CapitalBudgetRequest

Construct Undergraduate Science Laboratory Building	
Overview	
Agency	Virginia Polytechnic Institute and State University (208)
Project Code	
Project Type	New Construction
Biennium	2018-2020
Budget Round	Initial Bill
Request Origin	Previously Submitted
Project Location	Roanoke Area
Facility/Campus	Blacksburg Main Campus
Source of Request	Agency Request
Infrastructure Element	Laboratory / Classroom
Contains significant technology costs? No	
Contains significant energy costs? No	
Project will be used by other than a state or local governmental entity? No	

Agency Narrative

Agency Description

Executive Summary:

Detailed Planning for this project was authorized in Item 4 of Chapter 759 of the 2016 Acts of Assembly with an effective date of July 1, 2017. The University has internally advanced a feasibility study and primed the procurement process to be ready for a July 1, 2017 design contract execution.

Under this approach, Schematic Designs will be completed in October 2017 and Preliminary Designs (Detail Planning) will be complete in August 2018. After these designs are completed and then reviewed by the Bureau of Capital Outlay Management, the project would be ready for construction funding.

The state's current capital program would have the construction funding ready in fiscal year 2020 (start July 2019), which would mean the project would sit idle for approximately 11 months and then complete Working Drawings and be ready for construction start in October 2019. The estimated cost increases due to escalation for the 11 month holding period are $2.5 million.

The University respectfully requests a nongeneral fund debt authorization to provide and infuse temporary construction funding effective in fiscal year 2019 to collapse the project schedule to avoid the estimated $2.5 million of escalation costs, provide needed services to undergraduate students a full year earlier, and preserve a small portion of the state's future debt capacity.

Under this proposal, the University's temporary financing would be reimbursed by state funding in fiscal year 2020, which would be consistent with the state's capital construction funding schedule. The University would be willing to absorb the carrying costs of the temporary financing under this arrangement and recognizes the timing for permanent construction funding is not guaranteed in fiscal year 2020.

Project Description:

The proposed building is envisioned to be a 102,000 gross square foot, four story structure, clad in a combination of Hokie stone, precast concrete panels and trim, and a combination of curtain wall glazing and punched opening windows. The proposed building site is located on an existing paved parking lot adjacent to the new undergraduate Classroom Building which was opened in August 2016. The proposed building is expected to provide a strong connection to the site including landscaping for outdoor classroom sections.

The program for this building includes 14 dry laboratories, 10 wet laboratories, support/storage space for all the laboratories, five classrooms, faculty offices, graduate teaching assistant workspace, and library study areas and project work areas.

Instruction in neuroscience, nanoscience, biomedical engineering, materials science engineering and other advanced programs will involve the use of advanced imaging equipment that requires vibration isolation, electromagnetic shielding and sufficient building infrastructure to support advanced computing associated with this equipment.

The project scope, site development, and building configuration shall be consistent with the 2017 master plan update and include universal accessibility design principles as appropriate.

Justification

Program Description:

Virginia Tech continues to grow in undergraduate students, and particularly in STEM-H majors. The University graduates more than twice as many STEM-H majors as any other Virginia institution. From 2004 to 2016, the University grew undergraduate majors from 22,428 to 24,999, or by eleven percent. During this period, STEM-H majors grew from 8,514 to 11,092, or by 30 percent. Thus, as the total number of students is expanding, the number of STEM-H majors is growing at faster rate. Looking forward, the University has projected to SCHEV in its Form 2B a plan to grow by 1,800 undergraduates by 2018-19 and a significant portion of this growth is expected to be in the STEM-H areas. Much of this growth will be in engineering, traditional sciences, as well as in new degree programs such as neuroscience.

Meanwhile, during this period of expansion, the University last constructed an undergraduate laboratory facility in 2004 for instruction in chemistry and physics. The University's existing inventory of science laboratory instruction is now too small and generally outdated to accommodate the current demand for instruction spaces by engineering and science majors.

The increase in both the actual number of majors in STEM-H fields and the strategic actions of the University to continue to address the Top Jobs 21 goals for more STEM-H degrees creates significant pressures on existing, science instructional laboratory facilities. For example, since 2004, student credit hours in physics have jumped to 5,961 from 4,077, a 46 percent increase. Physics is a key service discipline for engineering and other physical science majors. Likewise biology laboratory credit hours, a key service discipline for the broad range of life science majors at Virginia Tech, has increased 56 percent.

The University cannot accommodate the class scheduling demands of growing STEM-H courses with the existing inventory. The University is confronted with the need to construct new instructional laboratories to support significant enrollment growth. Much of the instruction for these programs is currently housed in older facilities with equipment that is inadequate to support modern instructional methods and limited in the section sizes in which lab courses can be delivered. These buildings are unable to adequately support growing enrollments in STEM-H programs where increased demand for laboratory seats is driving the need for this new instructional lab facility.

This project is designed to meet the laboratory instruction demands of students enrolled in courses that are part of the growing emphasis on physical and life sciences. Within Virginia Tech there is an awareness of the need to transition from the traditional lecture/lab model toward team-based, problem-oriented learning that puts increased emphasis on research-like experience to provide a sense of relevancy, excitement, and engagement in the laboratory. This contrasts with the traditional model of repeating rote lab exercises with known results. Undergraduate science education is moving toward a more unified model of lecture and laboratory that makes use of Technology Enhanced Active Learning (TEAL) and Interdisciplinary Problem Based Learning (I-PBL). TEAL and I-PBL, while first applied to classroom design, are beginning to also have significant impact on lab design. This new approach to how science should be taught also has important implications for the design of instructional laboratories. Laboratories should be visually transparent, incorporating glass partition walls wherever possible, to publically display the laboratory activities and generate curiosity and engagement. Laboratories can be departmentally specific or they can be cross-disciplinary, collaborative, and highly interactive depending on the class size and the nature of the investigation. All new laboratories must be highly flexible and adaptable for future instructional needs. Ample computational space is a must as are generous floor to floor heights, sufficient cooling capacity, and abundant electrical power to each student station. Moveable furniture with overhead utility connections is costly but ensures flexibility and cost savings in the future.

This project requests authorization to construct a new undergraduate science laboratories facility of 102,000 gross square feet to accommodate the growing demand for STEM-H degrees at Virginia Tech.

This project supports several principal strategies of the University's strategic plan including:

• Increasing the number of our programs recognized as among the best internationally.
• Ensuring competency in data analysis and computational methods as a component of general education for all students.
• Developing an appropriate infrastructure for e-learning.
• Emphasizing translational research and scholarship.
• Building upon existing and emerging strengths.
• Pursuing quality-of-life initiatives in support of the University as a vibrant, dynamic, and sustainable workplace.
• Supporting a sustainable workplace.
• Increase in undergraduate involvement in meaningful research experiences and experiential learning opportunities by adopting a "hands on, minds on" philosophy that promotes connecting real life experience with academic concepts.
• Develop ways to integrate computational science/informatics and digital fluency for managing and analyzing complex data sets across a wide range of disciplines.
• Identify opportunities during construction and renovation to create flexible classroom spaces that fully support e-learning components.

Existing Facilities:

The existing laboratory facilities currently being used to deliver instruction include Derring Hall, Engel Hall, Robeson Hall, McBryde Hall, and the newly opened Classroom Building. With the exception of the Classroom Building, these buildings are reaching the age when a major retooling of their building systems is required.

The existing laboratory capacity in these buildings is not sufficient to meet the scheduling demands for courses. Physics teaching laboratories, for example, are constantly in use, from 8:00 am until 6:00 pm Monday through Thursday, with several sections held on Friday, leaving almost no time for regular maintenance, time to refresh experiment set-ups, or time for students to rework an unsuccessful lab project. Similarly, introductory biology and other undergraduate integrated science laboratories are heavily scheduled.

Building systems - mechanical, plumbing and, in many cases, electrical infrastructure - are inadequate to provide a safe, healthy laboratory environment in which to deliver instruction. Efforts to upgrade these facilities to accommodate the modern technology involved in teaching science courses are encountering major obstacles, including structural barriers and limitations, such as low floor-to-floor heights and bearing walls interfering with space reconfigurations as well as wireless transmission.

The new building will provide new instructional space serving undergraduate science programs, undergraduate science laboratories, laboratory support services, and flexible classroom space.

A new laboratory building will provide sufficient instructional space to allow the University to begin renovations and upgrades in these existing buildings to return them to their highest potential use. Future renovation projects for these facilities are envisioned in the University's long-term capital outlay plan.

Funding Plan:

The program of this project is entirely Educational and General instructional programs; thus, the funding plan calls for 100 percent General Fund support for the $75 million Undergraduate Science Laboratory building.

Detailed Planning for this project was authorized in Item 4 of Chapter 759 of the 2016 Acts of Assembly with an effective date of July 1, 2017. Under this timing, Schematic Designs will be completed in October 2017 and Preliminary Designs (Detail Planning) will be complete in August 2018. After these designs are completed and then reviewed by the Bureau of Capital Outlay Management, the project would be ready for construction funding.

The state's current capital program would have the construction funding ready in fiscal year 2020 (start July 2019), which would mean the project would sit idle for approximately 11 months and then complete Working Drawings and be ready for construction start in October 2019. The estimated cost increases due to escalation for the 11 month holding period are $2.5 million.

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Under this proposal, the University's temporary financing would be reimbursed by state funding in fiscal year 2020, which would be consistent with the state's capital construction funding schedule. The University would be willing to absorb the carrying costs of the temporary financing under this arrangement and recognizes the timing for permanent construction funding is not guaranteed in fiscal year 2020.

Options Considered:

Options considered include major renovations to Derring Hall, Engle Hall, Robeson Hall, and McBryde Hall. There is a planning effort currently underway to renovate space in Derring Hall to incorporate two additional teaching labs to partially meet the immediate need for additional seats in the Department of Biology. This has been problematic because Derring is already heavily used and has almost no space that can be compacted to make room for these labs. Other major renovations have not been pursued because efforts to upgrade these older facilities to incorporate the modern technology, equipment, and pedagogy required to teach STEM-H courses, are encountering major obstacles. These obstacles include structural barriers such as low floor-to-floor heights, column grids, and bearing walls interfering with space reconfigurations. In each of the four buildings, the building systems - mechanical, plumbing and, in many cases, electrical infrastructure - are generally inadequate to provide a safe, healthy laboratory environment in which to deliver instruction. The conclusion reached is that even with major renovations, the older buildings will not provide the required physical environment to support state-of-the-art STEM-H instruction. The only practical option is to construct a new science laboratory facility and renovate and reprogram in turn Derring Hall, Engle Hall, Robeson Hall and McBryde Hall for less intensive non-laboratory uses.

Alternatives Considered

Costing Methodology

A. Methods Used to Estimate Costs:

The method for estimating costs for the Data Analytics and Decision Sciences Building project includes: 1) using unit costs in the Bureau of Capital Outlay Management's Construction Costs Database updated October 2016 with a regional market multiplier and a multiplier for softs costs; and 2) comparables as shown in the CR-3. Both methods are escalated to a construction midpoint of 2020 at three percent in accordance with the instructions for developing the Six-Year Capital Outlay Plan.

On a total project cost basis, inclusive of design, construction, and equipment, the unit costs are $735 per gross square foot. The unit

construction costs of the project are $539 per gross square foot, including self-performed construction work. The building types in this request reflect a combination of science wet laboratory, dry laboratory, and research laboratory spaces in the Bureau of Capital Outlay Management's 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. Our 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. The proposed costs include the following critical considerations to ensure the project fully meets the needs of the program and the University:

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 provisions the cut material to the building; thus, the material costs are carried in the Other Costs section of the proposed budget while the construction budget carries all erection, final stone dressing, installation and intensive quality assurance inspection 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.

4) Ceiling heights must be a minimum of 16 feet for 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. This includes raised floor systems for maximum adaptation.

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.

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 an 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 is expected to require floodplain mitigation and extensive subsurface rock excavation and removal.

12) Utilities (power, steam, chilled water, gas, sanitary sewer, and storm water infrastructure) do not terminate at the building site and their extension is included the proposed budget.

Agency Funding Request

Phase	Year	Fund	Subobject	Requested Amount
Construction	2019	01000 - General Fund	2322 - Construction, Buildings	$75,000,000
			Total	$75,000,000

Project Costs

Cost Type	Total Project Costs	Requested Funding	DGS Rec
Acquisition Cost	$0	$0	
Building & Built-in Equipment	$54,983,610	$54,983,610	
Sitework & Utility Construction	$0	$0	

Construction Cost Total	**$54,983,610**	**$54,983,610**	
DESIGN & RELATED SERVICE ITEMS			
A/E Basic Services	$7,960,907	$7,960,907	
A/E Reimbursables	$117,046	$117,046	
Specialty Consultants (Food Service, Acoustics, etc.)	$7,172	$7,172	
CM Design Phase Services	$419,222	$419,222	
Subsurface Investigations (Geotech, Soil Borings)	$77,159	$77,159	
Land Survey	$27,255	$27,255	
Archeological Survey	$0	$0	
Hazmat Survey & Design	$0	$0	
Value Engineering Services	$184,487	$184,487	
Cost Estimating Services	$8,061	$8,061	
Other Design & Related Services	$0	$0	
Design & Related Services Total	**$8,801,309**	**$8,801,309**	
INSPECTION & TESTING SERVICE ITEMS			
Project Inspection Services (inhouse or consultant)	$396,918	$396,918	
Project Testing Services (conc., steel, roofing, etc.)	$424,507	$424,507	
Inspection & Testing Services Total	**$821,425**	**$821,425**	
PROJECT MANAGEMENT & OTHER COST ITEMS			
Project Management (inhouse or consultant)	$792,842	$792,842	
Work By Owner	$110,320	$110,320	
BCOM Services	$101,185	$101,185	
Advertisements	$139	$139	
Printing & Reproduction	$2,451	$2,451	
Moving & Relocation Expenses	$45,218	$45,218	
A/V Cabling	$0	$0	
IT Cabling	$0	$0	
Telephone Cabling	$0	$0	
A/V Equipment	$0	$0	
IT Equipment	$655,635	$655,635	
Telephone Equipment	$0	$0	
Signage	$69,122	$69,122	
Demolition	$0	$0	
Hazardous Material Abatement	$0	$0	
Utility Connection Fees	$0	$0	
Utility Relocations	$2,010,549	$2,010,549	
Commissioning	$745,814	$745,814	
Miscellaneous Other Costs	$594,930	$594,930	
Project Management & Other Costs Total	**$5,128,205**	**$5,128,205**	
Furnishings & Movable Equipment	$4,039,200	$4,039,200	
Construction Contingency	$1,226,251	$1,226,251	
TOTAL PROJECT COST	**$75,000,000**	**$75,000,000**	

Capacity

Cost Type	Unit of Measure	Units	Cost Per Unit
Acquisition Cost		0	$0
Construction Cost	GSF	102,000	$539
Total Project Cost	GSF	102,000	$735

Operating and Maintenance Costs (Agency)

Cost Type	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GF Dollars	$0	$0	$1,396,952	$1,438,861	$1,482,027	$1,526,487
NGF Dollars	$0	$0	$0	$0	$0	$0
GF Positions	0.00	0.00	8.05	8.05	8.05	8.05
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
CR-3_Project Planner-01 UGSL 102k gsf.xlsx	421,688	Rob Mann	7/7/2017	UGSL_CR-3 Form
01_UG Science Laboratory Building Program Chart.pdf	14,652	Rob Mann	7/7/2017	UGSL Program Chart

Workflow History

User Name	Claimed	Submitted	Step Name	Submit Action
Rob Mann	06/06/2017 09:13 AM	06/06/2017 09:13 AM	Enter Capital Budget Request	Continue Working
Rob Mann	06/06/2017 09:13 AM	06/06/2017 09:19 AM	Continue Drafting	Continue Working
Rob Mann	06/06/2017 10:29 AM	06/06/2017 11:07 AM	Continue Drafting	Continue Working
Jennifer Hundley	06/09/2017 03:57 PM	06/09/2017 04:22 PM	Continue Drafting	Continue Working
Rob Mann	07/06/2017 12:40 PM	07/06/2017 12:43 PM	Continue Drafting	Continue Working
Rob Mann	07/07/2017 12:27 AM	07/07/2017 01:05 AM	Continue Drafting	Submit for Agency Review
Rob Mann	07/07/2017 11:32 AM	07/07/2017 11:36 AM	Agency Review Step 1	Ready for DPB Bulk Submit
Rob Mann	07/07/2017 02:27 PM	07/07/2017 02:28 PM	Ready for DPB Submission	Continue Review
Bob Broyden	07/07/2017 04:35 PM	07/07/2017 04:35 PM	Ready for DPB Submission	Submit to DPB
Anne Smith	07/10/2017 10:54 AM	07/10/2017 10:54 AM	DPB Review	Continue Review
			DPB Review	