Opportunity Presentation
Integrated Building Systems Maintenance and Training Program

Buildings Working Group
Sustainability and Energy Task Force

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Opportunity

Lengthy history of conducting sick and failed building assessment and remediation in the public sector demonstrates that governments, as property owners and managers, often suffer programmatically from a lack of integration of building maintenance processes and functions. One example frequently encountered results when energy savings programs are not in sync with other building systems/functions. Programmed HVAC shutdowns often result in elevated temperature and moisture conditions that are mold supporting, which can lead to degraded buildings, absenteeism, evacuations, OSHA reports, and assessment/remediation requirements. Failed roofs, flashing, window and door framing and poorly maintained HVAC systems have result in similar circumstances. Lack of programmatic integration leads to failures which can include:

- Energy inefficiencies
- Water inefficiencies
- Elevated emissions
- Water and moisture damage
- Mechanical system degradation
- Structural degradation
- Substandard and/or unusable building space
- Elevated occupational safety risk
- Contaminant/irritant assessment and remediation requirements

An integrated building systems management and training plan would serve as a proactive means for ensuring timely maintenance, proper building function, and a proper balance of ownership objectives. The net result would be greater sustainability, long term maintenance and repair savings, improved space/use efficiency and reduced liability.

The United States Green Building Council has developed the Leadership in Energy and Environmental Design (LEED) program for sustainable building design, construction and maintenance. As part of the program, Green Building Rating System For Existing Buildings Upgrades, Operations and Maintenance (LEED for Existing Buildings, USGBC, July 2006) "provides a roadmap….to drive down operational costs, while increasing occupant productivity in an environmentally responsible manner."

Whether or not the Sustainability Task Force suggests that the City adopt LEED as an overarching programmatic objective, the LEED for Existing Buildings provides a template for achieving an integrated building systems maintenance approach (including

training). Capital and service expenditures for implementation could be minimized by coupling the initial development (system inventory and evaluation) activity with currently scheduled energy audits and building inventories. Implementation would take advantage of existing physical and labor infrastructure (City, PBA, etc) and incremental implementation would distribute costs for upgrades when repairs and replacements are required.

Program Design

The Program is envisioned to be developed for City-owned existing structures and implemented through existing maintenance and service facilities within City government. In addition, once the program is developed for City-owned structures, and after a track record is developed, it could be instituted for non-City owned structures funded through public grants (i.e. housing and service organizations). Incentive programs could be instituted in the private sector to encourage a broader demographic participation.

The program design is envisioned to be composed of three phases of activity:

- Systems inventory and evaluation
- Program development
- Program Implementation

System Inventory and Evaluation - The systems inventory requires developing a data base of buildings and systems. The data base would include all public buildings. Systems would include roofs, drainage (civil and architectural), mechanical (HVAC, water distribution), structural and electrical. The inventory would include information on system types, age, operational features/processes, physical condition, current maintenance/inspection regiments and responsible parties.

Program Development – The program would be developed based on the inventory and systems evaluation and municipal priorities. The program would include:

- Recognition of interrelated building systems and operational features
- Routine, planned and documented systems inspections using standardized checklists and an integrated systems tracking approach
- A maintenance plan that is based on system types, equipment and component life expectancies, projected system failures, and priority
- Training for maintenance and management personnel
- Audit element that ensures the program is implemented and that corrective measures can be taken as necessary
- Staffing Plan outlining roles, responsibilities and authority

Additional non-building-system elements recommended by LEED for Existing Structures include but are not limited to:

- Hazardous materials identification / planning (asbestos, lead based paint, mercury, PCB containing materials)
- Hazardous cleaning products
- Lighting features
- Air monitoring

- Transportation facilities.

These elements could be incorporated based on City priorities, environmental sustainability objectives, and LEED certification (or documentation) desires.

Costs and Benefits

Cost and Financial Benefits of Green Buildings – A Report to California's Sustainable Building Task Force (Kats, Capital E, October 2003) summarizes cost and benefit data for LEED building programs at 33 State of California owned green buildings. A Life Cycle Costing approach is used to evaluate life cycle benefits. As pointed out in the Executive Summary, "Integrating 'sustainable'…practices into the construction of state buildings is a solid financial investment." Return on sustainable systems and practice investments for green building lifecycles are reported in the range of a factor of ten. Combining the values of lifecycle savings for energy, emissions, water, waste, O&M and productivity/health, net performance values are calculated at $49 and $68 per square foot of constructed space depending on LEED certification level.

No specific studies were identified that relate solely to existing structures (and a process of integrated building system maintenance), but the components of sustainability are the same as for new structures and cost/benefit factors are expected to translate likewise. Detailed cost/benefit analysis is not attempted herein; however, an analysis of historic and current operations and cost could be used as a basis for this development. Cost considerations are discussed in general below.

Costs - System Inventory/Evaluation and Database Development are probably the most significant front end cost items. Depending on the degree of outsourced assistance, conservative estimates might range upward of $20,000 primarily in labor. This activity should be conducted by professionals trained and versed in building sciences and environmental health. The degree to which this is available within government will determine the degree to which outsourced labor is required.

Some software and data management system costs might also be anticipated. Inventory objectives could also be met cost effectively by taking advantage of existing programs of inspections and maintenance.

Incrementally initiated systems upgrades that conform to sustainable building industry (or LEED) practice and result in overall programmatic efficiencies could be accomplished within the framework of routinely budgeted repairs and replacements, so that upgrade costs are distributed prorata over a predetermined time period.

Additional incremental labor for implementation is expected to include tracking, managing and reporting. It is envisioned that existing management and maintenance labor force would absorb inspection and reporting into existing job functions. Training would require devotion of qualified internal resources, and depending on the actual

available expertise and anticipated burden, some level of outsourced training program development may be necessary.

Benefits would include savings related to

- Fewer catastrophic and unplanned building failures
- Detailed building system database for planning and budgeting
- Reduced risk of process/function contradiction
- Reduced environmental and occupational safety risk
- Improved building life cycle
- Reduced emissions
- Improved energy management

Costs and benefits may be more thoroughly quantified through the use of a City specific cost/benefit analysis or extrapolated from published data.

Implementation

The program would be implemented at the municipal general services level as described earlier and staffed and conducted as determined by the Integrated Building Systems Maintenance Plan and Staffing Plan. Once the program is in place, the Plan would be used to drive building needs, operations and maintenance and budgeting decisions. Again, incremental implementation within existing program infrastructures appears the most feasible and cost efficient manner of program institution. An evaluation of City priorities, objectives and limitations should be the driver of implementation schedule and program element selection.

Case Studies

Numerous cities nationwide have adopted sustainable building policies and practices. The degree to which older and existing buildings are proactively managed according to these practices is not demonstrated in the programs reviewed for Seattle, Washington, San Diego, California and Arlington County, Virgina.

Adoption of a City or City/County sustainable building policy would probably be the first step toward a system-wide public building application and eventual private sector adoption.