Engineering Research

THE PRACTICE OF BNIM

bnim

ABOUT BNIM

BNIM is an innovative leader in designing high performance environments. BNIM's instrumental development of the USGBC, LEED, and the Living Building concept, combined with projects, methods, and research, shaped the direction of the sustainable movement. Through this involvement, the firm has redefined design excellence to elevate human experience together with aesthetics and building performance. In practice, this multifaceted approach to design excellence has yielded national acclaim, including the AIA National Architecture Firm Award, and consistent design recognition nationally and internationally. BNIM is **Building Positive**, a notion that describes how our practice leverages its collective capacity for design thinking to solve issues at every scale in a way that is focused on building the positive attributes of community and the built environment. Through an integrated process of collaborative discovery, BNIM creates transformative, living designs that lead to vital and healthy organizations and communities.

Engineering Research

THE PRACTICE OF BNIM

bnim

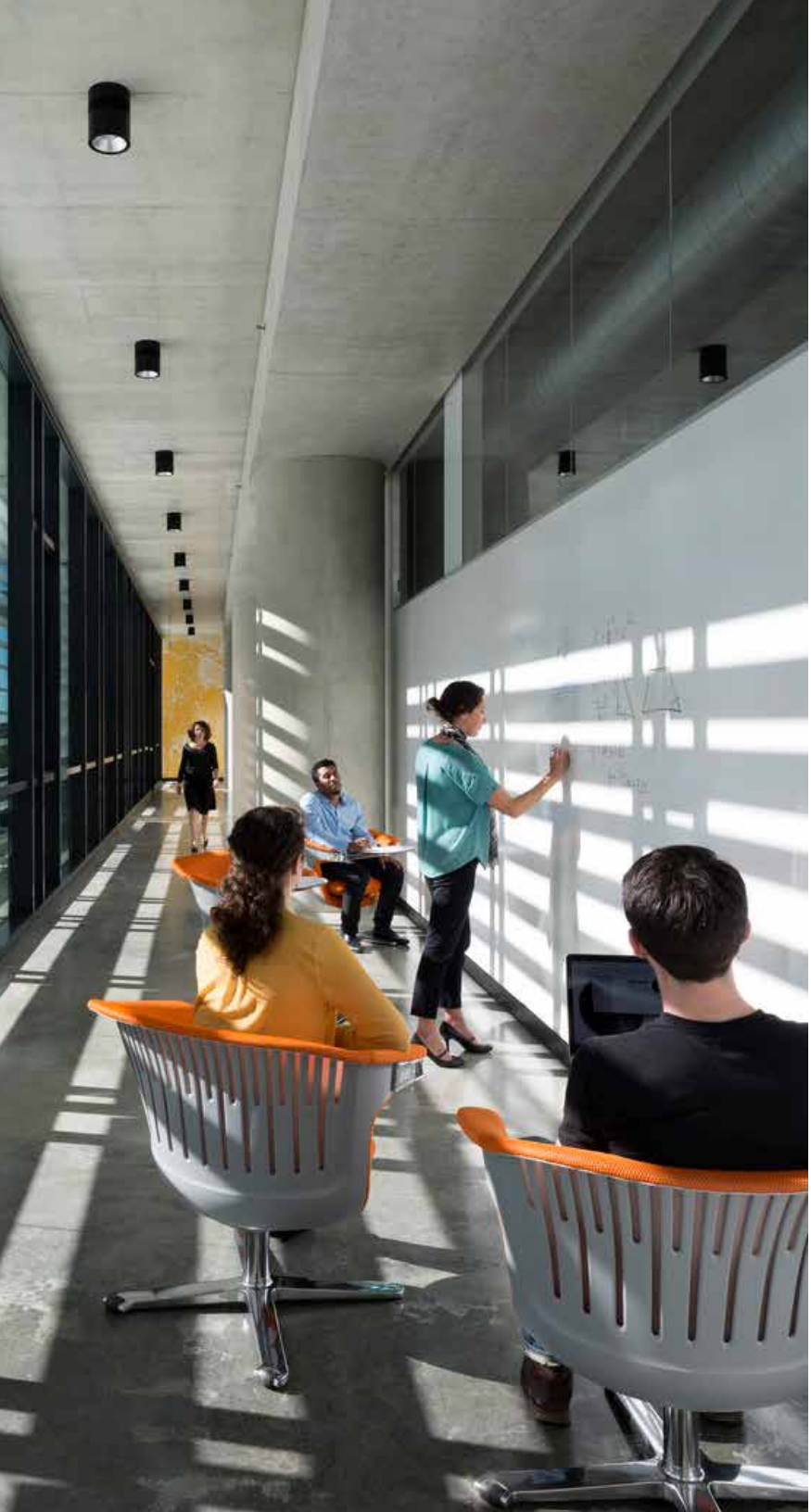
Designing for the Future of Engineering Research

Engineering education and research facilities serve a wide cross-section of needs and sub-disciplines. They provide a safe, inspiring environment for exploration and discovery. They act as a tool for faculty, researchers, and students. They serve as a powerful asset for institutions. And they constantly evolve to accommodate the important work that takes place within them. In the past two decades, several important trends have emerged that are transforming the way we design interdisciplinary engineering research facilities of the future:

Academic Spaces that Amplify National Recognition
Education and research buildings must elevate and advance the work of the teams within, while also supporting their productivity and vitality. The design of a world-class research and education facility can yield transformational results for an institute's recruitment and retention efforts.

Transparency
A building designed to encourage transparency will showcase the institution's scientific endeavors and achievements. This may involve digital displays, interior glazing, display cases, scientific artwork, graphics, and even building form to inform and educate on the function and scientific disciplines housed within.

Centralized Hubs of Scholarly Activity
Contemporary scientific instructional and research should activate the buildings they occupy. By providing intentional, strategically located spaces - small nooks, stairway landings, breakout lounges, small libraries, conference rooms - everyday user activity can spur chance



interaction and meaningful collaboration between traditionally disparate building user groups. These "collision spaces" are small but impactful solutions that promote cross pollination of knowledge and ideas.

High-Performance Integrated Design
Science and engineering buildings are extremely energy intensive, and today's design solutions reflect a high-performance integrated approach. In particular, programming-driven MEP strategies create energy efficiency, maintain critical environmental conditions and optimal human health, comfort, and safety for occupants.

Adaptable Facilities
Academic facility design continues to evolve with a need for highly flexible and adaptable buildings to support future needs and goals. Central to the long-term success of many of BNIM's projects is the concept of "long life, loose fit" — addressing future, unanticipated needs through the programming of space, adaptable infrastructure, and the overall design of buildings.

Seamans Center for the Engineering Arts and Sciences

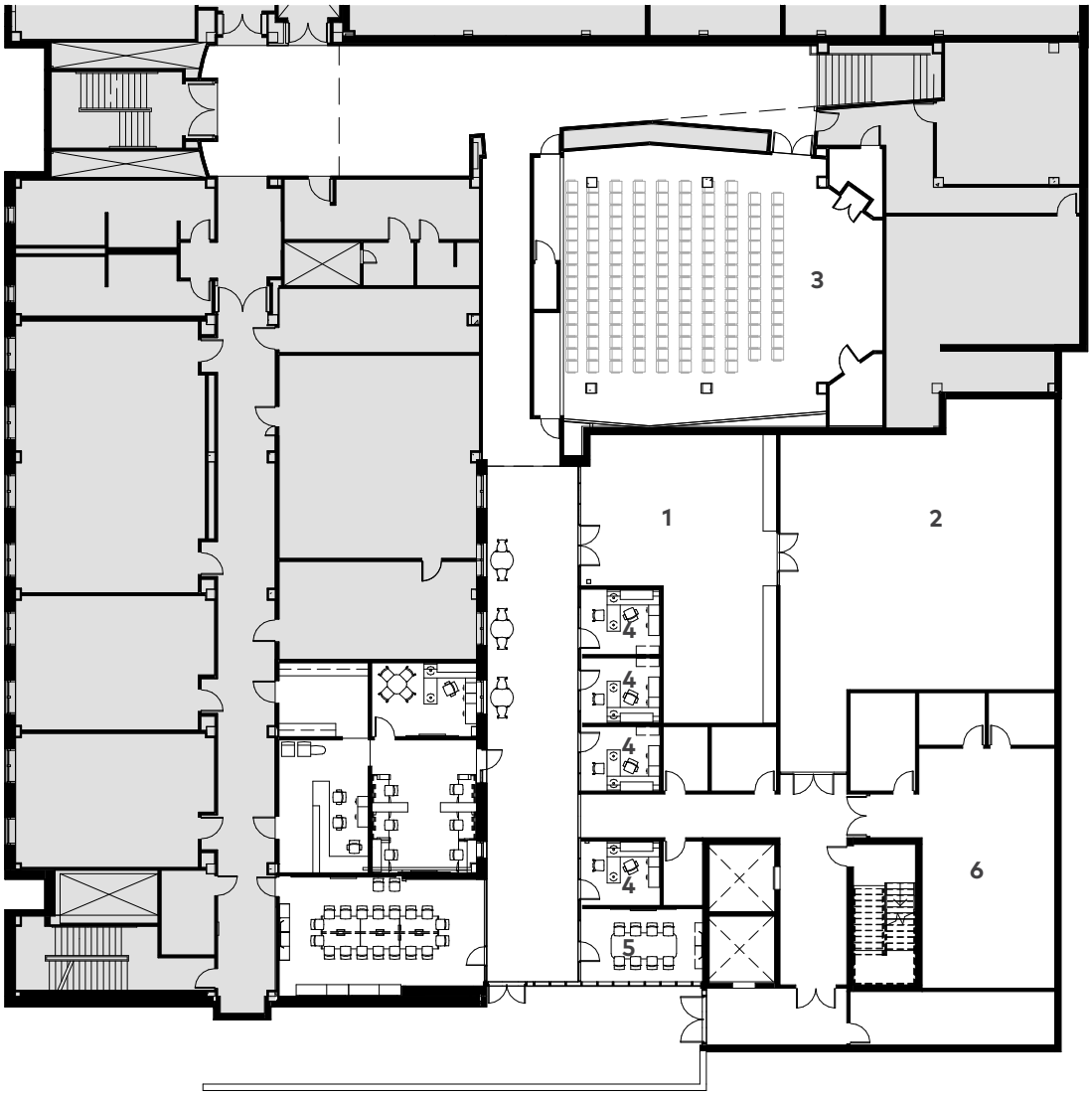
SOUTH ANNEX ADDITION
UNIVERSITY OF IOWA, IOWA CITY

bnim is building positive

The South Annex Addition to the Seamans Center for the Engineering Arts and Sciences will build a larger community within the entire engineering facility and foster innovation in teaching, learning, and discovery.

The Annex includes new formal and informal research spaces, varied sizes of active learning classrooms, student development and tutoring spaces, and the creation of a new common lobby centered around a technology-rich student project design studio that brings the entire engineering community together. Renovation work in the existing building includes creating an Engineering Learning Commons adjacent to the engineering library space. The Commons will include flexible study and presentation spaces for faculty and students use.

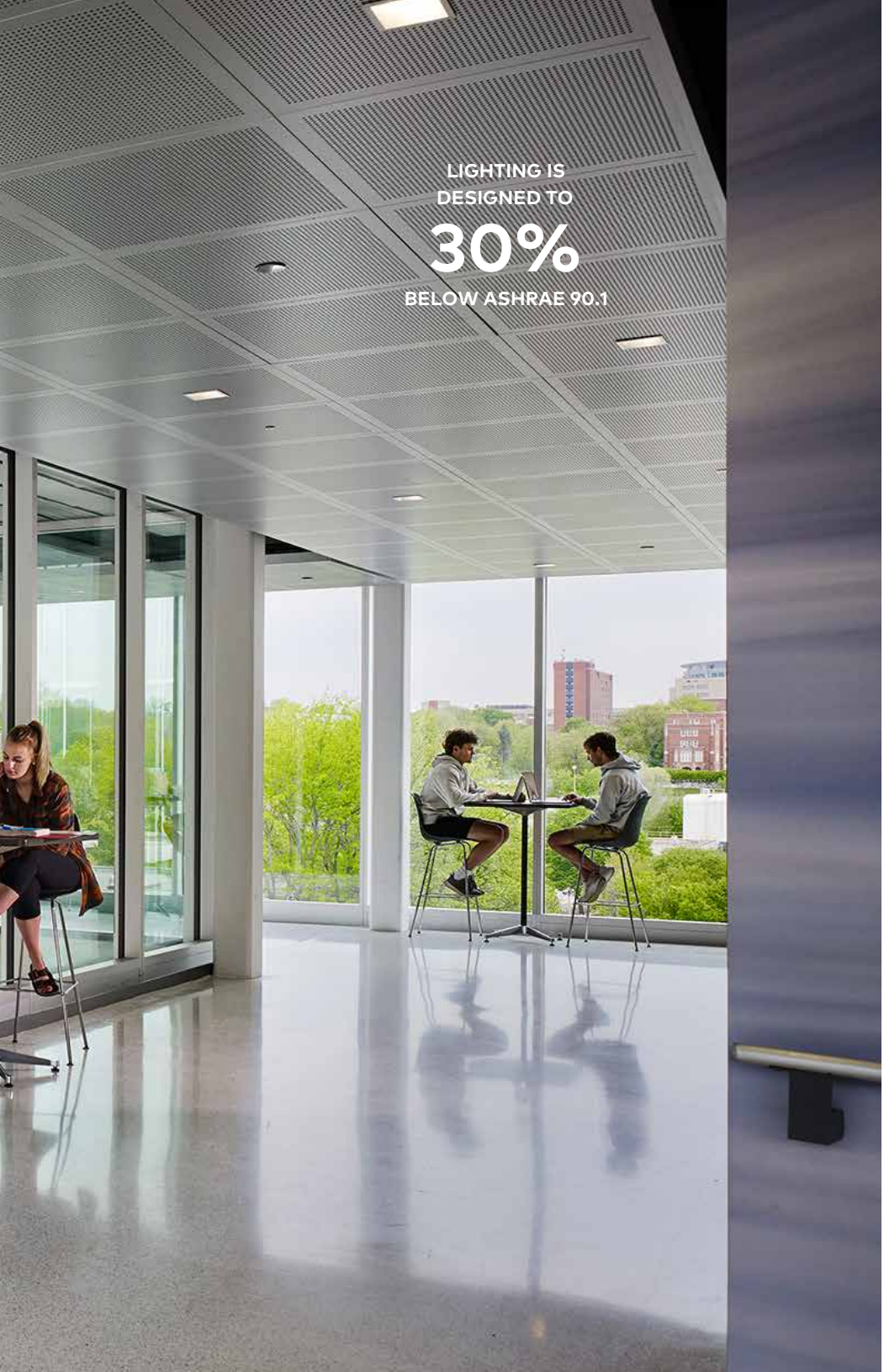
65,739 SF
Est. Completion in 2017



1 Fluids Workshop
2 Fluids Teaching Lab
3 Classroom
4 Office
5 Meeting
6 Mechanical
Existing Building

0 12'

LEVEL 1


LIGHTING IS
DESIGNED TO
30%
BELOW ASHRAE 90.1

SUSTAINABLE / NOTABLE FEATURES

- 68,094 SF facility
- Building will serve as a living laboratory that creates an attitude of discovery and innovation.
- The majority of the building is elevated above the grade plane to increase open space on the urban site and to create covered bicycle parking.
- The elevation also allows air and light to create a more habitable urban environment on a congested campus site.
- Above and beyond approach to universal design includes a digital kiosk with assistive learning technology and a comprehensive wayfinding strategy.
- The site / building design offers 24/7 accessible access up and down a steeply sloped site, which was previously a significant barrier in a heavily utilized pedestrian path.
- Prior to the project, stormwater would run-off down a steep slope to the storm sewer and near by river. The site now incorporates biocells to slow, cool, and clean storm water.
- Native landscaping and ground covers also create a more sustainable site condition.
- There is enough detention to reduce the post-developed 100-year storm to be less than half of the pre-developed rate.

UNDERGRADUATE
ENROLLMENT HAS DOUBLED,
REACHING

2,200

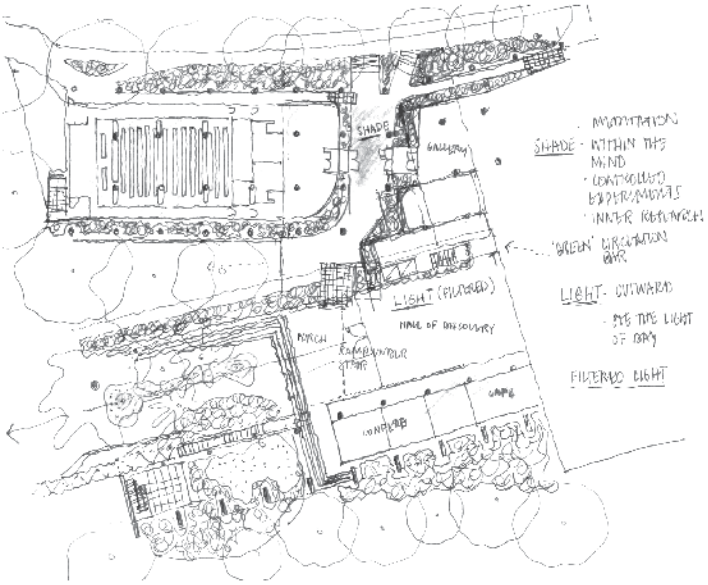
STUDENTS SINCE
THE EXPANSION

Fayez S. Sarofim Research Building

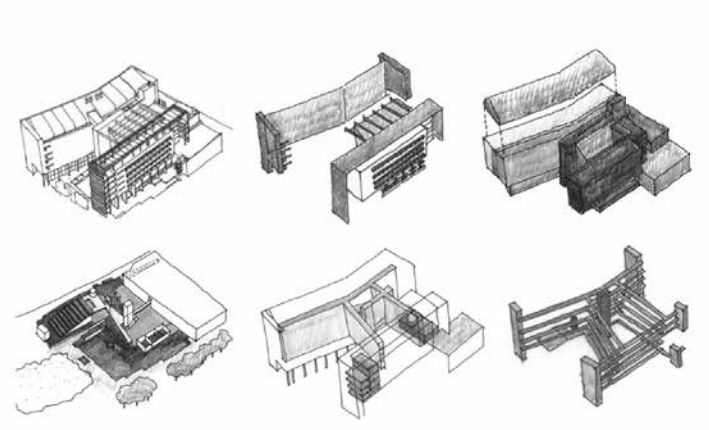
THE UNIVERSITY OF TEXAS
HEALTH SCIENCE CENTER AT HOUSTON
HOUSTON, TEXAS

The Fayez S. Sarofim Research Building, home of the Brown Foundation Institute of Molecular Medicine, is a comprehensive research facility on a tight urban site within the Texas Medical Center campus. This facility is designated to support research collaboration in the area of molecular medicine, particularly in genetics and proteomics and bioinformatics. The Sarofim Research Building houses dry and wet laboratories, offices, conferencing areas, a 200-seat assembly facility, and appropriate support spaces. The design creates a dynamic, interactive environment conducive to research and learning on multiple levels. From the relationship with the outdoors, to the architecture of the building, to the interior spaces, the approach considers form and function holistically, promoting the productivity and well-being of users.

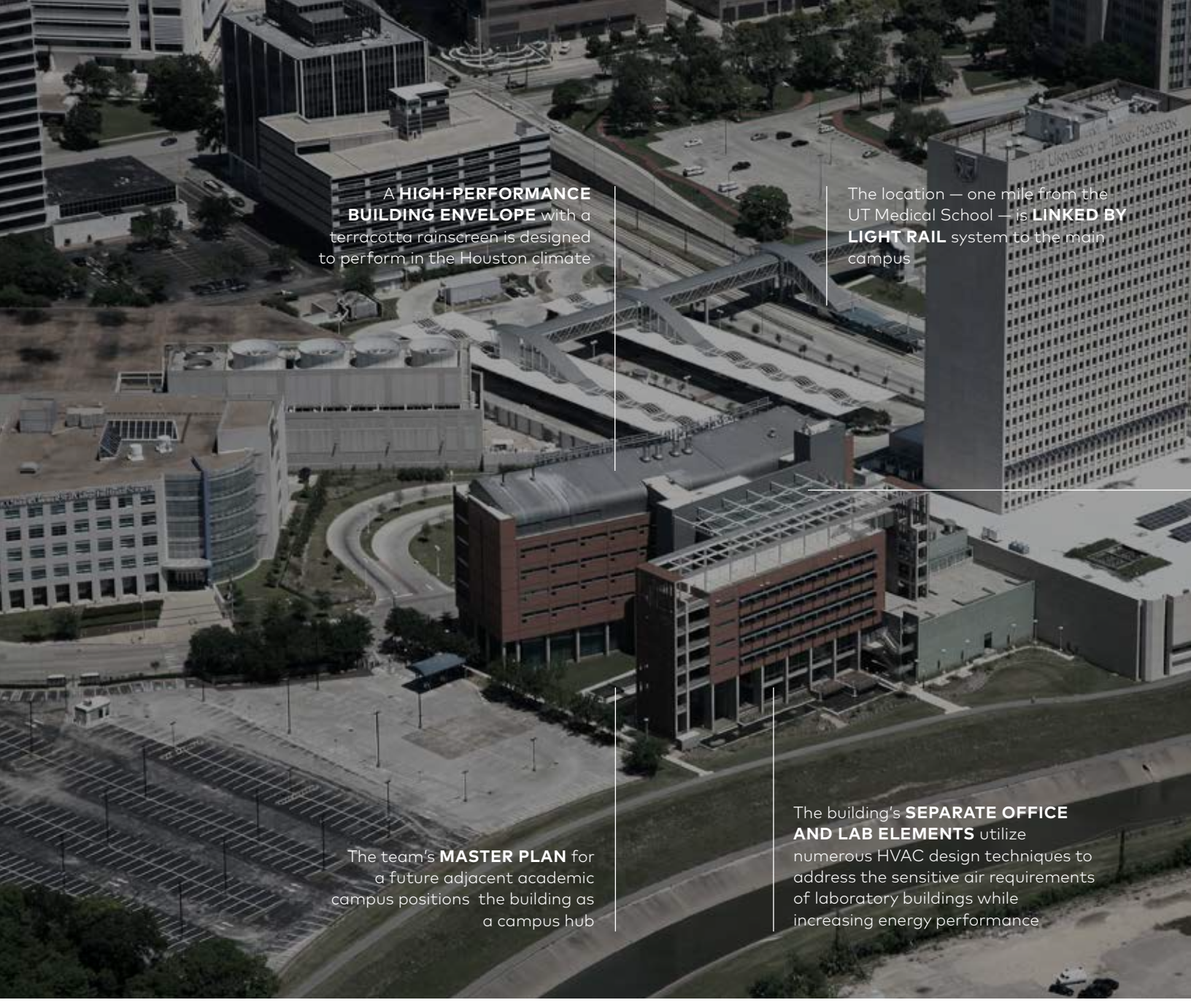
229,250 SF
Completion in 2005



The building incorporates sustainable design strategies at many scales. Building orientation allows optimum penetration and control of natural light in relationship to the differing programmatic elements of flexible laboratory space, support laboratories, office and common areas. The separation of office and lab elements enabled the environmental control system to capture and reuse energy that would normally have been wasted. The reinforced concrete column and slab structure employs high fly ash concrete thus reducing the upstream environmental impact of the building. The building also has a specialized facade design that responds to the Houston climate.



The approach to the design was based on three underlying principles: place, collaboration and sustainability. The design focuses on creating a dynamic, interactive environment conducive to research and learning on multiple levels. The building is a composition of separate functional "species". Each species is designed as a unique typology fulfilling the specific needs of its function and use. These separate building elements are then connected by an atrium and circulation spaces. Distinction between the interior and exterior is blurred by the continuation of materials throughout.

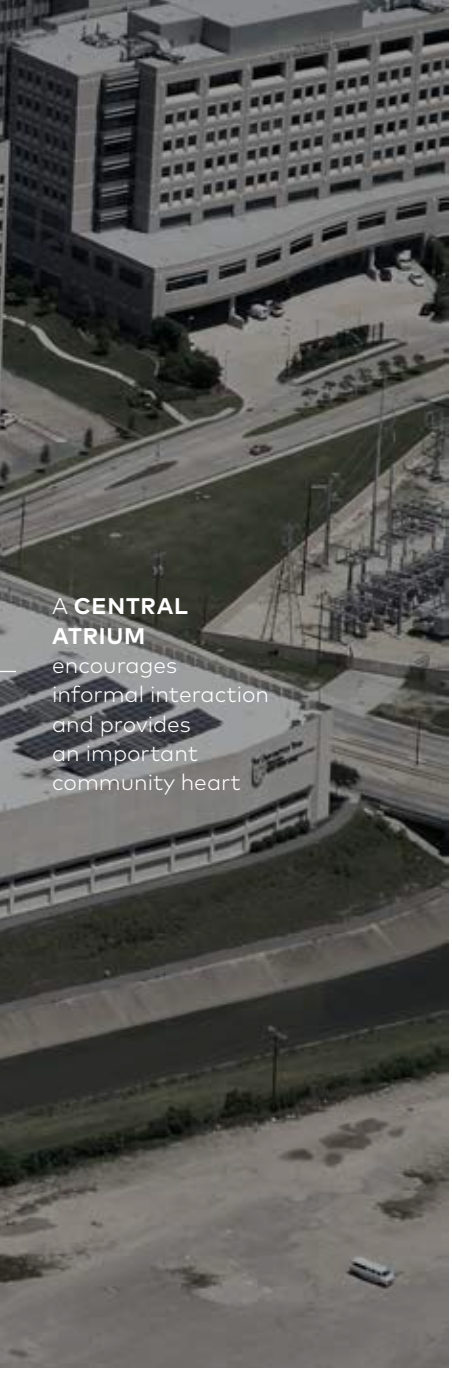


A **HIGH-PERFORMANCE BUILDING ENVELOPE** with a terracotta rainscreen is designed to perform in the Houston climate

The location — one mile from the UT Medical School — is **LINKED BY LIGHT RAIL** system to the main campus

The team's **MASTER PLAN** for a future adjacent academic campus positions the building as a campus hub

The building's **SEPARATE OFFICE AND LAB ELEMENTS** utilize numerous HVAC design techniques to address the sensitive air requirements of laboratory buildings while increasing energy performance



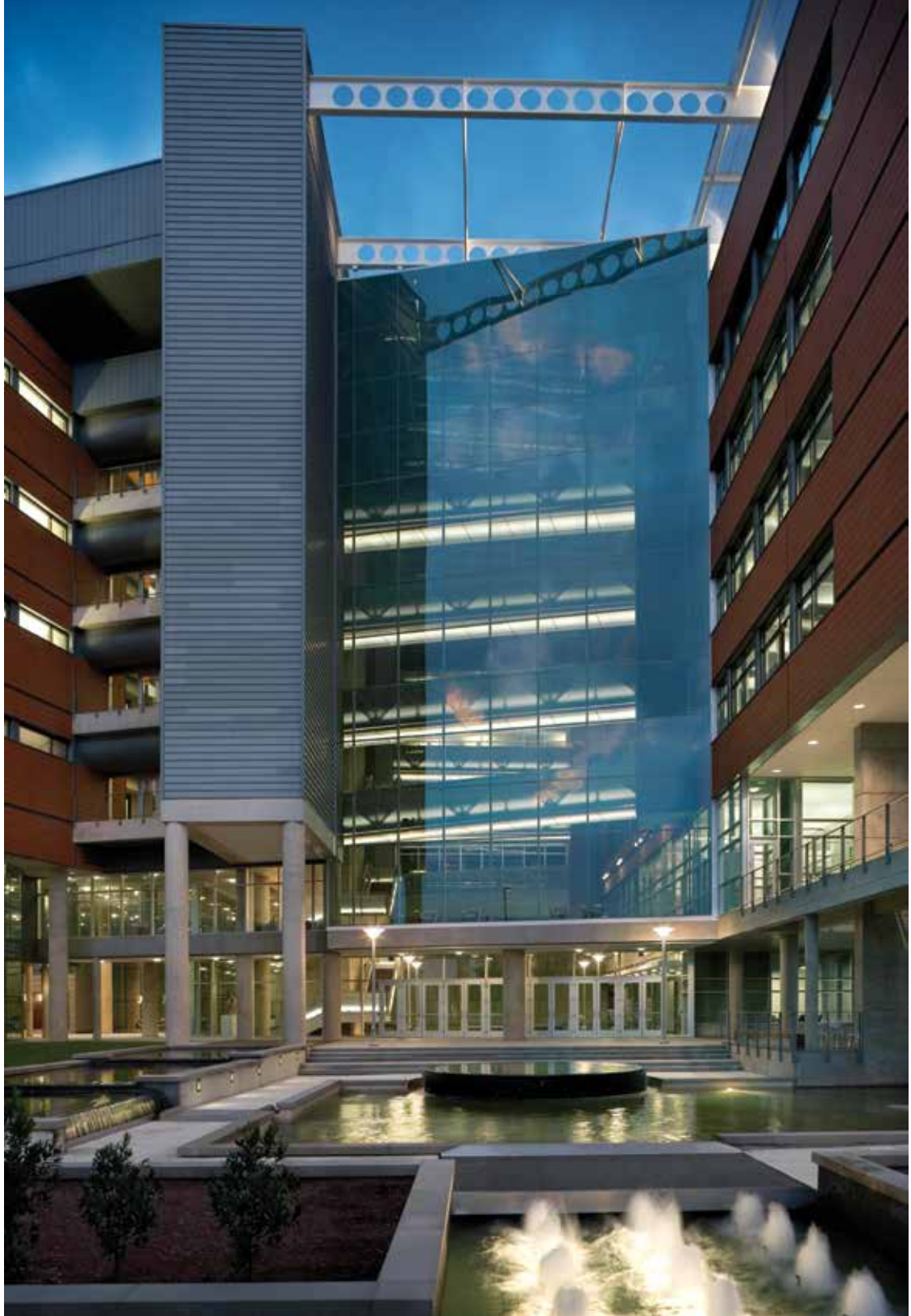
A **CENTRAL ATRIUM** encourages informal interaction and provides an important community heart

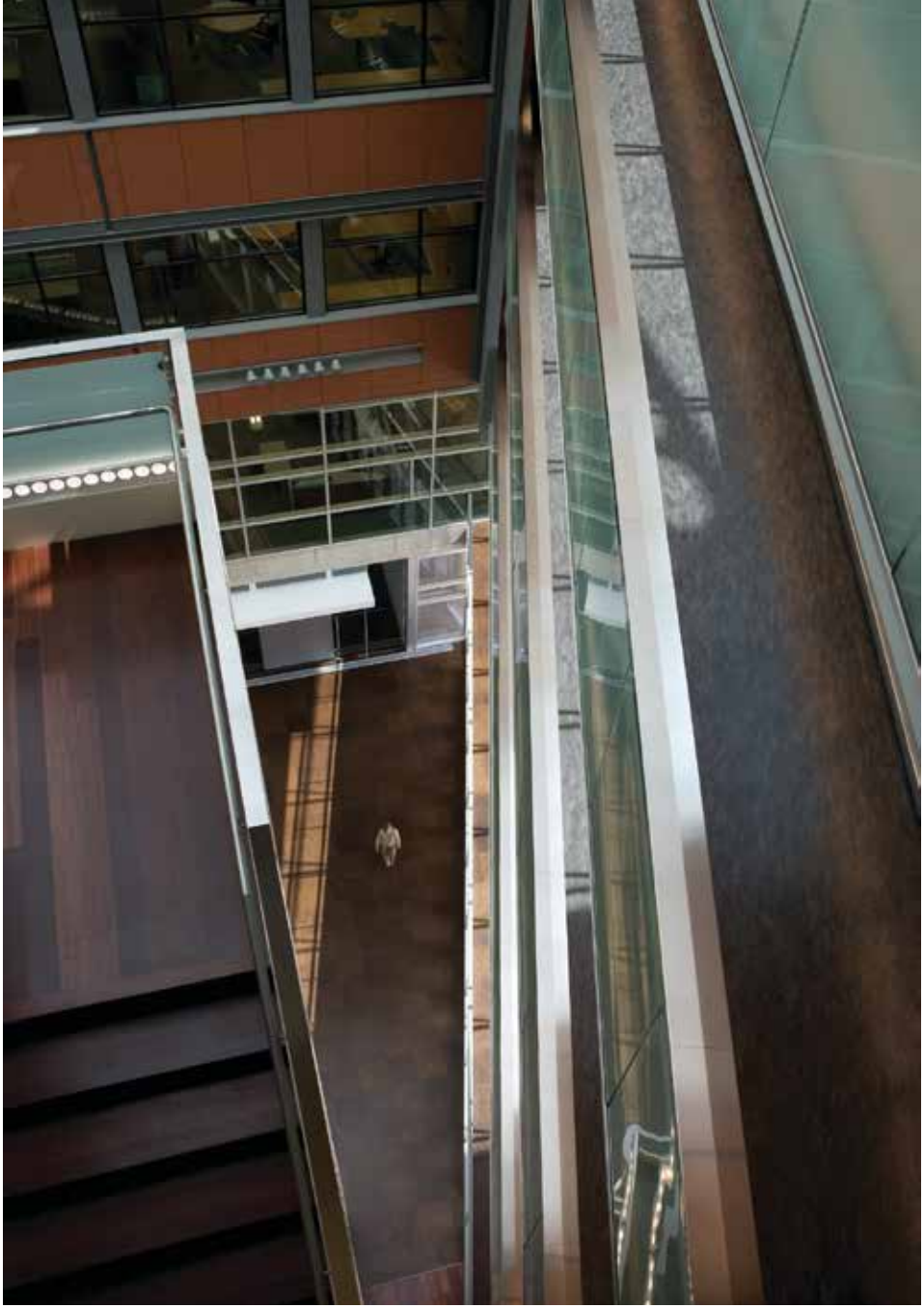
SUSTAINABLE / NOTABLE FEATURES

- 229,250 SF facility
- 101,000 SF Laboratory Space
- 22,367 SF Offices, Support
- Prominent site along Bray's Bayou in the Texas Medical Center
- Recipient of 9 Design Awards
- Designed to LEED Standards
- Conceived as a 100-year building
- Building orientation allows optimum penetration and control of natural light
- The building envelope is a terra cotta rain screen — a pressure-balanced system that reduces moisture penetration
- The reinforced concrete structure employs high fly ash concrete reducing the upstream environmental impact of the building
- The concept for this building is an "academic village" where a community of researchers, faculty, and students are engaged together in biomedical research and study
- Unique two-bar design that separates laboratory and office functions in to separate wings for energy optimization and promoting interdisciplinary collaboration
- Apex of two bar design enables informal exchange
- The Sarofim building was conceived as an organism with discrete parts or species. Each species is designed for individual functions with appropriate spatial configuration, mechanical system, lighting, furnishings, and other qualities to ensure the highest levels of health, comfort, productivity and innovation
- The Sarofim building houses dry and wet laboratories, offices, conferencing areas, a 200-seat assembly facility, vivarium and appropriate support spaces
- This facility is at once both an entire community to itself, complete with a sense of place, and an anchor for inviting future development within the planned campus
- The building is designed for long term flexibility, accommodating program changes and varying research parameters over time
- Lab spaces are open with custom designed overhead carriers to provide ventilation and a movable wall system to provide physical separation as needed
- Houses the IMM's 10 research centers: Human Genetics, Cardiovascular Genetics, Diabetes and Obesity, Cell Signaling, Neurodegenerative Diseases, Stem Cells, Immunology and Autoimmune Diseases, Proteomics and Systems Biology, Molecular Imaging, Senator Lloyd Bentsen and B.A. Bentsen Center for Stroke Research

"The community has embraced the building as an ideal spot to host events and lectures. The water feature has been the greatest 'discovery' for many within the building and within the TMC campus. The south decks are now a daily place of interaction for staff during breaks."

IRMA GIGLI, MD
Director Emeritus, Brown foundation Institute of Molecular Medicine





AWARDS

2007 Merit Award, Architecture
AIA Kansas

2007 Honor Award
AIA Houston

2007 Texas Society of Architects
Honor Award

2007 Design Award, Smooth Metal Walls
Metal Architecture

2006 Texas Construction Magazine
Best of Higher Education Award

2006 Merit Award
AIA Kansas City

2006 Merit Award, Architecture
AIA Central States Region

2005 Merit Award, Unbuilt
AIA Houston

2004 Excellence in Architecture, Unbuilt
AIA Kansas

"The building is a tremendous asset in the recruiting process. With BNIM's leadership we were able to achieve a new paradigm for collaborative science and research."

IRMA GIGLI, MD
Director Emeritus, Brown foundation Institute of Molecular Medicine

Western Institute of Nanoelectronics Green Engineering and Metrology

UNIVERSITY OF CALIFORNIA, LOS ANGELES
LOS ANGELES, CALIFORNIA

The development of the Western Institute of Nanoelectronics (WIN) and Green Engineering and Metrology (GEM) building (Phase I) on the UCLA campus represents the highest of aspirations for the research community in supporting the advancement of clean and green technologies. The building houses three primary driving Centers of Excellence in the field of nano-systems and clean technology.

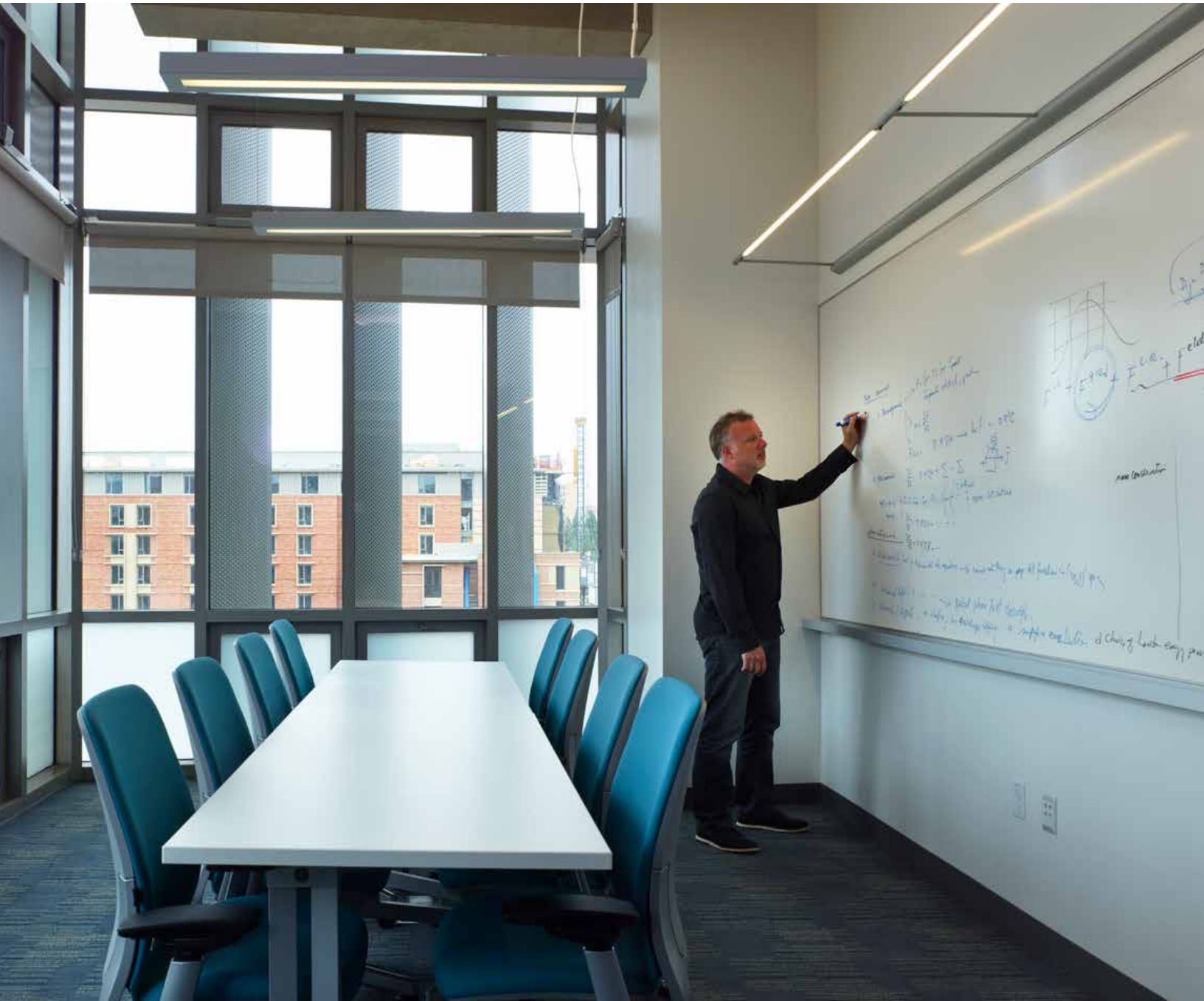
The WIN-GEM facility provides space for faculty and their industrial collaborators to perform research and development in energy harvesting, storage, conservation and management. As such the facility is thoughtfully designed for collaborative, multidisciplinary research, and the building itself is thought of as an expression and armature of that research.

With Moore Ruble Yudell

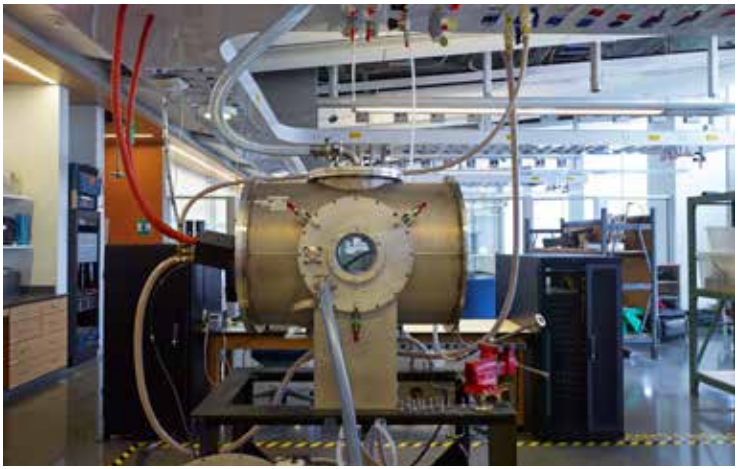
61,625 SF
Completion in 2014
LEED Gold certified

SUSTAINABLE / NOTABLE FEATURES

- 61,625 SF facility
- Active chilled beams in dry labs
- Natural ventilation in post doc office suites – mixed-mode VAV
- Demand ventilation in wet labs to reduce air change rates
- Exhaust stream monitoring to reduce fan power
- Fume hood sash management by reduced height to reduce air changes
- Dry lab return air used as supply air in wet research support space alcoves
- Grey water system - reclaims waste RO process water for toilet flushing
- Façade shading element for solar heat gain control




CORROSIVES
FLAMMABLE



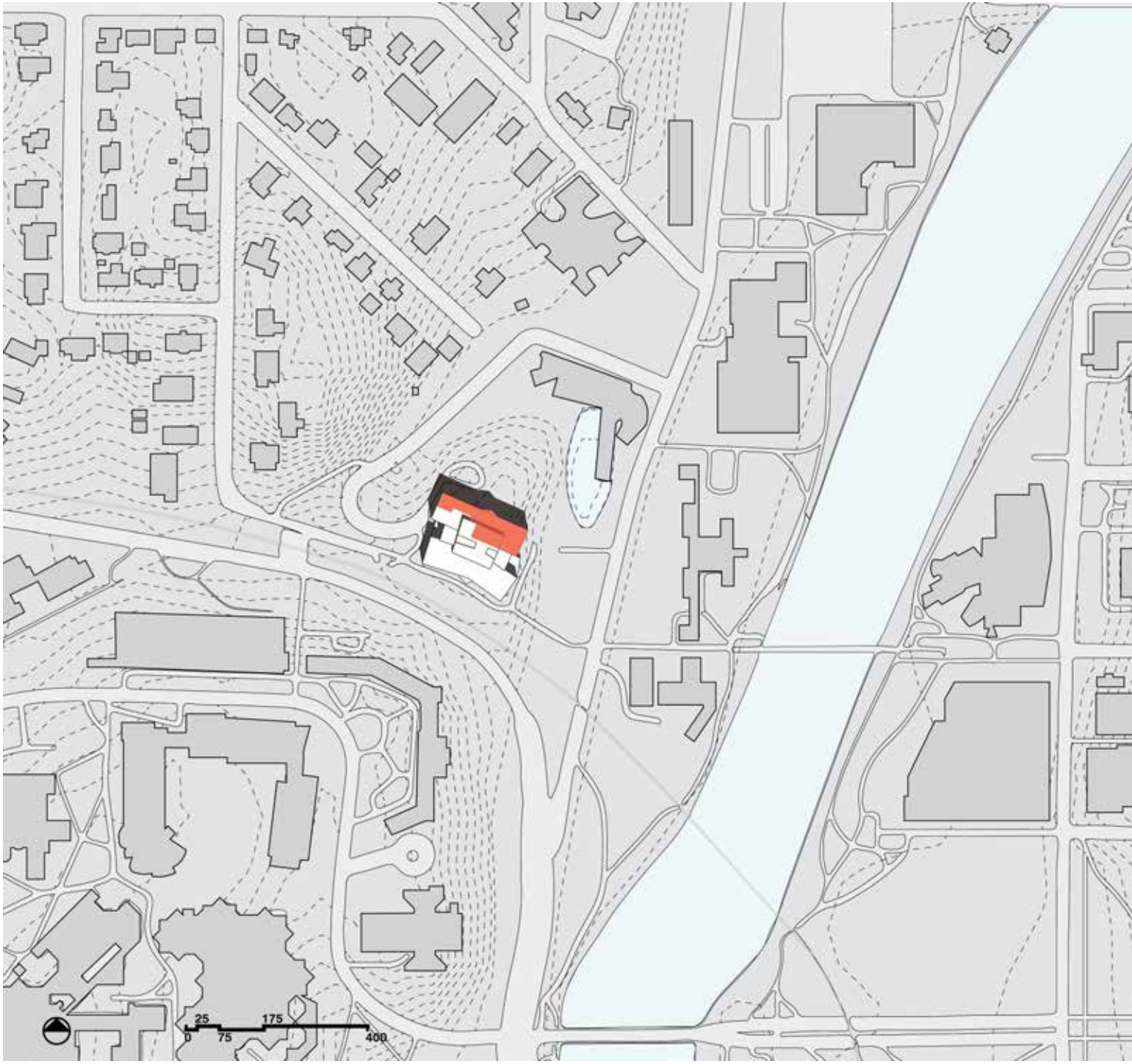
University of Iowa Informatics Initiative (UI^3)

UNIVERSITY OF IOWA
IOWA CITY, IOWA

The University of Iowa introduced a campus-wide initiative designed to foster collaborations and cultivate research opportunities across disciplines. The initiative joins the computational discipline with the humanities, arts, natural, biological, health, and social sciences to identify and resolve current issues. Researchers and faculty who work within these different disciplines needed a place that would allow them to connect and collaborate, to work together, and to work privately.

The University of Iowa Informatics Initiative (UI^3) creates a physical and intellectual home for the initiative within existing building shell space at the university. Establishing a culture and identity for this new collaboration was an important goal of the project. While the individuals who are part of the program are dispersed across campus, a common ground is found in the work they do. By offering a rich variety of functional opportunities, the design ensures users are attracted to the space and utilize it regularly, regardless of where their departments are located. The space draws together these individuals, who share a common pursuit, creating opportunities that lead to academic collaborations and innovations.

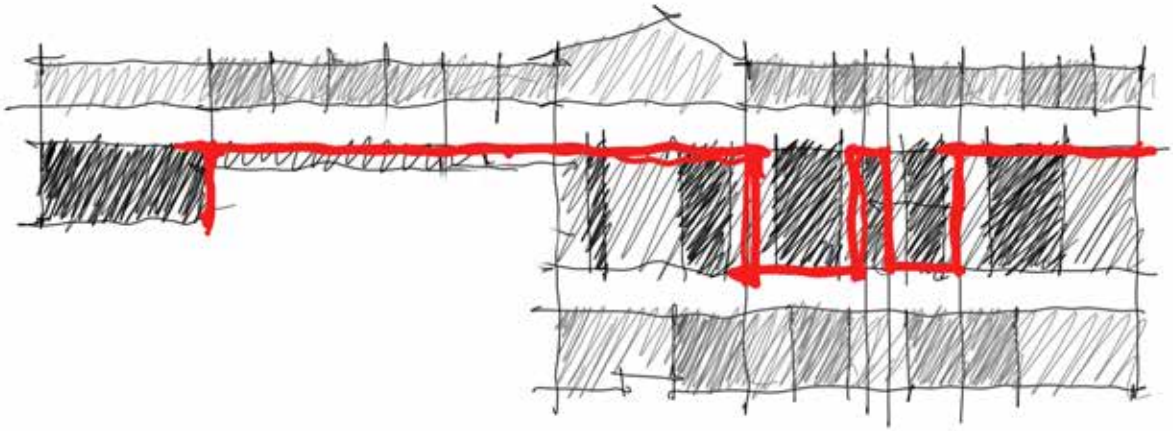
11,913 SF
Completion in 2016

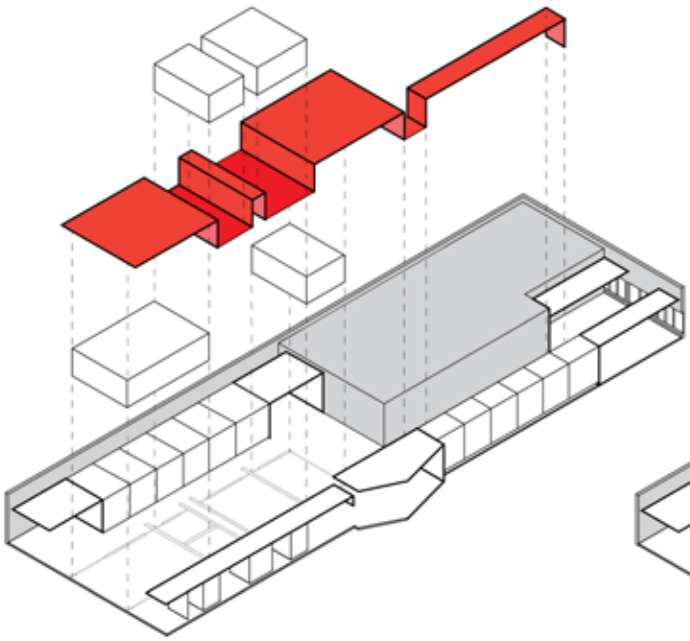

25
175
0
75
400

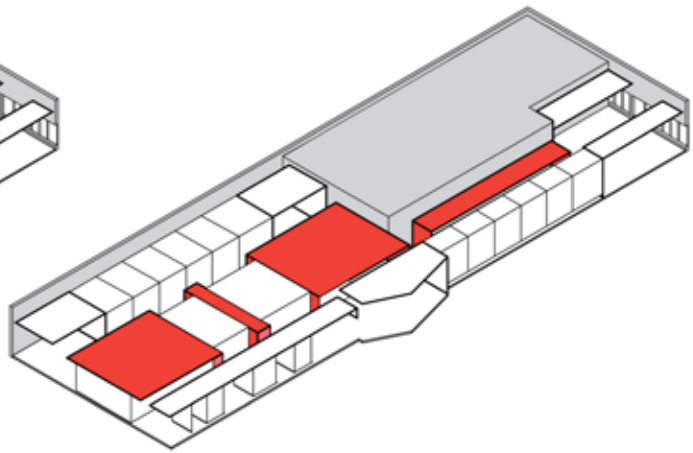
During the programming process, BNIM and the University of Iowa determined that people – and the connections between them – were the most important element that a space can offer. The design was shaped by organizing a spectrum of spaces to support various modes of work, optimize interactions, interweave relationships, and promote visual connections while respecting appropriate levels of privacy. The diverse disciplines and backgrounds within the initiative necessitated a single unifying element. Design cues were drawn from genetics – a human data element and common thread that binds these disciplines together. Visual connections through and across the entire space inspire curiosity and promote engagement.

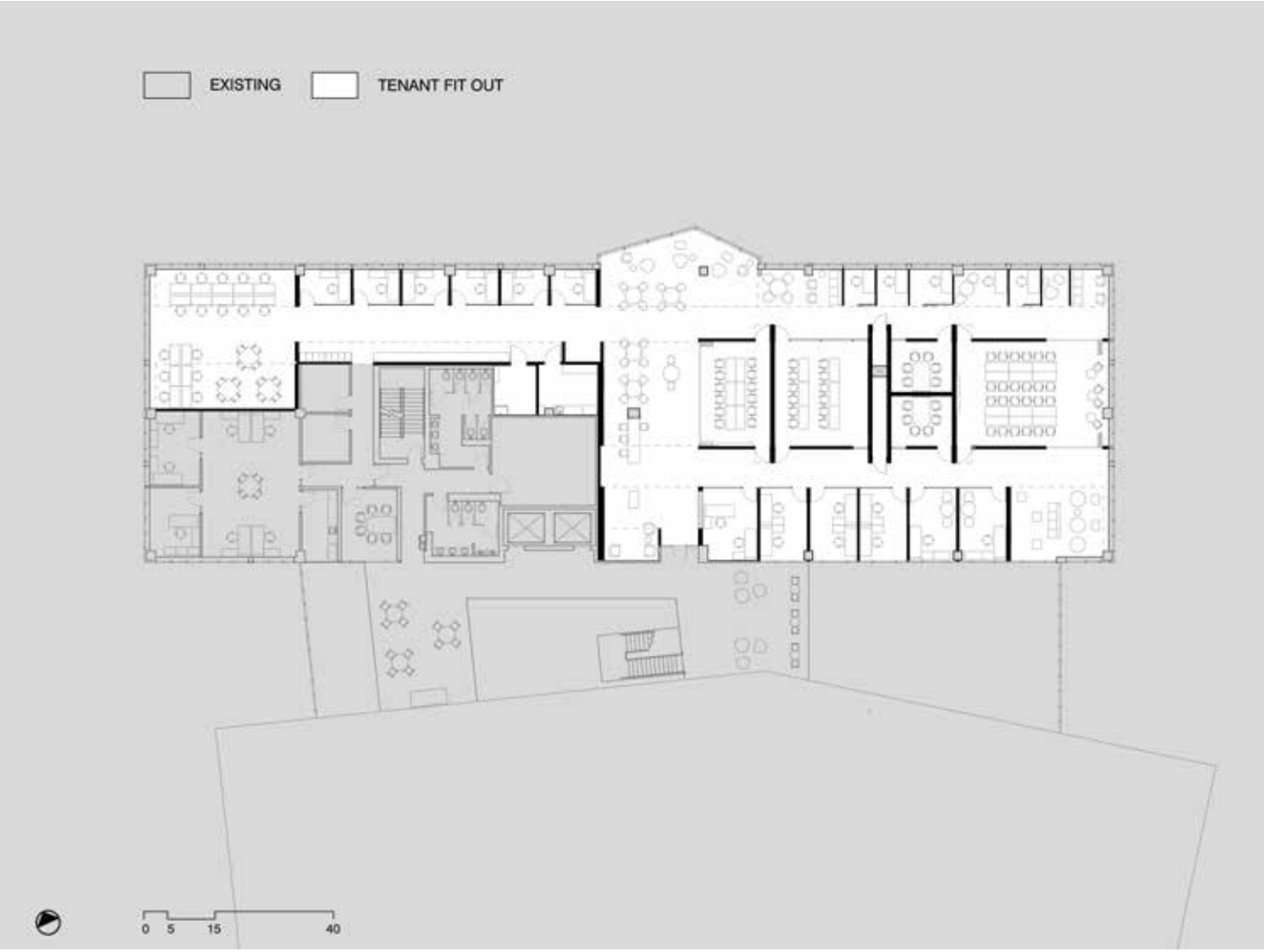
Bent linear ribbons, inspired by the graphic linearity of human genome mapping and the ribbon-like structure of DNA, serve as a spatial organizing device. This unifier was interpreted in various scales, from the organization of spaces united by contiguous bands, to surface treatment such as glazing frit patterns. The frit pattern, which provides privacy and writable space at key areas, was based on the pattern of the human genome and developed using digital algorithms. Within the pattern itself the coded message can be found, revealing the name of the initiative. This series of consistent gestures at various levels and scales establishes and reinforces a sense of place and identity unique to the program.

A central core of collaboration rooms spans east-west in the space, woven together with a series of bent wood ribbons. Secondary ribbons rendered in white capture and organize smaller scale collaboration and focused workspaces adjacent to those contained by the central spine. These spaces take advantage of their proximity with connectivity to the central spine as well as views to the exterior.








EXISTING
TENANT FIT OUT
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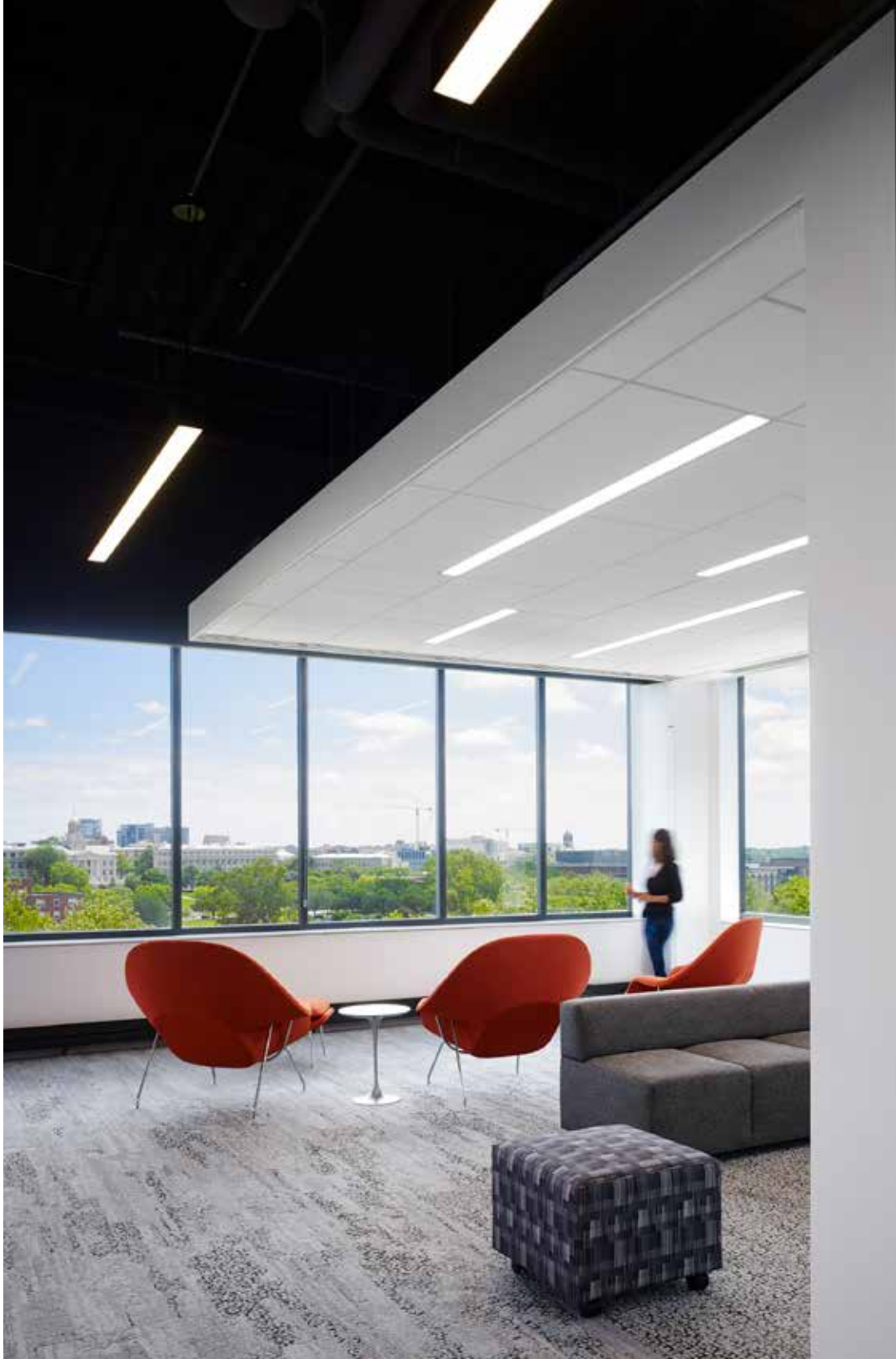


AWARDS

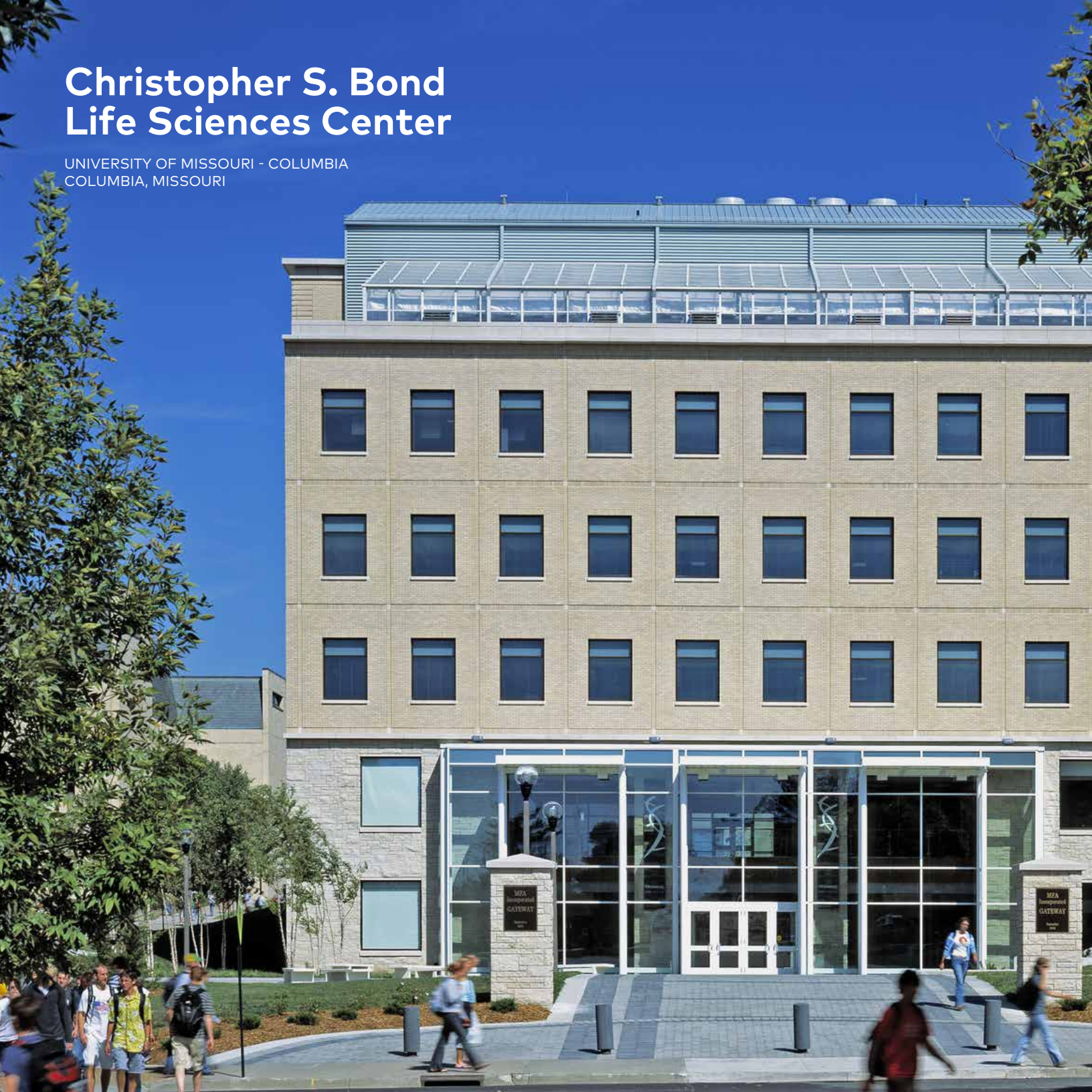
2017 IIDA Mid-America Design Awards
Gold Award, Higher Education, Research

"Working with BNIM was great. They were very collaborative and worked with us to help us better define our needs and vision, and then they came up with a wonderful design. We wanted to create a space that would help us bring the Informatics community together — from all corners of the University, from art to medicine — to foster collaborations, scholarship, and training."

GREGORY CARMICHAEL
Director
University of Iowa Informatics Initiative

Christopher S. Bond Life Sciences Center

UNIVERSITY OF MISSOURI - COLUMBIA
COLUMBIA, MISSOURI



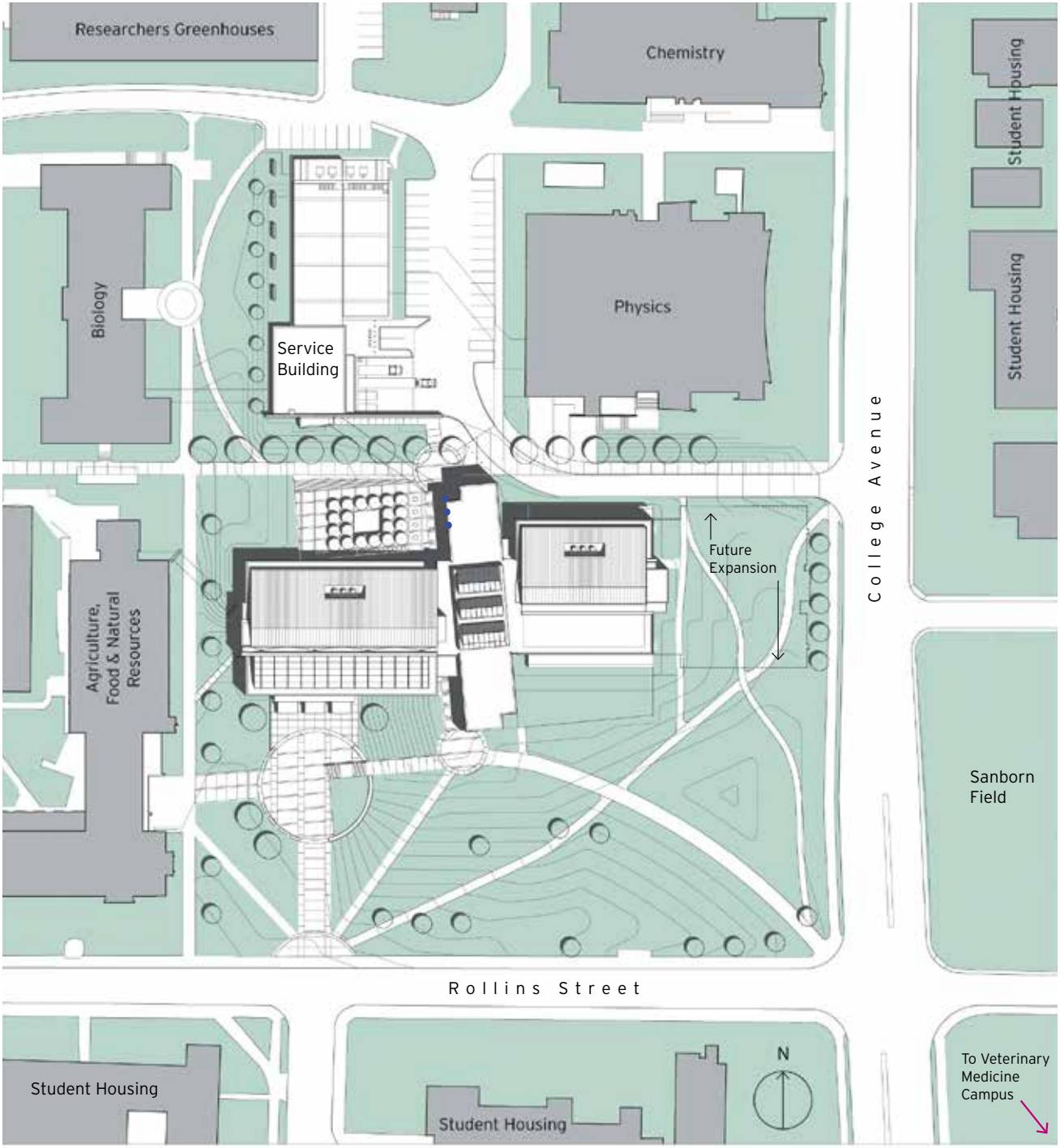
The Life Sciences Center at the University of Missouri - Columbia unites faculty and students from several schools and programs into one, collaboratively focused research center. The Colleges of Agriculture, Food and Natural Resources, Arts and Sciences, Veterinary Medicine, Human and Environmental Sciences Engineering, and the School of Medicine engage in joint research into genomic and biomolecular structures. State-of-the-art laboratories, shared meeting areas and public spaces provide unsurpassed opportunities for interdisciplinary biomedical science and agricultural biotechnology research.

239,714 GSF
Completion in 2004

With the idea that a healthy building illustrates the principles that life sciences embody, research, teaching and education converge in naturally daylit laboratory spaces, generous meeting areas, and informal teaming areas located off of the primary circulation spaces. The building features a central daylit atrium, strategically connecting the wings in an east-west direction to create a lively corridor called 'Main Street.' The naturally lit atrium, which centralizes faculty and research offices, a café and one of the reading rooms, encourages and facilitates interaction among users.

"The Center is kind of a catalyst that brings people together doing such different things."

MANNIE LISCUM
BIOLOGICAL SCIENCES PROFESSOR AND
ASSOCIATE DEAN OF GRADUATE STUDIES


Researchers Greenhouses
Chemistry
Student Housing
Student Housing
Biology
Service Building
Physics
College Avenue
Future Expansion
Agriculture, Food & Natural Resources
Sanborn Field
Rollins Street
Student Housing
Student Housing
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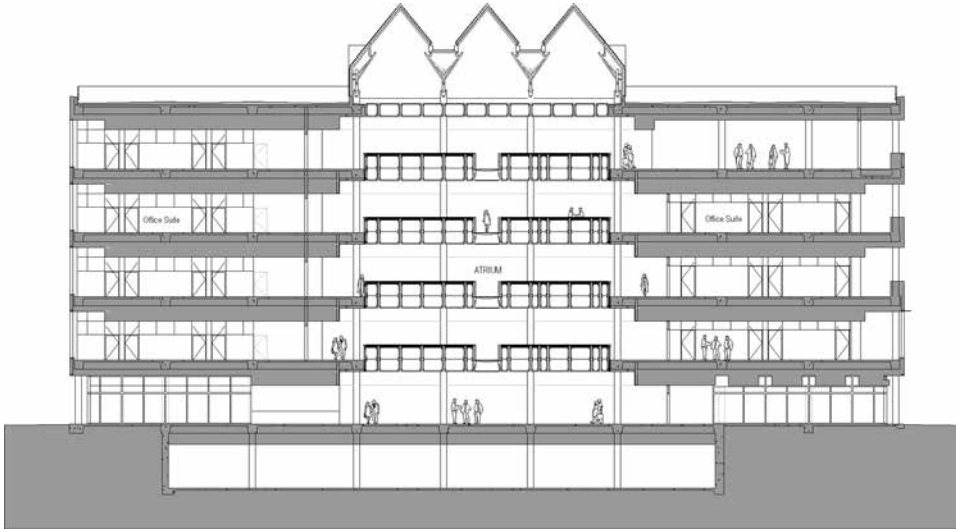
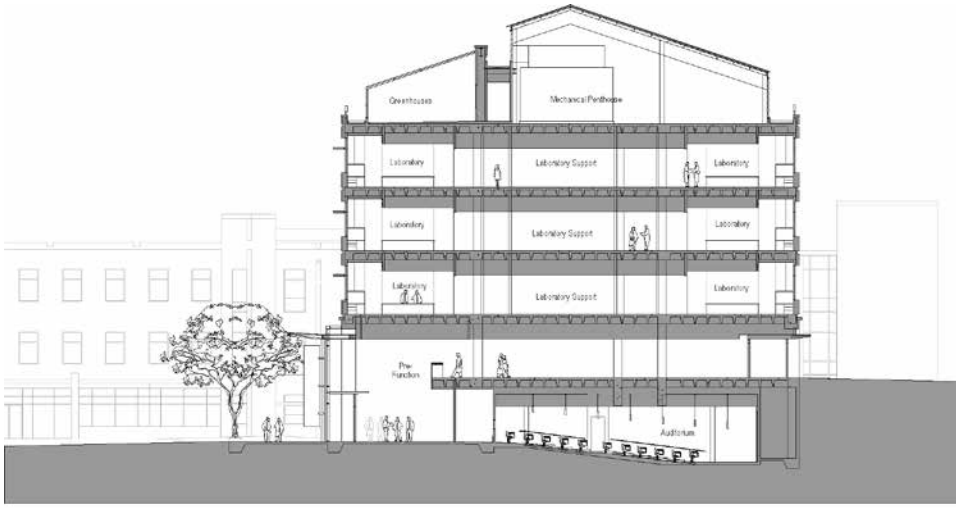
To Veterinary Medicine Campus



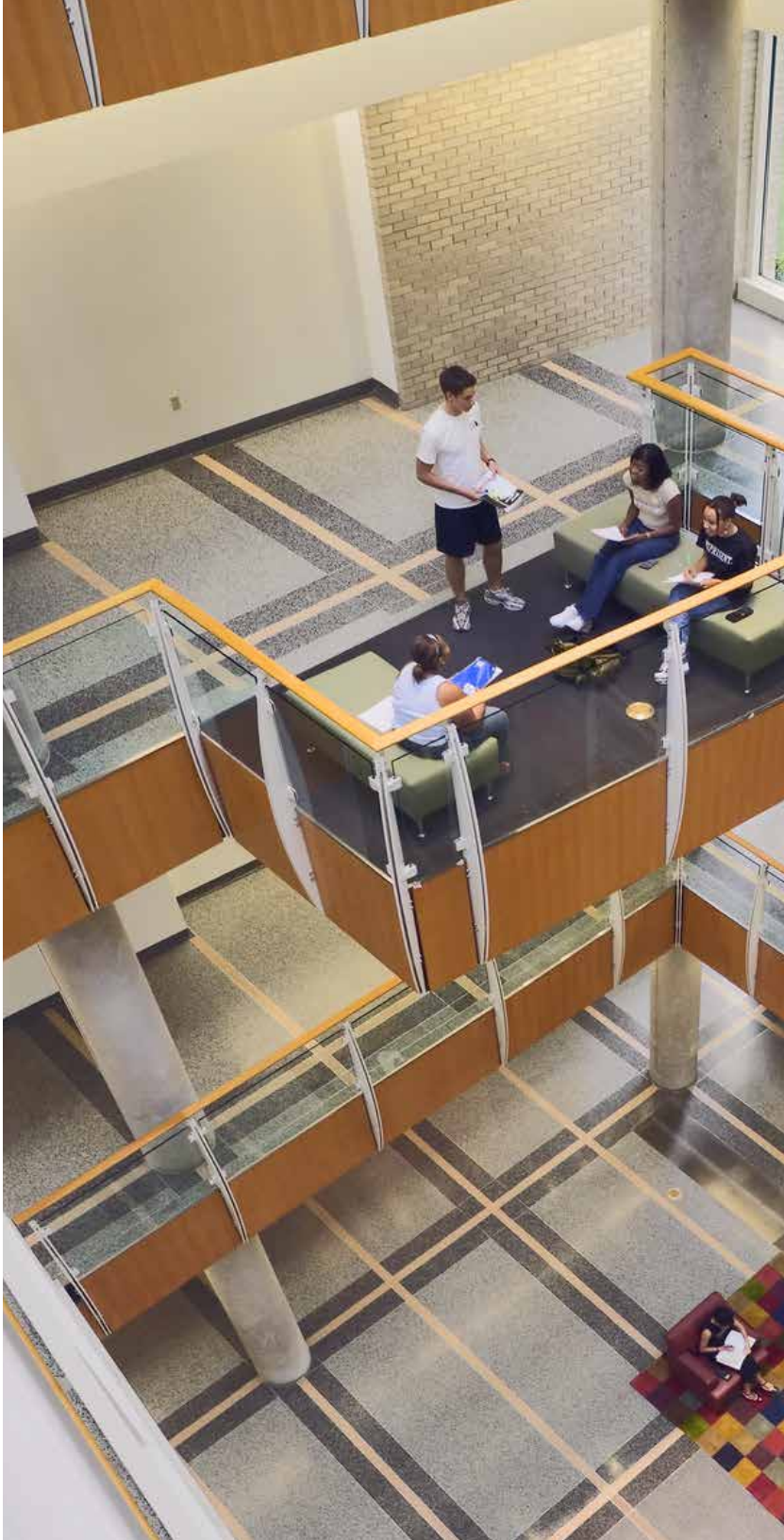
SECTION - ATRIUM



SECTION - LABS

"The Building has been set up with lots of what we call 'collision zones.' In Chemistry, when things collide you get a reaction. When two people can interact in a hall or corner and discuss an idea, that's when you get new ideas and new things happening. Students see how this happens and they grow and thrive under this."

DR. G. MICHAEL CHIPPENDALE, PH.D.
PROFESSOR EMERITUS
DIVISION OF PLANT SCIENCES



AWARDS

2005 Honor Award, Excellence in Architecture
AIA Kansas

2005 Merit Award
AIA Mid-Missouri

FASTER Feasibility Study and Programming

KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS

bnim is building positive

This comprehensive master planning and programming study evaluated over 1.1M SF of existing facilities. BNIM worked with 11 departmental groups to create a phased concept design with the overall goal to elevate the College of Agriculture from a top 20 program into the top 5 national ranking. The study identified additional space needs for research, teaching, offices, and greenhouses. The proposed expansion of facilities will be addressed by building two new buildings, a set of three new greenhouses, and renovating existing research and teaching space to provide opportunities for contemporary models of research, teaching, and collaboration.

385,000 SF
Completion in 2015 (study)


bnim

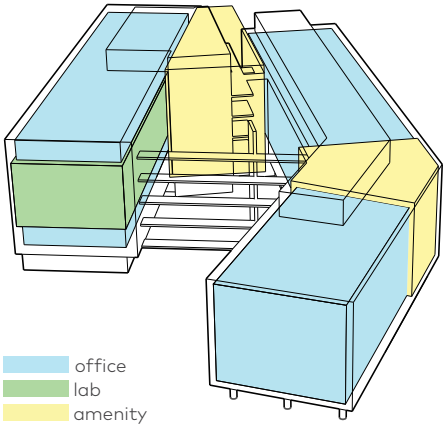

KANSAS STATE
UNIVERSITY
College of Agriculture

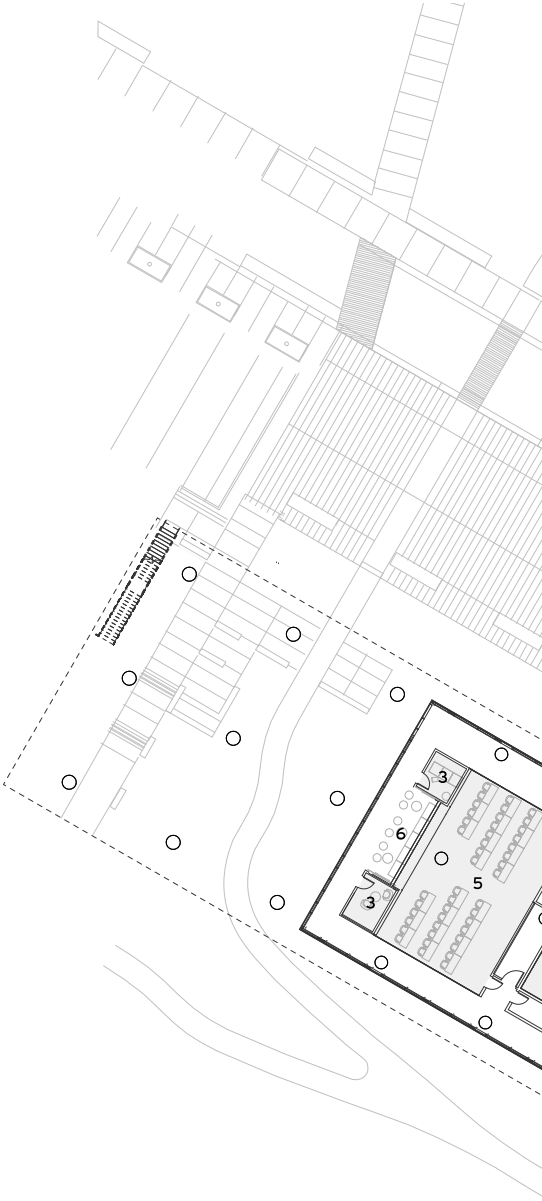
Pacific Center Campus R & D Building

SAN DIEGO, CALIFORNIA

After completing the for the Pacific Center Campus Master Plan in 2012, BNIM was selected to lead the design of a two-building expansion. The buildings are integrated into an environment that is organized around public spaces and amenities, and clear circulation systems. The Research and Development (R+D) Building accommodates office and laboratory spaces. Interior environments focus on enhancing surroundings to be more comfortable, inspiring and healthier. Laboratories are centrally located with adjacent workplaces for teams to interact seamlessly with the research environment. Conference spaces are located at the building's central gathering space to foster interaction, collaboration and innovation

357,000 GSF
Completion in 2015
LEED Gold Certified

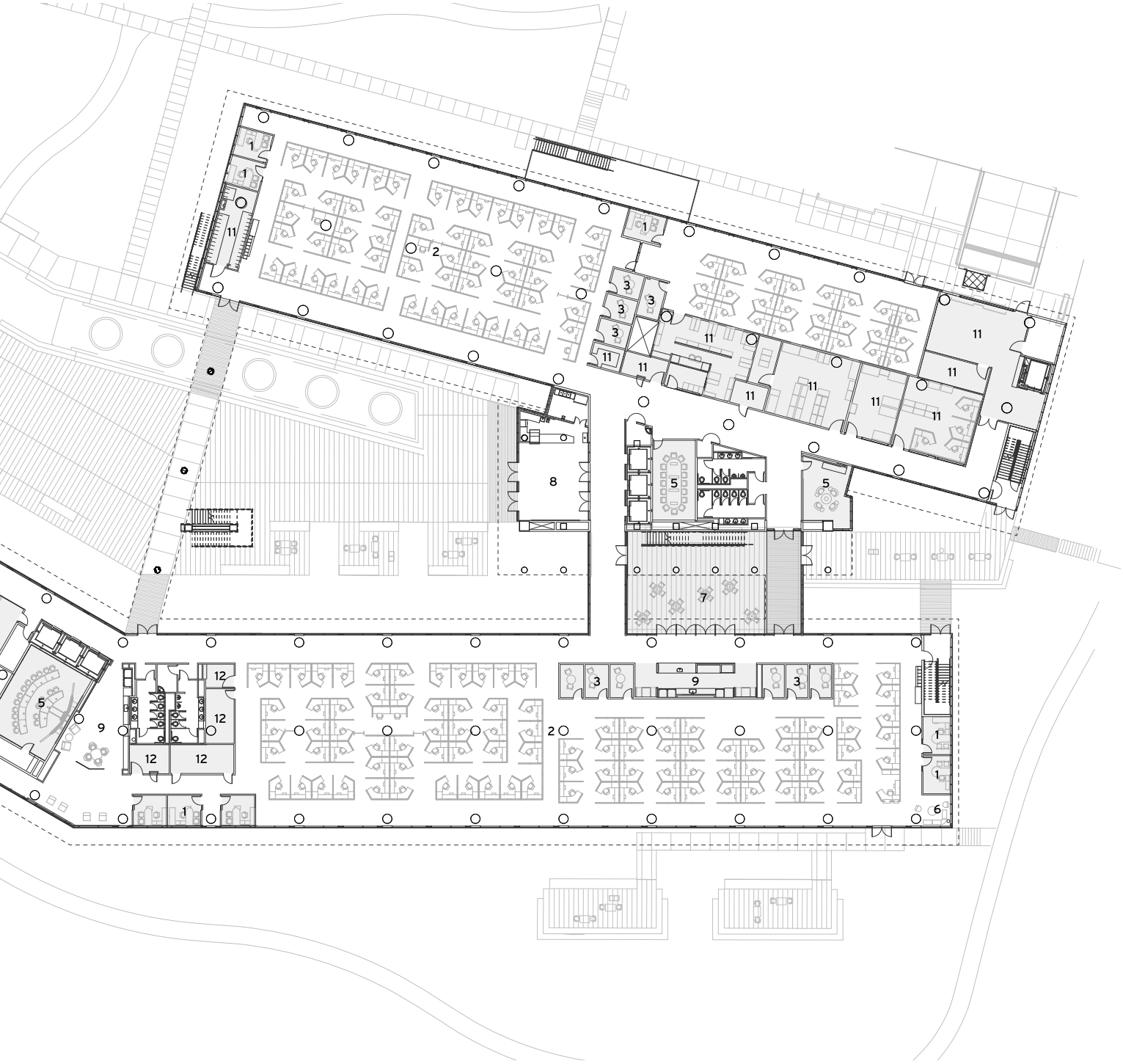




0 45′

LEVEL 1

1 Private Office
2 Open Office
3 Private Room
4 Lab
5 Conference
6 Collaboration
7 Outdoor Collaboration
8 Lobby/Cafe
9 Tech Cave
10 Support
11 Service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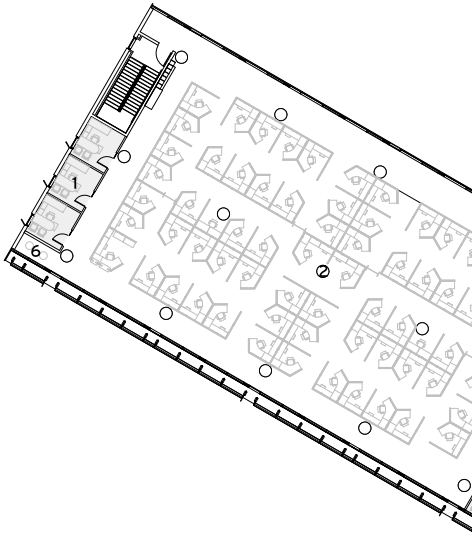
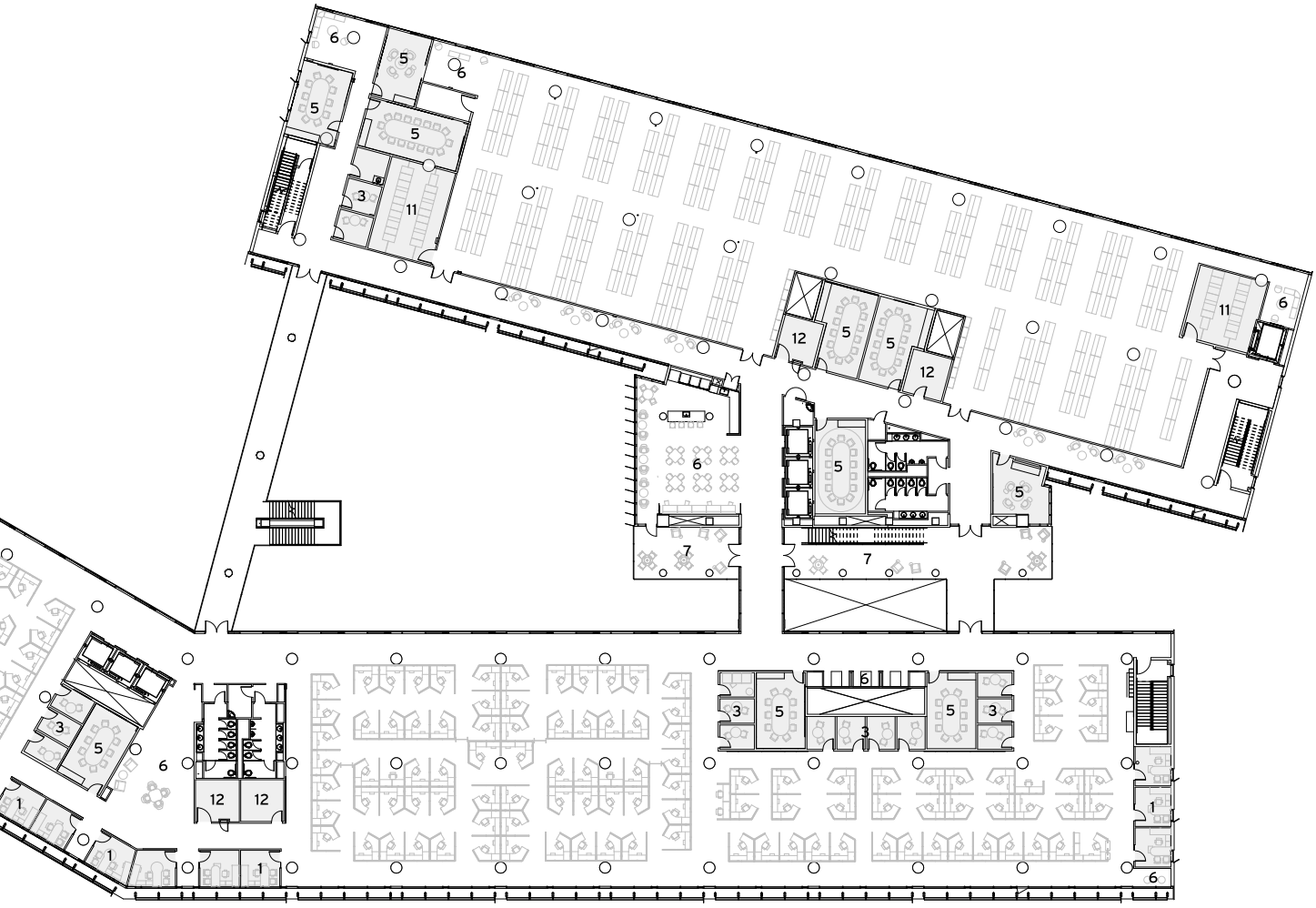


0 45′

LEVEL 2 - 3

1 Private Office
2 Open Office
3 Private Room
4 Lab
5 Conference
6 Collaboration
7 Outdoor Collaboration
8 Lobby/Cafe
9 Tech Cave
10 Support
11 Data Rack Rooms
12 Service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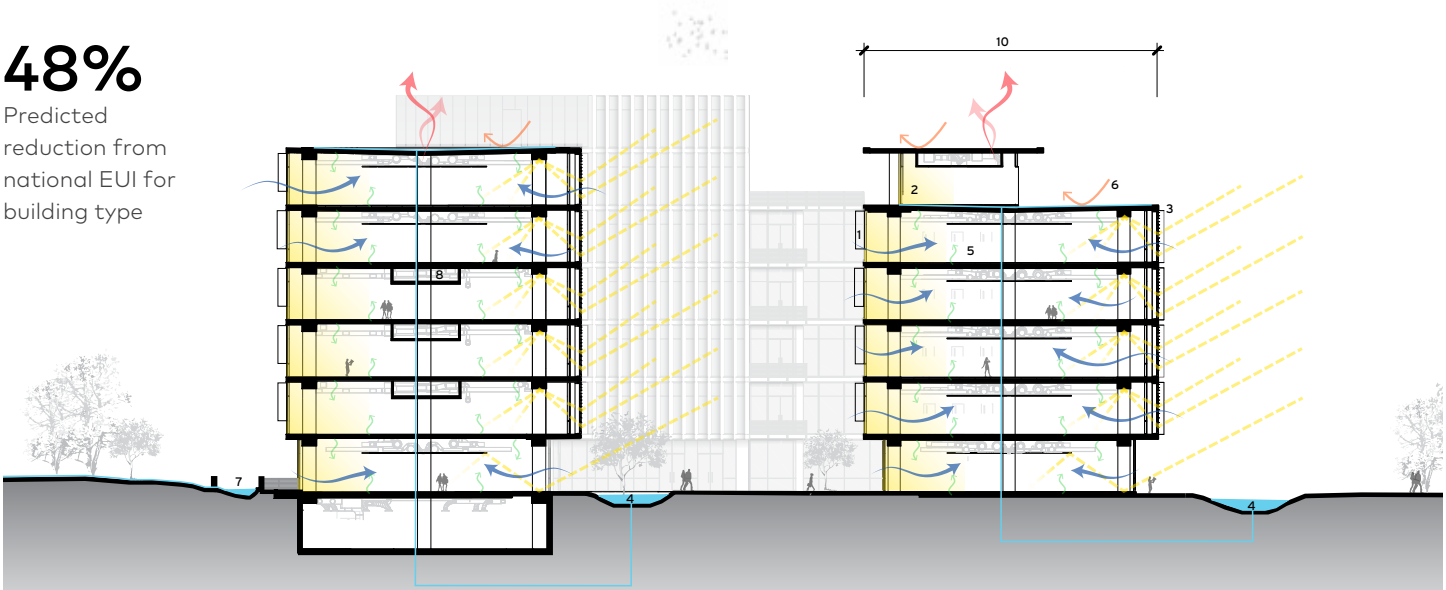
38
Predicted Net EUI

48%
Predicted reduction from national EUI for building type



1 Operable windows faciliate natural cross ventilation
2 Full glazing to maximize diffused north daylight
3 Horizontal louvers shade south daylight and reflect diffused daylight deep into the space
4 Bioswell treats roof top water
5 Concrete thermal mass structrue
6 Reflective roof designed for future pv
7 Modular wet land for site water runoff
8 Vav mechanical system
9 Drought tolerant plantings
10 Narrow floor plate to mazimize natural ventilation and daylight penetration

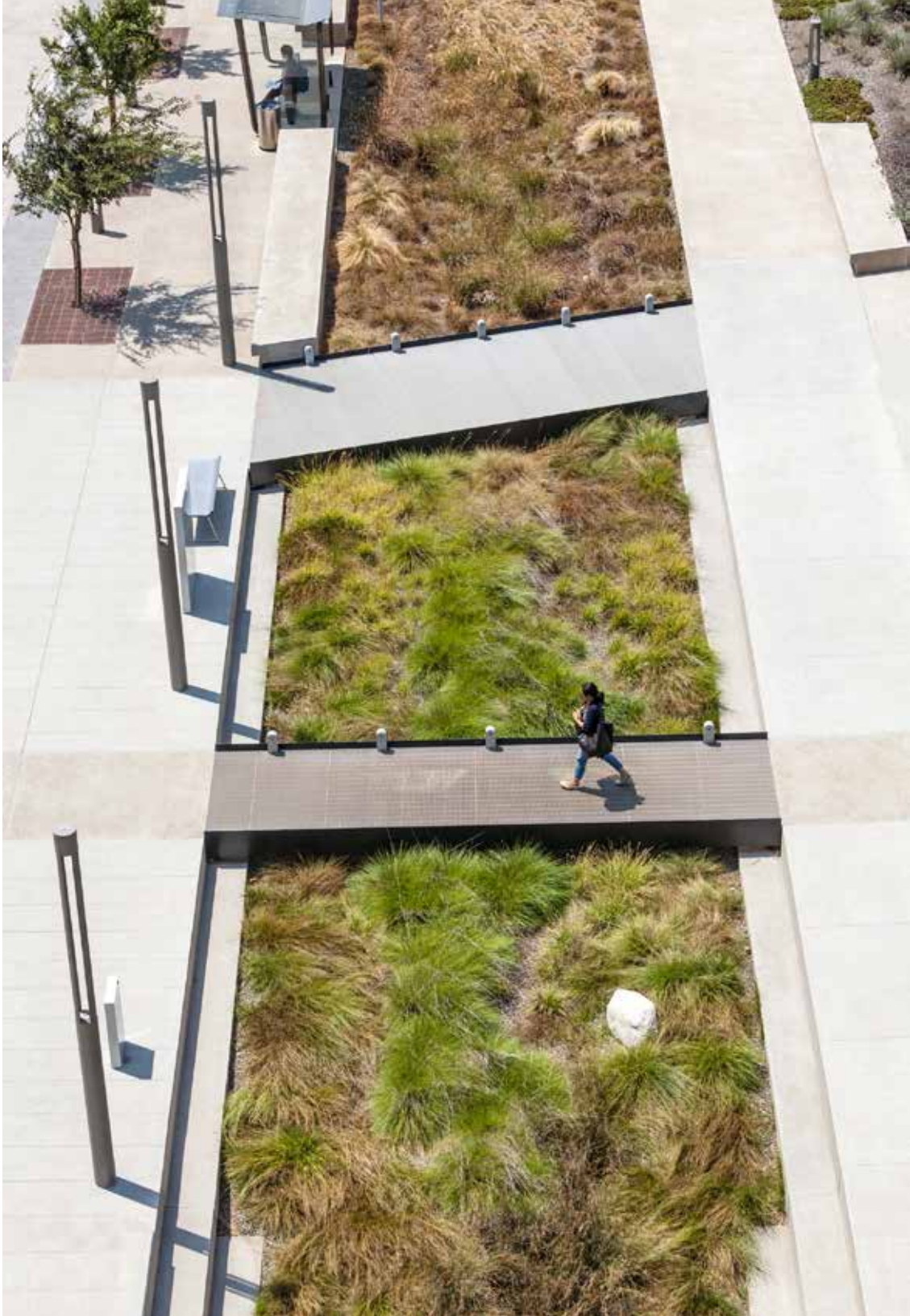

16-18%
productivity increase

84%
Floor area or occupant work stations with direct views of the outdoors

35%
Floor area or occupant work stations within 30′ of operable windows

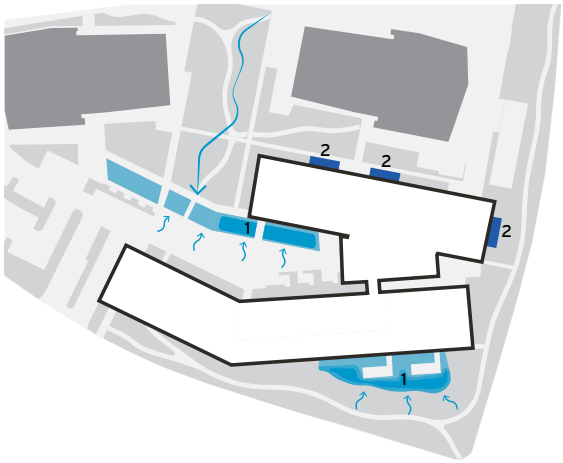
84%
Floor area or occupant work stations achieving adequate light levels without the use of artificial lighting

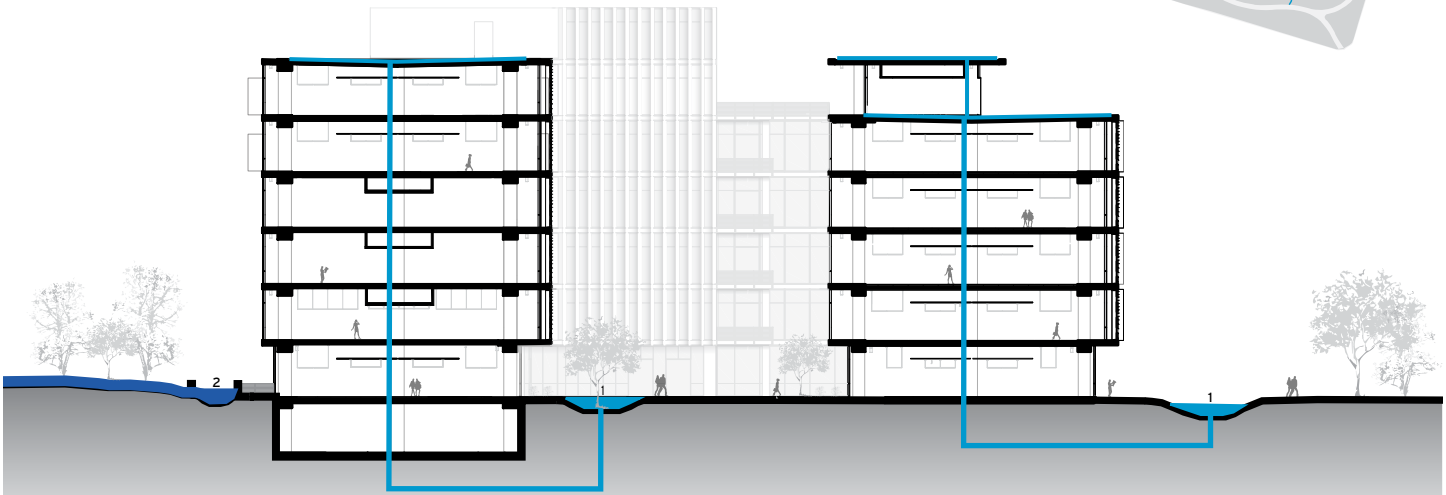

95%
REGULARLY OCCUPIED SPACES WITH ACCESS TO DAYLIGHT + VIEWS



36%
reduction in potable water
(baselines LEED 2009)

81%
reduction in potable water
consumption for landscaping





1 Bioswale treats roof top water
2 Modular wet land treats site run off water

Diverting materials from the waste stream was a priority. The following metrics also speak to this priority:

32%
Building materials with recycled content (by cost)

27%
Building materials with regional materials (by cost)

97%
Virgin wood products in the building that use FSC wood

76%
Construction waste diverted from local landfills

CAMPUS SITE PLAN

1 main courtyard
2 east courtyard
3 exterior meeting zones
4 interior courtyard
5 grand stair
6 exterior stair
7 bike storage
8 collaboration terrace
9 bioswale
10 modular wetlands
11 breakout meeting spaces
12 fountain
13 herb garden
14 north dining terrace
15 dining terrace
16 rooftop event space
17 green roof
18 athletic sports field
19 basketball court
20 campus composting station
21 urban garden
22 orchard
23 bocce court
24 central meadow
25 electric car charging station
26 tesla super charging stations
27 shuttle stop
28 trail
29 formal courtyard