

Evolution of TxDOT's Quality Assurance Programs

Design-Bid-Build, Design-Build, and Concession Projects

2009 AASHTO Subcommittee on Materials Meeting
Anchorage, Alaska

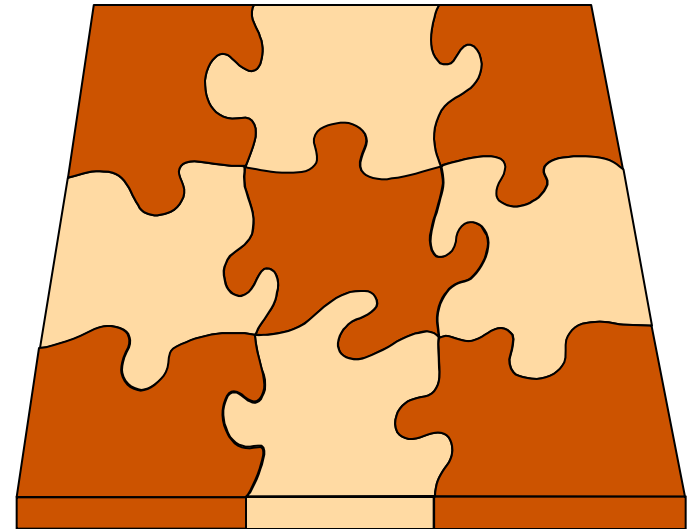
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Quality Assurance Program (QAP) Components

The QA Program utilizes a combination of quality procedures to meet program goals:

- Quality Control Testing (QC)
- Quality Assurance Testing (QA)
- Owner Verification Testing (OVT)
(D-B & Concessions only)
- Referee Testing (RT)
- Independent Assurance Testing (IA)



Definitions

- **Quality Control (QC)** – Internal procedures used by the Contractor, Suppliers, and Subcontractors to ensure that development work meets project plans and specifications
- **Quality Assurance (QA)** – Inspection, testing, auditing, documenting, and reviewing of all materials, operations, and processes
- **Owner Verification Testing (OVT)** – Sampling and testing performed to validate the results of the QA acceptance sampling and testing, using statistical analysis
- **Referee Testing (RT)** – Dispute resolution tests using split samples to resolve testing discrepancies
- **Independent Assurance Testing (IA)** – An unbiased and independent evaluation of the sampling and testing techniques used in the Acceptance Program

High 5 interchange DESIGN-BID-BUILD (D-B



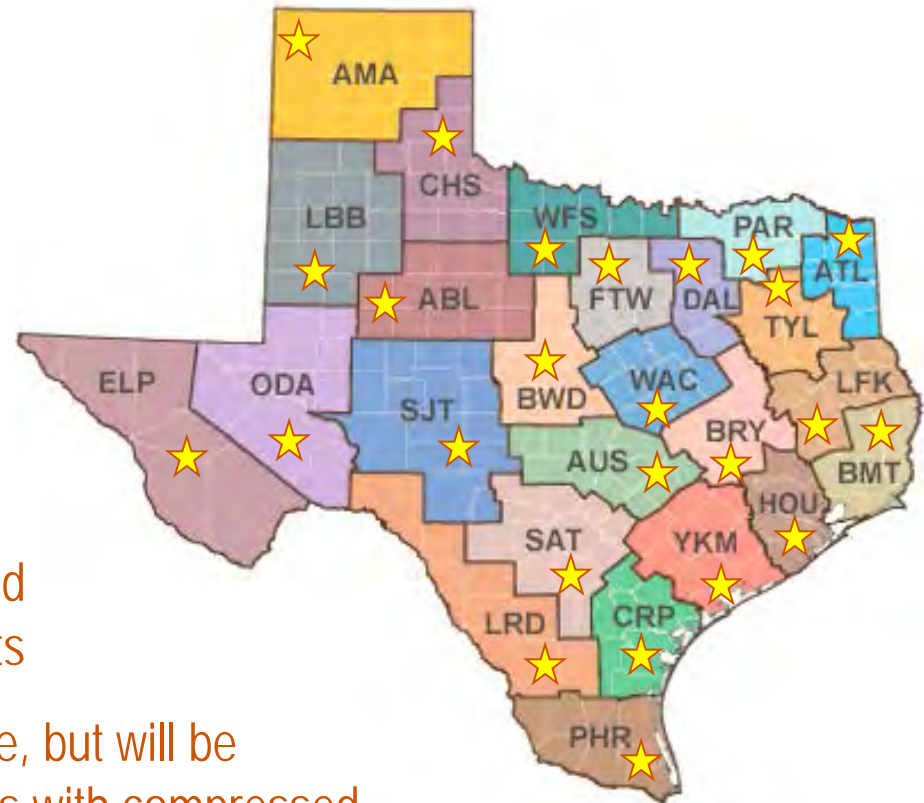
Baytown Cable Stay DESIGN-BID-BUILD (D-B-B)



DESIGN-BID-BUILD

Quality Assurance Program Summary DESIGN-BID-BUILD

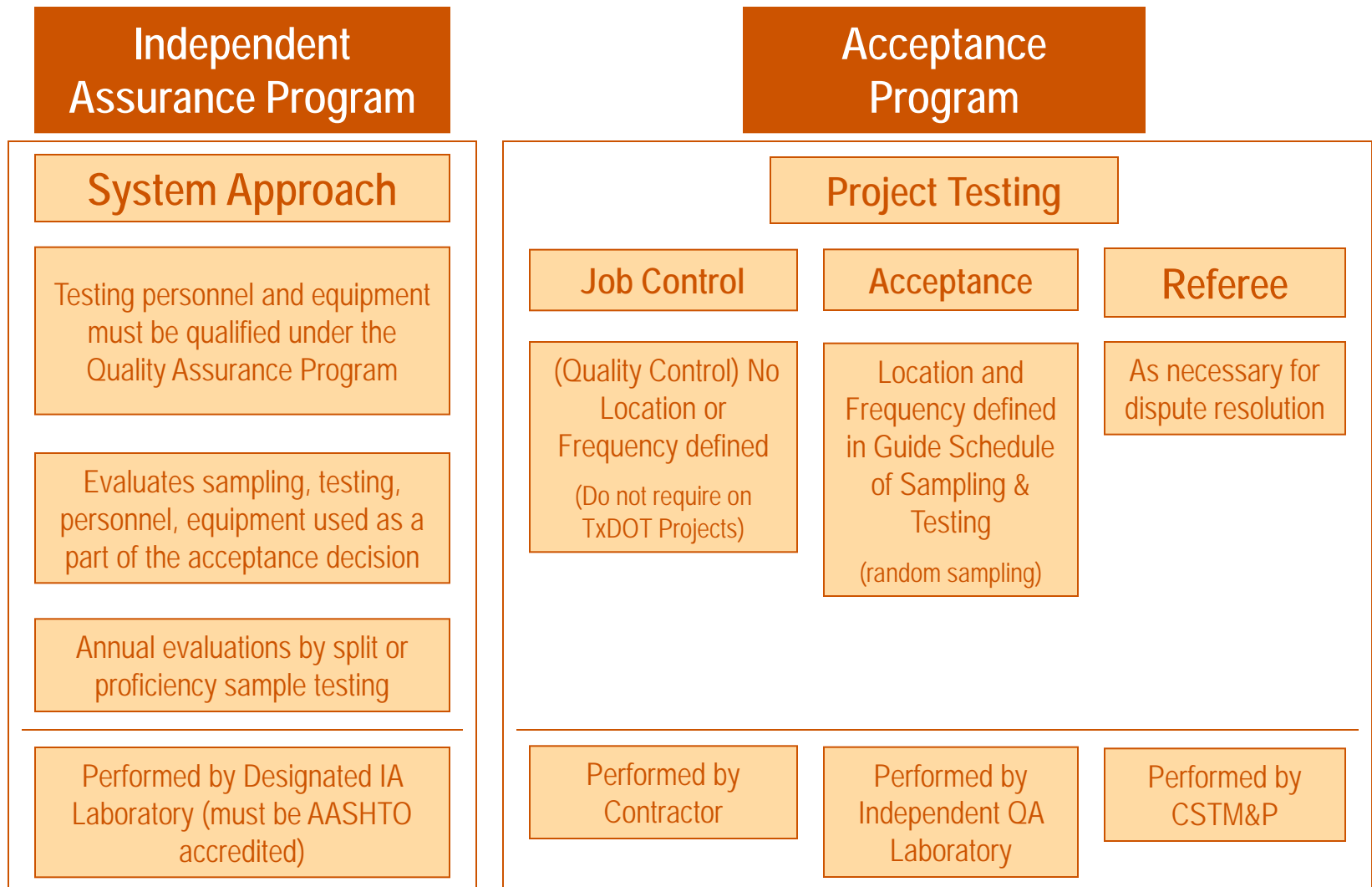
- TxDOT utilizes this project delivery method throughout the state for most of its projects
- Typically, no contractor QC for acceptance, but will be considered for very large complex projects with compressed construction schedules.
- Acceptance testing performed at Guide Schedule frequency by independent QA laboratory, most cases TxDOT
- Personnel & equipment must be qualified/certified
- System approach independent assurance (IA) program – annual personnel & equipment evaluations



Quality Assurance Program

DESIGN-BID-BUILD

* Modeled after 23 CFR 637 B and TxDOT Quality Assurance Program



SH 130 segments 1-4 DESIGN-BUILD-MAINTAIN (D-B-M)

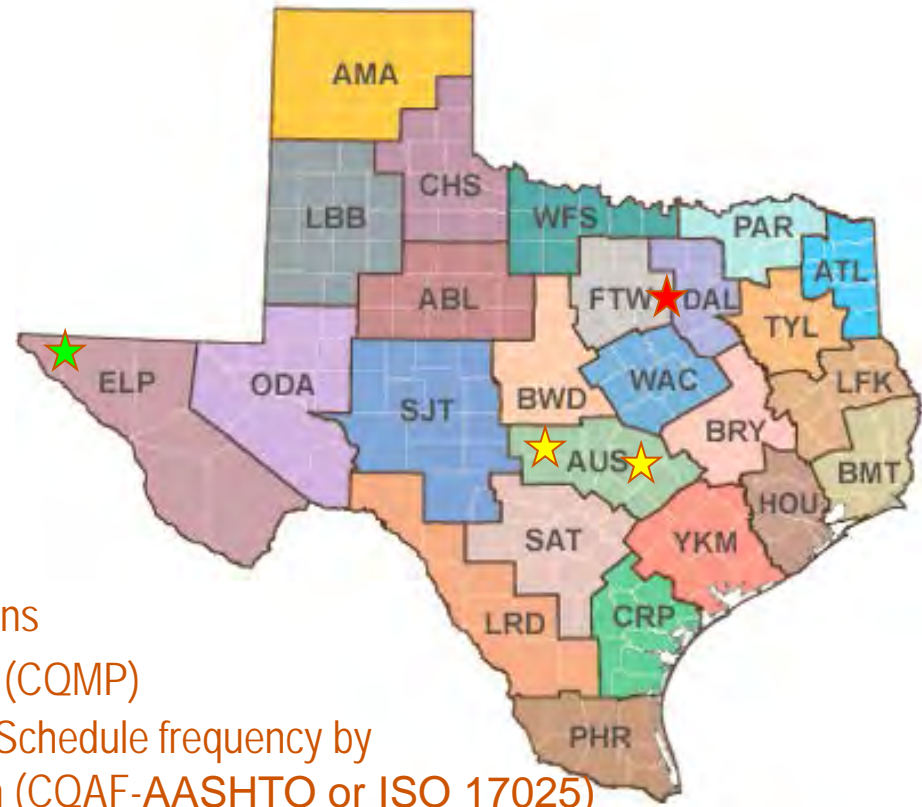




DESIGN-BUILD

Quality Assurance Program Summary DESIGN-BUILD

- "Quality Assurance Program for Design-Build Projects with an Optional 15-Year Capital Maintenance Agreement"
- Utilizes Contactor Acceptance testing to manage schedule risk without individual QC/QA specifications
- Developer Construction Quality Management Plan (CQMP)
- Developer/contractor acceptance testing at Guide Schedule frequency by independent Construction Quality Acceptance Firm (CQAF-AASHTO or ISO 17025)
- Owner Verification Testing & Inspection Plan (OVTIP)
- Owner verification testing (OVT) by the Owner's independent OVT testing firm
 - Required by 23CFR637B, complies with FHWA Technical Advisory 6120.3
 - Minimum 10% frequency of QA testing
 - Statistical validation of QA testing using F- and t-testing analysis
 - Quarterly statistical validation report to FHWA
- Dispute resolution (referee)
- Personnel & equipment certification
- System approach independent assurance (IA) program – annual personnel & equipment evaluations



Quality Assurance Program

DESIGN-BUILD

* Ref. 23 CFR 637 B, TxDOT Quality Assurance Program, & TA 6120.3

Independent Assurance

System Approach

Testing personnel and equipment must be qualified under the project Quality Assurance Program

Evaluates sampling, testing, personnel, equipment used as a part of the acceptance decision

Annual evaluations by split or proficiency sample testing

Performed by Designated IA Laboratory (must be AASHTO accredited)

Acceptance Program

Project Testing

Job Control

(Quality Control)
No Location or Frequency defined

Performed by Contractor

Acceptance

Location and Frequency defined in Guide Schedule of Sampling & Testing
(random sampling)

Performed by Independent CQAF Lab

Verification

Validates Acceptance Testing using statistical analysis, when contractor's results used for acceptance

Performed by OVT Laboratory

Referee

As necessary for dispute resolution

Performed by CSTM&P

Original Design-Build Owner Verification Approach

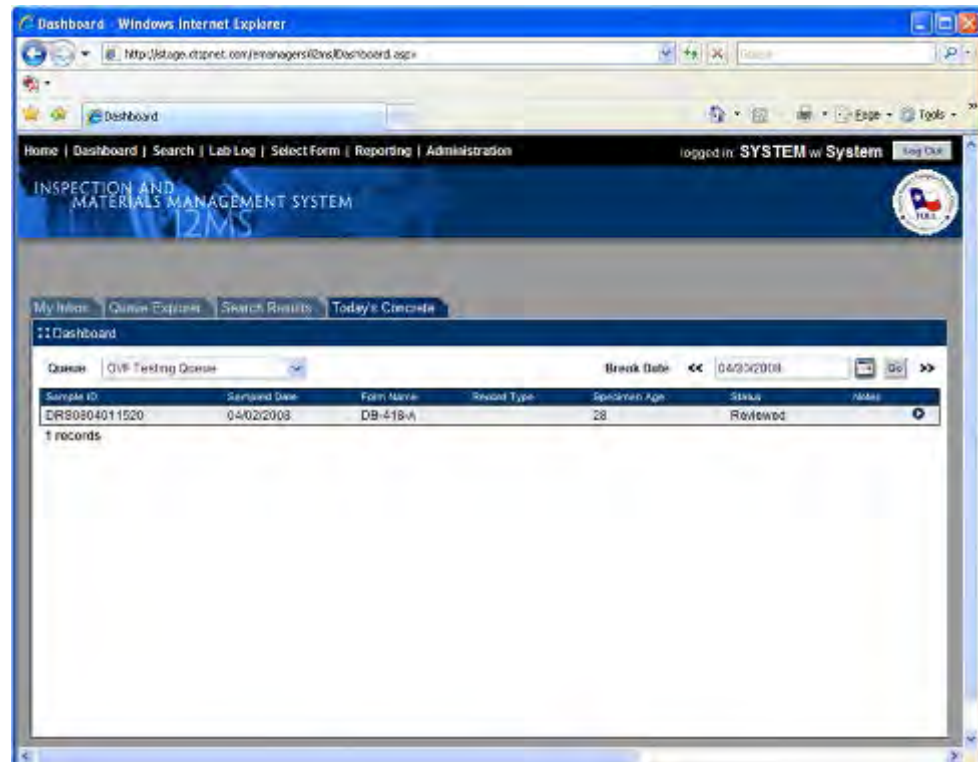
- One Verification Approach
- F- & t- Test Verification on All Analysis Categories
 - Started at $\alpha = 0.05$
 - Updated to $\alpha = 0.01$
- OV Testing Frequency ~ 10% of QA Testing Frequency
- Quarterly FHWA Reporting

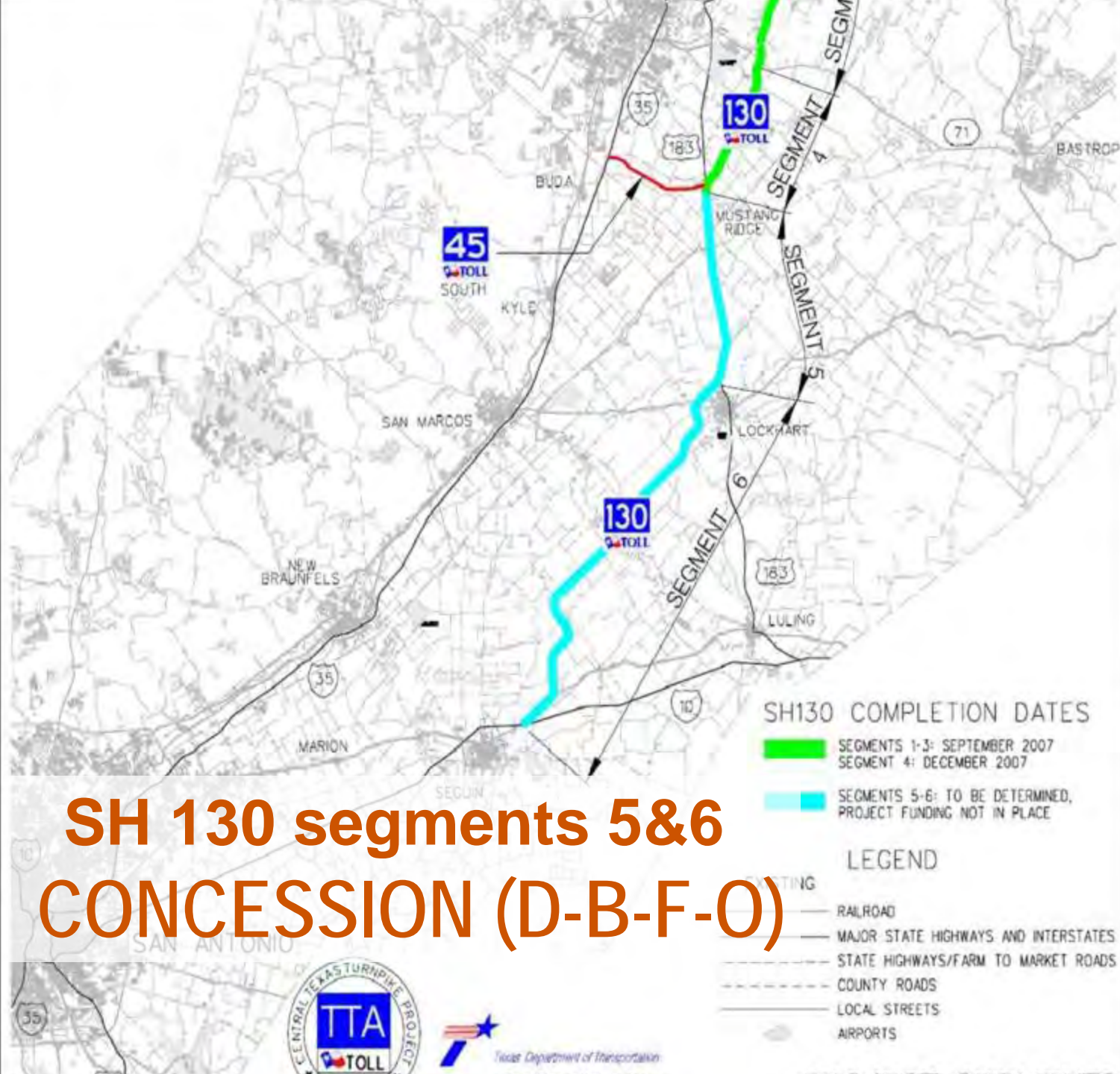
Updated Design-Build Owner Verification Approach

- Three-Tiered Verification Approach
 - Level 1: Continuous F- & t- Analyses
 - Almost Real-Time Verification
 - ~10% of QA Test Frequency
 - Allows for $\alpha = 0.01, 0.025, 0.05$ Based on Importance
 - Level 2: Independent Verification
 - Level 3: Observation Verification
- Start-Up and Quarterly Split-Sample Tests
- Quarterly FHWA Reporting

Inspection and Materials Management System (I2MS)

- Owner Verification Application Developed Collaboratively By TxDOT, FHWA, and HDR
 - Testing and Inspection Verification
 - Automated Statistical, Data, and Trend Analysis
 - Web-Based Application
 - Robust Security Features
 - Robust Search Capabilities
- Satisfies All FHWA Requirements



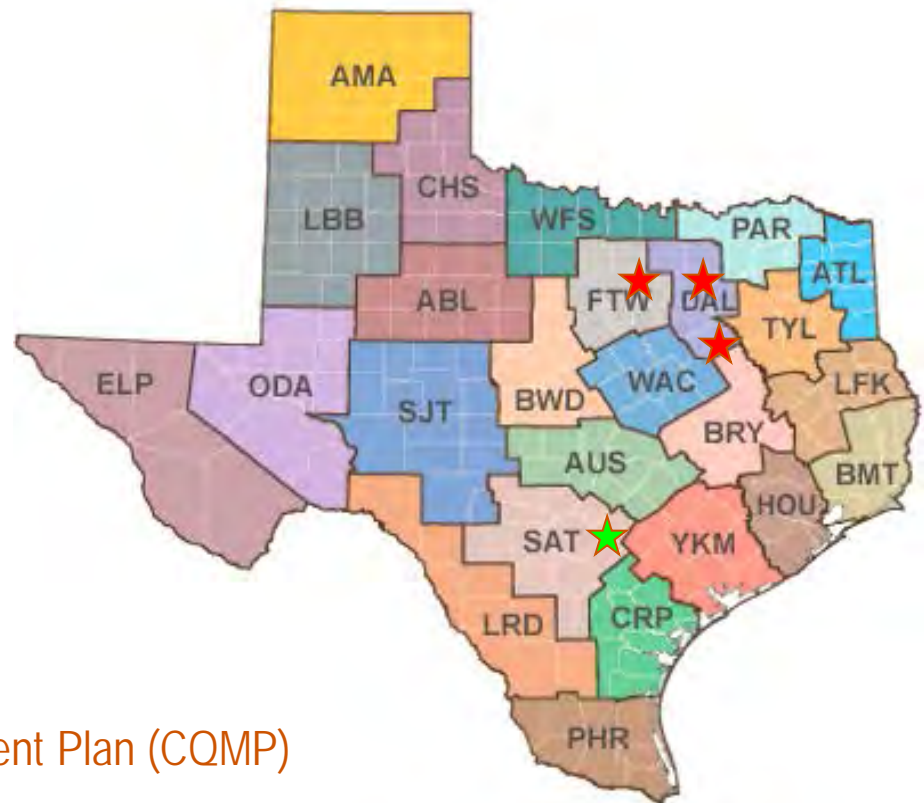


SH 130 segments 5&6 CONCESSION (D-B-F-O)

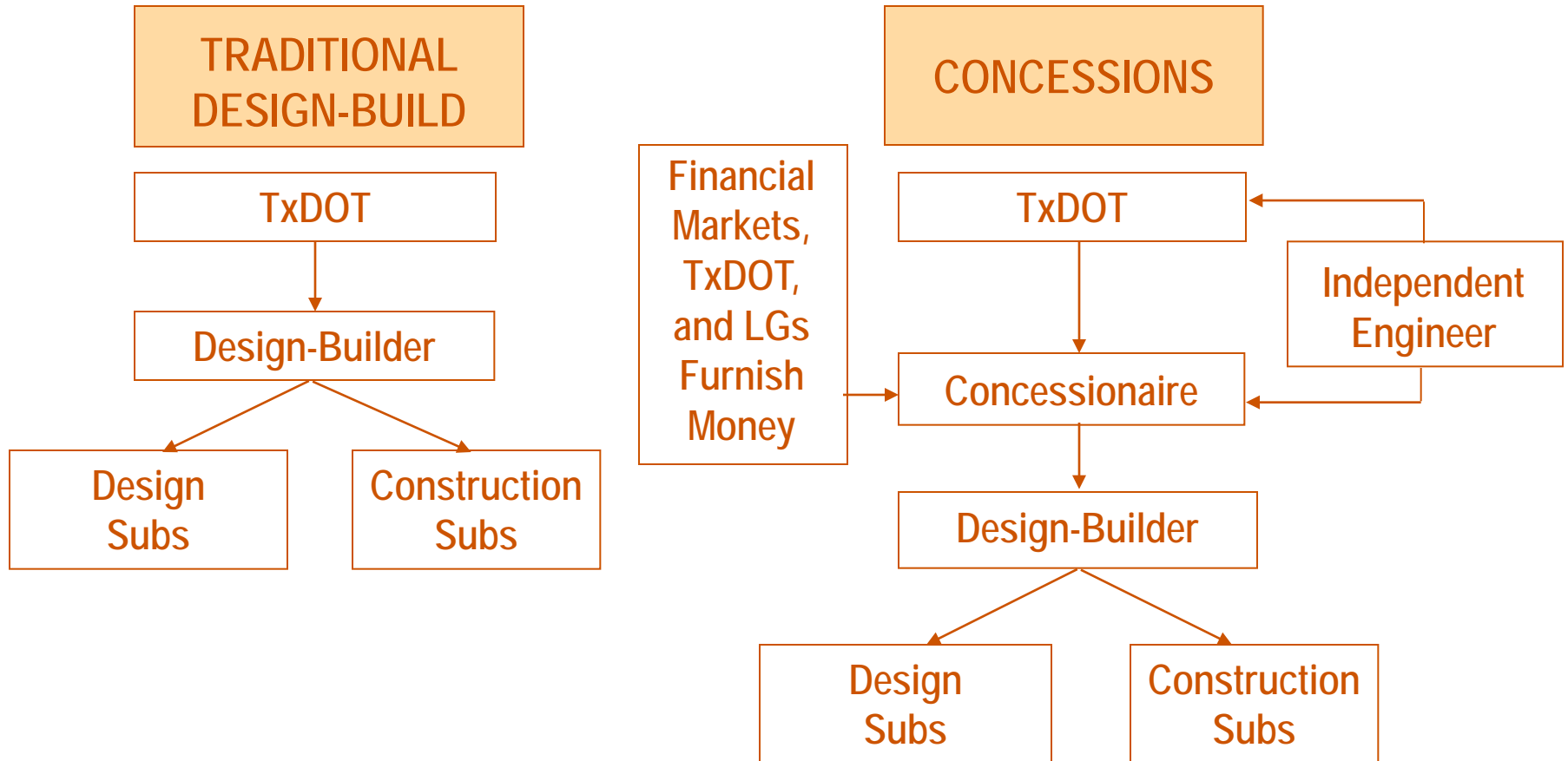
CONCESSION

Quality Assurance Program Summary CONCESSION

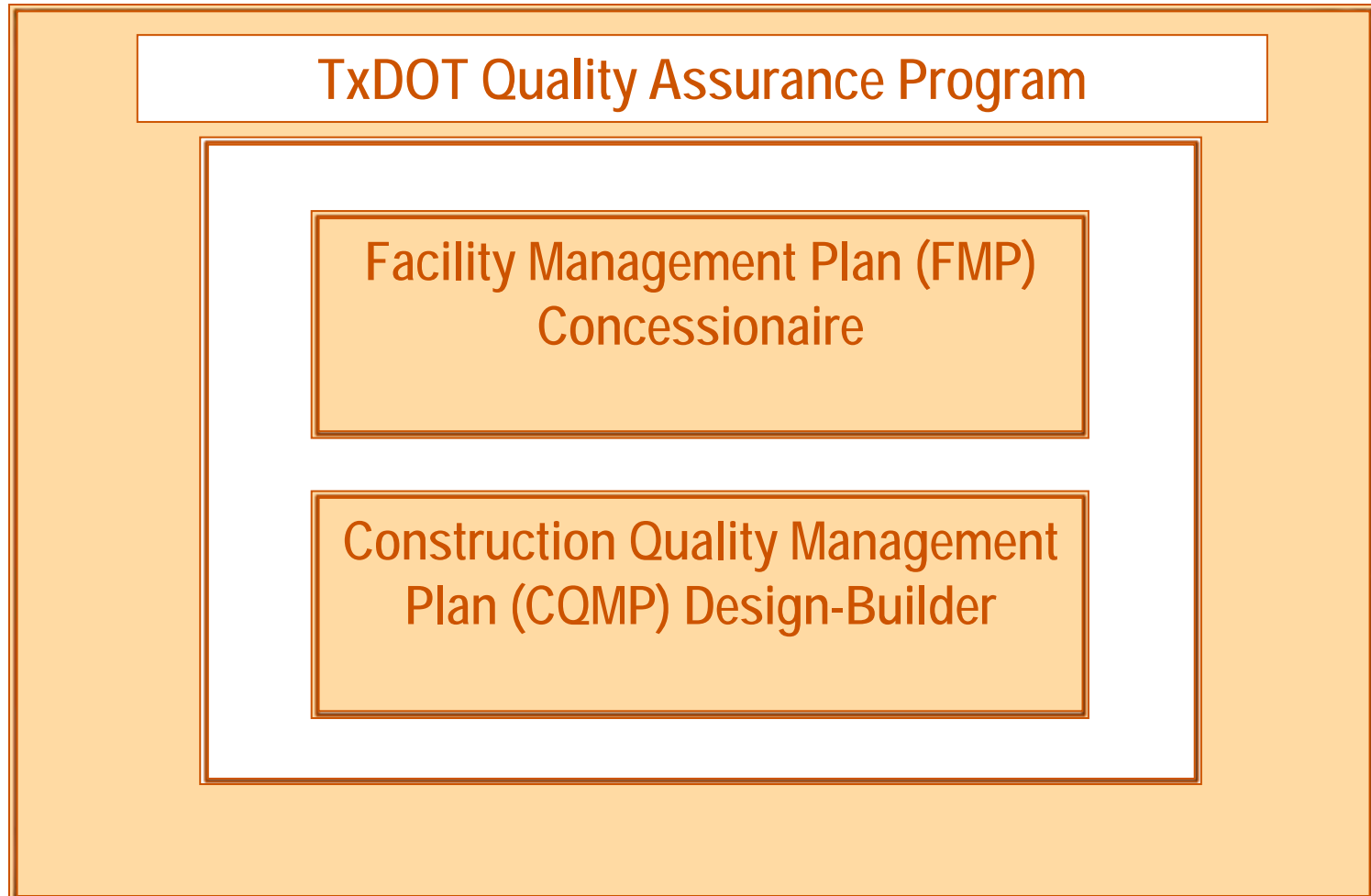
- Variation of the “*Quality Assurance Program for Design-Build Projects*” **based on risk analysis** on a per project basis
- Developer Facility Management Plan (FMP)
- QC testing by Concessionaire’s D-Ber
- Design-Builder Construction Quality Management Plan (CQMP)
- Acceptance testing at Guide Schedule frequency by D-Ber’s Lab (AASHTO or ISO 17025)
- Owner verification testing (OVT) by Independent Engineer (IE) firm
 - Required by FHWA Technical Advisory 6120.3
 - 2–10% frequency of QA testing (frequency based on how much verification the concessionaire is performing)
 - Validation of QA testing using F- and t-test statistical analysis
 - Quarterly statistical validation report to FHWA
- Dispute resolution (referee) & independent assurance (IA) by IE firm
- Personnel & equipment certification



Design-Build vs. Concessions



Concession Quality Assurance Structure



Quality Assurance Program

CONCESSIONS

Independent Assurance

System Approach

Testing personnel and equipment must be qualified under the project Quality Assurance Program

Evaluates sampling, testing, personnel, equipment used as a part of the acceptance decision

Annual evaluations by split or proficiency sample testing

Performed by IE Firm (AASHTO Accredited)

Acceptance Program

Project Testing

Job Control

(Quality Control)
No Location or Frequency defined

Performed by Concessionaire

Acceptance

Location and Frequency defined in Guide Schedule of Sampling & Testing
(random sampling)

Performed by Concessionaire (AASHTO or ISO 17025 Accredited)

Verification

Validates Acceptance Testing using statistical analysis, when contractor's results used for acceptance

Performed by IE Firm (AASHTO Accredited)

Referee

As necessary for dispute resolution

Performed by a different IE Firm (AASHTO Accredited)

Concession Owner Verification Approach

- Three-Tiered Verification Approach Similar to Design-Build Approach
- Modify Analysis Category Level and/or Alpha Table Based for each Concession Project's specific Risk Profile
 - E.g., Some Level 1 Analysis Categories may be Moved to Level 2

References

- TxDOT Quality Assurance Program for Construction
- TxDOT Quality Assurance Program for Design-Build Projects
- 23 CFR 637 B – Quality Assurance Procedures for Construction
- FHWA Technical Advisory 6120.3 – *Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks*
- TxDOT's Quality Assurance Program for Design-Bid-Build
<http://gsd-ultraseek/txdotmanuals/qap/index.htm>
- TxDOT's Quality Assurance Program for Design-Build
ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/qap_design_build.pdf



Special Thanks

James Travis - FHWA Texas Div. (Austin)
Darrin Grenfell - FHWA (Kentucky)
Dennis Dvorak - FHWA (RC -Illinois)
Weng On Tam - HDR Engineering (Austin)
Paul Bowen - HDR Engineering (Austin)
Greg Cleveland - HDR Engineering (Austin)
Tim Weight - TxDOT (Austin District)
Robert Stone - TxDOT (TTA)
David Belser - TxDOT (CST-M&P)
Darren Hazlett - TxDOT (CST-M&P)

Questions?

