University Medical Center at Princeton

Princeton, NJ

Technical Report One

ASHRAE Standards 62.1-2007
and 90.1-2007

Prepared by: Timothy Berteotti

Prepared for: Dr. Stephen Treado

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Executive Summary

The University Medical Center at Princeton located in Princeton NJ, is a new hospital designed to provide state-of-the-art medical care and assistance to its patients while consuming as little energy as possible The scope of this analysis is for the 6+1 story patient tower. Through analysis of ASHRAE standard 62.1 it was found that the UMCP is fully compliant with respects to natural ventilation system controls and materials. Through the analysis of ASHRAE standard 90.1 UMCP was not as compliant. All of the AHU fan motors exceed the prescribed horse power per CFM as did many of the exhaust fans. This can be attributed to the use of HEPA filters on all of the supply air lines as well as many of the exhaust lines to create a very clean and healthy interior environment. Many of the building spaces also exceeded the prescribed lighting power density. This could be to create a more alive and secure feeling while in those spaces that can often be very dismal and upsetting.

Building Overview

The University Medical Center of Princeton Replacement Hospital is a new 639,000 square foot state of the art faciltiy located in Plainsboro, New Jersey. It is to be part of a 171 acre healthcare campus located conveniently off of US route 1. The new faciltiy is being built to fullfill furutre ocupancy needs anticipated by the University Medical Center ofPrinceton. The main patient tower consists of 269 single bed rooms within its six floors along with state-of-the-art treatment and tesing equipment.

The facility is designed and built with the latest and strictest codes required for the Plainsboro, NJ area. Some of the included codes are the 2006 New Jersey Edition of the IBC, the 2005 edition of the National Electric Code, the ASHRAE 90.1 2004 Commercial Energy Code, the 2006 International Energy Conservation Code, and much more. The building is being constructed in a zone that was once considered I-100 Limited Industrial. However, this is changing now that the area will be a health facility rather than the FMC (previous owner) industrial plant.

The mechanical system is large and tailored to provide clean air to all locations as well as allow for personal comfort. It consists of 17 large AHUs that provide 100 percent outside air to the entire building. Chilled water is supplied from the CUP for cooling and humidity control. Each patient room and all of the major areas of the building have their own VAV boxes with hot water reheat provided from heat exchanging using steam from the CUP. Each patient has the ability to control the temperature in their own room to make it most comfortable for the patient. The filtering system for the majority of the hospital consists of merv 14 filters along with a UV sanitizing system.

ASHRAE 62.1-2007
Section 5

5.1 Natural Ventilation
The University Medical Center at Princeton (UMCP) has a mechanically designed natural ventilation system; therefore this section does not apply.

5.2 Ventilation Air Distribution
UMCP's mechanical ventilation system has proper controls to properly balance the air flow through each CAV and CAV boxes. The percent minimum outside air required for each space is listed in schedules found in the construction documents. These values have been found to comply with section 6 of standard 62.1.

5.3 Exhaust Duct Location
All exhaust air at UMCP is sucked through the ductwork from the roof thus creating a negative pressure in the duct relative to the building interior. This is in compliance with this standard.

5.4 Ventilation System Controls
All public spaces have a CAV box that is set to provide adequate air for cooling and ventilation. Air provided to these spaces is conditioned with adequate ventilation air as per section 6.

Each patient room in UMCP has an individually controlled VAV box with an appropriate minimum turn down for ventilation requirement. All medical spaces are provided with air via a CAV box that is properly balanced for adequate cooling. These areas are provided with 100 percent outside air, therefore meeting any ventilation requirement that falls within the cooling requirements of the space.

Therefore both types of spaces in UMCP are compliant to this section.

5.5 Air Stream Surfaces
All ductwork in UMCP is to comply with CADCA's ARC-2006 standard as a comparable method for mold resistance. The duct work must also comply with UL181 as well as SMACNA's "HVAC Duct Construction Standards- Metal and Fabrication" for materials and construction. UMCP is therefore compliant with section 5.5.

5.6 Outdoor Air Intakes
On UMCP, the roof exhaust fan discharge hood is at a 45 degree angle down, therefore there is no minimum separation distance required as per table 5-1 in ASHRAE 62.1. One return air exhaust vent is located on the first floor of the North wall of the bed tower directing the air an opposite direction than the air intake located on the West wall around the corner. Each rooftop AHU on UMCP has a triple layer roof protecting it from the elements. The louvers are to be tested in accordance with the AMCA 500-L wind driven test. Each air intake must have an

aluminum ½ inch mesh to prevent birds from nesting, as well as an access door for snow removal.

5.7 Local Capture of Contaminants

All possible areas of contamination (labs, imaging rooms, etc.) are exhausted directly to the roof to prevent recirculation within UMCP.

5.8 Combustion Air

Fume hoods are to be placed in the kitchen area where there are combustible gases used in cooking equipment. These fumes are exhausted directly outside through roof top exhaust fans. Therefor UMCP is compliant with this section.

5.9 Particulate Matter Removal

UMCP is designed with merv 6 filters are used for pre-filters as in compliance with ARI850.

5.10 Dehumidification System

Humidity within the University Medical Center at Princeton is controlled by the cooling coils within the cooling system. The system is designed to create 50% relative humidity at 74 degrees Fahrenheit. The air is then reheated accordingly in the CAV and VAV boxes before it enters the space.

5.11 Drain Pans

Drain pans are to be located at a low point of each coil within each AHU. Each drain pan is to be made of 16 gage 304 stainless steel. This design is in compliance with this ASHRAE standard.

5.12 Finned Tube Coils and Heat Exchangers

UMCP is designed to have drain pans are located under each steam humidifier. Also the coils in every AHU are to be at least 18 inches apart to allow access for cleaning as in compliance with this section.

5.13 Humidity and Water-Spray Systems

All water used in the steam humidification systems will be of a potable source. There will be no obstruction for a distance equal to or great than the absorption distance. Each humidifier is placed in the AHU prior to being conditioned by the coils. These coils are designed with drain pans as in compliance with section 5.11. Therefore the UMCP is in compliance with section 5.13.

5.14 Access for Inspection, Cleaning, and Maintenance

The UMCP is compliant with this section of ASHRAE standard 62.1. All equipment is designed with adequate clearance for access and maintenance. Each AHU is to have a direct access door, which is to open again high pressure and must be properly sealed.

5.15 Building Envelope and Interior Surfaces

The below grade walls of the UMCP consist of a waterproofing membrane and drainage panel. Above grade brick cavity walls are designed with a waterproofing membrane as well. The glass curtain wall on the south façade is designed to adequately resist moister. All duct work and plumbing is to be encased with appropriate insulation and constructed to prevent condensation.

5.16 Buildings with Attached Parking Garages

The University Medical Center at Princeton does not have an attached parking garage; therefore this section is not applicable.

5.17 Air Classification and Recirculation

The general administration and teaching rooms are considered class one and have recirculated air. This return air supplies a common return air duct to all three AHU in the lower level and is not re-designated. The excess air is then exhausted to the environment through a spill on the first floor. The kitchen is considered to be class three and four. All of the exhaust air from this space exits to the environment through the roof. Patient, operating, imaging, and all other rooms on the second through sixth floor are classified as class two and have dedicated exhaust systems. UMCP therefore complies with section 5.17.

5.18 Requirements for buildings containing ETS area and ETS free area

The UMCP is an entirely smoke free environment; therefore this section is not applicable.

Section 6

6.2 Ventilation Rate Procedure

The University Medical Center at Princeton complies with the minimum ventilation requirements specified in this section using the ventilation rate procedure. The analysis for this section was completed only for AHU 1,2 and 4; these air handlers are the only ones that recirculate air from the building. The remaining AHUs are 100 percent outside air, therefore they will meet the ventilation requirements by meeting the cooling load requirements. Below in table 1 is a summary of the findings for the analyzed air handling units.

AHU	Calculated Ventilation Requirement	Designed Maximum ventilation
1	22%	25%
2	25%	50%
4	18%	40%

Table 1. Percent OA Summary

The mechanical drawings of the UMCP list a “Maximum Outside Air” as can be seen in table 1 as “Designed Maximum Ventilation”. When completing this analysis, it was decided that if the required ventilation was less than or equal to the Maximum Outside Air, then the air handler is compliant; air handlers 1,2 and 4 are therefore compliant.

To calculate the required ventilation the following formulas from ASHRAE standard 62.1 section 6.2 were used within and excel workbook. The calculation spread sheet for all three air handlers can be found in index A.

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

Where: A_z = zone floor area
P_z = zone population
R_p = outdoor airflow rate required per person
R_a = outdoor airflow rate required per unit area

The values for R_p and R_a are defined in ASHRAE standard 62.1-2007 Table 6-1.

Zone Outdoor Airflow $V_{oz} = V_{bz}/E_z$ (eq. 6-2)

The value for zone air distribution effectiveness is defined in ASHRAE standard 62.1-2007 table 6-2.

Primary Outdoor Air Fraction $Z_p = V_{oz}/V_{pz}$ (eq. 6-5)

The value V_{pz} is the zone primary airflow

See ASHRAE table 6-3 for the values of E_v, The system ventilation efficiency.

The exhaust rates within University Medical Center at Princeton are compliant as well. Table 2 below demonstrates the exhaust rate per unit area of the commercial kitchen located on the lower level of the bed tower. As can be seen, the kitchen is very well ventilated.

Kitchen Area (ft^2)	Exhaust CFM	Calculated Exhaust rate (CFM/ft^2)	Minimu required exhuast rate (CFM/ft^2)
3234	12000	3.7	0.7

Table 2. Ventilation Exhaust

The indoor air quality is to be measured upon completion of construction and is specified to use HEPA filters with 99.97 percent collection efficiency for 0.3-micron size or greater particles. Therefore the system design is compliant with ASHRAE standard 62.1 section 6.2.

ASHRAE 62.1-2007 Summary

The University Medical Center at Princeton complies with the standards specified in ASHRAE 62.1. The building is specified to provide adequate, clean air to all spaces with more than the minimum required ventilation air to create a clean environment within the building. The spaces of possible contamination (labs, patient rooms, operating rooms, etc) are exhausted and resupplied with 100 percent outside air to prevent the spread of bacteria and disease. The mechanical equipment is designed with proper drainage and access. Each AHU and exhaust fan is accessible for maintenance and repairs both inside and outside the building. The exhaust rates for the kitchen, decontamination area, and imaging rooms all comply with the minimum exhaust rates as specified in this standard. Overall, UMCP is designed to not only comply with this standard but also to aid in the health and recovery of its patients.

ASHRAE 90.1-2007
Section 5

5.1 Space-Conditioning Categories

The University Medical Center at Princeton located in Princeton, NJ is designated as zone 4A. This can be found using the Image-1 below or referencing table B-1 in the ASHRAE 90.1 publication.

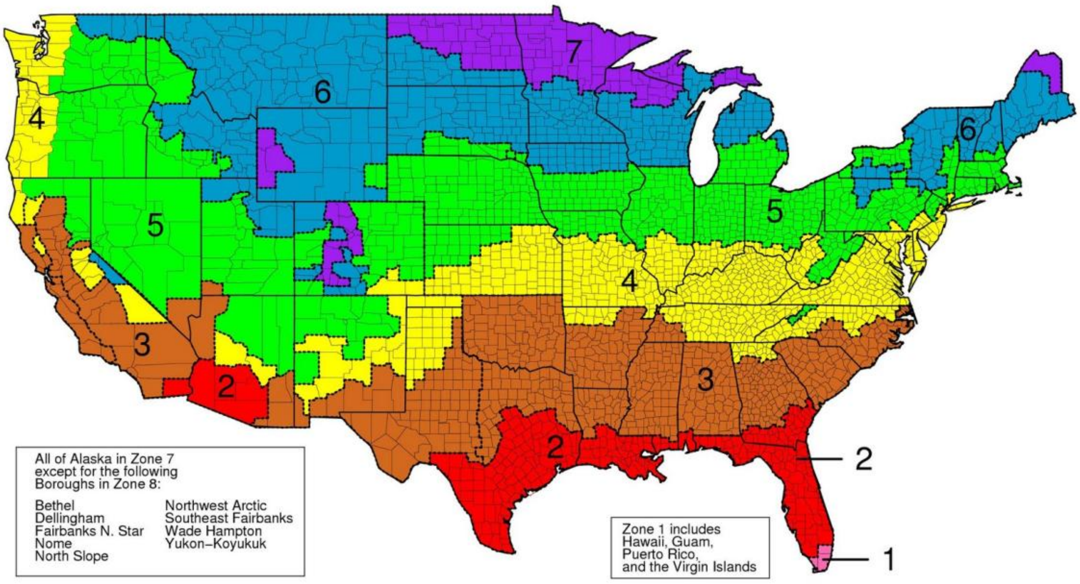

Image 1. Climate Zone Map (www.blogspot.com)

5.4 Mandatory Provisions

The UMCP's curtain walls are designed to prevent water infiltration using various membranes, flashing and sealants. The building is also designed with a vestibule located at both ends of the concourse. These vestibules will help prevent the infiltration of unconditioned air.

5.5 Prescriptive Building Envelope Option

The University Medical Center at Princeton has specific specifications for the thermal properties of all materials. Table 3 below give a summary of the R_{total} and $U_{Factors}$ both designed and required for various wall types, roof, and slab on grade.

Description	Design Specification		Required		Compliance
	Insulation R-value	Assembly U_{Factor}	Insulation Min R_{total}	Assembly Max U_{Factor}	
Brick on Metal Stud	12	0.039	0.4	0.5	Yes
Glass Curtain Wall	4	0.13	0.4	0.5	Yes
Roof assembly	10	0.094	20	0.048	NO
Below Grade Wall	10	0.086	NR	1.14	Yes

Table 3. Building Envelope Requirements

The majority of the building envelope designs are compliant with this standard. The roof assembly, however, is not. This calculation could be flawed. The thickness used for the rigid insulation that sits on top of the concrete roof deck was assumed as the minimum thickness of two inches. This only occurs at the drain locations and may skew the results giving a lower R-value than is actually present.

Section 6

The building fenestration is summarized in table 4. It can be seen that the University Medical Center at Princeton does not comply with the 40 percent or less fenestration area. The large percentage is because of the south curtain wall. This curtain wall is designed to provide an adequate U_{Factor} that is below the maximum allowed as shown in Table 3.

Fenestration Area (ft2)	Gross Wall Area (ft2)	Percent Fenestation	Allowable Percent Fenestration
78,871	122,478	64%	40%

Table 4. Fenestration Percent

6.2 Compliance Path

The UMCP must use the mandatory provisions approach as described in section 6.4 of this standard to comply with this section.

6.4 Mandatory Provision Approach

The UMCP is provided with chilled water and high pressure steam from a central utility plant located on the health campus. Although this is being constructed simultaneously with the hospital, it is outside of the scope of this project; therefore equipment efficiencies are not applicable.

Each patient room in the bed tower is to be provided with a thermostat to control the temperature as to the patients liking. The common spaces throughout the hospital are supplied through CAV boxes that are set to provide conditioned air to maintain a dry bulb temperature of 74 degrees fahrenheit. All stair and elevator shafts are ventilated and contain controls that are to open during a fire or smoke alarm. Upon the sense of fire or smoke, smoke dampers within the return air ducts that are to close and the supply fans are to shut down while keeping the exhaust fans running. At this time the chilled water valve will become fully open supplying the cooling coil.

All ductwork within the hospital is to be tested for leakage compliance. Each duct must be sealed as specified in the specifications for each class (A,B, and C) of ductwork. The leakage test is to be performed and analyzed as prescribed in section 6.4.4.2 of the ASHRAE 90.1-2007 standard.

6.5 Fan Power Limitations

This section analyzed the power consumption of all building fans in units of horse power per CFM. A summary of the count of compliant and non-compliant fan motors is shown as table 5. This count is separated into AHU motors and fan motors. A detailed list of motors and their values can be found in appendix B at the end of this report.

	Compliant	Non-Compliant
AHU Motors	0	18
Fan Motors	19	21

Table 5. Power Check Compliance Count

All of the air handling units exceed the limit of horse power per CFM as calculated using the equation hp < CFM * 0.0011. The reason for this can be found in the fact that this building contains HEPA filters on all supply air ducts to increase the indoor air quality. These filters create a very large pressure drop that must be overcome by using much more powerful fan units. The fan motors listed consist mainly of exhaust fans located in various areas throughout the bed tower. Almost half of these fans are compliant to this standard. Again the likely reason for the large number of non-compliant fan motors is the use of HEPA and other high pressure drop filters used to clean the exhaust air before releasing it to the environment.

Section 7

7.1 Water Heating

The University Medical Center at Princeton contains no combustion equipment to produce hot water. Instead, the Central Utility Plant located on the health campus provides high pressure steam (120 psi) which is reduced and then used in heat exchangers to produce hot water for building use. This section is therefore not applicable to this scope.

Section 8

The University Medical Center at Princeton is specified to comply with the National Electric Code. This code specifies that voltage drop in all risers must not exceed 2 percent and the voltage drop in all branch circuits must not exceed 3 percent. This standard in comparable to section 8 of ASHRAE standard 90.1-2007; therefore the UMCP is compliant.

Section 9

9.4 Mandatory Provisions

Each patient room consists of individual control of each lighting group within the room. All of the storage rooms and closets have occupancy sensors wired into the lighting control so auto shut off lights when the space is not being used. The majority of hallways and lobbies are switched at the breaker and are designed to be left on continuously.

9.5 Building Area Method Compliance

Because of the size of the building and the repetition of rooms from floor to floor, this method was not used to check lighting density. Instead see section 9.6 for the spacy-by-space method.

9.6 Space-by-Space method

The University Medical Center at Princeton contains a very repetitive floor plan as well as a large number of rooms. To simplify the lighting density calculation, a random sample of rooms were selected from levels L through 4. Floors five and six were ignored as they are identical copies to level 4. A summary count of compliant and non-compliant rooms is provided as a quick summary in Table 6. The full analysis performed is available in Appendix C at the end of this report.

Lighting Power Density by Space		
	Compliant	Non-Compliant
Number of Spaces	27	19

Table 6. Lighting Power Density Compliance Count

About half of spaces analyzed are compliant with the values given in ASHRAE 90.1-2007 Table 9.6.1. The non-compliant spaces were the Private Patient Room, Family Respite, Elevator Lobby, and Hold/Recovery etc. The commonality between these spaces is the type of patients, visitors, doctors, and staff will be using these spaces for many hours and/or at very late hours in the night. Because of the prolonged use of these spaces, they may have been designed to provide extra light to make the space seem very alive and awake. This design could also have been to help provide a sense of security for visitors still in the hospital late at night. The non-compliant rooms are highlighted in grey in Appendix C for easy finding. This sample of 36 rooms can be considered a good representation of the entire building because of the repetition of these spaces.

ASHRAE 90.1-2007 Summary

The University Medical Center at Princeton may not comply with all of the prescribed requirements of this section; however it has justifications for these designs as to comply with other requirements of the building. The air handling units have oversized motors as compared to the CFM to compensate for the large pressure drop created by the HEPA filters. The chilled water and high pressure steam are created at a central utility plant on the campus and provides adequate supplies of both to meet any demands of the buildings. The wiring design and installation is to comply with the National Electric Code as comparable to the ASHRAE standard. The lighting power density of the all the spaces within the building can be assumed to have very similar results to the ones analyzes due to the repetition of spaces. UMCP is designed with energy conservation in mind as well as providing a superior environment.

Appendix A

Building:	**UMCP**								
System Tag/Name:	**AHU 1**								
Operating Condition Description:	**Peak Cooling Load**								
Units (select from pull-down list)	**IP**								
Inputs for System	**Name**	**Units**		**System**					
Floor area served by system	As	sf		21054					
Population of area served by system (including diversity)	Ps	P	100% diversity	1,496					
Design primary supply fan airflow rate	Vpsd	cfm		58,410					
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.08					
OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.6					
Inputs for Potentially Critical zones					**Potentially Critical Zones**				
Zone Name			*Zone title turns purple italic for critical zone(s)*		**West Lobby**	**East Lobby**	**Corridor**	***Dinning Hall***	**Concourse**
Zone Tag							**T-1017**	**T-1116**	**T-1001**
Space type			Select from pull-down list		**Lobbies**	**Lobbies**	**Corridors**	**Cafeteria/fast-food dining**	**Corridors**
Floor Area of zone	Az	sf			4,933	2640	556	3600	9325
Design population of zone	Pz	P	(default value listed; may be overridden)		739.95	396	0	360	0
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			23,140	16960	800	8510	9000
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?			Select from pull-down list or leave blank if N/A		ITU	ITU	ITU	ITU	ITU
Local recirc. air % representative of ave system return air	Er				75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed									
Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	100%	100%	100%	100%
Air distribution type at conditioned analyzed			Select from pull-down list		CS	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				100%	100%	100%	100%	100%
Results									
Ventilation System Efficiency	Ev			**0.78**					
Outdoor air intake required for system	Vot	cfm		**12932**					
Outdoor air per unit floor area	Vot/As	cfm/sf		**0.61**					
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		**8.6**					
Outdoor air as a % of design primary supply air	Ypd	cfm		**22%**					
Detailed Calculations									
Initial Calculations for the System as a whole									
Primary supply air flow to system at conditioned analyzed	Vps	cfm	= VpdDs =	58410					
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As =	10075					
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps =	0.17					
Initial Calculations for individual zones									
OA rate per unit area for zone	Raz	cfm/sf			0.06	0.06	0.06	0.18	0.06
OA rate per person	Rpz	cfm/p			5.00	5.00	0.00	7.50	0.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm			23140	16960	800	8510	9000
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az =		3995.7	2138.4	33.4	3348.0	559.5
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez =		3996	2138	33	3348	560
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 =		0.17	0.13	0.04	0.39	0.06
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz =		0.17	0.13	0.04	0.39	0.06
System Ventilation Efficiency									
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa =		1.00	1.05	1.13	0.78	1.11
System Ventilation Efficiency (App A Method)	Ev		= min (Evz) =	**0.78**					
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3 =	0.76					
Minimum outdoor air intake airflow									
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev =	**12932**					
OA intake req'd as a fraction of primary SA	Y		= Vot / Vps =	**0.22**					
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev =	13316					
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps =	0.23					
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:	UMCP													
System Tag/Name:	AHU 1													
Operating Condition Description:	Peak Cooling Load													
Units (select from pull-down list)	IP													
Inputs for System	**Name**	**Units**		**System**										
Floor area served by system	As	sf		11299										
Population of area served by system (including diversity)	Ps	P	100% diversity	178										
Design primary supply fan airflow rate	Vpsd	cfm		15,050										
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.15										
OA req'd per person for system area (Weighted average)	Rps	cfm/p		7.0										
Inputs for Potentially Critical zones														**Potentially C**
Zone Name			*Zone title turns purple italic for critical zone(s)*		Offices	*Conference*	EKG/Holt	Cor/Storage	Cardiac Rehab	Work Area	Exam Room	Meds Storage	EEG	Electrode Attach
Zone Tag					T.1129, T.1111		T.1134		D.1231					
Space type			Select from pull-down list		Office space	Conference/meeting	University/college laboratories	Storage rooms	Daycare sickroom	University/college laboratories	Bank vaults/safe deposit	Pharmacy (prep. area)	Pharmacy (prep. area)	Pharmacy (prep. area)
Floor Area of zone	Az	sf			170	593	132	286	910	657	372	404	504	488
Design population of zone	Pz	P	(default value listed; may be overridden)		0.85	29.65	3.3	0	22.75	16.425	1.86	4.04	5.04	4.88
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			450	440	440	1310	1310	730	650	610	560	720
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?			Select from pull-down list or leave blank if N/A		ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU
Local recirc. air % representative of ave system return air	Er				75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed														
Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	100%	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	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				100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Results														
Ventilation System Efficiency	Ev			**0.78**										
Outdoor air intake required for system	Vot	cfm		**3765**										
Outdoor air per unit floor area	Vot/As	cfm/sf		**0.33**										
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		**21.1**										
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 =	15050										
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As =	2923										
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps =	0.19										
Initial Calculations for individual zones														
OA rate per unit area for zone	Raz	cfm/sf			0.06	0.06	0.18	0.12	0.18	0.18	0.06	0.18	0.18	0.18
OA rate per person	Rpz	cfm/p			5.00	5.00	10.00	0.00	10.00	10.00	5.00	5.00	5.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm			450	440	440	1310	1310	730	650	610	560	720
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az =		14.5	183.8	56.8	34.3	391.3	282.5	31.6	92.9	115.9	112.2
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez =		14	184	57	34	391	283	32	93	116	112
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	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	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	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz =		0.03	0.42	0.13	0.03	0.30	0.39	0.05	0.15	0.21	0.16
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz =		0.03	0.42	0.13	0.03	0.30	0.39	0.05	0.15	0.21	0.16
System Ventilation Efficiency														
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa =		1.16	0.78	1.07	1.17	0.90	0.81	1.15	1.04	0.99	1.04
System Ventilation Efficiency (App A Method)	Ev		= min (Evz) =	**0.78**										
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3 =	0.73										
Minimum outdoor air intake airflow														
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev =	**3765**										
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 =	3992										
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps =	0.27										
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 =	4										

Building:	UMCP
System Tag/Name:	AHU 1
Operating Condition Description:	Peak Cooling Load
Units (select from pull-down list)	IP

Item	Name	Units	Formula	System	Echo	EKG Work/Cardio	Phlabotomy	Work Area	Nurse Interview	X-Ray	Corridor/Elevator Lobby	Nurse Interview	Stress Test	Office
Inputs for System	**Name**	**Units**		**System**										
Floor area served by system	As	sf		11299										
Population of area served by system (including diversity)	Ps	P	100% diversity	178										
Design primary supply fan airflow rate	Vpsd	cfm		15,050										
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.15										
OA req'd per person for system area (Weighted average)	Rps	cfm/p		7.0										
Inputs for Potentially Critical zones				ritical Zones										
Zone Name			*Zone title turns purple italic for critical zone(s)*		Echo	EKG Work/Cardio	Phlabotomy	Work Area	Nurse Interview	X-Ray	Corridor/Elevator Lobby	Nurse Interview	Stress Test	Office
Zone Tag														
Space type		Select from pull-down list			Pharmacy (prep. area)	Pharmacy (prep. area)	University/college laboratories	Pharmacy (prep. area)	Pharmacy (prep. area)	Pharmacy (prep. area)	Lobbies/prefunction	Pharmacy (prep. area)	Pharmacy (prep. area)	Office space
Floor Area of zone	Az	sf			569	740	652	837	400	230	824	648	995	888
Design population of zone	Pz	P	(default value listed; may be overridden)		5.69	7.4	16.3	8.37	4	2.3	24.72	6.48	9.95	4.44
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			1310	440	830	880	900	420	700	700	980	670
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A			ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU
Local recirc. air % representative of ave system return air	Er				75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed														
Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	100%	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	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				100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Results														
Ventilation System Efficiency	Ev			**0.78**										
Outdoor air intake required for system	Vot	cfm		**3765**										
Outdoor air per unit floor area	Vot/As	cfm/sf		**0.33**										
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		**21.1**										
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 =	15050										
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As =	2923										
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps =	0.19										
Initial Calculations for individual zones														
OA rate per unit area for zone	Raz	cfm/sf			0.18	0.18	0.18	0.18	0.18	0.18	0.06	0.18	0.18	0.06
OA rate per person	Rpz	cfm/p			5.00	5.00	10.00	5.00	5.00	5.00	7.50	5.00	5.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm			1310	440	830	880	900	420	700	700	980	670
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az =		130.9	170.2	280.4	192.5	92.0	52.9	234.8	149.0	228.9	75.5
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez =		131	170	280	193	92	53	235	149	229	75
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	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	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	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz =		0.10	0.39	0.34	0.22	0.10	0.13	0.34	0.21	0.23	0.11
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz =		0.10	0.39	0.34	0.22	0.10	0.13	0.34	0.21	0.23	0.11
System Ventilation Efficiency														
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa =		1.09	0.81	0.86	0.98	1.09	1.07	0.86	0.98	0.96	1.08
System Ventilation Efficiency (App A Method)	Ev		= min (Evz) =	**0.78**										
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3 =	0.73										
Minimum outdoor air intake airflow														
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev =	**3765**										
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 =	3992										
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps =	0.27										
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 =	4										

Building:	UMCP	
System Tag/Name:	AHU 1	
Operating Condition Description:	Peak Cooling Load	
Units (select from pull-down list)	IP	

	Name	Units			System	Work Areas	Narc. Vault	IV Rooms	Break Room	Plumbing	Offices	Wood Shop	Welding/Electric	Offices	Locker Rooms
Inputs for System															
Floor area served by system	As	sf			23035										
Population of area served by system (including diversity)	Ps	P	100% diversity		286										
Design primary supply fan airflow rate	Vpsd	cfm			35,730										
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf			0.11										
OA req'd per person for system area (Weighted average)	Rps	cfm/p			6.6										
Inputs for Potentially Critical zones						Potentially Critical Z									
Zone Name			*Zone title turns purple italic for critical zone(s)*			Work Areas	Narc. Vault	IV Rooms	Break Room	Plumbing	Offices	Wood Shop	Welding/Electric	Offices	Locker Rooms
Zone Tag															
Space type			Select from pull-down list			Libraries	Pharmacy (prep. area)	Pharmacy (prep. area)	Break rooms	Storage rooms	Office space	Wood/metal shop	Wood/metal shop	Office space	Laundry rooms, central
Floor Area of zone	Az	sf				4,557	465	1088	858	2572	880	790	2230	678	670
Design population of zone	Pz	P	(default value listed; may be overridden)			45.57	4.65	10.88	21.45	0	4.4	15.8	44.6	3.39	6.7
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm				12,070	800	3650	900	2000	1090	1000	2430	730	720
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?			Select from pull-down list or leave blank if N/A			ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU
Local recirc. air % representative of ave system return air	Er					75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed															
Percent of total design airflow rate at conditioned analyzed	Ds	%			100%	100%	100%	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	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					100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Results															
Ventilation System Efficiency	Ev				**0.70**										
Outdoor air intake required for system	Vot	cfm			**6361**										
Outdoor air per unit floor area	Vot/As	cfm/sf			**0.28**										
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p			**22.3**										
Outdoor air as a % of design primary supply air	Ypd	cfm			**18%**										
Detailed Calculations															
Initial Calculations for the System as a whole															
Primary supply air flow to system at conditioned analyzed	Vps	cfm	= VpdDs	=	35730										
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As	=	4421										
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps	=	0.12										
Initial Calculations for individual zones															
OA rate per unit area for zone	Raz	cfm/sf				0.12	0.18	0.18	0.06	0.12	0.06	0.18	0.18	0.06	0.12
OA rate per person	Rpz	cfm/p				5.00	5.00	5.00	5.00	0.00	5.00	10.00	10.00	5.00	5.00
Total supply air to zone (at condition being analyzed)	Vdz	cfm				12070	800	3650	900	2000	1090	1000	2430	730	720
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az	=		774.7	107.0	250.2	158.7	308.6	74.8	300.2	847.4	57.6	113.9
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez	=		775	107	250	159	309	75	300	847	58	114
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	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	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	1.00	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz	=		0.06	0.13	0.07	0.18	0.15	0.07	0.30	0.35	0.08	0.16
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz	=		0.06	0.13	0.07	0.18	0.15	0.07	0.30	0.35	0.08	0.16
System Ventilation Efficiency															
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa	=		1.06	0.99	1.06	0.95	0.97	1.06	0.82	0.78	1.04	0.97
System Ventilation Efficiency (App A Method)	Ev		= min (Evz)	=	**0.70**										
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3	=	0.72										
Minimum outdoor air intake airflow															
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev	=	**6361**										
OA intake req'd as a fraction of primary SA	Y		= Vot / Vps	=	**0.18**										
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev	=	6129	**231.51**									
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps	=	0.17	**0.04**									
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	=	-23										

Building:	UMCP												
System Tag/Name:	AHU 1												
Operating Condition Description:	Peak Cooling Load												
Units (select from pull-down list)	IP												
Inputs for System	**Name**	**Units**		**System**									
Floor area served by system	As	sf		23035									
Population of area served by system (including diversity)	Ps	P	100% diversity	286									
Design primary supply fan airflow rate	Vpsd	cfm		35,730									
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.11									
OA req'd per person for system area (Weighted average)	Rps	cfm/p		6.6									
Inputs for Potentially Critical zones					ones								
Zone Name			*Zone title turns purple italic for critical zone(s)*		Offices	Storage/Bed Repair	Offices/Work Area	Break Room	Conference/Trash	Cart Hold	Corridor	*Elevator Lobbies*	Vestibule
Zone Tag													
Space type			Select from pull-down list		Office space	Storage rooms	Office space	Break rooms	Conference/meeting	Storage rooms	Corridors	Lobbies/prefunction	Lobbies/prefunction
Floor Area of zone	Az	sf			912	1858	1315	370	1018	636	239	1143	756
Design population of zone	Pz	P	(default value listed; may be overridden)		4.56	0	6.575	9.25	50.9	0	0	34.29	22.68
Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			1440	1730	1500	320	1690	1600	440	760	860
Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?			Select from pull-down list or leave blank if N/A		ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU	ITU
Local recirc. air % representative of ave system return air	Er				75%	75%	75%	75%	75%	75%	75%	75%	75%
Inputs for Operating Condition Analyzed													
Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	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	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
Primary air fraction of supply air at conditioned analyzed	Ep				100%	100%	100%	100%	100%	100%	100%	100%	100%
Results													
Ventilation System Efficiency	Ev			0.70									
Outdoor air intake required for system	Vot	cfm		6361									
Outdoor air per unit floor area	Vot/As	cfm/sf		0.28									
Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		22.3									
Outdoor air as a % of design primary supply air	Ypd	cfm		18%									
Detailed Calculations													
Initial Calculations for the System as a whole													
Primary supply air flow to system at conditioned analyzed	Vps	cfm	= VpdDs =	35730									
UncorrectedOA requirement for system	Vou	cfm	= Rps Ps + Ras As =	4421									
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps =	0.12									
Initial Calculations for individual zones													
OA rate per unit area for zone	Raz	cfm/sf			0.06	0.12	0.06	0.06	0.06	0.12	0.06	0.06	0.06
OA rate per person	Rpz	cfm/p			5.00	0.00	5.00	5.00	5.00	0.00	0.00	7.50	7.50
Total supply air to zone (at condition being analyzed)	Vdz	cfm			1440	1730	1500	320	1690	1600	440	760	860
Unused OA req'd to breathing zone	Vbz	cfm	= Rpz Pz + Raz Az =		77.5	223.0	111.8	68.5	315.6	76.3	14.3	325.8	215.5
Unused OA requirement for zone	Voz	cfm	= Vbz/Ez =		78	223	112	68	316	76	14	326	215
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	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	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	1.00	1.00
Unused OA fraction required in supply air to zone	Zd		= Voz / Vdz =		0.05	0.13	0.07	0.21	0.19	0.05	0.03	0.43	0.25
Unused OA fraction required in primary air to zone	Zp		= Voz / Vpz =		0.05	0.13	0.07	0.21	0.19	0.05	0.03	0.43	0.25
System Ventilation Efficiency													
Zone Ventilation Efficiency (App A Method)	Evz		= (Fa + FbXs - FcZ) / Fa =		1.07	0.99	1.05	0.91	0.94	1.08	1.09	0.70	0.87
System Ventilation Efficiency (App A Method)	Ev		= min (Evz) =	0.70									
Ventilation System Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3 =	0.72									
Minimum outdoor air intake airflow													
Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev =	6361									
OA intake req'd as a fraction of primary SA	Y		= Vot / Vps =	0.18									
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev =	6129									
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps =	0.17									
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 =	-23									

Appendix B

AHU Fan Power Check				
AHU	Total CFM	HP	Calculated hp allowance	Compliance
1	60000	125	66	No
2	35000	75	38.5	No
3	45000	100	49.5	No
4	33000	75	36.3	No
5	35000	100	38.5	No
6	60000	200	66	No
7	46000	100	50.6	No
8	50000	150	55	No
9	35000	100	38.5	No
10	42000	100	46.2	No
11	50000	125	55	No
12	30000	75	33	No
13	30000	75	33	No
14	20000	75	22	No
MUA 1	22000	40	24.2	No
15	40000	100	44	No
16	40000	100	44	No
17	20000	30	22	No

Fan Schedule				
Fan	Total CFM	hp	Calculated hp Allowance	Compliance
RF-1	58000	50	63.8	Yes
RF-2	27000	20	29.7	Yes
RF-3	32000	30	35.2	Yes
RF-4	30000	25	33	Yes
TX-1	11400	15	12.54	No
TX-2	6200	7.5	6.82	No
TX-3	10000	10	11	Yes
TX-4	7700	7.5	8.47	Yes
TX-5	15000	15	16.5	Yes
TX-6	16000	15	17.6	Yes
GX-1	2000	3	2.2	No
GX-2	7400	7.5	8.14	Yes
GX-3	2700	3	2.97	No
GX-4	4500	5	4.95	No
GX-5	4000	5	4.4	No
GX-6	7000	7.5	7.7	Yes
GX-7	7000	7.5	7.7	Yes
GX-8	3000	3	3.3	Yes
GX-9	500	2	0.55	No
IX-1	4000	7.5	4.4	No
IX-2	1200	1	1.32	Yes
SP-1	12000	7.5	13.2	Yes
SP-2	18000	10	19.8	Yes
SP-3	12000	7.5	13.2	Yes
Kx-1	12000	20	13.2	No
KX-2	6500	10	7.15	No
KX-3	4650	5	5.115	Yes
GX-10	7000	15	7.7	No
GX-11	4000	5	4.4	No
GX-12	4000	5	4.4	No
GX-13	4000	5	4.4	No
IX-3	6000	7.5	6.6	No
FX1	4000	5	4.4	No
FX2	600	1	0.66	No
FX-3	600	1	0.66	No
GX14	500	2	0.55	No
IX-4	2000	3	2.2	No
BF01	2000	1.5	2.2	Yes
VX-1	1000	1	1.1	Yes
FX-4	100	0.33	0.11	No

Appendix C

Location	Fixture	Number	Area	wattage	Total wattage	power density	Allowable	Compliant
	F1	2		66				
Critical Care Patient Room	F5	1	290	40	172	0.593	0.7	Yes
	F10	6		66				
	F5	2		40				
	F14	2		78				
Nurse Station	F9	2	393	22	636	1.618	1.0	Yes
OFFICE medial staff	F12	2	150	77	154	1.027	1.1	Yes
SOILED UTILITY	F22	3	160	66	198	1.238	1.4	Yes
Telecomm	F30	3	171	66	11286	66.000	0.6	Yes
OFFICE t.3101	F12	2	74	77	5698	77.000	1.1	Yes
	F1	2		66				
	F3	1		40				
	F4	1		33				
	F5	1		40				
	F6	1		32				
Intermediate care	F42	1	311	3	280	0.900	0.7	NO
	F1	2		66				
	F3	1		40				
	F4	1		33				
	F5	1		40				
	F6	1		32				
Private Patient Room	F42	1	281	3	280	0.996	0.7	NO
	F35	3		60				
Lounge & Lockers T.4171	F3	2	246	40	260	1.057	0.8	NO
Epilepsy Monitoring T.4171B	F16	4	255	80	320	1.255	1.0	NO
Conference Class	F12	3	144	77	231	1.604	1.3	NO
Conference/Classroom T.4183	F3	8	203	40	320	1.576	1.3	NO
On Call T.4183C	F29	1	98	40	40	0.408	1.2	Yes
	F32B	1		288				
	F35	2		60				
	F11	1		8				
Family Respite T.4195	F3	2	333	40	496	1.489	0.8	NO
	F35	5		60				
	F5	9		40				
	F32	5		66				
Dialysis	F3	1	1131	40	1031	0.912	0.7	NO
Lockers/Lounge T.3135	F12	6	279	32	192	0.688	0.8	Yes
Staff Work	F10	6	429	32	192	0.448	1.0	Yes
	F15B	2		98				
	F32B	1		368				
Elevator Lobby	F7	10	325	16	724	2.228	1.1	NO
Cystocopy Room D.2158	F16	8	384	80	640	1.667	0.7	NO
	F29	2		40				
	F24	6		186				
Conference Room D.2162	F16	1	254	80	1276	5.024	1.3	NO
Male Locker & Shower D.2155, D.21!	F13	7	522	100	700	1.341	0.6	NO
	F1	2		66				
	F6	1		32				
Hold/Recovery T.2124	F5	1	145	40	204	1.407	0.8	NO
Clean Supply T.2153	F13	2	179	100	200	1.117	1.4	Yes
Elevator Lobby T.1012	F7	14	258	16	224	0.868	1.1	Yes
	F15A	6		72				
	F9	2		22				
Cardiac Rehab D.1231	F12	2	761	77	630	0.828	0.8	NO
Office Supervisor	F22	1	95	66	66	0.695	1.1	Yes
	F37	4		40				
	F12	2		77				
	F5	5		40				
	F11	1		8				
Phlebotomy	F32	5	625	66	852	1.363	1.5	Yes
Café T.1159	F5	58	1292	40	2320	1.796	1.3	NO
	F16	4		80				
Exam T.1188	F11	1	150	8	328	2.187	1.5	NO
	F15A	4		72				
Staff Lounge T.1183	F11	1	165	8	296	1.794	0.8	NO
	F24A	3		100				
Education/Conference T.1214	F5A	8	231	40	620	2.684	1.3	NO
	F36	6		150				
Treatment Stations T.1173	F26	9	956	31	1179	1.233	1.5	Yes
Pharmacy	F12	4	255	77	308	1.208	1.2	NO
Tray Assembly T.L101	F39	38	3234	97	3686	1.140	1.2	Yes
Mechanical	F30	7	800	66	462	0.578	1.5	Yes
	F37	13		40				
Corridor T.L006	F13	1	1278	100	620	0.485	1.0	Yes