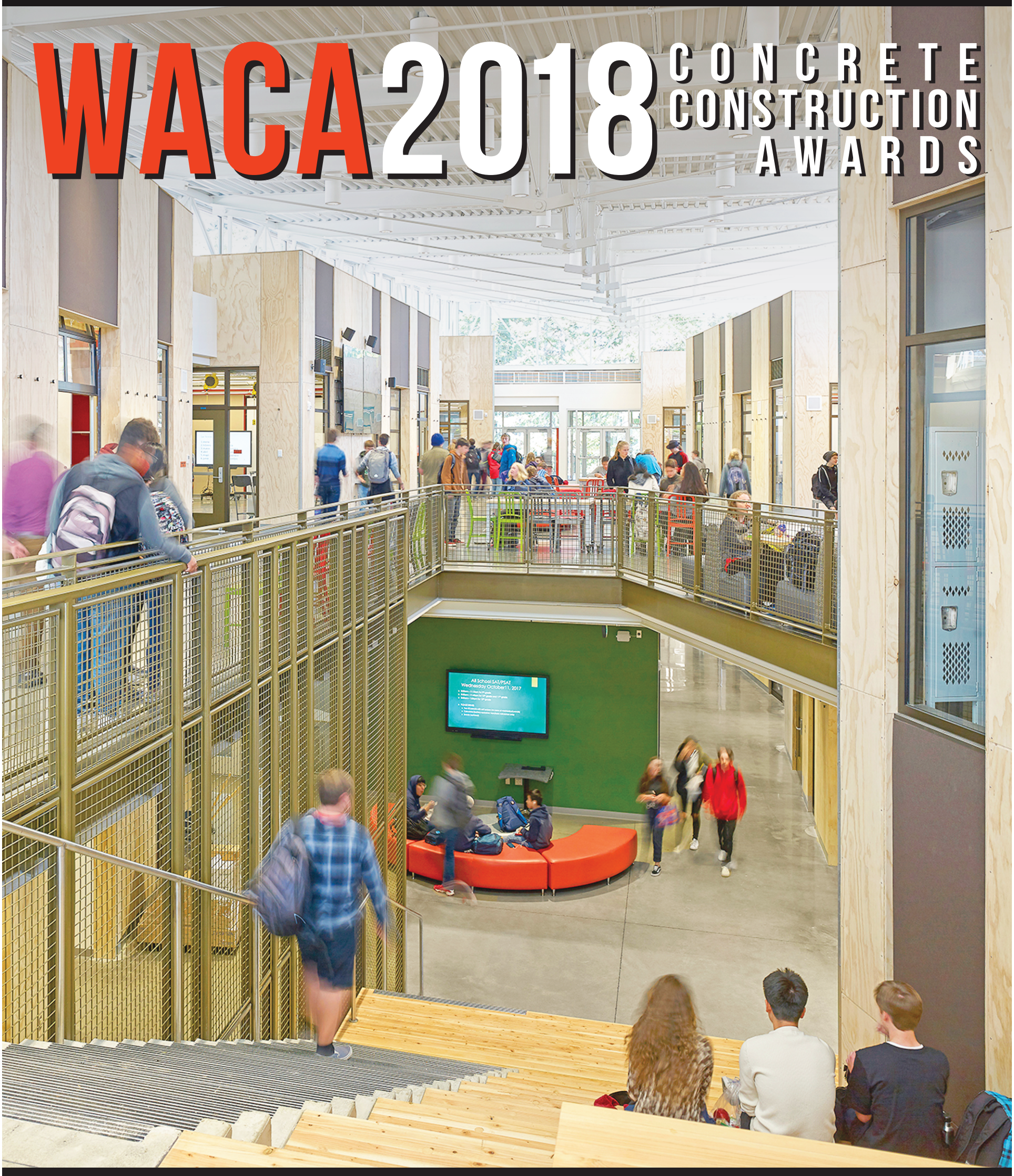
Seattle Daily Journal of Commerce

WACA 2018 CONCRETE CONSTRUCTION AWARDS



September 28, 2018

LOW-RISE STRUCTURES (NONRESIDENTIAL)

SAMI AT THE ENVIRONMENTAL LEARNING CENTER

Location: Tacoma
Owner/developer: Tacoma Public Schools
Team: Forma Construction, general and concrete contractor; McGranahan Architects, architect; PCS Structural Solutions, structural engineer; Miles Sand & Gravel, ready-mix supplier

The Environmental Learning Center is a unique partnership between Tacoma Public Schools and Metro Parks Tacoma where students can learn about sustainability, ecology and nature conservancy.

GRAND AWARD

Built on the Point Defiance Zoo & Aquarium campus, this multi-use facility houses formal learning spaces for Tacoma's Science and Math Institute (SAMI), as well as community spaces, collaborative and interpretive learning areas, and coordination and work spaces for zoo staff and volunteers.

Producing a 30,000-square-foot school on a very constrained site — and in the middle of an occupied zoo campus — required creative approaches to designing and building concrete forms, footings and shoring. Sited on a steeply sloping hill just 10 feet from the zoo's busy Animal Loop Drive, the west and north foundation walls — at 15 feet tall — were designed to serve a dual purpose as both foundation and retaining walls.

Collaborating with a local structural engineer on shoring plans, the general contractor installed a soil nail wall to support the road until these foundation/retaining walls were complete and the second floor was placed.

At its south entrance, the center features enormous concrete walls soaring 20 feet from their footings. Exposed on the exterior and interior of the building, these walls included numerous reveals and openings designed by the architect.

Bringing on a subcontractor to create shop drawings for these exposed walls helped streamline communication between the general contractor and architects, assuring that none of the details were lost in the process.

The restrictive site size and its proximity to the road through Point Defiance Park required that all concrete wall forms be hand-built with MDO using a typical strong back system — no tilt-up or precast concrete elements could be incorporated.

To take advantage of every inch of the construction site, the general contractor stored a majority of the construction materials 1,000 feet down the

Polished concrete covers 80 percent of the floor area inside Tacoma's Science and Math Institute.

PHOTO PROVIDED BY WACA

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TILT-UP STRUCTURES

This AutoZone distribution center in Pasco required 27,900 cubic yards of concrete.

PHOTO PROVIDED BY WACA

AUTOZONE DISTRIBUTION CENTER

Location: Pasco
Owner/developer: AutoZone Distribution Center
Team: Big D Construction Corp., general contractor; Poppoff, slab concrete contractor; Wm. Winkler Co., tilt concrete contractor; Pickering Firm, architect and structural engineer; American Rock Products, ready-mix supplier

This project is a testament to the advantages and sustainability of concrete in all facets of the building envelope and site components of construction.

The total project encompassed 27,900 cubic yards of concrete serviced from both on-site and off-site batch plant operations. Facilities included 409,800 square feet of Ductilcrete slabs, 93,000 square feet of conventional slab-on-grade and slab-on-deck, 139,300 square feet of cast-on-site tilt-up and 514,100 square feet of Portland cement concrete pavement with additional site curb, curb and gutter, and sidewalk.

Amenities included an integral colored and polished office/administrative area, truck maintenance facility as well as battery storage and warehousing and shipping/distribution warehouse operations.

The primary warehouse area utilized value-engineered Ductilcrete slabs, which eliminated traditional steel reinforcement and expanded joint spacing to 54 feet, offering significant operation and maintenance savings for the owner over the life of the building.

Portland cement concrete pavement utilized over the 11.5-acre site provided additional lifecycle advantages, reducing both maintenance costs and initial lighting costs.

The value-engineered concrete tilt-up construction provided further savings in initial construction costs compared with the project's initial steel building design, while accelerating the original construction schedule.

WASHINGTON AGGREGATES AND CONCRETE ASSOCIATION 2018 EXCELLENCE IN CONCRETE AWARD WINNERS

GRAND AWARD
Low-rise structures (nonresidential)
SAMI at the Environmental Learning Center
Tacoma

Tilt-up structures
Autozone Distribution Center
Pasco

High-rise structures
Kinects
Seattle

Infrastructure (transportation)
Second Avenue reconstruction project
Burbank, Walla Walla County

Infrastructure (non-transportation)
Oak Harbor clean water facility
Oak Harbor

Sustainable and resilient
Macnak headquarters
Gig Harbor

Architectural and artistic (residential)
Caledonia Summit
Tacoma

Architectural and artistic (nonresidential)
The Spheres
Seattle

ON THE COVER

The Science and Math Institute at the Environmental Learning Center in Tacoma won the grand award at the Washington Aggregates and Concrete Association's annual Excellence in Concrete Awards, held in Seattle on Sept. 27. The project was also the category winner for nonresidential low-rise structures. PHOTO PROVIDED BY WACA

DJC TEAM

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INFRASTRUCTURE (TRANSPORTATION)

SECOND AVENUE RECONSTRUCTION PROJECT

Location: Burbank, Walla Walla County
Owner/developer: Walla Walla County Public Works
Team: Wm. Winkler Co., general and concrete contractor; American Rock Products and Wm. Winkler Co., ready-mix suppliers

The Second Avenue project is the first compacted concrete pavement (CCP) prototype arterial construction in the United States.

While roller-compacted concrete has been utilized since the 1970s it has predominantly been utilized for log yards and spillway structures, but unable to serve our roadway infrastructure.

CCP is a next-generation application of this process that will allow for economical road construction and offer an extended life cycle similar to traditional concrete pavements. It utilizes proprietary additives in the project mix design, coupled with a proprietary surface enhancement.

The Second Avenue project required a total reconstruction of the failed asphalt pavement on the primary arterial into the Port of Walla Walla.

Existing asphalt and base material was pulverized and recycled utilizing cement treated base.

Concrete curb and gutter was constructed, followed by construction of the CCP. An on-site pug mill was erected for CCP to be constructed, and a high-density asphalt paver was used for placement, grading and compaction.

Unlike any other exterior pavement, the surface of the pavement was troweled with Whiteman hydrostatic riding trowels (typical of interior slabs) during application of the ACEiT Blue surface treatment. This allowed zero-slump materials to create a dense paste for final finishing immediately after troweling.

The surface is extremely dense and impermeable to water, ice and other environmental attacks. Upon applying the final tine finish, the surface was cured in a typical pavement procedure. Due to extremely low shrinkage, saw-cutting was not required, nor were dowels and load transfer devices required. To mirror a concrete pavement finish, saw-cuts were installed but not necessary.

This is the first project to enhance roller-compacted concrete basic products and provide for a structurally sound roadway that has the same finish and surface characteristics of traditional concrete pavement.

ACEiT Blue additives and surface application allow for final finishing (tine) of the pavement surface. Freeze-thaw resistance and surface durability mirror the performance of traditional concrete while also offering reduction in first cost.

Ultimately this process will be cost competitive with comparable asphalt and concrete sections while overcoming potholes, surface rutting and associated maintenance and life-cycle costs.

The 32-by-450-foot roadway was placed and finished in one day. The product achieved 98 percent density and strengths of 5,700 pounds per square inch in two days. Completed on Friday afternoon, the roadway was opened to heavy truck traffic on Monday morning.

This Tri-Cities-area street project used compacted concrete pavement, an alternative paving technology that can cut costs and resist potholes.

PHOTO PROVIDED BY WACA

HIGH-RISE STRUCTURES

KINECTS

Location: Seattle
Owner/developer: Security Properties
Team: Andersen Construction Co., general contractor; The Conco Cos., concrete contractor; Bumgardner, architect; Cary Kopczynski & Co., structural engineer; Stoneway Concrete, ready-mix supplier

Kinects is a 41-story tower located in the Denny Triangle, one of downtown Seattle's fastest growing neighborhoods.

The 550,000-square-foot project includes 356 apartments, retail, four levels of parking above grade and four additional levels below.

Three sides of this tower taper gently outward as the building rises. As a result, the 39th level is approximately 50 percent larger than the eighth level, creating more rentable square footage at the top of the building where views are best and rents are highest.

Construction started in early 2015 and finished in 2017. The project achieved LEED silver certification for its sustainable materials and advanced design.

Kinects utilized high-strength concrete and high-strength reinforcing bar to improve structural performance and enhance constructability.

A concrete strength of 12,000 pounds per square inch was specified for tower columns up to the eight level to reduce the column sizes, allow fewer and smaller columns, and increase the leasable floor area. This also allowed sizes to be kept constant nearly full height, which maximized formwork productivity.

Further, grade 80 reinforcement was used for all tie steel in columns and shear wall boundary elements, as well as in shear wall coupling beams. Grade 80 was also used in the mat foundation for all flexural reinforcement.

This synergistic use of high-strength concrete and high-strength rebar reduced the overall steel tonnage, minimized rebar congestion and reduced field labor.

Through a peer review process, the structural engineer used nonlinear analysis and performance-based design to develop a seismic system consisting of a single core extending from the foundation to the roof. This proved ultra-efficient, both in terms of material usage and spatial requirements.

To achieve the tower's outwardly sloping design, 10 columns on the expanding sides were slanted approximately 6 inches per level.

A consistent reinforcing layout was maintained by cantilevering the slab 12 feet at each floor and increasing the interior back span as the floor plates grew. This helped keep slab bending moments reasonable, while facilitating a repeatable reinforcing layout with only minor variations in rebar and tendon layout above the eighth level.

The floor system consists of 8-inch-thick, two-way post-tensioned slabs, with five 18-inch-deep outriggers extending 8 feet from the sloping columns. The outriggers helped extend the slab cantilevers to 12 feet at the perimeter.

The optimized slab design eliminated additional internal columns, which resulted in open and spacious interior layouts, and maximum floor-to-ceiling heights. Post-tensioned slabs were used at all levels, including the subterranean parking. Shotcrete perimeter basement walls were constructed after stressing of the subterranean slabs, while tower construction continued. The delay between basement slab and wall construction allowed unrestrained slab shortening, resulting in a nearly crack-free subterranean garage.

Three sides of the tower taper outward as the building rises. The floor plate on level 39 is 50 percent larger than the floor plate on level eight.

PHOTO PROVIDED BY WACA

INFRASTRUCTURE (NON-TRANSPORTATION)

OAK HARBOR CLEAN WATER FACILITY

Oak Harbor's new clean water facility is shown here under construction in June. It's scheduled to finish by the end of the year.

PHOTO PROVIDED BY WACA

Location: Oak Harbor
Owner/developer: City of Oak Harbor
Team: Hoffman Construction Co., general and concrete contractor; MWA Architects, architect; Carollo, structural engineer; Miles Sand & Gravel, ready-mix supplier

The Oak Harbor clean water facility broke ground in 2016. The facility will be capable of processing twice the daily flow of the facility it replaces when it begins serving the island's 24,000 residents by the end of 2018.

The facility's footprint covers just over 2 acres. It houses six membrane tanks, three aeration basin tanks, two WAS/RAS storage tanks, a cylindrical vortex chamber with a complex influent, wet well and effluent channel, as well as a two-chambered odor-control structure.

The two most complex and difficult structures within the complex are the membrane tanks and the vortex chamber. These structures were built using a combination of Peri and handset formwork.

The membrane tanks are supported by a sloping elevated concrete deck above a dry gallery below, supported by large cast-in-place walls and columns. The upper walls for the membrane follow the same sloping profile and tie into the effluent channel for the membrane tanks. Peri formwork was used to form the majority of the walls, but a combination of handset and Peri had to be used to form the connections between the trough, channel and supports below.

The large concrete conical vortex chamber consists of 1-foot-thick,14-foot-radius walls that transition into a 5-foot radius. The structure had to be poured in three stages due to intersecting concrete beams and deck.

Built-in-place hand-set forms were chosen due to the unique structure and the need to tie into adjacent Peri-formed walls that had to pour monolithically with the vortex.

SUSTAINABLE AND RESILIENT

MACNAK HEADQUARTERS

The Macnak headquarters has a timber-framed main entryway with a faux-granite base.

PHOTO PROVIDED BY WACA

Location: Gig Harbor
Owner/developer: Macnak Construction
Team: Macnak Construction, general and concrete contractor; Ambrose Lobato Design/Build, architect; Pacific Northwest Engineering, structural engineer; Holroyd, ready-mix supplier

The 7,500-square-foot Macnak headquarters is an energy-efficient office building and equipment maintenance facility.

Construction began in spring of 2016 and was completed in 10 months, including inspections.

The new office includes a basement with a classified concrete vault, employee gym, utility room and bathroom area.

The main floor is open with an atrium foyer, full-service kitchen, lounge area, restrooms/showers and nine large offices along the outer walls. The center has a 20-by-30-foot conference room with an accordion door divider to split the room into two smaller conference rooms.

Finished grade was set roughly 6 feet above the adjacent road, giving the building a commanding presence over the area and making it highly visible to roughly 30,000 cars per day.

The landscaping and exterior add to the grand design with faux granite covering the bottom 4 feet of the building, a timber-framed main entryway with two massive faux-granite rocks holding up the timber, retaining wall of faux striated granite and faux granite waterfall, and outdoor kitchen.

Each element of the property is designed to highlight the benefits of the materials and systems — from security to clean air, heating, media, connectivity and energy efficiency. Additional features include:

- Insulated concrete forms with R-50 actual performance walls that are 14 inches thick, creating a silent interior
- 10-zone radiant floor system
- Mitsubishi split-zone system and a variable refrigerant flow heat-exchange smart air system
- Concrete form basement ceiling
- Concrete floors mixed with Helix micro-rebar and finished with a high-strength industrial metallic polymer flooring
- Vaulted ceilings and smart LED suspended lighting
- State-of-the-art security and communications system

ARCHITECTURAL AND ARTISTIC (RESIDENTIAL)

CALEDONIA SUMMIT

Location: Tacoma
Owner/developer: David & Aya Kovanen
Team: Innovator Corporation, general contractor; Turnstone Construction, concrete contractor; David Kovanen and Angelo Architecture, architects; CT Engineering, structural engineer; Corliss Resources, ready-mix supplier

This project required tucking a large contemporary great room beneath a 90-year-old Tudor estate without impacting the existing historic structures.

The solution was to build into the side of an imposing Puget Sound cliff utilizing tall concrete shoring walls and then erecting a commercial-scale concrete structure to support the loads above.

In the process of achieving these goals other applications of decorative concrete were employed, including the construction of a naturalistic mine-shaft entry rendered in sculpted shotcrete, artistically finished exterior patios, and polished interior floors. Additionally, a concrete structure was built at the tideline below for housing boats, with its concrete construction protecting the structure from the strong tidal forces that pound against Browns Point in Tacoma.

The finished result is a building that virtually disappears into the side of a 45-foot-high cliff. The project features a multitude of concrete techniques and finishes:

- Artistic shotcrete at the building entrance that was sculpted as a rock formation with weathered timbers that appear as though one is entering a shaft blasted into native rock. This created a convincing theme that the project was an old mining operation that was "discovered" and remodeled. The mineral that was supposedly mined was "gingkonium", which to this day faintly glows through cracks between the rock fissures (it is actually hundreds of fiber optic strands embedded into the shotcrete).
- The green roof is large by single-family residential standards. The roof is structural concrete supported by a 45-foot-long beam, and it utilizes two novel technologies: Insulated concrete forms (ICF) and Xypex waterproofing. The ICF technology ensures this concrete roof is both strong and lightweight. The Xypex provides a secondary waterproofing that is integral within the concrete.
- The concrete walls use a modular ICF forming system, which solved the challenge of limited backside access and helped minimize the number of cold joints and hence the number of lifts required.
- Architectural concrete surfaces remain exposed on both the interior and exterior of the building. Transitions from sacked concrete walls to level 5 drywall are indistinguishable.
- The highly polished concrete floor is a deep grind with aggregate cut to be fully exposed. Beautiful colors in the aggregate are revealed by the deep cutting. The mirror-like, high-gloss finish of the floor makes the entire room incredible.

The 12-by-45-foot window facing Puget Sound is reflected in the concrete floor's mirror finish. Additives have minimized hairline cracking. The floor is slip resistant, requires no waxing or polishing, and has a shine equivalent to that of polished marble.

- The "star patio" at first glance seems to be like any other polished concrete patio. Yet buried in the concrete slab are 1,250 fiber optic strands that change colors, twinkle, and appear as stars at night. Invisible when off, they explode into color when illuminated.
- Extensive shoring was required. Controlled density fill (CDF) stabilized the project excavation. The soldier pile shoring and footings were shotcreted to retain the cliff face. Grouting injected into the tie-backs helped provide the structural support for the project. CDF also replaced soil backfill because of limited access.


The project included a concrete "star patio" with 1,250 embedded fiber optic strands that twinkle and change colors.

PHOTO PROVIDED BY WACA

ARCHITECTURAL AND ARTISTIC (NONRESIDENTIAL)

THE SPHERES

Inside the Spheres is a five-story independent structure made with 12 million pounds of concrete.

PHOTO PROVIDED BY WACA

Location: Seattle
Owner/developer: Amazon.com
Team: Sellen Construction, general and concrete contractor; NBBJ, architect; MKA, structural engineer; Stoneway Concrete, ready-mix supplier

The Spheres are a product of innovative thinking between the owner and design team through an extended conversation about what's typically missing from urban offices: a direct link to nature.

The Spheres are a place where Amazon employees can work and interact in an environment more akin to a garden than an office — an alternative workplace that fosters collaboration and innovation.

The facility is intended to delight, both inside and out. For the uninitiated visitor, it is an unexpected surprise in the cityscape. Views of its interior garden and accessible exterior landscape benefit the entire community, but particularly surrounding neighbors. For employees, it is the stimulus for serendipitous connections and a shared place where they are invited to think and work differently.

Separate structures support the exterior envelope and the five interior floor levels. This separation allows the self-supporting external shell to be as light and transparent as desired. The design team sought a unique structural system for the enclosure that would be modular and repetitive so that it could be largely fabricated off-site, but also highly organic in appearance to reflect the interior use.

The selected pattern was derived from a "Catalan" solid known as a pentagonal hexecontahedron. Essentially, a single pentagon of set dimensions is arrayed 60 times to form a complete sphere.

The enclosure structure and glazing system continues uninterrupted to street level so that the three spheres appear to be partially buried.

The project is both an experiment and a legacy project. The Spheres has an iconic structure recalling a traditional domed conservatory but is the product of design and engineering innovation.

Less visible from the outside is a five-story, independent concrete structure inside the Spheres made with 12 million pounds of concrete reinforced by 2.5 million pounds of rebar. Undulating concrete floor edges swim past the Catalan structure or pull away to create dramatic spaces. Two concrete shear cores resist seismic loads.

While the typical concrete shear core is rectangular-shaped and rough construction, these concrete cores were shaped like a football and a guitar pick with an exposed finished surface. The design team also wanted the structure to be a sculptural feature. The curved forms were over-sized by 2 inches, and form-liner pieces were used to impress a tree pattern climbing up the core.

Concrete also became the material to form the planter beds in the conservatory areas. These planters curve, swoop and dive to create spaces for introspection, conversation or exploration.

SAMI

CONTINUED FROM PAGE 2

road, carefully coordinating the delivery of materials to the site within the project schedule. Allowing all trades on site at the same time meant subcontractor crews were overlapping in schedules, requiring site electrical and excavation of power and utilities to run concurrent to excavation and backfilling of foundations.

During concrete pours, the contractor worked with Metro Parks Tacoma to close Animal Loop Road — requiring additional coordination with the zoo to ensure these closures were not limiting access for the zoo and the park's other ongoing improvement projects.

Inside, the gleaming, polished concrete floors on the first and second levels make up 80 percent of the school's floor area. The second-floor slab, installed over metal decking, required customized, detailed layout and saw-cutting of joints.

Several mock-ups of the floor polishing were created and tested on to help develop the best procedure for cutting the joints on the finished floors. These floors were then water cured and protected with filter fabric after placement, which was removed prior to crews using the Retro-Plate 99 system to polish the concrete floors.

Though not extremely large, the center and its site included extensive concrete work. Besides its traditional concrete stem walls and footings, concrete soil nail walls, and concrete basement and retaining walls, the project also included concrete amphitheater steps, new outdoor stairs and concrete walkways, exterior hardscape, exposed and polished concrete floors, and interior concrete shear walls.

The general contractor's self-performance of the concrete on the center brought to fruition the architect's design goals through efficient, cost-effective and long-lasting materiality.

Just like the environmental conditions that SAMI students study, the finished Environmental Learning Center looks like it was always meant to be there.

2018 EXCELLENCE IN CONCRETE AWARDS RUNNERS-UP

Tilt-up structures
IPT Tacoma Logistics Center
Location: Tacoma
Owner/developer: IPT Tacoma Logistics Center

Low-rise structures (nonresidential)
Ilani Casino Resort
Location: Ridgefield, Clark County
Owner/developer: Cowlitz Indian Tribe with Salishan-Mohegan LLC

High-rise structures
W Bellevue hotel
Location: Bellevue
Owner/developer: Kemper Development Co.

Infrastructure (transportation)
Mill Plain interchange to Northeast 18th Street
Location: Vancouver
Owner/developer: Washington State Department of Transportation

Infrastructure (non-transportation)
Newhalem Penstock saddle replacements
Location: Newhalem, Whatcom County
Owner/developer: Seattle City Light

Sustainable and resilient
Factoria Recycling and Transfer Station
Location: Bellevue
Owner/developer: King County Solid Waste Division

Architectural and artistic (residential)
Vallone residence
Owner/developer: Rick and Lori Vallone

Architectural and artistic (nonresidential)
Bellevue Downtown Park
Location: Bellevue
Owner/developer: City of Bellevue