



INNOVATIVE ACCESS TECHNIQUES FOR BRIDGE INSPECTION

INTRODUCTION



Tom Howell, PE
Bridge Inspection Team Leader
HDR

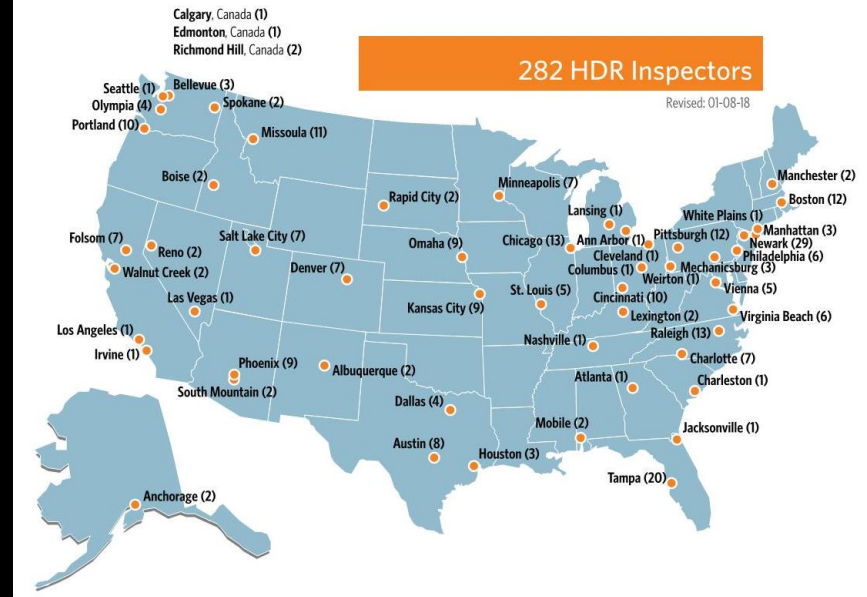


Jason Fogg, PE
Senior Bridge Engineer
HDR

HDR

Bridge Inspection Nationwide

- Founded in 1917
- Ranked #1 by ENR in Bridges (2017)
- 225 Offices Nationwide
- Over 10,000 Employee Owners
- More than 250 Bridge Engineers in the Midwest
- Working in Michigan since 1939
- Serving DOT and other bridge owners nationwide







COMMON ACCESS CHALLENGES

**CONVENTIONAL ACCESS FOR BRIDGE
INSPECTION**

INNOVATIVE ACCESS TECHNIQUES

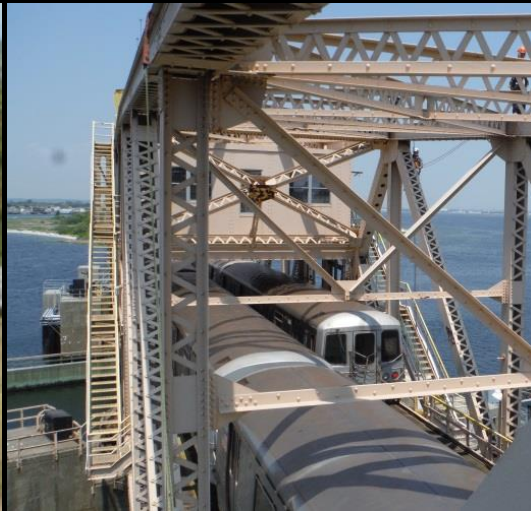
IMPLEMENTATION & LESSONS LEARNED



COMMON ACCESS CHALLENGES

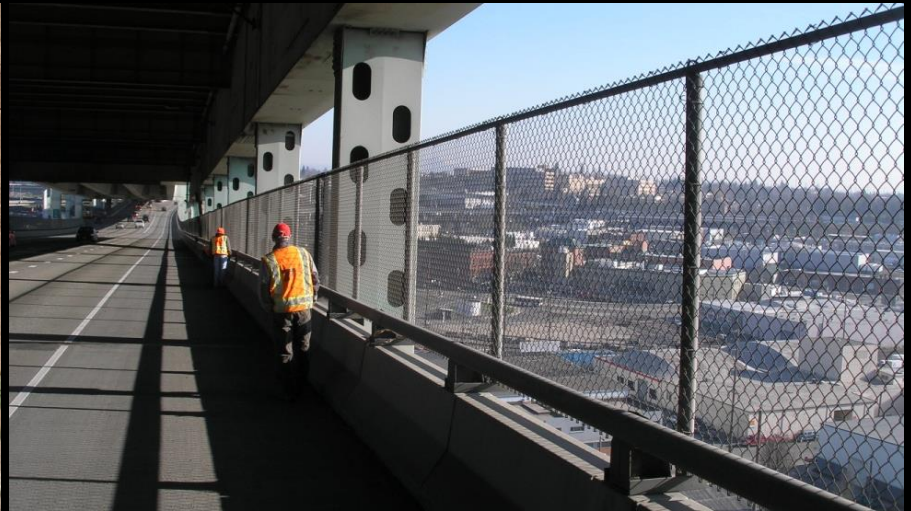
COMMON BRIDGE ACCESS CHALLENGES

- Traffic volumes, lane closure prohibitions
- Motorist & inspector safety
- Load posted bridges



COMMON BRIDGE ACCESS CHALLENGES

- Structure geometry prohibits efficient or typical access
- Terrain, water or other physical features
- Owner-installed features prevents use of typical access equipment



COMMON BRIDGE ACCESS CHALLENGES

- Remote / Rural vs. Urban / Congested locations
- Geography dictates economics of transporting conventional access tools & equipment
- Unique structural or geographic features warrant unique access approaches





CONVENTIONAL ACCESS



In the beginning,
there was walking,
crawling, ladders,
and waders...



Then we got
motorized with
hydraulics and had
Bucket Trucks,
Aerial Lifts,
And Under-Bridge
Inspection Units!



And we used sky-climbers, picks and free climbing...



And now we have
rope access to get
to every nook and
cranny!

CONVENTIONAL ACCESS LIMITATIONS

- Traffic & Safety
- Structure Geometry & Physical Features
- Structure Location & Site Features





INNOVATIVE ACCESS TECHNIQUES

ACCESS COMBINATIONS

Getting to the Details

- High-Efficiency in High-Volume Traffic areas with short-duration lane closures
- Schedule inspection & equipment during outages or lower-volume windows
- Using each access method where it excels



ACCESS COMBINATIONS

Getting to the Details

- Equipment use during on-site downtime
- Access methods minimizing flagging requirements and impacts to facility users



ACCESS COMBINATIONS

Getting to the Details, Safely

- Lane Closures with multiple TMAs for multiple crew equipment pieces
- Combination Lane Closures On / Under
- 1 TMA per crew equipment depending on roadway geometry
- “Rolling Lane Closures”
- Night Work & Auxiliary Lighting



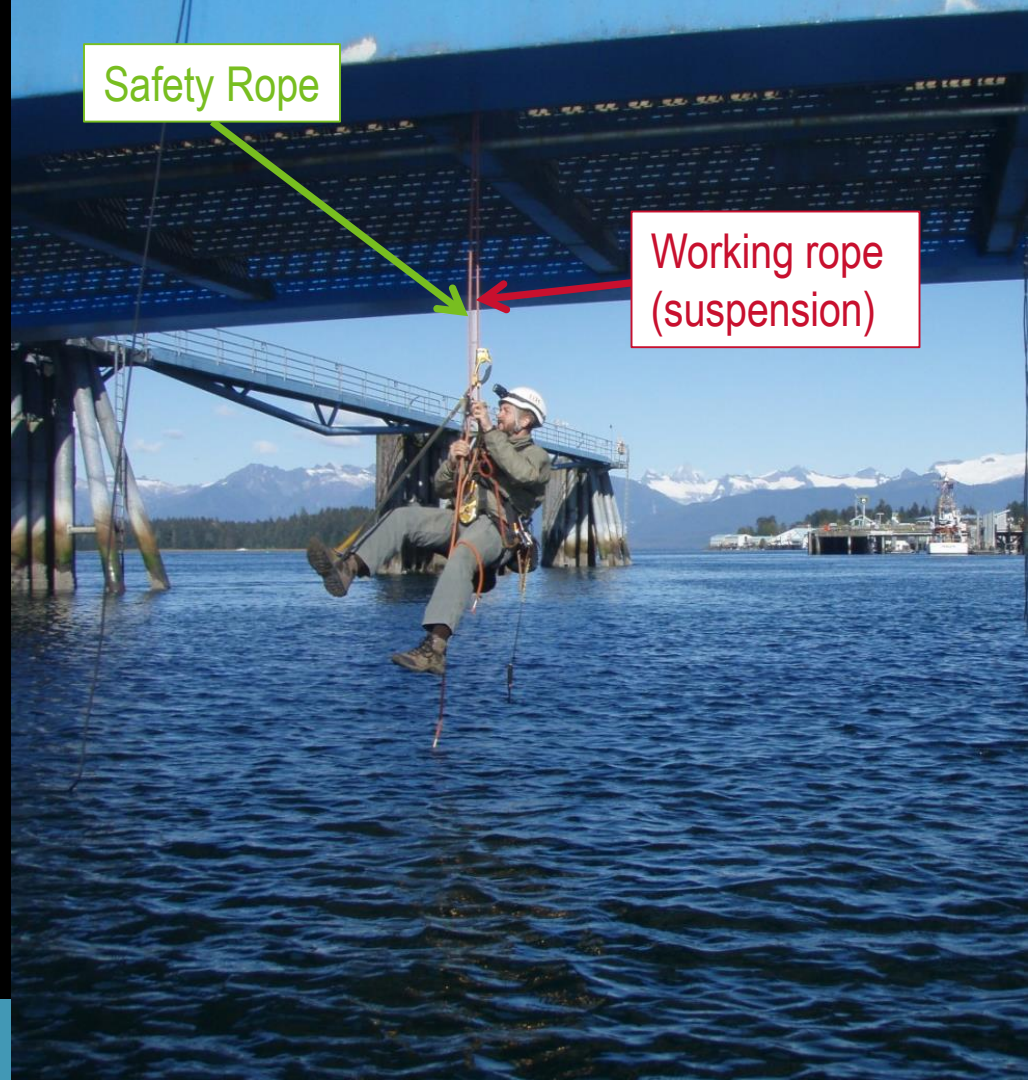
INTRODUCTION TO ROPE ACCESS

- Provides means to position inspector in virtually any location in a 3-D environment
- Differs from fall protection in that working rope serves as primary means of suspension; safety or back up rope provides fall protection



INTRODUCTION TO ROPE ACCESS

- SPRAT – Society of Professional Rope Access Technicians
 - Member-based organization
 - Develops and implements standards used in North America
- Central tenet is use of independent working and safety rope systems for each inspector



INTRODUCTION TO ROPE ACCESS

- Levels of SPRAT Certification
 - Level I (worker): 32 hours instruction + demonstrated proficiency in prescribed tasks
 - Level II (technician): 500 hours as a Level I + demonstrated proficiency in prescribed tasks
 - Level III (supervisor): 500 hours as a Level II + demonstrated proficiency in prescribed tasks
- HDR's 36-person rope access inspection team has 5 Level III, 9 Level II and 22 Level I personnel nationwide



STANDARD ROPE ACCESS TECHNIQUES

- Vertical access – use of descending and ascending devices



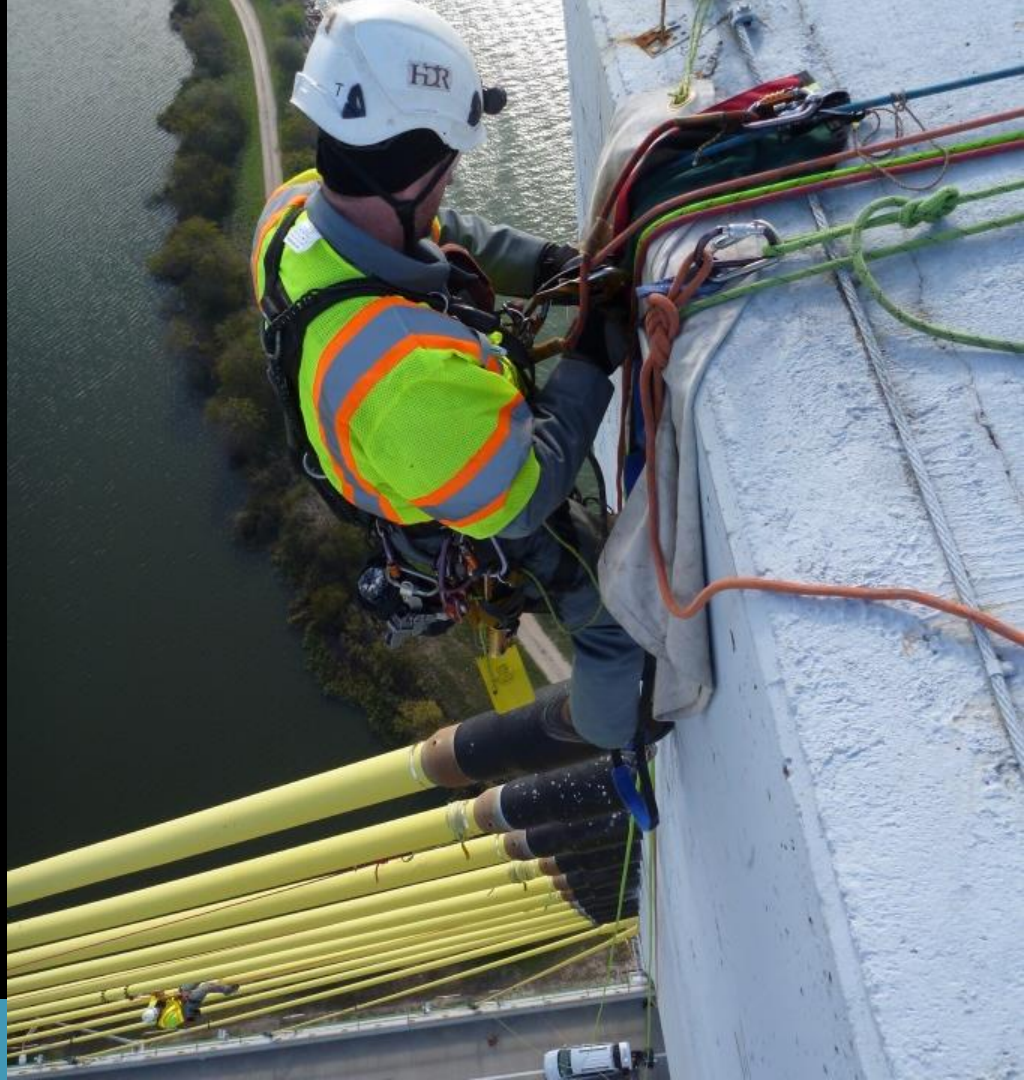
STANDARD ROPE ACCESS TECHNIQUES

- Horizontal access – use of rope-to-rope transfers, typically vertical to other vertical to traverse across



STANDARD ROPE ACCESS TECHNIQUES

- Edge negotiation



ADVANCED ROPE ACCESS TECHNIQUES

- Beam Clamps & Point to Point Aid Climbing



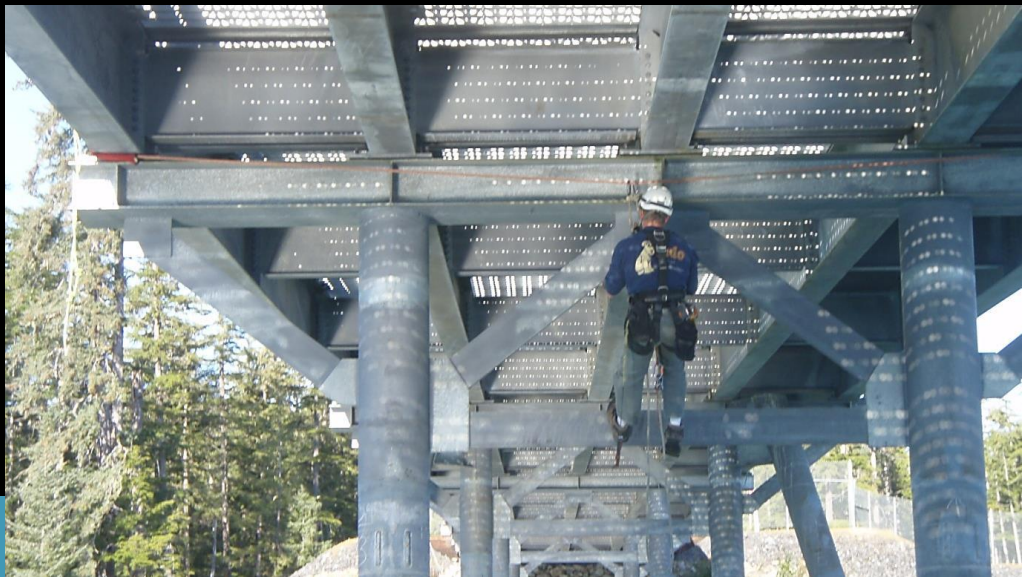
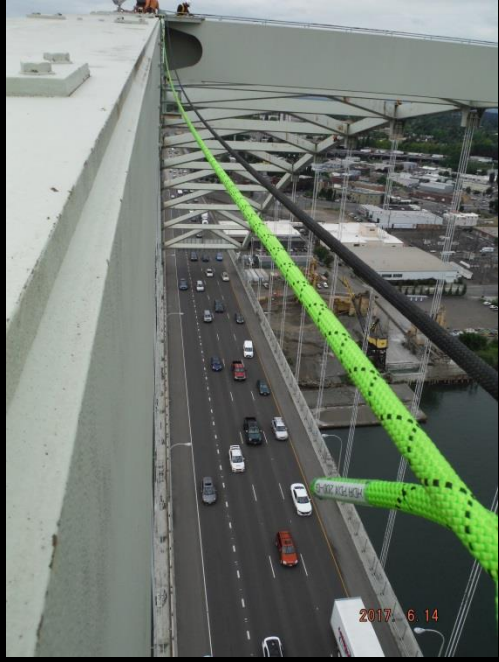
ADVANCED ROPE ACCESS TECHNIQUES

- Low Angle Traverse



ADVANCED ROPE ACCESS TECHNIQUES

- Tensioned high lines



ADVANCED ROPE ACCESS TECHNIQUES

- Tensioned high lines



ADVANCED ROPE ACCESS TECHNIQUES

- Cable Rollers



ADVANCED ROPE ACCESS TECHNIQUES

- Cross-hauling



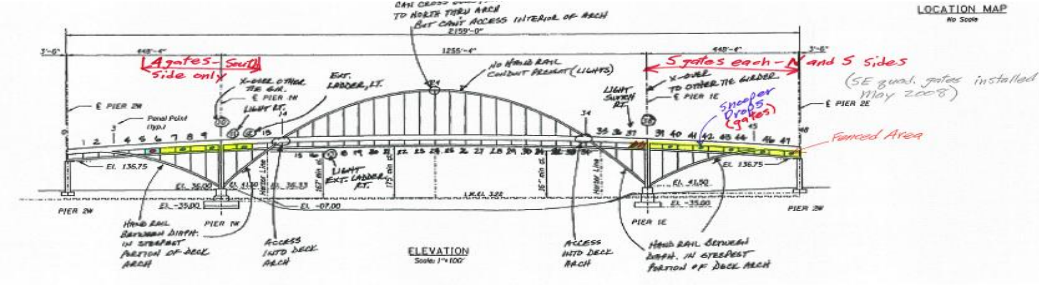


IMPLEMENTATION & LESSONS LEARNED



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Debris fence on lower deck of the Fremont Bridge prevents UBIV access to lower deck floor system



NON-STANDARD BRIDGE ACCESS

SOLUTION: Installed gates at selected panels



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Efficient access to upper deck floor system of the Steel Bridge's movable lift span under significant daily train traffic



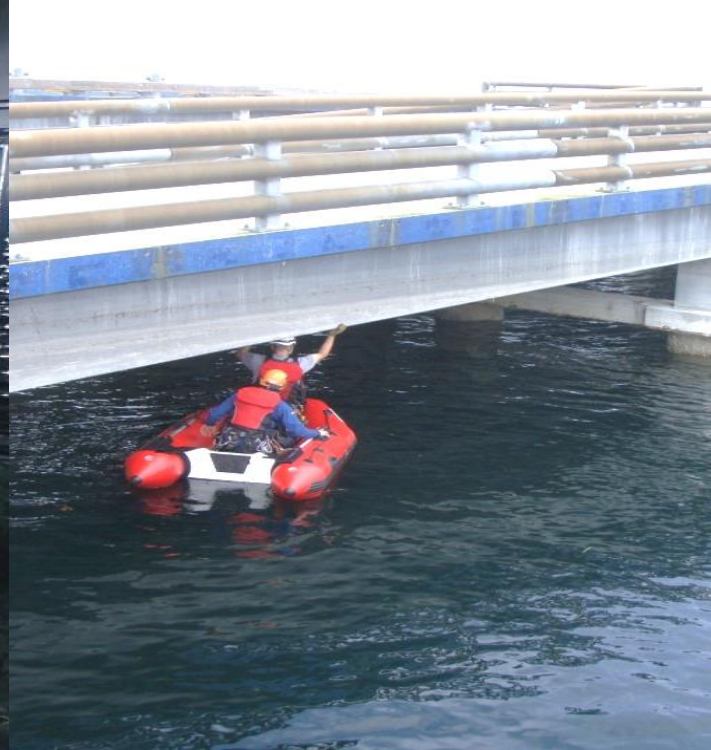
NON-STANDARD BRIDGE ACCESS

SOLUTION: Use the moveable lower deck to inspect the upper deck floor system members at eye-level



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Significant inspection effort required for large structures in remote locations throughout Alaska



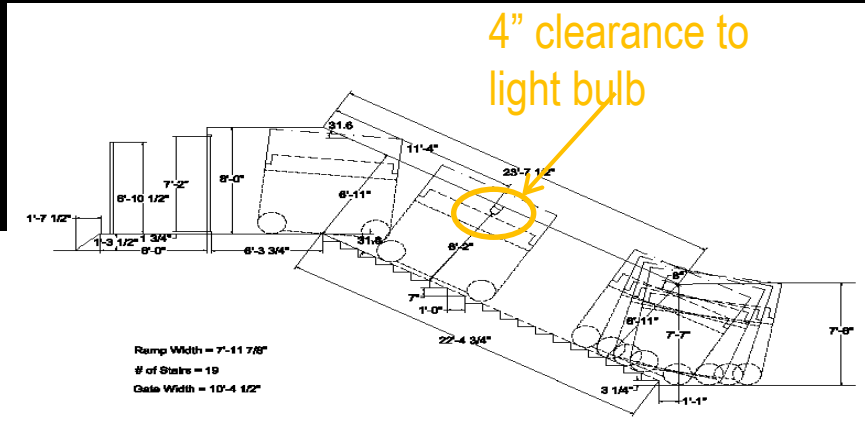
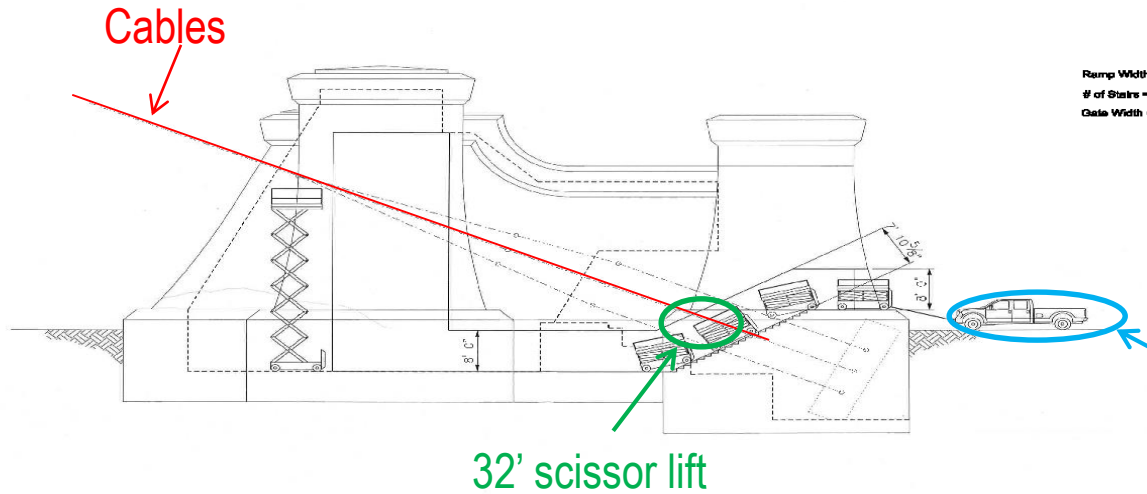
NON-STANDARD BRIDGE ACCESS

SOLUTION: Use tidal fluctuations (~40 feet) to expedite access



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Complex rope access techniques required to inspect cable anchorages in underground setting



Truck with winch

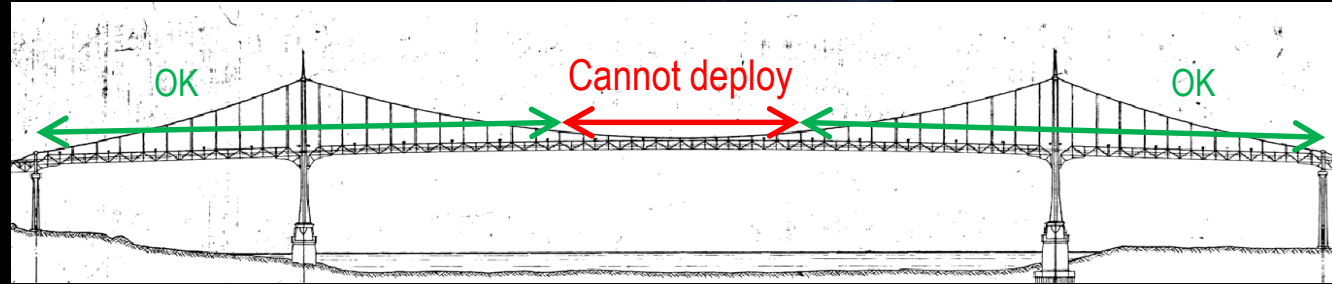
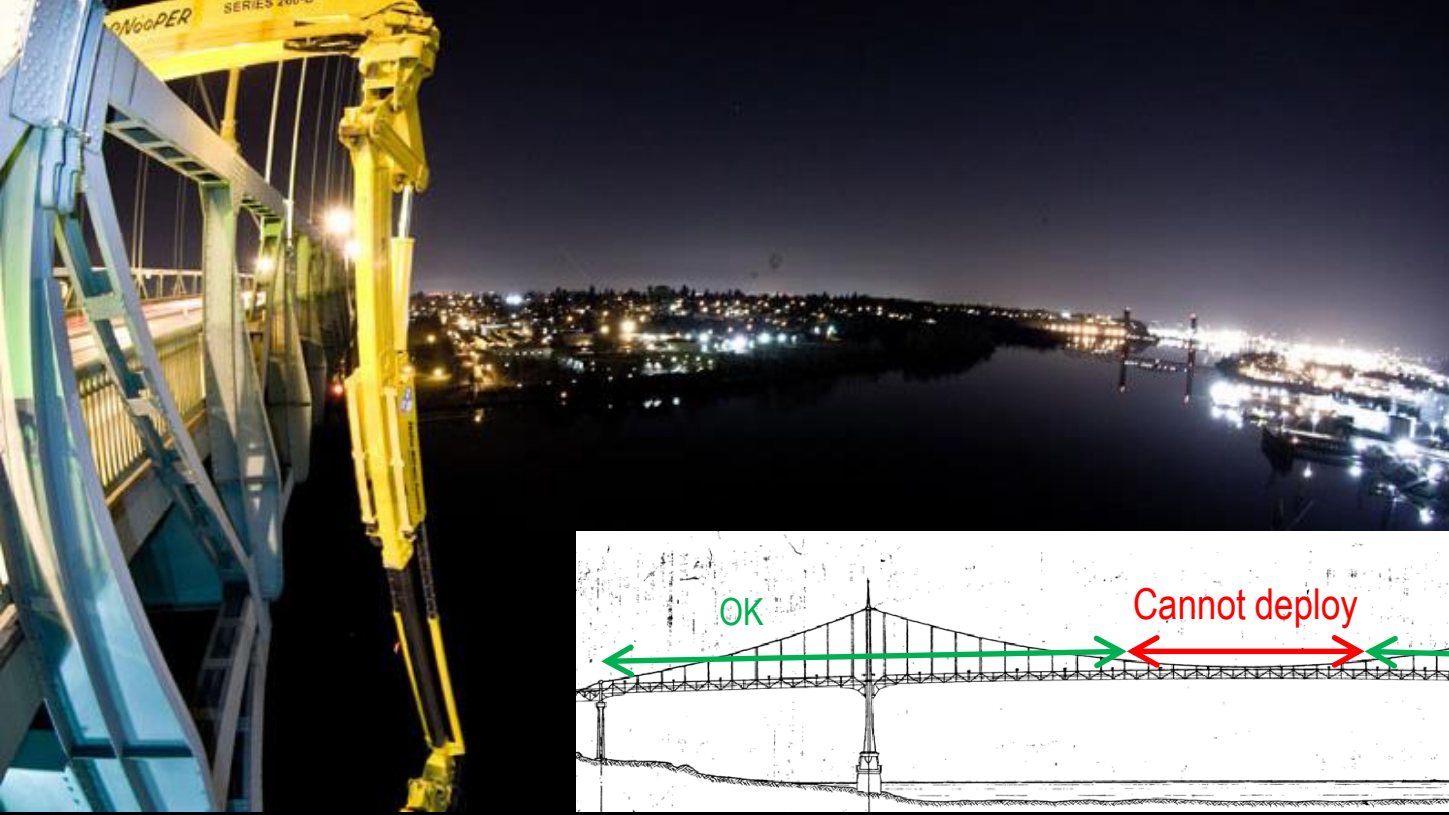
NON-STANDARD BRIDGE ACCESS

SOLUTION: Build ramps and winch appropriately-sized scissor lift down the stairs



NON-STANDARD BRIDGE ACCESS

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NON-STANDARD BRIDGE ACCESS

CHALLENGE: Underbridge inspection trucks unable to deploy over stiffening trusses where main suspension cables are low



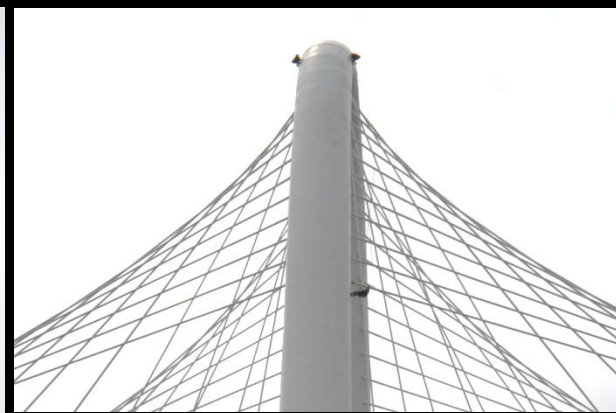
NON-STANDARD BRIDGE ACCESS

SOLUTION: Temporarily remove pedestrian rails and retrofit with bolted system



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Inspect exterior of arch with no positioning / redirecting anchorages



NON-STANDARD BRIDGE ACCESS

SOLUTION: Inspectors rappel arch connected to each other for stability and arm's reach access



NON-STANDARD BRIDGE ACCESS

CHALLENGE: Inspect steel and concrete supporting girders and deck soffit without interrupting A-line traffic



NON-STANDARD BRIDGE ACCESS

SOLUTION: Utilize boat-mounted hydraulic lift to efficiently access selected members

IMPLEMENTATION LESSONS LEARNED

- Collaboration with Owner
- Take Advantage of Unique Site Conditions
- Create Your Own Solution
- Teamwork
- Efficiency in Mobilizing Multiple Teams with Multiple Access Methods



SUMMARY

- Bridge Inspection Access can be challenging, but the right combination of techniques can provide an efficient, effective inspection solution
- Working Together always provides win-win solutions for the owner & inspector

QUESTIONS



THANK YOU!



