Mechanical Tech Report 2

Design Load Estimation and Energy Analysis

M Resort Spa and Casino Henderson, Nevada

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1.0 Executive Summary

Part I of this report utilizes building simulation software, Trane TRACE, to estimate the loads of The M Resort for one calendar year. The design documents were utilized to obtain the necessary information required by TRACE to run the simulation. In some instances information was not available and estimations were used such as in the case of the schedules.

The results of the load analysis fell within a marginal percentage of those values found in the design documents. In a majority of cases the Trace model yielded results that were conservative as compared to the design data. The model was tweaked and re run several times however there are still areas in which more detail could be added with knowledge from the design team as to correct occupancy and equipment use.

The second portion of this report focuses on the energy analysis of the M Resort. The Trace model developed in part one was again used to attain the needed yearly energy use requirements of the building. Energy costs were found through the Nevada Power Company and the Southwest Gas Corporation.

An important observation that was made during the energy analysis had to do with the demand charge for the electricity. During the peak summer hours the electrical demand charge per kW is \$8.47 compared to about \$0.50 for the non summer period of the year. This increases costs significantly and is an issue that needs to be addressed in the future. It is also important to note how very sensitive the model is to change. Small changes in the schedules and other loads can have big impacts on the bottom dollar.

The overall cooling cost per square foot was found to be \$9.86, which seems high, therefore a more detailed look at the model must be completed although there are climatic concerns as well as the demand charge that affect this value.

Part I Design Load Estimation

2.0 Design Load Estimation

Trane Air Conditioning Economics (TRACE) 700H software was used as the building simulation program to estimate the design loads for The M Resort. In order to accurately calculate the design loads, information from the design documents was used when available, or conservative assumptions were made using industry standards such as ASHRAE documents.

Many variables, including but not limited to internal thermal generation and heat gain through the building envelope, contribute to a building's design cooling and heating load. Internal thermal generation loads stem from mechanical and electrical systems, lighting, plug loads, and people while solar gain would be an example of a load incurred through the building envelope.

Through the design documents the room areas, wall areas, orientation, fenestration areas, ventilation rates, equipment loads and lighting loads were calculated and entered into the simulation program. Table 1 shows some of the various U-Values that were input into Trace to determine the thermal resistive properties of the walls, roofs, and glass items.

Section	U-Value (Btu/hr-ft ² -	R-Equivalent (hr-ft2-	Solar Heat Gain
	°F)	°F/Btu)	Factor
Low Rise Walls	0.09	11.0	-
Tower Walls	0.09	11.0	-
Below Grade Walls	0.05	19.0	-
Low Rise Roof	0.04	25.0	-
Tower Roof	0.05	19.0	-
Low Rise Glass	0.29	-	0.26
Tower Glass	0.29	-	0.36

Table 1 - Building Envelope Construction

The M Resort is comprised of a variety of spaces including casinos, retail, health spa, restaurants, and guest rooms. These spaces are not all occupied the same throughout the course of a typical day. In order for Trane TRACE to accurately model the building it is necessary to create schedules for the varying occupancies of the spaces. The guest rooms are more heavily occupied in the late evening and overnight while the conference rooms and spa areas have higher occupancies during the day. The casino on the other hand has a steadier load profile with people in the space at all times of the day, meaning that it does not close. Schedules for each of the spaces were not available from the design documents; therefore assumptions were made and in many cases the default Trace schedules were used for the simulation. Typical Trace inputs have been included in Appendix A of this report.

Table 2 lists the design weather data taken from ASHRAE Handbook of Fundamentals as well as the weather data found in Trace for Las Vegas, Nevada. The most conservative values were used for this analysis to attain the worst case scenario for cooling and heating loads.

Annı	ual Cooling D	esign Cor	Annual Heat Condi	ting Design tions	
ASHRAE 2005, 0.4% Trace Weather Data			ASHRAE 2005, 99.6%	Trace Weather Data	
Cooling DB (°F)	Evaporation WB (°F)	Cooling DB (°F)	Evaporation WB (°F)	Heating DB (°F)	Heating DB (°F)
108.4	71.4	106	70	28.9	28

 Table 2 - Design Weather Data

Table 3 is a summary of the computed loads compared to the actual design conditions. In some cases the Model values are close to the design documents. The inconsistency in the numbers could be due to estimation of equipment loads, occupancy loads, and lighting loads. Diversities could also have been factored into the design document values, without these numbers a more conservative result would be attained.

Table 3 - Load Calculations								
System	Output	Cooling ft2/ton	Percent Different Cooling	Supply Air CFM/ft2	Percent Different Supply	Ventilation Air CFM/ft2	Percent Different Ventilation	
	TRACE	116.7	-73	1.62	-0.6	0.84	-73	
Ano-Ti	DESIGN	135.0	-7.5	1.63	-0.0	0.88	-2.5	
<u> АНЦ_1_1</u>	TRACE	31.4	-10 5	8.16	-0.0	1.40	-5.1	
A110-1-1	DESIGN	38.8	-10.5	8.30	-0.9	1.55	-5.1	
	TRACE	201.9	0.6	1.27	0.6	0.52	0.0	
AH0-1-2	DESIGN	204.3	-0.0	1.29	-0.0	0.43	9.0	
	TRACE	155.8	4.5	1.61	-1.5	0.91	6.0	
An0-1-5	DESIGN	142.5		1.66		0.81		
	TRACE	183.5	147	1.21	0.5	0.82	0.6	
AN0-1-4	DESIGN	246.7	-14.7	1.20	0.5	0.5		
	TRACE	409.5	0.7	0.56	1.0	0.15	0.7	
AH0-1-5	DESIGN	497.7	-9.7	0.58	-1.9	0.17	-0.2	
	TRACE	304.0	12 7	0.90	0.2	0.48	5.6	
AH0-1-0	DESIGN	235.6	12.7	0.89	0.5	0.54	-5.0	
	TRACE	170.8	20.7	1.21	27	0.24	0.7	
AH0-1-7	DESIGN	260.2	-20.7	1.28	-2.7	0.24	0.7	
	TRACE	85.0	1 5	2.68	0.7	1.43	2.1	
AU0-1-9	DESIGN	82.4	1.5	2.72	-0.7	1.37	2.1	

Table 3 cont Load Calculations							
System	Output	Cooling ft2/ton	Percent Different Cooling	Supply Air CFM/ft2	Percent Different Supply	Ventilation Air CFM/ft2	Percent Different Ventilation
ΔHU-1-9	TRACE	431.1	-29.0	0.58	34	0.04	71
////019	DESIGN	782.6	25.0	0.54	5.4	0.04	7.1
AHU-1-10	TRACE	317.6	11	0.85	-2.2	0.25	-12.4
/ 10 1 10	DESIGN	310.6		0.89	2.2	0.32	12.7
AHU-2-1	TRACE	109.1	-8.2	1.51	-27	0.62	-7 4
////0 2 1	DESIGN	128.6	0.2	1.59	2.7	0.72	7.4
AHU-2-3	TRACE	143.6	-23	1.71	3.0	0.83	-1 2
////0 2 3	DESIGN	150.4	2.5	1.61	5.0	0.85	1.2
ΔHU-2-4	TRACE	104.9	91	2.78	21	1.55	-5.7
7110 2 4	DESIGN	87.3	5.1	2.66	2.1	1.74	5.7
ΔHU-2-5	TRACE	59.1	77	3.39	0.4	3.39	0.4
And 2 5	DESIGN	50.6	7.7	3.36	0.4	3.36	0.4
AHU-2-6	TRACE	48.2	-20	3.24	-20	3.24	-2.0
Ano-2-0	DESIGN	50.1	-2.0	3.37	2.0	3.37	2.0
ΔH11-2-7	TRACE	12.9	-3.0	12.85	-3.5	12.85	-3.5
AI10-2-7	DESIGN	13.7		13.77		13.77	
AHU-2-8	TRACE	47.7	-3.8	3.42	-3.5	3.42	-3 5
Ano-2-8	DESIGN	51.5	-5.0	3.67	-5.5	3.67	-5.5
AHI1-2-9	TRACE	226.6	-21.2	0.61	1.0	0.26	-13.3
AI10-2-3	DESIGN	348.8	-21.2	0.60	1.0	0.34	-13.5
AHU-2-10	TRACE	33.5	-16	5.28	-17	5.28	_1 7
A110-2-10	DESIGN	34.6	-1.0	5.45	-1.7	5.45	-1.7
<u> АНЦ-2-11</u>	TRACE	87.4	-16.6	1.95	-0.9	0.98	5 9
AI10-2-11	DESIGN	122.2	-10.0	1.98	-0.9	0.87	5.5
AHU_2_12	TRACE	152.5	10	1.48	_2.2	0.51	-10.4
A110-2-12	DESIGN	146.8	1.9	1.58	-5.5	0.63	-10.4
AHU-2-12	TRACE	115.0	_77	1.45	_2 0	1.45	-2 0
AII0-2-13	DESIGN	134.1	-7.7	1.53	-2.5	1.53	-2.9
ΔHU-3-1	TRACE	126.0	-7 3	2.02	10	0.59	-8.2
AII0-2-1	DESIGN	145.7	-7.5	1.98	1.0	0.69	-0.2
AHU-3-2	TRACE	44.5	-5.8	4.90	-0.5	1.73	-13
7110-3-2	DESIGN	49.9	-5.0	4.95	-0.5	1.88	-4.3
<u>лці 2 2</u>	TRACE	294.3	-14.0	0.72	-0.3	0.25	60
AHU-3-3	DESIGN	389.7	-14.0	0.72	-0.5	0.22	6.8

Note: Negative percentages for cooling indicate that the Trace value is smaller than the design value. Negative percentages for the airflows indicate that the design values are larger than the Trace Values.

The cooling capacity design values seen in Table 3 were taken from the capacities listed in the coiling coil schedule in the design documents. The over all cooling capacity of the building in tons should also be compared to the design. The Peak cooling load is listed as 5,061 tons while the maximum block load is 4,269 tons, each taken from the Trace model. However, the design documents indicate that the total current cooling capacity of the system is 3,900 tons, which shows that diversities and other assumptions based on demand were made for the design.

Part II

Energy Analysis

3.0 Energy Analysis

Trane Trace was again used for this section of this report. The design assumptions used in part one of this report were used again in this section. Motor efficiencies and other performance data was taken from the design documents and some of which can be found in tech report one. A summary of some of the Trace outputs for the energy analysis can be found in Appendix B of this report.

In order to conduct this analysis, local utility rates were found and applied to the same Trane Trace load estimation model used in section 2.0 of this report. Table 4 breaks down the various charges for electricity into the time of use charges, basic charges, and demand charges. Also listed in this table is the break down of the Natural Gas charges. For calculation purposes the peak load values have been used in conjunction with the Trace output.

Electric	Electric Utility Rates (Nevada Power Company) Rate Structure LGS-3						
Period	Time	Service Charge Per month	Consumption Charge Per kW	Demand Charge Per kW			
Summer On- Peak	1PM-7PM		\$0.10034	\$8.47			
Summer Mid-Peak	10AM-1PM, 7PM-10PM	\$167 70 +	\$0.08649	\$0.63			
Summer Off Peak	10PM-10AM	\$0.00627/kWh	\$0.06281	\$0.50			
All Other Periods	Winter (October- May)		\$0.06281	\$0.50			

Table 4 - Utility Ra	tes	
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Natural Ga	Natural Gas Utility Rates (Southwest Gas Corporation) Rate Structure SG-5L							
Period	Time	Service Charge Per month	Consumption Charge Per therm	Demand Charge Per therm				
All Periods	All Times	\$150.00	\$1.1310	\$0.00				



Figure 1 shows the electricity use per month for twelve consecutive months. The peak electricity use is during the summer months as suspected. However the base load is relatively high in comparison to the peaks. This is due in large part to the use of the spaces in the building, the casino for instance is open twenty four hours a day and although it is not at full occupancy for all 24 hours, there is still significant electrical use for all hours. Without detailed occupancy schedules from the owner it will be difficult to fully investigate the base load demand. Many of the schedules had to be assumed for the spaces based on the most logical knowledge available, which may not be the intended design schedules. After the first trace model was run the schedules were tweaked and a similar large base load resulted. Further investigation with the design team will be helpful in determining more accurate assumptions and considerations.



Figure 2 illustrates the water use for the mechanical systems per month for one calendar year. The volumes shown are in thousand gallons with the peak usage being about 7,505,000 gallons. This is a large water usage for the area, especially with the concerns for water supply in the future.

A further analysis of the system splits the annual electrical loads in to the various main branches including HVAC, Lighting, and other various loads which can be seen in Figure 3. This is helpful in verifying the split of the electrical use of the building. As a rule of thumb certain components of the building should have higher electrical demand than others, lighting, for instance, should be on of the largest loads for this type of space use, and in Figure 3 it is shown as the second highest load. Heating in this figure is one of the smallest sectors because much of the heat is from natural gas combustion as well as the climatic conditions Las Vegas, Nevada experiences in the off summer months. Temperatures do not drop down as far as they do elsewhere in the country as in Southern Nevada in the winter; therefore the electric heat required is not a high.



Tables 5, 6 and 7 list the energy cost per month broken up into electrical, natural gas and total cost respectively. It is important to note the high rise in the cost of electricity in the months of June through September. During these months the demand cost of the electricity explodes and the demand charge rises almost \$8.00. This is a significant cost which would warrant a future investigation into possible solutions. The natural gas cost is a cost per therm given.

Table 7 gives the cost of energy per square foot to be \$136.10 which seems high, however this again is due to the extremely high demand charges put in place for the summer peak months. The cooling cost per square foot came out to be \$9.86, which seems high growing up on the east coast; however this may be higher due to the climate conditions in Las Vegas Nevada and mainly from the high electricity demand cost in the summer. Also, the assumptions used for schedules and equipment must be validated in order to for this value to be true.

	Electricity							
Month	Electric Energy Usage	Basic Electric Service Charge	Basic Charge per kW	Consumption Charge per kW	Demand Charge per kW	Total Electricity Monthly Cost		
January	2,577,001	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,466,687		
February	2,345,305	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,334,834		
March	2,620,900	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,491,669		
April	2,651,593	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,509,136		
May	3,042,703	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,731,709		
June	3,110,550	\$167.70	\$0.00627	\$0.10034	\$8.47	\$26,678,142		
July	3,433,024	\$167.70	\$0.00627	\$0.10034	\$8.47	\$29,443,876		
August	3,400,223	\$167.70	\$0.00627	\$0.10034	\$8.47	\$29,162,554		
September	3,068,154	\$167.70	\$0.00627	\$0.10034	\$8.47	\$26,314,528		
October	2,905,252	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,653,489		
November	2,525,747	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,437,520		
December	2,593,591	\$167.70	\$0.00627	\$0.06281	\$0.50	\$1,476,128		

Table 5 - Electricity Cost

Table 6 - Natural Gas Cost

	Natural Gas						
Month	Gas Usage (Therms)	Gas Demand Charge	Gas Charge per Therm	Total Gas Monthly Cost			
January	36,197	\$150.00	\$1.13	\$41,088.81			
February	25,954	\$150.00	\$1.13	\$29,503.97			
March	17,174	\$150.00	\$1.13	\$19,573.79			
April	7,030	\$150.00	\$1.13	\$8,100.93			
May	2,329	\$150.00	\$1.13	\$2,784.10			
June	1,981	\$150.00	\$1.13	\$2,390.51			
July	2,033	\$150.00	\$1.13	\$2,449.32			
August	2,024	\$150.00	\$1.13	\$2,439.14			
September	2,050	\$150.00	\$1.13	\$2,468.55			
October	4,112	\$150.00	\$1.13	\$4,800.67			
November	20,388	\$150.00	\$1.13	\$23,208.83			
December	28,903	\$150.00	\$1.13	\$32,839.29			

Table 7 - Total Energy Cost

Utility	Annual Cost	Annual Cost Per SF
Electric	\$123,700,273	\$135.91
Natural Gas	\$171,648	\$0.19
Total	\$123,871,921	\$136.10

A final note, it is important to reiterate that the above analysis is simplified and very conservative. Small changed in the occupancy, lighting schedules, and equipment loads can have drastic impacts of the overall output of the simulation. In order to make complete conclusions from a simulation like this, a more accurate model must be created along with consultation from the design engineers to determine the correct schedules and detailed loads.

The design team conducted basic energy analysis through the simulation software that was used, however a detailed analysis was not conducted. The owner had no requirements for this type of analysis to be conducted in the request for proposal nor is this a LEED rated building. The M Resort had a very demanding time schedule for design, therefore energy use was kept in mind throughout the development of the construction documents; however a detailed analysis of the building component energy use was not conducted.

4.0 References:

- 1. ASHRAE Handbook of Fundamentals 2005.
- 2. Trane Trace 700h.
- 3. Southland Industries, Mechanical Drawings and Specifications.
- 4. Mike Hallenbeck and Jessica Lucas, Thesis Consultants, Southland Industries.
- 5. JBA Consulting Engineers, Electrical Drawings and Specifications.
- 6. Marnell Architecture, Drawings and Specifications.
- 7. The Pennsylvania State University Architectural Engineering Program, Thesis Advisor, Dr. William P. Bahnfleth
- 8. Past Thesis Technical Reports, e-Studio Archives, 2006-2008

Appendix A

Typical Trace Load Estimation Input Parameters

Typical Guest Suite Trace inputs.

d,	💬 Create Rooms - Single Workshe	et			_ □ 🛛
e:	Alternative 1 Room description T047 • T1533 • Stand	lard Room	•		<u>Apply</u>
: :0 :t ic	Templates Room Hotel Room - Standard Internal Hotel Room - Standard Airflow Hotel Room - Standard Tstat Hotel Room Constr Hotel Tower	Length 495 Roof © 0 C Equals flor 0 Wall 15 0 Image: State Sta	Width R 1 R t 0 t R or N S 0 S 0 S 0 S 0	% Glass or Qty Length (ft) Height (ft) 95 0 0 0 0 0 0 0 0 0 0 0 0 0 0	New Room Cgpy Delete
	Single Sheet Booms	Internal loads People 2 Lighting 0 Misc loads 500	People ▼ W/sq ft ▼ W ▼	Airflows Cooling vent 70 cfm Heating vent 70 cfm VAV minimum 100 % Clg Airflow Int Loads Airflows	Partn/Floors

Typical Restaurant Trace inputs.

Create Rooms - Single Workshe	et			_ 🗆 🛛
Alternative 1 Room description T1602 - Restaurant		•		Apply Close
Templates Room Dining (restaurant) Internal Dining (restaurant) Airflow Dining (restaurant) Tstat Restaurant Constr Hotel Tower - 15th Floo	Length E283 Roof C 0 Image: Comparison of the second sec	Width ft 1 ft 0 ft 13 0 19 270 19 207	% Glass or Qty Length (ft) Height (ft) 95 0 0 0 95 0 0 0 95 0 0 0 95 0 0 0	New Room Cgpy Delete
	Internal loads People 200 Lighting 2 Misc loads 0	People V/sq ft V/sq ft	Airflows Cooling vent 20 cfm/persor Heating vent 20 cfm/persor VAV minimum 30 % Clg Airflo	
Single Sheet Rooms	Roofs	<u> </u>	Int Loads <u>A</u> irflows	Partn/Floors

Typical Casino Trace inputs.

📁 Create Rooms - Single Worksho	et				X
Alternative 1					
Room description C129D - Casino		•			Cancel
Templates	Length	Width			
Room Casino 💌	Floor 19400 f	t 1 ft			New Room
Internal Casino 💌	Roof C 0 f	t 🚺 ft			Copy
Airflow Casino 💌	Equals flo	or			Delete
Tstat Casino Floor 💌	\w/all				
Constr Casino Level +27' 💌	Description Length (f	t) Height (ft) Direction	% Glass or Qty	Length (ft) Height (ft)	
-	0	27 0			
	0	27 0			
1]]0	27 0		0	-
-	lateral leads		A :-0		
	People 20	an Rimmon	Cooling vent	30 cfm/person	-
	Liahting 3	W/sn ft	Heating vent	30 cfm/person	
	Misc loads 9	W/sq ft 🗨	VAV minimum	30 % Clg Airflow	-
,					
Single Sheet Rooms	Hoo <u>f</u> s	Walls	Int Loads	Airtiows	Partn/Floors

Typical Spa Treatment Room Trace inputs.

ſ	Create Rooms - Single Worksho	et				
-	Alternative 1	en 1				Apply
	Templates					
-	Room Spa Treatment Room 💌	Floor 135	Width ft 1 ft			<u>N</u> ew Room
	Internal Spa Treatment Room 💌	Roof 🖲 🛛	ft 0 ft			Сору
5	Airflow Spa Treatment Room 💌	C Equals flo	10(Delete
-	Tstat Spa	Wall				
-		Description Length ((t) Height (ft) Directi	on % Glass or Qty	Length (ft) Height (ft)	1
t			17 0			Ē
-		0	17 0		o jo	_
-						
		Internal loads	_	Airflows		
		People 2	People -	L'ooling vent	20 cfm/person	
		Lighting 1.5	W/sq ft 💌	Heating vent	20 cfm/person	<u>•</u>
		Misc loads 0.5	W/sq ft 💽	VAV minimum	30 X Clg Airflow	•
	Single Sheet Rooms	Roo <u>f</u> s	<u></u> alls	Int Loads	Airflows	Partn/Floors

Typical Hotel Room People Schedule

🗖 Schedule Library						_ 🗆 🛛				
Schedule type Utilization Description People - Hotel rooms Simulation type © Reduced year © Full year		Schedule Definition Start Month Janu Day type Coolii	End ary 💌 Dec ng design 💌 Sur	cember 💌 Iday 💌		Save Close				
Comments		Start time Midnight	End time 9 a.m. 11	Percentage		Copy Sched				
January - December Cooling design to Heating design Del Definition) Sunday	9 a.m. 11 a.m. 5 p.m.	11 a.m. 21 5 p.m. 0 Midnight 11			Del Sched				
Reset and lockout table										
% Sensor type	Op	Reset	0)ffset An	d 🔺					
NOTE: The reset and lockouts are available for the following: Design phase infiltration, ventilation, reheat minimum, and all system simulation schedules.										
<u>S</u> chedule				<u>G</u> raphs						

Typical Hotel Room Lighting Schedule.

🔤 Schedule Li	brary										
Schedule type Description Simulation type	Utilization Lights - Hotel rooms		•	- Sched	ule Definition – Start Ionth Janua	iry 💌	End December	•	<u>S</u> ave <u>C</u> lose		
Comments	C Full year				ay type Coolin Start time Aidnight	eg design _▼ End time 6 a.m.	Sunday Percentage 5		<u>N</u> ew Sched C <u>o</u> py Sched		
January - Dece Heating design	mber Cooling design t	o Sunday			la.m. 1.a.m. ip.m. ip.m.	11 a.m. 5 p.m. 9 p.m. Midnight	50 0 100 5		Del Sched		
Peret and lasks	D <u>e</u> l Definition							-	Copy Definition		
Reset and locko	Sensor type	Op		Res	et		Offset	And]		
								•			
NOTE: The rese	NOTE: The reset and lockouts are available for the following: Design phase infiltration, ventilation, reheat minimum, and all system simulation schedules.										
	<u>S</u> chedule			Г			<u>G</u> raphs				

Typical Restaurant Lighting Schedule.

🔜 Schedule Library										
Schedule type Utilization Description Lights - Restaurant Simulation type If Reduced year Comments Full year January - December Cooling design to January - December Saturday January - December Saturday January - Becember Saturday Heating design Sunday	v v Veekday	Schedule Definition Start Month January Day type [Cooling de: Start time E Midnight 8 an 8 a.m. 11 a 11 a.m. Midr	End December sign Weekday and time Percentage m. 10 an. 60 night 90	Save Close New Sched Cgpy Sched Del Sched New Definition Cogy Definition						
Sensor type	Op	Reset	Offset .	And						
NOTE: The reset and lockouts are available for the following: Design phase infiltration, ventilation, reheat minimum, and all system simulation schedules.										
<u>S</u> chedule			<u>G</u> raphs							

Typical Restaurant People Schedule.

Schedule Li	ibrary									
Schedule type Description Simulation type	Utilization People - Restaurant		•	Schedule Definition- Start Month Janu	ary 💌	End December	•	<u>S</u> ave Close		
Comments	O Full year			Day type Cooli Start time Midnicht	ng design 💌 End time	Weekday Percentage		<u>N</u> ew Sched C <u>o</u> py Sched		
January - Dece January - Dece January - Dece Heating design	n Cooling design to mber Saturday mber Sunday	lay	Miningin Fa.m. 1 a.m. 8 a.m. 8 a.m. Noon Noon 2 p.m. 2 p.m. 5 p.m. 5 p.m. 6 p.m.		0 50 85 25 30 90		Del Sched			
	D <u>e</u> l Definition			10 p.m.	Midniaht	15	-	Copy Definition		
Heset and lock	out table Sensor type	Op		Reset		Offset	And			
NOTE: The reso	et and lockouts are available f	or the fo	llowing: Design	phase infiltration, venti	lation, reheat m	inimum, and all s	ystem			
	Schedule Graphs									

Weather Data Trace Values.

	,										
Region			Subregion		Locati	on					
United SI	ates	•	South West		▼ Las V	▼ Las Vegas, Nevada ▼					
Latitude Longitude	36	deg	Time zone Desian mont	8 h July		Saturation Curve Coefficients		<u>C</u> lose <u>N</u> ew			
- Altitude	2162	- ft	OA pressure	27.54	in. Hg	A -0.34446857		С <u>о</u> ру			
						B 1.0035879		Delete			
					Wind	C -0.014612262		Import			
	OADB °F	OAWB °F	Clearness	Ground reflect	velocity mph	D 0.00035764172					
Summer	106	70	1.1	0.2	13.5						
Winter	28		1	0.2	15						
Comments Created b	zo y C.D.S. Mar	keting	1	JU.2	15						

Appendix B

Trace Energy Analysis Output files

ENERGY CONSUMPTION SUMMARY

By PSUAE

	Elect Cons. (kWh)	Gas Cons. (kBtu)	Water Cons. (1000 gals)	% of To Buildi Energ	otal ng gy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1							
Primary heating							
Primary heating	502,517	15,017,323		12.7	%	16,732,412	20,953,490
Other Htg Accessories	258,092			0.7	%	880,867	2,642,865
Heating Subtotal	760,608	15,017,323		13.3	%	17,613,279	23,596,356
Primary cooling							
Cooling Compressor	6,653,564			17.2	%	22,708,614	68,132,656
Tower/Cond Fans	2,307,778		44,727	6.0	%	7,876,446	23,631,702
Condenser Pump				0.0	%	0	0
Other Clg Accessories	8,760			0.0	%	29,898	89,703
Cooling Subtotal	8,970,102		44,727	23.2	%	30,614,958	91,854,056
Auxiliary							
Supply Fans	3,306,535			8.6	%	11,285,202	33,858,992
Pumps				0.0	%	0	0
Stand-alone Base Utilities				0.0	%	0	0
Aux Subtotal	3,306,535			8.6	%	11,285,202	33,858,992
Lighting							
Lighting	9,785,095			25.3	%	33,396,529	100,199,600
Receptacle							
Receptacles	11,451,696			29.6	%	39,084,638	117,265,640
Cogeneration							
Cogeneration				0.0	%	0	0
Totals							
Totals**	34,274,036	15,017,323	44,727	00.0	%	131,994,608	366,774,656

* Note: Resource Utilization factors are included in the Total Source Energy value.
 ** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

Project Name: M Resort Dataset Name: C:\CDS\TRACE700\PROJECTS\M_RESORT.TRC

TRACE® 700 v6.1.2 calculated at 06:23 PM on 10/23/2008 Alternative - 1 Energy Consumption Summary report page 1

MONTHLY ENERGY CONSUMPTION

By PSUAE

		Monthly Energy Consumption												
Utility		Jan	Feb	Mar	Apr	Мау	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternati	rnative: 1 M Resort Load Calculations													
Electric														
	On-Pk Cons. (kWh)	2,577,001	2,345,305	2,620,900	2,651,593	3,042,703	3,110,550	3,433,024	3,400,223	3,068,154	2,905,252	2,525,747	2,593,591	34,274,040
	On-Pk Demand (kW)	4,649	4,584	4,470	4,710	5,174	5,426	5,767	5,686	5,330	4,982	4,404	4,742	5,767
Gas														
	On-Pk Cons. (therms)	36,197	25,954	17,174	7,030	2,329	1,981	2,033	2,024	2,050	4,112	20,388	28,903	150,173
On-	-Pk Demand (therms/hr)	90	78	49	21	5	3	3	3	3	12	56	73	90
Water														
	Cons. (1000gal)	1,263	1,366	1,900	2,631	4,723	5,770	7,505	7,288	5,458	3,792	1,599	1,431	44,727
Energy Consumption						nvironmen	tal Impact	Analysis						
Building	j 157,88	0 Btu/(ft2-ye	ar)	CO2 166,799,760 lbm/year										
Source	Source 438,703 Btu/(ft2-year)				SO	2	319,452 gm/	year						
				NO	Х	318,505 gm/	year							

Floor Area 836,043 ft2