5.0 Existing Condition Analysis of Standards

5.1 LEED-NC Version 2.2

The Leadership in Environmental Engineering Design Green Building Rating System is the nationally accepted benchmark for the design construction, construction, and operation of green buildings. The LEED system was created by the U.S. Green Building Council in order to make a credible standard for determining what constitutes a green building. There are several advantages associated with a LEED certified building. They typically provide healthy and comfortable spaces for occupants, reduce waste sent to landfills, conserve energy and water, and specifically in Massachusetts a green building tax program is being considered.

The Straumann USA Facility renovation project was not designed to attain a LEED rating. The project was analyzed however to determine which the areas where LEED points would have been obtained. According to the analysis performed in this report, it is determined that a total of 4 points would be obtainable above the prerequisites. Three of these points are located in the Indoor and Environmental Quality Section. Of the perquisites, only three of the seven were met. A summary of LEED points earned are listed in Appendix A.

5.2 Design Ventilation Requirements – ASHRAE Standard 62.1-2004

The ventilation requirements for the Straumann USA facility are calculated using ASHRAE Standard 62.1-2004 and will be compared to the amount of ventilation air in the original design. At the time of design, ASHARE Standard 62.1-2001 is the standard utilized, however, the results summarized in Table 5.2-1 show the ventilation rates meet or exceed those specified in ASHRAE Standard 62.1-2004. Each rooftop unit is actually oversized to allow for interior space layouts, occupancies, and sizes to change without having to alter or replace the rooftop units in order to provide the required ventilation air. A detailed Standard 62.1 analysis is provided in Appendix B.

ASHRAE 62.1-2004 Ventilation Requirements					
	ASHRAE Standard 62.1-2004 Ventilation Requirements (Vot) (CFM)	H.F. Lenz Ventilation Requirements	Nominal OA (Σvoz) (CFM)	Critical Zp Value	Compliance with ASHRAE Standard 62.1-2001
RTU-1	4299	5830	2580	0.54	Yes
RTU-2	3953	7949	2372	0.54	Yes
RTU-3	1096	3302	877	0.27	Yes
RTU-4	4009	6150	2406	0.47	Yes
RTU-5	2957	3883	1774	0.47	Yes
RTU-6	1996	4070	1397	0.38	Yes
RTU-7	902	990	902	0.09	Yes
RTU-8	902	990	902	0.09	Yes
RTU-9	902	990	902	0.09	Yes
RTU-10	902	990	902	0.09	Yes

Table 5.2-1: ASHRAE 62.1-2004 Ventilation Requirements

5.3 Building Envelope – ASHRAE Standard 90.1-2004

ASHRAE Standard 90.1-2004 provides minimum requirements for energy-efficient buildings with the exception of low rise residential buildings. Section 5 of ASHRAE Standard focuses on the specific requirements for the building envelope.

Located in Andover, MA, Straumann USA is in climate zone 5 as specified in Table B-1 of ASHRAE Standard 90.1. This is used to determine the building envelope requirements for the facility. The results of the analysis are listed in Table 5.3-1.

The first calculation of fenestration percentage for the building included the only the Straumann USA building. This resulted in 61.4% which is a larger area than allowed by Standard 90.1. However, upon further inspection of the entire 100 Minuteman building, the fenestration percentage was found to be 49% which is below the allowable limits. The entire building fenestration (49%) and is used for evaluating the fenestration heat transfer coefficient and solar heat gain coefficients, since table 5.5 in Standard 90.1 does not have compliance values for any fenestration above 50%. While complying with most of the requirements for the building envelope, the fenestration requirements do not comply with ASHRAE Standard 90.1-2004.

ASHRAE Standard 90.1-2004 Section 5 Building Envelope Climate Zone 5			
Description	Actual Used in Straumann USA	Standard 90.1 Compliance Value	Compliance
Roof (Inuslated Entirely Above Deck)	U = 0.061	Max U = 0.063	Yes
Walls (Steel Framed)	U = 0.055	Max U = 0.084	Yes
Slab on Grade Floor (unheated)	F = 0.21	Max F = 0.730	Yes
Fenstration (40.1-50%, Fixed)	U = 0.5	Max U = 0.46	No
	SHGC = 0.42	Max SHGCall = 0.26	No
		Max SHGCnorth = 0.36	No
Skylight (0-2%, Fixed)	U = 0.5	Max = 1.17	Yes
	SHGC = 0.42	Max SHGCall = 0.49	Yes
Section 5 Compliance			No

Table 5.3-1: ASHRAE Standard 90.1-2004 Building Envelope Compliance

5.4 HVAC Systems – ASHRAE Standard 90.1-2004

Section 6 of ASHRAE Standard 90.1-2004 specifies minimum efficiencies for mechanical equipment, insulation requirements for piping, and insulation requirements for ductwork. According to section 6.1.1 of Standard 90.1 only new equipment must comply. If existing systems are being used as in the case of the Straumann USA facility, the existing equipment does not need to comply with the minimum efficiencies specified. A summary of mechanical equipment compliances to Standard 90.1 section 6 can be found in Tables 5.4-1 through Table 5.4-3. Insulation compliances for piping and ductwork can be found in Table 5.4-4 and Table 5.4-5 respectively. In section 6 of Standard 90.1 the design did not comply with all requirements of the fan power and piping insulation sections.

Section	Description	Unit	MBH	Compliance
6.5.1	Air Economing for sytesms greater than 65 MBH	RTU-1	984.9	Yes
		RTU-2	984.9	Yes
		RTU-3	310	Yes
		RTU-4	984.9	Yes
		RTU-5	667	Yes
		RTU-6	667	Yes
		RTU-7	984.9	Yes
		RTU-8	984.9	Yes
		RTU-9	984.9	Yes
		RTU-10	984.9	Yes

Table 5.4-1: ASHRAE 90.1-2004 Economizer Compliance

Section	Description	Unit	hp/cfm	Compliance
6.5.3.1	Fan Power Limitation	RTU-1	1.5	No
	> 20,000 cfm (VAV)	RTU-2	1.5	No
	max of 1.5hp/cfm	RTU-3	1.2	No
	<20,000 cfm (CAV)	RTU-4	1.5	No
	max of 1.5hp/cfm	RTU-5	1.5	No
		RTU-6	1.5	No
		RTU-7	1.5	No
		RTU-8	1.5	No
		RTU-9	1.5	No
		RTU-10	1.5	No

Table 5.4-2: ASHRAE 90.1-2004 Fan Power Compliance

Section	Description	Unit	SEER	Compliance
6.8.1	Air Cooled Air Conditioners	AC-3	11.6	Yes
	(split sytem)	AC-6	11.6	Yes
	< 65 MBH Min of 10.0 SEER	AC-7	11.6	Yes
		AC-8	11.6	Yes
		AC-9	11.6	Yes
	>65MBH, <135 MBH	AC-1	16.5	Yes
	10.3 SEER	AC-2	16.5	Yes
		AC-4	16.5	Yes
		AC-5	16.5	Yes

Table 5.4-3: ASHRAE 90.1-2004 Mechanical Equipment Compliance

ASHRAE Standard 90.1-2004			
Section 6 HVAC			
Duct Insulation - Climate Zone 5			
Space Type	Minimum Insulation Required	Insulation Used	Compliance
Indirectly Conditioned Space (plenum)	none	1.5" mineral fiber blanket	Yes
Exterior	R-6	1.5" mineral fiber blanket	Yes

Table 5.4-4: Minimum Duct Insulation

ASHRAE Standard 90.1-2004					
Section 6 HVAC					
Minimum Pipe Inuslation Thickness					
Pipe Type	Supply/Return	Pipe Size	Minumum Insulation Required	Inuslation Used	Compliance
Hot Water	Supply	< 1"	1.5	1	No
		1" - < 1.5"	1.5	1	No
		1.5" - < 2"	2	1	No
		1.5 " - < 4"	2	1.5	No
		4" - < 8"	2	1.5	No
		≥ 8"	2	1.5	No
	Return	< 1"	1	1	Yes
		1" - < 1.5"	1	1	Yes
		1.5" - < 2"	1	1	Yes
		1.5 " - < 4"	1	1.5	Yes
		4" - < 8"	1.5	1.5	Yes
		≥ 8"	1.5	1.5	Yes
Chilled Water	Supply and Return	< 1"	0.5	1.5	Yes
		1" - < 1.5"	0.5	1.5	Yes
		1.5" - < 4"	1	1.5	Yes
		4" - < 8"	1	1.5	Yes
		≥ 8"	1	1.5	Yes
Steam	Supply	< 1"	1.5	1	No
		1" - < 1.5"	1.5	1	No
		1.5" - < 2"	2	1	No
		1.5 " - < 4"	2	1.5	No
		4" - < 8"	2	1.5	No
		≥ 8"	2	1.5	No
Condensate	Return	< 1"	1	1	Yes
		1" - < 1.5"	1	1	Yes
		1.5" - < 2"	1	1	Yes
		1.5 " - < 4"	1	1.5	Yes
		4" - < 8"	1.5	1.5	Yes
		≥ 8"	1.5	1.5	Yes

Table 5.4-5: Minimum Pipe Insulation Thickness

5.5 Power ASHRAE Standard 90.1-2004

According to the electrical engineer for the Straumann USA project all feeders and branch circuits were designed to comply with the voltage drop requirements of section eight of Standard 90.1. Feeders and branch circuits have a voltage drop of no more

than 3% and 2% respectively. Based on this information, the project complies with section 8 of ASHRAE Standard 90.1-2004

5.6 Lighting ASHRAE Standard 90.1-2004

Section 9 of ASHRAE Standard 90.1 sets requirements on maximum lighting densities for a building. One of two ways can be used to show compliance with the standard. The space by space method can be used to show that each individual area does not exceed the lighting power density determined by the occupancy. The second method is the building area method, where the entire building is considered and the maximum power density is set by the type of building.

A space by space method power density analysis calculation for the Straumann USA. This calculation resulted in several spaces not complying with the maximum requirements of Standard 90.1. Since either the space by space method or building area method is able to provide compliance to the standard, both calculations are performed. Since the building has two main occupancies, a weighted average of building area and occupancy type is used to calculate the allowable power density for the building. The results of this method are summarized in Table 5.6-1. Using the building area method, the project complies with section 9 of ASHRAE Standard 90.1-2004

ASHRAE Standard 90.1-2004		
Section 9 Lighting Power Density		
Building Type	Max Power Density	Area of Straumann USA
Manufacturing	1.3	75,000
Office	1	68,800
Weighted Avgerage	1.16	
Power Density of Straumann	1.02	
Compliance	Yes	

Table 5.6-1: Lighting Power Density Building Area Method