Energy + Environmental Science Education Research Center

a program update for the UT Institute of Agriculture - Knoxville, TN

Volume I

UTIA INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

LORD AECK SARGENT
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Energy + Environmental Science Education Research Center

VOLUME 1 of 2
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view towards Connector between Ellington [left] and Plant Biotech Building [right]

Tennessee's forests, pastures, and farmlands are our classrooms.
So are the state's gardens and arboretums, wetlands, and watersheds. The classrooms and teaching programs of the University of Tennessee Institute of Agriculture are as varied as the people they serve. Our programs assist students, farmers, families, 4-H and other youth, agribusinesses, state and federal agencies, consumers and the general public.

100 Overview

This program document was originally prepared in 2013. The 2018 update and revision included strategic space revisions, schedule updates, and and adjusted total project budget. the 2018 update did not include MEP, Civil, Landscape, or Structural consultants updating those respective sections of the program. However, UT Facility Services provided limited updates to those sections.

The University of Tennessee Institute of Agriculture is part of the University of tennessee system and is locaed in Knoxville, just west of the University of Tennessee - Knoxville [UTK] campus. The Institute of Agriculture contains four units that provide instruction, research and public service. These are AgResearch, College of Agricultural Science and Natural Resources, College of Veterinary Medicine and UT Extension. This document establishes the program for a new Energy and Environmental Science Education Research Center (EESERC) to replace the existing Ellington Science Building. Final approval of the new design is required by the UTK Campus Planning and Design Committee.

The site identified for this new Building is the current location of the Ellington Science Building and Hollingsworth Auditorium located on Chapman Drive near the intersection of Chapman and Joe Johnson Drive. The Energy and Environmental Science Education Research Center will be new construction totaling approximately 157,000 gross sf, as well as a 20,000 gross sf surge building to be located on the current site of the Plant Sciences Annex B building. This facility will house teaching laboratories, research and public service labs, offices and new classrooms for the UT Institute of Agriculture (UTIA). The project budget for the new Center and surge building totals $95,000,000 [$88.5million for EESERC; $6.5million for Surge). In addition to the construction of the Surge building, this project requires temporary use/occupancy of spaces in McCord Hall, as well as possible use of up to 5,000 sf of office space at the Cherokee Farm Innovation Campus, located west across the Tennessee River from the UTIA campus. These temporary uses allow the Ellington building to be fully vacated prior to demolition and construction of the new EESERC building.

The new Building's primary entrance and presence will be focused towards Joe Johnson Drive. There is also a strong desire to connect the new building to the existing Plant Biotech Building on all levels to create a seamless community environment. This project will enhance research opportunities and capacity, improve flexibility of emerging technologies, improve quality of programs and contribute to the economic growth and workplace development in Tennessee. The building will be equipped with a technology infrastructure of the highest level.

Departments with faculty included within the building are:

- The Herbert College of Agriculture [formerly known as CASNR[1]]
- Biosystems Engineering and Soil Science
- Entomology & Plant Pathology
- Forestry, Wildlife & Fisheries
- Plant Sciences
- Animal Science
- UT Safety Office

Space Types included in the building*:

- Interdisciplinary and specialized Research laboratories with support space.
- Teaching laboratories with prep space and specialized storage.
- Classrooms and lecture halls suitable for the most advanced pedagogy of today and designed to allow for the use of new technologies as yet unproven.
- A large auditorium to replace Hollingsworth with increased capacity to 500 persons.
- Faculty offices, departmental offices, graduate student spaces, and a commons area in which vending will be provided in a comfortable setting to allow those who work within the facility or who come there to gather and exchange ideas.
- Facility Support rooms such as offices, additional control areas and utility equipment to support controlling the entire Ag Campus.

*See pages 18-28 for a more detailed description of the Program.

1 Thanks to the generosity of UT alumni Jim and Judi Herbert, the Herbert College of Agriculture (formerly CASNR) becomes only the third named college in UT's 224-year history and one of only two-land-grant agricultural colleges in the nation to be named from a philanthropic gift. This gift elevates the College into a very elite group of the very best public land-grant colleges of agriculture in the nation. The Herbert College of Agriculture is a partnership of the University of Tennessee Institute of Agriculture and the University of Tennessee. Last Friday the Board of Trustees made a formal announcement to name the college in their honor.

Project Schedule Overview*

• Program Update	18 weeks	Mar. 2018	July 2018
• Designer RFP and Selection	8 weeks	July 2018	Sept. 2018
• Program Validation	8 weeks	Oct. 2018	Dec. 2018
• Phase I Surge Design	8 months	Nov. 2018	June 2019
• Phase II EESERC Design	21 months	Oct. 2018	May 2020
• Phase I Owner Review | GMP	10 weeks	June 2019	Sept. 2019
• Phase I Demo + Construction	45 weeks	Sept. 2019	July 2020
• Vacate Ellington; Surge move in	6 weeks	Aug. 2020	Sept. 2020
• Phase II Owner Review | GMP	18 weeks	June 2020	Oct. 2020
• Ellington demo	13 weeks	Oct. 2020	Jan. 2021
• Phase II EESERC Construction	30 months	Jan. 2021	May 2023
• Phase II FF&E and Move In	12 weeks	May 2023	Aug. 2023

*See page 37 for a more detailed description of the Schedule.

Given the complex phasing and construction requirements, it is recommended that this project be procured through a CM / GMP process with the CM beginning pre-construction services during the Program Validation phase.

102 Mission, Vision + Values

.01 MISSION STATEMENT

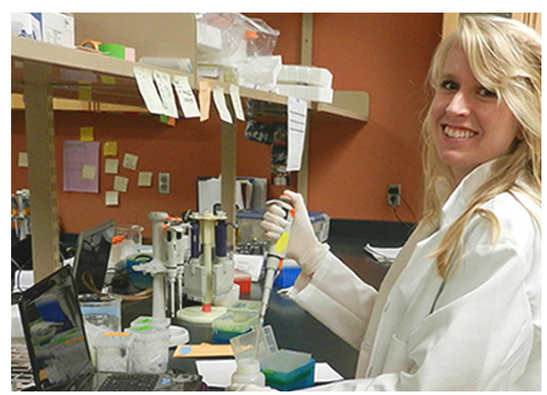
The University of Tennessee Institute of Agriculture (UTIA), through its colleges, research and education centers, and county extension offices, serves the people of Tennessee and beyond through the discovery, communication and application of knowledge. UTIA, working with the University of Tennessee - Knoxville, is committed to providing undergraduate, graduate and professional education programs in a diverse learning environment that prepares students to be leaders in a global society. The Institute's delivery of education, discovery, and outreach contributes to the economic, social and environmental well-being of all Tennesseans and focuses on contemporary problems faced by Tennessee, the nation, and the world.

.02 VISION STATEMENT

We create real life solutions. We will accomplish this vision by 1) preparing students to make a difference, 2) discovering knowledge which impacts real world issues and 3) connecting with people and communities to help them prosper.

.03 VALUES

- Responsiveness to constituent needs
- Integrity and mutual respect
- Transparency
- Accountability
- Science-based solutions
- Lifelong learning
- Diversity
- Civility



.04 COMPONENTS

The University of Tennessee Institute of Agriculture is made up of the following four units that provide instruction, research and public service:

AgResearch

AgResearch is an integral partner in teaching programs throughout the Institute. AgResearch faculty conduct world-class research programs in a variety of areas including crop breeding and genetics, soil conservation, no-till crop production, cattle reproduction, wood product development and many others. AgResearch is also a key funding source for graduate assistantships and research that graduate students undertake in their degree programs. The internship program of AgResearch offers undergraduates unparalleled field experience. The unit's 10 branch research facilities serve as field laboratories for faculty and students, while allowing the public to evaluate research trials and experience gardens and arboretums. Technologies developed by UTIA's researchers benefit producers and consumers alike.

College of Agricultural Sciences and Natural Resources

The College welcomes students from across Tennessee, the nation and the world. It offers academic programs in a variety of natural and social science based disciplines that apply to the food, fiber and natural resources systems. For students in the College of Agricultural Sciences and Natural Resources (CASNR), learning is personal and often hands-on. Student teams provide opportunities for self-directed study, leadership development, and a lot of fun. A new honors research and creative achievements program challenges students to excel. International study tours give graduates an edge in the increasingly connected world of global markets.

College of Veterinary Medicine

The College of Veterinary Medicine (CVM) is one of only 30 veterinary colleges in the nation. It is also a national leader in creating a collection of virtual microscope slides students can access from the convenience of their personal computers. New services in equine sports medicine offer students opportunities, as does the expansion of the college's facilities. The College serves pet owners, zoos and the livestock industry; protects public health, enhances medical knowledge and generates economic benefits to the state and nation. Outreach programs engage an array of citizens in learning programs that explore the animal-human bond.

UT Extension

UT Extension has an office in every county of Tennessee. Educational programs offered by University of Tennessee Extension touch the life of every citizen in Tennessee every day. UT Extension delivers research-based programs that improve lives, build stronger families, and strengthen communities. As a partner with local, state, and national agencies and through its statewide presence, Extension provides educational programming and assistance in areas of agriculture, natural resources and resource development, family and consumer sciences, and 4-H youth development.

.05 STRATEGIC PROJECT PRIORITIES + GOALS

The following priorities and goals for the new Energy and Environmental Science Education Research Center were developed with input from members of the Faculty, Administration and Facilities. The goals are listed in order of most requested to least.

1. Maximize Research Lab space with Prime functionality (utilities, emergency power, etc.)
2. Provide space for Social Interaction with food/break
3. Provide a large indoor gathering space for 500 Occupants to be used similar to Hollingsworth Auditorium
4. Plan a facility to meet the needs for the next 10 years (minimum)
5. Conform to the High Performance Buidling Requirements (HPBr) for Environmental Sustainability
6. Provide exterior gathering space for school wide gatherings (courtyard/green space)
7. Provide Teaching Labs
8. Provide adequate storage space
9. Consolidate the Forestry Department into one building (currently in 8 buildings)
10. Provide space for community outreach and extension
11. Design to separate public spaces (classrooms) from private spaces (labs)
12. Provide conference room space (Min. 1 per floor)
13. Create a "Universal UT" whereby the Agricultural Campus is seamlessly connected to the Main Campus
14. Design research space as Open Lab Concept (would require a culture change addressing responsibility and ownership)
15. Create a facility that will attract students, faculty and donors
16. Classroom controls that are uniform and simple
17. Provide a variety of classroom styles to suit multiple pedagogies
18. Provide space for Quiet Study
19. Plan for adequate and appropriate HVAC systems providing the required air pressures (postive or negative)
20. Look at the campus in totality - Not just another building
21. Provide flexible spaces
22. Identify similar facilities to visit for benchmarking comparisons

The goals were established to create a framework in which to design the new building. Items listed are of particular importance to the Administration, Faculty and Staff at the Institute of Agriculture.

Drive to 55 is a transformational initiative for the State of Tennessee. The goal is to equip 55 percent of Tennesseans with a college degree or educational certificate by the year 2025, thereby ensuring the state's future workforce is prepared to meet the demands of local, national, and global Job markets. Thus, the delivery of high-quality educational training in science, technology, engineering and math (STEM) is vital to the success of the Drive to 55 Initiative and to the long term sustainability of the state's economy. Governor Haslam described the need for STEM education to meet Intensive advanced Industry job growth In a Brookings Institution Report dated August 5, 2016 (http://www.tnecd.com/news/328/tennessee-is-top-state-in-us-for-advanced-industry-job-growth-brookings-institution-report-finds/) The report notes that to attract students to STEM disciplines, It Is essential to provide facilities that allow for experiential learning opportunities that are personal, active and practical.

Facilities and faculty on the campus of the UT Institute of Agriculture (UTIA), including those from the College of Agricultural Sciences and Natural Resources (CASNR), have long supported the philosophy of experiential learning. From the numerous camps and outreach activities conducted on campus by the state 4-H Program for the benefit of grammar and secondary students - who it is hoped are future CASNR students - to countless lab and classroom sessions for the growing undergraduate CASNR enrollment, the state's STEM students Interested In applied sciences have benefited from on campus experiential learning. However, not all activities are related to on campus students. Adult learners are also a vital segment of the population that must be served to realize the Drive to 55 goal.

UTIA's mission is to prepare students of all ages to solve present and future challenges (https://ag.tennessee.edu/UTIAPRIORITIES/Pages/default.aspx). Faculty and staff work to educate youth and adults to better understand the role of STEM disciplines in our world to provide a bright future for Individuals and our society. On campus, the hub of that effort lies within the facilities In the current Ellington Plant Sciences Building (EPSB), which houses classrooms, laboratories and faculty that support the Departments of Plant Sciences; Forestry, Wildlife and Fisheries; Entomology and Plant Pathology; and to a lesser extent the Department of Biosystems Engineering and Soil Science.

The EPSB serves the goals of the Drive to 55 Initiative in these ways:

- Through STEM activities designed to enlighten and inspire youth.
- Through teaching and research aimed at educating undergraduates In STEM-based disciplines.
- Through equipping adult learners with STEM-based skills.

How does the EPSB enlighten and Inspire youth to obtain further education? Tennessee has one of the largest 4-H programs in the country with more than 170,000 grammar and high school participants. A large number of these youth visit the UTIA campus throughout the year to participate in STEM-related, hands-on teaming opportunities, many of which are conducted in the current EPSB. Programs such as Electric camp, Roundup, or All Stars cover studies that include, but are not limited to, environmental science and alternative energy; engineering and technology; and plant and animal science. (https://4h.tennessee.edu/Pages/programs.aspx) As 4-H increases the appetite and capacity for STEM learning among Tennessee's youth, it is also the students' first exposure to higher education and often serves as a gateway to degree attainment.

At the undergraduate student level, EPSB serves as a hub of activities supporting some of the largest and fastest-growing CASNR departments, which therefore supports the Drive to 55's primary goal of advanced STEM education for Tennessee's students. College graduates play a vital role in Tennessee's workforce and fill the state's skills gap, especially in regard to STEM skills. Findings from the US Department of Education show that students enrolled In STEM programs such as those housed In EPSB are at least 25 percent more likely to finish a bachelor's degree and at least 33 percent less likely to leave college without a degree. In addition, STEM students have higher grade point averages and are better prepared for the job market than those who do not focus on STEM education after high school (Chen and Weko, 2009, Students Who Study Science, Technology, Engineering and Moth (STEM) in Postsecondary Education).

According to a recent report by the UT Center for Business and Economic Research, instructional programs in STEM fields are expected to show strong growth, and UTIA is front and center in addressing this need. Thirteen of 15 CASNR majors, or 80 percent, are required to take challenging STEM courses. What's more, UTIA Is committed to student success as evidenced in our strategic planning documents (https://ag.tennessee.edu/Pages/StrategicPlan.aspx) and in departmental plans such as those developed by the Forestry, Wildlife and Fisheries Department (https://ag.tennessee.edu/fwf/Documents/StategicPlan2016-2021.pdf) and in the Department of Plant Sciences' Department Head Report and Strategic Initiatives (https://ag.tennessee.edu/casnr/Documents/CASNR%20 2020%20Strategic%20Plan.pdf)

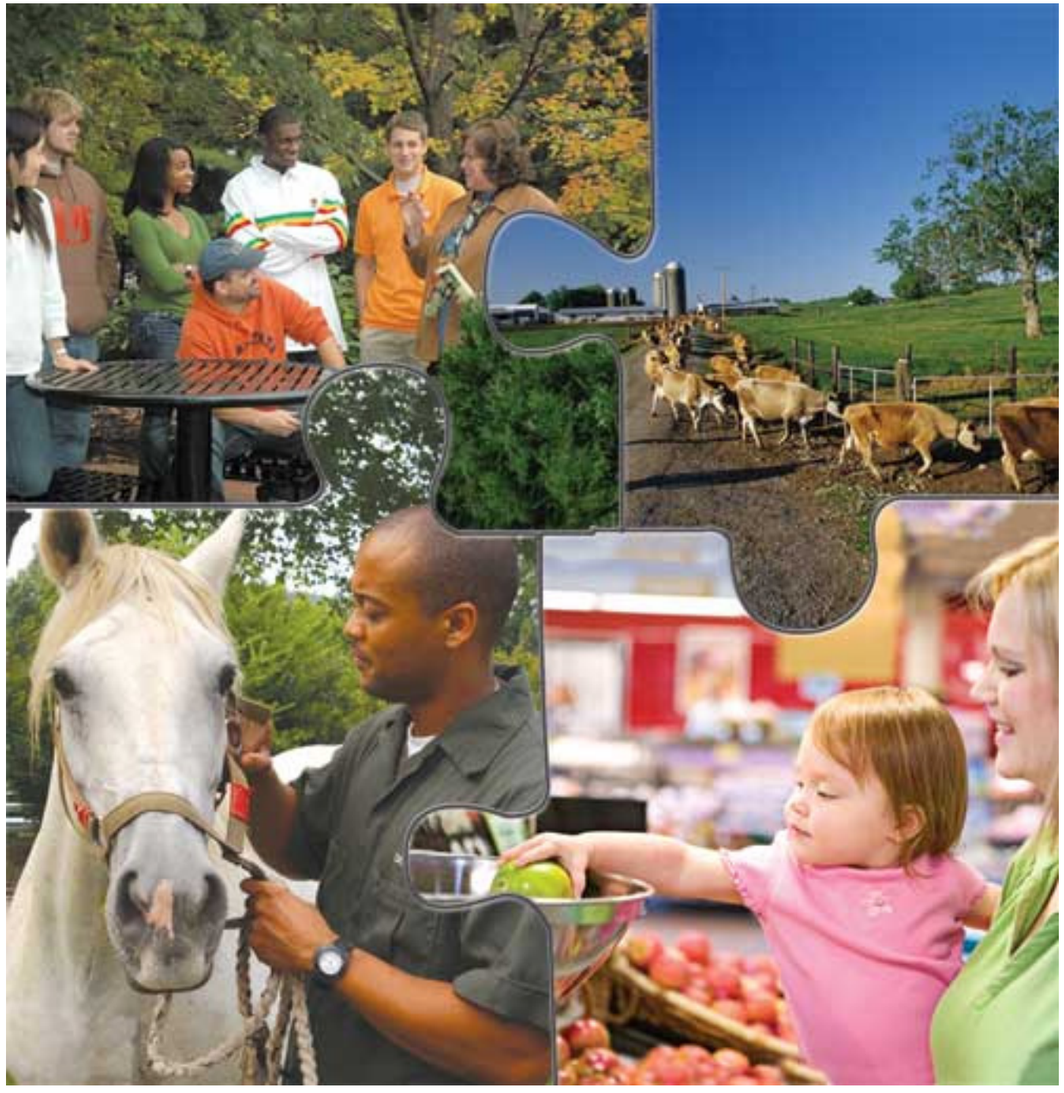
Finally, EPSB currently serves as the hub for UT Extension outreach and educational programs that fill skill gaps in Tennessee's workforce and increase opportunity for workforce development, as well as expand our public service mission to reach adult learners. For example, Tennessee's Pesticide Applicator Program is managed out of the current EPSB. Each year, the program certifies more than 1,400 commercial pesticide applicators and as many as 6,000 private applicators. To work in commercial pesticide application, an individual must first earn a private applicator certification.

The proposed new building, the Energy and Environmental Science Research and Education Center (EESERC), is of particular importance to UTIA as it pertains to obtaining the goal of the Drive to 55 Initiative. The 2015-2016 THEC Master Plan states that without increasing capacity for people entering the pipeline for postsecondary training (for example, increasing classroom capacity or enhancing the classroom and lab experience), the state will never reach the goal of the Drive to 55 Initiative. The student enrollment at UTIA's CASNR has already doubled over the past decade, but the capacity and technological infrastructure of CASNR's primary teaching facility, the EPSB, has stayed static. What's more, current CASNR enrollment stands at 1,450 undergraduate students. Of those, more than 75 percent, or about 1,300, are pursuing STEM-related degrees, and each year some 300 of those students graduate and enter the workforce. As stated in the 2015-2016 THEC Master Plan, "The proposition that postsecondary education has replaced high school as the gateway to a middle-class life has now evolved from proposition to principle. Widespread evidence exists that higher education affects economies and quality of life for states and individual citizens in myriad ways (e.g., earnings, health, civic engagement such as voting and volunteering, and innovative and resilient economies)". In preparing CASNR graduates for STEM-related jobs, UTIA is meeting the challenge of the Drive to 55 initiative and meeting a critical need for Tennessee's economic and community development, but without expanded classroom capacity, UTIA will fall behind.

One of UTIA's core values is to provide experiential learning to our students, whether they are undergraduates, graduates or adult learners. The proposed EESERC building will play a vital role in delivering educational programming in partnership with Governor Haslam's Drive to 55 Initiative. At the core of experiential learning Is lab work, and the current facility falls short In supplying space for CASNR's growing enrollment and the future enrollment for the Drive to 55 Initiative. Currently, EPSB also falls short in meeting basic needs to conduct research by students and faculty. For example, the current HVAC system is not working well and has difficulty maintaining an average temperature of 25 degrees Celsius, which is essential to conduct experiments to produce valid research results. Another example relates to Ellington's Technology Enabled Active Learning (TEAL) Classroom. This classroom is 10 years old and outdated, decreasing educational capacity, reducing experiential learning opportunities, and potentially lowering outcomes outlined in Drive to 55. The proposed EESERC will play a crucial role in helping make goals of Drive to 55 a reality with cutting-edge research facilities, a collaborative classroom environment, and a center of education and professional development for youth and adult learners.

The new building will also connect to the existing Plant Biotechnology Building on all levels to create a seamless community environment emphasizing the multidisciplinary research and education needed for future learners. This project will enhance STEM research opportunities and capacity, improve flexibility of emerging technologies, and improve quality of programs, all of which will ultimately contribute to the economic growth and workforce development in Tennessee.

As the Drive to 55 Snapshot (https://www.tn.gov/thec/research/redirect-research/drive-to-55-snapshot.html) deftly states, “producing skilled graduates attracts employers to our state and creates a positive economic cycle for Tennessee.” UTIA serves as a catalyst for economic growth in Tennessee through our mission of teaching, research and extension. To help our students and state achieve success, replacing the aging EPSB with the new EESERC is UTIA’s top capital project priority.



.01 MASTER PLAN

The University of Tennessee Institute Of Agriculture (UTIA) includes the College of Agricultural Science and Natural Resources (CASNR), the College of Veterinary Medicine (CVM), UT AgResearch, and UT Extension. The instructional programs of the two colleges within the Institute are also part of the UT Knoxville academic enterprise. Integral to the university's land-grant mission and consistent with the Institute's Priorities https://ag.tennessee.edu/utiapriorities, these units contribute to improving the quality of life, increasing agricultural productivity and income, protecting the environment, promoting the economic well-being of families, and conserving natural resources for all Tennesseans, the clientele served includes students, farmers, families, homeowners, 4-H and other youth, agri-businesses, state and federal governmental agencies, consumers and the general public are all served by UTIA.

The goal of the University of Tennessee, Knoxville (UTK) 2016 Master Plan is to create a guide for future growth at UTK and the Knoxville Campus of (UTIA). The master plan portrays a 30 year vision for the two adjacent campuses, identifies long-term opportunities, and defines phases for the cohesive development of facilities on the two campuses as a unified plan. The plan is in distinct alignment with the UTK strategic planning, Vol Vision 2020: Journey to the Top (http./top25.utk.edu to place itself firmly among the top 25 public research universities. Five strategic priorities have been institutionally adopted as necessary for inclusion in the top 25 group of public universities.

-Retain and enrich diverse body of well-educated undergraduate students
-Enhance diversity and inclusion through recruitment of diverse populations of students, faulty, and staff
-Strengthen capacity and productivity in research, scholarship and creative activity, and engagement
-Attract, develop, and retain stellar faculty
-Develop a resource base for the future and transform campus infrastructure

Having sufficient and contemporary facilities is essential for UTIA and an absolute prerequisite to attain actual and perceived quality, and is a base element within each of these strategic priorities. UTIA has immediate need for new and expanded facilities. This project's core element will address the critical need for academic programs at the undergraduate, graduate and professional level to fully address Tennessee's economic development, workforce and research needs.

The Energy and Environmental Science Education Research Center (EESERC) is the Number One UTIA priority for capital outlay and will replace the existing Ellington Plant Science Building. The existing building was built approximately 51 years ago and consists of approximately 80,000 gross sf.. The new construction is programmed for 157,500 gross sf.. Also included with this project is a 20,000 gross sf Academic Surge Facility. *The UTK Long Range Master Plan-2016 Update* documents these projects as the Number-One near term phased project for UTIA. Specific references cited are found at http://masterplan.utk.edu/.

Please refer to Table 1.03 Near Term Capital Projects Outlay List-page 28, Figure 1.0S Near Term Projects Phasing Plan-page 29, and University of Tennessee Institute of Agriculture Campus-page 37.

.02 STRATEGIC PLAN

The University of Tennessee Institute of Agriculture (UTIA) resides at the heart of the land-grant mission of educating, discovering, and connecting. Significant challenges are ahead of us as we work to find "Real. Life. Solutions." for our state, our region, and the world to the most pressing agricultural and natural issues that we face. We know that audiences outside of our agricultural community are not as aware of the critical role agriculture plays in their daily lives from the food they eat, to the clothes they wear, to the homes in which they live. We are committed to educating and assisting the public with this understanding. The proposed EESERC will directly impact our ability to perform this important role by creating an inviting environment that can engage our wide range of stakeholders.

Enhanced engagement is particularly important at this point as we begin to address the vision for advancing the agricultural community that Governor Bill Haslam laid out in the 10 year Governor's Rural Challenge. Also, the state's emphasis on creating job and career opportunities by attracting advanced industries in the automotive, energy and agribusiness sectors is creating new expectations, opportunities, and demands of the future workforce we are training. This, along with the enduring priorities of food, economic development and the environment, emphasizes the heightened demand for innovative instruction capabilities of students and targeted research and outreach programs to fulfill the opportunities outlined in these guiding documents. The need for the EESERC is reinforced in the 2016 Master Plan, which emphasizes "having sufficient and appropriate facilities is essential for the UTIA, both for the units with on-campus instructional responsibilities (College of Agricultural Sciences and Natural Resources and College of Veterinary Medicine) and those (UT Extension and UT AgResearch) with direct responsibility for the continuation and growth of the land-grant mission of the institution".

College success is essential to effective program delivery, and the proposed EESERC is essential to UTIA's continued success. The new facility will do so much more than simply expand the UTIA public service missions. It will also help to advance the quality of the academic experience by furthering the capacity for research and development programs that are essential to Tennessee. What should not be lost, though, is the impact the facility could have on our most valuable resource — the faculty and staff of UTIA that will ultimately make us even better. Over the course of the next 5 years, the Institute of Agriculture will face a significant period of transition that involves a loss of 25 percent of our faculty, through retirements alone. UTIA is not unique in this situation, which has created a very competitive environment for replacing these positions with the highest caliber candidates. In most cases, the decision to join UTIA's faculty is influenced by factors beyond salary, and is often determined by the quality of research laboratories, as well as the academic environment. The availability of state-of-the-art research laboratories that are versatile and safe represents a valuable recruitment advantage that will insure continued greatness of the programs we deliver by attracting great faculty. The issue of attracting and retaining outstanding research and teaching faculty is recognized as a critical challenge for all of the Institute's departments housed in the EESERC, as noted in their individual strategic plans (for example, see https://ag.tennessee.edu/fwf/Documents/StategicPlan2016-2021.pdf). Importantly, this highly desirable and essential outcome directly supports the goals and metrics of Vol Vision 2020: Journey to the Top.

Another important change in the research enterprise that the EESERC addresses is the scope of federal research programs. Requests for research that can be addressed by an individual researcher have become the exception rather than the rule. Instead, projects are expected to solve the complex challenges that necessarily involve the collaboration and cooperation of scientists with diverse disciplinary backgrounds that are typically housed in multiple departments. The design of the new structure, again providing a home to faculty from four different departments, will greatly facilitate the type of interaction that is needed to coalesce teams that can more effectively address grand challenges. That opportunity for increased interaction extends to graduate research assistants and undergraduate students. Access to this modern facility will help accelerate the transition to an integrated, multidisciplinary academic and research model that will strengthen the competitiveness of our science and engineering programs and better prepare our students to fit the evolving needs of Tennessee's workforce.

The new laboratories planned for the proposed building also acknowledge the dramatic change in the nature of agricultural and natural resources research since the Ellington Building was constructed. While fieldwork remains essential to transfer new discoveries to farmers, landowners and agribusiness interests, the reality is that today's R&D programs are more likely to involve molecular biotechnology, genomics, chemistry, and materials science approaches to problems. This shift in experimental methods is dramatically constrained by the current laboratory configurations that are limited in air exchange and other safety-related concerns. To remain competitive in the pursuit of external funds that are so important to advance our programs and accelerate problem solving for Tennessee's citizens, the EESERC is absolutely vital. In addition, the opportunity for undergraduate and graduate students to work and learn in a modern laboratory space is important for their professional development and marketability in the advanced industries that call Tennessee home.

Our strategic planning process will be completed by March 2018 and will be shared with our constituents. The end result will be a framework that crosses all units of UTIA, and connects with each of the current or future unit plans. In the meantime, strategic plan overviews for the four units that are stakeholders in the proposed EESERC can be viewed at:

https://ag.tennessee.edu/Pages/Strategic-Plan.aspx

Our priorities and vision is that UTIA is committed to discovering and providing "Real. Life. Solutions." that will boost our economy, protect the environment, and enhance health for the people of Tennessee and beyond.

The 2011 draft master plan was updated in 2016 in order to refine the long-range vision for the campuses of the University of Tennessee, Knoxville, and the Institute of Agriculture. A key element to moving UT Knoxville to the ranks of the Top 25 Public Research University involves having the resources to improve and supplement campus facilities to support first-rate academic and research programs, along with student housing and services.

The goal of the of the University of Tennessee, Knoxville (UTK) 2016 Master Plan is to create a master plan document that will serve as a guide for future growth at UTK and on the Knoxville Campus of The University of Tennessee Institute of Agriculture (UTIA). The master plan portrays a 30-year vision for the two adjacent campuses, identifies long-term opportunities, and defines phases for the cohesive development of facilities on the two campuses as a unified plan.

- The governing principles of this Master Plan update are:
- Align campus improvements to support UT Knoxville's Strategic Plan.
- Assume student population needs
- Continue to develop a safe, more accessible and pedestrian friendly campus
- Optimize limited space on campus
- Promote energy and environmental responsibility
- Expand and improve the east-west spine with better linkages north-south
- Accommodate vehicles at the periphery of campus and reinforce the pedestrian core
- Continue to develop the campus transit system
- Encourage preservation of historic and cultural resources
- Recommend refinements to various campus design guideline documents
- Maximize connections to surrounding communities
- Coordinate with Cherokee Campus Master Plan

Campus master plans are living documents and require review and updating on a regular basis to be relevant to the campus it informs. The 2011 Long Range Master Plan reflected wide ranging changes in the direction of UTIA and UTK. These changes included:

Revisions to the anticipated enrollment mix
Significant changes in research productivity and sponsored research projects
The UTK Chancellor's signing of the American College and University Presidents' Climate Commitment (UTK goal of climate neutrality by 2061 - signed in 2007 and reiterated 2010)
Increased strength in disciplines within the arts, humanities, social sciences and in professional schools
Economic changes
Strengthened relationships with the City of Knoxville and Knox County.

This Master Plan update builds on the 2011 Plan. In March 2015, a planning team with the assistance of Bullock Smith and Partners was selected to complete the update. The planning process has been highly participatory and relied on consensus building activities. A wide cross section of campus groups including administrative, academic, student life, athletics, faculty, staff, and students have been invited to provide input and feedback. In addition, off-campus stakeholder groups and organizations from the City of Knoxville and surrounding neighborhoods were invited to participate. Accomplishments emphasized in the previous plans which have progressed toward their goals include:

- Expansion of a campus transit system
- Completion of a transit hub on Phillip Fulmer Way
- Installation of Greenways—on both the north and south sides of the river
- Adoption of the Campus Landscape Vision & Site Standards (2012)
- Conversion of the Steam Plant from coal-fired to natural gas
- Expansion of the regional chiller plant program
- Major increases in recycling and energy conservation
- Increase in available parking

2011 Proposed Emphasis of Major Axis and Open Space Network

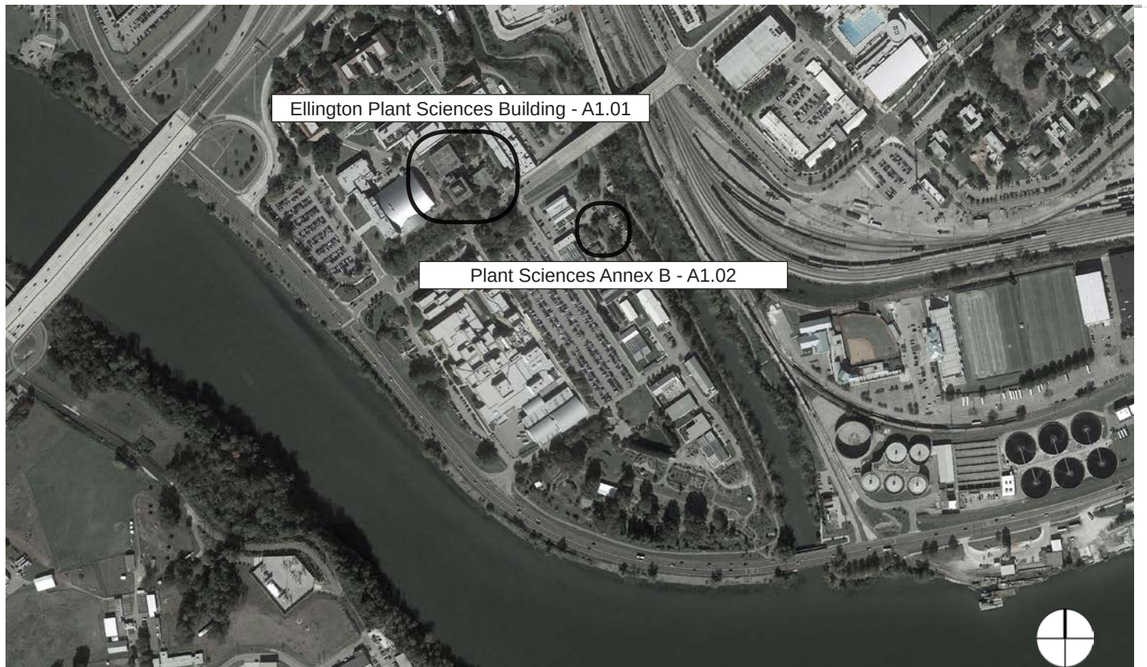
"During the early 20th Century the campus grew in what has been called a "suburban" model in which long straight streets are flanked by variegated buildings, each of these buildings surrounded by parking lots and lawn or other landscaping. There are two unfortunate consequences with this development pattern: the open space system on the campus was defined by vehicular movement, and the buildings and their placement were generally inadequate to define exterior open space that feels comfortable and complementary to pedestrians.

…The space-defining characteristics of the building edges will be critical in framing and amplifying the open spaces and pedestrian passages necessary to tie the campus together in a unified manner. The higher densities resulting from future development will be balanced by the improved clarity and linkage of pedestrian open spaces."

2011 Master Plan Assessment of the Ellington Plant Sciences Building

The need for major renovation of this facility (completed in 1968) has been documented by THEC evaluations and confirmed by consulting architects. Programmatically, it no longer serves the needs of the disciplines it serves: classrooms and laboratories are too small and lack infrastructure for today's pedagogy and inquiry; the design is inflexible; and the offices are not well-located or designed. A well integrated totality, including an expansion of the facility to *120,000** gross square feet (from its existing 81,000 square feet) is required to meet the current and foreseeable needs of the disciplines served.

***Note**: the 2016 update has increased the size of the proposed building to 160,000gsf. A 20,000sgf surge building at the location of the current Plant Sciences Annex B site has also been shifted to the Near Term projects list. This surge buidling will facilitate the demolition of Ellington and the construction of the new EESERC facility.



campus aerial | image courtesy of Google Earth

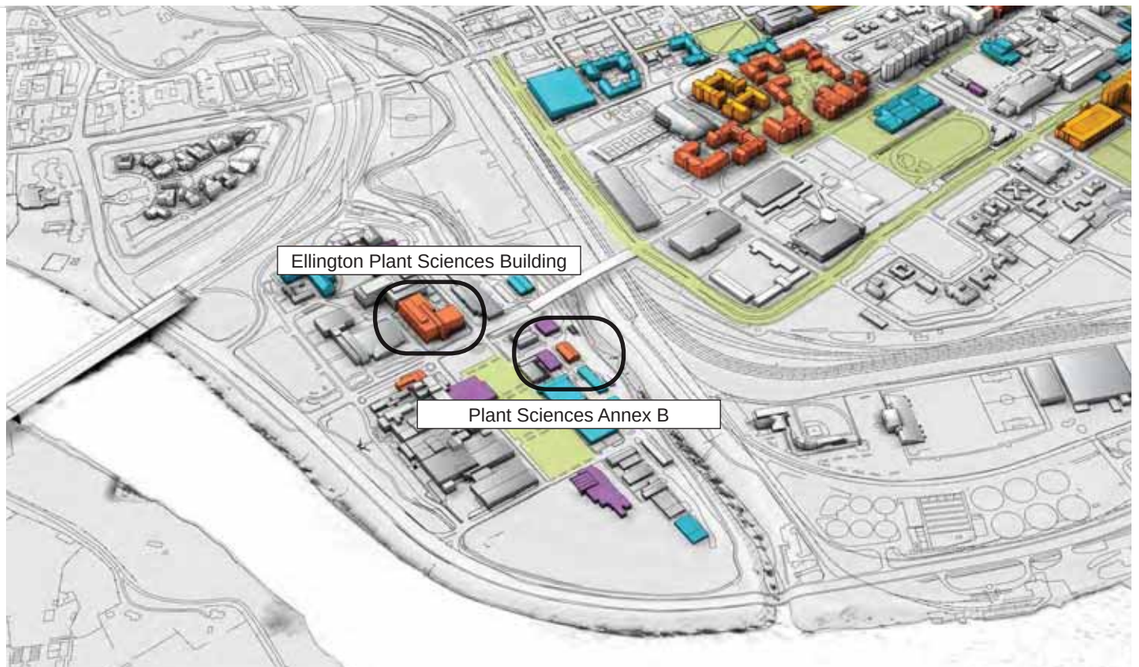
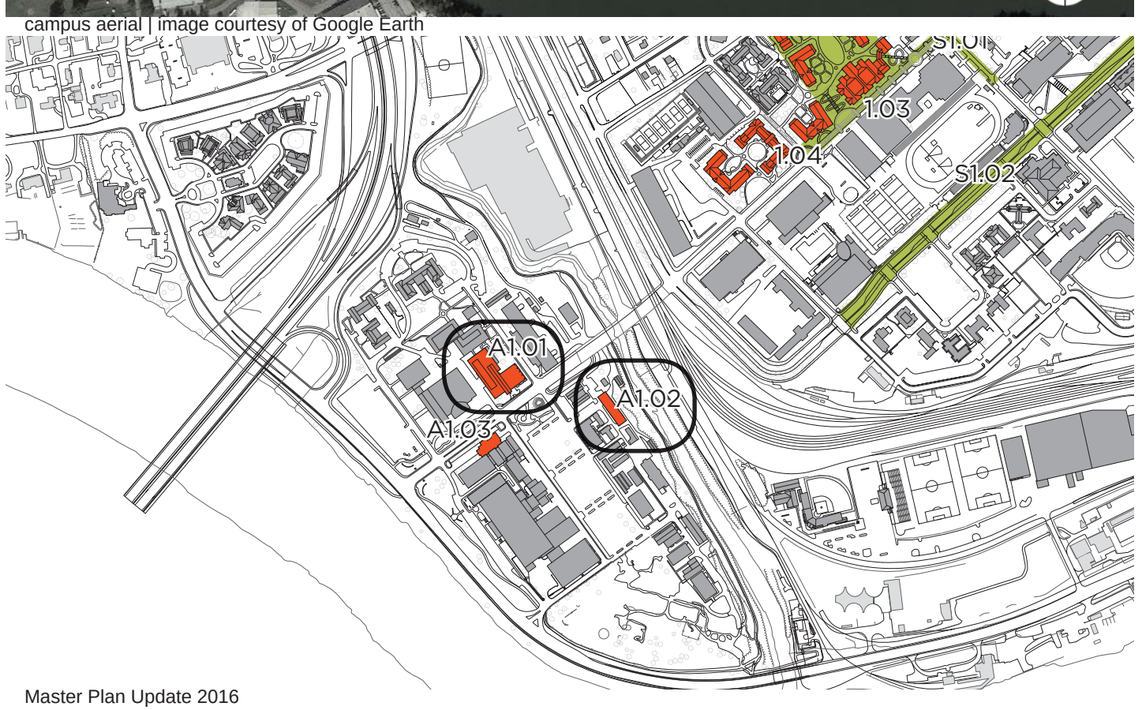
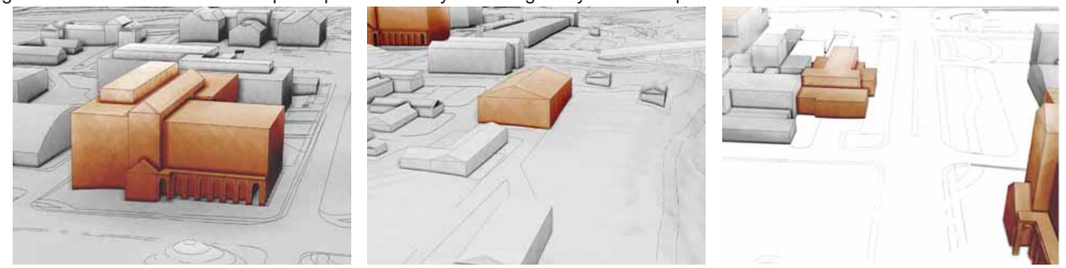


figure 1.09 from the 2016 master plan update - birdseye massing study of master plan build out



Master Plan Update 2016



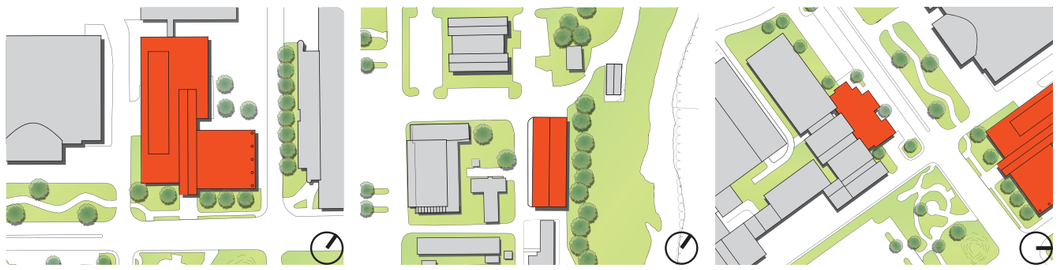


Figure 2.13
A1.01 ELLINGTON PLANT SCIENCES
160,000 GSF

New classroom building.

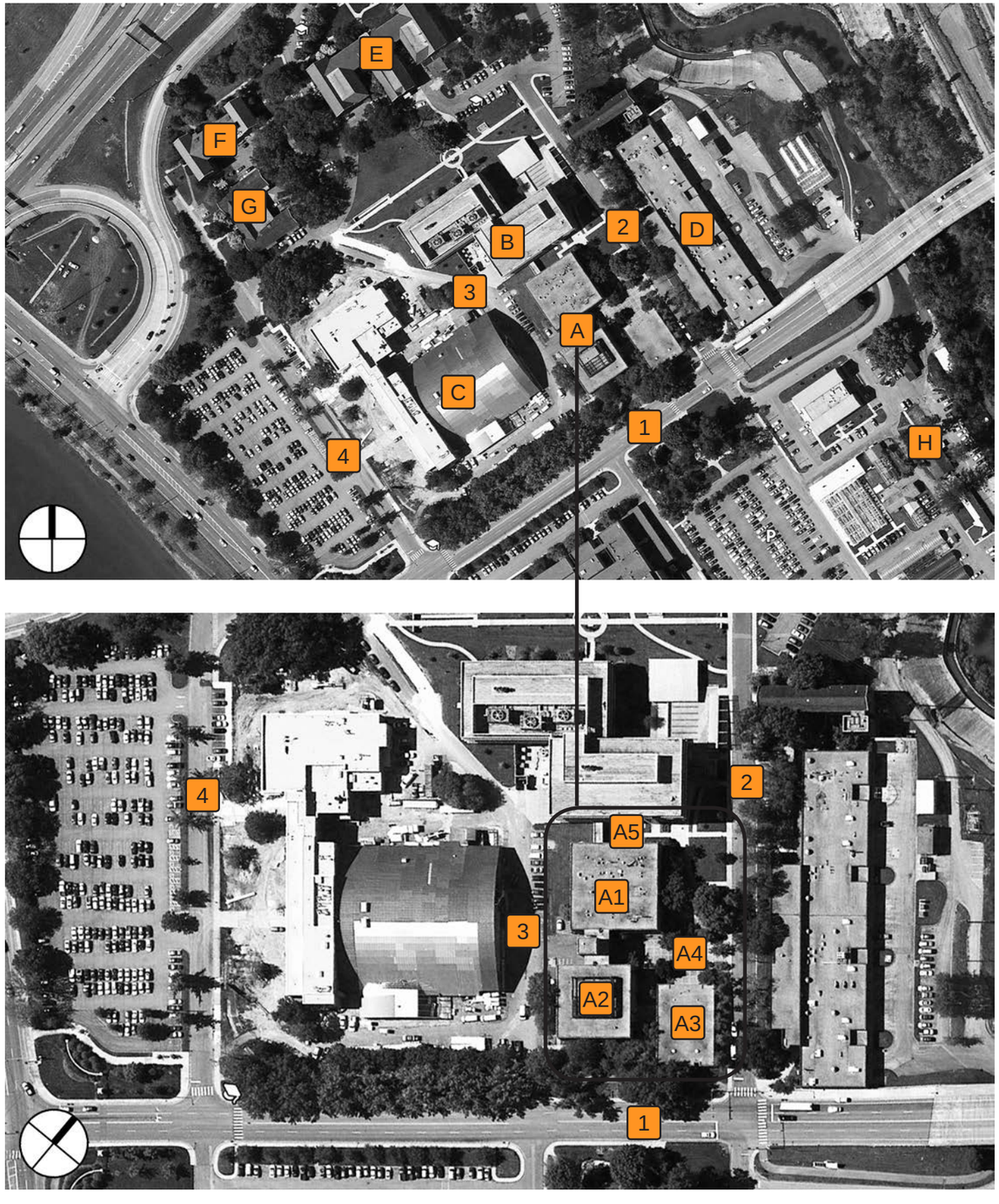
Figure 2.14
A1.02 RESEARCH BUILDING II
20,000 GSF

One story research and near term academic surge building.

Figure 2.15
A1.03 COLLEGE OF VETERINARY MEDICINE TEACHING & LEARNING CENTER
9,500 GSF

One story addition to the College of Veterinary Medicine.

Ellington Plant Sciences and Research Building II [Surge] - Master Plan Massings 2016



- A Ellington Plant Sciences
- B Plant Biotech
- C CE Brehm Animal Sciences
- D Biosystems Engineering and Environmental Science
- E Morgan Hall
- F McCord Hall
- G Food Safety and Processing
- H Plant Sciences Annex B - new Surge Building location

- 1 Joe Johnson Drive
- 2 E.J. Chapman Drive
- 3 Service Drive
- 4 River Drive

image courtesy of Google

- A1 Ellington Plant Sciences | Lab Wing
- A2 Ellington Plant Sciences | Classroom Wing
- A3 Ellington Plant Sciences | Hollingsworth Auditorium
- A4 Ellington Plant Sciences | Plaza
- A5 One Story Connection to Plant Biotech

image courtesy of Google

view S towards Morgan Hall

view E towards Plant Biotech Building

view N towards CE Brehm Animal Sciences

image courtesy of Bing

view S towards Plant Biotech Building

view W towards Plant Biotech Building Connector

view NW towards Hollingsworth Auditorium

Site Context

The Ellington site is bound on the East side by EJ Chapman Drive and on the South side by Joe Johnson Drive. To the North is the recently completed Plant Biotech Buillding and to the West is a Service Drive followed by the recently completed CE Brehm Animal Sciences Building. The existing building on site is a three-story structure with a partial basement and a one-story auditorum structure on the ground level. The three-story structure is divided into two wings, a classroom/office wing at the South and a laboratory wing at the North, connected by a central building with elevator and lobby space. At the North, there is a one-story “bridge” connector at the first floor level that connects the exising Ellington building to the Plant Biotech Building. The three-story structure, the one-story auditorium, and the one-story connector are all to be demolished. These are identified in Orange at the right on the Site Context Diagram.

Site Area

The boundary lines of the +/- 1.0 acre site are defined as follows: to the North, the boundary shall align with the north edge of the existing Ellington Building (verify building separation requirements with applicable Building Code) and jog to include the anticipated connection to Plant Biotech; to the West, the boundary line shall align with the Western boundary line of the Plant Biotech Building at its’ South Western most corner; to the South, the boundary line shall align with the Southern boundary line of the existing Ellington Building at its’ South Eastern most corner and *jog to avoid the existing electrical switches**; and to the West, the boundary shall align with the Eastern boundary of the existing Ellington Building at it’s South Eastern most corner and jog to then align with the Eastern boundary of the existing Plant Biotech Building at its’ first floor which is set back from its’ upper floors. The profile of the Eastern boundary jogs at this time to incorporate the continuation of the existing sidewalk and landscape plan but may be adjusted in the future design phases as the relative importance of this continuation is evaluated.

Site Development

The scope includes those areas of the site that, while excluded from the buildable area, are considered important to the character and quality of the site. Such improvements include the development of an interior courtyard at the East, the interface of the pedestrian paths along the southern and eastern edges of the site, and the potential interface with the western entrance of the CE Brehm Animal Science Building.

Site Utility

General locations of steam, water, and electric lines have been determined. A large electrical ductbank is located at the south edge of the site and a large electrical transformer serving a large portion of the UTIA campus is located near the South West corner of the site. Neither is anticipated to be relocated. Further information regarding on-site utility locations, including fiber optic cable locations, will need to be acquired during schematic design. See the Civil narrative for a more detailed description of the site utilities.

Site Features

A number of site features, both architectural and landscape, have been identified as important to the character and quality of the site.

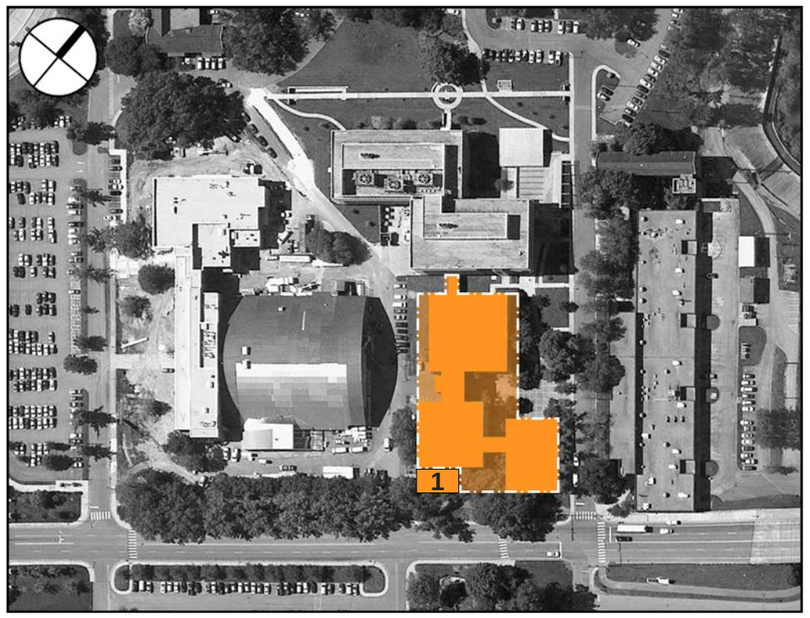
- The existing framework for the continuation of sidewalks in the North East corner of the site (to be evaluated).
- Several species trees at the West and South have been identified as candidates for preservation or relocation.
- The existing building connector at the Plant Biotech Building will be demolished and replaced.
- The Native American garden and burial ground shall be deemed an extremely significant, off-site feature.

Pedestrian Paths + Site Axis

The site is located along 2 significant pedestrian corridors running East-West, along Joe Johnson Drive and North-South, along EJ Chapman Drive. Primary pedestrian access is anticipated on East side where a new courtyard will replace the old one. Primary site axis will be the visual connection from Joe Johnson Drive.

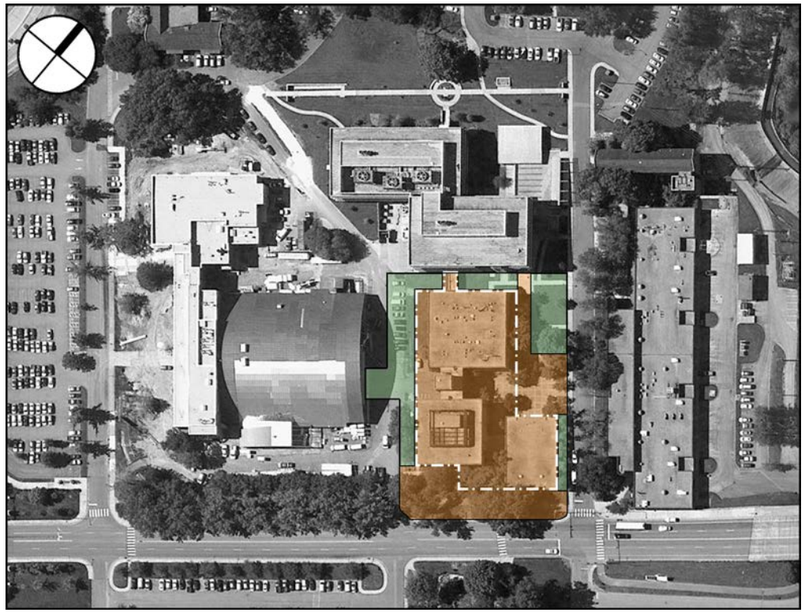
***Note** - Existing electrical switches will now be relocated

Site Context
1 Ellington Plant Sciences
1a Hollingsworth Auditorium
2 Plant Biotech
3 CE Brehm Animal Sciences
4 BESS



Site Area
the buildable site area, located withing the white boundary line, is approximately 1.0 acres

1. The 2018 update now includes the area previously reserved for maintaining the existing electrical switches, which will be relocated [final location TBD].

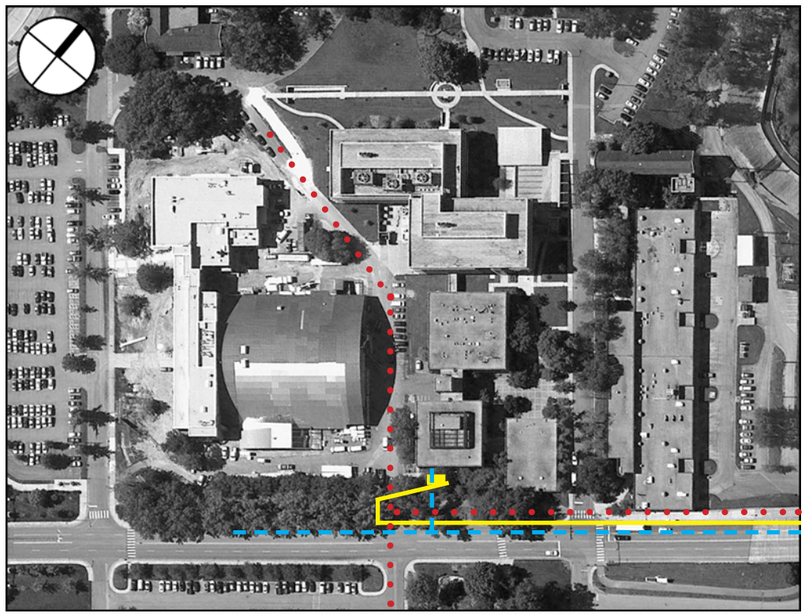


Site Development
that area outside of the buildable site area, but considered as part of the overall project scope

- site development
- minimal site improvements
- building boundary

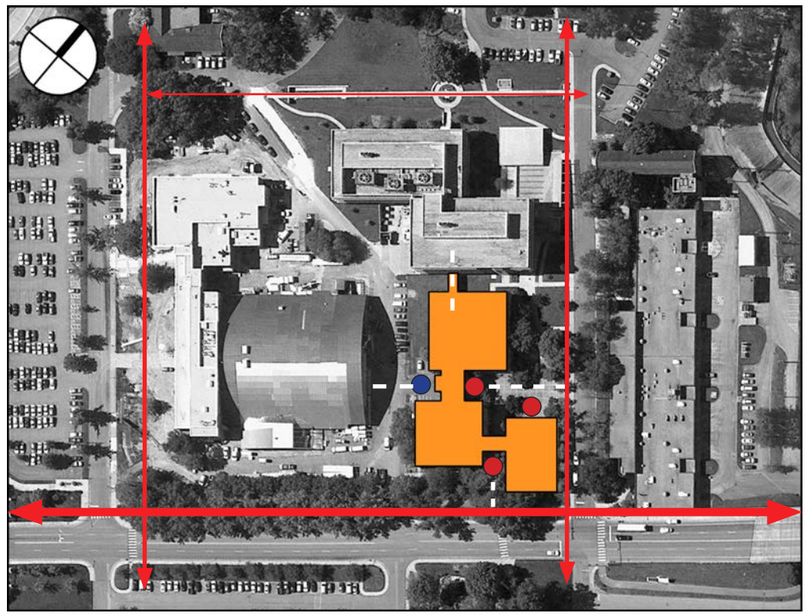
Site Features
a number of architectural as well as landscape features contribute to the overall character of the site

- walkway preservation
- trees preservation or relocation
- existing connection to PBB (to be demolished & replaced)
- Native American Garden & Burial Ground



Site Utility
existing steam, water, electric lines

- steam line
- water line
- electric line
- electric switches (to be relocated)



Pedestrian Paths + Site Axis
the site is located along 2 significant pedestrian corridors running East-West.

- pedestrian path
- site axis
- building entrance
- service entrance

.01 WHAT IS PROGRAMMING?

Architectural programming is defined, "…as the research and decision-making process that identifies the scope of work to be designed."* The process will, in general, proceed through six stages:

1. Research the Project Type
2. Establish Goals and Objectives
3. Gather Relevant Information
4. Identify + Develop Strategies
5. Determine Quantitative Requirements
6. Summarize the Program

As part of this process, plans, models and room data sheets of various space types are generated to illustrate and record programmatic relationships and requirements. Building Systems narratives, including a review of applicable Codes, are also included to further clarify the scope of the project.

Whole Building Design Guide, a program of the National Institute of Building Sciences
http://www.wbdg.org/design/dd_archprogramming.php

.02 PROGRAMMING SYNOPSIS

The following pages offer a detailed summary of the Energy and Environmental Science Education Research Center, as well as a conceptual project budget. Organizational diagrams are also included that describe, in general terms, the layout and adjacency desires of the various departments, both to each other as well as to the rest of the program components. A site diagram describes the various constraints, both in plan and in section, which define the scope and buildable area. Finally, a series of conceptual massing models were developed in order to test fit the proposed program on the site.

The building program is primarily comprised of teaching labs, research labs and support labs, and offices supporting the departmental needs within the College of Agricultural Sciences and Natural Resources (CASNR). There are also programmatic elements for general Classrooms, Academic Support Spaces, the US Forest Inventory and Analysis (FIA) and Informal Learning spaces. Additionally, the building will house Interdisciplinary spaces designed to promote student-faculty interactions. Support spaces for storage, building systems, recycling and service are also included in the program. Each of the spaces are planned around a 10'-6" x 30'-0" design module. This allows for future flexibility and change of program.

Also considered is the surge space associated with the current occupants of the Ellington Science Building. The programming team has been tasked with evaluating space needs of the displaced faculty and determining the type and amount of space needed during the demolition and building of the new facility. This information is part of the Appendix.

.03 GENERAL REQUIREMENTS

Classrooms

There are two types of classrooms planned. The Hollingsworth replacement space and curriculum specific classrooms will be departmentally assigned. The 45 and 100 seat classrooms will be nationalized spaces with the intent of meeting the lecture needs of CASNR programs as well as fulfilling other campus needs. All classrooms will be equipped with multi-media capability. This will include a ceiling mounted video projector in each room, a teaching station [podium] with a computer, a video projection screen, and white boards. Each classroom will have movable furniture to allow for grouping and change. Data access to all seats will be provided through wireless networks. The large lecture classroom will be equipped with a control panel system for lighting, a video presenter, and sound reinforcement from either the teaching lectern or a panel on the wall.

Teaching Laboratories

All teaching laboratories will be equipped with multi-media capability. This will include a ceiling mounted video projector in each room, a teaching station [podium] with a computer, a video projection screen, and white boards. Data access to all seats will be provided through wireless networks. Each student will have access to a duplex outlet for power needs.

Research Laboratories

The research laboratories are planned on a 10'-6" X 30'-0" module that includes both research and research support for Principal Investigators (PIs). To the extent practical, the research labs will be configured as open, interdisciplinary labs to allow collaboration and easier reallocation of lab space as individual PI research needs increase or decrease. The island configuration of each lab will have 5'-0" movable adjustable height tables serviced by overhead utilities. The ability to relocate each bench allows for additional equipment and ease of transition to new types of research.

Sinks, fume hoods and casework will be provided in each of the research labs to support a range of research activities and equipment by each PI. Care should be taken in placement of fume hoods and biosafety cabinets to ensure the proper airflow, operation and safety of the device.

Each lab will be provided with appropriate emergency power outlets. Data access will be provided through wireless network as well as hard wired points for specified equipment.

Offices

All offices are standardized. Each office will be equipped with systems furniture, lighting and telecom services. Offices will be arranged to promote interaction between the various programs.

Interactive Space

These spaces may be provided as student lounges, home bases, or lobby-type central spaces.

.04 2018 PROGRAM REVISIONS

1. Southern Research Station | Inventory & Analysis (9,760 NSF) has been removed from the program
2. Include Smith International Center (1,500 NSF)
3. Include College of Veterinary Medicine Classrooms (6,750 NSF)
4. Reduce standard Faculty Office size from 150nsf to 120nsf
5. Reduces overall sf of remaining office space by 2,220nsf [74 offices]
6. Increase Lobby size from 800nsf to 1,600nsf
7. Add 8 Small Collaboration areas for a total of 1,200nsf [150nsf each]
8. Renamed 'Faculty-Student Commons' to 'Collaboration Areas – medium'; increase to 800nsf per room.
9. Increase size of Large Collaboration Space from 600nsf to 1,200nsf
10. Adjust Classroom net sf per person to 20sf for seminar, 25sf for classrooms, and 15sf for 500-person Conference Center

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

156,933

	New SF	Total SF	Remarks
1.0 Herbert College of Agriculture | Classrooms, Classroom Support + Informal Learning Spaces			
1.1 Classrooms		21,325	
1.2 Informal Learning		7,575	
2.0 Offices & Dedicated Department Space			
2.1 Biosystems Engineering & Soil Sciences (BESS)		8,030	
2.2 Entomology & Plant Pathology		8,523	
2.3 Forestry, Wildlife & Fisheries		16,386	
2.4 Plant Sciences		15,670	
2.5 Biosafety | IACUC | OHP | OLAC		3,153	
2.6 Smith International Center		1,500	
3.0 Building Support Spaces			
3.1 Building Support		5,080	
3.2 Future Laboratory Space		3,780	
Total Program NSF		**91,021**	
Net Area to Gross Area Conversion		0.58	*circulation, restrooms, maintenance, mechanical, elec,*
Total Program GSF		**156,933**	**157,500 target SF**

Assumptions

1. Five Story Building (lowest level is partial basement) with Mechanical Penthouse above Roof.
2. Each Researcher / PI is assigned 2 modules of Research Space and 1 module of Research Support Space.
3. The 630 sf Research Support Space assigned to "Mark Fly Lab" in FWF will remain in PBB.
4. A large maintenance area is required on the basement level to serve as a staging/parts depot for the UTIA campus. Smaller maintenace areas are required on each floor for carts, supplies, and equipment.

Space Saving Options (that could be considered in the future design phase)

A. The 315 sf Field Lab in FWF could be removed if deemed appropriate
B. The 1,260 sf (945 + 315) General Teaching Lab in Plant Sciences could be removed if deemed appropriate.

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

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Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **28,900**

		Occupants per Room	NSF / person	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
1.0	**Herbert College of Agriculture | Classrooms, Classroom Support + Informal Learning Spaces**								
Room ID	**1.1 Classrooms**								
A100	Seminar / Conference Room	30	20	2			600	1,200	distribute 1 on alternate floors
A200	45 seat Classroom	45	25	3			1,125	3,375	
A300	100 Seat Classroom*	100	25	1			2,500	2,500	
A600	135 Seat Classroom**	135	25	2			3,375	6,750	for veterinary medicine, per request
A400	500 seat Conference Center	500	15	1			7,500	7,500	To replace Hollingsworth Auditorium
	Subtotal			**9**				**21,325**	
Room ID	**1.2 Informal Learning**								
	Lobby Commons	50		1			1,600	1,600	on First Floor
	Collaboration Areas - large	30		**1**			1,200	1,200	on First Floor, Pre-function for Conference Center
A500	Collaboration Areas - medium***	25		4			800	3,200	distribute 1 on each floor starting on Second
	Collaboration Areas - small	4		8			150	1,200	distribute 2 on each floor except main floor
	Vending-Students			3			25	75	every other floor; 3 machines in each space
	Coffee Shop / Kitchen	15		1			300	300	counter service + seating in lobby
	Outdoor Informal Learning	40		0			800	-	Not in building nsf or gsf
	Outdoor Classoom	40		0			1,200	-	Not in building nsf or gsf
	Subtotal			**3**				**7,575**	

*** Note 1 - increased from 75 person classroom**
**** Note 2 - will be dedicated classrooms space for Veterinary Medicine**
***** Note 3 - formerly Faculty-Student Commons**

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

		Occupants per Room	Program of Spaces: Room Quantity	Module Size	Modules / Room	NSF per room	8,030 Total	Remarks
2.0	**Offices & Dedicated Department Space**							
Room ID	**2.1 Biosystems Engineering & Soil Sciences (BESS)**							
B300	Faculty Office [includes Emeriti]	1	5	120	1.0	120	600	
B500	Grad Student | Post-Doc | GTA	1	10	50	1.0	50	500	Touchdown space for 20 Non-Regular Faculty
Room ID	**2.1b Teaching Labs**							
D100	General Teaching Lab	24	1	315	4.0	1260	1,260	
D200	General Prep Lab (Laboratory Support)		1	315	2.0	630	630	
Room ID	**2.1c Research Lab**							
	Research Lab	4	4	315	2.0	630	2,520	Analytical Instrument Room ICP (clean); 10 PI'S
	Research Support		4	315	1.0	315	1,260	
	Central Environmental Analysis Laboratory Hub	2	1	315	2.0	630	630	Dr. Ye's Lab, 2 rooms adjacent to each other
	BioFuel Lab	2	1	315	2.0	630	630	Dr. Ye's Lab, 2 rooms adjacent to each other
	Sub-Total						**8,030**	

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **8,523**

Room ID			Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
	2.0	**Offices & Dedicated Department Space**							
Room ID	**2.2**	**Entomology & Plant Pathology**							
B100		Departmental Suite	2	1	100	4.0	400	400	reception, faculty and staff mailboxes, work/file room
		Departmental Storage		2	100	2.0	200	400	
B300		Faculty Office [includes Emeriti]	1	8	120	1.0	120	960	
B400		Technical/Part Time Office	1	4	100	1.0	100	400	
B400		Casnr Honors Program	1	1	100	1.0	100	100	
B500		Grad Student | Post-Doc | GTA	1	15	50	1.0	50	750	Lab Technician Space - Locate outside of Lab
Room ID	**2.2a**	**Classrooms**							
C100		32 Seat Specialty Classroom - Bioinformatics	32	1	315	2.0	630	630	
Room ID	**2.2b**	**Teaching Labs**							
D100		General Teaching Lab	24	1	315	4.0	1260	1,260	
D200		General Prep Lab (Laboratory Support)		1	315	1.0	315	315	
Room ID	**2.2c**	**Research Lab**							
		Insect Museum		1	315	2.5	788	788	
		Research Lab	4	3	315	2.0	630	1,890	Potential for bug rearing space 0ff-Site.
		Research Support		2	315	1.0	315	630	Autoclave,Mill,Freezer,Cold,Rearing,Growth,Incubator
		Sub-Total						**8,523**	

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **16,386**

Room ID			Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
2.0	**Offices & Dedicated Department Space**								
Room ID	**2.3**	**Forestry, Wildlife & Fisheries**							
B100		Departmental Suite	6	1	100	9.5	1000	1,000	reception, faculty and staff mailboxes, work/file room; 6
B200		Department Head Conference Room	6	1	100	1.5	150	150	
		Departmental Storage		1	100	2.0	200	200	
B300		Faculty Office [includes Emeriti]	1	25	120	1.0	120	3,000	13 Exist Fac, Dept Head, Business Mgr,Strange; includes 1 advising office
B400		Technical Office	1	11	100	1.0	100	1,100	all except 4, includes Student Success Advisor
B500		Grad Student | Post-Doc | GTA	1	25	50	1.0	50	1,250	
Room ID	**2.3a**	**Classrooms**							
C100		32 Seat Specialty Classroom	32	2	315	2.8	866	1,733	
C200		40 Seat Specialty Classroom	40	1	315	3.3	1024	1,024	
Room ID	**2.3b**	**Teaching Labs**							
D300		Teaching Lab - Necropsy	15	1	315	2.0	630	630	Necropsy/Micropscopes
D400		Prep Lab-Necropsy (Laboratory Support)		1	315	1.0	315	315	Storage of Samples
Room ID	**2.3c**	**Research Lab**							
		Research Lab	4	2	315	2.0	630	1,260	Harper, Larry Wilson Replacement
		Research Lab	4	1	315	1.0	315	315	Sharon Jean Philippe
		Research Lab		2	315	1.0	315	630	Clatterbuck, Keyser
		Research Lab		2	315	1.0	315	630	Buehler and Wilcox
		Research Support		2	315	1.0	315	630	
		Research Lab - Wildlife Disease Lab		3	315	2.0	630	1,890	
		Research Support		1	315	1.0	315	315	
		Field Lab		1	315	1.0	315	315	chainsaws, nets, waders at the loading area
		Sub-Total						**16,386**	

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **15,670**

Room ID			Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	Total	Remarks
2.0	**Offices & Dedicated Department Space**								
Room ID	**2.4**	**Plant Sciences**							
B100		Departmental Suite	2	1	100	7.0	700	700	reception, faculty and staff mailboxes, work/file room
		Departmental Storage		3	100		400	1,200	
B300		Faculty Office [includes Emeriti]	1	23	120	1.0	120	2,760	
B400		Technical Office/Admin	1	23	100	1.0	100	2,300	4 People to Environmental Design Lab
B500		Grad Student | Post-Doc | GTA	1	30	50	1.0	50	1,500	Touchdown Space
		Pod Cast Room/Advising	2	1	100	1.0	100	100	
		Poster/Printer Room	2	1	180	1.0	180	180	
Room ID	**2.4a**	**Classrooms**							
C100		32 Seat Specialty Classroom	32	1	315	3.0	945	945	Drafting Design Room
Room ID	**2.4b**	**Teaching Labs**							
D100		General Teaching Lab	24	1	315	3.0	945	945	
D200		General Prep Lab (Laboratory Support)		1	315	1.0	315	315	
Room ID	**2.4c**	**Research Lab**							
		Research Lab	4	5	315	2.0	630	3,150	
		Research Support		5	315	1.0	315	1,575	
		Sub-Total						**15,670**	

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

PROJECTED SPACE UTILIZATION
May 18, 2018

Lord Aeck Sargent

	Width	Length	Module Size
Classroom | Laboratory Module size:	10.50	30.0	315
Lecture Hall Module size:	10.50	60.0	630
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **3,153**

		Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
2.0	**Offices & Dedicated Department Space**							
Room ID	**2.5 Biosafety | IACUC | OHP | OLAC**							
B100	Departmental Suite	2	1	100	6.0	600	600	2 Admin Separate; Workroom / Waiting
	Departmental Storage		1	100	2.0	200	200	Record Storage Room for OHP
B300	Faculty Office [includes Emeriti]	1	14	120	1.0	120	1,680	Biosafety (3), IACUC (3), OHP (1), OLAC (7)
B600	UTIA Safety Office	2	1	100	2.0	200	200	Two work stations, Storage Closet and place to meet
Room ID	**2.5c Research Lab**							
	Research Lab	2	1	315	1.5	473	473	Shared
	Sub-Total						**3,153**	

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Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

Program of Spaces **1,500**

		Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
2.0	**Offices & Dedicated Department Space**							
Room ID	**2.6 Smith International Center (SIC)**							
	Director Office	1	1	180	-	180	180	
	Administration | reception	2	1	200	-	200	200	
	Conference Room | Break Room	8	1	100	2.0	200	200	
	Departmental Storage		1	100	1.0	100	100	
	Faculty Office [includes Emeriti]	1	6	120	1.0	120	720	
	Grad Student | Post-Doc | GTA	1	2	50	1.0	50	100	
	Sub-Total						**1,500**	

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May 18, 2018

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	Width	Length	Module Size
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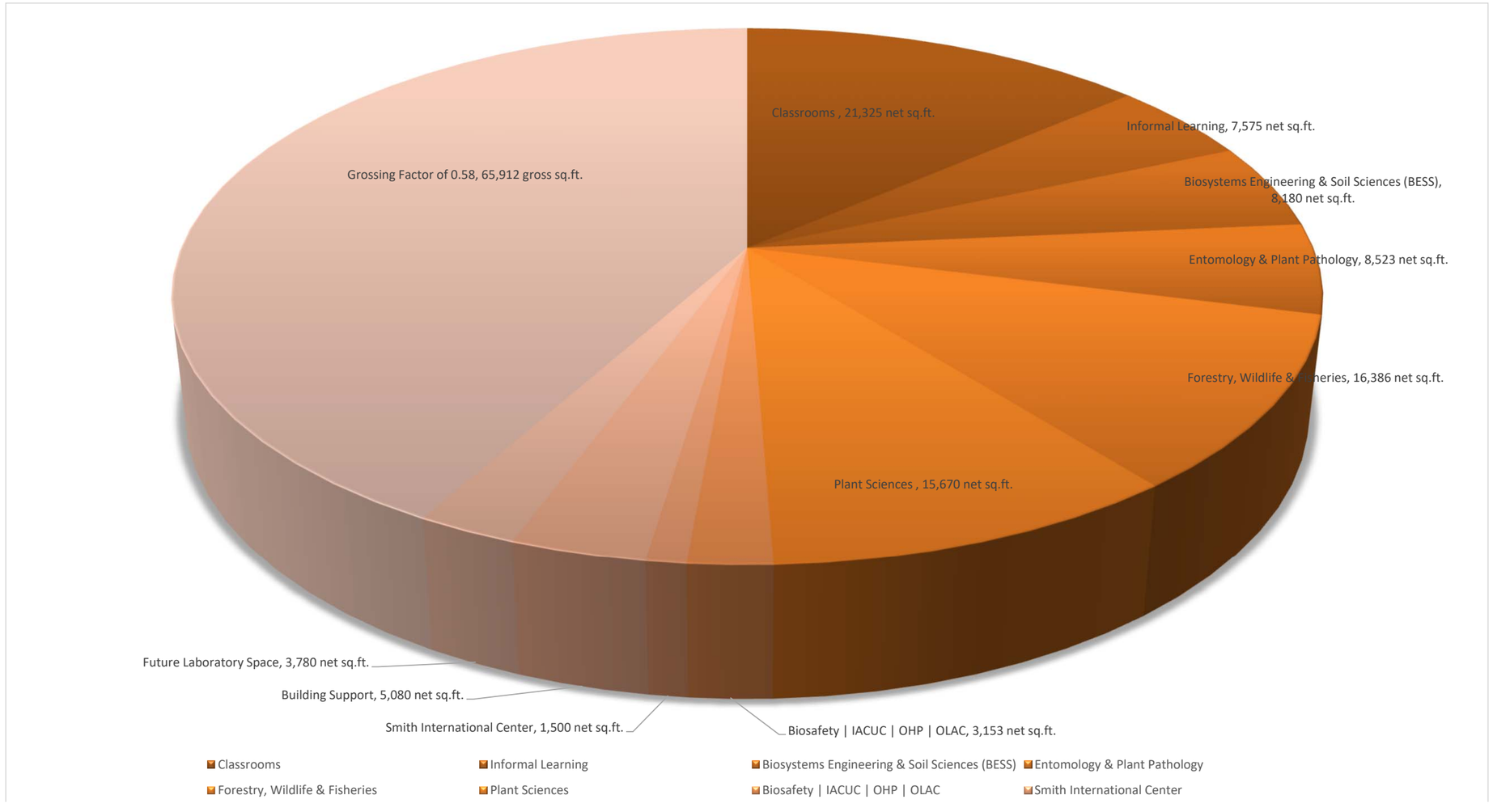
Faculty Office Module size:	10.50	12.00	120
Lecturer | Part Time | Adjunct Office Module size:	10.50	9.5	100
GTA Office Module size (per student):	10.00	5.0	50

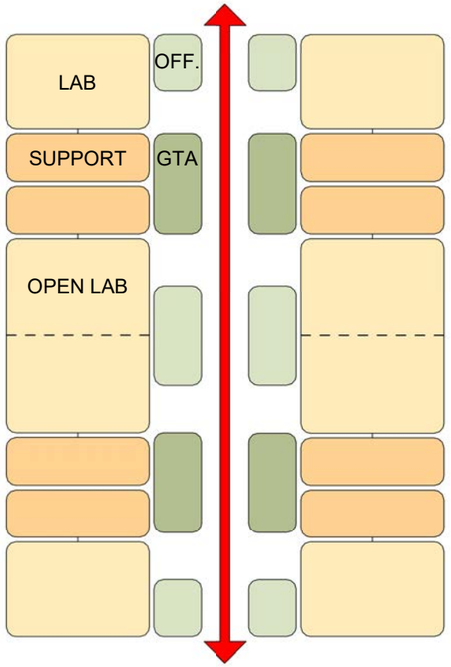
Program of Spaces **8,860**

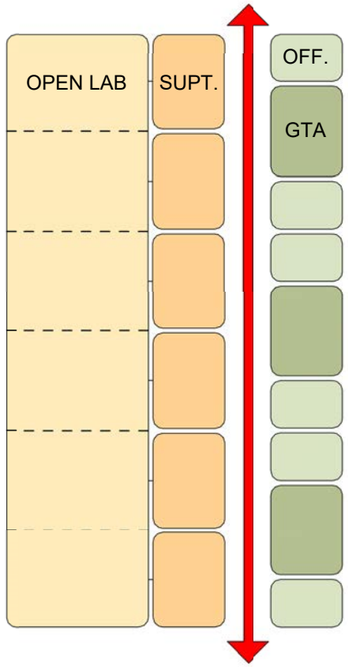
	Occupants per Room	Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
3.0 Building Support Spaces							
3.1 Building Support							
Loading Dock		1			150	150	
Freezer Room		4			200	800	
Cooler Room		4			200	800	
Locker and Shower Room	1	1			150	150	
Receiving Area / Holding Room		1			250	250	Hazardous Waste storage with Fume Hood
Building Storage		4			315	1,260	Caged Space
Conference Center Storage		1			630	630	Chair and Table Storage for Conference Center
Conference Support		1			630	630	Warming Kitchen, Serving Line
Custodial Storage		1			100	100	
Recycling Alcoves		8			20	160	1 per 15,000 NASF
Recycling Holding		1			150	150	Near Loading Dock
Sub-Total						**5,080**	
3.2 Future Laboratory Space							
Research Laboratory		4	315	2.0	630	2,520	
Research Support		4	315	1.0	315	1,260	
Sub-Total						**3,780**	

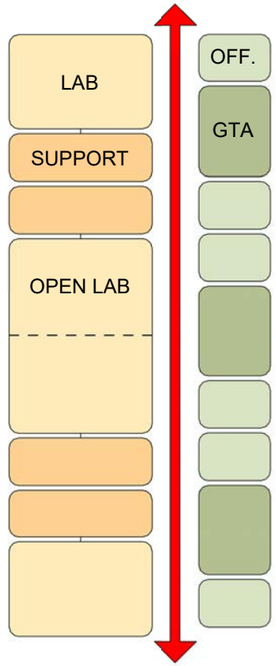
Classrooms	21,325 net sq.ft.	13.59%
Informal Learning	7,575 net sq.ft.	4.83%
Biosystems Engineering & Soil Sciences (BESS)	8,030 net sq.ft.	5.12%
Entomology & Plant Pathology	8,523 net sq.ft.	5.43%
Forestry, Wildlife & Fisheries	16,386 net sq.ft.	10.44%
Plant Sciences	15,670 net sq.ft.	9.99%
Biosafety | IACUC | OHP | OLAC	3,153 net sq.ft.	2.01%
Smith International Center	1,500 net sq.ft.	0.96%
Building Support	5,080 net sq.ft.	3.24%
Future Laboratory Space	3,780 net sq.ft.	
Grossing Factor of 0.58	65,912 gross sq.ft.	42.00%
Total Program	156,933 gross sq.ft.	100.00%

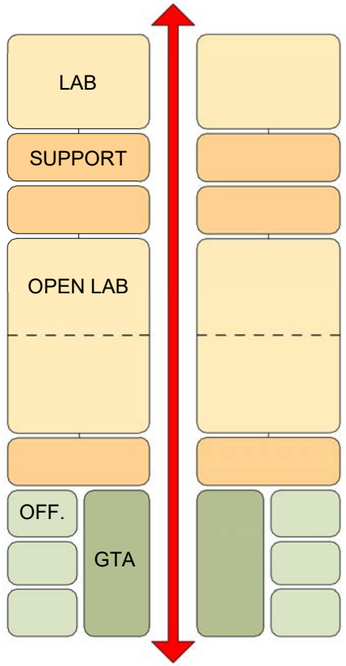


Adjacency Option Plan Diagrams - Research Lab to Lab Support to Office to GTA | Post-Doc

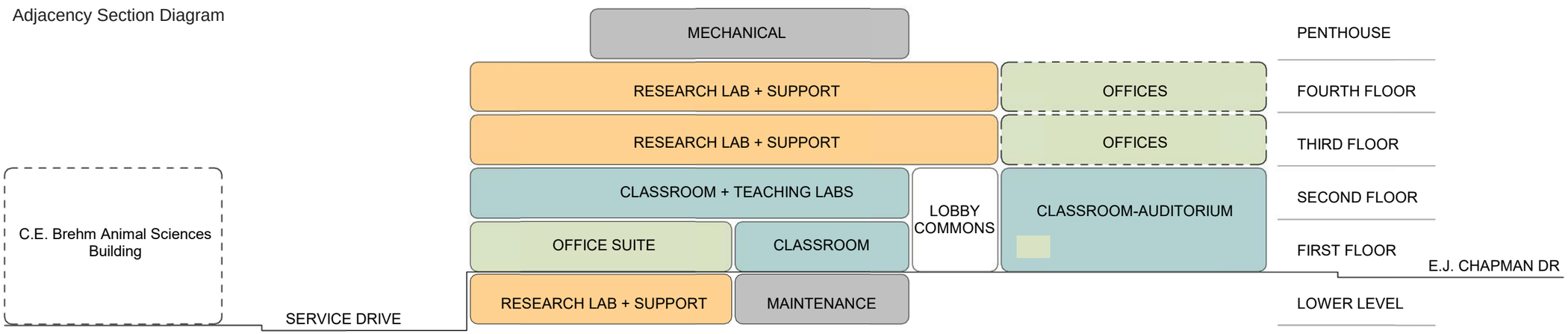








Adjacency Section Diagram



During the program process, a massing option was developed in order to test the capacity of the site, as well as to evaluate the height and boundary assumptions detailed here. The massing option is based upon a +/-157,000 gross sq.ft. building, as outlined in the program document.

Site Limits [build-to lines]

1 South Boundary

2 North Boundary

3 West Boundary

4 East Boundary

5 Existing Electrical Switches to be relocated

Project Scope [ouside of buildable area]

6 new interior courtyard

7 continuation of sidewalk + street improvements

8 project tie-in to all floors of Plant Biotech Building

9 tree preservation or relocation

10 address project interface with pedestrian traffic

Section Limits

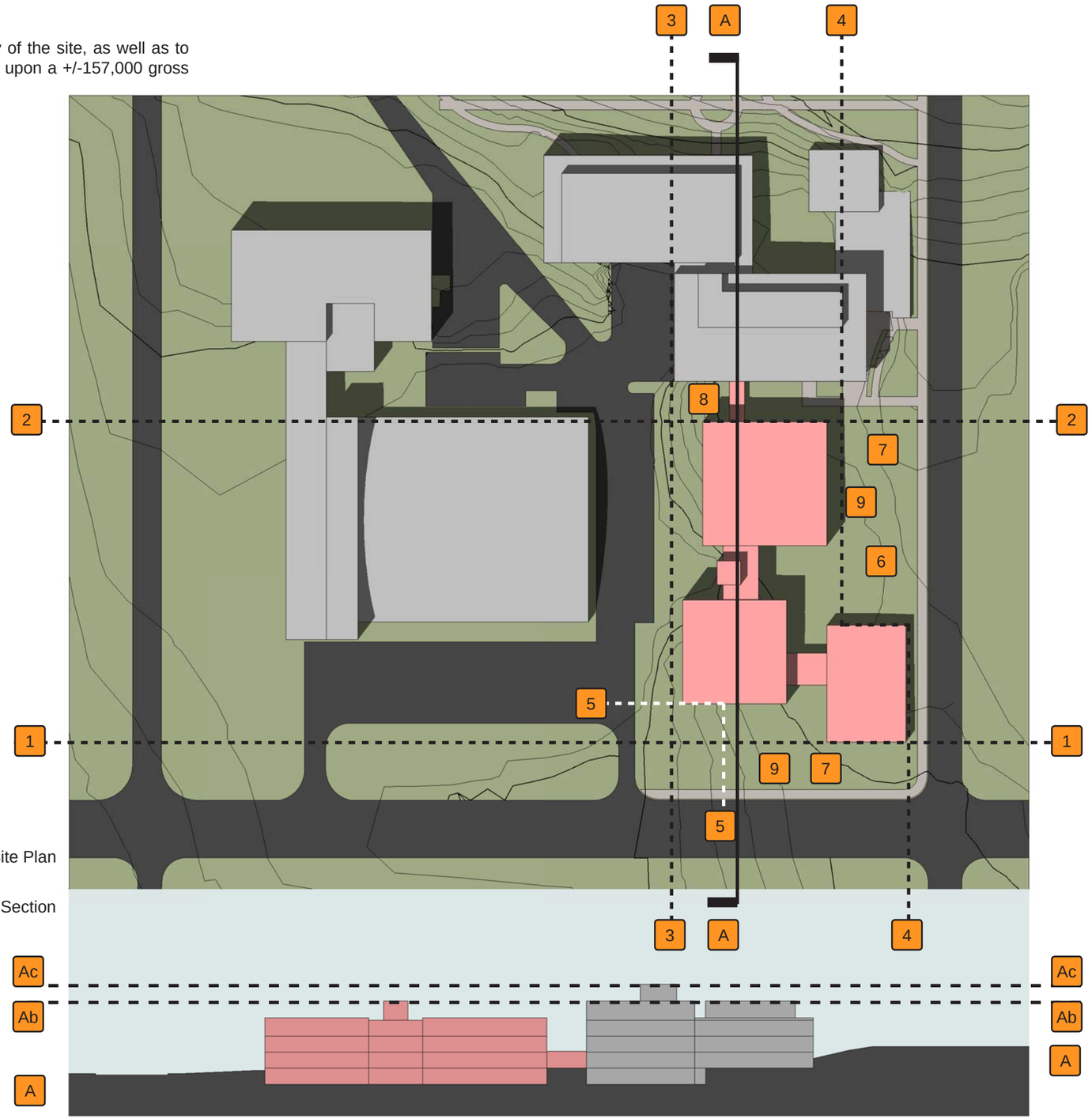
A Site Section Cut Line

Ab Occupied Building Height Maximum Limit | < 75 ft above the lowest level

(> 75 ft requires High-Rise Classification)

Ac Optimal Building Height Limit | +/- 90 ft

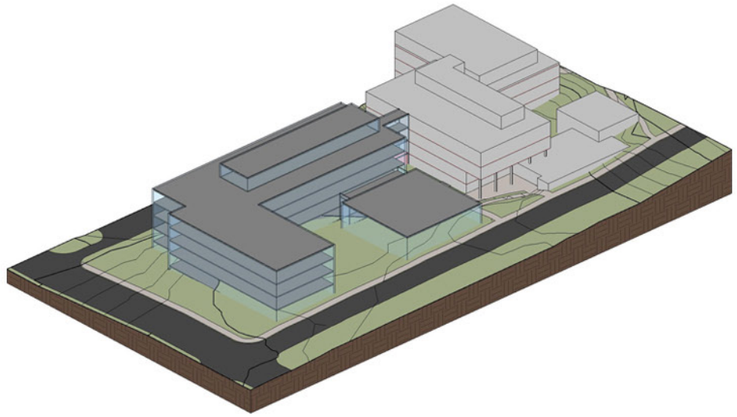
(*to align with the penthouse roof of the Plant Biotech Building)*

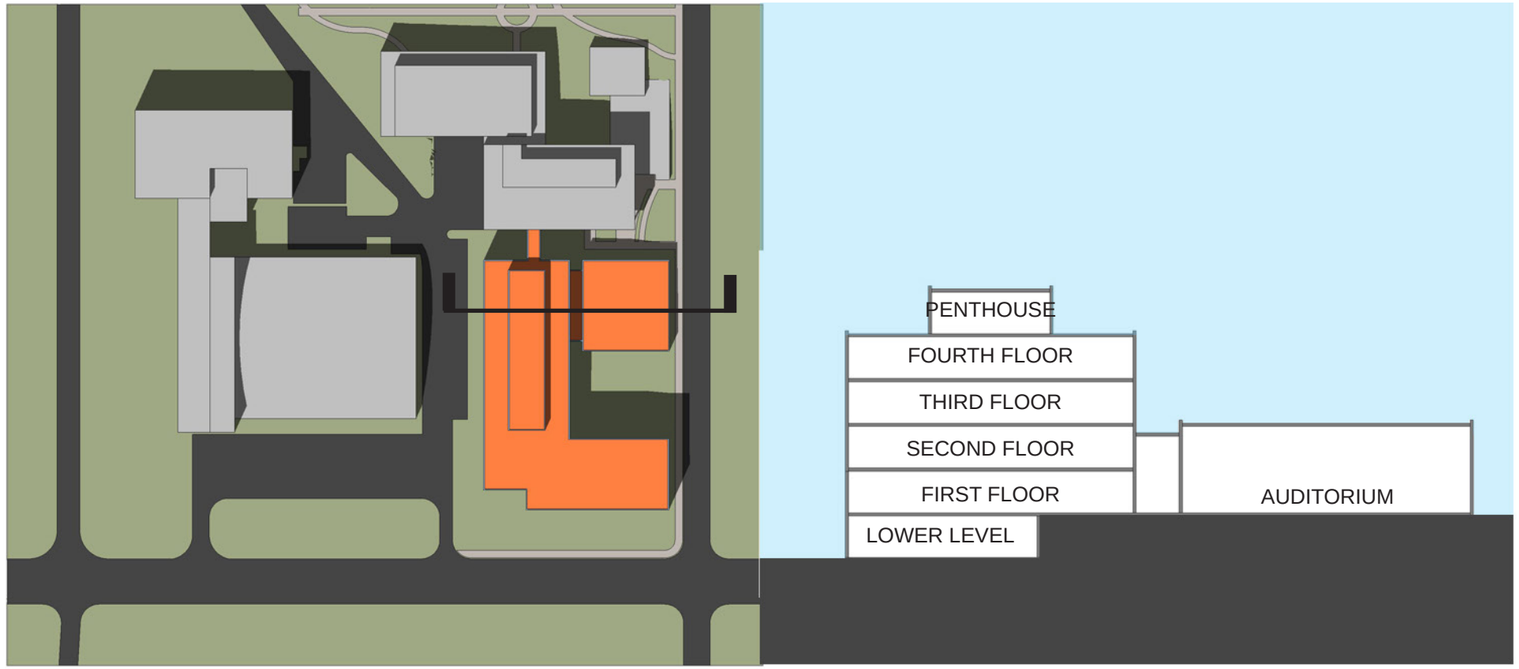


Existing Site Plan

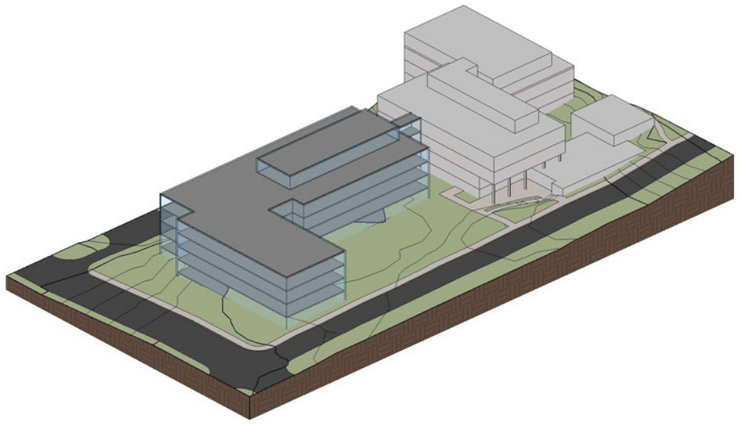
Existing Site Section

Option 1
This +/- 157,500 GSF option includes five floors + MEP penthouse:
+/- 15,000 GSF lower level on West side
+/- 41,500 GSF larger first floor with individual Auditorium element
+/- 31,500 GSF standard second, third, and fourth floors
+/- 6,500 GSF unoccupied MEP penthouse





Option 2
This +/- 157,500 GSF option includes five floors + MEP penthouse:
+/- 15,000 GSF lower level on West side
+/- 36,500 GSF first, third, and fourth floors
+/- 26,500 GSF second floor
+/- 6,500 GSF unoccupied mechanical penthouse



.01 MCCORD HALL

Select areas within McCord Hall will be used for swing space without any renovations during demolition and construction of both the new Ellington building and the Surge building. However, space within McCord has become more limited since the intial program was developed in 2013. The UTIA Center for Agricultural Synthetic Biology is expected to be approved and launch by July 1, 2018. The mission of the center is to establish UTIA as a global leader in agricultural synthetic biology innovation, communication, and research to address leading edge challenges facing agriculture. The UTIA space committee has approved McCord 111 including attached offices 110 and 111A for the Center

Additional office space on the second floor (IT Suites) within McCord may open up for swing space when Information Technology Services moves from McCord to the new Surge Building. This move will not occur until after the new EESERC complex is completed, so this space shall not be available to swing current programs during construction

.02 PLANT SCIENCES ANNEX B [PSAB]

PSAB will be demolished in order to construct the new Surge building. Occupants and functions of PSAB will need to be relocated to McCord Hall prior to demolition.

Office and laboratory space in PSAB is used to support two FWF faculty members, their regular and temporary employees (including graduate students and undergraduate students involved with research) and to provide office facilities to visiting scholars. The following describes who is currently housed in PSAB— note that the five student assistants mainly make use of work space in one or more of the labs rather than being assigned desk space. The four laboratory rooms can be characterized as “dirty” lab space — one has a new hood and functions as a wet lab, one has an old hood but is used mainly for processing field samples, one has a hood and a walk-in freezer, and one has a chest freezer and an upright freezer. All four labs are used for processing and storing plant and soil samples, herbicides and field equipment.

Regular Employees:
- Scott Schlarbaum, Professor Don Hodges, Professor
- Ami Sharp, Research Assoc. II Jason Hogan, Research Assoc. I
- Matt Aldrovandi, Research Specialist II (termination pending 6/1/18)

Temp Employees:
- Allison Mains, Research Assoc. I David Griffin, Research Specialist II
- Pattarawan Watcharaanantapong, Research Specialist I

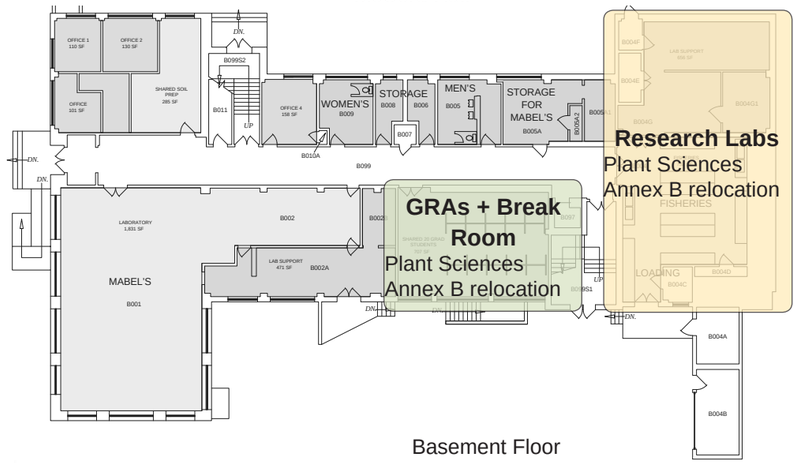
Student Employees:
- Alison Shimer, GRA (pending graduation 5/31/18) Eric Bisangwa, GRA (pending graduation 5/31/18) Binod Chapagain, GRA (pending graduation 5/31/18) Kyle Hazelman, Student Asst.
- Savannah Wood, Student Asst. Jeffrey Stephens, Student Asst. Nelson Shipman, Student Asst. Clayton Hale, Student Asst.

FR-Visiting Scholars:
- Youzhi Wang Wang Song Claudia Blair Li Xuemei Marco Kovac

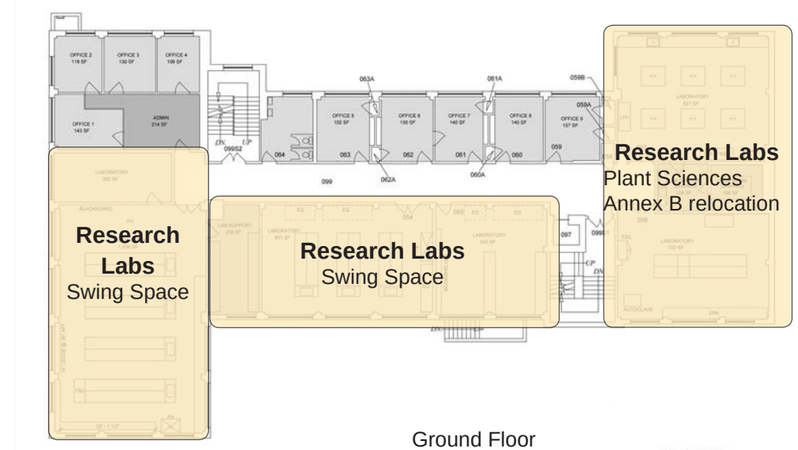
Room Count:
- 5 Offices
- 4 Lab rooms
- 1GRA/Visiting Scholar room (7 cubicles used by 7 people)
- 1 Kitchen/break room
- 2 Restrooms
- 2 Mechanical rooms

See Volume II - Appendix for more information on McCord Hall.

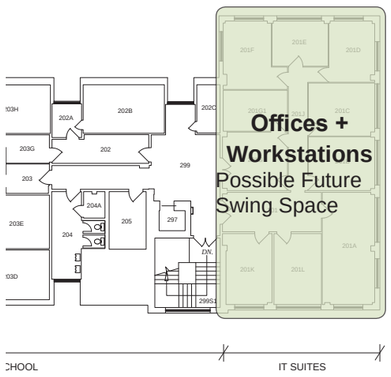
McCord Hall



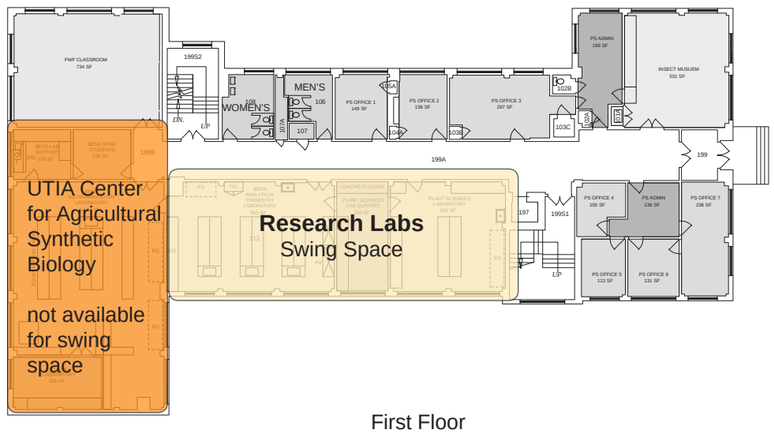
Basement Floor



Ground Floor



Second Floor



First Floor

.03 SURGE BUILDING

The 2016 Master Plan Update identifies the site of the Plant Sciences Annex B building as the location for the new Surge Building, construction of which is essential to the successful completion of the new EESERC complex.

As planned for in the Camps Master Plan update, the Surge Building shall be a 20,000gross sf, 2-story structure. Sun studies indicated that a 3-story structure would create unwanted shadow lines for the future greenhouse expansion. The proposed footprint of the new building will elminate the drive and parking area on the east side of the current site. While the loss of parking is not ideal, the wider footprint provides a more flexible and efficient building. This strategy is also in keeping with the proposals put forth in the Campus Master Plan.

The Surge building will house offices, workstations, graduate research space, research laboratories and laboratory suupport spaces. Initial concepts included classroom space. However, subsequent discussions with the stakeholders suggests this space allocation will likely best be used for either additional office space, or for a teaching lab [shown in the following diagrams]. Approximately 3,400 gross sf of space will need to be reserved for Information Technolgoy Services, which will move from McCord Hall into space vacated in the Surge Building once the new EESERC complex is constructed

See Volume II - Appendix for information on previous swing space strategies.

Surge Location

The surge building footprint [orange] displaces the existing drive and parking on the east side of the site [green]. The Campus Master Plan detail [figure 2.14] shows the drive and parking transformed into greenspace.

..... Approximate location of high water line. New construction is prohibited within 60ft of this line. Confirmation of location is required. Preliminary measurements indicated that the current East wall of PSAB is 120ft from this line

Surge Phasing

1. Move current occupants of Plant Sciences Annex B into McCord
   - 5 Offices [no office space available in McCord]
   - 4 Lab rooms
   - 1GRA | Visiting Scholar room (7 cubicles used by 7 people)
   - 1 Kitchen | break room
2. Demolish existing Plant Sciences Annex B
3. Construct new 20,000sf Surge Building
4. Move Ellington Occupants into McCord and Surge Building
5. Demolish and Construct new EESERC facility

.04 ADDITIONAL SURGE SPACE

Even with McCord and the new Surge Building, deficits exist in Office and Lab space. Assuming 3 PIs per lab, the existing McCord labs and the new Surge labs will accommodate up to 54 individuals. Current occupancy data for Ellington indicates up to 80 researchers utilize existing lab space.

Since McCord Hall likely cannot accomodate all of the functions that need to move out of PSAB before its demolition, approximately 5,000 sf of office space should be available for use on the Cherokee Farms Innovation Campus

Existing Plant Sciences Annex B site

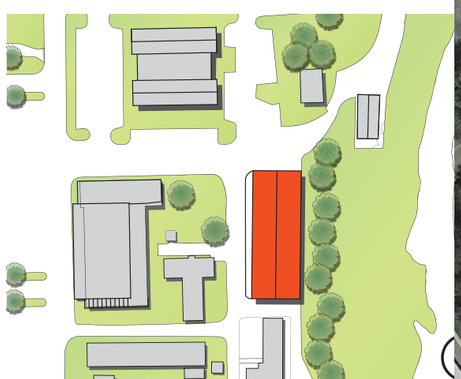


Figure 2.14
A1.02 RESEARCH BUILDING II
20,000 GSF

Campus Master Plan Update

Surge Buidling location

University of Tennessee - Institute of Agriculture - Knoxville | Energy & Environmental Science Education Reseach Center

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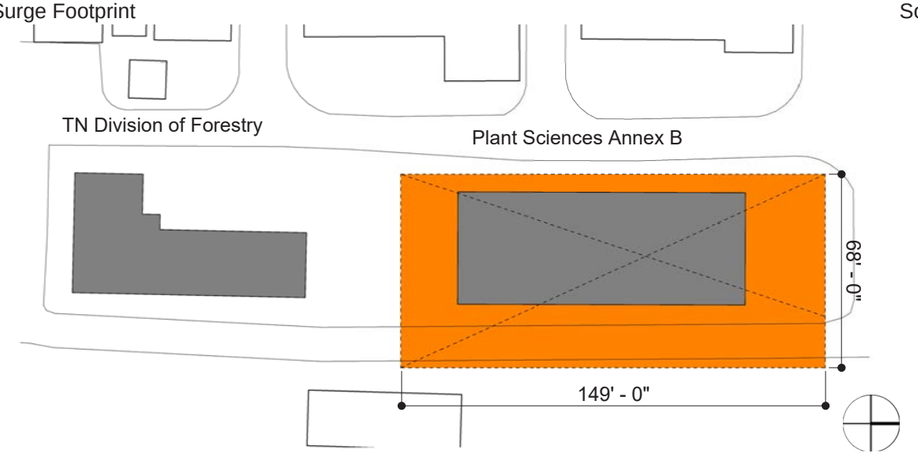
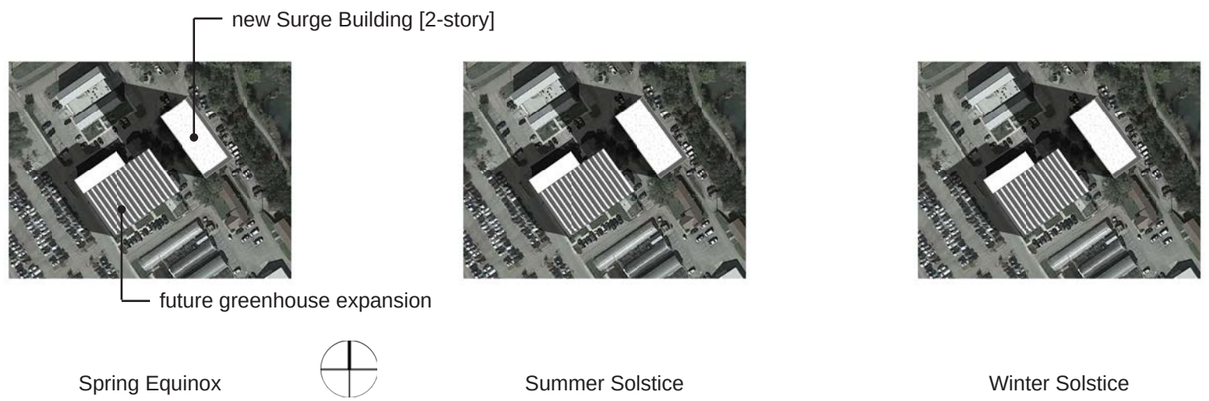
Lecturer | Part Time | Adjunct Office Module size:	10.50	10.5	100
GTA Office Module size (per student):	10.00	5.0	50

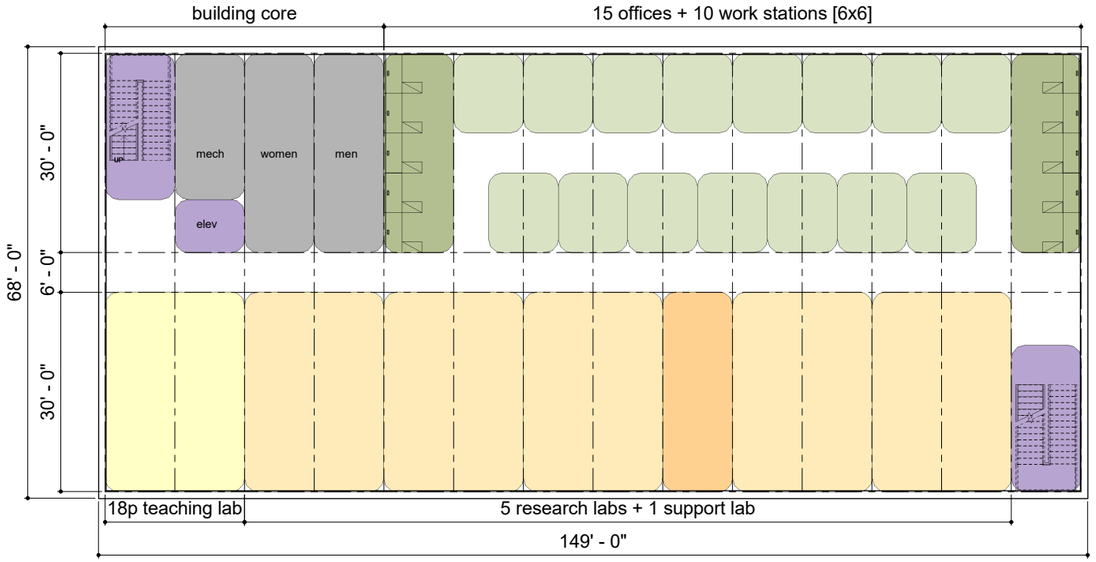
	Occupants per Room	Program of Spaces: Room Quantity	Module Size	Modules / Room	NSF per room	**Total**	Remarks
4.0 Surge Building							
4.1 Offices + Work Stations							
Faculty Office	1	24	120	1.00	120	2,880	
Grad Student | Post-Doc | GTA	varies	60	-	-	21	1,272	48" write-up desk; 30 stations per floor
4.2 Classrooms							
4.3 Teaching Labs							
General Teaching Lab	18	2	315	2.55	803	1,607	
4.4 Research Lab							
Research Lab	4	10	315	2.00	630	6,300	
Research Lab Support	2	2	315	0.75	236	473	
Sub-Total						12,531	
					Net Area to Gross Area Conversion	0.60	
					Total Program GSF	**20,885**	Target: 20,000 gross sf

Surge Footprint

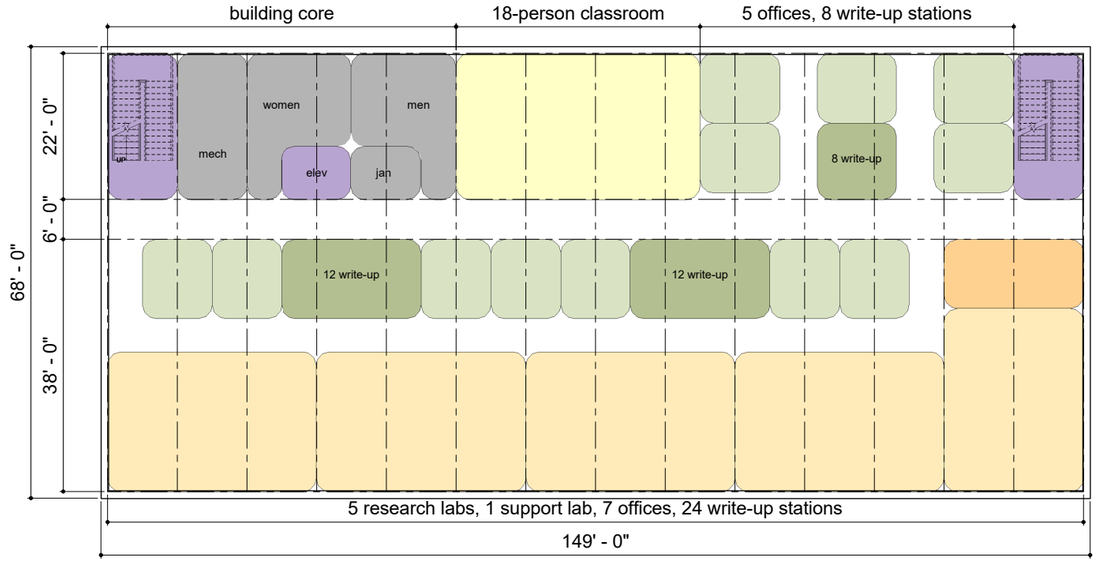


Solar Study

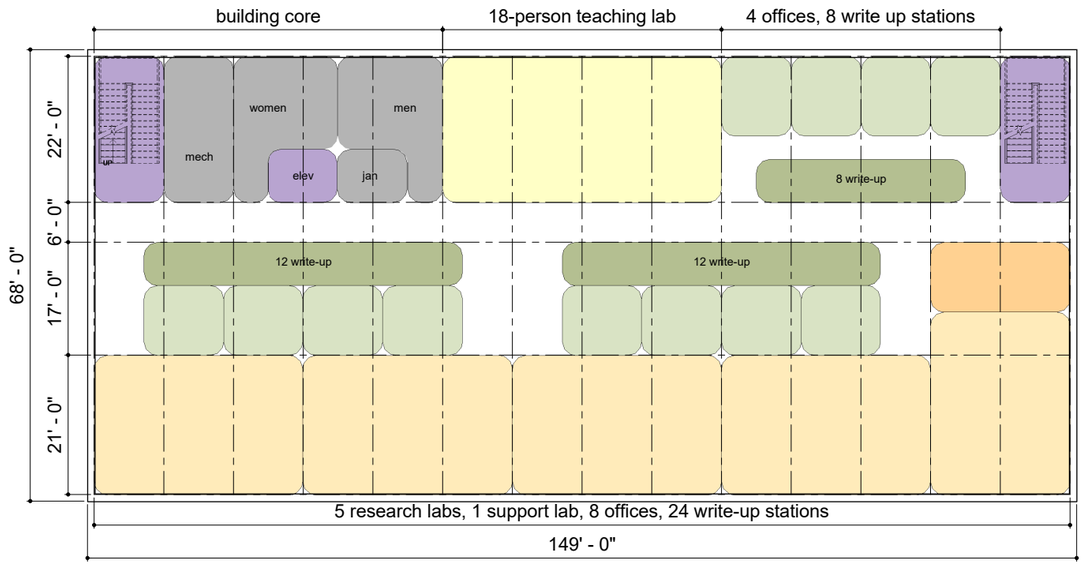




Opt 1- Typical Floor



Opt 2 - Typical Floor



Opt 3 - Typical Floor

These surge building diagrams illustrate the key strategy for an efficient, economical, and flexible building with roof-top air handling equipment and a minimum quantity of lab exhaust to support short-term research needs

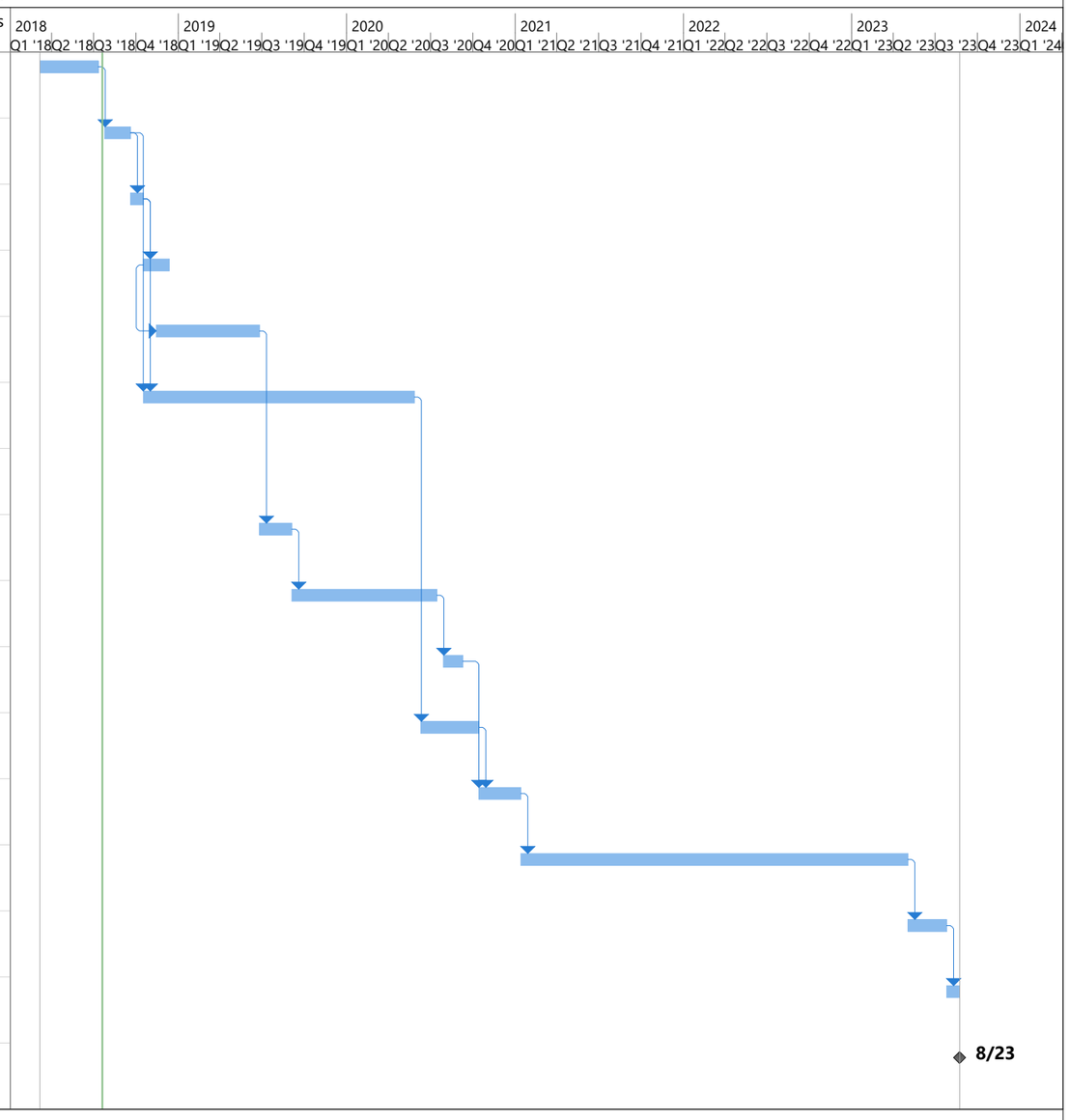
Note that Volume II Appendix contains surge stratediges from 2013 that are no longer valid, but are provided for information only.

UTIA Energy and Environmental Science Education Research Center
CONCEPTUAL PROJECT BUDGET - 157,500 GSF with Surge Building
May 18, 2018

	Phase 2 EESERC		Phase 1 Surge Space		Total (Ph 1+2) EESERC+Surge
New Construction GSF		**157,500**		**20,000**	**177,500**
COST/ GSF		**$370**		**$221**	**$353**
BUILDING BID TARGET	$370 /gsf	**$58,275,000**	$221 /gsf	**$4,420,000**	**$62,695,000**
Bid Target Items					
Hazardous Materials Abatement Allowance		$750,000		$30,000	$780,000
Distributed Antenna System (Public Safety Only)		$100,000			$100,000
Stormwater Allowance		$450,000		$50,000	$500,000
Earthwork, hardscape, planting (3% of Building Cost)		$1,750,000		$130,000	$1,880,000
Utility Relocation/Infrastructure Allowance		$750,000		$75,000	$825,000
High Performance Building Requirements (add 3%)		$1,750,000		$130,000	$1,880,000
Sub-Total:		**$63,825,000**		**$4,835,000**	**$68,660,000**
Deep Foundations		$1,800,000			$1,800,000
Demolition Allowance		$970,000		$120,000	$1,090,000
Knoxville Market Contingency					
BID TARGET INCLUDING DEMO/INFRASTRUCTURE (Mar 2018)	$423 /gsf	**$66,595,000**	$248 /gsf	**$4,955,000**	**$71,550,000**
Escalation through estimated Bid Date at 4.5% per year	9.0%	$5,994,000	4.5%	$223,000	$6,217,000
TOTAL BID TARGET	$461 /gsf	**$72,589,000**	$259 /gsf	**$5,178,000**	**$77,767,000**
Owner's Construction Contingency	5.14%	$3,731,000	5.14%	$266,000	$3,997,000
MACC	**$485 /gsf**	**$76,320,000**	**$272 /gsf**	**$5,440,000**	**$81,760,000**
Below-the-Line Items					
A/E Basic Services Fee: without renovation 1.25 multiple	5.199%	$3,968,000	6.266%	$341,000	$4,309,000
FF&E ($/gsf)	$ 18.00	$2,835,000	$ 18.00	$360,000	$3,195,000
OIT, AV, Security Equipment (2% of MACC, per Student Union)	2.000%	$1,526,400	2.000%	$108,800	$1,635,200
Admin and Miscellaneous (5% of MACC)	5.000%	$3,816,000	5.000%	$272,000	$4,088,000
Total B: Below-the-Line Items		**$12,145,000**		**$1,082,000**	**$13,227,000**
Project Subtotal		**$88,465,000**		**$6,522,000**	**$94,987,000**
Project Financing (not required)	0.000%	$0	0.000%	$0	$0
TOTAL PROJECT COSTS (New Building + Surge Building)		**$88,470,000**		**$6,520,000**	**$94,990,000**
Total Project Cost/GSF		**$562**		**$326**	**$535**

EESERC Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Program Update	18 wks	Wed 3/7/18	Tue 7/10/18	
2		Designer RFP	8 wks	Wed 7/25/18	Tue 9/18/18	1FS+2 wks
3		SBC / Selection of Design Team	4 wks	Wed 9/19/18	Tue 10/16/18	2
4		Program Validation	8 wks	Wed 10/17/18	Tue 12/11/18	3
5		Phase 1 Surge Space Design	8 mons	Wed 11/14/18	Tue 6/25/19	4SS+4 wks
6		Phase 2 EESERC Building Design	21 mons	Wed 10/17/18	Tue 5/26/20	3,2
7						
8		Phase 1 Owner Review, CM pricing, SFM Approval, Construction GMP Contract	10 wks	Wed 6/26/19	Tue 9/3/19	5
9		Phase 1 Site Demo & Surge Space Construction	45 wks	Wed 9/4/19	Tue 7/14/20	8
10		Vacate Ellington, Surge Space Move In	6 wks	Wed 7/29/20	Tue 9/8/20	9FS+2 wks
11		Phase 2 EESERC Owner Review, CM pricing, SFM Approval, Construction GMP Contract	18 wks	Wed 6/10/20	Tue 10/13/20	6FS+2 wks
12		Ellington Abatement & Demo	13 wks	Wed 10/14/20	Tue 1/12/21	11,10
13		Phase 2 EESERC Construction	30 mons	Wed 1/13/21	Tue 5/2/23	12
14		Phase 2 EESERC FF&E Installation	12 wks	Wed 5/3/23	Tue 7/25/23	13
15		Phase 2 EESERC Move In	4 wks	Wed 7/26/23	Tue 8/22/23	14
16		Classes Begin	0 days	Wed 8/23/23	Wed 8/23/23	



July 9, 2018

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

Page 1

200 Building Systems Narratives

This program document was originally prepared in 2013. The 2018 update and revision included strategic space revisions, schedule updates, and and adjusted total project budget. the 2018 update did not include MEP, Civil, Landscape, or Structural consultants updating those respective sections of the program. However, UT Facility Services provided limited updates to those sections.

.01 BUILDING CODES

Tennessee's codes apply as a mandatory minimum to all buildings except one and two family dwellings and licensed health-care facilities, except as otherwise indicated.
The 2012 International Building Code, excluding Chapters 11 & 34, Section 3411 was adopted August 4, 2016.

Tennessee Building Codes*
**http://www.tn.gov/fire/documents/adoptedcodes3.21.12.pdf*

Code Type	Code Model	Amendment
Building/Dwelling Code	IBC 2012 (excluding Chapters 11 & 34, Section 3411)	No
Plumbing Code	IPC 2012	No
Mechanical Codes	IMC 2012	No
Energy Conservation Code	IEC 2012	No
Electrical Code	2008 NFPA 70 - National Electric Code	No
Fire Code	IFC 2012	No
Life Safety Code	2012 NFPA 101 Life Safety Code	No
Accessibility Codes	2010 ADA Standards for Accessible Design	No
	1974 State Public Building Accessibility Act (2002 North Carolina Handicapped Code with 2004 Amendments)	Yes
Elevator Code	2004 ASME A17.1-The Safety Code for Elevators and Escalators	Yes[1]
Boiler Code	2010 ASME Boiler & Pressure Vessel Code	Yes[2]
Laboratory Code	2004 NFPA 45-Fire Protection for Laboratories Using Chemicals	No

Projects with State Building Commission Numbers are required to be reviewed by the TN State Fire Marshal Office. Local zoning ordinances do not apply to State of Tennessee owned facilities. However, property is zoned O-2.

All design building codes required for this project shall be in accordance with the applicable approved codes by the State of Tennessee. In the case of any overlap, the most stringent approved code reference should be applied. The designer shall be responsible for providing a current list of all related codes for this project.

The design team shall be responsible for adhering to any state mandate regarding Building Information Modeling (BIM) interfacing current at the time of design.

.02 ASSUMPTIONS

A. Gross Area: 157,483 GSF with approximately 34,838 sf maximum story area.
B. Approximately 23% will be offices, approximately 15% will be classrooms and approximately 20% will be laboratories. The remainder will be building support spaces.
C. 5 stories in height, plus an unoccupied mechanical penthouse.
D. No atrium spaces.
E. 32' adjacency to an existing building, with a connecting passage.
F. All new construction.
G. Project is located within the City of Knoxville Fire District.

1 with Addenda ASME A17.1a-2005 and the Supplement to ASME A17.1-2005, ASME A17.1S-2005.
2 with 2011 amendments; Boiler and Elevator Division, (615) 741-2123

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03 KEY ISSUES AND REQUIREMENTS

Occupancy Classification
A. Occupancy Type (IBC 302.1): Business – B; certain parts of the building will have Assembly requirements as well, depending on the sizes of the classrooms and conference spaces.
B. Hazard Type (LSC 6-2): Ordinary Hazard Group 1

Physical Properties
A. Table 503 IBC provides the allowable areas per floor based upon construction type and the maximum height allowed for each construction type based upon occupancy types.
   a. Type IA – Unlimited height (unlimited); Unlimited Area
   b. Type IB – 11 Stories height (160 feet); Unlimited Area
   c. Type IIA – 5 Stories height (65 feet); 37,500 GSF per floor
   d. Type IIB – 4 Stories height (55 feet); 23,000 GSF per floor
B. If the building is fully sprinklered, per IBC 504.2 the maximum height can be increased 20' and the number of stories increased by one. If sprinklered and multi-story, per IBC 506.3 there is an increase in allowable floor area of 200% per floor. Additionally, per IBC 506.2 the floor area can be increased for frontage on a public way or open space. The current scenario has 30' minimum clearance on all sides except at the connector passage.
C. The total allowable area increase needs to be evaluated on an individual design scenario basis. With the current design scenario and with both sprinkler and 30' minimum frontage increases, the allowable heights and area may be:
   a. Type IA – Unlimited height (unlimited); Unlimited Area
   b. Type IB – 12 Stories height (180 feet); Unlimited Area
   c. Type IIA – 6 Stories height (85 feet); 37,500 + 37,500 + 28,125 = 103,125 GSF per floor
   d. Type IIB – 5 Stories height (75 feet); 23,000 +23,000 + 17,250 = 63,250 GSF per floor
D. Per IBC 705, to consider the addition as a separate building with the above allowable square footages, there must be a fire separation between the new and existing buildings at the connecting passageway. For a Business occupancy, the fire wall must be 3 hour rated. Firewalls must be structurally stable to allow collapse of construction on either side.
E. Per IBC 403.1, the height at which a building is classified as High-Rise is an occupied floor 75' above the lowest level of fire department vehicle access. With the current design sections, there is 56' from the basement to the upper occupied floor or 70' to the roof.
F. With the current design scenario with 34,838 GSF per floor divided proportionately between office, labs, classrooms and support spaces, and 100 GSF per person per IBC 1004.1.1 calculates to approximately 349 persons per floor to evacuate. IBC 1019.1 requires a minimum of two separate means of egress per story for up to 500 persons. A third means of egress will be required for stories with 500-1,000 persons.
G. With a proposed new Auditorium at an assumed 5,670 NSF and an assumed concentrated seating design, per IBC 1004.1.1 it will need to be able to exit approximately 810 people. Per IBC 1019.1 the auditorium will need a minimum of 3 exits.
H. Per IBC 1007.1, not less than two of the means of egress will need to be made accessible. In a fully sprinklered building, the exit access travel distance is 250 feet (this can increased to 300 feet if the occupancy type is solely Type B). Minimum egress corridor width shall be 44" clear. Minimum clear opening width of exit doors is 32" (36" door). Required egress widths must be calculated per IBC Table 1005.1 for the occupant content served. Minimum ceiling height in exit access corridors = 7'-6". Accessible stair minimum width is 48" clear between the handrails unless sprinklered. Per 1007.3, accessible egress stairs require an Area of Refuge or accessed from an Area of Refuge or a horizontal exit.

.03 KEY ISSUES AND REQUIREMENTS [CONT]

Minimum Construction Type

A. Calculations must be carefully reviewed as the proposed design develops and changes. Based upon a total gross area of 157,483 square feet and maximum area per floor of 34,838 square feet, it appears that the minimum construction type could be Type IIB. To Use Type IIB the facility will need to be fully sprinklered. IBC Table 601 gives the required fire-resistance ratings for building elements for the various construction types. Type IIB requires no fire protection on the structural frame, walls, floors and roof construction.

B. Depending on the site configuration, additional area increases could be considered if the frontage clearances are reviewed and taken into account in accordance with IBC equations in 506.2.

Detailed Occupancy Requirements

A. Courts

i. Per IBC 1024, egress courts serving as a portion of the exit discharge component shall be sufficiently open to the exterior to minimize the accumulation of smoke and gases. The required width shall not be less than 44" and shall be unobstructed to a minimum height of 7 feet. Exit discharge shall provide a direct and unobstructed access to a public way. If access to a public way cannot be provided, a safe dispersal area shall be provided that meets all of the following: Sized to accommodate at least 5 SF person; located at least 50 feet away from the building; permanently maintained and identified as a safe dispersal area; provided with a safe and unobstructed path of travel from the building.

ii. Egress courts having window openings on opposite sides shall not be less than 6 feet in width. Courts shall not be less than 10 feet in length unless bounded on one end by a public way or yard. For buildings more than 2 stories in height, the court shall be increased 1 foot in width and 2 feet in length for each additional story. For buildings exceeding 14 stories, the minimum size shall be computed based on 14 stories.

iii. Courts more than 2 stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet in area and leading to the exterior of the building unless abutting a yard or public way.

B. Fire Department Access

i. The Authority Having Jurisdiction (AHJ) has the power to require access box(es) (commonly known as Knox Boxes provided by Facilities Services) to be installed in an accessible area where access to or within a structure is difficult because of security.

ii. Approved access roads shall be provided for every facility, building or portion of a building constructed. Fire Department access shall consist of roadways, fire lanes, parking lot lanes or a combination thereof. When fire department access roads cannot be installed due to location on property, topography, waterways, nonnegotiable grades, or other similar conditions, the AHJ is authorized to require additional fire protection features. Fire department access roads shall be provided such that any portion of the facility or any portion of the exterior wall of the first story of the building is not more than 150 feet from fire department access roads as measured by an approved route around the exterior of the facility.

iii. Fire department access roads shall extend to within 50 feet of at least one exterior door that can be opened from the outside and provides access to the interior of the building. When facility is fully sprinklered this distance can be extended to 450 feet.

C. Atriums - *(Not Part of Design)*

i. Per IBC 404, atriums are defined as openings connecting two or more stories other than enclosed stairways, elevators, hoist ways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall. It is assumed that this structure will not have an atrium planned.

D. Classrooms

i. Spaces with an occupant load and/or seating count of less than 50 persons shall be classified as Group B occupancy. Spaces with an occupant load and/or seating count of 50 or more occupants shall be treated either as Group A-1 (if fixed seating is provided) or Group A-3.

E. Auditorium

i. This space will be classified as Group A-3 occupancy. In planning the exiting requirements of this space the type of seating configurations will need to be examined. If the space is solely used for fixed seating, then the actual number of the seats should be used for exiting counts. If there are movable seats similar to a lecture hall, then the concentrated seating factor of 7 SF/person should be utilized in the exiting calculations. If the space is to be set up for tables and chairs then the seating factor can use 15 SF/person.

ii. A seating layout of the minimum number proposed (500 persons) for moveable seating of a lecture hall is to be provided for approval by Facilities Services Project Manager. This layout is to reflect any special area included within the limits that will be used to access or support the Auditorium design such as Restrooms, Gathering Areas, Storage, Food Holding/ Setup staging, stages, or similar spaces including AV and any technical items. The overall Auditorium space shall be shown with means to subdivide the area into smaller sections by sound rated folding partitions.

F. Occupancy Signage

i. Every classroom and laboratory space is required to have signage that clearly identifies the maximum allowable occupant count for that space. Size of both the sign and the font must be approved by the State Fire Marshall.

.04 NFPA 45 REQUIREMENTS

General

1. The Designer shall include a list from the Facilities Services Project Manager of the Lab Users chemicals and quantities to be used in each Lab. This list shall be shown on all documents for review and approval by both the SFMO and Facilities Services Project Manager.
2. The Designer shall include the appropriate safety storage or cabinets of the hazardous materials.

Requirements

A. Refer to figure A1.3 of the NFPA 45 to determine if NFPA 45 governs laboratory use.

B. Classifications
   - i. Laboratory units shall be classified as Class A (high fire hazard), Class B (moderate fire hazard), Class C (low fire hazard) or Class D (minimal fire hazard) according to the quantities of flammable and combustible liquids. See table 10.1.1 for limits for sprinklered units.
   - ii. For the purposes of determining laboratory fire hazard classification, quantities of liquefied flammable gases shall be treated as if they were Class I flammable liquids. For example, 4 liters of liquefied gases shall be considered to be 4 liters of Class I flammable liquid.
   - iii. Experiments and tests conducted in education and instructional laboratory units shall be under the direct supervision of an instructor. Instructional laboratory units shall be classified as Class C or Class D laboratory units. Educational laboratory units shall be Class D or shall be limited to 50 % of the flammable and combustible liquids quantities for Class C laboratory units.
   - iv. A laboratory work area shall be considered to contain an explosion hazard of an explosion of quantities or concentrations of materials could result in serious or fatal injuries to personnel with that laboratory work area.
   - v. A laboratory unit shall not be considered to contain an explosion hazard unless a laboratory work area within that unit contains an explosion hazard great enough to cause major damage or serious injury outside that laboratory work area.

F. Laboratory Unit Enclosures
   - i. Class A less than or equal to 10,000 SF shall have a fire separation of 2 hours from adjacent occupancies.
   - ii. Class A greater than 10,000 SF is not permitted.
   - iii. Class B less than or equal to 10,000 SF shall have a fire separation of 1 hour from adjacent occ.
   - iv. Class B greater than 10,000 SF is not permitted.
   - v. Class C or Class D of any size is not required to be separated.
   - vi. All floor openings shall be sealed or curbed to prevent liquid leakage to lowers floors.
   - vii. If water will create a serious fire or personnel hazard, a suitable not-water automatic extinguishing system shall be permitted to be an acceptable substitute for sprinklers.
   - viii. Window assemblies shall be permitted in fire-rated wall assemblies have a required fire resistance rating of 1 hour or less. Windows shall comply with NFPA 101 requirements for type and approved fire protection rating. Fire window assemblies shall comply with NFPA 80, Standard for Fire Doors and Windows.

D. Lab Safety Requirements
   - i. Class A, B and C laboratory units shall be classified as industrial occupancies in accordance with NFPA 101.
   - ii. Instructional laboratory units and Class D laboratories shall be classified as business occupancies in accordance with NFPA 101.

.04 NFPA 45 REQUIREMENTS [CONT]

E. Means of Access to an Exit
   A laboratory work area shall have a second means of a access to an exit when:
   - i. A laboratory work area contains an explosion hazard located so that an incident would block escape or access to the laboratory work area.
   - ii. A laboratory work area within a Class A laboratory exceeds 500 Sf.
   - iii. A laboratory work area within a Class B, Class C or Class D laboratory exceeds 1,000 SF.
   - iv. A hood in a laboratory work area is located adjacent to the primary means of exit access.
   - v. A compressed gas cylinder larger than a lecture bottle size (approx. 2 inches by 13 inches) is located such that it could prevent safe egress in the event of accidental release of cylinder contents.
     A cryogenic container located such that it could prevent safe egress in the event of accidental release of its contents.

F. Standpipes
   - i. In all laboratory buildings that are two or more stories above or below the grade level, standpipes shall be installed.
   - ii. The location of the standpipes shall be per areas limited to systems such as the stairwells.
   - iii. The fire protection system shall be designed by a State of Tennessee licensed engineer and/or contractor.

G. Sprinklers
   - i. Automatic Sprinkler system protection shall be required for all new laboratories.
   - ii. Class A and class B laboratory units shall be classified as Ordinary Hazard (Group 2).
   - iii. Class C and Class D laboratory units shall be classified as Ordinary Hazard (Group1).
   - iv. Where other automatic extinguishing systems are required or permitted in lieu of automatic sprinkler systems, they shall be designed and installed to meet the one or more of the following NFPA Standards: NFPA 11, NFPA 11A, NFPA 12, NFPA 12A, NFPA 15, NFPA 17, NFPA 17A, NFPA 69, NFPA 750, NFPA 2001.
   - v. Discharge of an automatic fire extinguishing system shall activate an audible fire alarm system on the premises.
     a. Audible Alarm & Strobes - The audible alarm location shall be verified by the field SFMO for the required decibel ratings for each room.
   - vi. The sprinkler system shall be designed by a State of Tennessee licensed engineer and/or contractor with experience of the University of Tennessee fire protection systems.

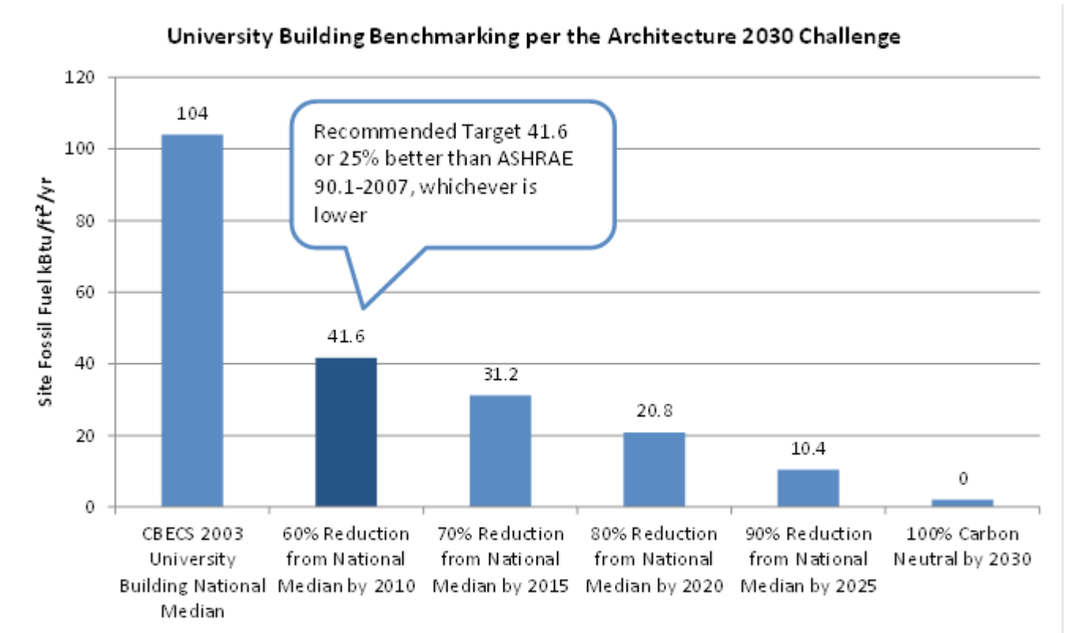
H. Laboratory Ventilating and Hood Requirements
   - i. Laboratory units and laboratory hoods in which chemicals are present shall be continuously ventilated under normal operating conditions.
   - ii. Chemical fume hoods shall not be relied upon to provide explosion (blast) protection unless specifically designed to do so.
   - iii. Laboratory ventilation systems shall be designed to ensure that chemicals originating from the laboratory shall not be recirculated.
   - iv. The release of chemicals into the laboratory shall be controlled by enclosures or captured to prevent any flammable and/or combustible concentrations of vapors from reaching any source or ignition.
   - v. The location and configuration of fresh air intakes shall be chosen to avoid drawing in chemicals or products of combustion coming either from the laboratory building or other structures and devices.
   - vi. The air pressure in the laboratory work areas shall be negative with respect to corridors and non-laboratory areas of a laboratory unit.
   - vii. Air exhausted from chemical fume hoods and other special local exhaust shall not be recirculated.

.01 STRATEGY

The design team's approach to sustainable design shall at minimum adhere to the State of Tennessee's High Performance Building Requirements (HPBr). LEED certification shall be used both as a guideline and measuring stick, while giving due consideration to sustainability measures above and beyond LEED[1]. The process shall employee cutting-edge sustainability practices.

The design team's pursuit of conceptual energy modeling through the SD and DD phases using the whole building energy simulation software eQUEST shall follow the HPBr. It is required for all State Buildings that the ASHRAE Standard 90.1, 2010 be used. The goal of such parametric modeling will be to test energy efficiency measures to meet and exceed ASHRAE 90.1-2010 prescriptive requirements for energy efficiency. Meeting the ASHRAE 90.1-2010 standard will facilitate compliance with energy code adopted by Tennessee while earning LEED EAp2 Minimum Energy Performance and EAc1 Optimize Energy Performance[2].

It is recommended that an energy performance target, set through benchmarking, be pursued using energy modeling. The baseline for the benchmarking can be from the CBECS 2003 database, as illustrated in the graphic below:



Daylighting performance shall be optimized through variables such as orientation, shading, amount and type of glazing. This analysis will inform the daylighting zone depth, i.e., the amount of electric lighting to be controlled by photosensors. Uniformity of daylight distribution, glare reduction and maximizing lighting energy savings shall be the outcomes of an integrated approach towards daylighting and lighting design. It is recommended that daylighting performance be optimized using climate based daylight metrics such as Daylight Autonomy.[3]

.02 UNIVERSITY OF TENNESSEE, KNOXVILLE SUSTAINABLE BUILDING POLICY

The University of Tennessee, Knoxville recognizes the importance of energy efficiency and sustainable design for campus buildings. Sustainable design considers human and environmental health along with economic and social concerns within the design, construction, and renovation process. As a member of the United States Green Building Council The University of Tennessee acknowledges the Leadership in Energy and Environmental Design (LEED™) rating system as the nationally accepted sustainable building standard (*http://www.usgbc.com*).

Campus structures are designed with a long life expectancy. The lifetime maintenance of building materials and systems (life cycle costs) should be considered along with capital cost in new constructions and major renovations. In accordance with the principles of the campus Environmental Policy he University of Tennessee, Knoxville shall use the United States Green Building Council's Leadership in Energy and Environmental Design (LEED™) rating system as the standard for the design and construction of new buildings costing more than $5 million and major renovations. All such projects shall be designed to meet current LEED certification as a minimum requirement under the LEED for New Construction and Major Renovations (LEED-NC) standard.

Architects, contractors, engineers, and all others involved with the building design process are expected to follow this policy. In addition to following LEED criteria, building planning teams should provide a building operation life cycle cost as early as possible in the design process to the Chancellor's staff for review.

.03 STATE OF TENNESSEE HIGH PERFORMANCE BUILDING REQUIREMENTS

See Sustainable Design Guidelines of the Designers' ManuaHigh Performance Building Requirements (HPBr)l dated January 2009December 2015 at:
https://www.tn.gov/content/dam/tn/statearchitect/documents/HPBr_Manual_v1.01.pdf

Footnotes:

1. State of Tennessee's Sustainable Design Guidelines High Performance Building Requirements at:
https://www.tn.gov/osa/capital---real-estate/capital-projects/high-performance-building-requirements--hpbr-.html

2. Energy Efficiency and Energy Code: The energy code adopted by Tennessee is 2006 IECC (codified version of ASHRAE 90.1-2004), EXCEPT for state owned/funded buildings, which are subject to ASHRAE 90.1-2007. LEED 2009 references ASHRAE 90.1-2007 too.
(Source: http://www.energycodes.gov/adoption/states/tennessee)

   Conceptual Energy Modeling
   "Design teams shall provide energy modeling during conceptual phases of design utilizing the eQUEST™ software. Project teams shall utilize eQUEST™ for the following analyses in the SD and DD phases of design…Model projections for energy intensity (Btu/ square foot) and annual utility cost ($/year) for energy operation."
   (Source: Appendix 2, Sustainable Design Guidelines,
   http://www.tn.gov/generalserv/psm/rpa/documents/080728StateofTNSustainableDesignGuidelinesv5.pdf)

3. "Artificial lighting is to be used only when daylight is insufficient to perform the task at hand, or where campus safety would be compromised without artificial lighting." "Daylighting shall be used to the fullest extent possible in major renovation projects and new construction projects."
(Source: http://www.tn.gov/generalserv/psm/rpa/documents/080728StateofTNSustainableDesignGuidelinesv5.pdf)

.01 BUILDING SITING AND DESIGN (see Site Analysis Drawing SA.1 on page 45)

- Site and design the new building with sustainable practices as an important principle – designing the building for optimum solar orientation, utilizing existing campus trees for reducing energy consumption, and accommodating stormwater run-off on site (refer to additional requirements).
- Site and design the building to preserve the integrity of valuable campus resources – historic structures, mature heritage and champion trees, campus landforms, historic campus traditions, and views to the river or the hills beyond.
- Preserve or relocate the trees within the site improvement areas as indicated on the project site analysis diagram (see Site Analysis Drawing SA.1 on page 37).
- Site the building to be compatible with the land planning and site design objectives of the “Long Range Master Plan”, the “Campus Design Standards”, and the “Campus Landscape Vision and Site Standards”.
- Site the building so that it provides positive first impressions of the campus for visitors arriving from the campus entrance at Joe Johnson Drive and Neyland Drive.
- Site the building in a manner that reflects its’ part of the tapestry and a design to contain the overall integrity of the campus landscape.
- Site the building to create spaces outside the building that are as positive and welcoming as those within. The design process to address the numerical, programmatic, and functional needs and goals including the University’s emotional and spiritual requirements and preferences.
- Program and design the building so that interior common spaces are located where they can enliven and support exterior gathering spaces, and link the indoor and outdoor spaces with entrances.
- Provide a balance of purpose, costs, use, design durability, and environmental performance.
- Comply with all federal, state, and municipal accessibility standards to ensure that the building and its exterior spaces are accessible to all. All codes to serve as both a guide and a framework to the architecture as it is being designed. The components and systems designed into the building must meet the rigorous standards in order to become part of an overall design strategy that provides the highest safety factor for the structure and the inhabitants.

.02 FINISH FLOOR ELEVATIONS AND GRADING

- Program, site and design the building so that the structure functions as a site retaining wall, creating positive at-grade connections for building entrances and successful common spaces wherever they occur.
- Program, site, and design the building so that the structure functions as a site retaining wall, ensuring that the provision of daylight to interior spaces does not require the use of window wells or large depressed areas adjacent to the building.
- Set finish floor elevations for the building that will create a positive setting for the building along Joe Johnson Drive yielding an upward gentle slope of 2 to 3% from the road to the building. Maintain existing finish floor elevations of the adjacent Plant Biotech Building as possible.
- Design to allow proposed structure to be a part of a flexible network to the surrounding facilities.
- Set finish floor elevations for the building that will allow for simple accessible connections, without the use of 8% ramps, from the sidewalk along Joe Johnson Drive to the main entrance.

.03 BUILDING ENTRANCES

- Locate and design the primary entrance to enliven the initial views of the campus when it is approached from the west along Joe Johnson Drive. Locate the primary entrance to reflect the primary pedestrian approach from the S65/66 parking area to the south.
- De-emphasize the entrance at the plaza at E.J. Chapman Drive.
- Locate entrances where they will not encourage mid-block pedestrian crossings but to play a dramatic role in changes and improvements to the aesthetic appeal of the particular area(s).
- Locate and organize building entrances so that the routes between entrances and to other destinations, such as the bus stop, will not require a multitude of paved ways.

.04 VEHICULAR ACCESS

- Locate the required number of accessible parking spaces along the service drive on the west side of the building in a location that will not intrude upon the pedestrian connection between the new building and the new arena. Provide a simple, accessible route from the accessible spaces to the building that accommodates unmet pedestrian connections so that the route appeals to all users.
- Locate the building’s service area off the service drive on the west side of the building where it will not create a desirable building entry point for pedestrians and intrude upon the pedestrian connection to the arena or to the accessible parking spaces.
- Existing campus parking areas at the site are to remain in conjunction with the proposed vehicular design. The final parking, drop-off zones, loading areas, etc. are to be reviewed and approved by Facilities Services Project Manager.
- All traffic and parking to include the elements shown in the Campus Master Plan.
- The existing location of the Campus transit stops in the area are to remain intact at their current locations.

.05 OUTDOOR SPACES

- Design the spaces for the building to enrich the campus with a comprehensive network of campus spaces; the prime consideration must be the spaces’ contribution to the entire campus open space system, not the enhancement of a particular building.
- Comply with all federal, state, and municipal accessibility standards to ensure that campus spaces are accessible to all.
- Design entry spaces to support but not visually compete with or obstruct the architectural definition of the building’s entry in order to support wayfinding and clarity of the campus landscape.
- With the relocation of the main entrance to the south side of the building, enliven the existing plaza space and integrate it into the life of the building by locating interior common areas adjacent to the space and interconnect the interior and exterior spaces with an entry and generous glazing.
- Design the plaza space with flexibility to accommodate functions in the life of the plant science department as well as an outdoor classroom and outdoor demonstration gardens.
- Accommodate the grade change in connecting walkways via sloping walkways with a maximum 5% slope rather than 8% ramps for the simplicity that walkways without handrails bring to the landscape. Locate walkways to accommodate unmet pedestrian connections so that they appeal to all users of the space.
- Size paved gathering spaces to accommodate the number of anticipated daily users rather than the occasional larger function, recognizing that underutilized paved areas near a building can undermine a sense of community on the campus.
- Refer to the campus site standards for paving within all spaces; employ simple undifferentiated concrete pavement, using smaller jointing patterns to enrich gatherings areas intended for longer use.
- Ensure adequate lighting for outdoor spaces either from the adjacent building faces or canopies or the campus standard pedestrian pole fixture; reserve the use of the campus bollard light for unique situations where the campus pedestrian fixture is not appropriate, recognizing that the required tight spacing of the bollard light can litter and overwhelm the landscape.
- Provide a power supply to outdoor gathering spaces to accommodate individual users and special events.
- Provide bike racks near building entries, in lines or curves that help define pedestrian circulation. Where possible, locate the racks where the building can provide overhead coverage for the parking area.
- Provide trash and recycling receptacles to accommodate users and the ease of maintenance access; at building entries, favor the placement of receptacles inside rather than outside the building.
- Refer to the campus site standards for information on site furnishings.

EXISTING CONDITIONS

Total Site Area – 102,750 SF
Associated ROW – 21,300 SF
Total Impervious Surface – 51,300 SF (50%)
Total Pervious Surface – 51,450 SF (50%)

Project Limits – 81,450 SF
Building Footprint – 30,447 SF (38.1%)
Site – 51,150 SF (63%) (16,349 SF of walks)
Drives, Loading & Parking – 4,600 SF (6%)
Open Space – 46,518 SF (57%)

PROPOSED CONDITIONS

Total Site Area – 102,750 SF – No Change
Associated ROW – 21,300 SF – No Change
Total Impervious Surface – 58,700 SF (57%) – Increase, maximum 7% increase
Total Pervious Surface – 44,050 SF (43%) – Decrease

Project Limits – 81,450 SF – No Change
Potential Development Area – 42,100 SF (52%) – Increase
Preserved Building Footprint – 0 SF (0%) – N/A
Site – 39,350 SF (52.3%) – Decrease

Drives, Loading & Parking – 4,600 SF (6%) – No Change
Open Space – 34,718 SF (43%) – Decrease

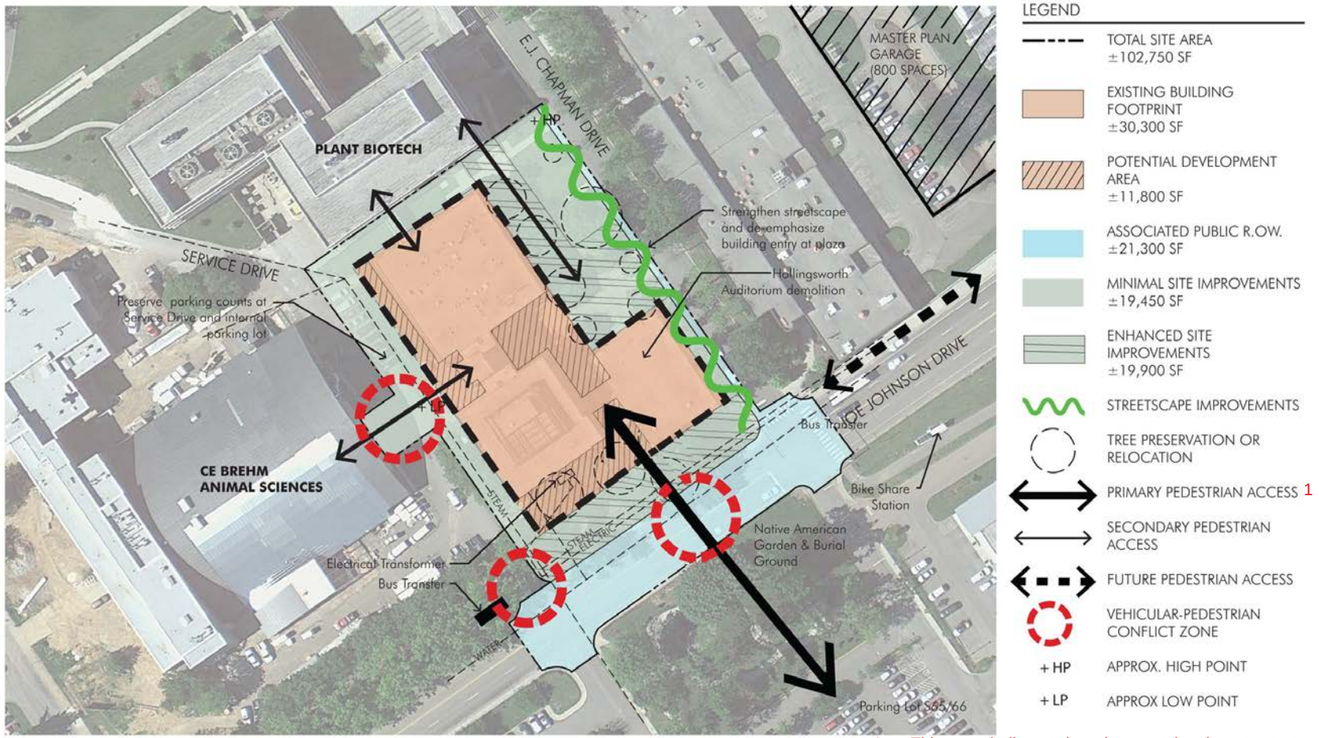
PROPOSED BUDGET

Infrastructure – $0/SF – Pending Information from Programming Team
Landscape – $10 – 18.50/SF = $750,000 maximum, includes ROW improvements

REFERENCE

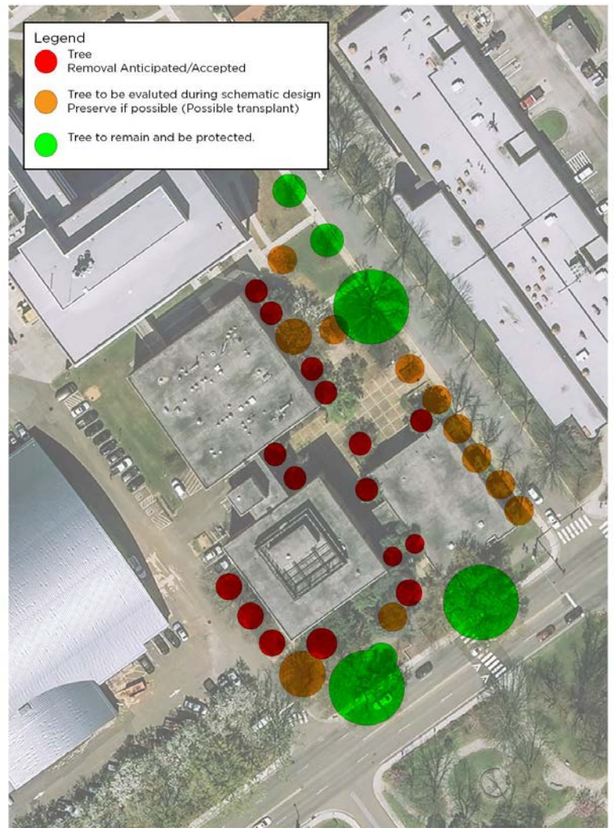
Campus Landscape Vision and Site Standards for the University of Tennessee, Knoxville
Prepared by: Carol R Johnson Associates, INC.
Dated: December 2012

DRAWING SA.1 - SITE ANALYSIS



1. This route indicates the primary pedestrian access as it currently exists with a striped crosswalk. The future location of this route wiAll need to be studied by the design team of the future EESERC project in relation to the building design and any future campus masterplans or studies

SITE ANALYSIS DRAFT - ELLINGTON PLANT SCIENCES
THE UNIVERSITY OF TENNESSEE KNOXVILLE, TN DECEMBER 18, 2012



UPDATED TREE PRESERVATION DIAGRAM
PREPARED BY UTK MAY 18, 2018

.01 GENERAL

CDM Smith appreciates the opportunity to provide Due Diligence Engineering Services in connection with the subject project. We have reviewed the sketches provided for Option 1 and 2 in relation to the subject Project. During the review of this conceptual design, we identified certain elements of work we believe is necessary to allow the University and the State Building Commission to budget and allocate the appropriate funds necessary for construction of such a facility.

We have used the information provided by your firm and Lord Aeck Sargent to assess the site utilities and grading needed to complete this project in concept for budgeting purposes. Our firm offers the following utility information for your review.

.02 EARTHWORK

CDM Smith has not evaluated earthwork quantities at this time.

.03 WATER SERVICE

Water service to the site is provided by KUB (Knoxville Utility Board) and the water lines are owned by UTK. The UTIA Campus is fed from two main meters along Neyland Drive; one is in front of the Vet School ant the others is at the side of McCord Hall at the end of River Drive.

Water is located in the right of ways of Joe Johnson Drive, Service Drive, and EJ Chapman Drive. The water supply to the building for domestic water service can come from either location as well as fire service. CDM Smith has evaluated options 6 and 7 provided to us and recommend the following routing of the water utilities. For domestic service install a new meter and water supply in Service Drive, we suggest upgrading the water line in EJ Chapman Drive in order to have loop for new building. This would require approximately 310 feet of 8 inch ductile iron piping. New Fire service would also be installed from EJ Chapman Street

.04 SANITARY SEWER

Sanitary sewer service to the site is provided by KUB (Knoxville Utility Board) and the sewer lines are owned by UTK. A KUB main is located on each side of the UTIA Campus into which the UTK lines feed into at various points. The interior lines of UTIA go to Neyland Drive for connection (2 mains, other main is at 3rd Creek Side). The future building would connect into the Service Drive side that is fed from Joe Johnson Drive as the current location at the southeastern corner of the existing Ellington Plant Sciences Building. Water valves are currently located along the Service Drive that control the chilled water system and not the potable water system.

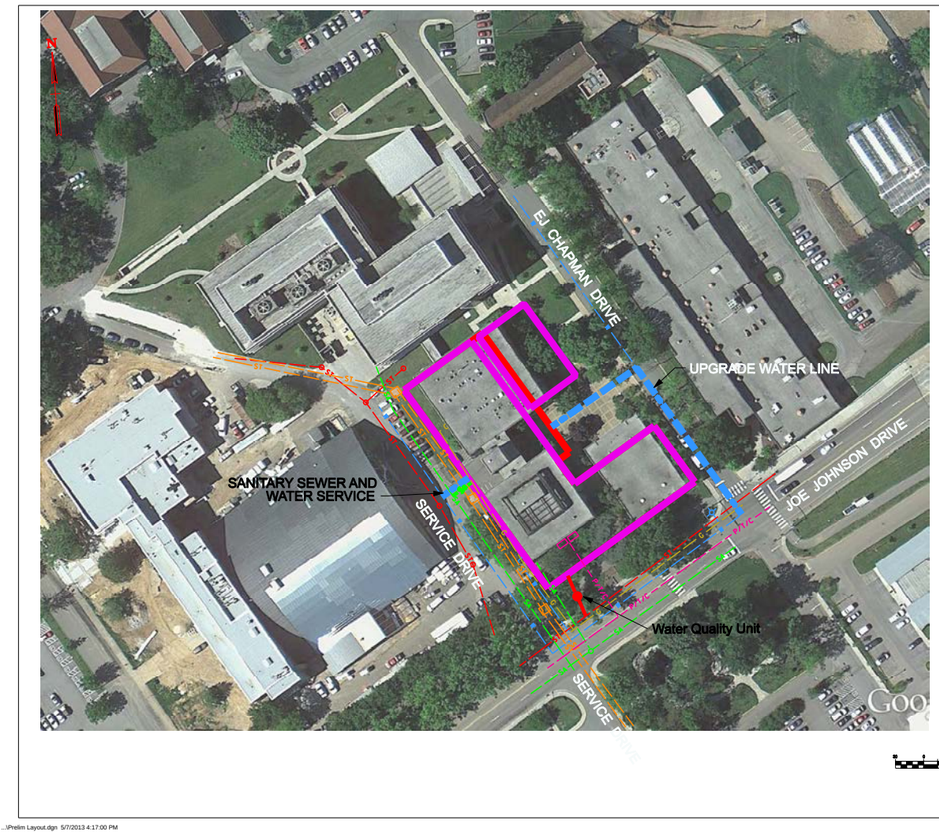
Sanitary sewer is located in the right of ways of both Joe Johnson Drive and Service Drive. With sanitary sewer being in both streets that nearly surround this site CDM Smith suggests tying to the closest manhole which is in Service Drive this allows minimal sanitary sewer pipe outside of the building to be installed. After evaluating the finish floor elevations of the proposed building we believe that all sanitary sewer can be on a gravity system with no lift stations needed. By exiting the building on the Service Drive side we estimate that the route from the west side of the building can be installed and placed into an existing sanitary manhole with approximately 30 lineal feet of 8” PVC pipe.

.05 STORM SEWER*

The University operates a Phase II MS4 governed by the State of Tennessee NPDES permit. As part of this MS4, UTK has established a Stormwater Management Plan that covers site runoff reductions, construction runoff control, and other aspects of stormwater management. Full compliance with all policies and applicable best practices is required. Particular attention should be paid to the fact that all phases of this project (surge building and main building) must be considered in aggregate when evaluating the required stormwater management efforts. The Stormwater Management Plan and associated policies can be found at http://stormwater.utk.edu.

The storm sewer system that surrounds this site is maintained by the City of Knoxville for Joe Johnson Drive and is maintained by the University in Service Drive. There is not storm service in EJ Chapman Drive.

*NOTE: section revised by UTK for the 2018 program update



.01 GENERAL

The approximately 157,000 gsf building will consist of five occupied floors and one unoccupied penthouse level for mechanical equipment. With the exception of the one basement level, the other four occupied levels will be of a similar size and overall footprint. These areas will have a diverse base of teaching and learning. An open and expressive dialogue between Facilities Planning, Construction Manager, Facilities Services Project Manager, and Designer will ensure the development of a truly collaborative and successful project.

The following sections represent a brief outline of items to be included but is not an all encompassing list. Additional sections may be required (such as roof access, walking paths, pavers, etc.) as the design proceeds.

.02 SITEWORK (See 203 - Landscape on pages 36-37 and 204 - Civil on page 38 for additional information)

Selective Demolition

Remove all site features, as required to prepare the site. Provide all required safety and protective measures during the demolition process. Verify any hazardous materials to be removed per the State of Tennessee guidelines. As part of the State's requirements for sustainability, refer to the material recycling requirements.

Utility Connections

Electrical, Steam, Gas, Water, Sewer, Storm, Telephone, and Fiber Optic are all available nearby. Compressed Air, Vacuum, and Treated Water are available (via extension) from the adjacent Plant Biotech Building. *(see Meeting Minutes from November 9, 2012)* Provide additional measures to supply or extend utilities for the project or workspaces.

Utility relocations

Existing Electrical, Gas, and Water lines will need to be relocated as part of the EESERC project. *(see Meeting Minutes from November 9, 2012)*

Sitework

Sitework includes all concrete sidewalks, asphalt paving, brick faced concrete retaining walls, site lighting, wheelchair ramps, landscaping, planting, and site furniture. Site preparation will include excavation as required for foundation systems, grading, excavation, scraping and grubbing as required to prepare the site .

Concrete Sidewalks and Paving

New concrete sidewalks will be 10' wide by 6" thick min., 4000 psi concrete with recycled content on stone base. All dumpster pads, loading areas, approaches to/from dumpsters and loading areas, and driveways to be concrete.

.03 CONCRETE

Foundations and Footings

All foundations and footings to be cast in place reinforced concrete. Foundation system and soil bearing capacity are to be determined .

Structural Concrete

See 206 - Structural Systems Narrative on pages 44-47.

Concrete Slabs

See 206 - Structural Systems Narrative on pages 44-47.

.04 UNIT MASONRY

Concrete Masonry Units

Exterior wall construction may include reinforced CMU construction as backup in selected areas to the exterior veneer or cast stone system.

Brick Veneer

Exterior wall construction will include brick veneer as selected by Facilities Services Project Manager (per Campus Building Guidelines) over waterproofed reinforced Steel Stud or CMU construction as backup . Brick work may also include brick faced retaining walls, pavers, and other architectural site features. All ground mounted utilities shall have brick veneer and/or stone screen walls matching the building design within the Campus Building Guidelines and to be approved by Facilities Services Project Manager.

Cast Stone

Exterior wall construction may include cast stone trim in colors and shapes as selected by Facilities Services Project Manager over waterproofed reinforced Steel Stud or CMU construction as backup. Cast Stone work may also include trim work at retaining walls, pavers, and other architectural site features.

Precast Cladding

Exterior wall construction may include precast cladding as selected by Facilities Services Project Manager over waterproofed reinforced Steel Stud or CMU construction as backup .

.05 METALS

Structural Steel

See 206 - Structural Systems Narrative on pages 44-47.

Miscellaneous Metals

Provide lintels, bracing, clips, equipment supports, rooftop mechanical equipment supports, and related metal framing for laboratory casework and equipment, including door systems or opening framing(s).

Structural Metal Stud Framing

Exterior wall construction may include structural steel stud construction as backup to the exterior veneer or cast stone system .

Cold Formed Metal Framing

Provide cold-formed metal framing for walls, equipment support, anchorage, and attachment.

Metal Handrails

Provide shop fabricated and finished stainless steel handrails at ramps, metal stairs, mezzanines and other areas as required by code.

Ornamental Metals

Provide shop fabricated and finished ornamental metalwork as designed by Architect and approved by Facilities Services Project Manager.

.06 WOOD AND PLASTICS

Wood Blocking

Provide fire retardent treated wood blocking (as approved by State Fire Marshall) as required for installation of laboratory casework and equipment, wall protection devices, grab bars, and other equipment.

Plastic Laminate

Provide chemical resistant plastic laminates in colors and surfaces (countertops) as selected by Facilities Services Project Manager.

Solid Surfacing

Toilet room vanities and other countertop surfaces as selected by Facilities Services Project Manager will be monolithic solid surface material equal to Corian.

.07 THERMAL AND MOISTURE PROTECTION

Building Insulation
All exterior wall, foundation wall, and underslab conditions to include rigid insulation as required meeting energy code of the State of Tennessee. Roofing system will include rigid insulation compatible with a modified bitumen membrane roofing system. Sound attenuating batt insulation will be installed in interior partition walls according to UL designations where required. If required, add a layer of batt insulation above the ceiling for additional sound control

Fire Stopping
Firestopping will be installed at all floor, wall, and ceiling penetrations as required by code to seal all rated penetrations. Firestopping rating to be equal to that of installed assembly. Label all penetrations above ceiling for rating. Use only U.L. fire rated stopping materials.

Joint Sealers
Interior: Butyl caulking for sound rated partitions, toilet room fixtures, and interior glazing and miscellaneous sealant. Chemical resistant silicone sealant where all lab benches and backsplashes meet walls.
Exterior: One or two part silicone or polysulfide type sealant to be used at all exterior joints. Color as selected by Facilities Services Project Manager. One part silicone sealant at all window sash to pre-cast joints.

Roofing Systems
The main roof is envisioned to be a flat roof, sloped appropriately for drainage, because this is predominately found on other buildings on campus; however, steeper sloped roofs may be considered.
Flat Roofs: Single·Ply Modified Bitumen Membrane Roofing system with High Solar reflectance index.
Copper and/or cast stone copings with Copper counter flashings.
Slope Metal Roof Features: Sloped metal roof over metal-decking on steel structure with gutters and downspouts as selected by Facilities Services Project Manager.

Fluid Applied Waterproofing
All exterior wall systems will include a continuous fluid-applied waterproofing system.

Metal Wall Panels
Exterior wall construction may include painted metal wall panels as selected by Facilities Services Project Manager over waterproofed reinforced Steel Stud or CMU construction as backup.

.08 DOORS AND WINDOWS

Standard Steel Doors and Frames
Interior and exterior frames to be hollow metal in styles and configurations as selected by Facilities Services Project Manager. Frames to be fully welded, shop primed and finished, ready for field painting. Grout as required for rating at masonry walls. Coordinate frame requirements with panic devices, electric strikes and card readers as required.
All interior metal doors to be rated seamless steel construction, shop primed and finished for field painting, shop fitted for hardware and glazing.

Hollow Metal Doors
Exterior hollow metal doors will be galvanized ready for field painting (fire rated where required) as selected by Facilities Services Project Manager.

Wood Doors
Interior doors at offices, classrooms, labs, and other public areas may be wood doors. They will be solid core (fire rated where required) with veneer as selected by Facilities Services Project Manager.
Standard interior doors, including those at classrooms, offices, and public areas will be 7’-0” in height and all classroom and office doors to have vision panel per code.
Lab entry doors to be two unequal leaf 5’-0” wide doors with vision panel and all laboratory doors will be 8’-0” in height.
All areas to have a minimum of one door with a minimum width of 36”.

Security Grill Doors
Provide upward-coiling grill door or side-folding grill door at potential retail/lease areas that may be located within the public spaces of the project. Security grills to be clear anodized aluminum in a pattern selected by Facilities Services Project Manager. For upward-coiling grill doors, provide electric operator with cylinder lock and manual release emergency egress. For side-folding grill doors, provide thumb-turn guards and protection bars.

Overhead Coiling Doors
Overhead coiling doors are intended at loading dock/receiving areas and will be motor operated with prefinished galvanized steel slats as selected by Facilities Services Project Manager. Doors will be provided with locks and full weatherstripping. Insulated slots will be provided at exterior door.

Door Hardware
All door hardware to be ADA approved, brushed chrome US 26D finish.
All door hinges to be 5 knuckle, 3 minimum per door. All lab doors to have lockset, closer, kick plate, and latch sets as required.

Security
All exterior doors to have magnetic lock, card access control.
Doors to lab corridors (or openings to labs from any common spaces) will be provided with card access.

Exterior Windows and Curtainwall Systems
Exterior windows to be thermally broken aluminum frame shop fabricated with welded corners. Stick built or site fabricated curtain wall systems will be thermally broken. Color and finish as selected by Facilities Services Project Manager.

Aluminum Entrances and Doors
Exterior entrance doors will be thermally broken aluminum or frameless laminated glass in aluminum frame to match exterior window and curtain wall system. Automatic door openers will be provided to fit in with current campus standards and will comply with ADA requirements.

Glazing
Exterior glazing will be high performance low-e type, 1” insulating unit with tinted vision glass. Interior glazing will be 1/4” safety clear vision glass and/or fire rated glass as required.

.09 FINISH SYSTEMS

Gypsum Drywall
Partitions to be painted gypsum wallboard on light gauge metal stud framing in UL assemblies, fire ratings, and STC ratings as required. Metal studs to be 22 ga. min., with no greater than 1/240 vertical deflection. In lobby and collaboration areas or other areas indicated, provide suspended gypsum wallboard ceiling on metal stud frame with furring strips. Seal all joints at walls, floors, and ceilings as described in Division 7.

Acoustic Tile Ceilings
All labs, classrooms, and office areas to receive new mineral based modular cast or molded acoustic tile with factory painted finish and fissured pattern. ACT to be 2'x2' square, white, revealed edge, NRC 0.60. Suspension system to be direct hung double steel web, roll formed and capped, pre-painted cold rolled steel, intermediate duty, with upward access.

Resilient Flooring
VCT will be provided at all labs, classrooms and corridors. The use and material of sustainable,"green" products is to be considered and explored. Colors and patterns as selected by Facilities Services Project Manager.

Resilient Base and Accessories
All base at resilient or carpeted floors to be 4" rubber base in color as selected by the Facilities Services Project Manager. Material to be continuous at corners with no spliced joints. All fixed casework to have 4" rubber base.

Thin Set Epoxy Terrazzo
Public lobbies, monumental stairs and passenger elevators may receive new thin set epoxy terrazzo with a polished concrete finish and aluminum divider strips. Colors and pattern as selected by Facilities Services Project Manager.

Ceramic Tile
Ceramic or Porcelain tile in toilet rooms with cove, base and bullnose to form a complete system. Wet walls and all walls to wet walls shall be tile at a minimum height of 60" or, extend tile to ceiling height with a continuous decorative border. Colors and pattern as selected by Facilities Services Project Manager.

Carpet or Carpet Tile
All offices and associated support area to have carpet or carpet tile with low VOC content and 4" rubber base. Colors and pattern as selected by Facilities Services Project Manager. Tiles to be 18"x18" or 24"x24" and carpet rolls to be standard 12'-0" width rolls.

Resinous Flooring
Necropsy Lab and associated Prep Lab / Gowning Room are to receive 1/4" troweled seamless epoxy flooring systems with 8" integral base. Colors and style as selected by the Facilities Services Project Manager.

Painting
All walls to be painted with low VOC semi·gloss water based latex paint. All walls to receive one coat primer and two coats paint or more to cover areas with no visible variations or blemishes in the coating finish. All shop primed ferrous metals to receive two coats low VOC latex enamel. All exterior paint to be alkaloid based gloss enamel or High Performance coatings as required. Final painting coverage of finish is to be approved by Facilities Services Project Manager.

High Performance Coatings
Walls in Necropsy Lab and associated areas are to receive high-build, three-coat semi-gloss epoxy paint system.

.10 SPECIALTIES

Visual Display Boards
All whiteboards to be dry erase marker board, porcelain enamel steel on rigid particleboard or composite substrate with aluminum frame with a mat finish. Each unit to have bottom marker rails as from the Claridge manufacturer. Provide movable units as noted.

Toilet Partitions
Toilet Partitions to be ceiling hung, solid phenolic or stainless steel partition system complete with doors with continuous hinges, panels, and hardware including bumpers, coat hooks, etc.

Fire Extinguishers, Cabinets, and Accessories
Provide fire Class ABC all-purpose fire extinguishers in rated stainless steel cabinets (U.L. semi-recessed mounting) with glass doors where indicated. Provide full body fire blankets by Lab Safety Supply or equal. All fire extinguishers, blankets, and accessories to comply with NFPA, OSHA and all locations to be per State Fire Marshall.

Signage
Designed and manufactured per the campus standard and as approved by Facilities Services Project Manager.

Toilet and Bath Accessories
All toilet and bath accessories to be stainless steel with #4 finish, by Bobrick or equal. Each toilet room to have paper towel dispensers, waste receptacle, soap dispensers at each sink, infrared sensors for water operation, mirrors, and sanitary napkin dispenser in women's toilets. Each stall to have two roll toilet tissue dispenser, grab bars, coat hook, and sanitary napkin disposal in women's toilet room. No toilet accessories are to be recessed. All accessories and finishes to be verified with Facilities Services Project Manager for type and all are to be provided in proposed construction contract.

Wall Protection
Corner guards are to be 60" high, surface mounted stainless steel with number 4 finish and installed at all corners. Wall bumpers to be flexible extruded vinyl inserts mounted over aluminum mounting channel secure to CMU or blocking in wall, including all corners, caps, and trim pieces. Color of wall bumpers to be selected by Facilities Services Project Manager. Basis of design: Boston Bumper Series 2000 or equal.

Folding Panel Partition
A folding panel partition may be provided in the selected spaces to provide flexible classrooms. Partitions to have a minimum sound rating of STC 56 and to provide pass through panel options and marker panel options.Style and finish to be selected by Facilities Services Project Manager. Basis of design: Modern Fold or equal.

Waste and Recycling Container Cabinets
Provide wood cabinetry to conceal waste and recycling containers at all public spaces (including corridors), classrooms, break rooms, and work/copy rooms. UTK to provide waste and recycling containers. See Section 413 - Recycling Station Design Guidelines on page 242 of the Appendix for additional information.

Emergency Aid Specialties
Provide recessed or semi-recessed cabinets to accommodate standard Automatic External Defibrillator (AED) devices. Include alarm connected to centrally monitored alarm system. Style and finish to be selected by Facilities Services Project Manager. Basis of design: JL Industries 1400 Series. UTK to provide the AED devices.

Information and Directory Cabinets
Provide recessed or surface mounted bulletin and directory board cabinets. Cabinets to be constructed of heavy-gage aluminum with cork display backing. Style and finish to be selected by Facilities Services Project Manager. Basis of design: Claridge Imperial Series Bulletin and Directory Board Cabinet.

.11 EQUIPMENT

Laboratory Fume Hoods
All fume hoods are to be by·pass style for use with the specified HVAC system. Cabinet construction to be powder-coated cold rolled steel frame construction. Each hood to have electronic face velocity sensors and infrared occupancy sensors. All hoods are to be pre-wired and pre-piped.
Basis of Design: Thermo Scientific Fisher Hamilton, ltd. or equal as approved by Facilities Services Project Manager. All hoods to meet ASHRAE 110-1995 (in-place tested), BS 7258, DIN 12924. Air sentry, flow-safe.

Bench Hoods

Size:	Typical: 6’ or 8’
Base Cabinets:	Metal Flammable Storage, Vented Acid waste storage or as noted on drawings.
Sash:	Counter weighted combination vertical rising sash.
Sash Glazing:	Tempered 1/4” safety glass.
Liner:	Modified epoxy resin liner, adjustable baffle.
Worktop:	Cast epoxy resin worktop.
Cup sink:	Yes
Interior light:	Two-tube fluorescent.
Electrical:	Two 120v and one 208v or 220v receptacles.
Lab Services:	Gas, Air, Vacuum, Cold Water, point of use DI water (to be determined in design)
Distillation Rack:	Not Required.

Autoclaves

Size:	20” X 20” X 39”
Door:	Single door, vertical-sliding
Steam System:	Integral, built-in steam generator
Required Utilities:	Floor drain, electrical service, cold water spigot, and purified water connection (if req’d)
Manufacturer:	Tuttnauer USA Co. Ltd. or equal as approved by Facilities Services Project Manager

.12 FURNISHINGS

Laboratory Casework
Wood Laboratory Casework (fixed and mobile units) is to be flush overlay style casework with semi-concealed hinges. Casework will include base cabinets, upper wall cabinets, tall storage cabinets, acid storage cabinets, flammable storage cabinets, vented storage cabinets, and other possible types such as balance tables. All base cabinets are to have full height removable backs for access to service chase and will be at either standing height, ADA height, or sitting height. Bases to consist of 50% drawers and 50% cupboard units. Perimeter, wall mounted casework will be fixed while interior (island) casework may be moveable. Flexible benches (adjustable metal laboratory casework systems) are used in many labs instead of fixed casework. Adjustable shelves will be provided for all base and wall units. Tall storage cabinets and upper wall cabinets may be provided with glass fronts and locks. All glazing is to be 1/8” tempered glass in wood or metal frames. All service chase enclosures are to receive matching finishes. Tops are to be made of 3/4” thick epoxy resin or stainless steel. Under cabinet lighting may be required.

Wood Laboratory Casework
Veneers of wood casework to be book matched and balanced. All doors and exposed edges to be edge banded in solid wood materials selected by Facilities Services Project Manager.

Metal Laboratory Casework
Metal casework to be stainless steel or cold rolled metal fabrication and powder coated in a color to be selected by the Facilities Services Project Manager.

Basis of Design

Wood Casework:	Thermo Scientific Fisher Hamiltion, ltd. or equal as approved by Facilities Services Project Manager.
Metal Casework:	Thermo Scientific Fisher Hamiltion, ltd. or equal as approved by Facilities Services Project Manager.

Casework Specifications

Wood Material:	Wood veneer on plywood substrate, solid select wood frame, in Red Oak, Maple or veneers as approved by Facilities Services Project Manager.
Wood Finish:	AWI #4 catalyzed clear finish or approved stain.
Metal Material:	Stainless steel or cold rolled sheet steel
Metal Finish:	Stainless steel or powder coated metal in color approved by Facilities Services PM.
Mounting:	Floor Mounted, movable tables, rolling casework.
Pulls:	4” Stainless steel wire pull.
Hinges:	Semi-Concealed Euro style.
Slides:	Accuride or equal telescoping slides w/ stainless steel ball bearings, 100-lb. min.
Latches:	Friction, magnetic, or self-closing type.
Locks:	Manufacturer’s standard, US 26 finish.
Floor levelers:	Screw type, fully adjustable.
Shelves:	Solid wood, adjustable.
Shelf Supports:	Metal, manufacturer’s standard for wall and bench supports. Provide floor mounted self supporting shelf systems for all reagent racks and island bench
Reagent Racks:	Manufacturer’s standard.
Worktops:	Cast epoxy chemical resistant resin (black) Stainless steel at moveable tables in Necropsy spaces
Sinks:	Cast epoxy chemical resistant resin (black), integral with tops, at worktops Stainless steel (with drainboards) at scullery sinks
Snorkels:	Articulated aluminum and cast plastic by Lab Safety Supply or equal.
Eyewash:	Deck mounted, single action, chrome finish .
Hose:	8ft. Reinforced PVC hose with squeeze lever-operated valve, spray type outlet head.
Emergency Shower:	Fully accessible, barrier free freestanding model by Kewaunee, Guardian, Hawes, or equal in chrome finish.
Pegboards:	Cast epoxy resin with white polypropylene pegs, mechanically fitted and friction mounted, removable. Stainless steel drain tray with clear polypropylene drain hose.
Balance Tables:	To be determined .
Mech Service Fittings:	Epoxy coated cast bronze by Kewaunee, Chicago or Water Saver, or manufacturer’s standard as approved.
Faucets:	As noted above, with vacuum breakers or aspirator as noted.
Elec Service Fittings:	Manufacturer’s standard stainless steel enclosures and faceplates. All electrical services fittings to be wall mounted at C-Frame metal casework.
Raceways:	2-compartment extruded aluminum raceway for 120v - 220v (to be verified)
Gas Cylinder Rack:	Capacity 1-2 cylinders at up to 12” diameter each. Fully welded stand, powder paint finish. Polypropylene strap and cinch buckle.
Emergency Shut-Off:	Provide emergency shut-off controls of gas and electrical service per SFMO for locations and per the code.

.12 FURNISHINGS [cont]

Interior Window Blinds
Windows shall be ready to receive an adjustable mini-blind system. Blinds shall be furnished and installed by UTK's Facilities Services contract vendor. Color selection shall be by Facilities Services Project Manager.

.13 SPECIAL CONSTRUCTION

Walk-In Cold Rooms
Adjustable Temperature 1º C to 10º C Cold Room: ESI, luwa, Thermaxx or approved equal. To be supplied with a stainless steel finish on all interior surfaces, checker plate stainless steel flooring. Provide integral ramp for on slab installation. Walls shall include blocking for shelving as indicated on the drawings. Freestanding heavy duty wire shelving to be provided. Where indicated, Cold Room shall include stainless steel worksurfaces with integral sinks, fixtures and accessories as indicated in programming data sheets. Both chart and digital temperature monitoring devices are required.

Provide floor drain, lockable door units with exterior type pad lock (with required interior safety features), interior lighting with appropriate ballast temperature ratings for general use, warning/safety lights with controls, and remote compressor units accessible from the interior spaces.

Walk-In Freezer Rooms
Fixed Temperature -20º C Freezer Room: ESI, luwa, Thermaxx or approved equal. To be supplied with a stainless steel finish on all interior surfaces, checker plate stainless steel flooring. Provide integral ramp for on slab installation. Freestanding heavy duty wire shelving to be provided. Both chart and digital temperature monitoring devices are required .

Provide floor drain, lockable door units with exterior type pad lock (with required interior safety features), interior lighting with appropriate ballast temperature ratings for general use, warning/safety lights with controls, and remote compressor units accessible from the interior spaces.

Walk-In Environmental Chamber
Adjustable Temperature and Humidity controlled chamber capable of maintaining the following ranges:

Temperature:	7C to 6OC, +/- .2C.
Humidity:	10% to 90%, +/- .5% RH.

Provide dedicated air handling unit with internal air or water-cooled refrigeration system. Basis of Design PGC Custom Sized Chamber with Series 9240 Vertical Conditioning Unit.

Provide floor drain, lockable door units with exterior type pad lock (with required interior safety features), interior lighting with appropriate ballast temperature ratings for general use, warning/safety lights with controls, and remote compressor units accessible from the interior spaces.

.14 CONVEYING SYSTEMS

Passenger Elevator

Type:	Electric Hydraulic
Capacity:	2500 lbs.
Speed:	150 fpm.
Floors:	To serve all floors. Roof access to be determined.
Operation:	Single push button
Interior Wall:	Stainless Steel *(decorative style and extra durable wall finish)*
Interior Floor:	Porcelain Tile, Terrazzo, etc. *(to match finish floor of main lobby space)*
Interior Ceiling:	Stainless Steel (to be removable)
Doors:	Double Automatic, 3'-6" Clear opening
Cab Dimensions:	6'-8" W X 4'-3" D X 8'-0" H *(must accommodate ambulance stretcher)*
Fixtures:	Stainless Steel
Lighting:	Manufacturers Standard [LED preferred)
Communications:	Telephone, Alarm Bell

Service Elevator

Type:	Electric Hydraulic
Capacity:	5000 lbs.
Speed:	150 fpm.
Floors:	To serve all floors. Roof access to be determined.
Operation:	Single push button
Interior Wall:	Stainless Steel *(decorative style and extra durable wall finish)*
Interior Floor:	Textured Stainless Steel
Interior Ceiling:	Stainless Steel *(to be removable)*
Doors:	Single Automatic, 4'-0" Clear opening
Cab Dimensions:	5'-8" W X 8'-5" D X 8'-0" H *(must accommodate ambulance stretcher)*
Fixtures:	Stainless Steel
Lighting:	Manufacturers Standard [LED preferred)
Communications:	Telephone, Alarm Bell

The project is an education, research, and public service building at the University of Tennessee, Knoxville. The building will support research in energy and environmental science laboratories, classrooms, lecture halls, and offices. This narrative is based on a building arrangements described as Options 1 and 2. The new main building is expected to be 5 stories in height with one partially below grade. The lower level of the main building will be attached to a new auditorium. The main building will support approximately 157,500gsf. The new auditorium will enclose approximately 8,300gsf. The governing building code for the project is the International Building Code, 2012 Edition with local amendments.

The main building arrangement allows for the use of several structural systems.

a.) One applicable structural system would include a two-way post-tensioned flat-plate cast-in-place concrete slab system supported by a single line of columns along the interior corridor and a line of columns along each exterior wall. The approximate column grid for this system would be 21 feet by 28 feet. The lateral force resisting system would consist of cast-in-place concrete shear walls.

b.) Another would include post-tensioned cast-in-place concrete beams span between the columns and supporting a regularly reinforced slab spanning approximately 21 feet. The approximate column grid for this system would be 40-42 feet maximum by 21 feet. The lateral force resisting system would consist of cast-in-place concrete moment resisting frames.

Basement wall construction will also be of cast-in-place concrete construction. The building will be founded upon cast-in-place concrete drilled piers. The drilled piers will be connected by a system of cast-in-place concrete tie-beams for seismic continuity.

Expansion joints may be required for either scheme to separate east-west wings from the north-south wings. No provisions for future expansion are expected. An expansion joint will also be required at the connection to the existing building.

DESIGN CRITERIA

Design Floor Loads

Live Loads (reduced as allowed by the Building Code):

• General Areas	100 psf
• Suites	40 psf
• Corridors	100 psf
• Mechanical Rooms	150 psf
• Partitions	15 psf

Dead Loads (in addition to the structure self-weight):

• Mechanical, Electrical, Plumbing	10 psf
• Ceiling	5 psf

Design Roof Loads

Live Loads (reduced as allowed by the Building Code):

• Roof	20 psf

Dead Loads (in addition to the structure self-weight):

• Mechanical, Electrical, Plumbing	10 psf
• Ceiling	5 psf

Snow Loads:

• Ground Snow Load	10 psf
• Exposure Factor - C_e	1.0 psf
• Thermal Factor - C_t	1.0 psf
• Importance Factor - I	1.1 psf
• Sloped Roof Factor – C_s	1.0 psf
• Drifts Included	

Design Wind Loads

• Basic Wind Speed	90 mph
• Exposure	C
• Importance Factor	1.15

Design Seismic Loads

• Seismic Factors S_S, S_1, and Soil Profile Type were determined using applicable building code tables and figures.	
• 0.2 Sec. Design Spectral Response Acceleration	S_s = 0.519
• 1.0 Sec. Design Spectral Response Acceleration	S_1 =0.118
• Seismic Use Group	III
• Site Class	D
• 0.2 Sec. Design Spectral Response Acceleration	S_{Ds} =0.479
• 1.0 Sec. Design Spectral Response Acceleration	S_{D1} =0.183
• Seismic Performance Category	C
• Structural Systems	
Basic Structural System	Building Frame System
• Analysis Procedure	Equivalent Lateral Force

MATERIAL PROPERTIES

Reinforcement

• Reinforcing Steel	ASTM A615, Grade 60
• Post-Tensioning Strand	ASTM A416 (270 ksi)

Normal-Weight Concrete

• Foundation elements	3,000 psi
• Slab-on-Grade	4,000 psi
• Basement Walls	4,000 psi
• Columns	5,000 psi
• Shear Walls	5,000 psi
• Framed Beams, Slabs	4,000 psi
• Slab on Metal Form	4,000 psi

Structural Steel

• W Shapes	ASTM A992, 50 ksi
• M, S, HP, C, MC, L Shapes	ASTM A36
• Round Hollow Tubing	ASTM A500, GRADE B, 42 ksi
• Shaped Steel Tubing Walls	ASTM A500, GRADE B, 46 ksi
• Misc. Plates /	ASTM A36
• Non-High Strength Bolts	ASTM A307
• High Strength Tension Bolts	ASTM A325
• Anchor Bolts	ASTM 1554, 36 ksi

DESCRIPTION OF STRUCTURAL SYSTEM

Site Preparation for Building Pad

- The elevation of the main floor will be approximately 940’.
- A partial basement is expected at the north and west wings of the building. Maximum basement depth is expected to be 14’.
- The contractor shall proofroll the building area to identify soft soils.

Foundations

- A geotechnical report will be required to establish criteria for foundation design.
- Ancillary foundations will include shallow spread footings bearing on soil/rock.
- Primary foundations will include drilled piers bearing on soil/rock.
- Cast-in-place concrete seismic tie-beams will be required between the drilled piers.

Basement / First Floor Structure

- The typical floor slab will be a soil-supported 4 inch thick concrete slab with WWF 6x6 - W1.4xW1.4 reinforcing.
- Mechanical room floor slabs will be a soil supported 6 inch thick concrete slab with WWF 6x6 - W2.9xW2.9.
- Basement wall will be cantilever cast-in-place concrete walls supported by a cast-in-place concrete strip footing.
- Exterior walls will be supported by a cast-in-place concrete foundation wall supported by a cast-in-place concrete strip footing.

Lateral Load Resisting System (LLRS)

- The LLRS will include cast-in-place concrete shear walls.

Columns

- Column types will include square or rectangular cast-in place concrete columns.

Elevated/Framed Floor Structure

- The elevated floor slab system will include two-way post-tensioned cast-in-place concrete slab supported by post-tensioned cast-in-place concrete beams at the exterior walls.

Roof Structure

- The roof slab will include two-way post-tensioned cast-in-place concrete slab supported by post-tensioned cast-in-place concrete beams at the exterior walls.

DESIGN CRITERIA – Auditorium Building

Design Floor Loads

Live Loads (reduced as allowed by the Building Code):

- Auditorium / General Areas 100 psf
- Corridors - First Floor 100 psf
- Corridors - Above First Floor 80 psf
- Mechanical Rooms 150 psf

Design Roof Loads

Live Loads (reduced as allowed by the Building Code):

- Roof 20 psf

Dead Loads (in addition to the structure self-weight):

- Ceiling/MEP 15 psf

Snow Loads:

- Ground Snow Load 20 psf
- Exposure Factor - C_e 1.0
- Thermal Factor - C_t 1.0
- Importance Factor - I 1.1
- Sloped Roof Factor – C_s 1.0
- Drifts Included

Design Wind Loads

- Basic Wind Speed 90 mph
- Exposure B
- Importance Factor 1.15

Design Seismic Loads

- Seismic Factors S_S, S_1, and Soil Profile Type were determined using applicable building code tables and figures.
- 0.2 Sec. Design Spectral Response Acceleration S_s =0.519
- 1.0 Sec. Design Spectral Response Acceleration S_1 =0.118
- Seismic Use Group III
- Assumed Site Class D
- 0.2 Sec. Design Spectral Response Acceleration S_{Ds} = 0.479
- 1.0 Sec. Design Spectral Response Acceleration S_{D1} = 0.183
- Seismic Performance Category C

Figure 1 – IBC 2012 Table 1604.5

DESCRIPTION OF STRUCTURAL STEEL SYSTEM

Reinforcement
- Reinforcing Steel — ASTM A615, Grade 60

Normal-Weight Concrete
- Foundation elements — 3,000 psi
- Slab-on-Grade — 4,000 psi

Structural Steel
- W Shapes — ASTM A992, 50 ksi
- M, S, HP, C, MC, L Shapes — ASTM A36
- Round Hollow Tubing — ASTM A500, GRADE B, 42 ksi
- Shaped Steel Tubing Walls — ASTM A500, GRADE B, 46 ksi
- Misc. Plates / — ASTM A36
- Non-High Strength Bolts — ASTM A307
- High Strength Tension Bolts ASTM A325
- Anchor Bolts — ASTM 1554, 36 ksi

Site Preparation for Building Pad
- The elevation of the first floor will match the elevation of the Main Building
- The contractor shall proofroll the building area to identify soft soils.
- The contractor may undercut the building area and replace unsuitable fill with compacted structural fill.

Foundations
- A geotechnical report will be required to establish criteria for foundation design.
- Foundations may include shallow spread footings bearing on soil.
- Foundations may include drilled piers bearing on sound rock.
- Foundations may include steel piles bearing on sound rock.

Basement / First Floor Structure
- The typical floor slab will be a soil-supported 5 inch thick concrete slab with WWF 6x6 - W2.9xW2.9 reinforcing.
- Mechanical room floor slabs will be a soil supported 6 inch thick concrete slab with WWF 6x6 - W2.9xW2.9.

Lateral Load Resisting System (LLRS)
- The LLRS may include Moment-resisting welded steel frames.
- The LLRS may include concentrically braced steel frames.

Columns
- Column types may include steel WF, HSS square or rectangular columns.

Roof Structure
- The roof system will include 3 inch metal deck (galvanized, 22 gage).
- The roof deck will be supported by steel joists and joist girders.
- The roof deck will be supported by steel wide-flange beams.

DESCRIPTION OF STRUCTURAL CONCRETE SYSTEM

Reinforcement
- Reinforcing Steel — ASTM A615, Grade 60
- Post-Tensioning Strand — ASTM A416 (270 ksi)

Normal-Weight Concrete
- Foundation elements — 3,000 psi
- Slab-on-Grade — 4,000 psi
- Columns — 5,000 psi
- Walls — 4,000 psi
- Framed Beams, Slabs — 4,000 psi

Site Preparation for Building Pad
- The elevation of the first floor will match the elevation of the main building.
- The contractor shall proofroll the building area to identify soft soils.
- The contractor shall undercut the building area and replace unsuitable soil with compacted structural fill.

Foundations
- A geotechnical report will be required to establish criteria for foundation design.
- Foundations may include drilled piers bearing on sound rock.
- Foundations mat include steel piles bearing on sound rock.

First Floor Structure
- The typical floor slab will be a soil-supported 5 inch thick concrete slab with WWF 6x6 - W2.9xW2.9 reinforcing.
- Mechanical room floor slabs will be a soil supported 6 inch thick concrete slab with WWF 6x6 - W2.9xW2.9.

Lateral Load Resisting System (LLRS)
- The LLRS may include precast or cast-in-place concrete shear walls at the exterior walls.
- The LLRS may include cast-in-place moment-resisting concrete frames.

Columns
- Columns types will include cast-in-place or precast concrete.

Elevated Roof Structure
- The elevated roof slab system will include single or double tee prestressed precast elements. These elements may be topped or untopped with a cast-in-place concrete slab.

A.1 HEATING, VENTILATING, AND AIR CONDITIONING GENERAL

HVAC systems will comply with the following minimum requirements:

- International Building Code 2012 (excluding Chapters 11 & 34, Section 3411)
- International Mechanical Code 2012
- International Energy Conservation Code 2012
- ASHRAE Standard 62.1-2007
- State of Tennessee HPBr
- University of Tennessee – Division of Facilities Planning – Designer's Manual

Design conditions will be as follows:

- Inside design cooling: 75°F db, 50% RH.
- Inside design heating: 72°F (no humidification required).
- Outside design cooling: 95°F db, 78°F wb.
- Outside design heating: 0°F db.
- Note: UTK Campus will only heat in the winter to a 68 degree (Max.) building temperature and only cool in the summer to a 76 degree (Min.) building temperature.

Pressurization Criteria:

- The following spaces will be designed to maintain inward directional airflow relative to adjacent building areas:
  - Laboratories and support spaces.
  - Insect Museum.
  - Toilets.
  - Locker Rooms.
  - Janitor Closets.

Air Change Rates:

- Supply/exhaust air change rates for laboratories and support spaces will be determined by cooling load calculations and exhaust requirements except that the spaces will be designed to maintain the following minimum air changes per hour at all times.
  - Minimum 6 air changes when occupied.
  - Minimum 4 air changes when unoccupied.

A.2 COOLING SYSTEM

The EESERC will be cooled by chilled water from the existing Biotech chilled water plant. The existing Biotech plant currently has three 800-ton chillers and should be able to serve the EESERC without major modification. The Facilities Planning office will require the following services with regard to the existing Biotech plant:

- Verify that the existing Biotech plant will be able to serve the peak capacity of all connected buildings plus the EESERC.
- Perform life cycle evaluation of a thermal storage system (ice or water) to serve the Biotech plant.

The chilled water service to the EESERC will be located in a mechanical room on the lower level of the building. Two tertiary chilled water pumps sized at 100% load each will be provided to serve the building along with a chilled water bridge control system consistent with other buildings served by the Biotech plant. Aboveground chilled water piping will be distributed to cooling coils in the air handling units, energy recovery units, and fan-coil units as follows:

- Piping 2" and smaller will be Type L, hard drawn seamless copper tubing with wrought copper, solder joint type fittings.
- Piping 2.5" and larger will be seamless schedule 40 black steel with welded or flanged fittings. Grooved piping will not be acceptable.
- Piping will be insulated with fiberglass pipe insulation. Fittings will be insulated with preformed fiberglass fitting
- finished with glass fabric and vapor barrier mastic.

A.3 STEAM SYSTEM

Steam for heating the EESERC and for laboratory equipment will be provided by the campus steam distribution system. Underground steam and pumped condensate piping will be provided to connect the building to the nearest underground steam vault. The steam entrance, pressure reducing assemblies, and main condensate return pump will be located in a dedicated mechanical room on the lower level of the building. The steam system will include the following:

- Steam pressure reducing valve (PRV) assemblies will be a single or two-valve, single stage type, complete with pressure reducing valves, pressure controller, air loading valves, relief valves, isolation valves, and pressure gauges.
- Campus steam will be reduced from 125 psig to 75 psig for laboratory equipment and from 125 psig to 15 psig for heating water and domestic hot water production.
- Underground steam piping will be direct-buried, pre-insulated, Class A, schedule 40 piping with welded joints.
- Valves, fittings and specialties in high pressure steam piping will be 300 psig cast steel construction. Gate valves will be butt-welded or socket-welded.
- The main condensate return pump will be duplex type complete with pumps, electric motors, receiver, and controls. Pump discharge pressure will be 30 psig.
- For steam flow monitoring, provide a clamped-on flow meter to the main condensate return line.

A.4 HEATING SYSTEM

The building heating water system will consist of two heat exchangers, two heating water pumps, valves, piping and accessories. Each heat exchanger and pump will be sized at 50% of the peak design load.

- Heat exchangers will be shell and U-tube type with ASME label for 125 psig working pressure.
- Pumps will be base-mounted, flexible-coupled, bronze-fitted, centrifugal type. Pumps will be selected to be non-overloading type so that motor nameplate rating will not be exceeded at any point on the pump curve. Acceptable manufacturers will be Aurora, Bell & Gossett, Crane-Deming, PACO, Peerless, and TACO.
- Factory-assembled heat transfer packages will not be acceptable.

Aboveground heating water piping will be distributed to heating coils in the air handling units, energy recovery units, fan-coil units, terminal units, duct-mounted heating coils, and unit heaters as follows:

- Piping 2" and smaller will be Type L, hard drawn seamless copper tubing with wrought copper, solder joint type fittings.
- Piping 2.5" and larger will be seamless schedule 40 black steel with welded or flanged fittings. Grooved piping will not be acceptable.
- Piping will be insulated with fiberglass pipe insulation. Fittings will be insulated with preformed fiberglass fittings finished with glass fabric and vapor barrier mastic.

A.5 AIR CONDITIONING SYSTEMS

The air conditioning systems serving offices, classrooms and support areas will be variable-volume air handling units with variable-volume reheat terminal units.

The air conditioning system serving the Conference Center will be a single-zone, variable-volume air handling unit. For energy savings, consider the use of demand controlled ventilation for this air-handling unit to automatically adjust the outside air to match the occupant load.

Air handling units will be modular, draw-through, factory-fabricated, medium pressure type including the following features:

- 2” thick, solid, galvanized steel, double-wall casings. Perforated inner walls will be allowed at fan sections for improved acoustic performance.
- 12” deep, cartridge filters with minimum MERV rating of 13 and 2” deep, pleated pre-filters.
- Hot water type preheat coils with 30°ΔT. If freeze protection is required, provide inline circulating pump to maintain full design flow at each preheat coil.
- Chilled water type cooling coils with maximum face velocity of 450 FPM, maximum 8 rows of depth, and 16°ΔT.
- Premium efficiency fan motors with variable frequency drives.
- Airside economizer with separate minimum and maximum outside air dampers and air blenders for proper mixing of air.
- Consider the use of fan arrays for large air handling units (30,000 CFM and higher).
- Acceptable manufacturers will be Carrier, CES Group, ClimateCraft, JCI-York, McQuay, and Trane.

The air conditioning systems serving laboratories, laboratory support areas, and the Insect Museum will be 100% outside air, variable-volume energy recovery units with variable-volume air valves and reheat coils.

Energy recovery units will be custom, factory-fabricated, medium pressure type including the following features:

- 2” thick, solid, galvanized steel, double-wall casings. Perforated inner walls will be allowed at fan sections for improved acoustic performance.
- 12” deep, cartridge filters with minimum MERV rating of 13 and 2” deep, pleated pre-filters.
- Energy recovery wheels will be made of coated corrosion-resistant aluminum complete with galvanized steel structural frame, belt drive rotor system, and purge section.
- Hot water type preheat coils with 30°ΔT. If freeze protection required, provide inline circulating pump to maintain full design flow at each preheat coil.
- Chilled water type cooling coils with maximum face velocity of 450 FPM, maximum 8 rows of depth, and 16°ΔT.
- Premium efficiency fan motors with variable frequency drives.
- Supply fan in blow-through arrangement to the energy recovery wheel. Exhaust fan in draw-through arrangement to the energy recovery wheel. Consider the use of fan arrays versus single fans for improved redundancy.
- Acceptable manufacturers will be Carrier, CES Group, ClimateCraft, JCI-York, McQuay, and Trane.

Telecom rooms will be served by fan coil units. Fan coil units will be 2-pipe, horizontal-concealed type complete with cooling coils, insulated casings, drain pans, filters, centrifugal fans, 3-speed motors, and disconnect switches. Size fan coil units as required by the University of Tennessee – Telecommunications Design and Installation Standards.

Elevator machine rooms will be served by ductless split systems. Systems will be heat pump type units complete with wall-mounted indoor fan coil section, outdoor condensing unit, wall-mounted controller, and disconnect switches.

Mechanical and electrical rooms containing heat generating equipment will be mechanically ventilated at a rate of not less than 30 air changes per hour. Air will be introduced on the cool side of the room and exhausted on the hot side with thermostatically-controlled exhaust fans.

A.6 AIR DISTRIBUTION SYSTEMS

Terminal units will be pressure-independent type complete with access doors, 1” thick foil-faced fiberglass liner, direct digital control, and maximum allowable leakage of 2% design air at 8” wg static pressure. Variable volume terminal units will provide cooling only for the interior office zones. Variable volume reheat terminal units will provide heating/cooling for the classrooms, perimeter office zones, and all zones on the top floor. Heat in the terminal units will be provided by hot water heating coils sized for a 30°ΔT.

Return air will be fully ducted from room grilles and registers back to air handling units. Return air fans and relief air fans will be utilized, where warranted for optimum economizer operation.

Air valves will be utilized in laboratories, laboratory support spaces, and the Insect Museum to provide space pressurization control. Types of air valves will include supply, general exhaust, fume hood exhaust, and snorkel exhaust. Acceptable manufacturer will be Phoenix Controls, Price, or approved equal. Where reheat is required, duct-mounted heating coils sized for a 30°ΔT will be provided downstream of supply air valves.

Toilets, janitor closets and other sanitary facilities will be exhausted at a minimum rate of 2.5 CFM per square foot. Exhaust fans will be roof-mounted, belt-driven, centrifugal type complete with corrosion-resistant gravity type backdraft dampers with blade edge and end seals.

Ductwork will be galvanized steel; will conform to SMACNA recommendations; and will have the following static pressure classifications:

- From variable volume air handling units to terminal units: 4” wg.
- From terminal units to grilles, registers and diffusers: 2” wg.
- From energy recovery units to supply air valves: 4” wg.
- From energy recovery units to general exhaust air valves: -4” wg.
- From air valves to grilles, registers and diffusers: 2” wg.
- From fan coil units to grilles, registers and diffusers: 2” wg.
- Return air: -2” wg.
- On the inlet of toilet exhaust fans: -2” wg.
- On the discharge toilet exhaust fans: 2” wg.

Ductwork will be insulated for energy conservation and to prevent condensation as follows:

- Exposed supply air, outside air, and mixed air ductwork will be insulated with 2” rigid fiberglass board insulation finished with canvas.
- Concealed supply air, outside air, and mixed air ductwork will be insulated with 2” flexible fiberglass insulation.
- Duct lining will be allowed on a limited basis, where needed for sound attenuation purposes and allowed by Facilities Planning. Duct lining will comply with Erosion Test Method described in UL Publication No. 181.

A.7 FUME HOOD EXHAUST SYSTEMS

Laboratory fume hoods will be variable-volume type and will be provided with air valves connected to a manifolded high-induction exhaust fan system located on the roof. Ceiling-mounted snorkels will be constant-volume type and will be provided with air valves connected to the same exhaust system. The high-induction exhaust fan system will include N+1 fans with variable frequency drives, a common plenum, fan isolation dampers, bypass dampers, and discharge nozzles capable of producing discharge velocities above 5000 feet per minute. Acceptable manufacturers will be Greenheck, MK Plastics, or Strobic Air. Manufacturers utilizing inline mixed flow type fans will be required to furnish a jib crane system for motor removal.

A runaround energy recovery system will be provided to transfer sensible energy between the fume hood exhaust system and the outside air for the office/classroom air handling units. The runaround system will be complete with coils, pumps, and piping. The coils for the fume hood exhaust airstream will be selected for a 30% propylene glycol / 70% water mixture and will include filters on the upstream side, low leakage isolation dampers, and a full size bypass to allow servicing/cleaning without loss of fume hood exhaust airflow.

Ductwork for the entire fume hood exhaust system will be type 304 stainless steel with welded longitudinal seams and transverse joints with a 6” static pressure classification.

Consideration will be given to hiring a separate consultant to perform CFD and/or wind tunnel analysis of airflow around the building to minimize the possibility of re-entrainment.

The HVAC system is to be designed such that each lab space have, at a minimum, the capability of adding one direct adjustable hood (fume extractor device) for small “spot” point-of-use areas within the laboratory. The flexible hood is not to be used in place of a standard chemical fume hood unit. It shall be capable of connecting to the standard fume hood for an independent control to provide a reduced air flow volume of min. exhaust.

Basis of Design: Phoenix Controls

A.8 AUTOMATIC TEMPERATURE CONTROL SYSTEMS

Provide direct digital controls (DDC) system with electronic operators to control and monitor the chilled water system, heating water system, air handling units, energy recovery units, fume hood exhaust system, fan coil units, terminal units, exhaust fans and other related systems. The DDC system will be fully compatible with and connected to the existing Energy Management System serving the campus. Acceptable manufacturers will be JCI and Schneider Electric (formerly TAC).

DDC controllers will be field programmable, microprocessor-based type incorporating direct digital control and energy management functions. Each DDC controller will perform its assigned control and energy management functions as a stand-alone unit and will comply with FCC Part 15, Subpart B 2008. Each DDC controller will be expandable by adding additional input/output modules that operate through the processor of the DDC controller. Each DDC controller will be provided with a UPS with minimum 5 minutes of battery backup.

Control valves will be provided as follows:

- Chilled water control valves will be 2-way type with electric actuators. Controls valves for air handling units will be pressure-independent type and control valves for fan coil units will be equal percentage, globe type.
- Heating water control valves will be 2-way, equal percentage, globe type with electric actuators.
- Steam control valves will be 2-way type, linear characteristic, globe type with electric actuators.
- Two position control valves for chiller isolation will be line size, butterfly type with electric actuators.

Control dampers will be low-leakage, opposed-blade type with airfoil blades, blade seals, side seals, and electric actuators.

DDC sensors will include the following:

- Space temperature sensors will be electronic type with setpoint adjustment, visual temperature scale, communication port, and accuracy of +/-1°F.
- Duct and pipe temperature sensors will be electronic type with accuracy of +/-0.5°F.
- Space and duct humidity sensors will have an accuracy of +/-2% RH.
- Air and water differential pressure sensors/transmitter will be provided with 3-valve manifold assembly to allow field test measurements to be taken without interrupting the DDC system reading.
- Current sensing relays for HVAC equipment status.
- Pressure switches for filter status.
- CO2 sensors will have accuracy of +/-5% of reading up to 10000 ppm.

Provide an operator station complete with computer, monitor, keyboard, printer, and software. Operator station is to be located in a dedicated Maintenance Office within the building. Software graphics with pictorial representations of equipment and devices being controlled will be provided.

A.9 LABORATORY PRESSURIZATION CONTROL SYSTEMS

Variable-volume laboratory pressurization controls will be provided in laboratory spaces. Controls will be fast-acting type to maintain CFM offsets in each space. Laboratories will include occupancy sensors at fume hoods to reduce airflow at hoods when unoccupied. Laboratory pressurization controls will also monitor lighting systems to determine occupancy and setback the minimum ventilation rate during unoccupied periods from 6 to 4 air changes per hour. Acceptable manufacturers will be Phoenix Controls and Price. Manufacturer shall provide interface to allow monitoring of the pressurization controls through the building DDC system.

A.10 TESTING, ADJUSTING, AND BALANCING

Systems will be tested, adjusted, and balanced to achieve proper operation, design flow, temperature and pressure differentials, and pressure drop through piping, ductwork, equipment, and components. A Subcontractor, certified by AABC or NEBB and independent of the Contractor, will be required to perform testing, adjusting, and balancing work.

A.11 HVAC SYSTEMS COMMISSIONING

The Contractor will provide basic commissioning of HVAC equipment and controls as required by the State of Tennessee High Performance Building Requirements.

A.1 PLUMBING GENERAL

Plumbing systems will comply with the following minimum requirements:

- International Building Code – 2012
- International Plumbing Code – 2012
- International Fuel Gas Code – 2012
- State of Tennessee High Performance Building Requirements
- University of Tennessee – Division of Facilities Planning – Designer's Manual

A.2 PLUMBING FIXTURES

Acceptable manufacturers for plumbing fixtures will be American Standard, Crane, Kohler, Toto, and Zurn. Preferred items are noted below in parenthesis. Plumbing fixtures will be provided as follows:

- Water closets will be elongated vitreous china, wall-hung, sensor-activated, flush valve type, 1.28 gallons per flush with white open front seats (Zurn Z5615.322.01.91.00).
- Urinals will be vitreous china, wall-hung, sensor-activated, flush valve type, 0.125 gallons per flush (Zurn Z5798.236.00).
- Lavatories will be vitreous china, self-rimming type, with sensor-activated centerset faucet, 0.5 gpm flow control, and grid strainer (Zurn Z5344.714.1.07.86.0).
- Water fountains will be electric, modular type with in-wall chiller, extended receptors, and bottle filler attachments built in. Fixtures to be barrier-free, UL Listed, NSF approved, and meet Lead Free compliance. Fixtures to include a filtration system as well as energy and water conservation technology. Unit shall be manufactured by Oasis International or equal. Standard finish shall be selected by Facilities Services Project Manager.
- Service sinks will be terrazzo, floor type with grid strainer, rim guard and faucet with hose thread outlet, vacuum breaker and wall brace.
- Break room sinks will be stainless steel, self-rimming, undercounter type with swing spout faucet, and 1.5 gpm flow control.
- Casework-mounted sinks and faucets will be provided by the casework manufacturer.
- Regular showers will be composed of pressure balanced or combination temperature/pressure valves set to prevent full hot, with metal lever handles, and maximum 1.5 gpm adjustable showerheads.
- Handicapped showers will be composed of pressure balanced or combination temperature/pressure valves set to prevent full hot, with metal lever handles, adjustable slidebars, and maximum 1.5 gpm handheld showers with braided hoses.

A.3 DRAINAGE SYSTEMS

Sanitary drain, waste, and vent systems will extend from 5' outside the building to all fixtures and equipment requiring service. Drainage and vent stacks will extend vertically through the roof. The system will be provided with traps, vents, and cleanouts as required by code. Trap primers will be provided for drains susceptible to loss of water seal by evaporation.

Rainwater primary and secondary drainage systems will extend from the roof and gutter drains to 5' outside the building. Cleanouts will be provided as required by code. Drain bodies and horizontal rainwater primary and secondary piping above grade and within heated spaces will be insulated to prevent condensation. Rainwater secondary drainage piping will be routed independent of other drainage systems and discharge above grade at an observable location.

Drainage and vent piping above grade will be hubless, coal-tar coated, service weight cast iron pipe and fittings with heavy duty compression type couplings. Drainage and vent piping below grade will be bell and spigot, coal-tar coated, service weight cast iron pipe and fittings with elastomeric compression joints. Horizontal, above grade rainwater piping will be insulated with flexible fiberglass blanket insulation.

Chemical-resistant waste and vent systems will be provided for all laboratory area sinks, cup sinks, fixtures and equipment requiring service. Drainage and vent stacks will extend vertically through the roof. The system will be provided with traps, vents, and cleanouts as required by code. Drainage will be discharged into a neutralization basin before being discharged into the site sanitary system. Chemical-resistant waste and vent piping above grade will be fire retardant polypropylene with a combination of mechanical and heat-fused joints.

Elevator pits will be provided with sump pumps with the discharge piped to the sanitary system.

A.4 DOMESTIC WATER SYSTEMS

The domestic water service will be located in a mechanical room on the lower level of the building. The water service will be provided with indoor parallel backflow prevention devices in accordance with local code.

The building will be served with a horizontal distribution system to each fixture group and to vertical risers. Isolation valves will be provided at the domestic water entrance, at the base or top of each vertical riser, at each branch to commons areas serving 2 or more fixtures, at each laboratory, and at each wall hydrant or equipment connection. Water hammer arresters will be provided for shock suppression. Water connections for mechanical system make-up will be isolated from the domestic water system by reduced pressure backflow preventers.

Domestic hot water service will be extended from water heaters to the plumbing fixtures and laboratory equipment (if required). Perform life cycle evaluation to compare steam-fired instantaneous, gas-fired and electric type water heaters to serve the building.

Domestic water piping within the building will be type L hard copper with wrought copper sweat type fittings, and joints using lead-free solder. In lieu of soldered joints, UTK may allow pressed joints. Water piping below slabs on grade will be type K soft copper with no joints below slab. Domestic hot and cold water piping will be insulated with fiberglass pipe insulation. Fittings will be insulated with preformed fiberglass fittings finished with glass fabric and vapor barrier mastic.

Reference section 204-Civil + Utilities on page 38 for information regarding water and plumbing on the project site.

A.5 LABORATORY SYSTEMS

Laboratory compressed air and vacuum will be provided to laboratory outlets and fume hoods. Piping will be type L hard copper tubing, precleaned for oxygen service with wrought copper fittings. Joints will be be brazed with 14% silver brazing alloy and continuously purged with nitrogen during brazing operations.

The source of laboratory compressed air and vacuum will be determined during design. Engineer will evaluate new stand-alone equipment versus connection to the existing systems serving the Plant Biotech Building.

A.6 FUEL GAS SYSTEMS

The fuel gas system will provide natural gas at 7" wg from the gas meter outside the building to the water heaters (if required), laboratory outlets, and fume hoods.

Underground piping will be yellow polyethylene with thermal fusion joints. Piping above ground will be schedule 40 black steel with welded or threaded fittings as required.

A.7 PLUMBING SYSTEMS COMMISSIONING

The Contractor will provide basic commissioning of domestic water heating systems as required by the State of Tennessee Sustainable Design Guidelines.

A.1 ELECTRICAL GENERAL

Electrical systems will comply with the following minimum requirements:

- International Building Code – 2006
- NFPA 70-2008, National Electrical Code with Tennessee State Amendments
- NFPA 110-2010, Emergency and Standby Power Systems
- NFPA 780-2011, Installation of Lightning Protection Systems
- ASHRAE Standard 90.1-2010
- State of Tennessee Sustainable Design Guidelines
- University of Tennessee – Division of Facilities Planning – Designer's Manual
- University of Tennessee – Telecommunications Design and Installation Standards
- University of Tennessee - Facility Services - Electrical Specifications

A.2 PRIMARY ELECTRICAL SYSTEM

Primary electrical service to the EESERC will originate from an existing manhole located along the south side of the project site. An existing medium voltage switch is located on the south side of the project site and shall remain, although it could be relocated. Underground concrete-encased duct bank will be used for primary feeder installation. If new manholes are required they will be spaced no further than 500' apart for straight runs. Manholes will be provided with cable racks, pulling irons, sump, and grounding electrode. Medium voltage cables will be single conductor, insulated, thermoplastic jacketed, copper tape shielded, rated for 15000 V 133% insulation level. Conductors will be copper with ethylene propylene rubber insulation. Medium voltage elbows and splices will be furnished. UT will make final terminations to the primary system.

Primary feeder will be routed from existing manhole to pad-mount primary switch. Primary switch will be SF6 gas insulated pad-mount medium voltage load interrupter switch and fault interrupter and arc flash protection. Switch will be located at building exterior adjacent to pad-mount service transformer.

Pad-mounted service transformer will be 3-phase, Envirotemp FR3 liquid-filled, self-cooled, 60 Hz, 65°C rise, with primary voltage of 13200 V delta, secondary of 480Y/277 V wye. Coils will be copper. Pad-mount transformer will be located outside within 50' of EESERC Building.

A.3 SECONDARY ELECTRICAL SYSTEM

Electrical service for the EESERC will originate from pad-mount service transformer. Service to the building will be 480Y/277 V, 4-wire, wye connected, grounded neutral. Secondary feeder will be installed in underground concrete-encased duct bank from pad-mount transformer to secondary service switchboard.

In general loads will be served as follows:

- Fluorescent lighting – 277 V
- Motors 0.5 hp and larger – 480 V, 3-phase
- Receptacles and motors 0.33 hp and smaller – 120 V, single-phase through use of step down transformers.

Service equipment will consist of a low-voltage main-tie-main switchboard. Service switchboard will be front accessible with individually mounted main and group mounted feeder devices. Switchboard bussing will be copper and will be braced for the available fault current. Main and feeder devices will be molded case circuit breakers. Solid state ground fault protection will be provided for main circuit breaker and feeder devices 1000 A and larger. Service switchboard will be provided with integral surge protection device. Service switchboard will be provided with an electronic power monitor, GE Mutilin PQM II-T20CA, to meter multiphase amperes and volts, and power parameters. Meter will be equipped with communications port for connection to campus SCADA network.

Building lighting, receptacle, mechanical equipment loads, and laboratory process loads will be served by separate feeders. Feeder risers will be cable in conduit to supply power to distribution and branch circuit panelboards. Laboratory distribution panelboards will be provided with integral surge protection device. Branch circuit panelboards will be provided on each floor to serve lighting and receptacles on the same floor. Laboratory panelboards will be provided on each floor and located within the laboratories to serve laboratory loads on the same floor. Protective devices in panelboards will bolt-on type circuit breakers. Bussing in panelboards will be copper. Panelboards will have minimum 10% spare circuit breakers plus 20% spaces for future breakers. Six spare 0.75" conduits will be stubbed up above ceiling for recessed panelboards. Dry-type transformers will be provided to serve receptacle and other 120 V loads. Dry-type transformers will be copper wound, 480 delta primary, 208Y/120 V secondary, 220°C insulation, 150°C rise.

Solid State ground fault protection will need to go on main circuit breaker and feeder devices 100A and larger, at 480V , 3ph (this requirement should not apply to emergency systems as per NEC 2008

Building Lighting, receptacle, mechanical equipment and laboratory process loads shall be able to be metered separately and individually.

Wiring will be insulated conductors installed in raceways. Conductors will be copper with type THWN/THHN or XHHW insulation. Conductors for power wiring will be minimum #12 AWG and a maximum of 500 kcmil. Separate neutral conductors will be provided for each branch circuit phase conductor.

Raceways will be minimum 0.75" for power and communications. In general, electrical metallic tubing will be provided for interior wiring installations. Rigid metal conduit will be provided for exposed raceways serving fire pumps and fire pump control equipment and other applications. Flexible metal conduits will be provided for connections to recessed luminaires, motors, dry-type transformers, and electrical equipment subject to movement or vibration. Liquidtight flexible metal conduits will be provided for connection to equipment exposed to rain or spray and fire pumps. Cable trays will be provided to form a system that interconnect all telecommunication rooms and extends throughout corridors and work areas.

Electrical systems, circuit and equipment will be grounded and bonded. The maximum resistance of electrical systems to ground will be 5 ohms. A green identified grounding conductor will be installed in raceways with phase conductors.

A lightning protection system will be provided and will be the concealed type installed with UL lighting protection inspection certificates.

Provisions will be made to accommodate a campus master clock system within the EESERC. Power for head end equipment and empty raceways to future roof mounted antennae will be provided to serve campus Primex wireless master clock system.

A.4 LIGHTING

Generally, interior lighting will be fluorescent type. Fluorescent luminaires will be provided with 3500K T8 lamps with electronic type ballasts. Dimmed fluorescent luminaires will be provided with Lutron Ecosystem electronic addressable ballasts. Illumination levels for work surfaces will be provided in accordance with IESNA recommended illumination levels.

In general, the following luminaire types will be provided:

- Enclosed offices: linear direct/indirect fluorescent systems.
- Open offices: linear direct/indirect fluorescent systems.
- Laboratories: linear direct/indirect fluorescent systems and recessed acrylic lensed luminaires.
- Lobbies and corridors: compact fluorescent downlights and architectural pendant-mounted fluorescent luminaires.
- Conference rooms and training rooms: recessed direct/indirect lighting systems.
- Classrooms: linear direct/indirect fluorescent systems and recessed direct/indirect lighting systems.
- Conference Center: linear direct/indirect fluorescent systems and recessed direct/indirect lighting systems.
- Mechanical and electrical rooms: industrial type fluorescent luminaires.
- Toilets: fluorescent downlights, linear fluorescent cove, and architectural fluorescent wall-mounted luminaires.
- Means of egress: LED edge-lit exit signs.
- Exterior area lighting: UT campus standard lamppost with induction lamp and full cut-off reflector.
- Exterior building lighting: wall-mount HID full cut-off luminaires and building mounted architectural luminaires at main entries.

Interior spaces will be provided controls for automatic lighting shut-off in accordance with ASHRAE Standard 90.1-2007. Automatic lighting shut-off controls will consist primarily of ceiling-mounted occupancy sensors with local vacancy override switch. Mechanical and electrical rooms will be provided with digital timer wall switches. Lighting within 15' of glazed exterior walls will be provided with daylight responsive dimming controls including dimming ballasts and photosensors. Interior office spaces will be provided with multi-level 50%/100% lighting controls. Architectural preset lighting control systems will be provided for classrooms, conference rooms, and the Conference Center. Fluorescent dimming and daylight control systems will be Lutron Ecosystem. Exterior lighting will be controlled by photocell, timeclock, and contactors.

A.5 EMERGENCY POWER SYSTEM

The emergency power system will include an engine-generator set, automatic transfer switches, remote annunciator, and accessories to automatically supply power during a utility power failure. Engine-generator set will be provided with a diesel-fueled engine with unit-mounted radiator. Generator will be 480Y/277 V, 3-phase, 4-wire, synchronous type with permanent magnet pilot exciter. The engine-generator set will be located at the building exterior in a weatherproof, acoustically-treated enclosure with a sub-base fuel tank sized to provide 48 hours of runtime at full rated load. Acceptable engine-generator manufacturers will be Caterpillar, Cummins, and Generac. Automatic transfer switches will be open transition type 4-pole switched neutral.

Generator exhaust piping will be extended to building roof and provided with expansion joints, anchors and guides to accommodate pipe expansion and contraction. Piping will be seamless schedule 40 black steel with welded or flanged fittings. Piping will be insulated with calcium silicate pipe insulation.

Emergency and standby power system loads:

- Egress lighting and exit lights.
- Fire detection and alarm systems.
- Fire protection systems.
- Elevators (arranged for operation of one per group on emergency).
- Lighting and receptacles in generator and main electrical rooms.
- Public safety communication systems.
- Sump pumps.
- Fume hood exhaust fan systems.
- DDC system.
- Automatic doors for handicap door operators.
- Lighting, receptacles, and outlets serving telecommunication equipment rooms.
- Receptacles in laboratories.
- Environmental rooms.
- Biological safety cabinets.
- Freezers.

A.6 FIRE PUMPS

Fire pumps will be served from two sources, a dedicated service connection from the pad-mount service transformer and from the emergency power system. Supply conductors will be kept independent of all other wiring and will be routed outside the building. Supply conductors will connect to a listed fire pump combination controller and transfer switch.

A.8 PHOTOVOLTAIC SYSTEM

The installation of a photovoltaic system on the roof will be considered in order to provide on-site renewable energy. Additional study will be performed in subsequent design phases.

A.9 COMMUNICATION SYSTEMS

A complete telecommunications system (equipment, equipment racks, cabling, duct banks, conduits, pathways, equipment rooms, work area outlets, wireless LAN, area of refuge system, etc.) will be furnished and installed per UT Telecommunications Design and Installation Standards.

Telecommunications service to the EESERC will originate from the main communications room of the Biosystems Engineering & Soil Science (BESS) building. The telecommunication copper and fiber optic cables will be connected to the existing service within BESS. Underground concrete-encased duct banks will extend from BESS to the existing manhole, located on the east side of project site, and from the existing manhole to the MDF room located within the EESERC..

Exterior pole-mounted site emergency phones will be provided.

A.10 SECURITY SYSTEMS

Electronic security systems will include an integrated system of intrusion detection, access control and alarm monitoring, and video surveillance. Building exterior entry, classrooms, conference rooms, auditoriums, and computer lab doors will be provided with electric strikes with access control and alarm monitoring. Video surveillance will be provided at building main entrances and exits. Final connectivity and programming will be by UT Facility Services.

A.11 ELECTRICAL SYSTEMS COMMISSIONING

The Contractor will provide basic commissioning of lighting controls systems as required by the State of Tennessee Sustainable Design Guidelines.

A.1 FIRE ALARM GENERAL

Fire alarm systems will comply with the following minimum requirements:

- International Building Code – 2006
- NFPA 70-2008, National Electrical Code with Tennessee State Amendments
- NFPA 72-2002, National Fire Alarm Code
- NFPA 101-2003, Life Safety Code
- University of Tennessee – Division of Facilities Planning – Designer's Manual

A.2 DESIGN CRITERIA

A new fire alarm will be installed to serve the EESERC. The system will be a supervised, local protective signaling system employing multiplex communication and individually addressable initiating devices. Acceptable manufacturers will be EST and Simplex.

Cardax interface equipment will collect data from the fire alarm system and connect to the central alarm reporting station at the University of Tennessee Police Department.

A.4 CONTROL EQUIPMENT

Control equipment will be modular in construction, UL listed, and housed in a recessed steel cabinet. Operating voltage will be 24 V DC. Standby power will be furnished by a 4-hour self-contained emergency battery power supply.

The main fire alarm control panel will include solid state construction, plug-in modules and dead front construction. Signaling line circuits and initiating device circuits will be arranged so that the number of connected devices does not exceed 80% of circuit capacity. The fire alarm annunciator will be an LCD display with minimum 80 character capacity.

Speaker circuits will be selectable for 1-way transmission of voice instructions. The circuit selector panel will be mounted adjacent to or integral with the CPU and will include individual zone selector switches, an all-call switch, and a microphone with press-to-call button and coil cord.

A.5 ALARM INITIATING DEVICES

Alarm initiating devices will include addressable manual pull stations, monitor modules, duct detectors, heat detectors, and smoke detectors. Addressable monitor modules will be provided for nonaddressable devices including sprinkler water flow switches and valve tamper switches.

Auxiliary functions will be performed by control modules located within 36" of the controls for the equipment to be operated.

A.6 NOTIFICATION DEVICES

Alarm signaling devices will consist of alarm speakers and strobe lights.

A.1 FIRE SUPPRESSION GENERAL

Fire suppression systems will comply with the following minimum requirements:

- International Building Code - 2006
- International Fire Prevention Code – 2006
- NFPA 13-2002, Installation of Sprinkler Systems
- NFPA 14-2003, Installation of Standpipe and Hose Systems
- NFPA 20-2003, Installation of Centrifugal Fire Pumps
- NFPA 24-2004, Installation of Private Fire Service Mains and their Appurtenances.
- University of Tennessee – Division of Facilities Planning – Designer's Manual

A.2 DESIGN CRITERIA

The building will be protected throughout by a combined system of Class I wet standpipes and automatic sprinklers.

Sprinkler piping will be sized by hydraulic calculations. Laboratories, mechanical rooms and storage areas will be classified Ordinary Hazard, Group 1. Other areas will be classified Light Hazard. Hydraulic design criteria will be in accordance with NFPA 13-2002, Paragraph 11-2.3 as follows:

- Light Hazard areas will be designed to provide a minimum density of 0.10 gpm/ft². Maximum area per sprinkler will be 225 ft².
- Ordinary Hazard, Group 1 areas will be designed to provide a minimum density of 0.15 gpm/ft². Maximum area per sprinkler will be 130 ft².
- Minimum design area will be the most hydraulically demanding 1500 ft² for wet systems.
- A simultaneous inside hose demand of 250 gpm will be included for all areas.
- Sprinkler connections on each floor will include a monitored control valve, a flow switch, and a test/drain connection. A drain riser with discharge at the building exterior will also be provided to serve each sprinkler system.

A.3 SYSTEMS

The fire water service will be located in a dedicated room on the grade level of the building. The fire water service will be provided with an indoor, UL-listed, ASSE-approved, reduced-pressure type backflow prevention device. A fire pump will be provided in the same room to serve the building. A fire department siamese connection and a fire pump test header will also be provided at the building. Fire pump controllers will be UL listed for use with electric motor-driven fire pumps and will include the motor starter, power transfer switch, and wye-delta closed transition starting.

Wet standpipes will be located within heated stairwells. Additional standpipes, if required, will be provided so that all portions of all floors are within reach of a 200' hose. Hose thread pattern will match the local fire department pattern.

Sprinklers heads will be commercial, quick response, UL listed type. Sprinklers in areas having ceilings will be semi-recessed pendent design with a white finish and white ceiling cup. Concealed type sprinklers with white coverplates will be used in areas with gypsum board ceilings.

Aboveground piping will be black steel with threaded, grooved, or welded fittings. Piping 2" and smaller will be schedule 40 and pipe 2.5" and larger will be schedule 10. No plain-end fittings, strap-on branch outlets, or couplings employing set screws will be used. Pump suction piping and piping subject to alternate wetting and drying will be galvanized.

Underground piping will be cement-lined ductile iron with mechanical joints. Underground piping will be anchored with concrete thrust blocks and tie rods.

The fire suppression system will be monitored by the building fire alarm system. Monitor points will include trouble and alarm conditions for pump status, waterflow switches, valve monitor switches, and fire department access key (Knox) boxes.

.01 CLASSROOMS

To create consistent standards for instructional technology, all presentation spaces in this project will be programmed to have similar basic AV capabilities. A terminology of “Level 1” through “Level 4”, described below, has been created to assist the core project team in communicating requirements in a shorthand manner. The more specific and detailed programming of each of the administrative, lab and classroom spaces in the building shall be developed during building design. The “Level” structure outlined below will be customized for the new Facility based on each individual application, so that an AV equipment budget that is tailored to the project can be determined. Where indicated below, some equipment will be Owner furnished. This equipment will be referred to as Owner Furnished Equipment (OFE).

LEVEL 1

The Level 1 systems will include only a ceiling-mounted video projector or flat panel display (as appropriate based on room size and visual content requirements) with program playback loudspeakers. The room includes no permanent AV source devices but does include the ability to display portable, OFE devices. AV input plate(s) will be placed at a convenient wall location and/or in a table for laptop or other portable AV source connectivity. A simple wall or tabletop control will allow for switching the display power and input selection as well as program audio volume control.

LEVEL 2

Level 2 represents standard AV system capabilities for typical presentation spaces. These spaces are designed for high-quality local AV presentations and include installed AV displays (a ceiling-mounted video projector or flat panel display as appropriate based on room size); AV source devices; program audio systems; and a multi-input windowing processor, which can display side-by-side presentation sources as a single image. In-room AV sources typically include a presenter’s PC (OFE), a Blu-ray player, Cable TV or satellite tuner, connections for a portable laptop computer (OFE), and auxiliary AV input. Additionally, Level 2 systems will include a digital document camera and the ability to electronically annotate over presentation sources, giving the presenter the ability to use the in-room display device as an electronic whiteboard. The presenter can take a digital “snapshot” of the displayed annotation(s). Audio recording of the session will be included as a feature of the Level 2 spaces.

These rooms will also contain an AV control system interface for connectivity to the environment and room controls (typically provided as part of the GC package), i.e., lights, screens, shades. These rooms may also be audio conferencing (ATC) capable. These rooms may be provided with an ergonomically adaptable lectern that allows the presenter to customize the height and angle of the lectern and annotation interface for better posture, comfort, and less presenter fatigue and/or physical repetitive motion issues.

LEVEL 3

Level 3 systems are appropriate for larger rooms, typically more than 60 people. Level 3 systems are planned to be identical to a Level 2 system with the additional capability for speech reinforcement, an ADA compliant assistive listening system, audience voice lift system, and additional AV inputs for multiple presenters. Additionally, the projection systems for these spaces are typically larger with a substantially higher cost and require special niches, alcoves, or lifts to mitigate the fan noise associated with the larger systems. Often for these larger spaces, two AV displays (projectors or flat panel displays) are installed to maintain optimum sight lines.

LEVEL 4

Level 4 systems are planned to be identical to a Level 2 or 3 system (depending on room size) with the additional capability for installed videoconference/distance-learning capability. These rooms have dedicated cameras, microphones, confidence monitors and associated videoconferencing hardware. These rooms feature enhanced lighting as well as acoustical and camera-friendly room finishes for improving outgoing audio and video quality.

.02 EMERGENCY PHONES

Emergency (Blue) phones shall be provided such that one is visible from all exterior locations on site. The phones shall be provided with an emergency circuit and communications from the new building. The unit shall be CODE BLUE Co. Model No. CB1D-PAS pedestal type with IA4100 phone. Provide concrete base and ground driven rod.

.03 ACCESS CONTROL

All exterior doors shall be provided with access control, connected to the existing campus VOLcard system. Provide head end equipment with power supplies for control in accordance with campus standards. The exterior doors shall have hardwired devices, HID Co. Mode. No. Iclass R40 readers.

.04 VIDEO SURVEILLANCE

A complete video surveillance system shall be installed. Cameras shall be located on the inside and outside of all exterior doors and in common areas. Camera shall be manufactured by the PELCO co.

.05 VOICE + DATA SYSTEMS

A complete data system shall be installed. Fiber optic cabling for data and copper riser cable for voice shall be installed to a network rack(s) on each floor. Horizontal data cabling shall be CAT6 and shall be terminated on RJ45 jacks on each floor. Each office shall be provided with an outlet containing data cable. Outlets with two data cables shall be provided throughout the corridors for wireless access points. Additional outlets shall be provided at appropriate locations in common areas. Provide voice cabling at all offices.

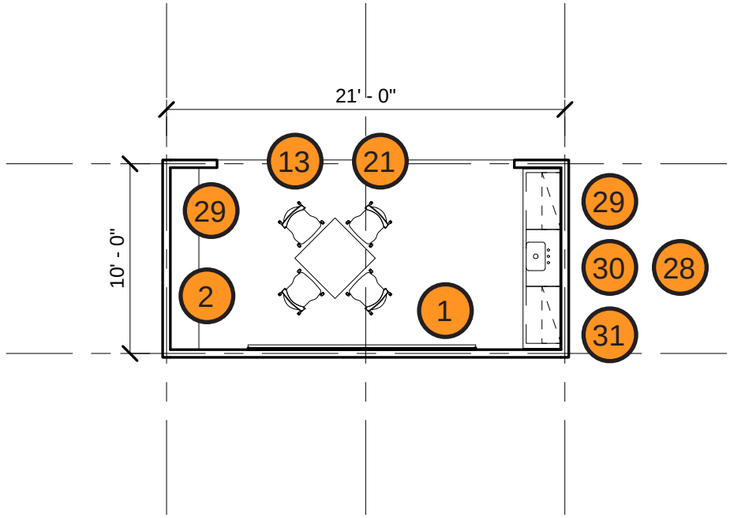
.06 PUBLIC ADDRESS SYSTEMS

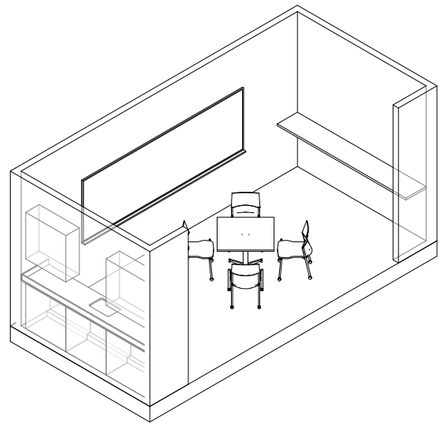
A complete public address system shall be installed. Speakers shall be located in corridors and common spaces on 30’ centers, as well as in the classrooms.

300 space diagrams

This program document was originally prepared in 2013. The 2018 update and revision included strategic space revisions, schedule updates, and and adjusted total project budget. the 2018 update did not include MEP, Civil, Landscape, or Structural consultants updating those respective sections of the program. However, UT Facility Services provided limited updates to those sections.

The following diagrams are conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change. Refer to Appendix sec. 403 Space Requirements for detailed space descriptions



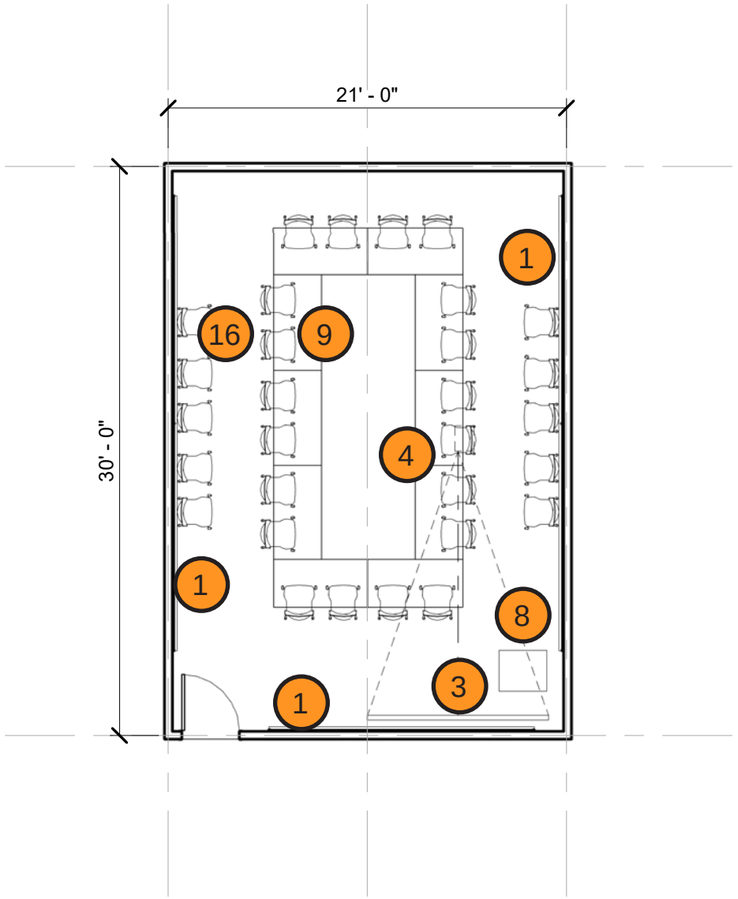


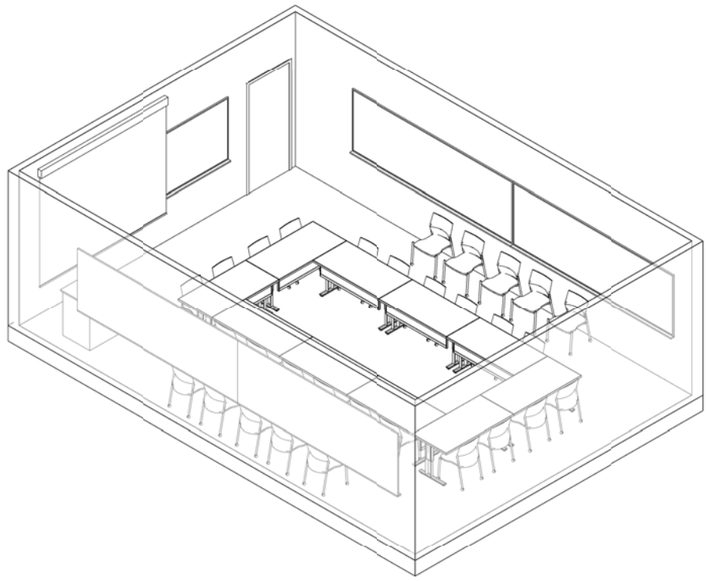
0 4 8 16 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

A-200 | 30 Seat Seminar and Conference Room





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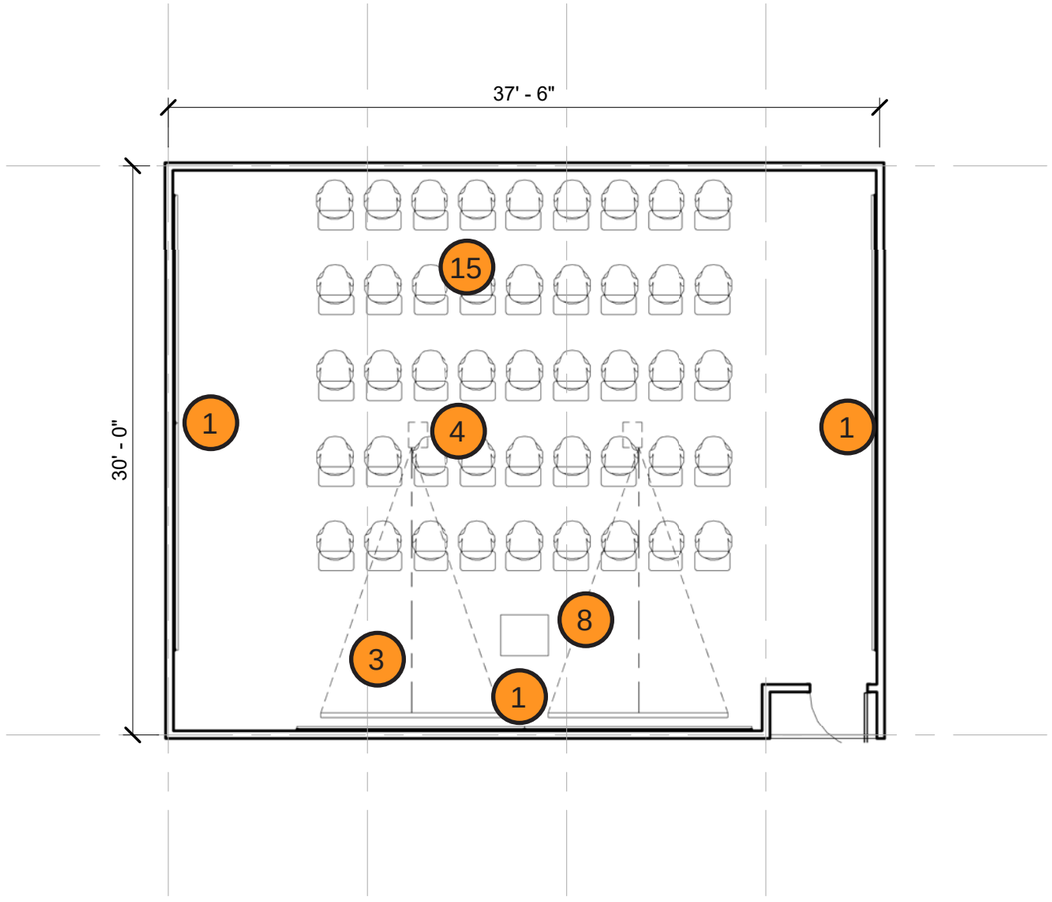
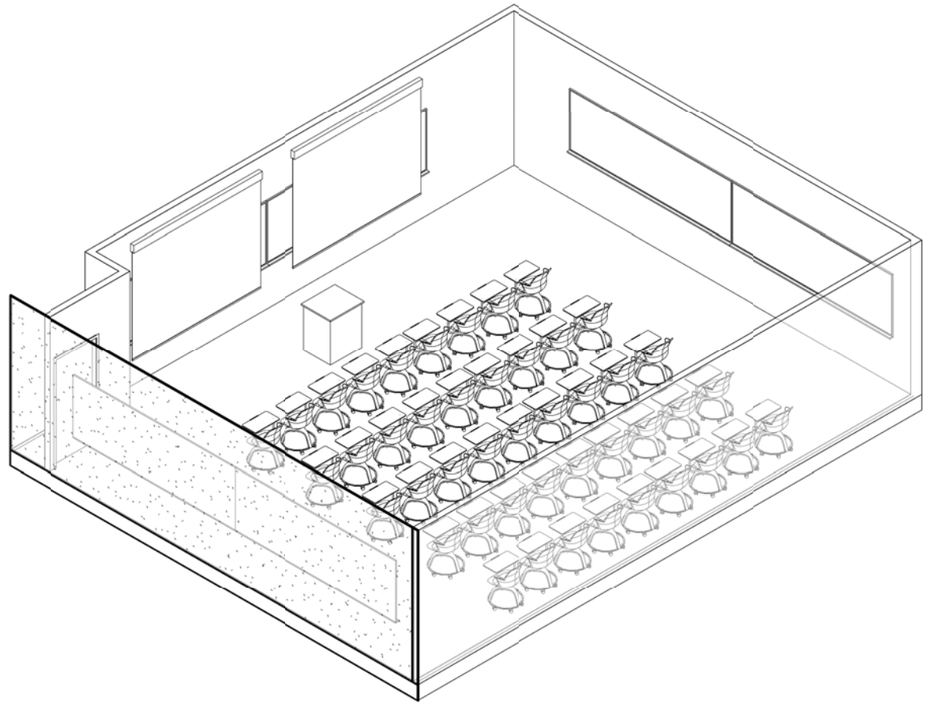
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

A-300 | 45 Seat Classroom





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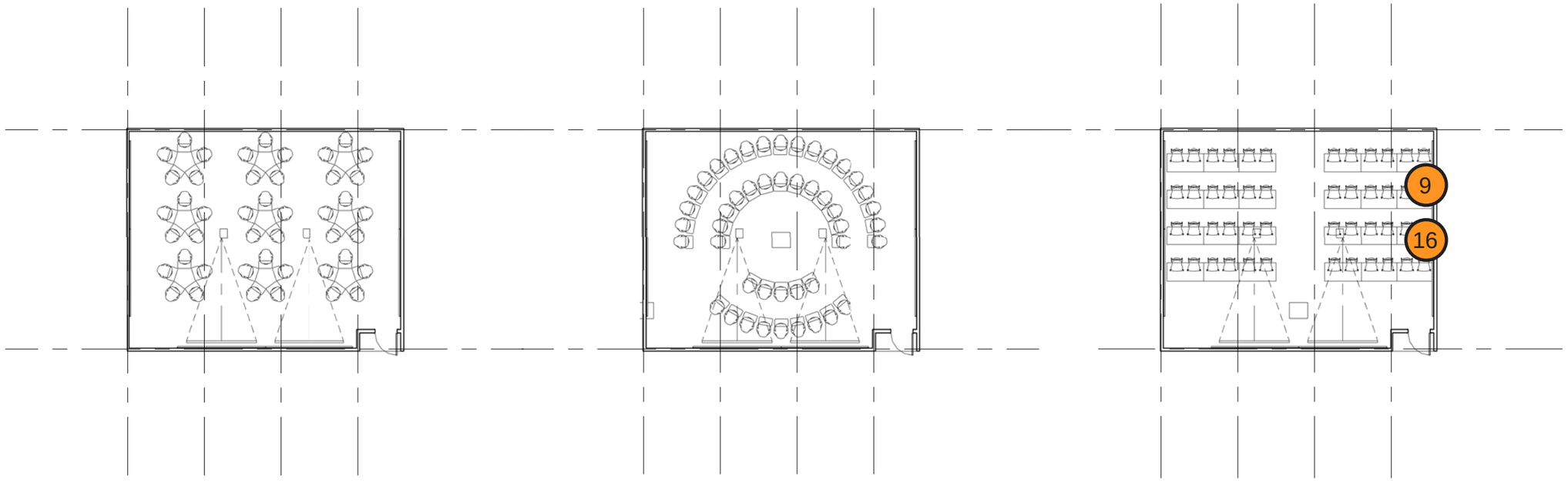
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

A-300 | 45 Seat Classroom Variations



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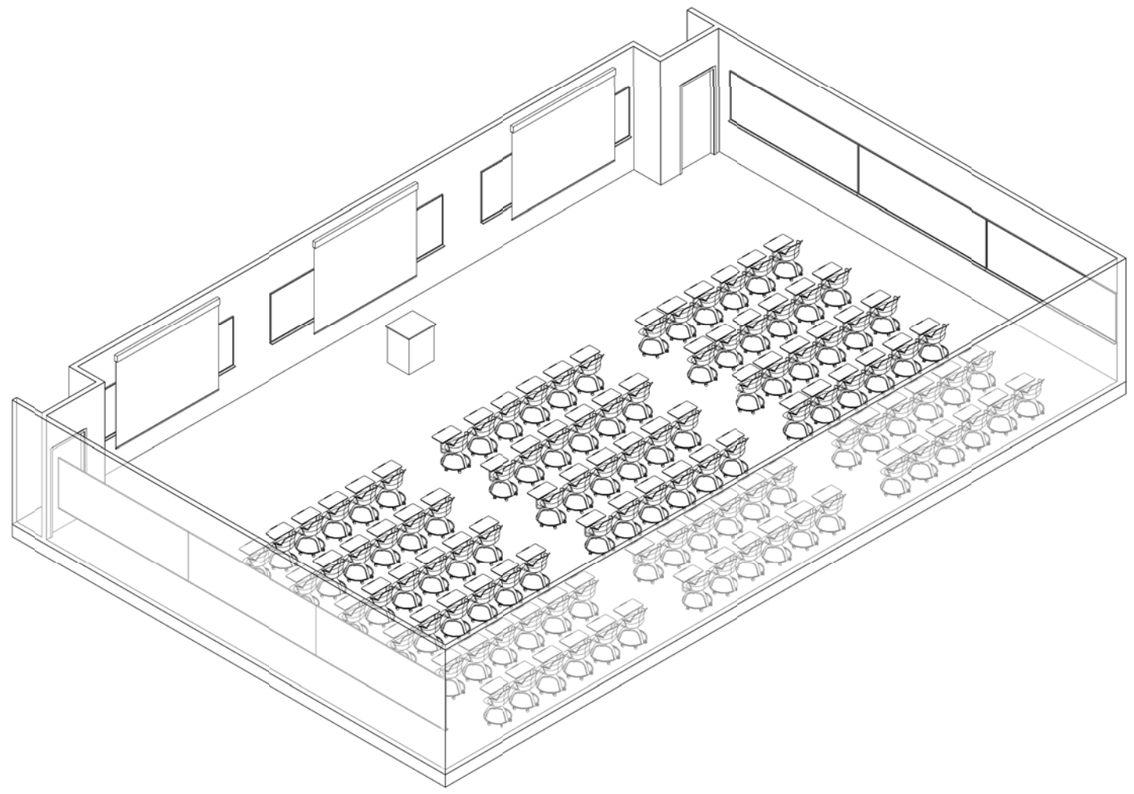
A-400 | 100 Seat Classroom



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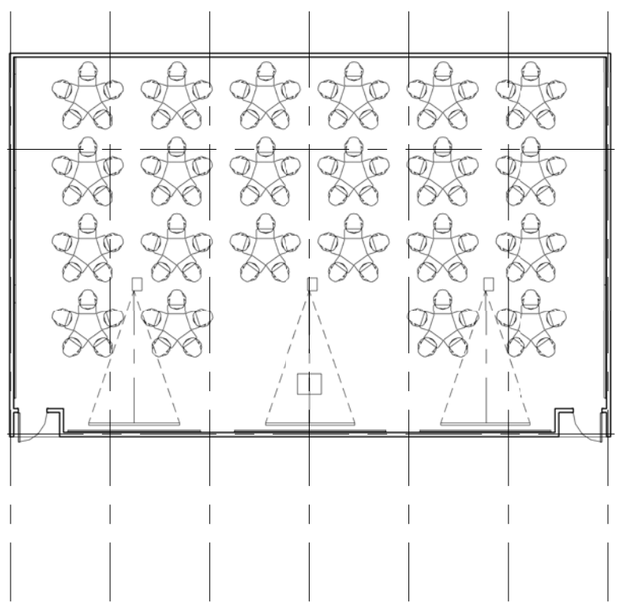
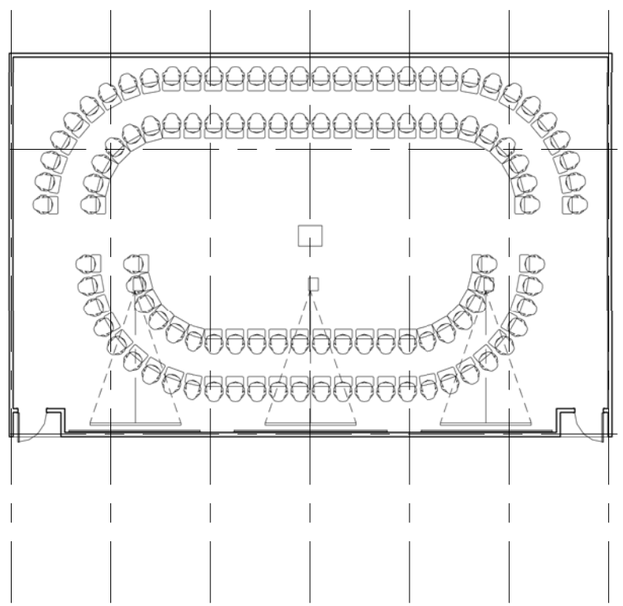
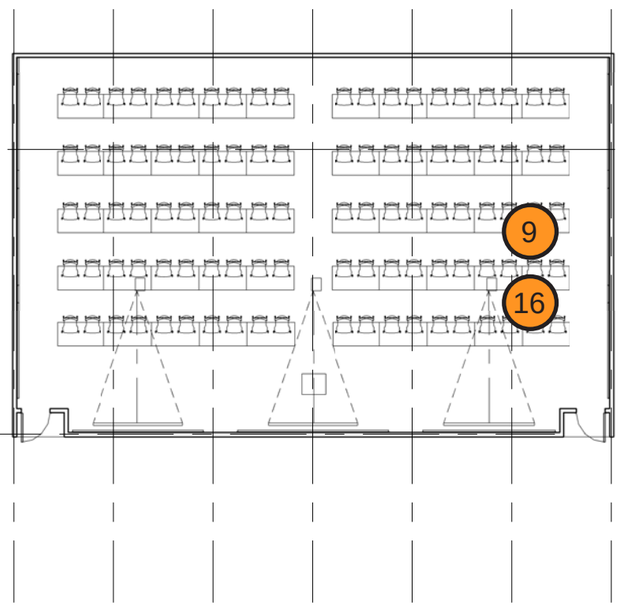
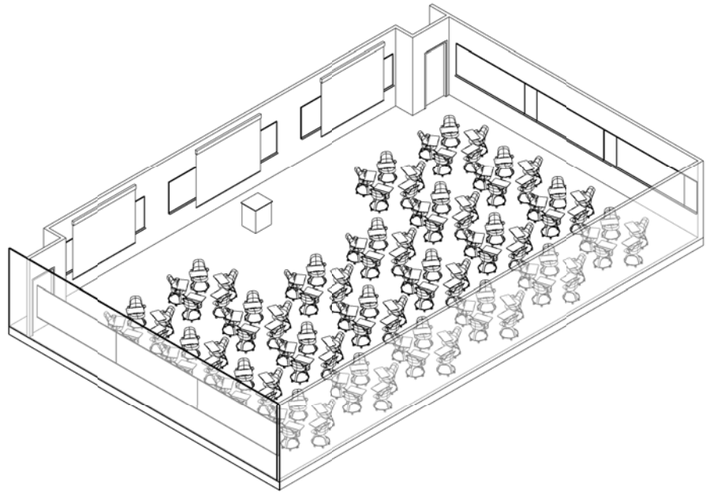
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

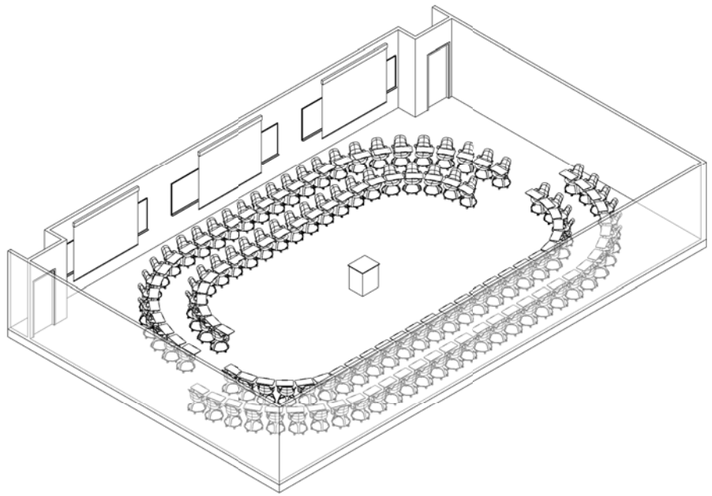
A-400 | 100 Seat Classroom Variations

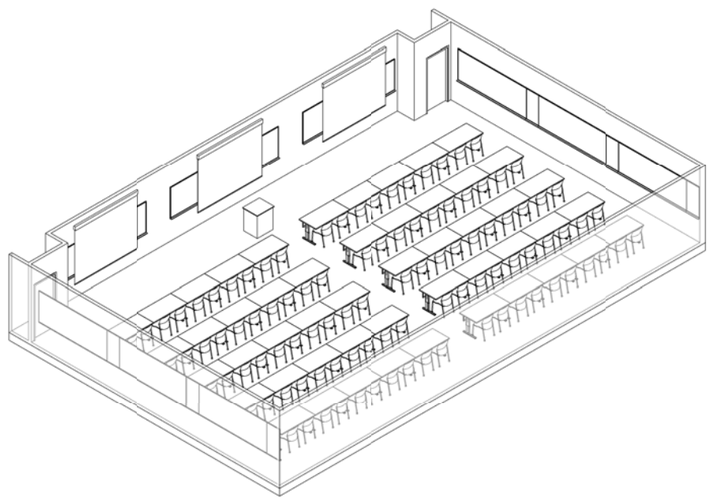






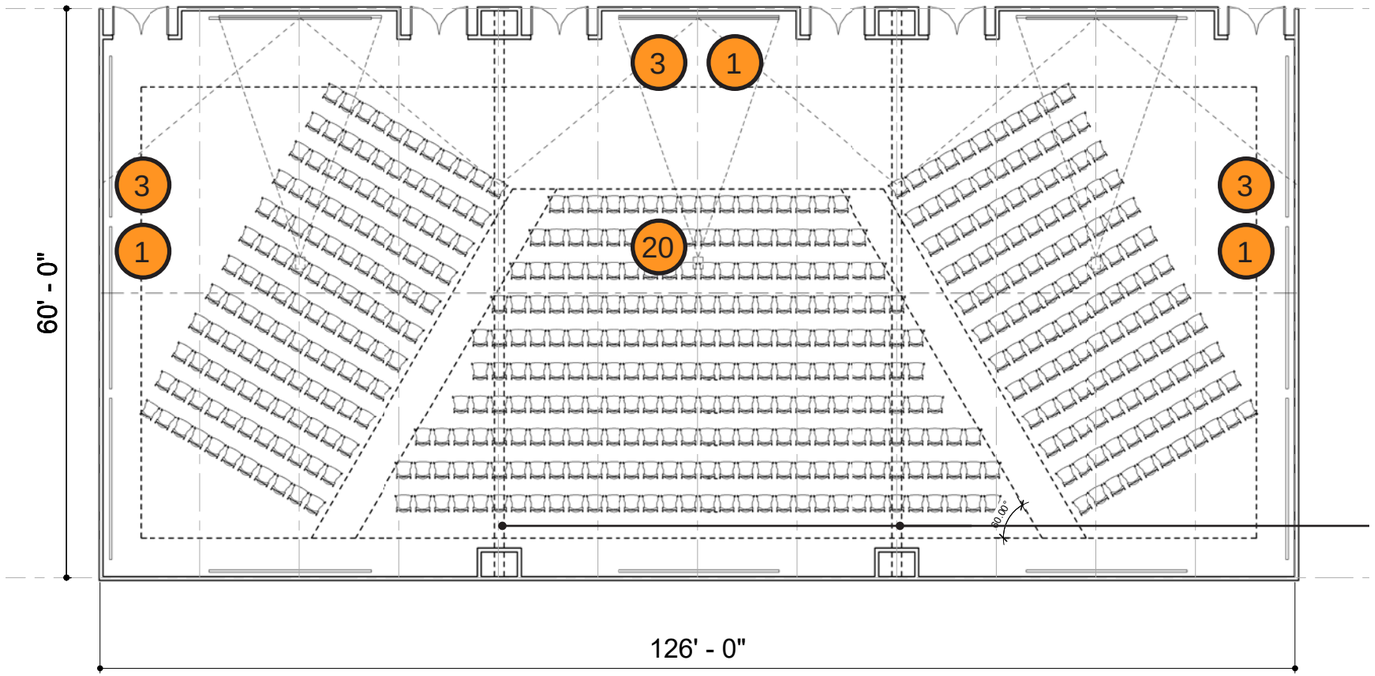


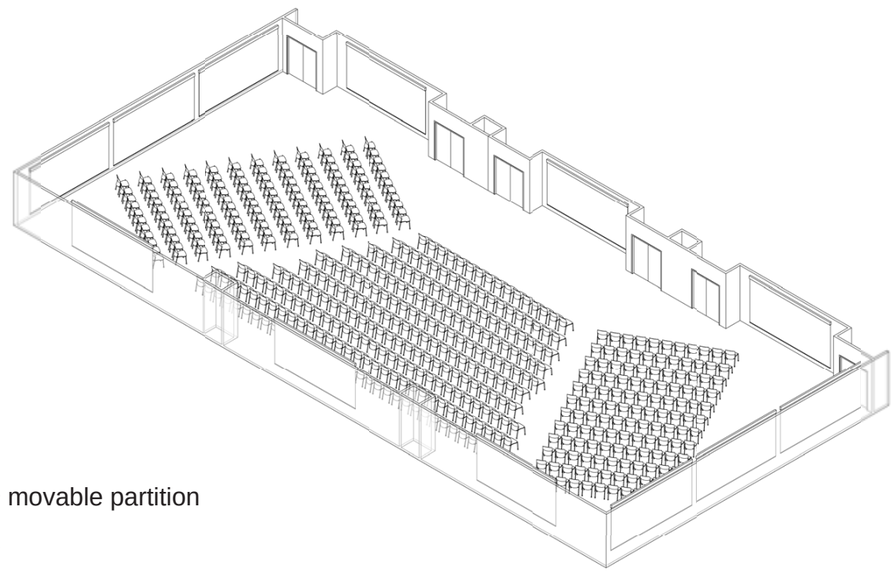




This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.

508 lecture classroom



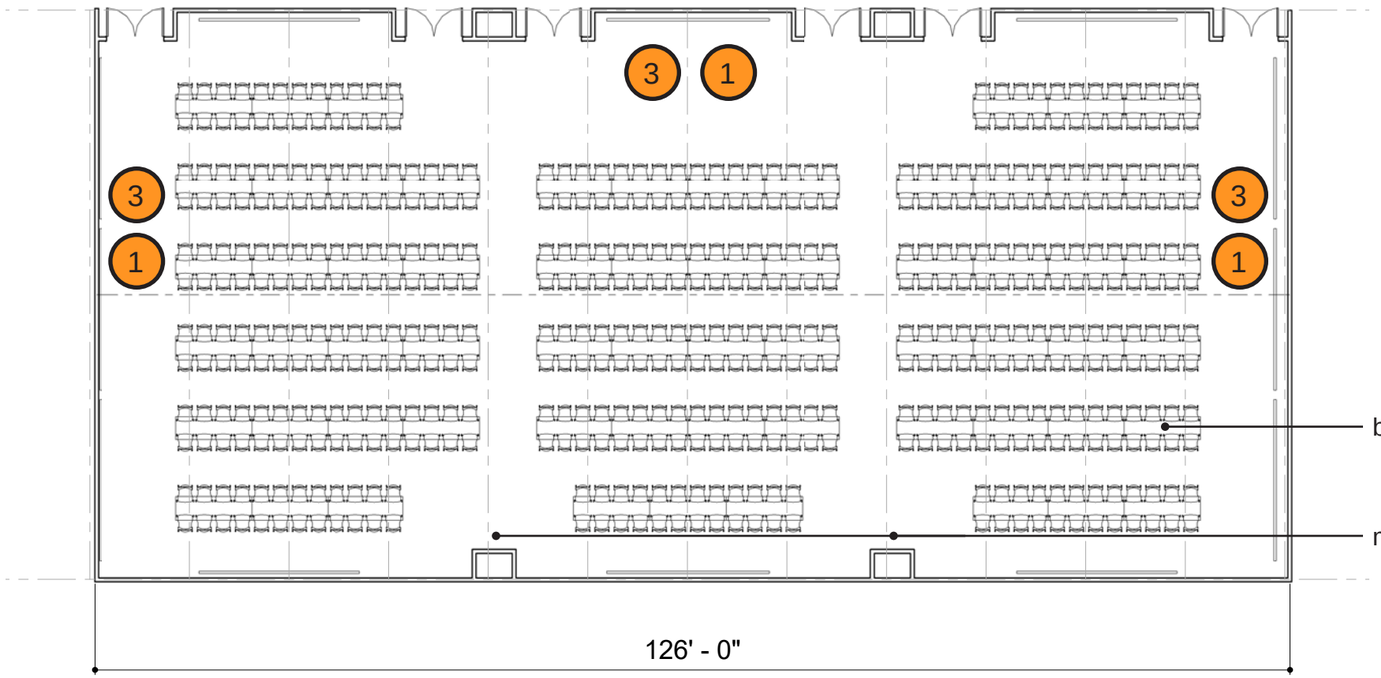


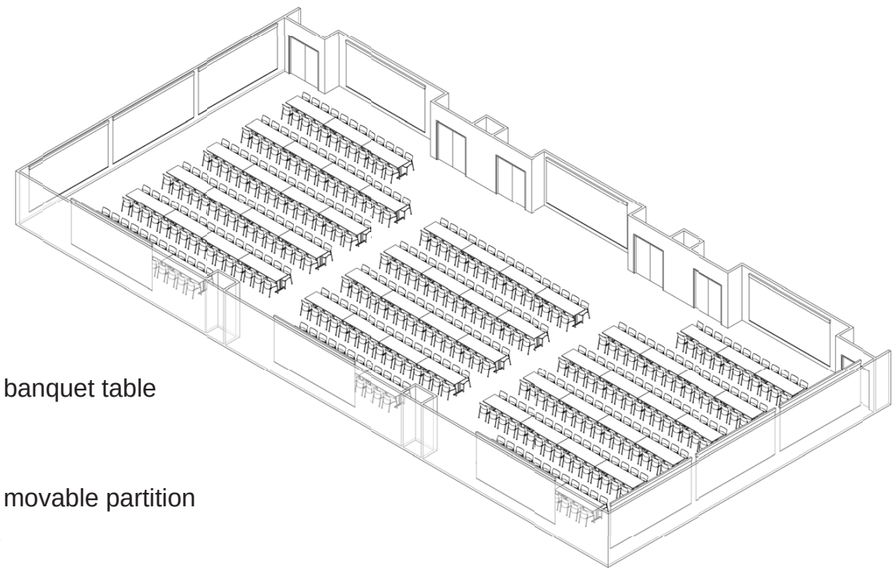
1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

A-500 | 500 Seat Conference Center - Banquet

504 seat banquet





0 8 16 32 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
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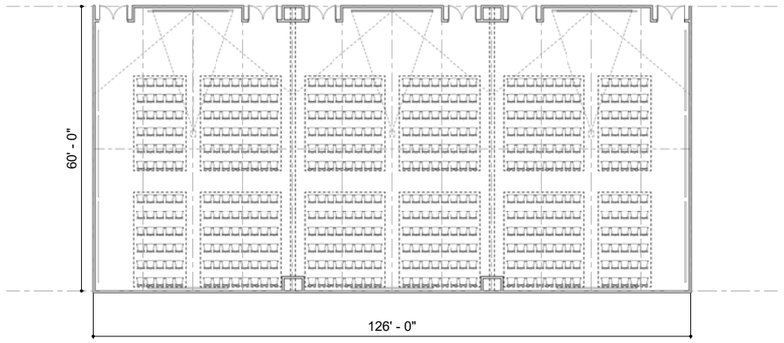
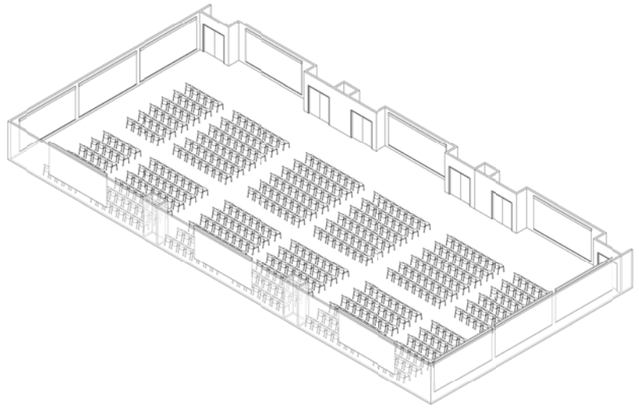
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

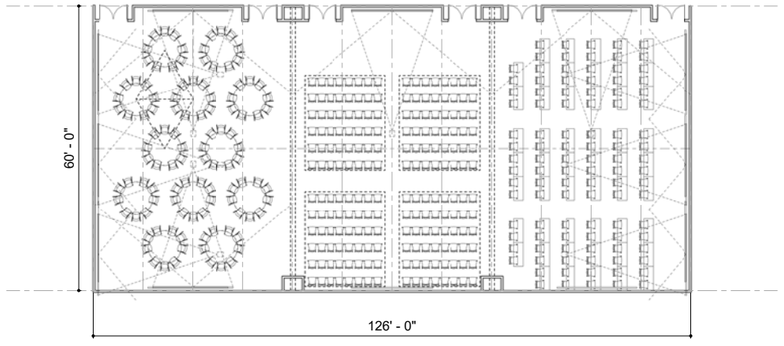
A-500 | 500 Seat Conference Center Variations

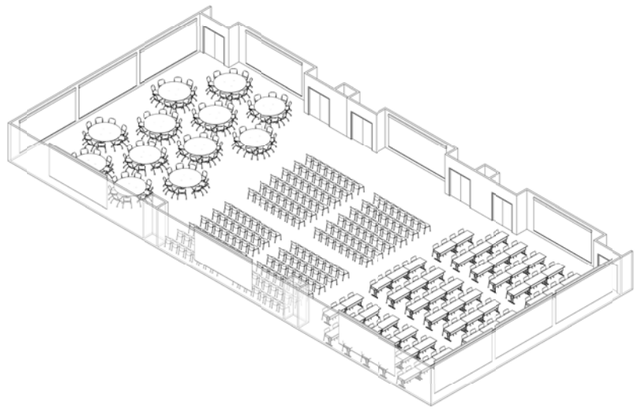
504 lecture classroom



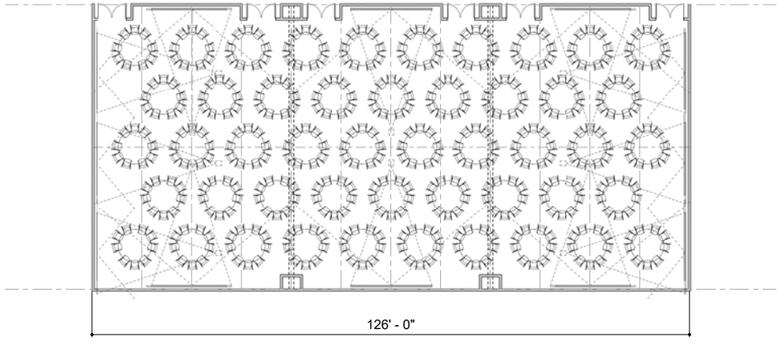


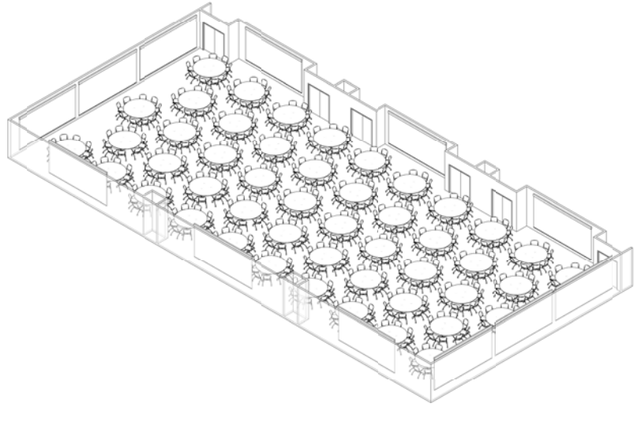
108 TEAL | 192 lecture | 104 Training Table





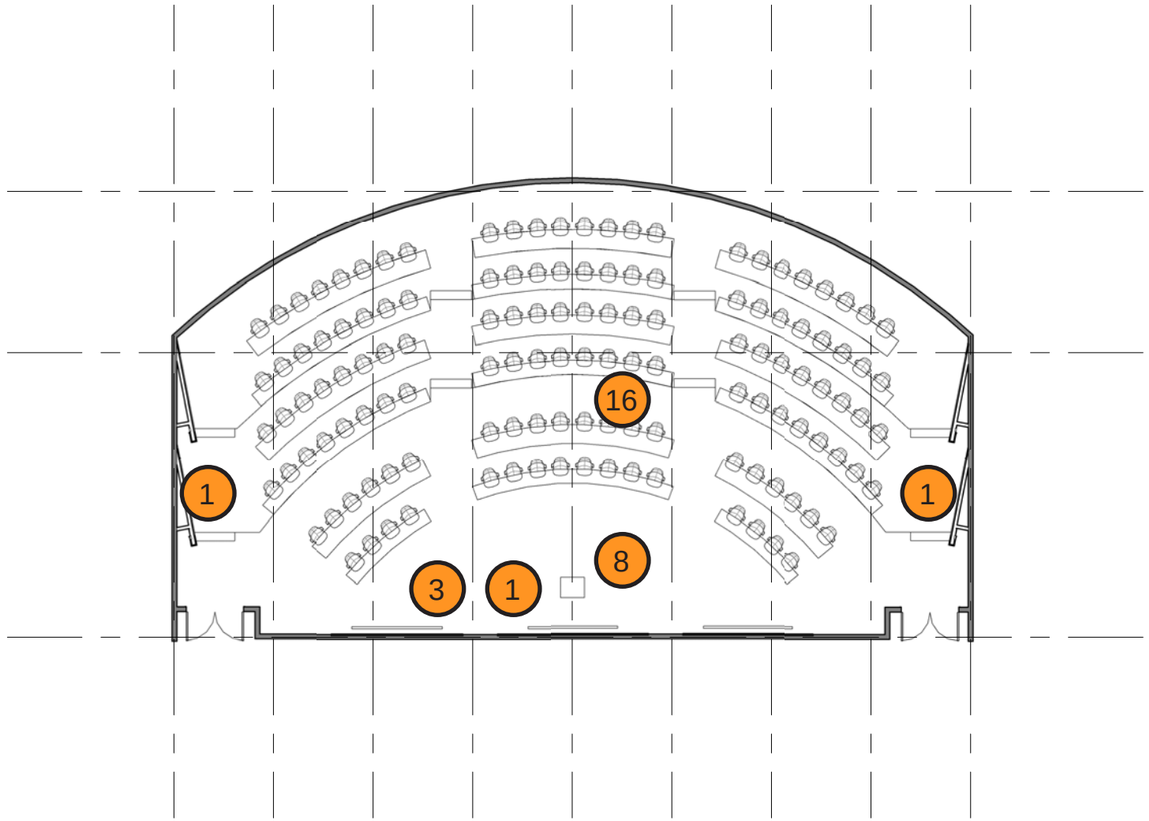
432 TEAL classroom

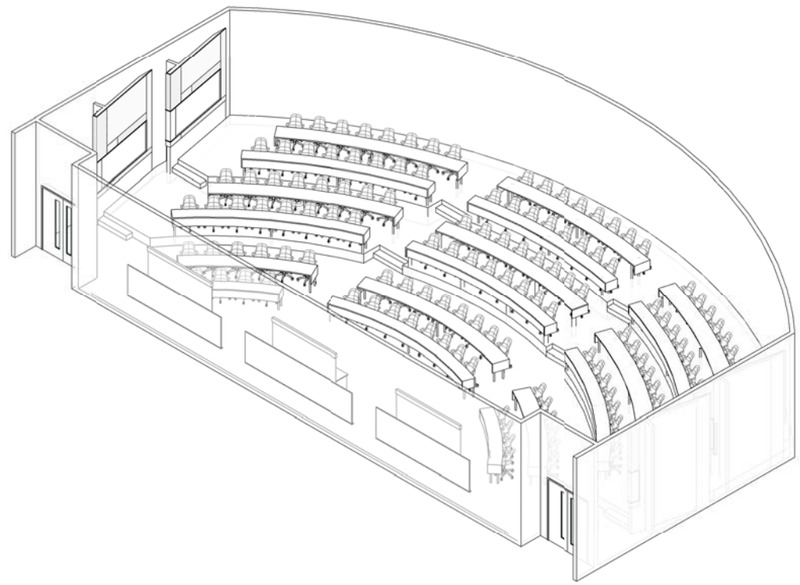




This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

A-600 | 135 Seat Tiered Classroom

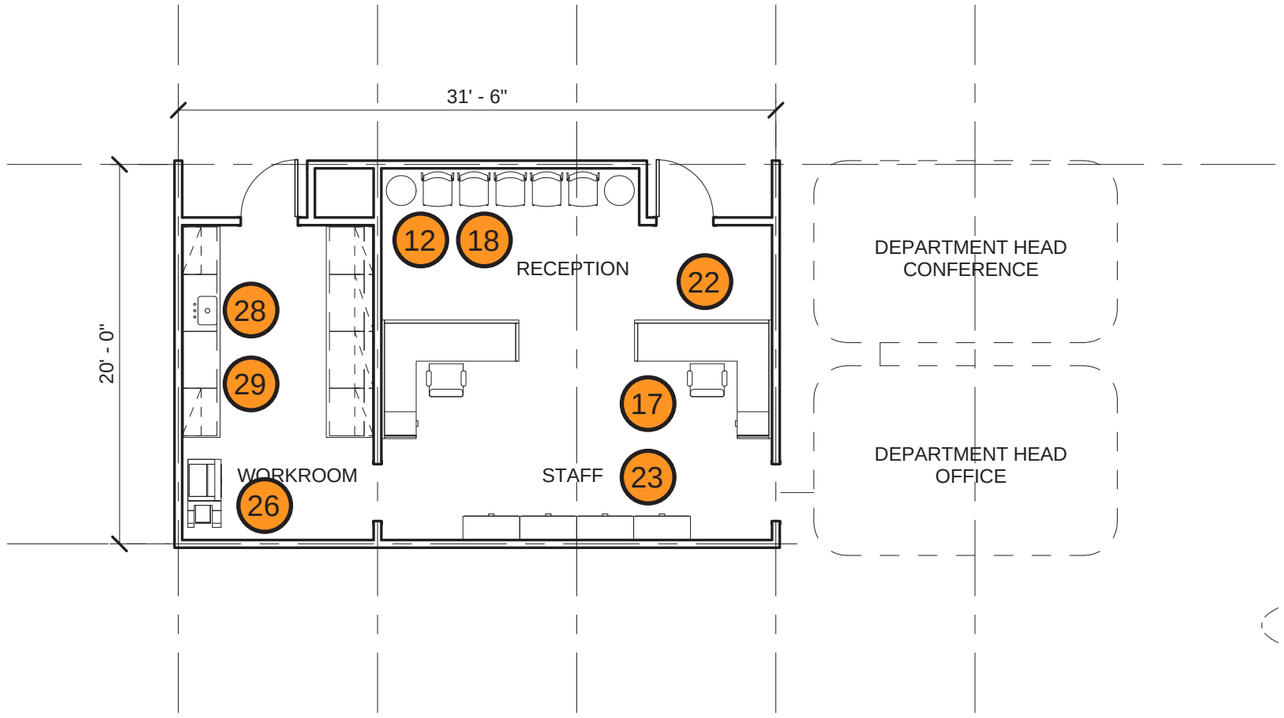


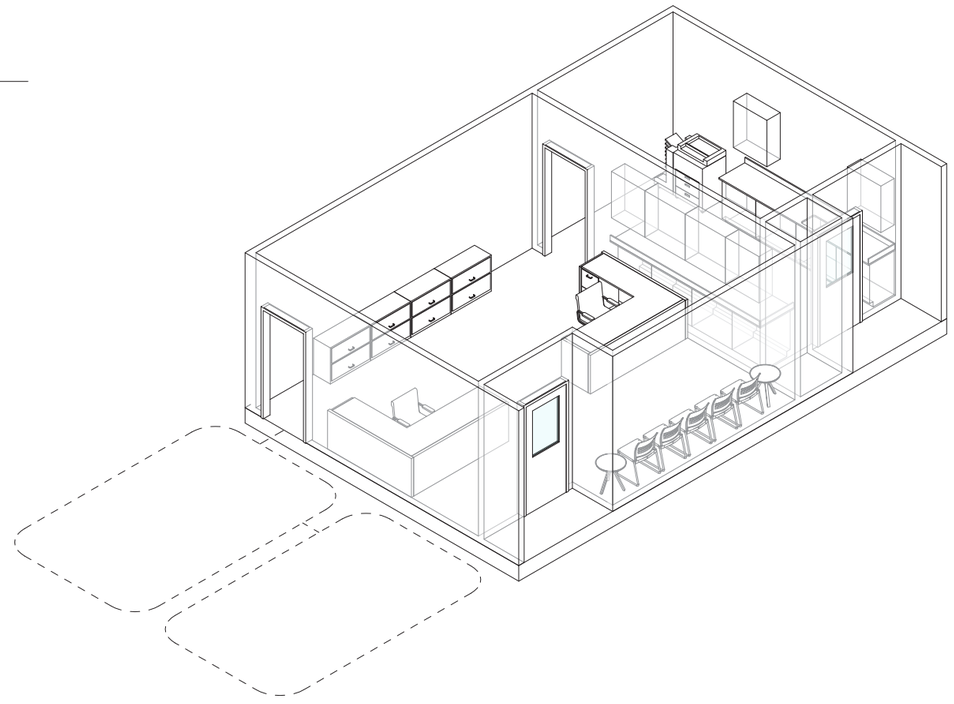


0 8 16 32 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

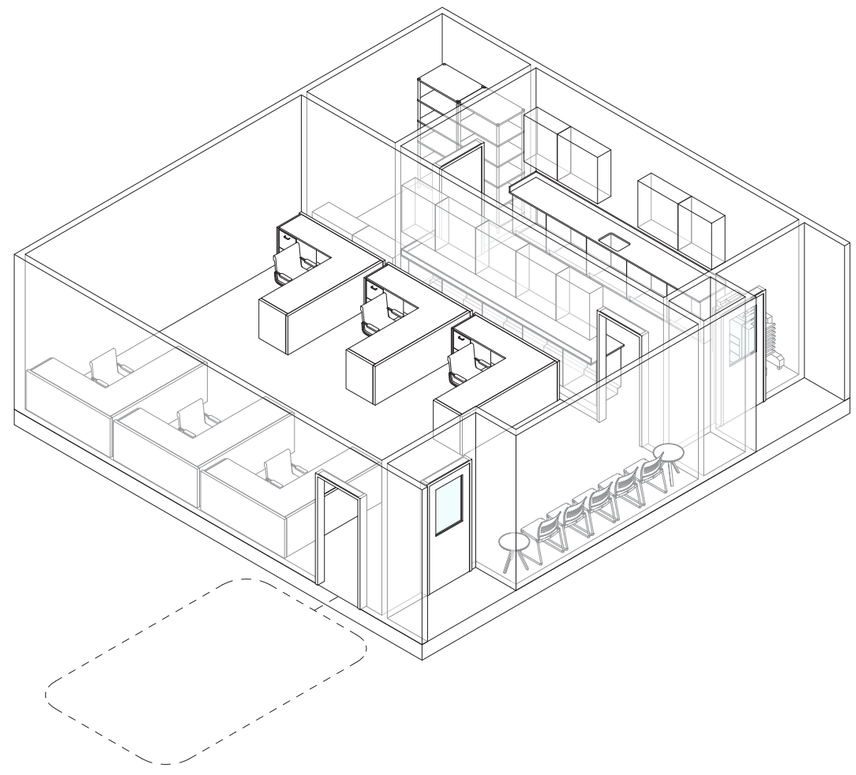




0 4 8 16 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.



1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
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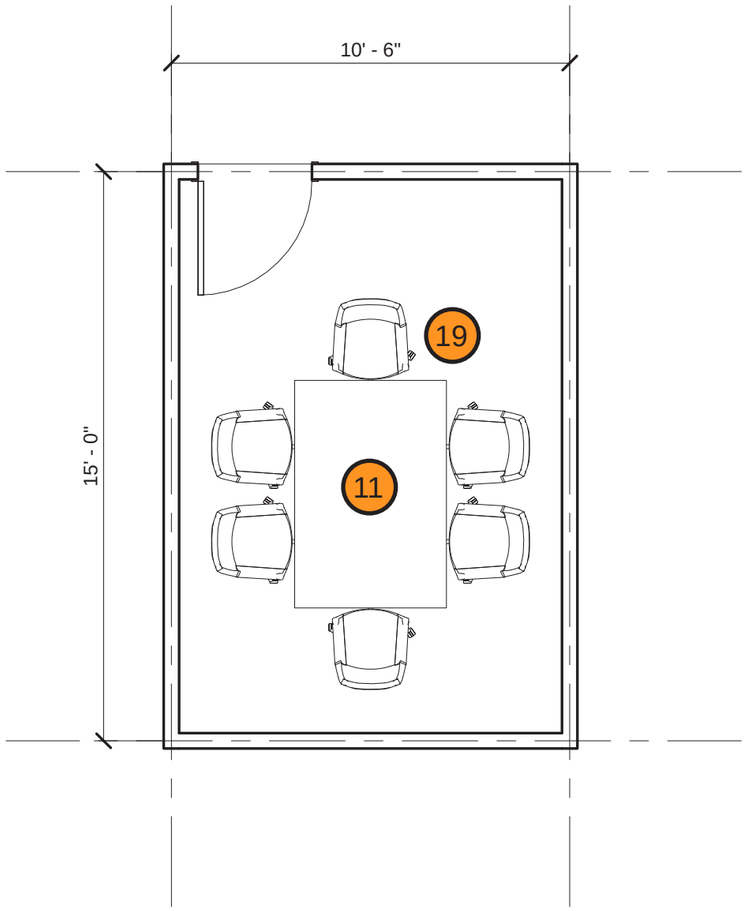
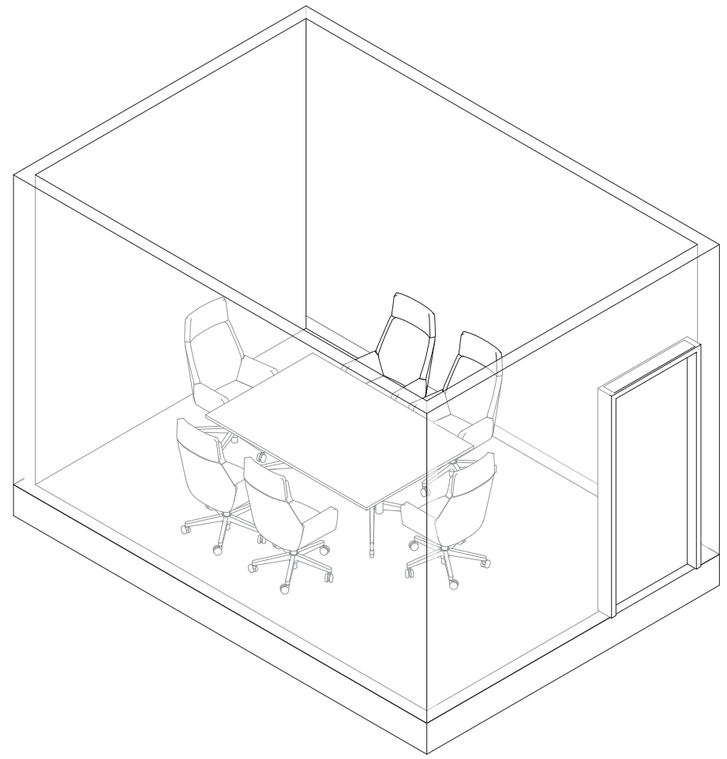
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-200 | Department Head Conference Room



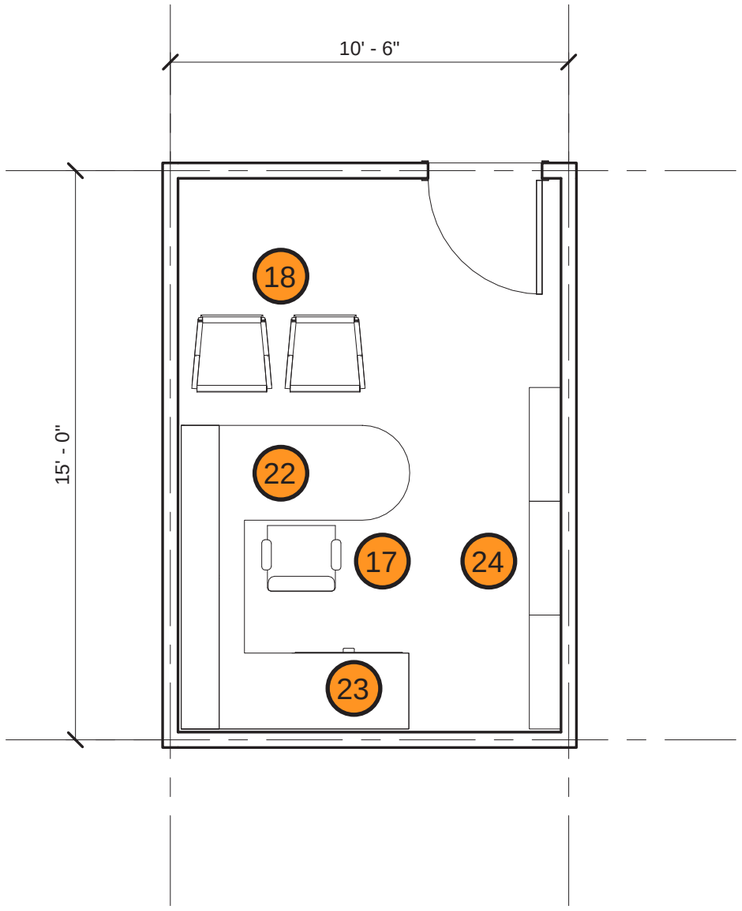


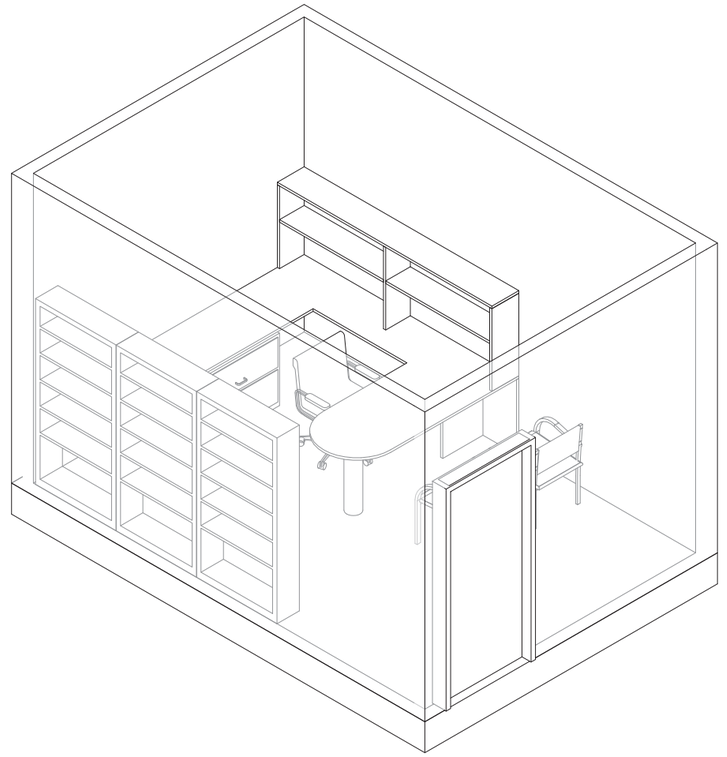
0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-300 | Faculty Office





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
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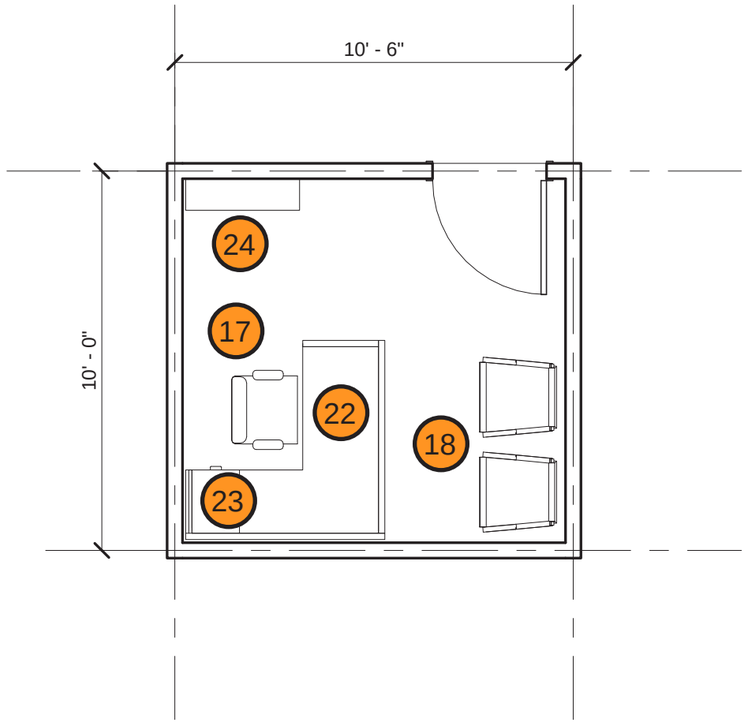
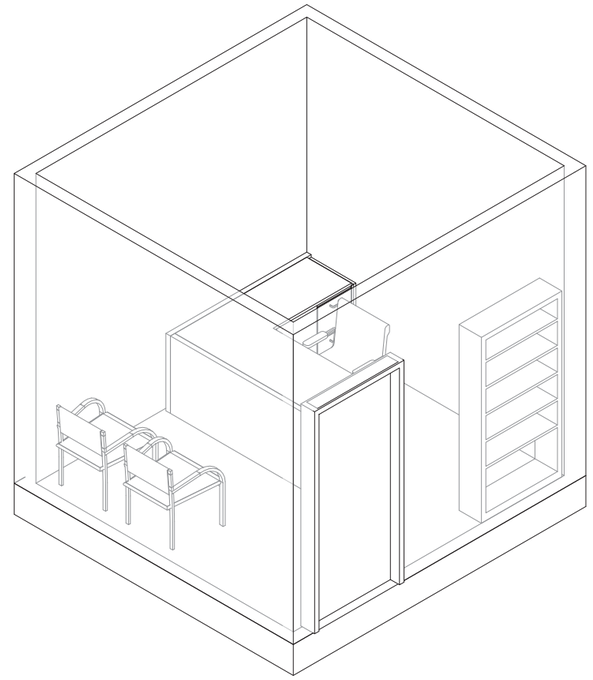
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-400 | Lecturer, Part-Time, Adjunct Office





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
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18. Guest Chair
19. Conference Chair
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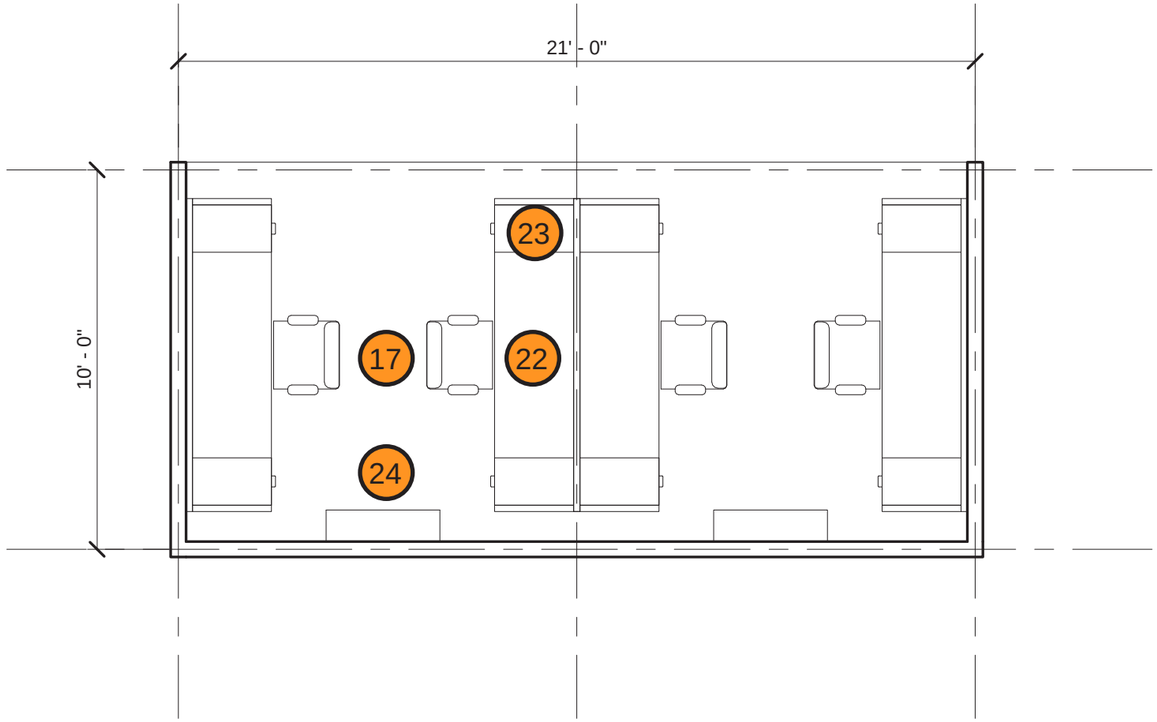
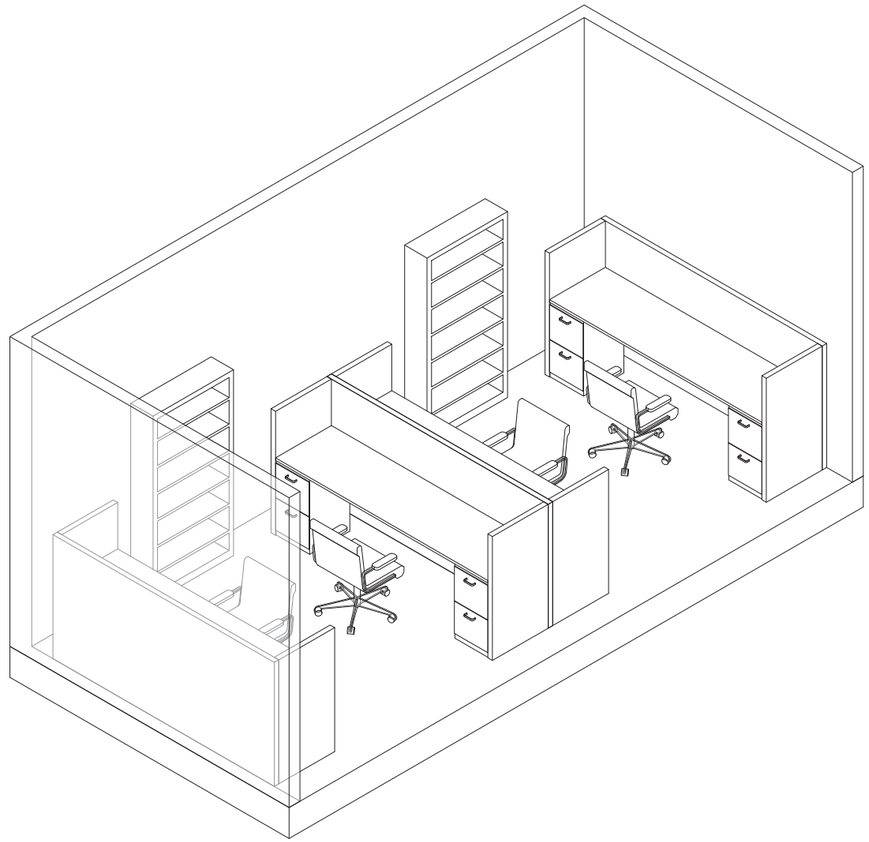
21. Cafe Chair
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-500 | GTA Office





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
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13. Cafe Table
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21. Cafe Chair
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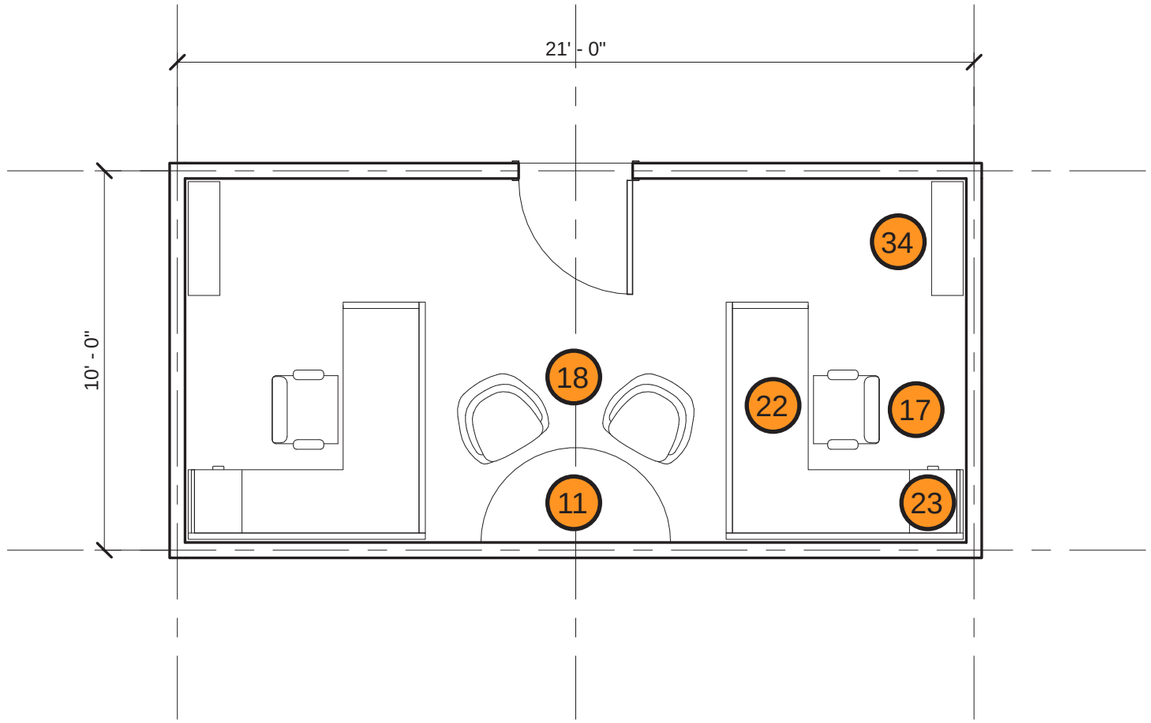
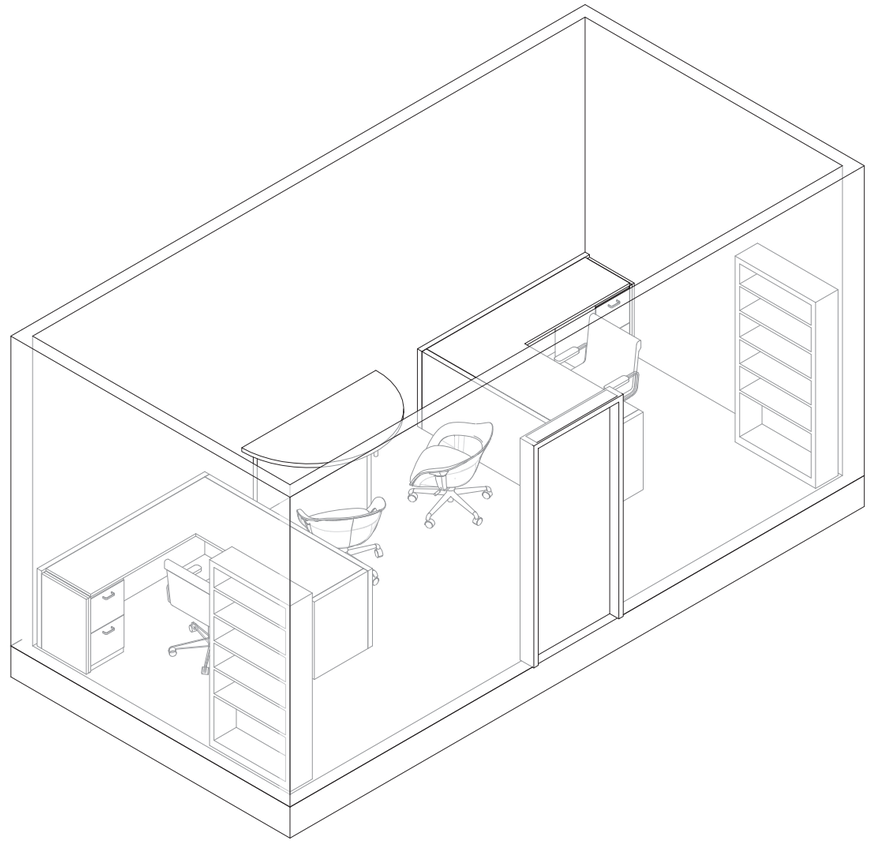
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-600 | UTIA Safety Office





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
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13. Cafe Table
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19. Conference Chair
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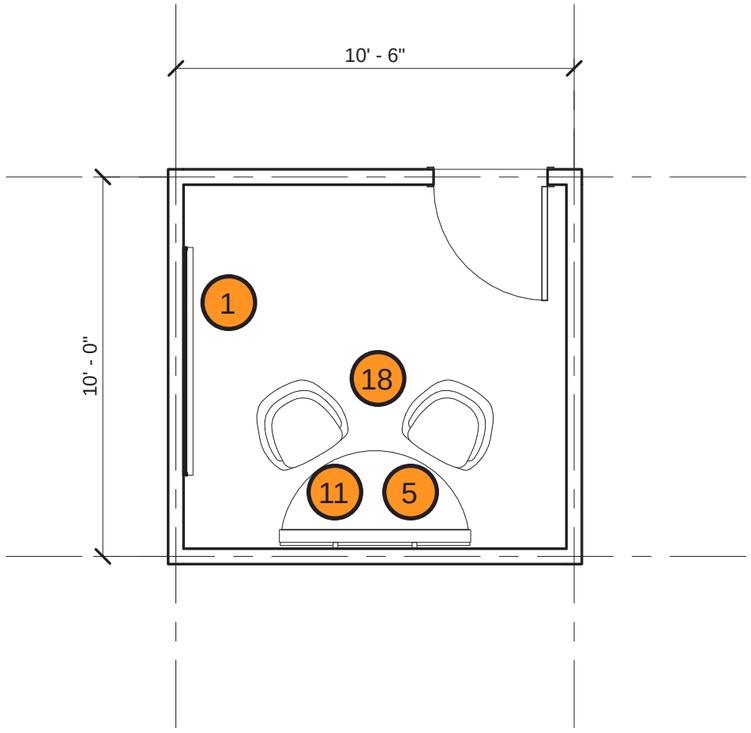
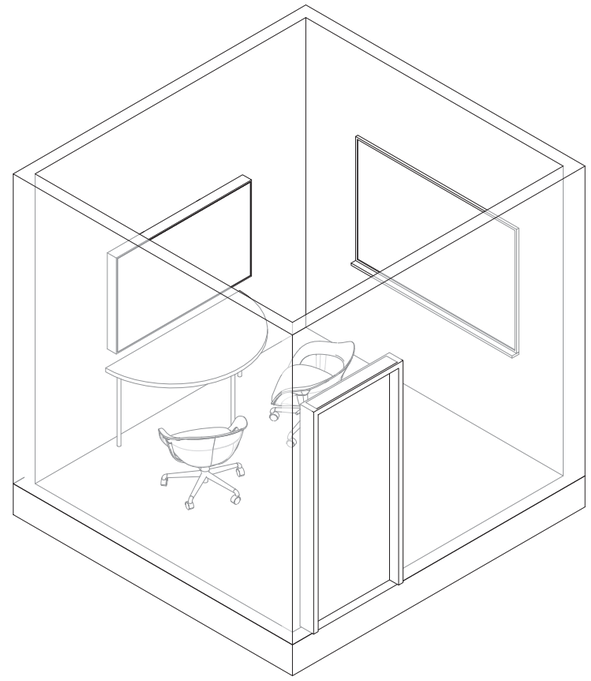
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-700 | Podcast Room and Advising





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
11. Conference Table
12. Side Table
13. Cafe Table
14. Lounge | Soft Seating
15. Tablet Arm Chair - Mobile
16. Student Chair
17. Task Chair
18. Guest Chair
19. Conference Chair
20. Stack Chair
21. Cafe Chair
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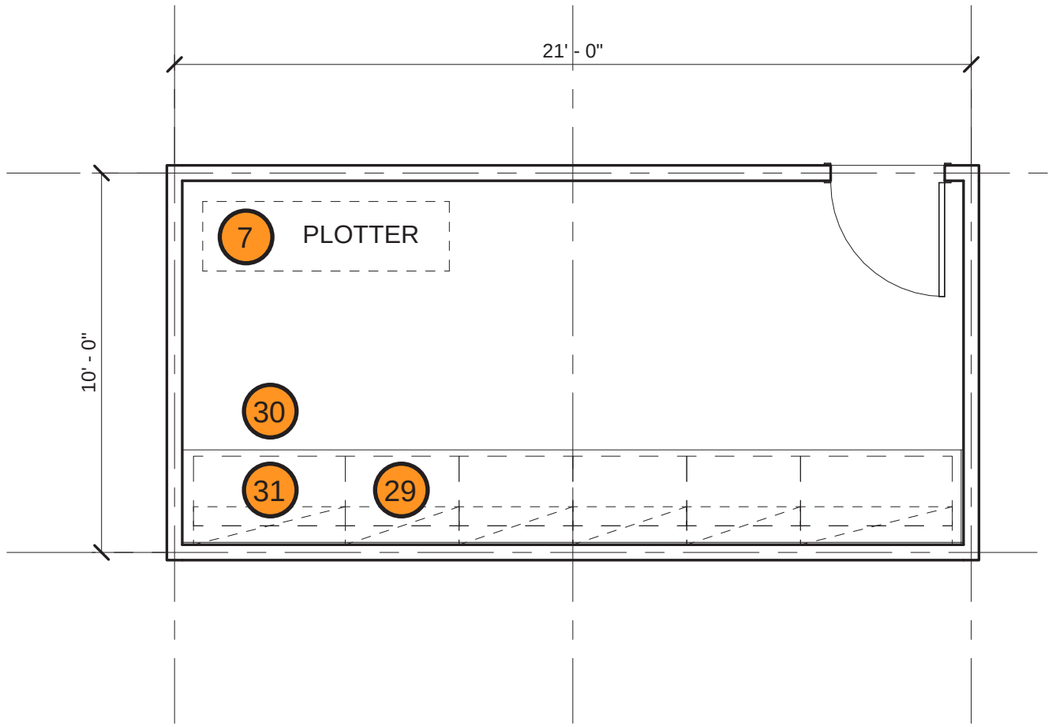
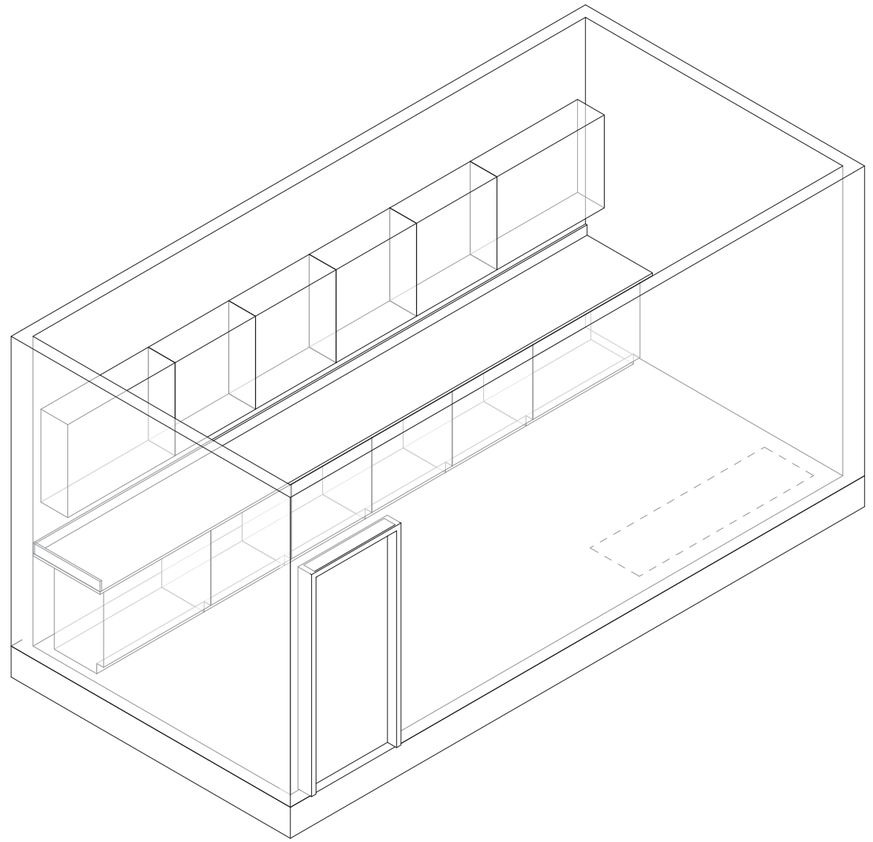
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

B-800 | Poster and Printer Room





0 2 4 8 ft

1. Whiteboard
2. Tackboard
3. Projection Screen
4. Overhead Projector
5. Flat Panel Display
6. Moveable Partition
7. Equipment Space
8. Mobile Teaching Lectern - Power | Data | AV
9. Training Table - Power | Data
10. Seminar Table
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17. Task Chair
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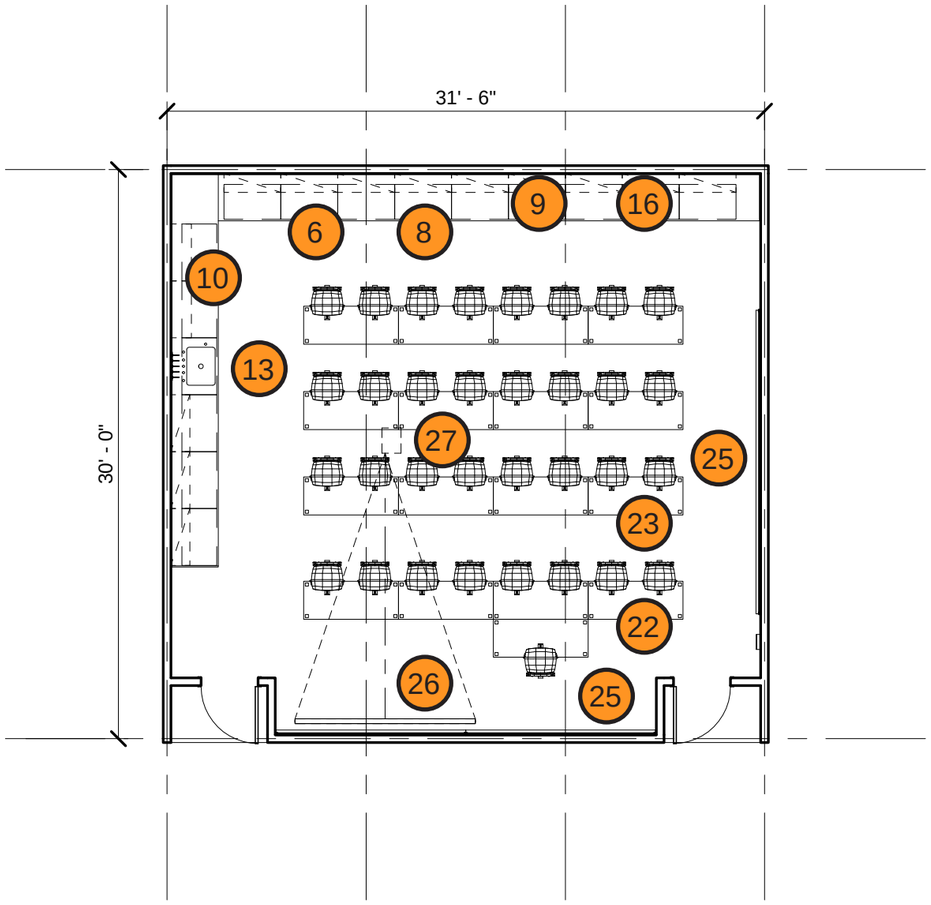
22. Office Desk
23. Lateral File Cabinet
24. Bookshelves
25. Credenza
26. Copy | Scanner Machine
27. 5-Shelf Wire Shelving Units
28. Sink
29. Work Counter - Standing
30. Base Cabinet | Wood
31. Wall Cabinet | Wood
32. Mail Boxes
33. Refridgerator
34. Tall Storage Cabinet

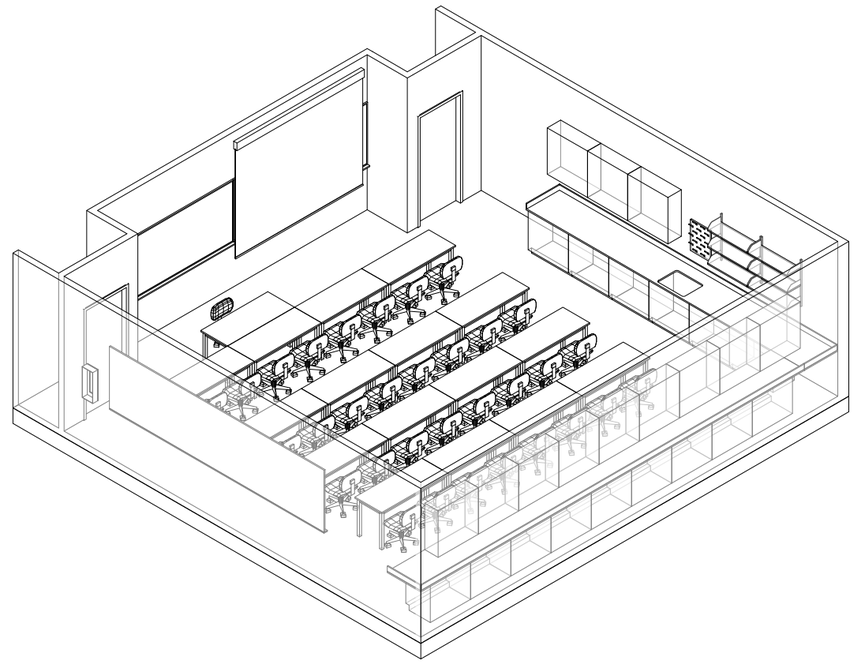
This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

302 Offices + Dedicated Department Space

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.

C-100 | 32 Seat Specialty Classroom





0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

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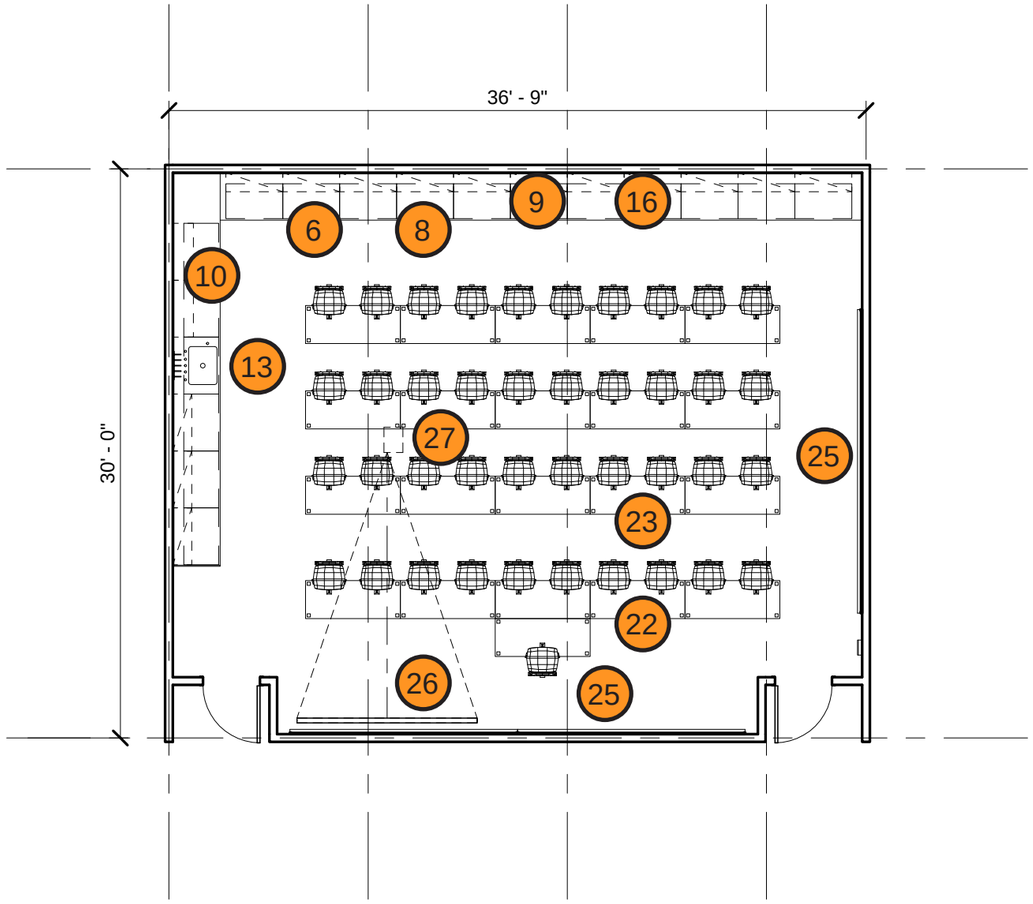
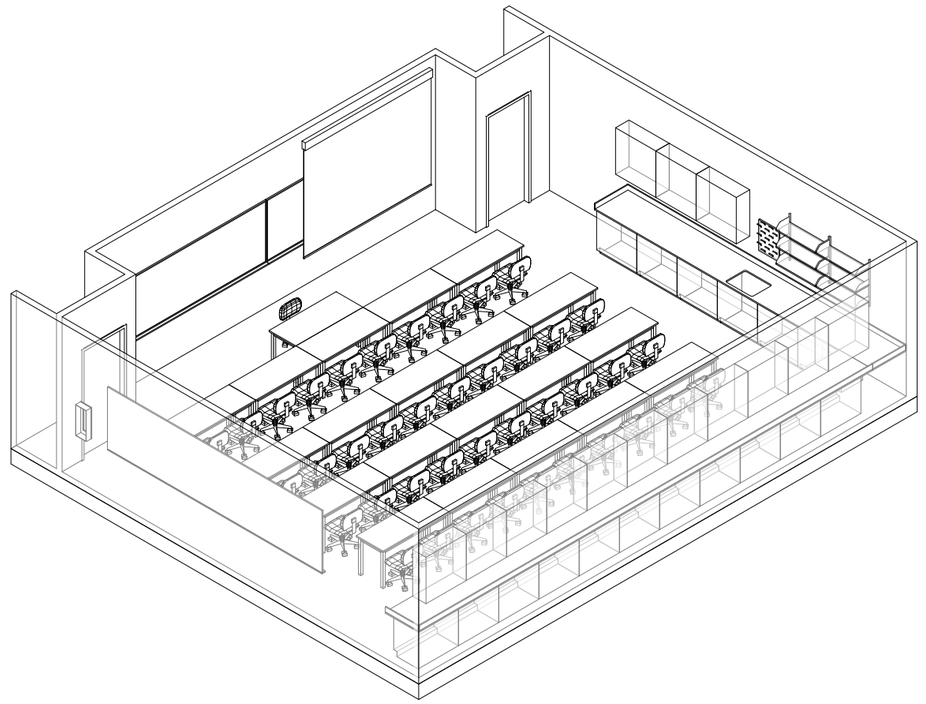
C-200 | 40 Seat Specialty Classroom



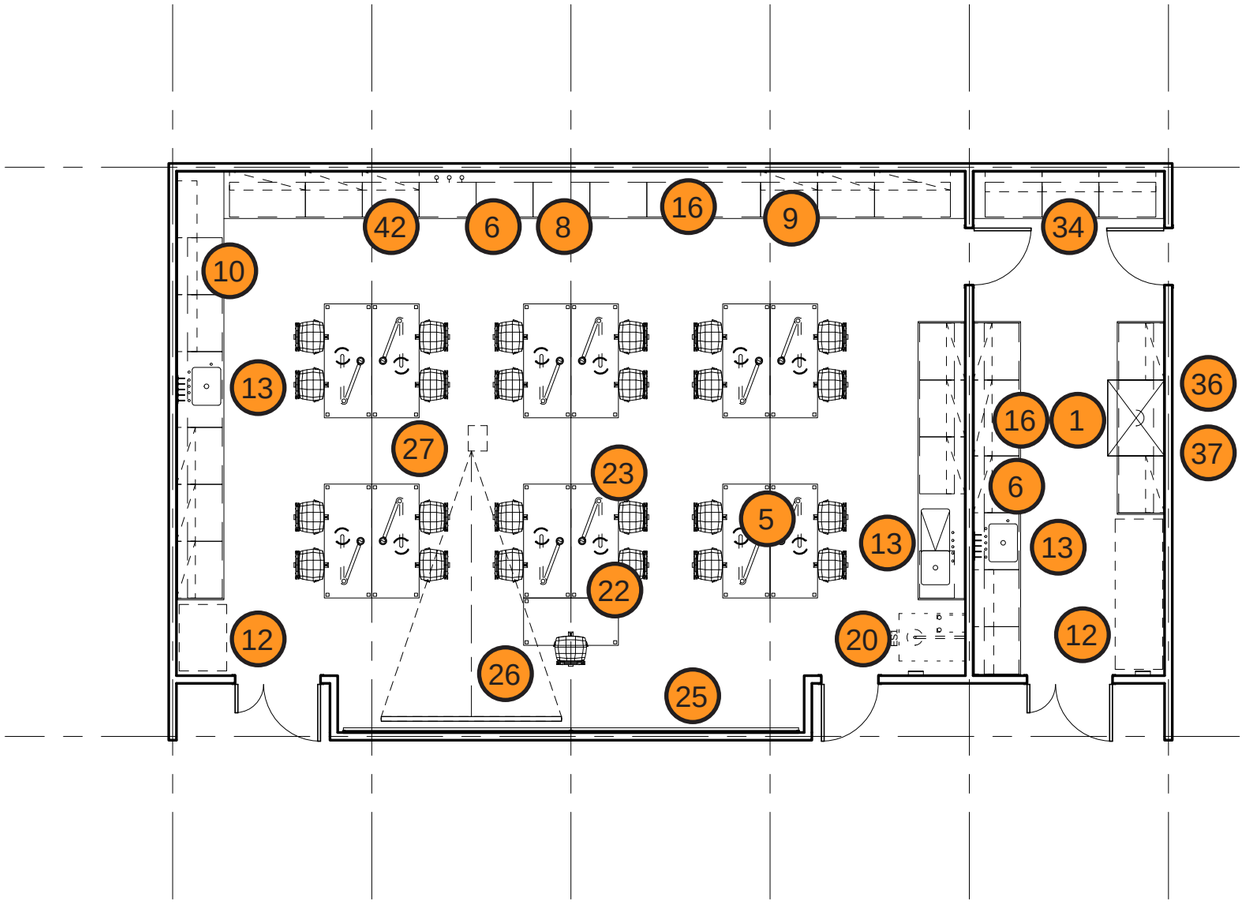


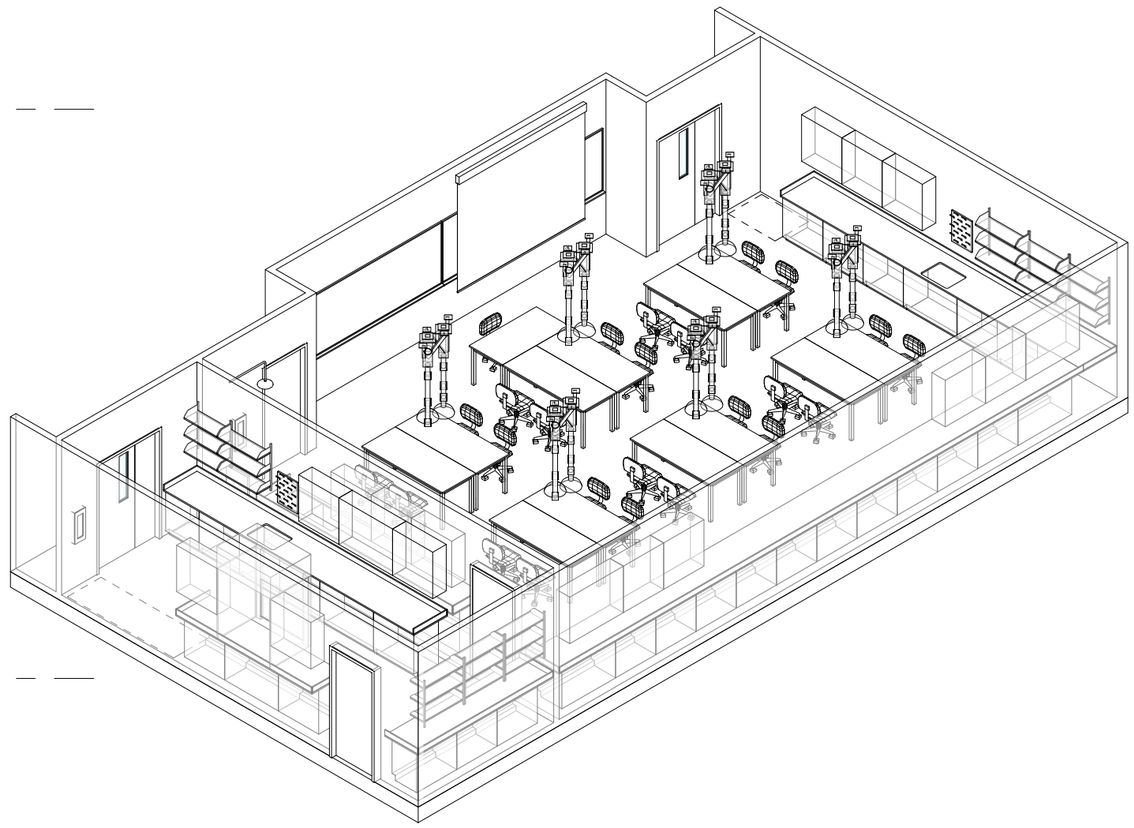
0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

D-100 | General Teaching Lab and D-200 | General Prep Lab



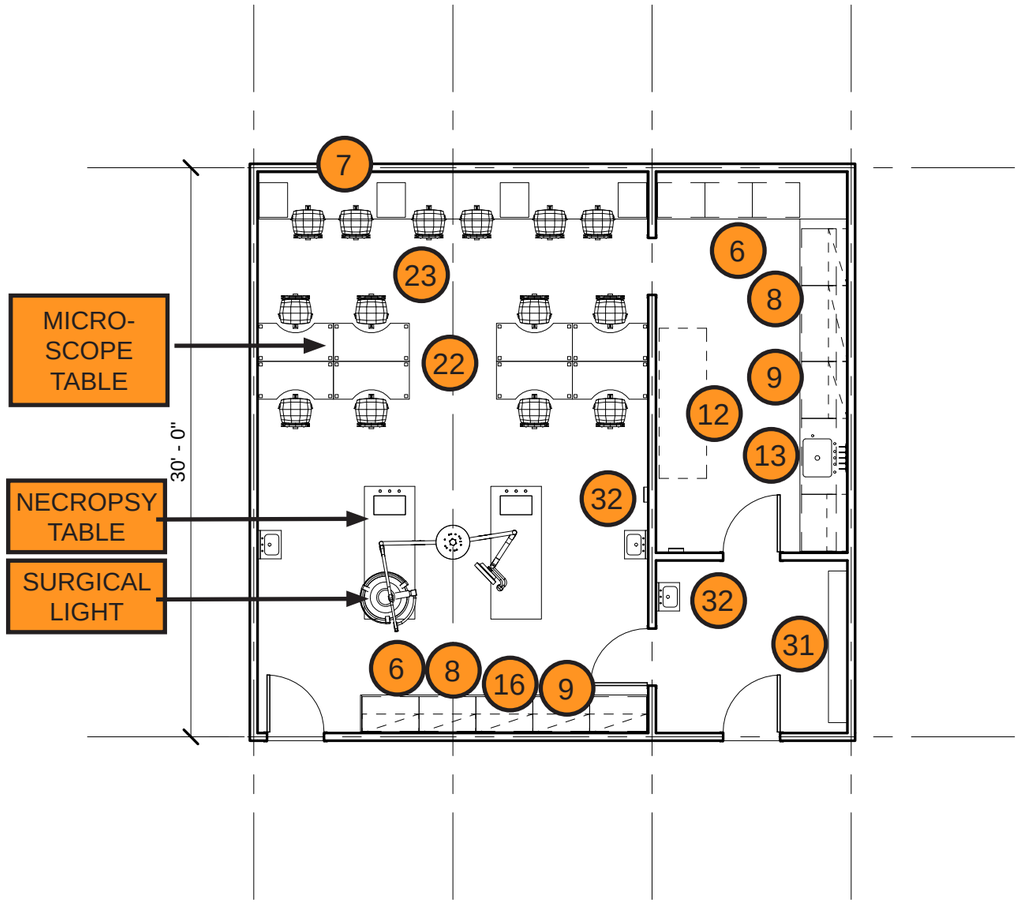


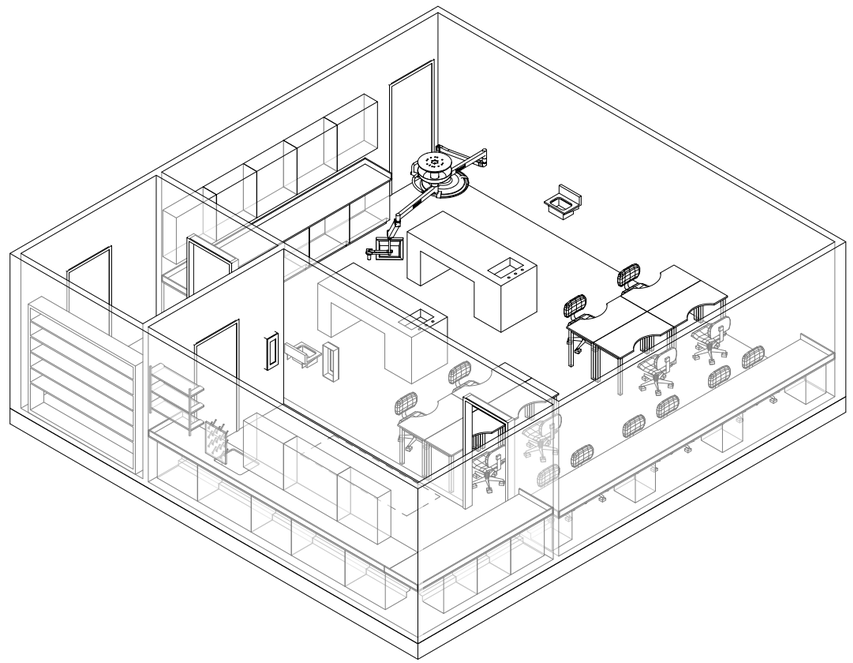
0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

D-300 | Necropsy Teaching Lab and D-400 | Necropsy Prep Lab and Gowning Room

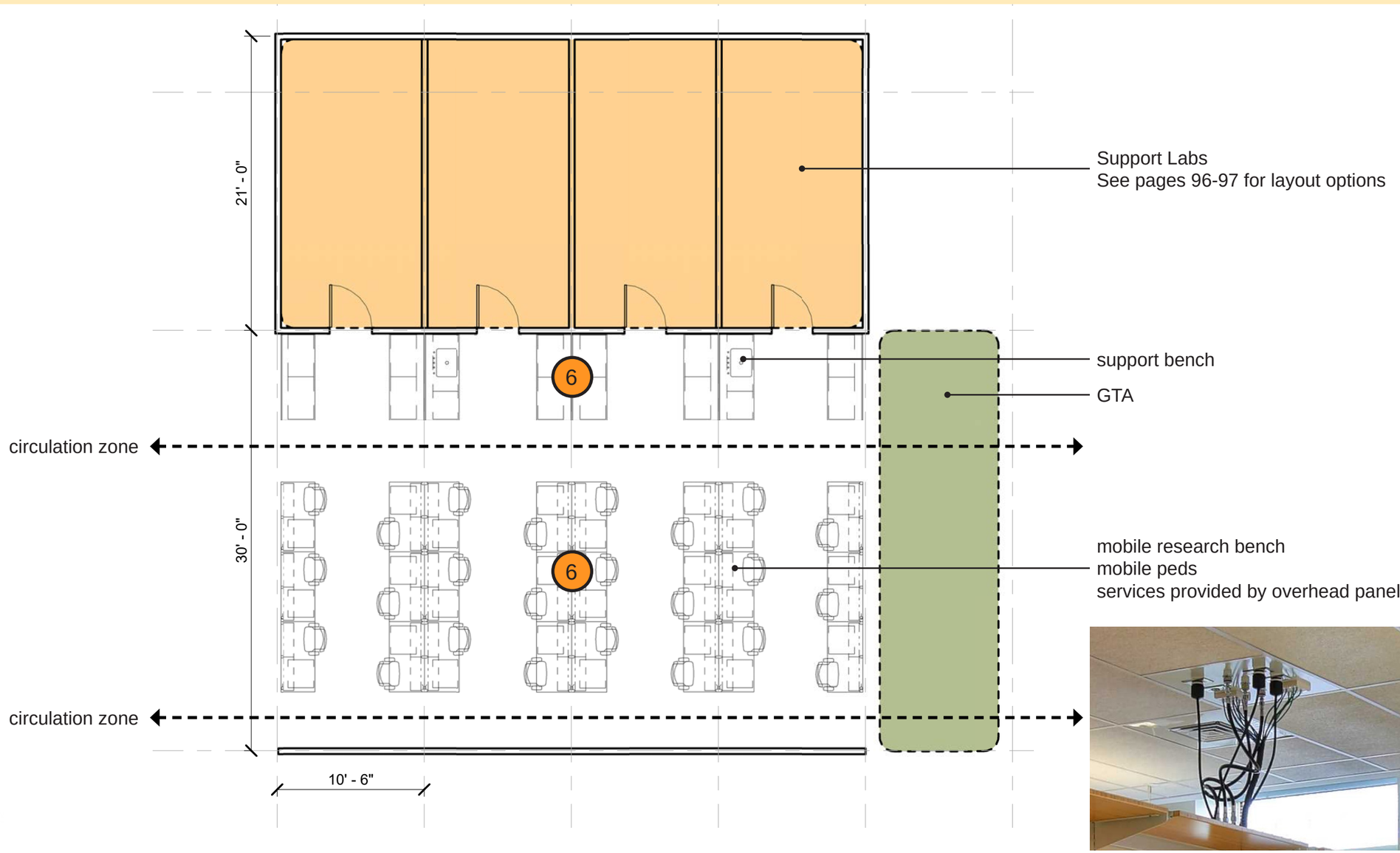




1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-100 | Research Lab



1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
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23. Lab Stool
24. Demonstration Table
25. Whiteboard
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27. Overhead Projector
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29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
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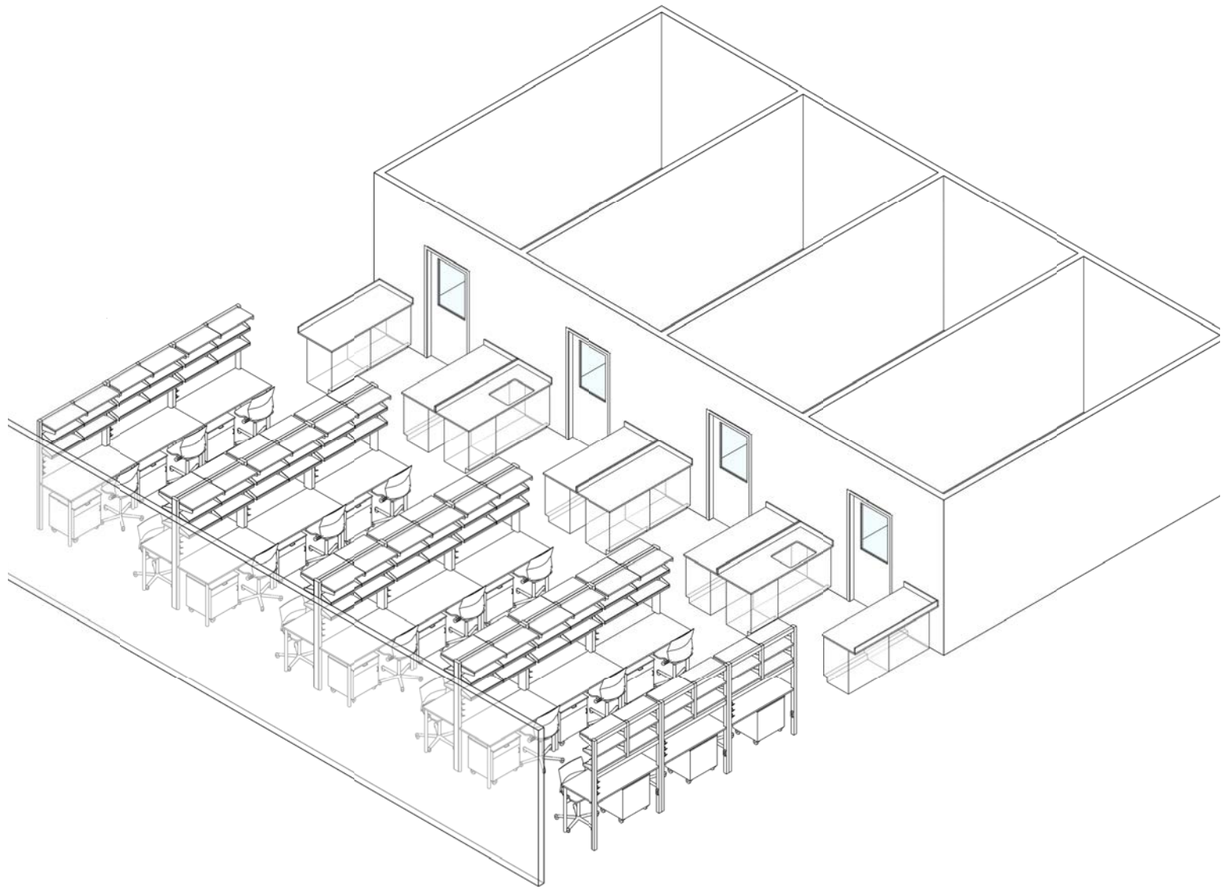
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-100 | Research Lab



0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

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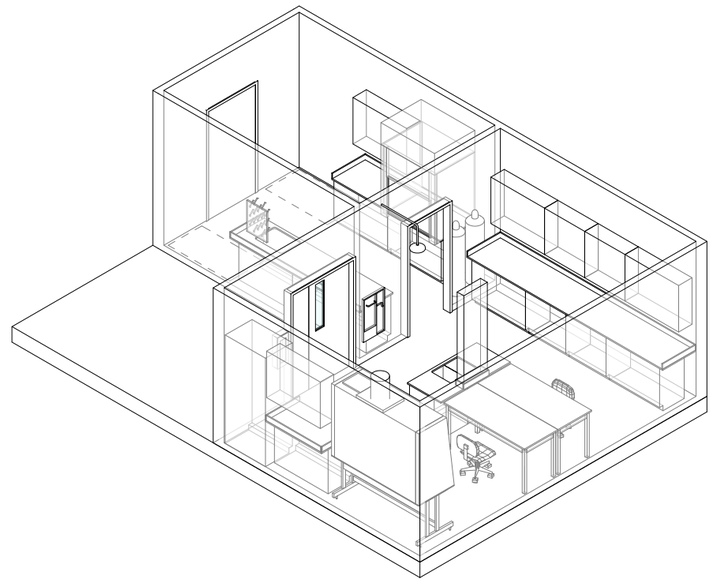
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-300 | Research Lab - OLAC

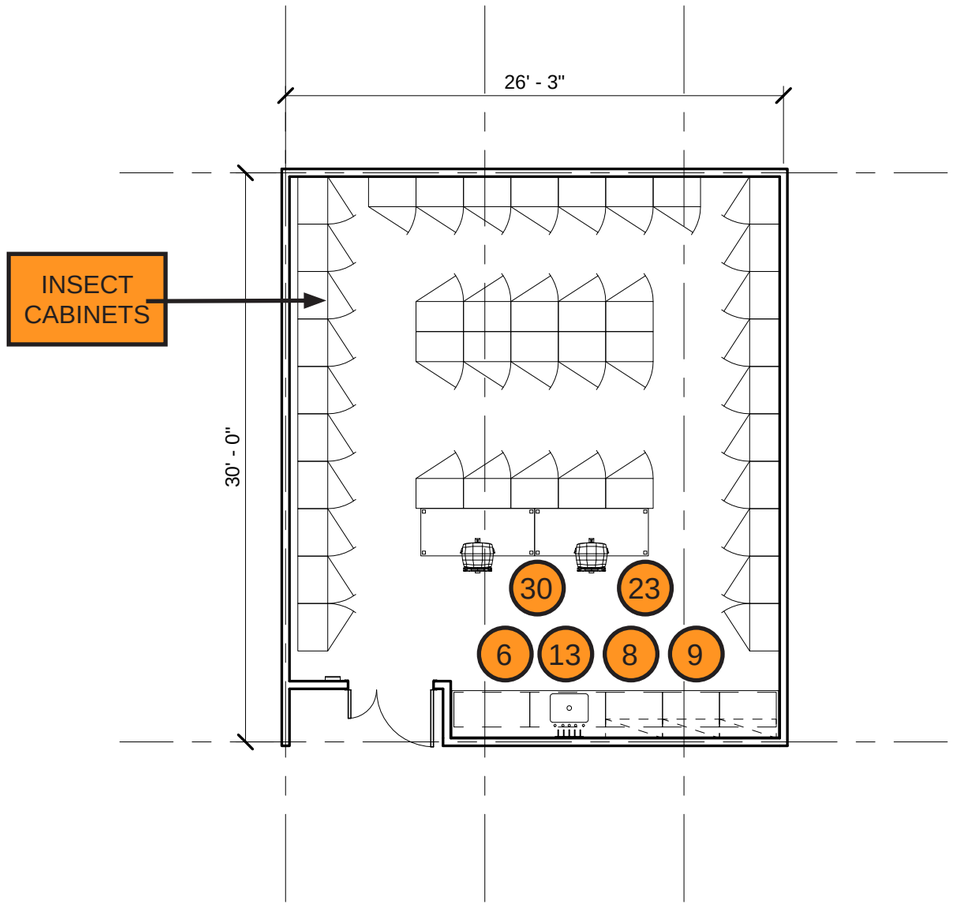


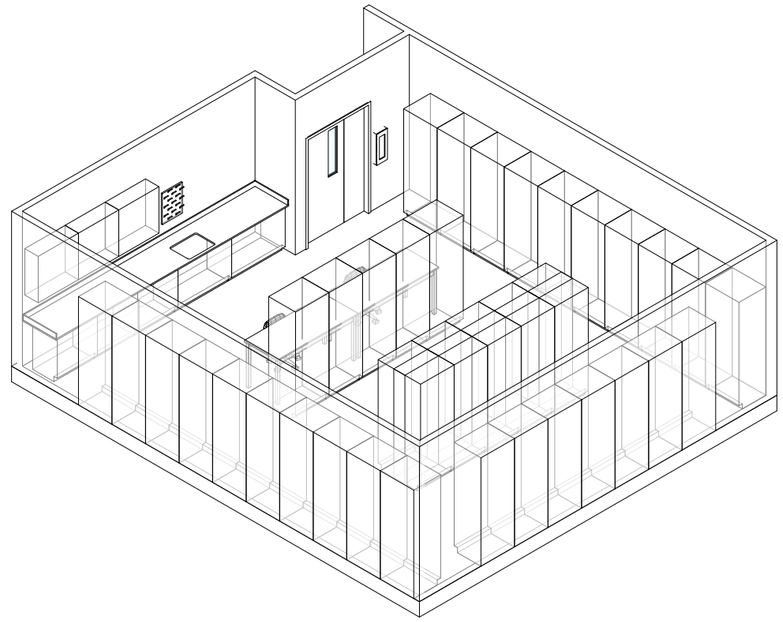
0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-400 | Research Lab - Insect Museum

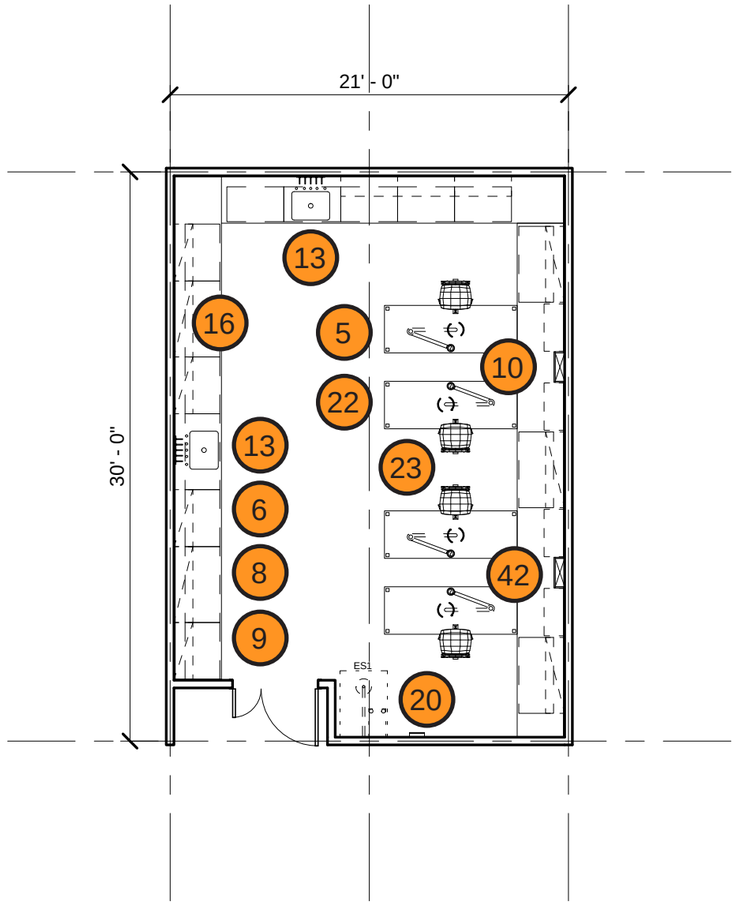


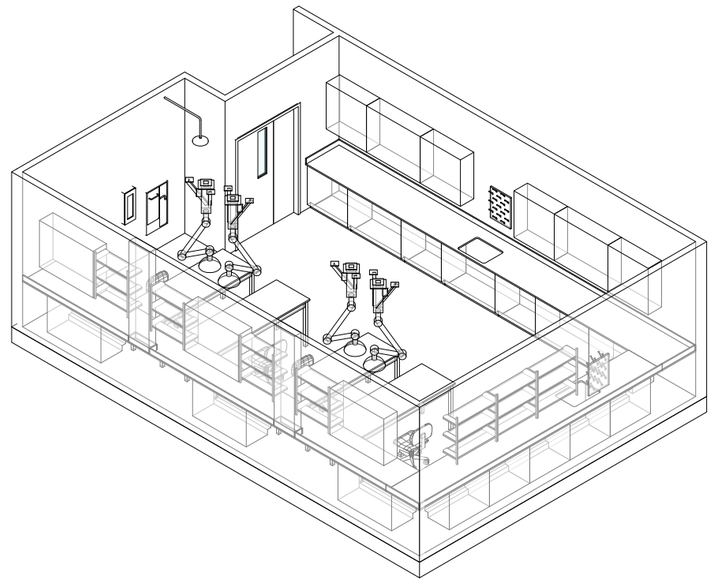


1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-500 | Research Lab - Central Environmental Analysis Laboratory Hub

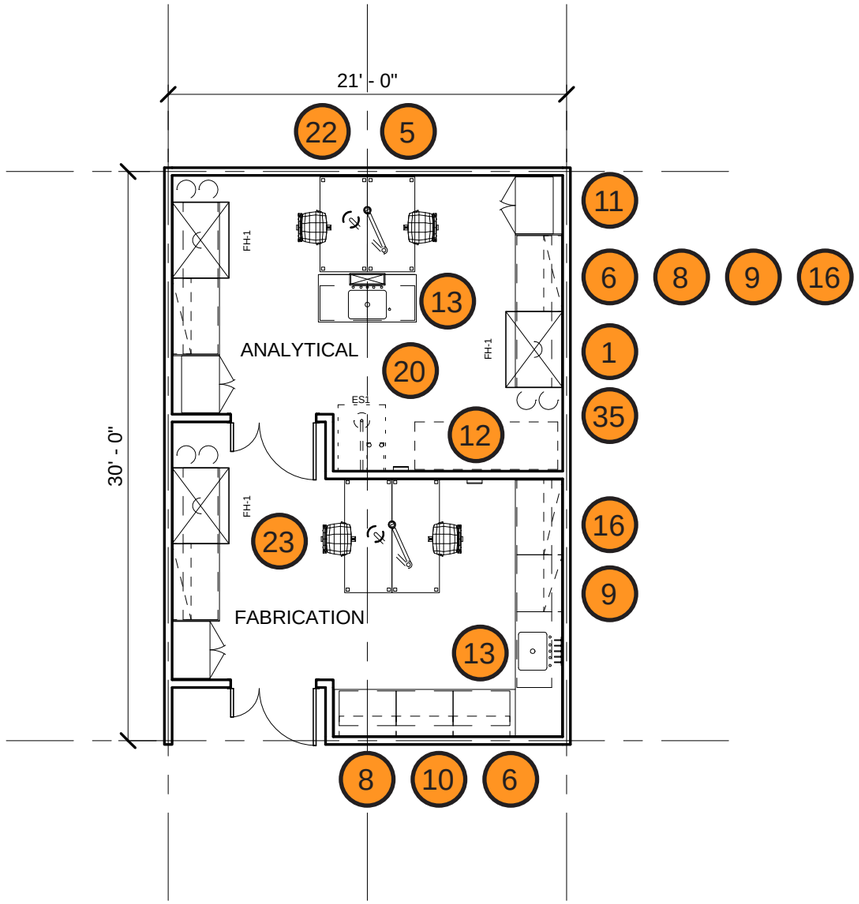


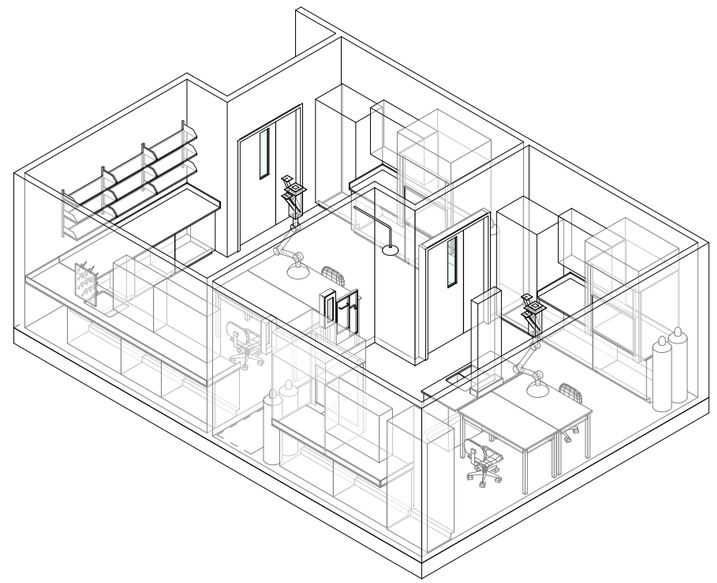


1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-600 | Research Lab - Biofuel Laboratory



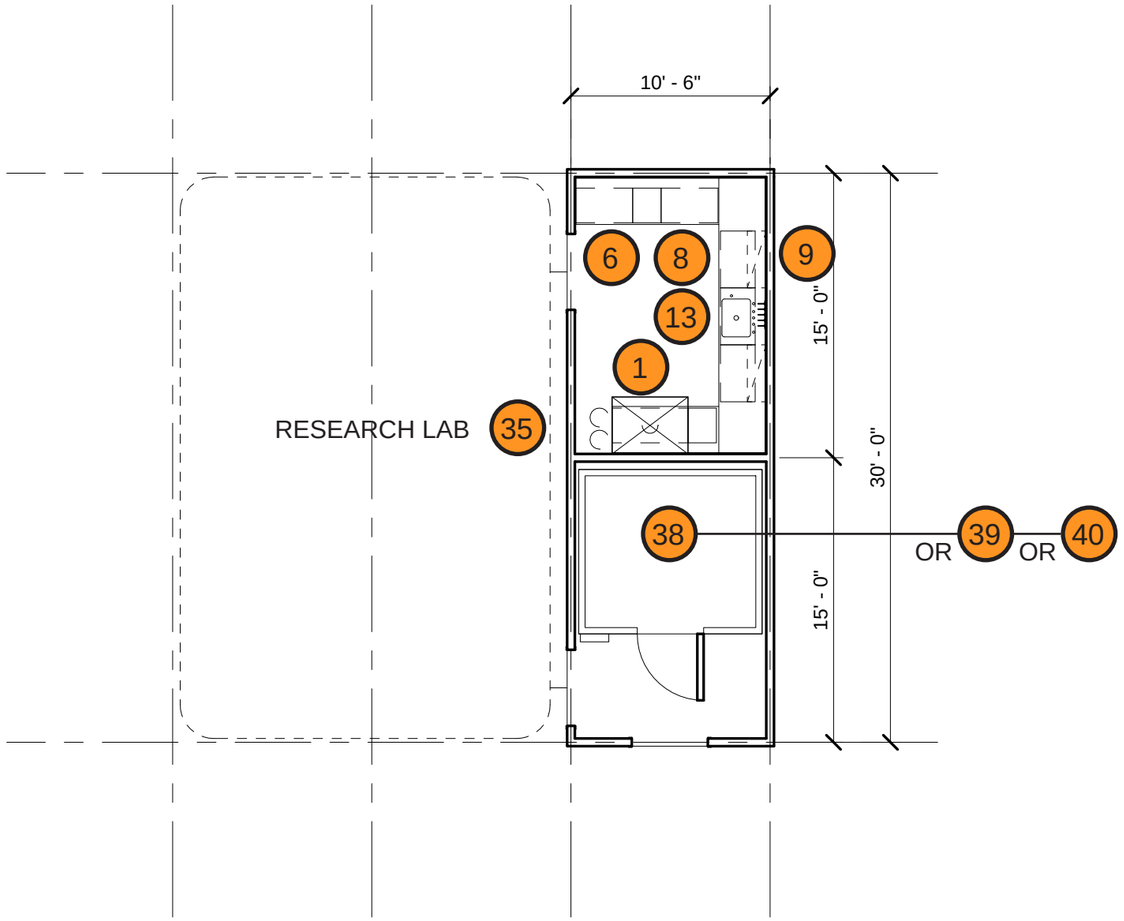


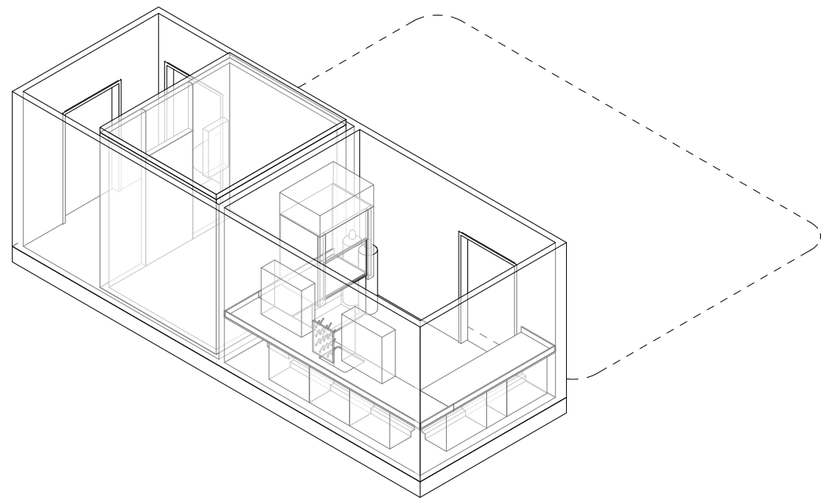
0 4 8 16 ft

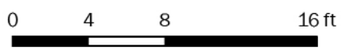
1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-700 | Research Lab Support - Option







1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
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23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
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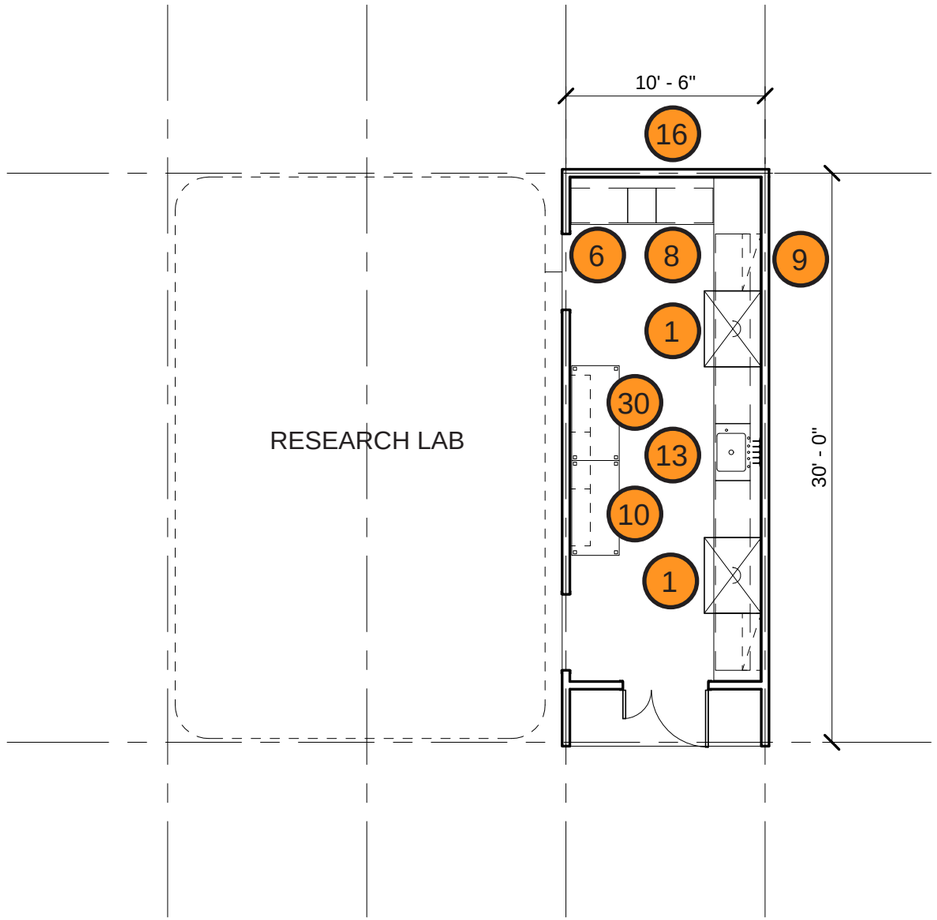
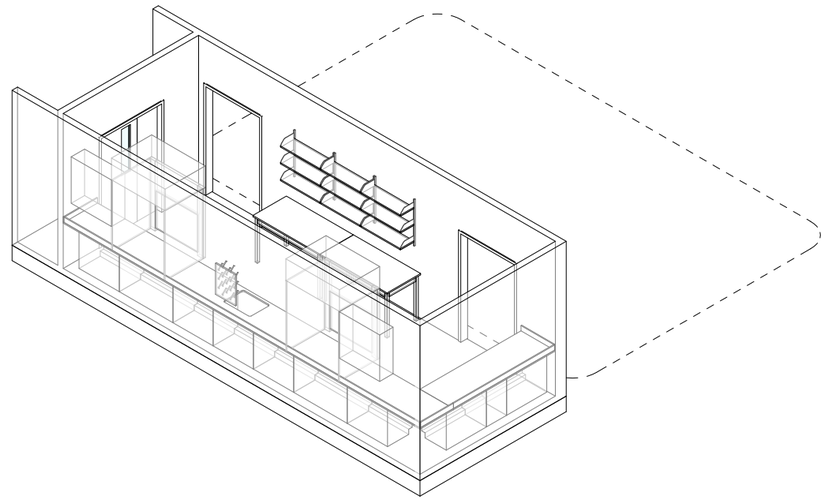
E-700 | Research Lab Support - Option





0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
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14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
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31. Freestanding Shelves
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40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

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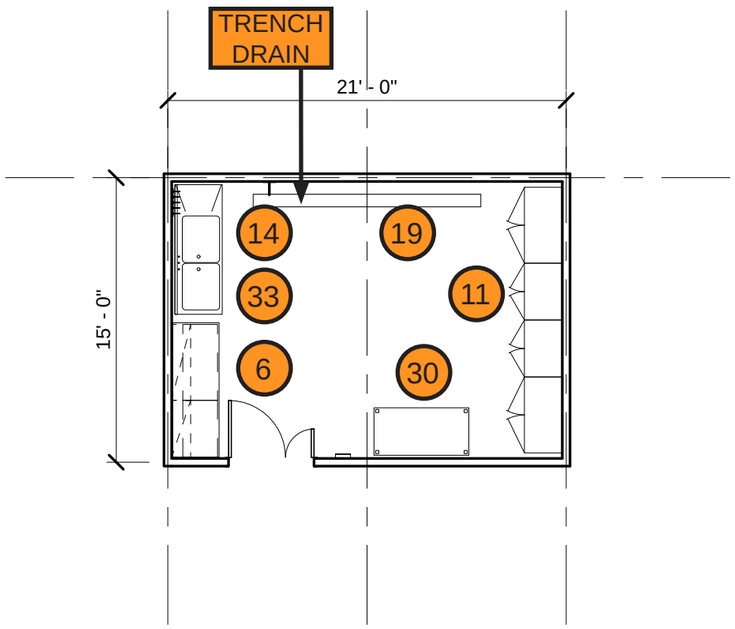

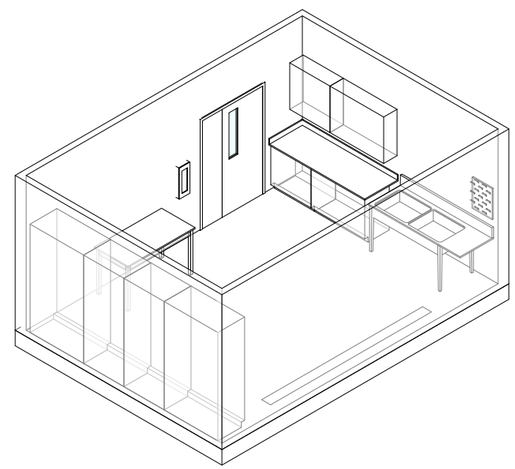

0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
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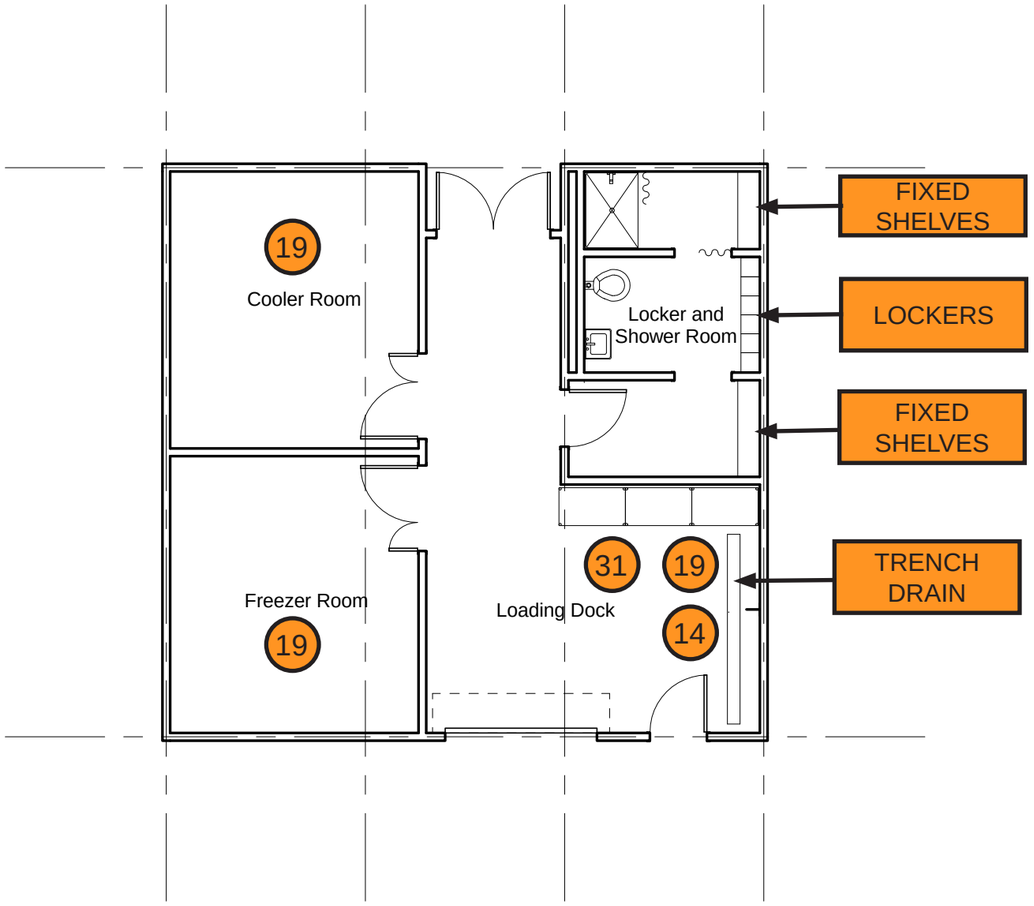
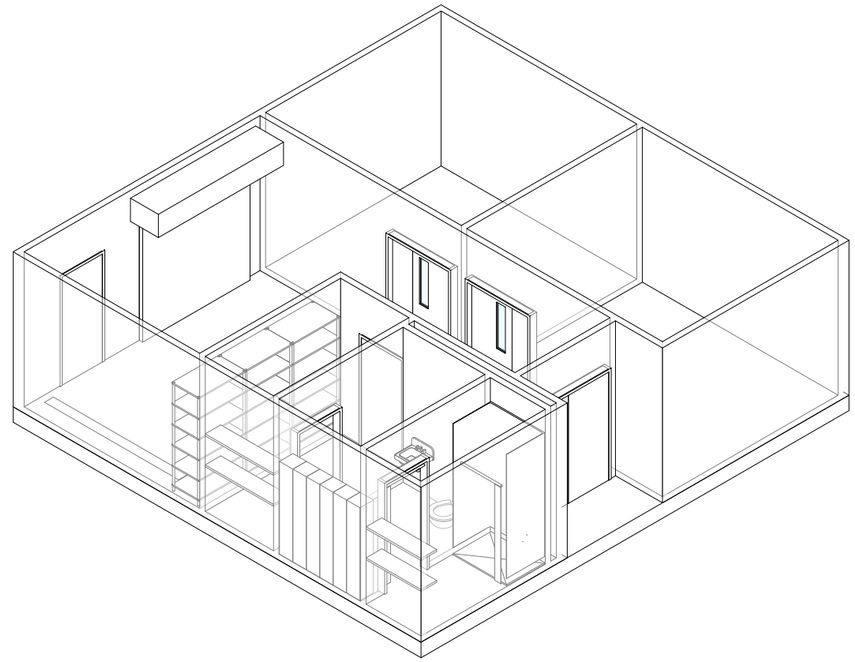
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
19. Floor Drain
20. Emergency Shower and Eyewash
21. Lab Cart
22. Lab Table
23. Lab Stool
24. Demonstration Table
25. Whiteboard
26. Projection Screen
27. Overhead Projector
28. Flat Panel Display
29. Open Lab Bench (Adjustable)
30. Work Table - Mobile
31. Freestanding Shelves
32. Wall Mounted Hand Sink
33. Scullery Sink with Drench Hose
34. Knee Space
35. Cylinders with Straps
36. Flammable Cabinet
37. Acid Cabinet
38. Environmental Growth Chamber
39. Cold Room
40. Autoclave
41. Ice Machine
42. A | G | V Gas Fittings

This diagram is conceptual and provided only to indicate required furnishings, equipment and general room proportions. Actual room design may change.
Refer to Appendix sec. 403 Space Requirements for detailed space descriptions.

E-900 | Loading Dock Suite





0 4 8 16 ft

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Laminar Flow Cabinet
4. Canopy Hood
5. Snorkel Exhaust
6. Laboratory Bench - Standing
7. Laboratory Bench - Sitting
8. Base Cabinet - Wood
9. Wall Cabinet - Wood
10. Adjustable Shelving
11. Tall Storage Cabinet
12. Equipment Space
13. Laboratory Sink
14. Hose Bibb
15. Peg Board
16. Plugmold - Outlets at 24” O.C.
17. Refridgerator | Freezer
18. Incubator
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