Sharon Wood Wortman
with Ed Wortman

BridgeStories

History of the 1894 & 1926 Burnside Bridges In Context

November 16, 2023
Multnomah Building
Portland, OR
Community Design Advisory Group (CDAG) Meeting #3

In this half-hour slideshow:

1. We see where the Burnside Bridge fits into the world of the lower Willamette River bridges and where the WRBs fit into the larger world.

2. We learn a bit about the history of the 1926 Burnside and its predecessor bridge, the 1894 Burnside.

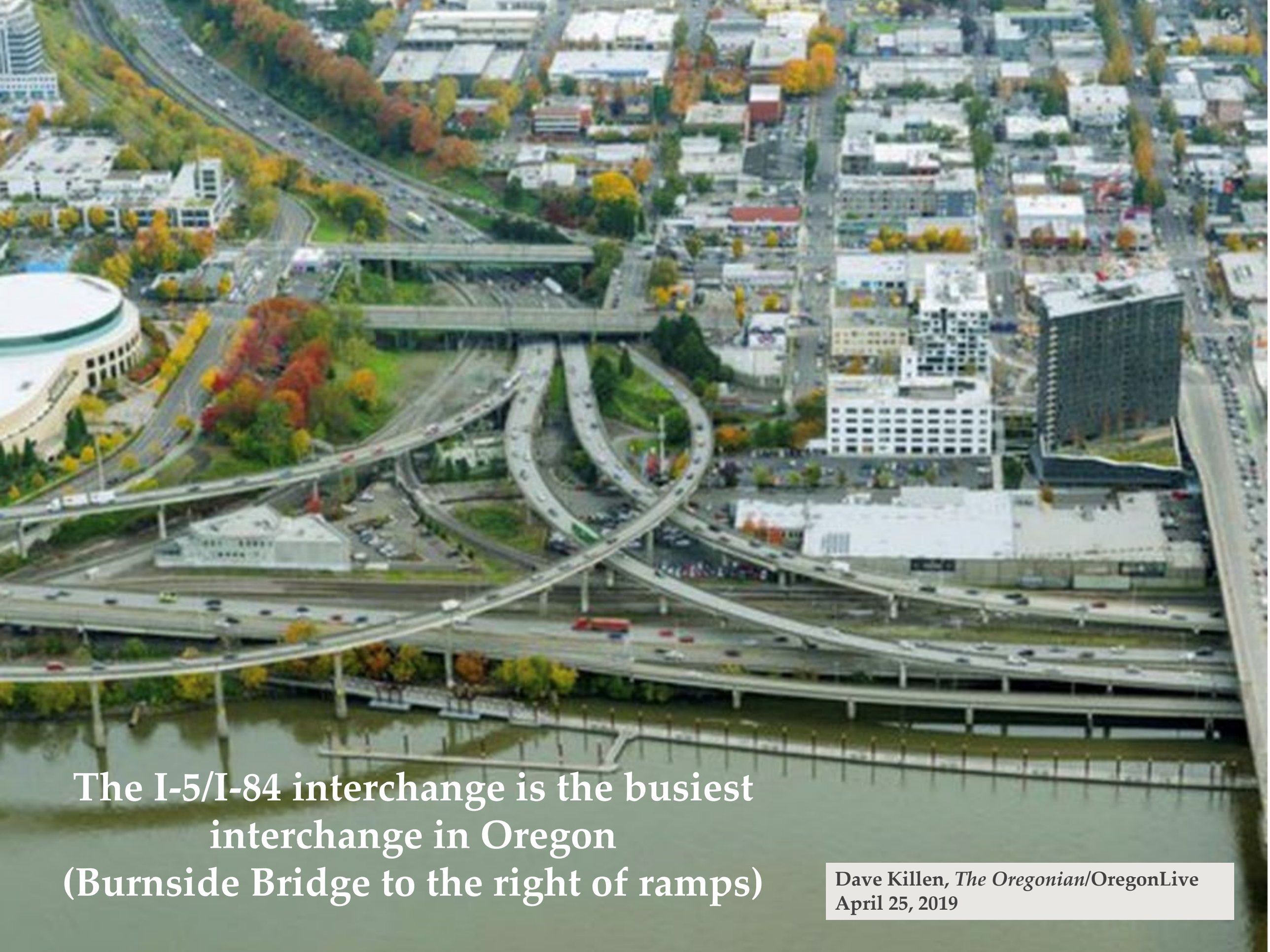
3. And we look closely at the changes and challenges during the 1926 Burnside's century-long evolution as we move forward in design of the third Burnside.

Definition of a bridge,
according to the Federal Highway Administration:

Any structure 20 feet or longer
carrying a highway load

In the U.S. this means 600,000
roadway bridges* inspected by the
federal government every two years

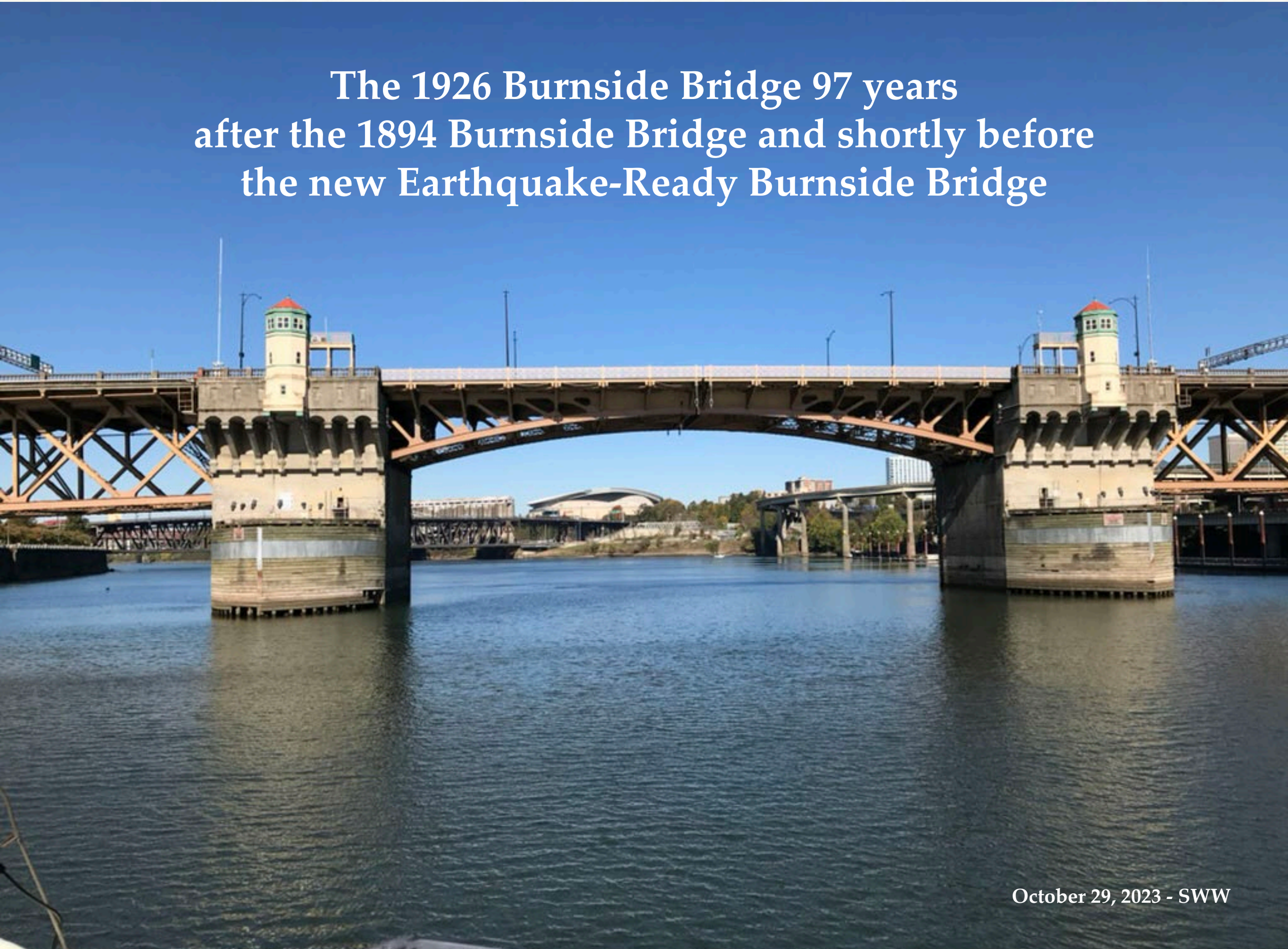
***Includes approach ramps**
and overcrossings!



The I-5/I-84 interchange is the busiest interchange in Oregon (Burnside Bridge to the right of ramps)

Dave Killen, *The Oregonian*/OregonLive
April 25, 2019

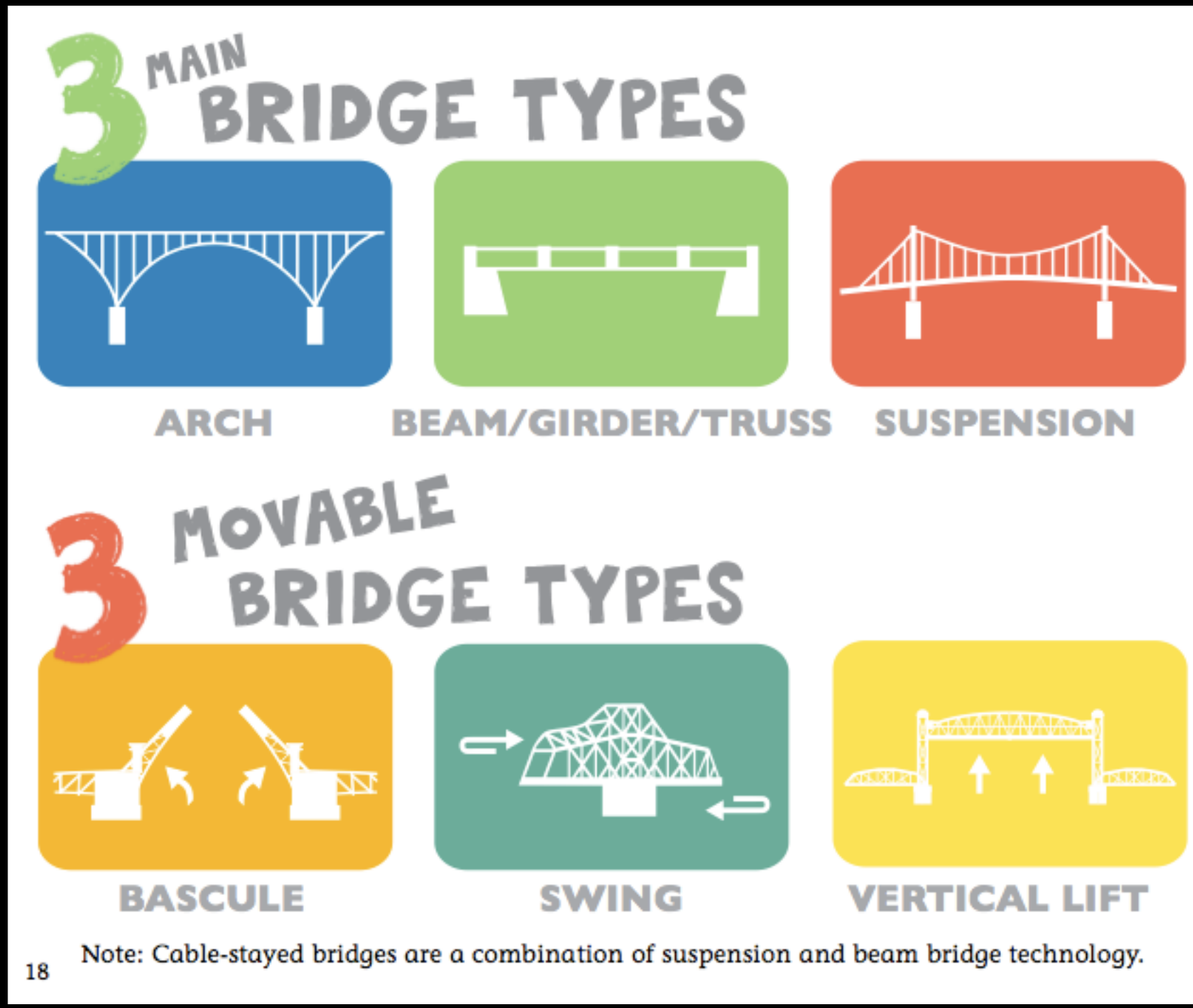
The 1926 Burnside Bridge 97 years after the 1894 Burnside Bridge and shortly before the new Earthquake-Ready Burnside Bridge



October 29, 2023 - SWW

The first bridge was likely a simple beam bridge


Add triangles
along both sides
of a beam bridge
and we have
a truss bridge
www



Bascule, a French word meaning seesaw

The Big & Awesome Bridges of Portland & Vancouver, p. 16

Different agencies care for the more than 8,000 public roadway bridges in Oregon, all of which must be inspected every two years

Among the largest are the fixed span and movable bridges on the lower 26 miles of the Willamette River

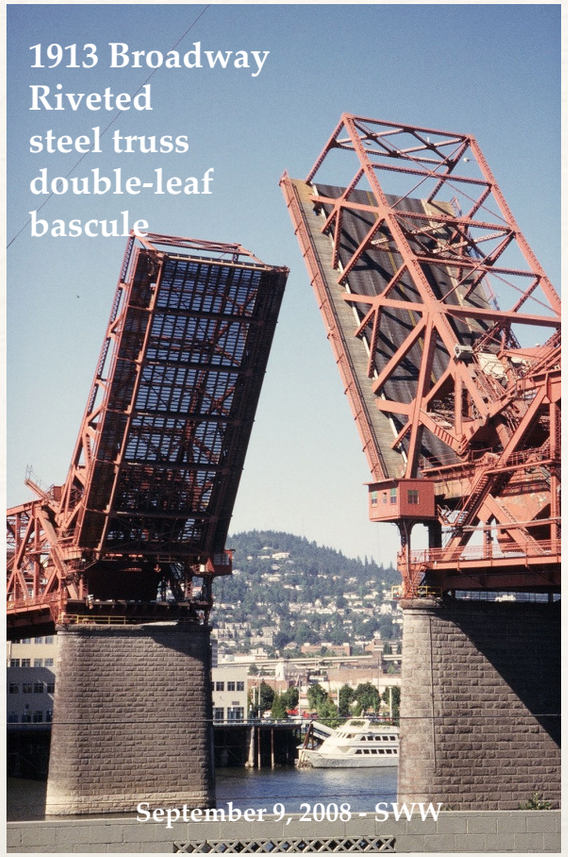
Five big river central city bridges sit one-third mile apart, all legal for pedestrians and bicyclists to cross

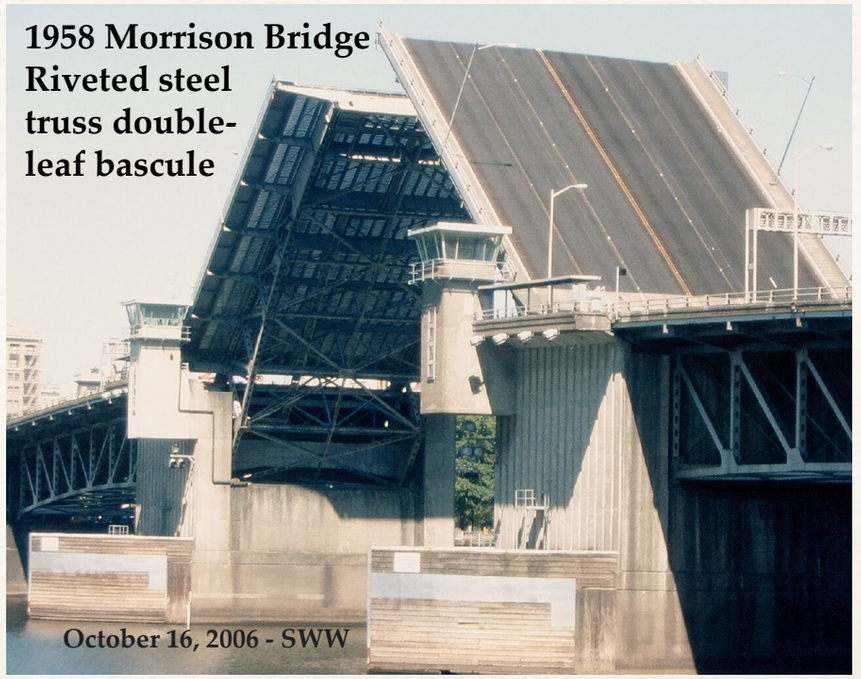
BridgeStories May 30, 2009

Multnomah County Bridge Engineering and Maintenance Shops
1403 SE Water Ave., under the east end approaches of the Hawthorne Bridge

Bridge operators, maintenance specialists, mechanics, inspectors, and engineers manage and maintain 20 smaller bridges, and five big bridges in addition to the really, really big Burnside Bridge


2008 Sauvie Island Bridge
Steel tied arch
Early 2008 - SWW


1913 Broadway
Riveted
steel truss
double-leaf
bascule
September 9, 2008 - SWW


1958 Morrison Bridge
Riveted steel
truss double-
leaf bascule
October 16, 2006 - SWW


1910 Hawthorne Bridge
Riveted steel truss vertical lift
October 29, 2023 - SWW


Hawthorne Bridge
September 9, 2008 - SWW


Sellwood Bridge
Three-span steel deck arch 2016
October 29, 2023 - SWW

In the Portland-Vancouver collection of 22 roadway and railroad bridges we have all 3 main bridge types and all 3 main movable bridge types— Among them the longest tied arch bridge in North America, the oldest vertical lift bridge in the world, and the massive Burnside Bridge— all vulnerable to Earthquake

The Big & Awesome Bridges of Portland & Vancouver, **p. 16**

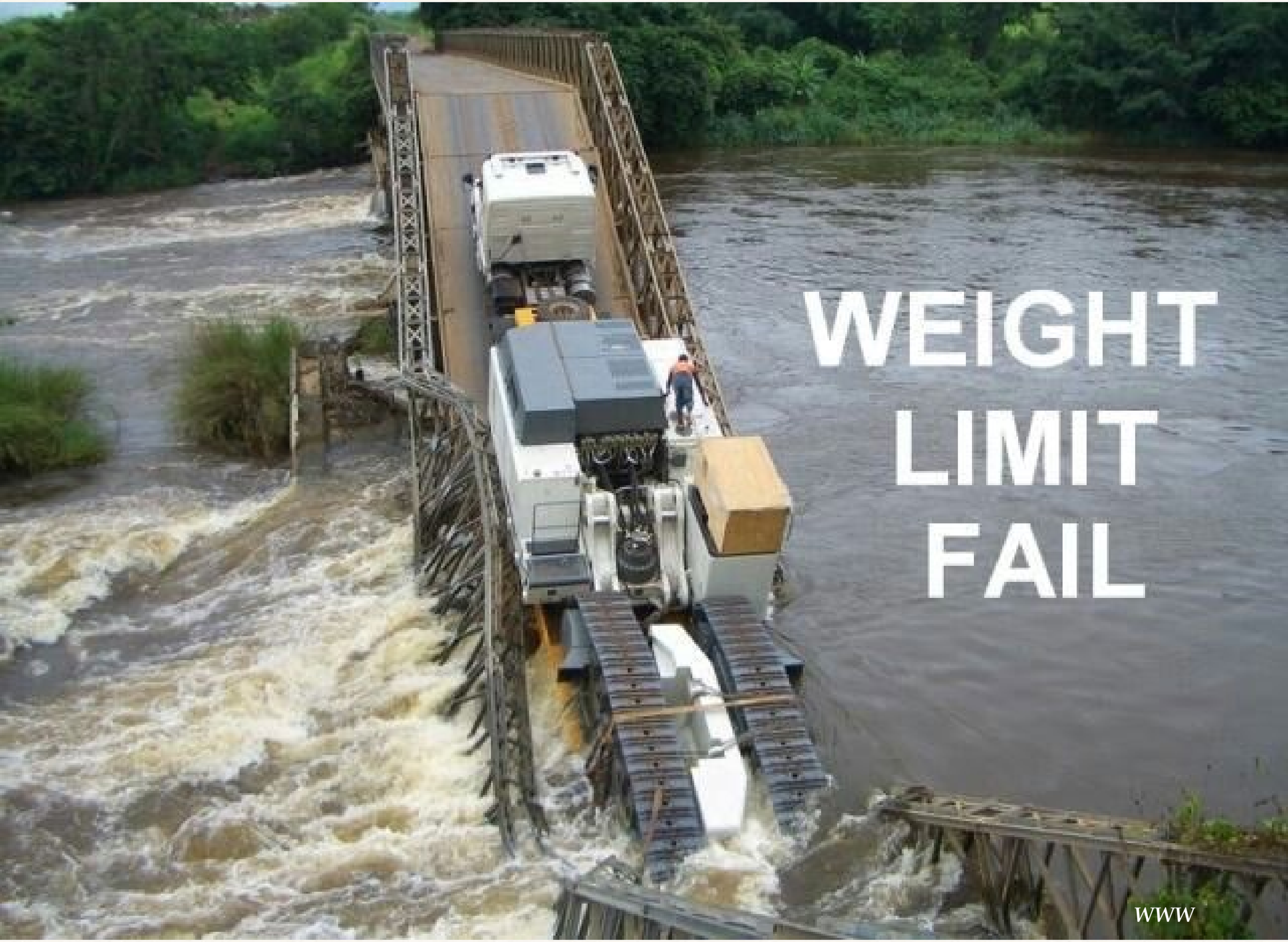
To the 3,316 third graders
in the 64 elementary schools
in the Portland Public School District
who will study bridges
as part of this year's
Social Studies curriculum:

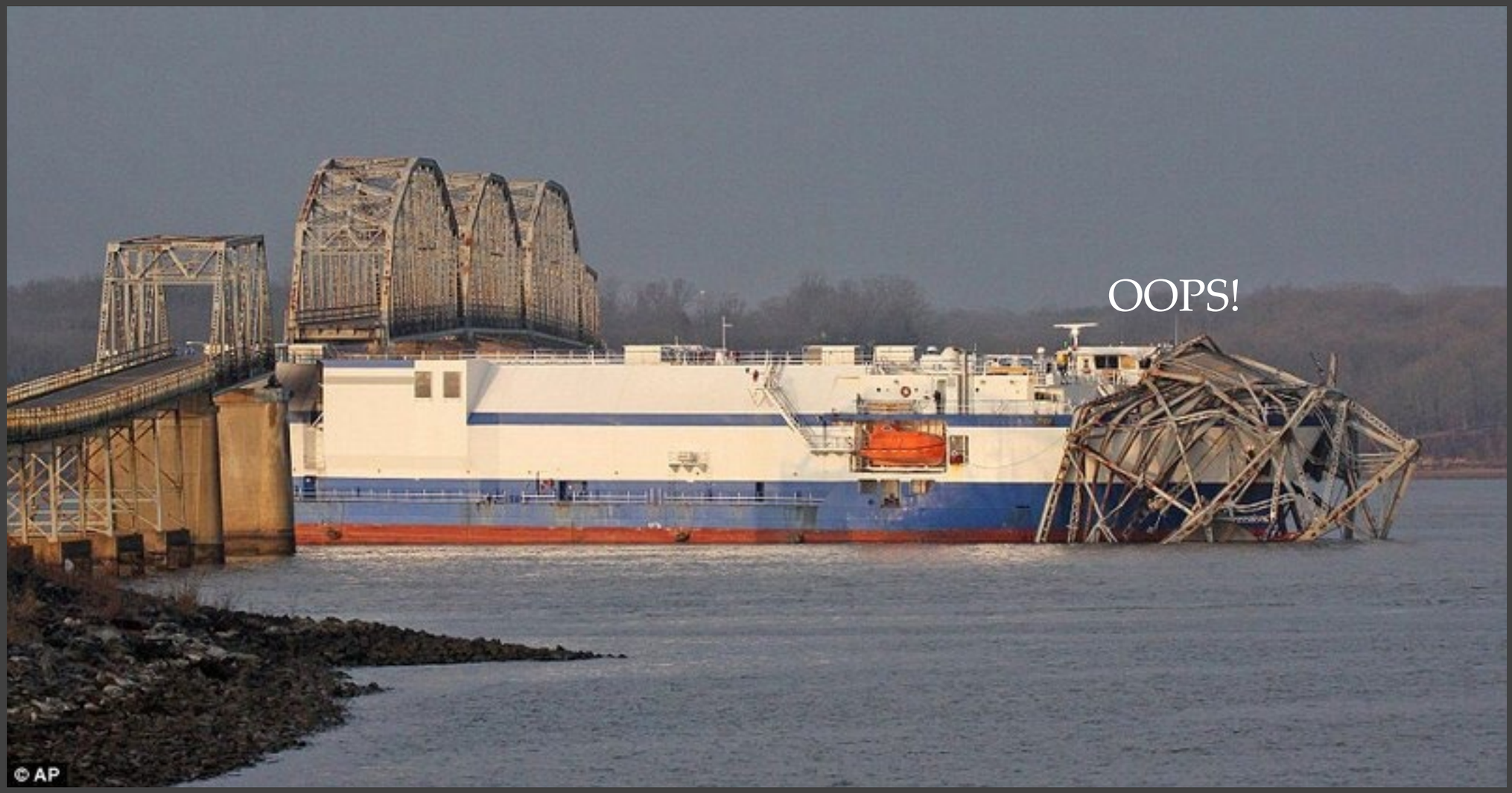
"Listen up, you future taxpayers—
our bridges are not held together by nor
maintained with duct tape!"

www

We would tell them that bridges are susceptible to damage caused by nature and human error, and why design and maintenance are so important

We don’t typically use salt to deal with snow on PDX roads and bridges . . .


WEIGHT
LIMIT
FAIL
www

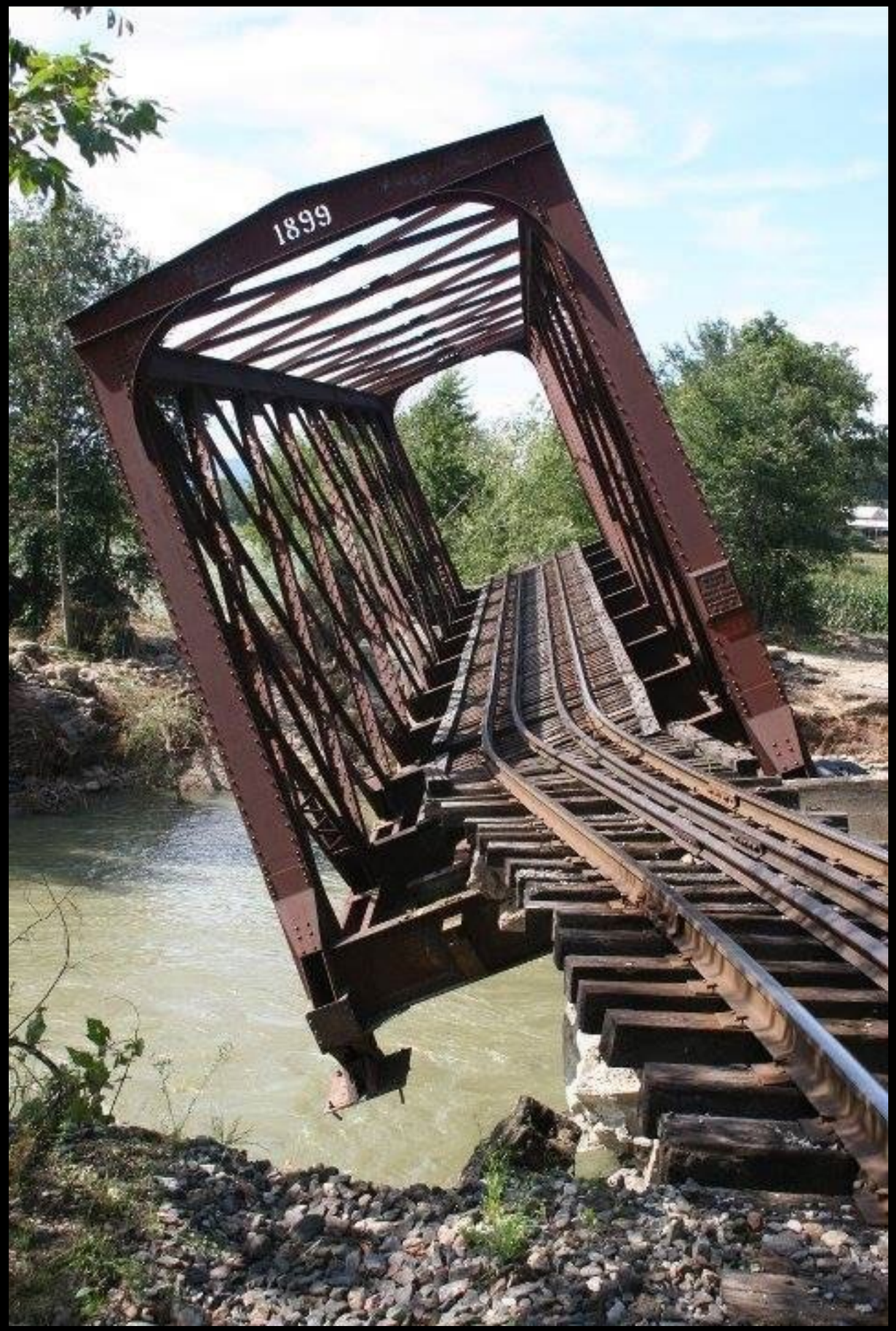


Tennessee River, 2012, two spans of the Eggner Ferry Bridge taken out by a ship delivering rocket parts to Cape Canaveral

AP

AP

Old railway bridge in Vermont, knocked off its bearings by a flood caused by Hurricane Irene 2011



www

Measured 6.9 on the Moment Magnitude Scale

Earthquake
Kobe, Japan
January 17,
1995

www

We don't want Kobe or Northridge or Anchorage or any other earthquake scenarios in Portland!

Robin "Lobster" Ludwig

Hawthorne Bridge 100th birthday Celebration

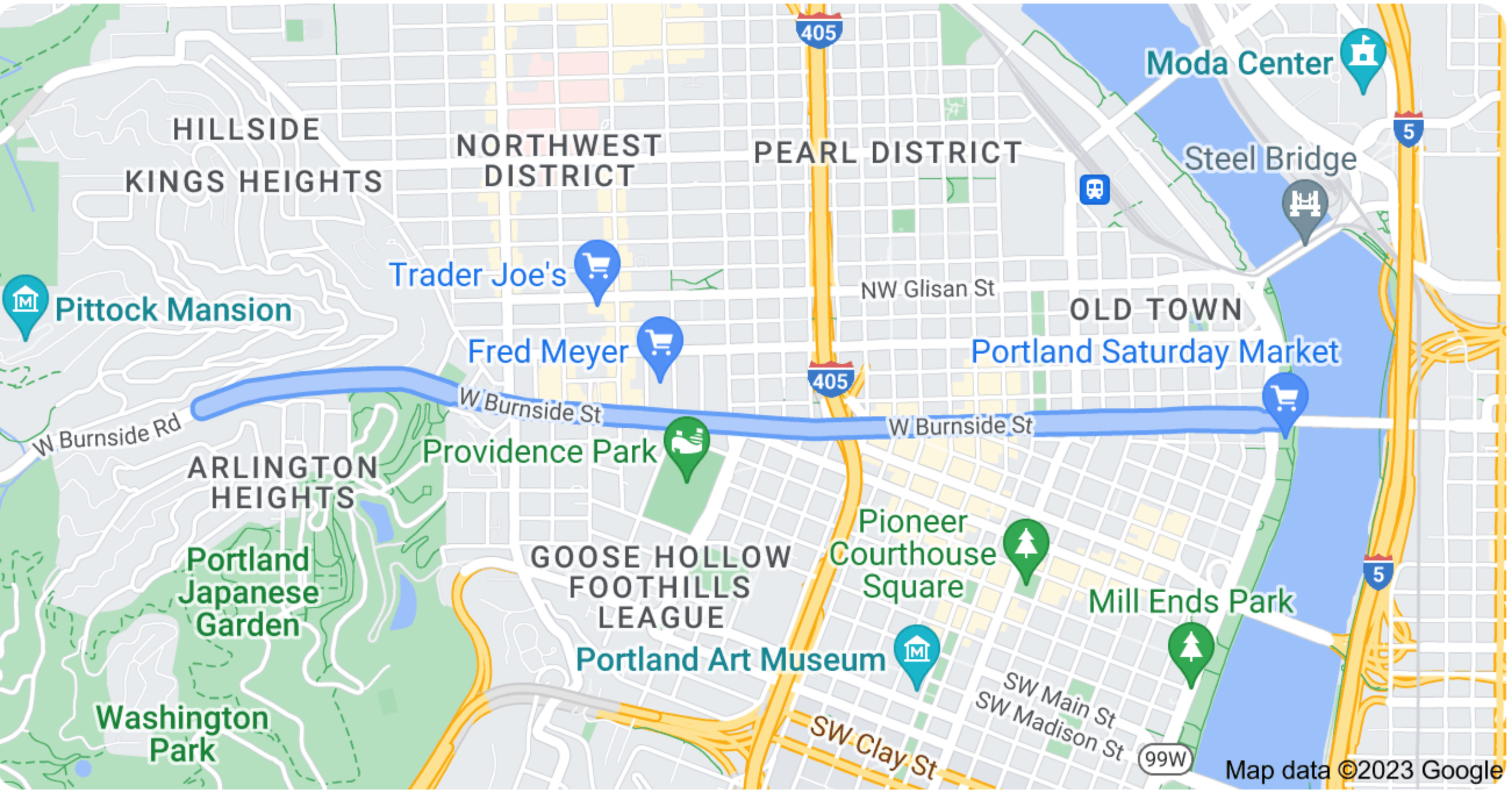
July 16, 2010 - SWW

When the "Big One" comes
we want an EQ-Ready Burnside in place
so that getting across
the Willamette River
will be possible

Today roughly 800,000 people
live and work west of the Willamette
in the Greater Portland Area!

Burnside Street is one of the Metro Area's longest surface streets at nearly 18 miles in length— extending from Gresham past the Pittock Mansion to the Washington County line

First called "B" Street, it was renamed in 1891, in honor of Dan Burnside, an early PDX flour mill operator


HILLSIDE
KINGS HEIGHTS
NORTHWEST DISTRICT
PEARL DISTRICT
405
Moda Center
5
Steel Bridge
Trader Joe's
Pittock Mansion
NW Glisan St
OLD TOWN
Fred Meyer
Portland Saturday Market
405
W Burnside St
W Burnside Rd
W Burnside St
Providence Park
ARLINGTON HEIGHTS
Pioneer Courthouse Square
GOOSE HOLLOW FOOTHILLS LEAGUE
Portland Japanese Garden
Mill Ends Park
Portland Art Museum
SW Main St
SW Madison St
SW Clay St
99W
Washington Park
Map data ©2023 Google

Bicyclist mid-span,
ready to cross
from the east
side of Portland
to the west side—
Burnside
Bridge,
with the
Willamette River,
divides
the city
north from
south, east
from west

September 28, 2023 - SWW

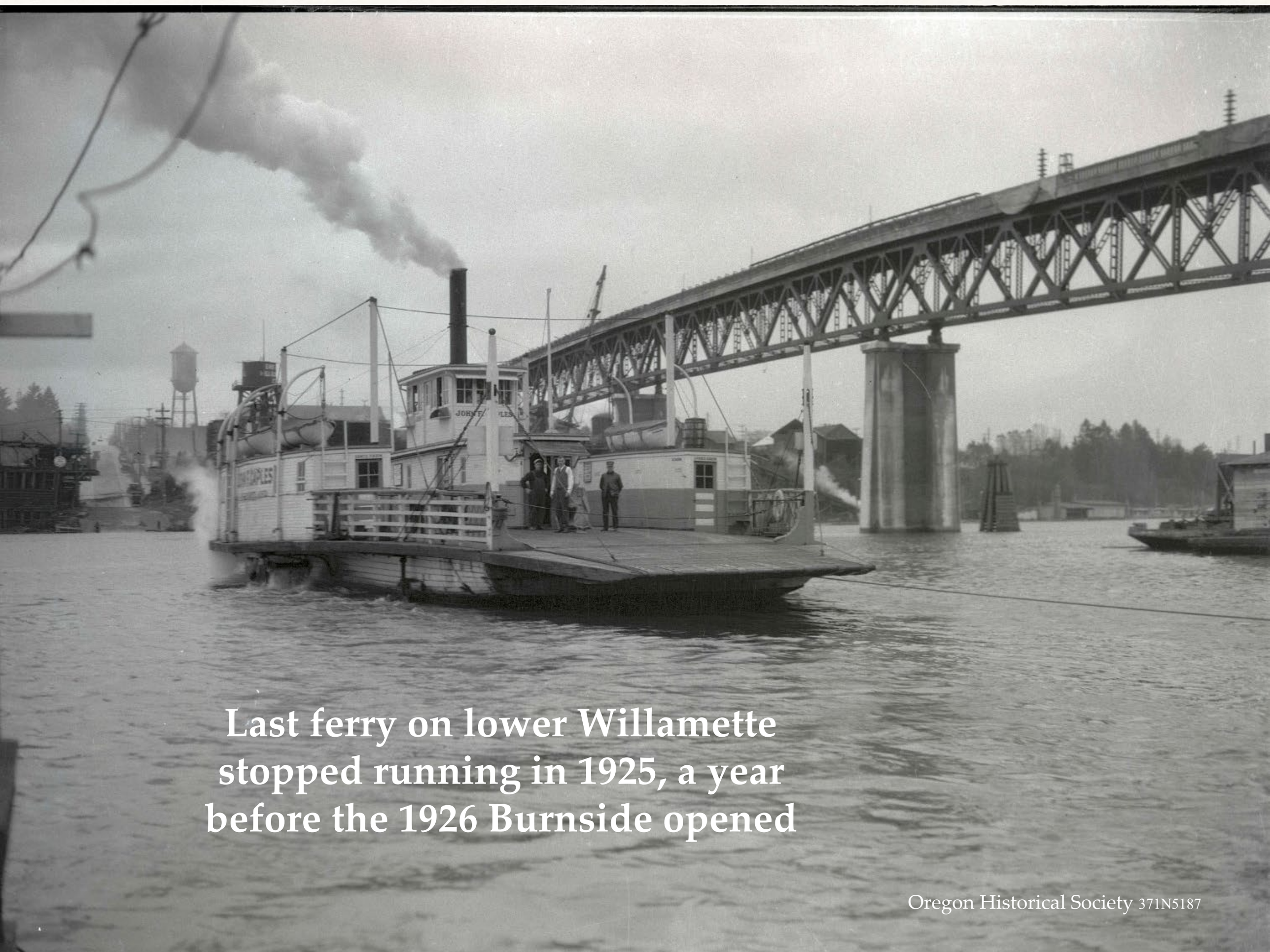
Another fact: Both the 1894 and 1926 Burnside bridges were built on unceded and occupied land and water that rest on the traditional territories of the Multnomah, Chinook, Cowlitz and Clackamas people and other tribes

A brief modern-day history of the 1926 Burnside Bridge, one of three Willamette River bridges added to the National Register of Historic Places in 2012

159

Portland Archives, A1999-004.1159

Before bridges, people crossed the Willamette in canoes, sternwheelers, and ferries



Last ferry on lower Willamette stopped running in 1925, a year before the 1926 Burnside opened

Oregon Historical Society 371N5187

The first Willamette River bridges were built by private companies and designed for pedestrians, bicyclists, horse and buggies, streetcars, trolleys, and railroads

The first roadway bridge across the lower Willamette was the 1887 Morrison, made of iron and wood

It was a toll bridge: one horse and rider, 10 cents; loose sheep and hogs, 5 cents

1887 Morrison during
the Great Flood of 1894,
a month before the
first Burnside Bridge opened

Portland Archives

1894 Burnside Bridge

Oregon Historical Society 373G0417

Slow moving swing spans fell out of favor because the central pier was in the middle of the river and impeded flow of river traffic

Next came the modern-day vertical lift and bascule bridges, prized for their zippier movement

Bascule bridges allowed free passage for river craft of any height

Swing span at full 90 degrees

BNSF Railway Bridge 5.1, pre-1989

Courtesy Steve Morgan

BNSF 5.1 – post 1989

Steve Morgan

Sauvie Island main span being
floated downriver 2007

The City of Portland built both
the 1910 Hawthorne
and the 1913 Broadway,
after which the Oregon Legislature turned
the business of Willamette River bridge building
and maintenance over to Multnomah County

The extant Burnside is one of a trio of bridges built by the County in the 1920s

The other two were Ross Island and Sellwood plus the no-longer-standing Lovejoy Viaduct, located at the west end of the Broadway Bridge

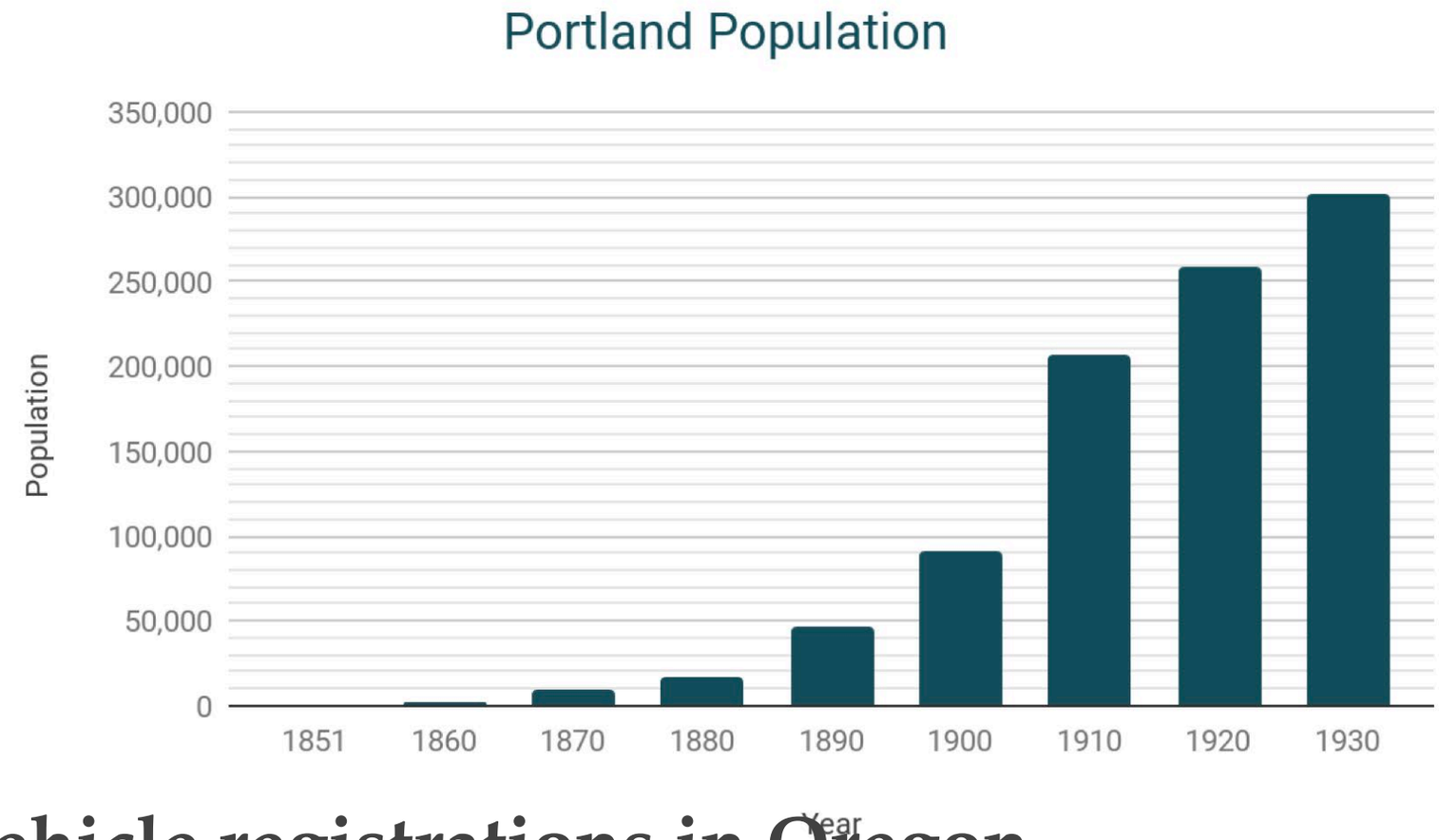
Multnomah County also built the St. Johns Bridge, opened in 1931

ODOT is now responsible for St. Johns and the Ross Island Bridge

**In the Burnside Bridge's 97-year history,
world population
has ballooned from two billion in 1926,
to more than 8 billion in 2023**

Portland proper population 2023: Just over 635,000 / GPA 3.2 million

Year	Population
1851	800
1860	2,874
1870	8,923
1880	17,577
1890	46,385
1900	90,426
1910	207,214
1920	258,288
1930	301,815



Passenger vehicle registrations in Oregon jumped from 207,000 in 1926 to today's 3.2 million

Source: http://worldpopulationreview.com/us-cities/portland-population/

Multnomah County

**The 1926 Burnside Bridge, with approaches,
cost $4.5 million**

**($80 million
in today's dollars)**

It was designed
by the engineering
firm Hedrick & Kremers

Following political
drama, the two were
replaced by the
internationally
famous bridge engineer
Gustav Lindenthal
(1850-1932),
shown here early
in his long career

Burnside Street widening demolition looking east from SW First Street ca. 1925-1926

Milo P. Atkins, courtesy Steve Dotterrer

e Bridge bascule span construction, ca. 1925. Pier walls were built after the bascule leaves and counterweights.

Under construction in 1926

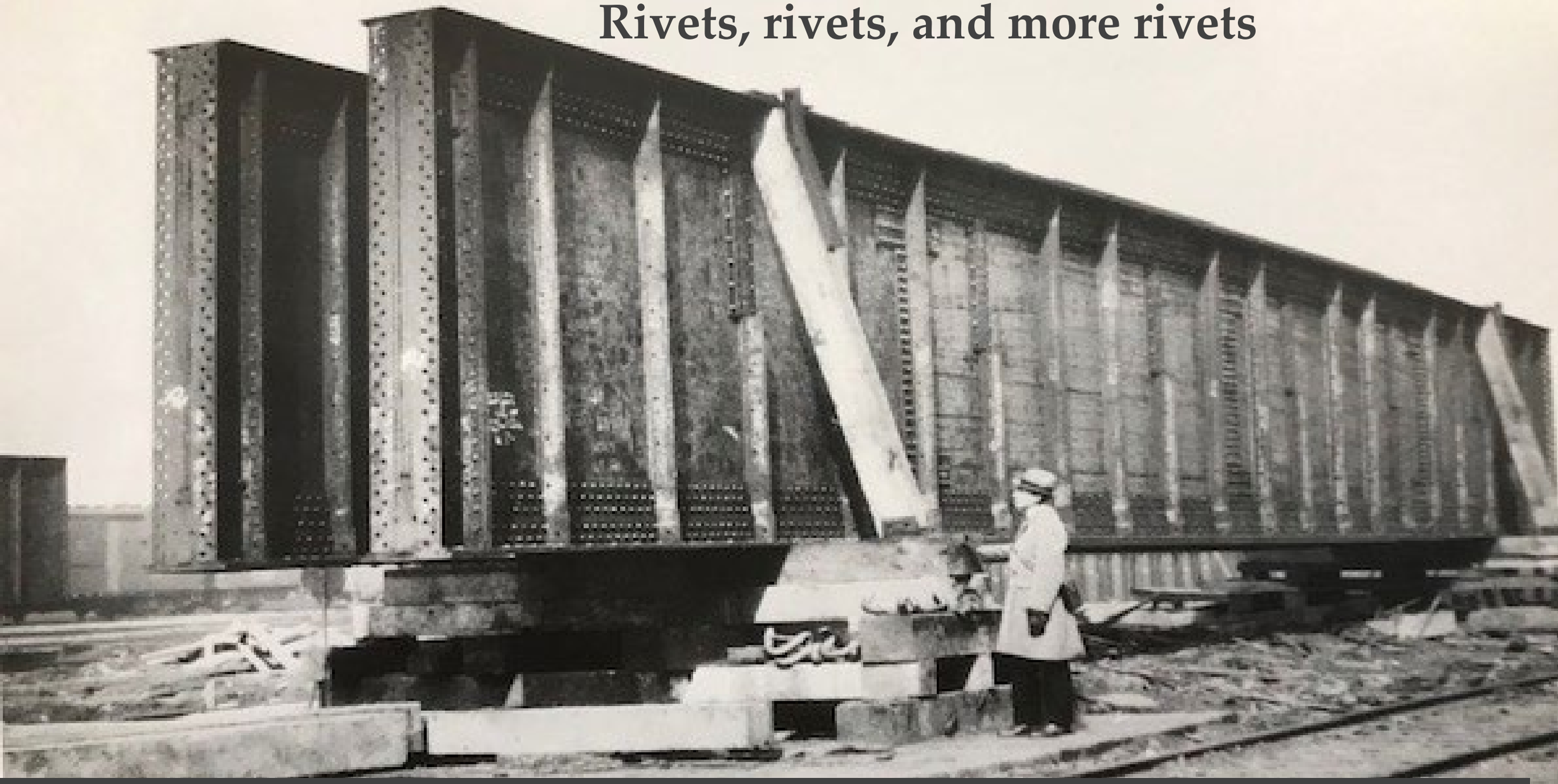
The Portland Bridge Book, p. 49

Notice the trolley poles in the center of the lift span

Concrete counterweight before it's enclosed for at least the next century

Oregon Historical Society 37IN5071

Steel girders for extant bridge's approach spans inspected by assistant engineer Kurt Siecke, ca. 1925
Rivets, rivets, and more rivets



Structural steel for the 1926 Burnside Bridge was fabricated by American Bridge, one of the contractors for the EQ-Ready Burnside

Steel girders for Burnside Bridge approach spans inspected by engineer Kurt Siecke, ca. 1925.

The Portland Bridge Book, p. 48

Getting ready for opening day May 28, 1926, lane striping to be added later, “if needed”

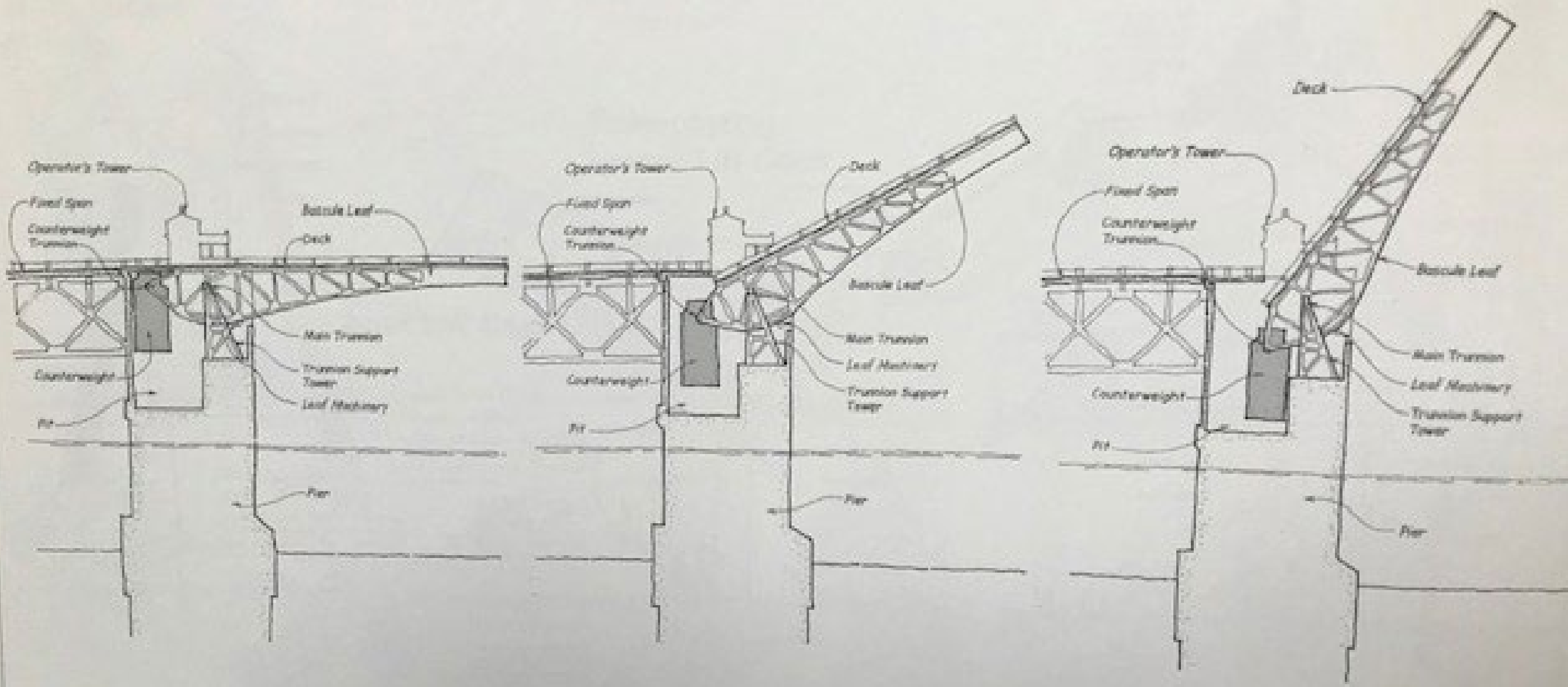
Streetcars were allowed to travel at 10 mph, instead of 4 mph as mandated for other Willamette River bridges

Wikipedia Commons

Opening Day May 26, 1926

Oregon Historical Society 37IN3006

Strauss-patented trunnion bascule



Joseph Strauss most famous for leading the way as Chief Engineer for the construction of the Golden Gate Bridge

The Portland Bridge Book, p. 150

The first large-scale bascule in the US with a concrete deck on its lift span, Burnside was the largest double leaf deck bascule constructed at the time

Wikipedia Commons

With a 252′-foot-long span deck made of solid concrete, Burnside remains a rarity

November 8, 2023 - SWW

Morrison's see-through lift span is made of steel and weighs about half as much as Burnside's lift span

October 24, 2006 - SWW

There are enormous counterweights in each of Burnside's piers

Counterweights go down, bridge deck lifts up

Top of counterweight showing beneath maintenance walkway

Multnomah County

James Norman for the Historic American Engineering Record

Counterweight to left
hangs from two hinges
called trunnions
(not shown)

15 feet thick at the base
each counterweight
weighs nearly
4 million pounds,
(that's 35 40-foot-long
Greyhound buses)

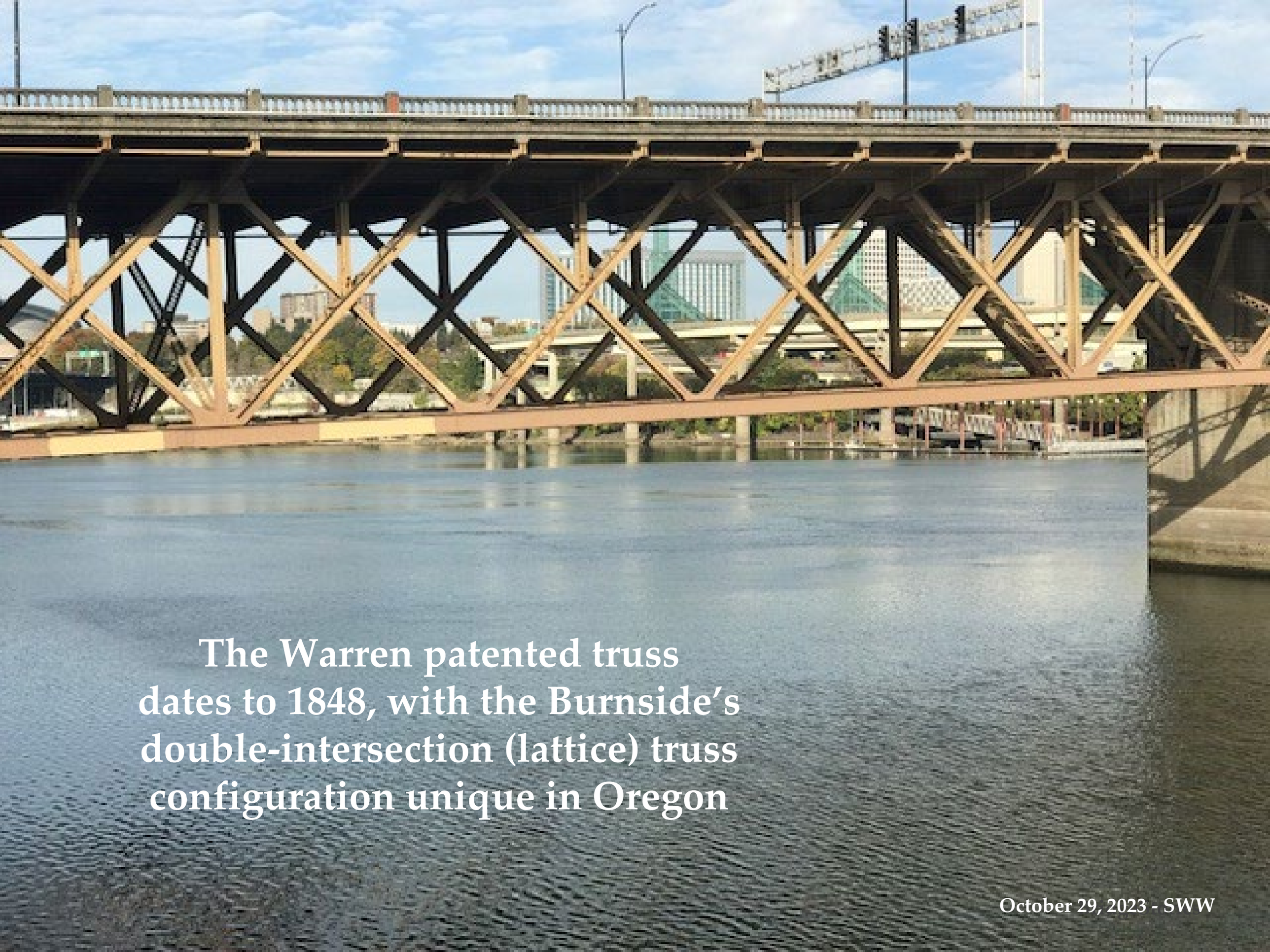
They are 36 feet tall,
the height of a
3-storybuilding,
and measure
57 feet wide—
the same length
as a standard
bowling alley lane

By comparison, Morrison's counterweights weigh only half of what Burnside's weigh

Gears 36 feet tall

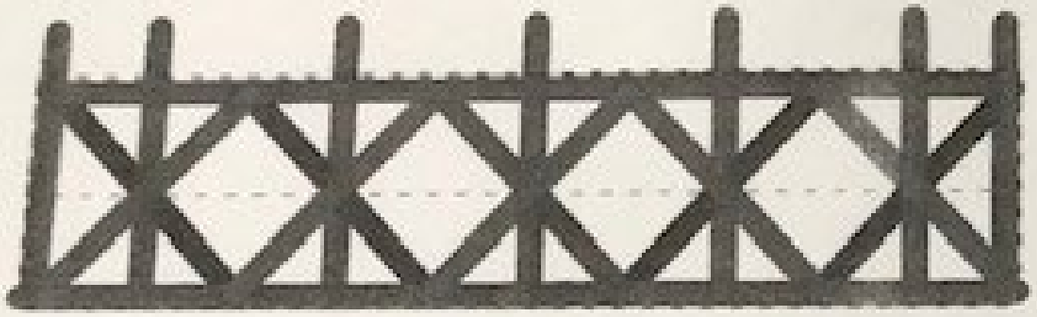
100 hp motor

Gary Weber 2009



The Warren patented truss dates to 1848, with the Burnside's double-intersection (lattice) truss configuration unique in Oregon

October 29, 2023 - SWW

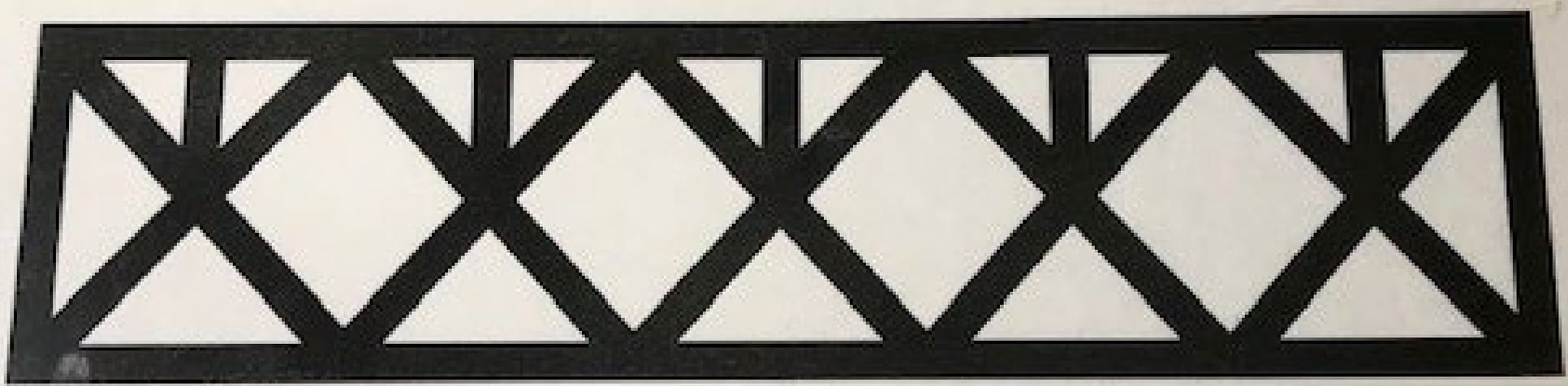


Truss Bridge Span Patterns

Bridges of the Willamette River, Portland, Oregon

Burnside Bridge

Double Intersecting (Quadrangular Warren) -Subdivided



Burnside Bridge
Side Spans

For use with "Design and Construction of Truss Bridge Spans Using Wooden Sticks and Low-Temperature Glue Guns," by Sharon Wood Wortman
An activities book from "Bridge Appreciation in a Box" and the "Portland Bridge Book"
Patterns developed by Darla Cole Reeves, "The Graphics Doctor", from truss bridge designs by the Historic American Engineering Record (see page 12 the CRAFT Bridge Book)

A cluster of 360 Douglas fir tree trunks, driven into the riverbed,
supports each of the Burnside Bridge's two bascule piers
12 other piers sit on tree trunks including the two piers
under the ends of the truss spans at the riverbanks
and another 10 piers sitting under the approach spans

September 5, 2008 - SWW

Wooden dolphins positioned below the operator houses are designed to deflect/divert river debris and watercraft floating downriver from banging into the bascule piers

Multnomah County

1926 Burnside Bridge Opening Controls in Place Until 1998

This is only one-half of the original 1926 opening panel. Notice that the control handle looks like an old streetcar lever. The operator turned two of these handles to open the bridge. If ODOT ever opens its Region 1 HQ again, you will find this hands-on interactive display along with other bridge artifacts.

Robert Hadlow ODOT
November 3, 2023

Historic American Engineering Record

COMPONENTS

DELINEATED BY: JOSEPH A. BOQUREN, 1999

WILLAMETTE RIVER BRIDGES
RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

PORTLAND

SPANNING BROADWAY
WILLAMETTE RI
MULTNOM

Robert Hadlow ODOT
November 3, 2023

Opening control panel as of 1999

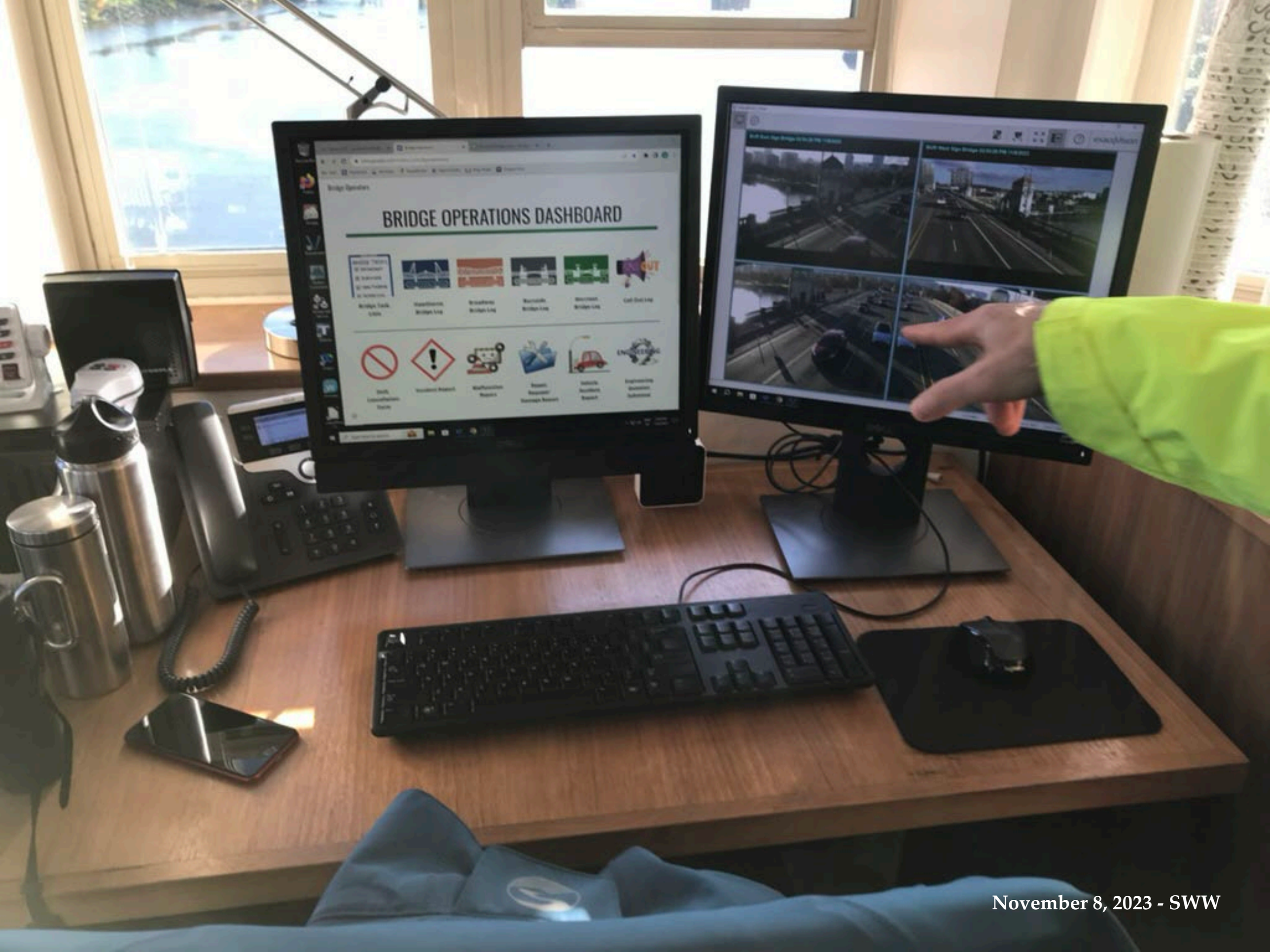
James Norman for the Historic American Engineering Record

Technology changing fast, this touch screen control panel was installed in 2003

Multnomah County

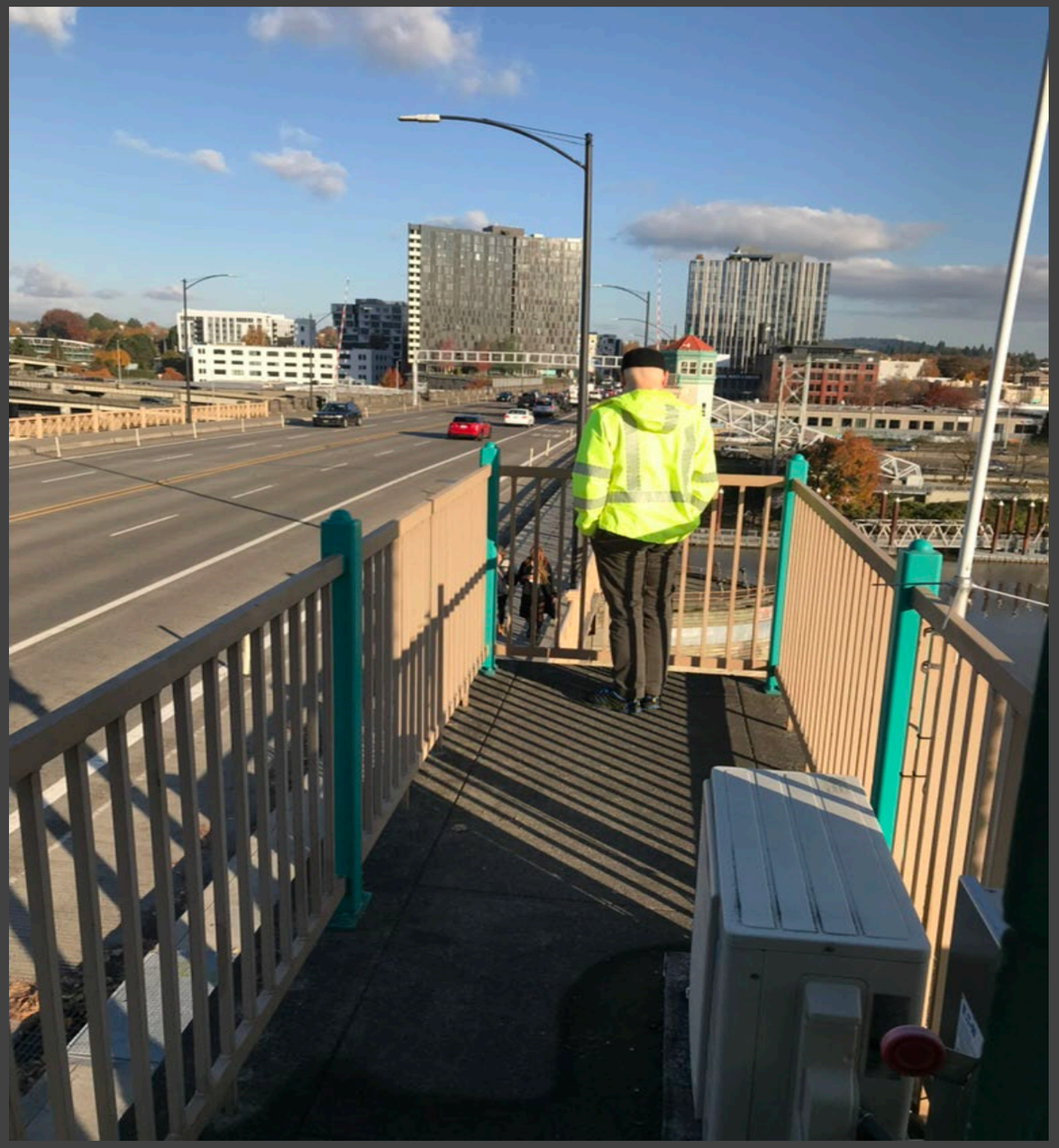
An operator is called to the Burnside Bridge when a vessel requests an opening, or when the river elevation is 12 feet or above

And at other times as well, such as during Rose Festival Fleet Week



November 8, 2023 - SWW

The west tower remains the only tower occupied by County bridge operators



November 8, 2023 - SWW

West end circular Staircase ca. 1999

James Norman for the Historic American Engineering Record

The east tower,
save for its circular stairway, is an
empty shell
used for storage

Today's Burnside was the first downtown bridge to be designed with the help of an architect

The Italian Renaissance-style towers reflect the Early 20th Century City Beautiful Movement that called for adding architectural ornamentation to engineering designs

November 8, 2023 – SWW

The prominent Portland architectural firm Houghtaling and Dougan designed the bridge operator towers, the cantilevered vaulted arches under the towers, bridge operator porches, and the distinctive railing

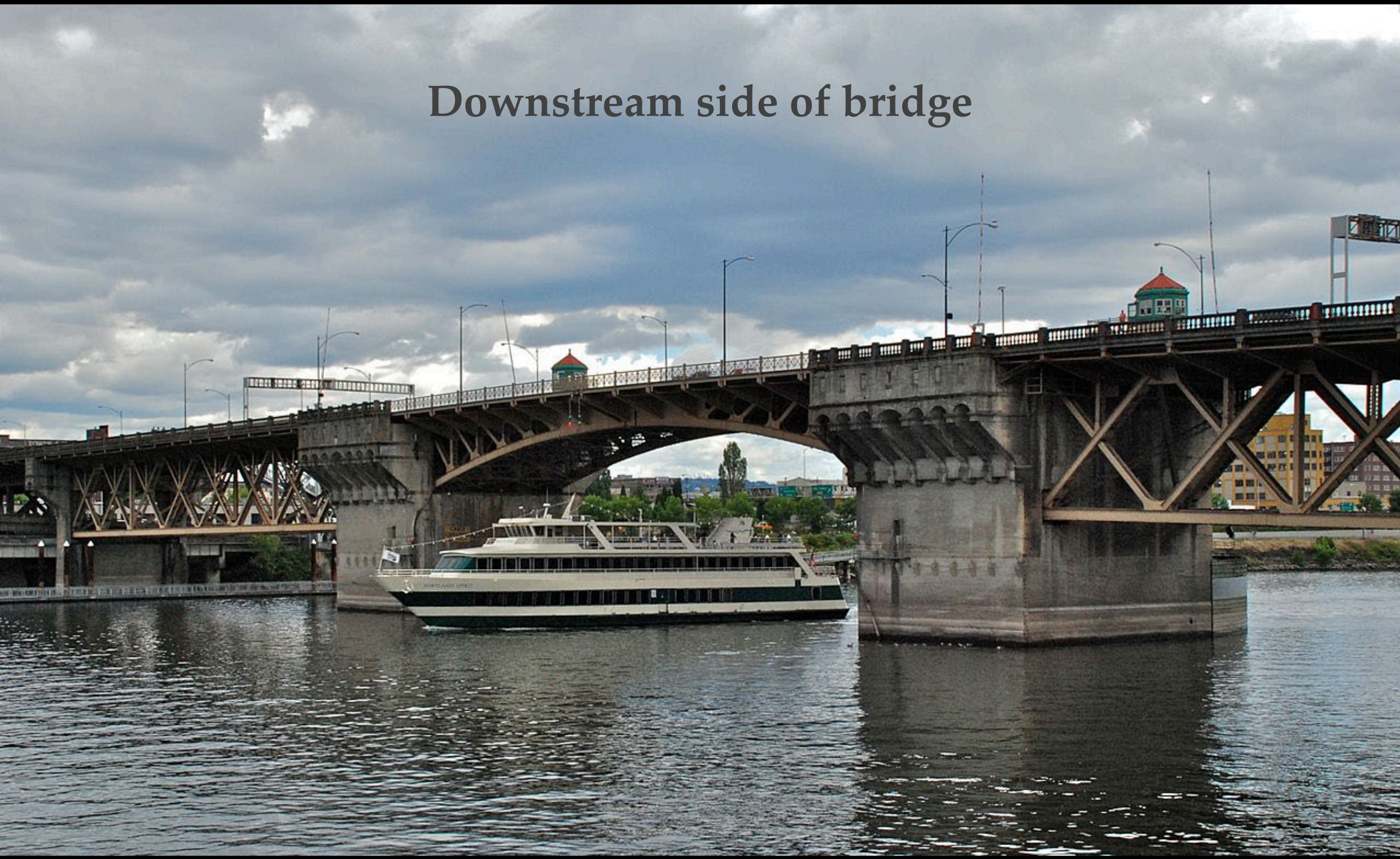
November 8, 23 – SWW

Facing river traffic headed north down the river

October 29, 2023 - SWW

October 29, 2023 - SWW

Downstream side of bridge



Wikipedia

Porch support legs

November 8, 2023 – SWW

Wrought iron railing on bascule span (lighter than the bridge's concrete balusters)

November 8, 2023 – SWW

November 8, 2023 - sww

1926 precast concrete
balusters with many originals
since replaced, also
made of precast concrete

There are an estimated
3,000 of these old and new
balusters seen on the
2,241-foot-long bridge today

November 8, 2023 - sww

November 8, 2023 - sww

November 8, 2023 - sww

Fencing mandated by ODOT installed
in 2020 to prevent objects
being thrown off onto traffic below

November 8, 2023 - sww

When the bridge opened in 1926,
its steel trusses were painted a light gray
and later green

In 1966 the County hired
Portland architect Lewis Crutcher
to recommend a color scheme for all its WRBs
and how we got today's yellow ochre color

It's unknown what color(s) the operator towers
were originally painted

October 23, 2023 - SWW

Today's Burnside Bridge has other beauty spots, not all of them obvious at all times

The Willamette Light Brigade's efforts to see the Burnside Bridge architecturally lighted resulted in the twin-turreted operator towers and cantilevered arches being illuminated in time for the 2012 Rose Festival

LED lights positioned on the south faces (upriver) side of the dolphins shine between 9 PM and daylight

November 2, 2023 - SWW

Sculpted Burnside Bridge Skateboard Park under the east end of the Burnside Bridge in an early photograph

www

October 25, 2023 - SWW

Last, more than any other downtown bridge, Burnside is "the" community gathering spot, a fact not likely to change for the Earthquake-Ready Burnside

Marchers ca. 1930's

Oregon Historical Society Reference code 371N4847

Rose Festival
ca. 1940s

Multnomah County

Rose Festival more recently

Portland State Vanguard

Protesters 2020

Beth Nakamura, *The Oregonian*/OregonLive June 2, 2020

Marchers / Protesters 2023

Mark Graves, *The Oregonian*/OregonLive October 28, 2023

Bridges
Willa Gagnon, age 9

Stretching across the rivers.
Carrying cars, trucks and trains.
Strong, old and reliable
I feel like I am on top of the world.

Bridges Long, Bridges Short
Benjamin Grosscup, age 9

Bridges tall, bridges small
Bridges up, bridges down
Bridges helping all around

Image sources:

Milo P. Atkins, courtesy Steve Dotterrer
Associated Press
The Big & Awesome Bridges of Portland & Vancouver
BridgeStories
Google Map
Robert Hadlow ODOT
Historic American Engineering Record
Steve Morgan
Multnomah County
James Norman
Oregon Historical Society
***The Oregonian*/Oregon Live**
Portland Archives
***The Portland Bridge Book* (3rd ed.)**
Portland State Vanguard
Structurae
Gary Weber
Wikipedia / Wikipedia Commons
SWW (Sharon Wood Wortman)
WWW – *World Wide Web*

Thank you to Megan Neill, Cassie Davis, Elizabeth Britell, Aysha Ghazoul, Bridge Operator Josef, Dennis Corwin of the *Portland Spirit*, Kohel Haver, Robert Hadlow, Therese Bottomly, Steve Dotterrer, Tony Lester, Scott Daniels, Robin "Lobster" Ludwig (1980-2015), and especially Ed Wortman, without whose above-and-beyond contributions this show would not have gone on, at least not this version.