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PROJECT OF
THE YEAR

The Century
Project for the
Space Needle,
Seattle

**BEST OF
THE BEST**

WINNING PROJECTS OF 2020

THROUGH THE LOOKING GLASS

PLATFORM PROVIDES SAFE
LANDING TO INSTALL GLAZING
FOR MULTIDIRECTIONAL VIEWS
AT SEATTLE'S SPACE NEEDLE
(P. 46)

BEST OF THE BEST

Space Needle Revamp Creates Iconic New Views

46 Among the 20 diverse category winners of ENR's annual Best of the Best Projects competition, the Century Project for Seattle's Space Needle wins the top prize. The sky-high renovation overcame logistical challenges to transform the landmark into a glass jewel box with take-your-breath-away views.

Cover photo courtesy of The Space Needle Corp.; photo (right) by Hufton + Crow Photography



BIRD'S-EYE VIEW The Space Needle renovation adds floor-to-ceiling windows and glass benches to the observation deck.

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TIME LAPSE The Century Project, Seattle's renovation of the Space Needle, used an elevated platform erected at night and placed 500 ft up.

BEST OF THE BEST 2020

WINNERS

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**BEST
OF THE
BEST**



These 20 awards come as the result of a nearly yearlong effort by ENR editors and about 100 members of the construction industry who judged project submissions at various stages of the contest. The projects represent the pinnacle of design and construction achievement in their respective categories from across the U.S. among those completed between May 2019 and May 2020. The contest began last March with a call for entries. Despite logistical and staffing challenges posed by COVID-19, the industry resoundingly responded with nearly 900 project teams submitting their work. In each of ENR's 10 regions, editors assembled a panel of judges to select winners in 20 categories, listed on the opposite page, which moved up to the national competition—around 200 projects in total. A new group of judges (below) examined each project in an effort to determine the best of the best in terms of teamwork, safety, overcoming challenges, innovation and quality. Three projects were shortlisted as Project of the Year nominees, and Seattle's logistically complex Space Needle renovation received top honors. Celebrate the winners on April 9. For more information, visit AOE2021.com.

JUDGES



Stephen T. Ayers
The Ayers Group LLC
President and the 11th
Architect of the Capitol



Randall "Randy" Iwasaki
Amazon Web
Services
Leader, State and
Local Transportation



Blake Peck
MBP
Founder



Wayne Crew
National Academy of
Construction
General Secretary



Diane Jacobs
Holly Street
Studio
Principal



Jennifer Pinck
Anser Advisory
Strategic Advisor and
Founder of Pinck & Co.



Bart Eberwein
Hoffman Corp.
Executive Vice President
(Retired)



Greg Kelly
STV
CEO



Timothy Psomas
P2S Engineering and
DKS Associates
Board Member



Steve Halverson
The Haskell Co.
Chairman



Tim Milam
FX Collaborative
Partner, Managing
Director



Matt Schlageter
Martin/Martin
Consulting
Engineers
Principal and
Director, Civil
Engineering

EXCELLENCE IN SAFETY JUDGES



Carl Heinlein
American Contractors
Insurance Group
Senior Safety
Consultant



Rick Zellen
Zurich North America
Assistant Vice
President, Principal
Risk Engineer

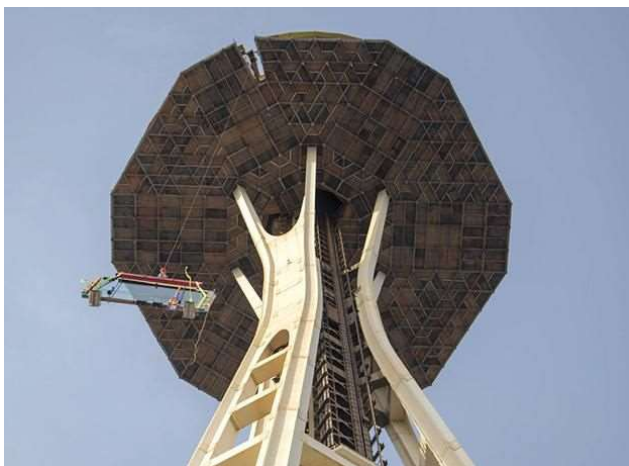
BEST PROJECT, RENOVATION/RESTORATION

GIVING VISITORS HEART-FLUTTERING MOMENTS

The Century Project for the Space Needle | Submitted by Hoffman Construction Co.

SEATTLE

SAUCERFUL OF SECRETS Seattle's Space Needle gets a major upgrade from its 1960s roots with the installation of 176 tons of glass for 360° views. The team peeled back layers of additions to reveal the original design's ingenuity and intent: take-your-breath-away views for a one-of-a-kind experience.



PROJECT OF THE YEAR

REGION: **ENR** NORTHWEST

OWNER Space Needle Corp.

LEAD DESIGN FIRM Olson Kundig

GENERAL CONTRACTOR Hoffman Construction Co.

STRUCTURAL/MEP ENGINEER (TOP HOUSE RENOVATION) Arup

ACOUSTIC ENGINEER BRC Acoustics

SUBCONTRACTORS Seneca Group; Battle Management Consulting; Magnusson Klemencic Associates; Holaday-Parks Inc.; Holmes; Front Inc.; Niteo; RDH; Tihany Design; McVey Oakley; Fives Lund LLC; O'Brien & Co.; BrandSafway; Apex Steel; Breedt Tooling & Design

When Jeff Wright was about three years old, his father, Howard S. Wright, one of the five original partner owners and general contractor for the Space Needle, loaded him into a then-under-construction elevator and took him to the structure's observation desk. With his father holding his ankles, Jeff lay on his stomach to peer over the Space Needle's edge.

"It scared the dickens out of me," says Wright, now chairman of the Space Needle Corp., a position he has held for 20 years. "I don't remember very many things 60 years back, but I remember that like it was yesterday."

That memory, in part, inspired the Century Project, the Space Needle's \$100-million renovation to transform the disk, set 520 ft in the air, into a glass jewel box in the sky and give the landmark's 1.3 million annual visitors the same gasp-inducing experience. The project's design called for installation of 176 tons of glass material—196% more than the Space

Needle originally had. The revamp includes floor-to-ceiling glass panels, an outdoor observation deck with open-air glass walls and glass benches, and a glass-floor oculus at the base of a cantilevered steel, wood and glass staircase that connects to the Loupe, the world's first and only rotating glass floor.

Built for the 1962 World's Fair, the Space Needle's original concept was to give sweeping Seattle views while symbolizing space-age aspirations and the city's innovative spirit. The view was always the point. But after 50 years of remodels and additions, including a cement barrier wall and wire cages, the landmark needed a modernization that would "get out of the way," expand views and reveal its internal structure by leaning on the Space Needle's original sketches.

Alan Maskin, principal and owner of lead design firm Olson Kundig, came to appreciate that same view when, doing research, he and a colleague crawled



OSCILLATIONS The Loupe, the world's only rotating glass floor, exposes the inner workings.

BEST OF THE BEST WINNERS

between the spaces under the Needle's floor, where they found a hole that looked 500 ft straight down. "We made a point of saying to each other that this is a view that nobody has ever seen before, and what if we opened that up to the world and let people see the aspects of the innovations of the original architects, builders and engineers."

Maskin's team began with a digital model of the existing space that allowed it to play a game of what-if. "We started to hit the delete key," says Maskin. What if they took away the cement barrier? What if they took away the rotating floor and made it glass? "So, we kept deleting and deleting and deleting, and the project became about subtraction because in that model we just kept erasing, and the project kept getting better and better the more we took away."

Space Oddity

The project presented enormous logistical challenges: demolition and construction set 500 ft in the air was like building a ship in a bottle, and Maskin says the construction might as well have been in outer space. "It really did feel like it could have been on the international space station—it felt like it could be that remote," Maskin says. The disc's limited workspace was accessible through only one of the Space Needle's three elevators. At the same time, the owners wanted the Space Needle to remain open to the public during the renovation.

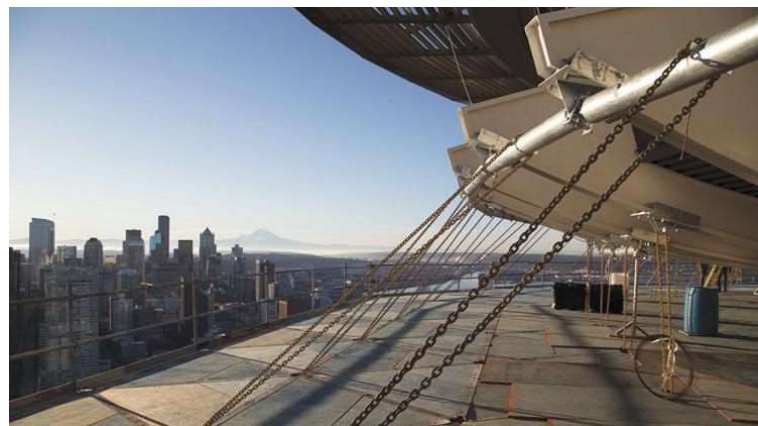
Bob Vincent, project manager at Hoffman Construction Co. and one of ENR's 2020 Top 25 Newsmakers, first had to figure out how to provide space for workers and get material to the observation deck. After rejecting the use of a giant, costly crane, the team recruited BrandSafway to create a suspended, retractable QuikDeck platform connected to the Needle's upper structure, starting with a 16-ft-wide suspended platform ring in three sections, each connected with an 8-ft walkway.

To avoid disturbing Space Needle visitors during the day, a crew of 25 hoisted the 14-ton, 106-ft-dia nascent platform in the middle of the night and placed the ring 500 ft in the air using a dozen two-part Tractel hoists, each with an 8,800-lb capacity. Meanwhile, a dozen workers were stationed on top of the rising platform to chain it in place. The platform was then built full size, to 135 ft dia, with a total weight of 87 tons. It had a weather barrier that could withstand 115-mph winds. Hoffman estimates the quick deck system resulted in cost savings of over \$7 million compared to traditional scaffolding and a large crane.

"Within days there was a windstorm, and it held up beautifully," says John May, BrandSafway branch manager.

Blowing in the Wind

But the challenge of how to hoist giant glass panels up to the platform and the observation deck remained, a task that Apex Steel helped to solve. The firm worked with Hoffman to design a custom gantry crane positioned on the Needle's roof to lift steel and glass panels and to eventually dismantle the scaffolding. Kevin Koester, president of Apex Steel, says the



THE WEIGHT The suspended QuikDeck platform weighs in at 87 tons.

beauty of the one-of-a-kind crane, brought up the elevator piece by piece and assembled by hand on the observation deck, was that it could be dismantled and reused. It is now in storage for future use to replace glass panels or other updates.

Vincent says that while he stood on the scaffolding in a harness, he was cognizant of how forceful Seattle's wind could be. During the 10-minute-long crane hoist for each 2,300-lb glass panel from the ground to the observation deck, the wind could turn the panels into dangerous pinwheels. To keep the



JUST ONE LOOK The Space Needle is built to withstand significant wind and move 1 in. for every 10 mph of winds.

glazing steady, the team developed motorized fans mounted to a custom spreader bar attached to the glass panels and controlled the fans remotely from the ground—similar to drones—to keep the panels from spinning during hoist.

Breedt Production Tooling and Design built a 5,600-lb glass-placement robot (nicknamed Ndulu) on the observation deck. Ndulu grabbed each panel through a suction-cup-like mechanism and maneuvered along a track to place the glass panels.

Spinning Wheel

Inside the Space Needle, Wade Morris, senior engineer and project manager at Fives Lund LLC, researched how to transform the floor into the Loupe, the world's first and only revolving glass floor. The floor formerly rotated on traditional, railroad-style rails mounted to the structure, with the wheels attached to the floor's underside. The new mechanism has 192 Nylatron wheels mounted to the stationary frame, allowing the floor to comply with the Space Needle's movement and geometry changes. Morris estimates the floor's rotation components weigh about 80 tons. The floor is rotated by 12

motors, each with ¼ horsepower and a 426:1 gear reduction. The motors essentially “follow” the slightly imperfectly round turntable by sliding radially to account for the building's inaccurate geometry, Morris explains.

“My concern was that things were not going to be flat and not going to be round but also they were not going to be positioned correctly and they might not roll perfectly straight,” says Morris. “As they were putting in those glass panels and they were manually rotating the table, all those concerns and worries of mine were alleviated when we realized that the table indeed was going to revolve and fit together properly.”

The Space Needle's designation as a Seattle landmark required the exterior look of the building to remain unaltered, creating a challenge to implementing the design of open floor views showcasing the turntable mechanics, elevators and ground below.

“It always rotated, but it had been opaque previously, with services running below it, so the glazing really required a rethink of the mechanical strategy in the space,” says Cress Wakefield, associate at Arup, the project's structural and building services engineer. With the underfloor services no longer an option, Arup designed an overhead air strategy using computational fluid dynamics (CFD) analysis to optimize the design. The new floor also required structural retrofits to accommodate the increased weight of the glass as well as maintenance loading.

“The modern manufacturing capabilities really allowed the engineer and the architect to design and install glazing in sizes and locations that the original designers could only have dreamt of—and that's how the extension of the views was realized, as well as the floor,” says Wakefield. It would not have happened “without the advance in the material science of glazing, and that is an innovation that will enable design and will be carried forward in a lot of other unique situations.”

Come Together

Olson Kundig's Maskin says one of his great joys is watching visitors experience the Space Needle. “It is one of the most visceral projects I will ever design, and it's also the most interactive—people have to use their bodies,” says Maskin, noting he has never before made architecture that people want to touch, lie down on, dance on and peer over. He hears children cajole grandparents to take the first steps onto the glass floor. “Almost everyone goes a little bit further than they think they are going to go.”

While the project team accomplished the renovation's ultimate goal of giving visitors a heart-fluttering experience, Wright is also proud that the project will inspire memories for the Century Project's team and crew.

“For the last 60 years, I've had people come up to me and say, ‘My dad built the Space Needle,’” says Wright, telling project workers their kids will have similar memories of their work. “That's a story that will be with them forever.”

By Erica Berardi