The State Institute of Rehabilitation

Technical Investigation

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Executive Summary

The following report is a preliminary investigation into the design and construction of the State Institute of Rehabilitation. The building, located in the northeastern United States and completed in 2005, is an approximately 120,000 ft^2, three story, stand-alone addition to an existing structure dating, at its earliest, to 1949.

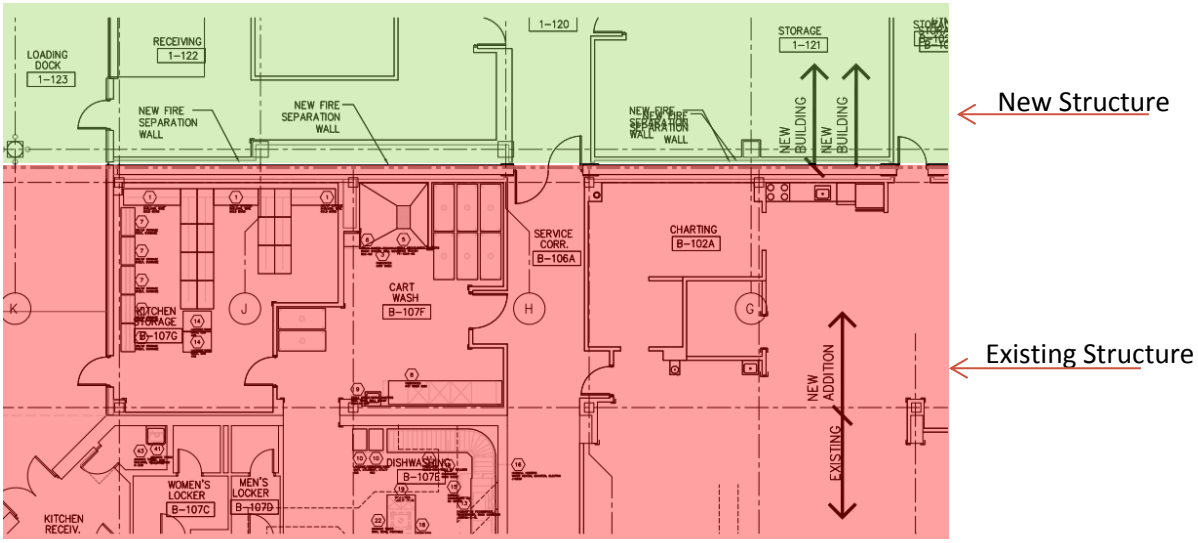

Figure 1: A color diagram depicting the joining of the existing Rehabilitation Center with the new wing

The building addition was proposed in an effort to expand the capabilities of the Institute to care for its booming inpatient and outpatient populations. To increase the building's physical capacity without disturbing the operation of the existing facility, the addition was built entirely on its own mechanical and chilled water systems.

The purpose of the following investigation is to establish that the building, as it currently stands, meets the mechanical specifications presented in the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) standards 62.1-2010, sections 5 and 6, and 90.1-2010, sections 5, 6, 7, and 8. These two standards represent the requirements for acceptable building ventilation and energy standards in commercial buildings, respectively.

The analysis of these two codes in conjunction with the State Institute of Rehabilitation's as-built drawings and building specifications is detailed below and will provide greater insight into its construction and compliance.

Mechanical Summary

Mechanically, the addition constructed abutting the existing structure is a stand-alone building. The equipment installed in the building handles, by itself, the loads generated by building occupants, equipment, and ambient conditions.

Rooftop Air Handling Units

Nine (9) variable air volume (VAV) rooftop air handling units were installed on the roof of the Institute of Rehabilitation. Individually, they are capable of handling loads between 466 and 567 MBH. They are each comprised, in order, of a return air fan, outside air intake, an economizer mixing box, a

pre-filter bank, a DX cooling coil, a supply fan, a natural gas fired heating bay, a final filter bank, and a natural gas fired steam humidifier.

Boilers

The building's heating hot water needs are served by three (3) 48 BHP boilers, located in the mechanical room on the ground level. Each boiler was installed in 2005 and is run off of natural gas. The heating hot water is produced in the boilers and pumped by one, two, or three fully operational pumps, depending on demand load, to the rest of the building.

Figure 2: The boilers, located in the Mechanical Room, which feed the Institute of Rehabilitation

Unit Heaters

The building makes use of eight (8) electric cabinet unit heaters and eight (8) hot water unit heaters throughout the building. Many of them are used in the "crawl space" which extends into the surrounding grade on the ground floor of the building.

Split System Air Conditioners

There are a total of five (5) rooms in the Institute which require supplemental cooling. These rooms, in no particular order, are the electric room, the (two) elevator machine rooms, the data room, and the vending room. The air conditioning units vary in size with the largest capable of handling 42.0 MBH and the smallest capable of handling 18.4MBH. They are coupled with an air cooled condenser unit located, depending on the AC unit in question, on either the lawn or the roof.

Variable Air Volume Boxes

The building contains approximately 135 Enviro-tec VAV boxes. The VAV boxes are distributed by zone throughout the first, second, and third floors, respectively.

ASHRAE Standard 62.1

Section 5.0, Systems and Equipment

5.1 Ventilation Air Distribution

Section 5.1.1 requires that the building ventilation system be constructed with a means by which to balance air flow and maintain a minimum delivery air flow at all times, under all circumstances. The State Rehabilitation Center utilizes ducted supply and return. Branches of the supply air ductwork

are sectioned by zone with VAV boxes which are controlled with their own manufacturer supplied control boxes. Within zones, air delivery by supply diffusers and return grilles is controlled by air dampers.

Section 5.1.2 requires that systems utilizing plenum return are provided with the minimum ventilation air flow. The State Rehabilitation Center does not use plenum return and so this section is not applicable.

Section 5.1.3 requires that all air balance testing requirements be documented with the design intent and assumptions made. The building specifications, specifically Section 15990, specify that all air systems shall be balanced according to the Associated Air Balance Council (AABC), the National Environmental Balance Bureau (NEBB) and the Sheet metal and Air conditioning contractors' National Association, Inc. (SMACNA).

5.2 Exhaust Duct Location

Section 5.2 requires that all areas requiring exhaust air be negatively pressurized such that the contents within the system do not leak into the spaces through which they pass. All areas in which exhaust ductwork is required are negatively pressurized relative to their surroundings- more air is being exhaust or returned than is being supplied. Were there to be gaps over the distance of the ductwork such that it was not completely sealed, the air of the spaces through which it passes would leak into the ductwork and the exhaust air would not leak out. Spaces which require the exhaust of supply air include all patient restrooms, oxygen distribution holding rooms, men and women’s public restrooms, and multiple storage areas.

5.3 Ventilation System Controls

Section 5.3 requires that the ventilation system be equipped with either an automatic or manual means of delivering air via fan, under all load conditions. The mechanical ventilation system uses, at a minimum, Room Thermostats/Temperature Sensors, VAV box damper actuators, air flow sensors, and individual VAV box controllers. These control devices report back to the rooftop air handling units, each of which is equipped with a standalone, DDC MicroTech II microprocessor which in turn communicates with the building management system (BMS). The BMS is equipped with alarms which indicate high or low CFM readings from supply and return fans, signaling equipment failure and the reduction in air delivery below the minimum required CFM. The air handling units, combined with the BMS, maintain the minimum outdoor airflow at all times.

5.4 Airstream Surfaces

The air distribution system dehumidifies and humidifies supply air within the rooftop air handling units (AHUs) to a value which adheres closely to 50% relative humidity. Additionally, the BMS system is equipped with alarms for high humidity readings in the event that the aforementioned sequences fails inside of an air handling unit, thereby providing two mechanisms by which to resist mold growth as specified in section 5.4.1.

The air distribution network is comprised of galvanized steel, as specified in Specification 15890, except where ductwork abuts a duct humidifier or exhaust network in which case it is to be constructed of stainless steel. The kitchen exhaust network is constructed of black steel. These construction specifications align with that of SMACNA 1985. These specifications align with the purpose of section 5.4.2 in assuring that materials used in the HVAC system resist erosion due to moisture content.

5.5 Outdoor Air Intakes

Section 5.5 prescribes minimum separation distances between certain potential contaminant sources and the outdoor air intake louvers of ventilation equipment. The outdoor air intake, on each of the nine AHUs, meets and in some cases exceeds the distances required. The packaged AHUs are also constructed with an integral bird screen and, additionally a “rain lip”, which resists rain entrainment.

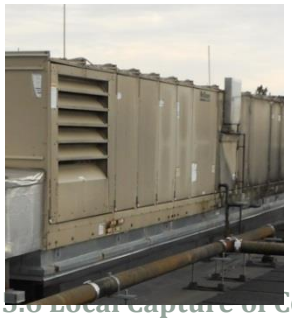

Figure 3: One of nine (9) rooftop air handling units (AHU)

5.6 Local Capture of Contaminants

There is no contaminant generating, non-combustion equipment located within the State Institute of Rehabilitation and so this section is not applicable.

5.7 Combustion Air

The fuel burning appliances, namely the three boilers located in the ground floor mechanical r

Figure 3: Rain lip on AHU OA louvers

lucted directly outdoors in compliance with both manufacturer ins

5.8 Particulate Matter Removal

This section requires that outdoor air be treated for particular matter in the form of filtration. The system of particulate matter removal in the nine AHUs is comprised of a pre-filter section, upstream of the cooling and heating coils, and a final filter section located downstream of the supply fan. The filtration systems within these sections were designed and installed before the adoption of the MERV system and are rated, instead, by percentages.

Because the State Institute of Rehabilitation is a healthcare facility, the filtration system in each air handling unit requires the use of two filtration banks. The first filtration bank in each RTU is located upstream of the heating and cooling coils, and is comprised of a 2”, 30% efficient panel which is roughly comparable to a MERV 5 filter. The second filtration bank, located downstream of both the supply fan, is comprised of a 12” thick 95% efficient panel, roughly comparable to a MERV 16 filter.

5.9 Dehumidification Systems

ASHRAE requires that the relative humidity in any occupied space be less than 65% to avoid the encouragement of mold and mildew growth. Each AHU is equipped with both a dehumidification and humidification system. The dehumidification process is comingled with conditioning and is comprised of a DX cooling coil, whereas the humidification system is comprised expressly of a gas fired steam humidifier downstream of the supply fan. Together, these two systems work to ensure a RH of approximately 50% during those months in which humidity poses a threat to building operation, namely the summer months.

5.10 Drain Pans

In accordance with section 5.10, all drain pans installed beneath condensate producing equipment are sloped at a minimum of 1/8 (0.125) in/ft. to provide positive draining. The drain pan itself is connected to a threaded drain connection which extends along the base of the unit, as per Specification 51780.001. The condensate drip pipes, additionally, are equipped with a P-trap which works against air entrainment.

Figure 4: The condensate pipe draining from the DX cooling coil, fitted with P-trap/U-bend

5.11 Finned-Tube Coils and H

All condensate producing heat exchangers are drained from the rooftop air handling units by an internal condensate drain pan and an exterior condensate drip pipe. The condensate which is evacuated from the provided drip pipes, however, is not itself appropriately drained away from the units.

Figure 5: The lack of appropriate drainage methods adjacent to AHU curbing beneath condensate pipe

5.12 Humidifiers and Water-Spray Systems

In accordance with section 5.12.1, the steam humidifiers in RTUs 1-9, located downstream from the final filter, are fed by potable municipal water and, in accordance with section 5.12.2, are free from obstructions downstream.

5.13 Access for Inspection, Cleaning, and Maintenance

Appropriately sized maintenance access panels, for RTUs 1-9, is provided downstream of the pre-filter, supply fan, and gas fired heating coils. Access to other system components including, but not limited to, VAV's, control boxes, and dampers, is provided throughout the building. These access panels and clearances, as stated by section 5.13, allow for "sufficient working space for inspection and routine maintenance." Access panels are provided with hinged access doors, as noted in Specification 157800.001, Section 2.10.

5.14 Building Envelope and Interior Surfaces

The building envelope is constructed largely of aluminum/glass system components and their accompanying interior finishes but also with a necessary weather barrier in the form of a vapor retarder and weather proofed sealants.

5.15 Buildings with Attached Parking Garages

The State Institute of Rehabilitation is not attached to any parking structure and so specifications from this section are not applicable.

5.16 Air Classification and Recirculation

The State Institute of Rehabilitation is classified as a healthcare building. There exists within the building a variety of different rooms and, subsequently, a number of different air classifications. Air circulating in hallways, reception areas, offices, and spaces of a similar nature is categorized as Class 1 or Class 2 and is allowed to be returned to the rooftop air handling units, treated by the pre-filters and final-filters, and recirculated. Patient toilets and public restrooms, however, are considered to be Class 3 and must be exhausted directly from the building to the outdoors.

5.17 Requirements for Building Containing ETS Areas and ETS-Free Areas

There is no part of the State Institute for Rehabilitation which falls under the classification of Environmental Tobacco Smoke (EMS) area, and so recirculation and treatment prescriptions from this section are not applicable.

Section 6.0, Procedures

6.1 General

The State Institute of Rehabilitation's ventilation system was designed using, exclusively, the Ventilation Rate Procedure and makes no use of either the IAQ Procedure or the Natural Ventilation Procedure.

6.2 The Ventilation Rate Procedure

The filtration system utilized within each of the nine (9) air handling units exceeds the provisions outlined in section 6.2.1.1 and 6.2.1.2, owing to the building's classification as a healthcare facility. The filtration adheres to AIA guidelines.

The calculations discussed here in comparison to the existing ventilation rates can be found in Appendix A.

The ventilation calculation, located at the end of the report, uses both ASHRAE 170/AIA volumetric air changes and IMC/ASHRAE 2009. The calculation completed in the design development phase of the project also used AIA but, as it was completed somewhere around the year 2003, varies greatly in results from the calculation done for this report. The values listed for their spaces sometimes exceed, sometimes meet, and sometimes fall below what was calculated here. Some of these discrepancies may be attributed to differences in code values and, additionally, in room classifications.

ASHRAE 62.1, Summary

The building is compliant with the majority of ASHRAE 62.1 standards and operates efficiently on the system it was designed with. The only foreseeable issue is that of drainage away from the 16" AHU curb.

Some modifications will clearly need to be made to the design, if only to update the building to modern standards.

ASHRAE Standard 90.1

Section 5.0, Building Envelope

5.1.4 Climate

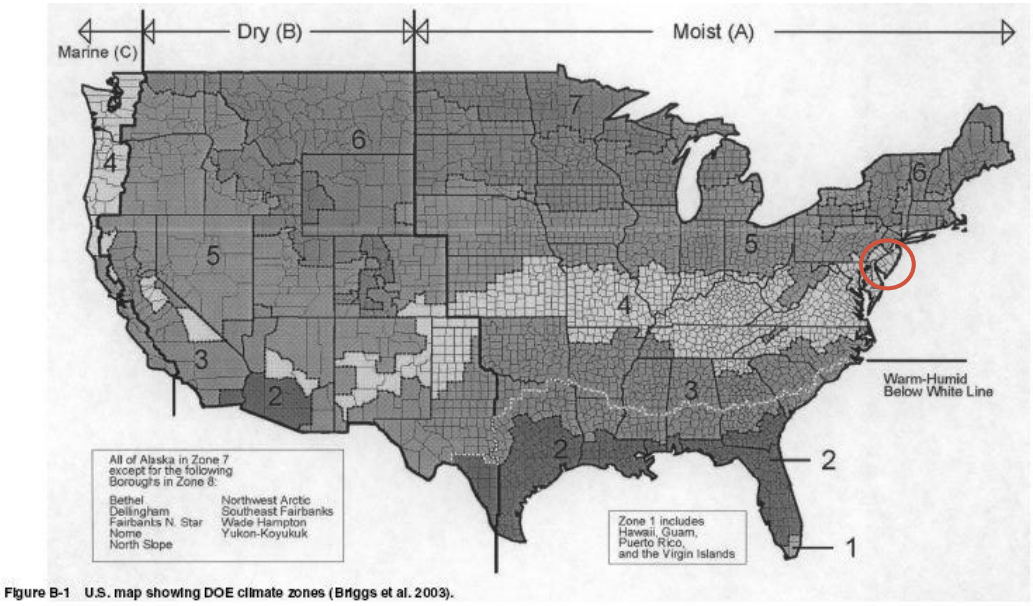

Figure B-1 U.S. map showing DOE climate zones (Briggs et al. 2003).

Figure 6: The Climate Zone map of the United States, ASHRAE 90.1 Appendix B

The State Institute of Rehabilitation lies within climate zone 4A, highlighted above. All of New Jersey, according to Table B-1 in Appendix B of 90.1, falls into the category of 4A excepting the counties

of Bergen, Hunterdon, Mercer, Morris, Passaic, Somerset, Sussex, and Warren. The State Institute of Rehabilitation does not reside in any of these counties, and so was zoned 4A.

5.2 Compliance Paths

The State Institute of Rehabilitation was designed using section 5.5, on which a discussion follows. This method is termed the Prescriptive Building Envelope Option and is allowable as long as a) vertical fenestration area does not exceed 40% of the gross wall area and b) the skylight fenestration area does not exceed 5% of the gross roof area.

The ratio of vertical fenestration area to gross wall area does NOT exceed 40%. Furthermore, there is no skylight fenestration. Owing to the fact that the Institute falls well within each of these parameters, the method outlined in section 5.5 is allowed.

5.5 Prescriptive Building Envelope Option

The Institute, being a conditioned space, must comply with the non-residential requirements presented in ASHRAE 90.1 Table 5.5-1, reproduced below.

TABLE 5.5-1 Building Envelope Requir

	Nonresidential	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs		
Insulation Entirely above Deck	U-0.063	R-15.0 c.i.
Metal Building[a]	U-0.065	R-19.0
Attic and Other	U-0.034	R-30.0
Walls, Above-Grade		
Mass	U-0.580	NR
Metal Building	U-0.093	R-16.0
Steel-Framed	U-0.124	R-13.0
Wood-Framed and Other	U-0.089	R-13.0
Walls, Below-Grade		
Below-Grade Wall	C-1.140	NR
Floors		
Mass	U-0.322	NR
Steel-Joist	U-0.350	NR
Wood-Framed and Other	U-0.282	NR
Slab-On-Grade Floors		
Unheated	F-0.730	NR
Heated	F-1.020	R-7.5 for 12 in.
Opaque Doors		
Swinging	U-0.700	
Nonswinging	U-1.450	
Fenestration	**Assembly Max. U**	**Assembly Max. SHGC**
Vertical Glazing, 0%–40% of Wall		
Nonmetal framing (all)[c]	U-1.20	SHGC-0.25 all
Metal framing (curtainwall/storefront)[d]	U-1.20	
Metal framing (entrance door)[d]	U-1.20	
Metal framing (all other)[d]	U-1.20	

Figure 7: Required assembly U-Values, ASHRAE 90.1

Section 6.0, Heating, Ventilation, and Air Conditioning

6.1 General

Though the structure in question is technically an addition, but only in that it physically connects to the existing structure. Aside from being able to travel between the two buildings, however, the new structure is classified mechanically as a stand-alone building and falls under the category listed by section 6.1.1.1 as a “new building.”

6.2 Compliance Path(s)

The compliance path utilized in the design of the State Institute of Rehabilitation is that outlined by section 6.4, Mandatory Provisions and 6.5, Prescriptive Path.

6.4 Mandatory Provisions

The equipment used in the building must meet the minimum standards outlined in table 6.8.1A and table 6.8.1F. These requirements, which are met by the building, can be found in Appendix B.

All ductwork is adequately insulated according to Specification 15525, shown here:

INSULATION SCHEDULE - RECTANGULAR DUCTWORK (SEE PARAGRAPH 2.07, B ABOVE)			
	CONCEALED	EXPOSED	OUTDOOR
TYPE	D-1	D-2	D-4
FINISH	---	---	F-3
THICKNESS (MIN)	1 IN.	1 IN.	2 IN.
VAPORSEAL REQD	YES	YES	YES

D. Insulation schedule - round ductwork except outdoor air intake duct:

INSULATION SCHEDULE - ROUND DUCTWORK (SEE PARAGRAPH 2.07, B ABOVE)		
	CONCEALED	EXPOSED
TYPE	D-1	D-1
FINISH	---	F-4
THICKNESS (MIN)	1 IN.	1 IN.
VAPORSEAL REQD.	YES	YES

Figure 8: Specified Insulation values for types of ductwork

6.5 Prescriptive Path

Each of the nine AHUs is equipped with a 0%-100% outside air economizer. The configuration of the AHU’s at the Institute of Rehabilitation utilizes outdoor air intake from the sides of the unit via horizontal louvers. Together, the outside air intake and the return air comprise 100% of the design supply air in the building, as per Specification 157800.001.

Section 7.0, Service Water Heating

Compliance will be determined based on Section 7.4, Mandatory Provisions and Section 7.5, the Prescriptive Path. It must be noted that the hospital is a continuously run system due to its occupancy classification for inpatient care. The HVAC system, therefore, was not designed to include “off-hour” operation settings.

All motorized dampers, except as noted, are to be tight close off dampers with 0% leakage, as presented in Specification 15980, section 2.08.

The heating hot water, generated by the three boilers in the mechanical room, is circulated throughout the building in a two pipe supply and return configuration. Make-up water in hot water boilers is softened and demineralized.

Section 8.0, Power

The State Institute of Rehabilitation uses open-ventilated, dry type transformers with an allowable temperature rise of 115^{o}C as prescribed in Specification 16060. As per the specifications in the Mandatory Provisions, the maximum voltage drop across a feeder is 2% of the design load. The maximum voltage drop across a branch circuit is 3% of design load.

Section 9.0, Lighting

As a healthcare facility, the Institute of Rehabilitation is allowed on average to have a Lighting Power Density (LPD) of 1.21, as per Table 9.5.1 in ASHRAE 90.1. The building uses mostly recessed direct and indirect fluorescent lighting and adheres, as an average, to the requirements.

ASHRAE 90.1, Summary

The State Institute of Rehabilitation, though fully functioning and aesthetically pleasing, will require system updates going forwards. The DX system, though operational, is not necessarily as efficient as connecting the building to the chiller plant, located beneath the original building. Going forwards, system updates would be advisable. Keeping structural limitations in mind, it would be prudent to introduce a mechanical room on the roof and, also, to connect the new building to the existing buildings plant. This would also require system updates to existing equipment in the plant and will take a great deal of redesign which, though expensive, would serve the building well in the long run.

APPENDIX B

Mandatory Provisions for ASHRAE 90.1, Section 6.4

TABLE 6.8.1A Electronically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency[a]	Test Procedure[b]
Air conditioners, air cooled	<65,000 Btu/h[c]	All	Split system	13.0 SEER	
			Single package	13.0 SEER	

Figure 1: Required efficiency of split system, air cooled air conditioner

TABLE 6.8.1F Gas- and Oil-Fired Boilers, Minimum Efficiency Requirements

Equipment Type[a]	Subcategory or Rating Condition	Size Category (Input)	Minimum Efficiency[b,c]	Efficiency as of 3/2/2010 (Date 3 yrs after ASHRAE Board Approval)	Efficiency as of 3/2/2020 (Date 13 yrs after ASHRAE Board Approval)	Test Procedure
Boilers, hot water	Gas-fired	<300,000 Btu/h	80% AFUE	80% AFUE	80% AFUE	10 CFR Part 430
		≥300,000 Btu/h and ≤2,500,000 Btu/h[d]	75% E_t	80% E_t	80% E_t	10 CFR Part 431
		>2,500,000 Btu/h[a]	80% E_c	82% E_c	82% E_c	
	Oil-fired[e]	<300,000 Btu/h	80% AFUE	80% AFUE	80% AFUE	10 CFR Part 430
		≥300,000 Btu/h and ≤2,500,000 Btu/h[d]	78% E_t	82% E_t	82% E_t	10 CFR Part 431
		>2,500,000 Btu/h[a]	83% E_c	84% E_c	84% E_c	

Figure 1: Required efficiency of gas fired boiler, <300,000 BTU/hr.

Ventilation Calculation and Comparison

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
2-190 Corridor	RTU 1	0.0	1,262	10	12,620	Corridor	2	N/R	N/R					0				0	N/R
2-191 Patient Room	RTU 1	2.0	226	10	2,260	Patient Rooms	6	2	N/R					75				98	1.30
2-192 Patient Room	RTU 1	2.0	226	10	2,260	Patient Rooms	6	2	N/R					75				94	1.25
2-193 Staff Break and Locker Room	RTU 1	4.0	211	10	2,110					Break Rooms	5	2.5	0		45			56	1.25
2-194 S Toilet	RTU 1	0.0	40	10	400	Toilet room	10	N/R	Yes					0		67		0	N/R
2-195 Electrical	RTU 1	0.0	60	10	600					Electrical Equipment Rooms	0	0.06	0		1			1	1.25
2-196 VIP Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-197 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-198 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-199 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-200 Clean	RTU 1	0.0	101	10	1,010	Clean workroom or clean holding	4	2	N/R					34				42	1.25
2-201 Cenral Bathing	RTU 1	2.0	129	10	1,290	Bathing Room	10	N/R	Yes					0		215		0	N/R
2-202 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-203 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-204 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-205 two bed Patient Room	RTU 1	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-206 Closet	RTU 1	0.0	15	10	150					Storage Rooms	0	0.12	0		1			2	1.25
2-207 Clean Linen	RTU 1	0.0	72	10	720	Clean linen storage	2	N/R	N/R					0				0	N/R
2-208 Janitors Closet	RTU 1	0.0	15	10	150	Janitors closet	10	N/R	Yes					0		25		0	N/R
2-209 HK	RTU 1	0.0	66	10	660					Storage Rooms	0	0.12	0		1			2	1.25
2-210 Soil Utility	RTU 1	0	72	10	720	Soiled or decontamination room	6	2	Yes	Storage Rooms	0	0.12	0	24	1	72		30	1.25
2-211 two bed Patient Room	RTU 1	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-212 two bed Patient Room	RTU 1	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-200 Corridor	RTU 2	0.0	1,262	10	12,620	Corridor	2	N/R	N/R					0				0	N/R
3-201 Patient Room	RTU 2	2.0	227	10	2,270	Patient Rooms	6	2	N/R					76				95	1.25
3-202 Patient Room	RTU 2	2.0	227	10	2,270	Patient Rooms	6	2	N/R					76				95	1.25
3-203 Staff Break	RTU 2	4.0	212	10	2,120					Break Rooms	5	2.5	0		45			56	1.25
3-204 S Toilet	RTU 2	0.0	40	10	400	Toilet room	10	N/R	Yes					0		67		0	N/R
3-205 Electric	RTU 2	0.0	60	10	600					Electrical Equipment Rooms	0	0.06	0		1			1	1.25
3-206 VIP Patient Room	RTU 2	2.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-207 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-208 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
	RTU 2			10															
3-209 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-210 Clean	RTU 2	0.0	110	10	1,100	Clean workroom or clean holding	4	2	N/R					37				46	1.25

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
3-211 Central Bathing	RTU 2	2.0	129	10	1,290	bathing room	10	N/R	Yes					0		215		0	N/R
3-212 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-213 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-214 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-215 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-216 Closet	RTU 2	0.0	15	10	150					storage rooms	0	0.12	0		1			2	1.25
3-217 Clean Linen	RTU 2	0.0	72	10	720	Clean linen storage	2	N/R	N/R					0				0	N/R
3-218 Janitors Closet	RTU 2	0.0	15	10	150	Janitors closet	10	N/R	Yes					0		25		0	N/R
3-219 HK	RTU 2	0.0	66	10	660					storage rooms	0	0.12	0		1			2	1.25
3-220 Soil Utility	RTU 2	0.0	72	10	720	Soiled workroom or soiled holding	10	2	Yes					24		120		30	1.25
3-221 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
3-222 two bed Patient Room	RTU 2	4.0	340	10	3,400	Patient Rooms	6	2	N/R					113				142	1.25
2-100 Elevator Lobby	RTU 3	0.0	278	10	2,780	Corridor	2	N/R	N/R					0				0	N/R
2-101 Corridor	RTU 3	0.0	911	10	9,110	Corridor	2	N/R	N/R					0				0	N/R
2-102 Nurse Station	RTU 3	4.0	240	10	2,400					Office Spaces	5	0.06	0		21			26	1.25
2-104 Chart	RTU 3	2.0	194	10	1,940					Office Spaces	5	0.06	0		11			13	1.25
2-105 Drug Distribution	RTU 3	0.0	120	10	1,200	Medication room	4	2	N/R					40				50	1.25
2-106 Day Dining	RTU 3	12.0	2,493	10	24,930	Resident gathering/activity/dining	4	3	N/R					1247				1558	1.25
2-107 SCI Coordination	RTU 3	2	115	10	1,150					Office Spaces	5	0.06	0		11			13	1.25
2-108 Assistant Therapy Director	RTU 3	1.0	115	10	1,150	Bathroom	10	N/R	Yes	Office Spaces	5	0.06	0	0	6	192		0	N/R
2-109 Team Conference Family Act	RTU 3	4.0	350	10	3,500	Bathroom	10	N/R	Yes					0		583		0	N/R
2-110 Vestibule	RTU 3	0.0	55	10	550	Corridor	2	N/R	N/R					0				0	N/R
2-111 Corridor	RTU 3	0.0	134	10	1,340	Corridor	2	N/R	N/R					0				0	N/R
2-112 Corridor	RTU 3	0.0	800	10	8,000	Patient Rooms	6	2	N/R					267				333	1.25
2-113 Patient Room	RTU 3	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-114 Patient Room	RTU 3	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-115 Nourishment	RTU 3	2.0	70	10	700					Kitchenettes	0	0	0.3		0			0	N/R
2-116 Patient Room	RTU 3	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-117 Exam	RTU 3	2.0	142	10	1,420					Office Spaces	5	0.06	0		11			13	1.25
2-118 Patient Room	RTU 3	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-119 Consultant Speech	RTU 3	1.0	134	10	1,340					Office Spaces	5	0.06	0		6			7	1.25
2-120 Patient Room	RTU 3	3.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-121 Nurse Manager	RTU 3	1.0	104	10	1,040					Office Spaces	5	0.06	0		6			7	1.25
2-122 Patient Room	RTU 3	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
2-123 Doctors Dictation	RTU 3	2.0	122	10	1,220					Office Spaces	5	0.06	0		11			13	1.25
2-160 Corridor	RTU 3	0.0	1,122	10	11,220	Corridor	2	N/R	N/R					0				0	N/R
2-161 two bed Patient Room	RTU 3	4.0	334	10	3,340	Patient Rooms	6	2	N/R					111				139	1.25
2-162 Data Telecom	RTU 3	0.0	69	10	690					Electrical Equipment Rooms	0	0.06	0		1			1	1.25

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
2-163 Respiratory Therapy Storage	RTU 3	0.0	90	10	900	Clean workroom or clean holding	4	2	N/R					30				38	1.25
2-164 Psych Office	RTU 3	1.0	128	10	1,280					Office Spaces	5	0.06	0		6			7	1.25
2-165 Case Manager Office	RTU 3	1.0	128	10	1,280					Office Spaces	5	0.06	0		6			7	1.25
2-166 Respiratory Therapy	RTU 3	2.0	135	10	1,350	Physical Therapy	6	2	N/R					45				56	1.25
2-167 Case Manager	RTU 3	1.0	133	10	1,330					Office Spaces	5	0.06	0		6			7	1.25
2-168 Case Manager	RTU 3	1.0	131	10	1,310					Office Spaces	5	0.06	0		6			7	1.25
2-169 Patient Toilet	RTU 3	0.0	50	10	500	Toilet room	10	N/R	Yes					0		83		0	N/R
2-170 Patient Toilet	RTU 3	0.0	50	10	500	Toilet room	10	N/R	Yes					0		83		0	N/R
2-186 Electrical	RTU 3	0.0	48	10	480					Electrical Equipment Rooms	0	0.06	0		1			1	1.25
3-100 Elevator Lobby	RTU 4	0.0	278	10	2,780					Lobbies/prefunction	7.5	0.06	0		1			1	1.25
3-101 Corridor	RTU 4	0.0	911	10	9,110	corridor	2	N/R	N/R					0				0	N/R
3-102 Nurse Station	RTU 4	4.0	240	10	2,400					Office Spaces	5	0.06	0		21			26	1.25
3-104 Chart	RTU 4	2.0	194	10	1,940					Office Spaces	5	0.06	0		11			13	1.25
3-105 Drug Distribution	RTU 4	0.0	120	10	1,200	Medication room	4	2	N/R					40				50	1.25
3-106 Day Dining	RTU 4	12.0	249	10	2,490	Resident gathering/activity/dining	4	3	N/R					125				156	1.25
3-107 TBI Coordination	RTU 4	1.0	107	10	1,070					Office Spaces	5	0.06	0		6			7	1.25
3-108 Director of Rehabilitation	RTU 4	1.0	107	10	1,070					Office Spaces	5	0.06	0		6			7	1.25
3-109 Test	RTU 4	2.0	106	10	1,060	examination room	6	2	N/R					35				44	1.25
3-110 Team Conference Family Act	RTU 4	4.0	448	10	4,480	Occupational therapy	6	2	N/R					149				187	1.25
3-111 Corridor	RTU 4	0.0	87	10	870	Corridor	2	N/R	N/R					0				0	N/R
3-112 Corridor	RTU 4	0.0	800	10	8,000	Corridor	2	N/R	N/R					0				0	N/R
3-113 Patient Room	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-114 Patient Room	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-115 Nourishment	RTU 4	2.0	70	10	700					Kitchenettes	0	0	0.3		0			0	N/R
3-116 Patient Room	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-117 Exam	RTU 4	2.0	142	10	1,420	examination room	6	2	N/R					47				59	1.25
3-118 Patient Room	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-119 Consultant Speech	RTU 4	1.0	133	10	1,330					Office Spaces	5	0.06	0		6			7	1.25
3-120 Patient Bedroom	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-121 Nurse Manager	RTU 4	1	105	10		Office Spaces													
3-122 Patient Bedroom	RTU 4	2.0	224	10	2,240	Patient Rooms	6	2	N/R					75				93	1.25
3-123 Doctors Dictation	RTU 4	2.0	115	10	1,150					Office Spaces	5	0.06	0		11			13	1.25
3-125 two bed Patient Room	RTU 4	2.0	334	10	3,340	Patient Rooms	6	2	N/R					111				139	1.25
3-131 SCU Dining	RTU 4	4.0	481	10	4,810	Resident gathering/activity/dining	4	3	N/R					241				301	1.25
3-151 two bed Patient Room	RTU 4	4.0	375	10	3,750	Patient Rooms	6	2	N/R					125				156	1.25

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
3-153 two bedroom Patient Room	RTU 4	4	375	10	3,750	Patient Rooms	6	2	N/R					125				156	1.25
3-156 two bed Patient Room	RTU 4	4.0	375	10	3,750	Patient Rooms	6	2	N/R					125				156	1.25
3-160 Corridor	RTU 4	0.0	1,123	10	11,230	Corridor	2	N/R	N/R					0				0	N/R
3-161 two bed Patient Room	RTU 4	4.0	334	10	3,340	Patient Rooms	6	2	N/R					111				139	1.25
3-162 Data Telecom	RTU 4	0.0	30	10	300					Electrical Equipment Rooms	0	0.06	0		1			1	1.25
3-163 Case Manager	RTU 4	1.0	133	10	1,330					Office Spaces	5	0.06	0		6			7	1.25
3-164 Speech Office 01	RTU 4	1.0	128	10	1,280					Office Spaces	5	0.06	0		6			7	1.25
3-165 Speech Office 04	RTU 4	1.0	128	10	1,280					Office Spaces	5	0.06	0		6			7	1.25
3-166 Case Manager	RTU 4	1.0	136	10	1,360					Office Spaces	5	0.06	0		6			7	1.25
3-167 Psych Office 02	RTU 4	1.0	133	10	1,330					Office Spaces	5	0.06	0		6			7	1.25
3-168 Psych Office 01	RTU 4	1.0	133	10	1,330					Office Spaces	5	0.06	0		6			7	1.25
3-169 Patient Toilet	RTU 4	0.0	50	10	500	Toilet room	10	N/R	Yes					0		83		0	N/R
3-170 Patient Toilet	RTU 4	0.0	50	10	500	Toilet room	10	N/R	Yes					0		83		0	N/R
2-124 Soiled Utility	RTU 5	0.0	63	10	630	Soiled workroom or soiled holding	10	2	Yes					21		105		26	1.25
2-125 two bed Patient Room	RTU 5	4.0	335	10	3,350	Patient Rooms	6	2	N/R					112				140	1.25
2-126 Corridor	RTU 5	0.0	176	10	1,760	Patient Rooms	6	2	N/R					59				73	1.25
2-127 WC and Bed Storage	RTU 5	0.0	240	10	2,400	Clean workroom or clean holding	4	2	N/R					80				100	1.25
2-130 Corridor	RTU 5	0.0	536	10	5,360	Corridor	2	N/R	N/R					0				0	N/R
2-131 Vent Storage	RTU 5	1.0	210	10	2,100	Clean workroom or clean holding	4	2	N/R					70				88	1.25
2-132 two bed Patient Room	RTU 5	4.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
2-133 Clean	RTU 5	2.0	80	10	800	Clean workroom or clean holding	4	2	N/R					27				33	1.25
2-134 Central Bathing	RTU 5	2.0	152	10	1,520	bathing room	10	N/R	Yes					0		253		0	N/R
2-135 Oxygen	RTU 5	0.0	28	10	280	Clean workroom or clean holding	4	2	N/R					9				12	1.25
2-136 two bed Patient Room	RTU 5	2.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
2-137 two bed Patient Room	RTU 5	2.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
2-138 Nurse Station	RTU 5	4.0	202	10	2,020					Office Spaces	5	0.06	0		21			26	1.25
2-139 Drug Distribution	RTU 5	0.0	133	10	1,330	Medication room	4	2	N/R					44				55	1.25
2-140 Charting	RTU 5	0.0	133	10	1,330					Office Spaces	5	0.06	0		1			1	1.25
2-141 Corridor	RTU 5	0.0	657	10	6,570	Corridor	2	N/R	N/R					0				0	N/R
2-142 Janitors Closet	RTU 5	0.0	54	10	540					storage rooms	0	0.12	0		1			2	1.25
2-143 Patient Room	RTU 5	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
2-144 Patient Room	RTU 5	2	248	10		Patient Rooms	6	2	N/R										
2-145 Patient Room	RTU 5	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
2-146 Patient Room	RTU 5	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
2-147 Isolation Room	RTU 5	1.0	280	10	2,800	All room	12	2	Yes					93		560		117	1.25
2-148 HK	RTU 5	0.0	54	10	540					storage rooms	0	0.12	0		1			2	1.25
2-150 two bed Patient Room	RTU 5	4.0	374	10	3,740	Patient Rooms	6	2	N/R					125				156	1.25

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
2-151 Supply	RTU 5	0.0	189	10	1,890	Clean workroom or clean holding	4	2	N/R					63				79	1.25
2-152 two bed Patient Room	RTU 5	4.0	374	10	3,740	Patient Rooms	6	2	N/R					125				156	1.25
2-153 Clean Linen	RTU 5	0.0	54	10	540	Clean linen storage	2	N/R	N/R					0				0	N/R
2-155 two bed Patient Room	RTU 5	4.0	374	10	3,740	Patient Rooms	6	2	N/R					125				156	1.25
3-130 Corridor	RTU-6	0.0	536	10	5,360	Corridor	2	N/R	N/R					0				0	N/R
3-132 two bed Patient Room	RTU-6	4.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
3-133 Clean	RTU-6	0.0	80	10	800	Clean workroom or clean holding	4	2	N/R					27				33	1.25
3-135 Oxygen	RTU-6	0.0	28	10	280	Clean workroom or clean holding	4	2	N/R					9				12	1.25
3-136 two bed Patient Room	RTU-6	4.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
3-137 two bed Patient Room	RTU-6	4.0	380	10	3,800	Patient Rooms	6	2	N/R					127				158	1.25
3-138 Nurse Station	RTU-6	4.0	203	10	2,030					Office Spaces	5	0.06	0		21			26	1.25
3-139 Drug Distribution	RTU-6	0.0	133	10	1,330	Medication room	4	2	N/R					44				55	1.25
3-140 Charting	RTU-6	2.0	133	10	1,330					Office Spaces	5	0.06	0		11			13	1.25
3-141 Corridor	RTU-6	0.0	312	10	3,120	Corridor	2	N/R	N/R					0				0	N/R
3-143 Patient Room	RTU-6	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
3-144 Patient Room	RTU-6	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
3-145 Corridor	RTU-6	0.0	344	10	3,440	Corridor	2	N/R	N/R					0				0	N/R
3-146 Patient Room	RTU-6	2	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
3-147 Patient Room	RTU-6	2.0	248	10	2,480	Patient Rooms	6	2	N/R					83				103	1.25
3-148 Isolation Room	RTU-6	1.0	280	10	2,800	All room	12	2	Yes					93		560		117	1.25
3-149 HK	RTU-6	0.0	54	10	540					storage rooms	0	0.12	0		1			2	1.25
3-150 Corridor	RTU-6	0.0	510	10	5,100	Corridor	2	N/R	N/R					0				0	N/R
2-172 Toilet	RTU-7	0.0	64	10	640	Toilet room	10	N/R	Yes					0		107		0	N/R
2-173 Gym Storage	RTU-7	0.0	456	10	4,560					storage rooms	0	0.12	0		1			2	1.25
2-174 Spinal Cord Injury Therapy G	RTU-7	10.0	7,707	10	77,070	Physical Therapy	6	2	N/R					2569				3211	1.25
2-175 Charting	RTU-7	2.0	465	10	4,650					Office Spaces	5	0.06	0		11			13	1.25
2-176 Corridor	RTU-7	0.0	214	10	2,140	Corridor	2	N/R	N/R					0				0	N/R
2-177 Toilet	RTU-7	0.0	60	10	600	Toilet room	10	N/R	Yes					0		100		0	N/R
2-178 CT 1	RTU-7	1.0	81	10	810	Resident Room	2	2	N/R					27				34	1.25
2-179 CT2	RTU-7	1.0	81	10	810	Resident Room	2	2	N/R					27				34	1.25
2-180 E ADL Equipment	RTU-7	0.0	180	10	1,800					storage rooms	0	0.12	0		1			2	1.25
2-181 E ADL	RTU-7	4.0	165	10	1,650	Physical Therapy	6	2	N/R					55				69	1.25
2-182 Office	RTU-7	1.0	100	10	1,000					Office Spaces	5	0.06	0		6			7	1.25
2-183 Treatment	RTU-7	2.0	151	10	1,510	Treatment room	6	2	N/R					50				63	1.25
2-184 Sr Therapists	RTU-7	2.0	133	10	1,330					Office Spaces	5	0.06	0		11			13	1.25
2-185 Toilet	RTU-7	0.0	52	10	520	Toilet room	10	N/R	Yes					0		87		0	N/R
3-177 CT1	RTU-7	1.0	80	10	800	Resident Room	2	2	N/R					27				33	1.25
3-178 CT2	RTU-7	1.0	80	10	800	Resident Room	2	2	N/R					27				33	1.25

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
			AREA	HGT.	VOL.		AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
							SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
3-172 Toilet	RTU-8	0.0	63	10	630	Toilet room	10	N/R	Yes					0		105		0	N/R
3-173 SCU Treatment	RTU-8	2.0	239	10	2,390	Treatment room	6	2	N/R					80				100	1.25
3-174 SCU Gym Storage	RTU-8	0.0	90	10	900					storage rooms	0	0.12	0		1			2	1.25
3-175 SCU Therapy Gym	RTU-8	20.0	3,062	10	30,620	Physical Therapy	6	2	N/R					1021				1276	1.25
3-175A SCU Gym Storage	RTU-8	0.0	93	10	930					storage rooms	0	0.12	0		1			2	1.25
3-175B SCU Gym Charting	RTU-8	4.0	128	10	1,280					Office Spaces	5	0.06	0		21			26	1.25
3-176 Charting	RTU-8	2.0	465	10	4,650					Office Spaces	5	0.06	0		11			13	1.25
3-180 Speech Office 03	RTU-8	1.0	137	10	1,370					Office Spaces	5	0.06	0		6			7	1.25
3-181 Corridor	RTU-8	0.0	213	10	2,130	Corridor	2	N/R	N/R					0				0	N/R
3-182 Toilet	RTU-8	0.0	60	10	600	Toilet room	10	N/R	Yes					0		100		0	N/R
3-183 CT1	RTU-8	1.0	82	10	820	resident room	2	2	N/R					27				34	1.25
3-184 CT2	RTU-8	1.0	82	10	820	resident room	2	2	N/R					27				34	1.25
3-185 PCU Therapy Gym	RTU-8	20.0	4,416	10	44,160	Physical Therapy	6	2	N/R					1472				1840	1.25
3-186 Speech Office 02	RTU-8	1.0	100	10	1,000					Office Spaces	5	0.06	0		6			7	1.25
3-188 PCU Gym Storage	RTU-8	0.0	352	10	3,520					storage rooms	0	0.12	0		1			2	1.25
3-190 Treatment	RTU-8	2.0	152	10	1,520	Treatment room	6	2	N/R					51				63	1.25
3-191 TBI Equipment Coordination	RTU-8	0.0	134	10	1,340	Clean workroom or clean holding	4	2	N/R					45				56	1.25
3-192 Toilet	RTU-8	0.0	52	10	520	Toilet room	10	N/R	Yes					0		87		0	N/R
1-100 Vestibule	RTU 9	0.0	172	10	1,720	Corridor	2	N/R	N/R					0				0	N/R
1-101 Lobby	RTU 9	0.0	1,231	10	12,310					Lobbies/prefunction	7.5	0.06	0		1			1	1.25
1-102 Security Reception	RTU 9	1.0	140	10	1,400	Corridor	2	N/R	N/R					0				0	N/R
1-103 Elevator Lobby	RTU 9	0.0	600	10	6,000					Lobbies/prefunction	7.5	0.06	0		1			1	1.25
1-104 Elevator Machine Room	RTU 9	0.0	160	10	1,600					Elevator Machine Rooms	0	0.12	0		1			2	1.25
1-105 Corridor	RTU 9	0.0	1,326	10	13,260	Corridor	2	N/R	N/R					0				0	N/R
1-106 Gift Shop	RTU 9	4	500	10						Sales (except as below)									
1-106A Gift Shop Storage	RTU 9	0.0	265	10	2,650					storage rooms	0	0.12	0		1			2	1.25
1-107 Service Access	RTU 9	0.0	200	10	2,000					Storage Rooms	0	0.12	0		1			2	1.25
1-108 Reception Waiting	RTU 9	0.0	180	10	1,800					lobbies	5	0.06	0		1			1	1.25
1-108A Directors Office	RTU 9	1.0	120	10	1,200					Lobbies	5	0.06	0		6			7	1.25
1-108B Cashier Office	RTU 9	1.0	103	10	1,030					Office Spaces	5	0.06	0		6			7	1.25
1-108C Storage	RTU 9	0.0	26	10	260	Clean workroom or clean holding	4	2	N/R					9				11	1.25
1-108D Interview	RTU 9	2.0	87	10	870					Office Spaces	5	0.06	0		11			13	1.25
1-108E Copy	RTU 9	0.0	90	10	900					Copy/Printing Rooms	0	0	0.5		0			0	N/R
1-108F Work Stations	RTU 9	4.0	375	10	3,750					Office Spaces	5	0.06	0		21			26	1.25
1-108G Office	RTU 9	1	92	10	920					Office Spaces	5	0.06	0		6			7	1.25
1-109 Mens Restroom	RTU 9	0.0	256	10	2,560	Bathroom	10	N/R	Yes					0		427		0	N/R
1-110 Womens Restroom	RTU 9	0.0	256	10	2,560	Bathroom	10	N/R	Yes	Office Spaces	5	0.06	0	0	1	427		0	N/R

VENTILATION SCHEDULE

ROOM NAME	SYS.	No. of Ppl.	ROOM DIMENSIONS			Space Type(ASHRAE 170)	MIN. AIR CHGS. PER HR.			Space Type(ASHRAE 62.1)	MIN. AIR CHGS. PER HR.			MINIMUM CFM REQUIRED				DESIGN CFM	
							AIA GUIDELINES				IMC GUIDELINES			OUTSIDE AIR		EXH.		O.A.	
			AREA	HGT.	VOL.		SUP.	OA	EXH.		OA		EXH.	AIA	IMC	AIA	IMC		
			(SF)	(FT.)	(CF)						PERSON	SF	Per sf	(CFM)	(CFM)	(CFM)	(CFM)	(CFM)	OA Supplied
1-112 Vestibule	RTU 9	0.0	140	10	1,400					Break Rooms	5	2.5	0		25			31	1.25
1-113 Corridor	RTU 9	0.0	1,285	10	12,850	Corridor	2	N/R	N/R					0				0	N/R
1-114 Residents Study	RTU 9	4.0	170	10	1,700	Resident gathering/activity/dining	4	3	N/R					85				106	1.25
1-114A Residents Lounge	RTU 9	4.0	412	10	4,120	Resident gathering/activity/dining	4	3	N/R					206				258	1.25
1-114B Toilet	RTU 9	0.0	55	10	550	Toilet room	10	N/R	Yes					0		92		0	N/R
1-114C Residents Quiet 1	RTU 9	2.0	82	10	820	Resident Room	2	2	N/R					27				34	1.25
1-114D Residents Quiet 2	RTU 9	2.0	82	10	820	Resident Room	2	2	N/R					27				34	1.25
1-120 Service Corridor	RTU 9	0.0	981	10	9,810	Corridor	2	N/R	N/R					0				0	N/R
1-121 Storage	RTU 9	0.0	585	10	5,850					storage rooms	0	0.12	0		1			2	1.25
1-124 Bulk Soiled Holding	RTU 9	0.0	238	10	2,380	Soiled workroom or soiled holding	10	2	Yes					79		397		99	1.25
1-125 Employee Locker	RTU 9	4.0	204	10	2,040					Break Rooms	5	2.5	0		45			56	1.25
1-126 Vacuum	RTU 9	0.0	202	10	2,020					storage rooms	0	0.12	0		1			2	1.25
1-127 Oxygen Distribution	RTU 9	0.0	60	10	600	Clean workroom or clean holding	4	2	N/R					20				25	1.25
1-128 Corridor	RTU 9	0.0	287	10	2,870	Corridor	2	N/R	N/R					0				0	N/R
1-132 Janitors Closet	RTU 9	0.0	40	10	400					storage rooms	0	0.12	0		1			2	1.25
1-133 HK	RTU 9	0.0	40	10	400					storage rooms	0	0.12	0		1			2	1.25
1-135 Electrical	RTU 9	0.0	48	10	480					Electrical Equipment Rooms	0	0.06	0		1			1	1.25

VENTILATION SCHEDULE COMPARISON

Room Name	System	DESIGN CFM			
		Actual		Calculated	
		SA	30% OA MINIMUM	(CFM)	OA Supplied
2-190 Corridor	RTU 1	1100.00	363.00	0	0.00
2-191 Patient Room	RTU 1	400.00	132.00	94	1.25
2-192 Patient Room	RTU 1	400.00	132.00	94	2.09
2-193 Staff Break and Locker Room	RTU 1	635.00	209.55	56	N/R
2-194 S Toilet	RTU 1	-	-	0	0.00
2-195 Electrical	RTU 1	-	-	1	0.01
2-196 VIP Patient Room	RTU 1	775.00	255.75	142	1.25
2-197 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-198 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-199 two bed Patient Room	RTU 1	775.00	255.75	142	4.21
2-200 Clean	RTU 1	100.00	33.00	42	N/R
2-201 Cenral Bathing	RTU 1	-	-	0	0.00
2-202 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-203 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-204 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-205 two bed Patient Room	RTU 1	775.00	255.75	142	118.06
2-206 Closet	RTU 1	-	-	2	N/R
2-207 Clean Linen	RTU 1	-	-	0	N/R
2-208 Janitors Closet	RTU 1	-	-	0	0.00
2-209 HK	RTU 1	-	-	2	0.06
2-210 Soil Utility	RTU 1	-	-	30	0.26
2-211 two bed Patient Room	RTU 1	775.00	255.75	142	1.25
2-212 two bed Patient Room	RTU 1	775.00	255.75	142	N/R
3-200 Corridor	RTU 2	1100.00	363.00	0	0.00
3-201 Patient Room	RTU 2	400.00	132.00	95	1.25
3-202 Patient Room	RTU 2	400.00	132.00	95	2.10
3-203 Staff Break	RTU 2	635.00	209.55	56	N/R
3-204 S Toilet	RTU 2	-	-	0	0.00
3-205 Electric	RTU 2	-	-	1	0.01
3-206 VIP Patient Room	RTU 2	775.00	255.75	142	1.25
3-207 two bed Patient Room	RTU 2	775.00	255.75	142	1.25
3-208 two bed Patient Room	RTU 2	775.00	255.75	142	N/R
3-209 two bed Patient Room	RTU 2	775.00	255.75	0	0.00
3-210 Clean	RTU 2	100.00	33.00	142	3.86
3-211 Central Bathing	RTU 2	-	-	46	N/R
3-212 two bed Patient Room	RTU 2	775.00	255.75	0	0.00
3-213 two bed Patient Room	RTU 2	775.00	255.75	142	1.25
3-214 two bed Patient Room	RTU 2	775.00	255.75	142	1.25
3-215 two bed Patient Room	RTU 2	775.00	255.75	142	1.25
3-216 Closet	RTU 2	-	-	142	118.06
3-217 Clean Linen	RTU 2	-	-	2	N/R
3-218 Janitors Closet	RTU 2	-	-	0	N/R
3-219 HK	RTU 2	-	-	0	0.00
3-220 Soil Utility	RTU 2	-	-	2	0.06
3-221 two bed Patient Room	RTU 2	775.00	255.75	30	0.26
3-222 two bed Patient Room	RTU 2	775.00	255.75	142	N/R
2-100 Elevator Lobby	RTU 3	225.00	74.25	0	N/R
2-101 Corridor	RTU 3	700.00	231.00	0	N/R
2-102 Nurse Station	RTU 3	225.00	74.25	0	0.00
2-104 Chart	RTU 3	160.00	52.80	26	2.43
2-105 Drug Distribution	RTU 3	150.00	49.50	13	0.33
2-106 Day Dining	RTU 3	3500.00	1155.00	50	0.04
2-107 SCI Coordination	RTU 3	120	39.60	1558	146.99
2-108 Assistant Therapy Director	RTU 3	120.00	39.60	13	N/R
2-109 Team Conference Family Act	RTU 3	2000.00	660.00	0	N/R
2-110 Vestibule	RTU 3	-	-	0	N/R
2-111 Corridor	RTU 3	600.00	198.00	0	N/R
2-112 Corridor	RTU 3	600.00	198.00	0	0.00
2-113 Patient Room	RTU 3	400.00	132.00	333	4.46
2-114 Patient Room	RTU 3	400.00	132.00	93	1.25
2-115 Nourishment	RTU 3	75.00	24.75	93	N/R
2-116 Patient Room	RTU 3	400.00	132.00	0	0.00
2-117 Exam	RTU 3	100.00	33.00	93	8.81
2-118 Patient Room	RTU 3	400.00	132.00	13	0.18
2-119 Consultant Speech	RTU 3	100.00	33.00	93	16.67
2-120 Patient Room	RTU 3	400.00	132.00	7	0.09

VENTILATION SCHEDULE COMPARISON

Room Name	System	DESIGN CFM			
		Actual		Calculated	
		SA	30% OA MINIMUM	(CFM)	OA Supplied
2-121 Nurse Manager	RTU 3	100.00	33.00	93	16.67
2-122 Patient Room	RTU 3	400.00	132.00	7	0.09
2-123 Doctors Dictation	RTU 3	100.00	33.00	93	8.81
2-160 Corridor	RTU 3	600.00	198.00	13	N/R
2-161 two bed Patient Room	RTU 3	775.00	255.75	0	0.00
2-162 Data Telecom	RTU 3	100.00	33.00	139	231.94
2-163 Respiratory Therapy Storage	RTU 3	-	-	1	0.03
2-164 Psych Office	RTU 3	100.00	33.00	38	6.70
2-165 Case Manager Office	RTU 3	100.00	33.00	7	1.25
2-166 Respiratory Therapy	RTU 3	105.00	34.65	7	0.16
2-167 Case Manager	RTU 3	100.00	33.00	56	10.04
2-168 Case Manager	RTU 3	100.00	33.00	7	1.25
2-169 Patient Toilet	RTU 3	-	-	7	N/R
2-170 Patient Toilet	RTU 3	-	-	0	N/R
2-186 Electrical	RTU 3	-	-	0	N/R
3-100 Elevator Lobby	RTU 4	225.00	74.25	0	0.00
3-101 Corridor	RTU 4	700.00	231.00	1	N/R
3-102 Nurse Station	RTU 4	225.00	74.25	0	0.00
3-104 Chart	RTU 4	160.00	52.80	26	2.43
3-105 Drug Distribution	RTU 4	150.00	49.50	13	0.33
3-106 Day Dining	RTU 4	3500.00	1155.00	50	0.40
3-107 TBI Coordination	RTU 4	100.00	33.00	156	27.79
3-108 Director of Rehabilitation	RTU 4	100.00	33.00	7	1.25
3-109 Test	RTU 4	100.00	33.00	7	0.20
3-110 Team Conference Family Act	RTU 4	2000.00	660.00	44	0.30
3-111 Corridor	RTU 4	600.00	198.00	187	N/R
3-112 Corridor	RTU 4	500.00	165.00	0	N/R
3-113 Patient Room	RTU 4	400.00	132.00	0	0.00
3-114 Patient Room	RTU 4	400.00	132.00	93	1.25
3-115 Nourishment	RTU 4	75.00	24.75	93	N/R
3-116 Patient Room	RTU 4	400.00	132.00	0	0.00
3-117 Exam	RTU 4	100.00	33.00	93	1.97
3-118 Patient Room	RTU 4	400.00	132.00	59	0.79
3-119 Consultant Speech	RTU 4	110.00	36.30	93	16.67
3-120 Patient Bedroom	RTU 4	400.00	132.00	7	0.09
3-121 Nurse Manager	RTU 4	100	33.00	93	N/R
3-122 Patient Bedroom	RTU 4	400.00	132.00	0	0.00
3-123 Doctors Dictation	RTU 4	100.00	33.00	93	8.81
3-125 two bed Patient Room	RTU 4	775.00	255.75	13	0.12
3-131 SCU Dining	RTU 4	-	-	139	0.58
3-151 two bed Patient Room	RTU 4	775.00	255.75	301	2.41
3-153 two bedroom Patient Room	RTU 4	775	255.75	156	1.25
3-156 two bed Patient Room	RTU 4	775.00	255.75	156	1.25
3-160 Corridor	RTU 4	500.00	165.00	156	N/R
3-161 two bed Patient Room	RTU 4	400.00	132.00	0	0.00
3-162 Data Telecom	RTU 4	100.00	33.00	139	231.94
3-163 Case Manager	RTU 4	100.00	33.00	1	0.13
3-164 Speech Office 01	RTU 4	100.00	33.00	7	1.25
3-165 Speech Office 04	RTU 4	100.00	33.00	7	1.25
3-166 Case Manager	RTU 4	100.00	33.00	7	1.25
3-167 Psych Office 02	RTU 4	100.00	33.00	7	1.25
3-168 Psych Office 01	RTU 4	100.00	33.00	7	1.25
3-169 Patient Toilet	RTU 4	-	-	7	N/R
3-170 Patient Toilet	RTU 4	-	-	0	N/R
2-124 Soiled Utility	RTU 5	-	-	0	0.00
2-125 two bed Patient Room	RTU 5	775.00	255.75	26	0.24
2-126 Corridor	RTU 5	215.00	70.95	140	2.38
2-127 WC and Bed Storage	RTU 5	33.00	10.89	73	0.92
2-130 Corridor	RTU 5	215.00	70.95	100	N/R
2-131 Vent Storage	RTU 5	33.00	10.89	0	0.00
2-132 two bed Patient Room	RTU 5	775.00	255.75	88	0.69
2-133 Clean	RTU 5	33.00	10.89	158	5.94

VENTILATION SCHEDULE COMPARISON

Room Name	System	DESIGN CFM			
		Actual		Calculated	
		SA	30% OA MINIMUM	(CFM)	OA Supplied
2-134 Central Bathing	RTU 5	66.00	21.78	33	N/R
2-135 Oxygen	RTU 5	-	-	0	0.00
2-136 two bed Patient Room	RTU 5	775.00	255.75	12	0.09
2-137 two bed Patient Room	RTU 5	775.00	255.75	158	1.25
2-138 Nurse Station	RTU 5	83.00	27.39	158	7.69
2-139 Drug Distribution	RTU 5	36.00	11.88	26	0.58
2-140 Charting	RTU 5	107.00	35.31	55	92.36
2-141 Corridor	RTU 5	272.00	89.76	1	N/R
2-142 Janitors Closet	RTU 5	-	-	0	0.00
2-143 Patient Room	RTU 5	400.00	132.00	2	0.02
2-144 Patient Room	RTU 5	400	132.00	103	N/R
2-145 Patient Room	RTU 5	400.00	132.00	0	0.00
2-146 Patient Room	RTU 5	400.00	132.00	103	1.25
2-147 Isolation Room	RTU 5	740.00	244.20	103	1.11
2-148 HK	RTU 5	-	-	117	97.22
2-150 two bed Patient Room	RTU 5	775.00	255.75	2	0.01
2-151 Supply	RTU 5	33.00	10.89	156	2.47
2-152 two bed Patient Room	RTU 5	775.00	255.75	79	0.63
2-153 Clean Linen	RTU 5	-	-	156	N/R
2-155 two bed Patient Room	RTU 5	775.00	255.75	0	N/R
3-130 Corridor	RTU-6	650.00	214.50	0	N/R
3-132 two bed Patient Room	RTU-6	775.00	255.75	0	0.00
3-133 Clean	RTU-6	100.00	33.00	158	5.94
3-135 Oxygen	RTU-6	-	-	33	3.57
3-136 two bed Patient Room	RTU-6	775.00	255.75	12	0.09
3-137 two bed Patient Room	RTU-6	775.00	255.75	158	1.25
3-138 Nurse Station	RTU-6	250.00	82.50	158	7.69
3-139 Drug Distribution	RTU-6	75.00	24.75	26	0.58
3-140 Charting	RTU-6	325.00	107.25	55	5.23
3-141 Corridor	RTU-6	425.00	140.25	13	N/R
3-143 Patient Room	RTU-6	400.00	132.00	0	0.00
3-144 Patient Room	RTU-6	400.00	132.00	103	1.25
3-145 Corridor	RTU-6	775.00	255.75	103	N/R
3-146 Patient Room	RTU-6	400	132.00	0	0.00
3-147 Patient Room	RTU-6	400.00	132.00	103	1.25
3-148 Isolation Room	RTU-6	740.00	244.20	103	1.11
3-149 HK	RTU-6	-	-	117	97.22
3-150 Corridor	RTU-6	500.00	165.00	2	N/R
2-172 Toilet	RTU-7	-	-	0	N/R
2-173 Gym Storage	RTU-7	150.00	49.50	0	0.00
2-174 Spinal Cord Injury Therapy G	RTU-7	7500.00	2475.00	2	0.00
2-175 Charting	RTU-7	450.00	148.50	3211	302.95
2-176 Corridor	RTU-7	200.00	66.00	13	N/R
2-177 Toilet	RTU-7	-	-	0	N/R
2-178 CT 1	RTU-7	100.00	33.00	0	0.00
2-179 CT2	RTU-7	100.00	33.00	34	1.25
2-180 E ADL Equipment	RTU-7	150.00	49.50	34	28.13
2-181 E ADL	RTU-7	150.00	49.50	2	0.03
2-182 Office	RTU-7	150.00	49.50	69	12.28
2-183 Treatment	RTU-7	700.00	231.00	7	0.14
2-184 Sr Therapists	RTU-7	200.00	66.00	63	5.94
2-185 Toilet	RTU-7	-	-	13	N/R
3-177 CT1	RTU-7	100.00	33.00	0	0.00
3-178 CT2	RTU-7	100.00	33.00	33	N/R
3-172 Toilet	RTU-8	-	-	0	N/R
3-173 SCU Treatment	RTU-8	300	99.00	0	0.00
3-174 SCU Gym Storage	RTU-8	-	-	100	82.99
3-175 SCU Therapy Gym	RTU-8	4300	1419.00	2	0.00
3-175A SCU Gym Storage	RTU-8	-	-	1276	1063.19
3-175B SCU Gym Charting	RTU-8	-	-	2	0.07
3-176 Charting	RTU-8	450	148.50	26	2.43
3-180 Speech Office 03	RTU-8	150	49.50	13	2.37
3-181 Corridor	RTU-8	200	66.00	7	N/R
3-182 Toilet	RTU-8	-	-	0	N/R
3-183 CT1	RTU-8	100	33.00	0	0.00
3-184 CT2	RTU-8	100	33.00	34	1.25
3-185 PCU Therapy Gym	RTU-8	4300	1419.00	34	0.02
3-186 Speech Office 02	RTU-8	450	148.50	1840	328.57

VENTILATION SCHEDULE COMPARISON

Room Name	System	DESIGN CFM			
		Actual		Calculated	
		SA	30% OA MINIMUM	(CFM)	OA Supplied
3-188 PCU Gym Storage	RTU-8	200	66.00	7	5.83
3-190 Treatment	RTU-8	600	198.00	2	0.03
3-191 TBI Equipment Coordination	RTU-8	450	148.50	63	1.42
3-192 Toilet	RTU-8	-	-	56	N/R
1-100 Vestibule	RTU 9	-	-	0	N/R
1-101 Lobby	RTU 9	2500.00	825.00	0	0.00
1-102 Security Reception	RTU 9	160.00	52.80	1	N/R
1-103 Elevator Lobby	RTU 9	300.00	99.00	0	0.00
1-104 Elevator Machine Room	RTU 9	750.00	247.50	1	0.63
1-105 Corridor	RTU 9	400.00	132.00	2	1.25
1-106 Gift Shop	RTU 9	400.00	132.00	2	N/R
1-106A Gift Shop Storage	RTU 9	280.00	92.40	0	0.00
1-107 Service Access	RTU 9	280.00	92.40	2	1.25
1-108 Reception Waiting	RTU 9	2550.00	841.50	2	2.50
1-108A Directors Office	RTU 9	240.00	79.20	1	0.13
1-108B Cashier Office	RTU 9	475.00	156.75	7	1.25
1-108C Storage	RTU 9	400.00	132.00	7	0.81
1-108D Interview	RTU 9	200.00	66.00	11	1.02
1-108E Copy	RTU 9	420.00	138.60	13	N/R
1-108F Work Stations	RTU 9	310.00	102.30	0	0.00
1-108G Office	RTU 9	-	-	26	4.60
1-109 Mens Restroom	RTU 9	-	-	7	N/R
1-110 Womens Restroom	RTU 9	-	-	0	N/R
1-112 Vestibule	RTU 9	120.00	39.60	0	0.00
1-113 Corridor	RTU 9	100.00	33.00	31	N/R
1-114 Residents Study	RTU 9	100.00	33.00	0	0.00
1-114A Residents Lounge	RTU 9	100.00	33.00	106	0.52
1-114B Toilet	RTU 9	160.00	52.80	258	N/R
1-114C Residents Quiet 1	RTU 9	400.00	132.00	0	0.00
1-114D Residents Quiet 2	RTU 9	400.00	132.00	34	1.25
1-120 Service Corridor	RTU 9	245.00	80.85	34	N/R
1-121 Storage	RTU 9	-	-	0	0.00
1-124 Bulk Soiled Holding	RTU 9	100.00	33.00	2	0.02
1-125 Employee Locker	RTU 9	100.00	33.00	99	2.20
1-126 Vacuum	RTU 9	-	-	56	46.88
1-127 Oxygen Distribution	RTU 9	-	-	2	0.08
1-128 Corridor	RTU 9	-	-	25	N/R
1-132 Janitors Closet	RTU 9	-	-	0	0.00
1-133 HK	RTU 9	-	-	2	1.25
1-135 Electrical	RTU 9	-	-	2	N/R