2013 Pacific Northwest BRIDGE INSPECTORS' Conference

MAXIMIZING YOUR BRIDGE INSPECTION PROGRAM

April 23 – 25, 2013

Hilton Portland and Executive Towers
Portland, Oregon

Hosted by

Federal Highway Administration, Washington State Department of Transportation, Oregon Department of Transportation, Alaska Department of Transportation and Public Facilities, Nevada Department of Transportation, and Idaho Transportation Department.

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Washington State University Conference Management

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TUESDAY APR. 23

11:00 AM **REGISTRATION**
Plaza Foyer

1:00 PM **SESSION 1: WELCOME, KEYNOTE, FEATURED, AND DISTINGUISHED PRESENTATIONS**
Pavilion Ballroom

Moderator: *Barry Brecto, FHWA HQ*

Opening Remarks & Welcome
Barry Brecto, FHWA HQ and Bruce Johnson, ODOT

National Bridge Inspection Program: Commendable Practices

Keynote Speaker:
Larry O'Donnell, FHWA Chicago Resource Center

FHWA Status Report
Tom Everett, FHWA HQ

Risk Based Inspection Frequencies
Glenn Washer, University of Missouri

3:10 PM **BREAK**
Plaza Foyer

3:30 PM **SESSION 2: NATIONAL INSPECTION TOPICS**
Pavilion Ballroom

Moderator: *Mike Premo, Nevada DOT*

Technical Committee 18 Bridge Management Evaluation and Rehabilitation
Matt Farrar, Idaho DOT

Summary of Critical Findings Reviews for the National Bridge Inspection Program
Brian Leshko, HDR Engineering

Non-Destructivbe Testing to Identify Concrete Bridge Deck Deterioration
Nenad Gucunski, Rutgers University

5:00 PM **ICE BREAKER RECEPTION**
Alexander's @ top of the Hilton

WEDNESDAY APR. 24

7:00 AM **BREAKFAST AND EXHIBITOR DISPLAY**
Plaza Foyer

8:00 AM **SESSION 3: NON-DESTRUCTIVE TESTING AND EVALUATION**
Pavilion Ballroom

Moderator: *Matt Farrar, Idaho DOT*

Using Thermography for Inspection
Glenn Washer, University of Missouri

Practical Applications and Experiences with FLIR
Steven Lovejoy, ODOT

Nondestructive Evaluation Methods for Structures
Dan Stromberg and Matthew Donahue, Collins Engineers, Inc.

Bridge Assessment Methods Using Image Processing and Infrared Thermography Technology
Masato Matsumoto, NEXCO-West USA, Inc.

10:00 AM **BREAK**
Plaza Foyer

10:30 AM **SESSION 4: UNDERWATER AND SCOUR**
Pavilion Ballroom

Moderator: *Holly Winston, ODOT*

Underwater Inspection Using ROV
Michael Smith and Loren Wilson, WSDOT

Case Studies of Bridge Scour Inspection
Edward Foltyn, ODOT

Investigation of Unknown Bridge Foundations in Oregon
Jan Six, ODOT

12:00 PM **LUNCH (PROVIDED)**
Grand Ballroom (Basement Level)

1:00 PM **SESSION 5: INSPECTION CHALLENGES**
Pavilion Ballroom

Moderator: *Tim Rogers, FHWA Oregon Division*

How Do You Inspect Something You Can't See? Destructive Testing and PT Ducts in Oregon
Marie Kennedy, ODOT

Ultrasonic Inspection of Steel Pins Protected with Cover Plates
Roman Peralta, WSDOT

In-Depth Inspection of the Historic Wheeling Suspension Bridge
Terry Ummer, HDR Engineering

Methods Used to Obtain Measurements of a Large Truss Bridge with No Plans
Jon Rooper, ODOT

3:00 PM **BREAK**
Plaza Foyer

3:30 PM **SESSION 6: DATA MANAGEMENT**
Pavilion Ballroom

Moderator: *Glen Scroggins, WSDOT*

WSDOT Bridge Inspection Integrated Information System
Steven Kollmansberger, WSDOT

Emerging Technology in Field Data Collection and Management
Brendan Prendeville and Nathan Cottrill, Burgess & Niple

iPad Mobile Inspection App
Kuan Go, HNTB Corp.

THURSDAY APR. 25

7:00 AM BREAKFAST AND EXHIBITOR DISPLAY
Plaza Foyer

8:00 AM SESSION 7: CONCRETE INSPECTION
Pavilion Ballroom

Moderator: *Debbie Lehmann, FHWA Washington Division*

Unexpected and Difficult-to-Observe Failure of Reinforced Concrete Bridges
Terrence Paret, Wiss, Janney, Elstner Assoc.

Precast Concrete Girder Fire Damage Inspection with Schmidt Hammer
Amanda Blankenship, David Evans and Associates

Eldridge Avenue Pipeline Crossing: Lessons Learned
Kash Nikzad, Trantech Engineering LLC

Inventory Inspection and Load Rating of a Complex Segmental Concrete Bridge
Matthew Lengyel, David Evans and Associates

10:00 AM BREAK
Plaza Foyer

10:30 AM SESSION 8: TUNNEL INSPECTIONS
Pavilion Ballroom

Moderator: *Roman Peralta, WSDOT*

Inspection of the Robertson Tunnel
Matthew Miller, Parsons Brinckerhoff

ODOT Tunnel Management and Rehabilitation Program
Jamie Schick, Jacobs & Associates

Closing Remarks: Door Prizes and Best Presentation Award
Jeff Swanstrom, ODOT and Tim Rogers, FHWA Oregon Division

TUESDAY APR. 23

KEYNOTE NATIONAL BRIDGE INSPECTION PROGRAM: COMMENDABLE PRACTICES

Larry O'Donnell, FHWA Chicago Resource Center

According to the National Bridge Inspection Standards (NBIS), each State Transportation Department must inspect, or cause to be inspected, all highway bridges located on public roads that are fully or partially located within the State's boundaries, except for bridges that are owned by Federal agencies. Additionally, each State Transportation Department must include a bridge inspection organization that is responsible for: agency-wide bridge inspection policies and procedures, quality assurance and quality control, preparation and maintenance of a bridge inventory, bridge inspections, reports, and load ratings. There are 52 State Transportation Departments with varying organizational structure that implement the NBIS. This presentation will highlight some commendable bridge inspection practices used by State Transportation Departments to implement the NBIS.

The proper assessment of element level bridge conditions and the ability to use the condition data to efficiently and effectively manage bridge inventories are cornerstones to providing safe and efficient transportation on the nation's highways. The introduction of element level bridge inspection techniques in the early 1990s represented a significant advancement in bridge inspection and management practice and has been adopted by the majority of State Transportation Departments in the United States. The FHWA and bridge owners nationwide have recognized the benefits of more detailed element level bridge inspection condition data that provides a better indication of the severity and extent of bridge condition deficiencies. This level of condition data allows for expanded performance measures, and improved bridge management system deterioration forecasting and evaluation of bridge preservation, improvement and replacement needs. As the use of element level bridge inspection techniques has proliferated, the need for improvements and national consistency has been identified and addressed in the AASHTO Guide Manual for Bridge Element Inspection. The collection and use of element level bridge inspection data by the FHWA is expected to improve the performance management of the nation's highway bridges through enhanced national level analysis, forecasting, and reporting of bridge conditions and needs (preservation, improvement, and replacement) using risk-based, data driven methods.

DISTINGUISHED SPEAKER FHWA Status Report

Thomas Everett, FHWA Headquarters

The presentation will provide a brief overview of several FHWA activities including implementation of MAP-21 initiatives relevant to bridge and tunnel inspections. Anticipated topics include updates to regulations, element level inspections, tunnel inspections, training course updates and inspection compliance assessments.

FEATURED SPEAKER Risk-based Inspection for Highway Bridges

Glenn Washer, University of Missouri

Bridge inspections for most bridges are conducted periodically at standard, uniform time intervals mandated by the National Bridge Inspection Standards (NBIS). As a result, a new bridge that may experience few problems in the first 10–15 years of service has the same inspection frequency and intensity as a 50-year-old bridge that is reaching the end of its service life. A more rational approach to determining inspection frequency and scope would consider the structure type, age, condition, environment, and other characteristics of the bridge to determine the appropriate inspection frequency and scope. This paper will discuss innovative new approaches to bridge inspection based on risk and reliability assessment for bridges. Such risk assessment frameworks are increasingly utilized in other industries, such as oil, gas and chemical production, as a means of optimizing the use of inspection resources and improving safety. Overall concepts and framework for reliability and risk-based assessments applied to inspection planning for bridges will be discussed.

SESSION 2 NATIONAL INSPECTION TOPICS

Technical Committee 18 Bridge Management Evaluation and Rehabilitation

Matt Farrar, Idaho DOT

The presentation will cover proposed changes to the AASHTO Manual for Bridge Inspection (MBE) in the areas that relate to the FHWA 23 metrics and CFR, proposed specifications for the load rating of gusset plates, and proposed revisions and improvements to the AASHTO Guide Manual for Bridge Element Inspection with the introduction of the new AASHTO Manual for Bridge Element Inspection. The presentation will also include future areas of development and direction for the AASHTO T-18 Committee.

Summary of Critical Findings Reviews for the National Bridge Inspection Program

Brian Leshko, HDR Engineering, Inc.

The Federal Highway Administration (FHWA) reviewed the current state of highway bridge inspection practice for identifying and following up on critical findings through a contract with HDR Engineering (HDR). Twelve States were visited during June-August, 2011 by HDR staff as part of an independent review team to assess processes and procedures for reporting and tracking critical bridge inspection findings (critical findings). The team visited State offices and bridge sites to review bridge inspection information and gain a better understanding of how this important area of the bridge safety program is administered. The team interviewed FHWA staff, State bridge inspectors and State inspection program managers, and investigated aspects of bridge inspection and other events that can lead to critical findings. This included fracture critical findings, scour critical deficiencies and plans of action, load rating calculations, critical findings on any primary bridge component, and other safety deficiencies. A summary report was developed to highlight best practices and areas for improvement, and provides a basis for improved processes for identifying, monitoring and correcting critical deficiencies. The information presented will also be useful for inspectors and inspection program managers who want to develop or improve their own procedures.

Non-Destructive Testing to Identify Concrete Bridge Deck Deterioration: Results of SHRP 2 R06-A Project

Nenad Gucunski, Rutgers University

The Strategic Highway Research Program 2 (SHRP 2) supported research to identify nondestructive evaluation methods that can detect and characterize deterioration in concrete bridge decks. The presentation provides an overview of the SHRP 2 project R06-A, "Nondestructive Testing to Identify Concrete Bridge Deck Deterioration". While there are many deterioration mechanisms that a concrete deck may endure throughout its lifetime, the project focused on those that were identified as of high importance to bridge owners. These deterioration mechanisms include delamination, rebar corrosion, concrete degradation and vertical cracking. A number of promising NDT technologies were selected to evaluate the aforementioned deteriorations on a fabricated slab with artificially introduced defects and deterioration, a recovered section of a bridge deck, and on an in service bridge. The technologies evaluated included: ground penetrating radar, impact echo, infrared thermography, electrical resistivity, half-cell potential, galvanostatic pulse measurement, ultrasonic surface waves, and chain drag/hammer sounding. The technologies were graded and ranked based on five performance measures: accuracy, speed, repeatability, ease of use, and cost. It was determined that no single technology is capable of characterizing all four deterioration types. Recommendations were made regarding the technologies that are most appropriate for detection and characterization of specific deterioration type, as well as regarding their recommended application. Finally, a web tool named NDToolbox was developed to assists practitioners in the selection of technologies. The NDToolbox provides in addition to the recommendations, provides descriptions about the technologies, their physical background, applications, equipment, advantages and limitations, typical data presentation, recommended procedures, etc.

WEDNESDAY APR. 24

SESSION 3 NON-DESTRUCTIVE TESTING AND EVALUATION

Applications of Infrared Thermography for Routine Bridge Inspection

Glenn Washer, University of Missouri

This presentation will focus on the application of infrared thermal cameras for routine inspections. The presentation will provide an overview of research conducted to develop guidelines for the use of hand-held infrared cameras as inspection tool to identify damage in concrete bridge components. Ongoing research to study the implementation of this technology in 10 states will be described, as well as example applications and results from the research.

Practical Applications and Experiences with Using FLIR for Bridge Inspection

Steven Lovejoy, Oregon DOT

ODOT was one of several DOT's that participated in the pooled fund research project TPF-5(152) Development of Hand-held Thermographic Inspection Technologies. A modern FLIR camera was loaned to the department to use in the field and gain experience with the technology as it applies to highway bridge inspection. This presentation will summarize the experiences of ODOT bridge inspectors using this new technology for assessing the degradation and/or structural integrity of bridge decks. Examples of both reinforced concrete and FRP decks will discussed.

Nondestructive Evaluation Methods for Structures

Dan Stromberg and Matthew Donahue, Collins Engineers, Inc.

The presentation will provide an overview of advanced technologies for bridge inspections with techniques discussed for concrete, steel, and timber members. Technical examples will include: Visual Augmentation Methods; Stress Wave Methods; Magnetic Methods; Radiographic Methods; Infrared Thermography Methods; Radar Methods; Electric, Chemical, Physical, and Other Methods. In particular, the following equipment devices will be discussed: Ultrasonics (D-meter, R-meter, V-meter, flaw detection and phased array units); Ultrasonic Pulse Echo Equipment; Ultrasonic Surface Wave (USW) Device; Spectral Analysis of Surface Wave (SASW) Device; Acoustic Emission; Visual Augmentation Devices; Liquid Penetrant; Magnetic Particle; Magnetic Flux Leakage; Eddy Current; Meandering Winding Magnetometer; X-Ray and Gamma Source Imaging Devices; Half-Cell Corrosion Potential Devices; Resistivity Devices; Chloride Ion Equipment; Galvanostatic Pulse Measurement Equipment; Impact Echo; Ultrasonic Pulse Echo; Handheld and Vehicle-Mounted Infrared Thermography Equipment; Ground Penetrating Radar; Optical Holography; 3-D Point-Cloud Imaging Devices; and Field Sampling Tools

Bridge Assessment Methods using Image Processing and Infrared Thermography Technology

Masato Matsumoto, NEXCO-West USA, Inc.

Identifying appropriate applications for technology to assess the health and safety of bridges is an important issue for bridge owners around the world. Traditionally, highway bridge conditions have been monitored by visual inspection with structural deficiencies being manually identified and classified by qualified engineers and inspectors. With traditional on-site inspections, qualified inspectors are performing close-up visual inspections and sounding tests, often from crane suspended lifting cages or built-in inspection staging; invariably putting inspectors at some safety risk. The need for safer inspection methods calls for new innovations in bridge inspection technologies. One of the solutions for this issue is leveraging non-destructive technologies as well as experimental approaches for a more advanced and efficient inspection process. Due to advancements in technology and computer science, new technologies are becoming more and more cost effective, and some of the technologies are ready to be applied for on-site bridge assessment practices. Some technologies can contribute to reducing inspection costs by replacing part of the visual inspection or hammer sounding tests, while other technologies can provide additional information for bridge engineers to make a decision on optimum inspection intervals or more cost effective maintenance strategies. If we can improve data collection efficiencies and reduce the time required by inspectors in the field to make general structure condition assessments, more time will be available for these same inspectors to perform detailed hands-on inspections and/or to apply non-destructive testing technologies for prescreened bridge elements in areas requiring close attention. NEXCO-West, one of major toll road operators in Japan has been working to develop efficient non-destructive highway bridge inspection methods using high quality digital image and Infrared (IR) thermography technologies. This paper describes the basic theory of these methods and results of on-site applications for deteriorating concrete bridge structures.

SESSION 4 UNDERWATER AND SCOUR

Augmenting a Bridge Inspection using a Remotely Operated Vehicle (ROV)

Michael Smith and Loren Wilson, Washington State DOT

In December of 2011, the WSDOT Bridge Preservation Office was afforded the opportunity to borrow an ROV from FHWA for the purposes of performing deep-water inspections of their floating bridge anchor cables. This presentation will describe the ROV inspection process including equipment setup and use. A discussion surrounding pros and cons will also be provided which other bridge inspection agencies can use to assess whether an ROV inspection is a tool that is suitable for a given inspection. A case study will be presented including video and representative data that is generated and how it is folded into the overall bridge inspection report.

Case Studies of Bridge Scour Inspection

Edward Foltyn, Oregon DOT

The purpose of this presentation is to review the ODOT scour inspection standards and to present two case studies of bridge scour. These case studies present the original discoveries, the resultant inspections, and the repairs during emergency conditions. The two bridges are the Dog River Bridge (Br #16006) on Mt. Hood Highway over the East Fork Hood River and the Alder Creek Bridge (Br #19957) over Alder Creek on Mt Hood Highway.

Dog River Bridge, originally constructed in the 1950s is a two-bent bridge with cantilevered deck slabs at each end. Maintenance records indicate that Bent 2 was lowered approximately six feet in 1981. Subsequent to the 2006 glacial outburst event on Mt Hood, high flows caused significant scour along the Newton/ Clark Creeks feeding the east Fork Hood River. During a storm, follow-up inspection by the Region Bridge Inspector noted a potential problem with scour and undermining at Bent 2.

Alder Creek Bridge was constructed as part of the OTIA 3 program in 2005. This bridge was designed and constructed as a design-build contract. During environmental monitoring for some replanting, the inspector noted evidence of scour and passed it on to the District and Maintenance crews. As the Region Bridge inspectors looked into the situation, it was apparent that the west abutment was supported by a spread footing approximately 20 feet above the thalweg of the channel. In this case, the river bottom is basalt so will not scour deeper, but based on the channel geometry, lateral migration is occurring.

Investigation of Unknown Bridge Foundations in Oregon

Jan Six, Oregon DOT

The term "unknown foundations" has been traditionally associated with existing bridges over waterways (riverine and tidal) where foundation details are unknown and therefore, foundations could not be evaluated against the hydraulic hazards related to scour. ODOT bridges with unknown foundations currently receive a Code U for Item 113 of the FHWA's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide). The FHWA exempted these bridges (except if they are on an Interstate) from being evaluated for their scour vulnerability due to the lack of a process and guidance that would have allowed bridge owners to determine their foundation characteristics and therefore, evaluate these bridges. The FHWA is concerned that some bridges within unknown foundations may be scour critical and as such need to have a Plan of Action as required by the NBIS regulation. After November, 2010 the FHWA mandated that any bridge having unknown foundations remain coded as "U", considered scour critical and subject to the plan of action requirement of the NBIS regulation, 23 CFR 650.313(e)(3), until properly designed countermeasures are installed to protect the bridge foundations or until the bridge is replaced.

ODOT has implemented a program to identify all bridges with unknown foundations located on the state highway system and begin the process of collecting existing foundation data or field testing data sufficient to conduct a scour evaluation and recode Item 113 to the appropriate level. ODOT has approximately 2700 NBI bridges and beginning in 2008 ODOT had 175 bridges coded as "U" (unknown) for item 113. This number has been reduced to 75 based on office research, non-destructive field testing and other information.

The non-destructive testing and other investigation work ODOT has completed to date, and work that is planned for the future, is covered in this presentation.

SESSION 5 INSPECTION CHALLENGES

How Do You Inspect Something You Can't See? Destructive Testing and PT Ducts in Oregon

Marie Kennedy, Oregon DOT

Oregon is ready to get ahead of the curve of Post-Tension Strand erosion. With other states such as Florida finding corroded strands in their PT ducts, Oregon began to wonder what their strands looked like. In an exploratory effort, Oregon contracted out WJE to look inside two bridges to see the condition of their strands. This required opening up parts of the bridge. Corrosion was found. The methods to open up the PT ducts, the findings of the testing of grout and strands, and what ODOT's future plans are will be discussed.

Ultrasonic Inspection of Steel Pins Protected with Cover Plates

Roman Peralta, Washington State DOT

WSDOT has over seventy structures that have steel pins within the superstructure that are ultrasonically tested on regular inspection frequencies. Several of the structures within this list have steel protective cover plates over the ends of the pins. Previous ultrasonic inspections required removal of these cover plates in order to perform the inspection properly. This presentation discusses the challenges that WSDOT has faced in performing these inspections as well as the viable and safe alternative for subsequent inspections of this bridge element.

In-Depth Inspection of the Historic Wheeling Suspension Bridge

Terry Ummer, HDR Engineering, Inc.

HDR Engineering, Inc. is currently under contract with the West Virginia Division of Highways (WVDOH) for a six-year inspection program of the historic Wheeling Suspension Bridge over the Ohio River in Wheeling, WV. The first year of the contract consisted of an In-Depth Periodic inspection, which was completed in May 2012. This presentation will discuss the unique design and history of the bridge, the non-conventional access methods used to inspect the bridge, results of the inspection, and lessons learned.

The Wheeling Suspension Bridge is the world's oldest existing suspension bridge. The bridge was designed by Charles Ellet, Jr. and built by the Wheeling and Belmont Bridge Company, beginning in 1847. In 1872, the diagonal stay cables were installed on the bridge under the direction of Washington Roebling (son of John Roebling). In 1956 a new steel floorsystem and steel grid deck were installed. The bridge gained national prominence in 1969, when the American Society of Civil Engineers dedicated it as a National Historic Civil Engineering Landmark. In 1975, the National Park Service designated it as a National Historic Landmark.

The overall length, measured from anchor to anchor, is 1307'-6". The span length, measured from center-to-center of each tower, is 1,008'-6". The superstructure is supported by two suspended cables on each side. The cables are approximately 7½" in diameter and consist of approximately 2,200 individual longitudinal No. 10 gauge wires, wrapped transversely with painted steel wire. Each wide flange floorbeam is bolted to two vertical hanger rods on each end. The hanger rods are attached to ½" thick steel bands, which encircle the main cables. The open steel grid deck is 20'-0" wide and welded to the top flanges of the floorbeams. Stability is provided by diagonal stay cables and timber stiffening trusses along each side of the bridge. The towers and cable anchorages are comprised of stone masonry. The bridge has a two-ton weight limit.

Due to the two-ton weight limit, conventional bridge inspection access methods such as underbridge inspection cranes and aerial lifts cannot be utilized on the bridge deck to inspect the floorsystem, main suspension cables, hanger rods, and stay cables. HDR utilized non-conventional access methods to complete the inspection. Industrial rope access was used to inspect the main suspension cables, hangers, stay cables, and portions of the towers. The floor system, deck underside, lower hanger connections, lower stay cable connections, and lower portions of the stiffening truss were inspected with a 125' barge-mounted aerial lift (over water) and an 85' aerial lift (over land). The 85' aerial lift was also used to inspect the back stays and portions of the towers.

Despite the age of the bridge, the inspection revealed that the structure is in fair-to-good condition. Significant defects were typically limited to section loss on the hangers and stay cables due to contact between members, and delaminated stone masonry. Lessons learned from the inspection are that the access methods utilized are extremely efficient and provide excellent hands-on coverage.

Methods Used to Obtain Measurements of a Large Truss Bridge with No Plans

Jon Rooper, Oregon DOT

The Bridge of the Gods is a steel truss cantilever bridge that spans the Columbia River between Cascade Locks, Oregon and Washington state. It is approximately 40 miles east of Portland, Oregon and four miles upriver from the Bonneville Dam. It currently serves as a toll bridge operated by the Port of Cascade Locks.

The bridge was built in 1926 at a length of 1,127 feet. It is the third oldest bridge on the Columbia River. The higher river levels resulting from the construction of the Bonneville Dam required the bridge to be further elevated and extended to its current length of 1,856 feet, which was completed in 1940. Sometime in the 1970's the plans for the main cantilever truss spans were lost.

Due to the I-35 bridge collapse in Minnesota in 2007, the inspection and load rating requirements for gusset plates were revised in 2008. As a result, the 2009 bridge inspection for the Bridge of the Gods had noted several locations with bowed/distorted gusset plates at main member truss connections. The deflections in the gusset plates may be a result of one, or a combination of the following; pack rust induced bending, the plates were bent during construction/erection for fit-up, or compression induced buckling/distortion from loads. It is difficult to determine which of these scenarios may be occurring at each gusset location without a load rating analysis.

To perform a load rating analysis, one would need the plans to be able to determine the structures geometry in order to accurately trace the loading to each truss member and compute their capacities. Once the loads to the truss members are known, then the gusset plates can be load rated.

In 2011 ODOT deployed different methods to acquire the needed measurements for the geometry of each truss member, the geometry of the gusset plate connections, and the overall bridge geometry so that an accurate load rating analysis can be performed. To obtain the cross-section measurements of the truss members, ODOT hired a consultant to climb the structure and hand measure and provide diagrams of the cross-sections for each unique truss member. With this information ODOT is able to calculate the member stiffnesses, capacities, and deadload.

While climbing the structure, the consultant also used ODOT's digital cameras and targets on the gusset plates. ODOT is then able to use the digital rectification software that was developed by Oregon State University to obtain accurate dimensions for each gusset plate directly from the digital photos.

ODOT's Geometronics Unit performed a LIDAR (Light Detection and Ranging) scan of the main cantilever truss spans. LIDAR is an optical remote sensing technology that can measure the distance to a target by illuminating the target with pulses from a laser. The data collected from the scan is used to create a high resolution 3-D model of the bridge. The model is then used to determine the overall bridge geometry, which is then used to create the finite element model used in the load rating analysis.

SESSION 6 DATA MANAGEMENT

WSDOT Bridge Inspection Integrated Information System

Steven Kollmansberger, Washington State DOT

A summary of the technology used by WSDOT to coordinate bridge inspections and relevant data. A summary of applications, including the inspection report application, web interface, scheduler, and inspection status report will be included. The automated integration of information between these systems will be discussed.

The presentation will emphasize live demonstration of the inspector user experience, from data entry to inventory management, and on to viewing of summary data. The application provides various views into the data depending on user need, including various types of inspections (underwater, movable, sign, structural) as well as data management (repairs and inventory).

Inspector data is automatically processed to provide for management reporting, used to determine which inspections are ahead or behind schedule, and to contribute to the scheduling of upcoming inspections by coordinating inspection requirements and resource availability. These reports will be demonstrated and discussed.

Connecting the inspector to data using mobile technology will also be discussed, including existing and proposed future mobile applications.

Emerging Technology in Field Data Collection and Management

Brendan Prendeville and Nathan Cottrill, Burgess & Niple, Inc.

One of the common challenges faced by all bridge inspectors is efficient collection, management, and processing of field data. Additionally, inspectors can benefit from having all the historical information regarding a structure at their fingertips in the field. In the past, pencil and paper has always been the preferred system for taking notes; however, recent advancements in tablet computers have swayed the tides. This presentation will focus on the methods for, and benefits gained by integrating iPads or other similar tablet computers into your bridge inspection program. Case studies will be presented that highlight such devices' successful use and advantages on both large long span structures, as well as local agency bridges. Specific topics will include: apps and programs ideally suited for data collection; customized databases; generating and using standardized forms; durability of the iPad in the field; data transfer and backup; searchable inspection manuals; creation of reports; generation of deficiency sketches; and much, much more!

iPad Mobile Inspection App

Kuan Go, HNTB Corporation

The iPad Mobile Inspection App records photos and inspection notes to a database in real-time. These photos and notes can be viewed and edited by others working on the same project from multiple locations in the field or office. The App organizes field data by physical location using either user-defined locations or GPS. The data can be manipulated in a variety of manners and can be added to throughout the life of the project and the life of the bridge. The App also serves as a reference tool for inspectors in the field by allowing remote access to documents stored on Bentleys' ProjectWise Explorer.

THURSDAY APR. 25

SESSION 7 CONCRETE INSPECTION

Unexpected and Difficult-to-Observe Failure of Reinforced Concrete Bridges

Terrence Paret, Wiss, Janney, Elstner Associates, Inc.

During routine bridge inspections on Interstate 40 near Needles, California, Caltrans inspectors observed signs of slight but advancing movement along the horizontal cold joints between the decks and girders in 12 normally reinforced, cast-in-place concrete T-girder bridges constructed in the early1970s. In one of the bridges inclined cracks propagating from the cold joint and a fractured stirrup were also found, leading to closure of the bridges. Later destructive investigations conducted prior to demolition of the bridges revealed that many of vertical stirrup legs crossing the construction joints had fractured, despite the evidence of joint movement being too slight to observe from greater than several feet away. This type of failure had not been seen before by Caltrans nor had it been reported previously in technical literature. With concrete T-girder and box-girder bridges with similar cold joints in service elsewhere in California, and with many of those joints in difficult-to-inspect locations, an investigation was conducted to determine the cause of the failures and develop recommendations to mitigate this type of failure in the future.

The investigation consisted of detailed field investigation, including destructive openings, core sampling, reinforcing steel sampling, crack mapping of the deck and girders; laboratory physical and chemical testing; analytical modeling using linear and nonlinear lattice modeling; and document review and literature search, including the effects of alkali silica reaction (ASR). One goal of the investigation was to correlate visible external conditions with the progression of stirrup fracture.

Based on the investigation, it was concluded that the bridges failed due to cyclic degradation of the horizontal construction joint due to the combined influence of five primary factors. Three factors pertain to the strength of the construction joint: inadequate joint roughness and cleanliness, inadequate quantity of reinforcing steel crossing the construction joint, and insufficient anchorage of the reinforcing crossing the construction joint. The fourth contributor is long-term cyclic loading from high-volume heavy truck traffic and the fifth contributor is behavior not explicitly accounted for in the original design, such as unbalanced wheel loading causing transverse moments on the construction joints and the influence of deck stiffness on the magnitude of tensile stresses on the joint due to those moments.

Recommendations were made to improve the surface roughness of the joint and increase the quantity and anchorage of reinforcing crossing the joint, and to develop a program to monitor this difficult-to-observe condition at other similar bridges.

Precast Concrete Girder Fire Damage Inspection with Schmidt Hammer

Amanda Blankenship, David Evans and Associates, Inc.

TriMet recently acquired the Johnson Creek Access Bridge for their Portland to Milwaukie Light Rail project. This bridge developed a transient camp under it and a camp fire under one end of the bridge got out of control and damaged the underside of the bridge. As a result, about a third of the bridge is black with soot, and portions of the precast prestressed concrete deck bulb-tee girders have spalls up to ⅝" deep. David Evans and Associates performed a special inspection to assess the fire damage. The damaged areas were mapped, sounded, photographed, and the surface hardness was measured with a Schmidt Hammer.

No reinforcing was exposed in any of the fire induced concrete spalls. The spall fracture planes cut through the aggregate, fracturing the aggregate and making the face of the spalls smoother than typical exposed aggregate degradation of concrete.

The Schmidt Hammer is a non-destructive testing hammer that measures surface hardness. The instrument works on the principle that the rebound of an elastic mass impacting the surface is a function of the hardness of the surface itself. The hammer comes with a chart that converts the Schmidt Hammer reading to concrete compressive strength. It was not expected that the Schmidt Hammer would give an accurate reading of the concrete compressive strength. However it was expected that verification would be made of the relative difference in concrete strength in the girder in an area affected by the heat versus not affected by the heat. The bridge is 106' long and the spalling is limited to the first 13' of the girders adjacent to Bent 1.

In general, it was found that concrete between the spalls at Bent 1 had higher Schmidt Hammer readings than at Bent 2. This was unexpected because it was thought that the heat would deteriorate the concrete not strengthen it. Several hypotheses were developed to explain these results.

We concluded that the concrete in the fire damaged area is generally sound and not reduced in strength. Deterioration is limited to the surface and the reinforcing steel and prestressing steel appears to be unaffected. Long-term service life of the structure may be reduced due to the reduced concrete cover.

Load rating recommendations were made including to reduce the effective concrete section by the maximum depth of the spalls. It was also recommended to continue to use the specified concrete strength of 7.0 ksi.

Eldridge Avenue Pipeline Crossing: Lessons Learned

Kash Nikzad, Trantech Engineering LLC

Eldridge Avenue Bridge is a 7-span, 360-foot long and 36-foot wide bridge in the City of Bellingham, WA. The City of Bellingham desired to cross a new 16-inch watermain from this bridge. During the 2005 routine inspection of this bridge, TranTech's inspection team observed wide spread cracking on the exterior girders of this bridge that was not observed in prior inspection cycles. This fact put the pipeline crossing project in question. Through a task order from the City, TranTech's team brought on-board Professor John Stanton from the University of Washington to study the nature of these newly formed cracks. In order to make sure that the cracks are not dynamic, laboratory glass films were glued onto the surface of the cracks and a Live Load testing was performed on the bridge deck. It was determined that none of the cracks are dynamic. Next, TranTech engineers in a condensed and cost-effective way were able to bring on board a crack injection team to perform the crack injections. In a two-day inspection period all the cracks were mapped and the injection team member was able to inject all of the cracks in a subsequent five day span. Following a load rating and validation of the fact that the exterior girders are now capable of carrying the extra pipeline load, PS&E construction documents were prepared and the construction was successfully carried through. An interesting feature of the design details was that the supports for the pipeline, occurring at each sidewalk support outrigger, had an extra restraining piece at the top of its standard roller supports which prevented the pipeline from a "snaking" behavior. This detail was applauded by the Ductile Iron Pipe research Association (DIPRA) group.

Inventory Inspection and Load Rating of a Complex Segmental Concrete Bridge

Matthew Lengyel, David Evans and Associates, Inc.

Bridges are an integral part of our transportation system. This statement holds true not only for large communities but also for small communities. In particular the small community of Moab, Utah is dependent on the US 191 crossing over the Colorado River. Prior to 2011, this world renowned tourist town was restricted by a structurally and functionally deficient steel plate girder bridge that was originally built in the 1950's. The bridge had been rehabilitated in the past but ultimately needed to be replaced. In 2009, UDOT selected a contractor to build two new parallel segmental concrete girder bridges with 428' long main spans. The new bridges not only removed a number of piers from the water, they significantly increased the safety and capacity of the crossing.

This presentation will focus on the inventory inspections and load ratings that were performed as part of the final commissioning activities for the bridges. The special inspection equipment for this type of bridge inspection will be discussed, as well as unique inspection elements that are normally not part of typical bridge inspections. Additionally, the specialized software and engineering tools needed to perform the load rating for these complex bridges will be discussed. Finally, the presentation will summarize the unique characteristics of complex segmental concrete bridges and how those factor into future inspections and load ratings for these types of structures.

Inspection of the Robertson Tunnel

Matthew Miller, Parsons Brinckerhoff

TriMet's Robertson Tunnel was constructed as part of the Westside Light Rail Project and is located in Portland's West Hills, connecting downtown Portland with Beaverton and Hillsboro, Oregon. The tunnel is approximately three miles in length and consists of twin running 19' diameter bores. Washington Park Station serves as the sole passenger stop within the tunnel and at 260 ft. below the surface is the deepest transit station in North America.

The Robertson Tunnel was constructed between 1993 and 1997. Geologic conditions of the tunnel alignment consist primarily of layered basalt flows with some locations of sedimentary deposits. The western third of the tunnel was excavated using drill and blast methods. In this location the basalt was removed by blasting while sedimentary deposits were mined conventionally via excavation.

The eastern two thirds of the tunnel was excavated with a hard rock tunnel boring machine (TBM), nicknamed Bore-Regard. Beginning at the East Portal, a 200' starter tunnel was mined conventionally in the westbound (WB) bore prior to the excavation proceeding with the TBM.

A comprehensive visual structural inspection of the Robertson Tunnel was performed by Parsons Brinckerhoff in March 2012. This was the first such inspection since the tunnel was placed in service in 1998. Parsons Brinckerhoff's scope included performing visual structural inspections of the running tunnels (bores), cross passages, and portals, documenting the condition of the tunnel and developing recommendations for repair/maintenance. This presentation gives a brief overview of the history of the tunnel, inspection planning, execution, and findings.

ODOT Tunnel Management and Rehabilitation Program

Jamie Schick, Jacobs & Associates

The Oregon Department of Transportation (ODOT) bridge group is currently responsible for 11 highway tunnels across the state. ODOT is actively managing its tunnel system through detailed inspections as well as upgrades and rehabilitation. ODOT bridge inspectors conduct reconnaissance level inspections approximately every two years using existing tunnel maps developed during detailed assessments. Tunnel cracking and defects are assessed for significant signs of degradation. In addition, all tunnels are being scanned with a laser scanning system to develop a high resolution digital elevation model (DEM) of the tunnel and portals. This will establish a baseline geometry that can be used with future scans to assess potential changes in conditions over time. ODOT is currently utilizes a tunnel consultant with design and construction expertise to perform detailed tunnel condition assessments for three tunnels within the system. A fourth tunnel was also recently inspected as part of a tunnel lining rehabilitation project. Tunnel assessments include detailed inspections to map defects, seepage conditions, lining performance, update tunnel maps, and develop recommendations for rehabilitation, as required. Information from these tunnel inspections is used to prioritize future tunnel repairs.

Several tunnels have recently undergone repairs both as a result of inspection recommendations and identification of needs at the Regional level. These include:

- Clearance improvement and liner repairs in the Salt Creek Tunnel and
- New lining and lining repairs in the Elk Creek Tunnel.

These repairs are designed to extend the life of these structures as well as improve the integrity of overall tunnel system. This presentation will provide a summary of ODOT Tunnel Management Program and will describe typical tunnel defects and discuss considerations for assessing tunnel stability and prioritizing tunnel rehabilitation repairs.

Amanda Blankenship
David Evans and Associates, Inc.

Amanda Blankenship earned a Bachelors in Civil Engineering from Oregon State University (OSU) in 2002 and a Masters in Engineering from Cornell University in 2003. Amanda has been a bridge designer and inspector at David Evans and Associates Inc for eight years. She is a Professional Engineer in Oregon and California. Amanda is a Certified Team Leader Bridge Inspector in Oregon and is a Level 1 SPRAT Rope Access Technician. Amanda has a broad range of experience including new bridge design, bridge rehabilitation design, routine and fracture critical bridge inspection, and load ratings. In her free time Amanda enjoys spending time with her husband working on home improvement projects.

Nathan Cottrill
Burgess & Niple, Inc.

Mr. Cottrill joined Burgess & Niple in 2008 as an engineer in the Facility Inspection Section. He is involved with inspections and evaluations of bridges, dams, river locks, and other structures. He has participated in more than 300 bridge inspections and has climbed more than 50 bridges in a total of twelve states. Mr. Cottrill's bridge inspection experience includes the use of both destructive and nondestructive testing methods to evaluate structural conditions. He has experience with AASHTO and FHWA inspection manuals, PONTIS, and a variety of other structural evaluation and inspection software. Mr. Cottrill has performed load rating analyses on several bridge types and gusset plates. He holds a Bachelor of Science degree in Civil Engineering from Ohio Northern University.

Matt Donahue
Collins Engineers, Inc.

Mr. Donahue is a Civil/Structural Engineer with over 20 years of experience in engineering research, remote field operations, construction management and design consulting. He has a broad background in structural, geotechnical and environmental engineering with project experience in cold region logistics and construction, marine and waterfront earthquake resistant design, underwater structural inspection, Superfund site closure, landfill construction, water resource management, project scheduling, cost estimating, permitting and conflict resolution. Mr. Donahue has been charged with lead and supervisory responsibilities for many of these projects with several under adverse conditions in an international setting.

Mr. Donahue is also a commercial diver and is certified by the Association of Diving Contractors International (ADCI) and the Dive Certification Board of Canada (DCBC).

Thomas Everett
FHWA Headquarters

Tom Everett is the Bridge Safety, Preservation, and Management Team Leader in the Federal Highways Administration's Office of Bridge Technology in Washington, DC. Mr. Everett currently manages several aspects of the Federal bridge program including the National Bridge Inspection Program. He is a member of many committees and task forces including the AASHTO Technical Committee on Bridge Management, Evaluation, and Rehabilitation. Prior to joining the Office of Bridge Technology, Mr. Everett served as a bridge management and inspection engineer in the Resource Center in Baltimore, bridge engineer in Tennessee, and as a structural engineer in the former Regional FHWA Office of Structures in Baltimore. Mr. Everett is a graduate of Rutgers University and holds a Masters degree in Civil Engineering from Johns Hopkins University. He is a licensed professional engineer in Rhode Island.

Matt Farrar
Idaho DOT

Matt Farrar is the State Bridge Engineer for the Idaho Transportation Department and has more than 27 years of experience in the areas of bridge planning, design, construction, inspection and evaluation of bridges. He has a Bachelors and Master of Science Degrees in Civil Engineering from the South Dakota School of Mines and Technology.

Edward Foltyn
Oregon DOT

Edward graduated from Clarkson University in 1984 with an MS in Civil Envineering with a specialty in Fluid Mechanics and thermal Sciences. He has worked as a Research Hydraulic Engineer for the US Army Corps of Engineers, as a self-employed consultant, for a civil engineering consulting firm, and for the last 6+ years as a Regional Hydraulic Engineer in Region 1 before taking the position as the Sr Hydraulic Engineer for the Bridge Section.

Kuan Go
HNTB Corporation

Kuan S. Go, P.E. is a Project Manager with HNTB Corporation. He obtained his B.S. Civil Engineering from University of Washington and M.S. Civil Engineering from the University of California at Berkeley. Mr. Go has 20 years of professional experience in managing projects, performing studies and design and providing construction support services for various transportation related infrastructure. He has completed over 100 bridges and structures assignments with a multitude of challenges in California, Nevada, Singapore and Hong Kong. Kuan has played key roles for many of the largest and most complex transportation projects including the Presidio Parkway Public-Private Partnership Project in San Francisco, I-405 Sepulveda Widening Design Build Project in Los Angeles, Silicon Valley Rapid Transit (SVRT) Civil Line Segment and Carquinez Bridge Seismic Retrofit projects.

Nenad Gucunski
Rutgers University

Dr. Nenad Gucunski is professor and chairman of Civil and Environmental Engineering at Rutgers University. He is also the Director Infrastructure Condition Monitoring Program at Rutgers' Center for Advanced Infrastructure and Transportation (CAIT). His expertise is in NDT/NDE of transportation infrastructure. He is leading a number of important infrastructure related research projects. He is the PI of the NIST-TIP (National Institute of Standards and Technology-Technology Innovation Program) ANDERS project, SHRP 2 (Strategic Highway Research Project 2) project on NDE for Bridge Decks, the Lead of the NDE Team for FHWA's Long Term Bridge Performance (LTBP) Program, and PI on several other projects. He is an active member of a number of societies and is serving as the chair of the ASCE's Geophysical Engineering Committee.

Bruce Johnson
Oregon DOT

Bruce Johnson is the State Bridge Engineer in Oregon since September 2004. He supervises 51 people in bridge design, standards, operations, inspection, major bridge maintenance, load rating, bridge management, and preservation. Prior to that, he was the Division Bridge Engineer, for Federal Highway Administration in Oregon from October 1988 to September 2004. He worked in various positions with FHWA in Oregon, Nevada, Kansas, Colorado, Indiana, and Iowa from 1975-1988. Bruce is chair of AASHTO SCOBS Technical Committee T-9 on Bridge Preservation, vice-chair of Technical Committee T-20 on Tunnels, and a member of T-10, Concrete, a member of T-3 Seismic and a member of the AASHTO Special Committee for Joint Development that oversees AASHTO Ware products. Bruce is chair of the TBR Committee on Bridge Management, AHD-35, and a member of TRB Committee on Bridge Aesthetics, AFF-10(2). He is the vice-chair of the FHWA Expert Task Group for Bridge Preservation. Bruce received many outstanding awards from FHWA, including an Engineering Excellence Award in 2001. He is a member of ASCE, fib, ACI, and the Underground Construction Association of the Society of Mining and Excavation.

Marie Kennedy
Oregon DOT

Marie Kennedy has BS in Mathematics and Masters in Engineering and is currently working at ODOT as a Bridge Data Analyst. She has been with ODOT for 4 years.

Steven Kollmansberger
Washington State DOT

Steve Kollmansberger is the primary software developer for the WSDOT Bridge Preservation Office, involved in on-going maintenance and new development of a variety of Bridge application, especially the primary bridge inspection reporting program.

Matthew Lengyel
David Evans and Associates, Inc.

Matt Lengyel has experience in the inspection, design, construction and load rating of bridges crossings and bridge interchanges across the United States of America. He earned his BSCE from the Citadel and MSCE from Kansas State University, and is currently a senior bridge engineer at David Evans and Associates. Matt provides bridge engineering services for a wide range of assessment, inspection, replacement or rehabilitation design and construction projects. During his career he has worked on 9 major bridge projects that had design and construction costs in excess of $100 million that were constructed using design-build or design-bid-build delivery methods. He has filled a variety of roles that included both technical leading and managerial roles for signature cable stayed bridges, segmental concrete girder bridges, steel plate girder bridges and prestressed concrete girder bridges. Additionally, Matt has provided engineering and/or construction services for the two longest cable-stayed bridges in North America, as well as for 4 other cable stayed bridges. He has also provided a variety of services on major cast-in-place and precast segmental concrete girder bridges that were built using span-by-span, balanced cantilever and unidirectional construction techniques.

Brian Leshko
HDR Engineering, Inc.

Mr. Leshko is a Vice President, Principal Professional Associate, and HDR's National Bridge & Structures Inspection Program Leader with experience in development of bridge plans and specifications, bridge analysis and ratings, bridge inspections and cost estimates. His experience in preliminary and final design of highway and pedestrian bridges for urban and rural interstates, freeways, and arterials includes geometry, steel and concrete superstructures, piers, abutments, foundations, retaining walls and sheet piling tieback walls. His experience also includes in depth bridge condition inspections, rehabilitation designs and ratings by working stress and load factor methods. He is a Certified Bridge Safety Inspector and a SPRAT-Certified Level I Rope Access Technician with extensive rope access and structure climbing experience inspecting large and complex structures, including plate girder, box girder, arch, suspension, segmental concrete and various truss bridges (highway and railroad). Design submissions include TS&L, foundation, and PS&E. Construction services include shop drawing review, steel/concrete fabrication quality assurance, responding to Requests for Information (RFI) and providing construction consultation.

Steven Lovejoy
Oregon DOT

Dr. Lovejoy is a senior engineer with the Oregon DOT. His work is focused on inspection, testing and maintenance of highway bridges.

Masato Matsumoto
NEXCO-West USA, Inc.

Masato Matsumoto's area of professional of expertise is focused on technical aspects of NDE bridge condition assessment, inspection, database development and data analysis, deterioration prediction, life-cycle expectancy and long-term highway asset management. Matsumoto is a globally recognized structural engineer currently a Committee Member for the IABSE (International Association for Bridge and Structural Engineering) Working Commission 4 (Conservation of Structures) as well as the IRF (International Road Federation) Asset Management Committee where he shares his knowledge and experience in these areas. He is also a contributing member of the International Bridge Study (IBS) under the Long-Term Bridge Performance Program.Matsumoto's academic background is primarily in bridge condition assessment and optimum lifetime maintenance strategies. He pursued these specific studies both at the University of Colorado at Boulder and Kobe University (Japan). In his professional career at Japan's highway agency (NEXCO), he utilized his academic knowledge and practical experience to devote himself to bridge inspection, NDE technologies, bridge maintenance and management. His paper entitled 'Development of Lifetime Bridge Maintenance Strategy for Expressway Bridges in Japan' was highly acclaimed and awarded recognition as Best Technical Paper during the 13th REAAA (Road Engineering Association for Asia and Australasia) Conference in Sept, 2009. His contributions to provide better quality in highway asset management programs have been recognized worldwide, and he is now serving as a member of the Board of Directors for IRF Washington.

Matthew Miller
Parsons Brinckerhoff

Matt Miller is a lead bridge engineer and project manager with Parsons Brinckerhoff in Portland, Oregon. He has been with PB for 13 years, specializing in structural applications for transportation infrastructure design and construction projects. Matt received his bachelor's degree in civil engineering from the University of Portland and his master's degree from Portland State University. He is also a Professional Engineer in five states. While with PB, Matt has been responsible for the inspection for over 2,000 structures including major bridges, local agency bridges, culverts, walls and tunnels while working in ten States and the United Kingdom.Evan Garich is a geotechnical engineer with Parsons Brinckerhoff in Portland, Oregon. Evan received his bachelor's degree in civil engineering from Portland State University and his master's degree from Texas A&M University. He has been with PB for six years and is a registered Professional Engineer. Evan has design and construction experience with conventional, TBM, and immersed tube tunnels as well as the inspection of roadway and transit tunnels and dam intake structures.

KASH NIKZAD, PH.D., P.E.
Trantech Enginerring LLC

Dr. Nikzad's 20 years experience includes structural analysis/design, load rating, seismic analysis/ research/ retrofit recommendation and construction supervision/ inspection for various types of bridges. He is an NBIS certified bridge inspector and has contributed 12 technical papers to well-known civil engineering journals and conferences.

Larry O'Donnell
FHWA Chicago Resource Center

Larry is a senior structural engineer in the Federal Highway Administration (FHWA) Resource Center Office located in Matteson, IL (Chicago). In this position he is responsible for providing technical assistance, training and technology deployment to FHWA Division Offices, industry, associations, state transportation departments, and local highway agencies in the areas of bridge inspection and management. He also provides assistance to the FHWA Office of Bridges and Structures in developing national policy and agency-wide procedures.Larry has worked for the FHWA for over 23 years. Prior to the Resource Center, he served as the FHWA Division Bridge Engineer in the Massachusetts Division Office and Assistant Bridge Engineer in the Ohio and Indiana Division Offices. He has a Bachelor of Science degree in Civil Engineering from the University of Nebraska – Lincoln and is a Registered Professional Engineer in the State of Indiana. His personal interests include his family (wife, son and two daughters), Nebraska Cornhusker Football, hunting, fishing and other sports.

Terrence Paret
Wiss, Janney, Elstner Associates, Inc.

Since joining Wiss, Janney, Elstner Associates in 1986, Mr. Paret has performed hundreds of engineering investigations in the U.S. and abroad, focusing on the evaluation of structures after damaging events. In addition to investigating structures that have failed due to disasters such as earthquake, flood and fire, he has investigated a wide variety of failures resulting from defective or deteriorated structural elements, construction materials and installations. Recent projects to which Mr. Paret has contributed his expertise include the post-earthquake damage and vulnerability assessment of the Washington Monument, the I-35W bridge collapse in Minnesota, performance-based seismic evaluation of the United Nations Secretariat in New York City, and seismic strengthening of 180 Howard Street in San Francisco, which project received the 2008 AISC Presidential Award of Excellence in Structural Engineering. Mr. Paret was the recipient of the 2001 Moisseiff Award from the American Society of Civil Engineers.

Roman Peralta

Washington State DOT

Roman G. Peralta is a Regional Bridge Inspection Engineer in the WSDOT Bridge Preservation Office. He is responsible for the development and maintenance of the bridge inspection program statewide, including scheduling, coordinating, equipping, and verifying the accurate completion of all routine, fracture critical, special, and short span inspections for all WSDOT owned bridges in accordance with FHWA and WSDOT requirements. He has been with the state for 16 years and been in the bridge office for the last 14.

Brendan Prendeville

Burgess & Niple, Inc.

Brendan joined B&N in 2003 and has performed bridge inspections and ratings around the U.S. He has inspected multiple types of structures including bridges, dams, stadiums, etc.

Jon Rooper

Oregon DOT

Jon graduated in 1996 from Texas A&M University at Galveston with a B.S. in Maritime Systems Engineering; which is basically structural engineering with emphasis in offshore and coastal environments. Being born and raised in Oregon, Jon moved back home after college and started working for the Oregon Department of Transportation in November of 1996 as a construction project inspector. With an education in structural design, he was mostly assigned to inspect bridge projects and other related structures. After gaining 5 years of experience constructing and inspecting bridges, Jon was promoted to ODOT's Bridge Engineering Section as a bridge designer in January, 2002. In 2005 he accepted a position as a load rating engineer, and in November of 2010 Jon became the Senior Load Rating Engineer for ODOT. As the Senior Load Rating Engineer, Jon serves as the primary source of technical guidance and information for ODOT staff, consultants, Local Agencies, and the Federal Highway Administration on load capacity evaluations of Oregon's bridges. As the head of the five person load rating unit at ODOT, he provides technical management of the Load Rating Program for State and Local Agency bridges and overweight truck permit application reviews.

James Schick

Oregon DOT

James Schick is a senior project geologist with over 20 years' experience in the practical application of the geological sciences to both large and small-scale engineering, permitting, and environmental projects including roadways, dams, tunnels, bridges, and light rail infrastructure. Mr. Schick has expertise in detailed site characterizations as well as broad general surveys for projects involving pipelines, industrial facilities, power generation sites, and environmental impact statements. He has extensive experience working with and managing multi-discipoinary teams to efficiently deliver projects. His expertise includes trenchless design geotechnical/ geologic investigations, rock slope investigations, trenchless design, slope stability analyses and permitting. Prior to working for Jacobs Associates, Mr. Schick worked for the Oregon Department of Transportation on their Unstable Slopes Program and was a member of the ODOT Tunnel Committee.

Jan Six

Oregon DOT

Jan Six is originally from Southern California, moving to Sweet Home, Oregon in 1976 to work for the US Forest Service. Shortly after graduating from the University of Idaho in 1982 with a BS in Geological Engineering, he was hired by the Oregon Department of Transportation and has worked with ODOT since then as a geotechnical engineer. His current position is Senior Geotechnical Engineer in the ODOT Bridge Section, responsible for establishing and maintaining ODOT policies and standards related to bridge foundation design. Over the years he has participated in several FHWA Technical Working Groups developing FHWA design manuals and is currently a member of two TRB committees.

Outside of ODOT he and his wife enjoy the outdoors, camping, traveling and playing in a marimba band.

Michael Smith

Washington State DOT

Michael Smith is a Washington native that graduated from Washington State University with B.S. in Civil Engineer in 2007. Since 2007 Michael has worked for the Washington State Department of transportation performing structural inspections. As of more recently Michael has joined the dive team at WSDOT and now performs underwater inspections. It is from here that he has gained experience in operating an ROV as well as other tools to augment structural inspections. Outside of work Michael enjoys hiking, fishing, and hunting.

Dan Stromberg

Collins Engineers, Inc.

Mr. Stromberg has over 27 years of experience in the inspection and design of highway and railroad bridges, as well as various waterfront and waterway-related structures. Mr. Stromberg has managed and conducted over 4,000 above and below water inspections on various private and public sector structures nationwide. As part of his inspection experience, Mr. Stromberg has prepared reports, in which complete accounts of the findings and accurate evaluations of the conditions have been provided. His work has also included the presentation of detailed repair or replacement recommendations and the development of associated cost estimates. Mr. Stromberg has also performed numerous load capacity ratings, based on original or existing conditions, for all or portions of many of the structures he has inspected.

Mr. Stromberg has prepared designs for steel truss, steel plate girder, timber stringer, and cast-in-place, precast or prestressed concrete beam highway and railroad bridges. These designs have included single and multiple span bridges over water and urban expressways/roadways. His bridge designs have been developed to meet AASHTO, AREMA, and other client specifications. Mr. Stromberg has also prepared various designs for Naval and other waterfront facilities including bulkheads, dockwalls, fuel wharves, vessel mooring piers, floating docks, water intakes or outfalls, and causeways/breakwaters.

Mr. Stromberg is also a commercial diver and is certified by the Association of Diving Contractors International (ADCI) and the Dive Certification Board of Canada (DCBC).

Terry Ummer

HDR Engineering, Inc.

Mr. Ummer is a structural engineer in HDR Engineering's Pittsburgh, PA office. He graduated from the Pennsylvania State University in 1998, and has been involved in bridge inspection, analysis, and design ever since. He has served in project management and team leader roles for numerous bridge inspections in Pennsylvania, West Virginia, Ohio, Oregon, Alaska, North Carolina, and Nebraska. His inspection experience ranges from stream crossings and culverts to long-span crossings including steel trusses, deep girders, suspension, cable stay, tied arches, concrete arch, and segmental bridges. He has also served as the lead engineer for rehabilitation inspections of steel trusses and reinforced concrete arches. He is a registered professional engineer in Pennsylvania, West Virginia, Ohio, and Alaska. He served as project manager and inspection team leader for the Wheeling Suspension Bridge Inspection.

Glenn Washer

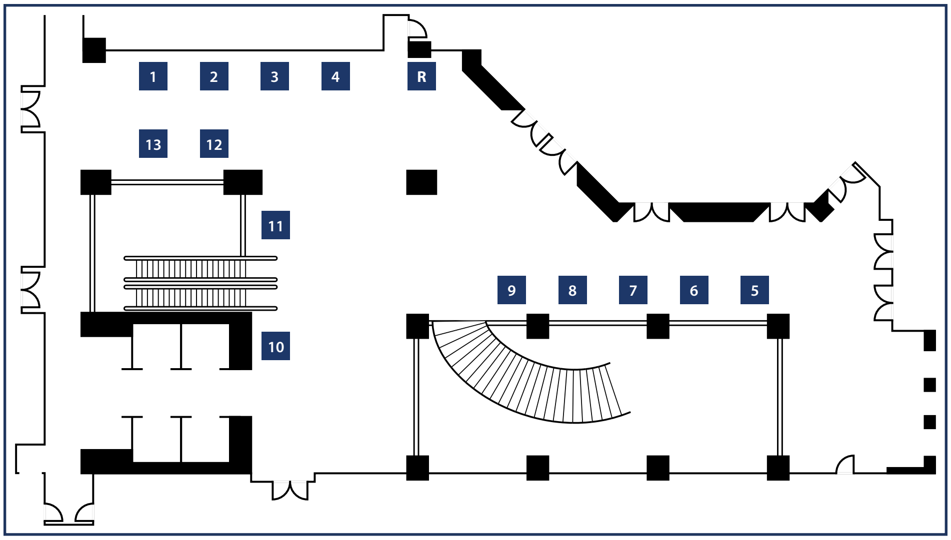
University of Missouri

Glenn Washer is an Associate Professor at the University of Missouri – Columbia (MU). Dr. Washer has expertise in a wide variety of NDE technologies for the condition assessment of highway bridges, including ultrasonics, thermography, ground penetrating radar, radiography and the visual inspection of bridges. His current research efforts include developing reliability-based bridge inspection practices (NCHRP 12-82) and investigating innovative methods for bridge condition assessment. He has published more than 80 conference and journal papers on the development of NDE technologies and their application bridge condition assessment. Dr. Washer is an active leader in the technical community, chairing several committees including the Transportation Research Board's (TRB) Committee on Field Testing and Nondestructive Evaluation of Transportation Structures, and past chair of the ASCE committee on Bridge Management, Inspection and Rehabilitation. Dr. Washer received his Ph.D. in Materials Science and Engineering from the Center for Nondestructive Evaluation (CNDE) at the Johns Hopkins University in 2001.

Loren Wilson

Washington State DOT

Loren Wilson is a licensed Professional Engineer in the state of Washington. He graduated from Washington State University with a B.S in Civil Engineering in 2007. After graduation Loren joined WSDOT Bridge preservation office as a Co-inspector in the special structures unit working on Ferry Terminals, Moveable Bridges and Tunnels. Since joining WSDOT Loren has become a part time member of the WSDOT Dive Team, helped formed and is now leading the Radio Tower inspection team and is one of two engineers currently involved working with the WSDOT's Bailey bridges.



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3 Coral Sales Company
4 Ayres Associates
5 Burgess and Niple, Inc.
6 Bridge Access Specialties
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