

Reroofing of Bloedel Conservatory Proves a Challenge

By Frank O'Brien

Workers replaced 1,488 acrylic domes in a “giant jig-saw” on the 45-year-old conservatory roof. The new domes had to fit the original aluminum structure. Photo by Richard Lam.

In a project that Spectrum Skyworks principal Ken Boyce calls a once-in-a-lifetime opportunity, the Port Coquitlam, British Columbia, company is replacing the 45-year-old triodetic-domed roof of Vancouver's Bloedel Conservatory in Queen Elizabeth Park.

It is a challenging and sensitive \$2.4 million² contract, ramped up by the fact the popular tourist destination had to remain open during the roof replacement, and special care was needed to ensure the safety of the profusion of plants and birds inside the temperature-controlled dome.

The historically sensitive work itself is daunting. The Bloedel Conservatory, designated as a heritage structure, was completed in 1969 as British Columbia's first

triodetic structure. The now-iconic dome is composed of 1,488 acrylic “bubbles” with 32 individual shapes. In all, the roof is 140 ft. in diameter and rises 34 ft. at the apex.

The unique contract with the city of Vancouver contained a provision that no birds could be allowed to escape and no raptors allowed to enter while the work was being completed, Boyce noted.

Spectrum's first issue, therefore, was to protect the conservatory roof and inhabitants while replacing the panels, which called for extensive and unique scaffolding.

“It was quite a challenge,” understated Paul Griffin, construction manager of Vancouver-based WestCan Scaffolding Inc., who rolled onto the site in January. WestCan first had to fabricate twin 180-ft.-

long spline beams, each weighing 10 tons, on site and crane them into place above the dome. Kansen Crane Service Inc. of Richmond brought in a 276-ton crane for the job, which proved tricky since the conservatory is built above a reservoir. This allowed only a narrow platform to work from due to weight restrictions. “There were times we were wondering if it would all go together,” Griffin conceded with a chuckle.

Read Jones Christoffersen (RJC) Consulting Engineers of Vancouver acted as the prime consultant and design engineer for the project. The RJC team's contribution included whole-building energy modeling, as well as design of thermal improvements required for the near half-century-old building.

TRICKY SCAFFOLDING

To protect the heritage structure, the scaffolding had to surround the whole building without touching it at any point. This meant that scaffolding formed a sheltering shell 55 meters (180 ft.) out from the building, Griffin said. The scaffolding was then draped in plastic sheeting to not only protect workers and the roof from winter rains, but also to continue to allow sunlight into the conservatory.

The protection continued inside, where netting was installed to shield visitors and staff from falling debris and to ensure no birds could enter or leave while the panels were replaced. "It took some high-riggers to put those in place," Boyce said. Pacific Ropes of Richmond was contracted to do this phase of work.

As Boyce explained during a spring walk-through of the construction site, each of the replacement dome panels was custom-molded and installed by Spectrum Skyworks and then fitted precisely onto the existing aluminum structure. The original aluminum tubes that form the structure were fabricated by Triodetic Structures Ltd. of Arnprior, Ontario, and remain in good shape nearly a half-century after they were installed.

"It is like a giant jigsaw," Boyce said, explaining how his crew follows a coded grid to

place each of the acrylic panels into its exact position, averaging 30 to 40 per day. Because they must fit the original aluminum frames, the panels are all single-pane acrylic but are twice as thick as the originals. "We tried to get as much in improved R-value as we could," explained Spectrum site foreman Wayne Dueck.

SEALING THE DEAL

The original caulking used to seal the dome panels was all removed and replaced by EPDM seals custom-made by Tremco Commercial Sealants and Waterproofing. Each panel was "fish-tank" sealed with silicone to prevent any leaks and heat loss, Dueck added.

The sealing system improved the thermal break of the aluminum frame, said Danica Djurkovic, director of facilities planning and development with the City of Vancouver, which projects it will achieve a 2% reduction in natural gas consumption for the building.

Spectrum expected to complete the project this fall and hosted a July 3 celebration as WestCan prepared to remove the scaffolding. It will be missed: As part of the job, Spectrum had strung lights from the scaffolding to allow the dome to continue to glow at night.

When the retrofit is complete, the Bloedel Conservatory will look much the same as the original, though more energy-efficient, brighter, and more comfortable. The work ensures one of Vancouver's most popular landmarks will remain a beacon in Queen Elizabeth Park for decades to come.

"It is a wonderful site and a great project to work on," Boyce said, in crediting his crews and subcontractors for a job well done. 

