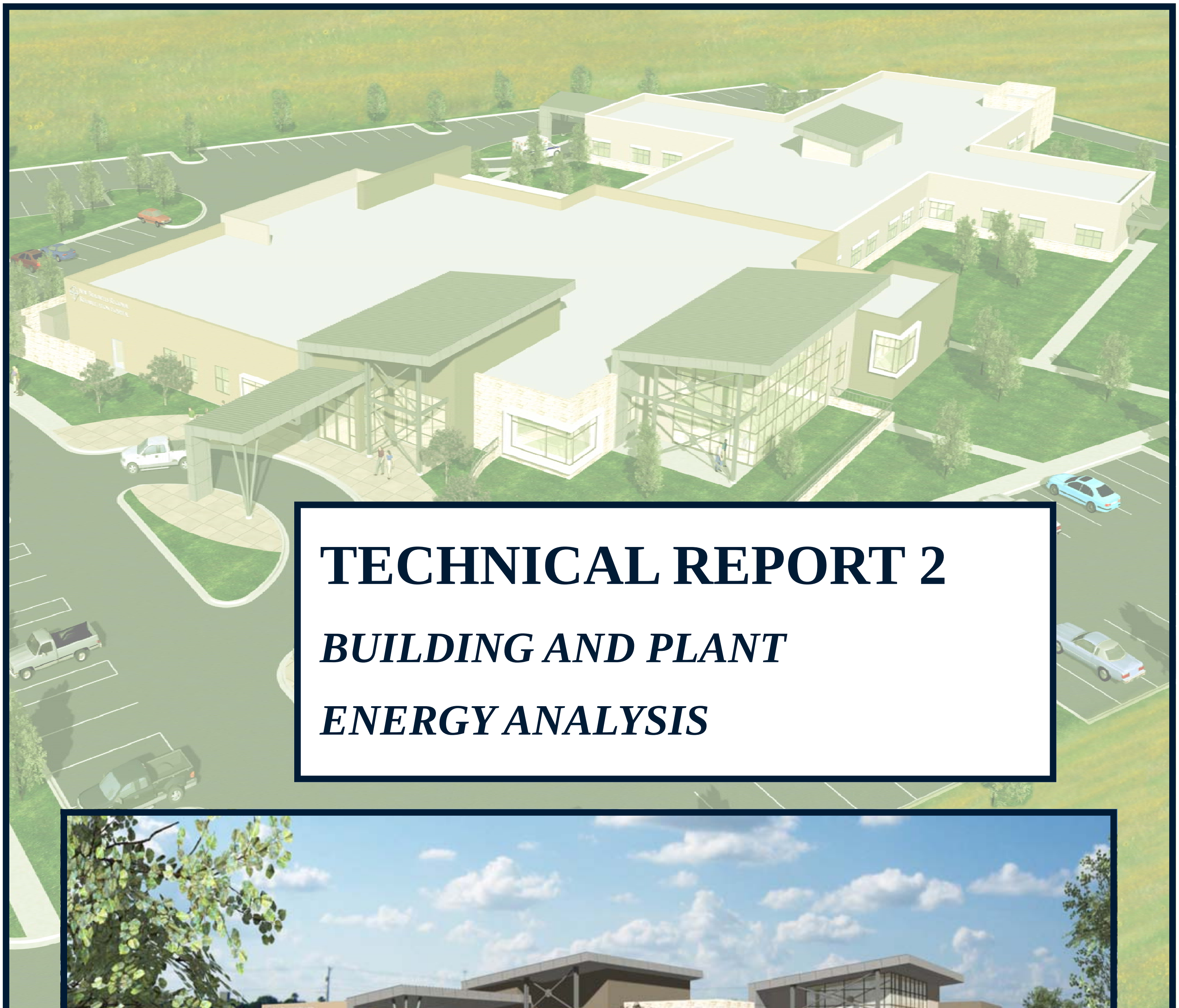

TECHNICAL REPORT 2

BUILDING AND PLANT ENERGY ANALYSIS

New Braunfels Regional Rehabilitation Hospital

New Braunfels, TX

Adam Bernardo

Mechanical Option

Faculty Advisor: Dr. William Bahnfleth

Date Submitted: 10/19/11

Table of Contents

List of Figures

List of Tables

(1.0) Executive Summary

This report describes the building and plant energy analysis performed on the New Braunfels Regional Rehabilitation Hospital (NBRRH) using Trane Trace 700 software. Included in this report are a summary of the design load estimation, an analysis of these results, and an energy and operating cost study. In order to run a complete load calculation and energy model, factors such as weather data and building construction had to be considered, and a number of assumptions about the building and occupant and process loads had to be made.

The results of the load estimation were analyzed in two different ways: by a broader, system-level approach and by a detailed, zone-level approach. Both analyses yielded peak heating and cooling load results that were much lower than expected values based on ASHRAE Fundamentals values and the actual designed capacity of existing systems.

The facility as a whole is modeled to use about 108 tons of cooling, while the design documents prescribe systems with a capacity of about 169 tons of cooling. The heating load of the Trace model came out to be about 550 MBh and was similarly lower than the designed systems, which prescribe 1,320 MBh of heating. A likely cause of these discrepancies is the assumption of the miscellaneous loads in circulation and therapy areas, as discussed in this report.

Using the loads calculated by the Trace model, an energy and economic analysis was also performed on the NBRRH. Though the model may be underestimating the energy used in the actual facility, this analysis is still useful because it gives a clear picture of which areas of the building are comparatively using the most energy and where improvements could be made.

The cooling system was determined to be the largest energy consumer in the building, which is expected for a facility in the American southwest. The monthly energy and operating cost profiles included in this report are good indications of the distribution of energy use throughout the year and could be used to make energy- and cost-saving decisions to improve the facility.

Also included in this report is a summary of harmful emissions as a result of the energy use discussed. Carbon dioxide, equivalent carbon dioxide, and solid waste were determined to be the pollutants emitted in the largest quantity, though several other harmful pollutants occur as a result of the mechanical heating and cooling processes.

(2.0) Building Overview

Facility Description

The New Braunfels Regional Rehabilitation Hospital is a 40-bed, acute-care hospital and physical rehabilitation clinic located about 30 miles northeast of San Antonio, Texas. Managed by Ernest Health, Inc., the nearly 50,000 square foot facility is located on a several hundred thousand square foot site that was previously a country club. Ernest Health operates 14 similar acute-care hospitals in various regions of the United States.

All of the patient rooms and hospital-specific functions are located in the northern wing of the building, which is arranged in a cross design. The south-facing sections of the building house public functions with a large amount of glazing. These include administrative offices, the entrance lobby and reception area, and the physical therapy and exercise room. Other functions included in the southern wing of the facility are the hospital's kitchen and patient dining areas, exam and therapy rooms, service rooms, and additional office space.

Mechanical System Overview

Three packaged rooftop units supply most of the facility with conditioned air. Each of these units is air-cooled and utilizes gas-fired heating. One 26,000 CFM unit serves the entire north patient wing of the building with air for ventilation and space conditioning. The other two units, totaling 29,500 CFM, serve the therapy, administrative, and kitchen/dining functions of the facility.

All zones are supplied by VAV terminal units and utilize a fully-ducted return system. Two gas-fired boilers provide heating hot water to reheat coils located in the VAV boxes at zone level. For the purpose of this load estimation and energy model, these boilers are not included and reheat occurs at the system level. This makes for a more manageable model and still provides an accurate estimation of the heating load and combustion gas consumed by the facility.

(3.0) Design Load Estimation Procedure

The heating and cooling loads for the New Braunfels Regional Rehabilitation Hospital were estimated using Trane Trace 700 software. The building itself and mechanical systems were modeled using mechanical and architectural design drawings and documents along with a number of assumptions and data, outlined in this report. Because of the manageable size of the facility, a room-by-room method was used to estimate the loads on the building.

(3.1) Load Calculation Assumptions

To perform the load estimation, several general assumptions were made that both accurately simulate design conditions and make the estimation easier to accomplish. It was assumed that the facility is fully operational at all times of the day throughout the entire year. This assumption is valid because of the critical functions occurring in the spaces and makes a difference in load profiles because spaces will need to be heated, cooled, and ventilated around the clock. Additionally, there were simplifications made to some design load data in order to make the modeling process time-efficient.

(3.2) Weather Data

Typical weather data for San Antonio, TX was obtained from the 2009 ASHRAE Handbook of Fundamentals. The measurements for this data were taken at the San Antonio International Airport, approximately 32 miles from the facility, so the data was assumed to be an accurate representation of the weather conditions that the site will see. A summary of the design conditions is shown in Table 1 below, while the entire ASHRAE Weather Data Sheet is provided in Appendix B. The listed design cooling and heating conditions are 0.4% and 99.6% values, respectively.

Table 1: ASHRAE Weather Data

Design Condition	Outdoor DB	Outdoor WB	DB Range	Indoor Design DB
Cooling	98.5 ºF	73.5 ºF	20.1 ºF	75 ºF
Heating	27.4 ºF	-	-	72 ºF

(3.3) Building Envelope

Building U-Factors were obtained from the basis of design performed by JBA Consulting Engineers and confirmed by the architect’s model in Autodesk’s Revit Architecture program. These values are shown in Table 2 on the next page. All exterior walls in the facility have a structure of 6” metal studs with insulation and have a gypsum wall board interior face. Two exterior facades exist in the facility, so for the purpose of this analysis an average U-Factor was used for all exterior faces. All exterior glazing, including components of the southeast curtain wall system, was assumed to have the same U-Factor and shading coefficient.

Table 2: Building Envelope U-Factors

Envelope Element	Description	U-Factor (BTU/hr-ft^2-°F)	Shading Coefficient
Floor Slab	4" HW Concrete	0.6587	-
Roof	Insulated Metal Deck	0.03569	-
Exterior Walls	Steel Frame, 6" Insulation	0.05543	-
Glazing	Steel Framed, Double-Pane	0.35	0.95

(3.4) Design Loads

Design loads used in this load estimation are shown below in Table 3 and discussed in the following two sections.

Table 3: Design Load Summary

Template Name	People	Equipment	Lighting	Ventilation	
	SF/Person	W/SF	W/SF	CFM/Person	CFM/SF
Breakroom	33.3	0.5	1.2	5	0.06
Classroom	20	0.5	1.4	10	0.12
Conference	20	0.5	1.3	5	0.06
Corridor	0	0.0	1.0	0	0.06
Custodian	0	0.0	0.9	0	0.12
Dining	10	0.0	0.9	7.5	0.18
Electrical	0	20.0	1.5	0	0.06
Files	0	0.0	1.1	0	0.12
Gym/Exercise	50	2.0	0.9	20	0.06
Kitchen	0	1.0	1.2	0	0
Laundry	0	5.0	0.6	7.5	0.06
Lobby	16.7	0.0	1.3	5	0.06
Locker Room	0	0.0	0.6	0	0
Mechanical	0	10.0	1.5	0	0.06
Nurse Station	143	0.5	1.0	5	0.06
Office	143	0.5	1.1	5	0.06
Pool	50	0.0	0.9	20	0.06
Restroom	0	0.0	0.9	0	0
Storage	0	0.0	0.9	0	0.12
Vestibule	0	0.0	1.3	0	0
Template Name	**# of People**	**Equipment**	**Lighting**	**Ventilation**	
		W/SF	**W/SF**	**Air Changes/Hour**	
Bathing	2	2.0	0.9	10	
Body Holding	0	2.0	0.9	10	
Clean Linen Storage	0	0.0	0.9	2	
Medical Storage	0	0.0	1.4	8	
Patient Room	2	2.0	0.7	6	
Patient Toilet	1	0.0	0.9	10	
Pharmacy	3	2.0	1.2	4	
Soiled Linen Storage	0	0.0	0.9	10	
Therapy	2	1.0	1.5	6	

(3.4.1) Design Occupancy and Ventilation

The design occupancy for spaces in the administrative, dining, and physical therapy areas were determined using the preset occupancy values in the Trace program based on the use of the space. In the hospital-specific spaces of the building, the occupancy density used by the mechanical engineer was used when available. If these values were not available, a reasonable estimate was made based on room function.

The ventilation requirements for the administrative, dining, and physical therapy areas were determined using Table 6-1 of ASHRAE Standard 62.1-2007 because this method was also used by the mechanical designer to calculate ventilation airflows. In the hospital-specific areas of the facility, Table 7-1 of ASHRAE Standard 170 was used to determine the required air changes per hour for this ventilation estimation.

(3.4.2) Lighting and Miscellaneous Loads

Lighting power densities used to generate lighting loads in the Trace model are based on Table 2 in Chapter 18 of ASHRAE Fundamentals 2009. The miscellaneous loads used in the model are based on this user's judgment of the likely equipment to be in the space. Safety factors or overestimating was not used in these load assumptions as an attempt to estimate an accurate heating and cooling load.

(4.0) Design Load Estimation Results

Two different approaches were taken to analyze the results of the load calculation performed by the Trace model. First, a system analysis was performed where the modeled loads on each RTU were compared to the existing RTUs, as designed. Following this, a more detailed zone analysis was conducted in order to determine the major contributors to these loads and to identify any spaces that were using an unexpected amount of energy for heating or cooling. These two analyses are shown in the following two sections.

(4.1) System Analysis

Shown in Figure 1 below are the areas that each of the rooftop units serve. RTU-1 delivers conditioned air to patient rooms and hospital-related functions in the northern wing of the facility. The physical therapy and exercise areas are served by RTU-2, and RTU-3 primarily serves the kitchen and dining area as well as administrative and back-of-house functions.

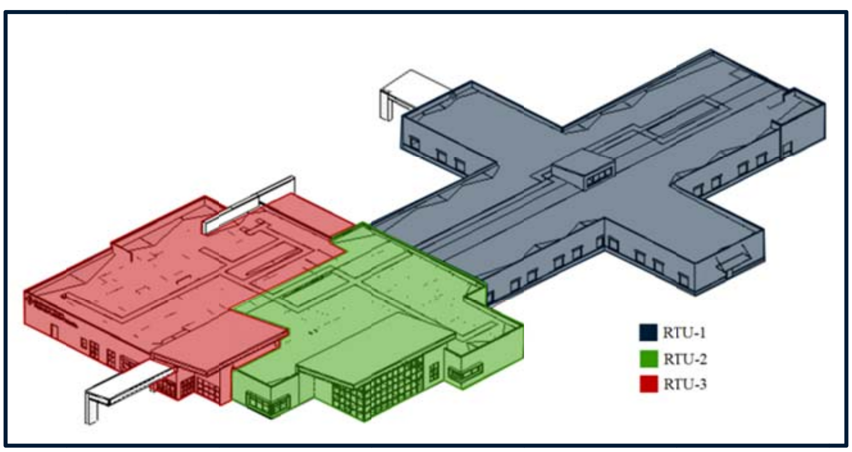

Figure 1: RTU Areas

Results of the load estimation for each system are shown in Table 4 below, which also compares these results to the as-designed systems. A number of discrepancies exist between the modeled and existing systems.

Table 4: System-Level Load Comparison

	System	Area (SF)	Exterior Wall Area (SF)	Glazing Area (SF)	Cooling Load (tons)	Supply Airflow (CFM)	Heating Load (MBh)	SF/Ton (Cooling)	CFM/SF
Modeled	RTU-1	22215	13085	1719	41.3	12962	241.3	538	0.583
	RTU-2	11378	5460	1977	32.3	8789	172.1	352	0.772
	RTU-3	10456	6203	593	34.2	6150	136.3	306	0.588
	Totals:	**44049**	**24748**	**4289**	**107.8**	**27901**	**549.7**	**409**	**0.633**
As Designed	RTU-1	22215	13085	1719	76.1	26000	520.0	292	1.170
	RTU-2	11378	5460	1977	34.8	12000	400.0	327	1.055
	RTU-3	10456	6203	593	57.2	17500	400.0	183	1.674
	Totals:	**44049**	**24748**	**4289**	**168.1**	**55500**	**1320**	**262**	**1.260**

The modeled heating load is less than half of the designed heating capacity for all three units. An explanation for this could be that, when designed, the heating capacity of the units may have been increased due to concerns of occupant safety and comfort.

Systems RTU-1 and RTU-3 also have significantly higher cooling capacities than what was estimated by the Trace load calculation. A likely cause of this difference is that the mechanical engineer may have used more conservative assumptions for process or miscellaneous power densities in these areas.

The modeled system has a relatively high square footage per ton of cooling when compared to ASHRAE Fundamentals, which gives a rule of thumb of about 275 SF/Ton for a hospital. The most likely cause is again the lack of knowledge of the process loads in the facility. If miscellaneous and receptacle loads are increased in the model, systems would have increased cooling loads and the square footage per ton of cooling would reduce to a more expected level.

(4.2) Zone Analysis

Following the broad system analysis, the same results were analyzed at a custom-created zone level to pinpoint the areas of the building where the model may be under-estimating the heating or cooling loads. Zones were created by segregating interior rooms from rooms with exterior walls. Exterior zones were then determined by the direction that they faced or the primary functions of a zone. Figure 2 on the next page shows the breakdown of the zones.

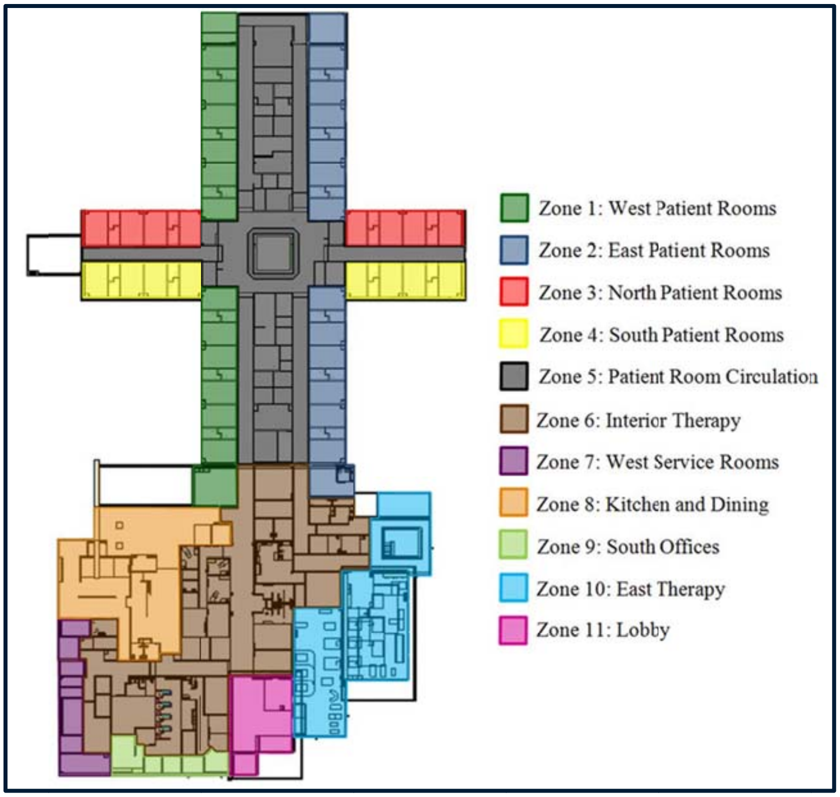

Figure 2: Building Zones

Table 5 below shows a summary of each zone's characteristics and modeled loads. The zones with the smallest cooling load per area are Zones 5 and 6, the interior zones of the building. To improve the accuracy or practicality of this model, a closer look at circulation and interior therapy spaces could be taken. Expectedly, the interior loads dominate in these two zones, according to the checksums for these zones supplied in Appendix C of this report. The people and miscellaneous loads that the model generates, however, are not as high of a portion of the interior load as expected.

Table 5: Zone-Level Load Comparison

Zone	Area (SF)	Exterior Wall Area (SF)	Glazing Area (SF)	Cooling Load (tons)	Cooling Airflow (CFM)	Heating Load (MBh)	Heating Airflow (CFM)	SF/Ton (Cooling)
1 - West Patient Rooms	3932	3483	468	9.8	3858	59.5	1162	401
2 - East Patient Rooms	3821	3405	468	10.4	3303	55.8	1011	367
3 - North Patient Rooms	2120	2420	288	5.0	1342	30.7	404	424
4 - South Patient Rooms	2121	2420	288	5.3	2042	33.4	625	400
5 - Patient Room Circulation	10221	1358	207	11.8	4301	61.9	1314	866
6 - Interior Therapy	9962	615	0	14.4	3205	67.0	968	692
7 - West Service Rooms	953	3135	0	3.4	1376	13.8	418	280
8 - Kitchen and Dining	3986	1928	366	22.3	3047	81.4	973	179
9 - South Offices	741	975	227	1.8	734	10.8	221	412
10 - East Therapy	4808	4342	1655	19.9	6225	110.7	1922	242
11 - Lobby	1384	668	322	5.0	1627	24.8	541	277
Totals:	**44049**	**24749**	**4289**	**109.1**	**31060**	**549.8**	**9559**	**404**

Each zone's percentage of the total cooling load on the building, according to the model, is shown in Figure 3 on the following page. Zone 8, which houses kitchen and dining functions, has the highest percentage of load. This is likely not true and these results could be due to the high estimate of miscellaneous load in this space. Because of the size of the existing units, it was expected that about half of the total load would come from Zones 1-5, which include all patient rooms and patient circulation. To improve this model, loads in these zones could be investigated to see if any load assumptions should be changed.

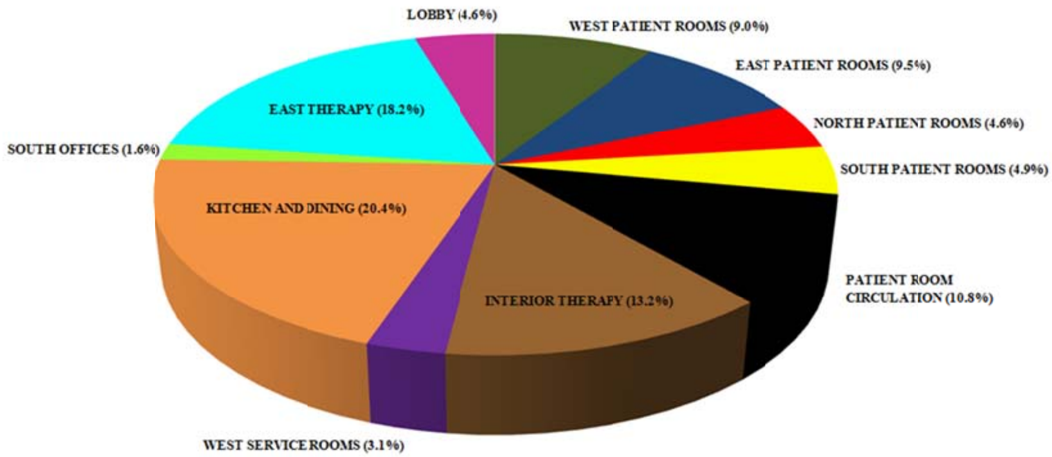

Figure 3: Zone Cooling Load Percentages

(5.0) Energy Consumption and Operating Costs

Using the results of the Trace load estimation, an analysis of the energy consumption and operating cost of the New Braunfels Regional Rehabilitation Hospital was performed. All systems were modeled as variable air volume systems with zone-level reheat. It is important to note that the accuracy of this yearly energy estimation is impossible to determine at the time of this report because the facility has only been occupied and operational for about four months.

(5.1) Annual Energy Consumption

Five main elements of the building contributed to the energy consumption of the facility. Direct expansion cooling, lights, supply and return air fans, and receptacle loads all contributed to the electricity consumed by NBRRH, while gas-fired space heating contributed to the natural gas consumed by the facility. A monthly summary of how each element used energy is shown in Table 6 on the next page, which is consistent with the results of the Trane Trace energy model.

Table 6: Monthly Energy Consumption

Month	Cooling (kWh)	Lights (kWh)	Fans (kWh)	Receptacles (kWh)	Heating (therms)
Jan	4002	12505	588	739	598
Feb	2490	11295	369	667	541
Mar	13428	12505	1905	739	112
Apr	28958	12102	3996	715	47
May	47601	12505	6351	739	21
Jun	55883	12102	7279	715	7
Jul	67256	12505	8946	739	3
Aug	69962	12505	8943	739	3
Sep	55478	12102	7343	715	11
Oct	20730	12505	2867	739	72
Nov	13874	12102	1973	715	99
Dec	4768	12505	701	739	525

Total Electrical Consumption (kWh): 591629
Total Gas Consumption (therms): 2039

As expected, the cooling load dominates the electrical consumption of the facility in the summer months because of Texas's hot, humid climate. Because the facility is occupied year-round at all hours of the day, the lighting system accounts for consistent electricity draw each month as evident by Figure 4 below, which shows the breakdown of the building's monthly energy consumption. Accompanying this breakdown, Figure 5 shows the total percentage of annual electrical consumption for each component.

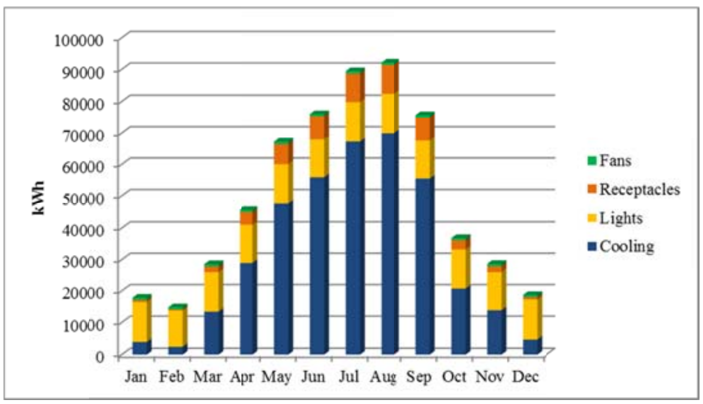

Figure 4: Monthly Electrical Energy Consumption

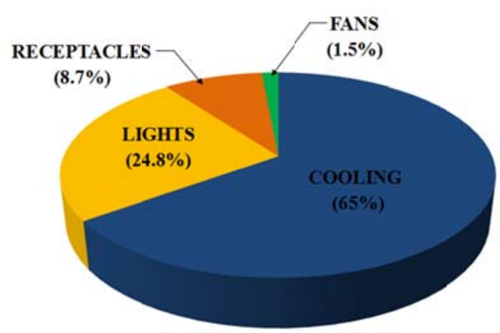

Figure 5: Equipment Electricity Percentages

The yearly natural gas consumption profile for the New Braunfels Regional Rehabilitation Hospital is shown in Figure 6 on the following page. As seen previously in Table 6 above, there is almost no heating required in the facility during summer months and thus a negligible amount of natural gas is consumed.

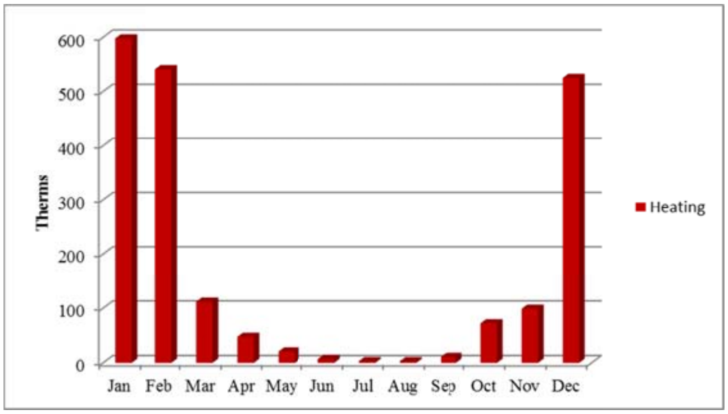

Figure 6: Monthly Natural Gas Consumption

(5.2) Equipment Operating Costs

Using the energy analysis from the previous section, the building's annual operating cost was determined. Electricity and water utility rates for New Braunfels were acquired through the New Braunfels Utility website while an average cost of natural gas in Texas was acquired through Center Point Energy's website. Table 7 below summarizes the utility rate structure that was used for this economic analysis and the total associated electricity and natural gas costs.

Table 7: Monthly Energy Costs

Month	Electricity Cost ($/kWh)	Natural Gas Cost ($/therm)	Total Electricity Cost ($)	Heating Cost ($)
Jan	0.04	0.9573	713.36	572.47
Feb	0.04	0.9573	592.84	517.90
Mar	0.04	0.9573	1143.08	107.22
Apr	0.04	0.9573	1830.84	44.99
May	0.04	0.9573	2687.84	20.10
Jun	0.05	0.9573	3798.95	6.70
Jul	0.05	0.9573	4472.30	2.87
Aug	0.05	0.9573	4607.45	2.87
Sep	0.05	0.9573	3781.90	10.53
Oct	0.04	0.9573	1473.64	68.93
Nov	0.04	0.9573	1146.56	94.77
Dec	0.04	0.9573	748.52	502.58
		Totals:	**$26,997**	**$1,952**

A distribution of monthly operating costs, broken down by component, is shown on the following page in Figure 7. Although heating loads dominate the energy consumption in winter months, the total annual operating cost is dominated by the electricity used to cool the facility. An interesting feature to notice in this profile as opposed to the electrical energy consumption shown in Figure 4 is the sharper increase in cost from May to June and the sharper drop-off from September to October. This can be attributed to the cost of electricity rising in the summer months. This analysis shows that the system having the most effect on energy consumption and operating cost in the building is by far the cooling system.

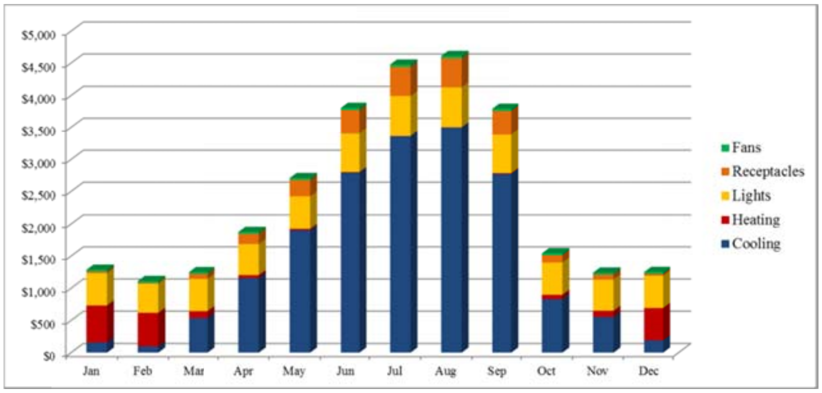

Figure 7: Monthly Operating Costs

(5.3) System Emissions

Important to consider in the system energy use of a building are the potentially harmful emissions associated with the use of this energy. The New Braunfels Regional Rehabilitation Hospital is located in the Electric Reliability Council of Texas (ERCOT) Interconnection, as shown below in Figure 8, taken from the National Renewable Energy Laboratory's (NREL's) Source Energy and Emission Factors for Energy Use in Buildings Report. That document also outlines the amount of energy generated in each region by each source of energy shown in Table 8, which is displayed on the following page.

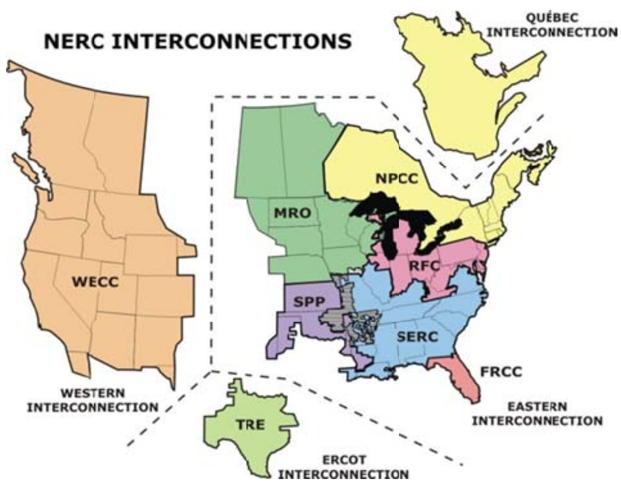

Figure 8: North American Electric Reliability Corporation Interconnections Map

Table 8: Percent Electricity Generation by Energy Type

Energy Type	National %	Eastern %	Western %	ERCOT %	Alaska %	Hawaii %
Bituminous Coal	27.8	34.3	13.1	0.0	0.0	1.0
Subbitumious Coal	19.8	19.6	19.8	21.4	9.9	13.1
Lignite Coal	2.3	1.4	0.0	14.8	0.0	0.0
Natural Gas	18.3	12.7	27.4	49.4	55.5	1.5
Petroleum Fuels	2.8	3.6	0.5	0.5	11.5	77.4
Other Fossil Fuel	0.2	0.2	0.3	0.2	0.0	0.2
Nuclear	19.9	23.0	9.9	12.4	0.0	0.0
Hydro	6.8	3.4	24.6	0.3	23.0	0.8
Renewable Fuels	1.5	1.7	1.3	0.2	0.1	4.2
Geothermal	0.4	0.0	2.1	0.0	0.0	1.9
Wind	0.4	0.1	1.0	0.9	0.0	0.1
Solar (PV)	0.0	0.0	0.1	0.0	0.0	0.0
Fossil Fuel Total	71.2	71.8	60.9	86.2	76.9	93.1
Renewable (non hydro)	2.2	1.8	4.6	1.1	0.1	6.1

The NREL's Energy and Emissions Report also specifies the volume of natural gas that needs to be delivered to a site in order to produce a certain capacity of heating. The calculation of delivered natural gas for NBRRH is shown below in Table 9 to be used later in the total emissions calculation.

Table 9: Delivered Natural Gas Calculation

Heating Capacity (BTU)	Natural Gas Heating Value (BTU/ft^3)	Natural Gas Delivered (ft^3)
549610	1010	544

Below, Table 10 shows the emission factors associated with the use of electrical energy and on-site combustion of natural gas for twelve prominent pollutants and the calculated annual mass of those pollutants associated with each form of energy. Shown graphically in Figure 9 on the next page, the most abundant pollutants associated with the energy used by the facility are CO_2, CO_{2e} (equivalent carbon dioxide), and solid waste.

Table 10: Emission Factors and Pollutant Mass

Pollutant	Electricity Emission Factor (lb pollutant/kWh electricity)	Mass of Pollutant (lbm/year)	Pre-Combustion Emission Factor (lb pollutant/1000 ft^3 Natural Gas)	Mass of Pollutant (lbm/year)
CO_{2e}	1.84E+00	1088597.36	2.78E+01	15.12
CO_2	1.71E+00	1011685.59	1.16E+01	6.31
CH_4	5.30E-03	3135.63	7.04E+01	38.30
N_2O	4.02E-05	23.78	2.35E-04	1.28E-04
NO_X	2.20E-03	1301.58	1.64E-02	8.92E-03
SO_X	9.70E-03	5738.80	1.22E+00	0.66
CO	9.07E-04	536.61	1.36E-02	7.40E-03
TNMOC	7.44E-05	44.02	4.56E-05	2.48E-05
Lead	1.42E-07	8.40E-02	2.41E-07	1.31E-07
Mercury	2.79E-08	1.65E-02	5.51E-08	3.00E-08
PM10	1.30E-04	76.91	8.17E-04	4.44E-04
Solid Waste	1.66E-01	98210.41	4.21E+02	229.02
Delivered Electricity = 591,629 kWh				
Delivered Fuel = 544 ft^3 Natural Gas				

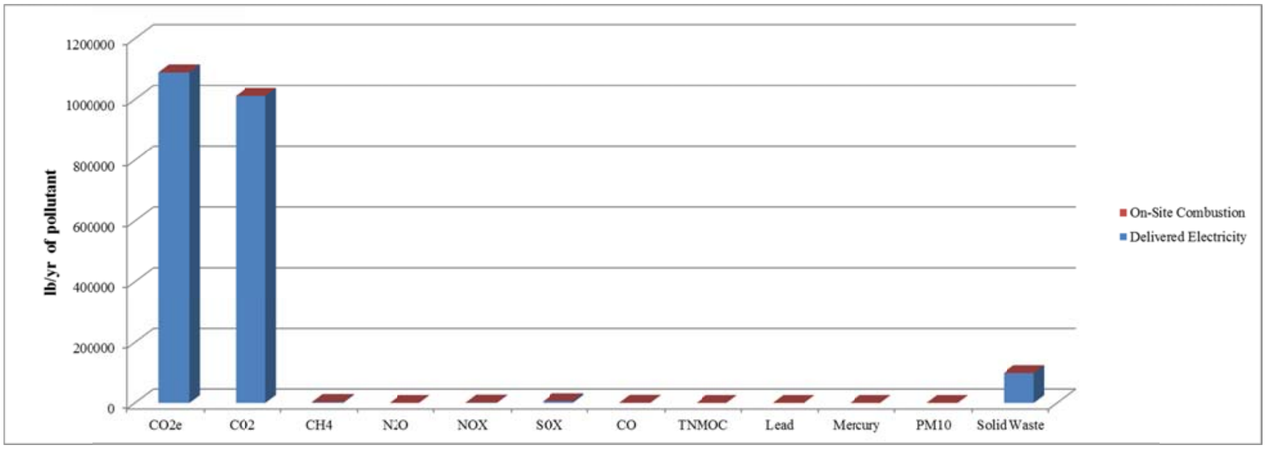

Figure 9: Annual Pollutant Mass

Though the carbon dioxide values dominate the above figure, the levels of the other pollutants should not be ignored. Sulfur oxides and nitrogen oxides in particular are common results of the combustion process and are significant contributors to the greenhouse effect, acid rain, and local air pollution.

Appendix A: Resources

- ANSI/ASHRAE (2010). Standard 62.1 - 2004, Ventilation for Acceptable Indoor Air Quality. Atlanta, GA: American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

- ANSI/ASHRAE (2010). Standard 90.1 - 2004, Energy Standard for Buildings Except Low-Rise Residential Buildings. Atlanta, GA: American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

- ASHRAE (2009). 2005 ASHRAE Handbook - Fundamentals. Atlanta, GA: American Society of Heating Refrigeration and Air Conditioning Engineers, Inc.

- ASHRAE (2007). 2007 ASHRAE Handbook - HVAC Applications. Atlanta, GA: American Society of Heating Refrigeration and Air Conditioning Engineers, Inc.

- Center Point Energy. Natural Gas and Electricity. 2011. http://www.centerpointenergy.com/services/naturalgas/business/naturalgasprices/energycostcomparison.

- National Renewable Energy Laboratory. *Source Energy and Emission Factors for Energy Use in Buildings*. M. Deru and P. Torcellini. 2007.

- New Braunfels Utilies. Current Rates, 2009. http://www.nbutexas.com

- Trane Trace 700 v.6.2.6.5 (2010) Tyler, TX, United States of America.

- United States Energy Information Administration. September, 2008. CBECS. Commercial Energy Use & Costs.

- United States Environmental Protection Agency. *Air Pollution Control Orientation Course*.2010. http://www.epa.gov/eogapti1/course422/ap5.html.

Appendix B: ASHRAE Weather Data Sheet

2009 ASHRAE Handbook - Fundamentals (IP)

SAN ANTONIO INTL AP, TX, USA

WMO#: 722530

Lat: 29.53N Long: 98.46W Elev: 810 StdP: 14.27 Time Zone: -6.00 (NAC) Period: 82-06 WBAN: 12921

Annual Heating and Humidification Design Conditions

Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB	
			99.6%			99%			0.4%		1%			
	99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD
1	27.4	31.6	10.3	9.6	38.9	15.6	12.5	44.6	24.4	46.8	20.9	50.2	8.3	10

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWS/PCWD to 0.4% DB	
		0.4%		1%		2%		0.4%		1%		2%			
		DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWS	PCWD
8	20.1	98.5	73.5	96.9	73.6	95.2	73.7	78.0	88.0	77.3	87.1	76.7	86.2	9.6	160

Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Hours 8 to 4 & 55/69
0.4%			1%			2%			0.4%		1%		2%		
DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	
75.9	139.4	80.1	75.2	136.0	79.8	74.4	132.6	79.8	42.0	88.0	41.2	86.9	40.6	86.0	690

Extreme Annual Design Conditions

Extreme Annual WS			Extreme Max WB	Extreme Annual DB				n-Year Return Period Values of Extreme DB							
				Mean		Standard deviation		n=5 years		n=10 years		n=20 years		n=50 years	
1%	2.5%	5%		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
20.2	18.2	16.6	82.9	21.5	102.2	5.8	2.6	17.4	104.1	14.0	105.6	10.8	107.1	6.6	109.0

Monthly Climatic Design Conditions

			Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperatures, Degree-Days and Degree-Hours	Tavg		69.5	52.2	55.6	62.1	69.5	76.7	82.0	84.6	85.1	79.7	71.2	61.1	53.1
	Sd			9.13	9.55	8.47	7.10	5.30	3.77	2.95	2.97	5.64	7.44	9.10	9.95
	HDD50		239	83	47	13	0	0	0	0	0	0	1	15	80
	HDD65		1480	406	283	154	39	1	0	0	0	2	30	179	386
	CDD50		7350	150	204	389	586	828	961	1071	1089	891	658	348	175
	CDD65		3115	8	20	65	175	364	511	606	624	443	221	62	16
	CDH74		32766	44	172	442	1390	3224	5615	7251	7674	4688	1870	341	55
	CDH80		15154	4	44	98	440	1283	2666	3733	4062	2162	607	52	3
Monthly Design Dry Bulb and Mean Coincident Wet Bulb Temperatures	0.4%	DB		78.8	85.4	87.1	93.2	96.5	99.2	100.4	100.2	99.6	92.2	85.0	79.1
		MCWB		60.5	60.9	64.8	68.1	72.5	74.7	72.9	73.7	72.3	71.6	68.6	63.9
	2%	DB		74.3	79.0	82.4	88.1	93.0	96.3	98.3	98.4	95.6	89.2	81.0	75.2
		MCWB		60.6	61.1	65.0	67.9	72.8	74.5	73.4	73.8	73.5	71.1	67.5	62.6
	5%	DB		71.0	74.5	79.0	84.7	89.9	93.8	96.4	96.8	93.1	86.5	78.0	72.1
		MCWB		60.1	60.3	63.8	67.9	72.8	74.3	73.8	73.8	73.2	70.3	66.5	62.3
	10%	DB		67.7	70.6	75.3	81.9	87.0	91.5	94.2	95.1	90.6	83.3	74.9	69.0
		MCWB		59.8	60.4	62.9	67.1	72.4	74.4	74.0	74.0	72.7	69.6	65.5	62.1
Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperatures	0.4%	WB		68.4	68.8	71.3	75.2	78.3	78.7	78.4	78.3	78.2	76.8	73.2	69.4
		MCDB		71.3	73.8	78.6	83.5	88.3	89.5	88.7	88.9	86.3	83.5	78.6	72.7
	2%	WB		66.5	67.3	69.7	73.4	76.7	77.8	77.6	77.4	77.1	75.5	71.5	67.8
		MCDB		69.8	71.9	75.3	80.9	86.0	88.2	87.9	87.3	85.2	81.9	76.3	71.1
	5%	WB		64.3	65.6	68.5	72.1	75.4	77.1	77.0	76.8	76.3	74.5	70.1	66.1
		MCDB		68.1	69.7	73.9	79.1	83.6	87.0	86.9	86.7	84.2	80.8	74.8	69.7
	10%	WB		61.1	63.1	66.9	70.8	74.4	76.3	76.3	76.2	75.5	73.0	68.5	63.7
		MCDB		66.4	69.0	72.4	77.3	82.5	85.7	85.8	86.0	83.3	79.3	73.3	68.1
Mean Daily Temperature Range		MDBR		20.7	20.8	21.0	21.1	18.9	18.7	19.1	20.1	20.1	20.4	20.3	20.5
	5% DB	MCDBR		25.5	26.7	24.6	24.6	21.3	21.0	21.9	21.9	21.8	21.7	20.9	23.0
		MCWBR		15.4	13.9	12.0	11.3	7.1	5.5	4.6	4.6	5.8	8.2	11.1	13.7
	5% WB	MCDBR		17.6	17.9	17.1	18.0	17.7	18.0	18.4	19.3	17.7	16.1	16.4	17.1
		MCWBR		13.7	12.5	10.0	9.7	7.3	6.1	4.7	5.0	5.9	7.6	11.2	13.2
Clear Sky Solar Irradiance	taub			0.336	0.351	0.366	0.395	0.421	0.435	0.441	0.449	0.423	0.368	0.345	0.331
	taud			2.422	2.371	2.308	2.223	2.189	2.174	2.167	2.144	2.228	2.398	2.443	2.501
	Ebn,noon			285	290	292	286	277	271	269	267	270	281	280	282
	Edh,noon			33	36	41	45	47	48	48	48	43	35	32	29

CDDn Cooling degree-days base n°F, °F-day
CDHn Cooling degree-hours base n°F, °F-hour
DB Dry bulb temperature, °F
DP Dew point temperature, °F
Ebn,noon } Clear sky beam normal and diffuse hori-
Edh,noon } zontal irradiances at solar noon, Btu/h/ft2
Elev Elevation, ft
Enth Enthalpy, Btu/lb
HDDn Heating degree-days base n°F, °F-day
Hours 8/4 & 55/69 Number of hours between 8 a.m. and 4 p.m with DB between 55 and 69 °F
HR Humidity ratio, grains of moisture per lb of dry air

Lat Latitude, °
Long Longitude, °
MCDB Mean coincident dry bulb temperature, °F
MCDBR Mean coincident dry bulb temp. range, °F
MCDP Mean coincident dew point temperature, °F
MCWB Mean coincident wet bulb temperature, °F
MCWBR Mean coincident wet bulb temp. range, °F
MCWS Mean coincident wind speed, mph
MDBR Mean dry bulb temp. range, °F
PCWD Prevailing coincident wind direction, °, 0 = North, 90 = East

Period Years used to calculate the design conditions
Sd Standard deviation of daily average temperature, °F
StdP Standard pressure at station elevation, psi
taub Clear sky optical depth for beam irradiance
taud Clear sky optical depth for diffuse irradiance
Tavg Average temperature, °F
Time Zone Hours ahead or behind UTC, and time zone code
WB Wet bulb temperature, °F
WBAN Weather Bureau Army Navy number
WMO# World Meteorological Organization number
WS Wind speed, mph

Appendix C: Interior Zone Checksums

Zone Checksums

By ACADEMIC

Zone 5: Patient Room Circulation

COOLING COIL PEAK / CLG SPACE PEAK

Cooling Coil Peak — Peaked at Time: Mo/Hr: 8 / 14; Outside Air: OADB/WB/HR: 96 / 78 / 124

Clg Space Peak — Mo/Hr: 7 / 19; OADB: 90

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads						
Skylite Solar	0	0	0	0	0	0
Skylite Cond	0	0	0	0	0	0
Roof Cond	0	29,283	29,283	21	0	0
Glass Solar	3,468	0	3,468	2	2,420	3
Glass/Door Cond	1,314	0	1,314	1	1,195	2
Wall Cond	490	1,453	1,943	1	641	1
Partition/Door	0		0	0	0	0
Floor	0		0	0	0	0
Adjacent Floor	0	0	0	0	0	0
Infiltration	0		0	0	0	0
Sub Total ==>	5,273	30,736	36,009	25	4,256	6
Internal Loads						
Lights	7,269	1,817	9,086	6	24,533	32
People	16,136	0	16,136	11	9,436	12
Misc	27,187	0	27,187	19	25,669	34
Sub Total ==>	50,592	1,817	52,409	37	59,638	78
Ceiling Load	14,158	-14,158	0	0	12,513	16
Ventilation Load	0	0	58,186	41	0	0
Adj Air Trans Heat	0		0	0	0	0
Dehumid. Ov Sizing			0	0		
Ov/Undr Sizing	0		0	0	0	0
Exhaust Heat		-4,508	-4,508	-3		
Sup. Fan Heat			0	0		
Ret. Fan Heat		0	0	0		
Duct Heat Pkup		0	0	0		
Underflr Sup Ht Pkup			0	0		
Supply Air Leakage		0	0	0		
Grand Total ==>	70,023	13,887	142,097	100.00	76,407	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design; OADB: 30

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-13,153	21.24
Glass Solar	0	0	0.00
Glass/Door Cond	-2,915	-2,915	4.71
Wall Cond	-544	-2,353	3.80
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	-3,459	-18,420	29.74
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-12,773	0	0.00
Ventilation Load	0	-37,481	60.52
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		3,696	-5.97
OA Preheat Diff.		-2,689	4.34
RA Preheat Diff.		-3,620	5.85
Additional Reheat		0	0.00
System Plenum Heat		-3,417	5.52
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-16,232	-61,931	100.00

TEMPERATURES

	Cooling	Heating
SADB	58.6	81.4
Ra Plenum	79.4	66.1
Return	79.4	66.1
Ret/OA	83.7	42.3
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	4,301	1,314
Terminal	4,301	1,314
Main Fan	4,301	1,314
Sec Fan	0	0
Nom Vent	953	866
AHU Vent	953	866
Infil	0	0
MinStop/Rh	1,314	1,314
Return	4,301	1,314
Exhaust	953	866
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	22.2	65.9
cfm/ft²	0.42	0.13
cfm/ton	363.20	
ft²/ton	863.16	
Btu/hr-ft²	13.90	-6.06
No. People	58	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	11.8	142.1	98.4	3,564	83.7	68.2	82.0	58.6	55.7	63.7
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	11.8	142.1								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	10,221		
Part	0		
Int Door	0		
ExFlr	0		
Roof	10,221	0	0
Wall	1,358	207	15
Ext Door	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-32.5	1,314	58.6	81.4
Aux Htg	0.0	0	0.0	0.0
Preheat	-29.5	953	30.0	58.6
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-61.9			

Project Name:

Dataset Name: TECH2.trc

'RACE® 700 v6.2.6.5 calculated at 06:29 PM on 10/17/2011

Alternative - 1 System Checksums Report Page 7 of 12

Zone Checksums

By ACADEMIC

Zone 6-1 Interior Therapy

COOLING COIL PEAK / CLG SPACE PEAK

Cooling Coil Peak — Peaked at Time: Mo/Hr: 8 / 15; Outside Air: OADB/WB/HR: 96 / 78 / 118

Clg Space Peak — Mo/Hr: 7 / 20; OADB: 87

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads						
Skylite Solar	0	0	0	0	0	0
Skylite Cond	0	0	0	0	0	0
Roof Cond	0	16,056	16,056	18	0	0
Glass Solar	0	0	0	0	0	0
Glass/Door Cond	0	0	0	0	0	0
Wall Cond	422	779	1,201	1	234	1
Partition/Door	0		0	0	0	0
Floor	0		0	0	0	0
Adjacent Floor	0	0	0	0	0	0
Infiltration	0		0	0	0	0
Sub Total ==>	422	16,835	17,256	19	234	1
Internal Loads						
Lights	3,748	937	4,685	5	14,055	40
People	19,159	0	19,159	21	11,324	32
Misc	5,179	0	5,179	6	4,811	14
Sub Total ==>	28,086	937	29,023	32	30,190	86
Ceiling Load	6,376	-6,376	0	0	4,757	14
Ventilation Load	0	0	47,630	53	0	0
Adj Air Trans Heat	0		0	0	0	0
Dehumid. Ov Sizing			0	0		
Ov/Undr Sizing	0		0	0	0	0
Exhaust Heat		-3,489	-3,489	-4		
Sup. Fan Heat			0	0		
Ret. Fan Heat		0	0	0		
Duct Heat Pkup		0	0	0		
Underflr Sup Ht Pkup			0	0		
Supply Air Leakage		0	0	0		
Grand Total ==>	34,883	7,907	90,421	100.00	35,181	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design; OADB: 30

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-6,837	18.67
Glass Solar	0	0	0.00
Glass/Door Cond	0	0	0.00
Wall Cond	-333	-947	2.59
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	-333	-7,784	21.26
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-5,032	0	0.00
Ventilation Load	0	-20,977	57.29
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,606	-4.39
OA Preheat Diff.		-9,779	26.71
RA Preheat Diff.		-387	1.06
Additional Reheat		0	0.00
System Plenum Heat		704	-1.92
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-5,364	-36,618	100.00

TEMPERATURES

	Cooling	Heating
SADB	56.1	79.6
Ra Plenum	78.9	66.9
Return	78.9	66.9
Ret/OA	89.7	32.4
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	1,720	518
Terminal	1,720	518
Main Fan	1,720	518
Sec Fan	0	0
Nom Vent	831	485
AHU Vent	831	485
Infil	0	0
MinStop/Rh	518	518
Return	1,720	518
Exhaust	831	485
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	48.3	93.6
cfm/ft²	0.33	0.10
cfm/ton	228.29	
ft²/ton	688.25	
Btu/hr-ft²	17.44	-7.06
No. People	65	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	7.5	90.4	53.9	1,323	89.7	72.9	98.8	56.1	51.9	52.5
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	7.5	90.4								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	5,186		
Part	0		
Int Door	0		
ExFlr	0		
Roof	5,186	0	0
Wall	450	0	0
Ext Door	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-13.2	518	56.1	79.6
Aux Htg	0.0	0	0.0	0.0
Preheat	-23.5	831	30.0	56.1
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-36.6			

Project Name:
Dataset Name: TECH2.trc

'RACE® 700 v6.2.6.5 calculated at 06:29 PM on 10/17/2011
Alternative - 1 System Checksums Report Page 8 of 12

Zone Checksums
By ACADEMIC

Zone 6-2 Interior Therapy

COOLING COIL PEAK — Peaked at Time: Mo/Hr: 8 / 14; Outside Air: OADB/WB/HR: 96 / 78 / 124

CLG SPACE PEAK — Mo/Hr: 7 / 20; OADB: 87

	Cooling Coil Peak: Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)	CLG Space Peak: Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads						
Skylite Solar	0	0	0	0	0	0
Skylite Cond	0	0	0	0	0	0
Roof Cond	0	13,706	13,706	17	0	0
Glass Solar	0	0	0	0	0	0
Glass/Door Cond	0	0	0	0	0	0
Wall Cond	172	319	491	1	89	0
Partition/Door	0		0	0	0	0
Floor	0		0	0	0	0
Adjacent Floor	0	0	0	0	0	0
Infiltration	0		0	0	0	0
Sub Total ==>	172	14,025	14,197	17	89	0
Internal Loads						
Lights	3,618	905	4,523	5	13,559	35
People	14,858	0	14,858	18	8,841	23
Misc	11,884	0	11,884	14	11,039	28
Sub Total ==>	30,361	905	31,265	38	33,440	86
Ceiling Load	6,326	-6,326	0	0	5,369	14
Ventilation Load	0	0	39,756	48	0	0
Adj Air Trans Heat	0		0	0	0	0
Dehumid. Ov Sizing			0	0		
Ov/Undr Sizing	0		0	0	0	0
Exhaust Heat		-2,953	-2,953	-4		
Sup. Fan Heat			0	0		
Ret. Fan Heat		0	0	0		
Duct Heat Pkup		0	0	0		
Underflr Sup Ht Pkup			0	0		
Supply Air Leakage		0	0	0		
Grand Total ==>	36,859	5,650	82,265	100.00	38,898	100.00

HEATING COIL PEAK — Mo/Hr: Heating Design; OADB: 30

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-6,110	20.17
Glass Solar	0	0	0.00
Glass/Door Cond	0	0	0.00
Wall Cond	-122	-341	1.12
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	-122	-6,451	21.29
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-6,288	0	0.00
Ventilation Load	0	-15,472	51.07
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,607	-5.31
OA Preheat Diff.		-6,560	21.66
RA Preheat Diff.		-1,457	4.81
Additional Reheat		0	0.00
System Plenum Heat		-1,961	6.47
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-6,410	-30,294	100.00

TEMPERATURES

	Cooling	Heating
SADB	50.5	83.3
Ra Plenum	79.2	65.9
Return	79.2	65.9
Ret/OA	88.3	37.1
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	1,469	446
Terminal	1,469	446
Main Fan	1,469	445
Sec Fan	0	0
Nom Vent	653	358
AHU Vent	653	358
Infil	0	0
MinStop/Rh	445	445
Return	1,469	446
Exhaust	653	358
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	44.5	80.3
cfm/ft²	0.31	0.09
cfm/ton	214.28	
ft²/ton	696.68	
Btu/hr-ft²	17.22	-6.34
No. People	54	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	6.9	82.3	51.0	1,165	88.3	72.6	98.9	50.5	50.4	56.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	6.9	82.3								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	4,776		
Part	0		
Int Door	0		
ExFlr	0		
Roof	4,776	0	0
Wall	165	0	0
Ext Door	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-15.8	445	50.5	83.3
Aux Htg	0.0	0	0.0	0.0
Preheat	-14.5	653	30.0	50.5
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-30.3			

Project Name:
Dataset Name: TECH2.trc

TRACE® 700 v6.2.6.5 calculated at 06:29 PM on 10/17/2011
Alternative - 1 System Checksums Report Page 9 of 12