2007 Summer Meeting AASHTO Highway Subcommittee on Construction

Project Quality for Design-Build

by Bob Burns
Quality Program Manual
Requirements

- Authority to stop Work
- Quality objectives
- Measurable work
- Quality records
- Corrective and Preventative Action

A. Provide Adequate Time for Inspection and Testing of Work
   - Timely Pour Schedule/Inspection Report Process
   - Notification by Noon Friday of the Next Week’s Construction
   - Notification of Quality Checkpoint 24 Hours Prior

B. Materials Installed or Placed in Accordance with Specifications or Requirements
   - Quality of Inspectors’ Daily Reports
   - NCRs/Weekly NCR Logs RFI/Weekly RFI Logs
   - Statistical Analysis Deviations
   - Owner Field Reviews QA

C. Quality Management Plan Adequately Addresses Needed Items
   - Quality Management Task Force Meetings/Actions
   - QMP Updates
   - Materials Documentation

Quality Audits
Operational Quality Assurance

- Project Management
- Safety
- Maintenance
- Traffic
- Maintenance
- Public Involvement
- Environmental
Product Control Plan (PCP)

- Manufacturing, receiving, and installation process
- Delivery, handling, and storage of furnished products
- Fabrication, assembly, and testing
Quality Documentation

**WEB-BASED DATABASE**

**DESIGN TEAM USERS:**
- Design Manager
- Design Leads
- Designers
- Public Information
- Environmental Compliance Manager

**CONSTRUCTION USERS:**
- Project Manager
- Admin. Assistant
- Project Engineer
- Segment Coordinators
- Superintendents
- Construction Manager
- Safety Manager

**QUALITY TEAM USERS:**
- Quality Manager
- QA Managers
- QC Managers
- QC Inspectors
- QA Auditors

**MANAGEMENT TEAM USERS:**
- NDOT
- JV Management Team
- Operations Manager
Construction Quality Documentation

- Daily inspection logs
- DOT’s Field Materials Manual
- RFI
- Submittals
- Deliverables
- Electronic Documents
- Check Lists
- Quality Documents
QA/QC Responsibility

- Stop Work
- Authority, interface, communication
- QA/QC separate from Production
- Identify, evaluate, and document quality problems
Nonconforming Work Notices

- Diary NCR
- Check list- NC’s
- Level 1, 2, 3
- Resolution NC
- Weekly meetings to resolve NCR’s
- Process Audits
Construction Coordination

- Procedures for approval of Released for Construction Documents and revision control
- Task Force Meetings
- Field design changes
- RFI’s
- Submittal Approval

COSMIX Contract Requirements for Structural Items

The table below is a checklist to confirm that the structural design is in conformance with the COSMIX Project Structural Design Criteria.

<table>
<thead>
<tr>
<th>Design Criteria Section No.</th>
<th>QC Requirement</th>
<th>Relevant to this Structure? Y or N</th>
<th>Conforms to Project Criteria (Y/N)</th>
<th>Confirmed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1.1</td>
<td>Confirm correct material densities used in design</td>
<td></td>
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<tr>
<td>2.2.1.2</td>
<td>Confirm correct barier weights used in design</td>
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<tr>
<td>2.2.2.3</td>
<td>Confirm correct future wearing surface weight used in design</td>
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<tr>
<td>2.2.2</td>
<td>Confirm correct live load used in design</td>
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<tr>
<td>2.2.2.3</td>
<td>Confirm impact factor used in design</td>
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<tr>
<td>2.2.3</td>
<td>Confirm thermal properties and specifications used in design</td>
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<tr>
<td>2.2.4</td>
<td>Confirm stream forces used in design</td>
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<tr>
<td>2.2.4</td>
<td>Confirm scour has been accounted for in design</td>
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<tr>
<td>2.2.5</td>
<td>Confirm seismic design has been performed</td>
<td></td>
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<tr>
<td>2.2.6</td>
<td>Confirm correct wind loads used in design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3.3</td>
<td>Confirm minimum separation between parallel structures</td>
<td></td>
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</tr>
</tbody>
</table>
Inspection and Test Plan

• Contractor Quality Control tests and Owner Verification tests

• DOT’s converting to Digital Records for test results

• Material testing forms vary by DOT
Quality Control

- Contractor documenting QC checklists

- Daily dairies by Field Engineers and QC staff

- Document NC and resolve
Quality Assurance

- QA Testing and Inspections
- Materials
- Hold Points
- Non Conformances
- 4 NCR Resolutions
  - Remove and replace
  - Repair
  - Deduction
  - Remain As-Is
Quality Improvement

- Contractor Audits
- Monthly Reports
- Quality Audits
- Identifying, analyzing, evaluating, and implementing solutions
- Training

D. Inspectors (also Testers and Testing Facility) are Qualified and Inspecting per QMP
  - Results of DOT Independent Audit of Inspector Qualifications
  - Release For Construction (RFC) Plans In-Hand
  - Equipment Certifications/Calibration Available on Request
  - Q/C, Q/A Inspectors Knowledgeable & Decisions Supported by DB

E. Cooperation to Resolve Issues/Non-Specification Work
  - Weekly NCR Logs/Remedial Actions/Response Timing
  - QC Team Involvement

F. Issues Resolved Prior to Succeeding Work Performed
  - NCRs/Remedial Actions/Response Timing
  - Statistical Analysis Deviations (SAMS)/Trends
  - Quality Checkpoints Reviewed Daily

Quality Audits
Quality Personnel

• “Do it right the first time”.

• Field Materials Certifications

• Quality Manager and Quality Control staff independent of the Contractor’s Project Manager
Training

- Specific plans, processes, and procedures as assigned in the QPM
- Erosion Control, Safety, MOT, RFI, Diaries
- Training Contract requirements
Owner Quality Acceptance Reviews

• Audit approach to assess Contractor’s compliance
• Reviews ongoing basis during the Project
• Non Conformance reports
• Independent QA testing
Project Acceptance

- Design Acceptance
- As-Builts
- Certifications
- Quantity/ Frequency of Testing
- Resolve NCN
- COC’s
- Third party approvals
Project Quality for Design-Build

Questions

Additional information
Contact Bob Burns
rburns2@ch2m.com
# INSPECTOR'S CHECKLIST

## 509 - DRILLED CAISSONS

<table>
<thead>
<tr>
<th>No.</th>
<th>Item Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Approved concrete mix design?</td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
<td>Locations adequately staked and referenced?</td>
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<td>3.</td>
<td>Underground utility conflicts checked and resolved?</td>
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<td>4.</td>
<td>Drilling rig suitable for the work?</td>
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<td>5.</td>
<td>Drilled shaft plumb?</td>
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<td>6.</td>
<td>Final centerline of shaft per plan location?</td>
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<td>7.</td>
<td>Excavation protected from persons or materials falling into hole?</td>
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<td>8.</td>
<td>Oversized protective casing required?</td>
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<td>9.</td>
<td>Excessive casing eliminated?</td>
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<td>10.</td>
<td>Drilled hole pumped free of water and cleaned of debris?</td>
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<tr>
<td>11.</td>
<td>Drilled hole to proper elevation and minimum embedment obtained and documented?</td>
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<td>12.</td>
<td>Reinforcing steel cage inspected and approved?</td>
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<td>13.</td>
<td>Necessary splices approved?</td>
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<td>14.</td>
<td>Steel cage placed immediately prior to placing concrete?</td>
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<tr>
<td>15.</td>
<td>Steel cage adequately supported and checked for bottom and side clearances?</td>
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<td>16.</td>
<td>Approved spacers provided at proper intervals?</td>
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<td>17.</td>
<td>Additional steel necessary to stiffen cage?</td>
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<td>18.</td>
<td>Steel casing properly sized and closed?</td>
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<tr>
<td>19.</td>
<td>Casing removed properly?</td>
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<tr>
<td>20.</td>
<td>Reinforced cage and concrete elevation checked after casing removed?</td>
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<tr>
<td>21.</td>
<td>Concrete placed within required time of drilling?</td>
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<tr>
<td>22.</td>
<td>Concrete placed in one continuous pour?</td>
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<tr>
<td>23.</td>
<td>Concrete dropping straight down without hitting sides of holes or reinforcing cage?</td>
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<tr>
<td>24.</td>
<td>Engineer approved concrete to be placed under water?</td>
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<tr>
<td>June 2021</td>
<td>Quality Workmanship Performance Evaluation Criteria</td>
<td>PSC</td>
<td>Notes</td>
<td>Comments</td>
<td></td>
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<td>-----------------------------------------------</td>
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<tr>
<td>A. Provide Adequate Time for Inspection and Testing of Work</td>
<td>9</td>
<td>S</td>
<td></td>
<td>Thepourboard hass worked into a one step shopinformation resource: structure name, time, day, week, schedule activity. Upcoming QCPs... Good Job!</td>
<td></td>
</tr>
<tr>
<td>Timely Turnaround of Scheduling/Inspection Report Process</td>
<td>X</td>
<td></td>
<td></td>
<td>CQA has established a relatively scheduling system by having CQA administration staff contact project personnel to confirm upcoming work within one hour. After receiving the updated information, QCP's are reviewed based on this updated information.</td>
<td></td>
</tr>
<tr>
<td>Notification by Noon Friday of the Next Week's Construction</td>
<td>X</td>
<td></td>
<td></td>
<td>Overall, WSDOT is impressed with A-OFF's efforts in implementing their QCP process.</td>
<td></td>
</tr>
<tr>
<td>Notification of Quality Checkpoint 24 Hours Prior</td>
<td>X</td>
<td></td>
<td></td>
<td>It's been noted additional QCP's i.e. sign structures, have been added to the project.</td>
<td></td>
</tr>
<tr>
<td>B. Materials Installed or Placed in Accordance with Specifications or Manufacturer's Requirements</td>
<td>0</td>
<td>4</td>
<td></td>
<td>As major traffic shifts approach and the work nears completion, WSDOT has concerns the inspectors may not be adhering to certain Items. Some of the Items still seem to be generically prepared, lacking substantive information about the work. All items were inspected and accepted by the CQA inspector.</td>
<td></td>
</tr>
<tr>
<td>Quality of Inspector's Daily Reports</td>
<td>X</td>
<td></td>
<td></td>
<td>WSDOT acknowledges CQA/QC using the 84/5/0 as a self test for the bolts and verifying proper use of the turn of the nut method.</td>
<td></td>
</tr>
<tr>
<td>NCP's/Weekly NCP Logs /RFP's/Weekly RFP Logs</td>
<td>X</td>
<td></td>
<td></td>
<td>The NCP's/RFP's are being turned in weekly. Concerns of WSDOT are that we are approaching important traffic shifts onto (completed) work, how will methodology be setup regarding inspection issues?</td>
<td></td>
</tr>
<tr>
<td>Statistical Analysis of Defects (SAM)</td>
<td>X</td>
<td></td>
<td></td>
<td>SAM results are being provided and discussed at each Quality Matters Meeting.</td>
<td></td>
</tr>
<tr>
<td>WSDOT Field Reviews (CATS)</td>
<td>X</td>
<td></td>
<td></td>
<td>CATS audits have been favorable.</td>
<td></td>
</tr>
<tr>
<td>C. Quality Management Plan Adequately Addresses Head and Items</td>
<td>0</td>
<td>4</td>
<td></td>
<td>The QMP is effective in that all of the key players, Stakeholders, and Teams, are in attendance to respond and/or initiate quality concerns.</td>
<td></td>
</tr>
<tr>
<td>Quality Management Task Force Meetings/Actions</td>
<td>X</td>
<td></td>
<td></td>
<td>WSDOT understands the QMP will be reviewed and made revisions to the surveying QCP process. The shift in terms that was reviewed by WSDOT Institution.</td>
<td></td>
</tr>
<tr>
<td>GMP Update</td>
<td>X</td>
<td></td>
<td></td>
<td>Materials delivered to the jobsite are being efficiently documented by CQA's materials technician to ensure materials are approved and acceptance samples are taken.</td>
<td></td>
</tr>
<tr>
<td>Materials Documentation</td>
<td>X</td>
<td></td>
<td></td>
<td>A recent WSDOT audit of CQA &amp; material qualifications for concrete testing proved acceptable.</td>
<td></td>
</tr>
<tr>
<td>D. Inspections and Testing Facilities are Qualified and Inspecting per GMP</td>
<td>0</td>
<td>4</td>
<td></td>
<td>Results of WSDOT Independent Audit of Inspector Qualifications</td>
<td>X</td>
</tr>
<tr>
<td>Release of Construction (RCP) Plans in Hand</td>
<td>X</td>
<td></td>
<td></td>
<td>WSDOT HQ Materials Lab performed an audit of the CQA on site laboratory. The audit found no major issues.</td>
<td></td>
</tr>
<tr>
<td>Equipment Certification/Validation Available on Request</td>
<td>X</td>
<td></td>
<td></td>
<td>Continued emphasis on training on acceptance methods for non-statistics and statistical materials.</td>
<td></td>
</tr>
</tbody>
</table>
| CQA, CQA inspectors knowledgeable & decisions supported by DB | X | | | }
Instructions:
1. On the line following a question type an answer of "Yes" "No" or "N/A"
2. Be sure there are no extra spaces after an answer
3. On the line following the answer type any comments
   (maximum one line of text)

A 1. Approved concrete mix design?
   No

A 2. Locations adequately staked and referenced?
   No

A 3. Underground utility conflicts checked and resolved?
   No

A 4. Drilling rig suitable for the work?
   No

A 5. Drilled shaft plumb?
   No

A 6. Final centerline of shaft per plan location?
   No

A 7. Excavation protected from persons or materials falling into hole?
   No

A 8. Oversized protective casing required?
   No

A 9. Excessive caving eliminated?
   No

A10. Drilled hole pumped free of water and cleaned of debris?
    No

A11. Drilled hole to proper elevation and minimum embedment obtained documented?
     No

A12. Reinforcing steel cage inspected and approved?
     No

A13. Necessary splices approved?
     No

A14. Steel cage placed immediately prior to placing concrete?
     No