AASHTO T-23/ASTM C31
Standard Practice for Making and Curing Concrete Test Specimens in the Field

Concrete Curing Analogy

- Concrete Mix Design ⇔ ***Recipe*** (Really Good Cake)
- Plastic Concrete ⇔ ***Batter*** (Really Good Cake Batter)
- Mold Cylinders ⇔ ***Batter in Cake Pan***
- ***Cure*** Cylinders ⇔ ***Bake*** ***That Cake***


Standard
6”x 12” Cylinder
Mold & Rod
4”x 8”
Cylinder
Mold & Rod

Consolidation by Rodding

- 6” x 12” Fill in 3 layers of approximately equal volume
- 4” x 8” Fill in 2 layers of approximately equal volume
- Rod each layer 25 times
  - rod first layer throughout its depth
  - distribute the strokes uniformly over the area
  - penetrate previous layer approximately 1 inch
- Tap the mold lightly after each rodded layer 10 to 15 times with a rubber mallet
- After consolidation - strike off and begin proper curing

Rodding and Consolidation

- Improper consolidation can cause a 17% decrease in 28 day strengths.
- For a cylinder that has the potential of achieving 5000 psi, you can lose 850 psi through improper consolidation.

Concrete Cylinder Curing

Two Methods:

- Field Curing
- Standard Curing

Field Curing Method

Trying to determine actual in-place strengths

- Put a structure into service
- Form or shoring removal
- Check on the adequacy of the curing and protection

EARLY BREAK CYLINDERS

Field Curing Method

- Store cylinders in or on the structure
- Protect the cylinders from the elements in the same way as the structure
- Provide the cylinders with the same temperature and moisture environment as the structure
- Remove from the molds at the time of removal of form work.

EARLY BREAK CYLINDERS

Standard Curing Method AASHTO T 23/ASTM C 31

- Acceptance testing for specified strength (28 day)
- Checking adequacy of mixture proportions for strength
- Quality control

Standard Curing Method

- ***Initial Curing**:* Immediately store the specimens for up to 48 h in a temperature range between 60 to 80°F and in an environment to prevent moisture loss. Shield all specimens from direct sunlight and, if used, radiant heating devices.

- ***Final Curing**:* Upon completion of initial curing and within 30 min after removing the molds, cure test cylinders with free water maintained on their surfaces at all times at a temperature of 73 ± 3°F

- During transport cylinders must be protected from Jarring, Freezing and Moisture Loss.

Initial Curing

- Curing at elevated temperatures can cause a 15% decrease in 28-day strength
- For a cylinder that has the potential of achieving 5000 psi you can lose 750 psi through curing at elevated temperatures

Initial and Final Cure

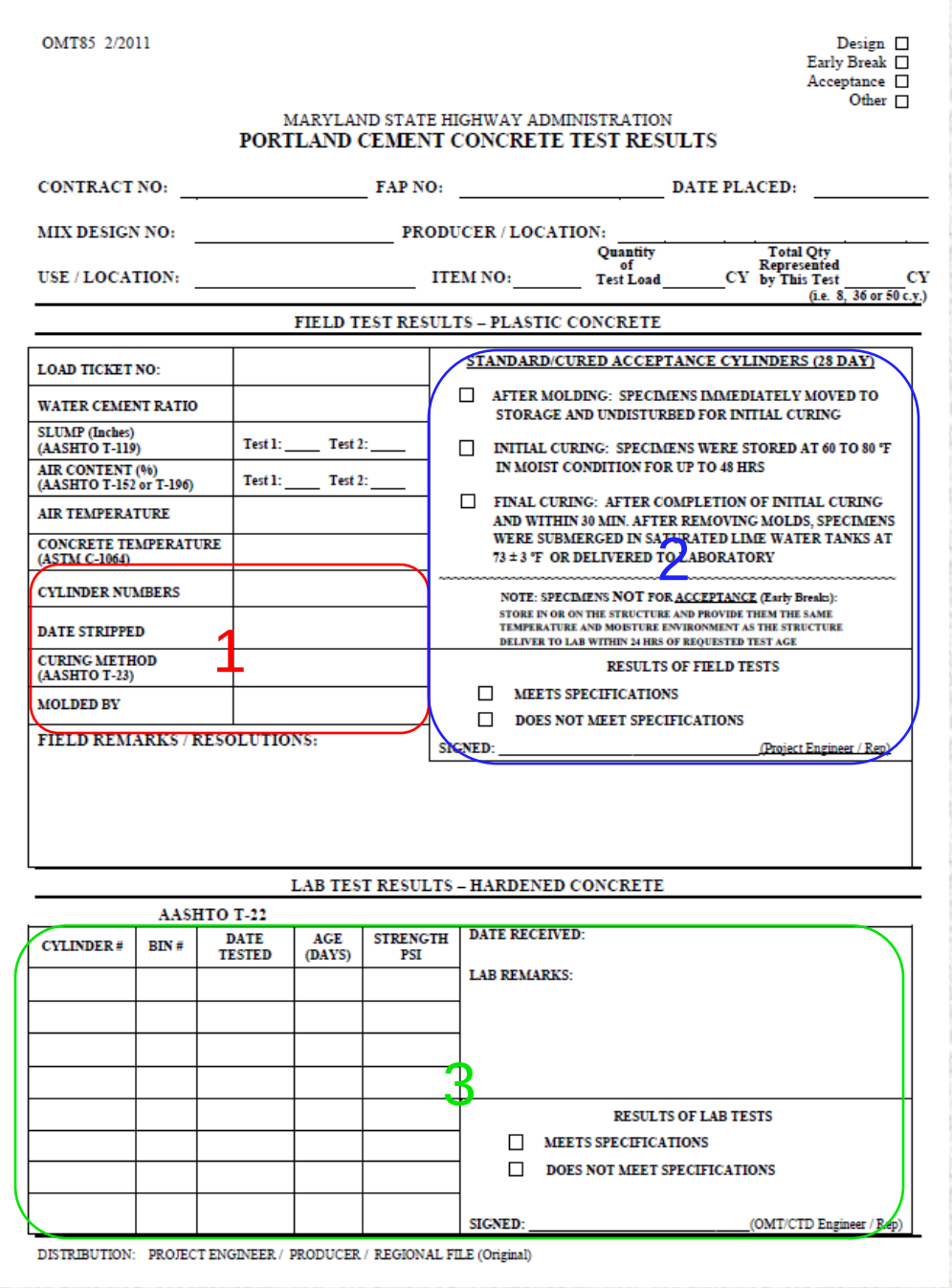
- Lack of moisture during curing can cause an 8% decrease in strength at one day, 11% at three days, 18% at seven days, and over 20% decrease in strength at 28 days
- For a cylinder that has the potential of achieving 5000 psi you can lose 1000 psi by air curing cylinders

Transporting Cylinders

- A bumpy ride in the back of a pickup can cause a 7% decrease in strength
- Dropping a cylinder can cause a 5% decrease in strength
- For a cylinder that has the potential of achieving 5000 psi, you can lose between 250 and 350 psi through improper handling

Portland Cement Concrete Test Results Form 85

- Field test results
  - Slump
  - Air Content
  - Concrete Temperature
  - Test Cylinders
- Document Quality of the concrete as it was delivered to the Job site
- Provides an indication of how the material was handled once received by Project Personnel



OMT85 2/2011

Design ☐
Early Break ☐
Acceptance ☐
Other ☐

MARYLAND STATE HIGHWAY ADMINISTRATION
PORTLAND CEMENT CONCRETE TEST RESULTS

CONTRACT NO: _____ FAP NO: _____ DATE PLACED: _____

MIX DESIGN NO: _____ PRODUCER / LOCATION: _____

USE / LOCATION: _____ ITEM NO: _____ Quantity of Test Load _____ CY Total Qty Represented by This Test _____ CY (i.e. 8, 36 or 50 c.y.)

FIELD TEST RESULTS – PLASTIC CONCRETE

LOAD TICKET NO:	
WATER CEMENT RATIO	
SLUMP (Inches) (AASHTO T-119)	Test 1: ____ Test 2: ____
AIR CONTENT (%) (AASHTO T-152 or T-196)	Test 1: ____ Test 2: ____
AIR TEMPERATURE	
CONCRETE TEMPERATURE (ASTM C-1064)	
CYLINDER NUMBERS	
DATE STRIPPED	
CURING METHOD (AASHTO T-23)	
MOLDED BY	

1

STANDARD/CURED ACCEPTANCE CYLINDERS (28 DAY)

☐ AFTER MOLDING: SPECIMENS IMMEDIATELY MOVED TO STORAGE AND UNDISTURBED FOR INITIAL CURING

☐ INITIAL CURING: SPECIMENS WERE STORED AT 60 TO 80 °F IN MOIST CONDITION FOR UP TO 48 HRS

☐ FINAL CURING: AFTER COMPLETION OF INITIAL CURING AND WITHIN 30 MIN. AFTER REMOVING MOLDS, SPECIMENS WERE SUBMERGED IN SATURATED LIME WATER TANKS AT 73 ± 3 °F OR DELIVERED TO LABORATORY

2

NOTE: SPECIMENS NOT FOR ACCEPTANCE (Early Breaks): STORE IN OR ON THE STRUCTURE AND PROVIDE THEM THE SAME TEMPERATURE AND MOISTURE ENVIRONMENT AS THE STRUCTURE DELIVER TO LAB WITHIN 24 HRS OF REQUESTED TEST AGE

RESULTS OF FIELD TESTS

☐ MEETS SPECIFICATIONS

☐ DOES NOT MEET SPECIFICATIONS

SIGNED: _____ (Project Engineer / Rep)

FIELD REMARKS / RESOLUTIONS:

LAB TEST RESULTS – HARDENED CONCRETE

AASHTO T-22

CYLINDER #	BIN #	DATE TESTED	AGE (DAYS)	STRENGTH PSI

3

DATE RECEIVED:

LAB REMARKS:

RESULTS OF LAB TESTS

☐ MEETS SPECIFICATIONS

☐ DOES NOT MEET SPECIFICATIONS

SIGNED: _____ (OMT/CTD Engineer / Rep)

DISTRIBUTION: PROJECT ENGINEER / PRODUCER / REGIONAL FILE (Original)

Portland Cement Concrete Test Results Form 85

Section 1 Identifies:

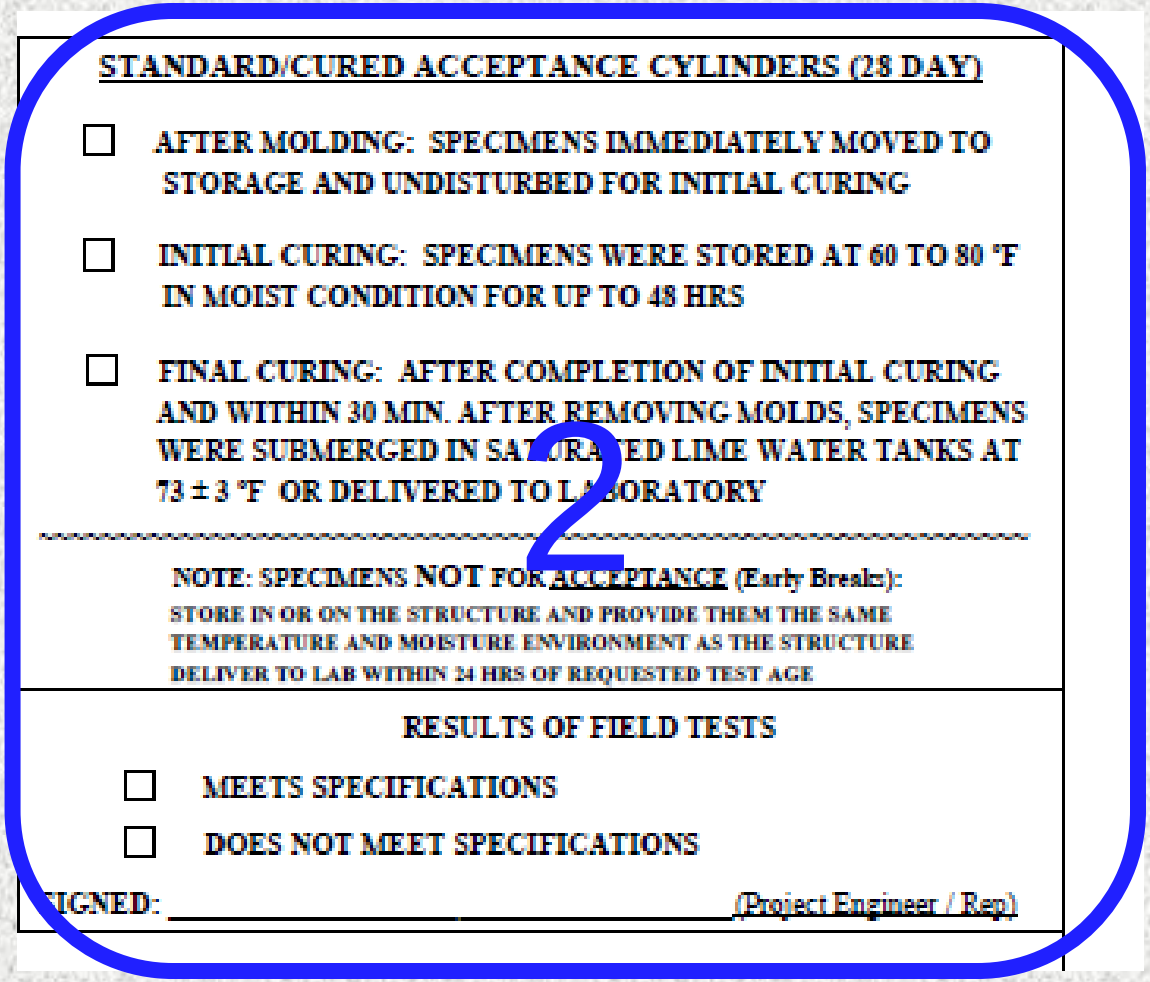
- Cylinder Number
- Date Stripped
- Curing Method
- Molded By

CYLINDER NUMBERS	
DATE STRIPPED	1
CURING METHOD (AASHTO T-23)	
MOLDED BY	

Portland Cement Concrete Test Results Form 85

Section 2 Identifies:

- Whether proper curing techniques were followed per AASHTO/ASTM
- Does Field Testing of concrete Meet Specifications



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STORE IN OR ON THE STRUCTURE AND PROVIDE THEM THE SAME TEMPERATURE AND MOISTURE ENVIRONMENT AS THE STRUCTURE
DELIVER TO LAB WITHIN 24 HRS OF REQUESTED TEST AGE

RESULTS OF FIELD TESTS

☐ MEETS SPECIFICATIONS

☐ DOES NOT MEET SPECIFICATIONS

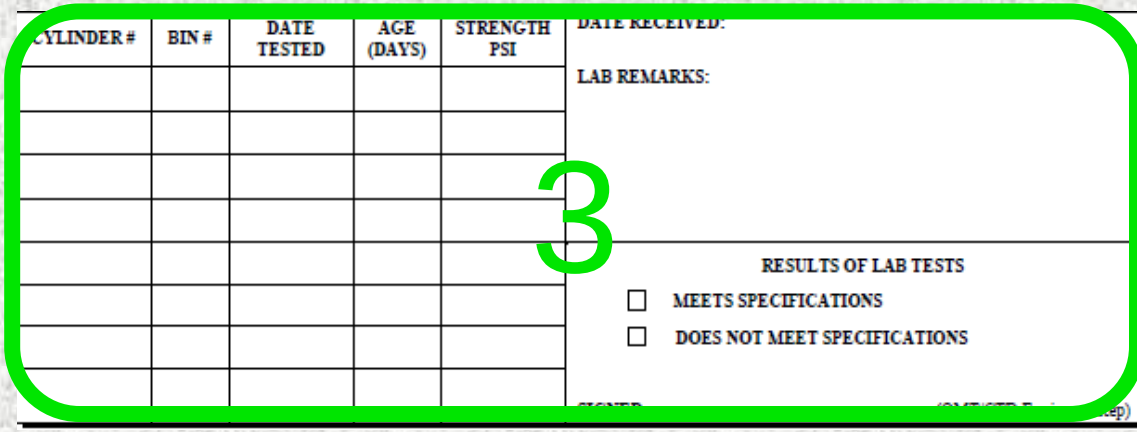
SIGNED: _____ (Project Engineer / Rep)

Portland Cement Concrete Test Results Form 85

Section 3 Identifies:

Compression Test Results

- Cylinder Identification Number
- Date of testing
- Age of test cylinder
- Resulting psi Strength



Concrete Curing Analogy

- Concrete Mix Design ⇔ ***Recipe*** (Just Like Grandma use to make)
- Plastic Concrete ⇔ ***Batter*** (Really Good Cake Batter)
- Mold Cylinders ⇔ ***Batter in Cake Pan***
- ***Cure*** Cylinders ⇔ ***Bake*** ***That Cake***

Concrete Curing Analogy

A Must….If You Want That Really Good Cake

- Cake must be baked according to the **recipe**
  Correct Temperature, Time and Oven

  Cylinders, Like Cake…

- Must be cured according to the **"recipe"** (AASHTO T-23/ASTM C31)
  Correct Curing Environment, Cure Temperature, and Cure Time

Remember...

The Concrete Supplier

MAKES THE

"BATTER"

But YOU...

"BAKE"

THE "CAKE"

QUESTIONS??