

## North and South Tunnel Portals

Both north and south tunnel entrances feature an operations building. These buildings run the tunnel's state-of-the-art lighting, traffic management and safety systems, house maintenance facilities, and each feature four distinctive yellow ventilation stacks.

### Operations buildings

- Yellow ventilation stacks: **40 feet tall**
- Ventilation stack diameter: **10 feet**
- Ventilation stack weight: **30,000 pounds** (built in Longview, Wash.)
- Ventilation fans: **500 horsepower**, can each move **160,000 cubic feet** of air per minute

The final SR 99 tunnel will be longer than the 1.7-mile section dug by Bertha. The tunnel is extended at both ends with “cut-and-cover” tunnels to connect the bored tunnel to surface lanes. The cut-and-cover method is just like it sounds: dig a trench, then build a floor, walls and a roof to cover the trench.

### Cut-and-cover tunnel facts

- South portal cut-and-cover length: **1,000 feet**
- North portal cut-and-cover length: **450 feet**
- Depth of north portal cut-and-cover excavation: **85 feet**



View of progress on the SR 99 tunnel's north portal operations building.

### For more information

Visit the website at [www.AlaskanWayViaduct.org](http://www.AlaskanWayViaduct.org)  
Call the hotline at 1-888-AWV-LINE  
Send an email to [viaduct@wsdot.wa.gov](mailto:viaduct@wsdot.wa.gov)  
Follow on Twitter: @BerthaDigsSR99

Send a letter to:  
Alaskan Way Viaduct Replacement Program  
Washington State Department of Transportation  
999 Third Ave., Suite 2200  
Seattle, WA 98104

### Americans with Disabilities Act & Title VI information

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## Alaskan Way Viaduct REPLACEMENT PROGRAM



May 2017

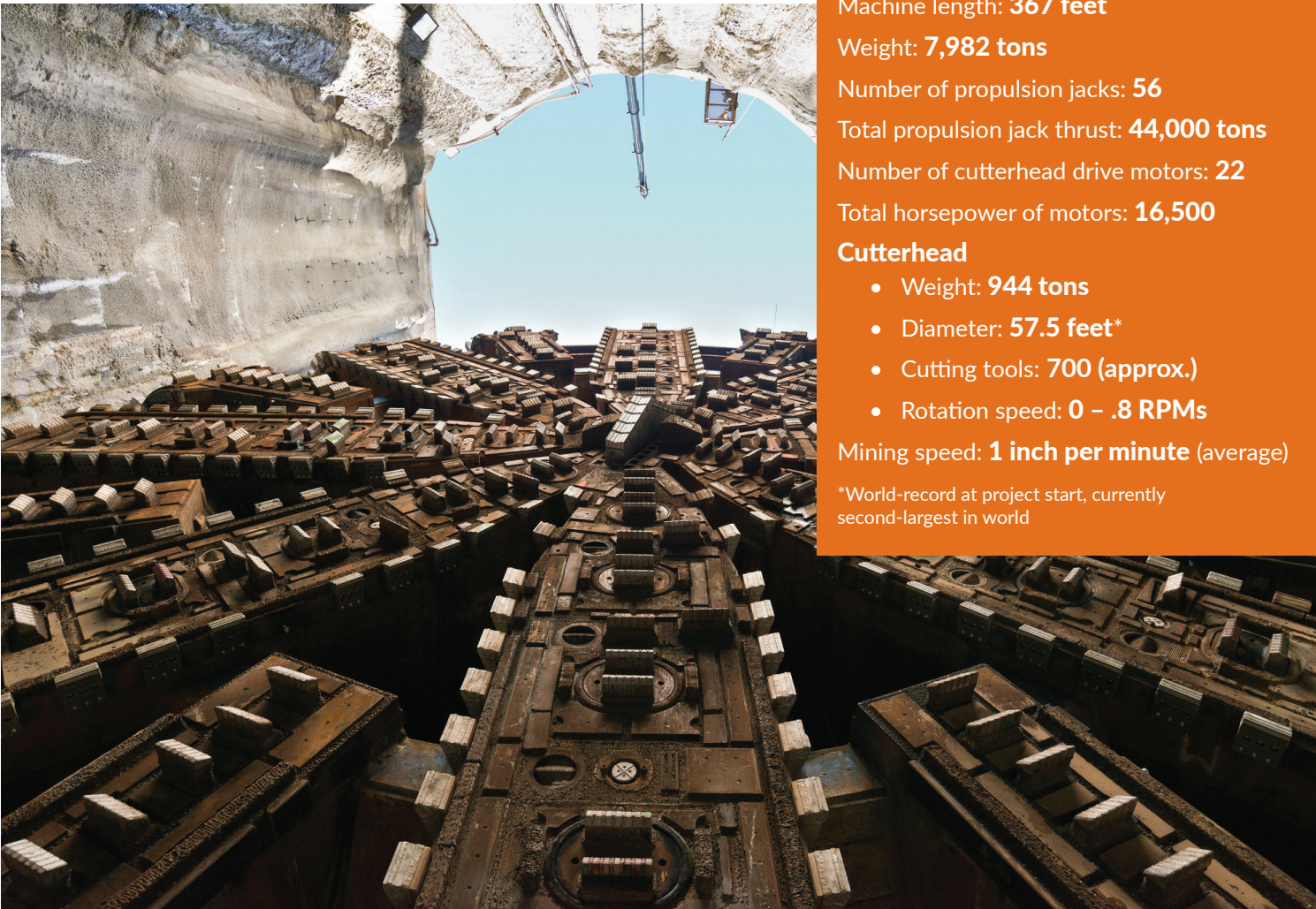
## Tunneling into the numbers

The Washington State Department of Transportation is replacing Seattle's seismically vulnerable Alaskan Way Viaduct with a tunnel. Once open, the two-mile-long tunnel will carry two lanes of State Route 99 in each direction underneath downtown Seattle. Digging this remarkable tunnel is a record-breaking tunneling machine, nicknamed Bertha. Here are some numbers that highlight the scope of this megaproject.

### The numbers behind Bertha

- Machine length: **367 feet**
- Weight: **7,982 tons**
- Number of propulsion jacks: **56**
- Total propulsion jack thrust: **44,000 tons**
- Number of cutterhead drive motors: **22**
- Total horsepower of motors: **16,500**
- Cutterhead**
  - Weight: **944 tons**
  - Diameter: **57.5 feet\***
  - Cutting tools: **700 (approx.)**
  - Rotation speed: **0 – .8 RPMs**
- Mining speed: **1 inch per minute** (average)

\*World-record at project start, currently second-largest in world





Bored tunnel stats

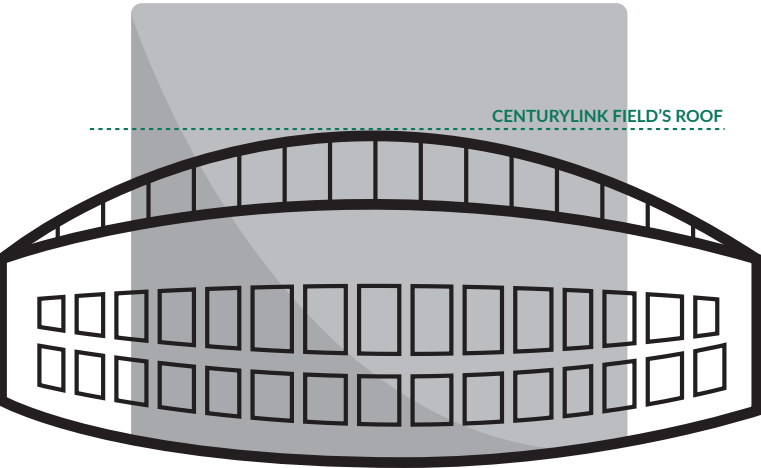
- Length: **9,270 feet (1.7 miles)**
  - Max depth: **215 feet\***
  - Wall thickness: **2 feet**
  - Outside diameter: **56 feet**
  - Number of tunnel rings: **1,426**
  - Width of tunnel rings: **6.5 feet**
  - Tunnel ring weight: **172 tons**
  - Concrete used to make rings: **118,000 cubic yards**
- \*Ground surface to crown of tunnel machine, near First Avenue and Virginia Street

Bertha dug the tunnel by chipping, grinding and cutting away the ground with her cutterhead. The soil was mixed with conditioners to give it a toothpaste-like consistency, and then carried by a corkscrew-like conveyor toward the back of the machine. From there, a conveyor belt carried it out of the tunnel to a waiting barge.

Soil stats

- Types of soil along tunnel route: **8**
- Amount of soil excavated per tunnel ring: about **550 cubic yards**
- Number of barges used to haul soil: **3**
- Amount of soil carried per barge: about **2,200 cubic yards**
- Dump truck equivalent of one barge: **160 trucks**

Bertha removed **850,000** cubic yards of dirt from the ground during SR 99 tunnel mining



Piling the dirt on the football field in CenturyLink Field would create a tower of dirt that would **overtop the stadium by 100 feet**



A completed section of the tunnel prior to the building of the road decks.



Tunnel design features

- Number of lanes in each direction: **2**
- Width of shoulders: **8 feet and 2 feet**
- Earthquake magnitude: **built to withstand a 9.0 quake**

A specially-designed truck carries 10 tunnel segments - one ring's worth - into the SR 99 tunnel.



Conveyor carries spoils (tunnel soil) to the barge for disposal.