K-12 DESIGN & CONSTRUCTION

Ocosta Elementary School has a tsunami safe refuge that can hold over 1,000 people.

PHOTOS BY ECKERT AND ECKERT PHOTOGRAPHY

TSUNAMI-SAFE ELEMENTARY A MODEL FOR COASTAL COMMUNITIES

Ocosta's vertical evacuation structure is the first of its kind in the U.S.

The recent swarm of earthquakes in Ridgecrest, California, should remind the Pacific Northwest that it's not a matter of if, but a matter of when.

Off the coast of Washington and Oregon lies the Cascadia subduction zone, a 700-mile-long fault that has the potential to release magnitude 9.0 earthquakes and devastating tsunamis.

BY CALE ASH
DEGENKOLB ENGINEERS

More than 100,000 people live in these areas and communities like Westport have as little as 20 to 30 minutes of evacuation time from a Cascadia-generated tsunami.

With its low-lying geography and little available high ground, this does not provide sufficient time for residents to evacuate.

The Ocosta School District has long recognized they are in the tsunami inundation zone and their previous evacuation plans were to shelter on the second floor of the 1980s high school.

Although the high school was not designed to resist tsunamis, this was the best available option until 2014 when residents overwhelmingly approved funding for a replacement elementary school to include the nation's first tsunami vertical evacuation structure.

A safe refuge

The new Ocosta Elementary School represents a multidisciplinary approach to public safety and the engineers and designers involved overcame several unique challenges to deliver the project.

The first challenge was to define the potential tsunami hazard as, at the time, it was not quantified in the building code in the same way that wind loads and seismic forces are codified.

This was accomplished through site-specific inundation modeling to define depth and flow velocity of the incoming water. The modeling combined with design guidelines resulted in a safe refuge which is 55 feet above sea level and 28 feet above grade.

Hart Crowser identified the presence of two liquefiable soil layers, meaning the school's foundation would have to resist earthquake-induced liquefaction prior to experiencing forces and scouring effects of tsunami inundation. Auger-cast concrete piles were selected for the foundation system and a performance-based design approach was utilized to ensure the piles could resist these cumulative effects.

Degenkolb Engineers designed the structural elements to resist global inundation forces such as hydrodynamic drag in addition to localized debris impact forces. Debris impact forces due to wood logs, vehicles, and submerged tumbling were considered.

Drawing on lessons from the 2011 Tohoku, Japan, earthquake and tsunami, Degenkolb designed reinforced concrete stair towers and concrete-encased steel columns to resist earthquake and tsunami forces while protecting against debris impact.

Progressive collapse analysis

TSUNAMI-SAFE — PAGE 12

Students enter the stair tower as they participate in a vertical evacuation drill.

A DESIGNER'S DAY AS A KINDERGARTNER

DLR Group takes on the challenge of designing a 600-student school just for 5-year-olds.

In 2013, Mukilteo School District hired DLR Group to design a new, 600-student kindergarten center called Pathfinder Kindergarten Center. As an architect I was excited and, honestly, a little terrified.

Recognizing the growing needs for early learners, the district decided on the idea of a kindergarten center in tandem with the passage of new Washington state laws for all-day kindergarten.

BY TODD FERKING
DLR GROUP

In lieu of adding additional classrooms to each elementary school in the district, Mukilteo School District opted for a central, kindergarten-only school as the most efficient solution to their capacity challenges.

Naturally, the idea of a kindergarten-only school presented a unique opportunity to design a facility for a single age group.

What does a school look like if it is designed specifically for them? We knew that a successful facility for these learners required us to forget what we thought we knew about traditional elementary school design. We needed to fundamentally challenge everything.

We began a process that attempted to reshape existing paradigms.

In order to do this, the design team went through several empathetic exercises with the client. We asked people to genuinely connect with the specific needs of a kindergarten student. For instance, in our initial workshop together, everyone was asked to share pictures of themselves as a kindergartner and to introduce themselves as they were then.

We also completed day-in-the-life exercises that asked participants to imagine a young learner of the future, considering their family, their unique needs and learning styles. Immediately following, the teams introduced and shared details about their students. It was at that time we got our first glimpse of our future students.

Mukilteo School District's Pathfinder Kindergarten Center divides its 600 students into four pods, each with six classrooms, allowing 25-student classes.

PHOTOS BY CHRIS J. ROBERTS PHOTOGRAPHY

Lesson learned

Using DLR Group's intranet platform, I surveyed our entire firm of approximately 1,200 people to share their first memories of kindergarten. The design team then categorized their responses. A high percentage

KINDERGARTNER — PAGE 4

INSIDE

ON THE COVER

Bellevue's Tillicum Middle School has decentralized learning spaces that encourage interaction and collaboration. NAC Architecture designed the project, which opened in 2018. Spee West Construction was the general contractor. PHOTO BY BEN BENSCHNEIDER

DJC TEAM

SECTION EDITOR: SAM BENNETT • SECTION DESIGN: JEFFREY MILLER
WEB DESIGN: LISA LANNIGAN • ADVERTISING: MATT BROWN

KINDERGARTNER

CONTINUED FROM PAGE 3

of responses reflected on play and creativity, but surprisingly, equally as many were related to fear, anxiety and rules.

Personally, I hadn't thought about kindergarten that way, as much of my personal recollection centered around play. By asking this simple question, the team began to really consider how we could alleviate some of this childhood anxiety.

To expand upon those reflections of childhood, I decided that it had been way too long since I had been in kindergarten. As a result, the director of facilities for Mukilteo School District and I sat through two half-day sessions of kindergarten to see what else would strike us about the daily activities of these unique learners.

First and foremost, we recognized that although necessary, transitions take valuable time away from learning. As you can imagine, moving a large group of kindergarten students can be both difficult and time consuming. In particular, shuttling students to work with specialists consumes a large amount of time during the school day.

I watched as students were gathered from a variety of classes, dressed in outer gear for the trek, and were guided to a small portable classroom across the campus where multiple specialists worked with small groups. The space was poorly designed, too noisy and too small for effective intervention. After the sessions, students re-dressed in their outer gear and traveled single file back to their respective classrooms.

Knowing that this specific group of students could gain the most from uninterrupted learning time, I asked myself, how does this situation help students? I knew immediately that design could mitigate this scenario.

Each classroom has a cozy, child-size nook and is furnished with play-and-learn stations for small groups of three to four students, or alone time.

PHOTOS BY CHRIS J. ROBERTS PHOTOGRAPHY

Child-centric environment

A school of 600 5-year-olds could be frightening for children away from their moms, dads and siblings for the first time.

DLR Group's design addresses this challenge by diverting the students into four pods — two upstairs and two at ground level. Pods consist of six classrooms, allowing 25-student classes. Each classroom has a cozy, child-size nook and is abundantly furnished with play-and-learn stations for small groups of three to four students, or alone time.

To reduce transition time, the design team introduced two concepts: push-in specialists and decentralization of services. Larger programs, like dining and specialist areas, are broken down into smaller breakout spaces and dispersed throughout pods. Teachers and specialists push into classrooms, allowing students to stay in their respective classrooms and utilize the breakout spaces throughout their pods. In addition, by distributing dining spaces within pods, eating is a more intimate activity that is also easily supervised.

A year after occupation, DLR Group and a third-party researcher conducted a post-occupancy study to identify the design effectiveness in reducing timely transitions in a typical school day between activities and spaces. The goal was to test the idea of a modern-day 21st-century kindergarten school and how to improve its efficiency for future use.

This user research included three elements: interviews to empathize with users — hearing what they think and say; behavioral observations to study the users' actions and why they do what they do; and photographic traces to identify how the spaces are being used.

The findings of this study support the design hypothesis that transitions can be decreased through this model to provide more time in the learning environment.

Next, through a comparative analysis with a more traditional elementary school, initial findings are indicating that the model used reduces transition time by more than 60%. This translates to more than seven school days (45 hours) of learning time recaptured.

In its pre-design process, DLR Group surveyed the entire firm to share their first memories of kindergarten, to create a more children-friendly result.

It is clear that by simply reducing transition time, we can make a meaningful impact on young learners.

Reflecting on how this project has affected my view of educational design and its unique design, shaped by the synergy of age-specific students, brings me pride. We must remember not to overlook the smallest of users, as they have the most to gain from an unconventional planning process that focuses solely on them and their needs.

Todd Ferking is a principal at DLR Group.

WHEN IT COMES TO RENOVATIONS, SEEING IS BELIEVING

Inconspicuous upgrades – no matter how major – can shake the faith of taxpayers who wonder where all the money went.

The average public school building is more than 40 years old, and most of these buildings have not been significantly improved in more than a decade.

Public school districts are faced with the need to replace, or extensively renovate and upgrade their schools. Since the burden of public school capital improvements falls primarily on local communities, voter satisfaction is a critical component in the ability to continue to pass bonds to improve our schools.

BY LAURA ROARK
FFA ARCHITECTURE AND INTERIORS

Westridge Elementary in Lake Oswego, Oregon, opted to replace instead of repair a low, tunnel-like entry canopy.

RENDERINGS PROVIDED BY FFA ARCHITECTURE AND INTERIORS

Those involved in K-12 work know the key to a successful school renovation is to meet the bond intent and open for the first day of school. However, the community's perception of this success is often dampened when these improvements are nearly invisible.

Millions of dollars are spent on deferred maintenance, seismic, security and technology upgrades. We know these are vital elements to keeping our aging schools safe and relevant for the future, but often this work is nearly invisible.

Major infrastructure upgrades, then patch and match the finishes — a thorough cleaning and fresh paint is almost all that is evident. Although we know this work is vital to making our buildings last, our local community members are sometimes perplexed about where all the money went when they walk through the newly reopened school.

It is essential for us to look at a school renovation holistically, even when the scope primarily consists of repairs and infrastructure upgrades. Equal to the value of assessing the structure and systems is understanding the values and visions of the staff and community that inhabit the school. Without looking at the big picture and perspectives, many of the best solutions could be missed.

Westridge Elementary

In 2017, the Lake Oswego School District in Oregon passed a bond to replace, renovate and upgrade their schools.

They identified three elementary schools to keep and upgrade for long-term use, one of which is Westridge Elementary School.

Nestled in the trees above the lake, this single-story school for approximately 450 students built in 1980 had received maintenance and repairs, but no significant investments. The building was slated for a full roof replacement, new windows, mechanical and plumbing overhauls, technology and security upgrades, as well as district-elected full seismic upgrades and a new makerspace.

When our firm assessed the building, we also met with the staff and community to help us understand their unique viewpoints and frustrations regarding the school.

As we developed concepts with the stakeholders to renovate their undersized restrooms and seismically upgrade the building, we looked for opportunities to improve their environment in small ways through these renovations. Through our assessments and meetings with the stakeholders, it became clear that two spaces presented opportunities for significant improvements.

The main entry canopy at Westridge had a wood frame which was found to have significant rot requiring extensive replacement. At the same time, it was noted that there was no sense of arrival to the school. The entry canopy was low and blocked natural light, making the approach feel like entering a tunnel.

FFA reviewed the cost of repairing the canopy with the owner's team, along with the alternative that they could use those same funds toward a new canopy which would provide a new welcoming identity for the school.

Together, we looked at concepts and the district agreed that it was more valuable to invest in the option that improved the presence of the school than to expend substantial resources to fix a canopy that created a dismal approach to the school.

A seismic upgrade provided a chance to redesign the library to improve flow and open up the space.

Another opportunity was discovered at the library. Centrally located, both physically and fundamentally, the library was to receive seismic upgrades, but it had other space-planning issues.

The library was chopped up with partial walls, a stairway and a loft. These partial walls divided the library from the hallways that encircled it and blocked the light from the perimeter clerestory windows.

A former reading loft occupied one side of the library. The loft was not usable for students and was being used as a work area for the teaching assistants and for storage. The seismic assessment further determined that partial-height walls and the loft would require significant work for the seismic improvements. The loft would need to nearly be rebuilt, each wall stripped, plywood added, and new footings would have to be cut into the slab and poured underneath. This meant costly work for a space that was not fully accessible.

Our team saw that these challenges could also be opportunities for significant improvements to the learning environment. Knowing that the staff and community felt that the library was the heart of the school, our team saw an opportunity to make the architecture match their values. Instead of investing in seismically bracing the partial walls, chopped up rooms and loft, we proposed to remove them.

Removing the loft and walls made the library feel bigger and allowed natural light from the clerestory into the space. Flexible meeting rooms and work areas were provided at one edge to accommodate various uses. The library was made safer, more functional and the clutter had been removed to reveal the heart of their school.

Rethinking renovations

Understanding the values and visions of the community and the school district for Westridge school was vital to FFA's design of their renovation. It provided a framework to analyze the needed maintenance and infrastructure upgrade work and find where we could add value to the school. Identifying these opportunities for the district allowed us to help them to consider how they could more effectively use their funds.

When the doors open at Westridge Elementary School this fall, the students and community will be able to appreciate how their bond-funded improvements have made significant impacts to the experience and learning environment of their school.

Laura Roark is an associate at FFA Architecture and Interiors and leader of their K-12 educational team. She has worked in educational architecture for nearly 20 years and is currently the project manager leading the Westridge Elementary School renovations.

NEW MIDDLE SCHOOL FURTHERS SEATTLE ACADEMY'S URBAN EVOLUTION

The six-story classroom building makes the most of its limited site while connecting with the surrounding neighborhood.

According to a recent study by the United Nations, 55% of the world's population lives in urban areas — a proportion that is expected to increase to 68% by 2050.

The Puget Sound Regional Council estimates that by 2050 the Seattle region will grow by 1.8 million people, which highlights the importance of design-centered approaches to creating vibrant mixed-use neighborhoods for the city's future.

BY WENDY PAUTZ
LMN ARCHITECTS

The Seattle Academy of Arts and Sciences Middle School exemplifies a new model for schools in dense urban centers.

The new middle school continues the evolution of Seattle Academy of Arts and Sciences Middle School's urban campus and provides educational programming configured vertically to leverage the limited site and enhance pedagogical principles, while connecting with the adjacent campus and surrounding neighborhood.

At the dynamic intersection between arterial and neighborhood streets, the middle school synthesizes its urban condition and program into two masses: a six-story academic volume relating in scale to the mixed-use commercial core along the arterial and a lower volume dedicated to athletic activities, which mirrors the scale of the adjacent urban residential neighborhood.

The middle school's core academic spaces occupy the upper floors in the new 69,900-square-foot building, while the lower floors provide for entry, general gathering, administration, maker space and music instruction. A gymnasium and outdoor rooftop playfield provide much-

EVOLUTION — PAGE 9

The middle school has an academic building and an adjacent gym with a rooftop playfield.

PHOTOS BY LARA SWIMMER

CORNERSTONE
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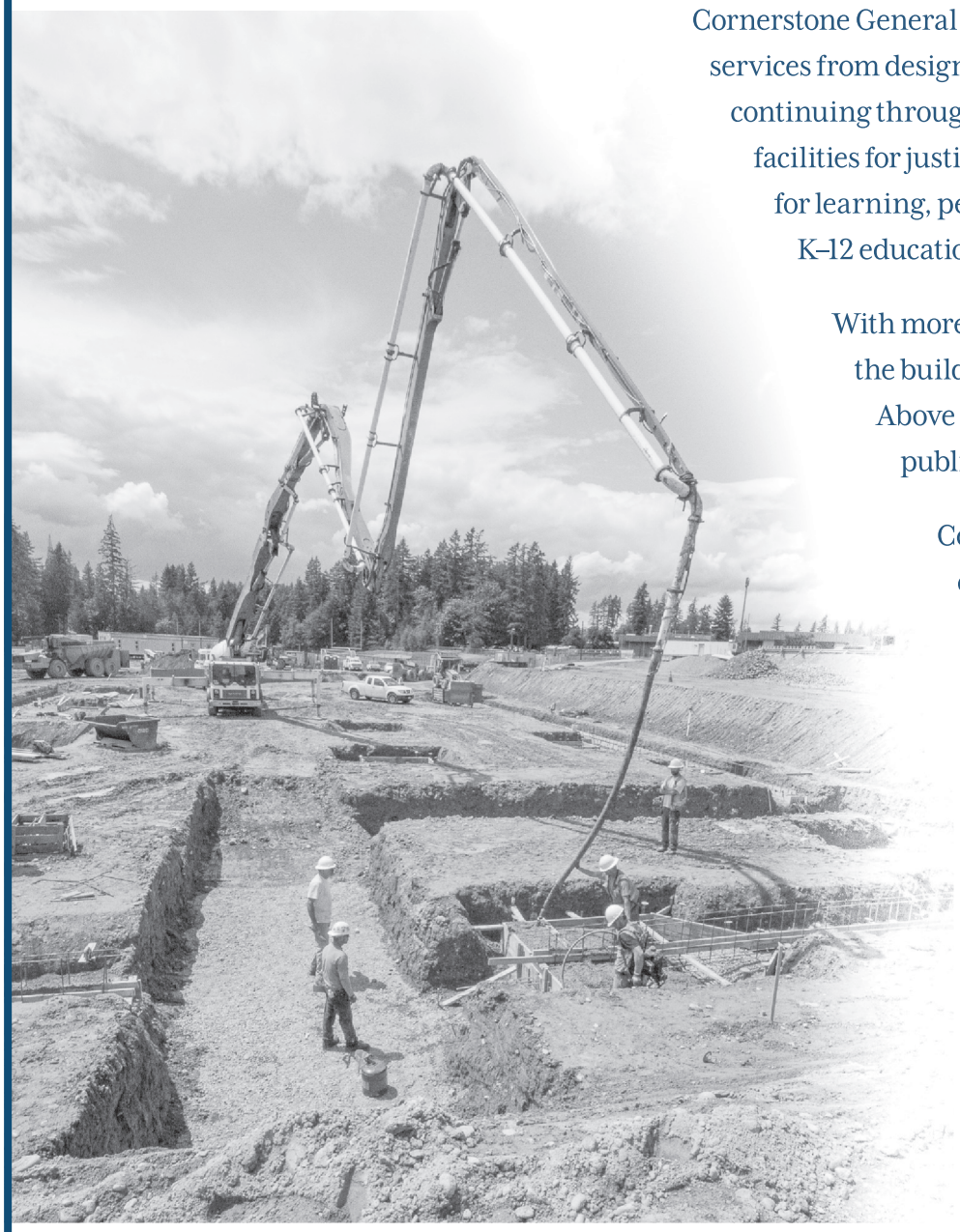

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EVOLUTION

CONTINUED FROM PAGE 6

needed physical activity space. The lower floors of the middle school provide internal access to adjacent Seattle Academy buildings, underscoring the project's important function as a campus connector.

Programming interaction

The school's educational curriculum is grounded in a culture of performance, focusing on creative, project-based learning and challenging students to take risks.

Middle school lies at the intersection of elementary education and high school, a springboard to adult life — offering students opportunities to explore the currents that push them forward, while finding eddies that allow them to pull out and break from established patterns.

The design of the new middle school actively supports this mission, configured to provide middle school students with a supportive learning environment that fosters independence and experimentation, while also infusing educational spaces with city life.

Each middle school grade occupies a floor within the building. Classrooms, the building block of the program, are organized around collaborative learning spaces promoting project-based learning and cross-disciplinary discovery.

The collaboration spaces are composed of a ribbon of faceted panels that line the walls and ceilings and visually reinforce the connections internally and within the neighborhood. The spaces are designed as a series of stepped, double-height interior volumes that cascade between floors, enhancing visual and physical connectivity within the stacked program and creating opportunities for students to explore, cross paths, interact and engage beyond the four walls of the classroom.

Ecological responsibility

The middle school reflects the Seattle Academy's DNA of innovation and commitment to a socially and ecologically responsible learning community, where sustainable features actively foster student engagement. The building creates a new front door with innovative construction techniques, materials, natural light and an apparent simplicity that challenges the traditional school models.

Building analysis modeling early in the design process helped to optimize daylight, solar exposure and natural ventilation. The multi-story classroom bar was intentionally oriented north-south, integrating with the adjacent urban fabric and maximizing solar heat gain in the winter, while sunshades limit solar gain in the summer. Daylight, natural ventilation and passive cooling were key factors in the programming and arrangement of learning spaces.

The three grade levels take advantage of Seattle's mild climate, incorporating mechanically assisted natural ventilation and passive cooling. Indicator lights tied to sensors in every classroom empower students to manage classroom operation modes. As indoor temperatures cool, the indicator light turns red, windows are kept closed and radiant panels warm the spaces. When dictated by changes in air quality or temperature, the light turns green to encourage students to open windows and operate ceiling fans.

Finally, the rooftop playfield efficiently utilizes an often-overlooked outdoor space in the dense urban neighborhood, while solar panels incorporated on the main building roof offset 9.8% of the building's electrical consumption. Living roofs adjacent to classrooms celebrate ecological responsibility and illustrate water quality issues and important ecological concepts for students.

The academic spaces occupy the upper floors of the 69,900-square-foot building.

PHOTOS BY LARA SWIMMER

A gymnasium and rooftop playfield provide much-needed space for physical activity.

Connecting to community

While the stepped collaboration spaces are central to the Seattle Academy's educational mission, they also form the architectural expression of the building. On the exterior, brick wraps both building volumes and is punctuated by expanses of transparency that directly relate to the collaboration spaces within. This transparent glazing cascades down the exterior of the building and resolves into a primary gathering space adjacent to the building entry that anchors the urban intersection. The glazing provides an opportunity for the neighborhood to connect with school activity.

An outdoor space at the entry provides a welcoming, street-level community gathering place for students and an urban amenity for the community. There is a balance created, both aesthetically and in scale, between the school's identity and the character of the surrounding neighborhood that adds value to the adjacent community as a neighborhood asset within Capitol Hill's urban fabric.

The middle school's urban integration and use of sustainable elements showcases forward thinking educational design in the urban context and exemplifies the school's pedagogy through a variety of collaborative, educational spaces that support the school's mission of cultural performance.

Given the complexity of the program and the constraints of the site, simplicity is perhaps the project's strength.

Wendy Pautz is a partner at LMN Architects

CAN A BUILDING HELP KIDS CULTIVATE PERSONAL RELATIONSHIPS?

At Birney Elementary in Tacoma, simple additions such as "Buddy Benches" and "Focus Spaces" give students cozy spaces to be themselves.

BY STEPHEN BLACK & AARON WINSTON
MCGRANAHAN ARCHITECTS

The design takes a holistic approach to learning, with a focus on strengthening students' social-emotional development.

IMAGE COURTESY OF MCGRANAHAN ARCHITECTS

In the past, school design has focused on the pure programmatic requirements of the school — concerned only with building the requisite number of classrooms and spaces.

Savvy school districts now know that the social-emotional development of a child is key to the child's ability to learn.

Social-emotional learning provides students with a way to understand and manage their emotions, how to set and achieve positive goals, how to feel and show empathy for others, how to establish and maintain positive relationships and how to make responsible decisions.

The first day of kindergarten is a day both loved and dreaded by most parents. Many kids make it through the day with no serious issues.

Some kids however see school as a scary place, full of strangers with whom they have no relationship which can lead to disruption or acting out by students.

Schools that focus on the social-emotional learning of a child understand that building a strong relationship with kids help them to see school as a safe and welcoming place full of friends — a place where they are comfortable enough to learn.

Schools in which social-emotional learning drives curriculum, relationship-building and other interactions create a strong sense of belonging and support for students in key areas.

With that type of supportive environment in mind, one of the key questions for us as we began to design Birney Elementary School in Tacoma was this: How can the design of a new school help cultivate these types of personal relationships?

Social-emotional learning is a central component in a district-wide program in Tacoma called The Whole Child Initiative. This holistic approach to learning is based on research that proves a dedicated support network strengthens students' social and emotional skills and enables them to confidently discover their passions and interests in life.

The design of the new Birney Elementary cultivates a dedicated support network around students by welcoming families and the community in and providing a diversity of spaces for engaging in the daily life of the school.

Relationships between students

Building relationships with other students can be easy if settings for social interaction are provided in the school. These spaces can be as simple as alcoves in the corridor or a separate small room in the building.

At Birney, we added Buddy Benches in the main circulation area. These colorful alcoves provide a slight increase in privacy to encourage one-on-one conversations without separating students from the hustle and bustle.

Students also have access to an open library, which provides settings for a variety of experiences, from cozy individual seating to small-group activity and large-group reading spaces.

Birney's classrooms are organized into clusters, with shared activity areas and small-group rooms, all visually connected to form a learning neighborhood. Just outside each neighborhood are areas that allow students to gather comfortably before and after school.

These spaces are also used by small groups for practicing self-management during collaborative work. Each learning neighborhood has a designated art gallery to foster a sense of belonging by allowing students to express their identity and creativity.

Students also need space within the classroom to concentrate on tasks or take a moment to refocus themselves and their emotions. At Birney, each classroom features a small Focus Space for students that looks out to nature with comfortable, adjustable seating.

Choice and flexibility allow students to create spaces that are most conducive to learning for them, when they need it, without being asked to leave class.

Student and adult relationships

Research shows that the relationship built with a teacher can be the most fruitful for a student. Relationships with multiple adults are even more beneficial. These relationships with teachers and specialists encourage students to trust the information being taught and gives students someone to consult for advice on issues such as how to resolve conflicts.

Birney's Peace Rooms provide space for teachers and support specialists to meet with students to discuss conflicts and develop solutions.

The purpose is to discuss the cause of the conflict and how students could have reacted dif-

RELATIONSHIPS — PAGE 12

TSUNAMI-SAFE

CONTINUED FROM PAGE 2

techniques were used to validate that failure of a single structural element would not result in disproportionate collapse. The new school replaces a 1960s structure with a 37,000-square-foot building includes an activity wing which houses the gymnasium, cafeteria and music classroom.

The roof of the activity wing was designed for assembly live loads and has four external stair towers to access the roof. With an area of approximately 8,500 square feet, the safe refuge has sufficient room for the entire K-12 student body along with faculty, district staff and local community members.

The safe refuge provides 24/7 emergency access for the public and can easily accommodate 1,000 people.

Secure access

Since the primary role of the building is to serve as an elementary school, TCF Architecture designed several security measures to ensure that the safe refuge can be accessed by the public in a non-tsunami emergency while the students remain safe during normal school operations.

All of the entry doors for the safe refuge are located on the exterior of the building. These doors are secured with magnetic-release locks which can be overridden in the front office if an earthquake occurs or a tsunami warning is issued. If the event happens after hours, the public can access the roof by breaking an access panel adjacent to the entry doors.

Security cameras deter unlawful access except in an emergency. The pioneering aspect of this project is leading many neighboring jurisdictions and other organization to take notice.

Several are taking deliberate steps towards developing vertical evacuation refuges in their communities. Although grant funding was not awarded to this project, the Federal Emergency Management Agency did deem the application eligible which allows future tsunami-safety projects an opportunity to apply for federal grant funding, such as recently awarded tsunami vertical evacuation structure projects for the Shoalwater Bay Indian Tribe, city of Ocean Shores and Aberdeen School District.

Finally, the project served as a proof of concept in that it was completed even before mandated by the building code, thus demonstrating that communities can take proactive steps to increase their safety even when confronted with a seemingly overwhelming hazard.

The design team included Hatton Godat Pantier as the civil engineer, Metrix Engineers as the mechanical engineer, and BCE Engineers provided electrical engineering services. Construction Services Group represented the Ocosta School District during design and construction.

The Ocosta Elementary School received the Outstanding Award for New Buildings Less than $20 million from the National Council of Structural Engineers Associations in 2018.

Cale Ash is a principal and the director of Degenkolb Engineers' Seattle office.

RELATIONSHIPS

CONTINUED FROM PAGE 11

ferently. This process, and space to support it, helps build empathy and problem-solving skills. These rooms should be positioned within the learning neighborhoods to be visible from the classroom.

This arrangement supports social-emotional learning and allows other student support services to be provided within the neighborhoods throughout the day. The principal and counselor offices are located in "the heart of action" rather than in a back hallway. They are provided with comfortable soft seating and large windows to be visible and create a sense of welcome rather than discipline – encouraging positive relationships.

Parents and partners

The design for Birney includes a welcoming Family Connection Center, hosted by a family liaison, for parents to meet with teachers, other parents and community partners.

The FCC fosters relationships with parents that break down social barriers and help them feel a part of the school community. In the FCC, parents learn how to model at home the social emotional lessons their children are learning in school.

By being thoughtful about providing school settings that support social-emotional learning, we can help students be more self-aware, practice self-management, have more social awareness, develop relationship skills and be responsible decision makers.

These skills boost students' success in school and in life and can transform stress and anxiety into happy and nurturing experiences for children.

Stephen Black is a project manager and Aaron Winston is a project architect with McGranahan Architects.

TACOMA TAKES A CHANCE ON PROGRESSIVE DESIGN-BUILD

An elementary school project tests the alternative delivery method in an effort to control costs and meet design and inclusion goals.

School districts face many challenges today. Escalating material prices, outdated budgets, tariffs and a competitive bid climate challenge the traditional delivery of new and renovated educational facilities.

When Boze Elementary School needed replacing, Tacoma Public Schools chose an innovative, non-traditional method to meet these challenges head-on: progressive design-build.

BY HEATHER HOCKLANDER
BCRA

The replacement of Boze marks the first time in Washington that a district has used progressive design-build to deliver a K-12 school.

Tacoma Public Schools officials knew they would need a cohesive team to mitigate risks and guide the replacement of Boze to a successful conclusion with this new delivery method.

The team of Korsmo Construction and BCRA were selected for their strength in design-build experience. Together with Tacoma Public Schools, the progressive design-build team focused on meeting program needs and design goals — all while maximizing the budget and meeting a rigorous inclusion target.

Meeting district needs

With progressive design-build, collaborative decision-making happens early and often. With designers and contractors in alignment prior to solicitation, Tacoma Public Schools joined a cooperative team where everyone was an engaged participant in a process dedicated to a value-rich outcome.

Using design-build best practices, Korsmo-BCRA and Tacoma Public Schools were able to expedite decision making and work through Boze's challenges together.

Early partnering allowed the progressive design-build team to create project efficiencies that saved time and maximized every program dollar for the district. Early agreements on which spaces and features were priorities for the owner helped control costs throughout design and construction without sacrificing program needs — a key to defining project success.

Tacoma Public Schools was also committed to investing in the local community by providing opportunities to disadvantaged and local businesses. The district worked closely with Korsmo to promote and secure inclusion goals of 30% local, 10% minority-owned, 6% women-owned, and 5% small business.

The project has doubled its local inclusion goal and its goal for minority-owned business involvement. As the project continues these numbers will continue to rise, proving to districts around the state that this type of outreach is attainable.

Students and staff will move into the new Boze Elementary School in September 2020.

IMAGE PROVIDED BY BCRA

Students and community

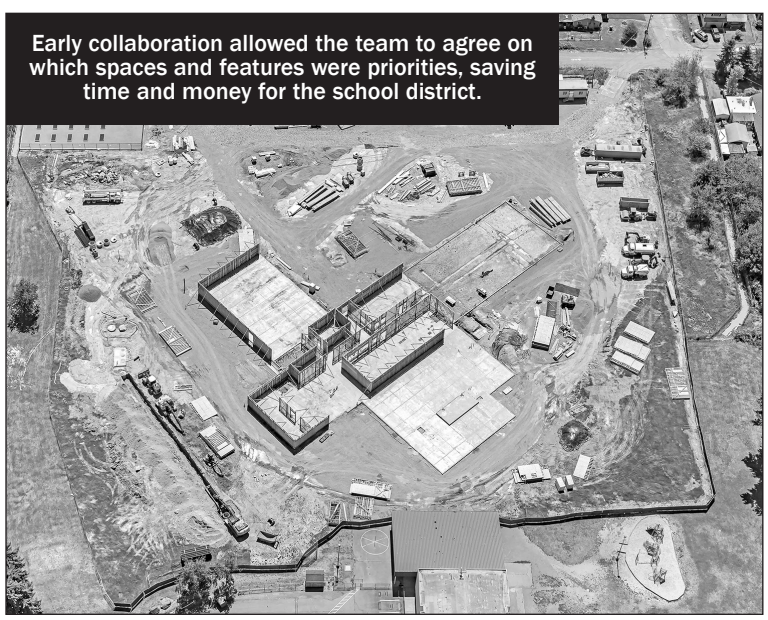
Boze Elementary School functions both as a school and community hub that provides a meeting place and social and wellness services to many residents of Tacoma's Eastside. Understanding these unique needs was critical to make design and construction decisions based on value to the overall program rather than their cost.

The collaborative nature of progressive design-build allowed the team to work with community partners such as the WIC program and the Technology Access Foundation to prioritize programming spaces, such as a family liaison office and a community meeting room with a separate entrance.

The city of Tacoma is also noticing the success of Boze.

"A new school only happens in a community once every couple decades, if you're lucky, and we've been given the opportunity to reconstruct Boze Elementary

TAKING A CHANCE — PAGE 20



Early collaboration allowed the team to agree on which spaces and features were priorities, saving time and money for the school district.

PHOTO PROVIDED BY SKYTECH AERIAL PHOTO

REDUCING K-12 CARBON FOOTPRINTS THROUGH REUSE

Does it always make sense to replace an aging school building with a new, energy-efficient one? Not necessarily.

BY KRISTIAN KICINSI
BASSETTI ARCHITECTS

Bassetti's rehabilitation of Franklin High School in Seattle became a national standard for historic school preservation.

PHOTOS BY JEFF AMRAM PHOTOGRAPHY

In 1986, when school districts across the country were razing historic schools in favor of building new ones, the citizens of Seattle held hands and surrounded Franklin High School declaring that their school would not be torn down.

Seattle Public Schools listened and Bassetti Architects was brought on board to restore the landmark. Franklin High School's rehabilitation became a national standard, inspiring districts throughout the country to carefully consider the preservation of their historic schools.

The project received numerous design and preservation awards, protected a community asset and revitalized the school's educational program within the historic shell.

What no one knew in 1986, however, is that by choosing to modernize the school, the project was also supporting the planet above and beyond the sustainable features that were incorporated into Franklin's redesign.

Since that time, Seattle Public Schools has revitalized more than two dozen historic schools and, although it has become increasingly apparent that these schools are more than capable of meeting the vast programmatic necessities associated with 21st-century learning, what about sustainability?

In the throes of climate change, can historic schools even begin to measure up to the green features being incorporated into new buildings?

They can, indeed.

In 2011, the National Trust for Historic Preservation conducted a study on the embodied energy of existing versus new buildings called "The Greenest Building: Quantifying the Environmental Value of Building Reuse." This document revealed that K-12 replacement projects can take up to 75 years to reach the carbon equivalency of an existing historic building.

After decades of research, there is now enough data to conduct a more conclusive life-cycle assessment of historic K-12 schools to inform the direction of our projects. This was the case with the current modernization of Benson Polytechnic High School in Portland.

After nearly 40 years since a major capital bond measure had been approved and, facing a growing backlog of deferred maintenance and inadequate facilities, Portland Public Schools set about creating a long-range plan in 2012.

With more than 40 landmarked or potentially landmarked schools built before 1950, this plan set priorities for the design teams who would work on these historic schools:

- Balance potential life-cycle savings of new construction with the embodied energy investment in exiting buildings.
- Respect and preserve historic elements unique to neighborhoods.
- Salvage and reuse high-quality materials.

Life-cycle assessment

Portland Public Schools also wanted to evaluate the life-cycle embodied energy impacts of rehabilitating their schools instead of replacing them.

With this imperative, Bassetti used a life-cycle assessment to evaluate the embodied energy impacts of the design for Benson. Coupled with the program requirements and first-cost analysis, the life-cycle assessment helped the design team determine the efficacy of restoring areas of the historic building. To do this, Bassetti used methodology recommended by the University of Washington's Carbon Leadership Forum.

For the study, we looked at four scenarios. In each one, we assumed a building lifespan of 75 years, consistent with the National Trust's study:

- Keep the existing building as-is and continue to operate it for 75 years. This was our control case. We knew it was not possible to continue operating the building for 75 years, as its systems are on the verge of failure and in dire need of replacement, but we used this scenario as a point of comparison.
- Use the proposed design, which renovates 268,000 square feet of the existing building, demolishes 155,100 square feet and constructs 136,800 square feet of new structure.
- Opt for replacement. We compared the proposed design against completely demolishing the 370,000 square feet of existing building and constructing an entirely new building, using the same energy conservation strategies as the proposed design.
- Replace the entire building with a baseline, code-compliant building. This is the same as the third scenario, but we assumed that the new building was constructed to baseline code standards, with no additional energy-saving measures.

A surprising finding

Our initial result was as expected, the proposed design generates approximately 12,000 metric tons of CO2e (the CO2 equivalent), versus about 24,000 metric tons for the replacement and baseline scenarios.

What does saving 12,000 metric tons of CO2e mean? To put some context to that number, we would need to plant 196 acres of trees and let them grow for 75 years to offset the carbon from the proposed design. For the replacement scenario, 355 acres of trees are required. For automobiles, 12,000 metric tons is the equivalent of saving 1.3 million gallons of gasoline and, for home energy use, it equates to a savings of 1,437 homes for one year.

To get a fuller picture, we combined the initial embodied carbon from construction with the footprint of operational energy over 75 years. When we did this, we encountered a few surprises. First, it appeared that the initial embodied energy was quickly dwarfed by the operational energy.

But what about the significant impact of construction?

We looked at this ratio over two timescales. A 20-year period showed that with the proposed design, construction accounted for about 33% of the total impact. For the replacement scenario, embodied energy was about 50% of the total. When looking at 75 years, the proposed and replacement scenarios showed 12% and 23%, respectively, for embodied energy.

The second finding surprised us. When we compared the proposed design to the existing building, we found that because the current energy use is already quite low it would take 20 years before the total footprint of the proposed design becomes less than the amount needed to continue to operate the existing building.

What's more, the complete replacement option didn't have a lower footprint until 40 years. This suggests that the often-held assumption that building

REUSE — PAGE 20

HOW SAFETY BY DESIGN MAKES SCHOOL PROJECTS SAFER FROM START TO FINISH, AND BEYOND

The concept promotes the health of students and school staff at every phase of the design process.

Facility safety has been pushed to the forefront as educational organizations grapple with the challenges of aging infrastructure.

As schools and universities face opportunities for new construction, designers are turning to environmental health consultants for guidance on how to integrate safety into the full building life cycle — from pre-planning, through occupancy and eventual demolition or reuse.

BY HEATHER GOUDIE
PBS ENGINEERING AND ENVIRONMENTAL

This safety-by-design approach promotes the health of students and school staff at every phase of the design process, including leading up to, throughout and after occupancy.

Safety steps

Safety begins from the ground up. During the initial phases of design, planners must assess the facility's placement to evaluate viability, integrity and longevity.

During this pre-design phase, the site undergoes studies that will eventually provide a road map for the project. Land surveys are used to determine the ideal placement of a site by assessing its proximity to other properties or environmental elements. Traffic studies are conducted to ensure safe travel and ADA compliance. Wetlands studies consider the safety of the local ecology during and after construction.

Lastly, environmental site assessments look toward the history of a site to determine whether underlying contamination issues are present. This step is critical to prevent any long-term health and environmental issues that may arise during facility occupancy.

The project then moves to the design phase, where safety will again play a key role. During this phase, the results of prior studies, regulations, budgets and specifications, are combined into a series of guidance documents that will steer the facility's construction.

Engineers and designers use these documents as a resource as they develop the infrastructural components of the site's safety.

Environmental engineers create solutions to protect and improve the health of living organisms.

Geotechnical engineers address the behavior of earth materials. Structural engineers design the "bones and muscles" that create the shape of a facility's foundation.

Traffic engineers focus on the safe and efficient movement to the school on adjacent roadways.

Civil engineers and architects look at how to safely maneuver people and vehicles throughout the interior of a school's site, especially during pick up and drop off.

Once site development is actively underway, the guidance documents are also used to safeguard the safety of site workers and minimize environmental impacts. At this stage, workers are trained on health regulations, and safety protocols are put in place for field activities.

Routine testing is conducted, particularly on sites with unusual chemicals requiring remediation. Occasionally, changes in site conditions such as severe weather will require adjustments in health and safety protections. Having a proactive safety plan in place allows staff to dynamically maintain focused on safety, while incorporating changes into ongoing protection protocols.

Open communication between contractors, owners and stakeholders is vital at this phase. Potential site risks, if identified early, can be addressed in a way that upholds regulatory compliance, while preventing situations that would otherwise bring work to a halt.

Finally, once construction is completed, facility managers step in to help secure continued safety for students and staff. This role comes with its own unique challenges.

During the initial phases of school design, planners evaluate viability, integrity and longevity to determine safety measures.

IMAGES COURTESY OF PBS ENGINEERING AND ENVIRONMENTAL

A more holistic approach

The field of facility management is constantly evolving. Regulations and codes are frequently updated in response to technological advancements or new discoveries in environmental health.

Over the last 20 years, changes to regulations associated with lead paint, asbestos, drinking water, seismic upgrades and dilapidated underground tanks have transformed the face of facility safety.

Schools and universities often rely on facility management programs to incorporate

SAFETY BY DESIGN — PAGE 20

Once site development is underway, the guidance documents are also used to safeguard the safety of site workers and minimize environmental impacts.

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AS CLASSROOMS EVOLVE TO MEET CHANGING NEEDS, THE FURNITURE SHOULD TOO

Today's collaborative environments call for desks, tables and chairs that can be moved around and used in different ways.

The classroom has come a long way from blackboards and chalk. The classroom today revolves around interaction, collaboration and technology.

Workpointe takes education seriously. We were all once students and now we see our kids growing up in a completely different environment than we once learned in.

BY MATT ARNOLD
WORKPOINTE

We have the opportunity to see this change evolve and to accurately support that growing change.

Classrooms and learning environments have evolved dramatically over the years. The classroom is more collaborative and teachers are encouraging students to work together, to learn from one another.

This means the furniture needs to adapt and grow with new methods and styles that are happening in today's schools. Beyond the classroom, we are also seeing a dramatic change in libraries, cafeterias and performing arts centers, just to name a few.

Libraries or media centers are more than just a place to read or check out books. They are social gathering places for teens, tutoring, study groups, meetings and activities for children.

Workpointe helps plan space to create a fun and exciting environment and still have flexible furniture to accommodate the needs for various functions.

Case study in Texas

Imagine an elementary school with no gym for future athletes, no stage for budding stars and inadequate classrooms for tomorrow's leaders.

Those are just some of the difficulties the Burkburnett Independent School District in Burkburnett, Texas, was facing when it started planning a new, 80,000 square-foot school to house all third- through fifth-grade students. The district also wanted to build a school centered around student and staff collaboration.

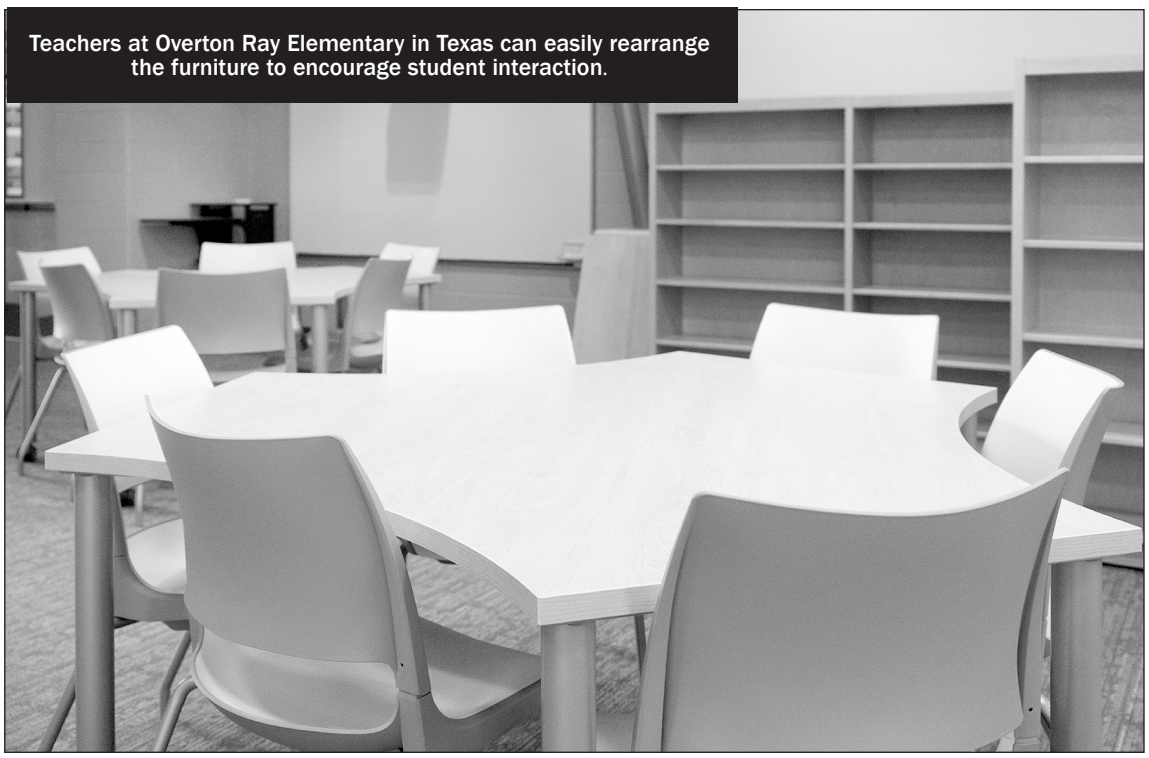
To execute this project, BYSP Architects was engaged to ensure a flexible yet connected design that addressed educational, social, recreational and environmental needs. Specifically, the district wanted to expand on the concept of student-centered learning it had tried to incorporate into its existing schools.

Touring the school was a critical part of the design phase to get a better understanding of how to approach the design.

"These were not traditionally structured classroom settings," said Terry Lowry, interior designer with BYSP. "The teachers and students were already accustomed to learning in a relaxed environment where students could choose their seating. We knew we wanted to provide both a plan and furniture options that allowed for a continued, modern atmosphere for learning."

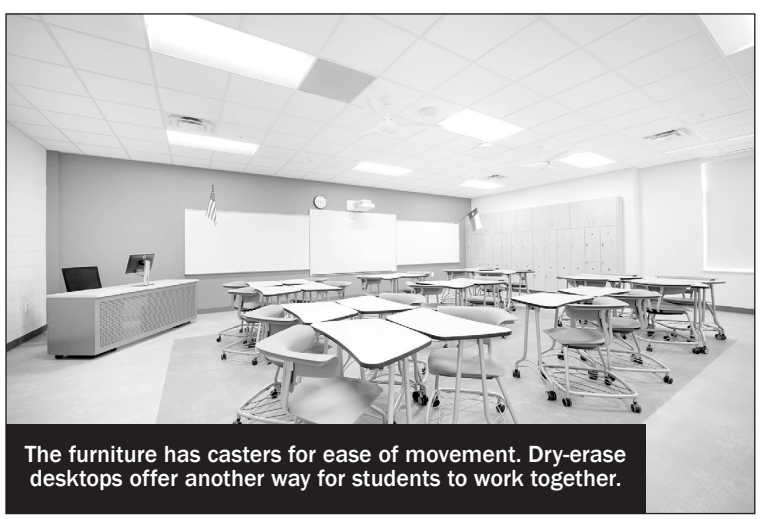
As a result, the new Overton Ray Elementary School is one of the most flexible and fluid elementary schools in north Texas. Aside from the 24 classrooms, the campus includes a variety of collaborative spaces, three STEM labs, three collaboration stations, an amphitheater and

FURNITURE — PAGE 20



Teachers at Overton Ray Elementary in Texas can easily rearrange the furniture to encourage student interaction.

PHOTOS COURTESY OF WORKPOINTE



The furniture has casters for ease of movement. Dry-erase desktops offer another way for students to work together.

Classrooms at Riverview Elementary School connect seamlessly to shared learning commons, allowing all manner of activities to occur throughout the space with easy supervision.

PHOTOS BY BEN BENSCHNEIDER

AT SUCCESSFUL SCHOOLS, LEARNING HAPPENS EVERYWHERE

To make the most of their spaces, educators should understand how the design relates to their educational mission.

Window seating located throughout the classrooms and common spaces allows students to create a space within a space for learning.

There are many schools of thought when it comes to designing K-12 facilities.

Tillicum Middle School in Bellevue and Riverview Elementary School in Snohomish are examples of two approaches — both designed by NAC Architecture to reflect the intentions of our clients.

Tillicum: a user's guide

Linking learning with meaningful experiences has been shown to significantly improve retention and increase student success. We can all remember the variety of places and contexts in which we have learned something meaningful. And chances are those places are as varied as we are. Successful schools and successful educators now embrace this simple truth — learning happens everywhere.

BY MATT RUMBAUGH
NAC ARCHITECTURE

Often called decentralized learning, this perspective seeks educational opportunities both inside and outside the classroom. A school building or campus can take advantage of site topography and nature to provide outdoor areas for engaging students through exploration and play. Introducing space for a garden lets students grow fruits and vegetables while studying the science of nutrition.

Highlighting sustainability measures throughout the building, such as LED lighting or energy-use dashboards, raises awareness about environmental stewardship. Informal gathering spaces throughout the school can feature soft seating and writeable walls to invite spontaneous group work or problem solving.

At the same time, great school design is a bit like the physical representation of potential energy. Fully activating new opportunities for learning requires a combination of educational understanding and cultural support mechanisms for the faculty. Even after a vigorous and inclusive process, it is unrealistic to assume that an entire school staff will comprehend the design intention without their own chance to learn about it.

What if every school facility — just like any new appliance or gadget — came equipped with a user's guide? Chock-full of information about reasons for the different spaces, each of the various technologies and systems and how all the parts work, it could serve as a reference tool for facilities staff and teachers to access the inner workings of their building and support their learning objectives.

Last year, the Bellevue School District opened its new Tillicum Middle School. The building was designed as a "marketplace of learning," organizing science, career and technical education, art, library and core classrooms around a flexible shared space. The scheme was selected by the design committee because it encourages collaboration, connects programs, and puts learning on display.

A user's guide, created and distributed to teachers and staff members, provides information on the design thinking behind the building's layout, purpose of non-classroom spaces, and inspiration for the graphics and artwork throughout the school. Sustainability was a key design consideration, so the guide highlights sustainable building features as well.

Riverview: making relationships

Throughout the design of Riverview Elementary School in Snohomish, Principal Tammy Jones and her faculty spent time rede-

fining their core values.

Jones explained, "For Riverview, it's simple: relationships — staff to parent, staff to staff, staff to student, student to student — are the foundation of everything we do. Therefore, we need both a culture and a building that supports all types of relationships."

The old building lacked the spatial framework to usher in new relationships and learning opportunities, so the concept that "learning happens everywhere" became a driving force when planning for the replacement school began in 2008.

"Successful relationships aren't stagnant," said Jones, "so the building shouldn't be either."

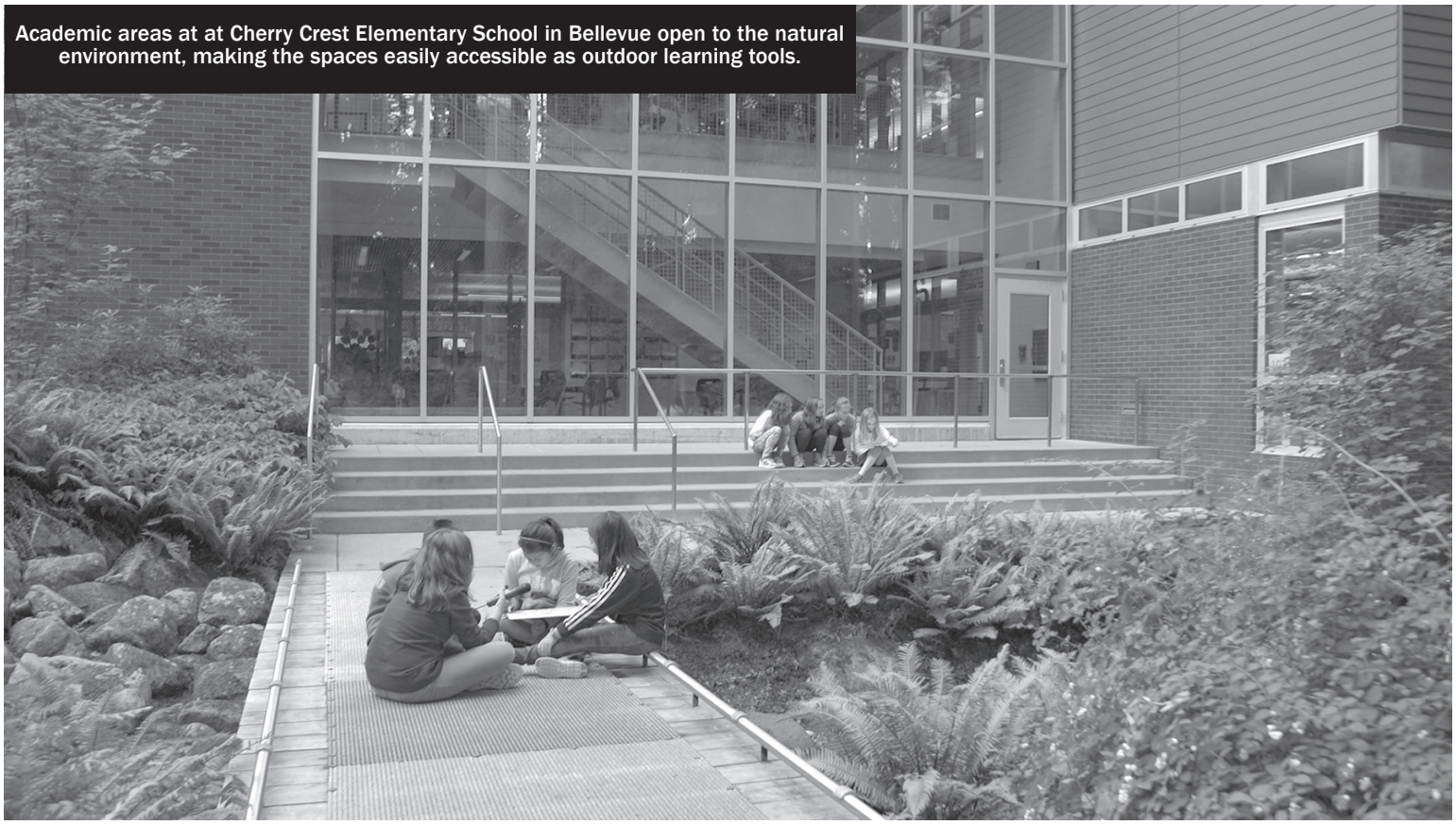
Spaces inside and outside the classroom intentionally support all types of learning. Within the classroom, considerable thought was given to establishing more opportunities for varied activities. Built-in window seats, mobile bookshelves and operable partitions between half of the classrooms diversify space types, sizes and potential activities.

Large classroom windows look into the shared learning commons and connect groups of four classrooms. In hallways and the library, nooks allow one to two students either to work independently or receive personalized instruction from educators.

Outside, a meandering path with informational signage and a large overlook turn the on-site wetland into a unique learning space. Amphitheater seating allows teachers to take instruction outdoors. The architecture, both indoors and out, serves as the connective tissue linking educational activities and facilitating decentralized learning.

The staff of Riverview Elementary moved into their new school in 2011. Jones continues to lead her team on a journey of cultural definition and reinforcement through daily, periodic, and annual activities.

Academic areas at at Cherry Crest Elementary School in Bellevue open to the natural environment, making the spaces easily accessible as outdoor learning tools.



Every year as new staff join and continuing staff prepare for a new school year, they discuss the "why" behind what they do as much, if not more, than how to execute the "why."

Kids spend the first three days of school in a multi-grade "family" group of 25 to 30 students participating in activities that reinforce the school's five cultural pillars. Students then continue to meet as a family once a month for the remainder of the year. This helps to integrate new and returning students across all grades, and further reinforces the school's foundation of relationship-building.

In lieu of traditional staff meetings, Riverview staff spends the first 10 minutes of the day in a standing staff-gathering where they focus on several things: what does the staff need to know today? Students who have done really well are recognized to make sure that other teachers can congratulate that student sometime during the day, and they also discuss any students that are struggling and have a staff member who is not their regular teacher reach out to that student.

School buildings will easily outlast the tenure of any particular leader or teacher at that school. Therefore, it is important from the first day to the last for educators to understand the intent behind their school, how the architecture relates to their educational mission and how to create synergy between their educational activities and their school's design.

Truly understanding and living a school's educational mission is not something that happens in a vacuum. Deliberate training, open dialogue and ongoing evaluation is necessary.

Recurring cultural activities and a clear purpose, such as what Jones has achieved at Riverview Elementary, allow educators and students alike to live the "why" behind their mission.

And it takes an equally dedicated design team to embrace a school's educational mission and translate that into a learning environment that supports a culture of collaboration. Creating spaces that allow learning to happen everywhere is just the beginning; the key is to design them in a way that communicates this culture to students and staff.

LEARNING EVERYWHERE — PAGE 20

Large marker-board panel walls and mobile touchscreen displays at Wilson High School in Tacoma encourage spontaneous group work and presentations.

TAKING A CHANCE

CONTINUED FROM PAGE 13

and invest in the Eastside of Tacoma," said City Councilmember Catherine Ushka. "The Korsmo-BCRA team made sure the reconstruction of Boze Elementary was done right. They bent over backwards to work with the community to ensure this wasn't just a beautiful school, but also a beautiful space for the community. The team went to great lengths to listen to and partner with the community and found ways to solve challenges like moving the community garden that is important to the neighborhood."

Achieving success

Thanks to the inherent collaboration found with progressive design-build, the new Boze Elementary School broke ground with an in-budget guaranteed maximum price. The project included its full program scope, record-setting diversity participation and community support.

The key to our success? A team committed to continuous collaboration, meaningful engagement with the project's stakeholders, and creative progressive design-build solutions. This approach has ensured the new Boze Elementary is not just a school, but a space to serve its community for decades.

Heather Hocklander is an associate principal and education market lead at BCRA, a design firm with offices in Seattle and Tacoma.

FURNITURE

CONTINUED FROM PAGE 17

a student lounge.

To support continued collaboration, most of the furniture choices included casters for ease of movement. The school also chose dry-erase desktops to further promote collaborative learning opportunities for students and staff. Having ample storage in both classrooms and labs adds to the functionality.

"The overall design represents an engaging, collaborative and flexible learning environment," Lowry said. "Teachers have access to furniture that allows the freedom to rearrange in many different configurations for their students. They are especially pleased with the KI Ruckus chairs and KI Enlite desks because students are comfortable, relaxed and interactive while learning."

We love being able to collaborate on a project that can bring such a positive impact to the community.

Matt Arnold is president of Seattle-based Workpointe.

REUSE

CONTINUED FROM PAGE 14

new, energy-efficient buildings to replace aging ones as a way of reducing impact isn't necessarily correct. This corroborates the findings in the previously mentioned study by the National Trust where the total footprint of a historic building became less than the footprint of a new one.

So where is the biggest impact coming from in construction? The life-cycle assessment shows that concrete accounts for more than half of the embodied carbon — and that's for a steel-frame building. Reducing concrete in construction reduces a project's overall footprint.

We also looked at the power sources for operational energy. For the sake of the data analysis, the makeup of the energy sources for the project were assumed to remain constant for 75 years.

However, we know that isn't accurate since Portland, along with many cities across the country, plans to increase the use of renewable energy and phase out fossil fuels.

Currently renewables account for about 24% of Portland's electricity, coal is 15% and natural gas is 28%. What if Portland transitions to cleaner power over the next 75 years? For comparison we ran the calculations again, this time using Seattle City Light's power mix as the operational energy. Seattle boasts the greenest electricity in the country, with 92% coming from hydroelectric and renewable sources.

Now, the percentage of embodied footprint versus operational footprint is different. Over the 20-year timeframe, construction accounts for 59% of the project's total footprint and a whopping 75% in the case of the replacement option. At the 75-year mark, construction impacts are still at 28% and 46% of the proposed and replacement options, respectively.

So, as Portland's energy sources get cleaner over time, the upfront impacts from construction become a larger factor.

By completing the life-cycle assessment, Bassetti was able to demonstrate three critical lessons:

- Replacing concrete with greener materials will greatly reduce the environmental impact of construction.
- City and regional sources of energy (renewable vs. fossil fuel) matter. Long-term decisions regarding the preservation of historic structures are integrally linked with power sources.
- The reuse of historic schools reduces the overall carbon footprint of K-12 projects, while allowing beautiful neighborhood landmarks like Benson and Franklin to remain intact.

Kristian Kicinski is an associate principal at Bassetti Architects and the firm's director of sustainability.

SAFETY BY DESIGN

CONTINUED FROM PAGE 15

new requirements and address issues as they arise.

Routine testing of air, water and building materials helps to identify issues proactively. If renovations are required, safety practices help ensure that impacts to building materials are handled appropriately, protecting air and environmental quality. Educational organizations are moving beyond the reactive to a more holistic approach to school safety.

Consultants, workers, and communities are beginning to work collaboratively to incorporate safety into the full building life cycle. When schools are designed on a foundation of safety, educators are freed to focus on instruction and students can thrive in an environment that fosters healthy minds.

Heather Goudie is senior marketing coordinator at PBS Engineering and Environmental.

LEARNING EVERYWHERE

CONTINUED FROM PAGE 19

That's why documents such as a thoughtful user's guide that lives on with the building can be instrumental in creating the baseline knowledge and understanding of how the building can support learning.

Riverview Elementary School is thriving still, more than a decade after design for the new school began (and eight years after opening the new building). The mixture of thoughtful, learner-centered architecture coupled with a strong culture demonstrates that learning happening in all places and contexts really does work.

Matt Rumbaugh is a principal at NAC Architecture.

2019

WASHINGTON PUBLIC SCHOOLS: TOP 10 PROJECT AWARDS

In education, it's not just fancy State U research labs that command those eye-popping, nine-figure capital budgets — we see them for primary and secondary school projects, too.

Seattle voters approved in February a six-year, $1.4 billion capital levy that will fund big-ticket projects such as replacements for Rainier Beach High School and Mercer International Middle School. And Seattle is not alone: Districts from Vancouver to Spokane this year have awarded contracts that, even if they're not in nine-figure territory, still offer school builders ample opportunities for high-dollar risk and reward.

The following is a list of the biggest public K-12 construction awards in Washington state in 2019, according to DJC bidding records. Contracts vary from project to project, depending on factors such as delivery methods. So where award amounts weren't available, we listed budgets or estimates instead.

1. MOUNTAIN VIEW HIGH SCHOOL REPLACEMENT

The 250,000-square-foot project will replace an outdated complex that opened in 1979 and serves more than 2,000 students.

The new high school will have a more compact footprint, including two- or three-story classroom wings, a gymnasium, kitchen and cafeteria, media center, front offices, support space, collaboration areas and specialty instructional spaces. An existing theater, commons and one of the gymnasiums may be remodeled.

The site will be redeveloped to include distinct travel and parking zones, and longer on-site queuing areas to reduce congestion in the neighborhood. Athletic fields will be replaced.

Estimate: $150 million; no award amount available
GC/CM: Skanska USA Building
Architect: LSW Architects
School district: Evergreen Public Schools, Vancouver

2. YELM MIDDLE SCHOOL AND SOUTHWORTH ELEMENTARY SCHOOL REPLACEMENTS

The new Yelm Middle School will have 100,000 square feet for grades six through eight, and serve 725 students on an 18-acre site.

The project will replace the existing 1966 middle school, which will be retrofitted to serve as an interim site for the new Southworth Elementary School.

The elementary will be built on the site of the existing school, which opened in 1972. The replacement will have 65,000 square feet and serve 550 students from kindergarten through fifth grade.

Both new schools will replace aging, undersized facilities that have reached the end of their usefulness.

Budget: $112 million; $68.4 million for Yelm Middle School and $43.7 million for Southworth Elementary; no award amount available
GC/CM: Forma Construction
Architect: BCRA
School district: Yelm Community Schools

TOP 10 PROJECT AWARDS

IMAGE BY MMEC ARCHITECTURE

3. KENNEWICK HIGH SCHOOL

The new two-story, 292,000-square-foot school will replace the existing Kennewick High, which opened in 1951. It will include a science wing, a dining commons, a courtyard and other features, and will connect to the existing Lion's Den gym and a remodeled auditorium.

Award: $86.9 million
General contractor: Fowler General Construction Inc.
Architect: MMEC Architecture
School district: Kennewick School District

IMAGE BY INTEGRUS ARCHITECTURE

4. SHAW MIDDLE SCHOOL AND ON TRACK ACADEMY

Work includes a new multi-use campus with a 140,000-square-foot middle school and a new 45,000-square-foot building for the On Track Academy, an alternative high school.

Estimate: $62 million; no award amount available
GC/CM: Lydig Construction
Architect: Integrus Architecture
School district: Spokane Public Schools

TOP 10 PROJECT AWARDS

IMAGE BY ARCHITECTS WEST

5. PROSSER HIGH SCHOOL

A five-level, 163,400-square-foot building will be constructed on a complicated, sloping site. The school will have a welcoming main entry and three floors of classrooms organized in a linear arrangement to make the most of daylight and views. Other spaces include a media center, 300-seat auditorium and a central kitchen. The school will serve up to 1,200 students in grades nine-12.

Award: $52.2 million
General contractor: Chervenell Construction Co.
Architect: Architects West
School district: Prosser School District

IMAGE BY NAC ARCHITECTURE

7. WING LUKE ELEMENTARY SCHOOL PHASE II

A new 93,000-square-foot building replace the original school, which opened in 1971 and has several major systems and structural challenges. Classrooms will be organized around flexible learning commons.

Award: $31.5 million
General contractor: Jody Miller Construction
Architect: NAC Architecture
School district: Seattle Public Schools

IMAGE BY MMEC ARCHITECTURE

9. RAY REYNOLDS MIDDLE SCHOOL

A new 115,000-square-foot middle school to serve 1,100 students.

Award: $31.04 million
General contractor: Fowler General Construction
Architect: MMEC Architecture
School district: Pasco School District

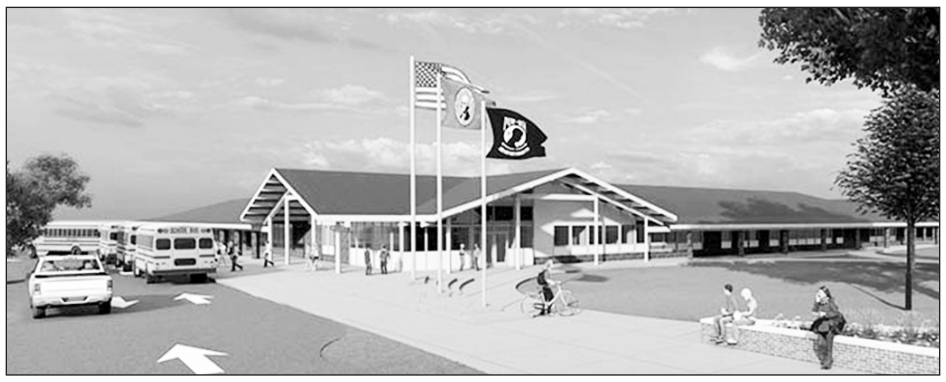


IMAGE BY ARCHITECTS WEST

6. WALLA WALLA HIGH SCHOOL RENOVATIONS AND IMPROVEMENTS

The two-phase project will begin with construction of an 18,000-square-foot science building with eight classrooms. Second-phase work will involve renovating eight buildings, replacing aging site utility infrastructure, and completing other site improvements.

Estimate: $48 million (maximum allowable construction cost)
General contractor: Jackson Contractor Group
Architect: Architects West
School district: Walla Walla Public Schools

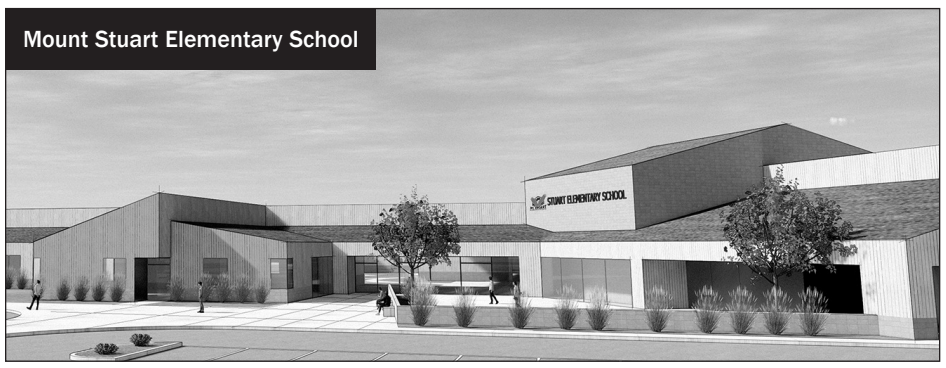


IMAGE BY INTEGRUS ARCHITECTURE

8. MOUNT STUART ELEMENTARY AND NEW ELEMENTARY

Work includes a 55,000-square-foot replacement building for Mount Stuart Elementary and an all-new 57,000-square-foot elementary to be constructed on a 29-acre parcel.

Budget: $31 million; no award amount available
GC/CM: Garco Construction
Architect: Integrus Architecture
School district: Ellensburg School District

10. OLYMPIC HIGH SCHOOL MODERNIZATION PHASE 2

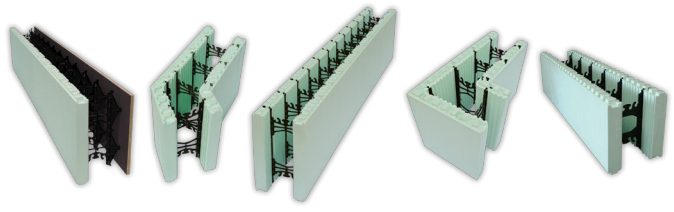
The project will modernize two “units,” or school wings, including classrooms and restrooms. Windowless interior classrooms will be converted to flex spaces, and locker rooms will be reconfigured. New spaces include a staff room and team classroom. Exteriors will be updated.

Total budget: $29.48 million; no award amount available
GC/CM: Forma Construction Co.
Architect: Sundberg Kennedy Ly-Au Young Architects
School district: Central Kitsap School District, Silverdale

Richardsville Elementary receives a $40,000 credit each year from the utility company!

The Nation's first Net-Zero school. Richardsville Elementary, a 77,285 sq. ft. school located in Bowling Green, Kentucky built using **NUDURA Insulated Concrete Forms**, sets the standards for being the first of its kind in the United States. Utilizing NUDURA ICFs for the high performance building envelope in conjunction with solar panels on the roof, allows Richardsville Elementary to harvest enough **energy** to offset the total energy consumed by the school, sending 300kw of power back to the grid.

Learn why your next school project should be designed and built with NUDURA ICFs by visiting nudura.com.



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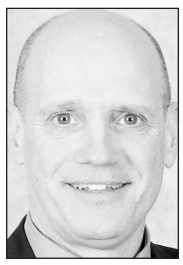
CONCRETE SYSTEMS HELP SCHOOLS ACHIEVE NET-ZERO GOALS

The combination of reinforced concrete and insulation provides an ideal load-bearing wall, thermal envelope and air barrier.

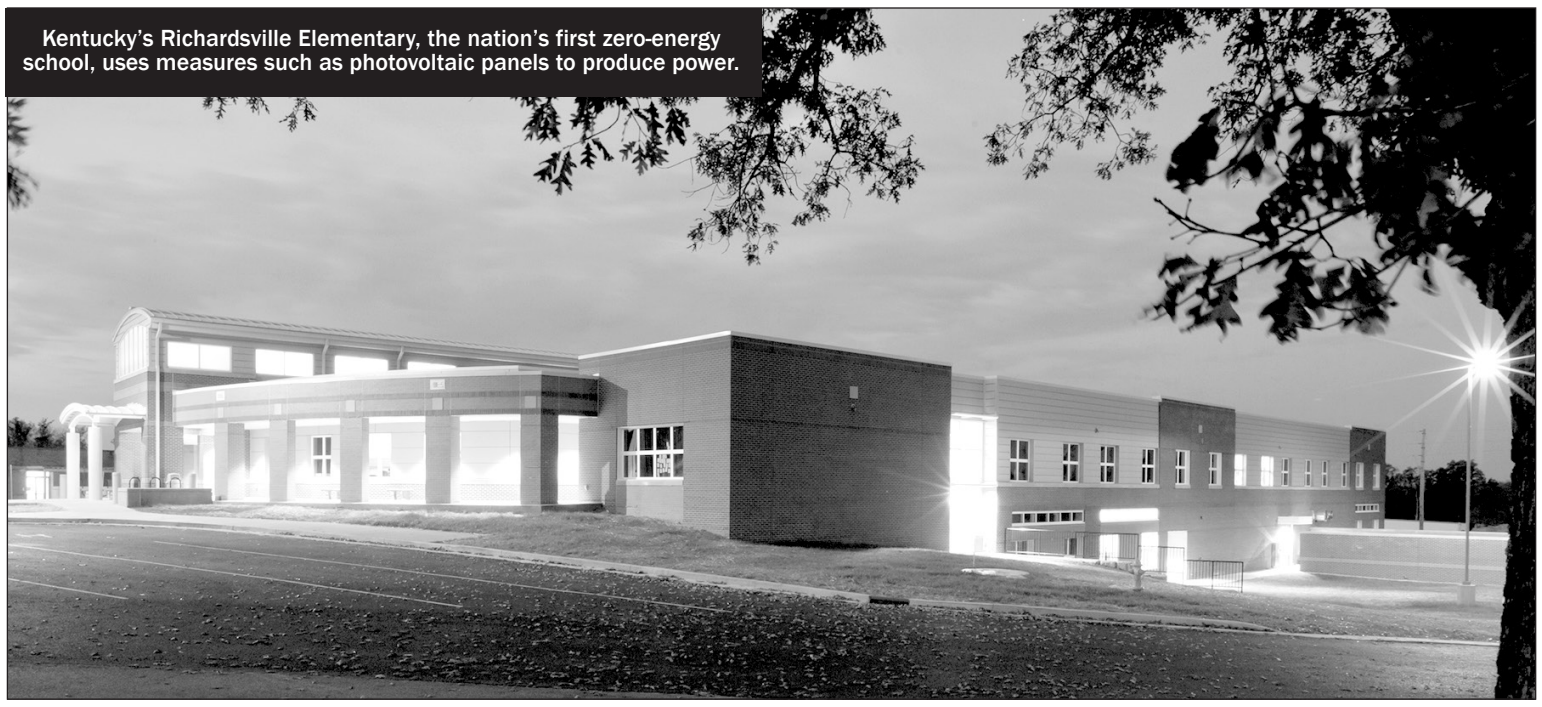
Concrete can make a major difference in reaching low- or net-zero goals on any K-12 project.

"Achieving zero-energy school facilities is a strategy of reducing energy use low enough that allows roof mounted solar panels or other on-site renewables can offset the buildings energy use over the course of an entire year," said Philip Donovan, one of the project architects for the net-positive energy Discovery Elementary School in Arlington, Virginia.



BY LIONEL LEMAY
NATIONAL READY MIXED CONCRETE ASSOCIATION

"Most of the energy savings are achieved through reducing the air leakage of the building skin thereby reducing the energy needed to heat and cool the building spaces," Donovan said. "Concrete is a modern building material with immense structural capacity and energy efficiency contributions. It also one of the most effective air barrier systems you can utilize."



Kentucky's Richardsville Elementary, the nation's first zero-energy school, uses measures such as photovoltaic panels to produce power.

PHOTO BY SHERMAN CARTER BARNHART

First to zero-energy

Following are several case studies highlighting the use of concrete and the role it plays in creating zero-energy school facilities.

Richardsville Elementary School, completed in 2010, is the nation's first zero-energy school. The 77,000-square-foot building combines drastic a reduction in energy consumption with on-site photovoltaic panels that produce more energy than is required to run the building.

The reduction in energy consumption was achieved using an insulating concrete form system for the exterior walls and geothermal heat pumps along with several passive solar strategies.

"We are tremendously proud that, since its opening in 2010, we have not paid a single utility bill on Richardsville Elementary School, said Jay Wilson, director of safety and management at Warren County Public Schools in Kentucky. "The reason for this cost avoidance is that the building actually generates more electricity than it consumes. At the end of the school year, we

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TACOMA SCHOOL HAS FLEXIBLE SPACES THAT INVITE LEARNING, COMMUNITY

The dual-purpose design of Browns Point Elementary allows quick and easy transformations to suit changing needs.

BY BRIAN HO & HOLLI SMITH
TCF ARCHITECTURE

Today more than ever before, designers are tasked with balancing diverse influences.

These include, but certainly are not limited to, increased budget pressure; compact sites that present challenging development requirements, and a requirement for architecture to keep ahead of our rapidly changing cultural, professional and educational landscape.

While maximizing the investment of public funds, it is increasingly important for public buildings to suit their primary purpose while also inviting broad community use after hours.

Today's school buildings strive to provide diverse and varied experiences to students, while inviting supplementary activities, both indoors and out. In the same way we encourage students to tap into a range of skills to solve problems with overlapping subject matter, we strive to produce buildings with components and spaces that support dual-purpose use.

Spatial relationships, size and sequencing of K-12 learning environments are consistently being re-studied in the effort to support rapidly evolving ideologies for learning and teaching.

Such is the case for Northeast Tacoma's Browns Point Elementary School, a project delivered as part of Tacoma Public Schools' 2013 bond.

This series of bond projects tasked design teams with dual-purposing every built square foot, interspersing opportunities for learning throughout and allowing quick and easy space transformation to suit changing needs.

In response to these criteria, Browns Point Elementary School relies on two primary strategies: first, circulation is considered a multifunctional "zone" intertwined with learning space, daylight and views. Second, outdoor space is carefully planned to invite engagement, performance opportunity and project-based work outside of the classroom.

Browns Point, one of a number of projects produced under this bond, shares a common attribute of celebrating the process of learning. Its efficient design enhances flow and function at every turn.

Community connection

In many communities, schools are the centers for congregation during non-school hours. This is true in the Browns Point neighborhood, in part due to the area's remote location across the waters of Commencement Bay.

An exercise of community asset mapping revealed the reliance of residents in utilizing the building and site for organized sports, as a neighborhood playground and spot for event gathering. This informed the floor plan's big move to promote the gymnasium, typically placed toward the back of the building, to the front and center.

This location allows easy access and celebrates, rather than hides, the exciting activity within through ground-level windows. Primary entrance for students and visitors during the school day, and secondary entrance for those accessing the building from the direction of the ballfields after hours, are offered through dual entries that flank the gym.

High and low glazing on three of the four sides allow visual connection to the front of the site, 51st Street to the north and the school's own internal core. To suit community events, doors open directly to the covered outdoor space at the front of the school to welcome visitors and allow activity to flow seamlessly from inside to out.

Reducing circulation

Most school floor plans are based on a series of wings connected by lengthy, double-loaded corridors. This traditional configuration offers direct access, acoustic separation and ample wall area to use as display surface. The downside: long corridors take time to navigate, a negative impact to valuable instructional time.

Contrarily, reducing the amount of space dedicated to circulation shortens transition time, compacts the building footprint

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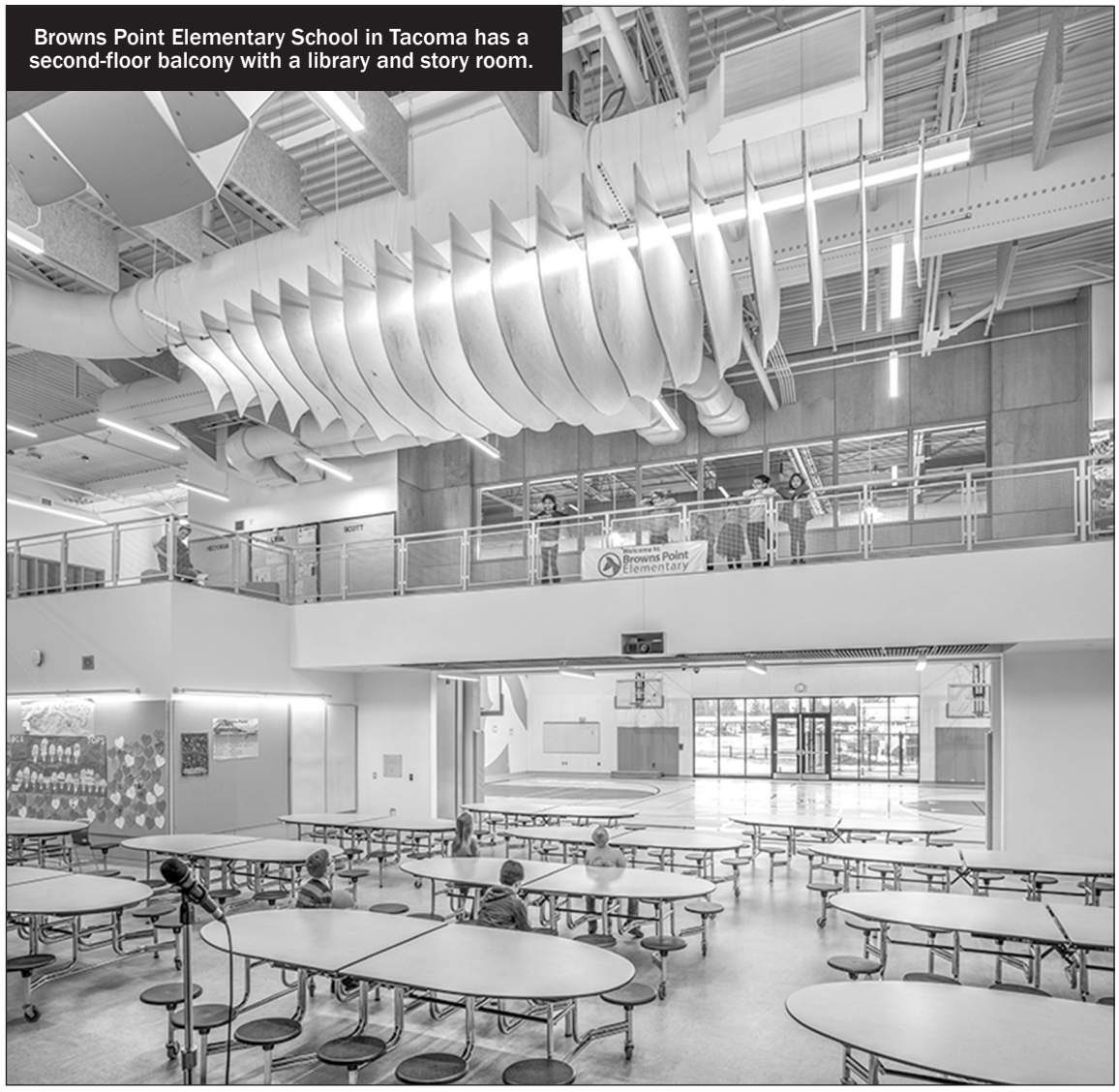
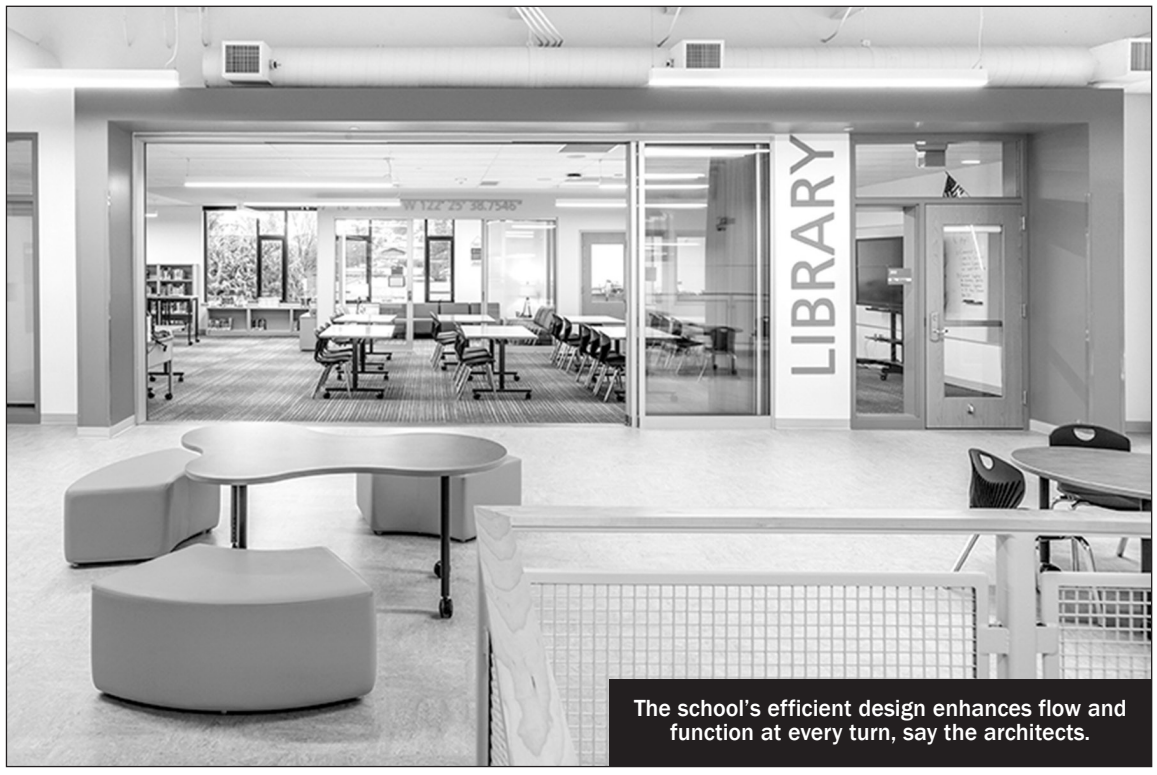


Browns Point Elementary School in Tacoma has a second-floor balcony with a library and story room.

PHOTOS BY ECKERT PHOTOGRAPHY



The school's efficient design enhances flow and function at every turn, say the architects.

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(reducing construction costs), and preserves space for dedicated instruction.

In an effort to decrease building area while protecting daylight and views, the floor plan of Browns Point reallocates circulation square footage as shared learning space. As a result, shared learning spaces are larger and more functional. Their placement between classrooms and outdoor courtyard gives nearly every classroom daylight from both the north and south.

Outdoor shelter

Outdoor covered space is a near-necessity for schools in the Pacific Northwest, to provide shelter before and after school and during recess on gray, wet days. Often an easy target for cost-cutting, it is important to maintain protected areas to facilitate much-needed outdoor time for elementary students.

The former Browns Point school building had negligible covered space, forcing rainy-day recess into small foyer spaces and long lines of students in corridors during afternoon pick-up.

Early in the design process for the replacement building, providing covered areas for these activities, as well as for other community events, was identified as a top priority.

It was recognized that because these activities could both occur in front of the building and happen at different times of day, the area allocated could be combined to offer a larger canopy than initially thought.

With the security gates open at the front of the school, parents can congregate under cover during pick up and drop off time. The canopy also serves after hours, for the community to share in the benefit of paved covered area as well as access to the building's activity zone.

Performance space

Performance space for performing arts and music, both formal and informal, lets students express themselves while sharing talents with family and peers.

In most schools, performance is directed toward the large assembly spaces offered by multipurpose rooms or gymnasiums. At Browns Point Elementary School, the music room is located between the performance platform and the end of the courtyard. This fulfills the adjacency requirement for complementary use with the multipurpose room as well as provides the ability to hold performances outside.

A large, transparent door set within a wall of glazing allows the easy movement of instruments and props to an outdoor stage, while inviting daylight inside — providing pleasant views to another instructional space.

The overlap between public and private space at Browns Point Elementary School achieves a sense of spaciousness within an efficient design. A combination of circulation-with-program-space fulfills the school district's desire to provide dual-purpose function to support students in their learning endeavors, while accommodating members of the community who make funding for these facilities possible.

Brian Ho is a managing principal of TCF Architecture and an accredited learning environment planner. Holli Smith is a senior associate, architect and certified interior designer.

CONCRETE SYSTEM

CONTINUED FROM PAGE 25

usually get a check back from the utility company in excess of $30,000."

Kenny Stanfield, principal at the architecture firm Sherman Carter Barnhart and architect on Richardsville Elementary School, said energy-saving schools pay off in the long run.

"The easiest way to increase a school districts budget is to reduce energy consumption," said Stanfield. "And the most cost-effective way to save energy is not to need it."

Stanfield, along with CMTA Engineers, lowered the energy use intensity for Richardsville Elementary School by 75%.

Because the energy use was so low and the building construction cost was below budget, the school district was able to absorb the cost of adding a 349-kilowatt photovoltaic array to provide enough energy to power the school and sell a small amount back to the electric utility.

And since energy is the highest operational expense in schools, these savings can go towards paying for additional teachers, the highest operational expense.

In late 2016, following the first full year of operation, the 98,000-square-foot Discovery Elementary School in Virginia became certified as the first zero-energy school in the mid-Atlantic and the largest zero-energy school in the country.

To meet energy goals, the design included insulating concrete form exterior walls, roof-mounted solar panels, a geothermal heating/cooling system and LED lighting.

"Insulating concrete form walls have an effective thermal mass equivalent to around R-40," said Donovan, one of the project architects at the time with VMDO for Discovery. "With its concrete core, it is one of the best air barrier systems you can utilize on a building. One of the most significant impacts on achieving an ultra-low energy use is reducing the air leakage of the building skin so we can reduce the size of the mechanical system and the amount of energy needed to heat and cool the building."

He added, "Code requires an air leakage maximum for the whole building to be no greater than 0.4 cubic feet per minute. The Army Corps of Engineers sets its standard at 0.25 cubic feet per minute. At Discovery, we required an air leakage of no greater than 0.15 cubic feet per minute for the whole building. We knew insulated concrete form, with its concrete core, was going to be the main building component to help us reach that metric, and it did. The building passed the air leakage test on the first try with a rate of 0.11 cubic feet per minute."

An energy dashboard that provides real-time energy data is utilized by both teachers and students to support and enhance the academic curriculum. The building was designed for an energy use intensity of 23, however actual energy use intensity is approximately 16, which is 76% lower than the national school average.

The school is net positive energy, meaning it produces more energy than it uses over the course of 12 months. The ultra-low energy use, coupled with the energy production of the solar array, means the school saves more than $100,000 per year on energy costs and is the easiest building to maintain in the school district's portfolio.

This is one of the main reasons why Arlington County Schools has mandated similar performance for all-new construction moving forward. The school was named a U.S. Department of Education Green Ribbon School and was an AIA COTE Top Ten Project in 2017. The project was completed under budget, returning millions of dollars to the district.

The U.S. Department of Energy selected Discovery as its case study to launch its Zero Energy Schools Accelerator Program.

First in Florida

NeoCity Academy in Kissimmee, Florida, will open in August and is on track to become the first zero-energy school building in the state of Florida.

The three-story, 45,000-square-foot STEM school will provide 500 students seats and was constructed in just nine months using concrete tilt-wall as its primary building material.

Cast flat on the first-floor slab, the 7¼-inch thick panels are tilted into place and secured to one another and the structural steel infill. Concrete tilt-wall construction is a primary building system in Florida for schools given its high thermal mass and quick construction timeframe.

The building is expected to hit a target energy use intensity of 16 and save the School District of Osceola County more than $115,000 year in energy costs.

"The key to ensuring a tight building envelope with tilt-wall construction is to provide a belt and suspenders approach to the detailing of the panel joints and wall openings." said Donovan, who is now community studio principal with Little Diversified Architectural Consulting and project architect.

"Building redundancy into the details ensures that the weakest part of the concrete wall system, the panel joint, remains viable even if several components of the detail fail. This keeps the high-performance air barrier intact and performing as designed."

NeoCity Academy will generate 228 kilowatts of electricity from its 694 self-ballasted and roof mounted solar panels. The project has already been recognized with an award of merit from the Florida Educational Facilities Planners Association.

According to Stanfield, the trend toward zero-energy schools, also known as net-zero energy or zero net energy, comes down to three factors: state-of-the-art design strategies and technologies to reduce energy consumption; affordable on-site solar energy, and insulating concrete forms that can provide high R-value, low air infiltration at a low cost.

Insulating concrete forms combine two well-established building products, reinforced concrete for strength and durability, and expanded polystyrene insulation for energy efficiency.

Insulating concrete form walls are made up of two layers of rigid insulation held together with plastic ties to form insulating concrete form units with a cavity in the center. The insulating concrete form units are stacked in the shape of the wall, reinforcing steel is added into the cavity and then concrete is placed into the form.

The result is a reinforced concrete wall with a layer of insulation on each side. What makes insulating concrete forms different from traditional concrete construction is that the forms remain in place after the concrete is cured to provide thermal insulation.

The combination of reinforced concrete and insulation provides an ideal load-bearing wall, thermal envelope, air barrier, fire barrier and sound barrier.

Insulating concrete forms are part of a concrete, masonry and steel building system regularly used in school construction to achieve high performance and energy efficient schools in Kentucky, Texas, Virginia and other states.

Lionel Lemay is executive vice president and division head of structures and sustainability for the National Ready Mixed Concrete Association.