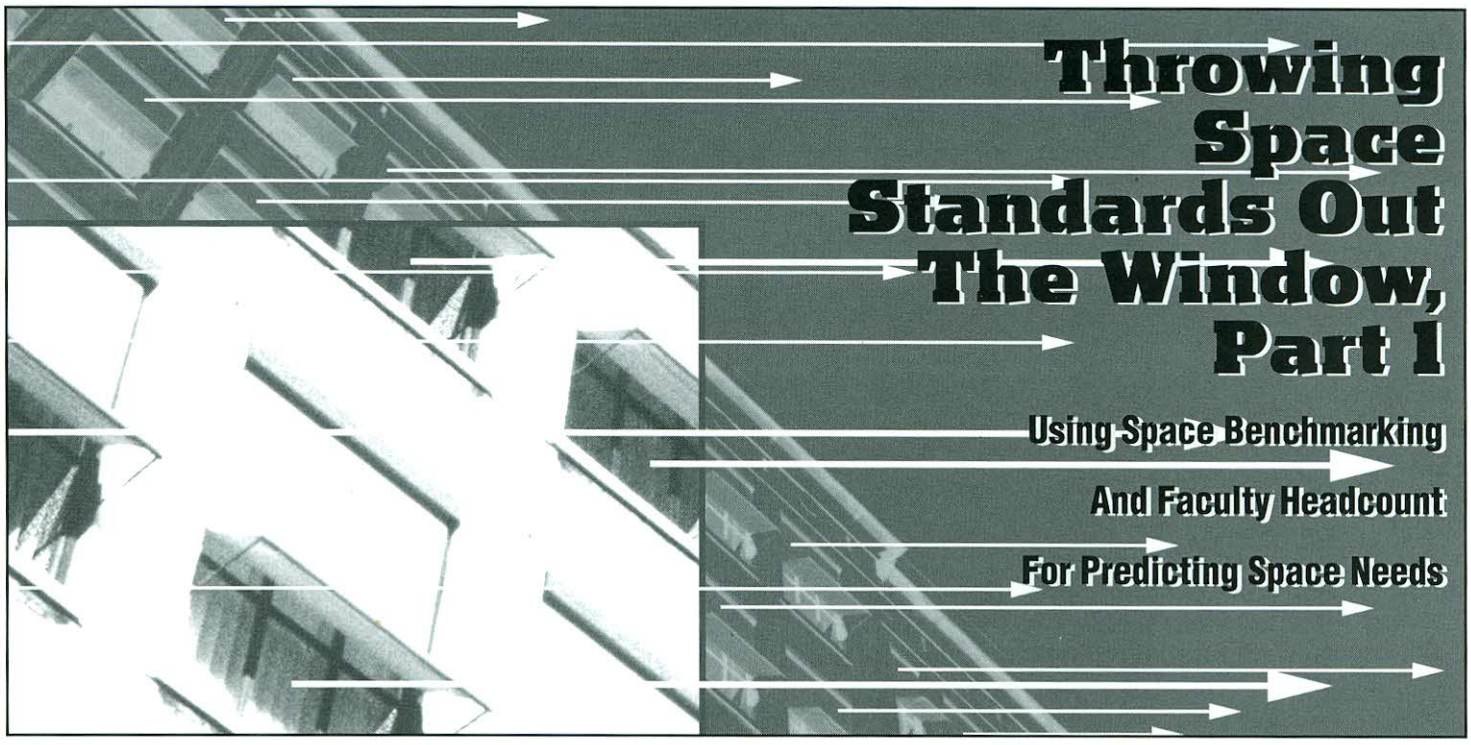

Throwing Space Standards Out The Window, Part I

Using Space Benchmarking And Faculty Headcount For Predicting Space Needs

By Ira Fink, Ph.D., FAIA

Institutions do not remain static. They grow, they decline, and they change. At each stage, a common question occurs—do we have adequate space? Or, more importantly, how do we know if we have adequate space? In other words, how much space do our academic units need?

One of the primary interests of space management on a campus is to create an equitable system of projecting future space needs and allocation among academic and administrative units. Space on campus is an important resource. Too little space can hamper the ability to accomplish a unit's objectives; too much space is wasteful of limited institutional assets. The limits derive from the need to manage university resources, including space; the cost of upkeep of space; and the perpetual need for renewal, replacement and additions of space as the institution moves forward. Much of this discussion is contained in my earlier APPA *Facilities Manager* article, "Space Counting is Not Space Management."[1]

Approach and Methodology

This article examines traditional numerical methods of space projections, questions some of the fundamental assumptions about space projections, and presents an alternative approach to space projections based on a new, straight forward benchmarking methodology. This approach is based upon projection methods that have not been derived from fixed space guidelines or standards, but instead on **space per faculty member** as the basis for prediction and allocation. This is an innovative and easily understood space projection methodology that my firm has pioneered and used most recently at Georgia Tech and are currently using at the University of California, Davis and St. Mary's College of California. This article also presents the results of a unique national space benchmarking study among Research I universities that were part of the projection methodology. The results, covering a range of disciplines, provide data on space per faculty member in nine Research I universities.

HISTORY OF SPACE STANDARDS

High School Origins

Traditional methods of space planning have their origins in reports about high schools and junior high schools in the 1920s and California public higher education in the 1940s and 1950s. The following summary, based on key space planning documents from 1948 to 1989, highlights the assumptions of traditional methods that I have challenged in developing the new space benchmarking approach. For readers interested in a more complete list of articles and books, please refer to my bibliography on this topic.[2]

1924 and 1926: Junior High Schools and High Schools

As near as I can tell, the idea of the use of space standards began with a study of high schools in the year 1924. A reference to a source document in *A Restudy of the Needs of California in Higher Education* (1955) [3] makes the following

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statement: "Several years ago the School Planning Division of the California State Department of Education developed a building formula for computing classroom space requirements for the state colleges. That formula as currently used, and which follows in general the pattern earlier developed by Packer in 1924 for high school buildings and by Anderson in 1926 for junior-high-school buildings...".[4] This is the earliest reference I can find as to how and where space standards were introduced into higher education. Interestingly enough, the first higher education standards in California were based on the space required for movable tablet arm chair seating which occurred in World War I-vintage high schools and junior high schools.

1948: *Report of a Survey of the Needs of California in Higher Education*—Strayer Report

The procedures of the 1924 New York high schools' formula for computing classroom space requirements was augmented by what is known as the Strayer Committee Report published in California in 1948 and which included a chapter on the physical plants in California state colleges and the University of California.[5] This report makes a number of assumptions about space, based primarily on net square feet (later called assignable square feet or ASF) per full time equivalent student, and established the first standard in California for the utilization of classrooms (65 percent utilization based on a 45-hour course week [6]).

This report cemented the pattern of projecting space needs based on students. Most likely this was the result of believing that space needs for higher education parallel that of high schools and junior high schools.

1955: *A Restudy of the Needs of California in Higher Education* (Restudy Standards)

In 1955, concerned with the cost of public higher education, and in anticipation of a tidal wave of students who would be entering higher education a decade later as a result of the baby boom following World War II, the California legislature approved a restudy of the higher education needs of the state. This report, *A Restudy of the Needs of California in Higher Education,* carefully reviewed space on public campuses in California, and recommended higher utilization rates for classrooms[7]. More importantly, the Restudy report defined the amount of floor area that should be allowed for instructional purposes, including: offices, research laboratories, shops, storage, and miscellaneous areas for nine general subject fields ranging from agriculture to social sciences. These Restudy standards added one more step in codifying and reducing the space needs of higher education to a set of standards—with data based on buildings in place and square feet per student as it existed in California in 1953.

1966: *Space Utilization Standards, California Public Higher Education*—CCHE

The 1966 report of the California Coordinating Council for Higher Education (CCHE), *Space Utilization Standards, California Public Higher Education,* summarizes another major assumption: "Standards to be used in determining need must necessarily be established on an arbitrary basis. They may be based on average practice or some point on a scale where a certain percentage of the institutions lie. They can be based on a theoretical computation which might appear reasonable to persons sophisticated in facility space planning. In any event, the imposition of new or revised standards on a group of institutions may cause some anguish to those who have an excess amount of space, but are still desirous of additional state support." [8]

This CCHE statement raised two observations about standards — they are likely to be arbitrary and they represent average practice, not necessarily best practice. It should also be noted that the CCHE *Space Utilization Standards* also imposed standards for the size of class laboratories, based on assignable square footage (ASF) per station, and per 100 weekly student contact hours.

1968: *University Space Planning*—Bariether and Schillinger Book

In 1968, Harlan Bareither and Jerry Schillinger of the University of Illinois published their book *University Space Planning: Translating the Educational Program of a University into Physical Facility Requirements.* They developed a procedure called "the numeric method" for translating the educational program into physical facility requirements that was based upon "building blocks." According to Bareither and Schillinger, "The total amount of space required at an institution for each "building block" is dependent upon the number of FTE "full time equivalent" students, the level of student, the fields of study, the institutional philosophy pertaining to scheduling patterns, size of library, etc." [9]

According to Bareither and Schillinger, the purpose of the numeric method was two-fold: to present a logical system in the calculation of space requirements and to present space standards that should be usable for most institutions of higher learning. While the permanent value of their work, as the authors stress, lies mainly in its analytical methodology, it is often the specific numerical values of station size and allocation that have been regarded as fixed standards. While they indicate that the underlying assumptions about the size of staff for a given program should be subject to a continuous review—as staff size is obviously an important determinant of space requirements—the process of internal checking and cross validation of the numerical values is often overlooked.

Bareither and Schillinger note that research space is very difficult to evaluate, as it involves space requirements for types of activities that are not predictable. They state that the purpose of projecting space is to "establish a boundary condition within which to work." Space would then be allocated on the basis of productive research programs.

The Bareither and Schillinger book begins to examine two additional assumptions of space standards used in higher education. First, that all space requirements can be codified and calculated. Second, that the basis for projecting needs should be based on student enrollment. The work of my firm challenges both premises.

1971: *Higher Education Facilities Planning and Management*—WICHE Manuals

In 1971, the Western Interstate Commission for Higher Education (WICHE) published its seven volume *Higher Education Facilities Planning and Management manuals.*[10] One of the key statements made in the manuals is as follows: "The content of these manuals has been influenced strongly by an assumption that they can be of maximum use if the

procedures deal with the problems as they are recognized currently rather than as they *may* develop in the future. As a result, these manuals are largely a compilation of the existing state of the art. The methodologies presented reflect the more traditional forms of education and the conventional measures of educational activity (e.g., student credit hours and weekly student hours)."[11]

The WICHE reports identify another questionable aspect of traditional space standards. They are based on solutions to current space problems, and they do not look ahead. This would certainly bother someone like the great hockey player, Wayne Gretsky, who is reported to have said, "I like to skate to where the puck is going, rather than where it has been." It is also a particularly important point as campuses today struggle with how much space technology requires, which has been completely overlooked in any set of standards or guidelines in use today. For example, our own research indicated that for classrooms with 100 or fewer stations, the average ASF needed per station in a fixed table, technology rich room, is 50 percent greater than for a movable tablet arm room.[12]

1985: *Space Planning Guidelines*—CEFPI

In 1985, the Council of Educational Facility Planners International issued its *Space Planning Guidelines*.[13] The introduction to the CEFPI report states, "The guidelines are directed to identify types and amounts of non-residential facilities that are required by departments on a campus. These are guidelines and not standards. Each institution should select planning modules which address its institutional mission, program mix, teaching techniques, and philosophies."

The CEFPI guidelines also cover space for research labs, based on the concept of planning modules which vary by discipline and also have a range of values in terms of square footage per module per discipline. It is not clear how one would choose to be at the low end or the high end of the CEFPI planning (design) module. The CEFPI guidelines describe in words the flexibility that should occur with the use of the guidelines. And indeed, the values presented are given in ranges. Yet at the same time, they represent one additional issue with guidelines or standards. We do not know the sources from which these guidelines are based. Are these opinions of a single author or committee? Are they based on empirical evidence from field work at unidentified institutions, or are they one more arbitrary and cumulative addition to the literature of higher education space planning?

1986: *Time and Territory*—CPEC

In 1986, The California Post Secondary Education Commission tried to bring together the complicated existing factors used in determining space needs. The needs analysis had been fine tuned, but basically not changed for more than four decades. CCHE hired a consulting firm to construct what became known as the Council's Facilities Analysis Model. As noted in a frank statement in the CCHE report, *Time and Territory: A Preliminary Exploration of Space and Utilization Guidelines in Engineering and*

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the Natural Sciences, CCHE indicates, "This model involved some rather sophisticated computer modeling and required the regular collection of massive amounts of data, so much so that it was finally abandoned due to the incapacity of campus data processing systems to manage it."[14]

CPEC was on the right track; not only is space data hard to model and process, but it is also hard to understand.

1989: *A Capacity for Learning*—California Post Secondary Education Commission

Again in 1989, the California Post Secondary Education Commission again reviewed space standards and guidelines that were in place in states across the nation. The CPEC report, *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education*[15], represented a massive effort to show where California public higher education stood relative to other states in facility space. The report pointed out the difficulties of maintaining space and utilization information. As the report indicates:

> A major finding of the study is that virtually all space standards tend to increase in detail and complexity over time and that—perhaps because of some fundamental quality of human nature—there is a tendency to try to draw greater and greater precision out of formulas that were never intended to be anything more than general guidelines. The result is often an architectural and academic straight jacket—a planning system that assumes too much from mathematics and fails to account for the fact that campuses are systems of buildings that must work together if the entire enterprise is to function effectively. Drastically limiting the amount of space that can be built in one category can have hidden effects on other space types, resulting in such unexpected and unwanted results as overcrowding, the construction of unneeded or overly expensive facilities, and general reduction in campus morale.[16]

A well-stated conclusion by CPEC.

Problems with Traditional Space Standards

The use of traditional space standards and guidelines raises many issues. First, too little is known about how institutional data were collected or how the standards and guidelines were actually derived. For example, the 1955 California studies were based on data obtained in 1953 at four University of California and ten California State College campuses. In other words, a precise measurement of past space use was being used as the means to project an unpredictable future. But for the other standards or guidelines, there is little information about how the space data was collected, how it might have been combined or weighted, and how anonymous data points were treated. Little is known about the characteristics of the institutions providing data—were they large or small, public or private, research universities or regional colleges, and how were their standards derived? Furthermore, there is no evidence that the premises were ever validated or tested. For example, the CEFPI Guidelines state that a review was made of guidelines from various state higher education coordinating boards and universities—but there is no further reference to the sources or their choice of one guideline number versus another.

Second, fixed standards imply that one size fits all institutions. Campuses vary considerably in culture, instructional modes, requirements for degrees and amount of research, all of which influence the amount of space needed for a program. Yet the guideline studies do not indicate how users of the guidelines should make important modifications or policy decisions when they use the standards.

Third, the standards or guidelines have a strong public institution bias. Do they work as well or apply to the hundreds of private colleges and universities in the U.S., many of which are the top ranked institutions in the country?[17] Of the list of 21 institutional participants in the WICHE study, only four represented private college or universities. While institutional affiliation is not shown for the 21 persons listed as the CEFPI Higher Education Committee, all of the names I recognize come from public higher education. Moreover, all of the named institutional sources are public.

Fourth, space guidelines often work best if they are administered as part of a centralized system and are used to create equity across institutions. But, in reality there are very few states that have higher education systems where multiple institutions have the same mission, are on par with one another, and where cross-campus space equity would be important.

Fifth, existing, commonly used space guidelines are averages based on unidentified institutions. What if your institution does not want to be average, but wants to excel? Where are the space standards or guidelines that promote excellence? How does an institution that wants to be best compare itself?

Lastly, these early documents suggest that the initial intent and purpose of space guidelines was to provide an umbrella, or envelope of space, as an entitlement for a discipline. Separate discipline entitlements would be added together to create a campus-wide allotment. This process has now deteriorated to the point where the space allotments have in some instances been used as a means to project room by room space needs as design standards for individual spaces rather than budgeting standards for an institution in aggregate.

It is the great diversity of institutions and of their student populations, faculty, and staff that make higher education so unique. It is important that guidelines and standards do not create a non-thinking mode of determining space needs and create average institutions across the board in terms of space. Guidelines should not remove discretion. They should be based on translating academic policy into facility needs. And they simply don't work well for some types of institutions.

Fatal Flaw of Standards

The most serious shortcoming of traditional standards or guidelines is their mechanical link to changes in student enrollment, either head-count or FTE. This connection may work well for enrollment formula funded public institution operating budget purposes, but it is inadequate for institutional space projections.

Most public institutions and some private institutions have experienced cycles and shifts in their enrollment base from full-time to part-time, from traditional to non-traditional, from day to evening. These institutions continue to survive, and even flourish, regardless of changes in enrollment. One reason these institutions remain stable is that most have a set cadre of faculty, regardless of enrollment fluctuations. The budget process that allocates funds for faculty positions, regardless of whether the institution is public or private, is rigorous. Faculty positions, once established, tend to remain in place. Faculty, once hired, also tend to stay. The process of creating faculty slots is usually more deliberate than the process that internally allocates funds based upon changes in student enrollment. *In other words, space standards and studies using student enrollment as the base use the wrong input. Space standards should be based on the number of faculty, not enrollment.*

Using faculty as a base presumes a response to issues not addressed by traditional enrollment standards. First, it assumes a student-to-faculty ratio. Second, it acknowledges that academic units know their own needs and that faculty have a sense of what space is required to execute their programs, more so than "space accountants" with calculators and computers. Finally, using faculty as a base allows faculty research space needs to be built into the result at levels that are appropriate to an institution's individual research missions.

Goals of Space Projections

The goals of space projections should be a "buy in" by faculty, staff and administration. They should provide understandable results and reflect a reproducible process. They should propel institutions to create a facility environment consistent with their academic environment. They should put space decisions into the hands of those who allocate related resources (i.e., directors, deans and faculty). They should provide a road map of facilities needs as a base for future master planning. Space planning, based on numbers of faculty derived from a benchmarking process, can accomplish these results.

An Alternate Approach to Space Projections

A New Methodology

My interest in creating a new methodology for space projection began nearly 35 years ago and has its roots in many different areas. First, while a staff member of the Office of the President of the University of California, I watched Donavan Smith and the late Bob Walen precisely estimate space needs for the nine campuses of the University of California, using state mandated formulas, and dutifully compute them by adding machine and calculator. Through the 1960s and 1970s, Donavan and Bob would crunch data on how big a campus should be, based on formula driven space entitlement from the State of California Restudy Standards.

Second, while interviewing faculty at George Washington University, Middle Tennessee State, John F. Kennedy University and other institutions where we have worked on space planning assignments, I was told by faculty that they would rather be next to their colleagues than be separated from them, even if they didn't get as much space as national space "standards" might provide. Adjacency, more so than size alone, was important.

Third, throughout my years in higher education, it became apparent that almost all institutions have a group of peer institutions with whom they compare themselves. Information

from this respected group of comparison peer institutions is valued for establishing equity in a number of areas, whereas "national" data or standards, including space, is often considered of lesser value.

The provost or chief academic officer carries enormous influence in directing an institution's future through the allotment of faculty positions that allow one department to expand while another contracts. This is done by providing or taking away faculty slots. The provost, while concerned about enrollment, has a major involvement in faculty recruitment and the space requests that often accompany the hiring of faculty. By contrast, it is the admissions officer, registrar, or enrollment manager, who is concerned much more about the details of student enrollment, which here-to-fore has been the primary basis for projecting space needs, using the standards that have just been explained.

The Challenge: How Much Space is Needed?

One challenge of space management is consistently overlooked — how to create a space guidelines system that will allow highly complex and research rich universities, as well as other institutions, to understand how much space would be required to meet their needs due to programmatic growth, in comparison to space they already have.

Against this background of reservations about the value of traditional, fixed space standards, we have worked as a firm to develop a simpler, and more easily understandable system of how much space a campus requires. Rather than rely on guidelines derived from unknown institutions and complex formulas, we have developed a methodology based on benchmarking among peer institutions. We started with the assumption that the lead institutions in this nation (both public and private) have figured out how to become and remain successful, and, in the process have built a physical plant that allows them to carry out their work effectively. Their facility inventory is a good place to start.

To develop space needs projections for a preeminent research university without using space standards or guidelines authored by organizations such as the Council of Education and Facility Planners, or those in place in the state of California or elsewhere, we derived a system of space requirements for the Georgia Institute of Technology based upon assignable square feet per faculty member, by college, and by academic space unit. Developing this system involved two major activities: first, identifying as a baseline how much space was currently held by each of the units (exclusive of classrooms and residential space) and second, creating a benchmark space allotment measure that could be agreed upon by the campus and its academic unit heads.

Notes

1. Fink, Ira. "Space Counting is Not Space Management," *Facilities Manager*, Vol. 12, No. 2 (April 1996), pp.32-35.

2. Fink, Ira. *Campus Planning and Facility Development: A Comprehensive Bibliography. Third Revised Edition.* Berkeley, California: Ira Fink and Associates, Inc., University Planning Consultants, June 1998, See Section IV-G, "Campus Space Planning," pp. 35-38.

3. T.R. McConnell, T.C. Holy and H.H. Semans. *A Restudy of the Needs of California in Higher Education.* Sacramento, California: California State Department of Education, 1955, 471 pp.

4. *Ibid.,* pp. 311-313.

5. *Ibid.,* p. 307, Reference to Strayer Committee Report, Chapter IV.

6. *Ibid.,* p. 315.

7. *Ibid.,* p. 369 (The Restudy report recommended 36 scheduled hours per week for room utilization, with a semester average of 67 percent of room capacity or student stations.)

8. Matsler, Franklin. *Space and Utilization Standards, California Public Higher Education. A Report to the Coordinating Council for Higher Education.* Sacramento, California: 1966, p. 9.

9. Bareither, Harlan D. and Jerry L. Schillinger. *University Space Planning: Translating the Educational Program of a University into Physical Requirements.* Urbana, Illinois: The University of Illinois Press, 1968, p. 51.

10. WICHE. *Higher Education Facilities Planning and Management Manuals. Manual One: An Overview* (38 pp.); *Manual Two: Classroom and Class Laboratory Facilities* (155 pp.); *Manual Three: Office and Research Facilities* (ii pp.); *Manual Four: Academic Support Facilities* (72 pp.); *Manual Five: General Support Facilities* (66 pp.); *Manual Six: Program Planning and Analysis* (93 pp.); *Manual Seven: Reference Guide* (41 pp.). Boulder, Colorado: Planning and Management Systems Division, Western Interstate Commission on Higher Education in Cooperation with the American Association of Collegiate Registrars and Admissions Officers, May 1971.

11. *Ibid., Manual One,* p. 9.

12. Fink, Ira. "How Much Space Does Technology Require?" *Presentation made at SCUP - 33 International Conference,* Vancouver, British Columbia, July 20, 1998.

13. Council of Education Facility Planners. *Space Planning Guidelines for Institutions of Higher Education.* Columbus, Ohio: Council of Educational Facility Planners, International, July 1985, 37 pp.

14. *Time and Territory: A Preliminary Exploration of Space and Utilization Guidelines in Engineering and the Natural Sciences.* Sacramento, California: (published by California Postsecondary Education Commission), Commission Report 86-2, February 1986, p. 9.

15. *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education.* Sacramento, California: (published by California Postsecondary Education Commission), Commission Report 90-3, January 1990, pp. 146.

16. *Ibid.,* p.3.

17. According to the 1999 "America's Best Colleges," issue of *US News and World Report,* of the 29 best national universities in the U.S., 24 are private. The highest ranking public institution is the University of California, Berkeley, which is ranked 22nd. (*US News and World Report,* 1999, p. 36). Of the 29 best national colleges, as ranked in *US News and World Report,* all are private. (*Ibid.,* p. 42).

The second part of this series, to appear in the January/February 1999 issue of *Facilities Manager,* will describe the process of facilities benchmarking. This approach is based upon projection methods that have not been derived from fixed space guidelines or standards, but instead on space per faculty member as the basis for prediction and allocation. This is an easily understood space projection methodology that has been used most recently at Georgia Tech and is currently being used most recently at Georgia Tech and is currently being used at the University of California, Davis and St. Mary's College of California. This second part of the series will also present results of a present results of a unique national space benchmarking study among Research I universities including an analysis of assignable square footage per faculty member in 23 separate academic disciplines at nine universities. The methodology for facilities benchmarking will also be shown. — *I.F.*