Maintenance Trades

Reflections on staffing solutions for educational facilities and a prognosis for the future

Guidelines

In 2002, APPA published *Maintenance Staffing Guidelines for Educational Facilities*, the first building maintenance trades staffing guideline designed to assist educational facilities professionals with their staffing needs.

The third book in APPA's trilogy of staffing guidelines, *Maintenance Staffing Guidelines for Educational Facilities* addresses how facilities professionals can determine the appropriate size and mix of their organization. Contents include solutions and best practices for:

- The maintenance of buildings
- Stewardship vs. service
- Maintenance vs. construction/renovation/alteration
- Outsourcing
- Zero-based staffing buildup

This maintenance staffing tool has proven to be a popular APPA bookstore item—with more than 1,600 copies sold—as it is unique in the industry. There is no other publication that quantifies specific building maintenance staffing needs for educational facilities. Previously, the building maintenance quantification was limited to expensive assessments by consultants or comparative analyses with other campuses (what some might call the blind leading the blind).

The maintenance staffing task force—led by Matt Adams and me—worked for four years to publish the book with five other contributors. One of our major achievements was to define five maintenance levels, with a general description of essential characteristics, for professionals to use in measuring the effectiveness of maintenance at each level. The levels are:

1. Showpiece Facility (Highest)
2. Comprehensive Stewardship
3. Managed Care
4. Reactive Management
5. Crisis Response (Lowest)

Maintenance staffing issues on college and university campuses is evolving as fast as many other facilities management issues these days. Thus, APPA plans to update this and the other two guidelines—*Custodial Staffing Guidelines for Educational Facilities* and *Operational Guidelines for Grounds Management*—in the next three years. This is an opportunity to build on the foundation we set nearly 10 years ago, using the "new blood" of educational facilities professionals. This article examines the current guidelines and identifies areas where the next second edition task force can revise.

TAMING THE MAINTENANCE BEAST

In developing the maintenance guideline, there were some challenges to our task. They are all centered on establishing a broad scope of definitions and criterion, and assembling them all into a simple formula that could be applied in virtually any college and university setting.

By Theodore J. Weidner, Ph.D., P.E., AIA

DEFINITIONS

Maintenance comes in many forms, and while a professor or administrator may think a certain task they want accomplished is a maintenance responsibility, no real maintenance benefit may be derived. At some large institutions—particularly public ones—who pays for work (maintenance or not) is a major area for discussion. We wanted to avoid getting embroiled in individual campus financial decisions and simply provide a facility officer with a rationale for developing and maintaining a consistent system for financial management. The definitions taken from APPA's body of knowledge and enhanced by the task force have created a foundation for others to develop maintenance staffing tools that hadn't existed previously.

POSITIONS

APPA has been an invaluable resource for industry position descriptions. However, many of these descriptions were not uniform. Some positions were described in great detail—with individual tasks and duties—while others were much more general and relied on professional background rather than on clear duties. The task force also discovered there were some maintenance positions missing. While the maintenance guideline may not have been the sole driver, APPA has developed a more consistent and diverse set of position descriptions.

THE ARRAY OF CAMPUS BUILDINGS

Campuses have a wide variety of buildings. They range from simple barns to sophisticated research laboratories. The buildings may have virtually no mechanical/electrical equipment or may be so full of sophisticated equipment that several entire floors are dedicated to equipment required to maintain special environmental conditions for occupants and/or research.

Campus buildings are used extensively and often. From administrative offices buildings, occupied 8 to 10 hours Monday through Friday—to residence halls or apartments, occupied 24/7—colleges and universities provide a broad range of facilities that demand a similarly broad range of service delivery.

ONE FORMULA FOR ALL MAINTENANCE

The development of maintenance guides for this broad portfolio of facilities first demanded a broad classification system that covered all possible higher education facilities. Fortunately, the task force was able to draw on a national standard for classification of higher education spaces, the FICM *(Facilities Inventory Classification Manual)*[1] which provided a clear system of classification and usually an independent (non-maintenance) source of what each space is.

A simple formula, the holy grail of budget officers but sometimes the bane of facilities officers, is probably the most difficult aspect of any staffing guideline. The simplest formula looks at all spaces as the same and assumes that $x/sf is good enough. I agree with the following conditions: the facilities are relatively new, less than 10-years old; the facilities are all the same age or are evenly (nearly flat line) distributed in age between new and 20-years old; and every facility has approximately the same ratio of classroom, laboratory, office, etc. space as every other campus facility.

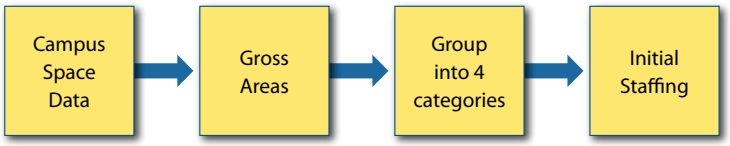
Show me that campus and I will advocate for a simple formula. The trouble is that I've never seen such a facility—and I doubt I ever will—even after seeing two campuses constructed from scratch over five years. No campus fits into a neat, uniform cost model. There are some models based on current expenditures that claim to be an accurate means to forecast staffing needs but those models ignore the life cycles of different building components, the varying intensity of use and abuse, and the varying design styles (non-architectural) of campus facilities because different design firms are used over time. They also fall under the trap of incremental budgeting which says what worked this year will work next year plus a little for inflation.

THE MAINTENANCE MODEL

The next level of complexity formed the basis of the model put forth in the guideline. The model provided for a number of employees to maintain one million gross square feet of campus area by each of four categories. The recommended staffing in the model was based, in part, on data from several campuses to arrive at the number of maintenance employees per million square feet. Total annual hours for maintenance activities by category were combined and through regression analysis a number of employees were identified for the mean campus in the sample. Each campus then identified its maintenance level to determine where each was relative to the result. This then established the range and intervals between Level 1 and Level 5 maintenance. The process grouped all campus space types (85 plus) into four categories:

1. Classroom
2. Laboratory
3. Office/Administration
4. Residential

These categories equated the cost of maintenance for office space with facilities maintenance shop space and similarly equated a teaching lab for computer science with a research lab for nanotechnology or gross anatomy. Those familiar with these



facilities may be quick to find fault with the model. However, because the model distinguished between spaces at all, there was some level of acceptance among facility officers. The model was not necessarily acceptable to budget officers.

Another challenge is conversion of space information from the FICM rules, net assignable square feet, to gross square feet. There is no nationally recognized *a priori* conversion for net assignable area to gross area. Every designer does something different with corridors, mechanical rooms, restrooms, structure, and stairs/elevators—the things that aren't counted in net assignable square footage. The only planning reference we found was with the Illinois Board of Higher Education (IBHE); other states or private institutions might not have the same level of comfort with the IBHE conversion factors.

THE ZBB APPROACH

Finally, there was a more detailed model I now prefer—yet it suffers from the tremendous amount of detail needed, which may not be understood by administrators or budget officers. The zero-based budget (ZBB) model, presented in Chapter 10 of the guideline, counted everything that required maintenance, used manufacturer or national standards for maintenance, and added staff time and material and equipment costs to arrive at an estimate of needs.

The challenge, and beauty, of the ZBB approach is that a computer is needed to keep track of all campus components; most modern facility operations have computers and a CMMS (computerized maintenance management system) to track and manage campus data to the appropriate level of detail and beyond. Thus, integration of information already needed or known with recognized standards, can tell a facility officer exactly how much time, materials, and equipment costs will be for each facility in the coming year. The problem with this approach is maintenance needs are never static; they change from year to year depending on the portfolio of buildings and components. Every model needs the expertise of a facility manager to make the budget work.

Dealing with the varying needs of facilities means the facility officer must manage staffing needs with an eye toward right-sourcing and financial needs by annualizing costs and having a sinking fund to take care of those years or facilities when/where needs exceed the operating budget. True, this level of complexity is nothing new for a facilities officer but putting that much money into the control of the facility officer is seen as risky by many campus executives. Sinking funds or facility needs have the potential of exceeding the campus endowment exposing the university to a number of financial issues that most facility officers want to avoid.

APPLICATION

A recent application of the guideline to the University of Nebraska–Lincoln (UNL) campus demonstrated a number of good and not so good outcomes. In Chapter 8 of the guideline, the fundamental input comes from the campus space database, which lists individual rooms according to FICM codes and definitions for area. General codes for campus spaces include:

- Classroom (100)
- Laboratory (200)
- Office (300)
- Study/Library (400)
- Special Use (500)
- General Use (600)
- Support (700)
- Clinic (800)
- Residential (900)

There are other codes of for corridors, stairs, elevators, public restrooms, and mechanical/ electrical equipment rooms.

Net assignable area is the interior room area measured in a specific manner—it excludes walls, structural elements, corridors, etc. For a given building or campus the net assignable areas of each space is accumulated by space type. Areas are converted to gross area then grouped into the four staffing categories. The total area of each category is used with a selected service level (1 through 5) to compute the total number of working (non-supervisory, non-support) building maintenance employees are needed.

After arriving at the initial staffing recommendations some adjustments are needed to account for different campus characteristics. There are five adjustments to 'fine tune' the results: campus size, campus age, varied facilities (recognizing different expertise in building systems), deferred maintenance, and campus mission. Each of these factors ranged between -10 percent and +10 percent, so in the most extreme case the fine-tuned staffing could be reduced or increased by 50 percent.

The four University of Nebraska facility officers endorsed using the maintenance, custodial, and grounds guidelines to identify a uniform method of determining O&M costs for new campus facilities across all four University of Nebraska campuses. To help the process, I performed detailed calculations of staffing by maintenance level.

The UNL campus Institutional Research and Planning office maintained all the campus space data and provided it in the 85 categories. Because UNL is a public institution there is administrative and financial separation between the educational and general facilities and the student support and residential facilities so the data was further separated by E&G and other facilities (e.g., residence halls, campus recreation, athletics, and student union). The building maintenance staffing was determined as described in the guideline and above. The results were shared internally for discussion with the directors in charge of the various campus areas.

LESSONS LEARNED & FUTURE PROJECTIONS

This process revealed some shortfalls in the guideline. A means to determine the number of supervisory staff (e.g., foremen, superintendents, and managers), support staff (e.g., clerks and other non-wrench personnel), administration, and budgets for materials, tools, and training were not provided. We attempted to overcome these deficiencies via some ratios that work for us. Ratios of employees to supervisor (for multiple levels), number of employees to support personnel, percentage of personnel budget to materials budget, annual equipment, and training expenditures were applied. The result of the analysis suggested a significant increase to our staffing and annual budget would be justified. Of course, the increase would have to come from somewhere else in the university, so the recommendation didn't go very far; this was not unexpected.

The exercise was helpful in a number of areas. It highlighted that we're doing a lot with very little in the way of personnel and materials. For instance, we've identified about as many efficiencies in the way of: working foremen; extension of duties and responsibilities; and reduction of overlapping tasks as might be possible. We've made good use of information technology and can implement more if additional personnel are available (see "Why our CMMS Isn't Living Up to Expectations," *Facilities Manager*, November/December, 2007). We are stretching every non-personnel dollar about as far as possible. Lastly, the condition of our facilities is a reflection of our staffing and budgets for operations as well as capital renewal. The exercise helped us document our efficient budget and may assist in getting the message out.

As APPA looks to revise the maintenance guidelines—beyond the need to revisit the staffing recommendations—it would be nice to see recommendations on supervisory ratios, support staff, and ratios or recommendations on non-personnel expenditures. There are real questions to consider: Is there a real correlation between annual maintenance expenditures and deferred maintenance? Does deferred maintenance incur additional annual O&M expenditures? What preventive maintenance tasks provide the greatest benefit for the institution? Does good preventive maintenance result in reduced capital renewal?

A number of these questions may not be answered by a revised guideline; they may require separate research efforts through CFaR, APPA's Center for Facilities Research. As we push educational facilities management towards greater excellence, I anticipate APPA's maintenance staffing and other guidelines to continue to be a critical resource for the industry.

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FOOTNOTE

1 National Center for Educational Statistics, Postsecondary Education Facilities Inventory and Classification Manual, NCES, 2006.

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