



# Life Cycle Costs

*“How Much Did That New Floor Covering Really Cost Me?”*

ILA 2010

Mike Montgomery AIA LEEDap  
[www.krmarchitecture.com](http://www.krmarchitecture.com)

# What is Life Cycle Costing ?

- The evaluation of the cost of building components over the life of the product.
- Includes
  - 1<sup>st</sup> costs
  - Maintenance
  - Replacement
  - Energy consumption (if applicable)

# Don't We Always Do This ?

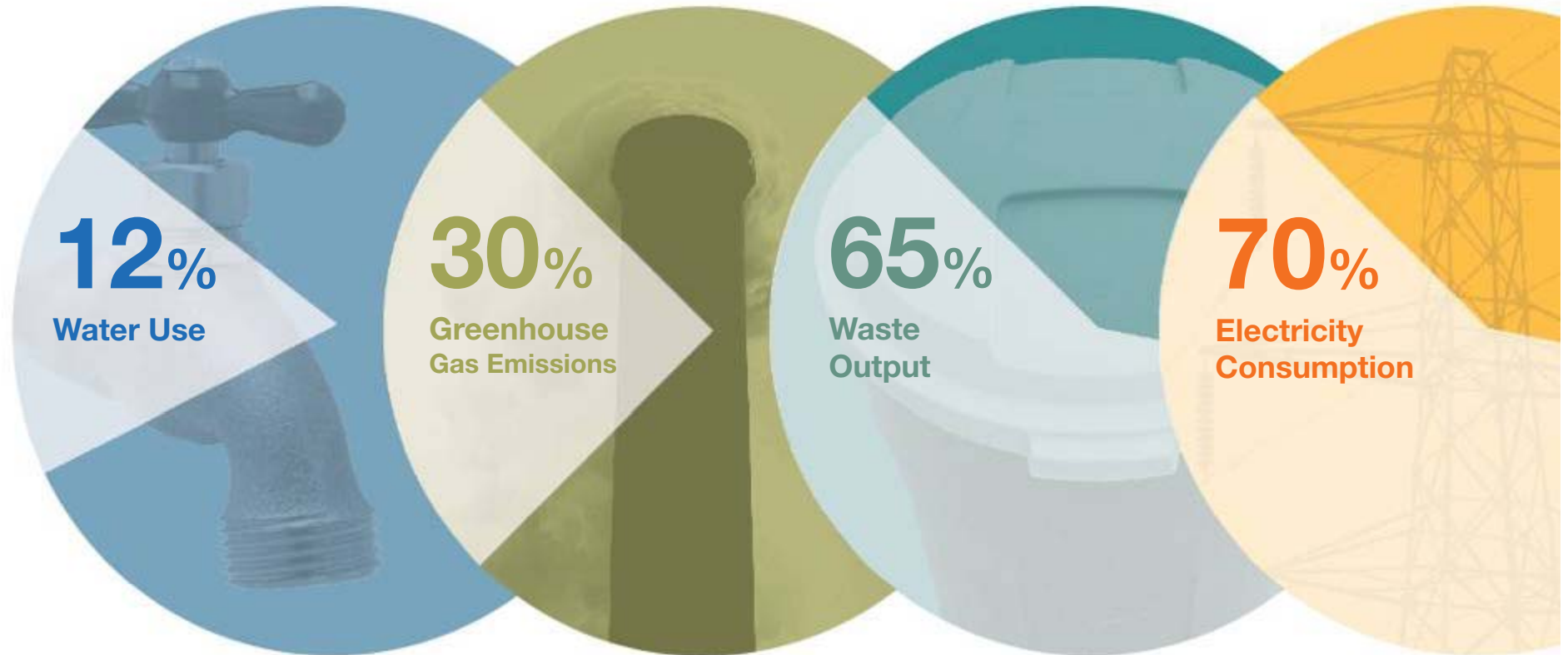
- Yes but . . .
  - Building materials and choices are increasing quickly.
  - There are too many choices to mentally contain the knowledge regarding cost, durability, etc.
  - An organized process helps evaluate the many choices.

# Buildings Consume . . .

- A large amount of our natural resources
- A large portion of your budget
  - Getting product decisions right have important long term implications for your budget.
  - Taking the long view is usually better for our planet.

# Our Buildings Consume Our Resources...

...and they last a long time.



Unknowingly, the architecture and building community is responsible for almost Half of all U.S. greenhouse gas emissions annually. Globally the percentage is even greater.



# How Much Does My Building Really Cost Per Year ?



## BUILDINGS...

*The Gifts That Keep on Taking*

2007  
Publication

A FRAMEWORK FOR  
INTEGRATED DECISION MAKING

RODNEY ROSE

WITH DAVID A. CAIN, Ph.D.,  
JAMES J. DEMPSEY, P.E.,  
AND RICH SCHNEIDER



# How Much Does My Building Really Cost Per Year ?

Cost Categories	National Average GSF/Yr	% CRV/Yr	Total Cost Impact-PV
<b>Birth and Burial Costs</b>			
Cost A: Planning and Design	\$0.30	0.20%	31.7%
Cost B: Financing	\$0.13	0.09%	
Cost C: Construction, Installation, Acquisition	\$3.00	2.00%	
Cost J: Decommissioning, Demolition, Disposal	\$0.80	0.53%	
<b>Maintenance &amp; Operations Costs</b>			
Cost D: Operations	\$1.50	1.00%	48.3%
Cost E: Maintenance	\$2.50	1.67%	
Cost F: Utilities	\$1.50	1.00%	
<b>Recapitalization Costs</b>			
Cost G: Improvements	\$1.20	0.80%	20.0%
Cost H: Programatic Upgrades	\$1.00	0.67%	
Cost I: Replacement and Renewal	\$0.80	0.53%	
<b>TOTALS</b>			100.0%
	<b>\$12.73</b>	<b>8.49%</b>	

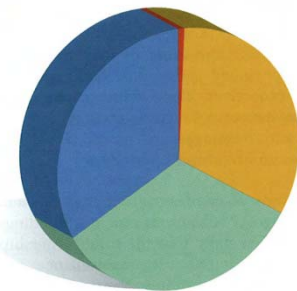
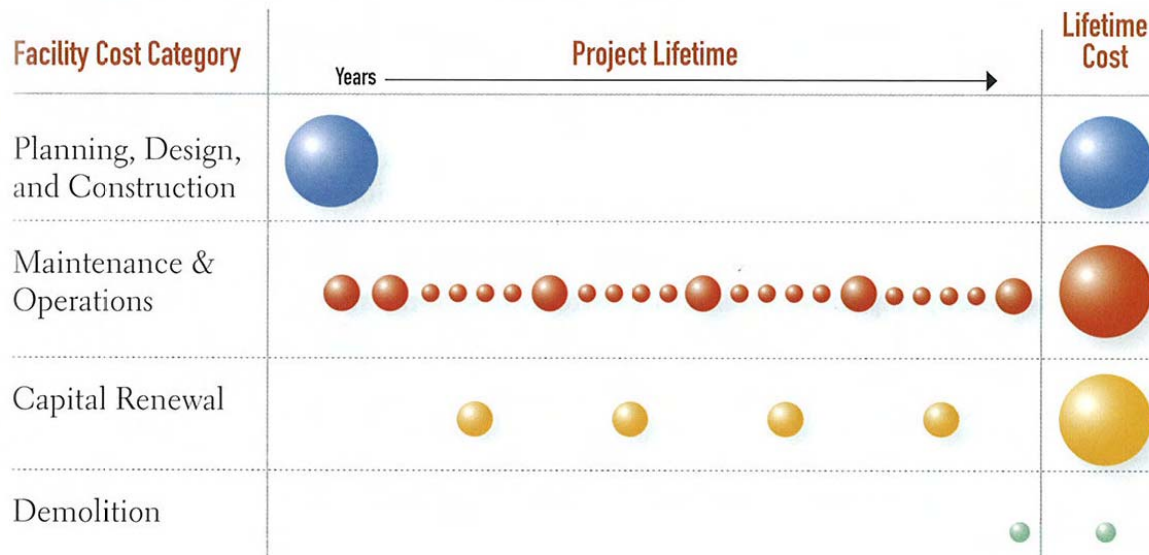
And I thought construction was expensive !



I am not budgeting anything like that per year !!

# How Much Does My Building Really Cost Per Year ?

Figure 4-6 Total Costs Distribution Over Lifetime



# How Do I Control These Costs ?

- The Old Saying . . .
  - Build as much (big) as you can because you only get one chance.
- The New Saying . . .
  - Build only what you need and build quality.
  - Plan for expansion if ever needed.

# Life Cycle Cost Analysis. An Increasingly Important Part of Planning . . .

- Some states require life cycle cost analysis.
- Federal government (GSA) require life cycle cost evaluations.

# Heating Cooling Example 3,000 sf Branch Library

*I like  
Option 4*



Windfall Public Library								
07.15.2009								
HVAC SYSTEM OPTIONS								HVAC Cost
<b>Option 1 - Match Existing System</b>								\$30,000.00
Likely lighting costs	\$0.40	per sf	3,052	\$1,220.80	per year	3.2 watts per sf		
Likely cooling costs	\$0.70	per sf	3,052	\$2,136.40	per year	SEER 10		
Likely heating costs	\$0.85	per sf	3,052	\$2,594.20	per year	78% efficient		
Total	\$1.95		3,052	\$5,951.40	per year			
<b>Option 2 - Air to Air Heat pump roof top unit</b>								\$33,000.00
Likely lighting costs	\$0.27	per sf	3,052	\$824.04	per year	2.2 watts per sf	2	
Likely cooling costs	\$0.53	per sf	3,052	\$1,643.00	per year	SEER 13	yrs payback	
Likely heating costs	\$0.72	per sf	3,052	\$2,197.00	per year	SEER 13		
Total	\$1.53		3,052	\$4,664.04	per year			
				\$1,287.36	possible reduction per year			
<b>Option 3 - Split system - air to air heat pump</b>								\$34,560.00
Likely lighting costs	\$0.27	per sf	3,052	\$824.04	per year	2.2 watts per sf	3	
Likely cooling costs	\$0.50	per sf	3,052	\$1,525.00	per year	SEER 14	yrs payback	
Likely heating costs	\$0.68	per sf	3,052	\$2,075.00	per year	SEER 14		
Total	\$1.45		3,052	\$4,424.04	per year			
				\$1,527.36	possible savings per year			
<b>Option 4 - High efficiency heat pump split system condensate gas furn. (16 SEER cooling , 92% gas heat</b>								\$35,000.00
Likely lighting costs	\$0.27	per sf	3,052	\$824.04	per year	2.2 watts per sf	3	
Likely cooling costs	\$0.44	per sf	3,052	\$1,342.00	per year	SEER 16	yrs payback	
Likely heating costs	\$0.71	per sf	3,052	\$2,166.00	per year	92% efficient		
Total	\$1.42		3,052	\$4,332.04	per year			
				\$1,619.36	possible savings per year			
<b>Option 5 - High efficiency roof top (13 SEER cooling , 82% gas heat)</b>								\$33,000.00
Likely lighting costs	\$0.27	per sf	3,052	\$824.04	per year	2.2 watts per sf	3	
Likely cooling costs	\$0.53	per sf	3,052	\$1,617.56	per year	SEER 13	yrs payback	
Likely heating costs	\$0.82	per sf	3,052	\$2,467.00	per year	82% efficient		
Total	\$1.61		3,052	\$4,908.60	per year			
				\$1,042.80	possible savings per year			
<b>Option 6 - Split system geo thermal water source heat pump (closed loop)</b>								\$62,260.00
Likely lighting costs	\$0.27	per sf	3,052	\$824.04	per year	2.2 watts per sf	18	
Likely cooling costs	\$0.49	per sf	3,052	\$1,495.48	per year		yrs payback	
Likely heating costs	\$0.60	per sf	3,052	\$1,831.20	per year		reduced carbon	
Total	\$1.36		3,052	\$4,150.72	per year			
				\$1,800.68	possible savings per year			

9% premium



# Floorcovering Life Cycle Costs

## Installation Carpet vs VCT

	Per Square Foot	
	CARPET	VCT
Materials plus Installation at year 0 (start)	\$2.11	\$0.89
Carpet Removal Cost after 11 years	\$0.22	\$0
Carpet Reinstalled (Materials plus installation) after 11 years	\$2.53 (20% inflation?)	\$0
Cost of Floor Covering System for 22 years	\$4.86	\$0.89
Cost of Cleaning and Maintenance for 22 years	\$12.20	\$23.81
<b>TOTAL LIFE CYCLE COST FOR 22 YEARS</b>	<b>\$17.06</b>	<b>\$24.70 +31%</b>

# Floorcovering Life Cycle Costs

## Maintenance Carpet vs VCT

<b>CARPET</b>	Frequency/ School Year	Minutes/ 1000 Sq. Ft.	School Year Total Minutes Per 1000 Sq. Ft.	Cost Per School Year \$/Sq. Ft.
Vacuumping	180 (daily)	**10	1800	\$0.2934
Spot Removal	180 (daily)	8	1440	\$0.2347
Rinse Cleaning	2 (Oct, May)	60	120	\$0.0196
Deep Cleaning***	3 (Aug, Dec, Mar)	120	360	\$0.0587
Chemical Costs				\$0.0040
<b>TOTAL</b>			<b>3720</b>	<b>\$0.6104</b>

\* Labor rate of \$9.76 derived from Cleaning Management Magazine, May '01 industry survey.

\*\* (Ref. notes under moderate soil schedule above) Realistically, most vacuuming will be concentrated in entry and channelized traffic flow areas. Time is largely dependent on the amount of furniture present and the width of the vacuum head.

\*\*\* Although the frequency of cleaning remains the same as for light-to-medium traffic areas, time spent cleaning is increased by 25%.

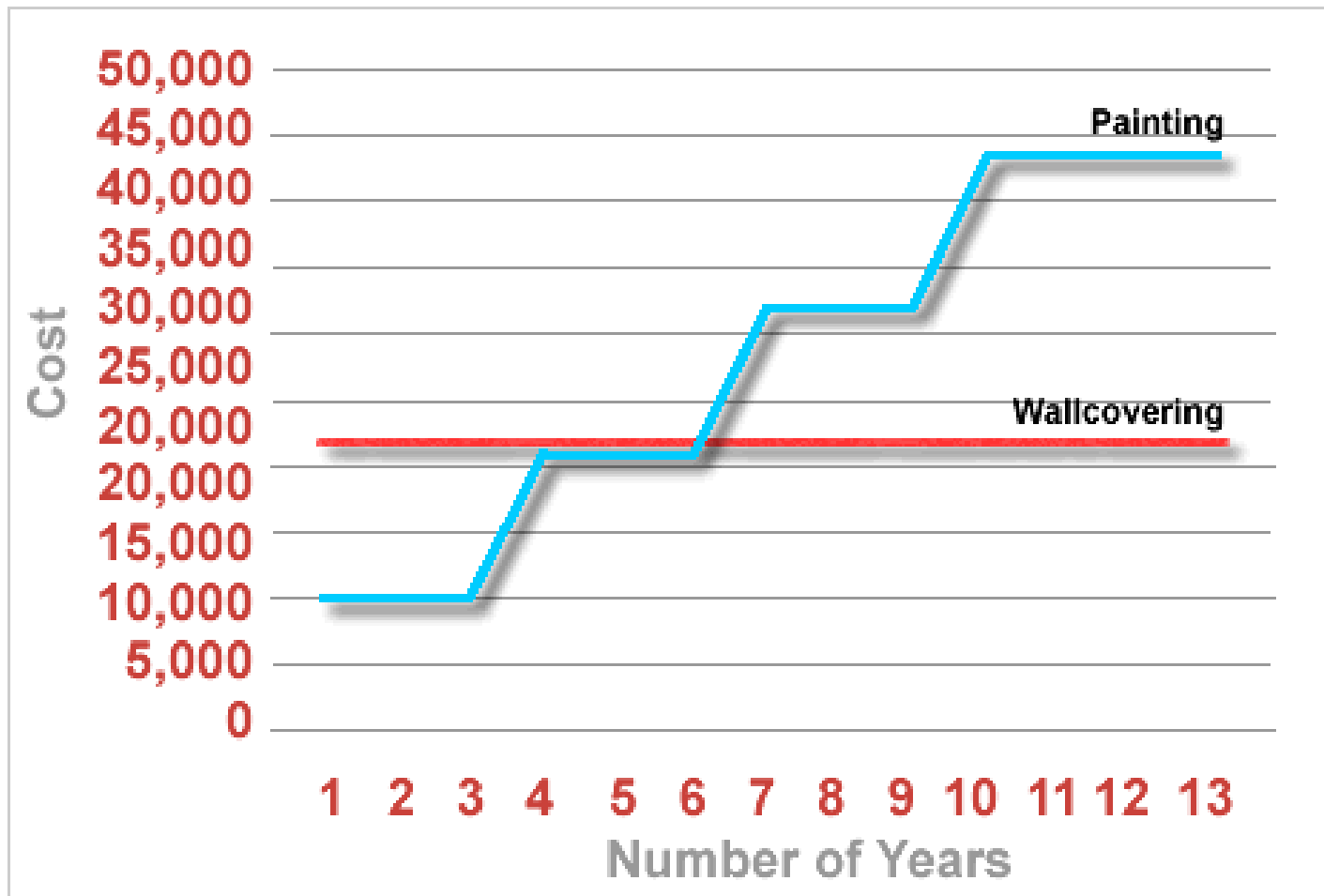
<b>VCT</b>	Frequency/ School Year	Minutes/ 1000 Sq. Ft.	School Year Total Minutes Per 1000 Sq. Ft.	Cost Per School Year \$/Sq. Ft.
Dust Mopping	180 (daily)	8	1440	\$0.2347
Spot Mopping	180 (2x wk +)*	8	1440	\$0.2347
Wet Mopping	108 (3x wk)	45**	4860	\$0.7922
Spray Buffing***	36 (1x wk) <sup>Note 1</sup>	48	1728	\$0.2817
Scrub/Recoat	5 (Sp/Nv/Fb/Ap) <sup>Note 2</sup>	120****	600	\$0.0978
Strip/Finish	1 (Jul.) <sup>Note 3</sup>	300	300	\$0.0489
Chemical Costs <sup>Note 4</sup>				\$0.0340
<b>TOTAL</b>			<b>10,368</b>	<b>\$1.724</b>

# Wallcovering Life Cycle Costs

Commercial Wallcovering vs Paint

Installed material cost - \$1.10 vs \$.57

Average life – 12 vs 3 years



# Wallcovering Life Cycle Costs

## Maintenance Wallcovering vs Paint

### "Wallcovering vs. Painting" Results

**Midwest  
Example**

#### Projected Life-Cycle Savings

Wall Surface Square Footage in Boxes

	Wall Surfaces (Sq. Ft.)	Regional Costs (\$/SF)
Type I	10,000	\$1.10
Type II	10,000	\$1.39
Paint	20,000	\$0.57

Day #1	Years From Start Date												
	1	2	3	4	5	6	7	8	9	10	11	12	
<u>Painting</u>	\$11,400	\$0	\$0	\$11,913	\$0	\$0	\$12,449	\$0	\$0	\$13,009	\$0	\$0	\$0
	\$11,400	\$11,400	\$11,400	\$23,313	\$23,313	\$23,313	\$35,762	\$35,762	\$35,762	\$48,771	\$48,771	\$48,771	\$48,771
<u>WC</u>	\$24,900	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900	\$24,900
<u>Savings</u>	\$13,500	\$13,500	\$13,500	-\$1,587	-\$1,587	-\$1,587	\$10,862	\$10,862	\$10,862	\$23,871	\$23,871	\$23,871	\$23,871
% Savings	-54.2%	-54.2%	-54.2%	-6.4%	-6.4%	-6.4%	43.6%	43.6%	43.6%	95.9%	95.9%	95.9%	95.9%

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# Can I Do This Myself ?

- Yes - especially for systems you are familiar with.
- It takes time to gather information.
- Not all info is accurate but getting better and easier to access.
- Roofing, windows, etc. are tricky because they involve both energy consumption and maintenance.
- For larger investments it is probably worth getting some assistance.

# Life Cycle Cost Work Sheet v.09.20.2010

<b>PROJECT NAME</b>	Room 100 Remodel (test)			
Item	FLOORING OPTIONS			
Date	09.15.2010			
<b>INPUT</b>				
Projected Annual Inflation Rate	3.0%			
Life Span Period For Evaluation (years)	75			
System Option	Vinyl tile	Carpet	Ceramic Tile	Terrazzo
Initial Installation Cost	\$ 30,000	\$ 60,000	\$ 100,000	\$ 150,000
Likely Life of Product in years	22	11	30	60
Annual Energy Consumption (if applicable)	\$ -	\$ -	\$ -	\$ -
Annual Maintenance Costs (today's dollars)	\$ 10,000	\$ 6,000	\$ 6,000	\$ 2,500
<b>OUTPUT</b>				
Time Period For Evaluation (yrs)	75	75	75	75
1st re-install cost (inflation adjusted)	\$ 57,483	\$ 83,054	\$ 242,726	\$ 883,740
2nd Re-install cost	\$ 110,144	\$ 114,966	\$ 589,160	\$ -
3rd re-install cost	\$ 211,046	\$ 159,140	\$ -	\$ -
4th re-install cost	\$ -	\$ 220,287	\$ -	\$ -
5th re-install cost	\$ -	\$ 304,929	\$ -	\$ -
6th re-install cost	\$ -	\$ 422,093	\$ -	\$ -
7th re-install costs	\$ -	\$ -	\$ -	\$ -
8th re-install costs	\$ -	\$ -	\$ -	\$ -
9th re-install costs	\$ -	\$ -	\$ -	\$ -
Re-Installs over Evaluation Period (9 max)	3.40	6.81	2.49	1.24
Prorated and Inflated Costs of Re-Installation(s)	\$ 378,673	\$ 1,304,469	\$ 831,887	\$ 883,740
Life Span Energy Consumption (Inflated)	\$ -	\$ -	\$ -	\$ -
Life Span Maintenance Costs (Inflated)	\$ 2,726,309	\$ 1,635,785	\$ 1,635,785	\$ 681,577
<b>Total Cost Over the Life Span</b>	<b>\$ 2,756,312</b>	<b>\$ 3,000,254</b>	<b>\$ 2,567,672</b>	<b>\$ 1,715,318</b>

Green Areas Are Values You Fill In. Others Are Locked (no password)

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Fractional Re-installs are not included - but should be budgeted

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# Life Cycle Cost Work Sheet v.09.20.2010

<b>PROJECT NAME</b>	HVAC unit 2 replacment			
Item	HVAC Equipment			
Date	09.15.2010			
<b>INPUT</b>				
Projected Annual Inflation Rate	3.0%			
Life Span Period For Evaluation (years)	20			
System Option	SEER 13 roof top	SEER 16 split sys	Geo-thermal	Match Existing
Initial Installation Cost	\$ 33,000	\$ 35,000	\$ 62,280	\$ 30,000
Likely Life of Product in years	13	13	20	13
Annual Energy Consumption (if applicable)	\$ 4,100	\$ 3,500	\$ 2,900	\$ 4,700
Annual Maintenance Costs (today's dollars)	\$ 3,000	\$ 3,000	\$ 5,000	\$ 3,000
<b>OUTPUT</b>				
Time Period For Evaluation (yrs)	20	20	20	20
1st re-install cost (inflation adjusted)	\$ 48,462	\$ 51,399	\$ -	\$ 44,056
2nd Re-install cost	\$ -	\$ -	\$ -	\$ -
3rd re-install cost	\$ -	\$ -	\$ -	\$ -
4th re-install cost	\$ -	\$ -	\$ -	\$ -
5th re-install cost	\$ -	\$ -	\$ -	\$ -
6th re-install cost	\$ -	\$ -	\$ -	\$ -
7th re-install costs	\$ -	\$ -	\$ -	\$ -
8th re-install costs	\$ -	\$ -	\$ -	\$ -
9th re-install costs	\$ -	\$ -	\$ -	\$ -
Re-Installs over Evaluation Period (9 max)	1.53	1.53	0.99	1.53
Prorated and Inflated Costs of Re-Installation(s)	\$ 48,462	\$ 51,399	\$ -	\$ 44,056
Life Span Energy Consumption (Inflated)	\$ 110,169	\$ 94,046	\$ 77,924	\$ 126,291
Life Span Maintenance Costs (Inflated)	\$ 80,611	\$ 80,611	\$ 134,352	\$ 80,611
<b>Total Cost Over the Life Span</b>	<b>\$ 272,241</b>	<b>\$ 261,056</b>	<b>\$ 274,556</b>	<b>\$ 280,958</b>

Green Areas Are Values You Fill In. Others Are Locked (no password)

Fractional Re-installs are not included - but should be budgeted

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Download This PowerPoint and the Excel Work Sheet at. . .

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Go to “Resources” tab at top of page  
Go to “Illinois Library Association 2010”  
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## Structured around listening.

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