Program Plan
For an Addition to the
Preservation and Access Service Center
For Colorado Academic Libraries
(PASCAL)

Acknowledgements to:

UNIVERSITY OF COLORADO at DENVER & HEALTH SCIENCES CENTER
Rick Forsman, Director, Denison Library
Patricia Nelson, Assistant Director, Denison Library
David Gleim, Dean and Director, Auraria Library
Brad Silsby, Office of Institutional Planning

UNIVERSITY OF COLORADO AT BOULDER
James F. Williams II, Dean of Libraries
Scott Seaman, Associate Director for Administrative Services

UNIVERSITY OF DENVER
Nancy Allen, Dean and Director, Penrose Library
Gary Alexander, Director, Law Library

COLORADO STATE UNIVERSITY
Catherine Murray-Rust, Dean of Libraries

Document Prepared by:

Bennett Wagner & Grody Architects PC
Martha Bennett, Partner-in-Charge
Melanie Weiss-Turner

Revised November 2005
Table of Contents
Program Plan – Addition to PASCAL

I. Preface and Summary  3
   • Executive Summary  3,4
   • Process  4

II. Program Information  5
   • Program Description  5-7
   • History, Role, Mission, Unique Programs  7,8
   • Program Needs and Trends  8
   • Relationship to Academic or Institutional Strategic Plans  9
   • Relationship to Other Programs or Agencies  9
   • Existing Programmatic/Operational Deficiencies  9-12
   • Program Alternatives  12,13

III. Facilities Needs  14
   • Total Space Requirements  14,15
   • Unique or Special Features  16
   • Health, Life Safety, and Code Issues  16-19
   • Site Requirements  19
   • Equipment Requirements  20
   • Acquisition of Real Property  20

IV. Project Description/Solution  21
   • Facility Improvements and Scope of Work  21-24
   • Project Sketches  24
   • Project Cost Estimate  25,26
   • Life Cycle Cost Analysis  27-28
   • Financial Analysis  29-31
   • Project Schedule  31

V. Relation to Master Plan/Other Projects  32

VI. Facilities Alternatives  33

VII. Appendices  34
    • Appendix A - Space Description Requirements  34,35
    • Appendix B - Anticipated Storage Needs  36,37
    • Appendix C - History of High Density Storage  38-47
    • Appendix D – CC-C Construction Request Form  48-54
    • Third Party Review Letter  55
1.0 Preface and Summary

Executive Summary

This Program Plan is presented in support of the construction of an addition to the Preservation and Access Service Center for Colorado Academic Libraries (PASCAL) storage facility located at the University of Colorado at Denver and Health Sciences Center, Fitzsimons Campus located in Aurora, Colorado. The PASCAL facility which was completed in 2001, currently houses collections from the University of Colorado at Boulder, University of Colorado at Denver and Health Sciences Center, and the University of Denver. The proposed addition will address the growth in the collections’ volumes and new program requirements.

This project request is consistent with the Institutional Master Plan for the University of Colorado Health Sciences Center and the University of Colorado Hospital Authority approved by CCHE in 1998 and the subsequent Institutional Master Plan Updates in 1999, 2000, 2001 and 2002 which were approved by the Board of Regents of the University of Colorado. The 2002 supplement was approved by CCHE. This plan will alleviate facility deficits identified in the master plans for the individual institutions in the library category and the ability of these institutions to send volumes to this storage facility. This will enable the individual libraries to add to their collections without requiring major additions to facilities in the short-term.

The initial PASCAL facility was designed in 1999 to contain approximately 1.6 million volumes in an environmentally controlled atmosphere with support space and a dock. The facility alleviated long-term storage needs for infrequently used, but valuable library materials. The initial projected storage volume for 2005 was 796,400; the actual volumes stored as of June 2005 is 970,454, which is 22% above the projected volume load. With the projected fill rate, the existing facility’s capacity will be exceeded in less than three years.

As the initial Program Plan envisioned, this proposed addition will consist of a new storage module which is 1.5 times the size of the original storage module, containing twelve rows of 179’ long by 30’ high storage shelving that is 3’ deep. The existing receiving, processing, and other support spaces have proven adequate, and require no expansion. A total of 16,585 gross square feet (gsf) which includes a 14,980 gsf storage room and a 1,605 gsf mechanical mezzanine is being proposed. The storage module will attach to the east side of the existing PASCAL facility; the site is master planned for three more storage modules to be constructed in the future. In the interim, the remaining site will be used for surface parking.

As the existing PASCAL storage facility reaches capacity with transfers from all participating institutions, the addition will meet the projected storage needs specific to three institutions: the University of Colorado at Boulder, Colorado State University, and the University of Denver.

The project is being cash funded by the three participating institutions – The University of Colorado at Boulder, Colorado State University and the University of Denver with the facility to be owned and operated by the Board of Regents of the University of Colorado. Yearly operations and maintenance costs will be divided among the participating institutions as a percentage of the total volumes housed by each institution in the facility.
A total project budget has been established at $5,695,269. This consists of $589,449 in professional services and $3,340,604 in total construction costs. Equipment costs of $1,429,014 have been budgeted and include over $1,200,000 for the structural shelving system to be installed inside the storage module, $52,500 for storage trays, $40,000 for an “order picker” and $120,000 for an inventory control system as well as $11,009 for communications. $65,000 in TAP fees and a project contingency of 5% bring the total miscellaneous costs to $271,203. Funding is being provided by the participating institutions in fiscal year 2006/2007 with occupancy of the structure anticipated in the fiscal year 2008.

1.2 Program Plan Process

The PASCAL facility was initially planned in 1999. At that time a Task Force consisting of representatives from the University of Colorado at Boulder, University of Colorado at Denver, University of Colorado Health Sciences Center and the University of Denver investigated options for developing a remote depository to house infrequently accessed portions of their collections in a cost effective manner. The initial Program Plan was approved and the first phase of the facility was constructed in 2000 at the University of Colorado Health Sciences Center Fitzsimons Campus located in Aurora, Colorado. In 2004, the University of Colorado’s downtown and health sciences campuses were consolidated into one entity, the University of Colorado at Denver and Health Sciences Center. For that reason, the earlier names of the then separate campuses appear as part of the PASCAL history, while the combined name appears when referring to plans for the future.

The PASCAL storage facility is available to libraries in higher educational institutions in Colorado. It has successfully proven to be a cost-effective method for remote collection storage. As it reaches capacity, participating institutions have projected their needs for an expanded facility.

Bennett Wagner & Grody Architects was retained in July of 2005 to assist the University of Colorado at Denver and Health Sciences Center, as manager/operator of PASCAL, in assembling this program plan document. This document has been reviewed by the participating institutions: the University of Colorado at Boulder, Colorado State University, the University of Denver, and the University of Colorado at Denver and Health Sciences Center and presented to the Board of Regents of the University of Colorado. It is hereby presented to the Colorado Commission of Higher Education for approval.
2.0 Program Information

2.1 Program Description

The PASCAL storage facility alleviates long-term storage needs by preserving valuable but infrequently used library materials in cost-effective high density storage.

In addition to alleviating the storage needs at the higher education library facilities in Colorado, PASCAL has been a means to avoid the high costs of major additions to these libraries. This facility has an atmosphere that is environmentally controlled for temperature, light and humidity, thus enhancing the preservation of older, more fragile volumes in particular.

The shared facility for participating libraries allows for permanent common retention decisions to minimize duplication of stored items, especially in the area of back runs of journals. Shared use data on important but lesser used research materials has been collected in order to implement a policy of minimal storage duplication. Collaborative decisions can be made to determine which copies are retained for storage, allowing every participating library to rely on permanent retention, in a preservation-oriented facility.

The total capacity for the existing PASCAL is 1.6 million volumes. At the current average fill rate of 214,000 volumes per year, it is anticipated that the facility will reach full capacity in about three years. The projected transfer of volumes into the storage facility for FY 2005/2006 is 245,004 volumes; this exceeds the average annual fill rate and could reduce available capacity even faster.

The archival collections at PASCAL are state, regional and national resources. Materials can be requested from and sent to any of twenty-three Prospector Colorado libraries within 48-hours of request or individuals may come to PASCAL and request items directly for research on or off-site. Circulation of items at PASCAL is increasing, as the following chart illustrates:

<table>
<thead>
<tr>
<th></th>
<th>FY02</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items Circulated</td>
<td>4,291</td>
<td>8,701</td>
<td>12,951</td>
<td>13,916</td>
</tr>
<tr>
<td>Articles sent electronically or faxed</td>
<td>90</td>
<td>976</td>
<td>1,400</td>
<td>1,747</td>
</tr>
</tbody>
</table>

The participating member libraries currently include CU-Boulder, University of Denver Penrose and Law Libraries, University of Colorado at Denver and Health Sciences Center (Auraria and Denison Libraries). Colorado State University will begin participation once the addition is complete. Due to the current state of capital construction funding in Colorado, other institutions have expressed interest in storing collection materials at PASCAL.

The number of volumes per participating library is shown below, projected through 2006:

<table>
<thead>
<tr>
<th>Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CU Boulder</td>
</tr>
<tr>
<td>CU Denver &amp; HSC - Auraria</td>
</tr>
</tbody>
</table>
The participating member libraries include:

**The University libraries in the CU-Boulder library system**, including Norlin Library and five branch libraries: Business, Earth Sciences, Engineering, Math/Physics, and Music house the general humanities and social sciences collections and various departments and services.

This system is the largest library collection in the Rocky Mountain region exceeding ten million books, periodicals, government publications, audio visual materials, microforms, maps, manuscripts, papers, broadsides, posters and computer based sources including:

- Special collections and archives about human rights; Colorado authors, history, and politicians; environmentalism; labor; women’s history; peace; mountaineering; English, American and children’s literature; photo books; the book arts; and John Milton.
- Subject libraries for art and architecture, business, earth sciences, East Asia, engineering, mathematics and physics, music, and natural and physical sciences.
- Computerized networks providing access to the University Libraries collection, the holdings of most Colorado libraries and many library systems nationwide and periodical and information databases.

The University Libraries offers electronic access to the records of its collections, as well as state and national libraries and systems. Many information sources, such as periodical indexes, are also computerized.

**The University of Colorado at Denver and Health Sciences Center – Auraria Library** which was completed in 1976 occupies 113,060 square feet of assignable space on two floors. This library serves a three-institution campus: Community College of Denver, Metropolitan State College, and the University of Colorado. The library is open 87.5 hours per week, or a total of 3,783 hours per year.

The library houses Reference, Periodicals in bound volumes and microform, Government Publications, Circulating, Archives and Special Collections. Much of Auraria’s print collection is replicated in fuller form in the libraries of the other participating institutions.

**The University of Colorado at Denver and Health Sciences Center – Denison Memorial Library** has been an essential part of the University of Colorado Health Sciences Center’s history and development. The original library building was completed in 1937 with new additions in 1962 and 1977. It is the largest biomedical research library in Colorado including collections in dentistry, medicine, nursing and pharmacy as well as the special collections: Arts in Medicine Collection, Strauss Complementary and Indigenous Medicine Collection, Isabel Anderson library science materials as part of the Education Committee of the Colorado Council of Medical Librarians and the Waring Room History of Medicine and Rare Books Collection.

**The University of Denver (DU) Penrose Library** was opened in 1972 as the main library for the larger of the two University of Denver campuses. Its 150,000 s.f. of space was planned to meet the needs of the University of Denver for the next 20 years. That projection proved accurate and by 1996, at the time of the original program plan, the building’s collections spaces exceeded the CCHE definition of “full” by approximately 12%. The Penrose Library special collections contain the University Archives, rare book and manuscript collections, Beck Archives of Rocky Mountain Jewish Historical Society, and the Carson-Brierly Dance Library. Penrose Library is an official U.S. government depository. Current books,
periodicals, and documents in Penrose Library number 2,172,470 with an additional 1,127,136 microfilm, microfiche, cartographic, sound and video items.

The Mary Reed Building was DU's library prior to 1972 and it contains approximately 18,000 linear feet of stacks. Both DU's Penrose and the Westminster Law Libraries have invested heavily in digitalized texts, both for reference materials and for journals. While the University of Denver libraries are well positioned to be able to exchange paper publications for electronic ones, it is not yet possible to regard this as a solution that will dramatically reduce the projected space needs prior to about 2015.

**Colorado State University Libraries** currently hold two million books and journals in its collection. William E. Morgan Library houses more than 70% of the collections of CSU's five library facilities and all but a small fraction of the service space. The remainder of the collections is housed at the libraries for Atmospheric Sciences, Veterinary Medicine, the Archives Annex, and the Lake Street Depository. About 20% of the collections are currently in storage, which is a high percentage for a research library.

The William E. Morgan Library was constructed in 1965 with a significant addition and renovation completed in 1998. The Library has recovered from a 1997 flood which damaged a large portion of their collection and resulted in the loss of 200,000 volumes. As a result of the 1997 flood, Colorado State University Libraries invests heavily in electronic delivery systems to share collections with other libraries in Colorado, the United States and overseas. Colorado State University Libraries on average still adds over 20,000 volumes per year.

### 2.2 History, Role, Mission, Unique Programs

The PASCAL facility, which was designed in 1999 and opened in 2001, responded to deficit stack space in several of the higher education libraries in Colorado. The Remote Storage Facility Task Force which was convened in 1996 determined that the most economical and efficient way to address the need for additional volume storage space was to create a centralized high density storage facility.

PASCAL is now the only shared repository of its kind in Colorado and is a successful example of a public-private partnership which was a stated goal of the original plan. The PASCAL Consortium meets twice a year to set policy and operational procedures for the participating libraries.

*The mission of the Preservation and Access Service Center for Colorado Academic Libraries (PASCAL) is to provide centralized, high-density environmentally-sound permanent storage for library materials from the member campuses of the University of Colorado and the University of Denver. PASCAL provides member libraries with rapid, efficient and safe access to and delivery of stored materials.*

PASCAL Mission Statement

PASCAL has provided storage space for 1.6 volumes in an environmentally controlled atmosphere for lesser used books, archival materials and other library material that had previously been stored on site at the participating libraries. It offers an economical solution to the space needs of the participating institutions' libraries.

### 2.3 Program Needs and Trends

The idea of having high density storage facilities such as PASCAL began in 1985 at Harvard University. A history of High Density Storage prepared by Reese Dill of Dill and Company, who designed the Harvard University facility, is included in the Appendices. Similar facilities now exist on over 30 campuses including Yale, Cornell, Johns Hopkins, Ohio State University, Arizona State University, Miami University, University of South Carolina, and Bowling Green. Many of these facilities have added storage modules to their initial facility; Harvard has added 6 storage modules.
The addition to the PASCAL Facility is being proposed because it is reaching capacity, and the participating member libraries continue to have increasing requirements for collections to be located at the existing PASCAL facility. By PASCAL’s projected addition completion date in 2008, the new bay will provide critically needed space for the participating libraries. The additional bay provides an economical solution to accommodating the growth needs of these libraries. Moving materials to the centralized facility frees up library space for frequently circulated materials and adequate user support space in the participating institutions’ libraries.

Storage fill-rate since PASCAL became operational by fiscal year:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Fill Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/2001</td>
<td>119,301</td>
</tr>
<tr>
<td>2001/2002</td>
<td>360,578</td>
</tr>
<tr>
<td>2002/2003</td>
<td>226,846</td>
</tr>
<tr>
<td>2003/2004</td>
<td>149,278</td>
</tr>
<tr>
<td>Total volumes stored, June 2004</td>
<td>856,003</td>
</tr>
</tbody>
</table>

Initial Program Plan projection for 2005 | 796,400 |
Average Fill Rate | 214,000 |

By 2004, the projected volumes in PASCAL for 2005 were exceeded by 59,603 volumes.
2.4 Relationship to Academic or Institutional Strategic Plans

This project is consistent with the 1998 Institutional Master Plan for the University of Colorado Health Sciences Center which identified additional space needs in the Library Category.

2.5 Relationship to Other Programs or Agencies

The consortium of participating institutions in the PASCAL storage facility are:

- University of Colorado at Denver and Health Sciences Center - Auraria
- University of Colorado at Denver and Health Sciences Center - Denison
- University of Denver Libraries
- University of Colorado at Boulder library system
- Colorado State University Libraries

2.6 Existing Programmatic/Operational Deficiencies

As noted in the previous section, the PASCAL storage facility is approaching capacity faster than expected. By June 2005, the PASCAL facility had 970,454 stored volumes from the participating institutions. This is 22% more than what was originally projected for the facility by this time. The average transfer of volumes has been 214,000 per year. The facility has a capacity for 1.6 million volumes, which translates to space for approximately 629,364 additional volumes. Projecting forward three years using the average increase rate yields an increase in the volumes stored of 642,000. Within three years PASCAL will not be able to meet the storage needs of the participating libraries. The estimated completion date of the new addition will be February 2008 which will allow continual transfer of materials. Any delay will exacerbate space problems detailed below in this section of the plan.

Although each of the libraries is utilizing and converting library material to electronic format, each of them serve research programs that include professional degree programs unique in the State of Colorado, and have a responsibility to keep the history of those fields for future researchers.

*The University of Colorado at Boulder* library collection’s additional storage space needs have recently been assessed at 1,032,000 volumes in order to alleviate severe over-crowding and to allow repurposing of space to provide user seating and technology-enabled group work areas.

Relocating little-used but scholarly significant volumes to high-density storage remains critical to transforming the University Libraries into a library for the 21st century. During the 1990s, widespread curriculum and pedagogy changes on the Boulder campus necessitated that students engage in more collaborative activities to complete coursework. This has placed enormous demand on the University Libraries for large amounts of technology-enabled group work spaces, but the current buildings cannot accommodate these user needs. In order to provide the necessary learning space, it is imperative that stack areas be converted into space for group collaboration and computer use. At the same time, scholarly communication has shifted dramatically towards electronic delivery with ever less reliance on print resources. Many Boulder campus disciplines now rely extensively on full-text electronic resources rather than print monographs and journals. The University has been carefully selecting little-used volumes from the Libraries’ collection to be moved off-site opens space for group workspace, additional individual reader space, and a planned information commons.

The remaining capacity of PASCAL is inadequate to accommodate the volume of material the Boulder campus needs to house there. In the year 2001, when phase one of PASCAL opened, the Boulder campus library system was at 135% of shelf capacity. Since 2001, nearly 750,000 volumes have been moved from the Boulder campus to PASCAL with another 300,000 scheduled to be moved in the next twenty-four months. During those four years, purchases of print materials, although trending downward, still added 300,000 volumes to the Boulder campus. As a result, over-crowding has improved but
remains at 120% of the total capacity of the University Libraries, with some collections (e.g., Music, Science, and Art) remaining well over 135% above capacity. This limits the University Libraries' abilities to transform spaces into the technology-rich collaborative work areas that are in extremely high demand.

Between 2007 and 2017, the Boulder campus University Libraries will need storage for an additional 1,101,000 volumes. Adding a second bay to PASCAL will satisfy that need. Currently, the university libraries have 2,650,000 volumes on-campus. Reducing the Libraries' count to 2,163,000 volumes will open the space necessary to create appropriate user spaces throughout the Libraries. To do so will require removing 487,000 volumes. At the same time, however, an estimated average of 35,000 volumes annually will be added to the collections. In order for shelf capacity to remain steady, an equal number of little-used volumes will need to be removed each year. Consequently, to achieve and maintain the appropriate capacity, the University Libraries expects to remove a total of 83,700 volumes annually to PASCAL. This cannot be accommodated in phase one of PASCAL. A total of 600,000 volumes will be sent to phase two.

The University of Colorado at Denver and Health Sciences Center – Auraria Library has already relocated many volumes to PASCAL and continues as a relatively modest contributor to PASCAL. Their space requirements for phase two are limited. It will continue to send an average of 850 monographic volumes per month for the foreseeable future. The library will be aggressively replacing print journal and document items with online formats in the next two years. Much of Auraria’s print collection is replicated in fuller form in the libraries of the other participating institutions; hence it is doubtful that many of these print items will be sent to PASCAL due to the policy of non-duplication.

The University of Colorado at Denver and Health Sciences Center – Denison Memorial Library has already relocated nearly 80,000 volumes of its relatively small collection to phase one of the PASCAL facility. Only a limited number of volumes will need to be transferred into phase two. The University has planned a new health sciences library for the Fitzsimons campus. Expected occupancy is late 2008. Programmatic projections for stack space in the new library have been made on the assumption that roughly one third of the older print collection be transferred to high density storage at PASCAL. As noted above, much of this transfer has already occurred. This is a much more cost effective option than building space to store all volumes in the new library building. Denison will continue to transfer a small number of aging volumes into phase two of PASCAL each year so that it does not become necessary to add shelving capacity in the new library building.

It should be noted, however, that ongoing delays in the construction of the new library may force a change of plans. If the lengthy delay results in large cost increases that require reduction in the number of square feet that can be built, it may be necessary to store more volumes in PASCAL. This question will be open until Certificates of Participation are sold and construction costs can be updated in light of the interest rates and materials costs at that time.

The University of Denver (DU) Penrose Library plans to relocate nearly 524,000 volumes to the PASCAL II addition in order to renovate Penrose Library, transforming stack areas into vital new user study and computer access space. In the next 18 months, to prepare for Penrose Library construction, DU will select for permanent storage about 273,949 volumes in addition to microform sets and boxed archival resources to PASCAL I. In total, DU intends to store about 797,997 volumes to PASCAL I and II as part of the Penrose Library renovation project, in addition to selected archival collections over the next ten years.

The University of Denver is moving ahead with plans to renovate the Penrose Library building, and a centerpiece of that plan involves compaction of the active collections, along with storage of lesser used material. Collection consolidation is a key enabling step that will precede renovation and re-alignment.
of service points, increases in seating and study areas, and creation of a Knowledge Commons for student use.

In order to use the on-campus storage area (the Mary Reed Building stacks) as a readily-accessible stack area for more frequently used resources, DU will transfer most resources now held in the Mary Reed Building to PASCAL, along with most bound serial volumes representing licensed (digital) material, lesser used serial volumes (pre-1985 science titles,) selected archival material, and at least 20,000 volumes/year of monographs. Between 2008 and the end of 2010 DU plans to transfer to PASCAL II 524,000 volumes. In addition, the DU Law Library will send nearly 40,000 volumes to PASCAL over the next ten years at the rate of 4,000 volumes per year. Of those, 8-10,000 will go in the current building, and perhaps 30,000 will go in the new bay.

Once DU reduces the size of the paper collections, it will compact the remainder by placing all monographs, federal publications, and boxed special materials in movable compact shelving. This will dramatically reduce the square feet occupied by collections, freeing space for new user oriented areas: the Knowledge Commons, a café, a graduate quiet seating area, new group study spaces, new technology assistance service areas, more individual seating space with furniture designed for both paper and computer use. Penrose Library also will be able to relocate and expand key service points, and to create a new Writing Center for the University-wide Writing Program.

Finally, the library storage area in the Mary Reed Building (formerly the University’s Library) may, at some time in the future, be renovated for administrative use, and if that project is scheduled, DU will need to completely empty that building of library materials. That building currently has about 3 linear miles of shelving capacity. Although this renovation is possible, it is not currently funded, and storage estimates related to this contingency are not included in the figures above. This scenario simply demonstrates the potential library storage need that University of Denver may have at some future date, and is further evidence of the need for a shared library storage facility.

**Colorado State University, William E. Morgan Library** must repurpose stack space for use by student readers and at the same time find new space to store its over-crowded print collections, following an accreditation review by the Higher Learning Commission. The only CSU library site that is not at full capacity or beyond is the Archives Annex, which was built with insurance flood funds to house manuscript collections, especially in water and agriculture. The Libraries lost the last two years of growth space in 2004 when insurance company requirements decreased available shelving in the Lake Street Depository. Morgan Library has been full for several years. At this time there is no space for new materials and no space in storage for older materials that are used infrequently.

User spaces are also a serious concern because of rapid enrollment growth in recent years. In 2004, seating was available for 7% of the student body, only 1% more than when Morgan Library was renovated and expanded in the mid-1990’s. Limited seating was a concern during a recent accreditation review by the North Central Association of Colleges and Schools’ Higher Learning Commission. Colorado State University is required to submit a progress report to the Higher Learning Commission on April 1, 2006 that includes a detailed plan to provide more seating to match increased enrollment and increased breadth and depth of collections to support doctoral level education. The availability of space in PASCAL is a key part of the solution to these two problems.

The CSU Libraries estimates that 1,032,000 volumes will need to be shipped to PASCAL in the next ten years, beginning as soon as space is available. Most of this material will be moved from the Lake Street Depository. Volumes will then be transferred from Morgan to Lake Street, freeing up shelving space for new materials in Morgan. Some sections of Morgan Library that are currently filled with older materials will be converted to user spaces.

### 2.7 Program Alternatives
After reviewing the programmatic needs of the participating libraries, this program plan proposes the solution of additional high density storage space at the PASCAL storage facility to meet their storage requirements. Other options considered were keeping the collections at their current locations on the individual campuses, digitization of existing materials, further reducing some of the reader spaces in the libraries, or reducing the sizes of the collections through disposal of some materials.

Moving to high density storage addresses the stack space shortage with a cost effective solution. Portions of the collections that are accessed infrequently by researchers (generally less than 20% of the total collection) are put into remote storage where their availability is not instantaneous and where researchers no longer have the ability to browse through the stacks and find a book that they had not previously considered. However, PASCAL provides 48-hour turnaround to stored materials. Because books are in trays which are completely filled, with books sorted by size and bar-coded by shelf and tray location, less frequently used books can be housed in less than one-tenth the space that would be utilized for regular library shelving or approximately one-fifth the space used in compact shelving.
Keeping the Collections Separate and on the Individual Campuses
This programmatic approach would maximize the convenience to the on-campus users. It would, however, require significant capital construction initiatives at each of the sites over the next decade. This will be true even with the prudent weeding programs that are in place.

Digitization of Existing Materials
The labor intensity of this process makes it cost prohibitive, except in those situations where a sufficient market exists for vendors to convert certain journals to electronic form. There are also significant copyright barriers to digitization of material for network access. It appears unlikely that most of the previously published monographs and back issues of academic journals will be converted to electronic form. Much of the collection proposed for the addition to PASCAL consists of these materials.

The libraries also have responsibilities as full or partial federal depositories to provide access to those materials. Most of the older items will not be reissued electronically.

Further Reduce Some Reader Spaces for More Volumes
In selected areas, the need to house a growing collection has resulted in conversion of reader areas to collections storage. The libraries are finding a greater need to accommodate a curricular emphasis on collaborative student work. This has generated a need for more group study areas where students can discuss issues with each other without disturbing other library users. The University of Colorado and the Colorado State University Libraries are undersized in the number of reader stations when compared to current program planning standards. The addition to the PASCAL storage facility allows selected conversion of collections expansion spaces to reader station use.

Dispose of Existing Collections at Member Libraries
To avoid further reduction in student seating areas, libraries could accommodate the increases in their collections by culling the existing collections. Eliminating portions of collections would free up stack space. This solution is undesirable because, although some portions of collections are infrequently used, they hold great value for researchers. Maintaining these resources in Colorado supports the missions of the higher education facilities.
3.0 Facilities Needs

This program plan is for the construction of an addition to the PASCAL storage facility located at the University of Colorado Health Sciences Center Fitzsimons Campus in Aurora, Colorado. This section of the plan will describe the facility needs, the project description including diagrammatic sketches, a statement of probable cost, and a schedule for implementation.

3.1 Total Space Requirements

The addition to the PASCAL storage facility will be specially designed to provide the maximum amount of storage potential in the least amount of shelving space. Additional processing space will not be needed as the original project provided adequate support spaces for future expansion of the storage areas. The addition will include a Storage Module consisting of a high bay rectangular facility with 30’ high, 3’ deep shelving in twelve rows approximately 175 feet long. Support for this depository storage space, including a second processing space, user services and space for a loading dock and storage of the book picked apparatus and its support equipment are not required. The existing facility was designed to accept four additional Storage Modules as demand for shelving increased and each previous storage module became full.

The addition will consist of a Storage Module of approximately 13,780 assignable square feet of storage area for books and materials and a mechanical mezzanine with 1,360 assignable square feet for a total of 15,140 assignable square feet and 16,585 gross square feet. This additional module will provide storage space for approximately 2.4 million volumes.
This additional Storage Module is anticipated to contain approximately 2.4 million volumes which will require 13,780 assignable square feet of space. This storage module is approximately 71'-4" wide, 210'-8" long, and has a high bay space of approximately 36'. It is 1.5 times the size of the original storage module. This includes a twenty foot turn around space at the end of the shelving aisles with a mechanical mezzanine above. This environmentally controlled space is the central storage location for items sent to the PASCAL storage facility and will contain approximately 175 feet of shelving in twelve rows 3’ deep and 30’ high. Six aisles approximately 54” wide will provide access to the shelving. In the first phase, twenty feet is provided at the end of the stack space closest to the loading dock for maneuvering of the order-picker vehicle and to provide maneuverability for the order-picker to gain access to the four aisles between shelving. This space will also provide access to the additional storage module.

The shelving system will provide storage for books and archival material for all participating institutions. Books will be stored in specially designed corrugated cardboard trays which are bar-coded, recorded in the on-line inventory control system, and placed in each shelving module which is approximately 54” wide and 36” deep. The corrugated trays will be in various sizes and will be processed outside the storage module prior to placement on the shelving unit. Archives and other storage materials will also be in closed corrugated archives boxes, inventoried, bar-coded, and stacked on the shelving in a similar manner. The shelving is accessed by an order-picker forklift type vehicle with a custom built work platform for the operator to access the book trays and archival materials. The space is to be environmentally controlled and limited access provided as will be discussed in later sections of this program plan.

The total space needs projection for the addition to the PASCAL Storage Facility is 15,140 assignable square feet and is distributed according to the table that follows:

<table>
<thead>
<tr>
<th>Library Remote Storage Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space Needs Projection</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>ASF/Unit</th>
<th>Total ASF</th>
<th>Total GSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Storage Module</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stack storage w/ aisles</td>
<td>1</td>
<td>12,550</td>
<td>12,550</td>
<td></td>
</tr>
<tr>
<td>Turn around at opposite end</td>
<td>1</td>
<td>1,330</td>
<td>1,330</td>
<td></td>
</tr>
<tr>
<td>Mechanical Mezzanine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1,360</td>
<td>1,360</td>
<td>1,605</td>
</tr>
<tr>
<td><strong>Subtotal:</strong></td>
<td></td>
<td></td>
<td><strong>13,780</strong></td>
<td><strong>14,980</strong></td>
</tr>
<tr>
<td><strong>Total Facility ASF:</strong></td>
<td></td>
<td></td>
<td><strong>15,140</strong></td>
<td><strong>16,585</strong></td>
</tr>
</tbody>
</table>
3.2 Unique or Special Features

This addition to the PASCAL Storage Facility will be constructed to house lesser used books, archival materials and other items now stored at the participating institution libraries. The storage module is designed specifically as a preservation environment which is a cost effective collection management approach to extending the life expectancy of a library’s collection. This space is programmed to house books and materials which are susceptible to deterioration from exposure to light and fluctuations in temperature and humidity. The space requires tight environmental and lighting controls designed to preserve valuable resources.

Deterioration of books, manuscripts, maps, photographs and other library resources result from various factors such as temperature, relative humidity, light, pollution, animal pests, bacterial and fungus or damage from fire and water accidents. An ideal environment, according to Duncan Cameron’s “Environmental Control: A theoretical Solution,” is “pollution free, totally dark, has a constant temperature and relative humidity, a vibration free structure, absent of all organisms, protected from fire and flood with an emergency back-up control system with cooperation from the Almighty.” Studies by James M. Reilly at the Rochester Institute of Technology to predict the preservation value of shelving situations showed that when comparing the predicted life span of paper materials stored in a typical library environment at 68 degrees Fahrenheit with 40% relative humidity to an environment of 50 degrees Fahrenheit with 30% relative humidity, the predicted lifetime of the material increases dramatically from 58 years to 275 years. Toward that goal, the storage module is designed to have minimum penetrations, low light levels, a mechanical system which maintains a constant temperature of 50 degrees Fahrenheit and relative humidity of 30%. All openings into the storage module are gasketed and the roof is designed to avoid any roof penetrations.

The shelving system is 30 feet high loaded with card board boxes accessed by means of an order picker. The aisles are designed to accommodate the order picker equipment. Given the extreme height of the shelving system and the heavy load of the material, the tolerances of the system for being installed out of level are very low. The stability of the shelving depends on the shelving not leaning at all. This high density system requires an Fmin 100 “super flat” concrete floor with a maximum rate of change in inches at 0.040” per foot of travel along the “order picker” path. In addition, the concrete slab floor must be able to sustain loading from the storage rack system roughly equivalent to 3,000 pounds per square foot.

3.3 Health, Life Safety and Code Issues

Order Picker at end of aisle

Applicable Codes
International Building Code (IBC), 2003 edition, Chapters 2-35 and Appendices C and I
International Mechanical Code (IMC), 2003 edition, Chapters 2-15
Uniform Plumbing Code (IPC), 2000 edition
International Fire Code (IFC), 2003 edition
National Electrical Code (NEC), 2002 edition

Fire Zone
The campus building official will present the project to the Aurora Fire Department.

**Type of Construction**  
Type II A

**Occupancy**  
S-1: Storage Moderate Hazard  
B Business - Original Building

**Gross Square Feet**  
16,585 GSF New  
19,567 GSF Existing

**Building Height**  
One Story – no basement  
Existing Mezzanine

**Fire Protection**  
Sprinklered

Table 302.3.2 Required Separation: S-1/B needs a 3 hr separation

**General Building Heights and Areas (Chapter 5)**

Table 503. Using a Type II A construction type the allowable height and building areas are as follows:  
Group B = 5 stories, with 37,500 sf per floor.  
Group S-1 = 4 stories with 26,000 sf per floor.

Section 506. Area modifications

\[ \text{Aa} = \text{At} + \left[ \text{At} \times \text{If} / 100 \right] + \left[ \text{At} \times \text{Is} / 100 \right] \]

- \( \text{Aa} \) = Allowable area per floor  
- \( \text{At} \) = Tabular area per table 503  
- \( \text{If} \) = Frontage area increase  
- \( \text{Is} \) = Sprinkler area increase

\[ \text{If} = 100 \left[ \frac{F/P - 0.25}{30} \right] \times \left( \frac{W}{30} \right) \]

- \( F \) = Building perimeter fronting public way  
- \( P \) = Entire building perimeter  
- \( W \) = Width of public way. (1.0 max. Ratio)

\[ \text{If} = 100 \left[ \frac{1364/1364 - 0.25}{30} \right] \times (65/30) \]

\[ \text{If} = 100 \left[ 1.00 - 0.25 \right] = 75 \]

For S-1 Occupancy Use: non-separated use:

\[ \text{Aa} (S-1) = 26,000 + \left[ 26,000 \times \frac{75}{100} \right] + \left[ 26,000 \times 300^* \times \frac{100}{100} \right] \]

\[ \text{Aa} (S-1) = 26,000 + [19,500] + [78,000] \]

\[ \text{Aa} (S-1) = 123,250 \text{ SF} \]

* for single story buildings with automatic sprinkler Is = 300

Proposed Square Footage:

- **Existing Facility**: 19,567 GSF  
- **This Addition**: 16,585 GSF  
- **Future Construction**: 28,375 GSF (2.5 modules with mechanical mezzanines x 11,350)

**TOTAL**  
64,527 GSF

Section 302.3.1 Non-separated Uses: The most restrictive type of construction shall apply to the entire building or portion of building determined to fall under Non-separated Use. Group S-1 is the most restrictive use.
Types of Construction (Chapter 6)

Table 601. Using a Type II A construction type the fire-resistant rating requirements for building elements are as follows:

- Structural frame: 4 hr Owner requirement (1 hour required by Code)
- Bearing walls - exterior: 4 hr Owner requirement (1 hour required by Code)
- Bearing walls - interior: 1 hour
- Nonbearing walls - interior: 1 hour at egress corridors Owner requirement (0 hours required by Code)
- Floor construction: 1 hour
- Roof construction: 1 hour

Table 602. Using a Type II A construction type the fire-resistant rating requirements for exterior walls based on fire separation distance.

Group S-1:
- <5 = 2 hours
- <10 = 1 hour
- <30 = 1 hour
- =>30 = 0 hours

Fire Protection Systems (Chapter 9)

903.2.8 Group S-1 Automatic sprinkler not required in buildings containing S-1 occupancy where S-1 is under 12,000 sf and is located on first floor and the combined S-1 area on all floors is less than 24,000 sf.

Fire sprinklers shall be provided for the entire building.

Section 906. Portable fire extinguishers will be installed in locations as required by the IFC.

Section 907.2. Fire alarm and detection system is required where automatic sprinkler protection is provided.

Means of Egress (Chapter 10)

Table 1015.1 Permits exit access travel distance as follows:
- Group B occupancy, sprinklered allows 300 ft. max.
- Group S-1 occupancy, sprinklered allows 250 ft max.

Table 1016.1 Corridor fire-resistance rating. Group B and S occupancies with a fire sprinkler system shall have a 0-hr fire-resistance rating.

Standards
- Colorado Revised Statutes, title 9, Article 5, as amended – Buildings Constructed by Public or Private Funds – Standards (contains State Standards for barrier-free access)
- Uniform Federal Accessibility Standards (UFAS) Fed Std – 795
- University of Colorado Health Sciences Center Standards
The architect/engineer shall check with the principal representative assigned to the project to receive any updates or adjustments to code or standards requirements. The editions of the code and standards that are current at the time of schematic design shall be used in this project.

3.4 Site Requirements

The initial planning process for the PASCAL storage facility included site planning for the eventual addition of four storage modules equal in size to the original storage module. The total site requirement for the initial building and four additional modules is between 2.75 and 3.0 acres of contiguous land, with 1.25 – 1.75 acres for the initial project. A portion of the remaining acreage is being used for surface parking, until the proposed and future storage modules are constructed, per the Health Sciences Center – Fitzsimons Master Plan.
3.5 Equipment Requirements

The equipment to be provided through funding of this program plan is generally limited to items that would be considered necessary to provide a functional facility ready upon opening to process immediately the items intended for the new Storage Module. The primary equipment component includes the structural shelving system and shelves with guides. Fourteen hundred linear feet of 30’ high shelving will be installed in the storage module and accounts for the majority of the cost under equipment requirements. Also included in the equipment budget is the battery powered order-picker, as well as the guardrails to guide the picker down the aisles of the storage module and book trays of varying sizes, constructed of low acid paper, and with handles at each end for ease of retrieval from the shelving unit. In addition, an inventory control system has been included in the budget under equipment.

The total equipment budget has been established at $1,412,500 with communication equipment of $16,514, for a total equipment budget of $1,429,014.

3.6 Land Acquisition

The addition to the PASCAL storage facility will be located on land that is owned by the University of Colorado at Denver and Health Sciences Center which was part of the original acquisition of the Fitzsimons Campus.
4.0 Project Description/Solution

The following information will describe the basic building requirements for this project. The discovery phase of physical planning, as well as schematic design will further refine the assumptions made at this level of program planning. This facility was patterned after 30 other like facilities built on campuses throughout the United States. Refinements were made in this facility reflecting the observations and conclusions formulated through discussions with previous book depository managers.

4.1 Facility Improvements and Scope of Work

This addition to the PASCAL storage facility has only one component. The sole component is the Storage Module which will be supported by the service spaces in the existing facility. The Storage Module will be approximately 71'-4" wide by 212' long, with a clear ceiling height of approximately 36'.

The Storage Module is anticipated to house approximately 2.4 million volumes, which will vary depending on collection size, book sizes, and weights. The facility will have a complete climate controlled environment designed to minimize any deterioration of the volumes to be stored in the facility. Within the Storage Module will be a specially designed metal shelving configuration approximately 30’ high by 175’ long and containing 3’ deep shelving. Six access rows, approximately 54” wide, will provide access with a battery powered order picker lift vehicle to access the shelving units and the book trays contained on those units.

The demanding environmental and structural requirements of the Storage Module require sophisticated design solutions not required in most construction or general storage space. Preservation of library materials requires an extremely sophisticated mechanical system to maintain a constant low temperature and relative humidity and the shelving units and high density/highbay configuration requires a “superflat” floor with high loading capacity. Both of these elements raise the cost of construction.

The facility is to be located at the University of Colorado at Denver and Health Sciences Center on the Fitzsimons Campus in Aurora, Colorado. One delivery per day of requested materials will be made to each of the participating institutions and schedule deliveries of materials to be stored will be accepted by facility staff.

Site Work

The addition will be located directly east of the existing facility consistent with the UCHSC Institutional Master Plan completed in August 2000. The site is currently being used as a temporary parking lot. A portion of this parking lot may be demolished as part of the construction project.

Landscape

The landscape design developed in the PASCAL storage facility will be continued to incorporate the new addition. Since the construction of the original facility, sidewalks have been completed to extend around the entire site. Materials used for the extension of the landscaping will include some or all of the following materials consistent with the original facility landscape design: concrete sidewalks, concrete unit pavers, granular paving at groves, ornamental deciduous trees, evergreen trees, large canopy shade trees, benches, trash receptacles and site lighting.

Foundations

Wall and footing foundations will be poured-in-place concrete on load bearing soils. The PASCAL storage facility foundations were planned and constructed with the addition of storage modules in mind. The east wall foundation incorporated a ledge for a new masonry wall to be built parallel to the east
exterior wall. Concrete will be of Type II or Type V where it is in contact with soils that contain sulfates. Soils analysis and structural engineering will determine the appropriate foundation design to support the structure and shelving system loading of the facility.

**Structure**

Floors on or below grade shall be reinforced concrete slabs as required to meet the recommendations of the soils engineer. Loading shall be as required by structural analysis and in accordance with the proposed uses of the facility. Should expansive soils be encountered, structural floors shall be utilized. Based on the construction of the Central Storage Module, the floor slabs will be between 10”-12” “super-flat” Fmin 100 concrete floors with a maximum rate of change in inches at 0.040” per foot of travel along the “order picker” path. The Storage Module flooring is one of the most critical elements of the facility. This floor must be structurally designed for minimal, or no movement over time.

The primary structural system anticipated for this facility is load bearing walls with a steel bar joist roofing system. During the initial construction of the PASCAL Storage Facility, a knock out panel was constructed at the north end of the east wall to allow for connection to the additional storage modules. A new 8” wall will be placed parallel to the existing exterior east wall. The roofing system shall be steel bar joists spanning the entire width of the Storage Module, to provide for a barrier free interior workspace. The Storage Module shall be constructed to four-hour standards per the Owner’s requirements, especially when in contact with other building elements.

Exterior load bearing walls will be constructed of reinforced concrete masonry walls with a 4” masonry veneer to match existing construction which was designed in keeping with the campus design standards developed in the Institutional Master Plan of the Health Sciences Center campus at Fitzsimons. Exterior doors shall be of anodized steel as appropriate for the space and security issues. No public entry into the Storage Module will be allowed.

To maintain the stringent environmental requirements of the space, the entire building envelope is insulated and has a tight vapor barrier to minimize the amount of humidity that can migrate into the space. All door penetrations into the Storage Module shall include fully gasketed isolation from the exterior. The Storage Module should be specially insulated to minimize the effects of external weather changes on the internal environment. No penetrations other than a connecting door will be provided in the Storage Module.
Interior

The Storage Module walls shall consist of concrete block. Extend all walls to structure for sound attenuation. Floors shall consist of sealed concrete and the ceilings shall be exposed to the structure above. These unfinished ceilings could be painted if appropriate.

Mechanical Systems

The mechanical systems for the Storage Module will be located at the mechanical mezzanine. The storage module shall be constructed for minimal air leakage, thereby requiring minimal recirculation of outside air. All outside air needed during periods of heating and cooling shall be dehumidified or humidified, and filtered to maintain a positive internal pressure and to remove all particulates and amazing gases that may be present in the outside air required. These filters shall also be used to consistently improve the internal air quality of recirculated air during all heating and cooling periods. A desiccant dehumidification system is required to maintain the low relative humidity at the 50 degree Fahrenheit temperature.

The maximum allowable high temperature and humidity will be 50 degrees plus/minus 2 degrees and 30 percent plus/minus 2 percent. The indoor environment shall be constant. The mechanical system will maintain positive pressure from the new module to the existing module to maintain air environment in the new module.

Air circulation around the stack units is extremely important and stratification of climates within this large volume of space shall be avoided. Electronic digital controls and multiple sensors shall constantly monitor the indoor environment. No penetrations of the roof will be allowed for plumbing or mechanical equipment, or ductwork. The only human functions to occur within the storage module itself will be the placement or retrieval of items to be stored in this facility. No work space shall be provided and storage of the mobile order picker shall occur outside of the Storage Module. No plumbing fixtures will be required in the Storage Module.

A standpipe system shall be extended to the Storage Module and located at each end of the building. A preaction system is the preferred sprinkler system. Fire extinguishers shall be provided as required for the building at both ends of each shelving row, and should be made a part of the mobile lift when in use.

Electrical Systems

The electrical design consultant will need to determine the power requirements and determine how service will be extended to this new addition. The existing fire alarm system which is monitored 24 hours a day will be extended into the addition. All electrical conductors, including wire substations, panel boards, and transformers shall be of copper.

The Storage Module shall have high pressure sodium fixtures that produce a total of approximately 5 foot candles of illumination throughout the facility. The Storage Module should be kept dark during all periods, except when occupants are placing or retrieving items from the shelving. Task lighting shall be provided on the mobile lift.

Smoke detectors shall be provided throughout the Storage Module. Fire detection devices shall be placed at the ceiling and various levels throughout the stack system, to provide for instantaneous annunciation of a potential hazard. A security system shall be provided and monitored from an external source during all periods when the facility is unoccupied.

Building Service and Other Requirements
Interior and exterior signage shall be provided according to the University of Colorado at Denver and Health Sciences Center guidelines. All rooms shall be lockable. Access for facility and program users who are physically challenged shall be furnished in such a manner that it is integrated and not separately provided from that for able-bodied users. The facilities shall be entirely ADA compliant.

4.2 Project Sketches

The following diagram shows the proposed relationship of the individually identified program areas. The diagram is intended to show the final arrangement of space. The final arrangement will be determined during the physical planning phase of this project.
4.3 Project Cost Estimate

The following project cost analysis makes assumptions about the cost of construction for this project. The base construction costs for the facility have been estimated at slightly over $185.71 per square foot. This is based primarily on review of bids received recently for projects similar in scope to this facility and the cost of construction for the existing facility. Those figures were adjusted to today’s construction costs relative to the State of Colorado.

Analysis suggested that a .90 building efficiency ratio be used due to the extremely simple character of the interior spaces of this facility. The table that follows shows the opinion of total project costs for the addition to the PASCAL storage facility. The opinion of the total project cost table is broken down into five different areas as follows:

- Land Acquisition
- Professional Services
- Construction
- Equipment
- Miscellaneous Costs

Professional fees include physical planning for this project, as well as costs associated with site investigation and non-building professional services such as architecture selection and bidding phase expenses. A factor of 12% for A&E services was used in this projection because of the anticipated higher fees for mechanical and electrical engineering.

The base construction hard costs were detailed earlier in this section, with the remainder of the construction costs contained in site development, landscaping, and utilities. Site development includes grading, drainage improvements, parking, and site lighting requirements. A total of $153,285 has been budgeted for site development in this project at this time. Another $107,300 has been allocated for utility infrastructure development.

The equipment requirements enumerated in Section 3.5 of this plan have been estimated based on manufacturer pricing. The total equipment budget has been established at approximately $1,412,500 with communication equipment of $16,514, for a total equipment budget of $1,429,014. The majority of the costs for this line item are for the shelving system that will be installed inside the Storage Module. Structural design of the shelving system has been included under the professional services category of this analysis.

A 5% contingency has been included. The overall project cost has been projected at $5,695,269 or approximately $343 per gross square foot total project costs. The following table shows the total project costs. This projected budget has increased since the submittal of the draft CC-C forms for this project by $2,061,310 which reflects a 50% increase in the originally planned bay size and an increase in the equipment budget with a proportionate increase in the contingency. Revised CC-C will be submitted showing this increase.

<table>
<thead>
<tr>
<th>CC-C CAPITAL CONSTRUCTION BUILDING PROJECT REQUEST FY 2006-2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title: PASCAL II</td>
</tr>
<tr>
<td>Institution: University of Colorado Health Sciences Center</td>
</tr>
<tr>
<td>Total Project Costs</td>
</tr>
</tbody>
</table>
### A. Land Acquisition

| (1) Land Purchase Cost | $ - |

### B. Professional Services

| (1) Master Plan/PP | $26,000 |
| (2) Site Surveys, Investigations, Reports | 60,551 |
| (3) Architectural/Engineering/Basic Services | 450,414 |
| (4) Code Review/Inspection | 10,730 |
| (5) Construction Management | 41,754 |
| (6) Advertisements | - |
| (7) Other (specify) | - |
| (8) Total Professional Services | $589,449 |

### C. Construction

| (1) Infrastructure |
| (a) Service/Utilities | $107,300 |
| (b) Site Improvements | 153,285 |
| (2) Structure/Systems/Components |
| (a) NEW (GSF) 16,585 | $3,080,019 |
| New $185.71/GSF | - |
| (b) Renovate GSF | - |
| (3) Other (specify) | - |
| (4) Total Construction Costs | $3,340,604 |

### D. Equipment and Furnishings

| (1) Equipment | $1,412,500 |
| (2) Furnishings | - |
| (3) Communications | 16,514 |
| (4) Total Equipment and Furnishings Cost | $1,429,014 |

### E. Miscellaneous

| (1) Art in Public Places = 1% of Total Construction Costs | - |
| (2) Relocation Costs | - |
| (3) Other Costs – TAP Fee | 65,000 |
| (4) Total Miscellaneous Costs | 65,000 |
| Total Project Costs | $5,424,066 |

### F. Project Contingency

| (1) 5% for new | $271,203 |
| (2) 10% for Renovation | - |
| (3) Total Contingency Requested | $271,203 |

### G. Total Budget Request

A(1)+B(8)+C(4)+D(4)+E(4)+F(3) = $5,695,269

### H. Source of Funds

| CCFE |
| CF |
| CFE | $5,695,269* |
| FF |

* Reflects increase in square footage, equipment budget and contingency over submitted CC-C forms. Revised CC-C forms to be submitted.

#### 4.4 Life Cycle Cost Analysis

Life cycle cost analysis tables for this project are included below. In a 30-year study, they indicate that the current project expenditure of $5,695,269 plus the present value of future operating costs and capital improvements of $3,642,480 compare favorably to a future facility value of $12,407,554. Due to the University of Colorado at Denver and Health Sciences Center commitment to develop the Fitzsimons campus as well and the commitment to other
PASCAL members to develop an efficient shared facility, comparative life cycle cost analysis for alternative sites not owned by the University of Colorado were not considered.

**Operating Costs in $/GSF**

<table>
<thead>
<tr>
<th></th>
<th>Costs/GSF/Year</th>
<th>GSF</th>
<th>Annual Operating Costs</th>
<th>Categorized Annual Operating Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>$2.76</td>
<td>16,585</td>
<td>$45,775</td>
<td>$45,775</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating &amp; Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Maintenance &amp; Repairs</td>
<td>1.57</td>
<td>16,585</td>
<td>26,038</td>
<td></td>
</tr>
<tr>
<td>Supplies &amp; Equipment</td>
<td>4.67</td>
<td>16,585</td>
<td>77,452</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2.11</td>
<td>16,585</td>
<td>34,994</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>$138,484</td>
<td>$184,259</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Building Life Expectancy**

<table>
<thead>
<tr>
<th>Facility Subsystem</th>
<th>Likely Life</th>
<th>Range</th>
<th>Useful Life Chosen</th>
<th>% Replaced @ Useful Life</th>
<th>% of Constr. Cost</th>
<th>Current Constr. Cost</th>
<th>Provision for Renewal w/o Inflation</th>
<th>FV Factor 5% Useful Life</th>
<th>Replace Cost w/Inflation Chsn &amp;% Replaced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation/structure</td>
<td>50</td>
<td>50 up</td>
<td>50</td>
<td>5%</td>
<td>25%</td>
<td>$835,151</td>
<td>7.04</td>
<td>$293,973</td>
<td></td>
</tr>
<tr>
<td>Roofing</td>
<td>25</td>
<td>15-40</td>
<td>15</td>
<td>100%</td>
<td>5%</td>
<td>167,030</td>
<td>11,135</td>
<td>2.079</td>
<td>347,256</td>
</tr>
<tr>
<td>Exterior Closure</td>
<td>50</td>
<td>50 up</td>
<td>30</td>
<td>20%</td>
<td>19%</td>
<td>634,715</td>
<td>21,157</td>
<td>4.322</td>
<td>548,647</td>
</tr>
<tr>
<td>Interior Construction</td>
<td>50</td>
<td>25 up</td>
<td>30</td>
<td>10%</td>
<td>5%</td>
<td>167,030</td>
<td>5,568</td>
<td>4.322</td>
<td>72,190</td>
</tr>
<tr>
<td>Interior Finishes</td>
<td>10</td>
<td>5-15</td>
<td>15</td>
<td>60%</td>
<td>3%</td>
<td>100,218</td>
<td>6,681</td>
<td>2.079</td>
<td>125,012</td>
</tr>
<tr>
<td>HVAC</td>
<td>25</td>
<td>15-75</td>
<td>25</td>
<td>50%</td>
<td>22%</td>
<td>734,933</td>
<td>29,397</td>
<td>3.386</td>
<td>1,244,241</td>
</tr>
<tr>
<td>Electrical</td>
<td>35</td>
<td>20-75</td>
<td>25</td>
<td>50%</td>
<td>10%</td>
<td>334,060</td>
<td>13,362</td>
<td>3.386</td>
<td>565,564</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>50</td>
<td>20-100</td>
<td>40</td>
<td>30%</td>
<td>1%</td>
<td>33,406</td>
<td>835</td>
<td>7.04</td>
<td>70,554</td>
</tr>
<tr>
<td>Special Equipment/Misc</td>
<td>30</td>
<td>10-50</td>
<td>20</td>
<td>20%</td>
<td>10%</td>
<td>334,060</td>
<td>16,703</td>
<td>2.653</td>
<td>177,252</td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td>3,340,604</td>
<td>104,839</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Project: PASCAL II
Study Period: 30 Years
Discount Rate: 6%
Date: 24-Aug-2005
Study Method: Present Value at One Dollar
Construction Cost: $3,340,604
Construction Cost & Fees: $5,695,269 First Year
Addl Optg & Maint Costs: $142,159 First Year
Addl Energy/Utilities: $46,989
Inflation Factor: 5%
Salvage Value Escalator: 4% Compounded Annually

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment Including Soft Costs</th>
<th>Major Repair Replacement</th>
<th>Operation &amp; Maintenance</th>
<th>Energy/Utilities</th>
<th>Salvage Total</th>
<th>Total</th>
<th>Discount Rate</th>
<th>Present Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$5,695,269</td>
<td>$142,159</td>
<td>$46,989</td>
<td>$189,148</td>
<td>0.9434</td>
<td>$178,442</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$149,267</td>
<td>$156,730</td>
<td>$51,805</td>
<td>$208,536</td>
<td>0.8900</td>
<td>$176,759</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$164,567</td>
<td>$172,795</td>
<td>$57,115</td>
<td>$229,911</td>
<td>0.7473</td>
<td>$171,812</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$181,435</td>
<td>$190,507</td>
<td>$59,971</td>
<td>$241,406</td>
<td>0.6724</td>
<td>$168,587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$200,032</td>
<td>$210,034</td>
<td>$69,424</td>
<td>$279,458</td>
<td>0.5919</td>
<td>$165,411</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$221,562</td>
<td>$220,535</td>
<td>$72,895</td>
<td>$293,431</td>
<td>0.5584</td>
<td>$163,852</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$243,140</td>
<td>$310,315</td>
<td>$80,367</td>
<td>$323,507</td>
<td>0.4970</td>
<td>$160,783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>$255,297</td>
<td>$325,831</td>
<td>$84,385</td>
<td>$339,682</td>
<td>0.4688</td>
<td>$159,243</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$268,062</td>
<td>$342,123</td>
<td>$113,085</td>
<td>$455,208</td>
<td>0.4305</td>
<td>$155,466</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$281,465</td>
<td>$359,229</td>
<td>$118,739</td>
<td>$565,220</td>
<td>0.3918</td>
<td>$151,754</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>$295,538</td>
<td>$377,190</td>
<td>$124,676</td>
<td>$501,866</td>
<td>0.3542</td>
<td>$147,649</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>$310,315</td>
<td>$396,050</td>
<td>$130,910</td>
<td>$526,960</td>
<td>0.3191</td>
<td>$143,231</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$325,831</td>
<td>$415,852</td>
<td>$137,455</td>
<td>$553,307</td>
<td>0.2925</td>
<td>$139,856</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>$342,123</td>
<td>$436,645</td>
<td>$144,328</td>
<td>$580,973</td>
<td>0.2683</td>
<td>$136,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>$472,268</td>
<td>$359,229</td>
<td>$118,739</td>
<td>$565,220</td>
<td>0.3918</td>
<td>$147,649</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>$281,465</td>
<td>$124,676</td>
<td>$501,866</td>
<td>$445,564</td>
<td>0.3542</td>
<td>$139,856</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>$310,315</td>
<td>$130,910</td>
<td>$526,960</td>
<td>$430,311</td>
<td>0.3191</td>
<td>$136,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>$325,831</td>
<td>$137,455</td>
<td>$553,307</td>
<td>$415,336</td>
<td>0.2925</td>
<td>$132,856</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>$342,123</td>
<td>$144,328</td>
<td>$580,973</td>
<td>$399,173</td>
<td>0.2683</td>
<td>$129,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>$1,809,805</td>
<td>$458,477</td>
<td>$151,544</td>
<td>$2,419,826</td>
<td>0.2330</td>
<td>$156,819</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>$481,401</td>
<td>$159,121</td>
<td>$640,522</td>
<td>0.2198</td>
<td>$140,787</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>$505,471</td>
<td>$167,078</td>
<td>$672,549</td>
<td>0.2074</td>
<td>$139,487</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>$530,744</td>
<td>$175,431</td>
<td>$706,175</td>
<td>0.1956</td>
<td>$138,128</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>$557,282</td>
<td>$184,203</td>
<td>$741,485</td>
<td>0.1846</td>
<td>$136,878</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>$620,837</td>
<td>$585,146</td>
<td>$193,413</td>
<td>(19,509,624)</td>
<td>$1,399,396</td>
<td>$243,635</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Present Value for Owning and operating Costs over the Study Period $5,463,707
4.5 Financial Analysis

Funding for the construction of this facility will be provided by the participating institutions. With enterprise status, the cash funded capital projects for the University are now recorded in COFRS fund 320.

The funding source for this project is cash funds provided proportionately by the three participating institutions, the University of Colorado at Boulder, Colorado State University and the University of Denver. In accordance with the Six Month Rule, 8.3% or $300,276 of the funds have been encumbered as consistent with previous University projects.

Since the facility will be located on the University of Colorado’ Fitzsimons site, the UCDHSC will be responsible for the facility’s upkeep and maintenance with each participating institution paying proportionately to cover these expenses. The projected annual expenses for the PASCAL I storage facility for 2005/2006 are $479,273.96 as detailed in the tables below which represents approximately $0.30 per volume based upon PASCAL I being at capacity at 1.6 million volumes. With the completion of this addition to the storage facility, the operating cost per volume will start to decrease and ultimately be approximately half. Statistics for the University of Colorado at Boulder indicate that the annual cost for storing a volume on campus is approximately $2.50. This index will vary somewhat between the different institutions dependent on such variables as land values and salary rates but it has been demonstrated that book storage in campus libraries is significantly more costly than storage in a high density facility.

Participants in the PASCAL Storage Facility include the University of Denver, which is a private institution not associated with the University of Colorado system. While the facility will be owned by the Regents of the University of Colorado, all participants in storage at the facility will participate in the yearly facility operations and maintenance costs. This participation will be calculated in relation to the amount of materials stored in the building.

These expenditures will include the costs of personnel, including a resident facility manager and staff hired to process materials into the facility. Besides personnel, the yearly operating expenditures include equipment and supplies, as well as maintenance for the mobile order picker, security, and computer-related equipment and software. The anticipated storage need and breakdown of space usage by institution is located in the appendices of this plan.
<table>
<thead>
<tr>
<th>PASCAL 05-06 Cost Projections</th>
<th>Period</th>
<th>Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor @ 15%</td>
<td>12 months</td>
<td>$13,296.76</td>
</tr>
<tr>
<td>Manager @ 100%</td>
<td>12 months</td>
<td>$68,592.00</td>
</tr>
<tr>
<td>Administration @ 10%</td>
<td>12 months</td>
<td>$7,718.00</td>
</tr>
<tr>
<td>Materials Handler @ 100%</td>
<td>12 months</td>
<td>$29,699.00</td>
</tr>
<tr>
<td>Materials Handler @ 100%</td>
<td>12 months</td>
<td>$29,699.00</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>$149,004.76</td>
</tr>
<tr>
<td><strong>General Operating:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bar codes – 1 order</td>
<td></td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Book Trays – 1 order</td>
<td></td>
<td>$20,000.00</td>
</tr>
<tr>
<td>General Office Supplies</td>
<td></td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Travel and Training</td>
<td></td>
<td>$1,000.00</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>$51,000.00</td>
</tr>
<tr>
<td><strong>Maintenance &amp; Services:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment maint. for Order Picker</td>
<td>12 months</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Telephone monthly charges</td>
<td>12 months</td>
<td>$1,415.00</td>
</tr>
<tr>
<td>Photocopi Rental</td>
<td></td>
<td>$2,400.00</td>
</tr>
<tr>
<td>Courier delivery services</td>
<td></td>
<td>$4,700.00</td>
</tr>
<tr>
<td>Trash pick up</td>
<td></td>
<td>$320.00</td>
</tr>
<tr>
<td>Custodial Services</td>
<td></td>
<td>$4,250.00</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>$15,085</td>
</tr>
<tr>
<td><strong>Utilities:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam</td>
<td></td>
<td>$12,920.00</td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td>$18,900.00</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td>$1,330.00</td>
</tr>
<tr>
<td>Sewer</td>
<td></td>
<td>$120.00</td>
</tr>
<tr>
<td>Flood Control</td>
<td></td>
<td>$40.00</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>$33,310.00</td>
</tr>
<tr>
<td><strong>Depreciation &amp; Allocation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation on Scanner</td>
<td></td>
<td>$3,000.00</td>
</tr>
<tr>
<td>Depreciation on Order Picker</td>
<td></td>
<td>$2,424.20</td>
</tr>
<tr>
<td>General Infrastructure Recharge</td>
<td></td>
<td>$215,800.00</td>
</tr>
<tr>
<td>General Administrative Recharge</td>
<td></td>
<td>$9,650</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td>$230,874.20</td>
</tr>
<tr>
<td><strong>Annual Operating Expense Total</strong></td>
<td></td>
<td><strong>$479,273.96</strong></td>
</tr>
</tbody>
</table>

* Includes Depreciation & Allocation which is not included in new project projected expenses included in CC-C forms.
### Projected Cost Participation by Participating Library through 2006

<table>
<thead>
<tr>
<th>Institution</th>
<th>Volumes</th>
<th>Estimated Amount Due FY 05/06</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulder</td>
<td>826,000</td>
<td>$310,665.38</td>
<td>64.82%</td>
</tr>
<tr>
<td>DU</td>
<td>273,949</td>
<td>103,043.90</td>
<td>21.50%</td>
</tr>
<tr>
<td>Auraria</td>
<td>65,866</td>
<td>24,778.46</td>
<td>5.17%</td>
</tr>
<tr>
<td>HSC</td>
<td>75,818</td>
<td>28,516.80</td>
<td>5.95%</td>
</tr>
<tr>
<td>DU-Law</td>
<td>32,600</td>
<td>12,269.42</td>
<td>2.56%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,274,233</td>
<td><strong>$479,273.96</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### 4.6 Project Schedule

The project schedule is based on the funding of physical planning by the July 2006. The construction phase of the project is projected for April 2007 through January 2008 with equipment installation in the final months of construction. This would place occupancy of the addition in April 2008.
5.0 Relation to the Master Plan/Other Projects

This project request is in conformance with the Institutional Master Plan for the University of Colorado Health Sciences Center and the University of Colorado Hospital Authority approved by CCHE on December 3, 1998 and the subsequent Institutional Master Plan Updates in 1999, 2000, 2001 and 2002 which were approved by the Board of Regents of the University of Colorado and submitted to CCHE. The 2002 supplement was approved by CCHE on February 7, 2003.

The relation of this project to the facility master plans for each institution participating in this project will be relatively similar in nature. This addition to the existing storage facility is being constructed to provide much needed space to house lesser used volumes from the libraries of each of the institutions participating in this project. As described in Section 2 of this plan, the libraries at each institution and the existing PASCAL storage facility are approaching their maximum capacity. Without the ability to decrease present holdings in existing library facilities, these institutions are being forced to consider additions to their libraries which are less cost efficient than high density storage. With construction of this facility, additional shelf space will be made available on each campus and the older, less used volumes can be maintained in the PASCAL storage facility for access to each campus. The collections held in the PASCAL storage facility will be non-duplicative and will either remain the property of the institution from where they came or will become commonly held.

Facility deficits identified in the master plans for the individual institutions in the library classification will be affected by the ability of these institutions to transfer volumes to this storage facility. This will prolong the ability of the individual libraries to add to their collections without requiring major additions to facilities in the short-term. In the case of Colorado State University, inability to relocate volumes to PASCAL may affect accreditation.
6.0 Facilities Alternatives

Facility alternatives would include not building, requesting additional funding for more costly additions to libraries to house new collections, the leasing or purchase of a building meeting the requirements of this facility, building out more storage modules for a longer term need, building out a smaller storage module or full implementation of this program plan.

Not building at this time, would seriously impact the participating institutions’ libraries space usage. If an additional storage module is not completed by 2008 and as projected, PASCAL will meet its capacity in less than three years and will not be able to accept additional volumes from participating libraries. These libraries will be unable to accommodate their excess materials. Libraries will need to either dispose of collection materials, build or lease new space at their campuses, or reapportion their stack, support and learning space to provide more stack space. To maintain the status quo would leave each institution in a situation where existing shelf storage is insufficient, with no ability to house new collections. This would not be in the best interests of these institutions. The capital funding that would be required to satisfy space deficits over time has not been identified.

Building additional library space on each of the participating campuses requires capital funding that exceeds that which would be required to build the additional storage module. The shared space allows collections to eliminate duplication between the various institutions’ collections. The ability to share staff and operating costs makes the PASCAL storage facility an extremely cost effective solution to long term storage needs for less used materials.

Leasing space presents several challenges. Because of the nature of the demanding environmental and security issues present in a book depository, finding associated space in the private sector to lease or to purchase would be extremely difficult. The Storage Module has unique environmental specifications and space requirements to house the shelving modules. The layout of the facility is in keeping with minimizing long-term operating costs for staff to operate the depository. The costs associated with retrofitting mechanical, electrical, and other specialized systems into an existing building would be cost prohibitive and more expensive than building an addition to the existing PASCAL storage facility. This addition will not require new support space and therefore will be highly cost efficient space.

Building two storage modules at this time has been considered. From a construction stand point, building a larger module is more cost efficient. At this time, however, the availability of initial first costs limits the size of the project and makes the two storage module option not feasible.

Building a smaller storage module at this time is not as cost effective an option. The six aisle storage module maximizes the efficiency of the space usage with consideration for shelving size, requirements of the order picker and constructability. The smaller module is less efficient based on capital and operating costs per equivalent volume of storage capacity.
SPACE DESCRIPTION
Addition to PASCAL Storage Facility
ROOM NAME: Storage Module

ASF: 15,140

ADDITIONAL IDENTICAL ROOMS: 0 TOTAL OF: 1

PRIMARY FUNCTION: Books, collection and archival storage

RELATIONSHIP TO OTHER FACILITIES: Close to:
- Processing room
- Lift storage
- Loading dock

SPECIAL REQUIREMENTS OF THIS SPACE:
- HVAC system, detectors, alarm system, ceilings. Concrete floor to
- Hard cleanable surface floors, walls, ceiling. Individual maintain positive air pressure. Smoke and water security system. High insulation value all walls and within one hundredth of one inch of level.

BUILT-IN EQUIPMENT:
- Shelving system and guard rails

MOVABLE EQUIPMENT:

OTHER DESIGN CONSIDERATIONS:
- Four hour construction all walls especially common walls
- No roof penetration allowed
- Fully gasket all penetration including doors. Filter all equipment or unit ventilators.
APPENDIX B
ANTICIPATED STORAGE NEEDS

PASCAL Bay 2 Construction Cost Apportioned by Projected Occupancy

As described in Section I.A. in the Memorandum of Understanding, all planning, construction management and construction costs will be shared by UCB, CSU and DU based on the following projections of volumes each institution will load into Bay 2.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Projected Volumes</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado State University</td>
<td>864,000</td>
<td>36%</td>
</tr>
<tr>
<td>University of Colorado at Boulder</td>
<td>1,032,000</td>
<td>43%</td>
</tr>
<tr>
<td>University of Denver</td>
<td>524,000</td>
<td>21%</td>
</tr>
<tr>
<td>Totals</td>
<td>2,420,000</td>
<td>100%</td>
</tr>
</tbody>
</table>
BRIEF HISTORY OF REMOTE LIBRARY STORAGE - USING HIGH DENSITY SYSTEMS
PROJECTS BY DILL AND COMPANY
Prepared by Reese Dill of Dill & Company

1. Harvard Depository, Southborough, Massachusetts

Harvard Planning Group originally retained Dill and Company in January 1984 to develop the most space and labor efficient methods for storage of the inactive books from the libraries of Harvard and other institutions in the Boston area.

We initially researched some of the existing depository operations including those locally and a recently completed facility at the University of California at Berkeley. We also collected as much data as possible on the size ranges for books of all types with particular attention to the ratios between height and depth. Published data on book sizes generated at Princeton, Brown, and Yale were evaluated and verified by a book size analysis of a collection of volumes in the New England Depository Library in Brighton, Massachusetts.

It became apparent to us that in order to get substantial improvement in space utilization, the books must be segregated by size and stored more than 9” deep, which is the shelf depth, used by most libraries. The University of California at Berkeley stores books 2 deep on 18” deep shelves, but we figured this system could create some difficult retrieval problems.

After looking at a number of storage configurations, we arrived at a system using a number of different sized but modular book trays which would allow books to be stored 36” deep. By grouping the books by size and height and using industrial type shelving and a high level order vehicle capable of elevating its operator to reach shelving up to 30’ from the ground, the amount of volumes stored per square foot of building area could be improved by a great degree over the other types of storage available.

We then did a number of return on investment analyses which compared the proposed system with the most attractive of the other systems which we had investigated. Harvard approved the concept in mid 1985 and we then completed the design of the system including the shelving, book trays and other equipment required.

An architect was hired by the Harvard Planning Group to design a building which would enclose the storage system, and which would also provide the work areas for sorting of books, and data entry into a computerized locator system. Bar codes are an integral part of this system and are placed on and in each book, on each book tray, and on each shelf location in the system.

We prepared requests for proposal for the shelving and other equipment and helped Harvard with the selection of the equipment vendors. During construction and equipment installation we monitored the interfaces between the equipment and building requirements.

The first Harvard Density Storage Module has 4 aisles and approximately 9000 shelves which are set at varying heights to accommodate the range of heights of the books and archive materials stored in the facility. The objectives in the design of the original Harvard Module were to maximize the amount of book storage and minimize the size of the building. A great effort was made to obtain the lowest costs for building construction, shelving, book trays and material handling equipment. The thirty-foot height of storage was the highest that it is possible reach with high-level order picker equipment, which can operate in a 54” aisle, which is also the minimum aisle width for this type of equipment.

Depending upon the size of the books in the collection stored, it is possible to store 1.5 to 2.2 million-volume equivalents in less than 10,000 square feet.

During the design of the HVAC system for the first module particular emphasis was placed on having good air circulation and this required incorporation of 20 vertical ducts for return air within the shelving system.
At project completion we helped the operators of the facility with the purchase of book trays and other equipment and the startup of operations.

By September 1990 the first module of the Harvard Depository had been nearly filled and we began working with Harvard on a second 4-aisle module. During the planning process on the second Harvard Module we developed an improved concept for the shelving system with the incorporation of welded steel uprights rather than the bolted systems common to shelving systems. There had been some problems with the shelving system in the first module, which used a more standard type of shelving. The shelving system concept used for the second module offers more flexibility in terms of shelf location and loading sequence than the shelving systems which were available during the conceptual process for the first Harvard Depository Module. The HVAC system for the second module was also modified to have less vertical ducts incorporated into the shelving when it was found that the amount of air moved in the first module was not needed for maintenance of the specified conditions.

The first and second modules were completed at a time when Harvard felt that a fire protection system would not be needed and that potential malfunctions of automatic sprinklers might cause more damage to the collection than the potential of fire. Due to the high value of the materials, which were being placed in the high-density storage modules, the question of fire protection was raised in connection with the design of the third Harvard module. An analysis of the available means of automatic fire protection was made in connection with the design of the third module and the potential effects of a sprinkler system on the operation of the facility were evaluated. A decision was made to incorporate 2 levels of in-rack sprinklers and perforated shelves in the third module. This degree of fire protection puts this module in the category of “most highly protected risk” as far as the insurance industry is concerned.

The fourth module has now been completed it incorporates the same fire protection system as the third module. The shelving system was further refined to allow for storage of the slightly larger archive boxes which one manufacturer is beginning to make. The system was also modified to accommodate standard flat files for storage of large sheet material. A small module with additional levels of fire protection was designed specifically for media storage such as microfilm and motion picture film.

Harvard’s fifth and sixth modules which each incorporate 6 aisle modules have now been completed and occupied and they have 4 levels of in-rack sprinklers and one level in the ceiling. These facilities have solid shelves instead of the perforated shelves. After these two modules were occupied Harvard moved the materials out of Modules 1 and 2 and into parts of Modules 5 and 6 and added 4 levels of in-rack sprinklers in the original Modules 1 and 2.

We are now working on the design of a seventh module that will incorporate 10 aisles and be used mainly for record box storage. When the seventh module is completed the Harvard Depository will have 38 storage aisles for books and records and two shorter aisles for film.

2. **Washington Research Library Consortium, Prince Georges County, Maryland.**

This facility, which uses the same basic concept as the Harvard Depository, was constructed in 1993. It has 6 aisles, which are somewhat shorter than the Harvard Depository. This facility serves a consortium of research libraries in the Washington, D.C. area. This project was federally funded and went through many iterations before being completed.

This was actually the first facility to incorporate special ESFR Sprinklers in the storage area. These sprinklers were required by the Price Georges County Fire Marshall for the safety of the fire protection personnel and personnel working in the facility.

3. **Southwestern Ohio Regional Depository, Middletown, Ohio.**
This facility, which was funded by the State of Ohio, is located on the Middletown campus of Miami University and takes material from a number of different universities libraries in that area. The first four-aisle module has now been completed and the second 4-aisle module has now been completed and is being occupied.

This facility uses a different type of locating system than that used at the Harvard Depository. The locating system at SWORD, Ohio State, and other Ohio facilities uses bar codes for each book, which include the actual location of the book within the system. With this system it is possible to find the assigned location of each book by looking at the human readable section of its bar code. However since every book has its location included on its label all books that are moved within the system must be re-labeled.

SWORD is currently in the midst of a project to double the storage capacity with the addition of another 4-aisle module.

4. Ohio State University Library Book Depository, Columbus, Ohio

This facility includes both an archive processing facility and library book depository. This is a four-aisle module with no fire protection system and is patterned after the first Harvard Module. One aisle of this facility is for storage of archival materials, which have a different locator system than the books, which have a locator system similar to the system at the Southwestern Ohio Regional Depository.

Ohio State’s Depository has close to 1 million volumes in storage and another 4-aisle module is currently under construction.

5. Bowling Green State University, Bowling Green, Ohio.

This four-aisle facility, which was completed in 1994, has an HVAC system that incorporates a horizontal laminar flow concept with supply ducts at one end of the system and return air ducts and the other. This feature makes it possible to have all shelves be the same size rather than having some shelving units that are made smaller to accommodate the vertical ducts in other systems. The locator system for this facility is the same as is used at Miami and Ohio State.

6. Moravia Park Book Storage Facility, Johns Hopkins University

This is the first High Density Book Storage Facility that we have designed to fit into an existing building. Several modifications had to be made in the design of the basic system to accommodate the existing structure. These included lower storage heights of 16’4” to the top shelf and the use of both single deep and two deep book tray storage to accommodate the column spacing in the existing building.

The existing building had several low beams in the ceiling that presented possible safety issues. For this reason the order picker vehicle had to be specially modified so that it would not allow travel or lift over a certain height unless specially directed by the operator.

Although this existing facility required extensive floor repairs and other modifications, it was already owned by the University and represented a lower cost than a comparable new facility.

7. Library Storage Facility, University of Missouri, Columbia, Missouri.

This 5-aisle system is the first High Density Storage Facility to use a rigid frame type building system with corrugated metal siding and roofing. Most of the other buildings have been masonry or precast panel construction. This type of construction required that the vapor barrier and insulation be installed under the roof structure.

The University of Missouri uses a similar locator system to those used at the Ohio facilities.
8. Minnesota Library Access Center, Minneapolis, Minnesota

This unique facility incorporates 3 high-density modules that are located in caverns in mined out space eighty feet below the campus of the University of Minnesota. The facility is located under a bluff next to the Mississippi River so that truck access is available through a portal opening next to the base of this bluff. The unique geology in the area allowed caverns to be located between layers of sandstone and limestone. The maximum depth of the sandstone layer and the high water mark of the river required that the maximum height of storage be limited to 16’7” to the top shelf.

One of the high-density modules is designed for storage of rolled drawings that will be placed into special drawing trays that will be handled in a similar manner to the book trays.

There is a forth module which incorporates a shelving supported mezzanine with one tray deep shelf storage for special archive material which needs direct access by staff personnel. Part of the material handling system in this project is a special vertical and horizontal conveyor system to move containers of books from the cavern level to the campus level where there is an architecturally significant archive research facility.

The storage areas of this $38 million facility have been completed and archive materials are being moved into them. Overflow book storage will begin soon.


This storage system is located in an existing building that originally housed the Philadelphia Bulletin Newspaper. The shelving system is actually located underground in a former paper storage warehouse. The existing facility had an irregular shape with large building columns and provided a maximum storage height of approximately 16’0”. There were some challenges to making this former underground warehouse into an efficient High Density Book Storage Facility.

One of the challenges involved with this project was the necessity to rapidly move about 300,000 volumes into the facility from another building which had to be vacated before there was time to properly size these materials and enter them into the locator system. This move involves temporary storage of non-sized material in the D size book trays which are to be stored two deep with the materials in call number sequence.

10. Library Storage Facility, Cornell University, Ithaca, New York

We were asked in 1995 by the Cornell University Library to evaluate their book storage requirements from that date to the year 2010 and recommend alternatives for storage of these materials. Cornell had about 750,000 volumes stored in an existing facility that they called their Annex. This facility used a number of finding systems and had narrow shelves between 30” wide shelf supported catwalks. It also had an existing processing area and was located on a large enough site to incorporate a High Density Storage Facility next to the existing building.

When we started this project, Cornell had already made linear foot growth projections for the collections in each of the 17 different library facilities on Campus. They also had measured the available shelving in each of these libraries. From this data we determined the amounts of high-density storage that would be required for each successive year to enable all libraries to be reduced to an acceptable level of capacity and kept there until the year 2010. Using this data we determined the optimum size of a High Density Storage Facility and considered the economic and operational advantages of various alternatives including the replacement of the existing Annex.

This study indicated that Cornell should construct a new 5 aisle High Density Storage Facility with a capacity of 1.6 million volumes connected to the existing Annex. It also indicated that due to the requirement for high levels of accession in the early years it was also necessary to construct additional processing area. We designed the
storage system to the meet the requirements outlined in the study and the High Density Storage Facility has now been completed as projected and is in the process of being filled.

10. Storage Facility at Fort Meade, The Library of Congress, Anne Arundel County, Maryland

We became involved with this project in the spring of 1996 when members of the Preservation Staff at the Library of Congress visited the Harvard Depository. Our initial work on this project involved helping with the configuration of a High Density Storage Facility to meet the special requirements of the Library of Congress, which at that time was considering a somewhat different configuration than that used in other facilities.

The collections to be moved into the proposed Ft. Meade facility are projected to have much higher circulation than the collections generally planned for remote high-density storage. There was also a desire to process the books at facilities in the Jefferson and Madison Libraries facilities rather than at the remote storage facility.

Due to the desire of the Library of Congress to have a high level of preservation for the materials to be stored in the facility, it was determined that the books should be stored in book trays which have covers to protect them from dust. We have designed special book trays with covers and prototypes have been constructed and tested.

The building and shelving system has been through many iterations and is now under construction. We are currently involved with the layout of the processing areas in the Jefferson Building. Since materials will be put into their storage containers before being moved from Capitol Hill to Fort Meade, it was necessary to design special delivery carts and specify a special refrigerated over the road truck.

11. Off-Campus Shelving Facility, Yale University, Hamden, Connecticut

This is the latest High Density Storage Facility to be completed and incorporates many of the ideas incorporated in the above projects. It is a 6-aisle system that includes a special packaged HVAC system incorporating a desiccant wheel to maintain a year around temperature of 50 degrees F. with a relative humidity of 35 percent.

We spent considerable effort to design the processing area within this facility to maximize the efficiency of the sizing, data input, verification, retrieval and refilling activities. Since most of Yale’s books will be coming from library areas that have recently been under construction it is also necessary to clean the books before they are accessioned. The design of the processing area includes a vacuum cleaning system that will be used to clean all incoming materials.

As with several other projects, Yale elected to defer purchase of shelves that would not be needed until future years. This defers investment in capital equipment, which will not be required until future years.

This project was completed within one year and is now finished and has over 1 million items in storage.

The second and third 4 aisle modules for storage of library books have now been completed plus three additional modules that will be initially used for storage and processing of art work from the Yale University Art Gallery while the Gallery is undergoing renovation. Eventually when the Gallery work is completed, the modules that are used for artwork will be converted to book storage modules.

12. High Density Book Storage Facility, West Virginia University, Morgantown, West Virginia

Our initial involvement in this facility was to evaluate the possibility of using an abandoned heating plant for High Density Storage. Although the heating plant was very close to the correct size and offered enough internal height for an efficient facility, the structural, mechanical and asbestos remediation work required would cost more than construction of a new facility.
West Virginia University’s projected storage requirements were about 1 million volumes which makes this facility the smallest of all the project with which we have been involved. The storage system is a short 4 aisle system with the mechanical systems located on a mezzanine over the cross aisle. The building design incorporates the same laminar flow HVAC system used at Bowling Green University and the facility will represent an economical way to solve West Virginia collection storage requirements and relieve needed space in their main libraries for patron activities.

The building and shelving system have been completed and are now being filled. The exterior appearance of the West Virginia University facility incorporates a peaked roof to make the facility more in keeping with the campus architecture.

13. Library Remote Storage Facility, University of South Carolina, Columbia, South Carolina

This facility is a 4-aisle system similar to the early Harvard Modules, but the local mechanical engineering firm has recommended a somewhat different air distribution system. Instead of having the vertical ducts within the shelving rows we have included larger longitudinal flue spaces behind the center back to back shelving row and behind the outside shelving rows so that the vertical return air ducts can be located in these areas. This shelving system includes horizontal spaces at the floor level to allow the return air ducts to extend from these flue areas to the aisles on either sides of these rows of shelving.


In December 1997 we were retained by Columbia and New York Public Library to investigate the feasibility of a joint High Density Book Storage Facility to serve these two institutions. Our initial work involved analysis of the storage requirements projected by year by both institutions determination of the size of a potential facility, which would have a joint processing area, but separate adjoined storage buildings.

We then prepared a complete description of a potential facility and its proposed operations. This document then became part of a Request for Information that could be given to potential contract managers of such a facility to solicit indications of their interest the project. This project is currently in the planning stages.

Several sites for the facility were evaluated and rejected in the New York City area. Princeton University has now been added to form a consortium, which is called RECAP. This project, which consists of 3 six-aisle modules plus a 25,000 square foot processing area, is located near Princeton, New Jersey. It was completed in early 2002 and is now being filled at a rapid rate. The full storage capacity will be approximately 7.5 million volumes. The large processing area is designed to allow accessions of materials at an annual rate of over 2 million volume equivalents per year. The first 18 aisles are expected to be filled between the third and forth year of operation. Additional modules will be constructed before the existing modules are filled. The site is designed to eventually accommodate 15 six-aisle modules and have a capacity of over 28 million volume equivalents when all modules are completed.

15. Library Remote Storage Facility, University of Colorado Health Sciences Center, Denver, Colorado.

The University of Colorado Health Sciences Center has competed a 4-aisle system that is being used for storage of books and other materials from UCHSC, and 3 other Denver Institutions including the libraries at the University of Colorado at Bolder and Denver and Denver University. This project was the first new facility to be constructed on the grounds of the former Fitzsimons Army Medical Center in Aurora, Colorado. is currently under construction.
16. Library Service Center, Duke University, Durham, North Carolina

Duke asked us to help them evaluate their storage requirements and develop a configuration for a potential High Density Storage Facility. We obtained collection size data and desired levels of shelving utilization for 6 of the libraries on the Duke campus plus an existing off-site storage facility that currently utilizes a compact storage system.

From the above data we prepared a number of spreadsheets looking at various alternative High Density Storage System alternatives. The spreadsheet information for the most attractive alternatives was then used to prepare preliminary drawings of potential high-density storage facilities whose preliminary capital costs were then estimated. The requirements analysis indicated that a six aisle facility would be the correct size to accommodate the material in the existing off-site storage, the material that would be removed from the Universities Libraries, and accommodate future growth in the collection size.

Duke has several uses planned for the space made available in the Libraries by removing materials to a storage facility.

A site was found and a six-aisle high-density facility was constructed using the Design-Build Process.

Upon completion an interesting approach was taken for quickly moving the approximate 650,000 volumes that were stored in the existing compact shelving system. By the time the new high-density facility had been completed, there were new users available for the compact shelving facility who needed to move quickly. There was not time to accession the books from the compact shelving system using the normal size sorting process, so the books were placed into larger than normal book trays and quickly moved to temporary storage locations within the new facility while keeping them a sequence that would allow use of the existing finding system.

These books will be sorted by size, and entered into the new locator system on a normal operating basis when processing time becomes available.

17. Auxiliary Library Facility, Indiana University, Bloomington, Indiana (Under construction)

Indiana’s libraries have been filled to maximum capacity for several years and after a detailed study of the requirements for storage from the main library and the Lilly Special Collections Library the decision was made to construct a facility with the equivalent capacity of a six-aisle storage module.

Consideration of the site available and the decision to combine a preservation laboratory with the storage facility were considerations in the decision to incorporate a center cross aisle configuration with the main access into the facility being in the center of the long dimension of the storage module.

The center cross aisle has 20 unit aisles running in both directions from the cross aisle, which essentially creates a 12 aisle system.

The processing area is designed for a maximum accession rate of 700,000 volumes per year. The building utilizes pre-cast concrete panels that match other campus for the exterior walls.

18. Library Service Center, Rice University, Houston Texas (Under construction)

Although Rice’s project was originally part of a larger project that involved construction of a new library, the new library part of the project has been shelved and the high-density storage project is proceeding. A site located 5 miles from Rice’s Main Houston Campus was donated to the University. A small part of the new site will be used for a high-density storage facility.
Since the high density storage facility is to be the first building on the new site and as part of the planning for the new site, the site architect wanted to have a building that was more square than the usual 4 or 6 aisle high density storage modules. For this reason a facility is being designed that will have 8 short aisles constructed. Although this is slightly less efficient from the standpoint of floor area due to the required larger cross aisle, the architect felt that the massing of the 8-aisle configuration improved its appearance.

19. Arizona State University

This is a very straightforward high-density book storage project that was constructed at minimal construction cost, but with all of the key operating features. In order to fit the capital cost into a very tight initial budget, the bidding documents for the shelving system were prepared in such a way that the purchase of various quantities of shelves could be deferred until needed for operations.

The uprights and major structural components of the shelving system were installed during the initial project, and various quantities of the shelves, which are shipped in palletized form and can be installed at a later date.
CC-C: CAPITAL CONSTRUCTION PROJECT REQUEST
FY 2006-07 — SUPPORT INFORMATION

Building and Project History and Description:

1. Project Description/History:

   (a) List key objectives of proposed project:

   PASCAL member libraries are at or approaching capacity for housing library collections. The PASCAL (Preservation and Access Service Center for Colorado Academic Libraries) storage facility alleviates long-term storage needs by preserving valuable but infrequently used library materials in cost-effective high-density storage.

2. Estimated Project Timetable. *(Each Phase Must Accomplish Distinct, Stand-Alone Functions)*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Start Date(s)</th>
<th>Completion Date(s)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Planning</td>
<td>7/1/06</td>
<td>4/1/07</td>
<td></td>
</tr>
<tr>
<td>Construction Phase</td>
<td>4/1/07</td>
<td>1/31/08</td>
<td></td>
</tr>
<tr>
<td>Equipment Phase</td>
<td>1/1/08</td>
<td>1/31/08</td>
<td></td>
</tr>
<tr>
<td>Occupancy</td>
<td>2/15/08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   (a) Phasing Explanation.

   This project follows a normal design and construction schedule. Except for HVAC requirements, it is a relatively uncomplex facility.

   (b) *(Only For Continuation Projects)* Expenditure Information.

       Year-to-Date Expenditure: $________ as of __/__/____

       Update of phase progression and expenditures:

   Justification Section:

3. Project/Program Justification.

   (a) Justification Related to Programs and Classifications served by Request (describe and enumerate):
Archival materials have increased significantly at the PASCAL member institutions, and the long term preservation of these materials will be enhanced by storage in a proper state-of-the-art climate controlled facility.

The driver for this project is increasing volume of archival library storage materials and not a specific population served.

<table>
<thead>
<tr>
<th>Justification Table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Service Population</strong></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
</tbody>
</table>

(b) Purpose Code Justification: F5 Construction of expanded space and increased level of service applies to this project as the new construction of this space will provide enhanced service to the PASCAL member libraries.

(c) Project Alternatives (include impact of not funding requested project):

High density storage is an efficient method of preserving library collections and avoids capital construction funding for new academic library space.

Alternatives are:

1) further reduce student seating at member libraries to increase collection space
2) dispose of existing print collections at member libraries to preserve student seating.
Project Relationship Section:

4. Project Association to Other Capital Improvement Projects: None

5. (Only For Continuation Requests) Comparison with Prior Request Made in FY __ - __

<table>
<thead>
<tr>
<th>Inflation Factor</th>
<th>Total Cost of Original Approved Request</th>
<th>New Total Cost Requested</th>
<th>Difference</th>
<th>Inflation Factor Used</th>
<th>Dollar Impact of Inflation Factor on Original Request</th>
<th>Difference not due to Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Explanation of Differences. *(Deviation from OSPB-specified inflation factor must be pre-approved)*:

Operating Impact:

6. Project Operating Impact:

<table>
<thead>
<tr>
<th>Operating Balance Sheet</th>
<th>First Year Operating Cost (Change Request Amount)</th>
<th>Second Year Operating Cost</th>
<th>Third Year Operating Cost</th>
<th>Fourth Year Operating Cost</th>
<th>Fifth Year Operating Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Facility Maintenance</td>
<td>$26,038</td>
<td>$26,820</td>
<td>$27,624</td>
<td>$28,422</td>
<td>$29,306</td>
</tr>
<tr>
<td>Utilities</td>
<td>$45,775</td>
<td>$47,148</td>
<td>$48,563</td>
<td>$50,020</td>
<td>$51,520</td>
</tr>
<tr>
<td>Supplies/Equipment</td>
<td>$77,452</td>
<td>$79,776</td>
<td>$82,169</td>
<td>$84,634</td>
<td>$87,173</td>
</tr>
<tr>
<td>Other</td>
<td>$34,994</td>
<td>$35,044</td>
<td>$37,125</td>
<td>$39,236</td>
<td>$39,366</td>
</tr>
<tr>
<td>Total Estimated Operating Cost</td>
<td>$164,259</td>
<td>$169,788</td>
<td>$172,481</td>
<td>$177,145</td>
<td>$177,365</td>
</tr>
<tr>
<td>Total Fund</td>
<td>$164,259</td>
<td>$169,788</td>
<td>$172,481</td>
<td>$177,145</td>
<td>$177,365</td>
</tr>
<tr>
<td>General Fund</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Fund (Fund Number and Name)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Fund Exempt (Fund Number and Name)</td>
<td>320 Enterprise Fund</td>
<td>320 Enterprise Fund</td>
<td>320 Enterprise Fund</td>
<td>320 Enterprise Fund</td>
<td>320 Enterprise Fund</td>
</tr>
<tr>
<td>Federal Funds (Fund Number and Name)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(b) Operating Cost Assumptions: Projections for year 1 are based on current operating costs for the existing facility, and they are anticipated to increase 3% per year through Year 5. Facility maintenance includes building maintenance, repair and housekeeping. Other operating costs are environmental health and safety, grounds, building security, and property and general liability insurance.

(c) The OSPB operating budget analyst ______________ has received a copy of the schedule 6 to cover the operating expenses denominated in table 12(a).

**Project Funding**

7. *(Required For Cash Funded, Partial Cash Funded, or Lease-Purchase Projects)* Capital Finance Sources

<table>
<thead>
<tr>
<th>Financing Balance Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Sources Fund Lists (List Each)</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Cash Fund</td>
</tr>
<tr>
<td>Cash Fund Exempt</td>
</tr>
<tr>
<td>Federal Funds</td>
</tr>
<tr>
<td>Capital Construction Funds Exempt</td>
</tr>
<tr>
<td>Total Funding</td>
</tr>
</tbody>
</table>

(a) For each cash funded source describe how the revenues accrue to the fund. With enterprise status, the cash funded capital projects for the University are now recorded in COFRS fund 320. The funding source for this project is cash funds provided by one of the users of the facility, the University of Colorado at Boulder.

(b) Demonstrate that sufficient funding is available from this source. Although it is anticipated that cash resources will be sufficient for the project, if they are not, the project will be delayed or downsized.

(c) Finance Information
   - Amount Financed $________________
   - Duration of Agreement ______________
   - Interest Rate ___%
   - Revenue Source ____________________
8. *(Only For Building Renovations and Additions)* Controlled Maintenance and Capital Construction Record.

(a) Estimated Current Value 3,294,929

<table>
<thead>
<tr>
<th>Past 5 Year Capital Construction Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>FY2004-05</td>
</tr>
<tr>
<td>FY2003-04</td>
</tr>
<tr>
<td>FY2002-03</td>
</tr>
<tr>
<td>FY2001-02</td>
</tr>
<tr>
<td>FY2000-01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Past 5 Year Controlled Maintenance Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>FY2004-05</td>
</tr>
<tr>
<td>FY2003-04</td>
</tr>
<tr>
<td>FY2002-03</td>
</tr>
<tr>
<td>FY2001-02</td>
</tr>
<tr>
<td>FY2000-01</td>
</tr>
</tbody>
</table>

9. Space Requirements by Facility Master Plan.

<table>
<thead>
<tr>
<th>Type of Space (List)</th>
<th>Existing ASF</th>
<th>ASF Needed Under Master Plan or Recommended Industry Standard (describe)</th>
<th>Surplus/(Deficit) ASF</th>
<th>Impact of This Project</th>
<th>Revised Surplus/(Deficit)</th>
<th>% Surplus/Deficit</th>
<th>Project GSF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15,156</td>
<td>20,000*</td>
<td>(4,844)</td>
<td>14,850</td>
<td>10,006</td>
<td>50.1%</td>
<td>16,585</td>
</tr>
</tbody>
</table>

TOTAL                  | 15,156       | 20,000                                                                   | (4,844)               | 14,850                 | 10,006                     | 50.1%            | 16,585      |

*The needed ASF refers only to projected Health Sciences Center requirements and does not include for other PASCAL member institutions.*
Project Compliance:

10. REQUIRED - Indicate Appropriate Approval Authority (Requests cannot be forwarded for consideration unless following questions are completed)

   a) This Project Request is in conformance with the most recently approved Facility Program Plan for this project entitled PASCAL II and will be submitted to the Board of Regents in October 2005.

   b) This Project Request is in conformance with the most recent Facility Master Plan for this project entitled Institutional Master Plan – University of Colorado Health Sciences Center and University of Colorado Hospital Authority and approved by CCHE on December 3, 1998. Subsequent Institutional Master Plan Updates of 1999, 2000, 2001, and 2002 respectively were approved by the Board of Regents of the University of Colorado and submitted to CCHE. The 2002 supplement was approved by CCHE on February 7, 2003.

   c) This Project Request is in conformance with the most recent Departmental Operating Strategic Plan for this project entitled Institutional Master Plan – University of Colorado Health Sciences Center and University of Colorado Hospital Authority and approved by CCHE on December 3, 1998. Subsequent Institutional Master Plan Updates of 1999, 2000, 2001, and 2002 respectively were approved by the Board of Regents of the University of Colorado and submitted to CCHE. The 2002 supplement was approved by CCHE on February 7, 2003.

11. Six Month Rule Compliance.

   (a) Amount and percentage encumbered: $450,414 7.9 %

   (b) Justification: This is consistent with previous projects.
APPENDIX E
Third Party Review Letter