CapitalBudgetRequest

Replace Randolph Hall	
Overview	
Agency	Virginia Polytechnic Institute and State University (208)
Project Code	18502
Project Title	Replace Randolph Hall
Project Type	New Construction
Biennium	2022-2024
Budget Round	Initial Bill
Bill Version	Regular Session
Request Type	Previously Approved
Project Location	Roanoke Area
Facility/Campus	Blacksburg Main Campus
Source of Request	Agency Request
Infrastructure Element	Classroom / Laboratory
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:

The Replace Randolph Hall (208-18502) project is authorized for Detailed Planning with an effective date of July 1, 2020 in Item C-33.10 of Chapter 1289 of the 2020 Acts of Assembly. Design is underway and will be reviewed by the Division of Engineering and Buildings (DEB) in accordance with the state's Cost Review Process. Preliminary Designs (Detail Planning) are scheduled to be completed and reviewed by DEB in fall 2022. At this pace, the project would be ready for construction funding in late spring 2023, the beginning of fiscal year 2024.

The university's largest engineering building, Randolph Hall, is located in the southeast segment of the North Academic District. It houses five departments in the college that serve more than 6,106 undergraduate majors and 951 graduate students and award more than 1,200 degrees (966 undergraduate, 247 graduate) each year. The 168 tenure track faculty who teach and perform research in these departments oversee sponsored research programs that account for approximately $79 million in annual research expenditures. The College of Engineering ranks 46th out of 902 institutions in engineering research expenditures, according to the National Science Foundation survey.

This project request is for construction funding authorization and appropriation to complete the project. Replacing Randolph Hall is at the core of supporting overall enrollment growth and growth for the engineering program at Virginia Tech and contributes to achieving the goals of the statewide Tech Talent Pipeline Initiative. The proposed replacement building is 284,000 gross square feet with a total project cost of $248 million. The funding plan calls for $223.4 million of General Fund support and $24.6 million of nongeneral fund. This capital project request is in accordance with the governor's stated priorities of workforce development and public education.

The pandemic has further emphasized the importance for hands-on learning of certain skills, techniques, and topics and the necessary spaces to support experiences integral to an engineering education from Virginia Tech. 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-based 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, including those in Randolph Hall. In person lab classes and exercises were reduced and many high enrollment labs were taught remotely due to insufficient space and time to provide 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 in Randolph Hall, the university cannot meet the expectations of students and faculty for an engineering education from Virginia Tech.

Project Description:

The existing Randolph Hall was constructed between 1952 and 1959 in two phases and totals approximately 166,000 gross square feet. The existing building is located in the north section of campus in the heart of the academic enterprise and is adjacent to other key buildings occupied by the College of Engineering.

This replacement project will demolish the entire existing building. In its footprint, a new facility will be constructed to maximize the buildable area of the site. Totaling approximately 284,000 gross square feet, the new facility will add over 70 percent more gross square feet in the same footprint. The existing Stability Wind Tunnel, one of the largest university-owned wind tunnels in the country, is located to the east of the building, will remain, and will be enclosed within the new facility.

The expanded replacement building will include approximately 54,000 assignable square feet (ASF) of classrooms and instructional laboratories; 12,400 ASF of student team-based projects for high profile, national science competitions and demonstrations spaces for team projects; approximately 56,000 ASF of research laboratories; approximately 55,000 ASF of shared faculty, staff and student office spaces; approximately 7,200 ASF of student advising, collaboration, teaming, studio space, and instructional lab breakout space; and approximately 6,400 ASF of building support and storage spaces. As in the original building, ‘dirty’ laboratory space and support spaces are planned to be located at the ground level.

The Virginia Tech Rescue Squad will be relocated to the new facility and occupy a portion of the ground level as well. Projected to be approximately 6,000 ASF in size, the student-run operation will consist of garage, support, and lounge spaces.

Hancock Hall adjoins Randolph Hall and shares an exterior wall and egress system with Randolph Hall. The demolition of Randolph Hall will require the shoring of Hancock Hall, site and building modifications, and construction of a portion of exterior envelope in order to make a stand-alone building and maintain logistics.

The new facility and existing site will be developed in line with the 2018 Campus Master Plan and 2021 Green Links Concept Design & Design Guidelines to achieve key university objectives which maximize existing site utilization while meeting the needs of this century’s engineering students and faculty.

The project will include the installation of an accessible pathway adjacent to Randolph Hall that is approximately 400 feet long and 10 feet wide (4,000 square feet of surface area) and manages a 5 percent slope on the site. 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:

Virginia Tech’s College of Engineering is comprised of 13 departments, 370 tenured and tenure-track instructional faculty, 70 non-tenure-track instructional faculty and 60 research faculty, 9,358 undergraduates, and 2,172 graduate students. According to US News and World Report, the engineering program is ranked 13th in Best Undergraduate Engineering Programs, 31st in Best Graduate Engineering Schools, 16th in Best Online Master’s in Engineering Programs, and 74th among National Universities.

Virginia Tech also 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. Undergraduate enrollment in the College of Engineering has grown 71.6 percent since 2006 (5,453) and is projected to grow further in both students and faculty members. The undergraduate enrollment in the College of Engineering will exceed 10,000 students by 2023-24 with the opportunity to grow beyond that with the Tech Talent Pipeline Initiative.

The proposed replacement building will house five large departments including Computer Science, Aerospace and Ocean Engineering, Chemical Engineering, Mechanical Engineering, and Engineering Education; and will provide additional space for student team research projects, including national team-based research and development competitions. The success of Virginia Tech in these competitions draws national attention to the Commonwealth’s leadership in science, technology, engineering, and math education.

The five departments proposed to occupy the building serve more than 6,106 undergraduate majors and 951 graduate students and award more than 1,200 degrees (966 undergraduate and 247 graduate) each year. The 168 tenure track faculty who teach and perform research in these departments oversee sponsored research programs that account for approximately $79 million in annual research expenditures. The college’s broad research portfolio includes publishing nearly 4,000 articles annually and conducting more than $90 million annually in externally sponsored research. The College of Engineering ranks 46th out of 902 institutions in engineering research expenditures, according to the annual National Science Foundation survey.

Since 2006, undergraduate enrollment in the College of Engineering has grown 71.6 percent and will continue to grow in both students and faculty members, with an ultimate goal to exceed 10,000 undergraduate students by 2023-24 and the opportunity to grow beyond that with the

Tech Talent Pipeline Initiative. However, existing instructional space must be replaced to support current enrollment and additional space is necessary to increase future enrollment within the college. Without improved and expanded space for these programs, the university cannot meet the expectations of students and faculty for an engineering education from Virginia Tech.

The university's strategic plan includes the following principle strategies that will be supported by the completion of this 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.
• Increasing the number of programs recognized as among the best internationally.
• Ensure 50% of academic degrees have a required experiential learning component.
• 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.
• Implement the Climate Action Commitment and Sustainability Plan as appropriate.

Existing Facilities:

Randolph Hall was constructed in two phases between 1952 and 1959. The existing 166,000 gross square feet, 69 year-old building has not been updated to meet new building code and accessibility requirements, its building systems are outdated, and its facility condition index is at 38 percent in the FICAS system as of April 2021. The existing building does not support teaching and research in the 21st century engineering disciplines, cannot sustain the existing enrollment in these engineering programs, and cannot support the demand for engineering degrees at Virginia Tech.

Soon after Randolph Hall was constructed, a Stability Wind Tunnel, built by NASA in 1940, was brought to the university and installed to the east of the building. The wind tunnel has continually been upgraded and is one of the largest in the country that is university-owned.

In 1990, Hancock Hall was constructed as an infill project to the west of Randolph Hall. Hancock Hall utilizes the entire west exterior wall and a portion of the north exterior wall of Randolph Hall as structural bearing wall and building envelope. The two buildings share a life safety egress route system. Revisions to Hancock Hall to create a stand-alone facility and to achieve the key site objectives and logistics for this replacement project will be necessary upon the demolition of Randolph Hall.

This intensively utilized, 69 year-old building is one of the most outdated academic buildings on campus with extensive egress and ADA deficiencies and deteriorated building systems. Numerous select, small scale renovations and limited classroom refurbishment have occurred over the years; however, no full scale comprehensive updates have occurred.

The increased use of modern scientific equipment is also exceeding the capabilities of the existing mechanical, electrical, plumbing, and environmental control systems. The existing building organization also includes some elements that do not comply with current code requirements for egress safety.

With a facility condition index of 38 percent in the FICAS system as of April 2021, Randolph Hall's condition has progressed beyond the scope of normal operations and maintenance reserve repairs. The building is undersized, outdated, out of compliance with today's building and accessibility codes, and does not support teaching and research in the 21st century in engineering disciplines.

Funding Plan:

The program of this $248 million project request is 80 percent instruction and 20 percent research. The funding plan for the project calls for $223.4 million of General Fund support for the instruction program, which includes approximately $2 million for the Green Link accessible pathway, and 50 percent of the research program on top of $24.6 million of nongeneral fund authorization 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 and targeted fundraising that will occur in the university's capital campaign.

Options Considered:

Options considered but rejected include a major building renovation, additional leasing of off campus space, and project deferral. A building renovation would not be cost effective in terms of capital expenditure, on-going operations, or facility capacity to accommodate engineering enrollments. Leasing an off campus location is not viable and the Town of Blacksburg prohibits the university instruction activity in space leased within the Town. Deferral of this project to a future biennium will impact the program's ability to efficiently provide instruction and to remain competitive for sponsored research projects.

A potential option is phasing the project over two biennia. A phased approach could be implemented with a manageable impact to the instruction programs and research programs. Under this concept, the university would design the entire project, demolish the entire excising building, and build approximately 60 percent of the replacement facility in "phase one." Phase two could include funding to complete construction of the remaining 40 percent of the envisioned facility.

Methodology

Cost Explanation and Methodology:

A. Methods Used to Estimate Costs:

The method for estimating costs for the Replace Randolph Hall 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 softs costs (via an in-house cost estimating system); and 2) comparables as shown in the CR-1. The project costs 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 $873 per gross square foot. The unit construction costs of the project are $659 per gross square foot, including self-performed construction work. The building types in this request reflect a combination of science wet laboratory, dry laboratory, research laboratory, classrooms, and office 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. 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 provides the cut material to the building; thus, the material costs along with intensive quality insurance inspections 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) Hazardous materials were utilized during the era in which this building was constructed. This will increase both the time and cost of making the building safe for the planned scope of work. The longer duration increases both general condition and escalation costs.

3) 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.

4) Academic buildings include interior glazing for energy efficiency, lighting for academic work, and to enhance pedagogy, while also creating a secure envelope.

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

6) 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.

7) 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 that require the capacity for an entire classroom to be connected simultaneously.

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

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

10) 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.

11) 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.

12) Site development costs in this region are historically in the medium to high range and require generally significant rock removal and deep foundations. The site scope and costs include the installation of an accessible Green Link pathway.

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

14) Specialized degrees in engineering and physical sciences require specialized equipment specific to those fields. This building requires shielded and vibration protected areas in which to operate this equipment.

15) The existing Randolph Hall incorporates a wind tunnel that supports a significant research enterprise and must continue. The wind tunnel will need to be adapted into the new building and may require specialized structural supports and enclosures.

16) Randolph Hall has a robust structural design including 12” floor slabs. Demolition costs will be in excess of standard demolition costs.

17) Hancock Hall adjoins Randolph Hall and shares an exterior wall and egress system with Randolph Hall. The demolition of Randolph Hall will require the shoring of Hancock Hall, site and building modifications, and construction of a portion of the exterior envelope.

18) 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 are required to be installed 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.

19) If construction funding is split and a phased delivery is necessary, the total project duration and costs will increase accordingly due to increased 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.

20) 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 university-wide 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 these mutual goals.

Funding Request

Phase	Year	Subobject	Fund	Amount
Full Funding	2023	2322 - Construction, Buildings	01000 - General Fund	$223,400,000
Full Funding	2023	2322 - Construction, Buildings	08150 - 9(D) Rev Bonds-Construction	$24,600,000
			Total	$248,000,000

Project Costs

Cost Type	Requested Funding
Acquisition Cost	$0
Building & Built-in Equipment	$187,104,491
Sitework & Utility Construction	$0
Construction Cost Total	**$187,104,491**
DESIGN & RELATED SERVICE ITEMS	
A/E Basic Services	$22,228,013
A/E Reimbursables	$37,421
Specialty Consultants (Food Service, Acoustics, etc.)	$0
CM Design Phase Services	$860,681
Subsurface Investigations (Geotech, Soil Borings)	$280,657
Land Survey	$0
Archeological Survey	$0
Hazmat Survey & Design	$56,131
Value Engineering Services	$0
Cost Estimating Services	$0
Other Design & Related Services	$1,609,099
Design & Related Services Total	**$25,072,002**
INSPECTION & TESTING SERVICE ITEMS	
Project Inspection Services (inhouse or consultant)	$1,740,072
Project Testing Services (conc., steel, roofing, etc.)	$1,029,075
Inspection & Testing Services Total	**$2,769,147**
PROJECT MANAGEMENT & OTHER COST ITEMS	
Project Management (inhouse or consultant)	$1,386,671
Work By Owner	$224,525
BCOM Services	$12,723
Advertisements	$10,197
Printing & Reproduction	$18,710
Moving & Relocation Expenses	$1,328,442
A/V Cabling	$0
IT Cabling	$0
Telephone Cabling	$0
A/V Equipment	$0
IT Equipment	$2,301,385
Telephone Equipment	$0
Signage	$149,684
Demolition	$0
Hazardous Material Abatement	$0
Utility Connection Fees	$0
Utility Relocations	$3,311,749
Commissioning	$1,814,914
Miscellaneous Other Costs	$4,789,875
Project Management & Other Costs Total	**$15,348,875**
Furnishings & Movable Equipment	$13,963,395
Construction Contingency	$3,742,090
TOTAL PROJECT COST	**$248,000,000**

Size and Scope

Cost Type	Unit of Measure	Units	Cost Per Unit

Acquisition Cost		0	$0
Construction Cost	GSF	284,000	$659
Total Project Cost	GSF	284,000	$873

Operating and Maintenance Costs

Cost Type	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
GF Dollars	$0	$0	$0	$1,978,209	$2,037,555	$2,098,682
NGF Dollars	$0	$0	$0	$0	$0	$0
GF Positions	0.00	0.00	0.00	10.05	10.05	10.05
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
RevHECO-2_Randolph_6.30.21.pdf	416,082	Cassidy Limer	9/16/2021	
Randolph Appropriation_C-33.10_Ch.1289.pdf	24,645	Cassidy Limer	9/16/2021	
Replace Randolph Hall Program Chart.pdf	495,266	Rob Mann	9/17/2021	
Randolph GreenLinks Exhibit A.pdf	671,157	Rob Mann	9/20/2021	
01 CR-1 Randolph Hall Replacement 9.2021.xlsx	582,217	Cassidy Limer	9/22/2021	

Workflow History

User Name	Claimed	Submitted	Step Name	Submit Action
Cassidy Limer	09/13/2021 11:51 AM	09/13/2021 11:51 AM	Enter Capital Budget Request	Continue Working
Cassidy Limer	09/13/2021 11:51 AM	09/17/2021 04:50 PM	Continue Drafting	Continue Working
Rob Mann	09/17/2021 05:49 PM	09/17/2021 06:12 PM	Continue Drafting	Continue Working
Rob Mann	09/20/2021 04:42 PM	09/21/2021 11:18 AM	Continue Drafting	Continue Working
Rob Mann	09/21/2021 05:47 PM	09/21/2021 06:13 PM	Continue Drafting	Continue Working
Cassidy Limer	09/21/2021 10:19 PM	09/21/2021 10:57 PM	Continue Drafting	Submit for Agency Review
Rob Mann	09/22/2021 03:35 PM	09/22/2021 03:47 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	