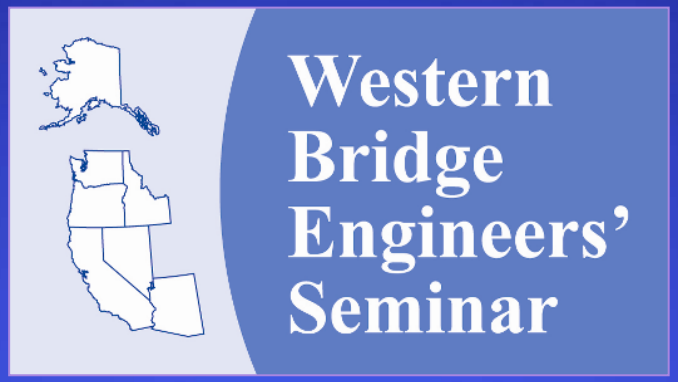
September 22, 2009



Sacramento, CA

Unique Fracture Critical Rope Access Bridge Inspections Throughout Alaska

Brian J. Leshko, PE
HDR Engineering, Inc.

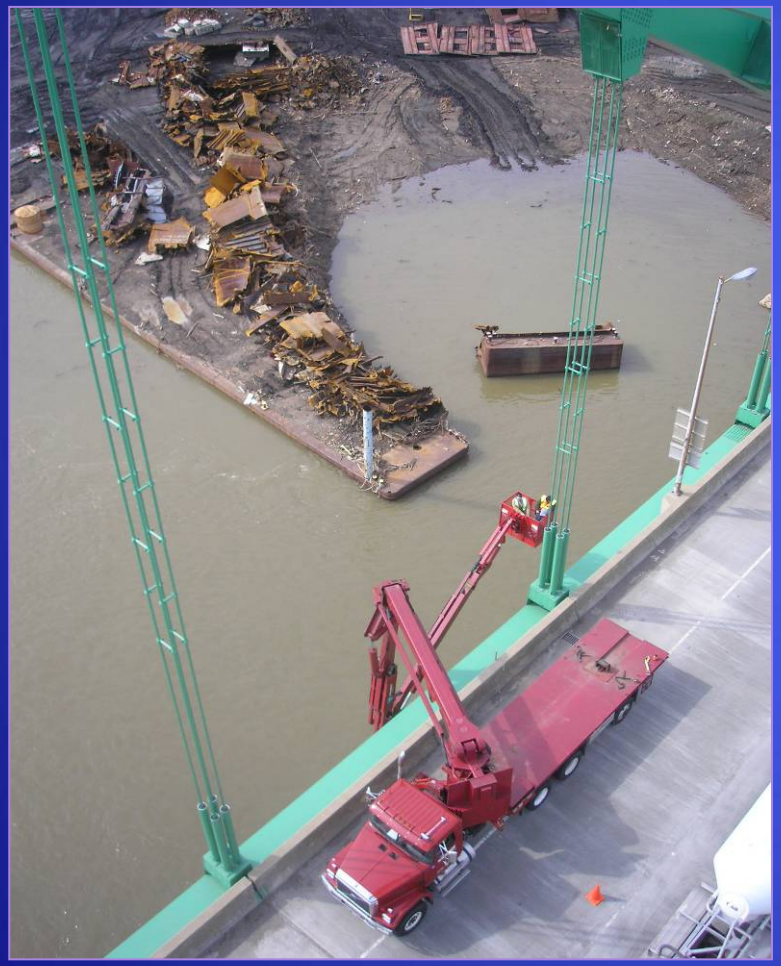
Session 8C

3:30 PM

Bridge Inspection Access Methods

- Underbridge Inspection Cranes
- Aerial Lifts and Bucket Trucks
- Stages and Powered Climbers
- Structure Climbing
- **Industrial Rope Access**

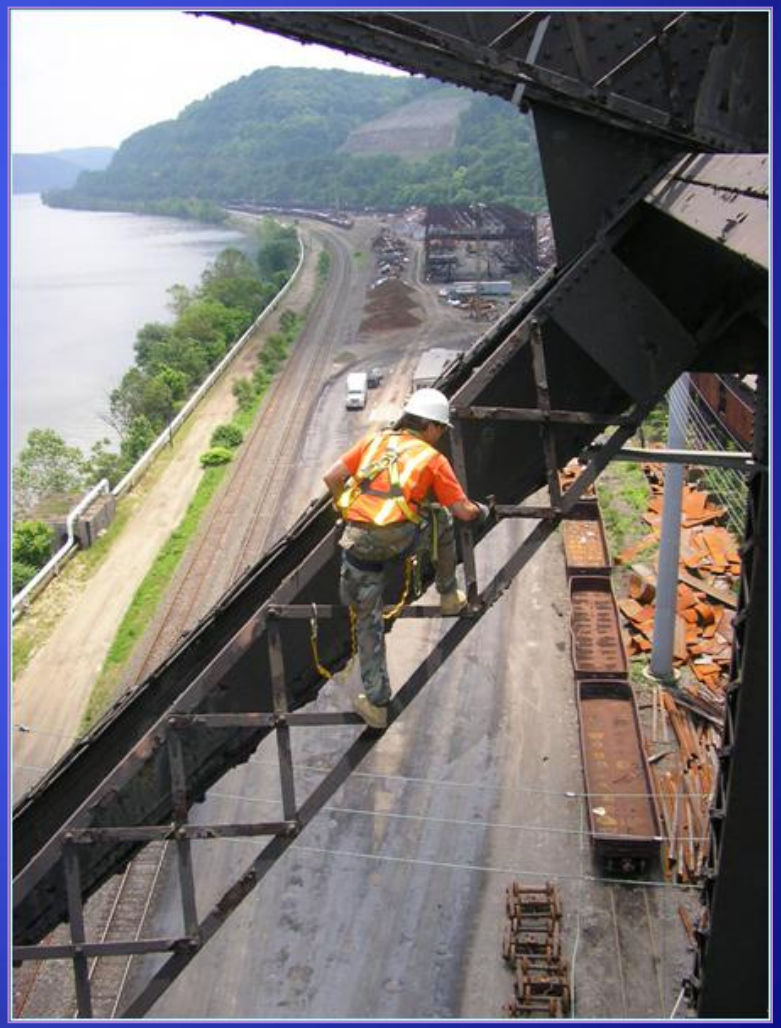
Bridge Inspection Access – Underbridge Inspection Cranes



Bridge Inspection Access – Aerial Lifts and Bucket Trucks

Bridge Inspection Access – Stages and Powered Climbers

Bridge Inspection Access – Structure Climbing



Bridge Inspection Access – Industrial Rope Access

Review of Climbing Methods

- Free Climbing – "Old School"
  - Prohibited by OSHA
  - Allowed by FRA 214 for Railroad bridges
- Structure Climbing
  - Connected to structure via lifeline or cross-arm strap
- **Industrial Rope Access**
  - "Rappelling" or "Rock Climbing Techniques"

Industrial Rope Access

- Rope access is a work system using ropes and specialized hardware as the primary means of supporting inspectors.
- Rope access inspectors descend, ascend and traverse ropes to access the structure to perform a truly “hands-on” inspection.

Industrial Rope Access

- The support of the rope completely eliminates the likelihood of a fall.
- Rope access inspectors use a back-up fall protection system in the unlikely failure of their primary means of support.
- This redundant system is usually achieved by using two ropes, a working line and a safety line.

Industrial Rope Access Inspection

- Society of Professional Rope Access Technicians (SPRAT®)
  - A member-based organization that serves the rope access industry by developing and maintaining standards and administering an independent certification program.
  - Proper training and supervision of personnel is the most critical component of safe rope access operations.

SPRAT Rope Access Technicians

- **Level I Technicians** (Authorized **Workers**) are qualified to work under appropriate supervision and are able to inspect their equipment and safety systems.
- **Level II Technicians** (Lead **Technicians**) are qualified to rig more complicated systems and trained to perform a wider range of rescue techniques.
- **Level III Technicians** (Safety **Supervisors**) have more documented experience and training and are responsible for the safety management of the job.

Rope Access Bridge Inspection Team

- **RABIT Teaming Partners:**
  - HDR Engineering, Inc.
  - Skala Group, Inc.

HDR + skala

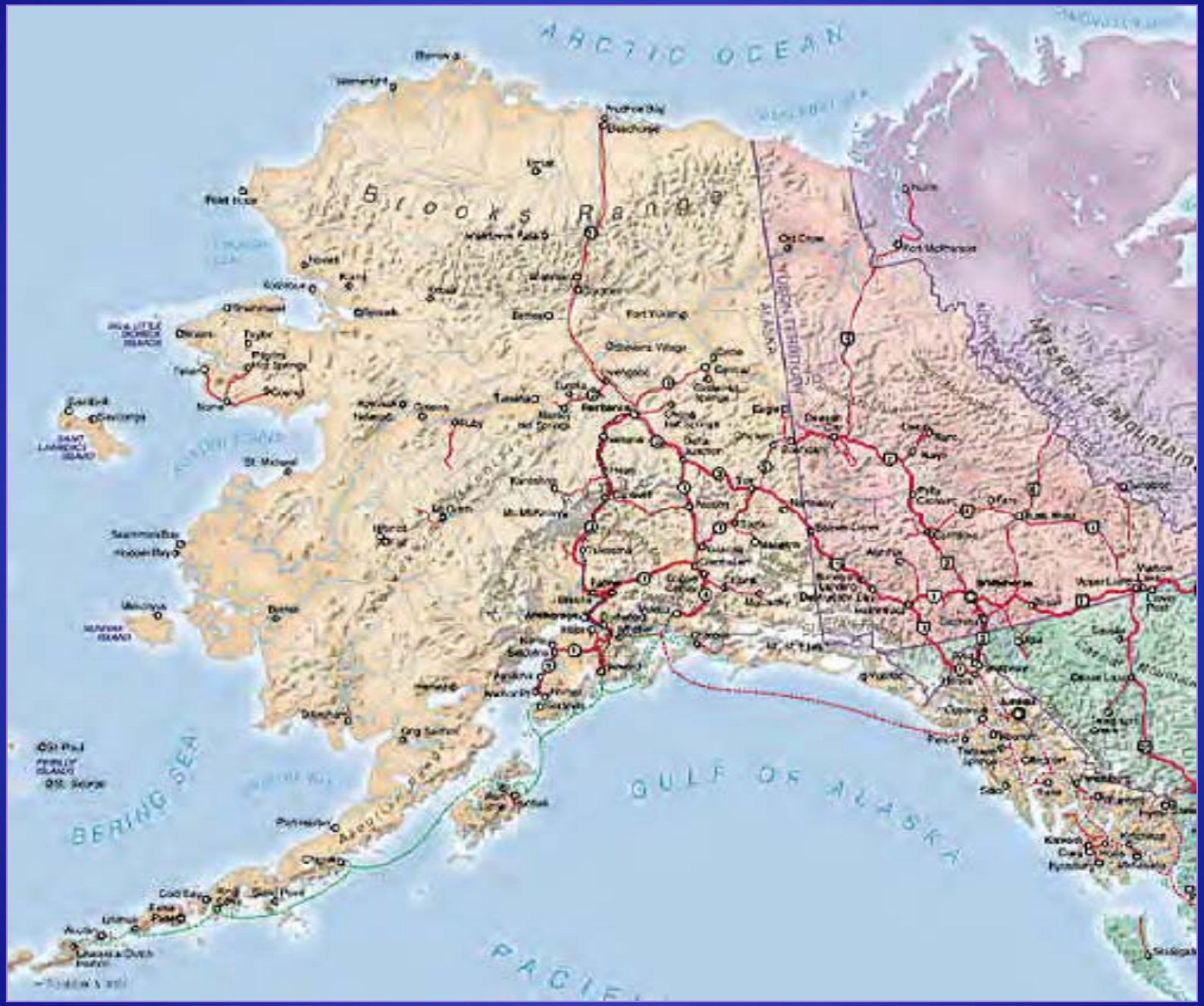
Alaska Department of Transportation & Public Facilities (AKDOT&PF)

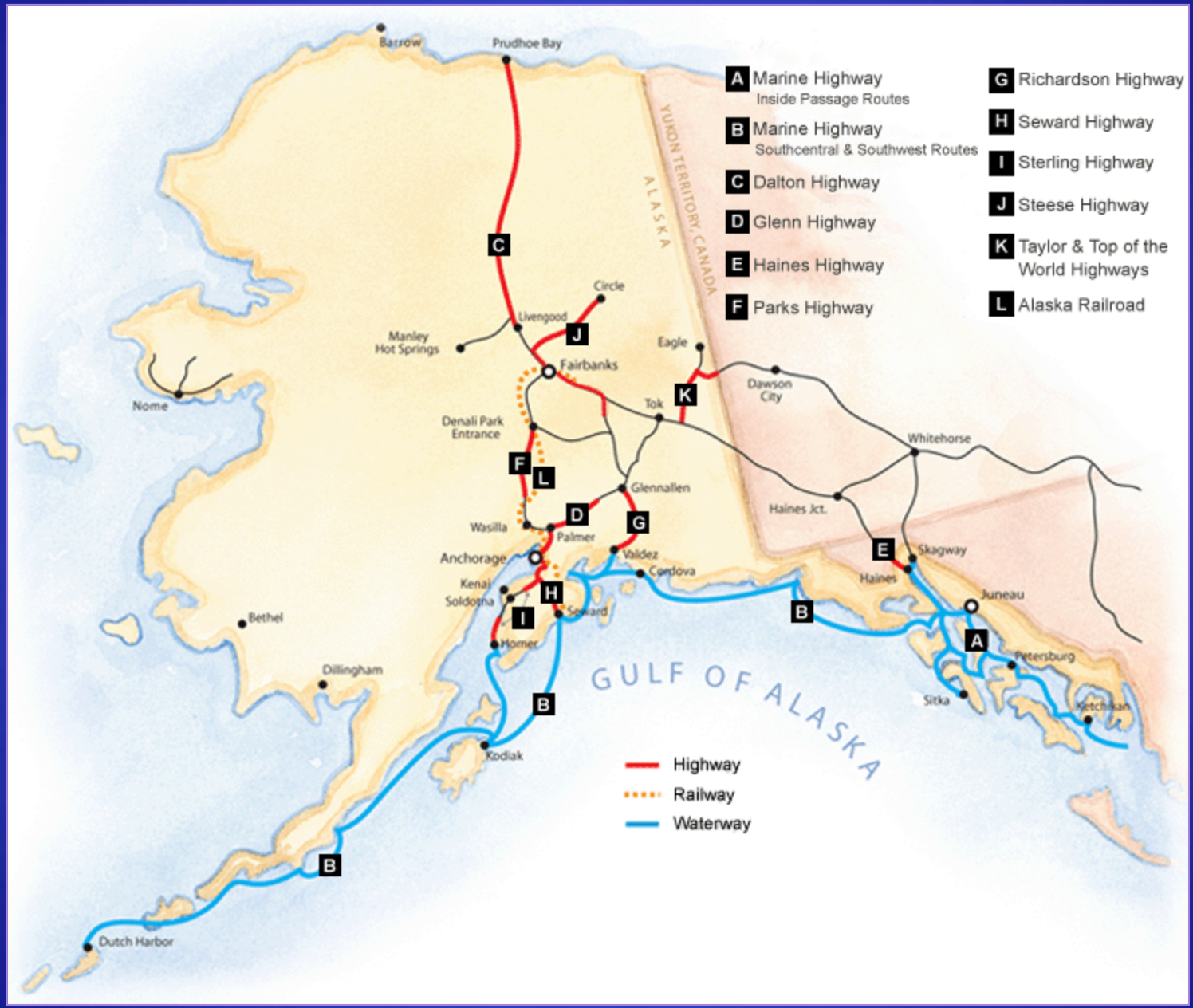
- Term Agreement (2006-2009) –
  Fracture Critical and Special Bridge Inspections

Rope Access – Rappelling

Rope Access – Structure Climbing


TRANSPORTATION & PUBLIC FACILITIES
STATE OF ALASKA


ARCTIC OCEAN
Brooks Range
BERING SEA
GULF OF ALASKA
PACIFIC


A Marine Highway
Inside Passage Routes
B Marine Highway
Southcentral & Southwest Routes
C Dalton Highway
D Glenn Highway
E Haines Highway
F Parks Highway
G Richardson Highway
H Seward Highway
I Sterling Highway
J Steese Highway
K Taylor & Top of the World Highways
L Alaska Railroad
Barrow
Prudhoe Bay
Circle
Livengood
Manley Hot Springs
Fairbanks
Eagle
Dawson City
Nome
Tok
Denali Park Entrance
Whitehorse
Glennallen
Haines Jct.
Wasilla
Palmer
Valdez
Skagway
Anchorage
Cordova
Haines
Kenai
Soldotna
Seward
Juneau
Bethel
Homer
Petersburg
Dillingham
Sitka
Ketchikan
Kodiak
Dutch Harbor
ALASKA
YUKON TERRITORY, CANADA
GULF OF ALASKA
Highway
Railway
Waterway

AKDOT&PF Bridge Inspections

- Task Order #4
- 36 Transfer Bridges throughout Alaska
  - **Marine Ferry Terminals**
  - **Seaplane Float Facilities**
- No Manlift, Bucket Truck or UBIV Allowed (Client Mandated Requirement)
- ***Rope Access used Exclusively***
- Fracture Critical Member Inspections
- "Hands-on" / "Within Arm's Reach"

Task Order #4 – 36 FCM Bridge Inspections Statewide

- Whittier (1 Bridge)
- Cordova (1 Bridge)
- Tatitlek (1 Bridge)
- Chenega Bay (2 Bridges)
- Valdez (1 Bridge)
- Juneau (3 Bridges)
- Haines (1 Bridge)
- Skagway (1 Bridge)
- Hoonah (2 Bridges)
- Tenakee Springs (1 Bridge)
- Sitka (1 Bridge)
- Pelican Bay (1 Bridge)
- Angoon (2 Bridges)
- Wrangell (1 Bridge)
- Petersburg (1 Bridge)
- South Mitkof (1 Bridge)
- Kake (1 Bridge)
- Metlakatla (2 Bridges)
- Craig (1 Bridge)
- Clark Bay/Hollis (2 Bridges)
- Coffman Cove (2 Bridges)
- Hydaburg (1 Bridge)
- Ketchikan (6 Bridges)

All Phases (Sept. 22 – Oct. 20, 2008)

Rope Access Bridge Inspection Team (RABIT)

- **Brian Leshko** (HDR-Pittsburgh) SPRAT Level I
- **Dave Klein** (Skala-Durango) SPRAT Level II
- **Matt Waskiewicz** (Skala-Reno) SPRAT Level III

SPRAT®
Society of Professional Rope Access Technicians

Alaska's Marine Highway

FERRYALASKA.COM

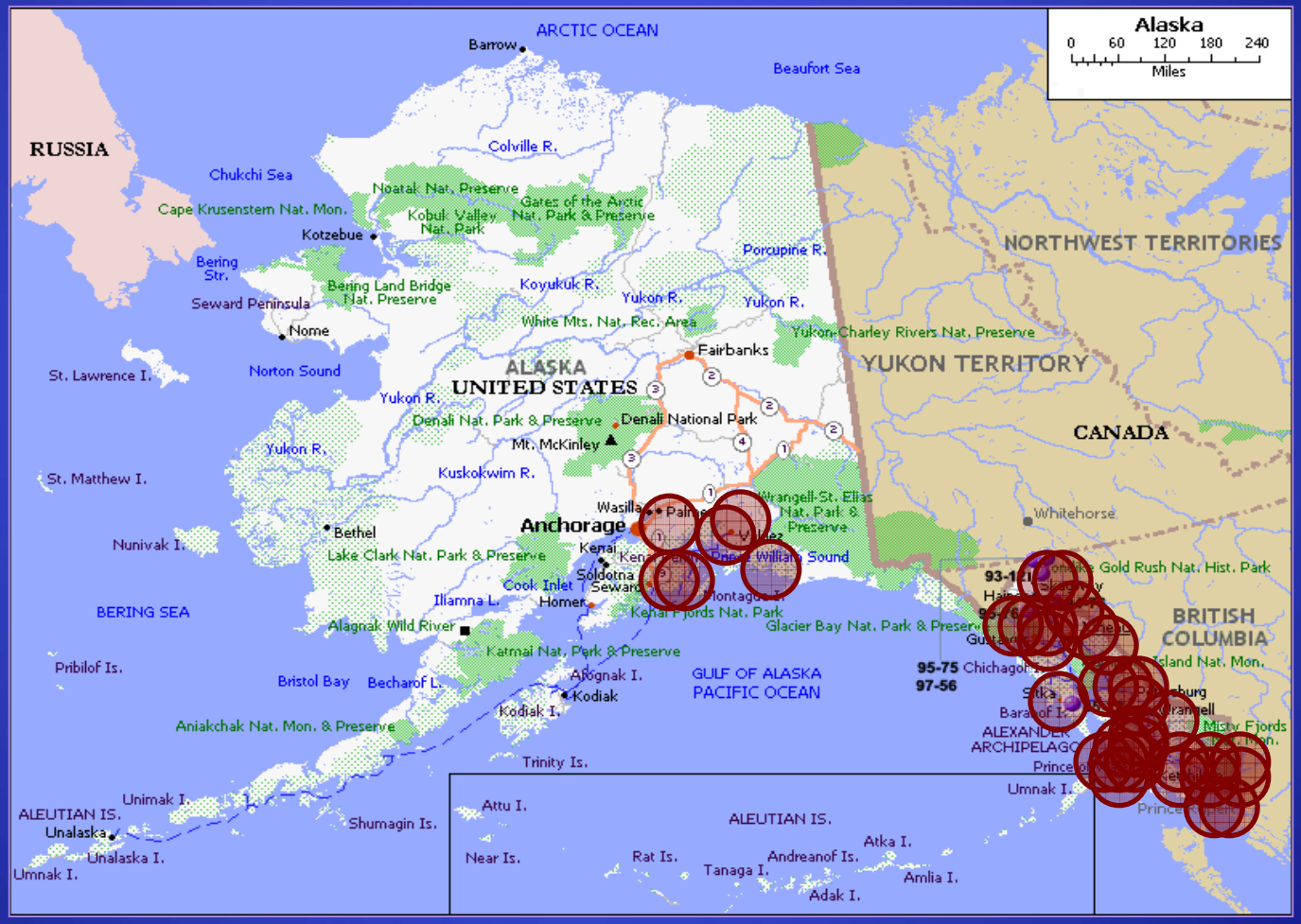
AMERICA'S BYWAYS

TRANSPORTATION & PUBLIC FACILITIES

STATE OF ALASKA


WELCOME
TO
ALASKA

Location of Bridges in Alaska



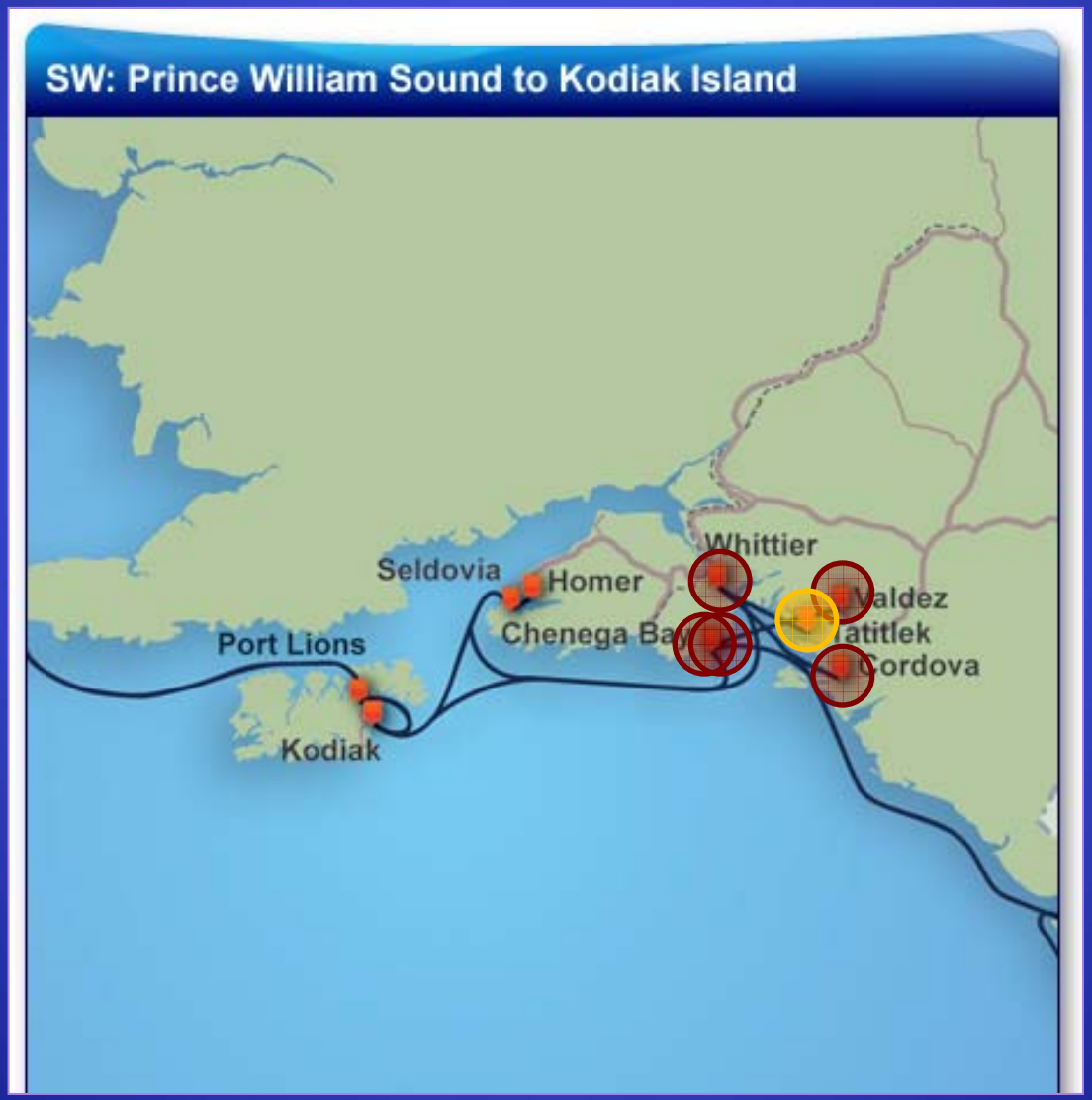
Remote Areas with Limited Access

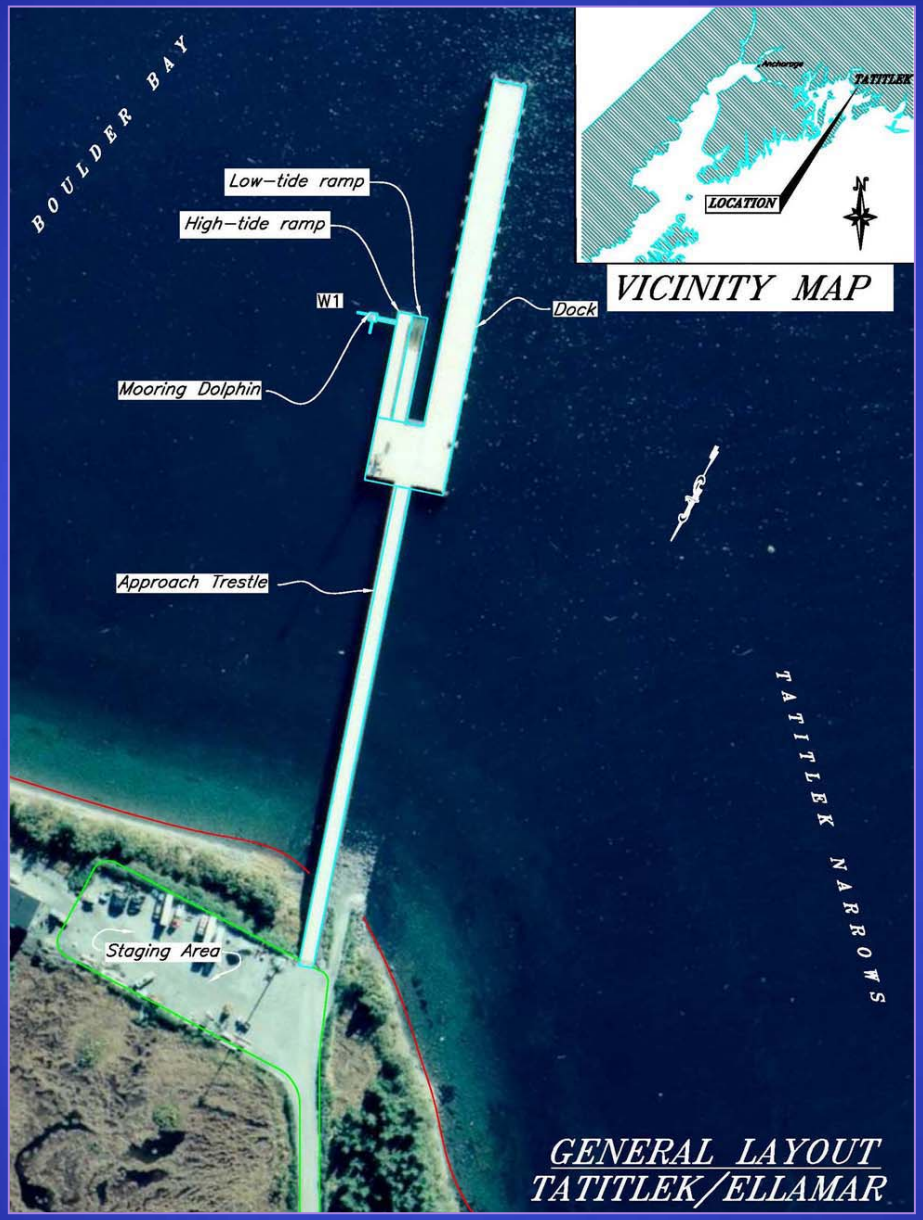
Phase I (Sept. 23-28, 2008)

South Central Alaska Region – 6 Structures

- Whittier (1 Bridge)
- Cordova (1 Bridge)
- **Tatitlek** (1 Bridge)
- Chenega Bay (2 Bridges)
- Valdez (1 Bridge)

Bridges on Prince William Sound



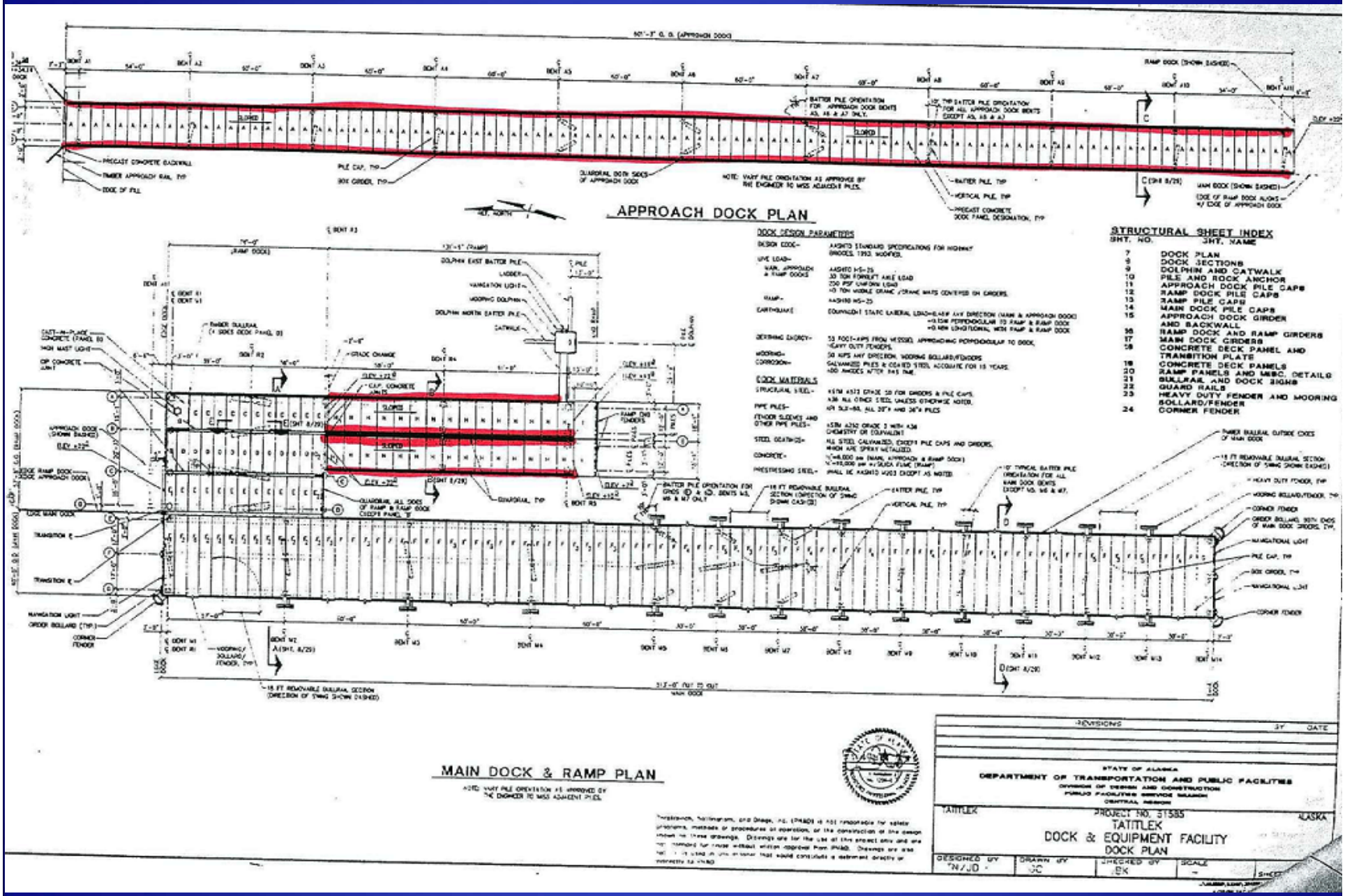


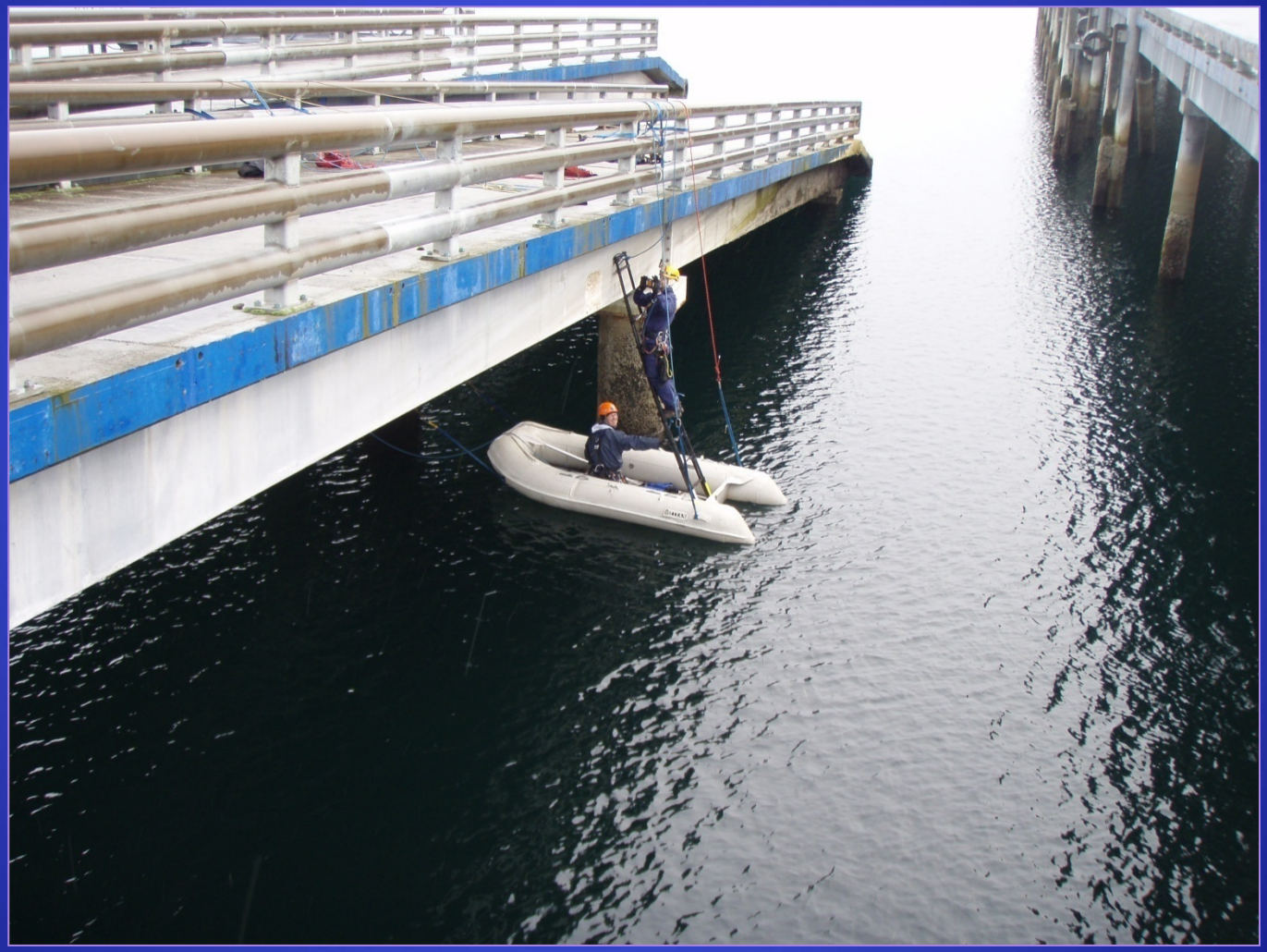
Tatitlek Ferry Terminal

Approach Trestle, Main Dock & Tidal Ramps

Approach Trestle Structure

Tidal Ramp Structures


APPROACH DOCK PLAN
MAIN DOCK & RAMP PLAN
DOCK DESIGN PARAMETERS
DESIGN CODE-
AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1992, WITH INTERIM
LIVE LOAD-
MAIN, APPROACH & RAMP DOCKS
AASHTO HS-25
20 TON FORKLIFT AXLE LOAD
250 PSF UNIFORM LOAD
40 TON MOBILE CRANE (CRANE MATS COVERED ON GIRDERS
RAMP-
AASHTO HS-25
EARTHQUAKE
EQUIVALENT STATIC LATERAL LOAD=0.40W ANY DIRECTION (MAIN & APPROACH DOCK)
+0.15W PERPENDICULAR TO RAMP & RAMP DOCK
+0.40W LONGITUDINAL, MAIN RAMP & RAMP DOCK
BERTHING ENERGY-
55 FOOT-KIPS FROM VESSELS APPROACHING PERPENDICULAR TO DOCK, HEAVY DUTY FENDERS.
MOORING-
50 KIPS ANY DIRECTION, MOORING BOLLARD/FENDERS
CORROSION-
GALVANIZED PILES & COATED STEEL ACCEPTABLE FOR 15 YEARS. ADD ANODES AFTER 845 DAYS
DOCK MATERIALS
STRUCTURAL STEEL-
ASTM A572 GRADE 50 FOR GIRDERS & PILE CAPS. A36 ALL OTHER STEEL UNLESS OTHERWISE NOTED.
PIPE PILES-
API 5LX-60, ALL 30" & AND 36" PILES
FENDER SLEEVES AND OTHER PIPE PILES-
ASTM A252 GRADE 3 WITH A36 CHEMISTRY OR EQUIVALENT
STEEL COATING-
ALL STEEL GALVANIZED, EXCEPT PILE CAPS AND GIRDERS, WHICH ARE SPRAY METALIZED
CONCRETE-
f'c=6,000 psi (MAIN, APPROACH & RAMP DOCK) f'c=5,000 psi w/SILICA FUME (RAMP)
PRESTRESSING STEEL-
SHALL BE AASHTO M203 EXCEPT AS NOTED
STRUCTURAL SHEET INDEX
SHT. NO. SHT. NAME
7 DOCK PLAN
8 DOCK SECTIONS
9 DOLPHIN AND CATWALK
10 PILE AND ROCK ANCHOR
11 APPROACH DOCK PILE CAPS
12 RAMP DOCK PILE CAPS
13 RAMP PILE CAPS
14 MAIN DOCK PILE CAPS
15 APPROACH DOCK GIRDER AND BACKWALL
16 RAMP DOCK AND RAMP GIRDERS
17 MAIN DOCK GIRDERS
18 CONCRETE DECK PANEL AND TRANSITION PLATE
19 CONCRETE DECK PANELS
20 RAMP PANELS AND MISC. DETAILS
21 BULLRAIL AND DOCK RAILS
22 GUARD RAILS
23 HEAVY DUTY FENDER AND MOORING BOLLARD/FENDER
24 CORNER FENDER
REVISIONS
BY DATE
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
DIVISION OF DESIGN AND CONSTRUCTION
PUBLIC FACILITIES SERVICE SECTION
CENTRAL REGION
TATITLEK
PROJECT NO. 31585
ALASKA
TATITLEK
DOCK & EQUIPMENT FACILITY
DOCK PLAN
DESIGNED BY
DRAWN BY
CHECKED BY
SCALE
SHEET



Ladder Access from Boat Access

Rope Access from Boat Access

Rope Access from Ground Access

Box Girder Exterior Inspection

Exterior Inspection via Pulley System

Bent Cap Exterior Inspection

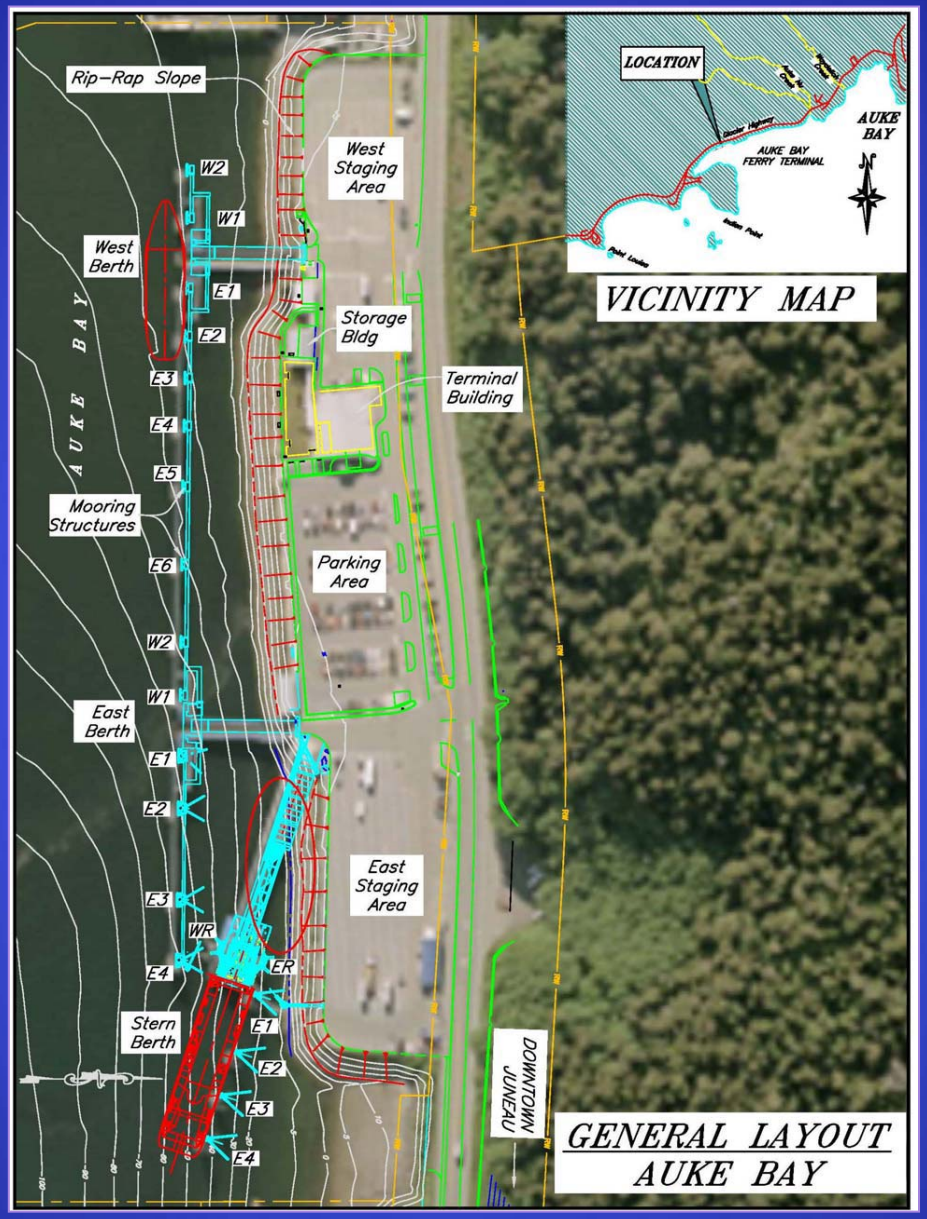
Typical Condition – Corrosion

Phase II (Sept. 29 - Oct. 7, 2008)

Southeast Alaska Region – 12 Structures

- Juneau [Auke Bay] (3 Bridges)
- Haines (1 Bridge)
- Skagway (1 Bridge)
- Hoonah (2 Bridges)
- Tenakee Springs (1 Bridge)
- Sitka (1 Bridge)
- Pelican Bay (1 Bridge)
- Angoon (2 Bridges)

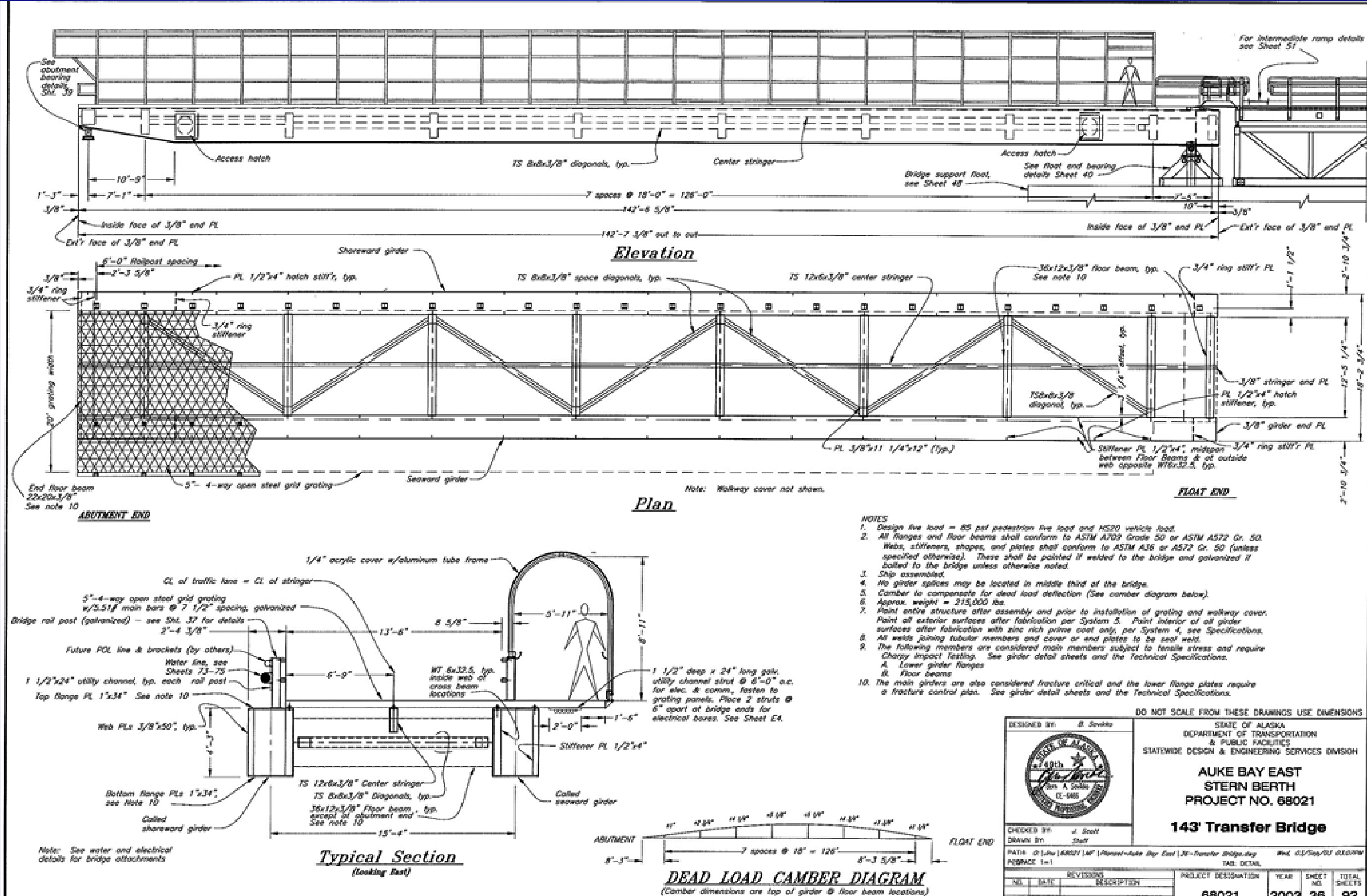
Bridges along Inside Passage



Auke Bay Ferry Terminal

Auke Bay East Stern Berth Transfer Bridge

Auke Bay East Stern Berth Transfer Bridge



Elevation
Access hatch
TS 8x8x3/8" diagonals, typ.
Center stringer
Bridge support float, see Sheet 48
See float end bearing details Sheet 40
For intermediate ramp details see Sheet 51
7 spaces @ 18'-0" = 126'-0"
142'-6 5/8"
142'-7 3/8" out to out
Inside face of 3/8" end PL
Ext'r face of 3/8" end PL
Plan
Shoreward girder
PL 1/2"x4" hatch stiff'r, typ.
TS 8x8x3/8" space diagonals, typ.
TS 12x6x3/8" center stringer
36x12x3/8" floor beam, typ. See note 10
3/4" ring stiff'r PL
3/8" stringer end PL
3/8" girder end PL
Seaward girder
5"- 4-way open steel grid grating
End floor beam 22x20x3/8" See note 10
ABUTMENT END
FLOAT END
Note: Walkway cover not shown.
Typical Section
(Looking East)
1/4" acrylic cover w/aluminum tube frame
CL of traffic lane = CL of stringer
Bridge rail post (galvanized) - see Sht. 37 for details
Future POL line & brackets (by others)
Top flange PL 1"x34" See note 10
Web PLs 3/8"x50", typ.
Bottom flange PLs 1"x34", see Note 10
Called shoreward girder
Called seaward girder
TS 12x6x3/8" Center stringer
TS 8x8x3/8" Diagonals, typ.
Stiffener PL 1/2"x4"
Note: See water and electrical details for bridge attachments
DEAD LOAD CAMBER DIAGRAM
(Camber dimensions are top of girder @ floor beam locations)
ABUTMENT
FLOAT END
7 spaces @ 18' = 126'
NOTES
1. Design live load = 85 psf pedestrian live load and HS20 vehicle load.
2. All flanges and floor beams shall conform to ASTM A709 Grade 50 or ASTM A572 Gr. 50. Webs, stiffeners, shapes, and plates shall conform to ASTM A36 or A572 Gr. 50 (unless specified otherwise). These shall be painted if welded to the bridge and galvanized if bolted to the bridge unless otherwise noted.
3. Ship assembled.
4. No girder splices may be located in middle third of the bridge.
5. Camber to compensate for dead load deflection (See camber diagram below).
6. Approx. weight = 215,000 lbs.
7. Paint entire structure after assembly and prior to installation of grating and walkway cover. Paint all exterior surfaces after fabrication per System 5. Paint interior of all girder surfaces after fabrication with zinc rich prime coat only, per System 4, see Specifications.
8. All welds joining tubular members and cover or end plates to be seal weld.
9. The following members are considered main members subject to tensile stress and require Charpy Impact Testing. See girder detail sheets and the Technical Specifications.
A. Lower girder flanges
B. Floor beams
10. The main girders are also considered fracture critical and the lower flange plates require a fracture control plan. See girder detail sheets and the Technical Specifications.
DO NOT SCALE FROM THESE DRAWINGS USE DIMENSIONS
DESIGNED BY: B. Sevikko
CHECKED BY: J. Scott
DRAWN BY: Staff
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
& PUBLIC FACILITIES
STATEWIDE DESIGN & ENGINEERING SERVICES DIVISION
AUKE BAY EAST
STERN BERTH
PROJECT NO. 68021
143' Transfer Bridge
TAB: DETAIL
REVISIONS
NO. DATE DESCRIPTION
PROJECT DESIGNATION 68021
YEAR 2003
SHEET NO. 36
TOTAL SHEETS 92

Within Arm’s Length Distance

Hands-on Inspection

Feet-on Inspection

Permit-Required Confined Space

- 16 of 23 Dual Steel Box Girder Bridges

- Entry Supervisor
- Entry Attendant
- Entrant

- 4-Gas Monitor

Entry Attendant

PRCS Entry - Box Girder Interior Inspection

Entrant

PRCS Entry - Box Girder Interior Inspection

4-Gas Monitor

- **Oxygen** (O_2)
- **Carbon Monoxide** (CO)
- **Hydrogen Sulfide** (H_2S)
- **Combustible Gases** (LEL)

PRCS Entry - Box Girder Interior Inspection

PRCS Entry - Box Girder Interior Inspection

Typical Condition - Condensation

Phase III (Oct. 8-19, 2008)

Inside Passage Region – 18 Structures

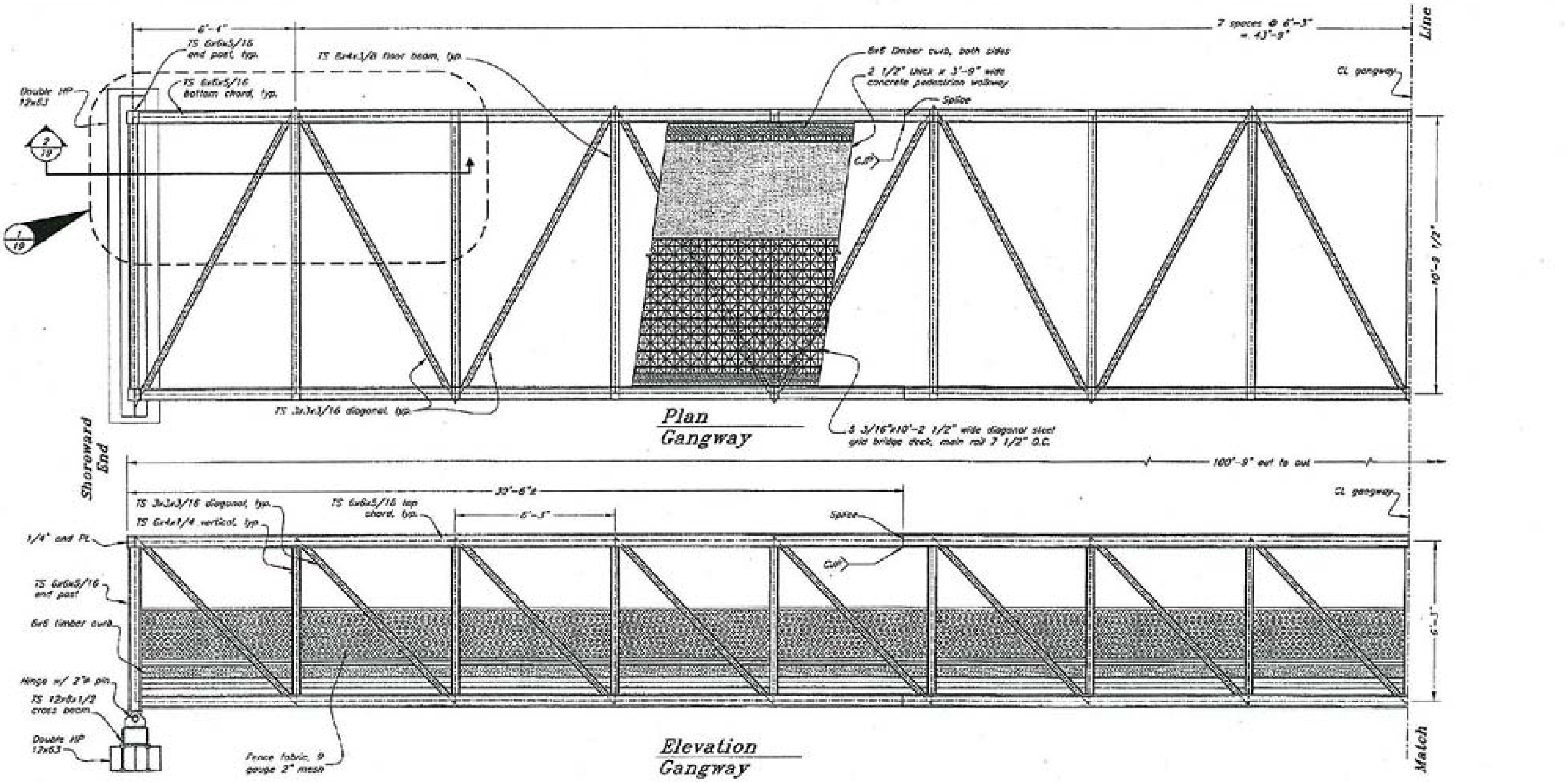
- Wrangell (1 Bridge)
- Petersburg (1 Bridge)
- South Mitkof (1 Bridge)
- Kake (1 Bridge)
- Metlakatla (2 Bridges)
- Craig (1 Bridge)
- Clark Bay/Hollis (2 Bridges)
- Coffman Cove (2 Bridges)
- Hydaburg (1 Bridge)
- Ketchikan (6 Bridges)

Bridges along Inside Passage

Bridges on Prince of Wales Island

Coffman Cove Seaplane Gangway Ramp

Coffman Cove Seaplane Gangway Ramp



General Notes

1. Design basis is AASHTO Standard Specifications for Highway Bridges as modified by Guide Specifications for Design of Pedestrian Bridges. Design live pedestrian load is 85 psf (reduced to 65 psf where permitted by AASHTO) and live vehicle load is AASHTO TS 3x3x3/16 truck.
2. All steel pipe and structural tubing shall conform to ASTM A53 Grade B and ASTM A500 Grade B, respectively. Rolled steel shapes and miscellaneous plates shall conform to ASTM A36.
3. No bottom chord splices may be located in the middle third of the span.
4. Camber to compensate for dead load deflection (see Camber Diagram)
5. Ship assembled. Approximate weight = 60,000 lbs.
6. All welds joining tubular members and end plates are to seal the joint.
7. All steel surfaces to be hot dip galvanized.

DO NOT SCALE FROM THESE DRAWINGS USE DIMENSIONS

DESIGNED BY: T. Daggett

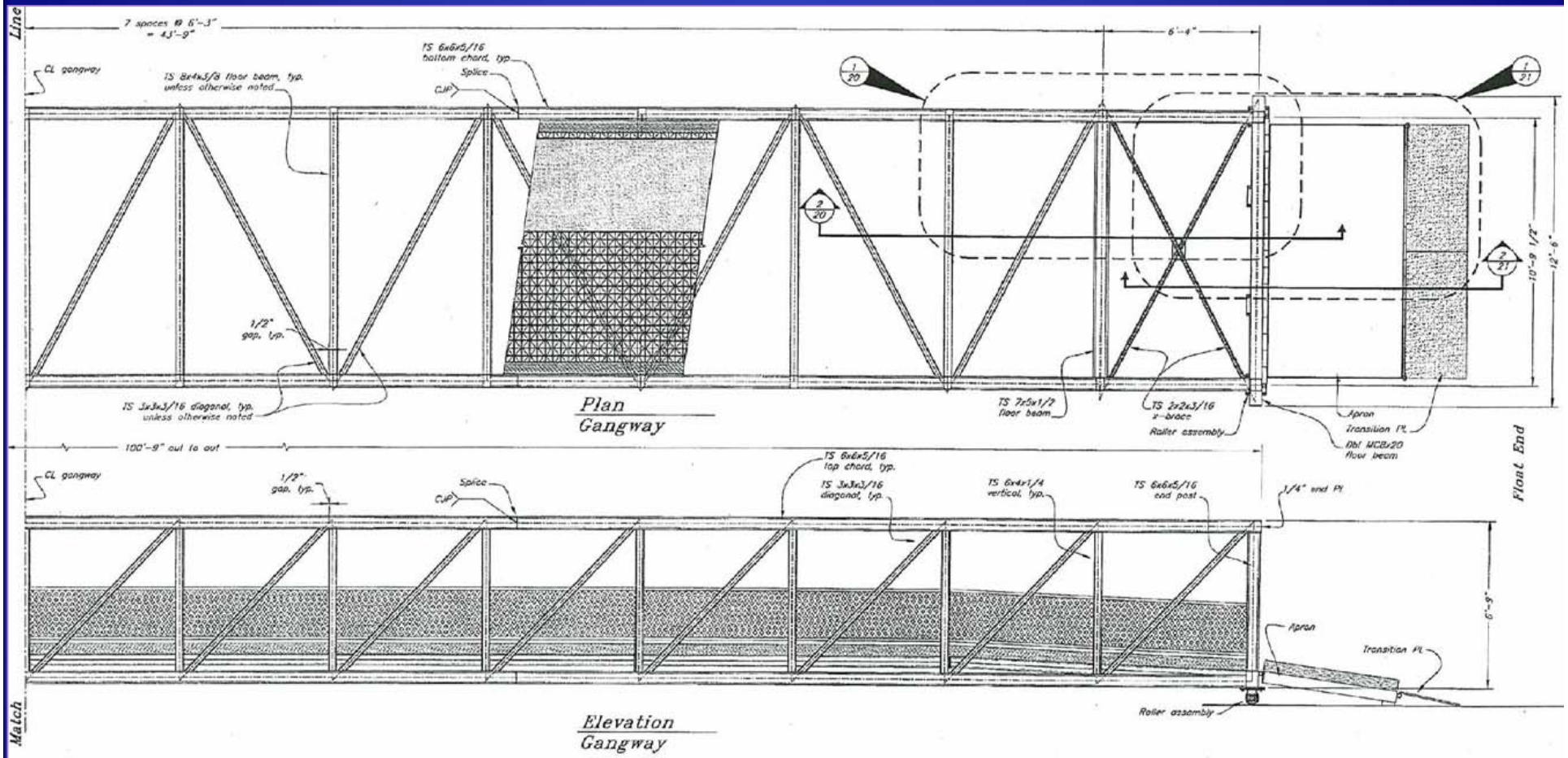
5-30-04

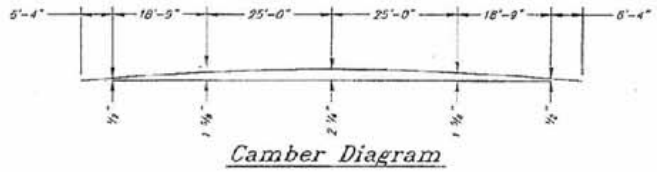
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
& PUBLIC FACILITIES
STATEWIDE DESIGN & ENGINEERING SERVICES DIVISION

Coffman Cove Seaplane Roat
Relocation
Project 67904

Gangway

PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
67904	2006	16	39





Camber Diagram

DO NOT SCALE FROM THESE DRAWINGS USE DIMENSIONS

DESIGNED BY: T. Doggett
DRAWN BY: T. Doggett/C. Moore
CHECKED BY: J. Beedle

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES
STATEWIDE DESIGN & ENGINEERING SERVICES DIVISION

Coffman Cove Seaplane Float Relocation
Project 67904

Gangway

REVISIONS NO.	DATE	DESCRIPTION	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			67904	2006	17	39

Positioned via Rope-to-Rope Transfer

Typical Condition – Truss Members

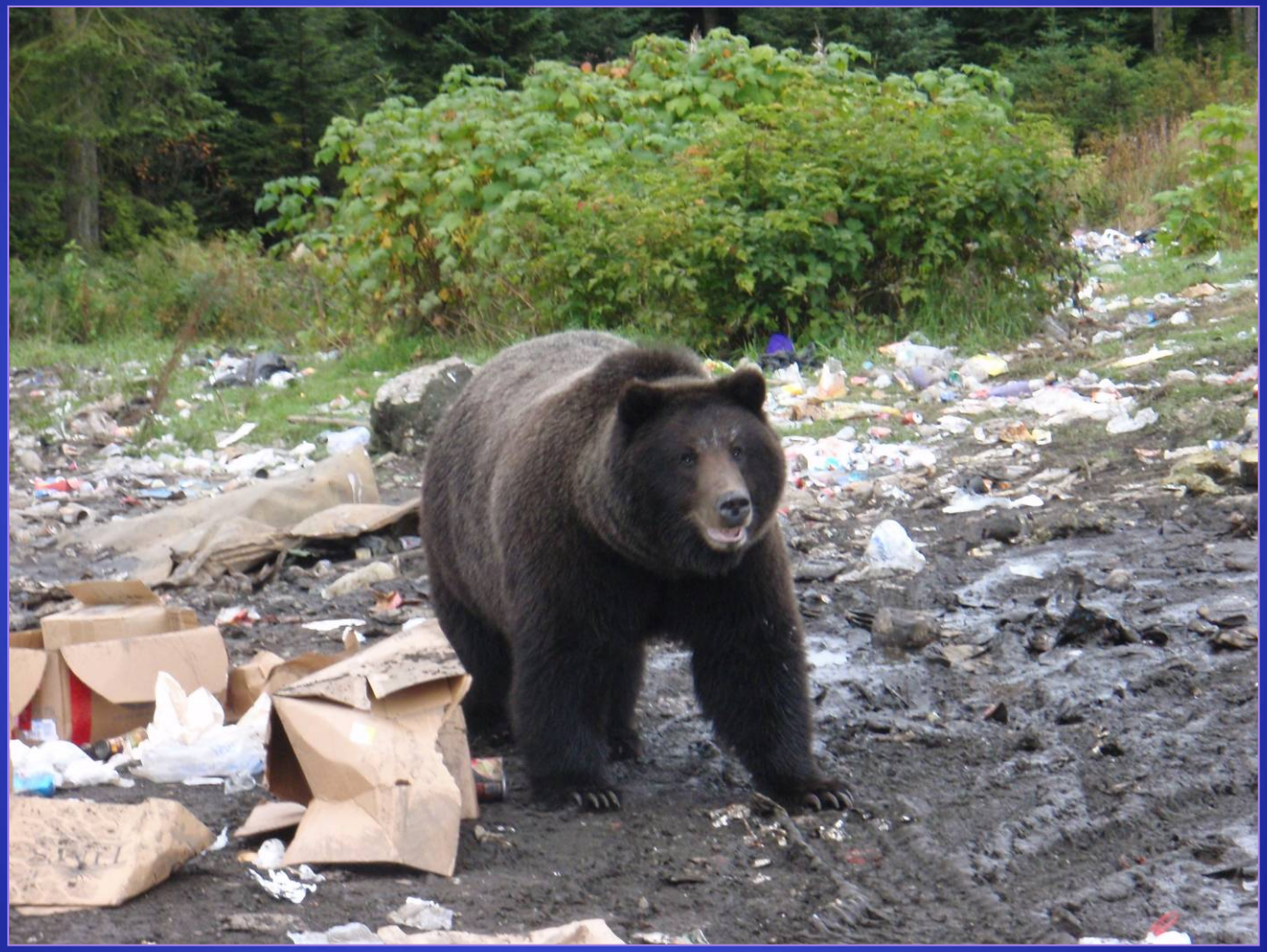
Day 11 of 27 Consecutive Days of Inspection

Inflatable Raft / Safety Boat in Hoonah

DeHavilland Canada DHC-2 Beaver

The Three

Glacier enroute from Juneau to Haines



Grizzly Bear in Angoon

skAlaska 2008

Acknowledgements

- Alaska DOT & Public Facilities
  - **Drew Sielbach** (Juneau, AK)
- HDR Engineering, Inc.
  - **John Sherk** (Anchorage, AK)
- Skala Group, Inc.
  - **Jan Holan** (Reno, NV)

Unique Fracture Critical Rope Access Bridge Inspections Throughout Alaska

Brian J. Leshko, PE
HDR Engineering, Inc.

Thank You!