CapitalBudgetRequest

Renovate and Expand Chemistry/Physics Facilities

Overview	
Agency	Virginia Polytechnic Institute and State University (208)
Project Code	none
Project Type	New Construction/Improvement
Biennium	2022-2024
Budget Round	Initial Bill
Bill Version	Regular Session
Request Type	Previously Submitted
Project Location	Roanoke Area
Facility/Campus	Blacksburg Main Campus
Source of Request	Agency Request
Infrastructure Element	Laboratory / Classroom
Contains O & M costs? Yes	
Contains significant technology costs? No	
Contains significant energy costs? No	
Possible that project will be used by other than a state or local governmental entity, or for research under sponsored programs (higher education)? No	

Agency Narrative

Agency Description

Executive Summary:

Virginia Tech leads the state in STEM-H degree production with over 5,550 degrees awarded annually. This represents 58 percent of Virginia Tech's total degree production and 26 percent of the statewide STEM-H degree production in public universities. The Chemistry department and Physics department provide essential instruction courses for all these programs.

In 2020, the Physics department graduated a record number of students with a bachelor's degree and is in the top 21 departments in the country in physics bachelor's degree production, according to the most recent American Institute of Physics survey in 2018. Physics is also a required core course for all undergraduates majoring in engineering, including those in the Tech Talent Pipeline Initiative, and many of those majoring in the life sciences. The Chemistry department teaches at least one class to 70 percent of all students at Virginia Tech.

These departments also promote university-based research that produces outside investment in the Commonwealth. In the 2019 fiscal year, the Chemistry department had approximately $12 million in extramural research expenditures. The Physics department's sponsored research activity has reached $6.4 million annually.

However, in their current deteriorated condition, the facilities supporting this instruction and research no longer provide the infrastructure needed in the 21st century. Hahn Hall South, constructed in 1988, is a chemistry research laboratory workhorse whose program now exceeds the capabilities of the existing infrastructure. Robeson Hall, constructed in 1960 for the Physics department, has not received a major renovation since its construction.

The pandemic has further emphasized the importance for hands-on learning of certain skills, techniques, and topics and the spaces which support these experiences. A May 2020 student and faculty survey revealed that, although satisfied overall with instructional changes made as a result of the pandemic, students were unsatisfied with changes required for laboratory instruction. Capacity restrictions during the pandemic compromised learning experiences and further increased scheduling challenges for laboratory courses, partially due to inflexible existing lab spaces that are not easily reconfigured. In person lab classes and exercises were reduced and many high enrollment labs, including general chemistry and first-year physics, were taught remotely due to insufficient space and time to provide a meaningful in person instruction. Students were not satisfied with online labs but appreciated the limited hands-on experiences where they were offered. Without improved and expanded space for these programs, the university cannot meet the expectations of students and faculty for an education from

Virginia Tech.

In support of the “Top Jobs Act” of 2011 and the Tech Talent Pipeline Initiative, this project will renovate existing chemistry facilities at Hahn Hall South and expand physics facilities with a new building. These improvements are essential to prepare Virginians for a knowledge-based economy by providing STEM-H instructional excellence, accomplished through cost efficient operation and technological and pedagogical innovation. The project will bring these departments up to modern standards, provide sufficient research and instructional space, promote additional university-based research and outside investment in the Commonwealth, and provide additional opportunities for the College of Science.

Project Description:

This renovation of the existing facility and the construction of the new facility are described below.

Renovate Chemistry Facilities at Hahn Hall South

At approximately 71,100 gross square feet, Hahn Hall South is a chemistry research laboratory workhorse constructed in 1988. Its physical connection to two other College of Science facilities (Robeson Hall to the east and Hahn Hall North to the north) positions this building to expose undergraduates to research activities. The current facility is in need of a complete overhaul, due in part to an outdated fume exhaust system.

A renovation of Hahn Hall South for the Chemistry department will extend the useful life of the facility as a critical science building and create modern teaching and laboratory spaces to support new pedagogical practices such as problem based learning and undergraduate research opportunities. The renovated space will consist of 32,400 assignable square feet (ASF) of research laboratories; approximately 5,000 ASF of faculty, staff, and student office spaces; approximately 2,700 ASF of collaboration, studio, and support space; and approximately 6,100 ASF of storage, shops, and receiving space. The renovation will also include an upgrade of all building systems and infrastructure to support modern instrumentation that is now the standard expectation for research.

Expand Physics Facilities

The construction of a new four-story building will add approximately 53,000 gross square feet to the facilities portfolio of the Physics department. The expansion building will be constructed to meet contemporary laboratory design standards, providing additional instruction and research labs, lab support spaces, and a cleanroom.

The building will include approximately 7,800 assignable square feet of classrooms and instructional laboratories; 12,000 ASF of research laboratories, 4,300 ASF of faculty, staff, and student office spaces; 2,500 ASF of collaboration, studio, and support space; and approximately 900 ASF of storage, shops, and receiving space; and 7,000 ASF of cleanroom space. The cleanroom space will advance research capabilities, keep the university competitive with other institutions nationwide, and help attract and retain top research faculty. Additional new high-quality research lab space provided through the expansion will increase the inventory and use of shared instruments and shared laboratory spaces on campus, promoting university-based research that is a catalyst for outside investment in the Commonwealth.

The expansion will provide space for a materials education and research hub for nanoscience and nanomedicine programs and allow for growth in the university’s quantum information science, soft matter and biological physics, and experimental high energy/nuclear physics programs. New classroom space will allow for engaged, active learning pedagogy. An accessible high bay space with a crane will provide space to build equipment for upcoming large initiatives in experimental high energy and nuclear physics such as the Deep Underground Neutrino Experiment and the Electron Ion Collider.

This expansion will be clad in a combination of Hokie Stone, architectural precast concrete panels and trim, and a combination of point-supported glazing and punched opening windows, complementing the architectural materials in the existing core campus facilities. The expansion is expected to provide a strong contribution to the campus’ collegiate gothic architecture and sense of place through its orientation, massing, and landscape.

The project scope, site development, and building configuration for the Renovate and Expand Chemistry/Physics Facilities project is consistent with the 2018 master plan and the 2021 Green Links Concept Design and Design Guidelines to achieve key university objectives which maximize existing site utilization while meeting the needs of this century’s students and faculty. The site’s key objectives include access for all through accessible and universal design, site interventions, appropriate building configuration, scale and massing, stormwater mitigation and site integration, and sustainability priorities consistent with the 2021 Climate Action Commitment.

Justification

Program Description:

Renovate Chemistry Facilities at Hahn Hall South

Entering the 2021-2022 academic year, the Chemistry department will be comprised of at least 30 tenure-track faculty, 22 non-tenure track faculty, 13 part-time and full-time instructional faculty, 14 postdoctoral research fellows, and at least 21 part-time and full-time staff

members. These faculty members have been nationally and internationally recognized through numerous university, state, national and international awards including: one University Distinguished Professor, 14 NSF Career or NIH FIRST awardees, four Research Corporation Cottrell Scholars, four Camille and Henry Dreyfus awardees, three Sloan Fellows, two Kavli Fellows of the US National Academy of Sciences, two Dirac Medalists, and one Medal winner of the International Academy of Quantum Molecular Sciences.

The Chemistry department teaches at least one class to 70 percent of all students at Virginia Tech. During the 2020-2021 academic year, the department had a total enrollment of approximately 215 undergraduate students and approximately 130 graduate students. Chemistry faculty mentored another 20 graduate students in the interdisciplinary Macromolecular Science and Engineering Degree program. In the 2019-2020 academic year, the chemistry faculty graduated 37 B.S. and B.A. students and at least 20 Ph.D. and 9 M.S. students. The department now offers two new majors, Polymer Chemistry and Molecular Chemistry, under the chemistry degree.

The faculty also provide leadership to the Macromolecules and Innovation Institute, the Macromolecular Science and Engineering Degree program, the Economical and Sustainable Materials Strategic Growth Area, and the Virginia Tech Center for Drug Discovery. The department also oversees multiple university service centers that serve the faculty and students at Virginia Tech as well as local and national industrial partners. Facilities in Hahn Hall South include nuclear magnetic resonance spectroscopy and mass spectrometry, a Surface Analysis Laboratory, and a laboratory glass shop.

The Chemistry department promotes university-based research that produces outside investment in the Commonwealth. In the 2019 fiscal year, the department had approximately $12 million in extramural research expenditures. Recent research accomplishments from the department include: Establishment of the Molecular Sciences Software Institute, a five-year, $19.4 million National Science Foundation funded center (2016), a $2.8 million National Institute of Health funded collaboration with the University of Virginia to discover drugs to treat auto-immune disorders, a $1.8 million Department of Energy funded collaboration with the Physics department to perform simulations of molecules on small, custom built superconducting quantum computers, and a significant role for chemistry faculty in the $22.9 million National Science Foundation funded GlycoMIP research project. The GlycoMIP project encompasses a national user facility and multidisciplinary research program that accelerates the discovery and development of glycomaterials.

The Renovate Chemistry Facilities at Hahn Hall South project will help prepare Virginians for a knowledge-based economy by providing STEM-H instructional excellence, accomplished through cost efficient operation and technological, and pedagogical innovation.

Expand Physics Facilities

The Physics department is comprised of 44 tenure-track faculty, part-time and full-time instructors, 21 postdoctoral research fellows, and 15 staff members. The department currently has a total enrollment of 242 undergraduate students and 75 graduate students. The department graduated a record number of 75 B.S. and B.A. students in 2020, and is in the top 21 departments in the country in physics bachelor's degree production according to the most recent American Institute of Physics survey in 2018. In the most recently completed fiscal year 2020, the Physics department delivered 33,796 student credit hours of instruction.

The Physics department provides a wide range of courses, including large service courses at the introductory level and a complete set of courses providing preparation for physics undergraduate and graduate students. Physics is a required core course for all undergraduates majoring in engineering, including those in the Tech Talent Pipeline Initiative, and many of those majoring in the life sciences. Along with the Biological Sciences department, the Physics and Chemistry departments won a University Exemplary department Award in 2017 for "developing and sustaining effective large-class instruction." For physics undergraduate majors, the department offers programs leading to the B.S. and B.A. degrees, with graduates going on to a wide range of options including graduate education and immediate employment in the private sector. In addition, the Physics Teachers Education Coalition program prepares students to be high school physics teachers.

The Physics department promotes university-based research that produces outside investment in the Commonwealth. Its sponsored research activity has grown from $2 million in 2008 to $6.4 million annually as of 2020. Recent research accomplishments from the department include: significant federal funding obtained to support research in the area of quantum information science, development of a compact, mobile neutrino detector with potential applications to nuclear reactor monitoring for security reasons, and significant federal funding obtained in the area of critical dynamics theory.

The expansion space also supports the College of Science's theme of Materials for Health, Information, and Energy through the Nanoscience and Nanomedicine degree programs and the Economical and Sustainable Materials Strategic Growth Area.

Providing a hub for education and research in materials will be an important part of the expansion. The Nanoscience and Nanomedicine degree programs involve materials at the smallest length scales at which matter can be controlled. The new degrees have applications in the technology areas of electronics, information technology, medicine, renewable energy, aerospace, and advanced materials. The Economical and Sustainable Materials strategic growth area will prepare students for today's jobs that extend beyond traditional materials science. This project allows faculty to instill within students the skills and subject knowledge necessary to make fundamental materials discoveries. Materials scientists have a key role in the implementation of material discoveries into the real world and their integration into multiple cross-cutting fields such as health, energy, environment, and resilient infrastructure.

The Expand Physics Facilities project will help prepare Virginians for a knowledge-based economy by providing innovative STEM-H

instructional excellence through cost efficient operation.

The university's strategic plan includes the following principle strategies that will be supported by the Renovate and Expand Chemistry/Physics Facilities project:

• Increase and sustain excellence in research, discovery, and creativity.
• Increase teaching and learning excellence for a holistic education.
• Increase institutional impact and visibility.
• Achieve top US public land-grant ranking.
• Increase the four-year graduation rate for all undergraduate students to 70 percent as well as the three-year graduation rate for all undergraduate transfer students to 75 percent.
• Reduce the student average student loan debt per graduating senior to $25,000.
• Increase representational diversity, cultural competency, and address critical societal issues impacting humanity and equity.
• Attract, retain, and develop the talents of students, faculty and staff prepared to serve both the local and global communities while also supporting lifelong engagement and learning.
• Continue to develop the physical campus and technology infrastructure.
• Increase the number of programs recognized as among the best internationally.
• Increase the number of post-doctoral positions in STEM-H research areas.
• Increase undergraduate involvement in meaningful research experiences and experiential learning through hands on minds on.
• Continue to investigate, develop, and utilize current and emerging technologies to enhance traditional classrooms, provide mobile access, and expand high-quality distance-learning opportunities.
• Identify opportunities during construction and renovation to create flexible classroom spaces that fully support e-learning components.
• Implementing the Climate Action Commitment and Sustainability Plan as appropriate.

Existing Facilities:

Renovate Chemistry Facilities at Hahn Hall South

Hahn Hall South was constructed in 1988 as phase one of a two-phase building project that spanned roughly two decades. The second phase, Hahn Hall North, was constructed in 2002 and is not directly included in this project's scope.

Hahn Hall South provides chemistry research laboratory space near the Drillfield, the center of the Blacksburg campus, and a concentration of College of Science facilities. The facility is physically connected to two other College of Science facilities. Hahn Hall North is connected through a lobby and stair, and Robeson Hall connects to Hahn Hall South through a three-story atrium.

Hahn Hall South is four stories tall and totals approximately 71,100 gross square feet, with a facility condition index of 57 percent in the FICAS system as of April 2021. The building houses the research laboratories, laboratory support spaces, and building systems space with a three-story atrium that provides connection to Robeson Hall on multiple levels. Hahn Hall South also includes offices, study space, and open area for symposia and related activities.

The use of scientific equipment, including computing and specialized laboratory equipment, is exceeding the capabilities of the existing mechanical, electrical, plumbing, and environmental control systems, particularly the building's original system for hooded ventilation. Hahn Hall South's condition has progressed beyond the scope of normal operations and maintenance reserve repairs. In its current deteriorated condition, it no longer provides the instructional and research infrastructure needed in the 21st century.

Renovating the existing building, with a focus on the laboratory research environment, is the most efficient and cost effective option for providing functional space for both the Chemistry department and additional opportunities for the College of Science.

Expand Physics Facilities

The primary existing facilities for the Physics department are Robeson Hall and Hahn Hall North. Combined, these facilities provide approximately 45,000 gross square feet of total instructional and research space. Robeson Hall was constructed in 1960 as the flagship building for the Physics department and has not benefited from a major comprehensive renovation since its construction. Its building systems and laboratory environments are now substantially out-of-date. The building has extensive egress and ADA deficiencies and a facility condition index of 36 percent in the FICAS system as of April 2021. The use of scientific equipment, including computing and specialized laboratory equipment, is exceeding the capabilities of the existing mechanical, electrical, plumbing, and environmental control systems.
The Expand Physics Facilities project will bring Virginia Tech's Physics department up to today's standards and provide sufficient research and instructional space to allow the university to begin renovations and upgrades to Robeson Hall to return it to its highest potential use.

Funding Plan:

The program of the Renovate Chemistry Facilities at Hahn Hall South portion of this request is 80 percent research and 20 percent instruction, and the program of the Expand Physics Facilities portion of this request is 33 percent research and 67 percent instruction.

The total funding plan for this $107.1 million project calls for $76.8 million of General Fund support for the instructional program and 50 percent of the research program. The remaining $30.29 million of nongeneral fund authorization is for the university's 50 percent support of the research program. The nongeneral fund component is requested as a revenue bond authorization that will be repaid by overhead revenue generated from the research program.

Options Considered:

Options considered but not pursued include new construction of the desired space elsewhere on campus and leasing the desired space at an off campus location. These approaches would cost more than the proposed renovation, would not use the existing space inventory to its highest capacity use, and would leave a significant space asset unserviceable. In addition, the dispersion of instructional and research programs across multiple buildings, required by each of these approaches, would negatively impact students and faculty. The cost to construct the new building elsewhere on campus would be similar yet lack the adjacency of neighboring science programs. Leasing an off campus location is not financially feasible because of the lack of suitable leasable inventory.

Methodology

Cost Explanation and Methodology:

A. Methods Used to Estimate Costs:

The method for estimating costs for the Renovate and Expand Chemistry/Physics Facilities project includes: 1) using unit costs in the Division of Engineering and Building's Construction Costs Database updated May 2020 with a regional market multiplier and a multiplier for soft costs; and 2) comparables as shown in the CR-1. Both methods are escalated to a construction midpoint of 2025 at 4.25 percent escalation in accordance with the instructions for developing the Six-Year Capital Outlay Plan and the rate utilized in the most recent CR-1 Project Planning form (as of July 2021).

On a total project cost basis, inclusive of design, construction, and equipment, the unit costs are $863 per gross square foot. The unit construction costs of the project are $653 per gross square foot, including self-performed construction work. The building types in this request are wet laboratory, dry laboratory, and classroom spaces in the Division of Engineering and Building's Virginia Construction Costs Database.

The university's project cost estimates are derived from a database of on campus construction costs of comparable project types. Virginia Tech building construction reflects the high level of quality, durability, and tradition that makes Virginia Tech a distinctive and memorable place for students. The estimates also include the cost of technology, specialized instruction, and energy efficiency goals of the institution.

Construction Manager at Risk is the intended delivery method for this project.

B. This section is presented in two parts, Renovate Chemistry Facilities at Hahn Hall South and Expand Physics Facilities, to depict cost specific to each of the components of this project request. The proposed costs include the following critical considerations to ensure the project fully meets the needs of the program and the university:

Renovate Chemistry Facilities at Hahn Hall South

1) Renovation of the existing portion of Hann Hall South will require the full inspection and repairs to the building envelope to extend the life of the facility. Extensive repointing of exterior masonry, installation of new windows, and replacement of the roofing system. The costs for this are included in the construction budget line item. Envelope commission and related inspection costs are carried in the Other Costs as they are performed by a third party.

2) Renovation will involve complete replacement of mechanical, plumbing, electrical systems and building automation systems that have exceeded their useful life. New systems shall meet current code and energy requirements. It will also require installation of sprinkler, fire alarm systems, distributed antenna systems and accessibility improvements.

3) Building structural support systems will be evaluated once exposed and potentially modified to accommodate and support programmatic changes to the existing building. Raised floor systems will be evaluated for spaces that are prone to future changes allowing for maximum adaptation.

4) High-capacity wireless networks to support multiple devices (laptop computer, tablet computer, smartphone, and other WIFI devices) used simultaneously by students and faculty to retrieve information and to communicate and to connect digitally with sites around campus and around the world. Testing and instruction can utilize online applications requiring the capacity for an entire classroom to be connected simultaneously.

5) Power outlets corresponding to the seat/station count and power outlets in common areas will exceed the minimum code requirements by approximately 30 percent.

6) Automated audiovisual and lighting controls are included for all classroom and class laboratory spaces.

7) Climate controlled technology server rooms, 10 feet by 10 feet, on each floor of the building or as required to provide efficient distribution

of services.

8) Communications infrastructure, wired and wireless, is installed by a university operated auxiliary; thus, these costs are shown in the Other Costs section of the proposed budget.

9) Restricted site access in a dense and active part of campus will increase mobilization and site logistics costs.

10) Code and regulation are updated over time. Following are some changes that have occurred that were not in place on the comparable projects that were used to provide the parametric estimate for this project:

• DEQ increased the storm water management requirements in 2014. Extensive BMP's and off-set credits are required to be installed and/or purchased to comply with this federal regulation.
• ASHRE 90.1 energy code stipulates that buildings use less energy with each successive issuance of the code. The most recent change requires 18.5 percent decrease in energy usage. This translates into increased capital costs.
• The state mandated High Performance Building Act provides three options for compliance. Virginia Tech utilized LEED V4, which mandates energy savings beyond the requirements of energy code, ASHRE 90.1. This increases the capital construction costs.
• LEED additionally requires the commissioning of the energy savings components. The costs are on the order of 0.75-1.3 percent of the construction costs. The services are provided by a third party and are captured in the Other Costs section.

11) If construction funding is split and a phased delivery is necessary, the total project duration and costs will increase accordingly due to increase escalation, logistics, and extended general conditions. The midpoint of construction for the total project will be extended increasing escalation costs, general conditions, inspection and PM expenses. Phasing will also increase the expenses associated with performing work in an occupied building. Additionally, phasing creates a major design constraint that may reduce design opportunities. To accommodate the phasing, the AE will need to produce multiple design packages increasing design fees and construction administration expenses.

12) The FICAS report for Hahn Hall South indicates building envelope elements that are in need of replacement to include the skylights in the atrium, the roof, windows and repairs to the exterior façade.

13) The Board of Visitors recently approved an expanded Climate Action Commitment. Capital projects will maintain high performance building characteristics, strive to integrate educational green initiatives into the built environment, and study the buildings performance in an effort to achieve carbon neutrality by 2030. Executive Order 43 (EO43) sets goals of carbon neutrality by 2050 and acknowledges the need to invest in K-12 education to create an educated work force to support the Commonwealth's goals. EO43 specifically states that "for newly-constructed buildings, all executive branch agencies and institutions shall evaluate the use of distributed solar resources during the design and engineering process." Virginia Tech plans to have buildings that lead by example, integrate climate initiatives into the academic mission, and add to the much needed workforce to achieve these mutual goals.

Expand Physics Facilities

1) The building envelope will be comprised primarily of Hokie Stone with precast concrete accents consistent with university standards as affirmed by the Board of Visitors. Brick, metal panels, and siding materials are not permitted as substitutions for Hokie Stone. The stone is a four-inch thick nominal stone thickness with a two-inch nominal air barrier over moisture resistant sheathing. Stainless steel anchoring straps and load bearing shelf angles and stainless steel flashings comprise the structural support and flashings system. The university owns the stone quarries and provides the cut materials to the building; thus, the material costs along with intensive quality insurance inspection costs are carried in the Other Costs section of the proposed budget, while the construction budget carries all erection, final stone dressing, and installation costs.

2) Mechanical equipment and building automation systems are designed and selected to meet performance requirements and to optimize total costs of ownership inclusive of energy costs and operations and maintenance costs. System selections are justified based on a 30-year economic life cycle analysis. Mechanical equipment will be covered and secured to maximize equipment life and service.

3) Academic buildings include interior glazing for energy efficiency, lighting for academic work, and to enhance pedagogy while maintaining a secure room envelope.

4) Ceiling heights will be appropriate for proper sound attenuation in large lecture and assembly environments as required for effective pedagogy.

5) Building structural support systems will accommodate large open and unimpeded interior spaces to maximize long-term programmatic functionality and adaptation to new program space and technology arrangements. The structure is additionally designed to reduce vibrations that would negatively impact scientific research.

6) High-capacity wireless networks to support multiple devices (laptop computer, tablet computer, smartphone, and other WIFI devices) used simultaneously by students and faculty to retrieve information and to communicate and to connect digitally with sites around campus and around the world. Testing can utilize online applications requiring the capacity for an entire classroom to be connected simultaneously.

7) Power outlets corresponding to the seat/station count and power outlets in common areas will exceed the minimum code requirements by approximately 30 percent.

8) Automated audiovisual and lighting controls are included for all classroom and class laboratory spaces.

9) Climate controlled technology server rooms, 10 feet by 10 feet, on each floor of the building.

10) Communications infrastructure, both wired and wireless, is installed by a university operated auxiliary; thus, these costs are shown in the Other Costs section of the proposed budget.

11) Site development costs in this region are historically in the medium to high range and require generally significant subsurface rock excavation and removal and deep foundations. This site may require extensive subsurface rock excavation and removal.

12) Utilities (power, chilled water, domestic water, sanitary sewer, natural gas, technology, and storm water infrastructure) do not terminate at the building site and their extension or on-site provision is anticipated to be a sizable cost driver for this project.

13) Restricted site access in a dense and active part of campus will increase mobilization and site logistics costs. Limited material lay-down areas increase material costs and risks due to necessitating just in time delivery and/or off-site storage.

14) Code and regulation are updated over time. Following are some changes that have occurred that were not in place on the comparable projects that were used to provide the parametric estimate for this project:

• DEQ increased the storm water management requirements in 2014. Extensive BMP's and off-set credits are required to be installed and/ or purchased to comply with this federal regulation.
• ASHRE 90.1 energy code stipulates that buildings use less energy with each successive issuance of the code. The most recent change requires 18.5 percent decrease in energy usage. This translates into increase capital costs.
• The state mandated High Performance Building Act provides three options for compliance. Virginia Tech utilized LEED V4 which mandates energy savings beyond the requirements of energy code, ASHRE 90.1. This increases the capital construction costs.
• LEED additionally requires the commissioning of the energy savings components. The costs are on the order of 0.75-1.3 percent of the construction costs. The services are provided by a third party and are captured in the Other Costs section.

15) If construction funding is split and a phased delivery is necessary, the total project duration and costs will increase accordingly due to increase escalation, logistics, and extended general conditions. The midpoint of construction for the total project will be extended increasing escalation costs, general conditions, inspection and PM expenses. Phasing will also increase the expenses associated with performing work in an occupied building. Additionally, phasing creates a major design constraint that may reduce design opportunities. To accommodate the phasing, the AE will need to produce multiple design packages increasing design fees and construction administration expenses.

16) The Board of Visitors recently approved an expanded Climate Action Commitment. Capital projects will maintain high performance building characteristics, strive to integrate educational green initiatives into the built environment, and study the buildings performance in an effort to achieve carbon neutrality by 2030. Executive Order 43 (EO43) sets goals of carbon neutrality by 2050 and acknowledges the need to invest in K-12 education to create an educated work force to support the Commonwealth's goals. EO43 specifically states that "for newly-constructed buildings, all executive branch agencies and institutions shall evaluate the use of distributed solar resources during the design and engineering process." Virginia Tech plans to have buildings that lead by example, integrate climate initiatives into the academic mission, and add to the much needed workforce to achieve these mutual goals.

Funding Request

Phase	Year	Subobject	Fund	Amount
Full Funding	2023	2322 - Construction, Buildings	01000 - General Fund	$76,809,000
Full Funding	2023	2322 - Construction, Buildings	08150 - 9(D) Rev Bonds-Construction	$30,291,000
			Total	$107,100,000

Project Costs

Cost Type	Requested Funding
Acquisition Cost	$0
Building & Built-in Equipment	$81,037,641
Sitework & Utility Construction	$0
Construction Cost Total	**$81,037,641**
DESIGN & RELATED SERVICE ITEMS	
A/E Basic Services	$8,671,028

A/E Reimbursables	$113,453
Specialty Consultants (Food Service, Acoustics, etc.)	$0
CM Design Phase Services	$194,490
Subsurface Investigations (Geotech, Soil Borings)	$40,519
Land Survey	$0
Archeological Survey	$0
Hazmat Survey & Design	$24,311
Value Engineering Services	$0
Cost Estimating Services	$16,208
Other Design & Related Services	$526,744
Design & Related Services Total	**$9,586,753**
INSPECTION & TESTING SERVICE ITEMS	
Project Inspection Services (inhouse or consultant)	$575,367
Project Testing Services (conc., steel, roofing, etc.)	$340,358
Inspection & Testing Services Total	**$915,725**
PROJECT MANAGEMENT & OTHER COST ITEMS	
Project Management (inhouse or consultant)	$1,186,907
Work By Owner	$284,435
BCOM Services	$129,660
Advertisements	$8,104
Printing & Reproduction	$8,104
Moving & Relocation Expenses	$353,719
A/V Cabling	$0
IT Cabling	$0
Telephone Cabling	$0
A/V Equipment	$0
IT Equipment	$2,285,261
Telephone Equipment	$0
Signage	$56,726
Demolition	$0
Hazardous Material Abatement	$353,719
Utility Connection Fees	$0
Utility Relocations	$632,094
Commissioning	$1,215,565
Miscellaneous Other Costs	$1,320,912
Project Management & Other Costs Total	**$7,835,206**
Furnishings & Movable Equipment	$6,103,921
Construction Contingency	$1,620,754
TOTAL PROJECT COST	**$107,100,000**

Size and Scope

Cost Type	Cost	Unit of Measure	Units	Cost Per Unit
Acquisition Cost			0	$0
Construction Cost	$81,037,641	GSF	124,147	$653
New Construction Cost	$53,400,000	GSF	53,040	$1,007
Improvement Cost	$53,700,000	GSF	71,107	$755

Operating and Maintenance Costs

Cost Type	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
GF Dollars	$0	$0	$0	$974,206	$1,003,432	$1,033,535

NGF Dollars	$0	$0	$0	$0	$0	$0
GF Positions	0.00	0.00	0.00	5.06	5.06	5.06
NGF Positions	0.00	0.00	0.00	0.00	0.00	0.00
GF Transfer	$0	$0	$0	$0	$0	$0
GF Revenue	$0	$0	$0	$0	$0	$0
Layoffs	0	0	0	0	0	0

Planned start date of new O&M costs (if different than the beginning of the fiscal year):---

Supporting Documents

File Name	File Size	Uploaded By	Upload Date	Comment
Renovate and Expand Chemistry-Physics Facilities Program Chart.pdf	503,090	Rob Mann	9/17/2021	
02-CR-1 Chem Physics 8.6.21 Updated DGS.xlsx	587,721	Cassidy Limer	9/21/2021	

Workflow History

User Name	Claimed	Submitted	Step Name	Submit Action
Cassidy Limer	09/13/2021 11:56 AM	09/13/2021 11:56 AM	Enter Capital Budget Request	Continue Working
Cassidy Limer	09/13/2021 11:56 AM	09/17/2021 04:50 PM	Continue Drafting	Continue Working
Rob Mann	09/17/2021 06:12 PM	09/17/2021 06:35 PM	Continue Drafting	Continue Working
Cassidy Limer	09/20/2021 11:36 AM	09/21/2021 03:28 PM	Continue Drafting	Submit for Agency Review
Rob Mann	09/21/2021 03:55 PM	09/21/2021 04:14 PM	Agency Review Step 1	Ready for DPB Bulk Submit
Rob Mann	09/23/2021 04:44 PM	09/23/2021 04:44 PM	Ready for DPB Submission	Submit to DPB
			DPB Review	