PennState
Physical Plant

Office of Physical Plant
Physical Plant Building
University Park, PA 16802-1118

Date: August 23, 2019

Subject: **Request for Proposals (RFP) – Architect/Engineering (A/E) Team Selection**
Physics Building and Osmond Renovation
University Park, PA 16802

To: Cooper Carry + Lake|Flato + Research Facilities Design (RFD)
Goody Clancy
Grimshaw + Research Facilities Design (RFD)
HDR
Hellmuth, Obata & Kassabaum, P.C. (HOK)
KieranTimberlake
Mitchell Giurgola Architects LLC
SmithGroup
Wilson HGA
ZGF Architects LLP

REQUEST FOR PROPOSALS - PART 1
PROJECT INFORMATION and OWNER REQUIREMENTS

The Pennsylvania State University (PSU) wants to first thank the 33 submitting teams that expressed interest in this project. After careful review of the submitted Letters of Interest, we congratulate the 10 A/E teams who were selected to continue to the next step in the process: invitation to respond to this Request for Proposal (RFP). PSU uses a qualifications-based A/E Team Selection Process with three assessments: Long-list (based on Letter of Interest), Short-list (based on Proposal responses), and in-person Interviews. This specific A/E Selection process is as follows.

Proposal responses are due in my office by **Noon on September 18, 2019.** After review of Proposal responses, the Screening Committee will identify three firms for in-person interviews. The **Short-List/ Interview Notice will be posted to website on October 8, 2019**. In-person interviews will occur on **October 31, 2019 in State College, PA.** Non-Binding Fees will be requested of the three Short-Listed teams, for each project, which will be due just prior to the respective Interview.

The results of the AE Team selection process will be announced at the Board of Trustees meeting on **November 15, 2019** and posted to the OPP website: https://opp.psu.edu/planningdesignconstruction/project-bidsproposals.

Participation in this RFP and selection process is voluntary and at no cost or obligation to PSU. PSU reserves the right to waive any informality in any or all Proposals, and to reject or accept any Proposal or portion thereof. PSU reserves the right to modify dates as/if it deems necessary.

Confidentiality and Non-Disclosure. News releases pertaining to this project will not be made without prior approval from PSU, and then only in coordination with PSU. The contents of all A/E selection process correspondence are to remain confidential, and as such, not be made public.

A. PROJECT OVERVIEW

The Eberly College of Science's Physics department is spread across four buildings in the central part of the University Park campus. Osmond Laboratory is the physics department's main facility housing 58% of the department's undergraduate teaching and advanced research spaces including labs, classrooms, lecture halls, faculty and administration. Over the past two and a half decades, the physics department has taken dramatic strides toward academic excellence, rising from an NRC ranking of 54th (in 1995) to 13th (in 2010). The 2014 US News and World Report ranked Penn State's Physics program 23rd in the country and 5th in the Big Ten Conference. This enhanced reputation stems from a sustained focus on maintaining the highest standards in every aspect of the department's academic mission. The physics department has an excellent and diverse faculty, comprised of both established scientific leaders and rising young stars, all actively making influential scientific discoveries.

To achieve the department's vision of permanently becoming a "top 10" physics program, they plan on increasing faculty by approximately 10% to 50 full time faculty, equally split between experimentalists and theorists. This increase in strategic-hire faculty would allow the department to strengthen strategic interdisciplinary links with other units at Penn State including astronomy and astrophysics, biology, biochemistry and molecular biology, computer science and engineering, the Huck Institutes of the Life Sciences, the Institute for CyberScience and the Materials Research Institute.

The most significant barrier to fulfilling this vision is the lack of available space. At present the department is at capacity and spread across multiple buildings to meet current space needs. Without a new building and/or renovation to the current space, the department is not only unable to sustain what it has currently, they also risk losing their current status among the top 15 NRC ranked programs and cannot hope to rise to a "top 10" department. Additionally, the lack of available modern research space limits the department's ability to compete for external grant funding.

A well-designed project would provide an opportunity to build spaces that facilitate and encourage spontaneous, informal interactions between faculty and students from different specialties, leading to an environment that can spark innovation and creativity. This free flow of ideas and creativity must be coupled with facilities that provide the highest level of technically advanced laboratories.

This project will support Penn State's vision of maintaining a world-class graduate program in physics that aspires to solve the most important fundamental mysteries posed by the universe, that seeks to translate this fundamental understanding into frontier technologies, and that pursues innovative approaches to educating a broad community of STEM students at Penn State.

Additionally, this project is driven by the goal to begin to address the differed maintenance backlog within the existing Osmond Laboratory. This project – in its totality – will begin to significantly address Osmond's differed maintenance. But, since this project doesn't fully renovate Osmond Lab, the remainder of differed maintenance items would be addressed at a later point. The overall concept of the project – including the idea to build a new freestanding building – was envisioned to help in the phased, occupied nature of the renovations to Osmond Lab in this project and potential future projects.

B. PROJECT-SPECIFIC INFORMATION AND PROGRAM

The project is envisioned as: a freestanding new building at approximately 105,000 Gross Square Feet (GSF) providing approximately 63,000 Assignable Square Feet (ASF); a renovation to the east wing of the existing Osmond (approximately 50,000 gsf) with a $146M total project cost ($112M total construction cost); demolishing the existing lecture hall wing of Osmond Lab; and development of the surrounding campus area. **The Program Document for this project is included within this RFP to share more definitive project information. The document is titled "*Osmond Laboratory - Renovation and Expansion Feasibility Study*" and is dated *August 2019.***

The new Physics building will house the physics administrative office, state-of-the-art research laboratories, offices and collaboration spaces for programs in quantum information science, condensed matter physics, and AMO physics. Additionally, we will provide lecture areas designed to facilitate innovation through peer learning and knowledge sharing and a 350-seat classroom.

The renovated east wing of Osmond will include physics teaching classrooms and laboratories that allow for innovative pedagogy; offices for teaching personnel, undergraduate study space, meeting and seminar rooms and a new building core.

A state-of-the-art high bay laboratory is needed for faculty from physics as well as astronomy/ astrophysics working on experimental projects that require the construction of large-scale equipment. The high bay should be located in such a way that high energy physicists have convenient access to the space. The new high bay is currently envisioned to serve Osmond and Davey Labs, as the buildings are connected underground.

A tall building on the Osmond parking lot will likely impact the ground plane around the building, in addition to impacting the research/teaching greenhouses located on the east side of the site, adjacent to the Telecommunications Building. A sun study must be completed to understand the implications of this design.

Project goals include:

- Build the facilities and infrastructure that will empower the physics department to be ranked amongst the top 10 graduate physics programs in the US and to be recognized as a national leader in undergraduate physics education.
- Create specialized laboratory space (low vibration, high ceiling, tight environmental controls) and office space that are configured to attract, support and retain a faculty with international leadership in quantum science and technology, condensed matter physics, and AMO (Atomic, molecular, and optical).
- Renovate an existing building to provide teaching spaces that are configured to promote innovative approaches to physics education with the requisite components of collaborative and engaged learning.
- Create a flexible and adaptable building, including state-of-the-art laboratories, modern office space, learning areas, and collaboration spaces in support of evolving educational pedagogies, technologies, and research initiatives.
- Improve this area/district of core campus from a campus-making, functionality, and aesthetic standpoint, while also improving the safety (including considerations to improve potential pedestrian, auto, and service vehicle conflicts).

- Consider/seek ways for this building to enhance the presence of the Physics and help to bring cohesion to a Physics department that will remain distributed a crossed multiple buildings.
- Deliver a highly space efficient building. We are seeking architecture and programming consultants that can drive our decision making on the optimal grossing factor and also seek ways to find efficiencies in the planning and design of the completed facility.
- To the greatest extent possible, address the differed maintenance backlog within the existing Osmond Laboratory, including: Replace deteriorated building element, infrastructure systems; and site utility services.
- Address significant stormwater issues in this region of campus by installing a regional stormwater management detention structure that will address uncontrolled runoff as a result of inadequate storm lines and aging infrastructure.
- Demolish the existing lecture hall wing of Osmond Lab. This is to occur, both to address significant differed maintenance, but also to provide additional land area to allow for additional campus space(s) around the freestanding new building.
- Design and build a high-performance building that will, at a minimum, attain LEED Certification.

C. SELECTION AND IMPLEMENTATION MILESTONES

__Physics Building and Osmond renovation Project Milestones__

• RFP Issued to Long-Listed Teams:	August 23, 2019
• **Submission of A/E Proposals Due:**	**Noon, September 18, 2019**
• Post Short-List results + Interview notice:	October 8, 2019
• **A/E Team Interviews:**	**October 31, 2019 (The Penn Stater Hotel)**
• Board of Trustees Selection of Team + Post Results:	November 15, 2019
• **Contract Award / Letter of Intent:**	**December 2019**
• Construction Start Date	October 1, 2021
• **Construction Completion**	**December 20, 2023**
• Project Occupancy	January 2024

D. PROJECT DELIVERY METHOD and PROJECT DELIVERY REQUIREMENTS

Penn State University and the Office of the Physical Plant (OPP) require a high level of collaboration and LEAN principles to ensure project success. **The final selected A/E design team must establish a process for the design, documentation, and execution of the project.**

PA Department of General Services (DGS) funding for the project requires that the project is delivered with multiple-prime contracting. PSU anticipates hiring a single Construction Manager as Agent to act as an owner's representative. PSU will hold all contracts for this project.

The successful A/E Team will work in conjunction with PSU's selected third-party Construction Manager as Agent throughout the design and construction phases. The A/E team and CM Agent will separately develop parallel cost estimates, at least through the Design Development Phase, which will be reconciled at the end of project phases. Confirmation of being within the project budget is required before PSU will allow the A/E Team to proceed to each subsequent project phase.

The selected A/E Team will begin this project with a validation of the aforementioned program, including meeting with individual research PIs, and other PSU and Office of the Physical Plant (OPP) stakeholders, to confirm the program requirements. The program to verify will include tabular/space program, space adjacency diagrams, site impact diagrams, and room data sheets that provide detailed room-by-room info.

After program validation, PSU typically follows industry-standard design Phases (Schematic Design, Design Development, Construction Documents, Bidding Phase, and Construction Administration) in accordance with Penn State's standard 1-P agreement.

Given the importance of this project, Penn State will require at least three (3) distinct design options be developed for PSU's review and approval. These options will be developed at least to a Concept Design level and may be developed Schematic Design level. We ask that you describe your approach to developing options in Proposal Section 3.

E. RFP ATTACHMENTS AND REFERENCED STANDARDS

- **Program Document**, titled "*Osmond Laboratory - Renovation and Expansion Feasibility Study", dated August 2019.*
- **Form of Agreement.** Included is the link to our Form of Agreement 1-P: https://wikispaces.psu.edu/display/OPPDCS/Division+00+-+Procurement+and+Contracting+Requirements.
  Please review this agreement to ensure that your firm accepts all terms and conditions as written. In submitting a proposal for this project, you acknowledge that you concur, without exception, with all terms, conditions and provisions of Form of Agreement 1-P.
- **Design Phase Deliverables.** Reference this document under the heading *00 51 00 MISCELLANEOUS FORMS* at the following link: https://wikispaces.psu.edu/display/OPPDCS/Division+00+-+Procurement+and+Contracting+Requirements
- **Office of the Physical Plan (OPP) Standards.** The web sites www.opp.psu.edu and https://wikispaces.psu.edu/display/OPPDCS/Design+and+Construction+Standards provide information regarding specific design submission requirements and standards, of the University. Please review to ensure that your team is able to deliver a compliant building.
- **OPP High Performance Standards.** The University has a commitment to environmental stewardship with a focus on University and campus-wide carbon reduction and total-cost-of-ownership. Our projects require maximum consideration of potential sustainable and energy-efficient designs and specifications for architectural, site, utility, structural, mechanical, electrical, and plumbing disciplines. Refer to the following link for the University's high performance standards that exceed building code minimum requirements: https://wikispaces.psu.edu/display/OPPDCS/01+80+00+PERFORMANCE+REQUIREMENTS

  A part of this is PSU's High-Performance Building Design Standards: Building projects shall comply with ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings, 2010 version AND as superseded by more stringent requirements of ASHRAE Standard 189.1 Standard for the Design of High-Performance Green Buildings, 2011 version.

The standard defines a minimum requirement of LEED Certified for this project. The project will consider additional sustainability or high-performance measures and innovations.

F. PRE-PROPOSAL SUBMISSION CONTACT

The Office of Physical Plant encourages you to visit the site and discuss the project with representatives of the user group in order to understand all goals and the major issues driving this project. The tours are not mandatory, but if you seek to attend a tour, you must RSVP for a one-hour time slot on the following days/times. **We will have scheduled tour date(s) at the following time(s).**

- Tour date 1: Monday, September 9, 2019 between 9am-4pm (Eastern Standard Time)
- Tour date 2: Thursday, September 12, 2019 between 9am-4pm (Eastern Standard Time)

Contact Susan Ann Marrone at 814.863.7976 or sam81@psu.edu to RSVP for a tour date.

Contact Monica Reed at 814.863.5765 or mjr204@psu.edu with any questions regarding the project.

Campus Planning, design-related, or A/E selection-process questions should be directed to Greg Kufner, University Architect.

REQUEST FOR PROPOSALS - PART 2
PROPOSAL REQUIREMENTS

Deliver <u>sixteen (16)</u> hard copies of your proposal and one (1) digital copy on a thumb drive to:

> **<u>Shipping Address (Note that this address has changed):</u>**
> **Greg Kufner, AIA, NCARB**
> **The Pennsylvania State University**
> **One Benedict House**
> **University Park, PA 16802**

Hard copies of the Proposals are due <u>September 18, 2019 at Noon</u>, Eastern Standard Time. A PDF version of your proposal should be included on a thumb drive with your submission. Proposals received after this date and time may be automatically rejected. Proposals shall be provided in an 8.5"x 11" format. Limit submission to fifty (50) single-sided pages maximum (25 double-sided), plus a cover letter. Double-sided printing is strongly encouraged. Font size is to be 10-point type, minimum.

A cover letter shall be provided from the proposed leader(s) of the Candidate Team submitting. The cover letter should be one page maximum. The cover letter should include the following:

A. This letter should establish the contact information (name, address, phone, and e-mail) for your team's main point of contact
B. Primary office location of the submitting candidate team
C. A concise summary as to why your team is best suited for this project
D. Statement of certification that all information provided in your submittal is accurate

Collate and bind proposals according to the following four (4) Sections:

Proposals shall follow the below format, in the order stated to ensure that all pertinent information necessary for evaluation is included and easily comparable by Selection Committee. The cover letter, table of contents, and divider pages will not count towards the RFP page limitation. OPP encourages you to be as brief as possible without sacrificing accuracy and completeness.

* **<u>Note 1: As applicable throughout the proposal, provide professional credit to architectural partners (including design architect, architect of record, and academic / lab planning partners) for all projects discussed within the proposal and for all project images shown.</u>**

<u>Section 1.0 –TEAM STRUCTURE</u>

A. Identify prime firm, architecture and/or planning consultants, and key engineering/ consultant firms. For each firm, identity the firm differentiators, size of firm, each firm's qualifications and experience on similar projects, and clearly identify each firm's role on this project. Identify past collaboration between prime firm and key consultants, including number/ value of projects, and the added benefit the key consultants provide to your team.

   Penn State University values variety in the composition of consultant teams. As such, teams should demonstrate previous successful collaboration, execution of projects similar to the ones in this RFP, and the ability to incorporate owner's design standards similar to the Penn State Design and Construction Standards. While we appreciate firms with experience at PSU we do not have a preferred vendor list and encourage the selection of the best talent possible for our projects.

B. **Provide team organizational chart.** Include prime and key consultant firms, and provide the name and role of key team members. Clearly identify which team members are designated for leadership positions on the team. Please highlight Diverse Business Enterprise Program (DBE) representation on your team.

C. **Provide role descriptions and resumes of key team members identified in the organizational chart.** Include registrations/ certifications, educational background, years of experience, and relevant project experience. Relevant project experience should include size, budget, program type, project overview, and define what each team member's role was on each project listed on their resume. Emphasize each team member's most relevant experience and ideally highlight that the team member has had comparable roles on similar projects. Include at least two client references for each key team member. **If possible, please avoid using Penn State employees as references.**

Include resumes for, at least, the following key team members:

1. Principal in Charge (Project Team Lead)
2. Lead Design Architect (Lead Designer)
3. Project Manager (PSU's day-to-day point of contact)
4. Project Architect (Architectural Technical Lead)
5. Laboratory Programmer/Planner(s)
6. Lead Mechanical, Electrical, Plumbing/FP, Structural, and Civil Engineers
7. Sustainability Leader and/or energy modeler
8. Landscape Architect
9. Interior Designer
10. Construction Administration Leader (Construction oversight leader)
11. Cost Estimator

Note: If any individual(s) is fulfilling multiple project roles, identify multiple roles on the organizational chart and within individual resumes.

Section 2.0 – TEAM QUALIFICATIONS

A. Provide a summary of qualifications and expertise of the firms with specific emphasis on:

1. Design Excellence, including national recognitions.
2. Distinguishing factors of team differentiation.
3. Experience delivering programs, studies and projects of a similar scope, scale, and complexity. **(See Note 1)**
4. Expertise in the planning, design, and delivery of state-of-the-art academic spaces, teaching labs, and research labs/spaces, and collaboration environments to support ***The Eberly College of Science - Department of Physics.*** Discuss expertise delivering spaces that support evolving pedagogies and research initiatives. **(See Note 1)**
5. Experience with multiple-prime contracting and/or the PA Department of General Services (DGS) specific processes.
6. Renovation and/or preservation expertise.

B. **Identify a maximum of 10 example projects, or studies, within the last ten (10) years, which BEST exemplify qualifications and expertise listed above for the proposed team.** Include brief description of each project, project gross square feet, project budget, final project cost, and completion date of project and a client reference(s). Consider/convey the relevance of each project and how it is similar to this project. Show illustrative representation of the example projects, particularly those highlighting the work of your team's proposed Lead Design Architect. **(See Note 1)**

(Optional) If important to your team, discuss any of the example project(s) that are highly relevant to our project, in more detail. Include insights into what made these project(s) successful, including how those design intentions were translated into a meaningful and synthesized/successful solution.

C. **Project Relevancy Matrix.** Develop a matrix that illustrates the similarities between the example projects and this project. Please be as specific to our project, as possible.

D. **People-Projects Matrix.** Develop a matrix to show the participation of key individuals from your proposed team on the example projects. List individual's role on example projects.

E. **Diverse Business Enterprise.** The Pennsylvania State University encourages the participation of Minority Business Enterprises, Women Business Enterprises, Veteran Business Enterprises, Service-Disabled Veteran Business Enterprises, and LGBT Business Enterprises; collectively referred to as Diverse Business Enterprise (DBE) for Design Professionals.

Briefly describe your proposed methodology to include Diverse Business Enterprise participation for this project. This may include, but not limited to partnerships, joint ventures, mentor/mentee protégé program, or other outreach efforts. Participating firms should specify whether the professional or consultants being proposed is a current DBE firm. If the proposing firm itself is a current Diverse Business Enterprise, the firm should state that fact in their proposal.

Submitting A/E team are encouraged to include at least one (1) certified DBE design professional firm as part of their team. If the proposing firm itself is a current Diverse Business Enterprise, the firm should state that fact in their proposal. Below is a partial list of acceptable certifying agencies:

1. Department of General Services Bureau of Small Business Opportunities (DGS BSBO)
2. Federal Department of Transportation
3. National Minority Development Council (NMSDC) or its affiliates
4. Southern PA Transportation Authority (SEPTA)
5. Women Business Enterprise National Council (WBENC)
6. Pennsylvania Unified Certification Program (PA UCP)
7. National Women Business Owners Corporation (NWBOC)
8. Minority Business Enterprise Council (MBEC)
9. National Gay and Lesbian Chamber of Commerce (NGLLC)
10. U. S. Department of Veteran Affairs (VOB/SDVOB)

* Or comparable state agencies or regulating bodies in other states or local jurisdictions.

F. List errors and omissions insurance coverage limits of the lead/ prime entity of the candidate team. Provide information on errors and omissions claims in the last (7) seven years.

G. Provide historic breakdown of project performance. Include project delivery method, history of project budgets compared to completed construction cost, history of change orders, average response time to RFIs, and any other key project profiles relevant to this project.

H. Acknowledgment of your review and acceptance of the attached Form of Agreement 1-P, ensuring that your firm accepts all terms and conditions as written. In submitting a proposal for this project, you concur, without exception, with all terms, conditions and provisions of this Form of Agreement.

Section 3.0 – PROJECT APPROACH AND SCHEDULE

A. **Describe your team's proposed design approach for this project. Given the importance of this project, the awarded A/E team would be required to provide at least three (3) distinct design options be developed for PSU's review and approval.** Options will be developed at least to a Concept Design level and could be developed to Schematic Design level. Be as specific to our project as possible. Discuss, at the least, your approach to the following:

   1. Project visioning and project mission/goal setting. And, your approach to then establishing a design process that works to achieve the project vision and goals.
   2. Validating the project program and gaining knowledge of the project brief. Additionally, describer any programming/building planning tools, benchmarking tools, and/or other firm-specific methodologies to assist in the design of our project.
   3. How the initial project phase leads into the Concept Design and/or Schematic Design Phase of the project.
   4. Developing building planning options and/or overall building design schemes. Approach to developing programmatic 'blocking and stacking' options that explore gallery and/or programmatic adjacencies.
   5. Working with PSU to analyze, compare/contrast different design options.
   6. Developing the interior/ exterior "look and feel" of the new building, particularly the level of advancement at the various project phases.
   7. Use of BIM, "predictive modeling", analytical/ digital tools, and other technologies.

B. **Approach to project delivery.** At least, describe your team's overall approach to:
   1. Achieving the project schedule.
   2. Identify key risks to project schedule and strategy for mitigating such risks.
   3. Planning, managing, and executing the project.
   4. Consensus building and guiding stakeholders through decision-making process(es).
   5. Creating a collaborative environment between architects, building/site planners, engineering consultants, and PSU/OPP stakeholders.

C. **Approach to project delivery- Multiple Prime contracting.** PA Department of General Services (DGS) funding for the project requires that the project is delivered with multiple prime contracting. PSU anticipates hiring a single Construction Manager as Agent to act as an owner's representative. PSU will hold all contracts and also manage the design/construction process, a typical for our projects.

Describe your approach to working with PSU's third-party Construction Manager as Agent throughout design and construction phases. Describe your approach and experience to successfully delivering projects with the multiple prime contracting.

D. **Approach to Cost Control.** Delivering our project on budget is critical. So, provide your approach to manage costs through all design and construction phases, especially considering currently escalating construction costs. Additionally, provide the following:
   1. Highlight your process of cost estimating, scope/budget alignment and cost/quality control through the design and construction phases.
   2. Define critical factors with respect to the project budget.
   3. Provide your impression of the project budget.
   4. Identify key risk to project budget and strategy for mitigating

E. **Approach to MEP and building system design.** Narrative approach to MEP planning/ design/ delivery of facility that will contain programs and space types as noted herein. Be specific with your experience and highlight your project type expertise. Please include your thoughts on a partial renovation of this existing building.

F. **Approach to Sustainability.** After reviewing PSU's High-Performance Standards, describe your team's approach to driving towards PSU's sustainability goals on the project, including exceeding our standards. Highlight your experience meeting similar high-performance standards and describe overall team commitment to sustainable design (including number of completed LEED projects). Among other applicable topics, discuss your team's approach and experience applying advanced sustainability measures, ability to apply best practice in sustainable design, applications of creative innovations to obtain the optimum performance for projects, and experience using energy models to drive design thinking.

G. Briefly describe your approach to Penn State reviews, PSU design reviews, and jurisdictional reviews. With assistance of the University, the selected AE team will be responsible for securing any/all local municipal reviews, Labor & Industry reviews and/or permits that are required. Any fees associated with permits shall be paid for by the Professional and will be reimbursed by the University.

H. **Project Staffing/Workload.** Verify the entire A/E team's availability to successfully staff the project, immediately, given our project schedule and other A/E Team workload.

I. **Graphic Schedule.** Create a graphic project schedule showing phase durations, owner engagement and review periods, and identify critical path items, milestones, and schedule drivers. This can be printed on an 11x17 fold-out and will only count as a single page.

<u>Section 4.0 – PROJECT-SPECIFIC KEY DRIVERS AND IDEAS</u>

A. Project Understanding. Briefly demonstrate your understanding of the project. Provide any observations of the project program or other provided information.

B. Your firm's vision of what, beyond purely functional issues, constitutes the essence of both the proposed new Physics building and the Osmond renovation.

C. To indicate your understanding of the uniqueness of this project, describe key project drivers, critical design elements, and potential constructability considerations your team has identified as a priority for this specific project. Discuss how you addressed similar issues on other projects.

   If important to your team, discuss an example project(s), highly relevant to our project, in more detail than your Section 2 response may allow. Include insights into what made the example project(s) successful, including how those design intentions were translated into a meaningful and synthesized final solution.

D. Delivering a highly active, collaborative and adaptable/flexible building is critical to project success. We seek to explore innovations and efficiencies in the planning and design of the completed facility. Describe programming, planning, benchmarking tools and methodologies that your team will use to meet these objectives.

   Provide specific principles/ideas or project examples for the following programs/spaces **(See Note 1)**:

   1. Physics Research Laboratories
   2. Research support spaces/labs
   3. High-Bay spaces
   4. Physics Teaching labs
   5. General purpose classrooms, especially ones similar to this program.
   6. University workplace environments
   7. Informal Learning spaces (student working and study space)

E. Provide any initial design ideas, thoughts or considerations regarding the project. We are not seeking design solutions, but rather your design thinking. Considerations may include your thoughts/opinions related to the project site, master planning and/or placemaking factors, environmental considerations, programmatic and/or thematic considerations, building massing and/or any other design considerations.

Thank you for your anticipated participation in this A/E Team Selection process. The Pennsylvania State University looks forward to reviewing your responsive proposal for this important project.

Please feel free to contact me with any questions you may have.

Respectfully,

Greg Kufner, AIA, NCARB

University Architect
The Pennsylvania State University
206 Physical Plant Building, University Park, PA 16802
Phone: 814-865-8177 | Mobile: 614-512-2287
Email: gak21@psu.edu

CC: Physics Building and Osmond renovation Screening Committee

PennState

The Pennsylvania State University

Osmond Laboratory
Renovation and Expansion Feasibility Study

University Park, PA

August 2019

HDR


OSMOND LABORATORY
EMERGENCY

Contents

Osmond Laboratory Entrance

Osmond Laboratory West View

01 Executive Summary

A Vision for the Department of Physics

Pennsylvania State University is excited to begin the Architecture-Engineering Team Selection process for the Osmond Building Demolition and Partial Replacement project. The project site is located on central campus at University Park. The project will support Penn State's vision of maintaining a world-class graduate program in physics that aspires to solve the most important fundamental mysteries posed by the universe, that seeks to translate this fundamental understanding into frontier technologies, and that pursues innovative approaches to educating a broad community of STEM students at Penn State. A concrete goal of the project is to provide the facilities and infrastructure that would empower the physics department at Penn State to be ranked amongst the top ten graduate physics programs in the US and to be recognized as a national leader in undergraduate physics education.

The existing 134,863 square foot Osmond Building was completed in 1940 and currently houses roughly half the faculty of the physics department. The project will include: renovation and hazardous abatement of one wing of the building into a state-of-the-art physics education facility; the demolition and hazardous abatement of a large section of the building and its replacement with a state-of-the-art high bay laboratory; the creation of a new physics tower that will accommodate some of the research and education activities of the physics department. The replacement building is currently envisioned to maximize the allowable build out of the site.

Due to the prominence and visibility of the location, thorough site analysis and design options will be required by the successful team to establish options for entry sequence, building orientation/ massing, campus connections, and aesthetic impact. The replacement building will house the physics administrative office, state-of-the-art research laboratories, offices, and collaboration spaces for programs in quantum information science, condensed matter physics, and AMO physics, & lecture areas designed to facilitate innovation through peer learning and knowledge sharing. The renovated sections of Osmond will house teaching classrooms and laboratories that allow for innovative pedagogy, and offices for teaching personnel. The project should also accommodate a state-of-the-art high bay laboratory for faculty from physics as well as astronomy/astrophysics working on experimental projects that require the construction of large scale equipment.

The goals of the project include the following:

- Realize the vision and goals of the University Leadership to boost the physics department to an overall top 10 graduate program ranking in the US and to a national leadership position in undergraduate physics education.
- Create a well-designed building that provides specialized laboratory space (low vibration, high ceiling, tight environmental controls) and office space that are configured to attract, support, and retain a faculty with international leadership in quantum science and technology, condensed matter physics, and AMO.
- Renovate an existing building to provide teaching spaces that are configured to promote innovative approaches to physics education with the requisite components of collaborative and engaged learning.
- Enhance the existing aesthetic and character of the University Park Campus.
- In keeping with our commitment to environmental sustainability, this facility will be a high performance building and will, at a minimum, attain LEED Certification.
- Create a flexible/adaptable building, including state-of-the-art laboratories, modern office space, learning areas, and collaboration spaces in support of evolving educational pedagogies, technologies, and research initiatives.
- Efficiency. Delivering a highly space efficient building is critical to the success of this project as the completed program expects to achieve up to a 65% efficiency. We are seeking architecture and programming consultants that can drive our decision making on the optimal grossing factor and also seek ways to find efficiencies in the planning and design of the completed facility.
- Replace deteriorated building, infrastructure systems, including the site utility services

With the University's vision and goals in mind, the following report includes the results of a programming feasibilty study, several conceptual design options, and an analysis of Osmond Laboratory's existing conditions.

Osmond Laboratory Renovation and Expansion Feasibility Study

Physics Program Overview

Over the past two and a half decades, the physics department has taken dramatic strides toward academic excellence, rising from an NRC ranking of 54th (in 1995) to 13th (in 2010). The 2014 US News and World Report ranked Penn State's Physics program 23rd in the country and 5th in the Big Ten Conference behind the Universities of Illinois, Michigan, Maryland and Wisconsin and tied with Ohio State. This enhanced reputation stems from a sustained focus on maintaining the highest standards in every aspect of the department's academic mission. The physics department has an excellent and diverse faculty, comprised of both established scientific leaders and rising young stars, all actively making influential scientific discoveries.

To achieve the department's vision of permanently becoming a "top 10" physics program, they plan on increasing faculty by approximately 10% to 50 full time faculty, equally split between experimentalists and theorists. This increase in strategic-hire faculty would allow the department to strengthen strategic interdisciplinary links with other units at Penn State including astronomy and astrophysics, biology, biochemistry and molecular biology, computer science and engineering, the Huck Institutes of the Life Sciences, the Institute for CyberScience and the Materials Research Institute.

The most significant barrier to fulfilling this vision is the lack of adequate space that meets current standards. At present the department is at capacity and spread across multiple buildings to meet current space needs. Without a new building and/or renovation with updated research space, the department is not only unable to sustain what it has currently, they also risk losing their current status among the top 15 NRC ranked programs and cannot hope to rise to a "top 10" department. Additionally, the lack of available modern research space limits the department's ability to compete for external grant funding.

A well-designed project would provide an opportunity to build spaces that facilitate and encourage spontaneous, informal interactions between faculty and students from different specialties, leading to an environment that can spark innovation and creativity. This free flow of ideas and creativity must be coupled with laboratories that provide the highest level of technically advanced laboratories.

Project Understanding

The Eberly College of Science's physics department is spread across four buildings in the central part of the University Park campus. Osmond Laboratory is the physics department's main facility housing 58% of the department's undergraduate teaching and advanced research spaces including labs, classrooms, lecture halls, faculty and administration.

The purpose of this study is to develop options for the next generation of Osmond Laboratory that could involve adaptive reuse, whole building renovation and selective expansion of Osmond Laboratory. Design solutions should provide attractive, modern, energy-efficient teaching and research spaces that support Penn State's pedagogical and research missions. The New Physics Complex must attract and retain the best researchers, faculty, post-docs and students, while meeting budget and maintaining a character that is appropriate given its architectural context.

To meet anticipated program growth and to accommodate the decanting of physics administration and research from adjacent buildings, additional space will be required. The project also involves addressing deficiencies in and around existing Osmond Laboratory including building code shortfalls, building envelope maintenance and thermal performance issues, barrier free access limitations, storm water infiltration, building loading inadequacies and the need to minimize impacts to the adjacent parking lot.

The location of this project also presents a unique opportunity to address a long-term central campus planning issue. As part of this project, Penn State will re-route existing storm sewers and introduce new underground stormwater detention structures beneath the existing adjacent parking lot. This work is necessary to alleviate the overburdened storm sewer system and to address central campus flooding.

Some key design goals for the New Osmond Laboratory Complex include:

- Co-locate the physics department into a single contiguous teaching and research center.
- Create flexible academic spaces that support more active and participatory learning.
- Provide attractive, forward-looking research facilities that meet critical design criteria including temperature, humidity and vibration.
- Address immediate deferred maintenance needs while at the same time establish a longer term expansion/renewal/replacement strategy.
- Manage the design to a fixed budget through a series of stand-alone phased projects.
- Create an exciting new image for Penn State's physics department that celebrates its rich history, is conducive to breakthrough research, continues to attract the best and brightest faculty and students, and positions it for growth over the next decade with the ambition of permanently becoming a "top 10" department.

History

Occupied in 1940, Osmond Laboratory was built with funds from the federal Public Works Administration and designed by Charles Klauder, architect of many original campus buildings so its historical value is immeasurable. However, at more than 75 years old, the building no longer provides an environment supportive of modern teaching pedagogies or conducive to state-of-the art physics research.

Pattee Library, Burrowes Building, Electrical Engineering West, Frear Lab, Ag Engineering, Ferguson Building, and additions to Steidle and Sparks buildings were designed during the same period as Osmond Laboratory and mark some of Klauder's final works before his death in 1938. Most, if not all, of Klauder's other works designed and constructed during this same period have seen significant capital improvements in recent years, while Osmond has not. This feasibility study and space program for the new physics tower provides the basis for modern and highly competitive teaching and research facilities.

Present Day

Osmond Laboratory is a 134,583 gross square foot, three-story concrete and masonry facility and has a basement and partial sub-basement. The resulting building includes 79,667 assignable square feet (ASF); of this, 61,485 ASF are assigned to the physics department, and 18,182 ASF within Osmond are general purpose classrooms (GPCs), assigned by the university central registrar and not controlled by physics. The remainder of the physics department is housed in Davey (36,580 ASF) and Whitmore (8,044) buildings. The department of physics has a total of 106,109 ASF in the three buildings.

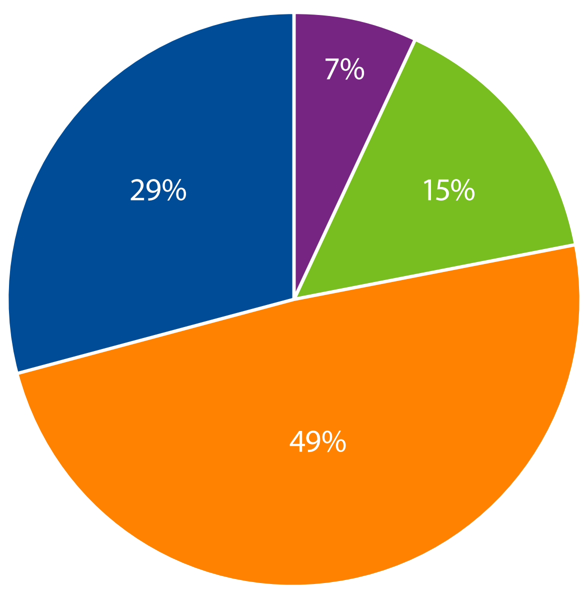
The facility's current condition is as expected for a well-maintained 75 year old structure. The exterior masonry needs maintenance, it lacks insulation to meet modern energy codes and windows need to be replaced. The interior is functional, however it requires significant improvement to bring up to modern day standards.

The general purpose classroom space is highly utilized and the building provides a majority of physics departmental functions. Osmond Laboratory is not fully conditioned and areas that are conditioned are substandard resulting in poor thermal comfort for occupants. Elevator cabs are undersized, inadequate for moving materials and equipment and do not meet current code requirements. Similarly, toilet rooms are also substandard and require renovation or replacement. The 11 foot column bay spacing limits the ability to repurpose and combine smaller spaces into larger and more open active-learning classrooms.

Osmond Laboratory is home to 15 general purpose classrooms ranging in size from 24 to 82 seats. It also houses two of the largest and most highly utilized tiered lecture spaces on campus which can hold 152 and 341 seats respectively. The largest classrooms are used for physics demonstrations and lectures for the 7,000 undergraduate students taught each year. However, while highly utilized, these lecture halls are steeply sloped, offer poor sightlines and keep students distant from faculty. The steep steps and fixed seating do not allow students to work in groups and make it difficult for faculty and teaching assistants to easily circulate through the room during lectures. Concerns with structural integrity of walls, clumsy egress paths and narrow entryways reinforce the idea that this space requires significant improvements to meet modern standards.

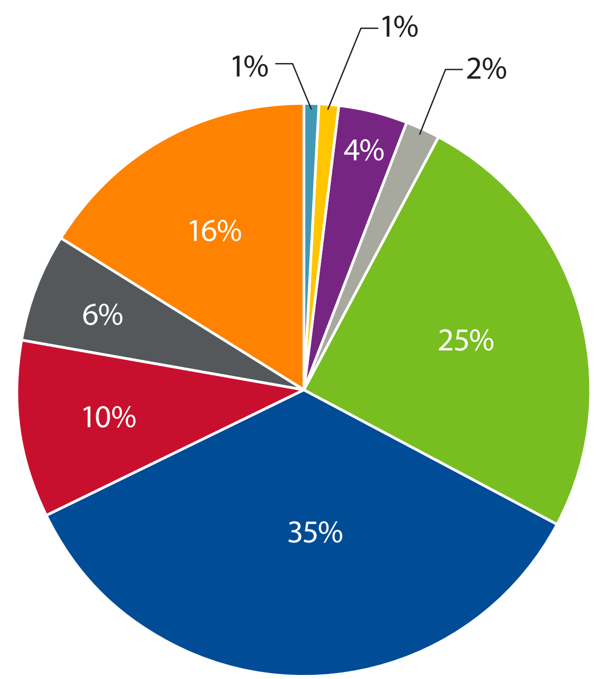
Research Labs are located in the basement and subbasement of Osmond as well as in adjacent Davey Lab. These labs house experimentalists who require low-vibration, high ceilings and consistent temperature and humidity to perform their studies. Several lower-level Osmond labs flood and the environmental stability as well as consistent cooling and ventilation of the spaces is problematic. The overall research environment is substandard compared to similar research programs at peer institutes. In order to support modern research, to recruit more top-tier faculty and post-docs and to continue to attract the best students, this space requires significant upgrading.

Based on preliminary observations and discussions with Penn State, the need to raze the existing lecture hall wing and replace the larger lecture halll, as well as the need to provide additional and improved research laboratories, consistently remained top priorities. The goal of unifying the physics department into a cohesive and contiguous complex also remained paramount to achieving their vision of the future.



Existing Space by Building

Davey Laboratory	36,578 NASF
Osmond Laboratory Physics	61,485 NASF
Osmond Laboratory GPC	18,182 NASF
Whitmore Laboratory	8,044 NASF
Physics and GPC:	124,289 NASF



Existing Space by Space Type

Alteration or Conversion Area	1,150 NASF
GPC and Support	19,417 NASF
Dept Classroom and Support	7,507 NASF
Class Lab and Support	12,266 NASF
Research Lab and Support	43,562 NASF
Office	30,492 NASF
Office Service and Support	3,109 NASF
Student Support and Amenity	5,532 NASF
Building Support	1,254 NASF
Physics and GPC:	124,289 NASF

Organic Research Laboratory, 1940

Osmond Interior Laboratory

02 Department of Physics Programming & Planning

Planning Background

Currently the physics department occupies space in four buildings: Davey, Osmond and Whitmore, with one faculty member with a joint appointment located in a fourth building which is the proper location for her and where she will most likely remain.

For purposes of collaborative research and efficient teaching, the department wishes to consolidate into space which is as contiguous as possible while providing the right types and amounts of space to take them well into the future. This feasibility study began in order to determine the amount and types of space required to do this and to develop conceptual options for the best location for physics, including whether they might eventually be able to vacate some of their currently occupied space and be consolidated into an existing renovated Osmond Lab with a new addition.

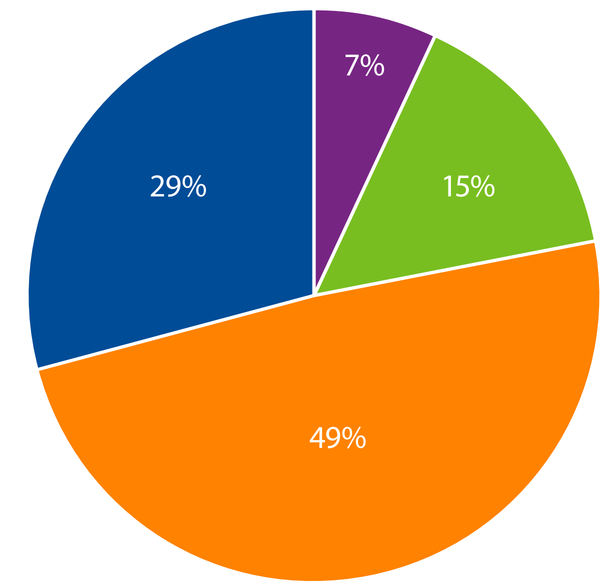
Existing Situation

Physics currently occupies a total of 106,107 assignable square feet (asf) in the three buildings; the department occupies 8,044 asf in the Whitmore facility, which serves as the Center for Gravitation and the Cosmos. The space in Whitmore is primarily office and theory space. The department has a significant presence in Davey, 36,578 asf, including research space for both experimentalists and theorists, offices for faculty, postdocs and graduate students, and the departmental administrative office. It is important to note that the research labs in Davey are in good shape and are quite exacting in terms of environmental parameters including temperature, humidity, vibration protection and EMI/RF shielding.

The primary home for physics is Osmond Laboratory, with 61,485 asf. All of the department's teaching labs, departmental classrooms, the remainder of offices for faculty, postdocs and graduate students, and research laboratories for several of the Condensed Matter experimentalists are housed in Osmond, as well as significant support space including core labs, the student and professional machine shops and storage space for both research and teaching. In addition, seventeen general purpose classrooms (GPC's), including a 341-seat lecture hall and a 152-seat lecture hall, are located in Osmond, for an additional 18,182 asf. The building was built in the first half of the last century and has several significant issues which impact the research and teaching that occur there.

The two lecture halls are far too steeply tiered for today's standards and are not able to provide the active learning functions that are associated with modern pedagogy. The classrooms have been updated and provide a reasonable learning environment, but are still located in facilities that are outdated. These classrooms would benefit from selective renovations, to provide appropriate arrangements, technology, electricity and teaching tools. The teaching laboratories were designed long ago to accommodate 48 students; the space allotted per student does not meet modern standards and the layouts do not lend themselves to the group work that is such an inherent part of today's teaching and learning styles.

The research laboratories in Osmond are outdated, overcrowded and do not provide the exacting environmental parameters that are crucial to physics research. As science has reached ever more exacting levels, the measurement activities inherent to physics research in condensed matter (CM) as well as atomic, molecular and optical physics (AMO) require stringent temperature and humidity control, vibration stability and protection against electromagnetic interference (EMI) and radiofrequency interference (RFI). Osmond is currently unable to meet these parameters, and further, due to a variety of issues, the building has frequent water leaks into the basement and sub-basement where these research efforts are located. The situation in the Osmond subbasement and basement has forced many investigators to have research labs in both Davey and Osmond, fragmenting their research.



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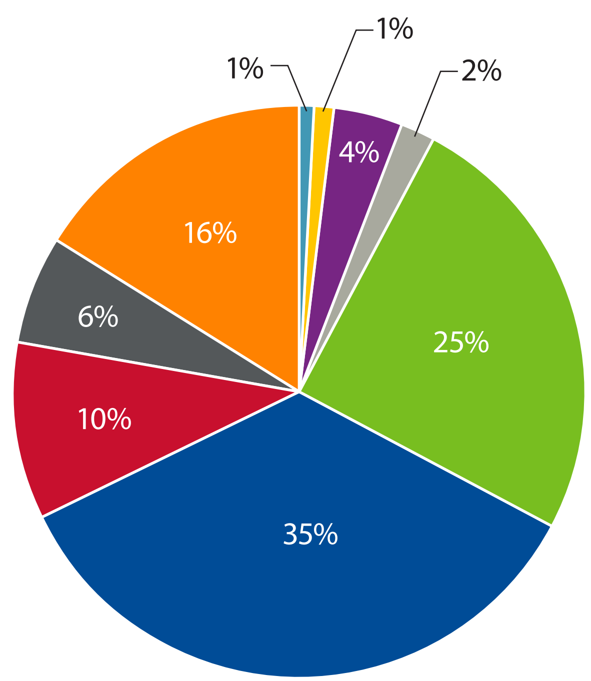

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Space Programming

After studying the department's current space research, activities and constraints, the initial task in understanding the feasibility of a consolidated home for physics was to identify a global space program, or the types and amounts of space needed by the department for its current and anticipated activities, regardless of where in the complex (or in what combination of buildings) that space might reside. This total amount of space would then form the basis for conceptual planning of renovations to Osmond, new construction on the site, and whether the department would then be able to vacate its space in Davey and Whitmore, allowing those spaces to be reclaimed by PSU for other purposes.

Headcount Projections and Office Requirements

The physics department currently (June 2019) has 46 faculty members: 21 experimentalists and 24 theorists, as well as several emeritus faculty, some of whom still have active research programs. This program assumes an ultimate faculty of 50. Of these, half would be theorists, requiring offices, computational and shared meeting space but not laboratories, and half would be experimentalists, requiring offices and access to meeting space, as well as dedicated experimental labs. Group sizes will vary; for planning purposes, each experimental faculty member is assumed to have two postdocs and five graduate students. Theorist faculty are assumed to have two postdocs and four graduate students. It is important to note that group sizes are extremely variable; flexibility in assigning desk space will be a key component of this program. Office and seating space will be located together for flexibility in assignment.

Offices are programmed at 121 square feet; PSU standard faculty office is 120 sf, and adhering to this standard as closely as possible while developing an office module that works well in a lab building results in an office size of 11' x 11'. For flexibility, this office module has been programmed to accommodate one faculty member, two postdocs or three graduate students. In addition to faculty offices, an additional nine offices have been programmed for lecturers, visiting faculty or others who may temporarily need offices in the building.

The space program includes three elements of office space. First, since the new tower will be considered the home for the physics department, the departmental office will be located there. The second element of office space is for the ten experimental faculty who will be located in the building and their postdoctoral and graduate students. The third element of office space is for theorists, and will provide enough offices for all existing faculty and staff in Osmond to vacate that building. Actual assignment of the offices will depend on the final decision by the physics department regarding faculty groupings in Davey and in the new tower. It is assumed that faculty in Whitmore, the Center for Gravitation and the Cosmos, will remain there.

Graduate students are generally assigned to a lab by the end of their second year, so after that, their seat is with their research group. First year graduate students and some second years have not yet chosen a lab, so seats for these students have also been provided in the program, either in the new tower or the renovated east wing.

A successful physics department depends not only on quality research space for both experimentalists and theorists, but also on collaborative space for them to meet. A seminar room large enough for the entire faculty to meet is included in the program as well as a "theory center", which is intended to be an informal collaborative space featuring furniture and writing spaces that are easily reconfigured, outlets and data ports that are readily available, and finishes that create a welcoming and dynamic atmosphere where both faculty and students will want to come together to study, talk and share their findings. This shared meeting space is a critical communication zone for theorists to collaborate with each other, for theorists and experimentalists within the same discipline, and for the mix of physics disciplines with each other and with other scientific disciplines.

Research Laboratories

Preliminary analysis of existing research space revealed that senior experimental investigators have an average of 1761 asf, while junior investigators have an average of 1220 asf. The department is heavily weighed toward senior investigators. The global program for experimental labs is based on a laboratory module of 11' x 30', with an average assignment per principal investigator (PI) of 5 modules, or 1650 asf per person, with seating and office space in addition to that. Shared laboratory and support functions include a high bay lab, student shop, machine shop, and prep and storage spaces.

Instrumentation and measurement tools required for modern physics research demand exacting environmental parameters. Physicists require stringent environmental parameters in terms of structural stability and resistance to vibration, temperature and humidity control, shielding from EMI and RFI, the ability to manipulate and control acoustics, and electricity, gases and cooling water for equipment, in ways that other sciences do not.

While the department has done an admirable job of operating research facilities within the Osmond building, the laboratory facilities are overcrowded and have reached the maximum level of capability for this exacting research. Systems are nearing the end of their useful life span. In addition, the lower floors of Osmond have water infiltration putting some laboratories out of commission.

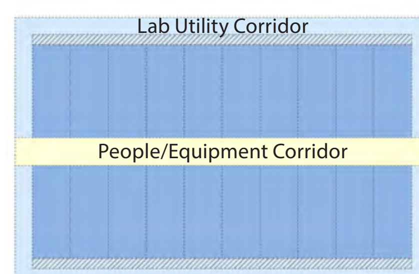
A new addition could accommodate the laboratories with the most stringent environmental requirements. A basic requirement for the project is that the research activities of Atomic, Molecular and Optical Physics must be protected from magnetic fields, and Condensed Matter Physics actually generates these fields, so the two groups must be appropriately segregated. At the same time, these groups communicate closely, and experimentalists within each group collaborate closely with the theorists in their groups. Current planning indicates that the two groups should be located in different wings of an addition or new building, and may be built at different times depending on when funding is available.

Therefore, it is a high priority of design to optimize communication between all physicists so that the faculty members continue the cohesive relationships that have characterized them in the past. Since slab-on-grade research space is precious, faculty and research staff offices will not be located on these floors but will be located on office floors with their colleagues.

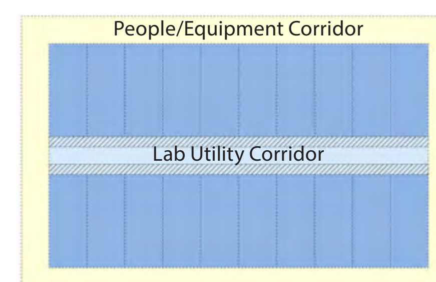
The laboratory program has been developed based on a laboratory module. A laboratory planning module is generally defined as the smallest practical laboratory environment, consisting of two bench/equipment zones, nominally 30" each or one equipment zone of 5', separated by an aisle (5' – 6'). Laboratory planning modules can be combined and/or subdivided to create the appropriately sized laboratory based on head count and/or function. The module acts as a 'skeleton' for the MEP systems in the building as well as a space assignment tool.

The laboratory module assumed for this feasibility study is 11' - 0" wide by 30' deep. However, it is important to note that while the module depth is 30', the wall for the lab will fall at 27', with 3' of the depth contributed to a laboratory utility corridor (LUC). The lab utility corridor will have a minimum clear travel aisle of 5' plus a 3' equipment zone that is considered part of the laboratory. Additionally a people/equipment corridor will be required, that will enable large optics tables and other lab equipment to move through the floors and into the laboratories. Equipment movement through the lab utility corridor is not desirable, as that corridor will be filled with pumps, chillers, etc. associated with the labs.

The two options below illustrate different configurations for the people/equipment and utility corridors. The laboratory utility corridor is considered distributed laboratory support space, located directly outside the lab proper, and would house vacuum pumps in vacuum pump cabinets, gas cylinders, electrical panels, and other lab support items. Grommets developed between the lab utility corridor and the laboratory proper would allow for easy piping and tubing transference. It is important to note that six feet of width for this utility corridor has been identified as net assignable space within the 30' module depth; an additional 1-2 feet may be required as part of the grossing factor and should be calculated as such.



Option A



Option B

Vibration

A defining premise of these laboratories is that all of them would meet strict vibration requirements. Most of the below-grade research labs require a very stable environment to conduct their studies. A vibration assessment survey was not conducted as part of this study so ambient site vibration conditions are currently unknown. The eventual design project should include a Vibration Assessment. Preliminary user group interviews were conducted with key stakeholders as part of this feasibility study. During these interviews vibration criteria was discussed and noted, however this requires futher investigation. Most research labs would be characterized as highly sensitive and be required to meet VC-E (3µm/s or 125 µin/s. Other labs such as AMO are even more sensitive and should be designed to meet NIST-A (0.025 µm or 1 µin displacement for $1 \leq f \leq 20$ Hz; 3µm/s or 125 µin/s or VC-E for $20 \leq f \leq 100$Hz). This will all require further investigation during the eventual project.

Specific points of note about the laboratories are as follows.

Planning includes an average of five modules per researcher. Some investigators will need more than five and some will need less. Each PI's lab will likely be subdivided into smaller lab rooms of 1, 2 or 3 modules. Optics and laser labs will ideally have HEPA filtered, recirculated air and will have positive pressure, while lab rooms with fume hoods will need once-through air and will need to be negatively pressured relative to adjacent spaces. Anterooms may need to be provided to allow for appropriate pressurization. It is anticipated that 5-6 investigators may require part of their space to be an ISO-6 Class 1000 clean room.

There are four types of Physics Research Labs: Condensed Matter (CM), Biological Physics, Atomic Molecular Optical Physics (AMO) and Particle Astrophysics. Preliminary planning identifies that CM and AMO experimentalists will be located in the new tower. It is critical that AMO be separated from the high-field magnets used by the CM researchers. Labs that use a significant amount of chemicals would be better served on basement or ground level. One chemical synthesis lab associated with one Condensed Matter researcher should be planned on an upper level and does not need the stringent environmental parameters of the sub-basement and basement levels labs.

Notes from User Interviews

1. Condensed Matter (CM): There are two types of CM labs: (1) those with optics tables and some low-temp cryostats, and (2) primarily cryogenic measurements.
   a. There will be a core lab to accommodate high-field magnets. Four to six pit locations (each 4' x 4' x 6' deep, one pit 6' x 6' x 10') will be required within that lab.
   b. Labs with optical tables and cryostats – no pits required.
   c. Fume hood requirements (6' hoods): Typically each lab will require at least one room with a fume hood. One or two labs will require up to three or four hoods.
   d. Temperature control tolerance = ±1°C
   e. Other requirements:
      i. All labs need recirculating process chilled water
      ii. Power – typically 120v, 208 single phase and 3-phase
      iii. CM labs use large quantities of helium so shared helium recovery system required. O2 sensors will be required. Need low pressure lines to bring helium back to a central location. Recovery involves a large inflatable bag – need a specific room devoted to this. Provide manifold to contain the gas. Helium currently in PVC pipe; copper would be better. (Helium recovery requirements to be validated during program verification).
      iv. Bring 480v to each floor, at panel; extend service as required to individual labs.
      v. Piped services: compressed air, de-ionized water located next to fume hoods, nitrogen (not currently provided in existing labs but would be useful – tank at Davey is too remote). Explore potential of using boil-off from liquid nitrogen tank if feasible.

vi. Some labs will need 1000 lb. crane.
vii. Point exhaust ("snorkels") required in some areas.
viii. CM labs produce large electromagnetic fields and must be separated from AMO labs which are sensitive to these fields.

2. Biological Physics: (not currently anticipated for new tower)
   a. Currently no Biological Physics, but this is an area of growth.
   b. Similar to CM lab requirements.
   c. Labs do not require vibration isolation.
   d. Department may have one researcher working with animals; depends on results of hiring search.

3. Atomic, Molecular, and Optical Physics:
   a. Currently five, expect maximum of seven researchers. Each researcher may have two or three labs, at two or three modules each. Typically each PI would have an optics lab and a fume hood lab, which would also be used for electronics work, soldering, etc.
   b. Labs require independent air and temperature control.
      i. Stringent temperature control requirements = ±0.1°C. Typically the optics room would require this tight control and would have HEPA-filtered recirculated air. Rooms with fume hoods would not need the stringent control and would have once-through air.
      ii. Separate air handling each lab.
      iii. HEPA filtered air – recirculate; 10% make-up air.
   c. Vacuum chambers and optics tables (assume total of two or three tables), with overhead shelving. Researchers need to be able to move optics tables around depending on experiments, and robust shelving system needed.
   d. Stand-by power for systems – very important. Temperature must remain stable even in power outage; otherwise months to recalibrate.
   e. Electrical Panels: one per 2 or 3 modules.
   f. AMO work is sensitive to electromagnetic fields – locate far from CM labs.
   g. Vibrational stability – 80% of AMO research labs should meet NIST-A standard for Low frequency (below 60Hz).
   h. Other Services:
      i. Cooling water supply and return. Pressure must be reliable. They sometimes dump water down the drain now because of unreliable pressure. Some chilling lines go into vacuum chamber; leak is very disruptive.
      ii. Compressed Air: Clean Dry Air
      iii. Nitrogen
      iv. Use lots of liquid Helium.
      v. Some Point Exhausts required.
4. Particle Astrophysics: (not currently anticipated for new tower)
   a. Currently 5 researchers: may grow to 6-7 PI's.
      i. These will be smaller labs, maybe two modules per PI. Four researchers have an electronics lab. Fume hoods could be shared.
      ii. One researcher has a CM type lab with vacuum and high-bay needs. No temperature control or vibration isolation required.
      iii. Labs are not sensitive to electromagnetic fields, nor do they create them.
   b. Lots of bench work (electronics).
   c. Power: 120v, 208 single-phase, and three-phase.
   d. Compressed air required.
   e. Recirculating process chilled water required only in the one CM-type lab.

5. High Bay – assume a two-ton minimum Gantry Crane. Minimum clear ceiling height of 20' below crane. Critical functional adjacency is to high energy physics / particle astrophysics.

General Research Lab Requirements

Water: All labs will require water service, at least one sink (10"-12" deep, 20"-30" wide), and floor drains. DI water required at hoods.

Cooling Water: A closed loop chilled water system is required throughout the building. Each laboratory (collection of bays used by a PI) should be isolated from the main loop with a heat exchanger and pump system.

Power: 120V, 208 1- and 3-phase required in laboratories. Provide 480v to corridors and to helium recovery system. Electrical panels, possibly one per two modules, per individual lab.

Grounding: All labs will require grounding bars.

Floor Material: resistant to liquid nitrogen and capable of handling heavy traffic.

Optics Tables: Optics tables and lasers are a basic element of physics research. Laser lights, integral tracks for laser curtains and overhead utility / shelving systems should be included in all laboratories. Clear travel patterns into the building and into the laboratories for a 5' x 10' optics table must be maintained, including elevator access.

Vibration / EMI / RF Criteria: A Vibration Assessment was not conducted as part of this study so ambient site vibration conditions are currently unknown. Based on projected research activities, lab vibration criteria is anticipated to be in the highly sensitive range requiring VC-E or NIST-A slab performance. In addition, efforts should be made to acoustically isolate different laboratories from each other and from adjacent corridors.

For vibrations induced by mechanical equipment, structural slabs between lab and mechanical spaces shall be constructed to provide an appropriate base for equipment isolators to work against. The design development will then provide equipment isolation to preclude vibrations from being transferred into the structure.

Materials to isolate laboratories from EMI and that provide acoustic isolation between laboratories and dampen acoustic noise within the laboratories should be selected for construction.

Teaching Laboratories

Preliminary design concepts all assume the west (auditorium) wing of Osmond will be demolished, and that the east wing of Osmond will be replaced or renovated as part of this project. The east wing consists of a basement and three floors, and houses research labs and offices, teaching labs and classrooms. The front bar of Osmond located along Pollock Road consists of research labs at the subbasement and basement level, general purpose classrooms primarily on levels 1 and 2, and faculty and research offices and dry research on level 3. Renovation of the Pollock bar is not anticipated as part of this project.

Currently teaching labs are running from 8 a.m. – 11 p.m. Monday through Thursday. Friday is prep time, when equipment is rotated out and experiments are changed over for the following week. Ten teaching labs will meet the needs of the physics program (nine currently exist in Osmond). In keeping with today's active learning standard, they have been programmed at 35 sf / seat. Four introductory labs at 48 students, three upper level labs at 36 students and three specialized labs are included. Two small instrument rooms should be located between the Graduate Lab and the Senior Undergraduate lab to be shared between the two. Rotational equipment and supply storage space for physics teaching labs is included and can be remotely located as long as it is within the same building.

Teaching labs are primarily taught by five instructors, who are considered full time and have faculty offices. Offices for these five instructors have been included in the program. When the east wing renovation is complete, these five lecturers ideally will have offices in the renovated Osmond, since their teaching functions and student spaces will be located there.

General Teaching Lab Requirements

Typical Undergraduate Teaching Labs: In the 48p and 36p labs, students work in groups of six. One 48p and one 36p lab need blackout shades. Central table needed for printer and to turn in assignments. Full instructor bench is not required.

Electronics and Optics: 20 students, but lab is not set up for all students to do the same thing at the same time as typical undregraduate teaching labs are. Lab contains both chairs for in-lab discussion and benches for equipment. Eight benches for equipment setups, each with a dedicated computer. Equipment is networked. Large storage cabinets needed to store equipment in the lab.

Senior Undergrad and Graduate Lab: look alike, stations have different equipment.

Senior Undergrad: 12 stations, one is in shared instrument room. Half of equipment stations are 5′ long, half are 12′ long. One vibration table, one STM/AFM. Chilled water for cooling equipment required.

Water: All labs will require water service, at least one sink (10″-12″ deep, 20″-30″ wide), and floor drains. DI water required at hoods.

Power: On student tables, provide one duplex outlet every 18″ o.c.

Data: Ethernet ports required in all labs.

No piped utilities are anticipated in the teaching labs.

Classroom Planning

In addition to departmental meeting spaces, the Osmond building houses seventeen general purpose classrooms, (15 classrooms and 2 auditoria) which are not owned by the department of physics but are centrally scheduled by the university registrar. These rooms are in high demand for many courses on the campus, and scheduling of their renovation/replacement must be carefully considered, with swing space to be found. Other than the 350 person auditorium, classrooms are not included in this space program.

- The 341-seat auditorium will be replaced by one of equal capacity, yet designed and geared toward appropriate technology, sightlines and acoustics, with active learning in mind, and an adjacent prep/storage area to be shared by physics and chemistry. This is a priority for the first phase of this project.
- The 152-seat tiered auditorium was intended to be replaced in this project, but preliminary budget information does not permit this.
- Currently it is anticipated that, when funds are available, the Pollock bar of Osmond (located along Pollock Road) would be renovated for general purpose classrooms. The existing column bay spacing suggests the building may be better suited to classrooms of 20-36 people, based on acceptable room dimensions and sightlines.

At the end of the day, the new tower, existing Osmond, Davey and Whitmore will all have a significant physics presence, and these buildings and their connection points should be regarded as one complex. Opportunity for general purpose classrooms to be created in an eventual renovation of the Osmond Pollock bar should be considered in the planning.

Pennsylvania State University- Osmond Laboratory Study

Prog ID	Space Name	floating head count	occupant head count	mod / room	nsf / room	no. rooms	total proposed new nasf	remarks
NEW CONSTRUCTION								
1A	Physics Departmental Office						2,517	Central, front face of department to public
1B	Experimentalist Offices: Fac+Staff						5,768	
1C	Theorist Offices: Fac+Staff						6,135	
2.0	Theory Center / Collaboration / Meeting Space						7,523	
3.0	Large Classrooms						14,090	
4.0	Research Labs, Experimentalist						22,300	Assumes 10 exp faculty, avg 5 modules (1650 sf)each. Assignment will NOT be all the same.
5.0	Building Support						4,820	7%
6.0	High Bay Research Labs						2,970	Location TBD, near High Energy Physics
							66,122	
							110,204	GSF at 60% efficiency
							114,004	GSF at 58% efficiency
							120,222	GSF at 55% efficiency
TOTAL NEW CONSTRUCTION:							66,122	NASF
							120,222	GSF
RENOVATION OSMOND EAST WING:								
7.0	Physics Teaching Labs						15,833	
8.0	Research Labs						3,878	East wing basement, Add Alternate or Phase 2
9.0	Physics Program Support						6,906	
							26,617	NASF

Assumptions:

1. All experimentalists and all theorists out of Osmond with this program.
   No theorists move out of Whitmore.
2. Shops, both professional and student shops, are not included in this program and are to remain in Osmond or relocate.
3. General purpose classrooms are not included in this program.
4. Offices are assigned at the new standard SF.

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Prog ID	Space Name	floating head count	occupant head count	mod / room	nsf / room	no. rooms	total proposed new nasf	remarks
NEW CONSTRUCTION: SPACE LIST								
1.0	**Office**							
1A	**Physics Departmental Office**							
	Department Head Office		1	2	242	1	242	
	Senior Admin Office		3	1	121	3	363	
	Reception / Staff Office		5	4	484	1	484	open area with workstations
	Conference Room	12-15		3	363	1	363	
	Copy / Printer / Workroom			2	242	1	242	used by all faculty, pdocs and admin
	Office Supply Storage			0.5	61	1	61	adjacent to workroom
	Coffee / Break Room			1.5	182	1	182	
							1,936	
	Secondary circulation at 30%						581	
1A	**Physics Departmental Office**						**2,517**	
1B	**Experimentalist Offices: Fac+Staff**	Experimentalists: Faculty and Students who work in SB and B labs. Typical Group: 1 PI, 2 PD, 5 GS						
	Office, Faculty		10	1	121	10	1,210	
	Office, PostDoc/Res Sci		20	1	121	10	1,210	2 Pdoc share one office
	Office, Grad Stud		50	1	121	17	2,017	3 GS share one office. Can be combined into max 15p
	Office subtotal						4,437	
	Secondary circulation at 30%						1,331	
1B	**Experimentalist Offices: Fac+Staff**						**5,768**	
1C	**Theorist Offices: Fac+Staff**	Theorists and others with offices in old Osmond. Typical Group: 1 PI, 2 PD, 4 GS						
		All offices out of existing Osmond. No one out of Davey or Whitmore						
	Office, Faculty		9	1	121	9	1,089	
	Office, PostDoc/Res Sci		18	1	121	9	1,089	2 Pdoc share one office
	Office, Grad Stud assigned to PI		36	1	121	12	1,452	3 GS share one office. Can be combined into max 15p
	Office, Lecturer		**5**	**1**	**121**	**5**	**605**	**Available for growth faculty after east wing renovation**
	Office, Visiting Fac/Sci		8	1	121	4	484	2 V Sci share 1 office. Always visitors, from 2 days to 1 year
	Office subtotal						4,719	
	Secondary circulation at 30%						1,416	
1C	**Theorist Offices: Fac+Staff**						**6,135**	

Pennsylvania State University- Osmond Laboratory Study

Prog ID	Space Name	floating head count	occupant head count	mod / room	nsf / room	no. rooms	total proposed new nasf	remarks
NEW CONSTRUCTION: SPACE LIST CONTINUED								
2.0	**Theory Center / Collaboration / Meeting Space**							
	Huddle Room	2-4		1	121	9	1,089	
	Conference Room, Sm	6-10		2	242	3	726	
	Seminar Room	35-40		8	968	1	968	
	Theory Center/Collabzone				1,000	2	2,000	open zones with tables, soft seating, whiteboards, acoustical control
	Graduate Student Lounge				400	1	400	
	Lactation Room				120	1	120	
	Pantry/Breakroom			2	242	2	484	
	Office subtotal						5,787	
	Secondary circulation at 30%						1,736	
2.0	**Theory Center / Collaboration / Meeting Space**						**7,523**	
3.0	**Large Classrooms**							
	Auditorium, 350p	350			7700	1	7700	tiered, 2 rows/ tier, horseshoe rows, fixed wired tables, movable chairs. 22 sf/seat
	Auditorium through addl floor						5390	Double height space
	Physics / Chemistry Prep / Stor				1,000	1	1,000	adjacent w entry to front of auditorium
3.0	**Large Classrooms**						**14,090**	
4.0	**Research Labs, Experimentalist**	25 modules per floor, basement and subbasement						
	Experimental Labs, PI*		10	1	330	46	15,180	Lab module = 30', with 27' inside lab and 3' equipment zone located in service corridor. Labs to be assigned from 2-5 modules per PI. With shared magnet lab, 50 lab modules total on SB and B levels
	Experimental Lab, Synthesis		10	5	1,650	1	1,650	Located on upper floor; chemical fume hoods
	Shared Magnet / Pit Lab			6	1,980	1	1,980	Shared lab on SB and B. Subbasement location to have 4 pits, ea. 4' x 4' x 6' deep.
	Lab Service Corridor				50	50	2,500	8' lab corridor between lab modules or on perimeter of floor plate consisting of 5' clear aisle (this program element) and 3' of lab equipment space which is included in the lab module.
	Satellite Machine Shop			1	330	1	330	
	Storage, Research			1	330	2	660	
4.0	**Research Labs, Experimentalist**						**22,300**	
5.0	**Building Support**							
	Building Entry / Lobby / Science Display				2,500	1	2,500	
	Loading Dock / Materials Staging				600	1	600	
	Janitorial: Main Janitorial Rm				600	1	600	Subdivide: custodial equipment: 400 sf and break: 200sf. Per PSU Standards
	Janitorial: Locker Rm				200	1	200	
	Building / Maintenance Storage				200	1	200	
	Chemical Storage and Waste				120	1	120	
	Helium Recovery System				480	1	480	
	Cylinder Storage				120	1	120	
5.0	**Building Support**						**4,820**	
6.0	**High Bay Research Labs**	Location to be found near High Energy Experimentalists						
	High Bay Lab, Shared			6	1,980	1	1,980	Height 20' clear, 2-ton minimum crane throughout. Direct access to outside; garage door required. Clean path to/from Davey
	Electronics Shop, Shared			2	660	1	660	Fabrication in conjunction with high bay
	Clean Room, ISO 6 /Class 1000			1	330	1	330	Gowning from electronics shop, Open clean room with benches for electronics fabrication.
6.0	**High Bay Research Labs**						**2,970**	
	TOTAL NASF NEW CONSTRUCTION:						**66,122**	

June2019

Pennsylvania State Univerisity- Osmond Laboratory Study

Prog ID	Space Name	floating head count	occupant head count	mod / room	nsf / room	no. rooms	total proposed new nasf	remarks
RENOVATION OF OSMOND EAST WING: SPACE LIST					323	module: 27.5' x 11.75'		
7.0	**Physics Teaching Labs**	* Sensitize sizes to fit within East Wing						
	Undergrad Physics Tchg Lab 48p	48		5.25	1696	4	6,786	Courses 211, 212, 213/214
	Undergrad Physics Tchg Lab 36p	36		4	1293	3	3,878	Courses 250, 251
	Senior Undergrad Lab	20		3	969	1	969	
	Graduate Lab	20		3	969	1	969	
	Electronics / Optics Lab	20		3	969	1	969	
	Instrument Room			0.5	162	2	323	locate between Graduate Lab and Senior Undergrad Lab
	Prep / Rotational Eqmt / Supply Stor			3	969	2	1,939	
7.0	**Physics Teaching Labs**						**15,833**	
8.0	**Research Labs**							
	Research Labs			4	1,293	3	3,878	East wing basement, add alternate. 4 modules reserved for MEP space to support these labs
8.0	**Research Labs**						**3,878**	
9.0	**Physics Program Support**							
	PARC Tutorial Open Lab			3	969	1	969	Staffed with tutors; open / available during scheduled hours
	Meeting / Group Study Room			0.5	162	2	323	Near/ adjacent to PARC
	Seminar / Meeting Room, 40p			3	969	1	969	Suitable for department meeting or classes
	Office, Bullpen,Grad Stud not assigned		50	2	646	3	1939	(40) 1st year, (10) 2nd year students. Can be divided. Max 16p per room
	Undergraduate Lounge / Break			2	646	1	646	Mix of soft seating, tables, carrels. Undergrad majors.
	Graduate Lounge / Break			2	646	1	646	Mix of soft seating, tables, carrels. Undergrad majors.
	Lactation Room			0.5	162	1	162	
	Student Organization Office			2	646	1	646	
	Office, Lecturer		5	5	605	1	605	Suitable suite w/ 5 offices already on first floor; updates required.
9.0	**Physics Program Support**						**6,906**	
	TOTAL NASF RENOVATION OF OSMOND EAST WING:						**26,617**	

June2019

ROOM CRITERIA SHEET

OFFICE, PRIVATE		**(1.0 OFFICE)**
	Size:	121 nsf
	Headcount:	1 person
	Quantity:	-
USE	Activities:	Enclosed Private Office
	Occupancy Class:	B
	Access:	Faculty, Lecturers, Visitors
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	9'-0"
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Carpet
	Wall Finish:	Latex Paint
	Natural Lighting:	Recommended
	Fit Out:	w/ Furniture
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	Not required
	Other:	-
MECHANICAL	Temperature:	72-75 ºF +/- 3 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	20 cfm/ person
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	Thermostat locations TBD
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	Computer, Printer	

ROOM CRITERIA SHEET

OFFICE, SHARED		**(1.0 OFFICE)**
	Size:	121 nsf
	Headcount:	2 Post docs or 3 Grad Students
	Quantity:	-
USE	Activities:	Enclosed Shared Office
	Occupancy Class:	B
	Access:	Post-doc, Graduate Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	9'-0"
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Carpet
	Wall Finish:	Latex Paint
	Natural Lighting:	Recommended
	Fit Out:	w/ Furniture
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	Not required
	Other:	-
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	20 cfm/ person
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	Thermostat locations TBD
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	Computer, Printer	

Pennsylvania State University- Osmond Laboratory Study- Room Criteria

ROOM CRITERIA SHEET

CONFERENCE/ SEMINAR		(2.0 MEETING/ COLLAB)
	Size:	Varies
	Headcount:	Varies
	Quantity:	Varies
USE	Activities:	Meeting / Study
	Occupancy Class:	B
	Access:	Students, Faculty, Staff
	Frequency/ Hours:	TBD
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	Varies based on size
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Carpet
	Wall Finish:	Latex Paint, Acoustical Panels, Writeable Surface
	Natural Lighting:	Recommended
	Fit Out:	w/ Furniture
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	None
	Other:	Motorized Mechoshades and blackout shades at exterior windows
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED, dimmable zones
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	Flat panel display/ projection Ceiling Mounted cameras & speakers
EQUIPMENT	AV Cabinet/ Rack	

ROOM CRITERIA SHEET

THEORY CENTER		(2.0 MEETING/ COLLAB)
	Size:	1,000 nsf
	Headcount:	-
	Quantity:	2
USE	Activities:	Meeting / Study
	Occupancy Class:	B
	Access:	Students, Faculty, Staff
	Frequency/ Hours:	TBD
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	10'-0"
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Carpet
	Wall Finish:	Latex Paint, Acoustical Panels, Writeable Surface
	Natural Lighting:	Recommended
	Fit Out:	w/ Furniture (different types)
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	35-40 NC
	Vibration:	None
	Other:	Motorized Mechoshades and blackout shades at exterior windows
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED, dimmable zones
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	Flat panel display/ projection Ceiling Mounted cameras & speakers
EQUIPMENT	AV Cabinet	

ROOM CRITERIA SHEET

CLASSROOM, AUDITORIUM (TIERED)		(3.0 CLASSROOM)
	Size:	7,700 nsf
	Headcount:	350p @ 22 nsf/seat
	Quantity:	1
USE	Activities:	Instruction
	Occupancy Class:	B
	Access:	Students, Faculty, Staff
	Frequency/ Hours:	TBD
	Adjacencies:	Prep/Stor
CHARACTERISTICS	Ceiling Height:	Existing
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	TBD
	Wall Finish:	Latex Paint, Acoustical Panels, Writeable Surface
	Natural Lighting:	Not Required
	Fit Out:	w/ Fixed wired tables, moveable chairs
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	None
	Other:	Motorized Mechoshades and blackout shades at exterior windows
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED, dimmable zones
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	Flat panel display/ projection Ceiling Mounted cameras & speakers
EQUIPMENT	AV Cabinet	

ROOM CRITERIA SHEET

CLASSROOM PREP/STORAGE		(3.0 CLASSROOM)
	Size:	1,000 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Prep
	Occupancy Class:	B
	Access:	Students, Faculty, Staff
	Frequency/ Hours:	TBD
	Adjacencies:	Auditorium
CHARACTERISTICS	Ceiling Height:	10'-0"
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Not Required
	Fit Out:	w/ casework
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	35-40 NC
	Vibration:	None
	Other:	Sub-dividable
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	(1) 6' Chemical Fume Hood
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI
	Drain:	Not required
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	Not required
EQUIPMENT	AV Cabinet	

ROOM CRITERIA SHEET

LABORATORY, EXPERIMENTAL (CONDENSED MATTER)		(4.0 RESEARCH LABORATORY)
	Size:	330 nsf /lab module (2-5 mod/PI)
	Headcount:	-
	Quantity:	Varies
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	Shared Magnet Lab, Fume Hood Alcove: Equipment produces strong magnetic fields so must be isolated from research and equipment that may be impacted.
CHARACTERISTICS	Ceiling Height:	11'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Not Required
	Fit Out:	w/ Casework
	Door Size/Type:	8'-0" high doors 36/36" (for equip)
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	NIST-A/ VC-E 125 µin/s
	Other:	RFI/EMI Shielding TBD
MECHANICAL	Temperature:	70-72 ºF +/- .2 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Recirculating (HEPA filtered), 10% make-up air
	Exhaust Equipment:	Point Exhaust Vacuum pump exhaust
	Additional Notes:	See Fume Hood Alcove- O2 sensors
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p,
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	Laser in-use sign (when required)
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	N2, He & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	Laser optics tables, 80/20 structural framing, laser curtains with tracks	

ROOM CRITERIA SHEET

LABORATORY, FUME HOOD ALCOVE		(4.0 RESEARCH LABORATORY)
	Size:	110 nsf /lab module
	Headcount:	-
	Quantity:	Varies
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	Within Research Lab
CHARACTERISTICS	Ceiling Height:	9'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Not Required
	Fit Out:	w/ Casework
	Door Size/Type:	-
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	NIST-A/ VC-E 125 µin/s
	Other:	-
MECHANICAL	Temperature:	70-72 ºF +/- .2 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	(1-2) 6' Chemical Fume Hood
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p,
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI,CDA, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	N2, He & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, EXPERIMENTAL (ATOMIC MOLECULAR OPTICS)		(4.0 RESEARCH LABORATORY)
	Size:	330 nsf /lab module (2-5 mod/PI)
	Headcount:	-
	Quantity:	Varies
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	Fume Hood Alcove: sensitive to magnetic fields. (Min. 80' from Shared Magnet Lab)
CHARACTERISTICS	Ceiling Height:	11'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Not Required
	Fit Out:	w/ Casework
	Door Size/Type:	8'-0" high doors 36/36" (for equip)
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	NIST-A/ VC-E 125 µin/s
	Other:	RFI/EMI Shielding TBD
MECHANICAL	Temperature:	70-72 ºF +/- .2 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Recirculating (HEPA filtered), 10% make-up air
	Exhaust Equipment:	Point Exhaust Vacuum pump exhaust
	Additional Notes:	See Fume Hood Alcove- O2 sensors
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p,
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	Laser in-use sign (when required)
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	N2, He, LHe & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	Laser optics tables, 80/20 structural framing, laser curtains with tracks	

ROOM CRITERIA SHEET

LABORATORY, EXPERIMENTAL (SYNTHESIS)		(4.0 RESEARCH LABORATORY)
	Size:	1,650 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	11'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	w/ Casework
	Door Size/Type:	36/18" (for equip)
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	VC-A 2,000 µin/s
	Other:	RFI/EMI Shielding TBD
MECHANICAL	Temperature:	70-72 ºF +/- .5 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	(5) 6' Chemical Fume Hood (2) 8' Chemical Fume Hood (1) 8' Walk-In Fume Hood Point Exhaust, Glove Box Vacuum pump exhaust
	Additional Notes:	Flammable cabinets, furnaces
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p,
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW, N2 (at fumehoods)
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, SHARED MAGNET/ PIT		(4.0 RESEARCH LABORATORY)
	Size:	1,980 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	AMO should be as far as possible
CHARACTERISTICS	Ceiling Height:	14'-0" minimum, higher directly over magnets
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	w/ Casework
	Door Size/Type:	8'-0" high doors 36/36" (for equip)
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	NIST-A/ VC-E 125 µin/s
	Other:	(4) 4'L x 4W x 6'D pits required
MECHANICAL	Temperature:	70-72 ºF +/- .5 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass (some HEPA filtered)
	Exhaust Equipment:	Point Exhaust, Vacuum pump exhaust
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p, 480v/100A (in shared space)
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	Laser in-use sign (when required)
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	N2, He, LHe & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, UTILITY CORRIDOR		(4.0 RESEARCH LABORATORY)
	Size:	8'-0" Wide (5' clear + 3' equip) or 11' wide if double loaded per floor
	Headcount:	-
	Quantity:	1
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	14'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	w/ Casework
	Door Size/Type:	8'-0" high doors 36/36" (for equip)
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	NIST-A/ VC-E 125 µin/s
	Other:	-
MECHANICAL	Temperature:	70-72 ºF +/- .5 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass (some HEPA filtered)
	Exhaust Equipment:	6' Chemical Fume Hood (1 min.) Point Exhaust, Vacuum pump exhaust
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p, 480v/100A
	UPS:	OFOI
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	N2, He, LHe & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, MACHINE SHOP		(4.0 RESEARCH LABORATORY)
	Size:	330 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Staff
	Frequency/ Hours:	24/7
	Adjacencies:	Experimental Labs
CHARACTERISTICS	Ceiling Height:	9'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Resilient Flooring
	Wall Finish:	Latex Paint
	Natural Lighting:	Not required
	Fit Out:	w/ Casework
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	50 NC
	Vibration:	None
	Other:	-
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p 480v/100A
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI, CDA, Vac, PCW
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, STORAGE		(4.0 RESEARCH LABORATORY)
	Size:	330 nsf
	Headcount:	-
	Quantity:	2
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Staff
	Frequency/ Hours:	24/7
	Adjacencies:	Experimental Labs
CHARACTERISTICS	Ceiling Height:	9'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Resilient Flooring
	Wall Finish:	Latex Paint
	Natural Lighting:	Not required
	Fit Out:	w/ Casework
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	50 NC
	Vibration:	None
	Other:	-
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	-
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LOADING DOCK		(5.0 BUILDING SUPPORT)
	Size:	600 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Materials staging
	Occupancy Class:	B
	Access:	Facilities personnel
	Frequency/ Hours:	TBD
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	10'-0" minimum
	Ceiling Treatment:	-
	Floor Finish:	Resilient Flooring
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	-
	Door Size/Type:	8'-0" high min, card reader access
	Acoustic Noise Criteria:	50 NC
	Vibration:	None
	Other:	-
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Wireless
TECHNOLOGY	Audio/Visual:	-
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, HIGH BAY, SHARED		(6.0 HIGH BAY LABORATORY)
	Size:	1,980 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	Direct access to outside 14'H x 12'W garage door required Near High-energy experimentalists
CHARACTERISTICS	Ceiling Height:	20'-0" clear minimum
	Ceiling Treatment:	Exposed
	Floor Finish:	Slip resistant sealed epoxy
	Wall Finish:	Latex Paint
	Natural Lighting:	Recommended; controllable
	Fit Out:	w/ Casework
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	50 NC
	Vibration:	None
	Other:	Garage Door required
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Recirculating, 10% make-up air
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI, CDA, PCW
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	N2, He, LHe & LN2 tanks (OFOI)
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	2-ton (min.) Gantry Crane throughout	

ROOM CRITERIA SHEET

ELECTRONICS SHOP		(6.0 HIGH BAY LABORATORY)
	Size:	660 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Fabrication
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	High Bay laboratory, Clean Room
CHARACTERISTICS	Ceiling Height:	10'-0"
	Ceiling Treatment:	FRP
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Recommended
	Fit Out:	w/ Casework
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	50 NC
	Vibration:	None
	Other:	Garage Door required
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	Fluorescent
	Grounding:	Required
	Additional Notes:	-
PLUMBING	Utilities:	-
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

CLEAN ROOM, ISO 6/ CLASS 1000		(6.0 HIGH BAY LABORATORY)
	Size:	330 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Fabrication
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	High Bay laboratory, Electronics
CHARACTERISTICS	Ceiling Height:	10'-0"
	Ceiling Treatment:	FRP
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Not required
	Fit Out:	w/ unistrut track support above casework mobile/ ht adj. benches
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	45-55 NC
	Vibration:	VC-E
	Other:	RF Shielding
MECHANICAL	Temperature:	72-75 ºF +/- 2 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass
	Exhaust Equipment:	Chemical Fume Hood, Snorkel
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p
	UPS:	Required
	Emergency Power:	Not required
	Lighting:	Fluorescent , Red light
	Grounding:	Required (clean)
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI, CDA, Vac, PCW
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LABORATORY, PHYSICS TEACHING		(7.0 TEACHING LABORATORY)
	Size:	Varies
	Headcount:	Varies
	Quantity:	Varies
USE	Activities:	Teaching
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	10'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	w/ Casework
	Door Size/Type:	36/18" (for equip)
	Acoustic Noise Criteria:	30-35 NC
	Vibration:	-
	Other:	-
MECHANICAL	Temperature:	70-72 ºF +/- .5 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Recirculating
	Exhaust Equipment:	-
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p,
	UPS:	Not required
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	-
	Additional Notes:	-
PLUMBING	Utilities:	HW, CW, DI
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	TBD
EQUIPMENT	Computers, vibration isolation tables, storage cabinets	

ROOM CRITERIA SHEET

LABORATORY, RESEARCH		(8.0 RESEARCH LABORATORY)
	Size:	1,293 nsf
	Headcount:	-
	Quantity:	3
USE	Activities:	Research
	Occupancy Class:	B
	Access:	Faculty, Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	10'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Vinyl Composition Tile
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	w/ Casework
	Door Size/Type:	8'-0" high doors 36/36" (for equip)
	Acoustic Noise Criteria:	35-45 NC
	Vibration:	VC-E
	Other:	RFI/EMI Shielding TBD
MECHANICAL	Temperature:	70-72 ºF +/- .5 ºF
	Humidity	30-50 %RH +/- 5 %RH
	Room Pressure:	Negative
	Air Changes/Hr:	4 (unoccupied)/ 6 (occupied)
	Recirc/ Single Pass Airflow:	Single Pass (some HEPA filtered)
	Exhaust Equipment:	6' Chemical Fume Hood (1 min.) Point Exhaust, Vacuum pump exhaust
	Additional Notes:	-
ELECTRICAL	Power:	120v/1p, 208v/1p, 208v/3p
	UPS:	Not required
	Emergency Power:	Required, equipment specific
	Lighting:	Fluorescent
	Grounding:	Required (clean)
	Additional Notes:	Laser in-use sign (when required)
PLUMBING	Utilities:	HW, CW, DI, CDA, Vac, PCW
	Drain:	Yes
	Safety Fixtures:	Eyewash/ Safety Shower
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Required
TECHNOLOGY	Audio/Visual:	n/a
EQUIPMENT	-	

ROOM CRITERIA SHEET

LOUNGE/BREAK		(9.0 STUDENT/AMENITY)
	Size:	1,200 nsf
	Headcount:	-
	Quantity:	2
USE	Activities:	Food Prep, eating, social gathering
	Occupancy Class:	B
	Access:	Students, Faculty
	Frequency/ Hours:	TBD
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	Varies
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Resilient Flooring or carpet
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	Plastic laminate with solid surface counter tops; upper and lower cabinets, furniture
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	35-40 NC
	Vibration:	None
	Other:	Mechoshade at exterior window
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	HCW
	Drain:	Yes
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	Kitchen sink, connection for dishwasher and refrigerator
TELECOMMUNICATIONS	Phone:	Required
	Data:	Wireless
TECHNOLOGY	Audio/Visual:	Flat panel display
EQUIPMENT	Dishwasher, Refrigerator/Freezer, Coffee maker, Bottle filling station Microwave	

ROOM CRITERIA SHEET

LACTATION ROOM		(9.0 STUDENT/AMENITY)
	Size:	120 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Breast milk pumping
	Occupancy Class:	B
	Access:	Students, Faculty
	Frequency/ Hours:	TBD
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	9'-0"
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Resilient Flooring or Carpet
	Wall Finish:	Latex Paint
	Natural Lighting:	Not required
	Fit Out:	Table for pump, comfortable chair
	Door Size/Type:	Solid door, lock and privacy required
	Acoustic Noise Criteria:	40 NC
	Vibration:	None
	Other:	Mechoshade at exterior window
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Not required
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	-
TELECOMMUNICATIONS	Phone:	Required
	Data:	Wireless
TECHNOLOGY	Audio/Visual:	Not required
EQUIPMENT	Under counter refrigerator	

ROOM CRITERIA SHEET

STUDENT ORGANIZATION OFFICE		(STUDENT/AMENITY)
	Size:	700 nsf
	Headcount:	-
	Quantity:	1
USE	Activities:	Collaboration, Meetings
	Occupancy Class:	B
	Access:	Students
	Frequency/ Hours:	24/7
	Adjacencies:	-
CHARACTERISTICS	Ceiling Height:	9'-0" minimum
	Ceiling Treatment:	Acoustical Ceiling Tile
	Floor Finish:	Resilient Flooring
	Wall Finish:	Latex Paint
	Natural Lighting:	Required
	Fit Out:	Furniture, writeable surface
	Door Size/Type:	w/ Vision Panel
	Acoustic Noise Criteria:	35-40 NC
	Vibration:	None
	Other:	Mechoshade at exterior window
MECHANICAL	Temperature:	72-75 ºF +/- 5 ºF
	Humidity	30-50 %RH +/- 10 %RH
	Room Pressure:	Positive
	Air Changes/Hr:	-
	Recirc/ Single Pass Airflow:	Recirculated
	Exhaust Equipment:	none
	Additional Notes:	-
ELECTRICAL	Power:	120v/ 1p
	UPS:	Not required
	Emergency Power:	Not required
	Lighting:	LED
	Grounding:	Not required
	Additional Notes:	-
PLUMBING	Utilities:	Not required
	Drain:	Yes
	Safety Fixtures:	Not required
	Fire Protection:	Wet system
	Additional Notes:	Drinking fountain/ bottle flitting station
TELECOMMUNICATIONS	Phone:	Required
	Data:	Wireless
TECHNOLOGY	Audio/Visual:	Flat panel display
EQUIPMENT	-	

Osmond Laboratory Renderings

03 Conceptual Design Options

Option A

Summary:

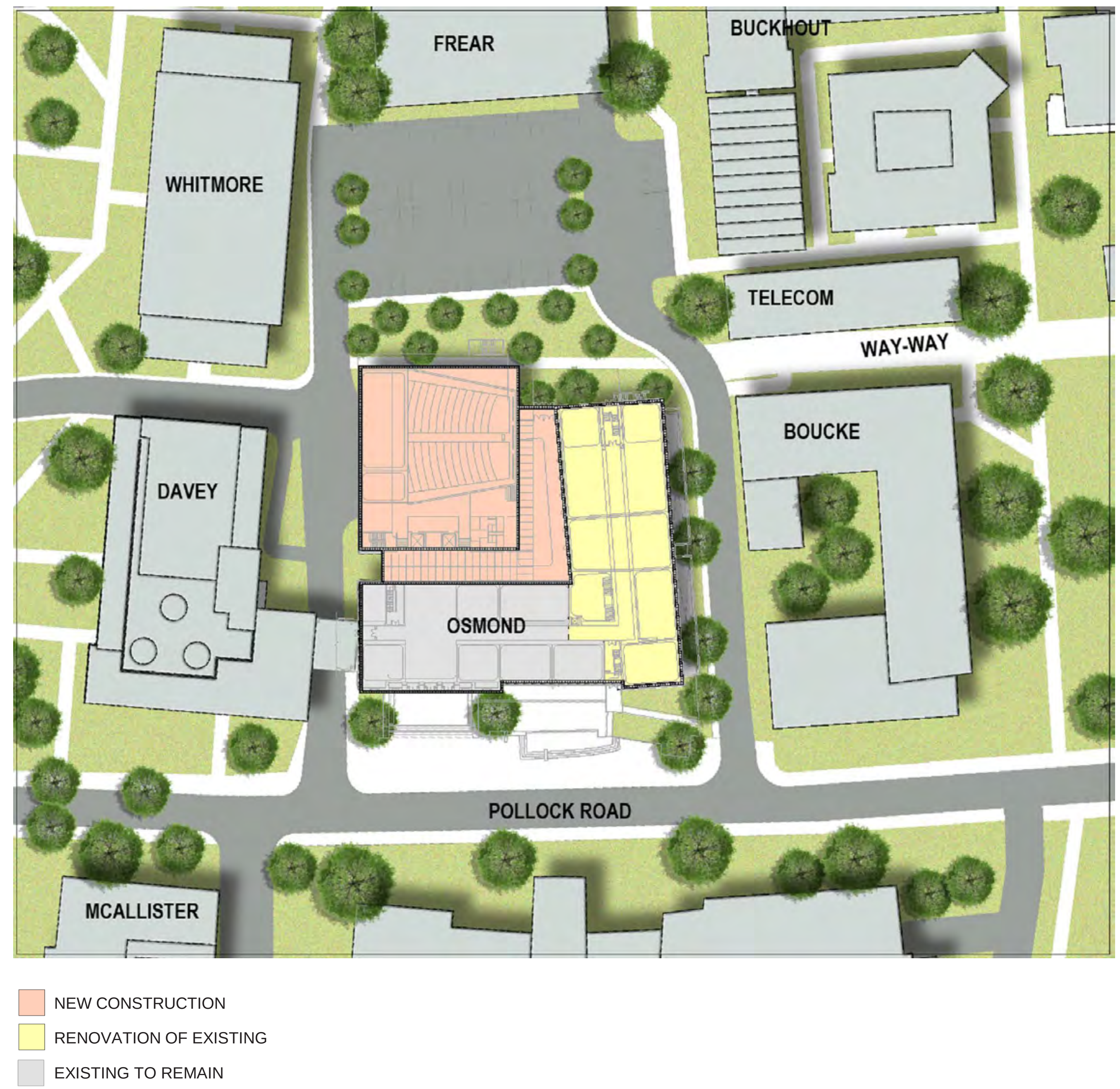
1. Demolish existing auditorium wing.
2. Create new in-fill addition to Osmond to expand research and education spaces.
3. Renovate some Osmond labs, classrooms and admin spaces.

Advantages:

1. Replaces existing 350p lecture hall.
2. Provides growth for physics department.
3. Maintains interior connections between existing and new spaces.
4. Renovates all remaining Osmond spaces so addresses campus backlog.
5. Preserves parking lot.

Disadvantages:

1. Unable to connection directly on every floor (existing floor heights are limited).
2. Displaces most, if not all of Osmond, for an extended period of time.
3. Lecture hall space will need to be rented for an extended period of time.
4. Osmond renovation will be tricky and expensive.



Option B

Summary:

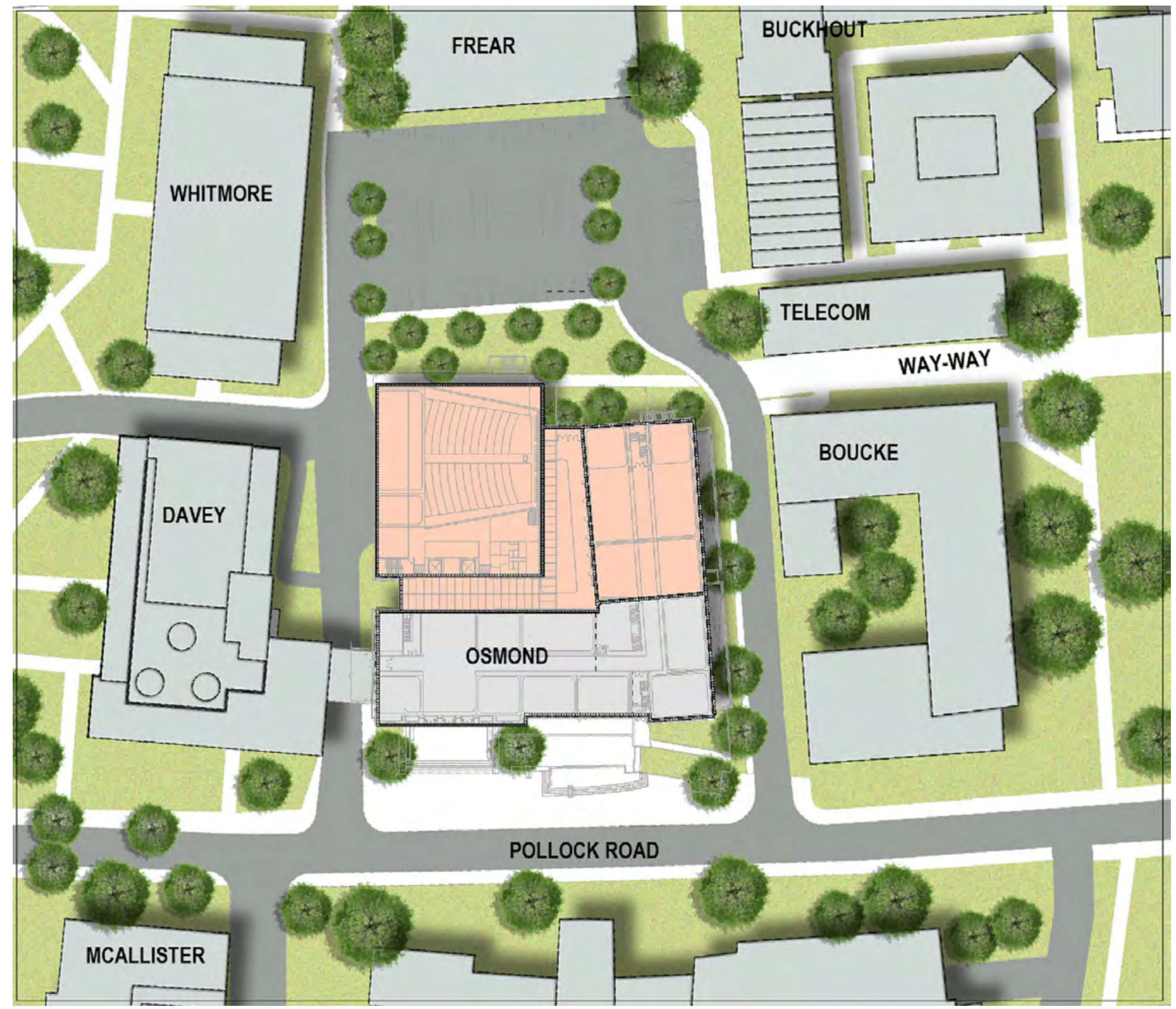
1. Demolish existing lecture hall and East wings.
2. Design new addition to expand research and education spaces.
3. Renovate some Osmond classroom and admin spaces.

Advantages:

1. Same as Option 'A'. In addition it provides a new subbasement level in East Wing.
2. Economical use central campus space.
3. More easily accommodates high bay.

Disadvantages:

1. Same as Option 'A'.
2. Significant impact to existing research programs.
3. More expensive than Option 'A' but creates more new and renovated space.



NEW CONSTRUCTION
RENOVATION OF EXISTING
EXISTING TO REMAIN

Option C

Summary:

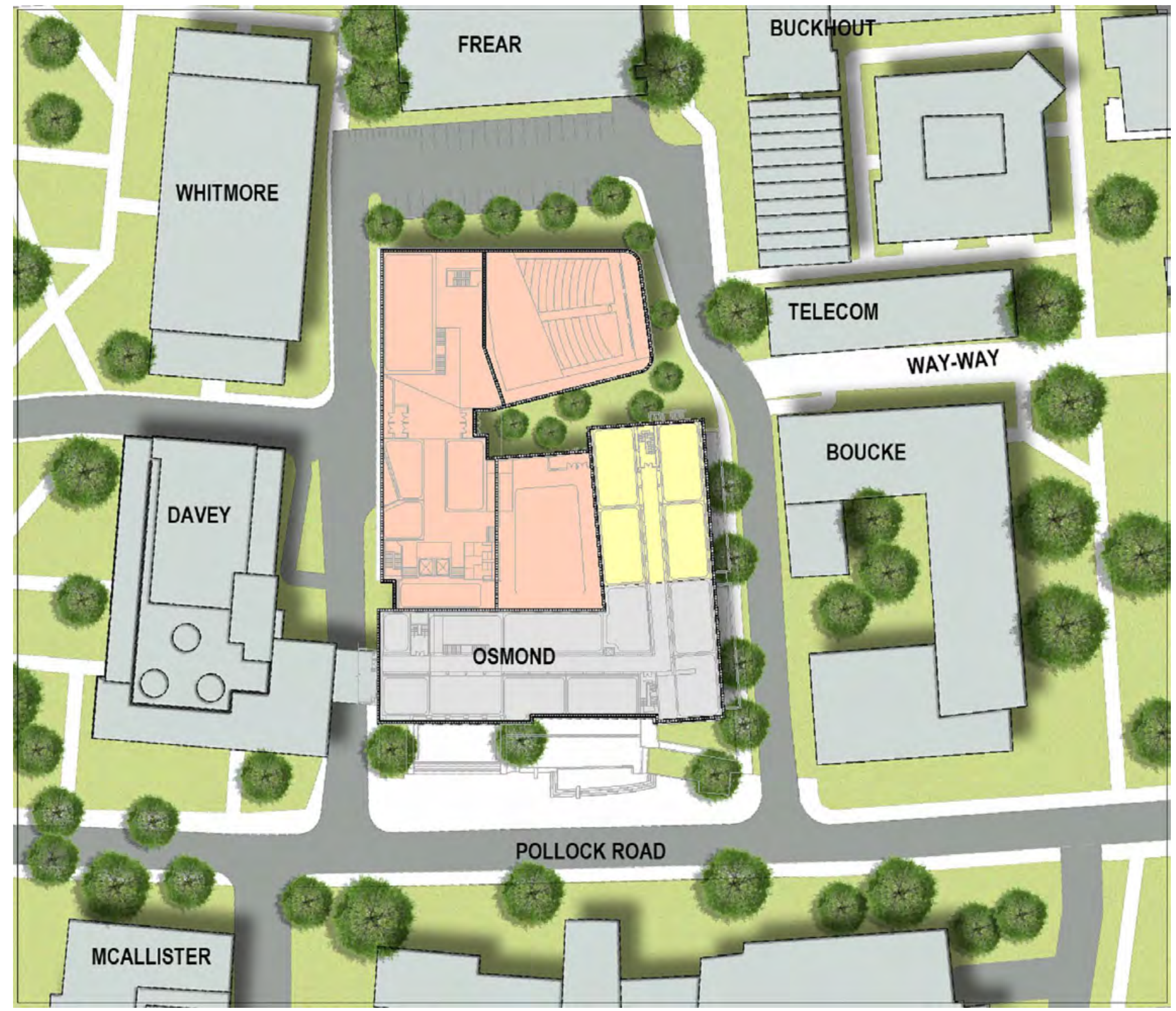
1. Demolish existing lecture hall wing.
2. Create new West Wing to expand research.
3. New 350p lecture hall created at northeast corner of new wing.

Advantages:

1. Same as Option ‘A’.

Disadvantages:

1. Same as Option ‘B’.
2. Displaces site storm water line.
3. Impacts flow of student/ pedestrian traffic along Way-Way.
4. Reduction of parking



NEW CONSTRUCTION

RENOVATION OF EXISTING

EXISTING TO REMAIN

Option D

Summary:

1. Build new Physics Tower to expand research, education and admin.
2. Relocate research and admin from Osmond to new tower.
3. Demolish lecture hall wing and renovate Osmond.

Advantages:

1. Replaces existing 350p lecture hall.
2. Provides growth for physics department.
3. Creates new stand alone research building designed to modern standards.
4. Allows Osmond to remain operational during construction of new tower.
5. Avoids impact to existing storm water line.

Disadvantages:

1. Significant reduction in parking
2. No internal connections to adjacent buildings
3. Physics tower is an interior building with no street address.
4. May be difficult to incorporate high bay within tower footprint.

NEW CONSTRUCTION
RENOVATION OF EXISTING
EXISTING TO REMAIN

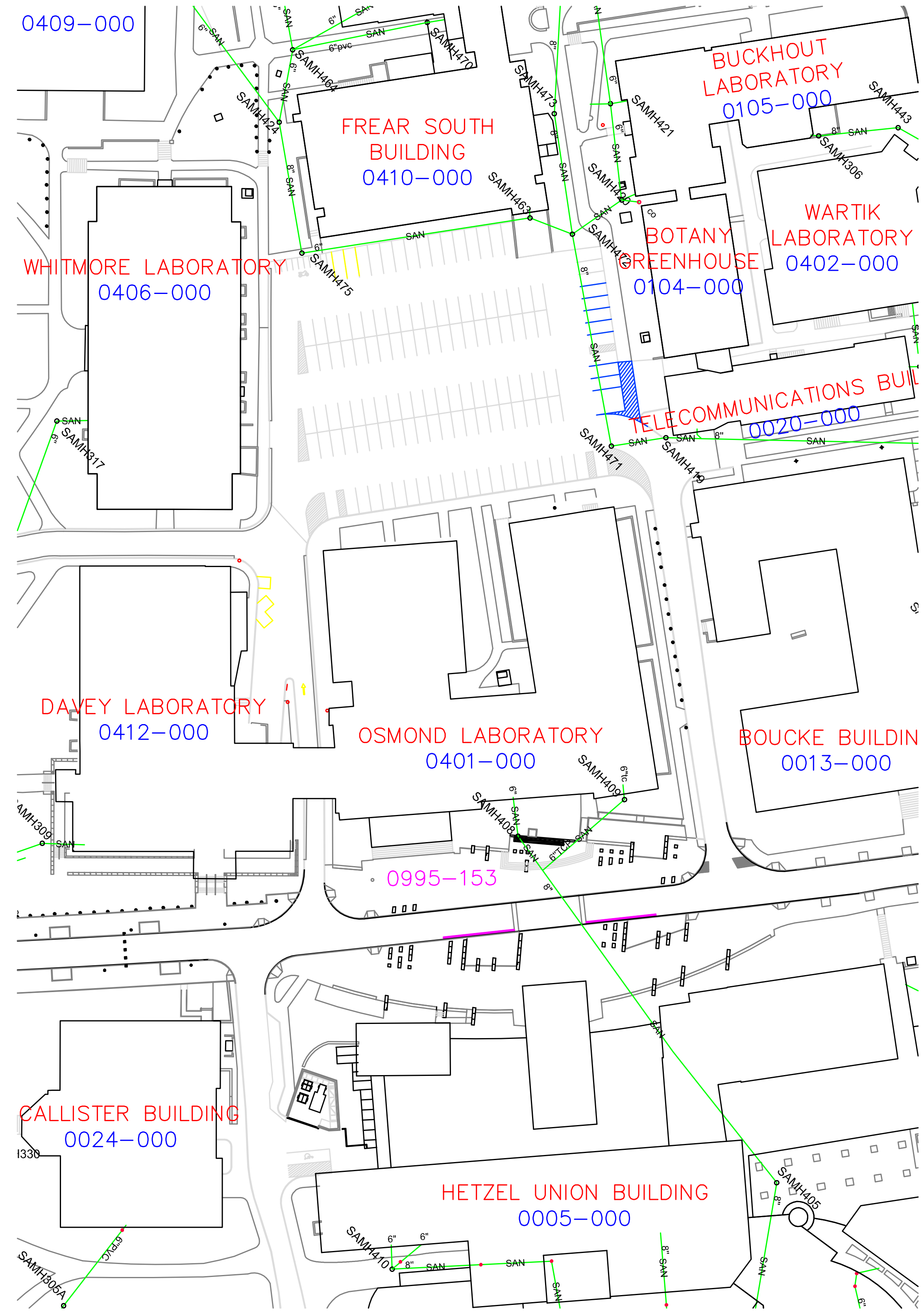
Osmond Laboratory Construction, 1938

04 Existing Conditions Analysis of Osmond Laboratory

Existing Conditions Site Plan and Utilities

The site is tributary to Thompson Run. Thompson Run is defined as an impaired stream by PaDEP. No waivers of stormwater criteria will be permissible due to being impaired. Stormwater controls will be required for peak runoff control, volume, and water quality criteria per the Borough's Act 167 Plan. PSU OPP Stormwater Guidance, Policies, and Master Plan also requires that peak runoff rates must be decreased up to the 10-year storm while considering all existing impervious areas as meadow in this area of University Park. This condition will be utilized when sizing rate control for this project.

The project will require a Land Development approval by State College Borough. Osmond Lab is within the University Planned District (UPD) Subdistrict 5. Subdistrict 5 has a total area of 456 acres and is regulated by a specific set of zoning requirements as listed in the State College Borough's ordinances. The proposed project would be an allowed use within this sub district as an educational building. The allowable impervious coverage in this district is 55% and currently has an impervious coverage of approximately 48%. There is a maximum allowable floor area ratio of 1.00; currently the district has a floor area ratio of 0.730. The maximum allowable building height is 90' where the structure is 250 feet or greater from the district boundary. The proposed project will not exceed any of these standards.



Stormwater Management

The local area stormwater system has some deficiencies in the stormwater conveyance system. The Office of Physical Plant documented some of these deficiencies on a plan dated 10/21/13. There are several pipes that have bellies in them, built up debris and root growth. There are several inlet structures that are not up to current standards. There are several interior floor drains within the building which connect to the storm system instead of the sanitary system. The deficiencies have led to flooding problems at Osmond Laboratory. Most of these deficiencies would need to be addressed in the Osmond Laboratory Complex project including demolition of existing storm structures and pipes, installation of new stormwater conveyance and the installation of a detention structure.

Existing Conditions Architecture/Code

Building Codes

The building analysis is based on the following building codes enforced in the State of Pennsylvania at the time of the analysis. The final building design is to be reviewed by the Authority Having Jurisdiction (AHJ) in Harrisburg, PA.

1. Building Code - International Building Code (IBC) – 2009 Edition
2. Structural Code - International Building Code (IBC) – 2009 Edition
3. Plumbing Code - International Plumbing code (IPC) – 2009 Edition
4. Mechanical Code – International Mechanical Code (IMC) – 2009 Edition
5. Electrical Code – International Building Code, Chapter 27 – 2009 Edition
   a. NEC – 2008 Edition
6. Fire/Life Safety Code – International Fire Code (IFC) – 2009 Edition, with amendment from Labor and Industry - Title 34
7. Accessibility Code - International Building Code (IBC) – 2009 Edition
8. ICC/ANSI A117.1 – 2003 Edition
9. Energy Code - International Energy Conservation Code IECC) – 2009 Edition
10. Elevator Code – Pennsylvania Elevator Regulation Law and PA Code Title 34 PA Code Chapter 405 – Elevator Section, Option 2 and Chapter 7. Elevator, Lifts, Escalators, Dumbwaiters, Hoists and Tramways.
11. Gas Code – International Fire Gas Code 2009 Edition
12. Boiler Code – ASME Boiler & Pressure Vessel Code (Pennsylvania Boiler Law and Regulations)

Summary of Building Code Deficiencies and Code Analysis

Osmond Laboratory was surveyed to determine building code compliance with current codes listed adjacent and with the current ADA disabilities requirements. The building has numerous code violations that should be addressed in the current building and any future building renovations or additions.

All stairs within the current building do not meet code requirements but can be retrofitted to meet most requirements. The stairs have sufficient width to handle the current occupant load of the building. Stair treads and risers are of correct dimensions to allow the stairs to be retrofitted without recreating the stairs or platforms. To meet code, guardrails height would need to be increased, baluster adjusted to provide a minimum 4" o.c. clear spacing, handrails added to the guardrails and handrails replaced at the wall to provide proper type, height and extensions.

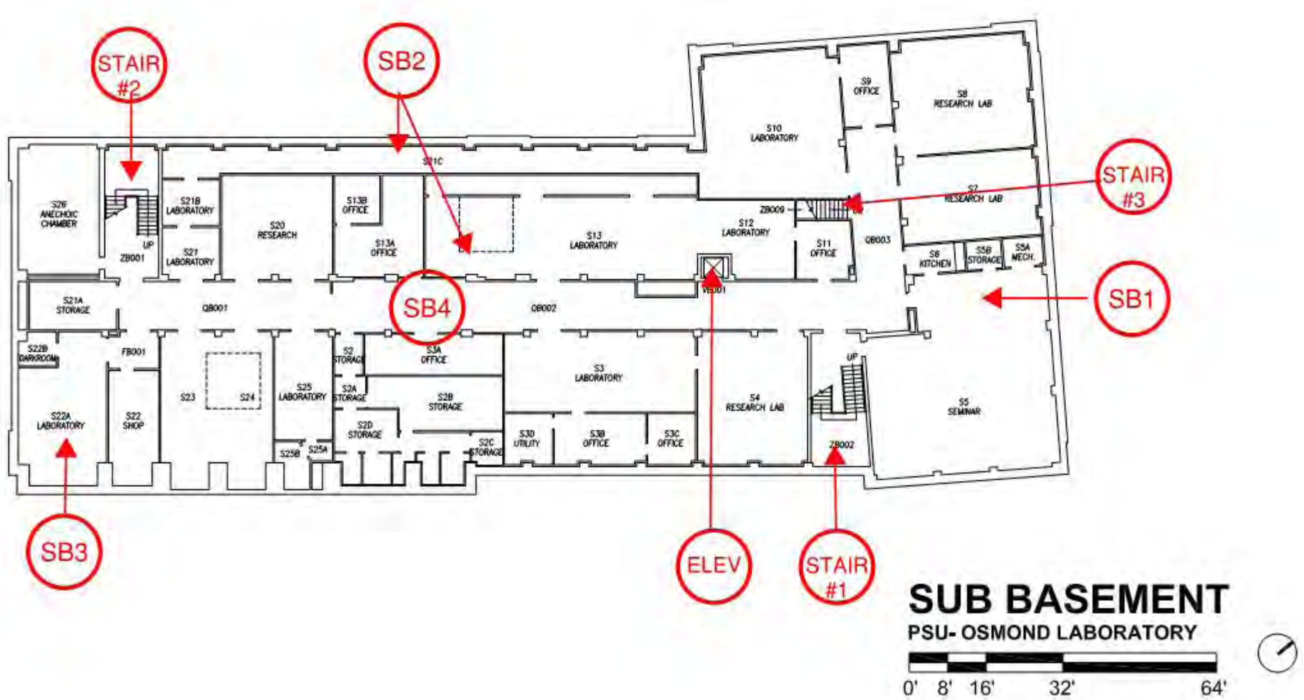
Proper egress signage and barriers should be provided within the stairs to direct occupants to the exterior from any level within the building. Currently, egress routes are not clearly defined once occupants are within the stair.

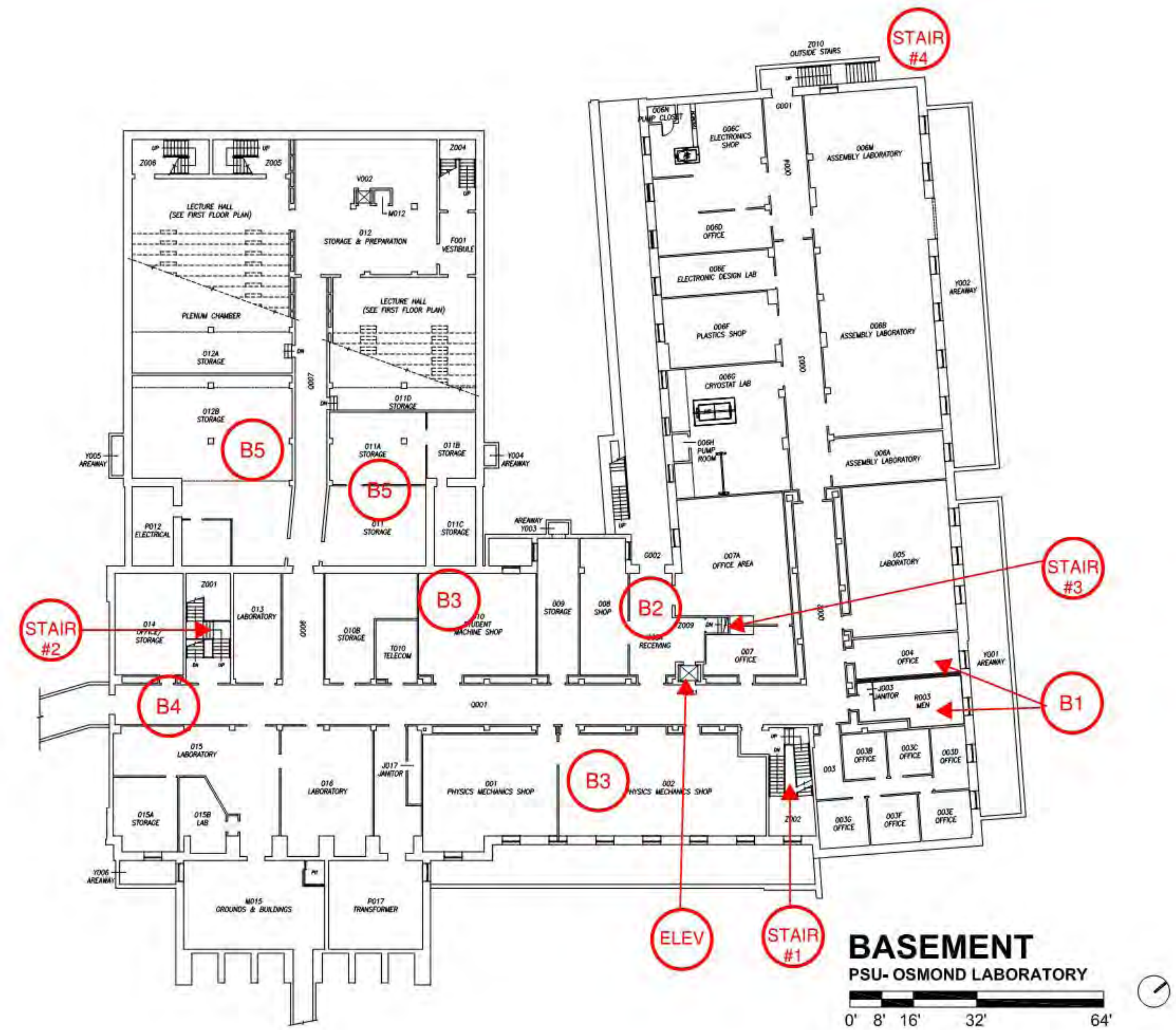
Fire rated partitions and doors should be defined throughout the building as required to meet specific needs. Doors connecting to rated conditions would need to be replaced with certified fire rated doors, frames and hardware. Hardware that does not allow free access for disabled occupants should be replaced. All classrooms doors within the rooms provide free exit from the room. Currently some rooms are provided with bolt locks or card readers that may not provide free exit from the space at all times. Some door hardware within the building, such as round door knobs, do not meet ADA requirements.

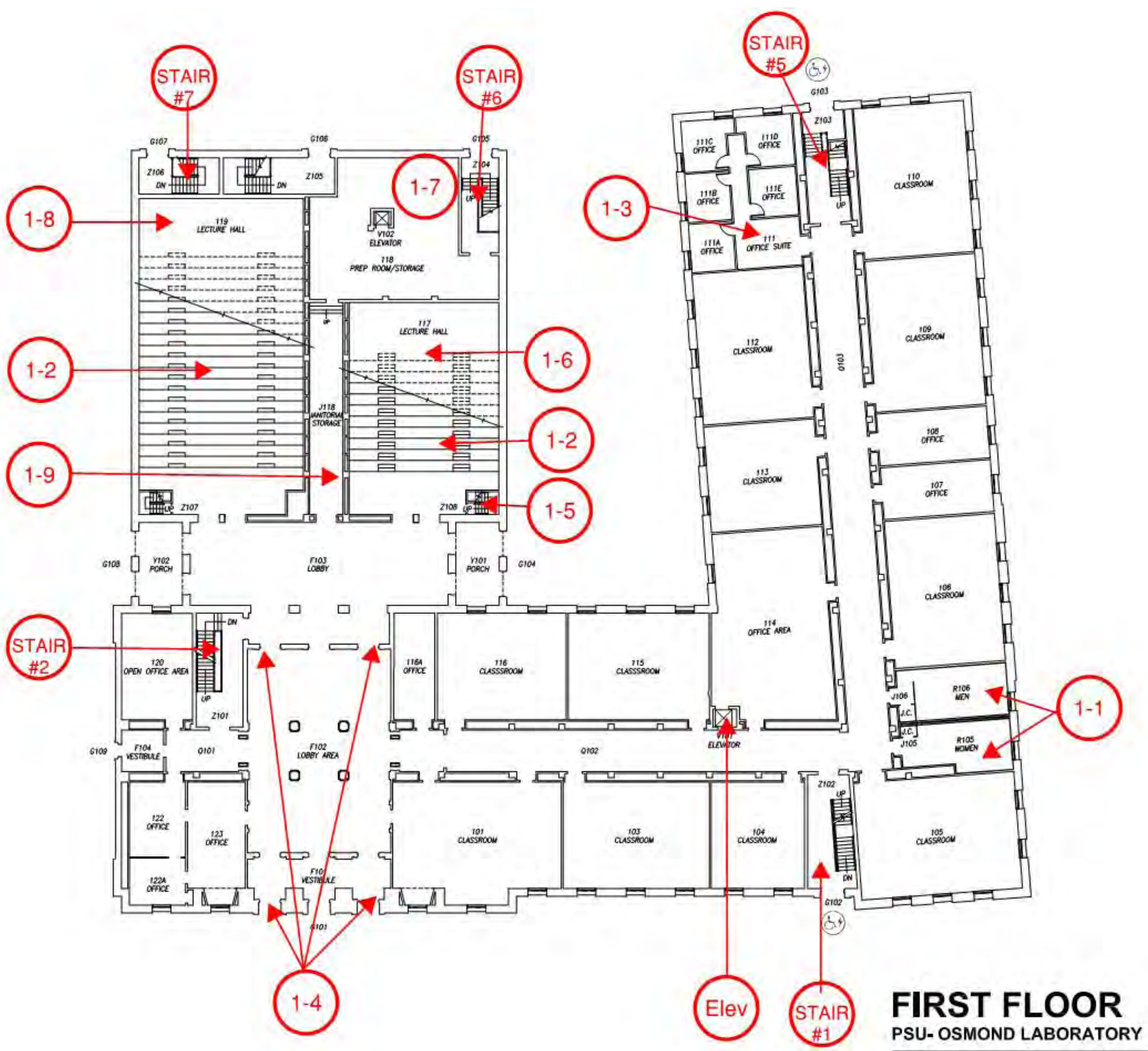
The building has limited and sporadic ADA accessibility facilities that do not provide access for the disabled to all areas within the building. The front entrance is not provided with a barrier free accessible entrance. A non-conforming ramp is provided at the rear of the building. Once inside the building limited accessible access is provided by a small undersized elevator that does not meet ADA standards.

Detailed Building Code Deficiencies and Code Analysis

The following detailed Building Code analysis was conducted on site July 25, 2016.
Code Analysis Floor Plans are provided as reference to numbered items that follow..

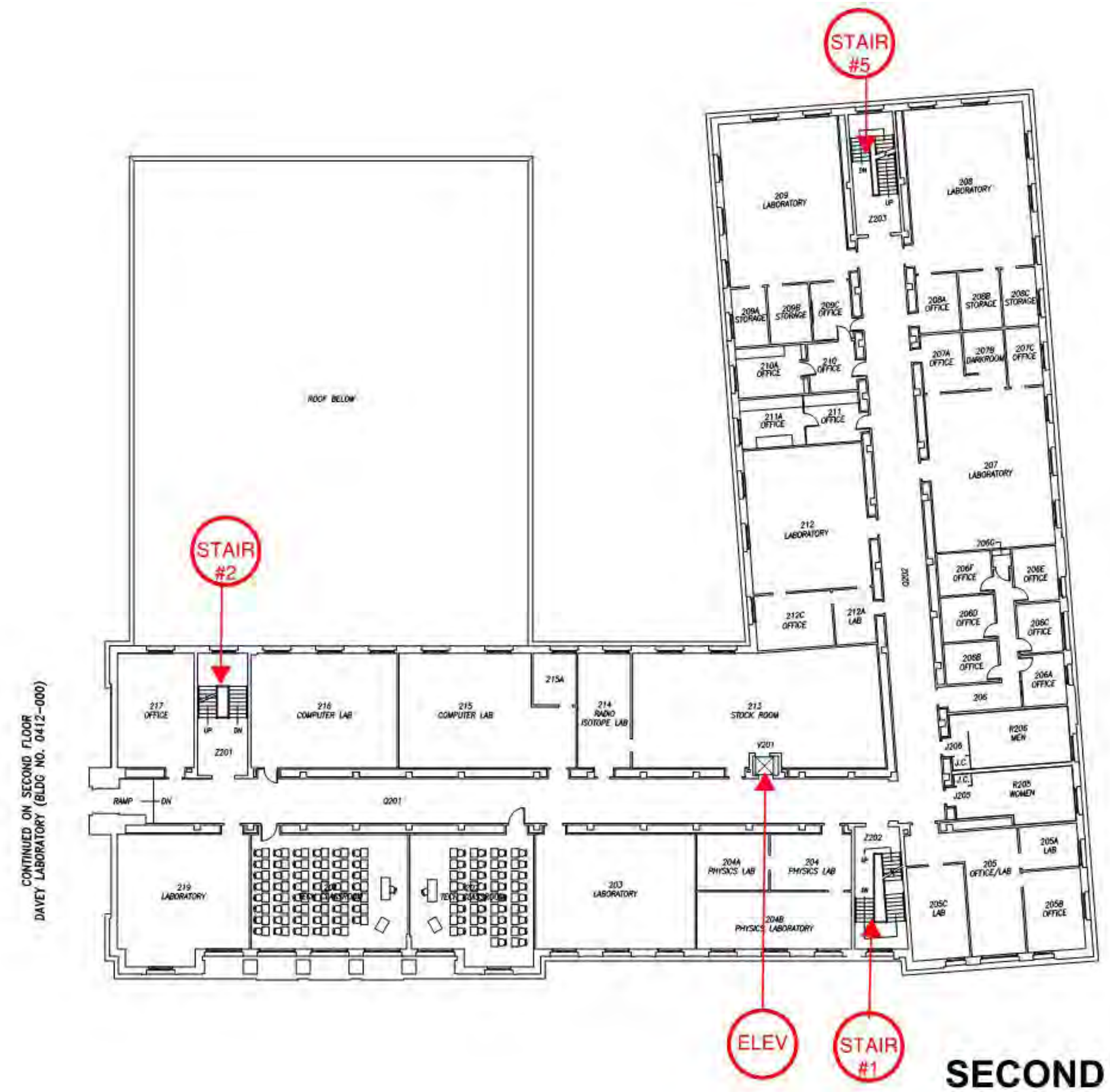






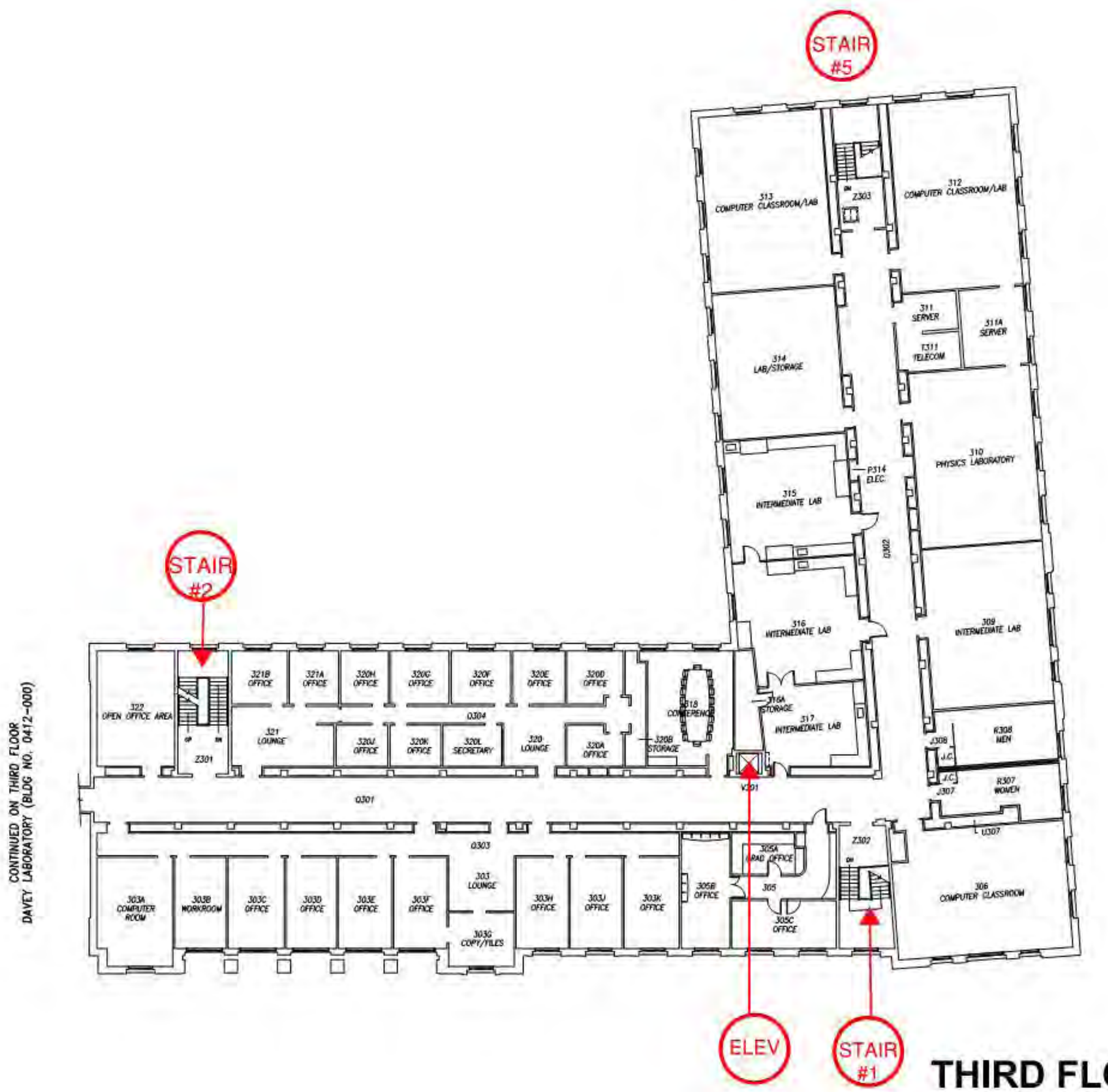
FIRST FLOOR
PSU- OSMOND LABORATORY

0' 8' 16' 32' 64'



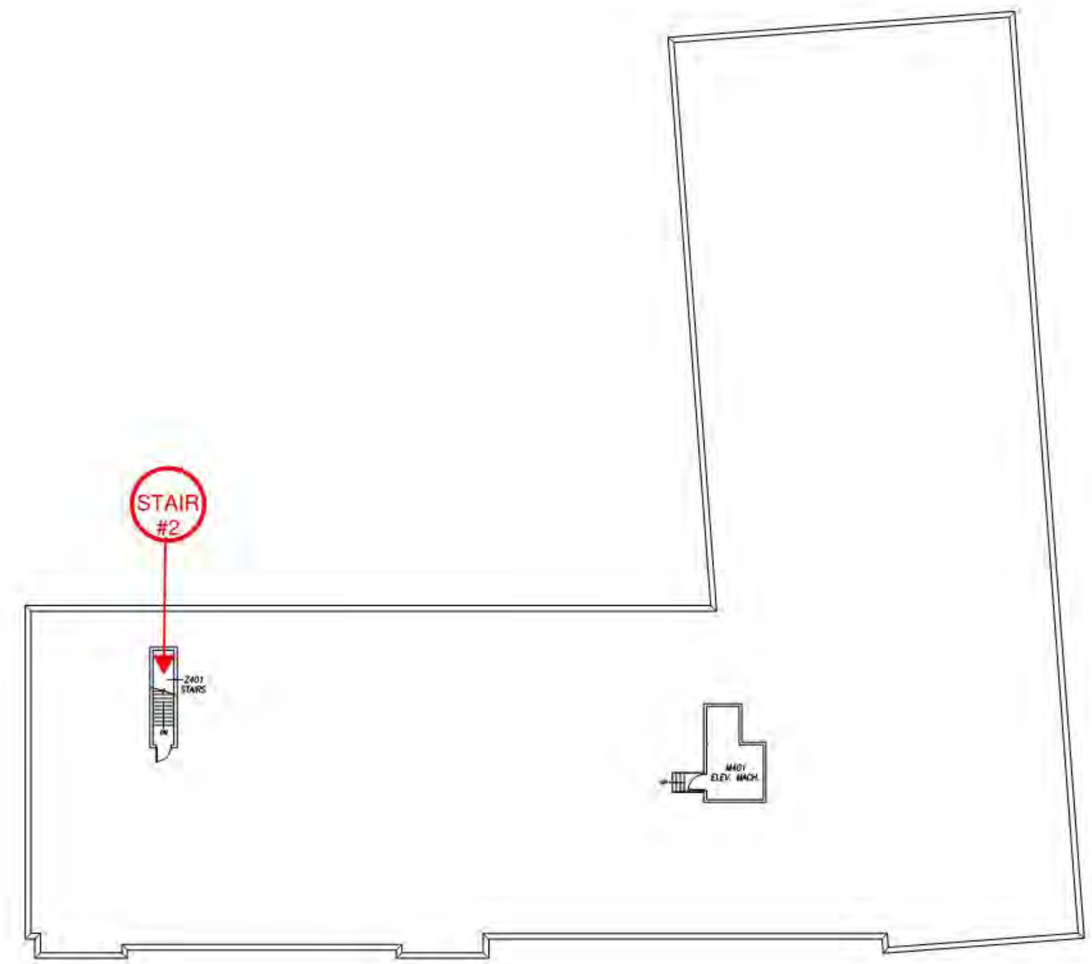
SECOND FLOOR
PSU- OSMOND LABORATORY

0' 8' 16' 32' 64'



THIRD FLOOR
PSU- OSMOND LABORATORY

0' 8' 16' 32' 64'



ROOF
PSU- OSMOND LABORATORY

0' 8' 16' 32' 64'

Vertical Circulation Elements

Stair #1

1. Egress door from Seminar Room 53 is not allowed to exit directly into a rated stair enclosure.
2. Walls, doors and openings are to be 2 hour fire rated. Insufficient information was available to determine current wall and wall penetration rating.
3. Doors and frames into the stairway are not provided with a UL rated label.
4. Door closure needs to be adjusted; doors do not meet the minimum 5lb force to open them.
5. Additional egress signs are required in the stair to direct occupants to the correct egress level and door to the exterior.
6. Guardrail height at 36″ does not meet 42″ minimum.
7. Guardrail/Handrail radius does not meet ADA minimum.
8. Handrails are not provided with proper rail extension at the top and bottom of the rail.
9. Doors are not provided with latch and panic hardware.
10. Gate should be provided at stairs leading to the basement to prevent occupants attempting to egress the building from continuing down into the basement areas.
11. The top floor of the stair tower has a cable tension wire that appears to be temporarily installed to structurally support the exterior wall system. Further investigation is needed to determine if any corrective actions should be taken.

Entrance to Stair #1 at Basement

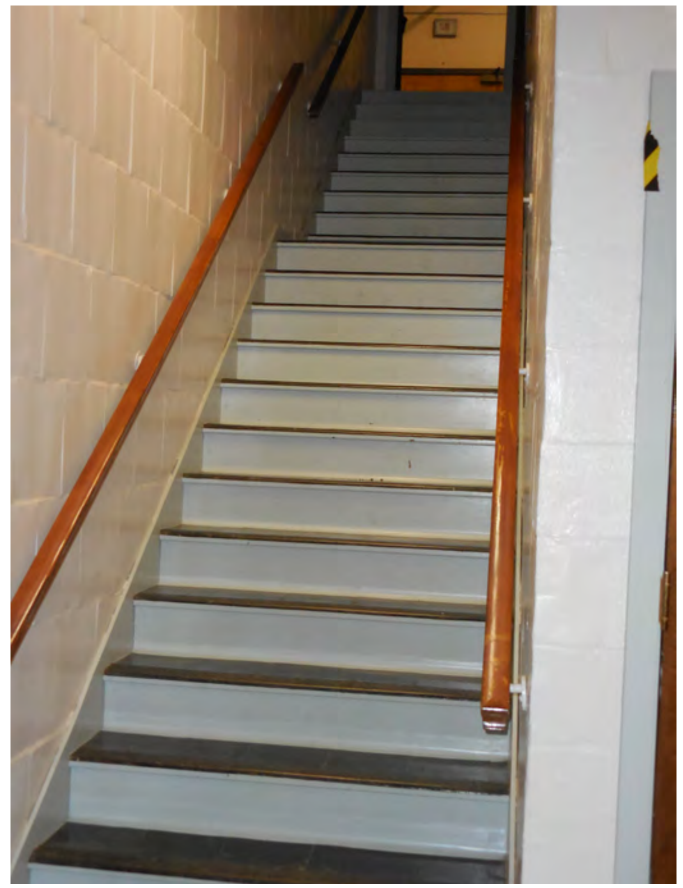
Stair #2

1. Egress door from Anechoic Chamber Room S26 is not allowed to exit directly into rated stair enclosure.
2. Walls, doors and openings are to be 2 hour fire rated. Insufficient information was available to determine current wall and wall penetration rating.
3. Doors and frames into the stairway are not provided with a UL rated label.
4. Door closure needs to be adjusted; doors do not meet the minimum 5lb force to open them.
5. Additional egress signs are required in the stair to direct occupants to the correct egress level and door to the exterior.
6. Guardrail height at 36″ does not meet 42″ minimum.
7. Guardrail/Handrail radius does not meet ADA minimum.
8. Handrails are not provided with proper rail extension at the top and bottom of the rail.
9. Stair does not exit directly to grade, but to 1st floor lobby. (See further comments in Level 1 analysis below.)
10. Exposed insulated piping in stair is not permitted within an egress stair.
11. Some non-rated plywood wall finish is exposed within the stair, which does not meet requirements for non-combustible stair construction.
12. Doors are not provided with latch and panic hardware.
13. At Sub-basement level, door at north side of stair is not an egress door. If door is to remain, signage must be provided to direct occupants that this is not an egress door.
14. At Level 1, the stair main egress is through the first floor lobby, the vending machine area and an exterior door to the exterior stairs. The lobby is not a rated passageway, so providing an enclosed, rated passageway that leads directly to the exterior is recommended. Vending machines should not be in the path of egress or within a rated passageway.
15. Exit signage is to be provided along the full path of egress to an exterior right of way.
16. Signage is to be provided within the stair tower that identifies the first floor door as the main means of egress; it is confusing once occupants are in the stairs as to which door leads to direct egress to the exterior.
17. At Level 1, a gate should be provided at stairs leading to the basement to prevent occupants attempting to egress the building from continuing down into the basement areas.

Landing in Stair #2 between Basement and First Floor

Stair #3

1. Stair is marked with exit sign to direct occupants to the egress corridor above, however stair is not provided with the rated enclosure required by code.
2. Stair handrails do not meet ADA requirements.
3. Stair discharges into non-compliant, non-rated egress passageway.



Stair #3 Connecting Sub Basement and Basement

Stair #4

1. Exterior concrete stair is in poor condition; the concrete steps are deteriorating, creating an unsafe condition.
2. Railings are rusted and do not provide a smooth surface to grasp.
3. Railing height is not per code.
4. Steps do not have the proper tread depth per code.
5. No railing extension is provided at either the top or bottom of the stair.
6. Insufficient lighting is provided with the stairwell.
7. Rotted steel lintel supporting the stair landing above is in poor condition, creating an unsafe situation.
8. Areaway drain at the bottom of the steps is clogged with debris and is not properly draining. The resulting flooded areaway does not provide a safe means of egress, the concern being that during winter months the areaway bottom freezes, creating a hazardous condition.
9. Mold and mildew on the face of the exterior walls can be a health concern for occupants using the stairs.
10. Pump areaway within the stair areaway is in poor condition. Iron gate door is rusted and deteriorated, and the interior of pump areaway is unfinished and full of debris. It is not recommended to provide an open gate door at this condition, where trash and debris can accumulate and create a fire hazard.
11. The top floor of the stair tower has a cable tension wire that appears to be temporarily installed to structurally support the exterior wall system. Further investigation is needed to determine if any corrective actions should be taken.

Stair #4 Basement Level

Stair #5

1. Walls, doors and openings are to be 2 hour fire rated. Insufficient information to determine wall and wall penetration rating.
2. Doors and frames into the stairway are not provided with a UL rated label.
3. Door closure to be adjusted. Doors do not meet the minimum 5lb force to open doors.
4. Additional egress signs required in the stair to direct occupants to the correct egress level and door to the exterior.
5. Guardrail height at 36" does not meet 42" minimum.
6. Guardrail/Handrail radius does not meet ADA minimum.
7. Handrails not provided with proper rail extension at the top and bottom of the rail.

Stair #6

1. Walls, doors and openings are to be 2 hour fire rated. Insufficient information was available to determine current wall and wall penetration rating.
2. Doors and frames into the stairway are not provided with a UL rated label.
3. Door closure needs to be adjusted; doors do not meet the minimum 5lb force to open them.
4. Additional egress signs are required in the stair to direct occupants to the correct egress level and door to the exterior from the main assembly areas.
5. Guardrail height at 36" does not meet 42" minimum
6. Guardrail/Handrail radius does not meet ADA minimum.
7. Handrails are not provided with proper rail extension at the top and bottom of the rail.
8. Doors are not provided with latch and panic hardware.
9. Insufficient lighting is provided for an egress stair.
10. No barrier free exit is provided from the lower assembly area.

Stair #7

1. Limited access was provided to this stair at the time of the on-site analysis.
2. Additional egress signs are required in the stair to direct occupants to the correct egress level and door to the exterior from the main assembly areas.

Stair #4 - Pump Areaway

Elevator

1. The existing elevator is a 2000 lb. hydraulic elevator, with interior cab dimensions of 5'-1" x 4'-1" and a 3'-0" wide door.
2. The interior cab size is insufficient for the current need to bring personnel and equipment to all levels of the building. Also, the cab size does not meet ADA requirements, as it does not provide the proper turning radius inside the cab.
3. 3'-0" door opening limits equipment that can enter into the cab.
4. Elevator should be equipped with audible signals to identify cab level and direction of movement.
5. Elevator should be equipped with lighting at the exterior to identify cab location and direction of movement.
6. Control panel should include braille lettering.
7. 2000 lb. capacity limits the weight of equipment that can be placed in the elevator.
8. An elevator within a 5-story building such as Osmond should be provided with an emergency call telephone.

Elevator Cab

Sub-Basement Level

SB1 – Missing Toilets

1. No women's toilet facilities are provided on this floor.
2. Existing Men's toilet is not ADA compliant.

SB2 – Exterior retaining wall water issues

1. Exterior wall shows evidence of water penetration. This will require further study to determine current and future stability.
2. Floor drain in sub-basement area overflows during peak rain events.

SB3 – Insufficient Ventilation

1. Existing laboratory/classrooms have insufficient ventilation for their current uses. See MEP sections for further information.

SB4 – Storage of Chemicals

1. Large quantities of nitrogen and helium gas are currently stored in the corridor.
2. Owner and users are to provide a list of chemicals and gases currently used in the facility and define quantity within the allowable limits per code.
3. No clearly defined control area spaces for storage of limited quantities of hazardous materials, as allowed for each level per code, are provided.
4. Owner to confirm that no exposed asbestos piping exists in open corridor or within the building.
5. Lighting levels in egress corridor to be confirmed.

Sub Basement Corridor

Basement Level

B1 – Non-Compliant ADA Toilet Faculties

1. Both Men's and Women's toilets on this floor have no barrier free facilities and are not ADA compliant.

B2 – Non-Compliant Exterior Passageway

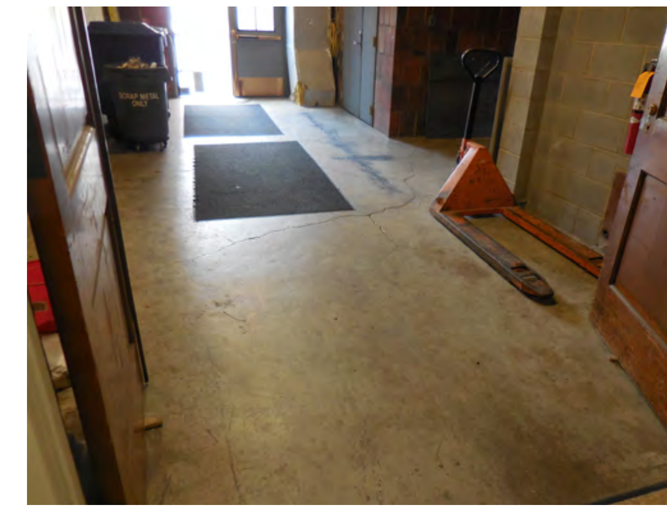
1. Exit sign at corridor side directs occupants to exit through non-compliant exit passageway.
2. Egress through passage does not direct occupants to a safe exterior right of way. The exterior ramp is too steep and the exterior stair is non-compliant. See Building Envelope Analysis section below for additional Information.
3. During periods of heavy rain, the rising water in the area makes egress difficult and creates a possibly dangerous condition.
4. Open stairwell from below does not provide a proper rated enclosure from the corridor to the exterior.
5. Ramp appears to be used as a loading area into the building, which creates the possibility that the exit would be blocked.
6. Doors at corridor are not fire rated.
7. Door is not provided with door closures or panic hardware.
8. Space is used for storage which is not permitted per code.
9. Lighting levels to be confirmed to meet egress requirements.
10. Doors that are currently propped open do not meet code requirements for egress passageway

B4 – Corridor Ramp to Adjacent Building

1. Slope of the ramp is too steep and does not meet ADA requirements.
2. No handrails are provided on either side of the ramp.
3. Ramps greater than 5'-0" wide will require an intermediate railing
4. Non-rated storage cabinet in corridor is not permitted.
5. Egress direction, as per door swing, is into Osmond building, which does not provide a clearly defined path of egress.
6. Insufficient ramp landing is provided at top of ramp adjacent to the door.
7. Carpet finish is not recommended for a ramped surface as it does not provide proper gripping texture for wheelchair access.
8. Door closure provided on one door only.
9. Confirm exit light provided at egress side of door.

B5 – Storage under Lecture Halls

1. Storage under lecture halls is not ideal due to potential fire hazard. Confirm that wall and ceiling of storage space is provided with proper fire-rated construction.



Basement Level Exit to Ramp at B2

Basement Corridor Ramp to Davey Laboratory

1.1 – Men's and Women's Toilets

1. Toilet rooms on this level are identified as barrier-free accessible toilets.
2. Doors are provided with automatic operators with push button control, allowing barrier free access with minimum push pull dimensions at the door.
3. Doors swing into the interior of the space adjacent to the ventilation closet. This configuration does not provide the proper clearance for wheelchair maneuvering adjacent to the door. It is unclear how a person in a wheelchair maneuvers at the door when the automatic door starts to open.
4. Toilet rooms are provided with a barrier-free toilet stall, urinal (Men's Room) and lavatory. Lavatory is provided with hands free controls and insulated drain pipes,
5. Accessories within the rooms should be installed at proper ADA heights and with floor clearance to provide proper access.
6. Toilet stall, urinal and lavatory would require reconfiguration to provide proper handrails and fixture heights

1.2 – Storage below Lecture Halls

1. Storage rooms below the lecture halls must have the appropriate fire-resistant rating for the walls, floors and underside of floor deck above.
2. Doors and frames to be replaced with proper fire-rated assembly.
3. Storage to be fully sprinkled and provided with proper smoke and fire alarm system that is tied back to the main fire alarm system.
4. Confirm that no hazardous materials are to be stored in this space.

1.3 - Office Suite

1. Office suite egress path exceeds code allowable distance for dead end corridors

1.4 – Main Building Entrance

1. Front entry doors are not provided with an exit sign.

1.5 – Lecture Halls Projector Room

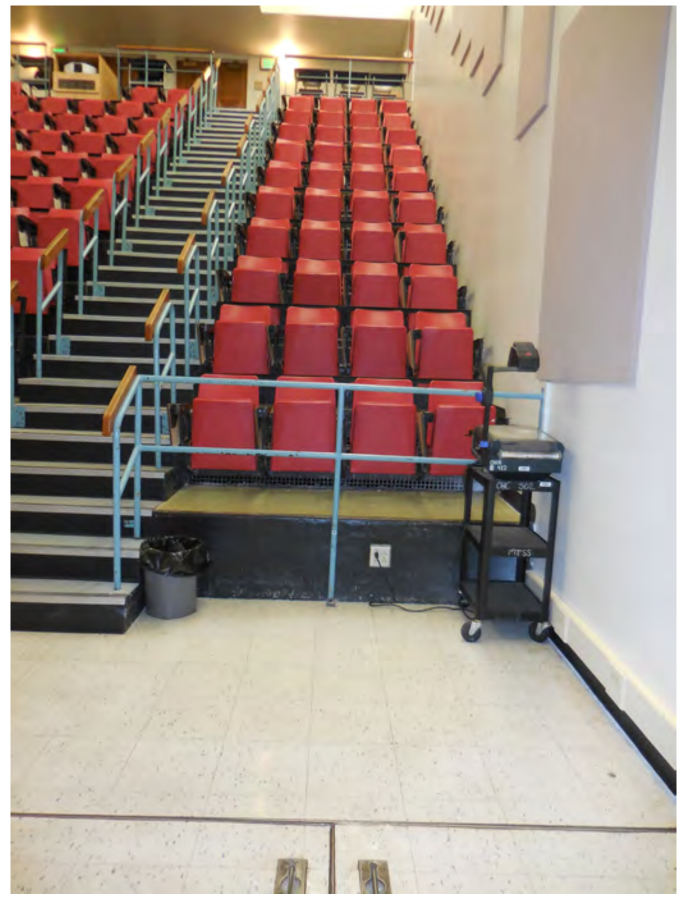
1. Upper level projection room does not provide proper ADA clearance requirements, fire rating and provisions for egress.
2. The small width of the entry door between the stair leading and the projection room does not meet ADA requirements.
3. Door to stair is provided with a knob type handle, which does not meet ADA requirements.
4. Width of the stairs leading to the upper projection room is too small to meet proper clearances. Handrails do not meet ADA requirements.
5. Secondary means of egress from the space is provided through a roof hatch accessible from a metal ladder.
6. Insufficient ventilation provided in projection room.

7. Code requirements for wall fire-rating and room clearances will be dependent on the final use of the space. Currently the space will not meet code for a projection room.

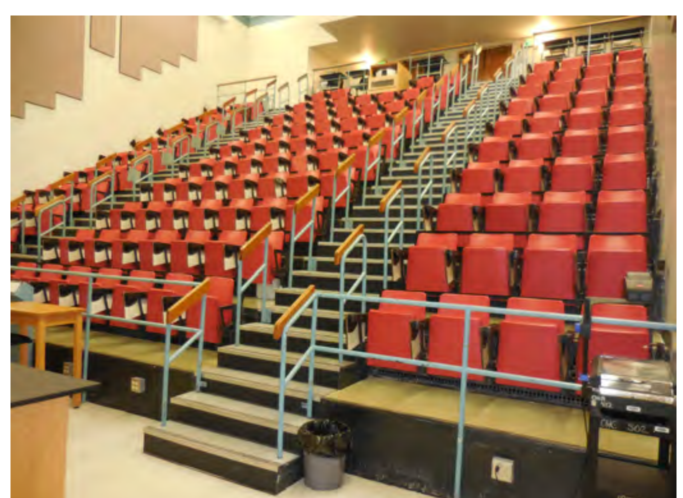
Former Projection Room at Lecture Halls

1.6 – 152-Seat Lecture Hall with Tiered Seating

1. Lecture Hall is to be considered an A-1 Assembly space. Space is provided with 150 fixed seats and two barrier free stations at the top of the classroom.
2. There are a total of ten rows of seating secured to a platform that is approximately 14" high. Stair access to the platforms have a typical 7" rise and 10 ½" run. Stair run is too small and does not comply with code. Stair railings to meet ADA and code requirements for an assembly space.
3. Barrier-free spaces are provided only at the top of the lecture hall and limit physically impaired persons access to the entire room.
4. There are two code compliant egress doors at the top of the room exiting into a lobby which then exits directly to the exterior.
5. At the bottom of the lecture hall one pair of doors egress through a vestibule and into a stair that will require occupants to travel one level up to a safe egress at the exterior. Additional exit signage to direct occupants to safe egress is required. See Stair #1 – Item 10, above, for additional stair comments.
6. Second door at the bottom of the lecture hall leads into a higher hazard space that appears to be a chemistry classroom or storage room. (See additional information below in Item 1-7.) Although there is no exit sign indicating to occupants that this is an egress door, its location could create confusion in an emergency. Additional signage could be provided to identify that this door is not to be used for egress and should remain locked.
7. Egress doors and frames in the room do not have a fire-rated label or classification.
8. Confirm that walls are provided with proper fire rating as required for an A-1 Assembly space within this type of building.
9. Podium is not provided with a barrier-free teaching station. There is a possibility for barrier-free access in the adjacent ramped corridor, if the ramp was modified to meet ADA requirements.



152-Seat Lecture Hall



152-Seat Lecture Hall

10. Sink and faucets at the podium do not meet ADA requirements.
11. Space to be evaluated to determine if adequate egress units per occupant are provided.
12. Space is not provided with fire sprinkler system.
13. Confirm structural stability of walls separating the space. Facility personnel have confirmed that the wall has failed in the past and has been reconstructed.
14. Confirm that adequate ventilation exists to provide proper air changes for maximum allowable occupancy.
15. Maximum allowable number of occupants would need to be posted in the room.

1.7 - Chemistry Classroom/Storage Area

1. The room behind the podium area of the lecture hall appears to be converted to a chemistry classroom with storage. This space does not conform to code for this type of space at the rear of assembly rooms.
2. It appears that the large lecture hall uses this room as a means of egress to the middle ramped egress corridor. This does not meet the requirements of a means of egress path.
3. There appears to be a non-functioning elevator in the center of the room. Elevator walls would need to be fully rated if this elevator is to be used as a means of egress or barrier free access, and then a rated passage would need to be provided to the lecture halls and at the upper level to the exterior.
4. Due to large quantity of storage or possible use of chemicals, the walls, doors and frames surrounding the room should be fire rated. Alternatively, hazardous materials could be removed and the room converted to a support space for lectures.
5. Door to the east stair egress vestibule should to be provided with fire rated frame and door.

Chemistry Classroom/ Storage Area

Chemistry Classroom/ Storage Area

1.8 – 341-Seat Classroom with Tiered Seating

1. Space to be considered an A-1 Assembly space. Space is provided with approximately 339 fixed seats and two barrier free stations at the top of the hall.
2. There are a total of nineteen rows of seating secured to a platform that is approximately 14" high. Stair access to the platforms have a typical 7" rise and 10 ½" run. Stair run is too small and does not comply with code. Stair railings to meet ADA and code requirements for an assembly space.
3. Barrier-free spaces are provided at only the top of the hall and limit physically impaired persons access to the entire room.
4. There are two code compliant egress doors at the top of the room exiting into a lobby, which then exits directly to the exterior.
5. At the bottom of the classroom two pairs of doors egress through two separate stairs that will require occupants to travel one level up to a safe egress at the exterior. Additional directional exit signage required to direct occupants to safe egress.
6. Third door at the bottom of the lecture hall leads into a higher hazard space that appears to be a chemistry classroom or storage room. (See additional information above in Item 1-7.) Although there is no exit sign indicating to occupants that this is an egress door, its location could create confusion in an emergency. Additional signage could be provided to identify that this door is not to be used for egress and should remain locked.
7. Egress doors and frames in the room do not have a fire rated label or classification.
8. Confirm walls are provided with proper fire rating as required for an A-1 Assembly space within this type of building.
9. Podium is not provided with a barrier-free teaching station. There is a possibility for barrier-free access in the adjacent ramped corridor, if the ramp was modified to meet ADA requirements.
10. Sink and faucets at podium do not meet ADA requirements.
11. Space to be evaluated to determine if adequate egress units per occupant are provided for clear access from space.
12. Space is not provided with fire sprinkler system.
13. Confirm structural stability of walls separating the space. Facility personnel have confirmed that the wall has failed in the past.
14. Confirm that adequate ventilation exists to provide proper air changes for maximum allowable occupancy.
15. Maximum allowable number of occupants would need to be posted in the room.

1.9 – Ramped Passage Corridor Between Lecture Halls

1. Slope of ramp does not meet ADA standard.
2. No handrails provided at ramp.
3. Proper egress signage not provided to egress discharge level.

Ramped Passage Between Lecture Halls

Level 2

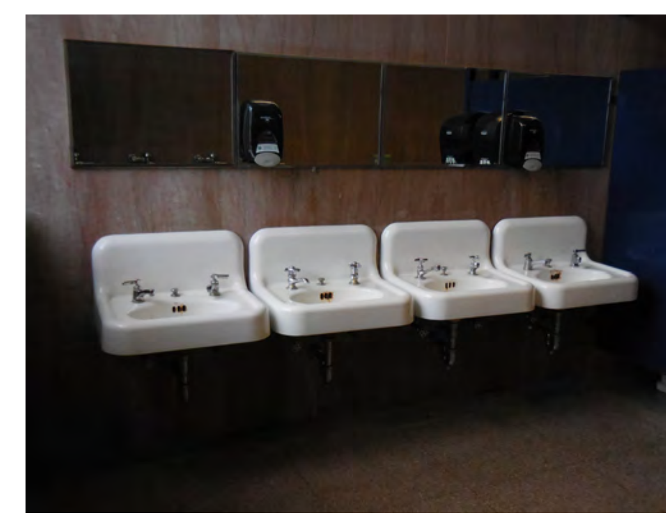
2.1– Men's and Women's Toilets

1. Toilet Rooms this level do not meet ADA requirements. Fixtures to be upgraded to meet ADA standards.
2. Doors are provided with latched handles and require greater than 5lb force to open.
3. Doors swing into the interior of the space adjacent to the ventilation closet. This configuration does not provide the proper clearance for wheelchair maneuvering adjacent to the door. It is unclear how a person in a wheelchair maneuvers at the door when the automatic door starts to open.
4. Toilet rooms are not provided with a barrier-free toilet stall, urinal (Men's Room) and lavatory. Lavatory is not provided with hands free controls and insulated drain pipes.
5. Accessories within toilet rooms must be provided and installed at proper ADA heights and floor clearance to provide proper access.
6. Toilet stall, urinal and lavatory would require reconfiguration to provide proper handrails and fixture heights.

Level 3

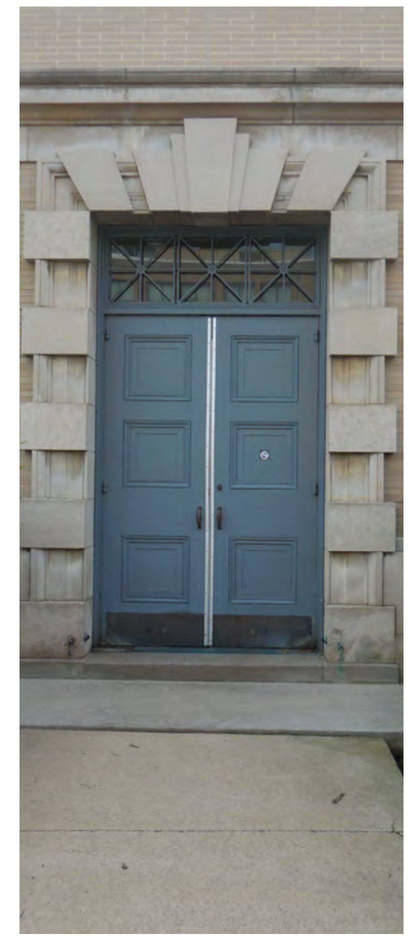
3.1 – Men's and Women's Toilets

1. See comments for 2-1.



Building Envelope Analysis

Main Entrance - South Elevation



Typical Entry Door

Typical window sill

Cornice Detail

Exterior Analysis

The Osmond building has a brick exterior secured to a terra cotta structural interior backup system. The brick is a custom sized buff color. The brick facade is in fair to good condition, with evidence of numerous repairs and repointing of the mortar joints over the years. The exterior wall construction is assumed not to be provided with cavity wall insulation, providing limited thermal insulation value that would fail to meet current energy code standards.

Window sills, decorative columns, decorative banding, roof cornice and door openings are made of cast stone, which typically appears to be in good condition.

The front entrance has numerous stairs that provide access from the street level to the entrance on the first floor. Stairs are not provided with sufficient handrails for access for the physically impaired. There should be minimally one set of handrails per set of large front entrance stairs that are five feet apart. There is no barrier-free access ramp at the front of the building, requiring persons with disabilities to circulate to the rear of the building where the only ramped access into the building is located.

Window with Unit Air Conditioner

Windows are steel frame with single-pane non-insulated wire glass. The windows have operable casement type panels and fixed glass sections. The glass panes are secured with putty that is typically deteriorated or missing. The existing window system provides minimal thermal insulation value and would not meet current energy code standards. Some window frames have been retrofitted with individual air conditioners units, where condensation from the units is staining the window sills and brick below.

Typical Window Detail

Rixon Hinge at Exterior Door

Exterior painted wood doors are in fair condition. Some have started to rot, typically at the base of the doors. Exterior rixon-type hinges at the base of the doors that have been exposed to the weather are deteriorating and may be difficult to operate.

West Elevation Exit Stair

At the west side of the building, egress stair #2 exits to a sidewalk adjacent to the loading dock road. It is recommended to provide a barrier to direct occupants away from the road during emergencies. The exterior concrete stairs are deteriorating and provide an unsafe egress path. Stair does not have proper handrail and guardrails. Insufficient lighting is provided at this egress stair which does not provide safe egress during evening hours.

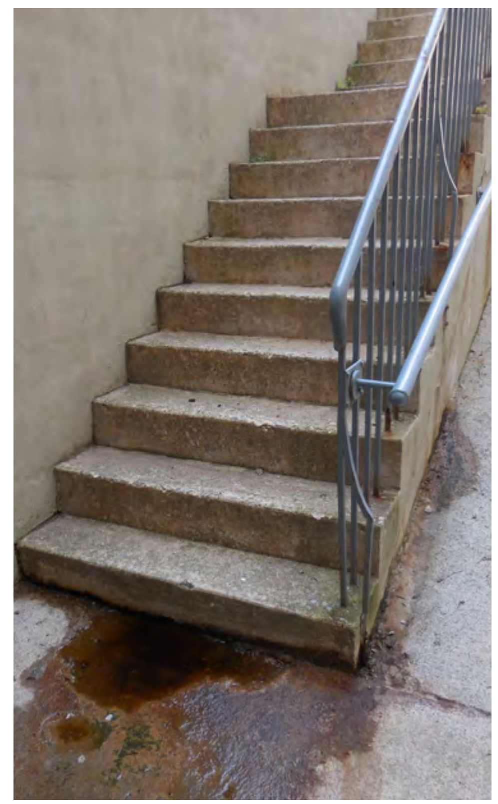
West Elevation and Connector to Davey Lab

The lecture hall's lobby egresses through pairs of exterior doors provided with proper egress signage and panic hardware. Occupants egress to an exterior courtyard that requires occupants to traverse a small set of stairs to an exterior egress path. No barrier-free ramp is provided in this area for egress.

Egress at the south side of the building, from Stairs #6 and #7, discharges to a raised platform that is not easily accessible by persons with disabilities. The large doors with deteriorated rixon hinges may be difficult to operate.

The interior grass courtyard between the assembly area and the large sloped ramp had drainage problems for which additional drainage wells have been provided. Facility personnel could not confirm if the drain wells are functioning properly.

The large sloped ramp at the exterior is used as a loading dock ramp to bring large equipment from the parking area down into Osmond's basement level. The exterior ramp and stair should not be used as a means of egress from the building; the slope of the ramp is too steep to meet current codes and no handrails are provided adjacent to the ramp. During heavy rains, water cannot sufficiently drain at the base of the ramp adjacent to the stair. By not properly draining at the entrance to the building it creates a hazardous condition where occupants cannot properly exit the building. The exterior drain at the base of the entrance to the stair also does not allow occupants proper access to the stair egress component. The handrails and guardrail at the stairs are in deteriorated condition and do not meet current code requirements for height and clearance. During winter, the ramp and stairs may provide an unsafe condition if not properly treated or cleared of snow and ice. It is apparent that during heavy rains that water flows down the ramp from the road and parking area and continues into the building due to poor drainage at the base of the stair.



Steps from Bottom of Ramp Up to Grade

Detail of Steps at Ramp

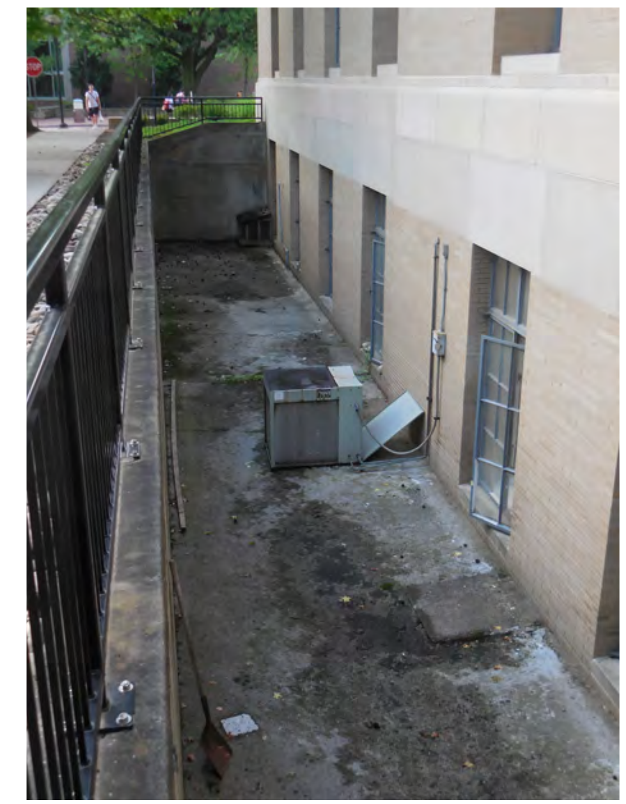
Ramp from Grade to Basement Level Access Point B2

The entrance ramp at the northeast corner of the building provides the only barrier-free access to the first floor level. The ramp currently does not meet ADA requirements. The slope of the ramp is greater than 1:12, and a guardrail with no handrail is provided adjacent to the areaway. No guardrail or handrail is provided at the opposite side. The landing at the top of the ramp is adjacent to steps down with no handrails or guardrail. This arrangement creates a hazardous turning condition for persons in a wheelchair that could slip backwards down the steps. Entrance into the building at the ramp area is through a pair of large wood doors that may be difficult to open.

Exterior stairs adjacent to the ramp that lead to the basement are in poor condition. The concrete steps are spalling, the handrails are rusted and do not provide the proper extensions at the top and bottom of the stairs, and mold and moss are growing within the stair area. Lighting is insufficient to provide occupants a safe path to the exterior. Drains at the bottom of the stairs do not appear to be working properly which may create flooding into the interior of the building.

Large areaways on the east side of the building extend from the sidewalk level to the basement level, providing light and ventilation into the laboratory space on that level. Similarly, areaways at the south side of the building provide light and fresh air to the basement level shop and sub-basement level laboratories. Areaways are secured with guardrails at the sidewalk level that are in good condition and provide proper fall protection. Numerous air conditioning condensers and equipment reside within the areaways.

Ramp and Stair #4 at Northeast Corner of the Building



East Side Areaway

Building Envelope Analysis

Roof Analysis

The Osmond Laboratory roof system is a modified Bituminous roofing system with small granular aggregate ballast. There is a minimal slope to drain and it is assumed that there is rigid tapered insulation under the roofing system that is secured to a concrete deck below. The Penn State University facilities group has said the roof is approximately 15 to 20 years old and is still under warranty. The typical warranty for this type of roof system is between 20 to 25 years. The roof appears to be in good condition with some evidence of ponding at low spots, however it is reaching the limits of its warranty period and may need to be replaced in a few years. PSU might consider conducting an infrared scan of the roof and insulation below to determine if there is any sub surface leakage or water damaged areas.

Access to the upper roof is provided with a full man door from Stair #2 that has a full extension to the roof. There is a full height mechanical penthouse on the roof, above the elevator, to house the elevator traction machine equipment. The penthouse is a prefabricated insulated metal panel structure in good condition. The upper roof has numerous small fans, ducts and equipment that are set on individual roof curbs. Numerous pipe and pipe vent penetrations are scattered across the roof. A low masonry parapet wall, approximately 2'-0" high, surrounds the perimeter.

Elevator Mechanical Penthouse

Osmond Roof Looking North

Roof Over Lecture Halls

The low roof, above the lecture halls, has limited equipment on it: approximately six fans and mechanical equipment in addition to approximately 18 pipe vent penetrations. Access to the low roof is through an existing window from Osmond. A low masonry parapet, approximately 2'-0" high, surrounds the perimeter of the roof. Spaces below the roof show evidence of some roof leakage; further investigation would be needed to determine the extent of roof damage at these areas.

Drainage from both roofs is provided through a roof drain system with no overflow system. Staff with the university's Office of Physical Plant (OPP) informed HDR that the drains along the south side of the high roof drain into the sanitary line along Pollock Road. OPP has also stated that the south roof drains are partially clogged, probably from tree roots at the front of the building that obstructs drainage resulting in flooding of the roof. A solution will be required to clear the drains and to allow proper flow, as well as redirecting the flow to a storm drain that is located at the rear of the building.

Any future roof replacement would require the perimeter metal through-wall flashing to be replaced with new. The roof equipment curbs should be replaced with new curbs and properly secured to the structure as required per current code. All pipe penetrations would require new flashing and drainage collars around each pipe.


Typical Parapet (East Side)


Door to Stair 2 from Roof

Existing Conditions Structure/Building Envelope

Summary

The Osmond Laboratory structure consists of spread footing foundations supporting steel columns, and a hybrid concrete slab and steel beam superstructure. The structural system appeared to be in relatively good shape with no evidence of structural distress or settlement. There was evidence of water damage in the partitions and flooring, however the damage did not appear to spread to the structural elements. There was an incident several years ago where the non-load bearing partition between the lecture halls partially failed, however the wall was repaired and the lecture halls are fully functional.

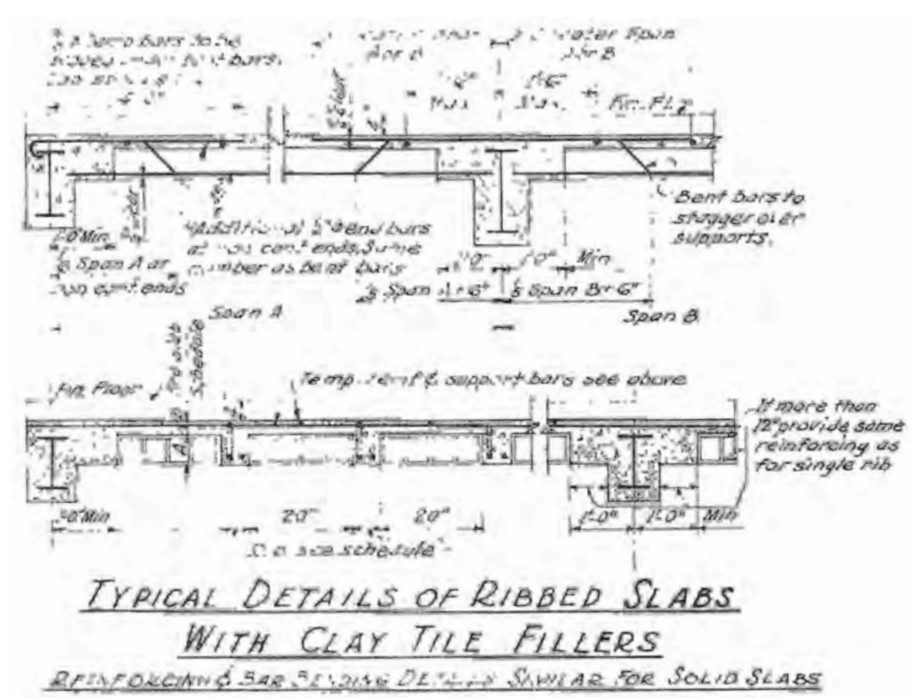
The load capacity of floor structure is well suited to the classroom, public space, and light laboratory environment, which within today's code translates to roughly 80 lbs/ft2 to 100 lbs/ft2 of live load. It would not typically be suited to heavy duty laboratories, storage, or heavy mechanical equipment without potential modification to the concrete floor structure. The ribbed concrete floor slab and tile system is a relatively inflexible system, meaning that strengthening the floor to accept additional weight, or to accept new openings is rather cumbersome and could be costly

Existing Structural Systems Assessment

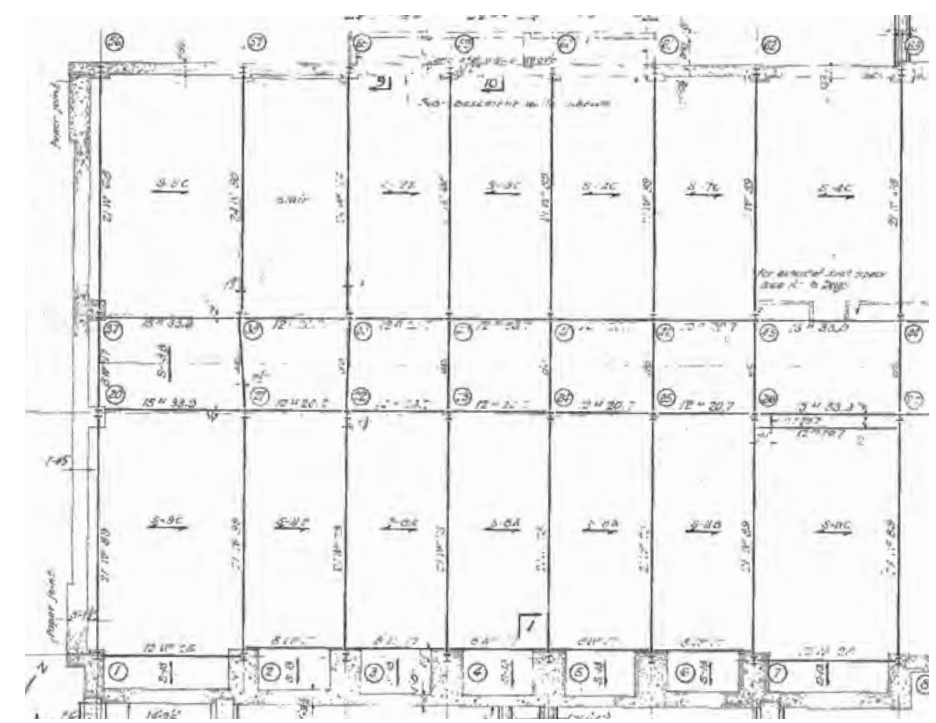
Drawings and History

A full set of structural design drawings were provided to HDR during the site assessment on July 25, 2016. The drawings were produced by Hunter & Caldwell and Charles Klauder, and were issued January 31, 1938. Charles Klauder, prior to his passing in 1938, designed roughly 18 buildings on the Penn State campus including current campus icons the Nittany Lion Inn, Rec Hall, Pattee Library, and Old Main. One of his final projects was Osmond Laboratory. The drawings provided to HDR are as follows:

- S-1 - Foundation Plan (Main Building)
- S-2 – Basement Framing Plan (Main Building)
- S-3 – Typical Floor Framing Plan (Main Building)
- S-4 – Roof Framing Plan (Main Building)
- S-5 – Foundation Plan – East Wing
- S-6 – Framing Plans – East Wing
- S-7 – Foundation Plan – Lecture Hall Wing
- S-8 – Framing Plans – Lecture Hall Wing



Typical Ribbed Slab with Clay Tile Filler Detail



Typical Steel Beam Framing with One-way Slabs in Between

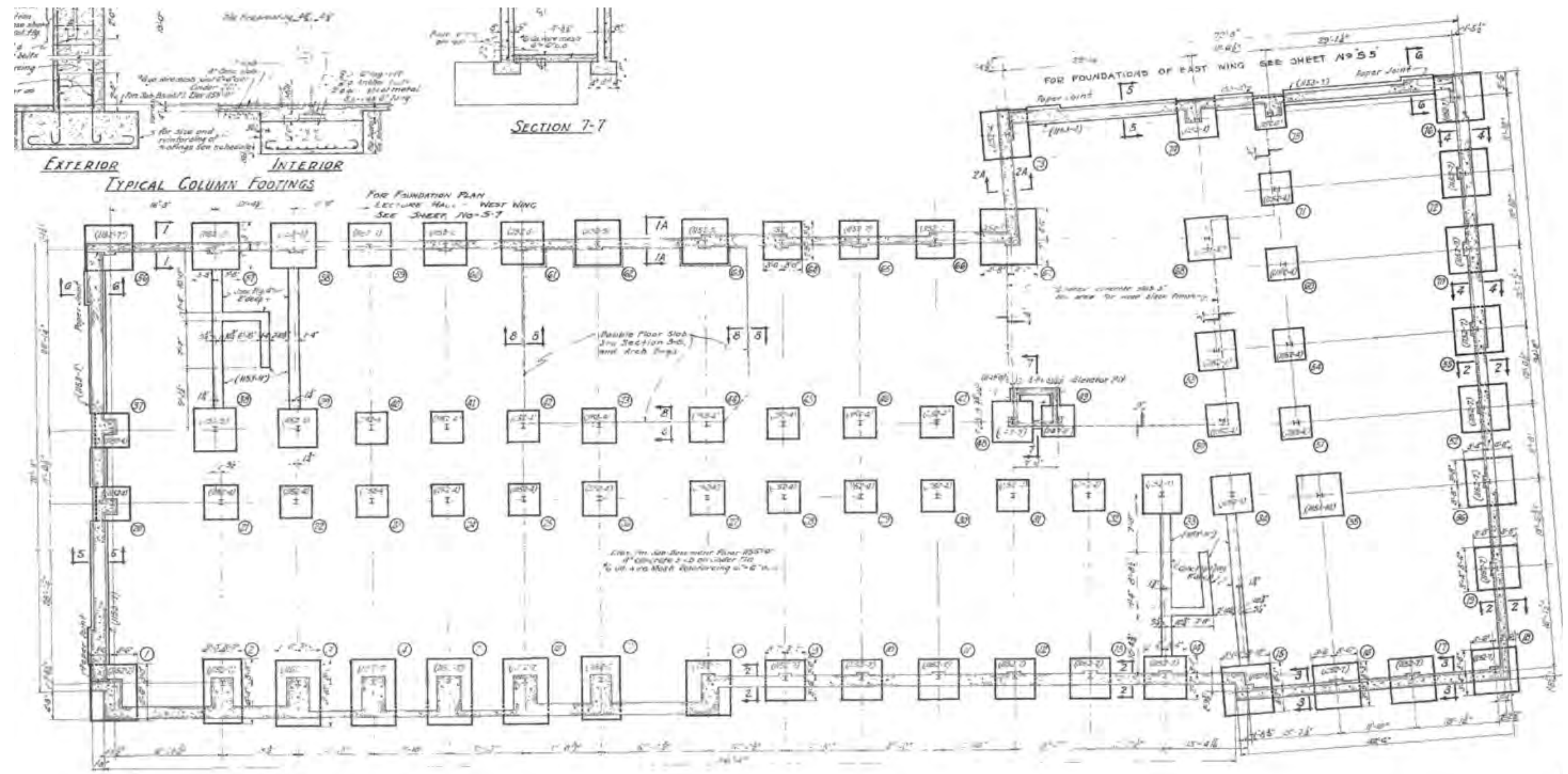
Foundation System

The building is founded on spread footings bearing on high-density strata, likely some form of weathered rock. The existing drawings do not indicate an allowable bearing capacity for the strata, but given the smaller size of the footings and the column loads, allowable bearing is estimated to be in the 6 to 8 ksf range. The sub-basement level footings are founded at roughly elevation 1152'-4", 3'-0" below the sub-basement slab level and 29 feet below the first floor slab elevation. More accurate information regarding the soil strata will be important for the project moving beyond the feasibility study as this will help determine the adequacy of the existing footings to accept new or additional loads, and will also form the basis of design for any addition or expansion.

The floor slabs, beams, and columns all appeared to be in good shape with no distress. There were numerous instances where the clay tiles were damaged and broken, however the damage did not appear to be causing any additional structural distress in the cast-in-place portion of the floor construction.

The roof construction consists of steel beams spanning between girders, with the girders spanning to columns. The beams support a concrete plank-type system that spans beam to beam.

The structural concrete slab is typically 2" thick, with the ribs being an additional 4" to 6" thick. The concrete spans between 11'-8" and 16'-11" from girder to girder, and there is a topping slab above to meet the finish floor elevations.



Typical Foundation Configuration, as Shown on Existing Drawing S-1

Basement-type concrete retaining walls bound the exterior of the building, ranging in thickness from 1'-5 ½" to almost 2'-0" thick. Walls have two curtains of steel reinforcing on each face and appear to set directly on unreinforced concrete footings. The building slabs provide the necessary lateral restraint for the walls. On the east and south sides, rubble stone walls form the large areaways.

During the site assessment, no evidence of excessive settlement or cracking was observed that would indicate foundation or soil type failures.

Superstructure System

The primary structural system from the sub-basement up to the third floor is a one-way concrete ribbed slab with clay tile infill, supported on concrete encased steel girders. The steel girders span in between the columns and are the primary load path down to the foundations.

No braced frames, moment frames, or shear walls were noted on the plans so it is assumed that the exterior walls act as shear walls and provide the lateral restraint against wind and seismic forces.

Ribbed Clay Tile Fillers Shown in Between Smooth Concrete Beams

Attic Space Showing the Underside of Roof Structure and Concrete Plank System

Observations and Conditions

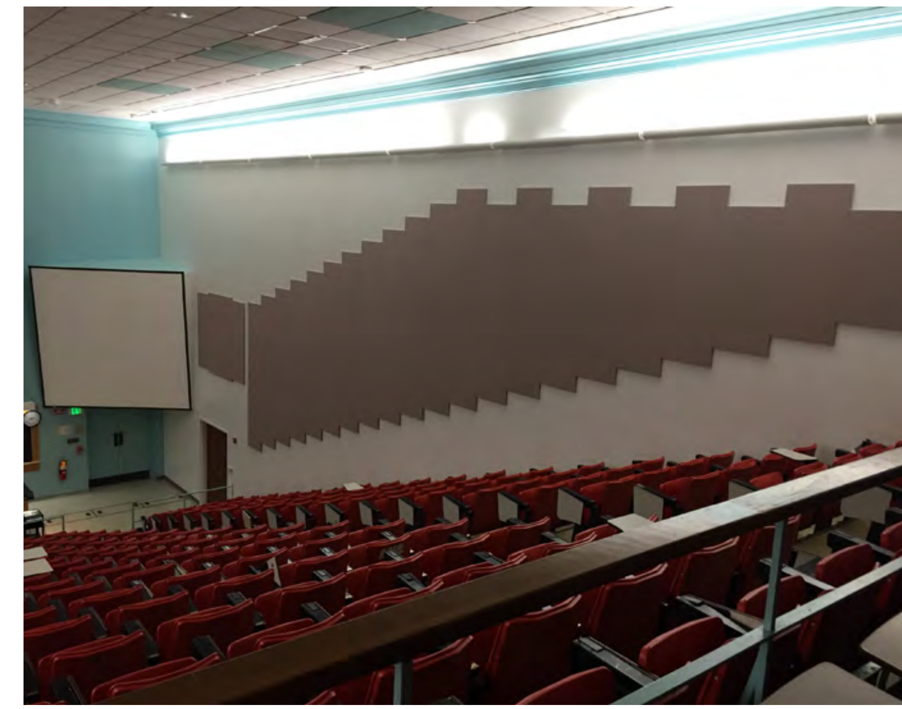
As a whole, the main Osmond Laboratory and East Wing structures appeared to be in relatively good condition. No evidence of settlement or distress in the slabs or primary structural members was observed during the walk through. There were a number of rooms and areas within the sub-basement level that had evidence of water and humidity damage, however the damage appeared to be limited to the masonry partitions, and had not extended into the primary structure.

During review meetings with facilities staff, it was conveyed that an incident occurred in the lecture hall where the demising partition between lecture halls started to bow and fail. The partition was repaired and the lecture halls are now currently in use. A review of the existing drawings confirms that this wall is non-load bearing. Drawings and reports regarding this incident were not made available to HDR for the preparation of this report.

An engineering review of the load capacity of floor structure reveals that the ribbed concrete slabs are well suited to the classroom, public space, and light laboratory environment, which within today's code translates to roughly 80 lbs/ft2 to 100 lbs/ft2 of reducible live load. It would not typically be suited to heavy duty laboratories, storage, or heavy mechanical equipment without potential modification to the concrete floor structure. The ribbed concrete floor slab and tile system is a relatively inflexible system, meaning that strengthening the floor to accept additional weight or to accept new openings is rather cumbersome and could be costly. The ability of the existing floors to support vibration sensitive equipment should be further evaluated based on the intended future use of the space. Inherently, the concrete structure and closely spaced columns provide a relatively stable platform for use as a laboratory, and preliminary calculations indicate that the vibrational velocity due to footfall is in the 2,000 to 4,000 micro-inches per second range for slow-paced walking. This makes the space suitable to many different types of non-highly sensitive laboratories.

The roof structure was also reviewed with respect to allowable load-carrying capacity, and it appears to be limited to light live loads due to the precast planking. Any future mechanical equipment appears to be best suited to be supported directly from the relatively closely spaced steel columns.

Cracking and Spalling of Sub-basement Storage Room S2 Column Enclosure and Masonry Partition



Repaired Lecture Hall Partition

Existing Conditions Mechanical Systems

Summary

The Osmond Laboratory currently employs a multitude of original and more modern retrofit systems. The bulk of most air systems can be considered non-centralized consisting of small to medium systems added as required to serve specific building areas. The building infrastructure currently includes site chilled water and low pressure steam service. High pressure steam services are minimal and potentially inactive at this time. Preliminary existing load estimates indicate a deficiency in site heating and cooling delivered to the building. The planned expansion and re-purposing of Osmond is likely to result in removal and replacement of much of the existing mechanical infrastructure.

Existing Systems Assessment

Air Systems

The original air systems appear to be in a mixed state of active and inactive use. There was no cooling capability integrated with the original HVAC systems. Labs and large classrooms were provided with exterior wall mounted unit ventilators that directly brought in and tempered fresh air to the room. These units are steam heating only and utilize exhaust grilles on the far wall to complete space circulation. Additional labs on the upper floors received tempered fresh air from central ducts and coils located at grade. Additional investigation will be required to determine whether the original steam unit ventilators have since been replaced in favor of hot water models.

Typical Classroom with Unit Ventilator (Bottom Center)

The loft area of the building housed multiple exhaust fan sets that served individual or small clusters of rooms to exhaust fresh air delivered to the building. Primary vertical distribution of exhaust ductwork originated in the loft and routed down through small chases that flank both sides of the main corridors. Survey of the loft area saw that multiple duct systems have been disconnected and abandoned in place, while others still appear to be in active operation.

Typical Loft Space Housing Both New and Abandoned Mechanical Infrastructure

Typical Utility Chaseway at Loft Space with Approximate 19" Clear Inner Opening

Multiple areas of the building have since seen replacement or embellishment of the base systems to support more modern heating and cooling systems. These systems have been installed in various areas such as the roof, loft and lightwell areas. Other terminal units are installed within the building itself and use either chilled water or DX cooling fed from remote condensers.

Air Handling Unit Serving Lecture Halls

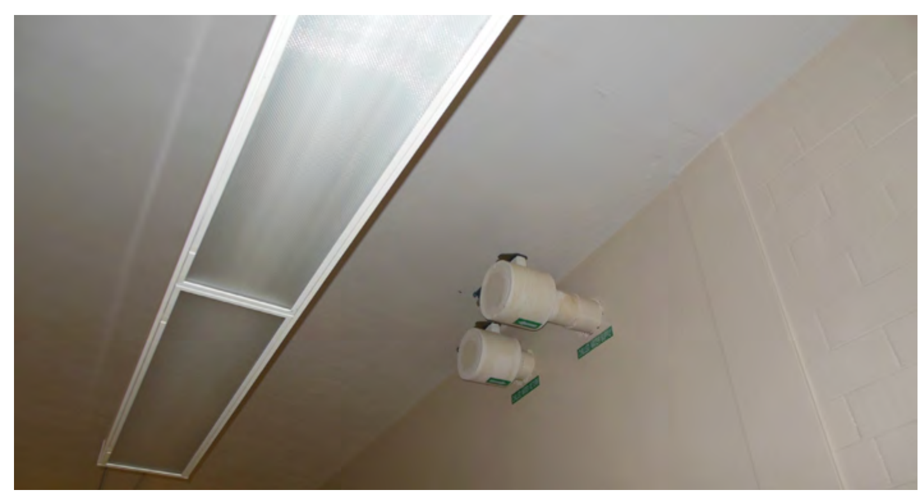
Roof of Osmond Showing Retrofit HVAC Systems

Steam and Hydronics

Chilled water entry into Osmond takes place at the basement level MER located underneath the large lecture halls. Documentation indicates that the incoming line size is 8" and is taken from the 24" site main that runs between Osmond and Davey buildings. Pursuant to the site standard, the incoming chilled water lines are provided with a booster pump and bypass arrangement. The chilled water lines are distributed to multiple areas throughout the building for service to air handling units, fan coil units and secondary chilled water loops. Chilled water infrastructure is also distributed vertically using the chaseways flanking the corridor. Each level of Osmond is provided with a valved and capped connection for the floor intended for future use.

Point of Entry for 8" CHWS/R Lines at Basement MER Beneath Lecture Halls

CHWS/R Booster Pumps at the Basement MER Below Lecture Halls



Typical Future CHWS/R Lines Located on Each Floor

Certain portions of the Osmond building require a secondary chilled water loop to perform specific processes. The primary chilled water is distributed to these locations as the cooling medium for the secondary loop. In the building these systems were noted to be both packaged water-to-water chillers or plate and frame heat exchangers with pump sets.

The point of entry for steam into Osmond is located at the basement level building and grounds room adjacent to Pollock Street. Osmond currently has an incoming 8" low pressure (building guaranteed 5 psig) steam line that is fed off of one of the steam lines at the Pollock utility trench. There is an existing trench and man door that extends from Osmond to its point of tie-in with the main at Pollock. The site steam infrastructure consists of interconnected piping loops fed from both directions by the campus steam plants. The site main pipe size located at Pollock is also 8", which would render any up-sizing of the service pipe into Osmond as ineffective. Steam condensate out of Osmond is returned using the same pathway as the incoming steam.

Secondary Chilled Water Pump Loop with Plate and Frame Heat Exchanger

Secondary Chilled Water Pump Loop with Water to Water Chiller

Incoming Low Pressure Steam Line at the Basement Level Building and Grounds Room

The site steam infrastructure also includes a high pressure (140 psig) steam loop. The high pressure steam system includes campus "spiking stations" which supplement the low pressure system in order to maintain a 7-8 psig site operating pressure. One such spiking station is located in close proximity to Osmond in Davey lab. Original documentation indicates a 3" high pressure steam line entering directly into Osmond, however, it's primary use has been described as obsolete and would require further investigation as to its active status.

The incoming low pressure steam service is the primary heating medium for most of the building heating and plumbing infrastructure. Low pressure steam is sent to shell and tube heat exchangers in order to generate hot water and hot water glycol (ethylene). Each system is provided with its own set of pumps for distribution to the building. Additional investigation is required to determine which air systems retain service from these respective hot water systems. Low pressure steam is also utilized to generate domestic hot water for the building.

The original heating and ventilation systems at Osmond had low pressure steam distributed to each unit ventilator fed vertically at the exterior walls. Other central ventilation air systems were heated by steam coils, however, it appears from the documentation that these coils have since been replaced for hot/chilled water units at the loft.

Hot Water Pumping Systems Fed from Steam Heat Exchangers

Steam to Domestic Hot Water Heat Exchanger

Observations and Noted Deficiencies

Air Systems

The vast majority of air systems at Osmond are de-centralized and lack total building coverage. Multiple systems still rely upon integral air cooled condensers and do not take advantage of available site chilled water. The piecemeal configuration of many systems does not lend itself to any level of redundancy in the way that multiple shared air handlers can achieve, which is especially important for laboratories. The existing systems at their current sizes and locations are not able to be scaled to match the ultimate conditioning goals for the proposed renovation. Only retro-fit equipment has the ability to provide cooling with the rest of the building employing heating only equipment.

Though some units, such as the auditorium air handler, are in good working order, their re-use is unlikely due to possible re-purposing of the existing building. Multiple other air handlers, such as those on the roof, are showing definite signs of aging and are approaching the end of their useful lives. To the extent observable, it does not appear as though the entirety of the building is actively ventilated in order to meet code required flow rates.

The exhaust systems were noted to follow similar form to that of the supply systems in that they serve specific small areas. The equipment does not have any level of redundancy that can be achieved from a centralized system. The vast majority of roof penetrations for exhaust are assumed to be inactive and in general do not follow good standard of practice for exit nozzle location above finished roof. Abandoned ductwork systems should be considered for removal during a major renovation in an effort to purge obsolete system infrastructure out of the building.

It was noted that helium was conveyed through piping as part of a recovery system, but there was no oxygen depletion monitoring or purge system noted to compliment this concept. The implementation of a monitoring/purge system should be considered a pre-requisite for any planned renovation of this system.

Steam and Hydronics

Site chilled water available to the building appears to be appropriate in size, but the incoming line size may not be adequate to support the proposed building renovation. Additionally, the location of the incoming chilled water may conflict with proposed building expansion options and may need to be relocated prior to demolition. The chilled water infrastructure routed through the building is suitable for re-use provided that it is routed and sized appropriately for its new service. During the walk through, it was noted that some chilled water piping is constructed of schedule 10 PVC, which should be considered for replacement.

The chilled water booster pump system appears in good condition and working order, however, its location will need to be evaluated as part of the proposed renovation options. Additionally, the sizing of these pumps is likely to fall short of the planned future load. The secondary (process) chilled water system is non-centralized and lends itself to operational and maintenance inefficiencies as a result.

The size of the low pressure steam infrastructure in proximity to Osmond can be considered insufficient for proposed renovations, however, the “spiking station” concept employed around the campus is assumed to overcome any low pressure system shortcomings. Any original steam piping within Osmond can be considered at the end of its useful life and should be considered for removal/replacement.

Existing Conditions Electrical Systems

Summary

Osmond Laboratory is supplied from the campus 12.47kV distribution system. Dual feeders terminate at an automatic transfer switch near the Botany Building. A single feeder from the automatic transfer switch supplies a 500kVA pad mount transformer located outside Osmond. The transformer secondary is 208/120V, 3 phase, 4 wire.

The main electrical room is located at the basement level. Draw out switchgear supplied from the pad mount transformer was recently installed. The switchgear is rated 2000 A. This switchgear supplies power to Osmond and also backup power to limited loads in Davey Laboratory. Automatic power factor correction equipment maintains an approximate power factor of 0.95.

Standby and emergency (life safety) power is provided from the existing campus emergency power network which operates at 4.16kV. A primary switch and 75kVA transformer supplies standby power needs for the building. A second primary switch and 50kVA transformer supplies emergency power to the building as well as the McAllister Building. The emergency power network is supplied from generators located at the Central Utility Plant.

The 2000A switchgear is only a few years old. Sub-distribution and local panels vary in age, some reportedly to the building's original construction.

An existing Uninterruptible Power System provides power to one of the research laboratories.

Current maximum demand load is approximately 300kVA or about 60% of the building transformer capacity. Preliminary thinking is that there is enough capacity to allow renovation of the building for general use classrooms and/or offices, but more robust needs will have to be evaluated.

University electrical engineering personnel stated that scheduling shutdowns for preventative maintenance has been challenging due to the nature of research being conducted. Minimizing the impact of maintenance shutdowns on ongoing research should be considered in the electrical design.

The existing building lacks a lightning protection system. Engineering personnel stated that the new building will be required to have a lightning protection system.

Emergency Power Disconnect

Main Switchboard

Standby Power Disconnect

Medium Voltage Switch and Building Transformer

Existing Conditions Plumbing Systems

Summary

Osmond Laboratory currently houses an aging infrastructure due for replacement and not all of the required plumbing systems for the renovation are presently installed. A building wide renovation should consider complete replacement of all existing plumbing utilities.

Existing Systems Assessment

Storm Water System

Multiple interior storm water leaders convey the storm water from the roof drains via gravity to the site storm sewer system. Modification options for the site storm sewer system are included in the Site Plan and Utilities portion of this report.

Sanitary Waste System

The sanitary waste, including laboratory sinks and related equipment, drains by gravity and discharges through two 6″ lines on the south side of the building to the site sewer system. Areaways located on the east and south sides of the building currently discharge to the sanitary system and will need to be modified to drain to the site storm water system.

Domestic Water System

An 8″ water main in the street on the south side of the building feeds a 4″ water main that enters the south side of the building at the basement level mechanical room. A water meter, dual backflow preventors and a bag filtration system are located in the mechanical room.

Domestic hot water for the building is provided by a steam-to-water heat exchanger located in the basement mechanical room. A domestic hot water recirculation pump is provided.

Helium System

Helium for the labs is supplied from manifolded cylinders located in the mechanical room with a single regulator and piped to the building spaces. A helium recovery system is provided in the labs.

Incoming Water Service, Including Bag Filtration

Helium Cylinder Banks and Associated Manifold

Existing Conditions Fire Protection & Fire Alarm

Summary

Fire Protection

Osmond Laboratory is currently only partially covered by a sprinkler system. These existing sprinkler system components will need to be removed and a new complete building-wide wet-pipe type automatic sprinkler system will need to be installed. The system shall be in accordance with NFPA 13 and FM Global Data Sheet 2-8N.

Fire Alarm

The existing fire alarm system in Osmond Lab is manufactured by Cerberus (Siemens) Pyrotronics and is their Model MXL. It is a relatively new system, therefore the new building-wide fire alarm system should conform to this standard.

Primarily because the existing building is not fully sprinklered, there are considerably more spot type smoke detectors located throughout the entire building. Not all of these smoke detectors will necessarily need to remain as part of the new work. If the building will be fully sprinklered, the requirement for smoke detection throughout the entire building is not applicable. However, there will be smoke detectors required in more of the public spaces, such as corridors and lobbies.

The existing system configuration also includes duct type smoke detectors installed on all air handling equipment and within ducts where due to the volumetric air flow capacities this type of smoke detection is required, regardless of whether or not the building is fully sprinklered. All new and existing air handling equipment that exceeds the typical volumetric airflow capacities as required by the applicable codes should be provided with duct type smoke detection.

The existing fire alarm notification for the building is via horns and combination horn/strobe devices.

Existing Conditions Security System

The Pennsylvania State University (PSU) Design and Construction standards encompass the solutions necessary to meet the security needs for the Osmond Laboratory expansion project. The renovation of the existing laboratory facility will provide PSU with interconnected spaces requiring a range of security solutions including access control, video surveillance, intrusion detection and emergency call stations. These systems will need to integrate with the existing head end systems on the campus to allow the PSU Physical Security Office (PSO) to perform their duties.

Security System Components

The following are the current Osmond Laboratory security system components. All of these systems have been approved as Proprietary Items.

- Access Control: PSU has standardized their access control system on the Software House CCure platform. The CCure system server is currently running on the CCure 800/8000 software platform.
- Video Surveillance: PSU has standardized their video surveillance systems on the American Dynamics VideoEdge NVR platform.
- Intrusion Detection System: PSU has standardized on the Bosch D9412 control panel for intrusion detection systems.
- Emergency Communication System: PSU has standardized on Talk-A-Phone for emergency communication systems.

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