Architectural Program

Learned Hall
Engineering Expansion Phase II

KU Project No. 088-8941

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Introduction

The University of Kansas, School of Engineering is rich in tradition and excellence. One of the first degrees granted by the University in 1873 was a degree in civil engineering. In 1891, KU became home to the first school of engineering in the State. Over the years, the school has continually adapted its programs to fit the needs and demands of society, and reflect the changing forces of technology. Today the School of Engineering has eight departments and programs, offers ten undergraduate and sixteen graduate programs emphasizing strong educational and interdisciplinary projects and leading edge development in a variety of disciplines.

The demand for engineering graduates at national and state levels is high and projections indicate this trend will continue for many years. In fact, most projections suggest that engineering and technology fields will play key roles in a state's ability to rebound from the current economic downturn. In the National Academy of Sciences/Engineering report, "Rising Above the Gathering Storm," the shortage of professionals in the science, technology, engineering and mathematics (STEM) areas was reported to be staggering, and could lead to a national and State crisis. The report pointed out that as much as 85 percent of measured growth in income per capita in the United States over the last several years has been due to technological change.

In Kansas, 80 percent of all science and technology-based occupations are in the engineering and IT fields. The State's engineering programs are the primary source of this workforce for companies. Unfortunately, compared to surrounding states, Kansas produces the lowest fraction of engineering graduates per capita. Thus, there is an immediate need to bolster the production of engineering graduates in Kansas.

Current Space and Pressing Demand

Our current principal classroom and project development space, Learned Hall, contains 144,000 net square feet (nsf)/225,000 gross square feet (gsf). The original building was constructed in 1963. Although expanded in a series of additions and renovations, Learned is sized for much smaller student and faculty populations than we currently have within the School of Engineering (SOE).

A principal goal for Engineering programs is to increase the number of Bachelor of Science graduates by 50 percent annually. In order to accomplish this goal, the School must build its educational capability by adding faculty, instructional and support staff, and facilities. Over the last five years, the KU School of Engineering has been able to attract, develop and retain faculty who can generate and lead instructional and research project development efforts. Success requires expansion of physical structures that can accommodate recent and projected growth. We cannot ensure capacity for continued growth, diversification, and improvement, or meet the many and varied requirements of our industry partners for graduates unless space is added to the Engineering complex.

The school serves Kansas by the production of engineers and computer scientists who become employed in a broad range of Kansas industries. The SOE also serves Kansas through partnerships, new development, applied technologies and outreach programs. A brief sample of programs would include a focus on better recovery of oil from our aging petroleum reservoirs; aircraft design and manufacturing; developing bio-fuels and bio-chemicals; serving the IT industry needs of Kansas companies; and working with companies focused on design and construction, transportation planning and technology development.

Competing demands for space have reached a critical level that threatens to decrease productivity, to further limit our ability to meet industry's demand for new graduates, and to limit opportunities in areas where the SOE has a leadership position nationally. The school's activities are currently spread not only among buildings in the engineering complex but throughout other structures considerable distances from the main buildings and classrooms.

The proposed structure is an essential component in an overall building plan that the SOE has developed with its industry and other partners over the last five years.

The first component is an ARRA Stimulus Proposal submitted in September 2009 for a $21.6 million, 36,000 gsf interdisciplinary research facility, which was awarded a $12.3M NIST grant and is currently under construction. The partially-NIST-funded Measurement, Materials and Sustainable Environment Center (M2SEC) project is scheduled for completion in June 2012.

The additional component proposed for development is envisioned as a combined Classroom Instructional, Academic Support and Student Project expansion that incorporates project development and instructional labs and core service facilities. This will allow expansion of the project development resources available to Engineering and related industrial and commercial partners. This proposed development will also provide a building complex that will accommodate the many varied, existing and planned projects that, at this point, cannot be effectively accomplished.

In recent years, KU has developed an interdisciplinary service lab approach used in the design of its Multidisciplinary Research Building on KU's West Campus. That structure houses faculty and graduate students associated with multidisciplinary science programs including Engineering from across the campus. The building is designed to encourage interaction among its many disciplines and personnel. The design integrates shared support labs for specialized instrumentation to enable access from multiple participants engaged in projects.

The same approach applied to the proposed structure will help to create critical links between faculty expertise, student development, project-focused initiatives and outside enterprise. The building project is required to further integrate an academic focus, to expand training and development ventures that benefit graduates, to deliver research ventures and outreach projects related to the Kansas economy and the next generation of the KU School of Engineering students and graduates.

School of Engineering Expansion Phase II

Instructional Space	**26,800 gsf**
Academic Program Support Space and Tutoring Areas	**18,850 gsf**
Student Project Center	**17,600 gsf**
Total Academic and Student Project Space	**63,250 gsf**
Project Development Laboratory	**37,540 gsf**
Total Project Area	**100,790 gsf**

Space for Contemporary Models for Instruction

The current engineering classroom space is at capacity and growing enrollments cannot be accomplished without adding additional instructional space. Nearly all of the engineering teaching facilities, other than computerized classrooms, are located in Learned Hall. The only teaching classroom in Eaton Hall is Spahr Classroom which has a capacity of 233. Learned Hall has small 1970's lecture-style classrooms.

Most existing classrooms are long, flat and narrow which was indicative of the teaching style when they were constructed and are not able to accommodate larger classes or newer methods or technology. Today's instructional models are different but the physical construction of Learned Hall prohibits reconfiguration of the classrooms to better integrate technology and accommodate enrollment growth.

The School of Engineering remains committed to producing top-level undergraduates. Today, the School of Engineering's top faculty are as successful in classroom instruction as they are in leading-edge project development and related research. Two School of Engineering departments were among the first three at KU to receive KU's Center for Teaching Excellence departmental award recognizing excellence across the department. Numerous faculty are Kemper Awardees as well as HOPE winners which recognizes exemplary teachers selected by students.

New teaching facilities are needed not only to maintain but to improve the level of student engagement. New instructional methods are based on interactive discussion and work related to shared project development. Contemporary standards for classrooms provide spaces which are wider and tiered to provide a better view for students of the instructor as well as the instructor viewing the students.

Instead of the tablet arm chairs used since the 1970s, work tables are implemented where students can spread their work and share ideas. In the 1970s views were focused on the instructor, emphasis was on the individual student working alone and teamwork was not encouraged. Today's engineering market demands that students are adept at working in teams. Modern teaching trends maintain individual work to ensure that each student grasps the concepts, but meshes teamwork into the curricula to reinforce the principles used in today's industry. Larger tiered lecture classrooms will provide the necessary space and working environment for both lecture and projects to improve student outcomes.

Once larger classrooms are provided in the new facility, the existing classrooms in Learned Hall can be reconfigured for the newer teaching style needs for Engineering classrooms with existing smaller-capacity classes in Learned Hall. The goal is to benefit overall classroom utilization. Generally, larger freshman and sophomore classes will be accommodated in the larger new classrooms and somewhat smaller upperclassman courses in existing renovated classrooms.

One of the newer teaching methods for lecture-laboratory classes is to integrate both functions into one classroom. This requires a larger room with round tables with computers at each table. The tables typically hold four to nine students with projection equipment and flat panel monitors serving the room and available to each group. Several studies have been conducted documenting improved student learning as well as increased retention. The advantage of this type of classroom is it can be easily reconfigured to suit changing needs and different methods of instruction.

Instructional Space	Quantity	Seats	NSF per space				Total GSF	
Instructional classrooms, tiered lecture	1	125	3,125	nsf	x	1.65 =	5,200	gsf
Instructional classrooms, tiered lecture	1	100	2,500	nsf	x	1.65 =	4,100	gsf
Integrated lecture/lab, flat floor w/round tables	1	80	2,400	nsf	x	1.65 =	4,000	gsf
Instructional tiered classroom	1	75	1,950	nsf	x	1.65 =	3,200	gsf
Computerized classroom for design classes	1	60	1,800	nsf	x	1.65 =	3,000	gsf
Instructional classrooms, tiered lecture	2	50	2,400	nsf	x	1.65 =	4,000	gsf
Wet lab (Environmental/Chemical coursework)	1		1,350	nsf	x	1.65 =	2,200	gsf
Instructional classrooms, flat floor	1	30	660	nsf	x	1.65 =	1,100	gsf
Total classroom seat count		520					26,800	gsf

Building elevations include the NIST-M2SEC Facility to be complete June 2012. Total Construction Cost = $24 million.

Proposed Engineering Expansion Phase II including Instructional Space adjacent to Learned Hall.

Academic Support Program Elements

Along with the necessary instructional facilities for expansion of the number of KU engineering graduates, this proposal also incorporates programs intended to retain larger percentages of students by expanding programs for Student Engagement.

Student Engagement

To maximize the success rate of students, expanded programs and facilities will be provided to engage individual students from the recruiting process through graduation. This focus on individual success and related programs requires a physical layout of academic support facilities and a program connection between time spent in the classroom and reinforcement outside of the classroom integrated with the student's day. While students transition from one phase of their education to another, engagement is provided by access to programs that bridge instruction, provide peer support, and support overall student development.

These sorts of programs require configurable space suitable for meetings and discussions that will support a few students to an entire visiting class of potential students. As the students matriculate, the space will also serve the Engineering Learning Community, a student group focused on improving student engagement and retention. Currently, the learning community meets in a large lecture room or in smaller groups in classrooms.

These activities are better accomplished in a space staffed and available during and outside of the class hour day. Directly related to work outside the classroom, improving retention requires a strong model and program for tutoring.

The School of Engineering has tried various models for tutoring, but they have been limited in scope and success due to space constraints. The new space for this program will include an area with multiple tables, computers and marker boards. Staff and teaching assistant will be available outside of the scheduled classroom sessions and will include office and tutoring space. The teaching assistants will hold office hours and help sessions in this area rather than in remote buildings as is the case today. This will provide greater access for students and better support given the academic and development challenges of an engineering program.

The School of Engineering also has very active student groups, such as the Engineering Student Senate, Society for Women Engineers, Engineers Without Borders and the Society of Black Engineers to name a few. Prior to Summer 2004, student groups were able to utilize Koch Lounge located in the Spahr Engineering Library which contained a few offices and areas for study. When the library was renovated in 2004, the area for Koch Lounge was eliminated to create the current library circulation work area. While the overall benefit of the library renovation was very positive, it did leave an unmet need for the student groups.

Social learning and creating a sense of shared community are facets of education expanding upon work in the classroom that have related operational and space requirements for students. The proposed programs and related facilities will help with the process of building success both in retention and graduation rates. As students make progress towards a degree these program spaces will be used by the Engineering Career Center for conducting academic support sessions ranging from resume writing to interview workshops and culminating with information sessions with industry representatives and interviews.

Academic Program Support Space

Program Areas of Support	Quantity	NSF		GSF
Offices	15	140	nsf	= 3500 gsf
Cubicles	8	45	nsf	= 590 gsf
File room	1	200	nsf	= 330 gsf
Work room	1	300	nsf	= 500 gsf
Storage room	1	400	nsf	= 660 gsf
Kitchen	1	140	nsf	= 230 gsf
Restrooms	2	90	nsf	= 300 gsf
Large Conference Room	1	550	nsf	= 910 gsf
Small Conference Rooms	1	320	nsf	= 530 gsf
100 person convertible meeting space	1	2000	nsf	= 3300 gsf
(To be divisible, 4 to 8)				
Catering kitchen	1	250	nsf	= 410 gsf
Small offices/interview rooms	6	120	nsf	= 1390 gsf
Lounge area	1	300	nsf	= 500 gsf
Libraries	1	150	nsf	= 250 gsf
Student conference room (12 person)	1	320	nsf	= 530 gsf
Informal study (tables, couches, etc.)	1	1000	nsf	= 1650 gsf
Student offices around lounge area	6	100	nsf	= 990 gsf
Student Resource Room (tutoring)	1	1000	nsf	= 1650 gsf
GTA/TA offices	4	100	nsf	= 630 gsf

Total Academic Program Space **18,850 gsf**

Student Project Center Space

The heart of Engineering education, student and faculty development and professional practice is projects. Engineers produce products and services that improve humankind ranging from methods for drug delivery, to bio-engineered components for joint replacements, to cleaner, more efficient energy, transportation systems and related infrastructure. Academic programs in the School of Engineering have student projects of one form or another. Currently, those projects are spread throughout Learned and Eaton Halls as well as facilities at the Lawrence Municipal Airport. There are departments that have little or no space for these activities.

The concept being implemented at most other Engineering programs in the country is to include a central student project center. Individual project labs would be located around central facilities that are shared by all student project groups. For example, the central facility capabilities would range from composite material construction space for Aerospace or Structural engineering to a computer integrated machining center for the production of precision parts and components for any relevant engineering project.

Students would gain a knowledge and understanding of state-of-the-art manufacturing techniques that they would be expected to apply to industrial processes. And after experience with this type of project development lab they would have experience with a range of engineered solutions, processes and products. For example, the Formula SAE vehicle team arguably has the best facilities of any student group at KU in a retrofit lower level of a 1984 addition to Learned—marginal, with concerns about appropriate ventilation and access to utility services—but used to exceptional levels for an annual project of producing a competitive race car.

Through the years, the vehicle design team has performed at an award-winning level at international competitions. This has provided a high level of engagement in the process of design, fabrication, integration and overall student performance. In an expanded program, the goal is for student projects in various disciplines to engage in leading edge competition. The program investment and resources include the required space for a variety of student developed projects.

The new building is intended to bring engineering disciplines together to support project and personal development. This will improve the support for ways to develop ideas and the required skills to share ideas—skills critical to the professional engineer. This results in a higher graduation rate and more engaged graduates for the engineering workforce.

Today most students are exposed to project development, in one form or another, during their studies and the clear trend is for greater exposure to interdisciplinary and team based project research and development. Although interdisciplinary activities are the preferred practice among faculty, students, and our industry partners, lack of adequate and appropriate space diminishes potential opportunities to collaborate. And this diminishes the likelihood of developing skills important to interdisciplinary solutions to various problems.

Placing faculty, student researchers and industry partners in environments that encourage informal and frequent communication will enhance project-focused problem-solving.

Space planning must also address an efficient model for resource allocation that reflects State and National interests, needs and opportunities. Evolving areas of emphasis need to be accommodated and the development of shared support spaces should maximize the number and type of projects accommodated. Facilities need to integrate opportunities for personal exchange, communication, insight, and technical support and the space required to effectively complete projects. Principles that will guide the building design include:

- Collaborative spaces must be interwoven into the lab/office mix so that students, faculty, industry representatives, etc. have multiple opportunities to meet and discuss projects, developments, information, and project relevant topics;

- Equipment and instrumentation must be in shared spaces so that multi-disciplinary and inter-disciplinary teams have ready access;

- All labs/offices/collaborative spaces must be designed as functional units in order to promote maximum space usage efficiencies and interaction;

- All spaces must, to the extent possible, be reconfigurable to meet larger, newer or more pressing demands for programs

Principles for operating the space also require that designated spaces be allocated on the basis of external funding sufficient to support usage of project development lab, equipment and supporting design and meeting space and retained for the duration of a project, then shifted as needs dictate.

Assignment of space based upon project duration will be the practice with a preference for long-term, interdisciplinary use for larger team projects. The focus will be on the ability of teams to share space and analytical and development capabilities within a project development and office complex.

Student Projects Center

Composite materials processing room (curing oven, walk-in freezer, autoclave, hot press, lay-up room)	1	800	nsf	x	1.7	=	1400	gsf
Materials finishing lab (sanding room, etc.)	1	800	nsf	x	1.7	=	1400	gsf
Engine Test Facility	1	400	nsf	x	2	=	800	gsf
Restricted machining center	1	1500	nsf	x	1.7	=	2600	gsf
(CNC mill, lathe, router, manual machines)								
Open access manufacturing lab	1	1000	nsf	x	1.7	=	1700	gsf
(Welder, drill presses, etc.)								
Conference room (seats12)	1	320	nsf	x	1.7	=	500	gsf
Open, clean work area (computers, tables, etc.)	1	600	nsf	x	1.7	=	1000	gsf
20 x 40 configurable bays	6	800	nsf	x	1.7	=	8200	gsf
							17,600	gsf
Total Academic Program Space							**17,600 gsf**	

Project Development Investment Principles

The positive performance of the sponsored project development components enhances the likelihood that there will be a return for the investment of State and Federal dollars. Either through Indirect Cost Return or more robust intellectual property development, it is anticipated that the revenue potential will be both more robust and diversified by the projects supported by faculty within this complex. In order to increase these prospects, the next generation of core service lab capabilities will need to be developed.

Properly equipped and staffed service labs support institutional outreach and open the door to use for industry and university partnerships. Unique capabilities and services provide added revenue that can help pay for staff, equipment and building operations and maintenance. The focus is on state-of-the-art components and adaptability. The construction of project labs assigned to individuals is intended to be a minor component in the complex.

Core service labs have been developed in KU's National Institutes for Standards and Technology (NIST) funded ARRA Stimulus project and are included in the current separately-

funded $24 million expansion. These **Core Shared Project Labs** include:

1. **Sustainable Practices** (Energy; fuel development and testing; water),

2. **Materials** (Biomaterials, composite development, construction and testing)

3. **Chemical Analysis and Imaging** (Cross-disciplinary)

Each of these project support areas will provide opportunities to tackle larger-scale projects expanding the potential rates of return. Services would also be available to a range of interested parties, including start-up ventures and commercial purposes. Access to key technologies supporting entrepreneurial activities and job creation will also help to provide revenue to support core service labs as shared resources and the required skilled personnel needed to provide services, complete analytical steps and to maintain and update specialized equipment.

Project Development Lab Components

Sustainability, Water, Fuels, Transportation, Oil Recovery, New Materials, Bioengineering and Instrumentation Labs

Sustainability: The increase in funding for project development and education in sustainable energy practices, together with the increased demand for “energy literate” graduates, will provide major growth opportunities within Engineering. Similarly, water has become a limiting factor in energy and biomass production; professionals in water supply and demand are in equally short supply. The project development space includes wet labs for water and waste reuse research, biofuels testing and characterization, biofuels processing, testing, treatment and chemical analysis.

Biofuels and Biorefining: This area will continue to develop over the next 10 years as the nation moves towards the production of transportation fuels and chemical feedstocks from renewables. Progress requires interdisciplinary collaboration among chemical, mechanical, electrical and computer science, and environmental engineers, as well as chemists, mathematicians, and physicists. KU SOE’s key strengths are directly relevant to this area, and include catalysis, separations, process development and applications, coupled with the integration of production technologies for fuels with vehicle design and performance, and with environmental impact considerations. Lab space is needed to support this effort, which is led by KU’s Center for Environmentally Beneficial Catalysis and the Transportation Research Institute, both affiliated with the School of Engineering.

Transportation: The KU Energy Research Council’s ‘Feedstock to Tailpipe’® initiative involving the development of algae based feedstocks will continue to grow. The major demand for space is related to process demonstration and scale-up. This is a key step to obtain realistic data which will provide proven models for industry and then the industrial and venture capital partners to participate in full-scale development of KU based technologies.

Currently, there is no facility for the construction of pilot-scale evaluation experiments. Such a facility requires specialized construction for the installation of larger scale process equipment, such as water and solvent storage, solid-liquid separation equipment, high speed centrifuges, distillation columns, mixers, reactors, and product storage. The area would require "tall space" for distillation and absorption

columns and for the support of heavy equipment. The building includes a high-bay, open area for installation of this type of equipment as well as other large scale installations.

Petroleum Engineering: The need for enhanced oil recovery (EOR) technologies will undoubtedly continue for many years. The leading edge EOR techniques which Chemical and Petroleum Engineering will continue to invest in include use of nano-structured particles for the delivery of EOR reagents, biosurfactants, gel polymer techniques, and fundamental understanding of CO2 near-miscible flooding systems.

Material Development and Testing: KU SOE has significant experience in material development and testing, and structural characteristics. Examples include carbon-fiber (C-F), bio-mechanical substrates, polymers, hydrogels, nano-scale and phase-change materials, and other composite materials. Students currently work in collaboration with our colleagues in various SOE departments, as well as our partners in Chemistry, Pharmacy, and Physics on material development, testing, and application.

Our material development work is particularly significant given international trends. At present, the automobile industry is the major user of carbon fiber worldwide. The market will expand in the near future as uses, such as antistatic coatings, sensors for gas detection, electrode material for batteries, touch-screen displays, structural reinforcements, and composite matrices grow. The US Department of Energy has declared the area one of three significant research and development areas for its national laboratories.

Medical Devices: Innovation in biomaterials will lead to a new generation of medical devices. One of the primary goals of the Bioengineering program is to serve as a catalyst in bringing together leading medical and bioengineering research with advanced manufacturing and materials development applications.

Engineering Expansion Project Development Space

I. Water, Energy, Transportation (Assumed faculty count **3**; average project group size 3)

Project development lab	2,160	nsf x	1.7	=	3,670	gsf
Office (Faculty and GRA)	990	nsf x	1.7	=	1,680	gsf
Office service	200	nsf x	1.7	=	340	gsf
Conference rooms	540	nsf x	1.7	=	920	gsf
Special use lab support (chemical/material management)	600	nsf x	1.7	=	1,020	gsf
Shared analytical lab capabilities	800	nsf x	1.7	=	1,360	gsf
	5,290	**nsf**			**8,990**	**gsf**

II. Energy Infrastructure (Assumed faculty count **1**; average project group size 3)

Project development lab	720	nsf x	1.7	=	1,220	gsf
Office (Faculty and GRA)	330	nsf x	1.7	=	560	gsf

Office service	70	nsf x	1.7	=	120	gsf
Conference rooms	540	nsf x	1.7	=	920	gsf
Special use lab support (in conjunction w/ M2SEC)	600	nsf x	1.7	=	1,020	gsf
Shared analytical lab capabilities	800	nsf x	1.7	=	1,360	gsf
	3,060	**nsf**			**5,200**	**gsf**

III. Healthcare (Assumed faculty count **2**; average project group size 3)

Project development lab	2,160	nsf x	1.7	=	3,670	gsf
Office (Faculty and GRA)	660	nsf x	1.7	=	1,120	gsf
Office service	130	nsf x	1.7	=	220	gsf
Project development conference room	540	nsf x	1.7	=	920	gsf
Special use rooms (chemical/biological material management)	600	nsf x	1.7	=	1,020	gsf
Shared analytical lab capabilities	800	nsf x	1.7	=	1,360	gsf
	4,890	**nsf**			**8,310**	**gsf**

IV. Information Technology and Global Change (Assumed faculty count **4**; average project group size 3)

Project development lab	1,300	nsf x	1.7	=	2,210	gsf
Office (Faculty and GRA)	660	nsf x	1.7	=	1,120	gsf
Office service	130	nsf x	1.7	=	220	gsf
Project development/meeting room	540	nsf x	1.7	=	920	gsf
Special use computing/server room	600	nsf x	1.7	=	1,020	gsf
	3,230	**nsf**			**5,490**	**gsf**

VII. High-bay structure/multi-purpose lab

Open floor, slab-on-grade, high bay area	7,200	nsf x 1.25 =	**9,000 gsf**
Fixed equipment crane allowance		$300,000 (included below)	
Strong wall component		$300,000 (included below)	

Phase II Staging Requirement: Burt Hall relocation, remediation and demolition

Environmental Health and Safety relocation; Kurata Hall renovation	$1,400,000	(design services by others)
Burt Hall remediation	220,000	
Burt Hall demolition	330,000	
Total construction and equipment cost	**$1,950,000**	**(included below w/ construction costs)**

Proposed Total Project Construction Budget

Total Building Construction Cost	$42,334,000
Building exterior plaza/courtyard development	500,000
Site grading, landscaping	720,000
Storm water management/ underground cell	240,000
Relocated primary electrical	700,000
Central plant chilled water capacity	1,100,000
Parking/roadway/curb/sidewalk	344,000
Anticipated FY 2012 Building Construction Cost	**$45,938,000**
Additional Construction Contract Items	
Voice/data systems	1,191,000
Fire alarm systems	492,000
Building automation controls	639,000
	2,322,000
Project Development and Consultant Fees	
A/E Project Design/Management Fees	4,150,000
Special Consultants (Engine test cell; specialize lab)	350,000
DCM/DFM project management fees	624,000
	$5,124,000
Subtotal Construction Related Project Development Costs	**$53,384,000**

Project Development Support Costs	
Project related costs - FO, EHS; survey, utility locate	90,000
Site survey, borings, testing	85,000
Construction testing & inspections	45,000
City-required buffer zone studies - traffic, noise, storm water	26,000
	246,000

Additional Project Development Costs

Moveable equipment w/ FO housekeeping	360,000
Project development costs: printing, mailing, travel	84,000
Equipment Furnishings/moving costs	358,000
Building signage	75,000
Campus Infrastructure Fee @ 3%	1,380,000
Project Contingency @ 5%	2,153,000
	4,410,000

		Estimated Total Project Cost	**$58,040,000**
Inflation/cost escalation	FY 2013/14	2.0 years @ 6.0% per year	**$6,960,000**
		Total Estimated Project Construction Cost	**$65,000,000**

Total Building Area 100,790 gross square feet; Total project cost is based on a January, 2014 completion @ $645 per gross square foot incl. identified high-bay equipment; no project development equipment: excludes Environmental Health & Safety relocation.

Project Design Criteria and Goals

The design for this project shall address the following needs, goals and objectives:

Building design for sustainable construction: We expect significant growth in energy conservation technologies associated with construction of this building. This project will provide opportunities for application of photovoltaic technology experimentation, solar energy, phase change materials and potential of wind energy technologies for purposes of evaluation and additional research. The first phase of this is being developed in the course of the design for the NIST building.

The application of these techniques ultimately involves development of components and techniques for realistic testing, evaluation and prototyping of materials, units and modules used in building construction.

The larger application of Smart-grid technologies for the optimization of power usage in institutional, commercial and domestic buildings will grow rapidly. The local impact includes opportunities to save energy and reduced utility bills and reduce emissions associated with campus buildings.

The proposed building will be designed with sustainability as a design principle with LEED-caliber design as a goal. Additional project and site development components include:

- Maintain access to and use of adjacent site areas and buildings and address the delivery, trash, maintenance and service needs of the complex, both during design and in the completed project, including provision of appropriately screened trash dumpsters and parking for service vehicles.
- Address life safety issues and meet current code requirements.
- Develop separate bidding / procurement packages for work that can be expedited, including abatement, demolition and long-lead-time equipment.
- Develop and implement a proactive and collaborative team approach to delivering the overall project on time and within budget.

Site Improvements

- The existing parking area and entry drive west of Learned Hall shall remain and existing parking west of Burt Hall shall be retained as much as possible.
- The north end of Burt Hall shall be demolished once vacated by EHS and SOE personnel/programs, as part of this project scope.
- A new service shall be extended to the M2SEC/NIST building, which is currently under construction, from the existing service drive serving the parking and dock area west of Learned Hall, through the area currently occupied by the north end of Burt Hall.
- The project scope includes provision of an outdoor terrace extension adjacent to Spahr Library, to serve the new main entrance to this project.
- The green space south of Spahr Library shall be retained and enhanced, with consideration for future development of an extended compatible green space on the south side of 15th Street.
- Existing pedestrian pathways shall be retained or relocated as approved in the course of project design. In

addition, sidewalk and bus stop locations along 15th Street will be included in the project scope.

- Landscaping including appropriate shrubs, trees and perennials shall be planted around the new building, with an emphasis on low-maintenance landscape materials and details.
- Storm water management will require expansion of the underground storage system which currently exists under the lawn south of Spahr Library.
- Site furnishings shall include exterior benches, bus stops, waste receptacles and lighting specified to comply with current KU standards.
- Provide new service drives and trash dumpster locations, if existing areas are affected. Dumpsters shall be screened from public view.

Utilities & Infrastructure

- The project scope includes a budget allocation for central plant chilled water to be placed in the remaining south structure of Burt Hall. Extensions of the utility services shall be included as part of this work, as required to serve the proposed expansion and potential service back to the existing facility.
- The design team shall advise KU on potential costs and benefits of replacing/relocating the primary electrical service equipment.
- The existing underground primary electrical service which crosses the new building's footprint, between Burt Hall and Learned Hall, will be relocated as an early separate bid package. The new service will be routed to the south and to the east, along 15th Street, to a point of re-connection near Eaton Hall.
- Water service to this complex is owned by the University. Fire sprinkler systems will be added and will require the design team to evaluate the available water pressure and flow capacities, and to provide appropriate service to serve that need.
- Existing mechanical / electrical equipment serving un-disturbed portions of the complex shall be maintained in service at all times, except for short-term shutdowns scheduled well in advance. All proposed outages shall be anticipated and planned for during design, with temporary provisions included as part of the project scope as needed to maintain essential services to the building, particularly related to ongoing research.
- All necessary utility systems and infrastructure needs shall be fully addressed as part of this project scope, in the most cost-effective manner for the University's ongoing operation and maintenance of those systems. If adjustments are required in the project scope, they shall be made in other areas of the proposed program, after these needs are met.

Hazardous Materials

The KU Environmental Health & Safety Office has performed tests of existing materials in the affected buildings and has identified the asbestos-containing and radioactive materials that need to be abated prior to demolition of existing components of Burt Hall.

Burt Hall was originally constructed as a nuclear reactor facility for teaching and research. It has been partially decommissioned, but was never formally decommissioned. KU-EHS has determined the costs to complete that process, and they are included in these project costs. This work will take approximately 10-12 months to complete prior to any demolition activities, and will need to be accounted for in the overall project delivery schedule.

Code Requirements

Codes currently used on KU projects include the following:

- International Building Codes
- Kansas Fire Prevention Code, KSFMO, current edition.
- Other codes as listed at the State of Kansas, Division of Facilities Management (DFM) website.

Code Footprint templates of the existing buildings shall be prepared by DCM and furnished to the architect. The architect shall update these drawings to reflect all proposed work and submit them for approval to OFPM through the KU-DCM office, immediately following approval of the Design Development phase.

- Electronic files of the approved code drawings shall be forwarded to DCM in both .PDF and .DWG formats.
- Fire alarm systems shall comply with current code and KU requirements for an intelligent addressable system.

The A/E consultant shall include, as part of the code footprint and as part of the overall project schedule, phasing plans and temporary means of egress from adjacent occupied buildings, as required to meet the approval of OFPM and the University Fire Marshal.

Design Standards & Consultant Services

The consultant team shall comply with the latest provisions of The University of Kansas *Design and Construction Standards*, as maintained by the Office of Design and Construction Management (DCM).These standards are available online at the DCM website: http://www.dcm.ku.edu/standards/design/

The consultant team shall also comply with supplemental updates to these standards which may be issued during the course of the project.

- The University's Owner Representative shall be a DCM staff person assigned to serve as KU's Project Manager, and who shall be the primary point of contact for all communications between the Owner, A-E and Contractor.
- Special Consultants that will be required on the A-E team, in addition to the usual A/E disciplines:
  - Lab design consultant for a range of lab types
  - Classroom program and technology consultant for direction regarding instructional spaces and related technology
  - Acoustical engineer to evaluate and advise on sound isolation provisions from M/E rooms and equipment
  - Telecommunications system engineer must be pre-approved by KU-NTS
  - Construction market analyst and cost estimator
  - Optional – Construction Cost auditor
- Commissioning Agent: Will be separately selected and contracted directly to the University. A/E consultants will fully cooperate and assist the commissioning agent in the delivery of their services, both during design and construction / close-out of the building.
- Electronic Files: Consultants shall deliver to KU complete sets of electronic files for the drawings and manuals / specifications for <u>each</u> design review submittal and for the bid sets <u>and</u> as-built sets. Each set of electronic files shall include both PDF and AutoCAD .dwg files for each sheet.
  - Revit files shall also be provided to the University, if used in the project's document development.
- Models, if produced by the consultant to explain the design, shall be delivered to and remain at KU.
- Full-color renderings will be required to fully explain the exterior and interior design of the project. Rendered prints and copies of the electronic files are to be provided to KU.

Future Project Planning

Planning may be required in order to include provisions for future phases of the Engineering facility expansion. Those provisions would include issues such as appropriate interior and exterior circulation paths, site improvements, extension of utilities and infrastructure to serve future phases of development and similar considerations. The A/E team shall review future expansion options with the University and shall include appropriate provisions to responsibly develop the architectural and engineering components of this project so that they may be extended to and incorporated into those future projects, with the least amount of future cost or disruption. Future provisions may include a structural frame that would support additional or future floors.

Historic Preservation Reviews

The proposed new construction is not located within 500 feet of any properties listed on either the State or National Registers of Historic Place being outside of the 500' notification limits of the Chi Omega Sorority, which is a listed property. It is also located in a non-impact zone as identified in the environs definition that was mutually developed and approved by the Campus Historic Preservation Board (CHPB) and the Lawrence Historic Resources Commission (LHRC) for the Chi Omega Sorority property.

KU / City of Lawrence Agreement

This project does fall within 150' of the perimeter of the University's property, and will be required to comply with the provisions of the KU / City of Lawrence Cooperation Agreement.

The project team will be required to assist the University, with compliance with those provisions, including but not limited to:

- Reviewing the proposed design with the Neighborhood Advisory Committee, and addressing their concerns to the greatest extent feasible, while fully addressing the University's programmatic needs.
- Preparing impact studies on transportation and pedestrian traffic, noise,, and storm water.
- KU will provide samples of previous impact studies to use as a guideline for preparing these studies.

Annual Maintenance & Operating Costs

Funding for annual maintenance and operating costs will come from University general funds. Estimated annual operating costs are based on historic data collected by KU-FO for Learned Hall and Eaton Hall, which through 2009 was averaging $2.55/GSF/year.

The estimated annual utility costs (to be escalated to Fall, 2013) are 101,000 GSF x $2.55/GSF = $257,550 per year.

Housekeeping and maintenance personnel costs are based on the campus average through 2009 of $1.38/GSF/year. The estimated housekeeping and maintenance costs are 101,000 GSF x $1.38/GSF = $140,000 per year inflation to be added to FY 2014.

Space Standards & Utilization Analysis

This project consists primarily of new space, with a partial demolition and reconstruction of existing space. The net effect on the University's space inventory is as follows:

New Construction:	100,790 SF
Academic/Office Space	45,650 SF
Student Project Space	17,600 SF
Research Space	37,540 SF
Demolished Space:	19,120 SF
Burt Hall	19,116 SF
Learned Hall	0SF
Net Additional Space:	81,670 SF

This additional space is required in order to expand the School of Engineering's student enrollment, hire additional faculty members, accommodate existing program, and to expand other required support spaces. There will be no space vacated as a result of this expansion.

Construction Method Options

The University of Kansas may choose to use a traditional but expedited design-bid-build process for this project. If it does, the Owner and consultant team will jointly develop strict pre-qualification criteria designed to ensure that the only contractors approved to bid this project have a proven track record delivering similar projects.

The University may elect to retain the services of a construction management consultant during the design phases to assist with cost estimating, value-engineering and scheduling issues given the complexity associated with removing and overbuild on that site and the proposed project completion schedule.

As a process to expedite the construction bid process, the University may choose to utilize the State of Kansas alternate project delivery method for "Construction Management At-Risk" for this project, subject to State Building Advisory Commission (SBAC) approval.

The University believes that a CM At-Risk method may be appropriate for this project due to challenging phasing and staging complexities. This method may result in cost and time savings to the State of Kansas for the following reasons.

- Extensive remediation, demolition and construction work adjacent to the current project for the NIST / M2SEC building scheduled to be completed in June 2012.
- Temporary exiting requirements and pathways that must be identified and maintained at all times from Learned Hall, Spahr Library and the M2SEC/NIST building during construction. This is complicated by the fact that they new construction will abut those buildings, which may require temporary exit paths through the construction site.
- Staging of Burt Hall demolition concurrent with structural work on the Phase II expansion is a concern related to project sequence. Completion of proposed High-Bay project space which sits on the original site of the north wing of Burt Hall may be delayed.
- Relocation of the primary electrical underground service that crosses the project site must be completed as an early separate package of work.
- The existing site allows virtually no staging area for the Contractor adjacent to the construction site and site access issues will be difficult.
- Existing parking lots are over-taxed and must largely remain usable. Emergency access to the west end of the site will also be a concern.
- A Construction Manager's input is needed to verify non-standard processes which may be needed for material deliveries / storage, and to adjust the project schedule and work activities to avoid disruptions to the University's ongoing academic programs and to minimize disruptions that may affect adjacent property owners.

Proposed Project Schedule

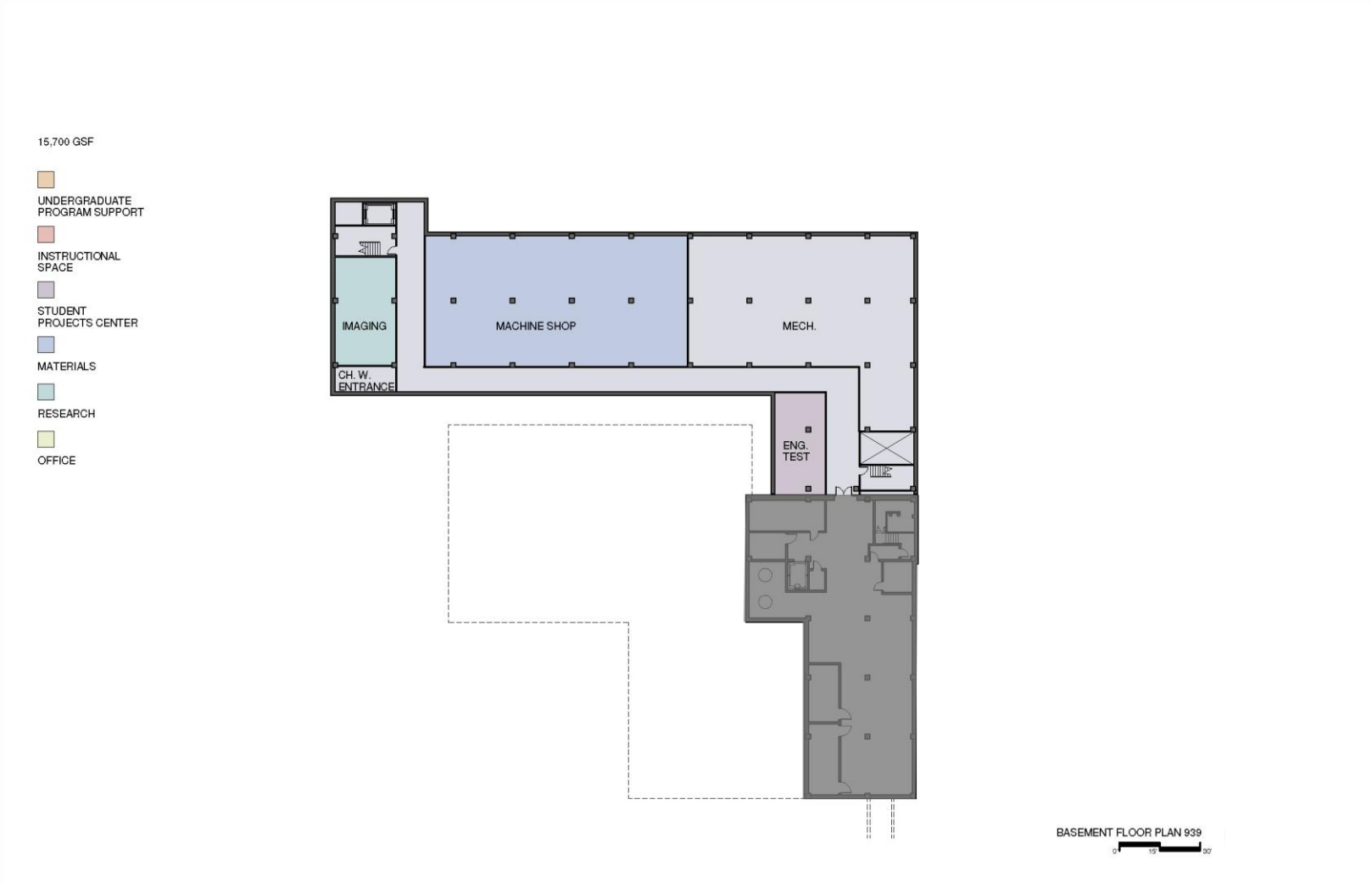
FY 2012 Funding availability	**July, 2011**
Engineering Expansion Phase II design consultant selection (Includes EHS relocation)	November, 2011 – March 2012
EHS Relocation design and construction complete (separate Contract)	January 2013
Engineering Expansion building design	March, 2012 – May 2013
Engineering Expansion contractor selection	May, 2012
Early Construction Package(s) – Start of Construction	November 2012
FY 2013 Start of Building Construction	**October 2013**
Burt Hall remediation complete	May, 2013
Burt Hall demolition complete (Bid as part of the construction contract)	July, 2013
Completion of Engineering Expansion Phase II target date	**March 2015**
Occupied program space available	
Faculty and Student project development space occupancy	March 2015

Date: April 1, 2011 (Updated: November 29, 2011)

Proposed Engineering Expansion Phase II

Basement Plan Concept design option for possible floor plan; some program requirements have changed

NIST M2SEC Phase I shown in dashed line and shaded area

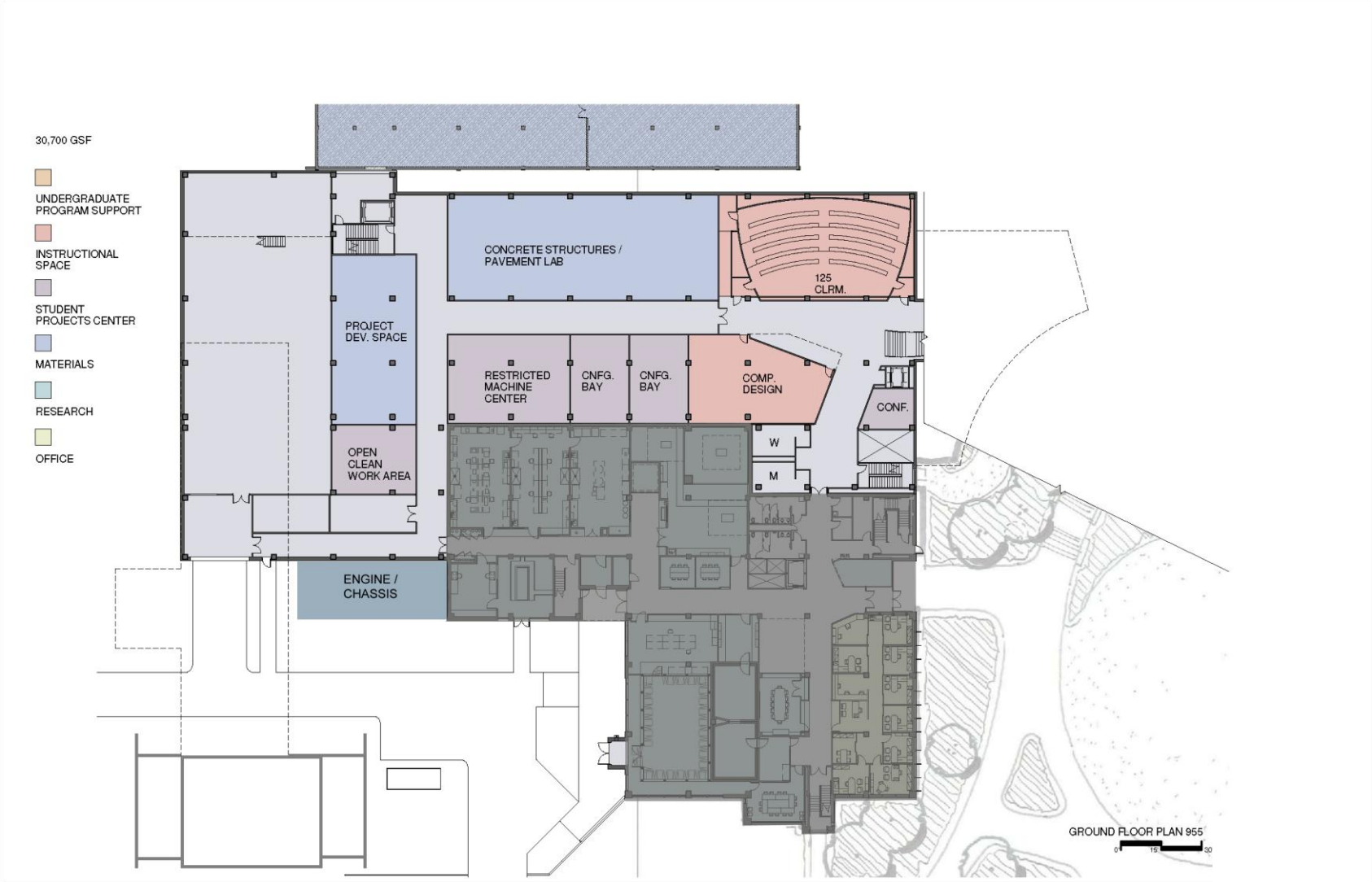


Date: April 1, 2011 (Updated: November 29, 2011)

Proposed Engineering Expansion Phase II

Ground Floor Plan Concept design option for possible floor plan; some program requirements have changed.

NIST M2SEC Phase I shown in shaded area

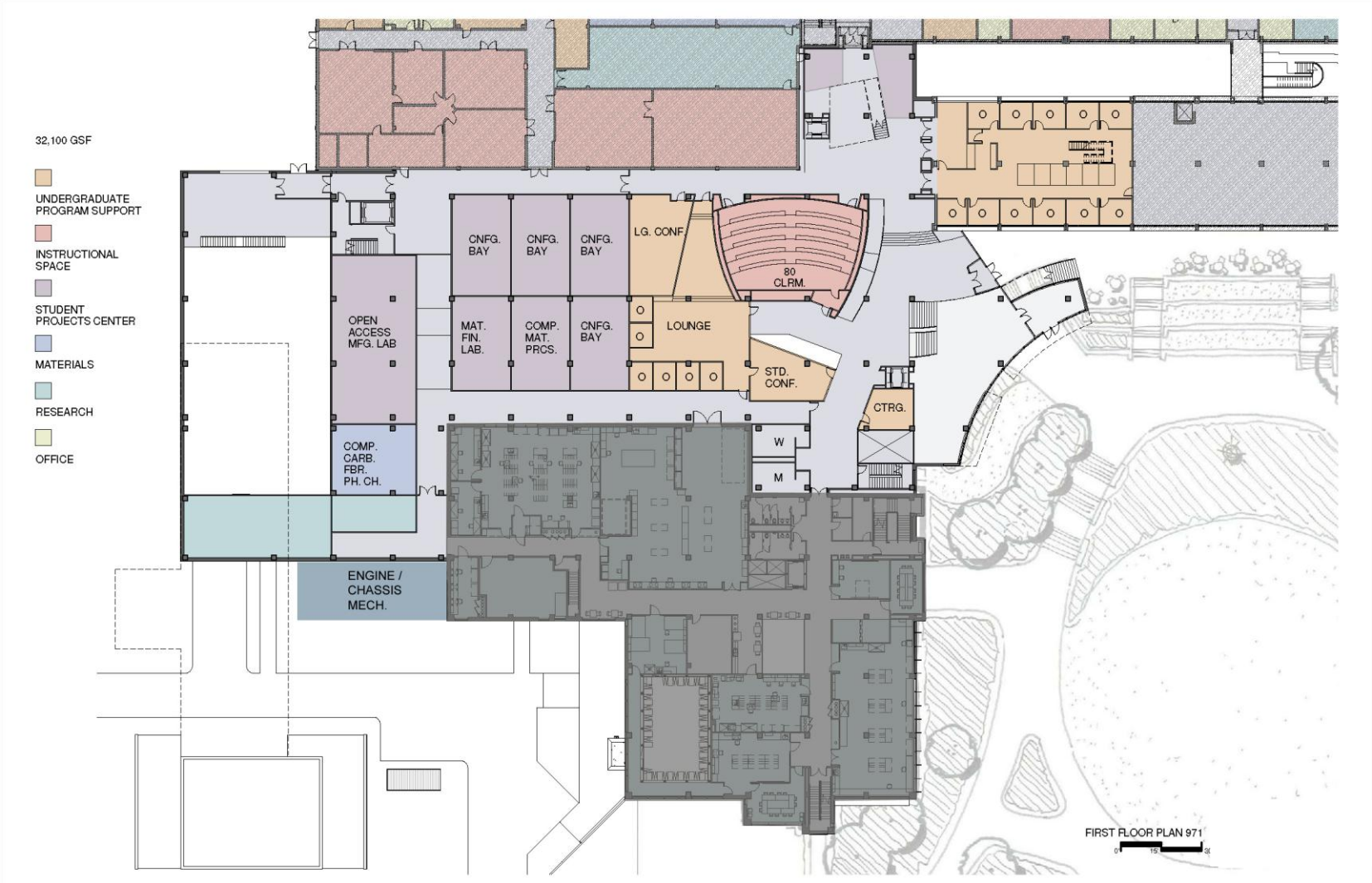


Date: April 1, 2011 (Updated: November 29, 2011)

Proposed Engineering Expansion Phase II

First Floor Plan Concept design option for possible floor plan; some program requirements have changed

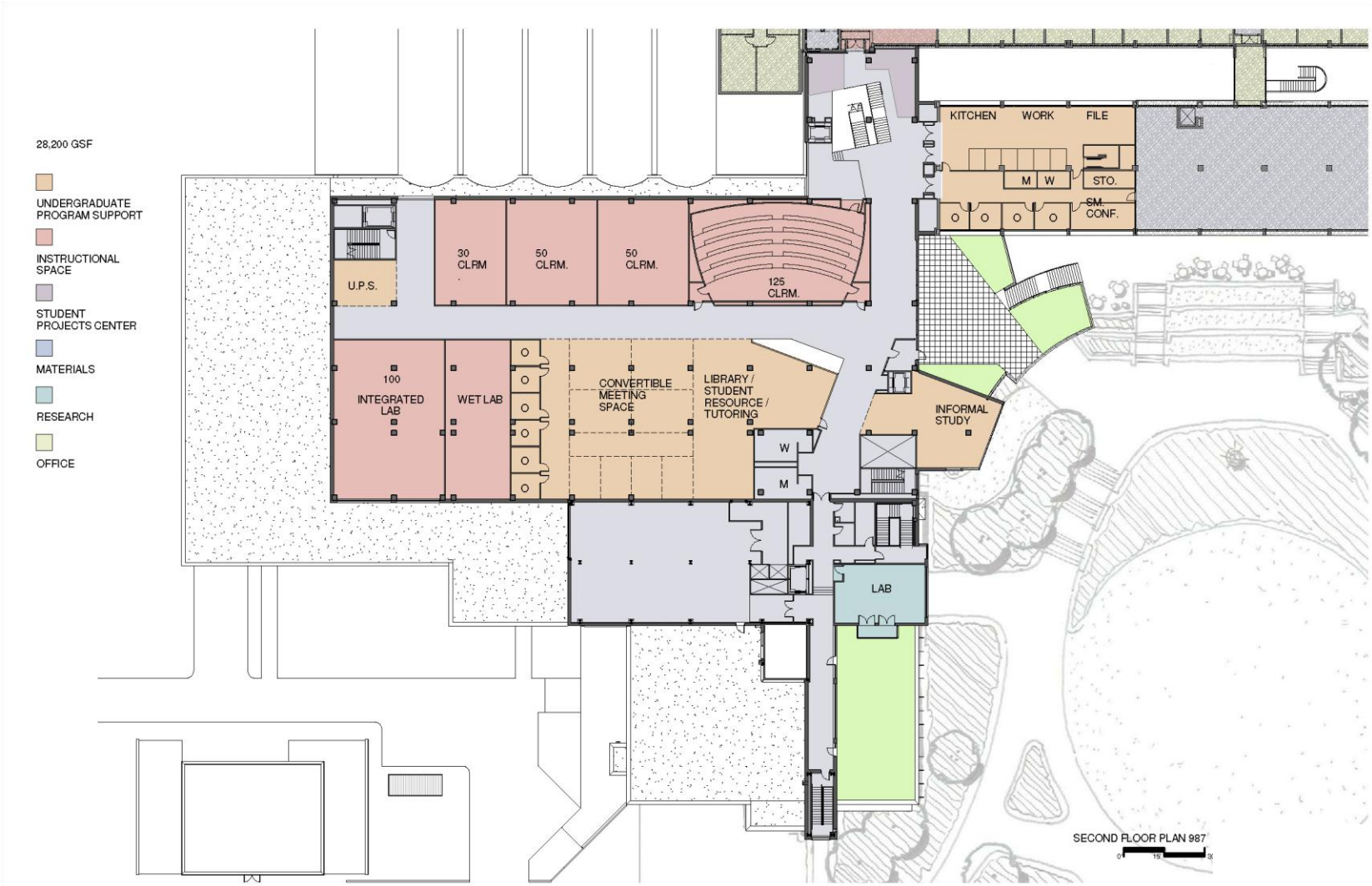
NIST M2SEC Phase I shown in shaded area



Date: April 1, 2011 (Updated: November 29, 2011)

Proposed Engineering Expansion Phase II

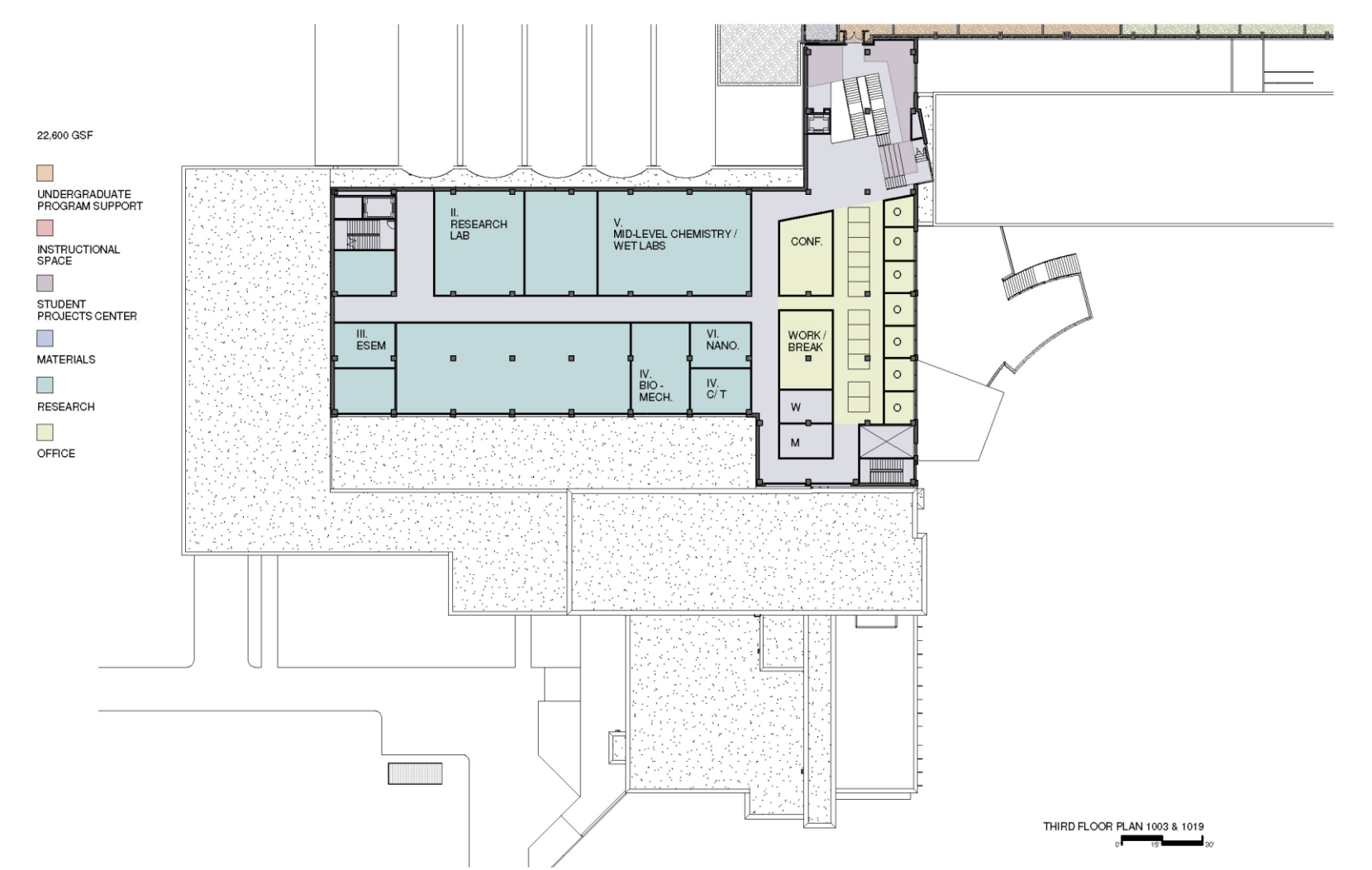
Second Floor Plan Concept design option for possible floor plan; some program requirements have changed



Date: April 1, 2011 (Updated: November 29, 2011)

Proposed Engineering Expansion Phase II

Partial Research Floor Plan Concept design option for possible floor plan; some program requirements have changed



Date: April 1, 2011 (Updated: November 29, 2011)