



Luxury Mixed Use Hotel

Southeast U.S.

Thesis – Assignment 3

Design Loads & Energy Calculations

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Executive Summary

The purpose of this report is to model the heating and cooling loads of a mixed use hotel and calculate the energy usage of its systems throughout the year. Design Conditions and Energy Calculations are the main two portions of the report. Using the information found in this report, the performance of the building can be compared to the performance of similar buildings, which will help guide the redesign.

This mixed-use hotel was split into two portions for modeling; the guestrooms and the rest of the hotel. Overall, 580,000 square feet of spaces were modeled. For the main hotel model, the rooms have many different occupancy types, which influenced factors such as the occupant density, equipment loads, and lighting loads. Some of the main amenities in the hotel include a kitchen, restaurant, spa, fitness center, meeting rooms, and ballrooms. In the guestroom model, 24 different sized rooms and suites were modeled to represent all 516 guestrooms.

Trane TRACE 700 was used to estimate the heating and cooling loads in the spaces. ASHRAE Fundamentals contained useful information for the building envelope construction U-values. It also had climate data for the region the building is located. Guidelines for lighting loads and equipment loads were found in ASHRAE 90.1. The occupant densities for the different spaces were given by the hotel brand's standards. By inputting all of the parameters, the heating and cooling loads could be predicted.

The calculated loads were then compared to the scheduled equipment for the project to ensure the equipment had the correct capacity. The central energy plant was oversized for the overall cooling load by about 445 tons; the predicted load was 1154 tons and the scheduled load is 1600 tons. Most of the air handling units and fan coil units were scheduled with a larger capacity than needed, but a few pieces of equipment were undersized. For heating, a lot of the equipment was also sized incorrectly.

By modeling the central energy plant in the TRACE models, the monthly and annual energy consumption was found. Using the location's utility rates, the energy costs were also calculated by TRANE. These results made it possible to find the building's source energy use intensity, which was 182.1 kBTU/SF. Compared to CBECS data for U.S. Energy Use Intensity by Property Type, the calculated value was above the suggested value of 146.7 kBTU/SF for a typical hotel and motel/inn. This can be explained by the various occupancy types throughout the hotel that need more energy than a typical hotel, but it is still an issue to consider during the redesign.

Building Summary

This project is a 516-room new mixed-used hotel located in the Southeast U.S. There will be amenities such as ballrooms, meeting rooms, a spa, fitness center, and restaurants. The bottom three levels host most of the amenities and the tower levels hold the guestrooms. The architecture is very modern with a large portion of glass as the building enclosure, which allows for a high solar heat gain. It is currently being constructed and should be completed by the beginning of 2020. With 350,000 square feet of lodging area; 180,000 square feet of public area; and 43,000 square feet of back of house area, it is about 575,000 total square feet.

Mechanical Overview

Since the hotel is such a large building with many different occupancy types, it has a large mechanical system with many different components. Overall, the central energy plant serves the whole building and has two chillers with two cooling towers. There are no boilers because the heating season is so short; all heat needed is produced by electric resistive heat. All HVAC equipment is powered by electricity. Gas is only used for domestic water, pool water, and food service.

The central energy plant located in the parking garage and contains the main refrigeration equipment. Right outside are the two cooling towers. Each chiller has a dedicated condenser pump to send water to the cooling towers, and there is a bypass for water that is at a temperature too low to go through the cooling tower. Another energy recovery method on the condenser water side is a heat exchanger that removes heat from the condenser water to pre-heat the domestic water. The chilled water loop supplies the terminals units and air handling units with chilled water to cool the air. There is a pressure de-couple heat exchanger to separate the pressures between the podium levels and the guestroom tower levels.

Guestrooms have fan coil units to control the space temperature. They are two-pipe fan coils because there is just chilled water. To ventilate the guestroom and corridor spaces, there are dedicated outdoor air units (DOAS) with hot gas reheat. There are six DOAS units on the roof.

Serving the public spaces are air handling units. Some are constant volume and some are variable. The air handling units serving the ballroom have a desiccant wheel to help handle the high latent load. There are 30 air handling units without the desiccant wheel and 11 with one. There are also some back of house spaces served by fan coil units and DOAS units.

Design Conditions

Climate

Although the exact location cannot be disclosed due to confidentiality, this project is located in ASHRAE Climate Zone 2A, which is classified as a hot-humid region. Hot-humid climate receives more than 20 inches of precipitation annually and has between 6300 and 9000 cooling degree days with a base temperature of 50°F. The U.S. Climate Zone Map and International Climate Zone definitions from ASHRAE 90.1 can be found in the appendix of this paper. Using the 2013 ASHRAE Fundamentals Handbook, the exact weather data from the undisclosed location was found to override the Climate Zone data in TRACE. The Table below summarizes the summer design cooling and winter design heating conditions for the model.

Summer Design Cooling	
1% Dry Bulb Temperature	92.5
0.4% Mean Coincident Wet Bulb Temperature	76.2
Winter Design Heating	
99.6% Dry Bulb Temperature	37.8

Table 1: Weather Conditions

Building Envelope

Most of the building envelope consists of a glazed aluminum curtain wall. A lot of cooling will be needed for the solar heat gain to the spaces. For the parts of the building that are not glass, there are walls with stucco coating and walls with aluminum composite wall panels. The south facing ballroom wall has stucco coating and R-19 batt insulation also to help slow the solar heat gain to the space. Normal weight concrete was used in the building for the slabs. There is a thermoplastic polyolefin roofing membrane that is white to help reflect the sun off the building. It is a very energy efficient material that is resistant to UV, ozone and chemical exposure. The roof assembly is shown below.

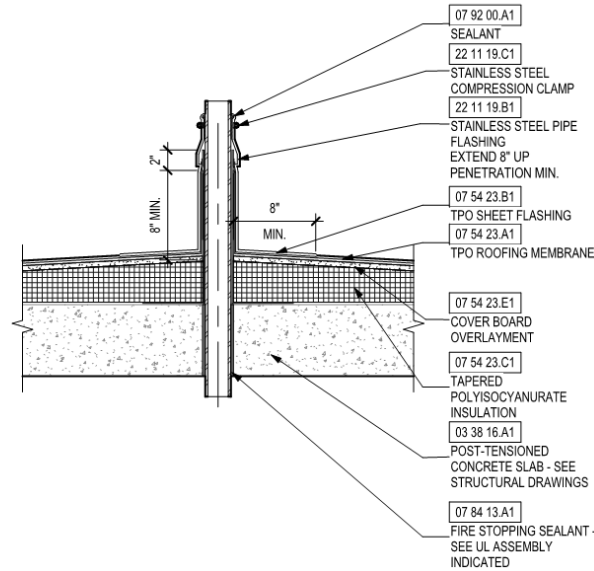


Figure 1: Typical Roof Penetration Detail. The TPO roofing membrane, cover board overlayment, and polyisocyanurate insulation can be seen in this section.

The U-values for all the construction materials are listed in the figure below. ASHRAE 90.1 2013 requires a maximum wall U-factor of 0.084. Only the stucco with R19 insulation and gypsum wallboard meets that requirement. The slab U-value was assumed using TRACE for the given slab thickness in the building. For roof U-values, ASHRAE standards give 0.039 as the maximum U-value for roofs with insulation entirely above deck. The current roofing assembly does not meet that standard. Vertical fenestrations with fixed metal framing have a maximum U-value of 0.57 according to ASHRAE, which is not met by the glazing assembly in this project. The U-values along with a description of the different construction types are in the table below. All of the resistance values for the individual materials in the building envelope are listed in Table A-3 of the appendix and the U-values of the assemblies are broken down in Table A-4.

Construction	Description	U-Value (BTU/hr*SF*F)
Wall	Aluminum Composite Wall Panel	0.34
	Stucco with Gypsum Sheathing and Gypsum Wallboard	0.94
	Stucco with R19 Insulation and Gypsum Wallboard	0.05
Slab	8" Normal Weight Concrete	0.49
Roof	TPO Roofing Membrane with Coverboard Overlayment and Polyisocyanurate Insulation	0.07
Glazing	Glazed Aluminum Curtain Wall	0.81

Table 2: U-Values for construction materials.

Internal Loads: People

In order to correctly model the heat gain in the spaces, the sensible and latent loads from the building occupants were calculated. The hotel brand for this project has their own standard for preferred occupancy densities in each space type. Based on the number of occupants in each room, the sensible and latent heat gain can be found using the occupant heat gain rates in the appendix Table A-6. These values are slightly modified from typical ASHRAE values based on the hotel's preferences and EXP's historical data from the occupancy types. The occupancy densities for the space types are simplified in Table 3.

Space	Occupancy (SF/person)
Main Entrance Lobby	30
Business Center	50
Lounge Restaurant	10 or seat count
Exercise Area Spa	45
Retail	45
Pre-Function	10
Ballrooms	10
Meeting Rooms	15
Service Corridors	100
Guestroom Suites	2 people
Guest Floor Lounge	15
Admin Facilities	100
Employee Cafeteria	10
Engineering Maintenance	10
Kitchen Areas	50
Landry/ Valet	30
Housekeeping	50
Computer Room	100

Table 3: Occupant density for different space types.

Internal Loads: Lighting

Using ASHRAE 90.1 Lighting Power Densities Table 9.5.1 (Table A-8), a conservative value of 1.0 W/SF was selected for all spaces to simplify the model. This report focuses on the HVAC loads, so the value used was a reasonable assumption to ensure that the systems would cover the lighting loads.

Internal Loads: Equipment Loads

Table A-6 contains the typical equipment loads for the different space types in this hotel. Offices and meeting rooms have equipment heat gains of 2 W/SF. Rooms that have a high equipment density like telecommunication and electrical rooms have heat gains of 5 W/SF.

The highest equipment load is the kitchen load, which is 20 W/SF. The loads listed in Table A-6 were used as inputs for the TRACE 700 model.

Thermostat Settings

Different rooms had different heating and cooling thermostat settings based on the hotel's brand standard. For heating, all rooms are set for 70°F. The only two rooms that differ are the exit stairs, which are set for 40°F, and the refrigerated trash room, which is set for 55°F for heating and cooling. Most rooms have a thermostat setpoint of 75°F for cooling with 50% relative humidity. Kitchen prep rooms have a cooler temperature of 59°F. Beverage storage is set at 70°F, but red wine storage is set at 55°F. The computer room is also kept cooler at 70°F. Laundry and valet areas are allowed a higher temperature setpoint of 80°F. The relative humidity for all rooms in this project is 50%. All of the design temperatures and relative humidity values can also be found in Appendix Table A-7.

System Selection

Since it is such a massive project, the TRACE model was split into two; one for the guestrooms and one for all of the other spaces. The guestroom model had a sample room for each size and type of room, so there was a total of 24 rooms modeled. They were given a floor multiplier based on the total number of each type of room within the building. The capacity results were used to size the fan coil units in each room type. In the hotel model, there were 41 air handling units modeled and some fan coil units for the back of house spaces. Both models were given a central plant with water cooled chillers and cooling towers. Resistive heat was set as the heating plant for both models. The chillers selected were centrifugal with parallel sequencing. For the control options, a plate and frame heat exchanger on the variable volume condenser side pump was used. This is where the condenser water gives off heat to the domestic water to help save energy. Also, the chiller has a chilled water reset with a maximum reset temperature difference of 5°F.

Heating and Cooling Loads

After receiving the results from the TRACE model, they were compared to HVAC rules of thumb as an engineering check. Since the building refrigeration load was the main focus of this report, the results were compared to the SF/ton values given by ASHRAE Pocket Guide 8th Edition. The results for a hotel are supposed to be within 220 and 350 SF/ton.

All of the fan coil types but one for guestrooms had results that were higher than 350 SF/ton. Most of the values did fall within the medium residential range of 400 to 700 SF/ton, which is a reasonable assumption since a guestroom is similar to a bedroom at home. A lot of the air handling units did not fall within the range either. Some were over the limit, but most were under. It is difficult to compare the air handling units to just the hotel range because they serve a variety of functions. All of the values seem rational when looking at other classifications like restaurants, offices and residential centers. The engineering checks from the TRACE model can be referenced in Table A-9.

Then, the results were compared to the scheduled values for this project. Overall, the central plant is scheduled for 1600 tons of cooling, but the TRACE model calculated that it only needs a capacity of 1154 tons. The chillers are oversized and will be running at part load, which is not efficient.

Table A-10 and Table A-11 show the calculated cooling and heating peaks versus the scheduled cooling and heating capacities for the hotel load and guestroom equipment, respectively. Scheduled values are color-coded based on if they are over or under the calculated value by 10%. Red means they are oversized, and blue means they are undersized. As seen in the table, most units are not correctly sized.

The majority of the units are sized too large, which can be because of added safety factors. This can be an issue because the units will be more expensive and will be running at part load most of the time. Many units were either missing a heating coil or did not have enough heating capacity. It may not be too big of an issue since heating is not needed most of the year. The fan coils in the back of house areas were undersized. Fan coil units in the guestrooms were mostly oversized except for the luxury suite units, which are undersized for the space.

With all the unique space types and changing parameters in the hotel; it is difficult to get an exact value for equipment sizes. Making sure that the loads are met is most important so that the hotel guests are comfortable. For that reason, it is acceptable to oversize some of the equipment. Also, the inputs for this project were different than those used by the design firm. For example, EXP's model used more generic values for construction types since the exterior materials were not selected at the stage of design. It will be important to consider how the equipment is sized when redesigning the mechanical system in the next stage of the project.

Energy Consumption & Cost

Energy Consumption

TRACE energy evaluation gives monthly energy consumption and consumption by equipment type. All of the HVAC equipment and lighting is powered by electricity for this project. Figure 3 below shows the electricity use per equipment type. These values do not account for all of the electricity used in the building because it doesn't include building plug loads or some of the mechanical accessory equipment. About 45% of the electricity use is from the water-cooled chillers. Cooling towers use about 10% and the electric resistance heat is about 7%. As seen in the chart, the hotel spaces use a lot more energy than the guestrooms.

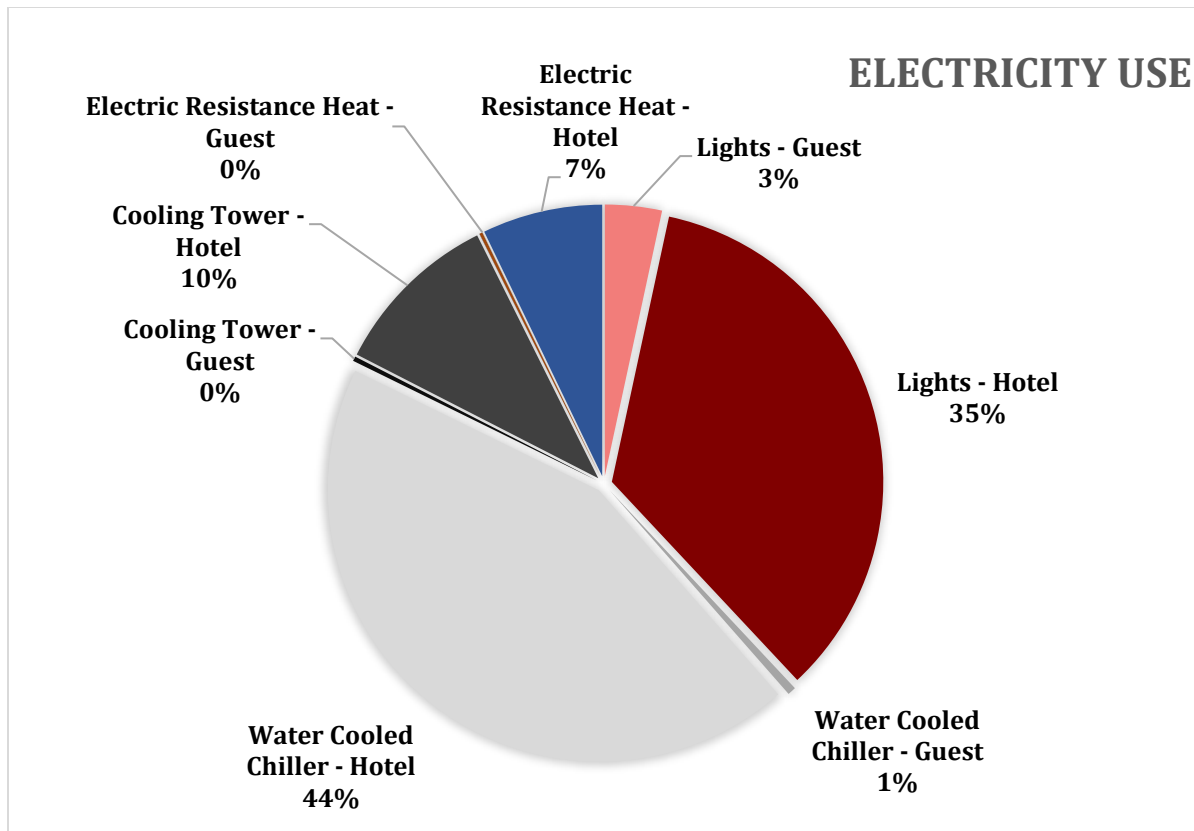


Figure 2: Electricity use (%) by equipment type.

Equipment	Energy (kWh)
Lights - Guest	164040.6
Lights - Hotel	1679632.50
Water Cooled Chiller - Guest	24266.8
Water Cooled Chiller - Hotel	2120457.9
Cooling Tower - Guest	13303.7
Cooling Tower - Hotel	489747.9
Miscellaneous Accessory Equipment - Guest	589
Miscellaneous Accessory Equipment - Hotel	8760
Electric Resistance Heat -Guest	580.6
Electric Resistance Heat - Hotel	347070.3

Table 4: Electricity use (kWh) by equipment type.

The higher electric consumption for the hotel spaces compared to the guestrooms can be more clearly seen in Figure 3. Electric consumption for the general hotel spaces is almost twice as much as the electric use for all of the guestrooms. This can be explained because the general areas have higher occupant densities and equipment loads than the guestrooms. Hotel spaces use 4,645,670 kWh annually and the guestrooms use 2,686,408 kWh annually.

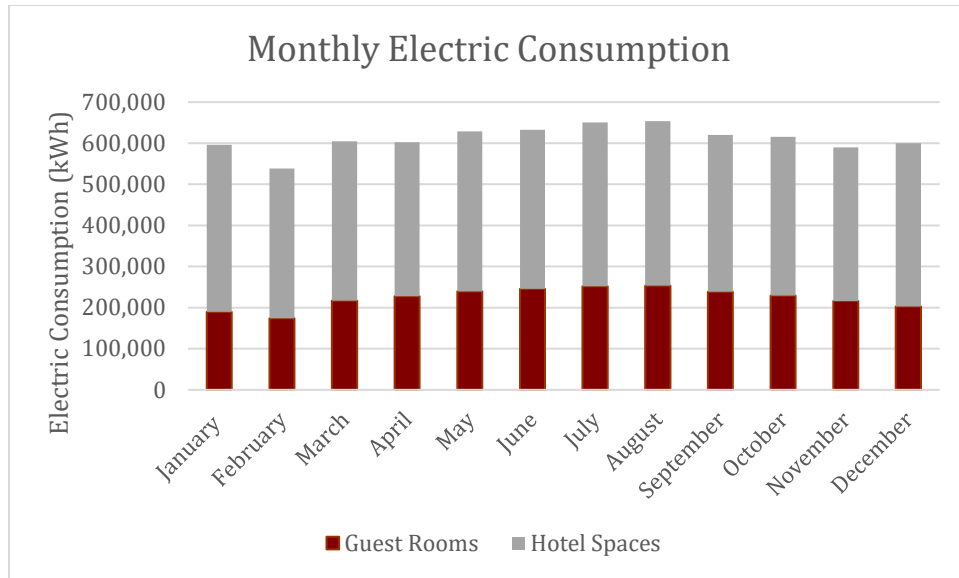


Figure 3: Monthly electric consumption.

Figure 4 below shows the monthly water consumption. The water use is higher in the summer months, since more cooling is needed. In the winter, water use in the guestrooms is very low since the fan coils don't need it for cooling. Water use also decreases overall when it is not the peak cooling season.

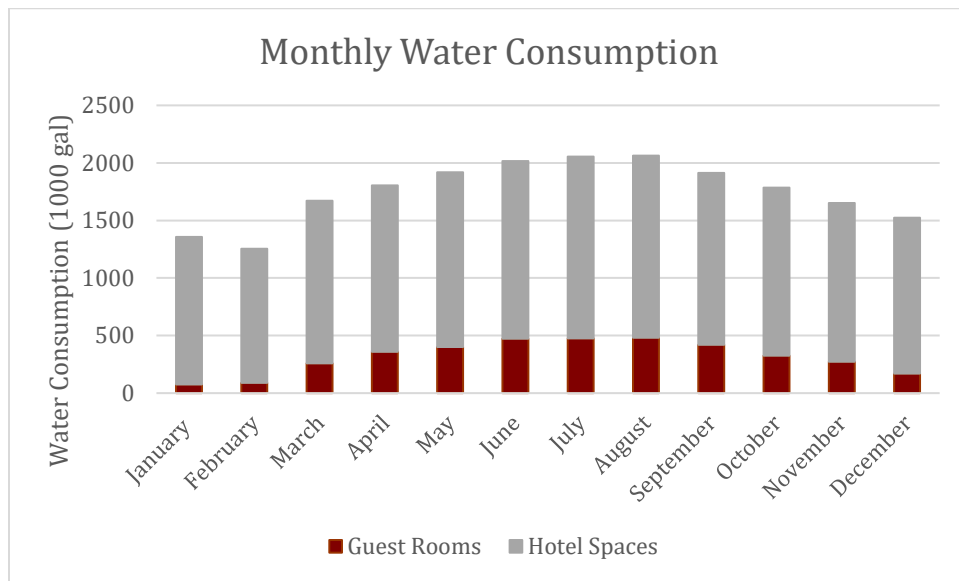


Figure 4: Monthly water consumption.

The TRACE exports gave an Energy Use Intensity of 182.1 kBTU/SF for the building. It is higher than the CBECS data for U.S. Energy Use Intensity by Property Type of 146.7 kBTU/SF for a hotel. Although it is higher, this hotel has many more amenity spaces than a typical hotel would have. The amenity spaces have larger equipment loads and occupant densities; hence, more energy is consumed per square foot.

Annual Emissions

Table 5 below shows a breakdown of pollutant emissions by area for CO₂, SO₂, and NO_x. These values were calculated by TRACE using the energy consumption rates. Keeping the emission rates down is important for lowering environmental impact of the building.

Area	Pollutant	Impact
Guest rooms	CO ₂	3,377,729 lbm/year
	SO ₂	9,584 gm/year
	NO _x	5,420 gm/year
Hotel	CO ₂	5,841,185 lbm/year
	SO ₂	16,574 gm/year
	NO _x	9,373 gm/year

Table 5: Annual emissions per space type.

Utility Cost

In order to accurately predict the utility costs in the building, the local electric rates were found. Commercial buildings in the area had two options: a standard rate and a rate based on peak times. For simplification, the standard rate of 6.090 cents/kWh was used. Future redesign may try to take advantage scheduling during the off-peak rate times. The guestroom spaces had an annual energy consumption of \$163,602 and the other hotel spaces had a consumption of \$282,921, coming to a total of \$446,524 of electricity per year for the hotel.

References

American Society of Heating, Refrigerating and Air-Conditioning Engineers. 2013 ASHRAE Handbook: Fundamentals. Inch-pound ed. Atlanta, GA.: ASHRAE, 2013.

ANSI/ASHRAE Standard 90.1-2013, Energy Standard for Building Except Low-Rise Residential Buildings. Atlanta, GA: American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

ASHRAE Pocket Guide for Air-Conditioning, Heating, Ventilation, Refrigeration. Atlanta, GA: ASHRAE, 2013.

Appendix

Table A-1: ASHRAE 90.1 Table B1-4.

Zone Number	Name	Thermal Criteria
1	Very Hot–Humid (1A), Dry (1B)	$9000 < \text{CDD}_{50^\circ\text{F}}$
2	Hot–Humid (2A), Dry (2B)	$6300 < \text{CDD}_{50^\circ\text{F}} \leq 9000$
3A and 3B	Warm–Humid (3A), Dry (3B)	$4500 < \text{CDD}_{50^\circ\text{F}} \leq 6300$
3C	Warm–Marine	$\text{CDD}_{50^\circ\text{F}} \leq 4500$ and $\text{HDD}_{65^\circ\text{F}} \leq 3600$
4A and 4B	Mixed–Humid (4A), Dry (4B)	$\text{CDD}_{50^\circ\text{F}} \leq 4500$ and $3600 < \text{HDD}_{65^\circ\text{F}} \leq 5400$
4C	Mixed–Marine	$3600 < \text{HDD}_{65^\circ\text{F}} \leq 5400$
5A, 5B and 5C	Cool–Humid (5A), Dry (5B), Marine (5C)	$5400 < \text{HDD}_{65^\circ\text{F}} \leq 7200$
6A and 6B	Cold–Humid (6A), Dry (6B)	$7200 < \text{HDD}_{65^\circ\text{F}} \leq 9000$
7	Very Cold	$9000 < \text{HDD}_{65^\circ\text{F}} \leq 12600$
8	Subarctic	$12600 < \text{HDD}_{65^\circ\text{F}}$

Figure A-1: ASHRAE 90.1 Figure B1-1.

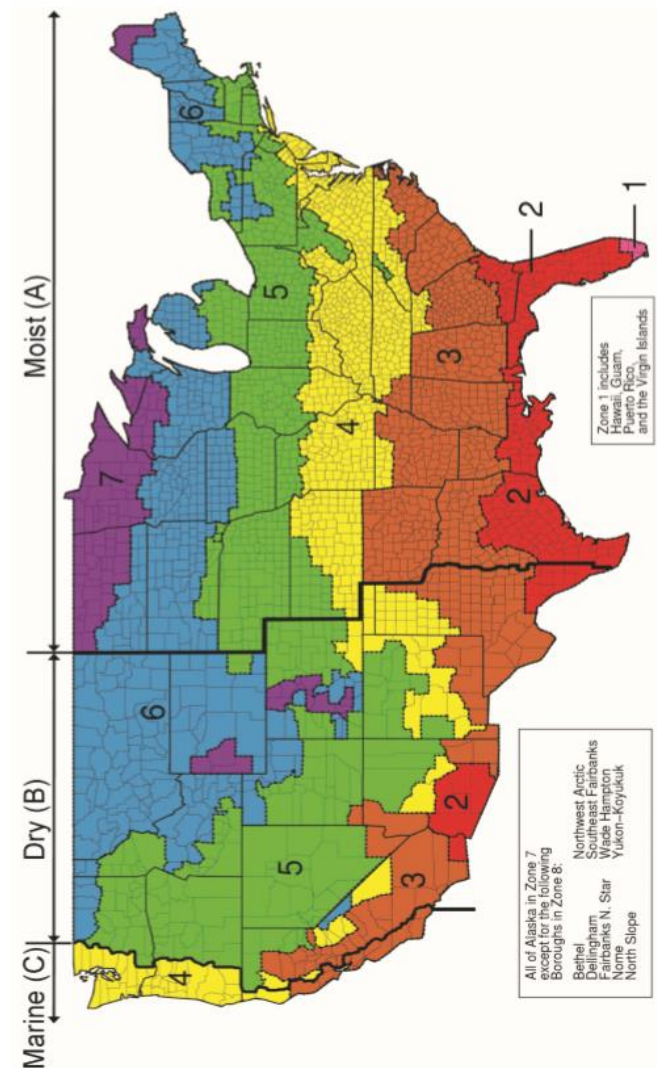


Figure B1-1 U.S. climate zone map (ASHRAE Transactions, Briggs et al., 2003).

Table A-2: Climate data for the location.

Annual Heating and Humidification Design Conditions

Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB	
			99.6%			99%			0.4%		1%			
	99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
1	37.8	42.3	20.6	15.5	46.7	26.4	20.5	49.3	23.8	63.1	20.7	63.5	7.9	350

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWS/PCWD to 0.4% DB	
		0.4%		1%		2%		0.4%		1%		2%			
		DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWS	PCWD
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
8	16.3	93.8	76.5	92.5	76.2	91.1	76.0	79.6	87.5	78.8	86.7	78.2	86.1	8.1	290

Extreme Annual Design Conditions

Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Hours 8 to 4 & 55/69			
0.4%			1%			2%			0.4%			1%				2%		
DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB				
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)			
77.6	144.2	81.8	76.9	140.9	81.4	76.2	137.5	80.9	43.0	87.4	42.2	87.0	41.6	86.4	525			

Extreme Annual Design Conditions

Extreme Annual WS			Extreme Max WB	Extreme Annual DB				n-Year Return Period Values of Extreme DB							
				Mean		Standard deviation		n=5 years		n=10 years		n=20 years		n=50 years	
1%	2.5%	5%		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
20.2	18.1	16.4	84.4	31.3	96.7	4.5	1.4	28.1	97.7	25.4	98.5	22.9	99.2	19.6	100.2

Table A-3: Resistance values.

Key Value	Material	IP RESISTANCE	
		PER INCH	FOR THICKNESS LISTED (F*SF*hr/BTU-IN)
033000.A1	CONCRETE SLAB ON GRADE	0.05	0.25
033000.A2	STRUCTURAL CONCRETE SLAB	0.05	0.4
033816.A1	POST-TENSIONED CONCRETE SLAB	0.05	0.4
042200.A1	8" REINFORCED CMU	-	1
044313.16.A1	3/4" STONE VENEER	0.01	0.0075
044313.16.D1	MORTAR	0.1	0.0375
061600.C2	5/8' GLASS MAT FACED GYPSUM SHEATHING	-	0.56
072100.G4	1-1/2" POLYISOCYANURATE BOARD INSULATION	6.25	9.375
074213.23.A1	ALUMINUM COMPOSITE WALL PANEL	-	0.61
074213.23.B1	ALUMINUM COMPOSITE SOFFIT PANEL	-	0.61
075423.A1	TPO ROOFING MEMBRANE	-	0.2
075423.C1	TAPERED POLYISOCYANURATE INSULATION	6.25	12.5
075423.E1	COVER BOARD OVERLAYMENT	-	0.45
076200.H1	PRE-FINISHED ALUMINUM EDGE FLASHING	-	0.61
076200.I1	PRE-FINISHED ALUMINUM PARAPET COPING	-	0.61

077100.B1	PRE-FINISHED ALUMINUM PARAPET COPING	-	0.61
078100.A1	SPRAYED-ON FIREPROOFING	1.83	1.83
084413.A1	GLAZED ALUMINUM CURTAIN WALL	-	1.23
084419.A1	GLAZED ALUMINUM WINDOW WALL	-	1.23
088000.H1	SPANDREL GLASS	-	1.62
092216.T1	METAL CEILING SUSPENSION SYSTEM	-	0.108108108
092400.A1	2-COAT STUCCO	0.1	0.075
092400.A2	3-COAT STUCCO	0.1	0.1125
092900.A1	5/8" FIRE-RESISTANT GYPSUM WALLBOARD	-	0.39
092900.D1	5/8" FIRE-RESISTANT GYPSUM CEILING BOARD	-	0.39
093013.L1	CEMENTITIOUS BACKER BOARD	-	0.08
107113.A1	METAL SCREEN PANEL	-	0.61

Table A-4: Wall Assembly U-values.

ID	Name	R-VALUE	U- VALUE
092900.A1	5/8" FIRE-RESISTANT GYPSUM WALLBOARD	0.39	0.94
061600.C2	5/8" GLASS MAT FACED GYPSUM SHEATHING	0.56	
092400.A2	3-COAT STUCCO	0.1125	
TOTAL		1.0625	

ID	Name	R-VALUE	U- VALUE
092400.A2	3-COAT STUCCO	0.1125	0.05
072100.A4	R-19 FIBERGLASS BATT INSULATION	19	
092900.A1	5/8" FIRE-RESISTANT GYPSUM WALLBOARD	0.39	
TOTAL		19.5025	

ID	Name	R-VALUE	U- VALUE
075423.A1	TPO ROOFING MEMBRANE	0.2	0.07
075423.F1	COVER BOARD OVERLAYMENT	0.45	
033000.A1	CONCRETE SLAB	0.5	

075423.C1	TAPERED POLYISOCYANURATE INSULATION	12.5	
TOTAL		13.65	

ID	Name	R-VALUE	U- VALUE
074213.23.A1	ALUMINUM COMPOSITE WALL PANEL	2.96	0.34

ID	Name	R-VALUE	U- VALUE
084413.A1	GLAZED ALUMINUM CURTAIN WALL	1.23	0.81

Table A-5: ASHRAE Building Envelope Requirements.

Table 5.5-2 Building Envelope Requirements for Climate Zone 2 (A,B)*									
Opaque Elements	Nonresidential			Residential			Semiheated		
	Assembly Maximum	Insulation Min. R-Value		Assembly Maximum	Insulation Min. R-Value		Assembly Maximum	Insulation Min. R-Value	
Roofs									
Insulation Entirely above Deck	U-0.039	R-25 c.i.		U-0.039	R-25 c.i.		U-0.173	R-5 c.i.	
Metal Building ^a	U-0.041	R-10 + R-19 FC		U-0.041	R-10 + R-19 FC		U-0.096	R-16	
Attic and Other	U-0.027	R-38		U-0.027	R-38		U-0.053	R-19	
Walls, above Grade									
Mass	U-0.151 ^b	R-5.7 c.i. ^b		U-0.123	R-7.6 c.i.		U-0.580	NR	
Metal Building	U-0.094	R-0 + R-9.8 c.i.		U-0.094	R-0 + R-9.8 c.i.		U-0.162	R-13	
Steel Framed	U-0.084	R-13 + R-3.8 c.i.		U-0.064	R-13 + R-7.5 c.i.		U-0.124	R-13	
Wood Framed and Other	U-0.089	R-13		U-0.089	R-13		U-0.089	R-13	
Wall, below Grade									
Below Grade Wall	C-1.140	NR		C-1.140	NR		C-1.140	NR	
Floors									
Mass	U-0.107	R-6.3 c.i.		U-0.087	R-8.3 c.i.		U-0.322	NR	
Steel Joist	U-0.038	R-30		U-0.038	R-30		U-0.069	R-13	
Wood Framed and Other	U-0.033	R-30		U-0.033	R-30		U-0.066	R-13	
Slab-on-Grade Floors									
Unheated	F-0.730	NR		F-0.730	NR		F-0.730	NR	
Heated	F-0.900	R-10 for 24 in.		F-0.860	R-15 for 24 in.		F-1.020	R-7.5 for 12 in.	
Opaque Doors									
Swinging	U-0.700			U-0.500			U-0.700		
Nonswinging	U-0.500			U-0.500			U-1.450		
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical Fenestration, 0%–40% of Wall		(for all frame types)		(for all frame types)		(for all frame types)			
Nonmetal framing, all	U-0.40			U-0.40			U-0.93		
Metal framing, fixed	U-0.57			U-0.57			U-1.20		
Metal framing, operable	U-0.65	SHGC-0.25	1.10	U-0.65	SHGC-0.25	1.10	U-1.20	NR	NR
Metal framing, entrance door	U-0.83			U-0.77			U-0.83		
Skylight, 0%–3% of Roof									
All types	U-0.65	SHGC-0.35	NR	U-0.65	SHGC-0.35	NR	U-1.80	NR	NR

* The following definitions apply: c.i. – continuous insulation (see Section 3.2), FC – filled cavity (see Section A2.3.2.5), Is – liner system (see Section A2.3.2.4), NR – no (insulation) requirement.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see Section A2.3.2).

b. Exception to Section 5.5.3.2 applies for mass walls above grade.

Table A-6: Typical Equipment and People Loads from EXP.

Table 2: Typical Equipment and People Loads

Application	Equipment Heat Gain (watts/sf)	Occupant Heat Gain (Btuh/person)	
		Sensible	Latent
Offices	2	245	155
Conference Rooms	2	250	200
Meeting Rooms	2	250	200
Administrative Support Areas	2	245	155
Corridors/Support	0	225	105
Entrances and Lobbies	0	250	200
Ballrooms/Banquet Areas	1.5	275	275
Kitchen/Food Preparation	20	275	275
Dining	0	275	275
Common Areas	1	250	200
Telecommunications Rooms	5	N/A	N/A
Electrical Equipment Rooms	5	N/A	N/A
Mechanical Equipment Rooms	5	N/A	N/A
Guest Rooms (Hotel)	0	250	200
Restrooms	0	225	105

Table A-7: Hotel brand design standards.

Module	Space	Design Temperature / Relative Humidity		Occupancy m ² /Person (ft ² /Person)	Outside Air		Max. Lighting Load Watts/m ² (Watts/ft ²)	Remarks
		Cooling °C (°F) %RH	Heating °C (°F)		l/s/person + l/s/m ² (cfm/person + cfm/sf)			
1	Parking Structures	-	-	-	-	-	-	Provide supply and exhaust of 7.5 l/s/m ² (1.5 cfm/sf) minimum controlled by carbon monoxide sensors.
2A	Main Entrance Lobby	24°C (75°F) 50% RH	21°C (70°F)	3.0 (30)	3.8 l/s person + 0.3 l/s/m ² (7.5 cfm/person + 0.06 cfm/sf)	43 (4)	-	-
	Public Toilets	24°C (75°F) 50% RH	21°C (70°F)	-	-	-	-	Provide conditioned supply air into each restroom. Keep toilets under negative pressure with respect to surrounding public areas. Min. exhaust quantity 10 l/s/m ² (2 cfm/sf).
2B	Business Center	24°C (75°F) 50% RH	21°C (70°F)	4.6 (50)	3.8 l/s person + 0.3 l/s/m ² (7.5 cfm/person + 0.06 cfm/sf)	75 (7)	-	-
3	Lounge Restaurant	24°C (75°F) 50% RH	21°C (70°F)	1.0 (10)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	54 (5)	-	Individual temperature control in each Private Dining Room.
4	Exercise Area	24°C (75°F) 50% RH	21°C (70°F)	4.0 (45)	10 l/s person + 0.3 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding public areas. Provide dedicated HVAC unit or combine with locker room unit only.
	Locker Room	24°C (75°F) 50% RH	21°C (70°F)	-	Exhaust required	-	-	Keep under negative pressure with respect to surrounding public areas.
	Dressing Area	-	-	-	-	-	-	Provide 471/s (100 cfm) exhaust in ceiling plenum above each sauna and steam room door.
	Steam Sauna	-	-	-	-	-	-	-
	Spa Treatment Room	24°C (75°F) 50% RH	21°C (70°F)	-	100% Exhaust	32 (3)	-	Provide individual temperature control and 100% exhaust in each treatment room.
	Indoor Pool	27°C (80°F) 65% RH	21°C (70°F)	-	2.4 l/s/m ² (0.48 cfm/sf) outside air	-	-	Keep under negative pressure with respect to surrounding public areas. Provide separate HVAC unit.
5	Retail	24°C (75°F) 50% RH	21°C (70°F)	4.0 (45)	3.8 l/s person + 0.6 l/s/m ² (7.5 cfm/person + 0.12 cfm/sf)	-	-	Provide individual temperature control in each shop.
6	Pre-Function	24°C (75°F) 50% RH	21°C (70°F)	1.0 (10)	3.8 l/s person + 0.6 l/s/m ² (7.5 cfm/person + 0.12 cfm/sf)	54 (5)	-	Provide individual temperature sensor connected to BAS.
	Ballrooms	24°C (75°F) 50% RH	21°C (70°F)	1.0 (10)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	54 (5)	-	Provide individual temperature sensor connected to BAS with local occupant control in each Salon.
	Meeting Rooms	24°C (75°F) 50% RH	21°C (70°F)	2.0 (15)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	54 (5)	-	Provide individual temperature sensor connected to BAS with local occupant control in each Meeting Room.
	Boardrooms	24°C (75°F) 50% RH	21°C (70°F)	2.0 (15) or seat count	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	54 (5)	-	Provide individual temperature sensor connected to BAS with local occupant control in Board Room.
	Service Corridors	24°C (75°F) 50% RH	21°C (70°F)	10 (100)	0.3 l/s/m ² (0.06 cfm/sf)	32 (3)	-	Keep under negative pressure with Meeting Spaces but positive with respect to Banquet Kitchen.
	Guestrooms	24°C (75°F) 50% RH	21°C (70°F)	2 people	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	-	-	Hard duct 100% outside air into each guestroom. Provide supply air into large 4 or 5 fixture guest bathroom and bathrooms with exterior exposure.
7A	Suites	24°C (75°F) 50% RH	21°C (70°F)	-	2.0 air changes per hour 100% outside air	11 (1)	-	Supply Min. 2 air changes per hour 100% outside air.
7B	Guestroom Corridors	24°C (75°F) 50% RH	21°C (70°F)	-	50 l/s (100 cfm) exhaust	-	-	Water-cooled ice machines
	Elevator Foyers	-	-	-	-	-	-	-
	Ice Machine Rooms	-	-	-	-	-	-	-
	Linens Room	24°C (75°F) 50% RH	21°C (70°F)	-	Exhaust required	-	-	Exhaust to maintain conditions.
7C	Service Elevator Foyer	24°C (75°F) 50% RH	21°C (70°F)	-	Exhaust required	-	-	Provide 100 l/s (200 cfm) exhaust in foyer to keep negative to guestroom corridors.
	Exit Stairs	-	5°C (40°F)	-	-	-	-	-
8A	Guest Floor Lounge	24°C (75°F) 50% RH	21°C (70°F)	2.0 (15) or seat count	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Provide individual temperature controls in Lounge, Meeting Room and Pantry. Provide hood exhaust in Pantry.
8B	Administrative Facilities	24°C (75°F) 50% RH	21°C (70°F)	10.0 (100)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	43 (4)	-	Provide individual temperature controls in offices. Provide exhaust for office equip.
8B	Employee Facilities	24°C (75°F) 50% RH	21°C (70°F)	10.0 (100)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	32 (3)	-	Provide exhaust.
	Employee Cafeteria	24°C (75°F) 50% RH	21°C (70°F)	1.0 (10)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas. Provide exhaust for grease hood and dishwasher.
9	Engineering Maintenance	24°C (75°F) 50% RH	21°C (70°F)	1.0 (10)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	43 (4)	-	Provide individual temperature controls in offices. Provide exhaust for workshops.
	Refrigerated Trash Room	13°C (55°F) 50% RH	50% RH	-	-	-	-	-
	Receiving Area	-	-	-	-	-	-	Provide air curtains at each entrance from receiving dock into building. Provide radiant heating panels in Receiving Area at locations where winter temperatures drop below 0°C (32°F). Provide circulating fans in hot climates.
	Commercial Kitchens	24°C (75°F) 50% RH	21°C (70°F)	5.0 (50)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas. Operate dishwasher exhaust 24 hours per day / 7 days per week.
10	Food and Beverage	15°C (59°F) 50% RH	-	5.0 (50)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Provide individual split system connected to BAS.
	Cold Prep.	21° to 24°C (70° to 75°F) 50% RH	-	-	-	32 (3)	-	Provide individual temperature control connected to BAS.
	Vegetable Prep.	-	-	-	-	-	-	-
	Dry Storage	-	-	-	-	-	-	-
	Meat/Fish/Poultry/Prep Area	15°C (59°F) 50% RH	-	5.0 (50)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas. Provide individual split system connected to BAS.
	Pastry / Chocolate Room	15°C (59°F) 50% RH	-	5.0 (50)	3.8 l/s person + 0.9 l/s/m ² (7.5 cfm/person + 0.18 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas. Provide individual temperature control connected to BAS.
11A	Red Wine Storage	13°C (55°F) 50% RH	-	-	-	32 (3)	-	Provide individual split system connected to BAS.
	Beverage Storage	21°C (70°F) 50% RH	-	-	-	32 (3)	-	Provide individual temperature control connected to BAS.
11B	Laundry/Valet	27°C (80°F) 50% RH	21°C (70°F)	3.0 (30)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas. Provide spot cooling over each valet station.
11B	Housekeeping	24°C (75°F) 50% RH	21°C (70°F)	5.0 (50)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	32 (3)	-	Keep under negative pressure with respect to surrounding areas.
12	Elevator Equip. Room	24°C (75°F) 50% RH	21°C (70°F)	-	-	-	-	Provide split systems with individual temperature controls. Ventilation not required.
13	Computer Room	21°C (70°F) 50% RH	-	10.0 (100)	2.5 l/s person + 0.3 l/s/m ² (5 cfm/person + 0.06 cfm/sf)	43 (4)	-	Provide two computer room a/c units sized at 65% of total equipment load. Connect a/c units to emergency backup power.
	IDF	-	-	-	-	-	-	-
	Sound Equip. Room	-	-	-	0.3 l/s/m ² (0.06 cfm/sf)	-	-	Provide 24 hours per day / 7 days per week air conditioning. Provide IDF supply and exhaust based on specific project requirements but typically 1.5 kW (5,000 Btu/hr) per guestroom floor. Connect a/c units to emergency backup power.
	Dimmer Equip. Room	-	-	-	-	-	-	-
15	Mechanical, Electrical, Telephone Rooms + Closets	-	-	-	0.3 l/s/m ² (0.06 cfm/sf)	-	-	Split system a/c unit for main telephone room, on emergency backup power.
16	Security	24°C (75°F) 50% RH	21°C (70°F)	-	-	43 (4)	-	Provide individual temperature control connected to BAS.

Table A-8: ASHRAE 90.1 Table 9.5.1 Lighting Power Densities

**TABLE 9.5.1 Lighting Power Densities
Using the Building Area Method**

Building Area Type^a	LPD, W/ft²
Automotive facility	0.80
Convention center	1.01
Courthouse	1.01
Dining: Bar lounge/leisure	1.01
Dining: Cafeteria/fast food	0.90
Dining: Family	0.95
Dormitory	0.57
Exercise center	0.84
Fire station	0.671
Gymnasium	0.94
Health-care clinic	0.90
Hospital	1.05
Hotel/Motel	0.87
Library	1.19
Manufacturing facility	1.17
Motion picture theater	0.76
Multifamily	0.51
Museum	1.02
Office	0.82
Parking garage	0.21
Penitentiary	0.81
Performing arts theater	1.39
Police station	0.87
Post office	0.87
Religious building	1.00
Retail	1.26
School/university	0.87
Sports arena	0.91
Town hall	0.89
Transportation	0.70
Warehouse	0.66
Workshop	1.19

a. In cases where both a general building area type and a specific building area type are listed, the specific building area type shall apply.

Table A-9: TRACE engineering checks

				COOLING					HEATING			
System	Zone	Room	Type	Floor Area ft²	% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
Alternative 1												
AHU 1-1	East Service Corridor	Zone		510	0.00	0.27	485.0	1,787.6	6.71	0.00	0.08	-1.60
AHU 1-1	Carpentry Shop	Zone		210	0.00	1.39	344.5	247.9	48.41	0.00	0.42	-6.56
AHU 1-1	Central Service Corridor	Zone		895	0.00	0.27	485.0	1,787.6	6.71	0.00	0.08	-1.60
AHU 1-1	Corridor VAV 5	Zone		190	0.00	0.57	532.8	931.8	12.88	0.00	0.17	-16.75
AHU 1-1	Custodial	Zone		130	0.00	0.19	515.5	2,782.2	4.31	0.00	0.06	-1.22
AHU 1-1	Custodial VAV 8	Zone		135	0.00	0.35	578.2	1,658.6	7.24	0.00	0.10	-5.00
AHU 1-1	Dir of Engrg	Zone		95	0.00	0.62	519.8	842.7	14.24	0.00	0.19	-3.13
AHU 1-1	Electrical Storage	Zone		60	0.00	0.19	515.5	2,782.1	4.31	0.00	0.06	-1.22
AHU 1-1	Elevator Lobby	Zone		100	0.00	0.53	375.7	709.4	16.91	0.00	0.16	-2.75
AHU 1-1	Elevator Vest	Zone		165	0.00	0.22	565.3	2,533.7	4.74	0.00	0.07	-4.34
AHU 1-1	Keg Room	Zone		490	0.00	0.36	1,007.4	2,782.3	4.31	0.00	0.11	-2.00
AHU 1-1	Laundry	Zone		1,125	0.00	0.74	405.9	548.8	21.83	0.00	0.22	-3.67
AHU 1-1	Laundry Office	Zone		115	0.00	0.42	356.7	842.7	14.24	0.00	0.13	-2.27
AHU 1-1	Linen Receiving	Zone		280	0.00	0.74	465.1	657.9	18.24	0.00	0.22	-3.67
AHU 1-1	Lobby	Zone		1,290	0.00	1.12	487.5	437.0	27.46	0.00	0.33	-23.13
AHU 1-1	Locked Storage	Zone		125	0.00	7.86	507.1	64.5	186.08	0.00	2.36	-151.40
AHU 1-1	Luggage Storage	Zone		185	0.00	0.16	305.2	1,925.2	6.23	0.00	0.05	-3.02
AHU 1-1	M & E Workshop	Zone		170	0.00	1.39	344.5	247.9	48.41	0.00	0.42	-6.56
AHU 1-1	Men RR	Zone		65	0.00	0.19	515.5	2,782.1	4.31	0.00	0.06	-1.22
AHU 1-1	Mens RR	Zone		305	0.00	0.16	565.0	3,515.9	3.41	0.00	0.05	-1.11
AHU 1-1	Parts Storage	Zone		60	0.00	0.19	515.5	2,782.1	4.31	0.00	0.06	-1.22
AHU 1-1	Plan File Storage	Zone		30	0.00	0.19	515.5	2,781.9	4.31	0.00	0.06	-1.22
AHU 1-1	Solded Linen	Zone		770	0.00	0.11	265.3	2,348.8	5.11	0.00	0.03	-3.61
AHU 1-1	Toil Storage	Zone		165	0.00	7.86	507.2	71.8	167.11	0.00	2.12	-135.25
AHU 1-1	Vestibule VAV 8	Zone		150	0.00	0.48	525.7	1,095.6	10.95	0.00	0.14	-5.92
AHU 1-1	West Service Corridor	Zone		1,190	0.00	0.32	494.5	1,555.9	7.71	0.00	0.10	-4.02
AHU 1-1	Women RR	Zone		65	0.00	0.19	515.5	2,782.1	4.31	0.00	0.06	-1.22
AHU 1-1	Womens RR	Zone		540	0.00	0.16	565.0	3,515.9	3.41	0.00	0.05	-1.11
AHU 1-1		System - Variable Volume Reheat (30% Min Flow Default)		9,600	0.00	0.65	463.0	655.3	17.51	0.00	0.21	-10.05
AHU 1-10	AHU 1-10 JR Ballroom	Zone		2,610	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-10		System - Single Zone Variable Air Volume		2,610	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-11	AHU 1-11 JR Ballroom	Zone		1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-11		System - Single Zone Variable Air Volume		1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-12	AHU 1-12 JR Ballroom	Zone		1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-12		System - Single Zone Variable Air Volume		1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00

System	Zone	Room	Type	Floor Area ft ²	COOLING					HEATING		
					% OA	cfm/ft ²	cfm/ton	ft ³ /ton	Btu/hr-ft ²	% OA	cfm/ft ²	Btu/hr-ft ²
AHU 1-13	Custodial	Zone		60	0.00	0.10	287.7	2,782.1	4.31	0.00	0.03	-1.19
AHU 1-13	Event HUB	Zone		1,195	0.00	1.60	241.7	151.4	79.24	0.00	0.48	-37.74
AHU 1-13	Mens RR	Zone		320	0.00	0.09	319.9	3,515.9	3.41	0.00	0.03	-1.06
AHU 1-13	Prefunction 1A	Zone		2,390	0.00	1.49	265.5	165.7	72.43	0.00	0.44	-28.14
AHU 1-13	Prefunction 1B	Zone		1,325	0.00	0.97	218.5	224.2	53.53	0.00	0.29	-8.62
AHU 1-13	Womens RR	Zone		870	0.00	0.09	319.9	3,515.9	3.41	0.00	0.03	-1.06
AHU 1-13	System - Variable Volume Reheat (30% Min Flow Default)			6,360	0.00	1.82	233.4	229.2	52.36	0.00	0.32	-19.71
AHU 1-14	Banquet Kitchen	Zone		3,795	0.00	0.38	319.3	832.6	14.41	0.00	0.12	0.00
AHU 1-14	System - Single Zone Variable Air Volume			3,795	0.00	0.38	319.3	832.6	14.41	0.00	0.12	0.00
AHU 1-15	AV & Sound Storage	Zone		295	0.00	6.56	431.6	65.7	182.53	0.00	1.97	-141.27
AHU 1-15	Banquet Storage	Zone		2,405	0.00	3.66	1,010.2	275.9	43.49	0.00	1.10	-21.43
AHU 1-15	Beverage Pantry	Zone		390	0.00	2.86	428.2	149.5	80.26	0.00	0.86	-64.65
AHU 1-15	Beverage Pantry 2	Zone		490	0.00	2.83	428.2	151.2	79.35	0.00	0.85	-63.91
AHU 1-15	BOH Corridor	Zone		2,450	0.00	0.56	300.2	532.5	22.54	0.00	0.17	-14.85
AHU 1-15	Commissary	Zone		1,620	0.00	1.02	318.0	311.3	38.54	0.00	0.31	-30.57
AHU 1-15	Elev Vestibule	Zone		170	0.00	0.11	200.6	1,787.5	6.71	0.00	0.03	-2.72
AHU 1-15	Green Room	Zone		175	0.00	0.51	427.1	842.7	14.24	0.00	0.15	-5.49
AHU 1-15	Liquor Bev Storage	Zone		445	0.00	1.65	427.0	259.3	46.20	0.00	0.49	-35.39
AHU 1-15	RR	Zone		55	0.00	0.03	121.4	3,515.7	3.41	0.00	0.01	-3.17
AHU 1-15	Serving Pantry	Zone		490	0.00	9.19	966.9	105.2	114.03	0.00	2.76	-63.65
AHU 1-15	Serving Pantry 2	Zone		1,230	0.00	7.14	974.7	136.5	87.90	0.00	2.14	-48.57
AHU 1-15	Serving Pantry 3	Zone		280	0.00	8.45	969.2	114.7	104.63	0.00	2.54	-58.23
AHU 1-15	Vestibule	Zone		137	0.00	0.11	200.6	1,787.5	6.71	0.00	0.03	-2.72
AHU 1-15	Vestibule 2	Zone		135	0.00	2.35	329.6	140.4	85.45	0.00	0.70	-66.51
AHU 1-15	Vestibule 3	Zone		200	0.00	1.80	326.4	181.5	66.13	0.00	0.54	-50.85
AHU 1-15	Vestibule 4	Zone		200	0.00	1.80	326.4	181.5	66.13	0.00	0.54	-50.85
AHU 1-15	Vestibule 5	Zone		90	0.00	2.28	329.3	144.3	83.13	0.00	0.68	-64.63
AHU 1-15	Vestibule Green Room	Zone		142	0.00	0.21	369.3	1,787.5	6.71	0.00	0.06	-3.38
AHU 1-15	System - Variable Volume Reheat (30% Min Flow Default)			11,409	0.00	2.99	668.7	224.0	53.58	0.00	0.90	-34.74
AHU 1-16	Grand Ballroom	Zone		2,700	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-16	System - Single Zone Variable Air Volume			2,700	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-17	Grand Ballroom	Zone		2,700	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-17	System - Single Zone Variable Air Volume			2,700	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-18	Grand Ballroom	Zone		5,500	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-18	System - Single Zone Variable Air Volume			5,500	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-19	Grand Ballroom	Zone		5,500	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-19	System - Single Zone Variable Air Volume			5,500	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-2	Kitchen Area 1	Zone		695	0.00	1.78	528.6	296.3	40.50	0.00	0.54	0.00
AHU 1-2	Kitchen Area 2	Zone		440	0.00	3.76	649.3	172.5	69.66	0.00	1.13	0.00
AHU 1-2	Kitchen Area 3	Zone		785	0.00	11.16	782.1	70.1	171.30	0.00	3.35	0.00

System	Zone	Room	Type	COOLING						HEATING		
				Floor Area ft²	% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
AHU 1-2		AHU 1-2 Kitchen Area 4	Zone	380	0.00	4.59	677.5	147.5	81.34	0.00	1.38	0.00
		AHU 1-2 Kitchen Area 5	Zone	490	0.00	4.92	686.6	139.5	86.03	0.00	1.48	0.00
		AHU 1-2 Kitchen Area 7 - Storage	Zone	120	0.00	0.19	322.3	1,875.2	7.16	0.00	0.06	0.00
		AHU 1-2 Kitchen Area 7 Corridor	Zone	170	0.00	0.20	279.0	1,378.2	8.71	0.00	0.06	0.00
		System - Single Zone Variable Air Volume		3,680	0.00	5.15	709.2	137.6	87.22	0.00	1.55	0.00
AHU 1-20		AHU 1-20 Grand Ballroom	Zone	2,700	0.00	1.53	192.3	125.5	95.63	0.00	0.46	-24.17
		System - Single Zone Variable Air Volume		2,700	0.00	1.53	192.3	125.5	95.63	0.00	0.46	-24.17
AHU 1-21		AHU 1-21 Grand Ballroom	Zone	2,700	0.00	1.53	192.3	125.5	95.63	0.00	0.46	-24.17
		System - Single Zone Variable Air Volume		2,700	0.00	1.53	192.3	125.5	95.63	0.00	0.46	-24.17
AHU 1-22		AHU 1-22 Garage Lobby	Zone	2,930	0.00	1.17	405.4	345.3	34.75	0.00	0.35	-17.01
		AHU 1-22 Garage Storage	Zone	335	0.00	0.22	486.1	2,163.9	5.55	0.00	0.07	-4.45
		AHU 1-22 Valet/Ball	Zone	190	0.00	7.47	469.9	62.9	190.63	0.00	2.24	-136.84
AHU 1-22		System - Variable Volume Reheat (30% Min Flow Default)		3,365	0.00	1.19	408.8	344.9	34.79	0.00	0.38	-19.32
		AHU 1-24 Pool Kitchen Area 2	Zone	335	0.00	17.52	756.3	43.0	278.89	0.00	5.29	-67.71
AHU 1-24		AHU 1-24 Pool Kitchen Area 3	Zone	125	0.00	4.96	697.0	135.2	88.74	0.00	1.46	-5.85
		AHU 1-24 Pool Kitchen Area 4	Zone	325	0.00	11.85	733.6	61.9	193.76	0.00	3.55	-42.58
AHU 1-24		AHU 1-24 Pool Kitchen Area 5	Zone	136	0.00	5.71	571.0	100.0	119.84	0.00	1.71	-61.43
		AHU 1-24 Pool Kitchen Area 6 Men RR	Zone	235	0.00	7.01	610.8	87.1	137.79	0.00	2.10	-88.37
AHU 1-24		AHU 1-24 Pool Kitchen Area 7 Women RR	Zone	315	0.00	3.50	431.8	123.5	87.14	0.00	1.05	-73.10
		System - Single Zone Variable Air Volume		1,380	0.00	9.29	704.8	75.9	158.11	0.00	2.79	-61.96
AHU 1-3		AHU 1-3 Casual Dining Area 1	Zone	375	0.00	1.23	378.0	307.7	39.00	0.00	0.37	-21.96
		AHU 1-3 Casual Dining Area 10	Zone	420	0.00	5.03	532.2	105.9	113.37	0.00	1.51	-24.85
AHU 1-3		AHU 1-3 Casual Dining Area 11	Zone	360	0.00	10.17	539.8	53.1	226.01	0.00	3.05	-49.92
		AHU 1-3 Casual Dining Area 2	Zone	445	0.00	1.61	420.7	261.1	45.96	0.00	0.48	-34.06
AHU 1-3		AHU 1-3 Casual Dining Area 3	Zone	340	0.00	2.03	427.1	210.9	56.89	0.00	0.61	-40.16
		AHU 1-3 Casual Dining Area 4	Zone	510	0.00	2.88	391.6	136.0	88.23	0.00	0.86	-49.23
AHU 1-3		AHU 1-3 Casual Dining Area 5	Zone	320	0.00	0.93	462.0	487.3	24.13	0.00	0.28	-4.86
		AHU 1-3 Casual Dining Area 6	Zone	655	0.00	0.64	302.5	469.3	25.57	0.00	0.19	-3.48
AHU 1-3		AHU 1-3 Casual Dining Area 7	Zone	385	0.00	0.93	293.6	316.4	37.92	0.00	0.28	-4.86
		AHU 1-3 Casual Dining Area 8	Zone	355	0.00	0.99	292.4	295.6	40.60	0.00	0.30	-5.16
AHU 1-3		AHU 1-3 Casual Dining Area 9	Zone	1,145	0.00	0.61	304.3	498.6	24.07	0.00	0.18	-3.31
		System - Variable Volume Reheat (30% Min Flow Default)		5,730	0.00	2.93	429.0	211.5	56.74	0.00	0.61	-18.13
AHU 1-4		AHU 1-4 Event Hub Display	Zone	540	0.00	1.48	332.6	224.2	53.53	0.00	0.45	-7.42
		AHU 1-4 Mens RR	Zone	290	0.00	0.13	451.0	3,515.9	3.41	0.00	0.04	-0.64
AHU 1-4		AHU 1-4 Prefunction 1C	Zone	965	0.00	1.48	332.6	224.2	53.53	0.00	0.45	-7.42
		AHU 1-4 Prefunction 1D	Zone	1,190	0.00	1.48	332.6	224.2	53.53	0.00	0.45	-7.42
AHU 1-4		AHU 1-4 Prefunction 1E	Zone	6,430	0.00	1.60	341.3	213.4	56.22	0.00	0.48	-10.01
		AHU 1-4 Womens RR	Zone	560	0.00	0.13	451.0	3,515.9	3.41	0.00	0.04	-0.64
AHU 1-4		System - Variable Volume Reheat (30% Min Flow Default)		9,975	0.00	1.44	339.5	235.3	51.00	0.00	0.43	-8.51
		AHU 1-5 Ante Room	Zone	135	0.00	2.00	1,823.4	909.7	13.19	0.00	0.60	-4.43

System	Zone	Room	Type	COOLING						HEATING		
				Floor Area ft²	% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
AHU 1-5		AHU 1-5 BD Room #1	Zone	530	0.00	2.43	351.2	144.4	83.09	0.00	0.73	-41.53
		AHU 1-5 Meeting Room #1C	Zone	1,300	0.00	2.11	349.0	165.5	72.49	0.00	0.63	-36.54
		AHU 1-5 Meeting Room #1E	Zone	1,105	0.00	1.77	336.6	190.6	62.97	0.00	0.53	-27.52
		AHU 1-5 Meeting Room #1F	Zone	1,120	0.00	1.85	347.0	210.2	57.09	0.00	0.50	-22.26
		AHU 1-5 Meeting Room #1G	Zone	1,100	0.00	1.60	344.8	216.0	55.56	0.00	0.48	-20.87
AHU 1-5		AHU 1-5 Pantry	Zone	195	0.00	0.14	385.4	2,782.2	4.31	0.00	0.04	-1.59
		System - Variable Volume Reheat (30% Min Flow Default)		5,495	0.00	1.80	354.9	197.5	60.75	0.00	0.54	-27.11
AHU 1-6		AHU 1-6 Meeting Room 1A	Zone	1,995	0.00	0.73	218.6	298.2	40.24	0.00	0.22	-6.70
		AHU 1-6 Meeting Room 1B	Zone	1,929	0.00	0.73	218.6	298.2	40.24	0.00	0.22	-6.70
AHU 1-6		AHU 1-6 Meeting Room 1D	Zone	1,110	0.00	0.73	218.6	298.2	40.24	0.00	0.22	-6.70
		System - Variable Volume Reheat (30% Min Flow Default)		5,634	0.00	0.73	218.6	298.2	40.24	0.00	0.22	-6.70
AHU 1-7		AHU 1-7 Applicant Screening	Zone	75	0.00	0.55	402.2	736.7	16.29	0.00	0.16	-8.49
		AHU 1-7 BOH Corridor	Zone	3,500	0.00	0.33	361.7	1,107.3	10.84	0.00	0.10	-5.44
AHU 1-7		AHU 1-7 Director of HR	Zone	105	0.00	0.50	396.9	788.2	15.22	0.00	0.15	-5.84
		AHU 1-7 Exam Room	Zone	160	0.00	0.46	391.5	842.7	14.24	0.00	0.14	-3.42
AHU 1-7		AHU 1-7 Flower Shop	Zone	430	0.00	3.18	396.2	124.7	96.23	0.00	0.95	-73.73
		AHU 1-7 Housekeeping	Zone	940	0.00	0.56	369.8	657.9	18.24	0.00	0.17	-4.00
AHU 1-7		AHU 1-7 Housekeeping 2	Zone	1,030	0.00	0.60	375.1	625.0	19.20	0.00	0.18	-6.36
		AHU 1-7 HR	Zone	230	0.00	0.46	391.5	842.8	14.24	0.00	0.14	-3.42
AHU 1-7		AHU 1-7 HR Coordinator	Zone	60	0.00	0.46	391.5	842.7	14.24	0.00	0.14	-3.42
		AHU 1-7 Loss Prevention	Zone	260	0.00	0.14	342.2	2,385.9	5.03	0.00	0.04	-3.14
AHU 1-7		AHU 1-7 Nurse	Zone	120	0.00	0.46	391.5	842.7	14.24	0.00	0.14	-3.42
		AHU 1-7 Office Holding Room	Zone	95	0.00	0.52	399.5	763.1	15.73	0.00	0.16	-7.09
AHU 1-7		AHU 1-7 Receiving Gen Stor	Zone	730	0.00	0.14	340.2	2,421.5	4.96	0.00	0.04	-2.96
		AHU 1-7 Receiving Offices	Zone	210	0.00	0.46	391.5	842.8	14.24	0.00	0.14	-3.42
AHU 1-7		AHU 1-7 Security Director	Zone	95	0.00	0.46	391.5	842.7	14.24	0.00	0.14	-3.42
		AHU 1-7 Serving Corridor	Zone	670	0.00	0.18	330.4	1,787.6	6.71	0.00	0.06	-1.78
AHU 1-7		AHU 1-7 Serving Pantry	Zone	1,500	0.00	1.08	3,017.4	2,782.3	4.31	0.00	0.33	-2.39
		AHU 1-7 Storage	Zone	80	0.00	0.12	320.4	2,782.1	4.31	0.00	0.03	-1.37
AHU 1-7		AHU 1-7 Temp Cooler Storage	Zone	160	0.00	0.14	338.0	2,461.4	4.88	0.00	0.04	-2.76
		AHU 1-7 Unisex RR	Zone	60	0.00	0.10	334.9	3,515.7	3.41	0.00	0.03	-1.26
AHU 1-7		System - Variable Volume Reheat (30% Min Flow Default)		10,510	0.00	0.58	489.9	839.9	14.29	0.00	0.18	-7.97
AHU 1-8		AHU 1-8 JR Ballroom	Zone	1,290	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
		System - Single Zone Variable Air Volume		1,290	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 1-9		AHU 1-9 JR Ballroom	Zone	1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
		System - Single Zone Variable Air Volume		1,295	0.00	1.60	301.4	188.9	63.53	0.00	0.48	0.00
AHU 2-1		AHU 2-1 Specialty Kitchen	Zone	1,295	0.00	3.06	519.1	169.7	70.73	0.00	0.92	-49.15
		System - Single Zone Variable Air Volume		1,295	0.00	3.06	519.1	169.7	70.73	0.00	0.92	-49.15
AHU 2-10		AHU 2-10 - EMP CAFE SERV	Zone	335	0.00	5.11	436.2	85.4	140.50	0.00	1.53	-67.00
		AHU 2-10 - EMPLOYEE CAFE	Zone	1,850	0.00	2.29	317.2	138.6	86.61	0.00	0.69	-22.67
AHU 2-10		AHU 2-10 - SERVERY 274	Zone	290	0.00	3.46	379.0	109.7	109.42	0.00	1.04	-36.16

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
AHU 2-10		System - Single Zone Variable Air Volume		2,475	0.00	2.81	348.9	124.3	96.58	0.00	0.84	-30.25
	AHU 2-11	Coffee BOH	Zone	200	0.00	0.38	431.8	1,140.2	10.52	0.00	0.11	-5.41
	AHU 2-11	Conference Room	Zone	120	0.00	0.76	226.5	298.2	40.24	0.00	0.23	-0.54
	AHU 2-11	Director	Zone	190	0.00	0.70	591.3	842.8	14.24	0.00	0.21	-0.52
	AHU 2-11	Manager	Zone	145	0.00	0.70	591.3	842.7	14.24	0.00	0.21	-0.52
	AHU 2-11	Manager 2	Zone	115	0.00	0.70	591.3	842.7	14.24	0.00	0.21	-0.52
	AHU 2-11	Reception	Zone	220	0.00	0.70	591.3	842.8	14.24	0.00	0.21	-0.52
AHU 2-11		System - Single Zone Variable Air Volume		990	0.00	0.64	464.0	721.1	16.64	0.00	0.19	-1.51
	AHU 2-12	PASTERY / BAKERY AREA 1	Zone	485	0.00	2.27	1,396.2	610.5	19.66	0.00	0.68	-0.12
	AHU 2-12	PASTERY/BAKERY AREA 2	Zone	151	0.00	3.83	437.9	114.4	104.93	0.00	1.15	-104.15
AHU 2-12		System - Single Zone Variable Air Volume		636	0.00	2.64	797.4	302.8	39.74	0.00	0.79	-24.82
	AHU 2-2	PRIVATE DINING	Zone	505	0.00	3.03	366.8	121.0	99.19	0.00	0.91	-87.39
	AHU 2-2	SPECIALTY RESTAURANT	Zone	2,110	0.00	1.20	303.5	253.6	47.32	0.00	0.36	-25.53
AHU 2-2		System - Variable Volume Reheat (30% Min Flow Default)		2,615	0.00	1.51	323.6	214.9	55.83	0.00	0.47	-37.47
	AHU 2-3	WOMEN RR CLOSET295	Zone	89	0.00	0.19	667.5	3,515.8	3.41	0.00	0.06	-2.75
	AHU 2-3	DEPOSIT BOXES	Zone	85	0.00	7.14	517.8	72.6	165.37	0.00	2.14	-115.04
	AHU 2-3	FRONT DESK POOS 285	Zone	976	0.00	0.60	318.0	531.9	22.56	0.00	0.18	-4.57
	AHU 2-3	FRONT OFFICE 293	Zone	490	0.00	0.64	420.3	652.6	18.39	0.00	0.19	-4.77
	AHU 2-3	GUEST DEPOSIT	Zone	85	0.00	7.14	517.8	72.6	165.37	0.00	2.14	-115.04
	AHU 2-3	LOBBY CENTRAL	Zone	3,420	0.00	2.15	412.6	192.2	62.44	0.00	0.64	-42.40
	AHU 2-3	LOBBY EAST	Zone	1,255	0.00	3.25	436.5	134.3	89.32	0.00	0.97	-67.52
	AHU 2-3	LOBBY WEST	Zone	896	0.00	2.05	443.0	215.7	55.62	0.00	0.62	-27.20
	AHU 2-3	MEN 297	Zone	50	0.00	0.19	667.5	3,515.6	3.41	0.00	0.06	-2.75
	AHU 2-3	VESTIBULE BY ELEC TELECOM ROOM	Zone	480	0.00	1.20	467.4	388.3	30.90	0.00	0.36	-18.47
	AHU 2-3	WOMEN 295	Zone	50	0.00	0.19	301.3	1,586.9	7.56	0.00	0.06	-2.75
AHU 2-3		System - Variable Volume Reheat (30% Min Flow Default)		7,275	0.00	1.97	414.7	210.4	57.03	0.00	0.64	-39.47
	AHU 2-11	ATM Phone	Zone	165	0.00	0.55	465.5	842.7	14.24	0.00	0.17	-3.84
	AHU 2-11	Corridor 150	Zone	160	0.00	0.25	443.8	1,787.5	6.71	0.00	0.07	-2.23
	AHU 2-11	Service Elevator Lobby	Zone	320	0.00	0.25	271.8	1,094.9	10.96	0.00	0.07	-2.23
	AHU 2-11	COFFEE 215	Zone	445	0.00	3.34	485.2	145.2	82.67	0.00	1.00	-18.53
	AHU 2-11	Elev Lobby 205	Zone	160	0.00	0.31	454.2	1,462.4	8.21	0.00	0.09	-5.84
	AHU 2-4	MEN RR	Zone	255	0.00	0.15	236.3	1,566.5	7.66	0.00	0.05	-1.72
	AHU 2-4	BUSINESS CENTER 231	Zone	155	0.00	0.66	338.6	510.9	23.49	0.00	0.20	-4.42
	AHU 2-4	LOBBY 200	Zone	7,596	0.00	0.94	361.2	385.1	31.16	0.00	0.28	-15.58
	AHU 2-4	LOBBY CENTRAL	Zone	2,355	0.00	0.51	270.9	529.6	22.66	0.00	0.15	-3.62
	AHU 2-4	LOBBY EAST	Zone	405	0.00	1.58	372.3	235.6	50.93	0.00	0.47	-34.55
	AHU 2-4	LOBBY WEST	Zone	896	0.00	2.29	411.7	179.8	66.73	0.00	0.69	-36.15
	AHU 2-4	WOMEN RR	Zone	420	0.00	0.15	236.3	1,566.5	7.66	0.00	0.05	-1.72
	AHU 2-4	Elevator Lobby	Zone	330	0.00	0.31	301.9	988.1	12.14	0.00	0.09	-5.56
AHU 2-4		System - Variable Volume Reheat (30% Min Flow Default)		13,662	0.00	0.91	368.9	406.8	29.50	0.00	0.29	-13.75

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
	AHU 2-5	MEN 249	Zone	282	0.00	0.14	221.7	1,551.5	7.73	0.00	0.04	-0.56
	AHU 2-5	MEN 255	Zone	330	0.00	2.95	655.9	222.3	53.98	0.00	0.89	-31.79
	AHU 2-5	PREFUNCTION 2 250	Zone	5,260	0.00	1.50	335.9	224.2	53.53	0.00	0.45	-1.25
	AHU 2-5	PREFUNCTION 2A	Zone	1,455	0.00	1.50	310.8	207.4	57.85	0.00	0.45	-1.25
	AHU 2-5	WOMEN 247	Zone	350	0.00	0.14	221.7	1,551.5	7.73	0.00	0.04	-0.56
	AHU 2-5	WOMEN 253	Zone	530	0.00	4.18	671.6	160.6	74.72	0.00	1.25	-41.75
AHU 2-5		System - Single Zone Variable Air Volume		8,207	0.00	1.63	376.5	251.6	51.82	0.00	0.49	-5.04
	AHU 2-6	ANTE RM 2 238	Zone	270	0.00	1.86	1,568.7	842.7	14.24	0.00	0.56	-5.23
	AHU 2-6	BOARD RM 2 239	Zone	510	0.00	0.98	292.1	298.2	40.24	0.00	0.29	-7.35
	AHU 2-6	MEETING RM 2E	Zone	1,305	0.00	1.70	314.8	184.6	64.99	0.00	0.51	-25.60
	AHU 2-6	MEETING RM 2F 234	Zone	1,720	0.00	1.78	316.0	177.4	67.63	0.00	0.53	-27.50
	AHU 2-6	MEETING RM 2F 251	Zone	1,030	0.00	0.98	263.5	269.0	44.61	0.00	0.29	-7.35
	AHU 2-6	MEETING RM 2G	Zone	1,720	0.00	1.79	316.4	176.5	67.98	0.00	0.54	-27.79
	AHU 2-6	PANTRY 2	Zone	75	0.00	1.86	1,568.7	842.7	14.24	0.00	0.56	-5.23
AHU 2-6		System - Variable Volume Reheat (30% Min Flow Default)		6,530	0.00	1.59	325.8	205.3	58.45	0.00	0.48	-21.36
	AHU 2-7	MEETING RM 2A 244	Zone	2,130	0.00	0.79	214.3	270.6	44.35	0.00	0.24	-8.16
	AHU 2-7	MEETING RM 2C 245	Zone	1,600	0.00	0.79	214.3	270.6	44.35	0.00	0.24	-8.16
	AHU 2-7	MEETING RM 2D	Zone	970	0.00	0.79	214.3	270.6	44.35	0.00	0.24	-8.16
	AHU 2-7	MEETING RM 2B 242	Zone	2,080	0.00	0.79	214.3	270.6	44.35	0.00	0.24	-8.16
AHU 2-7		System - Variable Volume Reheat (30% Min Flow Default)		6,180	0.00	0.79	214.3	270.6	44.35	0.00	0.24	-8.16
	AHU 2-8	2HR EXIT PASSAGEWAY	Zone	1,170	0.00	0.35	317.3	914.4	13.12	0.00	0.10	-9.42
	AHU 2-8	ADMIN 265	Zone	1,415	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.67
	AHU 2-8	ADMIN VESTIBULE	Zone	125	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	BANQUET STORAGE 254	Zone	790	0.00	1.28	377.1	293.7	40.86	0.00	0.39	-33.39
	AHU 2-8	COPY / MAIL	Zone	70	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	CORRIDOR 257	Zone	3,495	0.00	0.39	335.9	857.2	14.00	0.00	0.12	-7.63
	AHU 2-8	COUNTING ROOM 265D	Zone	70	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR BUSINESS TRAVEL	Zone	90	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR CATERING CONF 265K	Zone	90	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR FINANCE 265F	Zone	120	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR HOTEL 265J	Zone	140	0.00	3.40	401.0	117.8	101.86	0.00	1.02	-64.82
	AHU 2-8	DIR PUBLIC RELATIONS 265Q	Zone	90	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR REV MGMT	Zone	115	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	DIR SALES MARKETING 265H	Zone	140	0.00	3.78	405.1	107.2	111.97	0.00	1.13	-72.99
	AHU 2-8	ELEV CONTROL RM 264	Zone	50	0.00	0.24	270.1	1,104.5	10.86	0.00	0.07	-3.04
	AHU 2-8	ELEV VEST 778	Zone	60	0.00	0.24	270.1	1,104.5	10.86	0.00	0.07	-3.04
	AHU 2-8	F B EXEC 265L	Zone	120	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	FB ASST DIR	Zone	80	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	GEN CASHIER SAFE 265C	Zone	100	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
	AHU 2-8	GENERAL MANAGER 265G	Zone	210	0.00	2.82	402.4	142.9	83.95	0.00	0.84	-52.75
	AHU 2-8	JAN STORAGE 260	Zone	250	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.67
	AHU 2-8	MEETING ROOM 265R	Zone	225	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.67
	AHU 2-8	PANTRY 267	Zone	380	0.00	0.17	247.2	1,417.7	8.46	0.00	0.05	-2.63

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
AHU 2-8		AHU 2-8 - ROOMS EXEC 265N	Zone	90	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
		AHU 2-8 - STORAGE 265A	Zone	55	0.00	0.24	270.1	1,104.5	10.86	0.00	0.07	-3.04
		AHU 2-8 - VESTIBULE 263	Zone	270	0.00	0.24	270.1	1,104.6	10.86	0.00	0.07	-3.04
		AHU 2-8 - PANTRY 252	Zone	850	0.00	5.78	1,598.9	276.5	43.40	0.00	1.73	-27.12
		AHU 2-8 Paymaster	Zone	100	0.00	0.53	343.4	652.5	18.39	0.00	0.16	-4.68
AHU 2-8		System - Variable Volume Reheat (30% Min Flow Default)		10,460	0.00	0.84	479.0	568.1	21.12	0.00	0.27	-12.08
AHU 2-9		AHU 2-9 - F EMPLOYEE LOCKERS 706	Zone	1,600	0.00	2.51	624.5	248.8	48.24	0.00	0.75	-20.44
		AHU 2-9 - M EMPLOYEE LOCKERS 268	Zone	2,200	0.00	2.48	623.8	251.4	47.74	0.00	0.74	-20.14
		AHU 2-9 - UNIFORM ISSUE 266	Zone	425	0.00	0.29	305.9	1,039.7	11.54	0.00	0.09	-1.48
		AHU 2-9 General Storage	Zone	115	0.00	0.29	305.8	1,039.7	11.54	0.00	0.09	-1.48
AHU 2-9		System - Single Zone Variable Air Volume		4,340	0.00	2.22	615.8	277.4	43.26	0.00	0.67	-17.93
AHU 3-1		AHU 3-1 Corridor	Zone	1,340	0.00	0.30	533.8	1,787.6	6.71	0.00	0.09	-2.20
		AHU 3-1 Elev Lobby	Zone	150	0.00	0.30	533.8	1,787.5	6.71	0.00	0.09	-2.20
		AHU 3-1 Elev Vest	Zone	60	0.00	8.00	538.1	67.3	178.37	0.00	2.40	-122.00
		AHU 3-1 EMPLOYEE LOUNGE	Zone	625	0.00	4.65	523.8	112.7	106.46	0.00	1.39	-67.68
		AHU 3-1 Level 2 Spa	Zone	1,215	0.00	1.19	485.8	407.8	29.43	0.00	0.36	-14.02
		AHU 3-1 Level 2 Spa BOH	Zone	220	0.00	7.57	529.2	70.0	171.55	0.00	2.27	-113.20
		AHU 3-1 Level 2 Spa Storage 1	Zone	75	0.00	7.41	529.1	71.4	168.04	0.00	2.22	-110.75
		AHU 3-1 Level 2 Spa Storage 2	Zone	75	0.00	8.17	529.9	64.8	185.07	0.00	2.45	-122.70
		AHU 3-1 Level 2 Treatment Room	Zone	205	0.00	2.42	537.7	221.8	54.09	0.00	0.73	-35.13
		AHU 3-1 Mens Locker Room	Zone	1,285	0.00	1.18	457.3	386.1	31.08	0.00	0.36	-16.17
		AHU 3-1 MGR OFFICE	Zone	110	0.00	0.67	564.0	842.7	14.24	0.00	0.20	-3.69
		AHU 3-1 Relaxation Men	Zone	275	0.00	2.63	465.6	177.3	67.67	0.00	0.79	-43.02
		AHU 3-1 Relaxation Women	Zone	275	0.00	2.59	468.1	180.4	66.52	0.00	0.78	-42.42
		AHU 3-1 Salon	Zone	1,105	0.00	1.59	466.9	293.5	40.89	0.00	0.48	-20.53
		AHU 3-1 Spa Reception	Zone	465	0.00	0.67	564.0	842.8	14.24	0.00	0.20	-3.69
		AHU 3-1 Storage	Zone	60	0.00	0.21	574.0	2,782.1	4.31	0.00	0.06	-1.83
		AHU 3-1 TR 1	Zone	168	0.00	0.47	423.1	894.6	13.41	0.00	0.14	-2.90
		AHU 3-1 TR 10	Zone	275	0.00	1.83	459.9	282.6	42.47	0.00	0.49	-24.40
		AHU 3-1 TR 2	Zone	190	0.00	5.55	526.1	94.8	126.64	0.00	1.67	-81.77
		AHU 3-1 TR 3	Zone	170	0.00	5.89	526.7	89.5	134.13	0.00	1.77	-87.02
		AHU 3-1 TR 4	Zone	210	0.00	0.47	423.1	894.6	13.41	0.00	0.14	-2.90
		AHU 3-1 TR 5	Zone	265	0.00	2.56	503.6	196.4	61.10	0.00	0.77	-35.45
		AHU 3-1 TR 6	Zone	570	0.00	3.21	467.7	145.5	82.48	0.00	0.96	-55.18
		AHU 3-1 TR 7	Zone	165	0.00	6.54	538.7	82.3	145.74	0.00	1.96	-97.17
		AHU 3-1 TR 8	Zone	245	0.00	2.71	469.4	173.5	69.16	0.00	0.81	-47.73
		AHU 3-1 TR 9	Zone	235	0.00	2.01	469.6	233.8	51.32	0.00	0.60	-31.50
		AHU 3-1 Womens Locker Room	Zone	1,380	0.00	1.15	469.7	406.7	29.50	0.00	0.35	-15.60
AHU 3-1		System - Variable Volume Reheat (30% Min Flow Default)		11,413	0.00	1.82	485.4	267.3	44.89	0.00	0.60	-28.42
AHU 3-2		AHU 3-2 Fitness	Zone	1,421	0.00	1.86	338.5	181.8	66.00	0.00	0.56	-28.44
		AHU 3-2 RR	Zone	40	0.00	0.15	541.3	3,515.5	3.41	0.00	0.05	-1.26
AHU 3-2		System - Single Zone Variable Air Volume		1,461	0.00	1.82	338.8	186.7	64.29	0.00	0.54	-27.70

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
AHU 9-1		AHU 9-1 BOH	Zone	435	0.00	2.28	328.0	144.0	83.33	0.00	0.68	-57.25
		AHU 9-1 Corridor/Waiting	Zone	770	0.00	0.16	396.7	2,370.1	5.06	0.00	0.05	-2.77
		AHU 9-1 Destination Bar	Zone	3,235	0.00	1.85	243.0	131.2	91.45	0.00	0.56	-36.20
		AHU 9-1 Restrooms	Zone	595	0.00	0.78	321.7	409.9	29.28	0.00	0.24	-22.87
		System - Variable Volume Reheat (30% Min Flow Default)		5,035	0.00	1.46	253.9	173.5	69.14	0.00	0.45	-31.33
FCU 2-1		FCU 2-1 PASTERY/BAKERY AREA.3	Zone	167	0.00	4.08	504.1	123.4	97.21	0.00	4.08	-98.02
		System - Fan Coil		167	0.00	4.08	504.1	123.4	97.21	0.00	4.08	-98.02
FCU 3-1		FCU 3-1 Motion Studio	Zone	665	0.00	1.93	276.5	143.5	83.65	0.00	1.93	-25.51
		System - Fan Coil		665	0.00	1.93	276.5	143.5	83.65	0.00	1.93	-25.51
FCU 6-1		FCU 6-1 Corridor	Zone	195	0.00	4.06	622.4	153.2	78.32	0.00	4.06	-46.57
		FCU 6-1 Restrooms	Zone	140	0.00	0.15	535.5	3,515.8	3.41	0.00	0.15	-0.50
		FCU 6-1 Teen Center	Zone	1,055	0.00	1.25	418.9	336.3	35.68	0.00	1.25	-13.07
FCU 6-2		FCU 6-2 Kids Play Room	System - Fan Coil	1,390	0.00	1.53	477.3	311.9	38.48	0.00	1.53	-16.51
		Zone		1,005	0.00	1.19	396.9	334.0	35.92	0.00	1.19	-13.82
FCU 9-1		FCU 9-1 Destination BAR	System - Fan Coil	1,005	0.00	1.19	396.9	334.0	35.92	0.00	1.19	-13.82
		Zone		590	0.00	1.74	219.7	125.9	95.29	0.00	1.74	-29.78
FCU 9-1		System - Fan Coil		590	0.00	1.74	219.7	125.9	95.29	0.00	1.74	-29.78

				Floor Area	COOLING					HEATING		
System	Zone	Room	Type	ft²	% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
Alternative 1												
FCU - Exec Suite 1 - East	FCU - Exec Suite 1 - East	Zone	FCU - Exec Suite 1 - East	390	0.00	0.85	504.4	593.4	20.22	0.00	0.85	-9.17
			System - Fan Coil	390	0.00	0.85	504.4	593.4	20.22	0.00	0.85	-9.17
FCU - Exec Suite 1 - West	FCU - Exec Suite 1 - West	Zone	FCU - Exec Suite 1 - West	335	0.00	0.95	496.9	522.6	22.96	0.00	0.95	-10.65
			System - Fan Coil	335	0.00	0.95	496.9	522.6	22.96	0.00	0.95	-10.65
FCU - Exec Suite 2 - East	FCU - Exec Suite 2 - East	Zone	FCU - Exec Suite 2 - East	330	0.00	0.97	504.2	519.4	23.10	0.00	0.97	-10.82
			System - Fan Coil	330	0.00	0.97	504.2	519.4	23.10	0.00	0.97	-10.82
FCU - Exec Suite 2 - West	FCU - Exec Suite 2 - West	Zone	FCU - Exec Suite 2 - West	435	0.00	1.19	578.9	484.8	24.75	0.00	1.19	-14.56
			System - Fan Coil	435	0.00	1.19	578.9	484.8	24.75	0.00	1.19	-14.56
FCU - Exec Suite 3 - East	FCU - Exec Suite 3 - East	Zone	FCU - Exec Suite 3 - East	380	0.00	0.87	503.1	580.8	20.66	0.00	0.87	-9.40
			System - Fan Coil	380	0.00	0.87	503.1	580.8	20.66	0.00	0.87	-9.40
FCU - Exec Suite 3 - West	FCU - Exec Suite 3 - West	Zone	FCU - Exec Suite 3 - West	360	0.00	1.18	515.8	437.9	27.40	0.00	1.18	-13.51
			System - Fan Coil	360	0.00	1.18	515.8	437.9	27.40	0.00	1.18	-13.51
FCU - King/QQ - 0	FCU - King/QQ - 0	Zone	FCU - King/QQ - 0	360	0.00	1.06	512.5	485.1	24.74	0.00	1.06	-9.95
			System - Fan Coil	360	0.00	1.06	512.5	485.1	24.74	0.00	1.06	-9.95
FCU - King/QQ - 165	FCU - King/QQ - 165	Zone	FCU - King/QQ - 165	360	0.00	0.90	500.3	555.2	21.61	0.00	0.90	-9.92
			System - Fan Coil	360	0.00	0.90	500.3	555.2	21.61	0.00	0.90	-9.92
FCU - King/QQ - 180	FCU - King/QQ - 180	Zone	FCU - King/QQ - 180	360	0.00	0.91	509.2	559.0	21.47	0.00	0.91	-9.92
			System - Fan Coil	360	0.00	0.91	509.2	559.0	21.47	0.00	0.91	-9.92
FCU - King/QQ - 75	FCU - King/QQ - 75	Zone	FCU - King/QQ - 75	360	0.00	0.59	458.8	774.7	15.49	0.00	0.59	-9.84
			System - Fan Coil	360	0.00	0.59	458.8	774.7	15.49	0.00	0.59	-9.84
FCU - K1	FCU - K1	Zone	FCU - K1	370	0.00	1.32	584.7	441.6	27.17	0.00	1.32	-13.67
			System - Fan Coil	370	0.00	1.32	584.7	441.6	27.17	0.00	1.32	-13.67
FCU - K2	FCU - K2	Zone	FCU - K2	515	0.00	1.40	493.6	353.5	33.95	0.00	1.40	-18.31
			System - Fan Coil	515	0.00	1.40	493.6	353.5	33.95	0.00	1.40	-18.31
FCU - Luxury Suite 1 - North	FCU - Luxury Suite 1 - North	Zone	FCU - Luxury Suite 1 - North	525	0.00	1.65	498.8	302.9	39.62	0.00	1.65	-21.88
			System - Fan Coil	525	0.00	1.65	498.8	302.9	39.62	0.00	1.65	-21.88
FCU - Luxury Suite 1 - South	FCU - Luxury Suite 1 - South	Zone	FCU - Luxury Suite 1 - South	745	0.00	1.59	653.2	410.1	29.26	0.00	1.59	-18.26
			System - Fan Coil	745	0.00	1.59	653.2	410.1	29.26	0.00	1.59	-18.26
FCU - Luxury Suite 2 - Central	FCU - Luxury Suite 2 - Central	Zone	FCU - Luxury Suite 2 - Central	330	0.00	0.96	496.1	516.0	23.26	0.00	0.96	-10.81
			System - Fan Coil	330	0.00	0.96	496.1	516.0	23.26	0.00	0.96	-10.81
FCU - Luxury Suite 2 - East	FCU - Luxury Suite 2 - East	Zone	FCU - Luxury Suite 2 - East	370	0.00	0.88	501.7	568.1	21.12	0.00	0.88	-9.66
			System - Fan Coil	370	0.00	0.88	501.7	568.1	21.12	0.00	0.88	-9.66
FCU - Luxury Suite 2 - West	FCU - Luxury Suite 2 - West	Zone	FCU - Luxury Suite 2 - West	390	0.00	0.85	504.4	593.4	20.22	0.00	0.85	-9.17
			System - Fan Coil	390	0.00	0.85	504.4	593.4	20.22	0.00	0.85	-9.17
FCU - Luxury Suite 3 - Central	FCU - Luxury Suite 3 - Central	Zone	FCU - Luxury Suite 3 - Central	315	0.00	0.93	489.8	524.6	22.87	0.00	0.93	-10.50
			System - Fan Coil	315	0.00	0.93	489.8	524.6	22.87	0.00	0.93	-10.50
FCU - Luxury Suite 3 - East	FCU - Luxury Suite 3 - East	Zone	FCU - Luxury Suite 3 - East	395	0.00	1.13	497.7	441.8	27.16	0.00	1.13	-19.14
			System - Fan Coil	395	0.00	1.13	497.7	441.8	27.16	0.00	1.13	-19.14
FCU - Luxury Suite 3 - West	FCU - Luxury Suite 3 - West	Zone	FCU - Luxury Suite 3 - West	265	0.00	1.45	525.5	362.1	33.14	0.00	1.45	-18.02

				Floor Area	COOLING					HEATING		
System	Zone	Room	Type	ft²	% OA	cfm/ft²	cfm/ton	ft³/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
FCU - Luxury Suite 3 - West	FCU - Presidential Suite - Central	Zone	System - Fan Coil	265	0.00	1.45	525.5	362.1	33.14	0.00	1.45	-18.02
			Zone	335	0.00	1.02	509.6	499.2	24.04	0.00	1.02	-11.43
FCU - Pres Suite - Central	FCU - Presidential Suite - East	Zone	System - Fan Coil	335	0.00	1.02	509.6	499.2	24.04	0.00	1.02	-11.43
			Zone	395	0.00	0.85	513.8	603.6	19.88	0.00	0.85	-9.05
FCU - Pres Suite - East	FCU - Presidential Suite - North	Zone	System - Fan Coil	395	0.00	0.85	513.8	603.6	19.88	0.00	0.85	-9.05
			Zone	530	0.00	1.67	499.7	299.2	40.11	0.00	1.67	-22.17
FCU - Pres Suite - North	FCU - Presidential Suite - West	Zone	System - Fan Coil	530	0.00	1.67	499.7	299.2	40.11	0.00	1.67	-22.17
			Zone	805	0.00	1.48	656.7	444.9	26.97	0.00	1.48	-16.59
FCU - Pres Suite - West		Zone	System - Fan Coil	805	0.00	1.48	656.7	444.9	26.97	0.00	1.48	-16.59

Table A-10: TRACE calculated peaks vs. scheduled equipment for main hotel space.

Red highlight means that the scheduled equipment is sized over 10% more of what the calculated peak is. Blue highlight means that the scheduled equipment is sized under 10% less than what the calculated peak is.

EQUIPMENT	COOLING COIL PEAK (MBH)	SCHEDULED COOLING COIL PEAK (MBH)	HEATING COIL PEAK (KW)	SCHEDULED HEATING COIL (KW)
AHU 1.1	168.1	487.2	28.28	20
AHU 1.2	268.6	763.5	0.00	46
AHU 1.3	325.1	633.9	30.45	0
AHU 1.4	508.7	1062	24.88	123
AHU 1.5	333.2	446.9	43.58	0
AHU 1.6	202.6	366.8	9.88	5
AHU 1.7	150.2	295	21.78	0
AHU 1.8	82	125.5	0.00	15
AHU 1.9	82.3	125.5	0.00	15
AHU 1.10	165.8	173.3	0.00	30
AHU 1.11	82.3	120	0.00	15

AHU1.12	82.3	103	0.00	15
AHU 1.13	333	732.4	36.72	111
AHU 1.14	54.7	963.4	0.00	74
AHU 1.15	611.3	309.6	116.14	0
AHU 1.16	171.5	213.9	0.00	31
AHU 1.17	171.5	213.9	0.00	31
AHU 1.18	349.4	427.7	0.00	62
AHU 1.19	349.1	427.7	0.00	62
AHU 1.20	258.2	277.2	19.14	34
AHU 1.21	258.2	277.2	19.14	34
AHU 1.22	117.1	185	19.05	18
AHU 1.24	218.2	585.7	25.06	76
AHU 2.1	91.6	488.6	18.64	50
AHU 2.2	146	246.8	28.72	9
AHU 2.3	414.9	659	84.14	18
AHU 2.4	403	808.4	55.04	42
AHU 2.5	425.3	1425.6	12.13	178
AHU 2.6	387.5	463.8	41.50	0
AHU 2.7	274.1	365	14.80	8
AHU 2.8	220.9	230.5	37.04	0
AHU 2.9	187.8	306.1	22.80	49
AHU 2.10	239	251.6	21.95	24
AHU 2.11	16.5	152.7	0.44	0
AHU 2.12	25.3	250	4.63	36
AHU 3.1	512.3	867.1	95.07	46
AHU 3.2	93.9	397.3	11.87	24
AHU 9.1	348.1	516	46.25	41
FCU 2.1	10.4	24	3.08	4
FCU 3.1	55.6	24	4.98	4
FCU 6.1	53.5	12	6.71	2
FCU 6.2	36.1	24	4.07	4
FCU 9.1	56.2	24	5.16	4

Table A-11: TRANE calculated peaks vs. scheduled equipment for guestroom spaces.

Red highlight means that the scheduled equipment is sized over 10% more of what the calculated peak is. Blue highlight means that the scheduled equipment is sized under 10% less than what the calculated peak is.

ROOM	COOLING COIL PEAK (MBH)	SCHEDULED COOLING COIL PEAK (MBH)	HEATING COIL PEAK (KW)	SCHEDULED (KW)
EXS-1 EAST	7.9	16.2	1.06	3
EXS-1 WEST	7.7	16.2	1.06	3
EXS-2 EAST	7.6	16.2	1.06	3
EXS-2 WEST	10.8	16.2	1.85	3
EXS-3 EAST	7.9	16.2	1.06	3
EXS-3 WEST	9.9	16.2	1.44	3
K/QQ 0	8.9	16.2	1.06	3

K/QQ 165	7.8	16.2	1.06	3
K/QQ 180	7.7	16.2	1.06	3
K/QQ 75	5.6	16.2	1.03	3
K1	10.1	16.2	1.49	3
K2	17.5	19.4	2.75	3
LXS-1 CENTRAL	20.8	17.3	3.37	3
LXS-1 N	20.8	17.3	3.37	3
LXS-1 S	21.8	17.3	3.99	3
LXS-2 CENTRAL	7.7	16.2	1.06	3
LXS-2 EAST	7.8	16.2	1.06	3
LSX-2 WEST	7.9	16.2	1.06	3
LXS-3 CENTRAL	7.2	16.2	0.97	3
LXS-3 EAST	10.7	16.2	2.23	3
LSX-3 WEST	8.8	16.2	1.41	3
PS TOTAL	53.5	75.9	9.55	13
PS CENTRAL	16.2	24	1.11	4
PS EAST	8.1	17.3	1.06	3
PS NORTH	7.9	17.3	3.46	3
PS WEST	21.3	17.3	3.93	3