

### PRELIMINARIES

Area of installation (sq. ft.):	18576
Owner's cost of capital (decimal fraction):	13%
Owner's income tax rate (decimal fraction):	40%
Years in planning horizon or economic life:	15

### A. INITIAL COSTS

	Ind./Task	Tambient
1. Lighting system installed cost:	\$99,311	\$97,012
1a. Lighting system installed cost (pendants):	\$65,311	
1b. Lighting system installed cost (task lights):	\$34,000	
Number of lamps in system:	508	240
Lamp wattage:	28	32.67
Ballast wattage per lamp:	5	5
2. Total kW lighting:	16.76	9.04
3. Tons of air conditioning required to dissipate heat of lighting:	4.77	2.57
Cost per ton of air conditioning equipment:	\$1,800	\$1,800
4. First cost of air conditioning tons in line A.3:	\$8,582	\$4,628
5. Reduction in first cost of heating equipment (enter as negative):	(\$1,388)	(\$748)
6. Utility rebates (enter as negative):		
7. Other first costs engendered by the presence of lighting system:		
8. Subtotal mechanical and electrical installed cost:	\$106,505	\$100,892
9. Initial taxes	\$6,390	\$6,053
10. Total costs	\$112,895	\$106,945
11. Installed cost per square foot (memo):	\$6.08	\$5.76
12. Watts of lighting per square foot (memo):	0.90	0.49
13. Residual value at end of economic life:		

### B. ANNUAL POWER AND MAINTENANCE COSTS

Operating hours	2600	2600
Energy cost per kWh (in dollars):	\$0.10	\$0.10
1. Lighting energy cost:	\$4,359	\$2,350
Air conditioning operating hours:	1300	1300
Air conditioning efficiency (kW/ton):	1.2	1.2
2. Air conditioning energy cost:	\$744	\$401
Annual maintenance cost per ton of installed air conditioning:	\$150	\$150
3. Air conditioning maintenance:	\$715	\$386
Cost of heating fuel in dollars per MBtu	\$0.01	\$0.01
4. Reduction in heating cost:	(\$0)	(\$0)
Heating plant annual maintenance cost per Mbtu of capacity:	\$2	\$2
5. Reduction in heating maintenance:	(\$114)	(\$62)
6. Other annual costs engendered by the lighting system:		
Cost of spot replacement, one lamp (materials plus labor):	\$12	\$10
Lamp life (hours):	20000	20000

#### Note

This life cycle cost analysis is based on industry standards, national standards and RS Means Electrical Cost Data 27<sup>th</sup> Annual Edition (2004). Published and inferred costs should not be used for any purpose other than this analysis. All projects should be calculated regardless of any similarity (size, shape, quantities) to the cited project, and regional cost factors should be considered.

7a. Cost of lamps annually (spot relamping):	\$812	\$312
7b. or Annual group relamping cost:	\$0	\$0
Cost of spot replacement, one ballast (materials plus labor):	\$70	\$68
Ballast life (hours):	50000	50000
Lamps per ballast:	1.52	2.00
8. Cost of ballast replacement	\$1,220	\$424
9. Luminaire washing cost	\$4	\$4
10. Annual insurance cost:	\$2,024	\$1,917
11. Annual property tax	\$5,325	\$5,045
12. Subtotal, annual power and maintenance (after tax):	\$9,053	\$6,466
Annual depreciation -		
Accelerated for furniture mounted luminaires:	\$4,857	\$13,859
or straight line for building installed luminaires:	\$1,675	\$0
13a. Income tax effect of depreciation for years 1-7:	(\$2,613)	(\$5,544)
13b. Income tax effect of depreciation for years 8-15:	(\$670)	

**C. COMPARISONS**

1. Present worth	\$158,841	\$112,908
2a. Annual life cycle cost for years 1-7	\$22,577	\$14,600
2b. Annual life cycle cost for years 8-15	\$19,551	\$10,295

See page 3 for baseline assumptions and explanations.

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### Suspended Indirect w/Task Lighting

This design represents conventional recommended practice for lighting offices with VDT's. Separate task and ambient lighting systems are installed. General ambient lighting is provided by 160 eight-foot long suspended ceiling mounted uplights. Each uplight contains two 4-foot F28/T5 lamps. The pendants provide approximately 20 footcandles of general ambient illumination. In addition, each of the 200 workstations has a panel-mounted task light with one 4-foot F28/T5 lamp to provide task illuminance. Notably, the area of conforming task illuminance is limited to the extent covered by the 4-foot task light.

### The Tambient System

This system consists of 200 panel-mounted task ambient luminaires -- one at each workstation. Each of the (160) 6'x6' workstations is provided with one 69-3/4" long L201 luminaire with one 5-foot F35/T5 lamp. Each of the (40) 8'x8' workstations are fitted with one 94-1/4" long L201 luminaire with two 4-foot F28/T5 lamps. This results in approximately 16 footcandles of general indirect ambient illumination. In addition to the economic benefits outlined in the analysis, this system provides a significantly larger area of conforming task lighting and vertical surround illuminance in each workstation than the conventional design.

### Baseline Assumptions

#### Preliminaries

- a. The building footprint and workstation layout is based on a typical large open-plan office.
- b. The information presented in this section is based on the financial structure of a typical company and the lifespan of a typical office fit-out.

#### Initial Costs

- a. Labor rates are based on industry standards and RSMeans (2004).
- b. Material costs are based on industry averages and company information.
- c. When a system uses multiple lamp types/wattages, the lamp and ballast wattage is a weighted system average.
- d. Other costs and equations are based on IES RP-31-96's suggested formulas with inflation estimations.
- e. Initial Taxes: CT 6%.

#### Annual Power and Maintenance Costs

- a. Office hours and energy costs are based on national averages.
- b. HVAC equipment and fuel costs are based on national averages and IES RP-31-96's suggestions with inflation estimations.
- c. Lamp and Ballast information is based on manufacturer information and RSMeans (2004).
- d. When a system uses different lamps, the lamps per ballast is a weighted system average.
- e. Annual insurance cost and property taxes are based on typical company standards and the IES RP-31-96's suggestions.
- f. Remaining costs and equations are based on IES RP-31-96's suggested formulas with inflation estimations.
- g. Annual Accelerated Depreciation is the installed cost of furniture mounted lighting divided by 7.

#### Comparisons

- a. Annual life cycle costs are averaged and include the income tax and investment effects of depreciation.

#### Additional Considerations

1. This analysis does not consider the cost of advanced lighting controls often installed on conventional lighting systems to reduce energy use and meet locally prescribed limits.
2. This analysis does not consider the cost of overhead branch wiring circuits required by the conventional ceiling-mounted uplights.
3. The cost of standby emergency lighting should also be considered. For example, consider standby battery ballasts for pendant luminaires and discrete unit battery equipment to complement the Tambient installation.

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