Condition Assessment of Iowa Timber Bridges Using Advanced Inspection Tools

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Las Vegas

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Outline

- Introduction – Iowa Timber Bridges
- Bridge Cluster Overview
- Case Study 1: Blackhawk 5
- Case Study 2: Clarke 1
- Wrap-up

Introduction

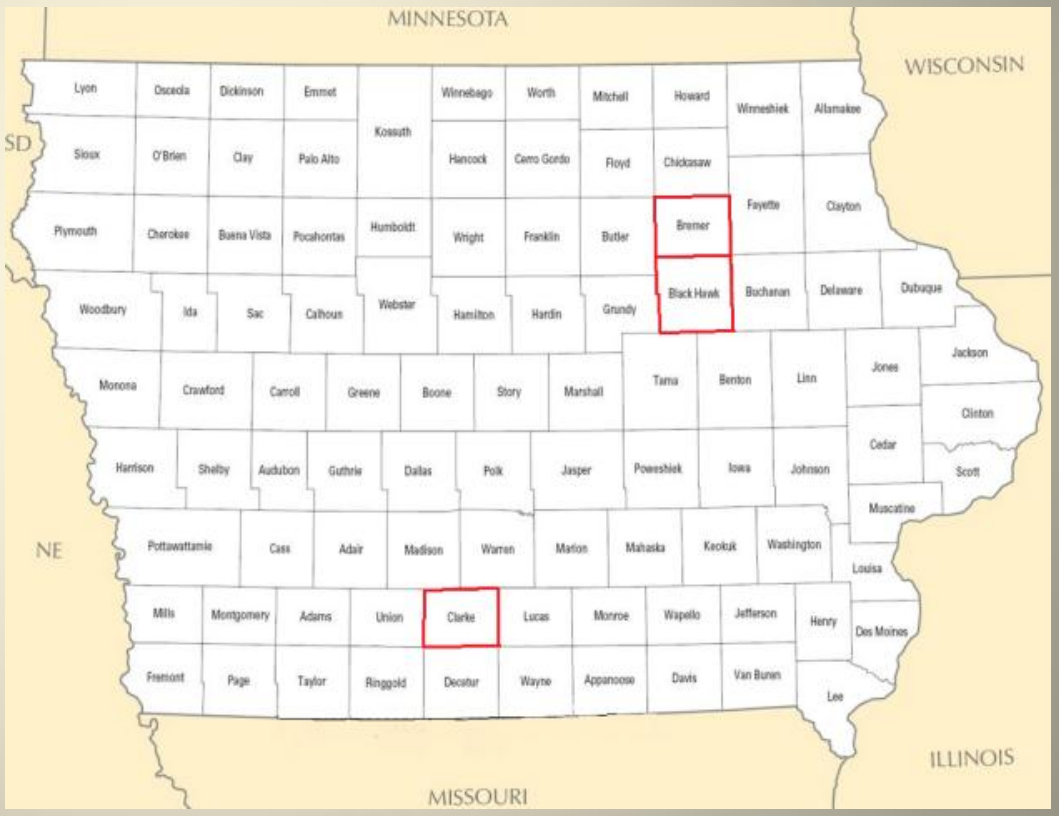
- Iowa
  - ~2,454 Timber Bridges
    - 189 timber slab
      - Majority built after 1990
    - 2265 timber girder
      - Majority built between 1940-1990

Bridge Clusters

- Public road
- Access (safety, ‘arms length’ inspection, etc)
- Similar design type, age
- Location

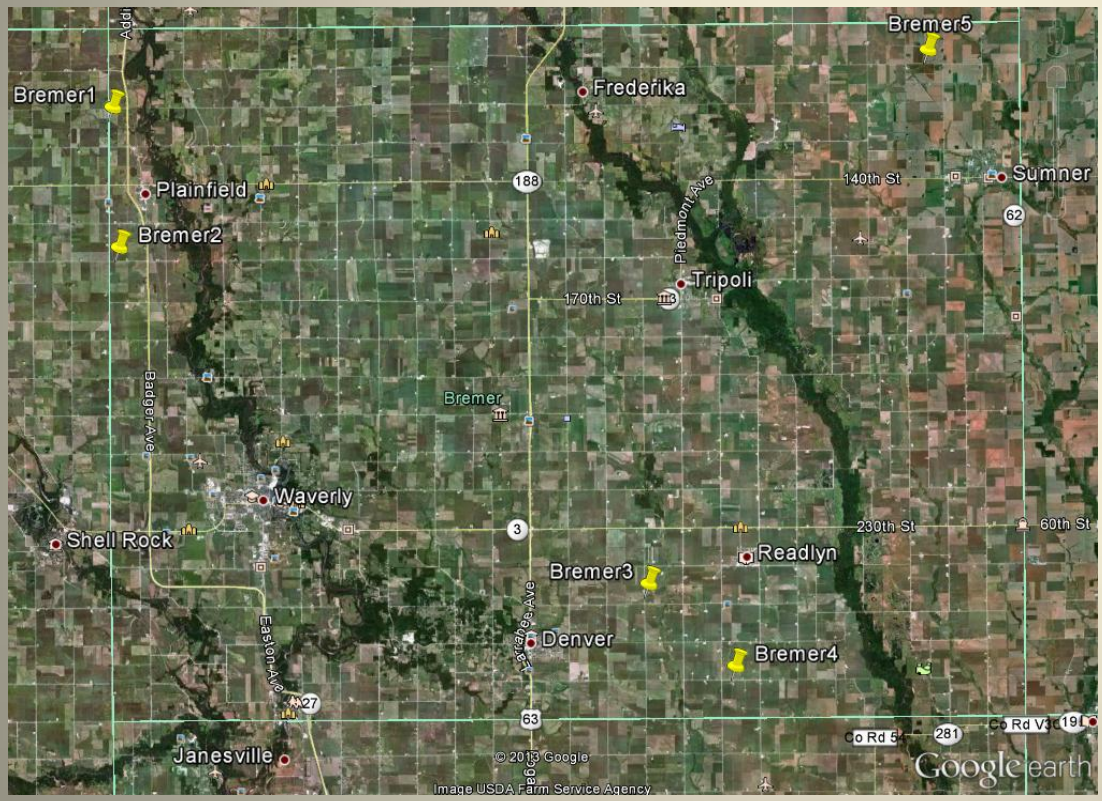
Iowa Clusters

- Bremer County
- Blackhawk County
- Clarke County



Iowa Clusters Cont.

- Bremer County

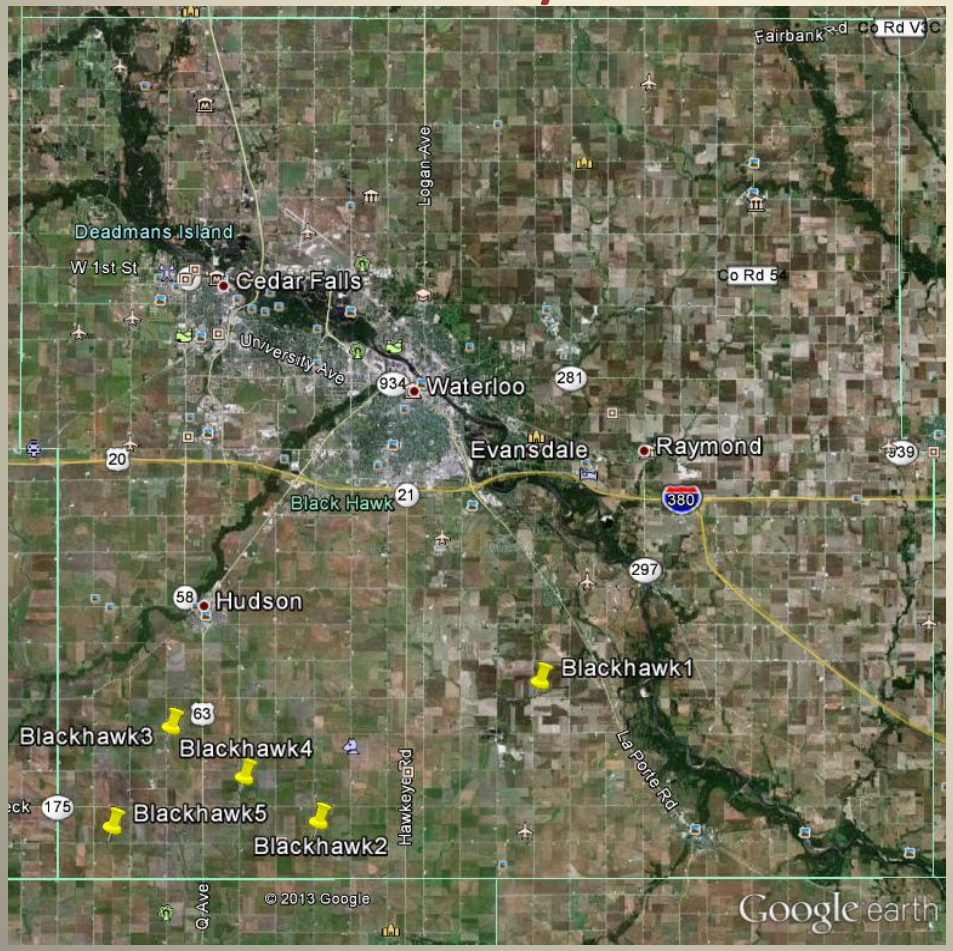


- Bremer 1
  - 1996
  - 21ft
- Bremer 2
  - 1997
  - 21ft
- Bremer 3
  - 1994
  - 22ft
- Bremer 4
  - 1994
  - 22ft
- Bremer 5
  - 1997
  - 27ft

*All Girder Bridges

Iowa Clusters Cont.

- Blackhawk County

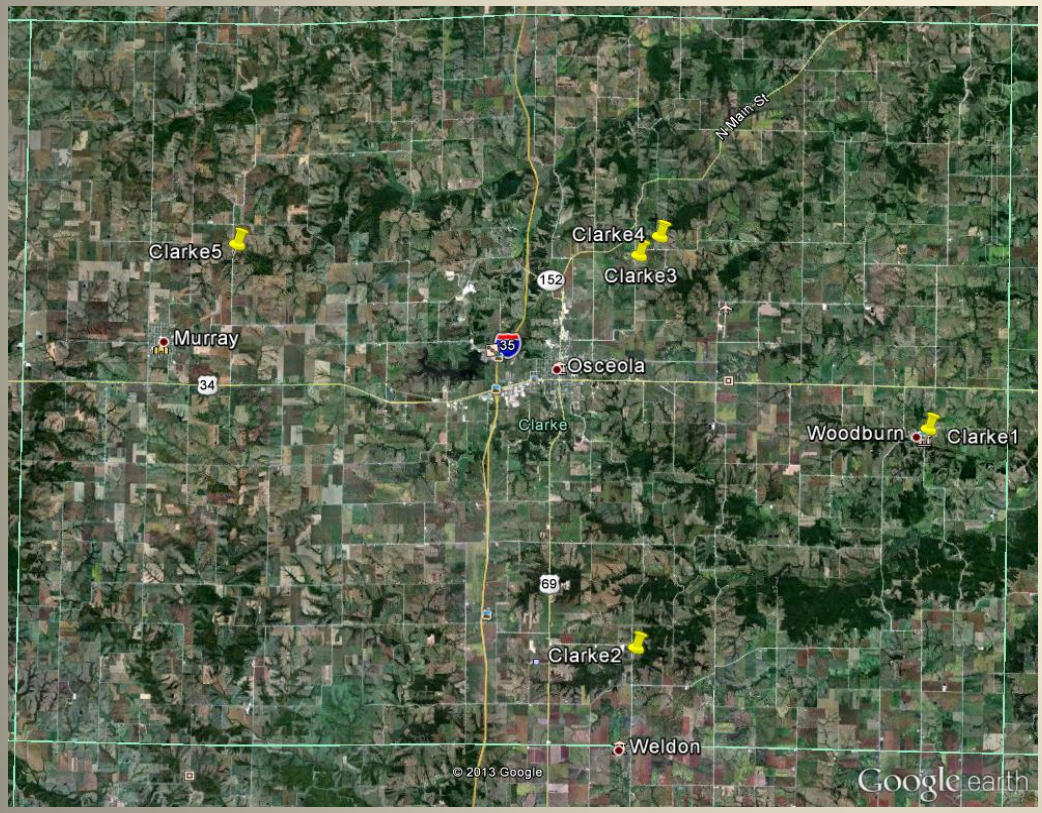


- Blackhawk 1
  - 1983
  - 19ft
- Blackhawk 2
  - 1985
  - 18ft
- Blackhawk 3
  - 1985
  - 17ft
- Blackhawk 4
  - 1985
  - 18ft
- Blackhawk 5
  - 1985
  - 18ft

*All Girder Bridges

Iowa Clusters Cont.

- Clarke County

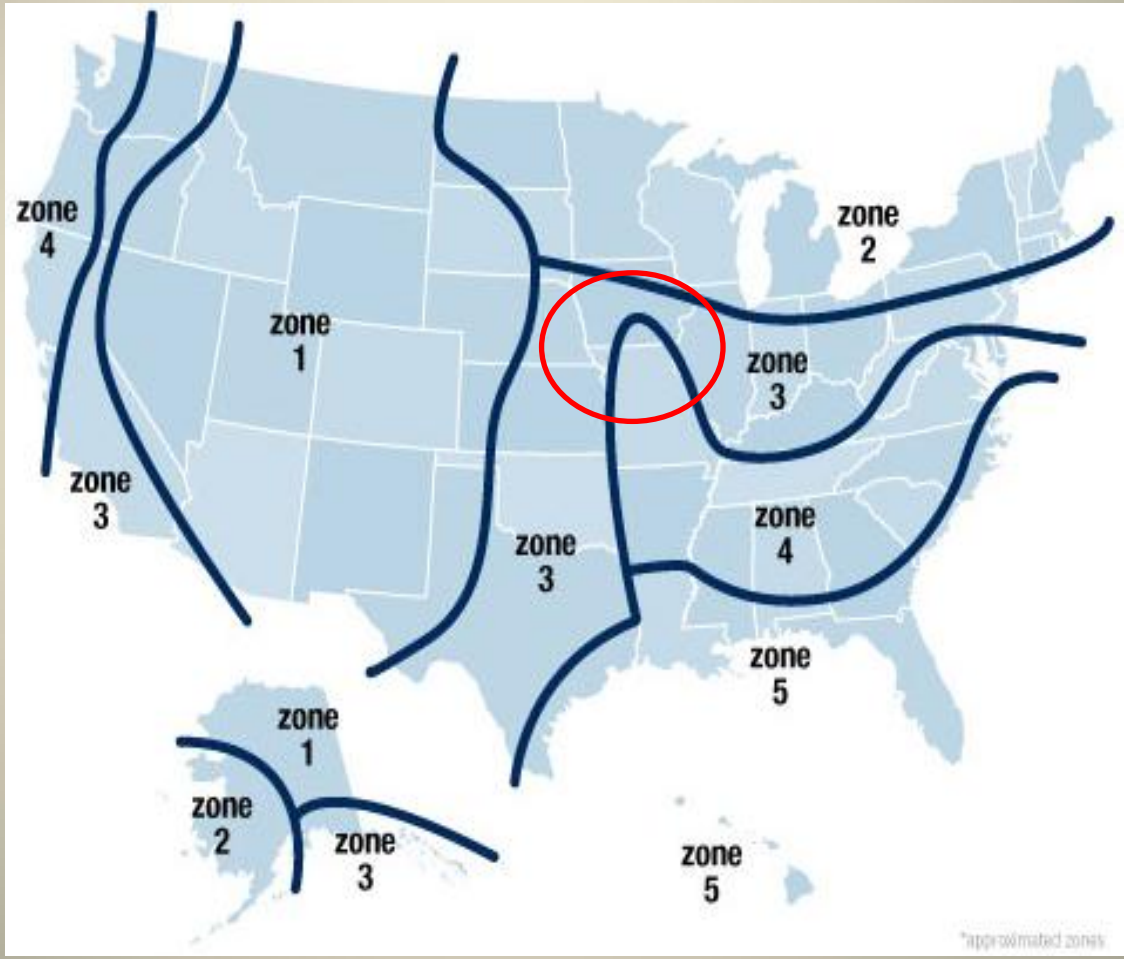


- Clarke 1
  - 1985
  - 30ft
- Clarke 2
  - 1983
  - 30ft
- Clarke 3
  - 1983
  - 30ft
- Clarke 4
  - 1983
  - 30ft
- Clarke 5
  - 1982
  - 30ft

*All Deck Bridges

Decay Hazard Zones

- US



Case Study 1: Blackhawk 5

- FHWA 74731
- Timber girder; transverse plank deck
- Single span, 18ft
- 1985
- Steel guardrail
- Timber abutments
- Gravel wearing surface

Blackhawk 5

Blackhawk 5

Blackhawk 5

Blackhawk 5

Blackhawk 5

Blackhawk 5

- Girders
  - No noticeable rotation at bearings
  - Small (1/8-1/4in.) settlement of several girder ends under load
  - Numerous bottom ‘flanges’ splintered
- Deck
  - Moisture staining
  - 1/8-1/2in. gaps btw planks

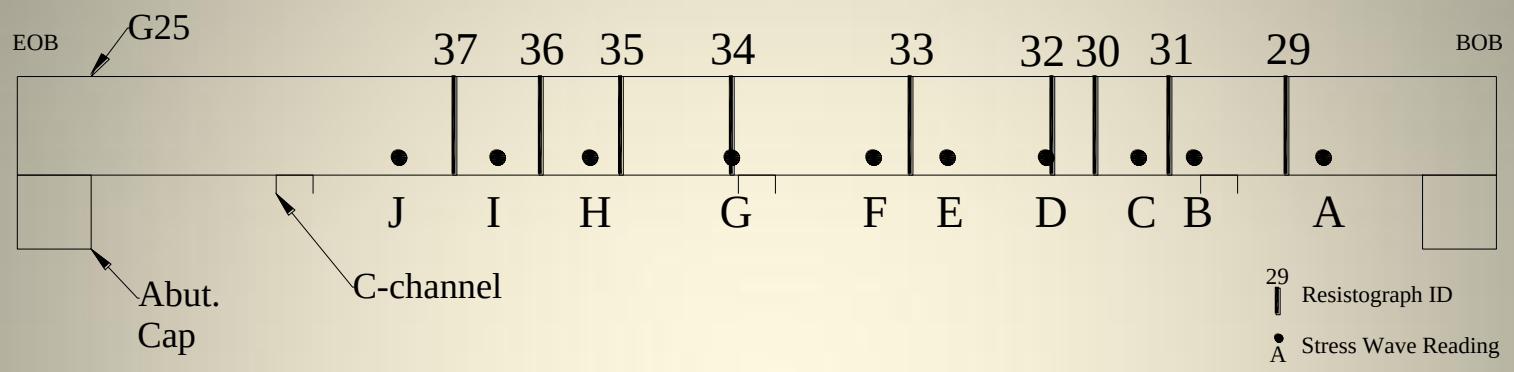
Blackhawk 5

- Girder G19
  - Plywood shim on top
  - Large splinter
    - Bottom flange
    - ~6ft long, from near EOB to midpsan
    - Located ~1/3 d from bottom

Blackhawk 5

- Girder G25
  - Deterioration
    - Start: 2ft from BOB
    - End: ~2ft E. of midspan
  - High moisture content, low 20's, very soft
  - Stress Wave
  - Resistograph

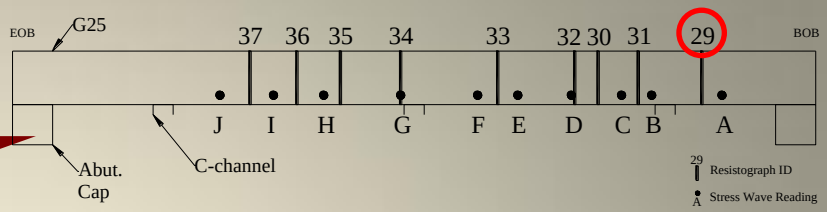
Blackhawk 5



Stress Wave Readings

J	I	H	G	F	E	D	C	B	A
70	75	132	440	160	111	155	145	140	69

Blackhawk 5



Resistograph Readings

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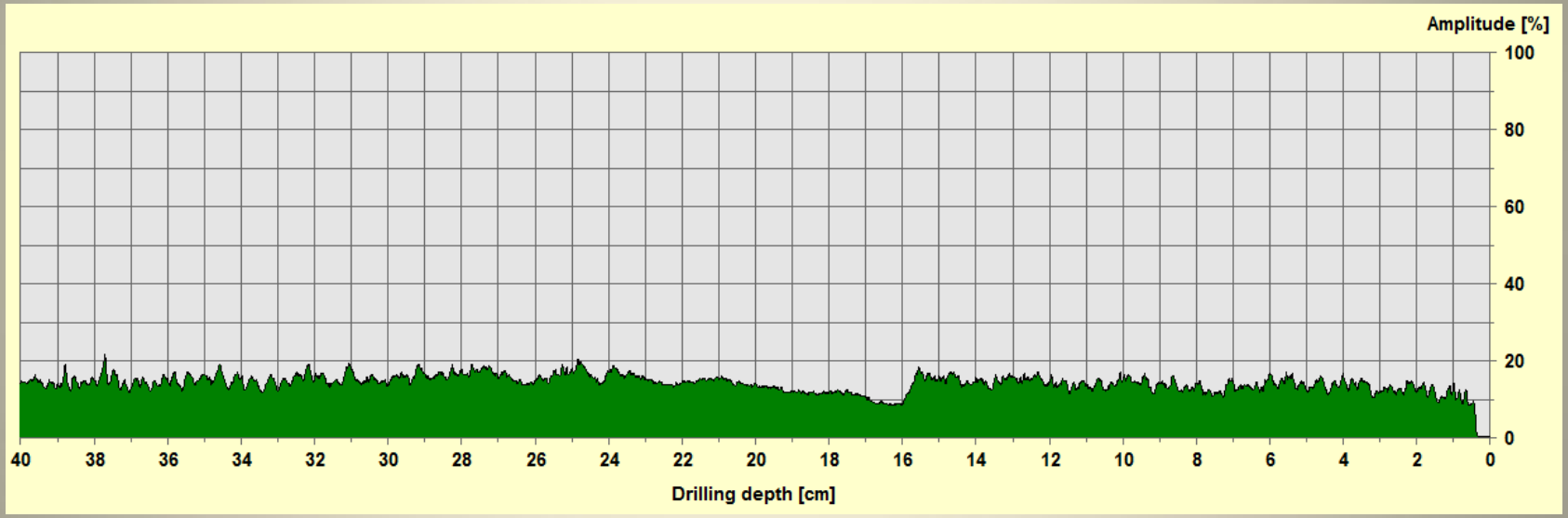
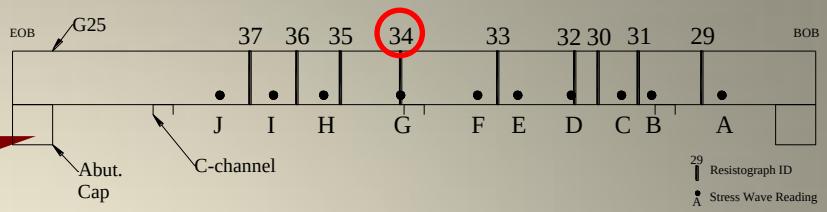


Blackhawk 5



Resistograph Readings

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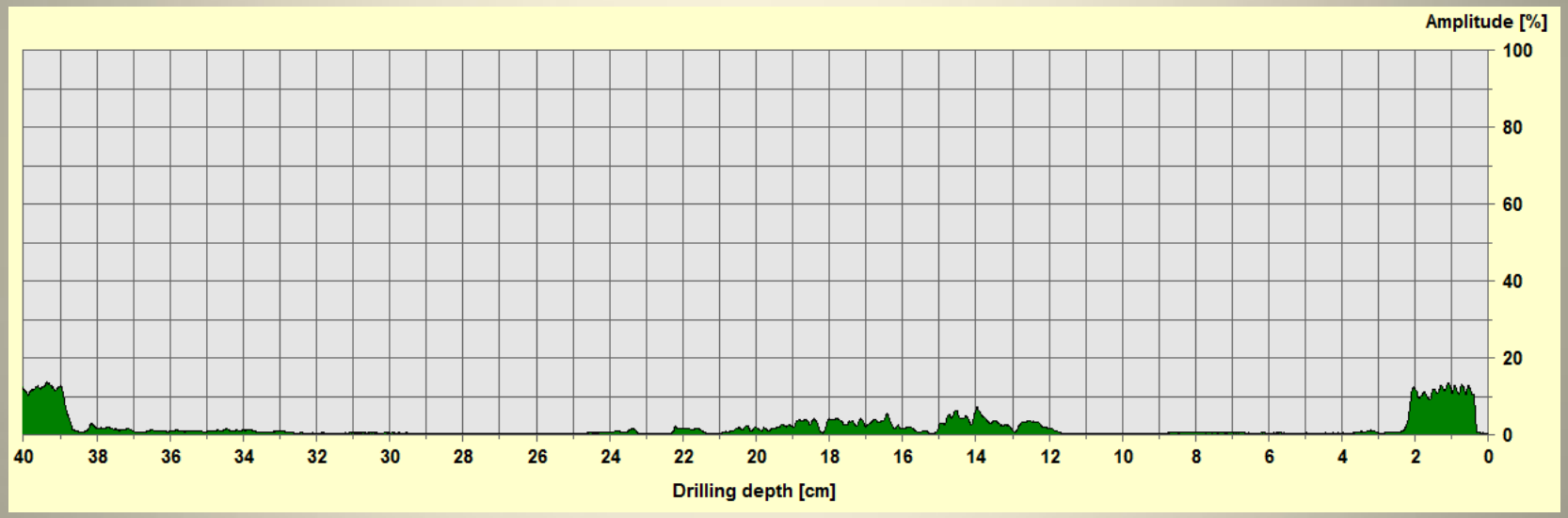
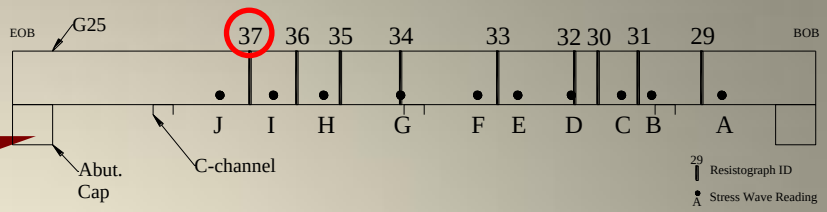


Blackhawk 5



Resistograph Readings

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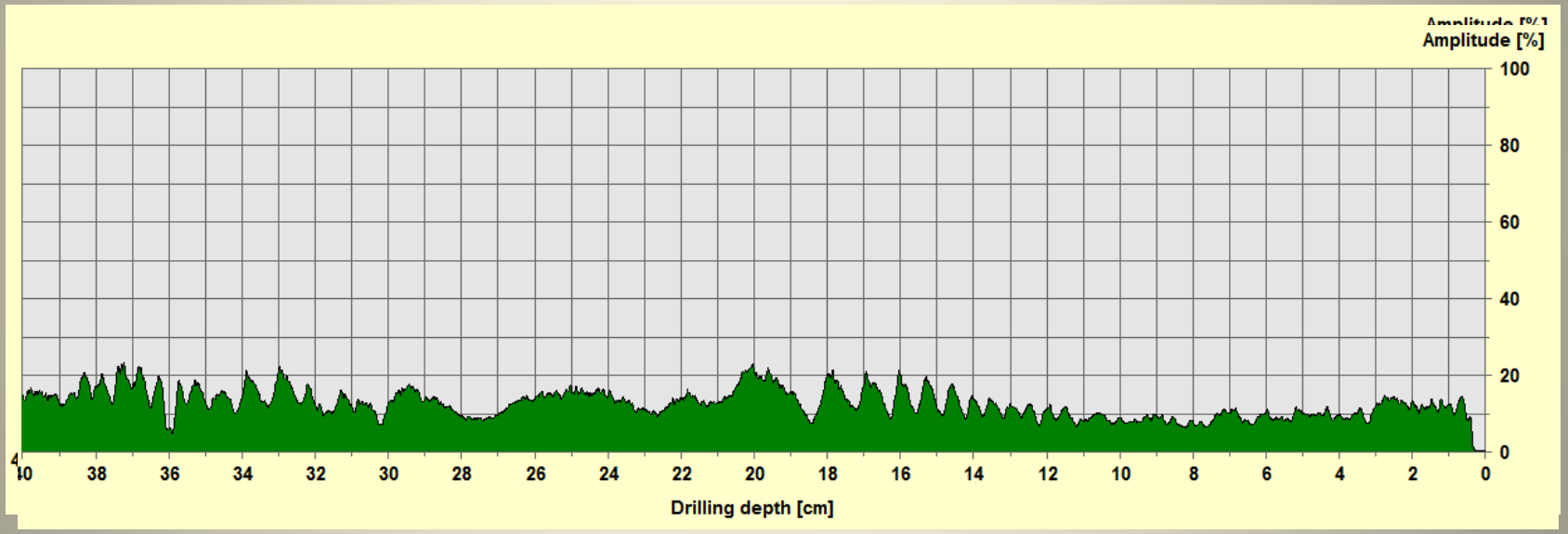
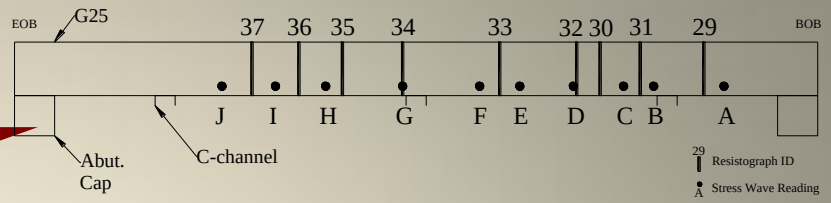


Blackhawk 5



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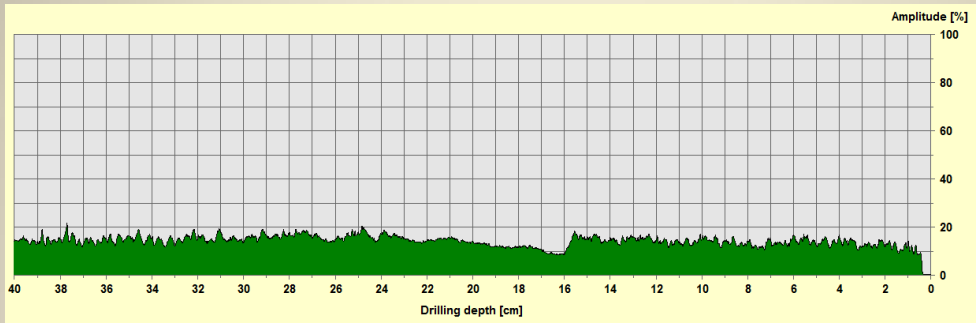

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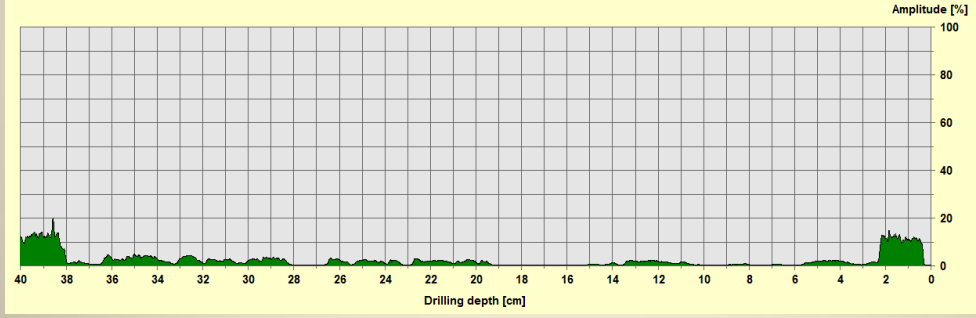

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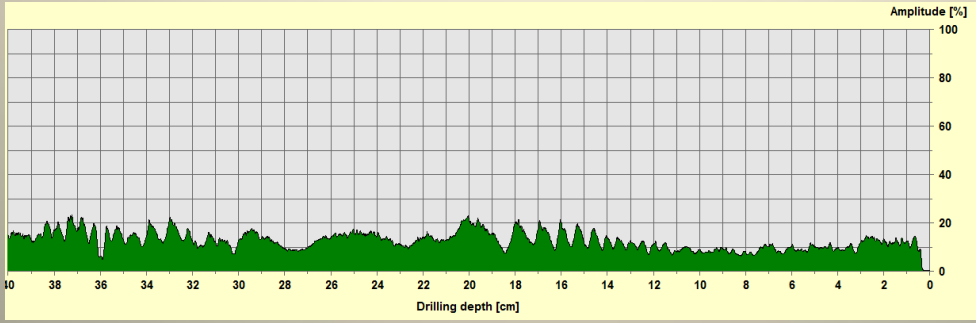


Blackhawk 5

- Other ‘Findings’…

Case Study 2: Clarke 1

- FHWA 12821
- Longitudinal Deck
- Single span, 30ft
- 1985
- Timber guardrail
- Timber abutments
- Asphalt Wearing Surface

Clarke 1

Clarke 1

Clarke 1

Clarke 1

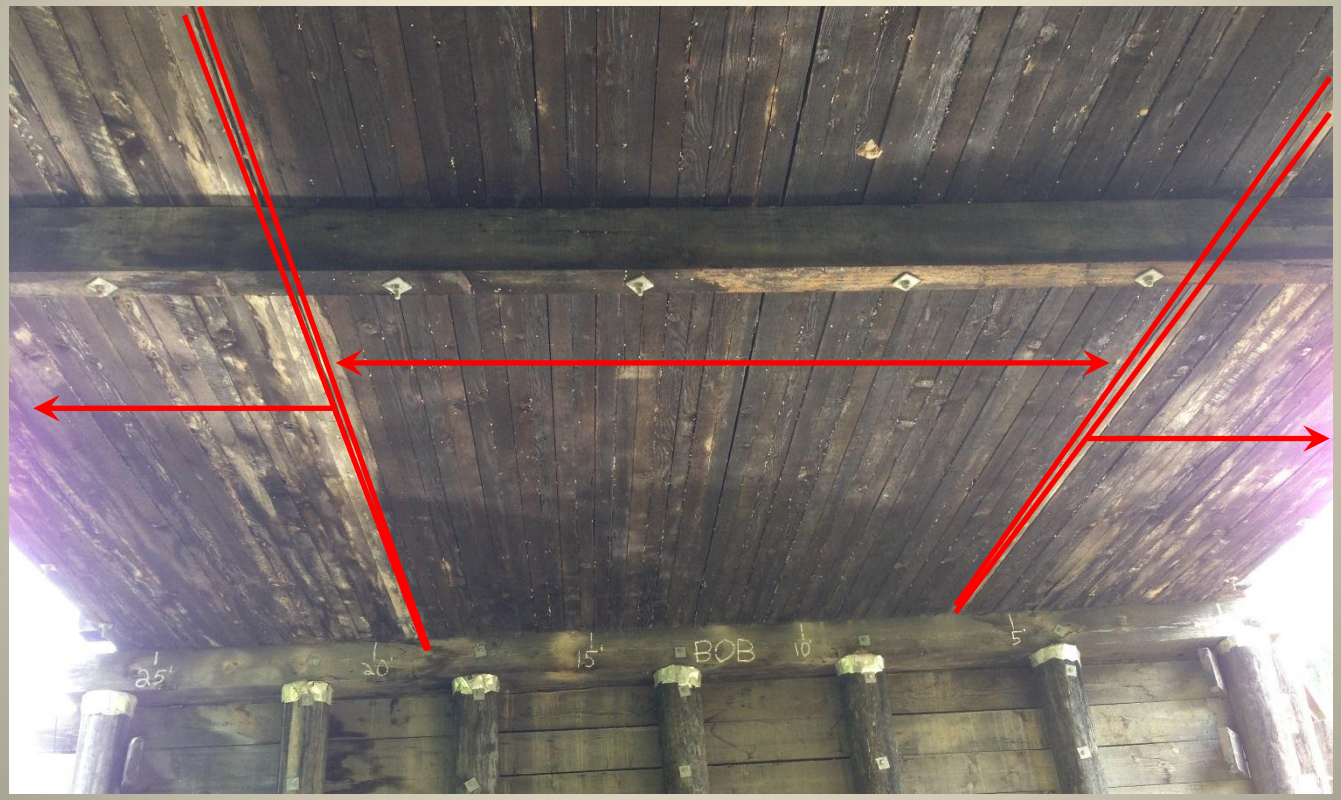
Clarke 1

Midspan Transverse Stiffener Beam

Clarke 1

Moisture Content Readings

Mid to Upper Teens



Timber Slab Bridges

- Three main issues found:
  1) Condition, maintenance, of wearing surface
  2) Adjacent deck panel connection detail
  3) Abutment backwall movement

Timber Slab Bridges

1) Wearing Surface

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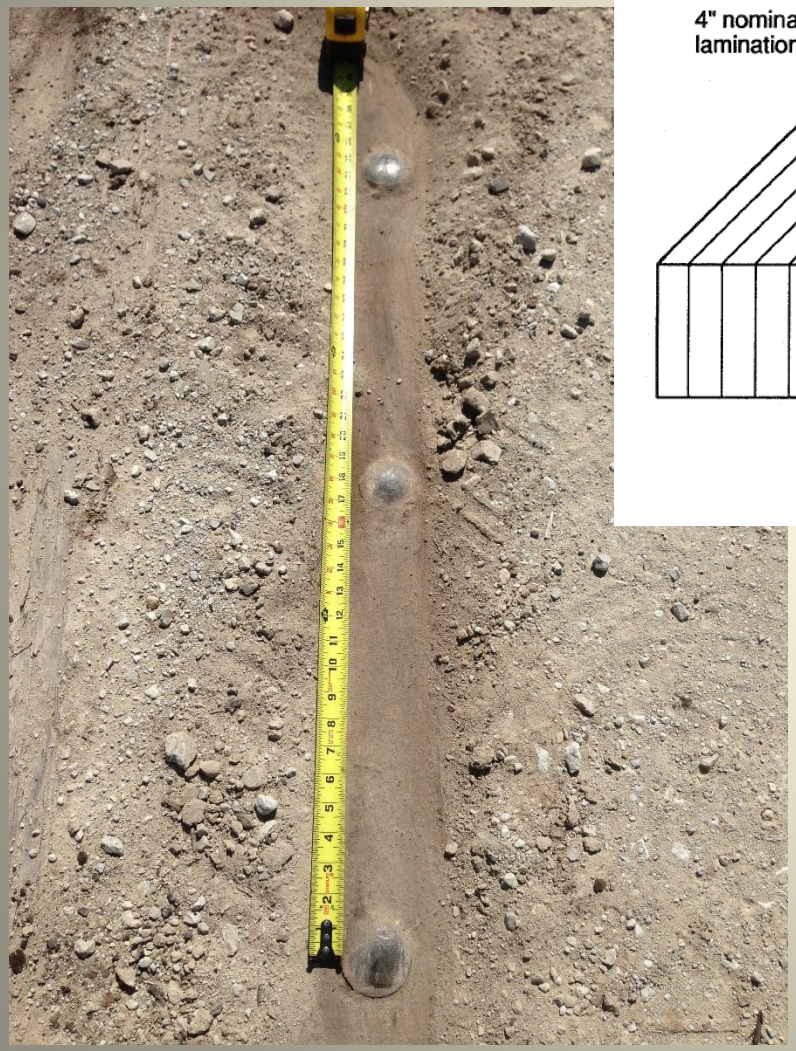
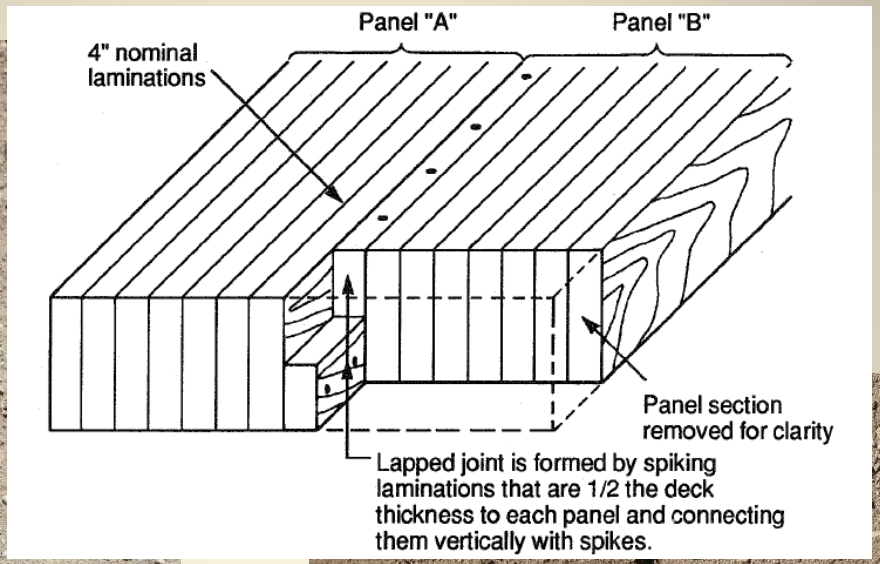
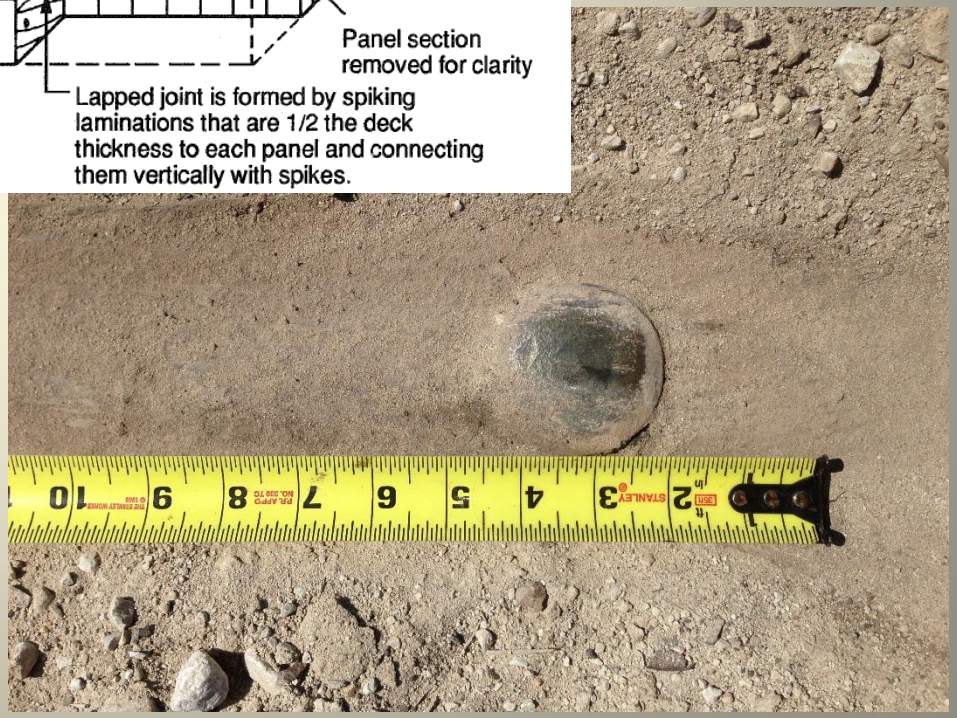
Timber Slab Bridges







Timber Slab Bridges

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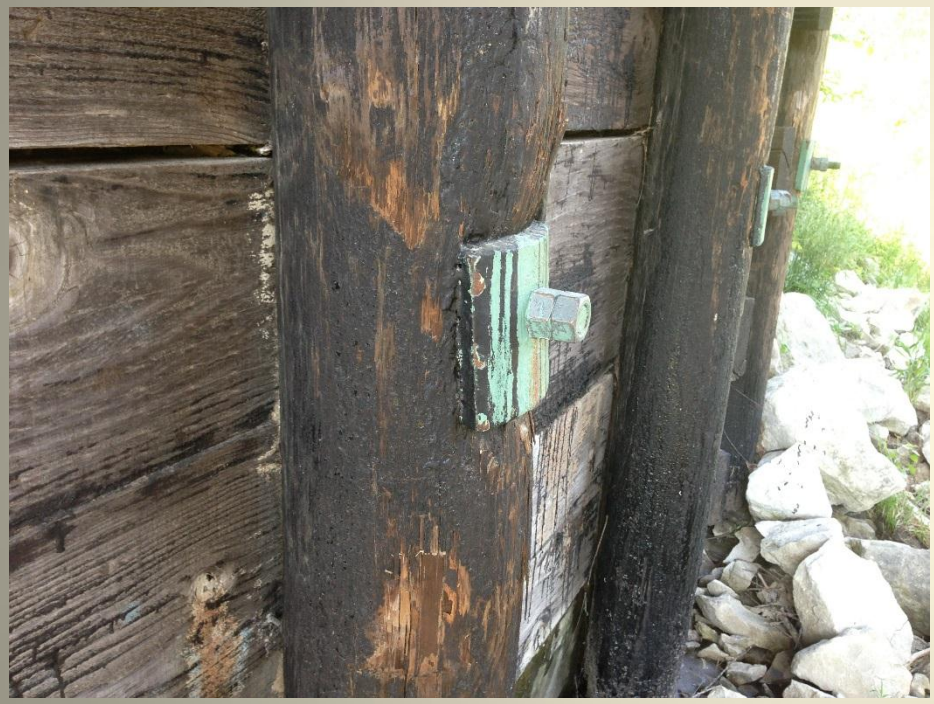

Timber Slab Bridges

Thanks for your Attention