

PASADENA CITY COLLEGE TOTAL COST OF OWNERSHIP

INTRODUCTION

The Pasadena City College District is implementing a Total Cost of Ownership (TCO) framework to establish a data driven process to assure adequate, well maintained capital assets to meet the educational Mission and Vision of the College. The TCO process considers all costs associated with an asset from acquisition to demolition or disposal, including facility development, annual operations, and long-term management. The TCO plan provides information and an awareness of all costs expended over the life-cycle of a building or equipment. The TCO is a data driven document that establishes guidelines and factual costs to assist in future budgeting and funding decisions at Pasadena City College. TCO process guides the College to consider all facilities costs from conceptual planning, date of occupancy of the facility, through the life-cycle and demolition of a building. Total Cost projections break down the cost to operate, maintain and refurbish each building by identifying the dollar per gross square foot value associated with each asset. The plan compares and contrasts utility costs between years and includes an assessment of custodial, maintenance and grounds staffing. The TCO will be implemented in all future planning of new facilities by the Pasadena City College.

BACKGROUND INFORMATION

The recently adopted 2014 Accreditation Standards of the Accrediting Commission for Community and Junior Colleges-Western Association of Schools (ACCJC) instituted accreditation standards for development and long-term management of a college's physical assets. The relevant standards are from Section III-Physical Resources:

III - PHYSICAL RESOURCES

1. The institution assures safe and sufficient physical resources at all locations where it offers courses, programs, and learning support services. They are constructed and maintained to assure access, safety, security, and a healthful learning and working environment.
2. The institution plans, acquires or builds, maintains, and upgrades or replaces its physical resources, including facilities, equipment, land, and other assets, in a manner that assures effective utilization and the continuing quality necessary to support its programs and services and achieve its mission.
3. To assure the feasibility and effectiveness of physical resources in supporting institutional programs and services, the institution plans and evaluates its facilities and equipment on a regular basis, taking utilization and other relevant data into account.
4. Long-range capital plans support institutional improvement goals and reflect projections of the Total Cost of Ownership of new facilities and equipment.

The College is implementing a TCO program to formalize the process of planning and managing the development and long-term operational costs of the District's physical assets. The College funds new facilities from local and state bonds. Annual operating expenses, including maintenance and operations staff, expenses and utilities, are funded from annual General Fund allocations. Major repairs, renovations and updates are funded from state programs, local facility funds, as well as local general obligation bonds. Regardless of funding source, all investment in College assets are accounted for through the District Fund Budgets.

TOTAL COST OF OWNERSHIP DEFINITIONS

The TCO process considers all costs associated with an asset from acquisition to demolition/disposal. TCO provides a means to evaluate initial development costs with long-term operational costs and ongoing repairs, renovations and upgrades. The TCO process provides data to compare the District's costs to operate, maintain, and refurbish with state and national averages to identify areas for potential improvement. The TCO provides estimates of future costs to operate and maintain facilities providing information to inform future budgeting and funding decisions. Integral to the TCO process is the assessment of custodial, maintenance and grounds staffing levels needed to maintain facilities to the standard of care compared to national averages.

The TCO process provides a structured means to measure the effectiveness of the programs implemented and to chart program improvements. The TCO program focuses on three primary facility ownership phases:

- Facility Development-Planning, Design, Construction
- Annual Operations – Maintenance and Operations staffing, building utilities, maintenance costs, repairs.
- Long-Term Management-Scheduled Maintenance, Renovation, Updating and Reuse.

The APPA (Association of Physical Plant Administrators) has developed a number of Key Performance Factors that can be evaluated and tracked. Some of these Key Performance Factors are:

Facility Planning

- Building Utilization Capacity/Load Ratio
- Project Development Cost per Square Foot
- Custodial Staff per Building Gross Square Foot
- Maintenance Staff per Building Gross Square Foot
- Electrical-Cost and Use per Gross Square Feet
- Natural Gas-Cost and Use per Gross Square Feet
- Use Intensity-Total Energy Use per Gross Square Feet
- Total Utility Cost per Gross Square Feet
- Annual expense for maintenance and custodial materials, supplies and vendors

Long-Term Management

- Facility Condition-Facility Condition Assessment
- Facility Condition-Amount of Scheduled Maintenance 5
- Average investment for Renovation, Upgrades, or Repurpose

DEFINITIONS

The facilities management industry has developed some standardized terms and definitions relating to the TCO. An APPA partnership published a Glossary and Definitions of Terms associated with the TCO Management. In addition, the California State Community College Chancellor's Office has defined terms relating to the ownership and operation of community college facilities. Some of the key terms are:

Total Cost of Ownership (TCO)-Lifecycle Cost Management

TCO is a dollar per gross square foot value (\$/GSF) associated with a facility. It is a calculation of all facilities-specific costs (not including furnishings or non-facility specific equipment) divided by estimated lifespan of the building (30 to 50 years) and the total gross area.

Facilities-specific costs include all construction, preservation, maintenance, and operations costs. TCO is a strategic asset management practice that considers all costs of operations and maintenance, and other costs, in addition to acquisition costs. TCO, therefore includes the representation of the sum total of the

present value of all direct, indirect, recurring and non-recurring costs incurred or estimated to be incurred in the design, development, production, operation, and maintenance of a facility/structure/asset over its anticipated lifespan. This is also Inclusive of site/utilities, new construction, scheduled maintenance, preventive/routine maintenance, renovation, compliance, capital renewal and occupancy costs. Land values are specifically excluded.

Capacity/Load Ratio

The Capacity to Load ratio is an indicator used to determine how efficiently available space is being used. The California Community College Chancellor's Office's (CCCCO) FUSION system lists the Capacity Load Ratio for four key space types for each college in the state. The Cap Load Ratio compares the amount of educational space required to support a college's enrollment as measured by weekly student contact hours (WSCH) with the CCCCCO's established utilization factor for lecture, laboratory, library and audio/visual spaces on the college campus. The calculations are based on assignable square feet, which is a measure of the space within a building that can be used for instruction. It does not include hallways, mechanical spaces or other non-educational space. A 100% Cap Load Ratio indicates that the available space matches the needs of the student classroom hours. A Cap Load Ratio exceeding 100% indicates more available space than needed to support the calculated need.

Capacity Ratio = Actual Assignable Square Footage

Calculated Required Square Footage (based on student population)

Lifecycle Cost Analysis

Lifecycle Cost Analysis is an estimating procedure used to determine the cost of facility system/component renewal based on the average useful life of an individual component. This procedure is typically based upon visual observations, via a facilities conditions assessment/audit, to determine the remaining useful life of a system and the development of cost models for the facility. This process enables multi-year budgeting of future replacement costs and timing for replacement.

Facility Operating Cost per Gross Square Foot (GSF)

The Facility Operating Cost per GSF is an asset management practice that considers the yearly costs of facilities operations and maintenance per gross square foot of space using the APPA Facility Operating Gross Square Foot national averages as a Performance Indicator. The annual costs are evaluated on a square foot basis:

- Custodial Costs
- Grounds Keeping Costs
- Maintenance Costs
- Energy Use
- Utility Costs
- Facility Maintenance Expenses (including the annual costs of materials, equipment, service providers to maintain the facilities)

Energy Usage

This performance indicator is expressed as a ratio of British Thermal Units (BTUs) for each Gross Square Foot (GSF) of facility, group of facilities, site or portfolio. This indicator represents a universal energy consumption metric that is commonly considered a worldwide standard. This energy usage metric can be tracked over a given period of time to measure changes and variances of energy usage. Major factors that affect BTU per gross square foot are outside ambient temperature, building load changes, and building envelope and equipment efficiencies. The total energy usage includes the amount of energy it takes for heating, cooling, lighting and equipment operation per gross square foot. The indicator is traditionally represented as total energy consumed annually or monthly. All fuels and electricity are converted to their respective heat, or BTU content, for the purpose of totaling all energy consumed.

Energy Usage = British Thermal Units = BTUs

Gross Area = GSF

Energy/Utility Terms

Terms used when listing energy usage include:

KBTU-Thousand British Thermal Units

MBTU-Million British Thermal Units

kW-Kilo Watts-Thousand Watts (electrical power)

MW-Mega Watt (million watts)

kWh-Kilo Watt Hours (electrical energy usage)

MWH-Mega Watt (million watt) Hours (electrical energy usage)

CCF-One Hundred (C) Cubic Feet-Water Measure, 748 gallons

Normal/Routine Maintenance and Minor Repairs

This applies to work activities that are cyclical, planned activities funded through the annual budget cycle, and done to continue or achieve either the originally anticipated life of a fixed asset (i.e., buildings and fixed equipment), or an established suitable level of performance. Normal/routine maintenance is performed on capital assets such as buildings and fixed equipment to help them reach their originally anticipated life. Deficiency items are typically low in cost to correct and are normally accomplished as part of the annual Operation and Maintenance (O&M) funds. Normal/routine maintenance excludes activities that expand the capacity of an asset, or otherwise upgrade the asset to serve needs greater than, or different from, those originally intended.

Repair(s)

Repairs refer to work that is performed to return equipment to service after a failure, or to make its operation more efficient. This is the restoration of a facility or component thereof to such condition that it may be effectively utilized for its designated purposes by overhaul, reprocessing, or replacement of constituent parts or materials that have deteriorated by action of the elements or usage and have not been corrected through maintenance.

Preventive Maintenance

Preventive Maintenance (PM) consists of a series of maintenance requirements that provide a basis for planning, scheduling, and executing scheduled maintenance, which is planned versus corrective in nature. The purpose of PM is to improve equipment life, to avoid any unplanned maintenance activity and minimize equipment breakdowns. These PM activities can be defined through a Maintenance Plan (MP) or Work Order Plan. The purpose of a Maintenance Plan is to describe the best means to maximize equipment operational availability, while minimizing equipment downtime. Once developed, the MP will typically identify PM task descriptions and schedules, troubleshooting, corrective maintenance (repair) task descriptions, spare parts identification, stock (quantity), and any unique storage requirements. This information will be incorporated into the manual, both as tabular data and text.

Scheduled Maintenance

Scheduled Maintenance is the total dollar amount of existing maintenance repairs and required replacements (capital renewal), not accomplished when they should have been, not funded in the current fiscal year or otherwise delayed to the future. These needs are typically quantified by a comprehensive facilities condition assessment/audit of buildings, grounds, fixed equipment and infrastructure and have not been scheduled to be accomplished in the current budget cycle and thereby are postponed until future funding budget cycles. For calculation of facility condition index (FCI) values, scheduled maintenance does not include code generated renovation or renovation for a new use.

Facility Condition Assessment (FCA)/Audit

A Facility Condition Assessment Audit is the structured development of a profile of existing facilities conditions, typically placed in an electronic database format, and populated with detailed facility condition inspection information. A detailed FCA typically involves an assessment team of three professionals (architect, mechanical engineer, electrical engineer). The assessment team depends upon

robust, scalable methodologies to assure accurate and consistent information. It is recommended that a FCA be done on a regular basis, approximately every three years, or to conduct a portion of the overall portfolio annually. The FCA identifies existing deficient conditions (requirements), in a logical grouping, with priorities, and associated recommended corrections and corrective costs. Costs are generally based upon industry standard cost databases (e.g., Building News, Craftsman Book Company, Richardson General Construction Estimating Standards, RSMeans).

Facility Condition Index (FCI)

A Facility Condition Index is a comparative industry indicator/benchmark used to indicate the relative physical condition of a facility or group of buildings. The FCI is expressed as a ratio of the cost of remedying existing deficiencies (scheduled maintenance (SM)) and capital renewal (CR) requirements to the current replacement value (CRV), i.e., $FCI = (SM + CR) / CRV$. The FCI provides a corresponding rule of thumb for the annual reinvestment rate or reserve account to prevent further accumulation of scheduled maintenance deficiencies. The FCI value is a snapshot in time, calculated on a periodic basis. The FCI is represented on a scale 0% to 100%, with higher FCI values, representing poorer facility conditions. A “fair to good facility” is generally expressed as having an FCI of less than 20%. A “critical facility” is generally considered as having an FCI of 40% or more.

Facilities Deterioration Rate

Each element in a facility has an effective useful life. The replacement of these elements over time may be expressed as a percentage of current total building replacement value per year. A benchmark deterioration rate for a reasonably well maintained facility is approximately 1-2% of the total building replacement value per annum.

Current Replacement Value (CRV)

The CRV is the total expenditure in current dollars required to replace any facility at the institution, inclusive of construction costs, design costs, project management costs and project administrative costs. Construction costs are calculated as replacement in function vs. in-kind. The value of design (10%), project management (5%), and administrative costs (5%) can be estimated at 20% of the construction cost.

Recapitalization/Reinvestment Rate

A facility, system, or component with existing deficiencies will deteriorate at a faster rate than a component that is in good condition. The recapitalization or reinvestment rate is the level of annual funding for facility renewal and scheduled maintenance expressed as a percentage of facility replacement values. Altering the recapitalization/reinvestment rate has direct impact upon the facility condition index (FCI) and associated scheduled maintenance levels over time.

Adaptation/Renovation/Modernization

The adaptation/renovation/modernization of facilities includes any improvement, addition or expansion of facilities by work performed to change the interior alignment of space or the physical characteristics of an existing facility so it can be used more effectively, be adapted for new use, or comply with existing codes. This includes the total amount of expenditures required to meet evolving technological, programmatic or regulatory demands.