COST ANALYSIS

COST CONSIDERATIONS

Performing a cost analysis is important in determining the best system to select for a certain application. Two different analyses have been used to determine the best "case" situation for this report. These calculations include a simple payback comparison and a 20-year life cycle cost analysis.

Cost considerations include the initial cost of the equipment, life of the equipment, and the operating costs. While a system may have a very low first cost, the annual operating cost of the system may be so large that the owner cannot afford to maintain the building. Therefore it is important to find a balance between first cost and the operating cost.

INITIAL COST OF EQUIPMENT

The initial cost of all the equipment under consideration was determined by contacting sales representatives to receive price quotes. The following table summarizes the initial costs:

Table 15

Equipment First Costs [$]					
Unit	**Type**	**Description**	**Manufacturer**	**Product No.**	**Unit Price [$/X]**
L1	Original Fixture	Recessed Bivergence 7"	Zumtovbel Staff	RBNIC7423282	135
L1A	Original Fixture	Recessed Bivergence 7"	Zumtovbel Staff	RBNIC7423282	135
L8	Original Fixture	Recessed Bivergence 1'	Zumtovbel Staff	RBIC1423282	129
L8A	Original Fixture	Recessed Bivergence 1'	Zumtovbel Staff	RBIC1423282	129
L36	Original Fixture	6" Recessed DL	Zumtovbel Staff	S5D6308HU6313HRC	81
L1	Original Lamp	(2) F32/835/XPS/ECO	OSI	21697	13.56
L1A	Original Lamp	(2) F32/835/XPS/ECO	OSI	21697	13.56
L8	Original Lamp	(2) F32/835/XPS/ECO	OSI	21697	13.56
L8A	Original Lamp	(4) FT40DL/835/RS	OSI	20585	19.1
L36	Original Lamp	(1)CF32DT/E/IN/835	OSI	20885	10.33
L1	New Fixture	Recessed Bivergence 7"	Zumtovbel Staff	RBNIC7423282	135
L8A_A2	New Fixture	Recessed Bivergence 1'	Zumtovbel Staff	RBIC1423282	129
L1_A	New Fixture	Recessed Row 1'X8' 2 Lamp T8	Lithonia Lighting	RR 2 96T8 TUBI	215
L36_A	New Fixture	6" Recessed DL	Zumtovbel Staff	S5D6308HU6313HRC	81
L1	New Lamp	(2) F32/835/XPS/ECO	OSI	21697	13.56
L8A_A2	New Lamp	(2) F40T8 TL835 60 ALTO 1LP	Philips	368340	4.89
L1_A	New Lamp	(2) FO96/835/XP/SS/ECO	OSI	22100	10.33
L36_A	New Lamp	(1) Mini Dec Twister 27W Med EL/mDT 1CT	Philips	137158	5.99
Cooling Tower	--	NC Class	Marley	NC8311J1	79,300
Pumps	Split-Coupled	Series 4300, 4x4x10	Armstrong	PT82-1-0	6,150
Pumps	End Suction	Series 1510 Model 4 BC	Bell & Gossett	--	3,050
Heat Exchanges	Plate-Frame	B56Hx200 4*2 1/2"NPT	SWEP	11487-200	6,636

As this table shows, the cooling towers are the single most expensive equipment at $79,300 each. While they are expensive, installing either the ground loop or pond loop systems is more expensive than the cooling towers.

ENERGY SOURCES & RATES

Electric service is provided by Dominion Virginia Power. Table 16 shows the expected rates for the Landscape Building. Natural Gas is provided by Washington Gas. The rates can be seen in Table 17. All data has been provided by the mechanical engineer and was used in the actual energy analysis. These rates will most likely continue to increase until the building is operational and beyond. Therefore, it is important to keep energy usage and cost in the forefront of all design considerations.

Table 16

Electricity Cost Summary	
Energy Charges	
On-peak	$0.05599 per kWh
Off-peak	$0.03166 per kWh
Supply Charge	
On-peak	$1.17150 per kW
Off-peak	$0.6320 per kW

Table 17

Natural Gas Cost Summary	
Distribution Charge	
Flat Price	$0.570 per therm

SIMPLE PAYBACK

The simple payback is a simple calculation to determine how long it would for the first cost investment to pay for itself through annual cost savings. The equation is as follows:

Simple Payback [yrs] = Change in first cost/Change in annual cost

In order to do this calculation, a base case must be chosen to which all other cases are compared. For the purposes of this report, the base case is Case 1. Table A.37 in Appendix L has all the inputs used. These include the first cost of both the mechanical system under discussion and the lighting system. In addition, the HVAC operating costs and the maintenance costs of replacing lamps over a period of 20 years plays a major role in the cost of the systems. The following table is a summary of the simple payback calculation for all important cases:

Table 18

Simple Payback					
	Case 1	**Case 4**	**Case 5**	**Case 6**	**Case 7**
Relative First Cost	188,871	179,612	1,169,759	243,156	233,897
Change in First Cost	0	-9,259	980,888	54,285	45,026
Annual HVAC Operating Cost	968,542	727,465	948,796	898,891	682,818
Annual Lighting Maintanance Cost	1,640	729	1,640	1,640	729
Total Annual Cost	970,182	728,194	950,436	900,531	683,547
Chance in Annual Cost	0	-241,987	-19,746	-69,651	-286,634
Simple Payback [years]	**–**	**0.0**	**49.7**	**0.8**	**0.2**

It was determined that Case 5 is not a feasible solution. Typically, owners prefer to have a payback of less than 5 years. A payback of almost 50 years is completely out of the question. Both Cases 6 and 7 are reasonable solutions. Case 7 which has the least expensive for operating costs and the least expensive first costs for the alternative designs has a payback of about 72 days. This system is therefore selected as most economically feasible alternative to the current design.

LIFE CYCLE COST

The life cycle cost analysis was performed using Engineering Economic Analysis 3.01 by Carrier. This program uses the annual and first costs to calculate the cost of the system over a specified period of time.

Results from this analysis again show that Case 7 is the best alternative. The system has a net present worth of $7,252,521 after 20 years, as opposed to Case 1 with a NPV of $9,612,197. For full results of this analysis, please see Appendix L.