

The National Academies of Sciences, Engineering, and Medicine

Training on Post-Award Contract Administration for Highway Projects Delivered using D-B and CM-GC

Based on NCHRP Research Report 939 Volumes 1, 2, and 3

Session 7 of 8: November 17, 2022

Agenda

- 10:00-10:10 am Welcome and reminders
- 10:10-10:20 am Contractor-controlled quality control testing
- 10:20-10:30 am Contractor involvement in establishing quality control standards
- 10:30-10:40 am Incentive-disincentive program for superior quality
- 10:40-10:50 am Real-time electronic quality management information
- 10:50-11:00 am Dual construction engineering inspection roles
- 11:00-11:45 am Peer Exchange: Panel Discussion
- 11:45-12:00 pm Wrap-up (+poll)

Note: All times are in Pacific Daylight Time (PDT)

Review: Last Session's Learning Objectives

- **Phases and strategies** - Review the *preconstruction* phase and the *preconstruction services quality* strategy
- **Tools** - Explain the following tools, illustrated with examples from DOTs:
 - Cost-comparison spreadsheet
 - Cost-modeling approach
 - CM-GC bid validation
 - Independent cost estimator
 - Opinion of probable construction cost
 - Risk pools
- **Peer exchange** - Discuss issues affecting tools for enhancing quality in the preconstruction phase

Review: Last Session's Takeaway Points

- **Cost-comparison spreadsheet** compares the estimates across the key stakeholders to verify pricing and assumptions.
- **Cost-modeling approach** develops a list of assumptions regarding the construction phase of the project to help reduce differences in cost estimates.
- **CM-GC bid validation** uses **cost-comparison spreadsheet** to verify the fairness of the bid proposal.
- **Independent cost estimator** is a consultant who verifies that the estimate is competitive and helps identify differences in the assumptions.
- **Opinion of probable construction cost** helps monitor the development of the cost estimate at key design milestones.
- **Risk pools** quantify and assign risk and set aside a fund to cover risks that might happen on a project.

Overall Learning Objectives

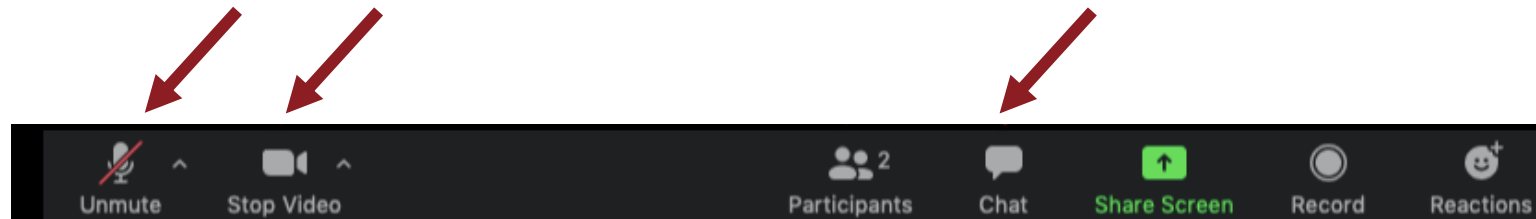
1. Navigate and interpret the information in the D-B and CM-GC Guidebooks that is relevant to your project.
2. Select and implement appropriate tools for various types of D-B and CM-GC projects for all phases of contract administration.

Today's Learning Objectives

- **Phases and strategies** - Introduce the *construction* phase and the *construction quality* and *construction efficiency* strategies
- **Tools** - Explain the following tools, illustrated with examples from DOTs:
 - Contractor-controlled quality control testing
 - Contractor involvement in establishing quality control standards
 - Incentive-disincentive program for superior quality
 - Real-time electronic quality management information
 - Dual construction engineering inspection roles
- **Peer exchange** - Discuss successful practices using tools for enhancing quality and efficiency in the construction phase

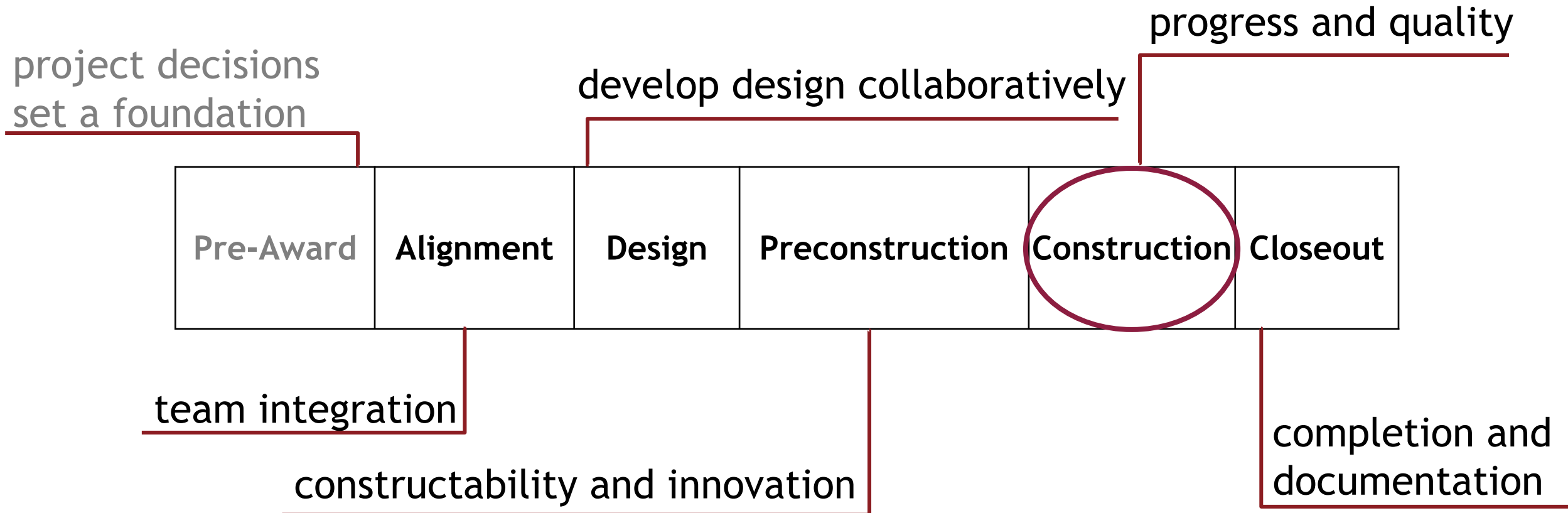
Logistics Reminders

- Please make sure you are registered (only once)
- Please make sure your name is correct on Zoom
- Download the *Guidebooks for Post-Award Contract Administration* [Vol. 1](#) and [2](#)
- No formal break; please take one if/as needed
- Actively engage and participate when prompted
- Use the chat feature as needed
- Ask for help



Contract Administration Phases

The guidebooks describe the following phases of D-B and CM-GC contract administration



Construction Phase Administration

- The construction phase is when the contractor begins performing the work, and all associated activities
- **Key activities include:**
 - Control and inspect work
 - Review potential additional scope
 - Execute supplemental agreements
 - Measure progress and pay contractor
 - Ensure as-builds are being developed

Pre-Award	Alignment	Design	Preconstruction	Construction	Closeout
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Overarching Contract Administration Strategies for D-B and CM-GC



ALIGNMENT

Alignment Strategy



SCOPE

Scope Strategy



DESIGN
QUALITY

Design Quality Strategy



PRECONSTRUCTION
QUALITY

Preconstruction Services Quality Strategy



CONSTRUCTION
QUALITY

Construction Quality Strategy



CONSTRUCTION
EFFICIENCY

Construction Efficiency Strategy

Construction Quality Strategy

- Definition
 - Promote quality during construction and enforce requirements of the D-B or CM-GC contract
- Example tools within this strategy:
 - **Incentive-disincentive program for superior quality:** *Encourages superior performance by the contractor in quality. Also used for performance in other areas such as safety, cost, environmental compliance, or disruption to the traveling public.*
 - **Contractor-controlled QC testing:** *Removes restrictions placed on contractors that force them to retain third parties to perform QC testing and inspection.*



Construction Efficiency Strategy

- Definition
 - Implement a system that increases efficiency during construction and aligns with roles and contractual responsibilities
- Example tools within this strategy:
 - **Delegation of authority:** *Delegates authority, within specific limits, to the agency engineer managing the project. This enables project decisions to be made quickly when necessary.*
 - **Real-time electronic QM information:** *An organized system for all parties to record and access information.*



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Contractor-Controlled Quality Control Testing

Contractor-Controlled Quality Control Testing

- What is it?
 - Contractor performs their own QC testing instead of an independent third party
- Why use it?
 - Simplify the scheduling of quality control testing to keep the project progressing at required quality standards and reduce the cost

22 D-B
28 CM-GC



Contractor-Controlled Quality Control Testing

- When to use it?
 - Agency should specify options for QC testing in the RFP

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ \$10 million	\$10 million–\$50million	> \$50 million
22 Contractor-Controlled QC Testing			✓		●	●	●	●	●	●

Note: ● = Recommended; ◐ = Consider case by case; ○ = Not recommended.

22 D-B
28 CM-GC

Contractor-Controlled Quality Control Testing

- How to use it?
 - Replace clauses with a requirement for third-party QC testing with clauses establishing acceptable certification levels for the contractor's inspectors and technicians

22 D-B
28 CM-GC

Contractor-Controlled Quality Control Testing

- Synthesis of Examples
 - Depending on the project, the contractor may retain a third party for testing or perform it in house
 - Contractor staff should be fully dedicated to QC testing and not have multiple roles on the project
 - Contractor should maintain detailed records and open communication with the agency

22 D-B
28 CM-GC

Contractor-Controlled Quality Control Testing

- Synthesis of Examples
 - Agency should develop a QM program with processes and checks on quality
 - Agency should retain remedies to enforce contract provisions related to quality
- Guidebook example
 - DB p.125; CM-GC p.159

22 D-B
28 CM-GC

Example: Portland Transit

- TriMet typically requires independent QC testing hired by the contractor
- On S. Corridor Light Rail Extension, TriMet allowed contractor to use directly employed inspectors and technicians for QC testing
- Both joint venture parties have reputations for quality and integrity
- All inspectors and technicians nationally certified
- Scheduling streamlined and money saved

22 D-B
28 CM-GC

Example: Lahaina Bypass (1)

- Review the **planned testing, inspection, and reporting requirements** with the QC personnel
- Explain reporting procedures used when **defective work** is identified.
- Conduct a **start-up meeting** for each type of work to be performed upon beginning the work
- Inspect and test start-up of work at a **frequency sufficient to establish confidence** in the work process

22 D-B
28 CM-GC

Example: Lahaina Bypass (2)

Inspector qualifications

- NICET level II
- WAQTC
- 1 or more years with an AASHTO certified lab

22 D-B
28 CM-GC

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Contractor Involvement in Establishing Quality Control Standards

Contractor Involvement in Establishing Quality Control Standards

- What is it?
 - Creating more efficient QM programs by allowing changes to the QC standards
- Why use it?
 - Customize and/or streamline QC without sacrificing quality

23 D-B
29 CM-GC



Contractor Involvement in Establishing Quality Control Standards

- When to use it?
 - Can be used with prescriptive-based quality specifications
 - For innovative or uncommon situation or when materials are used in nontraditional ways

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ \$10 million	\$10 million–\$50 million	> \$50 million
23 Contractor Involvement in Establishing QC Standards			✓		◐	●	●	◐	●	●

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23 D-B
29 CM-GC

Contractor Involvement in Establishing Quality Control Standards

- How to use it?
 - Contractor may **propose alternatives** to contract specification with sufficient justification
 - Agency involves **agency discipline-specific experts** in the review of proposals
 - **Agency retains the authority** to approve or deny the proposal
 - Agency PM **communicates** the benefits of the approved changes to other agency personnel

23 D-B
29 CM-GC

Contractor Involvement in Establishing Quality Control Standards

- Synthesis of Examples
 - Align QC standards with intended function of the facility
 - Provides the opportunity for an agency to adjust the standards to the context of a specific project
- Guidebook example
 - DB p.128 ; CM-GC p.162

23 D-B
29 CM-GC

Example: ODOT Willamette River Bridge

- Customized quality standards and reduced the agency's QC costs
- ODOT wrote a minor hot-mix asphalt specification that was more in line with what the local park agencies needed resulting in cost savings from the typical project-specific mix designs and optimum rolling procedures for highways

23 D-B
29 CM-GC

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Incentive–Disincentive Program for Superior Quality

Incentive-Disincentive Program for Superior Quality

- What is it?
 - Motivation to encourage excellence in quality
 - Can also be used to encourage safety performance, environmental compliance, managing disruption to traffic, etc.
- Why use it?
 - Communicates clear goals with motivation to achieve
 - Improve construction efficiency and reduce rework

Incentive-Disincentive Program for Superior Quality

- When to use it?
 - Agency has clear goals of where high performance is beneficial

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ \$10 million	\$10 million–\$50 million	> \$50 million
24 Incentive–Disincentive Program for Superior Quality			✓		◐	●	●	●	●	●

Note: ● = Recommended; ◐ = Consider case by case; ○ = Not recommended.

Incentive-Disincentive Program for Superior Quality

- How to use it?
 - Set objective, definable, and quantifiable objectives for incentives for use as accurate indicators of achievement
 - Written in contract or established collaboratively after contracting
 - Focus on tasks that frequently result in nonconforming work in order to reduce rework

Incentive-Disincentive Program for Superior Quality

- Synthesis of Examples
 - Reduction in rework can **reduce agency time and cost** for inspecting rework
 - **Set meaningful incentives** that will be sought after by the contractor
 - **Pay incentives in increments** to encourage high performance throughout the project
 - **Clearly define** responsibilities and evaluation process
- Guidebook Example: D-B p. 130-134

Example: ADOT US60 & Bell Road TI

- Incentive program for superior quality in the RFP of this D-B project.
- Checklists were developed collaboratively, regular inspections of checklist items were conducted, and progress payments were made monthly.
- When incentive payments were made, the additional money went to the contractor's staff who worked directly on these items.

Example: ADOT US60 & Bell Road TI

Checklist Performance Goals	Workmanship Inspection Checklist Categories	
	Measurement by Examination	Dimensional Measurement
<p>a) Safety: Goal = 97.5 percent conformance</p>	<p>Traffic control Job-site safety Concrete barrier Guardrail Crash attenuators Signs Traffic signals (Others as required)</p>	<p>(Developed as required)</p>

24 D-B

Example: ADOT US60 & Bell Road TI

<p>b) Operability: Goal = 95.0 percent conformance</p>	<p>Curbs, gutters, sidewalks, and driveways Drilled shafts and other deep foundations Portland cement concrete pavement Electrical underground materials Electrical hardware and wiring Reinforced concrete pipe (Others as required)</p>	<p>Reinforcing steel tolerances Reinforcing steel cover Concrete member dimensions (Others as required)</p>
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Example: ADOT US60 & Bell Road TI

<p>c) Durability and Appearance: Goal = 90.0 percent conformance</p>	<p>Aggregate base Concrete materials Concrete curing Bituminous tack coat Asphaltic concrete Concrete structures Landscaping National Pollutant Discharge Elimination System (NPDES) protection Grading Rubberized asphalt (Others as required)</p>	<p>(Developed as required)</p>
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24 D-B

Example: WSDOT I-45 Express Toll Lanes

TABLE 7
ALLOCATION OF INCENTIVE AWARD AMONG KEY MEASURES

Key Measure	Maximum Possible Award
Periodic Incentive	
Environmental Compliance	\$600,000
Subtotal	\$600,000
Project Incentive	
Pavement Smoothness	\$420,000
Subtotal	\$420,000
TOTAL	\$1,020,000

24 D-B

Example: WSDOT I-45 Express Toll Lanes

TABLE 9

INCENTIVE AWARDS AND CRITERIA FOR ENVIRONMENTAL COMPLIANCE

Criteria	Test Criteria	Maximum Possible Award
A. Environmental Awareness		\$100,000
B. Environmental Inspections and Compliance Monitoring		\$300,000
C. Reacting to Non-Compliance Events		\$200,000
Total Maximum Award:		\$600,000

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Real-Time Electronic Quality Management Information

Real-Time Electronic Quality Management Information

- What is it?
 - Digital system to store, organize, share, and manage project information
- Why use it?
 - Document submission, receipt, and approval of documents
 - Quick retrieval of project documents
 - Track noncompliance issues
 - Provided varying levels of access for different roles

25 D-B
30 CM-GC



Real-Time Electronic Quality Management Information

- When to use it?
 - Large projects receive the most benefit, but smaller projects can add their information to an agency database

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25 Real-Time Electronic Quality Management Information			✓		●	●	●	●	●	●

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25 D-B
30 CM-GC

Real-Time Electronic Quality Management Information

- How to use it?
 - Requires **ongoing commitment** from agency personnel
 - On a project-by-project basis, or on all projects
 - **Handheld devices in the field** can be used to directly input information
 - **Format input** to match permanent final records-retention protocols

25 D-B
30 CM-GC

Real-Time Electronic Quality Management Information

- Synthesis of Examples
 - Train agency personnel on benefits and use of an electronic system
 - Use consistently with proper procedures
 - Equip inspectors with handheld devices
- Guidebook example
 - DB p.136-137, CM-GC p.164

25 D-B
30 CM-GC

Example: GDOT NW Corridor Project

- \$600M project with lots of data
- GDOT used an off-the-shelf system called Assure-It to track all materials used on the job.
- Inspectors used tablets and laptop computers in the field to enter data. They also had access to testing standards and the current version of construction documents to facilitate materials verification.

25 D-B
30 CM-GC

Example: TXDOT SH-130 Turnpike Project

- Used Electronic Laboratory Verification Information System (ELVIS), a web-based tool
- Input of 43 different field and lab test results
- ELVIS provided a wide range of data management, project management, and deficiency monitoring functions, as well as statistical analysis and enterprise-level management tools
- Reduced nonconformance reports

25 D-B
30 CM-GC

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Dual Construction Engineering Inspection Roles

Dual Construction Engineering Inspection Roles

- What is it?
 - Contractor hires one construction engineering inspector (CEI) to inspect, test, and verify quality and the agency hires an oversight CEI to conduct statistical sampling for quality acceptance
- Why use it?
 - Encourages quality construction
 - With CEI-OCEI handling quality management, the agency can focus on other aspects of the project



Dual Construction Engineering Inspection Roles

- When to use it?
 - Projects that lack quality incentives

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ \$10 million	\$10 million–\$50 million	> \$50 million
26 Dual Construction Engineering Inspection Roles			✓		◐	◐	●	◐	●	●

26 D-B

Note: ● = Recommended; ◐ = Consider case by case; ○ = Not recommended.

Dual Construction Engineering Inspection Roles

- How to use it?
 - Decide to use CEI-OCEI before construction starts
 - CEI should act independent of the contractor
 - Conduct partnering sessions with CEI and OCEI to promote good communication

Dual Construction Engineering Inspection Roles

- Synthesis of Examples
 - Decide on using CEI-OCEI prior to start of construction
 - Encourage good communication between CEI and OCEI
 - Perform quality test before work is covered
- Guidebook example
 - DB p.139-141

Example: FDOT I-595 Express Corridor

- Provide daily QC activities by adhering to the specifications and design provided in the contract
- OCEI audited the quality testing and inspections performed by the CEI

Example: MoDOT St. Louis Safety Project

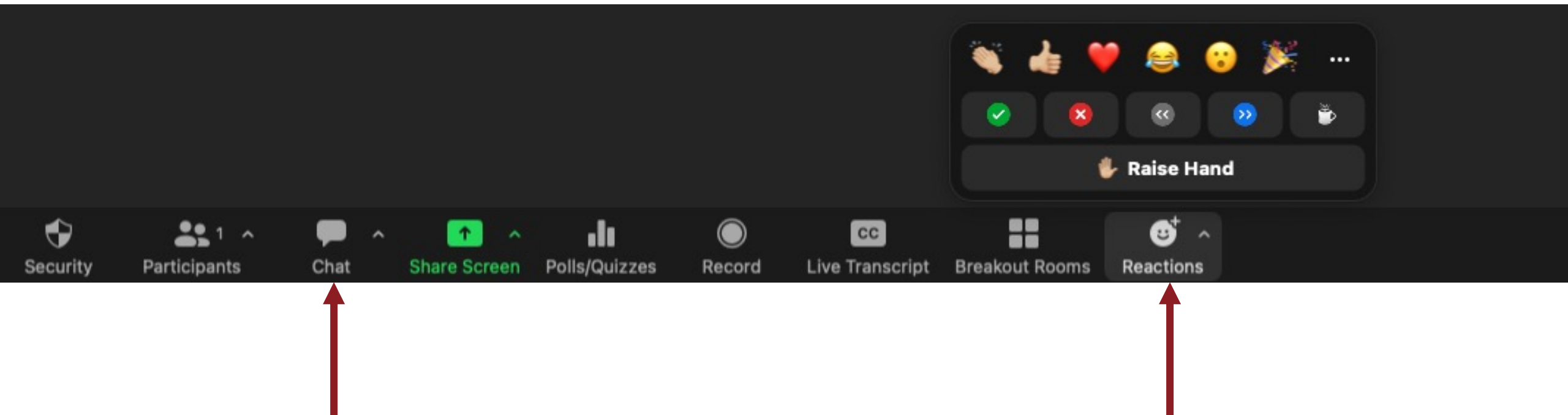
- D-B performed QC and QA
- MoDOT performed quality verification by checking 10 percent of all items
- If Work exposed or examined proves unacceptable, the uncovering, removing and recovering or making good the parts removed, and recovery of delay shall be at the Contractor's expense

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Q and A

- Chat or raise your hand



Peer Exchange

Peer Exchange: Panel Discussion on Preconstruction Tools



Matthew Pacheco, PE
Alternative Delivery
Program Manager,
Colorado DOT



Erika Drury, PE
Alternative Delivery Program
Manager, Kentucky
Transportation Cabinet



Saad Samani
Office of Innovative Design
and Delivery,
California DOT

Wrap-up

Today's Learning Objectives

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Key Takeaway Points

- **Contractor-controlled quality control testing** allows the contractor to perform their QC testing to keep project progress aligned with quality standards and at a reduced cost.
- **Contractor involvement in establishing quality control standards** enables innovative solutions by customizing QC standards.
- **Incentive-disincentive program for superior quality** creates motivation to achieve efficient performance and excellence in quality.
- **Real-time electronic quality management information** enables tracking project progress in real-time for quality management purposes.
- **Dual construction engineering inspection roles** enables contractor to hire their own construction engineering inspector (CEI) while the agency hires an oversight CEI; thus, more efficient use of time and quality construction.

Progress Update

- **Sessions** - completed 7 out of 8
- **Phases** - completed 5 out of 6
- **Strategies** - completed 6 out of 6
- **Tools** - completed 34 out of 36
- **Peer exchange** - engaged with 16 expert panelists and 300+ participants

NEXT: Final Session - Closeout phase administration and culminating experience!

Next: Session 8

- Thursday December 1, at 10:00 AM Pacific
- For preparation, preview the final 2 tools:
 - Witness and hold points
 - Payment checklist
- Also feel free to review all 36 tools that we discussed throughout this training.

Path Forward

- Session 8 will cover the remaining two tools
- We will work through a case study in small groups
- It will also include a flash overview of a number of resources related to the topic
- We will discuss an opportunity, next step of 1:1 agency training on the tools and strategies
 - An opportunity for your agency to RSVP early
- *Be ready for our class graduation photo on Zoom!*

Learning Assessment

1. T/F: Contractor involvement in establishing quality control standards advocates ...
2. T/F: Incentive-disincentive program for superior quality is acknowledged
3. Single Answer: Dual construction engineering inspection roles requires a ...
4. Interest in follow-up step
5. Open feedback.

OPEN DISCUSSION

QUESTIONS 

Q & A

 ANSWERS