A photograph of a modern brick university building with a paved walkway and students sitting on benches. The building is multi-storied with large windows and a mix of brick and light-colored panels. In the foreground, a wide, light-colored paved walkway runs alongside the building. Several students are sitting on wooden benches along the walkway. In the background, other university buildings and a clear sky are visible.

SUMMARY OF QUALIFICATIONS **HIGHER EDUCATION**

bkm

Section One
FIRM PROFILE



bkm

Firm Profile

Burdette, Koehler, Murphy & Associates Inc. (BKM) is a Small Business engineering firm providing mechanical, electrical, and plumbing solutions to further our clients’ missions.

Based in Baltimore, Maryland and with an office in Norfolk, Virginia, our team of 114 professional and technical staff includes 41 registered engineers, 17 EITs, and 23 LEED Accredited Professionals. Our engineers have extensive experience across education, government, healthcare, science & technology, commercial, and mission critical sectors, and are deeply knowledgeable of the codes and regulations our work must satisfy.

BKM was founded in 1968 with core values of transparency, responsiveness, extreme diligence, and the celebration of great ideas. Today, James L. Barrett, Jr., Mark A. Flickinger, and Anthony R. Page lead the firm with these values instilled in everything we do. From the management-level professionals actively involved in every project to the innovative solutions we develop for our clients, exceeding expectations is always our goal.

Throughout the Baltimore region—and beyond—BKM’s work at schools, public safety buildings, research laboratories, medical centers, even Camden Yards is well established. We’re proud of

that, but we’re more proud that our work helps each organization continue its work.

We owe our success today to our founders—John C. Burdette, Jr., Louis A. Koehler, Jr. and Thomas V. Murphy, Jr.—to the BKM employees who have brought their energy and enthusiasm to work every day, and to our clients who have trusted us to design their greatest ideas.

Collaboration is at our core.

With collaboration at our core and a 56-year legacy of responding to our clients’ needs, we design MEP solutions that harmonize with their surroundings and further our clients’ missions.

We’re engineers who listen.

Our people make BKM the company it is. We’re a dedicated team of creative people who genuinely enjoy each other and solving problems together. Most of all, we love turning challenges into smart, practical designs that allow our clients to do their best work.

We work to enhance the everyday.

Buildings are living spaces. At BKM, we respond to our clients’ needs with mechanical, electrical, and plumbing solutions designed to support everyday life.

Every project is a partnership.

In our 57 years, collaboration has been crucial to helping our clients succeed. That’s why our team brings openness, responsiveness, and a transparent design process to every project.

Celebrating over 57 years of partnerships.

When BKM was founded on April 1, 1968, three Baltimoreans realized their idea of creating an engineering firm where collaboration, transparency, and responsiveness produced better MEP designs.

70%	MEP Prime Work Allocation
<1%	MEP Prime Change Orders
81%	Work from Repeat Clients
57	Years of Excellence
Certified Small Business	State of Maryland Small Business Reserve Program



Services

Mechanical Engineering

We tailor our mechanical design to meet the requirements of every project with a focus on indoor environmental quality, efficiency, maintainability, and flexibility. Our engineers recommend systems that will best serve the function of the space and provide the best possible environment for its occupants.

Electrical Engineering

At BKM, we understand the complexity of power systems and the responsibility owners face to provide service to a large number of users. Maintainability and energy efficiency are key aspects to our electrical system designs. Our engineers design safe, reliable, and efficient power distribution systems.

Additionally, we proudly offer extensive expertise in designing and implementing electric vehicle (EV) charging infrastructure solutions. With a deep understanding of the latest technologies and industry standards, our team of experienced engineers is equipped to provide customized solutions for a wide range of projects.

Low Voltage Design

Our designers provide a variety of services to fit our clients low voltage needs, including AV/IT and security systems.

Plumbing Engineering

Our engineers are well versed in plumbing and piping design allowing clients to rest easy in knowing we are looking out for their best interests. As with all other systems, plumbing must suit the client's objectives for sustainability, user convenience, cost constraints, and space limitations.

Lighting Design

Lighting design is an essential system merging science and art, engineering and architecture, functionality and aesthetics. Proper lighting design strikes a careful balance between the artistic vision of a space and the comfort, safety, and aspirations of its occupants. BKM is dedicated to providing an attractive and streamlined lighting design that is fully coordinated, sustainable, and economically attainable for our clients.

Building Assessments

Because of our thorough understanding of how the MEP systems are interrelated and how they affect decisions in other disciplines, our approach is inherently holistic. We can quickly recognize the positive and negative impacts of various decisions, helping our clients to work through the possibilities, clarify their vision, and then make it a reality.

Energy Modeling

BKM offers whole building energy analysis to satisfy the growing needs of building owners in an increasingly energy cost-conscious market. Building energy analysis plays a crucial role in the earliest stages of design, informing the building owner and design team of the true impact and value gained by various

siting, envelope, and MEP systems design strategies. Services can be provided to address the requirements of LEED Energy & Atmosphere, IgCC 2012, building life cycle cost analysis, building energy code compliance, and utility incentives and rebates.

CFD Modeling

CFD is an essential part of the design process for critical spaces. CFD allows us to optimize the design of a space by evaluating space configuration, airflow distribution, operating conditions, and energy consumption. We work with our clients to produce a design that is energy and cost effective while ensuring that the design can maintain the desired space setpoints.

Power System Studies

BKM understands the importance of electrical safety, maintenance, reliability, and asset protection within your facility. That's why we've placed an emphasis on our power systems studies program. Our Power System Engineers specialize in load flow, fault current, coordination, protection, and arc flash studies. Our goal is to minimize your down time while maximizing protection of your assets and personnel.

Commissioning

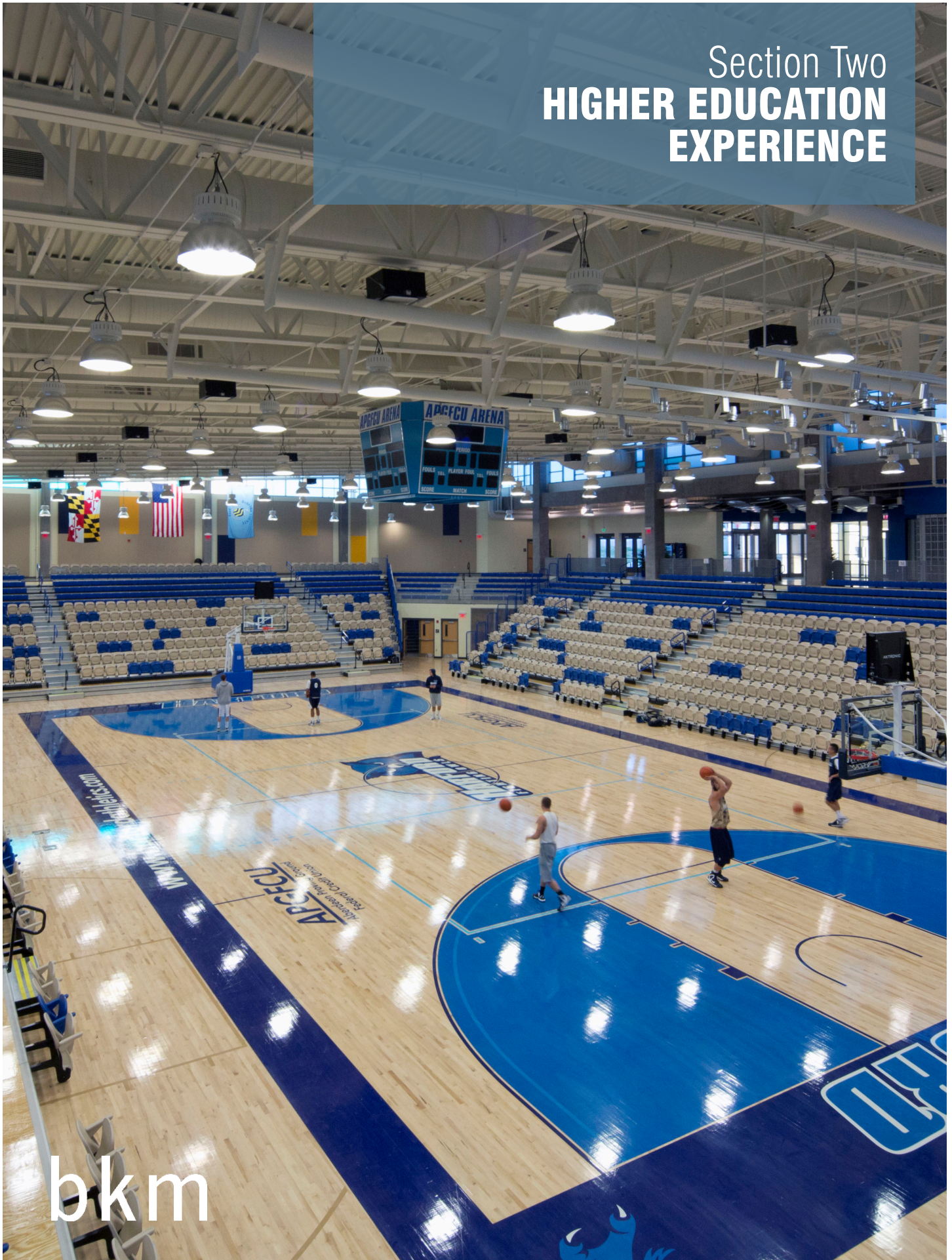
BKM's commissioning process ensures the owner receives the full benefit of their building systems, which are comprised of inter-related automation systems to maximize energy efficiency and occupant comfort. Our goal is to provide the building manager with the training and experience to monitor the facility and also be comfortable to modify the components to align with the occupant's changing needs throughout the building's life-cycle.

EV Charging Infrastructure Solutions

With a deep understanding of the latest technologies and industry standards, our team of experienced engineers is equipped to provide customized solutions for a wide range of projects, from commercial buildings to public parking facilities. We take a comprehensive approach to every EV charging station design aspect, including site selection, electrical and power systems integration, and network connectivity. Our commitment to innovation and sustainability ensures our clients benefit from the most efficient and reliable charging solutions.



Section Two
**HIGHER EDUCATION
EXPERIENCE**



bkm

Higher Education Experience

BKM has designed MEP systems for over 55 years with a multitude of experience in occupied, phased addition and renovation projects that include community colleges, universities, hospitals, public and private K-12 schools, government facilities, and laboratories. Over 80% of BKM's work focuses on renovations, including systemic upgrades and HVAC renovations. 70% of that work has been as the prime consultant giving us experience to both manage a project as well as work as a team partner as a sub-consultant.

We are highly experienced at working within tight budgets and schedules that usually accompany government and locally-funded projects. We understand the challenges associated with occupied renovations, especially in academic settings, which often require fast-track schedules, short durations, and summer construction in order to minimize interruptions to the safe, learning environment of students and administrators.

Higher Education Clients

- Allegany College of Maryland
- American University
- Anne Arundel Community College
- Bowie State University
- Cabrini University
- Carroll Community College
- Catonsville Community College
- Cecil College
- Chesapeake College
- Community College of Baltimore County
- Coppin State University
- Frederick Community College
- Frostburg State University
- Gallaudet University
- Garrett College
- George Mason University
- Georgetown University
- Harford Community College
- Johns Hopkins Bloomberg School of Public Health
- Johns Hopkins Facilities & Real Estate
- Johns Hopkins University
- Johns Hopkins University, Applied Physics Laboratory
- Johns Hopkins University, Montgomery County
- Johns Hopkins University, School of Medicine
- Juniata College
- Loyola University Maryland
- Maritime Institute of Technology
- Messiah College
- Montgomery College
- Morgan State University
- Mount St. Mary's University
- Penn State Health
- Prince George's Community College
- Salisbury University
- The Pennsylvania State University
- The Universities at Shady Grove
- University of Baltimore
- University of Delaware
- University of Maryland
- University of Maryland Baltimore
- University of Maryland Baltimore County
- University of Maryland Biotechnology Institute
- University of Maryland Center for Environmental Science
- University of Maryland College Park Facilities Management
- University of Maryland Eastern Shore
- University of Maryland School of Medicine
- University of Maryland University College
- University of the District of Columbia
- University of Virginia
- US Naval Academy
- Wor-Wic Community College



Independence Hall

University of Delaware, Newark, DE

BKM provided MEP design services for this 600-bed facility that is comprised primarily of semi-suites, each with a shared bathroom.

Two-story student lounges and smaller study lounges were provided in each wing on each floor of the facility. The ground floor includes 3 private residence apartments for the hall directors, 2 large central laundry rooms, and a 4,000-square-foot fitness center.

Chilled and heating water were extended from the campus central plant and provide heating and cooling for each suite via four-pipe vertical fan coil units in a back-to-back stacked arrangement, providing individual room temperature control throughout. Two 20,000 cubic feet-per-minute central station 100 percent outdoor air, air handling units were located in the building's attic, to provide conditioned ventilation air to each room, corridor, and various public spaces. Glycol recovery coils capture energy from the exhaust air to pre-treat the outdoor air. A floor-by-floor smoke control was provided in compliance with local codes. Power was extended from the central plant's 15kV gear, to serve a new 1,500 kVA pad mounted transformer, provide 480-volt secondary to the building's 2,000 Amp switchboard. A diesel generator provides emergency power for life safety functions, including the building's smoke control system. Special systems include fire alarm, voice, data, cable television, access control, and emergency phones.

The entire student housing complex at the University of Delaware's Laird Campus encompassed nearly 2,800-beds and with each building being served from a central plant. Under a separate contract, BKM provided the design to expand the central plant capacity to 3,750-tons of chilled water and 1,750 BHP of heating water.

SIZE

200,000 SF, 600-beds

COST

\$53 Million

COMPLETION

2008

PROJECT FOCUSES

Higher Education, Student Life

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design

ARCHITECT

Ayers Saint Gross



West Village Undergraduate Housing Phases I & II

Towson University, Towson, MD

Within this Capstone Development project, BKM provided MEP design services for four, 155,000 -square-foot podium buildings.

Each building has similar floor plans that house approximately 330 students. The buildings feature double rooms with private baths, three study lounges on most floors, and a large multipurpose room located on the first floor of each building. The security features include swipe-card access, one door entry, and 24-hour desk coverage. Phase II was designed to achieve LEED Silver certification. The sustainable features on this project include low cut-off site lighting fixtures, low flow plumbing fixtures, and a high efficient variable refrigerant flow heating, ventilating, and air conditioning system that seeks to attain over 20 percent energy savings above the standard American Society of Heating, Refrigerating, and Air Conditioning Engineers 90.1 baseline.

SIZE

Four buildings; 159,184 SF; 1,320-beds

COST

\$20.5 M (per phase)

COMPLETION

2008 (Phase One) 2011 (Phase Two)

PROJECT FOCUSES

Higher Education, Student Life

CAPABILITIES

Building Assessments, Mechanical Design, Electrical Design, Plumbing Design, Lighting Design, Sustainable Design

ARCHITECT

Design Collective, Inc.



Darden Residences

University of Virginia, Charlottesville, VA

BKM is providing MEP design services for the new Darden Graduate/Family Residences for the University of Virginia.

This project consists of a 231,000 GSF of 215 apartments with a 355 bed-count. Design services for this project include full MEP systems, including HVAC, plumbing, fire protection, direct digital controls, electrical service, power distribution, emergency power, fire alarm, lighting, and lighting controls.

Sustainability was at the forefront of this project, with design considerations made to achieve LEED V4 Platinum certification at the completion of the project.

SIZE

231,000 SF

COST

\$60 Million

COMPLETION

2022

PROJECT FOCUSES

Graduate Student Housing, Higher Education, Student Life

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design, Sustainable Design

ARCHITECT

Robert A.M. Stern Architects LLP



South Campus Commons

University of Maryland, College Park, MD

BKM provided MEP design services for this modern seven apartment-style student residence buildings that was developer led public-private enterprise. South Campus Commons was designed with easy access to the campus and downtown College Park.

These four- and five-story buildings are fully furnished two- or four-bedroom apartment suites with separate bedrooms for each student (totaling 2,250 private bedrooms). Amenities included a full kitchen, laundry, and living-dining areas. Extensive common space was provided to support the students' Living-Learning Program, featuring student lounges and administrative offices. Each

unit was complete with campus telephone, data hook-up, and cable TV. The first phase of this project included a central plant that served the Building 1 & 2 with a tie-in to the existing campus steam system where steam was converted to heating within a heat exchanger. The last phase, Building 7 was delivered ahead of schedule, under budget, and attained LEED Gold instead of the required Silver that was indicated in the project solicitation. The sustainable design solutions featured on this project include: high efficiency heat pumps, lighting fixtures, and domestic water heaters. Low-flow plumbing fixtures were provided for all faucets, toilets and showers. Fundamental and enhanced commissioning along with green power were included to attain the LEED Gold designation.

SIZE

790,000 SF, 2,250-beds, seven buildings

COST

\$125 M

PROJECT FOCUSES

Higher Education, Student Life

CAPABILITIES

Building Assessments, Mechanical Design, Electrical Design, Plumbing Design, Lighting Design, Sustainable Design



Conway School of Nursing

The Catholic University of America, Washington, DC

BKM provided the comprehensive design of MEP systems, energy modeling, and lighting design for the Conway School of Nursing Building.

Beyond the mechanical and electrical systems interior to the building, BKM coordinated the site work for dry electrical utilities and HVAC underground heating water and chilled water from the campus central plant. A new natural gas fired emergency power generator was provided. All new HVAC systems included all air and semi-custom

VAV air handling units, served by the campus central utilities. Plumbing systems included new compressed air and natural gas services to teaching laboratory spaces. Ventilation and freeze-resistant sprinkler piping were provided for an underground parking space below the building. Electrical and plumbing systems were integrated with the campus new gateway entrance and fountain.

SIZE

102,275 SF

COST

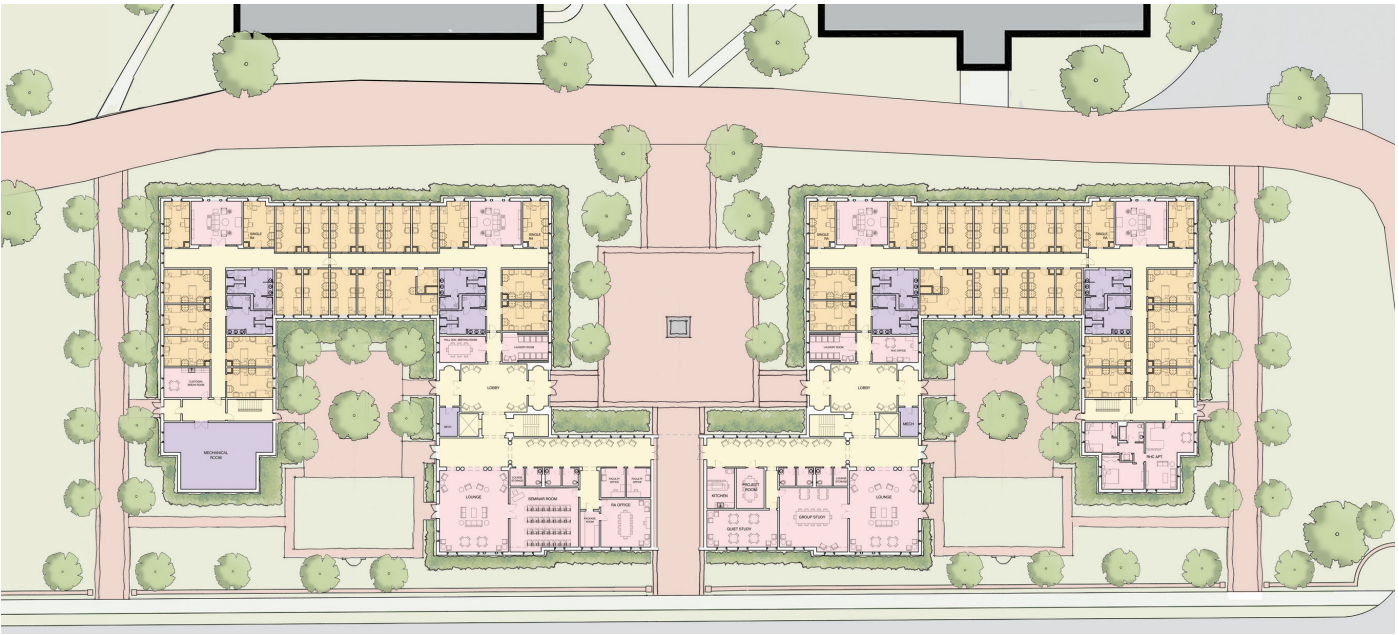
\$67.8 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Sustainable Design



New Campus Housing

University of Delaware, Newark, DE

BKM provided MEP design services for a new four-story residence hall and classroom spaces. The building will be provided with full HVAC air conditioning.

The residence area mechanical systems are designed to accommodate the building's limited available service spaces by utilizing a dedicated outside air unit for ventilation along with concealed fan coil units for direct conditioning. Careful consideration was given to integrating MEP systems with the architectural elements of the building's main entryway and meeting room areas. Two lecture-style classrooms and three smaller classrooms are located on the Ground Floor.

Mechanical systems are being provided to those spaces with traditional all-air overhead HVAC. Heating and cooling infrastructure is being provided and coordinated with the campus' steam and chilled water central utility distribution. MEP services are also provided for the building demonstration kitchen. An integrated, energy-efficient ventilation system with duct-mounted reheat make-up air is being provided for the washer / dryer room, serving six commercial dryers simultaneously. The electrical systems include a new gas-fired generator on site and all new 460-voltage power distribution and electrical equipment service yard. A new dedicated fire pump is being provided to provide full sprinkler coverage to the building.

SIZE

170,000 SF

COST

\$64 M

PROJECT FOCUSES

Higher Education, Student Life

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Sustainable Design



929 N. Wolfe Street

Johns Hopkins University, Baltimore, MD

BKM provided mechanical and plumbing design services for this project which was designed as part of the East Baltimore Development Initiative, this 20-story high-rise graduate student housing facility was programmed with one, two, and four-bedroom apartments, adjacent structured parking, fitness center, and central plant.

Facing the newly redeveloped neighborhood's central green, the building was located within walking distance of both the new biotech research facilities and Johns Hopkins Hospital, and provided housing for the medical and nursing schools. The sustainable features on this project included a green roof, low cut-off site and building lighting fixtures, low flow plumbing fixtures, and a high efficient HVAC system.

UNITS

576 Beds/Rooms

SIZE

276,160 SF

COST

\$60.7 M

PROJECT FOCUSES

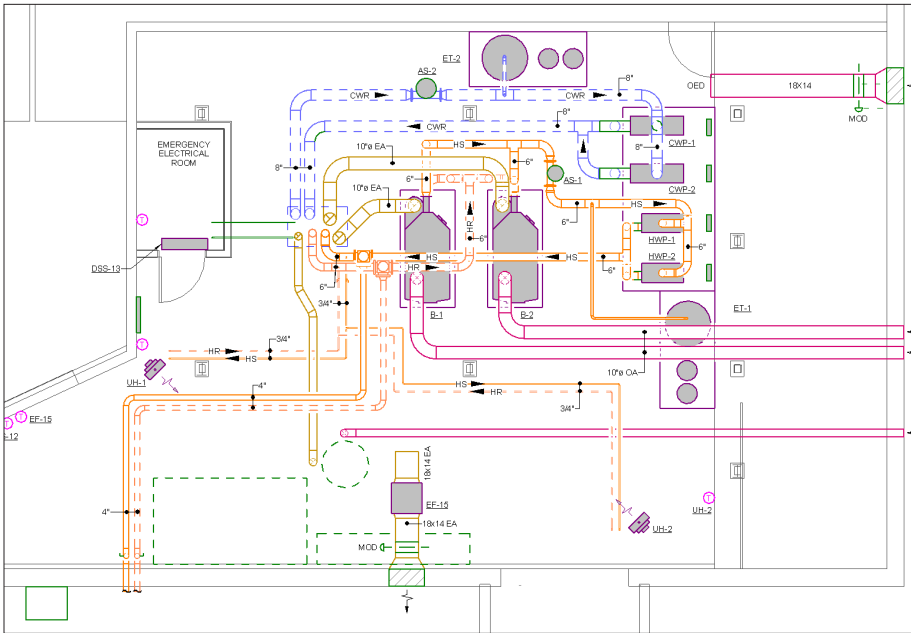
Higher Education, Student Life

CAPABILITIES

Mechanical Design, Plumbing Design, Sustainable Design

AWARDS

ASHRAE Technology Award, Region III, Honorable Mention: Residential



Chesapeake Welcome Center Renovation & Addition

Harford Community College, Bel Air, MD

BKM served as the MEP consultant for the Harford Community College Chesapeake Welcome Center Renovation and Addition project.

The existing Chesapeake Center is a single-story approximately 32,000 SF building. Under this project, portions of the existing building will be demolished and the remaining existing area will be fully renovated. There will also be a major addition bringing the total size of the facility to 78,545 SF. The building will house office space, a theater, a gallery, conference center and dining services. The building is designed to achieve LEED Silver certification.

Under this project, the building will receive all new MEP systems. The primary HVAC system serving the building will be a four pipe variable air volume system. A roof mounted air cooled chiller will be the primary cooling source for the building and gas fired condensing boilers will be the primary heating source. Rooftop air handling units will distribute air to VAV terminals with hot water heating coils throughout the building. A new gas and electric service will be brought into the new lower level mechanical room. The building currently has a solar photovoltaic system. This system will be upgraded / expanded as part of this project.

SIZE
78,545 SF

COST
\$53 M

PROJECT FOCUSES
Higher Education, Student Union

CAPABILITIES
Mechanical Design, Electrical Design, Plumbing Design, Sustainable Design



Bioscience Education Center

Montgomery College, Rockville, MD

This state-of-the-art facility provides teaching laboratories, classrooms, offices, and a 15,000 SF multipurpose conference center.

This project, which was designed to achieve LEED Gold, incorporated sustainable features such as solar domestic hot water and off-season reheat, energy recovery wheels for 100 percent OA units, Ammonia chillers for ice storage, supplementary gas-fired engine chillers, solar power (PV) and an array of mini roof mounted wind turbines to backfeed the building's power supply. Under our ID/IQ Contract with Montgomery College, BKM performed peer review at each design milestone and continued to support the project as the third party commissioning agent.

SIZE

140,000 SF

COST

\$52 M

PROJECT FOCUSES

Higher Education, Research Facility

CAPABILITIES

Commissioning



The Energy Project, Central Heating & Chilled Water Plant & Distribution Piping

The Catholic University of America, Washington, DC

BKM provided MEP design services in two phases for conversion of the central steam plant to a heating water system with provisions for a new central chilled water system. The project included the provisions for all new distribution piping, pumps, and conversions of campus buildings from steam heating to heating water.

This project connects to twenty-nine buildings, including the removal of twenty-five steam to heating water heat exchangers in sixteen different buildings. This project provides cooling piping connections to serve ten buildings on campus previously without any form of cooling, as well as provides eleven new secondary distribution pumps. Three new gas-fired steam boilers are provided to select buildings on campus which are heated by steam unitary equipment. Underground primary distribution piping provided under these projects extends approximately 6,000 linear feet in a loop across campus with twenty-three new underground vaults.

The existing central plant building, originally built in 1910, was renovated under this project to allow for the installation of the new central heating and cooling equipment. The installation was phased to allow for operation of existing gas-fired steam boilers. A project total of twelve condensing hot water boilers with dual-fuel gas/fuel oil firing and with a total capacity of 72 million BTU. Cooling is provided by three 1,000-ton centrifugal water-cooled chillers with cross-connection points for a future additional 3,000 tons of cooling. Three associated cooling towers were located adjacent to the central plant building equipped with a rainwater harvesting system and underground water storage cistern.

SIZE

3,000 tons cooling
72 Million BTU heating
8 miles of direct-buried piping currently serving
24 buildings on campus

COST

\$50 M

PROJECT FOCUSES

Higher Education

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Bob Carpenter Center Addition

University of Delaware, Newark, DE

The Bob Carpenter Center (BCC) is the home of the University of Delaware's basketball program. Opened in 1992, "The Bob" has a seating capacity of 5,000 for Blue Hens' games.

The facility also hosts concerts and graduation ceremonies. Most recently, the BCC played host to the Delaware US Senatorial Debate.

As the athletic program expands in notoriety, the University has committed to improve its facility to stay ahead of the competition among peer institutions. To this end, a 50,000 SF, two-story addition was developed to house dedicated basketball and volleyball practice gyms, along with team-specific locker rooms, lounges, video rooms, coaches' offices and administrative support spaces. The main entrance consisted of a two-story grand lobby, which doubled as the basketball and volleyball Hall of Fame.

BKM provided the MEP design for this addition as well as the infrastructure upgrades to the existing BCC. The updated utility plant consisted of 1,000 tons of chillers and 20,000 MBH of boilers. Multiple variable speed distribution loops were developed to enable the University to serve / isolate any of the (3) primary building functions: 1) The Bob Carpenter Arena, 2) the various administrative / support spaces within the BCC, and 3) the new addition.

The project was designed with multiple bid-packages to facilitate a fast-track construction process, ensuring it was facility-ready for the start of the basketball season.

SIZE

50,000 SF (new), 143,535 SF (renovation)

COST

\$35 M

PROJECT FOCUSES

Higher Education, Gymnasium

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design

AWARDS

2013 ASHRAE Technology Award, Region III, Educational, New



APG Federal Credit Union Arena

Harford Community College, Bel Air, MD

BKM provided MEP services for the 52,000 SF APG Federal Credit Union Area HVAC renovation that was originally constructed in 1968 and housed the gymnasium, indoor pool, dance studios, fitness center, general purpose classrooms, and faculty offices.

The construction was phased to allow the building to remain in operation during construction. The new 27,000 SF expansion accommodates a new therapeutic pool, sauna, whirlpool, racquet ball courts, indoor practice rooms, training rooms, and much needed storage. This addition is also home to new 3,000-seat arena and associated fitness center, showers, and locker rooms. BKM designed the MEP services to achieve LEED Silver certification. The sustainable features on this project include low cut-off site lighting fixtures, low flow plumbing fixtures, and a high efficient HVAC system and a green roof.

All new MEP services were brought into the building's addition (sized for the final build-out). HVAC included chilled water and heating water distribution to central station air handlers, while power exists of a new 480-volt/3 phase service. To validate the HVAC design for the large volume basketball arena, BKM performed a computational fluid dynamics model of the space to demonstrate airflow patterns, air velocity, and thermal characteristics.

SIZE

52,000 SF

COST

\$26 M

PROJECT FOCUSES

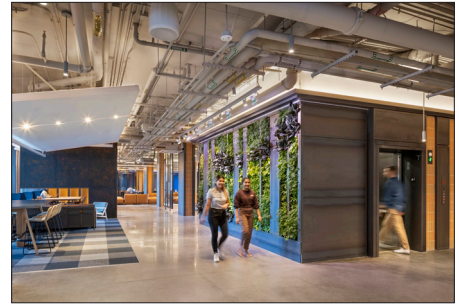
Higher Education, Gymnasium

CAPABILITIES

Building Assessments, Mechanical Design, Electrical Design, Plumbing Design, Lighting Design, Sustainable Design

AWARDS

2015 ASHRAE Technology Award, Region III, 1st Place: Institutional, New



New Student Housing, 55 H Street, NW

Georgetown University, Washington, DC

BKM provided MEP design services for this new twelve-story residence hall and support spaces. The building was provided with full HVAC air conditioning. The residence area mechanical systems were designed to accommodate the building's limited available service spaces by utilizing a dedicated outside air unit for ventilation along with variable refrigerant flow (VRF) units for direct conditioning. Careful consideration was given to integrating MEP systems with the architectural elements of the building's main entryway and meeting room areas. Academic spaces and parking are located on the Ground Floor.

Each wing of each floor is served by a VRF condensing unit, for a total of fourteen condensing units. This allows sharing of heating and cooling loads via the heat recovery system. Ceiling-mounted VRF cassettes are provided throughout the building for space temperature control. VRF indoor units serving 4-bedroom suites and larger common areas are provided with insulated low-pressure supply ductwork. A pair of ducted VRF cassettes were provided for each typical 4-bedroom suite. A stand-alone air handling unit AHU-1 serves the Penthouse Fitness Center and Commons Lounge. This unit has a direct-expansion cooling coil and gas-fired furnace. The electrical systems include a new fuel oil fired generator on site and all new 460-voltage power distribution and electrical equipment service yard. A new dedicated fire pump was provided to provide full sprinkler coverage to the building.

The project achieved LEED v4 Platinum certification and is an all-electric, fully decarbonized building with fossil fuels used only for emergency systems.

UNITS

474 Beds/Rooms

SIZE

214,000 SF

COST

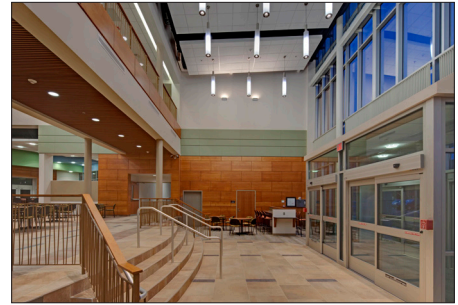
\$60 M

PROJECT FOCUSES

Higher Education, Graduate Student Housing

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



K Building

Carroll Community College, Westminster, MD

BKM provided MEP design services for a new three-story classroom building, as well as the renovation of approximately 6,500 SF within the adjacent building.

Classroom Building #4 serves as the expansion for criminal justice, biotechnology, environmental science, teacher education, and information technology and included 2,700 SF of forensic science classrooms. In addition to classrooms, the new building houses its science and computer laboratory, 175-seat lecture room, commercial kitchen, cafeteria, dining room, meeting rooms, daycare facility, and space for student clubs and organizations, and study lounges. The project included sustainable design features suitable to obtain a USGBC rating of LEED Silver.

With the completion of this facility, BKM has provided the MEP design for all seven buildings at the college, totaling more than 300,000 SF. One such building was the 50,000 SF Learning Resource Center, which housed a library/research center for the college, academic support laboratory for students, academic health suite for classroom instruction, complete community and academic media center, and bookstore. The facility also included a distant learning laboratory linked with lectures and classes at or from remote locations, allowing student interaction from different campuses.

SIZE

77,000 SF

COST

\$24 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Sustainable Design



Maloney Hall Renovation

The Catholic University of America, Washington, DC

BKM provided MEP design services for the renovation of Maloney Hall, a 62,000 SF historic academic building built in 1919.

Located on CUA's urban campus the building was converted from a chemistry occupancy to the School of Business with the replacement of all MEP systems. The design program for Maloney Hall was to provide fully renovated interior spaces including but not limited to the layout of new offices and classrooms and 600-seat auditorium space. The Maloney Hall mechanical systems include semi-custom air handling units to accommodate limited space in the historic building, an underfloor air distribution system for the auditorium to maintain the integrity of the historic ceiling and auditorium finishes, and a greywater harvesting system integrating with the building plumbing fixtures. The building will also be the first connected to the campus' new energy efficiency central chilled water and heating water plant, also being designed by BKM. The project was designed to achieve LEED Silver certification.

SIZE

62,000 SF

COST

\$22 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Building Assessments, Mechanical Design, Electrical Design, Plumbing Design, Lighting Design



Darlington Hall, Nursing & Allied Health Building

Harford Community College, Bel Air, MD

The Nursing and Allied Health Building is a three-story facility comprised of laboratories, classrooms, offices, and a variety of informal collaborative student learning spaces within a central atrium. The building houses a two-year nursing program, allied health program, as well as non-credit nursing programs.

Laboratories are AV/IT intensive spaces and designed to capture simulated tasks and nurse/patient interaction. The recorded video and audio data is then accessible to students and teachers in classrooms, control rooms, observation/debrief rooms, as well as, informal learning spaces. Active learning classrooms empower students to construct their own learning in collaborative creative problem solving exercises. Informal student and group study spaces are also provided throughout the central atrium.

The building is steel framed with masonry, glass, and metal panel over metal stud walls.

The main heating and cooling needs of the building are met by a series of three condensing boilers and a premium efficiency air cooled chiller. The chiller and three air handling units sit on top of a low slope TPO roof membrane system. A first floor mechanical room houses the boilers, heating and chilled water pumps and many hydronic system accessories. The air handling units distribute air to several VAV terminal units throughout the building. Each VAV terminal unit is equipped with a hydronic heating coil to allow for individual space temperature control. Hot water radiant ceiling panels are also located in all perimeter spaces to enhance the thermal comfort during heating season. Several energy efficiency measures including the use of VFDs on fans and pumps, economizer control and demand control ventilation are present throughout the building.

SIZE

51,600 SF

COST

\$15 M

PROJECT FOCUSES

Higher Education, Nursing/Allied Health Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Culinary Arts Center

Prince George's Community College, Largo, MD

The Culinary Arts Center is a single-story building located on the campus of Prince Georges Community College, tailored towards providing a specialized environment for education in the culinary arts fields.

BKM provided MEP design services for this project. The Culinary Arts Center houses three commercial style instruction kitchens, classrooms, offices, dining areas, event spaces and a 2,200 SF lobby with a commercial grade display kitchen. The primary purpose of this building is provide training for students and community members interested in the various culinary arts fields. Along with the instructional kitchens used primarily by the students, there is a community kitchen located in the center of the building. This area is equipped with residential type kitchen equipment and night classes will be provided to offer culinary training for people in the surrounding communities.

Extensive mechanical and electrical systems were required for this building due to the large amount of kitchen spaces. A premium efficiency air cooled chiller serves as the primary source of cooling for the building, while a gas-fired condensing boiler meets the heating needs. Two rooftop air handling units condition and distribute air to VAV terminal units throughout the building. Both units were provided with economizer controls for energy conservation and the unit primarily serving the kitchen areas is equipped with an energy recovery wheel. This building contains eight commercial style kitchen exhaust hoods to serve the instructional and display kitchen areas. Each hood is equipped with demand control ventilation for optimal energy performance. Four dedicated outside air (DOAS) rooftop units with heating and cooling coils serve the make-up air needs of the kitchens. Also present in the instructional kitchens and the community kitchens is a variable refrigerant flow (VRF) supplemental cooling system. This system helps overcome the excessive heat output of kitchen equipment. A sophisticated automatic temperature control system was installed to allow seamless operation and communication between the kitchen hoods, DOAS units, VRF systems, and the VAV terminal units.

SIZE

21,2600 SF

COST

\$14.4 M

PROJECT FOCUSES

Higher Education, Commercial

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design, Sustainable Design



Warner Hall Renovations Design

University of Delaware, Newark, DE

BKM provided MEP design services to convert the existing women's residence hall, built in the 1920's, to administrative and counseling services spaces.

The building was converted from a heating-only system to full HVAC air conditioning. The mechanical systems are designed to accommodate the historic building's limited available service spaces by utilizing a dedicated outside air unit for ventilation along with concealed fan coil units for direct conditioning. Careful consideration was given to integrating MEP systems with the retained architectural elements of the building's main entryway and meeting room areas. Heating and cooling infrastructure was provided and coordinated with the campus' steam and chilled water central utility distribution. The electrical systems include a new gas-fired generator on site and all new 208-voltage power distribution. A new dedicated fire pump was provided to provide full sprinkler coverage to the building.

SIZE

28,000 SF

COST

\$11 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



East Campus Housing

University of Delaware, Newark, DE

BKM provided MEP design services for the East Campus Housing Complex that was dedicated for freshman housing.

Phase I was limited to the construction of two new buildings (A and B) and combining for approximately 800 beds. An additional 1,300 beds will be brought on-line under Phase II. The larger of these buildings will include a complex lounge, retail, and other related amenities to create a destination hub for the East portion of the campus. Power for the complex will consist of two 35 kV feeders, extended from an outdoor switchgear lineup located adjacent to East Campus Central Plant.

SIZE

252,000 SF

COST

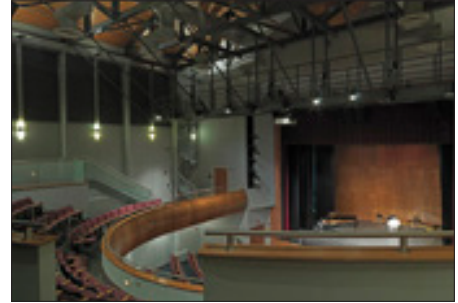
\$60 M

PROJECT FOCUSES

Higher Education, Student Life

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design



Fine Arts & Fitness Building

Carroll Community College, Westminster, MD

This spacious building houses the 500-seat auditorium for musical and theatrical performances, complete with a backstage area, control room, automated sound system, and computerized lighting control system. This facility also included an art gallery, music instruction and practices rooms, 2-D and 3-D art laboratories, public meeting rooms, and a grand two-story lobby.

HVAC for this building originated from the campus's central plant, distributing chilled water, and heating water to the various central station air handlers. DDC automatic temperature control maintain space temperature and humidity levels and also regulated the amount of outside air being provided to the auditorium, resulting in improved IAQ while minimizing operational costs.

SIZE

29,000 SF

COST

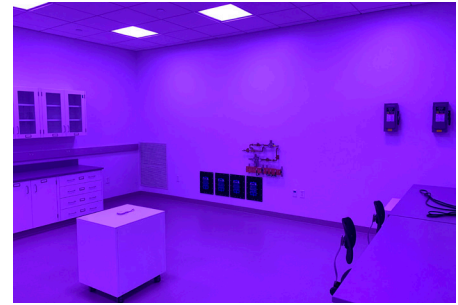
\$10.2 M

PROJECT FOCUSES

Higher Education, Performing Arts

CAPABILITIES

Mechanical Design, Plumbing Design



Stieff Building, Materials Characterization & Processing Core

Johns Hopkins University, Baltimore, MD

BKM provided MEP services to support the installation of advanced electron microscope laboratory spaces, as well as renovation of associated adjacent researcher office space.

Laboratory space HVAC systems include provisions for desiccant dehumidification, limited total air velocity less than 15 feet per minute, and extremely precise control of space temperature to within 1F. Tight temperature controls were achieved using passive chilled panels. Rooftop air cooled chillers provided cooling both to standard air handling unit cooling coils, post-cooling coils, and a separate temperature control loop for microscope lab chilled panels utilizing a 1F approach. Electron microscope laboratory spaces were designed to cleanliness class of ISO 8. Ceiling mounted HEPA filters and low return air devices were provided to achieve laminar unidirectional airflow to limit airborne particulate concentrations within the laboratory spaces. Double wall partitions were provided to meet strict acoustic and EMI shielding requirements.

Natural gas fired generators are provided to support emergency power requirements. UPS was provided for continuous and smooth operation of all advanced laboratory equipment. Electron microscope spaces were also provided with a dry-type sprinkler system. Compressed air and local gas manifold systems were provided to the laboratory spaces. Design for these systems was provided to allow construction during a fully occupied building.

SIZE

17,000 SF

COST

\$10 M

PROJECT FOCUSES

Science & Technology, Research Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Building L Renovation & Addition

Frederick Community College, Frederick, MD

BKM is currently providing MEP design services for the renovation and addition of Linganore Hall. The project scope includes the renovation of 33,000 GSF and an approximately 16,000 GSF addition to create updated space for Allied Health and Nursing Labs, including additional general classrooms and informal learning areas. As part of the project, the current technology hub room will be converted into a data center for the college. The construction for this project will occur over an approximately two year phased occupied period.

The main heating / cooling source will continue to be from water cooled chillers and condensing boilers located at the campus central plant. The existing air handling units will be refurbished and rebalanced to accommodate the new space loads in the renovated portion of the building. The existing chilled water and heating water pumps and piping system will be evaluated for re-use and replaced

as required. New variable air volume terminals and low pressure ductwork will be provided to accommodate the new architectural layout. Multiple system options are being considered for the addition (i.e. chilled water rooftop units fed from the central plant, packaged DX rooftop units, VRF / DOAS system). The design team will work in conjunction with the construction manager during the DD phase to determine which system is the most practical and cost effective.

The existing electrical switchboard will be replaced to accommodate new loads in the renovated spaces and addition. New distribution equipment will be specified to serve the proposed addition loads. The existing generator will supply loads inside the renovated areas and addition. All new lighting fixtures in renovated spaces and addition will be LED type. The new lighting control system will consist of a local digital control system located in each room/space providing a system, which meets owner's preference, while still complying with current energy codes. The existing addressable fire alarm panel will be reused to connect to new fire alarm devices in renovated spaces and the addition.

SIZE

49,000 SF (16,000 SF addition; 33,000 SF renovation)

COST

\$9.1 M

PROJECT FOCUSES

Higher Education, Science & Technology

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Library Renovation & Addition

Juniata College, Huntingdon, PA

BKM providing MEP design services for a renovation/addition to the library at Juniata College. The overall existing GSF of the library is 35,206 GSF and we have identified several program spaces that can be combined in multi-purpose program spaces to maximize efficiency.

In addition, the majority of the existing library spaces was renovated. The new addition along the eastern side of the existing Library facing the Quad (4,800 GSF) was added to house the new Learning Commons. BKM provided design of new rooftop air handling unit systems utilizing heating provided by the campus central steam plant. A new emergency power generator was provided and closely

coordinated with the campus grounds master plans to fully integrate with the campus landscape.

This project included an archive sections with specific temperature and humidity requirements to preserve sensitive antique manuscripts. A separate, dedicated HVAC system with integral humidification and dehumidification was provided to maintain these environmental controls. Additional filtration and BAS controls were provided for this space to ensure adequate control and monitoring. Extensive coordination was performed between BKM and the architectural division to provide for interior room construction to support the Archives Room differential temperature and humidity relative to the adjacent spaces.

SIZE

40,006 SF (4,800 SF addition; 35,206 SF renovation)

COST

\$7.5 M

PROJECT FOCUSES

Higher Education

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Dundalk Library Renovations

Community College of Baltimore County, Baltimore, MD

BKM provided the renovation of the existing library, café, and bookstore spaces located within the adjoining K and L buildings of the CCBC Dundalk campus.

The primary focus of the 50,000 SF renovation was to create a new state-of-the-art library complete with high-technology access to computer and online database systems as well as traditional hard copy materials. The main campus bookstore and food service café were also redesigned to meet the current needs and trends of student life. Additional renovated support spaces included the testing center, tutoring center, employee technology center, office of public safety, and printing/duplicating center.

SIZE
50,000 SF

COST
\$5.6 M

PROJECT FOCUSES
Higher Education, Library

CAPABILITIES
Building Assessments, Mechanical Design, Electrical Design, Plumbing Design



Accokeek Hall Renovation

Prince George's Community College, Largo, MD

BKM provided MEP design services for the occupied renovation of a library/media center, including a complete upgrade to the building's mechanical source equipment.

The existing chilled water system was replaced with a new water cooled modular chiller installed in sections to minimize potential disruption, demolition, and costs associated with the replacement of the preexisting chiller. Existing air handling units were replaced as well with minimal disruption to the occupants, allowing the facility to continue operation throughout the construction's duration. Additional zone control was provided throughout the distribution system, and the existing pneumatic controls were upgraded to direct digital control type. In addition, a complete upgrade to the lighting system was included throughout the library facility.

SIZE

71,000 SF

COST

\$5.6 M

PROJECT FOCUSES

Higher Education, Library

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design



Business Building Classroom Renovations

The Pennsylvania State University, University Park, PA

BKM is providing MEP design services for a 13,500 SF, \$5.0 M renovation within the Business Building for the Smeal College of Business on the University Park campus.

The project includes the renovation of seven classrooms and associated group study rooms. The new classrooms will have the flexibility for in person instruction, virtual instruction, as well as hybrid learning configurations. MEP scope includes modifications to the existing HVAC and power distribution system as well as new lighting and lighting control systems that allow for multiple scene changes based on the instructional focus.

SIZE

13,500 SF

COST

\$5 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Building Assessments, Mechanical Design, Electrical Design, Plumbing Design



Evans Hall MEP Systems Replacement

University of Delaware, Newark, DE

BKM provided MEP design services for the systemic renovation of Evans Hall.

The scope includes the replacement of the existing main electrical service, main air handling unit, building pneumatic HVAC controls with DDC controls. The secondary HVAC equipment including steam condensate receiver pumps, chilled water pumps, heating water pumps, and laboratory air compressor will also be replaced. The existing building mechanical and electrical rooms will be rearranged and redesigned to maximize usability given the new electrical and mechanical services being provided. New equipment will be provided with variable frequency drives. All equipment replacement is intended to be performed in a phased manner to coordinate with existing building classroom and research laboratory spaces, including coordinated timing and minimization of building shutdowns.

SIZE

20,000 SF

COST

\$3.7 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Macklin Tower MCTV Renovation

Montgomery College, Rockville, MD

BKM provided MEP design services for the renovation of the MCTV Suite and TV Studio, as well of the replacement of all HVAC and electrical systems in these areas and the basement mechanical room within Macklin Tower on the Rockville Campus of Montgomery College.

A new variable air volume system was provided to replace the existing constant volume systems serving the suite and TV Studio. A 19,000 CFM custom air handling unit was selected to fit within an existing 18'-0" x 25'-0" footprint in the building's mechanical room and was dedicated to serve the MCTV suite and TV Studio on the floor above. The new air handling unit included a supply air fan array equipped with a variable frequency drive (VFD), chilled water and heating water coils, and MERV 8 and MERV 13 filter racks equipped with magnehelic pressure gauges for monitoring filter pressure drop. The unit was provided with access doors at each section for maintenance. An external return air fan was provided and equipped with a VFD. The unit features economizer operation based on outside air enthalpy for energy savings and demand controlled ventilation based on occupancy sensors installed throughout the suite. Ductwork sound attenuators were installed in the supply and return ductwork to achieve an NC value of 25 within the MCTV editing suites and TV Studio. Additional sound attenuators were provided downstream of all terminal units to manage terminal unit discharge noise levels.

The buildings existing dual temperature pumps were removed under this renovation and new chilled water and heating water pumps were provided to serve the building 4 pipe system. Change over valves were installed where the existing dual temperature system remains within the building. The new base mounted end suction chilled water and heater water pumps were equipped with VFDs and are connected to the campus central chilled water and heating water plant. All new equipment provided under the renovation was connected to the campus's DDC energy management control system.

SIZE

11,300 SF

COST

\$4.6 M

PROJECT FOCUSES

Higher Education, Academic Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Todd Performing Arts Center

Chesapeake College, Wye Mills, MD

This design-build project provided a 308-seat balcony addition, expanded lobby, and elevator to an existing performing arts center that accommodated theatre, music and drama events, meetings, luncheon and dinner events, children's theatre, and drama department productions. BKM's work on this project encompassed a complete renovation to the HVAC system.

The project required complete replacement of the existing MEP infrastructure, as well as relocating the central audio/visual control room to the new balcony expansion. Improvements to the HVAC included new air handlers, duct distribution, increased cooling capacity, and improved ventilation. Automatic temperature controls were replaced with DDC and connected into the campus-wide energy management system.

The lighting for the auditorium and lobby were replaced with new fixtures and supplemented with a dimming system. The existing control room was relocated to the balcony expansion, resulting in a state of the art facility with remote sound systems, lighting control, and voice/data cabling. In addition, a new ADA compliant elevator was provided for public access to the new second level.

COST
\$3.5 M

PROJECT FOCUSES
Higher Education, Performing Arts

CAPABILITIES
Mechanical Design, Electrical Design, Plumbing Design



Fast Forward Space at R. House

Johns Hopkins University, Baltimore, MD

BKM provided mechanical and electrical design services for the tenant fit-out of approximately 9,900 SF of space within R. House located at 301 West 29th Street. For use by Johns Hopkins University programming, the fit-out is comprised of offices, specialized labs, and support spaces.

Seven wet and dry labs are served by a 100% outside air rooftop unit. Additional spaces included: a shared wet lab space, two conference rooms, 11 offices, copy/print support space, a shared kitchen/pantry, open office spaces, storage space, and IT/LAN room. Designs incorporated central RO water, compressed air, and laboratory vacuum systems, point-of-use acid neutralization at each lab drain, and a gas-fired emergency generator.

Mechanical and electrical designs adhere to Baltimore International Green Construction Code (IgCC) requirements. Glycol run-around loop provides heat recovery to the lab exhaust air for a more sustainable design. Energy analysis was done to prove that the gas-fired hot water boiler for terminal reheat used in the design was the more sustainable and more economical option. Integrated lighting and HVAC controls in both the space and at each exhaust hood to safely reduce lab airflow during unoccupied times and save additional energy and utility costs.

Because the labs were designed to fit the start-up atmosphere of the space, the power systems were designed to be robust enough to support the wide range of unique technology and equipment any tenant may need for their specific field. This meant providing in each lab an unusual number of options when it came to voltage configurations, power capacities, and electrical connection locations. The IgCC required several new panels for segregating the loads into different types of energy usage (for metering). This caused the need to be creative with the limited space available in the electrical room. To accommodate this the transformers were structurally hung from the ceiling. Light levels were provided per the IES while improving upon energy code requirements by over 10%. Additionally, electrical designs were well planned out due to the construction of the base building during initial field surveys for the space.

The electrical system was also design to meet the IGCC requirements for separation of loads for sub-metering by load usage type. Dedicated panels for specific loads such as lighting and mechanical equipment or plug and operational loads were provided for both the normal and generator standby power systems. The sub-metering requirements caused the design of the electrical room for the space to be especially challenging as space for the additional equipment needed to be coordinated within the already crowded existing electrical room.

SIZE

9,900 SF

COST

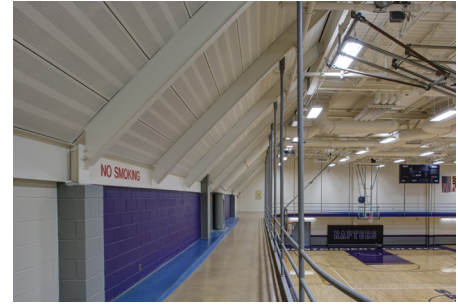
\$2.7 M

PROJECT FOCUSES

Science & Technology, Commercial

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design, Lighting Design



Falcon Hall HVAC Upgrades

Montgomery College, Takoma Park/Silver Spring, MD

BKM was initially retained as the prime A/E consultant to perform a comprehensive assessment of mechanical and electrical systems, as well as the building envelope.

The building, which was built in 1978 and included 39,000 SF of gymnasium, natatorium, fitness areas, locker rooms, classrooms and offices, was determined to have original equipment and materials that were past their useful life, and in some cases, not meeting current code.

Since the completion of the assessment, BKM continued to serve in the role of prime consultant for a three phase mechanical and electrical upgrades project to provide new HVAC, power and lighting systems throughout the building. Each of the three phases were developed to allow construction to occur during the summer season when the College is generally in recess (May through August).

Phase 1 included the replacement of three air handling units (AHUs) housed within a structural truss that supported the gymnasium roof, the replacement of the air distribution and lighting systems serving the gym, and other provisions. Custom air handling units were designed to permit the units to fit within the truss and provided a service vestibule to allow facilities personnel access to unit components while protected from the outdoor elements. New HVAC piping was extended from the mechanical room to the units to replace the fuel oil heating and direct

expansion (DX) cooling to reduce energy costs. All related temperature controls and monitoring were converted to direct digital controls (DDC).

Design for Phase 2 includes the replacement of the existing constant volume system serving the locker areas, classrooms and offices with VAV terminal units with heating water coils. Chilled water from the central plant was connected to the new AHUs by means of new pumps incorporated into the renovated mechanical room. Electrical service and distribution equipment replacement was included in this phase.

Phase 3 included the replacement of HVAC, power and lighting for the natatorium, along with other upgrades.

Commissioning: BKM provided commissioning services for this project that consisted of the replacement of three air handling units that serve the gymnasium, locker rooms and some administrative areas. The building, which was built in 1978 and included 39,000 SF gymnasium, natatorium, fitness areas, locker rooms, classrooms and offices, was determined to have original equipment and materials that were past their useful life, and in some cases, not meeting current code. Therefore, the project encompassed a phased mechanical and electrical upgrade to provide new HVAC, power and lighting systems throughout the building.

Systems commissioned included: AHUs, VAVs, heater water coils, energy recovery, and the Building Automation System (BAS).

SIZE
39,000 SF

COST
\$2.5 M

PROJECT FOCUSES
Higher Education, Academic Building

CAPABILITIES
Mechanical Design, Electrical Design, Plumbing Design



Brown Laboratory Energy Conservation Measures

University of Delaware, Newark, DE

The scope of work consisted of the renovation of approximately 33,000 SF to this existing facility to incorporate five energy conservation measures (ECMs) in tandem with contractor implementation and University review of ECM feasibility. The work related primarily to the HVAC and control systems with some electrical requirements.

The five ECMs in the project scope included the following:

- Developed an HVAC control strategy to modulate air handling unit fan speed based on feedback from the terminal VAV boxes. Sequences of operation were modified to implement this control strategy. The control sequences were also designed to maintain minimum pressure differential (0.6" wc) required by Phoenix air control valves through integration with the Building Automation System (BAS). Modifications and analysis were reviewed by University personnel to be implemented by University maintenance personnel and hired contractors.
- Developed control sequences to reduce static

pressure setpoints for laboratory building main exhaust fans (total of three fans) in the Brown Lab North wing. Setpoints were audited to determine optimal static pressure values for three exhaust fans. Design modifications were then made to convert existing constant volume exhaust systems into a variable airflow volume system. All modifications to the exhaust fans, electrical systems, and building controls were documented to be implemented by University maintenance personnel and hired contractors.

- Designed all modifications needed to convert the operation of air handling unit AHU-5 from two-speed airflow control to full-range variable airflow. Documentation and audit of existing HVAC systems included physical modifications to the air handling unit, supporting electrical systems, and BAS controls.
- Developed a control strategy to convert all constant volume laboratory exhaust and supply in the North Wing of Brown Laboratory into variable airflow volume.
- Performed all calculations and analysis necessary to determine the correct airflow and space pressurization for each space in both wings of Brown Laboratory.

SIZE

33,000 SF

COST

\$871 K

PROJECT FOCUSES

Higher Education, Science Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Allen Lab BSL-3 Chiller Replacement

University of Delaware, Newark, DE

BKM provided MEP design services for this 25,500 SF, three story animal research laboratory located on the South Campus. The facility houses poultry research spaces, including several BSL-3 laboratories.

The facility HVAC equipment, namely its existing air-cooled chiller, was at the end of its useful life. Furthermore, the facility had outgrown its original design space and sought to expand its infrastructure capacity for future consideration of building expansion. BKM's design provided for a replacement of the existing 160-ton air-cooled chiller with a larger capacity 310-ton air-cooled chiller and new vertical inline chilled water pumps. The pumping arrangement of the system was changed from primary-secondary to variable primary to reduce overall energy usage in the building by utilizing the new air-cooled chiller capabilities at operating at a lower minimum water flow. In support of the HVAC upgrade, the facility main motor control center was completely renovated. Custom panel sections were provided to support the increased electrical load of the new chiller. Phasing and coordination with manufacturer installation requirements of the electrical equipment was focused on to ensure a minimum downtime of laboratory operations, planned to coincide with a narrow construction window over winter holidays.

Additionally, a new submersible sewage ejector pump with cutting blades was provided to replace the existing grinder-style ejector pump. This change in ejector pump style is expected to greatly reduce the laboratory downtime and maintenance issues caused by the original grinder ejector pump.

SIZE

25,500 SF

COST

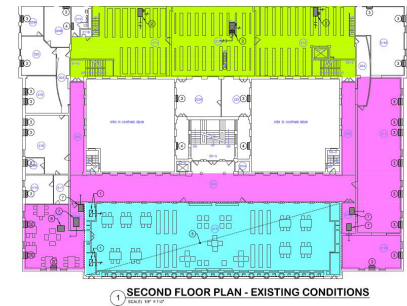
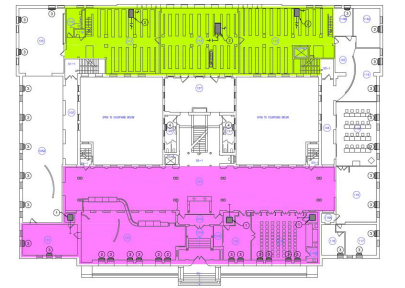
\$750 K

PROJECT FOCUSES

Science & Technology, Research Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



1 SECOND FLOOR PLAN - EXISTING CONDITIONS

Mullen Library HVAC Feasibility Study

The Catholic University of America, Washington, DC

BKM performed an evaluation of the mechanical and electrical systems of Mullen Library to address near-term concerns as well as future programming planning.

Evaluations were made including site observations, meetings with occupants, and review of existing construction documents. The current air-side mechanical systems in the building were determined to be nearing the end of their useful life. Recommendations for replacement in the near future under controlled conditions were made, before mechanical system failure.

The replacement HVAC equipment recommended is to be designed with the capability of greater

temperature and humidity control by using low temperature chilled water from the campus central plant. A near-term solution of providing chilled water distribution to fan coil units and a new hydronic rooftop air handling unit was recommended to solve the immediate concerns over humidity and temperature control in critical areas such as the two-story Reading Room 215, Computer Lab 216, and the Ground Floor Rare Books area. Long-term HVAC replacement options were presented in this report using centralized all-air systems, as well as a replacement of key components to the electrical infrastructure and distribution.

SIZE

100,000 SF

PROJECT FOCUSES

Higher Education, Library

CAPABILITIES

Building Assessments, Mechanical Study, Electrical Study, Plumbing Study



Bloomberg Speller Lab Renovation

Johns Hopkins Facilities & Real Estate, Baltimore, MD

BKM provided MEP engineering and low voltage infrastructure design for the renovation of the existing 1,300 SF Speller Lab located in the Bloomberg Center for Physics & Astronomy.

The renovation included the addition of a dilution refrigerator that has a magnet component of 10-14 Tesla requiring specialized construction in its vicinity, a laser room, temporary clean space and wet lab space, all of which required support utilities that were present in the building. Standby power as required for the new equipment was connected to an existing generator. Existing utilities serving

the current occupancy were removed back to their respective mains and new lighting and controls replace the existing lighting. A new secondary process chilled water system was provided with a new heat exchanger to isolate the process cooling from the building system. Additionally, a domestic water emergency procedure was provided to protect the dilution refrigerator during building outages. New lab gases, including Helium, Argon and Nitrogen, were provided to serve a new fume hood and additional equipment within the lab. The building's existing Helium recovery system was extended to recover gaseous Helium expelled during experiments.

SIZE

1,300 SF

COST

\$430 K

PROJECT FOCUSES

Higher Education, Science Building

CAPABILITIES

Mechanical Design, Electrical Design, Plumbing Design



Student Services Building Programming

Community College of Baltimore County, Catonsville, MD

BKM provided the mechanical, electrical, plumbing engineering services for the programming of the proposed Student Services renovation.

The areas under consideration for renovation included: Advising/Counseling, Career Development, Dining, Food Service, Kitchen, Multi-Cultural Affairs, student lab and multi-purpose room. BKM provided a conditions assessment of the MEP infrastructure serving the areas to be renovated and provided our findings and recommendations to support the renovation. In general, the major equipment in the building (including air handling units, VAV terminals, main electrical gear, lighting, etc) had served its useful life and recommendations typically indicated replacement would be most prudent.

Following the program of the Student Services Building, BKM has been contracted by CCBC to begin design services for the addition and renovation to this facility.

PROJECT FOCUSES

Higher Education, Student Services Building

CAPABILITIES

Building Assessments

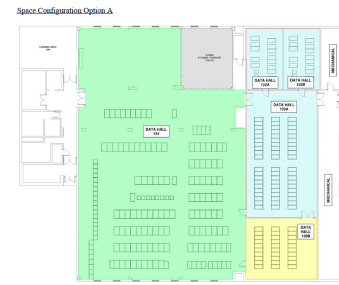


Figure 1.3: Space Configuration Option A

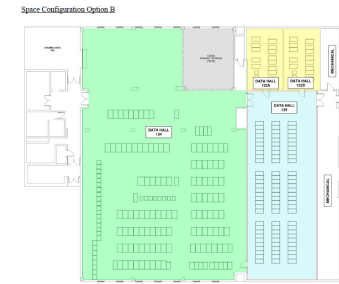


Figure 1.4: Space Configuration Option B

Computer Building Data Center Study

The Pennsylvania State University, University Park, PA

BKM was the prime consultant for the study to extend the life of the University’s Computer Building to accommodate high performance research computing and retain enterprise computing in the data center.

The study consisted of an initial assessment of the existing infrastructure systems supporting the data center, followed by an analysis and conceptual design of renovation options. The study includes a comprehensive evaluation of options to reconfigure the space and modify or replace infrastructure systems while maintaining continued operation of the data center.

Systems Included:

- UPS Distribution
- Busway Distribution
- Chiller Plant
- Raised Floor Cooling
- High Density Cooling
- Fire Protection
- Security

Services Provided:

- Data Center Assessment
- Strategic Infrastructure Planning
- Conceptual Design

SIZE

30,000 SF

COST

\$8 M

PROJECT FOCUSES

Higher Education, Data Center

CAPABILITIES

Building Assessments, Mechanical Study, Electrical Study, Plumbing Study

A photograph of a modern office interior. The ceiling is high and features exposed white pipes and ductwork. A large, vibrant green living wall is visible on the right side. Two women are walking in the foreground. The floor is polished concrete. In the background, there are orange armchairs and a dark wood desk area.

Section Three
SUSTAINABILITY

55
bkm

Sustainable Design

Sustainability is a core belief at BKM. We were designing green buildings before the term even existed, simply by doing smart, energy-conscious, cost-effective MEP systems design. At BKM we believe sustainable design requires a commitment to integrated design that emphasizes the involvement of all stakeholders from the beginning of the design process. The opportunities for affordable sustainability are greatest at the project start and decrease significantly as the design progresses.

BKM takes a collaborative approach to sustainable design. We are proactive in expressing our ideas to other team members and are always ready to listen to suggestions that can improve our designs. This collaborative approach allows for the optimum integration of the engineering systems with the architecture and results in the best project.

Our approach includes involvement from all parties, including the architect, engineers, Owner, and project managers early in the process to establish environmental goals, opportunities, and costs. By taking a whole-systems approach to the design process, the design team can maximize the potential sustainable design benefits and reduce any added costs.

Our process includes these fundamental steps:

- » Assemble a collaborative design and construction team committed to sustainable design.

- » Establish specific environmental and economic goals, and sustainable targets for design.
- » Determine the baseline case to serve as a model for analyzing sustainable design alternatives.
- » Identify appropriate sustainable design strategies and alternatives.
- » Determine and evaluate associated costs and benefits (both initial and long term).
- » Select the appropriate strategies for application on the project, and include in the documentation and specifications.

Throughout the design and building process, the selected environmental goals must be encouraged, monitored, and reinforced as new team players, such as contractors, building maintenance personnel, and finally occupants, enter the process. Attention to the environmental issues must be carried through to the building commissioning process and final occupancy to ensure that the project operates in a manner consistent with the original design.

There are several architectural strategies that greatly influence the energy conserving abilities of the building, such as advantageous building orientation, massing and fenestration. The proper utilization of daylight has a profound impact on building energy use, occupant comfort and health. We are proponents of the use of natural ventilation, passive heating and/or cooling where appropriate.

Once maximum benefit is realized from available site resources and building imposed loads are reduced to the greatest extent possible, “right sized” energy efficient MEP systems further optimize the building’s performance. We believe this approach results in a better overall project in terms of energy use, operating cost, and occupant comfort.

At BKM our sustainable design capabilities start with our experienced professional staff and collaborative approach to engineering. We are members of the United States Green Building Council and nearly all of our technical staff is LEED® Accredited Professionals.

Solutions

Our sustainable design solutions have included the following:

- » geothermal heat pump systems
- » solar heating
- » radiant heating and cooling
- » thermal storage
- » energy recovery
- » gray water storage and treatment systems
- » natural ventilation
- » photovoltaics
- » energy efficient lighting control systems
- » cogeneration plants
- » alternate fuel chillers
- » computational fluid dynamics

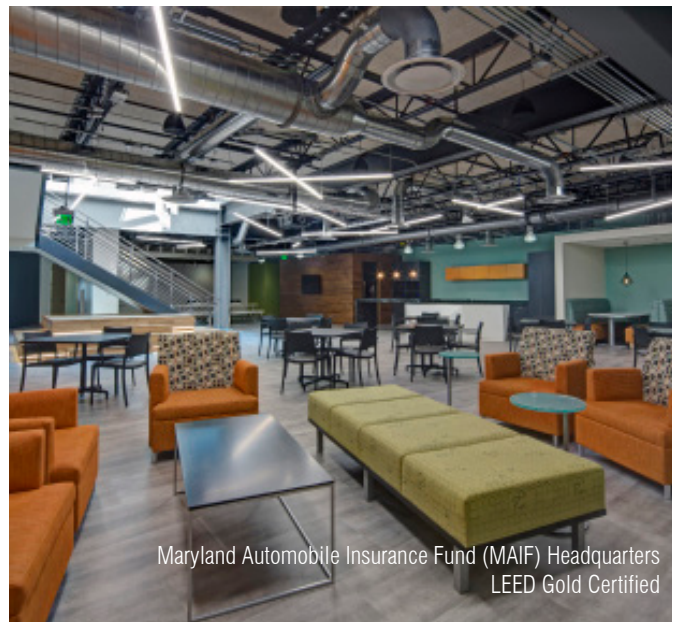
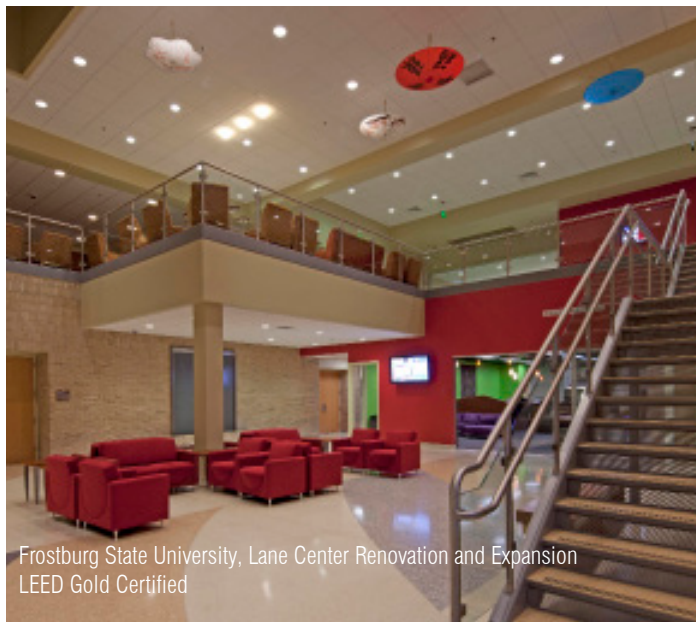


BKM's LEED Experience

Project	Project Value	Size (SF)	LEED Rating	LEED Program
Anne Arundel County Public Schools, Arnold Elementary School Replacement	\$28,900,000	85,800	Silver	LEED 2009 Schools
Baltimore City Public School System, Arlington ES Renovation/Addition	\$28,700,000	100,000	Gold	LEED 2009 Schools
Baltimore City Public School System, Cherry Hill Elementary School	\$44,800,000	120,000	Gold	LEED 2009 Schools
Baltimore City Public School System, Elmer A. Henderson ES Renovation	\$1,000,000	71,000	Designed to Silver	Existing Buildings
Baltimore City Public School System, Pimlico PK-8 Renovation/Addition	\$30,500,000	120,000	Gold	LEED 2009 Schools
Baltimore County Property Management, Center for Maryland Agriculture	\$5,890,000	14,000	Gold	New Construction
Baltimore County Property Management, Eastern Family Resource Center	\$26,000,000	80,000	Anticipating Silver	New Construction
Baltimore County Property Management, Towson Fire Station	\$5,822,766	19,693	Silver	New Construction
Baltimore County Property Management, Westside Men's Shelter	\$4,012,473	8,400	Silver	New Construction
Baltimore County Public Schools, Colgate Elementary School	\$30,620,000	80,000	Anticipating Silver	New Construction
Baltimore County Public Schools, West Towson Elementary School	\$16,193,679	57,640	Silver	New Construction
CASA de Maryland, Baltimore Regional Education and Training Center	\$6,500,000	15,000	Anticipating Gold	New Construction
C.B. Richard Ellis, Workplace 360	\$1,000,000	16,000	Silver	Commercial Interiors
Carroll Community College, K Building	\$24,000,000	77,000	Designed to Silver	New Construction
The Catholic University of America, Conway School of Nursing	\$65,000,000	102,275	Anticipating Gold	New Construction
The Catholic University of America, Maloney Hall	\$25,000,000	62,000	Gold	New Construction
District of Columbia Public Schools, Walker Jones Pre-K-8 School	\$32,000,000	125,000	Silver	New Construction
Eagle Academy Public Charter School	\$4,500,000	20,000	Anticipating Certified	New Construction
Friends School, New Dining Hall	\$5,000,000	20,000	Designed to Silver	New Construction
Frostburg State University, Lane Center Renovation and Expansion	\$13,000,000	65,000	Gold	New Construction
Gedco, Green House at Stadium Place	\$6,129,144	30,400	Anticipating Silver	New Construction
Georgetown University, New Student Housing	\$60,000,000	214,000	Anticipating Platinum	New Construction
Harford Community College, APG Federal Credit Union Arena & Susquehanna Center	\$26,000,000	79,000	Anticipating Silver	New Construction
Howard County Parks and Recreation, Roger Carter Community Center	\$13,877,470	46,000	Anticipating Gold	New Construction
Johns Hopkins Bayview Medical Center, Building 301	\$6,500,000	60,000	Anticipating Gold	Commercial Interiors
Johns Hopkins University, 929 N. Wolfe Street	\$60,700,000	276,160	Anticipating Silver	New Construction
Jones Lang LaSalle, First Annapolis	\$1,585,000	14,250	Designed to Silver	Commercial Interiors
I-95 Travel Plazas at Maryland and Chesapeake House	\$63,000,000	72,000	Silver	New Construction
Maryland Automobile Insurance Fund (MAIF) Headquarters	\$3,300,000	55,000	Gold	Commercial Interiors
Metro Heights Multifamily Housing Development	\$15,875,000	95,060	Gold	Homes
Montgomery College, Bioscience Education Center	\$52,000,000	140,000	Anticipating Gold	New Construction
Montgomery County, Dennis Avenue Health Clinic	\$22,956,529	51,200	Gold	New Construction
Mount St. Mary's University, Bicentennial Hall Student Housing	\$12,500,000	60,000	Designed to Silver	New Construction
National Aquarium in Baltimore, Center for Aquatic Life and Conservation	\$30,000,000	60,000	Designed to Gold	New Construction
Obrecht Commercial Real Estate, Inc., Brewers Hill Natty Boh Tower	\$105,000,000	160,000	Designed to Silver	Existing Buildings
Prince George's Community College, Culinary Arts Building	\$14,400,000	21,260	Gold	New Construction
The Canusa Corporation, The Canusa Corporation	\$1,500,000	4,000	Designed to Silver	Existing Buildings
Towson University, Childcare Center	\$3,500,000	12,000	Certified	New Construction
Towson University, Public Safety Building	\$6,400,000	20,270	Anticipating Silver	New Construction
Towson University, West Village Undergraduate Housing Phase I & II	\$41,000,000	640,000	Designed to Silver	New Construction

BKM's LEED Experience

U.S. Environmental Protection Agency, Building 209, Bay 'A' Fit-out	\$2,256,877	15,000	Platinum	New Construction
U.S. NIST, Net Zero Utility Connections	\$520,000	-	Platinum	New Construction
University of Delaware, Life Sciences Research Facility	\$12,000,000	15,000	Certified	New Construction
University of Maryland Baltimore, 620 W. Lexington Street, 6th Floor Fit-Out	\$2,000,000	13,000	Silver	Commercial Interiors
University of Maryland, South Campus Commons	\$116,000,000	788,000	Gold	New Construction
University of Maryland, South Campus Commons Building 7	\$34,000,000	140,000	Gold	New Construction
USACE Savannah District, Renew Winder Troop Medical Clinic at Ft. Benning	\$1,700,000	16,625	Anticipating Silver	Existing Buildings
VAMC Perry Point, Building 24H Replacement	\$5,000,000	33,000	Designed to Silver	New Construction
VAMC Perry Point, Community Living Center Replacement	\$66,000,000	160,000	Anticipating Silver	New Construction



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