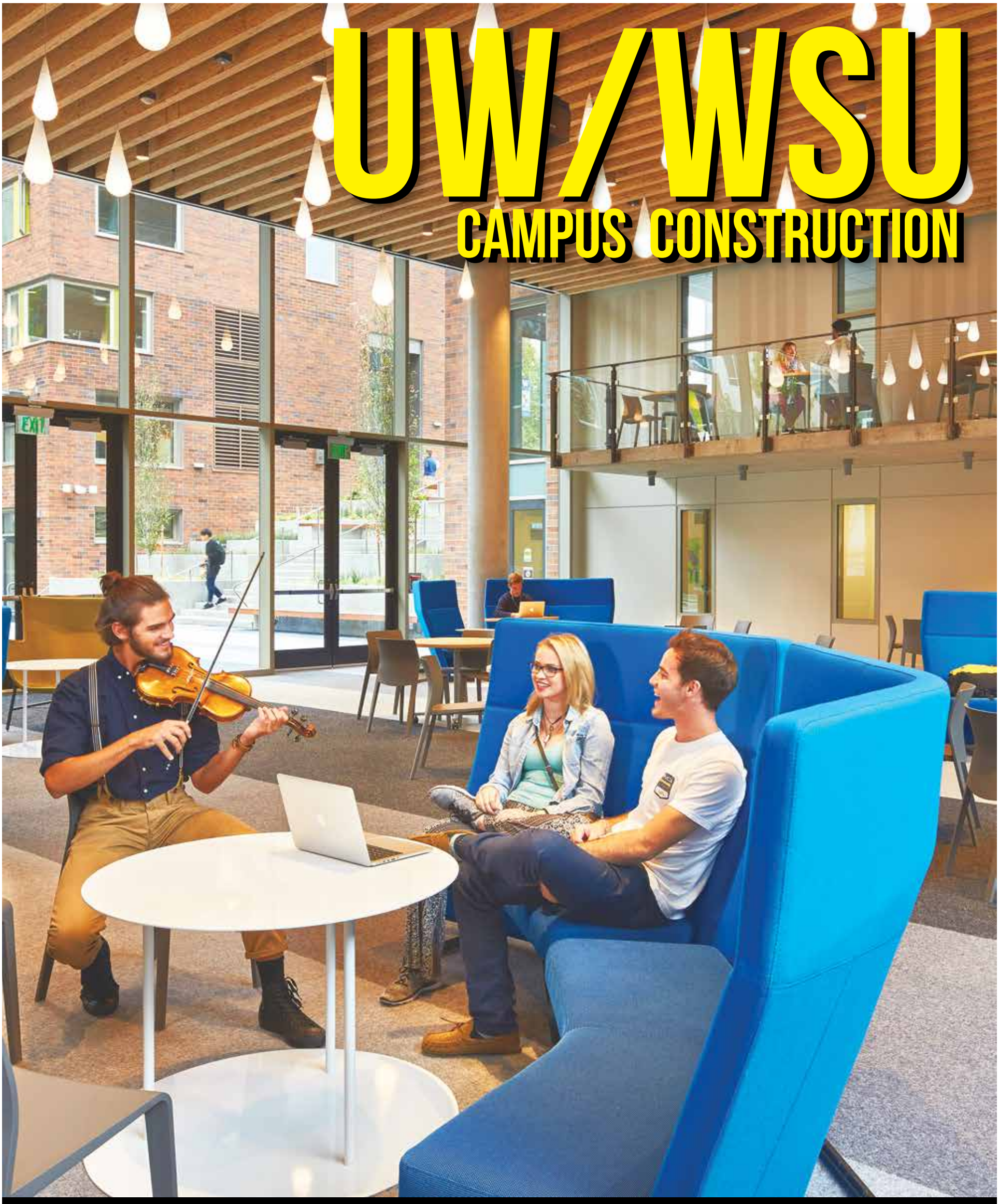
UW/WSU

CAMPUS CONSTRUCTION



UW, WSU FIND WAYS TO DO MORE WITH LESS

Both schools are developing projects using alternatives that cut costs and limit delays.

Across the Pacific Northwest, institutions of higher learning are turning to alternative funding and delivery models to develop their large- and small-scale design and construction projects. Institutions like the University of Washington and Washington State University are seeing the benefits: closer team collaborations, marked cost savings, and on-time or even early delivery.

BY ANTHONY GIANOPOULOS
PERKINS+WILL

A public-private model

Within the higher-education sector, a progressive public-private partnership (P3) model offers institutions unique contractual relationships with private sector companies to develop revenue-generating projects such as student housing, student unions, academic research laboratories and on-campus medical centers.

With P3s, institutions benefit from private sector development tools, which generally mean a more efficient design and permitting process, a faster delivery schedule and overall lower costs. Through the P3 model, public institutions develop a well-designed and customized facility as an annual lease rather than the large capital outlay typically required.

The University of Washington turned to P3 as an alternative project delivery model to develop its two-block biomedical research campus in South Lake Union. The project includes five buildings and multiple biomedical research laboratories.

Vulcan Real Estate served as the developer, leasing land to a special-purpose not-for-profit entity created by the National Development Council's Housing and Economic Development Corp., on behalf of the UW.

To pay for the campus, two unique forms of tax-exempt revenue bonds were used by the NDC entity. The bonds were backed by leases to the UW, supported by its general revenue and paid from its research grants and other sources.

When the bonds are paid off, both the facilities and ground lease will transfer at no cost from the NDC entity to the UW.

Currently the UW Medicine Lake Union Phase 3.2 research building is in design development, and the entire project will be completed in three and a half years from the start of programming, compared with a norm of five to six years on the main campus for conventional projects. The other UW Medicine campus structures were also completed within three and a half years.

WSU is renovating Troy Hall under a design-build contract.

IMAGE COURTESY OF PERKINS+WILL

Quicker delivery

As a result of funding reductions and delays for design and construction, institutions of higher learning are using design-build to develop projects.

As a model, design-build is designed to deliver projects more quickly. It also requires a closer collaboration among owners, designers and contractors than traditional models. In design-build, risk is shared and carried by those best suited to manage that risk, whether it is the contractor, designer or owner.

The model is also designed to save time and money in the selection of the designer, contractor and subconsultants, who are all appointed at the beginning of the project.

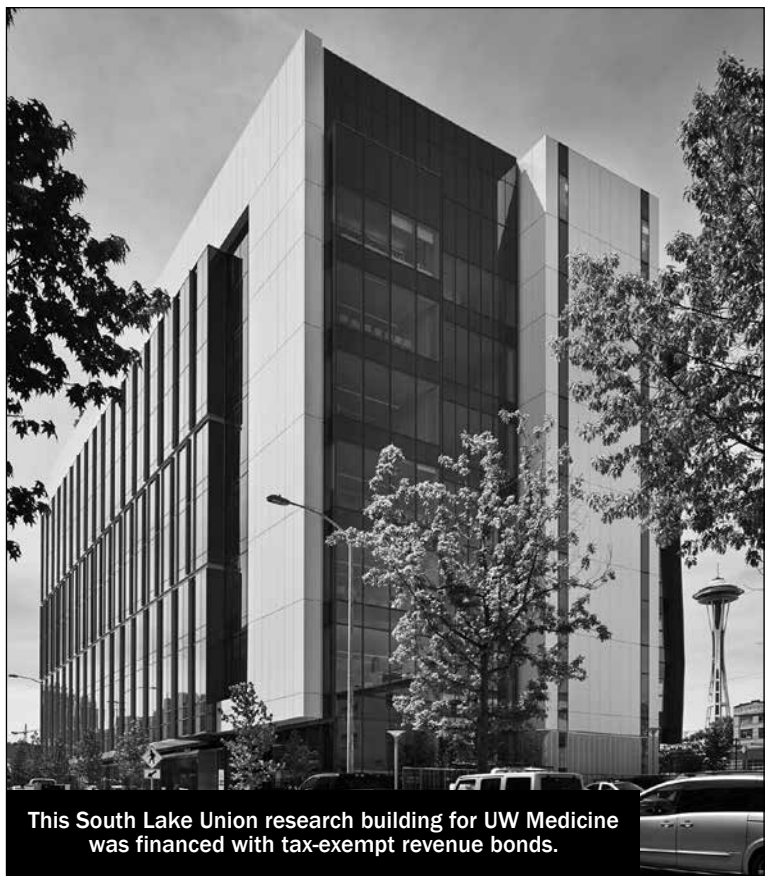
Washington State University turned to design-build to implement its first major remodel, Troy Hall, with the team of Lydig Construction and the Seattle office of Perkins+Will.

WSU was looking for an integrated project approach that was highly collaborative and offered the most value to the project-delivery process. Under current Washington laws, design-build provides the closest contract procurement and contract vehicle for that approach.

The Troy Hall project involves the preservation and restoration of the historic WSU campus building. Currently in design development, the design-build process to date has allowed for creative solutions for the reuse of the existing exterior, structural solutions for the laboratory use and space layout solutions.

As more institutions of higher learning face funding shortfalls or delays, unorthodox funding and delivery models such as P3 and design-build have proven solid alternatives. P3 and design-build have track records for producing high-quality buildings, often with less cost and less time than traditional models — fostering more collaborative teams and creative solutions along the way.

Anthony Gianopoulos is a principal with Perkins+Will's Seattle office.



This South Lake Union research building for UW Medicine was financed with tax-exempt revenue bonds.

PHOTO BY BENJAMIN BENSCHNEIDER, COURTESY OF PERKINS+WILL

WSU'S PACCAR BUILDING HOUSES 5 R&D LABS

The green-technology research center will focus on water quality, atmospheric sciences, and sustainable design and construction.

Wood-framed skyscrapers, resistant to fire and earthquakes and made from locally harvested wood, may someday dot the skylines of North American cities. A new building at Washington State University, opening early next year, is already leading the charge.

The $45 million Paccar Environmental Technology Building, a 96,000-square-foot facility delivered by the design-build team of LMN and Skanska, is the first phase of the university's plan to expand its campus core to the east.

BY ADRIAN MACDONALD
LMN ARCHITECTS

The building will house five of WSU's long-standing research and development centers, all dedicated to tackling multifaceted environmental issues through interdisciplinary collaboration. Focus areas include sustainable design and construction, water quality and atmospheric sciences.

"Addressing grand societal challenges requires interdisciplinary teams pursuing large-scale grants," says Don Bender, director of the Composite Materials and Engineering Center. "This is precisely what Paccar is designed to facilitate."

The Composite Materials and Engineering Center (CMEC) will occupy several laboratories in the new facility, including a high-bay materials testing lab. Floor-to-ceiling glass windows on three sides of the lab make its activities visible to the street, as well as inside to the building's central lounge and future coffee shop. The strategy is to spur dialogue about environmental research, both within the building and with the campus community at large.

Engineered wood

"Mass timber," the use of cross-laminated timber as a structural material for commercial high-rises and other typologies, is a key area of investigation for the CMEC, building on decades of innovation in the field at WSU. As a result, the western portion of the Paccar building, including the high-bay lab, is framed entirely in cross-laminated timber as well as glue-laminated timber and laminated-veneer lumber.

The history of these engineered wood products is intricately tied to WSU. The CMEC is the modern successor to the Wood Materials and Engineering Laboratory founded at WSU in 1949, which participated heavily in the development of a billion-dollar national industry in "up-cycling" wood waste from the timber industry. In the 21st century, as designers and builders seek new ways to increase their use of renewable resources and reduce the carbon impact of new construction, the momentum for this kind of research has only accelerated.

PACCAR LAB — PAGE 5

Open-plan workstations and informal breakout areas surround an open central stairwell on each floor.

RENDERING COURTESY OF LMN/SKANSKA

INSIDE

ON THE COVER

Maple Hall is an eight-story student residence that opened this fall at the University of Washington in Seattle. Mithun was the architect and W.G. Clark Construction Co. was the general contractor.

PHOTO BY BENJAMIN BENSCHNEIDER, COURTESY OF MITHUN ARCHITECTS

DJC TEAM

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WSU'S WINE CENTER AIMS TO TRAIN NEXT GENERATION OF WINEMAKERS

Construction crews had to overcome a steep site with sandy soil, and other site challenges.

BY VINCE CAMPANELLA AND KRIS TOTH
LYDIG CONSTRUCTION

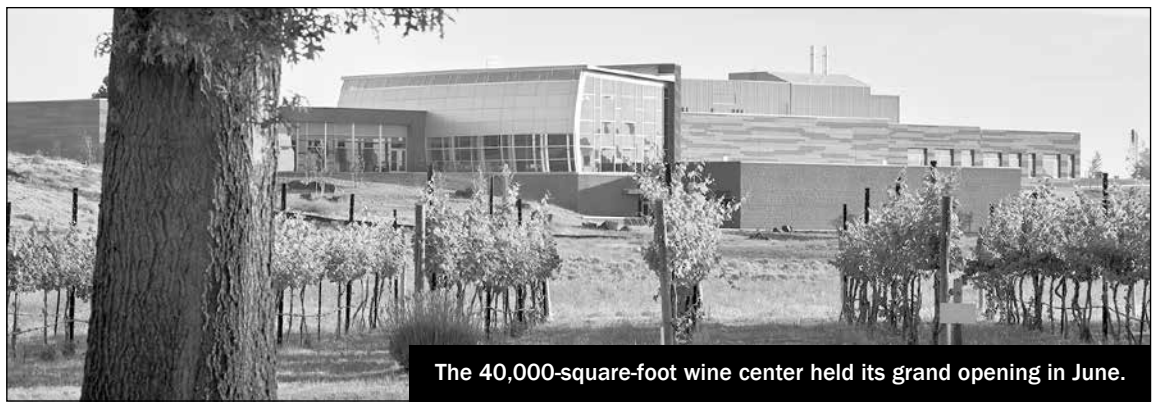
The Chateau Ste. Michelle Wine Estates Wine Science Center is located in Washington's thriving wine country, on the campus of Washington State University Tri-Cities.

The technologically advanced facility provides the perfect training environment and research facility for future wine industry leaders and innovators.

The design-build project was completed by Lydig Construction and ALSC Architects.

The center is the only one of its kind. It's the result of vision, support and collaboration among WSU, state and local leaders, the Washington Wine Commission, and wine industry pioneers and supporters.

Constructing such a high-profile facility required a clear understanding of the center's role in supporting Washington's wine industry, careful consideration of the site, effective teamwork and skillful execution. During construction, Lydig took some unusual approaches to overcome the project's particular challenges.



The 40,000-square-foot wine center held its grand opening in June.

PHOTOS BY BENJAMIN BENSCHNEIDER, COURTESY OF LYDIG CONSTRUCTION

A steeply sloped site

The building site is heavily sloped, so the center was designed with a daylit lower level that is created by large retaining walls along its north side. However, the lower level on the south elevation created a large excavation void on the north elevation that presented significant access limitations for Lydig and its crew.

In addition, the soil of the site consisted of sand and therefore could not hold a slope. The building design required that the retaining walls be braced with backfill before work on the upper floors could proceed. Accomplishing this would have involved bracing the 20-foot walls from the inside, but such bracing would have hindered the work of construction crews and trade personnel.

After extensive research, Lydig applied a counterfort system, which involved building concrete masonry unit gussets inside the building and attaching them to footings that had been enlarged in order to accommodate the gussets. Once these were in place, workers could backfill to the top of the wall on the north elevation without having to work around any bracing.

Site challenges

The wine center is located at the northwest corner of WSU's Tri-Cities campus in Richland, at the corner of George Washington Way and University Drive. While this location is ideal for a center that is significant to Washington's wine industry, the site presented its own set of challenges.

To begin excavation for the building pad and lower-level foundations, Lydig first watered the sloped, sandy site for three weeks. This would ensure that the soil would maintain a slope when excavation began.

Running through the middle of the site is a utility easement, which constrained the siting of the building, as well as grading and utility layout. Buried pipe in the easement had to be protected from the weight of heavy loads during construction.

The building is also nearly a quarter mile from the other WSU campus buildings, so planning and design efforts had to consider its connectivity to the existing campus data and telecommunications infrastructure. Extensions of the infrastructure had to be carefully planned so that future building sites on the campus would not be affected.

Much of the center's winemaking equipment, including the state-of-the-art fermentation equipment, was donated. These donations occurred during design and construction, which required design revisions to the center's electrical systems to accommodate larger and, in some cases, more demanding equipment with significant electrical requirements.

High-end finishes

The design of the center is meant to invoke the concepts inherent in the winemaking process: taking ingredients in raw form and transforming them into a finished product. For the main winery production spaces on the lower level of the building, the finishes are primarily concrete and painted concrete masonry units for easy cleaning.

The upper level houses laboratories, administrative offices and classrooms. These areas have higher-end finishes, while the main lobby and the wine library in the center of the lobby have the highest level of finishes.

The wine library is cladded in a highly reflective plastic laminate that has the color of red wine. Because the lobby is wrapped on three sides with extensive glazing and lit strategically, the wine library can be seen clearly at night, glowing like a red jewel in the spacious lobby.

Displayed in the library are bottles of wine from the local wineries that made donations to the facility, as well as special wines from other sources. Both the lobby and the wine library offer upper-level views of the fermentation production area below.

A unique feature of the building, and one that turns the facility into a premier wine science center, is its cutting-edge fermentation control system. Designed by Cypress Semiconductor founder and CEO T.J. Rodgers, the control system is the latest version of a system first installed at the University of California's Davis campus 10 years ago.

Rodgers donated the control system to the WSU wine center along with the 192 stainless steel fermentation tanks that are housed in the fermentation floor of the building.

Vince Campanella is a vice president of operations at Lydig Construction. Kris Toth is a Portland-based freelance writer.

PACCAR LAB

CONTINUED FROM PAGE 3

"Mass timber has caused a resurgence of interest in wood construction in the architectural and engineering communities," says Bender, whose group is conducting federally funded studies to assess the seismic performance and supply chain issues of cross-laminated timber. "A critical issue is the need for education in the wise use of timber in buildings."

Exemplifying the kind of synergistic thinking that lies behind the Paccar building, CMEC is currently working together with WSU's Institute for Sustainable Design on a yearlong design studio for architecture and engineering students, called Integrated Design Experience.

CMEC and the Institute for Sustainable Design will share space on the first and second floors of Paccar, and Integrated Design Experience will have a glass-enclosed, dedicated studio adjacent to the high-bay lab. The mission of the studio is to partner with outside organizations on real-world environmental problems.

This year, graduate and undergraduate students in Integrated Design Experience are analyzing the potential of mass timber in Pacific Northwest building markets, working with the nonprofit group Forterra. Guided by faculty and industry experts, students will produce economic models and designs for a series of "benchmark" buildings, such as wood-framed office towers, mid-rise to high-rise multifamily buildings, warehouses and big-box stores.

They will use these studies to assess demand for the product, and research the capacity of local supply chains. In the spring, they will also collaborate with architecture and construction management students at the University of Washington to investigate, among other concepts, the quantities of embodied energy and carbon.

"The idea is to show enough that the organization can carry it forward and implement it," says Michael Wolcott, director of the Institute for Sustainable Design and a lead faculty member for Integrated Design Experience.

Typically, students in the program produce design concepts for partner organizations up to 20 percent completion.

"They don't take our design exactly, but our job is to get people to think outside the box," he says.

A place for research

In the new Paccar facility, design concepts developed by the studio will carry over directly into lab research. Students will be able to test materials and structural assemblies in the high-bay lab, or make use of CMEC's digital manufacturing facilities to explore complex designs integrating multiple systems. Full mock-ups and prototypes can be constructed in the testing yard behind the building, which includes a reaction slab with a matrix of threaded holes to provide a pre-built foundation for structures.

Wood composites and structures are far from the only area of focus for CMEC.

Other research topics include permeable pavements, biofuels, biochemicals and nanotechnologies, investigated in a variety of specialized laboratories. Much of this work will occur in the eastern part of the building, which is separated from the highly transparent and publicly accessible "showcase" section by secure entries.

While less public, this private "workhorse" section will be no less animated by social interactions and the potential for serendipitous encounters.

Four floors are connected by an open central stairwell, surrounded by open-plan graduate workstations and informal breakout areas on each floor. Graduate students — "the students in the trenches doing all the work," says Wolcott — will have visibility from their workstations to laboratories in every specialization.

"It's all about facilitating interdisciplinary collaborative research," says Jonathan Yoder, director of the State of Washington Water Research Center and a professor of economics at WSU.

CMEC and the Institute for Sustainable Design will occupy the first and second floors, while the third floor will house the Water Research Center, and the fourth floor will be the Laboratory for Atmospheric Research. The Center for Environmental Research, Education, and Outreach is integrated on both upper levels.

The Laboratory for Atmospheric Research — well-known for its advanced computer models that provide air-quality forecasting across the Pacific Northwest — will have weatherproof roof hatches in its fourth-floor labs that allow researchers to expose instruments directly to the sky, as well as 10-meter-tall instrument towers on the working roof. These instruments provide a baseline measurement for comparison with the laboratory's mobile lab — essentially a van loaded with instruments — which deploys from a testing bed at the yard level. In addition, an atmospheric simulation lab will be capable of recreating a variety of atmospheric conditions for smog chemistry studies, one of only a few facilities of its kind in the country.

Wolcott sees the science-oriented research of the upper floors as working to understand the problems that exist in the environment, while the lower floors develop technology to alleviate those problems.

"There's a saying about unintended consequences," Wolcott adds. "They result from not considering the problem and the solution at the same time."

Adrian MacDonald is the communications manager at LMN Architects.

UW: TOP 10 CAPITAL PROJECTS

The University of Washington's 10 biggest projects account for nearly $1.1 billion in spending.

Where will the money go? More than a third — $360 million — is for student housing. Much of the rest is for classroom, office and research construction. Also in the works are a new Burke Museum and a utility plant.

The projects are ranked by budget. All are in planning or construction, or have been completed in the last year.

Left off the list is a $143 million biomedical research building for UW Medicine in South Lake Union. UW will initially lease the building.

The information is from the UW Capital Projects Office.

1. NORTH CAMPUS STUDENT HOUSING

Replaces McCarty Hall with three seven-story buildings and a total of 1,870 beds.
Budget: $240 million
Location: Seattle
Architect: Kieran Timberlake
General contractor: W.G. Clark Construction Co.
Construction finish: June 2018

2. MONTLAKE TOWER PHASE 2

A build-out of 107,000 square feet of shelled spaces in UW Medical Center's new Montlake Tower. Another 137,000 square feet in Pacific and Muilenburg towers are being renovated.
Budget: $186.3 million
Location: Seattle
Architect: NBBJ
General contractor: Mortenson
Construction finish: October 2017

3. LIFE SCIENCES BUILDING

This is a seven-level, 193,600-square-foot lab and office space for the Department of Biology. An 18,000-square-foot greenhouse is also planned.
Budget: $164.8 million
Location: Seattle
Architect: Perkins+Will
General contractor: Skanska USA
Construction finish: July 2018

4. ANIMAL RESEARCH AND CARE FACILITY

A two-story, underground building that connects to the Foege Building and Hitchcock Hall. The building will provide flexible housing for large and small animals and primates.
Budget: $123.5 million
Location: Seattle
Architect: ZGF Architects, Flad Architects
General contractor: Skanska USA
Construction finish: June 2017

5. MAPLE AND TERRY HALLS

Two seven-story residential buildings totaling 390,000 square feet and 1,090 beds. Housing and Food Services offices are located there. Read more on page 12.
Cost: $119.7 million
Location: Seattle
Architect: Mithun
General contractor: W.G. Clark Construction Co.
Construction finish: August 2015

6. NANOENGINEERING AND SCIENCES BUILDING

A 78,000-square-foot, six-story research building connecting to the existing Molecular Engineering & Sciences Building. Read more on page 9.
Budget: $81.9 million
Location: Seattle
Architect: ZGF Architects
General contractor: Hoffman Construction Co.
Construction finish: November 2016

7. DENNY HALL RENOVATION

Denny Hall is the oldest building on the UW campus. The 86,400-square-foot classroom building is receiving an array of building-systems upgrades. Read more on page 10.
Budget: $52.9 million
Location: Seattle
Architect: Hacker
General contractor: BNBuilders
Construction finish: August 2016

8. NEW BURKE MUSEUM

A three-story, 110,000-square-foot replacement building for the Burke Museum. It's planned for a site west of the existing museum.
Budget: $51.1 million
Location: Seattle
Architect: Olson Kundig
General contractor: Skanska USA
Construction finish: To be determined

9. FLUKE HALL RENOVATION

Fluke Hall is a research building. Work involves upgrades to its infrastructure to support lab and clean-room tenant improvements.
Budget: $37 million
Location: Seattle
Architect: HDR
General contractor: Hoffman Construction Co.
Construction finish: April 2017

10. WEST CAMPUS UTILITY PLANT

This 17,000-square-foot building will house generators, chillers, cooling towers and other equipment. When fully built out it will be able to produce 12 megawatts of emergency power and 10,500 tons of chilled water.
Budget: $36.2 million
Location: Seattle
Architect: Miller Hull Partnership
General contractor: Mortenson
Construction finish: January 2017

WSU: TOP 10 CAPITAL PROJECTS

Washington State University's biggest projects represent a wide range of campus structures: housing, labs, classroom buildings and even a student center renovation.

The projects below are ranked by budget. All are in planning or construction, or were completed in the last year. Completion dates refer to the end of construction or beginning of occupancy.

The information is from WSU Facilities Services.

1. PLANT SCIENCES BUILDING

This 100,000-square-foot research lab would be the fourth of six or seven planned buildings in the Research and Educational Complex.
Budget: $66 million (estimated)
Location: Pullman
Architect/general contractor: To be determined
Completion: June 2019

2. NORTH PUGET SOUND AT EVERETT ACADEMIC BUILDING

The four-story, 95,700-square-foot classroom and lab building will house WSU North Puget Sound at Everett and Everett University Center.
Budget: $64.6 million
Location: Everett
Architect: SRG Partnership
General contractor: Hoffman Construction Co.
Completion: July 2017

3. GLOBAL ANIMAL HEALTH PHASE 2

A 75,500-square-foot project to house WSU's disease surveillance lab. The building would connect to the Paul G. Allen School for Global Animal Health, which opened in 2012.
Budget: $61.3 million (estimated)
Location: Pullman
Architect/general contractor: To be determined
Completion: June 2019

4. DIGITAL CLASSROOM BUILDING

An 80,000-square-foot building with high-tech classrooms. Read more on page 11.
Budget: $55 million
Location: Pullman
Architect: ZGF Architects
General contractor: Clark Construction
Completion: June 2017

5. PACCAR ENVIRONMENTAL TECHNOLOGY BUILDING

A 96,000-square-foot hub of interdisciplinary research and education in renewable materials, sustainable design, water quality and atmospheric research. Read more on page 3.
Budget: $52.8 million
Location: Pullman
Architect: LMN Architects
General contractor: Skanska USA
Completion: October 2015

6. GLOBAL SCHOLARS HALL

A five-story, 275-bed residential hall.
Budget: $40 million
Location: Pullman
Architect: Genus Architecture
General contractor: BNBuilders
Completion: August 2015

7. CHINOOK STUDENT CENTER RENOVATION

The 88,000-square-foot space will house a restaurant, study and recreation spaces, a fitness center and an outdoor courtyard.
Budget: $40 million
Location: Pullman
Architect: GGLO
General contractor: Absher Construction
Completion: January 2017

8. TROY HALL RENOVATION

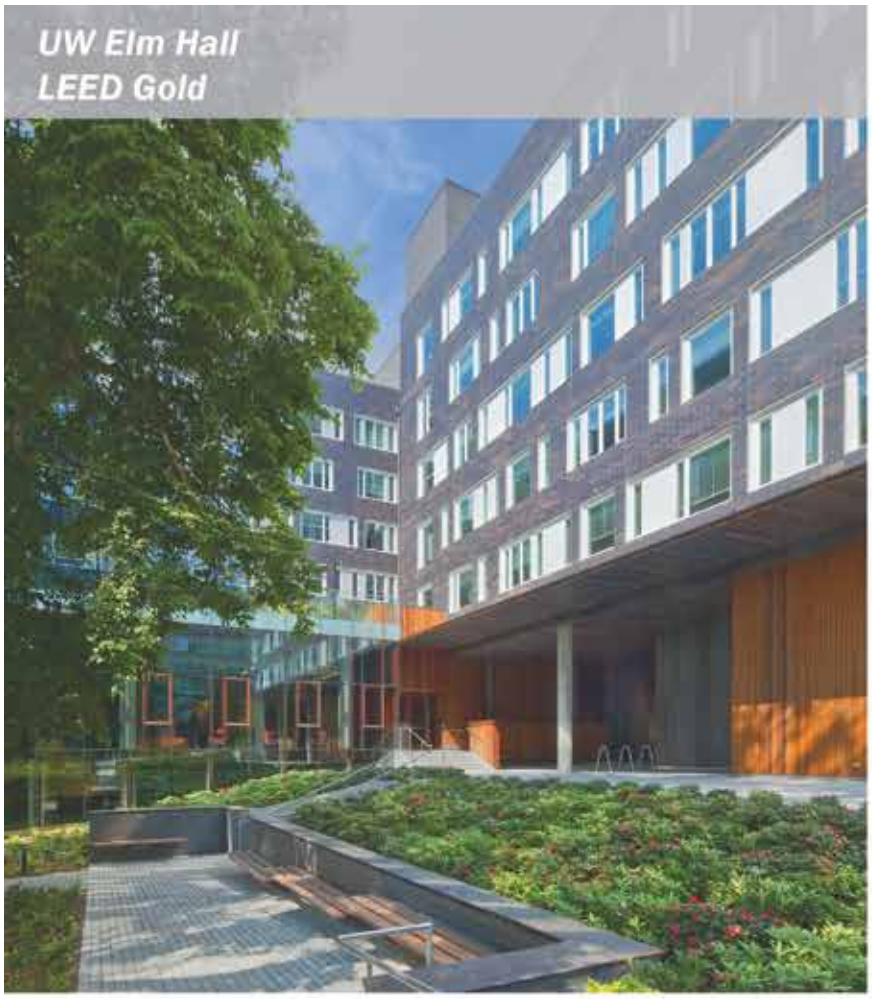
This 1920s brick building will be renovated to house chemistry and environmental sciences programs. Read more on page 2.
Budget: $32.3 million
Location: Pullman
Architect: Perkins+Will
General contractor: Lydig Construction
Completion: February 2017

9. STE. MICHELLE WINE ESTATES WSU WINE SCIENCE CENTER

A 39,300-square-foot research and teaching winery with labs, classrooms and a 3,500-bottle wine library. Read more on page 4.
Budget: $23 million
Location: Richland
Architect: ALSC
General contractor: Lydig Construction
Completion: December 2014

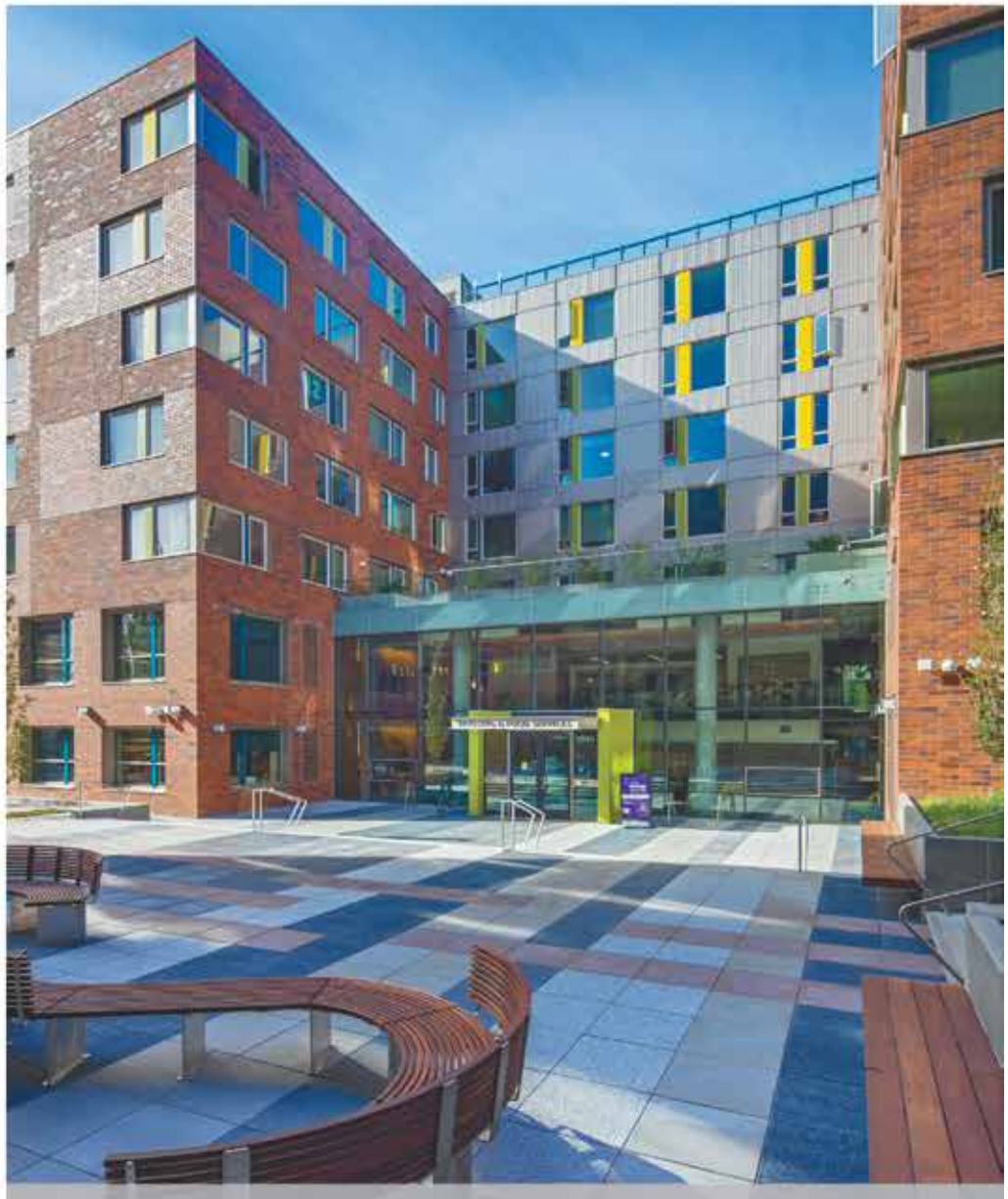
10. CHIEF JOSEPH VILLAGE APARTMENTS

An energy-efficient update and expansion of a 42-year-old student apartment complex. It will have 113 units after the addition is completed.
Budget: $20 million
Location: Pullman
Architect: Genus Architecture
General contractor: BNBuilders
Completion: To be determined



UW Elm Hall
LEED Gold

UW Mercer Court
LEED Gold



UW Cedar Apartments
LEED Silver

UW Maple & Terry Halls
LEED Gold pending

NO DETAIL IS TOO SMALL FOR UW NANOENGINEERING LAB

The new research building will pull out the stops to cut energy use: chilled beams, fewer air changes, and gel packs that cool the building.

BY NICOLE COOPER
ZGF ARCHITECTS

The 78,000-square-foot Nanoengineering & Sciences Building is the second phase of a 168,000-square-foot complex at the center of the University of Washington campus.

The first phase was the 90,000-square-foot Molecular Engineering & Sciences Building, completed in 2012. The two-phase project accommodates growth in the molecular engineering and nanoengineering fields, responds to the evolving interdisciplinary nature of teaching and research, and fits within a historic, high-density area of the campus.

The Nanoengineering & Sciences building will be specifically equipped for the performance of organic, inorganic and biomolecular synthesis, and will accommodate students and faculty in a variety of nanoengineering disciplines.

Sited in the science and engineering core of campus, the complex occupies a highly visible location on Grant Lane, and shares a courtyard completed as part of the Molecular Engineering & Sciences project. The buildings help to form and enhance outdoor public space and extend pedestrian pathways, aiding in wayfinding and connections to other parts of the campus and the surrounding community. Additionally, its proximity to other science and engineering buildings allows for cross-departmental pollination and joint research opportunities.

Fewer air changes

Research laboratory buildings present distinct challenges in achieving energy-efficiency. These challenges are largely due to unique programmatic and safety requirements, as well as heavy energy use for plug loads, ventilation, and associated heating and cooling needs.

The building will achieve LEED gold certification using integrated design strategies that focus on the environmental impacts of the laboratory operations. The building will incorporate the high-performance sustainability strategies that were utilized in the Molecular Engineering & Sciences Building, the first naturally ventilated laboratory on campus.

The Nanoengineering & Sciences Building will be part of a two-building research complex. The new addition is on the right.

IMAGE COURTESY OF ZGF ARCHITECTS

Air-change rates can be the single most influential factor in building energy use — using up to 50 percent of energy loads. The design team worked closely with UW to reexamine the number of air changes required to provide high air quality.

Consequently, air change rates were adjusted from approximately 10 to six per hour in main laboratory spaces. Chilled beams were selected for use in non-air-driven spaces such as labs containing ultra-sensitive electron microscopes and large pieces of research equipment in the building's basement.

Another unique sustainable feature of the project is the use of phase-change materials

NANOENGINEERING — PAGE 15

HOW CREWS USED BIM TO COPE WITH UNWELCOME SURPRISES AT DENNY HALL

Rehabbers discovered the building's columns weren't where the construction drawings said they were, and some support braces were missing entirely.

The University of Washington is an institution that is proud of its history. Its pride endures with the restoration and modernization of many of its original buildings, including the significant renovation now occurring at Denny Hall.

The entire design team's use of building-information modeling (BIM) and digital scanning has been one significant key to the success of this challenging project.

BY CRAIG STAUFFER
PCS STRUCTURAL SOLUTIONS

In the late 1880s, the city of Seattle had grown to over 50,000 people. Due to that growth, as well as the success of the programs offered by the University of Washington, a nearly 350-acre plat of land was acquired near Union Bay. The campus remains at this location today, surrounded by buildings rich in history.

The very first facility built on the new campus was Denny Hall. Designed by Charles Saunders, construction began in the summer of 1894, with classes first held in the fall of 1895.

It was positioned with a view of Lake Washington and the Cascades in the distance. Located up the hillside at the northwest corner of the campus, Denny Hall would remain a focal point for the growing campus in the decades to come.

As the first building on campus it needed to provide space for many different uses, including laboratories, presentation rooms, a museum, offices and a grand assembly hall. A prominent structure, Denny Hall was intended to last for generations.

Lost glory

Nearly 120 years after its doors were first opened, the university elected to perform a major renovation and restoration to the historic building.

The exterior has changed little over the years — Charles Saunders would likely be pleased to see how much of the exterior retains his original design. The brick, stone, and terra cotta has been well-maintained over the decades, and very few exterior modifications have occurred.

However, and perhaps unfortunately, the interior has been dramatically altered. The original construction consisted of wood-framed floors and roofs supported by exterior and interior brick walls and cast-iron columns.

Large fireplaces were located throughout the building, and the grand staircase, which connected the basement level to the fourth floor, was ornately ringed with cast-iron handrails. The auditorium was a stately, two-story space with main-level and balcony seating and a proscenium opening at the stage.

Due to campus growth and significantly changing needs, the building underwent a major renovation in the 1950s. While the roof framing was saved, all of the wood-framed floors and supporting structures were removed, and replaced with concrete floors supported by steel columns and concrete walls. The grand two-story auditorium was lost, converted into three minimal-height office levels.

The new interior configuration added much-needed space for additional classrooms and offices. Some areas, such as the classrooms at the curved entry archway, remained a regal space that was reminiscent of the original construction.

However, in many cases the magnificence of the interior was lost. Vertical circulation was now limited to enclosed concrete stair cores. In an attempt to gain as many rooms as possible, many of the office spaces were cramped and lacked windows.

A problem discovered

In 2007, the university hired Hacker Architects to lead a team charged with designing a substantial modernization to Denny Hall. A large portion of that task was to upgrade the interior systems and improve the seismic performance. Additionally, a central, full-height staircase with a large overhead skylight was reintroduced to the building, recapturing some of the hall's original grandeur.

One monumental challenge became apparent during review of the existing documentation. A building-information model was developed that showed, in high detail, the relationship of the existing structural elements. The model revealed that the roof configuration shown in the original 1890s drawings didn't align with the 1950s renovation drawings, and neither layout correlated with on-site investigations.

It was determined that an internal digital scan, also known as a point cloud, would be valuable to the development of the model and subsequent design solutions.

BNBuilders, acting as the general contractor/construction manager on the project, performed an interior scan of the attic space, and later of the entire building. The PCS Structural Solutions team then imported the scan into the structural model, which was originally developed from the existing drawings.

It became clear that many liberties had been taken during the building's original construction and subsequent renovations. In several locations the columns were actually built several feet away from where the construction drawings had indicated, and secondary support braces were missing entirely.

The scan also showed that some of the roof slopes didn't match the existing documents, which pushed beams and joists to elevations that didn't match the existing drawings either.

Updating the model

In the past, many of these

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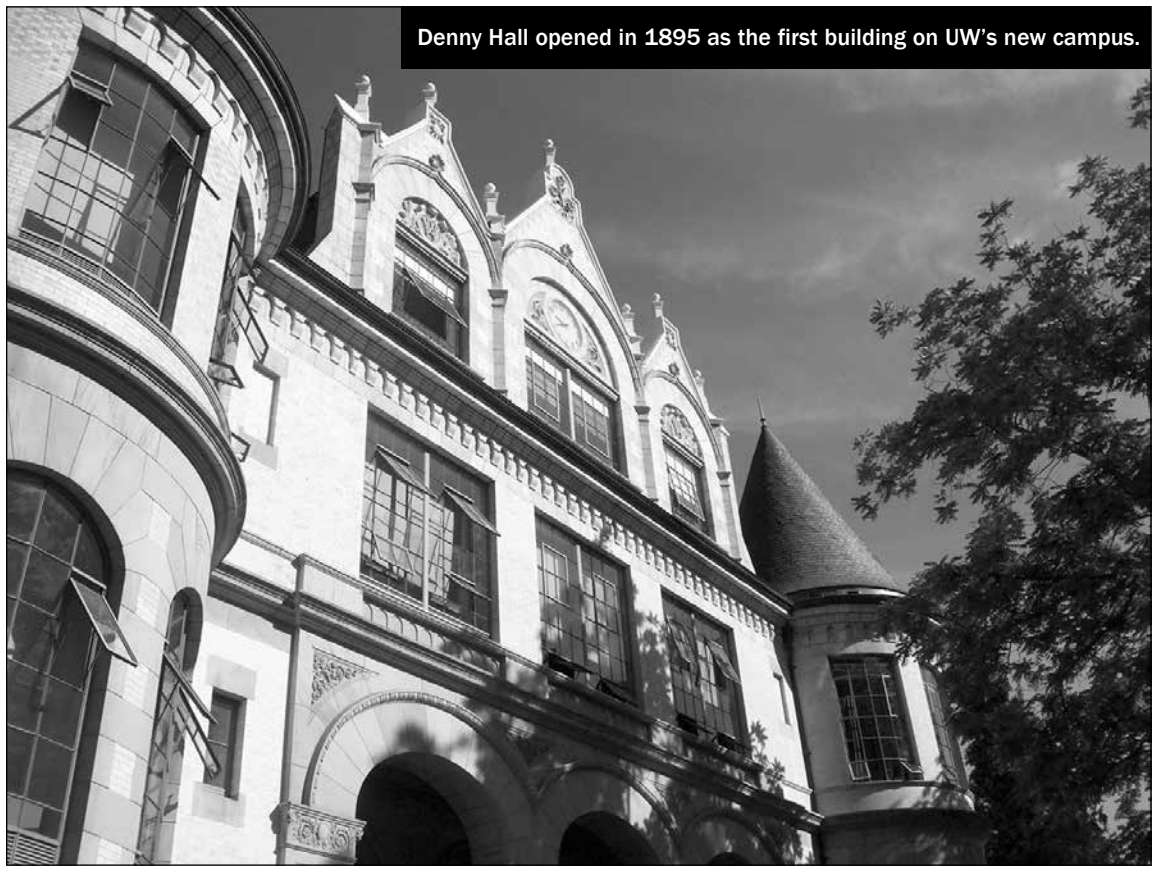


Denny Hall opened in 1895 as the first building on UW's new campus.

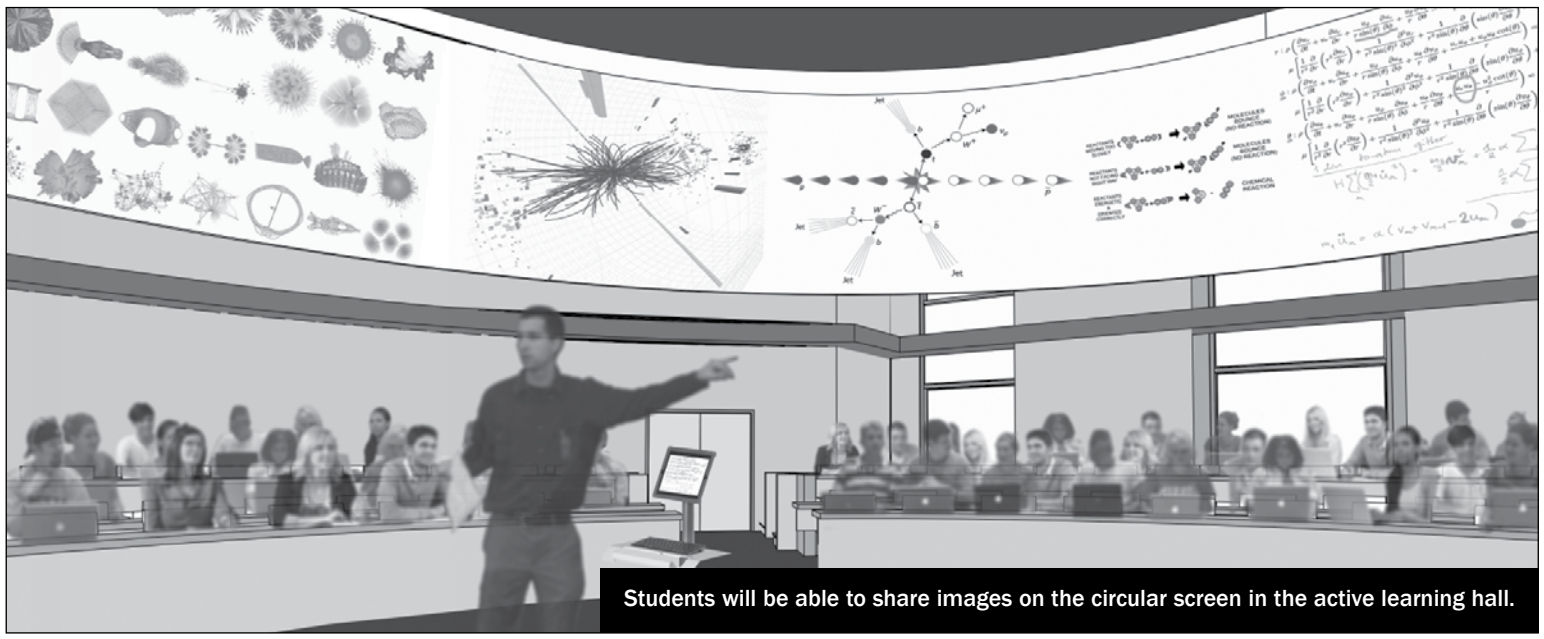
PHOTO COURTESY OF PCS STRUCTURAL SOLUTIONS

A central staircase and large overhead skylight are planned.

IMAGE BY HACKER ARCHITECTS

CLASSROOM OF THE FUTURE TAKES SHAPE AT WSU — AND IT'S ROUND

The Digital Classroom Building will showcase the latest in technology, including a round learning hall where instructors stand below a 360-degree ring of display screens.



Students will be able to share images on the circular screen in the active learning hall.

IMAGE COURTESY OF VANTAGE TECHNOLOGY CONSULTING GROUP

Vantage Technology Consulting Group is designing comprehensive, cutting-edge teaching and learning systems for Washington State University's new Digital Classroom Building, in collaboration with Clark Construction and ZGF Architects.

The striking new 80,000 square foot facility will serve as a gateway, showcase venue and catalyst for WSU's campus-wide initiative to address the tremendous advances that have been made in understanding the way students learn in the 21st century.

BY PARKE RHOADS
VANTAGE TECHNOLOGY CONSULTING GROUP

Vantage has worked closely with the WSU administration, faculty and students to provide robust designs that allow flexibility in teaching modes, address the way students learn and create learning across multiple disciplines.

With this project we are offering a "true path" to innovation: classroom technology that is designed around the institution's vision for pedagogy in the future (and not the other way around.)

These innovations include adaptable learning spaces, places for technology-enhanced collaboration, and specialty experimental and hands-on skill-building platforms. Here are a few examples:

Adaptable learning places

- The active learning hall is a rounded open-floor space where lecturers can feel close and connected to participants, roaming freely and able to collaborate within an innovative technology-rich environment.

This space addresses evolving struggles with the traditional large-seat auditorium in a modern teaching environment. By placing the instructor in the middle, surrounded by students in fewer rows, the sense of communal learning is strengthened.

A 360-degree ring of display screens helps to further the experience of shared storytelling and discovery, and additional technology for wireless sharing of screens allows for some teaming and student-contribution activities that have never been possible before.

- Flexible flat-floor classrooms with intuitive technologies will support presentation, instruction, active learning collaboration, and communication within the classroom and across the globe.
- A central lobby common area will tastefully evoke the excitement of the space and instantly transform for use as a public presentation or event space.

Tech-enhanced collaboration

- The building will offer a learning ecosystem that tailors itself to the educational needs of each individual with robust data, power and access to key information like building schedule and room availability.
- Active learning labs are where classes of up to 120 students sit at six-person group tables sharing a table, facilitated by an instructor on hands-on digital learning activities. All tables are interconnected through technology to allow students to interact seamlessly and share in the learning process.
- Problem-based learning, open informal learning and other small "huddle spaces" are where students and instructors can gather for informal learning with collaborative technology that's available when needed but not in the way.
- The student skills studio and faculty test kitchen, located within the academic resource center, is designed to encourage users to experiment, gain confidence and push frontiers with access to new and emerging collaboration and digital media technologies.

Skill-building platforms

- The "maker space" will have tactical-grade mobile presentation and conferencing appliances to enhance development projects.
- Room and centralized technologies will offer logistics-free blending of online, remote (distance learning) and classroom/face-to-face learning.

The Digital Classroom Building is expected to energize and enable students and faculty, provide support for students and faculty to learn new technologies, and create a nexus between the adjacent academic and housing facilities.

Occupancy is scheduled for the first quarter of 2018.

Parke Rhoads is a principal at Vantage Technology Consulting Group.

NEW UW DORMS REVIVE A LONG-LOST URBAN PATHWAY

The university closed 12th Avenue Northeast in the 1950s to build a dorm complex. The dorms were replaced, and so was the street.

The 12th Avenue plaza between Maple and Lander halls offers students an outdoor space to meet and relax.

PHOTOS BY BENJAMIN BENSCHNEIDER, COURTESY OF MITHUN

The demographic of students seeking to attend college is continuing to grow — particularly for our state universities — and many of these students are seeking a complete college experience by living on campus.

BY BILL LAPATRA
MITHUN

In addition, today's students are especially attracted to universities in urban settings. According to a 2014 Nielsen Co. study, Millennials "prefer to live in dense, diverse urban villages where social interaction is just outside their front doors."

As these trends increase the demand for student housing, universities are expanding beyond campus boundaries and merging into neighborhoods.

The new Terry, Maple and Lander residence halls at the University of Washington's West Campus exemplify land development patterns at urban universities that are changing from a "buildings in the green" pattern to "buildings in the city." Located near a new light rail station, bike paths and improved pedestrian connections, these residence halls are contributing to a livable, walkable community and a vital student district.

The original Terry and Lander residence halls were designed as traditional mid-century dormitories, with two high-rise buildings and a dining hall in between. To accommodate this large scale within the urban grid, two streets were closed to create a long block and a 700-foot-long set of buildings without any mid-block break.

The university's plan was to renovate these buildings. However, as the design and construction team studied the costs of seismic upgrades and modernization, it became apparent that new residence halls could be built for a similar cost and provide more density.

Bert Gregory, Mithun's project director, summarized the project this way: "The rebuild essentially bought the university a full city block of development capacity in Seattle a few blocks from future light rail, added capacity for 600 more students with quality ame-

Students can take a break in Maple Hall's game center.

nity spaces, while providing great public spaces and new connectivity to the city."

A connected campus

Rebuilding also opened tremendous opportunities to realize elements of the university's 2001 master plan.

Where the closed streets created a barrier, "the master plan's goal was to integrate the neighborhood with the campus and provide safe, direct access connecting the residence halls and providing access to Portage Bay at the south," said Mithun Principal Emeritus Lee Copeland, who designed the plan while at his previous firm Weinstein Copeland.

The plan restored the orthogonal grid structure of the area, and enhanced Campus Parkway with pedestrian and bicycle circulation through the neighborhood and to the central UW campus.

"To a great extent the goals of the master plan are being realized," Copeland said.

Now, 12th Avenue Northeast no longer dead-ends at a building. Instead, a new pedestrian street and plaza increases connectivity for bicyclists and pedestrians, and provides spaces with benches and tables for socializing.

Living spaces

The new West Campus develop-

URBAN PATHWAY — PAGE 14

The new residence halls have flexible classrooms and spaces like this one for group study.

DENNY HALL

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circumstances would not have been discovered until construction was underway.

Modifications to the design and layout of the systems would occur on a case-by-case, and often frantic, basis. However, the entire Denny Hall design team, as well as the contractor, embraced the use of BIM.

Existing drawings and the point cloud were used in unison to accurately model the existing structural system. The new structural elements were then added to the model, and framing that was to be demolished was left in the model so that it could be referenced during construction sequencing.

Using the updated structural model, BNBuilders led their team of contractors in accurately modeling all of the new systems being installed in the building before demolition of the structure had even begun. The team incrementally worked through the building, carefully coordinating, adjusting and re-coordinating the structure, ducting and piping to ensure an accurate virtual layout, so that in-the-field surprises were kept to a minimum.

Thanks to the use of 21st-century technology by a design and construction team committed to accuracy and efficiency, the University of Washington's historic Denny Hall will remain a cornerstone of the Seattle campus for another century to come.

Craig Stauffer has 22 years of experience in education design and is Managing Principal and President of PCS Structural Solutions, which has offices in Seattle and Tacoma.

URBAN PATHWAY

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ments also support the university's mission of providing a comprehensive approach to student life beyond the classroom. Students living in residence halls are on their own for the first time, and the spaces at Lander, Terry and Maple halls create places for students to learn, live healthy, eat healthy and connect socially.

Numerous spaces, indoors and out, foster collaboration and shared learning as students gather in small groups to work on projects or just hang out. Places for students to interact are created through programming, as well as locations of lounges, stairways and lobbies.

For example, at Lander Hall, students' rooms wrap an interior courtyard that accommodates games, exercise or relaxing and studying. This private, extensively landscaped outdoor space fosters more interaction and a sense of a Lander community.

The dining facility for the area's nearly 6,000 students is located at the heart of West Campus in Lander Hall, where students are encouraged to learn about healthy food. Lined with glass walls to inspire student engagement, an innovative chef's table with theater-style seating accommodates classes in nutrition and cooking, and doubles as a space for relaxed dining or meeting friends. This mixing of spaces is another trend among universities, maximizing their available square footage while providing amenities that students love.

Building community is the primary goal of these LEED gold buildings, as freshmen begin to live on their own in this transformational time. Spaces are created for friends to get together and play music in the "music lab," cook a meal in the group kitchen, celebrate birthdays, or play billiards and ping-pong in the game center.

Maple Hall's "great room," at the heart of the building and filled with daylight, is a welcome place for all types of activities. This flexible, two-story space can serve as a lecture hall then quickly become a study lounge, and later convert for movie night.

Study rooms

Much of today's curriculum is taught outside the classroom through group study. Now this activity has come to the residence hall, with a plethora of study rooms available on all floors.

Lander, Terry and Maple halls reflect these blurred lines between academic and social spaces with flexible classrooms and spaces for large groups, small groups or team projects. At Lander Hall, a help desk is staffed with advisors for any freshman question, supporting people who have never lived on their own.

Blending indoor spaces with the outdoors, the sidewalks and plazas also offer a series of communal spaces for students to recreate, study, relax, collaborate and dine. These areas become the social mixing areas for students through a series of walkable plazas and street-fronts that further blend the campus into its unique student-focused urban neighborhood.

The design strategies behind Terry, Maple and Lander halls and the West Campus master plan help the university meet a number of objectives. They create housing and amenities that today's students want amid an increasingly competitive higher-education landscape, they accommodate growth for universities within a tight urban footprint, and they help blend the campus edges with city neighborhoods.

The daily pulse of activity around West Campus provides the real evidence of the design in action — and the shared benefits of integrating a university with its surroundings.

Bill LaPatra is a partner at Mithun, an integrated design firm with offices in Seattle and San Francisco.

NANOENGINEERING

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(PCM) — a gel that becomes warm and liquid during the day and solidifies at night. Encapsulated in walls and ceiling panels, the gel reduces temperature as it changes material states.

The PCM is developed from vegetable oil and is "charged" at night when windows to office spaces are automatically opened to provide a flush of cool air. With the completion of phase one, the design team was able to set up temperature monitoring in the spaces, wall cavities and ceilings to quantify the effects of the PCM.

It was determined through two years of data collection that the PCM reduces the temperature around 1.5 to 2 degrees during peaks times on the hottest days of the year. This provided significant savings in the design of the mechanical systems for both phases as well as a beneficial cost savings to UW.

Light-filled labs

As was done on the phase one, the phase-two design also incorporates rain gardens. Stormwater runoff will be directed to the roof gardens, reducing runoff to additional drainage systems. Green roofs are planted with vegetation to attract native bees and support on-site water conservation efforts.

Along with the sustainable features, the building is designed with connectivity and transparency as key drivers. In phase two, the first floor of the building balances the research-intensive spaces of phase one by providing two highly adaptable classrooms and a large open informal learning area.

One large classroom is designed as an active learning space while the second is designed as a kit-based teaching lab classroom. The informal learning area provides additional breakout spaces for the researchers in the building and classrooms.

Access to daylight and open connections to lab spaces were high priorities in the design. Open, light-filled research labs offer views of the campus and University District, and puts "research on display." The labs and offices are separated with glass walls and doors to maintain visual connections between the two spaces while also maximizing daylight to the interior spaces.

Designed for flexibility

The flexibility of space has been a key driver for both phases. During the design and planning of phase one and two, the team formed the building elements — such as columns and shafts — to allow for the greatest amount of flexibility and evolution.

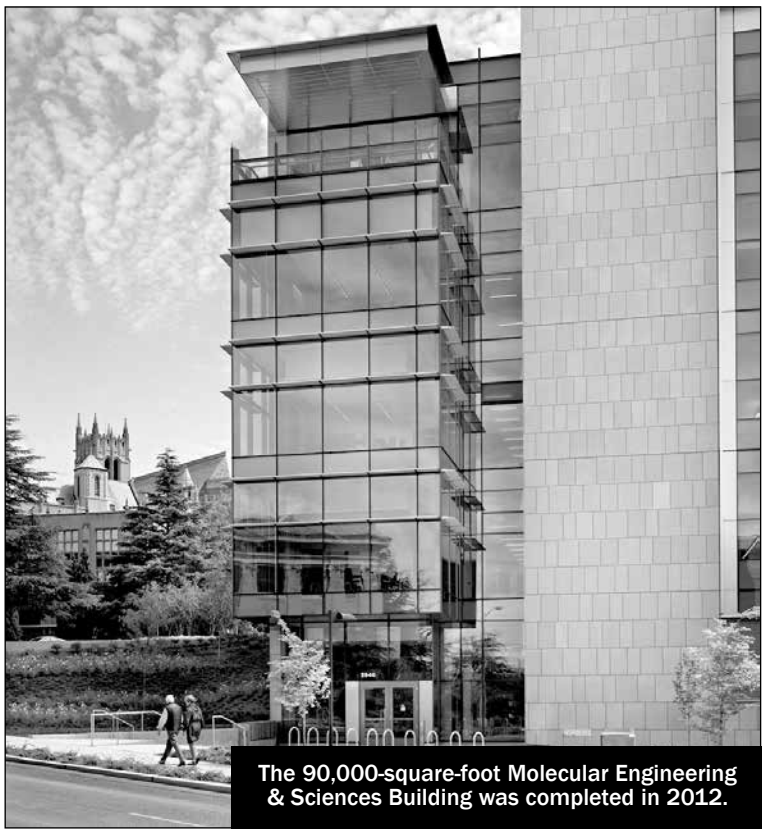
The research labs were designed so that as the equipment, research and faculty change the spaces can support and morph as needed. The lab benches allow for equipment to be moved into and out of the lab spaces easily.

The overhead service carriers above the benches allow for researchers to "plug and play" in any location. At each end of the labs, there are rooms that can be arranged to house large equipment or specialty research spaces, depending on the tenant.

For phase two, with its mainly southern and northern exposures, a strategy was needed to address the added heat loads to the building due to the different orientation from phase one.

Where the radiant flooring is used in phase one for heating purposes, it is used for heating and cooling in phase two. In addition, chilled sails are utilized in the ceilings along the south wall of the office spaces.

The units are ceiling-mounted and flush to the ceiling plane. Radiating panels are supplied with chilled water for cooling.



The 90,000-square-foot Molecular Engineering & Sciences Building was completed in 2012.

PHOTO BY BENJAMIN BENSCHNEIDER, COURTESY OF ZGF ARCHITECTS

Because this is a high-performance building, the time to commission the phase one building and do the fine-tuning of the systems took about one year.

The strong partnership between UW and the design team, as well as a commitment to sustainability, brings the Molecular Engineering & Sciences Building and the Nanoengineering & Sciences Building together to create one high-performance building that fosters a collaborative research environment for years to come.

Nicole Cooper is an architect with over 10 years of experience across a wide range of diverse project types.