# Facility Condition Assessment & Space Study Project

## KRS 164 / M-05468008

Final Report




**Submitted by:**

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Paulien & Associates

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# Kentucky Postsecondary Education System
# University of Louisville
# Facility Condition Assessment & Space Study

February, 2007 (v.060507)

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*Note on Figure and Table Headings: Figures and Tables are numbered sequentially as if both illustrations were part of the same list. i.e. Figure 1.3 may be followed by Table 1.4, without there being a Table 1.3.*

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# Part II. H.

# University of Louisville

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## Section 1. Introduction

The Kentucky Council on Postsecondary Education (CPE) contracted with Vanderweil Facility Advisors, Inc. (VFA) to assess the condition, space adequacy and space capacity of selected facilities at Kentucky's nine public higher education institutions during the summer and fall of 2006. The studies are intended to inform both the Council and the institutions as the basis for a 15-year capital plan that would help address the following important questions:

- What is the condition of each institution's facilities? What system renewals are due for those facilities, both deferred renewals due today and future renewals due within the next 15 years?
- Is the current space (in selected buildings) fit for continued use? If not, how much would it cost to upgrade those buildings?
- Does each institution have enough space, now and to meet enrollment projections for the year 2020? If not, how much will it cost to add the needed space?
- How do Kentucky facilities compare to other postsecondary educational portfolios?
- Is there evidence to indicate why the predicted capital reinvestment is needed?
- What recommendations does the project team have as KPES creates a 15 year capital plan for facilities?

**Summary of Findings Figures:**

**Figure 1.1: U of L 15-Year System Renewal Needs**

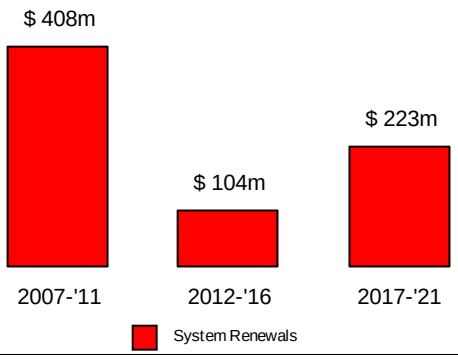



**Figure 1.2: U of L 15-Year Space Adequacy + Capacity Needs**

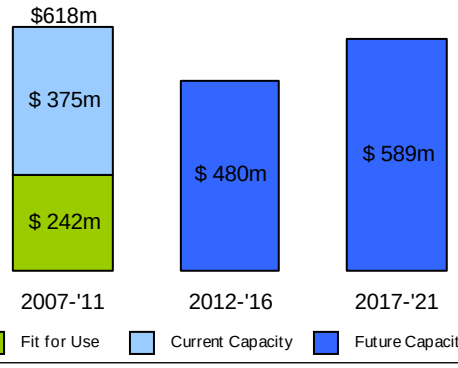
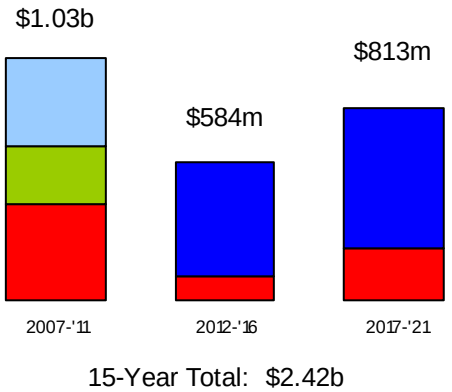



**Figure 1.3: U of L 15-Year Blended Needs**




LEGEND: Colors in Figure 1.3 correspond to labels in Figures 1.1 & 1.2. Figure 1.3 summarizes the annual needs presented in Figure 6.4.

Attributions:
All sections of this report are by Peter Scanlon, Thomas Bart and Joseph Maggiore of VFA, Inc., unless otherwise noted under the Section heading.

**Table 1.4: Percentage of Institutional Portfolios Included in Study**

| Institution | Institutions' Portfolios* Total # of Buildings | Gross Square Ft | Condition Assessment by VFA** Total # of Buildings | | Gross Square Ft | | Space Adequacy Study by Paulien Total # of Buildings | | Gross Square Ft | |
|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Kentucky University | 190 | 4,626,458 | 55 | (29%) | 2,829,774 | (61%) | 10 | (5%) | 867,593 | (19%) |
| KCTCS | 284 | 6,138,142 | 198 | (70%) | 5,740,720 | (94%) | 8 | (3%) | 509,813 | (8%) |
| Kentucky State University | 54 | 1,223,473 | 37 | (69%) | 726,963 | (59%) | 7 | (13%) | 148,841 | (12%) |
| Morehead State University | 112 | 2,718,050 | 39 | (35%) | 1,556,012 | (57%) | 11 | (10%) | 813,450 | (30%) |
| Murray State University | 169 | 3,710,171 | 48 | (28%) | 2,453,372 | (66%) | 3 | (2%) | 203,667 | (5%) |
| Northern Kentucky University | 109 | 2,440,541 | 26 | (24%) | 1,558,254 | (64%) | 5 | (5%) | 649,987 | (27%) |
| University of Kentucky | 908 | 14,884,891 | 167 | (18%) | 8,700,858 | (58%) | 51 | (6%) | 3,564,946 | (24%) |
| University of Louisville | 136 | 7,889,007 | 107 | (79%) | 4,513,765 | (57%) | 36 | (26%) | 2,469,961 | (31%) |
| Western Kentucky University ** | 54 | 4,266,565 | 40 | (74%) | 1,860,621 | (44%) | 10 | (19%) | 809,809 | (19%) |
| Total | 2,016 | 47,897,298 | 717 | (36%) | 29,940,339 | (63%) | 141 | (7%) | 10,038,067 | (21%) |

*Source: Fall 2005 Building Data Base submission.
**Space assessed by VFA is Education and General Space.
***Revised to include WKU housing facilities.

## Summary of Findings:

- The present study examined only a portion of University of Louisville's (UofL) portfolio (107 of 136 buildings (79%) for condition study and 36 of 136 buildings (26%) for space study). The results of the present study most likely understate the amount of capital investment needed.
- UofL facilities included in the study require $408 million in system renewals during 2007-2011, and $328 million more between 2012 and 2022, totaling $736 million in system renewals over 15 years. (Figure 1.1 and Section 4.)
- UofL facilities included in the space fit-for-continued use study require $242 million between 2007 and 2011 to bring them up to current educational adequacy standards. (Figure 1.2 and Section 5.)
- UofL facilities require $375 million between 2007 and 2011, to have enough space to meet current enrollment needs, and an additional $1.07 billion over the following 10 years to meet 2020 enrollment projections. (Figure 1.2 and Section 5.)
- For facilities included in the study, the total 15-year capital investment required to address condition, adequacy and capacity is $2.42 billion. (Figure 1.3 and Section 6.)
- University of Louisville compares unfavorably (31% 5-year Facility Condition Index) to the benchmark higher education institution's portfolio (18% 5-year FCI). (Section 4.)
- The condition of facilities UofL is generally consistent with the age and construction methods of the facilities. There are many major system renewals due because 57% of UofL buildings were built over 30 years ago, and as would be expected, many systems are at the end (or beyond the end) of their expected useful life. (Section 4.)
- The project team recommends KPES and UofL address all three needs (condition, adequacy and capacity) with blended investments to address them simultaneously, staged over 15 years. (Section 6.)
- Funding options for UofL to consider vary according to the type of facility: The "cleanest" approach to funding the backlog of deferred renewals would be a state bond issue paid from general operating revenues, together with a requirement that each institution spend an amount equal to the GASB recommended depreciation amount. New construction of auxiliary facilities is most often funded with long term debt supported by student direct use charges. The predominant funders of general academic facilities—classrooms, labs, offices, and libraries—are state and local governments (direct appropriations or debt) and private donors (outright gifts). The primary funders of research facilities are state and federal governments and private donors (either individuals or philanthropic organizations). (Table 1.5 below, and Section 7.)

Table 1.5 below (a copy of Table 7.3 in Section 7) is presented as a worksheet for KPES.

Here, the subtotals of the "Strategic Funding" scenario suggested in Section 6.8 are shown in the "Amount Needed, from 2006 Study" column. (The total amount needed, $2,306m, is less than the $2.42b shown in Figure 1.3 because the recommended "strategic funding" leaves a small, usually acceptable (10%), portion of the deferred renewals undone.)

KPES and UofL policy makers can use Table 1.5 as a framework to allocate the Amounts Needed across the most likely sources of funds to create KPES' 15 Year Funding Plan.

If KPES and UofL choose to supplement this study with additional information, any additional capital investments identified would need to be included.

**TABLE 1.5**
**UofL Funding Patterns Worksheet for Higher Education Facilities**

| USES | | SOURCES | | | | | |
|---|---|---|---|---|---|---|---|
| | Amount Needed, from 2006 Study | Students | State | Local Govt. | Federal Govt. | Donors | Institutional Funds |
| Renewal and Renovation | | | | | | | |
| • Condition/End of Life | $620m | | Approp./debt | | | | Approp./debt |
| • Space Adequacy | $242m | | Approp./debt | | | | Approp./debt |
| New Construction | | | | | | | |
| • Auxiliary | n/a | | | | | | |
| 2006 Capacity | | | | | | | |
| • Academic facilities | $219m | Fees | Approp./debt | Debt | | Gifts | Lease/ purchase |
| • Research facilities | $156m | | Approp./debt | | Grants | Gifts | |
| 2020 Capacity | | | | | | | |
| • Academic facilities | $494m | Fees | Approp./debt | Debt | | Gifts | Lease/ purchase |
| • Research facilities | $575m | | Approp./debt | | Grants | Gifts | |
| TOTAL | $2,306m | | | | | | |

*Figure 1.5 is a copy of Figure 7.3 in Section 7.*

## Section 2. Project Overview: Methodologies, Data, Outcome & Limitations

The nine institutions included in the study were:

- Eastern Kentucky University
- Kentucky Community & Technical College System
- Kentucky State University
- Morehead State University
- Murray State University
- Northern Kentucky University
- University of Kentucky
- University of Louisville
- Western Kentucky University

The study includes selected buildings identified by CPE as education and general space on each institution's campus. In total, VFA performed a Level 1 Lifecycle Condition Assessment (LCA) of 107 assets at UofL comprising 4.5 million square feet (93% of 136 buildings; 57% of square footage in portfolio). Nearly 3.5 million square feet (43%) of institutional space was NOT included in the condition study. Also, VFA's project partner Paulien & Associates was asked to examine the space adequacy of 36 education and general buildings selected from various campuses (only 26% of 136 buildings in the portfolio), and evaluate the space capacity of each institution vs. current and future student populations.

The number of buildings and amount of space not included in the present study means the results of the study most likely understate the amount of capital investment needed at UofL.

## Methodologies

In the Level 1 Lifecycle Condition Assessments, VFA facility experts profiled each asset's major building systems to assess the capital renewals required now and in the future. A renewal of a building system is defined as an investment required at the end of the system's useful life, to prolong, or renew, its service in the facility — for example, re-roofing a worn out old roof. "Deferred Renewals" are renewals that, based on the age of the facility, were due in the past, but have not yet been completed.

Each building's system lifecycle assessment included establishing a replacement value of each system, comparing the system's expected (industry standard) useful lifespan to its observed remaining life, and estimating the cost to renew that system when replacement is due. Replacement values (adjusted to reflect local market conditions) of each asset's component systems were then added together to establish an asset's replacement value, and the cost of system renewals due within the coming five years was summed. The ratio of these 5-year renewal costs divided by the replacement value of their asset(s) establishes an index, called a Facility Condition Index, which can be used to compare the relative condition of assets. Lower FCIs indicate an asset requires little renewal investment; buildings with higher FCIs are in worse shape. Lower FCIs are better.

$$FCI = \frac{[\text{Sum of 5-year Renewals}]}{[\text{Replacement Value of Asset(s)}]}$$

The LCA process and methodology is supported by the expert opinions of facilities engineers and architects, along with VFA's web-based capital planning software application, VFA.facility. Condition data about each facility were collected during an on-site visual inspection and through a series of interviews and feedback cycles with facility managers at the institution. Detailed cost estimates for the replacement value and renewal cost of each system were developed using the VFA.facility software application, which has the widely accepted R.S. Means construction cost estimating database embedded within it. R.S. Means estimates, already localized by a city cost index by Means, were further adjusted (up) to match the historical project cost experiences represented by a cross section of Kentucky public postsecondary institutions. For consistency between campuses, the same adjustment factors were made across all institutions. Expected useful lifespans for individual building systems were based on Building Owners & Managers Association (BOMA) standards and verified though consultation with CPE and APPA (formerly the Association of Physical Plant Administrators). A detailed account of these sources and adjustment factors is presented in Appendix A2.

Selected buildings that were less than five years old were assumed in "good" condition (because of their young age). Their future system renewal needs were included in the condition study by modeling system types and renewals based on construction records and interviews with university feasibility managers. This produced data compatible with the Level 1 (and Level 2) assessments. No physical walk through or visual inspection was conducted on these buildings. (As expected, due to their young age, many 5-year-old-or-less buildings had no renewals due within the coming five years, and hence an FCI = 0.)

Each asset greater than five years old was assumed to have a backlog of systems that were at or beyond their expected useful life. In determining the backlog, all capital renewals due in 2006 or previous years were defined as "deferred capital renewals." Renewals due in 2007 or beyond were treated as future capital renewals.

It is worth noting that the Level 1 Lifecycle Condition Assessment process does not include identifying "deferred maintenance" deficiencies. These facility needs, while often rising to the level of requiring capital investment to address, would each require less than replacing each deficiency's entire system. (Replacements of entire systems are called renewals, and are included in Level 1 LCAs.) Identifying and estimating the cost of deferred maintenance requirements is a service available through VFA's Level 2 Detailed Facility Condition Assessments.

In the Space Adequacy or Fit-for-Continued-Use portion of the study, buildings selected by CPE and the institution were visually inspected for compliance with 9 metrics of the facility's educational adequacy. Where gaps were identified, recommended corrective actions were developed, including cost estimates for those actions. Cost estimates were based on historical averages for similar upgrades at higher education institutions nationwide, and adjusted to coincide with the replacement values for similar building types estimated in the VFA condition study.

The Space Capacity portion of the study addresses the need for additional educational and general (E&G) space to meet the needs of the student and staff population, both now and into the future, based on enrollment data and projections provided by CPE.

Detailed methodologies explaining both the condition assessment and the space study are presented in Appendices A2 (Condition) and A4 (Space).

## Data

Detailed records of each building in the study are presented in the appendices:

Appendix A3. Facility Condition Data Reports
- Asset List Report
- Asset Detail Report(s)
- System Renewal Report, by Year
- System Renewal Crosstab Report

Appendix A5. Space Study Data Reports
- Building Space Fit-for-Continued-Use Profiles
- Space Capacity Detailed Report

Complete electronic records of each asset are available for licensed users of VFA.facility, VFA's capital planning and management software system. VFA.facility software offers the flexibility to investigate, analyze and model the capital needs for each institution, and for the Kentucky postsecondary education system as a whole.

## Outcomes

KPES' and UofL's goal is to gain a complete picture of Kentucky's public higher education facility capital needs over the coming 15 years.

To that end, this study presents some valuable pieces of that picture, though not yet a complete picture:

| | |
|---|---|
| Condition: | Major system renewal needs for 107 assets, or 4.5 million square feet of space (57% of portfolio square footage) |
| Space Adequacy: | "Fit-for-continued-use" ratings, and cost estimates for upgrades, for 36 buildings (26% of portfolio buildings; 31% of square footage). |
| Space Capacity: | Capacity projections and cost estimates for UofL's |

education and general use space needs, now and to meet 2020 enrollment goals.

Funding Source Options: A summary of options for funding higher education capital needs, presented at a statewide level. Funding options are most efficiently approached across Kentucky's postsecondary education portfolio, and are not broken down by institution within this report.

Section 6 of this report presents the 15 year capital needs outlook for each portion of the study. The 15-year plan also presents models for how UofL might want to invest in those needs, based on various spending patterns and strategic priorities. The spend alternatives are included to demonstrate how a truly complete picture of Kentucky's public higher education capital plan might be constructed.

However, as mentioned in the Limitations section below, the outcome of the present study does not present a 100% complete picture of the whole. Each portion of the study is valuable on its own, but the condition, space adequacy and space capacity needs portions each examined only a specific group of each institution's facilities. Further, the Space Capacity projections, while updated from the Paulien 1999 model (revised by Paulien in 2001), may not be aligned with other strategic initiatives underway or planned at individual institutions.

Section 6 includes the consultants' team suggestions for further work to align goals and construct a more complete picture of Kentucky's public higher education facility capital needs.

In the condition assessment portion of the study, VFA found the amount of system renewals required by the great majority of UofL's facilities to be consistent with the age and use of each facility, and many buildings to be surviving (for the time being) past their expected useful lifespans. And while there are examples of major capital investment in new facilities, the amount of investment in the existing building stock has not met these buildings' aging needs.

## Limitations

It is important to note a few limitations to the VFA | Paulien portions of the study:

- **Assessed only selected buildings** – 107 of UofL's facilities (93% of the number of buildings), comprising 4.5 million gross square feet (57% of gross square footage), were included in the condition assessment. Further study or modeling of the remaining assets would be required to gain a 100% complete picture of the condition or capital needs of the institutions.
- **Assessed for budgeting purposes –** The survey outcomes are intended for planning and budgeting purposes; they are not intended to provide construction specification-grade information about an asset. Outcomes for condition needs, space adequacy needs and space capacity needs may be added together to ascertain a more rounded picture of an institution's needs (in fact, the project team encourages such a blended view of capital investments for each asset/campus), however because such a limited portion of most institutions' portfolio was studied, the "blended" picture is far from complete.
- **Assessed for system renewals only** – The Level 1 LCA services provided under this contract included profiling the type, condition and renewal needs of each building and its major systems. The condition assessment does NOT provide a detailed list of requirements for each building. (This service is available through VFA's Level 2 Detailed Facility Condition Assessment.) Thus, while projecting system renewals over 15 years, the forecast does not account for sub-component needs related to a system unless they collectively contribute to general system failure. These are sometimes called "deficiencies" or "requirements," are usually concentrated in the next 1-5 years, and again, are not included in this report.

  Also not included in the study is any assessment of the day-to-day facilities operations. The study specifically and intentionally focused on the level of investment needed for major system renewals only. The study collected no data and draws no conclusions about how institutions are

budgeting to address daily operations and maintenance of their facilities.

- **Space Study only for selected Education and General buildings –** The Space Study included 36 buildings across the nine institutions. This represents only 26% of the total number of buildings (and 31% of gross square footage). The space adequacy study is intended to summarize the adequacy of the study buildings only. Since the buildings surveyed were not chosen to serve as a statistical sample of the overall university's space adequacy, extrapolation of the space adequacy results to model all adequacy needs for each institution is not recommended.
- **Space capacity projections include Education & General Space only** – The Space Capacity Study accounted for the education and general space at each institution, the institution's current enrollment, and the 2020 enrollment projections. Needs for residential and related enterprise space such as agriculture were not included. As noted, further survey or advisory services are available from the VFA | Paulien team to help fill in any gaps in the information that are deemed of high importance.

# Section 3: Study Overview: Project Organization & Implementation

## Organization

In April, 2006, the Council on Postsecondary Education contracted with VFA, Inc. of Boston, MA, as prime contractor, to conduct the overall facility condition and space adequacy | needs study. VFA provided overall project management as well as facility condition assessment services and capital planning software for the project. VFA teamed with higher education space planning experts Paulien & Associates of Denver, CO, to provide the Space Adequacy / Fit-for-Continued-Use and Space Capacity portions of the study. And, as a subcontractor to Paulien, the National Center for Higher Education Management Systems, of Boulder, CO, provided an analysis of funding sources KPES may want to consider when deciding how to implement the 15 year capital plans.

A project organization chart is shown in Figure 3.1

**Figure 3.1 Project Organizational Chart**

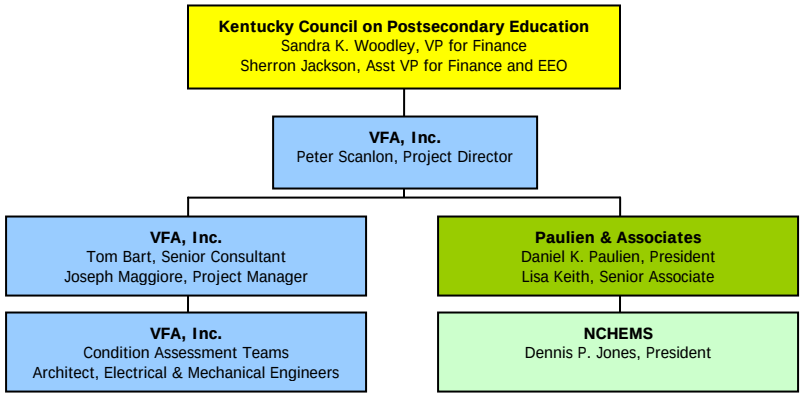
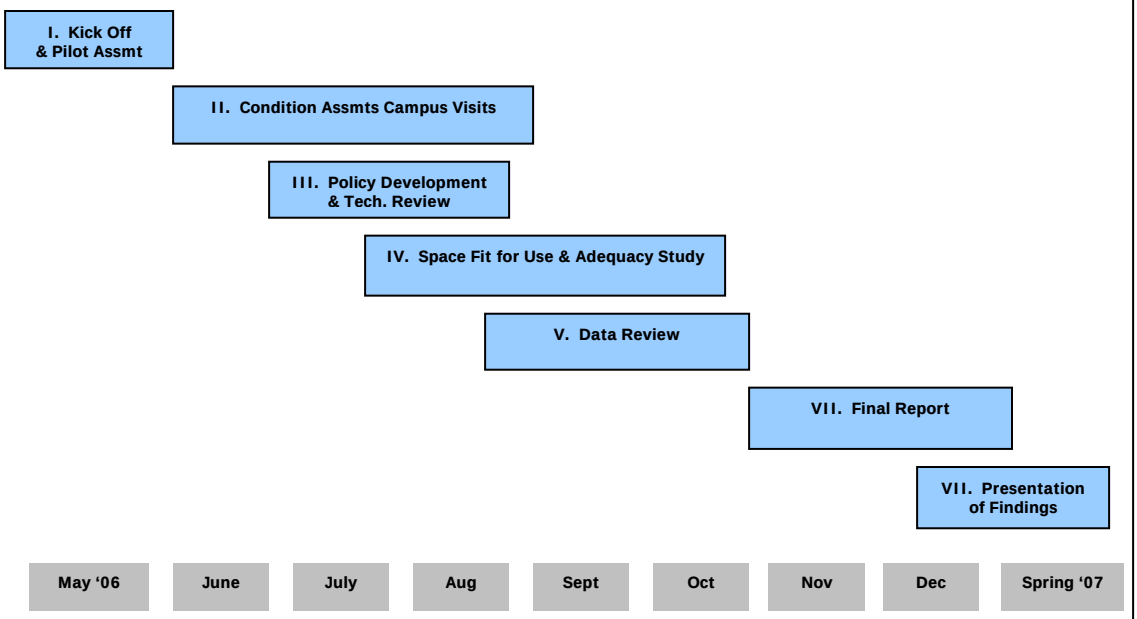


**Figure 3.2: Project Schedule**




## Implementation

The study proceeded under a fast track schedule during which 27 million square feet, and 700+ assets, were assessed statewide during five months of 2006. Figure 3.2 illustrates the major portions of the project schedule.

### Phase I: Kick Off & Pilot Assessment

The project kicked off in early May 2006 at a planning meeting hosted by Kentucky State University and attended by representatives of the Council, each of the public postsecondary education institutions, and the VFA | Paulien project team. The overall project schedule and methodology were presented, and a pilot assessment was conducted.

For the pilot assessment, a team of VFA assessors conducted a Level 1 Life Cycle Assessment of 2 facilities on the KSU campus. Representatives from each institution joined the VFA team to familiarize themselves with the Level 1 LCA process. During a debriefing session at the conclusion of the visual inspections, questions about the process, standards and schedule were answered.

In the weeks following the kick-off meeting, VFA developed sample data and reports based on the KSU pilot buildings. The reports were submitted to the Council and institutional representatives, who approved the data content and format that would be used for the subsequent Level 1 LCAs on their respective campuses.

### Phase II: Campus Visits

During the summer and fall of 2006, assessment teams from VFA and Paulien visited selected buildings at each institution.

Data generated in the Facility Condition Assessment portion of the study was collected by teams of VFA assessors – typically architects, electrical and mechanical engineers and/or facility managers – during a visual inspection of each asset. The detailed project assessment schedule is included in Appendix A1.

During the visual inspection, VFA assessors interviewed key facility managers at the institution, profiled the type, age, condition and renewal actions due for each major system of each building/infrastructure asset. Assessors also took digital photos, which are included in the reports and stored in the project database.

Upon completion of the field visit, the assessment teams began the data and cost estimating portion of the work, when they developed detailed cost estimates of each building system, the time remaining in each system's useful life, and the likely cost of renewing the system at the end of its useful life.

The replacement values of each system were totaled for each asset to derive a current replacement value (CRV) for that asset. CRVs presented in the data are intended to represent the construction cost of replacing the building (or system), with a similarly functioning building/system, in 2007 dollars. The CRVs do not include any "upgrades" of particular systems unless current building methods make the upgrade equal or less expensive.

#### Phase III: Policy Development and Technical Review

The project team worked closely with the Council to develop policies that would guide the submission, review and possible adjustment of the data. Guiding principles that shaped these policies included goals of:

- Accuracy: data should reflect actual conditions for each facility, as closely as possible given methodologies used for each portion of the study, providing a reliable record of the portfolio today.
- Consistency: similar standards, reference information and adjustment factors should apply uniformly to all institutions statewide, ensuring fair and equitable treatment across the postsecondary system.
- Transparency: all data sources, cost estimating and adjustment processes should be easy to reference, understand and track, providing maximum transparency to the information underlying the study's conclusions.

The process of reviewing and refining the data (Phase V, below) followed these principles as closely as possible.

#### Phase IV: Evaluation of Space Adequacy & Capacity

The Space Adequacy and Capacity portion of the study was led by Paulien & Associates. A detailed explanation of Paulien's methodology is included as Appendix A4.

### Space Adequacy | Fit-for-Continued-Use Study

CPE and the institutions identified a specific set of education and general facilities for evaluation in the space adequacy study. The facility selection process was developed by CPE and was the same for each campus. Selection criteria for inclusion in the space adequacy study included: (a) research facilities, (b) constructed before 1965, (c) identified by the institution as being unfit for continued use, or (d) identified as being in too deteriorated condition to support programs currently housed in the space.

The key areas evaluated include:

- *Does the building serve the program's current and future needs either by design or retrofit?*
- *How do the spaces in the building fit today's expectations and/or can the building be reasonably renovated to meet those expectations?*
- *Is the building's physical condition adequate to meet program needs and today's expectations (including life safety issues) and how major of a conversion or renovation is needed?*
- *Where applicable, are research laboratories of acceptable, flexible dimensions and up-to-date equipment to sustain on-going use as modern research facilities?*

Multiple rooms in each building were reviewed. The goal was to examine a sampling of the best, worst, and norm for the building. Classrooms, laboratories, offices, special use spaces, and bathrooms are examples of spaces reviewed. Mechanical and structural spaces were typically not included.

At the end of each day's assessments, the team discussed each building and collectively determined each building's criteria rating and recommended action.

### Building Design

When evaluating the buildings in the space adequacy study, there were several conditions examined on a case-by-case basis. These conditions contributed to the recommended action

for each building. Where possible these types of issues are included in the comment section of each building's evaluation. In general, it is important for a facility to promote and serve the activities and programs it houses as well as support the mission and overall master plan of the institution. It is entirely possible that a building was designed for and adequately serves the programs it houses yet be physically located in the wrong precinct of a campus or be a smaller single story building in a prime location that would be better served by a larger, multi-story building.

Some of the buildings were specifically designed for the programs contained in them or for the functions they serve, yet the building may now be overcrowded due to the institution's/ program's growth or the physical design is antiquated for today's standards or the construction materials do not allow for an cost-effective or efficient renovation. Certain buildings are on the historical registry. Many of these older facilities are best suited for administrative offices and not instructional programs. If the building does not meet ADA requirements then the additional constraint is that the administrative function should not be one that is high profile which generates a lot of people traffic.

### Space Adequacy Assessment

The consultants reviewed nine criteria and rated each building on a one to four scale as follows: 1 = Unsatisfactory; 2 = Somewhat Unsatisfactory; 3 = Somewhat Satisfactory; 4 = Very Satisfactory; 0 = Not Applicable. An average rating was calculated based upon the criteria that were applicable to the building. The nine criteria are:

1. *Room Capacities*
2. *Functionality*
3. *Suitability to Purpose*
4. *Flexibility of Space for Different Learning Styles*
5. *Gathering Space*
6. *Multi-Media Technology*
7. *Computers and Connectivity*
8. *Instructional Laboratories / Lab Equipment*
9. *Research Laboratories / Lab Equipment*

### Physical Condition

Each building's physical condition was reviewed in general terms. Areas of observation included, but were not limited to: ADA accessibility, roof leakage, asbestos related materials, air quality/condition issues, electrical and lighting issues, window glazing, elevator presence and condition, type of construction, and general maintenance of the building.

Buildings were then categorized into four major groups to more easily quantify the estimated renovation costs for the adequacy study.

The four categories used ($25/sf, $50/sf, $75/sf, $150/sf) provide budgetary guidance which should fall within a plus or minus 20% range of actual costs. The dollar value selected (as part of the space study estimates) includes all costs, both soft and hard. Categories carrying $25/sf and $50/sf renovation costs were termed "minor" --- indicating they could likely be occupied during renovation (mostly finishes, slight reconfigurations). Categories carrying $75/sf and $150/sf were termed "major" renovations – indicating the need to move all occupants out during renovation. Also, when we refer to a renovation as "major" we are attaching a sense of urgency to the need.

How were the four cost ranges determined and what documentation from the construction industry was used? Until recently, all construction estimates and contracts were guided by the Construction Specifications Institute Format (CSI) and the 16 divisions therein:

Division 1 General Conditions
Division 2 Site Work
Division 3 Concrete
Division 4 Masonry
Division 5 Metals
Division 6 Wood & Plastics
Division 7 Thermal & Moisture Protection
Division 8 Doors & Windows
Division 9 Finishes
Division 10 Specialties
Division 11 Equipment
Division 12 Furnishings
Division 13 Special Construction
Division 14 Conveying Systems
Division 15 Mechanical
Division 16 Electrical

The CSI format has been in use for 75 years or so, and is well suited for use in estimating the renovation costs. CSI has revised the format recently, but this traditional version was used. Each of the Divisions above has several subheadings--- for example, Division 9 - Finishes

has 14 subheadings among which are Painting, Tile, Carpet, Acoustical Treatment, etc. Division 15 - Mechanical has 12 subheadings among which are Plumbing, Fire Protection, Air Distribution, etc. Therefore, ALL pieces of a building are given in the CSI format. In a simple but lengthy process, an experienced construction estimator could assign square foot values to all the nearly 200 subheadings and have the information necessary for a reasonably accurate renovation cost. Paulien's construction consultant, Wayne Elwell, used his experience to provide values for most of the subheadings necessary for budgetary purposes. These incremental pieces, for example, $15/sf for a new HVAC system, $12/sf for an updated electrical system, $4/sf for new paint, etc., all contribute to the number that fits one of the four categories.

### Space Needs Study

The Finance Unit from CPE provided a Fall 2004 facilities inventory, staff full time equivalents, and research expenditure data for each of the institutions. The Council also provided enrollment, staffing and research expenditure projections for year 2020.

The Space Model used in the current study was based on the 1999 Space Needs Model developed for CPE by Paulien & Associates, updated by Paulien in 2001, and again updated during this study per the consultant's recommendations to reflect changing use standards and the physical limitations of certain Kentucky buildings.

The existing assignable square footage (ASF) used in the model reflects educational and general (E&G) state supported space only. It does not include hospital space, farms, and locations (remote locations and service centers) off the main campus. This is important as the student and staff full-time equivalents (FTE) include all students and staff for an institution. The Kentucky postsecondary education system provided a dataset of the spaces to be included in the model. It was the consultants' understanding that the non E&G spaces were removed. As the study progressed, the consultants found parking garages, leased space, farm space, and other spaces that typically should have been excluded in the model were actually included at individual institutions. Where possible, the consultants excluded these spaces. Council staff was informed of these anomalies, and agreed that these adjustments should be made. In future applications of the space model, the consultants encourage the Council and the institutions to review the spaces carefully so that each institution is being measured appropriately against the model.

### Phase V: Institutional Review of Data

As campus visits were ending during the summer of 2006, ten representatives of the Council and institutions were trained on the capital planning software, VFA.facility. These facility managers and planners then reviewed draft condition data developed by VFA. Current Replacement Values for each asset and system definitions and scopes were reviewed by representatives of each institution. Where gaps in cost or scope were identified by the institutions, and supported by historical or industry standard data, VFA adjusted the data. A list of adjustments is included as Appendix A6.

Some cost adjustments were statewide and necessitated comparison of Kentucky data to national norms, as defined by APPA, or a compilation of historical data from Kentucky institutions. In these cases, VFA carefully compared the scope and costs, and where necessary, considered specific adjustments. The Council had final approval on which adjustment factors would be applied statewide, and which could be applied specifically to each institution's data.

### Phase VI: Final Report

A draft of the Final Report was assembled and produced for the Council during December 2006. Each institution received a copy of Part I, the Council-level Executive Summary, plus the portions of Part II applicable to their institution.

Comments from the Council and the institutions on a draft of the report were incorporated in the Final Report.

### Phase VII: Presentation of Findings

At the time of this writing, the consultants' team of VFA | Paulien | NCHEMS plans to present the findings of the study to the Council during the spring of 2007.

# Section 4. Facility Condition Assessment

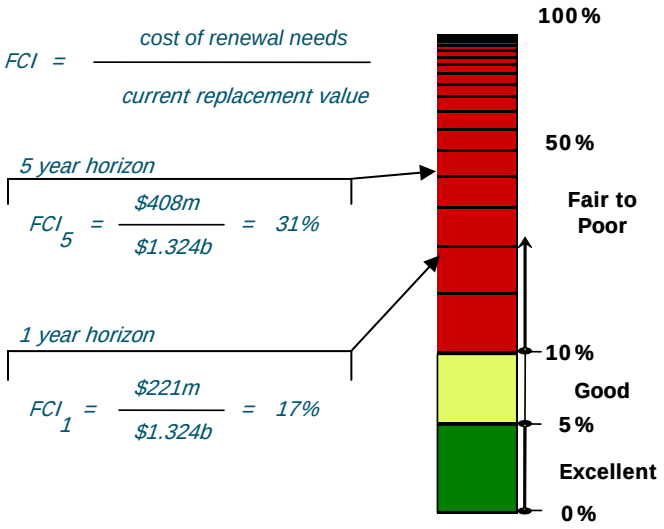
### *How do University of Louisville's facilities compare?*

At UofL, for the 107 facilities assessed, the estimated cost of system renewals currently due (1-YR Renewal Cost) is $221 million, and the estimated cost of renewals due within the next 5 years (5-YR Renewal Cost) is $408 million. (Note: present 2007 dollars are used in all reported numbers. Inflation factor considered = zero.)

The facilities assessed have a current replacement value of $1.324 billion, so the Facility Condition Index (cost of renewals, divided by current replacement cost) for the portfolio is 17% for a 1-year horizon, and 31% for a 5-year horizon. Based on International Facility Managers Association standards, both the 1-year and 5-year FCIs would be considered "fair" to "poor" rankings.

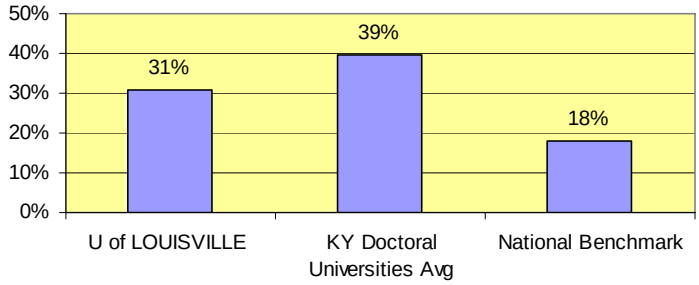
Compared to other higher education portfolios evaluated by the consultants' team over the past 5 years, UofL's is in worse condition (31% UofL 5-year FCI vs. 18% benchmark 5-year FCI).

**Figure 4.1: University of Louisville Facility Condition Index**




*Condition ratings based on International Facilities Managers Association standards.*

**Figure 4.2: KENTUCKY DOCTORAL UNIVERSITIES 5YR FCI**



### *What are the most urgent facility condition needs?*

This Executive Summary highlights the capital renewal needs of UofL assets. More detailed information is available in Appendix A3 or in KPES' VFA.facility database (http://kcpe.vfafacility.com).

Of the assessed assets, UofL as a whole has 23 facilities in "Satisfactory" condition, 17 requiring "Remodeling A" work, 51 requiring "Remodeling B" work, and 16 requiring "Remodeling C" work. Based on condition alone, none of the assessed assets required Demolition or Termination (see box below).

Figure 4.4 ranks the facilities assessed at UofL by their 5-year Facility Condition Index.

To see which systems across the UofL portfolio require the most renewal work, Table 4.5 lists the 5-year facility renewal needs by major system type. Distribution Systems, Electrical Service & Distribution, Communications and Security, Lighting & Branch Wiring, and Heat Generation Systems are among the systems requiring the most immediate large scale investment.

A complete list of all facilities assessed, showing renewal needs by year, is included in Appendix A3 in the System Renewal Crosstab Report.

**Figure 4.3: SUMMARY OF UofL BUIDLINGS BY CONDITION CODE**

| APPA CONDITION CODE | MIN FCI | # Bldgs | 5-YR RENEWAL COSTS |
|---|---|---|---|
| 1 - Satisfactory | 0%* | 23 | $ 245,000 |
| 2 - Remodeling A | 0% | 17 | 20,078,000 |
| 3 - Remodeling B | 25% | 51 | 300,433,000 |
| 4 - Remodeling C | 50% | 16 | 85,578,000 |
| 5 – Demolition | | 0 | 0 |
| 6 - Termination | | 0 | 0 |
| | | 107 | $ 406,334,000 |

*No single need > $40k
Total may differ slightly from other tables due to rounding.

A list detailing specific system renewals (and in which asset they are located) for years 2007 through 2022, is provided in Appendix A3, as the System Renewal Report.

The tables and reports included in this document represent only a small fraction of the ways the facility condition data can be sorted, organized, subtotaled and analyzed. More detailed (or differently organized) data is available in the VFA.facility software for data export and further detailed exploration.

Condition Study vs. Space Study Recommendations:
VFA's condition assessment (Section 4) and Paulien's space study (Section 5) evaluated facilities based on different criteria, and in some cases different recommendations are shown for the same building. This is entirely appropriate, given the different questions posed to each team. For example: VFA was asked to evaluate the condition of facilities based on their current use only, not considering the appropriateness or cost of adapting a building to a new use, while Paulien's space study specifically addressed the possibility of adaptive re-use for buildings. Also, VFA did not categorize any asset in 'Demolition' despite a small number of buildings having very high FCIs. (Assets with FCIs over 75% are sometimes considered good candidates for replacement.) The space study in Section 5 incorporated different standards for evaluating buildings, and may have reached different conclusions.

## Table 4.4: University of Louisville Facilities, Ranked by 5-Year FCI

| Institution: Campus | Asset Name | Asset Replacement Value | 5YR FCI Cost | 5YR FCI ↓ | 5-YR Building Condition Code |
|---|---|---|---|---|---|
| **University of Louisville** | | | | | |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1953 Thru 1969 | 2,562,000 | 3,203,000 | 125% | 4. Remodeling C |
| UofL: Belknap | Site: Exterior Lighting | 2,704,000 | 2,344,000 | 87% | 4. Remodeling C |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1953 Thru 1969 | 9,485,000 | 7,296,000 | 77% | 4. Remodeling C |
| UofL: Belknap | Site: Tunnel Chilled Water Distribution - 1953 Thru 1969 | 3,091,000 | 2,377,000 | 77% | 4. Remodeling C |
| UofL: Belknap | Hughes Hydro-Tech | 1,034,000 | 683,000 | 66% | 4. Remodeling C |
| UofL: Belknap | Miller Info Tec Generator Bldg | 969,000 | 608,000 | 63% | 4. Remodeling C |
| UofL: Belknap | Hughes Grounds Shop | 525,000 | 323,000 | 61% | 4. Remodeling C |
| UofL: Health | Carmichael Building | 10,699,000 | 6,145,000 | 57% | 4. Remodeling C |
| UofL: Moore | Moore Observatory | 214,000 | 121,000 | 57% | 4. Remodeling C |
| UofL: Belknap | Ekstrom Library | 41,864,000 | 23,531,000 | 56% | 4. Remodeling C |
| UofL: Belknap | Natural Sciences Building | 23,487,000 | 13,127,000 | 56% | 4. Remodeling C |
| UofL: Belknap | Schneider Hall | 13,513,000 | 7,506,000 | 56% | 4. Remodeling C |
| UofL: Belknap | Miller Info Tech | 24,223,000 | 12,616,000 | 52% | 4. Remodeling C |
| UofL: Belknap | Sackett Hall | 5,311,000 | 2,751,000 | 52% | 4. Remodeling C |
| UofL: Belknap | Hughes Carpet Shop | 282,000 | 144,000 | 51% | 4. Remodeling C |
| UofL: Belknap | Music School | 35,627,000 | 18,011,000 | 51% | 3. Remodeling B |
| UofL: Health | Myers Hall | 5,585,000 | 2,803,000 | 50% | 4. Remodeling C |
| UofL: Health | School Of Medicine | 47,489,000 | 23,820,000 | 50% | 3. Remodeling B |
| UofL: Belknap | J. B. Speed Hall | 12,379,000 | 6,170,000 | 50% | 3. Remodeling B |
| UofL: Health | Mdr Building | 28,595,000 | 14,110,000 | 49% | 3. Remodeling B |
| UofL: Belknap | College Of Education | 22,623,000 | 11,145,000 | 49% | 3. Remodeling B |
| UofL: Belknap | Hughes Office Bldg. | 2,533,000 | 1,238,000 | 49% | 3. Remodeling B |
| UofL: Belknap | Engineering Graphics | 591,000 | 288,000 | 49% | 3. Remodeling B |
| UofL: Belknap | Wilson Wyatt Hall - Law Building | 27,467,000 | 13,382,000 | 49% | 3. Remodeling B |
| UofL: Belknap | Life Sciences | 34,821,000 | 16,558,000 | 48% | 3. Remodeling B |
| UofL: Belknap | Ernst Hall | 12,419,000 | 5,880,000 | 47% | 3. Remodeling B |
| UofL: Belknap | Robbins Hall | 3,390,000 | 1,589,000 | 47% | 3. Remodeling B |
| UofL: Health | Health Sciences Bldg | 23,212,000 | 10,807,000 | 47% | 3. Remodeling B |
| UofL: Belknap | Crawford Gymnasium | 15,437,000 | 6,963,000 | 45% | 3. Remodeling B |
| UofL: Belknap | Service Complex | 6,877,000 | 3,090,000 | 45% | 3. Remodeling B |
| UofL: Shelby | Founders Union Bldg | 10,153,000 | 4,531,000 | 45% | 3. Remodeling B |
| UofL: Health | Kidney Disease Program Building | 4,908,000 | 2,145,000 | 44% | 3. Remodeling B |
| UofL: Shelby | Burhans Hall | 18,140,000 | 7,779,000 | 43% | 3. Remodeling B |
| UofL: Health | Library & Commons | 14,938,000 | 6,399,000 | 43% | 3. Remodeling B |
| UofL: Belknap | Strickler Hall | 23,670,000 | 10,081,000 | 43% | 3. Remodeling B |
| UofL: Belknap | Oppenheimer Hall | 3,676,000 | 1,503,000 | 41% | 3. Remodeling B |
| UofL: Belknap | Chemistry Building | 27,373,000 | 10,923,000 | 40% | 3. Remodeling B |
| UofL: Belknap | Grawemeyer Hall | 11,476,000 | 4,559,000 | 40% | 3. Remodeling B |

## Table 4.4: University of Louisville Facilities, Ranked by 5-Year FCI

| Institution: Campus | Asset Name | Asset Replacement Value | 5YR FCI Cost | 5YR FCI ↓ | 5-YR Building Condition Code |
|---|---|---|---|---|---|
| UofL: Belknap | Health And Counseling Building | 3,203,000 | 1,267,000 | 40% | 3. Remodeling B |
| UofL: Belknap | Urban Research Institute | 10,813,000 | 4,264,000 | 39% | 3. Remodeling B |
| UofL: Belknap | Davidson Hall | 22,932,000 | 9,026,000 | 39% | 3. Remodeling B |
| UofL: Belknap | W. S. Speed Hall | 9,954,000 | 3,865,000 | 39% | 3. Remodeling B |
| UofL: Belknap | Dougherty Hall | 8,060,000 | 3,052,000 | 38% | 3. Remodeling B |
| UofL: Belknap | Steam And Chilled Water Plant | 30,793,000 | 11,286,000 | 37% | 3. Remodeling B |
| UofL: Belknap | Jouett Hall | 2,993,000 | 1,090,000 | 36% | 3. Remodeling B |
| UofL: Belknap | Studio Arts / Hpes | 5,441,000 | 1,961,000 | 36% | 3. Remodeling B |
| UofL: Belknap | Kersey Library | 10,108,000 | 3,621,000 | 36% | 3. Remodeling B |
| UofL: Belknap | Honors Program Building | 1,701,000 | 609,000 | 36% | 3. Remodeling B |
| UofL: Belknap | Bingham Humanities Bldg | 26,816,000 | 9,593,000 | 36% | 3. Remodeling B |
| UofL: Belknap | Baptist Student Center | 2,046,000 | 731,000 | 36% | 3. Remodeling B |
| UofL: Health | School Of Dentistry | 48,091,000 | 16,996,000 | 35% | 3. Remodeling B |
| UofL: Belknap | Gardiner Hall | 8,288,000 | 2,859,000 | 34% | 3. Remodeling B |
| UofL: Belknap | Minority Affairs | 1,165,000 | 398,000 | 34% | 3. Remodeling B |
| UofL: Belknap | Updc / University Planning/Design/Construction | 2,427,000 | 789,000 | 33% | 3. Remodeling B |
| UofL: Belknap | The Playhouse | 5,981,000 | 1,936,000 | 32% | 3. Remodeling B |
| UofL: Belknap | Brigman Hall | 4,969,000 | 1,559,000 | 31% | 3. Remodeling B |
| UofL: Belknap | Solvent Storage Building | 175,000 | 52,000 | 30% | 3. Remodeling B |
| UofL: Belknap | Mccandless Hall | 2,557,000 | 764,000 | 30% | 3. Remodeling B |
| UofL: Shelby | Tele Research Center | 4,285,000 | 1,275,000 | 30% | 3. Remodeling B |
| UofL: Belknap | Red Barn | 1,694,000 | 503,000 | 30% | 3. Remodeling B |
| UofL: Health | Ky Lions Eye Research | 28,515,000 | 8,360,000 | 29% | 3. Remodeling B |
| UofL: Belknap | Houchens Building | 16,100,000 | 4,616,000 | 29% | 3. Remodeling B |
| UofL: Belknap | School Of Business | 30,007,000 | 8,594,000 | 29% | 3. Remodeling B |
| UofL: Shelby | Junior Achievement | 1,341,000 | 372,000 | 28% | 3. Remodeling B |
| UofL: Belknap | Brodschi Hall | 1,497,000 | 401,000 | 27% | 3. Remodeling B |
| UofL: Belknap | Gottschalk Hall | 3,806,000 | 1,006,000 | 26% | 3. Remodeling B |
| UofL: Belknap | Swain Student Activity Center | 72,444,000 | 18,619,000 | 26% | 3. Remodeling B |
| UofL: Belknap | Patterson Hall | 3,166,000 | 784,000 | 25% | 2. Remodeling A |
| UofL: Belknap | Environmental / Dehs | 2,189,000 | 535,000 | 24% | 2. Remodeling A |
| UofL: Belknap | Development & University Relations | 3,375,000 | 798,000 | 24% | 2. Remodeling A |
| UofL: Belknap | Interfaith Center | 2,370,000 | 457,000 | 19% | 2. Remodeling A |
| UofL: Health | Abell Administration Center | 6,901,000 | 1,174,000 | 17% | 2. Remodeling A |
| UofL: Belknap | Vogt Building | 8,884,000 | 1,450,000 | 16% | 2. Remodeling A |
| UofL: Belknap | Bass-Rudd Tennis Center | 10,763,000 | 1,564,000 | 15% | 2. Remodeling A |
| UofL: Belknap | Ford Hall | 3,495,000 | 486,000 | 14% | 2. Remodeling A |
| UofL: Belknap | Information Center South | 210,000 | 27,000 | 13% | 1. Satisfactory |
| UofL: Belknap | Iid | 1,920,000 | 247,000 | 13% | 2. Remodeling A |
| UofL: Belknap | Information Center North | 580,000 | 67,000 | 12% | 1. Satisfactory |
| UofL: Health | K-Wing | 22,129,000 | 2,377,000 | 11% | 2. Remodeling A |
| UofL: Belknap | Site: Combined Sewer Systems Distribution - 1953 Thru 2005 | 45,895,000 | 4,413,000 | 10% | 2. Remodeling A |

## Table 4.4: University of Louisville Facilities, Ranked by 5-Year FCI

| Institution: Campus | Asset Name | Asset Replacement Value | 5YR FCI Cost | 5YR FCI ↓ | 5-YR Building Condition Code |
|---|---|---|---|---|---|
| UofL: Belknap | Site: Combined Sewer Systems Distribution - 1953 Thru 2005 | 45,895,000 | 4,413,000 | 10% | 2. Remodeling A |
| UofL: Health | Research Resource Center | 11,239,000 | 982,000 | 9% | 2. Remodeling A |
| UofL: Belknap | Paul C Lutz Hall | 28,347,000 | 2,437,000 | 9% | 2. Remodeling A |
| UofL: Health | Kosair Pediatric Center | 14,159,000 | 1,036,000 | 7% | 2. Remodeling A |
| UofL: Belknap | Gheen Science / Planetarium | 3,630,000 | 201,000 | 6% | 2. Remodeling A |
| UofL: Belknap | Ehs Service Center | 1,143,000 | 62,000 | 5% | 1. Satisfactory |
| UofL: Health | Baxter Research Center | 28,522,000 | 892,000 | 3% | 2. Remodeling A |
| UofL: Health | Cardiovascular Bldg | 5,834,000 | 89,000 | 2% | 1. Satisfactory |
| UofL: Belknap | Belknap Research | 18,875,000 | 246,000 | 1% | 2. Remodeling A |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1973 Thru 1975 | 1,328,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1978 Thru 1979 | 7,915,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1983 Thru 1987 | 1,456,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1990 Thru 1996 | 913,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 1997 Thru 1999 | 3,397,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Duct Bank Electrical Distribution 2001 Thru 2005 | 920,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Chilled Water Distribution - 1978 Thru 1979 | 56,165,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Chilled Water Distribution - 1983 Thru 1989 | 4,227,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Chilled Water Distribution - 1990 Thru 2005 | 2,703,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1973 Thru 1975 | 3,336,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1978 Thru 1979 | 54,228,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1983 Thru 1987 | 3,196,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1990 Thru 1996 | 1,564,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 1997 Thru 1999 | 16,446,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Site: Tunnel Steam Distribution - 2001 Thru 2005 | 4,279,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Underground Utility Tunnel System | 3,205,000 | 0 | 0% | 1. Satisfactory |
| UofL: Belknap | Wright Natatorium | 7,782,000 | 0 | 0% | 1. Satisfactory |
| UofL: Shelby | Grounds Shop | 217,000 | 0 | 0% | 1. Satisfactory |
| UofL: Health | Delia Baxter Research | 22,680,000 | 0 | 0% | 1. Satisfactory |
| | **TOTAL** | **1,367,022,000** | **420,750,000** | **31%** | |

Totals may differ slightly from other tables due to rounding.

> $10 million
> $1 million

**Table 4.5: UofL Building Systems Ranked by 2007 Dollar Value Renewal Needs**
(figures in millions of dollars)

| SYSTEM NAME | 2007 + backlog ↓ | 2008 | 2009 | 2010 | 2011 | 5-YR TOTAL | 15-YR TOTAL |
|---|---|---|---|---|---|---|---|
| Distribution Systems | 89.828 | 0.126 | 0.003 | 10.629 | 10.017 | 110.603 | 145.359 |
| Electrical Service and Distribution | 28.646 | 0.310 | 5.522 | 1.756 | 7.610 | 43.844 | 55.171 |
| Communications and Security | 15.663 | 7.425 | 1.524 | 3.758 | 1.961 | 30.331 | 73.920 |
| Lighting and Branch Wiring | 14.093 | 0.953 | 0.000 | 3.404 | 0.000 | 18.451 | 26.416 |
| Heat Generating Systems | 10.331 | 0.000 | 0.000 | 0.000 | 1.000 | 11.331 | 11.388 |
| Controls and Instrumentation | 9.783 | 0.430 | 0.082 | 2.487 | 0.000 | 12.782 | 16.013 |
| Domestic Water Distribution | 8.410 | 0.000 | 0.000 | 0.542 | 1.583 | 10.536 | 14.800 |
| Plumbing Fixtures | 7.897 | 0.012 | 0.470 | 0.551 | 1.040 | 9.971 | 11.662 |
| Steam Supply | 7.296 | 0.000 | 0.000 | 0.000 | 0.000 | 7.296 | 51.577 |
| Sanitary Sewer | 4.413 | 0.000 | 0.000 | 0.000 | 0.000 | 4.413 | 4.413 |
| Plumbing | 3.716 | 0.003 | 0.437 | 0.021 | 0.463 | 4.639 | 10.140 |
| Cooling Generating Systems | 3.466 | 0.000 | 0.349 | 0.000 | 0.378 | 4.194 | 10.753 |
| Cooling Distribution | 2.377 | 0.000 | 0.000 | 0.000 | 0.000 | 2.377 | 45.581 |
| Ceiling Finishes | 2.352 | 2.412 | 4.472 | 3.629 | 5.774 | 18.640 | 23.564 |
| Emergency Light and Power Systems | 2.325 | 0.772 | 0.086 | 0.781 | 0.228 | 4.191 | 11.019 |
| Conveying | 2.306 | 0.000 | 0.223 | 0.240 | 0.000 | 2.769 | 7.731 |
| Fire Protection | 2.163 | 1.478 | 2.708 | 0.286 | 0.018 | 6.653 | 11.329 |
| Fittings | 1.298 | 0.293 | 0.121 | 1.501 | 0.370 | 3.583 | 4.244 |
| Roofing | 1.253 | 0.932 | 0.279 | 1.558 | 0.432 | 4.453 | 10.128 |
| Wall Finishes | 1.232 | 1.994 | 1.384 | 9.666 | 6.733 | 21.010 | 47.761 |
| Terminal and Package Units | 0.863 | 0.042 | 0.000 | 0.144 | 0.238 | 1.286 | 3.932 |
| Exterior Windows | 0.641 | 1.107 | 6.725 | 0.942 | 14.526 | 23.942 | 37.166 |
| Exterior Doors | 0.555 | 0.105 | 1.102 | 0.052 | 2.924 | 4.738 | 7.520 |
| Partitions | 0.500 | 0.040 | 0.003 | 0.166 | 2.023 | 2.732 | 19.841 |
| Floor Finishes | 0.422 | 4.748 | 3.803 | 8.060 | 14.454 | 31.486 | 57.848 |
| Grounding Systems | 0.120 | 0.000 | 0.130 | 0.123 | 0.085 | 0.458 | 0.476 |
| Other Plumbing Systems | 0.012 | 0.000 | 0.140 | 0.000 | 0.000 | 0.151 | 1.062 |
| Substructure | 0.000 | 0.001 | 0.000 | 0.000 | 0.042 | 0.043 | 0.382 |
| Equipment and Furnishings | 0.000 | 0.000 | 0.693 | 3.402 | 5.379 | 9.473 | 20.810 |
| Exterior Walls | 0.000 | 0.000 | 0.000 | 0.000 | 0.165 | 0.165 | 0.987 |
| Superstructure | 0.000 | 0.000 | 0.000 | 0.000 | 0.040 | 0.040 | 0.398 |
| Stairs | 0.000 | 0.004 | 0.000 | 0.000 | 0.146 | 0.149 | 0.459 |
| Interior Doors | 0.000 | 0.000 | 0.502 | 0.240 | 2.830 | 3.571 | 10.218 |
| Total | 221.962 | 23.187 | 30.755 | 53.939 | 80.457 | 410.300 | 754.068 |

Totals may differ slightly from other tables due to rounding.

# Section 5. Space Study
# Evaluation of Adequacy and Fit for Continued Use

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## OVERVIEW

Paulien & Associates, Inc. as part of the VFA team, reviewed selected buildings for educational adequacy and fit for continued use as well as reviewed and applied the KCPE Space Needs Model. For the doctoral universities, the Paulien team included an additional team member to evaluate research space. Richard Heinz, a Principal with Research Facilities Design (RFD) of San Diego, California, who specializes in laboratory planning and design, evaluated the research space at the University. The details of this process and methodology are included in the overall KCPE study.

The buildings included in the educational adequacy and fit for continued use study were selected by Council staff and the institution representatives. The outcome of this portion of the overall analyses does not represent an institutional summary – only the outcome for the buildings assessed.

2020 Projections

| | Fall 2004 | 2020 | Percent Increase |
|---|---|---|---|
| Student FTE | 16,759 | 23,816 | 42% |
| Faculty/Staff FTE requiring Office Space | 4,829 | 6,862 | 42% |
| Research Expenditures | $100,548,334 | $400,000,000 | 298% |

The student enrollment, faculty and staff, and research expenditure projections were provided by the Council for use in this study. The only space intended to be included in the Space Needs Model is Educational and General (E&G) space. Therefore all of the assignable square footage (asf) from a particular building may not be included. The Council provided a dataset of the spaces to be included in the model. It was the consultants' understanding that the non E&G spaces were removed. However at individual institutions parking garages, barns, and farm spaces were included. Where possible, the consultants excluded these spaces. Council staff was informed of these anomalies, and agreed that these adjustments should be made.

## FIT FOR CONTINUED USE

The University of Louisville had the consultants assess buildings on the Belknap campus where their arts and sciences, engineering, education, and business programs are located and the Health Sciences Center, which is just on the edge of downtown Louisville. The Shelby campus, which is primarily being developed as a research park, had no buildings that the University of Louisville decided to have assessed for this study. Of the 37 buildings the consultants assessed, there are only two that seem logical candidates for demolition. These include the Engineering Graphics building, which is a former restaurant located in the middle of a parking lot that has some engineering computer labs and a few offices. It just does not seem a desirable building for additional investment. It is 40 years old and should be demolished at the earliest practical date. The other building is Myers Hall, which is the original School of Dentistry. It is at an edge of the Health Sciences campus and directly adjacent to the elevated Interstate 65. This building is multiple stories, has no elevator access, and the top floor has debris on the floor in most of the rooms, in some cases a dropped ceiling is hanging down. That floor has not been viewed as occupiable for some period of time. The other three floors (including basement) are being used primarily by speech pathology and audiology. While Myers contains institutional history, the current uses have nothing to do with that history and the

building does not seem to be an asset to the campus. There may be an option of selling the building. Jefferson Community and Technical College is located directly across the freeway from Myers Hall. University of Louisville should demolish or dispose of this building.

One other building that either needs major renovation or could be a candidate for demolition is Urban Research, which is off the Belknap campus by a couple of blocks. It was a former corporate office building. The suite on the third floor which is occupied by a social work entity does not have elevator access. The other floors are served by an elevator and are in different states of adequacy. There are major problems with the building that should be addressed if it is retained. The building is almost 100 years old.

The University of Louisville asked the consultants to see all research buildings including new ones and there are several that appeared to the consultant to be in very good condition. These include Delia Baxter Research, Donald Baxter Research, and Belknap Research. The University of Louisville Health Sciences Center has stayed with a 650 square foot module for its research labs although the consultants understanding is the next building will utilize a more open concept. It should be noted that there are major health sciences centers that are staying with the individual lab module approach. The consultants felt that the work that has been done in recent buildings is quite impressive and what one would expect to see in state-of-the-art research facilities. The Research Resources building consists of animal quarters, meets AALAC accreditation requirements, appears to be well maintained and is currently being expanded.

Note Regarding Demolition:
The criteria that would cause a recommendation of demolition are different than the Lifecycle Conditions Assessment criteria set forth by VFA for this project. The criteria used for this portion of this assessment has to do with educational adequacy and fit for continued use and building design as it relates to these issues. While the building's physical condition was overviewed as part of this assessment it was done from the point of educational adequacy, land usage, etc., and what could/should be done to enhance the educational experience and the campus environment.

The University of Louisville has made a strong effort to provide ADA accessibility to many of the older buildings. The consultants were particularly impressed with the elevator tower in Patterson Hall that provided a very nice elevator lobby and matches the 120-year-old building façade quite well. The University of Louisville has a cluster of academic buildings that are all 120 or more years old. They are in different states of educational adequacy. A number of them need major renovation. They all seem assets to the campus, especially because they form a cluster. The consultants recommend that the classroom uses on the upper floors of these buildings be carefully evaluated and when possible removed as these buildings seem to lend themselves better to office space uses. While there are elevators in the buildings they have a small capacity load and are slow. Occupants indicate to the consultants that students tend to use the stairs even when their classes are on an upper floor of one of these buildings.

Another issue at the University of Louisville is that large buildings that were built in the 1970's on the Belknap campus usually only have one elevator. At the time this was adequate. It was assumed that students would use the stairs and the elevators were there for a mix of service use and handicapped accessibility. Now in some cases it is very inconvenient to get from the elevator to certain parts of the building adding additional elevators over time would be highly desirable.

Hallway lighting is very dark in several of the buildings. Davidson is the darkest the consultant saw on this entire project. Bingham Humanities is a very strong architectural statement from the early 1970's. The architects intended there to be a significant reliance on natural light in the hallways. The day the consultants evaluated the building was a cloudy, rainy day and the hallways were very dark during the morning hours. There is a fairly extensive use of incandescent lights in hallways, which would be a desirable changeover to non-incandescent fixtures for better energy use and a better lighting result.

The College of Education building which is 25 years old does not serve the education program well. It does not have the specialized facilities one would normally expect to see at a college of education at a

Metropolitan Research I university and there is a glaring code problem with the open stairwell in the main lobby which has a concrete element at approximately six feet off the ground which can result in persons hitting their heads on this. Code requires a seven foot clearance.

The Business building is approximately 20 years old. It is a strong architectural statement of its era. It has a multi-story atrium and substantial natural light into the atrium. From a fairly thorough tour of the building it appears that the School of Business is in need of additional space, but from the key evaluation points, the building appeared to be in relatively good educational adequacy.

## *Summary of Evaluation of Adequacy and Fit for Continued Use Outcomes*

| Building Name / No. | ASF in Space Model | Building Age | Rating | Recommended Action | Gross Sq. Ft. |
|---|---|---|---|---|---|
| **University of Louisville** | | | | | |
| Baxter Research • 055E | 66,267 | 7 | 3.9 | None | 113,577 |
| Belknap Researc • 0004 | 50,092 | 1 | 4.0 | None | 103,621 |
| Bingham Humanit • 0017 | 49,821 | 33 | 1.8 | Major Renovation | 109,554 |
| Brigman Hall • 0002 | 10,058 | 119 | 2.0 | Major Renovation | 21,030 |
| Chemistry Build • 0036 | 68,095 | 25 | 2.1 | Major Renovation | 110,578 |
| College Of Educ • 0084 | 55,007 | 25 | 1.5 | Major Renovation | 95,479 |
| Davidson Hall • 0087 | 49,195 | 32 | 2.4 | Major Renovation | 90,731 |
| Delia Baxter Re • 055F | 70,353 | 3 | 3.9 | None | 125,841 |
| Dougherty Hall • 0029 | 17,014 | 61 | 2.0 | Major Renovation | 30,697 |
| Engineering Gra • 0037 | 2,005 | 41 | 1.6 | Demolition | 3,043 |
| Ernst Hall • 0033 | 26,185 | 39 | 1.9 | Major Renovation | 48,231 |
| Ford Hall • 0007 | 6,800 | 131 | 2.4 | Minor Renovation | 12,345 |
| Gardiner Hall • 0008 | 13,398 | 134 | 1.6 | Major Renovation | 24,766 |
| Gottschalk Hall • 0010 | 5,847 | 119 | 1.1 | Major Renovation and Assign to a New Use | 10,842 |
| Health Sciences • 055B | 64,543 | 36 | 2.8 | Major Renovation | 108,405 |
| J.B. Speed Hall • 0030 | 23,571 | 64 | 2.2 | Major Renovation and Assign to a New Use | 40,974 |
| Jouett Hall • 0006 | 5,242 | 120 | 2.0 | Major Renovation | 9,591 |
| Kersey Library • 0028 | 26,293 | 60 | 3.4 | Major Renovation and Assign to a New Use | 33,482 |
| K-Wing • 059B | 49,787 | 16 | 2.8 | Minor Renovation | 108,211 |
| KY Lions Eye Re • 0056 | 34,426 | 37 | 1.3 | Major Renovation | 80,660 |
| Life Sciences • 0018 | 66,392 | 37 | 2.3 | Major Renovation | 117,772 |
| MDR Building • 0051 | 61,865 | 44 | 1.7 | Major Renovation and Assign to a New Use | 113,293 |
| Myers Hall • 0058 | 8,610 | 106 | 1.4 | Demolition | 27,276 |
| Natural Science • 0034 | 52,642 | 53 | 1.8 | Major Renovation and Assign to a New Use | 87,410 |
| Oppenheimer Hal • 0005 | 5,026 | 121 | 2.6 | Major Renovation | 10,979 |
| Patterson Hall • 0003 | 5,098 | 119 | 2.1 | Minor Renovation | 9,370 |
| Paul C. Lutz Ha • 0023 | 47,241 | 11 | 2.9 | Minor Renovation | 89,746 |
| Research Resour • 0057 | 9,570 | 16 | 3.4 | None | 37,069 |
| Sackett Hall • 0031 | 16,189 | 58 | 2.0 | Major Renovation and Assign to a New Use | 24,119 |
| Schneider Hall • 0020 | 51,580 | 49 | 2.1 | Major Renovation or Major Renovation and Assign to a New Use | 65,765 |
| School Of Busin • 0090 | 60,718 | 21 | 3.4 | Major Renovation | 121,253 |
| School Of Denti • 055C | 80,535 | 36 | 2.6 | Major Renovation | 197,351 |
| School Of Medic • 055A | 74,542 | 36 | 2.7 | Major Renovation | 174,956 |
| Urban Research • 0043 | 18,390 | 94 | 2.3 | Major Renovation or Demolition | 38,927 |
| Vogt Building • 0099 | 18,155 | 19 | 3.7 | Minor Renovation | 33,486 |
| W.S. Speed Hall • 0032 | 27,451 | 49 | 1.8 | Major Renovation | 39,531 |
| **Total ASF** | **1,298,003** | **Total ASF in Space Model:** 2,476,144 | | | **2,469,961** |
| *No. of Buildings Assessed: 36* | | ***Total ASF as a Percent of Total ASF in Space Model:*** *52%* | | | |
| **Average** | | **55** | **2.4** | ***Most Recommended Action:*** *Major Renovation* | |

***Rating Scale:*** Unsatisfactory = 1; Somewhat Unsatisfactory = 2; Somewhat Satisfactory = 3; Very Satisfactory = 4

## Estimated Renovation Costs

| Building Name / No. | Gross Sq. Ft. | Renovation Type | Renovation Costs |
|---|---|---|---|
| Baxter Research • 055E | 113,577 | None | $0 |
| Belknap Researc • 0004 | 103,621 | None | $0 |
| Bingham Humanit • 0017 | 109,554 | Category 4, Major | $16,433,100 |
| Brigman Hall • 0002 | 21,030 | Category 3, Major | $1,577,250 |
| Chemistry Build • 0036 | 110,578 | Category 3, Major | $8,293,350 |
| College Of Educ • 0084 | 95,479 | Category 3, Major | $7,160,925 |
| Davidson Hall • 0087 | 90,731 | Category 3, Major | $6,804,825 |
| Delia Baxter Re • 055F | 125,841 | None | $0 |
| Dougherty Hall • 0029 | 30,697 | Category 4, Major | $4,604,550 |
| Engineering Gra • 0037 | 3,043 | Demolition @ $30 | $91,290 |
| Ernst Hall • 0033 | 48,231 | Category 4, Major | $7,234,650 |
| Ford Hall • 0007 | 12,345 | Category 4, Major | $1,851,750 |
| Gardiner Hall • 0008 | 24,766 | Category 4, Major | $3,714,900 |
| Gottschalk Hall • 0010 | 10,842 | Category 4, Major | $1,626,300 |
| Health Sciences • 055B | 108,405 | Category 4, Major | $16,260,750 |
| J.B. Speed Hall • 0030 | 40,974 | Category 4, Major | $6,146,100 |
| Jouett Hall • 0006 | 9,591 | Category 4, Major | $1,438,650 |
| Kersey Library • 0028 | 33,482 | Category 4, Major | $5,022,300 |
| K-Wing • 059B | 108,211 | None | $0 |
| KY Lions Eye Re • 0056 | 80,660 | Category 4, Major | $12,099,000 |
| Life Sciences • 0018 | 117,772 | Category 4, Major | $17,665,800 |
| MDR Building • 0051 | 113,293 | Category 4, Major | $16,993,950 |
| Myers Hall • 0058 | 27,276 | Demolition @ $30 | $818,280 |
| Natural Science • 0034 | 87,410 | Category 4, Major | $13,111,500 |
| Oppenheimer Hal • 0005 | 10,979 | Category 4, Major | $1,646,850 |
| Patterson Hall • 0003 | 9,370 | Category 4, Major | $1,405,500 |
| Paul C. Lutz Ha • 0023 | 89,746 | Category 1, Minor | $2,243,650 |
| Research Resour • 0057 | 37,069 | None | $0 |
| Sackett Hall • 0031 | 24,119 | Category 4, Major | $3,617,850 |
| Schneider Hall • 0020 | 65,765 | Category 4, Major | $9,864,750 |
| School Of Busin • 0090 | 121,253 | Category 3, Major | $9,093,975 |
| School Of Denti • 055C | 197,351 | Category 4, Major | $29,602,650 |
| School Of Medic • 055A | 174,956 | Category 4, Major | $26,243,400 |
| Urban Research • 0043 | 38,927 | Category 4, Major | $5,839,050 |
| Vogt Building • 0099 | 33,486 | Category 1, Minor | $837,150 |
| W.S. Speed Hall • 0032 | 39,531 | Category 3, Major | $2,964,825 |
| **Total GSF Assessed** | **2,469,961** | | **$242,308,870** |
| *No. of Buildings Assessed:* | *36* | | |

***Renovation Costs per GSF:*** Category 1, Minor - $25; Category 2, Minor - $50; Category 3, Major - $75; Category 4, Major - $150; Demolition - $20 or $30

## *Research Laboratories*

During the Paulien team's assessment review of the existing science facilities, several elements common to modern science facilities were considered as part of the evaluation criteria. These elements include:

- *Floor-to-Floor Height*
  Contemporary science buildings generally have a floor-to-floor height of 14' to 16' in order to provide adequate vertical clearance for the distribution of mechanical, plumbing and electrical systems with a deep enough structure to provide good vibration resistance while allowing for a reasonable finished ceiling height. Many newer science facilities are using pendant hung direct/indirect lighting fixtures for better light distribution which tend to require ceiling heights of 9'-6" or higher.

  At the University of Louisville, the newest science building on main campus, the Belknap Research Building, has a floor-to-floor height of 16'-0", while many of the older facilities have much tighter floor-to-floor dimensions. The newest science buildings at the University of Louisville Health Sciences Center, the Delia Baxter Research Building and the Donald Baxter Research Building, each have a floor-to-floor height of 14'-8".

- *Modular Planning*
  One of the fundamental planning methodologies to accommodate flexibility in science facilities is the concept of 'modular planning'. Laboratories should be organized around modular planning principles so that they are developed with standardized units or dimensions for adaptability and a variety of uses. Modular planning is used as an organizational tool to allocate space within a building. The module establishes a grid by which building structure, architectural partitions, laboratory casework, and primary utility routings are located. As modifications are required because of changes in laboratory use, instrumentation, or departmental organization, partitions can be relocated, doors moved, and laboratories expanded into larger laboratory units or contracted into smaller laboratory units without requiring modification of building structural elements or major reconstruction of building electrical and mechanical elements.

  The module is based on the bench space (width and length) required for work stations, instruments, and procedures. The space required between benches or tables is designed to allow people to work back-to-back at adjacent benches, to allow for accessibility for disabled and still allow for movement of people and laboratory carts in the aisle.

  Common planning module dimensions in modern science facilities are 10'-6" to 11'-0" in width by 28'-0" to 32'-0" in depth. This module will generally provide adequate bench space plus space for floor standing equipment and fume hoods, and can be divided for smaller support spaces such as equipment and instrument rooms.

  For purposes of our assessment review, it was important to keep in mind that research laboratories are much more adaptable to alternative room proportions and column locations than teaching laboratories, where optimal proportions are more critical for sightlines to instructional media such as chalk or white boards, projections screens and demonstration tables while maintaining a column-free space.

  Many of the older science facilities at the University of Louisville have module dimensions that are too narrow and/or too shallow to properly accommodate 21st century science in a safe, functional and efficient manner. (See the Laboratory Building Assessment Summaries tables listing the approximate key module dimensions or structural column spacing for the buildings included in this assessment review.)

## Laboratory Building Assessment Summary

| Building Number | Building Name | Floor to Floor Height | Floor to Floor Rating | Module Size/ Column Spacing | Module Size Rating |
|---|---|---|---|---|---|
| 4 | Belknap Research Building | 16'-0" | Excellent | 21' x 28'-10" | Very Good |
| | | 22' @ 1st floor | Excellent | | |
| 18 | Life Sciences Building | 13'-0 3/4" | Fair | 22' x 35' | Very Good |
| 20 | Schneider Hall | 9'-5 1/4" Lower flr | Poor | Varies/Shallow | Poor |
| | | 12'-0" Main flr | Poor | | |
| 23 | Paul C. Lutz Hall | 12'-0" 1st/2nd flrs | Poor | 10'-6" x 30' | Very Good |
| | | 16'-0" Bmt/3rd flrs | Excellent | | |
| 28 | Kersey Library | N/A | Poor | No drawings provided | Poor |
| 30 | J.B. Speed Hall | 12'-3" | Poor | Varies/Shallow | Poor |
| 31 | Sackett Hall | 13'-1 1/2" | Fair | Varies/Shallow | Poor |
| 32 | W.S. Speed Hall | N/A | Poor | Varies/Shallow | Poor |
| 33 | Ernst Hall | 14'-0" 1st flr | Good | Inconsistent | Poor |
| | | 12'-0" 2nd/3rd flrs | Poor | | |
| 34 | Natural Science Builidng | 11'-6" | Poor | Varies/Shallow | Poor |
| 36 | Chemistry Building | 14'-0" | Good | 30' deep | Good |
| 37 | Engineering Graphics | N/A | Poor | N/A | Poor |
| 43 | Urban Research | N/A | Poor | Varies/Shallow | Poor |
| 50B | K-Wing | Varies 13'-1" to 14'-6" | Fair/Good | Varies | Poor/Fair |
| 51 | MDR Building | 12'-0" | Poor | Very Shallow | Poor |
| 55A | School of Medicine | 13'-0" | Fair | 10' x 22' | Poor |
| 55B | Health Sciences Building | 14'-0" | Good | Varies | Fair |
| 55C | School of Dentistry | 14'-0 | Good | Varies | Fair |
| 55E | Donald Baxter Research Building | 14'-8" | Good | 10'-6" x 29'-0" | Very Good |
| 55F | Delia Baxter Research Building | 14'-8" | Good | 10'-6" x 29'-0" | Very Good |
| 56 | KY Lions Eye Research Institute | 12'-0" B/1st flrs | Poor | Very Shallow-old bldg | Poor |
| | | 15'-0" 2nd/3rd flrs | Excellent | 10' x 24' - new bldg | Fair |
| 57 | Research Resources Center | Interstitial flr above | Good | N/A | N/A |
| 58 | Myers Hall | N/A | Poor | Varies/Shallow | Poor |
| 87 | Davidson | 15'-0" | Excellent | 35' x 35' | Fair |
| 99 | Vogt Building | 20'-0" 1st flr | Excellent | 20' x 28' | Fair/Good |
| | | 15'-4" 2nd flr | Excellent | | |

*Note: Floor to floor height and module dimensions are approximate, based on review of drawings and observation of field conditions. This data should not be relied upon for accuracy, but is provided for general indication of appropriateness of the facilities for continued use for laboratory functions in comparison with contemporary industry standards.*

*Prepared by:* **Research Facilities Design**

### *Trends in Undergraduate Science Facilities*

Over the past two decades, significant changes have evolved in undergraduate science programs throughout the country. One of the major catalysts for reform has been the organization known as Project Kaleidoscope (PKAL) in Washington, DC. In 1989, PKAL was founded with grant funding from the National Science Foundation (NSF) to study 'what works' in science education. PKAL discovered that 'what works' in science education is a hands on, laboratory rich environment in which students learn science by doing science. Thus, a trend has evolved in which there has been an increased emphasis on laboratory experience and collaborative work where students are more active participants in the learning process.

Another trend has been the integration of technology to support and enhance the laboratory experience. Computers and other electronic instruments have proliferated in the laboratories and support spaces, requiring more bench space and access to IT systems. Multi-media audiovisual equipment is becoming commonplace not only in classrooms, but in the teaching laboratories as well. This is related to another trend of greater integration of laboratory and lecture activities within the same space. Although lecture sections comprised of multiple laboratory sections are still the norm, particularly at larger institutions, the integration of lecture/discussion activities within the teaching laboratory is becoming increasingly common. This requires proper room proportions and clear sightlines to allow visibility to the 'teaching wall' including chalk or marker boards, projection screens and other educational technology.

Scientific collaboration is another important trend observed in recent years. This can take many forms, including provision of adequate Faculty/Student Research Laboratories and spaces for interaction among faculty and students outside of the laboratories. There has been an increased recognition of the importance of these interaction spaces for student study and as places to 'hang out' waiting for a class or to meet a faculty member. They can also provide a safe haven for consumption of food and drink outside of the laboratory environment. Another form of collaboration is how the building 'engages' the occupants and visitors in the 'Celebration of Science' with places for display of student posters, incorporation of scientific art, displays of collections or scientific artifacts, and the use of interior windows to put 'science on display'. A key to the development of an effective undergraduate science facility is creating an environment where students and faculty want to be, resulting in an 'active' building.

These and other relevant evaluation criteria were used as a 'benchmark' against which the Paulien team assessed the suitability of the University of Louisville science and engineering laboratory buildings for continued use in support of laboratory related functions.

## SPACE NEEDS MODEL

The Fall 2004 application of the space needs model showed UofL with a need of approximately 645,000 ASF, representing a 26% deficit. The greatest need for space is in the research laboratory category with a deficit of about 390,000 ASF. Office, physical education and recreation, and support spaces also have significant deficits. While there is a shortage of teaching laboratory space, some of this shortage can be offset with the open laboratory surplus. Both of these categories represent the total need for instructional laboratories. Combining the lack of teaching laboratory space with the surplus of open laboratory space, results in an overall deficit of approximately 18,000 ASF.

Applying the space needs model to the 2020 projections shows a significant space need in all space types. The deficit is slightly larger than all the existing E&G space at UofL. The 2.55 million need of space is approximately 4.11 GSF of new construction. As with the 2004 application, the largest deficits of space are in the research laboratory and office space categories.

## Space Needs Model Application

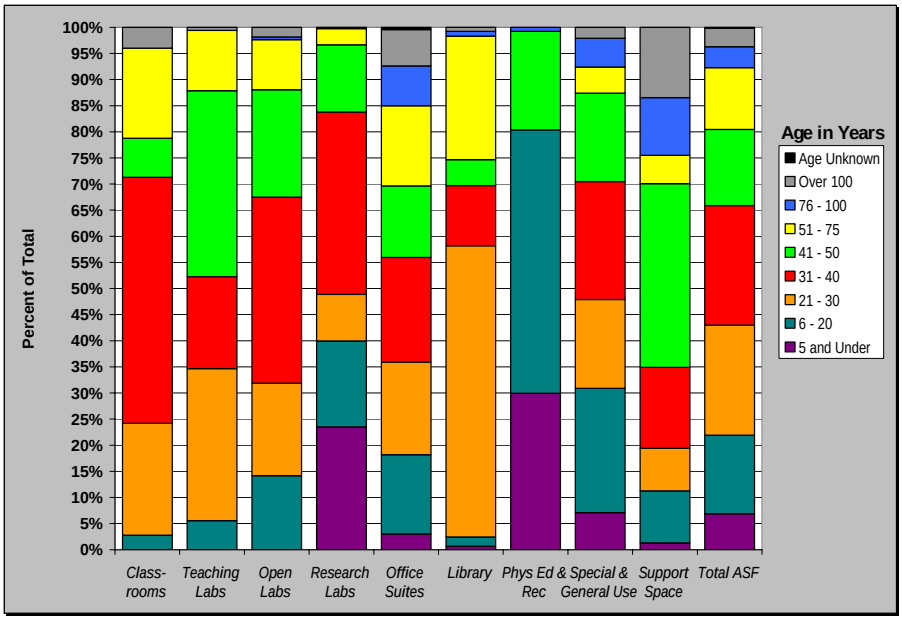
| Space Category | Existing ASF | Fall 2004 Student FTE = 16,759 Staffing FTE = 4,829 Research Expenditures = $100,548,334 Guideline ASF | Surplus/ (Deficit) | Percent Surplus/ (Deficit) | 2020 Student FTE = 23,816 Staffing FTE = 6,862 Research Expenditures = $400,000,000 Guideline ASF | Surplus/ (Deficit) | Percent Surplus/ (Deficit) |
|---|---|---|---|---|---|---|---|
| Classrooms & Service<br>*10 ASF/Student FTE* | 131,289 | 167,590 | (36,301) | (28%) | 238,160 | (106,871) | (81%) |
| Teaching Laboratories<br>*8 ASF/Student FTE* | 88,970 | 134,072 | (45,102) | (51%) | 190,528 | (101,558) | (114%) |
| Open Laboratories<br>*8 ASF/Student FTE* | 161,456 | 134,072 | 27,384 | 17% | 190,528 | (29,072) | (18%) |
| Research Laboratories<br>*900 ASF/$100,000 for first $50M in R&D Expenditures; 600 ASF/$100,000 for $50M-$100M R&D Expenditures; 350 ASF/$100,000 over $100M in R&D Expenditures* | 362,219 | 751,919 | (389,700) | (108%) | 1,800,000 | (1,437,781) | (397%) |
| Office Suites<br>*195 ASF/Staff FTE* | 865,002 | 941,655 | (76,653) | (9%) | 1,338,090 | (473,088) | (55%) |
| Library<br>*No Standard* | 333,483 | 333,483 | 0 | 0% | 333,483 | 0 | 0% |
| Physical Education & Recreation<br>*12.10 ASF for 100% Undergraduate Student FTE, 25% of Graduate FTE, and 15% of Staffing FTE (75,000 ASF minimum)* | 100,014 | 171,982 | (71,968) | (72%) | 244,399 | (144,385) | (144%) |
| Special Use & General Use Space<br>*21 ASF/Student FTE* | 366,834 | 351,939 | 14,895 | 4% | 500,136 | (133,302) | (36%) |
| Support Space<br>*8 ASF/Student FTE plus 4 ASF/Student FTE if land grant mission* | 66,877 | 134,072 | (67,195) | (100%) | 190,528 | (123,651) | (185%) |
| **TOTAL** | **2,476,144** | **3,120,784** | **(644,640)** | **(26%)** | **5,025,852** | **(2,549,708)** | **(103%)** |

*ASF = Assignable Square Feet*

# EXISTING E&G SPACE

### *Age of Existing E&G Facilities*

Approximately 43% of UofL's space is about 30 years old and younger. About 38% of its space is between 30 and 50 years old and less than 20% of its space is over 50 years old. The support space category has about 65% of its facilities in buildings that are more than 40 years old.



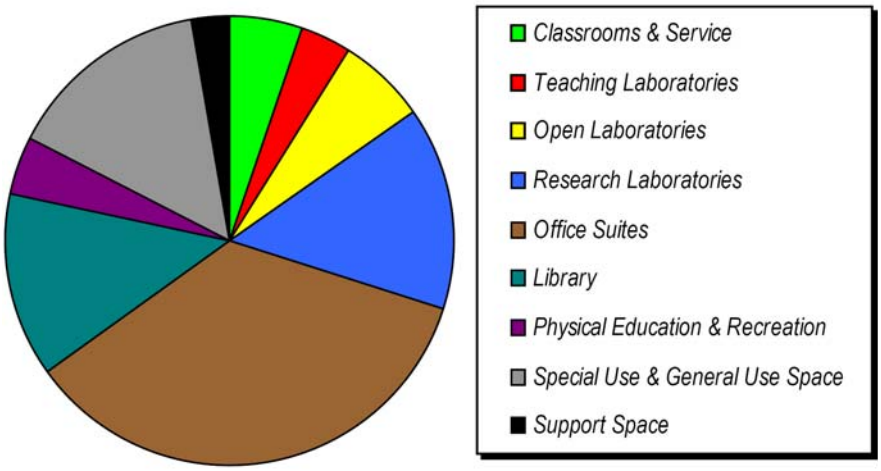
## *Comparison of E&G Space to KCPE Doctoral Universities Average*

UofL has 148 ASF per Student FTE which is approximately 12% lower than the KCPE Doctoral University average. With the exception of the open laboratory, library, physical education and recreation, and special use and general use space categories, all other categories are at the low range for KCPE Doctoral Universities.

| | Existing E&G Facilities | | KCPE Doctoral Universities | |
|---|---|---|---|---|
| Space Category | ASF per Student FTE | % of Total | Average ASF per Student FTE | Range of ASF |
| Classrooms & Service | 8 | 5% | 9 | *8 - 10* |
| Teaching Laboratories | 5 | 4% | 7 | *5 - 9* |
| Open Laboratories | 10 | 7% | 8 | *6 - 10* |
| Research Laboratories | 22 | 15% | 29 | *22 - 36* |
| Office Suites | 52 | 35% | 57 | *52 - 63* |
| Library | 20 | 13% | 19 | *18 - 20* |
| Physical Education & Recreation | 6 | 4% | 6 | *5 - 6* |
| Special Use & General Use Space | 22 | 15% | 22 | *21 - 22* |
| Support Space | 4 | 3% | 14 | *4 - 23* |
| **TOTAL** | **148** | **100%** | **169** | **148 - 191** |

## *Distribution of Existing E&G Space by Space Category*

Fifty percent (50%) of UofL's space is in office space and research space (35% and 15% of total respectively). Only 16% of its space is instructional space (classrooms and all instructional laboratory categories). Another 15% of its space is in the special use and general use space category.




*NOTE: The percentages are found in the "Percent of Total" column in the table above.*

# Section 6: 15 Year Capital Plan

The 15-year Capital Plan presented in this section incorporates all three portions of the study – condition, space adequacy & space capacity. Condition and space funding needs are presented separately first, and then aggregated together to show the total funding needed for the university facilities included in the study. In addition, two views of the spending pattern are shown:

**Table 6.1: UOFL 15-year Actual Capital Needs**

Data supports Figures 6.2 through 6.4. Note: In 2007 dollars, Inflation factor set to 0%.

| Funding Year | Condition Needs | Space - Adequacy | Space - Current Capacity | Space - Future Capacity | Total Funding |
|---|---|---|---|---|---|
| 2007 | $ 221,467,726 | $ 242,309,000 | $ 375,281,000 | $ - | $ 839,059,733 |
| 2008 | 22,682,966 | - | - | - | 22,684,974 |
| 2009 | 30,238,727 | - | - | - | 30,240,736 |
| 2010 | 53,475,011 | - | - | - | 53,477,021 |
| 2011 | 80,116,633 | - | - | - | 80,118,644 |
| 2012 | 12,038,183 | - | - | 87,284,000 | 99,324,195 |
| 2013 | 8,068,824 | - | - | 91,648,000 | 99,718,837 |
| 2014 | 22,146,695 | - | - | 96,012,000 | 118,160,709 |
| 2015 | 30,331,969 | - | - | 100,377,000 | 130,710,984 |
| 2016 | 31,805,296 | - | - | 104,741,000 | 136,548,312 |
| 2017 | 23,653,655 | - | - | 109,105,000 | 132,760,672 |
| 2018 | 103,786,951 | - | - | 113,469,000 | 217,257,969 |
| 2019 | 17,286,447 | - | - | 117,833,000 | 135,121,466 |
| 2020 | 52,564,577 | - | - | 122,198,000 | 174,764,597 |
| 2021 | 26,107,982 | - | - | 126,562,000 | 152,672,003 |
| Total | $ 735,771,642 | $ 242,309,000 | $ 375,281,000 | $ 1,069,229,000 | $ 2,422,620,852 |

ENDING FCI = 0%

- **Actual** – with spending assumed to vary to meet the annual dollar amount predicted by the forecasts each year;
- **Strategic** – with spending aligned to meet strategic goals recommended by the consultants for each five year period of the 15-year plan. The strategic goals and timeframes can be adjusted to match priorities set by the Council and the institutions.

## Actual Needs

The "actual needs" summarized here depict the amount of capital investment estimated to be needed in each of the next fifteen years based on the consultant team's professional opinion of when each need would come due. The needs are broken out by three reasons that investment might be required: (a) to address system renewals that are driven by poor physical condition (orange for first year, red in later years), (b) to address space adequacy issues preventing a facility from being utilized in its highest and best use by current educational standards (green), and (c) to grow space capacity to meet current (light blue) and future (dark blue) enrollment projections.

Based on condition alone, University of Louisville's Lifecycle Condition Assessments identified $221 million in deferred capital renewals due in or before 2007, and $408 million by 2011, creating a starting 5-Year FCI of 31% (next 5-year renewal needs / current replacement value).

Spending that amount would reduce the FCI to zero and bring all assessed facilities into excellent condition. Maintaining an FCI level = 0% forecasts needing an additional $328 million in capital renewals over the following 10 years, for a 15-year total capital renewal need of $736 million. (Note: All in 2007 dollars; Inflation factor = 0%.)

If the university funded the capital renewals in the exact years each renewal is forecast to be due, the investment pattern would look like Figure 6.2.

The Space Study identified $242 million needed to make selected buildings fit-for-continued-use, plus $375 million needed for E&G buildings to meet current enrollment capacity, and $1.069 billion needed for E&G buildings to meet the 2020 enrollment projections. Figure 6.3 shows capital investments based on space needs, including investment in future capacity starting in the second 5-year period, and growing modestly over the following 10 years until all space capacity needs are met by 2021.

When aggregated together, the condition + space needs of the University look like the spend pattern shown in Figure 6.4, totaling $2.42 billion (in 2007 dollars, inflation = 0%).

**Figure 6.2: University of Louisville**
**15 Year Facilities Capital Plan**
**Actual Renewal Costs for Assessed Facilities**

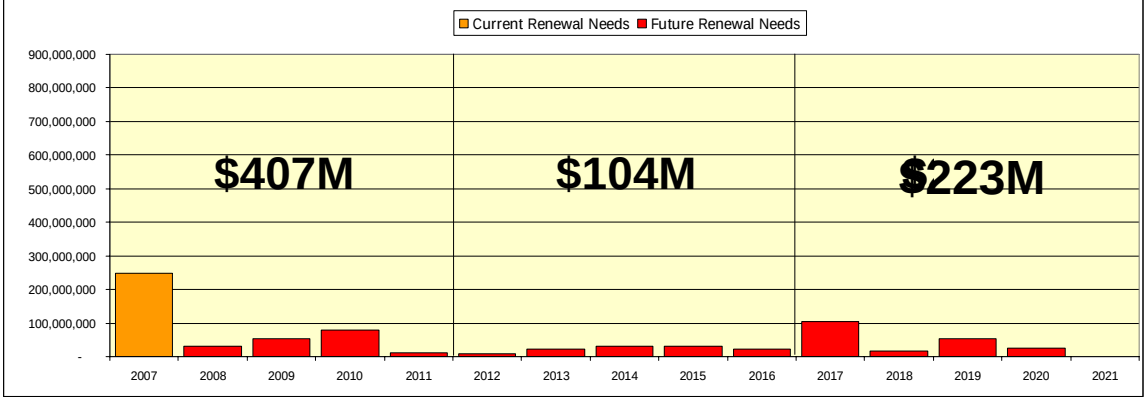



**Figure 6.3: University of Louisville**
**15 Year Facilities Capital Plan**
**Actual Space Needs**

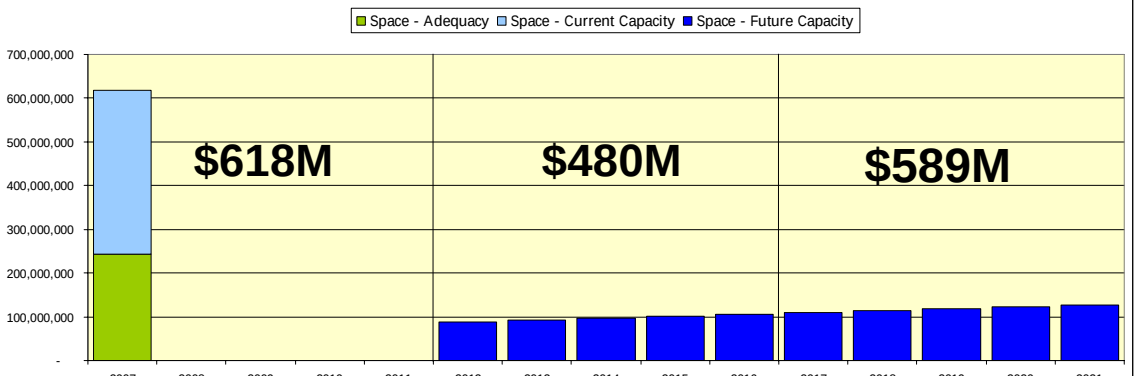
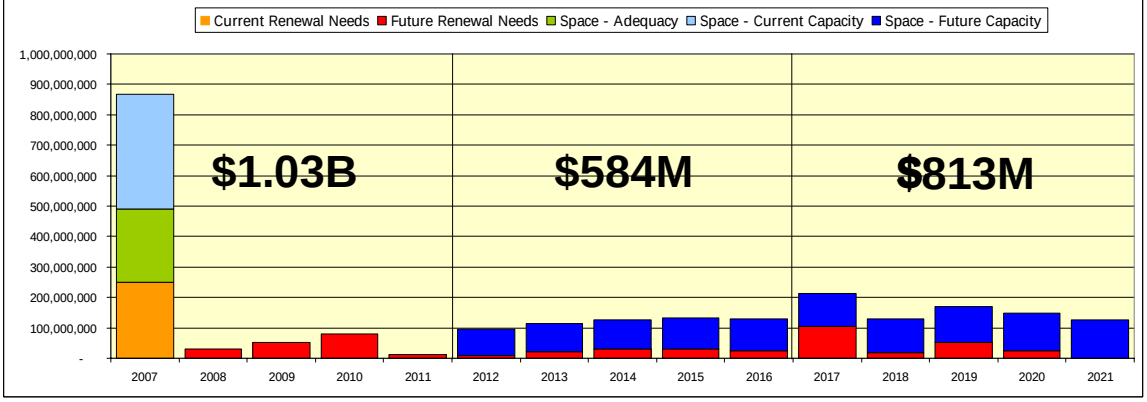



**Figure 6.4: University of Louisville**
**15 Year Facilities Capital Plan**
**Aggregated Space + Renewal Costs**



## Funding to Meet Strategic Goals

The consultants' team believes the spending pattern depicted in Figure 6.4 to be difficult to achieve – it is unlikely KPES and the institutions could mobilize the financial, facility planning and project management resources necessary to make such a high level of investment in year 1 of a 15 year plan.

**Table 6.5: UOFL 15-year Strategic Capital Investments**

Data supports Figures 6.6 through 6.8. Note: In 2007 dollars, Inflation factor set to 0%.

| Funding Year | Condition Needs | Space - Adequacy | Space - Current Capacity | Space - Future Capacity | Total Funding |
|---|---|---|---|---|---|
| 2007 | $ 83,096,000 | $ 48,462,000 | $ - | $ - | $ 131,558,000 |
| 2008 | - | 48,462,000 | 87,275,000 | - | 135,737,000 |
| 2009 | - | 48,462,000 | 91,638,000 | - | 140,100,000 |
| 2010 | - | 48,462,000 | 96,002,000 | - | 144,464,000 |
| 2011 | - | 48,462,000 | 100,366,000 | - | 148,828,000 |
| 2012 | 59,571,000 | - | - | 87,284,000 | 146,855,000 |
| 2013 | 58,266,000 | - | - | 91,648,000 | 149,914,000 |
| 2014 | 56,962,000 | - | - | 96,012,000 | 152,974,000 |
| 2015 | 55,657,000 | - | - | 100,377,000 | 156,034,000 |
| 2016 | 54,352,000 | - | - | 104,741,000 | 159,093,000 |
| 2017 | 53,048,000 | - | - | 109,105,000 | 162,153,000 |
| 2018 | 51,743,000 | - | - | 113,469,000 | 165,212,000 |
| 2019 | 50,438,000 | - | - | 117,833,000 | 168,271,000 |
| 2020 | 49,133,000 | - | - | 122,198,000 | 171,331,000 |
| 2021 | 47,829,000 | - | - | 126,562,000 | 174,391,000 |
| | $ 620,095,000 | $ 242,310,000 | $ 375,281,000 | $ 1,069,229,000 | $ 2,306,915,000 |

ENDING 1-Year FCI = 10%

Further, while the 2007 backlog of deferred capital renewals, space adequacy and space capacity needs are real today, the dates for future renewals and capacity investments are only forecasts – the exact year each is required can be adjusted if aligned with careful maintenance practices and space use assignments. Thus, spreading the investment out is a reasonable, and practical, goal.

To best manage the capital investment, UofL should establish some high level programmatic goals for capital investments. The goals should represent a 'blended' approach to address all three causes for facilities investments: condition, adequacy and capacity. The consultants propose the following strategic capital funding goals:

1. **Fit-for-Use in 5 Years:**
   Bring all facilities up to Fit-for-Continued-Use standards within the first 5 years. (Table 6.5, green column, with spending averaged over 5 years.)

2. **All "Good" Condition within 10 Years:**
   Reduce the backlog of deferred capital renewals to 10% (all buildings in "good" condition) over the first 10 years, and maintain a 10% FCI thereafter. (Table 6.5 red column. Note this is less than "Actual Needs" shown in Table 6.1 because the investment is spread out over more years (rather than invest immediately when predicted the need with come due), and maintaining 10% FCI is a reasonable goal. (Maintaining 0% FCI is not reasonable.)

3. **Invest Regularly to Build Capacity:**
   Invest regularly to build space capacity, addressing current capacity needs over first 5 years (light blue) then, starting in year 6 (dark blue) growing with enrollment through year 15.

Table 6.8 summarizes the investment pattern required to meet the proposed strategic goals. (Note that the total spent for Condition is less than in Table 6.4, because Goal 2 allows for carrying forward 10% of the current replacement value in renewals.)

To meet the proposed strategic goals, the System's 15-year capital investment would be $2.3 billion (in 2007 dollars, inflation = 0%).

Establishing funding needs that align with priorities this way will enable UofL to better access various funding sources, which are frequently targeted at specific initiatives or available at more favorable terms when pooled with similarly grouped needs from multiple Kentucky public postsecondary education institutions. Section 7 includes a more detailed discussion of funding sources potentially available to KPES and UofL.

**Figure 6.6: University of Louisville**
**15 Year Facilities Capital Plan**
**Strategic Investment in Renewal Costs**

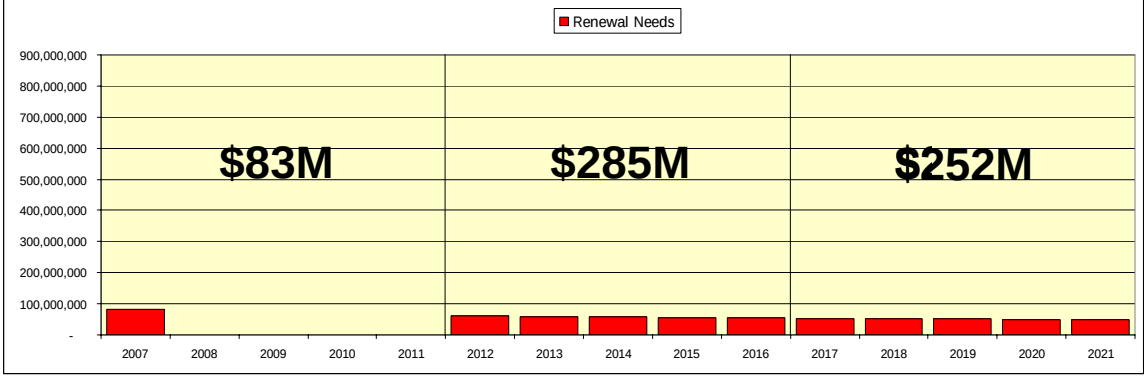



**Figure 6.7: University of Louisville**
**15 Year Facilities Capital Plan**
**Strategic Investment in Space Needs**

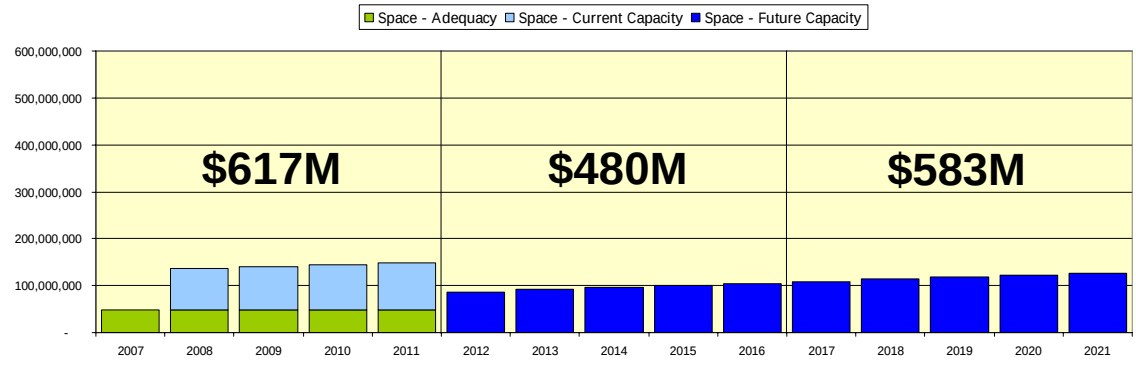
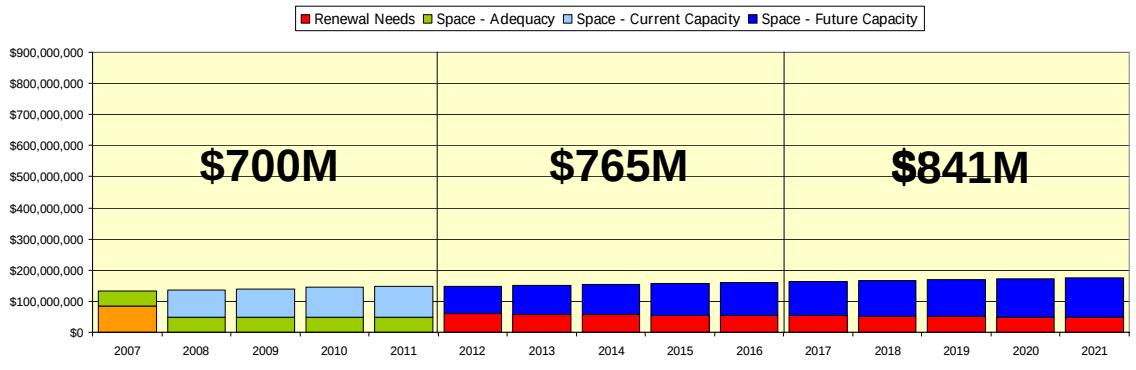



**Figure 6.8: University of Louisville**
**15 Year Facilities Capital Plan**
**Strategic Investment in Aggregated Space + Renewal Costs**



# Section 7:
# Financing of Physical Facilities

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## INTRODUCTION

Physical plant represents the primary asset of most institutions of higher education. Many facilities were built in response to the enrollment growth of the baby-boom generation. These buildings are now of an age where they need either replacement or considerable renovation if they are to meet current needs. In addition, programmatic additions and mission changes (such as increased emphasis on research) create needs for additional facilities even under conditions of enrollment stability. These factors, and likely others, create ongoing requirements for financial resources that can be devoted to replacement, renewal, or expansion of an institution's stock of physical assets.

This need for resources comes at a time when state governments, the primary source of capital funding for public institutions, are under considerable pressure to reduce tax burdens and/or to fund competing programs. This requires institutions to look further afield for sources of funds for capital projects. This brief white paper explores the array of alternatives and some of the financing mechanisms that are commonly employed. The paper employs a simple conceptual schema with three components:

- Potential Sources of Revenue
- Uses of Revenues
- Financing Mechanisms

The schema is shown diagrammatically in Table 7.1.

This schema reflects the realities that:

- Institutions have multiple sources that can be tapped for capital projects.
- Different sources are often aligned with different uses (the specifics in this regard will be explored later in the paper).
- There are different kinds of uses (renewal vs. new, auxiliary facilities versus general academics). Different finance mechanisms are often used with the financing of these different kinds of facilities.

Each of these dimensions will be explored in more detail in subsequent sections of this paper.

**TABLE 7.1**
**The Dimensions of Financing Alternatives**

| USES | SOURCES | | | | | |
|---|---|---|---|---|---|---|
| | Students | State | Local Govt. | Federal Govt. | Donors | Institutional Funds |
| Renewal and Renovation<br>New Construction<br>• Auxiliaries<br>• General Academic<br>• Research | MECHANISMS | | | | | |

## THE ALTERNATIVE SOURCES OF FINANCING AND THE ASSOCIATED MECHANISMS

Colleges and universities obtain financing for facilities from a variety of sources. Chief among them are the following:

A. Students

Students have traditionally been a source of funding for certain college and university facilities, particularly those where there is a direct relationship between a funding stream and a provided service. The classic example is funding for dormitories and dining halls. In this case, room and board charges are almost always established in a way that allows the institution to repay bonds issued to pay for construction and/or to accumulate a reserve fund sufficient to pay the necessary costs of renewal and renovation.

Closely related are fees levied on all students for purposes of paying for construction of facilities. Typically such fees are used to pay for construction and renewal of facilities such as student unions and student recreation buildings. It is rare that such fees are collected for the purpose of constructing new academic buildings (and never research facilities). While the practice of using student fees to construct academic space is still not common, it is a practice that is gaining adherents. There are recent examples in which students have voted increases in fees in order to pay for badly needed campus instructional space. In the few instances to date in which students have paid for academic facilities at public institutions, the situations were unique, typically ones in which state funds were not available for a critically needed building. Student funding of a new Law School facility at the University of Colorado—needed to meet accreditation requirements at a time of state revenue declines—is a good illustration. This very nascent movement represents further recognition that students—not the state—are the dependable source of institutional revenues. This is explicitly the case regarding operating funds in the several states in which tuition revenues exceed state appropriations. With this precedent in place, there is no reason to believe that the practice will not evolve on the capital side as well.

It should be noted that funds obtained from students are acquired in ways (and at a rate) that make their use consistent with repayment of bonded indebtedness rather than up-front payment for construction or renovation.

B. State Governments

States have historically been—and continue to be—the primary provider of funds for the construction (and reconstruction) of academic buildings on college campuses. While institutions are always seeking to diversify sources of funds for capital projects, very few public institutions get to the point where states become the junior partner in such ventures. This situation is unlikely to change. Buildings are very tangible; legislators know quite precisely what they are getting when they appropriate funds for campus construction. Capital appropriations have at least two other attractive features:

1. They create (construction) jobs for blue-collar workers and thus spread the benefits across a wider swath of the citizenry.

2. They do not obligate the legislature to ongoing payments in the same way as do increases in appropriations for operating purposes. This feature explains why it is often easier to get funds for capital (one-time) expenditures than for increases in the operating budget.

The mechanisms used by states to provide funds for capital constructions vary over a relatively narrow range. On one side are states that adhere to a pay-as-you-go philosophy and appropriate funds in a lump sum to pay for construction (although the payment may be split with payment for planning being covered in one year's appropriation and actual construction in another). Other states are more prone to issue bonds to pay for campus capital projects. Some states (North Carolina, New Jersey) issue general obligation bonds that are backed by the full faith and credit of the state; the states, not the institutions, are responsible for repaying the debt. In other states, legislatures establish ground rules (and sometimes devices for pooling borrowing in the search for better rates) that let institutions borrow up to some predetermined limit. In such cases, institutions often must pledge tuition as collateral for the debt. While

the state is not directly responsible for the debt, there is recognition that, in case of institutional default, the obligation will likely end up on the legislative doorstep. With this in mind, the state's authorization to issue debt instruments is typically coupled with inclusion of repayment amounts in the operating budgets requested by, and appropriated to, the institutions.

C. Local Governments

In the main, only community colleges that have their own taxing authority have been in a position to acquire and use local tax revenues to pay for capital construction projects. The norm is a situation in which the state establishes an upper limit on the tax rate (almost always a real property mill levy) that can be imposed without a referendum approving an override. Given the nature of the revenue stream, these tax revenues are most frequently used to repay debt rather than being accumulated and utilized in a pay-as-you-go manner.

Recently, there has been a break in the tradition of local tax revenues being confined to use by community colleges having their own taxing authority. The City of Phoenix has successfully passed a tax referendum that will provide local tax support for the construction of a downtown campus for Arizona State University. As local governments increasingly recognize the value of institutions of higher education as "anchor tenants" in their downtown redevelopment efforts, there will likely be opportunities for such arrangements in other urban areas.

D. The Federal Government

In the 1960s, the federal government—through the Higher Education Facilities Act—was a major funder of academic facilities on college campuses. Those days are long since past. Now federal funds for capital projects are limited to facilities that are:

1. In direct support of a federal priority. This translates almost completely into support for the construction of special-purpose research facilities that will house activities of a very select nature (for example, research into different issues related to bio-terrorism).

2. Constructed as a result of Congressional earmarking. These appropriations can cover any type of facilities and are dependent solely on relationships with a Member in a position to "bring home the bacon" to an institution in his/her state or district. Since the level and nature of earmarking is causing considerable consternation in some quarters, this may be a funding mechanism that has reached its high-water mark.

E. Private Donors

For some public institutions—specifically those with large (and affluent) alumni bases and effective fund-raising offices—private donors have been, and will continue to be, important sources of financing for capital projects. Such support is typically found at major research universities; comprehensive universities and community colleges are much less likely to obtain major funding from such sources. Very few public institutions have an alumni base—and a history of success in tapping that alumni base for academic building support—to make this source a reliable one for most institutions. It takes a rare combination of a rich alum and common ground between donor and institutional need to bring such funding to fruition. Even when such funds are provided, they are much more likely to be focused on facilities normally not priorities of the state. Most donors would consider general academic buildings at public institutions to be a state responsibility.

Donors with the ability to provide substantial amounts of funds for capital projects will typically provide:

1. All the funding for a building, or

2. Funds that match those from another (type of) contributor—usually the state or federal government.

In almost all cases, they are interested in having naming rights for the building—they want either themselves or someone of their choosing to have their names inscribed in stone on the campus. This particular interest on the part of donors means that money from this source is rarely available for renewal and renovation projects; naming rights for existing buildings have long since been granted.

Accepting funds from private donors can create problems as well as benefits. It is not unheard of

for donors to provide funds for a building that is not a campus priority—or may not even be on the institution's radar screen. Institutions are hard-pressed to say "no" in such circumstances, but saying "yes" may cause friction within the institution and with the state over issues of funding the maintenance and operations of the building and the programs it is designed to house. Further, the gift may be for a priority project but come with complicating strings attached. A major gift for construction of a sports facility at the University of North Dakota came with the stipulation that the "Fighting Sioux" label on the sports teams be retained, a requirement that has put the University in a difficult position vis-à-vis the NCAA.

F. Institution's Own Funds

There are circumstances in which institutions can, and do, use undesignated general fund revenues to renovate or acquire academic buildings. This is particularly the case regarding renovation projects that are required but unfunded by other sources, specifically state governments. However, there are also instances in which campuses acquire new academic buildings using their own resources. Two instruments are favored under such circumstances:

1. Bonded indebtedness in which the "full faith and credit" of the institution lies behind the securities. This is little different from state bonds that must be repaid by institutions with the exception that there is less tacit understanding that state appropriations are made with repayment in mind. Another variation on this theme is the circumstance in which universities designate indirect cost reimbursement funds to pay off indebtedness on research facilities. Even in situations where this arrangement is utilized, special permissions may be requested from the state—or such arrangements may be included in the broader financing plan for major construction projects. This was the case for the financing of the new Health Science complex at the University of Colorado.

2. Lease-purchase arrangements in which the institution enters into a long-term lease arrangement with an owner with a provision that title transfers to the institution at some specified point in the future. This mechanism is easier to arrange for residential space since the owner can find an alternative use should the institution renege on its obligations. The more specialized the space, the more difficult it is to make a lease/purchase work—it is easier, for example, with general office space than with science laboratories.

Regardless of the instrument, these arrangements require a regulatory environment that allows institutions to engage in such practices. Such is not often the case; most states insist on prior approval that may or may not be granted under the premise that such actions are indirect means of obligating the state to future payments. The rules around this practice vary substantially from sate to state. They also require institutions to accept the responsibility of making the associated payments an annual budget priority—taking funds "off the top" of the annual budget—in the face of vagaries in funding streams for general institutional operations.

Perhaps the least constrained environment for use of institutional funds to repay borrowing for construction of academic buildings is in Arizona, where the state formulaically establishes a ceiling on borrowing and allows institutions to manage their own borrowing portfolios within the limits established.

## MECHANISMS

In one way or another, all of the frequently used mechanisms were discussed in the prior section. This section serves to summarize the bits and pieces in a more orderly fashion. In reality there are only two generic mechanisms for supporting capital projects—outright purchase or acquisition through payments over time. The equivalent is paying cash or borrowing and repaying the loan.

The former is straightforward; the institution accumulates resources and pays for the capital project when the funds are accumulated. The funders who are in a position to support such an approach are state governments, the federal government, and private donors.

The case in which institutions essentially borrow funds and pay them off over time is only slightly more complicated. The basic instruments are either debt or lease/purchase arrangements.

There are numerous variations around the former:

- Whose obligation is it—the state or the institution?
- What is the nature of the collateral—full faith and credit or specific revenue streams (housing revenues, tuition, indirect cost recovery)?
- What is the recourse in case of default?
- What is the specific nature of the instrument—revenue bonds, tax anticipation notes, etc.?

While these are highly technical differences, the basics are fundamentally the same.

State practices vary enormously in this arena. Some states believe strongly in pay-as-you-go funding for capital construction and pay for most construction out of general fund appropriations for specific construction projects. Others rely heavily on state bond issues where the proceeds are utilized for campus construction projects and annual payments are made by the state. Massive bond issues in North Carolina and California are examples. Finally, there are states like Arizona that allow institutions to borrow (up to a limit) with repayment coming from the institutions' operating funds. Typically the state appropriations to institutions are structured with these repayment obligations in mind. The latter arrangement provides institutions with the most freedom; it also carries the most risk.

## USES

As indicated in Table 1, there is but a limited number of different kinds of capital projects:

- Renewal and renovation projects
- New construction projects
  - Auxiliaries
  - General Academic
  - Research

The relationships between revenue sources and uses were noted in several instances in Section II but will be treated more systematically here.

A. Renewal and Renovation

In most states renewal and renovation projects take their place alongside new construction projects and get prioritized in competition with them. Projects dealing specifically with safety concerns frequently migrate to the top of the priority list while others slip to the bottom—a new building is much more attractive to funders than replacing steam lines or replacing the electrical system in Old Main.

The funders for such projects are predominantly the states, local taxing authorities (typically only for community colleges), and the institutions themselves, with the states being the primary source. They tend to use the same approaches—direct funding or debt—regardless of the type of project. One can make a very good case for shifting responsibility for renovation and renewal projects entirely to the institutions, leaving the state's capital projects appropriations to cover new construction projects. The rationale goes as follows:

1. The state (or some other funder) paid for the facility in the first instance; at that point it becomes the institution's responsibility. The state should not have to pay multiple times for the same facility.
2. Sound management practices would call for depreciation accounts (1½-2% of replacement value) that accumulate funds for renewal purposes. GASB accounting rules now require recognition of depreciation expense. Unfortunately such rules did not take effect until well into the useful lives of most buildings. The new rules help to avoid further accumulation of deferred maintenance liabilities. They do little to reduce the level of deferred maintenance that had occurred prior to the GASB reforms.
3. Use of set-aside funds puts establishment of priorities in the hands of the institutions where, many would argue, it rightfully belongs. Legislatures are not in a position to establish interinstitutional priorities for such projects.

4. Legislatures are much better equipped—and much more interested—in establishing priorities for new buildings.

The state of Missouri follows this policy (at least it did a few years ago). Under this policy the institution was obliged to spend the equivalent of the depreciation expense amount on renewal and renovation projects. The institutions selected the projects; their only obligation to the state was an accountability requirement indicating that the required funds had, indeed, been allocated to renewal projects.

In reality, institutions typically find ways to use their own funds only when needs become dire and funds are not forthcoming from the state (or any other source).

Sound practice with regard to funding renewal and renovation would have the following features:

- An explicit, system-wide determination of levels of deferred maintenance on each campus.

- A multi-year plan for the elimination (or significant reduction) of this backlog. This plan should be established as separate from financing for new facilities. The "cleanest" approach would be a state bond issue paid from general operating revenues and intended to remove R&R from the agenda as a state obligation.

- A requirement that an amount equal to GASB depreciation amounts be spent each year out of institutional operating funds on renewal and renovation projects. The institutions should make the selection of projects to be so funded. The accountability requirement should be that a) the institution has an annually updated list of R&R priorities, and b) funds in the amount of prior year's deprecation amount are expended on the highest priority items.

  Such a process, if implemented, would result in elimination of past accumulations of deferred maintenance and make the institutions, not the state, responsible for ensuring that deferrals do not accumulate in the future. Such a policy would also create disincentives for institutions to acquire additional facilities of marginal benefit or to hang onto facilities that might better be removed from the inventory. Finally, it would keep the focus of the capital process on new facilities—a focus consistent with legislators' interests and policy determinations and eliminate the confounding of policy decisions (new facilities) with ongoing operational decisions at the campus level. Kentucky would do well to consider such a policy.

B. New Construction Projects

1. Auxiliary Facilities

   Construction of auxiliary facilities—residential and dining facilities—is almost always funded by students through direct use charges (room and board fees). If such use charges are insufficient, institutional funds are tapped as a last resort to fill the gap.

   Construction of facilities such as student unions and recreation facilities are also typically paid for by students although the mechanism is almost always a broadly applied student fee rather than a use charge. For these types of facilities, private donors often contribute as part of a larger capital campaign. In some instances, states contribute directly to construction of such facilities.

   In virtually all projects supported by student charges or fees, the instrument used is some form of long-term debt.

2. General Academic Facilities

   The predominant funders of general academic facilities—classrooms, labs, offices, and libraries—are state and local governments and private donors. In rare instances students (through an imposed fee) and institutions themselves contribute. The federal government will participate only in the case of Congressional earmarks.

   The instruments most likely to be used by the state are direct appropriations for construction of the building or debt instruments that are repaid by the state either directly or indirectly through annual appropriations to the

institutions. Conceptually, the most satisfying approach is likely to be one similar to Arizona, where the state establishes a borrowing cap for each institution and empowers the institution to borrow in its own name. This avoids much of the competition for funds borrowed through a centralized state pool. A compromise is to establish borrowing limits for each institution but bundle the bond offerings each year as a way of securing better rates than can be negotiated by each institution acting independently.

Donor contributions most often come in the form of outright gifts.

3. Research Facilities

The primary funders of research facilities are state and federal governments and private donors (either individuals or philanthropic organizations). Funds from the latter two providers most frequently come in the form of lump-sum contributions. Funds from states follow the same pattern as funding for other academic facilities—in some states it is direct, pay-as-you-go appropriation. In other states, funds are provided through issuance and repayment of debt instruments. States fund research facilities in much the same way as they fund other academic facilities. Pay-as-you-go states maintain this practice for research facilities. States that borrow for general academic space also borrow for research facilities. To the extent that there are variations, they take the form of:

a. The state providing a challenge grant that leverages the capacity of the institution to generate funds from private sources.

b. Comprehensive financing plans for truly large undertakings such as the multi-billion dollar Health Services Campus at the University of Colorado.

## SUMMARY

Reverting to Table 7.1 and filling in the blanks, primary funding patterns for higher education facilities are predominantly as indicated in Table 7.2.

While there are exceptions in almost all instances, the summary in Table 7.2 represents the weight of practice.

**TABLE 7.2**
**Primary Funding Patterns for Higher Education Facilities**

| USES | SOURCES | | | | | |
|---|---|---|---|---|---|---|
| | Students | State | Local Govt. | Federal Govt. | Donors | Institutional Funds |
| Renewal and Renovation | — | Approp./debt | — | — | — | Approp./debt |
| New Construction | | | | | | |
| • Auxiliary | | | | | | |
| – Residential/dining | Use charges | — | — | — | — | — |
| – Recreation | Fees | Approp./debt | — | — | Gifts | — |
| • Academic facilities | Fees | Approp./debt | Debt | — | Gifts | Lease/purchase |
| • Research facilities | — | Approp./debt | — | Grants | Gifts | — |

Table 7.3 below is presented as a worksheet for UofL.

Here, the subtotals of the "Strategic Funding" scenario suggested in Section 6.8 are shown in the "Amount Needed, from 2006 Study" column.

KPES and UofL policy makers can use Table 7.3 as a framework to allocate the Amounts Needed across the most likely sources of funds to create UofL's 15 Year Funding Plan.

If UofL chooses to supplement this study with additional information, any additional capital investments identified would need to be included.

**TABLE 7.3**
**UofL Funding Patterns Worksheet for Higher Education Facilities**

| USES | | SOURCES | | | | | |
|---|---|---|---|---|---|---|---|
| | Amount Needed, from 2006 Study | Students | State | Local Govt. | Federal Govt. | Donors | Institutional Funds |
| Renewal and Renovation | | | | | | | |
| • Condition/End of Life | $620m | | Approp./debt | | | | Approp./debt |
| • Space Adequacy | $242m | | Approp./debt | | | | Approp./debt |
| New Construction | | | | | | | |
| • Auxiliary | n/a | | | | | | |
| 2006 Capacity | | | | | | | |
| • Academic facilities | $219m | Fees | Approp./debt | Debt | | Gifts | Lease/ purchase |
| • Research facilities | $156m | | Approp./debt | | Grants | Gifts | |
| 2020 Capacity | | | | | | | |
| • Academic facilities | $494m | Fees | Approp./debt | Debt | | Gifts | Lease/ purchase |
| • Research facilities | $575m | | Approp./debt | | Grants | Gifts | |
| • TOTAL | $2,306m | | | | | | |

# Section 8: Recommended Next Steps

The VFA | Paulien | NCHEMS team recommends KPES and UofL work closely together to align each institution's capital needs with its strategic priorities for the coming 15 years. The following steps should be considered to help complete the picture that this study has started to paint, and well position the Commonwealth's public postsecondary education system as a national leader in stewardship of its facilities:

1. **Establish strategic goals for the 15-year capital plan**, possibly broken down into three 5-year periods. The strategic goals may go beyond those considered or recommended in this study, such as a new emphasis on building research capacity, a residential campus or other programmatic goals specific to the institutions.

2. **Complete the data** so that the 15-year plan includes ALL assets. There are various ways to establish or estimate the investments needed to address condition and space needs for the facilities not yet studied, including more facility condition assessments, further sampling and extrapolating condition or space results of similar buildings, or pure modeling based on age and use profiles of buildings yet to be studied.

3. **Integrate all capital planning data into central records** for each asset, and maintain those records to reflect recent changes (improvements or degradations). Records should be stored in capital planning and management software that makes strategic planning, spend management, and progress tracking easy.

4. **Fund according to needs –** as established in this and subsequent studies. "Needs based funding" can serve as a defensible, transparent way to allocate funds while addressing any past capital investment inequalities among the institutions, or on any particular campus. Funding allocated by percent of student population or annual increases to historical distributions tend to perpetuate past inefficiencies.

5. **Pool institutional capital needs** with similar needs from other Kentucky postsecondary education institutions, to facilitate better sources and financial terms for those funds. For example, to consider one possible funding source, the Legislature might fund (from appropriations or another source) all roof projects statewide in one budget cycle, or issue a bond for building new research facilities across multiple institutions.

It is the consultants' strong belief that the Kentucky Postsecondary System and University of Louisville have already made a wise investment in their facilities through this study, which should serve as the basis for well-informed capital decisions that will help UofL and the Commonwealth achieve their 15 year goals.

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