



CONCEPTUAL STUDY

BUTLER-CARLTON HALL

HIGH BAY EXPANSION

AUGUST 15, 2012



Acknowledgement

Hastings+Chivetta Architects would like to acknowledge the campus stakeholders who participated in the programming and design process. These team members provided the background knowledge and guidance that led to the development of the final concept.

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EXECUTIVE SUMMARY

In the Spring of 2012, administrators from the Missouri University of Science and Technology (Missouri S&T) engaged the St. Louis-based firm of Hastings+Chivetta Architects, Inc. to program and develop a concept for expanding the high bay laboratory in Butler-Carlton Hall. Programming and design activities occurred over several months including three on-campus visits by the design team to conduct stakeholder workshops and survey existing conditions.

Butler-Carlton Hall is home to the Missouri University of Science and Technology (Missouri S&T) Civil, Architectural and Environmental Engineering (CArEE) Department. With its world-class facility, renowned researchers, and dedicated faculty, our programs are unique in the State of Missouri. And, we are the only civil engineering program at any university in Missouri to have been ranked as a Top-25 undergraduate program by U.S. News & World Report. Educated in specialized areas such as construction management, infrastructure systems, water resource engineering, and pollution control, our graduates recognize the importance of improving our national security, preserving the environment, and maintaining our country's aging infrastructure. From theory to hands-on experiences, Missouri S&T civil, architectural, and environmental engineering students are dedicated to addressing current global challenges, as well as anticipating those of the future.

The proposed laboratory expansion project will build on this rich tradition by expanding the department's current structural and materials engineering laboratory facilities. This much-needed expansion will provide increased research laboratory space that will allow faculty to engage in new scholarly activities that are

critical in addressing the ever-changing infrastructure needs of the State and the Nation. Interactive areas, such as a conference room overlooking the expansion, are also included. These areas will promote vital student and faculty interaction to enhance the educational experiences of students on campus and to enable the newly expanded research laboratory capabilities to be showcased to campus visitors, public agencies, and industrial partners.

These expanded facilities will also consolidate teaching and research functions that are currently spread over multiple buildings on campus. Specifically, the new space will allow the activities of several well-funded research programs to be housed in one central location, which will further enhance and lead to new collaborative and interactive scholarly activities. These dynamic programs include the Center for Infrastructure Engineering Studies and the Center for Transportation Infrastructure and Safety (CTIS). In May 2012 the CTIS has recently secured a \$2.25M grant from the U.S. Department of Transportation to purchase the equipment that will be housed in this expansion. The space needed to house this major investment in the campus' research infrastructure is currently unavailable.

The new Advanced Construction Materials Laboratory will enable the development, manufacturing, and implementation of innovative and sustainable materials for civil infrastructure, with an emphasis on cement-based materials. The development of "green" technologies that would ultimately lead to cost savings in new infrastructure construction in Missouri and in the United States is of primary interest. Studies to be performed in the development of these technologies will include proj-



EXECUTIVE SUMMARY

ects on the performance of self-consolidating concrete (SCC) in cast-in-place bridge superstructure and substructure elements, the use of high volume fly ash concrete (HVFAC) in infrastructure applications, the performance of roller compacted concrete (RCC) for rigid concrete pavement for highways, rural roads, and airfield pavements, as well as the feasibility of using high contents of reclaimed asphalt pavement and reclaimed asphalt roofing shingles in flexible pavement mixtures. These activities will be facilitated by new capabilities that will allow the fabrication and testing of full-scale structural members with advanced materials that are not always readily available. The common denominators in all of these technologies are savings in construction time and cost, extension of service life, and reduction in the carbon footprint of construction materials and activities.

With this expansion, Missouri S&T CArEE faculty will lead the effort in developing solutions for the design and construction of durable, reliable, and sustainable infrastructure. The new state-of-the-art facility will be unique in the State of Missouri and will enable Missouri S&T investigators to add their advanced research capabilities to other leading universities in North America specializing in advanced civil engineering materials. This will enable Missouri S&T to be on the leading edge of research and development in civil engineering materials.

Additionally, the CArEE Department provides laboratory experiences to many undergraduate and graduate students, an activity that is at the core of Missouri S&T's mission. Faculty members in the Department are internationally known for their scientific contributions in a variety of fields ranging from advanced cement-

based material science to the use of environmentally friendly industrial bi-products. The proposed laboratory expansion will therefore not only further advance the research capability of the faculty, but will also enhance the teaching missions of the Department, positively impacting approximately over 700 students each year who are majoring in civil, architectural, and environmental engineering.



Photos of existing building:
Exterior (top right), Atrium (left) and Structures Laboratory (bottom right)



PROGRAM STATEMENT

High Bay Space & Fabricating / Staging Area			
100	High Bay Laboratory	7,287 sf	
101	Mortar Rheology Room	312 sf	
102	Creep and Shrinkage Room	516 sf	
103	Temperature Control Room	431 sf	
104	Grout Room	303 sf	
105	Moist Curing Room	463 sf	
106	Elevator Machine Room	67 sf	
107	Stairs	231 sf	
108	Control Room	72 sf	
	Total of Net Areas	9,682 sf	
Gross Area			10,007 gsf

Mezzanine			
200	Unisex Toilet	51 sf	
201	Conference Room	324 sf	
202	Storage / Future Room	232 sf	
203	Calorimetry Room	260 sf	
204	Utility Room	113 sf	
205	Durability Room	388 sf	
206	Freeze Thaw Room	206 sf	
207	Scaling Room	173 sf	
	Total of Net Areas	1,747 sf	
Gross Area			2,600 gsf

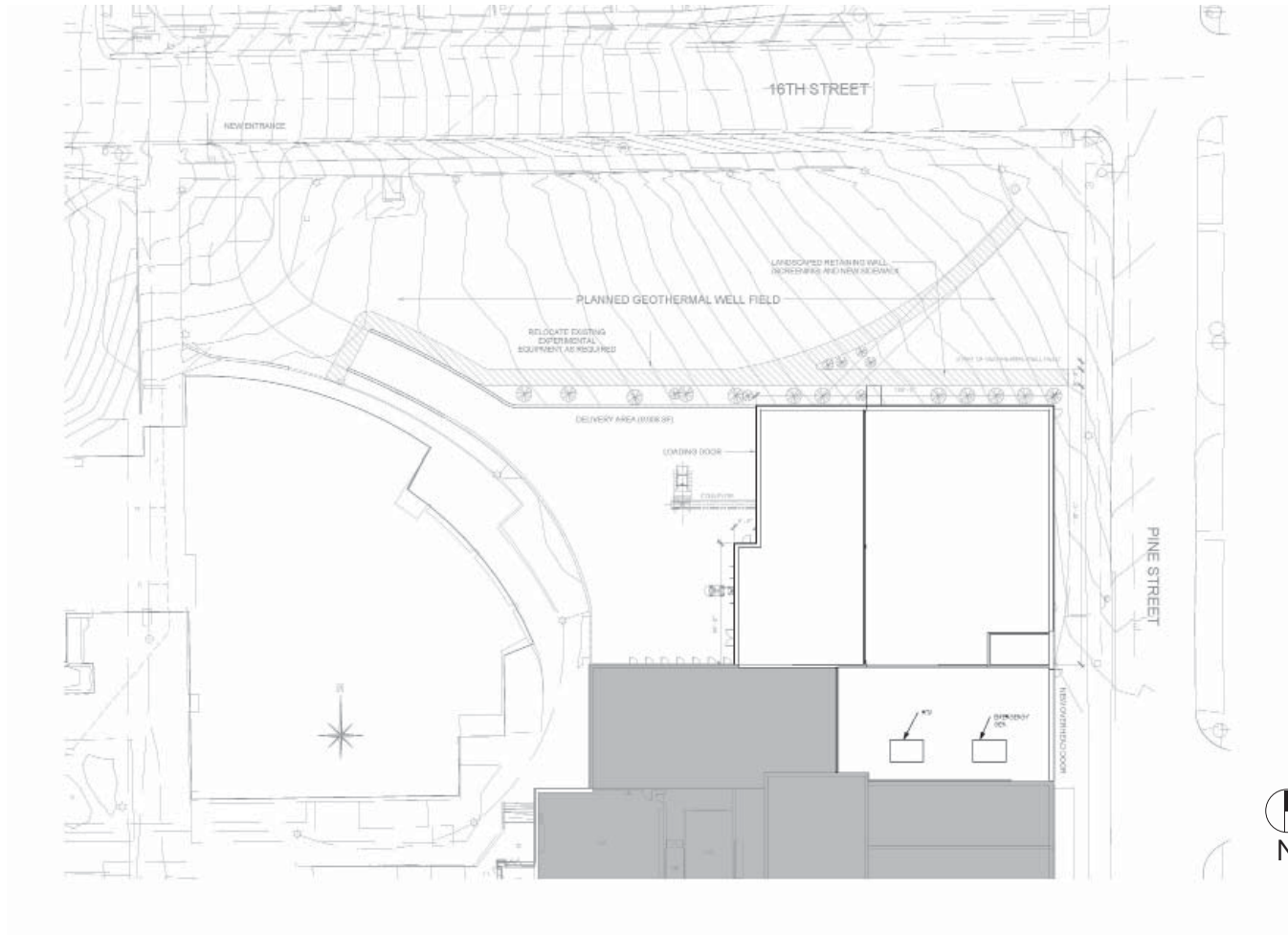


Photos of existing building:
 Structures Laboratory (left), Concrete Laboratory (right)

Existing Building Areas			
EX	Retrofit of Dock		3,130 gsf
EX	Retrofit of Testing Area		500 gsf
Gross Area Total			3,630 gsf
Total Project Gross Area			16,237 gsf

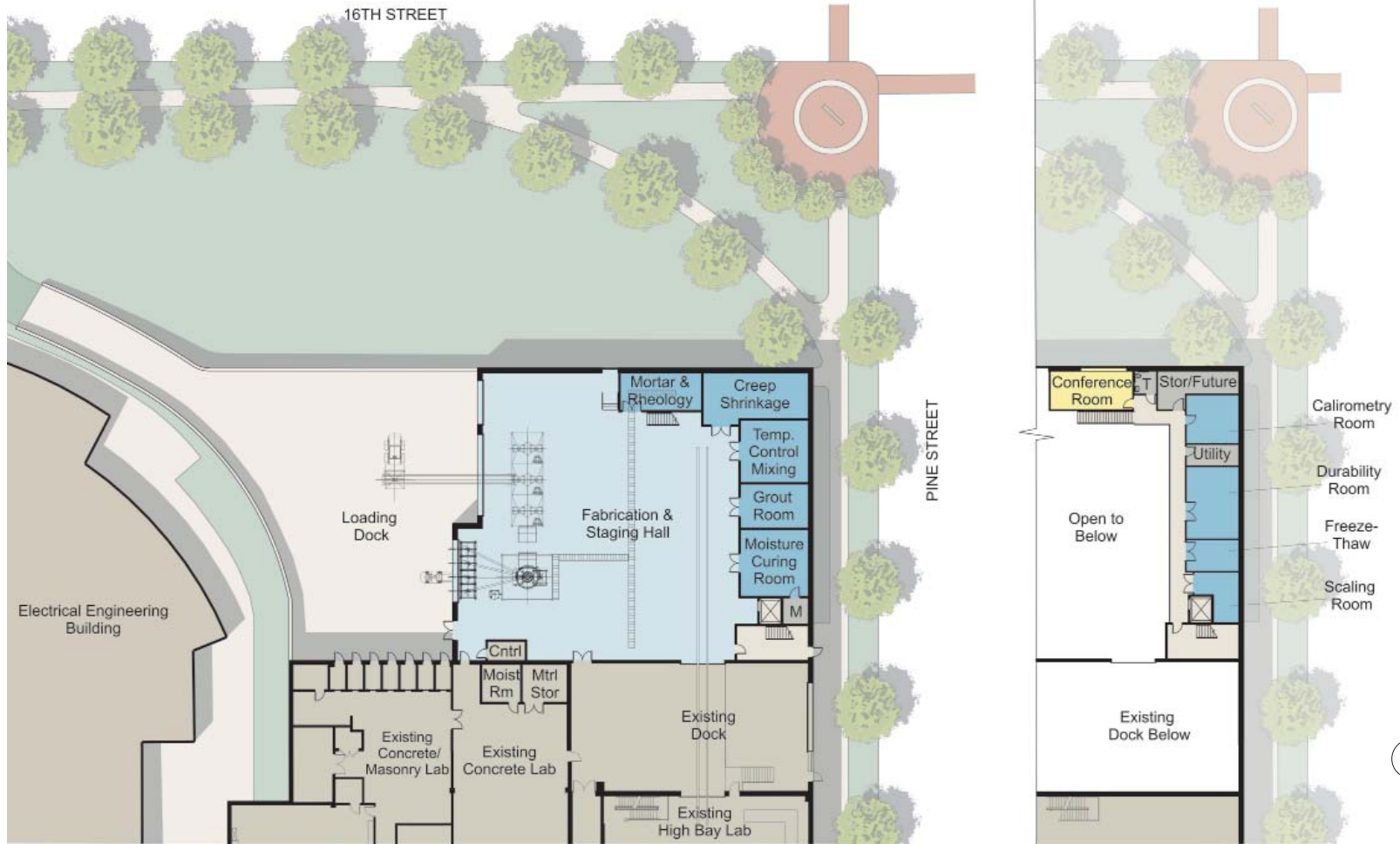


CONCEPTUAL DRAWINGS - SITE PLAN





CONCEPTUAL DRAWINGS - FLOOR PLANS



FIRST FLOOR

SECOND FLOOR



MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
BUTLER-CARLTON HALL HIGH BAY EXPANSION

CONCEPTUAL DRAWINGS - PERSPECTIVES



NORTH EAST CORNER OF EXPANSION



CONCEPTUAL DRAWINGS - PERSPECTIVES



NORTH WEST CORNER OF EXPANSION



BUDGET ESTIMATE

Revised: August 15, 2012

16,237 SF

Escalation compounded annually at:		2.00%		
COST COMPONENT			BUDGET	
GROSS BUILDING AREA - HIGH BAY SPACE AND FAB./STAGING				10,007 SF
Building Construction Cost per Square Foot			\$	200
Subtotal			\$	2,001,400
GROSS BUILDING AREA - MEZZANINE				2,600 SF
Building Construction Cost per Square Foot			\$	350
Subtotal			\$	910,000
GROSS BUILDING AREA - RETROFIT OF EXIST. DOCK				3,130 SF
Building Construction Cost per Square Foot			\$	200
Subtotal			\$	626,000
GROSS BUILDING AREA - RETROFIT OF EXIST. TESTING AREA				500 SF
Building Construction Cost per Square Foot			\$	250
Subtotal			\$	125,000
CURRENT CONSTRUCTION COST			\$	3,036,400
EMERGENCY GENERATOR RE-LOCATION			Allowance	\$ 60,500
BATCH PLANT TRANSPORTATION AND INSTALLATION			Allowance	\$ 50,000
ON-SITE WORK (utilities, paving, walks, landscaping, etc. - No off-site)			Allowance 10.00%	\$ 303,640
TOTAL CONSTRUCTION COST BEFORE ESCALATION			\$	3,450,540
TERM OF ESCALATION			2nd Q 2013 2.00%	\$ 138,022
A	ESCALATED BUILDING COST			\$ 3,588,562
B	BID / DESIGN CONTINGENCY	A x	10.00%	\$ 358,856



BUDGET ESTIMATE (CONT'D)

C	CONSTRUCTION COST (A+B)			\$	3,947,418
	1 New Furnishings, Fixtures and Equipment Allowance	Allowance	5.00%	\$	197,371
	2 Audio/Visual/IT Equipment	Allowance	4.00%	\$	157,897
D	FF&E and TECHNOLOGY TOTAL (1 thru 3)			\$	355,268
	1 Basic Services - Architect/Engineer (Does not include FF&E Design)	7.20% of C		\$	284,214
	2 Hazardous Materials Design/Testing	Allowance		\$	12,100
	3 Site Survey	Allowance		\$	16,500
	4 Soils Survey	Allowance		\$	14,641
	5 Construction Testing Services	Allowance		\$	36,300
	6 Permit Fees	Allowance		\$	18,150
	7 Code Consultants	Allowance		\$	12,100
	8 Building Commissioning	Allowance		\$	46,234
	9 Testing/Balancing	Allowance		\$	23,117
E	PROFESSIONAL FEES TOTAL (1 thru 7)			\$	463,356
F	CONSTRUCTION CONTINGENCY	10.00% of C		\$	394,742
	1 Owner Project Management/Facilities Management Charges	Allowance		\$	213,162
	2 Printing of Bid Sets	in Item F1		\$	-
	3 Hazardous Material Removal (If Required)	TBD		\$	-
	4 Builders Risk	Allowance		\$	-
				\$	-
G	CONSTRUCTION PHASE COSTS TOTAL (1 thru 4)			\$	213,162
H	PROJECT COSTS (D+E+F+G)			\$	1,426,528
I	TOTAL PROJECT COSTS (C+H)			\$	5,373,945