



## **FACT SHEET: RENOVATION CONSTRUCTION**

In September 2017, the Space Needle started its multi-year renovation venture. The \$100 million remodel, called Century Project, included updates to the 56-year-old landmark's physical systems and elevated the visitor experience by dramatically enhancing the views.

### **RENOVATION AT A GLANCE:**

- 10 Layers (37 tons) of Glass Form The Rotating Floor
- Never-Before-Seen Views of Exterior Structure
- New Kinetic Floor Mechanism, Visible For The First Time
- 196% More Glass (176 Tons) Overall
- Removed Walls, Security Cages and Floors
- New Interior Stair Connects All Three "Top House" Levels
- Never-Before-Seen Views of Interior Structure
- New Glass-Floored Oculus at Base of Stair
- New Glass Structural Barriers and "Skyriser" Benches
- Unobstructed 360-Degree Views
- Increased Accessibility and LEED Gold for Commercial Interiors

### **RENOVATION HIGHLIGHTS:**

- The design and installation of *The Loupe*—the world's first and only revolving glass floor.
- The removal of walls, security caging, and flooring, which were replaced with more than 20,000 square feet of glass surface.
- The design and installation of a cantilever interior grand staircase that connects the Space Needle's 520 and 500-foot levels.
- The design and installation of 24 tilted *Skyrisers* (or glass benches) on the Space Needle's 520-foot open-air observation level.
- An overall reimagined design that exposes never-before-seen views of the landmark's unique exterior.

### **DID YOU KNOW?**

- The Century Project is the Space Needle's largest renovation investment to date. Privately funded, the project cost \$100 million. The original construction costs to build the Space Needle in 1961-62 was \$4.5 million. Taking into account inflation, you could build almost three whole Space Needles for the cost of this renovation project.
- Prior to the Century Project, the Space Needle has had two major upgrades that shaped the landmark into what it is today. In 1982, the tower's 100-foot event level was added. In 2000, a two-story pavilion at the base of structure was added to extend the arrival experience and expand the retail store, Spacebase, which showcases the work of many northwest craftsman and curators.

- More than 50 companies and experts in specialties in areas like wind, seismic, acoustics, steel, and glass came together from around the world to be part of the renovation.
- On any given day, between 100 and 170 workers were active on the construction site, representing up to 18 different trades. To date, more than 500 workers contributed to the project.
- Workers were onsite 20 hours per day, 6 days a week to complete the project.
- In order to do construction while remaining open to the public, the construction team hoisted a temporary work platform 500 feet in the air using 12 independent cables and motors. Workers used the platform, weighing 100 tons and fixed to the canoe beams just below the lower observation level, to install the glass floor and make other significant updates to the tower.
- A gantry crane was installed on the roof of the Space Needle to lift materials too large for the landmark's elevators. The tower's largest pieces of the glass, each 11-feet by 7-feet and weighing 2,300 pounds, were hoisted with the gantry crane.
- A custom designed and fabricated robotic glass placement machine was built to put the large pieces of glass into place 520-feet in the air. A total of eight 20-inches by 12-inches suction cups joined to a robotic arm attached to the glass panel to create a lock-tight seal. Once secured, the robot moved each glass panel carefully into place where it was then secured to the base by the construction team. With the renovation, the Space Needle was able to greatly improve accessibility with a custom-designed, state-of-the-art ADA lift and improved access with the addition of double-sized doors and wide stairways allowing for a more gracious, crowd-friendly ingress and egress to the outer open-air deck.

#### **REVOLVING GLASS FLOOR**

- The Space Needle installed *The Loupe*—the world's first and only glass revolving floor.
- Weighing 37 tons, the floor has a total of 10 layers of glass. There are six layers of glass in the rotating portion, including a "scuff" layer that can be easily replaced if damage occurs without compromising the floor's integrity. The other four layers are part of the soffit glass, or the floor's most outer layers.
- The outer side of the underlying soffit glass includes a frit pattern; similar to a design wrap on a bus, this frit pattern gives visitors clear downward views from the inside of the structure and opaque views from the outside or ground level looking up.
- A total of 12 - ¼ horsepower (hp) motors are used to rotate the glass floor which sits on top of 48 rollers, allowing the glass floor to smoothly guide as it revolves.
- The new motors allow *The Loupe's* speed to be modified as needed. The floor can make a full rotation in 20 minutes. The slowest speed is 90 minutes. The glass floor will rotate at a speed of one full rotation every 45 minutes when the floor is unveiled to guests.
- Historically, the Space Needle's floor used a 1.5 hp motor and made a full rotation in 47 minutes.
- The Loupe can be partially covered with a high tech carbon fiber panels. Stronger than steel, these sturdy sleek panels were manufactured by a military contractor in central Michigan. This gives the Space Needle the option to cover the glass turntable as needed.

Glass and steel were the two main materials use during the renovation. More than 250 tons of glass and steel have been added to increase the strength, stability, functionality, and beauty to the tower's overall design.

## **GLASS**

- Glass for the Century Project came from California, Switzerland, and Germany.
- A total of 48 glass panels were installed on the exterior barrier of the observation deck as part of the renovation.
- Each panel of barrier glass on the observation deck weighs 2,300 pounds measuring 2.5 inches thick, 7 feet wide and 11 feet high.
- Ten different kinds of glass were used in the renovation, totaling more than 176 tons of glass material.
- Total glass incorporated in the new design, including the new glass rotating floor, increased by more than 196% (vs. the amount of glass utilized when the Space Needle opened).
- A total of 24 sleek, slanted glass benches called Skyrisers were affixed to alternating pieces of barrier glass. The benches give guests the thrilling feeling of floating on air as they sit on the Space Needle's open-air observation deck.

## **THE STRENGTH OF GLASS AT THE SPACE NEEDLE**

- The glass used for the Space Needle's new rotating glass floor, glass barriers, and glass benches was designed like reinforced concrete.
- Each section was custom-designed with multiple redundant layers of structural glass fused together with a high-strength interlayer giving the glass composite a strength capacity up to five times the design loads used for code requirements.
- On these sturdy glass structures, there is no single structural layer of glass. The glass used for the barriers, benches, and floor have 3-to-10 structural layers each. With these redundant layers, the glass floor, glass barriers, and glass benches would still be structural sound and safe even if one or more layers of glass were compromised.
- The glass has been extensively tested and is designed to be very safe. All glass is tested for structural integrity under wind loads, live loads, and human impact.
- Even though the glass barriers on the open-air deck have no framing, the 11-foot high and 7-foot wide glass panels are designed like the windscreen of a jumbo jet, so they can take all design loads even if it is damaged.
- The glass floor is the strongest structural glass added to the renovated Space Needle. Between the rotating glass floor and its underlying soffit, there are a total of 10 layers of glass.
- The glass floor is sturdier and safer than the previous rotating floor at the Space Needle and much stronger than standard office and retail floors in Seattle.
- The very top layer of that glass floor is a scuff plate designed to be an aesthetic layer to protect the main stack of structural glass from scuffs marks from shoes, heels, etc. The scuff plates are designed to be replaced periodically for visual clarity, but have no load-bearing responsibilities.
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## **STEEL**

- From internal piping to exposed structural beam support, 80 to 90 tons of steel have been added to the tower.
- Seismic upgrades were part of this project. The Space Needle was originally overbuilt to withstand some of the harshest weather conditions. The additional steel added to the tower during the project enhanced the overall strength of the building.
- The new seismic upgrades accommodate for ¾-inches of movement in every direction.

**WORD KEY:**

*The Loupe*: The world's first and only revolving glass floor.

*Skyrisers*: The Space Needle's 24 titled glass benches, located on the 520-foot observation level.

*Atmos*: The Space Needle's top house, which includes both the 500- and 520-foot observation levels.

*Atmos Café*: The café located on the Space Needle's 520-foot observation level.

*Atmos Wine Bar*: The lounge located on *The Loupe*, the world's first revolving glass floor.

*\*For location and other details, please refer to the diagram in the press kit.*