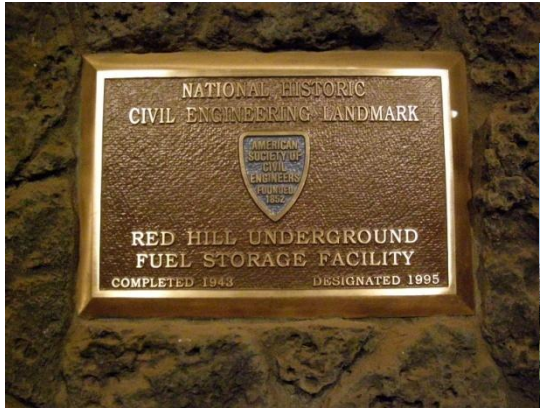


Maintenance Cost Forecasting



Frank Kaleba, PE, Certified Building Code Official
Senior Engineer,
R&K Engineering, Roanoke/Alexandria VA

Learning Objectives

Describe the challenge of forecasting

Explain a method of sustainment modeling as a solution

Identify applications to a portfolio

Why Do This?

By simply expending the necessary resources to conduct maintenance activities intended to be used by the equipment designer, equipment life is extended and its reliability is increased. In addition to an increase in reliability, more money is saved than when using a program of reactive maintenance. Studies indicate that this savings can amount to as much as 12% to 18% on average. Depending on the facility's current maintenance practices, present equipment reliability, and facility downtime, there is little doubt that many facilities purely reliant on reactive maintenance could save much more than 18% by instituting a proper preventive maintenance program.

DOE, Energy Efficiency and Renewal Energy

Preventive maintenance adds 5 to 10 years of life to an existing pavement.

SAVINGS FROM PREVENTIVE MAINTENANCE, Larry Galehouse and Al Friend, Michigan Department of Transportation, 1996

Facilities in which proper HVAC maintenance is completed will use at least 15 to 20 percent less energy than those where systems are allowed to deteriorate.

HVAC Maintenance and Energy Savings, James Piper, P.E. *Facilities Net.Com*, March 2009

Sustainment, Restoration, Modernization (SRM)



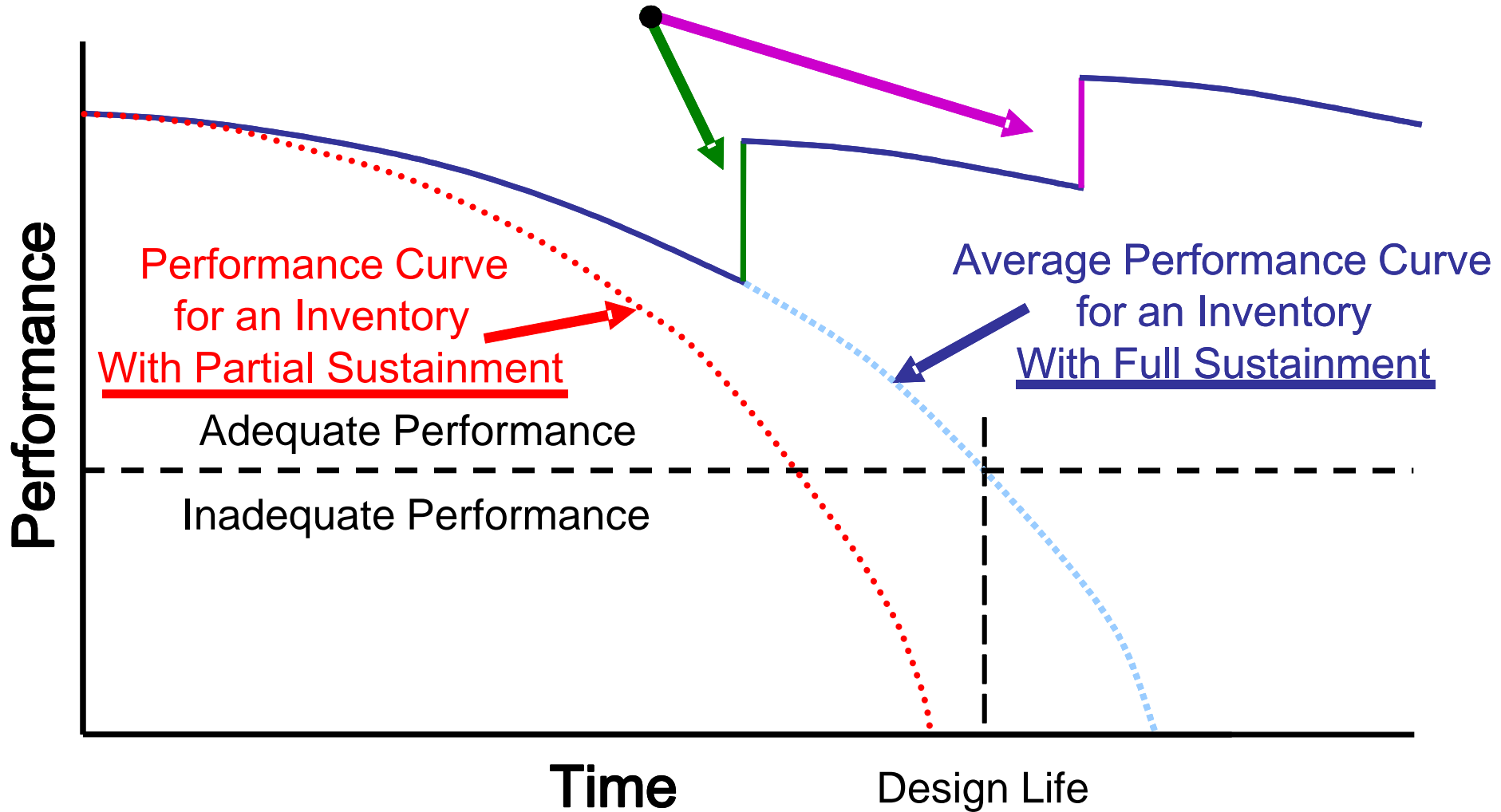
Sustainment:

It's more than just maintenance

Sustainment includes those actions necessary to keep a good facility in good condition, extracting full use over the design life of the facility.

This includes regularly scheduled inspections, preventive maintenance, emergency response, and major repairs or replacements that are expected to occur periodically over the design life – for example, blasting/recoating surfaces, replacing motors, pumps, reroofing, painting, replacing floor coverings

Impact of Sustainment on Recapitalization Frequency



Restoration

Restoration includes repair and replacement work to restore facilities damaged by inadequate sustainment, excessive age, disaster, accident, or other causes.



Modernization

Modernization includes alteration of facilities solely to implement new or higher standards (including regulatory changes), to accommodate new functions, or to renew building components that typically last more than 50 years (such as foundations and structural members).

Problem

How do you get reliable, estimates of longer term maintenance needs for a large number of similar facilities that are:

- **Consistent,**
- **Auditable, and**
- **Objective**

Why Try?

To provide creditable estimates of resource needs to key decision makers in the organization

Resource Requirements



Determining the Present Condition



CMMS or Backlog



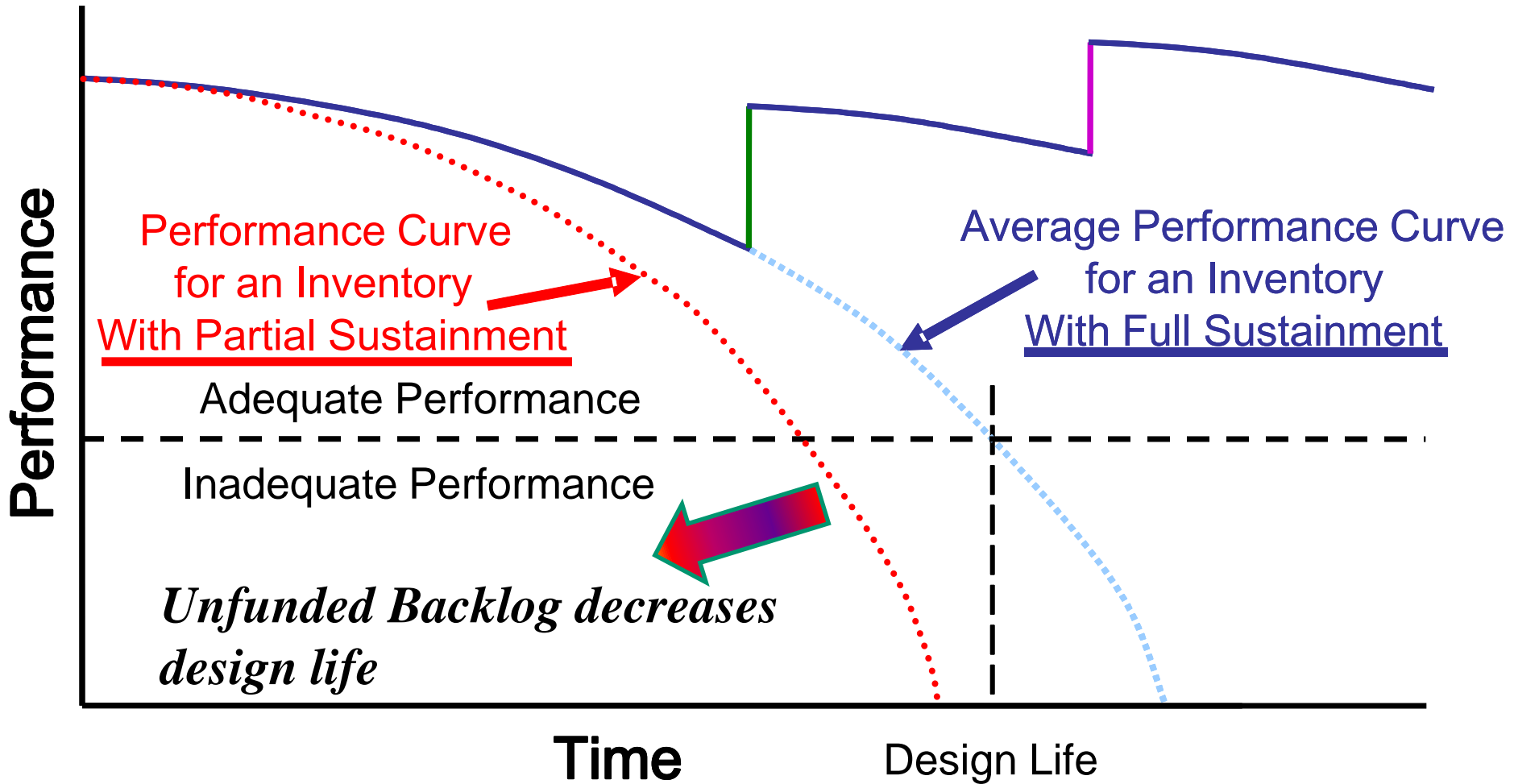
Facility Assessment



CMMS or Backlog

- **As accurate as you make it**
- **Should include PM**
- **Lots of CMMS software on the COTS market – for example:**
 - 360Facilty
 - Maximo
 - Archibus
 - SchoolDude
 - MicroMain
 - Maintenance Connection
 - COGZ
 - MaintSmart

Backlog Effect



Sustainment Forecast

- **Is not the cost of restoring deterioration**
 - **Deterioration can be caused by.....**
 - **Natural disaster**
 - **Lack of maintenance and repair (sustainment)**
 - **Occupant damage (e.g. graffiti)**
- **Preventive**
- **Expected replacements, repairs**
- **Sources:**
 - **Modeling**
 - **Benchmarking**
 - **Delphi Method (guessing)**

Assessments

- **Bottom Line Up Front (BLUF) – as they say in real estate, don't invest in a depreciable asset**
- **Many types – in house and contract**
- **Assessments are worthwhile – but many turn into expensive door stops**
- **Lag between report and funding results in lowered worth of initial assessment effort**
- **NASA Method allows identification and prioritization at minimal cost**

The SRM Solution – DOD and other federal agencies

- Develop cost factors which are interchangeable between proponents & locations
- Agreement on definitions
- Engineering Analysis to produce SRM cost factor
- Regular updates

Justifying and Prioritizing Funding through the SRM Model

It's still all politics and money, but the Services cooperated in the design, development and implementation of the SRM model, so they now have a

Logical, methodical approach to planning, programming, budgeting and execution for facilities sustainment which is acceptable to Congress

Sustainment Formula

FAC 8999

$$\text{Sustainment} = \sum_{\text{FAC 1111}} \text{SCF} * \text{Record Asset Quantity} * \text{ACF}$$

- **Where:**
- **SCF is an individual cost factor for the FAC, expressed in \$ per unit (SF, GA, MB, KVA, MGD, LF, SY, etc.) normalized to Washington DC**
- **ACF is an area cost factor to adjust to the specific location**

Sustainment Cost Factor

- **Commercial (non-DOD) sources**
 - **Facility models using R.S. Means CostWorks adjusted for average size of asset, typical materials, expected service life**
 - **Published data or studies**
 - **Unpublished data (e.g. state DOT's, city agencies, vendor quotes)**

Methodology

- **Step 1 – Identify the components of the building**
- **Step 2 – Identify all routine M&R activities required for expected service life of the facility.**
- **Step 2 – Determine the cost and frequency for each activity (e.g., \$300/SF roof – every 20 years).**
- **Step 3 – Sum all the costs throughout the expected service life (reduced at end of life).**
- ***Optional steps to get an annualized requirement:***
- **Step 4 – Divide the sum by the expected service life. (Cost per year)**
- **Step 5 – Divide the result by the size of the facility. (Cost per SF per year)**

Modeling Example

FAC 7213 Student Barracks				This spreadsheet was exported from R.S. Means CostWorks		Terminal Cutoff is the removal of a single task occurrence if that task occurs within 10% of the end of the design life and if the frequency of the task exceeds 20% of the design life. This prevents scheduling major work near the end of the design life					
CostWorks 2009 Quarter 3											
Design Life		55									
Average Size		21,947									

Description	Frequency	Crew	Qty	Unit	Total In-House	Total Incl. O&P	Zip Code Prefix	Type	Release	Occurrences in Design Life	Adjusted Occurrences	Terminal Cutoff
Repair brick wall - 1st floor	25	1 Bric	309.700	S.F.	12,264.12	14,908.96	200	FMR	2009 Qtr 3	2	1	\$ 14,908.96
Replace brick wall - 2nd floor	75	2 Bric	30.900	C.S.F.	67,043.11	81,092.42	200	FMR	2009 Qtr 3	0	0	\$ -
Replace brick wall - 3rd floor	75	2 Bric	30.900	C.S.F.	67,043.11	81,092.42	200	FMR	2009 Qtr 3	0	0	\$ -
Replace glass - 1st flr. (1% of glass)	1	1 Carp	9.500	S.F.	97.66	114.48	200	FMR	2009 Qtr 3	55	55	\$ 6,296.13
Repair 3' x 4' aluminum window - 1st floor	20	1 Carp	79.000	Ea.	21,726.58	25,388.23	200	FMR	2009 Qtr 3	2	2	\$ 50,776.46
Replace 3' x 4' aluminum window - 1st floor	50	1 Carp	79.000	Ea.	62,985.91	72,982.57	200	FMR	2009 Qtr 3	1	0	\$ -
Replace glass - 2nd flr. (1% of glass)	1	1 Carp	10.100	S.F.	146.65	174.43	200	FMR	2009 Qtr 3	55	55	\$ 9,593.49
Repair 3' x 4' aluminum window - 2nd floor	20	1 Carp	84.000	Ea.	26,618.76	31,336.20	200	FMR	2009 Qtr 3	2	2	\$ 62,672.40
Replace 3' x 4' aluminum window - 2nd floor	50	1 Carp	168.000	Ea.	140,978.88	163,884.00	200	FMR	2009 Qtr 3	1	0	\$ -
Replace glass - 3rd floor (1% of glass)	1	1 Carp	10.100	S.F.	222.60	267.55	200	FMR	2009 Qtr 3	55	55	\$ 14,715.20
Repair 3' x 4' aluminum window - 3rd floor	20	1 Carp	84.000	Ea.	30,211.44	35,752.08	200	FMR	2009 Qtr 3	2	2	\$ 71,504.16
Replace 3' x 4' aluminum window - 3rd floor	50	1 Carp	168.000	Ea.	148,164.24	172,715.76	200	FMR	2009 Qtr 3	1	0	\$ -
Repair aluminum storefront door	12	1 Carp	2.000	Ea.	896.20	1,062.14	200	FMR	2009 Qtr 3	4	4	\$ 4,248.56
Replace 3'-0" x 7'-0" aluminum storefront doors	50	1 Carp	2.000	Ea.	3,497.66	4,099.68	200	FMR	2009 Qtr 3	1	0	\$ -
Repair steel, painted, door	14	1 Carp	7.000	Ea.	4,395.16	5,183.92	200	FMR	2009 Qtr 3	3	3	\$ 15,551.76
Refinish 3'-0" x 7'-0" steel, painted, door	4	1 Pord	7.000	Ea.	247.17	303.87	200	FMR	2009 Qtr 3	13	13	\$ 3,950.31
Replace 3'-0" x 7'-0" steel, painted, door	45	1 Carp	7.000	Ea.	3,876.04	4,482.03	200	FMR	2009 Qtr 3	1	1	\$ 4,482.03
Debris removal by hand & visual inspection,modified bitu	1	2 Rofc	7.300	M.S.F.	229.59	277.69	200	FMR	2009 Qtr 3	55	55	\$ 15,273.06
Non-destructive moisture inspection,modified bitu	5	2 Rofc	7.300	M.S.F.	713.06	858.48	200	FMR	2009 Qtr 3	11	11	\$ 9,443.28
Minor membrane repairs-(2% of roof area),modified	1	G5	1.500	Sq.	417.45	491.93	200	FMR	2009 Qtr 3	55	55	\$ 27,055.88
Flashing repairs-(2 S.F. per sq. repaired),modified	5	2 Rofc	2.900	S.F.	10.03	11.89	200	FMR	2009 Qtr 3	11	11	\$ 130.79
Membrane replacement-(25% of roof area),modified	20	G5	18.300	Sq.	12,166.21	14,463.04	200	FMR	2009 Qtr 3	2	2	\$ 28,926.08

Replace manual pull station	15	1 Elec	5.000	Ea.	645.20	785.10	200	FMR	2009 Qtr 3	3	3	\$ 2,355.30
Repair smoke detector	10	1 Elec	53.000	Ea.	2,068.06	2,568.91	200	FMR	2009 Qtr 3	5	5	\$ 12,844.55
Check operation smoke detector	1	1 Elec	53.000	Ea.	632.29	791.29	200	FMR	2009 Qtr 3	55	55	\$ 43,520.95
Replace smoke detector	15	1 Elec	53.000	Ea.	10,271.93	12,317.73	200	FMR	2009 Qtr 3	3	3	\$ 36,953.19

					\$1,821,672.21	\$2,162,265.08						
											MR Subtotal	\$ 4,053,859.76
											MR Per Year	\$73,706.54
											PM Per Year	\$25,959.63
											Subtotal	\$99,666.17
											Total Per Unit	\$4.54

Modeling Example – Preventive Maintenance

CostWorks 2008 Quarter 2 - FAC 6100 Office						
Qty	Description	Labor Hours	Total Incl. O&P	Zip Code Prefix	Type	Release
3.000	Door, emergency egress, swinging, annualized	0.78	172.53	200	FMR	2008 Qtr 2
22.000	Fire doors, swinging, annualized	8.62	656.92	200	FMR	2008 Qtr 2
2.000	Drink fountain, annualized	1.24	118.72	200	FMR	2008 Qtr 2
5.000	Lavatories, annualized	1.74	150.40	200	FMR	2008 Qtr 2
4.000	Toilet (vacuum breaker type), annualized	0.91	64.60	200	FMR	2008 Qtr 2
3.000	Urinals, annualized	0.68	48.45	200	FMR	2008 Qtr 2
1.000	Centrifugal, over 1 HP, annualized	1.20	103.19	200	FMR	2008 Qtr 2
2.000	Fan, centrifugal, up to 5,000 CFM, annualized	2.16	151.90	200	FMR	2008 Qtr 2
1.000	Fan, centrifugal, 5,000 to 10,000 CFM, annualize	1.14	79.37	200	FMR	2008 Qtr 2
4.000	Fan coil unit, annualized	13.35	1,066.40	200	FMR	2008 Qtr 2
10.000	VAV Boxes, annualized	9.34	760.00	200	FMR	2008 Qtr 2
2.000	Package unit, air cooled, 3 thru 24 ton, annualize	4.80	502.06	200	FMR	2008 Qtr 2
1.000	Fire alarm annunciator system, annualized	11.05	990.03	200	FMR	2008 Qtr 2
2.000	Panelboard, 225 A and above, annualized	0.88	135.42	200	FMR	2008 Qtr 2
1.000	Motor control center, over 400 A, annualized	0.39	64.15	200	FMR	2008 Qtr 2
4.000	Light, emergency, dry cell, annualized	1.48	320.72	200	FMR	2008 Qtr 2
1.000	Central clock systems, annualized	1.32	96.23	200	FMR	2008 Qtr 2
			\$5,481.09			

Benefits/Results

Offices responsible for approving funds see this method as:

- objective,**
- consistent,**
- auditable,**
- uniform methodology**

Result is that appropriations for facility sustainment are more readily approved

Applications of Modeling

Organizations with large number of facilities:

- **School systems, colleges and universities**
- **State and local governments**
- **Banking and telecommunications**
- **Real Property Portfolio Management**

For organizations with a small number of facilities, customized benchmarking models are worth investment

Community College Example



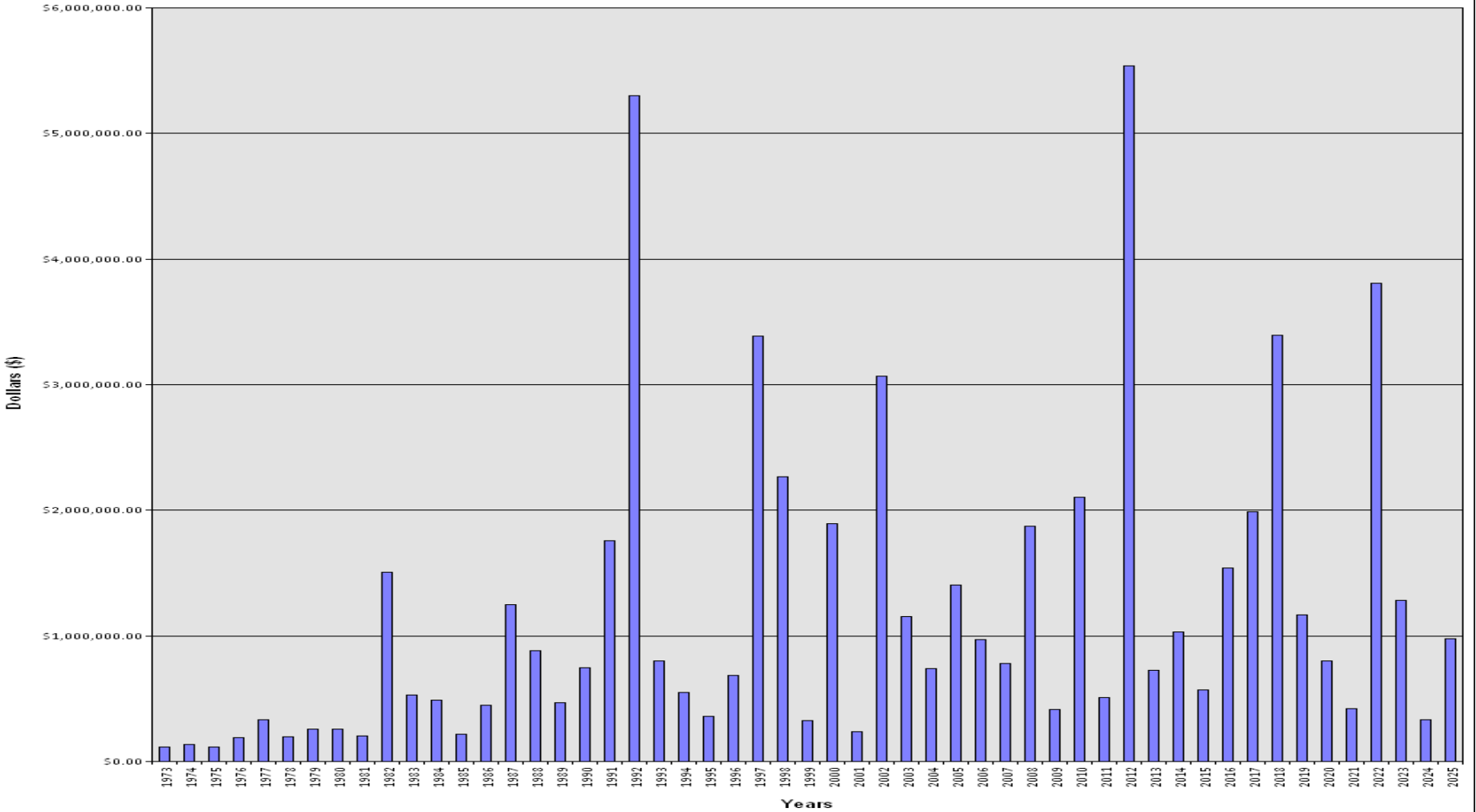
Routine M&R Requirement

- **Campus Example**
 - **Built a model of each building**
 - **Size and Components based on**
 - **Site Survey**
 - **Available Campus CC Data**
 - **CAD Drawings**
 - **Reasonable Assumptions for quantities of common components (electrical outlets, lighting)**
 - **50 year expected service life assumed**

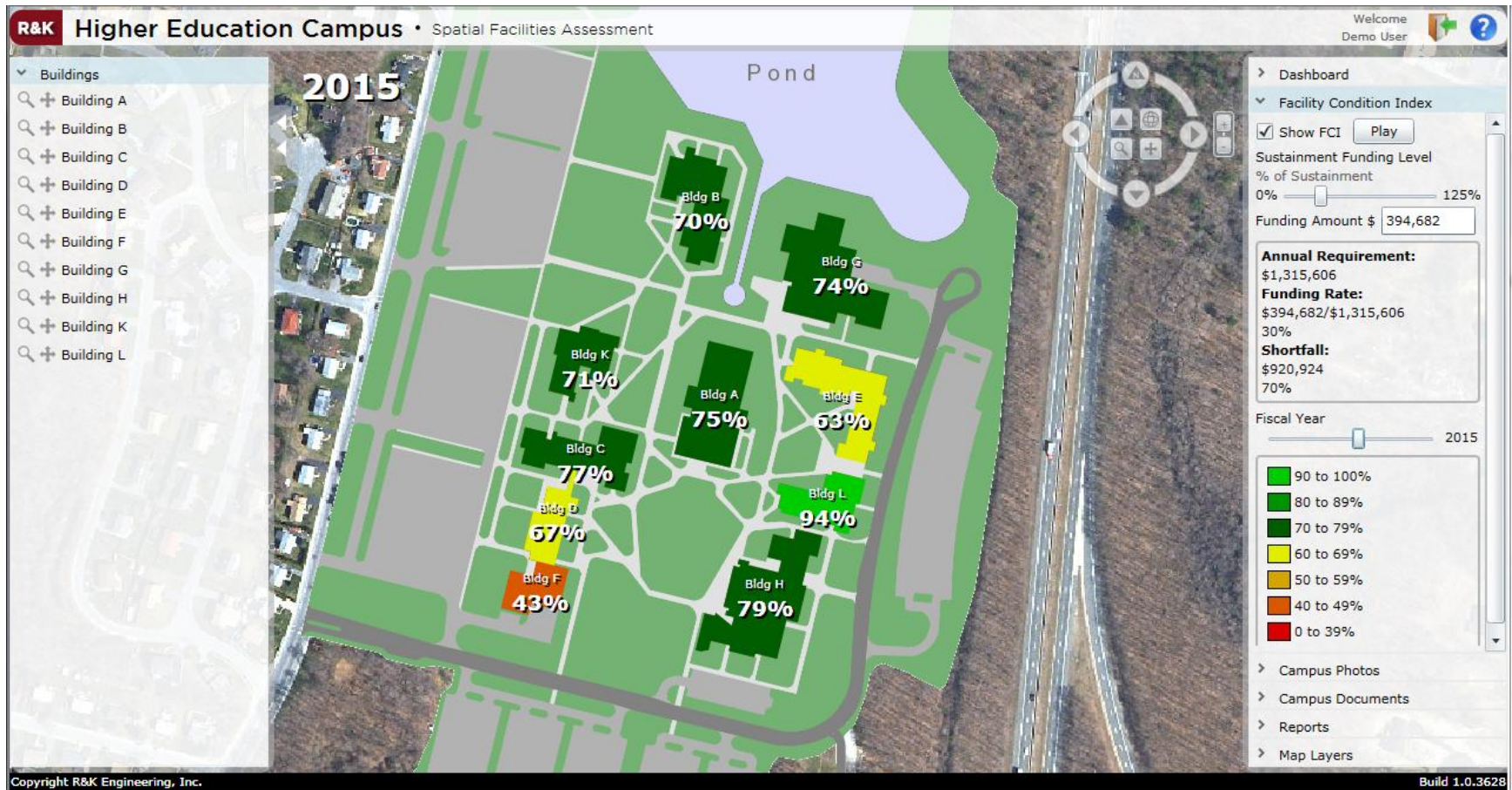
CostWorks – Composite Chart

All Buildings Annual Sustainment

Sustainment by Year - Terminal Cutoff Applied



Community College Graphical Display of Conditions



Campus Prioritization

Categories	Category Weight		Criteria Scoring		
		Essential to Operations/ QOL	Major Impact on Operations/ QOL	Minor Impact on Operations/ QOL	No Impact
Campus Operations/Quality of Life (QOL)	1.5	10	7	3	0
		Failure of Facility	Major Damage to Facility	Minor Damage to Facility	No Impact
Envelope/Structure	2.0	10	7	3	0
		Not in Compliance/ No Access	Limited Compliance/ Limited Access	Not in Total Compliance but Significant Access	No Impact
Americans with Disabilities Act (ADA)	1.5	10	7	3	0
		Death/ Permanent Disability	Loss of Limbs	Severe Injury/Serious Illness	No Impact
Building Code, Health, Life, Safety	1.5	10	7	3	1

SCF Reference

The screenshot shows a Windows Internet Explorer browser window displaying the website <http://www.wbdg.org>. The page title is "Construction Criteria Base - Unified Facilities Criteria (UFC) | Whole Building Design Guide". The browser's address bar shows the URL http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4. The search bar contains the text "uniform facilities criteria".

The website header features the WBDG logo with the tagline "The Gateway to Up-To-Date Information on Integrated 'Whole Building' Design Techniques and Technologies". Navigation links include Home, About, Contact, Site Map, and a search box. A secondary search box labeled "Advanced Search" is also present.

The main navigation menu includes Design Guidance, Project Management, Operations & Maintenance, Documents & References (highlighted), Tools, Continuing Education, and BIM.

The left sidebar, titled "DOCUMENTS & REFERENCES", lists various libraries and criteria:

- Federal Mandates
- Construction Criteria Base
- Specifications Library
- Regulations Library
- Standards Library
- Documents Library
 - DOD Criteria
 - NAVFAC Criteria
 - ARMY/COE Criteria
 - NASA Criteria
 - Air Force Criteria
 - VA Criteria
 - GSA Criteria
 - DOE Criteria

The main content area displays the "Construction Criteria Base (CCB)" and "Unified Facilities Criteria (UFC)" sections. The CCB is described as a service of the Whole Building Design Guide. The UFC section explains that these documents provide planning, design, construction, sustainment, restoration, and modernization criteria, applicable to Military Departments, Defense Agencies, and DoD Field Activities. It references a [USD \(AT&L\) Memorandum](#) dated 29 May 2002 and lists responsible agencies: the [United States Army Corps of Engineers \(HQUSACE\)](#), [Naval Facilities Engineering Command \(NAVFAC\)](#), and [Air Force Civil Engineer Support Agency \(AFCESA\)](#). It also mentions the [MIL-STD-3007](#) manual. A link to a [Matrix of UFCs and their superseded Agency-Specific Documents](#) is provided. A note at the bottom states: "For additional information regarding NAVFAC documents that have been superseded, see".

The right sidebar contains options to "COMMENT ON THIS PAGE" and "EMAIL THIS PAGE", a "SEARCH CCB" section with a "Quick Search" input and "GO" button, and checkboxes for "Search only in Unified Facilities Criteria (UFC)" and "Search titles only". An "Advanced Search" link is also present. At the bottom of the sidebar is an "CCB RSS" feed link with the text "Keep up with CCB additions or updates."

The Windows taskbar at the bottom shows the Start button, several open applications including "G:\NFMT Presentation", "Portfolio O&M Cost Pr...", "Data_Used_in_FXM.p...", and "Construction Criteria ...", and the system clock showing 3:21 PM on 3/21/2008.

UFC 3-701-series

Construction Criteria Base - Unified Facilities Criteria (UFC) | Whole Building Design Guide - Windows Internet Explorer

http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

Google search: uniform facilities criteria

UFC 3-600-01 Telecommunications Building Cabling Systems Planning and Design (06-22-2007) [PDF 1750 KB, 45 pgs](#)

UFC 3-580-10 Navy and Marine Corps Intranet (NMCI) Standard Construction Practices, with Changes 1-3 (07-14-2004) [PDF 989 KB, 83 pgs](#)

SERIES 3-600: FIRE PROTECTION

UFC 3-600-01 Fire Protection Engineering for Facilities (09-28-2008) [PDF 783 KB, 129 pgs](#)

UFC 3-600-02 O&M: Inspection, Testing, and Maintenance of Fire Protection Systems (01-01-2001) [PDF 308 KB, 39 pgs](#)

SERIES 3-700: COST ENGINEERING

UFC 3-700-01A Programming Cost Estimates for Military Construction (03-01-2005) [PDF 3220 KB, 82 pgs](#)

UFC 3-700-02A Construction Cost Estimates (03-01-2005) [PDF 1228 KB, 124 pgs](#)

UFC 3-701-07 DoD Facilities Pricing Guide, FY2007 (07-02-2007) [PDF 430 KB, 51 pgs](#)

UFC 3-710-01A Code 3 Design with Parametric Estimating (03-01-2005) [PDF 375 KB, 43 pgs](#)

SERIES 4: MULTI-DISCIPLINARY AND FACILITY-SPECIFIC DESIGN

UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings, includes Change 1 (10-08-2003) [PDF 298 KB, 71 pgs](#)

UFC 4-010-02 DoD Minimum Standoff Distances for Buildings (FOUO), includes Change 1 (10-08-2003) [PDF 67 KB, 6 pgs](#)

UFC 4-020-01 DoD Security Engineering Facilities Planning Manual (09-11-2008) [PDF 2874 KB, 321 pgs](#)

UFC 4-020-02FA Security Engineering: Concept Design (FOUO) (03-01-2005) [PDF 64 KB, 4 pgs](#)

Taskbar: start | G:\NFMT Presentation | G:\NFMT Presentation | Portfolio O&M Cost Pr... | Data_Used_in_FXM.p... | Construction Criteria ... | 3:22 PM

Navigation bar of Internet Explorer showing address bar, search, and various toolbars.

UFC 3-701-07
2 July 2007

Table 3: FAC Cost Factors

Table 3: FAC Cost Factors for DoD Cost Models
(not to be used for military construction projects)

FAC	FAC Title	UM	Unit cost factors (\$/Y07)											Expected Service Life (years)	Modernization Factor (no units)
			Replacement	Sustainment	Energy	Water/Waste-water	Real Property Mgmt	Lease	Custodial Svcs	Refuse Collection	Grounds Maint	Plant Clearance	Pest Control		
1111	Fixed-Wing Runway, Surfaced	SY	\$120.19	\$1.38	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.27	\$0.13	\$0.06	45	0.0133
1112	Rotary-Wing Landing Area, Surfaced	SY	\$120.19	\$1.07	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.11	\$0.13	\$0.03	45	0.0133
1113	Runway Overrun Area, Surfaced	SY	\$120.19	\$0.87	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.27	\$0.13	\$0.06	45	0.0133
1114	Runway, Unsurfaced	SY	\$7.45	\$0.22	\$0.00	\$0.00	\$0.02	\$1.41	\$0.00	\$0.00	\$0.27	\$0.13	\$0.06	45	0.0133
1121	Taxiway, Surfaced	SY	\$104.66	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.13	\$0.01	60	0.0099
1122	Rotary-Wing Taxiway, Surfaced	SY	\$104.66	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.13	\$0.01	60	0.0099
1131	Aircraft Apron, Surfaced	SY	\$122.50	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.00	\$0.13	\$0.00	60	0.0099
1161	Compass Calibration Pad, Surfaced	SY	\$114.87	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.05	\$0.01	60	0.0099
1162	Missile Launching Pad, Surfaced	SY	\$114.87	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.05	\$0.01	60	0.0099
1163	Aircraft Washing Pad, Surfaced	SY	\$114.87	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.05	\$0.01	60	0.0099
1164	Miscellaneous Airfield Pavement, Surfaced	SY	\$114.87	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.13	\$0.01	60	0.0099
1165	Aircraft Pavement Shoulder	SY	\$114.87	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.05	\$0.01	60	0.0099
1166	Miscellaneous Airfield Pavement, Unsurfaced	SY	\$7.45	\$0.22	\$0.00	\$0.00	\$0.02	\$1.41	\$0.00	\$0.00	\$0.07	\$0.0005	\$0.01	45	0.0133
1167	Aircraft Rinse Facility	SY	\$162.82	\$1.05	\$0.00	\$0.00	\$0.22	\$19.81	\$0.00	\$0.00	\$0.07	\$0.05	\$0.01	30	0.0210
1211	Aircraft Fueling Facility	GM	\$312.06	\$10.40	\$13.15	\$0.00	\$0.68	\$61.41	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	30	0.0210
1212	Aircraft Defueling Facility	GM	\$312.06	\$10.40	\$13.15	\$0.00	\$0.68	\$61.41	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	30	0.0210
1221	Marine Fueling Facility	GM	\$28.85	\$0.87	\$1.03	\$0.00	\$0.05	\$4.78	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	37	0.0170
1231	Vehicle Fueling Facility	OL	\$12,699.34	\$468.34	\$0.00	\$0.00	\$27.82	\$2,498.99	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	25	0.0252
1241	Operating Fuel Storage	GA	\$4.22	\$0.28	\$0.00	\$0.00	\$0.01	\$0.84	\$0.00	\$0.00	\$0.0018	\$0.00	\$0.00	31	0.0199
1251	POL Pipeline	ME	\$609,444.86	\$20,185.63	\$0.00	\$0.00	\$1,278.94	\$114,866.73	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	31	0.0199
1261	Liquid Fuel Loading/Unloading Facility	OL	\$12,699.34	\$423.36	\$0.00	\$0.00	\$10.31	\$926.19	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	25	0.0252
1262	POL Pump Station	SF	\$629.21	\$20.85	\$0.00	\$0.00	\$1.31	\$117.32	\$0.00	\$0.00	\$0.01	\$0.00	\$0.00	50	0.0119
1311	Communications Building	SF	\$203.71	\$3.20	\$13.13	\$0.18	\$0.46	\$40.96	\$1.18	\$0.08	\$0.01	\$0.00	\$0.03	50	0.0120
1312	Small Satellite Communications Building	SF	\$550.93	\$9.34	\$1.50	\$0.09	\$1.13	\$101.67	\$1.18	\$0.08	\$0.01	\$0.00	\$0.03	50	0.0123
1321	Communications Facility	EA	\$48,647.69	\$700.15	\$0.00	\$0.00	\$94.42	\$8,659.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	50	0.0123
1331	Aircraft Navigation Building	SF	\$329.63	\$6.74	\$72.70	\$0.00	\$0.66	\$38.85	\$1.18	\$0.08	\$0.01	\$0.00	\$0.01	50	0.0120
1341	Aircraft Navigation Facility	EA	\$10,006.25	\$167.50	\$0.00	\$0.00	\$19.88	\$1,785.78	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	50	0.0123
1351	Communications Lines	ME	\$90,228.37	\$147.57	\$0.00	\$0.00	\$178.83	\$16,061.15	\$0.00	\$0.00	\$20.91	\$0.00	\$0.00	28	0.0221
1361	Airfield Pavement Lighting	LF	\$68.35	\$6.55	\$0.50	\$0.00	\$0.99	\$89.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	20	0.0301
1362	Airfield Lighting	EA	\$2,653.44	\$47.48	\$705.23	\$0.00	\$5.63	\$305.57	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	20	0.0301

14 x 8.5 in

Windows taskbar showing Start button, open applications (G:\NFMT Presentation, Portfolio O&M Cost Pr..., Data_Used_in_FXM,p...), and system tray (Internet, 100%, 3:24 PM).

Presenter

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Questions?



Backup Slides

FCI Difficulty

- **FCI – Facility Condition Index**
- **Defined by APPA as “...a comparative indicator of the relative condition of facilities. The F.C.I. is expressed as a ratio of the cost of remedying maintenance deficiencies to the current replacement value”.**
- **Only 2 things are troublesome – the numerator and the denominator**

Troublesome FCI

- **Denominator – no standard way of expressing plant replacement value. Possible choices include:**
 - **State defined valuation**
 - **Marshall and Swift**
 - **Design Cost Data**
 - **Square Foot Cost data (Means, BNI, ENR)**
 - **Inflated original cost to construct**
 - **Insurance value**

Troublesome FCI

- **Numerator:**
 - **Tends to be subjective, no matter who does it**
 - **Often includes non-deficiency items (e.g. new work)**
 - **Out of date shortly after completion**
 - **Typically very expensive if done by contract (price can be \$0.50 to \$5.00 per square foot if done by contract)**
 - **Contractor sometimes “low balls” inspection cost to sell expensive proprietary software**
 - **Leaves out unfunded sustainment costs**

FCI Work-Around

- **Denominator** – as long as campus/state is consistent in definition, trends will be valid, but can't compare to others
- **Numerator recommendation:**
 - Spend as little as possible on evaluation
 - Use one of the self-survey tools to get estimate and set priorities
 - Use technical inspectors once priorities set

Inspection & Design

- **Corrective projects – funded as sustainment, restoration or modernization – are still designed by professionals**
- **Sustainment can be thought of as “reserve” account – providing a “banked reserve” for maintenance and expected replacements**
- **Inspections still needed to:**
 - **Develop owner’s estimates before contracting**
 - **Identify specific M&R requirements & timing**

Influences on SRM Funding

Politics and Money

- Geographic interests**
- Inter-service preferences**
- Constituencies**
- Targeted industry and sector support**
- Availability of funds**
- Competition for funds**
- Budget requests from services and agencies**

