# Accessibility / Inspectability / Maintainability



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#### Purpose of this Presentation

 Case Studies that could be referred to by some as "DUH" moments.

 An opportunity to reflect on your operations and design standards.



#### Objective of this Presentation

- 1. Re-organizing an agency and increased outsourcing can be perilous.
- 2. Bottom-line, we need:
  - Bridges that are Accessible,
  - Inspectable, and
  - Maintainable.



#### **Presentation Outline**

- **Our legal responsibilities**
- Who has a vested interest in these decisions
- Access Methods
- Bridge Safety / Maintainability Issues
- **Stridge Materials**
- Complex Structures



# Who has a vested interest in these decisions?



#### **Transportation Interests**

- Vehicular Traffic
- Pedestrians
- Trains
- Buses
- Freight
- Navigation



#### **Utility Companies**

**Electrical** 

**Telephone** 

Gas

Water

Sewer



## Agency and Other Agency Personnel

- Bridge Inspection Personnel
- Maintenance Personnel
  - ✓ Bridge Maintenance
  - ✓ Electricians
  - √ Traffic Signs
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## Agency and Other Agency Personnel

Bridge Engineers

✓ Load Raters

✓ Bridge Repairs / Rehab Designers



#### First Step

- ✓ Understand the distinction between process safety (bridge features) and personal safety (PPE and procedures).
- ✓ Understand the total impacts associated with site-specific trade-offs.
- ✓ Understand the value and content of a Bridge Specific Job Hazard Assessment (JHA).
  - Oregon Department of Transportation

#### Job Hazard Assessment (JHA)

- ✓ List step-by-step procedures that have to be performed in order to complete the assigned task.
- ✓ Identify the safety hazards that are associated with each step.
- ✓ Describe how each hazard is going to be mitigated.



## **Access Management**



#### **Accessing Bridge Components**

#1 - - - No Parking / Work Staging
Area



#### Parking / Work Staging Area



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#### Parking / Work Staging Area



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#### **Accessing Bridge Components**

- Using a Ladder (low tech)
- Using a UBIT / Man-lift
- Using Climbing Techniques



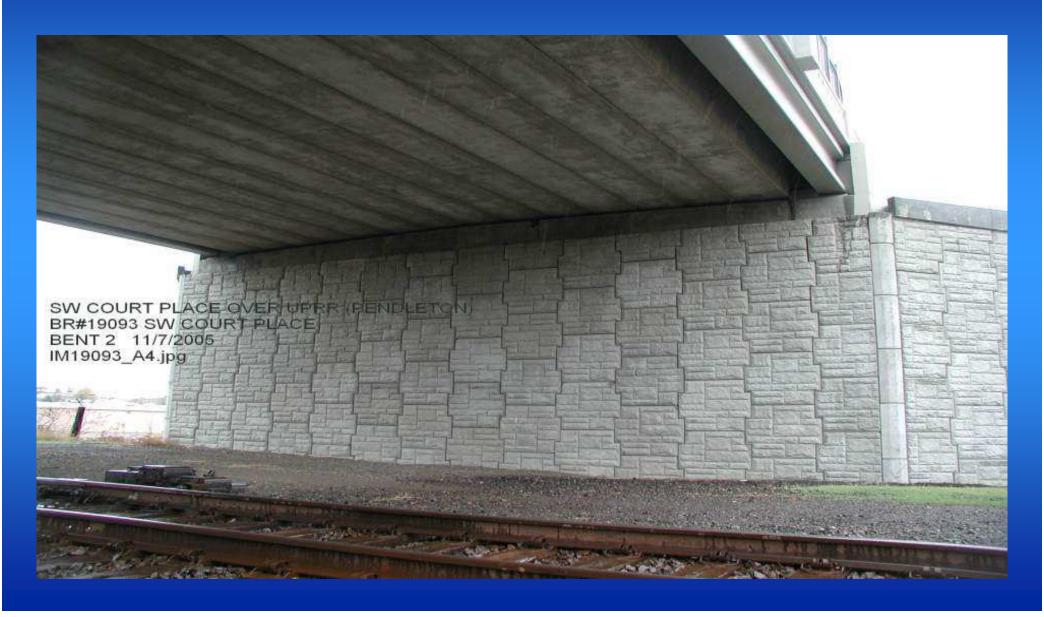
## Access Using a Ladder



## Access Using a Ladder



## Access Using a Ladder / Man-lift



#### Access Using a Ladder / Man-lift



#### **Access Ladder Pad**



#### Access Using a Ladder vs Man-lift

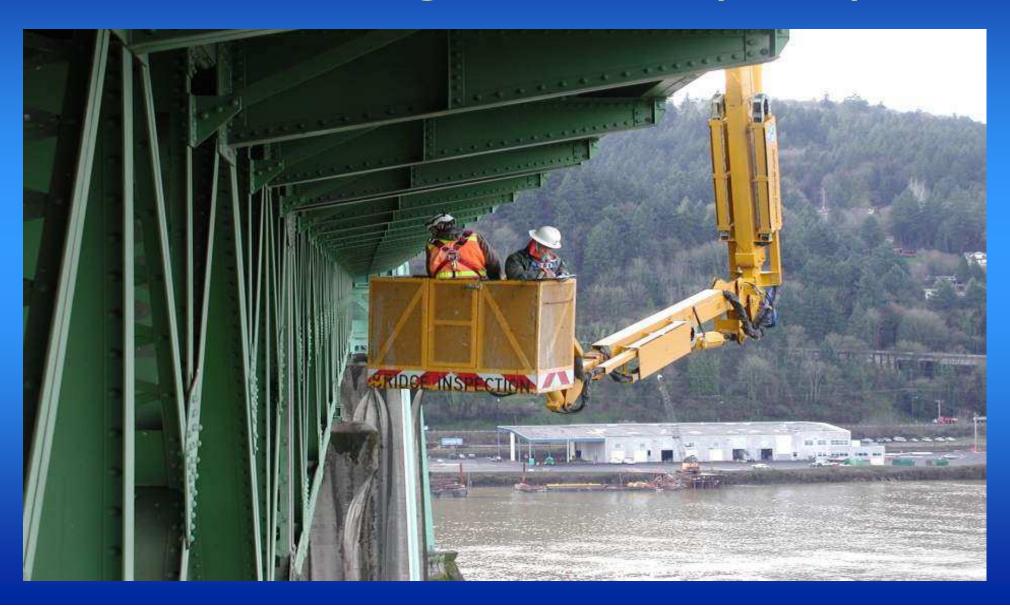


#### **Accessing Bridge Components**

- Using a UBIT / Man-lift
- Using Climbing Techniques



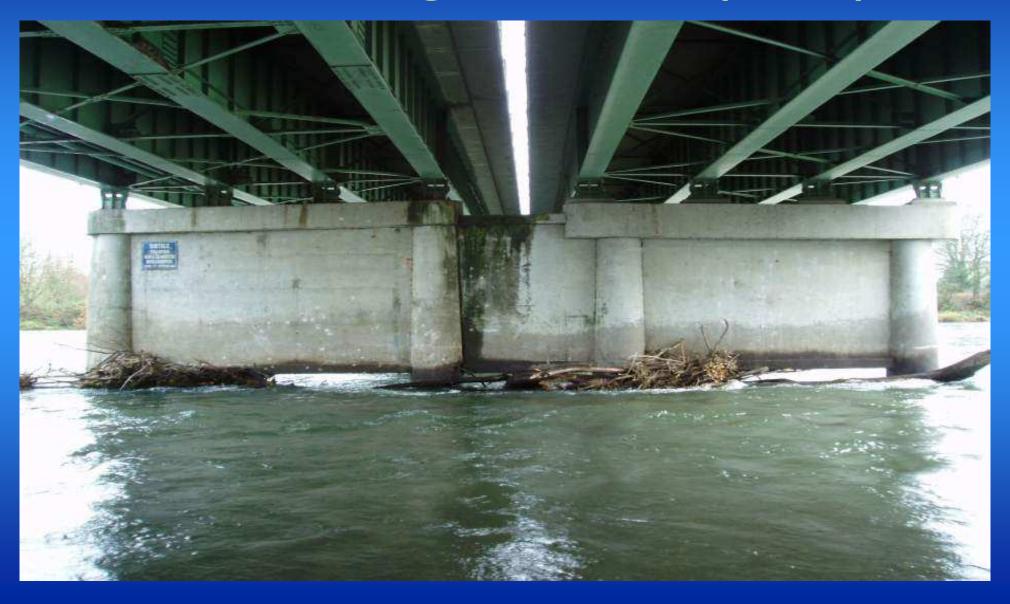
#### Access Using a Man-lift (UBIT)



#### Access Using a Man-lift (UBIT)



## Access Using a Man-lift (UBIT)



#### **Inspection / Maintenance Access**

Concrete Segmental Bridge

- Limited Access



## **Dealing with Freight Corridors**



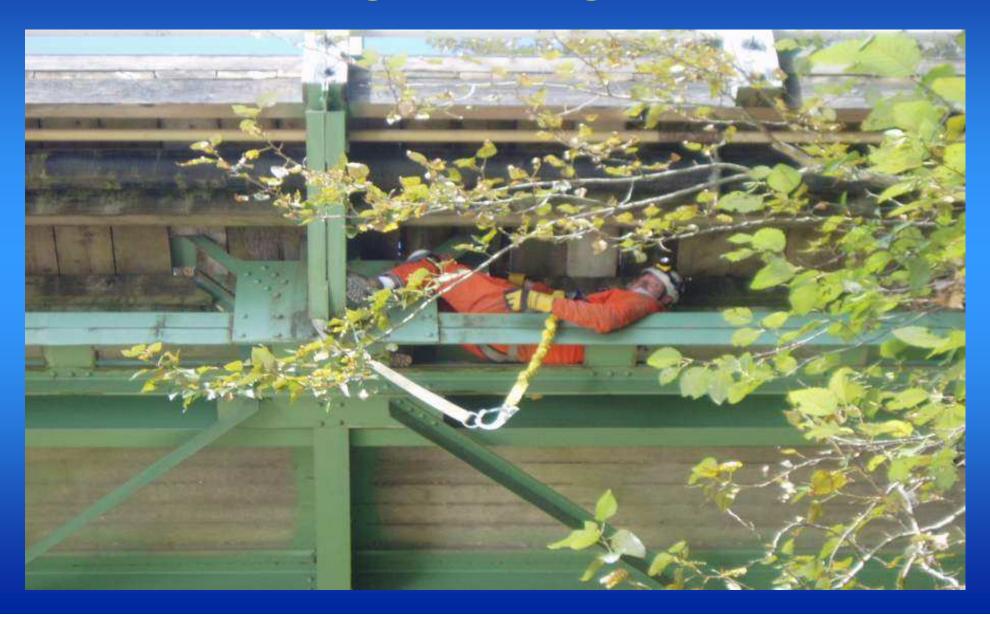
#### **Dealing with Railroads**



#### **Access Using Climbing Techniques**



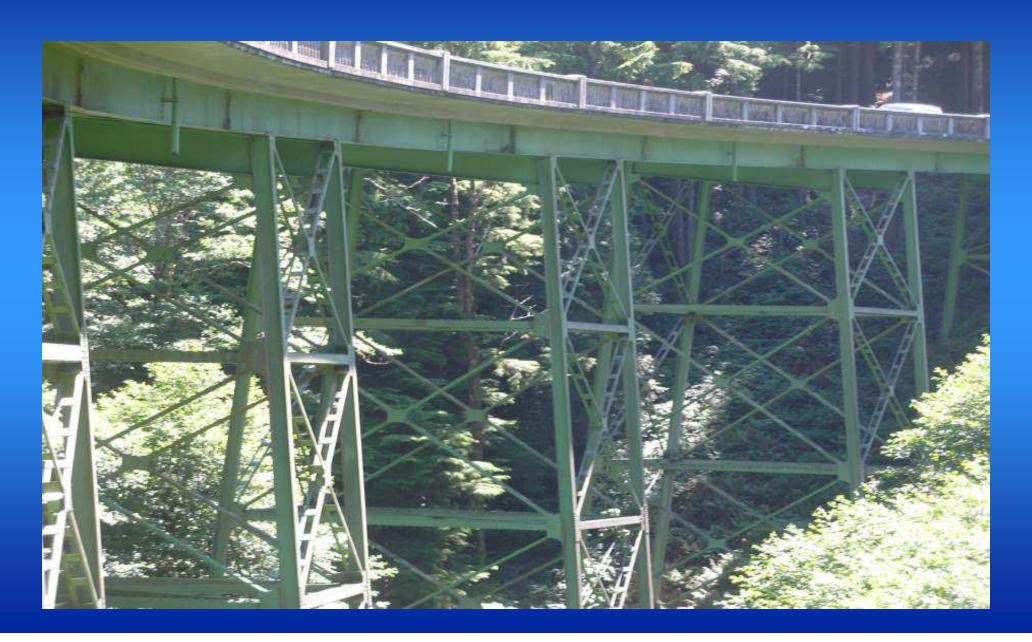
#### **Access Using Climbing Techniques**



#### **Access by Climbing**



#### **Access Using Climbing Techniques**



#### **Accessing Other Bridge Components**



# Accessing Bridge Components

3. Fall Restraint Systems

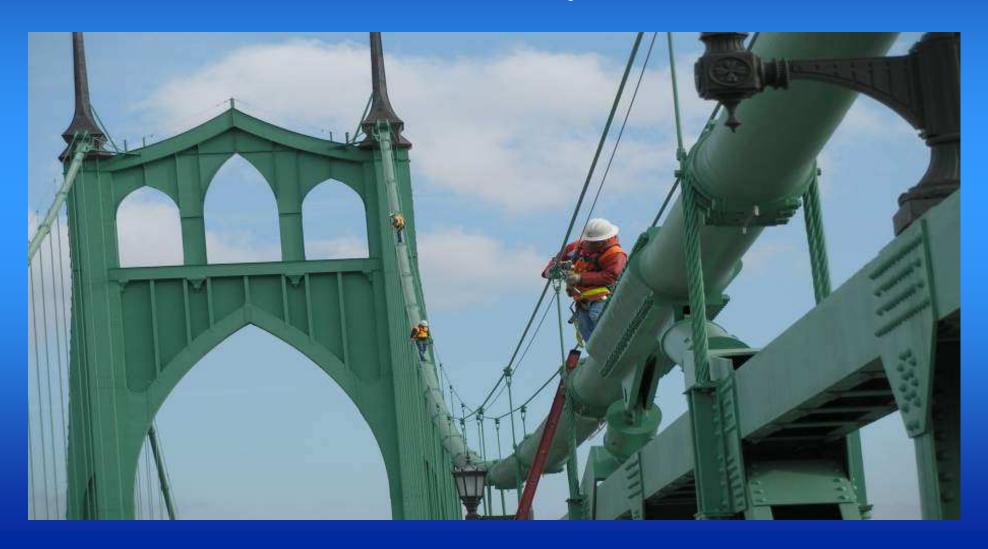
4. Catwalks / Railings

5. Accessing component interior



#### **Access Using Climbing Techniques**

Fall Restraint System



#### Providing Access can be a Challenge



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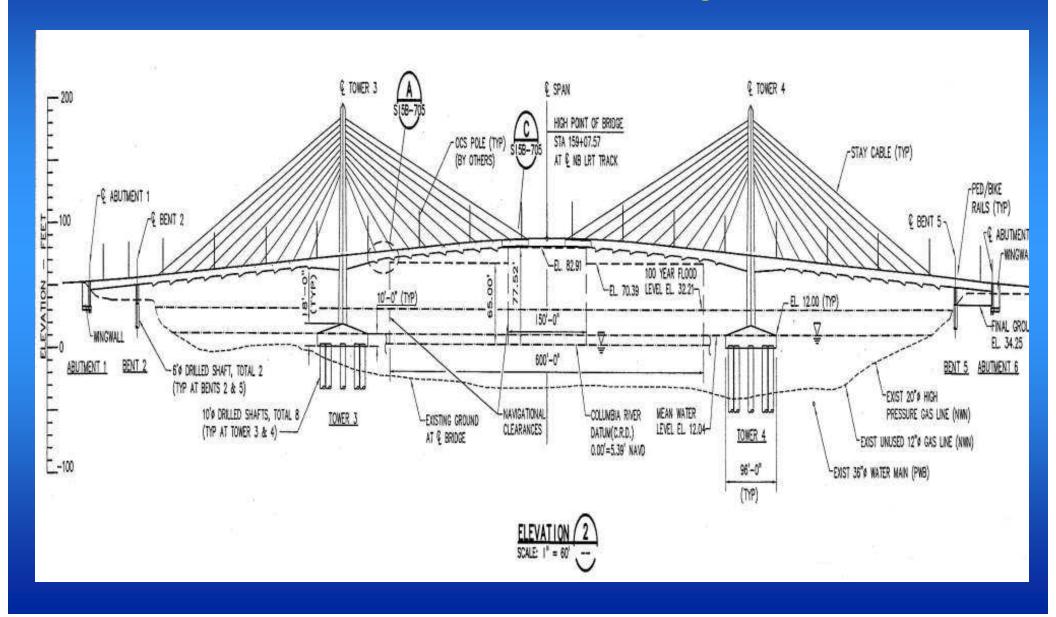


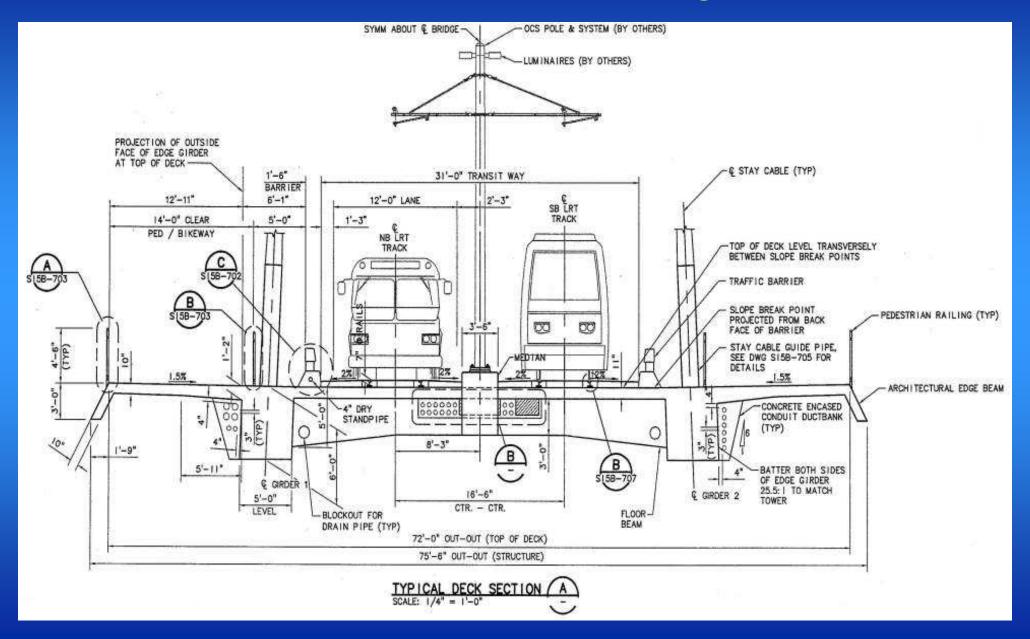




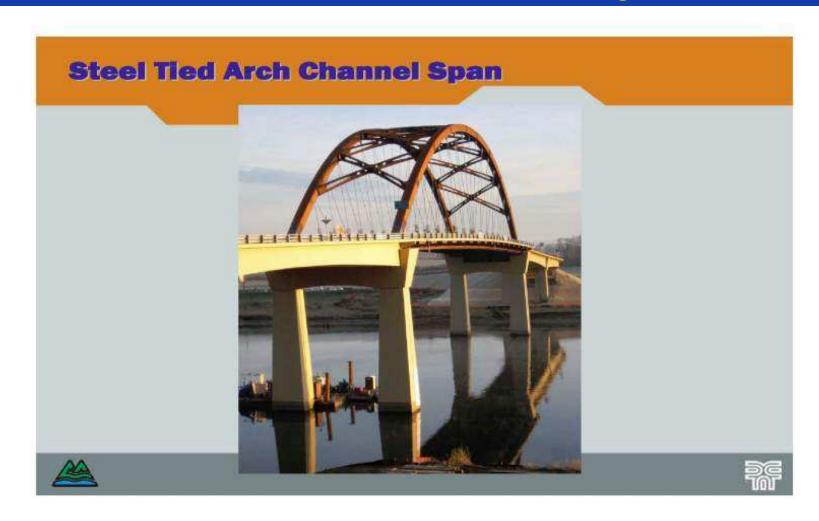






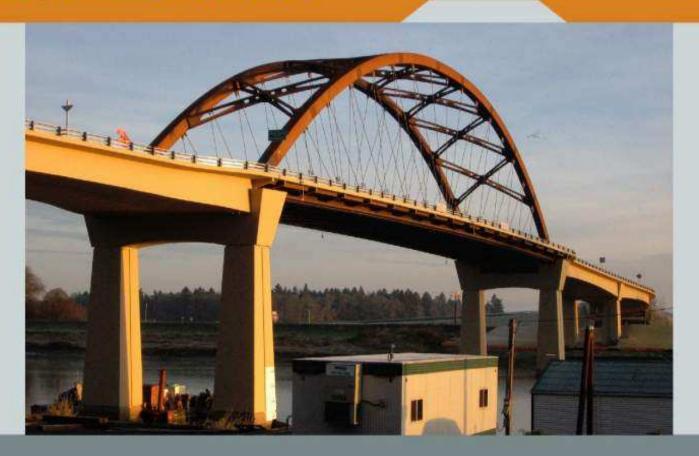






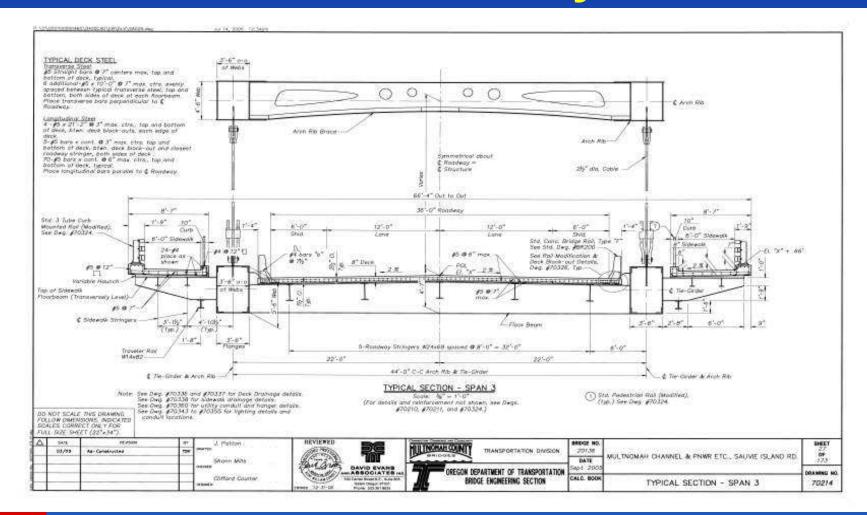


#### **Completed Structure**









#### Hanger Cable Systems

Vertical cables

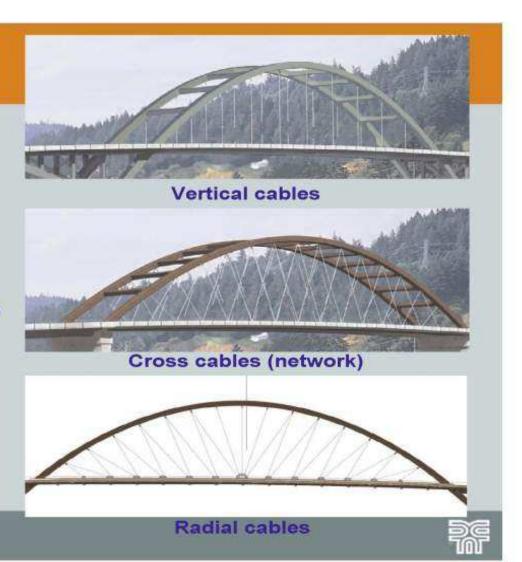
Simplicity

Cross cables

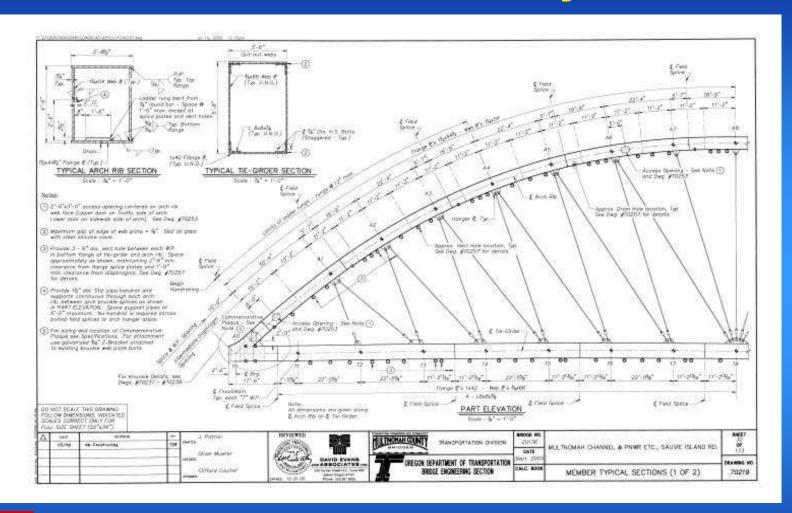
 Reduction in deflections and moments

Radial cables

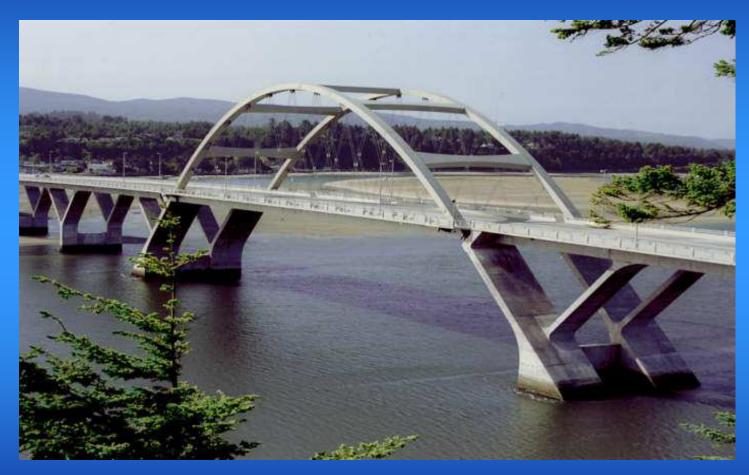
Aesthetics







# Bridge Inspection / Maintenance Safety Issues



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# **Bridge Inspection / Maintenance Safety Issues**

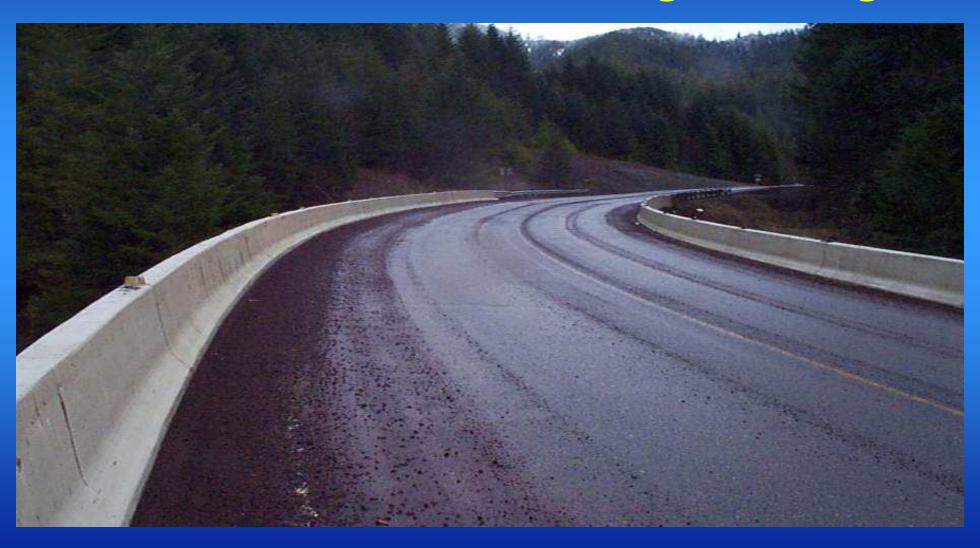
- -Transients
- Bridge Railings
- Utilities
- Confined Space Entry



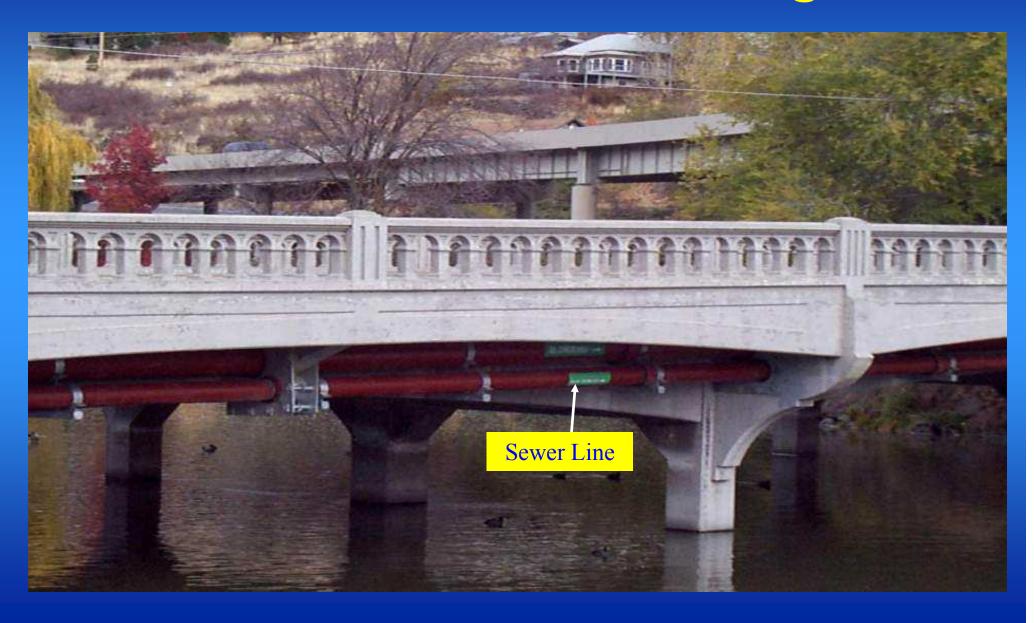
# **Build a Flat Area and They Will**



# Bridge Inspection / Maintenance Fall Restraint Issue – Bridge Railings



# **Utilities Located on a Bridge**



# (Utilities - APWA Color Code)

- Electrical
- ◆Gas
- Communication
- ◆Potable Water
- Irrigation
- ◆Sewer

Company & Phone No.

Red

**Yellow** 

**Orange** 

Blue

Purple

Green



#### **Utilities**



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# **Utility Exposure**



# **Utility Maintenance**



# **Utility Maintenance**



# **Confined Space Entry**



#### **Confined Space Entry**

Permit Required Entry

Vs

No Permit Required Entry

Huge difference in entry requirements



# Inspectability & Maintainability (Safety Issues)

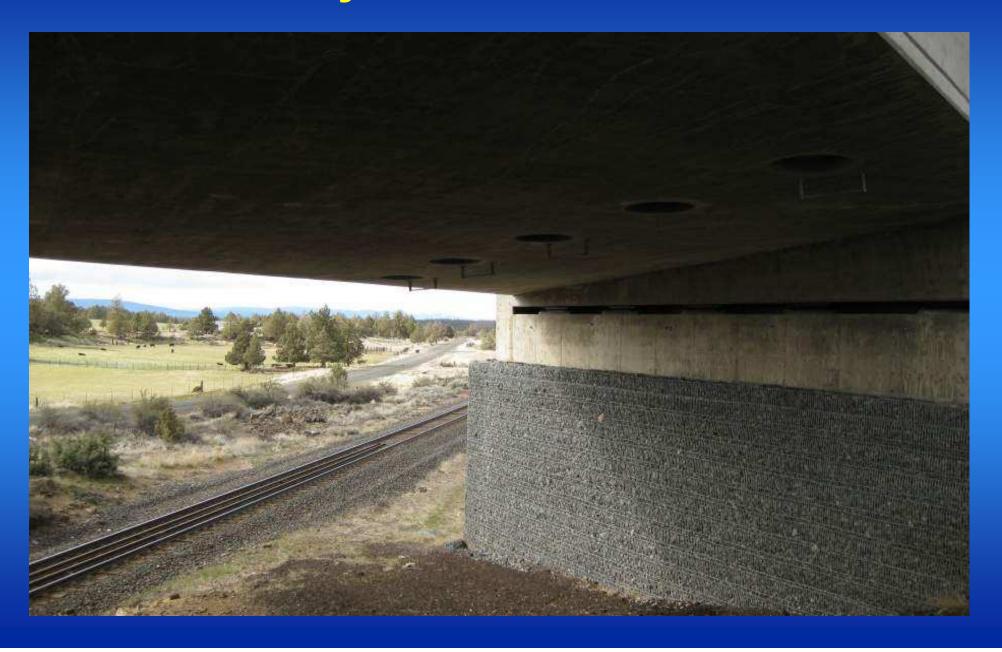
**Confined Space** 



# Air Quality inside of a Box Girder



# Air Quality inside of a Box Girder



# **Animal Habitat – Peregrine Falcons**



# **Animal Habitat – Peregrine Falcons**



# Animal Habitat Provide access to Potential Nesting area They will come.



# **Animal Habitat - Bats**



# **Proactive promotion of Bat Habitat**



# **Bat Habitat**



# **Animal Habitat - Bats**



#### **Bridge Materials**

#### All Materials are not Created Equal

- **✓ Design Standards**
- **✓ODOT Qualified Products List**
- ✓Bridge Maintenance Personnel Expertise
- **✓** Bridge Deterioration Modeling



# **Bridge Maintenance**



# Maintenance



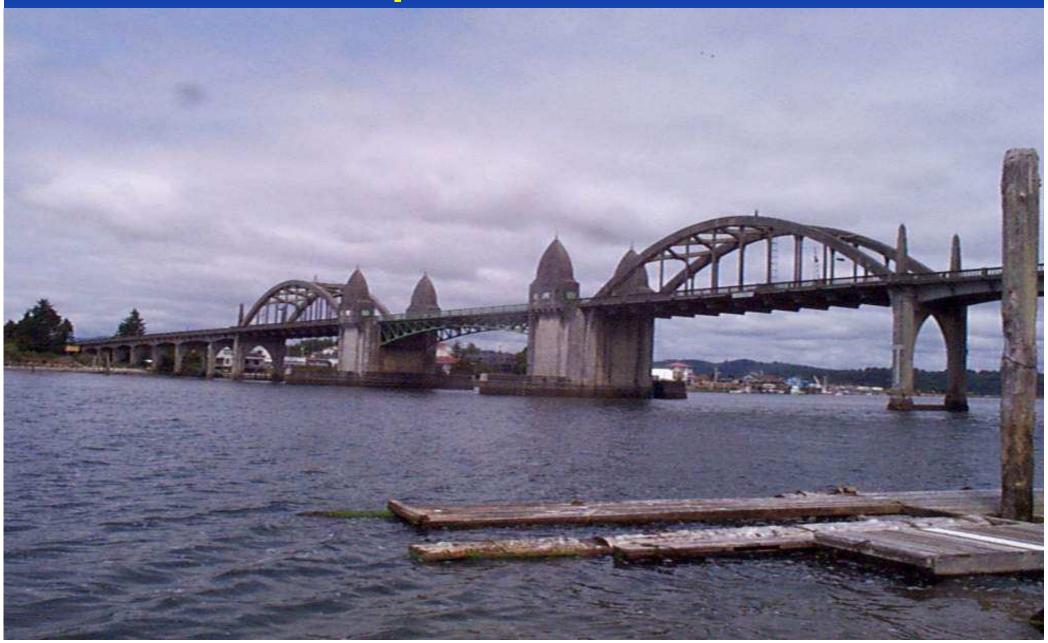
# **Graffiti Management**



# **Graffiti Management**



# **Complex Structures**



#### **Complex Structures**

**Identify and Location of Critical Features** 

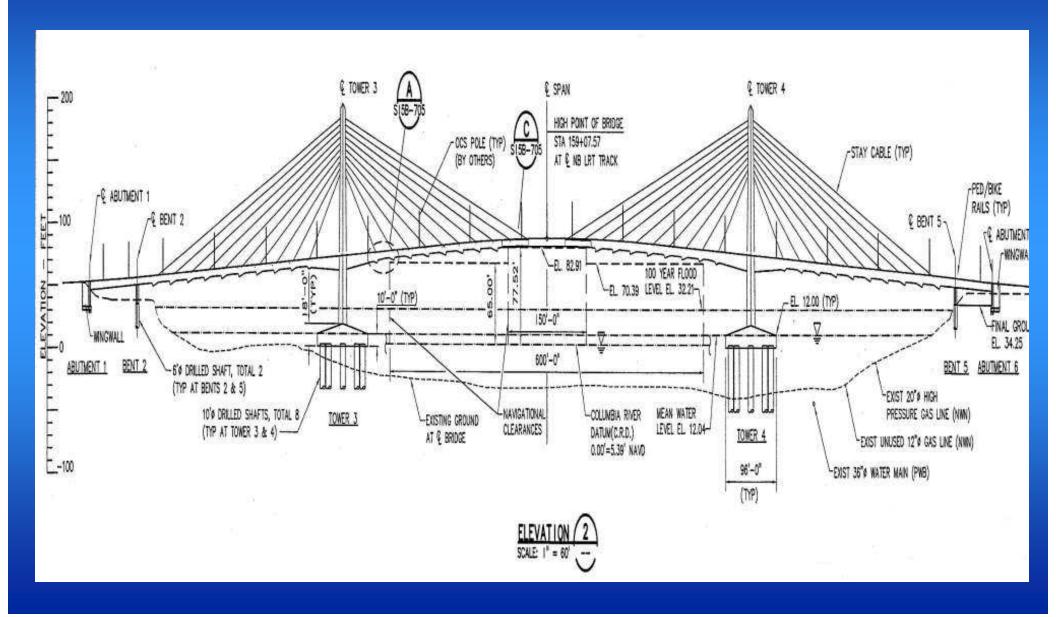
- ✓ Operational Features
- ✓ Unique Details
- ✓ Owners Manual Needed



#### **Owners Manual Information**

- ✓ Procedures to Access each Unique Detail?
- How should the condition of the feature be assessed?
- ✓ How Frequent should the component be assessed?
- ✓ What are the maintenance procedure?
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#### **Complex Structures**



# Legal Responsibilities

**Bottom-line Solution:** 

Get involved in the bridge plan review process throughout the bridge design phase.

You will find Designers are much more receptive Early-On than Later-On.



# Questions???



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