Joint DOT/FHWA Major Projects Webinar

November 8, 2017
Agenda

1. Major Project Spotlight

   Quality Assurance on Major Projects

   • Texas DOT
   • Florida DOT
   • New York State Thruway Authority
   • Arizona DOT

2. Major Project Information

   • Identifying FHWA Major Projects
   • Major Projects Requirements Timeline
   • Major Projects FMIS Update

3. Comments/Questions
Major Project Spotlight: Quality Assurance on Major Projects

Peer Exchange Featuring:
- Texas DOT
- Florida DOT
- New York State Thruway Authority
- Arizona DOT
TXDOT Quality Assurance Program

Claudia Izzo
Texas DOT
TXDOT QUALITY ASSURANCE PROGRAM

Joint DOT/FHWA Major Projects Webinar

Claudia Izzo – November 2017
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<td>Lessons Learned from FHWA Program Review</td>
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</tbody>
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INTRODUCTION-DBB, DB, AND CONCESSION PROJECTS
History

- TXDOT first DBB QAP implemented in 2000 and last updated in 2016

- First DB project started in 2002, utilizing a project specific quality assurance approach until TxDOT’s first programmatic DB QAP was implemented in 2008

- DB QAP last updated in 2017 which includes changes based on lessons learned and the findings of FHWA Program review of “Quality Assurance for TxDOT DB and Concession Projects”
**DBB/DB Projects**

### Design Bid Build (DBB)
- Separate selection process for design and construction
- Advertise & award the construction contract
- Construct the project
- TxDOT maintains responsibility for all Quality Acceptance including inspection and testing

### Design Build (DB)
- TxDOT enters into a contract with a developer to design, construct and possibly maintain the project
- Developer responsible for QC/IQF testing and inspection
- TxDOT has an oversight role on testing and inspection (OVF); as well as Independent Assurance (IA)
## QAP Comparison for CDA/DB and DBB

<table>
<thead>
<tr>
<th>Quality Control</th>
<th>Design-Build</th>
<th>Design-Bid-Build</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IQF Testing and Inspection</td>
<td>Quality Acceptance</td>
</tr>
<tr>
<td>DB Contractor &amp; Subcontractors</td>
<td>DB Contractor’s Independent Quality Firm (IQF)</td>
<td>TxDOT’s Independent OVT Laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Owner Verification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TxDOT District Lab. or Designated IA Lab.</td>
</tr>
<tr>
<td>Contractor</td>
<td>TxDOT District</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TxDOT (CST-M&amp;P and District Laboratory)</td>
</tr>
</tbody>
</table>

**For Design-Build:**
- **Owner Verification:** TxDOT’s Independent OVT Laboratory
- **Independent Assurance (IA):** TxDOT District Lab. or Designated IA Lab.

**For Design-Bid-Build:**
- **Owner Verification:** N/A
- **Independent Assurance (IA):** TxDOT (CST-M&P and District Laboratory)
## TxDOT CDA/DB Accomplishments

### Concession:
- SH 130 Segments 5 & 6 / $1.37B *(DBFOM – 50 yr.)*
- North Tarrant Expressway Segments 1, 2 & 3A / $3.4B *(DBFOM – 52 yr.)*
- I-635 LBJ Freeway / $3.1B *(DBFOM – 52 yr.)*
- SH 288 / $815M *(DBFOM – 52 yr.)*

### Design-Build:
- SH 130 Segments 1–4 / $1.35B *(DBM – 15 yr.)*
- DFW Connector / $1.2B *(DBM – 15 yr.)*
- Dallas Horseshoe / $804M *(DBM – 15 yr.)*
- SH 99 (Grand Parkway) Segments F1, F2, and G / $1.45B *(DBM – 15 yr.)*
- Loop 1604 WE / $126M *(DBW – 2 & 5 yr.)*
- US 77 / $84M *(DBM – 15 yr.)*
- ESR2P / $189M *(DBW – 1yr.)*
- Harbor Bridge / $803M *(DBM – 25 yr.)*
- Plus Four More / $2.31B *(3 DBM – 15 yr. and 1 DBW – 2 & 5 yr.)*
## Risk Allocations Comparisons

<table>
<thead>
<tr>
<th>Risk</th>
<th>Design-Bid-Build</th>
<th>Design-Build</th>
<th>Concession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Scope</td>
<td>Owner</td>
<td>Owner</td>
<td>Owner</td>
</tr>
<tr>
<td>Right of Way</td>
<td>Owner</td>
<td>Shared</td>
<td>Shared</td>
</tr>
<tr>
<td>Utilities</td>
<td>Owner</td>
<td>Shared</td>
<td>Shared</td>
</tr>
<tr>
<td>Design</td>
<td>Owner</td>
<td>Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td>Construction</td>
<td>Contractor</td>
<td>Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td>Site Conditions</td>
<td>Owner</td>
<td>Shared</td>
<td>Contractor</td>
</tr>
<tr>
<td>Quality Control (QC)</td>
<td>Contractor</td>
<td>Contractor</td>
<td>Contractor</td>
</tr>
<tr>
<td>Independent Quality Firm (IQF)</td>
<td>Owner</td>
<td>Shared</td>
<td>Shared</td>
</tr>
<tr>
<td>Hazmat</td>
<td>Owner</td>
<td>Shared</td>
<td>Shared</td>
</tr>
<tr>
<td>Operation &amp; Maintenance</td>
<td>Owner</td>
<td>Shared/Owner</td>
<td>Concessionaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three optional 5-yr. term</td>
<td>52 yr. required</td>
</tr>
<tr>
<td>Traffic (Demand/Revenue)</td>
<td>Owner</td>
<td>Owner</td>
<td>Concessionaire</td>
</tr>
<tr>
<td>Financial</td>
<td>Owner</td>
<td>Owner</td>
<td>Owner/Concessionaire</td>
</tr>
<tr>
<td>Toll Technology</td>
<td>Owner</td>
<td>Owner</td>
<td>Concessionaire</td>
</tr>
<tr>
<td>Force Majeure</td>
<td>Shared</td>
<td>Shared</td>
<td>Shared</td>
</tr>
</tbody>
</table>
CDA/Design Build (DB) QAP

- Ensures that materials and workmanship incorporated into the highway construction project are in reasonable conformance

- Provides statewide consistency and a programmatic approach.

- Clarifies and Implements the Federal requirements

- Developed specifically for the risk profile associated with projects that have a CMA with three optional 5-year terms
Federal Requirements and References

Quality Assurance Procedures for Construction

FHWA Technical Advisory T 6120.3 (2004)
“Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks”

Quality Assurance

FHWA Publication No. FHWA-HRT-12-039
To Meet the Federal Requirements

**TxDOT Quality Assurance Program**

- TxDOT Quality Assurance Program for CDA/Design-Build Projects with a Capital Maintenance Agreement with three optional 5-year periods (CDA/DB QAP)

- DB Guide Schedule of Sampling & Testing by the Independent Quality Firm (IQF)

- Design-Build Contract

Figure 1—Components and Reporting Relationship in the QAP
TxDOT Quality Organization Framework

FHWA Project Manager

TxDOT Project Manager

CDA/Design-Builder Project Manager

Dual Reporting

Independent Assurance (IA) Manager

Owner Verification (OV) Testing Manager

CDA/Design-Builder Corporate Management Team

Professional Services Quality Assurance Manager (PSQAM)

Independent Quality Firm Manager (IQFM)

Professional Services Quality Control Manager

Construction Quality Control Manager
## Design-Build - Who Performs the Activity?

<table>
<thead>
<tr>
<th>Activity</th>
<th>TxDOT</th>
<th>CDA/DB Contractor</th>
<th>FHWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Management Plan</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Construction Quality Management Plan</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Design Quality Management Plan</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Owner Verification Testing &amp; Inspection Plan</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner Verification Testing</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oversight of the QAP</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Design Quality</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Quality</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent Assurance</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance Program</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
### Quality Control (QC)
- CDA/DB Contractor’s CQMP required – defines internal procedures used by contractor, suppliers, and subcontractors
- Ensure work is delivered in accordance with Contract Documents
- QC is foundation- Responsible for the quality of the work
- CQMP systematic approach. Clearly define authority and responsibility for administration of QC plan
- Results of testing and inspection not used for acceptance but used to ensure quality has been incorporated into all elements of work prior to requesting IQF testing and inspection.

### Independent Quality Firm (IQF)
- CDA/DB Contractor’s inspection & testing by Independent Quality Firm (IQF)
- Follows DB Contractor’s CQMP requirements
- Frequency of sampling and testing per DB Guide Schedule
- Results of inspections and Testing will be used for acceptance
- Acceptance Program = IQF + OVF results
- Start-up split sample testing with OVF, for alignment
- IQFM assigned = “Engineer” in TxDOT spec book and/or contract, not considered the EOR
# Quality Responsibilities – TxDOT

## Owner Verification (OV)

- Required by 23 CFR 637 B & TA 6120.3
- Owner’s independent firm
- Owner verification testing and Inspection
- Statistical validation and verification of IQF testing results
- Oversight of non-validation investigations
- Develop OV Testing & Inspection Plan (OVTIP)
- Audits to verify: DB Contractor’s CQMP and OVTIP compliance
- OVI and OVT Risk Assessment Workshop (In conjunction with TxDOT and FHWA).

## Independent Assurance (IA)

- Evaluate all sampling and testing procedures, personnel, and equipment used as part of an acceptance decision
- Verify/maintain documentation of qualifications for all individuals and laboratories performing testing for the acceptance decision
- Develop IAQP
- Oversight of misconduct accusations, investigations.
- Develop and submit a project-level IA report to CST/M&P
- TxDOT CST/M&P will develop and submit to FHWA an annual report on the IA program
Owner Verification Approach

- Three-Tiered Verification Approach - Appendix D: “OV Levels for Mtls. Testing Validation”
  - Level 1: Continuous F- & t-test analysis
    - Almost real-time verification
    - Minimum 10% of IQF testing frequency
    - Covers most critical performance properties
  - Level 2: Independent Verification (min. 3/quarter)
  - Level 3: Observation Verification (start-up & periodically as needed)
  - Analysis levels based on keys to performance

- Split-sample testing: Start-up and quarterly

- OV Validation Report: Statistical analysis results, Level 2 and 3 results, Split sample analysis results, Non-validation investigations, Non-conformance log, EJ logs, and monthly material certifications.
Resolving Material Quality Issues

- Each party (IQF and OVF) must resolve individual material quality issues that arise on the project timely with dispositions reported.
- The resolution of these issues depend upon whether materials are statistically validating or non-validating.
- If the material is not validating, the IQF does not have engineering authority to accept failing materials.

<table>
<thead>
<tr>
<th>Validating Materials</th>
<th>Non-Validating Materials*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation for acceptance is made by the IQF and validated by the OVF, or Referee testing</td>
<td>Acceptance decisions are based on TxDOT/OVF results, Percent Within Limits (PWL), or Referee Testing</td>
</tr>
</tbody>
</table>

*Additional IQF testing to resolve a NCR can be used only if IQF’s results are validated by OVF. TxDOT’s concurrence is required.*
LESSONS LEARNED
Active Communication

- Communication between DB Contractor, IQF, OVF, IA, and TxDOT should begin early in the project.
- DB Contractor/QC needs to notify the IQF and TxDOT (or OVF, as appropriate) in a timely manner when the Work/materials are ready for sampling and testing.
- Weekly materials coordination meetings between TxDOT, the OV materials manager, the IQFM, and the CQCM is highly recommended.
  - Invitations to other members of the staff (e.g., resident engineers) as appropriate for the construction activities being discussed.
  - Meeting minutes so that future reference to discussions and decisions can be made.
  - Daily communication is important for any activity schedules that vary from the submitted three week look-ahead.
Lessons Learned

- IQF must have a reliable system of keeping track of quantities, and quantities must be communicated weekly with OVF.
- Communications in the field between IQF and OVF techs is a good way to make sure samples are taken when needed.
- Owner verification must take an active role in scheduling resources available to the project.
- All Parties must play an active role in the project’s implementation for an active materials management program.
- Develop and implement opportunities for improvements based on final audit findings.
- Plan, schedule and perform audits timely.
- Constant communication is needed between all the laboratories so the software used to analyze the data can be used to its fullest to meet the project needs.
- IQF personnel cannot perform QC functions and vice versa.
- Acceptable method to determine if a result may be classified as an outlier is ASTM E178-16a.
Lessons Learned

- Repeated discoveries by the IQF of Nonconforming Work, Construction Deficiency Reports (CDRs)/Nonconformance Reports (NCRs) or excessive use of Engineering Judgment is considered a breakdown in QC operations and will be cause for investigation and corrective action.

- Review and posting of testing results need to be timely to allow for proper acceptance decisions.

- IA needs to be readily available for certifications.

- IA needs to inform IQF and OVF of impending certification expirations. Labs have varying levels of competency in maintaining current technician certifications and equipment calibrations.

- Consistency is needed for split sampling procedures: one firm to sample with other firm observing.
Success!

- Get the IA out as soon as possible, sometimes hard to schedule
- Begin the correlation process early
- Analysis software: IQF and OV to agree early on categories and Controlled Vocabulary Language (CVL)
- Perform timely statistical analysis and OVF to review and communicate analysis results with QC and IQF on a daily basis
- Co-location of IQF and OVF labs is crucial
LESSONS LEARNED - FHWA PROGRAM OVERVIEW
Lessons Learned from FHWA Program Review

- Review conducted in June 2017 on ten DB and Concession projects.

- Nine Program Level Observations/Recommendations

- TxDOT Responded to each of the nine Observations and Recommendations to FHWA’s program review; resulting in
  - changes to TxDOT’s DB QAP
  - project specific quality training for all alternative delivery projects
  - TxDOT has agreed to Action Plan and identified items to address FHWA’s recommendations
Observation 1 –

Improper Non-Validation Acceptance Justifications:
- Accepted based on post construction maintenance responsibilities
- Contractor accepting additional risk will not preclude meeting CFR requirements
- Additional testing by the Contractor and not the independent firm used as justification for acceptance
- OV Tests were Outliers
- Investigation Split-Samples were Good
- Validation is Expected in the Future
- OV is Only 1/10

TxDOT Response:
- Statewide QAP Revisions:
  - Accepting work based on future maintenance agreements or contractor test results is not allowed regardless of the length of any maintenance agreement.
  - Emphasis – IQF Results used Only if Verified. Use of IQF test results as part of the acceptance decision only IF the IQF’s results are verified by the OV testing results.
  - Address all Failing IQF and OV Results
  - Definition of outliers and split testing defined
  - Increase OV sampling and testing frequency to provide additional OV data for potential continuing non-validation analysis.
- Mandatory Training for TxDOT Project Team
- Revisions to Contract Documents:
  - Hold Payment for Unresolved NCRs or Non-Compliance Points
  - 60 day time limit for submitting quarterly reports
  - Reporting test results within 48 hr. of test completion
Observations #2, #3, and #6:

Examples of Non-Timely Evaluation:

- Analysis evaluated at end of Quarter
- Quarterly Reports Developed Months after Work Complete
- Multiple Revisions to Acceptance Justification

TxDOT Response:

- Implemented SharePoint Workflow process for tracking Quarterly Reports
- Time Limits for submitting quarterly reports
- A quarterly report template and instructions are being developed
- Emphasis – Addressing Problems as they Occur
Observation 4 –

Improper use NCR Process:
- NCR improperly used without proper justification that conforms to 23 CFR 637

TxDOT Response:
- NCRs addressed in Statewide QAP:
  - Revisions to OVTIP requirements to include a procedure for review and approval of NCR resolutions proposed by DB Contractor.

- Emphasis – 23 CFR 637 Still Applies for NCR Resolution:
  - Revised NCR section in DB QAP to clarify that any NCR resolution involving materials should be base on:
    - Acceptance procedures in the RFC plans and specifications
    - Random testing by IQF with OV validation
    - Using test methods qualified by IA
    - Consistent with IQF’s CQMP and OVTIP
Observation 5 –

Examples problems of Final Project Material Certifications:
- Projects not aware one is required
- No one wants to sign
- Projects not closed out

TxDOT Response:
- Statewide QAP Revisions: Required projects to provide a final material certification letter signed by the District Engineer (DE) or designee
- Included in Training for project team
Observation 7 –

Potential Technician Reporting Issues:

- Always assume an equipment or testing cause
- Split Samples Right on, but Independent Indicates Bias

TxDOT Response:

- Statewide QAP Revisions: If OV test results do not validate the IQF’s test results, an investigation shall be conducted to determine the reason for non-validation.
- Emphasis on complete informal and formal Investigations.
- Areas for investigation:
  - data integrity and accuracy
  - Technician reporting issues
  - Testing equipment and procedures
  - Sampling variability
  - Material variability
- Training for project team
Observation 8 –

Concern with Concession Projects:
- Independent Engineer with OV Lab creates misinterpretation of QAP
- Resistance from projects that do not specifically require adhering to the QAP if not specifically referenced in contract documents

TxDOT Response:
- Contract documents modified to follow QAP
Observation 9 –

FHWA’s involvement:
- FHWA is currently reviewing and approving all Quarterly Reports
- Program Continues to expand
- Becoming a Resource Issue

TxDOT Response: Action Plan
- Implementation of Quarterly Report Template for Standardization and Efficiency
- TxDOT Construction Division Review Prior to FHWA Review
- Transition to FHWA Random Review
QUESTIONS?
Contact Information

Claudia Izzo
Texas Department of Transportation
Claudia.Izzo@txdot.gov
Questions & Input

Submit a question using the chat box

Or

Dial *1 to call in your question by phone
I-4 Ultimate Project
FDOT Risk Based Audit Program

Michael Gwynne, P.E.
HNTB
I-4 Ultimate Project
FDOT Risk Based Audit Program

FHWA Major Project Webinar
November 8, 2017
Project Scope by the Numbers

- Public Private Partnership (P3)
- $3.8B Concession Agreement with a term of 40 Years
  - $2.323B for Design and Construction (Construction Period)
- Financial and Commercial Close September 4, 2014
- NTP 1 for Design October 4, 2014
- NTP 2 for Construction and O&M Work February 1, 2015
- 2,310 Days from NTP 1 to Substantial Completion
- 90 Days from Substantial Completion to Final Acceptance
- Long-term Operations

Construction Period
+/- 7 Years

Operating Period
+/- 33 Years

Interim Period
Project Scope by the Numbers

- 21 miles of Interstate reconstruction
- Increase posted speed 50mph to 60mph
- 15 Major Interchanges
- Addition of 4 Managed Lanes
- 150 Bridges
- + 13,535 EA Steel and Concrete Piles
- 86 Miles of Drainage improvements
- + 5,000,000 CY of Imported Embankment
- + 3,800,000 SF of MSE Walls
- + 577,000 SY of Concrete Pavement
- + 908,000 TN of Asphalt
- Corridor O&M during Construction Period
Project Organization

Florida Department of Transportation

Sponsors (50/50)
- SKANSKA
- John laing
- VOLKERT

Equity Contribution Agreement

DB Agreement

CJV (40/30/30)
- SKANSKA
- GRANITE LANE
- HDR
- JACOBS

Concession Agreement

Financing Agreements

O&M Agreement

Lenders

O&M Works

O&M during Construction

Sponsors (50/50)
- DJV (65/35)
- ICA

U.S. Department of Transportation

Federal Highway Administration
Construction Oversight Services

- Audit Concessionaire QC System
- Acceptance Inspection
- Administration

Concessionaire Verification

- Design
- Specifications
- Analysis

Concessionaire

Quality Manager

Lead Contractor

Engineer of Record

Process Control

Quality Control Firm

FDOT

Technical Advisor
Construction Oversight Services

• Construction Oversight Services Consultant (COS)
  – Responsible to administer the Contract on behalf of the FDOT
  • *Role is similar to that of an FDOT Construction Resident Engineer, Operations Engineer and Materials Engineer*
  – Review and coordination of all Construction Engineering and Administrative Functions:
    – Perform Agency Acceptance inspection
    – Managing Lane Closure requests
    – Monitoring EEO, DBE, SBE and OJT requirements
    – Monitoring the Project Schedule
    – Coordinating Submittal Review and Acceptance of RFC Plans and Shop Drawings with the FDOT Technical Advisor
    – Processing Supplemental Agreements and Payments
The Risk Based Audit Plan (RBAP) is an evolution of the I-595 model
- Incorporating and improving on the Audit Forms used
- Incorporating the Statistical Validation approach used
- FDOT scope for its RBAP model inspired by commercially available platforms
  - Focus is on specific requirements and recording audit results in a database
- Research by COS of Risk Based approaches
  - CALTRANS – Tiers of Risk from ‘Catastrophic’ to ‘Monetary’
  - VDOT – Tiers of Risk by Category of Work
  - ODOT – Inspection Prioritization scale
  - INDOT/Purdue Study – Tiers of Risk by Category of Work
  - OIG and CIG auditing – Mathematical expression of Risk

The best aspects of all the approaches reviewed were selected to create the I-4 Ultimate Project RBAP
Risk Based Audit Plan (RBAP) had to include:

- Identifies risks specific to the Project
- Rates those risks based on criteria specific to the Project and/or Industry Practice /Standards
- Establishes an audit program based on the risks identified, which can be adjusted based on actual performance and trends
- Audits and their results are integrated to a Concession Agreement Requirements Verification Database (RVD)
- All Audits are conducted using the RBAP System
• The Requirements Verification Database (RVD) is a compendium of requirements extracted from the Contract Documents, which includes but is not limited to:
  • Volume I (Concession Agreement)
  • Volume II (Technical Requirements)
  • Volume III (Additional Mandatory Standards)
  • Specifications and Standards associated with the Final Design
  • Permits and other Project Commitments
• The requirements included within the Database form ‘data points’; to date the COS Team has populated the RVD with over 10,000 individual requirements
• The RVD also houses the Project record of each audit conducted and facilitates analyzing audit results, associated trends and the possible need to re-evaluate Project risks
For the I-4 Ultimate Project the RBAP is based on Project risks that are focused on the Project elements that will be a part of the Final Design, in addition to other requirements included in the Contract Documents.

Distinct ‘Work Elements’ have been established to represent the different Project elements such as Deck Placement – Category II, Embankment, Erosion Control, Payrolls, etc.

Each ‘Work Element’ falls into one of three audit categories:

- Risk Rated
- Frequency Based
- Ad-hoc
Acceptance Inspection - RBAP

- Risk Rated ‘Work Elements’ are individually rated which sets their audit priority
- Frequency Audited ‘Work Elements’ represent persistent or repetitive risk e.g.
  - Safety and Mobility (MOT Lane Closures or MOT Reporting, etc.)
  - O&M Performance
  - EEO, DBE, Payroll and OJT compliance
- Ad-hoc Audits can be either Risk Rated or Frequency Based ‘Work Element’ and generated at any time deemed by FDOT or COS
Acceptance Inspection - RBAP

• Risk Rated ‘Work Elements’
  • For large scale projects, risk is typically rated using Qualitative and Quantitative means:
    – *Probability of Occurrence (P)*
    – *Consequence of Occurrence (C)*
    – *Detectability or Discovery of Occurrence (D)*
    – *For the I-4 the COS Team added History of Performance (H)*
  • Associated with the specific requirements of the Contract Documents (e.g. Specifications) or the Project elements themselves (e.g. bridge foundation – mass concrete)
  • **Translated to a numerical value** to establish its ranking and the associated audit priority i.e. \( P \times C \times D \times H = \text{Risk Rating/Ranking} \)
Risk Rated Work Elements – Jointly developed between FDOT and COS during Workshops. **Concessionaire was NOT involved**

### FINAL BASELINE RISK INDICES

<table>
<thead>
<tr>
<th>Work Element</th>
<th>Sub-Category</th>
<th>RBAP CODE</th>
<th>COS TEAM</th>
<th>FDOT TEAM</th>
<th>AVERAGE TEAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Pavers</td>
<td>Incidental Construction</td>
<td>APAV</td>
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<td>5.0</td>
<td>5.0</td>
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<tr>
<td>Landscaping Materials/Placement</td>
<td>Landscaping</td>
<td>LAND</td>
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<tr>
<td>Patterned Pavement</td>
<td>Incidental Construction</td>
<td>PPAV</td>
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<td>Fencing</td>
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<tr>
<td>Turf</td>
<td>Incidental Construction</td>
<td>TURF</td>
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<tr>
<td>Geosynthetics</td>
<td>Incidental Construction</td>
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<td>Sidewalk and Curb Ramps</td>
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<td>Roadway</td>
<td>CUGU</td>
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<td>Signage and Pavement Markings</td>
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<tr>
<td>Conduit, Pull boxes and Vaults</td>
<td>ITS</td>
<td>CPBL</td>
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<td>5.0</td>
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<td>ITS</td>
<td>CCTV</td>
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<tr>
<td>Span Wire or Pole Mounted</td>
<td>Signaling</td>
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<tr>
<td>Conduit, Pull boxes and Conductors</td>
<td>Lighting</td>
<td>CPBL</td>
<td>5.0</td>
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<td>Signage and Pavement Markings</td>
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<tr>
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<td>ITS</td>
<td>CHMS</td>
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<td>DMS, RWIS and HAR</td>
<td>ITS</td>
<td>DRHD</td>
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<td>Embankment - Minor</td>
<td>Earthwork</td>
<td>EMB1</td>
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<td>Earthwork</td>
<td>CLGR</td>
<td>5.0</td>
<td>5.0</td>
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</tbody>
</table>
The number of Audits to be conducted each period is based on a statistically validated Audit Sample Population i.e. the minimum number of ‘Work Element’ Audits necessary to be mathematically representative of the Concessionaire’s Activities.

- Known Population (N) derived from the Progress Schedule
- Assume 20% of Audits will illicit Nonconformance findings (p)
- Set Confidence Interval (e) of 5% for Audit Sample accuracy
  - Confidence Interval is +/- deviation from the Mean
- The objective is to prove that the Audit Sample Size (n₀) is representative of the Known Sample Population. Assumed to be 95% Confidence Level (CL)
- Using NIST Equation to calculate Audit Sample Size (n₀)
  - n₀ = p x (1-p) x z²/e²
  - z factor from Normal Distribution Probability Tables with 95% CL
- Using the finite population correction formula below for a known Population, the COS can derive the Audit Sample Size
  - n = n₀ / (1 + (n₀ -1)/N)

Very similar to FHWA CAP Program for determining sample size
In order to maximize efficiency FDOT/COS has encapsulated the I-4 Ultimate RBAP into a web based platform or tool (RBAP System) that automates many of the processes involved:

- Houses the ‘Work Element’ audit templates
- Establishes the Audit Sample Population and derives the Audit Sample Size, or ‘Work Elements’ to be audited
- Assigns the ‘Work Element’ to the COS Audit Specialists based on their Risk Rating and/or Frequency priority
- Captures Audit findings, including supporting objective evidence such as photos, scanned documents, etc.
- Facilitates trend analysis and Audit data result reporting
- Archives Audit results within the RVD, integrating the associated results to each requirement reviewed
• For those Risk Rated items, the COS creates an Audit Profile or Audit Sample Size within the RBAP System for a given period.

• The Audit Profile is derived from the Concessionaire’s Construction Schedule using a Risk Rating code cypher which translates Activities into ‘Work Elements’.

• The ‘Work Elements’ are separated into Risk Quartiles from ‘Very High’ to ‘Very Low’:
  • FDOT expects 50% of monthly audits in the ‘Very High’ Quartile.
  • FDOT expects 30% of monthly audits in the ‘High’ Quartile.
  • FDOT expects 10% of monthly audits in the ‘Low’ Quartile.
  • FDOT expects 10% of monthly audits in the ‘Very Low’ Quartile.

• RBAP System randomly selects Work Elements for audit within each Risk Quartile based on the prioritization above.
## Audit Profile – separated into Risk Quartiles

<table>
<thead>
<tr>
<th>Checked Activity</th>
<th>Activity Description</th>
<th>WBS Start Date</th>
<th>WBS End Date</th>
<th>Work Element</th>
<th>Risk Rating</th>
<th>Auditor Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2310111313</td>
<td>Expose Drilled Shafts (46A) - P12 - Br No. 230 (Ph. 1-1)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Drilled Shafts</td>
<td>1467</td>
<td>Bryan Barko, Shane Heyder</td>
</tr>
<tr>
<td>B251109130</td>
<td>Install 8 Drilled Shafts (1EA) - P9 - Br No. 225 (Ph. 1-1)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Drilled Shafts</td>
<td>1467</td>
<td>Bryan Barko, Shane Heyder</td>
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<tr>
<td>P20000766</td>
<td>Install and Test Drilled Shaft - Area 2</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Drilled Shafts</td>
<td>1467</td>
<td>Bryan Barko, Shane Heyder</td>
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<tr>
<td>B27110120</td>
<td>Drive Test Piles (4EA) - Br No. 285 (Ph. 1-0)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Test Pile Program</td>
<td>1247</td>
<td>Bryan Barko, Shane Heyder</td>
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<tr>
<td>B27110130</td>
<td>Drive HP14x99 Piles (90EA) - EB1 to EB6 - Br No. 285 (Ph. 1-0)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Pile Foundation</td>
<td>1247</td>
<td>Bryan Barko, Shane Heyder</td>
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<tr>
<td>U1A1AE3A0</td>
<td>Overhead Electric Relocations - OUC-D - Kirkman Road &amp; Grand National Driv East of I-4</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Utility Adjustment by UAO</td>
<td>791</td>
<td>Faisal Waseem, Joel Valentin</td>
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<tr>
<td>U1A1AE4A0</td>
<td>BURied Electric Relocation - OUC-D - STA 1906+50-1971+90 (1.4 M), (Matrix # 1168, 1171, 1175)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Utility Adjustment by UAO</td>
<td>791</td>
<td>Faisal Waseem, Joel Valentin</td>
</tr>
<tr>
<td>U1A1AE5A0</td>
<td>B.T. &amp; Fibertop Relocations - AT&amp;T PL - Oak Ridge Rd (1+0,12+0,20+0,12+0,14+00) (Matrix # 1090,84-85,87,90,93,99,1440)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Utility Adjustment by UAO</td>
<td>791</td>
<td>Faisal Waseem, Joel Valentin</td>
</tr>
<tr>
<td>U1A1AE6A0</td>
<td>Buried Fibertop Relocations - Bithghouse - Oak Ridge Rd (12+50) (P1 S2) (Matrix # 1063, 1091)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Utility Adjustment by UAO</td>
<td>791</td>
<td>Faisal Waseem, Joel Valentin</td>
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<tr>
<td>R41B1623</td>
<td>Construct Jigged Cross Pick @ 61700 - I-4 EB (Ph.1-2) PK2 Rev 1</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Jack and Bore</td>
<td>774</td>
<td>Faisal Waseem</td>
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<tr>
<td>R41D1A270</td>
<td>Construct 36&quot; Jacked Pipe Crossing I-4 EB/WB 75500 (Ph.1-1) PK51&quot;</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Jack and Bore</td>
<td>774</td>
<td>Faisal Waseem</td>
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<tr>
<td>B2711UD3158</td>
<td>Erect Steel Box Girders (2 UNITS) - 56 to SB (Unit 3) - Br No. 227 (Ph. 1-1)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Steel Girders</td>
<td>754</td>
<td>Faisal Waseem</td>
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<tr>
<td>B141D12070</td>
<td>Erect Steel Plate Girders (9EA) - Br No. 104 (P1 S2)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Steel Girders</td>
<td>754</td>
<td>Faisal Waseem</td>
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<tr>
<td>R41A5B060</td>
<td>Construct Curb &amp; Gutter - STA 1033-1631 - Southfall Ln (Ph.1-1)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Sidewalk and Curb Ramps</td>
<td>101</td>
<td>Angela Kahne, Marc Gregory</td>
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<tr>
<td>R41A5B0105</td>
<td>Construct Sidewalk - STA 1033-1631 - Southfall Ln (Ph.1-1)</td>
<td>1-11-2016</td>
<td>4-10-2016</td>
<td>Sidewalk and Curb Ramps</td>
<td>101</td>
<td>Angela Kahne, Marc Gregory</td>
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<tr>
<td>R41A5C2124</td>
<td>Construct Sidewalk - STA 1100-1700 Ri - Keller Rd (Ph.1-2) PK3</td>
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<td>R41A5A195</td>
<td>Construct Curb &amp; Gutter - STA 2520-3030 Li - Keller Rd (Ph.1-3)</td>
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<td>4-10-2016</td>
<td>Sidewalk and Curb Ramps</td>
<td>101</td>
<td>Angela Kahne, Marc Gregory</td>
</tr>
</tbody>
</table>
• The COS Audit Specialists are assigned ‘Work Element’ Audits by the COS Risk Manager. These Audits are reflected in the COS Auditor Specialist’s Dashboard and can be launched by simply double ‘clicking’. The Risk Manager can assign target or deadline dates as well.
Each ‘Work Element’ Audit is a fixed template that includes Audit data points which are extracts from the Contract Documents. These templates can also be customized by the Risk Manager without external Site Administrator Support.
Acceptance Inspection - RBAP

• The ‘Work Element’ Audit template guides the COS Audit Specialist through their review and ensures consistency with the Contract Documents and their quality/performance across the COS Team.

• For any requirement that is not satisfied, the RBAP System automatically requires the Audit Specialist to collect and attach objective evidence (photo, measurement, scanned document, etc.) and they must explain the specific reason(s) for the nonconforming finding(s).
Acceptance Inspection - RBAP

RBAP System capture of Nonconformance

Contract Requirement

Audit Requirement

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Req. Met?</th>
<th>Audit Result</th>
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</thead>
<tbody>
<tr>
<td>[P3. Contract Volume II. Section 3 Attachment 4 Appendix 3.4] Material used</td>
<td>No</td>
<td>N/A</td>
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<tr>
<td>for embankment shall not contain muck, Stumps, roots, brush, vegetable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>matter, rubbish or other Material that does not compact into a suitable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and enduring Roadbed. (Spec. 120-7)</td>
<td></td>
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</tbody>
</table>

Attachments (Required if requirement not met)

Attachments are required in order to submit a completed audit.

Add File

Awareness

Has Concessionaire/Contractor already identified issue in On-Ramp, PEP, VAIR, NCWR, QC Checklist, etc.? *
- Yes
- No

Has QM/QAF already identified issue in VAIR, NCWR, QA Checklist, etc.? *
- Yes
- No

Objective Evidence *

...
Acceptance Inspection - RBAP

- Nonconformance e-mail notice to Concessionaire issued from RBAP
- Electronic dialogue occurs in the RBAP System – COS notates location and specific Contract requirement that was found deficient

### Nonconformance

<table>
<thead>
<tr>
<th>Nonconformance #</th>
<th>2058</th>
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<tr>
<td>Date NCR Created</td>
<td>05/09/2016 09:06:37 AM</td>
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<tr>
<td>Audit Title</td>
<td>MSE Wall PM 105B at Bridge 104 End Br</td>
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<tr>
<td>Work Request</td>
<td>56</td>
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<tr>
<td>Segment</td>
<td>1A</td>
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<td>Audit Supervisor</td>
<td>Jeremy Grady</td>
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<td>NCR Title</td>
<td>A-7485-R4209</td>
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<td>WBS Activity</td>
<td>W1A1AF350</td>
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<tr>
<td>Area</td>
<td>Attractions Area</td>
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<tr>
<td>Location</td>
<td>Bridge 104</td>
</tr>
<tr>
<td>Auditor</td>
<td>Tony Wescott</td>
</tr>
</tbody>
</table>

**Requirement Description**

Panels - Precast panels are being inspected for rejection criteria established in Spec. 548-4. Panels that meet rejection criteria according to Spec 548-5 are being rejected. Make sure that no panels with bent connector tabs are used. [Spec. 548-6]

**Comments**

Observation of a panel installed on MSE Wall PM 105 B Column 326 that was in conflict with the cheek wall on Bridge 104 End Bent 1 cap.
The RBAP System dialogue is designed to document, and provide an auditable/traceable process that records:

- Concessionaire proposed corrective actions
The RBAP System dialogue is designed to document, and provide an auditable/traceable process that records:
- FDOT/COS Acceptance of any proposed corrective action
- Ultimate Nonconformance resolution
The RBAP System dialogue is designed to document, and provide an auditable/traceable process that records all phases of the exchange from identification of the Nonconformance to its resolution.
• The RBAP System dialogue is designed to document, and provide an auditable/traceable process that records all phases of the exchange from identification of the Nonconformance to its resolution.
• The RBAP System of data capture and Nonconformance reporting allows the FDOT to identify, store and correlate Concessionaire performance to each requirement included in the Contract using minimal resources, whilst also limiting interference to the Concessionaire’s organization, process and procedures. This data is used to:
  • To **validate** the accuracy of the Concessionaire’s self-monitoring and reporting
  • Gauge the effectiveness of the Concessionaire’s QC System (CQCS)
  • Issue Nonconformances and track and document their resolution
  • Identify trends and analyze root causes such that the Concessionaire can work to improve the quality of the Work
  • Demonstrate compliance with **23 CFR 637**
### Weekly Trend Analysis

<table>
<thead>
<tr>
<th>Top 5 Last 3 Month Contract NCR's</th>
<th>% of NCR's</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

**TABLE: Acceptance Inspection - RBAP**

- **Environmental Compliance**: Concessionaire shall provide and maintain all erosion control features in accordance with the Contract Documents. (10hrs/24hrs/50hrs)

  - Foundation Certification Package must be submitted for each foundation unit. A foundation unit is defined as all the piles within one bent or pier for a specific bridge for each phase of construction. Each Foundation Certification Package shall contain:
    - A GFD/ER letter certifying the piles have the required axial capacity including compression and uplift, lateral stability, pile integrity, and settlement will not affect functionality of the structure.
    - The package includes legible copies of all driving logs, EDC records, weld inspection records, all supplemental dynamic testing data and analyses for the foundation unit. All RRF's, RRM's, FCR's, and EAP's are included in the package.
    - All NCR's and CCE's noncompliance issues have been resolved.
    - GFD/ER Production Pile length letter has been included.
    - GFD/ER Sectional Letter is included or a FRI has been approved to allow 100% instrumented production pile driving.
    - As-built pile locations are within tolerance, the pile head out of pocket is no more than 3 inches laterally in the XY coordinate from the Plan position or approved RRM/FCR is included in package.
    - Production pile tips are 20 feet above the bottom of the boring.
    - Pile logs demonstrate compliance with drive criteria.
    - Signed and sealed letter by the FRC stating the package has been reviewed and concurrence is given.

- **Construction Zone Floodlights**: Shall be aimed and shielded to keep light within the confines of the immediate construction zone.

- **QA Process - Verify QA staff witnessed the installation of the monitoring devices. Verify the QA inspection was documented. QA/GC Plan - Construction Inspection Plan**: 12 NCR's, 3.60%

- **Form material must be approved and must have the proper dimensions, chamfers, positioning, bracing, friction collars, release agent, and be free of dirt or any other debris. QAM must approve forms, prior to concrete placement**: 11 NCR's, 3.32%
Direct read access to RVD Database using **Power Query and Power Pivot** which gives 100% customizable reporting capabilities.
Direct read access to RVD Database using **Power Query and Power Pivot** which gives 100% customizable reporting capabilities.
Acceptance Inspection - RBAP

Work Element Trends – Dashboards to convey performance Risk

Total # of Requirements Checked 4035

Fail R&R 6 0.6%
Fail LTM 40 2.2%
Fail QAQC 90 7.3%

R&R Checked 967
LTM Checked 1828
QAQC Checked

Drainage Audits 259

NOTE: R&R means Remove and Replace Requirements
LTM means Long Term Maintenance Requirements
QAQC means Quality Assurance or Quality Control Requirements
Acceptance Inspection - RBAP

COS Audits Quarterly Control Charts to confirm ‘Normal Distribution’ of Audit Findings – Project to Date

Binomial Distribution Plot
Acceptance Inspection - RBAP

COS Audits Quarterly Control Charts to confirm
‘Normal Distribution’ of Audit Findings – Work Element
COS Audits Quarterly Control Charts to confirm ‘Normal Distribution’ of Audit Findings – Project to Date
Acceptance Inspection - RBAP

COS Audits Quarterly Control Charts to confirm ‘Normal Distribution’ of Audit Findings – Work Element
Acceptance Inspection - RBAP

- Construction Audits Performed to Date - through **11/06/17**
  - 3,168 Audits (includes Risk Rated, Frequency and Ad-hoc Audit types)
    - 25,406 Contract Requirements reviewed
      - **92.9%** found to be in conformance to the Contract
  - Construction Risk Audits Performed to Date **1,874** out of 3,168 Audits
    - 19,457 Contract Requirements reviewed
      - **94.2%** found to be in conformance to the Contract
- Top 5 Construction Nonconformance by Work Element:
  1. Concrete Placement and Curing
  2. MSE Walls
  3. Mass Concrete Plan compliance
  4. Pile Foundation Certification Packages
  5. Density Log Book compliance
Baseline Risk Rating Analysis and Re-evaluation will adjust the Concessionaire’s History of Performance (H) variable as used to calculate the Work Element Risk Rating.

\[
\text{RISK RATING} = P \times C \times D \times H
\]

The baseline value for H was set to ‘5 out of 10’
Baseline Risk Rating Analysis/Re-evaluation – example MSE Wall

<table>
<thead>
<tr>
<th>Work Element</th>
<th>Total # of Audits Performed</th>
<th>Total # of Requirements in Conformance</th>
<th>Total # of Requirements in Non-Conformance</th>
<th>% of Passing Requirements (CQCS Requirements included)</th>
<th>% of Passing Requirements (CQCS Requirements Excluded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE Wall</td>
<td>92</td>
<td>783</td>
<td>163</td>
<td>82.77%</td>
<td>88.05%</td>
</tr>
</tbody>
</table>

- MSE Wall Baseline Risk Rating is **1,078** and after 92 Audits
  - Since the Audit Profile population is driven by the assumed Audit conformance rate, the ‘H’ variable will be adjusted from ‘5’ to ‘6’
  - Baseline Risk Rating has been adjusted to **1,294** which over the longer term will result in an increase to COS Audits for this Work Element until performance improves
• The RBAP findings have been responsible for the following changes to the Concessionaire QC System (CQCS):
  • MSE Wall inspection process and frequency of measurements
  • Drainage inspection process and frequency of measurements
  • Issuance of Contractor Process Control (PC) Alerts and/or retraining sessions for MSE Walls, Drainage, Erosion Control, Curing Concrete, Drilled Shafts, Modifications to TTCP, Temporary Critical Walls and Vibration Monitoring
• Concessionaire and its Quality Manager have been slow to react to trends detected by the RBAP audits or Concessionaire generated Nonconforming Work Reports (NCWRs), but that has been changing in the last quarter. The Quality Manager is now proactively generating a Monthly Quality report that analyzes recent performance and recommends changes to the CQCS without intervention from the FDOT or COS
• Questions?
Contact Information

Michael Gwynne, P.E.
COS Resident Engineer
HNTB
mgwynne@hntb.com

Loreen Bobo
I-4 Ultimate Construction Program Manager
Florida Department of Transportation
Loreen.Bobo@dot.state.fl.us
Questions & Input

Submit a question using the chat box

Or

Dial *1 to call in your question by phone
New NY Bridge Project
Quality & Construction
Oversight

Tom McGuinness
New York State Thruway Authority
New NY Bridge Project
Quality & Construction Oversight

Tom McGuinness PE - Construction Compliance Engineer
Project Overview

- Replacement of the Tappan Zee Bridge.
  - Bridge carries I-87 / I-287 over the Hudson River.
  - Project owner is the NYS Thruway Authority.
  - $3.1 Billion contract cost.

- N.Y. States first Design-Build contract.

- Quality Roles
  - QC performed by Design – Builder.
  - QA performed by Independent QA Firm.
  - Owner performs Verification Oversight.
Organizational Framework
Owner Oversight – Integrated Structure

- NYSTA
  - Project Director
  - Design/Construction
  - Commercial/Environmental/Safety

- Owner’s Engineer team
  - Functional support (Contract/Quality)
  - Design & Construction compliance
  - Specialized technical (Foundations/Structures/Environmental)
Owner’s Project Organization

Governor/NYSTA Board

Project Director

- FHWA/NYSDOT Liaisons
- Technical Advisors
- Diversity
- Safety

Outreach

- Compliance
- Mitigation
- Field Compliance

Legal

Environmental

- Component Leaders
  - Foundations
  - Main Span
  - Approach Spans
  - Landings & Roadways
  - Facilities & Systems
  - Security & Operations

Design

- On & Off Site Verification
- Site Laboratory

Construction

Commercial

- DB Contract
- Project Controls
- OE Contract
- Risk Management
- Office Management
- IT Support
- PLA Advisor

Quality Verification
Key Owner Quality Roles

- **On-site**
  - Design coordination and compliance
  - Construction compliance
  - Materials validation testing
  - Environmental compliance
  - Commercial compliance support
Key Owner Quality Roles

- Off-site
  - QC and QA verification
  - Quality audits
  - 24 locations
  - 12 states
Off Site Fabrication

[Map of the United States with various cities marked by red circles.]

[Logo and text at the bottom right corner: NEW YORK THRUWAY AUTHORITY]
Systems & Practices
Key “Design-Build” Perspectives

- REQUIREMENTS not PREFERENCES
- COMPLIANCE not ASSURANCE
- SIZE & COMPLEXITY not “THE STANDARD”
- OWNER’S STRUCTURE = DB’S STRUCTURE
Clarification & Alignment

- Establishing and Verifying Requirements
- Working Plans / Quality Plans
- Inspection, Testing and Reporting
- Change Management (Construction and Design)
  - Noting Deficiencies
  - Non-Conformance Reporting
  - Requests for Information
- Close Out and Commissioning
Key Actors & Roles

- **TZC**
  - Quality Manager and Construction QC Manager
  - Independent QA firms

- **Owner**
  - Design compliance
  - Construction compliance
  - Environmental compliance

- **NYSDOT**
  - Technical support

- **FHWA**
  - Funding and oversight
Responsibilities

- **Design – Builder (Tappan Zee Constructors)**
  - Design and Construct “the Work” per Contract Requirements
  - Provide Quality Control to verify conformance

- **Independent QA Engineer (IQAEF)**
  - Verify QC has been properly performed (design & construction)
  - “Off Site” at fabrication and assembly locations
  - “On Site” during construction activities

- **Owner (NYSTA)**
  - Oversight of QA activities
    - Conformance with established Inspection & Testing frequencies
    - Statistical Validation of Materials Testing Results (f & t Testing)

- **FHWA – Process Reviews & Oversight Inspections**
Design Development Process

- Stages of Design prior to the start of construction
Design Quality Hierarchy

- **D-B’s Designer**
  - Undertake Design
- **D-B’s Design Manager**
  - Certify Contract Compliance
- **D-B’s Design QC Manager**
  - Perform QC of Design Activities
- **D-B’s Design QA Manager**
  - Certify QC Process / Track Progress
- **NYSTA DCE**
  - Design Review / Consultation & Comment
  - Consultation & Comment (as required)
- **NYSTA Project Director**
  - Design Review / Consultation & Comment
- **Executive Management**
- **FHWA**

Decreasing Hands on Involvement

Design-Builder

NYSTA

Undertake Design Certify Contract Compliance Perform QC of Design Activities Certify QC Process / Track Progress Design Review / Consultation & Comment Consultation & Comment (as required)
Design Quality Review Process

**Figure 4.3  Design Review Process**
Construction Quality Hierarchy

- FHWA
- ESC
- NYSTA Project Director
- Independent Assurance
- NYSTA CCE & CCM’s
- Construction QA Manager (IQAEF)
- D-B’s Construction Manager
- D-B’s Construction QC Manager
- D-B’s Construction QC Inspectors

Decreasing Sampling, Testing & Inspection
Design-Builder
NYSTA
NYSTA
Requirements Verification

- Verification of D-B Quality Program
- Based upon Construction Oversight Guides
- Detail key requirements
  - Frequency of Audit/Monitoring
  - Requirements to be verified
  - Method of Verification
- Compiled in O-E Database System
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<td>0239 Approach Span CIP Pier Cap Construction</td>
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<td>5.02. Piles</td>
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<td>5.03. Sheet and Retaining Wall Systems</td>
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<td>5.05. VACANT</td>
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<td>5.06. Reinforcing Steel</td>
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<td>0009 Rebar Fused Rings Fabrication</td>
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Construction Oversight Guides

Key Elements:

- Purpose / Scope
- Required Certifications
- Oversight / Sampling & Testing Requirements
- Verification Requirements
  - Process / Materials / Fabrication
  - Environmental Compliance
- Reference documents
Key Elements:

- **Purpose / Scope**
- **Required Certifications**
  - Owner CCM/ D-B QC/QA
  - Oversight / Sampling & Testing Requirements
  - Verification Requirements
  - Process / Materials / Fabrication
  - Environmental Compliance
- **Reference documents**
Field Verification Checklist

Key Features / Framework:

- “Editable” pdf form
- Detail Requirements
- Allows record of “Objective Evidence”
- Records Verification Methodology & Result
  - Verification of QA Activity
  - Direct Observation
  - Joint Observation/Verification
  - Not Observed / Not Applicable
# Field Verification Checklist

## COG 5.06.03 Steel Reinforcement

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<tr>
<th>No.</th>
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<td>5. Non-Conforming</td>
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### Section 1 – Product Verification

1.0 Certificate of compliance and material certifications for all items (galvanized steel reinforcement, fused rings, mechanical connectors, headed bar anchors) are present and available for review. (DB ITP & DB Spec 556.02030099)

**Objective Evidence / Remarks:**

2.0 Reinforcing Steel Physical Markings (bar grades, tags, markings) are identifiable on bars and conform to material certificates and approved construction documents. (DB ITP & DB Spec 556.02030099)

**Objective Evidence / Remarks:**

3.0 Galvanizing conforms to project specifications. (DB Spec 556.02030099)

**Objective Evidence / Remarks:**

4.0 Materials are stored above ground and configured to freely drain rainwater off bars. (DB Spec 556.02030099).

**Objective Evidence / Remarks:**
“Non-Conformance” Process

- “Deficiencies, non-compliance, errors and/or omissions”
- Can be issued by: D-B (QC), QA, or Owner
- Managed electronically in ELVIS
- Designer concurs in proposed resolutions
- “Repair” or “As-Is” action requires Owner “consent”
- Four (4) Categories:
  - Design
  - Construction
  - Management
  - Environmental
- All NCR’s require “Action Verification”
“Non Conformance” Process

1. NCR Initiated
2. NCR Issued
3. Proposed Resolution
4. Replace?
5. As is? Repair?
6. Kick Back
7. Designer Concur
8. Owner Concur
9. Action Verification
10. NCR Closure
Field Use of Technology

iPad use in Field – provides:

- ELVIS Remote Access
  - Plans / Specs / Shop Drawings / Work Plans
  - Electronic Daily Work Reports
  - Electronic Reporting of Test Data
- Real Time Conferencing (via FaceTime)
- Digital Photography
Audits

Objective: Verify conformance with requirements

- Internal Audits (Focus: NYSTA)
  - Conformance with established procedures
    - Project Management Plan
    - Project Procedures

- External Audits (Focus: TZC, Sub-contractors, QA)
  - Conformance with D-B Contract
  - Conformance with established procedures
    - NYSTA / NYSDOT Standards
    - TZC Quality Plan (including sub-contractors/suppliers)
Plan for the Finish

- It’s never too early to start close out
- Orderly & timely acceptance of major construction elements.
- Full compliance of all documentation & resolution of issues.
- Commissioning and Start-up

“Begin with the end in mind.” – Stephen Covey
Positioning for Success

- Start early
- Build a culture
- Systems matter
- Be prepared

- Stay in front
- Agility
- Co-location works
- Plan for the finish
Questions

Tom.McGuinness@newnybridge.com
Contact Information

Tom McGuinness
Construction Compliance Engineer
New York State Thruway Authority
Tom.McGuinness@newnybridge.com
Questions & Input

Submit a question using the chat box

Or

Dial *1 to call in your question by phone
Public-Private Partnership Quality Assurance Program

Julie Gadsby
Arizona DOT

Weng On Tam
Tam Consulting Services LLC
Public-Private Partnership
Quality Assurance Program
Joint DOT/FHWA Major Projects Webinar

Julie Gadsby (ADOT) & Weng On Tam (TCS)
November 8, 2017
South Mountain Freeway

ADOT’s First Highway P3 Project

- Design-Build-Maintain
- Public Funds – $1.77 Billion (40% Federal, 60% Regional)
## Quality Assurance Program
### Traditional vs SMF

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<td>Contractor</td>
<td>Developer</td>
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<td>Acceptance Inspection</td>
<td>ADOT</td>
<td>Developer’s IQF with ADOT OV</td>
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<tr>
<td>Acceptance Testing</td>
<td>ADOT</td>
<td>Developer’s IQF with ADOT OV</td>
</tr>
</tbody>
</table>
| Independent Assurance| ADOT: *Field Tests – Systems Basis*  
Lab Tests – Project Basis | ADOT: *Field Tests – Systems Basis* 
Lab Tests – System Basis |
| Referee Testing      | ADOT Central Lab                          | ADOT Central Lab                                  |
| ADOT Software        | ADOT PEN/FAST                             | ADOT PEN/FAST with Analysis Software             |
SMF Construction QAP

Quality Assurance Program

Acceptance Program

Quality Acceptance (QA) IQF

Owner Verification (OV) ADOT

Independent Assurance Program

Independent Assurance (IA) ADOT

Quality Control (QC) Developer
SMF Construction QAP Process

**Finalize QAP & OVTIP**
- QAP Technical Provisions
- Project Risks Identification
- Risk Workshop
- OVTIP
- ADOT & FHWA Approval

**Project Start-Up**
- Developer Submittals
- Analysis Software Development & Deployment
- CQMP Training
- OVTIP Training
- ADOT & IQF Laboratory Alignment

**Project Operations**
- Sampling/Testing and Test Frequencies
- Perform Verification Analyses
- Dispute Resolution
- Quarterly Materials Certification & Validation
- Inspection Oversight
- Compliance Audits

**Project Close-Out**
- Final FHWA Report
- Release of Records

PUBLIC PRIVATE PARTNERSHIP (P3) DESIGN-BUILD-MAINTAIN AGREEMENT

for

202 MA 054 H882701C
SR 202L (SOUTH MOUNTAIN FREeway)
I-10 (MARICOPA FREeway) – I-10 (PAPAGO FREeway)

Between

ADOT
ARIZONA DEPARTMENT OF TRANSPORTATION
and
CONNECT 202 PARTNERS, LLC

TECHNICAL PROVISIONS

Dated as of: February 26, 2016
QAP Process

OVTIP Procedures

- Program (P)
- Administrative (A)
- General (G)
- Specific (S)
QAP Process

Risk / Levels of Analysis

- Risk Identification
- Risk Workshop
- Determine Level of Analysis for Each Test Method and Material Type
- Levels of Analysis Table in OVTIP
Levels of Analysis

Level 1 – Continuous Analysis

- High Residual Risk
- Strong Performance Indicator
- OV Frequency ≈ 10%
- Continuous F- and t- Tests
- Use of p-value
Levels of Analysis
Level 2 – Independent Verification

- Medium Residual Risk
- Secondary Performance Indicator
- OV Frequency Once Per Quarter
Levels of Analysis
Level 3 – Observation Verification

- Low Residual Risk
- No Testing. Test Observation.

### LEVEL 3 OBSERVATION LOG

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<th>Test Type</th>
<th>Observation Date</th>
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QAP Process
Analysis Software

- Dashboard
- Technical Qualifications
- Levels of Analysis
- Search
- Data Entry
- Administration
# IA Program

## System Basis

**ADOT SMF Project Independent Assurance Program**

**All Evaluation Performed on System Basis**

**ADOT Assigned IA Lab Evaluates Each IQF & DV Technician Annually** (Evaluation Methods Defined Below)

### Field Sampling & Testing
- **Field Density of Soil**
  - ARZ 23B Field Density (Sand Cone)
  - ARZ 23S Field Density (Nuclear)
- **Plastic Concrete**
  - ASTM C443 - Concrete Slump
  - ASTM C318 - Concrete Air Content
  - ASTM C31 - Concrete Cylinder Fabrication

**NOTE**: Field Technicians will be evaluated annually on the basis of observation. IQF or DV Lab Management initiates evaluation request.

### Laboratory Testing
- **Soil & Aggregate**
  - ARZ 2016 - Sieve Analysis of Soils & Aggregates
  - AASHTO IPI - Sand Equivalent
  - AASHTO T96 - Plastic Limit & Plasticity Index
- **Rutted Concrete**
  - ARZ 346 - Compressive Strength of Concrete

**NOTE**: Lab Technicians will be evaluated annually on the basis of either observation, an individual’s IA Split test results (small groups), or an individual’s Proficiency test results (large groups). Technicians will be evaluated for the test methods they will perform. IQF or DV Lab Management initiates evaluation request.

**ADOT Assigned IA Lab Verifies that Each IQF & DV Technician is Currently Certified as Appropriate for Tests Performed**

- All Field Technicians MUST be ATII Field and ACI Field Certified. In addition to field certifications, all Lab Technicians MUST also hold ATII Soil & Aggregate, ATII Asphalt, and ACI Compressive Strength Certification, as appropriate for the tests being performed.

**ADOT Assigned IA Lab Verifies that All IQF & DV Test Equipment is inventoried and currently calibrated**

- All test equipment (field and lab) used by any Technician must be in the active inventory of an AASHTO Accredited and ADOT Approved Laboratory. Actual calibration records for each specific inventory item must be current, and must be provided upon request.
Inspection Oversight & Audits

**Inspection Oversight**
- Verify IQF Inspection and Reporting
- Verify QC Inspection and Reporting

**Audits**
- CQMP Audit
  - QC and IQF Commitments
- OVTIP Internal Audit
South Mountain Freeway
Today and Moving Forward

South Mountain Freeway
- First P3 QAP (Use of QA/OV Acceptance)
- Lessons Learned

Moving Forward
- P3 is a Tool in the Toolbox
- Programmatic QAP
- Implementation Guide
Questions?

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Weng On Tam, PE  
Co-Owner  
Tam Consulting Services LLC  
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Contact Information

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Weng On Tam, PE
Co-Owner
Tam Consulting Services LLC
wengontam@tam-cs.com
Construction QA TechBrief (April 2012)

- Quality Assurance (QA)
  - Not specific role of one entity

- Construction QA Program
  - Six core elements apply to D-B

- Responsibilities
  - Design-Builder = QC
  - Agency = Acceptance
FHWA Technical Assistance
QA for Design-Build Projects

– Jeff Lewis, RC Const & Project Mgmt Team
  Jeff.Lewis@dot.gov

– Greg Doyle, MA Division/RC Const & Project Mgmt Team
  Gregory.J.Doyle@dot.gov

– Dennis Dvorak, RC Pavement & Materials Team
  Dennis.Dvorak@dot.gov

– Jim Travis, Texas Division
  James.Travis@dot.gov
Alternative Contracting Methods (ACMs) Library

The Federal Highway Administration supports the deployment of Alternative Contracting Methods-Design-Build (D-B), Construction Manager/General Contractor (CM/GC), Alternate Technical Concepts (ATC)-to accelerate project delivery, encourage the deployment of innovation, and minimize unforeseen delays and cost overruns.

In traditional highway construction contracting (design-bid-build), cost is generally the one criterion that determines the winning bid. As State and local agencies strive to meet customer needs, factors such as quality, delivery time, social and economic impact, safety, public perception, and life-cycle costs have gained in importance. Since the 1990s, the FHWA has been supporting the use of these innovative alternative contracting methods to help achieve these goals.

This Library has been assembled to provide access to Samples of documents prepared by State legislatures, and transportation owner agencies in the execution of roadway construction contracting, deploying these methods. It does not constitute a standard, specification, or regulation.

- Design-Build (D-B)
- Construction Manager/General Contractor (CM/GC)
- Alternate Technical Concepts (ATC)
- Quick Reference, Background Material, and Useful Information
- FHWA Division ACM Contacts

ACM Technical Contacts

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<th>ATC</th>
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<td>Lead</td>
<td>Lead</td>
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<tr>
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<td>David Unkefer</td>
<td>Ken Atkins</td>
<td>Jeff Lewis</td>
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<tr>
<td>FHWA Resource Center (Atlanta)</td>
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<td>(404) 562-3669</td>
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<tr>
<th>Team Lead</th>
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<tbody>
<tr>
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Questions & Input

Submit a question using the chat box

Or

Dial *1 to call in your question by phone
Upcoming Webinars

Joint DOT/FHWA Major Project Webinar
Wednesday, May 2, 2018
1:00 p.m. to 3:00 p.m. ET

Quarterly Major Project Webinar (FHWA)
Wednesday, February 7, 2018
1:00 p.m. to 3:00 p.m. ET

Send topic ideas for upcoming webinars to MajorProjectsDiscipline@dot.gov
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Contact Information

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