



Boeing's Everett Expansion: Building 777's Heaven

In the early 1990s, Boeing and The Austin Company set out to increase the size of the world's largest industrial building. The facility wouldn't be just a bit larger. This expansion of Boeing's 747/767 Everett, Washington facility would be jaw-dropping.

To accommodate the production of Boeing's newest jetliner — the 777 — Austin was charged with the task of increasing the enormous existing plant with a 1.9 million-square-foot expansion. The existing plant was 298,000,000 cubic feet and would need to sprawl to 440,000,000 cubic feet.

Austin had plenty of experience with Boeing's behemoth facilities in Everett. The company had previously designed and built the original Everett 747 plant in 1966-67 and the 767 expansion in 1978-79.

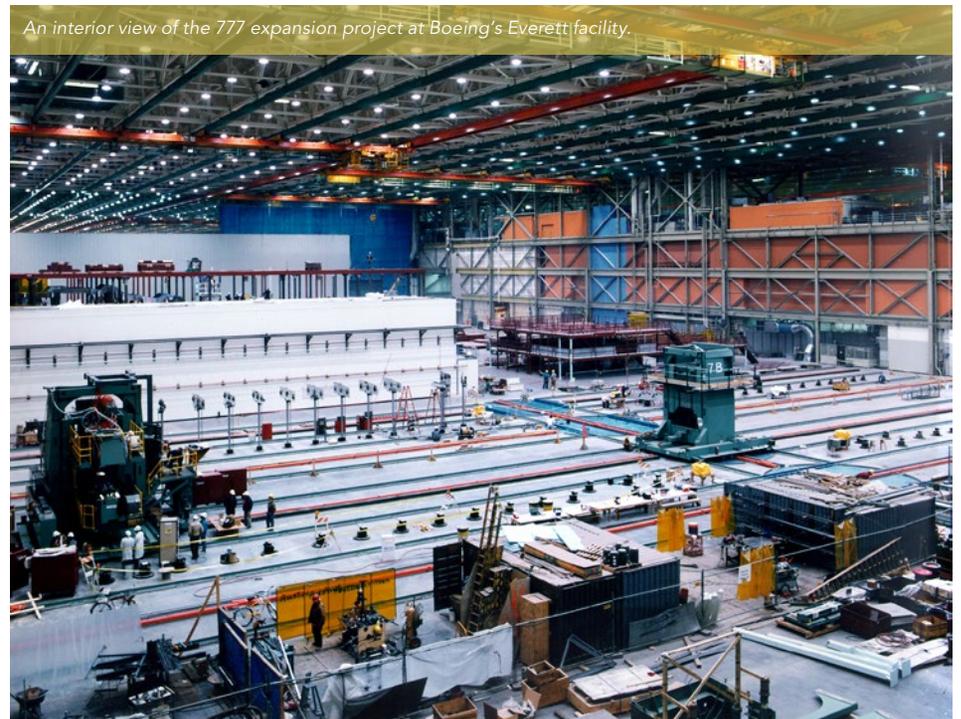
"For this expansion, we had 100 acres under a roof. That's a big farmer's field," says Jim Peterson, a retired Austin vice president who served as the project manager for the 777 expansion. He oversaw the design, engineering, procurement and construction of the project.

The timeframe to complete the design and construction was incredibly

At the time, Boeing produced three to four 777s monthly in their Everett, Washington facility.



An interior view of the 777 expansion project at Boeing's Everett facility.



The first 777 — named “Working Together” — rolled out of the Everett facility on April 9, 1994. There were 15 ceremonies — and more than 100,000 guests — at the Boeing plant that day.

The first flight took place two months later, which began an 11-month flight test. Following the flight test, Boeing delivered United Airlines' first 777 jet on schedule, in May, 1995.

tight. By the end of 1990, Boeing already had orders for dozens of the twin-engine wide-body jet and the first 777 was scheduled to roll out of the facility in 1994.

Boeing purchased more than 250 acres of land that had become available in Puget Sound, and in the spring of 1991, construction began. With Austin's method of simultaneously designing, engineering and building facilities, the company's team of architects, engineers and construction crews worked together to develop the expansion that ultimately included five assembly buildings. Within those buildings were high-bay support towers, assembly lines, office space, storage,

cafeterias, tunnels and trenches that were needed to build the 777.

Peterson says that more than 700 Austin employees and contractors worked on the project that wrapped up in March 1993.

The utility tunnels and trenches that were required to build the big jetliners were an intricate maze that snaked underground throughout the facility. All together, Austin dug 6,500 feet of tunnels to accommodate utility mains and

emergency evacuation, and 11,500 feet of trenches for branch utility lines. More than 140,000 cubic yards of concrete were poured for the foundation.

Above ground, the expansion featured clear spans of 350 feet, with internal clear heights of 87 feet. The 777 is smaller than the 747, but still has an incredible wingspan of nearly 200 feet. Its length is just over 209 feet.

Eight cranes were added to the plant's overhead crane system. Each crane

The 777 expansion required more than 140,000 cubic yards of concrete to create the facility's foundation.



As construction of the 777 expansion began in 1991, The Austin Company was recognizing its 75th anniversary in the aerospace industry. With a long history of partnership with Boeing, it seemed fitting that Austin was selected to design, engineer and build a plant that would be critical to the future of the aircraft manufacturer.

In addition to the 777 expansion project, here are just a few highlights of Austin's partnership with Boeing:

- 1926: Plant II: Design and Construction: 300,000-square-feet, Seattle, WA
- 1936: Boeing Corporate Headquarters: 250,000-square-feet, Seattle, WA
- 1941: Assembly Buildings: 1,713,800-square-feet, Renton, WA
- 1965: Fabrication Facilities: 1,502,214-square-feet, Auburn, WA
- 1964-65: 727 Assembly Building: 708,500-square-feet, Renton, WA
- 1965-66: 747 Assembly Buildings: 1,800,000-square-feet, Everett, WA
- 1978-80: 767 Aircraft Assembly Facility: 820,000-square-feet, Everett, WA
- 1988: C-17 Assembly Facility: 400,000-square-feet, Long Beach, CA
- 1998-2000: Delta IV Rocket Manufacturing Plant: 1,500,000-square-feet, Decatur, AL
- 1997-2002: High Bay Factory Buildings Structural Upgrade to Improve Seismic Performance: 4,000,000-square feet, Everett, WA

was capable of lifting 40 tons and were used to handle components and sub-assemblies — and to move airplane parts from one assembly position to another.

Peterson explains that cranes move the components and assembled sections along the line. “None of the components touch the floor until the wheels are

In the late 1980s, Boeing was losing to competitors Airbus and McDonnell Douglas. Boeing recognized the need to develop a new jetliner that brought more value to airlines.

According to Boeing's archives, the company invited eight global airlines to participate in designing the 777. In March 1990, “The Gang of 4” met in Everett and shared ideas that would eventually be used in the design of the jet. The collaborative group was comprised of United, All Nippon Airways, British Airways and Japan Airlines.

Asking customers for their input on the design of an aircraft was unheard of, but Boeing compiled the survey data and feedback from meetings and incorporated the Gang of 4's suggestions. The result of the collaboration was a jet that featured a cabin cross-section that was similar to the 747, capacity of up to 325 passengers, flexible interiors, a glass cockpit, fly-by-wire controls, and a 10-percent improvement to seat-mile costs than the Airbus A330 and



In the early 1990s, Austin partnered with Boeing to transform 100 acres into a facility to build the 777 jetliner.

McDonnell Douglas's MD-11.

Boeing's 777 was the first commercial aircraft designed entirely with CAD. The design and production was so accurate that a prototype wasn't needed. The 777 project was launched with an \$11 billion order from United Airlines for 34 Pratt & Whitney powered airframes.

Since its debut in the mid-1990s, Boeing's 777 has received more orders than any other wide-body airline. It has been one of Boeing's best-selling models. Over the past 20 years, more than 60 customers have ordered nearly 1,900 of the jetliner (all variants).

installed on the plane,” he says. “It's an amazing process.”

The expansion also had to account for new technology. In addition to computer-aided-design (CAD), other innovative production methods were going to be used in the construction of the 777s. One of these methods was the installation of a barrel turning machine that could rotate fuselage subassemblies 180 degrees. This allowed Boeing's employees easier access to the jet's upper body sections.

By September of 1992, Boeing moved more than 6,000 members of its 777 design team from its Renton facility to Everett. At the beginning of 1993, employees started assembly of the first 777. About 14 months later, the new jet was ready to roll out of the expanded facility. Soon after, Boeing employees were producing three to four 777s each month.

Through the past five decades, Boeing's Everett plant has evolved to meet the demands of the aerospace industry. The facility continues to produce 747s, 767s and 777s.

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