When Preservation Fails: A Story of Alsea Bay

Western Bridge Preservation Partnership
Presented by:
Rebecca Burrow, P.E.
ODOT Bridge Preservation
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Outline

- History of the bridge
- Problems with construction
- Deterioration
- What we learned
History of the Alsea Bay Bridge

Conde B. McCullough and the Bridges of the Oregon Coast Highway
History of the Alsea Bay Bridge

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ALSEA BAY BRIDGE AT WALPORT
ON OREGON COAST HIGHWAY IN LINCOLN COUNTY
BRIDGE NO. 1746

Description: (From North) 2-62' reinforced concrete deck girder spans. 3-150' reinforced concrete deck arches. 1-154', 1-210', 1-154' reinforced concrete tied arches. 3-150' reinforced concrete deck arches. 30 reinforced concrete deck girder spans totaling 1,460'-6". Total length - 3,028'. 2 lanes with 2 sidewalks.

Constructed: 1934-36

Principal Quantities:  
- Excavation: 8,973 cubic yards
- Piling: 71,806 linear feet
- Concrete: 19,298 cubic yards
- Metal Reinforcement: 1,884,423 pounds
- Structural Steel: 265,204 pounds

Construction Cost: $746,762.28
History of the Alsea Bay Bridge
Construction Problems

Building Materials: Hemlock Piles
Construction Problems

Building Materials: Concrete Aggregate
Construction Problems

Building Materials: Concrete Aggregate
Construction Problems

Building Materials: Concrete Aggregate
Construction Problems

Building Materials: Concrete Additive

Diatomite is mixed and milled at the Atomite Corporation plant twelve miles northwest of Redmond, Oregon. It is marketed in three principal grades for definite uses. They are:

RED DOG: Which is an admixture for concrete. The use of this material in concrete construction is becoming very prominent and has been used by the U.S. government for the last three years in all their dams and concrete work. Its value to the trade is that it renders the concrete more workable, prevents segregation of the aggregate, gives a smoother surface, insures adhesion to reinforcing steel, and lubricates the mixture with a minimum amount of water. This also permits of more rapid drying and setting of the concrete and renders it nearly 100% water proof.
Construction Problems

Diatomite
Construction Problems

Other Problems: Scour and Efflorescence
Construction Problems

Completion?
**Deterioration**

**1937**

**SUPPLEMENTARY**

**BRIDGE INSPECTION AND MAINTENANCE REPORT**

OREGON STATE HIGHWAY COMMISSION — BRIDGE DEPARTMENT

For bridge over Alice Bay  
Hwy. No. 9  
Section No. 21-22  
Br. Loc. No. 169.87

County Lincoln

Mileage numbering from Astoria

General description 32 HDCG spans, 6 HC deck arches, 3 HC tied arches

Inspection made by W. L. Goodnight

Date October 1937

**REMARKS**

(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

No scouring around footings of south approach bents where brush and gravel was placed during construction.

Crevices in sidewalks and deck slab bent #1---

Center arches and about middle of south approach.

Sidewalk cracked loose from plaza.

5th expansion joint south of arch spans has spalled back 2 1/2", next to last joint on south approach spalled 3".
Deterioration

1954

REMARKS

(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

(1) Hanger columns on thru arch spans are spailing, reinforcing exposed. Light control house need painting.

1968

REMARKS

(Use second sheet when space below is not sufficient; also, list cause of all defects such as cracking and scaling of concrete whenever possible.)

1. Floor beams show numerous longitudinal crack on the bottom faces. There should be checked over and many should be sealed. Some will need patching.

2. Expansion joints need repouring, concrete deck broken at edge of 4 expansion joints

3. Under the sidewalk left side at south end of bridge, the concrete has been damaged by driftwood fire, some resteel exposed.

4. Four hangers have spalled areas reinforcing exposed.
Deterioration

Scour Repairs - 1968
Deterioration

Scour Repairs - 1968
Deterioration

Cathodic Protection - 1973

NOTE: REFERENCE ELECTRODE IN CONCRETE CONSISTS OF 4" OF 3/8" DIA DIAMOND-LINE ZINC ANODE IN PLASTER OF PARIS BACKFILL.

NOTE: REFERENCE ELECTRODE STRAPPED ON SIDE OF BEAM CONSISTS OF 1 FOOT OF 3/8" X 1/2" DIAMOND-LINE ZINC ANODE.

SIDE ELEVATION OF PRESTRESSED BEAM SHOWING LOCATION OF ANODES, REFERENCE ELECTRODES, AND PRESTRESSED CABLES.
Cathodic Protection System on the Alsea Bay Bridge:

An inspection of eight randomly-selected beams was made to determine the physical condition of the system. It was found that:

A complete electro-chemical evaluation of each beam should be made and, if the results are consistent with the initial findings, one or two beams should be chosen, removed from the pier and sent to Salem for evaluation. The probability that several of the beams are near or in failure is sufficiently great that disturbing any in place for strand inspection is not advised.
Deterioration

Condition Evaluation, 1984
Deterioration

Scaling, 1984

LOOSE CONCRETE ON ALSEA BRIDGE
TO BE REMOVED BY HIGHWAY DIV

October 19, 1984
84-87-S
Deterioration

Scaling, 1984

LOOSE CONCRETE ON ALSEA BRIDGE
TO BE REMOVED BY HIGHWAY DIV

October 19, 1984
84-87-S

The rehabilitation study stated the bridge would last only about five more years if deterioration were not stopped. At that time, more serious restrictions would be necessary, along with extensive maintenance.
Deterioration

End of Life, 1990-91

BRIDGE INSPECTION REPORT
OREGON STATE HIGHWAY DIVISION

BRIDGE TYPE RC Tied Arch NAME Alsea Bay
CROSSING (OVER, UNDER) Bay COUNTY Lincoln
DISTRICT 4 YEAR BUILT 1934 A.C. (in.) --- DATE 3/6/90

REMARKS (Key-in to item and number above)

There is extensive corrosion, cracking, and spalling throughout the deck and superstructure.
There is heavy transverse cracks and some map cracking throughout the deck. Deck joints are
open, edges of joints are broken in places (No Problem). The const. joint between deck &
sidewalk slabs appear to be open up in places (No Change). The anchor bolts at the roller
bearing have rusted in half. Bearings in Deck Arches have failed and temporary bearings
were added. The ends of the interior beams at Bent 16 (over rockers) are spalled 2" to 3" Deep.
Additional pile were driven to prevent settlement in S. approach spans. Cathodic protection
is not working & beyond repair. North approach shows erosion under backwall and some
settlement of A.C.

REMARKS (Key-in to item and number above)

There is extensive corrosion, cracking, and spalling throughout the deck and
superstructure. Many stirrups near midspan of the deck arch beams are one to
100 % section lose. Many of the beam ends and bearing areas for the
same area have spalled, providing very little bearing area. Temp. bearing
Aftermath
Aftermath

Old Bridge Loved

Requiem for a grand old BRIDGE

Historic Bridge Interpretive Center
Coastal Bridge Preservation Program

- 13 bridges with impressed current CP
- 2 more in development
Aftermath

Coastal Bridge Preservation Program
Aftermath

- Replacement in 1991:
  - $52M
- Estimated Replacement Cost
  Today:
  - $225M
- Estimated Rehabilitation Cost
  Today:
  - $60M
Thank you.