FHWA UPDATE

- National Tunnel Inventory
- Load Rating of Tunnels
- Tunnel Inspection Refresher Course
- Possible Research Partnering Opportunities
- TWG01, TWG02, TWG03, TWG04, TWG05
NATIONAL TUNNEL INVENTORY

- Preliminary Submission
- Full Submission
- Metrics for Tunnels
- Inventory Data Cycles
Preliminary tunnel inventory
• Overall data submissions were satisfactory
• Coding was mostly accurate
  – Some minor inconsistencies
• Few had issues with incorrect format
• 473 Tunnel Records submitted
• Starting to analyze the data
  – 39 States submitted tunnel records
  – 22 with 5 or fewer tunnel records
• 5 States (CA, WA, MA, CO, PA) > ½ of State records
• 10 States (add OR, DC, VA, HI, WY) > 2/3rd of State records
• Correcting errors on preliminary inventory
• Database is being prepared to hold the tunnel data
• System ready to collect data later this year
• Voluntary request for data will occur Spring 2017
• Submittals will be required Spring 2018
• What is the status of tunnel inspection programs
  — Tunnel inspection organization & Program Manager
  — Written procedures, forms, self perform or contracts
  — Initial inspection & Team Leader
• NTI POT (Program Oversight Team)
  – 14 tunnel metrics are similar to the (23) bridge metrics
  – 2 metrics are more specific to tunnels
• Status of Tunnel Metrics
  – Metrics have mostly been identified
  – “How to measure each metric” is being discussed
• Review copies sent to T-18 & T-20 this winter
• Metrics to include more robust error checks
# The 16 Tunnel Metrics

<table>
<thead>
<tr>
<th>Category</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunnel Inspection Organization</td>
<td>Tunnel Inspection Organization</td>
</tr>
<tr>
<td>Program Manager</td>
<td>Program Manager</td>
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<tr>
<td>Certified Team Leaders</td>
<td>Certified Team Leaders</td>
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<tr>
<td>Routine Inspection Intervals</td>
<td>Routine Inspection Intervals</td>
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<tr>
<td>Extended Interval Policy</td>
<td>Extended Interval Policy</td>
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<tr>
<td>Damage, In-Depth Inspection Policy</td>
<td>Damage, In-Depth Inspection Policy</td>
</tr>
<tr>
<td>Quality Inspection</td>
<td>Quality Inspection</td>
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<tr>
<td>Inspection Procedures</td>
<td>Inspection Procedures</td>
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<tr>
<td>Functional System Testing</td>
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<tr>
<td>Load Rating</td>
<td>Load Rating</td>
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<tr>
<td>Posting</td>
<td>Posting</td>
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<tr>
<td>Tunnel Files</td>
<td>Tunnel Files</td>
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<tr>
<td>QC/QA</td>
<td>QC/QA</td>
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<tr>
<td>Critical Findings</td>
<td>Critical Findings</td>
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<tr>
<td>Inventory Data Items</td>
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</tr>
<tr>
<td>Timely Data</td>
<td>Timely Data</td>
</tr>
</tbody>
</table>
• Coordinating with AASHTOWare
• Providing feedback to aid in development
• Will run tests to ensure compatibility with BrM
Divisions review the data annually
National review generally occur every ± 5 years

• Data held static between national reviews
• Possible refinements and slight adjustments
\[ RF = \frac{C - DL}{LL} \]
WHEN DO YOU NEED TO LOAD RATE A TUNNEL?

\[
RF = C \pm \gamma_{DC} \pm \gamma_{DW} \pm \gamma_{EV} \pm \gamma_{EH} \pm \gamma_{ES} \pm \gamma_P \\
(\gamma_{LL})(LL+1M) \pm \gamma_{LS}
\]

- Design load rating
- Legal load rating
- Permit load rating
Tunnel load rating help from FHWA

- Case Studies
- Webinars
INSPECTION REFRESHER COURSE
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- FHWA-NHI-130124 Inspection Refresher – web based training
- FHWA-NHI-130125 Inspection Refresher – instructor led training (100% attendance)
- End of course assessment (70% or better)
• Program managers
• Team leaders
• Certified tunnel inspectors
POSSIBLE RESEARCH PARTNERING
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INTEGRATED DESIGN OF FFFS

Ventilation

Tunnel

Fire Suppression (FFSS)

Fire development
Bill Connell – WSP/PB  Igor Maevski – Jacobs
Gary English – Seattle Fire  Bill Bergeson – FHWA
RESEARCH PROGRAM

- Synthesis
- Reliability Evaluation
- Computer Simulation
- Laboratory Testing
  - Full-Scale Testing
- Research Products

Flowchart:

<table>
<thead>
<tr>
<th>NFPA TECHNICAL LEAD</th>
<th>ASHRAE TECHNICAL LEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Guidelines and Recommendations</td>
<td></td>
</tr>
</tbody>
</table>

• Contractor:
• RAMAT:
  - 1 Federal Highway
  - 1 AASHTO
  - 1 NFPA
  - 1 ASHRAE
• TRP:
  - 2 Federal Highway
  - 2 AASHTO T20
  - 2 NFPA 502
  - 2 ASHRAE TC5.9
RESEARCH CONTRACT

• Contractor:
  – Qualified
  – Proposal
  – Bid

• RAMAT:
  – Administration
  – Management
  – Represent organizational interests

• TRP:
  – Technical requirements
  – Contractor qualifications
  – Scope
  – Represent committee interests
TECHNICAL WORKING GROUPS
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- TWG01 – Tunnel Safety
- TWG02 – Major Tunnel Projects
- TWG03 – Tunnel Preservation
- TWG04 – Tunnel Resilience
- TWG05 – Tunnel Security
• Performance of fire and life safety systems
• Emergency response training, drills, and protocols
• Inspection and maintenance practices
• Emergency egress criteria for reduced mobility users
Managing alternative technical concepts

Tools for managing risk ownership

Global influences in the tunnel market

Maintaining quality over a long project duration
• Functional system inspection and maintenance
  – Mechanical components
  – Electrical components
  – Lighting components
• Repair and rehab of structural systems
TWG04 – Resiliency

- Climate change
- Floods
- Seismic events
- Fires
- Geohazards
- Security
- Corrosion
- Loads and Ratings
• Functional system vulnerabilities and countermeasures
• Blasts effects on tunnel specific structures
• Cyber security and hacking threats
• Self-performed vulnerability assessments
• Response training – possible partnering with trucking and motor vehicle safety industry
SUMMARY

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QUESTIONS

William Bergeson, PE
Senior Tunnel Engineer
FHWA – HIF/HIBS