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Mid-Coast Transit Constructors Quality Control & Quality Assurance

August 15, 2017

Welcome and Introductions

- Introduction
  - Cory Raymond, MCTC DBE/SB Compliance and Outreach

    (DBE Team: Alison Lobenstein; Désirée Benet)
- Presenters
  - Leonard Paulino, MCTC Quality Control Manager
  - Jon Ostler, MCTC Quality Control Manager, North Segment
  - Steve Gilbert, SANDAG Quality Assurance Manager

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Mid-Coast Project QA/QC Workshop

- Agenda
  - Project Overview
  - QC Program
  - QA Program
  - Responsibility Matrix / Inspection and Testing Frequency
  - Case Studies
  - Q & A
- Housekeeping

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Project Overview

THE TEAM

MID-COAST TRANSIT CONSTRUCTORS

Mid Coast Transit Constructors (MCTC) is a fully integrated Joint Venture of Stacy and Witbeck, Herzog, and Skanska. We have combined these three highly successful construction organizations to bring a collection of talents uniquely suited for the CMGC 1 projects. MCTC team members are heavy civil constructors specializing in CM/GC contracting for rail projects. We are experts at self-performing rail and bridge work proudly managed and built by our own forces.

In the past 10 years our firms have constructed over 600 miles of track for passenger service. Together, our CM/GC experience includes more than 30 rail transit projects with a total value of over $4.7 billion.

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Mid-Coast Project Overview

- *Extension of Trolley Blue Line from Downtown to UTC Transit Center*
- *10.9 miles of new LRT tracks*
- *4 plus miles of elevated guideway & bridges*
- *9 stations: 4 at-grade and 5 aerial stations*
- *Traction power, signals & communications*
- *Special trackwork & shoofly track*
- *Utility relocation*

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Program Summary

Project Name
Supplement 1 Early work Package (CP Rose & Wet Utilities)
Supplement 2 San Diego River Double Track (SDRDT)
Supplement 3 Gilman Bridge
Supplement 4 Mid-Coast Transit Project (MCCTP)
Supplement 5 Elvira – Morena DBL Track (EMDT)
Supplement 6 Voigt Drive Over Crossing
Supplement 7 Rose Creek Bikeway (RCBW)
Total Project Value – in excess of $1 Billion & 56 Month Duration

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Quality Control Program

Background

- Project Special Provisions 5-1.24 Restates Primary QC/QA Responsibilities

"…the Contractor has developed a Construction Quality Control Plan… The Contractor shall, at all times, comply with the requirements of the applicable CQC Plan"

"The Contractor shall be responsible for the quality of the work…"

"SANDAG will perform a Quality Assurance (QA) role, closely monitoring performance of the Contractor's QC program to verify its effectiveness"

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Background

- Terminology

MCTC = Quality Control = Acceptance Testing and Inspection

SANDAG = Quality Assurance = Verification Testing and Inspection

Management Responsibility

- Purpose:
  - The objective of the MCTC CQCP is to proactively prevent non-conforming work through the control of the activities affecting the quality of the work during construction and through final acceptance and turnover of the completed facilities.
  - Contract Requirement

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Management Responsibility

- Responsibility for Achieving Quality:
  - Quality is the responsibility of the entire MCTC construction team, including subcontractors and major suppliers.

    Only effective if everyone commits
  - The ultimate responsibility for achieving quality and meeting technical requirements expected rest with the person(s) performing the work.

    Craft Superintendent Foreman Engineer Subcontractor

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Who is Responsible?

QUALITY CONTROL

- PROCESS CONTROL (MCTC)

    Craft, Superintendents, Foreman, Engineers, Subcontractors, Suppliers

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QUALITY CONTROL

- INSPECTION & TESTING (MCTC / 3rd Party)

    Quality Control Manager, QC Engineers, Inspectors, Technicians

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Life Cycle of a Quality Program

QC Manager Appointment & QC Plan Approval

- Call out QC Mgr at time of proposal
- Interview testing labs and inspectors
- QC Plan approval

QC Team Responsibilities

- Understand work
- Scheduling
- Inspections
- Documentation
- Communication
- Training
- Incentive

Periodic Quality Audits and Reviews

- Monthly Pay Certification
- Internal reviews
- Agency audits
- As-Built reviews

Safety Certification and Project Close-out

- Safety Certification
- As-built Final Review
- Final submittals
- Document turn-over

Why is a Quality Program Necessary?

- There are good contractors with good quality programs
- Other contractors with no programs and they have been misinformed contractors
- <u>QC programs give confidence to clients</u>
- Have standards for construction and a way to ensure quality for public safety

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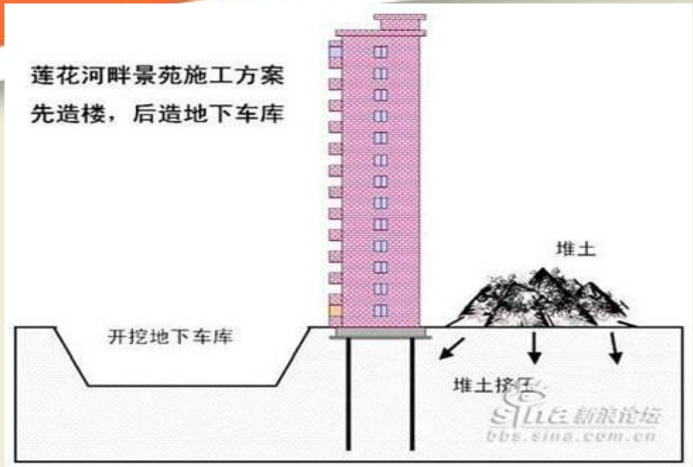
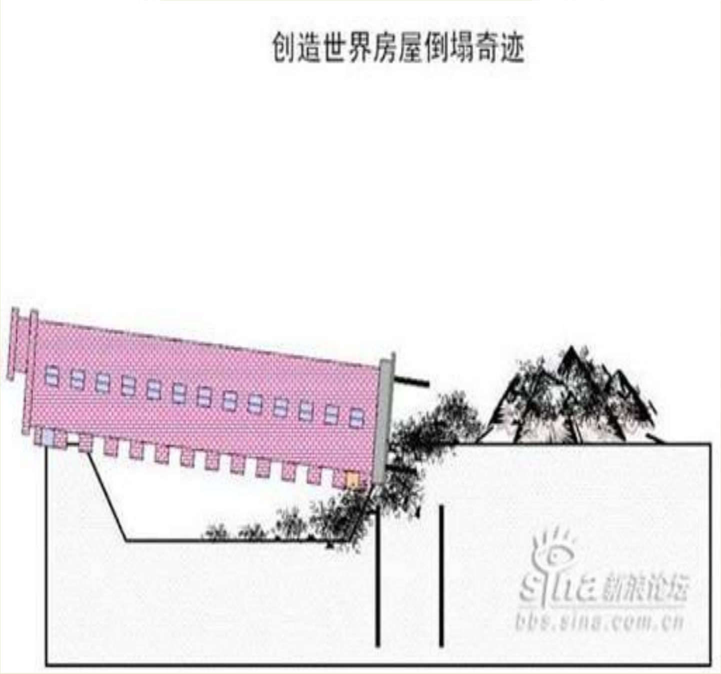
Why is a Quality Program Necessary?





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Why is a Quality Program Necessary?

As a Business Owner

- A QC Plan can:
  - Help you organize and streamline your systems and processes
  - Help you manage and train your employees
  - Help you prepare for growth
  - Result in better products and services
  - Make you stand out among competitors (if implemented well)
  - Reduce re-work costs…

Increase profitability

Developing a QC Plan

- **F**ederal **T**ransit **A**dministration
  - Sets the standards for mass transit construction projects
  - 15 Quality Control elements are identified

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FTA 15 Elements of QC

1. Management Responsibility	2. Documented Quality System	3. Design control
4. Document Control	5. Sub, Supplier & Procurement Control	6. Product Identification & Traceability

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FTA 15 Elements of QC

- 7. Process Control
- 8. Inspection & Testing
- 9. Control of Measuring & Testing Equipment
- 10. Inspection & Test Status
- 11. Nonconformance ID and Control
- 12. Corrective Action

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FTA 15 Elements of QC

13. Documentation by Quality Records

14. Quality Audits

15. Training

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Three Phase Inspection

- QC will document and ensure quality through the Three Phase Inspection process.
  - Preparatory Phase Meeting
  - Initial Phase Inspection
  - Follow-Up Phase Inspection

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Preparatory Phase Meeting

- ❑ Planning tool that aids in the control of work.
  Ensures that:
  - Planning of each construction activity is complete
  - Contract requirements are understood.
  - Permanent materials are correct and on hand
  - Individuals performing the work are competent and knowledgeable
  - Work Plan is developed and reviewed
- ❑ Scheduled by engineer in charge of work 1 week prior to start of work
- ❑ Operations may not begin until Quality Control and SANDAG agrees that we are prepared to do so

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Initial Phase Inspection

- A formal Inspection of the first completed element of work
  - Initial Phase Inspections will be identified at the Preparatory Meeting.
  - Performed by Superintendent/Foreman, QC Staff and SANDAG Representative.
  - Scheduled and documented by the Quality Control Manager.

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Follow-Up Phase Inspection

QC Inspections are scheduled at the Daily Gameplan Meeting

- Inspections and Checklists
  - Performed by Superintendent, Foreman, Engineers, QC Inspectors
  - A document which verifies that each step of the construction process has been checked and is in compliance.
  - Performed from the start thru to completion of an element of work at specific hold points
  - Handed in to QC Manager for review and documentation.

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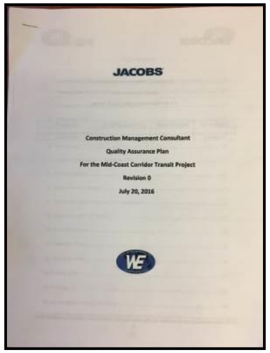
Quality Assurance Program

Mid Coast Program QA Role

- QA Plan



✓ Outlines QA Verification Role
✓ Follows FTA 15 Elements
✓ Living Document with tracked revisions.

- Examples of QA Verification:

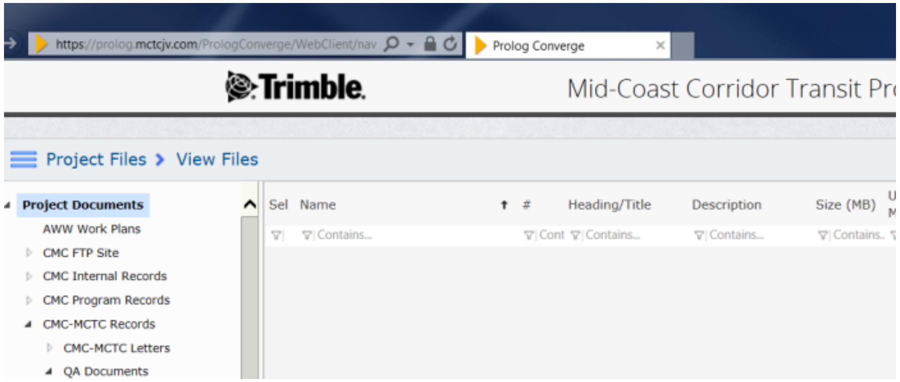
✓ Participating in meetings
✓ Review of Submittals
✓ Participating in 3 Phase Process
✓ QA Inspection (Periodic Checks)
✓ QA Lab Sampling and Testing
✓ QA Surveying
✓ Audits

Key Elements of QA Work

1. Submittal Review
2. QA Inspection and Reporting
3. QA Sampling and Testing

Submittals

Submittals
1. Program-wide
2. Project Specific



- Generated by MCTC or subs
- Workflow in Prolog
- QC is last check – QC checking that process was followed.
- Expectation is <u>minimal QA comments needed</u>

QA Inspections

1. QA Inspection is not full time, it is to check the process
2. QA Inspection is to:

    Ensure QC is conducting necessary inspections

    Ensure that QC is using the appropriate methods

    Ensure that QC follows the work plan from the 3 phase meeting

    Ensure that QC is documenting the work

QA Inspections

SAN DIEGO ASSOCIATION OF GOVERNMENTS (SANDAG)

ASSISTANT RESIDENT ENGINEER'S DAILY REPORT

Project Name:
Contract #
CIP No.

SANDAG Calendar Day
Date 8-24-15 1 of 1
S M T W T F S
Shift Hours Start Stop

ASSISTANT RESIDENT ENGINEER'S DAILY REPORT
Location & Description of Operation
Visitors:

OVERTIME: INSPECTOR WORKED 0 HOURS
INSPECTION TYPE:

HOURS - BID ITEM NO. | Idle or Down

WEATHER
:
Precip: 0.00"
Wind:

EQUIPMENT CODE – MANUF – MODEL | RT or OT | LABOR NAME/CLASSIFICATION/COMPANY

1. Was QC Present? [Use Daily Game Plan to Contact]
2. Did QC have the needed equipment/plans to inspect?
3. What did QC do to check the work?
4. Spot checks we conducted?
5. Other discussion as needed

Signature	Title Civil Inspector
Resident Engieer's Signature	Title

Lab Testing

1. Target 10 percent of the MCTC Testing

2. Tests are Verification, therefore:
   - Samples taken concurrently with QC
   - Samples are to verify QC results

Inspection and Test Frequency

Contractor's Testing and Inspection Matrix Supplement 2- SDRBDT- Package-August 2016

Work Product to be tested/inspected	Characteristics to be tested/sampled	Reference Procedure	Physical Point of testing/inspecting Work Product	Frequency of test/inspection
Subgrade for track bed, maintenance roads and paved areas	Observation, sampling, Moisture-Density Relationship, Density testing of soil	SS 19-1.03F ASTM D1557 ASTM 6938	On-site	Scarified to a minimum depth of 12". Every 5,000 tons or change in material. 95% compaction for track bed/roadway and 2' beyond limit; 90% outside of 2' limit. 1 test/2,000 SY
Subgrade for new embankments		SS 19-1.03F		Scarified a minimum depth of 6 inches, and compacted to at least 90% relative compaction prior to beginning placement of embankment.
Subgrades for structure foundations or footings		SS 19-1.03F		Scarified a minimum depth of 12 inches, compacted to at least 95% relative compaction prior to beginning placement of reinforcing steel.
Rock Materials and Qualification	Observation, sampling and laboratory testing	California Test Methods: 202, 205, 206, 211, 217, 229, 301, 302. ASTM C131, ASTM C127	Source and/or On-site	Sample prior to delivery to site and then every 3,000 tons or if a material change is noted.
Common Fill	Observation, sampling, Moisture-Density Relationship, Density testing of soil	ASTM D1557, ASTM D6938	Source and/or On-site	Sample prior to delivery to site and then every 2,000 CY or if a material change is noted or once a week. One in-place moisture density test per 300 LF of track/lift or minimum of one test for each shift of compaction operation.
Trench Backfill	Observation, sampling, Moisture-Density Relationship, Density testing of soil	ASTM D1557, ASTM D6938, ASTM D1556, C136, CT 202, ASTM D2419 or CTM 217	Source and/or On-site	Sample prior to delivery to site and then every 2,000 CY or if a material change is noted or once a week. One in-place moisture density test per 12" lift and 2,000 SY or minimum of one test for each shift of compaction operation.
Structure Excavation and Backfill	Observation, sampling, Moisture-Density Relationship, Density testing of soil	ASTM D1557, ASTM D6938, ASTM D1556, C136; CT 202, ASTM D2419 or CTM 217	Source and/or On-site	Sample prior to delivery to site and then every 2,000 CY or if a material change is noted or once a week. One in-place moisture density test per 12" lift and 2,000 SY or minimum of one test for each shift of compaction operation.
Structural Backfill		SS 19-3.03E		

Document Control

Contractor's Filing Set Up

12.1	Inspection Reports
12.1.1	Inspection Daily Reports (IDR)
12.1.1.1	CPROSE
12.1.1.2	ADWETS
12.1.1.3	ADWETN
12.1.1.4	EMDT
12.1.1.5	SDRBDT
12.1.1.6	Gilman
12.1.1.7	MCLRT 1&2
12.1.1.8	MCLRT 3&4
12.1.2	Daily Field Reports (DFR)
12.1.2.1	CPROSE
12.1.2.2	ADWETS
12.1.2.3	ADWETN
12.1.2.4	EMDT
12.1.2.5	SDRBDT
12.1.2.6	Gilman
12.1.2.7	MCLRT 1&2
12.1.2.8	MCLRT 3&4
12.2	Test Reports
12.2.1	On-Site
12.2.1.1	ASTM D6938 Soil Density
12.2.1.2	NDT - UT VT PT RT
12.2.1.3	ASTM D2950 HMA Density
	Logs
12.2.2	Lab Reports
12.2.2.1	ASTM C39 Concrete Strength
12.2.2.2	ASTM C136 Aggregates
12.2.2.3	ASTM D1557 Proctor
12.2.2.4	ASTM D2419 SE
12.2.2.5	HMA Various
12.2.2.6	CTM 670 Tensile
12.2.2.7	ASTM D4829
12.3	Three-Phase Inspection
12.3.1	Preparatory
12.3.2	Initial
12.3.3	Follow Up
12.3.4	Definable Features of Work
12.3.5	Field CWP Review

12.4	Material Certifications
12.4.1	MRI
12.4.2	Concrete
12.4.3	HMA
12.5	QA-QC Audits
12.5.1	Surveillances
	Old Format
	Surveillance Log 7 Schedule
	Surveillances QCF-12 (by date)
12.5.2	Audits
12.5.2.1	Internal Audits (by date)
12.5.2.2	Corporate Audits (by audit #)
12.5.3	QA Audits and Surveillances
	QA Audits
	QA Surveillances
12.5.4	Quarterly Quality Evaluations
12.6	QC Plan
12.6.1	Plan
12.6.1.1	Approved Plan (by revision #)
12.6.1.2	Revisions to Plan (by revision #)
12.6.1.3	Organziational Chart
12.6.1.4	Resumes
12.6.2	QCP (by QCP #)
12.6.3	Forms (by QCF #)
12.6.4	Training
12.7	Deficiencies
12.7.1	Non-conformance Reports (NCR) (listed by number)
12.7.2	Quality Action Items (QAI) (listed by number)
12.7.3	Corrective Action Report (CAR)
12.7.4	Root Cause Analysis (RCA)
12.7.5	Lessons Learned (LL)
12.7.6	Stop Work Order (SWO)
12.8	Closeout
12.8.1	Walk-down (listed by date)
12.8.2	Punchlist
12.9	Sub-Suppliers
12.9.1	QC Plans (alphabetical by supplier)
12.9.2	Source Inspections Reports

12.10	Certifications
12.10.1	Lab Certifications
12.10.1.1	Twining
12.10.1.2	RMA
12.10.1.3	Sequoia
12.10.1.4	CTI
12.10.2	Equipment Calibration
12.10.3	Inspector Qualifications (alphabetical by company name)
12.10.4	Twining Certification Packages
12.10.5	Sequoia Certification Packages
12.10.6	RMA Certification Packages
12.11	QA-QC Reports
12.11.1	Daily Reports [Under Review] (by WE date)
12.11.2	Weekly Reports (by WE date)
12.11.3	QA-QC Meeting Minutes - South
12.11.4	Photos & videos
12.11.4.1	Photos
12.11.4.2	Videos
12.11.5	Progress Meetings (by date)
12.11.6	Internal QC Meeting Minutes
12.11.7	QA-QC Meeting Minutes - North
12.12	Administrative Tools and Documents
12.12.1	Recognition & Incentive Program
12.12.2	Rework Tracking
12.12.3	QA-QC Budget & Lab Proposals
12.12.4	QA-QC Manager Correspondence
12.12.5	RFI
12.12.6	Submittals
12.13	Statement of Working Days (by year; alphabetical by project name)
12.14	AREMA
12.15	Field Forms
12.16	Quality Training
	Mass Safety & Quality Training
	QC Trainings
	Quality Orientation
12.17	Field Change Form (QCF-34)
	Completed FCF QCF-34
	FCF Log

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Q/C Case Studies

Case Study #1

"Subcontractor 'Brand X' is laying 48" RCP. I witnessed the first stick of pipe being placed and noted that the crew was using a pipe laser to verify alignment. Grade / flow line / alignment was verified off existing survey staking and the pipe was placed within tolerance. Left the area to perform inspection / concrete pre-placement checklist (see attached). Upon return, subcontractor 'Brand X' had placed two additional sections of pipe, however they had stopped using the laser to verify alignment. Asked foreman to re-install the laser to check flow line and once the laser was re-installed, it was determined that the last section of pipe was out of lateral tolerance by 1.5'. As the pipe has not been back filled yet, the foreman has elected to fix the pipe next week when he is back in the area."

What happens next?

1. Nothing. Report is done.
2. Issue QAI as a reminder to fix pipe.
3. Issue NCR for pipe misalignment.

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Case Study #2

"*During the Absolute Work Window,* Subcontractor 'Brand X' is laying 48" RCP. I witnessed the first stick of pipe being placed and noted that the crew was using a pipe laser to verify alignment. Grade / flow line / alignment was verified off existing survey staking and the pipe was placed within tolerance. Left the area to perform inspection / concrete pre-placement checklist (see attached). Upon return, subcontractor 'Brand X' had placed two additional sections of pipe, however they had stopped using the laser to verify alignment. Asked foreman to re-install the laser to check flow line and once the laser was re-installed, it was determined that the last section of pipe was out of lateral tolerance by 1.5'. *Since the track needed to be opened in 4 hours, the foreman elected to backfill as-is and not correct the pipe misalignment issue*."

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What happens next?

1. Nothing. Report is done.
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Case Study #3

- A subcontractor has been hired to supply, place, and compact 4" of HMA.
- The subcontract excludes survey and base/sub-base installation/prep.
- An MCTC QC inspector is on-site to monitor the HMA placement.
- A SANDAG QA inspector periodically checks the QC inspection/testing.

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Case Study #3a

- The day after HMA placement is finished, core samples for HMA density, determine that the HMA is only 3” thick and an NCR is issued.

- *Who is responsible for repair costs?*
  - *Subcontractor*

- *Who is responsible to enforce compliance?*
  - *QC*

Case Study #3b

- During placement, the QC inspector determines that the temperature of delivered HMA (in the trucks) is lower than specified. The QC inspector informs the placing foreman. The placing foreman continues HMA placement and subsequent HMA density cores determine that compaction is less than specified. An NCR is issued.

- *Who is responsible for repair costs?*

  - *Subcontractor*

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Case Study #3c

- During placement, the QC inspector determines that the temperature of delivered HMA (in the trucks) is lower than specified. The QC inspector informs the placing foreman. The placing foreman calls the supplier, but rejects 3 loads of HMA with lower than specified temperatures, before the supplier can rectify the problem. Subsequent loads of HMA are delivered to the job proper temperatures and the placement is finished. A month later, the HMA supplier attempts to bill the subcontractor for the 3 rejected loads.

- *Who is responsible for the cost of the rejected HMA?*

  – *Supplier*

Case Study #3d

- During placement, the subcontractor's paving machine runs out of fuel. While the crew waits for re-fueling, HMA trucks continue to be delivered and start 'stacking up'. The QC inspector determines that the temperature of delivered HMA (in the trucks) is lower than specified after sitting for approximately an hour. The QC inspector informs the placing foreman. The placing foreman continues HMA placement and subsequent HMA density cores determine that compaction is less than specified. An NCR is issued.

- *Who is responsible for repair costs?*
  - *Subcontractor*

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Case Study #3e

- During HMA placement, the QC inspector identifies an area of HMA that is exhibiting excessive ‘pumping’ during compaction. Core samples taken in the area, the following day, do not pass compaction criteria and the area exhibits extensive cracking. An NCR is issued.

- *Who is responsible for re-work costs?*
  - *Contractor*

- *Who is responsible to perform re-work?*
  - *Subcontractor (but it’s a change order!)*

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Case Study #3f

- HMA test samples taken during placement of HMA fail oil content criteria. An NCR is issued.

- *Who is responsible for re-work costs?*

  - *Supplier*

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Q/A Case Studies

Part 3: QA Inspection

QA Example 1:

- QA is called out to take concrete cylinders. Which of the following is proper verification practice?

a) Take samples and cylinders from a different truck than QC
b) Sample from the same truck as closely as possible in time
c) Add dirt to the QC sample so your sample will be stronger

– Discussion Note: A QA Sample is to verify the QC results. The best method for verification is to coordinate and sample alongside of QC and in the same manner to allow for a true comparison.

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QA Inspection

QA Example 2:

- QA is requested to perform Ultrasonic Testing on Class N steel pile. Which is the best practice?

a) Hide results to ensure secrecy and independence
b) Use stricter calibration than required to ensure compliance
c) When QC takes a bathroom break, secretly mis-calibrate the QC machine to test their knowledge.
d) Calibrate with QC, observe each other's tests and reach concurrence onsite or elevate as needed.

  – Discussion Note: If QA is not satisfied that they are able to verify the QC results and reach agreement, it is important to elevate the issue **at that time**.

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QUESTIONS?

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