The Pennsylvania State University

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Technical Report Two

Building and Plant Energy & Emissions Analysis

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The Walt Disney Family Museum in San Francisco, CA

Fall 2009

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Executive Summary

This report summarizes an energy load analysis that was performed in order to determine the design load, annual energy consumption and operating costs of the Walt Disney Family Museum, located in the Presidio of San Francisco.

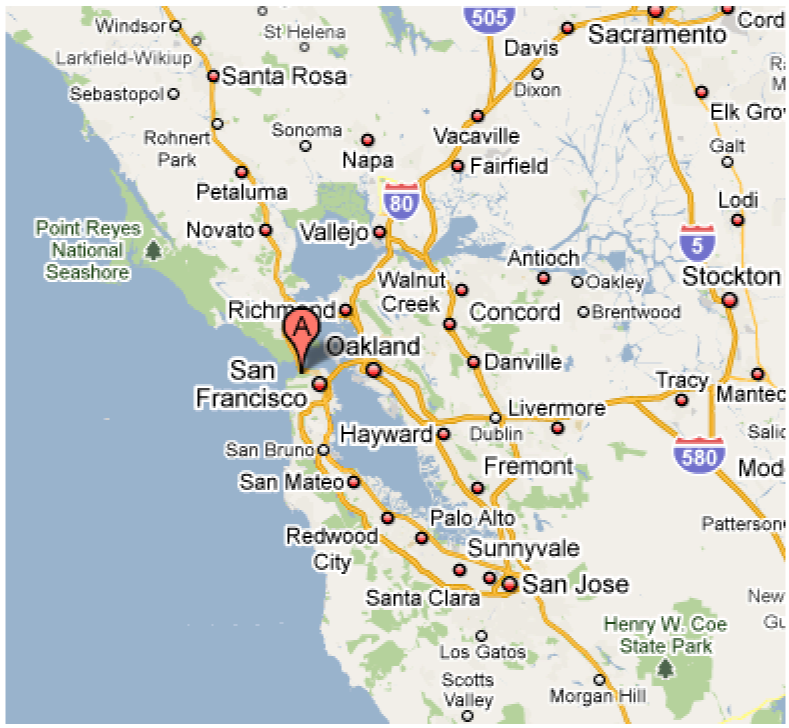
This energy load analysis was performed by using Trane Trace. All room areas as well as window areas were calculated by hand because electronic files of the building were not available. Trane Trace was selected for the analysis because of my familiarity with using the program on past projects as well as the input ease. All data inputted into Trane Trace were taken directly from the design documents, such as the Outside Air Ventilation Rates, the lighting and equipment electrical loads, the design indoor and outdoor air conditions for the heating and cool conditions within San Francisco.

Load and ventilation rates were calculated and found to be within range of the design document loads. However, the results of the annual energy consumption could not be compared with the utility bills and data from the Museum because the Museum opened on October 1, 2009.

Most of the loads and ventilation within the building were found in the Exhibit Spaces, Media and Gallery Spaces as well as the Lecture Hall where high lighting loads, equipment loads and occupancy loads are found. Interactive programs, video displays and audio equipment create large demands on the electrical loads as well as cooling loads for the Museum spaces. Addressing such large energy consumption within the lighting and media equipment may be a concern for the WDFM in future years to come.

Calculating Heating and Cooling Loads

The first step in building a load and energy model is to select the location of the building. The Walt Disney Family Museum is located in the Presidio of San Francisco. For this analysis, San Francisco, California, at 37degrees latitude and 122 degrees longitude, was selected as the location, in an urban city environment.



The seasonal loads were also selected by the designers in order to calculate the cooling and heating loads within the building. Indoor design conditions were also selected and this information is listed in the following table:

Design Conditions as per ASHRAE and Building Requirements		
Seasonal Loads	Dry Bulb Temperature	Wet Bulb Temperature
Cooling Loads (Summer)	75°F (0.4%)	63°F (0.4%)
Heating Loads (Winter)	40°F (99.6%)	-
Indoor Design Conditions	68-70°F (±2°F)	-

After inputting the location and weather data for the city, the next step in creating an appropriate energy modeling analysis is to define the building materials found within the Museum.

These materials are located in the following table:

Building Component	Type of Material	U-Value (Btu/hr-ft^2-°F)
Slab	4" LW Concrete	0.2126
Roof	Attic Roof, 6" Insulation	0.048
Wall	Wood-framed, brick façade	0.089
Partition	Drywall	0.388
Windows	¼" Single Pane	0.95
Windows (Infill area)	Insulating Tinted	0.60

The next step in creating the model was to define room areas and room heights, which were calculated by hand from the drawings. Room heights were taken as 10 feet with 2 feet of ceiling spaces. Areas were taken from previous analysis calculated in past projects.

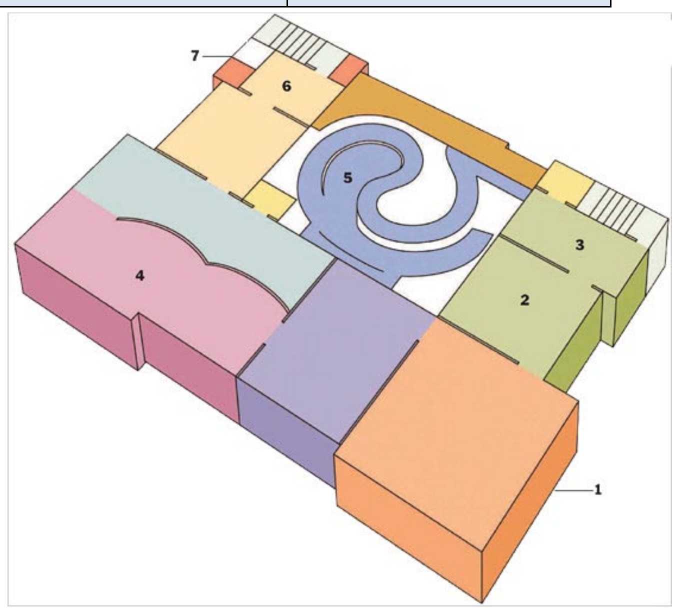
Building lighting and equipment loads are defined by individual space uses. The Museum has higher lighting loads due to the artistic, theater style lighting within the Exhibit Spaces, Media Explosion Areas and Galleries. Also, the Museum does not utilize natural day lighting due to the historical preservation requirements that required the architect to keep as much of the original building, the structure as well as the façade intact. The Lecture Hall in the Basement Level also has high lighting loads as the space requires appropriate lighting for events and is also located in the basement.

These same areas and the Learning Areas also have heavy equipment loads due to interactive displays, movie projects and audio exhibits.

Building Electrical Loads as Individual Spaces		
Spaces	Lighting (W/ft^2)	Equipment (W/ft^2)
Exhibit Spaces, Media Explosions	6	3
Gallery Spaces	6	3
Lecture Hall	3	1400 W
Learning Areas	1.5	1400 W
General Offices	1.2	0.5
Corridor	1.5	0.0
Bookstore	1.5	0.0
Conference Rooms	1.2	0.0
Lobby	1.5	1.5
Reception	1.5	0.5
Restaurant/Dining	1.5	1.5
Telephone/Data	1.5	350W

Within the next step of building the energy model, occupant loads and necessary outdoor air must be factored into the model as well. In most cases, the occupancy loads were determined using the furniture drawings in order to appropriately calculate loads. For example, in the Learning Areas, 24 desks are located within the room in addition to 2 instructor desks and therefore, 26 people may occupy the area. However, not all of the design occupancy loads were available from the design documents. Therefore, typical people loads and ventilation rates per occupants were taken from the Trane Trace library. The chart below shows values that were inputted in the program when design occupancy loads could not be calculated using the drawings.

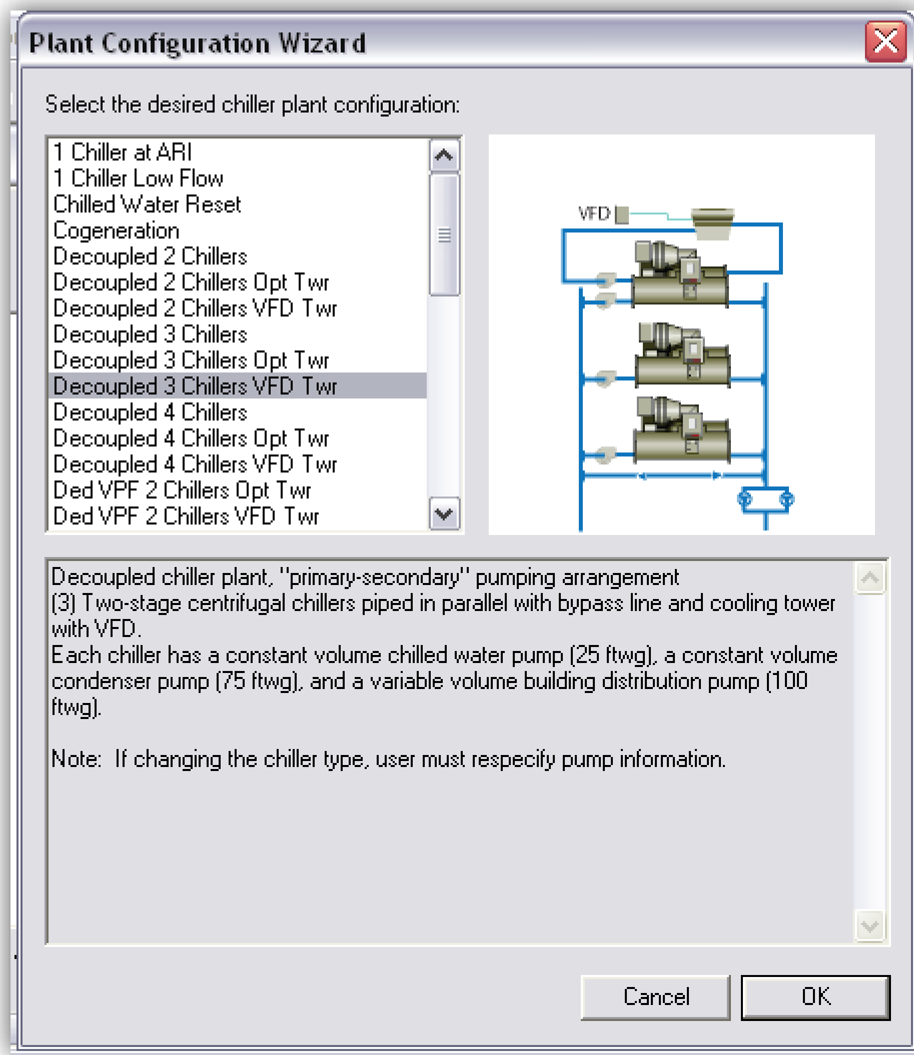
Designed Occupancy and Outside Air as Individual Spaces		
Spaces	People (ft^2/person)	Outside Air (cfm/person)
Exhibit Spaces, Media Explosions	75	20
Gallery Spaces	75	20
Lecture Hall	125 persons	20
Learning Areas	75	20
General Offices	Varies per office	Operable windows
Corridor	-	0.05 cfm/ft^2
Bookstore	50	15
Conference Rooms	20	20
Lobby	33.3	15
Reception	16.7	15
Restaurant/Dining	15	20
Telephone/Data	143	20



The energy model room inputs were not inputted into the program as exterior zones versus interior zones, however, instead the Museum was broken down into the 9 different gallery zones, learning areas, lecture hall as well as different offices on the attic level. The diagram to the right shows how the galleries were selected (Disregard the numbering).

In selecting the equipment within the building, the 4 AHUs were modeled as 1 AHU and the system was entered as a Bypass VAV with Reheat (30% Minimum Flow Default) within the Air Conditioning system.

The system was assigned to the two plants that were entered in the model. The cooling system consists of a three centrifugal, water-cooled chillers and cooling tower with a variable frequency drive. Each chiller has a constant volume chilled water pump associated as well as a variable volume building distribution pump. Therefore, the system was modeled as a Decoupled 3 Chiller, Variable Frequency Drive Tower within the Trane Trace Program.



The heating system entered as a gas fired hot water boiler with a capacity of 1000Mbh with an efficiency energy rate of 83.3%. The primary-secondary hot water pump system has a full load consumption of 80 ft of water. There is no thermal storage within this system.

In the chart below, a break-down of the load sources within the building is listed. The largest cooling loads are lighting loads, occupancy loads, miscellaneous equipment which and solar gain which also correlate with the energy consumption of each of these components.

Calculated Cooling Loads Type	Total Load (Btu/hr)	Percent of total load
Solar Gain	128,272	20.4%
Glass Transmission	-7,851	-1.2%
Roof Transmission	3,462	0.6%
Lighting	195,881	31.1%
People	163,230	26.0%
Misc. Equipment	131,889	21.0%
Cooling Infiltration	-7,475	-1.2%
Ventilation	-31,348	-5.05%
Exhaust Heat	-9,998	-1.6%
Lighting Load to Plenum	48,970	7.8%
Supply Fan Load	8,274	1.3%
Totals	615,632	100%

As a result of the energy modeling analysis, the total cooling and heating loads as well as the total supply air and ventilation supply air were calculated. The results from the energy model calculated by Trane Trace and the Design Documents were comparable. The Trace calculations over-estimated the cooling loads by 13.5% and under-estimated the heating loads by 8.3%. The total calculated supply air was less than the calculated design document calculations and the ventilation supply air was also less than the design documents as well. The outside air percentage was also higher in the design documents than the Trace energy model.

However, overall, the results are within an appropriate range. A Trane Trace energy model was created by the original design team and used in calculating loads. Therefore, the results are within range of the design documents.

AHU	Trane Trace Calculations	Design Document Calculations
Cooling Load	159.99 ft^2/ton	138.25 ft^2/ton
Heating Load	18.02 Btuh/ft^2	19.65Btuh/ft^2
Total Supply Air	1.71 cfm/ft^2	2.21 cfm/ft^2
Ventilation Supply Air	0.3365 cfm/ft^2	0.4884 cfm/ft^2
Outside Air Percentage	19.7%	22.1%

Annual Energy Consumption and Operating Cost

Within the Museum, the largest load within the building is the lighting system followed by receptacles. When analyzing the results of the Trane energy load generation, this makes sense because the lighting loads are so large due to the uses within the spaces as well as the lack of natural day lighting incorporated into the building. The Museum, as a protected historical building, was forced to keep as much of the façade and structure in tact as possible, including the original windows. The original wooden widows with 1/4" single pane glass are 1.5' x 3.5ft' with a total area of each window equaling 5.5 ft^2.

The loads on the receptacles come from the projectors, interactive displays, audio exhibits and other electronic education tools.

Total heating consumption is very small, totaling only 5.7% of the overall energy consumption within the building each year. Due to the mild weather within San Francisco as well as the heating from the lighting and receptacles, heating loads are much smaller than most other buildings such as office buildings, retail centers, etc.

Total cooling loads equal 6.9% of the building total energy consumption while the Auxiliary loads total 25.8% of the total energy consumption.

Total Energy Consumption within Building per Year				
Energy Load Type	Electrical Consumption (kWh)	Gas Consumption (kBtu)	Water Consumption (1000 gals)	Percentage of Total Energy
Primary Heating	-	247,947	-	4.8%
Heating Accessories	13,140	-	-	0.9%
Cooling Compressor	83,281	-	-	5.4%
Tower/Condenser Fans	10,093	-	764	0.7%
Condenser Pump	8,035	-	-	0.5%
Cooling Accessories	4,816	-	-	0.3%
Supply Fans	119,160	-	-	7.8%
Pumps	19,455	-	-	1.3%
Base Utilities	256,666	-	-	16.8%
Lighting	628,448	-	-	41.1%
Receptacles	313,984	-	-	20.5%
Totals	1,457,078	247,947	764	100%

Pacific Gas and Electric Utility Company bills the Walt Disney Family Foundation per therm each month. The Museum consumes2479 therms per year, therefore, it falls under the category of consuming 123.1 therms and up. The Customer Charge per day is the highest amount billed at $2.14936 multiplied by 365 days per year for an amount of $784.52, a Procurement Chare totaling $1,271.08 and a Transportation Charge of $257.93 for a total year cost of $2,313.54.

The Presidio Trust Utility Building provides electricity at a constant cost of $0.141 per kWh. Therefore, the cost of electricity to the Walt Disney Family Museum totals $205, 447.98 each year.

The Presidio Trust also provides water to the Museum at a rate of $2.77 per kgal. Therefore, the total cost of providing water to the system totals $2,116.28

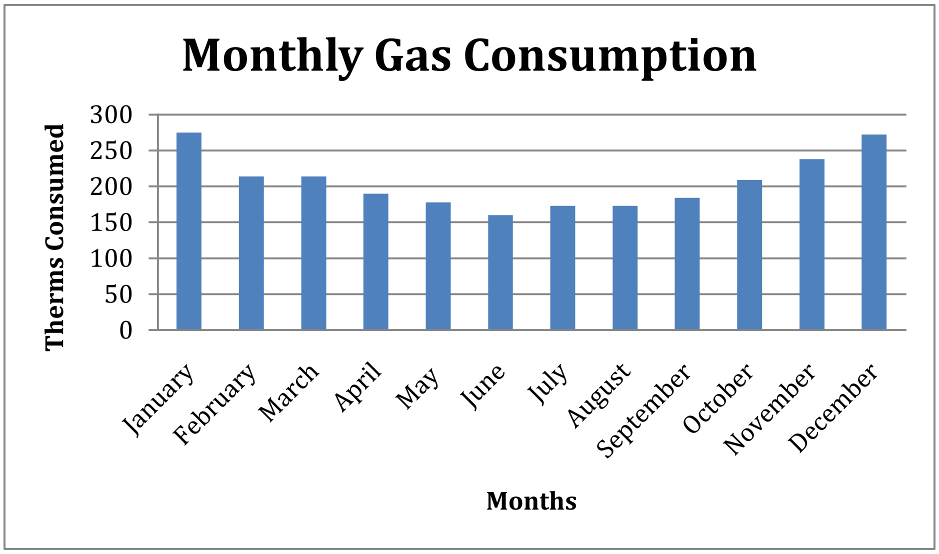
Utility Rates from the Presidio Trust Utility Billing	
Water Consumption Rate	$2.77 kgal
Electricity Rate	$0.141 kW/h

Gas Rates from Pacific Gas and Energy (G-NR1 Schedule Type)	
Customer Charge (per day)	$2.14936
Procurement Charge (per therm)	$0.51274
Transportation Charge (per therm)	$0.10405
Total Cost per Year	$2313.54

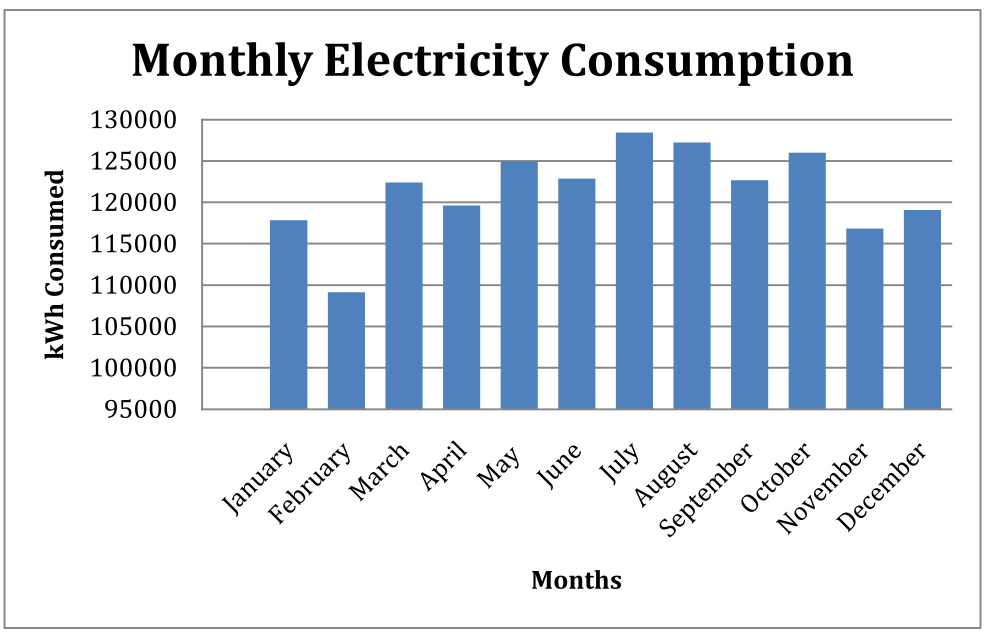
The table below shows a break-down of the cost of each energy load. Once again, the lighting and receptacle loads are the largest energy consumers. When averaged per each month, the cost of lighting for the Museum each month totals $7,384.26 while the cost of receptacles totals $3489.31.

Total Energy Consumption within Building per Year				
Energy Load Type	Electrical Consumption Cost	Gas Consumption Cost	Water Consumption Cost	Percentage of Total Energy
Primary Heating	-	$2313.54	-	4.8%
Heating Accessories	$1852.74	-	-	0.9%
Cooling Compressor	$11,742.62	-	-	5.4%
Tower/Condenser Fans	$1,423.11	-	$2,116.28	0.7%
Condenser Pump	$1,132.93	-	-	0.5%
Cooling Accessories	$679.05	-	-	0.3%
Supply Fans	$16,801.56	-	-	7.8%
Pumps	$2743.15	-	-	1.3%
Base Utilities	$36,189.91	-	-	16.8%
Lighting	$88,611.17	-	-	41.1%
Receptacles	$44,271.74	-	-	20.5%
Totals	$205, 447.98	$2,313.54	$2116.28	100%

The following two charts show the usage of gas and electricity based on monthly usage. The peak months found within the winter, utilize much more gas than the summer months based on heating loads.



The electricity consumption within the Museum peaks during the summer months, when a greater cooling demand arises due to the higher outside air conditions.



Finally, the cost each year per square foot to operate the building can be calculated by dividing the total cost per year by the total conditioned building area. A monthly analysis is also provided in the table below.

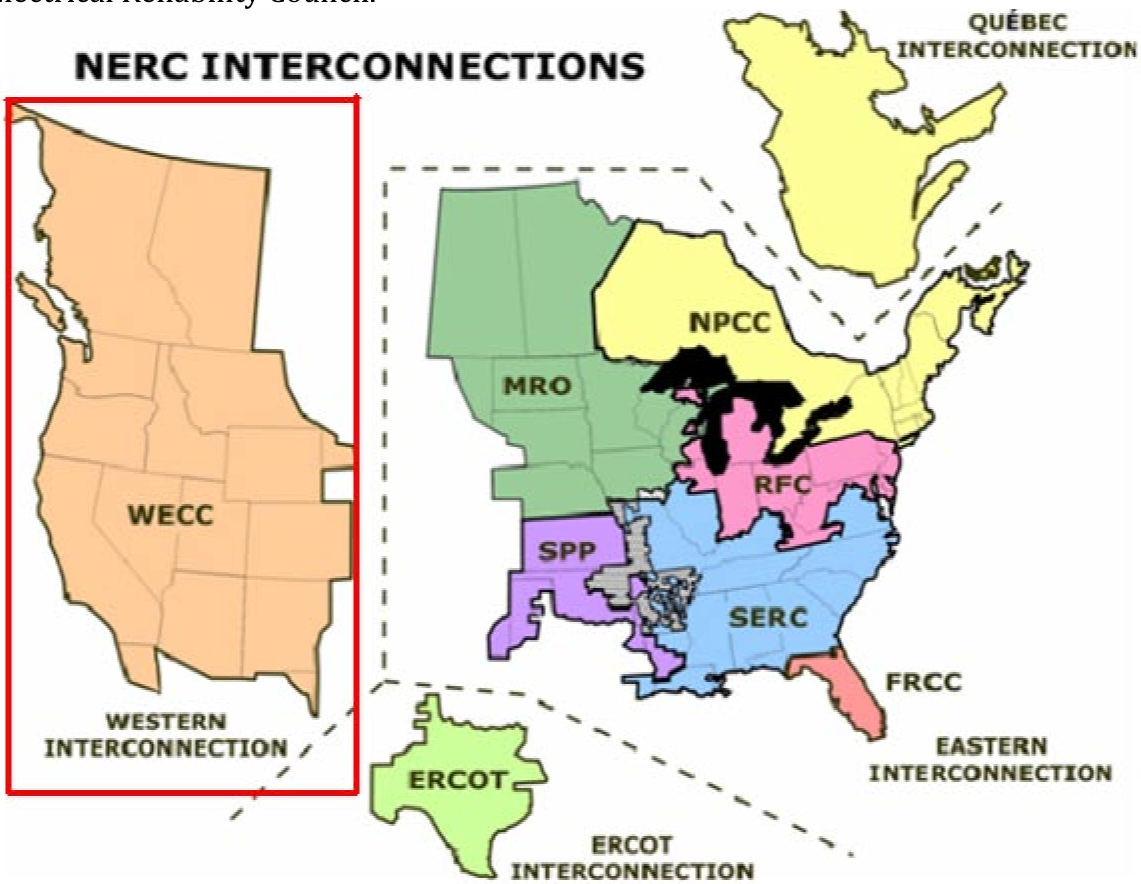
Utility	Electricity	Gas	Water	Total Cost per Year
Totals	$205, 447.98	$2,313.54	$2116.28	$209,877.80

Yearly and Monthly Energy Cost	
Yearly Energy Cost	$6.05/ft^2

Unfortunately, no energy model was created by the design staff because it was not required by the owners. The Walt Disney Family Foundation did not wish to qualify for any type of LEED Certification. A possible reason for this could be due to budget restraints and also because California Code of Energy, Title 24, a very strict energy guideline for building required the Museum to be compliant with energy standards.

Annual Energy Emissions

The Walt Disney Family Museum's annual energy emissions associated with the electrical energy consumption have been calculated. The Museum, located in San Francisco, CA, is within the Western Interconnection of the North American Electrical Reliability Council.



The following chart consists of the type of energy used in generating the electricity within the Western Interconnection. The largest energy consumed in creating electricity is natural gas in which the Museum consumes 399,239.4 units of natural gas per year from its consumption of electricity.

Total Energy Produced from Fossil Fuels in the Production of Electricity		
Energy Type	Western %	kWh Produced
Bituminous Coal	13.1	190,877.22
Subitumious Coal	19.8	288,501.44
Lignite Coal	0.0	0
Natural Gas	27.4	399,239.37
Petroleum Fuels	0.5	7,285.39
Other Fossil Fuels	0.3	4,371.234
Nuclear	9.9	144,250.72
Hydro	24.6	358,441.19
Renewable Fuels	1.3	18,942.01
Geothermal	2.1	30,598.64
Wind	1.0	14570.78
Solar (PV)	0.1	1457.07

The Museum utilizes electricity in providing energy for the loads within the building and therefore, when using electricity, emissions result from the delivery from the power plant to the building. In determining the total annual emissions due to delivery to the Museum, the total electrical energy used by the Museum was multiplied by the lb_m of pollutants per kWh.

Total Annual Emissions from Delivered Electricity to the Museum		
Pollutant (lb)	Western	Lb of Pollutant per kWh
CO_{2e}	1.31E+00	1,908,772.18
CO_2	1.22E+00	1,777,635.16
CH_4	3.51E-03	5,114.34
N_2O	2.97E-05	43.27
NO_x	1.95E-03	2,841.3
SO_x	6.82E-03	9,937.27
CO	5.46E-04	795.56
PM10	6.99E-05	101.85
Solid Waste	1.39E-01	202,533.84
Total Emissions		3,907,868.75 lb

The total emissions listed in the charts are emissions which are notable contributors to green house gases and potentially global warming. Within the DOE's report on Source Energy and Emission Factors for Energy Use in Buildings, the National Renewable Energy Lab includes Lead and Mercury emissions within their analysis; however, I omitted these two types of emissions because the amounts were so small.

The following chart calculates the emissions from the boiler's on-site combustion of natural gas per 1000ft^3. Again the largest pollutant is carbon dioxide and carbon dioxide equivalent (CO_{2e}) which shows the overall lbm of pollutant of carbon dioxide plus the radiative properties which is based on the global warming potential (GWP). Therefore, the overall impact of carbon dioxide totals that of the carbon dioxide equivalent.

Total Annual Emissions from On-Site Combustion of Natural Gas within Museum		
Energy Type	Western	Lb of Pollutant per 1000 ft^3
CO_{2e}	1.23E+02	304,974.81
CO_2	1.22E+02	302,495.34
CH_4	2.50E-03	619.86
N_2O	2.50E-03	619.86
NO_x	1.11E-01	27,522.11
SO_x	6.32E-04	156.70
CO	9.33E-02	23,133.45
PM10	8.40E-03	2,082.75
Total Emissions		663,124.97

Finally, the overall annual emissions from electrical energy delivered to the Museum, as well as the on-site combustion of natural gas by the heating system, is totaled in the following chart. The largest amount of pollutants comes from carbon dioxide followed by nitrous oxides. A large amount of solid waste is also produced while using electricity and natural gas which this waste consists of bottom ash, fly ash, boiler slag and sludge. This can contribute to a build-up of waste within the system and also contributes to air pollution as well. Finally, PM10, which stands for particulate matter, which is the measure of particles within the atmosphere that are 10 micrometers of smaller.

Total Annual Emissions from Energy used within the Museum			
Pollutant (lb)	Lb_m of Pollutant per 1000 ft^3	Lb_m of Pollutant per kWh	Total pounds of Pollutants
CO_{2e}	304,974.81	1,908,772.18	2,213,746.99
CO_2	302,495.34	1,777,635.16	2,080,130.5
CH_4	619.86	5,114.34	5,734.2
N_2O	619.86	43.27	663.13
NO_x	27,522.11	2,841.3	30,369.41
SO_x	156.70	9,937.27	100,93.27
CO	23,133.45	795.56	23,929.01
PM10	2,082.75	101.85	2,184.6
Solid Waste	-	202,533.84	202,533.84
Total lb_m of emissions per year			4,453,409.51

Again, the Museum's design team did not perform an energy analysis therefore, no annual emissions were calculated. However, from the Trane Trace analysis, the environmental impact analysis reports that emissions from CO_2 equal 1,071,430 lbm which is half of the calculation determined by the DOE's method of analysis.

References

Trane Trace 700 Software, Building Energy and Economic Analysis

Deru, M., and P. Torcellini. *Source Energy and Emission Factors for Energy Use in Buildings*. Oak Ridge, TN: U.S. Department of Energy, 2007.

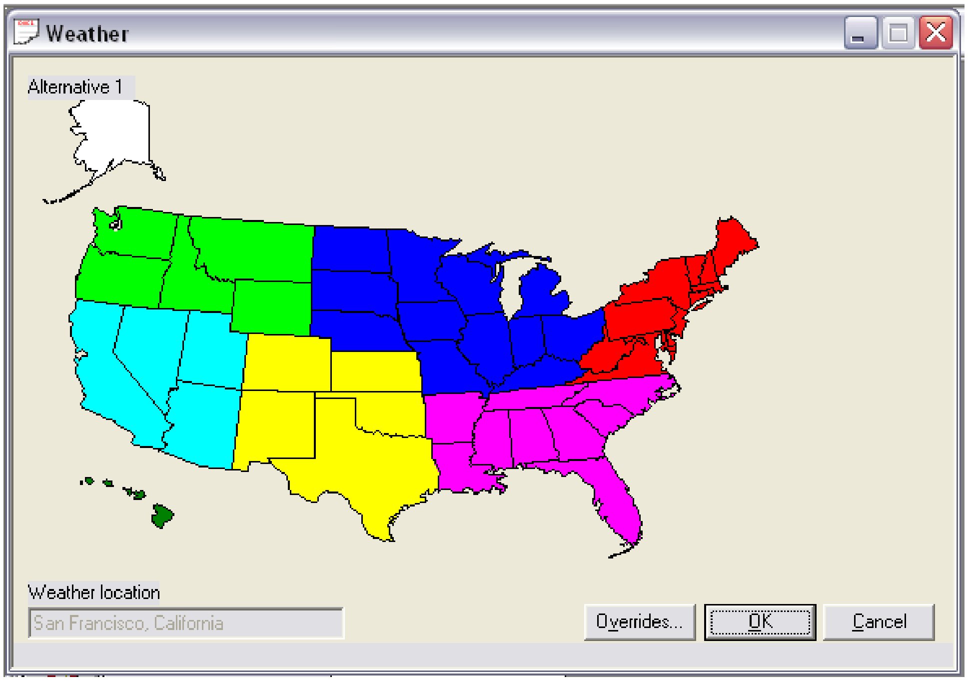
Appendix A – Room, Wall and Window Inputs

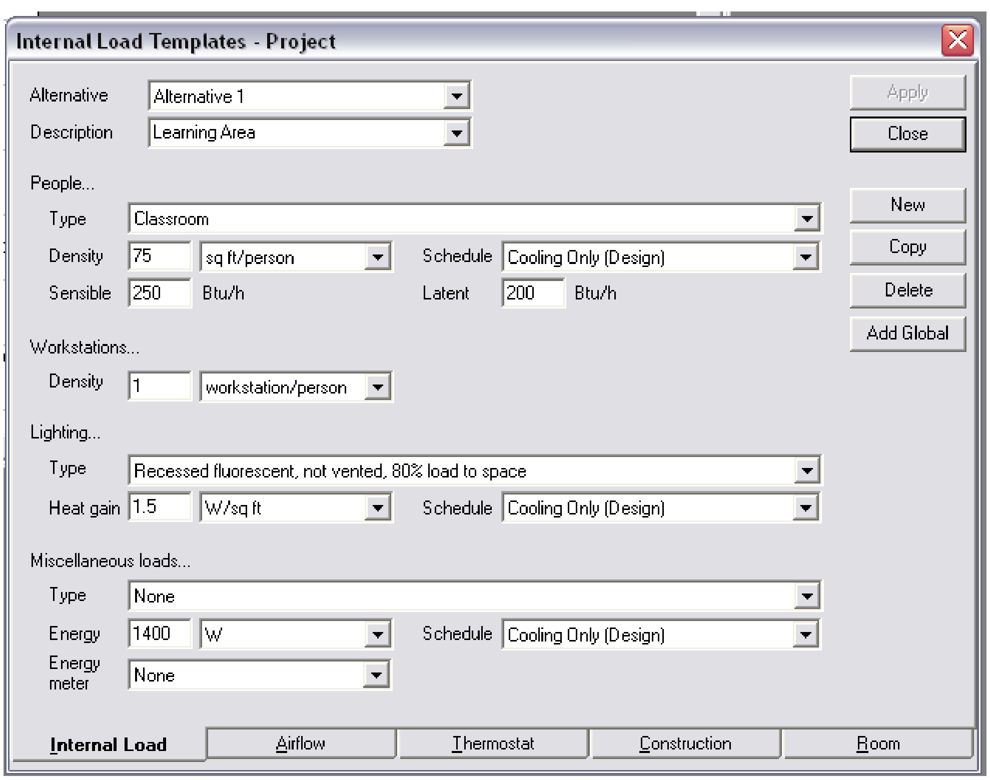
Room	Room Title	A_z (ft^2)	P_z (Zone Pop)	Wall 1 Length (ft)	NSWE (In degrees)	Window (ft^2)	Wall 2 Length (ft)	NSWE (In degrees)	Window (ft^2)
013	Light Lock	32	-						
013A	Vestibule	28	2						
014	A/V Closet	28	1						
015	Elec. Closet	24	1						
016	Group Lobby	420	32						
017	Light Lock	36	-						
018	Control Room	80	2						
020	Stair/Elev. Lobby	128	10						
020A	Coatroom	54	-						
021	Drinking Fountains	32	-						
022	Janitor Closet	60	-						
023	Men's Room	180	N/A						
024	Women's Room	180	N/A						
025	Corridor	540	-						
026	Nurse's Room	140	1						
027	Learning Area	420	8						
028	Learning Area	504	9						
029	Warming Kitchen	160	4						
030	Corridor	40	-						
030A	Trash	16	N/A						
031	Elev. Pit	50	N/A						
032	Elec. Closet	40	1						
033	Staff Rm/Green Rm.	120	3						
034	Mail Room	100	-						
036	Staff Entry	144	1						
037	Security	96	1						
038	Security Closet	64	-						
102	Gallery 10A	288	6	11	180	5.25	-	-	-
103	Elec. Closet	24	0						
104	A/V Closet	28	0						
105	Galley 10B	450	9	32	180	26.25	-	-	-
106	Exit Lobby	280	21	32	90	15.75	-	-	-
107	Coffee Shop	220	8	-	-	-	-	-	-
108	Bookstore	650	6	38	180	15.75	42	270	21
109	Mngr. Office	40	1	10	180	5.25	10	90	5.25

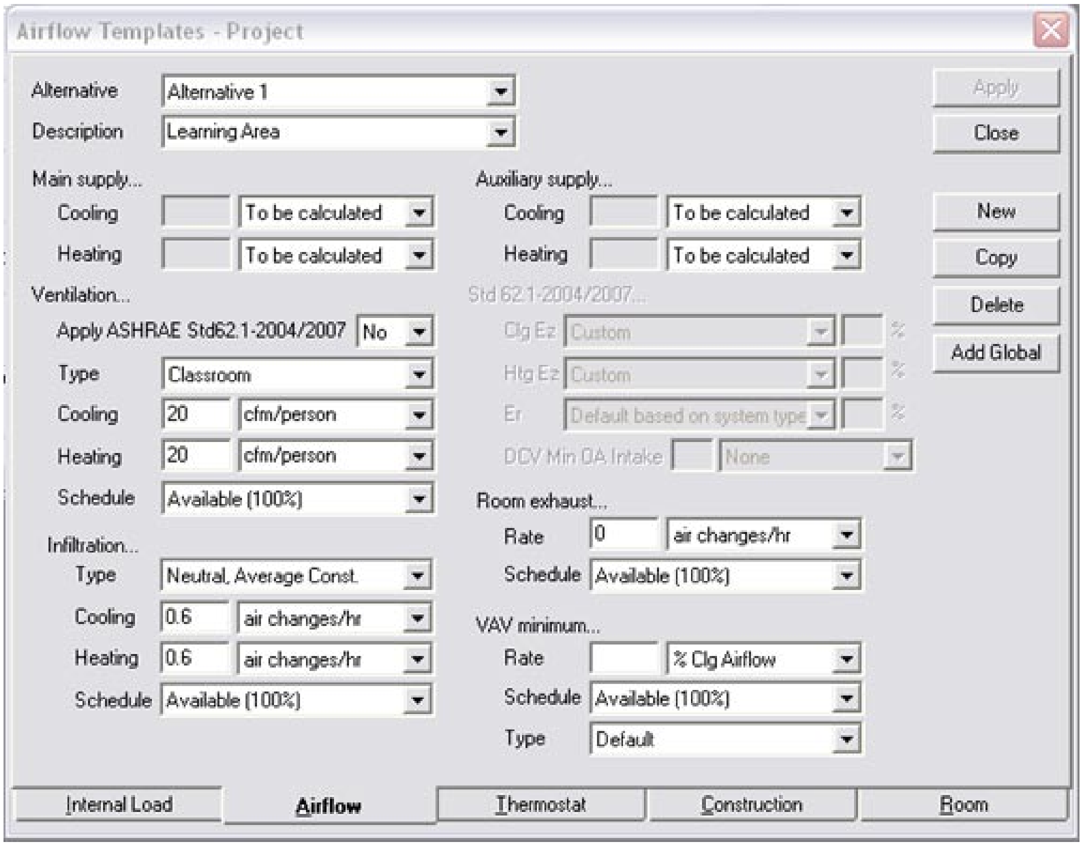
110	Reception/Info	650	6	32	270	15.75	-	-	-
111	Pre-Show/Assembly	760	11	42	270	21	48	0	21
112	Gallery	448	9	32	0	26.25	-	-	-
113	Electrical Room	40	1						
114	Gallery 1C	288	6	18	0	5.25	-	-	-
117	Blue Sky/Scene 9	1840	30	64	90	320	-	-	-
201A	WC	28	N/A						
202	Gallery 7B	200	4	-	-	-	-	-	-
203	Elec. Closet	24	0						
204	A/V Closet	28	0						
205	Gallery 7	480	10	32	180	26.25			
206	Gallery 6	800	16	48	180	21	42	270	26.25
207	Gallery 5	680	14	32	270	21	-	-	-
208	Gallery 4	720	14	32	270	21	-	-	-
209	Gallery 3	760	15	42	270	26.25	48	90	21
210	Gallery 2B	510	10	32	0	26.25	-	-	-
211	Electrical Closet	20	0						
211A	Janitor/Storage	40	-						
212	Gallery 2A	288	6	18	0	5.25	-	-	-
216	Gallery 9	1660	45	-	-	-	-	-	-
218	Gallery 8	272	6	64	90	320	-	-	-
301	Corridor	68	2	-	-	-	-	-	-
302	Coffee/Break Room	128	5	11	180	5.25	-	-	-
303	WC	50	N/A						
304	Elec. Closet	20	-						
305	Storage	50	-						
306	Corridor	250	2	8	0	5.25	-	-	-
307	IT Room	150	5	16	180	10.5	-	-	-
308	Storage	80	-						
309	Elev. Mech. Room	28	-						
310	Corridor	140	2	-	-	-	-	-	-
312	Open Office	500	8	13	180	15.75	14	270	10.5
312A	Storage	40	-						
312B	Storage	60	-						
313	Office	200	4	-	-	-	-	-	-
315	Corridor	200	2	15	90	10.5	-	-	-
316	Corridor	20	2	-	-	-	-	-	-
317	Conference Room	192	18	-	-	-	-	-	-
318	Work Station	100	2	28	270	21	-	-	-
319	Office	320	8	14	270	10.5	13	0	15.75
319A	Conference Room	60	6	-	-	-	-	-	-

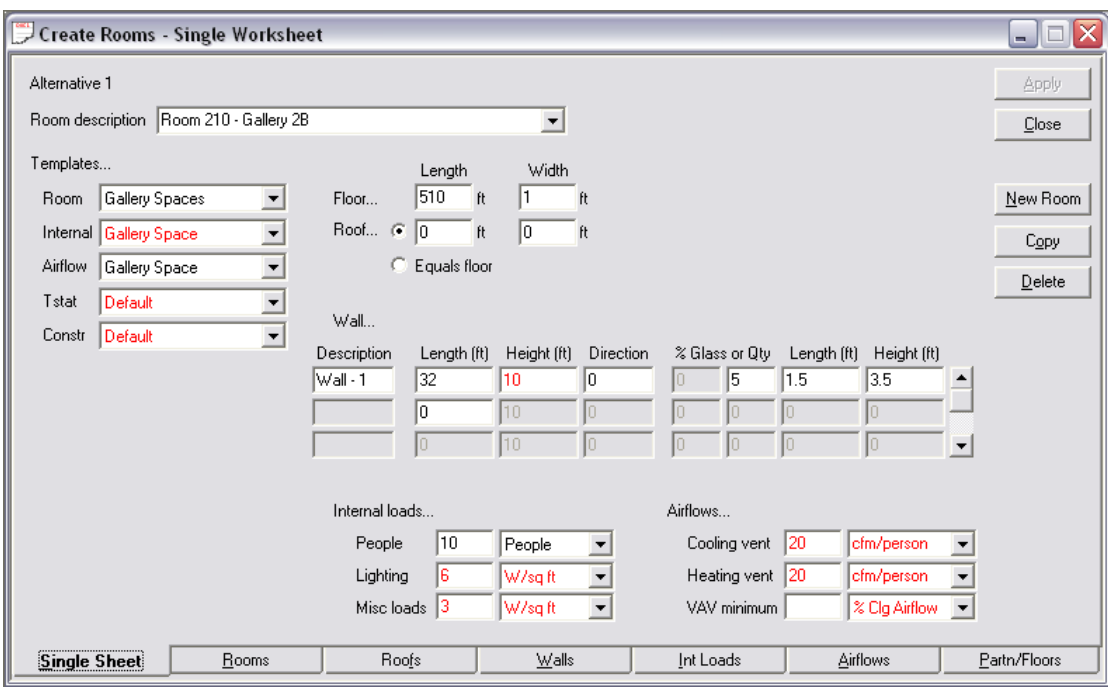
321	Office	56	1	-	-	-	-	-	-
322	Office	56	1	-	-	-	-	-	-
323	Corridor	50	2	8	90	5.25	-	-	-
323A	Storage	150	-						
324	Electrical Room	16	-						
325	Office	192	4	16	0	10.5	-	-	-
326	Corridor	90	2	-	-	-	-	-	-
327	Elevator Mech. Room	24	-						
328	WC	36	N/A						

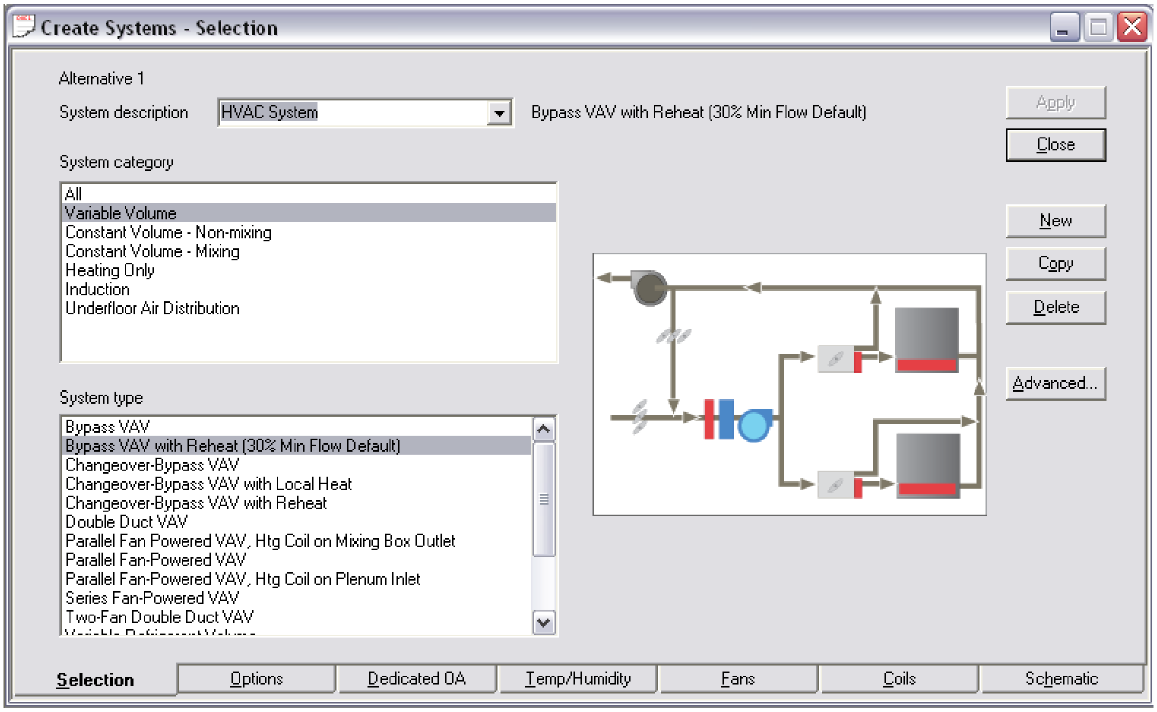
Appendix B – Trane Trace 700 Templates Used

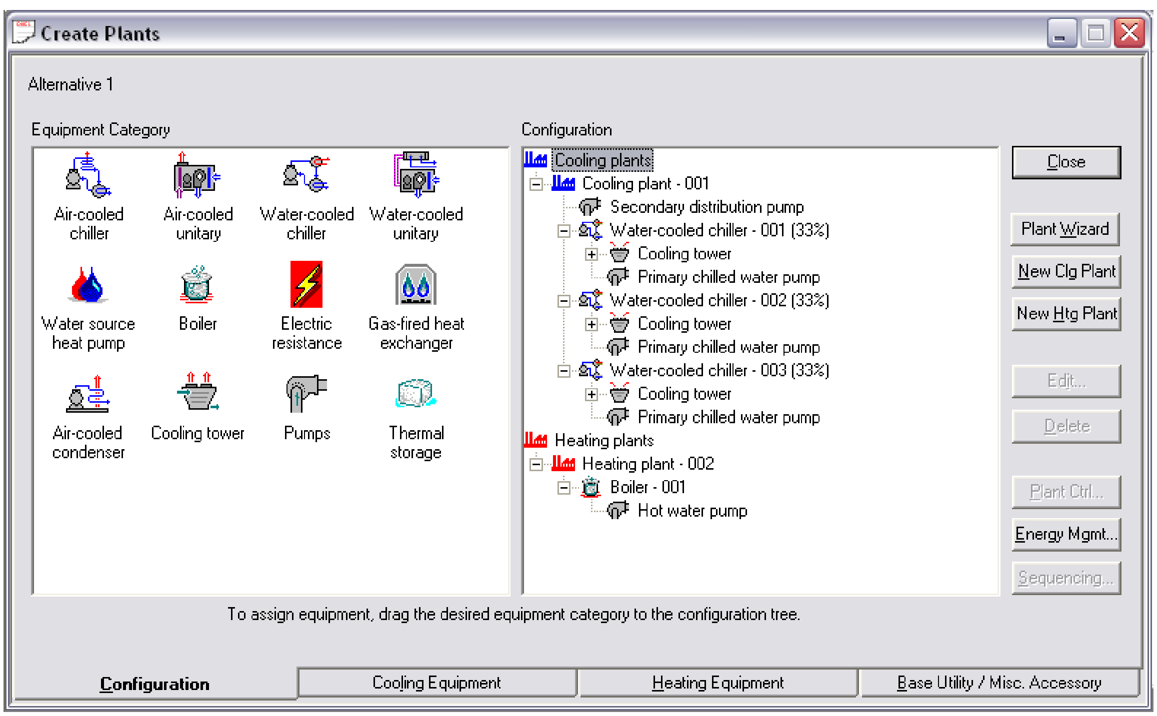





Airflow Templates - Project
Alternative
Alternative 1
Description
Learning Area
Apply
Close
New
Copy
Delete
Add Global
Main supply...
Cooling
To be calculated
Heating
To be calculated
Auxiliary supply...
Cooling
To be calculated
Heating
To be calculated
Ventilation...
Apply ASHRAE Std62.1-2004/2007
No
Type
Classroom
Cooling
20
cfm/person
Heating
20
cfm/person
Schedule
Available (100%)
Std 62.1-2004/2007...
Clg Ez
Custom
Htg Ez
Custom
Er
Default based on system type
DCV Min OA Intake
None
Room exhaust...
Rate
0
air changes/hr
Schedule
Available (100%)
Infiltration...
Type
Neutral, Average Const.
Cooling
0.6
air changes/hr
Heating
0.6
air changes/hr
Schedule
Available (100%)
VAV minimum...
Rate
% Clg Airflow
Schedule
Available (100%)
Type
Default
Internal Load
Airflow
Thermostat
Construction
Room


Create Rooms - Single Worksheet
Alternative 1
Room description
Room 210 - Gallery 2B
Apply
Close
New Room
Copy
Delete
Templates...
Room
Gallery Spaces
Internal
Gallery Space
Airflow
Gallery Space
Tstat
Default
Constr
Default
Length
Width
Floor...
510
ft
1
ft
Roof...
0
ft
0
ft
Equals floor
Wall...
Description
Length (ft)
Height (ft)
Direction
% Glass or Qty
Length (ft)
Height (ft)
Wall - 1
32
10
0
0
5
1.5
3.5
Internal loads...
People
10
People
Lighting
6
W/sq ft
Misc loads
3
W/sq ft
Airflows...
Cooling vent
20
cfm/person
Heating vent
20
cfm/person
VAV minimum
% Clg Airflow
Single Sheet
Rooms
Roofs
Walls
Int Loads
Airflows
Partn/Floors


Create Systems - Selection
Alternative 1
System description
HVAC System
Bypass VAV with Reheat (30% Min Flow Default)
Apply
Close
System category
All
Variable Volume
Constant Volume - Non-mixing
Constant Volume - Mixing
Heating Only
Induction
Underfloor Air Distribution
New
Copy
Delete
Advanced...
System type
Bypass VAV
Bypass VAV with Reheat (30% Min Flow Default)
Changeover-Bypass VAV
Changeover-Bypass VAV with Local Heat
Changeover-Bypass VAV with Reheat
Double Duct VAV
Parallel Fan Powered VAV, Htg Coil on Mixing Box Outlet
Parallel Fan-Powered VAV
Parallel Fan-Powered VAV, Htg Coil on Plenum Inlet
Series Fan-Powered VAV
Two-Fan Double Duct VAV
Selection
Options
Dedicated OA
Temp/Humidity
Fans
Coils
Schematic


Create Plants
Alternative 1
Equipment Category
Air-cooled chiller
Air-cooled unitary
Water-cooled chiller
Water-cooled unitary
Water source heat pump
Boiler
Electric resistance
Gas-fired heat exchanger
Air-cooled condenser
Cooling tower
Pumps
Thermal storage
Configuration
Cooling plants
Cooling plant - 001
Secondary distribution pump
Water-cooled chiller - 001 (33%)
Cooling tower
Primary chilled water pump
Water-cooled chiller - 002 (33%)
Cooling tower
Primary chilled water pump
Water-cooled chiller - 003 (33%)
Cooling tower
Primary chilled water pump
Heating plants
Heating plant - 002
Boiler - 001
Hot water pump
Close
Plant Wizard
New Clg Plant
New Htg Plant
Edit...
Delete
Plant Ctrl...
Energy Mgmt...
Sequencing...
To assign equipment, drag the desired equipment category to the configuration tree.
Configuration
Cooling Equipment
Heating Equipment
Base Utility / Misc. Accessory