supply fan airflow rate	Vpsd	cfm	39,825
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

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	ones	Elect. Closet	Comm. Closet	Corridor	Corridor	Breakroom	Office space	Elect. Closet
				Az	Pz	Vdzd	Er			1W1-11	1W1-9	1W1-10	1W1-7	1W1-7	1W1-7	1W1-6
										Electrical equipment rooms	Telephone closets	Corridors	Corridors	Break rooms	Office space	Electrical equipment rooms
				96	0	1000				96	89	1102	717	145	571	118
				0	0	400				0	0	0	0	3.625	2.855	0
				1000	400	710				1670	1670	1670	1670	1670	1670	1000

Inputs for Operating Condition Analyzed	Percent of total design airflow rate at conditioned analyzed	Ds	%	100%
Air distribution type at conditioned analyzed	Zone air distribution effectiveness at conditioned analyzed	Ez	Select from pull-down list	CS
Primary air fraction of supply air at conditioned analyzed	Ep			1.00

Results	Ventilation System Efficiency	Ev	0.82
	Outdoor air intake required for system	Vot	cfm
	Outdoor air per unit floor area	Vot/As	cfm/sf
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p
	Outdoor air as a % of design primary supply air	Ypd	cfm

Detailed Calculations	Initial Calculations for the System as a whole	Vps	cfm	=	VpdDs	=	39825
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	3745
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.09
	Initial Calculations for individual zones	Raz	cfm/sf	0.06	0.00	0.06	0.06
	OA rate per person	Rpz	cfm/p	0.00	0.00	0.00	0.00
	Total supply air to zone (at condition being analyzed)	Vdz	cfm	1000	400	710	1670
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	5.8
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	6
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.01
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.01
	System Ventilation Efficiency	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.09
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	0.82
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.88
	Minimum outdoor air intake airflow	Vot	cfm	=	Vou / Ev	=	4568
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.11
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	4276
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.11
	OA Temp at which Min OA provides all cooling	Deg F		=	{(Tp-dTsf)-(1-Y)*(Tr+dTr	=	-76

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	1W-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	31658
Population of area served by system (including diversity)	Ps	P	309
Design primary supply fan airflow rate	Vpsd	cfm	39,825
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.07
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones		Comm. Closet	Office space	Lobby	Breakroom	File Storage	Office space
Zone Name	<i>Zone title turns purple italic for critical zone(s)</i>	1W1-5	1W1-4	1W1-4	1W1-4	1W1-4	1W1-1
Zone Tag		Telephone closets	Office space	Lobbies	Break rooms	Storage rooms	Office space
Space type	Select from pull-down list						
Floor Area of zone	Az sf	110	3282	449	205	1850	166
Design population of zone	Pz P (default value listed; may be overridden)	0	16.41	67.35	5.125	0	0.83
Design total supply to zone (primary plus local recirculated)	Vdzd cfm	450	2160	2160	2160	2160	160
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Er Select from pull-down list or leave blank if N/A						
Local recirc. air % representative of ave system return air							

Inputs for Operating Condition Analyzed	Ds	%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed								
Air distribution type at conditioned analyzed	Ez	Select from pull-down list	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ep		1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed								

Results	Ev	0.82
Ventilation System Efficiency		
Outdoor air intake required for system	Vot cfm	4568
Outdoor air per unit floor area	Vot/As cfm/sf	0.14
Outdoor air per person served by system (including diversity)	Vot/Ps cfm/p	14.8
Outdoor air as a % of design primary supply air	Ypd cfm	11%

Detailed Calculations									
Initial Calculations for the System as a whole									
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	39825			
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	3745			
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.09			
Initial Calculations for individual zones									
OA rate per unit area for zone	Raz	cfm/sf				0.00	0.06	0.06	0.06
OA rate per person	Rpz	cfm/p				0.00	5.00	5.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				450	2160	2160	2160
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	0.0	279.0	363.7	37.9
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	0	279	364	38
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.00	0.13	0.17	0.02
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.00	0.13	0.17	0.02
System Ventilation Efficiency									
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.09	0.96	0.93	1.08
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=				0.99
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=				0.88
Minimum outdoor air intake airflow									
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=				4568
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=				0.11
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=				4276
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=				0.11
OA Temp at which Min OA provides all cooling									
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=				-76

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	2W-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	7193
Population of area served by system (including diversity)	Ps	P	504
Design primary supply fan airflow rate	Vpsd	cfm	11,000
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Potentially Critical Zones				
Zone Name	Zone title turns purple italic for critical zone(s)			Courtroom	Courtroom	Courtroom	Courtroom
Zone Tag				2W1-1,2W1-12	2W1-13,2W1-2	2W1-14,2W1-3	2W1-15,2W1-3
Space type	Select from pull-down list			Courtrooms	Courtrooms	Courtrooms	Courtrooms
Floor Area of zone	Az	sf		1,794	1795	1799	1805
Design population of zone	Pz	P	(default value listed; may be overridden)	125.58	125.65	125.93	126.35
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm		2,750	2750	2750	2750
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Select from pull-down list or leave blank if N/A						
Local recirc. air % representative of ave system return air	Er			75%	75%	75%	75%

Inputs for Operating Condition Analyzed							
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed	Select from pull-down list			CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez		1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep						

Results			
Ventilation System Efficiency	Ev		1.00
Outdoor air intake required for system	Vot	cfm	2952
Outdoor air per unit floor area	Vot/As	cfm/sf	0.41
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	5.9
Outdoor air as a % of design primary supply air	Ypd	cfm	27%

Detailed Calculations

Initial Calculations for the System as a whole				
Primary supply air flow to system at conditioned analyzed	Vps	cfm	= VpdDs	= 11000
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As	= 2949
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps	= 0.27

Initial Calculations for individual zones				
OA rate per unit area for zone	Raz	cfm/sf		0.06
OA rate per person	Rpz	cfm/p		5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm		2750
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az	= 735.5
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez	= 736
Fraction of zone supply not directly recirc. from zone	Fa		= Ep + (1-Ep)Er	= 1.00
Fraction of zone supply from fully mixed primary air	Fb		= Ep	= 1.00
Fraction of zone OA not directly recirc. from zone	Fc		= 1-(1-Ez)(1-Ep)(1-Er)	= 1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz	= 0.27
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz	= 0.27

System Ventilation Efficiency				
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa	= 1.00
System Ventilation Efficiency (App A Method)	Ev		= min (Evz)	= 1.00
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3	= 0.88

Minimum outdoor air intake airflow				
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev	= 2952
OA intake req'd as a fraction of primary SA	Y		= Vot / Vps	= 0.27
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev	= 3348
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps	= 0.30

OA Temp at which Min OA provides all cooling				
OAT below which OA Intake flow is @ minimum	Deg F		= {(Tp-dTsf)-(1-Y)*(Tr+dTr	= 9

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Comm. Closet	Meeting rooms	Vestibule	Meeting Rooms	Vestibule	Elect. Closet	Storage
Zone Name	Zone Tag	Space type	7W3-68	7W3-66	7W3-66	7W3-64	7W3-64	7W3-58	7W3-57
Floor Area of zone	Design population of zone	Design total supply to zone (primary plus local recirculated)	Telephone closets	Conference/meeting	Corridors	Conference/meeting	Corridors	Electrical equipment rooms	Storage rooms
		Select from pull-down list							
Az	Pz	Vdzd	101	191	56	189	56	111	84
		(default value listed; may be overridden)	0	9.55	0	9.45	0	0	0
		Select from pull-down list or leave blank if N/A	400	200	50	200	50	1000	200
Er									

Inputs for Operating Condition Analyzed			100%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed	Air distribution type at conditioned analyzed	Zone air distribution effectiveness at conditioned analyzed	Ds	Ez	Ep	CS	CS	CS	CS
		Select from pull-down list							
			1.00	1.00	1.00	1.00	1.00	1.00	1.00

Results			0.71	2337	0.25	10.7	25%
Ventilation System Efficiency	Outdoor air intake required for system	Outdoor air per unit floor area	Ev	Vot	Vot/As	Vot/Ps	Ypd
				cfm	cfm/sf	cfm/p	cfm

Detailed Calculations									
Initial Calculations for the System as a whole									
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255			
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663			
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18			
Initial Calculations for individual zones									
OA rate per unit area for zone	Raz	cfm/sf				0.00	0.06	0.06	0.06
OA rate per person	Rpz	cfm/p				0.00	5.00	0.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				400	200	50	200
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	0.0	59.2	3.4	58.6
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	0	59	3	59
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.00	0.30	0.07	0.29
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.00	0.30	0.07	0.29
System Ventilation Efficiency									
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.18	0.88	1.11	0.89
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=				
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=				
Minimum outdoor air intake airflow									
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=				
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=				
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=				
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=				
OA Temp at which Min OA provides all cooling									
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y))*(Tr+dTr	=				

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Jury room	Corridor	Jury Room	Meeting rooms	Vestibule	Meeting Rooms	Vestibule
Zone Name	Zone Tag	Space type	7W3-59	Corridors	7W3-61	7W3-55	7W3-55	7W3-53	7W3-53
			Conference/m eeting	Corridors	Conference/m eeting	Conference/m eeting	Corridors	Conference/m eeting	Corridors
Floor Area of zone	Az	Select from pull-down list	268	378	270	197	54	196	58
Design population of zone	Pz	(default value listed; may be overridden)	13.4	0	13.5	9.85	0	9.8	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	250	50	250	200	50	200	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A							
Local recirc. air % representative of ave system return air	Er								

Inputs for Operating Condition Analyzed			Ds	%	100%	100%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed	Ds	%										
Air distribution type at conditioned analyzed		Select from pull-down list			CS	CS	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep											

Results			Ev	0.71
Ventilation System Efficiency	Ev			
Outdoor air intake required for system	Vot	cfm		2337
Outdoor air per unit floor area	Vot/As	cfm/sf		0.25
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		10.7
Outdoor air as a % of design primary supply air	Ypd	cfm		25%

Detailed Calculations												
Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255						
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663						
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18						
Initial Calculations for individual zones												
OA rate per unit area for zone	Raz	cfm/sf				0.06	0.06	0.06	0.06	0.06	0.06	0.06
OA rate per person	Rpz	cfm/p				5.00	0.00	5.00	5.00	0.00	5.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				250	50	250	200	50	200	50
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	83.1	22.7	83.7	61.1	3.2	60.8	3.5
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	83	23	84	61	3	61	3
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.33	0.45	0.33	0.31	0.06	0.30	0.07
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.33	0.45	0.33	0.31	0.06	0.30	0.07
System Ventilation Efficiency												
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	0.85	0.73	0.84	0.87	1.11	0.88	1.11
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=							
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=							0.68
Minimum outdoor air intake airflow												
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=							2337
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=							0.25
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=							2439
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=							0.26
OA Temp at which Min OA provides all cooling												
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=							5

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Potentially Critical Zones						
Zone Name	<i>Zone title turns purple italic for critical zone(s)</i>		deposition	Deposition	Comm. Closet	Security Office	Jury room	Corridor	Evidence
Zone Tag			7W3-65	7W3-54	7W3-50	7W3-49	7W3-76		7W3-79
Space type	Select from pull-down list		Conference/m eeting	Conference/m eeting	Telephone closets	Office space	Conference/m eeting	Corridors	Storage rooms
Floor Area of zone	Az	sf	255	121	161	119	325	391	69
Design population of zone	Pz	P (default value listed; may be overridden)	12.75	6.05	0	0.595	16.25	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	515	565	400	50	350	100	50
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Select from pull-down list or leave blank if N/A								
Local recirc. air % representative of ave system return air	Er								

Inputs for Operating Condition Analyzed									
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed	Select from pull-down list		CS	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep								

Results			
Ventilation System Efficiency	Ev		0.71
Outdoor air intake required for system	Vot	cfm	2337
Outdoor air per unit floor area	Vot/As	cfm/sf	0.25
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	10.7
Outdoor air as a % of design primary supply air	Ypd	cfm	25%

Detailed Calculations										
Initial Calculations for the System as a whole										
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255				
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663				
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18				
Initial Calculations for individual zones										
OA rate per unit area for zone	Raz	cfm/sf		0.06	0.06	0.00	0.06	0.06	0.06	0.12
OA rate per person	Rpz	cfm/p		5.00	5.00	0.00	5.00	5.00	0.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm		515	565	400	50	350	100	50
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	79.1	37.5	0	10.1	100.8
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	79	38	0	10	101
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.15	0.07	0.00	0.20	0.29
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.15	0.07	0.00	0.20	0.29
System Ventilation Efficiency										
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.03	1.11	1.18	0.98	0.89
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	0.71				
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.68				
Minimum outdoor air intake airflow										
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	2337				
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.25				
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	2439				
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.26				
OA Temp at which Min OA provides all cooling										
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	5				

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			AV	Meeting Rooms	Vestibule	Meeting Rooms	Vestibule	AV	Corridors
Zone Name	<i>Zone title turns purple italic for critical zone(s)</i>		7W3-79	7W3-77	7W3=77	7W3-62	7W3-62	7W3-60	
Zone Tag			Electrical equipment rooms	Conference/meeting	Corridors	Conference/meeting	Corridors	Electrical equipment rooms	Corridors
Space type	Select from pull-down list		26	217	41	251	66	26	223
Floor Area of zone	Az	sf	0	10.85	0	12.55	0	0	0
Design population of zone	Pz	P (default value listed; may be overridden)	150	225	50	225	50	200	100
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm							
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Select from pull-down list or leave blank if N/A								
Local recirc. air % representative of ave system return air	Er								

Inputs for Operating Condition Analyzed			Ds	%	100%	100%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed	Ds	%										
Air distribution type at conditioned analyzed	Select from pull-down list		CS	CS	CS	CS	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep											

Results			Ev	0.71
Ventilation System Efficiency	Ev			
Outdoor air intake required for system	Vot	cfm	2337	
Outdoor air per unit floor area	Vot/As	cfm/sf	0.25	
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	10.7	
Outdoor air as a % of design primary supply air	Ypd	cfm	25%	

Detailed Calculations												
Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255						
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663						
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18						
Initial Calculations for individual zones												
OA rate per unit area for zone	Raz	cfm/sf				0.06	0.06	0.06	0.06	0.06	0.06	0.06
OA rate per person	Rpz	cfm/p				0.00	5.00	0.00	5.00	0.00	0.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				150	225	50	225	50	200	100
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	1.6	67.3	2.5	77.8	4.0	1.6	13.4
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	2	67	2	78	4	2	13
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.01	0.30	0.05	0.35	0.08	0.01	0.13
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.01	0.30	0.05	0.35	0.08	0.01	0.13
System Ventilation Efficiency												
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.17	0.88	1.13	0.83	1.10	1.17	1.05
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	0.71						
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.68						
Minimum outdoor air intake airflow												
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	2337						
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.25						
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	2439						
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.26						
OA Temp at which Min OA provides all cooling												
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	5						

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Evidence	Meeting Rooms	Vestibule	Vestibule	Meeting Rooms	Evidence	AV
Zone Name	<i>Zone title turns purple italic for critical zone(s)</i>		7W3-63	7W3-63	7W3-63	7W3-73	7W3-73	7W3-72	7W3-72
Zone Tag			Storage rooms	Conference/meeting	Corridors	Corridors	Conference/meeting	Storage rooms	Electrical equipment rooms
Space type	Select from pull-down list		79	273	66	60	279	67	35
Floor Area of zone	Az	sf	0	13.65	0	0	13.95	0	0
Design population of zone	Pz	P (default value listed; may be overridden)	50	225	50	50	225	50	200
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm							
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Select from pull-down list or leave blank if N/A								
Local recirc. air % representative of ave system return air	Er								

Inputs for Operating Condition Analyzed			Ds	%	100%	100%	100%	100%	100%	100%	100%	100%
Percent of total design airflow rate at conditioned analyzed	Ds	%										
Air distribution type at conditioned analyzed	Select from pull-down list				CS	CS	CS	CS	CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep											

Results			Ev	0.71
Ventilation System Efficiency	Ev			
Outdoor air intake required for system	Vot	cfm	2337	
Outdoor air per unit floor area	Vot/As	cfm/sf	0.25	
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	10.7	
Outdoor air as a % of design primary supply air	Ypd	cfm	25%	

Detailed Calculations												
Initial Calculations for the System as a whole												
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255						
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663						
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18						
Initial Calculations for individual zones												
OA rate per unit area for zone	Raz	cfm/sf				0.12	0.06	0.06	0.06	0.06	0.12	0.06
OA rate per person	Rpz	cfm/p				0.00	5.00	0.00	0.00	5.00	0.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				50	225	50	50	225	50	200
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	9.5	84.6	4.0	3.6	86.5	8.0	2.1
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	9	85	4	4	86	8	2
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.19	0.38	0.08	0.07	0.38	0.16	0.01
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.19	0.38	0.08	0.07	0.38	0.16	0.01
System Ventilation Efficiency												
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	0.99	0.80	1.10	1.11	0.80	1.02	1.17
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=							
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=							
Minimum outdoor air intake airflow												
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	2337						
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.25						
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	2439						
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.26						
OA Temp at which Min OA provides all cooling												
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	5						

Building:	Duval County Unified Courthouse Facility
System Tag/Name:	7W-3
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System	Name	Units	System
Floor area served by system	As	sf	9,454
Population of area served by system (including diversity)	Ps	P	218
Design primary supply fan airflow rate	Vpsd	cfm	9,255
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06
OA req'd per person for system area (Weighted average)	Rps	cfm/p	5.0

Inputs for Potentially Critical zones			Corridor	Meeting Rooms	Vestibule	Corridors
Zone Name	<i>Zone title turns purple italic for critical zone(s)</i>					
Zone Tag				7W3-75	7W3-75	
Space type	Select from pull-down list		Corridors	Conference/meeting	Corridors	Corridors
Floor Area of zone	Az	sf	222	257	68	1958
Design population of zone	Pz	P (default value listed; may be overridden)	0	12.85	0	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm	100	225	50	350
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?	Select from pull-down list or leave blank if N/A					
Local recirc. air % representative of ave system return air	Er					

Inputs for Operating Condition Analyzed						
Percent of total design airflow rate at conditioned analyzed	Ds	%	100%	100%	100%	100%
Air distribution type at conditioned analyzed	Select from pull-down list		CS	CS	CS	CS
Zone air distribution effectiveness at conditioned analyzed	Ez		1.00	1.00	1.00	1.00
Primary air fraction of supply air at conditioned analyzed	Ep					

Results			
Ventilation System Efficiency	Ev		0.71
Outdoor air intake required for system	Vot	cfm	2337
Outdoor air per unit floor area	Vot/As	cfm/sf	0.25
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p	10.7
Outdoor air as a % of design primary supply air	Ypd	cfm	25%

Detailed Calculations						
Initial Calculations for the System as a whole						
Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	9255
UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	1663
Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.18
Initial Calculations for individual zones						
OA rate per unit area for zone	Raz	cfm/sf		0.06	0.06	0.06
OA rate per person	Rpz	cfm/p		0.00	5.00	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm		100	225	350
Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=	13.3
Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=	4
Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=	1.00
Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=	1.00
Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=	1.00
Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=	0.13
Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=	0.13
System Ventilation Efficiency						
Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=	1.05
System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	0.71
Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.68
Minimum outdoor air intake airflow						
Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	2337
OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	0.25
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	2439
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.26
OA Temp at which Min OA provides all cooling						
OAT below which OA Intake flow is @ minimum	Deg F		=	((Tp-dTsf)-(1-Y)*(Tr+dTr	=	5