PennState
Physical Plant

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

Date: July 16, 2018

Subject: **Request for Proposals – Architect/ Engineering Team Selection**
Beaver Community Center Expansion
Penn State Berks

To: Architectural Resources Cambridge (ARC)
Atkin Olshin Schade Architects / Hastings + Chivetta
BLT Architects (BLTa) / SportsPLAN Studio
DIGSAU
DLA+ Architecture and Interior Design
Gensler
HG Architects
Kimmel Bogrette
Moody Nolan / AP Architects
NK Architects / Layer Architecture
ZGF

A. INTRODUCTION

The Screening Committee will review responses to this Request for Proposal, which is due in my office at **Noon on August 06, 2018**. The Screening Committee will identify a short list of three teams to be interviewed on **August 31, 2018.** The results will be announced at the Board of Trustees meeting on **September 14, 2018** and posted to this website.

Participation in this selection process by submitting firms shall be at no cost or obligation to The Pennsylvania State University (PSU). The University reserves the right to waive any informality in any or all Proposals, and to reject or accept any Proposal or portion thereof. Additionally, the University may also hold all proposals for up to 45 days and to reject all proposals or to award on the basis of technical merit and the best interests of the University.

B. PROJECT OVERVIEW & PROGRAM OF REQUIREMENTS (Edited from Request for Letter of Interest)

Constructed in 1980, the Beaver Community Center serves as the Penn State Berks indoor facility for athletic programs, kinesiology instruction and research (including to support biomechanics and exercise physiology), physical activity courses, intramural programs, general recreational activities and special events. The existing 28,060 gross square foot building includes a gymnasium, fitness room, studio, offices, locker rooms, training room, small research area and concourse. Minor renovations over the years have attempted to accommodate the growth of programs and student population. The intent of this project is to fully address the ongoing space inadequacies to support current programs and broader aspirations.

Kinesiology is the second largest major at Berks with strong growth projection. It is intended to provide the kinesiology program with the best available space(s), equipment and environment to enhance the

learning experience, attract new students and position students for their successful careers. Additionally, the importance of the kinesiology space is enhanced, given the recently-approved athletic status of Division III. This new facility will provide an important transition to aid in recruiting and build pride in varsity and club sport programs. At the campus scale, it is critical that the project considers a building expansion in the direction of the campus center, connecting to the adjacent Perkins Student Center and providing an enhanced campus aesthetic.

The goals of the project include the following:

- Provide a facility that fully addresses the current space limitations for the growing Kinesiology Program
- Provide adequate facilities to support NCAA athletic programs, enhance the Berks athletics brand and improve recruiting and retention
- Provide adequate recreational, fitness and athletic programs for Students and Student Athletes
- Improve the existing building infrastructure systems, including site utilities
- Connect the Beaver Community Center with the Perkins Student Center per the Master Plan
- Create an expansion that will enhance the existing campus aesthetic and character
- In keeping with our commitment to environmental sustainability, we expect that this facility will, at a minimum, attain USGBC's LEED Certified Level.

The project's new construction will support program space for an auxiliary gym, fitness center, locker rooms, kinesiology program, athletic offices and a convenience store. A portion of the existing building will be renovated to include an exercise studio, athletic training room and locker rooms. The remaining portion of the existing building will be renovated in a future construction project.

The University has completed a concept level program document with the assistance of DLA+ Architecture and Interior Design. The program document defines a building of 74,301 gross square feet. This project will feature 40,017 GSF of new construction and 5,706 GSF of renovation. A future construction project will address the remaining portion of the existing building renovation of 23,040 GSF with 5,538 GSF of addition.

Review and verification of the program will be the initial project phase for the selected project team. After the program validation phase, the project will follow the standard design and construction administration phases of the project.

The total project budget, including soft costs and FF&E is $26,600,000. This is divided into $20.5M for construction, $4.1M in soft costs and $2.0M in contingency. The successful A/E firm will be expected to work in conjunction with a Construction Manager selected by the University throughout design and construction phases.

C. RFP ATTACHMENTS AND REFERENCED STANDARDS

Enclosed you will find the following supplemental documents:

- **Program statement**, including test fit floor plans, with suggested space allocation.
- **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 and requires the maximum possible use of sustainable and energy-efficient designs and specifications, for architectural, site, utility, structural, mechanical, electrical, and plumbing work. 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

  Apart 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.

D. SELECTION AND IMPLEMENTATION MILESTONES

RFP Issued to Long-Listed Teams:	July 16, 2018
Submission of A/E Proposals Due:	**Noon EST, August 6, 2018**
Post Short-List results and Interview notice:	August 17, 2018
A/E Team Interviews:	**August 31, 2018 (University Park)**
Board of Trustees Selection of Team + Post Results:	September 14, 2018
Contract Award / Letter of Intent:	**October, 2018**
Construction start date:	February 2020
Project Occupancy:	**November 2021**

E. 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. Contact Kyle Hollick, Project Leader at Penn State OPP at 814.865.3789 or kwh121@psu.edu with any project questions. Contact Kim Berry at 610.396.6030 or krb11@psu.edu or Mark Dawson at 610.396.6373 or mxd318@psu.edu at Penn State Berks to schedule your site visit.

F. PROPOSAL REQUIREMENTS

Deliver Twelve (12) hard copies of your proposal and one (1) digital copy on a thumb drive to:

Greg Kufner, AIA, NCARB
University Architect
The Pennsylvania State University
206 Physical Plant Building, University Park, PA 16802

Hard copies of the Proposals are due August 6, 2018 at Noon, Eastern Standard Time. A PDF version of your proposal should be included on a thumb drive within 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 thirty-two (32) single-sided pages maximum (16 double-sided). Double-sided printing is strongly encouraged.

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 (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.

* **Note 1: As applicable throughout 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.**

Section 1.0 –TEAM STRUCTURE

A. Identify prime firm and key consultant firms, size of prime firm, each firm's role on this project, and each firm's qualification and experience on similar projects. Identify past collaboration between prime firm and key consultants, including number/ value of projects. Describe overall team commitment to sustainable design, including number of completed LEED 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, relevant project experience and define each key team member's role on each project. Include at least two client references for each key team member (Do not use PSU employees as references).

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 projects of a similar scope, scale, and complexity. **(See Note 1)**
4. Expertise in the planning, design, and delivery of state-of-the-art environments to support Kinesiology and Collegiate Athletics. Include expertise in delivering spaces that have a similar mix of space types/users, facilities that support creating highly collaborative environments, and those that support evolving initiatives. **(See Note 1)**

B. Identify a maximum of seven (7) 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. If project is a study, clearly define the scope of the study. Show illustrative representation of the example projects, particularly those highlighting the work of your team's proposed Lead Design Architect. **(See Note 1)**

Develop a matrix that illustrates the similarities between the example projects to this project.

In matrix form, show the participation of individuals from the proposed team on the identified projects. List team member's respective role on each of the example projects.

C. Briefly describe your proposed methodology to help address PSU's Diverse Business Enterprise Program (DBE), including outreach, and how you propose to maximize DBE firm participation within your proposed team. DBE requirements can be found in this link: https://opp.psu.edu/planningdesignconstruction/diverse-business-enterprise-program-dbe

D. 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.

E. 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.

F. 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 design approach, including:
    1. Validating project program, including verifying the mix of program elements.
    2. Helping to define project vision, goals and expectations and methodology for achieving goals/ expectations from concept design through construction.
    3. Programming, space planning and programmatic adjacencies, including the creation of blocking and staking options to respond to project aspirations, sustainability and other factors relevant to the program elements.
    4. Additionally, your approach to design from visioning through early concepts to interior/ exterior "look and feel", through execution of the design.

B. Describe your team's overall approach to:
    1. Planning, managing, and executing the project. Include approach to including decision making process(es), consensus building, and tools that you will utilize.
    2. Innovative design.
    3. Use of BIM, technology, predictive modeling, and digital tools.
    4. Cost estimating, cost control, and quality control through the design and construction phases.
    5. Creating a collaborative environment between architects, academic/ lab planners, engineering consultants, and PSU stakeholders.
    6. Creating a collaborative design and construction process, including integration of the design team with the Construction Manager and trades.

C. Briefly describe your approach to Penn State reviews, PSU design reviews, and jurisdictional reviews. Anticipated jurisdictional reviews include Labor & Industry and building code. Local municipal reviews and permits may be required and the professional shall be responsible for securing these permits with assistance of the University. Any fees associated with permits shall be paid for by the Professional and will be reimbursed by the University.

D. Brief narrative approach to MEP planning/ design/ delivery of a commission-ready, energy efficient, and high performing academic and athletic facility.

E. 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. Define which individuals are leading certain sustainability efforts.

    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.

F. Provide statement validating the proposed project schedule and your entire team's availability to appropriately staff the anticipated workload.

    Create a graphic project schedule showing phase durations, owner engagement and review, critical milestone and other critical schedule elements. This can be printed on an 11x17 fold-out and only count as a single page.

Section 4.0 – PROJECT-SPECIFIC KEY DRIVERS AND IDEAS

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

   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.

B. Delivering a highly functional and efficient building is critical to project success. We are seeking teams that can drive our decision making, including determining adjacencies/space types/space functionality and access/security/circulation between uses in order to meet all programmatic needs. Describe programming, planning, benchmarking tools and methodologies that your team will use to meet these objectives.

   Additionally, provide specific principles/ideas or project examples for the following:
   1. Kinesiology teaching and research spaces, including to support biomechanics and exercise physiology.
   2. Athletics/ Wellness spaces, like described in this project's program (see Section B).
   3. Approach to facilitating design and planning ideas to achieve a high level of user collaboration and creating collaboration spaces within dense/ efficient buildings.

C. Your firm's vision of what, beyond purely functional issues, constitutes the essence of this type of facility. Provide additional evidence of your firm's ability to translate design intentions into a meaningful project.

   Discuss example project(s), relevant to our project, that best indicates the appropriate resolution of an understanding of the uniqueness of a project, design intentions, and how those design intentions translated into a meaningful and synthesized final solution.

D. Provide any initial design ideas, thoughts or considerations regarding the project. We are not seeking design solutions, but rather your design thinking. Considerations should be related to the building, site, and broader campus planning issues.

Thank you for your anticipated participation in this RFP process. The Pennsylvania State University looks forward to reviewing your responsive proposal for this important project.

Respectfully,

Greg Kufner, AIA, NCARB

University Architect
The Pennsylvania State University
206 Physical Plant Building, University Park, PA 16802
Phone: 814-865-4402 | Email: gak21@psu.edu

CC: Screening Committee

7 PROGRAM SUMMARY

Indoor Program Area	Programmed	As Designed	Program Variance
A. Kinesiology	4,704	5,185	481
B. Athletics	7,284	7,037	(247)
C. Shared Support	470	439	(31)
D. Building Support	2,094	3,082	988
E. Shared Spaces	35,050	36,394	1,344
F. Athletic Training	1,148	1,300	152
Total Useable	**50,750**	**53,437**	2,687
Grossing factor	13,195	14,918	1,723
Grand Total Space Demand	**63,946**	**68,355**	4,409
Existing Space Supply	*28,182*	*28,182*	0
New Construction	**35,764**	**40,173**	**4,409**
Added Program for C-Store			
C-Store	0	1,961	1,961
Dining Shell Space	0	2,175	2,175
Storage	0	346	346
Circulation	0	1,464	1,464
Subtotal	**0**	**5,946**	5,946
New Grand total	**63,946**	**74,301**	**10,355**
Outdoor Program Area			
6 Tennis Courts	43,200	43,200	0
Basketball Court	0	6,600	6,600
Sand Volleyball Court	0	4,050	4,050
Bike Storage	300	300	0
Total Outdoor Program	**43,500**	**54,150**	**10,650**

The building program was developed via a series of meetings with user groups to identify specific needs for space and functions. A takeoff of the 'Current' space in the BCC was prepared and a comparison made to the 'Future' space to arrive at the variance. The "Programmed" column is the state of the project program prior to design solution studies. After the initial series of studies, which did not connect the BCC to the PSC, in order to avoid utility relocations, the University requested that they desired to have program serve as a connector between the two buildings and were willing to consider utility relocation. Therefore, the concept would revert back to the master plan vision for the campus.

Due to the change in elevation from PSC to BCC of 12 vertical feet from each ground floor, a bridge and a series of stairs and ramps were added to the program. This resulted in an increased total GSF for the project. Other programmed to designed variances are due to the natural evolution of the planning process.

Finally, the location chosen for the tennis courts caused the relocation of existing basketball and sand volleyball courts.

Floor Plans

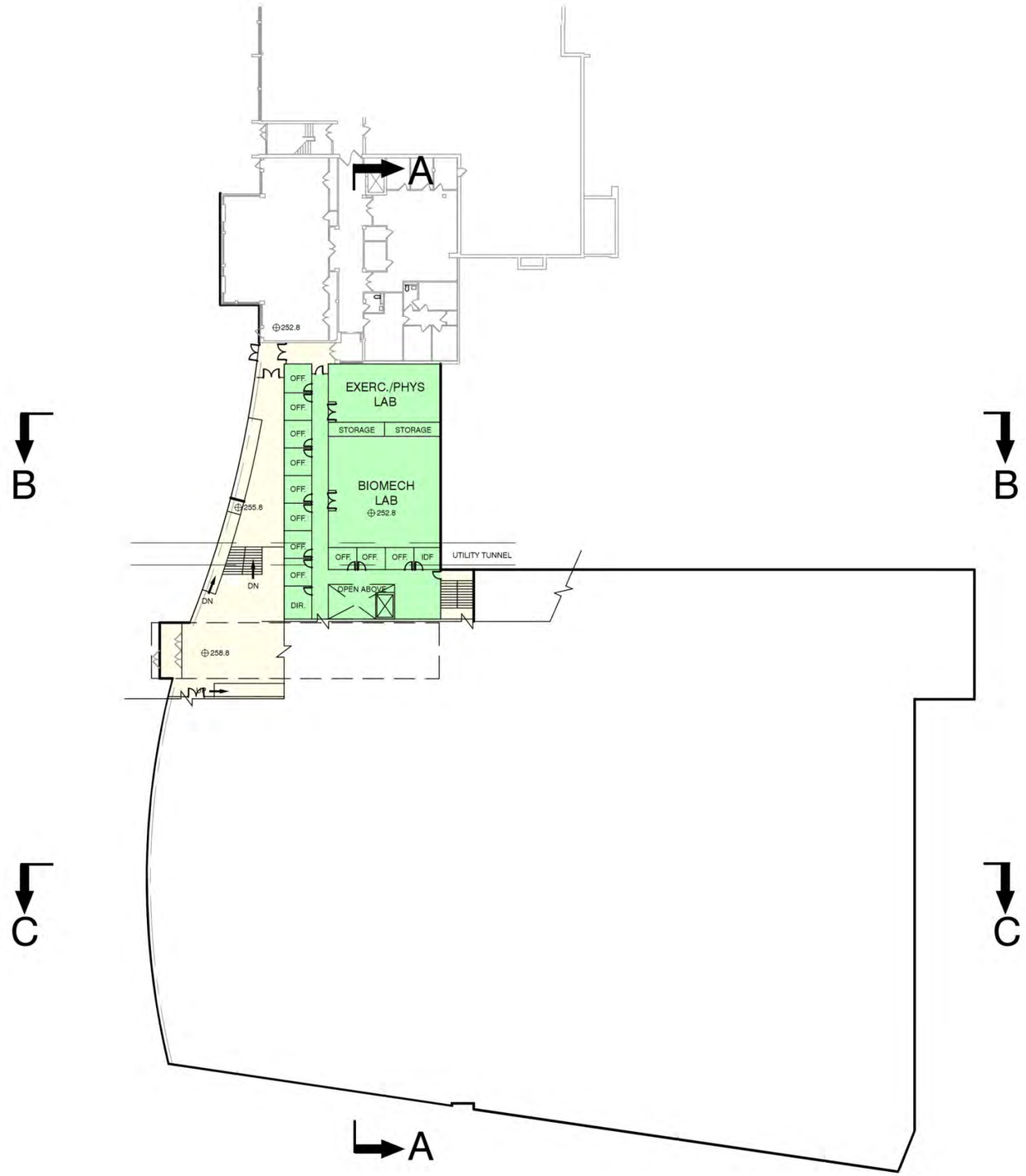
Lower Level Plan

Kinesiology

Department

Mid-Level Lobby

- Kinesiology
- Athletics
- Shared Support
- Building Support
- Shared Spaces
- Athletic Training
- Convenience Store
- Circulation



Upper Level Plan

C-Store/Future Shell

Athletics Department

Upper Lobby

Fitness Center

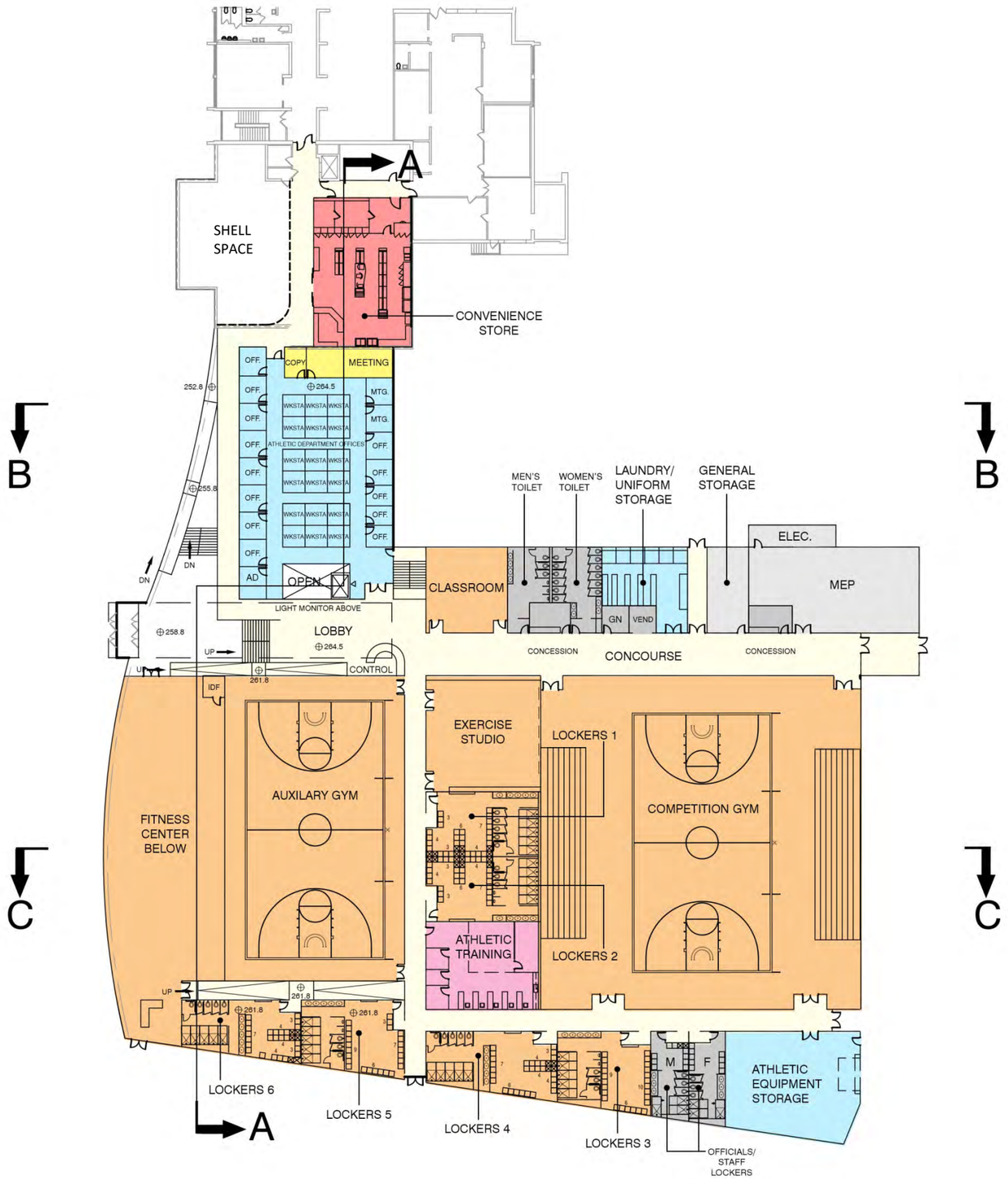
Shared Facilities

Athletic Training

Building Support

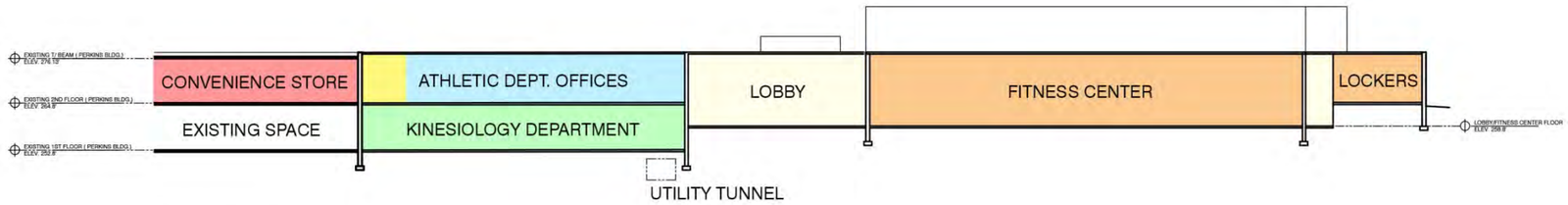
Classroom

- Kinesiology
- Athletics
- Shared Support
- Building Support
- Shared Spaces
- Athletic Training
- Convenience Store
- Circulation

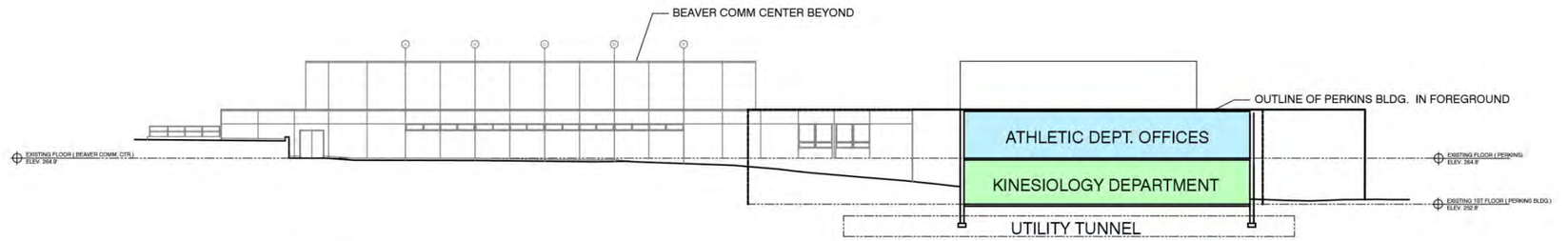


Building Sections

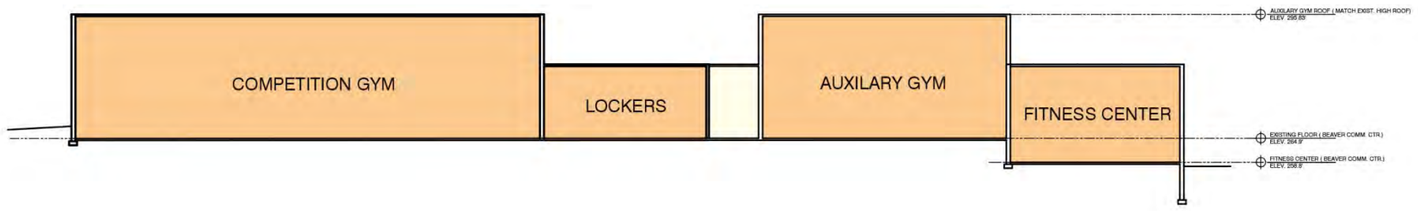
Kinesiology
Athletics
Shared Support
Building Support
Shared Spaces
Athletic Training
Convenience Store
Circulation



SECTION A-A



SECTION B-B



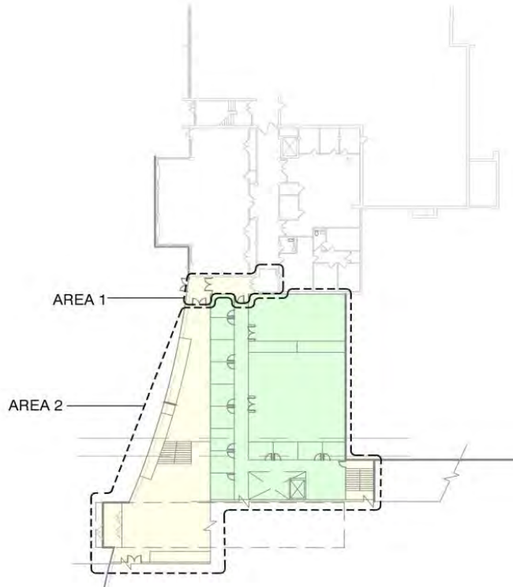
SECTION C-C

11 PHASING OPTIONS

Three phasing plans were developed and reviewed with the University. The pros and cons of each were debated and a plan selected for estimating.

Phase Plan Options
The following options refer to the attached "Area Plan for Estimating". Each Phase will reference what area is included and a brief macro view of the scope of work. Phase for each option can be combined into one phase depending upon available funding.

The phasing plan options take into account programmatic sequencing so that existing space is replaced by new or relocated space to minimize any loss of operations.



Phasing Plan Option 1

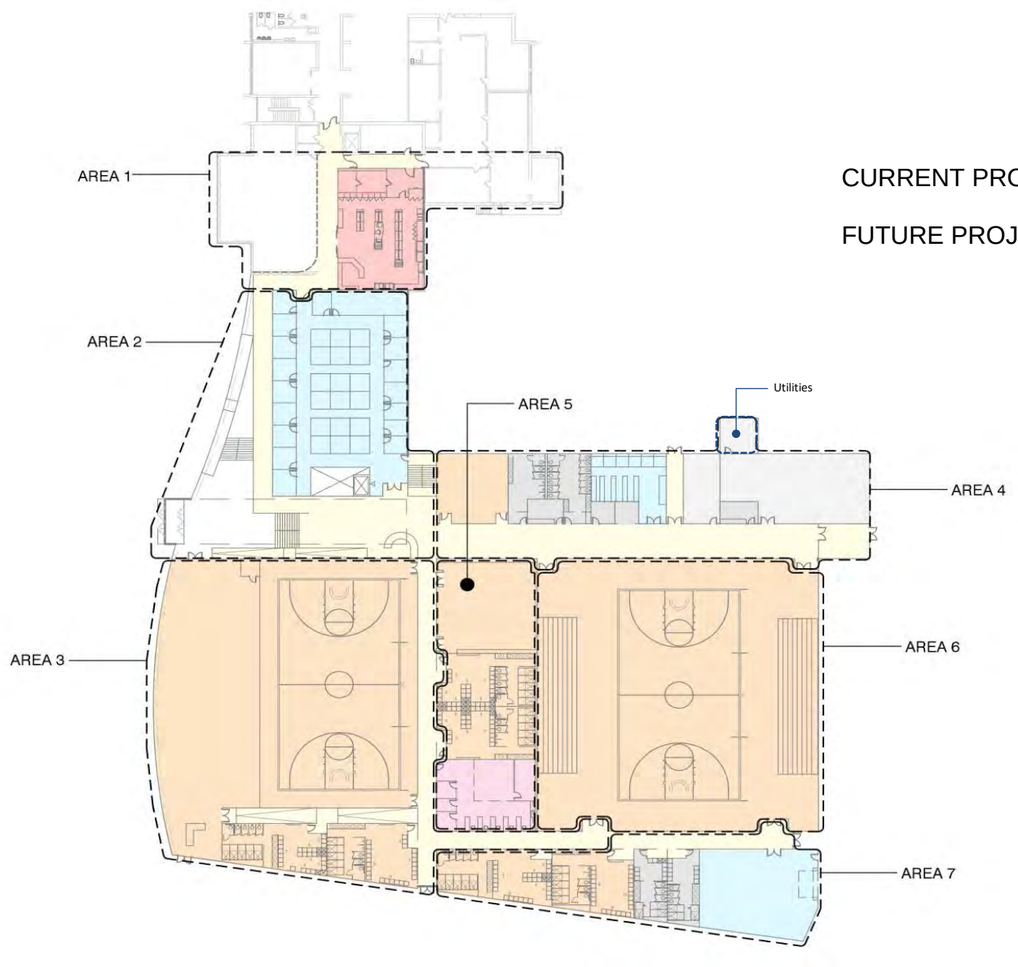
Phase 1	Atrium/Kinesiology/Athletic Dept. Office
Phase 2	C-Store (1st and 2nd Floor of Perkins)
Phase 3	Site Impr./Fitness Center/Aux Gym/2 Lkr. Rms./Corridors New Studio/2 Lkr. Rms./Athletic Train./temp. Corridor
Phase 4	Existing Concourse and Renovations
Phase 5	Existing Performance Gym Renovations
Phase 6	4 New Lkr. Rms./Athletic Storage/Corridor

Phasing Plan Option 2

Phase 1	Site Impr./Fitness Center/Aux Gym/2 Lkr. Rms./Corridors
Phase 2 A	Atrium/Kinesiology/Athletic Dept. Office
Phase 2B	New Studio/2 Lkr. Rms./Athletic Train./temp. Corridor
Phase 3	C-Store (1st and 2nd Floor of Perkins)
Phase 4	Existing Concourse and Renovations
Phase 5	Existing Performance Gym Renovations
Phase 6	4 New Lkr. Rms./Athletic Storage/Corridor

Phasing Plan Option 3

Phase 1	C-Store (1st and 2nd Floor of Perkins)
Phase 2	Atrium/Kinesiology/Athletic Dept. Office
Phase 3	Site Impr./Fitness Center/Aux Gym/2 Lkr. Rms./Corridors
Phase 4	Existing Concourse and Renovations
Phase 5	New Studio/2 Lkr. Rms./Athletic Train./temp. Corridor
Phase 6	Existing Performance Gym Renovations 4 New Lkr. Rms./Athletic Storage/Corridor



CURRENT PROJECT: AREAS 1, 2, 3, AND 5

FUTURE PROJECT: AREAS 4,6, AND 7

10 NARRATIVES

ARCHITECTURAL NARRATIVE

Project Design Statement

The Beaver Community Center (BCC) at Penn State Berks is an existing facility that accommodates 500 spectators for campus events and a variety of indoor athletic functions, especially Division III basketball, volleyball and intramural events. The facility provides the campus community with a fitness center that was renovated in the summer of 2008. Other amenities include weight room, workout room, studio, locker rooms, and athletic offices. The varsity basketball and volleyball teams practice and compete in this facility.

Design Standards

The facility shall be Leadership in Energy and Environmental Design (LEED) certified, achieve a minimum of at least 30% energy savings over the 2004 ASHRAE 90.1 standard, and meet selected indoor air quality criteria in accordance with the University's LEED Policy. All aspects of the building design must conform to the University's Design Standards as of the date of the Contract for this engagement.

Building Design

This facility will enhance the recreational and educational needs of the University and will provide a competitive venue to aid in recruiting student athletes.

The BCC is located 72' south of the Perkins Student Center (PSC). The PSC houses offices for Student Affairs, Admissions, Financial Aid, ASPIRE Coordinator, and Housing and Food Services. The building also is home to Tully's (the campus dining hall), the Freyberger Art Gallery, the Perkins Auditorium, a game room, a multi-purpose room, and several classrooms. Blocking and stacking creates a 'bridge' connection between the two buildings with Kinesiology Department and Athletic Offices making this connection. Since the second floor of the PSC aligns with the ground floor of BCC, the 'bridge' elements will tie the two buildings together without ramps. The 'bridge' will feature a new public entrance lobby providing access to either building through a spacious lobby.

Additional program elements will wrap around the west and north sides of BCC, including a fitness center, auxiliary gym, and locker rooms.

A Convenience Store will be constructed on the second floor of PSC at the north end. The space is currently an open roof that was designed to accommodate a future second floor. An adjacent shell space is planned as an amenity for the C-Store however it is outside the scope of this project. The shell space use is yet to be determined, but could serve as soft seating, casual dining or other food service program use.

Image and Facades

The exterior of the BCC is designed to integrate with the existing campus Architecture. The design will express an appropriate feature building presence while adhering to the master planning principles of the main campus. The existing entrance from the parking lot will be demolished and a new entrance integrated into a new façade. The west façade features curtainwall with low E glazing having a fritted treatment to manage sun light. Masonry accents of field stone and precast concrete will frame glazed openings. Silver composite metal panels will frame the main building entrance. The new auxiliary gym walls will be faced in EFIs. Roof top mechanical equipment will be shielded with clear anodized aluminum screen walls.

This facade overlooks the lawn in front of PSC and the adjoining parking lot. The north south and eastern facades have minimal openings since programmatic functions located along the exterior walls do not require natural light. The new addition to the south will consist of concrete masonry backup with integral color split face block. Existing wall cladding consists of exterior insulation finish system (EIFS) which is in good condition and requires repair/repainting.

Interior Design

The BCC interior design will combine an image that reflects the college and community, and provide the latest in technology-related training and development.

The main lobby will be the focal point of the interior design with higher grade materials and Penn State branding to welcome guests. It will house the main vertical circulation with a grand stair, ramps and elevator. Beyond the lobby, a wide concourse that serves as an internal 'street' connects locker rooms with the competition and auxiliary gyms as well as connecting the lower and upper campus communities. The public lobbies and concourse will be designed to be easily maintained and functional for multiple uses.

The BCC locker rooms, training room, and weight room will reflect the University's commitment to student athletes. They will echo tradition, pride, and excellence. These spaces will aid in the recruiting of student athletes and will be easily maintained and functional.

The Fitness Center will serve the entire Penn State Berks community. All students will have access to the facility and faculty/staff can participate. The facility boasts weight and fitness equipment with an expansive view towards campus. Members can also enjoy free group exercise classes, wellness programs and fitness testing.

All "back of house" spaces will be designed to be cost effective with an emphasis on durability and ease of maintenance. The estimate was based on the exterior and interior renderings presented in this report. Additionally, please refer to the existing conditions assessment report findings and the room data sheets located in the appendix. These elements are also represented in the cost estimate.

SITE NARRATIVE

Introduction

Site restrictions were studied to identify how and where the building expansion could be accommodated. These restrictions included, but were not limited to:

- the investigation of topography from existing mapping
- code research
- investigation of public and private utility plans
- stormwater management
- information obtained from the internet

Additional information provided by Penn State Berks included AutoCAD base plan and Berks master plan as the basis for the building improvements.

Site Background

The Penn State Berks Campus resides in Spring Township, Berks County, Pennsylvania. The campus includes 28 buildings with residence halls providing housing for 800+/- students. From County records, the Campus is made of five parcels totaling 248 acres. Two parcels are west of Broadcasting Road and three are east of Broadcastings Road. Although an existing conditions survey of the campus was provided, it did not include a boundary survey to confirm the County tax parcels.

Campus Lot Size

From discussions with Campus staff, the Design Team understood that previous Zoning/Land Development applications considered the campus in two parts, east and west of Broadcasting Road. For this report the zoning analysis used the outside boundary lines for the three parcels that make up the campus on the east side of Broadcasting Road. The three parcels east of Broadcasting total approximately 123.68 Acres.

To date a Boundary Survey has not been prepared for the Campus or the adjacent parcels owned by the University. An overall boundary is required in order to accurately determine the campus lot size to use for a zoning application. For the purposes of this study, lot sizes and parcels areas were gathered from existing Township plans, County tax parcel records and plans provided by the University. From this information a lot size for the campus was prepared.

Aerial View

A summary of the lot sizes per Berks County property records:

Parcel Summary (County Tax Map)						
LOT #		**Tax Map ID**	**Owner**	**Address**	**Lot Size (AC)**	**Lot Size (SF)**
1	West side Broadcasting	80439803202360	Pennsylvania State University	na	17.41	758,380
2	West side Broadcasting	80439803304322	Pennsylvania State University	00 Tulpehocken Rd	107.51	4,683,136
	West Campus size				124.92	5441515.2
3	East side Broadcasting	80439706496898	Pennsylvania State University	00 Tulpehocken Rd	9.76	425,146
4	East side Broadcasting	80439707584710	Pennsylvania State University	2080 Tulpehocken Rd	102.14	4,449,218
5	East side Broadcasting	96439711771170	Pennsylvania State University	Tulpehocken Rd	11.78	513,137
	East Campus size				123.68	5,387,501
Currently PSU Owned				**TOTAL**	**248.60**	**10,829,016.00**

Zoning District

The campus is located in the Planned Office Business District. College and University are allowed within this district by Special Exception. The Design Team's understanding is this project is part of an approved master plan and the spirit of the expansion to BCC and it's link to PSC is part of the approved Master Plan. It is not known if these improvements have received a Special Exception.

Lot Dimensions

The location of the proposed improvements is entirely on the PSU owned parcel. The existing lots conform to the existing zoning regulations and because there is no proposed change to the lots, a variance is not anticipated.

Impervious Coverage

Due to the proposed expansion to BCC, the link to PSC, and the proposed tennis courts, the estimated impervious coverage will increase by 99,500 square feet. The proposed increase of impervious will not require a variance. The maximum allowed impervious coverage is 75%. After the proposed improvements the impervious will be 27.38%.

Green Area

'Green Area' is defined by code as the portion of the a lot or parcel of land which is not covered by buildings, structures or other impervious materials, and which is required to remain as open space with plantings and vegetation. Basically, it is the inverse of the impervious surface on the site. Since the estimated impervious coverage is within the bulk area requirements, a variance of green space will not be required.

Parking

The current zoning code requires one parking space per two students and one space per employee at the largest shift. In order to verify if the campus parking is currently in conformance with the Spring Township Zoning Code, an inventory of student population and number of employees needs to be developed and then compared to the existing parking on campus. The proposed improvements will eliminate 40 parking spaces from the BCC parking lot. Alternate locations have been shown to relocate the 40 displaced parking spaces. Parking was located as close to the building as possible to minimize the amount of new construction. The selected locations are flat and can be accessed by an existing road. However, a variance for parking may be required once the inventory of students and employees is conducted and it is determined that the parking on campus is deficient. The Township Code also requires landscaping within 10% of proposed parking. A variance will be required to meet this requirement.

Building Coverage

The existing Campus building coverage is 5.52% and the proposed improvements will increase the coverage to 6.16%. The maximum building coverage allowed is 60%, therefore a variance will not be required.

Coverages	**Lot 3 (9.76 acres)**		**Lot 4 (102.14 acres)**		**Lot 5 (11.78 acres)**		**East Campus Total**		
	Ex. Coverage (SF)	Required	Ex. Coverage (SF)	Required CURRENT	Ex. Coverage (SF)	Required	Ex. Coverage (SF)	Required	Proposed
Buildings	21,166		273,119		3,043		297,328		
									34,500
subtotal building	**21,166**	127,544	**273,119**	1,334,766	**3,043**	153,941	**297,328**	1,616,250	**331,828**
	4.98%	60%	6.14%	60%	0.59%	60%	5.52%	60%	6.16%
Parking lots & access drives	54,724		822,140		0		876,864		9,000
Pedestrian Pathways and Misc. Impervious	5,834		170,518		25,685		202,037		55,220
subotal non-building	**60,558**		**992,658**		**25,685**		**1,078,901**		**1,474,948**
Total Impervious Surfaces	**81,724**	161,555	**1,265,777**	1,690,703	**28,728**	194,992	**1,376,228**	2,047,250	**1,474,948**
TOTAL Impv (in acres)	1.88	3.71	29.06	38.81	0.66	4.48	31.59	47.00	33.86
	19.22%	75%	28.45%	75%	5.60%	75%	25.54%	75%	27.38%
Total Lot Area	425,145.60		4,449,218.40		513,136.80		5,387,500.80		
TOTAL Lot Area (in acres)*	**9.76**		**102.14**		**11.78**		**123.68**		

Building and Parking Setbacks

The Spring Township Zoning code has a definition of a Front, Side and Rear Yard setback. Because the lot has three sides of road frontage, the front yard must be defined by the Township Zoning officer. However, the most restrictive setback is 20' (side yard) from the property line. Because the proposed improvements are more than 35' from the closet point of a property line, a variance is not anticipated.

There are also minimum setback requirements for parking. As shown on the Overall Site plan, 27 parking spaces are proposed within 25' of the property line. Therefore a variance will be required for these 27 spaces. To avoid the variance, these spaces would need to be relocated somewhere else on campus.

Natural Resources

The Township Zoning ordinance restricts disturbance of steep slopes. There is a minimal amount of steep slopes in front of BCC that are proposed to be disturbed. In order to build the tennis courts, the existing steep slopes will also be disturbed. The disturbance of steep slopes will need to be reviewed by the Township but a variance is anticipated for the disturbance.

Storm Water Management

Spring Township Stormwater ordinance requires a match to peak flows from pre-development to post development run-off. In addition, the PADEP NPDES permit will require re-charge and water quality measures. Rock is assumed to be shallow and re-charge will most likely not be feasible. A below ground stormwater basin will most likely be used for rate control and a green roof in combination with two small rain gardens should be incorporated. Porous paving can also be investigated as an alternative. The plan will conform to the MS4 plan for the campus.

Grading

It is assumed that the site will have excess fill from building foundations, pipe trenches and stormwater facilities. From historical data, this region has pinnacled hard rock ranging from 3'-10' feet in depth. It is anticipated that significant rock removal will be required.

Standard erosion and sediment control measures are included in the cost estimate. Super silt fence will be required around the perimeter of the site during construction in combination with Silt Sox. Standard dewatering will be required.

Site Access

The vehicular access to BCC will maintain its current configuration to and from the existing parking lot. However, the PSC link will cut off pedestrian access between the buildings. As part of this study, the Design Team was also asked to investigate the possibility of constructing a road between BCC and the newly installed athletic field. The purpose of this road is to provide a new vehicular access to the PSC loading dock. Sketches were developed showing that a road could be installed. However, the horizontal geometry of the road provides a sharp turn for a truck. The vertical alignment provides a steep slope into the dock area because of the available space and preserve cover over existing utilities. Once a delivery truck enters the loading area, multiple turns will be required to maneuver in and out of the area.

Fire Protection Access

The current plan needs to be reviewed by the Township Fire Chief.

Site Utilities

Between BCC and PSC, four separate utility lines (sanitary, storm, water and gas) will be in conflict with the proposed 'bridge'. Two options were considered to remediate the conflict. The first option would relocate all four of the utilities under the proposed 'bridge' within a new utility tunnel. The second option would relocate all four utility lines around BCC.

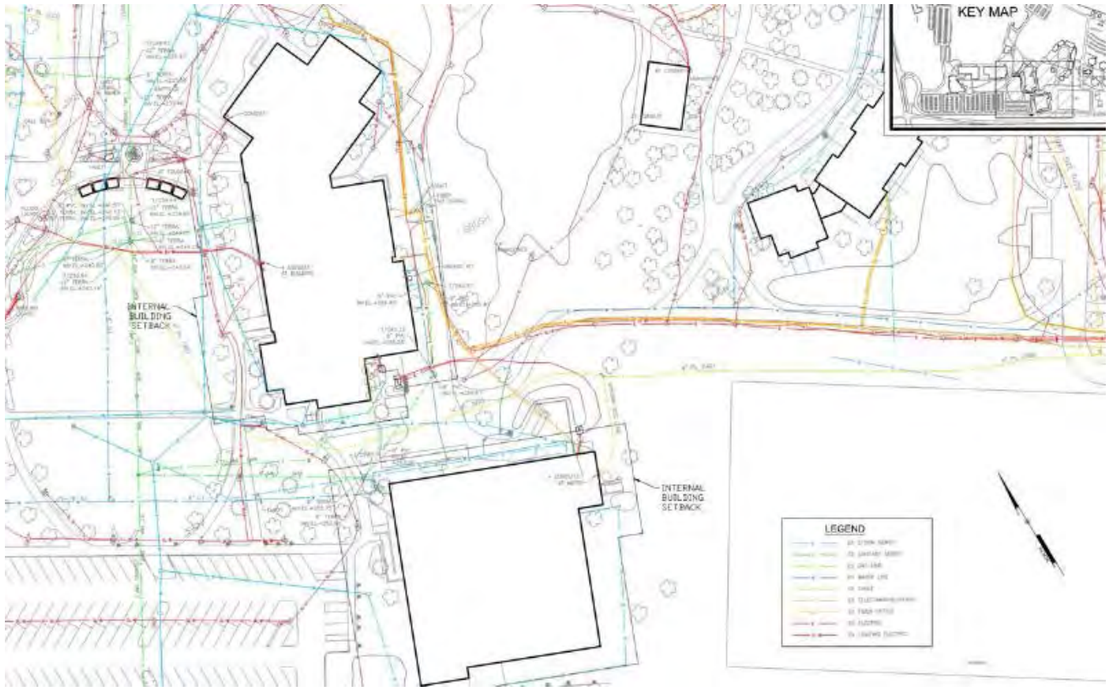
The existing sanitary and storm lines are gravity fed lines and therefore have limited abilities to be re-located because of the need for slope to drain them. The existing gas and water lines are pressure lines which can be extended without the need of maintaining a slope. Because the slope of the sanitary and storm pipes cannot be maintained around BCC, it was concluded these two lines would stay in the same general area they are today. Investigation of records revealed the water and gas lines are distribution lines owned and maintained by private utility companies. The Design Team assumed they will not allow their utilities to run underneath a private building.

After evaluating each option, it was concluded the sanitary and storm lines will be re-configured to run through pre-cast concrete tunnel and the water and gas lines be relocated around BCC. Note that the relocation of each line has not been discussed with each utility company and this information will need to be confirmed.

Sewer Capacity

As required by all development projects, sewer discharge has an impact to schedule and cost. It is assumed that sewer capacity is available through the Township sewer authority. The Design Team has not discussed this project with the Township at the request of the University. It is recommended that the Design Team be authorized to discuss capacity with the Township as one of the first steps in the development of the project.

Site Utility Plan



Tree Replacement

Site disturbances of one thousand (1,000) square feet of land or greater require a tree replacement if a single tree is removed. One tree (2 inch caliper or greater in diameter) shall be planted for each inch of tree diameter being removed. A tree survey is required to calculate the total diameter of tree removal. It is estimated based on the current plan that 2,500 sf of existing woodlands will be disturbed as part of the improvements.

Geotechnical Considerations

A Geotechnical study was not performed as part of this study for the project area. Given the experiences on other projects in or around the region, there is a high probability rock will be encountered as part of the excavation activities on the project. Should the project move forward, it is highly recommended that this be examined for any potential issues on final design. A rock allowance should be included as part of the project scope. A current project on Campus encountered bedrock at 1'-3' excavation depth. Based on geotechnical results from the nearby project, the typical rock encountered is a gray gneiss or schist.

Signage

A comprehensive sign program is recommended that will establish a uniform sign theme with a common style, shape, size and material existing at the campus today.

Site Furnishings

Benches, trash receptacles, kiosks, lighting, bicycle racks, planters, bollards are not yet defined for this option but an allowance should be added to the estimate. Furnishing assumed to be made of high quality durable material. They should be compatible with the surrounding architectural style and color of the building. Benches should be sturdy.

Pedestrian scaled ornamental lights shall be provided at regular intervals. Luminaires should be night sky friendly and utilize "house side" shields where applicable. Metal Halide or LED light sources are encouraged. Lights in the pedestrian and access drive areas shall have a maximum height of 25 feet.

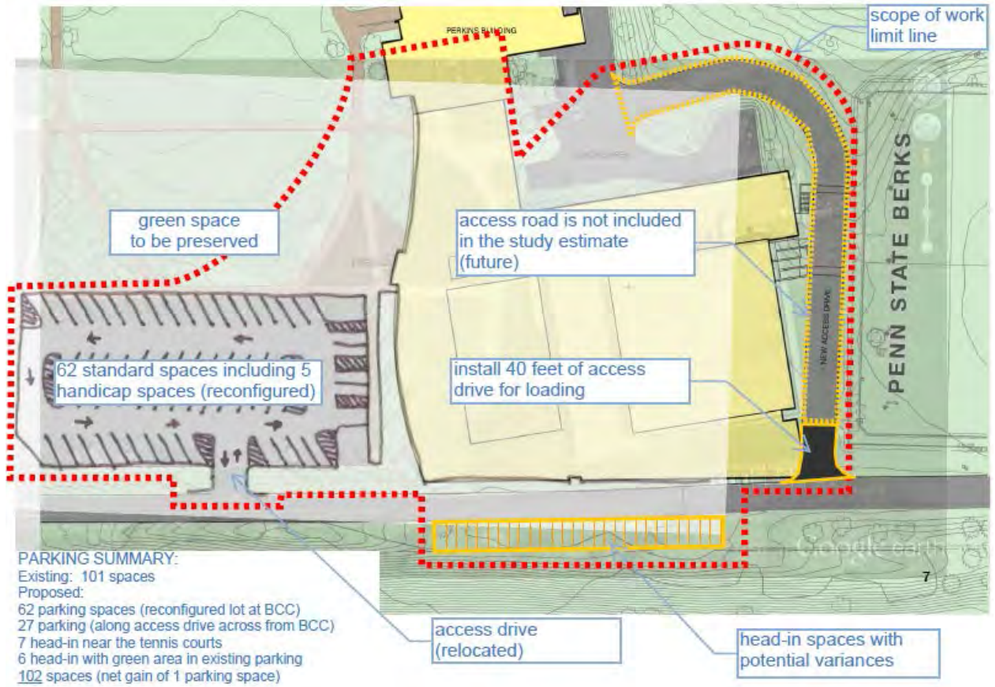
Landscape architectural design will be an important component of the project as it will be use elements to visually reinforce pedestrian and vehicular circulation and create an image and identity.

Tennis Courts

In addition to the expansion to Beaver, we were asked to explore the feasibility of constructing 6 NCAA regulation tennis courts. Campus staff had requested that we explore the idea of installing tennis courts within the area east of the athletic field, in the area of the existing basketball and volley ball courts. A sketch of the courts has been provided on the overall site plan. Although the requested area accommodates six courts, a couple issues to consider:

- A long retaining wall at 2'-5' high will be required due to the sharp drop in grades around the site.
- The court orientation does not meet the recommended guidelines. For optimum orientation, the courts would need to rotated counterclockwise 30-45 degrees
- Should the courts be required to meet optimum orientation, the basketball and volleyball courts will need to be relocated to another area.
- Storm water basin would need to located under adjacent parking lot

SITE PLAN CONCEPT SKETCH



STRUCTURAL NARRATIVE

GENERAL

The Baker Building on the Berks Campus of Pennsylvania State University is a 28,000 square foot, single story recreation facility configure on a flat site without basement. This building houses recreation, classroom, and locker facilities to serve both the student population and campus teams. A feasibility study was undertaken to develop several options related to continued use and expansion of this building to meet the growing needs of the campus. In addition, a food service operation study was included in the study to explore the expansion of food service in the adjacent Perkins Student Center. Several options were studied and presented to the University and the most optimum selected for further investigation with respect to cost of construction.

An architectural program to include expanded space to service the Kinesiology Department, Athletic Offices, Fitness Center, Auxiliary Gymnasium space, Team Lockers, Exercise, and Athletic Training was designed. Below are described the structural elements associated with the additions to be constructed and the renovations planned.

AREA 1 – PERKINS STUDEN CENTER VERTICAL EXPANSION

We understand that the single story addition to Perkins Student Center was designed and constructed to support a vertical expansion of one additional story. Existing roof framing would support future floor loads. Similarly, the columns and foundation are adequate for support of an additional level. Structural framing consists of steel bar joists spaced at 2'-0" on center maximum with 22 gage metal form deck. Joists are supported by steel beams and columns. Existing foundations are shallow spread footing. Based on a review of existing construction documents and structural analysis of the framing, the live load capacity of the joists framing would be 100 psf. It should be noted that concrete topping for floor construction was not placed during construction of the additional to Perkins.

New construction would include extension of all current columns and new roof framing. In the absence of specific details for the vertical extension of the columns and details of the existing condition of the top of the columns, the following connection is assumed. A 3/8" plate would be welded to the top of existing HSS 8x8x3/8 columns. All existing columns are HSS 8x8x3/8. All new columns would be HSS 7x7x1/4 with ¼" cap plate. The new columns would be welded to the 3/8" plate fashion at the top of the existing column with continuous fillet welds. Roof framing would consist of steel bar joists spaced at 5'-0" on center maximum with 1½", 20 gage, galvanized metal deck. Joist spans to 20'-0" would be 16K3. Joists spanning between Rows 4 and 10 would be 26K9. Steel girders would be W21x44.

The existing roofing material at the Second Floor level is to be removed in the area of the vertical expansion. New normal weight concrete topping, 3" thick would be introduced. Concrete reinforcing would be 6X6-W1.4xW1.4 WWR.

An allowance of 5% should be included for additional lateral bracing framing.

AREA 2 – KINESIOLOGY / ATHLETIC DEPARTMENT / NEW LOBBY ADDITION

A two story addition is planned immediately adjacent to the northwest facade of the existing building extending to the Perkins Student Center. This addition would house the Kinesiology Department, Athletic Department Offices and the New Lobby Entrance. The addition would not be directly connected to Perkins. At the interface with Perkins, a building expansion joint would be created.

Floor framing shall be composite construction consisting of 3-1/4" light weight concrete slab on 3", 20 gauge galvanized composite metal deck on structural steel beams (6-1/4" total slab thickness). The slab shall be reinforced with 6x6-W2.1xW2.1 welded wire fabric draped over supports. Typical steel filler beams shall span a maximum of 35'-0" and would be W21x44 spaced at a maximum of 10'-0". Typical steel girders shall span a maximum of 30'-0" and be W24x84. Composite beams and girders shall be reinforced with approximately (1) 3/4" dia. x 4-1/2" long headed studs per foot of length. Interior column size for this area of the structure shall be W12x65. Two story columns at expansive glass façade would be HSS 8x8x5/16.

Roof framing shall consist of 1½", 20 gauge, Type B, galvanized metal deck on open web steel joists. Typical roof joists shall be 20K6 spaced at 5'-0" on center (maximum). Steel joists are based on a maximum span of 35'-0" to bear on steel spandrel beams. Typical steel girders shall be W21x44 with spans up to 30'-0" maximum.

Foundations would be shallow spread footings. In the absence of a geotechnical report for this specific project, allowable soil bearing capacity of 2,000 PSF, noted on original construction documents, was assumed to determine footing sizes. Interior footings would be 10'-6"x10'-6"x2'-4" thick reinforced with 11-#8 bars each way. Exterior footings would be 7'-6"x7'-6"x1'-8" thick reinforced with 8-#7 bars each way. Slab on grade, stair on grade and/or ramp on grade shall consist of 5" thick normal weight concrete slab with 6x6-W2.1xW12.1 WWR. Slab on grade elevations change in this area with stairs and ramps fashioned to accommodate changes. Retaining walls at interface of change in grade shall be braced 8" CMU walls reinforced with #6 vertical reinforcing at 24" on center. Retaining wall footing shall be 3'-0" wide by 1'-0" thick reinforced with 4-#5 bars continuous.

Masonry stair walls are designed as shear walls and shall be 12" CMU reinforced with #5 vertical bars typically at 24" on center plus 4 additional #6 bars at each corner. Shear wall footing shall be 4'-0" wide by 1'-0" thick reinforced with 5-#5 bars continuous.

In addition to the masonry shear walls at the stair, the lateral load resisting system is anticipated to consist of structural steel moment frames. Increase steel framing by 10% to accommodate moment frames, connections, base plates, etc.

AREA 3 – FITNESS CENTER / AUXILIARY GYM / LOCKER ROOMS

Low roof bays are approximately 44'x28' at the fitness center. Steel bar joists would be oriented to span 28' to accommodate the shallow sloping curve of the façade. Steel Girders would vary slightly in length with maximum span 44'. Roof framing construction shall consist of 1½", 20 gauge galvanized Type B metal deck on 20K6 open web steel joists spaced at 5'-0" on center to accommodate snow drifted loads adjacent to the auxiliary gym high roof. W24x76 steel girders with spans up to 44'-0" maximum, shall be used to support the roof joists. Spandrel girders along the exterior façade would be W16x26. Low girders at the interface of the fitness center and auxiliary gym would be W18x40. Exterior columns would be HSS8x8x5/16. Interior columns at the interface of the fitness center and the auxiliary gym would be W12x53. Roof framing and column support at the locker rooms would be similar to framing at the fitness center.

At the corridor between the auxiliary gym and the existing building, new low roof framing is required. Roof framing construction would consist of 1½", 20 gage galvanized Type B metal deck on 10K1 open web steel joists spaced at 5'-0" on center to accommodate now drifted loads adjacent to the auxiliary gym high roof. Low girder along the interface with the auxiliary gym would be W18x40. At the interface with the existing building, a shelf angle L3x3x1/4 would be attached to the existing masonry wall with Hilti expansion bolts at 16" on center. Cells of existing masonry should be fully grouted at expansion bolt locations. This detail would be coordinated with new framing anticipated in Phase 5 of either of the phasing Options to accommodate new large wall openings.

High roof framing construction at the auxiliary gym would consist of 1½", 20 gauge galvanized Type B metal deck on long span open web steel joists. Steel joists, 40LH13, with spans of up to 66'-0"maximum, shall be spaced at 5'-0" on center (maximum). Spandrel girders would be W18x50 spanning approximately 28' shall be used to support the ends of the long span joists. Columns located between the auxiliary gym and the corridor would beW10x39.

Foundations would be shallow spread footings. Exterior footings shall be 5'-0"x5'-0"x1'-0" deep reinforced with 6-#6 each way. Interior footings would be7'-0"x7'-0"x1'-6" deep reinforced with 7-#7 each way. Slab on grade, stair on grade and/or ramp on grade shall consist of 5" thick normal weight concrete slab with 6x6-W2.1xW12.1 WWR. Slab on grade elevations change in this area with stairs and ramps fashioned to accommodate changes. Retaining walls at interface of change in grade shall be braced 8" CMU walls reinforced with #6 vertical reinforcing at 24" on center. Retaining wall footing shall be 3'-0" wide by 1'-0" thick reinforced with 4-#5 bars continuous. Typical footing for exterior masonry knee walls shall be 3'-0" wide x1'-0" deep reinforced with 3-#5 continuous.

AREA 4 – RENOVATE FORMER LOCKER ROOMS / ATHELCTIC OFFICES

Minor shoring and lintels to reconfigure door openings from former locker area to concourse.

AREA 5 – RENOVATE EXERCISE STUDIO / ATHLETIC TRAINING / TEAM LOCKERS

Renovation of this area will required large openings in the existing masonry bearing wall which is currently the exterior façade wall. Except for a length of wall at the new team locker room, this wall would be removed and a series of columns and beams introduced to re-support the roof framing. Six new columns, W8x24, would support new 4-W12x30 beams introduced to support existing joists. Existing slab and wall footing would be removed as required to construct new individual column footings 4'-0"x4'-0"x1'-0" deep reinforced with 5-#6 each way. Where existing masonry wall "extensions" are to be removed at the new corridor between athletic training and team locker rooms, provide W8x15 header beams across the corridor to support existing roof joists. Beams should bear on masonry walls.

AREA 6 – RENOVATE MAIN GYM

Structural work in this area would be limited to new header beams for support of the masonry at four new entrances to the gym. These would be W12x14 beams to bear on existing masonry. Masonry should be filled with grout at bearing locations.

AREA 7 - TEAM LOCKERS / STAFF LOCKERS / OFFICIALS LOCKERS

A single story addition is planned immediately adjacent to the existing gymnasium. This addition would house the Team Lockers, Staff Lockers, and Officials Lockers. The roof framing would be steel bar joist on masonry bearing walls. No expansion joint would be necessary between the addition and existing building.

Roof framing construction shall consist of 1½", 20 gauge galvanized Type B metal deck on open web steel joists. Joist spans vary with the diagonal exterior masonry wall. Joists to 30' in length K10 to 45'. Joists shall be 5'-0" on center and would be design to accommodate snow drifted loads due to the adjacent gymnasium high roof configuration. Joists would bear on 12" exterior CMU reinforced with #5 vertical reinforcing at 24" on center. Wall footing would be 3'-6" wide x 1'-0" deep reinforced with 3-#5 bars continuously. On the opposing end, the joists would bear on the existing masonry wall. A shelf angle L3x3x1/4 would be attached to the existing masonry wall with Hilti expansion bolts at 16" on center. Cells of existing masonry should be fully grouted at expansion bolt locations.

Typical slab on grade shall consist of 5" thick normal weight concrete slab with 6x6-W2.1xW2.1 WWR.

DESIGN DATA

The following loads have been determined in accordance with the International Building Code, 2006.

Design Dead Loads

Typical Roof	25 psf
First Floor	Slab on grade
Typical floor – Composite Option	72 psf

Live Loads

Typical Floor	100 psf
Minimum Roof Live Load	30 psf

Mechanical Equipment	150 psf (Assumed)

Snow Loads

Ground Snow Load (P_g)	30 psf
Snow Exposure Factor (C_e)	1.0
Snow Load Importance Factor	1.1
Thermal Factor (C_t)	1.0
Flat Roof Snow Load (p_f)	22.0 psf plus drifting

Wind Loads

Basic Wind Speed	90 mph
Site Exposure Category	C
Wind Importance Factor	1.15
Internal Pressure Coefficient (GCpi)	+/- 0.18

Components and Cladding shall be designed in accordance with Section 6 of ASCE 7 using the above information.

Seismic Loads – Pending Geotechnical Report

MATERIAL SPECIFICATIONS

The following ASTM standards and design stresses shall be used for the appropriate materials used in the construction of this project.

Cement:	ASTM C150; Type I or III
Blended Hydraulic Cement (Cement Substitutes):	ASTM C595, Type IS (limit to 25% max of cementitous content by weight)
Aggregates:	ASTM C33 (normal weight)
	ASTM C330 (light weight)

Admixtures:

Air Entraining Admixtures:	ASTM C260
Chemical Admixtures:	ASTM C494
Concrete:	Air-entrain all exposed concrete 5% + 1-1/2% by volume unless otherwise noted. No air for steel trowel finish slabs and slabs-on-grade.

Application	f'c at 28 Days(PSI)	(PCF)	W/C (Max.)
Footings	3000	145	0.50
Piers	3000	145	0.50
Slab-on-Grade	3500	145	0.50
Elevated Slabs	3500	115	0.50
Walls	4000	145	0.50

Reinforcement:

Deformed Reinforcing Bars	ASTM A615, Grade 60
Welded Wire Fabric (WWF)	ASTM A185

Masonry:

Concrete Masonry Units	Hollow – ASTM C90, Type I, Grade N, Minimum Compressive Strength on Net Area = 2000 psi
Mortar	ASTM C270 – Type S
Grout	ASTM C476: Minimum Compressive Strength at 28 Days = 3000 psi
Prism Strength	f'm = 1500 psi

Steel:

Wide Flange Shapes	ASTM A992
Other Structural Shapes	ASTM A36
Plates	ASTM A36
Structural Tubing	ASTM A500, Grade B, fy = 46 ksi
High Strength Bolts	ASTM A325-N
Anchor Bolts	ASTM A307
Headed Shear Studs	ASTM A108
Welding Electrodes	AWS A5.1 or A5.5, E70XX
Galvanized Steel Floor Deck	ASTM A653 SQ and ASTM A525, G-60
Galvanized Steel Roof Deck	ASTM A653 SQ and ASTM A525, G-90
Grout	Non-shrink, non-metal, f'c = 5000 psi

MECHANICAL, ELECTRICAL AND PLUMBING NARRATIVES

GENERAL PROVISIONS – MECHANICAL AND ELECTRICAL

Project Description

The Project consists of renovations and additions to the Penn State Berks Campus Beaver Community Center. The original building was constructed in 1984 and has not had significant renovations since. As such, the mechanical and electrical systems are at or beyond their expected service lives. The entire 28,182 square foot building will be renovated and will house the Main Competition Gym, Locker Rooms, an Exercise Studio, Toilet Rooms, Storage and Support spaces including the Main Mechanical Room.

Additions of approximately 36,000 square feet will house a Convenience Store, Shell Space for future dining, Athletic Office space, Kinesiology Office and Labs, a Connecting Lobby, Auxiliary Gym, Fitness Center, Locker Rooms, an Electrical Room and Support Space.

The building additions and renovations will be completed in a phased manner. There is an alternate option to maintain an accessible route between the Beaver Community Center and the adjacent Perkins Building that modifies the location of the aforementioned program spaces within the existing building and additions.

Codes, Standards, Permits and Inspections

A. Mechanical and Electrical work will be subject to provisions of the Pennsylvania Uniform Construction Code (2009 International Construction Codes) and will be designed and constructed to be in compliance with the Code.

B. Mechanical and electrical work will comply with ASHRAE Standard 90.1-2010 and as superseded by more stringent requirements of ASHRAE Standard 189.1-2011.

FIRE PROTECTION

Existing Conditions

The existing building is partially protected by a wet pipe sprinkler system. The sprinkler system is served from a combination fire protection and domestic water service located in the main mechanical room.

Demolition

The existing fire protection system will be removed in its entirety.

SPRINKLER SYSTEMS

System Description

A. A 6 inch combination fire/water service will be extended from the existing 8 inch water main located on the northwest side and adjacent to the building. The combination water/fire service will split in the main mechanical room into a 4 inch fire line and a 3 inch water line. The entering service will be provided with a double detector backflow preventer for each service.

B. The entire building will be fully protected by a wet pipe sprinkler system. The fire protection contractor will be responsible for final design and installation in accordance with applicable code and agency requirements.

Design Criteria

A. The fire protection system will conform to the latest requirements of the National Fire Protection Association (NFPA 13), Pennsylvania Uniform Construction Code, state and local authorities, and the Owner's fire insurance underwriters (FM Global).

B. The sprinkler system for the storage rooms, mechanical rooms, electrical rooms, and other areas as required by NFPA 13 will be designed based upon ordinary hazard requirements. The sprinkler system for the remaining portions of the building shall be designed based on light hazard occupancy.

Material and Equipment Specifications

A. All components of the fire protection system shall be FM and UL approved, rated for a minimum pressure rating of 175 psi, designed and installed in accordance with NFPA standards.

B. Piping, Above Grade: Schedule 40 steel pipe with threaded joints (thru 2 inches) or Schedule 10 steel pipe with mechanically coupled joints (over 2 inches). Plastic pipe will not be permitted.

C. Piping, Below Grade: Ductile iron pipe with push-on joints.

D. Valves and Supports: In accordance with NFPA standards.

E. Backflow Preventer: ASSE certified double check Ames Fire & Waterworks Model 3000 SS. Double check backflow prevention devices shall comply with the latest version of AWWA Standard C510 and have FM Global approval.

F. Pipe Penetration Seal: Modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.

G. Penetrations, Non-rated: Pack annular space with fiberglass insulation.

H. Penetrations, Fire or Smoke-rated:

1. Seal annular space with fire stop sealing system, UL listed as a "Fill, Void or Cavity Material." and tested per ASTM E 814.
2. Penetration fire stop sealing systems shall be identified on both sides with permanently mounted, preprinted vinyl labels which include the following information:
   a. The words “Warning: Through Penetration Firestop System – Do Not Disturb” or similar phrase
   b. Manufacturer’s brand name, product type or catalog number
   c. Testing agency designation and rating
   d. Installer’s Name
   e. Installation Date

I. Fire Department Connection shall be wall type Siamese connection, 1-1/2 inch size with chrome polished brass body and FM/UL approved. Hose coupling threads for Siamese connections shall conform to threaded fittings used by local fire department (Reading threads). Fire department connection shall be lettered STANDPIPE. Furnish and install a Knox Company FDC Plug Model 3043 bright stainless steel cover on each Siamese connection. Coordinate coupling threads with FDC connection.

J. Flexible Drop Connections: Stainless steel, braided, 2 to 6 feet in length for application in concealed areas.

K. Adjustable Drop Nipples: 3 inches maximum adjustment.

L. Sprinkler Heads, Finished Ceiling Areas: Adjustable, fully concealed with white cover plate.

M. Sprinkler Heads, Other Areas: Brass of appropriate orientation (upright, pendant, or sidewall, etc.).

N. Supervisory System: Include the following:

1. OS&Y Valve(s).
2. Post Indicator Valve(s).
3. Flow Alarm Switch(es).
4. Solenoid Valve(s).
5. Electric Alarm Bell: 6 inch diameter.

PLUMBING

Existing Conditions

A. Domestic Water Systems

1. The existing building is served by a combination fire protection and domestic water service that enters the building in the main mechanical room.

B. Storm Drainage

1. The existing storm drainage system consists of roof drains that extend to the storm water system along the north side of the building.

C. Sanitary System

1. The existing building is served by a 5 inch sanitary sewer that exits the building on the northwest corner of the building.

Demolition

All existing plumbing fixtures, sanitary, vent and domestic water piping will be removed.

PLUMBING BASIC MATERIALS

Material and Equipment Specifications

A. Access Panels: 18 inch by 18 inch minimum size, type and fire rating to suit application. Furnish and install in ceilings and walls for service and repair access to concealed equipment.

B. Escutcheon Plates: Installed on all pipes passing through floors, walls and partitions in exposed areas, solid ring, chrome plated.

C. Equipment Nameplates: Laminated phenolic, two outer layers of white phenolic and an inner layer of black with engraving depth to the inner layer. Coordinate with Owner for nameplate designations.

D. Hangers, Insulated Piping: Clevis type with rod, bolts and nuts, sized to accommodate the pipe and insulation, with support shield to prevent hanger from compressing insulation.

E. Hangers, Uninsulated Piping: Clevis type with rod, bolts and nuts, copper plated or plastic coated for bare copper piping support.

F. Penetrations, At or Below Grade: Pack annular space with waterproof mastic sealer or cement base quick-set repair mortar.

G. Penetrations, Fire or Smoke-rated:

1. Seal annular space with fire stop sealing system, UL listed as a "Fill, Void or Cavity Material." and tested per ASTM E 814.
2. Penetration fire stop sealing systems shall be identified on both sides with permanently mounted, preprinted vinyl labels which include the following information:
   a. The words “Warning: Through Penetration Firestop System – Do Not Disturb” or similar phrase
   b. Manufacturer’s brand name, product type or catalog number
   c. Testing agency designation and rating
   d. Installer’s Name
   e. Installation Date

H. Penetrations, Non-rated: Pack annular space with fiberglass insulation.

I. Pipe and Valve Identification: Identified piping by legend and flow arrow conforming to ANSI A-13.1. Identify shutoff valves with brass or plastic discs with identification numbers provided by Owner.

J. Pipe Riser Clamps: 2 piece clamp with bolts and nuts, sized for OD of bare pipe, galvanized for ferrous pipe, copper plated for copper pipe.

K. Sleeves: Galvanized steel pipe, square cut with smooth edges, minimum 2 inches larger than outside diameter of bare pipe or OD of insulation, flush with finished wall faces, extended 2 inches above finished floors. Core-drilled openings above grade in solid concrete need not be sleeved, but must be clean and neat.

L. Three Phase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency. Inverter-duty rated with shaft grounding ring for variable frequency drive applications.

PLUMBING PIPING AND PUMPS

Systems Descriptions

A. A 6 inch combination fire/water service will be extended from the existing 8 inch water main located on the northwest side and adjacent to the building. The combination water/fire service will split in the main mechanical room into a 4 inch fire line and a 3 inch water line. The service will be provided with a double detector backflow preventer for each service.

B. The water service will enter the building and be distributed to fixtures and equipment throughout the building. A reduced pressure zone backflow preventer will be installed on the water service inside of the building. A pressure reducing valve will be installed to lower the water pressure to below 70 psi.

C. Isolation ball valves will be installed on each branch connection to water mains.

D. Domestic make-up water will be provided for the hydronic heating system and chilled water system. A reduced pressure zone backflow preventer will be installed on each system connection.

E. Wall hydrants will be installed along the exterior of the addition at approximately 100 feet spacing.

F. The building will be served by a 6 inch sanitary sewer line. A house trap will be installed on the sanitary sewer lateral adjacent to the building.

G. Each plumbing fixture will be vented and trapped. Sanitary drainage will be collected from all plumbing fixtures and connected to the sanitary drainage system. Drainage lines shall be properly vented, graded and trapped to conform to local and state requirements. Where a vertical riser connects to another vent riser, an inverted wye fitting will be provided.

H. Elevator pits will be provided with oil sensing sump pumps to discharge to the sanitary drainage system.

I. A floor drain will be installed adjacent to each boiler, water heater, storage tank, backflow preventer and base mounted pump.

J. Roof drains will be collected to multiple storm drain laterals and will be extended from the building to the site storm drainage system.

K. An emergency (overflow) roof drainage system will be installed as required by code. The emergency roof drainage system will discharge to grade via multiple vertical risers with downspout discharge nozzles.

Design Criteria

A. Hot and cold water piping shall be sized per the International Plumbing Code, Appendix E. Sizing of piping shall be based on Type 'L' copper pipe, a pressure drop of 2 psi per 100 feet of tube with a maximum velocity of 4 feet per second.

B. Hot water recirculation piping and pump sizing shall be based on a heat loss of 30 BTUH per foot with a temperature differential of 5 degrees F.

C. Expansion compensators and anchors shall be installed on straight piping lengths longer than 100 feet.

D. Sanitary piping shall be sized per the tables in the International Plumbing Code. Horizontal sanitary and waste lines 2 inches and smaller inside building shall be sloped a minimum of 1/4 inch per foot. Horizontal sanitary and waste lines 2-1/2 inches and larger shall be sloped a minimum of 1/8 inch per foot.

E. Vent piping shall be sized per the tables in the International Plumbing Code.

F. Drainage lines shall be vented, graded and trapped to conform to local codes.

G. Cleanouts shall be provided in soil and waste piping, at the ends of all mains, at intersections of branches with mains, at base of vertical stacks, at intermediate points of long runs not exceeding 40 feet, and at additional locations required by local ordinances.

H. Storm drainage piping shall be sized per the tables in International Plumbing Code tables based on a rainfall rate of 3 inches per hour.

I. Cleanouts shall be provided in storm piping, at ends of all mains, at intersection of branches with mains, at bases of vertical stacks, at intermediate points of long runs not exceeding 40 feet, and at other points required by local ordinances.

Material and Equipment Specifications

A. Piping

1. Domestic Water Piping, Above Grade: Type L (hard) copper tube with solder joints.
2. Domestic Water Piping, Below Grade: Type K copper with solder fittings (thru 3 inches), or ductile iron pipe with push-on joints (over 3 inches).
3. Sanitary and Vent Piping, Above Grade: Service weight cast iron soil pipe with no-hub joints, or type DWV hard copper drainage with solder joints.
4. Sanitary and Vent Piping, Below Grade: Service weight cast iron with push-on joints.
5. Rainwater Conductors, Above Grade: Service weight cast iron with no-hub joints.
6. Storm Piping, Below Grade: Service weight cast iron pipe with push-on type joints.

B. Piping Insulation

1. Domestic Cold Water Piping Insulation: Fiberglass or foam plastic, 1/2 inch minimum thickness, 25 flame/50 smoke rating in accordance with ASTM E-84.
2. Domestic Hot Water Piping Insulation: Fiberglass or foam plastic, 1 inch minimum thickness (thru 2 inch pipe size) or 1-1/2 inch minimum thickness (over 2 inch pipe size), 25 flame/50 smoke rating in accordance with ASTM E-84.
3. Horizontal Rainwater Conductors: Fiberglass or foam plastic, 1/2 inch minimum thickness, 25 flame/50 smoke rating in accordance with ASTM E-84.

C. Valves

1. Ball Valves, thru 2 inches: NSF/AWWA approved for potable water, bronze, 2 piece body, chrome plated ball, Teflon seats, 150S/400WOG psig pressure rated.
2. Ball Valves, over 2 inches: NSF approved for potable water, flanged ends, epoxy coated A126 Class B iron body, Teflon-fused solid ball, full port, 200WC psig pressure rated.

3. Check Valves, thru 2 inches: Threaded or soldered ends, bronze body, swing type disc, 125S/200WOG psig pressure rated.
4. Check Valves, over 2 inches: Flanged ends, iron body, bronze trim, bronze swing type disc, 125S/200WOG psig pressure rated.
5. Check Valves, Pumped Sanitary and Storm thru 2 inches: Threaded ends, bronze body, swing type disc, 125S/200WOG psig pressure rated.
6. Check Valves, Pumped Sanitary and Storm over 2 inches: Flanged ends, iron body, horizontal swing type disc with weight and lever, 125S/200WOG psig pressure rated.

D. Piping Specialties

1. Dielectric Connections Waterway Fittings for pipe joints connecting dissimilar metals. Victaulic clearflow waterways.
2. Expansion Compensators, Guides and Anchors: Suitable for absorbing expansion and contraction in specific pipe material at working pressure, constructed with bellows, shroud, threaded or solder end fittings, internal guides, external guides and anchors installed in accordance with manufacturer's recommendations. Flexonics.
3. Flexible Pipe Connectors: Stainless steel corrugated core covered with high tensile tubular braiding.
4. Pipe Penetration Seal: Modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.
5. Pressure Gages: 4 inch dial, cast aluminum case, accuracy of 1 percent of scale range, indication of operating range in middle third of scale.
6. Strainers, thru 2 inches: Bronze body, Y pattern type having stainless steel screen with 20 mesh perforations.
7. Strainers, 2-1/2 inches and larger: Cast iron or semi steel body, Y pattern type having stainless steel screen with 3/64 inch (2-1/2 and 3 inch pipe) or 1/8 inch (4 inch pipe and larger) mesh perforations.
8. Thermometers: 9 inch scale, cast aluminum case, acrylic window, liquid-filled, separable socket.

E. Plumbing Specialties

1. Downspout Nozzles: Cast bronze body and flange, stainless steel screen. J.R. Smith 1770.
2. Floor Drains: Adjustable nickel bronze or nickel brass finish, cast iron body with trap primer connection. J.R. Smith 2010.
3. Hose Bibbs, Interior: 3/4 inch hose thread, chrome plated, integral vacuum breaker, removable tee handle/shield cap. Chicago Faucet.
4. Hose Bibbs, Hot and Cold Water: Service sink faucet, brass body, chrome plated, vacuum breaker, threaded spout, loose key stops in shanks, pail hook, 5 feet of hose and wall hook. T & S Brass.
5. Overflow Drains: Cast iron body with cast iron, rough bronze, aluminum, or brass lock-type dome, flashing collar and gravel stop, extension flange, under-deck clamp. J. R. Smith.
6. Roof Drains: Cast iron body and dome. J.R. Smith 1010-R-C.
7. Thermostatic Mixing Valves: Tamperproof temperature adjustment control, union inlets, combination strainer-check-stops, built-in shutoff in the event of hot or cold water supply failure, or thermostatic element failure. Powers Hydroguard or Symmons.
8. Trap Guard Device: Barrier type trap seal protection device, inline floor drain trap sealer, elastomeric, neoprene rubber. Prevents the evaporation of the trap seal and the emission of sewer gases. Proset Trap Guard.
9. Wall Hydrants: Non-freeze, bronze or brass casing, hinged, locking nickel bronze cover, T-handle key, nickel bronze box, integral vacuum breaker. J. R. Smith.
10. Water Hammer Arrestors: Bellows, pressurized chamber, pre-pressurized tank, or free turning piston design, stainless steel or steel tank with polypropylene liner surge chamber, or barrel fabricated of type K hard drawn copper, furnished for flush valve plumbing fixtures and washers. J. R. Smith.

F. Pumps

1. Inline Circulating Pumps: Hermetically sealed with motor and impeller on common shaft, bronze fitted construction. Bell & Gossett Series PL.
2. Sump Pumps, Oil Sensing: Submersible, single pump unit, float operated level switch and oil sensing systems for elevators pits. Weil.

G. Domestic water piping shall be tested in accordance with local codes or by the method prescribed by latest edition of the ICC plumbing code. All domestic water piping shall be disinfected before systems are placed into service.

PLUMBING EQUIPMENT

System Description

A. Domestic hot water will be furnished to the building from a manifold of the existing domestic water heater and (1) new ASME rated, high efficiency, condensing, natural gas fired water heaters located in the main mechanical room. The new water heater will have a minimum recovery rate of 200 GPH. The storage temperature of the water heating system will be set at 140 degrees F.

B. Mixing valves will be provided to generate 110 degrees F water for distribution to the building. A circulating pump and return piping will be provided for the 110 degrees F hot water system.

Design Criteria

A. Domestic water heater shall be sized per ASPE Plumbing Engineer Design Handbook 2, Plumbing Systems, Table 6-1.

B. Expansion tank shall be sized per the manufacturer's sizing method.

Material and Equipment Specifications

A. Domestic Water Storage Heater, Gas:

1. Style: Standard vertical, AGA approved, powered direct vent with steel burner, PVC, ABS, or CPVC vent piping, wall/roof termination kit with intake and exhaust screens.

2. Materials: Welded steel tank, porcelain (glass lined) tank lining, steel outer shell with baked enamel finish, blanket type glass fiber or polyurethane foam insulation, high density magnesium cathodic protection anode, brass or bronze water connections, steel or cast iron base and legs.
3. Working Pressure: 150 psig.
4. Fuel: Natural gas.
5. Thermostat and Gas Safety Valve: Designed to shut off gas supply if pilot light is extinguished.
6. Gas Pressure Regulator: For specified fuel.
7. Temperature-Pressure Relief Valve: 3/4 inch (minimum) ASME.
8. Compliance: ASHRAE/IESNA 90.1-1999.
9. Manufacturer's Guarantee: 5 years.
10. A.O. Smith FPSH

B. Expansion Tank: Sealed-in diaphragm type, vertical, steel tank, bearing ASME label for unfired pressure vessels, polypropylene tank lining, factory charged with air charging valve for field charging. Amtrol.

PLUMBING FIXTURES

Design Criteria

A. Each hot and cold water connection to plumbing fixtures and equipment shall be valved, if not provided with integral stops.

B. Plumbing fixtures shall be filled with water and checked for leaks or retarded flow. Remove, clean and reinstall all aerators.

Fixture Specifications

A. Fixtures shall be of one manufacturer, insofar as possible, and of first quality.

B. Wall hung vitreous china fixture backings shall be drilled and tapped for mounting carriers.

C. All plumbing trim and exposed supply and waste piping, including traps, shall be chrome plated brass.

D. Hot water, cold water, and drain piping exposed below ADA compliant fixtures shall be protected with flexible vinyl insulation installed complying with ANSI A117.1-2003.

E. Coordinate the orientation of all plumbing fixtures (i.e. left-hand, right-hand) with ADA requirements and general building conditions.

F. Calk space between plumbing fixtures and wall or floor watertight with silicone, white for all white fixtures, clear for all other colors.

G. Water Closets

1. Water Closet (WC-1): Wall hung, vitreous china, 1.6 gallon flush. Kohler K-4325 with Sloan 111 ES-S electronic flush valve, hard wired.
2. Water Closet (WC-2): ADA compliant, wall hung, vitreous china, 1.6 gallon flush. Kohler K-4325 with Sloan 111 ES-S electronic flush valve, hard wired.
3. Water Closet Seats: White, open front, less cover.

H. Urinals

1. Urinal (UR-1): Wall hung, vitreous china, 1 gallon flush with electronic flush valve. Kohler K-4904-ET with Sloan 186-1 ES-S.
2. Urinal (UR-2): Wall hung. Vitreous china, 1 gallon flush, ADA compliant with electronic flush valve. Kohler K-4904-ET with Sloan 186-1 ES-S.

I. Lavatories

1. Lavatory (L-1): ADA compliant, wall hung, vitreous china. Kohler K-2032 with Sloan ETF-600-BDT electronic faucet hard wired and thermostatic mixing valve.
2. Lavatory (L-2): ADA compliant, oval, countertop, vitreous china. Kohler K-2196 with Sloan ETF-600-BDT electronic faucet hard wired.

J. Sinks

1. Sink (S-1): Deep, single compartment, stainless steel. Elkay DLR1919 with Chicago Faucet 895-317ABCP and thermostatic maxing valve.

K. Mop Receptors

1. Mop Receptor (MR-1): Floor mounted, one piece precast terrazzo with stainless steel protective caps. Fiat TSB-500 with Kohler K-8928 faucet.

L. Shower Fittings

1. Shower Fitting (SF-1): Anti-scald pressure balancing shower valve with color coded dial plate, cast bronze dial plate and die cast faceplate, chrome plated metal lever control, Dole flow control limiting flow to 2 GPM, adjustable temperature limit stop. Powers Series 420
2. Shower Fitting (SF-2): Anti-scald pressure balancing shower valve with color coded dial plate, cast bronze dial plate and die cast faceplate, chrome plated metal lever control, Dole flow control limiting flow to 2 GPM, adjustable temperature limit stop, ADA compliant. Powers Series 420.

M. Electric Water Coolers

1. Electric Water Cooler (EWC-1): Wall hung, dual level, ADA compliant. Halsey Taylor HTV8BL-Q.

N. Washing Machine Box (WMB-1): Washer supply and drain unit with drain located in box between supply valves, steel box and faceplate with white powder coat finish, 1/2 inch water supplies, 1/2 inch quarter turn MIP valves, 2 inch slipnut drain kit. IPS Corporation/Guy Gray "T" Series.

FUEL GAS SYSTEMS

System Description

A. A new natural gas main will be extended from local gas company main located adjacent to the building. The gas company will install meter set and extend piping from the main to meter set. Gas will be distributed by the contractor to all mechanical equipment at a pressure of 2 psi. Individual gas regulators with vents will serve each piece of equipment.

Design Criteria

A. Natural gas piping shall be sized per the International Fuel Gas Code.

B. All welding of gas piping shall be performed by welders approved by local gas company.

C. Provide cathodic protection on gas piping as required by local gas company.

D. Rough-in and make final connection to HVAC gas-fired equipment with suitable drips and cocks. Verify gas pressure requirements and locations for rough in with equipment supplier prior to start of work.

E. All gas regulator vents shall be extended to the exterior. Vent limiting devices will not be acceptable. Vent piping shall be installed per local codes and manufacturer's recommendations.

F. Natural Gas Piping: After installation of piping, but before installation of outlet valves, the lines shall be blown clear by means of oil free dry air or nitrogen. Piping shall be tested in accordance with NFPA 54.

G. Natural gas piping shall be tested in accordance with recommendations of the National Fire Protection Association (NFPA 54), American Gas Association, and local gas company.

Material and Equipment Specifications

A. Piping

1. Gas Piping, Interior: Schedule 40 black steel with threaded joints.
2. Gas Piping, Exterior: Schedule 40 black steel with welded joints, prepared, primed and painted with 2 coats of acrylic enamel to prevent corrosion. Color selected by Owner.
3. Gas Piping, Below Grade: Schedule 40 black steel with welded joints and coal tar coating.

B. Valves

1. Ball Valves, thru 2 inches: Threaded ends, bronze body, chrome plated brass ball, full port, 5 psig pressure rating.
2. Plug Valves, thru 2 inches: Threaded ends, cast iron body, lubricated plug, wrench operated, 200 WOG psig pressure rated.
3. Plug Valves, over 2 inches: Flanged ends, iron body, lubricated plug, wrench operated (thru 4 inches) or worm gear operated (over 4 inches).

C. Flexible Pipe Connectors: Stainless steel corrugated core covered with high tensile tubular braiding.

D. Gas Regulators: High tensile iron body and cast aluminum diaphragm casing, spring loaded type, renewable valve disc and orifices, built-in relief valve, vent. Fisher Control Series S 100.

E. Pressure Gages: 4 inch dial, cast aluminum case, accuracy of 1 percent of scale range, indication of operating range in middle third of scale.

HEATING, VENTILATING & AIR CONDITIONING (HVAC)

Existing Conditions

The existing HVAC system primarily consists of constant volume gas fired heating rooftop units. The office area is provided with a constant volume gas fired heating, direct expansion cooling rooftop unit. For the most part, the HVAC system is original to the building and beyond its expected service life.

Demolition

The existing HVAC system will be removed in its entirety. Three rooftop units currently on Perkins will be relocated to the roof of the addition on Perkins and reconnected to existing duct distribution systems.

Systems Description

A. Heating, cooling, and ventilation for the building will be provided by multiple rooftop air handling units with hot water heating coils and chilled water cooling coils. Zone control will be provided by variable air volume boxes with hot water reheat coils for each space.

B. Refer to "Appendix A – Concept HVAC Zoning Plans" for zoning and system delineation.

C. Offices, labs and instructional spaces will be served by 4 pipe rooftop variable air volume air handing units with hydronic control reheat units.

D. Large volume single zone spaces such as the Lobby, Fitness Center, Auxiliary Gym, Main Gym, Convenience Store and Future Dining will be served by 4 pipe single zone variable air volume handling units.

E. Ductless split system air conditioning units with exterior direct expansion condensing units will serve data rooms and the elevator machine room.

F. Heating and ventilation for stairwells and entryways will be provided by hot water blower coils.

G. Heating and ventilation for mechanical spaces and storage areas will be provided by hydronic terminal heating equipment and exhaust fans.

H. A central hot water plant located in the main mechanical room will provide hot water to air handling unit, central reheat units, energy recovering units and terminal heating devices/units.

I. A central chilled water plant located on the roof of the main mechanical room will provide chilled water to air handling units.

Environmental Design Conditions

J. The building HVAC systems sizing will be based on heating/cooling load calculations per the 2009 International Mechanical Code, the 2009 International Building Code, and ASHRAE Standard 183-2007 using the following outdoor and indoor design conditions.

K. Outdoor Design Conditions:

1. Winter dry bulb: 0 degrees F.
2. Summer dry bulb: 95 degrees F.
3. Summer wet bulb: 75 degrees F.

L. Indoor Design Conditions:
   a. Summer space temperature: 75 degrees F.
   b. Winter space temperature: 72 degrees F.
   c. Summer maximum relative humidity: 50 percent.

HVAC BASIC MATERIALS

Material and Equipment Specifications

A. Access Panels: 18 inch by 18 inch minimum size, type and fire rating to suit application. Furnish and install in ceilings and walls for service and repair access to concealed equipment.

B. Engineered Strut Support System: Structural grade steel channel members, steel fittings, pre-galvanized by hot dip process prior to roll forming with G90 zinc coating. Unistrut Corporation.

C. Equipment Nameplates: Laminated phenolic, two outer layers of white phenolic and an inner layer of black with engraving depth to the inner layer. Coordinate with Owner for nameplate designations.

D. Equipment Supports: Galvanized steel with integral base plate, pressure treated wood nailer.

E. Penetrations, At or Below Grade: Pack annular space with waterproof mastic sealer or cement base quick-set repair mortar.

F. Penetrations, Fire or Smoke-rated:

1. Seal annular space with fire stop sealing system, UL listed as a "Fill, Void or Cavity Material." and tested per ASTM E 814.
2. Penetration fire stop sealing systems shall be identified on both sides with permanently mounted, preprinted vinyl labels which include the following information:
   a. The words “Warning: Through Penetration Firestop System – Do Not Disturb” or similar phrase
   b. Manufacturer’s brand name, product type or catalog number
   c. Testing agency designation and rating
   d. Installer’s Name
   e. Installation Date

G. Penetrations, Non-rated: Pack annular space with fiberglass insulation.

H. Pipe and Valve Identification: Identified piping by legend and flow arrow conforming to ANSI A-13.1. Identify shutoff valves with brass or plastic discs with identification numbers provided by Owner.

I. Pipe Portals: Insulated galvanized steel with integral base plate, acrylic clad ABS plastic cover, graduated step boots, stainless steel clamps, and fastening screws.

J. Pipe Rail Support System: High tensile strength aluminum/magnesium alloy slip-on/bolt-on fittings, fastened to pipe with knurled cup-point set screws. Hollaender.

K. Sleeves: Galvanized steel pipe, square cut with smooth edges, minimum 2 inches larger than outside diameter of bare pipe or OD of insulation, flush with finished wall faces, extended 2 inches above finished floors. Core-drilled openings above grade in solid concrete need not be sleeved, but must be clean and neat.

L. Three Phase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency. Inverter-duty rated with shaft grounding ring for variable frequency drive applications.

M. Variable Frequency Drives: Matched with fan or pump horsepower and voltage to serve as starter, circuit breaker, motor overload protection**,** furnished with bypass in accordance with Penn State standards.

N. Vibration Isolation:

1. Free-standing Spring, Type 1: Adjustable, open spring mounting with combination leveling bolt and fastening bolt, neoprene pad bonded to baseplate, designed for a minimum Kx/Ky of 1.0. Kinetics Noise Control FDS.
2. Restraining Spring, Type 2: Adjustable, open spring having one or more coil springs, welded steel enclosure with top plate and rigid lower housing, designed to limit vertical movement using restraining bolts, neoprene pad bonded to baseplate. Kinetics Noise Control FLS.
3. Molded Neoprene Pad, Type 3: Double deflection elastomeric mounting with steel baseplate and top threaded insert, designed for approximately 1/4 inch deflection and loaded not to exceed 15 percent of the free height. Kinetics Noise Control Model RD.
4. Neoprene or Fiberglass Pad, Type 4: Two layers of ribbed or waffled neoprene pads bonded to a steel separator plate, or precompressed molded fiberglass coated with elastomeric material. Kinetics Noise Control Model NG.
5. Hanger, Type 5: Combination spring and elastomeric or fiberglass, steel box, steel spring. Designed for approximately 1/4 inch deflection and loaded not to exceed 15 percent of the free height. Kinetic Noise Control Model SFH.
6. Concrete Inertia Base, Type B: Minimum 6 inch deep perimeter steel pouring form with reinforcing bars welded in place, height saving side mounted spring brackets, sized with a minimum overlap of 4 inches around base of equipment, drive shaft and pump suction/discharge elbows. Kinetic Noise Control Model CIB.
7. Curb Rail Isolator, Type C: Prefabricated extruded aluminum or formed galvanized steel rail system, 1 inch deflection free-standing springs, continuous air and water seal, one piece unitized or multiple sections designed to fit base of rooftop equipment. Kinetic Noise Control Model ASR.
8. Application

Equipment Type	Isolator Type	Base Type
Air handling unit, suspended*	5	None
Base-mounted pump	1	B
Boiler	4	None
Chiller	2	None
Curb-mounted air handling unit	n/a	C
Condenser-compressor unit	3 or 4	None
Fan, suspended	5	None
Piping, as specified below	5	n/a

* Isolators are not required on air handling units with manufacturer furnished vibration isolation in motor/fan section.

9. Provide hanger isolators for piping over 1 inch outside diameter located in mechanical equipment rooms, and for a minimum of 50 feet or 100 pipe diameters, whichever is greater, from connection to vibration isolated equipment.

O. Outdoor installations shall be suitably protected to prevent corrosion. Steel bases shall be primed and painted. Springs, nuts, bolts, etc., shall be cadmium plated and neoprene coated. Spring housings shall be neoprene coated.

HVAC PIPING AND PUMPS

System Description

A. Heating hot water will be distributed throughout the building by a pair of base-mounted pumps with variable frequency drives. The pumps will operate in a lead-standby sequence. Constant speed, inline primary pumps will be provided for each boiler.

B. Chilled water will be distributed throughout the building by a pair of base-mounted pumps with variable frequency drives. The pumps will operate in a lead-standby sequence.

Design Criteria

A. Hydronic piping shall be sized for no more than 3.50 feet of head friction loss per 100 feet of pipe.

Material and Equipment Specifications

A. Pipe and Fittings

1. Chilled Water: Schedule 40 black steel with threaded**,** mechanically coupled grooved**,** or flanged joints, or type L (hard) copper tube with 95-5 solder or press coupled joints. Polypropylene-random (PR-R) piping can be considered for the piping and fitting medium for the chilled water systems.
2. Condensate Drainage, Cold: Type L (hard) copper tube with 95-5 solder or press coupled joints. Polypropylene-random (PR-R) piping can be considered for the piping and fitting medium for the chilled water systems for the condensate drainage piping.
3. Hot Water: Schedule 40 black steel with threaded**,** mechanically coupled grooved, or flanged joints, or type L (hard) copper tube with 95-5 solder or press coupled joints for hot water systems at 140 degrees F or below only.
4. Make-up: Type L (hard) copper tube with 95-5 solder joints.
5. Refrigerant: Type L (hard) copper tube with AWS A5.8 B Cup silver/phosphorous/copper alloy brazed joints.

B. Pipe Insulation

1. All pipe fitting insulation shall have a 25 flame/50 smoke rating in accordance with ASTM E-84.
2. Chilled Water Piping: Fiberglass with all purpose vapor retarder jacket, or flexible elastomeric. 1-1/2 inch minimum thickness for all pipe sizes.
3. Condensate Drainage Piping: Fiberglass with all purpose vapor retarder jacket, or flexible elastomeric, 1/2 inch minimum thickness.
4. Hot Water Piping: Fiberglass with all purpose vapor retarder jacket, or flexible elastomeric**.** 1-1/2 inch minimum thickness for pipe 1-1/2 inches and under and 2 inch minimum thickness for pipe over 1-1/2 inches.
5. Make-up Piping: Fiberglass with all-purpose vapor retarder jacket, or flexible elastomeric, 1/2 inch minimum thickness.
6. Refrigerant Suction Line: Flexible elastomeric, 1-1/2 inch minimum thickness. For outdoor installations, insulation shall be covered with glass fiber mesh and painted with protective finish.
7. Pipe Fittings: Fiberglass batt with PVC covers or pre-molded fiberglass fittings compatible with fiberglass pipe insulation, or flexible elastomeric insulation compatible with flexible elastomeric insulation.

C. Valves

1. Ball Valves, thru 2 inches: Threaded ends, bronze breakdown style body, stainless steel ball, Teflon seats, 150S/400WOG psig pressure rated.
2. Balancing Valves, thru 2 inches: Threaded ends, bronze body, square head plug cock, 125S psig pressure rated.
3. Check Valves, thru 2 inches: Threaded or soldered ends, bronze body, regrinding or renewal bronze swing type disc, 150S psig pressure rated.
4. Check Valves, over 2 inches: Flanged ends, iron body, bronze trim, bronze swing type disc.
5. Gate Valves, thru 2 inches: Threaded or soldered ends, bronze body, rising stem, solid wedge disc.
6. Gate Valves, over 2 inches: Flanged ends, iron body, bronze trim, OS&Y.
7. Butterfly Valves, over 2 inches: Lug type flange, iron body, stainless steel disc, EPDM seat, stainless steel trim.
8. Butterfly Valves, over 2 inches on campus chilled water and at mechanical room exit: Lug type flange, carbon steel body, stainless steel offset disc, RPTFE seat and packing, stainless steel trim.

D. Piping Specialties

1. Air Separator, Coalescing; welded steel body, 125 psi working pressure, ASME companion automatic air vent.
2. Dirt Separator, Coalescing: welded steel body, 125 psi working pressure, ASME removable head.
3. Air Vents, Automatic: Brass body with either stainless steel or non-ferrous internal working parts, vacuum breaker and flapper type valve assembly to automatically vent air from system. 75 psig working pressure.
4. Air Vents, Manual: Brass body with quick venting slotted adjustment with shutoff ball check.
5. Backflow Preventers: Bronze body reduced pressure type, two independently acting spring loaded toggle lever check valves, relief valve, two shutoff valves, air gap fitting, 150 psig maximum working pressure. Watts Series 009.
6. Calibrated Balancing Valves: Bronze body with threaded ends, multi-turn glove style, tour Anderson STA.
7. Dielectric Connections: Waterway fittings for pipe joints connecting dissimilar metals. Victaulic Clearflow Waterways.
8. Expansion Tank: Sealed-in diaphragm or removable bladder type, galvanized steel, 125 psig working pressure, charging valve, fittings for gage, fill, drain and system connections, constructed in accordance with ASME code for unfired pressure vessels and bearing ASME label.

9. Flexible Pipe Connectors: Stainless steel corrugated core covered with high tensile tubular braiding.
10. Pipe Penetration Seal: Modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.
11. Pressure Gages: 4 inch dial, cast aluminum case, accuracy of 1 percent of scale range, indication of operating range in middle third of scale.
12. Pressure Reducing Valves, Water: Bronze body, diaphragm type with self-cleaning seat, self-contained strainer, 200 psig maximum inlet pressure, factory set discharge pressure. Cash Acme Type B.
13. Steam Traps, Thermodynamic: Cold finished steel body, zinc plated, reversible stainless steel seats and discs. Spirax Sarco Model TD.
14. Strainers, thru 2 inches: Bronze body, Y pattern type having stainless steel screen with 20 mesh perforations.
15. Strainers, over 2 inches: Cast iron or semi steel body, Y pattern type having stainless steel screen with 3/64 inch (2-1/2 and 3 inch pipe) or 1/8 inch (4 inch pipe and larger) mesh perforations.
16. Thermometers: 9 inch scale, cast aluminum case, acrylic window, liquid-filled, separable socket.

E. Pumps

1. Base Mounted, End Suction Pump: End suction design, in cast iron and bronze fitted construction. Pump and motor shall be mounted on a common structural steel base. Furnish pump with angle type suction diffuser with inlet vanes, combination diffuser-strainer-orifice, and an adjustable foot to support weight of unit and piping. Bell & Gossett Series 1510.
2. In-Line Pump: Vertical design, in cast iron and bronze fitted construction. Bell & Gossett Series 60.

Testing

A. Water piping shall be leak tested at one and one half times the maximum system design pressure, but not less than 100 psi static pressure for four hours with pressures noted each hour. All leaks shall be repaired and proven leakproof by retesting.

B. Refrigerant piping shall be leak tested with a mixture of system refrigerant and dry nitrogen. Pressurize to 350 psi and inspect for and repair all leaks. Purge system. Evacuate system and charge system with dry nitrogen. Purge system again, evacuate and recharge with system refrigerant. (Leak testing is not required with pre-charged refrigerant tubing.)

C. Following tests for all water piping, systems shall be cleaned by wasting water until it becomes clear after which all strainers shall be cleaned. Inject water treatment chemicals at time of system refill.

AIR DISTRIBUTION

System Description

A. Ventilation for toilet rooms will be provided by roof mounted air handlers with energy recovery. The fans will be controlled by the building automation system.

B. Ventilation for mechanical and electrical rooms will be provided by roof exhaust fans. The fans will be thermostatically controlled.

C. Temperature control in occupied spaces will be provided by variable air volume (VAV) boxes with hot water heating coils.

Design Criteria

A. Double wall insulated spiral round ductwork shall be provided in spaces without finished ceilings. .

B. Ductwork shall be sized for no more than 0.10 inches of water column friction loss per 100 feet. Turning vanes shall be used for all 90 degree elbows.

C. Exhaust airflow for toilet areas shall be sized per the International Mechanical Code or 2 CFM per square foot, whichever is the larger of the two.

D. Manual volume control dampers will be located at VAV boxes and all branch takeoffs for supply air, return air and exhaust air duct connections.

E. Fire dampers will be installed at all ductwork penetrations through fire-rated assemblies including vertical shaft walls and floors.

F. Smoke detectors and dampers will be installed in the main supply and return ductwork of each air handling unit and in smoke partition ductwork penetrations as required by NFPA and building codes.

Material and Equipment Specifications

A. Ductwork

1. Acoustic Flexible Duct: Helical wound corrugated steel with PE fabric and exterior insulation and reinforced, metalized vapor barrier with minimum R5 exterior fiberglass insulation. ASTM E84 25 flame/50 smoke 50 spread. Installed in maximum 6 foot lengths. Flexmaster Type 1M, or as approved.
2. Dryer Vent Ductwork: Galvanized sheet metal in accordance with NFPA Standard 54.
3. Rigid Metal Ductwork and Plenum Chambers: Fabricated from galvanized sheet steel and constructed in accordance with SMACNA, HVAC Duct Construction Standards, and the latest publication of the ASHRAE Equipment Handbook.
4. Round (Spiral) Ductwork: Factory fabricated of galvanized steel meeting ASTM A-527-71 as spiral Uniseal, all fittings fabricated of galvanized steel with continuous welds.

B. Ductwork Insulation:

1. Fiberglass Duct Wrap Insulation: Exterior fiberglass insulation with foil scrim kraft laminated (FSKL) facing, 0.29 maximum K factor, 1.0 or 1.5 pcf density, ASTM E84 25 flame/50 smoke spread rating, 2 inch wide tape for butt joints. 1-1/2 inch minimum thickness for supply, outdoor, and return air ducts.

C. Ductwork Accessories

1. Duct Access Doors: Installed in ductwork within working distance of all volume dampers, motor operated dampers, fire dampers, smoke dampers, and duct coils to permit adjustments and inspections, double cam latch closure method, insulated where installed in insulated duct systems.
2. Fire Dampers: Type B, multiple interlocking steel curtain type damper, galvanized steel frame and blades, vertical or horizontal mount, blades stacking out of air stream, SMACNA frame. 165 degree UL fusible link. NFPA 90A. Dynamic rated 1-1/2 hr, UL 555.

3. Flexible Duct Connectors: Provided in on inlet and outlet of each fan and air handling unit, standard or metal edge glass fabric double coated with neoprene. ASTM E84 25 flame/50 smoke spread. UL 181.
4. Sealant: Applied to all ductwork joints and seams.
5. Take-Off Fittings: Prefabricated galvanized steel straight tap-in, with damper, same size as flexible duct.
6. Turning Vanes: Provided in all square elbows unless noted otherwise, single thickness vane style with no trailing edges.
7. Volume Dampers: Multiple, opposed blade, equipped with adjustable quadrant and lock. Single blade damper units will not be permitted.

D. Grilles, Registers and Diffusers:

1. Ceiling Exhaust/Return Registers: Extruded aluminum with 1 inch frame, 1/2 inch x 1/2 inch x 1/2 inch cellular grid core and opposed blade damper. Baked white enamel finish.
2. Sidewall Exhaust/Return Registers: Extruded aluminum with 1 inch frame. Fixed position 35-40 degree horizontal bars. Opposed blade damper. Baked white enamel.
3. Sidewall Supply Registers: Extruded aluminum with 1 inch frame. Double deflection with horizontal front bars. Opposed blade damper. Baked white enamel finish.
4. High Performance Diffusers: Extruded aluminum with flush cones, fixed pattern removable center core, adjustable volume damper. Baked white enamel finish.
5. Square Diffusers: Extruded aluminum with overlap margins, flush cones, fixed pattern removable center core, adjustable volume damper, diffusing grid, square-to-round neck adapter. Baked white enamel finish.
6. Round Diffusers: Steel construction, adjustable cone, removable center core. Adjustable volume damper. Baked white enamel.

E. Fans and Gravity Roof Ventilators:

1. Cabinet Fan: Centrifugal cabinet style, insulated steel housing, integral backdraft damper, integral terminal box and electronic speed controller. Provide brick vent, wall vent, or roof cap as required. Greenheck Fan Corp.
2. Roof Fan, Belt Drive: Aluminum housing, vibration isolated motor and fan assembly, prewired UL listed disconnect, motor operated damper, birdscreen, variable pitch motor pulley, 12 inches high insulated roof curb. Greenheck Fan Corp.
3. Gravity Roof Ventilator, Round or Rectangular: Aluminum housing, birdscreen, hinged/removable hood, motor operated damper, backdraft damper (relief/exhaust applications only), minimum 12 inches high insulated roof curb. Greenheck Fan Corp.
4. Accessory Roof Curb: Galvanized sheet steel with continuous welded seams, wood nailer, 1-1/2 inch fiberglass or 1/2 inch sprayed urethane insulation, 12 inches minimum height or higher as required by fan/ventilator application. Same manufacturer as fan/ventilator.

F. Louver, Waterproof: Extruded aluminum, 6 inches deep, Kynar 500 finish in selected color, AMCA certified for air and water penetration. 1/2 inch mesh aluminum bird screen.

G. Variable Air Volume (VAV) Boxes, Reheat: Galvanized steel box lined with 1-1/2 pcf foil-faced insulation meeting UL 181 and NFPA 90, factory calibrated air damper assembly with electric actuator, internal regulator for independent airflow control, 2 row hot water heating coil, access door for coil cleaning. Trane, Carrier, Titus, or Enviro-Tec/Johnson Controls.

CENTRAL HEATING EQUIPMENT

System Description

A. Hot water for the building will be provided by two, 1800 MBH input high efficiency condensing type boilers. The number and capacity of the boilers will be sized to allow one boiler to remain in a standby function at all times. Hot water will be supplied to the building at 140 degrees F. Hot water terminal units will be designed for a nominal 40 degrees F temperature drop. The hot water supply temperature will be reset to 100 degrees F during the cooling season and use recovered heat from the chilled water plant.

Design Criteria

Material and Equipment Specifications

A. Boiler, Packaged Condensing Watertube Type: Patterson-Kelly.

1. High efficiency, condensing type (gas-fired) watertube boiler with energy management controls and burner.
2. Low pressure, stainless steel tube heat exchanger type capable of 92.7 percent efficiency at a 100 degree F. water inlet temperature. Boiler shall be configured as a sealed combustions heater.

B. Chemical Water Treatment

1. Complete water treatment program with chemicals, service and equipment supplied by a single water treatment company. 4 quart, one shot feeder, one year's supply of the recommended chemical formulas for control of scale, pitting and corrosion of the closed loop systems.
2. Water management and service program for a period of one year from startup of the system to include initial water analysis and recommendations, system installation and start up assistance, and training of operating personnel.

CENTRAL COOLING EQUIPMENT

System Description

A. Chilled water for building cooling will be provided by one nominal 150 ton air-cooled rotary screw compression chillers. The installed cooling capacity will be approximately 150 tons. The chiller will include 2 compressors. Chilled water will be supplied to the building at 45 degrees F. Chilled water terminal units will be designed for a nominal 14 degrees F temperature rise.

B. A plate and frame heat exchanger will be incorporated in the condenser water system to recover heat from the chillers and use it for preheating domestic water.

Design Criteria

Material and Equipment Specifications

A. Chiller, Packaged Air-cooled: Trane RTAE

1. Evaporator: Shell and tube, ASME, internally finned copper tubes, heat tape with thermostat to protect the evaporator from freezing at ambient temperatures down to -20 degrees F, shell drain and vent connections, fittings for temperature control sensors, 3/4 inch foam plastic insulation.
2. Compressor: Rotary screw design, capable of part load operation down to 15 percent load, direct drive variable speed motor.
3. Condenser Coils and Fans: Aluminum fins and copper tubing coil, direct-drive, variable speed, vertical discharge fans.
4. Electrical: Non-fused power disconnect switch, control power transformer.
5. Control Center: BAS communication interface to permit remote chilled water setpoint and demand limiting by accepting a 4-20mA or 10-20Vdc analog signal to a terminal strip.

CENTRAL HVAC EQUIPMENT

System Description

A. Heating, cooling and ventilation throughout the building will be provided by indoor rooftop air handling units.

B. The building will be zoned into the following air systems:

Unit Designation	Area(s) Served
RTAH -1	Future Dining
RTAH -2	Convenience Store
RTAH -3	Lobby
RTAH -4	Athletic/Kinesiology
RTAH -5	Fitness Center
RTAH -6	Auxiliary Gym
RTAH -7	Locker Rooms
RTAH -8A & 8B	Main Gym

Design Criteria

Material and Equipment Specifications

A. Central Station Air Handling Units, Rooftop: Trane UCCA.

1. Sections:
   a. Return Fan: variable frequency drive.
   b. Economizer
   c. Filter: MERV 8
   d. Hot Water Heating Coil
   e. Access
   f. Chilled Water Cooling Coil
   g. Supply Fan: variable frequency drive.
2. Unit Casing
3. Insulation: 2 inch R13
4. Roof Curb: Full perimeter.
5. External Piping Cabinet
6. Electrical Wiring
7. Controls
8. Integral energy recovery as noted

DECENTRALIZED HVAC EQUIPMENT

System Description

A. Cooling for data rooms will be provided by ductless split system air conditioning units.

B. Supplemental heat for large window areas will be provided by hot water wall-hung radiation. The perimeter heat and VAV box heating coils will be sequenced through the building automation system to provide staged heating control in those areas.

C. Heating for stairwells, vestibules, toilet rooms, etc. will be provided by hot water cabinet, wall insert heaters or blower coils.

D. Heating and cooling for stairwells with large amounts of glass will be provided with horizontally mounted 4- pipe fan coil/blower coil units with hot and chilled water coils.

E. Heating for mechanical and electrical rooms and other “back-of-house” spaces without finished ceiling will be provided by hot water heaters.

Design Criteria

Material and Equipment Specifications

A. Cabinet Unit Heater, Hot Water: Trane

1. Cabinet: Wall mounted, fully recessed steel cabinet finished in baked enamel of color to be selected.
2. Fans: Forward curved, double inlet, aluminum centrifugal fans mounted on double extended shaft.
3. Filters: Throwaway type fiberglass.
4. Coil: Seamless copper tubing and aluminum fin heating element
5. Controls: interface with the building automation system.

B. Ductless Split System: Mitsubishi.

1. General: Ceiling recessed indoor evaporative blower unit with matching outdoor condenser-compressor unit
2. Controls: Microprocessor remote control with automatic cooling/heating changeover capability.
3. Low ambient kit to allow condenser-compressor to operate down to 0 degrees F.
4. Integral condensate pump.

C. Fan Coil/Blower Coil Unit: Trane

1. Type: Water with outside air and without outside air.
2. Cabinet:
   a. Steel, finished with baked enamel of color selected by Architect. Removable front panel.
   b. Steel bar-type discharge grille for exposed units.
   c. Duct flanges shall be provided for concealed units**.**
3. Insulation: Cabinet thermally and acoustically insulated with closed cell insulation.
4. Water Coil: Seamless copper tubes mechanically bonded to aluminum fins, leak tested to 100 psig air under water. ARI certified capacities.
5. Fan: Aluminum or galvanized steel, forward curved, double width, centrifugal type, statically and dynamically balanced.
6. Motor: Multi speed split capacitor with UL listed thermal overload protection.
7. Filter: Throwaway glass fiber type.
8. Drain Pans: Galvanized steel or ABS main pan with closed cell insulation. Molded plastic auxiliary pan shall extend under all end-pocket piping and valving.
9. Damper: 18 gage motor operated to provide 25 percent maximum outside air. Gasketed along entire length to provide airtight seal when closed.
10. Outside Air Louver as applicable: Furnished by Mechanical Contractor.
11. Piping Package: Building Automation System installer shall supply fan coil unit manufacturer with a normally open, two way valve for the heating coil and a normally closed, two way valve for the cooling coil. Valves shall be electric and factory mounted by unit manufacturer. The piping packages shall be arranged to supply the heating coil and the cooling coil from opposite ends and shall be provided complete with combination stop and balancing valve, stop valve and automatic air vent for each coil.
12. Unit Heater: Steel cabinet with baked enamel finish, aluminum or steel propeller type fan with removable wire fan guard, adjustable discharge louver (horizontal arrangement) or cone (vertical arrangement), seamless copper tubing with aluminum fin heating element, leak tested at 300 psig. Trane.
13. Wall Hung Radiation, Hot Water: Furnish with full front and back panels with corner pieces, fillers, sleeves and end caps for individual or wall-to-wall application as required, finished in baked enamel in color to be selected, seamless copper tubing and aluminum fin heating element, manual control damper, sloped top outlet. Trane.
14. Wall Insert Heater, Hot Water: Recess mounted, tamperproof steel front cover with down flow discharge louver, aluminum or steel propeller fan blades, baked enamel finish, seamless copper tubing and aluminum fin heating element. Beacon/Morris.

BUILDING AUTOMATION SYSTEM

System Description

A. A complete Building Automation System (BAS) will be provided that is capable of directly networking through either the Internet. This system will be capable of controlling the operation of all HVAC equipment, including monitoring of actual conditions, set points and control of equipment with factory-packaged controls.

Design Criteria

Material and Equipment Specifications

A. Furnish and install a complete direct digital control (DDC) building automation system (BAS). System shall be complete in all respects including all labor, materials, equipment and services necessary, and shall be installed by personnel regularly employed by system manufacturer. The system shall be a web based system or web browser with an open standard protocol for BACNet over IP on the Ethernet level.

B. Building automation system (BAS) shall be an extension of the existing system as manufactured by Automated Logic. New control equipment shall be manufactured by the existing system manufacturer and include all devices, materials, and software modifications required to accomplish the specified sequence of operation. Connections shall be made to the existing system as required and equipment shall be installed by personnel regularly employed by system manufacturer.

TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEM

A. Testing, adjusting and balancing (TAB) of the air and water distribution systems will be provided by an independent air balance and testing agency certified by AABC, NEBB, or TABB.

B. The TAB contractor will be procured by the Contractor and approved by the Engineer.

C. Heating, ventilating, and air conditioning equipment shall be completely installed and in continuous operation as required to accomplish the test and balance work specified.

D. TAB shall be performed at the end of each phase of construction, prior to occupancy, verified for all phases at the completion of construction, and when outside conditions approximate design conditions indicated for heating and cooling functions.

E. Certified TAB reports shall be submitted within thirty days after substantial completion of the project.

ELECTRICAL

Existing Conditions

The existing electrical service for the building is fed from an exterior PP&L pad-mounted transformer located to the north of the existing mechanical/electrical room. The building service (480Y/277 volts) is fed underground from this transformer to a main 1600-amp Square D fused switch compartment which in turn feeds a Square D switchboard section, all located along the north wall of the existing mechanical room.

The existing switchboard serves large mechanical loads (existing heating & ventilating units) and branch panelboards within the existing building. Step-down transformers provide 208Y/120-volt power for receptacle branch panelboards.

An existing indoor 15kW natural gas generator provides emergency power for the building.

Demolition

The existing electrical systems are at or past their expected service lives. All existing normal and emergency power distribution equipment within the building will be removed in its entirety.

Removal of existing equipment will be coordinated with the proposed phased construction. The existing service and distribution equipment will remain energized until an electrical room addition is constructed to allow for transfer of service from existing to new location. Removal and installation of all electrical work will be sequenced to allow for minimal outages to the facility throughout the construction.

ELECTRICAL BASIC MATERIALS

Material and Equipment Specifications

A. Access Panels: 18 inch by 18 inch minimum size, type and fire rating to match application. Furnish and install in ceilings and walls for service and repair access to concealed equipment.

B. Boxes: Outlet boxes shall be of galvanized steel, bonded to ground. Furnish and install ganged boxes where more than one device is shown at same location.

1. Mounting Heights: Measured to centerline as follows, unless noted otherwise:
   a. Wall Receptacles: 18 inches above finished floor.
   b. Wall Receptacles, Above Countertops: 6 inches above backsplash.
   c. Wall Receptacles, Exterior Weatherproof: 24 inches above finished grade/roof.
   d. Wall Switches: 44 inches above finished floor.

C. Danger/Warning Labels for Electrical Equipment That Can Be De-energized: Premium polyester with clear over-laminate, self-adhering label, minimum 4 inches wide by 2 inches high, wording message on label to read: “HAZARDOUS VOLTAGE. Disconnect power before servicing”. Place on electrical equipment that can be de-energized for examination, adjustment, servicing, repairing, maintenance, modifying, installing components within, etc. Clarion Safety part no. H6010/6058.

D. Danger/Warning Labels for Electrical Equipment That Cannot Be De-energized: Premium polyester with clear over-laminate, self-adhering label, minimum 4 inches wide by 2 inches high, wording message on label to read: “ARC FLASH AND SHOCK HAZARD. WILL CAUSE SEVERE INJURY OR DEATH. FOLLOW ALL REQUIREMENTS FOR SAFE WORK PRACTICES AND PERSONAL PROTECTIVE EQUIPMENT.”. Place on electrical equipment that cannot be de-energized for examination, adjustment, servicing, repairing, maintenance, modifying, installing components within, etc. Clarion Safety custom labels, or as approved.

E. Detectable Warning Tape: Install continuously above all underground raceways, 12 inches below finished grade on 12 inch centers as required to cover overall width of conduits. Tape shall be 6 inches wide, 4.5-6 mils thick, color-coded and labeled as follows:

1. Red for power with permanent black lettering to read, “CAUTION - BURIED ELECTRIC LINE BELOW”.
2. Orange for telecommunications with permanent black lettering to read, “CAUTION - BURIED TELECOMMUNICATIONS LINE BELOW”.

F. Equipment Backboards:

1. Material: 3/4 inch fire resistive plywood, with beveled edges and square cut corners. Plywood shall be type A/C or better with “C” side towards wall.
2. Backboards shall be sized as required for mounting of electrical equipment at specific locations. Anchor backboards securely to building structure.
3. Plywood shall have two coats of white fire retardant paint, both sides.
4. Where used for telecommunications, shall have ‘D’ rings, spools, etc., as required for installing wiring neat and orderly.

G. Equipment Nameplates: Laminated phenolic, two outer layers of white phenolic and an inner layer of black with engraving depth to the inner layer. Coordinate with Department for nameplate designations.

H. Grounding System: Continuous from all electrical items to the system main ground point, in accordance with the NEC.

I. Penetrations, Fire or Smoke-rated:

1. Seal annular space with fire stop sealing system, UL listed as a "Fill, Void or Cavity Material." and tested per ASTM E 814.
2. Penetration fire stop sealing systems shall be identified on both sides with permanently mounted, preprinted vinyl labels which include the following information:
   a. The words “Warning: Through Penetration Firestop System – Do Not Disturb” or similar phrase
   b. Manufacturer’s brand name, product type or catalog number
   c. Testing agency designation and rating
   d. Installer’s Name
   e. Installation Date

J. Penetrations, Non-rated: Pack annular space with fiberglass insulation.

K. Raceway

Application	Raceway Type
Areas subject to mechanical damage, unless noted	Rigid Metal Conduit (RMC)
Branch circuit wiring concealed in walls & above ceilings	Electrical Metallic Tubing (EMT)
Connections to recessed lighting fixtures, maximum 6 feet in length	Flexible Metal Conduit (FMC)
Connections to motors, pipe mounted equipment and equipment exposed to vibration, maximum 2 feet in length	Liquid Tight Flexible Metal Conduit (LFMC)
Connections to modular furniture and power poles	Flexible Metal Conduit (FMC)
Exterior, exposed	Rigid Metal Conduit (RMC)
Fished within existing furred concrete and concrete block walls	Flexible Metal Conduit (FMC)
Interior, exposed within an area between floor and 4 feet above floor	Rigid Metal Conduit (RMC)
Interior, exposed at ceiling and above 4 feet above floor	Electrical Metallic Tubing (EMT)
Interior, under concrete slabs on grade	Polyvinyl Chloride Sch 40 (PVC)
Underground encased in concrete	Polyvinyl Chloride Sch 40 (PVC)
Under exterior concrete slabs on grade & encased in concrete	Rigid Metal Conduit (RMC)
Within rooms in lieu of EMT and wire for #10 wire and smaller from the first junction box or outlet box in the room after the branch circuit home run wiring enters the room	Metal-clad (MC) and Armor-clad (AC) cable

1. All conduits shall be minimum 3/4 inch.
2. All normal emergency and emergency only system wiring shall be installed in electrical metallic tubing (EMT).
3. All conduits and wiring shall be run concealed, unless otherwise noted.
4. Electrical metal conduit (EMT) and wire shall be installed for all branch circuit homerun wiring from the panelboard to the first junction or outlet box within the room as well as between rooms on the same circuit. The first junction box or outlet box shall be located within the room where the utilization equipment and wiring devices, etc., are located.
5. MC and AC cables supplying patient care area receptacles shall be hospital grade.
6. Conduit connectors shall be insulated throat type.

L. Sleeves: Galvanized steel pipe, square cut with smooth edges, minimum 2 inches larger than outside diameter of conduit or EMT, flush with finished wall faces, extended 2 inches above finished floors. Core-drilled openings above grade in solid concrete need not be sleeved, but must be clean and neat.

M. Wire and Cable, 600 Volts and Below

1. Shared neutral conductors will not be permitted. Each branch circuit phase conductor shall be paired with a dedicated neutral conductor along its entire path
2. Type MC cable shall only be used for final connection (maximum six feet in length) to recessed lighting fixtures or to fish down to devices in existing walls.
3. Wire shall be not less than 98 percent conductivity copper, type THW or THHN/THWN insulation rated for 75 degrees C, 600 volt. Minimum size for branch circuits shall be #12 AWG. Minimum size for control wiring shall be #14 AWG. 24 volt wiring shall be solid copper, minimum size - #18 AWG.
4. Minimum power wire size shall be #12 AWG. Wire sizes #8 AWG and larger shall be stranded. Sizes #10 and smaller for power and lighting circuits shall be solid conductor, unless otherwise specified.
5. Minimum size for control wiring shall be #14 AWG, except 24 volt and below. All control wiring shall be stranded.
6. Aluminum conductors will not be permitted.

Field Quality Control

A. Inspection and testing of all applicable electrical equipment shall be done in accordance with the latest version of NETA Acceptance Testing Specifications.

B. Perform system function tests upon completion of the equipment tests as outlined. It is the purpose of the system function tests to prove the correct interaction of all sensing, process, and action devices.

LOW-VOLTAGE ELECTRICAL DISTRIBUTION, 600V AND BELOW

System Description

A. Building Service

1. The building will be served by a 277/480 volt, 3-phase, 4-wire, 1200 ampere underground service from the existing utility owned (PP&L) pad mounted transformer located on northeast side of the building.
2. Modification to the underground service conduit routing will be required to accommodate the electrical room addition, and to coordinate with the project's proposed phased construction.

B. Normal Power Distribution

1. 480/277 Volt
   a. A single-ended, front accessible-only, 1200 ampere, 3-phase, 4-wire, 480/277 volt switchboard will be installed as the main 480/277 volt switchboard. The switchboard will contain a draw-out, electronic trip, main circuit breaker and digital power monitor connected to the Owner's telecommunication network. The main and distribution circuit breakers in the switchboard will have ground fault protection.
   b. The main switchboard will house distribution breakers to serve 277/480 volt panelboards (as listed below), a 225 kVA step-down transformer for 208Y/120 volt power, an elevator, two automatic transfer switches, and a rooftop top chiller.
   c. The switchboard will be provided with future provisions for a minimum of two (2) 400-amp rated distribution circuit breakers.
2. 120/208 Volt
   a. The 800 ampere, 3-phase, 4-wire, 208 volt distribution panelboard will contain a main circuit breaker and digital power monitor.
   b. The panelboard will supply normal power to panelboards throughout the building.
   c. Panelboard locations and areas served by branch panels will be coordinated with phased construction.
3. Preliminary schedule of normal power switchboard and panelboards will be as follows:

Ampacity	No. of Sections	No. of Poles	Location/Area Served	Service
1200A	-		Main Elec Rm	480Y/277V switchboard
300A	1	42	Roof Mech Equip	480Y/277V
300A	1	42	Lower Level Mech Equip	480Y/277V
80A	1	42	Lighting	480Y/277V
80A	1	42	Lighting	480Y/277V
80A	1	30	Exterior Ltg & Tennis Courts	480Y/277V
800A	-		Main Elec Rm	208Y/120V switchboard
225A	1	42	Lower Level Kinesiology	208Y/120V
150A	1	42	Upper Level Offices/Classrm	208Y/120V
125A	1	42	Aux Gym/Fitness/Lockers	208Y/120V
125A	1	42	Main Gym/Equip Storage	208Y/120V
100A	1	30	Mech Room	208Y/120V
100A	1	30	Misc/TBD	208Y/120V
150A	1	42	Perkins Renovations/C-Store	208Y/120V *

* Feed from existing Perkins Building power distribution system

C. Emergency Power Distribution

1. The emergency power distribution system will be separated into two systems, the Life Safety System and the Equipment System (EQ). The Life Safety System will consist of lighting and equipment code required to accommodate safe egress from the building in the event of an emergency/power failure.
2. Wiring for lights and equipment on either emergency-only or normal-emergency power will be run in non-flexible metal raceways. This wiring will be kept independent of all other wiring and equipment and will not enter the same raceways, boxes, or cabinets with each other or other wiring, except in transfer switches, bypass/isolation switches, or lighting fixtures supplied from two sources.
3. 480/277 Volt Distribution
   a. Two automatic transfer switches will be installed, one for life safety and equipment systems.
   b. Each transfer switch will supply a 480/277 volt, 3-phase, 4-wire distribution panel rated the same as its transfer switch.
   c. Each distribution panelboard will supply a 120/208 volt distribution panelboard via a step-down transformer.
   d. The life safety panelboards will supply 480/277 volt lighting panelboards throughout the building.
4. 120/208 Volt Distribution
   a. 120/208 volt distribution panels for the life safety and equipment branches will be provided.
   b. Each distribution panelboard will supply 120/208 volt panelboards for miscellaneous loads required to be on emergency power.
5. Preliminary schedule of emergency power panelboards will be as follows (LS = Life Safety; EQ = Equipment/Standby):

Ampacity	No. of Sections	No. of Poles	Location/Area Served	Service
200A	1	42	Emergency Elec Rm	480Y/277V (EQ)
60A	1	30	Emergency Elec Rm	480Y/277V (EQ)
80A	1	30	Emergency Elec Rm	208Y/120V (EQ)
40A	1	24	Upper Level Misc/TBD	208Y/120V (EQ)
60A	1	30	Emergency Elec Rm	480Y/277V (LS)
40A	1	24	Upper Level/Lighting	480Y/277V (LS)
60A	1	30	Emergency Misc Loads	208Y/120V (LS)

D. Existing Perkins Building

1. Electrical work will be required within the existing adjacent Perkins Building. Provide panelboard to service loads for the new C-store, and make modifications as required to allow for the community center 2-story building connection
2. The C-store power will originate from the existing Perkins Building distribution system and be provided with sub-metering equipment.

E. Grounding and Bonding

1. Separate grounding conductors will be installed in all raceways.
2. All electrical equipment in the building will be connected to the main switchboard grounding bus bar.

3. A telecommunication grounding bus bar will be installed in the Data Room. The telecommunication bus bars will be connected to the main switchboard.

F. Wiring Devices

1. General lighting and receptacle loads will not be connected to the same branch circuits.
2. Each room will contain at least one receptacle on each wall longer than 5 feet. Walls longer than 30 feet will have multiple receptacles.
3. Each desk location will be provided a duplex receptacle.
4. Receptacles located within 6 feet of sinks and exterior to the building will be the GFCI-type.
5. Corridor receptacles will not be spaced greater than 30 feet on center.
6. An emergency duplex receptacle will be installed at each group of panelboards or in each electrical room or closet.
7. Double duplex receptacles will be installed 6 feet on-center around the perimeter of each Data Room. Each double duplex location will have a dedicated homerun.
8. Ceiling receptacles for ceiling mounted projectors will be installed in classrooms, conference rooms, and the other spaces as defined by the Owner.
9. Receptacles will be installed 18 inches above finished floor and 6 inches above countertop backsplashes. Receptacles shall be oriented with the “ground” insert above the phase inserts.
10. Receptacles will be labeled with the panel designation and circuit breaker number on the wall plate.

Material and Equipment Specifications

A. Combination Motor Starters: Switch type, non-reversing, class ‘R’ fuse holders as scheduled on the Drawings, Square D Class 8538 or Siemens, Eaton Cutler-Hammer, General Electric.

B. Disconnect Switches: Heavy duty, fusible, NEMA 1 or 3R for interior and exterior locations. Square D, or Siemens, Eaton Cutler-Hammer, General Electric.

C. Manual Motor Starter with Overloads: Square D Class 2510, single-speed, and Class 2512 two-speed. 120/240 volts AC, single phase, or Siemens, Eaton Cutler-Hammer, General Electric.

D. Overcurrent Protective Devices: Type RK5 fuses, circuit breakers same manufacturer as switchboards and panelboards.

E. Panelboards, 120/208 volt: 42 and 84-pole, double section, 3-phase, 4-wire, with copper bus and bolt-on circuit breakers and main lugs, hinged covers with or without integral hinged doors typewritten circuit directories for all panelboards. Square D Type NQ, or Siemens, Eaton Cutler-Hammer, General Electric.

F. Panelboards, 277/480 volt: 42-pole, single section, 3-phase, 4-wire, with copper bus and bolt-on breakers and main lugs, hinged covers with or without integral hinged doors, typewritten circuit directories for all panelboards. Names of panels to be as directed by Owner. Square D, or Siemens, Eaton Cutler-Hammer, General Electric.

G. Switchboard, Interior: Front accessible, completely self-supporting with number and type of sections as required, full height isolation between sections, constructed of steel or plastic non-flammable insulation, plastic insulated barrier enclosing crossover bars between sections, side, top, and rear panels removable screw-on code gage steel plates, panel mounted devices. Square D, or General Electric, Siemens, Eaton Cutler-Hammer.

H. Surge Protection: Provide integral to main switchboard.

I. Power Factor Correction: Allow for circuit breaker space in switchboard to feed future power factor correction equipment. The need for this equipment will be confirmed once the building is renovated and in operation for six (6) months. A power factor of less than 0.95 will require correction to be provided at that time.

J. Transformer, Step-Down: Floor-mounted, dry-type, wye-delta, isolation transformer with 480 volt primary and 120/208 volt secondary and 2.5 percent +/- taps.

K. Wiring Devices and Wall Plates

1. Wiring devices shall be specification grade, color as selected for normal devices and red in color for devices on the normal emergency circuit. Hubbell, Leviton, P&S, or Bryant, unless specified otherwise.
2. Receptacles, GFI: 20 amperes, duplex, 125 volt, 2 pole, 3 wire, grounding, NEMA 5-20R, grounding fault circuit interrupter (GFCI), weather-resistant where applicable. Hubbell GF5362, GF8300, or SNAPConnect™ Series.
3. Receptacles: 20 amperes, duplex, 125 volt, 2 pole, 3 wire, grounding, NEMA 5-20R. Hubbell 5362, 5252, 8310 Series, or SNAPConnect™ Series
4. Switches: 20 amperes, 120/277 volt, specification grade, quiet, single or double pole, three-way or four-way as required. Hubbell 1221 Series.
5. Wall Plates, Exterior: NEMA 3R rating while in use, hinged cover/enclosure marked “Suitable for Wet Locations While in Use”, gasketed, UV stabilized polycarbonate and impact resistant, vertical mount.
6. Wall Plates, Interior: Brushed stainless steel.

ELECTRICAL POWER GENERATING EQUIPMENT

System Description

A. One 150 kW, 480/277 volt, 3-phase, 4-wire, diesel fueled, standby emergency generator will be installed outdoors in a sound attenuated enclosure to supply emergency power for egress lighting, fire alarm system, heating systems, and select standby equipment as defied by the Owner.

LIGHTING

System Description

A. Lighting throughout the building will be primarily by 277 volt LED fixtures.

B. Lighting Fixture Applications

Areas	Fixture Type/Description
Non-public corridors, toilet rooms and "back-of-house" spaces with finished ceilings	2x2 foot, recessed LED troffer or LED downlights.
Electrical and mechanical rooms, telecommunication rooms, elevator machine rooms, and other "back-of-house" spaces without finished ceilings	4ft, surface mounted LED, impact resistant, industrial fixtures for general lighting.
Public corridors, offices, multi-purpose rooms, waiting areas and common areas	2x2 foot, recessed, LED architectural troffer; recess linear narrow LED; and/or LED architectural downlights.
Lobbies / Entries	Architectural LED downlights; architectural LED pendants; recessed linear narrow LED; decorative wall sconces/downlights; and/or other decorative lighting fixtures as defined in next design stage.
Locations with wall cabinets	Solid-front under cabinet LED task lights, acrylic prismatic lens, integral rocker switch.
Toilet rooms, individual	Linear recessed LED fixtures; LED downlights; and/or wall mounted LED vanity lights above sink mirrors.
Stairs	4 foot wall mounted LED fixtures at landings.
Auxiliary Gym	High output LED high bay lighting fixtures.
Performance Gym	Investigate possible replacement of existing high bay fluorescent T5 lighting fixtures in next design phase. The existing gym fixtures have been replaced over the years, and are in good condition.

1. Exterior Lighting :
   a. Pathway lighting will be provided along sidewalks.
   b. Building mounted exterior lighting will be provided at all building entrances.
   c. Pole mounted, sharp cut off type site lighting will be provided for all parking and driveway areas, coordination with existing campus site lighting fixtures.
   d. Tennis Courts – Exterior pole mounted, high output LED lighting fixtures for proper court illumination.

C. Lighting Control

1. Each room/area will be controlled by at least one wall switch located within the room/area.
2. Dimmable lighting will be installed throughout.
3. Most rooms will have ceiling mounted dual-technology occupancy sensors and controls except for electrical and mechanical rooms, and public corridors. Multiple sensors will be utilized in large rooms/areas.
4. Small rooms will utilize wall-mounted passive infrared wall switches.
5. Wall switches will be installed 44 inches above finished floor.
6. Building wide lighting controls will be provided for all public spaces for automatic control via occupancy or time-of-day programming. Wattstopper DLM system, or approved equal.

D. LED edge-lit exit signs will be installed throughout the building.

Design Criteria

A. Design types and quantity of light fixtures in each space in accordance with lighting power densities limits listed in ASHRAE 90.1.

SPECIAL SYSTEMS

System Description

Contractor will furnish and install a system of conduits, outlet boxes, and wiring for installation of an elevator.

Elevator power circuit shall include a horsepower rated, 3-pole, fusible switch with a shunt trip device having a normally open auxiliary contacts for interfacing with the battery back-up for elevator lowering.

Material and Equipment Specifications

A. Elevator Power Disconnect Module: Bussman Power Module Switch, or Ferraz-Shawmut

LIGHTNING PROTECTION

System Description

Contractor will furnish and install a lightning protection system consisting of rooftop air terminals, roof HVAC equipment air terminals, downleads, perimeter ground rods and all interconnecting conductors.

Material and Equipment Specifications

Lightning Protection System: UL Master label.

COMMUNICATIONS

Systems Description

The existing telecommunication system in the building will be upgraded to comply with current PSU-TNS standards. The telecom service will enter the building in the northeast portion of the upper level. A telecom room centrally located on the upper level will be investigated to allow for a single room to service the entire facility.

CABLING

System Description

A. A conduit, box and raceway system will be installed for Owner furnished and installed data system wiring and equipment. The Contractor will provide the following:

1. Outlet boxes, device rings, and conduit rough-ins at all telecommunications outlet locations.
2. Raceways and pathways for backbone cables and horizontal distribution cables throughout the building including conduit risers and sleeves.
3. Conduit raceways in all areas with non-accessible ceilings and exposed structure.
4. Racks to support communications cable terminations and Owner-furnished and installed equipment.
5. Cabinets to support Owner-furnished and installed equipment.
6. Category-rated copper patch cords, equipment cords and work area cords for connection of horizontal distribution cables to Owner-furnished and installed equipment.
7. Fiber optic patch cords and equipment cords for connection of backbone cables to Owner-furnished and installed equipment.

B. Outlet Locations

1. Telecommunication outlets will be provided at each work station, in classrooms, and in support areas.
2. A wall-hung telephone wall outlet and combination telephone and data outlet will be installed in each of the following areas:
   a. Conference Rooms
   b. Training Rooms
   c. Fitness Rooms
3. Eight-foot high, fire-rated plywood backboards painted white will be installed around the perimeter of all Data rooms.
4. Conduit sleeves will be installed above all non-accessible ceilings where telecommunication system cabling is installed.
5. A non-continuous cabling system of cable J-hooks will be installed above accessible ceiling for routing of low-voltage telecommunication system cabling. Separate J-hooks will be installed for each low-voltage system type.

C. Grounding and Bonding

1. A telecommunications main grounding bus bar will be installed in the building main distribution frame (MDF) room. Telecommunications grounding bus bars will be installed in each intermediate distribution frame (IDF) room. A #6 AWG (minimum) telecommunications bonding conductor will be installed from the main grounding bus bar to the electrical switch gear in the main electrical room.

Material and Equipment Specifications

A. Backbone Cabling: Multi-mode and single mode fiber backbone cable.

B. Conduits: 1 inch minimum, with plastic bushing protector on the stubbed out end of conduit.

C. Raceway, Wire, Wire Connections and Bus Bars: Requirements and sizes specific for communications cable system installation.

D. Cabinets: 19 inch mounting rails, 24 inches wide x 84 inches high x 32 inches or 48 inches deep, typical (sizes to be coordinated with Owner), steel frame construction, steel side/end panels, fully height perforated front and rear doors, solid steel top, adjustable foot base, power distribution units (as coordinated with Owner). Dell, or HP, APCC, Great Lakes.

E. Cable Management Hardware: Horizontal units 2 rack units high, front and rear management, typical. Vertical units full rack height, six inches wide, typical. CPI, Homaco, or Cooper/B-Line, Hubbell, Leviton, Ortronics.

F. Cable Supports: Non-continuous raceway (J-hooks) or similar system, typical. Cable tray in telecommunications rooms and as required by Owner.

G. Connecting Cords: Category 6 rated patch cords and equipment cords, typical. Fiber patch cords as required by Owner to connect Owner-furnished and installed equipment. Hubbell, or Leviton, Ortronics.

H. Faceplates and Connectors: Single gang faceplates, single port, stainless steel faceplates for wireless access point outlets above the ceiling, stainless steel or plastic faceplates for wireless access point outlets mounted in the ceiling or below ceiling, Category 6 8P8C (RJ-45) jacks. Hubbell, or Leviton, Ortronics.

I. Horizontal Distribution Cable: Category 6 rated, 4-pair unshielded twisted pair, 23-24 AWG solid copper conductors (conductor size as required to meet Category 6 performance), plenum cable construction. CommScope, or Hubbell, General Cable, Superior Essex, Berk-Tek

J. Outlet Boxes: 4-11/16 inch x 4-11/16 inch square, 2-1/8 inch deep out box with a single or double gang plaster ring as required by outlet type.

1. Mounting Heights: Measured to centerline as follows, unless noted otherwise:
   a. Wall Outlets: 18 inches above finished floor.
   b. Wall Outlets, Above Countertops: 6 inches above backsplash.
   c. Wall Hung Telephone Outlets: 44 inches above finished floor.

K. Patch Panels: Category 6 Rated, 8P8C (RJ-45) jack to 110-type punch-down termination, 48-port, typical. Hubbell, or Leviton, Ortronics

L. Penetrations: 1.5 x 1.5 inch square aluminum sleeve system installed above all accessible ceilings and doors in walls extending to underside of structure, regardless of whether or not the walls are fire or smoke rated. Specified Technologies Inc. (STI) EZ Path System.

M. Uninterruptible Power Supply (UPS) Units: 120 volt or 208 volt input, 120 volt or 208 volt output, rack

mount system, double conversion on-line system. Input/output voltages, quantity and type of output receptacles to be coordinated with Owner. Liebert, or APCC, MGE

Testing, Identification and Documentation

A. Testing, Copper: Continuity testing for non-category rated copper cables as required for copper backbone cables. Performance testing to Category 6 standards for Category rated copper horizontal distribution cables.

B. Testing, Fiber: Power loss (attenuation) testing for fiber cables as required for **[relocated]**fiber backbone cables

C. Identification and Documentation

1. Cable and outlet labeling
2. Record drawings to include outlet and cable identification and installed cable locations.

D. Copy of record drawings to be made available to Owner for connection of Owner-furnished and installed equipment.

AUDIO-VISUAL COMMUNICATIONS

System Description

A. Multi-media Support Systems

1. A multi-media interface, audio amplification and multi-media control system for Owner furnished and installed classroom projectors will include ceiling mounted projector media interface outlets, wall mounted source equipment interface outlets, wall mounted interface outlets and interface cables as coordinated with the Owner. The system will include wall mounted controls and ceiling or projector pole mounted audio amplifiers and audio video control system for input selection and volume control of the Owner furnished and installed projector and media source equipment. The system will also include ceiling mount speakers (two per classroom typical) connected to the ceiling mounted audio system amplifier as required by room layout and configuration and as coordinated with the Owner.

Material and Equipment Specifications

A. Boxes: 4-11/16 inch x 4-11/16 inch square, 2-1/8 inch deep out box with a single or double gang plaster ring as required by outlet type.

B. Conduits: Minimum 1 inch conduit with plastic bushing on the stubbed out end of conduit.

SAFETY AND SECURITY

Systems Description

An access control and security system, including connections to the Owner's central monitoring location, will include security/access control panels, cameras, card readers, door contacts, security system power supplies, wiring and cabling. The system will include all wiring and cabling as required to connect door hardware power supplies and electric door hardware. The contractor will test the installed system in coordination with the general contractor to verify proper system operation.

FIRE DETECTION AND ALARM SYSTEM

Existing Conditions

The existing Simplex zoned fire alarm system and components to be removed and a new system provided.

System Description

A. An addressable fire alarm system will be provided with central fire alarm control panel, remote panels, initiation devices, automatic detectors, monitoring devices, relay devices and notification appliances as required by code. Notification appliances will be grouped by zone as required by code and as coordinated with the Local Authority Having Jurisdiction.

B. The fire alarm system will be furnished and installed in accordance with the requirements of NFPA 72-National Fire Alarm Code.

C. A remote fire alarm annunciator will be installed at the main entrance.

D. Manual fire alarm pull stations will be furnished and installed at exits, at doors entering stairwells and other locations along egress path as required by code.

E. Smoke detector and heat detectors will be furnished and installed as required by code and as required by the Owner.

F. Duct smoke detectors will be installed as required to shut down air handling units.

G. Sprinkler system water flow and tamper switches will be monitored by the fire alarm system.

H. Audible and visual notification devices will be installed as required by code in all public, common areas, and staff work areas. Audible and visual notification devices will not be installed in private offices.

I. Fire alarm system magnetic door holders will be installed to close smoke control doors upon activation of the fire alarm system.

J. The Contractor will furnish and install all connections required for communications between the fire alarm control panel and the remote monitoring system.

Material and Equipment Specifications

A. Fire Alarm Control Panel (FACP): Panel capacity as required by overall system size (initial and planned expansion), battery backup, local front panel annunciator. Siemens MXL system.

B. Digital Communicator (DACT): Same manufacturer as FACP manufacturer.

C. Extender Panels: Same manufacturer as FACP manufacturer.

D. Audio/Visual and Visual only Alarm Devices: Same manufacturer as FACP manufacturer.

E. Manual Pull Stations: Single action manual pull station with key reset. Same manufacturer as FACP manufacturer.

F. Smoke Detectors: Photo-electric type smoke detectors. Same manufacturer as FACP manufacturer.

G. Heat Detectors: 135 degree rate of rise, 200 degree fixed temperature. Same as FACP manufacturer.

H. Duct Detectors: Duct mounted detector head and sampling tubes, remote relay for control of HVAC equipment, remote test and indicator lamp device. Same manufacturer as FACP manufacturer.

I. Addressable Interface Modules: Monitoring modules and relay modules. Same manufacturer as FACP manufacturer.

J. Wiring

1. Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
2. All interior wiring shall be installed in electrical metallic tubing (EMT).

Testing

A. All connected fire alarm devices shall be tested for operation, proper programming, and verified to meet proper sequence of operation. Printout of test showing test of all these devices and interconnected systems shall be provided. Test shall include all detectors, pull stations, duct smoke detectors, associated fan shutdown, any fire alarm sub-system interconnection, etc. Final fire alarm testing shall be completed in the presence of a representative from the Owner with sufficient prior notification.

HVAC Concept Diagram

The HVAC concepts for the building described in the above narrative are shown on the 2 plan diagrams that follow on the next 3 pages.