

## Capital Budget Request

### Construct Addition and Renovate Holden Hall

#### Overview

Agency	Virginia Polytechnic Institute and State University (208)
Project Code	none
Project Type	New Construction/Improvement
Biennium	2016-2018
Budget Round	Initial Bill
Request Origin	Previously Submitted
Building Name	Holden Hall
Project Location	Roanoke Area
Facility/Campus	Blacksburg Main Campus
Source of Request	Agency Request
Building Function	Higher Education Instruction & Research -- 100% E&G
Infrastructure Element	Classroom / Laboratory

Contains significant technology costs? No

Contains significant energy costs? No

#### Agency Narrative

##### Agency Description

###### Project Summary:

Virginia Tech's comprehensive College of Engineering is comprised of 13 departments, 335 faculty, 7,200 undergraduates, and 2,000 graduate students. The undergraduate engineering program is ranked 6th nationally among public universities. A [Wall Street Journal] survey of employment recruiters ranked Virginia Tech the 5th best school for engineering graduates.

This capital project is requested to support three of the 13 engineering programs: Material Science Engineering, Mining and Mineral Engineering, and Computer Science. Material Science and Mining and Mineral are located in Holden Hall and Computer Science is located in leased space off-campus. Currently, these three departments serve 876 undergraduates and 350 graduate students, which reflects a growth of 73 percent increase in undergraduate majors since 2008-09. Like all departments in the College of Engineering, these three programs are expected to grow in majors as Virginia Tech increases overall enrollment through 2018-19. The combined annual research expenses of the three departments approaches \$17 million, on average, each tenure/tenure track faculty member in these departments generates \$291,000 in annual research expenditures.

Holden Hall, which currently houses Material Science Engineering and Mining/Mineral Engineering was constructed in 1940 with no major renovations or building improvements since it went into service and totals about 42,100 gross square feet. The building is located in the heart of the academic enterprise and within the engineering precinct of campus. While the location is critical to delivery and support of engineering instruction and research work, the facility condition index of the building in FICAS is 48 percent and the building no longer adequately supports engineering instruction or research work because it is too small and outdated.

To provide an appropriate amount of modern instruction and research space for these three departments, this project requests authorization to renovate a 21,000 gross square foot portion of Holden Hall. The remaining 21,100 gross square feet will be demolished and replaced with approximately 81,000 gross square feet of engineering instruction and research space for a total new building size of 101,000 gross square feet. The new and renovated space will provide modern laboratories and classrooms sufficient to support the growth and activities of all three departments, including the return of the computer science program to main campus, a critical need for the college of engineering to serve students.

Without improved and expanded space for these departments, the university cannot meet the expectations of students and faculty for an engineering education from Virginia Tech.

###### Physical Description of the Facility:

The scope of the project is envisioned to include renovation and addition of offices, laboratories, and engineering classrooms. This project will renovate a portion of the building with upgrades to include mechanical systems, electrical systems, fire protection and plumbing systems, telecommunication systems, accessibility, egress, installation of air-conditioning, refurbishment of architectural finishes, and building envelope

repairs. These improvements will extend the useful life of the building for continued service for instruction, research and academic support programs. The renovation will also address accessibility and life safety codes and improve the programmatic function of the building.

The construction of an addition will incorporate modern wet and dry laboratories and support space to meet the shortfall in instructional and research laboratory space incurred by the Mining and Minerals Engineering program, the Materials Science and Engineering program, and the Computer Science Engineering program. This project also creates the opportunity to develop an outdoor classroom and informal learning space through landscape improvements and site amenities.

**Building Renovation Component:** The 21,000 gross square foot renovation of the south wing will include reconfiguration of STEM-H classrooms, seminar rooms, and teaching laboratories, and improved space for academic departments within the College of Engineering. These spaces will comprise approximately 2,800 net assignable square feet (nsf) of classroom and seminar space, approximately 1,680 nsf of laboratory space, and approximately 8,050 nsf of faculty office space

**Building Demolition and Replacement with Addition Component:** An 81,000 GSF addition is planned on the east and north sides of Holden Hall, replacing the deteriorated single story 21,648 GSF east/north wings. The three and four story replacement wings will house approximately 26,000 square feet of new instructional laboratories including core computing facilities, 12,000 square feet of classrooms and 15,000 square feet of academic support and faculty office space, constructed to meet contemporary design standards.

The university's long-term capital plan includes a project to replace Randolph Hall for undergraduate engineering instruction. In the short term the addition to Holden Hall will serve as swing space for occupants in Randolph Hall as Randolph Hall undergoes improvements. After Randolph Hall replacement construction is finished and the Holden Hall addition has completed its use as a swing space facility, the addition will house the Computer Science department. This new home will address a shortage of modern academic space capable of supporting the advanced technologies employed in the growing fields of computer science and engineering.

To meet the current demands for modern instructional space in computational science, the university temporarily leases approximately 45,000 net square feet of off-campus space in its adjacent research center, supplementing on-campus departmental space scattered around campus. Under this project, the expansion in Holden Hall will provide permanent space for the program to relocate back to the core of campus to meet the needs of the Department of Computer Science for modern classroom, laboratory, and academic office space.

The facility will provide a highly advanced computing infrastructure with considerable flexibility in its instructional spaces and research laboratories. The computing infrastructure will need to include state-of-the-art wired and wireless communication services and provide above normal levels of electrical and HVAC capacity to support large-scale servers and computing clusters in a high performance computing core facility. These servers and clusters provide the backbone of the technical infrastructure underlying the learning and research environment of the broader college and are themselves objects of study for advanced courses in high performance computing and grid computing. The flexibility will permit adaptation over time to evolution of new technologies, shift in research programs, repurposing of teaching laboratories, and experience with the subtle effects of the spatial arrangements on student learning.

This addition is envisioned to be clad in a combination of Hokie stone, precast concrete panels and trim, and a combination of curtain wall glazing and punched opening windows, complementing the architectural materials in the existing structure.

#### Justification

##### Program Description:

Virginia Tech's comprehensive College of Engineering is comprised of 13 departments, 335 faculty, 7,200 undergraduates, and 2,000 graduate students. The undergraduate engineering program is ranked 6th nationally among public universities. A [Wall Street Journal] survey of employment recruiters ranked Virginia Tech the 5th best school for engineering graduates. The college also has a broad research portfolio publishing 3,740 articles in 2013 and conducting more than \$90 million in externally sponsored research. The College of Engineering is the primary occupant of this building.

The requested renovations will fully renew the building and expand it to serve as high quality academic space to support engineering instruction and research enrollment growth. Specifically, the building will house the departments of Material Science Engineering, Mining and Mineral Engineering, and Computer Science. These departments serve 876 undergraduates and 350 graduate students. Their combined annual research expenses approach \$17 million. All departments in the College of Engineering have experienced growth in undergraduate majors. These programs are also growing (a 73 percent increase in majors since 2008-09) and will continue to grow as Virginia Tech increases enrollment through 2018-19. Growth in enrollment will also require additional faculty for instruction and advising. These faculty will also be expected to have active research programs and will require wet, dry, and specialized research space. On average, each tenure/tenure track faculty member in these departments generates \$291,000 in annual research expenditures. Modular, flexible lab design will be needed to provide efficient and readily reconfigured lab space to maintain and improve this level of productivity and to support the interim swing space mission of the new building.

The university's strategic plan includes the following principle strategies that will be supported by this project:

- Ensuring competency in data analysis and computational methods as a component of general education for all students.
- Developing an appropriate infrastructure for high performance computing.
- Building upon existing and emerging strengths.
- Increasing undergraduate involvement in meaningful research experiences and experiential learning--hands-on, minds-on.
- Developing ways to integrate computational science/informatics and digital fluency for managing and analyzing complex data sets across a wide range of disciplines.
- Identifying opportunities during construction and renovation to create flexible classroom spaces that fully support e-learning components.

#### Existing Facilities:

Holden Hall was constructed in 1940 and has not had any major renovations or building improvements since it went into service. The building totals about 42,100 gross square feet and houses the Mining and Minerals Engineering program and the Materials Science and Engineering program. In addition to a small basement the existing building comprises a three story south wing totaling approximately 21,000 gross square feet and east and north single story wings totaling approximately 21,000 gross square feet.

The building is outdated and does not adequately support engineering teaching and research in the 21st century. The building is no longer able to provide a satisfactory environment for contemporary STEM-H instruction. The needed use of modern scientific equipment ranging from computers, chemical fume hoods, and other specialized laboratory equipment exceeds the capabilities of the existing mechanical, electrical, plumbing, telecommunications, and environmental control systems. The building has become outdated and deterioration is progressing beyond the scope of normal operations and maintenance reserve repairs. The facility condition index of the building in FICAS is 48 percent.

The existing single story classroom and laboratory wing is an inefficient use of space in the north campus where academic space is at a premium and land for new facility construction is not available.

#### Funding Plan:

The program of this project is for instruction and research programs; thus, the funding plan for the \$73.5 million project calls for \$61 million of general fund support for 100 percent of the instruction costs and 50 percent for the research costs and \$12.5 million of nongeneral fund support for 50 percent of the research costs.

#### Options Considered:

Other options considered but not selected include continuing to lease space for computer science. Renovating and expanding the current facility is the selected option because it is the most cost effective solution to the shortage of modern instructional space for the Department of Computer Science and the short-term need to temporarily house programs dislocated by a renovation of Randolph Hall.

Continuing to lease is rejected as an option as a permanent solution because it is not financially favorable long-term to enter into a capital lease for this project. It is also problematic to have a growing academic department that serves residential students located more than a mile from central campus, particularly when the scheduling difficulties of students and faculty commuting to an off-campus location are considered.

#### Alternatives Considered

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#### Costing Methodology

The method for estimating costs includes: 1) using unit costs in the Bureau of Capital Outlay Management's Construction Costs Database updated April 2015 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 2019 at three percent

On a total project cost basis, inclusive of design, construction, and equipment, the unit costs are \$727 per gross square foot. The unit construction costs of the project are \$573 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 Bureau of Capital Outlay Management's Construction Costs Database.

This project will involve renovation of a historical building and construction of new laboratory space. Virginia Tech's project cost estimate is 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.

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. The Virginia Tech Board of Visitors has directed that all new building projects and expansion projects built on the Blacksburg central campus must use Hokie stone as the predominate building material on all building facades. Brick, metal panels, and siding materials are not permitted as substitutions for Hokie stone. In maintaining the random ashlar stone pattern of our collegiate Gothic buildings, the university has explored a wide range of contemporary stone erection means, methods and systems. The most efficient system tested that meets erection, insulation and moisture protection requirements utilizes 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, meeting our requirement for a 50-100 year enclosure life expectancy. Because the university owns the stone quarry, the quarrying and stocking of all the cut stone is carried as a project (soft) cost, and the construction budget carries all erection, final stone dressing, installation and intensive quality assurance inspection costs. Renovation of the historic portion will require extensive repointing and installation of new windows.

Mechanical equipment and building automation systems will be designed to maximize energy efficiency and minimize operations and maintenance costs. Mechanical equipment will be located inside and screened from view to maximize student use of the campus landscape. Electrical systems will support current academic technologies and increased student use of individual technology equipment. Effective use of exterior and interior glazing will enhance energy efficiency lighting fixtures for an improved academic experience. Design priorities will include flexibility to maximize the long-term programmatic functionality of the building.

Virginia Tech produces the most STEM-H graduates of any university in the Commonwealth. Our role as the leading producer of STEM-H degrees relies upon a system of classrooms and instructional laboratories that support technology driven instruction in engineering, physical sciences, life sciences, and advanced mathematics. All buildings must have high-capacity wireless networks to support multiple devices (laptop

computer, tablet computer, smartphone) used simultaneously by students to retrieve information and to communicate within the classroom and to connect digitally with instructional sites around campus and around the world. The use of electronic equipment in the classroom by student participants also requires dedicated power outlets corresponding to the seat/station count and power outlets in common areas. Raised floor systems are needed to accommodate these and future developments in technology and classroom configuration. Specialized degrees in engineering and physical sciences require specialized equipment specific to those fields and shielded or vibration protected areas in which to operate this equipment. The university operates its own communications network using primarily internet connectivity which requires accessible, climate controlled server rooms in lieu of the traditional phone closets. Because the communications infrastructure is installed by our own university operated auxiliary it is carried as a project (soft) cost outside of the normal construction budget.

This particular building, because it will serve the Computer Science department and may house a high performance computing core facility will require exceptional electrical, HVAC, and internet connectivity throughout.

Renovation of the historic portion will involve complete replacement of mechanical, plumbing, electrical systems that have exceeded their useful life. It will also require installation of sprinkler, fire alarm systems and accessibility improvements. The entire building envelope of the historic portion will be evaluated and repaired and replaced as needed.

The project is anticipated to have moderate site conditions but restricted site access in a dense and active part of campus will impact mobilization costs. This project will use a C-M at risk construction delivery method appropriate for the size and complexity of this project. Project costs are estimated to the mid-point of construction using three percent escalation in accordance with the instructions for developing the Six-Year Capital Outlay Plan.

Summary of Holden Hall Renovation and Expansion Other Costs:

1. Hokie stone used as primary exterior building envelope material.
2. Building foundation deep caissons or piers to remediate unsound subsurface foundation conditions.
3. Extensive subsurface rock excavation and removal.
4. Raised flooring systems throughout classrooms and laboratories for flexible use of electronic equipment.
5. Specialized building slabs designed to eliminate ground vibration interfering with sensitive scientific equipment.
6. High performance computing will require exceptional electrical, HVAC, and internet connectivity throughout.

#### Agency Funding Request

Phase	Year	Fund	Subsubject	Requested Amount
Construction	2017	0100 - General Fund	2322 - Construction, Buildings	\$61,000,000
Construction	2017	0815 - 9(D) Debt Service - Construction Costs	2322 - Construction, Buildings	\$12,500,000
Total				\$73,500,000

#### Project Costs

Cost Type	Total Project Costs	Requested Funding	DGS Rec
Acquisition Cost	\$0	\$0	
Building & Built-in Equipment	\$44,669,000	\$44,669,000	
Sitework & Utility Construction	\$6,903,000	\$6,903,000	
<b>Construction Cost Total</b>	<b>\$51,572,000</b>	<b>\$51,572,000</b>	
<b>DESIGN &amp; RELATED SERVICE ITEMS</b>			
A/E Basic Services	\$6,802,000	\$6,802,000	
A/E Reimbursables	\$183,000	\$183,000	
Specialty Consultants (Food Service, Acoustics, etc.)	\$355,000	\$355,000	
CM Design Phase Services	\$771,000	\$771,000	
Subsurface Investigations (Geotech, Soil Borings)	\$109,000	\$109,000	
Land Survey	\$22,000	\$22,000	
Archeological Survey	\$0	\$0	
Hazmat Survey & Design	\$10,000	\$10,000	
Value Engineering Services	\$0	\$0	
Cost Estimating Services	\$41,000	\$41,000	
Other Design & Related Services	\$508,000	\$508,000	
<b>Design &amp; Related Services Total</b>	<b>\$8,801,000</b>	<b>\$8,801,000</b>	

<b>INSPECTION &amp; TESTING SERVICE ITEMS</b>			
Project Inspection Services (inhouse or consultant)		\$1,472,000	\$1,472,000
Project Testing Services (conc., steel, roofing, etc.)		\$397,000	\$397,000
<b>Inspection &amp; Testing Services Total</b>		<b>\$1,869,000</b>	<b>\$1,869,000</b>
<b>PROJECT MANAGEMENT &amp; OTHER COST ITEMS</b>			
Project Management (inhouse or consultant)		\$1,035,000	\$1,035,000
Work By Owner		\$81,000	\$81,000
BCOM Services		\$10,000	\$10,000
Advertisements		\$0	\$0
Printing & Reproduction		\$0	\$0
Moving & Relocation Expenses		\$91,000	\$91,000
Non Built-In Data and Voice Communications		\$964,000	\$964,000
Signage		\$51,000	\$51,000
Demolition		\$609,000	\$609,000
Hazardous Material Abatement		\$152,000	\$152,000
Utility Connection Fees		\$0	\$0
Utility Relocations		\$589,000	\$589,000
Commissioning		\$634,000	\$634,000
Miscellaneous Other Costs		\$1,901,000	\$1,901,000
<b>Project Management &amp; Other Costs Total</b>		<b>\$6,117,000</b>	<b>\$6,117,000</b>
Furnishings & Movable Equipment		\$4,110,000	\$4,110,000
Construction Contingency		\$1,031,000	\$1,031,000
<b>TOTAL PROJECT COST</b>		<b>\$73,500,000</b>	<b>\$73,500,000</b>

**Capacity**

Cost Type	Unit of Measure	Units	Cost Per Unit
Acquisition Cost		0	\$0
Construction Cost		0	\$0
New Construction Cost		0	\$0
Improvement Cost		0	\$0

**Operating and Maintenance Costs (Agency)**

Cost Type	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
GF Dollars	\$0	\$0	\$848,047	\$873,488	\$899,693	\$926,684
NGF Dollars	\$0	\$0	\$173,696	\$178,907	\$184,274	\$189,803
GF Positions	0.00	0.00	5.31	5.31	5.31	5.31
NGF Positions	0.00	0.00	1.09	1.09	1.09	1.09
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
<a href="#">02-CR-3 Holden Hall Renovation Expansion.xls</a>	625,664	Rob Mann	6/13/2015	CR-3_Renovate Holden Hall

**Workflow History**

User Name	Claimed	Submitted	Step Name
Rob Mann	05/18/2015 05:12 PM	05/18/2015 05:12 PM	Enter Capital Budget Request
Rob Mann	05/18/2015 05:13 PM	05/18/2015 05:16 PM	Continue Drafting
Rob Mann	05/18/2015 11:00 PM	05/18/2015 11:03 PM	Continue Drafting
Rob Mann	06/08/2015 05:22 PM	06/08/2015 05:38 PM	Continue Drafting
Jennifer Hundley	06/12/2015 03:28 PM	06/12/2015 05:41 PM	Continue Drafting
Rob Mann	06/12/2015 07:55 PM	06/12/2015 07:58 PM	Continue Drafting
Rob Mann	06/12/2015 07:58 PM	06/12/2015 07:59 PM	Continue Drafting
Rob Mann	06/13/2015 08:51 AM	06/13/2015 08:56 AM	Continue Drafting
Rob Mann	06/13/2015 12:32 PM	06/13/2015 12:35 PM	Agency Review Step 1
Rob Mann	06/13/2015 12:42 PM	06/13/2015 12:43 PM	Agency Review Step 1
Rob Mann	06/13/2015 06:58 PM	06/13/2015 07:02 PM	Agency Review Step 1
Rob Mann	06/13/2015 08:30 PM	06/13/2015 08:31 PM	Ready for DPB Submission
Rob Mann	06/13/2015 08:31 PM	06/13/2015 08:32 PM	Ready for DPB Submission
Bob Broyden	06/14/2015 02:18 PM	06/14/2015 02:18 PM	Ready for DPB Submission
			DPB Review