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PROJECT TITLE
CENTER FOR ADVANCED MATERIALS AND CLEAN ENERGY TECHNOLOGY

PREDESIGN DOCUMENT

UNIVERSITY OF WASHINGTON
CENTER FOR ADVANCED MATERIALS AND CLEAN ENERGY TECHNOLOGY

PREPARED FOR:
Washington State Office of Financial Management

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UW Capital Planning & Development

IN COOPERATION WITH:
CannonDesign

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[01] EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Proposed Phase 1 of the UW Innovation District, location + site analysis

LEGEND

- UW Campus
- UW Innovation District, Phase 1
- Sound Transit Stop
- Pedestrian Path
- UW Campus Expansion
- Burke Gilbert Trail
- Major Pedestrian Connections
- Major Pedestrian Connections

The UW Innovation District

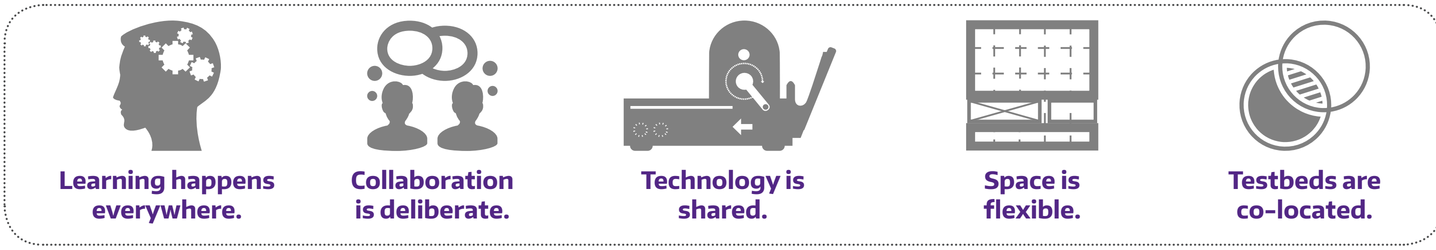
The University of Washington is embarking on a bold new plan that will dramatically accelerate the way it translates knowledge discovery into solutions for the greatest needs of society. Founded on the premise that direct and deliberate integration of UW research with industry, civic and non-profit partners will catalyze solutions and amplify global impact, UW will develop the West Campus as an Innovation District that brings together partners across a wide spectrum of influence.

West of 15th Avenue Northeast and bounded by Northeast Campus Parkway to the South, the first phase of the UW Innovation District will be a group of three buildings comprising up to one million square feed of new mixed use development.

The UW Innovation District presents an unprecedented opportunity for the university to redefine its role in the

"I have launched tech start-ups in Silicon Valley and Cambridge UK, and there is really no other place where students, faculty, industry, and start-ups have such potential for friction-free interactions. ***CAMCET will be an amazing global asset for taking research from lab to market****."*

-Devin MacKenzie
Associate Professor and Serial Entrepreneur



UW Innovation District & CAMCET program drivers.

city and build a dynamic hub of innovation, leveraging an already vibrant neighborhood. With The Center for Advanced Materials and Clean Energy Technology (CAMCET) as a cofounding anchor, the UW Innovation District concept will mix partnerships with industry, government and education in a live, work, learn environment to create a hot bed of ideas, productivity, entrepreneurship and impact.

Delivery Approach

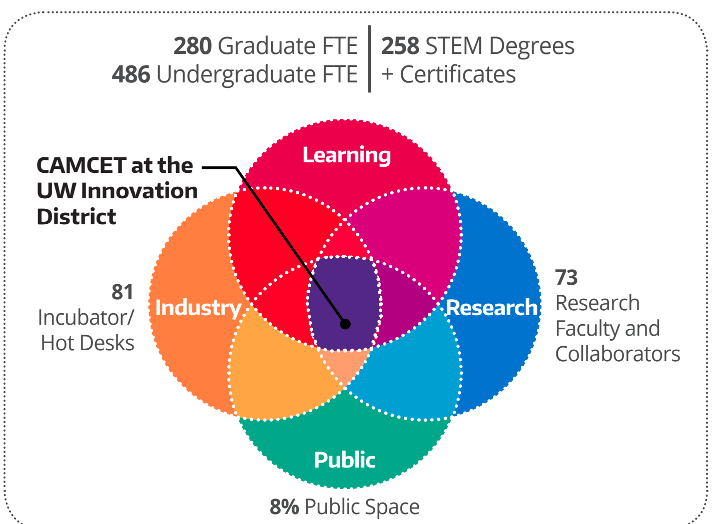
The critical mass of new development in the UW Innovation District provides a unique opportunity to leverage public - private partnerships. UW's academic priorities will define the business model, management and operations strategy for growth in the UW Innovation District. We will then identify a high caliber developer or developers with the capabilities to implement the plan. Our plans for delivering CAMCET enable the university to redefine its building procurement process, with the goal to procure buildings faster and more cost effectively for the university and state. It also provides the opportunity to potentially outsource operations and maintenance and concentrate on its core business of learning and innovation.

Culture of Innovation

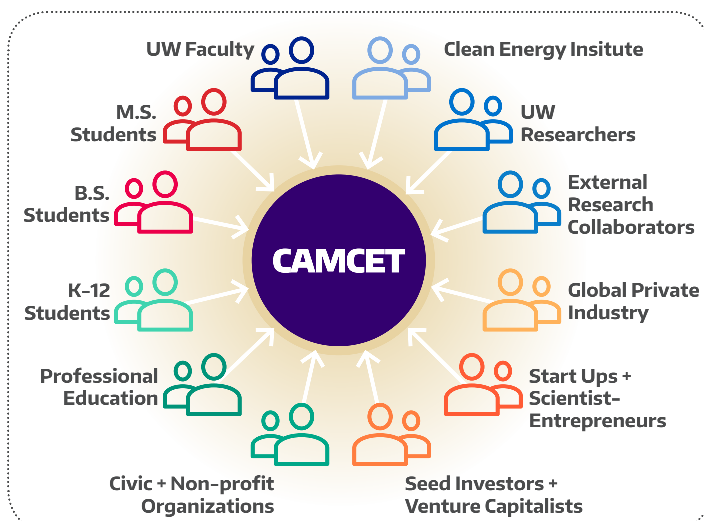
Five assumptions provide the foundation for a new culture at the UW Innovation District, and have guided the creation of the CAMCET Mission, Goals and Program. These five assumptions are specifically designed for university research, learning, and technology activities to collaborate with industry and government and create impact. (See diagram above.)

Mission

CAMCET will be an innovation hub that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

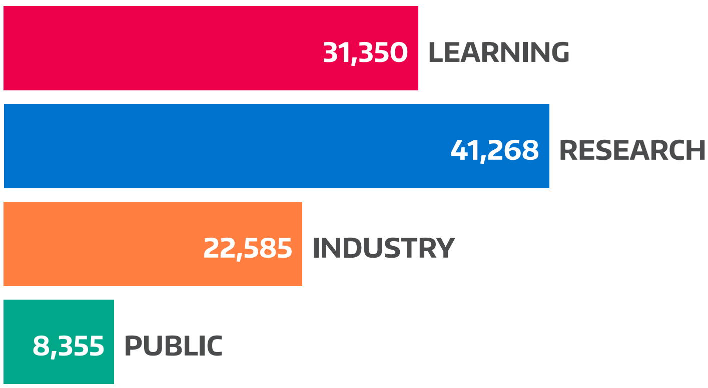


Program concept diagram.



CAMCET building user groups.

CAMCET Program Summary
Total 172,596 Gross Square Feet



* Areas are in Assignable Square Feet

Master Plan

Podium Height	42Ft / 3 Floors
Tower Height	140 Ft / 10 Floors
Max Sf	283,649 Sf
Ground Floor	36,363 Sf
Demolished Sf	32,497 Sf (S. Of Terry Lander)

Goals

CAMCET will foster collaborative research that accelerates solutions for a healthy planet.

CAMCET will increase STEM degree production and provide students with innovative STEM learning environments.

CAMCET will catalyze partnerships.

CAMCET will convene the clean tech community, and incubate start-up companies that succeed in the marketplace.

CAMCET will accommodate FTE growth and relieve some critical campus classroom needs.

CAMCET will kickstart the UW Innovation District.

Exterior view of CAMCET within the UW Innovation District

Program

We are proposing 172,596 GSF of new, mixed use program. CAMCET will create impact in these four priority areas: Learning, Research, Industry, and Public. In one place, we will have students, faculty, industry partners, tech scouts, and start-ups working in the world's premier cleantech innovation building.

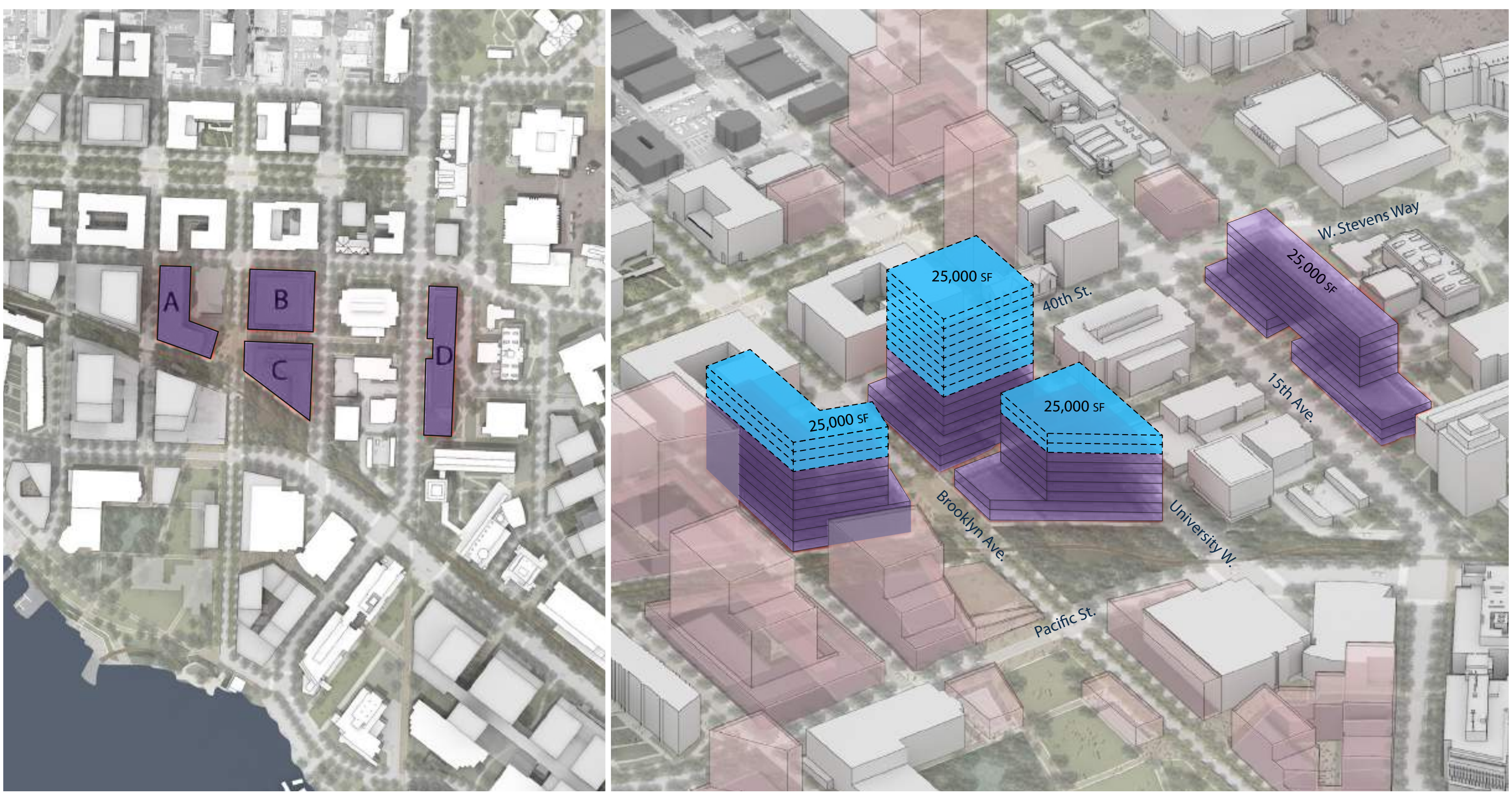
Learning space is dedicated to active learning spaces, STEM project teaching labs and collaborative social learning spaces. Research space includes wet, dry, and computational research lab modules, and significant space for shared instrumentation and equipment. Industry space includes Testbeds, the scale up facilities that allow prototype technologies to be manufactured and tested, as well as start up lab modules and hot desks. Lastly, Public space includes venues for events, conferences, and K-12 and public outreach.

Site Analysis

Four sites were identified within the West Campus precinct for further consideration. The sites range in location from direct adjacency to the western edge of Campus to the center of the UW Innovation District two blocks further West. Massing studies were developed for all four sites to test each site's physical parameters. Critical parameters include: the ability for each site's floor plate size to be large enough to create a collaborative scientific environment and the ability to optimize each site's development potential with the total CAMCET program area.

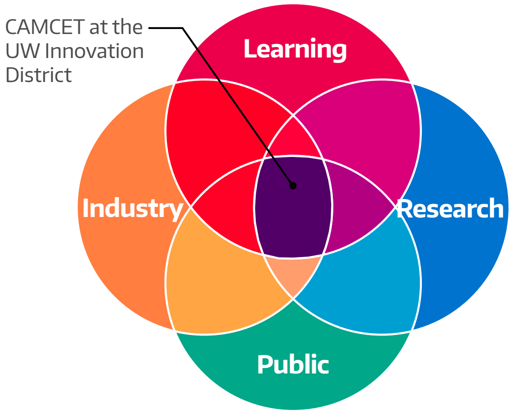
Site C Test Fit

In this process Site C was selected as a desirable test fit for the purpose of illustrating the program concept and flexibility of design. Site C enables a large floor plate that creates a highly collaborative scientific research and



Considered site locations within the proposed UW Innovation District. Site C was chosen for the sake of this report.

CORE PROGRAM AREAS



LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms

- Lab Offices + Research Admin.
- Research Labs & Equipment
- Shared Instrumentation

- Administration
- Test Beds
- Hot Desks
- Incubation Labs

- Back of House
- Cafe
- Building Entry

- Core/Mechanical/Unassignable

learning environment. As outlined in the draft Campus Master Plan, Site C also provides the greatest alignment of development potential with CAMCET program. Additionally, Site C is adjacent to the West Campus Receiving Station, which is the UW energy hub that links us to Seattle City Light. Adjacency to key campus energy infrastructure helps integrate practical energy issues into the education and research happening in CAMCET.

Cutting Edge Program Integration

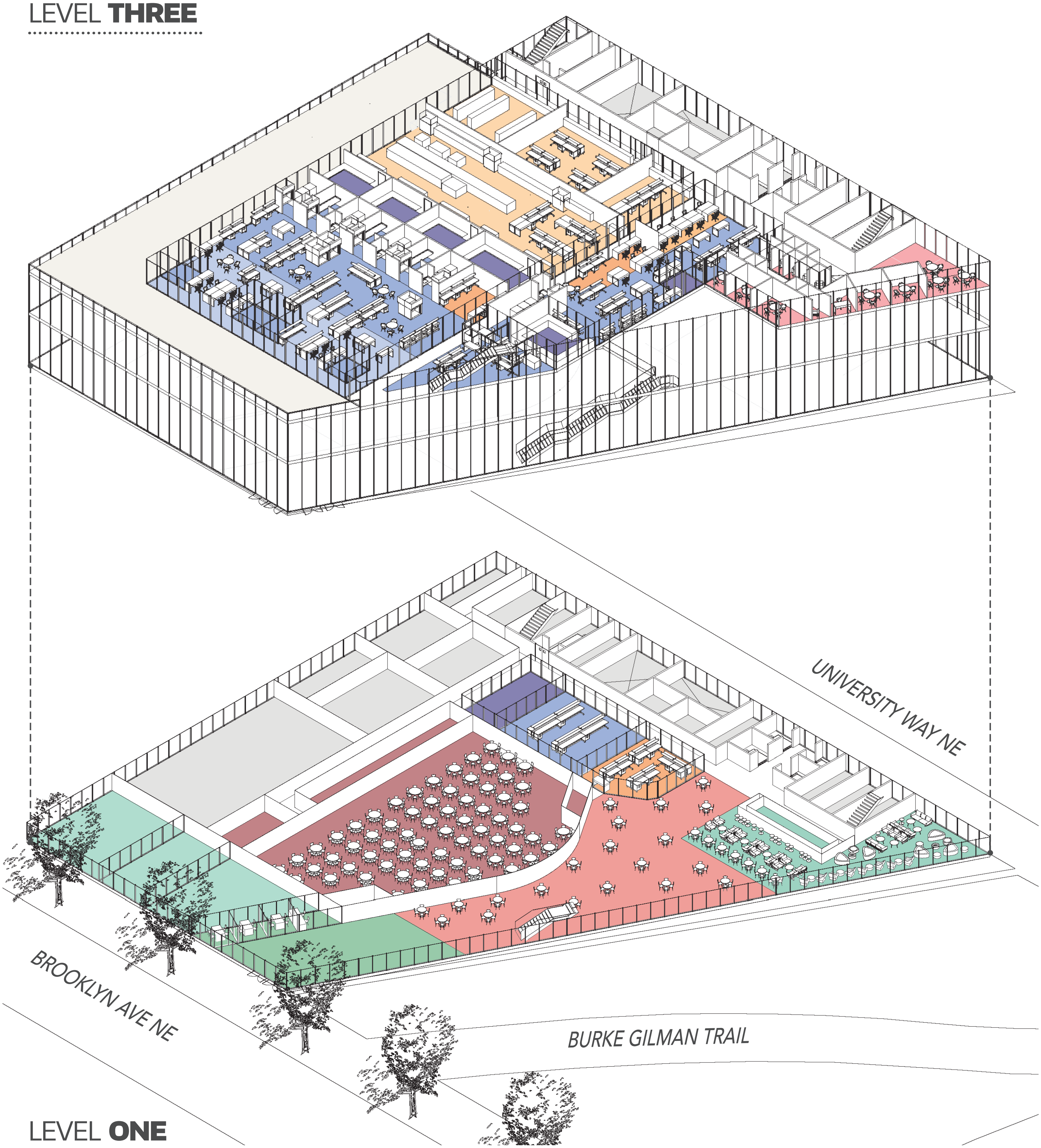
Students want to be integrated into a solutions producing context that exposes them to real world clean technology challenges, and alongside the researchers and industry professionals who are actively working to address them. To create CAMCET as an innovation hub, collaborations between those that discover knowledge and those that translate knowledge into solutions must be deliberate and purpose-driven. This means that the translation of the CAMCET program must create an environment that deliberately integrates people and functions, where students, researchers, and industry partners can interact continuously, with the ability to seamlessly move from lab, to technical instruments to meeting and social spaces.

Exemplary of this strategy is the connectivity and layout of the first and third floors. On the first floor, the lobby, building café and active classroom are immediately adjacent to a start up research lab and dry research lab. The Public and Learning spaces can host large scale events like conferences, public events, interdisciplinary student competitions, and K-12 field trip visits, with cleantech research immediately adjacent on display.

An open atrium to the third floor provides visual connectivity so a visitor understands the intensive cleantech research and technology activities on the floors above. Stairs provide direct physical connection and access. Once on the third floor, we find Learning, Research and Industry spaces where a diversity of activities will occur. Here, UW Researchers, Research Collaborators, Students, Start Up teams and Industry Partners can move seamlessly between their labs, areas of shared instrumentation, Testbed equipment, hot desks, and break out spaces for meetings, group study, private conversation and solo study.

> *"Daily interactions with company professionals would transform my university experience by providing me with invaluable skills and perspectives to tackle engineering problems."*
>
> *-Elena Pandres*
> *UW Graduate Student, Chemical Engineering*

LEVEL THREE



LEVEL ONE

Axonometric views of Level One and Level Three showing programmatic adjacencies.

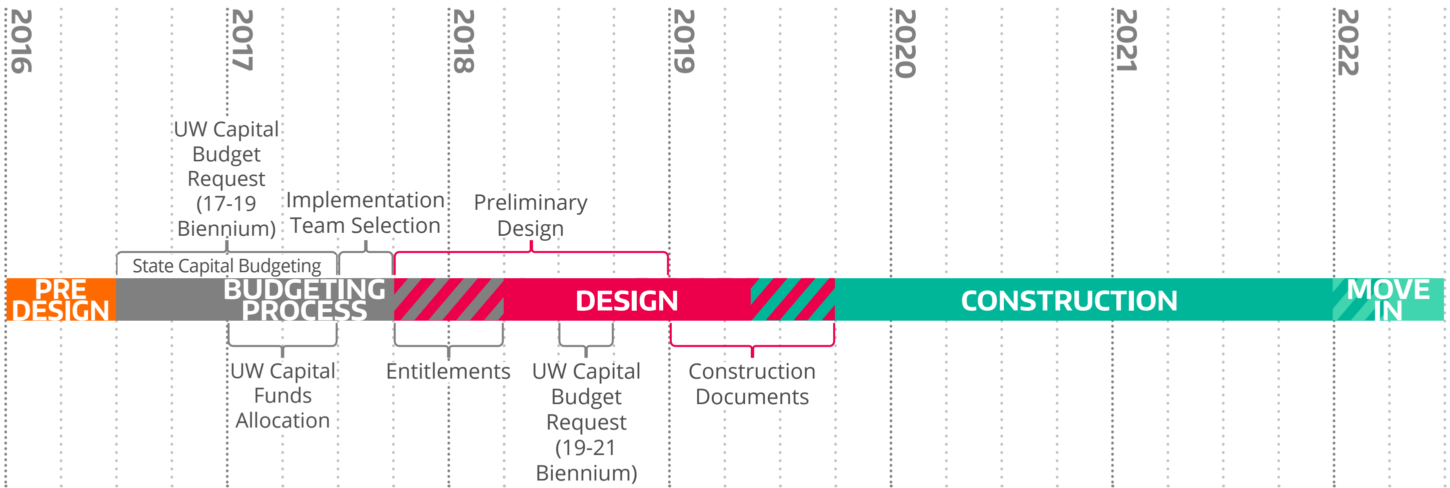
Interior view of the CAMCET facility.

Cleantech on Display

The core of the CAMCET experience is an environment that puts cleantech on display. To attract the best talent and cutting edge scientist entrepreneurs, CAMCET must provide a technology-rich environment that not only is unique to the cleantech sector but enables scientists to test and scale up discoveries into viable solutions. The culture of students, researchers and industry partners sharing these facilities in the common goal of turning ideas into solutions and impact is the hallmark of CAMCET. In doing so, CAMCET will be a dynamic place and a hub of activity; it will inspire the next generation of Washington learners to be cleantech scientist entrepreneurs.

Flexibility

Pulling students, researchers, and industry partners together in one place requires that space is flexible to meet a diverse set of operational needs. Recognizing that over time, as new knowledge is discovered, businesses and partnerships formed and solutions created, the CAMCET environment must be agile enough to respond to dynamic needs while avoiding future renovation. Modular program and vertical zoning are strategies that optimize space, anticipate changing needs, but also balance cost effective capital investment.



Anticipated project schedule, from pre-design through move-in.

Schedule and Cost

The UW CAMCET Project Schedule includes the Predesign Phase through the Construction and Occupancy Phase. As of June 2016, approximately one year will be used to secure appropriate university and State of Washington legislative support. The formal design/build process is planned to begin in the third quarter of 2017. Construction activities are planned to begin in early 2019, conclude in the second quarter of 2021 and beneficial occupancy in the third quarter of 2021.

The following cost model was developed in collaboration with the entire project team and establishes the total project cost based on historical cost data for similar programmatic spaces, and institutions of a similar size and function with escalating costs to today's dollars.

Consultant Services	$21,407,000
Construction Contracts	$115,760,000
Equipment & FFE	$14,450,000
Art Work	$462,000
Other Costs	$2,279,000
Project Management	$4,675,000
Total Project Costs	**$159,033,000**

** Costs are rounded to nearest $1,000

*"Once built, **[CAMCET] will provide much needed infrastructure that is sorely lacking in Seattle and the surrounding area**. It will have everything I need for my next cleantech company including: research ideas, a network of ambitious people, testbed facilities and connections to facilitate success for creating market-ready technologies and services..."*

-John Plaza
Cleantech Entrepreneur

“Discovery is at the heart of our university. We discover timely solutions to the world’s most complex problems and enrich the lives of people throughout our community, the state of Washington, the nation and the world.”

-University of Washington Vision Statement

[02] PROJECT ANALYSIS

UNIVERSITY CONTEXT

The UW Innovation District

The University of Washington is embarking on a bold new plan that will dramatically accelerate the way it translates knowledge discovery into solutions for the greatest needs of society. Founded on the premise that direct and deliberate integration of UW research with industry and civic and non-profit partners will catalyze solutions and amplify global impact, UW will develop the West Campus as a UW Innovation District that brings together partners across a wide spectrum of influence. The UW Innovation District presents an unprecedented opportunity for the university to redefine its role in the city and build a dynamic hub of innovation, leveraging an already vibrant neighborhood. This forward looking vision embraces a new mode of learning, teaching, working and delivering impact that represents a new frontier for implementing the University's Vision and Four Pillars of Excellence.

University of Washington Vision

The University of Washington vision statement is:

The UW educates a diverse student body to become responsible global citizens and future leaders through a challenging learning environment informed by cutting-edge scholarship. Discovery is at the heart of our university. We discover timely solutions to the world's most complex problems and enrich the lives of people throughout our community, the state of Washington, the nation and the world.

In everything we do, four pillars form the foundation of the UW experience:

Leading-edge student experience

With access to an extensive network of top faculty, researchers, peers, alumni and the community, UW students form lasting connections. Our students are doing more than reading about positive changes; they're the catalyst making change happen.

Public as a philosophy

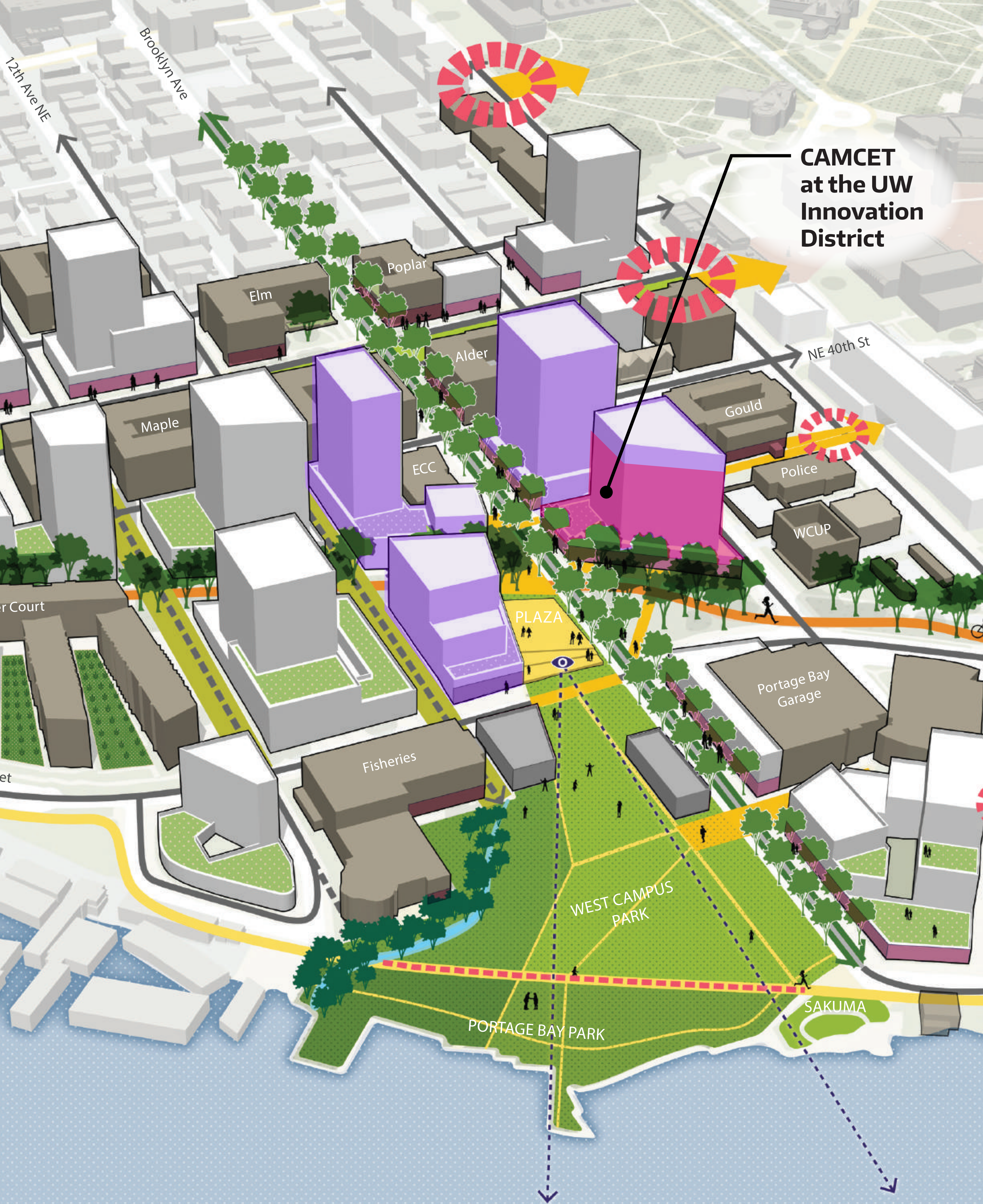
As one of the world's preeminent public universities, advancing social equity and changing lives is integral to who we are. We're dedicated to leading the dialogue as promoters of positive change. At our core, we believe in human potential and our role in unleashing it.

Proven impact

For decades, our students and faculty have collaborated to turn ideas into life-changing realities, from creating vaccines to improving early education, revolutionizing global health, imagining greener technologies and so much more. In all we do, we strive to make an impact, whether it's by touching one life or millions.

Innovation Mindset

Ranked by Thomson-Reuters as the most innovative public university in the world in 2015, the "Innovation Imperative" Is an extraordinary effort to expand the University's impact on the productivity, welfare, and health of the planet and its occupants. The UW Innovation Imperative is an integrated research and educational approach that will drive positive change for our state and beyond. Our goal is to empower students and researchers to learn, discover and build solutions to tomorrow's challenges.


12th Ave NE
Brooklyn Ave
CAMCET at the UW Innovation District
Poplar
Elm
Alder
NE 40th St
Gould
Maple
ECC
Police
WCUP
PLAZA
Portage Bay Garage
Fisheries
WEST CAMPUS PARK
SAKUMA
PORTAGE BAY PARK

STATE CONTEXT

Clean technology, “cleantech,” is one of the fastest growing sectors in the nation, and the State of Washington has a unique opportunity for sustained leadership.

We have a long history as the top producer of clean electricity in the U.S., and as a result, the average American produces 41% more carbon emissions than a Washingtonian. Our State is home to the largest state-based clean technology business membership organization in the Nation, the Cleantech Alliance. Large companies like Itron, Schweitzer Engineering Laboratories, McKinstry, PACCAR and Boeing are sector leaders in energy, efficiency and sustainability. Our large cloud computing companies, Amazon and Microsoft, are market makers in the fastest growing energy load in the country (data centers). Finally, in the area of grid storage, Greentech Media recently called Washington one of the five States to watch as an emerging leader.

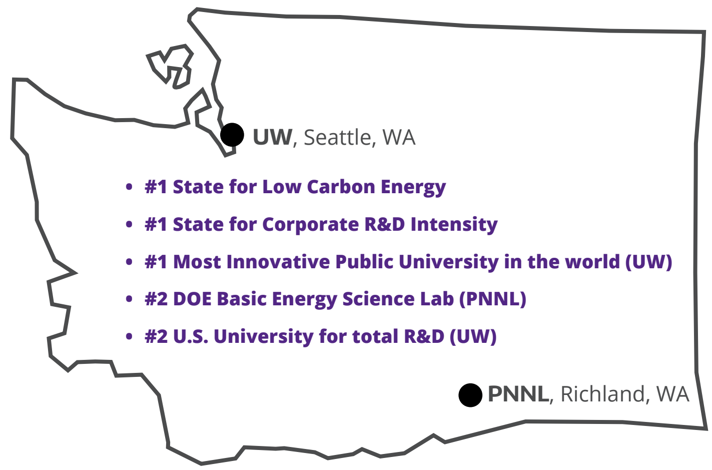
Not only does the State have well-established industry leaders, but we have the R&D infrastructure for inventing disruptive new clean energy/clean tech solutions.

A brief survey of our highly ranked regional R&D assets are impressive:

#1 Most R&D Intensive State on a per capita basis

The National Science Foundation reports that the Seattle combined statistical area has the second highest corporate R&D expenditures among U.S. cities---over $10 billion per year---and, overall, the State is the most intensive for corporate R&D per capita.

Shared Infrastructure, R&D Ideas, and Funding create an ecosystem



NSF Report #14-315, August (2014)
NSF Science & Engineering Indicators (2015)

#1 Most Innovative Public University in the World

Using a variety of patent success metrics, along with industry research collaboration metrics, Thomson-Reuters found UW to be the top global public university for innovation.

#2 Basic Energy Science Lab in the U.S.

The Pacific Northwest National Laboratory (PNNL) is the second largest DOE basic energy science laboratory in the Nation, with an R&D portfolio of roughly $1 billion dollars per year.

#2 University for R&D expenditures in the U.S.

The University of Washington is second in overall R&D expenditures and third in federally funded R&D, with overall expenditures of nearly $1.3 billion per year. Materials science and technology (MS&T) is critical to cleantech innovations; Thomson-Reuters ranked UW #1 in the world for MS&T impact over 2000-2010.

LOCAL CONTEXT

Despite these impressive corporate and R&D assets, the U.S. Chamber of Commerce's forward-looking "Innovation that Matters" report from 2016 ranked the Seattle area as #11 overall among 25 leading urban areas. Seattle's Energy Tech industry ranked #10, faring slightly better than the overall #11 ranking. The Chamber report had five important observations about the overall Seattle innovation landscape:

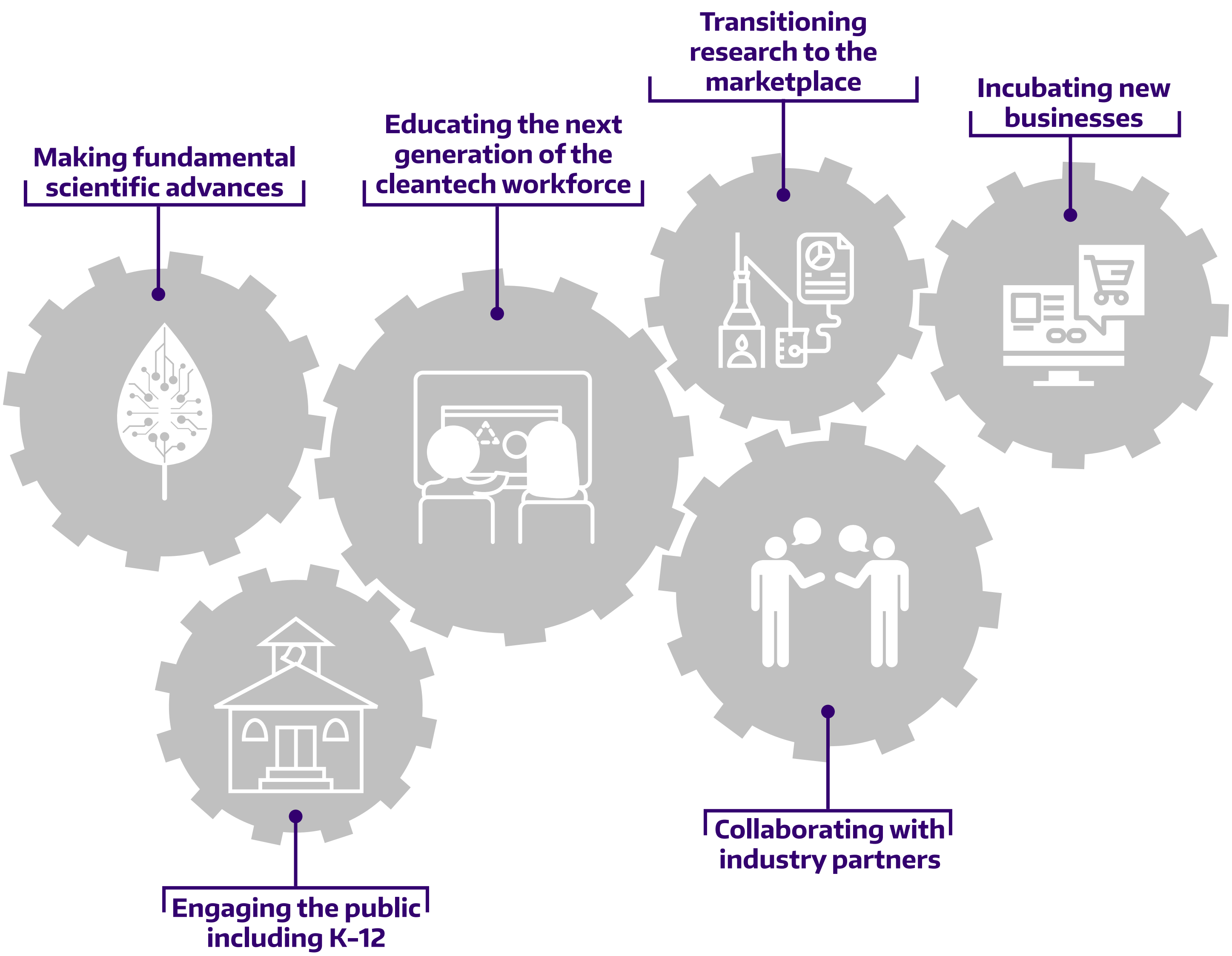
1. Seattle's tech sector is booming, but connectivity and culture indicators point to challenges ahead.

2. The talent base in Seattle is thriving.

3. Within the ecosystem, support from professional service firms, universities and civic institutions such as city government are relative strengths, whereas lack of engaged corporations, citizens, cheerleaders and mentors remain weaknesses.

4. Startups in Seattle are doing well in a variety of sectors, but no clear specialization has emerged yet.

5. A high concentration of tech startups means that Seattle should feel like a dense community, but local entrepreneurs don't perceive it that way.



Aerial view of downtown Seattle

Survey results suggested that work needs to be done to build the collaborative community and cultural foundations of the Seattle area innovation ecosystem for long-term success (both ranked 22nd in U.S.). Data also shows a strong disconnect between the actual startup density (5th in U.S.) and the perceived density by entrepreneurs (21st in U.S.), meaning there is a lot of activity on the ground, but that activity may be occurring in isolated pockets; Seattle entrepreneurs do not feel connected. Despite having a top national talent pool (4th in U.S. according to "Innovation that Matters"), "the region is not producing enough homegrown talent with the right skill sets for the middle- and high-income jobs of the future," according to John Wenstrup, senior partner and managing director at the Boston Consulting Group, who has studied Seattle's competitiveness. The "Innovation that Matters" report is clear:

Seattle needs to do a better job connecting all the dots in order to improve the ecosystem dynamics.

Developing the vision for CAMCET has begun connecting the dots for the city and State. We have engaged external stakeholder input at every visioning meeting, with participation by representatives from major corporations and start-ups, PNNL, service providers, K-12 education professionals, and investors. As a result of this broad input from outside stakeholders, CAMCET will not be a standard university building. Moreover, it will complement, not duplicate, prior State capital investments in research infrastructure for low carbon technologies such as:

- WSU-PNNL Bioproducts Sciences & Engineering Laboratory (BSEL), a facility that supports advanced research in domestically-sourced low carbon biofuels **($14,500,000, 2005-2007 biennium);**
- WSU Clean Technology Laboratory (CTL), a building that houses a wide range of clean technology research projects that impact air and water quality as well as energy and carbon efficient buildings **($32,835,000, 1011-2015 biennia).**
- WSU-led Joint Center for Deployment Research in Earth-Abundant Materials (JCDREAM), a capital investment intended to position Washington State as a hub for innovation and manufacturing with earth abundant and strategically located materials **($2,000,000, 2015-17 biennium);**
- UW Center for Advanced Materials and Clean Energy Research Testbeds, the capital funds that partially supported this predesign effort, but mainly supported the launch of a temporary testbed facility to accelerate the transition of clean energy research to market **($9,000,000, 2015-17 biennium).**

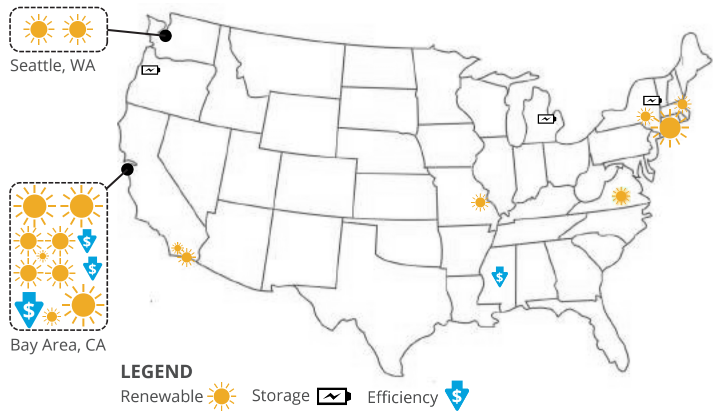
In 2017, the University of Washington will officially open three Testbeds which will provide advanced facilities, equipment and training to the academic and business clean tech communities. The Research and Training Testbed is co-located on the main UW Seattle campus near the faculty researchers and instructors and the students; this Testbed offers the unique opportunity for undergraduate and graduate students from different disciplines, such as chemistry and electrical engineering, to work side-by-side in fabricating and characterizing advanced clean-tech materials and devices. The Scale Up and Characterization and Systems Integration Testbeds are located in a UW leased space near the UW Seattle campus offering state-of-the art and unique, one-of-a-kind equipment for fabrication, characterization and integration into the UW-WSU-PNNL Connected Campuses smart grid project. The construction is on track for completion by January 2017.

Specialized infrastructure is part of what it will take to connect the dots for the City and State. We believe that combining research and learning spaces with thoughtful public spaces and leased spaces for research collaborators, industry, and start-ups is the critical ingredient for supercharging the cleantech innovation ecosystem. Connecting the dots will catapult Washington into the fastest growing cleantech innovation hub in the nation.

If we draw on the full assets of the region, and connect the dots, Seattle can have the nation's fastest growing cleantech sector.

The San Francisco Bay Area has done a good job connecting the dots. The U.S. Chamber's analysis recognized the Bay Area as the #1 Energy Tech city. The adjacent U.S. map shows the consequences of connecting the dots of top corporate, university, and DOE Lab R&D with professionals, government, public and global corporations. Plotted are all of the investor-backed Energy Tech start-up companies in renewables, efficiency, and storage that had an exit through a merger and acquisition (M&A) or an initial public offering (IPO) during the period 2011-2015. The Bay Area is head and shoulders above the rest of the Nation at converting cleantech research discoveries into companies that reach the marketplace.

Clean Energy Start Up IPOs and M&As Between 2011 and 2015



CB Insights data is for investor-backed exits (2011 - 2015)

Connecting the dots has real consequences for economic development in the cleantech sector.

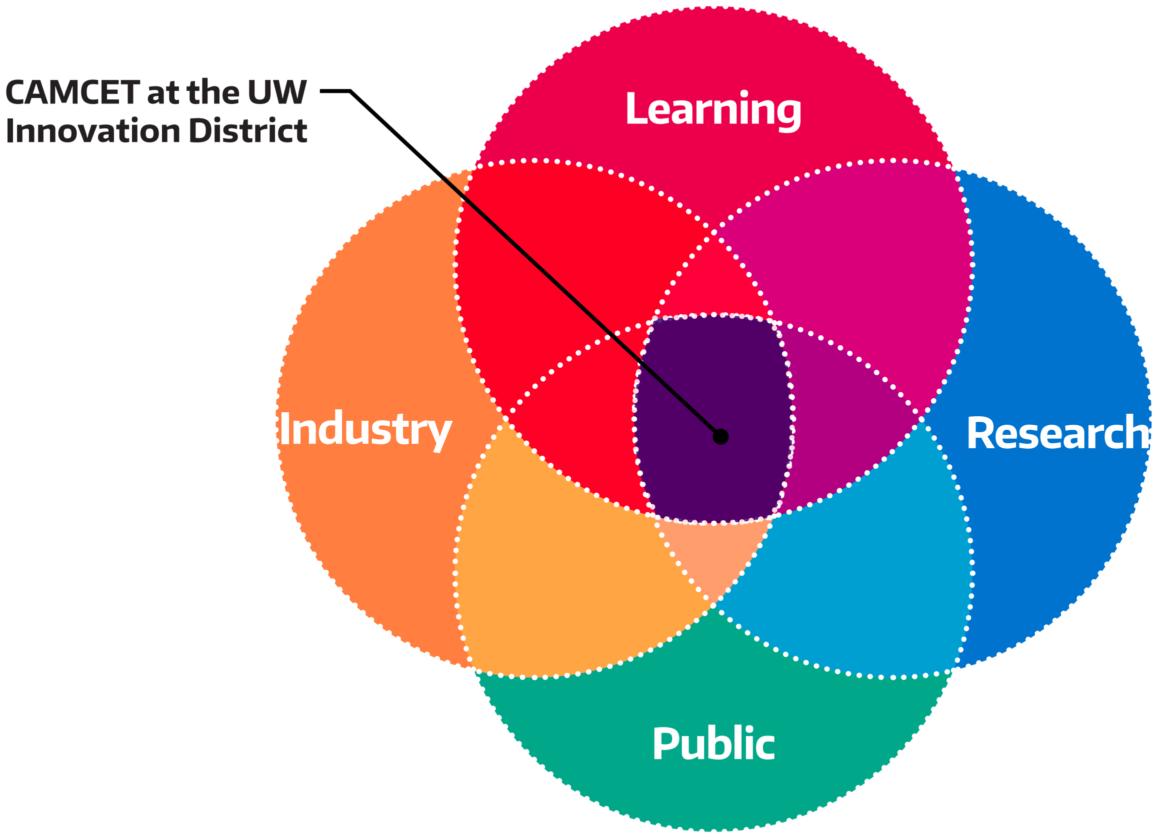
The formation of new businesses is a key component of growth. The 2013 Seattle-UW Incubator Study advises that we not only create a new space to attract such businesses, but create a program to attract talent and stimulate entrepreneurial activity, focused on the University of Washington. Specifically, it addresses the needs of start-ups to thrive. Individuals involved in successful start-ups indicate that flexible rental terms and access to key amenities are the driving factors in making a decision to locate in a particular neighborhood or office space.

In short, start-ups want:

- Flexible spaces, including the ability to "rent by the desk"
- Access to common spaces, such as kitchens and conference rooms
- Proximity to transportation, both public and private transit
- Proximity to other start-ups
- Access to mentorship services, such as venture capital, business mentorship and legal services

We believe a unique public-private partnership can deliver all of this in the UW Innovation District.

CAMCET AT THE UW INNOVATION DISTRICT



In response to these needs, and to accelerate the growth of Washington's cleantech economy and the UW Innovation District, we are proposing a new 172,000 GSF mixed use building. We call this building the Center for Advanced Materials and Clean Energy Technology (CAMCET). The CAMCET Building is a UW priority for catalyzing the partnerships needed to accelerate solutions for a healthy planet.

As a regional center of excellence and founding anchor of the UW Innovation District, CAMCET will connect a vibrant Washington clean technology research and innovation ecosystem to the world. CAMCET will foster university research, education, and technology activities that collaborate with key business, civic, and non-profit partners to accelerate solutions and impact in the clean technology sector.

CAMCET will house the University of Washington Clean Energy Institute (CEI) , and key cleantech research partnerships occurring across the state, such as the joint UW-WSU-PNNL Transactive Campus project sponsored by DOE and the State, the UW-PNNL Northwest Institute for Advanced Computing, and future looking UW-PNNL initiatives in materials research. Other campus research teams focused on clean technology science, engineering, and STEM education will join these anchor tenants. CAMCET will create an ecosystem that enables researchers to leverage work going on in labs across the state, and amplify it through access to the transportation connections, corporate titans, and financial institutions that exist in the region's largest urban center. CAMCET will be a regional resource that connects Washington to the world.

CAMCET will create impact in these four priority areas: **Learning**, **Research**, **Industry**, and **Public**.

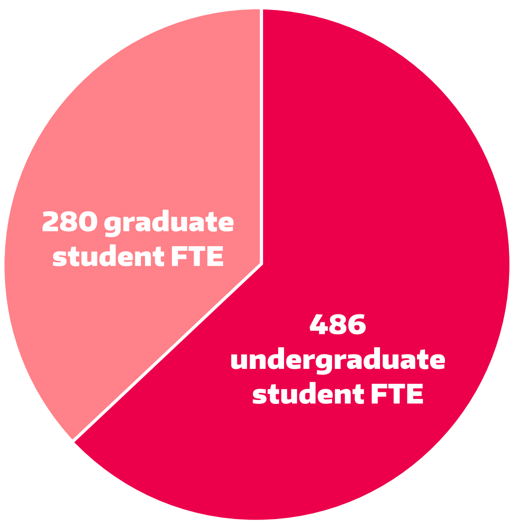
1. Learning

Despite having been recognized as one of the top talent magnets in the U.S., Seattle is still short of college graduates with high level STEM skills. In the 2013 joint report by the Boston Consulting Group (BCG) and the Washington Roundtable (WR), entitled, "Great Jobs within our Reach: Solving the problem of Washington state's growing job skills gap", the implications for growing the STEM skills pipeline were stated clearly: filling the growing STEM skill gap in Washington will create 160,000 new jobs in many sectors, and generate $720 million in state tax revenues annually. Do too little, and high paying engineering and computer science jobs will migrate from our region, along with all of the indirect jobs and tax revenues they generate. The recommendations in the BCG/WR report were as clear as the consequences: Increase capacity for student enrollment in STEM areas and increase degree production.

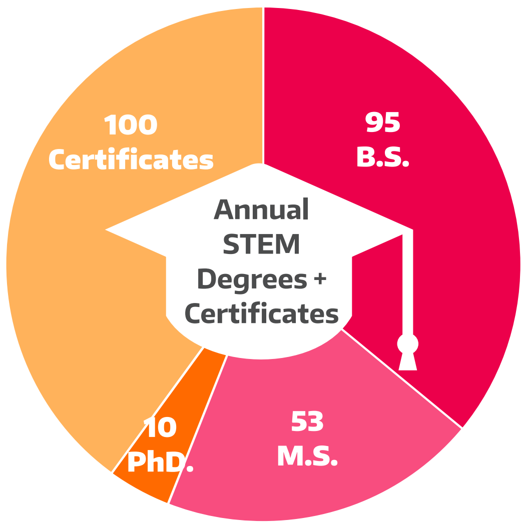
Simultaneously, the demand for STEM courses and degrees are exploding on the UW Seattle Campus. A 2014 report on access to engineering and computer sciences at UW noted that 500 well-qualified degree applicants were rejected annually. Since the 2014 access report, demand for STEM courses and degrees have accelerated. In response, UW has been a good steward of past investments that grow STEM education. Over the past several biennia, about $7 million of state funding provisos have targeted high demand computer science and engineering degrees at UW. We are monitoring and meeting our targets for growth in undergraduate and graduate degree production as a result of this funding.

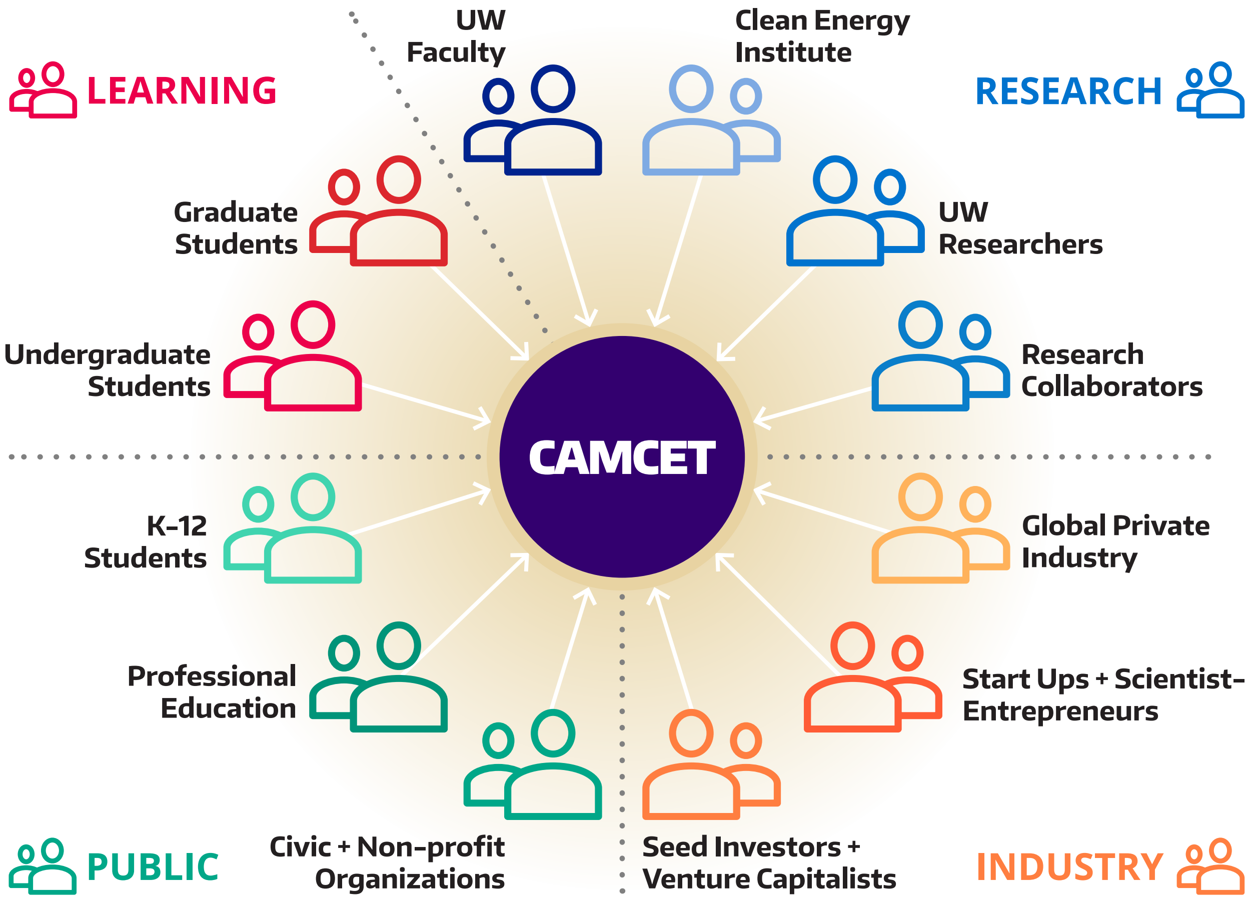
With growth in UW research and education programs tied to the science and engineering of clean energy, clean water, and clean air, as well as the advanced materials that underpin them, more students than ever seek an education that prepares them for leadership in growing segments of the economy. CAMCET will be the first UW building designed to support interdisciplinary student project-based learning at the B.S. and M.S. level for students in chemistry, business, engineering, environmental science, and physics. In any given quarter, we expect about 2000 different students to be taking classes in the building and participating in projects such as cleantech capstone designs, business competitions, and cleantech oriented project-based courses. Specialized clean tech M.S. degrees will be developed to utilize the specialized research instruments and Testbed capabilities of CAMCET. Cleantech M.S. and certificate students will rely on the facilities in CAMCET for their degrees. Taken together, CAMCET will generate an additional 258 STEM degrees and certificates annually.

Annual Student FTE



STEM Degrees + Certificates





1. Learning (continued)

The diverse teaching and learning space built into the CAMCET program, coupled with the engineering and science faculty research teams to be housed in CAMCET, means campus will have the ability to accommodate 486 undergraduate (UG) and 280 graduate (Grad) student FTE growth.

2. Research

Our plans are for CAMCET to house 21 UW research teams comprised of 154 dedicated faculty and graduate students who will work and collaborate with about 14 external research teams from PNNL and other partner organizations. CAMCET is designed to enable significantly enhanced interactions by embedding external researchers with the UW research teams and our industry partners. Cleantech research requires the coordination of top talent, as evidenced by the growing list of collaborative efforts, such as the UW-WSU-PNNL Transactive Campus project, the joint UW-PNNL Northwest Institute for Advanced Computing (NAIC), and the just-being-conceived UW-PNNL Pacific Northwest Materials Institute. CAMCET's purposeful integration of external research collaboration labs is informed by our experience placing PNNL lab employees on the Seattle campus as part of NIAC. CAMCET has space to house as many as 14 external research teams, comprised of 14 senior investigators and 38 research team members (postdocs and early career scientists). This significant allocation of space to external researchers will enable closer collaboration among our research institutions, more opportunities for joint recruiting, and enhanced competitiveness for major grants. CAMCET re-envisions the relationship among the State's research organizations by creating an opportunity for collaborators to lease laboratory and office space adjacent to their UW colleagues, world-class shared instruments, and Testbeds. The unique facilities and organization of CAMCET will enable a new route for accelerating cleantech research and development, to the benefit of our state and nation.

3. Industry

CAMCET will be home to the shared research instruments that help accelerate cleantech discoveries and the scale-up and characterization Testbeds that enables prototype technologies to be manufactured and tested. We expect to have an affiliated space where start-ups can lease a hot desk to take advantage of shared research instrumentation and Testbed facilities to prototype and test ideas, while meeting other clean tech entrepreneurs and early stage funders. The availability of a "one stop shop" for companies to find talent, research, and technologies will attract global strategic partners to CAMCET who are critical for impact. It will be a place where prospective employers in the clean tech sector come to recruit students. In one place, we will have industry partners, students, faculty, tech scouts, and start-ups working in the world's most integrated cleantech laboratory building.

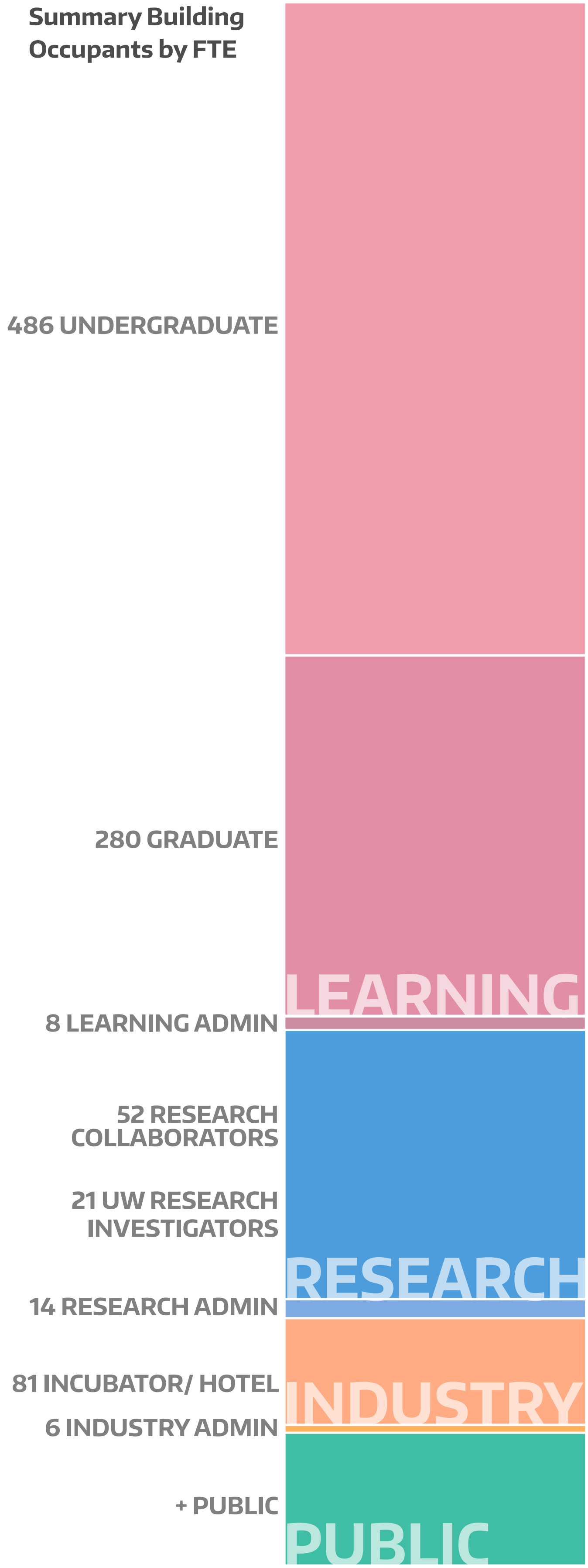
4. Public

CAMCET will have public spaces for events, conferences, workshops, and general convening. CAMCET will host K-12 students and the next generation of cleantech scientist entrepreneurs to discover science and inspire them to invent the technologies that will enable future generations to enjoy clean energy, clean air, and clean water. Our clean energy ambassador program has partnerships with K-12 and community college teachers across the state, participates in informal education programs with the Pacific Science Center. Thousands of students have participated in our solar derbies or other events focused on teaching about the clean energy technologies they see going up in the neighborhoods or on their drives across the state. As an innovation hub, CAMCET will be the destination to learn about how Washington is accelerating solutions for a healthy planet.

Occupant Summary by FTE

Given the spectrum and diversity of activity, CAMCET addresses a wide range of operational needs for permanent occupants and periodic users. To the right is a graphic showing CAMCET's occupant capacity by type. A detailed projection for permanent and periodic populations by space type can be found in Appendix J.

Summary Building Occupants by FTE



RESULTS WASHINGTON

Washington state is diligently focused on building a more responsive, data-driven government. Through the strategic framework Results Washington, Washington state is actively implementing and monitoring impact in five target areas. Not only is it important that CAMCET align with the Results Washington framework, but deliver real results that contribute to the State's vitality, prosperity and quality of life. CAMCET will generate outcomes that align the Washington state Results Washington framework.

Results Washington is helping drive improvements on dozens of key goals.

The five goal areas include:

- World-class education
- A prosperous economy
- Sustainable energy and a clean environment
- Healthy and safe communities
- Efficient, effective, accountable government

World Class Education	CAMCET will house next generation active learning classrooms, project-based and lab-based learning spaces, with special focus on that most critically needed learning spaces to accommodate student enrollment growth across campus

Results Washington			**CAMCET**				
Category	**#**	**Goal**	**Description**	**Occupants**		**Space**	
				Type	**#**	**Type**	**Amount**
Post Secondary	1.3f	Increase number of students enrolled in STEM and identified high demand program in 4 year colleges	CAMCET will meet the educational needs for next generation clean tech workforces including: (i) interdisciplinary learning, (ii) teamwork for technical and business product development, (iii) new educational offerings that include business and public policy, with science and engineering	Enrolled U/G Students (New FTE)	486	Active Classrooms, STEM Project Studio, STEM Project Laboratory, Testbeds, Research Laboratory, Seminar Rooms, Small Classrooms, Group/Team study areas, Solo Study Areas	Learning Space: 31,350 ASF 30%
	1.3h	Increase number of graduates in STEM and identified high demand programs in public 4 year colleges		Annual STEM Degrees & Certificate Recipients	258		
	1.3i	Increase the percentage of post secondary graduates from 4 year colleges who during the 4th quarter after graduationare either enrolled in post secondary edcuation or training or are employed in Washington		Enrolled Graduate Students (New FTE) *Including PhD Students	369*		

<table>
<tr><td>Prosperous Economy</td><td colspan="7">CAMCET is a world-class research and learning space that also houses company incubator space adjacent to cleantech scientific instruments & scale-up manufacturing facilities. It is designed to be a convening space where students, researchers, start-ups, and established companies mix.</td></tr>
<tr><th colspan="3">Results Washington</th><th colspan="5">CAMCET</th></tr>
<tr><th rowspan="2">Category</th><th rowspan="2">#</th><th rowspan="2">Goal</th><th rowspan="2">Description</th><th colspan="2">Occupants</th><th colspan="2">Space</th></tr>
<tr><th>Type</th><th>#</th><th>Type</th><th>Amount</th></tr>
<tr><td rowspan="4">Competitive and Distinctive Economy</td><td>1.1a</td><td>Increase total exports from Washington</td><td rowspan="4">CAMCET will meet the business development needs of Washington small, medium, and large clean tech enterprises, as well as the clean tech investment community by:

(i) creating shared instruments and development testbeds that lower the cost of starting business in Wahington,

(ii) by bringing the resrouces of a National Lab more actively into the hub of commerce and finance in the Puget Sound,

(iii) by education that lowers the skills gap in clean tech,

(iv) by convening the regional, national, and international industry</td><td>Conference or exhibition attendees</td><td>Up to 400</td><td rowspan="4"><u>Learning</u>:
-Collborative Commons
-Meeting Rooms
- Active Classrooms

<u>Research</u>:
-Research Labs
-Shared Instrumentation
-Specialist Facilities

<u>Industry</u>:
-Industry Hot Desks
-Project + Incubation Labs
- Testbeds

<u>Public:</u>
-Lobby + Cafe
-Exhibit
-Conference
- Back of House</td><td>Public Spaces
8,355 ASF
8%</td></tr>
<tr><td>1.1b</td><td>Maintain or improve the state's ranking in the U.S. Chamber of Commerce's Innovation and Entrepreneurship metric</td><td>Incubator Users</td><td>56</td><td rowspan="2">Industry Spaces
22,585 ASF
22%</td></tr>
<tr><td>1.3i</td><td>Increase GBI in these sectors: clean technology, agriculture, aerospace, life sciences and global health, information and communication technology, and maritime</td><td>Hot desk users: strategic partners, finance parterns, recruiters</td><td>25</td></tr>
<tr><td>1.2b</td><td>Increase small business GBI in Washinton</td><td>Researchers - UW & Collaborators</td><td>217</td><td>Research Spaces
41,268 ASF
40%</td></tr>
</table>

<table>
<tr><td>Efficient, Effective, & Accountable Government</td><td colspan="8">CAMCET will create a highly collaborative environment for students, researchers, industry partners, and the public and will accelerate the timelines of discovery and translation to market.</td></tr>
<tr><th colspan="3">Results Washington</th><th colspan="6">CAMCET</th></tr>
<tr><th rowspan="2">Category</th><th rowspan="2">#</th><th rowspan="2">Goal</th><th rowspan="2">Description</th><th colspan="2">Occupants</th><th colspan="2">Space</th></tr>
<tr><th>Type</th><th>#</th><th>Type</th><th>Amount</th></tr>
<tr><td>Customer Satisfaction</td><td>1.1</td><td>Increase percentage of agency core services where customer satisfaction is over 67%</td><td rowspan="4">CAMCET will create a highly engaging learning environment that will be satisfying to students, while creating a collaborative environment for employees, tenants, public and funders of research development and development projects. CAMCET will accelerate the timelines of discovery and translation to market, and support recruitment and retention of employees.</td><td>Students</td><td>899</td><td rowspan="4">Incubator spaces, Testbeds, shared instrumentation, meeting spaces, visitor hot desks, public spaces, admin services, UW aand Collaborator Research Labs, Learning spaces, meeting spaces</td><td>Learning Space: 31,350 ASF 30%</td></tr>
<tr><td>Service Reliability</td><td>1.2</td><td>Increase percentage of agencies measuring timelines for agency core services</td><td>Researchers</td><td>206</td><td>Research Spaces 41,268 ASF 40%</td></tr>
<tr><td>Employer of Choice</td><td>1.3</td><td>Increase Washington as an employer of choice</td><td>Industry Users</td><td>81</td><td>Industry Spaces 22,585 ASF 22%</td></tr>
<tr><td>Workplace Culture</td><td>1.4</td><td>Increase percentage of state employees who respond positively when asked if their leaders create a culture of respect, feedback, and teamwork</td><td>Faculty, Grad student employees, staff</td><td>182</td><td>Public Spaces 8,355 ASF 8%</td></tr>
</table>

Prosperous Economy (continued)	CAMCET is a world-class research and learning space that also houses company incubator space adjacent to cleantech scientific instruments & scale-up manufacturing facilities. It is designed to be a convening space where students, researchers, start-ups, and established companies mix.

Results Washington			**CAMCET**				
Category	**#**	**Goal**	**Description**	**Occupants**		**Space**	
				Type	**#**	**Type**	**Amount**
Quality Jobs	2.1a	Increase employment in these sectors: clean tech, agriculture, aerospace, life sciences, information and communication tech, maritime	CAMCET will create the ecosystem needed to perform research translate that to company start-ups in the cleantech sector. Small companies are the major source of job growth in America.	Incubator Users	56	Incubator spaces, testbeds, shared instruments, meeting spaces, visitor hot desks, interaction spaces, admin services, UW and Collaboration Research Lab	Industry Spaces 22,585 ASF 22%
				Hotdesk Users	25		
	2.1e	Increase small business employment		Researchers - UW	154		Research Spaces 41,268 ASF 40%
				Researchers - Collaborators	52		
Expanding Opportunities	2.2a	Expand skilled workforce to match increase in high-demand industries	CAMCET is a learning facility geared toward STEM disciplines. WHile our classrooms serve all of campus, our STEM teaching lab, STEM project space, and research labs are filled with B.S., M.S., and Ph.D. students who will graduate to fill high-demand jobs.	STEM Dedicated Teaching (New UG FTE)	111	Incubator spaces, testbeds, shared instruments, meeting spaces, visitor hot desks, interaction spaces, admin, UW and Collaboration Research Lab	Learning Space: 31,350 ASF 30%
				General Assignment Classrooms (New UG/ Grad FTE)	766		Research Spaces 41,268 ASF 40%
	2.2b	Increase number of workers in occupations who earn an average of at least $35,000		Incubation Users	56		Industry Spaces 22,585 ASF 22%
Reliable Infrastructure	3.1c	Maintain the percent of non-transportation infrastructure assets in satisfactory condition.	CAMCET is a new breed of technical infrastructure that will support the State's cleantech research	Students, researchers, faculty, staff, industry tenants, and public	1081 weekly FTE + additional pulic users	Entire building	103,558 ASF

Sustainable Energy + Clean Environment	CAMCET is an innovation hub that connects Washington to the world by catalyzing the partnerships needed to achieve solutions for a healthy planet.						
Results Washington			**CAMCET**				
				Occupants		**Space**	
Category	**#**	**Goal**	**Description**	**Type**	**#**	**Type**	**Amount**
Clean Transportation	1.1a	Reduce the average emissions of greenhouse gases for each vehicle mile traveled in Washington by 25% from 1.15 pounds (lbs.) in 2010 to 0.85 pounds (lbs.) by 2020	CAMCET will create a cleantech ecosystem that improves the efficiency and lowers the cost of electrified transportation systems. CAMCET housed education will accerate learning and discovery in battery-enabled technologies.	Researchers from UW and collaborators	217	Testbeds, Shared Instruments, Research Labs, Incubation Spaces, Public Spaces, Learning Spaces.	Research Spaces 41,268 ASF 40%
	1.1b	Increase the average miles traveled per gallon of fuel for Washington's overall passenger and light duty truck fleet from 19.2 miles per gallon in 2010 to 23 miles per gallon in 2020		Incubation and hotdesk users	81		Industry Spaces 22,585 ASF 22%
Clean Electricity	1.2a	Increase electric load served by renewable energy	CAMCET will create a cleantech ecosystem that inproves the performance and lowers the cost of renewable electricity and efficiency enhancing products. Ther research, development, and deployment activities carried out in CAMCET will enable deeper renewabes penetration on the grid, and efficient devices, from indoor lighting to data centers. CAMCET housed education will accerate learning and discovery in clean energy technologies.	Researchers from UW and collaborators	217	Testbeds, Shared Instruments, Research Labs, Incubation Spaces, Public Spaces, Learning Spaces, study and meeting spaces.	Research Spaces 41,268 ASF 40%
	1.2b	Increase electrical load growth replaced by conservation		Incubation and hotdesk users	81		Industry Spaces 22,585 ASF 22%
				Annual STEM Degrees & Certificate Recipients	258		Learning Space: 31,350 ASF 30%

ALTERNATIVES

Please reference the Life Cycle Cost Model located in Appendix K for a financial analysis of the alternatives discussed below.

Alternative 1: No Action

Currently, Clean Energy Institute member faculty are appointed in 7 UW departments and PNNL. These faculty members and their students are housed in 9 different UW buildings, and routinely access instrumentation and lab facilities located in 11 different UW buildings and PNNL. If no action is pursued, it will be business as usual, where academic team members are dispersed across campus, with minimal exposure to research collaborators and industry partners. The vision for transformative partnerships across learning, research, industry and the public that have real impact in the cleantech sector would not be possible, and specifically:

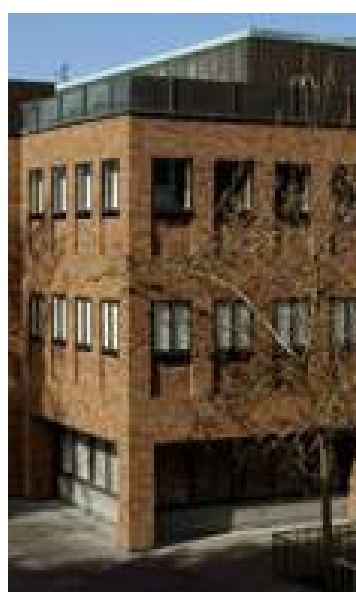
- Testbeds that are currently being housed in temporary off-campus space will not be able to be fully integrated with aligned research, education, and industry activities.
- The accommodated growth in FTE and STEM degree and certificate will not be possible
- Separating the different functions of CAMCET across campus and in off-campus spaces will also lose the opportunity to easily show the public how research discoveries get turned into the clean energy systems and services that touch their lives.

Alternative 2: Place Operations within Existing Space

Operations would be dispersed across campus. The scale up facilities Testbeds will be located in off campus leased space and NanoES. Faculty will continue to be located in their home departments. Industry collaboration would only take place in existing labs. Incubation would continue in Fluke Hall. This option was not analyzed financially in the Life Cycle Cost model. It was rejected for not providing sufficient space to achieve the CAMCET goals of: (1) collaborative, fundamental research partnerships, (2) incubation of cleantech start-up companies and innovative ideas, (3) educating the next generation cleantech workforce with new and innovative teaching facilities. A different long-term solution is needed as proposed through Alternative 4.

Alternative 3: Replace Existing Building

It is cost prohibitive to demolish and replace Benson Hall, the Chemistry Library. In order to accommodate the demolished program, CAMCET would have to contain mainly chemistry and chemical engineering labs, which is not a viable option to achieve the vision. This option is over $44M more than Alternative 2 over a 50 year analysis period.



Alternative 4: Leased Space

Leased space offers a limited opportunity to house equipment for use by researchers and industry partners, including established companies and startups. Two of the three Testbed facilities that were funded in the 2015-2017 capital budget are currently being temporarily housed in UW leased space. Leased space offers the opportunity to immediately house the equipment needed by the cleantech community but it offers very limited space for expansion beyond this goal. There is not sufficient space to achieve the CAMCET goals of: (1) collaborative, fundamental research partnerships, (2) incubation of clean tech start up companies and innovative ideas, (3) educating the next-generation clean-tech workforce with new and innovative teaching facilities. A different, long-term solution is needed.

Alternative 5: Co-location in the UW Innovation District

Colocation in the UW Innovation District will deliver the CAMCET program and optimize phase one development opportunities in the UW Innovation District. As a co-anchor, the larger development footprint will create opportunity for alternative, developer-driven delivery method, decreasing the CAMCET capital request from the State.

This alternative provides the Lowest Cost Option for achieving all of the program goals.

SELECTING ALTERNATIVES

Colocation in the UW Innovation District will deliver the CAMCET program and optimize phase one development opportunities in the UW Innovation District. As a co-anchor, the larger development footprint will create opportunity for alternative, developer-driven delivery method, decreasing the CAMCET capital request from the State.

The CAMCET State Funding Request is a small part of the total project cost, but it is focused on specialized equipment for learning and research ($11.6 million), and the funding of specialized design elements to accommodate STEM education and research ($8.4 million). If State funding is reduced, it will sacrifice the range of specialized equipment possible for learning and research.

STEM learning and research is capital equipment intensive, with a need for specialized design to accommodate the mission.

The innovative new developer-driven delivery model proposed here must be customized and equipped for our needs. Without State funding CAMCET will be a generic, developer-driven laboratory building ill-suited to the STEM education and research goals laid out in this document, and needed by the growing advanced materials and clean technology industries.

ISSUES IDENTIFIED

Contamination issues have been identified in the west campus, where the UW Innovation District is located. A detailed study will be necessary to determine the appropriate, if any, environmental remediation measures. Historically in the area that is now the UW Innovation District, zoning permitted residential and retail land uses, so findings of heavy contamination are not anticipated.

Additionally, EMI and vibration will be considerations for exact site selection. CAMCET does not contain critically sensitive program elements, so most sites are likely to be favorable to accommodate CAMCET's EMI and vibration criteria.

	Program	Cost to Benefit	Collaboration	Flexibility
Alternative 1 **No Action**	0	0	0	0
Alternative 2 **Within Existing Space**	+	+	0	0
Alternative 3 **Renovate Existing Building**	++	+	++	++
Alternative 4 **Lease Space**	+	++	+	0
Alternative 5 **UW Innovation District**	+++	+++	+++	+++

PRIOR PLANNING AND HISTORY

A New Dawn for Solar Energy

In the 1990s, the UW College of Engineering and College of Arts & Sciences made a strategic decision to build a cluster of talent in photonics (the science and technology that underpins high speed fiber optic communications, and much more). Support from the State's Advanced Technology Initiative enabled key faculty hires, and this team turned UW into a powerhouse. Recently, Thomson-Reuters did a review of global materials science and technology R&D over the period 2000-2010, and found UW to be #1 in the world for the impact of our scientific work, largely due to our photonics research.

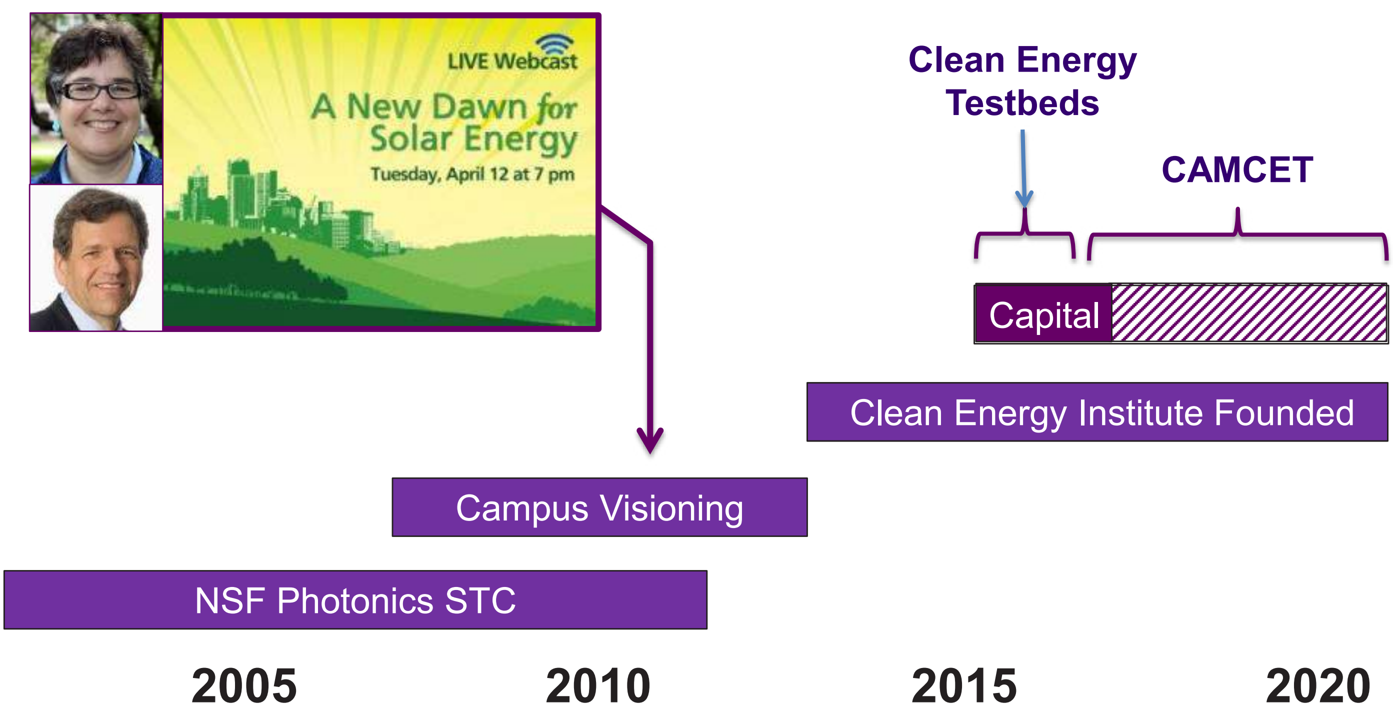
In the mid-2000s, UW began a visioning efforts focused on the next area for our materials research team to have global impact: Clean Energy. The vision was articulated at a public presentation entitled, "A New Dawn for Solar", presented by President Ana Mari Cauce (then Dean of Arts & Sciences) and Dean Matthew O'Donnell (Engineering Dean at the time).

UW had the materials expertise to be a global leader in solar energy and batteries, and partnerships with PNNL and WSU positioned us for global leadership in smart grid. However, for greatest impact, we developed a strategy for recruiting key new faculty talent, and a vision for new facilities that foster interaction and engagement of partners.

Clean Energy Institute

In 2012, UW submitted a request to the State for new investment in the Clean Energy Institute. Our Institute is mission oriented: we are accelerating the adoption of a scalable clean energy future through our focus on innovation, education, and transformation in the areas of solar energy, battery storage, and their integration into systems and the grid.

Our innovation agenda is driven by new hiring and facilities. Operating funds provided in the 2013-2015 biennium, combined with a $6,740,000 gift from the Washington Research Foundation, has enabled UW to make key faculty hires in battery materials, control



algorithms, advanced manufacturing, and key junior faculty in materials chemistry and physics. Capital funds provided in the 2015-17 biennium have been invested in predesign for a transformational new building, CAMCET, and the development of the Washington Clean Energy Testbeds, an advanced manufacturing and system integration facility that is temporarily housed in off-campus space.

Our education agenda transects K-20. We have mobilized UW students through a fellowship program, and these 88 students now reach several thousand school kids each year through their formal and informal education programs. Our fellows are also our research students that push science and engineering forward. Though our partnership with the Foster School of Business Buerk Center for Entrepreneurship, we catalyze prototype design and testing of new environmental tech ideas and test their suitability for the marketplace.

Our transformation agenda is to breakdown barriers, both in the university and between the UW, PNNL and industry. All our hiring to date has been interdisciplinary across departments or joint with PNNL. Our engagement with the CleanTech Alliance puts us in contact with industry, and our participation in Element 8 connects UW science and engineering to the seed funders that help take it from lab to market. We have notable successes in all of these areas.

CLEAN ENERGY TEST BEDS

Developing breakthrough clean energy technologies is extremely capital intensive, and the path from a research discovery to product has technology risks in manufacturing, durability, interoperability, etc. The Washington Clean-Energy Testbeds (CETs) will reduce the capital and risk associated with launching new products and companies, enabling our State to capture more of the economic value of research discoveries.

In the 2015-2017 capital budget, Washington state funded the Clean-Energy Testbeds (CETs). The Testbeds are intended to provide state-of-the-art equipment and instrumentation to the research and business communities in the area of clean technology. The Testbeds are fee-based user facilities (fees support operation and maintenance of the facilities) and are industry and research compatible facilities available to external users, not just UW.

The Testbeds are focused on cutting the cost for prototyping and testing next generation solar, energy storage, and system integration technologies as well as supporting the education and training the next-generation clean technology workforce.

STAKEHOLDERS

Stakeholder input has drive a pre-design vision for a high impact interdisciplinary science and engineering building to produces graduates and research to address the growing regional need in advanced materials and clean technologies. The CAMCET pre-design process has involved faculty, students, and administrators from the College of Engineering, the College of Arts and Science, and the Foster School of Business, as well as leaders from regional small and large industry (see appendix with support letters).

The predesign process included four rounds of meetings that consulted with the following stakeholders:

- UW Students: Arts and Sciences, and Engineering
- UW Faculty: Arts and Sciences, Built Environments, Engineering
- UW Administrative leaders: Applied Physics Labs, Buerk Center for Entrepreneurship, Clean Energy Institute, College of Arts and Sciences, College of Built Environments, College of Engineering, College of Environment, and CoMotion.
- UW staff and leaders in Capital Planning and Development and Real Estate Office
- Pacific Northwest National Laboratory
- Global corporations: Amazon, Boeing, Microsoft
- Clean tech service organizations: CleanTechnology Alliance, APCO Worldwide, Perkins Coie
- Clean tech angel and private equity investors
- Clean tech start-ups executives: Energ2, 1EnergySystems, UniEnergy Technologies, microflowCVO, Imperium Renewables, RenewH2O, 3Tier, Polydrop

A list of participants during the predesign report process and letters from various stakeholders are included in Appendix H.

PROJECT DESCRIPTION

Agency Name University of Washington

Agency Code 360

Project Number 91000016

Project Title Center for Advanced Materials and Clean Energy Technology

Agency Contact:

John Seidelman, Director of Capital Planning
Capital Planning and Development
UW Planning and Management
University of Washington
UW Tower, T-12, Box 98195-9445
(206) 616-0590 (seidj@uw.edu)

Mission

CAMCET will be an innovation hub that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

Goals

CAMCET will foster collaborative research that accelerates solutions for a healthy planet.

CAMCET will increase STEM degree production and provide students with innovative STEM learning environments.

CAMCET will catalyze partnerships.

CAMCET will convene the clean tech community, and incubate start-up companies that succeed in the marketplace.

CAMCET will accommodate FTE growth and relieve some critical campus classroom needs.

CAMCET will catalyze the UW Innovation District.

Administration Higher Education Inderdisciplinary Research and Education Building

Technical Facility Requirements:

31,918 ASF Research Labs
17,030 ASF Test Beds
8,400 ASF Shared Instrumentation
4,410 ASF Incubation Labs

Existing Facilities Affected

CEI member faculty are appointed in 7 UW departments and PNNL. These faculty and their students are housed in 9 different UW buildings, and routinely access instrumentation and lab facilities located in 11 different UW buildings and PNNL. They include:

Bagley Hall
Benjamin Hall
Benson Hall
Electrical Engineering Building (EEB)
Fluke Hall
Mechanical Engineering Building (MEB)
Roberts Hall
Molecular Engineering + Sciences Institute (MolES)
Allen Center for Computing
Physics Building
Wilcox Hall

Previous Action Taken

For the 2015 - 2017 Biennium, the UW requested $12 million and was awarded $9 million for the Clean Energy Test Beds. To date, $8 million has been used to design, construct and purchase equipment for the Test Beds in their temporary home of leased space. The remaining $1 million has been allocated to planning and predesign for CAMCET.

Current 10YR Capital Plan

CAMCET is in the current 10-year UW Capital Plan.

Legislative intent

For the 2017 - 2019 Biennium, UW will request funding.

IMPLEMENTATION APPROACH

The Executive Committee is responsible for strategic decision making and oversight that will guide design through implementation. The Executive Committee is comprised of leadership from the Capital Planning Office, the Office of the University Architect, the Clean Energy Institute and the Office of Research Administration and Infrastructure for the College of Arts + Sciences.

The Building Committee is responsible for project implementation. Members are representatives from Capital Planning and Development, Real Estate Office, IT Academic Affairs, Office of the University Architect, College of Engineering, College of Arts + Science and the Clean Energy Institute.

The A/E/C Team is responsible for architectural design, engineering and construction of CAMCET.

EXECUTIVE COMMITTEE

Clean Energy Institute
Capital Planning and Development
Office of University Architect
Capital Planning Office
College of Arts and Sciences

BUILDING COMMITTEE

Clean Energy Institute
Capital Planning and Development
Office of University Architect
Capital Planning Office
College of Arts and Sciences
College of Engineering
Real Estate Office
IT Academic Services

RESPONSIBLE PARTY

A/E/C Team

PROJECT MANAGEMENT

Management Organization

The project goals will be established at the initial phase with an executed Project Agreement. The stakeholders for the project will all provide their sign-off prior to the project moving forward. The document establishes the Executive and Building Committee's membership and charter. These committees provide direct oversight of the project meeting regularly with the UW project manager, design and contracting teams. The Building Committee meets on a continuous basis working with the consultants and other interested parties to lead, manage, and develop the project within the agreed upon the project goals and objectives The Executive Committee meets less frequently with a charge to provide overall project direction to assure the project achieves its objectives. The committee is sometimes asked to resolve issues or concerns that arise as necessary.

Method of Delivery

> The project will utilize a Design-Build (DB) process for contracting the design and construction in cooperation with a developer partner.

The project team and site will be selected by RFP. Bidders will be chosen on the basis of their ability to maximize performance specifications focused on unit cost and program fulfillment.

The University will enter into a development contract and a long term lease with the selected development team. Developer project financing is backed by the University's long term lease of the project for CAMCET. The University will mitigate its lease costs in part by subleasing portions of its space and equipment to key program partners. These sublease arrangements also support the CAMCET vision of partnership and collaboration.

Construction of the project shell and core will be managed by the developer to meet the specifications required by the University's Tenant Improvements. TI's will be managed by the developer and the University and its sub-tenants will be directly involved in the construction and budget decisions to ensure the final build out meets program requirements.

Alternatively, the University may choose to lease space for CAMCET in an independent speculative laboratory project. In this approach a developer interested in capitalizing on high demand for commercial lab space may choose to build a U-District project at their own risk and on their own credit. This possibility is increasingly likely given low interest rates and the strength of the Seattle bio-tech real estate market.

A private developer, in this scenario, would obtain the University's commitment as an anchor tenant for at least 50% of a project, and would seek to secure other high credit tenants as well including some of CAMCET's likely research partners. The University and its research partners would enter into operating leases with the developer who would build the shell and core to meet the basic requirements specified in each tenant's TI package. Specifications would include common area program elements as well as tenant-specific requirements.

Upon completion of the shell and core, the developer would provide an allowance for tenants to complete tenant improvements. TI costs would be supplemented by CAMCET project costs to complete the final build out. The university may choose to complete TI's using Design Build or may elect to have the developer finish TI's along with the shell and core.

The University may consider the operating lease approach to take advantage of favorable market conditions and to minimize its construction risk and debt exposure.

This project has specific design and construction criteria that will require an integrated coordination during all phases of the project. The developer and their can deliver a project that suits the needs of the university and the program while not encumbering university borrowing capacity. The developer will help strategize phasing of the project and develop the schedule to address the campus operation issues.

Capital Planning and Development will still provide direct oversight of the team managing the project for compliance with scope, schedule and cost.

Recommended Strategy

This project will proceed using the similar milestone approaches of Preliminary Design, Construction Documentation, and Bidding and Construction phases, which allow the University of Washington oversight and opportunities for campus stakeholder input and direction. The University's engineering staff and the Building & Executive Committees will conduct a review of the design documents at specific milestone points during the design phase to ensure the progress complies with the program and University technical standards. CPD and the client will be involved throughout the project, ensuring the University's goals and requirements are implemented.

By using a continuous costing method, budget controls are ensured. The developer will also be required to provide an independent cost estimate of the project at the end of each phase for third-party oversight. CPD will manage the reconciliation process of the two cost estimates as a check and balance for confirmation the estimates are appropriate for the scope of work considered.

The UW architectural Commission will review the design of the building at the end of Predesign, then again during the schematic Design and Design Development phases. The UW board of regents will review and approve the design and budget at the end of schematic Design. Prior to awarded the contract to the DB, the

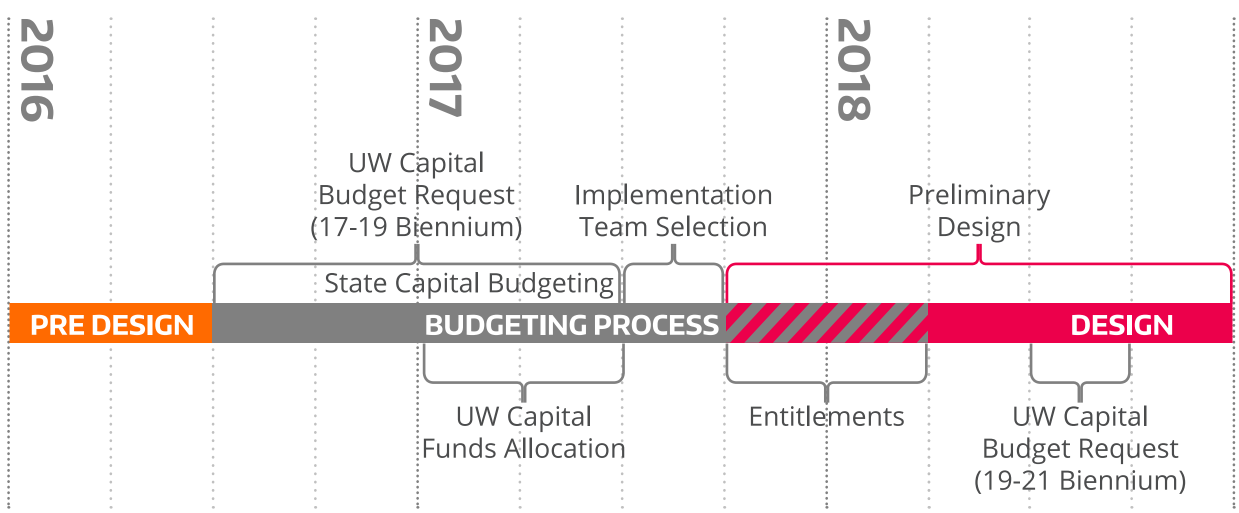
UW Board of Regents will also review and approve the selection.

During the construction phase, a UW Construction Manager will be assigned to coordinate the construction activities with ongoing operations on the campus. These include review and processing of submittals, request for information (RFI), change orders, and payment applications. The Construction Manager will be assisted by other University staff including a projects clerk and one or more construction coordinators. The developer's team will include a full-time, onsite architect to expedite coordination and interpret the intent of the design documents. The architect will organize and facilitate reviews by other members of the design team.

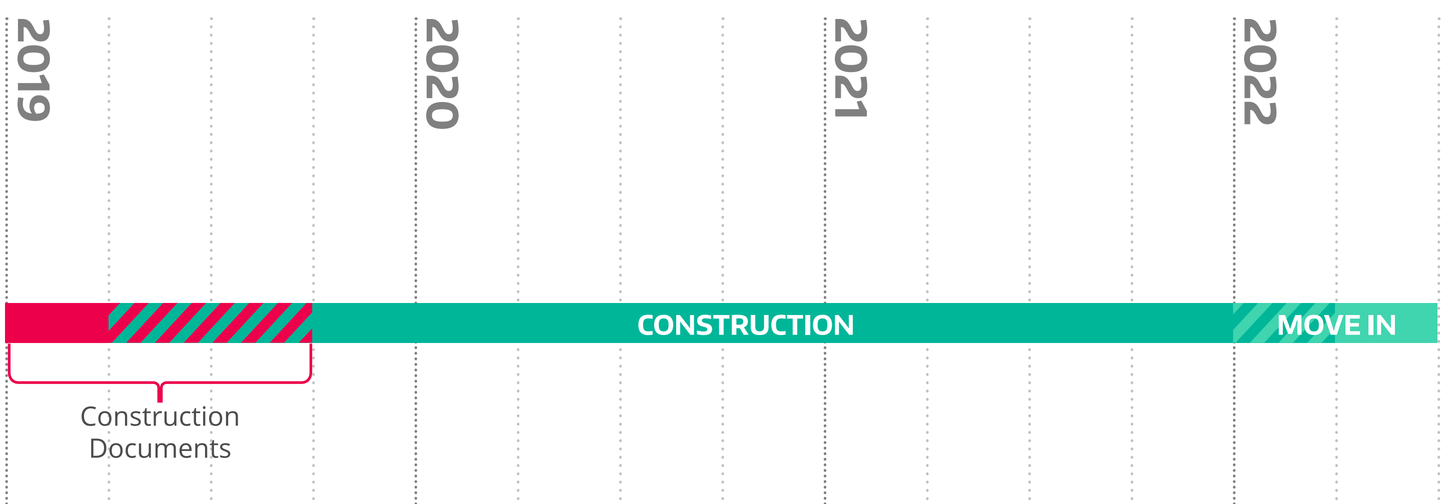
SCHEDULE

The UW CAMCET Project Schedule includes the Predesign Phase through the Construction and Occupancy Phase. The total project duration will be dependent on funding aligning with the phases identified in the chart below. The project Predesign process started in January, 2016 and will conclude in June, 2016. Approximately a year will be used to secure appropriate university and State of Washington legislative support.

The formal design/build process is planned to begin in the third quarter of 2017. Construction activities are planned to begin in early 2019. Construction will conclude in the fourth quarter of 2021 and beneficial occupancy in the first quarter of 2022.



Activity	Targeted Start Date	Targeted Completion Date
Establish Project		
Project Predesign	September 10, 2015	June 24, 2016
UW Capital Budget Request (17-19 Biennium)	August 1, 2016	June 27, 2017
State Capital Budgeting (17-19 Biennium)	September 12, 2016	June 27, 2017
UW Capital Funds Allocation (17-19 Biennium)	January 6, 2017	August 21, 2017
UW Capital Budget Request (19-21 Biennium)	August 1, 2018	September 12, 2018
State Capital Budgeting (19-21 Biennium)	September 12, 2018	June 28, 2019
Project Implementation		
Implementation Team Selection Process	June 27, 2017	September 6, 2017
Entitlements	October 17, 2017	March 1, 2019
Design	October 17, 2017	October 16, 2019
Construction	May 23, 2019	July 13, 2022
Owner Activities (Move-In)	April 28, 2022	June 22, 2022



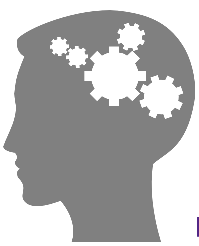
CAMCET will foster university research, learning, and technology activities that collaborate with key business and government partners to create impact in the clean technology sector.

[03] PROGRAM ANALYSIS

ASSUMPTIONS

CAMCET will foster university research, learning, and technology activities that collaborate with key business and government partners to create impact in the clean technology sector.

In one place, we will have industry partners, students, faculty, tech scouts, and start-ups working in the world's most integrated cleantech laboratory building. In order to accommodate this new, integrative approach, several future-focused assumptions drive the creation of the CAMCET program.

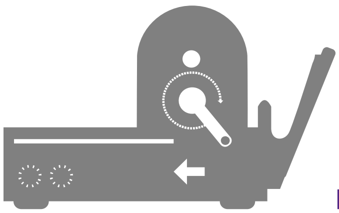


Learning happens everywhere.

Students want to be integrated into a solutions producing context that exposes them to real world clean technology challenges, and alongside the researchers and industry professionals who are actively working to address them. This means that CAMCET students will learn in active classrooms and project labs, but also in the labs, using shared instruments, and in the flexible research and meeting spaces alongside researchers and industry partners.

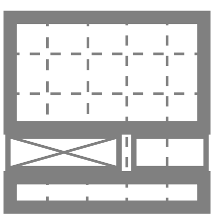
Collaboration is deliberate.

To deliver on CAMCET's mission as an innovation hub, collaborations between those that discover knowledge and those that translate knowledge into solutions must be deliberate and purpose-driven. In the CAMCET planning process, we refer to this as the ability to connect "problem-holders" with "problem-solvers". This assumption leads to the creation of an environment that integrates people and functions, where researchers, industry partners and students interact continuously, with the ability to seamlessly move from lab, to technical instruments to meeting and social spaces.



Equipment is shared.

To attract the best talent and cutting edge scientist entrepreneurs, CAMCET must provide equipment that not only is unique to the cleantech sector but also enables scientists to test and scale up discoveries into viable solutions. Increasingly, STEM research and learning is capital equipment intensive, with a growing need for a wide range of technical instruments. In response to these needs, CAMCET must enable shared access to a wide range of users.



Space is flexible.

Pulling students, researchers, and industry partners together in one place requires that space must be flexible to optimize a diverse set of operational needs. Recognizing that over time, as new knowledge is discovered, businesses and partnerships formed and solutions created, the CAMCET environment must be agile enough to respond to dynamic needs without renovation. Modular program and vertical zoning are strategies that optimize space, anticipate changing needs, but also balance cost effective capital investment.

Testbeds are co-located.

CAMCET will be the permanent home for the Clean Energy Testbeds, funded in the 15-17 biennium and temporarily housed in leased, off-campus space, and additional Testbeds that support broad campus cleantech research and education.

The function of a Testbed facility is to take an outstanding idea from research, and then manufacture and test a prototype device or software product to authenticate its manufacturability, performance and scalability. In all cleantech areas---whether tackling clean energy, clean air, or clean water---the technical gap between a great idea and a great product is one of the major barriers for transitioning technologies from the lab to market. Co-location of Testbeds with the researchers, students, and industry partners in CAMCET will lead to fast learning by all members of the CAMCET user community.

For Testbed facilities to have maximum impact on research, learning, and industry, they must be co-located. Currently, the Clean Energy Testbeds are mostly off campus, with a small learning lab on campus. CAMCET will enable co-location and synergy not possible with existing campus or leased spaces.

EXISTING FACILITIES

There are no existing facilities on campus that can co-locate the program requirements. In order to accommodate students, researchers, and industry partners working together in a new way, a new space typology is required.

SPACE NEEDS

The University of Washington hired Ricks and Associates to perform a learning space assessment in Fall 2013. In this study, the current inventory of instructional spaces was assessed including utilization rates, physical condition, attributes, and fit for emerging instructional needs. Three findings from this assessment are relevant to the learning spaces proposed for CAMCET:

1. According to data from UW Profiles, the number of students on the Seattle campus increased from 39,936 in 2006/7 to 45,408 in 2015/16. Growth has created a need for more instructional spaces. Although some efficiencies in classroom use will be realized by the implementation of new scheduling policies, previous and continued enrollment growth requires a corresponding increase in instructional space.

2. There is a substantial demand for classrooms that support 100 or more students. The current classroom inventory is focused on smaller instructional spaces, with approximately 90 classrooms having an occupancy of 21-30 students. In contrast, there are a very limited number of classrooms that can support over 100 students, with requests for classrooms that can accommodate 100 to 200 students currently outstripping the eight available classrooms of corresponding occupancy.

3. The current classroom inventory is not able to support modern pedagogy. Central to CAMCET is the concept of inquiry based learning. Students learn by exploring ideas through experimentation and collaboration. Accommodating this instructional approach requires spaces that can support open and collaborative work. The number of so-called “active learning classrooms” available to instructors at the UW is extremely modest (four at present), and none of them can accommodate the variety of pedagogical approaches that faculty are requesting to employ in their instruction. The new learning spaces in CAMCET will address this increasing need.

FUNCTIONS AND SCOPE

CAMCET is a new, 172,000 GSF interdisciplinary research and education building and founding anchor of the UW Innovation District. CAMCET will integrate students, faculty, and industry partners across the learning, discovery, translation, commercialization, incubation and outreach spectrum through an innovative approach to space programming.

The scope of CAMCET is organized by four overarching space categories:

Learning, **Research**, **Industry**, and **Public**.

Learning:
To deliver team and project based STEM education and collaborative environments for students, researchers and industry partners, Learning includes active classrooms, STEM Project studios and labs, collaborative commons for social learning and working, and a variety of meeting and study rooms and collaboration spaces.

Research:
For cleantech basic and applied knowledge discovery, Research includes modular suites of wet labs, dry labs and computational labs. Embedded in each of the modular suites is space for lab office, collaboration and storage of equipment. Research also includes areas for shared instrumentation and research administration.

Industry:
For the incubation of discovery into solutions, the incubation of new companies, and the access to technical infrastructure for the cleantech community. Specialized industry spaces include leasable incubation labs, hot desks, and Testbeds. Our industry spaces are focused on accelerating solutions for the common good of all Washingtonians. For assistance in the navigation of these spaces, Industry also includes space for external partnership relations, events and a welcome concierge.

Public:
To convene the Cleantech ecosystem, host cleantech oriented conferences and large scale student competitions, educate future STEM learners and the general public through exhibits and outreach programs, Public includes spaces like an Exhibition + Conference Center and Central Café.

Because researchers, students and industry partners will engage in activities in all four areas of Public, Learning, Research, and Industry, we can understand CAMCET through three distinct lenses.

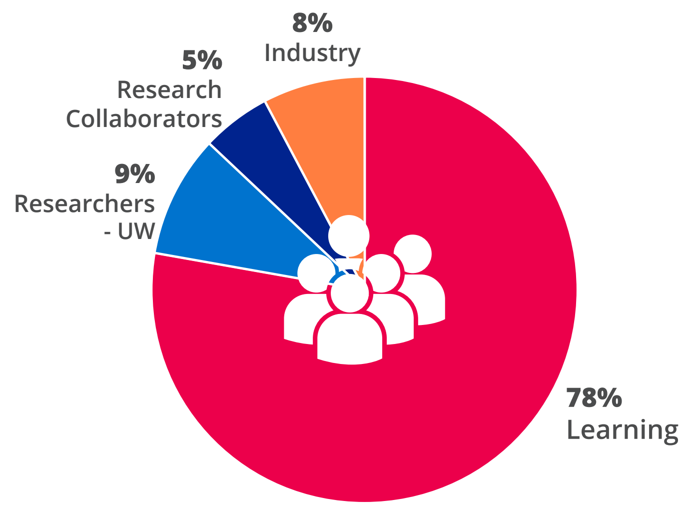
University of Washington - CAMCET			
Program Summary			
#	**Area Name**	**ASF**	**%**
A	**LEARNING**		
1.00	Exhibition & Conference	4,500	4%
2.00	Collaborative Commons	7,120	7%
3.00	Learning	16,230	16%
4.00	Meeting Rooms	3,300	3%
5.00	Administration	200	0.19%
		31,350	**30%**
B	**RESEARCH**		
6.00	Research Labs	31,918	31%
7.00	Shared Instruments	8,400	8%
8.00	Administration	950	1%
	Sub total	**41,268**	**40%**
C	**INDUSTRY**		
9.00	Incubation Labs	4,410	4%
10.00	Test Beds	17,030	16%
11.00	Administration	1,145	1%
		22,585	**22%**
D	**PUBLIC**		
12.00	Building Entry	1,975	2%
13.00	Central Cafe	1,700	2%
14.00	Back of House	4,680	5%
		8,355	**8%**
	Total Net ASF	**103,558**	
	Net To Gross	x1.67	
	GROSS INTERNAL AREA	**172,596**	

CAMCET THROUGH THREE LENSES

LENS: PEOPLE

How many people will CAMCET accommodate?

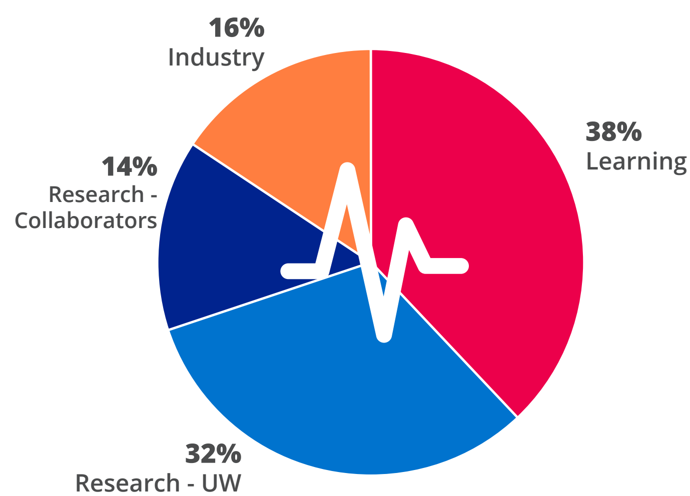
If we look at the number of people coming to CAMCET throughout a given week, students comprise the majority of FTE. This is testimony to the critical classroom needs that CAMCETE will fulfill.



LENS: ACTIVITY

What activities will occur in the building?

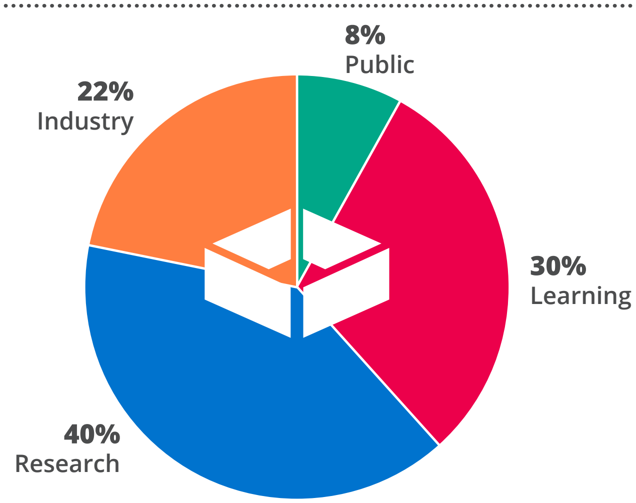
If we take a snapshot of the activity happening at CAMCET at any given moment, about 46% of space will be used for UW / UW Collaborator research, 38% will be used for learning, and 16% for industry related activity.



LENS: AREA

What are the main intentions of the spaces?

If we consider spaces by their primary use, we find that 40% of the building is considered Research space, 30% Learning space, 22% Industry Space, and 8% Public space. Given the primary goal of CAMCET is to "connect the dots," each kind of space is likely to be used by the diverse occupants, for a wide variety of activities.



CAMCET EXPERIENCE

LEARNING

"Cleantech entrepreneurship is exploding at the University of Washington. We see students from all disciplines, from undergraduates to PhD candidates, who are passionate about creating workable solutions to cleantech problems. ***[CAMCET] would not only have the physical space we need, but the visibility and community engagement we want.****"*

-Connie Bourassa-Shaw, Director of the Buerk Center for Entrepreneurship, Foster School of Business-

"Daily interactions with company professionals would transform my university experience *by providing me with invaluable skills and perspectives to tackle engineering problems."*

-Elena Pandres, UW Graduate Student, Chemical Engineering-

"CAMCET will give UW a major recruiting edge *if we can offer new faculty members research labs next to established shared instrumentation clusters. A new prof's career depends on getting their students productive in research fast, and top notch shared facilities do just that."*

-Dr. Brandi Cossairt, Assistant Professor, Chemistry-

RESEARCH

"PNNL has already started placing a small number of researchers on the UW campus, because we see close university partnerships as a key strategy for accelerating solutions to the toughest challenges. ***CAMCET has the potential to transform how PNNL and UW partner.****"*

-Dr. Doublas Ray, PNNL Associate Lab Director for Partnerships-

"I have launched tech start-ups in Silicon Valley and Cambridge UK, and there is really no other place where students, faculty, industry, and start-ups have such potential for friction-free interactions. ***CAMCET will be an amazing global asset for taking research from lab to market****."*

-Devin MacKenzie, Associate Professor and Serial Entrepreneur-

Undergraduate Students | **Graduate Students** | **UW Faculty** | **Clean Energy Institute** | **UW Researchers** | **Researcher Collaborators**

INDUSTRY

"[CAMCET] will provide much needed infrastructure that is sorely lacking in Seattle and the surrounding area. It will have everything I need for my next cleantech company including: research ideas, a network of ambitious people, testbed facilities and connections to facilitate success for creating market-ready technologies and services..."

-John Plaza, Cleantech Entrepreneur-

"Amazon is hungry for top talent in all aspects of the company. The idea that I can get a hot desk at CAMCET and interact with so much talent in one place is really attractive."

-Ron Stimmel, Global Renewable Energy Manager, Amazon-

Our work with leading clean technology clients makes it clear that solutions for creating a sustainable future require a collaborative, cross-sector approach. I drew upon my background combining global business experience with creation of successful community engagement strategies to help shape CAMCET into a place to help nurture a culture of partnership and success.

-Maggie Brown, APCO Worldwide, Executive Director, Energy & Clean Tech Practice-

PUBLIC

Our interaction with thousands of K-12 students and teachers has proved that the public display and tour possibilities in CAMCET will make it a must go to venue for educators in our state. A permanent home for interactive science and engineering displays will transform the number of people we can reach and the quality of the experience.

-Shaun Taylor, Education Director, Clean Energy Institute-

"Students are hungry to participate in meaningful interdisciplinary projects, and companies are often eager to support STEM projects, but finding suitable spaces for these student projects is a real challenge."

-Brian Fabien, Associate Dean for Academic Affairs in Engineering-

Global Private Industry | Start Ups + Scientist-Entrepreneurs | Seed Investors + Venture Capitalists | Civic + Non-profit Organizations | Professional Education | K-12 Students

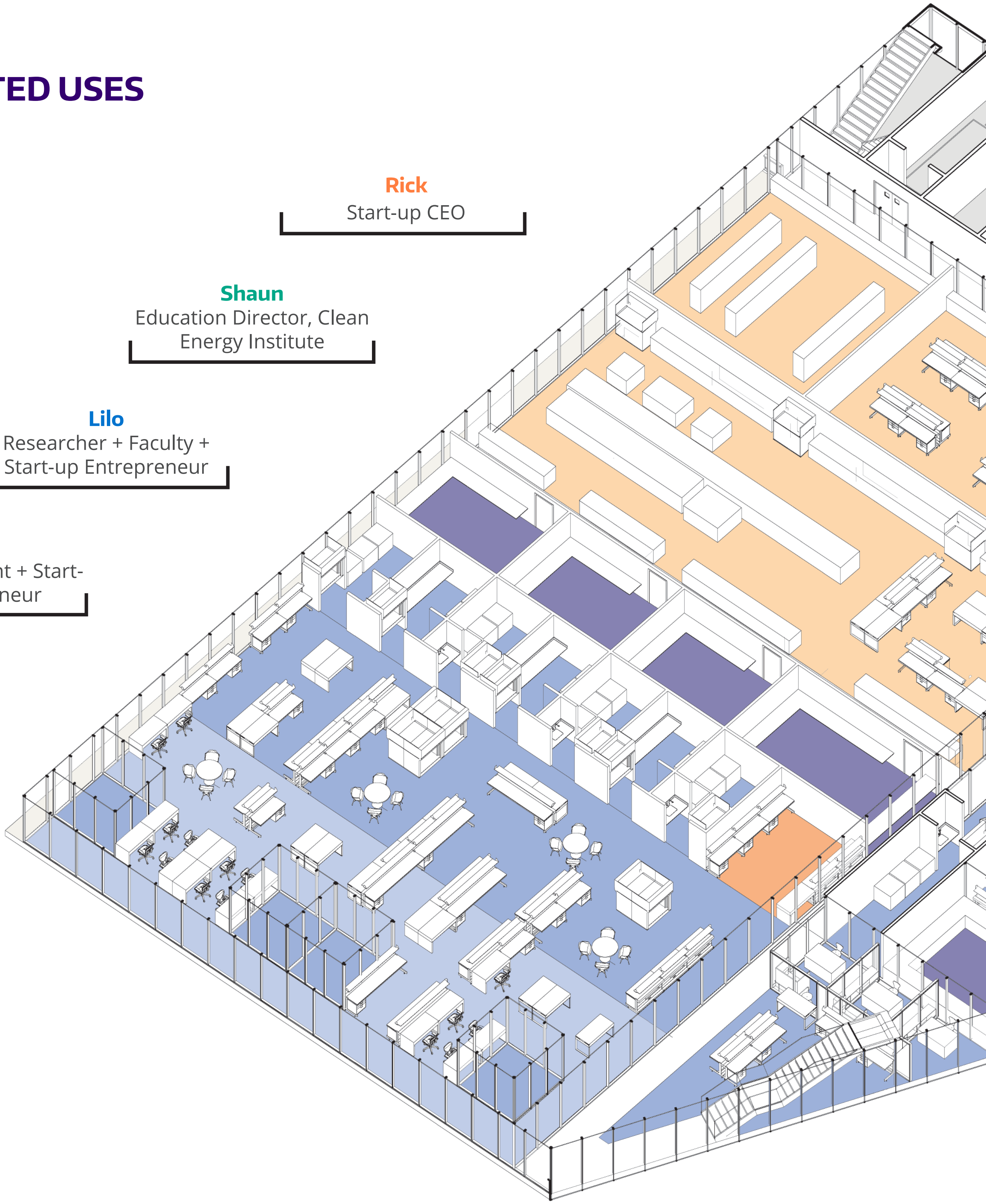
INTEGRATED USES

Rick
Start-up CEO

Shaun
Education Director, Clean Energy Institute

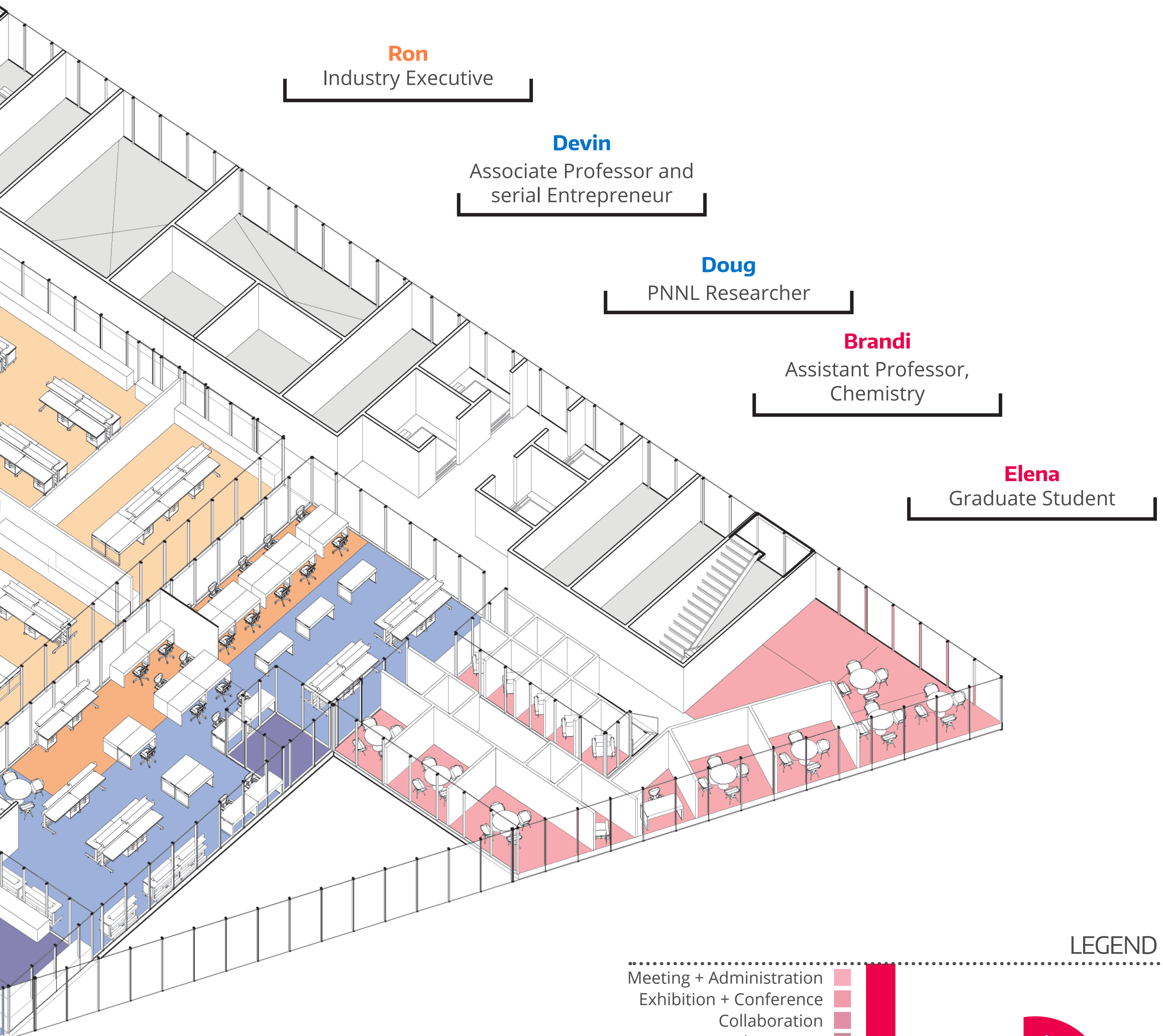
Lilo
Researcher + Faculty + Start-up Entrepreneur

Matt
Graduate Student + Start-up Entrepreneur



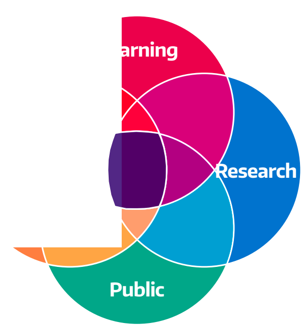
LEVEL **THREE**

LEARNING **10%** | RESEARCH **58%** | INDUSTRY **32%**



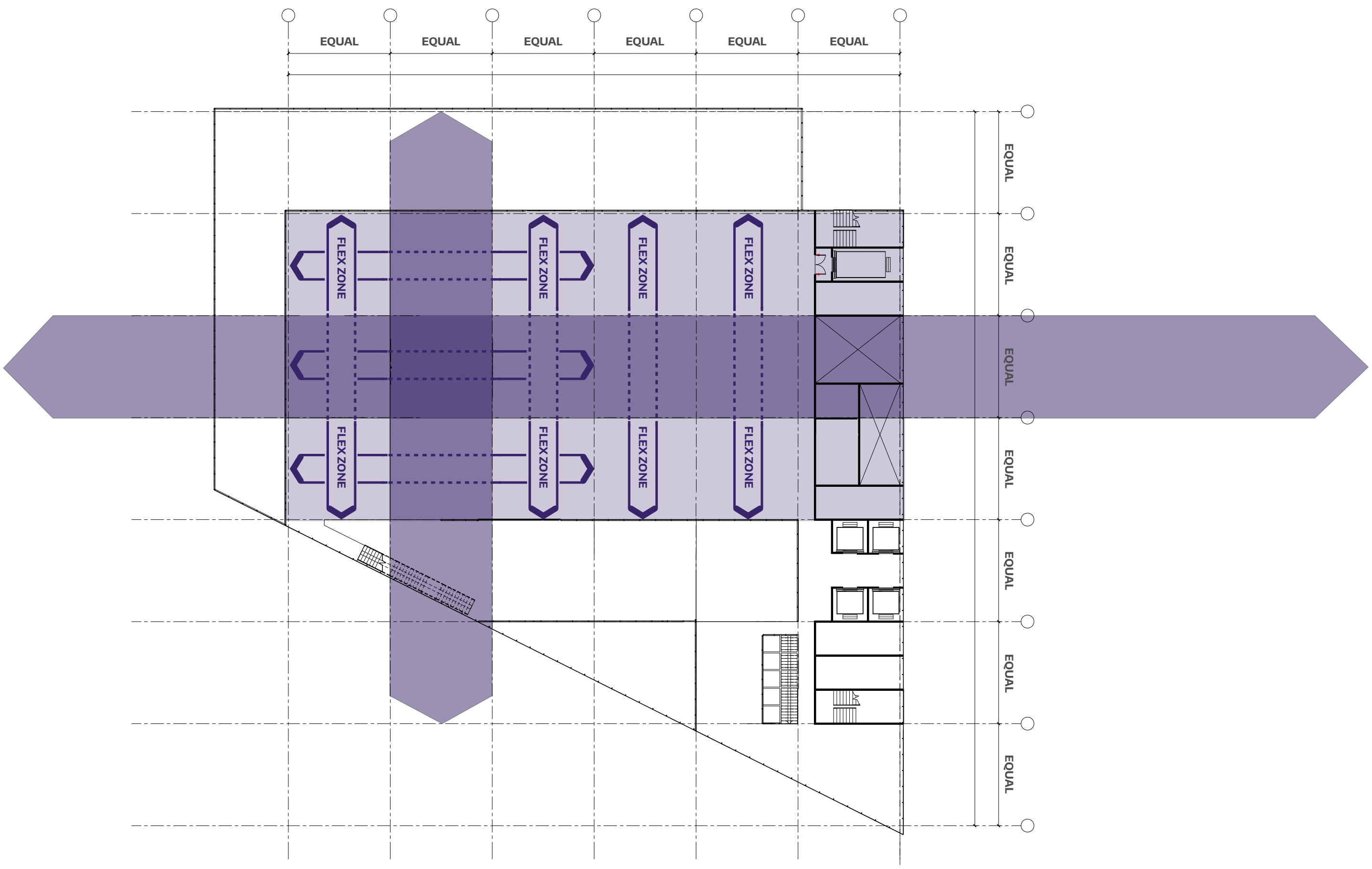
LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Admin
- Research Labs & Equipment
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core/Mechanical/Unassignable



CORE PROGRAM AREAS

PLANNING PRINCIPLES

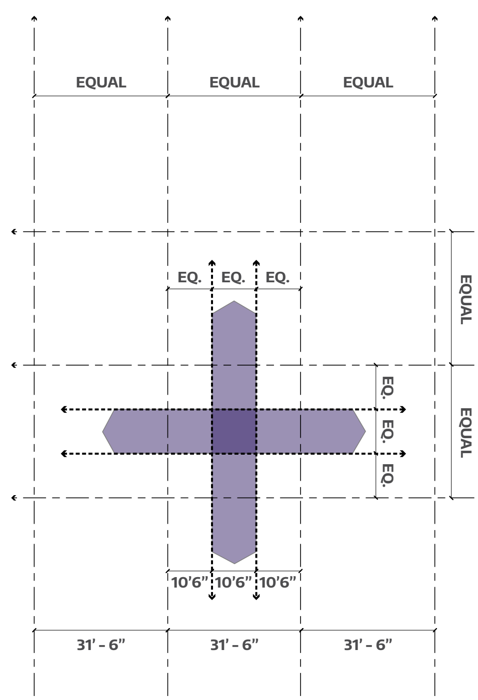


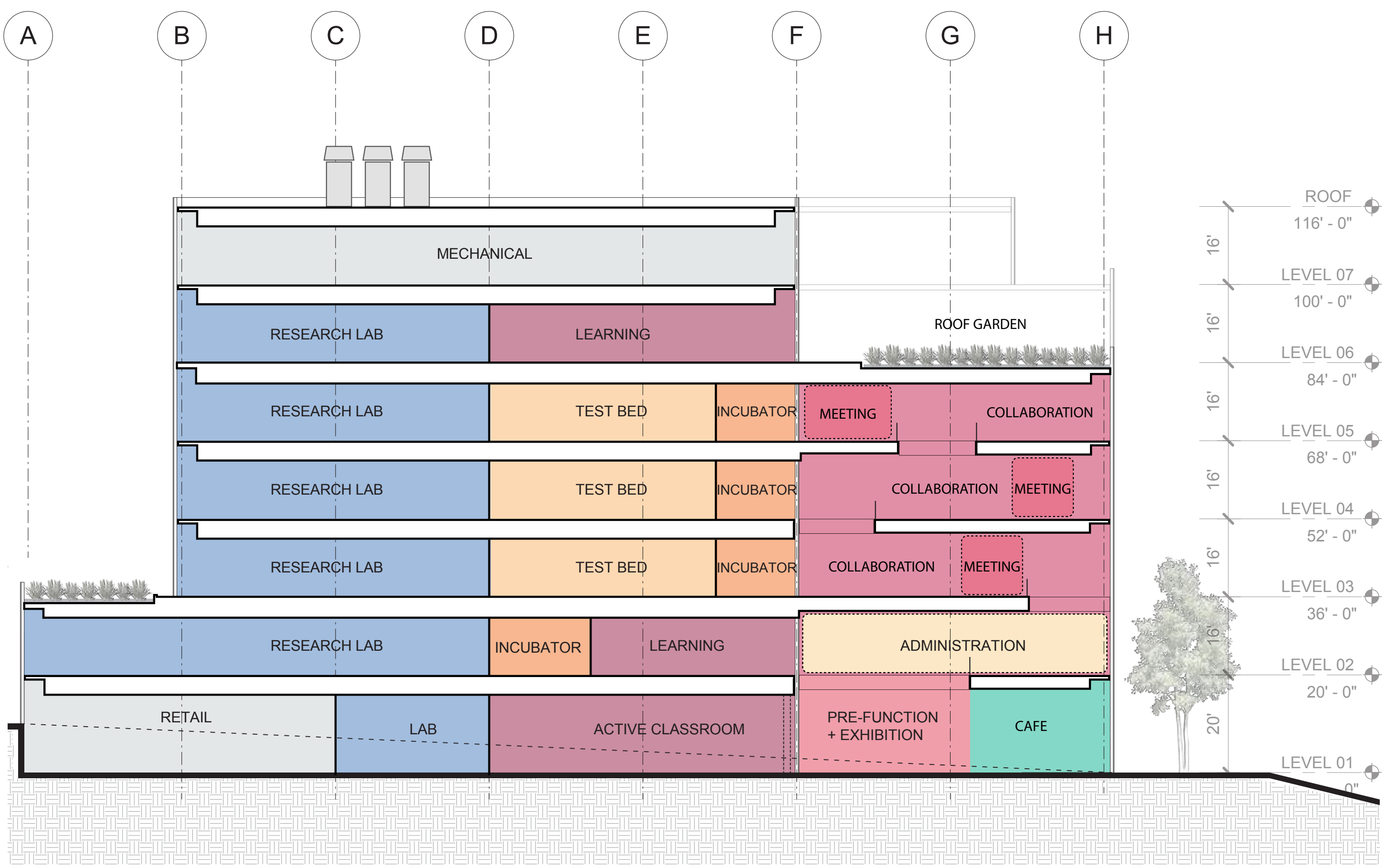
Modular Planning

The utilization of the Universal Grid as the base for the building planning allows for ultimate modularity, flexibility and adaptability during the design process and in the evolution of the building. The Universal Grid lab module allows for team sizes and lab bench/support/office ratios to fluctuate, while still being able to modularly accommodate differing needs now and in the future. The laboratories, lab casework and office layouts can all be modularized to the grid to allow flexible planning and expansion based on research and user needs.

The concept diagram above shows the method in which program areas can be expanded into adjacent zones based on need and space availability.

The use of mobile furniture systems and prefabricated MEP modules allows for greater flexibility and adaptability options. CAMCET shall be planned for ease of fit-out and turn over to new research space, with minimal demolition of built systems. This enables new researchers, industry leaders, and students to quickly and easily integrate into the existing CAMCET programs.

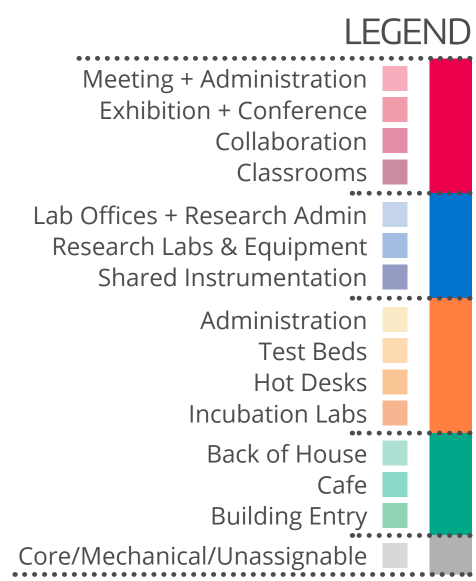




Vertical Zoning

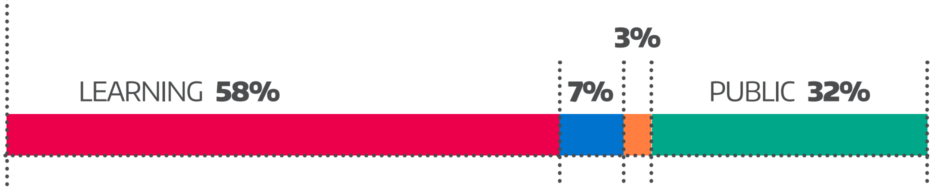
Vertical zoning is a planning principle which balances the types of science on a floor-by-floor approach. Labs with heavy chemistry needs would be limited up to the third floor due to the IBC chemical height/ quantity restrictions. Other, less-specific research and educational spaces can be integrated at each level, creating a more equal division of program type at each floor.

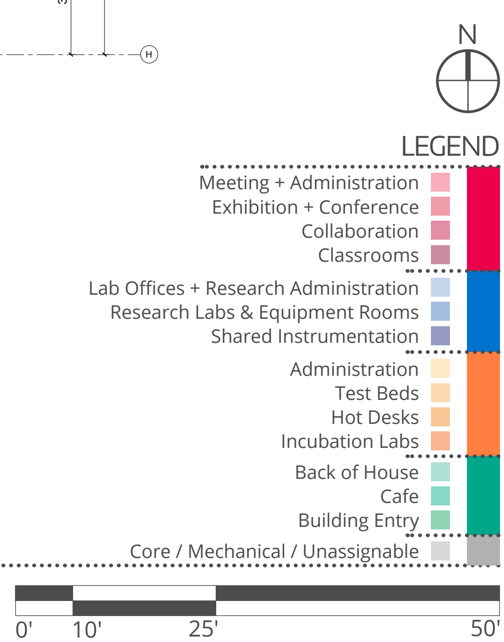
This mixed vertical stacking of program facilitates interdisciplinary collaboration across user-groups while aiding in way-finding. The above section demonstrates how the various building programs are dispersed across multiple floors, but stacked vertically.



PROGRAM ADJACENCIES

LEVEL **ONE**





LEGEND

LEARNING
- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms

RESEARCH
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation

INDUSTRY
- Administration
- Test Beds
- Hot Desks
- Incubation Labs

PUBLIC
- Back of House
- Cafe
- Building Entry

Core / Mechanical / Unassignable

A summary of the FTEs within the CAMCET program is included in Section 2.1 Operational Needs. A detailed projecation for permanent and periodic populations by space type can be found in Appendix H.

GROUND FLOOR

The ground floor of CAMCET contains the most public, interactive and highest populated spaces. Activated by retail along Brooklyn Avenue NE, the main entry is located at the southeastern corner of the building. Once inside, the main lobby is interconnected to a café, flexible seating area and exhibit space, designed for casual every day social activity, as well as accommodate large scale events. With views of the Burke Gilman trail, the ground floor organizes the public spaces to take advantage of the park space to the south and will integrate indoor outdoor program space for events.

A pair of large flexible multi-purpose learning spaces are adjacent to the public amenities. These technology-enhanced active learning spaces accommodate 200 students. As the main teaching space in CAMCET, these classrooms are immediately adjacent to research and start up labs, so that cleantech research and entrepreneurial activity will be on display for the many students coming to CAMCET for classes throughout each week.

The core is aligned with University Way and separates the inflexible building service space from the flexible open lab space. Back of House support functions are located partially underground along the northern face of the building.

For an enlarged view of the ground floor plan, go to page 119.

GOAL FOCUS:

- Convene the clean tech community
- Provide innovative STEM learning environments
- Relieve critical campus classroom needs

RESEARCH

PUBLIC

LEARNING

LEVEL **TWO**

LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core / Mechanical / Unassignable

LEARNING **35%** | RESEARCH **35%** | INDUSTRY **30%**

0' 10' 25' 50'

LEVEL TWO

Due to the grade change from the north end of the site down to the Burke Gilman trail, CAMCET's second floor is at street level along University Way. To accommodate the pedestrian traffic coming from Central Campus, a secondary entry is located on the eastern side of the building. The entry is located next to the STEM project space and elevator core, so that students coming to CAMCET can immediately access the learning space, and other users can easily find their way to the floors above.

With space allocated equally to learning, research and industry functions, the second floor layout creates an integrated environment where students, researchers, research collaborators and industry partners learn, work and collaborate side by side. The STEM teaching labs and project spaces are centrally located and create a bridge to the research-heavy labs and industry-focused Testbeds. The research lab space is comprised of research and start up lab modules, so that researchers and industry partners are in direct and immediate proximity. All users have access to the shared instrumentation suites.

A series of collaboration spaces designed for groups of varying sizes run alongside the atrium, that is open to the café and seating below. Hot desks leased by industry partners are interwoven throughout the collaboration zone, and telephone booth enclaves provide space for individuals in need of privacy. A one stop shop that houses learning, research, and industry administrative functions overlooks the double height lobby. Loading and support occurs at the north east corner of the building directly above the remainder of support on the ground floor.

For an enlarged view of the second level plan, go to page 120.

GOAL FOCUS:

- Provide students with innovative STEM learning environments.
- CAMCET will catalyze partnerships.

INDUSTRY

LEARNING

LEARNING

LEARNING

LEVEL **THREE**

LEGEND

Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable

10% RESEARCH **58%** INDUSTRY **32%**

0' 10' 25' 50'

LEVEL THREE

Moving up to the third floor, Level Three will serve as a home base to students, UW researchers, research collaborators, and industry partners. As a more typical CAMCET floor, Level Three exemplifies an integrated scientific and collaborative environment, where all users can seamlessly move between their lab, shared equipment, the Testbed, meeting and social spaces.

The northwest corner of the building is dedicated to a research zone with flexible, adaptable research space meant to tailor to a wide range of researchers and Ph.D. students. Adjacent to this lab space is a large Testbed facility over 5,000 sf in size. This facility, along with the similar facility on the floor above, will serve as a more permanent home for the large Testbeds located temporarily in leased space off campus.

The collaborative learning spaces are located along the southern edge of the building, stacked vertically with the similar areas on the below floors. This area is open and bright, and located centrally around the building core and vertical circulation pathways. This space is ideal to foster collaboration between various building users from each of the programmatic use groups.

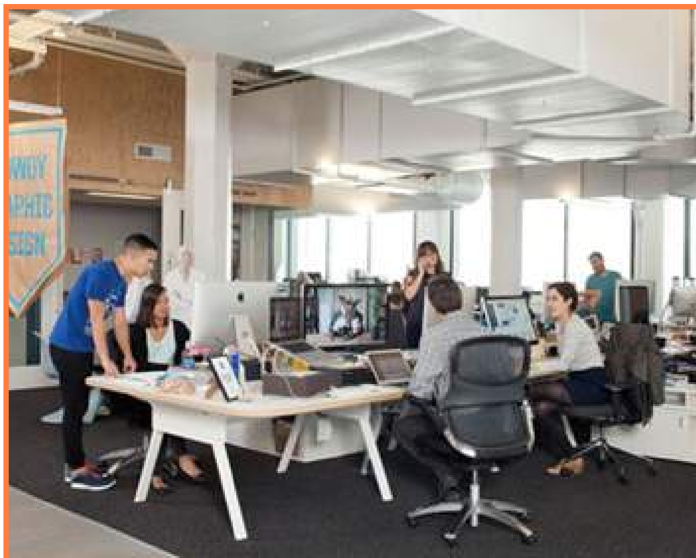
Level Three is interconnected vertically through double-height collaboration spaces to Level Two below and Level Four above.

For an enlarged view of the third level plan, go to page 121.

GOAL FOCUS:

- CAMCET will foster collaborative research that accelerates solutions for a healthy planet.
- CAMCET will catalyze partnerships.
- CAMCET will incubate start-up companies that succeed in the marketplace.

RESEARCH



INDUSTRY

LEARNING

N

LEVEL **FOUR**

LEGEND

Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable

LEARNING **20%** | RESEARCH **47%** | INDUSTRY **33%**

0' 10' 25' 50'

LEVEL FOUR

Similar in organization to Level Three, Level Four is distinguished by a central cluster of industry hot desks, a pair of incubation and research lab modules, and two suites of shared instrumentation. As soon as getting off the elevator, each user is immersed into a collaborative, technology rich, research intensive work environment.

As in Level Three, the northwest corner of Level Four is dedicated to a research zone with flexible, adaptable research space comprised of wet, dry and computational lab modules. Adjacent to this lab space is a large Testbed and the permanent home for the large Testbeds located temporarily in leased space off campus.

Also as in Level Three, the collaborative learning spaces are located along the southern edge of the building, stacked vertically with the similar areas on the below floors. This area is open, with minimal walls to promote interaction between user communities. To support the diverse activities in Learning, Research and Industry, the collaboration spaces are designed to accommodate meetings of varying sizes, with telephone booth enclaves providing space for individuals in need of privacy.

Level Four is interconnected vertically through double-height collaboration spaces to Level Three below and Level Five above.

For an enlarged view of the level four plan, go to page 122.

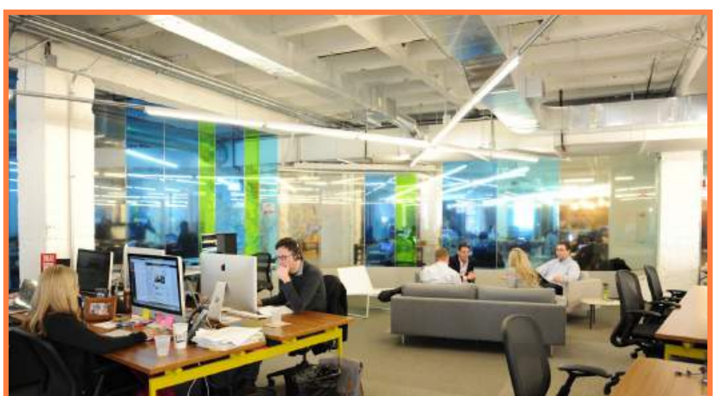
GOAL FOCUS:

- CAMCET will foster collaborative research that accelerates solutions for a healthy planet.
- CAMCET will catalyze partnerships.
- CAMCET will incubate start-up companies that succeed in the marketplace.

RESEARCH

PUBLIC

RESEARCH



INDUSTRY

N

LEVEL **FIVE**

LEARNING **14%**

RESEARCH **58%**

INDUSTRY **28%**

LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core / Mechanical / Unassignable

0' 10' 25' 50'

LEVEL FIVE

Moving up to the fifth floor, we find industry hot desks, an incubator lab module, shared instrumentation and a research lab module centrally located immediately off the elevator core. This integrated cluster of research and industry functions are open to the Level Four collaboration zone below, and terminate in a roof deck with views to the southwest and the Burke Gilman trail.

Similar to Levels Three and Four, the northwest quadrant of the floor plan is dedicated to a research zone with flexible, adaptable research space comprised of wet, dry and computational lab modules. Seven shared instrumentation suites are situated between the lab zone and the Testbed, shown here as a virtual reality and data visualization studio. Clustered between the shared instrumentation and research labs is an area dedicated to incubator labs, so that UW researchers, research collaborators and industry partners can share equipment and seamlessly move between their lab bench, office, and the scale up technology located in the Testbed.

Spaces dedicated to collaboration are located along the southern edge of the building, stacked vertically with the similar areas on the below floors. This area is open and bright, and ideal for meetings between the various building users from the four programmatic user communities. The collaboration spaces are designed to accommodate groups of varying sizes, with telephone booth enclaves providing space for individuals in need of privacy.

Level Five is interconnected vertically through double-height collaboration spaces to Level Four below and Level Six above.

For an enlarged view of the level five plan, go to page 123.

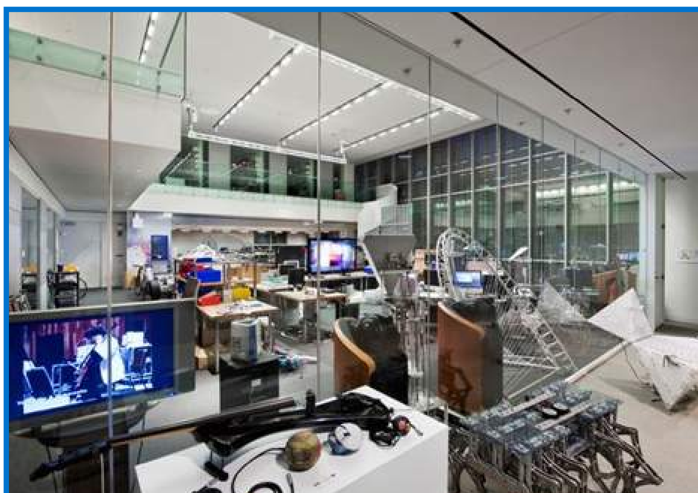
GOAL FOCUS:

- CAMCET will foster collaborative research that accelerates solutions for a healthy planet.
- CAMCET will catalyze partnerships.
- CAMCET will incubate start-up companies that succeed in the marketplace.

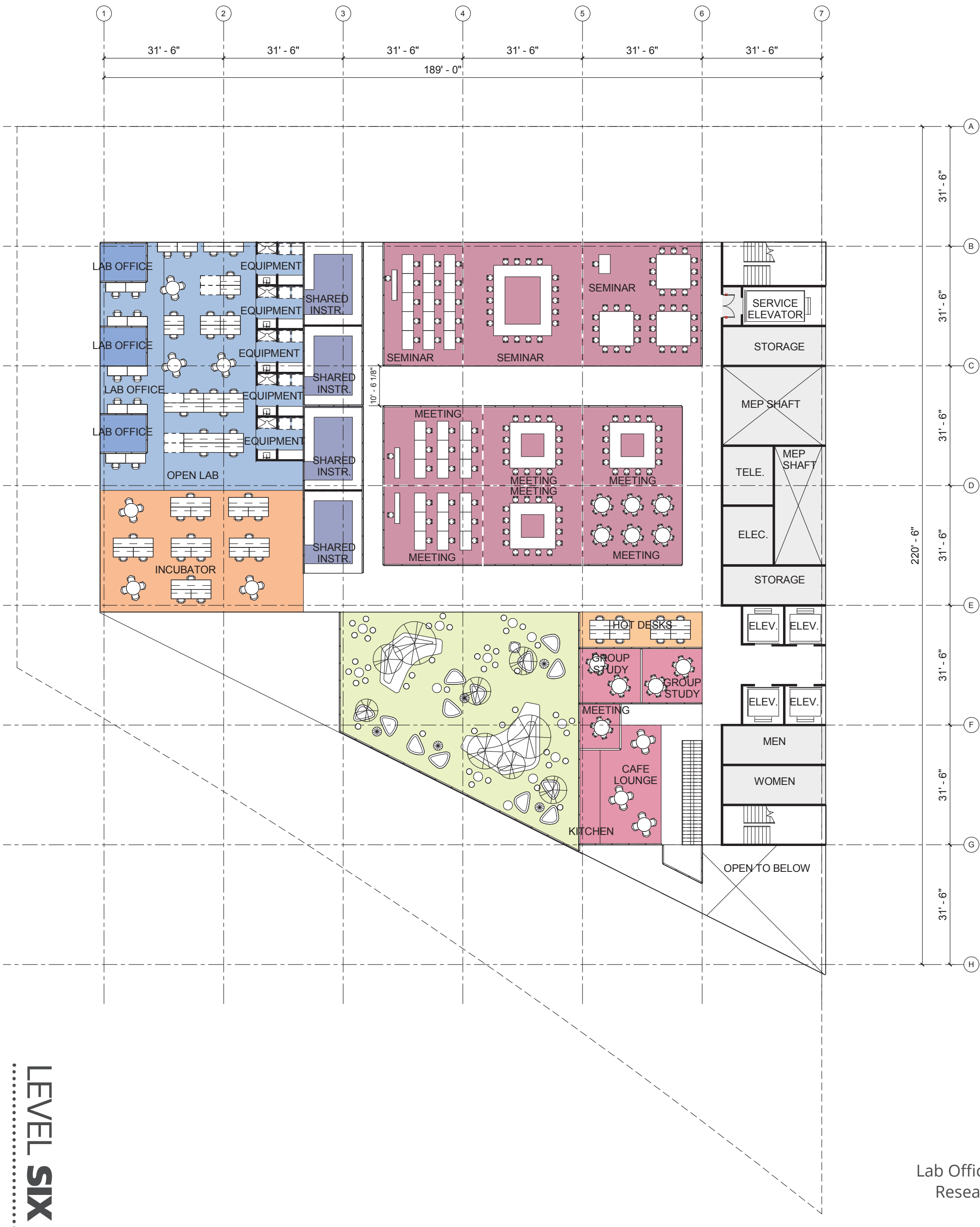
RESEARCH

RESEARCH

RESEARCH



RESEARCH



N

LEVEL **SIX**

LEGEND

Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms

Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation

Administration
Test Beds
Hot Desks
Incubation Labs

Back of House
Cafe
Building Entry

Core / Mechanical / Unassignable

LEARNING **35%** RESEARCH **35%** **10%**

0' 10' 25' 50'

LEVEL SIX

Similar to the ground and second levels, the sixth floor is designed to be accessible to all user communities with programmed area for learning, research, industry and public functions. Designed for flexibility, a cluster of modular conference rooms are connected to an outdoor roof terrace and collaboration spaces highlighted by views overlooking Portage Bay. This unique meeting and event space provides a distinctive environment where cleantech community stakeholders can come together for symposia, seminars, and outreach activities, with the overarching goal to accelerate solutions and promote partnerships.

As with other floors, it is important to integrate cleantech research and technology-intensive activities on this floor. Due to the more public nature of this floor, these labs exemplify cleantech on display, and provide an additional opportunity to integrate UW researcher, research collaborators and industry partners with students and the public.

For an enlarged view of the level six plan, go to page 124.

GOAL FOCUS:

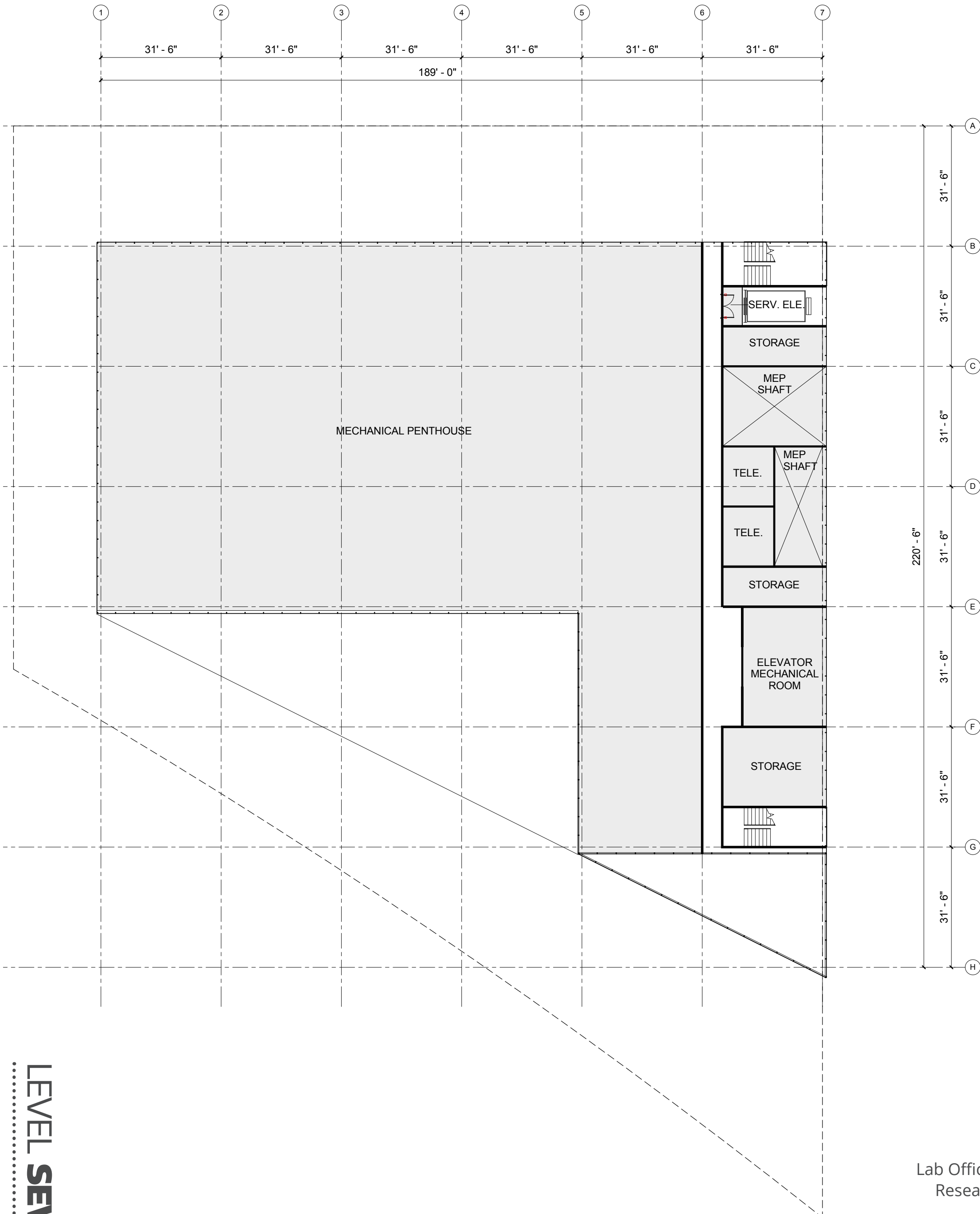
- CAMCET will foster collaborative research that accelerates solutions for a healthy planet.
- CAMCET will convene the clean tech community, and
- CAMCET will catalyze the UW Innovation District.

PUBLIC

PUBLIC

PUBLIC

PUBLIC



LEVEL SEVEN

This floor houses Mechanical spaces and is organized to allow services to stack directly above the open laboratory floors to help generate efficient systems.

For an enlarged view of the level seven plan, go to page 125.

N

LEGEND

Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable

LEVEL **SEVEN**

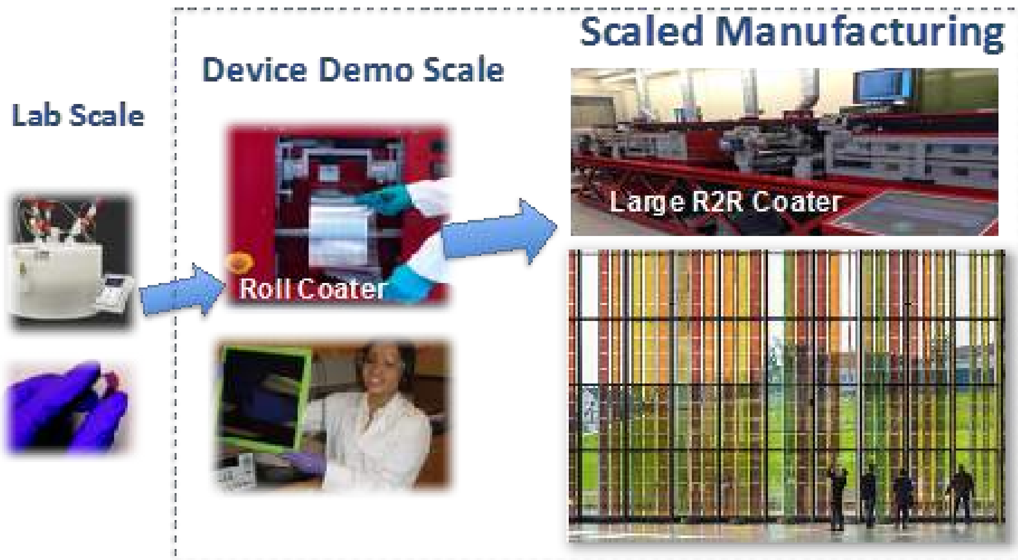
LEARNING **35%** | RESEARCH **35%** | INDUSTRY **35%**

0' 10' 25' 50'

EQUIPMENT REQUIREMENTS

The Scale-up and Characterization Testbed will have facilities to evaluate manufacturing processes and develop prototype products with validated performance. These facilities focus on development, characterization and fabrication of new materials and devices for energy storage and collection. The Testbed provides unique equipment that will permit research ideas to “scale up” to industry-ready devices. The facilities can be used for a wide range of printable and coatable materials.

System Integration Testbed will be a flexible commercial-scale clean energy system with plug and play replacement of software and hardware components, to test component performance as part of an operating system. The system will use the UW-PNNL grid.








LAB ADJACENCIES

Wet Lab Module

The lab zone on the following page represents a typical planning strategy for a research team with a chemical science base. The chemical research bay areas are configured on a series of planning principles which include the following:

The bench area will be focused on wet bench space, with a fume hood zone.

Sinks can either be located directly outside of the bench zone, or at the end of the benches.

Each team will have the ability to include up to one (1) chemical fume hood per person up to six (6) chemical fume hoods total.

Ratio of 11:1 bench lab to support lab space

Shared Instrumentation areas will facilitate equipment needs of a cluster or group of researchers on each floor.

Dry Lab Module

The lab zone to the right represents a typical planning strategy for a research team with a physical science base. The physical research bay areas are configured on a series of planning principles which include the following:

The bench area shall provide flexibility for location of larger equipment or instrumentation needs.

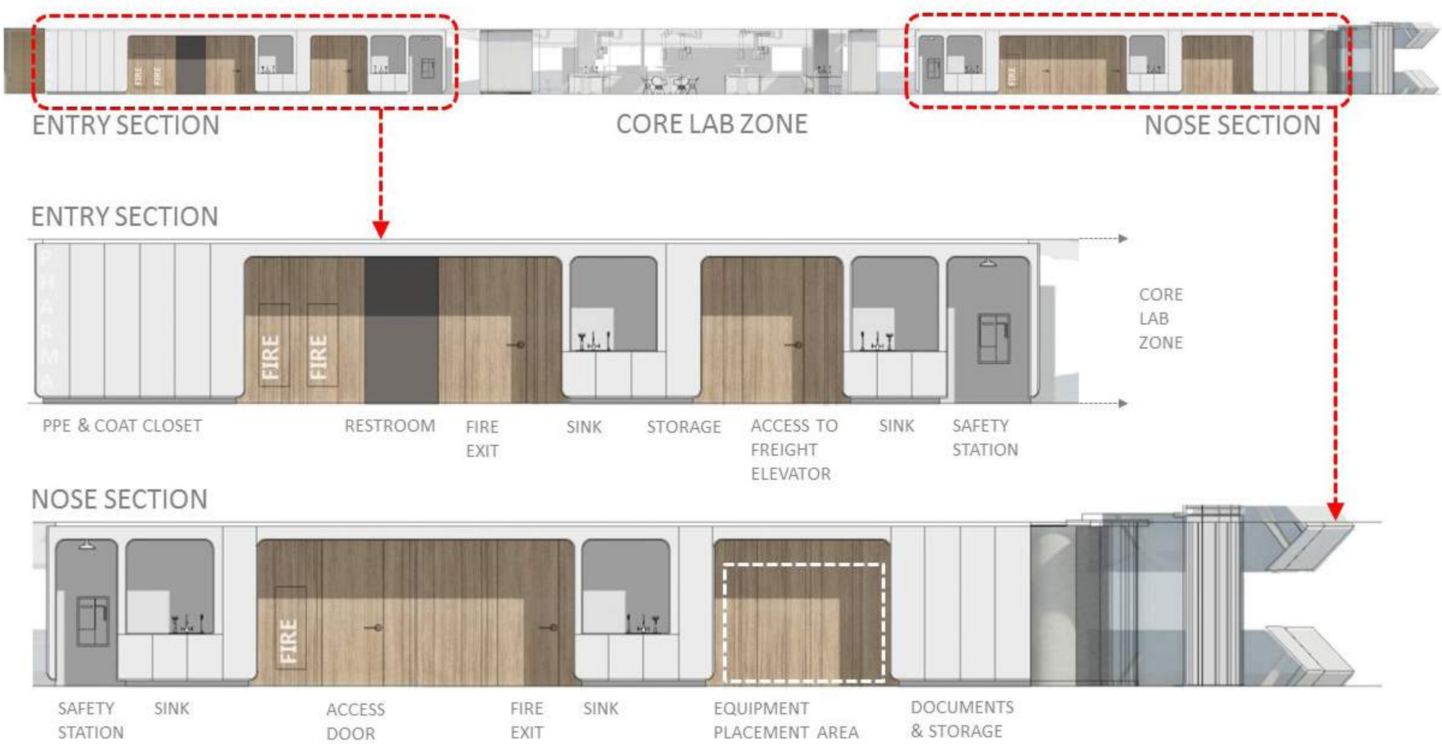
Primarily a dry lab, with ability to include a sink if needed.

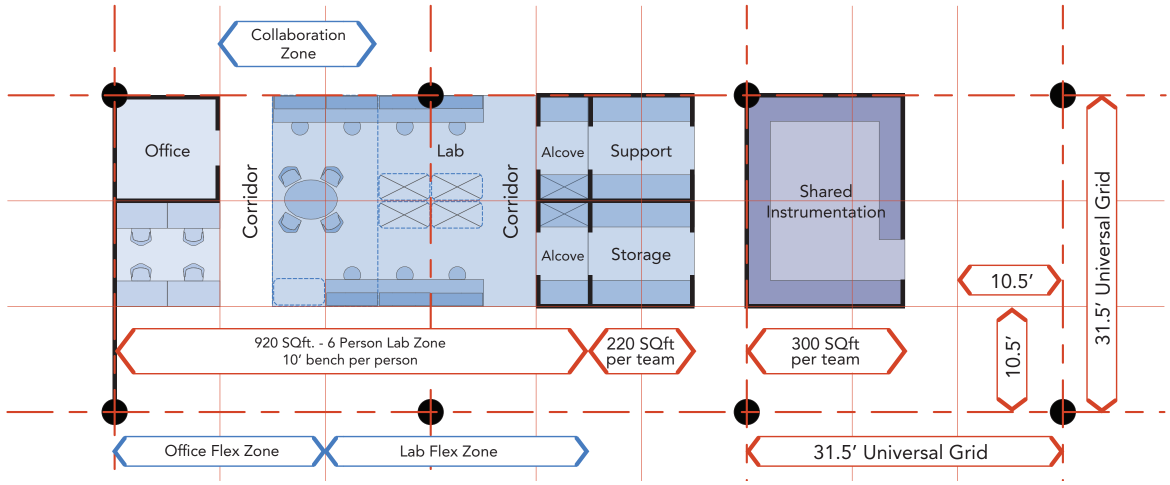
Each team will have the ability to include up to two (2) fume hoods

Ratio of 12:1 bench lab to support lab space

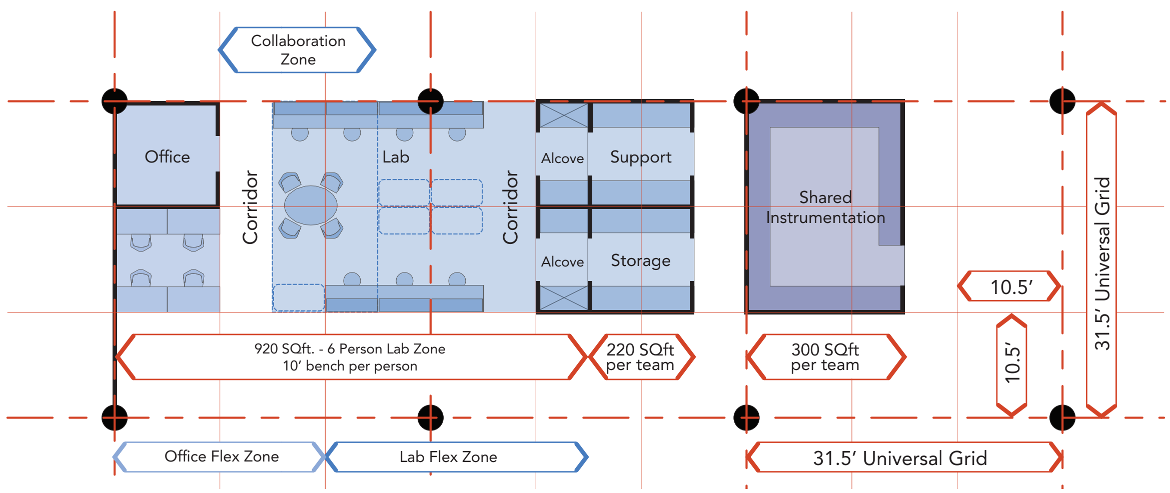
Shared Instrumentation areas will facilitate equipment needs of a cluster or group of researchers on each floor.

CORE AND EQUIPMENT

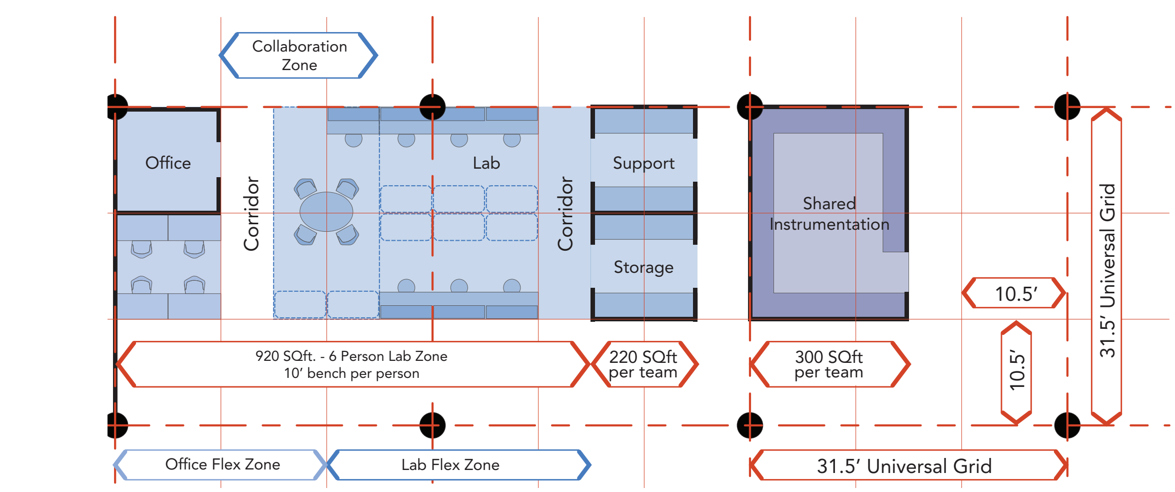




Wet Lab Module – With Alcove



Dry Lab Module – With Alcove



Dry Lab Module – No Alcove

LEGEND

Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation

Computational Lab Module

The lab zone to the right represents a typical planning strategy for a research team with a computational science base. The computational research bay areas are configured on a series of planning principles which include the following:

The bench area shall provide flexibility for location of larger equipment or instrumentation needs tables with computers, monitors. and small instrumentation, and shall be combined with the desk area.

Each team will have the ability to include up to two (2) monitors per person.

Primarily a dry lab, no sinks are required. However, it is flexible enough to have the ability to include a sink if needed.

No fume hoods are required for this type of lab module.

Ratio of 12:1 bench lab to support lab space.

Shared Instrumentation areas will facilitate equipment needs of a cluster or group of researchers on each floor.

Incubation Lab Module

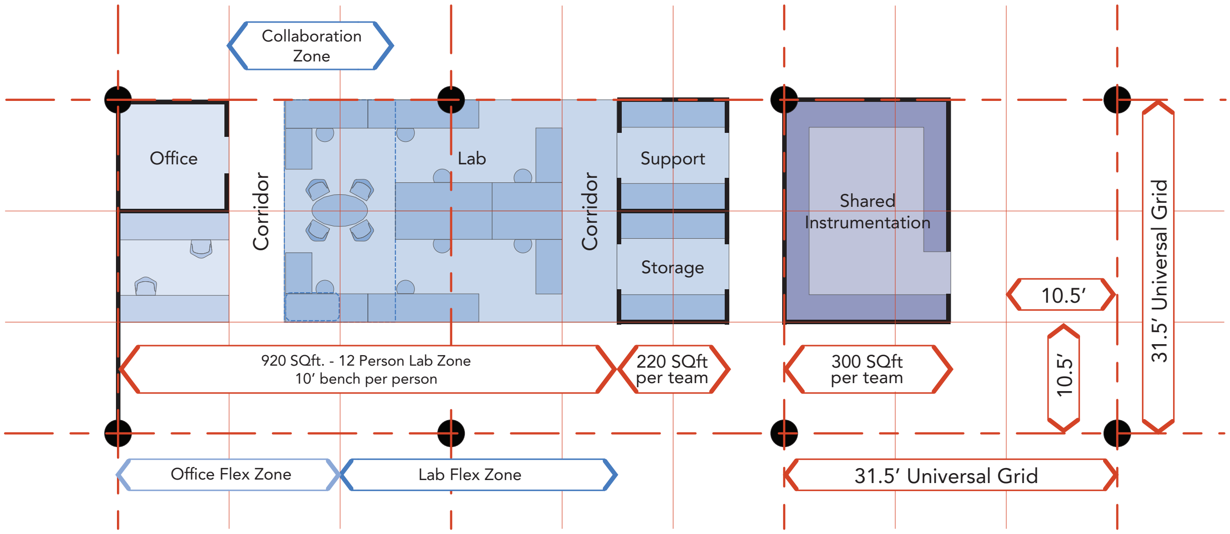
The lab zone to the right represents a typical planning strategy for two project teams of 4 members. Each bay is configured on a series of planning principles which include the following:

The bench area shall provide flexibility for location of larger equipment or instrumentation needs.

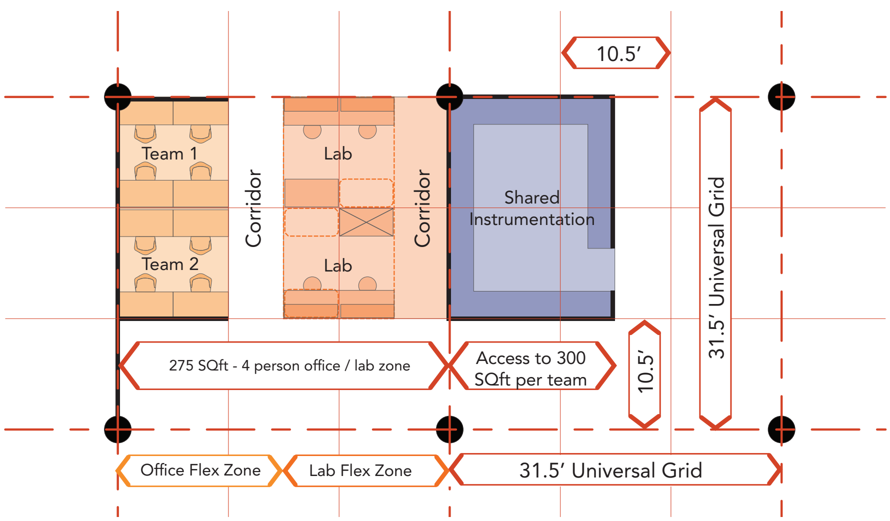
Primarily a dry lab, with ability to include a sink if needed.

Each team will have the ability to include up to two (2) fume hoods.

Ratio of 1:1 bench lab to support lab space with the ability to use the shared instrumentation on each floor for additional equipment needs.



Computation Lab Module

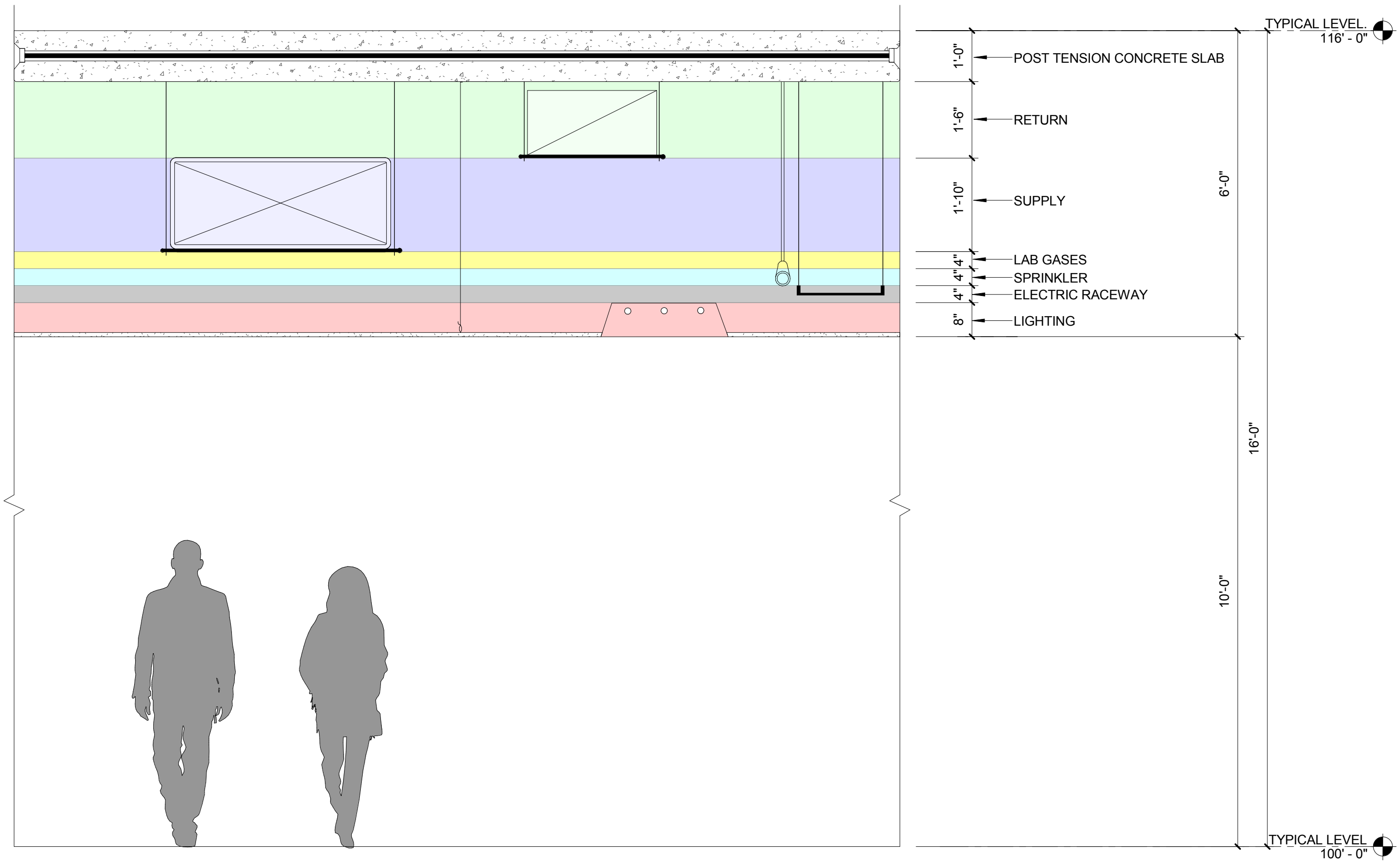


Incubation Lab Module

LEGEND

Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Hotel Spaces
Incubation Labs

MECHANICAL



Above: Prefabricated MEP Modules in typical ceiling section

Prefabricated MEP Modules

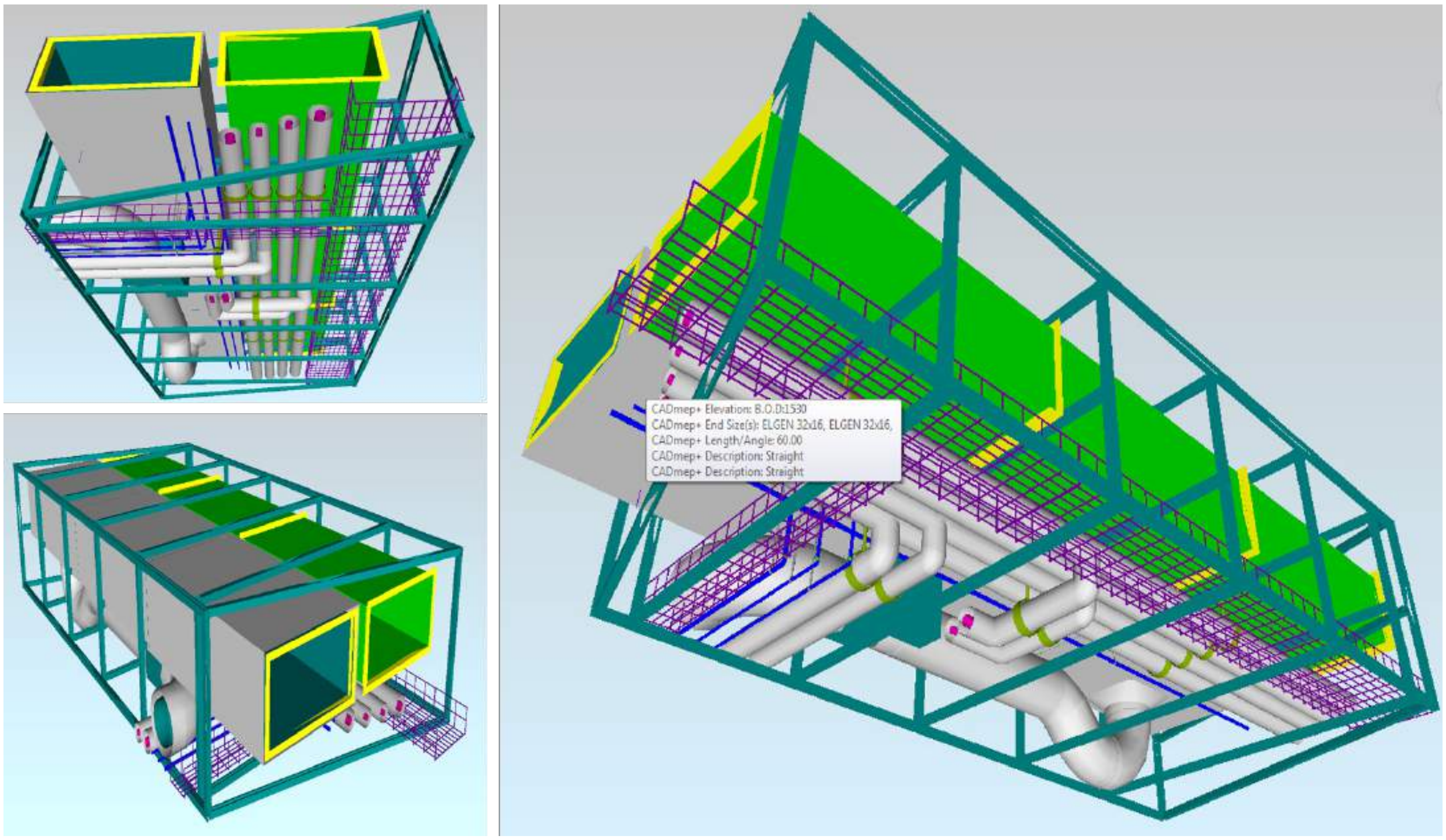
Speed has been identified as an important criterion for the construction of this project. One method that has been employed on many projects lately is the use of prefabricated modules for MEP systems.

These modules are assembled in a “factory” (typically a warehouse type facility located near the construction site) and delivered to the job site, to be connected to other modules, to create the piping, ductwork and conduit systems that serve the building.

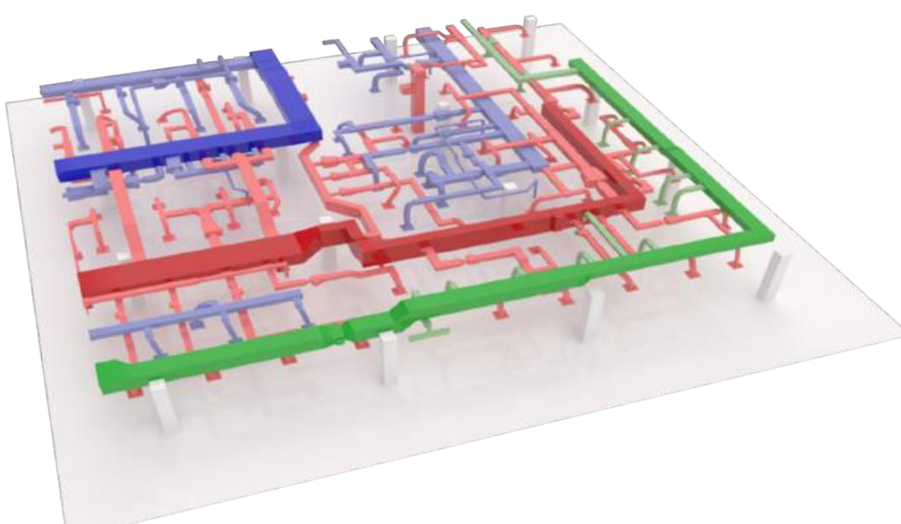
There are several advantages to this type of construction. Most of the work in this construction is performed in a clean, environmentally controlled space, by workers standing on a floor, as opposed to working overhead from ladders and scaffolds. This not only makes the process quicker, it also provides better quality control and improved safety and comfort for the workers.

The assembly of the modules offsite means that the MEP work can begin before the building shell is completed, and scheduling the various trades is simpler as there are fewer workers on the construction site.

All of this can lead to faster construction times, with better quality than standard “stick-built” system construction.



Above: 3D model of Prefabricated MEP Modules assembly



SUSTAINABILITY

Environmental Stewardship Advisory Committee

The University of Washington's commitment over the years has progressively been reinforced by the following measures:

- Establishment of the Environmental Stewardship Advisory Committee (ESAC), which provides recommendations for environmental policies at the University of Washington, and oversees progress towards meeting the goals of the UW Climate Action Plan

- Signing of the President's Climate Commitment for higher education institutions, which commits the University to a joint effort between academia and operations to achieve carbon neutrality

-Development of the Climate Action Plan, which commits the University to climate neutrality by 2050.

State legal mandates require publically funded new or majorly remodeled buildings to meet a minimum LEED Silver Certification level and report energy and water use for all UW buildings to the EPA's Energy Star Portfolio Reporting Program.

A summary of the Sustainability Design Charrette and the LEED v4 Checklist can be found in Appendix C.

UW Climate Action Plan

The UW is a founding signatory to the American College & University Presidents' Climate Commitment (ACUPCC), and is committed to developing an institutional action plan for becoming climate neutral.

In January 2009, under the auspices of the Environmental Stewardship Advisory Committee, a Climate Action Planning Oversight Team formed to coordinate the drafting of a Climate Action Plan. Teams of faculty, students, administrative leaders and staff across all three campuses worked together to develop the UW plan, which was submitted to ACUPCC on September 12, 2009. The Plan describes preliminary strategies to be explored by the UW, including our intent to work toward becoming climate-neutral. The UW Climate Action Plan sets out broad strategies--i.e. a "Plan to Plan," that will guide us to that goal.

In order to achieve zero carbon by 2050, major investments in the University's infrastructure are required. Analysis is currently underway on existing legacy buildings that will provide information to set broader policies where individual building projects can contribute to overall carbon reduction. The largest source of Scope I & II emissions comes from the power plant, which heats the buildings on the Seattle campus. Replacing the Central Utility Plant is a long term goal; however, in the interim, the focus should be on heating and cooling buildings more efficiently and sustainably, including reducing energy demand and looking for alternative sources of energy.

This project supports the energy use and greenhouse gas emission reduction goals of the UW Climate Action Plan by replacing existing space with new, more efficient spaces. Building system improvements that are part of this project, including upgrades to mechanical, electrical and lighting systems will be more efficient than the systems they replace. More efficient systems are anticipated to help reduce the overall campus energy use.

CODES AND REGULATIONS

Applicable Building Codes

The building design will be designed in accordance with adopted building and energy codes and local amendments current at the start of design. It is expected that the project will target LEED silver certification, and be developed consistent with the University's most current Master Plan goals.

The City of Seattle Municipal Code (SMC) is the governing document for land use and building codes applicable to the Facility.

The construction will comply with the Seattle Building Code (SBC) and ADA accessibility codes as adopted and amended by the City of Seattle, Department of Construction and Land Use.

Structural design and construction shall be in accordance with the more stringent requirements of the following codes and standards:

- Seattle Building Code, 2012 Edition
- ASCE 7-10, Minimum Design Loads for Buildings and Other Structures
- Design and Construction shall be in accordance with applicable Energy Codes including:
- The Washington Energy Code
- Seattle Energy Code
- Washington State Ventilation and Indoor Air Quality Code

The most current edition of the above codes and regulations shall be used.

CAP
UW CLIMATE ACTION PLAN

[CAMCET] will add momentum to the future growth of the University of Washington Innovation District - and will be an important asset to the campus in its future growth.

[04] SITE ANALYSIS

GUIDING PRINCIPLES OF THE CAMPUS MASTER PLAN

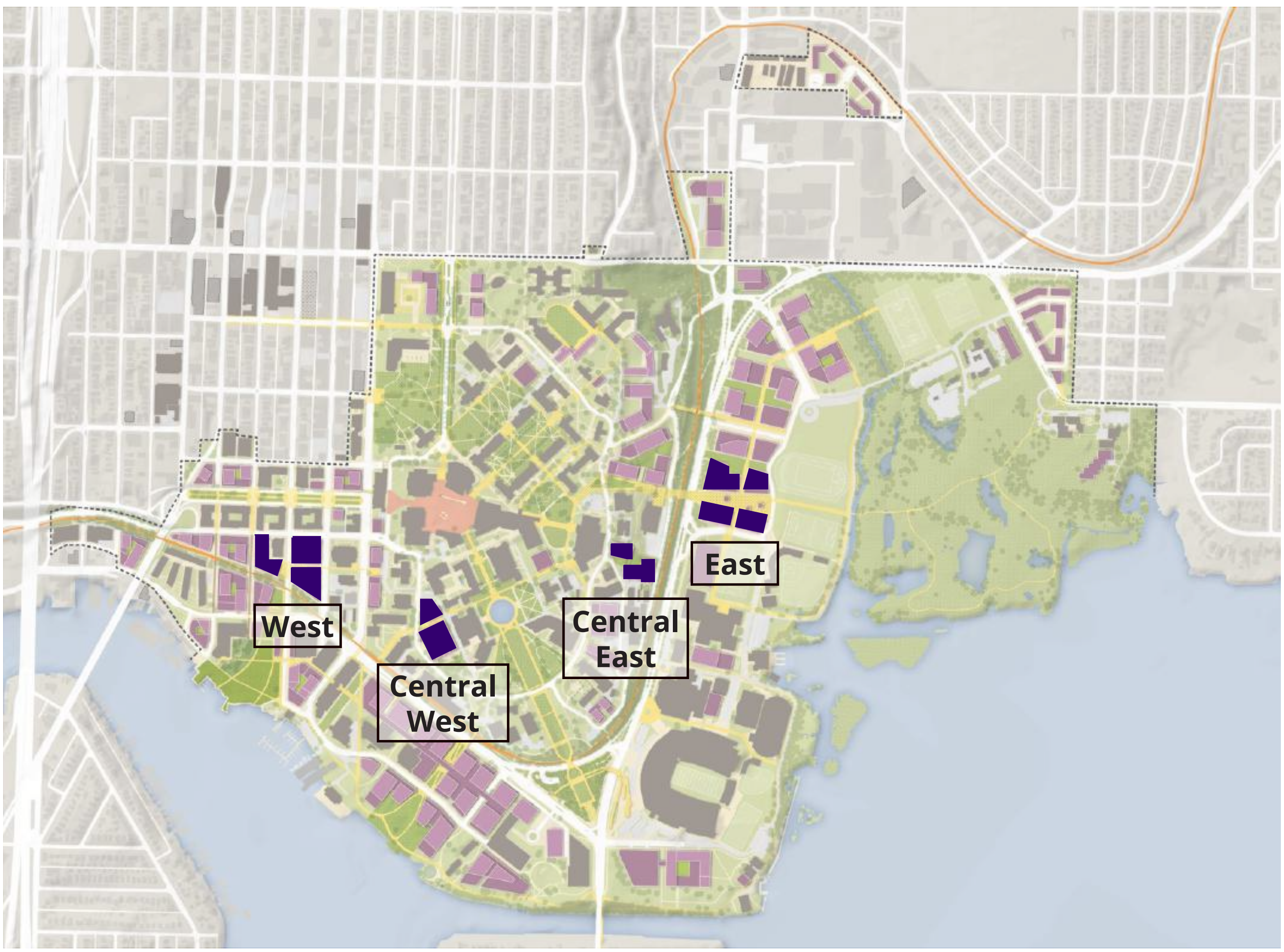
1. Flexible Framework for growth and expansion
2. Pedagogy based University / Industry
3. Partnership
4. Sustainable development
5. Connectivity
6. Stewardship of Historic & Cultural resources

Four Districts identified by the University of Washington Master Plan were evaluated and the west campus specifically the UW Innovation District was determined as the ideal location for the CAMCET building.

Campus Precinct Plan

EVALUATION CRITERIA

1. Access to campus research diversity and multidisciplinary interaction
2. Campus connectivity
3. Access to ecosystem support amenities (food, Recreation and living)
4. Site availability for Ecosystem growth
5. Proximity to university resources
6. Vehicular and public transportation accessibility by UW and partners
7. Visibility and exposure (inward and outward)
8. Site Capacity
9. Impact on Existing Uses
10. Relative Construction Cost



Alternative Sites

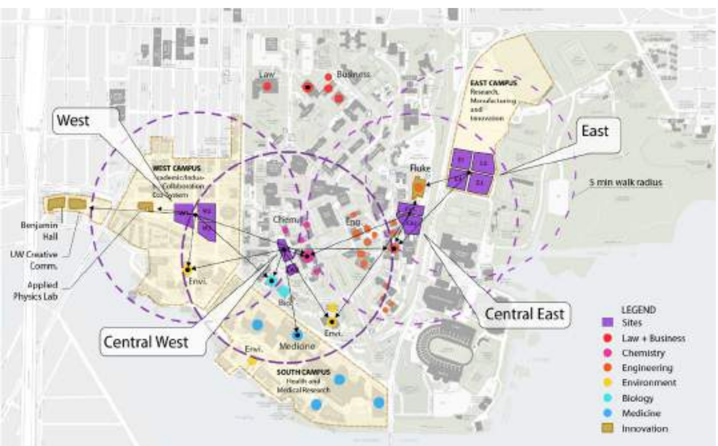
CAMPUS PRECINCT EVALUATION

Site Selection Process

The design team evaluated a wide cross section of sites around the campus to establish an appropriate location on the UW campus for the proposed Center for Advanced Materials and Clean Energy Technologies (CAMCET). Twelve sites in total were identified across the four campus precincts per the diagrams below. These four precincts East, Central East, Central West and West were evaluated in respect to criteria established to promote the development and future growth of a research ecosystem, a key criteria for proposed CAMCET facilities. The four diagrams below depict the key attributes that have been utilized to define the success of an ecosystem and were used as the foundation of the evaluation tool used to grade each of the four precincts and their respective sites. Each district was studied relative to their assets that assist in the creation of a support system necessary for the development of an innovation/partnership synergies:

1. Proximity to Existing Scientific and Innovation Buildings on Campus
2. Accessibility to the Site from Campus and Outside Partners
3. Accessibility to Amenities that Support a 24/7 Innovation Culture
4. Potential for a large Scientific Floor plate, maximum allowable area and future growth

The West Campus was found to be an ideal location for CAMCET as the Center's operational model makes it a synergistic anchor for the developing UW Innovation District in this precinct.



Proximity To Scientific And Innovation Facilities

1. The west campus has been identified as an Industry collaboration zone.
2. There are innovation type programs currently on the west campus.
3. While the central sites are in closer proximity to campus resources, chemistry and engineering remain somewhat disjointed.
4. Fluke as a resource has adjacency to Cw and the east campus.
5. The East campus is identified as an innovation hub.
6. Business and Law schools could be looked at as participants in this collaborative environment.

Access To Amenities

7. The west campus is close to commercial, recreation, food and living.
8. The Central-East site is close to the Husky Union as a resource but disjointed from commercial and living.
9. The Central-West site does not have a strong adjacency to food, commercial or living.
10. The East campus will remain disjointed from commercial resources for some time.

Campus Precinct Scorecard

POSITIVE (+) | NEUTRAL | NEGATIVE (-)

VISION

	W	Cw	Ce	E
Proximity to assets	Positive	Neutral	Neutral	Negative
Proximity to scientific diversity and interaction	Neutral	Positive	Positive	Neutral
Promote unique brand	Positive	Neutral	Neutral	Positive
Visibility	Positive	Negative	Neutral	Neutral

W

	W	Cw	Ce	E
Compatibility with Master Plan Land Use	Positive	Neutral	Neutral	Positive
Synergies with neighboring facilities	Neutral	Positive	Positive	Negative
Opportunities for future expansion	Positive	Neutral	Neutral	Positive
Pedestrian access and connection to campus	Neutral	Positive	Positive	Negative
Proximity to university resources	Neutral	Positive	Positive	Negative
Integration of amenities that nurture ecosystems	Positive	Neutral	Neutral	Negative
Accessibility	Positive	Negative	Negative	Neutral

SUSTAINABILITY

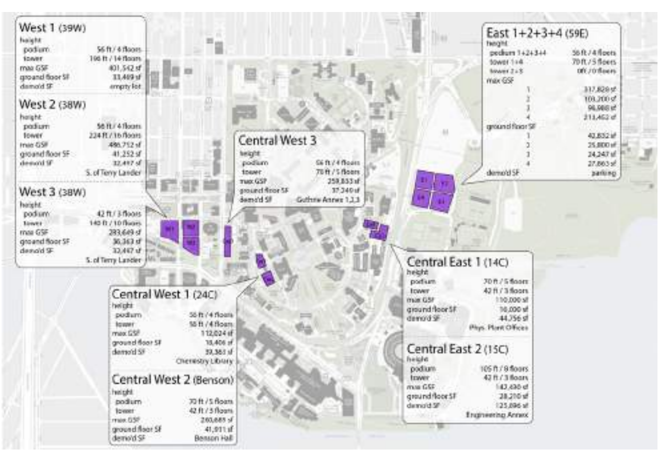
	W	Cw	Ce	E
Ability to maximize buildable area	Neutral	Positive	Positive	Neutral
Orientation	Positive	Neutral	Negative	Positive

PROGRAM

	W	Cw	Ce	E
Accommodates parking	Neutral	Negative	Negative	Positive
Service access	Positive	Negative	Negative	Positive
Access to transit	Neutral	Neutral	Neutral	Negative

COST

	W	Cw	Ce	E
Displaced facilities	Neutral	Neutral	Neutral	Positive
Utilities access	Positive	Positive	Positive	Neutral
Total	+10	+2	+2	+1



Site Accessibility

1. The west campus is well connected to the adjacent districts and will be enhanced by future master plan projects.
2. All sites will be within a five minute walk to the future subway stations. The East site is slightly further than the other three sites.
3. The east site will have opportunity to create ample parking for future development.
4. West campus will have the opportunity to plan ample parking but might be below grade at a higher cost than above grade.
5. Both central sites are landlocked into the university core with limited parking resources.
6. The west site will be the most convenient to access from outside of the university.
7. There is a strong link back to the central campus from the West site.

Site Statistics

8. The west and east sites will provide the most development opportunity to grow the proposed ecosystem.
9. The central sites although most closely aligned with existing campus resources, will not be able to support much future growth of the ecosystem.

WEST CAMPUS ALTERNATIVE SITE ANALYSIS

West Site A

Master Plan

Podium Height	56Ft / 4 Floors
Tower Height	196 Ft / 14 Floors
Max Sf	401,542 Sf
Ground Floor	33,469 Sf
Demolished Sf	Empty Lot

West Site B

Master Plan

Podium Height	56Ft / 4 Floors
Tower Height	224 Ft / 16 Floors
Max Sf	486,752 Sf
Ground Floor	41,252 Sf
Demolished Sf	32,497 Sf S. Of Terry Lander

Massing

Podium Sf	41,200 Sf X 3 Floors
Tower Sf	25,000 Sf X 4 Floors
Total Sf	223,600 Sf

Alternative Site Consideration

Four sites have been identified within the West Campus precinct for further consideration. The sites range in location from direct adjacency to Campus Engineering at the edge of the Central Campus to the center of the UW Innovation District two blocks further west.

Massing studies were developed for all four sites to test each sites physical parameters including floor plate size large enough to create a collaborative scientific environment and each sites available maximum Floor Area versus the proposed Center's program wanting to accommodate close to the Area envisioned in the 2016 West Campus Master plan guidelines. Other important criteria were costs to make the site ready for construction such as demolition and utility infrastructure, pedestrian access, as well as access from neighboring resources.

A similar scoring process utilized for identifying the West Campus precinct was used to focus in on the most desirable West Campus site for developing CAMCET.

In this process Site C was clearly the most desirable site due in part to the sites ability to house a large scientific floor plate able to be organized around the idea of collaborative work/learn environment and the program of CAMCET being able to maximize development potential outlined in the Campus Master plan. It is also desirable for this facility to add momentum to the future growth of the UW Innovation District which is an important asset to the campus in its future growth. Adjacency to the west campus utility plant provides additional educational opportunities.

West Site C

Master Plan

Podium Height	42Ft / 3 Floors
Tower Height	140 Ft / 10 Floors
Max Sf	283,649 Sf
Ground Floor	36,363 Sf
Demolished Sf	32,497 Sf S. Of Terry Lander

Massing

Podium Sf	36,363 Sf X 2 Floors
Tower Sf	25,000 Sf X 6 Floors
Total Sf	222,726 Sf

West Site D

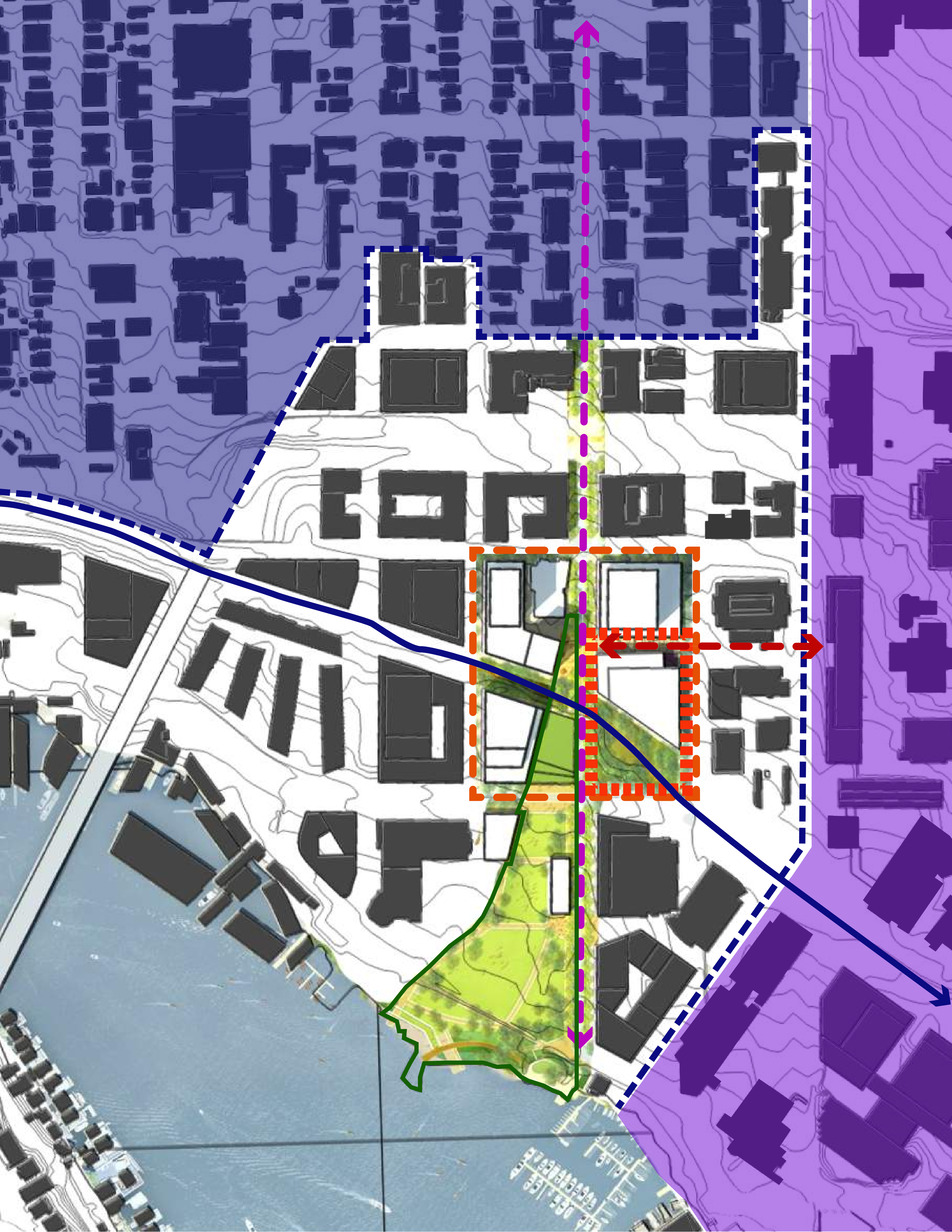
Master Plan

Podium Height	56 Ft / 4 Floors
Tower Height	70 Ft / 5 Floors
Max Sf	259,833 Sf
Ground Floor	37,249 Sf
Demolished Sf	Guthrie Annex 1-2-3

West Campus Site Scorecard

Category	W_A	W_B	W_C	W_D	Criterion
VISION	Neutral	Neutral	Neutral	Positive	Proximity to assets
	Neutral	Neutral	Neutral	Positive	Proximity to scientific diversity and interaction
	Positive	Positive	Positive	Neutral	Premote unique brand
VISIBILITY	Neutral	Positive	Positive	Neutral	Visibility from campus
	Neutral	Positive	Positive	Neutral	Visibility from city
UNIVERSITY OF WASHINGTON	Negative	Positive	Positive	Negative	Compatibility with Master Plan Land Use
	Neutral	Positive	Positive	Neutral	UW Innovation Initiative (Proximity to UW Inn. District)
	Neutral	Positive	Positive	Positive	Campus Master Plan fit
	Positive	Positive	Positive	Positive	Synergies with neighboring facilities
	Positive	Positive	Positive	Negative	Opportunities for future growth
	Neutral	Neutral	Neutral	Positive	Proximity to university resources
	Positive	Positive	Positive	Neutral	Integration of amenities that nurture ecosystems
	Positive	Positive	Positive	Neutral	Access to green space
SUSTAINABILITY	Positive	Neutral	Positive	Positive	Site Capacity / Fit (target 250K)
	Negative	Positive	Positive	Negative	Ability to receive natural daylight
	Neutral	Neutral	Neutral	Negative	Orientation
	Negative	Negative	Neutral	Neutral	Ability to receive PV radiation
PROGRAM	Positive	Positive	Positive	Negative	Accommodates parking
	Negative	Positive	Positive	Negative	Program need/support (floorplates, floor to floor)
	Neutral	Neutral	Positive	Negative	Ground level inside/outside connection
COST	Negative	Negative	Neutral	Neutral	Site related costs (Displaced facilities)
	Negative	Negative	Neutral	Neutral	Timing issues (Demolition/Relocation needed)
ACCESS	Neutral	Neutral	Neutral	Neutral	Access to transit
	Positive	Positive	Positive	Neutral	Service access
	Neutral	Positive	Positive	Positive	Adjacency to campus utility tunnel
	Neutral	Neutral	Neutral	Positive	Pedestrian access and connection to campus
TOTAL SCORE	2	12	17	1	

+ POSITIVE   NEUTRAL   - NEGATIVE

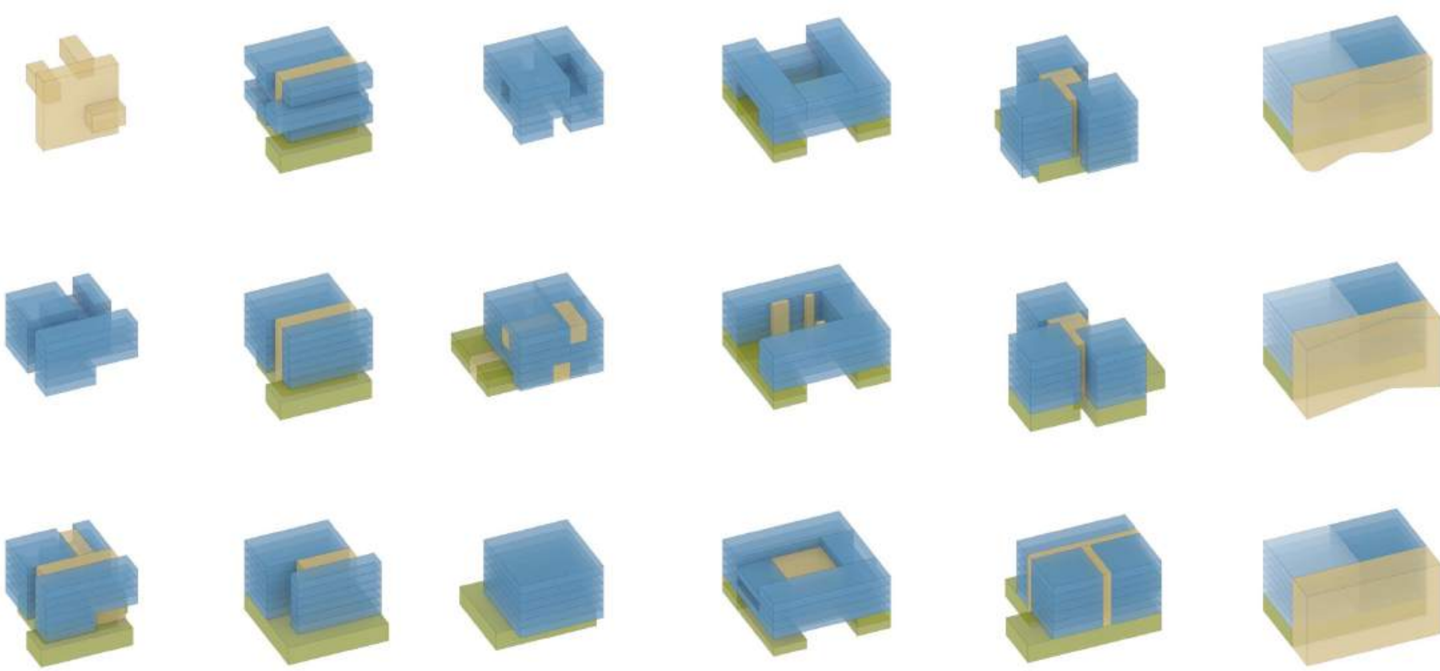


ORGANIZATIONAL MASSING STUDIES

A concern with West Campus Site C was its unique trapezoidal shape. To test the viability of this sites shape, massing options for the CAMCET program were tested without constraint to site. Massing options with an optimum floor plate size and configuration with the ability to integrates the learn/work collaborative environments were developed and compared to options that on were shaped to fit Site C.

The discovery was that the unique configuration of site C could be utilized as an advantage defining large flexible scientific floor plates integrated with articulated collaborative environments, giving definition to both elements and creating a unique mass that is descriptive of its use from the external massing of the Center.

Generic Program Organization Studies



Site West C – Program Organization Studies

4.2 Minimizing Mitigation Requirement

Since the preferred site is not selected as part of the Predesign efforts, the budget has allowed for soils remediation to minimize site mitigation.

4.3 Acquisition Process

All sites under consideration are existing campus development sites already owned by the University of Washington.

4.4 Preferred Site(s)

The preferred site will be identified prior to the start of design following additional review of site conditions and constraints, and further development of building and site program requirements.

Site C has been chosen for the purpose of completing the project analysis and illustrating the program concept in this predesign report.

In one place, we will have industry partners, students, faculty, tech scouts, and start-ups working in the world's most integrated cleantech laboratory building.

[05] PROJECT BUDGET ANALYSIS

BUDGET ASSUMPTIONS

Basis of Estimate

This estimate has been prepared to provide an estimate of anticipated construction cost and total project cost for the proposed University of Washington Center for Advanced Materials and Clean Energy Technologies (CAMCET) project located on the Seattle Campus.

The estimate is based upon information obtained from and included within the final programming package dated June 30, 2016 prepared by CannonDesign. Where information was insufficient, assumptions and allowances were made based on, wherever possible, discussions with the Owner, Architect and Engineers.

The estimate is for the sole use of providing construction and project budgets based on the available programming documentation. The estimate is not to be used for comparison with actual bids received at any time. An updated estimate based on fully developed construction documents will have to be prepared for comparison with any future bids.

Benchmarking

The following cost model was developed in collaboration with the entire project team, and it establishes the construction cost for the building as well as the overall project cost. It is based on historical cost data for similar programmatic spaces as identified in Program Analysis section and similar institutions of a similar size and function with escalating costs to today's dollars.

Detailed benchmarking table can be found in Appendix B.

The State of Washington commissioned Berk & Associates to complete a Higher Education Capital Facilities Financing Study in December, 2008. This information was used as an additional resource when benchmarking the UW CAMCET cost model. To achieve an appropriate cost comparison, the 2008 study cost data was escalated to the midpoint of construction the CAMCET project. The analysis addressed the major programmatic group space types. The cost benchmark process result, for a 172,596 gross square foot CAMCET project, is $159,033,000.

Program Element	Escalated Berk & Associates Study $ / Gross Square Feet	Gross Square Feet	Total Project Cost
Learning Space	$801	52,250	$41,852,000
Research Space	$1,005	68,780	$69,124,000
Industry Space	$1,005	37,641	$37,829,000
Public Space	$734	13,925	$10,228,000
TOTAL		**172,596**	**$159,033,000**

COST ESTIMATE

Key Project Metrics

The following is a list of key project metrics (estimate variables) that have been used in the preparation of the estimated construction cost:

Gross Floor Area (GFA)

- Level 1 – 33,000SF
- Level 2 – 27,596SF
- Level 3-6 – 23,000SF
- Level 7 – 20,000SF

Total (Building GFA) – 172,596SF

Floor to Floor Heights

- Level 1 to Level 2 – 20'-0"
- Level 2 to Level 3 – 18'-0"
- All intermediate levels – 16'-0"
- Level 7 (Penthouse Level) – 18'-0"

Pricing

Unit pricing is based on June 2016 costs. Project costs were based upon progressive design-build procurement method. Construction escalation has been carried at 4.5% per year in the estimate and assumes midpoint of construction to be in April of 2020. A construction contingency has also been included at 5%.

Detailed Cost Estimate

A detailed cost estimate can be found in Appendix B.

FUNDING

Overview

CAMCET program revenues will be used to cover costs of debt (or rent) and operating expenses. Revenues in this report are separated into two categories: external and internal. All revenues are generated by base rents, operating expense reimbursements and membership fees. Furthermore, internal (UW) occupancy charges are funded by internal funding, research grants, and lab fees.

Numbers are in 2016 dollars, not escalated to 2021.

CAMCET vacancy is assumed to be 7% rather than using an industry standard 5% because of the dynamic nature of the expected occupancies—low obstacles to entry, high dependence on entrepreneurial activities and new technologies leads us to expect higher churn than a typical research or commercial laboratory building.

All square foot (sf) references are shorthand for Rentable Square Feet (RSF) and Gross Square Feet (GSF) which are assumed to be the same for the purposes of this plan.

External Rent

Some space will be rented by external tenants at market rates. The current plan is to rent out 22,500 SF to external tenants or approximately 26% of the CAMCET assignable space. The expected external rent revenues (after 7% vacancy) are a little under 2.4 million a year

External Membership fees

Costs for some of the space occupied by UW will be mitigated by revenue from individuals who pay for use of space on a monthly or hourly basis. The fees will be based on the amount of access to equipment and lab space. External customers pay full market rates.

External Fee Assumptions

Currently we've allocated 17,000 SF of space to memberships. Monthly membership capacity is estimated at 50 SF per monthly member and 10 SF a month per hour of hourly use.

Based on those numbers external membership revenue is expected to be a little over 1.6 million per year.

External Expense Reimbursements

All long term lease tenants, whether internal or external, will reimburse expenses. Based on the expected space composition and these assumptions (plus vacancy @7%), external expense reimbursements will total about 1.0 million a year.

Total External Revenues

Total gross external revenues are approximately 5.0 million per year.

Internal Rent

Some space will be occupied by internal (UW) tenants a reduced market rate.

Assuming 122,000 SF is allocated to internal occupants, or approximately 70% of the CAMCET space, the expected internal occupancy revenues (after 7% vacancy) are approximately 4.1 million a year.

Internal Membership Fees

Internal Membership fees are also calculated as 75% of market rates. Currently we've allocated 17,000 SF of space to memberships. Monthly membership capacity is assumed to be 50 SF per monthly member and 10 SF a month per hour of hourly use.

Based on those numbers internal membership revenue is expected to be a little over 1.1 million per year

Internal Expense Reimbursements

All long term lease tenants, whether internal or external, will reimburse operating expenses. Based on the expected space composition and these assumptions (plus vacancy @7%), internal expense reimbursements will total about 1.9 million a year.

Total Internal Revenues

Total internal revenues are approximately 7.1 million per year.

Total Revenues

Total revenues are approximately 12.1 million per year.

Additional Potential Revenue Streams

Internal revenue must be generated to contribute to coverage of occupancy costs that are counted as "internal revenue".

UW internal occupancy charges and expense reimbursements (internal memberships are currently not being paid out of this revenue pool) are generated by allocating a cost-share for the classroom space. A small portion of the revenue is also generated by lab fees. Revenue is also generated by Principal Investigators (PI's) through grant mechanisms.

Based on our assumptions, about 6.4 million is generated per year.

PROJECT COST ESTIMATE

COST ESTIMATE & TARGET VALUE BUDGET

The UW Capital Planning and Development Office developed a Total Project Cost target value budget based on the Maximum Allowable Construction Cost (MACC) cost estimate prepared by the consultant. The state of Washington's C100 (2014) cost estimating model was used as the basis for this budget, applying consultant and project management fees, contingencies and escalation.

A summary of projected project costs are included in the Executive Summary.

A detailed cost budget using the OFM C100 form and the cost analysis based on the space types are provided in Appendix D.

Consultant Services	$21,407,000
Construction Contracts	$115,760,000
Equipment & FFE	$14,450,000
Art Work	$462,000
Other Costs	$2,279,000
Project Management	$4,675,000
Total Project Costs	**$159,033,000**

FINANCING PLAN

This plan has CAMCET as anchor tenant in a large privately owned building. Instead of debt service, CAMCET's biggest expenditure will be lease payments. Other major expenditures are operating expenses, equipment, capital expenses, Tis, and leasing commissions for sub-lessees.

Numbers are in 2016 dollars, not escalated to 2021.

REVENUES

Internal revenues are discussed in detail in the separate CAMCET Revenue Business Plan and are assumed to total 12.1 million a year once occupancy is stabilized in year 4.

State funding is modeled at 20 million and grant and donor funds also at 20 million. Of that 11.4 million will go immediately to purchasing equipment for the building and the remaining 28.6 million will be used to initiate design and the entitlements process.

Model for CAMCET Revenue Flow

	One Time	Ongoing
State	$20M	$0
Debt	$0	$0
Local	$0	$12.1M/YR
Grant/Donor	$20M	$0
TOTAL	**$40M**	**$12.1M/YR**

Model for CAMCET Expense Flow

	One Time	Ongoing
Equipment	$11.4M	$0
Ramp-up	$28.6M	$0
Rent	$0	$11.7M/YR
Reserves	$0	$0.4M/YR
TOTAL	**$40M**	**$12.1M/YR**

EXPENDITURE

Rents

Assumption below reflects the developer/landlord offsetting market rents downward slightly as an incentive for anchor tenancy and in lieu of ground lease payments [note: more time needed to market-test offset estimate with developer proforma]

- Wet lab - $55 (base rent)
- Computational - $40 (base rent)
- Office - $35 (base rent)

The space composition for CAMCET is assumed to be:

- Wet & Dry Labs – 67,000 SF
- Computational Labs – 38,000 SF
- Office – 67,000

Based on those numbers UW would be paying a little over 7.5 million dollars a year in rent.

Anchor Tenant UW

Lab Revenue	$3,685,000
Computational Revenue	$1,520,000
Office Revenue	$2,345,000
Anchor Tenant Total Rent	**$7,550,000**

Expense Reimbursements

UW will also be reimbursing operating expenses to the landlord. With our assumptions for the CAMCET program, UW will be reimbursing around 3.1 million a year (the $200,000 a year difference between internal and external expense reimbursements is due to an assumed 7% internal vacancy).

Equipment

Equipment for the CAMCET program is assumed to cost approximately 11.4 million dollars. This is a one-time expenditure and will be covered by the state funding outlined above.

Capital Expenses

Because the space will be built specifically for the CAMCET program and equipment costs have already been calculated TIs are expected to be minimal. The building will be brand new so capital repairs should be minimal. Finally, leasing commissions should also be lower than average because most of the tenants are either internal UW occupants or external tenants with whom we have a relationship (PNNL, etc.)

First year capital assumptions

- Capital repairs - $1 per SF
- TI allowance - $5 per SF
- Leasing incentives – $.50 per SF

Based on these assumptions the total capital needs for the first year are approximately 1.1 million dollars.

Total Yearly Expenditures

The total yearly expenditures (not including the one-time equipment fee) are assumed to be 11.7 million dollars.

SIGN-OFF BY AGENCY

SIGN-OFF BY THE UNIVERSITY OF WASHINGTON

This submittal, by its nature, signifies that University of Washington approves of this project.

Changes to the campus should improve and enhance, rather than detract from, the value and quality of the campus.

[06] MASTER PLAN AND POLICY COORDINATION

IMPACTS

In 2001 the UW Seattle campus completed its Campus Master Plan for the City of Seattle as determined by the Seattle Municipal Code (SMC) Chapter 23 section 69. The Master Plan follows, builds on, and replaces the 1992 General Physical Development Plan and includes guidelines and policies for developing 3 million gross square feet of additional building space on campus. A campus master plan update is underway and will support the sites considered in the pre-design.

Goals of the Current (2010) Campus Master Plan

The following goals were developed for the Campus Master Plan to support the mission of the University:

- Ensure good stewardship of the existing campus, maintaining and protecting the value of the University's physical resources and character, history, architecture and open space.

Changes to the campus should improve and enhance, rather than detract from, the value and quality of the campus. The Campus Master Plan identifies and encourages preservation of historic resources and open space.

- Provide for the facility and infrastructure needs of the next decade.
- Provide the maximum amount of flexibility in order to best accommodate future growth and take advantage of unforeseen opportunities.
- Create an aesthetic quality appropriate to the campus as a whole and to specific areas, conserving and improving existing buildings, open spaces, and views on campus, and looking for opportunities to create additional open spaces.
- Create a safe and healthy environment, with personal and workplace safety considerations integral to planning and design of circulation elements, buildings, and open spaces.
- Value the environment and strive to promote the conservation of natural resources and goals of the Growth Management Act and Shoreline Management Act.
- Encourage efficiency and economy in University operations, with advantageous locations for facilities and advantageous adjacencies of uses.
- Recognize the importance of the surrounding communities and strive to achieve compatible working relationships with these communities to improve the quality of life and public benefits for all in the vicinity.

All regulatory requirements identified in the Master Plan will be adhered to.

2018 Masterplan Schedule

October 2015	Kick-off of Campus Master Pland and EIS Scoping
Winter & Spring 2016	Preliminary Plan Concepts Developed
September 2016	**Draft Plan and Draft EIS published**
Winter 2017	Final Plan and Final EIS published
Summer 2017	Hearing Examiner and City Council
Late 2017 or Early 2018	City Council and Board of Regents approval

STATE REQUIREMENTS

Clean Air Act of 1991

The University of Washington's response to the Clean Air Act of 1991 is illustrated on a campus wide basis by capital improvements to the existing power plant and the University's U-Pass program, which has resulted in a campus wide reduction in the number of single occupancy vehicle commuters. Measures to encourage commuting by non-automobiles are incorporated in each capital project through such measures as provisions for bicycle racks and safety improvements. Design standards for emissions and indoor air quality will be implemented in the building design stages as part of a comprehensive LEED strategy.

Growth Management Act of 1990

The Growth Strategies legislation requires state agencies to comply with local land use regulations adopted pursuant to the Growth Management Act, which the University of Washington acknowledges through the development of the Campus Master Plan.

Governor's Executive Order 90-94 for Protection of Wetlands

The University has surveyed the wetland areas on campus as required by the Growth Management Act and Governor's Executive Order. Surveys were prepared for use during capital project planning to ensure that wetland resources remain protected.

Governor's Executive Order 05-05 Archeological and Cultural Resources

The University will comply with requirements of the Governor's Executive Order and consult with the Department of Archaeology and Historic Preservation (DAHP) to review the project as required for state funded projects.

Clean Water Act

The University is incorporating storm water, drainage and erosion control plan requirements into its construction documents for all major capital projects. National Pollution Discharge Elimination System (NPDES) permit requirements will be implemented through the installation and maintenance of drainage utility systems for each capital project.

Hazardous Substances

Prior to occupancy, the University prepares an inventory of all hazardous substances to be utilized in the facility; a chemical hygiene plan is prepared for all employees.

State Environmental Policy Act

As the Lead Agency, the University of Washington will ensure compliance with the State Environmental Policy Act RCW 34.21C, WAC 197-11 and WAC 478 for all capital projects.

Chapter 39.35 RCW Energy Conservation in Design of Public Facilities

In conformance with this statute, during the design phase of the proposed project, reviews and studies conforming to the guidelines developed in RCW 39.35.050 will be prepared.

OTHER IMPACTS

The following is a brief summary of planning documents which collectively set a direction for the development of the campus and city in the vicinity of the potential project sites. In general all support the following:

- Increased quality of site character and public realm in all proposed sites and area surrounding the sites.
- Development of a comprehensive character defining network of campus open space system.
- Integration of shared streets and green streets surrounding most sites.
- Opportunity to work with proposed planning efforts to extend the presence and function of the CAMCET program within the immediate surroundings and where located on a major local or regional connector.
- Opportunity to support objective to develop adjoining shared streets, green streets and concurrently support the CAMCET program and influence.
- Opportunity to support objective to provide increased pedestrian network and mid-block pedestrian scaled connections.

University of Washington Campus Master Plan, currently underway

- Over-arching goal of the West Campus is as an Innovation District, an area where academic and industry collaboration initiates U District as an Innovation Neighborhood.
- Develop in a way that strengthens U District Urban Center.
- Strengthen east-west connections and connections into Central Campus from West Campus.

UW Campus Landscape Framework Plan, currently underway

- West Campus neighborhood is defined by urban grid and city street life.
- The goal for future developments is to create a sense of urban campus and connect with context, for example the waterfront, Burke Gilman Trail, and Campus Parkway.
- Brooklyn Avenue NE is identified as an urban frontage street type, with activated street frontage and multi-modal circulation prioritized.
- Reconfigure sidewalks and new landscape to improve pedestrian environment. Create or enhance pedestrian and accessible routes to Central Campus.
- Provide stormwater swales along shoulder of Burke Gilman Trail.

West Campus Framework Study, April 2015

- Research partnerships are noted as collaborative opportunities between the University and industry partners.
- Sites West A, B, C, and D are shown as near-term development sites.
- The existing landscape character of the West Campus is a combination of intentional and residual landscapes that reflect a connected system of investments. Future planned landscapes will have a significant impact on the identity of the West Campus. A significant public open space linking the Brooklyn Avenue NE Green Street to Portage Bay is identified.
- The development of Green Streets (i.e., Brooklyn Avenue NE) and strong pedestrian-oriented streetscapes are encouraged. Identified pedestrian corridors include shared streets on NE 40th Street and Brooklyn Avenue NE, as well as east-west and north-south pedestrian ways such as those at Lander and Alder Halls and south of Gould Hall. These corridors serve to stitch together the campus and diverse landscape open space system.
- There is a strong desire to test hybrid of urban garden, a series of small distributed open spaces,

along with a central open space, a big, bold open space to serve the larger area, and linear landscapes that link precincts.

- The recent development of Lander and Alder Halls is seen as a direction for streets and streetscapes to provide public realm amenities, benches, plazas, and pedestrian mews, and for buildings to provide transparency at the ground floor.
- Brooklyn Avenue NE is noted as a Community Corridor, anchored by the UW tower at the north and the proposed expanded Portage Bay Park at the south. It is also identified as a Shared and Green Street, serving all modes of transportation.
- Campus Parkway is noted as a Learning Living Corridor
- NE Pacific Street is identified as a Collaboration Corridor. Identified partners include: Ben Hall, NOAA partnerships, and Program on the Environment.
- University Way NE is identified as a street that should serve vehicular access/circulation.
- 15th Avenue NE is acknowledged as a primary transit, vehicular, and pedestrian north-south corridor.
- Parking: The proposed parking strategy indicates maintaining the existing ration of parking spaces with parking in underground structures to create a more pedestrian oriented environment.
- Sites West B and C are shown as being developed with underground parking with entries along University Way NE.
- Site West A is shown as a mix of University and Innovation activity along Cowlitz Way, transitioning to commercial ground floor uses as it turns the corner fronting the Burke Gilman Trail. West B is shown with commercial use along Brooklyn Avenue NE and NE 40th Street. West C is shown with commercial along Brooklyn Avenue NE. Both West B and C are shown with University activity along NE 40th Street and in the alley / laneway between the sites. West D, although outside of the primary area of study for this plan, is shown as University ground floor activity along much of 15th Avenue NE.
- West A test fit shows this site as being potential student housing with parking access and active ground floor uses.
- West B and C test fits show these sites as accommodating both undergraduate and graduation, maintaining a 5-minute walk to medical / health sciences schools, maintaining proximity to labs on Roosevelt Way NE, focusing on dry research and teaching, having no clinical outreach component. These parcels are considered prime development parcels and are slated to be developed in this initial Phase 1.
- West D test fit shows this site as a potential clinical, dry research use that accommodates outside visitors.

City of Seattle U District Green Streets Concept Plan, Spring 2015

- Brooklyn Avenue NE is designated as a Green Street from Portage Bay to Ravenna and is an important pedestrian corridor. This document references the Seattle Bicycle Master Plan, which recommends an uphill climbing lane on here as well.
- The road section concept plan for Brooklyn Avenue NE illustrates 5-6’ sidewalk, curb to curb = 24’, uphill bike lane, retain pin oaks, no parking either side.

University of Washington Secure Bicycle Parking Study, 2011-2012

- The University’s goal is to have 20% of faculty, staff, and students arrive on bicycle by 2020.
- There is a designed campus-wide system of bike parking shelters and secure parking areas.
- Bike Space is a Facilities / Transportation Services program that helps people plan bike routes to the campus and parking/storage within the campus.

To attract the best talent and cutting edge scientist entrepreneurs, CAMCET must provide a technology-rich environment that not only is unique to the cleantech sector but enables scientists to test and scale up discoveries into viable solutions.

[07] FACILITIES OPERATIONS AND MAINTENANCE REQUIREMENTS

ASSUMPTIONS

Design Considerations And Recommended Alternatives For Energy Efficiency And Innovation

Recommendations and alternatives to improve facility energy efficiency and/or reduce the carbon footprint.

- To support efficient utilization of space, the mechanical and electrical systems serving the occupied areas should be designed with the flexibility to adapt to future lab needs. Areas that are currently programmed for classroom, office, or meeting rooms should have the necessary infrastructure to convert to lab space. This is accomplished by creating risers containing typical utilities such as fume hood exhaust, compressed gas (nitrogen, argon, etc.), compressed air, chilled water, heating hot water, make-up air, and electrical power. Due to the size of the utilities, this approach would best be served by multiple shafts located near the core – possibly a quadrant layout. As floors are reconfigured, the necessary utilities are available to accommodate typical lab requirements.
- The use of a low temperature heating system would make this facility 'future ready". This would allow for alternative system implementation, as discussed below. To assist with the transition to this technology, an upgraded building envelope including insulation, windows, shading, operable windows, and night cooling strategies (purge mode), contribute to a dramatic reduction in energy use (and carbon footprint).
- The use of a solar hydronic heating system consisting of roof mounted evacuated tube collectors or closed loop flat plate collector can offset natural gas consumption by 40%. This technology would require low temperature heating coils in air handling units.
- A ground source heat pump system consisting of wells located under the lower level slab can offset building heating (and cooling) costs by 80%. The high water table at this site location makes for a more efficient heat transfer. This strategy would mean a shift to heat pump technology for space heating and cooling.
- Heating/cooling water storage. Depending on system selection, storage can be incorporated into building design to help the building float through peak demands or store energy during peak generation.
- Solar Photovoltaic (PV) panels can be installed on the roof to offset building electrical use. Depending on final building configuration and roof obstructions, 10% of the building's electrical consumption may be offset by the use of a PV array.
- Chilled beam heating and cooling would allow for a reduction in duct size. Depending on final space programming, this option may add flexibility to future space reconfiguring.
- Natural ventilation through operable windows. Windows in classroom and office areas could be operable. When windows at a particular location are open, the air conditioning unit serving that zone would be off, resulting in energy savings.
- Deep Water Cooling. This has been a topic of discussion for the University of Washington campus for several years. The close proximity to Lake Washington and Lake Union, bodies of water that could provide a heat sink for a building of this type, make this type of system feasible. Although studies have shown its effectiveness, Deep Water Cooling has not been implemented on prior projects due to environmental and public considerations.

- Campus Chilled Water: With the new West Campus Central Utility Plant located close to this site, an underground tunnel could be constructed to provide connection to the campus chilled water system. Plant capacity and operation (operating hours) would have to be confirmed. City codes would need to be researched to verify if the facility could be served by off-site utilities (other than PSE & SCL).
- Campus Power: Campus utilities include an electrical power distribution system. The system is a multi-feed loop that provides a level of redundancy. Campus emergency power is also available. Both systems would need to be evaluated for adequacy to meet the facility's needs. City codes would need to be researched to verify if the facility could be served by off-site utilities (other than PSE & SCL).

Facility Services Design Guide Considerations (Mechanical & Electrical)

The university's Facilities Services Design Guide (FSDG) is established for campus buildings to guidelines for energy efficient system design and other minimum construction standards. Although new buildings tend to have increased energy demands and operation costs due to more sophisticated technology, this demand is anticipated to be offset by energy conservation measures incorporated in the design. This facility will be designed to achieve, at a minimum, LEED Silver Certification consistent with state policy. That being said, UW has a multiyear history of achieving LEED Gold certification on major capital projects and it is a recommended target and strong aspiration that CAMCET reach LEED Gold as well. Energy conservation measures such as high performing mechanical systems, stormwater strategies, and green roof elements will be considered and the priorities are laid out in more detail in Appendix F and H.

The following are systems that may (or may not) conform to the current FSDG REV 07 – JUN 2015.

- The initial concept for the proposed CAMCET building service is via local utilities. The UW campus utilities were not selected at this stage of development due to the University of Washington Climate Action Plan (September 2009). The climate action plan requires a 15% reduction below 2005 levels by 2020 and a 36% reduction below 2005 levels by 2035. Since the campus power plant contributes 1200 kg (CO_2 equivalent), which is approximately 45% of the total campus emissions, alternate fuel sources were pursued. Also, alternate fuel sources were pursued as a result of the "moratorium on new central utility plant interconnections" (reference University of Washington Climate Action Plan Section 4.1.2 Proposed Actions)
- Mechanical and electrical systems are not incorporating redundancy strategies.
- Large mechanical equipment may not be placed in the basement (or lower level) if sensitive (EMF and/or vibration) laboratory equipment is located in the vicinity. Final equipment location is still to be determined.
- Hot water heating radiation systems may not necessarily be used in areas where people are located adjacent to the outside wall.
- Lighting will not rely on the prescriptive measures to meet the Seattle Energy Code. Interior design will maximize the use of LED and Linear Fluorescent lighting systems.
- Third party commissioning "Test Engineer" was used as the estimating basis for this project.
- EH&S Laboratory Safety Design Guide is incorporated in the basis of design for this facility.

MAINTENANCE & OPERATIONS

The CAMCET building is expected to have typical maintenance and operations costs, which are in line with traditional University of Washington lab, classroom, and office type occupancy. As the initial concept for this building is “decentralized” utilities (no interconnections to campus steam, chilled water, compressed air or electrical power), this building is more similar to the latest facilities constructed on the UW Tacoma and UW Bothell campuses. Maintenance and operations costs will be similar to the UW Tacoma Phase 2A Science Building and on a smaller scale, the IPS Clean Water Innovation Lab (project #204118).

As the building becomes more defined and the MACC is firmed up, systems with a higher first cost (e.g. chilled beam, solar hydronic, etc.) may become viable options if budget allows. At that time, the LCCT will help in making alternative system selection. The higher maintenance and operations costs associated with these systems will be reflected in the LCCT and will provide a reasonable comparison of the impact of the systems on long-term costs.

STAFFING PLAN

	FY 2015	FY 2017	Cost for CAMCET FY 2017
Building Maintenance & Support			**$1,944,488**
Utilities			
Fuel	0.6632	0.7036	$121,017
Electricity	1.2694	1.3467	$231,634
Water / Sewer	0.6916	0.7337	$126,200
Power Plant	0.3250	0.3448	$59,304
Total Utilities		**2.7840**	**$538,155**
Other			
Custodial Services	1.1945	1.2672	$217,966
Grounds Maintenance	0.1675	0.1777	$30,565
Solid Waste	0.0608	0.0645	$11,094
Recycling	0.0300	0.0318	$5,474
Total Other			**$265,099**
TOTAL ANNUAL COST			**$2,747,742**

* Building Maintenance @ 100% Formula
** Bioengineering/Genome used for Research Building Maintenance
*** All other entries at Actual Cost per GSF Experienced in FY 2015, escalated by 3% per year

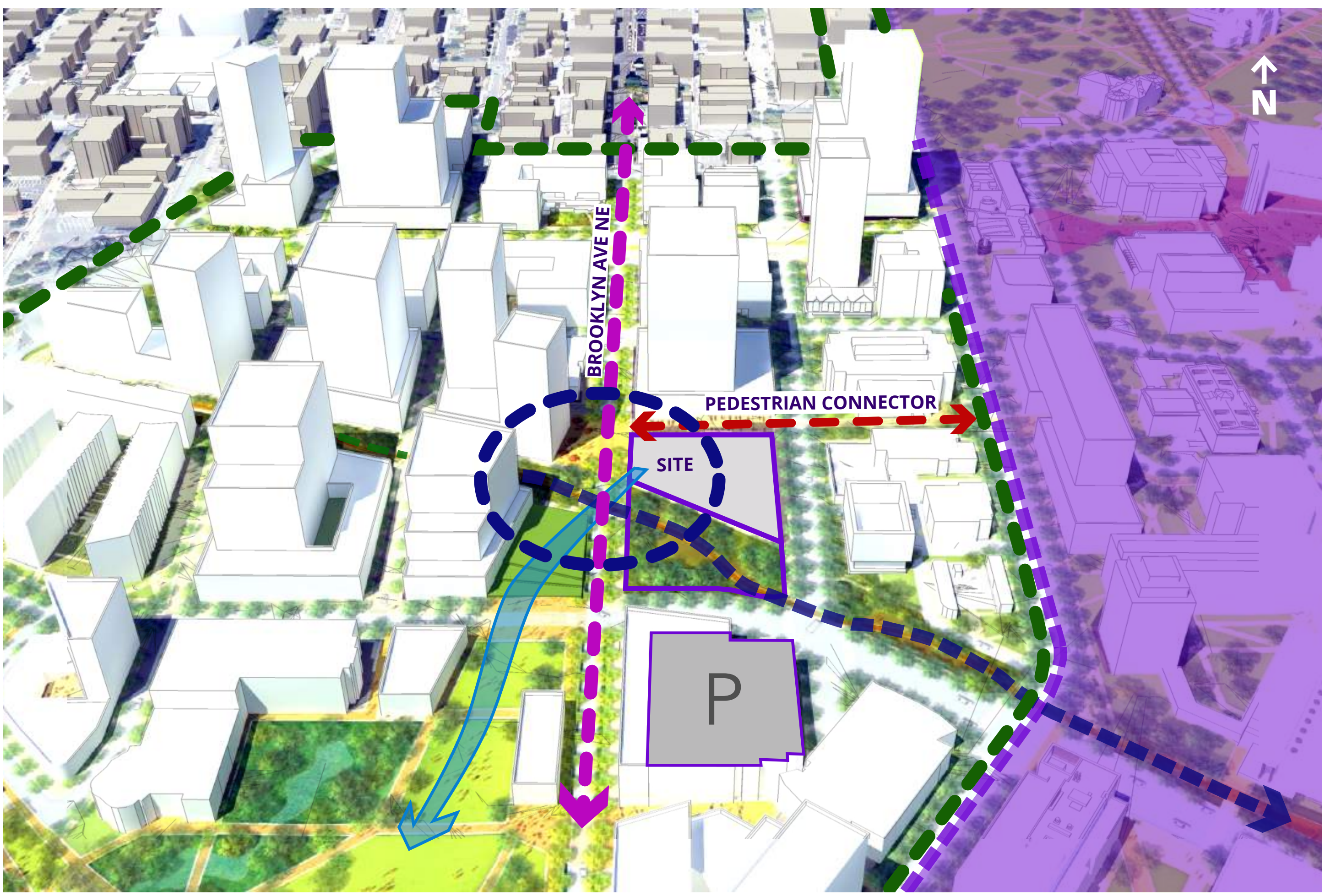
The UW Innovation District presents an unprecedented opportunity for the university to redefine its role in the city and build a dynamic hub of innovation, leveraging an already vibrant neighborhood.

[08] PROJECT DRAWINGS AND DIAGRAMS

SITE ANALYSIS

Specific site parameters were identified for Site C were that lead to the development of that site within the UW Innovation District. Attributes were discovered that create the foundation for integrating within the neighborhood and the UW Campus context at large.

1. Brooklyn as a green street becomes a main connector for pedestrians and vehicles in the north south direction. This makes the Brooklyn street edge of the site have the most public visual prominence.
2. 15th Avenue NE within the district is a secondary connector and its adjacency of the University Central Plant makes it more of a Back of House connector for this site.
3. The diagonal edge of the site fronts the future park and has great visibility to Portage Bay and Seattle downtown.
4. The Northeast corner of the site can be used to create a visual connection back to the Central Campus.
5. The proposed pedestrian connector to the north of the site which connects the UW Innovation District to the Main Campus creates visual prominence to the northeast corner of the site. This connector also suggests that a secondary entry occur in proximity to this corner of the site.
6. The site slopes nearly a full floor from its southwest corner to its northwest corner. This could allow ground floor connections on both the ground and second floor levels of the building making both floors more public in nature.
7. Most vehicle traffic from surrounding areas will come through NE 42 Street to Brooklyn to access the site
8. Most pedestrian traffic will come from the north down Brooklyn.

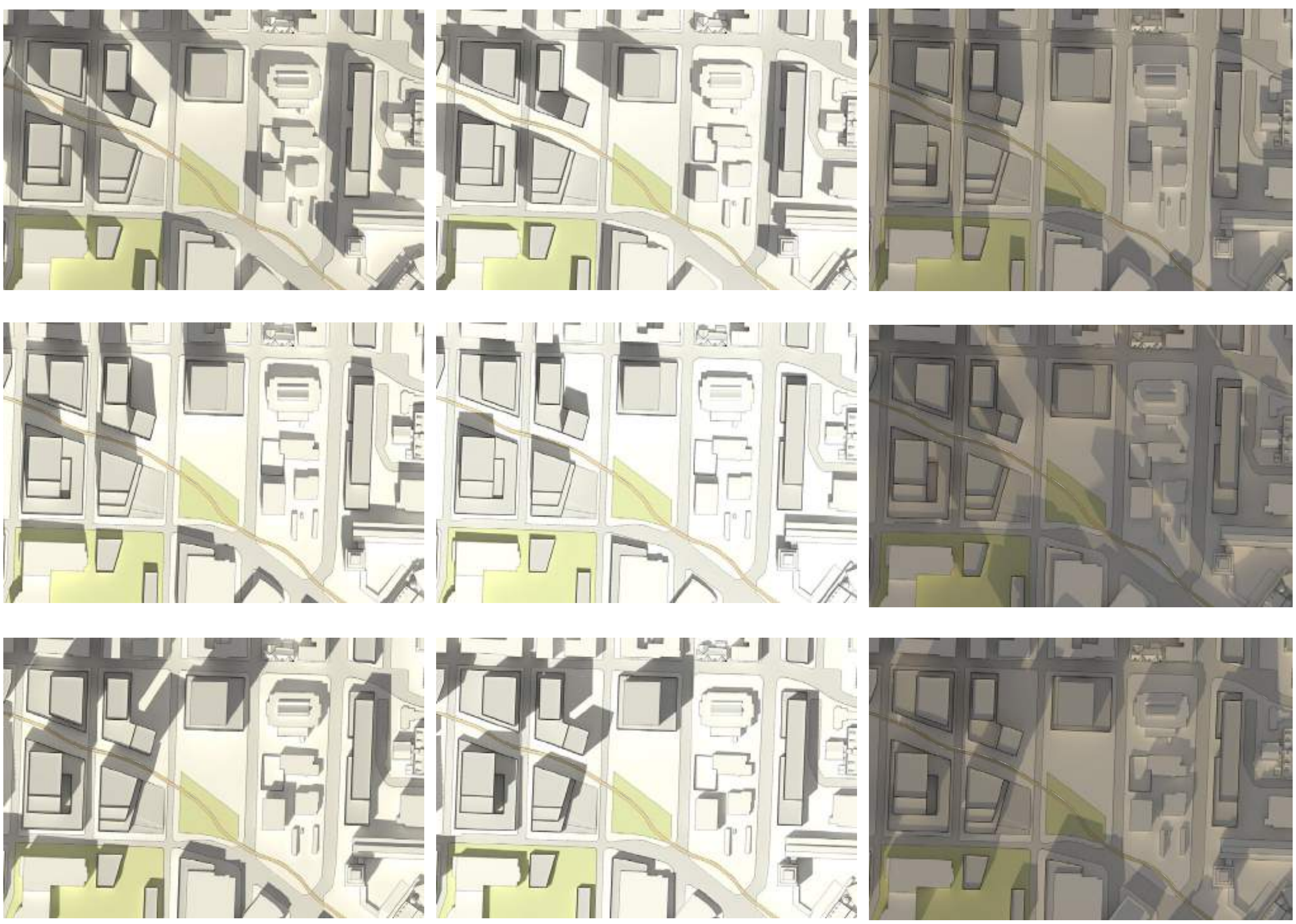


Solar/ Shade Study

A sun/shade study of the site was developed to understand sustainability implications regarding heat gain and day lighting. On all sides of the site adjacent buildings will not throw shadow onto Site C. This is ideal from a daylight/personal comfort standpoint, but will need to be address in the building design from an energy/sustainability aspect. The sites southern exposure overlooks Portage Bay, so will be important to balance the energy performance of this façade while taking advantage of spectacular views and integrating daylight into the interiors.

Western and eastern sun will be more difficult to control in particular to daylight and glare but the limited quantity of Western façade will be helpful to the overall building performance. The observations made in this study are considered in the building test fit as a foundation to the overall organization of the building program of core zones, scientific workplace zones and collaborative zones.

SPRING - FALL EQUINOX | SUMMER SOLSTICE | WINTER SOLSTICE



10AM

12PM

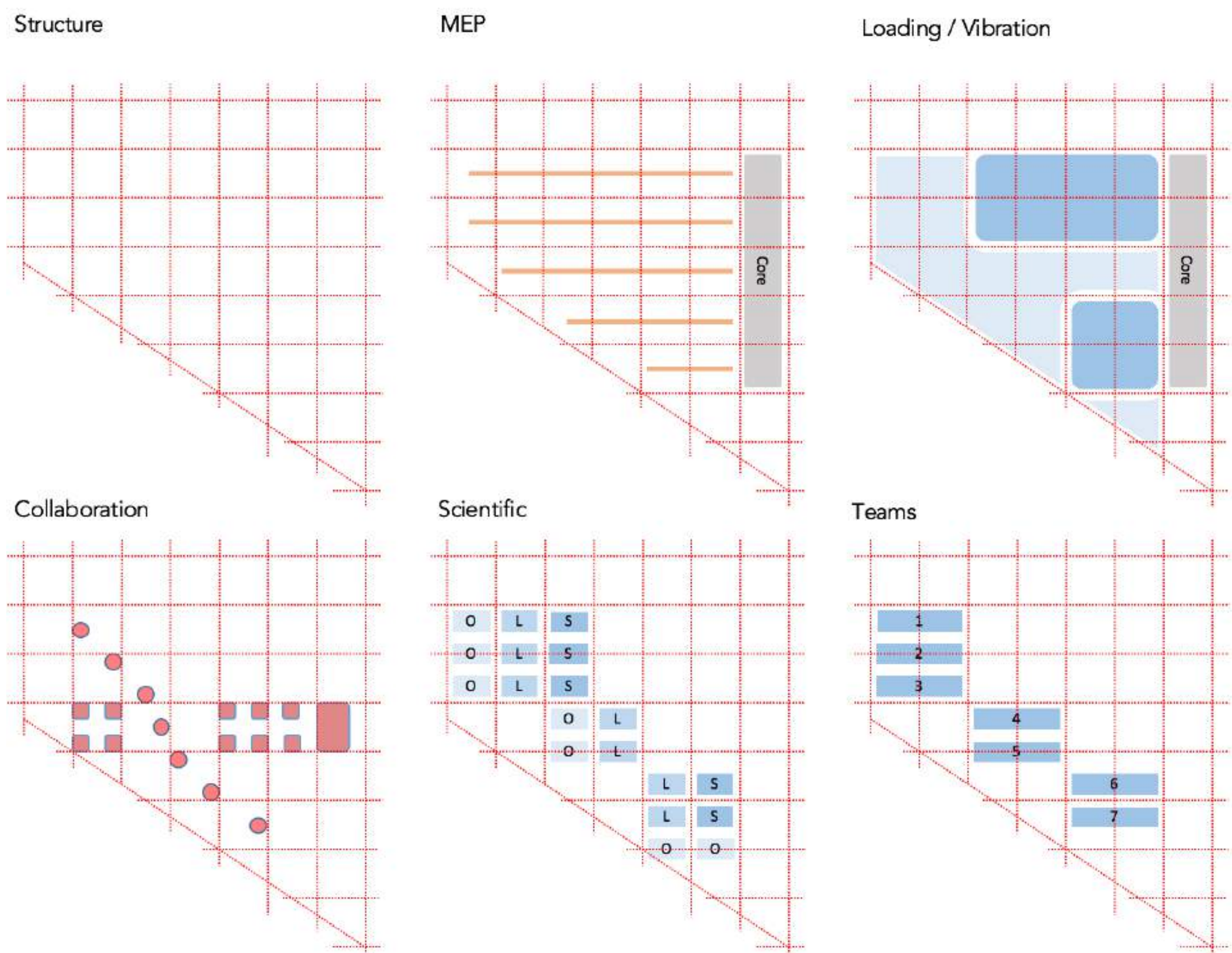
14PM

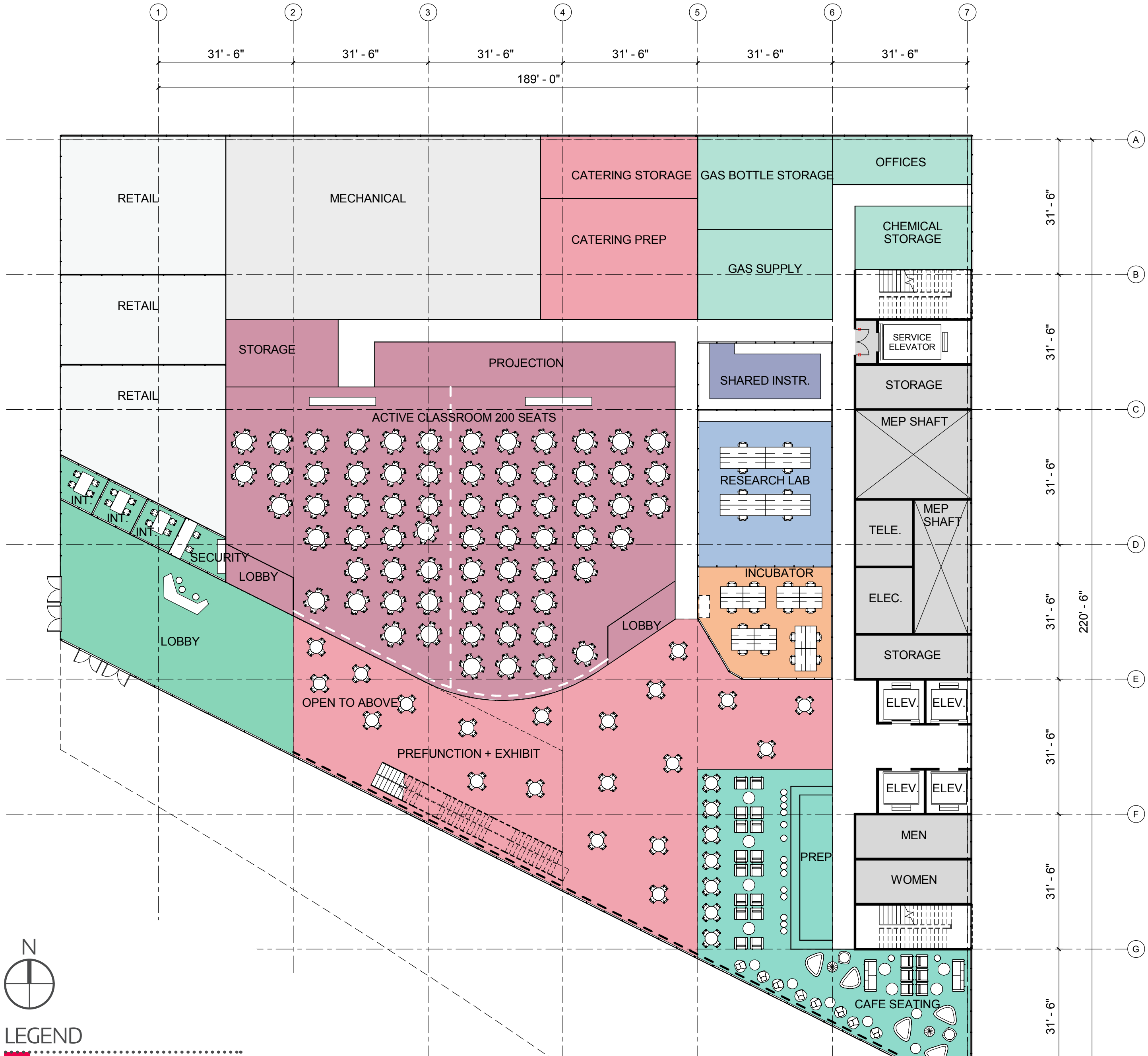
FLOOR PLANS

The following diagrams represent the overall organizational strategy for how the major building components come together on the site to create a simple yet functional and cost effective Scientific Workplace.

1. Structure is organized on a universal Lab planning module of 31’-6” x 31’-6”.
2. The service core of the building is placed to one side to create uninterrupted floor plates that are adaptable to a wide range of uses throughout the life of the building.
3. Main feeders for services run from the service core to the west of the building creating a rational distribution of utilities within the flexible Laboratory floor plates.
4. The Laboratories are planned as an open flexible ballroom concept and within the large floor plate areas are identified that will have enhanced vibration control to allow for specific needs of higher vibration control while still maintaining structural efficiency.
5. Collaboration space is integrated throughout each level with multi height spaces connecting the collaborative environment throughout the facility.
6. The Scientific workplace is organized around zones of office, open laboratory and shared equipment.
7. Within the organization of the workplace, laboratory groupings are set organized on each floor to enhance interconnected research and collaboration.

Planning Diagrams





LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core / Mechanical / Unassignable

LEVEL ONE

0' 10' 25' 50'

189' - 0"
31' - 6"
220' - 6"
9' - 11 7/8"
LAB OFFICE
EQUIPMENT
SHARED INSTR.
OPEN LAB
INCUBATOR
STORAGE
LAB
ANALYSIS
WASTE
CHEM. WASTE
RECY.
COMPACTOR
BIO WASTE
LOADING DOCK
SERVICE ELEVATOR
MEP SHAFT
TELE.
ELEC.
ENTRY
ELEV.
MEN
WOMEN
STEM TEACHING LAB
PREP/STORAGE
STEM PROJECT SPACE
COLLABORATION
OPEN OFFICE
SOLO STUDY
MEETING
HOT DESKS
TECH DESK
CAFE
KITCHEN
PHONE
OPEN LOUNGE
GROUP STUDY
OPEN TO BELOW
N
LEGEND
Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Of
Resear
Shared
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable
LEVEL TWO
0'
10'
25'
50'

31' - 6"
189' - 0"
220' - 6"
LAB OFFICE
OPEN LAB
EQUIPMENT
SHARED INSTR.
INCUBATOR
STORAGE
LAB
ANALYSIS
SERVICE ELEVATOR
MEP SHAFT
TELE.
ELEC.
ELEV.
OPEN LAB + LAB OFFICE
HOT DESKS
OPEN TO BELOW
PHONE
MEETING
GROUP STUDY
MEN
WOMEN
STORE
KITCHEN
CAFE
OPEN LOUNGE
UP
N
LEGEND
Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable
0'
10'
25'
50'

LEVEL THREE


31' - 6"
189' - 0"
220' - 6"
LAB OFFICE
OPEN LAB
EQUIPMENT
SHARED INSTR.
INCUBATOR
STORAGE
LAB
ANALYSIS
SERVICE ELEVATOR
MEP SHAFT
TELE.
ELEC.
ELEV.
OPEN TO BELOW
DN
UP
HOT DESKS
GROUP STUDY
PHONE
MEETING
MEN
WOMEN
SOLO STUDY
KITCHEN
CAFE LOUNGE
N
LEGEND
Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable
LEVEL FOUR
0'
10'
25'
50'

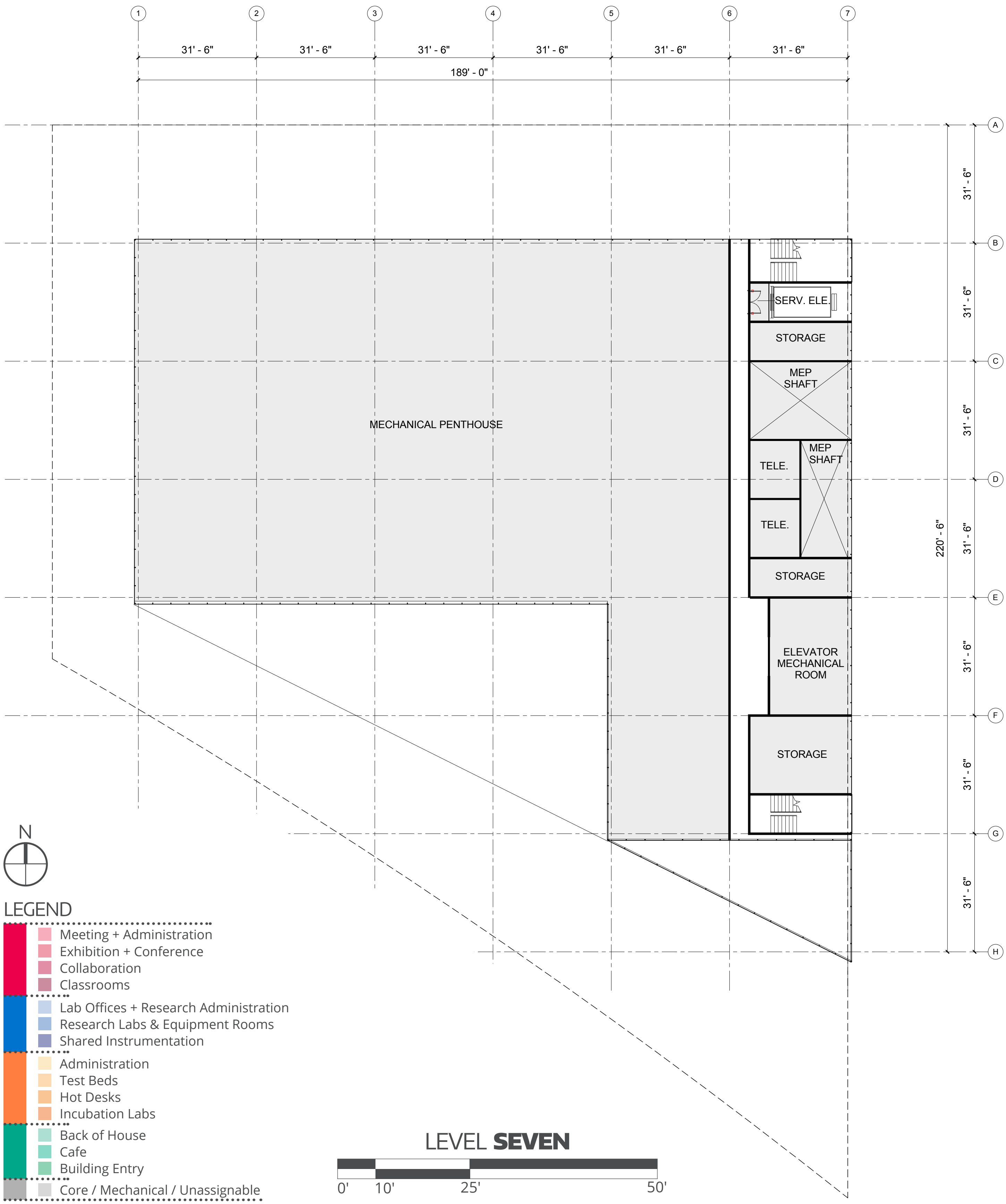

31' - 6"
189' - 0"
220' - 6"
EQUIPMENT
SHARED INSTR.
TECH STORE
SERVICE ELEVATOR
STORAGE
LAB OFFICE
OPEN LAB
MEP SHAFT
STUDIO
TELE.
ELEC.
INCUBATOR
CONTROL
LOBBY
ELEV.
OPEN LAB + LAB OFFICE
HOT DESKS
MEN
WOMEN
MEETING
OPEN TO BELOW
SOLO STUDY
PHONE
DN
KITCHEN
OPEN LOUNGE
CAFE
MEETING LARGE
N
LEGEND
Meeting + Administration
Exhibition + Conference
Collaboration
Classrooms
Lab Offices + Research Administration
Research Labs & Equipment Rooms
Shared Instrumentation
Administration
Test Beds
Hot Desks
Incubation Labs
Back of House
Cafe
Building Entry
Core / Mechanical / Unassignable
LEVEL FIVE
0'
10'
25'
50'

LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core / Mechanical / Unassignable

LEVEL **SIX**

0' 10' 25' 50'

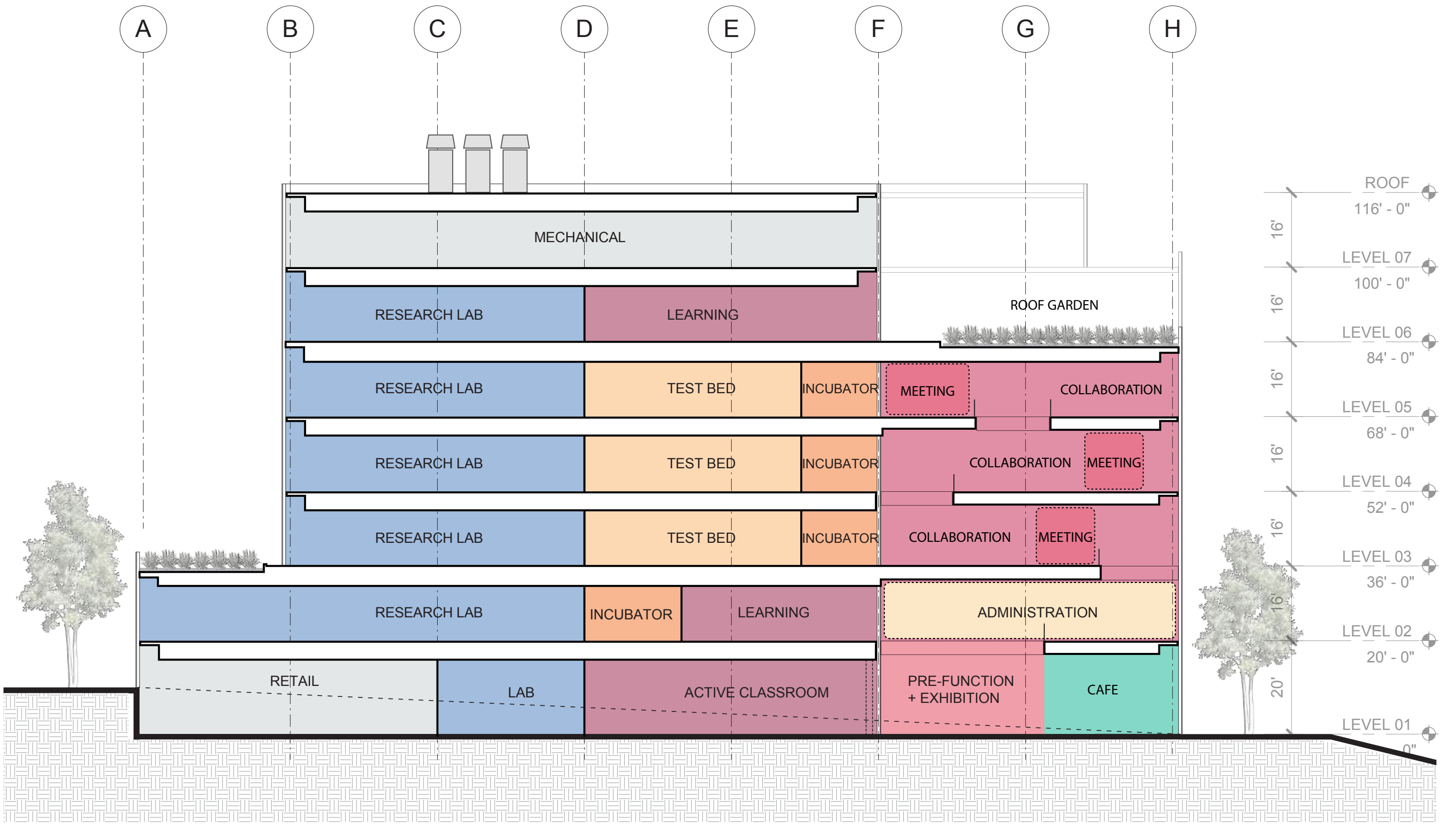


LEGEND

- Meeting + Administration
- Exhibition + Conference
- Collaboration
- Classrooms
- Lab Offices + Research Administration
- Research Labs & Equipment Rooms
- Shared Instrumentation
- Administration
- Test Beds
- Hot Desks
- Incubation Labs
- Back of House
- Cafe
- Building Entry
- Core / Mechanical / Unassignable

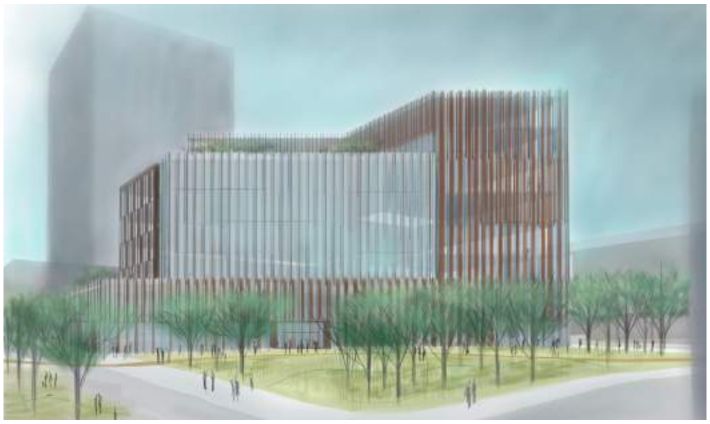
LEVEL **SEVEN**

BUILDING STACKING



The stacking section diagram illustrates the fundamental organizational qualities of the Center.

1. Laboratories housed on all level to ensure the building places research on display to all users of the building.
2. Along with Research being conducted on all levels, the research is continuously connected through a series of collaboration spaces that front the parkway to the south.
3. Mission control, the program that makes the building operate as an ecosystem is visible upon entry from the double height lobby/exhibition space.
4. All floors contain a mix of UW/Partner laboratory spaces.
5. The upper floor is conceived as a conference center connected to outdoor gardens overlooking the Portage Bay.
6. Mechanical is located directly above flexible laboratory space to create efficiency in the distribution of services.



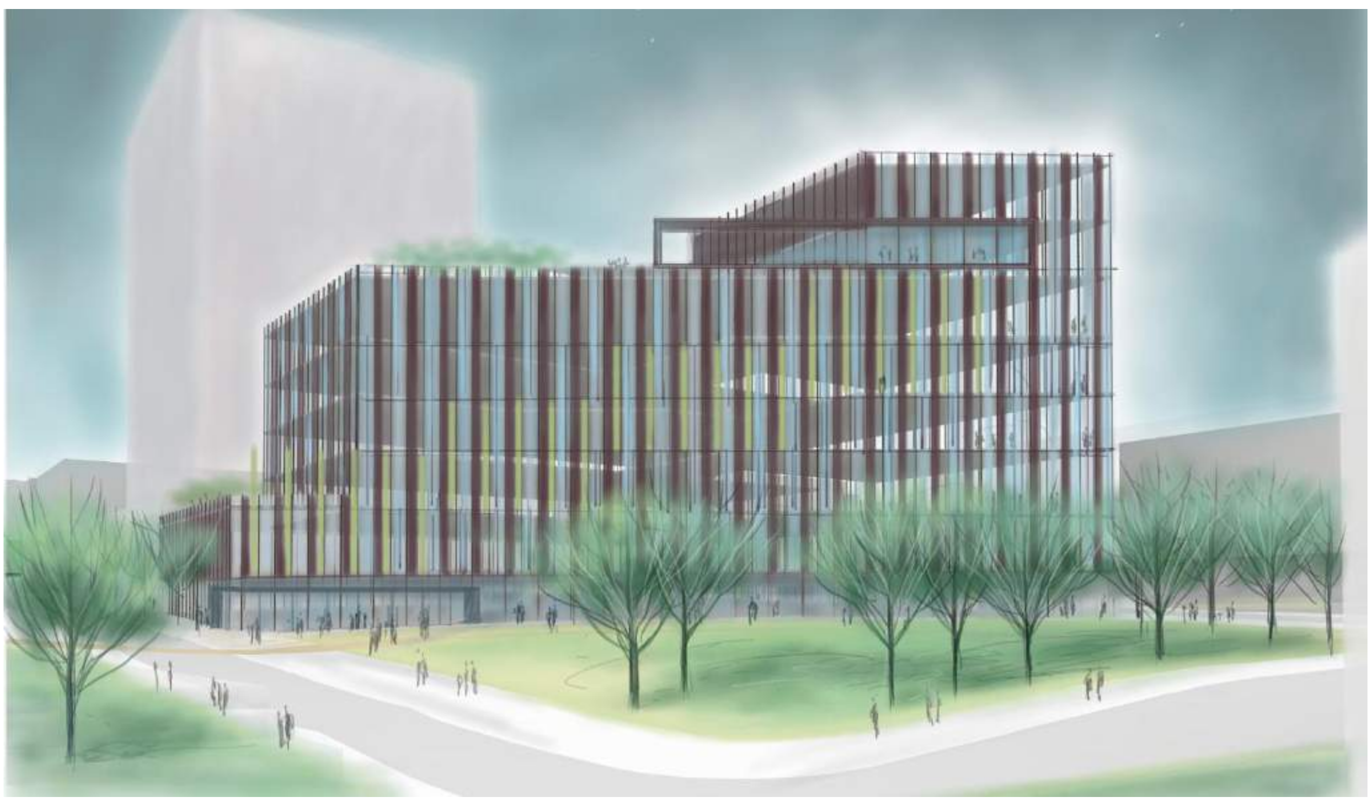
Exterior Massing Studies

A series of sketches were developed that studied variations in the building massing as well as potential alternatives to materials and articulation.

Looking from the parkway towards the collaboration spaces, communicates one of the key features of the building concept which is to put inter-disciplinary research on display.

This facade has been studied in different ways to creates a window into the research and collaboration.

The selected option displayed on the following page, was selected as the option that best communicates the Center's research principles as well as connecting to the University's visual ambitions.



APPENDIX

PREDESIGN CHECKLIST

The predesign checklist should be completed by the agency and included with the predesign. Are the following in the predesign? If not, the item should be noted “not applicable.”

Executive Summary

Project Analysis

Program Analysis

Site Analysis

Project Budget Analysis

Master Plan and Policy Coordination

Facility Operations and Maintenance Requirements

Project Drawings/Diagrams

Appendix

PROJECT BUDGET – UNIT COST DETAIL

Rm. No.	Room Name		Qty	ASF	GSF	TOTAL PROJECT COST $/SF		Project Cost Total	
Program Summary					1.67				
0	SHELL & CORE- ONLY SHOWN IN GSF			**172,596**	**172,596**	**$**	**476.26**	**$**	**82,200,000**
A	**PUBLIC**		**8.07%**						
1.00	Building Entry			**1,975**	3,292	$	334.18	$	1,100,000
2.00	Central Café			**1,700**	2,833	$	247.06	$	700,000
3.00	Exhibition and Conference			**4,680**	7,800	$	269.23	$	2,100,000
A		**PUBLIC**	**Sub total**	8,355	**13,925**	**$**	**280.07**	**$**	**3,900,000**
B	**LEARNING**		**30.27%**						
4.00	Exhibition & Conference			**4,500**	7,500	$	268.40	$	2,013,000
5.00	Collaborative Commons			**7,120**	11,867	$	320.22	$	3,800,000
6.00	Learning			**16,230**	27,050	$	388.17	$	10,500,000
7.00	Meeting Rooms			**3,300**	5,500	$	272.73	$	1,500,000
8.00	Administration			**200**	333	$	300.00	$	100,000
B		**LEARNING**	**Sub total**	31,350	**52,250**	**$**	**342.83**	**$**	**17,913,000**
C	**RESEARCH**		**39.85%**						
9.00	UW Research Labs		**28**	**31,918**	53,196	$	518.83	$	27,600,000
10.00	Shared Instrumentation		**28**	**8,400**	14,000	$	478.57	$	6,700,000
11.00	Administration			**950**	1,583	$	265.26	$	420,000
C		**RESEARCH**	**Sub total**	41,268	**68,780**	**$**	**504.80**	**$**	**34,720,000**
D	**INDUSTRY**		**21.81%**						
12.00	Incubation Labs			**4,410**	7,350	$	476.19	$	3,500,000
13.00	Test Beds			**17,030**	28,383	$	574.28	$	16,300,000
14.00	Administration			**1,145**	1,908	$	262.12	$	500,000
D		**INDUSTRY**	**Sub total**	22,585	**37,641**	**$**	**539.31**	**$**	**20,300,000**
		Cold Shelled Space	**0.00%**		**0**	**$**	**-**	$	-
		TI Space	**100.00%**		**172,596**				
Building Gross Area-Project Cost			**SubTotal**	103,557	**172,596**	**$**	**921**	**$**	**159,033,000**

STATE OF WASHINGTON

AGENCY / INSTITUTION PROJECT COST SUMMARY

Agency	University of Washington
Project Name	Center for Advance Materials and Clean Energy Technologies Research B
OFM Project Number	

Cost Estimate Summary

Acquisition			
Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**
Consultant Services			
Predesign Services	$1,743,110		
A/E Basic Design Services	$3,780,391		
Extra Services	$2,615,000		
Other Services	$11,121,598		
Design Services Contingency	$963,005		
Consultant Services Subtotal	**$20,223,104**	**Consultant Services Subtotal Escalated**	**$21,407,552**
Construction			
GC/CM Risk Contingency	$0		
GC/CM or D/B Costs	$6,186,800		
Construction Contingencies	$4,267,000	Construction Contingencies Escalated	$4,630,122
Maximum Allowable Construction Cost (MACC)	$85,340,000	Maximum Allowable Construction Cost (MACC) Escalated	$92,389,052
Sales Tax	$9,196,205	Sales Tax Escalated	$9,958,318
Construction Subtotal	**$106,896,949**	**Construction Subtotal Escalated**	**$115,760,014**
Equipment			
Equipment	$12,150,000		
Sales Tax	$1,166,400		
Non-Taxable Items	$0		
Equipment Subtotal	**$13,316,400**	**Equipment Subtotal Escalated**	**$14,449,626**
Artwork			
Artwork Subtotal	**$461,945**	**Artwork Subtotal Escalated**	**$461,945**
Agency Project Administration			
Agency Project Administration Subtotal	$2,710,085		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$1,597,895		
Project Administration Subtotal	**$4,307,980**	**Project Administation Subtotal Escalated**	**$4,674,590**
Other Costs			
Other Costs Subtotal	**$2,156,879**	**Other Costs Subtotal Escalated**	**$2,279,390**

Project Cost Estimate

Total Project	$147,363,257	Total Project Escalated	$159,033,117
		Rounded Escalated Total	$159,033,000

State of Washington
AGENCY / INSTITUTION PROJECT COST SUMMARY

Agency	University of Washington
Project Name	Center for Advance Materials and Clean Energy Technologies Research B
OFM Project Number	

Contact Information	
Name	Eric McArthur
Phone Number	(206)485-0477
Email	ekmca@uw.edu

Statistics			
Gross Square Feet	172,596	MACC per Square Foot	$494
Usable Square Feet	103,558	Escalated MACC per Square Foot	$535
Space Efficiency	60.0%	A/E Fee Class	A
Construction Type	Laboratories (Research)	A/E Fee Percentage	6.42%
Remodel	No	Projected Life of Asset (Years)	50
Additional Project Details			
Alternative Public Works Project	Yes	Art Requirement Applies	Yes
Inflation Rate	2.80%	Higher Ed Institution	Yes
Sales Tax Rate %	9.60%	Location Used for Tax Rate	Seattle
Contingency Rate	5%		
Base Month *(The month and year of the cost estimate)*	January-18		
Project Administered By	Agency		

Schedule			
Predesign Start	February-16	Predesign End	July-16
Design Start	July-17	Design End	April-20
Construction Start	January-20	Construction End	December-21
Construction Duration	23 Months		

Cost Estimate Details

Acquisition Costs				
Item	**Base Amount**	**Escalation Factor**	**Escalated Cost**	**Notes**
Purchase/Lease				
Appraisal and Closing				
Right of Way				
Demolition				
Pre-Site Development				
Other				
Insert Row Here				
ACQUISITION TOTAL	**$0**	**NA**	**$0**	

Cost Estimate Details

Consultant Services					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Pre-Schematic Design Services					
Programming/Site Analysis	$743,110				
Environmental Analysis	$1,000,000				
Predesign Study					
Other					
Insert Row Here					
Sub TOTAL	**$1,743,110**		**1.0000**	**$1,743,110**	Escalated to Design Start
2) Construction Documents					
A/E Basic Design Services	$3,780,391				69% of A/E Basic Services
Other					
Insert Row Here					
Sub TOTAL	**$3,780,391**		**1.0244**	**$3,872,633**	Escalated to Mid-Design
3) Extra Services					
Civil Design (Above Basic Svcs)	$157,500				
Geotechnical Investigation	$157,500				
Commissioning	$1,100,000				
Site Survey	$100,000				
Testing	$500,000				
LEED Services	$200,000				
Voice/Data Consultant	$100,000				
Value Engineering					
Constructability Review					
Environmental Mitigation (EIS)	$100,000				
Landscape Consultant	$200,000				
Other					
Insert Row Here					
Sub TOTAL	**$2,615,000**		**1.0244**	**$2,678,806**	Escalated to Mid-Design
4) Other Services					
Bid/Construction/Closeout	$1,698,437				31% of A/E Basic Services
HVAC Balancing	$500,000				
Staffing					
Other	$5,923,161				
DB Preconstruction Services	$3,000,000				
Sub TOTAL	**$11,121,598**		**1.0851**	**$12,068,046**	Escalated to Mid-Const.
5) Design Services Contingency					
Design Services Contingency	$963,005				
Insert Row Here					
Sub TOTAL	**$963,005**		**1.0851**	**$1,044,957**	Escalated to Mid-Const.
CONSULTANT SERVICES TOTAL	**$20,223,104**			**$21,407,552**	

Cost Estimate Details

Construction Contracts					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Site Work					
G10 - Site Preparation	$1,970,000				
G20 - Site Improvements	$1,320,000				
G30 - Site Mechanical Utilities	$1,500,000				
G40 - Site Electrical Utilities	$750,000				
G60 - Other Site Construction	$1,000,000				
Other					
Insert Row Here					
Sub TOTAL	**$6,540,000**		**1.0568**	**$6,911,472**	
2) Related Project Costs					
Offsite Improvements	$1,000,000				
City Utilities Relocation					
Parking Mitigation					
Stormwater Retention/Detention					
Other					
Insert Row Here					
Sub TOTAL	**$1,000,000**		**1.0568**	**$1,056,800**	
3) Facility Construction					
A10 - Foundations	$3,500,000				
A20 - Basement Construction					
B10 - Superstructure	$10,400,000				
B20 - Exterior Closure	$9,400,000				
B30 - Roofing	$1,400,000				
C10 - Interior Construction	$5,700,000				
C20 - Stairs	$400,000				
C30 - Interior Finishes	$5,400,000				
D10 - Conveying	$1,200,000				
D20 - Plumbing Systems	$3,200,000				
D30 - HVAC Systems	$12,500,000				
D40 - Fire Protection Systems	$500,000				
D50 - Electrical Systems	$11,300,000				
F10 - Special Construction					
F20 - Selective Demolition					
General Conditions	$3,600,000				
Reimbursables					
Other					
Escalation beyond 2.8%	$9,300,000				
Sub TOTAL	**$77,800,000**		**1.0851**	**$84,420,780**	
4) Maximum Allowable Construction Cost					
MACC Sub TOTAL	**$85,340,000**			**$92,389,052**	

5) GCCM Risk Contingency					
GCCM Risk Contingency					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0851**	**$0**	
6) GCCM or Design Build Costs					
GCCM Fee					
Bid General Conditions					
GCCM Preconstruction Services					
Design Build Fee	$4,480,000				
Bond and Insurance	$1,706,800				
Sub TOTAL	**$6,186,800**		**1.0851**	**$6,713,297**	
7) Construction Contingency					
Allowance for Change Orders	$4,267,000				
Other					
Insert Row Here					
Sub TOTAL	**$4,267,000**		**1.0851**	**$4,630,122**	
8) Non-Taxable Items					
Tax on Design for DB Contract	$1,906,944				
Insert Row Here					
Sub TOTAL	**$1,906,944**		**1.0851**	**$2,069,225**	
Sales Tax					
Sub TOTAL	**$9,196,205**			**$9,958,318**	
CONSTRUCTION CONTRACTS TOTAL	**$106,896,949**			**$115,760,014**	

Equipment					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
E10 - Equipment	$8,000,000				
E20 - Furnishings	$400,000				
F10 - Special Construction					
Cabling & Wireless	$2,000,000				
A/V	$1,000,000				
Security	$750,000				
Sub TOTAL	**$12,150,000**		**1.0851**	**$13,183,965**	
1) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0851**	**$0**	
Sales Tax					
Sub TOTAL	**$1,166,400**			**$1,265,661**	
EQUIPMENT TOTAL	**$13,316,400**			**$14,449,626**	

Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Project Artwork	$0				0.5% of Escalated MACC for new construction
Higher Ed Artwork	$461,945				0.5% of Escalated MACC for new and renewal construction
Other					
Insert Row Here					
ARTWORK TOTAL	**$461,945**		**NA**	**$461,945**	

Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Agency Project Management	$2,710,085				
Additional Services					
Other					
Construction	$1,597,895				
PROJECT MANAGEMENT TOTAL	**$4,307,980**		**1.0851**	**$4,674,590**	

Cost Estimate Details

Other Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Mitigation Costs					
Hazardous Material Remediation/Removal	$190,000				
Historic and Archeological Mitigation					
Permits	$1,716,879				
Metro Connection Fees	$250,000				
OTHER COSTS TOTAL	**$2,156,879**		**1.0568**	**$2,279,390**	

COST BENCHMARK

CANNONDESIGN

University of Washington CAMCET
Benchmarked Cost Model
March 8, 2016

		Kansas University Medical Research Building		U of Michigan Bio Science Research Building		Coppin State University - Life Science Building	
ID	Description	Adjusted Cost $	109,000 BGSF	Adjusted Cost $	478,663 BGSF	Adjusted Cost $	149,470 BGSF
A10	Foundations	2,937,281	26.95	18,542,852	38.74	3,522,955	23.57
B10	Superstructure	7,266,185	66.66	19,708,927	41.17	6,847,984	45.82
B20	Exterior Enclosure	4,149,809	38.07	25,817,034	53.94	9,031,897	60.43
B30	Roofing	679,316	6.23	936,422	1.96	2,109,067	14.11
C10	Interior Construction	3,144,290	28.85	21,779,372	45.50	7,717,258	51.63
C20	Stairs	302,668	2.78	1,928,643	4.03	248,549	1.66
C30	Interior Finishes	1,811,830	16.62	12,328,560	25.76	4,056,164	27.14
D10	Conveying	1,367,072	12.54	4,145,505	8.66	1,712,205	11.46
D20	Plumbing	3,596,928	33.00	42,675,805	89.16	2,942,761	19.69
D30	HVAC	18,102,493	166.08	43,636,225	91.16	13,894,413	92.96
D40	Fire Protection	616,616	5.66	5,840,475	12.20	960,362	6.43
D50	Electrical	9,461,985	86.81	42,361,914	88.50	9,161,619	61.29
E10	Equipment			6,985,702	14.59	1,704,863	11.41
E20	Furnishings	2,969,150	27.24	11,941,261	24.95	3,867,880	25.88
F10	Special Construction					654,926	4.38
F20	Selective Building Demolition-Excluded			234,104	0.49	3,824,586	25.59
G10	Site Preparation-Allowance	840,001	7.71	5,129,030	10.72	3,783,298	25.31
G20	Site Improvements-Excluded	1,212,909	11.13	2,449,576	5.12	6,139,922	41.08
G30	Site Mechanical Utilities-Excluded	1,106,311	10.15			1,599,086	10.70
G40	Site Electrical Utilities-Excluded	1,021,211	9.37			1,476,079	9.88
Z10	General Conditions & Requirements	11,446,363	105.01	22,481,821	46.97	8,969,253	60.01
	SUBTOTAL CONSTRUCTION COST	72,032,419	660.85	288,923,229	603.60	94,225,126	630.39

Estimate Clarifications:

The above is a benchmark average of comparable project bid values adjusted to Seattle, WA in February 2016 Construction Dollars.

The costs associated with tempoarary relocation, move management and soft costs, including but not limited to, A/E fees, financing and FF&E, are excluded.

Allowances have been included for landscaping, site improvements and site utilities.

Costs exclude existing site demolition and sales tax.

Factors used for regionalization of the construction costs to the Seattle, WA market are based on the RS Means City Cost Index.

Factors used for escalation of the construction costs to February 2016 dollars are based on the ENR Building Cost Index, and average to a rate of approximately 4.0% annually.

University of Washington Life Sciences		University of Washington Molecular Engineering Building		Benchmark Average					
				Lower Cost		Median Cost		Upper Cost	
Adjusted Cost $	202,556 BGSF	Adjusted Cost $	91,076 BGSF	Lower Cost		Median Cost	235,988 BGSF	Upper Cost	
5,217,896	25.76	3,205,056	35.19	6,380,481	27.04	7,089,424	30.04	7,798,366	33.05
11,128,187	54.94	6,848,502	75.20	12,054,641	51.08	13,394,046	56.76	14,733,450	62.43
14,980,661	73.96	7,390,264	81.14	13,063,447	55.36	14,514,941	61.51	15,966,435	67.66
3,781,001	18.67	929,198	10.20	2,173,497	9.21	2,414,996	10.23	2,656,496	11.26
3,155,221	15.58	3,347,676	36.76	7,574,306	32.10	8,415,895	35.66	9,257,485	39.23
268,515	1.33	229,044	2.51	522,876	2.22	580,973	2.46	639,070	2.71
		948,601	10.42	3,395,296	14.39	3,772,551	15.99	4,149,806	17.58
1,360,129	6.71	821,253	9.02	2,055,493	8.71	2,283,881	9.68	2,512,269	10.65
3,553,386	17.54	2,323,419	25.51	7,854,028	33.28	8,726,698	36.98	9,599,368	40.68
26,438,325	130.52	6,443,230	70.75	23,425,156	99.26	26,027,952	110.29	28,630,747	121.32
1,065,048	5.26	354,483	3.89	1,420,204	6.02	1,578,004	6.69	1,735,805	7.36
15,172,118	74.90	4,765,325	52.32	15,454,609	65.49	17,171,788	72.77	18,888,967	80.04
4,961,897	24.50	666,019	7.31	2,455,621	10.41	2,728,468	11.56	3,001,314	12.72
757,723	3.74	1,031,009	11.32	3,955,768	16.76	4,395,298	18.63	4,834,828	20.49
648,191	3.20			322,055	1.36	357,839	1.52	393,622	1.67
101,531	0.50			1,128,975	4.78	1,254,417	5.32	1,379,858	5.85
779,910	3.85	1,479,614	16.25	1,297,934	5.50	1,651,916	7.00	2,005,898	8.50
5,185,695	25.60	1,967,289	21.60						
1,196,691	5.91	128,178	1.41						
1,104,638	5.45	118,318	1.30						
24,141,777	119.19	18,530,265	203.46	22,710,037	96.23	25,233,374	106.93	27,756,711	117.62
124,998,541	**617.11**	**61,526,745**	**675.55**	**127,244,423**	**539.20**	**141,592,460**	**600.00**	**155,940,496**	**660.80**
					539.20		600.00		660.80
7.5%	Escalation 1.5 Yrs @5% Const. Start 7/2017			$ 9,540,000	$ 40.43	$ 10,620,000	$ 45.00	$ 11,700,000	$ 49.58
	Construction Cost Start 7/ 2017			**$ 136,780,000**	**$ 579.61**	**$ 152,210,000**	**$ 644.99**	**$ 167,640,000**	**$ 710.38**

SUSTAINABLE DESIGN CHARRETTE SUMMARY

The University of Washington CAMCET design and client team conducted a Sustainability Charrette during project Workshop Round 3 on March 24, 2016. Attending were representatives of representatives of UW Facility Services and Capital Planning, UW College of Engineering, project engineering, landscape and architectural consultants, the Director of the UW Clean Energy Institute and the UW Manager of Sustainability. Given the projects predesign phase, general reviews of environmentally opportunities in multiple facets of the future project were discussed. The UW enthusiastically supported design and construction concepts that will foster energy efficiencies, smart planning, material choices and construction processes. Many ideas were reviewed with recognition that future design decisions are to be environmentally responsible. The UW has identified a USGBC LEED Silver Certified target level for the design and construction of the project with aspirations of USGBC LEED Gold Certification. The UW stated that decisions related to sustainability must be made within the context of environmental stewardship, first costs, life cycle implications and project budget.

The Sustainable Charrette Reviewed the Following Topics

- Sustainable Regional Context
- Sustainable Infrastructure
- UW Facility Services Design Guidelines 2015
- Energy Efficiencies
- Site and Water Relationships

Reference the narratives in the Appendix for Design Considerations and Recommended Alternates for Energy Efficiency and Innovation. A holistic view of sustainable approaches will be required upon further definition of project site and overall development composition.

Landscape Design, Civil, & Engineering:

Best practices and current City of Seattle code for stormwater management to be implemented to the 'maximum extent feasible' will influence this project on any of the four sites. Stormwater reuse and/or infiltration is one method by which UW CAMCET could manage stormwater on-site. Reuse would include such techniques as cisterns for irrigation or use in flushing toilets. Infiltration would include such methodologies as bioretention, pervious paving, green roofs, and installation of plantings, especially large trees.

Along with stormwater mitigation, retaining healthy existing soils and vegetation supports heat island reduction and comfortable interior building environments. This should be a priority for mature, healthy vegetation on any selected site,

Treating graywater to reuse on site is another approach that could work well on any of these sites. This would include taking water from sinks and showers and treating it constructed wetlands for reuse in 'purple pipe' applications such as landscape irrigation.

Black wastewater treatment (water from toilets) can also be treated in constructed wetlands and reused for landscape irrigation. In the future, it may also be used for other 'purple pipe' applications such as toilets.

The following draft LEED Checklist was analyzed given the current potential of the program, budget and many to be determined project influences.

LEED V4 CHECKLIST

LEED-NC v4 Scorecard

University of Washington Predesign Study

Center for Advanced Materials and Clearn Energy Technology

40-49 Pts - Certified
50-59 Pts - Silver
60-79 Pts - Gold
80+ Pts - Platinum

Number	Credit Name	LEED v4 Description	Prerequisite?	Exemplary Performance?	Points: Available	Points: Yes	Points: Maybe	Points: Less Likely	Points: No	Remarks
					110	**61**	**25**	**15**	**22**	**Point Totals**
Integrative Process					1	**1**	**0**	**0**	**0**	
IP102	Integrative Process	Use "simple box" energy modeling analysis and water budget analysis to inform the OPR and the BOD, design documents and construction documents before the completion of Preliminary Design.			1	**1**				Energy Model provided in Pre-Design Study and will continue in Preliminary Design
Location and Transportation					16	**14**	**2**	**0**	**16**	
LT101	LEED for Neighborhood Development Location	Locate the project within a development certified under LEED for Neighborhood Development.			16				**16**	Projects attempting this credit are not eligible to earn points under other LT credits. Points for NC: Certified - 8 pts, Silver - 10 pts, Gold - 12 pts,
OR:										
LT102	Sensitive Land Protection	OPTION 1: Develop on a previously developed site. OPTION 2: Do not develop on environmentally sensitive land.			1	**1**				All sites under consideration have hosted prior development.
LT103	High Priority Site	OPTION 1: Locate the project on an infill location in a historic district (1 pt) OPTION 2: Locate the project on a government-identified priority site (1 pt) OPTION 3: Locate on a brownfield where soil or groundwater contamination has been identified and perform remediation (2 pts)			2		**2**			
LT104	Surrounding Density and Diverse Uses	OPTION 1: Locate on a site whose surrounding existing density within 1/4-mile radius meets required values (2-3 pts). AND/OR OPTION 2: Locate on a site within 1/2-mile walking distance of at least 4-7 (1 pt) or 8 (2 pts) publicly available diverse uses.			5	**5**				
LT107	Access to Quality Transit	Locate a functional entry within 1/4-mile walking distance of a bus/streetcar/rideshare stop or 1/2-mile walking distance of a bus rapid transit, train, commuter, or ferry stop, meeting minimum weekday and weekend service numbers.			5	**5**				All 4 sites are within 1-2 blocks of bus stops that should meet the requirements and all are less than 1/2 mile from future light rail station.
LT108	Bicycle Facilities	- Locate an entry within 200 yards of a bicycle network which connects to at least 10 diverse uses, a school or employment center (if 50% or more of project area is residential), or a rapid transit stop (destinations must be within 3-mile radius from project boundary). - Provide short-term bike parking for 2.5% all peak visitors (4 spots minimum; within 100 ft of bldg entrance). - Provide long-term bike parking for 5% FTE (4 spots minimum; within 100 ft of bldg entrance). Provide storage for 30% of occupants for residential project. - Provide a shower for each 100 FTE, and one additional shower for each 150 FTE thereafter.			1	**1**				UW requirements will be more stringent with regard to bike parking. All 4 sites are proximate to BG & bike routes (bike lanes, sharrows).
LT110	Reduced Parking Footprint	Do not exceed local code minimums for parking and show a percentage reduction from referenced Transportation Planning Handbook recommendations. 20% for projects not earning points in LT104 and LT107; 40% for projects earning at least 1 pt under either LT104 or LT107. Calculation must include all parking, including existing, which is to be used by the project. Dedicate 5% of spaces, preferred, to carpool/vanpool.			1	**1**				Parking will be minimal on the site.
LT111	Green Vehicles	Designate 5% of all parking used by the project to dedicated parking for green vehicles (ACEEE minimum rating of 45) or provide discounted parking rate of at least 20% for green vehicles. AND OPTION 1: Install electric vehicle supply equipment for at least 2% of all parking spaces. OR OPTION 2: Install liquid or gas alternative fuel fueling facilities or battery switching station for at least 2% of all parking spaces.			1	**1**	**0**	**0**		If there is paking, one space will be dedicated to green vehicles. If not, nearby parking garage will likely fulfill the requirment.
Sustainable Sites					10	**3**	**1**	**3**	**3**	
SS101	Construction Activity Pollution Prevention	Create and implement an Erosion and Sedimentation Control Plan for all construction activities associated with the project. Plan must comply with requirements of the 2012 US EPA Construction General Permit or local equivalent.	Y		0	**Y**				
SS104	Site Assessment	Complete and document a site survey or assessment which includes topography, hydrology, climate, vegetation, soils, human use, and human health effects.			1		**1**			
SS105	Site Development - Protect or Restore Habitat	Preserve and protect 40% of greenfield area on site AND OPTION 1: restore 30% of previously developed areas of the site with native or adapted vegetation. If project's FAR is at least 1.5, vegetated roof may be counted. AND Restore all disturbed or compacted soils which will be vegetated (2 pts). OR OPTION 2: Provide financial support equivalent to at least $0.40 per square foot for the total site area (including bldg footprint) to a nationally or locally recognized land trust or conservation organization (1 pt).			2				**2**	

C. Sustainable Design Charette Summary & LEED Project Checklist

Number	Credit Name	LEED v4 Description	Prerequisite?	Exemplary Performance?	Available	Yes	Maybe	Less Likely	No	Remarks
					110	61	25	15	22	Point Totals
Sustainable Sites					10	3	1	3	3	
SS107	Open Space	Provide outdoor open space greater than or equal to 30% of total site area. Minimum 25% of this must be vegetated (turf grass does not count as vegetation) or have overhead vegetated canopy. This space must be physically accessible and be one or more of the following: pedestrian-oriented paving/turf for outdoor social activities, recreation-oriented paving/turf for physical activity, garden space with diversity of vegetation providing year-round visual interest, garden space dedicated to community gardens/urban food production, preserved or created habitat meeting SS105. Vegetated roof with physical access may contribute toward the vegetation requirement if FAR is at least 1.5.			1				1	Building footprint to extend to perimiter boundaries of the site, with small setback interventions to address street life and support the pedestrian experience.
SS108	Rainwater Management	OPTION 1 (select path): Path 1: Manage on-site the runoff from the developed site for the 95th percentile of the regional or local rainfall events using low-impact development and green infrastructure (2 pts). Path 2: Achieve Path 1 for the 98th percentile (3 pts). Path 3: For zero lot line projects, achieve Path 1 for 85th percentile (3 pts). OR OPTION 2: For projects that are part of multi-tenant complex, implement onsite management of annual increase in runoff volume from natural land cover conditions to postdeveloped condition (3 pts).			3			3	0	Detention is not required thus there is no significant nexus for the installation/use of a cistern for flushing toliets that could help achieve this threshold. Bioretention and green roofs will not achieve the required reduction alone.
SS110	Heat Island Reduction	OPTION 1: Use nonroof and roof strategies in combination to meet calculation thresholds. Strategies include shade trees, vegetated planters, shading structures, high SR paving, open grid pavement, high-reflectance roof, vegetated roof (2 pts). OR OPTION 2: 75% of parking under cover (1 pt).			2	2				reflective roof, roof garden, low-SRI paving
SS112	Light Pollution Reduction	Meet requirements for uplight and light trespass at the lighting boundary and requirements for internally illuminated exterior signage.			1	1				Goal is to meet this requirement
Water Efficiency					11	4	0	5	0	
WE101	Outdoor Water Use Reduction	**PREREQUISITE** Landscaping within the project boundary must meet one of the following: OPTION 1: Requires no permanent irrigation system OPTION 2: Reduced Irrigation by 30% from calculated baseline through plant species selection and irrigation system efficiency. **CREDIT** OPTION 1: No Irrigation Required (2 pts) OPTION 2: Reduced Irrigation by 50% (1 pt) or 100% (2 pts) from calculated baseline. Strategies beyond the prereq 30% may be any combination of efficiency, alternative water sources, and smart scheduling technologies.	Y		2					
WE102	Indoor Water Use Reduction	**PREREQUISITE** Install fixtures and fittings to reduce water consumption by 20% from calculated baseline. Install equipment, appliances, and processes which meet prescriptive requirements. **CREDIT** Achieve calculated savings from baseline: 25% - 1 pt 30% - 2 pts 35% - 3 pts 40% - 4 pts 45% - 5 pts 50% - 6 pts	Y		6	1		5		
WE104	Building-Level Water Metering	Install permanent water meters that measure total potable water use for the building and associated grounds. Commit to sharing data with USGBC for 5 years post-certification.	Y		0					
WE110	Cooling Tower Water Use	For cooling towers and evaporative condensers, conduct a one-time potable water analysis in order to optimize cooling tower cycles.			2	2				write this into installation and commissioning specs
WE112	Water Metering	Install meters for two or more of the following water subsystems: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boiler >100,000 gallons/yr or > 500,000 BtuH/yr, reclaimed water, other process water.			1	1				
Energy and Atmosphere					33	15	9	3	1	
EA101	Fundamental Commissioning and Verification	Commission mechanical, electrical, plumbing, and renewable energy assemblies. OPR, BOD and design review to include exterior enclosure.	Y		0	Y				Commissioning will be completed.
EA103	Energy Performance	**PREREQUISITE** OPTION 1: Demonstrate a 5% reduction (3% for major renovation) in proposed building performance over the calculated baseline building based on ASHRAE/IESNA Standard 90.1-2010. OR OPTION 2: Comply with mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010: HVAC and service water heating requirements in Chapter 4 for appropriate ASHRAE 50% Advanced Energy Design Guide & climate zone. OR OPTION 3: Comply with mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010, Sections 1, 2, and 3. Project must be less than 100,000 SF; does not apply to healthcare, warehouse, laboratory projects.	Y		18	8	5			Option 1 - 33.5% reduction from ASHRAE Standard 100-2015 target EUI for laboratory in Climate Zone 4C. Use of high efficiency cooling systems and hydronic heating systems. • Building envelope insulation will minimize energy consumption. • Operable windows for classrooms and office space will utilize natural ventilation to reduce air conditioning. Exterior shading (including landscaping) will reduce heat loss and heat gain. Automated shades will improve heating/cooling efficiency. • The use of a solar hydronic heating system consisting of roof mounted evacuated tube collectors or closed loop fla plate collector can offset natural gas consumption.

		CREDIT OPTION 1: Demonstrate an improvement in proposed building performance over the calculated baseline for New Construction (NC) and Major Renovation (MR) by: 6% (NC) or 4% (MR) for 1 point 8% (NC) or 6% (MR) for 2 points 10% (NC) or 8% (MR) for 3 points 12% (NC) or 10% (MR) for 4 points 14% (NC) or 12% (MR) for 5 points 16% (NC) or 14% (MR) for 6 points 18% (NC) or 16% (MR) for 7 points 20% (NC) or 18% (MR) for 8 points 22% (NC) or 20% (MR) for 9 points 24% (NC) or 22% (MR) for 10 points 26% (NC) or 24% (MR) for 11 points 29% (NC) or 27% (MR) for 12 points 32% (NC) or 30% (MR) for 13 points 35% (NC) or 33% (MR) for 14 points 38% (NC) or 36% (MR) for 15 points 42% (NC) or 40% (MR) for 16 points 46% (NC) or 44% (MR) for 17 points 50% (NC) or 48% (MR) for 18 points OR OPTION 2: Implement and document compliance with applicable recommendations and standards in Chapter 4 of the ASHRAE 50% Advanced Energy Design Guide (1-6 points)								• A ground source heat pump system consisting of wells located under the lower level slab can offset building heating and cooling. • Heating/cooling water storage. Storage can be incorporated into building design to help the building float through peak demands or store energy during peak generation. • Solar Photovoltaic (PV) panels can be installed on the roof to offset building electrical use. • Chilled beam heating and cooling would allow for a reduction in duct size. Depending on final space programming, this option may add flexibility to future space reconfiguring. • Avoid temperature stratification with heating, either by proper air supply system design or by using temperature destratifiers (e.g., ceiling fans). • Deep Water Cooling. This has been a topic of discussion for the University of Washington campus for several years. The close proximity to Lake Washington and Lake Union, bodies of water that could provide a heat sink for a building of this type, make this type of system feasible. Although studies have shown its effectiveness, Deep Water Cooling has not been implemented on prior projects due to environmental and public considerations. • Campus Chilled Water: With the new West Campus Central Utility Plant located close to this site, an underground tunnel could be constructed to provide connection to the campus chilled water system. Plant capacity and operation (operating hours) would have to be confirmed. City codes would need to be researched to verify if the facility could be served by off-site utilities (other than PSE & SCL).
EA106	Building-Level Energy Metering	Install building-level energy meters or submeters that can be aggregated, to provide building-level data representing total building energy consumption. Commit to sharing data with USGBC for 5 years post-certification.	Y		0	**Y**				
EA108	Fundamental Refrigerant Management	Do not use CFC-based refrigerants in new systems. When reusing existing HVAC&R equipment, complete a comprehensive CFC phase-out conversion before project completion. This prerequisite applies to equipment containing 0.5 pounds or more of refrigerant.	Y		0	**Y**				
EA110	Enhanced Commissioning	OPTION 1 Path 1: Provide enhanced commission scope for mechanical, electrical, plumbing, and renewable energy systems (3 pts). OR Path 2: Achieve Path 1 and develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems (4 pts). AND/OR OPTION 2: Complete commissioning process for thermal envelope (2 pts)			6	**4**				Option 1 Path 2
EA118	Advanced Energy Metering	Install advanced energy metering for all whole-building energy sources and individual energy end uses that represent 10% or more of total annual consumption. Metering equipment must be permanently installed, record at intervals of 1 hour or less, and transmit data to a remote location. Electricity consumption and demand must be recorded. Data collection system must use a LAN, BAS, wireless network, or comparable system. System must be capable of reporting hourly, daily, monthly, and annual energy use. Data must be remotely accessible and stored for at least 36 months.			1	**1**				
EA121	Demand Response	Participate in am existing demand response program (2 pts). If not available, provide infrastructure and coordination to take advantage of future demand response programs or dynamic, real-time pricing programs (1 pt).			2	**2**				
EA123	Renewable Energy Production	Use renewable energy systems to offset building energy costs: 1% - 1 pt 5% - 2 pts 10% - 3 pts			3		**4**	**1**		Possible Solar PV. Since the building will have a high energy use, a 1% offset would be the most likely target. Solar hydronic may also be an option. Ground-source heat pump and solar hydronic will as be pursued.
EA126	Enhanced Refrigerant Management	OPTION 1: No use of refrigerants OR OPTION 2: Select refrigerants for HVAC&R equipment that comply with the refrigeration calculation which sets a maximum threshold for the combined contributions to ozone depletion and climate change.			1				**1**	
EA128	Green Power and Carbon Offsets	Engage in a contract for green power, RECs, or carbon offsets, for a minimum 5 years. The contract must specify the provision of a portion of the project's energy: At least 50% - 1 pt 100% - 2 pts			2			**2**		Purchase green power from SCL would need to come out of project budget

Number	Credit Name	LEED v4 Description	Prerequisite?	Exemplary Performance?	Available	Yes	Maybe	Less Likely	No	Remarks
					110	61	25	15	22	Point Totals
Materials and Resources					13	**6**	**5**	**0**	**2**	
MR101	Storage and Collection of Recyclables	Provide areas for collection and storage of materials for recycling. Establish a collection system which includes, at a minimum: paper, corrugated cardboard, glass, plastic, metals, batteries, mercury-containing lamps and electronic waste.	Y		0	**Y**				
MR103	Construction and Demolition Waste Management	Develop and implement a construction and demolition waste management plan and provide a final report detailing all major waste streams generated. Note: ADC does not qualify as diversion from disposal.	Y		0	**Y**				
MR108	Building Life Cycle Impact Reduction	OPTION 1: Historic Building Reuse - maintain existing bldg structure, envelope, and interior non-structural elements of a historic bldg (5 pts). OR OPTION 2: Renovation of Abandoned or Blighted Bldg - Maintain at least 50% by surface area of existing bldg structure, enclosure, and interior structural elements. Up to 25% of bldg area can be excluded because of deterioration or damage (5 pts). OR OPTION 3: Building and Material Reuse - reuse or salvage bldg materials from off site or on site as percentage of surface area (2-4 pts). OR OPTION 4: Whole-bldg Life-Cycle Assessment - for new construction, conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building, in at least three of the six following impact categories: global warming potential (must be included), ozone depletion, acidification of land and water, eutrophication, formation of troposhperic ozone, and depletion of nonrenewable resources (3 pts).			5		**3**		**2**	Building Life Cycle Assessment will be conducted with goal to demonstrate 10% reduction in impact categories compared to baseline building.
MR112	Building Product Disclosure and Optimization - Environmental Product Declarations	OPTION 1: Select at least 20 permanently installed products from at least 5 different manufacturers that have a product-specific declaration, and EPD, or a USGBC-approved disclosure program (1 pt) AND/OR OPTION 2: Use products that comply with one of the following criteria for at least 50% by cost of total value of permanently installed products (1 pt): - third party certified products that demonstrate impact reduction below industry average for at least 3 of 6 categories listed in MR108. - USGBC approved program for products that comply with other USGBC approved multi-attribute frameworks. Note: locations of extraction and manufacture determines percentage of value included.			2	**2**				Goal is to meet Option1.
MR114	Building Product Disclosure and Optimization - Sourcing of Raw Materials	OPTION 1. Use at least 20 permanently installed products from at least five manufacturers with a publicly released report covering raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, commitment to reducing environmental harm from processes, commitment to meeting applicable standards or voluntary programs that address responsible sourcing criteria (1 pt). AND/OR OPTION 2: Use products for at least 25% by cost, meeting at least one of the following: extended producer responsibility; bio-based legally harvested material; new wood products which are FSC certified; salvaged, refurbished or reused materials; recycled content; USGBC approved prgoram. Locations of extraction and manufacture determines percentage of value included (1 pt).			2	**1**	**1**			Goal is to meet Option 2 with a stretch goal of Option 1.
MR115	Building Product Disclosure and Optimization - Material Ingredients	OPTION 1: Use at least 20 permanently installed products from at least five different manufacturers with demonstrated chemical inventory via manufacture inventory, Health Product Declaration, Cradle to Cradle or other USGBC approved program. Chemicals to be inventoried to at least 0.1% (1 pt). AND/OR OPTION 2: Use products that document their material ingredient optimization for at least 25% by cost via GreenScreen v1.2 Benchmark, Cradle to Cradle v2 Certified, REACH (International Alternative Compliance Path), or other USGBC approved program (1 pt). AND/OR OPTION 3: Use products for at least 25% by cost that are sourced from manufacturers who engage in validated and robust safety, health, hazard, and risk programs or are sourced from manufacturers who get independend thrid party verification of their supply chain (1 pt). *Note: Locations of extraction and manufacture determines percentage of value included.*			2	**1**	**1**			Goal is to comply with either Option 2 or 3 and have Option 1 as stretch goal.
MR123	Construction and Demolition Waste Management	OPTION 1: Path 1: Divert at least 50% of total construction and demolition material; must contain at least 3 material streams (1 pt). OR Path 2: Divert at least 75% with at least 4 material streams (2 pts). ORx OPTION 2: Do not generate more than 2.5 pounds of construction waste per square foot of building's floor area (2 pts).			2	**2**	**0**			Goal to meet Option 2 Path.
Indoor Environmental Quality					16	**13**	**4**	**1**	**0**	
EQ101	Minimum Indoor Air Quality Performance	Meet requirements for ventilation and monitoring.	Y		0	**Y**				
EQ104	Environmental Tobacco Smoke Control	Prohibit smoking in the building and within 25 feet of entries, outdoor air intakes, and operable windows. Signage must be posted within 10 feet of all building entrances indicating the no-smoking policy.	Y		0	**Y**				

EQ110	Enhanced Indoor Air Quality Strategies	OPTION 1: Enhanced IAQ Strategies - comply with the following requirements (1 pt): - Entryway systems 10' long at exterior entrances. - Interior cross-contamination prevention: exhaust spaces where hazardous gases/chemicals may be present: garages, housekeeping and laundry areas, copying, printing rooms, etc. - Filtration MERV 13 or higher, replace all before occupancy. - Natural ventilation calculations: demonstrate system employs appropriate strategies in CIBSE Applications Manual AM10. - Mixed-mode design calculations: demonstrate system complies with CIBSE Applications Manual 13-2000. AND/OR OPTION 2: Additional Enhanced IAQ Strategies: comply with the following requirements (1 pt): - Exterior contamination prevention analysis - Increased ventilation - Carbon dioxide monitoring - Addional source control and monitoring - Natural ventilation room-by-room calculations *Note: separate requirements for naturally ventilated areas, and mixed-mode systems .*			2	**1**		**1**		Initial target is to meet Option 1. Option 2 unlikely due to natural venitlation within an open, flexible laboratory building.
EQ112	Low-Emitting Materials	Achieve VOC requirements in categories including paints and coatings, interior adhesives and sealants, flooring, composite wood, ceilings, and furniture. OPTION 1: Product Category Calculations - achieve the threshold levels for 2-5 of seven categories (1-3 pts) OPTION 2: Budget Calculation Method (1-3 pts)			3	**3**				Typically achievable. Careful attention to specifications and submittals.
EQ113	Construction Indoor Air Quality Management Plan	Develop and implement an IAQ management plan for the construction and preoccupancy phases of the building.			1	**1**				In specification.
EQ114	Indoor Air Quality Assessment	OPTION 1: Flush-out - follow requirements for flush-out before or during occupancy (1 pt). OR OPTION 2: Air Testing - after construction ends, but before occupancy (2 pts).			2	**3**	**1**			Flush out will be required. Testing TBD.
EQ115	Thermal Comfort	OPTION 1: design HVAC systems and envelope to meet ASHRAE 55-2010. OR OPTION 2: Design HVAC systems and envelope to meet ISO 7730: 2005 or CEN Standard EN 15251: 2007. Provide individual thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces.			1	**1**				
EQ117	Interior Lighting	OPTION 1: Provide individual lighting control for at least 90% of individual occupant spaces with at least 3 lighting levels or scenes (on, off, midlevel). Provide multizone control for all shared multioccupant spaces, separate control of presentation wall lighting, locate switches or manual controls in the same space with controlled luminaires (1 pt). AND/OR OPTION 2: Choose four strategies from list of options addressing efficient hardware, surface reflectance, and illuminance (1 pt).			2	**2**				Task lighting at all desks and lab benches, attention to specification requirements.
EQ121	Daylight	Provide manual or automatic glare-control devices for all regularly occupied spaces AND OPTION 1: Simulation - Spatial Daylight Autonomy and Annual Sunlight Exposure (2-3 pts). OR OPTION 2: Simulation - Illuminance Calculations (1-2 pts). OR OPTION 3: Measurement (2-3 pt)			3		**3**			Option 3 is target, but will depend on budget, final buidling design and prioritization of budget.
EQ123	Quality Views	Achieve direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area. 75% of all regularly occupied area must also have at least 2 of the following types of views: multiple lines of site in different directions; views that include flora/fauna/sky, movement, and objects at least 25 ft from glazing; unobstructed views located within distance of 3x head height of vision glass; and views with view factor of 3 or greater.			1	**1**				
EQ124	Acoustic Performance	Comply with design criteria for HVAC noise levels listed in ASHRAE 2011 Applications Handbook, Table 6. Calculate or measure sound levels. Meet applicable prescriptive sound transmission class (STC) ratings and reverberation time requirements. For all large conference rooms seating more than 50 persons, evaluate whether sound reinforcement and AV playback capabilities are needed.			1	**1**				

Innovation					6	**4**	**2**	**0**	**0**	
IN101	Innovation	Combination of innovation, pilot, and exemplary performance strategies TBD by project team. Exemplary performance points are limited to 2.			5	**3**	**2**			Green Bldg Education, Exemplarary Performance, Policy related strategy (green cleaning),
IN102	LEED Accredited Professional				1	**1**				

Regional Priority					4	**1**	**2**	**3**	**0**	
RP C1.1	Regional Priority				1		**1**			Demand response
RP C1.2	Regional Priority				1			**1**		renewable energy
RP C1.3	Regional Priority				1	**1**				environmental product declarations
RP C1.4	Regional Priority				1		**1**			sourcing of raw materials
					0			**1**		rainwater management
					0			**1**		indoor water use reduction

OWNER'S PROJECT REQUIREMENTS

Intent

The intent of this Owner's Project Requirements (OPR) is to provide high-level guidance to the project team focused on the desired outcomes and performance of the building. It indicates where specific design standards apply but does not lock in design solutions or repeat detailed information in other documents, such as the UW Facility Services Design Guide. It merges environmental and sustainability goals into an integrated document focused on the overall results desired by the UW for all aspects of the project.

Version

An OPR is a living document that should be updated several times during an integrated design process. The following is the preferred process for developing and updating an OPR on University of Washington projects.

1. Predesign: The Predesign OPR is created by the University Capital Planning and Development office as an appendix to the Predesign document produced by the predesign team. It translates overall project goals, predesign analysis, and results of the predesign eco-charrette into high level owner's requirements. The Predesign OPR is used by the selected design team as a guiding document to begin schematic design.
2. Design: The OPR is further developed to include more detailed requirements typically found in OPRs during schematic design in partnership with the design team but is still a representation of the University's goals, not a design document. It should be completed prior to development of the basis of design (BOD) and expressly responded to in the BOD by the design team. As the final version of the OPR is developed, the document reflects refinements in project goals in concert with the design team's development of possible design strategies, issues and costs, and the University making more detailed decisions on design direction and budget. It should be updated prior to a similar update to the BOD by the design and issuance of the 100% Design set. This version of the OPR is then used by the Commissioning Authority for the project to conduct a review of the Design set.

General Project Information

The purpose of the Center for Advance Materials and Clean Energy Technology (CAMCET) is:

To convene the Cleantech ecosystem, host cleantech oriented conferences and large scale student competitions, and educate future STEM learners and the general public through exhibits and outreach programs,

To deliver team and project based STEM education and collaborative environments for students, researchers and industry partners, and

For cleantech knowledge discovery, the incubation of discovery into solutions, the incubation of new companies, and the access to technical infrastructure for the clean tech community.

CAMCET will integrate students, faculty, and industry partners across the learning, discovery, translation, commercialization, incubation, and outreach spectrum through an innovative.

Project Team Members (for Predesign)	
Client Group:	UW Clean Energy Institute and UW PNNL Materials Institute
Owner's PM:	Eric McArthur
Architect:	Cannon Design
MEP Engineer:	Integrity Energy Services, Co.
Civil/Structural Engineer:	MKA
Landscape Architect:	Swift Company

Project Description

CAMCET is a new, 172,000 GSF interdisciplinary research and education building and founding anchor of the UW Innovation District on West Campus. CAMCET will house the UW Clean Energy Institute (CEI) and UW-PNNL Northwest Materials Institute, a major new collaborative effort under joint development. Other teams focused on clean technology science, engineering, and STEM education will join these anchor tenants.

Site and Context

During the predesign four sites were identified within the West Campus precinct for further consideration. The sites range in location from direct adjacency to Campus Engineering at the edge of the Central Campus to the Center of the UW Innovation District two blocks further west. Site C, located in West Campus on University Way, just north of the Burke-Gilman Trail, is considered the most desirable site due in part to the sites ability to house a large scientific floor plate able to be organized around the idea of collaborative work/ learn environment and the program of CAMCET being able to maximize development potential outlined. The preferred site will be identified prior to the start of design, following additional review of site conditions and constraints, and further development of building and site program requirements.

The whole West Campus area has great public transportation access actively supported by the University. There are plenty of nearby amenities within walking distance. The preferred site has potential for views to the East and South. Contamination issues have been identified in the west campus. A detailed study will be necessary to determine the appropriate, if any, environmental remediation measures. Historically in the area zoning permitted residential and retail land uses, so findings of heavy contamination are not anticipated.

A sun/shade study of the site was developed to understand sus¬tainability implications regarding heat gain and day lighting. On all sides of the site adjacent buildings will not throw shadow onto Site C. This is ideal from a daylight/personal comfort standpoint, but will need to be address in the building design from an energy/ sustainability aspect. The sites southern exposure overlooks Portage Bay, so will be important to balance the energy perfor¬mance of this façade while taking advantage of spectacular views and integrating daylight into the interiors. Western and eastern sun will be more difficult to control in particular to daylight and glare but the limited quantity of Western façade will be helpful to the overall building performance.

General Operational and Occupancy Expectations

CAMCET will have a variety of space types including public space for events and display, food or coffee vendors, active classrooms, STEM studios and labs, collaborative learning spaces, meeting rooms, a variety of labs and technology test beds, and administrative and back of house support. Occupancy will vary over time of day and year with a peak occupancy of around 1000 staff and students.

Building Life and Flexibility

The University holds and maintains it buildings over a long time period so all projects should be designed with durability and flexibility in mind to function well for 50 to 100 years. CAMCET will have about 25%-30% of its space leased to external tenants that are partners or incubating business so supporting non-university tenants in a requirement.

First and Life Cycle Cost Requirements

The CAMCET building is expected to have typical maintenance and operations costs, which are in line with traditional University of Washington lab, classroom, and office type occupancy. As the initial concept for this building is “decentralized” utilities (no interconnections to campus steam, chilled water, compressed air or electrical power), this building is more similar to the latest facilities constructed on the UW Tacoma and UW

Bothell campuses. Maintenance and operations costs will be similar to the UW Tacoma Phase 2A Science Building and on a smaller scale, the IPS Clean Water Innovation Lab (project #204118).

As the building becomes more defined and the MACC is firmed up, systems with a higher first cost (e.g. chilled beam, solar hydronic, etc.) may become viable options if budget allows. At that time, the LCCT will help in making alternative system selection. The higher maintenance and operations costs associated with these systems will be reflected in the LCCT and will provide a reasonable comparison of the impact of the systems on long-term costs.

The total estimated project cost is $159 million. The delivery method is projected to be design-build which will allow an integrated design and construction team to maximize the value of decisions addressing.

Preferred Design and Construction Schedule		
	Start	**End**
Predesign:	First half of 2016	
Design:	Third Qtr of 2017	End of 2018
Construction:	Early 2019	Second Qtr of 2021
Occupancy:	Third quarter of 2021	

Project Goals, Objectives, Performance Metrics and Standards

CAMCET's overall mission is to be an innovation hub that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet. The Centers goals are to:

- Foster collaborative research that accelerates solutions for a healthy planet.
- Increase STEM degree production and provide students with innovative STEM learning environments.
- Catalyze partnerships.
- Convene the clean tech community, and incubate start-up companies that succeed in the marketplace.
- Accommodate FTE growth and relieve some critical campus classroom needs.
- Catalyze the UW Innovation District in West Campus.

In terms of building performance, the CAMCET project supports the energy use and greenhouse gas emission reduction goals of the UW Climate Action Plan by replacing existing space with new, more efficient spaces. Building system improvements that are part of this project, including upgrades to mechanical, electrical, and lighting systems will be more efficient than the systems they replace. More efficient systems are anticipated to help reduce the overall campus energy use.

Goals Areas and Objectives

The University of Washington CAMCET design and client team conducted a Sustainability Charrette during project Workshop Round 3 on March 24, 2016. Attending were representatives of representatives of UW Facility Services and Capital Planning, UW College of Engineering, project engineering, landscape and architectural consultants, the Director of the UW Clean Energy Institute and the UW Manager of Sustainability. The following goal areas were enthusiastically supported as broad objectives for evaluating design concepts. The UW stated that decisions related to sustainability must be made within the context of environmental stewardship, first costs, life cycle implications, and project budget.

Performance Metrics and Standards

The following specific targets or requirements for the project build on the goal areas and objectives identified above.

LEED Gold

Certification as a LEED Silver building is a requirement both as University policy and because this project will receive Washington state funding. This OPR assumes the project will fall under the Version 4 of LEED. This newer version of LEED has higher baselines than version 3 (LEED 2009) and some new credits that likely mean a LEEDv4 Silver building is more equivalent to a LEEDv3 Gold building. That being said, the University has a multi-year history of achieving LEED Gold certification on major capital projects in all previous versions of LEED. Therefore the project team has set LEED Gold as the performance target for CAMCET.

The design team has prepared a draft scorecard for LEEDv4 Gold as part of the predesign document. The follow credits are required by the University as part of any pathway to LEED Silver or Gold because of their contributions to better operating performance, to meeting the University's Climate Action Plan, and to faculty, staff, and student health and quality of life. These credits, at the required thresholds, contribute 28 points towards LEED for New Construction certification (point thresholds vary for LEED for Schools).

- Integrative Process
- Bicycle Facilities
- Light Pollution
- Site Assessment
- Outdoor Water Use Reduction (2 points)
- Indoor Water Use Reduction (3 to 4 points)
- Water Metering
- Enhanced Commissioning (all 6 points, including Building Envelope Commissioning and Monitoring Based Commissioning)
- Optimize Energy Performance (at least 10 points)
- Advanced Energy Metering
- Building Product Disclosure and Optimization – Sourcing of Raw Materials (1 points)
- Construction and Demolition Waste Management (2 points)
- Enhanced Indoor Air Quality Strategies (1 point)

Goal Area	Notes
Foster Energy Efficiencies	The CAMCET project supports the energy use and greenhouse gas emission reduction goals of the UW Climate Action Plan by replacing existing space with new, more efficient spaces. Building system improvements that are part of this project, including upgrades to mechanical, electrical, and lighting systems will be more efficient than the systems they replace. More efficient systems are anticipated to help reduce the overall campus energy use.
Smart Planning	At the master plan level for the University as a whole and for West Campus, there are clear priorities around strengthening surrounding neighborhoods and integrating public and private, including green streets and stormwater infrastructure and supporting connectivity and transportation.
Material Choices	LEEDv4 has a new set of criteria by which to select materials focused on life-cycle assessment of the whole building and individual materials and an understanding of materials ingredients and their impact on human health. As a home of advanced materials research, selection and demonstration of progressive green materials is a priority for CAMCET

- Low-emitting Materials (all 3 points)
- Construction Indoor Air Quality Management Plan
- Indoor Air Quality Assessment
- Interior Lighting (1 point)

In addition, the following prerequisites, credits, and innovation will be implemented and documented by the University for an additional 10 points.

- Surrounding Density and Diverse Uses (2 pts)
- Access to Quality Transit (all 5 points)
- Reduced Parking Footprint
- Storage and Collection of Recyclables
- Up to 2 Innovation credits for campus practices including Salmon Safe certification, Integrated Pest Management and Green Housekeeping

In developing a LEED Gold for CAMCET, the following credits are desired by the University in keeping with the goals above.

- Rainwater Management
- Renewable Energy Production
- Building Product Disclosure and Optimization – Building Life-cycle Impact Reduction
- Building Product Disclosure and Optimization – Environmental Product Declarations, Transparency Option
- Building Product Disclosure and Optimization – Materials Ingredients, Transparency Option
- Daylighting, Quality Views, and Acoustic Performance for occupant health

Energy Metrics

The preliminary LEED scorecard targets 20% to 32% energy cost savings over a baseline building in the ASHRAE 90.1 2010 standard. In addition the CAMCET team should establish a specific Energy Use Intensity (EUI) target that is reflective of the University's climate action plan and the Architecture 2030 targets. Based on the predesign energy model results, the Building has an EUI of 119 kBTU/SF and an annual utility spend of $357,740 per year.

Water Metrics

Specific water metrics for CAMCET will be developed as part of complying with the Integrative Process credit in LEEDv4.

Design Process Expectations

During predesign, the UW determined that a Life Cycle Cost Analysis as proscribed in the 2014 Predesign Guidance manual from the Washington State Office of Financial Management would not benefit the project in clarifying specific design directions given the stage of the project and it was therefore deferred to schematic design where it will be especially valuable in helping to determine the most cost efficient design options to achieve program and sustainability goals.

In addition, the project team is directed to pursue the Integrative Process credit in LEEDv4 which requires a shoe box energy model and water budgeting exercise to occur before 30% design, along with development and updating of this OPR document. The IP credit and the state LCCA process should be integrated such both requirements are meet and the project team gets the best analysis to inform project decisions.

The LEED credit for a Site Assessment in schematic design is also a required credit and should be included. The integrative design process consists of iterative cycles of large group working sessions alternating with small group or individual analysis throughout design, construction and into operations, and within the increasing constraints on the project overtime. So far, the CAMCET has completed the initial group working session and early analysis. Schematic design should begin with another large group working session, including Health Sciences representatives, and include LCCA, energy modeling, water budgeting, and site assessment to evaluate concepts from the workshop.

GREENHOUSE GAS EMISSIONS & VEHICLE MILES REDUCTION

The University of Washington (UW) is a recognized leader in environmental stewardship and sustainability practices. Through the UW Climate Action Plan (CAP), the UW has identified targets to substantially reduce its carbon footprint. The CAP's strategies include:

- Moving toward climate neutrality,
- Engaging faculty and students in conservation practices and related behavior changes,
- Integrating formal and informal learning on sustainability,
- Facilitating more active transportations and less reliance on motorized transportation, and
- Becoming energy efficient.

The CAP's executive summary and excerpts related to greenhouse gas reduction targets are included in this section.

The complete UW Climate Action plan can be viewed online at:

http://f2.washington.edu/oess/sites/default/files/file/UW%20Climate%20Action%20Plan%2010_9.pdf

The 2010 Climate Action Plan Update can be viewed online:

http://f2.washington.edu/oess/sites/default/files/UW%20CAP%202010%20Update%20final.pdf

The UW's progress can be viewed online at:

http://green.uw.edu/cap/progress-and-updates.

GREENHOUSE GAS EMISSIONS REDUCTION POLICY

As described in the CAP, the University is committed to reducing emissions by at least 15% below 2005 levels by the year 2020, and 36% below 2005 levels by the year 2035. The UW is hoping to achieve neutrality by 2050. The reduction targets meet our obligations under the American College and University Presidents Climate Commitment and the Washington State goals in **RCW 70.235.020**. The targets also meet the greenhouse gas emissions reduction that is required of all capital budget requests (as outlined in **RCW 70.235.070**), and that is required to reduce annual per capita vehicle miles in accordance with **RCW 47.01.440**.

VEHICLE MILES REDUCTION POLICY

The majority of the UW's trip reduction policies are outlined in the UW Transportation Management Plan and the CAP. A sampling of the UW's vehicle miles reduction programs are listed below:

1.U-Pass transit program – supports regional mass transportation use and significant reductions in single occupant driving; 80% of commute trips to Seattle are made using green transportation options. U-Pass participating agencies include:

- King County Metro
- Community Transit
- Sound Transit
- Everett Transit
- Kitsap Transit
- Pierce Transit
- Seattle Street Car

2.Active transportation – solutions, programs and support:

- Biking facilities near every building – surveyed yearly for need
- Low-cost, student-run bicycle repair center
- Bicycling and walking events and classes taught by certified instructors
- UWalk community forums, route and meet ups
- Online tools for walking and biking facilities, showers and routes

3. Intra-facility and Intra-campus shuttles

- Health Sciences Express – connects the UW Medical Center facilities
- South Lake Union shuttle – connects the U District to the UW Medicine South Lake Union campus and the Fred Hutchinson Cancer Research campus
- Night Ride – provides shuttles between six on-campus pick-up sites and any passenger-requested location inside of a two-zone area.
- Dial A Ride – delivers transportation options to students, faculty, staff, and UWsponsored conference attendees who have disabilities that limit mobility within designated zones.

4. Vehicle and ride sharing for business and academic use

- Ucar program – UW short term vehicle fleet
- Rideshare – UW carpooling commute program
- Emergency Ride Home – covers 90 % of taxi ride home for faculty and staff U-PASS holders
- Discounts on national car sharing services

5. Campus fleet – by making greener choices, the UW has reduced the size of its automotive fleet and has engaged in significant financial commitments to replace gas-only powered vehicles with hybrid, electric, and biofuel vehicles.

6. Telecommuting - University policy allows employees to telework as determined by the department.

NATIONAL AWARDS AND RECOGNITION

The UW's success in areas of environmental conservation and sustainability have been recognized by the following national standards:

- 2014 – Sierra Magazine, the official publication of the Sierra Club, ranked the UW 12th for the "coolest" schools in America and placed the UW in the top echelon in the country for its initiatives to operate sustainably and limit its contributions to global warming
- 2014 – UW Medicine achieved the top 25 Environmental Excellence Award by *Practice Greenhealth*
- 2013-14 – the UW received an A- on the College Sustainability Report Card
- 2013 – the UW received 99/100 on the Princeton Green Rating for its green initiatives

Adopted Policies in accordance with RCW 70.235.020

The University of Washington is a founding signatory to the American College & University Presidents' Climate Commitment (ACUPCC), and is committed to developing an institutional action plan for becoming climate neutral.

In January 2009, under the auspices of the Environmental Stewardship Advisory Committee, a Climate Action Planning Oversight Team formed to coordinate the drafting of a Climate Action Plan. Teams of faculty, students, administrative leaders and staff across all three campuses (Seattle, Tacoma and Bothell) worked together to develop the UW plan, which was submitted to ACUPCC on September 12, 2009 and updated in 2010. The Plan describes preliminary strategies to be explored by the UW, including our intent to work toward becoming climate-neutral. The UW Climate Action Plan includes:

- Strategies for Academic Engagement in Climate Change
- University Greenhouse Gas Emissions and Emission Targets
- Strategies for Reducing University Emissions
- Looking Beyond the Inventory (land use, food and composting, reduce/reuse/recycle)
- Strategies for Financing the Climate Action Plan
- Climate Policy Development and Implementation
- Tracking Progress

One of the annually tracked sustainability metrics is greenhouse gases. Emissions are broken down by 'scope.' Scope 1 - emissions generated by the UW on campus (e.g. burning natural gas for heating). Scope 2 - emission produced by generating energy purchased by the UW (we purchase most of our electricity from Seattle City Light, which is carbon neutral). Scope 3 - emissions produced off campus in support of UW work (e.g. commuting and professional travel). Our goal for total emissions is a 15% reduction from 2005 levels by 2020 and a 36% reduction by 2035.

LETTER FROM DAHP

A letter from DAHP on the impact of potential sites on cultural resources will be provided to the Office of Financial Management as soon as it is received from DAHP. The letter requesting review is provided below.

Date: June 22, 2016

To: Allyson Brooks
State Historic Preservation Officer
Department of Archaeology & Historic Preservation
PO Box 48343
Olympia, WA 98504-8348

From: John Seidelmann
Director of Capital and Space Planning
University of Washington – Office of Planning and Budgeting

Subject: UW Predesign Report Submissions in Support of UW State Capital Budget Request 2017-2019

In accordance with Executive Order 05-05 directing agencies to consult with the Department of Archaeology and Historic Preservation (DAHP) on all capital construction projects to be considered for state funding, the University of Washington is hereby providing information on the following three (3) proposed projects.

These projects will follow the University's historic resources review through the design review process and requirements set forth by Executive Order 05-05. It is anticipated that a Historic Resources Addendum would be prepared if building demolition or alteration was proposed.

The three projects are:

CAMCET – The Center for Advanced Materials & Clean Energy Technologies was created by the State of Washington in 2013 to accelerate the creation of a scalable clean energy future. Permanent operational funding was established in 2015. A new facility is needed for their operations and activities, laboratories (testbeds), collaboration spaces, teaching and offices. The center is proposed to be located in the new UW Innovation District in the west sector of campus. A specific site has not been selected.

Population Health Education Facility – The Population Health Education Facility would support flexible, active and teambased learning for pedagogical and technological needs of the University's Health Sciences as mandated by Medicine, Nursing, Pharmacy and Dentistry accreditation boards. It would centrally locate research, academic and clinical programs. It is intended to be located in the south sector of campus near the Magnuson Health Sciences Center.

Bothell Phase 4 – To accommodate additional students in the School of Science, Technology, Engineering and Mathematics (STEM), the new University of Washington Bothell campus proposed Phase 4 facility would be for classrooms, learning labs, collaborative faculty office space, and student collaboration space. There are currently multiple on-campus site location options, which is anticipated to be selected during the Campus Master Plan update currently underway.

We would appreciate a letter from you confirming receipt of this information for OFM purposes.

TECHNICAL NARRATIVES

ARCHITECTURAL

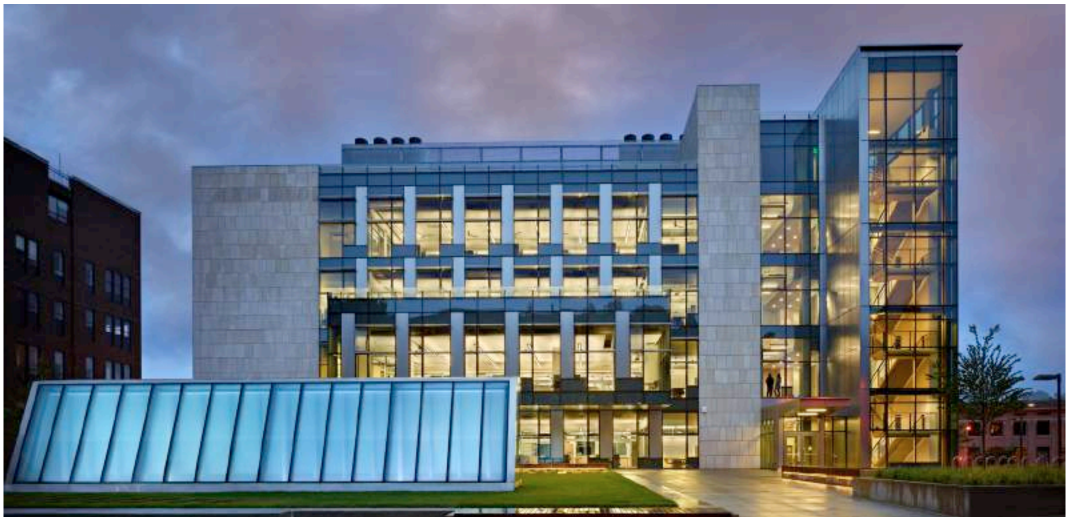
ARCHITECTURAL NARRATIVE

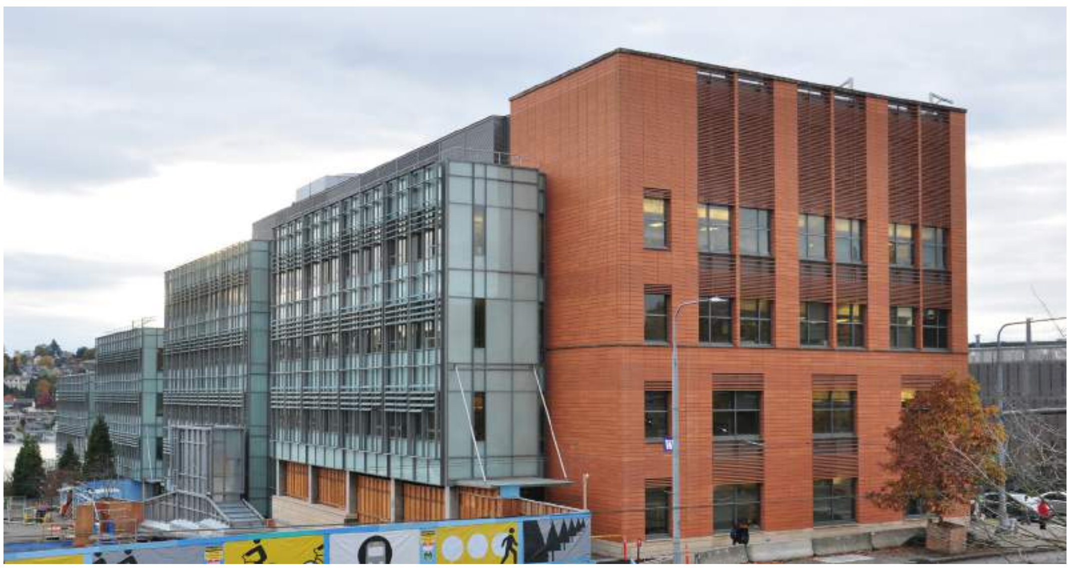
Exterior Materials

The University of Washington campus has a rich collection of buildings that speaks to the long history of building development. From the materials and details of buildings clustered around the historic center of the campus to the latest development of buildings that form the outer boundaries, there exists a continuity of material and scale that, in its totality, represents the aesthetic of the campus.

CAMCET will be the first building in the UW Innovation District, initiating the development of a new and unique zone of the campus. The building should represent its unique attributes and confirm that innovation is at the core of the district's vision. The design of the CAMCET facility has considered the overlap of two objectives: compatibility with the look of the campus and innovation in the use of materials. The Clean Technology and "green" aspect of CAMCET should also be visible throughout the facility and can be an additional driver for material selection.

At this early stage in the process the design team has not completed an in-depth exterior material analysis. Some ideas that have been brought forward to blend with the campus and CAMCET visions are maximizing glazing with the buildings energy performance, and finding innovative materials that are both cutting edge, visually sympathetic with the campus character and the next generation of green materials. This might be seen as utilizing the latest developments in high performance coatings on glass, thin ceramic or terracotta panels that are developed as rain screen facade systems or metals that age naturally.





Sustainability: It's in our nature.

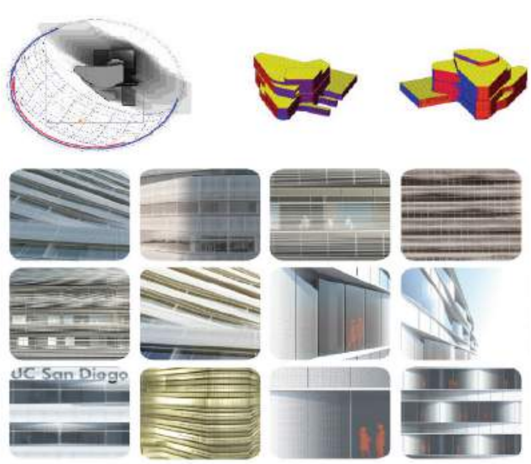
As an environmental leader among higher education institutions, the University of Washington is rated one of the greenest colleges in the country and reached a Gold rating on the Sustainability Tracking, Assessment & Rating System™ (STARS). The new building will adhere to the University's sustainability goals and reach a minimum LEED Silver rating, however as a building vested in clean energy research, CAMCET should strive for an even higher level of improved building performance. In addition to achieving the highest, most cost-effective LEED rating, there should be an attempt to achieve exemplary status when possible. The design team should incorporate sustainable design strategies early in the design process and consider building orientation, planning solutions, passive systems, and overall system efficiencies.

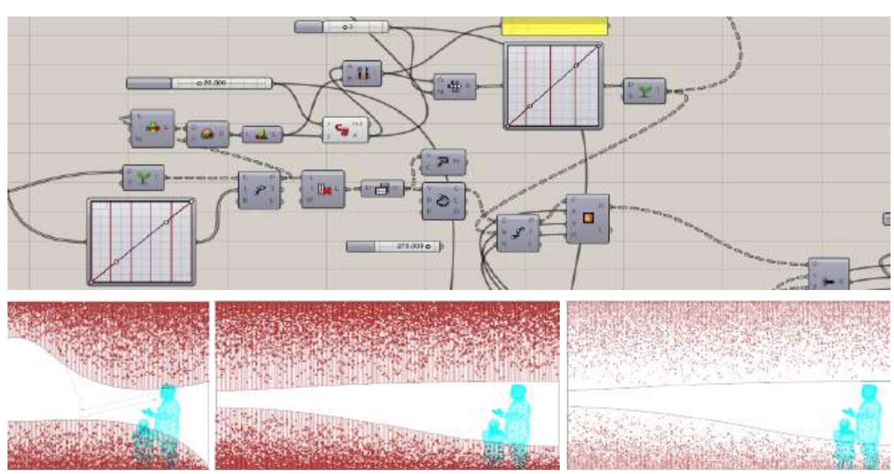
Passive Systems

Passive systems need to be studied in detail early in the design process to determine the optimal starting point for systems efficiencies. As a research building, the floor plate will be large and generally rectangular with a north-south orientation, however the preferred site is trapezoidal with the southern edge rotated towards the west, which will create a more complicated solar condition for the southwest facade. The building planning has developed a building core to the east; this east facade will have minimal glazing and can act as a heat shield to the interior spaces. The need for, and the value of, shading devices on glazed areas of the east facade shall be evaluated during design. To the west, shading devices will need to be analyzed, to determine what additional devices will be beneficial. The north facades are fronted by research labs and can take advantage of larger expanses of glazing. All analyses of shading shall also incorporate daylight harvesting potential, with the aim of maximizing energy efficiency while maintaining occupant comfort. Collaboration spaces have been located along the angled southern edge of the building with lab spaces organized inboard of the exterior wall. The inboard lab walls are proposed to be glazed to allow the bench areas to receive natural daylight through the collaboration zone along the perimeter.

Envelope Optimization

The design should aim to exceed the current ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standard 90.1 baseline standard by 30% or more. The design team must design an airtight, energy-efficient building envelope that minimizes energy use by reducing heat loss and gain. Thermal breaks should be provided in exterior wall and roof systems to avoid thermal bridging. The building envelope should be optimized for energy performance before load calculations are performed to size and select HVAC equipment. All glazing systems need to consider the use of spectrally selective high performance glazing systems. The use of electro-chromic and photo-chromic glazing need to be evaluated, along with the analysis of shading devices, to determine feasibility of these technologies. The analyses of these systems need to be





developed in conjunction with Life Cycle Cost Analysis.

An energy target shall be established by the design team, in cooperation with the Owner, and a strategy developed to ensure that continued operations meet the targets. To meet these goals, early phase energy modeling needs to be employed as part of the optimization process, and results shared with the team in graphical format to provide comparative analysis of the results. The goal of the envelope performance optimization shall be to minimize HVAC equipment sizing, and to minimize energy usage during operation of the facility, utilizing passive means to the maximum extent practical. Developing the buildings energy design utilizing the parameters of carbon neutrality requires a more creative mindset for developing energy solutions for the building and should be sought out to the greatest extent possible. Final energy modeling shall be performed in the CD phase for LEED certification purposes.

Materials Selection

The selection of materials must not only meet energy reduction goals, but also needs to include analysis of material toxicity and embodied energy to consider the total energy over the life cycle of the building. It is important to consider embodied energy as part of the analysis to ensure that trade-offs made relative to cost and durability are representative of true life cycle analysis, and not just first cost issues. Toxic effects of materials need to be addressed to ensure the safety and comfort of building occupants. The design team should include in their material selection process a review of HPDs (Health Product Declarations) and EPDs (Environmental Product Declarations) for the materials under consideration.

Water Conservation

Because water is a long term global concern, the design team shall evaluate the inclusion of water conservation measures in the project. These measures may include low-flow and waterless fixtures, gray water recycling, and rainwater capture and use for non-potable applications.

Sustainable Design Approaches

The following sustainable design strategies should be explored throughout the design process:

• Unoccupied temperature and humidity/airflow and occupancy sensors on lights

• Outside air reset of chilled water, hot water and air flow set points

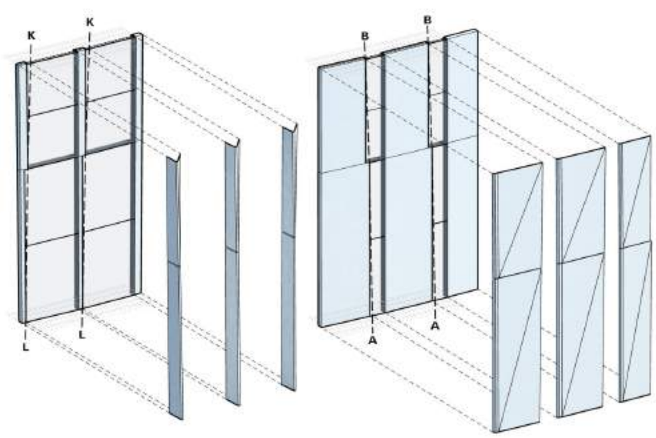
• Heat Recovery systems employed on Air Handling and Hydronic Systems

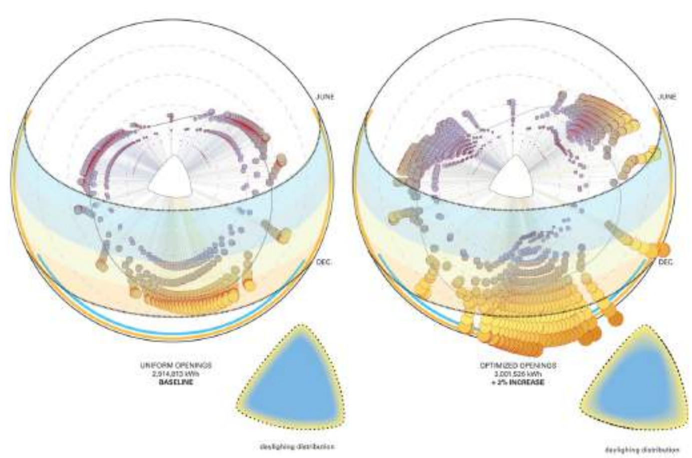
• Water and Air side Economizers

• Utilizing fan coil units for high heat load core spaces

• Shared core laboratory spaces to reduce fume hood requirements

• Grey water recovery systems





TECHNICAL NARRATIVES

CIVIL

CIVIL NARRATIVE

1) SITE ANALYSIS

a) Potential Site Descriptions and Evaluations

i) Site West A

The site contains three buildings, a children's area, landscaped areas and a limited parking/loading dockarea. The Southwest Maintenance Building (SWMB) and Child Care Center (CCC) buildings are located onthe western portion and Brooklyn Trail Building (BTB) is located on the eastern portion of the site. TheSamuel E. Kelly Ethnic Cultural Center (ECC1) is located on the Northeast corner which is anticipated toremain. The children's play area is located between the Children's Center and Ethnic Cultural Center. Thesite is bound to the north by NE Lincoln Way, which is an extension of NE 40th Street, the west and a portionof the south by Cowlitz Road NE and to the east by Brooklyn Avenue NE. The Burke-Gilman Trail is also tothe south of the site. The site gently slopes from the north to south with an approximate 15 foot grade difference at around a 3-5% grade.

Storm Drainage Utilities

The site is located in a dedicated storm basin and is tributary to a 36-inch storm line in Brooklyn Ave NE. Aportion may also drain to a 12-inch storm near the intersection of Cowlitz Road and the Burke-Gilman Trail.Side sewer cards show a 12-inch dedicated storm line conveying flow south to a 15-inch storm line in theBurke-Gilman Trail then into the 36-inch system in Brooklyn. These systems convey stormwater south andeventually discharge into the designated receiving water, Portage Bay, near intersection of Brooklyn Ave &NE Boat St. Per conversations with the City of Seattle, the system is not capacity constrained thus detention

(flow control) would not be required for the site. Water quality would only be required if the limitedloading/service area (pollution generating surface) exceeds 5,000 square feet. The project will be required to provide "Onsite Stormwater Management" to the maximum extent feasible. Potential Onsite Stormwater Management strategies include bioretention, green roof, stormwater re-use and infiltration.

Sanitary Sewer Utilities

Per City of Seattle side sewer cards, the southern and eastern portion of the site appear to be connected tothe 21-inch sanitary sewer main within the Burke Gilman Trail discharging to the west. A portion of the sitealso appears to be discharging to the system in Brooklyn Ave NE. There are two separate sewer mains inBrooklyn Ave NE, a 12-inch main in the center of the street and a 18-inch main toward the east side of thestreet. Based upon coordination information from the UW facilities, the 12-inch main has been or is beingabandoned and desired connections within Brooklyn would have to be to the 18-inch main on the easternmargin. It is difficult to determine which system the Brooklyn Trail Building is currently connected to,however, it is anticipated that the connection to the southern 21-inch system could be utilized and that no offsite sewer main extension improvements would be required.

Water Utilities

There is an 8-inch cast iron water main Brooklyn Ave NE to the east and a 12-inch cast iron water main in NE Lincoln Way (NE 40th Street) to the north. Per City of Seattle mapping, existing services to the site include a 1-1/4 inch and 3/4-inch domestic service and a 4-inch fire service from the 8-inch main in Brooklyn Ave NE currently serving the Brooklyn Trail Building. Based upon utility mapping provided by the University of Washington, there is a 2-inch domestic service from Cowlitz Rd serving the Children's Center and a 1-inch domestic service for the SW Maintenance Building. A 4-inch fire service is provided to the SW Maintenance Building. These services are connected to a private 8-inch main in Cowlitz Rd to the west of the potential site, which reaches a dead end at Lincoln Way and Cowlitz Rd. There is one private hydrant near the site on the west side of the site near the northwest corner of the SW Maintenance Building.

Frontage Improvements

Brooklyn Avenue NE: As outlined in the Landscape Narrative, Brooklyn Ave NE is designated as a green street that will be required to serve all modes of transportation from pedestrian and bicycle to vehicular. At a minimum it should be anticipated that the frontage improvements would be required to remove of the widened area of concrete and expand the landscape strip to match the north end of the block and dedicating ROW to allow for a further expansion of the landscape strip to 9 feet, widen sidewalk to 6.5 feet and a 5 foot landscape buffer behind the walk.

NE Lincoln Way (NE 40th Street): NE 40th Street has been recently improved by adding a driveway cut at Brooklyn, removed the mid road planter and added a pedestrian plaza on the north side of the road.

The addition of street trees and a sidewalk replacement is anticipated along the frontage on the south side of the road.

Cowlitz Road: This frontage appears to be vacated and part of the University of Washington Campus. The University of Washington, likely in coordination with the community, appear to be in the process of modifying the allowed access and channelization of the extension of NE 40th Street adjacent to the north end of the site, as well as Cowlitz Road along the east frontage. Cowlitz Road north of NE Lincoln Way (NE 40th Street) is a pedestrian plaza and the use of Cowlitz adjacent to the site appears to be in transition. NE Lincoln Way, along this frontage, appears to be transitioning to a dedicated bike way. Access to a loading area and coordination of the final frontage along Cowlitz may be much more challenging than the other typical street improvements.

For the purpose of cost estimating, we have assumed that the full pavement will be removed and replaced with a concrete pedestrian plaza for the full length of the western frontage.

We have assumed the loading dock access will be retained at the south end of the site.

ii) Site West B

The site contains five (5) buildings and a portion of a parking area. The building on the northeast corner of the site houses the Instructional Center/Theater (ICT). SOuth of the ICT is a paved parking area. Along the western portion of the site is a series of four attached buildings which house the Community Design Center (SGS), School of Drama (DSC), Behavioral Research and Therapy Clinics (BRTC) and Department of Psychology (GCS). The site is bound to the north by NE 40th Street, to the south by the Purchasing and Accounting Building (PCH) and parking, to east by University Way NE and to the west by Brooklyn Avenue NE. There are three potential vehicular access points from Brooklyn Ave NE, University Way NE and NE 40th. The site slopes from the northeast to the southwest with an approximate 25 foot grade difference across the site with the most significant drop currently from the "alley" into the parking area.

Storm Drainage Utilities

The site is located in a dedicated storm basin and is tributary to a 36-inch storm line in Brooklyn Ave NE which conveys stormwater south, eventually discharging into Portage Bay near the intersection of Brooklyn Ave & NE Boat St. Side sewer cards do not indicate any dedicated storm infrastructure in University Way along the project site. Historically, since the site grades toward Brooklyn and this would likely continue to be the discharge location it would not be assumed that the City of Seattle would request a storm main extension within University Street. However, most recently the City of Seattle, although somewhat inconsistently, has been requiring for main extensions on all frontages and this cost may want to be carried in the budget. No detention is anticipated for this site. Water quality would only be required if the limited loading/service area (pollution-generating surface) exceeds 5,000 square feet. The project will be required to provide "Onsite Stormwater Management" to the maximum extent feasible. Potential Onsite Stormwater Management strategies include bioretention, green roofs, stormwater re-use, and infiltration.

Sanitary Sewer Utilities

According to City of Seattle side sewer cards, there is a 15-inch sanitary sewer main in Univeristy Way NE to the east. Side sewer cards indicate multiple connections from the site to the main in University Way. There are two separate sewer mains in Brooklyn Ave NE, a 12-inch main in the center of the street and a 18-inch main toward the east side of the street. Based upon coordination information from the UW facilities, the 12-inch main has been or is being abandoned and any desired connections within Brooklyn would have to be to the 18-inch main on the eastern margin. There appears to be two (2) existing connections to the 18-inch main in Brooklyn. There also appears to be multiple stub from the 12-inch main in the center of the street toward the property but these are anticipated to be abandoned and not re-usable. No public sewer main extensions are anticipated to be required for this site.

Water Utilities

There is an 8-inch cast iron water main in University Way NE to the east, a 12-inch cast iron water main in NE 40th Street to the north, and an 8-inch cast iron water main in Brooklyn Ave NE to the west. The existing ICT building on the west side of the site has two service lines from the 8-inch main in Brooklyn Ave NE, including a 4-inch fire service line and a 3/4 inch domestic service line. Per City of Seattle mapping, there are four (4) 3/4-inch domestic service lines connecting to the site from University Way NE. There are five (5) fire hydrants within the vicinity of the project including one at each of the intersections surrounding the block as well as one mid-block on Univeristy Way NE. No water main improvements or additional hydrants are anticipated to be required for this site.

Seattle City Light

Seattle City Light has infrastructure within the private "alley" between Brooklyn Ave NE and University Ave NE. This infrastructure extends into the alley underground from NE 40th Street, and then extends above grade on poles through the alley. This infrastructure terminates within the alley and only serves the existing building currently located within this block.

Frontage Improvements

Based upon existing field conditions, it is assumed that the following may be required as part of frontage improvements.

University Way NE: A ROW dedication may be required along this frontage to install the required planing strip with street trees and walkway. Curb bulb, at the intersection of University Way and NE 40th Street are anticipated and updated ADA curb ramps and companian ramps will also be required. It is assumed for the purposes of cost estimating that only the project frontage (north half of the block) will be improved.

NE 40th Street: The addition of street trees and a sidewalk replacement is anticipated along this frontage.

Brooklyn Avenue NE: As outlined in the Landscape Narrative, Brooklyn Ave NE is designated as a green street that will be required to serve all modes of transportation from pedestrian and bicycle to vehicular. Frontage improvements may require a ROW dedication to accommodate the 6 foot bike lane, 6 foot landscape strip, 6.5 foot sidewalk and a 5 foot landscape buffer as shown in the U District Green Street Concept Plan. It could also be required have the roadway expanded to match the bike lane and parking north of NE 40th Street. A curb bulb is anticipated at the intersection with NE 40th Street extending into Brooklyn; updated ADA curb ramps are also anticipated. It has been assumed that the full block would be improved.

iii) Site West C

The western portion of this site is paved parking. The eastern portion of the site contains the Purchasing and Accounting Building (PCH) with access to the parking area located both north and south of the building. Additional parking is located south of the PCH. The site is bound to the north by the West-B site, to the south by the Burke Gilman Trail, to the east by University Way NE, and to the west by Brooklyn Avenue NE. The site slopes from the northeast to the southwest with an approximate 18 foot grade difference across the site with the most significant drop currently from the "alley" into the parking area.

Storm Drainage Utilities

The site is located in a dedicated storm basin and is tributary to a 36-inch storm line in Brooklyn Ave NE which conveys stormwater south, eventually discharging into Portage Bay near the intersection of Brooklyn Ave and NE Boat St. Per the side sewer cards, the site is also tributary to a 12-inch dedicated storm system at a SDMH at the corner of University Way NE and the Burke Gilman Trail. Historically, since the site grades toward Brooklyn and this would likely continue to be the discharge location it would not be assumed that the City of Seattle would request a storm main extension within University Street. However, most recently the City of Seattle, although somewhat inconsistently, has been requiring main extensions on all frontages and this cost may want to be carried in the budget. No detention is anticipated for this site. Water quality would only be required if the limited loading/service area (pollution generating surface) exceeds 5,000 square feet. The project will be required to provide "Onsite Stormwater Management" to the maximum extent feasible. Potential Onsite Stormwater Management strategies include bioretention, green roofs, stormwater re-use, and infiltration.

Sanitary Sewer Utilities

According to City of Seattle side sewer cards, the site is tributary to an 18-inch private sewer line running parallel to the Burke Gilman Trail and NE Pacific Street. There is also a 15-inch sanitary sewer main in University Way NE to the east with potential connection locations. According to City of Seattle side sewer cards, there is a 15-inch sanitary sewer main in University Way NE to the east. There are two separate sewer mains in Brooklyn Ave NE, a 12-inch main in the center of the street and a 18-inch main toward the east side of the street. Based upon coordination information from the UW Facilities, the 12-inch main has been or is being abandoned and any desired connections within Brooklyn would have to be to the 18-inch main on the eastern margin. The sewer card appears to have a stub from the 18-inch line toward the southwest corner of the site, however this will need to be confirmed. Any connection from the site to the 18-inch main would need to extend either over or under the existing 36-inch storm main between the site and the sewer.

Water Utilities

There is an 8-inch cast iron water main in Univeristy Way NE to the east and another 8-inch cast iron water main in Brooklyn Ave NE to the west. A 2-inch domestic water service from the 8-inch main in University Way NE serves to the building on the east side of the site. According to City of Seattle mapping, there appears to be another 2-inch water line at the southeast corner of the site although not connecting to the building. This line may be used for irrigation service to the park surrounding the Burke Gilman Trail. There are five (5) fire hydrants within the vicinity of the project including one at each of the intersections surrounding the block as well as one mid-block on University Way NE. No water main improvements or additional hydrants are anticipated to be required for this site.

Seattle City Light

Seattle City Light has infrastructure within the private "alley" between Brooklyn Ave NE and University Ave NE. This infrastructure extends into the alley underground from NE 40th Street, and then extends above grade on poles through the alley. This infrastructure terminates within the alley and only serves the existing building currently located within this block.

Frontage Improvements

Based upon existing field conditions, it is assumed that the following may be required as part of frontage improvements:

University Way NE: A ROW dedication may be required along this frontage to install the required planing strip with street trees and walkway. It is assumed that only the project frontage (south half of the block) will be improved.

Brooklyn Avenue NE: As outlined in the Landscape Narrative, Brooklyn Ave NE is designated as a green street that will be required to serve all modes of transportation from pedestrian and bicycle to vehicular. Frontage improvements may require a ROW dedication to accommodate the 6 foot bike lane, 6 foot landscape strip, 6.5 foot sidewalk and 5 foot landscape buffer as shown in the U District Green Street Concept Plan. It could also be required to have the roadway expanded to match the bike lane and parking north of NE 40th Street. A curb bulb is anticipated at the intersection with NE 40th Street extending into Brooklyn; updated ADA curb ramps are also anticipated. It is assumed that the entire block would need to be improved for this project.

iv) Site West D

This site contains three buildings, Guthrie Annex 1 and Guthrie Annex 3, which house the Department of Psychology, and Guthrie Annex 2 which is shared by the Department of Psychology and the Robinson Center for Young Scholars. The rest of the site is predominantly landscaped. The site is bound to the west by 15th Avenue NE, to the west by parking and green space above an underground garage, to the north by NE Grant Street, and to the south by the Physics/Astronomy building. The site slopes from the northeast to the southwest with a retaining wall along 15th Avenue NE. Above the retaining wall, there are a number of mature evergreen trees that would be impacted by the removal of the wall.

Storm Drainage Utilities

The site is located in a dedicated storm basin. Per City of Seattle side sewer cards, there is a 24-inch storm line in 15th Avenue NE, which becomes a 30-inch storm line at a manhole structure in between the northernmost and middle building (i.e., between Guthrie Annex 2 and 3). Side sewer cards do not show routing of stormwater facilities, but there appears to be a connection to the 30-inch storm line between the middle buildign and southernmost building (Guthrie Annexes 1 and 2). The 30-inch storm line conveys flow south eventually discharging into Portage Bay near the intersection of Brooklyn Ave and NE Boat Street. No detention is anticipated for this site. Water quality would only be required if the limited loading/service area (pollution generating surface) exceeds 5,000 square feet. The project will be required to provide "Onsite Stormwater Management" to the maximum extent feasible. Potential Onsite Stormwater Management strategies include bioretention, green roofs, stormwater re-use, and infiltration.

Sanitary Sewer Utilities

According to City of Seattle side sewer cards, there are two parallel 12-inch sanitary sewer mains in 15th Ave NE. There appears to be an 8-inch side sewer connection to the northnmost building, connecting to the 12-inch main closest to the site. The southernmost building has an 8-inch side sewer connection at the south end of the building. Both of the aforementioned connections, according to sewer cards, appear to downsize to 6-inch connections at their respective buildings. Additionally, there is an 8-inch side sewer in the driveway paralleling the east side of the site. The middle building (Guthrie Annex 2) is served by a connection to this 8-inch line.

Water Utilities

Per city of Seattle mapping, there is an 8-inch cast iron water main in 15th Ave NE. There are two fire hydrants on the frontage abutting the site, with one located to the northwest of the middle building and the other located southwest of the southernmost building. It is anticipated that domestic water and fire service connections are from the campyus system.

Frontage Improvements

15th Avenue NE: The existing frontage appears to meet the City of Seattle's Standards except for the concrete drainage swale located at the back of the sidewalk and base of the existing wall. It is anticipated that the sidewalk and swale will be impacted by the removal of the wall, so the sidewalk would be required to be replaced. There is no planter, so it is expected that tree wells will be required to be installed behind the curb. It is anticipated that the wells can be cut from the existing sidewalk.

b) Civil Site Development Criteria

i) Site West A

1. Approximate Site Area: 38,600 square feet (sf)
2. Assumed Building Area: 33,500 sf
3. Onsite Stormwater Management Assumptions:
    a) 30 % green roof. 10,000 sf
    b) 70% roof tributary to bioretention. Concept bioretention size with 6-inch ponding: 1,400 sf
    c) Remaining Site Area:
        i) 5,100 sf
        ii) assumed 70% impervious = 3,600 sf
        iii) Assume pervious paving = 1,100 sf
        iv) Remaining area concrete/pavement = 2,500 sf
        v) Remaining tributary to bioretention. Concept bioretention size with 6-inch ponding: 150 sf
4. Sewer
    a) 8-inch side sewer connection
5. Water
    a) 4-inch domestic water service and meter
    b) 6-inch fire service and DC meter
6. Frontage Improvements
    a) Cowlitz
    b) NE Lincoln Way
    c) Brooklyn Ave NE

ii) Site West B

1. Approximate Site Area: 50,700 square feet (sf)
2. Assumed Building Area: 41,200 sf
3. Onsite Stormwater Management Assumptions:
    a) 30 % green roof. 12,400 sf
    b) 70% roof tributary to bioretention. Concept bioretention size with 6-inch ponding: 1,600 sf
    c) Remaining Site Area:
        i) 9,500 sf
        ii) Assumed 70% impervious = 6,700 sf
        iii) Assume pervious paving = 2,700 sf
        iv) Remaining area concrete/pavement = 4,000 sf
        v) Remaining tributary to bioretention. Concept bioretention size with 6-inch ponding: 250 sf
4. Sewer
    a) 8-inch side sewer connection
5. Water
    a) 4-inch domestic water
    b) 6-inch fire service
6. Frontage Improvements
    a) NE 40th Street
    b) Brooklyn Ave NE
    c) University Way NE

iii) Site West C

1. Approximate Site Area: 54,400 square feet (sf)
2. Assumed Building Area: 38,200 sf
3. Onsite Stormwater Management Assumptions:
    a) 30 % green roof. 11,500 sf
    b) 70% roof tributary to bioretention. Concept bioretention size with 6-inch ponding: 1,500 sf
    c) Remaining Site Area:
        i) 16,200 sf
        ii) Assumed 70% impervious = 11,400 sf
        iii) Assume pervious paving = 3,400 sf
        iv) Remaining area concrete/pavement = 9,000 sf
        v) Remaining tributary to bioretention. Concept bioretention size with 6-inch ponding: 550 sf
4. Sewer
    a) 8-inch side sewer connection
5. Water
    a) 4-inch domestic water
    b) 6-inch fire service
6. Frontage Improvements
    a) Brooklyn Ave NE
    c) University Way NE

iv) Site West D

1. Approximate Site Area: 45,500 square feet (sf)
2. Assumed Building Area: 41,900 sf
3. Onsite Stormwater Management Assumptions:
    a) 30 % green roof. 12,500 sf
    b) 70% roof tributary to bioretention. Concept bioretention size with 6-inch ponding: 1,650 sf
    c) Remaining Site Area:
        i) 3,600 sf
        ii) Assumed 70% impervious = 2,500 sf
        iii) Assume pervious paving = 0 sf
        iv) Remaining area concrete/pavement = 2,500 sf
        v) Remaining tributary to bioretention. Concept bioretention size with 6-inch ponding: 150 sf
4. Sewer
    a) 8-inch side sewer connection
5. Water
    a) 4-inch domestic water
    b) 6-inch fire service
6. Frontage Improvements

TECHNICAL NARRATIVES

LANDSCAPE

LANDSCAPE NARRATIVE

Pedestrian & Bike Access

Sites West A, B, and C are all adjacent to Brooklyn Avenue NE, which should be considered a major north-south route for both bikes and pedestrians as well as the gateway and route to the southwest campus open space, new waterfront park, and the Sound Transit Lightrail Station.

Sites West B and C are adjacent to University Way, which is characterized as a Community Connector in the forthcoming UW master plan and is an important link between both sites to the active mixed-use and retail corridor of the portion of "The Ave" north of the Campus Parkway. Development along this corridor should incorporate entries and connections that address University Way to ensure this street is activated with daily life supports and expands the activities of the UW Innovation District and truly connects the campus north-south.

The northern edge of sites West A, B, and D are adjacent to NE 40th Street, which is designated as an east-west connector and future shared street from West Campus into Central Campus. The desire is that this connection be strengthened and treatment along here to emulate new development of Lander and Alder Halls: generous sidewalk widths, public amenities like seating, provision of on-street small gathering or social eddies. Building entries and right-of-way development should respond to and strengthen this connection.

The Burke Gilman Trail, located just south of West A and C, is the most active walking and biking path on campus with regional connections, used for both recreation and commuting.

The alley between sites West B and C provides an opportunity to break up the superblock, connect the campus in the east west direction and create a space that serves the academic program and surrounding community.

Bike Infrastructure

The University of Washington has a goal of 20% of faculty, staff, and students arriving on bicycle by 2020. All new developments must provide covered bike racks as well as secured bike parking sufficient to support this goal. Secured bike parking is defined as either a room in a building and adjacent to an entrance dedicated to bicycles or exterior bike lockers. University requirements dictate the amount of bike parking to help guide the development of this infrastructure:

• Covered bike racks: Minimum 24 covered bike racks OR 10% of the faculty, staff, and paid student employees plus 5% of student classroom capacity, whichever is greater.

• Secure bike parking in building rooms, exterior bike lockers, or bicycle houses: Minimum 10 spaces OR 3% of faculty, staff, and paid student employees.

With a permanent building population projected to be 305 and a transient population of 275, covered bicycle parking is estimated at 45 and secured parking at 17.

The recommended approach to the accommodation of bicycle parking is to co-locate covered bike parking with covered pedestrian walks and arcades that are publicly accessible and visible. Because of generally limited exterior space for all sites, locate secure bike parking within the building as much as possible. For site West A, locate covered bike parking along east side of building along with a covered pedestrian walk and arcade. This location is adjacent to the cycle track on NE 40th Street and across the street from the widened walk in front of Alder Hall, which will further contribute to activating this as a shared street public space. For sites West B and C, locate covered bike parking adjacent to the alley along with a covered pedestrian walk and arcade. This alley has the potential to become a laneway, encouraging bicyclists as well as pedestrians to use this as a route and gathering space would provide activation as well space. For site West D, locate covered bike parking along the east edge of the building; some spaces could potentially be placed in the entry corridor if that is made an exterior space on the first level. Given the constrained nature of this site, secure bike parking should be located in the building. With the Burke Gilman adjacent to West C and only ½ block from West B, both are prime locations for building users to arrive via bicycle.

The City of Seattle Bicycle Master Plan shows two possible bike share stations within one block of both sites, increasing the opportunity for multi-modal connections. One is located at Campus Parkway and University Way and the other is located NE 40th Street and 15th Ave NE.

Barrier-Free Accessibility

Brooklyn Avenue NE, University Way NE, and Cowlitz Road are all greater than 5%, therefore accessible entry for West A, B, and C should be considered along NE 40th Street or Lincoln Way. NE 40th Street between Brooklyn Ave NE and University Way NE is approximately 4.8%. Where NE 40th Street turns into Lincoln Way, between Brooklyn Avenue NE and Cowlitz Road, grade is very gentle at less than 2%. Cowlitz Rd itself is over 6%. 15th Ave NE is approximately 4.4%, making it a more desirable location for an accessible entry as NE 40th Street at this point is over 11%.

Landscape and Open Space Relationships

NE 40th Street, Brooklyn Avenue NE, and 15th Avenue NE present an opportunity for the UW CAMCET site to adopt the street as an extension of the building program and mission creating an activated street environment. The development of an entry plaza / open space associated with these streets would further extend the exterior public space and help develop social space while supporting current planning efforts to enhance pedestrian and bike access along street corridors. This use and blurring of the sidewalk and entry plazas may also present opportunities to use the exterior environments in expanding the presence and communicating the program and mission of the CAMCET building beyond the building walls.

Alder Hall is across NE 40th Street from sites West A and B. Alder Hall houses the District Market, which is dining open to the public, and Alder Commons, an auditorium for events and programs. The sidewalk and streetscape at Alder have been enlarged to create an exterior public space. There is an opportunity to take advantage of this and extend this exterior space for site West B, creating a social / public zone that would support the academic / private partner nature of the CAMCET programming.

The widened sidewalk proposed for the Brooklyn Avenue NE section also supports the opportunity for UW CAMCET public and social portion of programming to spill into exterior space at sites West A, B, and C.

For sites West B and C, University Way as a Community Connector should have entries that front it and create activity on the street. Additionally, across the street is Gould Hall with two entries, a coffee shop, and gallery that are used by students and the public alike, which supports activation of the street and a potential relationship with users of sites West B and C. At the intersection of NE 40th Street and University Way NE are the College Inn Pub and Spring Kitchen, both busy dining establishments. Safe and comfortable pedestrian connections to these should be provided. There are currently no street trees along either the West B or C portion of University Way NE and development of either site should provide those. Because both Brooklyn Avenue NE and University Way NE are steeper than 5%, resting points such as benches and lean rails should be provided.

Site west C's adjacency to Burke Gilman Trail offers an opportunity to create a frontage to a well-used thoroughfare that does not have cars. Should this site be selected, the south side of the building should be treated equally as a front as the façade on University Way NE.

Site West C, with its adjacency to the Burke Gilman trail provides an opportunity to integrate stormwater management. There is the potential for incorporating stormwater elements along the other streets adjacent to all four sites, but the viability of this needs to be vetted with the University.

In support of the existing campus development and the Campus Landscape Framework Plan, there are a number of landscape typologies that are relevant and should be incorporated into any selected site. Courtyards are relatively small exterior spaces related to specific buildings, but are also connected to and overlap with larger campus circulation and open space. It is important that these are of intimate, comfortable scale, but visible and connected such that they do not appear to be privatized.

The forest frame typology consists of large established deciduous and coniferous trees and includes the landscape south of through which the Burke Gilman trail passes south of West C and also a portion of the landscape south of West D. This woodland edge is a character-defining attribute that complements cleared/developed areas and offers borrowed views/landscapes especially valuable for this urban portion of campus. The frontage along Brooklyn Avenue NE and 15th Avenue NE is characterized as urban frontage. The development of any of the sites provides an opportunity for the CAMCET project to influence and activate these visible streets.

SITE PROGRAM

Regardless of which site is selected, there are exterior program components that should be included to support both the programmatic needs of the project and the urban design and planning objectives of the neighborhood and University of Washington campus.

Vehicular, Service and Emergency Access:

Vehicular, service, and emergency access should be located in a way that minimizes conflicts with designated pedestrian and bicycle corridors, shared streets, and Green Streets. This includes creating a single service access point, maximizing visibility to enter and exit, and where possible, locating these facilities so that access does not cross a major pedestrian route. The location of service access is to be adjacent to the appropriate interior facilities including room for garbage and recycling. Loading and service access to be designed to minimize impact on any side of the building/site given that all sides have a public function and use. Required service access includes loading dock, deliveries, recycling, trash compactor, and chemical, gas, and biological waste, and storage.

Service access for West A should be located on the west side of the site, along Cowlitz Road. For West B, the service area should be located at the southwest corner of the building with access from Brooklyn Avenue NE. The service area for West C should be located at the northwest corner of the building with access from Brooklyn Avenue NE. West D should have service located behind the building at the southeast corner, with access along the south side. There is also the potential to share the existing below-grade loading dock with the Physics Building.

Exterior Gathering Spaces:

Exterior gathering spaces are academic and social spaces that support the function of the CAMCET building as well as contribute to the overall campus. Gathering areas located at entries and plazas should be designed and furnished to support the mission of the building and extend the internal activities out into the adjoining site and uses. These areas could range from 500 SF for entry plazas and up to 6000 SF for larger exterior gathering spaces.

Exterior spaces associated with the building should be strategically located such that they are adjacent to both interior and other exterior functions that place the right uses next to each other adjacencies of these spaces need to be tied to interior and exterior functions that place the right uses next to each other, creating synergies in support of the University and CAMCET's mission.

Interior public spaces such as the exhibit space, lobby, café, mission control, and collaborative spaces could spill into exterior spaces such as an outdoor convening space/classroom, an informal class space, or main entries which provide seating and gathering areas. Within the campus context, these should be located to allow for open space, street, and pedestrian corridor interaction. These spaces should be flexible in their use with solar access where possible and overhead cover for all seasons use.

In addition, exterior spaces to be designed with consideration for CPTED criteria to assure comfort and safety at all times and be ADA accessible.

Site-Specific Exterior Program

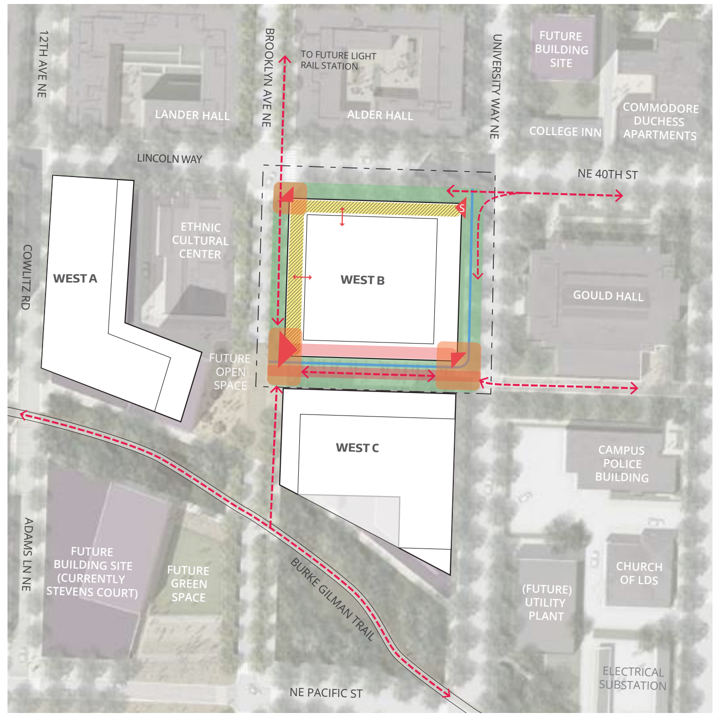
Specific access and exterior gathering space recommendations per site option are as follows:

- **West A**: Locate the primary entry and entry plaza at the east side such that it is adjacent to pedestrian oriented Brooklyn Avenue NE. This also locates the entry adjacent to the proposed open space / terrace that will serve as an entry to the new waterfront park. This site allows for a larger open space (approximately 6000 SF dependent on final building configuration) through development of the open space terrace that wraps the southeast portion of the building and serves as an entry to the new waterfront park. Use this terrace to create a connection to the Burke Gilman trail and create a relationship between the building's interior activities and exterior spaces.
- **West B**: Locate the primary entry and entry plaza at the southwest corner to engage with the pedestrian and bike oriented Brooklyn Avenue NE. The building should have some visual and /or physical connection with NE 40th Street as well to respond to the pedestrian oriented development of the right-of-way associated with Alder Hall. Incorporate amenities such as site furnishings and rain gardens and create direct interior / exterior relationships that promotes the building's identity and activates the Brooklyn Avenue NE edge. Locate a secondary entry at the southeast corner to address University Way NE as well as the newly created urban laneway. This laneway also provides opportunity for interior / exterior relationships that promote CAMCET's mission and identity. It should be developed to allow visual and physical connections with the interior and serve as a spill-out space for the building; potential uses are outdoor classroom, gathering space, and exhibit space.
- **West C**: Locate the primary entry and entry plaza at the southwest corner to engage with Brooklyn Avenue NE and the Burke Gilman trail. As in West B, this the laneway provides an opportunity for interior / exterior relationships that promote CAMCET's mission and identity. It should be developed to allow visual and physical connections with the interior and serve as a spill-out space for the building; potential uses are outdoor classroom, gathering space, and exhibit space. Amenities such as site furnishings and rain gardens should be incorporated and a direct interior / exterior relationships that promotes the building's identity and activates should be incorporated along the University Way NE edge.
- **West D**: Locate the primary entry and entry plaza at the west-middle of the site. This will break up the length of the building and allow for an open entry corridor that provides a more pedestrian-scaled entry. Providing this entry corridor along with a small plaza / gathering area on the east end of this would serve as a visual and physical connection through the building into the central part of campus. At the northwest corner, a secondary entry addresses a busy intersection and engages 40th Street as an east-west connector into the central campus. Providing interior / exterior connections, both physical and visual, along 15th Avenue NE will break up the massing of a long linear building, activate the street edge, and provide opportunities for creating identity and promoting CAMCET's work and research.

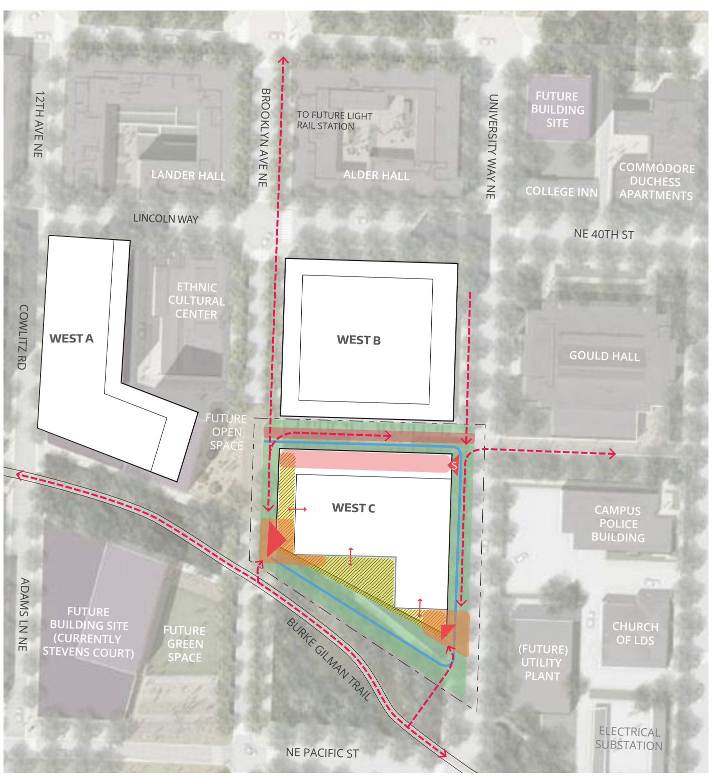
Exterior class function should include area with seating sized for a class of approximately 25. Area size to range from 300 to 400 square feet. Facilities to include seating, leaning rails, and a work table.

West A:

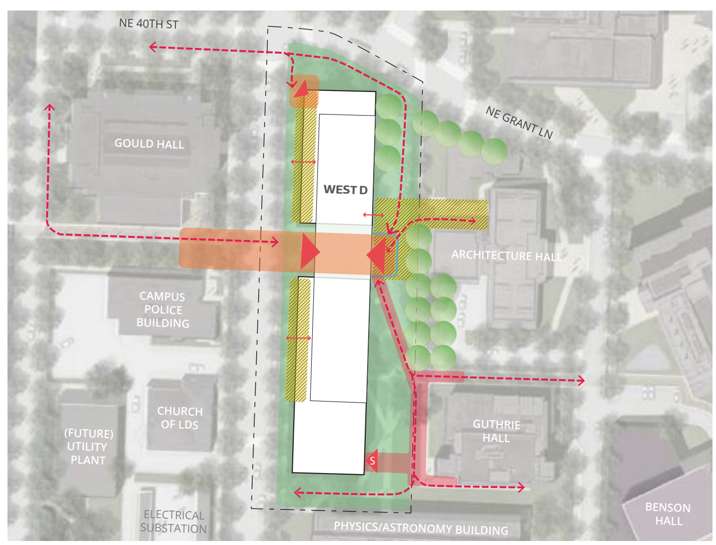
West B:



West C:



West D:



PRIMARY BUILDING ENTRY AND THRESHOLD

SECONDARY BUILDING ENTRY AND THRESHOLD

MOVEMENT
walkway, laneway, bike parking, courtyard

SERVICE ENTRY

STORM WATER DESIGN

GATHERING
covered arcade, overlook, terrace, extension of interior space

PRIMARY PEDESTRIAN AND BICYCLE ACCESS

INTERIOR/EXTERIOR CONNECTIONS

CAMPUS LANDSCAPE
outdoor classroom, laneway, raingarden, greenspace

LIMIT OF WORK

TECHNICAL NARRATIVES

STRUCTURAL SYSTEM

STRUCTURAL NARRATIVE

APPLICABLE CODE AND STANDARDS

The project will be governed by the Seattle Building Code (SBC), which is based on the International Building Code (IBC). The SBC defines minimum design loads for floors, roofs, wind, and seismic.

To guide the design of buildings at University of Washington (UW), the Engineering Services division of the Facility Services Office has developed a Facilities Services Design Guide (FSDG). Appropriate provisions will need to be incorporated into the design where required.

BUILDING CODES

- Building Code: International Building Code, 2012, with City of Seattle Amendments (Seattle will be adopting the 2015 IBC in January 2017).
- Design Loads: American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures, ASCE 7-10.
- University of Washington Campus Engineering and Facility Design Information.

MATERIAL CODES

- Reinforced Concrete: American Concrete Institute, Building Code Requirements for Structural Concrete and Commentary, ACI 318-11.
- Masonry: American Concrete Institute, Building Code Requirements for Masonry Structures and Commentary, ACI 530-11.
- Structural Steel: American Institute of Steel Construction, Steel Construction Manual, 14th Edition, AISC 2011.
- Structural Steel: American Institute of Steel Construction, Seismic Design Manual, 2nd Edition, AISC 2012.

EXISTING CONDITIONS

Four potential sites are under consideration for the project, all of which are located on the western side of the University of Washington Campus in what is being called the Innovation District in master plan studies. The final site is to be chosen at a later date. All sites currently contain existing operational buildings that would need to be demolished. Available drawings for these structures were reviewed to determine impacts on the new building.

- Site A: Low-rise existing structures circa 1950s-1990s, shallow foundations, adjacent to Ethnic Cultural Center building to northeast which is to remain
- Site B: Low-rise existing structures circa 1960s-1990s, shallow foundations, split north-south by retaining wall, east edge is adjacent to below-grade utilities tunnel on east side of University Way NE
- Site C: Low-rise existing structure circa 1960s-1980s, shallow foundations, split north-south by retaining wall, east edge is adjacent to below-grade utilities tunnel on east side of University Way NE
- Site D: Low-rise existing structures circa 1910s-1930s, shallow foundations, south edge is adjacent to loading dock of Physics-Astronomy building

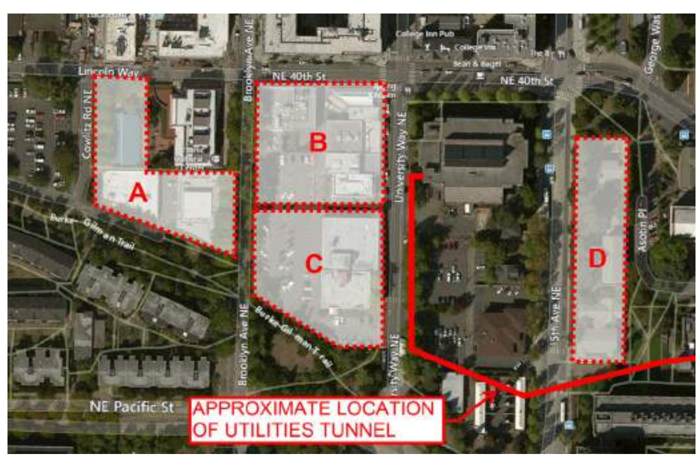


Figure 1. Overview of Potential Project Sites – West Campus

LOADING CRITERIA

GRAVITY LOADING

The following loads are in addition to the self-weight of the structure. The following live loads are recommended based on the requirements of the SBC and the FSDG. Live loads are reduced where permitted in accordance with Section 1607.10 of the SBC. Loads are given in pounds per square foot (psf).

Table 1. Floor and Roof Loads

Area	Live Loading	Super-imposed	Note
Dead Loading	Note	60 psf	1
Auditorium	100 psf	60 psf	1
Offices/ Classrooms	80 psf (R) + 20 psf for partitions	20 psf	
Auditorium	100 psf	30 psf	2
Lobbies and Corridors	100 psf	30 psf	2
Typical Labs	100 psf (R)	20 psf	3
Heavy Labs (on grade)	250 psf	30 psf	3
Loading Dock	250 psf	40 psf	4
Stairs/Exits	100 psf	10 psf	
Mechanical/ Electrical Rooms	150 psf	20 psf	5
Storage (Light)	125 psf	20 psf	
Roof	25 psf (R) or Snow Drift Load	25 psf	

Notes:

1. The superimposed dead load (SDL) for the auditorium includes a raised floor system above the main structure, which may be removed during future renovations to increase the live load capacity.
2. The SDL for the lobbies and corridors assumes 1-1/2-inch-thick stone flooring.
3. Point loads for the lab space will be determined based on planned loading or 2,000 pounds, whichever is greater.
4. Loading dock areas designed for HS-20 axle loads.
5. The live load for mechanical/electrical rooms will be 150 psf, or the actual weight of the equipment plus 50 psf for the surrounding space, whichever is greater.

In addition to these uniform slab loads, a perimeter dead load is applied to the structure to account for the weight of the cladding system.

Table 2. Cladding Loads

Load Type	Load
Glass Window Wall	15 psf
Metal Panel	10 psf
Brick with Metal Stud Backup	50 psf

SNOW DESIGN CRITERIA

Snow drifting, unbalanced loading, and partial loading are considered in the design of the roof framing. The following parameters for snow loads are in accordance with the SBC:

Table 3. Snow Design Criteria

Parameter	Value
Ground Snow Load (Pg)	20 psf
Risk Category	III
Terrain Category	B
Exposure	Partially Exposed
Snow Exposure Factor (Ce)	1.0
Thermal Factor (Ct)	1.2
Importance Factor (Is)	1.10
Flat Roof Snow Load (Pf)	22 psf

WIND DESIGN CRITERIA

The following parameters for wind loads are in accordance with the SBC:

Table 4. Wind Design Criteria

Parameter	Value
Basic Wind Speed, 3-second gust (V)	115 mph
Exposure	B
Enclosure Classification	Enclosed
Topographic Factor	1.0

SEISMIC DESIGN CRITERIA

The following parameters for seismic loads are in accordance with the SBC:

Table 5. Seismic Design Criteria

Parameter	Value
Building Latitude	47.65435°N
Building Longitude	122.31395°W
Risk Category	III
Importance Factor (Ie)	1.25
Mapped Spectral Acceleration	SS = 1.290; S1 = 0.499
Mapped Long Period	TL = 6.0
Site Class	C
Site Class Coefficients	Fa = 1.0; Fv = 1.3
Spectral Response Coefficients	SDS = 0.860; SD1 = 0.433
Seismic Design Category	D
Analysis Procedure Used	Modal Response Spectrum Analysis

VIBRATION PERFORMANCE

General performance criteria of VC-A (2,000 micro-inches/sec.) will be used in lab areas in accordance with the FSDG requirements and with criteria of AISC Design Guide 11: Floor Vibrations Due to Human Activity. Areas requiring more stringent criteria may require local stiffening of the structure or the use of vibration isolation devices, such as specialized tables or pads. These programs could also be strategically located on the slab on grade level of the building.

MATERIALS

The material properties used for the design include the following:

Table 6. Structural Steel Properties

Member	Standard, Strength
Wide Flange Shapes	ASTM A992, Fy = 50 ksi ASTM A913, Fy = 50 ksi
Tube Sections	ASTM A500, Grade B, Fy = 46 ksi
Pipe Sections	ASTM A53, Type E or S, Grade B, Fy = 35 ksi
Angle and Channel Sections	ASTM A36, Fy = 36 ksi
Miscellaneous Plates	ASTM A572, Fy = 50 ksi
High-Strength Bolts 7/8" diameter and smaller 1" diameter and larger	 ASTM A325 ASTM A490
Steel Composite Deck	ASTM A653, Grade A or C, 20 gage minimum
Steel Roof Deck	ASTM A653, Grade A or C, 20 gage minimum

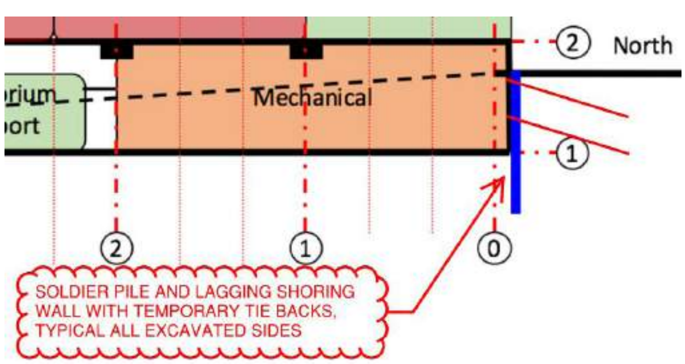


Figure 2. Section of Shoring Wall at Basement

Table 7. Concrete Properties

Member	Strength*
Slab on Ground, Sidewalks, Curbs, Mechanical Pads	f'c = 4.0 ksi
Basement Walls & Footings, Spread Footings	f'c = 5.0 ksi
Mat Foundation	f'c = 6.0 ksi at 56 days
Composite Slabs on Metal Deck	f'c = 4.0 ksi
Shear Walls and Columns	f'c = 6.0 and 8.0 ksi at 56 days
Suspended Mild/PT Slabs	f'c = 6.0 ksi
Reinforcing Steel	ASTM A615, Grade 60 ASTM A706, Grade 60
Post-Tensioning Tendons	ASTM A415, Grade 270
Welded Wire Fabric	ASTM A185

*28-day strength, unless noted otherwise.

CONSTRUCTION

FOUNDATIONS

Based on previous geotechnical knowledge of areas surrounding the proposed sites, the foundation system is anticipated to be concrete shallow foundations, with spread footings at columns, continuous strip footings at basement walls, and mat foundations supporting the building's lateral systems. A suitable bearing elevation with adequate soil bearing capacity will need to be identified by a geotechnical consultant.

At below-grade portions of the site a soldier pile and lagging shoring wall is expected to limit excavation to the perimeter lot line of the chosen site. Tie-back anchors for the shoring wall will be temporary, with soil and surcharge pressures resisted by the basement walls in the final condition. Slab on grade will be used at the base level with thicker slabs provided as needed for mechanical or lab areas that require heavier load criteria.

GRAVITY FRAMING SYSTEM

Both steel and concrete framing options were studied by the design team based on a typical 31'-6" grid in each direction. Factors such as cost, constructability, architectural impacts, and future flexibility were considered for each option. Steel framing was eliminated from consideration due to its significantly deeper structural depth and comparatively poor vibration performance relative to concrete options.

The various systems were evaluated using a customized scoring matrix with ranking criteria related to constructability and architectural impacts, cost, and future flexibility. That matrix of options is included here along with diagramed structural plans noting each system.

Of all the options considered, a post-tensioned concrete flat-slab system was deemed to be the preferred framing for the purposes of this study. This system will consist of a continuous 12-inch-thick concrete slab supported by reinforced concrete columns. The columns are expected to be 24 inches square, though the final size can be modified to meet program space requirements. This system has a major benefit of being approximately 2 feet shallower than the steel option, which provides an opportunity to shorten the story heights from 18 feet to 16 feet, which in turn will reduce the cost of cladding and MEP vertical distribution elements. Future flexibility of this option and other post-tensioned options can be addressed by placing sleeves for future penetrations at column locations and as needed within the structural bays to minimize the need for complicated coring at a later date.

Vibration performance was a component in system selection. Previous design experience with similar lab use and grid setup achieved VC-A criteria (2,000 micro-inches/sec.) with a comparable structure. The predicted vibration analysis and in-situ tested performance are presented here. Further vibration study will be necessary as programming is finalized and performance criteria are determined.

UW CAMCET

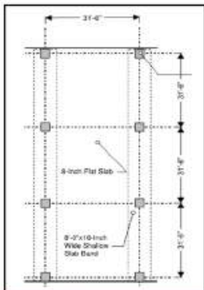
Selection Matrix for Structural Systems

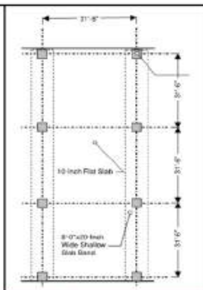
Weighting Factor
"7" = Most Important
"1" = Least Important

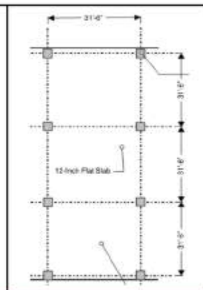
Rating Value
Range as a measure of variance from a base line of 1.0 (eg 0.95-1.05)

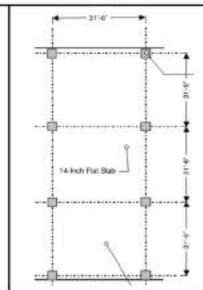
No.	Evaluation Criteria
	A Constructability/Architectural
1	Flexibility in Fast Track Design
2	Floor flatness & levelness
3	Ability to express structure and eliminate additional finishes
4	Impact of floor cracking on finishes due to thermal shrinkage
5	Acoustic separation (potential for added costs, value of exceeding minimum requirements)
6	System Accomodation of Exterior Cladding
7	Ease of accommodating slab penetrations in design & construction
8	Ease of installing horizontal systems during construction
9	Ease of making attachments to the ceiling
10	Schedule impacts based on availability and lead time
11	Schedule impacts based on speed of construction and tolerance for adverse weather
12	Staging needs, impact on campus
	Subtotal
	Item A Normalized score to 30%
	B Cost
13	Structural Cost per sq ft (Provided by Jon Bayles of JMB Consulting Group LLC) Quantitative structural costs (including foundations, beam penetrations, & fireproofing
14	Structural Depth (inches) Qualitative impact on cost as a result of structural depth
	Subtotal
	Item B Normalized score to 50%
	C Future Flexibility
15	Flexibility for future space planning (e.g. accommodating increased loads)
16	Ease of accommodating slab penetrations in future
17	Ease of rerouting systems in future (horizontal)
18	Vibration Control
	Subtotal
	Item C Normalized score to 20%
	Total Score:

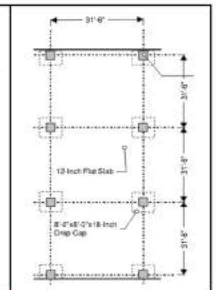
Figure 3. Structural System Comparison Matrix











	Scheme		Scheme		Scheme		Scheme		Scheme	
	Concrete Option 1C		**Concrete Option 2C**		**Concrete Option 3C**		**Concrete Option 4C**		**Concrete Option 5C**	
	8-Inch / 16-Inch Wide Shallow (PT)		10-Inch / 20-Inch Wide Shallow (Mild)		12-Inch (PT)		14-Inch (Mild)		12-Inch / 18-Inch Caps (Mild)	
Weighting Factor	Rating	Weighted Value	Rating	Weighted Value	Rating	Weighted Value	Rating	Weighted Value	Rating	Weighted Value
2	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0
4	1.05	4.2	1	4.0	1.05	4.2	1	4.0	1	4.0
5	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0
1	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0
5	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0
3	0.95	2.9	1	3.0	0.95	2.9	1	3.0	1	3.0
5	0.85	4.3	0.9	4.5	0.85	4.3	0.9	4.5	0.9	4.5
4	0.95	3.8	0.95	3.8	1.05	4.2	1.05	4.2	1.03	4.1
2	0.95	1.9	1	2.0	0.95	1.9	1	2.0	1	2.0
3	1	3.0	1	3.0	1	3.0	1	3.0	1	3.0
2	0.97	1.9	0.97	1.9	0.97	1.9	0.97	1.9	0.97	1.9
6	1	6.0	1	6.0	1	6.0	1	6.0	1	6.0
		40.9		41.2		41.3		41.6		41.6
		35.6		**35.9**		**36.0**		**36.3**		**36.2**
7	$32.00 1.05	7.4	$34.20 0.98	6.9	$32.90 1.02	7.2	$34.90 0.96	6.7	$34.20 0.98	6.9
5	16.0 0.83	4.2	20.0 0.67	3.3	12.0 1.11	5.6	14.0 0.95	4.8	18.0 0.74	3.7
		11.5		10.2		12.7		11.5		10.6
		50.9		**45.2**		**56.2**		**50.9**		**46.8**
2	0.9	1.8	0.9	1.8	0.9	1.8	0.9	1.8	0.9	1.8
3	0.85	2.6	0.9	2.7	0.85	2.6	0.9	2.7	0.9	2.7
5	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0
3	1	3.0	1	3.0	1	3.0	1	3.0	1	3.0
		12.4		12.5		12.4		12.5		12.5
		19.9		**20.1**		**19.9**		**20.1**		**20.1**
		106.5		**101.2**		**112.0**		**107.2**		**103.1**

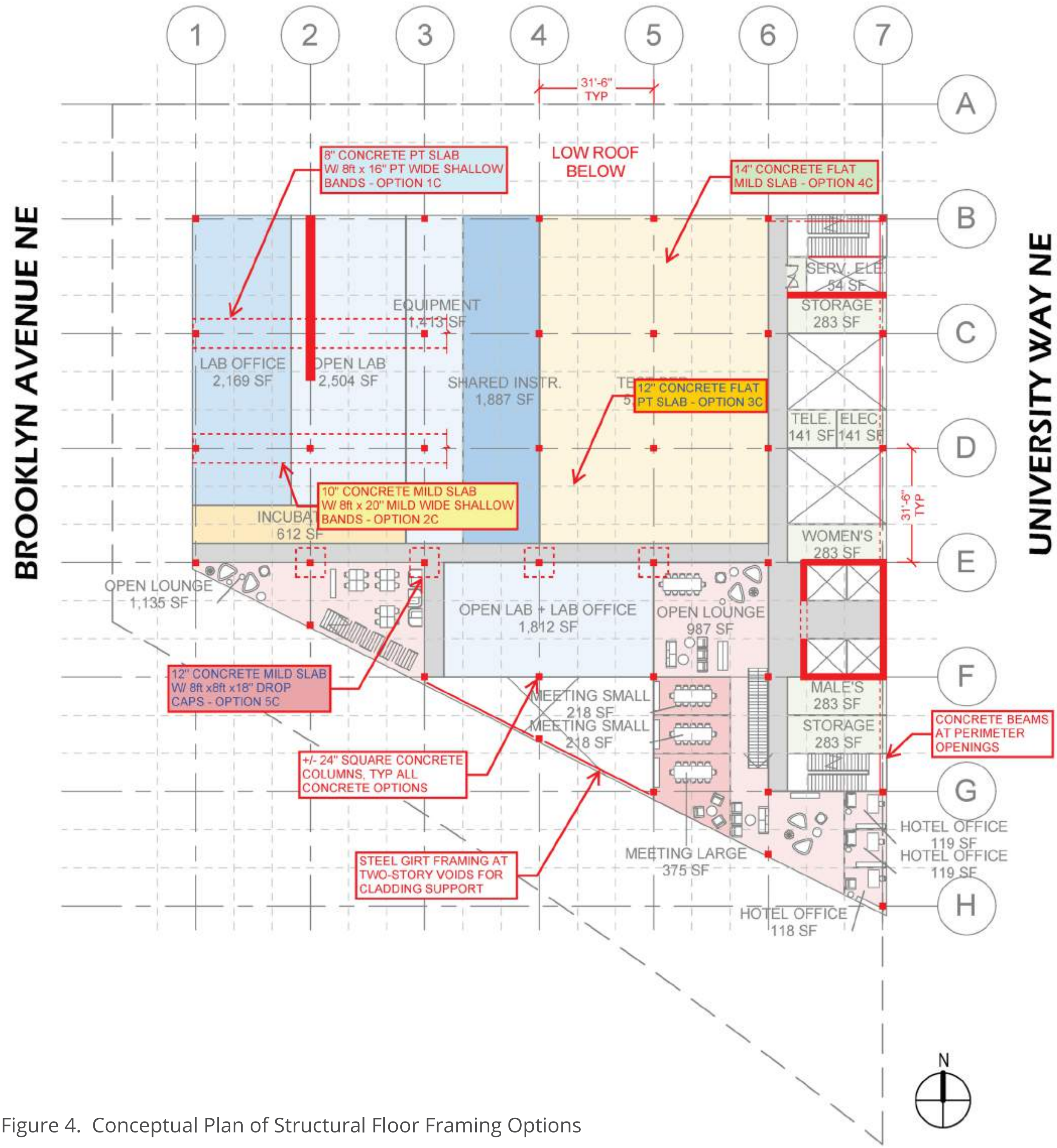


Figure 4. Conceptual Plan of Structural Floor Framing Options

Section

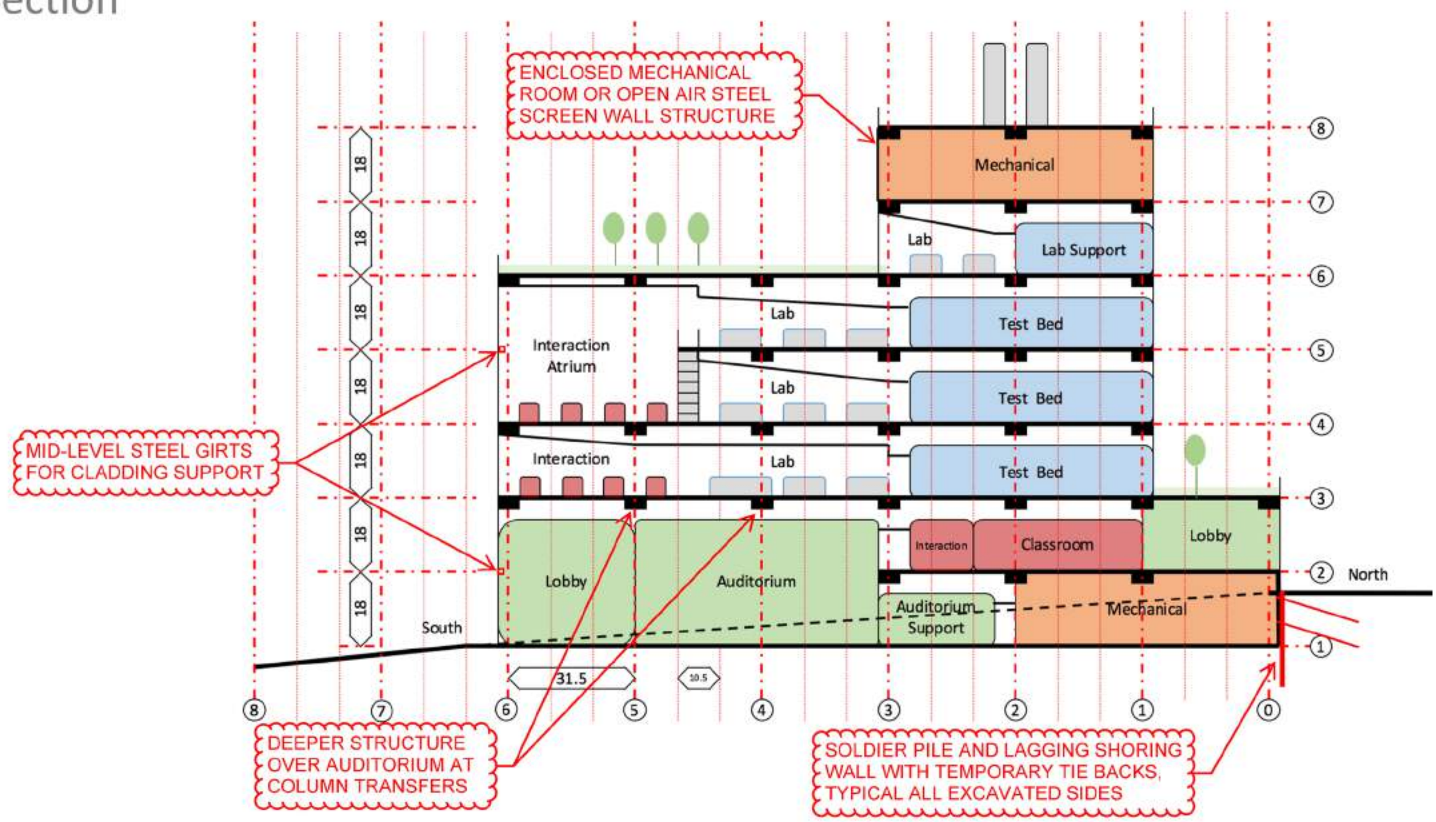
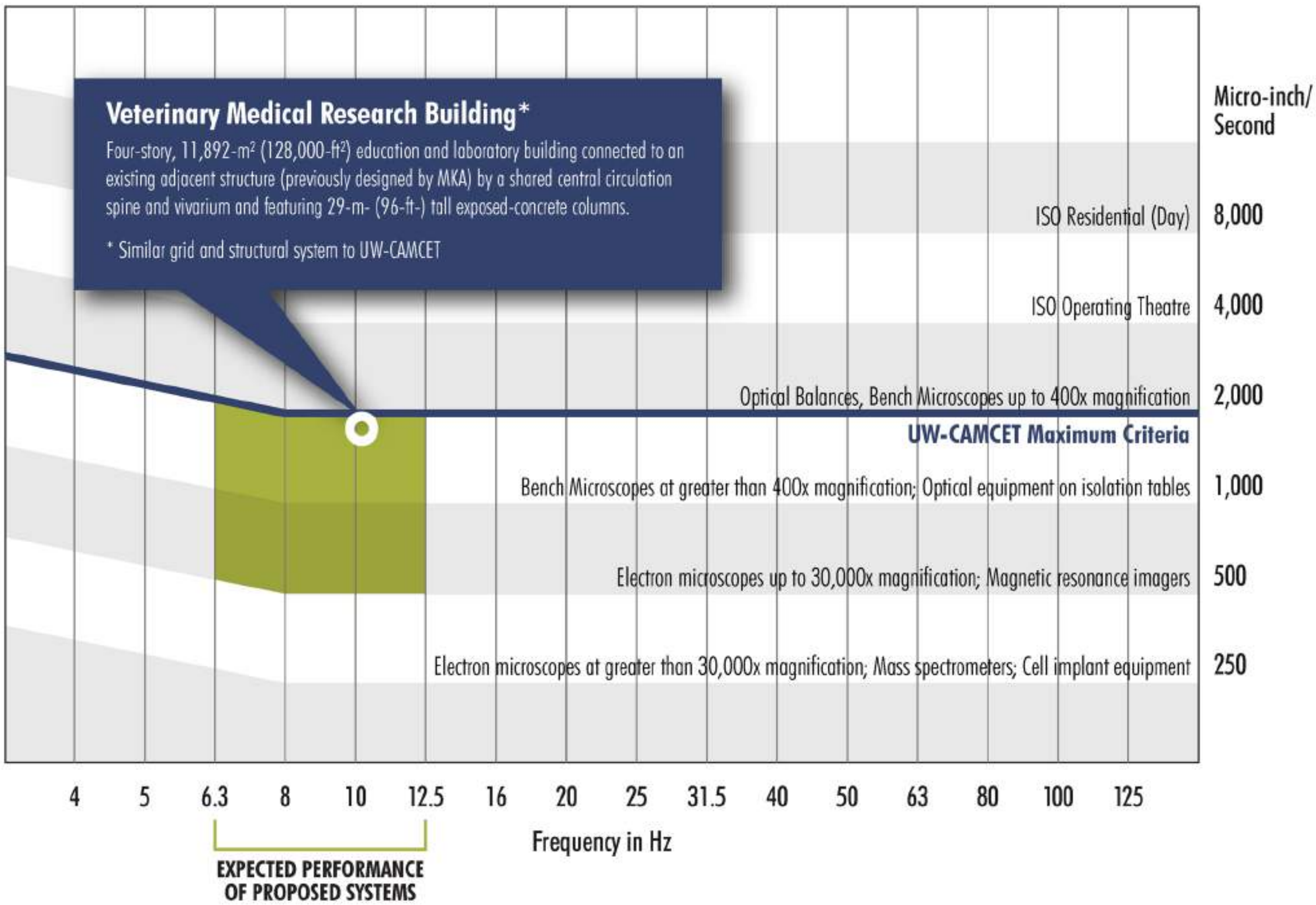
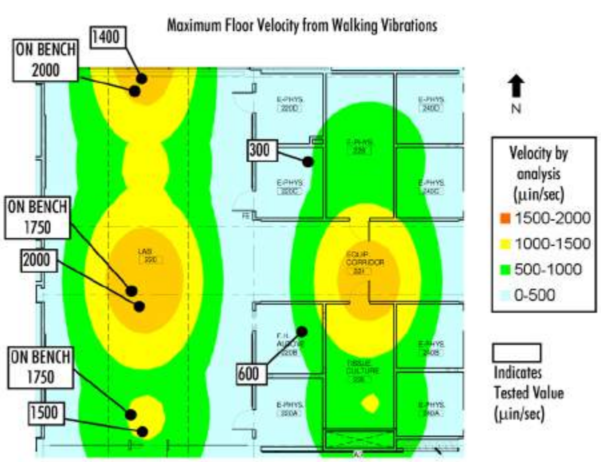


Figure 5. Conceptual Section of Structural Framing Elements

MKA Vibration Analysis





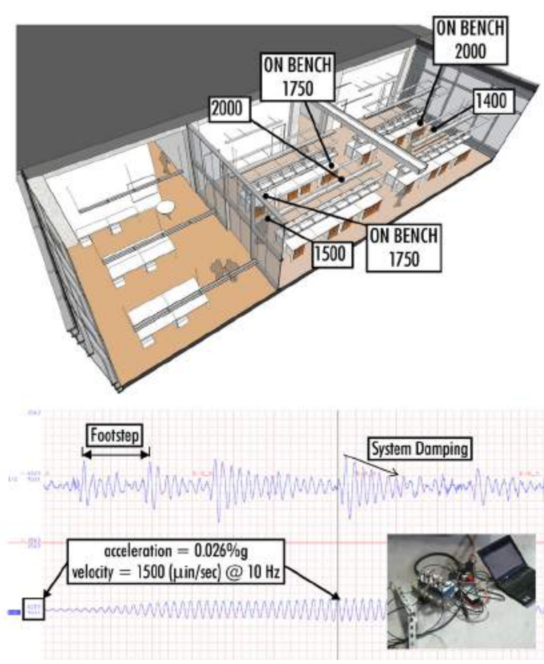


Figure 6. Lab Vibration Performance of a Similar Structure

LATERAL FORCE-RESISTING SYSTEM

The proposed structure is a six-story building with anticipated floor-to-floor heights of approximately 16 feet. Lateral forces due to wind and seismic loads will be carried by the floor diaphragms to the vertical elements of the lateral force-resisting systems and then transferred to the foundations of the building. The primary option for lateral system framing is proposed to be special reinforced concrete shear walls, which can be utilized with either concrete or steel gravity framing systems.

Proposed system locations are at continuous vertical transfer elements, such as the elevator core and near the perimeter of the building at stair or mechanical shafts, with a focus on minimizing disruption to the open programming. See the included structural plan for additional information. The current configuration shown has been balanced to minimize torsional aspects of behavior during a seismic event. This produces an efficient lateral system design with reduced force levels in the wall elements. Other configurations are possible but would require careful study to prove their feasibility.

UW has indicated that no vertical expansion is to be incorporated into the design of the building.

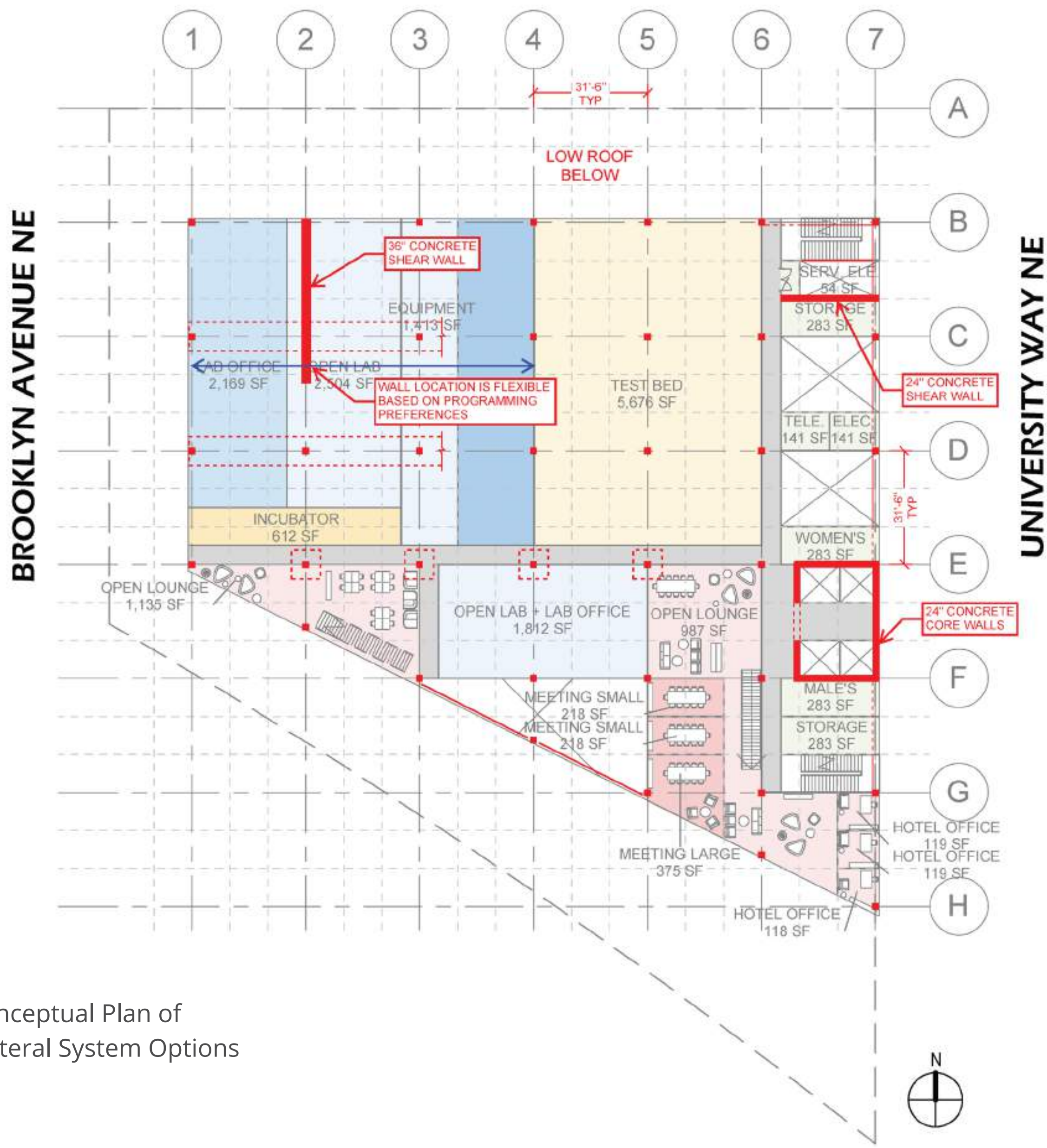


Figure 7. Conceptual Plan of Structural Lateral System Options

RISK AND MITIGATION

Foundation design and seismic hazard assumptions are based on existing available geotechnical data. A project-specific report will be needed to confirm these assumptions and provide recommendations for design.

Sequencing the work to accommodate continuous operation of the surrounding buildings of the campus will be a challenge from both a design and construction standpoint. The following aspects are risks and potential mitigation measures:

- Phasing of existing building demolition and installation of the shoring wall system will need to be carefully coordinated so that traffic flow of the surrounding streets is not impacted. Noise levels and operation of the adjacent buildings may also be a concern.
- Movement of the shoring system near existing structures poses a risk to adjacent structures and utilities. This design will need to be robust in order to provide earth retention and acceptable levels of earth movement during the construction phase.
- Construction phasing will need to address the continuous operation of adjacent existing utilities and the need for mechanical connections made during construction.
- Structurally significant lab equipment and design criteria need to be identified and located early in order to properly configure the structure for the load criteria and vibration requirements.

OUTLINE SPECIFICATIONS

DIVISION 03 – CONCRETE

031000 - Concrete Formwork

Submittals:

- Formwork shop drawings sealed by professional engineer
- Calculations of formwork, reshoring and back shoring sealed by professional engineer
- For exposed surfaces, show general construction of forms including jointing, reveals, tie holes and other items that affect the exposed concrete visually.
- Data on form facing materials proposed for smooth-form finish

Quality Assurance:

- Design and construction of formwork is responsibility of the contractor.
- Allowable tolerances shall not exceed tolerances specified in ACI 117.

Materials:

- Form-facing materials
- Commercially manufactured formwork release agents
- Expansion Joint filler: ASTM D994, D1751, or D1752
- Other embedded items indicated on drawings (Waterstops, reglets, dovetail anchor slots, etc.)

Performance and Design Requirements: Maximum deflection of facing materials exposed to view limited to L/240.

Fabrication: Place ¾” chamfer strips in corners of formwork where exposed to view.

Construction: Camber forms to compensate for anticipated formwork deflections and crushing of formwork. Place sleeves and embedded items required for adjoining work before concrete placement. Apply form release agent to prevent bond of concrete to form materials.

Removal of Formwork: Leave formwork and shoring in place to support weight of concrete until concrete has reached specified compressive strength.

Reshoring and Backshoring: Place reshores and backshores in sequence with stripping operations

032000 - Concrete Reinforcing

Submittals:

- Placing drawings
- ICC-ES Reports for mechanical splices
- Welding Procedures and qualifications
- Mill certificates

Tolerances: Fabrication and placement tolerances shall be in accordance with ACI 117.

Welder Qualifications: Welders shall be qualified by AWS D1.4 within the last 6 months.

Products:

- Reinforcing Bars: ASTM A615, Grade 60
- “Special Ductile Quality” reinforcing:
  ASTM A706, Grade 60
- Column Spirals: ASTM A82
- Welded Wire Fabric: ASTM A185 or ASTM A497
- Mechanical Splices: See General Notes on Structural Drawings
- Do not field bend or cut reinforcing except when specifically permitted.

033000 - Cast-in-Place Concrete

Submittals:

- Concrete mix designs
- Curing methods
- Repair methods
- Construction joint layout
- Maintain tolerances per ACI 117, unless otherwise noted. Retain records of all material used.

Concrete Materials:

- Portland Cement: ASTM C150, Type I or Type II
- Aggregate: ASTM C33
- Fly Ash: ASTM C618, Class C or F. The maximum amount shall be 30% by weight of the total cementitious material.
- Water: ASTM C94

Admixtures:

- Air-Entraining Admixture: ASTM C260
- Water-Reducing Admixture (Low Range): ASTM C494, Type A
- Water-Reducing Admixture (High Range): ASTM C494, Type F

Related Materials:

- Dissipating resin curing materials: ASTM C309, Type I
- Cure and Seal Combination Materials: ASTM C309 (Types 1 and 1D, Class B) or ASTM 1315
- Moisture Retaining Cover: ASTM C171
- High Density Insulation Fillers: ASTM C578, Type VII
- Commercial Bonding Grout and Repair Materials:
- Portland cement mortar modified with latex acrylic: ASTM C1059 Type II.
- Epoxy mortars and compounds: ASTM C881.
- Shrinkage-compensating or non-shrink Portland cement grout: ASTM C1107
- Dry concrete repair materials: ASTM C928.

Concrete Delivery:

- Ready-Mix concrete: Comply with ASTM C94. Batch tickets shall indicate how much water can be added at the site within the maximum water/cement ratio per the approved mix design
- Control of Mixing Water: Water may be added at the site once within first 15 minutes after the truck arrives at the job-site, under specified conditions.
- Admixtures: Admixtures shall be added within an accuracy of 3%.

Concrete Placement:

- Consolidate concrete by vibration
- Re-tamping concrete that has taken initial set is not allowed.
- Cold Weather Placing: ACI 306.1
- Hot Weather Placing: ACI 305.1

Finishes for Formed Surfaces: Where finish is not specified in contract documents, apply Rough-form finish on concrete surfaces not exposed to public view and smooth-form finish on concrete surfaces exposed to public view.

Finishes for Unformed Surfaces: Where finish is not specified in contract documents, use the following finishes and tolerances:

- Scratched Finish: Apply to surfaces intended to receive bonded cementitious mixtures. Produce a finish meeting conventional bullfloated tolerance requirements of ACI 117.
- Floated Finish: Apply to walks, drives, steps, ramps and surfaces intended to receive waterproofing, roofing, insulation, or sand-bed terrazzo. Produce a finish meeting conventional straightedge tolerance requirements of ACI 117.
- Full Steel Troweled Finish: Apply to floors intended as walking surfaces, floors in manufacturing and storage areas, or for floors intended to receive floor covering. Produce a finish meeting conventional straightedge tolerance requirements of ACI 117.

Concrete Curing and Protection: Cure with specified Curing Methods for a minimum of 7 days after placement.

Concrete Surface Repairs: Remove and replace concrete with defective surfaces if defects cannot be repaired to satisfaction of Architect.

033800 – Post-Tensioned Concrete

Submittals:

- Product Data for prestressing steel, anchorages, sheathing, couplings, accessories and water-tight tape
- Placing drawings with stressing sequences, floor openings, calculated elongation and added reinforcing at anchorages
- Calculations sealed by a civil or structural engineer licensed in Washington
- Certified Test Reports for anchorages and each coil of strand
- Stressing Records

Work shall be performed by Contractor specializing in post-tensioning that has successfully completed similar projects. Inspector shall be present during placement and stressing of post-tensioning, placement of reinforcing and testing of concrete.

Products:

- Prestressing Steel: ASTM A415, Grade 270, ½" diameter, seven-wire strand, low-relaxation tendons
- Anchorages and couplings: Develop at least 95% of the actual ultimate strength of the prestressing steel tendons, without exceeding anticipated set.
- Sheathing: Waterproof polyethylene with minimum thickness of 0.040 inches.
- Tendon Coating: Specially compounded, corrosion inhibiting and lubricating grease meeting PTI recommendations.

Coordinate placement of post-tensioning tendons and mild reinforcement. Do not displace tendons to clear reinforcing or embedded items. Place tendons with of vertical tolerance of +/- 3/8" in beams. Additional tolerances per ACI 117.

Anchorages shall be attached rigidly to formwork by bolting or screwing. Fixed-end anchorages shall be shop-installed and furnished with a watertight cover.

Concrete Placement: Do not place concrete until tendons have been inspected and approved.

Stressing:

- Do not begin stressing operations until test reports indicate concrete has attained compressive strength specified in the drawings.
- Stress tendons with hydraulic jacks equipped with calibrated hydraulic pressure gauges so stress can be computed at any time.
- Conduct stressing operations so tendon elongations can be accurately measured and recorded to the nearest 1/8".

Do not cut tendons until the Contractor receives Architect's written review of post-tensioning records. Do not remove forms, shores and bracing until concrete has been tensioned to a strength sufficient to carry its own weight, construction loads and design loads.

DIVISION 05 – METALS

05 12 00 - Structural Steel Framing

Tolerances shall comply with AISC requirements. Work is subject to special testing and inspection. Refer to Section 014500. Contractor shall engage a structural or civil engineer to review and design support of hoisting equipment, construction imposed loads, temporary bracing, shoring, and other safety related construction procedures. Welders shall be qualified in accordance with AWS D1.1

Submittals: Submit Fabrication and Erection drawings, Fabricator's quality assurance procedures, Mill certificates, Manufacturer's certified test reports on load indicator washers and/or tension control bolts, Welding Procedures per AWS D1.1, and Erection Plan.

Materials:

- W-Shapes: ASTM A992, Fy = 50 ksi, or ASTM A913, Fy = 50 ksi
- Angles: ASTM S36, Fy = 36 ksi
- Tubes: ASTM A500 Grade B, Fy = 46 ksi
- Steel Pipe: ASTM A53, Type I or S Grade B, Fy = 35 ksi
- Standard Fasteners: ASTM A307
- High-Strength Fasteners: ASTM A325 or ASTM A490
- Weld Electrodes: AWS D1.1
- Headed Shear Connector Studs: ASTM A108, Grade 1015 or 1020

Fabrication:

- Shop prime steel surfaces except those:
  - Surfaces embedded in concrete or mortar
  - Surfaces to be high-strength bolted with slip-critical connections
  - Surfaces to be welded
  - Surfaces to be fireproofed
- Clean surfaces to be primed to SSPC specification SSPC-SP3 "Power Tool Cleaning"

Execution: Provide temporary shoring and bracing as required and according to AISC Code of Standard Practice. Plumb, level and align pieces in accordance with the requirements of the "AISC Code of Standard Practice for Steel Buildings and Bridges." Survey alignment and elevations of all steel members as noted on the drawings.

051213 – Architecturally Exposed Structural Steel

Provide architecturally exposed structural steel fabrication and erection for all items identified in the construction drawings as "AESS" and as listed in specifications. Comply with requirements of Section 05 12 00. Comply with provisions of AISC Code of Standard Practice, Section 10, except where more stringent requirements are indicated.

Materials:

- Metal surfaces: For work exposed to view, use materials that are smooth and free of blemishes. Remove blemishes by welding and grinding prior to cleaning and application of finishes.

- Shop paint: fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer compatible with substrates and types of silicone alkyd-type paint systems indicated; generally complying with requirements of FS TT-P86, Types I, II, and III.

Tolerances:

As specified in AISC Code of Standard Practice, Section 10, unless otherwise shown on drawings.

Shop Painting: Shop paint surfaces of architecturally exposed steel work, except as noted below:

- Surfaces to be embedded in concrete or mortar.
- Contact surfaces to be welded or high-strength bolted with slip-critical connections.
- Surfaces to receive sprayed-on fireproofing.

Surface Preparation: Clean steel to equivalent of SSPC SP-6, "Commercial Blast Cleaning."

Execution:

- Tolerances: Comply with erection tolerances of 1/2 those in AISC Code of Standard Practice, Section 10, for members within 20 feet of finished grade.
- Erection Bolts: Remove bolts, fill holes with plug welds and grind smooth at exposed surfaces
- Field Welds: Grind smooth.
- Gas Cutting: Do not use gas cutting torches in the field to correct fabrication errors.
- Touch-Up Painting: After erection, clean shop paint from field welds, bolted connections and abraded areas. Apply paint to exposed areas with same material used for shop painting.

053100 - Steel Decking

Section includes steel roof deck and composite steel deck. All deck material and connections are to have current ICC-ES reports. Each welder shall be AWS Certified.

Submittals:

- Shop drawings
- Manufacturer's product data
- Welder qualifications
- Mill test reports

Galvanized composite steel deck:

- Galvanize with a G60 coating.
- Depth of decking as specified on the drawings.
- Gage of deck shall be determined by the contractor (20 gage minimum).

Roof deck:

- Galvanize with a minimum G60 coating.
- Depth of decking as specified on the drawings.
- Gage of deck shall satisfy the load requirements shown on the drawings or the minimum gage indicated on the drawings (20 gage minimum).
- Connections to be designed by the contractor (button punching not allowed for roof deck).

Tolerances:

- Edge locations: +/- 1/2" from established building working lines.
- Edge height: +/- 1/8" from established slab thickness.

Shear connectors to be welded through deck onto supporting steel beams, in accordance with the stud placement details on the drawings.

Hanging loads: Do not hang concentrated loads exceeding 50 pounds from the metal roof deck.

Galvanizing repair: Repair both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

TECHNICAL NARRATIVES

MECHANICAL SYSTEM

MECHANICAL NARRATIVE

General

The mechanical scope of the project is to provide heating, ventilating, and air-conditioning (HVAC), plumbing, fire protection and laboratory gas systems for the UW CAMCET. To meet the need for flexibility on a floor by floor basis (office and / or classroom space can be converted to lab space) the concept of multiple risers will be implemented on this project. The risers will contain the utilities listed below. The utilities will be extended from the riser to the areas requiring the specific services. There is a higher cost to constructing this initial infrastructure but will provide the required program flexibility.

Codes and Standards

ASHRAE Handbooks - 2012 Through 2015

Chapter 51-11 WAC - 2015 Washington State Energy Code

Chapter 51-50 WAC - Washington State Amendments to the 2015 International Building Code

Chapter 51-52 WAC - Washington State Amendments to the 2015 International Mechanical Code

Chapter 51-54 WAC - Washington State Amendments to the 2015 International Fire Code

Chapter 51-56 and 51-57 WAC - Washington State Amendments to the 2015 Uniform Plumbing Code

RCW 39.35 – Energy Conservation In Design of Public Facilities

FM Global Requirements

NFPA 13 - Standard for the Installation of Sprinkler Systems, 2016

NFPA 14 - Installation of Standpipe and Hose Systems, 2016

NFPA 45 – Standard on Fire Protection for Laboratories Using Chemicals

NFPA 90A - Air Conditioning and Ventilating Systems, 2015

NFPA 110 - Emergency and Standby Power Systems, 2016

HVAC DESIGN CONDITIONS

Interior Conditions (Design Temperatures)

	Winter Design (Degrees F)	Summer Design (Degrees F)
General	70° F	75° F
Office, Meeting, Conference Rooms	70° F	75° F
Laboratories	70° F	75° F
Electrical/Ancillary/Mechanical Rooms	55° F	85° F

Outside Conditions (Design Temperatures)

	Winter Design (Degrees F)	Summer Design (Degrees F)
Design Temperatures	15° F	90°F DB/69° F WB

The proposed design temperatures are more stringent than the ASHRAE 0.2% data in the winter (21°F) and 0.1% data in the summer (84°F DB/67°F WB) for Seattle, Washington in order to meet some stringent lab design requirements. This will be further developed as the project progresses.

Acoustical Requirements

Standard size classrooms will be designed to NC 25-30. Labs containing fume hoods will be designed to NC 40-50.

BUILDING SYSTEM

HVAC

Air-Handling

Four indoor custom air-handling units (AHUs) will serve the seven floors of the building. Each air-handling unit will be a variable air volume, return air system and will be capable of providing 100% outside air in the economizer mode, for normal operation as required by code. The units will also have the heating, cooling coils, and heat recovery coil for outside air intake portion. The air-handling units will be configured as follows:

- Sound attenuators – return air
- Return air multiple fan array with air measurement stations and variable frequency drives (VFDs)
- Outside air dampers for full economizer and 100% OSA with air measurement station
- Mixing plenum - economizer
- Pre-filters, MERV 7
- Glycol run-around heat recovery coils
- Hydronic heating coils
- Hydronic cooling coils
- Supply air multiple fan array with air measurement stations and VFDs
- Sound attenuators – supply air
- Final filters, MERV 13

The AHUs will be constructed with 4-inch thick insulated double metal wall construction and capable of withstanding 15-inches of pressure (w.g.) with less than 1% leakage. The floor of the AHUs will be constructed of diamond plate and will be fully welded. Units shall be wired for fan motors and VFDs, lights in the unit sections, and convenience outlets. The AHUs will be located in an architectural penthouse above the seventh floor.

The current design approach locates the air-handling units such that one AHU will serve the perimeter of north and east exposures, the second unit serves the south exposure, third unit serves the west exposure, and the forth unit serves the core support areas. Dividing floor plates by exposure and load profile allows the supply air temperature of each air-handling unit to be reset to provide the optimum energy efficiency.

Another viable option is provision of four equal size AHUs, all serving a main header. This would provide built in redundancy in HVAC functionality. Uniform AHUs allows for easier maintenance, with respect to both parts and labor. Proper staging of the AHUs will provide an energy efficient system; however, this configuration will not be capable of resetting the supply air temperature at each exposure to optimize energy efficiency.

Low-velocity AHUs will have maximum coil and filter velocity of 400 FPM. Provide low-velocity ductwork with a maximum velocity of 1,600 FPM and maximum pressure drop of 0.05-inches (w.g.) per 100 feet of duct.

The supply and return air duct connections will be provided in the supply and return plenum of the AHUs with the ductwork routed to rated airshafts in the penthouse. Branch ducts will take off on each floor with combination fire/smoke dampers located at the shaft wall penetration. Ductwork will be routed, concealed above the ceiling, to serve the individual temperature zones. These zones will be provided for each lab space, conference room, meeting room, and office room. For each temperature zone, the main ducts will provide supply air to pressure-independent terminal units with hot water heating coils, and return air through pressure-independent return terminal units. Each terminal unit shall be provided with a controller and air measurement device. Each zone will have a space temperature sensor. For example, every temperature zone will have an independent supply terminal unit, independent return terminal unit, and space temperature sensor.

The ground floor electrical rooms, telecom room, and UPS room will be cooled and ventilated by fan coil units located in the ceiling space of the ground floor.

Humidification

Base humidification will not be provided at air handling unit, however, local humidification could be provided to meet selected specialized rooms.

Laboratory and General Exhaust

The fume hood exhaust will be exhausted through high plume, high dilution type exhaust fans, similar to Strobic exhaust fans. There will be total of six exhausts fans on the roof the penthouse. All six-exhaust fans will be headered together and will have a common intake plenum. The lab fume hood exhaust, specialized exhaust, building toilets, and other areas required to have a negative room air pressure, relative to adjacent spaces, will be connected to the exhaust plenum. All exhaust fans with variable speed drives will be staged to provide proper discharge velocity, based on the building load. The exhaust fan common plenum will be designed with heat recovery units. The main exhaust duct will be located in a fire-rated vertical shaft through all levels. Branch ducts will take off on each floor and be routed above the ceiling to fume hoods and the exhaust grilles. Exhaust duct associated with fume hoods will be stainless steel.

Laboratories

Lab rooms with fume hoods will be served by variable air volume (VAV) air valves with hot water reheat coils and matching VAV exhaust air valves for each temperature zone. Lab exhaust system will include low face velocity fume hoods, fume hood sash tracking system, and zone presence (occupancy) sensor to track fume hood exhaust requirements and to provide VAV system functionality.

Office/Meeting Rooms

Office rooms, meeting rooms, and other similar areas will be served by variable air volume (VAV) terminal units with hot water reheat coils and matching VAV return terminal units for each of temperature zones.

Elevator Machine Rooms

The elevator machine rooms are assumed to be located at the top of each elevator bank/shaft. Packaged rooftop air conditioning units will be provided for each elevator machine to meet cooling requirements.

Elevator Hostway Pressurization

Elevator pressurization fans required for high-rise building with variable speed drives will be provided for hoist way shafts pressurization.

Stair Pressurization

Pressurization fans required for high-rise building with variable speed drives will be provided stair pressurization.

Smoke Vestibule

Pressurization and exhaust fans required for high-rise building with variable speed drives will be provided for smoke vestibule pressurization and exhaust.

Hydronic Cooling System

Cooling for the building will be provided by three high efficiency centrifugal chillers and rooftop induced-draft cooling towers. The chilled water system will be piped to the AHU cooling coils and will be part of the heat recovery system. The chilled water and condenser water systems will each have three variable speed pumps, with one pump providing redundancy to the system. The chillers will operate to trim the peak loads and provide back up for the heat recovery chiller. The chilled water system will be designed as a variable flow primary loop system.

Heat Recovery System

Two heat recovery chillers will be installed to provide supplemental cooling to the chilled water return water and supplemental heat to the heating hot water systems. The heat recovery chillers will cool the chilled water return from the chilled water system and, at under low loads, will be able to handle the cooling demands of the building. This chilled water load will be divided between the two heat recovery chillers. The heat from the heat recovery chillers can then utilized to re-heat the building hydronic heating system that serves the air-handling unit heating coils and terminal unit reheat coils. The hydronic heating supply temperature will be 120 deg F.

Hydronic Heating System

To provide back up for the heat recovery system and the peak heating loads, four natural gas fired, condensing type hot water boilers will be provided. The 120 deg F heating water will be distributed to the heating coils in the air-handling unit and to the zone terminal units. Three heating water pumps with VFDs are scheduled. The heating water system will be designed as variable flow primary loop system.

Controls

Provide a complete direct digital control (DDC) system for the building. System will include a complete operating station, web-server, programming, and graphics. Provide all DDC field panels and interlocking wiring to integrate all system components. All panels will be stand-alone and fully programmable.

Provide adjustable high / low alarms for all sensors. Fully checkout the system and verify that all points and sequences operate per design requirements. Integration into one of the existing DDC systems on the University of Washington main campus is preferred.

PLUMBING SYSTEMS

Domestic Potable Cold Water

New domestic cold water lines will be provided for the building potable use from the City water mains located on the street. One assembly of 4-inch parallel reduced-pressure backflow preventers will be provided on the ground floor. The lower levels of the building will be fed directly using the City water pressure; a duplex variable speed packaged water pump booster system will be provided for the upper levels.

Non-Potable Cold Water

New non-potable cold water lines will be provided for the laboratory non-potable water system connected to the domestic potable cold water system. The building potable cold water system will be protected by two separate reduced pressure backflow preventers for the lower and upper levels of the building.

Domestic Potable Hot Water

Domestic hot water for the building will be provided by natural gas fired condensing type water heaters. One water heater will serve for the lower levels and another heater will serve for the upper levels of the facility. A third heater will be piped such that it can be used as a backup for either primary heater. Each heater will have a recirculating pump.

Tempered Hot Water

Tempered hot water for the safety equipment, including emergency showers and eyewash stations, will be provided by natural gas fired hot water heaters. One heater will serve the lower levels and another heater will serve the upper levels of the building. A third heater will be piped such that it can be used as a backup for either primary heater. Each heater will have a recirculating pump.

Non-Potable Hot Water

Non-potable hot water for the lab will be provided by natural gas fired condensing type water heaters. One heater will serve the lower levels and another heater will serve the upper levels of the building. A third heater will be piped such that it can be used as a backup for either primary heater. Each heater will have a recirculating pump.

Sanitary Sewer System

Sanitary sewer piping will be routed down through the building for connection to the site utilities located on the street. Automatic trap primers will be provided for all floor drains excluding shower drains and sinks.

A separate vent system will be routed up through the building collecting various fixture vent pipe and terminating above the roof(s).

Laboratory Waste Water System

Laboratory waste piping will be routed down through the building, collecting lab waste for a neutralization process. The lab waste neutralization system will include dual mixing tank, mixers, chemical feed tanks, pH probes, control panels, and all other required equipment to monitor and adjust the pH balance of the lab waste. Once the lab waste is balanced, it will be delivered to the site utilities located on the street.

A separate lab vent system will be routed up the building collecting various fixture vent pipe and terminating above the roof(s).

Lab waste and vent piping material shall be polypropylene piping with fusion joints and mechanical joints at connections to sink p-traps.

Roof Drain System

Roof drains and overflow drains will be provided on the various roof levels and collected by the rainwater and overflow pipe systems.

Rainwater piping will be routed down through the building for connection to the site utilities located on the street. A separate rainwater overflow system daylights at the ground level to provide visual indication of an issue with the primary system. Both the rainwater and overflow pipes will be gravity systems.

LAB GAS

General

Argon, nitrogen, and lab compressed air will be provided to all of the building floors to serve the lab gas outlets.

Compressed Air

Lab compressed air for the building will be provided by dual compressors, tank, filters, and dryers, located in the lower mechanical room. Vertical risers will be provided to accommodate floor by floor compressed air needs.

Vacuum

The lab vacuum system will be provided locally using lab compressed air.

Argon and Nitrogen

An argon and nitrogen systems that serves the lab gas system will be located in the cylinder room. The cylinders (Dewar Tanks) will be manifold with single stage gas regulator and automatic switch over valve to provide continuous supply of lab gases. Vertical risers will be provided to accommodate floor by floor argon and nitrogen gas needs.

MECHANICAL SYSTEM BALANCING AND COMMISSIONING

System balancing and commissioning of the mechanical systems will be by a third party, hired by the Owner. The mechanical contractors will be required to provide full support to the Testing, Adjusting, and Balancing (TAB) or

National Environmental Balancing Bureau (NEBB) firm and commissioning agent.

FIRE PROTECTION SYSTEMS

General

The fire protection system shall be designed and installed per NFPA and FM Global requirements. Shop drawings and hydraulic calculations will be reviewed by the AHJ and FM Global. All components shall be UL and FM approved. All sprinkler heads shall be quick response type.

Water Supplies

The building fire protection system will be supplied from the City water at the street. A backflow preventer (double detector check valve assembly) will be provided in the fire pump room. A fire pump will provide the pressure and quantity of water for the standpipes and sprinkler system. The fire pump will be sized for 750 GPM and provide a boost in pressure to provide 100 psi at the roof outlets. Pressure reducing valves will be provided as required on the lower floors.

A 35,000-gallon on-site storage tank with a vertical fire pump will be provided for the system as required by the IBC code for high rises. The tank will be underground, below the fire pump room, allowing the fire pump to be protected in the room.

Fire pump test connections will be provided for both pumps.

A common loop on the ground floor will supply the combination standpipe and hose standpipe located in the stairwells for the building.

A fire department connection line will run into the building and connect downstream of the backflow preventers and fire pumps. Fire department pumper connections will be wall mounted and coordinated with the authority having jurisdiction.

Automatic Sprinkler System

The building will be fully covered by a wet sprinkler system. Portions of the building that are subject to freezing will be provided with a dry sprinkler system off the wet system. Each floor of the building will have a fire sprinkler zone. Each zone will be supplied from a floor control valve station, which will include a shut-off valve with a tamper switch, a flow switch, test valve, and a drain. The floor control valve stations will be connected to the combination standpipe located in the stairwell.

Standpipes

A standpipe with fire hose valves for fire department use will be required in the stairways. Fire hose valves will be 2-1/2-inches. A 2-way fire hose valve outlet will be provided on the roof.

TECHNICAL NARRATIVES

ELECTRICAL SYSTEM

ELECTRICAL NARRATIVE

ELECTRICAL SYSTEMS

Codes and Standards

NFPA 70 – National Electrical Code, 2014

NFPA 72 – National Fire Alarm and Signaling Code, 2015

NFPA 110 - Emergency and Standby Power Systems, 2016

City of Seattle amendments to the 2012 International Building Code

City of Seattle Electrical Code, 2014

City of Seattle Energy Code, 2012

City of Seattle amendments to the 2012 International Fire Code

General

Raceways, boxes, and supports will be provided. Conduit will be RGS, IMC, EMT, PVC Schedule 80 (underground), and flexible metal conduit (for connections to lights and equipment). MC and AC cabling may be allowed for restricted applications, such as concealed drops to individual receptacles.

Cabling and conductors will be provided. All conductors will be copper.

Surface mounted raceways and cable trays in lab spaces.

Grounding will be provided as required by the NEC.

Power system studies, including fault current, coordination and arc flash calculations.

Electrical systems design relating to off campus utilities is not required to comply with UW Facilities Services Design Guide

Instrumentation and Control for Electrical Systems

Electrical Power Monitoring: A networked power metering system will be provided throughout the power distribution system in order to comply with Seattle Energy Code requirements.

Lighting Controls: Lighting controls will be provided in order to comply with Seattle Energy Code requirements. A networked lighting control system will be provided to control non-occupancy sensor controlled lights. Manual, occupancy, and/or daylight sensors will be provided where applicable. Daylight controlled fixtures shall be dimmable type.

Medium-Voltage Electrical Distribution

Two sources of power are potentially available at this site, Seattle City Light (SCL) and the University of Washington campus electrical distribution network. Preliminary discussions with SCL indicate their preference is to use SCL's dual feed as the building's electrical service. Seattle City Light (SCL) network will be extended underground to a vault located inside of the building. All electrical power utility work will be per SCL standards and requirements. We discussed the alternate of using the University of Washington's electrical distribution as the source of building power with the added benefits of redundancy and reliability. SCL's response was to request we submit a "new service" application and they would perform their analysis that would conclude with their final determination. As there is some uncertainty as to the final location, size & load for the proposed facility and the SCL analysis would take several weeks to complete, we recommend an application be submitted once the variables are refined to be more conclusive. The cost estimate is based upon a local SCL connection. Construction cost to accommodate a campus power interconnect, including a tunnel under University Way, have not been incorporated at this time due to the final source uncertainty.

The Contractor will provide the vault and underground ductbank.

SCL will provide primary conductors and transformers pending their assessment and final recommendation.

Note: This approach is the same approach that was followed with the latest dormitory projects which concluded campus power was the preferred source of electrical power.

Low-Voltage Electrical Service Entrance

480Y/277V, 3 phase, 4 wire service will be extended from the SCL vault to five 4,000A main switchboards via copper or aluminum busways.

Current transformer enclosures, including meter sockets, will be provided by the Contractor. Meters will be provided by SCL.

Low-Voltage Transformers

K13 rated transformers will be provided on each floor to step down from 480V to 208Y/120V.

Transformers will meet the 2016 Department of Energy requirements.

Low-Voltage Switchboards and Panelboards

Five main switchboards will be provided near the SCL vault. Switchboards will be metal-enclose type.

480Y/277V and 208Y/120V panelboards will be provided at all levels as needed to support building loads. One or two electrical rooms will be provided on each floor, depending on the floor plate.

Motor Control Center(s) will be provided to support mechanical equipment.

Low-Voltage Enclosed Bus Assemblies

Assume one 4,000A busway will be provided to support every two floors, for a total of four bus risers. Busways may be either copper of aluminum.

Low-Voltage Distribution Equipment

Wiring devices will be provided to support general use and equipment needs.

At least 50 percent of all 125V, 15A, and 20A receptacles in offices, conference rooms, break rooms, classrooms, and similar areas, shall be controlled by either an occupancy sensor or a programmable system, in compliance with Seattle Energy Code requirements.

Low-Voltage Circuit Protective Devices

Fuses and circuit breakers will provide overcurrent protection to feeders and branch circuits. Draw-out power type circuit breakers will be provided in switchboards. Molded case circuit breakers will be provided in panelboards. Busway riser plugs will be enclosed circuit breaker type.

Low-Voltage Controllers

Motor starters and variable frequency drives will be provided to control motor loads.

Photovoltaic Collectors

In order to comply with the City of Seattle Energy Code, assume a minimum 10kW solar photovoltaic array will be required and will be located on the roof. The array will interface with the power distribution system. Further discussions with CAMCET leadership are recommended to determine if additional PV capacity is required to meet program objectives.

Packaged Generator Assemblies

An approximately 1500kW diesel generator-set will be provided to support building Life-Safety and Legally Required Standby loads. The generator will be located inside the building and be provided with a UL 142 listed fuel tank with capacity for a minimum of 8 hours runtime at full load.

Transfer Switches

Automatic transfer switches will be provided to support Life-Safety and Legally Required Standby loads. Transfer switches will be bypass-isolation type.

Facility Lightning Protection

At this stage of pre-design, a Lightning Protection System is not expected to be required. This will need to be confirmed during design.

Surge Protection Devices

Surge protection devices will be provided at the service entrance switchboards and on 208Y/120V panels serving sensitive or valuable equipment

Lighting

Interior: Fluorescent and/or LED type lights will be provided. LED lights should have a lower life cycle cost by the time of design and construction. The lighting system will be designed to comply with the City of Seattle Energy Code. Life-Safety exit signs and lights will be connected to the Life-Safety branch of the generator power distribution system.

Exterior: Building mounted LED lights will be provided. Pole mounted lights, in compliance with City of Seattle standards, may be required depending on the site configuration.

COMMUNICATION SYSTEMS

General

Telephone, Data, and Cable Television (CATV) services will be extended underground to a Main Equipment Room in the building.

One or two Equipment Rooms will be located on each floor, depending on the floor plate.

Raceways, cable trays, boxes, cabling, supports, and grounding will be provided.

The communication systems design intends to comply with UW-Information Technology Design Guide requirements.

Structured Cabling

Cable trays, cabinets, racks, frames and termination equipment will be provided in each Equipment Room. Active electronic data communications equipment will be provided by the Owner.

Backbone and horizontal cabling will be provided to support voice, data, and CATV outlets. Horizontal voice/data cabling will be Category 6 type.

Audio-Visual Communications

Audio-visual systems will be provided in large conference, auditorium, and exhibition rooms. Audio-visual system design requirements vary greatly and will need to be confirmed during the design phase.

Distributed Communications and Monitoring Systems

At this stage of pre-design, we expect a clock system will be provided throughout the building.

A Distributed Antenna System (DAS) is required by Code and will be provided throughout the building.

At this stage of pre-design, a Public Address system is not expected to be required. This will need to be confirmed during design.

ELECTRONIC SAFETY AND SECURITY

General

Raceways, boxes, cabling, supports, and grounding will be provided.

Access Control

Access control will be provided at exterior doors, elevators, and other interior doors as directed by the Owner.

The Access Control system will be designed and provided by RFI Communications, the Access Control/ Intrusion Detection vendor for all UW projects.

Video Surveillance (CCTV)

CCTV cameras will be provided at all exterior entrances. Additional locations, if any, will be coordinated with the Owner. Camera control and monitoring equipment and digital video recorders will be provided at the main security station.

Intrusion Detection

Intrusion detection will be provided at all exterior doors, and other interior locations, as directed by the Owner.

The Intrusion Detection system will be integral with the Access Control system and will be designed and provided by RFI Communications, the Access Control/ Intrusion Detection vendor for all UW projects.

Fire Detection and Alarm

An addressable Fire Detection and Alarm system will be provided throughout the building to meet Code requirements for a high-rise building.

The Fire Detection and Alarm system will be a Simplex 4100U system designed and provided by Simplex, the Fire Detection and Alarm vendor for all UW projects.

Site Utilities

Electrical: The electrical service will be provided by SCL. The estimated electrical load is 10MW. SCL has confirmed that the service is available.

TECHNICAL NARRATIVES

COMMISSIONING

COMMISSIONING NARRATIVE

Codes and Standards

The Building Commissioning Association's (BCA) "Essential Attributes of Building Commissioning (1999)" ASHRAE Guideline 0-2005

MEP Systems Commissioning

The following systems are included in the commissioning scope.

- Plumbing
- Heating, Ventilating and Air Conditioning (HVAC)
- Specialty/Process Systems
- Building Energy Management and Control System
- Electrical Power
- Lighting Control
- Electronic Safety and Security
- Communications
- Irrigation Systems
- Laboratory Gases, Vacuum, and Compressed Air

Seasonal (or deferred testing)

Based on timing of the construction and initial building occupancy, seasonal testing is recommended. This is conducted when conditions exist that did not occur during the initial functional testing period (e.g. seasonal transitional temperatures).

Building Commissioning

The building will be commissioned per Washington State requirements for all applicable systems.

TECHNICAL NARRATIVES

ENERGY MODEL

ENERGY MODEL

DESIGN CONSIDERATIONS AND RECOMMENDED ALTERNATIVES FOR ENERGY EFFICIENCY AND INNOVATION

Recommendations and alternatives to improve facility energy efficiency and/or reduce the carbon footprint.

- To support efficient utilization of space, the mechanical and electrical systems serving the occupied areas should be designed with the flexibility to adapt to future lab needs. Areas that are currently programmed for classroom, office, or meeting rooms should have the necessary infrastructure to convert to lab space. This is accomplished by creating risers containing typical utilities such as fume hood exhaust, compressed gas (nitrogen, argon, etc.), compressed air, chilled water, heating hot water, make-up air, and electrical power. Due to the size of the utilities, this approach would best be served by multiple shafts located near the core - possibly a quadrant layout. As floors are reconfigured, the necessary utilities are available to accommodate typical lab requirements.
- The use of a lower temperature heating systme would make this facility "future ready". This would allow for alternative system implementation, as discussed below. To assist with the transition to this technology, an upgraded building envelope including insulation, windows, shading, operable windows, and night cooling strtegies (purge mode), contribute to a dramatic reduction in energy use (and carbon footprint).
- The use of a solar hydronic heating system consisting of roof mounted evacuated tube collectors or closed loop flat plate collector can offset natural fas consumption by 40%. This technology would require low temperature heating coils in air handling units.
- A ground source heat pump system consisting of wells located under the lower level slab can offset building heating (and cooling) costs by 80%. The high water table at this site location makes for a more efficient heat transfer. This strategy would mean a shift to heat pump technology for space heating and cooling.
- Heating/cooling water storage. Depending on system selection, storage can be incorporated into building design to help the building float through peak demands or store energy during peak generation.
- Solar Photovoltaic (PV) panels can be installed on the roof to offset building electrical use. Depending on final building configuration and roof obstructions, 10% of the building's electrical consumption may be offset by the use of a PF array.
- Chilled beam heating and cooling would allow for a reduction in duct size. Depending on final space

programming, this option may add flexibility to future space reconfiguring.

- Natural ventilation through operable windows. Windows in classroom and office areas could be operable. When windows at a particular location are open, the air conditioning unit serving that zone would be off, resulting in energy savings.
- Install exterior shading, such as blinds or awnings, to cut down on heat loss and to reduce heat gain. Install interior and/or exterior shading to reduce solar heat gain and cut down on heat loss and control the amount of light entering the space from the exterior. Automated shades will improve heating/cooling efficiency.
- Landscape/plant trees to create shade and reduce air-conditioning loads
- Install transpired air heating collector (solar wall) for ventilation air preheating.
- Avoid tempoerature stratification with heating, either by proper air supply system design or by using temperature destratifiers (e.g., ceiling fans).
- Adjust housekeeping schedule to minimize HVAC use.
- Install point-of-use electric water heaters. This will remove heat loss from transmission and storage when hot water is not needed.
- Deep Water Cooling. This has been a topic of discussion for the University of Washington campus for several years. The close proximity to Lake Washington and Lake Union, bodies of water that could provide a heat sink for a building of this type, make this type of system feasible. Although studies have shown its effectiveness, Deep Water Cooling has not been implemented on prior projects due to environmental and public considerations.
- Campus Chilled Water: With the new West Campus Central Utility Plant located close to this site, an underground tunnel could be constructed to provide connection to the campus chilled water system. Plant capacity and operation (operating hours) would have to be confirmed. City codes would need to be researched to verify if the facility could be served by off-site utilities (othre than PSE & SCL).
- Campus Power: Campus utilities include an electrical power distribution system. The system is a multi-feed loop that provides a level of redundancy. Campus emergency power is also available. Both systems would need to be evaluated for adequacy to meet the facility's needs. City codes would need to be researched to verify if the facility could be served by off-site utilities (other than PSE & SCL).

Model Basis and Inputs

The energy simulation for the UW CAMCET building was developed based on Space PRogram design allotments provided by CannonDesign to construct an energy-use analysis model using eQUEST software. The software simulated a building from conceptual design parameters and benchmark design guidelines (such as ASHRAE Standard 90.1). This model can be used to compare different design considerations to evaluate the impacts on energy consumption and life-cycle costs, as well as study projected compliance with energy code and LEED analysis.

The model simulates a seven-story building with capacity for Public (including cafe, exhibition, and conference hall), Interaction (commons, meeting, and learning), Administration (Mission Control and Back of House), and Innovation (research and project labs, instrumentation, and test beds). Both permanent and transient populations were defined to simulate the internal heating/cooling, ventilation, lighting, and equipment loads in the building. Interior and exterior walls, windows, doors, and roof were modeled using typical construction materials and methods.

The building heating, ventilation, and air condition (HVAC) systems were analyzed using air and water distributions commonly used for standard office, teaching, and laboratory facilities. High-efficiency condensing boilers were modeled for the hydronic heating system. A water-cooled centrifugal chiller produces the chilled water for cooling, and an open-cell, induced-draft coolin tower was modeled to condition the condenser water. The air-side HVAC was modeled as a typical variable air volume air-handling unit for the Public, Interaction, and Administration spaces. A powered induction unit serving zone reheat boxes and labs with fume hoods was modeled for the Innovation space. The modeling software sizes mechanical equipment to serve the intrenal load parameters entered, as well as factoring aggregated weater data for the location selected.

The characteristics of the building floor plate, floor-to-floor height, program make-up, and population are based on Space Program dated 5-17-16.

Based on preliminary project schedule, the building envelope thermal values, mechanical equipment efficiencies, and lighting allowances are based on the proposed 2015 Seattle Energy requirements that would be adopted by the time of building construction.

The building was modeled utilizing the following program make-up:

- **Public - 25,927 gross square feet**
    - Building Entry
    - Central Cafe
    - Exhibition & Conference

- **Interaction - 30,728 gross square feet**
    - Collaborative Commons
    - Meeting Rooms
    - Learning
- **Administration - 11,598 gross square feet**
    - Mission Control
    - Back of House
- **Innovation - 110,571 gross square feet**
    - Research Labs
    - Project & Incubation Labs
    - Shared Instrumentation
    - Test Beds

The program areas were grouped into two different HVAC system types:

- Fan Powered VAV System - A Variable Air Volume Air Handling Unit with Fan Powered Mixing Box Terminal Units that serve Public, Interaction, and Administration. This system type has distinct occupied and unoccupied periods and zone temperatures may be set back during unoccupied periods.
- Lab System - A Variable Air Volume Air Handling Unit with VAV terminal units that serve the Innovation areas. This system operates year-round and is assumed to maintain a constant temperature regardless of occupancy. This system has a large percentage of outside air to account for lab exhaust requirements.

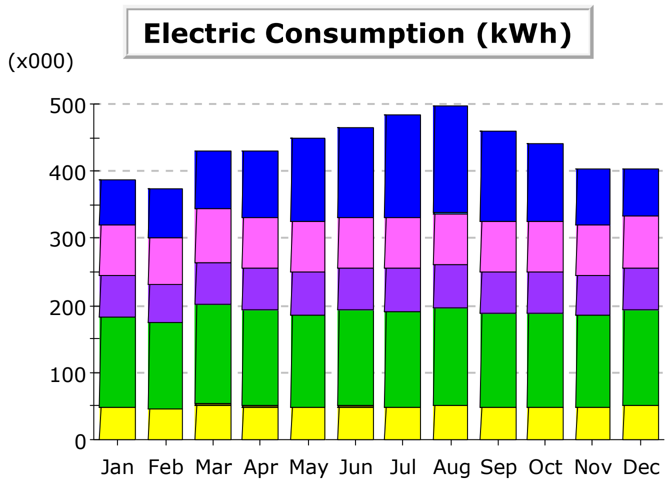
Note: Each system may split into two or more air-handling units depending on the final building configuration and shaft size.

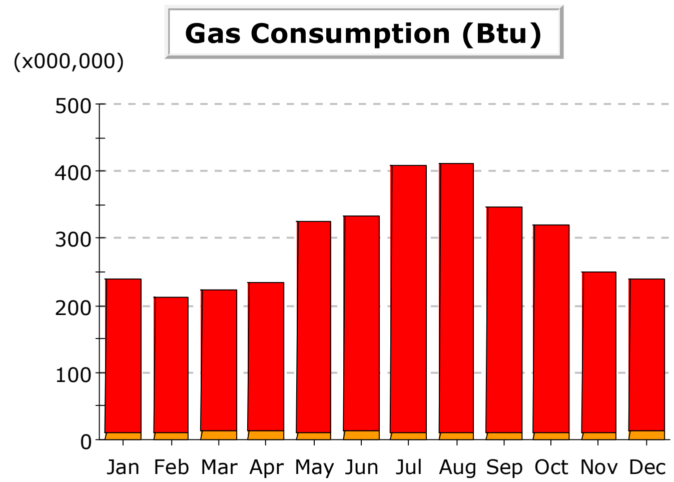
Both systems utilize a hydronic heating system that provides heat to the AHUs and terminal units. A heat recovery system is also used to recover heat from the exhaust air stream and pre-heat the outside air.

Approximately 62% of the building is served by the Lab System.

Based on the energy model results, the Building has an EUI of 119 kBTU/SF and an annual utility spend of $357,740 per year.

Model Output(s)



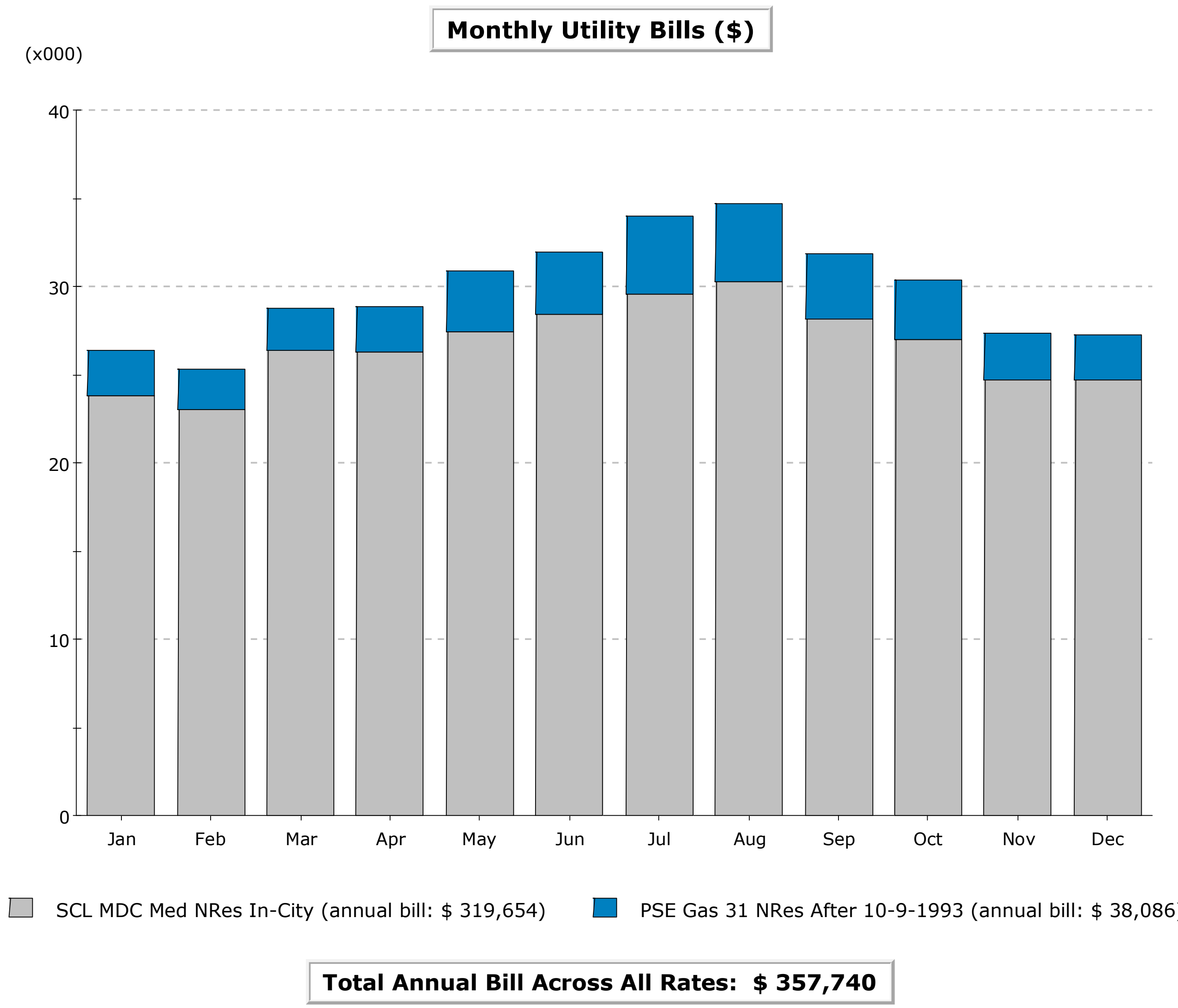


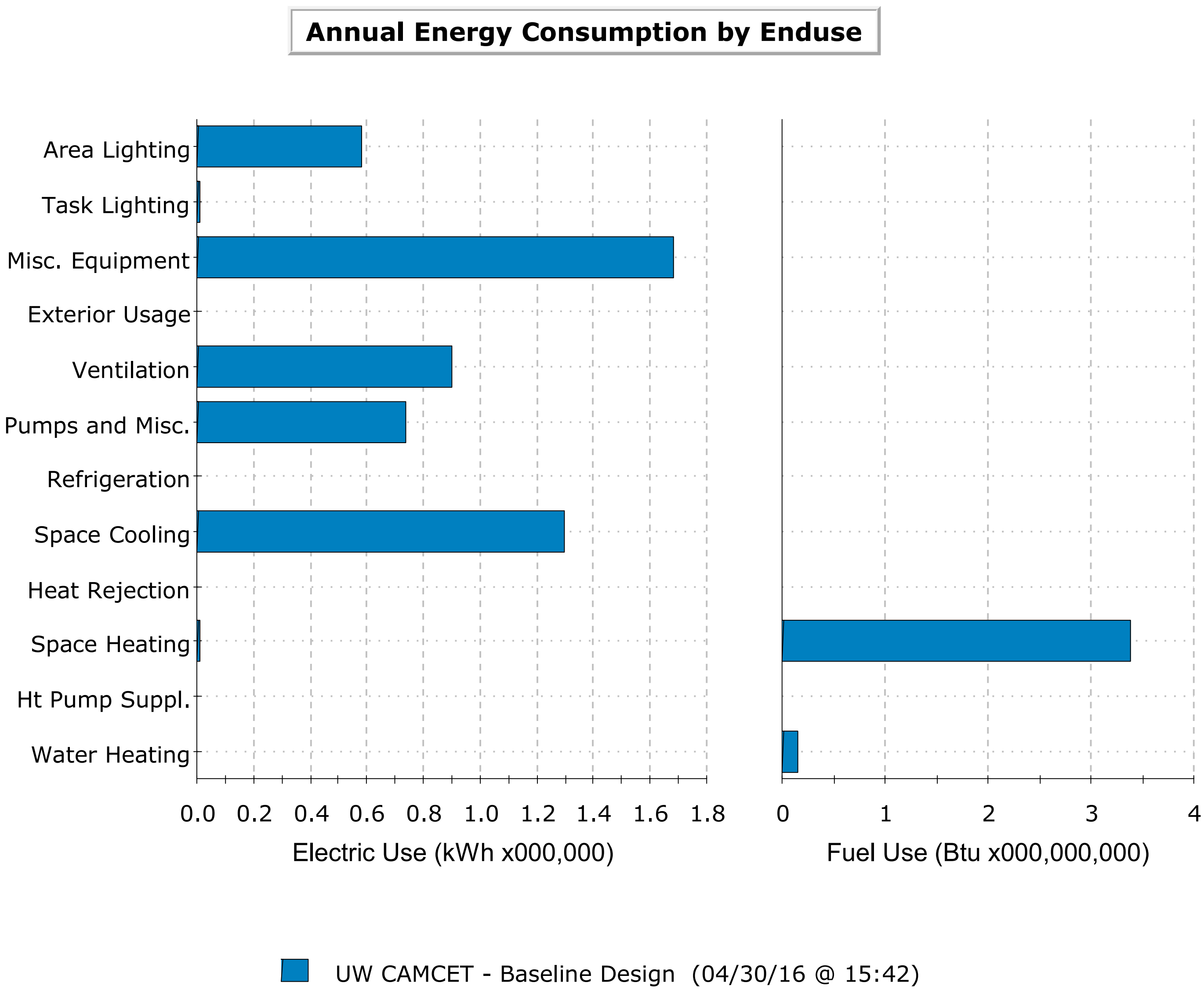
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	67.2	74.0	86.3	98.8	122.9	133.3	152.5	159.4	134.8	115.5	83.0	69.0	1,296.8
Heat Reject.	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.6	0.3	0.1	0.0	-	1.9
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.7	0.6	0.6	0.7	0.8	0.8	0.9	0.9	0.8	0.8	0.7	0.7	9.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	75.7	69.9	79.7	75.6	75.2	74.7	75.3	75.7	73.5	74.6	73.8	78.0	901.6
Pumps & Aux.	61.9	56.0	62.1	60.3	62.7	61.0	63.5	63.7	61.1	62.5	60.1	61.9	736.9
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	134.7	128.4	149.4	143.6	138.4	143.6	142.1	145.7	140.0	138.4	136.3	142.1	1,682.8
Task Lights	1.0	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	13.0
Area Lights	47.2	44.7	51.8	49.5	47.1	49.1	48.4	50.0	48.3	48.0	47.7	50.2	582.0
Total	388.4	374.7	431.1	429.6	448.3	464.0	484.3	497.2	459.9	441.0	402.7	403.0	5,224.2

Gas Consumption (Btu x000,000)

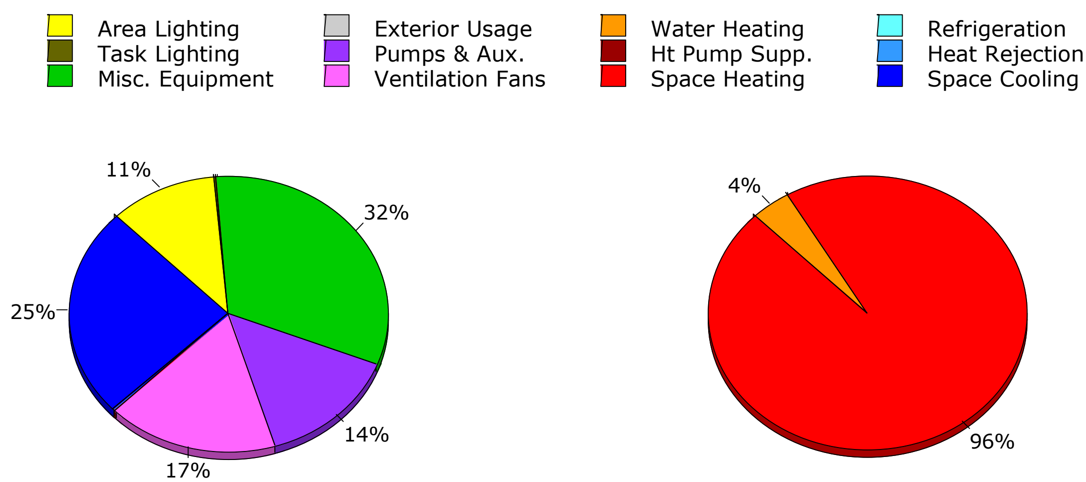
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	227.8	200.1	207.6	220.7	314.5	319.6	397.1	399.0	334.1	307.5	237.6	226.4	3,392.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	11.8	11.9	14.4	13.6	12.1	12.6	11.7	11.9	11.4	11.1	11.5	12.5	146.6
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	239.6	212.1	222.0	234.4	326.6	332.2	408.8	411.0	345.5	318.6	249.1	239.0	3,538.8


Monthly Utility Bills ($)
(x000)
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SCL MDC Med NRes In-City (annual bill: $ 319,654)
PSE Gas 31 NRes After 10-9-1993 (annual bill: $ 38,086)
Total Annual Bill Across All Rates: $ 357,740


Annual Energy Consumption by Enduse
Area Lighting
Task Lighting
Misc. Equipment
Exterior Usage
Ventilation
Pumps and Misc.
Refrigeration
Space Cooling
Heat Rejection
Space Heating
Ht Pump Suppl.
Water Heating
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8
Electric Use (kWh x000,000)
0 1 2 3 4
Fuel Use (Btu x000,000,000)
UW CAMCET - Baseline Design (04/30/16 @ 15:42)

Annual Energy Consumption by Enduse

	Electricity kWh (x000)	Natural Gas MBtu	Steam Btu	Chilled Water Btu
Space Cool	1,296.8	-	-	-
Heat Reject.	1.9	-	-	-
Refrigeration	-	-	-	-
Space Heat	9.2	3,392.2	-	-
HP Supp.	-	-	-	-
Hot Water	-	146.6	-	-
Vent. Fans	901.6	-	-	-
Pumps & Aux.	736.9	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	1,682.8	-	-	-
Task Lights	13.0	-	-	-
Area Lights	582.0	-	-	-
Total	5,224.2	3,538.8	-	-



Electricity

Natural Gas

System & Zone Name	System Type Principal Zone Activity	Type* Ret Zn	Design Flow Area sqft	Design Flow Supply cfm	Supply cfm/sf	Design Ventilation Min Flow	OSA cfm	OSA %
Lab VAV System	Variable Air Volume	D	109,776	284,046	2.59	31%	284,046	100%
··· Innovation 1	Innovation - Labs	C	84,240	217,972	2.59	31%	67,392	31%
··· Innovation 1 Pl Zn (M.C20)	(unknown)	U	84,240	n/a	n/a	n/a	n/a	n/a
··· Innovation 2	Innovation - Research TC	C	16,848	43,594	2.59	31%	13,478	31%
··· Innovation 2 Pl Zn (T.C30)	(unknown)	U	16,848	n/a	n/a	n/a	n/a	n/a
··· Innovation 3	Innovation Research TS	C	2,172	5,620	2.59	31%	1,738	31%
··· Innovation 4	Innovation - Research TE	C	2,172	5,620	2.59	31%	1,738	31%
··· Innovation 5	Innovation - Research TN	C	2,172	5,620	2.59	31%	1,738	31%
··· Innovation 6	Innovation - Research TW	C	2,172	5,620	2.59	31%	1,738	31%
··· South Perim Pl Zn (T.S26)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· East Perim Pl Zn (T.E27)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· North Perim Pl Zn (T.N28)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· West Perim Pl Zn (T.W29)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
Sum of Zones	··	··	··	284,046	··	··	··	··
Sum of Zones / System Total	··	··	··	100%	··	··	··	··

System & Zone Name	System Type Principal Zone Activity	Type* Ret Zn	Design Flow Area sqft	Design Flow Supply cfm	Supply cfm/sf	Design Ventilation Min Flow	OSA cfm	OSA %
Fan Powered VAV System	Powered Induction Unit	D	68,976	79,529	1.15	6%	4,560	6%
··· Public 1	Public - Cafe' Confrence	C	16,848	8,552	0.51	2%	150	2%
··· Public 1 Pl Zn (G.C10)	(unknown)	U	16,848	n/a	n/a	n/a	n/a	n/a
··· Public 2	Public - Entrance	C	2,172	2,307	1.06	4%	90	4%
··· Public 3	Public - Cafe'	C	2,172	2,758	1.27	20%	540	20%
··· Public 4	Public - Conference	C	2,172	1,312	0.60	18%	240	18%
··· Public 5	Public - Enterence Confrence	C	2,172	2,391	1.10	7%	165	7%
··· South Perim Pl Zn (G.S6)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· East Perim Pl Zn (G.E7)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· North Perim Pl Zn (G.N8)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· West Perim Pl Zn (G.W9)	(unknown)	U	2,172	n/a	n/a	n/a	n/a	n/a
··· Interaction 1	Interaction Learning - Meeting	C	10,860	18,689	1.72	9%	1,650	9%
··· Interaction 2	Interaction - Commons	C	10,860	15,812	1.46	5%	750	5%
··· Interaction 3	Interaction-Commons-Meeting-BOH	C	10,860	10,011	0.92	7%	750	7%
··· Administration 1	Adm - Mission Cnt - BOH	C	10,860	17,697	1.63	1%	225	1%
··· South Perim Pl Zn (M.S16)	(unknown)	U	10,860	n/a	n/a	n/a	n/a	n/a
··· East Perim Pl Zn (M.E17)	(unknown)	U	10,860	n/a	n/a	n/a	n/a	n/a
··· North Perim Pl Zn (M.N18)	(unknown)	U	10,860	n/a	n/a	n/a	n/a	n/a
··· West Perim Pl Zn (M.W19)	(unknown)	U	10,860	n/a	n/a	n/a	n/a	n/a
Sum of Zones	··	··	··	79,529	··	··	··	··
Sum of Zones / System Total	··	··	··	100%	··	··	··	··

Project Totals

System & Zone Name	System Type Principal Zone Activity	Type* Ret Zn	Design Flow Area sqft	Design Flow Supply cfm	Supply cfm/sf	Design Ventilation Min Flow	OSA cfm	OSA %
Sum of SYSTEMs	··	··	178,752	363,575	2.03	25%	288,606	99%
Sum of ZONEs	··	··	··	363,575	2.03	··	··	··
Sum of Zones / System Total	··	··	··	100%	··	··	··	··

* Return Types: ·· 'P' = Plenum Return ·· 'D' = Ducted Return ·· 'd' = Direct return ·· (Plenum Zones are not shown on this report)
* Zone Types: ·· 'C' = Conditioned Zone ·· 'U' = Unconditioned Zone ·· 'S' = Slave Zone ·· (conditioned but no t-stat)

Design Capacity							Hrs Outside Thrl-Range	
OSA cfm/sf	OSA cfm/per	Cool tons	Cool sf/ton	Cool cfm/ton	Cool Btuh/sf	Heat Btuh/sf	Cool Hrs	Heat Hrs
2.588	1,086.6	846	130	336	92.5	4.2	0	0
0.800	320.0	649	130	336	92.5	4.2	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.800	560.0	130	130	336	92.5	4.2	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.800	260.0	17	130	336	92.5	4.2	0	0
0.800	260.0	17	130	336	92.5	4.2	0	0
0.800	260.0	17	130	336	92.5	4.2	0	0
0.800	260.0	17	130	336	92.5	4.2	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
..	..	846	..	..	..	..	0%	0%
..	..	100%	..	..	..	..	..	..

Design Capacity							Hrs Outside Thrl-Range	
OSA cfm/sf	OSA cfm/per	Cool tons	Cool sf/ton	Cool cfm/ton	Cool Btuh/sf	Heat Btuh/sf	Cool Hrs	Heat Hrs
0.066	15.0	225	306	353	39.2	12.6	0	1
0.009	15.0	24	695	353	17.3	5.9	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.041	15.0	7	332	353	36.1	11.9	0	0
0.249	15.0	8	278	353	43.2	10.8	0	0
0.110	15.0	4	584	353	20.5	5.3	0	1
0.076	15.0	7	320	353	37.4	11.8	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.152	15.0	53	205	353	58.5	17.9	0	0
0.069	15.0	45	242	353	49.5	16.1	0	0
0.069	15.0	28	383	353	31.4	9.8	0	0
0.021	15.0	50	216	353	55.4	19.0	0	0
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
..	..	225	..	..	..	..	0%	0%
..	..	100%	..	..	..	..	..	..

Design Capacity					Throttling Range		
OSA cfm/sf	OSA cfm/per	Cool tons	Cool sf/ton	Cool cfm/ton	Cool Btuh/sf	Heat Btuh/sf	Hrs Outside Thrl-Range
1.615	510.4	1,071	167	339	71.9	7.4	0%
..	..	1,071	..	..	..	..	..
..	..	100%	..	..	..	..	..

TECHNICAL NARRATIVES

LABORATORY PLANNING

LABORATORY PLANNING

I. Codes, References, Standards, and Guidelines

Refer to building codes identified elsewhere in this report.

II. Modular Planning, Flexibility, and Adaptability

Laboratory facilities conceived with modular planning principles provide a basis for flexibility and adaptability during design, construction, and through to the occupancy of the facility into the future.

Standardized units shall be developed to serve as the organizing basis for building structure, walls and partitions, as well as the distribution of building ventilation, utilities and services.

This approach to the building design will provide an organization for future modifications, minimizing the impact on the building infrastructure, and a rationale for planning decisions.

The modular unit shall be the basis for small instrumentation-based or special use laboratories, or combined for larger laboratories.

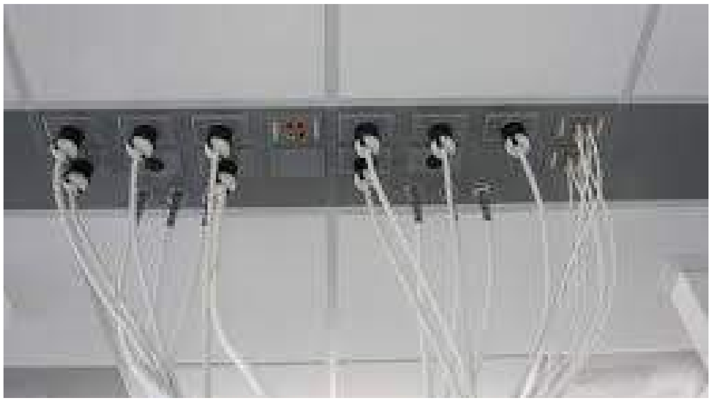
The planning module shall be based on the bench area as a work place for procedures, protocols, instrumentation, equipment, and work stations, along with the aisle space in front of the bench to allow for movement.

Wall benches and island or peninsula benches of 30 inches and 60 inches, respectively, should be provided, along with 60 inch aisles.

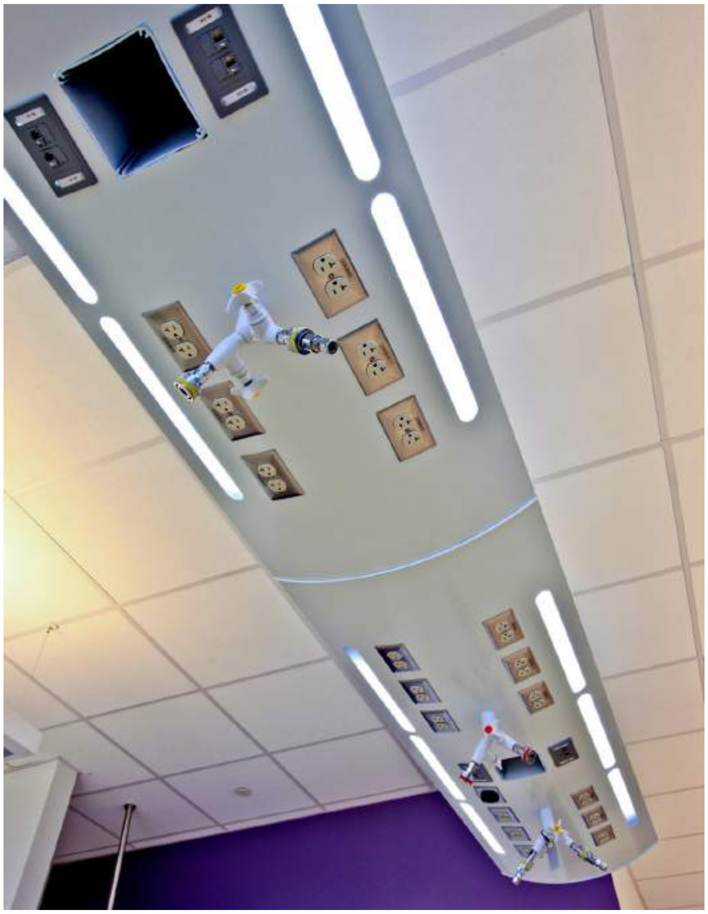
A. Utility Distribution

Install utility distribution in a grid pattern that allows for flexible connections to benches and/or equipment in the research spaces.

Overhead service carriers or panels shall be considered for flexibility. These systems can house electrical, data, phone, plumbing and gas services to the bench spaces. These systems allow for a quick change out of utilities needed at each lab or bench space and provide for a quick plug and play capability with mobile furniture systems.



Ceiling Service Panels



Overhead Service Carrier

B. Flexible Casework Systems

Casework systems shall be modular and mobile to support the flexible design intent of the building. Casework shall be pre-wired and pre-piped in order to be able to connect to the overhead utility distribution system.

Refer to the conceptual plan layouts for suggested modular planning dimensions for the laboratories and to the images to the right for examples.

Broad Institute

USC Broad CIRM Center

Gates Vascular Institute Clinical Translational Research Center

III. Universal Structural Grid

Refer to Universal Structural Grid described elsewhere in this report.

IV. Floor to Floor Height

The architectural intent of the conceptual layout is to have a floor to floor height of 16’-0”. However, higher floor to floor height is recommended at the first floor to accommodate taller high bay space needs.

Refer to building section included elsewhere in the report.

V. Accessibility for the Disabled

The facility shall be designed to be fully accessible to the disabled.

Accessible laboratory work stations and fume hoods should be provided based on building code requirements. Location of accessible work stations as close as possible to eyewash and safety showers.

General criteria and guidelines for accessible work stations in laboratories include:

- Work surfaces should be 30 inches to 34 inches above finished floor with wheelchair clearance below; adjustable work surfaces may be provided to provide a range of height adjustments.
- Laboratory service fittings, controlled environment room controls, etc. shall be within reach limitations as prescribed in the applicable building code. Laboratory service fittings require single lever handles and water faucets require blade handles.
- 60 inch-wide aisles are recommended to facilitate wheelchair turning radius.

VI. Interaction/Collaboration

Interaction is critical to contemporary science facilities and should consider the following aspects of interaction:

- Interaction within each laboratory group
- Interaction between laboratory groups
- Intra-departmental interaction
- Inter-departmental interaction
- Private partnership interaction

To satisfy this need, spaces should be created within laboratories, between laboratories, on each floor, and in public areas of building. Successful interaction occurs in a variety of settings, both, in formal and informal settings. Concepts for interaction should be developed as the design develops.

Formal interaction spaces in the building include:

- Conference/Meeting rooms

Informal interaction is more difficult to predict, because it relies more on human behavior and perceptions, as well as each institution’s cultural objectives of collaboration. Within CAMCET it is intended that collaboration spaces be purposefully planned to allow collaboration to happen in a multitude of ways. Each programmed area must serve a purpose and contain the tools and media necessary for groups to work together, collaborate and record this sharing of information.

VII. Circulation

In addition to people, circulation is required for the distribution of chemicals, supplies, and equipment as well as removal of debris and laboratory waste. Efficient and clear circulation is critical for the safety within the facility.

Internal circulation within individual laboratory spaces and from laboratories to building exits shall be through an uncomplicated path of egress. In addition, the circulation system should facilitate the preferred spatial adjacencies identified for:

- Laboratories and laboratory support spaces.
- Laboratories and offices.

Other features that should be considered in the design of the circulation system include:

- A minimum of one door into each laboratory space should have a minimum 42 inch wide clear opening; though a double door arrangement is preferred, consisting of a 36 inch active leaf and an 18 inch inactive leaf.
- Equipment lists should be coordinated with door widths to verify that equipment, including anticipated future items, can be transported and maneuvered between spaces.
- Building corridors should be a minimum of 72 inches wide in laboratory areas.
- Doorways into corridors should open in the direction of egress into recessed alcoves.
- Fume hood locations within laboratories should be coordinated to avoid exiting in front of the fume hoods.

VIII. Acoustical Criteria

Noise criteria for common laboratory rooms shall be as follows:

- Research Laboratory (no or few fume hoods) NC40-45
- Research Laboratory (with fume hoods) NC45-55
- Equipment, Instrumentation Room, NC40-45
- Laboratory Support Rooms, NC40-45
- Glasswash Room, NC42-46
- Office, NC33-38
- Corridors, NC38-43

IX. Structural and Vibration Criteria

See Structural Design Criteria Narrative

X. Laboratory Piped Services

Each research laboratory should have convenient access to all services and should be isolated for service shut down and repair without affecting other laboratories. Shut off valves shall be located in consistent manner throughout the building.

A complete set of laboratory piped services should be stubbed out for each research laboratory to increase flexibility and minimize remodel and retrofit costs as laboratory uses change. For additional flexibility consider extending the concept of stub in services to all teaching laboratories.

The following piped services are required in the laboratories:

- Non-Potable hot and cold water for laboratory use (IHW, ICW).
- Potable tepid water for safety equipment.
- Purified Water: Provide Type 3 reverse osmosis.
- Compressed Dry Air: Low and high pressure from a central house system (CDA)
- Laboratory Specialty Gases: Refer to Mechanical Systems narrative.
- Laboratory Waste (LW). Refer to Mechanical Systems narrative.
- Sanitary Sewer (SS). Refer to Mechanical Systems narrative.

XI. Laboratory Safety

A. Safety Equipment:

Safety showers and eyewash fixtures shall be provided throughout laboratory in accordance with ANSI Z-358.1.

Floor drains should be provided below safety showers and eyewash fixtures.

B. Laboratory Exhaust Systems

The laboratory ventilation system, in addition to promoting human comfort, is critical to maintaining health and safety by providing primary containment of potential hazards. Potentially hazardous chemical vapors, particulates, and biological aerosols shall be removed by the ventilation system. A variety of exhaust devices are available for use in the laboratory to assist the ventilation system and provide safe work areas for personnel. Further discussion and evaluation of the appropriate systems for design and implementation need to happen with the university.

C. Chemical Fume Hoods and Floor Mounted Hoods

Chemical fume hoods and floor mounted hoods are the primary protection device for chemical containment. All fume hoods should be positioned at least 10 feet from doors to reduce drafts effects and allow for safe egress. Fume hoods should not be located along main circulation aisles in the laboratories.

The UW standard for fume hood design is to maintain 100 fpm +/- 10 percent at the 18 inch sash open position. In order to reduce air flow rate and energy consumption, alternative fume hood configurations may be considered. Please refer to the mechanical section design criteria for potential alternative fume hood configurations.

Fume hood sashes may be vertical, horizontal, or combination, and will be identified during the Design Development phase of the project.

D. Secondary Containment

Secondary containment is achieved by a combination of ventilation system design and other exhaust devices that are not engineered to the sorts of regimes established for primary containment devices.

E. Room Pressurization

Laboratory spaces shall generally be under negative pressure relative to adjacent corridors and non-laboratory spaces. To be effective, windows shall not be operable and doors require closers to be kept closed. In some applications, monitoring devices may be provided to verify proper pressurization. Some rooms may require air lock anterooms to assist in preventing potential contamination of adjacent spaces or corridors.

F. Room Air Change Rate

Room air changes assure that fresh air is constantly supplied to laboratory spaces. Laboratory spaces shall be supplied with 100 percent filtered outside air; though, in some cases, air from adjacent non-laboratory spaces may be transferred to the laboratories as part of an energy conservation solution. Air changes shall be determined by either:

- Recommended air changes rates for the type of activity, ranging from 6 where non-hazardous activities occur to 12 where hazardous materials are in frequent use.
- The exhaust rate demanded by the exhaust devices to be provided in the room.

- The rate to remove heat gain in the room to maintain personnel comfort.

G. Laboratory Wastes

Laboratory staff will contain and identify chemical and biological wastes in the laboratories and take them to temporary storage rooms adjacent to the loading/ receiving facilities for pick up and disposal.

H. Other Safety Requirements

Doors:

- Doors are required for access control.
- Door to each laboratory shall be self-closing and lockable.

Personnel Protection:

- Facilities are required for personnel protective clothing, including gowns or scrubs, gloves, eye and face protection, and foot coverings. Areas for disposal and storage shall be provided.

Ventilation System:

- The ventilation system preferably shall provide sustained directional airflow from "clean" areas and toward "contaminated" areas. Exhaust air shall not be recirculated in the building.

Room Finishes and Surfaces:

- Room finished and materials shall be easily cleaned and decontaminated.

Laboratory Casework and Work Surfaces

- Laboratory work surfaces shall be impervious to water, and resistant to heat, organic solvents, acids, alkalis, and other chemicals.

Sinks:

- Each laboratory shall have a sink for hand washing.

Vacuum System:

- Vacuum lines shall be protected with HEPA filters, or equivalent. Liquid disinfectant traps may be required.

Safety Equipment:

- An eyewash fixture shall be provided in each laboratory.

XII. Chemical Limitations

The chemical quantity and allocations within the new CAMCET building will be governed by the Chemical Limitations of the builing code and NFPA 45.

During design phase the design team shall acquire specific research and chemical quantity data from UW and along with the building programming and planning requirements set forth in this document shall verify that code requirements for building chemical limitations are met.

STAKEHOLDERS – ATTENDEES LIST

Maggie Brown	APCO WW
Dian Gay	APL - UW
Connie Bourassa-Shaw	Buerk Center for Entrepreneurship
Tom Rankin	Clean Tech Alliance
Jeff Canin	Element 8
Rick Luebbe	EnerG2
Gino Borland	ES
Steven Gottlieb	GreenC3
Doug Ray	PNNL
John Feo	PNNL, NIAC Computing
Volha Hrechka	PolyDrop
Ron Stimmel	Renewables/AMZN
Sanjay Kumar	Reuse H2O
Sean James	Reuse H2O
Craig Husa	SuperCritical Technologies
Ulrich Hetmaniuk	UW Applied Math
Steve Majeski	UW Arts & Science
Lara Gamble	UW BioE
Carolyn Goodman	UW Cambia Palliative Care
Fred Pitz	UW Campus Engineering
James Morin	UW Campus Engineering
Tom Pittsford	UW Campus Engineering
Alex Wilson	UW Campus Engineering
Brian Fabien	UW CEO
Joamma Glickler	UW CFR
Venkat Subramanian	UW CHE/PNNL
Elena Pandres	UW Chemical Engineering
Hugh Hillhouse	UW Chemical Engineering
Jim Pfaendtner	UW Chemical Engineering
Lilo Pozzo	UW Chemical Engineering
Shaun Taylor	UW Chemical Engineering
Dave Castner	UW Chemical Engineering
Steve Leith	UW Chemical Engineering
Brandi Cossairt	UW Chemistry
Daniel Gamelin	UW Chemistry
Jenny Stein	UW Chemistry
Lauren Kang	UW Chemistry

Phil Reid	UW Chemistry
Dan Schwartz	UW Clean Energy Institute
David Ginger	UW Clean Energy Institute
Dawn Lehman	UW Clean Energy Institute
Jill Aronson Pfaendtner	UW Clean Energy Institute
Renee Gastineau	UW Clean Energy Institute
Pedro Arduino	UW College of Education
Mike Clarke	UW CoMotion
Elizabeth Scallon	UW CoMotion
Bjorn Frogner	UW CoMotion
Eric McArthur	UW CPD
Jon Lebo	UW CPD
Mike McCormick	UW CPD
Rebecca Barnes	UW CPD/OVA
Mushfigur Sarker	UW EE
John Gunderson	UW EH&S
John Kelly	UW EH&S
Daniel Kirschen	UW Electrical Engineering
Vikram Jandyaia	UW Electrical Engineering
Joe Cook	UW Public Policy
Karl Bohringer	UW
John Kelly	UW
Philip Red	UW IT
Alex Jen	UW Material Science CEI
Steve Kennard	UW ME
Bruce Hinds	UW MSE
Christine Luscombe	UW MSE
Devin MacKenzie	UW MSE/ME
Kai-Mei Fu	UW Physics/EE
Xiaodong Xu	UW Physics/MSE
Brian Young	UW Real Estate (CPD)
Steve Tatge	UW Real Estate (CPD)
Clara Simon	UW Sustainability Coordinator
John Plaza	WA Dept. of Commerce

STAKEHOLDERS – LETTERS OF SUPPORT

FOSTER
Buerk Center for Entrepreneurship

President Ana Mari Cauce June 18, 2016
University of Washington
Seattle, WA 98195

Dear President Cauce,

We've seen, as you well know, tremendous growth in the demand for entrepreneurship courses, activities, and programs at the University of Washington. The Buerk Center for Entrepreneurship has more than 130 PhD candidates from across campus in the same classes as our MBAs. Our new ENTRE minor for nonbusiness students is currently at 150+ undergraduates—and growing with each application period. The new Health Innovation Challenge attracted 34 applications for prototype funding, and on March 3 we had the top-ranked 18 teams pitch their ideas to an audience of 121 judges from the Seattle health care and entrepreneurial communities. The new Master of Science in Entrepreneurship 12-month degree will open for applicants this fall (assuming all continues to go well at the Graduate Program office). We already have a mailing list of candidates who are waiting for the application period to open.

This is just background for my real reason for writing you: CAMCET. I was happy to be one of the stakeholders to participate in the CAMCET building predesign process. It was fascinating to hear from our partners across the region and learn from their opinions how the University of Washington could build a new sense of collaboration and participation within the cleantech community. But what was truly exceptional about the conversations we were having was the enthusiasm for seeing these collaborations play out within a new physical space.

Space is so limited at the University of Washington. We hold our annual Alaska Airlines Environmental Innovation Challenge at the Seattle Center Exhibition Hall, because there is no space that large on campus—especially since the EIC student teams design and build prototypes like biogas digesters and conversion kits to turn gasoline-powered vehicles into electric vehicles. But CAMCET could change all that. I can clearly envision the EIC teams in the proposed facilities and see exactly where—on the building predesign—they'll be pitching their ideas to an audience of 150+ judges and showcasing their prototypes. Most importantly, it would all be on campus, where their faculty and other students might be able to stop by and see what the EIC has produced.

But students, faculty, and collaborators need more than space for a Challenge or a "Straight Talk for Entrepreneurs" panel discussion. I heard the CAMCET stakeholders talk about:

- Testbeds – specific facilities/instruments they wouldn't have access to elsewhere, with research experts on hand to help refine research ideas, run samples, etc.
- Incubation space - near other startups, new initiatives, cutting-edge instrumentation facilities

- Hot desks – creative workspaces in a unique facility that is a center for innovation, translation, and entrepreneurship

- Social/collaboration spaces – a unique environment in which to connect serendipitously with colleagues, host informal meetings, get connected to what's happening at the university

- An auditorium – space for small- to medium-sized meetings and conferences that will help bring together diverse groups and seed new partnerships

- Mission Control – a single source of information about the facilities, events, initiatives, entrepreneurship, funding opportunities, administrative and research support

One of the most difficult tasks I have as director of the Buerk Center for Entrepreneurship is determining how we can bring together students from different programs and disciplines. It's crazy hard for a chemistry student with an idea to meet an MBA who wants to start a company and a design student who can finesse the product. Those chance meetings aren't easily scheduled—although we keep trying. [By the way, we've stopped using the word "networking" with engineers and scientists. Way too scary. We now have "meet-ups"!]

This new space would invite collaboration from across campus, from the cleantech and entrepreneurial communities—and anyone else who wonders where to go to meet other people who share their curiosity and commitment to accelerating solutions for a healthy planet. I love the idea of CAMCET, and I'll love it even more the day we move in. I just want you to know that CAMCET has my strongest support. It's innovative, it's entrepreneurial, and it's exactly what the University of Washington needs to ensure its reputation as a national leader in cleantech.

Best,

Connie Bourassa-Shaw, Director

Buerk Center for Entrepreneurship

Foster School of Business, University of Washington

cbshaw@uw.edu

Battery Informatics

Dr. Ana Mari Cauce
President
University of Washington
Seattle, WA 98195

May 30, 2016

Dear President Cauce:

Thank you for inviting outside stakeholders to participate in the CAMCET Building Pre-Design Process. It was refreshing to learn how the University of Washington plans to build collaborations with their partners across the region. I was impressed by the enthusiasm from the campus and our local clean tech community. I look forward to continuing my involvement and support as the project moves ahead.

As CEO and co-Founder of Battery Informatics, Inc., (Bii), I wish to move my team into the proposed facilities at the earliest time possible. Bii was incorporated in November 2015 and we will start our first paid project in July 2016 but we will be in a "virtual" mode for another 6 to 12 months. I believe Bii is a perfect example of a startup to be located in CAMCET. We need a dynamic environment where we can grow, collaborate, share, and be stimulated. We need several of the services that will be available; we are particularly interested in the following:

- Testbeds: Bii needs to perform battery charging/discharging cycling that will take days to complete. We also need other types of testing and measurements. The equipment we need is expensive and the need to use it is only occasional. So, sharing makes good sense and will reduce everybody's cost.
- Incubation space: Being near other startups will greatly facilitate people networking, sharing of skills, and stimulate peer support.
- Auditorium: We will need space for small to medium sized meetings with clients and other groups who like to hear our story.
- Mission Control: A central source of information about the facilities, events, initiatives, entrepreneurship, funding opportunities, administrative and research support will enable our team to rapidly find useful information.
- Innovation district: Being located in the innovation district will improve our ability to attract new people to work with us.

Prior to coming to Seattle in 2015, I was EiR for 6 years in Maryland where I visited most of the 20 incubators in that state. Prior to that, I was an entrepreneur in Silicon Valley for 30 years; so I know the importance of a solid entrepreneurial ecosystem. I have also visited incubators in China and taught entrepreneurship and innovation to more than 50 Chinese groups. I find that the concepts underlying CAMCET are consistent with the wishes that I have heard many times but not seen comprehensively implemented. I have high expectations that the thoughts that have gone into CAMCET will result in great collaboration that will accelerate innovation in the Washington area.

In summary, I strongly support this innovative facility that will help connect Washington to the world by establishing partnerships that can accelerate solutions for a healthy planet.

Best regards,

Bjorn Frogner, PhD

Co-Founder and CEO

Battery Informatics, Inc.

19491 Willet Ln NE

Poulsbo, WA 98370

bjorn.frogner@batteryinformatics.com

ELEMENT8
www.element8angels.com

Dr. Ana Mari Cauce
President
University of Washington
Seattle, WA 98195

June 1, 2016

Dear President Cauce

Thank you for inviting outside stakeholders to participate in the CAMCET Building Pre-Design Process. It was refreshing to be asked for our opinion on how the University of Washington can build collaborations with its partners across the region. We saw a high level of enthusiasm from constituents on campus and across our local clean tech community and are looking forward to continuing our involvement and support as the project moves ahead.

As early stage clean tech angel investors, we clearly envision our colleagues and sponsors using the proposed facilities and engaging with teams of interdisciplinary faculty and students, other clean tech companies and startups, and university and National Lab researchers with expertise in clean tech research areas.

Ultimately, we need a much larger pipeline of clean tech startups to bolster the northwest's regional economy. The traditional barriers are funding and facilities to graduate from lab success to customer validation via prototypes and pilots. The other barrier is a perceived opacity to research activity. CAMCET directly addresses both of these barriers. We are particularly interested in the testbeds and incubation space to lower the cost of commercialization. Since relationships are a key ingredient to investing, we're also enthusiastic about the social and collaboration spaces, hot desks, auditorium and location in the innovation district in providing places for long term relationships to be built. Successful collaborations lead to a positive feedback loop attracting accelerators and opportunities to connect to major national initiatives such as Mission Innovate and the Department of Energy's ARPA-E, regional efforts such Connected Campus, and private effort like the Breakthrough Energy Coalition.

CAMCET uniquely provides accessibility to students, faculty, research, facilities and interdisciplinary collaboration with a shared mission. It's how innovation works. We strongly support this innovative approach connecting Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

Sincerely,

Gino Borland
Member
Element 8
ginoborland@hotmail.com

Jeff Canin
Board Member
Element 8
jeffcanin@earthlink.net

SuperCritical Technologies

Dr. Ana Mari Cauce
President
University of Washington
Seattle, WA 98195

June 15, 2016

Dear President Cauce,

I'd like to thank you and your staff for inviting outside stakeholders to participate in the CAMCET Building Pre-Design Process. It was refreshing to be asked for my opinion on how the University of Washington can build collaborations with their partners across the region. I saw amazing enthusiasm from constituents on campus and across our local clean tech community. I am looking forward to continuing my involvement and support as the project moves ahead.

As the CEO of a growing clean energy company, I can clearly envision my colleagues, team members, and me using the proposed facilities and engaging with teams of interdisciplinary faculty and students, other clean tech companies and startups, researchers with expertise in relevant research areas at PNNL/UW, and more.

I am particularly interested in CAMCET's testbeds, shared lab facilities, collaboration spaces, auditorium, and proximity to the innovation district. These are tremendously valuable resources in building successful companies that are simply not available otherwise due to a variety of factors, not the least of which is costs for early stage companies. I've seen over and over again that access to these types of facilities, subject matter experts, and support can mean the difference between success and failure for companies competing in international markets.

This will not be just another shared work space like WeWork or other spaces that are popping up. Things that I think will make this space unique include CAMCET's opportunity to interact with students and faculty in a whole new way. That is mutually valuable. It will also help grow the impact of our ecosystem for clean tech innovation. Many states and cities talk about wanting to create their own Silicon Valley. That is easier said than done and it requires nurturing an ecosystem that is vibrant and dynamic. CAMSET won't do that by itself but will connect researchers, entrepreneurs, potential employees, capital providers, opportunities, and enabling facilities in ways that are transformative and will absolutely contribute significantly to that ecosystem.

I would like to emphasize my strong support for this innovative new approach that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

Very Truly Yours,

Craig Husa,

Chief Executive Officer

SuperCritical Technologies, Inc.

CleanTech Alliance™
WASHINGTON

Dr. Ana Mari Cauce
President
University of Washington
Seattle, WA 98195

May 27, 2016

Dear President Cauce,

The CleanTech Alliance was pleased to participate in the CAMCET Building Pre-Design Process. We are a trade association of nearly three hundred organizations working on developing the cleantech sector. The University of Washington is a Gold Member and Dr. Daniel T. Schwartz serves on our Board of Directors.

We are very enthusiastic about this project and how it might help to catalyze the growth of the sector in our state, as well as clearly stake out a leadership role for the University of Washington. We are hopeful that the completed project might have an impact on:

- Enhance interaction between faculty, students, businesses, investors, and government to help grow the impact of our innovation ecosystem;

- Build the visibility of our region with respect to initiatives such as Mission Innovate, Connected Campus, and the Breakthrough Energy Coalition

We are happy to continue to support this project and to assist the University of Washington Clean Energy Institute as an important driver in the development of this sector.

Very truly yours,

J. Thomas Ranken President & CEO

From: "Stimmel, Ron" <rstimmel@amazon.com>
Subject: Re: Amazon letter of support for building...
Date: June 25, 2016 at 11:37 PM PDT
To: "Daniel T. Schwartz" <dts@uw.edu>

Dr. Ana Mari Cauce
President
University of Washington
Seattle, WA 98195

Dear President Cauce,

Thank you for inviting outside stakeholders to participate in the CAMCET Building Pre-Design Process. It was refreshing to be asked for my opinion on how the University of Washington can build collaborations with their partners across the region. I saw amazing enthusiasm from constituents on campus and across our local clean tech community. I am looking forward to continuing my involvement and support as the project moves ahead.

As part of Amazon's global renewable energy team, I can clearly envision my colleagues and teams using the proposed facilities and engaging with entrepreneurs, technical experts, and job-recruiting resources.

I am particularly interested in CAMCET's collaborative working spaces, hot desks, and event area to have happenchance meetings with individuals who could influence my team's thinking about energy – or maybe find our next star recruit.

What will make this space unique is CAMCET's appeal to the entire ecosystem of this industry sector,bringing together teams and ideas that can learn from one another. Our region already has the important tinder: industry titans, world-class research facilities, and an inspired workforce, and CAMCET will help bring it all together.

I would like to emphasize my strong support for this innovative new approach that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

Best,

Ron Stimmel

Sr. Program Manager, Global Renewable Energy Strategy

Amazon.com

amazon

Dr. Ana Mari Cauce, President
University of Washington
Seattle, WA 98195

June 28, 2016

Re: CAMCET Building

Dear Ana Mari:

Thank you for inviting outside stakeholders to participate in the CAMCET building pre-design process. It was refreshing to be asked for my opinion on how the University of Washington can build collaborations with their partners across the region. I saw amazing enthusiasm from consituents on campus and across our local clean tech community. I am looking forward to continuing my involvement and support as the project moves ahead.

As the Director of the Washington Nanofabrication Facility (WNF), the largest open-access cleanroom facility in the Northwest, and as Site Director for the NSF National Nanotechnology Coordinated Infrastructure (NNCI) network, I can clearly envision that many of the hunders of users of the WNF and its partner, the Molecular Analysis Facility (MAF), engage and actively use the proposed CAMCET facilities. Moreover, these facilities could be an invaluable resource to the researchers affiliated with NNCI, which includes sixteen of the leading nanotechnology sites across the U.S. and whose explicit mission is to make advanced nanofabrication and nanocharacterization facilities available to a very broad user base. CEI Director Dan Schwartz and I have already been in active discussions about leveraging each other's facilities and benefitting from the economies of scale that a growing network of shared user facilities can provide to our campus and beyond. In fact, we intend to build on the extensive infrastructure for facility and tool management, logging of user activity and billing that we have already implemented for WNF and MAF. Furthermore, we intend to coordinate staff hires and provide more extensive opportunities for staff training and retention, including training of our large body of undergraduate and graduate lab assistants and interns from regional community colleges. In this way, we will make a significant impact on the workforce development in nanotech and clean tech in Washington State.

I am particularly interested in CAMCET's testbed and scale-up facilities. While WNF and MAF focuses on basic research and proof-of-concept prototyping of novel devices, the CAMCET testbed facilities will offer our user base resources that provide a pathway towards more refined systems that can take them closer to applications and commercialization.

The vision for the CAMCET building is bold and extremely exciting. It is putting under one roof an amazing list of resources. Besides the technology testbeds, there will be incubator space and hot desks, social spaces for collaboration and learning, and all of that in the attractive environment of the Innovation District.

I am enthusiastic about the vision that the CAMCET leaders have laid out. I believe that it is going to be nothing less than a game changer for UW and our region. CAMCET will provide a whole new experience for our students, faculty and researchers associated with UW; it will be a hotbed for innovation in clean tech; it will generate opportunities to connect to major national and international initiatives such as NNCI; and it will offer new pathways to leverage the unique capacilities such as WNF and MAF and make them available to a new audience. In other words, it is among the top most exciting initiatives that I have been involved in during my almost two decades at UW. I emphasize my strongest support for this innovative approach that connects Washington to the world by catalyzing the key partnerships needed to accelerate solutions for a healthy planet.

Sincerely,

Karl F. Böhringer, Ph.D.
Director, Washington Nanofabrication Facility
Site Director, National Nanofabrication Infrastructure Network
Professor of Electrical Engineering and Bioengineering
Adjunct Professor of Computer Science and Engineering
Adjunct Professor of Mechanical Engineering

DETAILED PROGRAM

University of Washington - CAMCET — **Space Program**

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF	
Program Summary							
						FTE Allocations	
A	PUBLIC						
1.00	Building Entry					1,975	2%
2.00	Central Café					1,700	2%
3.00	Back of House					4,680	5%
					Sub total	8,355	8%
B	LEARNING						
4.00	Exhibition & Conference					4,500	4%
5.00	Collaborative Commons					7,120	7%
6.00	Learning					16,230	16%
7.00	Meeting Rooms					3,300	3%
8.00	Administration					200	0.19%
					Sub total	31,350	30%
C	RESEARCH						
9.00	Research Labs					31,918	31%
10.00	Shared Instruments					8,400	8%
11.00	Administration					950	1%
						41,268	40%
D	INDUSTRY						
12.00	Incubation Labs					4,410	4%
13.00	Test Beds					17,030	16%
14.00	Administration					1,145	1%
					Sub total	22,585	22%
	Net ASF				60%	103,558	
	Net To Gross				1.67	69,039	
	Gross Internal Area					172,596	
							% Area Allocations

W University of Washington - CAMCET **Space Program**

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
A	PUBLIC					
1.00	**Building Entry**					
1.01	Lobby			1,500	1	1,500
1.02	Security	1	75	75	1	75
1.03	Reception Desk	1	100	100	1	100
1.04	Interview rooms	1	100	100	3	300
				Subtotal		1,975
				Population	2	
2.00	**Central Café**					
2.01	Queuing / condiments			400	1	400
2.02	Café style seating	1	15	15	40	600
2.02	Prep / servery area	1	250	250	2	500
2.03	Café storage			200	1	200
				Subtotal		1,700
				Population	2	
				Seats	40	
3.00	Back of House					
	Facilities Management					
3.01	Building Manager	1	120	120	1	120
3.02	IT support	1	100	100	1	100
3.03	Shared Facilities Manager	1	100	100	1	100
3.04	Shared Instrument Tech	1	100	100	3	300
3.05	Shared TestBed Techs	1	60	60	5	300
3.06	Materials handling office	1	60	60	1	60
	Materials Management					
3.07	Loading dock			500	1	500
3.08	Deliveries secure holding			500	1	500
3.09	Gas bottle storage			500	1	500
3.10	Chemical waste			500	1	500
3.11	Chemical Storage			500	1	500
3.11	Biological waste			300	1	300
3.12	Recycling			200	1	200
3.13	Compactor			200	1	200
3.14	General waste			200	1	200
3.15	House gas supplies			300	1	300
				Subtotal		4,680
				Population	12	

W University of Washington - CAMCET — Space Program

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
B	LEARNING					
4.00	**Exhibition & Conference**					
4.01	Prefunction	200	10	2,000	1	2,000
4.02	Exhibition	100	10	1,000	1	1,000
4.03	Catering prep		1	1,000	1	1,000
4.04	Catering storage			500	1	500
				Subtotal		4,500
5.00	Collaborative Commons					
5.01	Open lounge seating	1	25	25	48	1,200
5.02	Café style seating	1	15	15	48	720
5.03	Solo study space	1	25	25	48	1,200
5.04	Prof. hotel offices	1	80	80	25	2,000
5.05	Group study	6	25	150	12	1,800
5.06	Tech desk			200	1	200
				Subtotal		7,120
				Seats	216	
				Population	25	
6.00	Learning					
6.01	Flat Floor Active Classroom	100	30	3,000	2	6,000
6.02	Storage	1	200	200	2	400
6.03	Acoustic lobbies	1	150	150	2	300
6.04	AV control / editing	5	35	175	2	350
6.05	Tech store	1	150	150	2	300
					Sub total	7,350
6.06	STEM Project space	60	30	1,800	1	1,800
6.07	Storage	1	180	180	1	180
					Sub total	1,980
6.08	STEM Teaching Lab	25	45	1,125	1	1,125
6.09	Prep / storage	25	15	375	1	375
					Sub total	1,500
6.10	Seminar	30	30	900	3	2,700
6.11	Meeting Room - Medium	15	30	450	6	2,700
				Subtotal		16,230
				Seats	465	

W University of Washington - CAMCET **Space Program**

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
7.00	Meeting Rooms					
7.01	Meeting Room - Small	6	25	150	6	900
7.02	Meeting Room - Mini	4	25	100	6	600
7.02	Storage	1	100	100	6	600
7.03	Telephone Booths	2	13	25	24	600
7.04	Kitchenettes	4	25	100	6	600
				Subtotal		3,300
				Seats	132	
8.00	Administration					
14.06	Student Programs	1	100	100	1	100
14.08	Team Support Staff	1	100	100	1	100
				Subtotal		200
				Population	2	

W University of Washington - CAMCET — Space Program

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
D	RESEARCH					
9.00	**Research Labs**					
	Wet Research Lab Suite					
9.01	Offices - enclosed	1	120	120	1	120
9.02	Workstations - open	1	60	60	5	300
9.03	Research lab	1	75	75	6	450
9.04	Equipment Room 1	1	110	110	1	110
9.05	Collaboration	2	25	50	1	50
9.06	Equipment Room 2	1	110	110	1	110
				subtotal		1,140
				No of Suites / Total	**16**	18,240
				Population	96	
	Dry Research Lab Suite					
9.07	Offices - enclosed	1	120	120	1	120
9.08	Workstations - open	1	60	60	7	420
9.09	Research lab	1	55	55	8	440
9.10	Collaboration	2	25	50	1	50
9.11	Equipment Room	1	110	110	1	110
				subtotal		1,140
				No of Suites / Total	**5**	5,700
				Population	40	
	Computational Research Lab Suite					
9.12	Offices - enclosed	1	120	120	1	120
9.13	Workstations - open	1	83	83	9	750
9.14	Equipment Room 1	1	110	110	1	110
9.15	Collaboration	2	25	50	1	50
9.16	Equipment Room 2	1	110	110	1	110
				subtotal		1,140
				No of Suites / Total	**7**	7,978
				Population	70	
	Total Labs Area				28	31,918
				Population	206	
10.00	**Shared Instruments**					
	Shared Instrumentation					
10.01	Equipment and storage	1	300	300	1	300
				subtotal		300
				No of Suites / Total	28	8,400
	Total Research Labs Area					40,318

W University of Washington - CAMCET **Space Program**

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
11.00	Administration					
	CAMCET Administration					
11.01	Director	1	150	150	1	150
11.02	Associate Director	1	120	120	2	240
11.03	Operations Manager	1	120	120	1	120
11.04	Admin Assist	1	60	60	1	60
14.07	Communications Manager	1	120	120	1	120
14.07	Digital Media	1	60	60	1	60
	Research Admin					
14.08	Project Manager	1	100	100	1	100
14.09	Finance	1	100	100	1	100
				Subtotal		950
				Population	9	

University of Washington - CAMCET — Space Program

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
D	INDUSTRY					
12.00	**Incubation Labs**					
12.01	Offices - open	1	60	60	4	240
12.02	Research lab	1	75	75	1	75
				subtotal		315
				No of Suites / Total	**14**	4,410
				Population	56	
13.00	**Test Beds**					
13.01	**Test Bed #1**					
	Offices - Operations	1	60	60	1	60
	Offices - Touch Down	1	60	60	5	300
	Research lab	1	75	75	18	1,350
	Equipment Space	1	75	75	37	2,775
	Storage	1	75	75	7	525
					subtotal	5,010
13.02	**Test Bed #2**					
	Offices - Operations	1	60	60	1	60
	Offices - Touch Down	1	60	60	5	300
	Research lab	1	75	75	18	1,350
	Equipment Space	1	75	75	37	2,775
	Storage	1	75	75	7	525
					subtotal	5,010
13.03	**Test Bed #3**					
	Offices - Operations	1	60	60	1	60
	Offices - Touch Down	1	60	60	5	300
	Research lab	1	75	75	18	1,350
	Equipment Space	1	75	75	37	2,775
	Storage	1	75	75	7	525
					subtotal	5,010
13.04	**Test Bed #3: Data Analytics Studio**					
	Studio	16	75	1,200	1	1,200
	Lobby	1	200	200	1	200
	Editing / control	4	50	200	1	200
	Technology storage	1	200	200	1	200
	Other storage	1	200	200	1	200
				subtotal		2,000
					Subtotal	17,030
				Population	18	

University of Washington - CAMCET | **Space Program**

Rm. No.	Room Name	Occ.	SF/Occ	ASF/Rm	Qty	ASF
14.00	**Administration**					
	Welcome Area					
14.01	Concierge / Welcome / Helpd	1		200	1	200
14.02	General Info Kiosks			20	4	80
14.03	Waiting area	15	15	225	1	225
	Events and Engagement					
14.04	Director External Rel & Polic	1	120	120	1	120
14.05	Event Manager	1	120	120	1	120
	External Partnerships					
14.06	Industry Liaison	1	100	100	2	200
14.07	Enterpreneur in Residence	1	100	100	1	100
14.08	Project Space Management	1	100	100	1	100
				Subtotal		1,145
				Population	876	

POPULATION PROJECTIONS

University of Washington - CAMCET Space Program				Area / FTE Allocation			
Rm. No.	**Room Name**	**ASF**		**Learning**	**Research**		**Industry**
Program Summary					**UW**	**Collaborator**	
		FTE Allocations		78%	9%	5%	8%
A	PUBLIC						
1.00	Building Entry	1,975	2%	1,533	182	103	152
2.00	Central Café	1,700	2%	1,319	157	89	131
3.00	Back of House	4,680	5%	1,096	1,404	1,090	1,090
		8,355	8%	3,948	1,743	1,282	1,373
				47%	21%	15%	16%
B	LEARNING						
4.00	Exhibition & Conference	4,500	4%	3,492	415	236	347
5.00	Collaborative Commons	7,120	7%	3,974	472	268	2,394
6.00	Learning	16,230	16%	9,281	2,892	1,642	2,415
7.00	Meeting Rooms	3,300	3%	2,561	304	173	254
8.00	Administration	200	0.19%	80	70	25	25
		31,350	30%	19,388	4,154	2,343	5,436
				62%	13%	7%	17%
C	RESEARCH						
9.00	Research Labs	31,918	31%	10,259	13,679	7,979	-
10.00	Shared Instruments	8,400	8%	2,520	4,200	672	1,008
11.00	Administration	950	1%	268	408	134	224
		41,268	40%	13,047	18,287	8,785	1,232
				32%	44%	21%	3%
D	INDUSTRY						
12.00	Incubation Labs	4,410	4%	-	-	-	4,410
13.00	Test Beds	17,030	16%	2,555	8,515	2,384	3,576
14.00	Administration	1,145	1%	-	25	38	38
		22,585	22%	2,555	8,540	2,422	8,024
				11%	38%	11%	36%
	Net ASF	103,558		38,938	32,723	14,832	16,064
	Net To Gross	69,039		25,959	21,816	9,888	10,709
	Gross Internal Area	172,596		64,897	54,539	24,720	26,773
		% Area Allocations		38%	32%	14%	16%

W University of Washington - CAMCET Space Program | Area / FTE Allocation

Rm. No.	Room Name	ASF	Learning	Research		Industry
A	PUBLIC					
1.00	**Building Entry**					
1.01	Lobby	1,500				
1.02	Security	75				
1.03	Reception Desk	100				
1.04	Interview rooms	300				
		1,975	1,533	182	103	152
2.00	**Central Café**					
2.01	Queuing / condiments	400				
2.02	Café style seating	600				
2.02	Prep / servery area	500				
2.03	Café storage	200				
		1,700	1,319	157	89	131
3.00	Back of House					
	Facilities Management					
3.01	Building Manager	120	24	60	18	18
3.02	IT support	100	33	33	16.50	16.50
3.03	Shared Facilities Manager	100	15	50	17.50	17.50
3.04	Shared Instrument Tech	300	45	150	52.50	52.50
3.05	Shared TestBed Techs	300	45	150	52.50	52.50
3.06	Materials handling office	60	9	36	7.50	7.50
	Materials Management					
3.07	Loading dock	500	125	125	125	125
3.08	Deliveries secure holding	500	125	125	125	125
3.09	Gas bottle storage	500	125	125	125	125
3.10	Chemical waste	500	125	125	125	125
3.11	Chemical Storage	500	125	125	125	125
3.11	Biological waste	300	75	75	75	75
3.12	Recycling	200	50	50	50	50
3.13	Compactor	200	50	50	50	50
3.14	General waste	200	50	50	50	50
3.15	House gas supplies	300	75	75	75	75
		4,680	1,096	1,404	1,090	1,090

University of Washington - CAMCET Space Program			Area / FTE Allocation			
Rm. No.	Room Name	ASF	Learning	Research	Industry	
B	LEARNING					
4.00	**Exhibition & Conference**					
4.01	Prefunction	2,000				
4.02	Exhibition	1,000				
4.03	Catering prep	1,000				
4.04	Catering storage	500				
		4,500	3,492.48	415.12	235.65	346.71
5.00	Collaborative Commons					
5.01	Open lounge seating	1,200	931	111	63	92
5.02	Café style seating	720	559	66	38	55
5.03	Solo study space	1,200	931	111	63	92
5.04	Prof. hotel offices	2,000				2,000
5.05	Group study	1,800	1,397	166	94	139
5.06	Tech desk	200	155	18	10	15
		7,120	3,974	472	268	2,394
6.00	Learning					
6.01	Flat Floor Active Classroom	6,000				
6.02	Storage	400				
6.03	Acoustic lobbies	300				
6.04	AV control / editing	350				
6.05	Tech store	300				
		7,350	4,925	1009	573	843
6.06	STEM Project space	1,800				
6.07	Storage	180				
		1,980	1,327	272	154	227
6.08	STEM Teaching Lab	1,125				
6.09	Prep / storage	375				
		1,500	1,005	206	117	172
6.10	Seminar	2,700	1,350	562	319	469
6.11	Meeting Room - Medium	2,700	675	843	478	704
		16,230	9,281	2,892	1,642	2,415

University of Washington - CAMCET Space Program | Area / FTE Allocation

Rm. No.	Room Name	ASF	Learning	Research	Industry	
7.00	Meeting Rooms					
7.01	Meeting Room - Small	900	698	83	47	69
7.02	Meeting Room - Mini	600	466	55	31	46
7.02	Storage	600	466	55	31	46
7.03	Telephone Booths	600	466	55	31	46
7.04	Kitchenettes	600	466	55	31	46
		3,300	2,561	304	173	254
8.00	Administration					
14.06	Student Programs	100	60	30	5	5
14.08	Team Support Staff	100	20	40	20	20
		200	80	70	25	25

University of Washington - CAMCET Space Program | Area / FTE Allocation

Rm. No.	Room Name	ASF	Learning	Research	Industry	
D	RESEARCH					
9.00	**Research Labs**					
	Wet Research Lab Suite		42%	58%		
9.01	Offices - enclosed	120				
9.02	Workstations - open	300				
9.03	Research lab	450				
9.04	Equipment Room 1	110				
9.05	Collaboration	50				
9.06	Equipment Room 2	110				
		1,140	475	665		
		18,240	5,700	7,980	4,560	
	Dry Research Lab Suite		44%	56%		
9.07	Offices - enclosed	120				
9.08	Workstations - open	420				
9.09	Research lab	440				
9.10	Collaboration	50				
9.11	Equipment Room	110				
		1,140	498.75	641.25		
		5,700	1,995	2,565	1140	
	Computational Research Lab Suite		45%	55%		
9.12	Offices - enclosed	120				
9.13	Workstations - open	750				
9.14	Equipment Room 1	110				
9.15	Collaboration	50				
9.16	Equipment Room 2	110				
		1,140	512.87	626.84		
		7,978	2,564	3,134	2279.4	
	Total Labs Area	31,918	10,259	13,679	7,979	
10.00	**Shared Instruments**					
	Shared Instrumentation		30%	50%	8%	12%
10.01	Equipment and storage	300	90	150	24	36
		300	90	150	24	36
		8,400	2520	4200	672	1008
	Total Research Labs Area	40,318				

University of Washington - CAMCET Space Program | Area / FTE Allocation

Rm. No.	Room Name	ASF	Learning	Research		Industry
11.00	Administration					
	CAMCET Administration					
11.01	Director	150	49.50	50	25	25
11.02	Associate Director	240	79	79	40	40
11.03	Operations Manager	120	40	40	20	20
11.04	Admin Assist	60	20	20	10	10
14.07	Communications Manager	120	40	40	20	20
14.07	Digital Media	60	20	20	10	10
	Research Admin					
14.08	Project Manager	100	20	60	10	100
14.09	Finance	100	-	100	-	-
		950	268	408	134	224
			28%	43%	14%	24%

University of Washington - CAMCET		Space Program	Area / FTE Allocation			
Rm. No.	**Room Name**	**ASF**	**Learning**		**Research**	**Industry**
D	INDUSTRY					
12.00	**Incubation Labs**					
12.01	Offices - open	240				
12.02	Research lab	75				
		315				
		4,410				4,410
13.00	**Test Beds**					
			15%	50%	14%	21%
13.01	**Test Bed #1**					
	Offices - Operations	60				
	Offices - Touch Down	300				
	Research lab	1,350				
	Equipment Space	2,775				
	Storage	525				
		5,010				
13.02	**Test Bed #2**					
	Offices - Operations	60				
	Offices - Touch Down	300				
	Research lab	1,350				
	Equipment Space	2,775				
	Storage	525				
		5,010				
13.03	**Test Bed #3**					
	Offices - Operations	60				
	Offices - Touch Down	300				
	Research lab	1,350				
	Equipment Space	2,775				
	Storage	525				
		5,010				
13.04	**Test Bed #3: Data Analytics Studio**					
	Studio	1,200				
	Lobby	200				
	Editing / control	200				
	Technology storage	200				
	Other storage	200				
		2,000				
		17,030	2,555	8,515	2,384	3,576

W	University of Washington - CAMCET	Space Program	Area / FTE Allocation			
Rm. No.	**Room Name**	**ASF**	**Learning**		**Research**	**Industry**
14.00	**Administration**					
	Welcome Area					
14.01	Concierge / Welcome / Help	200	66	66	33	33
14.02	General Info Kiosks	80				
14.03	Waiting area	225	54	77	32	41
	Events and Engagement		-			
14.04	Director External Rel & Polic	120	40	40	20	20
14.05	Event Manager	120	24	48	24	24
	External Partnerships					
14.06	Industry Liaison	200	40	80	40	40
14.07	Enterpreneur in Residence	100	33	33	17	17
14.08	Project Space Management	100	-	25	38	38
		1,145	257	368	202	211
			22%	32%	18%	18%

LIFE CYCLE COST ANALYSIS

Life Cycle Cost Analysis - Project Summary

Agency	360 Unversity of Washington
Project Title	Center for Advance Materials and Clean Energy Technologies Research Building

Existing Description	

Lease Option 1 Description	LONG TERM LEASE (alternative 4): lease 172,000 SF of space inside of a larger development

Lease Option 2 Description	

Construction Option Description	NEW CONSTRUCTION: either Replace Existing Building (alternative 3) or Co-Locate in the Innovation District (alternative 5). Both options are similar in size and cost, and differ only in site and relationship to other activities.

Purchase Option Description	MULTIPLE RENOVATIONS (alternative 2). Operations dispersed across campus, and scale up facilities Test Beds in Bowman and NanoES. Faculty office in other locations. Industry collaboration would only take place in existing labs. Incubation would continue in Fluke Hall.

Lease Options Information	**Existing Lease**	**Lease Option 1**	**Lease Option 2**
Total Rentable Square Feet	-	172,000	-
Annual Lease Cost (Initial Term of Lease)	$ -	$ 8,600,000	$ -
Full Service Cost/SF (Initial Term of Lease)	$ -	$ 50.00	$ -
Occupancy Date	n/a	5/27/2021	
Project Initial Costs	n/a	$ 9,632,000	$ -
Persons Relocating	-	-	-
RSF/Person Calculated			

Ownership Information	**Construction**	**Purchase**
Total Gross Square Feet	172,596	175,000
Total Rentable Square Feet	103,558	103,000
Occupancy Date	1/1/2022	12/1/2021
Initial Project Costs	$ 2,156,879	$ 3,790,000
Est Construction TPC ($/GSF)	$ 895	$ 1,117
RSF/Person Calculated	-	-

Financial Analysis of Options

Years	Financing Comparisons	Existing Lease	Lease 1	Lease 2	Construction				Purchase			
	Display Option?	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No
Years	Financing Means	Current	Current	Current	GO Bond	COP	COP Deferred *	63-20	GO Bond	COP	COP Deferred	63-20
50	50 Year Cumulative Cash	$ -	$858,728,172	$ -	$424,920,403				$471,857,297			
	50 Year Net Present Value	$ -	$752,648,226	$ -	$387,794,894				$432,406,621			
	Lowest Cost Option (Analysis Period)		3		1				2			

The best NPV result for the 50 year analysis period is the Construction option using GO Bond financing. This option becomes the best financial alternative in 2043.

Years	Financing Comparisons	Existing Lease	Lease 1	Lease 2	Construction				Purchase			
Years	Financing Means	Current	Current	Current	GO Bond	COP	COP Deferred *	63-20	GO Bond	COP	COP Deferred	63-20
30	30 Year Cumulative Cash	$ -	$374,277,309	$ -	$302,010,574				$343,489,417			
	30 Year Net Present Value	$ -	$347,940,604	$ -	$285,105,419				$325,157,020			
	Lowest Cost Option (30 Years)		3		1				2			

The best NPV result for the 30 year analysis period is the Construction option using GO Bond financing. This option becomes the best financial alternative in 2043.

Years	Financing Comparisons	Existing Lease	Lease 1	Lease 2	Construction				Purchase			
Years	Financing Means	Current	Current	Current	GO Bond	COP	COP Deferred *	63-20	GO Bond	COP	COP Deferred	63-20
50	50 Year Cumulative Cash	$ -	$858,728,172	$ -	$424,920,403				$471,857,297			
	50 Year Net Present Value	$ -	$752,648,226	$ -	$387,794,894				$432,406,621			
	Lowest Cost Option (50 Years)		3		1				2			

The best NPV result for the 50 year analysis period is the Construction option using GO Bond financing. This option becomes the best financial alternative in 2043.

** - Defers payment on principle for 2 years while the building is being constructed. See instructions on Capitalized Interest.*

Financial Assumptions

Date of Life Cycle Cost Analysis:	6/20/2016
Analysis Period Start Date	5/28/2019
User Input Years of Analysis	50

All assumptions subject to change to reflect updated costs and conditions.

	Lease Options			Construction Option			Purchase Option		
	Existing Lease	Lease Option 1	Lease Option 2	GO Bond	COP	63-20	GO Bond	COP	63-20
Inflation / Interest Rate	3.006%	3.006%	3.006%	3.160%	3.460%	3.660%	3.160%	3.460%	3.660%
Discount Rate	0.441%	0.441%	0.441%	0.441%	0.441%	0.441%	0.441%	0.441%	0.441%
Length of Financing	N/A	N/A	N/A	20	20	20	20	20	20

See Financial Assumptions tab for more detailed information

COP Deferred and 63-20 Financing defer the payment on principle until construction completion.

New Lease Assumptions

Real Estate Transaction fees are 2.5% of the lease for the first 5 years and 1.25% for each year thereafter in the initial term of the lease.

Tenant Improvements are typically estimated at $15 per rentable square foot.

IT infrastructure is typically estimated at $350 per person.

Furniture costs are typically estimated at $500 per person and do not include new workstations.

Moving Vendor and Supplies are typically estimated at $205 per person.

Construction Option Assumptions

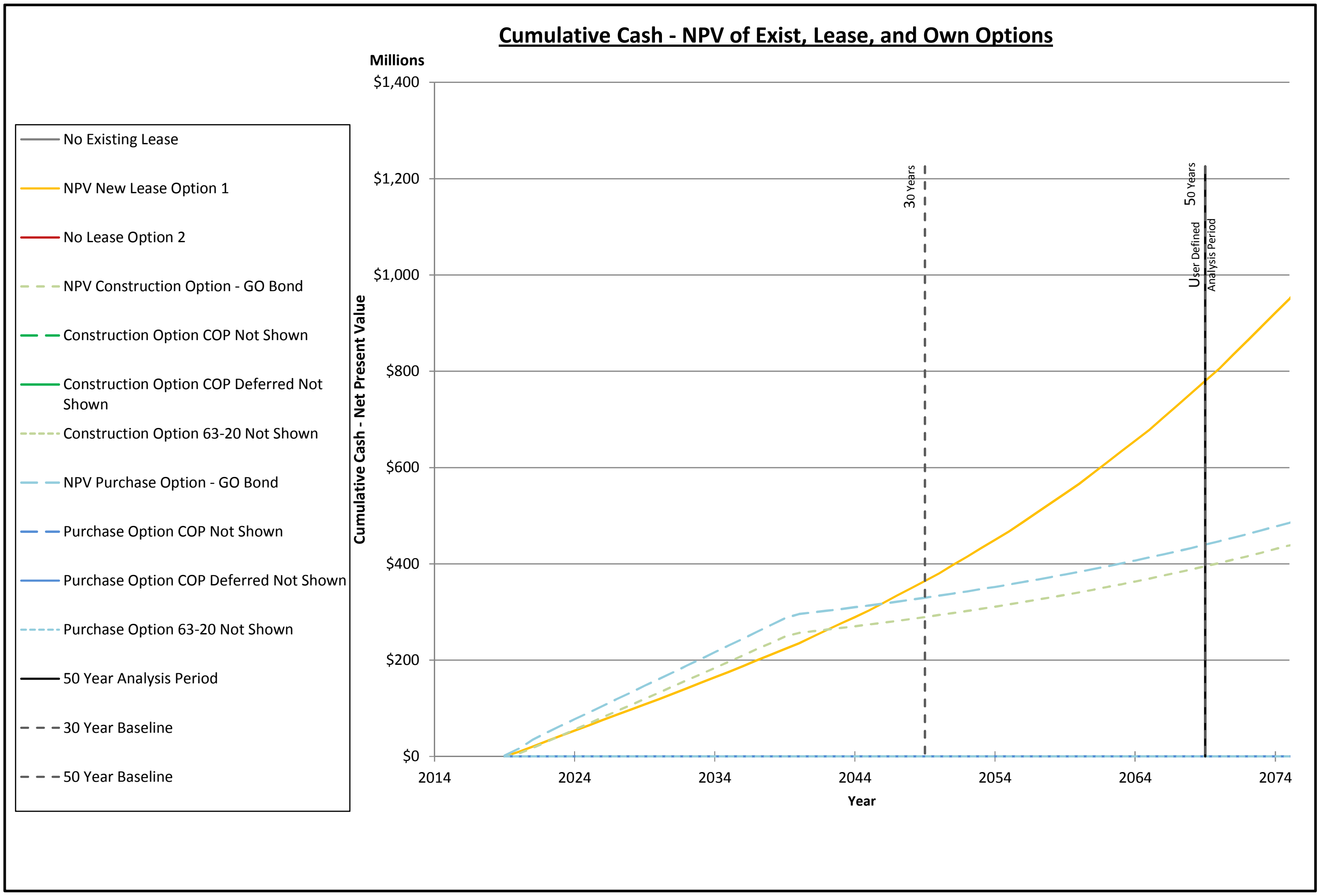
Assumes a 2 month lease to move-in overlap period for outfitting building and relocation.

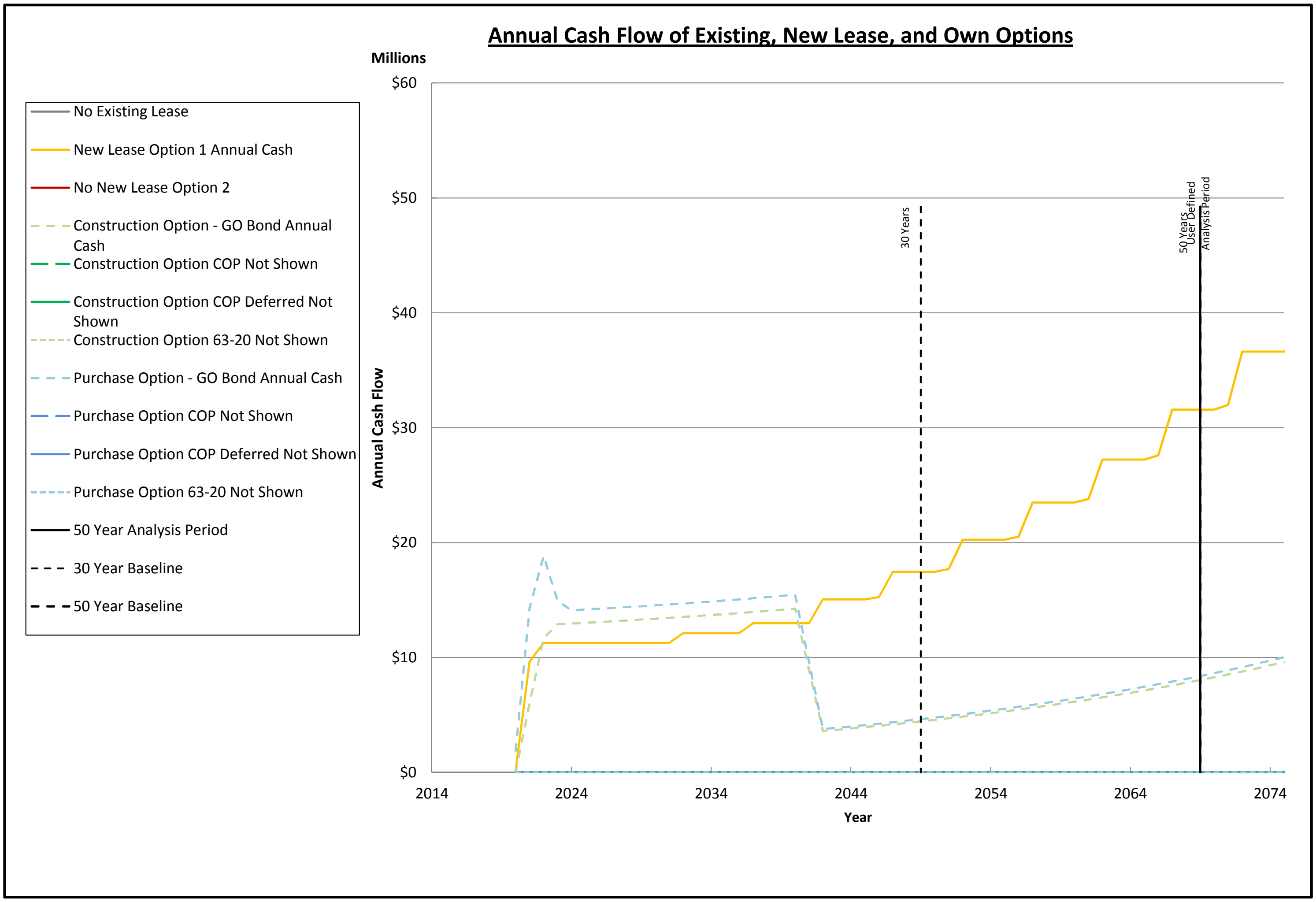
Assumes surface parking.

The floor plate of the construction option office building is 25,000 gross square feet.

The estimated total project cost for construction is $420.00 per square foot.

See the Capital Construction Defaults tab for more construction assumptions.


Cumulative Cash - NPV of Exist, Lease, and Own Options
Millions
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
Cumulative Cash - Net Present Value
2014
2024
2034
2044
2054
2064
2074
Year
30 Years
50 Years
User Defined
Analysis Period
No Existing Lease
NPV New Lease Option 1
No Lease Option 2
NPV Construction Option - GO Bond
Construction Option COP Not Shown
Construction Option COP Deferred Not Shown
Construction Option 63-20 Not Shown
NPV Purchase Option - GO Bond
Purchase Option COP Not Shown
Purchase Option COP Deferred Not Shown
Purchase Option 63-20 Not Shown
50 Year Analysis Period
30 Year Baseline
50 Year Baseline


Annual Cash Flow of Existing, New Lease, and Own Options
Millions
$60
$50
$40
$30
$20
$10
$0
Annual Cash Flow
2014
2024
2034
2044
2054
2064
2074
Year
30 Years
50 Years
User Defined
Analysis Period
No Existing Lease
New Lease Option 1 Annual Cash
No New Lease Option 2
Construction Option - GO Bond Annual Cash
Construction Option COP Not Shown
Construction Option COP Deferred Not Shown
Construction Option 63-20 Not Shown
Purchase Option - GO Bond Annual Cash
Purchase Option COP Not Shown
Purchase Option COP Deferred Not Shown
Purchase Option 63-20 Not Shown
50 Year Analysis Period
30 Year Baseline
50 Year Baseline

UNIVERSITY OF WASHINGTON

CENTER FOR ADVANCED MATERIALS AND CLEAN ENERGY TECHNOLOGY

PREPARED FOR:
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IN COOPERATION WITH:
CannonDesign

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