A brief summary of the CTAC program and why it is beneficial to the concrete industry

Presented by JT Mesite, P.E.
Program Manager
Colorado Ready Mixed Concrete Association (CRMCA)
jt@coloradocaa.org
About Me

- Graduated Univ. of Wyoming in 2001
  Civil Engineering (Geotech discipline)

- Received Professional Engineer (P.E.) in 2006

- Career includes construction materials testing, pavement and foundation design, and inspection/forensics for 15 years

- Employed with CTL|Thompson, Geocal, and Cesare

- Enslaved PROUDLY working with the CRMCA since Fall 2016
TO: CRMCA BOARD OF DIRECTORS

Gentlemen:

The December meeting of the CRMCA Board of Directors is scheduled on Wednesday, December 16, 1970, in the Continental Denver Motor Hotel (Speer Blvd. (north) & Valley Highway) Australia Room, at 12 Noon.

This will be a dutch treat luncheon meeting, and a luncheon reservation will be made for each Board member.

AGENDA

ROLL CALL
**Not Just in Colorado...**

- **1997 – NRMCA Survey**

<table>
<thead>
<tr>
<th>List of 15 Highest Rated Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Quality Assurance</strong> - Improper handling and curing of cylinders</td>
</tr>
<tr>
<td>2. <strong>Quality Assurance</strong> - Tests of fresh concrete at the job</td>
</tr>
<tr>
<td>3. <strong>Mixing &amp; Delivery</strong> - Control of air content</td>
</tr>
<tr>
<td>4. <strong>Quality Assurance</strong> - Lack of qualified testing technicians</td>
</tr>
<tr>
<td>5. <strong>Proportioning</strong> - Quality and uniformity of local materials</td>
</tr>
<tr>
<td>6. <strong>Proportioning</strong> - Selection of optimum proportions (cement, fly ash, admixtures)</td>
</tr>
<tr>
<td>7. <strong>Mixing &amp; Delivery</strong> - Control of slump</td>
</tr>
<tr>
<td>8. <strong>Records of Test Results</strong> - Obtaining test results for commercial labs/agencies</td>
</tr>
<tr>
<td>9. <strong>Specification Problems</strong> - Conflicting w/c ratio - performance requirements</td>
</tr>
<tr>
<td>10. <strong>Raw Materials Variability</strong> - Aggregates</td>
</tr>
<tr>
<td>11. <strong>Quality Assurance</strong> - Compressive strength testing</td>
</tr>
<tr>
<td>12. <strong>Raw Materials Variability</strong> - Lack of communication from suppliers on changes in product</td>
</tr>
<tr>
<td>13. <strong>Raw Materials Variability</strong> - Cement</td>
</tr>
<tr>
<td>14. <strong>Customer Complaints</strong> - Plastic Concrete - Plastic shrinkage cracking / crusting</td>
</tr>
<tr>
<td>15. <strong>Specification Problems</strong> - Unreasonable performance requirements</td>
</tr>
</tbody>
</table>
Background and Long-Term Problem

1. Improper concrete testing procedures in the field have a huge impact on construction projects:
   - Placement acceptance
   - Timelines
   - Project teamwork
   - Owner satisfaction

2. Producers are “Guilty, ‘til proven innocent” if breaks are low.
   - Sometimes results from problems with the concrete
   - Many times, result of improper field sampling and cylinder casting and care

3. Labs may be accredited, and technicians certified, but doesn’t mean ALL criteria is followed.
   - QA and QC technicians performing testing differently
   - Certification ≠ consistency
Concrete Industry Expectations

Technicians **must** be certified
Technicians **must** know procedures
Technicians **should** know WHY testing is needed and meaning of tests
Managers **should** know who tests correctly and consistently
Managers **should** know if training is working
Producers **should** know their results are not due to “poor” testing
Owners **must** feel at ease with testing and results
Pre-Construction Meeting
- Plan → Execute

On-site Communication
- Self-check and Team-checks

Meet Expectations through Industry Partnership
- Resolutions

Successful Project
- Confident Concrete Construction

Long-Lasting Industry Relationships
- Mutual benefits
Adherence to Standards
Overview

• Goal of the CTAC Program

Fair and Consistent Assessment of
Ready Mixed Concrete

• ASTM and ACI established standards and guidelines to evaluate the performance of concrete
  • Not consistently followed or monitored across the industry
Application of Observation

iOS and Android mobile apps
- On-site Observations and submittal during testing
- Input by ACI Certified and experienced individuals
- QA, QC, Inspector, Contractor, Engineer, Owner Representative

NOT a “Finger Pointing” device
- Drives accountability
- Provides Training initiatives
- Security in reliable results
- Shared responsibility
Current Main Questions

ACI CERTIFIED...? Is the testing technician currently ACI Field 1 certified to test concrete?

SAMPLED CORRECTLY...? Excluding preliminary check tests, was the concrete sampled in accordance with ASTM C172?

TESTS DONE CORRECTLY...? Where physical property tests completed and strength specimens molded (if required for cast) in accordance with the appropriate ASTM procedures?

SPECIMENS PROPERLY CURING...? Were the concrete specimens (if required to cast) stored in an initial curing environment following ASTM C31, section 10.1.2?
Observer Company and Name
Add ACI Number
Is Technician certified?
Testing Company?
Type of Job
[geo-location]
Sample correctly?

Q. Excluding preliminary check tests, was the concrete sampled in accordance with ASTM C172?

- Yes
- No
- Check Test

*Preliminary check tests* are defined as field concrete tests not used for quality assurance/quality control and will not be compared with results of strength specimens.
Observer Company and Name
Add ACI Number
Is Technician certified?
Testing Company?
Type of Job
[geo-location]
Sample correctly?

Link to Standard summary
Observer Company and Name
Add ACI Number
Is Technician certified?
Testing Company?
Type of Job
[geo-location]
Sample correctly?
Link to Standard summary
If not sampled correct...
Take a photo
Is it a Check Test?
Sampling Location
Physical properties (testing)

Q. Were physical property tests completed and strength specimens molded (if required to cast) in accordance with the appropriate ASTM procedure?

- [ ] Yes
- [x] No

*See summary of ASTM References here: https://www.crmca.org/astm-reference-summaries/
Observer Company and Name
Add ACI Number
Is Technician certified?
Testing Company?
Type of Job [geo-location]
Sample correctly?
Link to Standard summary
If not sampled correctly...
Take a photo
Is it a Check Test?
Sampling Location
Physical properties (testing)
If not tested correctly…

Q. Which testing procedure was not followed?

- a. Temperature ASTM C1064
- b. Slump ASTM C143
- c. Air Content ASTM C231 or ASTM C173
- d. Density (unit weight) ASTM C138
- e. Casting concrete strength specimens ASTM C31
- f. Tests completed within time requirement ASTM C172, section 4.1.2
Observer Company and Name
Add ACI Number
Is Technician certified?
Testing Company?
Type of Job
[geo-location]
Sample correctly?
Link to Standard summary
If not sampled correctly...
Take a photo
Is it a Check Test?
Sampling Location
Physical properties (testing)
If not tested correctly...
Explain...

Q. What was observed?
Did not keep top lift heaping; quick pull
*Be specific for all tests selected under Q3.1 not meeting requirements.
No specimens?

Initial Curing

Storage

Q. Which of the following was utilized?

- a. Fabricated curing box or storage area
- b. Water bath
- c. Cooler or buckets (dry)
- d. Insulation (i.e. space blanket, foam, plastic shavings, etc.)
- e. Earthen burial
- f. Other; Explain: Touch here to enter...

*Select all that apply to describe the facility.
No specimens?

Storage

Temperature monitoring

Q. Which type of temperature monitoring device was utilized in the curing environment?

- a. Continuous record (i.e. wheel, data logger)
- b. Min/Max
- c. Instant read only
- d. Thermostatic control (heat)
- e. Thermostatic control (cool)

*Select all that apply to describe the facility.
Initial Curing

No specimens?

Storage

Temperature monitoring

If not initial cured correctly...

Observation info
No specimens?

Initial Curing

Storage

Temperature monitoring

If not initial cured correctly...

Observation info

**Sampling/observation time/date**

<table>
<thead>
<tr>
<th>Hour</th>
<th>Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>08</td>
<td>15</td>
</tr>
<tr>
<td>09</td>
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<td>10</td>
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<td>11</td>
<td>30</td>
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<td>12</td>
<td>45</td>
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<tr>
<td>13</td>
<td>00</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

(Enter '0' ONLY if unknown)
Initial Curing
No specimens?
Storage
Temperature monitoring
If not initial cured correctly...
Observation info
Sampling/observation time/date
Technician name
Initial Curing

No specimens?

Storage

Temperature monitoring

If not initial cured correctly...

Observation info

Sampling/observation time/date

Technician name

Last Name if possible!

ACI Number if available

[Look it up through ACI App link]

Concrete supplier

Dispatch ticket number
No specimens?
Initial Curing
Storage
Temperature monitoring
If not initial cured correctly...
Observation info
Sampling/observation time/date
Technician name
Last Name if possible!
ACI Number if available
[Look it up through ACI App link]
Concrete supplier
Dispatch ticket number
Other Observation notes
• Where there’s a concrete pour, CTAC observation can occur.
• Observe, document, share on-site
• Reporting Dashboard for company and regional enhancement
## Executive Report: January 2019 - July 2021

### Summary of Observations

<table>
<thead>
<tr>
<th>Question 1</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the testing technician currently A1C Field certified to test concrete?</td>
<td>91.1%</td>
<td>89.7%</td>
<td>90.0%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>What type of project/site is concrete testing observed at?</td>
<td>Residential</td>
<td>11.1%</td>
<td>6.6%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Federal/State</td>
<td>18.9%</td>
<td>8.2%</td>
<td>9.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Other</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>-0.0%</td>
</tr>
<tr>
<td>Private</td>
<td>1.5%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>-0.0%</td>
</tr>
<tr>
<td>Local/Municipality</td>
<td>22.1%</td>
<td>20.4%</td>
<td>19.5%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>46.4%</td>
<td>64.1%</td>
<td>58.4%</td>
<td>-5.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 3</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where was the sample(s) collected from?</td>
<td>At end of mixer truck discharge, prior to pump/belt (if used)</td>
<td>65.3%</td>
<td>60.9%</td>
<td>53.0%</td>
</tr>
<tr>
<td>At point of placement; end of mixer truck discharge</td>
<td>31.2%</td>
<td>33.9%</td>
<td>41.3%</td>
<td>7.4%</td>
</tr>
<tr>
<td>At point of placement; end of pump/belt (if used)</td>
<td>3.9%</td>
<td>5.5%</td>
<td>5.7%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Other</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 4</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following was observed?</td>
<td>Did not combine and remix</td>
<td>42.2%</td>
<td>64.9%</td>
<td>69.0%</td>
</tr>
<tr>
<td>Exceeding sample time allowance</td>
<td>0.3%</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Incorrect location (outside middle 1/3rd of truck discharge)</td>
<td>26.6%</td>
<td>12.7%</td>
<td>4.9%</td>
<td>-7.8%</td>
</tr>
<tr>
<td>Incorrect portion/interval sampled</td>
<td>30.8%</td>
<td>25.9%</td>
<td>1.9%</td>
<td>-24.0%</td>
</tr>
<tr>
<td>Incorrect sample size taken</td>
<td>41.0%</td>
<td>44.2%</td>
<td>35.1%</td>
<td>-9.1%</td>
</tr>
<tr>
<td>Other</td>
<td>22.8%</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

### Observation Totals

<table>
<thead>
<tr>
<th>CRMCA Member</th>
<th>Employees</th>
<th>All Time</th>
<th>Current Period</th>
<th>Last 12 Months</th>
<th>Last 3 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Industries</td>
<td>2</td>
<td>506</td>
<td>46</td>
<td>39</td>
<td>22</td>
</tr>
<tr>
<td>BURNCO Colorado, LLC</td>
<td>9</td>
<td>1457</td>
<td>457</td>
<td>378</td>
<td>111</td>
</tr>
<tr>
<td>CRMCA Staff</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Four Corners Materials</td>
<td>5</td>
<td>42</td>
<td>26</td>
<td>10</td>
<td>8</td>
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<tr>
<td>Loveland Ready Mix Concrete</td>
<td>1</td>
<td>13</td>
<td>11</td>
<td>11</td>
<td>6</td>
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<tr>
<td>Martin Marietta (Metro)</td>
<td>19</td>
<td>3743</td>
<td>2399</td>
<td>894</td>
<td>226</td>
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<tr>
<td>Martin Marietta (Northern)</td>
<td>7</td>
<td>1337</td>
<td>97</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Martin Marietta (Southern)</td>
<td>6</td>
<td>814</td>
<td>635</td>
<td>268</td>
<td>50</td>
</tr>
<tr>
<td>Pete Lien &amp; Sons (EOC)</td>
<td>1</td>
<td>6</td>
<td>2</td>
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<tr>
<td>Top 5 CRMCA Members by # Total Observations (Last 12 Months)</td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>CRMCA Member</th>
<th>Aggregate Industries</th>
<th>BURNCO Colorado, LLC</th>
<th>Martin Marietta</th>
<th>United-Oldcastle Southwest</th>
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<tr>
<td></td>
<td>120</td>
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<td>Sep 2020</td>
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<td>Nov 2020</td>
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<td>Jan 2021</td>
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<td>Mar 2021</td>
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<tr>
<td>May 2021</td>
<td>120</td>
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### Summary of Observations

<table>
<thead>
<tr>
<th>Question 5</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were physical property tests completed and strength specimens molded (if required to cast) in accordance with the appropriate ASTM procedure?</td>
<td>82.8%</td>
<td>85.8%</td>
<td>80.9%</td>
<td>-4.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 6</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Prev Year Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which procedure was not followed?</td>
<td>Air Content</td>
<td>96.9%</td>
<td>97.8%</td>
<td>97.2%</td>
</tr>
<tr>
<td>Casing concrete strength specimens</td>
<td>98.3%</td>
<td>98.4%</td>
<td>98.0%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>Density (unit weight)</td>
<td>89.9%</td>
<td>97.2%</td>
<td>96.0%</td>
<td>-1.2%</td>
</tr>
<tr>
<td>Slump</td>
<td>94.3%</td>
<td>89.5%</td>
<td>84.1%</td>
<td>-5.4%</td>
</tr>
</tbody>
</table>
Results based on Timeline

Results based on Timeline

Company Performance and Comparison

Individual Employee Results

1. Is the testing technician currently ACI Field Certified to test concrete?

91.4% 90.5% 0.9%

What type of project/site is concrete testing observed at?

Selected Company Other Companies Variance

Commercial/Industrial 17% 60% -43.1%
Federal/State 31% 9% -22.0%
Local/Municipality 51% 19% 32.0%
Other 0% 0% 0%
Private 1% -0.7% 0.7%
Residential 11% -10.9%

2. Excluding preliminary check tests, was the concrete sampled in accordance with ASTM C31?

80.0% 75.2% 4.8%

Where was the sample(s) collected from?

Selected Company Other Companies Variance

At end of mixer truck discharge prior to pump/belth (if used) 26% 54% -28.4%
At point of placement and mixer truck discharge 71% 39% 32.1%
At point of placement and end of pump/belth (if used) 3% 4% -1.1%
Other 0% -0.2%

3. Were physical property tests completed on strength specimens (if required to cast) in accordance with the appropriate ASTM procedure?

85.7% 82.7% 3.1%

Which procedure was not followed?

Selected Company Other Companies Variance

Air Content 100% 100% 0%
Casting concrete strength specimens 97% 96% -1.2%
Density (unit weight) 97% 96% 0.8%
Slump 54% 50% 4.0%
Temperature 97% 97% 0.0%
Tests completed within time requirement 100% 99% 1.0%

4. Were the concrete specimens (if required to cast) stored in an initial curing environment following ASTM C31, section 10.5.3?

54.8% 61.6% -6.8%

Which of the following was utilized?

Selected Company Other Companies Variance

Cooler or buckets (dry) 60% 52% 7.6%
Fahrenheit 0% 0% 0%
Fiberglass lining box or storage area 3% 15% -12.0%
Insulation (ispace blanket, foam, plastic shavings, etc.) 20% 20% 0.5%
Nothing, specimens left in open environment 1% -1.3%
Water bath 20% 23% -3.6%
Other 11% 8% 3.2%

Variances

Selected Company Other Companies Variance

1. Which of the following was observed?

Selected Company Other Companies Variance

Did not combine and remix 11% 15% -3.3%
Exceeding sample time allowance 0% 0%
Incorrect location (outside middle 1/3 of truck discharge) 1% -1.4%
Incorrect portions/intervals sampled 1% -0.3%
Incorrect sample size taken 20% 9% 11.5%
Other 0% -0.1%

2. Which type of temperature monitoring device was utilized in the curing environment?

Selected Company Other Companies Variance

Continuous record 3% 1% 2.3%
Instant read only 26% 14% 12.1%
MiniMax 20% 43% -23.3%
Nothing 40% 30% 10.0%
Thermocorder (cool) 3% 4% -0.7%
Thermocorder (heat) 9% -0.9%
### Question 1: Is the testing technician currently ACI Field I certified to test concrete?

<table>
<thead>
<tr>
<th>Type of Project/Site</th>
<th>Selected Company</th>
<th>Other Companies</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial/Industrial</td>
<td>17%</td>
<td>60%</td>
<td>-43.1%</td>
</tr>
<tr>
<td>Federal/State</td>
<td>31%</td>
<td>9%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Local/Municipality</td>
<td>51%</td>
<td>19%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>0%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Private</td>
<td>1%</td>
<td>-0.7%</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>11%</td>
<td>-10.9%</td>
<td></td>
</tr>
</tbody>
</table>

- **Results:** 91.4% for Selected Company, 90.5% for Other Companies, 0.9% Variance

### Question 2: Excluding preliminary check tests, was the concrete sampled in accordance with ASTM C172?

<table>
<thead>
<tr>
<th>Where was the sample(s) collected from?</th>
<th>Selected Company</th>
<th>Other Companies</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>At end of mixer truck discharge; prior to pump/belt (if used)</td>
<td>26%</td>
<td>54%</td>
<td>-28.4%</td>
</tr>
<tr>
<td>At point of placement; end of mixer truck discharge</td>
<td>71%</td>
<td>39%</td>
<td>32.1%</td>
</tr>
<tr>
<td>At point of placement; end of pump/belt (if used)</td>
<td>3%</td>
<td>6%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>0%</td>
<td>-0.2%</td>
</tr>
</tbody>
</table>

- **Results:** 80.0% for Selected Company, 75.2% for Other Companies, 4.8% Variance

### Question 3: Were physical property tests completed and strength specimens molded (if required to cast) in accordance with the appropriate ASTM procedure?

<table>
<thead>
<tr>
<th>Which procedure was not followed?</th>
<th>Selected Company</th>
<th>Other Companies</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content</td>
<td>100%</td>
<td>97%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Casting concrete strength specimens</td>
<td>97%</td>
<td>98%</td>
<td>-1.2%</td>
</tr>
<tr>
<td>Density (unit weight)</td>
<td>97%</td>
<td>96%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Slump</td>
<td>94%</td>
<td>86%</td>
<td>8.4%</td>
</tr>
<tr>
<td>Temperature</td>
<td>97%</td>
<td>97%</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Tests completed within time requirement</td>
<td>100%</td>
<td>99%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

- **Results:** 85.7% for Selected Company, 82.7% for Other Companies, 3.1% Variance

### Question 4: Were the concrete specimens (if required to cast) stored in an initial curing environment following ASTM C31, section 10.1.2?

<table>
<thead>
<tr>
<th>Which of the following was utilized?</th>
<th>Selected Company</th>
<th>Other Companies</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooler or buckets (dry)</td>
<td>60%</td>
<td>52%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Earthen burial</td>
<td>0%</td>
<td>0%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Fabricated curing box or storage area</td>
<td>3%</td>
<td>15%</td>
<td>-12.0%</td>
</tr>
<tr>
<td>Insulation (i.e., space blanket, foam, plastic shavings, etc.)</td>
<td>20%</td>
<td>20%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Nothing; specimens left in open environment</td>
<td>1%</td>
<td>1%</td>
<td>-1.3%</td>
</tr>
<tr>
<td>Water bath</td>
<td>20%</td>
<td>23%</td>
<td>-2.6%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
<td>8%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

- **Results:** 54.8% for Selected Company, 61.6% for Other Companies, -6.8% Variance
<table>
<thead>
<tr>
<th>Technician</th>
<th>Total</th>
<th>Past 3 Months</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Air Content</th>
<th>Casting Strength</th>
<th>Density (unit weight)</th>
<th>Slump</th>
<th>Temperature</th>
<th>Time Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Unknown</em></td>
<td>3</td>
<td>1</td>
<td>98.9%</td>
<td>83%</td>
<td>95%</td>
<td>84%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Audie Martinez</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Cam Breton</td>
<td>3</td>
<td>2</td>
<td>100.0%</td>
<td>100%</td>
<td>33%</td>
<td>100%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>33.33%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Chase Winters</td>
<td>3</td>
<td>1</td>
<td>66.7%</td>
<td>67%</td>
<td>67%</td>
<td>33%</td>
<td>100.00%</td>
<td>66.67%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Don Fitzner</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Edgar Perez</td>
<td>3</td>
<td>3</td>
<td>100.0%</td>
<td>67%</td>
<td>100%</td>
<td>100%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Emilio Martinez</td>
<td>1</td>
<td>1</td>
<td>0.0%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Garret Vond</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Garrett Bond</td>
<td>2</td>
<td>2</td>
<td>100.0%</td>
<td>50%</td>
<td>100%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Jon Hooks</td>
<td>1</td>
<td>1</td>
<td>0.0%</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Matt</td>
<td>1</td>
<td>1</td>
<td>58.3%</td>
<td>33%</td>
<td>33%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Nick Horianopoulos</td>
<td>6</td>
<td>6</td>
<td>100.0%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Rosco Sprinkle</td>
<td>6</td>
<td>4</td>
<td>100.0%</td>
<td>71%</td>
<td>71%</td>
<td>43%</td>
<td>100.00%</td>
<td>83.33%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Tyler Bistline</td>
<td>3</td>
<td>1</td>
<td>100.0%</td>
<td>67%</td>
<td>67%</td>
<td>0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>18</strong></td>
<td><strong>93.5%</strong></td>
<td><strong>78%</strong></td>
<td><strong>86%</strong></td>
<td><strong>69%</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>97.14%</strong></td>
<td><strong>97.14%</strong></td>
<td><strong>94.29%</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>
### Find Individual Results to Review in-depth

**Detailed Individual Review of Specific Observations**

<table>
<thead>
<tr>
<th>Technician</th>
<th>Total</th>
<th>Past 3 Months</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Air Content</th>
<th>Casting Strength</th>
<th>Density (unit weight)</th>
<th>Slump</th>
<th>Temperature</th>
<th>Time Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Unknown&quot;</td>
<td>3</td>
<td>1</td>
<td>63%</td>
<td>63%</td>
<td>64%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audie Martinez</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cam Breton</td>
<td>3</td>
<td>2</td>
<td>100.00%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>33.33%</td>
<td>33.33%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chase Winters</td>
<td>3</td>
<td>1</td>
<td>66.7%</td>
<td>67%</td>
<td>67%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don Fitzner</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edgar Perez</td>
<td>3</td>
<td>3</td>
<td>100.00%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emilio Martinez</td>
<td>1</td>
<td>1</td>
<td>0.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garret Bond</td>
<td>2</td>
<td>2</td>
<td>100.0%</td>
<td>100.0%</td>
<td>50%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jon Hooks</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matt</td>
<td>1</td>
<td>1</td>
<td>58.3%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nick Horianopoulos</td>
<td>6</td>
<td>6</td>
<td>100.00%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosco Sprinkle</td>
<td>8</td>
<td>4</td>
<td>100.00%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tyler Bistline</td>
<td>3</td>
<td>3</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**

Excluding preliminary check tests, was the concrete sampled in accordance with ASTM C172?

- 66.7% (Selected Company)
- 0.0% (Other Companies)
- 66.7% (Total)

**Table 4**

Were the concrete specimens (if required to cast) stored in an initial curing environment following ASTM C310, section 10.1.2?

- 33.3% (Selected Company)
- 0.0% (Other Companies)
- 33.3% (Total)

**Selected Company**

<table>
<thead>
<tr>
<th>Question</th>
<th>Selected Company</th>
<th>Other Companies</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not combine and remix</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Exceeding sample time allowance</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Incorrect location (outside middle 1/3rd of truck discharge)</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Incorrect portions/intervals sampled</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Incorrect sample size taken</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Other</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
</tbody>
</table>

**Table 6**

Which type of temperature monitoring device was utilized in the curing environment?

- Continuous record
- Instant read only
- Min/Max
- Nothing
- Thermostatic control (cool)
- Thermostatic control (heat)
- Water bath
- Earthen burial
- Fabricated curing box or storage area
- Insulation (space blankets, foam, plastic shavings, etc.)
- Nothing: specimens left open environment
- Other

- 67% (Selected Company)
- 66.7% (Other Companies)
CTAC Program in Colorado

- On-site conversations
  - Let technicians know immediately if procedure is incorrect
  - Share on-site observations testing and other concrete-related events
- Testing Firm validation
  - Company evaluation of technicians
  - Training program evolution
- Association mitigation
  - Teamwork through membership
Currently in Colorado
- Administrator shares reports monthly
- Reports specific to each company
- Companies utilize reports
- Training/Education
- Marketing
- Communication
- Rare disputes reference Batch Ticket
- Specific report shared with all parties involved

National Partnerships
- Live access to Report System
- “Enforcement” of Industry Standards
- Teamwork makes the Dream Work!
- Takes time

Program Administration
## CTAC Program Expectations

**Benefits at State Level**
- Reporting information assists in company-level training
- Company insights based on regional average
- Quick corrections and kudos to individual testing technicians

**Educating at State Level**
- Development of regional industry training
- Educational concepts created through data analysis

**Drive Change Nationally**
- Minimize the effects of false negative/positive concrete tests
- Consistency and confidence in proper concrete testing
Bottom Line ... to Raise the Bar

- CTAC Observers
  - CTAC Observations
  - CTAC Record
  - CTAC Team
  - CTAC Dashboard
- Widespread Consistency

There will always be resistance
QUESTIONS?
COMMENTS?

JT Mesite, P.E.
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jt@coloradocaa.org

Todd Ohlheiser
Executive Director, CRMCA
todd@coloradocaa.org

c tac@coloradocaa.org