PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

"This session may be recorded for training and record-keeping purposes. By participating in this session, you are consenting to the recording, retention and use of this session. At any time if you have a question or comment, feel free to place that in the Q&A, and we will respond to you as soon as possible. Please note that by doing so, you are consenting to the recording, retention and use of your statements recorded as part of this session."

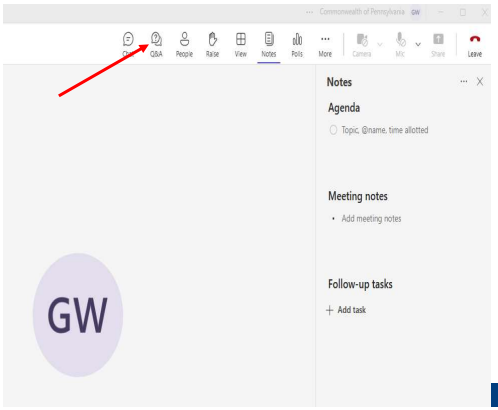
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

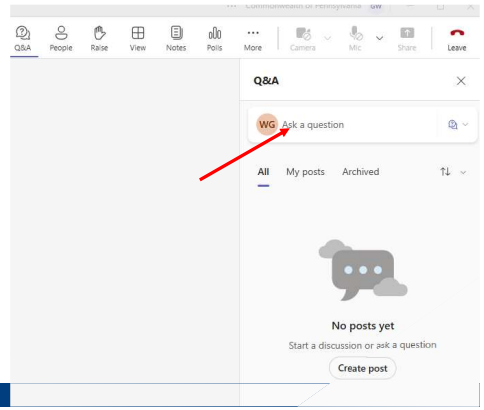
Housekeeping

- Breaks and Lunch
- Course
- Review Questions
- Course Evaluation
- Exam

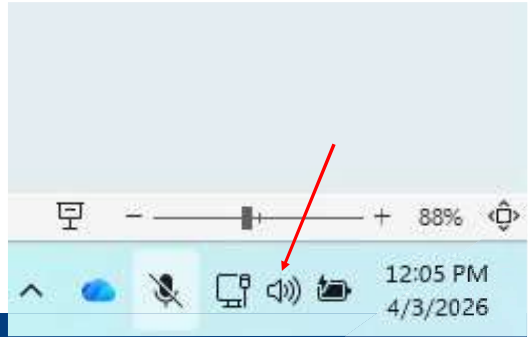
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

- Cell Phones are not recommended for the course
- Attentiveness Tracking
  - Must answer 75% of the end of chapter review questions
- Asking Questions
  - Q & A
  - Ask a question





- If experiencing issues, please try the following:
  - Log off and reconnect
  - Copy the TEAMS link from the meeting invite, and paste into either **Microsoft Edge** or **Google Chrome** web browser
  - If you have issues with the sound, check your speaker settings



Purpose for Certification

Why Require Concrete Field-Testing Technician Certification?

- To assure quality PCC pavements and structures
- Mandated by FHWA by June 2000
  - Effective April 6, 2002

Two Steps to Certification

- ACI Concrete Field-Testing Technician - Grade I
- PennDOT Concrete Field-Testing Technician

ACI Concrete Field-Testing Technician - Grade I

- Teaches the ASTM Testing Procedures for 7 Concrete Field Tests

7 ACI Concrete Field Tests

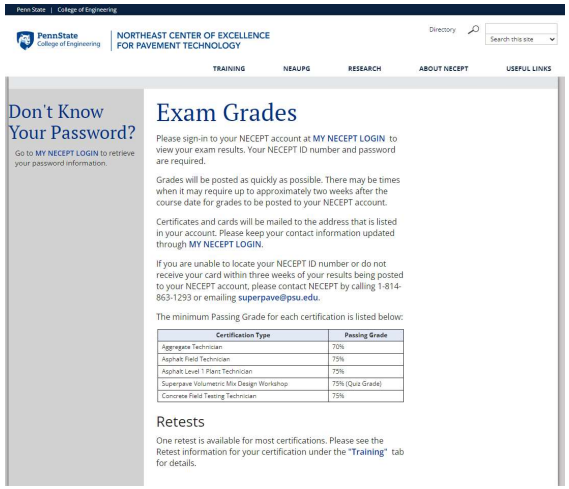
- Concrete Temperature
- Slump
- Plastic Air Content – Pressure Meter
- Plastic Air Content – Roll-a-Meter
- Molding Cylinders
- Unit Weight
- Yield

PENNDOT Certification Course

- Teaches Topics Related to PennDOT Specifications and Testing Procedures
  - Exam
    - 50 Multiple Choice – True / False Questions
    - 75% or More to Pass
    - 1 Hour
    - Must be Submitted

For Exam Grades

http://www.superpave.psu.edu/Training/Exam-Grades/Exam-Grades.aspx



Exam Grades are posted in 2-3 Weeks

Publication 536 (V9-22)

Concrete Technician Certification Program

- Technician-in-Training Requirements
- Initial Certification Requirements
- Re-certification Requirements
- Retest Procedures
- Code of Ethics

Manual page 137

Publication 536

Technician-in-Training Requirements

- 24 Hrs Minimum Training
- Evaluated by PennDOT Representative
  - Must retain copy of evaluation
  - Valid for one year
  - Must take ACI and PennDOT courses as soon as possible and within one year

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Publication 536

Re-Certification Requirements

- All certifications are valid for approx. 5 years, expiring April 30.
  - For courses January – April, the cert will be 5 years + remaining days to April 30
  - For courses/retests May 1 through end of retest period, cert will be slightly less than 5 years to April 30

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Publication 536

Retest Procedures

- Applicant may attend a maximum of 2 courses and take a maximum of 1 retest
  - Only 3 retests available,
    - 3/23/2027
    - 4/08/2027
    - 5/13/2027
- Clarified applicant's responsibility to contact NECEPT for retest
  - No refunds for failing to contact NECEPT within the current NECEPT training season

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Publication 536

Code of Ethics

- A PENNDOT Certified Concrete Field Technician will not create or participate in a threatening, intimidating, or hostile environment toward any recipients of services, including Department Representatives

Publication 536
Wallet Card

- Must present current card if involved with testing concrete on a PennDOT project
  - FHWA requirement

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

ANY QUESTIONS
ON THE
CERTIFICATION PROCESS ??

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

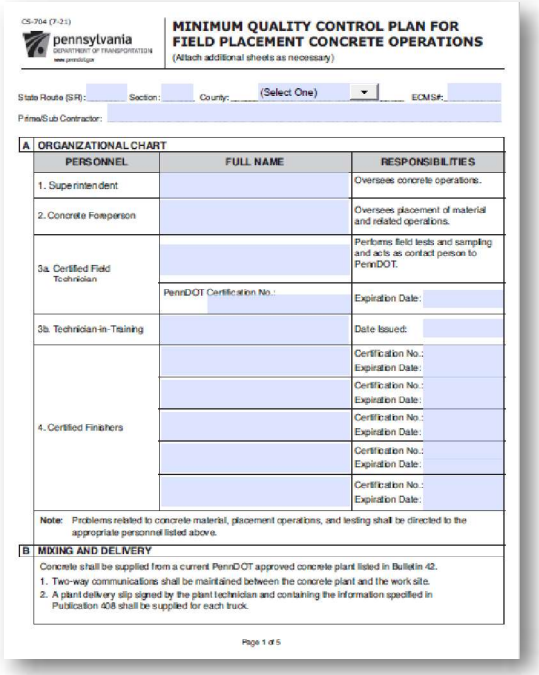
Five Course Sections

- Review of ASTM Testing
- Quality Control Practices
- Project Documentation
- Acceptance Processes
- PENNDOT Concrete Testing Procedures

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

VIDEO OF ACI
TEST
METHODS

- What hat do you wear on the job ?



CS-704 (7-21)

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.penndot.gov

MINIMUM QUALITY CONTROL PLAN FOR FIELD PLACEMENT CONCRETE OPERATIONS
(Attach additional sheets as necessary)

State Route (SR): Section: County: (Select One) ECMS#:
Prime/Sub Contractor:

A ORGANIZATIONAL CHART

PERSONNEL	FULL NAME	RESPONSIBILITIES
1. Superintendent		Oversees concrete operations.
2. Concrete Foreperson		Oversees placement of material and related operations.
3a. Certified Field Technician		Performs field tests and sampling and acts as contact person to PennDOT.
	PennDOT Certification No.:	Expiration Date:
3b. Technician-in-Training		Date Issued:
4. Certified Finishers		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:

Note: Problems related to concrete material, placement operations, and testing shall be directed to the appropriate personnel listed above.

B MIXING AND DELIVERY

Concrete shall be supplied from a current PennDOT approved concrete plant listed in Bulletin 42.
1. Two-way communications shall be maintained between the concrete plant and the work site.
2. A plant delivery slip signed by the plant technician and containing the information specified in Publication 408 shall be supplied for each truck.

Page 1 of 5

I. QUALITY CONTROL PRACTICES

Manual page 6

I. QUALITY CONTROL PRACTICES

A good quality control system helps assure all materials and products submitted to the Department are in compliance with all specification requirements

I. QUALITY CONTROL PRACTICES

- Quality must be “built in”
- It cannot be tested or inspected into a product
- Adherence to “good concrete practices” helps eliminate many common problems in the field

I.a. Quality Control Plans

- No "out-of-spec" material will knowingly be incorporated into the work
  - It is the contractor's responsibility to reject concrete not meeting specification requirements
  - Action and Rejection points are to be addressed in QC Plan

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.a. Quality Control Plans

- Addresses actions needed to keep the process in control
- Provides a quick determination when the process trends out of control
- Provides an adequate response to bring the process back in control in a timely manner without harming the final product

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

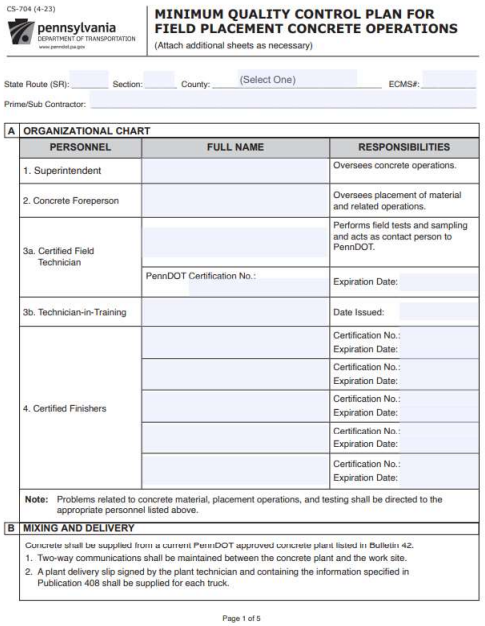
I.a. Quality Control Plans

- Form CS-704 – Field Operations QC Plan
  - Required by 408/704.1(d)1.a
  - Outlines Minimum QC Plan requirements
  - Found in the P.O.M. or on the internet with PennDOT Forms and Publications

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.a. Quality Control Plans

- Form CS-704 – Field Operations QC Plan
  - Addresses Concrete testing in accordance with Section 704
  - Must be submitted at least *3 weeks* prior to first concrete pour
  - Is NOT to be used as a substitute for the more comprehensive QC Plans required within Section 500



CS-704 (4-23)

pennsylvania DEPARTMENT OF TRANSPORTATION

MINIMUM QUALITY CONTROL PLAN FOR FIELD PLACEMENT CONCRETE OPERATIONS

(Attach additional sheets as necessary)

State Route (SR): _____ Section: _____ County: (Select One) ECMS#: _____

Prime/Sub Contractor: _____

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PERSONNEL	FULL NAME	RESPONSIBILITIES
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	PennDOT Certification No.:	Expiration Date:
3b. Technician-in-Training		Date Issued:
4. Certified Finishers		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:
		Certification No.: Expiration Date:

Note: Problems related to concrete material, placement operations, and testing shall be directed to the appropriate personnel listed above.

B MIXING AND DELIVERY

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1. Two-way communications shall be maintained between the concrete plant and the work site.
2. A plant delivery slip signed by the plant technician and containing the information specified in Publication 408 shall be supplied for each truck.

Page 1 of 5

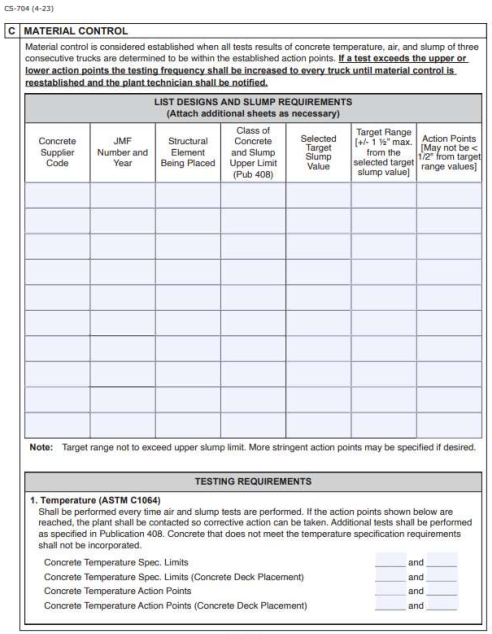
Part A and B

Organization Chart

And

Mixing and Delivery

Manual page 7



CS-704 (4-23)

C MATERIAL CONTROL

Material control is considered established when all tests results of concrete temperature, air, and slump of three consecutive trucks are determined to be within the established action points. **If a test exceeds the upper or lower action points the testing frequency shall be increased to every truck until material control is reestablished and the plant technician shall be notified.**

LIST DESIGNS AND SLUMP REQUIREMENTS
(Attach additional sheets as necessary)

Concrete Supplier Code	JMF Number and Year	Structural Element Being Placed	Class of Concrete and Slump Upper Limit (Pub 408)	Selected Target Slump Value	Target Range [+/- 1 ½" max. from the selected target slump value]	Action Points [May not be < 1/2" from target range values]

Note: Target range not to exceed upper slump limit. More stringent action points may be specified if desired.

TESTING REQUIREMENTS

1. Temperature (ASTM C1064)

Shall be performed every time air and slump tests are performed. If the action points shown below are reached, the plant shall be contacted so corrective action can be taken. Additional tests shall be performed as specified in Publication 408. Concrete that does not meet the temperature specification requirements shall not be incorporated.

Concrete Temperature Spec. Limits _____ and _____

Concrete Temperature Spec. Limits (Concrete Deck Placement) _____ and _____

Concrete Temperature Action Points _____ and _____

Concrete Temperature Action Points (Concrete Deck Placement) _____ and _____

Page 2 of 5

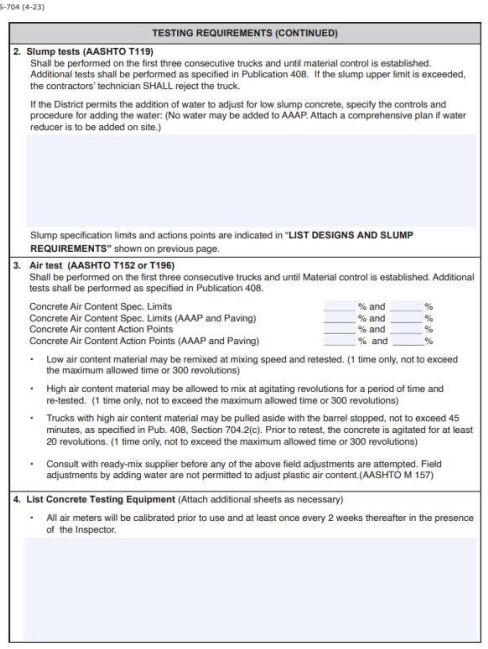
Part C

Mix Designs/Slump Requirements

Testing Requirements

Temperature

Manual page 8



CS-704 (4-23)

TESTING REQUIREMENTS (CONTINUED)

2. Slump tests (AASHTO T119)

Shall be performed on the first three consecutive trucks and until material control is established. Additional tests shall be performed as specified in Publication 408. If the slump upper limit is exceeded, the contractors' technician SHALL reject the truck.

If the District permits the addition of water to adjust for low slump concrete, specify the controls and procedure for adding the water: (No water may be added to AAAP. Attach a comprehensive plan if water reducer is to be added on site.)

Slump specification limits and actions points are indicated in "**LIST DESIGNS AND SLUMP REQUIREMENTS**" shown on previous page.

3. Air test (AASHTO T152 or T196)

Shall be performed on the first three consecutive trucks and until Material control is established. Additional tests shall be performed as specified in Publication 408.

Concrete Air Content Spec. Limits _____ % and _____ %

Concrete Air Content Spec. Limits (AAAP and Paving) _____ % and _____ %

Concrete Air content Action Points _____ % and _____ %

Concrete Air Content Action Points (AAAP and Paving) _____ % and _____ %

- Low air content material may be remixed at mixing speed and retested. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- High air content material may be allowed to mix at agitating revolutions for a period of time and re-tested. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- Trucks with high air content material may be pulled aside with the barrel stopped, not to exceed 45 minutes, as specified in Pub. 408, Section 704.2(c). Prior to retest, the concrete is agitated for at least 20 revolutions. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- Consult with ready-mix supplier before any of the above field adjustments are attempted. Field adjustments by adding water are not permitted to adjust plastic air content.(AASHTO M 157)

4. List Concrete Testing Equipment (Attach additional sheets as necessary)

- All air meters will be calibrated prior to use and at least once every 2 weeks thereafter in the presence of the Inspector.

Page 3 of 5

Part C

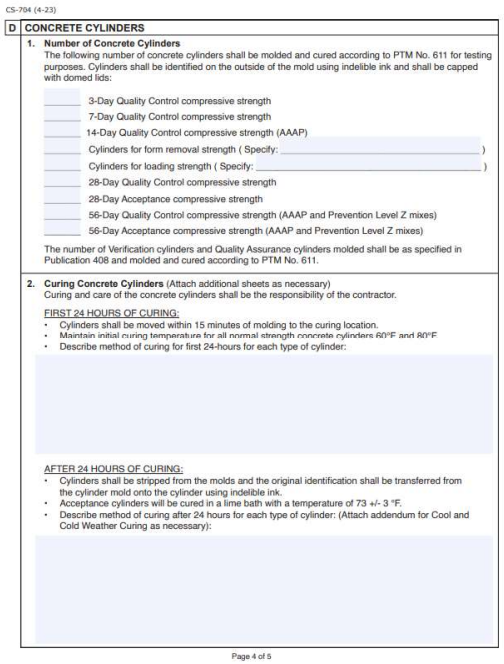
Testing Requirements Continued

Slump Tests – Addition of Water

Air Tests

Concrete Equipment

Manual page 9



CS-704 (4-23)

D CONCRETE CYLINDERS

1. Number of Concrete Cylinders

The following number of concrete cylinders shall be molded and cured according to PTM No. 611 for testing purposes. Cylinders shall be identified on the outside of the mold using indelible ink and shall be capped with domed lids:

_____ 3-Day Quality Control compressive strength

_____ 7-Day Quality Control compressive strength

_____ 14-Day Quality Control compressive strength (AAAP)

_____ Cylinders for form removal strength (Specify: _____)

_____ Cylinders for loading strength (Specify: _____)

_____ 28-Day Quality Control compressive strength

_____ 28-Day Acceptance compressive strength

_____ 56-Day Quality Control compressive strength (AAAP and Prevention Level Z mixes)

_____ 56-Day Acceptance compressive strength (AAAP and Prevention Level Z mixes)

The number of Verification cylinders and Quality Assurance cylinders molded shall be as specified in Publication 408 and molded and cured according to PTM No. 611.

2. Curing Concrete Cylinders (Attach additional sheets as necessary)

Curing and care of the concrete cylinders shall be the responsibility of the contractor.

FIRST 24 HOURS OF CURING:

- Cylinders shall be moved within 15 minutes of molding to the curing location.
- Maintain initial curing temperature for all normal strength concrete cylinders 60°F and 80°F.
- Describe method of curing for first 24-hours for each type of cylinder:

AFTER 24 HOURS OF CURING:

- Cylinders shall be stripped from the molds and the original identification shall be transferred from the cylinder mold onto the cylinder using indelible ink.
- Acceptance cylinders will be cured in a lime bath with a temperature of 73 +/- 3 °F.
- Describe method of curing after 24 hours for each type of cylinder: (Attach addendum for Cool and Cold Weather Curing as necessary):

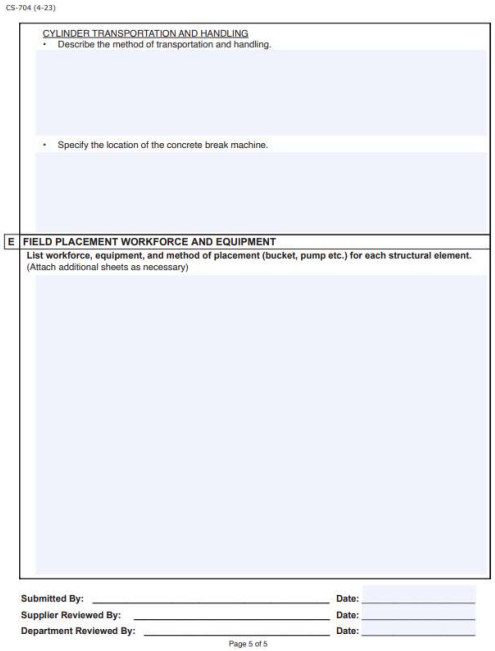
Page 4 of 5

Part D

No. of Concrete Cylinders

Curing of Concrete Cylinders

Manual page 10



CS-704 (4-23)

CYLINDER TRANSPORTATION AND HANDLING
- Describe the method of transportation and handling.

- Specify the location of the concrete break machine.

E FIELD PLACEMENT WORKFORCE AND EQUIPMENT
List workforce, equipment, and method of placement (bucket, pump etc.) for each structural element.
(Attach additional sheets as necessary)

Submitted By: _____ Date: _____
Supplier Reviewed By: _____ Date: _____
Department Reviewed By: _____ Date: _____
Page 5 of 5

Part D and E

Cylinder Transportation and Handling

Manpower and Equipment

Signatures of Submitted by and Reviewed by

Manual page 11

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.a. Quality Control Plans

- Address potential issues that commonly arise in the QC Plan:
  - Prior to the start of work
  - The course of action to be taken will be clearly defined
  - Provide a timely problem resolution
  - No interruption in the concrete placement operation

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.b. Transporting, Mixing, & Placing Concrete

Truck Mixed Concrete

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.b. Transporting, Mixing, & Placing Concrete

- Truck-Mixed Concrete
  - 70 to 125 revolutions at mixing speed (6-18 rpm) prior to leaving the plant
  - Mixed at agitating speed (2-6 rpm) in route to the project
  - Agitate **20** additional revolutions at jobsite prior to placement

Manual pages 12 & 13

I.b. Transporting, Mixing, & Placing Concrete

- Truck-Mixed Concrete
  - No more than *45 minutes* of non-agitation
  - Discharged in less than *300 revolutions* and *1 ½ hours.* ***2 hours with a Retarding Admix***
  - Discharged in *1 hour* if concrete exceeds 80 ^{0}F unless concrete has a set retarding admixture. ***1 ½ hours with a Retarding Admix***
  - No contact with aluminum

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.b. Transporting, Mixing, & Placing Concrete

Central Mix Plant

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.b. Transporting, Mixing, & Placing Concrete

- Central-Mixed Concrete
  - 50 to 90 sec. for most
  - 70 sec. minimum for HES
  - Counted at the plant
  - Mix at <u>agitating speed only</u> in route to the project, if possible
  - Agitate **20** additional revolutions at jobsite prior to placement

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.b. Transporting, Mixing, & Placing Concrete

- Central-Mixed Concrete
  - No more than *45 minutes* of non-agitation
  - Discharged in *1 ½ hours* if delivered in trucks *with agitation without a retarding admix.* ***2 hours for mixes with a Retarding Admix***
  - Discharged in *1 hour* if concrete exceeds 80 ^{0}F unless concrete has a set retarding admixture. ***1 ½ hours with a Retarding Admix***

I.b. Transporting, Mixing, & Placing Concrete

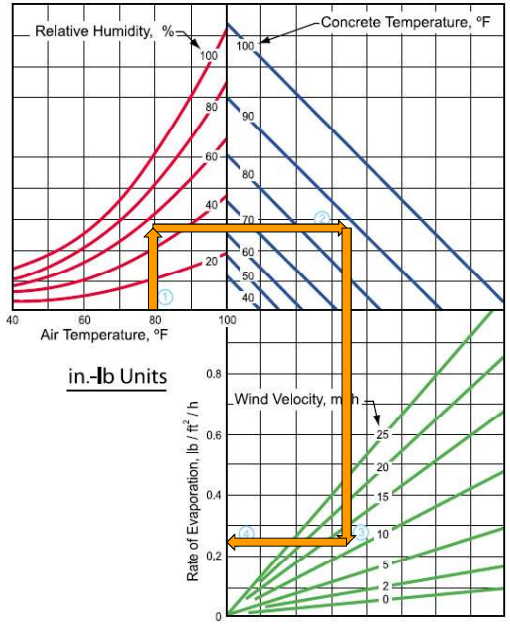
- Central-Mixed Concrete
  - Discharged in *45 minutes* if delivered in trucks without agitation
  - No contact with aluminum unless delivered in trucks without agitation

I.b. Transporting, Mixing, & Placing Concrete

- Concrete Temperatures
  - *50* °F *to 90* °F for most applications
  - Bridge decks *50* °F to *80* °F
  - Accelerated Concrete *50* °F to *100* °F
  - For special applications, refer to special provisions
  - Action points should allow enough time for corrections

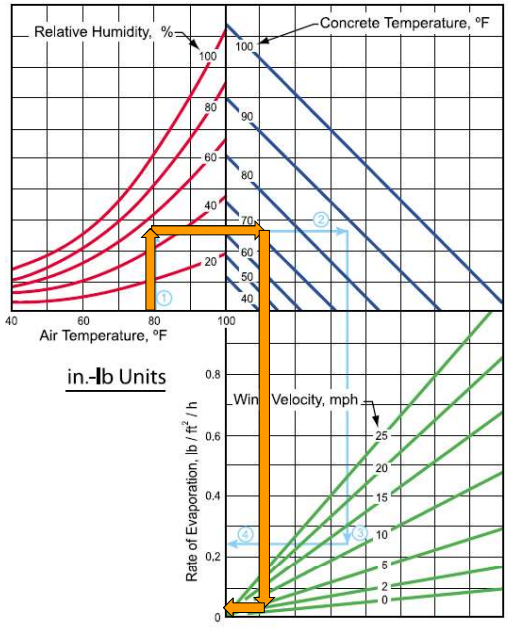
I.b. Transporting, Mixing, & Placing Concrete

- Evaporation Rate
  - Provide equipment to monitor before deck and roadway placements and every hour during placement
  - Cannot exceed 0.06 lbs/ft^2/hr (Decks)
  - Cannot exceed 0.20 lbs/ft^2/hr (Roadway)
  - If exceeded, stop the placement until protective measures are taken



- Evaporation Rate
  - Ambient Air Temp 80° F
  - Relative Humidity – 50%
  - Conc. Temp. - 87° F
  - Wind Velocity – 12 mph
  - Evaporation Rate – 0.24 lb/ft^2/hr

Ref. Concrete International / MARCH 2007



- Evaporation Rate

- Ambient Air Temp 80° F
- Relative Humidity – 50%
- Conc. Temp. - 73° F
- Wind Velocity – 2 mph

- Evaporation Rate – 0.03 lb/ft^2/hr

/ MARCH 2007

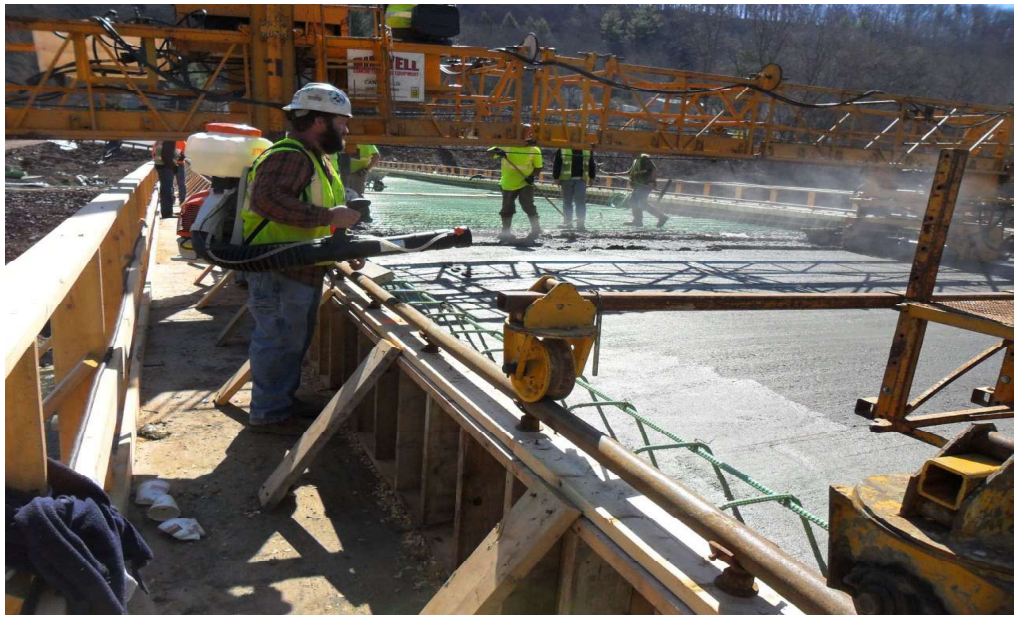
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Kestrel® 4300 Construction Weather Tracker

Kestrel 4300 Measures
- Evaporation rate
- Relative humidity
- Current, maximum and average Wind Speed
- Ambient Air Temperature
- Dewpoint
- Barometric pressure
- Heat stress index
- Wet bulb temperature
- Wind chill
- Altitude
- Density altitude

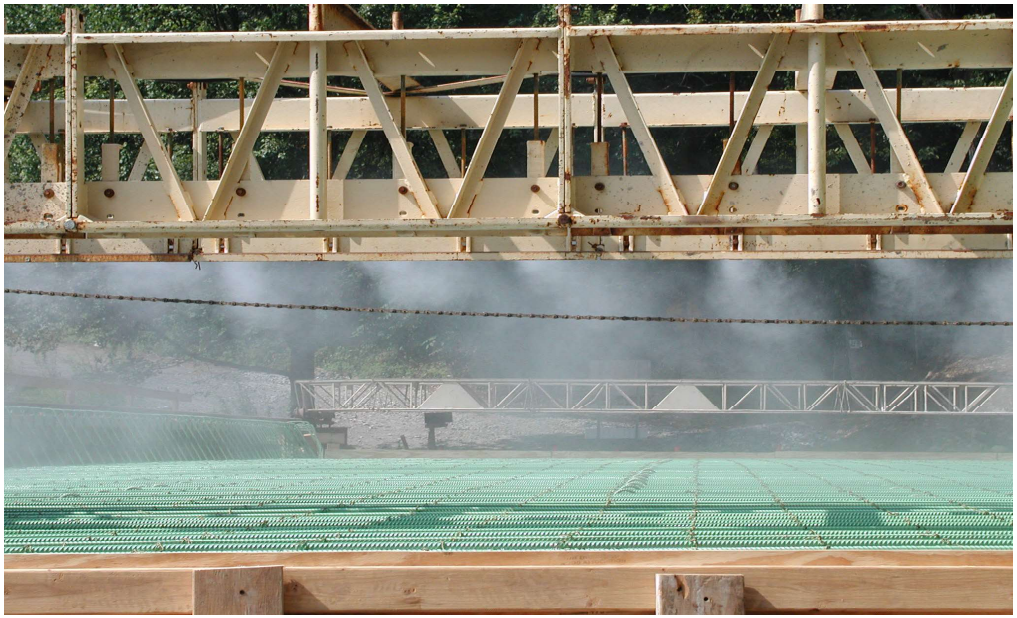
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Remediation Equipment used to reduce the Evaporation Rate

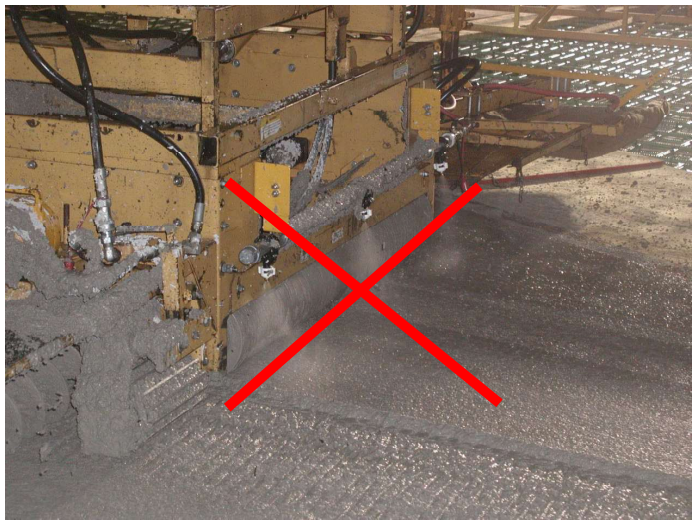


PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Remediation Equipment used to reduce the Evaporation Rate



Remediation Equipment used to reduce the Evaporation Rate



Improper positioning of Spray Nozzles

Water cannot be added to the surface of the concrete

I.c. Communication Between Jobsite and Plant

Good Communication Starts Early

- Involve all parties (PennDOT, prime, subs, and producer)
- Pre-job meeting – discusses parameters and anticipated schedule of the project
- Pre-placement meeting – discusses actual placement issues, responsibilities, QC Plan (Contractor's technician should attend)
- Get everyone involved on the same page prior to the placement!

I.c. Communication Between Jobsite and Plant

Importance of Communication

- Maintain Quality Control on the project
- Inform Producer of compliance or non-compliance of material
- Allow Producer to make necessary adjustments
- Communication between jobsite and plant can minimize problems and ensure a quality product

Mix Design with 6.0% Air/Max. Slump 6.5"

Truck #1 – Air Content 6.0%/Slump 3"

Truck #2 – Air Content 5.2%/Slump 2.5"

Truck #3 – Air Content 4.6%/Slump 2"

Truck #4 – ?????????

What will Truck #4 be?

Mix Design with 6.0% Air/Max. Slump 6.5”

Truck #1 – Air Content 6.0%/Slump 3”

Truck #2 – Air Content 5.2%/Slump 2.5”

Truck #3 – Air Content 4.6%/Slump 2”

Truck #4 – ?????????

What will Truck #4 be?

Without proper communication from the start, Truck #4 will most likely be out of spec!

Project / Plant Communication

- Two-way Radio (R/M Truck)

- Cellular Phone

- Regular Phone

Other Factors on Jobsite That May Require Communication to Plant

- Equipment breakdowns
- Weather conditions
- Medical emergencies
- New/different test equipment
- Changing traffic conditions between jobsite and plant

I.d. Common Sense Quality Control in the Field

- QC Test Frequency
  - Establish in QC Plan
  - Minimum frequencies in Specifications
- **Test each load until Material Control is established [704.1(d)4.a]**

I.d. Common Sense Quality Control in the Field

- Material Control (Uniformity)
  - Established when all tests for concrete slump, air, and temperature on 3 consecutive trucks are within the established action points
  - Frequency of QC testing can be reduced to once every 50 cubic yards as long as material is within specification and established action points

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.d. Common Sense Quality Control in the Field

- Material Control (Uniformity)
  - If a QC test fails to conform to the specified requirements or exceeds the upper or lower action points included in the reviewed QC Plan, increase the testing frequency to every truck until material control has been reestablished

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.d. Material Control Example

C MATERIAL CONTROL

Material control is considered established when all tests results of concrete temperature, air, and slump of three consecutive trucks are determined to be within the established action points. **If a test exceeds the upper or lower action points the testing frequency shall be increased to every truck until material control is reestablished and the plant technician shall be notified.**

LIST DESIGNS AND SLUMP REQUIREMENTS (Attach additional sheets as necessary)

Concrete Supplier Code	JMF Number and Year	Structural Element Being Placed	Class of Concrete and Slump Upper Limit (Pub 408)	Selected Target Slump Value	Target Range [+/- 1 ½" max. from the selected target slump value]	Action Points [May not be < 1/2" from target range values]
RCM02A42	18-555	Pavment Patching	AA / 6 1/2"	4"	2 1/2" - 5 1/2"	3" - 5"

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

I.d. Material Control Example

4" Target Slump, Range 2.5" – 5.5", AP – 3" / 5"

Truck #1 has a Slump 4.75"

I.d. Material Control Example

4" Target Slump, Range 2.5" – 5.5", AP – 3" / 5"

Truck #1 – Slump 4.75"

Truck #2 – Slump 5.00"

I.d. Material Control Example

4" Target Slump, Range 2.5" – 5.5", AP – 3" / 5"

Truck #1 – Slump 4.75"

Truck #2 – Slump 5.00"

Truck #3 – Slump 5.25"

I.d. Material Control Example

4" Target Slump, Range 2.5" – 5.5", AP – 3" / 5"

Truck #1 – Slump 4.75"

Truck #2 – Slump 5.00"

Truck #3 – Slump 5.25"

Has material control been established, and can the frequency of QC testing be reduced to once every 50 cubic yards?

I.d. Material Control Example

4" Target Slump, Range 2.5" – 5.5", AP – 3" / 5"

Truck #1 – Slump 4.75"

Truck #2 – Slump 5.00"

Truck #3 – Slump 5.25" ⟵

No !! The third QC test exceeds the upper action point of 5" so testing must be continued until material control has been established

I.d. Material Control Example

Remember that *any* time a QC test fails to conform to the specified requirements or exceeds the upper or lower action points included in the reviewed QC Plan, increase the testing frequency to every truck until material control has been reestablished

I.d. Material Control Example

TESTING REQUIREMENTS			
1. Temperature (ASTM C1064) Shall be performed every time air and slump tests are performed. If the action points shown below are reached, the plant shall be contacted so corrective action can be taken. Additional tests shall be performed as specified in Publication 408. Concrete that does not meet the temperature specification requirements shall not be incorporated.			
Concrete Temperature Spec. Limits	50	and	90
Concrete Temperature Spec. Limits (Concrete Deck Placement)	50	and	80
Concrete Temperature Action Points	55	and	85
Concrete Temperature Action Points (Concrete Deck Placement)	55	and	75

I.d. Material Control Example

3. Air test (AASHTO T152 or T196)
Shall be performed on the first three consecutive trucks and until Material control is established. Additional tests shall be performed as specified in Publication 408.

Concrete Air Content Spec. Limits	4.5	% and	7.5	%
Concrete Air Content Spec. Limits (AAAP and Paving)	5.5	% and	8.5	%
Concrete Air content Action Points	5.0	% and	7.0	%
Concrete Air Content Action Points (AAAP and Paving)	6.0	% and	8.0	%

- Low air content material may be remixed at mixing speed and retested. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- High air content material may be allowed to mix at agitating revolutions for a period of time and re-tested. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- Trucks with high air content material may be pulled aside with the barrel stopped, not to exceed 45 minutes, as specified in Pub. 408, Section 704.2(c). Prior to retest, the concrete is agitated for at least 20 revolutions. (1 time only, not to exceed the maximum allowed time or 300 revolutions)
- Consult with ready-mix supplier before any of the above field adjustments are attempted. Field adjustments by adding water are not permitted to adjust plastic air content.(AASHTO M 157)

I.e. Pub 408/704 Slump Quality Control Requirements

- Slump provides a measure of the workability of a selected mix
- Slump also provides an indication of the consistency of the concrete delivered to the project

I.e. Pub 408/704 Slump Specification Summary

- Contractor selects an appropriate target slump for each structural element (in QC Plan)
- Slump must be maintained within *± 1.5 inches* of the selected target value

C MATERIAL CONTROL

Material control is considered established when all tests results of concrete temperature, air, and slump of three consecutive trucks are determined to be within the established action points. **If a test exceeds the upper or lower action points the testing frequency shall be increased to every truck until material control is reestablished and the plant technician shall be notified.**

LIST DESIGNS AND SLUMP REQUIREMENTS
(Attach additional sheets as necessary)

Concrete Supplier Code	JMF Number and Year	Structural Element Being Placed	Class of Concrete and Slump Upper Limit (Pub 408)	Selected Target Slump Value	Target Range [+/- 1 ½" max. from the selected target slump value]	Action Points [May not be < 1/2" from target range values]
RCM02A42	18-555	Pavment Patching	AA / 6 1/2"	4"	2 1/2" - 5 1/2"	3" - 5"

I.e. Pub 408/704 2020 IE Slump Specification Summary

- **Specification provides an upper limit that cannot be exceeded**

Type of Mix	*Upper Limit*
Without WR	5″
With WR	6 ½″
With HRWR (Super Plasticizers)	8″
Extra Cement Mixes [Section 704.1(h)]	2 ½″
Tremie Mixes [Section 1001.2(j)]	8″
AAAP	5 ½″
AAAP LW	6″

I.f. Field Adjustment of Concrete Mixes

PennDOT's policy for making field adjustments of concrete mixes to improve workability by adding water at the jobsite is defined in *P.O.M. B/6/17*

– **District's decision to allow**

REPLACES	PENNSYLVANIA DEPARTMENT OF TRANSPORTATION	PART	SECTION	PAGE
B.6.17		B	6	17-1
DATED 04/01/2020	PROJECT OFFICE MANUAL	DATE April 1, 2024		
SUBJECT FIELD ADJUSTMENT OF CONCRETE MIXES				

As specified in Publication 408, Section 704, water may only be added to concrete mixes from a concrete plant's water measuring system. However, due to errors that may occur in the moisture content of the aggregates at the start of a batching operation or due to unforeseen circumstances at or in route to a jobsite, the need may arise to add water to correct the slump of the mix at the project site.

The decision to add water to a mix at a project site must be made by the contractor's PennDOT certified field testing technician. The Department Representative will determine the maximum amount of water that can be added. The addition of water must be done under the supervision of the Department Representative.

Water may only be added to trucks at the start of the batching operation or due to unforeseen circumstances that may occur during the concrete placement. The producer should be informed immediately whenever field adjustments are required. Allow the producer sufficient time to make necessary adjustments at the plant. Concrete shall be mixed to the approved proportions in the design. Water shall not be withheld deliberately.

The addition of water is limited to 1 gallon per cubic yard of concrete in the truck, and the total water in the mix cannot exceed the maximum water/cement ratio of the trial mix on the design. The addition of water is only permitted to be added at the beginning of the full load after the initial testing is complete. All mix adjustments must be recorded in the iPad App eConcrete. After the additional water has been loaded into the mixing drum, the drum must be turned an additional 30 revolutions or more at mixing speed. The total number of mixing revolutions cannot exceed 300. The concrete must be resampled and retested for slump, temperature, and plastic air content and meet the specification requirements prior to incorporating into the work. In addition, compressive strength cylinders must be molded from the retested material.

Transit truck mixers must be inspected annually, including the truck-mounted water systems, and documentation (See Form CS-4337) must be presented to the Inspector prior to adjusting the mix.

Specific details regarding the field adjustment of concrete mixes must be included in the contractor's concrete quality control plan. Districts that do not currently permit the field adjustment of concrete mixes may continue this policy.

This policy is not intended for use with Bridge Decks. For Bridge Decks, do not add water to concrete in the field. Adjustment of slump may be allowed by adding water reducer at the job site if a comprehensive procedure detailed in the QC plan has been submitted and accepted by the DME/DMM for this purpose as specified in Publication 408, Section 1001.3(h).

April 2023 Edition

POM B/6/17
Field Adjustment of Concrete Mixes

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I.f. Field Adjustment of Concrete Mixes

- The intent of this policy is to allow for corrections at the beginning of a placement or for unforeseen circumstances that may occur during the placement
- It is *NOT* intended for a repetitive means of controlling workability at the jobsite

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I.f. Field Adjustment of Concrete Mixes

- Failure to effectively communicate the problem to the producer from the jobsite and failure of the producer to make necessary adjustments will be grounds for discontinuing this policy
- Failure to provide concrete with a slump within the selected target range is grounds for the contractor to reject

76

I.f. Field Adjustment of Concrete Mixes

- Must have permission of the DME
- Inspector confirms District's policy and determines amount of water that can be added and supervises addition of water
- Detail the process in the QC plan

77

Manual page 18

I.f. Field Adjustment of Concrete Mixes

- Producer must NOT withhold water deliberately
- Communicate results and necessary adjustments immediately to the producer
  - Can make necessary adjustments at the plant (check moistures, increase WR, switch to another adjusted mix)

Until such time as ready-mixed concrete meets acceptance criteria, it is still the property of the ready-mix producer

Remember . . .

Consult with Ready-Mix Supplier before any field adjustments are attempted

Rules for the Addition of Water in the Field

- A maximum of *1 gallon* of water per CY concrete in truck
  - A ½" of slump change ≈ 1% air content change
- Must never exceed maximum Design W/C ratio for the mix
- Must be using a mixer-truck

Rules for the Addition of Water in the Field

- Water can only be added upon arrival at the job site and the tested slump of the concrete is less than the target range
- Water is only permitted to be added at the beginning of the full load after initial testing
- Water ***shall not*** be added to the load at any other time

Rules for the Addition of Water in the Field

- For bridge decks, **do not** add water to concrete in the field
- Add water according to reviewed QC plan
- Additional *30* revolutions (mixing)
- Cannot exceed *300* revolutions
- Must be re-sampled and re-tested
- If used, must make full set of cylinders from each load

I.g. Slump Adjustments at the Jobsite

Low Slump: (below contractor's target range)

- *Contractor's technician* may reject the material
- Re-mix at mixing speed & retest
- Add water (if approved) per PennDOT Policy, P.O.M. B/6/17, mix & retest

I.g. Slump Adjustments at the Jobsite

Low Slump (below contractor's target range)

- If the concrete is incorporated into the work, cast a full set of AT & QC cylinders in addition to the cylinders made for the originally selected PTM 1 sample location
  - Required when any slump result is outside the target range and the concrete is incorporated into the work, whether water is added or not
- Adjustment details must be in QC Plan
- <u>Consult with Ready-Mix Supplier before any field adjustments are attempted</u>

I.g. Slump Adjustments at the Jobsite High Slump

- If slump exceeds the target range, but not the upper slump limit, you may place concrete:
  - You must cast a Full set of AT & QC cylinders in addition to the cylinders made for the originally selected PTM 1 sample location
- The contractor's technician may also elect to reject the concrete

I.g. Slump Adjustments at the Jobsite High Slump

- If slump exceeds upper slump limit per PennDOT slump spec, the contractor's technician will reject the concrete

I.h. Air Content Adjustments at the Jobsite

Air Content:

- *6.0% ± 1.5%*
  (4.5% to 7.5%) for most applications
- *7.0% ± 1.5%*
  (5.5% to 8.5%) for AAAP and AA mixes (bridge decks and paving mixes)
- Check for contract special provisions

I.h. Air Content Adjustments at the Jobsite

Low Air Content

- Re-mix at mixing speed & retest
- The contractor's technician will reject material if unsuccessful
- **Field adjustments by adding water are NOT permitted to adjust plastic air content (AASHTO M 157)**

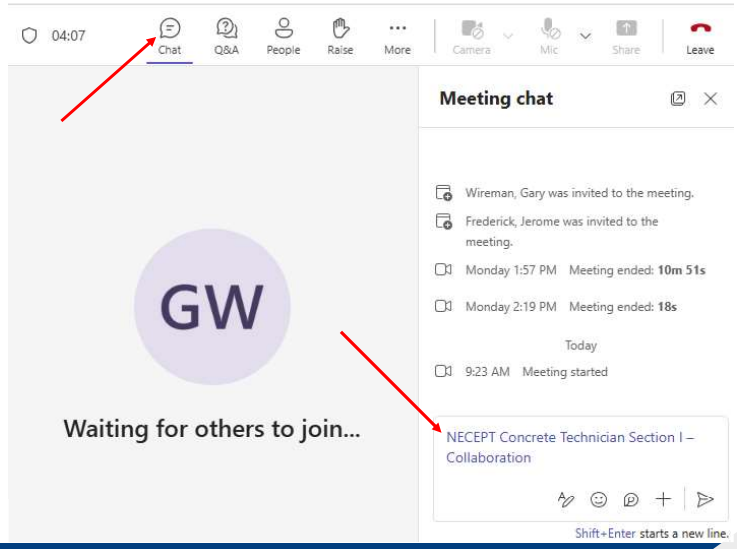
I.h. Air Content Adjustments at the Jobsite

High Air Content

- Mix on agitation (slow) speed & retest
- Stop barrel, not to exceed 45 min. & retest
  - Must agitate barrel for at least 20 revolutions prior to obtaining sample
- If neither procedure is successful, the contractor's technician will reject material

I. QUALITY CONTROL PRACTICES

Review Questions

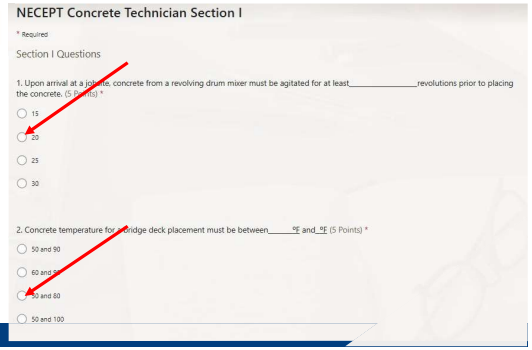


PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

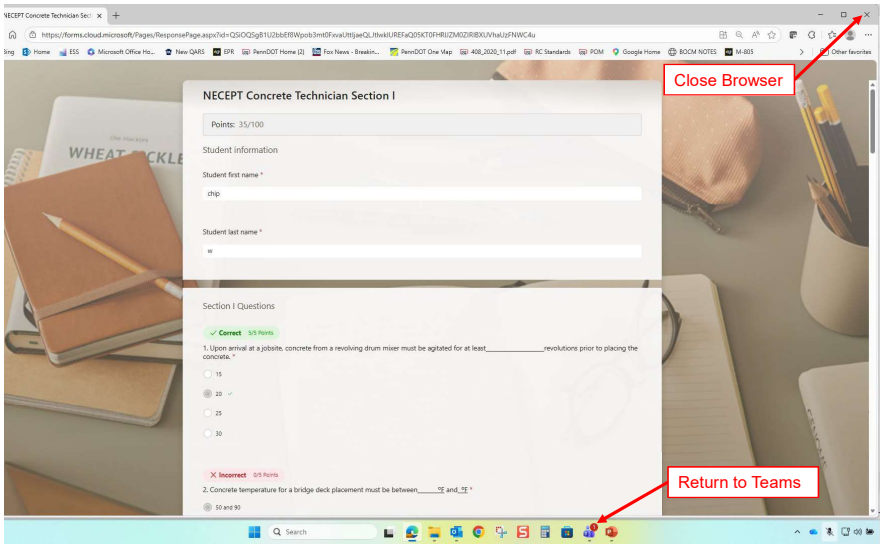
I. QUALITY CONTROL PRACTICES

Review Questions

- You must answer all the questions before you will be able to Submit!!



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



REMEMBER: After reviewing your answers, close the internet browser and return to Teams.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

1. Upon arrival at a jobsite, concrete from a revolving drum mixer must be agitated for at least **20** revolutions prior to placing the concrete.
2. Concrete temperature for a bridge deck placement must be between **50** °F and **80** °F.
3. The maximum allowable slump for a mix with a high range water reducing admixture is **8** inches.
4. For an accelerated concrete placement the concrete temperature is to be maintained between **50** °F and **100** °F.
5. The contractor's target range for slump is **±1 1/2** inches from the selected target value.
6. The contractor must provide a quality control plan as outlined on CS-704 to the Department at least 3 weeks prior to the first concrete placement.
   True / False
7. Central mixed concrete delivered in non-agitating vehicles must be completely discharged in **45** minutes.

8. If out of specification concrete is not brought into specification compliance, it should be rejected by the contractor's technician.
9. The Department permits water to be added to the mix at the jobsite to increase the air content of the mix. True / False

Only for slump (workability) when permitted by the District

10. If the mix arrives with a high plastic air content it must be rejected. True / False ***May be allowed to mix on agitating revolutions for a period of time or sit with barrel stopped not to exceed 45 minutes***
11. Where permitted by the district, water may be added at the jobsite to increase the slump for workability at a rate of one (1) gal/CY, not to exceed the maximum W/C ratio of the trial mix on the design.
12. If a slump test result for a mix with a water reducer exceeds the contractors specified target range for acceptance but is less than the 6 ½ inch maximum permitted by specification, the concrete must be rejected. True / False ***Contractor may elect to use the concrete provided an additional complete set of QC & AT cylinders are molded and tested for acceptance from the sample.***

13. Truck-mixed concrete must be discharged before the drum has revolved 300 revolutions.
14. A full set of QC and AT cylinders must be made if a contractor elects to use concrete with a slump test result that is outside the contractors specified target range for acceptance but is less than the maximum allowed by the specification. True / False

Contractor may elect to use the concrete provided an additional complete set of QC & AT cylinders are molded and tested for acceptance from the sample.

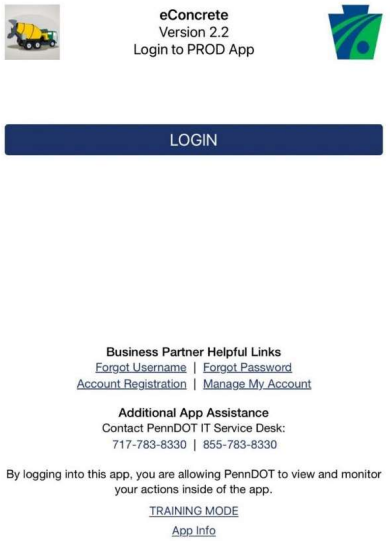
15. A contractor submits a Quality Control Plan in order to provide timely resolution to problems encountered during a concrete placement.
16. During a bridge deck placement if the evaporation rate exceeds 0.06 pounds per square foot per hour, the concrete placement should be stopped until protective measures are taken as specified in the QC Plan.

17. A 10 CY load of concrete arrives at a jobsite. The slump is within the contractor's selected target range and the plastic air content is tested and is 3.9%. How many gal/CY of water may be added to increase the air content to 4.5%?

NONE – Neither PennDOT nor AASHTO M 157 permits the addition of water to raise the air content

18. In general, communication between the jobsite and the plant can minimize problems on both ends of the project and ensure a quality product as an end result. True / False
19. Material control (uniformity) is established when all test results of concrete slump, air, and temperature on three (3) consecutive trucks are within the established action points.
20. The frequency of QC testing can be reduced to a minimum of once every 50 cubic yards as the placement progresses as long as the material is within specification requirements and established action points.

II. PROJECT DOCUMENTATION



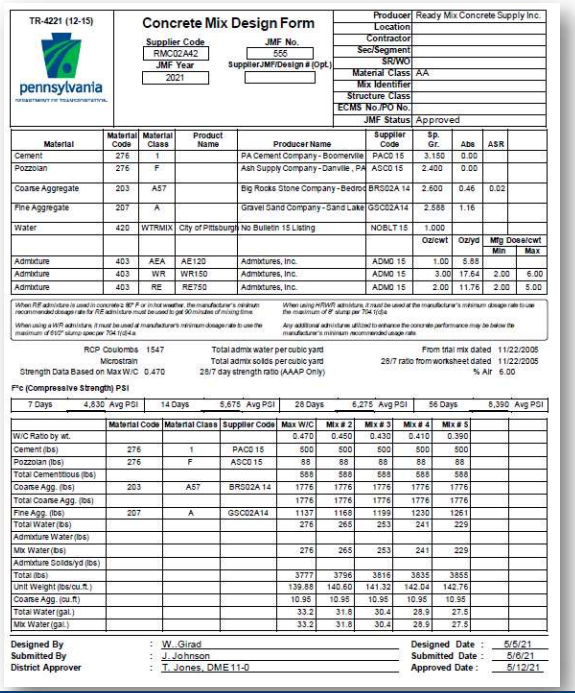
II. PROJECT DOCUMENTATION

The Concrete Technician should have the following documentation at the placement:

- Contractor Quality Control Plan (CS-704)
- Approved Mix Design (TR-4221)
- Batcher Mixer Slip (CS-4220)
- Concrete Delivery Ticket
- PennDOT Certification Card

Manual page 24

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



TR-4221 (12-15)

pennsylvania

Concrete Mix Design Form

Supplier Code	RMC02A42
JMF Year	2021
JMF No.	555
Supplier JMF/Design # (Opt.)	
Producer	Ready Mix Concrete Supply Inc.
Location	
Contractor	
Sec/Segment	
SR/WO	
Material Class	AA
Mix Identifier	
Structure Class	
ECMS No./PO No.	
JMF Status	Approved

Material	Material Code	Material Class	Product Name	Producer Name	Supplier Code	Sp. Gr.	Abs	ASR
Cement	276	1		PA Cement Company - Boomerville	PAC0 15	3.150	0.00	
Pozzolan	276	F		Ash Supply Company - Danville , PA	ASC0 15	2.400	0.00	
Coarse Aggregate	203	A57		Big Rocks Stone Company - Bedrock	BRS02A 14	2.600	0.46	0.02
Fine Aggregate	207	A		Gravel Sand Company - Sand Lake	GSC02A14	2.588	1.16	
Water	420	WTRMIX	City of Pittsburgh	No Bulletin 15 Listing	NOBLT 15	1.000		

Material	Material Code	Material Class	Product Name	Producer Name	Supplier Code	Oz/cwt	Oz/yd	Mfg Dose/cwt Min	Mfg Dose/cwt Max
Admixture	403	AEA	AE120	Admixtures, Inc.	ADM0 15	1.00	5.88		
Admixture	403	WR	WR150	Admixtures, Inc.	ADM0 15	3.00	17.64	2.00	6.00
Admixture	403	RE	RE750	Admixtures, Inc.	ADM0 15	2.00	11.76	2.00	5.00

When RF admixture is used in concrete ≥ 80° F or in hot weather, the manufacturer's minimum recommended dosage rate for RF admixture must be used to get 90 minutes of mixing time.

When using a WR admixture, it must be used at manufacturer's minimum dosage rate to use the maximum of 6½" slump spec per 704.1(d)4.a.

When using A/R/WR admixture, it must be used at the manufacturer's minimum dosage rate to use the maximum of 8" slump per 704.1(d)a

Any additional admixtures utilized to enhance the concrete performance may be below the manufacturer's minimum recommended usage rate.

RCP Coulombs 1547
Microstrain
Strength Data Based on Max W/C 0.470

Total admix water per cubic yard
Total admix solids per cubic yard
28/7 day strength ratio (AAAP Only)

From trial mix dated 11/22/2005
28/7 ratio from worksheet dated 11/22/2005
% Air 6.00

F'c (Compressive Strength) PSI

7 Days	4,830 Avg PSI	14 Days	5,675 Avg PSI	28 Days	6,275 Avg PSI	56 Days	6,390 Avg PSI

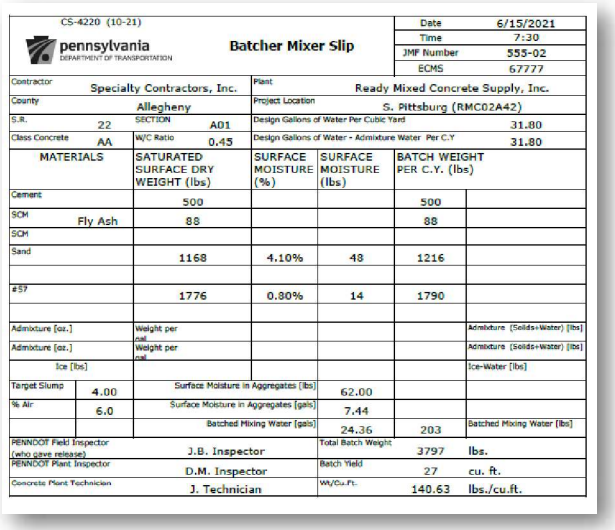
	Material Code	Material Class	Supplier Code	Max W/C	Mix # 2	Mix # 3	Mix # 4	Mix # 5	
W/C Ratio by wt.				0.470	0.450	0.430	0.410	0.390	
Cement (lbs)	276	1	PAC0 15	500	500	500	500	500	
Pozzolan (lbs)	276	F	ASC0 15	88	88	88	88	88	
Total Cementitious (lbs)				588	588	588	588	588	
Coarse Agg. (lbs)	203	A57	BRS02A 14	1776	1776	1776	1776	1776	
Total Coarse Agg. (lbs)				1776	1776	1776	1776	1776	
Fine Agg. (lbs)	207	A	GSC02A14	1137	1168	1199	1230	1261	
Total Water (lbs)				276	265	253	241	229	
Admixture Water (lbs)									
Mix Water (lbs)				276	265	253	241	229	
Admixture Solids/yd (lbs)									
Total (lbs)				3777	3796	3816	3835	3855	
Unit Weight (lbs/cu.ft.)				139.88	140.60	141.32	142.04	142.76	
Coarse Agg. (cu.ft)				10.95	10.95	10.95	10.95	10.95	
Total Water (gal.)				33.2	31.8	30.4	28.9	27.5	
Mix Water (gal.)				33.2	31.8	30.4	28.9	27.5	

Designed By : W. Girad — Designed Date : 5/5/21
Submitted By : J. Johnson — Submitted Date : 5/6/21
District Approver : T. Jones, DME 11-0 — Approved Date : 5/12/21

II.a. Concrete Mix Design

TR-4221

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



CS-4220 (10-21)

pennsylvania DEPARTMENT OF TRANSPORTATION

Batcher Mixer Slip

Date	6/15/2021
Time	7:30
JMF Number	555-02
ECMS	67777

Contractor	Specialty Contractors, Inc.	Plant	Ready Mixed Concrete Supply, Inc.
County	Allegheny	Project Location	S. Pittsburg (RMC02A42)
S.R. 22	Section A01	Design Gallons of Water Per Cubic Yard	31.80
Class Concrete AA	W/C Ratio 0.45	Design Gallons of Water - Admixture Water Per C.Y	31.80

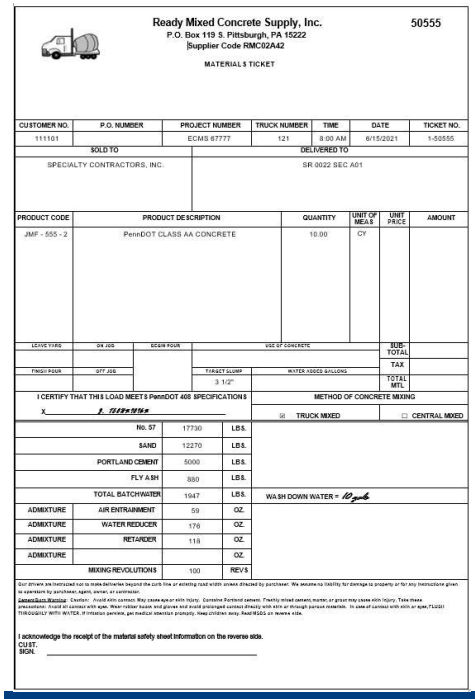
MATERIALS	SATURATED SURFACE DRY WEIGHT (lbs)	SURFACE MOISTURE (%)	SURFACE MOISTURE (lbs)	BATCH WEIGHT PER C.Y. (lbs)	
Cement	500			500	
SCM Fly Ash	88			88	
SCM					
Sand	1168	4.10%	48	1216	
#57	1776	0.80%	14	1790	
Admixture [oz.]	Weight per gal				Admixture (Solids+Water) [lbs]
Admixture [oz.]	Weight per gal				Admixture (Solids+Water) [lbs]
Ice [lbs]					Ice-Water [lbs]
Target Slump 4.00	Surface Moisture in Aggregates [lbs]		62.00		
% Air 6.0	Surface Moisture in Aggregates [gals]		7.44		
	Batched Mixing Water [gals]		24.36	203	Batched Mixing Water [lbs]

PENNDOT Field Inspector (who gave release)	J.B. Inspector	Total Batch Weight	3797	lbs.
PENNDOT Plant Inspector	D.M. Inspector	Batch Yield	27	cu. ft.
Concrete Plant Technician	J. Technician	Wt./Cu.Ft.	140.63	lbs./cu.ft.

II.b. Batcher-Mixer Slip

CS-4220

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



Ready Mixed Concrete Supply, Inc. 50555
P.O. Box 119 S. Pittsburgh, PA 15222
Supplier Code RMC02A42

MATERIALS TICKET

CUSTOMER NO.	P.O. NUMBER	PROJECT NUMBER	TRUCK NUMBER	TIME	DATE	TICKET NO.
111101		ECMS 67777	121	9:00 AM	6/15/2021	1-50555

SOLD TO: SPECIALTY CONTRACTORS, INC.
DELIVERED TO: SR 0022 SEC A01

PRODUCT CODE	PRODUCT DESCRIPTION	QUANTITY	UNIT OF MEAS	UNIT PRICE	AMOUNT
JMF - 555 - 2	PennDOT CLASS AA CONCRETE	10.00	CY		

LEAVE YARD | ON JOB | DOWN POUR | USE OF CONCRETE | SUB-TOTAL
FINISH POUR | OFF JOB | | TAX
| | | 3 1/2" | TOTAL MTL.

I CERTIFY THAT THIS LOAD MEETS PennDOT 408 SPECIFICATIONS | METHOD OF CONCRETE MIXING
X J. Batcher | ☒ TRUCK MIXED ☐ CENTRAL MIXED

No. 57	17730	LBS.
SAND	12270	LBS.
PORTLAND CEMENT	5000	LBS.
FLY ASH	880	LBS.
TOTAL BATCHWATER	1947	LBS.
ADMIXTURE AIR ENTRAINMENT	59	OZ.
ADMIXTURE WATER REDUCER	176	OZ.
ADMIXTURE RETARDER	118	OZ.
ADMIXTURE		OZ.
MIXING REVOLUTIONS	100	REVS

WASH DOWN WATER = 10 gals

Our drivers are instructed not to make deliveries beyond the curb line or existing road width unless directed by purchaser. We assume no liability for damage to property or for any instructions given to operators by purchaser, agent, owner, or contractor.

Concrete Burn Warning: Caution - Avoid skin contact. May cause eye or skin injury. Contains Portland cement. Thoroughly mixed cement, mortar, or grout may cause skin injury. Take these precautions: Avoid all contact with eyes. Wear rubber boots and gloves and avoid prolonged contact directly with skin or through pervious materials. In case of contact with skin or eyes, FLUSH THOROUGHLY WITH WATER. If irritation persists, get medical attention promptly. Keep children away. Read MSDS on reverse side.

I acknowledge the receipt of the material safety sheet information on the reverse side.
CUST. SIGN.

II.c. Delivery Ticket Requirements

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

eConcrete
Version 2.2
Login to PROD App

LOGIN

Business Partner Helpful Links
Forgot Username | Forgot Password
Account Registration | Manage My Account

Additional App Assistance
Contact PennDOT IT Service Desk:
717-783-8330 | 855-783-8330

By logging into this app, you are allowing PennDOT to view and monitor your actions inside of the app.

TRAINING MODE

App Bulletin App Info

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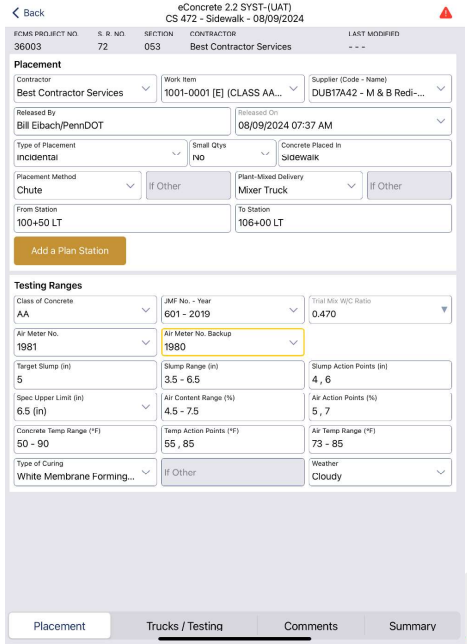
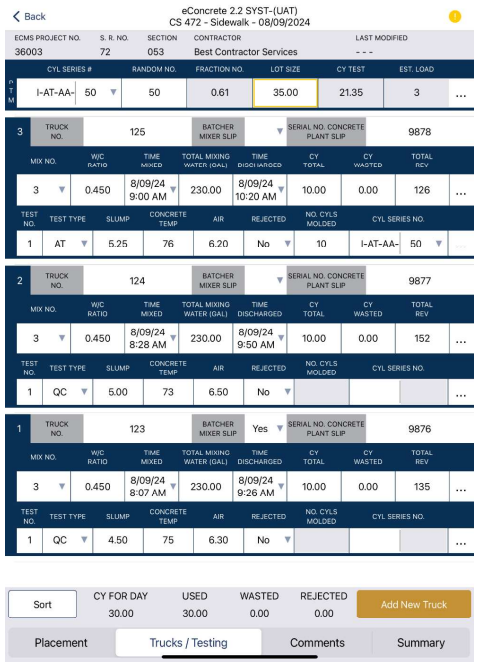
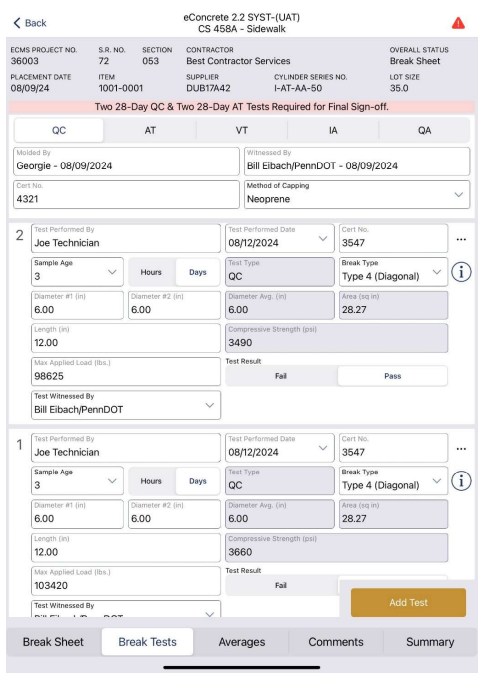
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

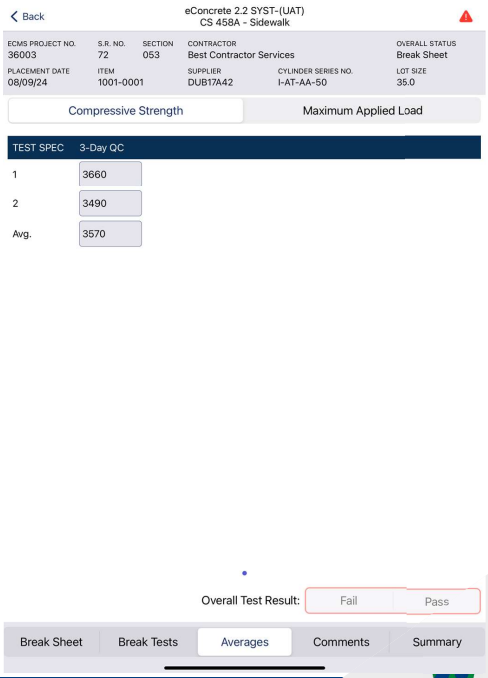


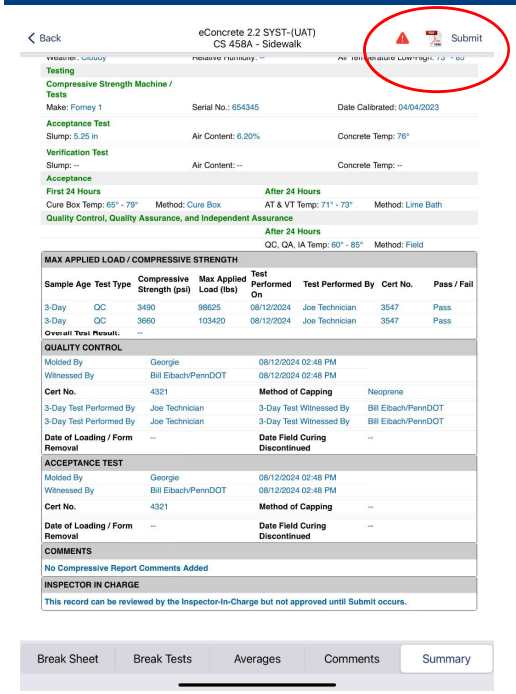
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION







Final Approval / Submittal

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PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION


CS-458A (6-09)

REPORT OF COMPRESSIVE STRENGTH OF PORTLAND CEMENT CONCRETE

pennsylvania DEPARTMENT OF TRANSPORTATION

DATE COMPLETED & SENT TO DISTRICT: 07-13-2021
CLASS OF CONCRETE: AA
SERIES NO.: AA-1
TEST FOR: ☐ DESIGN ☐ CONTROL ☐ IA ☐ QA
JMF NO.: 555
MIX NO.: 02

Contractor: Specialty Contractors, Inc.
Producer: Ready Mixed Concrete Supply, Inc.
ECMS Proj. No.: E0123456
S.R. No.: 22
Sec.: A01
County: Allegheny
Station Molded: 101+46 NB RT
Concrete Placed In: 9" Type A Patches
Date Molded: 06-15-2021
Weather: Sunny
Air Temp.: HI 80 LOW 58
Relative Humidity: N/A
Acceptance Test: Air Content: 5.9% Concrete Temp.: 69 Slump: 4.0"
Verification Test: Air Content: 6.0% Concrete Temp.: 70 W/C Ratio: 0.45
Testing Apparatus: Make: FTE Serial No.: 02165 Date Calibrated: 01-06-2021
Quality Control Specimen Curing: First 24 HRS: Temperature: HI 78 LOW 67 Method Cure Box; After 24 HRS: Temperature: HI 80 LOW 69 Method Plastic
Acceptance Specimen Curing: First 24 HRS: Temperature: HI 78 LOW 67 Method Cure Box; After 24 HRS: Temperature: HI 80 LOW 69 Method Lime Bath

TEST SPEC.	Maximum Applied Load - Newtons (lbs) DAY QC	7-DAY QC	28-DAY QC	28-DAY AT	VERIFICATION	Compressive Strength - kPa (PSI) Conv. Factor = Load/192.40 (28.27) DAY QC	7-DAY QC	28-DAY QC	28-DAY AT	VERIFICATION
1		109360					3870			
2		106050					3750			
Avg.		107705					3810			
3			130820					4630		
4			133380					4720		
Avg.			132100					4675		
5				137440	134210				4860	4750
6				136530	132990				4830	4700
Avg.				136985	133600				4845	4725

Quality Control & Acceptance Tests

SIGNATURE OF CONTRACTOR EMPLOYEE & DATE	SIGNATURE OF DOT REPRESENTATIVE & DATE
MOLDED BY: J. Molder 06-15-2021	WITNESSED BY: B. Witnesser 06-15-2021
CERT NO.: 1234	METHOD OF CAPPING: ☐ NEOPRENE ☐ SULFUR
7-DAY TESTED BY: T. Tester 06-22-2021	WITNESSED BY: S. Lawker 06-22-2021
28-DAY TESTED BY: T. Tester 07-13-2021	WITNESSED BY: S. Lawker 07-13-2021
____ DAY TESTED BY:	WITNESSED BY:
DATE OF LOADING/FORM REMOVAL: 06-22-2021	
DATE FIELD CURING DISCONTINUED: 06-22-2021	

Verification Test

SIGNATURE OF DOT REPRESENTATIVE & DATE	SIGNATURE OF CONTRACTOR EMPLOYEE & DATE
MOLDED BY: B. Witnesser 06-15-2021	WITNESSED BY: J. Molder 06-15-2021
CERT NO.: 4321	METHOD OF CAPPING: ☐ NEOPRENE ☐ SULFUR
TESTED BY: T. Tester 07-13-2021	WITNESSED BY: S. Lawker 07-13-2021
REPORTED BY: S. Lawker 07-13-2021	
REMARKS: All breaks pass for 100% Pay; VT within Tolerance	

Inspector In Charge: B. Boss

White - Project Engineer Yellow - District Materials Engineer Pink - MTD/QA Division

II.e. Compressive Strength Results

CS-458A

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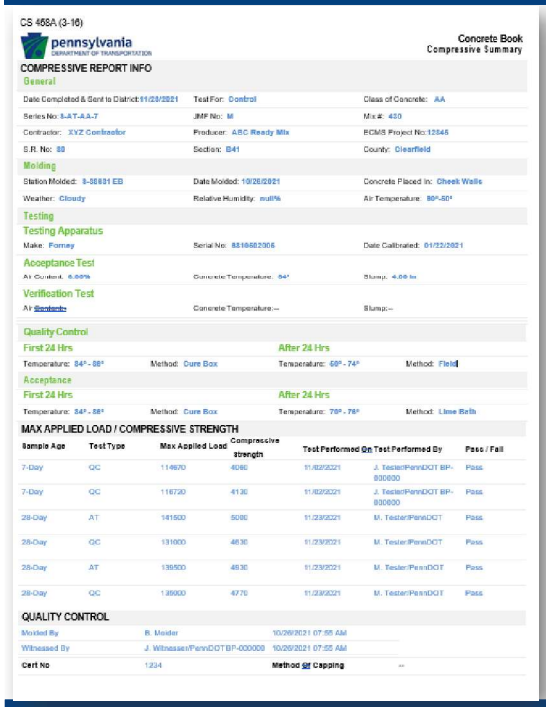
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION


CS 458A (3-16)

pennsylvania DEPARTMENT OF TRANSPORTATION

Concrete Book Compressive Summary

COMPRESSIVE REPORT INFO

General

Date Completed & Sent to District: 11/23/2021
Test For: Control
Class of Concrete: AA
Series No: 5-AT-AA-7
JMF No: M
Mix #: 430
Contractor: XYZ Contractor
Producer: ABC Ready Mix
ECMS Project No: 12345
S.R. No: 80
Section: B41
County: Clearfield

Molding

Station Molded: 8-58881 EB
Date Molded: 10/26/2021
Concrete Placed In: Cheek Walls
Weather: Cloudy
Relative Humidity: null%
Air Temperature: 80°-50°

Testing

Testing Apparatus

Make: Forney
Serial No: 8810682306
Date Calibrated: 01/22/2021

Acceptance Test

Air Content: 6.00%
Concrete Temperature: 84°
Slump: 4.00 in

Verification Test

Air Content:
Concrete Temperature: --
Slump: --

Quality Control

First 24 Hrs
Temperature: 84° - 88°
Method: Cure Box
After 24 Hrs
Temperature: 69° - 74°
Method: Field

Acceptance

First 24 Hrs
Temperature: 84° - 88°
Method: Cure Box
After 24 Hrs
Temperature: 78° - 78°
Method: Lime Bath

MAX APPLIED LOAD / COMPRESSIVE STRENGTH

Sample Age	Test Type	Max Applied Load	Compressive Strength	Test Performed On	Test Performed By	Pass / Fail
7-Day	QC	114670	4060	11/22/2021	J. Tester/PennDOT BP-000000	Pass
7-Day	QC	116720	4130	11/22/2021	J. Tester/PennDOT BP-000000	Pass
28-Day	AT	141500	5000	11/23/2021	M. Tester/PennDOT	Pass
28-Day	QC	131000	4630	11/23/2021	M. Tester/PennDOT	Pass
28-Day	AT	135500	4830	11/23/2021	M. Tester/PennDOT	Pass
28-Day	QC	135000	4770	11/23/2021	M. Tester/PennDOT	Pass

QUALITY CONTROL

Molded By | B. Molder | 10/26/2021 07:55 AM
Witnessed By | J. Witnesser/PennDOT BP-000000 | 10/26/2021 07:55 AM
Cert No | 1234 | Method of Capping | --

II.e. CS-458A Compressive Strength Results

eConcrete App Web Portal

II.f. Water/Cement Ratio Determination

Importance of W/C Ratio

- **W/C is an indicator of freeze-thaw durability of a concrete mix and its strength potential**
- Air-entrained concrete with a low W/C ratio is much more resistant to freeze-thaw cycles than a high W/C mix

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PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

II.f. Water/Cement Ratio Determination

Importance of W/C Ratio

- There is also a correlation of the W/C to compressive strength
  - Lower W/C mixes provide a higher compressive strength than high W/C mixes

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

II.f. Water/Cement Ratio Determination

Table A
Cement Concrete Criteria

Class of Concrete	Use	Cement Factor[2][4][10] (lbs./cu. yd.)		Water Cement Ratio[5] (lbs./lbs.)		Minimum Mix[1,7] Design Compressive Strength (psi)				28-Day Structural Design Compressive Strength (psi)
						Days				
		Min.	Max.	Min.	Max.	3	7	28[8]	56[8]	
AAAP	Bridge Deck	560	640		0.45	—	3,000	4,000	—	4,000
AAA[3]	Other	634	752		0.43	—	3,600	4,500	—	4,000
AAAP LW	Bridge Deck	600	730		0.45	---	3,000	4,000	---	4,000
AA	Slip Form Paving	517	611	0.37	0.42	—	3,000	4,000	—	3,500
AA	Form Paving	517	611	0.37	0.45	—	3,000	4,000	—	3,500
AA	Accelerated Paving[6]	517	800		0.47	—	—	3,750	—	3,500
HES	Paving	517	800	0.37	0.42	2,000	---	4,000		3,500
S	Sidewalk	517	611	0.37	0.45		3,000	4,000		3,500
AA	Structures and Misc.	587	752		0.47	—	3,000	3,750	—	3,500
AA LW		587	752		0.47	---	3,000	3,750	---	3,000
ASC[9]		587	846		0.47	---	---	4,000	---	4,000
A		564	752		0.50	—	2,750	3,300	—	3,000
C		394	658		0.66	—	1,500	2,000	—	2,000
HES		752	846		0.40	3,000	—	3,750	—	3,500

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

II.f. Water/Cement Ratio Determination

$$W/C = \frac{\text{Total Water (by weight)}}{\text{Total Cementitious (by weight)}}$$

1. Calculate the total weight of water
2. Calculate the total weight of cementitious
3. Divide total water by total cementitious

Manual page 42

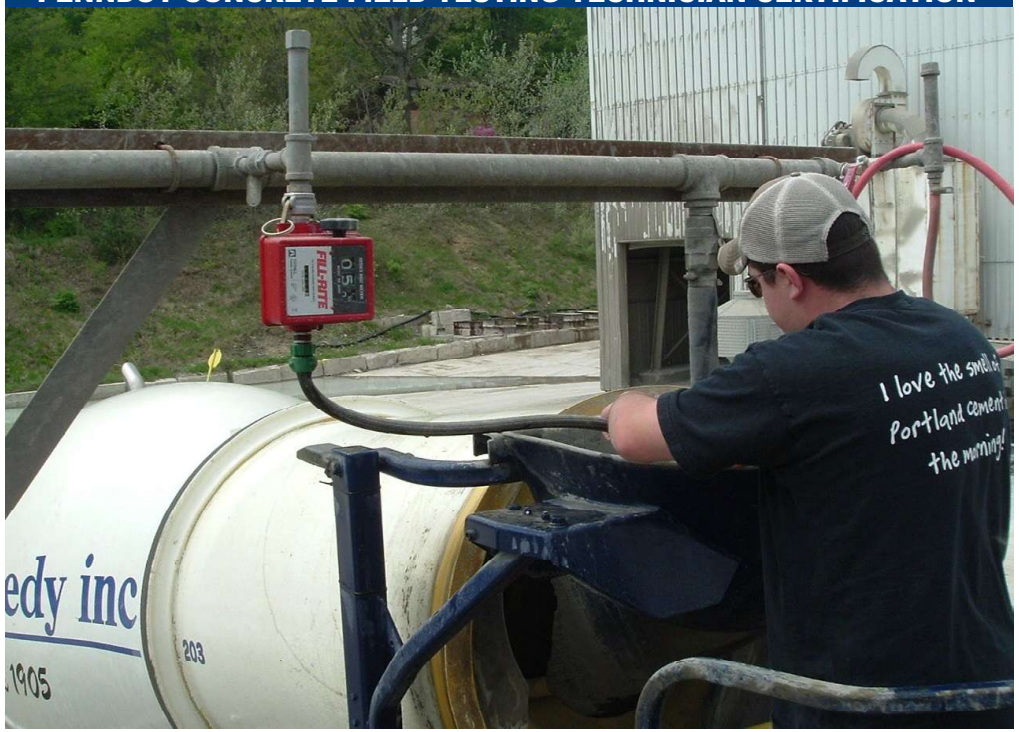
II.f. Water/Cement Ratio Determination

Total Water = Batched Water + Surface Moisture in the Aggregates + Wash Down Water + Ice

Total Cementitious = Cement + Pozzolan

Pozzolan

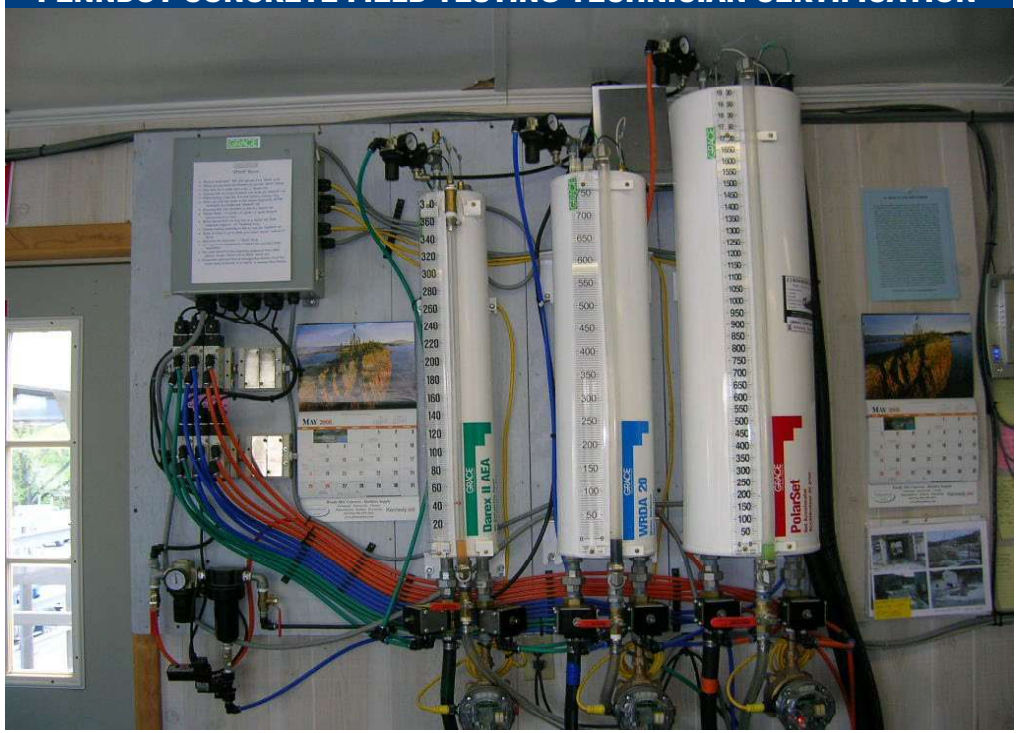
- Fly Ash
- Slag Cement
- Silica Fume (microsilica)



II.f. Water/Cement Ratio Determination

Additional Info to Know

- Water and cementitious material need to be in *like* units
  - lbs/CY
  - lbs/Load
- Some admixtures like accelerators and corrosion inhibitors of *1 gal/CY* or more count as water
- 1 gallon of water = 8.33 lbs
- 1 lb of ice = 1 lb of water



II.f. Determine W/C from Batcher-Mixer Slip & Delivery Slip

Ready Mixed Concrete Supply, Inc. 50555
P.O. Box 119 S. Pittsburgh, PA 15222
Supplier Code RMC02A42
MATERIALS TICKET

CUSTOMER NO.	P.O. NUMBER	PROJECT NUMBER	TRUCK NUMBER	TIME	DATE	TICKET NO.
111101		ECMS 67777	121	8:00 AM	6/15/2021	1-50555

SOLD TO: SPECIALTY CONTRACTORS, INC.
DELIVERED TO: SR 0022 SEC A01

PRODUCT CODE	PRODUCT DESCRIPTION	QUANTITY	UNIT OF MEAS	UNIT PRICE	AMOUNT
1 JMF - 555 - 2	PennDOT CLASS AA CONCRETE	10.00 2	CY		

I CERTIFY THAT THIS LOAD MEETS PennDOT 408 SPECIFICATIONS
METHOD OF CONCRETE MIXING: ☒ TRUCK MIXED ☐ CENTRAL MIXED

3	PORTLAND CEMENT	5000	LBS.
	FLY ADD	880	LBS.
	TOTAL BATCH WATER	1947	LBS.
ADMIXTURE	AIR ENTRAINMENT	59	OZ.
ADMIXTURE	WATER REDUCER 8	176	OZ.
ADMIXTURE	RETARDER	118	OZ.
ADMIXTURE			OZ.
	MIXING REVOLUTIONS	100	REVS

WASH DOWN WATER - 10 gals 9

I acknowledge the receipt of the material safety sheet information on the reverse side.
CUST. SIGN.

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CS-4220 (10-21)
pennsylvania DEPARTMENT OF TRANSPORTATION — Batcher Mixer Slip

Date 6/15/2021
Time 7:30
JMF Number 555-02 1
ECMS 67777

Contractor: Specialty Contractors, Inc.
Plant: Ready Mixed Concrete Supply, Inc.
County: Allegheny
Project Location: S. Pittsburg (RMC02A42)
S.R. 22 SECTION A01
Class Concrete AA W/C Ratio 0.45
Design Gallons of Water Per Cubic Yard 31.80
Design Gallons of Water - Admixture Water Per C.Y 31.80 6

MATERIALS	SATURATED SURFACE DRY WEIGHT (lbs)	SURFACE MOISTURE (%)	SURFACE MOISTURE (lbs)	BATCH WEIGHT PER C.Y. (lbs)	
Cement	500			500	
SCM Fly Ash	88			88	
SCM					
Sand 4	1168	4.10%	48	1216	
#57	1776	0.80%	14	1790	
Admixture [oz.]	Weight per gal.				Admixture (Solids+Water) [lbs]
Admixture [oz.]	Weight per gal.				Admixture (Solids+Water) [lbs]
Ice [lbs]					Ice-Water [lbs]
Target Slump 4.00	Surface Moisture in Aggregates [lbs]		62.00		
% Air 6.0	Surface Moisture in Aggregates [gals]		7.44		
	Batched Mixing Water [gals]	24.36	203		Batched Mixing Water [lbs]
PENNDOT Field Inspector (who gave release)	J.B. Inspector			3797	lbs.
PENNDOT Plant Inspector	D.M. Inspector		Batch Yield 7	27	cu. ft.
Concrete Plant Technician	J. Technician		Wt/Cu.Ft.	140.63	lbs./cu.ft.

5

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II.f. Determine W/C from Batcher-Mixer Slip & Delivery Slip

1. Record # yards on truck	**10 CY**	**Delivery Slip**
2. Batched Water for this load	**1947 lbs**	**Delivery Slip**
3. Surface Moisture in Aggregates / CY	**62 lbs**	**Batcher/Mixer Slip**
4. Surface Moisture in Aggr for this load	**620 lbs**	**(#1 x #3)**
5. Wash Down Water for this load	**10 gals**	**Delivery Slip**
6. Convert Wash Down from gal to lbs	**83 lbs**	**(#5 x 8.33 lbs/gal)**
7. Calculate Total Water in load	**2650 lbs**	**(#2 + #4 + #6)**
8. Total Cementitious Material in load (Cement + Pozzolan)	**5000 + 880 5880 lbs**	**Delivery Slip**
9. Calculate W/C Ratio	**0.45**	**(#7 ÷ #8)**

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TR-4221 (12-15)
pennsylvania DEPARTMENT OF TRANSPORTATION

Concrete Mix Design Form

Supplier Code: RMC02A42
JMF No.: 555
JMF Year: 2021
Supplier/JMF/Design # (Opt.):

Producer: Ready Mix Concrete Supply Inc.
Location:
Contractor:
Sec/Segment:
SR/WO:
Material Class: AA
Mix Identifier:
Structure Class:
ECMS No./PO No.:
JMF Status: Approved

Material	Material Code	Material Class	Product Name	Producer Name	Supplier Code	Sp. Gr.	Abs	ASR
Cement	276	1		PA Cement Company - Boomerville	PAC0 15	3.150	0.00	
Pozzolan	276	F		Ash Supply Company - Danville , PA	ASC0 15	2.400	0.00	
Coarse Aggregate	203	A57		Big Rocks Stone Company - Bedrock	BRS02A 14	2.500	0.46	0.02
Fine Aggregate	207	A		Gravel Sand Company - Sand Lake	GSC02A14	2.586	1.16	
Water	420	WTRMIX	City of Pittsburgh	No Bulletin 15 Listing	NOBLT 15	1.000		

						Oz/cwt	Oz/yd	Mfg Dose/cwt Min	Mfg Dose/cwt Max
Admixture	403	AEA	AE120	Admixtures, Inc.	ADMI0 15	1.00	5.88		
Admixture	403	WR	WR150	Admixtures, Inc.	ADMI0 15	3.00	17.64	2.00	6.00
Admixture	403	RE	RET50	Admixtures, Inc.	ADMI0 15	2.00	11.76	2.00	5.00

When RE admixture is used in concrete ≥ 80° F or in hot weather, the manufacturer's minimum recommended dosage rate for RE admixture must be used to get 90 minutes of mixing time.
When using a WR admixture, it must be used at manufacturer's minimum dosage rate to use the maximum of 8.01" slump spec per 704.1(4).a.
When using HRWR admixture, it must be used at the manufacturer's minimum dosage rate to use the maximum of 9" slump per 704.1(4)a.
Any additional admixtures utilized to enhance the concrete performance may be below the manufacturer's minimum recommended usage rate.

RCP Coulombs 1547 — Total admix water per cubic yard — From trial mix dated 11/22/2005
Microstrain — Total admix solids per cubic yard — 28/7 ratio from worksheet dated 11/22/2005
Strength Data Based on Max W/C 0.470 — 28/7 day strength ratio (AAAP Only) — % Air 6.00

F'c (Compressive Strength) PSI

7 Days	4,830 Avg PSI	14 Days	5,675 Avg PSI	28 Days	6,275 Avg PSI	56 Days	6,390 Avg PSI

	Material Code	Material Class	Supplier Code	Max W/C	Mix # 2	Mix # 3	Mix # 4	Mix # 5
W/C Ratio by wt.				0.470	0.450	0.430	0.410	0.390
Cement (lbs)	276	1	PAC0 15	500	500	500	500	500
Pozzolan (lbs)	276	F	ASC0 15	88	88	88	88	88
Total Cementitious (lbs)				588	588	588	588	588
Coarse Agg. (lbs)	203	A57	BRS02A 14	1776	1776	1776	1776	1776
Total Coarse Agg. (lbs)				1776	1776	1776	1776	1776
Fine Agg. (lbs)	207	A	GSC02A14	1137	1168	1199	1230	1261
Total Water (lbs)				276	265	253	241	229
Admixture Water (lbs)								
Mix Water (lbs)				276	265	253	241	229
Admixture Solids/yd (lbs)								
Total (lbs)				3777	3796	3816	3835	3855
Unit Weight (lbs/cu.ft.)				139.88	140.60	141.32	142.04	142.76
Coarse Agg. (cu.ft)				10.95	10.95	10.95	10.95	10.95
Total Water (gal.)				33.2	31.8	30.4	28.9	27.5
Mix Water (gal.)				33.2	31.8	30.4	28.9	27.5

Designed By : W. G. Girad — Designed Date : 5/5/21
Submitted By : J. Johnson — Submitted Date : 5/6/21
District Approver : T. Jones, DME 11-0 — Approved Date : 5/12/21

II.f. Determine W/C from Batcher-Mixer Slip & Delivery Slip

- Review the Approved Mix Design
- Verify that the Plant is sending Mix #2 with the proper amount of water
- What is the maximum # of gals/CY of water permitted to be added to this load?

App Calculator

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

II.g. Water/Cement Ratio Determination by Batch Plant Printout

A/R Concrete Plants

- Use moisture probes that determine the actual percentage of moisture in the aggregates
- Automatically adjust the amount of batch water based on the design target, actual batched quantities and the amount of moisture in the aggregates determined by the probes
- Some plants are equipped, but do not use
  - Contact supplier prior to placement

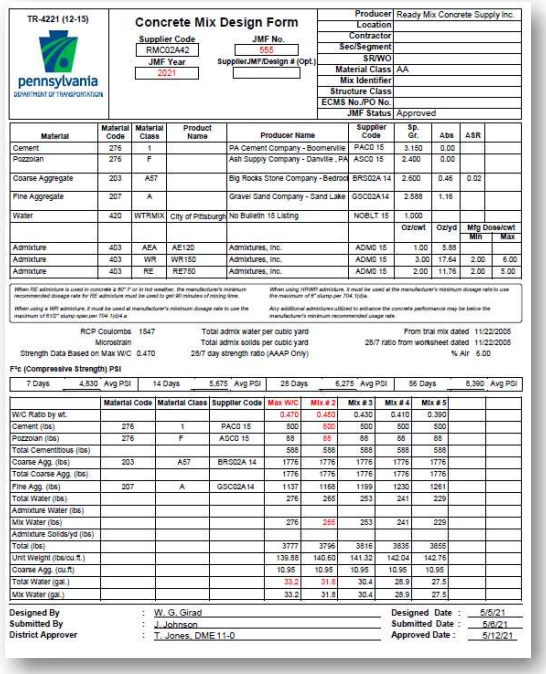
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Water/Cement Ratio and Adding Water

- Max W/C ratio for each mix is listed on the mix design form, normally the Trial mix
- This is the W/C ratio used to determine the strength potential of the mix
- When adding water, this is the amount of water that cannot be exceeded for this particular mix

	Material Code	Material Class	Supplier Code	Max W/C	Mix # 2	Mix # 3	Mix # 4	Mix # 5
W/C Ratio by wt.				0.470	0.450	0.430	0.410	0.390
Total Water (gal.)				33.2	31.8	30.4	28.9	27.5

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



TR-4221 (12-15)

pennsylvania
DEPARTMENT OF TRANSPORTATION

Concrete Mix Design Form

Supplier Code: RMC02A42
JMF Year: 2021
JMF No.: 555
Supplier/JMF/Design # (Opt.):

Producer	Ready Mix Concrete Supply Inc.
Location	
Contractor	
Sec/Segment	
SR/WO	
Material Class	AA
Mix Identifier	
Structure Class	
ECMS No./PO No.	
JMF Status	Approved

Material	Material Code	Material Class	Product Name	Producer Name	Supplier Code	Sp. Gr.	Abs	ASR	Oz/cwt	Oz/yd	Mfg Dose/cwt Min	Mfg Dose/cwt Max
Cement	276	1		PA Cement Company - Boomerville	PAC0 15	3.150	0.00					
Pozzolan	276	F		Ash Supply Company - Danville , PA	ASC0 15	2.400	0.00					
Coarse Aggregate	203	A57		Big Rocks Stone Company - Bedrock	BRS02A 14	2.600	0.46	0.02				
Fine Aggregate	207	A		Gravel Sand Company - Sand Lake	GSC02A14	2.586	1.16					
Water	420	WTRMIX	City of Pittsburgh	No Bulletin 15 Listing	NOBLT 15	1.000						
Admixture	403	AEA	AE120	Admixtures, Inc.	ADM0 15	1.00	5.88					
Admixture	403	WR	WR150	Admixtures, Inc.	ADM0 15	3.00	17.64	2.00	6.00			
Admixture	403	RE	RE750	Admixtures, Inc.	ADM0 15	2.00	11.76	2.00	5.00			

When RE admixture is used in concrete ≥ 80° F or in hot weather, the manufacturer's minimum recommended dosage rate for RE admixture must be used to get 90 minutes of mixing time.

When using a WR admixture, it must be used at manufacturer's minimum dosage rate to use the maximum of 8.5" slump per 704.1(4)4.a.

When using HRWR admixture, it must be used at the manufacturer's minimum dosage rate to use the maximum of 9" slump per 704.1(4)e.

Any additional admixtures utilized to enhance the concrete performance may be below the manufacturer's minimum recommended usage rate.

RCP Coulombs: 1547
Microstrain:
Strength Data Based on Max W/C: 0.470

Total admix water per cubic yard:
Total admix solids per cubic yard:
28/7 day strength ratio (AAAP Only):

From trial mix dated: 11/22/2005
28/7 ratio from worksheet dated: 11/22/2005
% Air: 6.00

F'c (Compressive Strength) PSI

7 Days	4,830	Avg PSI	14 Days	5,675	Avg PSI	28 Days	6,275	Avg PSI	56 Days	6,390	Avg PSI

	Material Code	Material Class	Supplier Code	Max W/C	Mix # 2	Mix # 3	Mix # 4	Mix # 5
W/C Ratio by wt.				0.470	0.450	0.430	0.410	0.390
Cement (lbs)	276	1	PAC0 15	500	500	500	500	500
Pozzolan (lbs)	276	F	ASC0 15	88	88	88	88	88
Total Cementitious (lbs)				588	588	588	588	588
Coarse Agg. (lbs)	203	A57	BRS02A 14	1776	1776	1776	1776	1776
Total Coarse Agg. (lbs)				1776	1776	1776	1776	1776
Fine Agg. (lbs)	207	A	GSC02A14	1137	1166	1199	1236	1261
Total Water (lbs)				276	265	253	241	229
Admixture Water (lbs)								
Mix Water (lbs)				276	265	253	241	229
Admixture Solids/yd (lbs)								
Total (lbs)				3777	3796	3816	3835	3855
Unit Weight (lbs/cu.ft.)				139.88	140.60	141.32	142.04	142.76
Coarse Agg. (cu.ft)				10.95	10.95	10.95	10.95	10.95
Total Water (gal.)				33.2	31.8	30.4	28.9	27.5
Mix Water (gal.)				33.2	31.8	30.4	28.9	27.5

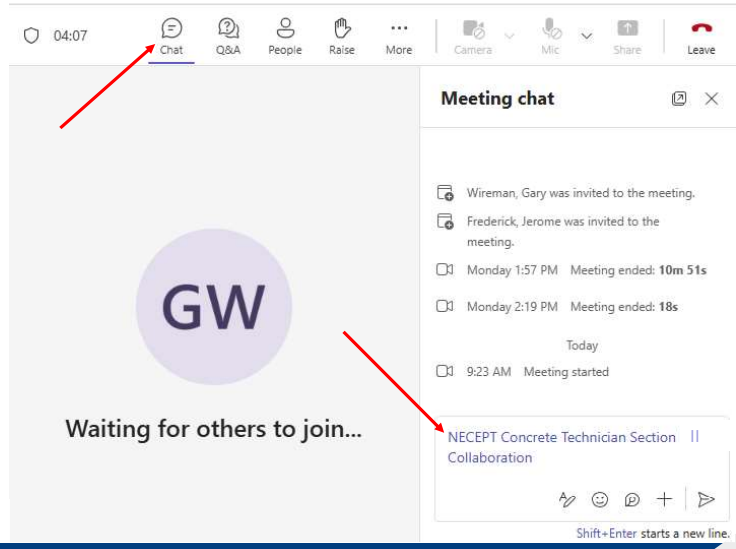
Designed By : W. G. Girad — Designed Date : 5/5/21
Submitted By : J. Johnson — Submitted Date : 5/6/21
District Approver : T. Jones, DME 11-0 — Approved Date : 5/12/21

Water/Cement Ratio and Adding Water

Water/Cement Ratio

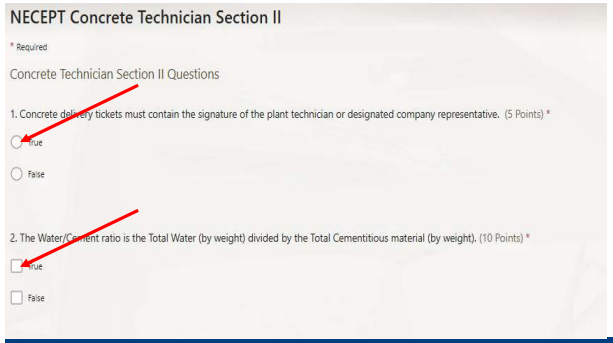
- It is essential that the jobsite technicians are familiar with the paperwork and documentation and only the first page of the Mix Design is needed on the project
- Some admixtures like accelerators and corrosion inhibitors of *1 gal/CY* or more count as water
  - Example included in Appendix I, Page 153
- **The W/C ratio is an indicator of the freeze thaw durability and strength potential of the concrete mix**

II. Project Documentation Review Questions

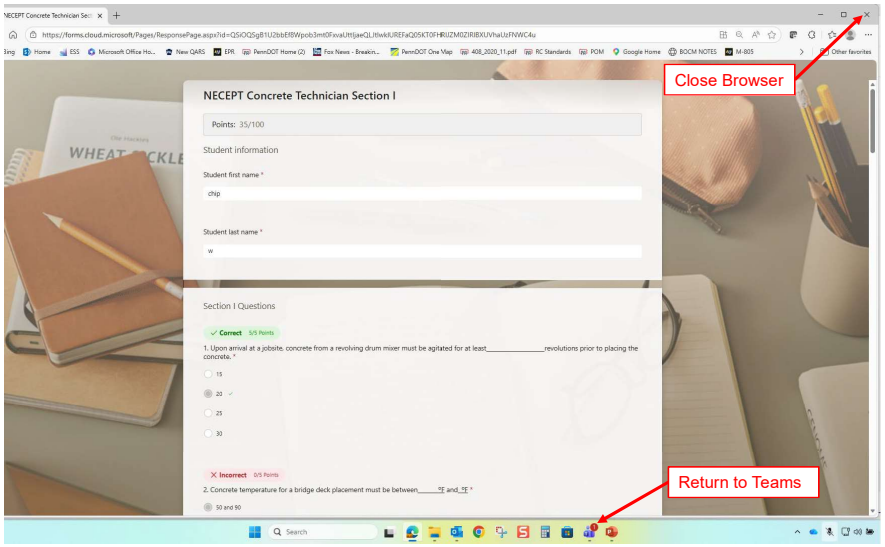


II. PROJECT DOCUMENTATION

Review Questions



• You must answer all the questions before you will be able to Submit!!



REMEMBER: After reviewing your answers, close the internet browser and return to Teams.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

1. Concrete delivery tickets must contain the signature of the plant technician or designated company representative. True / False
2. The Water/Cement ratio is the Total Water (by weight) divided by the Total cementitious material (by weight). True / False
3. At the start of a concrete operation and prior to the field adjustment of any mixes, the technician and inspector must have the following information at the placement: quality control plan, approved mix design, batcher-mixer slip, and delivery ticket.
4. A concrete mix design must be reviewed by the DME prior to use. True / False
5. A batcher-mixer slip is to be provided with the first truck and at a minimum of every 4 hours during the placement. True / False
6. Compressive strength test results are reported on Form CS-458A.
7. Total cementitious material used to determine the Water/Cement ratio of a mix includes, by weight, Portland cement, fly ash, silica fume, or slag cement.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

8. The contractor's technician should verify their information is entered in the eConcrete App. True / False
9. One gallon of water weighs 8.33 pounds.
10. Calculate the Water/Cement ratio given the total cementitious material is 5,880 lbs. and the total water is 304 gallons. 0.43.

To calculate W/C Ratio, both the water and the cementitious material must be the same units

Total water = 304 gal x 8.33 lbs/gal = 2532 lbs

W/C = total water ÷ total cementitious material = 2532 lbs / 5880 lbs = 0.43

11. One pound of ice equals One (1) pound of water.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

12. The maximum Water/Cement ratio for a Class AAAP mix design is 0.45.
13. When completing a CS-458A, compressive strengths are recorded to the nearest 10 psi.
14. Calculate the W/C ratio given the following information for a 10 CY load: From the delivery ticket the total cementitious material 6580 lbs and the total batched water is 2048 lbs. From the batcher-mixer slip there is 65 lbs. of surface moisture per CY. 0.41.

Surface moisture is given in lbs/CY. Calculate for a 10 CY load:

10 CY x 65 lbs/CY = 650 lbs of surface moisture in the load

W/C = (2048 lbs + 650 lbs) ÷ 6580 lbs = 0.41

15. When computing W/C ratio in mixes using certain accelerating or corrosion inhibiting admixtures, the admixture liquid needs to be included with the total water when the dosage is one (1) gal/CY or more.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

16. Total water in the concrete mix includes batched water plus surface moisture plus wash down water plus ice.
17. Only the front sheet of the Master Concrete Mix Design (TR-4221) needs to be submitted to the project. True / False
18. A concrete mix has a maximum W/C ratio of 0.47 based on total water in the mix of 33.2 gal/CY. A 10 CY load of concrete from a step-down interval of this mix is delivered to the project. The batched water is 2118 pounds for the load. The batcher-mixer slip tells you the surface moisture in the aggregates is 7.1 gal/CY. The W/C ratio for this step-down interval is 0.46. If the contractor is permitted to add water to improve the workability, how many gallons can be added at the jobsite? 0.7 gal/CY

Or 7 gallons

How many gals/CY of water are allowed in this load of concrete by the Trial Mix (Max. Mix Design W/C)?

(provided in the question) : **33.2 gal/CY**

How many gals/CY of water are already in this 10 CY load of concrete?

Batched Water: 2118 lbs (provided in the question) / 8.33 lbs/gal = **254 gal**

OR 254 gal / 10 CY = **25.4 gal/CY**

Surface Moisture in the Aggregates: (provided in the question) **7.1 gal/CY**

Total Water: 25.4 gal/CY + 7.1 gal/CY = **32.5 gal/CY**

How many gals/CY of water can be added to this load of concrete?

33.2 gal/CY – 32.5 gal/CY = **0.7 gal/CY**

0.7 gal/CY x 10 CY = **7 gallons**

III. Acceptance Process

Manual page 59

III. Acceptance Process

The Department's overall concrete acceptance process includes a combination of *Quality Control*, *Acceptance*, *Verification*, and *Quality Assurance* sampling and testing

III.a. Acceptance Testing

- A higher class of concrete may be used in place of an indicated lower-class concrete if the higher-class concrete conforms to all the requirements of the indicated lower class and if approved by the Department
  - The indicated lower class is the class required by the contract documents
    - Typically, the class is either shown in the plans or the specifications for the element to be constructed

III.a. Acceptance Testing

Table A
Cement Concrete Criteria

Class of Concrete	Use	Cement Factor[2][4][10] (lbs./cu. yd.)		Water Cement Ratio[5] (lbs./lbs.)		Minimum Mix[1,7] Design Compressive Strength (psi)				28-Day Structural Design Compressive Strength (psi)
						Days				
		Min.	Max.	Min.	Max.	3	7	28[8]	56[8]	
AAAP	Bridge Deck	560	640		0.45	—	3,000	4,000	—	4,000
AAA[3]	Other	634	752		0.43	—	3,600	4,500	—	4,000
AAAP LW	Bridge Deck	600	730		0.45	---	3,000	4,000	---	4,000
AA	Slip Form Paving	517	611	0.37	0.42	—	3,000	4,000	—	3,500
AA	Form Paving	517	611	0.37	0.45	—	3,000	4,000	—	3,500
AA	Accelerated Paving[6]	517	800		0.47	—	—	3,750	—	3,500
HES	Paving	517	800	0.37	0.42	2,000	---	4,000		3,500
S	Sidewalk	517	611	0.37	0.45		3,000	4,000		3,500
AA	Structures and Misc.	587	752		0.47	—	3,000	3,750	—	3,500
AA LW		587	752		0.47	---	3,000	3,750	---	3,000
ASC[9]		587	846		0.47	---	---	4,000	---	4,000
A		564	752		0.50	—	2,750	3,300	—	3,000
C		394	658		0.66	—	1,500	2,000	—	2,000
HES		752	846		0.40	3,000	—	3,750	—	3,500

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PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.a. Acceptance Testing

- Minimum mix design compressive strength for AAAP is 4000 psi
- Maximum Water/Cement ratio is 0.45 for AAAP
- The goal of Class AAAP is to increase resistance to chloride ion penetration and to reduce shrinkage potential while still exceeding compressive strength requirements

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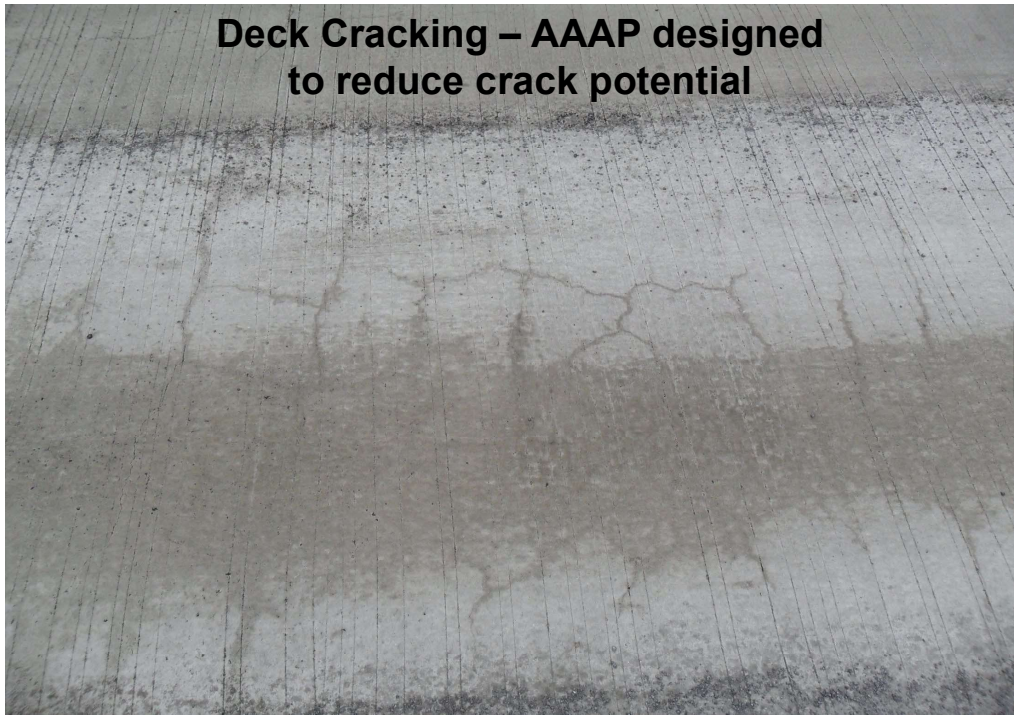
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.a. Acceptance Testing

- Acceptance Lots are established DAILY in accordance with Table B
  - Do not continue Lots from one day to the next
    - Except for RPS and Long-Life Concrete Pavements

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III.a. Acceptance Testing

TABLE B
Maximum Lot Size for Concrete Acceptance

Construction Area	Maximum Lot Size
Structural Concrete	100 cu. yd.
Pavement Concrete	500 cu. yd.
Pavement Patching Concrete	200 cu. yd.
Incidental Concrete	100 cu. yd.

Daily lot sizes are determined by the contractor, not to exceed maximum lot sizes

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.a. Acceptance Testing

- Bridge Deck 110 cubic yards
  - How many lots? Size of the lots?
- Paving Patching 300 cubic yards
  - How many lots? Size of the lots?
- Paving 450 cubic yards on Monday and 50 cubic yards on Tuesday for a total of 500 cubic yards
  - How many lots? Size of the lots?

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.a. Acceptance Testing

- Bridge Deck 110 cubic yards
  - How many lots? Size of the lots?
    - 2 lots, 100 CY and 10 CY or
    - 2 lots, 50 CY and 60 CY etc.
- Paving Patching 300 cubic yards
  - How many lots? Size of the lots?
- Paving 450 cubic yards on Monday and 50 cubic yards on Tuesday for a total of 500 cubic yards
  - How many lots? Size of the lots?

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.a. Acceptance Testing

- Bridge Deck 110 cubic yards
  - How many lots? Size of the lots?
    - 2 lots, 100 CY and 10 CY or
    - 2 lots, 50 CY and 60 CY etc.
- Paving Patching 300 cubic yards
  - How many lots? Size of the lots?
    - 2 lots, 200 CY and 100 CY or
    - 2 lots, 150 CY and 150 CY etc.
- Paving 450 cubic yards on Monday and 50 cubic yards on Tuesday for a total of 500 cubic yards
  - How many lots? Size of the lots?

III.a. Acceptance Testing

- Bridge Deck 110 cubic yards
  - How many lots? Size of the lots?
    - 2 lots, 100 CY and 10 CY or
    - 2 lots, 50 CY and 60 CY etc.
- Paving Patching 300 cubic yards
  - How many lots? Size of the lots?
    - 2 lots, 200 CY and 100 CY or
    - 2 lots, 150 CY and 150 CY etc.
- Paving 450 cubic yards on Monday and 50 cubic yards on Tuesday for a total of 500 cubic yards
  - How many lots? Size of the lots?
    - 1 lot on Monday, 450 CY
    - 1 lot on Tuesday, 50 CY

III.a. Acceptance Testing

- Acceptance Lots must be specific to each structural element unless allowed in writing to combine
- Acceptance sampling locations are determined randomly per PTM No. 1 by the Inspector
- Acceptance samples are obtained at the point of placement
  - Exception, Section 1001.3(k)4, Pumping

III.a. Acceptance Testing

- Acceptance samples will be obtained and tested by the contractor – *witnessed* by the *Inspector*
- Acceptance samples will be tested for plastic air content, temperature, and compressive strength according to Pub 408 Section 704.1(d)5

III.a. Acceptance Testing

- AT cylinders are lime-bath cured and must be tested at 28 days
  - Strength requirements are outlined in Table A
  - Lot Acceptance is based on the 28-day AT compressive strength results as well as the 28-day QC cylinder results
  - The 28-day breaks are not extended when cold weather curing temperatures are not maintained

III.a. Acceptance Testing

- 2 Acceptance cylinders are tested with the results averaged
  - Most Contractors mold 4 acceptance cylinders – 2 are back-ups for unforeseen issues

For AAAP mixes, mold 56-day cylinders and conduct compressive strength testing **only** if cylinders fail to meet their strength requirements at 28 days

III.b. QC Cylinder Requirements

III.b. QC Cylinder Requirements

- Quality Control cylinders must be obtained from the same sample selected for *Acceptance testing*
- Contractor's responsibility to mold sufficient cylinders for form removal, loading strengths, and any other special requirements
- Handling and protection of field-cured QC cylinders should be covered in detail in the contractor's QC plan

III.b. QC Cylinder Requirements

- 7-day QC Compressive Strength Cylinders
  - Used to discontinue field cure for the Lot
  - If 7-day strengths aren't met, curing must be continued until 28-day strengths are met or 28 days
  - The 7-day breaks are not extended when cold weather curing temperatures are not maintained

III.b. QC Cylinder Requirements

- 28-day QC Compressive Strength Cylinders
  - Lot Acceptance is based on the 28-day QC compressive strength results as well as the Acceptance cylinder strength results
  - The 28-day breaks are not extended when cold weather curing temperatures are not maintained
  - Care must be taken to protect QC cylinders if they are relocated after curing is discontinued on the structural element, they represent

III.b. QC Cylinder Requirements

- 28-day QC Compressive Strength Cylinders
  - If the 28-day QC compressive strength test results are < the Table A 28-day structural design compressive strength, acceptance of the lot is based on core results as per Section 110.10(d)
    - For bridge decks, Section 110.10 says to conduct 56-day cylinder compressive strength testing
    - Make sure to mold enough cylinders

III.c. Verification Testing

- Verification testing (VT) is performed by a Department Representative from the same sample of material obtained for Acceptance testing
- The Department Rep., using the same equipment as the contractor, should be able to provide similar results from the same sample of material
- VT cylinders are lime-bath cured with the AT cylinders

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III.c. Verification Testing

- VT testing is performed in conjunction with the first acceptance test and once for every 10 acceptance tests thereafter for each type of concrete specified in Table B, not by class of concrete

TABLE B
Maximum Lot Size for Concrete Acceptance

Construction Area	Maximum Lot Size
Structural Concrete	100 cu. yd.
Pavement Concrete	500 cu. yd.
Pavement Patching Concrete	200 cu. yd.
Incidental Concrete	100 cu. yd.

- Department Representative will determine all test locations and document all results

III.c. Verification Testing

- Use a back-up thermometer and check the temperature concurrently with the contractor
- Immediately after the contractor runs an acceptable plastic air content test, the Department Representative runs an air test from the same sample using the ***same air meter*** to verify the contractor's results

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.c. Verification Testing

- The Department Representative molds two (2) verification cylinders from the same sample as the acceptance cylinders
- Cure the cylinders in the lime bath with the acceptance cylinders
- **Department Representative will perform tests for 28-day compressive strength**

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.c. Verification Testing

If the test results differ by more than 5 °F for Temperature, 1.0% for Plastic Air Content, or 500 psi for Compressive Strength, the Department will immediately review test procedures, equipment, and personnel used in the acceptance testing process and implement corrective measures to ensure tests meet the specified tolerances

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.c. Verification Testing

Please test the AT and VT cylinders until failure when performing comparison tests!!!

III.d. Quality Assurance/Independent Assurance Testing

QA/IA testing provides an independent check on the equipment used in the acceptance process by having the Quality Assurance representative run tests from the same sample of material with two sets of equipment.

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III.d. Quality Assurance/Independent Assurance Testing

- With a QC test, Quality Assurance will obtain a companion temperature of the concrete along with the technician's temperature
- After the Contractor's technician runs the plastic air content test, the QA representative will run a second air content test using the back-up air meter

III.d. Quality Assurance/Independent Assurance Testing

- QA/IA cylinders will be molded and are tested at both the project and LTS at 28-days to provide a check on the compression machine used in the acceptance process
- QA/IA cylinders are field-cured the same as the QC cylinders

III.d. Quality Assurance/Independent Assurance Testing

If the test results differ by more than 5 °F for Temperature, 1.0% for Plastic Air Content, or 500 psi for Compressive Strength, the Quality Assurance Representative will immediately review test procedures, equipment, and personnel used in the acceptance testing process and implement corrective measures to ensure tests meet the specified tolerances

III.d. Quality Assurance/Independent Assurance Testing

Please test the QC cylinders until failure when performing comparison tests!!!

- LTS will test QA/IA cylinders until failure

III.e. Section 501 Concrete Pavements

- The mix design will have an air content of 7.0% +/- 1.5% in the plastic state
- The mix design will have an optimized aggregate structure
- Does not apply to Accelerated AAPAVE

III.e. Section 501 Concrete Pavements

- Comprehensive QC plan required
  - Covers the entire concrete production and pavement process, not just concrete testing
  - QC test frequencies may be reduced to one set of tests for every 50 cubic yards or 30 minutes whichever is greater of continuous production
  - QC cylinders for Opening to Traffic

III.e. Section 501 Concrete Pavements

- Curing Materials
  - Poly-alpha-methylstyrene (PAMS) liquid membrane

III.e. Section 501 Concrete Pavements

- Opening to Traffic
  - QC cylinders molded from the same sample of concrete selected for Acceptance testing and from the last mixer load of the day for accelerated strength pavements
  - Strength Requirements

Table D

Slab Thick, inches	Strength for Opening to Traffic, psi	
	Slab Length < 10 ft	Slab Length ≥ 10 ft
	f'c	f'c
6.0	3000	3600
7.0	2400	2700
8.0	2150	2150
9.0 +	2000	2000

III.f. RPS Cement Concrete Pavements

- RPS (Restricted Performance Specification) Concrete Pavements – Pub. 408 Section 506

III.g. Long-Life Concrete Pavements (LLCP)

- Pub. 408 Section 530

III.h. Accelerated Concrete for Patching

III.h. Accelerated Concrete for Patching

- Accelerated strength concrete patches require special consideration with regards to curing temperatures and opening to traffic strengths
- Read contract special provisions carefully to ensure all requirements are being met as conditions differ statewide

III.h. Accelerated Concrete for Patching

- The mix design will have an air content of 6.0% +/- 1.5% in the plastic state (SOL 481-21-01)
- Does not require optimized aggregate gradation
- Section 501.3(l) provides general "curing"
- Section 501.3(q) provides "opening to traffic" compressive strength requirements

III.h. Accelerated Concrete for Patching

Curing

- Cylinders are to be cured under the same conditions as the patch
- Ambient air temperature around the patch must be 80 °F or above
- Curing temperature in any 1 hr period cannot vary in excess of 40 °F
  - Patches will be considered defective if > 40 °F
  - Temperatures should be monitored and recorded

III.h. Accelerated Concrete for Patching

QC Cylinder Testing

- 1,200 psi compressive strength required prior to "opening to traffic"
- MINIMUM "opening to traffic" QC cylinders required every 200 CY or fraction thereof and from the final load placed

III.h. Accelerated Concrete for Patching

AT Cylinder Testing

- Daily Lots and every 200 CY or fraction thereof
- 28-day AT & QC cylinders are also required for acceptance
  - Except for Opening to Traffic failures
  - Section 704 Table A requires 3,750 psi

III.i. Placing Concrete in Water

- When placing concrete in extremely wet conditions or under water a concrete mix with an Anti-Washout Admixture (AWA) is required by specification
- A mix with a 2.5" max slump and +25% extra cement may be permitted by DME/DMM if AWA is waived

Manual page 73 & 74

III.i. Placing Concrete in Water

- Do not begin concrete placement until the placement procedures, concrete mix design, inspection procedures, and concrete sampling procedures have been approved
- Details for an underwater concrete placement should be clearly defined in the contractor's QC Plan and reviewed at the pre-placement meeting
- Water must have a temperature of ≥ 40 °F

III.i. Concrete with Anti-Washout Admixture (AWA)

- Concrete with an AWA must have a plastic air content between 4.5% and 7.5%
  - Not required to be air-entrained below the frost line
- Maximum allowable slump is 8"
- All AT & QC compressive strength requirements must be met

Manual page 73

III.i. +25% Extra Cement Concrete

- Maximum allowable slump is 2.5”
- Plastic air content must be between 4.5% and 7.5% - Regardless of above/below frost line
- All AT & QC compressive strength requirements must be met
  - If ≥ 50% of the Lot is +25% extra cement, sampling can be used from a +25% load
  - If < 50% of the Lot is +25% extra cement, select another random number so sampling is not from a +25% load

III.j. Pumping Concrete

III.j. Pumping Concrete

Section 1001.3(k)4

- The objective of this specification is to minimize disruptions to the concrete pumping and placement operations
  - Permits AT sampling & testing at a location other than at the point of placement

III.j. Pumping Concrete

QC & AT SAMPLING & TESTING

- QC & AT sampling location will be determined *daily* on the first load and every 200 CY thereafter
  - Obtain a sample prior to the concrete pump and test for slump and plastic air content
  - Obtain another sample at the discharge end of the pump at the most severe configuration and test for slump and plastic air content
  - Compare test results

SECTION 1001—CEMENT CONCRETE STRUCTURES

1001.3(k)4.a. Concrete Pump and Reduction Device. Revise to read as follows:

4.a Concrete Pump and Reduction Device. Provide a concrete pump with a flexible end section at least 10 feet long equipped with a reduction devise or combination of devices to provide a steady and continuous discharge. Devices that may be used include, but are not limited to, a combination of 90-degree angles, a tapered reduction hose, a slide gate, a 6-foot diameter loop in rubber hose, or a finger reducer. **Prime the pump and line set using only grout material either prepackaged from a manufacturer listed in Bulletin 15 and mixed according to the manufacturer's instructions, or grout mixed as follows: one part cement, two parts fine aggregate, and enough water to provide the desired consistency for priming the pump and line set.**

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

1001.3(k)4.b. Determining QC and Acceptance Testing Location

Revised to read as follows:

4.b Determining QC and Acceptance Testing Location. The location of the QC and acceptance sampling will be determined daily on the first load of concrete, whenever the pump is relocated, and for every 200 cubic yards thereafter, by the following procedure:

- Provide a concrete mixture in conformance with specification requirements for slump, air content, and temperature before placement into the pump.
- Obtain a sample of concrete before placement into the pump and perform slump, air content, and temperature testing.
- Pump and waste enough material through the pump to ensure the grout used to prime the pump has been completely discharged from the system.
- Position the pump into the most severe vertical drop boom configuration anticipated during the placement. If using an extended slick line configuration, obtain the sample at the greatest distance from the pump that will be encountered during the placement.
- Obtain a sample of concrete at the discharge end of the pump and perform slump and air content testing.
- Compare the test results from the sample obtained before placement into the pump to the test results from the sample obtained at the discharge end of the pump to determine correlation.
- **Correlation tolerances: ± 1.0 inch for slump and ± 2.0% for air content.**

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

1001.3(k)4.b. Determining QC and Acceptance Testing Location

Revised to read as follows:

If the test results for slump and air content are within the correlation tolerances, perform all QC and acceptance testing for slump and air content, including molding of the compressive strength cylinders, on material obtained before placement into the pump.

If the test results for slump and air content are not within the correlation tolerances, discard the sample and waste additional material through the pump to ensure the grout has been fully discharged from the system. Obtain a new sample at the discharge end of the pump and test for slump and air content, a maximum of one time only.

If these test results are still not within the correlation tolerances, continue to perform the QC and acceptance testing for slump and air content before placement into the pump. However, the compressive strength cylinders must be molded from concrete obtained at the point of placement.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

III.k. Self-Consolidating Concrete (SCC)

- SCC mix designs must meet Class A Concrete requirements with the following modifications:
  - The Maximum W/C ratio is 0.45
  - Must have a plastic air content 6.5% ± 1.5% (5.0% to 8.0%)

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

- SCC mix designs use admixtures which enable the mix to flow and still maintain stability (cohesion of aggregate and cement)
  - HRWR's and VMA's are admixtures that are permitted to be added in the field, but the process is to be detailed in the QC Plan

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

QC & AT Sampling & Testing

- Similar to Section 704 except:
  - QC Slump testing is replaced with Slump Flow, J-Ring (passing ability) and Visual Stability Index (VSI)
  - The Slump Flow and VSI are determined in accordance with ASTM C1611
    - Slump Flow must be between 20" and 30"
    - VSI must be ≤ 1
  - The J-Ring is tested in accordance with ASTM C1621
    - J-Ring result must be within 2" of the Slump Flow result

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

QC & AT Sampling & Testing

- Action points and corrective actions are to be detailed in the QC Plan for:
  - Slump Flow
  - J-Ring (passing ability)
  - Visual Stability Index (VSI)

III.k. Self-Consolidating Concrete (SCC)

Slump Flow (ASTM C1611)

- Slump cone can be used either in the "normal" position or it can be "inverted"
- Slump Cone is filled in ONE lift
- Wait for concrete to stop flowing; measure the largest diameter of resulting circular spread
- Measure a second diameter of the spread at an approximate perpendicular angle to the original measured diameter
- Slump Flow = $(d_1 + d_2)/2$; reported to nearest ½"

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

VSI = 0 (ASTM C1611)

- Highly stable mix
- Coarse aggregate is evenly distributed
- Not segregated
- No bleeding or mortar halo

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

VSI = 1 (ASTM C1611)

- Stable mix
- Coarse aggregate is evenly distributed
- Not segregated
- Slight bleeding
- Slight mortar halo

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

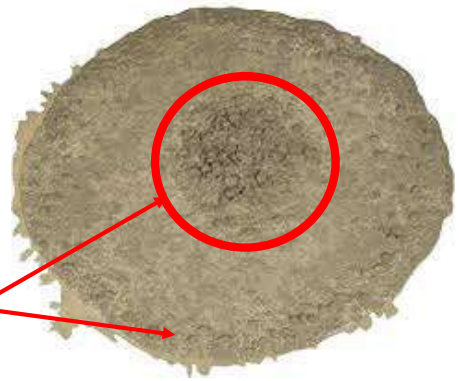
VSI = 2 (ASTM C1611)

- Unstable mix
- Coarse aggregate is slightly segregated
- Slight bleeding
- Slight mortar halo ≤ ½"

III.k. Self-Consolidating Concrete (SCC)

VSI = 3 (ASTM C1611)

- Highly unstable mix
- Coarse aggregate is segregated
- Bleeding
- Mortar halo > ½”



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.k. Self-Consolidating Concrete (SCC)

J-Ring (ASTM C1621)

- Determines the passing ability of the SCC mix
- Conducted the same as Slump Flow except cone is placed inside of J-Ring
- J-Ring = $(d_1 + d_2)/2$; reported to nearest ½"

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

- Latex Modified Mortar
  - Depths less than 1 ¼ inches
- Latex Modified Concrete
  - Depths 1 ¼ inches or greater

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PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

GENERAL REQUIREMENTS

- Latex Placement Quality Control plan required (CS-1042)
- Contractor provides test equipment
- Approved mix designs required
- Calibrated mobile mixers required
- Department must witness all testing

III.l. Latex Modified Concrete or Mortar

- Evaporation Rate
  - Provide equipment to monitor before deck placement and every hour during placement
  - Cannot exceed 0.06 lbs/ft^2/hr
  - If exceeded, stop the placement until protective measures are taken

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

- The supplier of the latex should make satisfactory arrangements with the Representative at least 7 calendar days in advance of calibration
- Mobile mixers must be calibrated by the supplier and witnessed by the Department in advance of the placement
- They must be re-calibrated for every 100 CY of production per unit or as directed
- Re-calibrate if aggregate sources are changed

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

LATEX SAMPLING & TESTING

- Slump
  - Discharge the sample from the mixer and transport it to a point unaffected by vibration
  - Do not disturb for 5 minutes
  - Remix and perform the slump test
    - Slump range for mortar is 4” to 6”
    - Slump range for concrete is 3” to 7”

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

LATEX SAMPLING & TESTING

- Plastic Air Content
  - Due to constraints of the slump sample, provide an additional sample for air testing and cylinders
  - Perform while waiting for the slump test
  - Specified range 1% to 7%

III.l. Latex Modified Concrete or Mortar

LATEX SAMPLING & TESTING

- Plastic Latex Mixture Temperature
  - Place latex at a plastic latex mixture temperature between 50 °F to 85 °F
  - If ambient temperatures are expected to reach 80 °F any time 24 hours before placement, the mix component temperatures must be mitigated

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

LATEX SAMPLING & TESTING

- Cylinders
  - Perform initial cure for 48 hrs +/- 2 hrs
  - Strip cylinders and air cure cylinders as specified in Section 1042 Table A

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

TABLE A
Curing Times and Application of Live Load

Overlay Type	Depth	Water Cure (hours)	Dry Cure (hours)	Live Load Application Total Cure Time MIN (hours)	Live Load Application Comp. Strength MIN (psi)
LMM or LMC	≤ 2 inches	48	72	120	3,000
	> 2 inches	48	96	144	3,000
Accelerated LMC, 3 Hour	All	3	None	3	3,000
Accelerated LMC, 12 Hour	All	12	None	12	3,000

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III.l. Latex Modified Concrete or Mortar

QC SAMPLING & TESTING

- Quality Control plan required
- Test each 5 CY until control is established for plastic air content, slump, and temperature

III.l. Latex Modified Concrete or Mortar

AT SAMPLING & TESTING

- Acceptance is on a lot-by-lot basis
- Lots consist of 20 CY or a day's placement (whichever is less)
- Acceptance is based on 5-day compressive strengths meeting 3,000 psi (Table A)
  - 6-day strength if > 2" depth
  - No 28-day testing is required

III.m. Acceptance of Small Quantities

P.O.M. B/6/6

- Department's policy for Acceptance of Small Quantities of Portland Cement Concrete
- The Contractor must provide a QC Plan (CS-704)
  - Covering the Acceptance of Small Quantities of Materials
- The District will inform the Contractor at the preconstruction conference of the circumstances under which this acceptance procedure will be used

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III.m. Acceptance of Small Quantities

- Must be < 25 CY per day per class of concrete per project for non-critical, incidental items
- Is not permitted for structures of any type; mainline, shoulders, and ramp paving; or other structurally critical items which may carry traffic loads
- Specifications are not to be waived nor are materials of lower quality to be accepted

III.m. Acceptance of Small Quantities

- This procedure may be used for non-critical, incidental items to allow reduced inspection and acceptance procedures
  - Paved Ditch
  - Curb Cuts
  - Pipe Headwalls
  - Base Course Widening
  - Fence Posts
  - Curb and Gutter
  - Raised Medians
  - Inlets
  - Sidewalks
  - Guide Rail Anchors
  - Sign Bases (Except Overhead Structure Foundations)

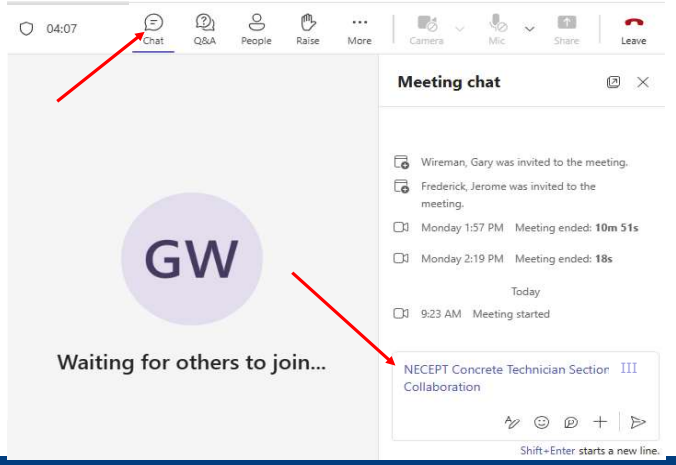
III.m. Acceptance of Small Quantities

- Molding cylinders may be waived but it is recommended that QC testing for slump, air content and temperature be performed
  - If the total quantity of Portland Cement Concrete for a contract line item exceeds 100 CY, at least one set of AT cylinders is to be molded during **one** of the daily placements for acceptance of that day's material
- The Contractor will provide a Form CS-4171 daily, from the material producer, certifying the material was produced in accordance with the approved mix design and PennDOT specifications

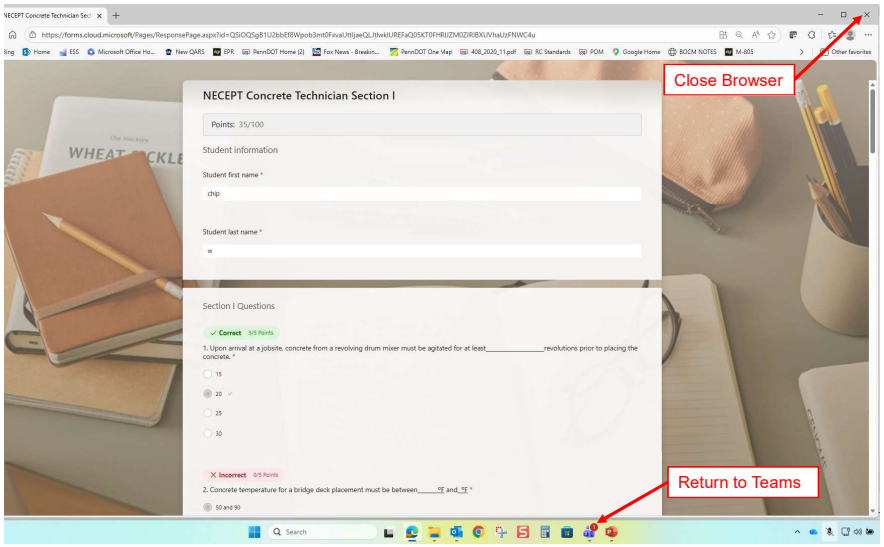
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

III. Acceptance Process Review Questions

- Do not Submit until you answer all the questions!!



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



REMEMBER: After reviewing your answers, close the internet browser and return to Teams.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

1. The Department's concrete acceptance process includes sampling and testing for acceptance, quality control, verification and quality assurance. True / False
2. Acceptance sample locations are determined by the Department in accordance with PTM #1. True / False
3. Acceptance lots must be specific to each structural element unless approved in writing to combine prior to placing concrete. True / False

   At contractor's request, structural elements may be combined if approved in writing
4. When a higher class of concrete is used in place of an indicated lower class (contractor elects to place Class AA instead of Class A which was indicated), the concrete placed must meet all specification requirements of the indicated class. True / False

   If the concrete does not meet the higher class, you should probably determine why and inform the producer and DME

5. When the lime-bath Acceptance cylinders are tested at 28 days and meet the 28-day minimum design compressive strengths in Table A, the concrete is accepted for 100% payment. True / False

28-day QC results are also required to confirm strength gain of in place concrete

6. If the 7-day QC cylinder compressive strength is not met in 7 days, curing must be continued until 28-day compressive strength is met or 28 days.

7. It is the responsibility of the contractor to ensure a sufficient number of QC cylinders are molded to satisfy all specification requirements for cure removal, opening to traffic, form removal, etc.

8. When QC cylinders meet the 28-day minimum design compressive strengths in Table A, the concrete is accepted and no additional testing for compressive strength is required. True / False

28-day QC & AT testing are required

9. Verification testing is performed by Department representative using concrete from the same sample of material and with the same equipment used for acceptance testing.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

10. Verification testing will consist of testing for temperature, air content, and compressive strength on the initial acceptance sample and for each type of concrete specified in Table B and a minimum of one for every ten acceptance tests thereafter.

11. Quality Assurance testing on a project for temperature and air content provides a check on the equipment used in the acceptance process by having a concrete technician and QA representative run tests on different sets of equipment from the same sample of concrete. True / False

12. When Verification or QA/IA compressive strength testing is performed, all cylinders must be tested to absolute failure at the project. True / False

13. Accelerated concrete patches must meet a minimum compressive strength of 1200 psi at the time of opening to traffic or it will be considered defective and must be removed and replaced.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

14. Minimum "opening to traffic" cylinders are required every 200 cubic yards or fraction thereof and from the final load placed.

15. When placing concrete in extremely wet conditions or under water, the concrete mix must contain *an anti-washout admixture* or *+ 25 % cement*.

16. When placing concrete in water, the water must have a temperature ≥ 40 °F.

17. After material control has been established, the frequency of QC testing for Section 506 RPS and Section 530 Long-Life concrete pavements may be reduced to a minimum of one test every *50 CY or 30 minutes whichever is greater*

18. For Latex Concrete or Mortar, mobile mixers must be calibrated by the supplier and witnessed by the Representative in advance of the placement and must be re-calibrated if aggregate sources change and for every 100 cubic yards of production per unit or as directed. True / False

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

19. If the test results for slump and air content taken at the discharge end of the pump are within ± 1.0 inch of the slump and ± 2.0% of the air content taken before the pump, QC and acceptance testing may be performed before the pump. True / False

20. For small quantities of concrete that have a contract line item that exceeds 100 cubic yards, at least one set of AT cylinders is molded during one of the daily placements for acceptance of that day's material. True / False

IV. PENNDOT CONCRETE TESTING PROCEDURES

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IV.a. Slump Test Method

- Slump
  - PennDOT references AASHTO T-119 Slump of Hydraulic Cement Concrete

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Standard Method of Test for

Slump of Hydraulic Cement Concrete

AASHTO Designation: T 119M/T 119-13
ASTM Designation: C 143/C 143M-12

1. SCOPE

1.1. This test method covers determination of slump of concrete, both in the laboratory and in the field.

1.2. The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3. The text of the standard reference notes and footnotes provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4. *This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
Warning—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards:*
- R 60, Sampling Freshly Mixed Concrete
- T 23, Making and Curing Concrete Test Specimens in the Field
- T 121M/T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
- T 196M/T 196, Air Content of Freshly Mixed Concrete by the Volumetric Method

2.2. *ASTM Standard:*
- C 150/C 150M, Standard Specification for Portland Cement
- C 670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

3. SUMMARY OF TEST METHOD

3.1. A sample of freshly mixed concrete is placed and compacted by rodding in a mold shaped as the frustum of a cone. The mold is raised and the concrete allowed to subside. The vertical distance between the original and the displaced position of the center of the top surface of the concrete is measured and reported as the slump of the concrete.

- Slump

AASHTO T-119 Slump of Hydraulic Cement Concrete

IV.b. Air Content Test – Pressure Method

- Air Content – Pressure Method
  - PennDOT references AASHTO T-152 Air Content of Freshly Mixed Concrete by the Pressure Method
    - Used for stone and gravel mixes
    - DO NOT APPLY AGG CORR FACTOR as per Pub. 408 Section 704.1(c)3

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IV.c. Air Content Test – Volumetric Method

- Air Content – Volumetric (Roll-a-Meter)
  - PennDOT references AASHTO T-196 Air Content of Freshly Mixed Concrete by the Volumetric Method
    - Used for slag coarse aggregate and lightweight aggregate mixes
    - DO NOT APPLY AGG CORR FACTOR as per Pub. 408 Section 704.1(c)3

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PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

IV.c. Air Content Test – Volumetric Method

- Air Content – Volumetric (Roll-a-Meter)
  - AASHTO T-196
    - When determining the air content, the final meter reading will be the air content if less than 3.0 pints of isopropyl alcohol is used
    - If 3.0 pints or more isopropyl alcohol is used, subtract the Table 1 correction factor from the final meter reading to determine the air content

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Table 1—Correction for the Effect of Isopropyl Alcohol on ASTM C 173/C 173M Air Meter Reading

70% Isopropyl Alcohol Used			Correction
pt	oz	L	(Subtract)[a]
0.5	8	0.2	0.0[b]
1.0	16	0.5	0.0[b]
1.5	24	0.7	0.0[b]
2.0	32	0.9	0.0[b]
3.0	48	1.4	0.3
4.0	64	1.9	0.6
5.0	80	2.4	0.9

[a] Subtract from final meter reading.

[b] Corrections less than 0.125 are not significant and are to be applied only when 1.2 L [2.5 pt] or more alcohol is used. The effect occurs when the meter is inverted after being filled with an alcohol-water solution which then becomes further diluted when it's mixed with the water in the concrete. The values given are for air meters that have a bowl volume of 2.1 L [0.075 ft^3] and a top section that is 1.2 times the volume of the bowl.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

IV.d. Density (Unit Weight), Yield, and Air Content of Concrete (Gravimetric) Method

- Unit Weight, Yield, and Grav. Air Content
  - AASHTO T-121
    - Air meter bowl is permitted for unit weight test

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IV.e. Concrete Temperature Test Method

- Temperature of Freshly Mixed Hydraulic-Cement Concrete Content
  - ASTM C1064
    - Includes thermometer calibration procedure

IV.f. Sampling Concrete

- Sampling Fresh Concrete
  - PTM No. 601
    - AASHTO R-60 except as follows when sampling from revolving drum truck mixers:
      - Sample from the first 1/3rd of the batch
      - Do NOT sample from the beginning or end of the discharge
    - Variance from AASHTO R-60 which specifies samples from the middle of the batch

IV.f. Sampling Concrete

PTM No. 601

- Protect the sample from the elements during testing
- Remix prior to testing
- Complete testing within 15 minutes

IV.g. Concrete Test Cylinders

- Making and Curing Concrete Compression and Flexural Test Specimens in the Field
  - PTM No. 611
    - Numerous differences from ASTM C31 and AASHTO T-23:
      - Cylinder size
      - Curing times

IV.g. Concrete Test Cylinders

PTM No. 611

- Only 6” x 12” cylinders
- Rodding vs Vibrating
- Complete storage within 15 minutes
- Initial cure – 24 ± 2 hours

IV.g. Concrete Test Cylinders

PTM No. 611

- Don’t scribe cylinder tops
- Covering - must be tight fitting domed cap
  - Ensure cylinder roundness

IV.g. Concrete Test Cylinders

- PTM No. 611 Section 13
  - Section 13 is for the identification and security of both the compression test specimen molds and compression test specimens
  - These security measures are to ensure the specimens are not tampered with prior to testing and/or at any time during the curing period

IV.g. Concrete Test Cylinders

- PTM No. 611 Section 13
  - Each Specimen Mold and Cylinder Specimen Must Contain
    - Date Molded
    - Construction Area
    - Series Number
    - Class of Concrete
    - Specimen Type
    - PennDOT Representative Signature
    - Contractor's Certified Technician Signature and Certification Number

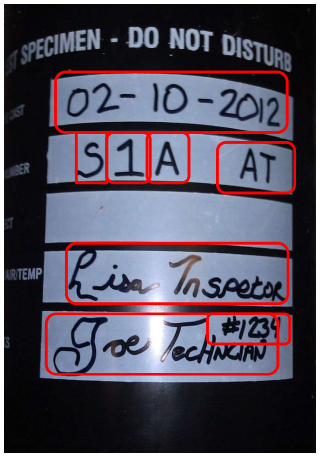
Construction Areas

Structural Concrete	(S)
Pavement Concrete	(P)
Pavement Patching Concrete	(PP)
Incidental Concrete	(M)
RPS Pavement Concrete	(RPS)

Specimen Types

Acceptance Testing	(AT)
Quality Control Testing	(QC)
Verification Testing	(VT)
Independent Assurance Testing	(IA)
Quality Assurance Testing	(QA)

- Date Molded
- Construction Area
- Series Number
- Class of Concrete
- Specimen Type
- PennDOT Rep Signature
- Concrete Technician
- Technician's Certification #



- Date Molded
- Construction Area
- Series Number
- Class of Concrete
- Specimen Type
- PennDOT Rep Signature
- Concrete Technician
- Technician's Certification #

IV.i. Care of Concrete Test Cylinders

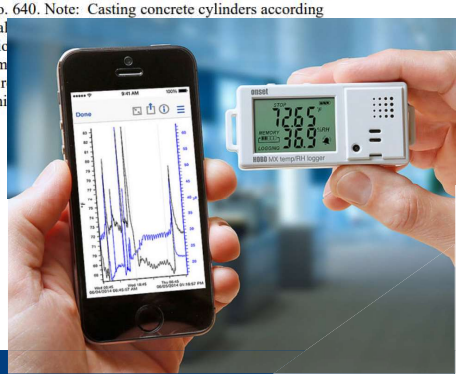
- Initial Curing
  - First 24 hours are the most crucial, but the remainder cannot be ignored!
  - Moist condition
  - 60 – 80°F
  - Free from vibration/disturbance
  - Stored in safe location
  - Out of direct sunlight

3. Testing Facilities and Equipment. Provide sufficient thermometers, air meters conforming to AASHTO T 196 and T 152, and slump cones conforming to AASHTO T 119 for each separate project operation as needed. In the presence of the Inspector, calibrate all air meters a maximum 2 weeks before beginning concrete placement. Recalibrate all air meters, in the presence of the Inspector, every 2 weeks during concrete placement. Have back-up equipment available to ensure no tests are missed. Provide sufficient 6-inch by 12-inch cylinder molds and tight-fitting domed caps (PTM No. 611) for QC, acceptance, verification, and QA samples. Provide sufficient incidental equipment such as wheelbarrows, shovels, and scoops as needed.

Provide acceptable means to conduct compressive strength testing using a compression machine and capping device conforming to PTM No. 604. Provide a curing tank conforming to PTM No. 611. Provide curing boxes, or other acceptable equipment, conforming to PTM No. 611 and capable of maintaining the temperature immediately adjacent to the field-cured cylinders in the range of 60F to 80F for the first 24 ± 2 hours. Provide a digital system, accessible by Bluetooth, that records and stores temperature in the curing box at least every hour, within the range of 30F to 120 °F and to an accuracy of 1°F. Collect temperature data for the first 24 hours and provide it to the Representative. Have the output from the automated temperature measuring device made available in real time to the Representative, upon request. If required, cap cylinders at the testing site under the Representative's supervision.

If using the maturity method to estimate concrete compressive strength, provide one or more maturity meters and a sufficient number of temperature sensors conforming to PTM No. 640. Note: Casting concrete cylinders according to PTM 611 is recommended in case maturity meter equipment mal

Maintain all equipment used for testing in an operable conditio Department, calibrate scales, balances, and the compression m compression machine whenever it is relocated. Maintain accurate r is out of tolerance or malfunctions, return it to working order withi problem is corrected.

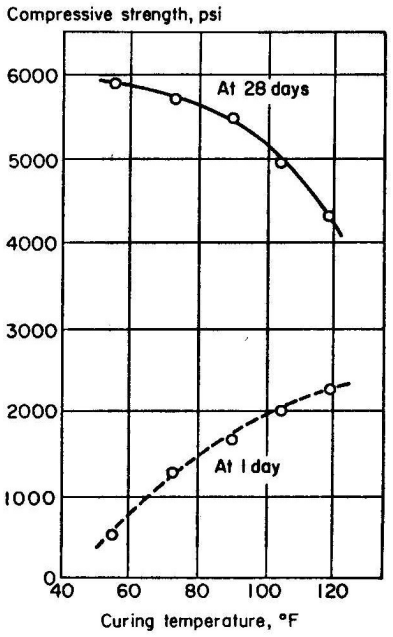


Curing boxes should be durable and well insulated, with enough room for adequate ventilation

IV.i. Care of Concrete Test Cylinders

- Cure Boxes
  - Heat inside box can exceed 120 °F due to exothermic reaction of cement
  - Sufficient air circulation minimizes adverse effects and helps maintain required temperature (60 – 80 °F)
  - Do not overcrowd cylinders in curing box
  - Monitor temperature with a digital Bluetooth Hi/Low thermometer
  - If ice is used, prevent direct contact with cylinders

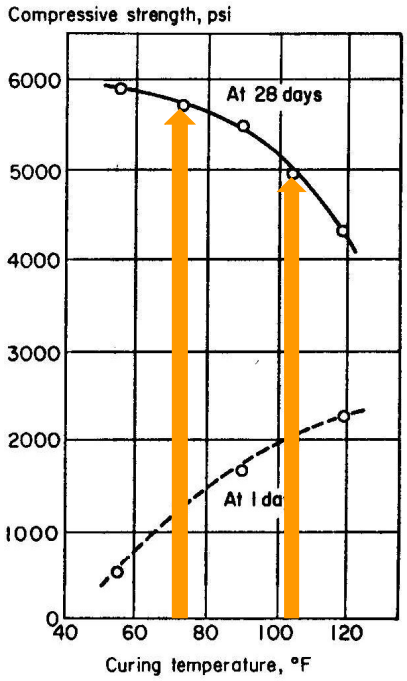
Proper storage in a curing box requires ample spacing between cylinders to allow for adequate air circulation



Importance of Maintaining Proper Curing Temperature

- Greatest variances in strength result from high temperatures in first 24 hours

Ref. Verbeck & Helmuth; Structures and Physical Properties of Cement Pastes, 1968



The Chart shows that concrete cylinders cured above 80 F will produce higher 24-hour compressive strengths but *LOWER* 28-Day compressive strengths

Ref. Concrete International / MARCH 2007

IV.i. Care of Concrete Test Cylinders

- After Initial Cure
  - AT cylinders are stripped from molds and stored in curing tank at 73 ± 3 °F until tested for compressive strength at 28 days
  - QC cylinders are stripped from molds at the time formwork is removed
    - QC cylinders are cured and stored on the jobsite and receive the same protection from the elements as the structure which they represent

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

IV.i. Care of Concrete Test Cylinders

- Curing Cylinders After 1st 24 (± 2) hours

AT/VT specimens

- De-molded
- Placed in lime-bath @ 73 ± 3 °F

QC/QA/IA specimens

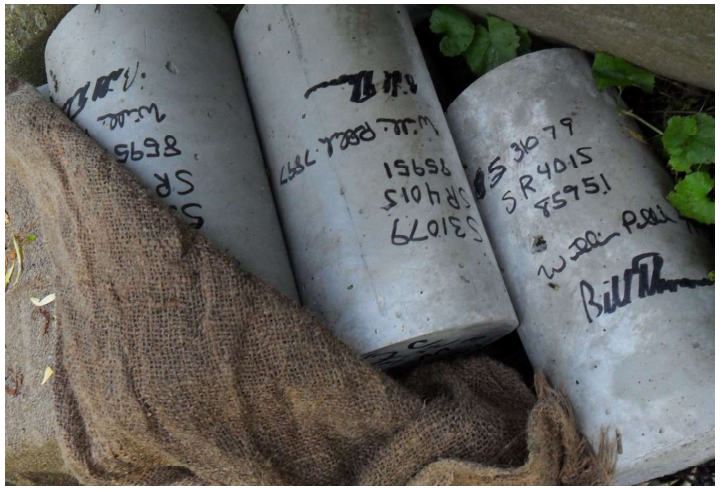
- De-molded when the formwork is removed
- Cured on site, adjacent to structure

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

AT & VT cylinders

Saturation in lime water tank

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION



QC/QA cylinders cured on-site must be cured under the same conditions as the structure they represent

Key Cylinder Issues

- Standard size of cylinder 6” x 12”
- Cast on rigid, level surface, free of vibration
- Proper consolidation (rodding)
- Finished surface smooth and free from defects
- Maintain roundness & flatness
- Cap with tight-fitting domed lids (PTM 611)
- Variations can affect outcome of compressive strength test

Why do Cylinders Fail to Meet Strength?

Field Related Factors

- Obvious
  - out-of-round
  - poor finished surface
  - not flat or plane
- Not so obvious
  - temperature related strength development
  - moisture depravation
  - improper transportation
  - disturbance during strength development

Concrete cylinders are not meant to be used as worktables, stools . . .

. . . or end tables

Cylinders must be protected throughout the curing process

Hopefully, the condition of the molds are better than this, and the placement of the tight-fitting domed lid is better as well

Proper transportation of cylinders to lab

IV.h. Testing Facilities & Equipment

- The Contractor is Responsible for all Testing Facilities & Equipment
  - The specification requirements are as per Section 704.1(d)3

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Compression testing machine must be calibrated annually or whenever it is relocated

IV.j. Compressive Strength of Molded Cylinders

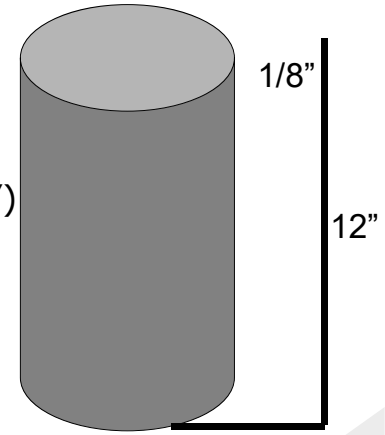
- PTM No. 604
  - AASHTO T-22 except:
    - Compressive strength results from the same sample cannot differ by more than 1000 psi
  - Not covered by ACI – Grade I
    - ASTM C39

IV.j. Compressive Strength of Molded Cylinders

- Cylinders not out of round more than 2%
- 28-day tests within ± 20 hours
- Properly align cylinders in machine
- 100 uses max for neoprene caps
- Tested at proper load rate
  - 35 ± 7 psi/s (989 ± 198 lbs/s)

IV.j. Compressive Strength of Molded Cylinders

- Ends of all compression test cylinders must be plane within 0.002 inches
- Perpendicular to the axis of the cylinder within 0.5° (1/8” in 12”)
- Two types of caps
  - Sulfur
  - Neoprene



IV.j. Compressive Strength of Molded Cylinders

Strength Test Results

Cylinder Position	Comp. Strength (psi)
On Center	7660
1/8” Off Center	7030
1/4” Off Center	5910
1/2” Off Center	4500

IV.j. Compressive Strength of Molded Cylinders

Because neoprene cap use must not exceed 100 tests per cap, a usage log must be kept

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

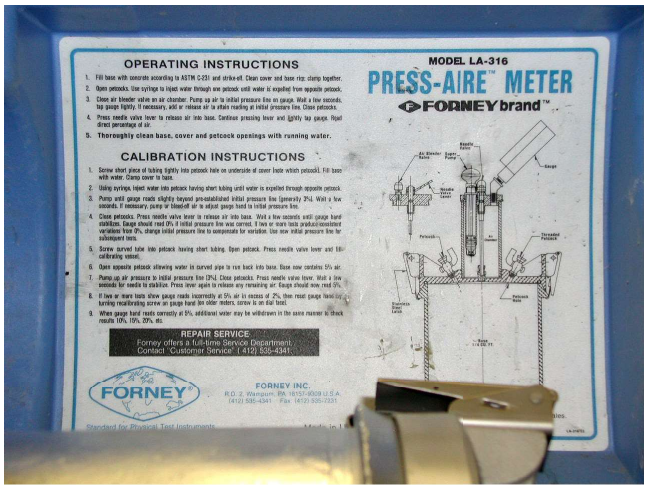
IV.l. Concrete Air Meter Calibrations

- Section 704.1(d)3
  - "In the presence of the Inspector, calibrate all air meters a maximum 2 weeks before beginning concrete placement. Re-calibrate all air meters, in the presence of the Inspector, every 2 weeks during concrete placement. Have back-up equipment available to ensure that no tests are missed."
  - The Inspector will document these calibrations

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

IV.l. Concrete Air Meter Calibrations

- Follow Manufacturer's instructions



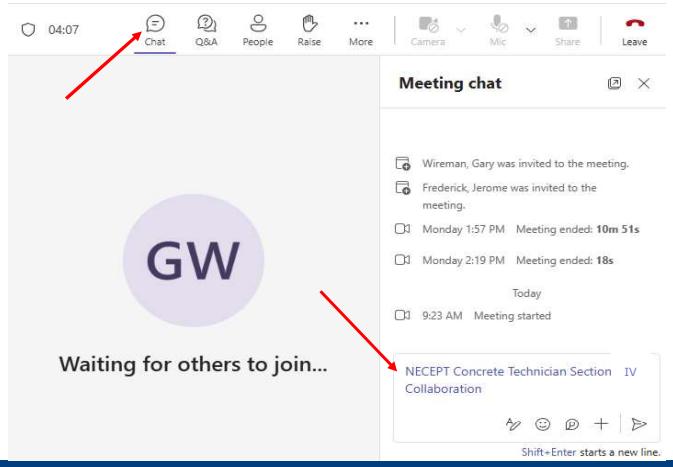
PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

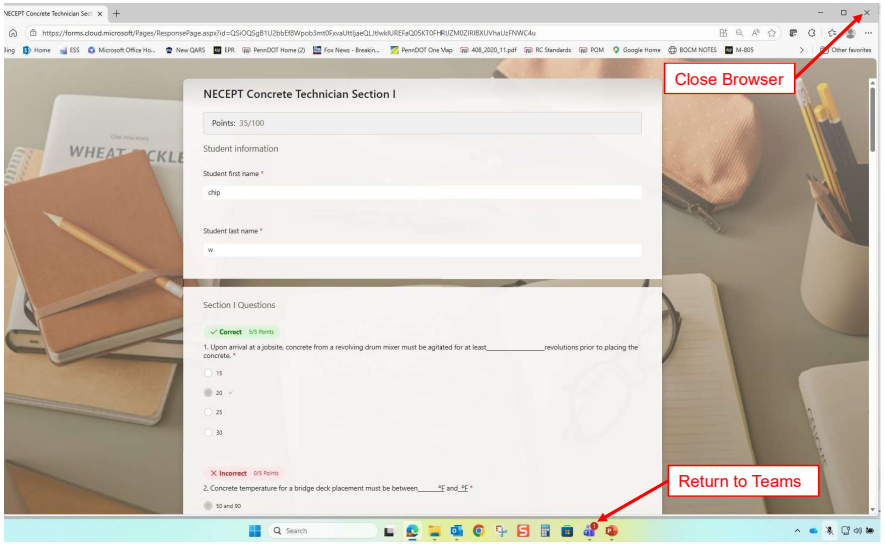
IV.m. Packaging QA Cylinders being sent to LTS

IV. PENNDOT CONCRETE TESTING PROCEDURES

Review Questions

- Do not Submit until you answer all the questions!!





REMEMBER: After reviewing your answers, close the internet browser and return to Teams.

1. All Pennsylvania Test Methods (PTM's) have been eliminated by the Department and replaced with AASHTO Standards. True / False

   Pub. 19 Field Test Manual identifies PTM's active & PTM's replaced

2. When testing for plastic air content, the aggregate correction factor must be calculated for each concrete mix and added to the results obtained using AASHTO T-152 or T-196 methods. True / False

3. PTM 601, Sampling Fresh Concrete, specifies that concrete must be sampled from what portion of the load?
   first ⅓rd, but not the initial discharge from truck

4. The Department specifies in Section 704.1(d)4.a that concrete temperatures are to be taken in accordance with ASTM C1064 "Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete".

5. After the initial 15 minutes, PTM 611 specifies the initial cure period for all cylinders is 24 hours ± 2 hours.

6. The contractor must re-calibrate air meters, including back-up air meters, every two (2) weeks during concrete placements.

7. All concrete test cylinders must be covered during initial curing using tight-fitting domed lids.

8. Cylinders need only to be identified with the date molded and the series number True / False Must meet PTM 611 Section 13 criteria

9. Plastic air content for concrete with lightweight aggregates must be obtained by testing using the *volumetric method – Roll-a-Meter* method.

10. Neoprene caps may be re-used for compression testing of cylinders a maximum of 100 times.

11. Compressive strength testing machines must be calibrated yearly or whenever the machine is relocated.

12. After initial cure, Quality Control cylinders are stripped from the molds at the time that the form work is removed from the concrete placement, and they are cured and stored on the jobsite and receive the same protection from the elements, in so far as practical, as the structure which they are to represent. True / False

13. Refer to the Manufacturer's instructions for complete detailed procedures when calibrating air meters.

14. All concrete testing should be completed within 15 minutes of obtaining the sample.

15. Concrete samples do not need to be protected from the elements with damp burlap if all testing is completed within 15 minutes of obtaining the sample. True / False

16. A pressure meter is used to test plastic air content of concrete using lightweight aggregates. True / False

17. The bowl of a pressure meter may be used as the measuring vessel for determining the unit weight of a concrete sample. True / False

18. The slump and air content shall be determined before 1/3 of the batch has been placed. True / False

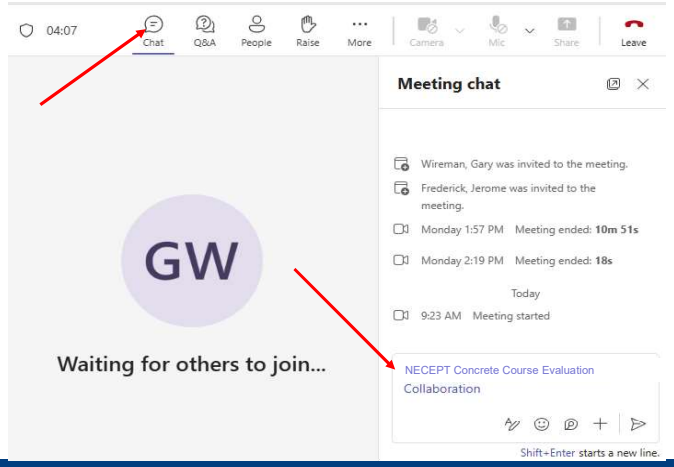
19. After the first 15 minutes up until 24 hours (± 2 hrs), cylinders must be cured at a constant, moist temperature between 60 º F and 80 º F.

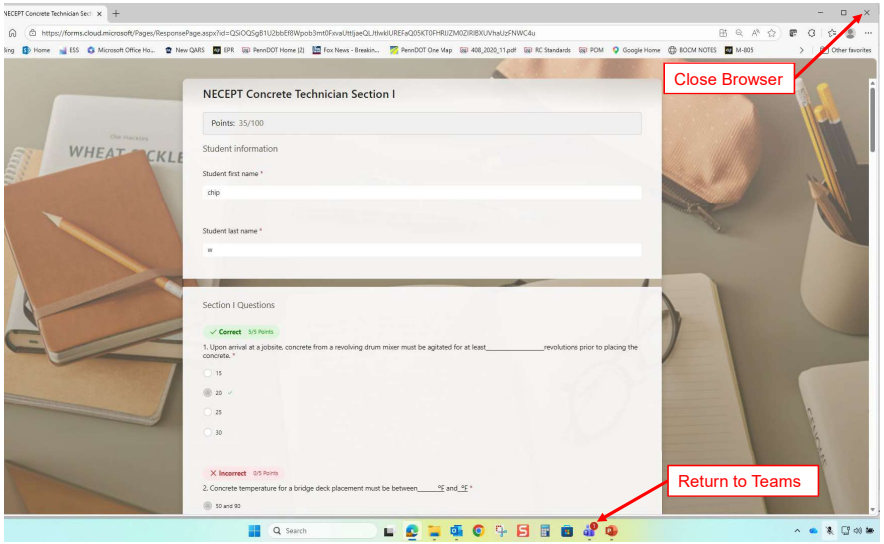
20. After the first 24 hours (± 2 hrs), acceptance cylinders are cured in a lime bath solution at a constant temperature between 70 º F and 76 º F until compressive strength testing is performed at 28 days.

Everyone involved in a construction project benefits from the use of certified concrete field testing technicians

Course Evaluation

- Do not Submit until you answer all the questions!!

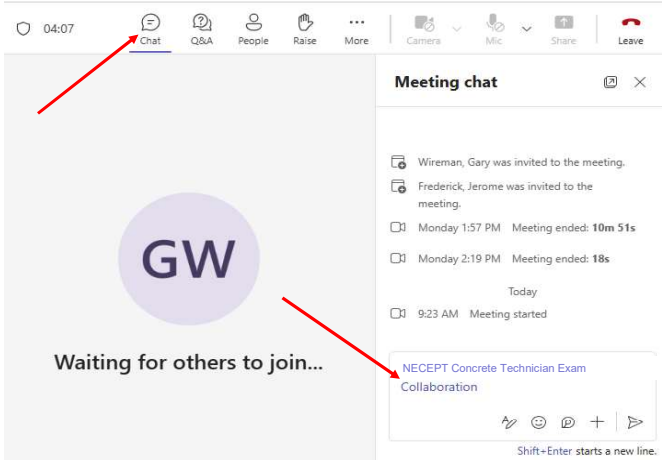




REMEMBER: After finishing the evaluation, close the internet browser and return to Teams.

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

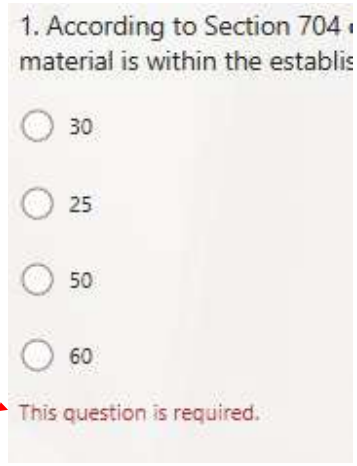
Certification Test



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Certification Test

- 50 Questions (all must be answered)
- 60 Minutes



PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Certification Test

- Test Results

Certification Test

- Need a sheet of scratch paper
- Different exam versions
- 60 minutes allowed for the completion of the exam
- Thanks for your participation!

PENNDOT CONCRETE FIELD TESTING TECHNICIAN CERTIFICATION

Make sure you answer all 50 questions before hitting Submit.

Once you have submitted your exam, you are free to leave.

GOOD LUCK !!!