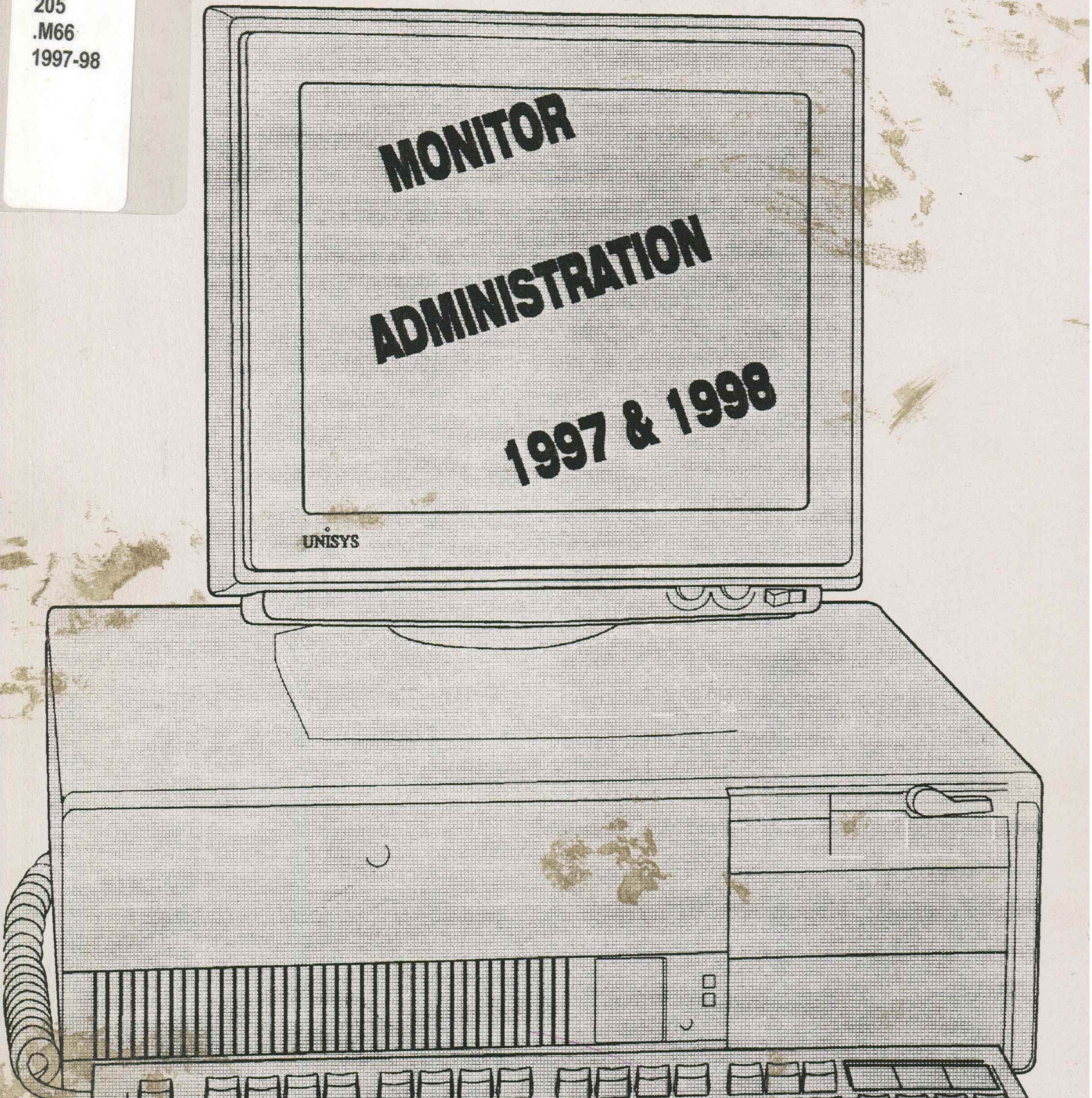
Debrae Betsy ~~233-8607~~ ext 460
232-1332

Rial 239-3710
ext 143



Nancy Paulson
Rich Millard

Jan 20, 1998
KC 187

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TABLE OF CONTENTS
(*Continued*)

PCC STRUCTURAL

WEEKLY REPORT

FILLED OUT BY THE CPI.

Some information will be given to the CPI by the Grade Inspector.

1. % Used concrete
2. Water Added

NEW COMPUTER FORM

•All the information is filled out by the Certified Plant Inspector.

•There is a separate form that will be filled out by the Road Inspector.

•Since these are Weekly Reports, they should be faxed in by the Monday following the week of the report.

STRUCTURAL COLDFEED SAMPLES

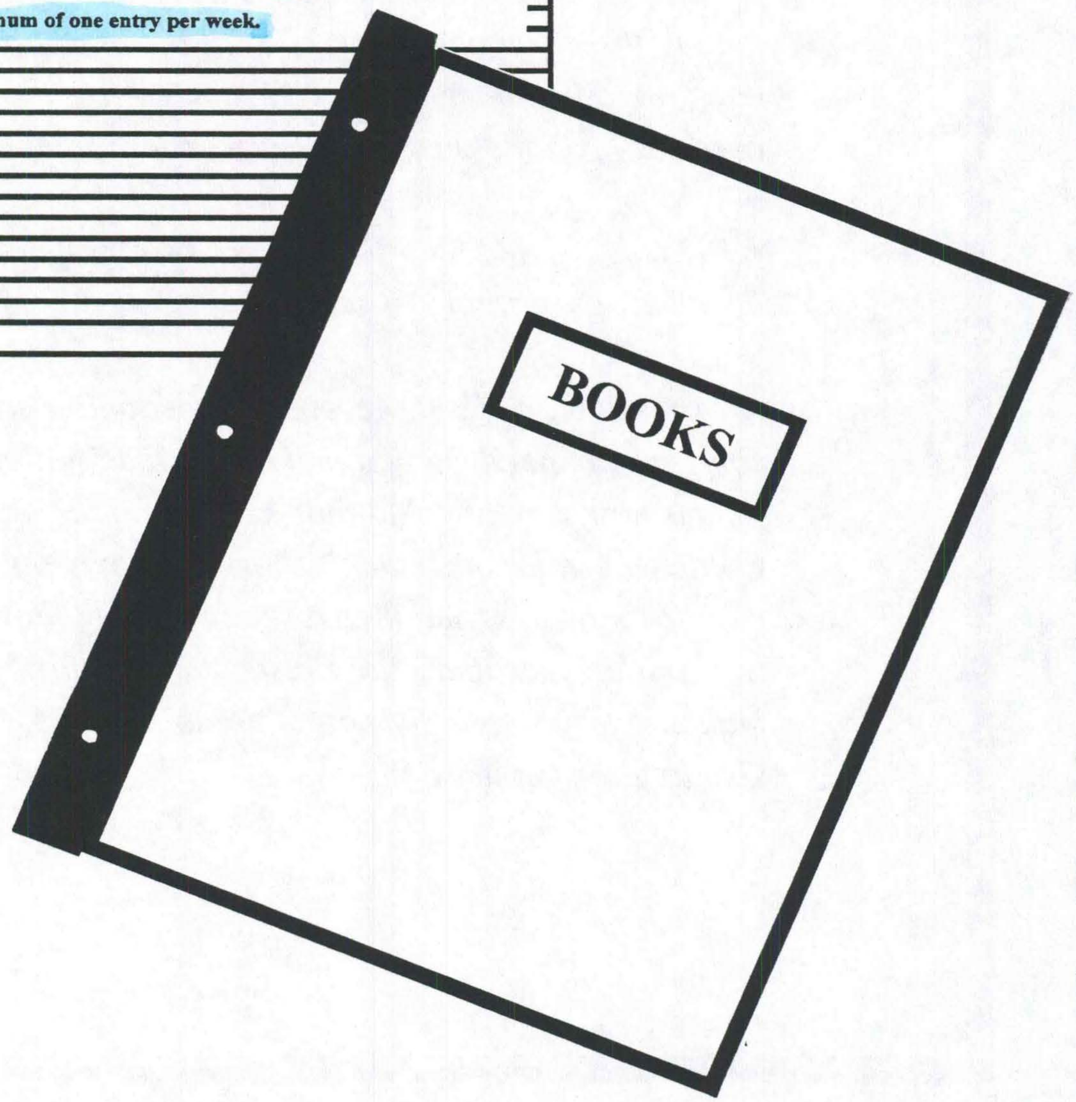
•As a Monitor, you need to run the first sample of the week for the first three weeks. Then 10% of the project after that, unless there happen to be failures.

•Remember, the Certified Plant Inspector should be getting three samples a week. Split the first sample, hang on to the other two for backups. Also, the CPI needs to "roll the dice" for their random samples.

•On the E240 or M240 Form there is only space for the CPI's gradation test result.

•Form E200 or M200, Acceptance Gradation in 216 comparison, needs to be filled out by the Monitor. This is how you, as a Monitor, report out any of your Coldfeed gradations. On this form you may put the monitor's results, and then directly on the following line, put the Certified Plant Inspector's results. This makes it very simple for you to do an I.M. 216 Gradation comparison.

Certified Plant Inspectors should keep up their books or computer daily, due to the Monitor being able to check them any day of the week. Monitoring once a week is the minimum. The CPI should keep a pretty good daily diary, since the Monitor is usually at the plant only once a week. This makes it easy for the Monitor to know what has happened during that week. As a Monitor, you will have a minimum of one entry per week.



first 2 days
every other of the that

MOISTURES

SPECIFIC GRAVITY

THE MONITOR WILL RUN THESE TESTS ONLY IF THE CERTIFIED PLANT INSPECTOR IS HAVING PROBLEMS.

ADMIXTURES

Obtain Computer Report from Central Materials once a month. These report lot numbers that have been tested. If the lot number is on this report there is no need to get another sample of this material. If the lot number is not on this list or it did not comply, you need to get the appropriate size of sample (IM 204) and send it to the Central Materials Lab for testing.

This report is distributed by Central Materials via your office computer. It covers the following:

- *Air Entrainments*
- *Water Reducers*
- *Retarders*
- *Paint Beads*
- *White Curing Compound*

FLYASH

CEMENT

THE ASSURANCE DEPARTMENT OR THE AREA INSPECTOR SHOULD BE GETTING SAMPLES OF THESE.

PCC PAVING

DAILY PAVING REPORT: FORM E240 OR M240

FILLED OUT BY THE CPI.

Monitor will check it over. The Road Inspector will notify the CPI of information pertaining to the road.

1. % Used

2. Water Added

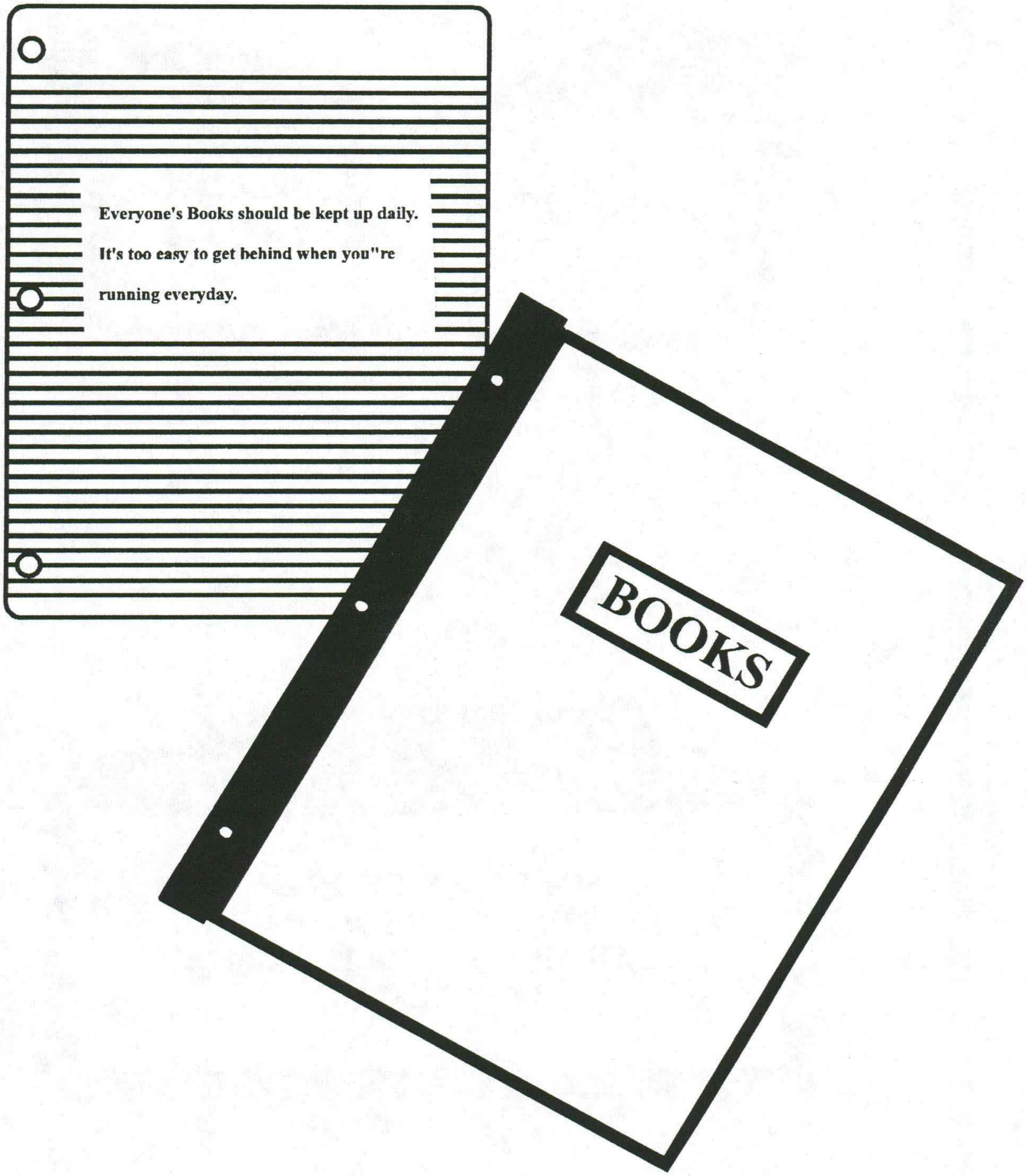
These should be faxed in within four hours of the following working day.

COLDFEEDS

•Monitor will run the first three days of paving, then 10% of the project from there on.

•CPI needs to run the first one everyday. CPI also needs to catch two more everyday and hold onto them for backups. Remember to "roll the dice" for random gradation samples, done by the CPI. The CPI may have to run two samples on a given day.

•There is no space given to the Monitor on this report for their gradation results. Remember to use Form E200 or M200 (same one used for weekly report).


Everyone's Books should be kept up daily.
It's too easy to get behind when you"re
running everyday.
BOOKS

MOISTURES

SPECIFIC GRAVITY

THE MONITOR WILL RUN THESE TESTS ONLY IF THE CERTIFIED PLANT INSPECTOR IS HAVING PROBLEMS.

ADMIXTURES

Obtain Computer Report from Central Materials once a month. These report lot numbers that have been tested. If the lot number is on this report there is no need to get another sample of this material. If the lot number is not on this list or it did not comply, you need to get the appropriate size of sample (IM 204) and send it to the Central Materials Lab for testing.

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- *Air Entrainments*
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- *White Curing Compound*

CEMENT

FLYASH

THE ASSURANCE DEPARTMENT OR THE AREA INSPECTOR SHOULD BE GETTING SAMPLES OF THESE.

START OF ANY PCC PROJECT:

Before Any Pour


MONITOR SETS UP BOOKS
PROVIDES CPI WITH THEIR BOOKS, FORMS, AND ANY OTHER SUPPLIES THEY MAY NEED.
EXPLAINS THE BOOKS OR FORMS TO THE CPI.
STRESSES THE IMPORTANCE OF MAINTAINING GOOD DIARY PAGES.

ASK WHERE THE MATERIAL IS ALL COMING FROM:

- *Any material hauled to the plant must have proper documentation.*

- *Take a look at the tickets-all correct information on tickets?*

- *Remind them to keep a copy of all tickets at the Ready Mix Plant.*

Fly Ash

While looking at tickets, check the dates of the cement tickets (Especially early Spring projects)-If over ~~30~~ 60 days old, the Ready Mix Plant cannot use this cement.

can use if matl's gets sample & it passes

Notify your Materials Department. They will come and get a sample of the material and take it to their lab to run tests.

Must Pass #20 Screen.

• *Is the Plant certified to do state work?*

• *Calibration must be done yearly. This is done by the Materials Department.*

• *Calibration sheet must be visual at the Ready Mix Plant.*

• *Go look at the Stockpiles.*

The Specific Gravity Test is run by the CPI unless they are having problems, then the monitor would run one.

*Allowed +-.02 Off given SP.GR.

ALWAYS HAVE YOUR T-203 SECTION WITH YOU.

* This is a list of Quarries and Pits.

You can look up the materials you are using to check for Specific Gravity.

*If there is a DWU, You need to contact the Area Inspector or the Materials Department.

METRIC

*Absolute Volumes

*Converting

SAFETY FIRST

Make sure everything is safe where the CPI Catches their gradations.

The person catching the coldfeed samples has to be Level I Aggregate Certified.

• If the project has small quantities, ask your Engineer if testing may be waived.

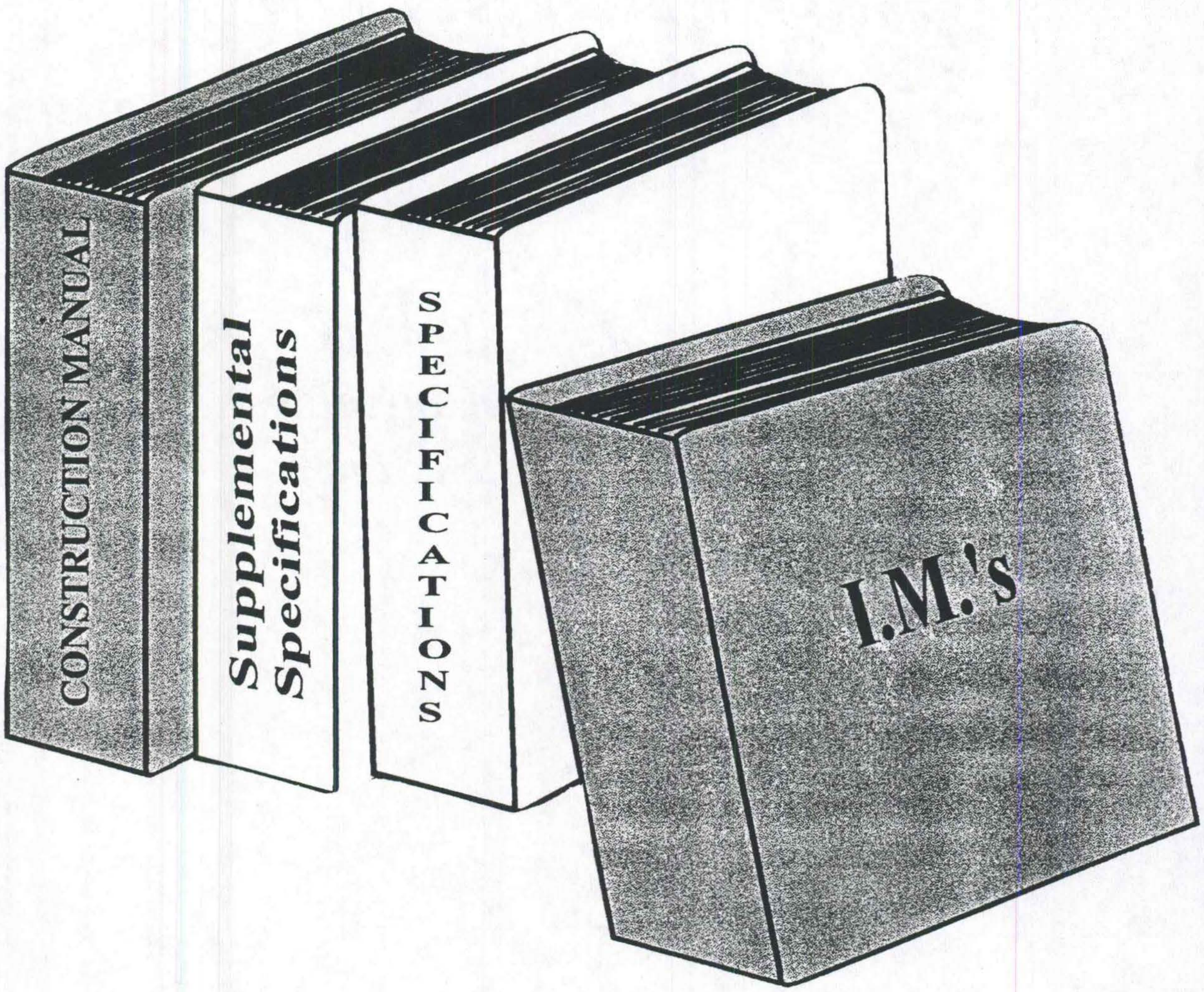
• No Gradations, Specific Gravities, or Moistures would be run.

• For Specific Gravities, you would use T-203 answer, and batch person usually knows where they are for moistures, due to commercial loads.

- ***It is helpful to have a looseleaf book, with a copy of approved Cement, Flyash, and Admixture sources in it, as well as a copy of T-203 in it.***

- ***Extra copies of the Absolute Volume worksheet and anything that can help you while at the plant.***

Instead of hauling all your I.M.'s with you, have Specifications book (either blue or orange) and a copy of the latest Supplementals, and your Construction Manual in your vehicle.



Check Admixture tanks.

Are they correctly set up?

-Minimum of 5 minutes each day per 100 gallons.

-Circulation pump (1/3 h.p. pump motor)

-5/8" inside diameter hose (minimum requirement)

-Stream of air bubbles will not be acceptable.

Make sure the Plant circulates any material before pour.

Ask Batch person when they add the Admixtures.

Retarder and Water Reducer shall be introduced into the mixer after all other ingredients are in the mixer.

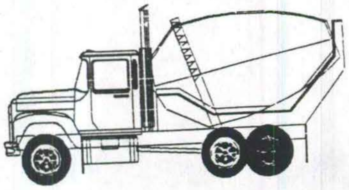
Air can be mixed w/ H_2O @ beginning

FIRST DAY OF POURING

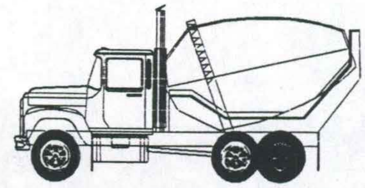
- ***BE THERE BEFORE POUR BEGINS***

- ***CHECK OVER BATCH WEIGHTS***

- ***WITNESS SCALE CHECKS***



READY MIX TRUCKS



• Metal Plate (Rated RPM) needs to be on every truck, and you need to be able to read it. If not on truck, tell them it needs to be on before next pour. It is your call if this truck should be used or not.

• Are the trucks certified?

They should have a card in the cab of truck, with the date and signature of who did the inspection of the truck.

• Climb up and look into the drum of the truck yourself. Are the fins clean and have no holes?

• Make sure trucks are getting all their "Revs" before they leave the plant

-According to IM 527, it states **BEFORE** leaving plant, not M.O.R. (Mixing on Road).

- 70 and 90 are the Rev counts.

• Watch Loader Operator

Is the person working the piles correctly?

• Scale checks being done once each ½ day. If you have a small pour you can also use commercial loads.

• CPI filling out truck tickets properly?

One copy stays at plant, the other copy goes with truck driver to give to the Road Inspector.

• Make sure discharge time is on every ticket-This is how the road inspector knows to reject the load or not (I.M.527).

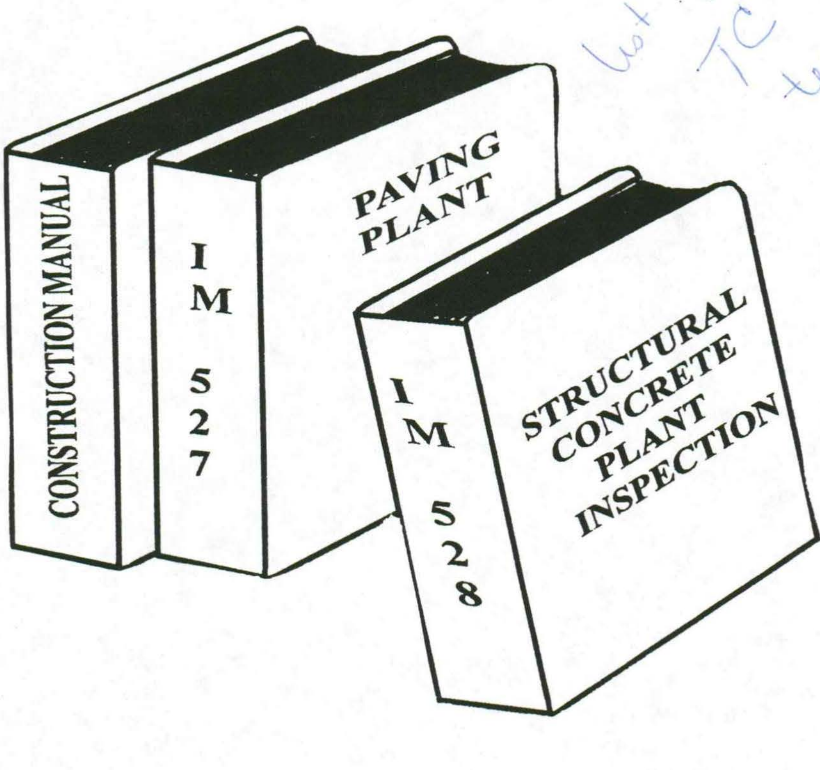
• Guide the CPI through the report for the first day's pour if needed.

• If working with Flowable Mortar, need mix design number.

• Make sure the CPI keeps all sample backups, until you tell them they can get rid or them.

GOOD REFERENCES

list of TC techs



PAVING PLANT

• *Not too much different when at paving plant. You'll have a cement yield to look over-CPI fills this out.*

• *Gradations will be different.*

• *Reports will be made daily rather than weekly.*

WEEKLY CHECKS: STRUCTURAL

- *Reports and Book Entries*

- *Proportion Controls*
  - Scale Weights/ Scale Operations
  - Admixture Dispensers
  - Mixing Time

60 secs mixing time p129

- *Stockpiles*

DAILY CHECKS: PAVING

- *All Above Listed Items for Structural*

- *Cement Yields*

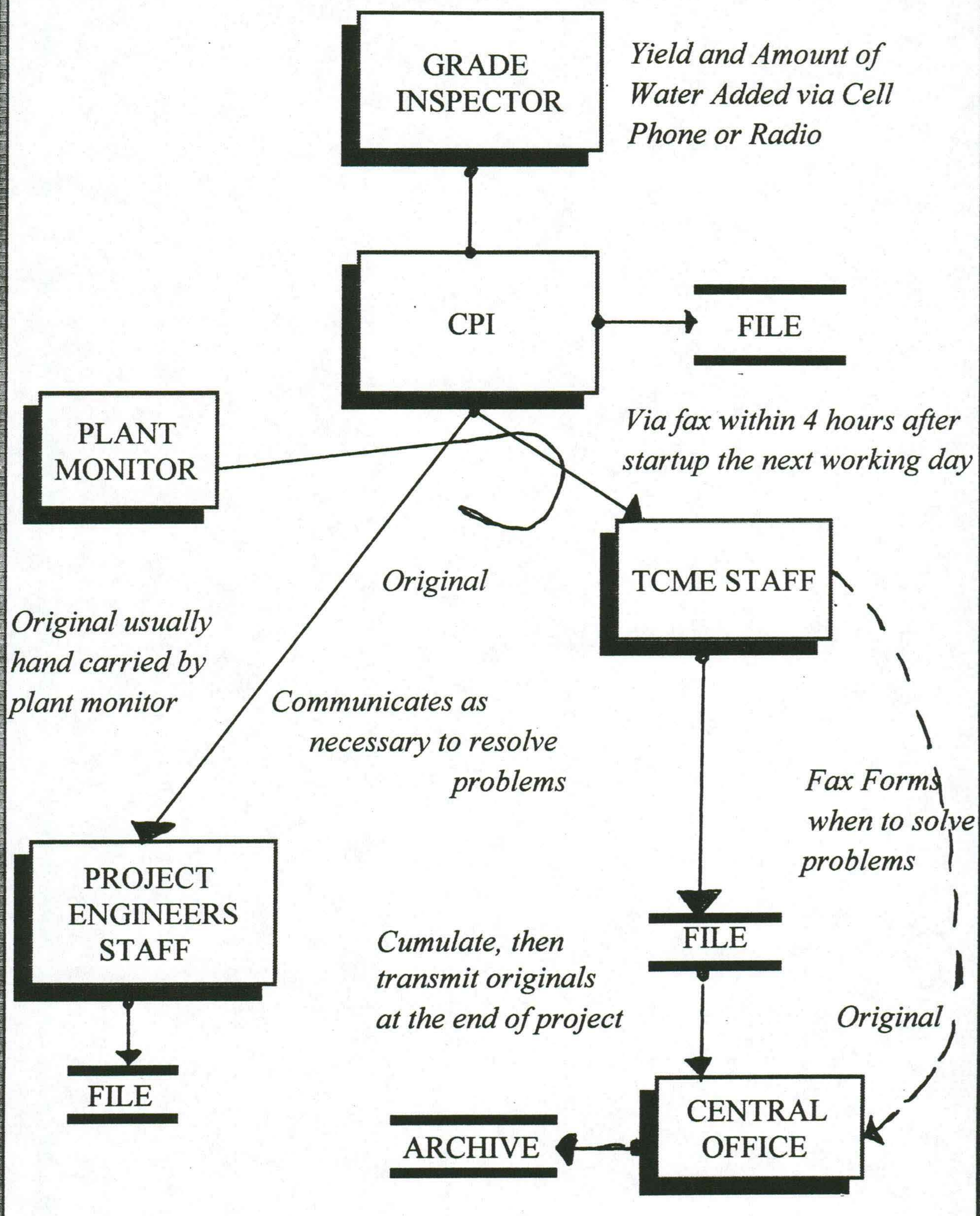
ASSURANCE CHECKS

- *CPI will Get The Assurance Samples and Split Them*

- *Either The Monitor or Whoever is Running the Acceptance Gradation will Run Half of the Assurance Split, not the CPI.*

- *Have Ready: All Tickets*

- *If You Know a Pour is Going To Be a Smaller One, Notify Assurance. They May Wait and Come to a Larger Pour Later On.*



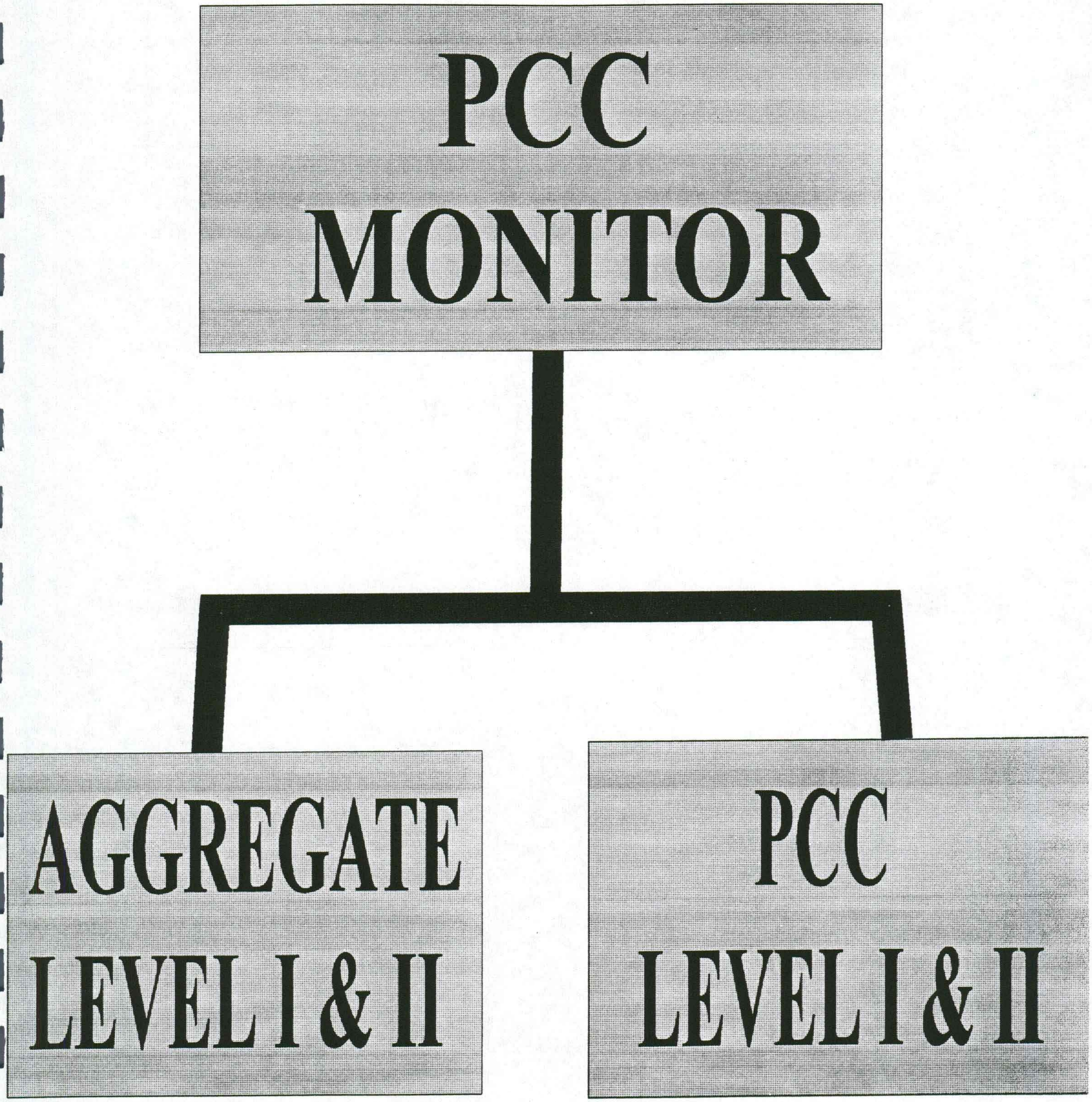
Flowchart for PCC Plant Page (e240 or m240)

QUESTIONS

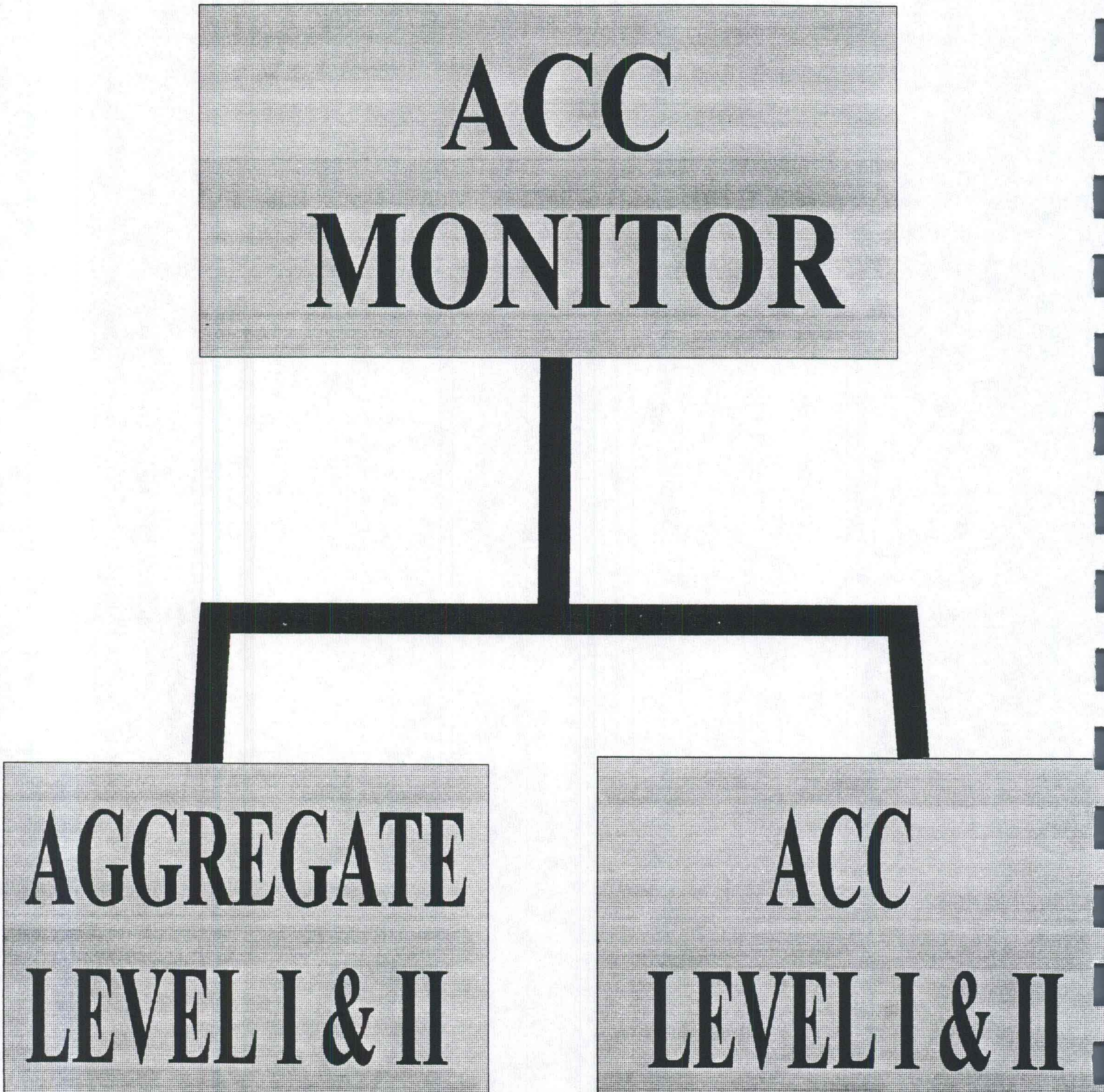
PROBLEMS

EXPERIENCES

REQUIREMENTS



DO NOT HAVE TO HAVE TEN DAYS EXPERIENCE TO BE A MONITOR



DO NOT HAVE TO HAVE TEN DAYS EXPERIENCE TO BE A MONITOR

REFERENCES

D57 Can't use 12" sieves

GENERAL

I.M. 204	***Sampling and Testing***
I.M. 209	***Certified Aggregate Testing and Certified Aggregate***
I.M. 216	***Guidelines for Verifying Certified Testing Results***
I.M. 302	***Sieve Analysis Fine***
I.M. 303	***Sieve Analysis Course***
I.M. 304	***Sieve Analysis Combined***
I.M. 305	***Sieve Analysis Combined With 305mm (12 in.) Sieves***

PCC

I.M.'S

I.M. 527 PAVING PLANT INSPECTION

I.M. 528 STRUCTURAL CONCRETE PLANT INSPECTION

I.M. 529 P.C.C. CONCRETE PROPORTIONS

CONSTRUCTION MANUAL:

APPENDICES:

3-2.1	MONITOR DUTIES PCC
3-3.1	MONITOR DUTIES PCC

CHAPTERS

11-47 to 11-56	MONITOR DUTIES PCC
3-3 to 3-14	MONITOR DUTIES PCC

ACC

CONSTRUCTION MANUAL:

APPENDIX

3-4.1 to 3-4.4 MONITOR DUTIES ACC

CHAPTER

8-1 to 8-32 MONITOR DUTIES ACC

I.M.'S

I.M. 208 app. C	Interlaboratory Correlation Testing
I.M. 510 app. A	QMA Test Equipment
I.M. 214 app. A	Asphalt Inspection Duties
I.M. 322	Method of Sampling Uncompacted Asphalt
I.M. 323	Method of Sampling Asphaltic Materials (What Size of Container and What Kind of Container to use for the Different Samples)
I.M. 508	Asphaltic Plant Inspection
I.M. 508 app. B	Weighing Equipment
I.M. 511	Outline of Responsibilities
I.M. 511 QMA	Outline of Responsibilities

DUTIES

MONITOR DUTIES

• Set up looseleaf Books

• Take Books, Forms, Job Mix, and any supplies to the plant before project begins.

~~Contracting authority, which is the DOT or County, will supply boxes, 3 oz. tins, and papercups to the Contractor for that project.~~

• Check over the QMA Lab. I.M. 510, Appendix A

NEIM-Something new in '96. They have an AC Specialist who will go out to the Labs and check over everything. They also check over the Materials Lab.

• Get familiar with the plant and personnel, as well as Stockpiles, Bins (bin dividers), Sampling locations, and AC storage.

Important

• At the PRE-CON, suggest that the QMA Lab Technician should keep current Supplemental Specifications and current I.M.'s in the QMA Lab.

• Plant Calibration is done by the Contractor and witnessed by the Materials ACC Technician. The Monitor is not required to be there during Calibration.

• If need extra copies of 955 or 956, may want to call the ACC Tech. and have them bring to them to the Calibration.

• Monitor Tank Stick once a week. & witness

• Sensitivity Test first day and once a week there after.

• Run first Gradation Split for the first three days, and 10% of the project there after. 1st if

If they mix i.e.: base, surface

MONITOR DUTIES
(Continued)

*• **Do Not** stay in the trailer or your truck all day. Get out and walk around the Plant. Go into the Control Trailer. Check the gate settings-keep an eye on these during the day.*

• Monitor the Mix temperatures-Need to tarp

• See that Aggregate are getting properly coated (you can usually see inside the truck boxes).

• If a truck uses a distillate, the trucks will have to sit for 5 hours with their boxes in an upward position.

• Check to see that the person doing the Sampling off the road is doing it properly.

• Monitor, or whoever the TC designates, "Rolls the Dice" for which box is to be sent to Materials.

• Monitor will let CPI know when they can throw away any Aggregate samples.

• Materials Lab will let the QMA Lab Technician know when they can throw away their boxes and pills.

• The Mix Design (956) is given to a certain project. An approved 956 for one project may not be used for another project without the approval of your Materials Lab or ACC Technician. There are different criteria that need to be met.

• Assurance samples are independent from the daily lot sample.

• Check any Materials tickets.

• Use truck ticket weights on liquid asphalt tankers (no longer have to get a weight before they unload and after they unload).

MONITOR DUTIES
(Continued)

• *You do not need individual truck tickets from every truck if a Plant is set up in a Quarry from which you may be getting products. The Scale person may give you a daily total sheet for each Material.*

• *Looseleaf pages-No longer have the large Tankstick sheets on the walls.*

• *Computer Tankstick-Just enter your numbers and the computer calculates everything for you.*

• *Minimum FBR=0.30*

• *Gradation Test Results-The #200 Sieve should not go below 3.0. This is the daily result, not what is submitted for the Job Mix.*

QUESTIONS

PROBLEMS

EXPERIENCES

ACC NON QMA GENERAL

DAILY FORMS: E241 or M241

- *Mostly completed by Certified Plant Inspector.*

- *Always a day behind at the Plant due to the fact that roadway cores are usually cut the following working day.*

- *Report should be faxed in within four hours of the next working day, unless you have any kind of failures.*

SAMPLING

AC SAMPLES (Liquid)

CPI gets a 3 oz. tin of 1/40 ton of Asphalt (not 1/40 ton of Mix).

MIX (Hotbox)

- *Sampled by QMA tech. or CPI on QMA projects.*

- *First Sample each day is sent to the Materials Lab directly for testing.*

GRADATIONS

• Run the first Split Sample of the first three days of production, and then 10% of the project thereafter. (Split is between CPI and Monitor.)

• The CPI will run the first one everyday, and then get two more throughout the day for backups.
Random Gradations-The CPI "Rolls the Dice" to see if they have to run an extra Gradation everyday.

• For some projects, the CPI will run the Split of the first sample, and then will elect to run the Split of the second or third sample everyday. They must tag the other half of the Split for the Monitor.

• All the backups should be kept at the Plant site until the Monitor tells the CPI which ones they can throw.

• On Daily Asphalt Plant Report-Form E241 or M241 (handwritten one), there is a location for the Monitor to enter their Gradation results.

• The Monitor still needs to report their Gradations on Form E201 or M201.

Put Monitor's results, and then directly below, put the CPI's results. Then do the Gradation comparison, according to I.M. 216.

DENSITY CORES

On Non-QMA projects, the Monitor will weigh the Cores and calculate the Densities.

Make sure you get the Cores ready to be sent into your Materials Department.

- *The Lab will hold onto them.*

- *They randomly choose a set per week run .*

- *Then they will see how close they correlate with the fields' answers.*

BOOKS:
LOOSELEAF AND COMPUTER

* MUST BE KEPT UP DAILY

TACK SAMPLING

• *One every 10,000 gallons. Usually the Road Inspector will get this sample.*

• *The tickets will usually come into the Plant.*

• *Make out Sample Identification Form #193, and an envelope.*

• *Sample according to I.M. 323.*

1 qt or 1 liter

• *You can either give the Superintendent the bottle to take to the Road Inspector for you, or you can give it to a reliable truck driver.*

• *The Road Inspector will send it back to the Plant the same way.*

• *Put the paperwork with it and send it in.*

ACC QMA GENERAL


FORM E241 & M241
- Required on all projects.
- CPI and Lab Technician will fill out all of the Report.

SAMPLING

AC SAMPLES (Liquid)

CPI gets a 3 oz. tin of
1/40 ton of Asphalt
(not 1/40 ton of Mix).

MIX (Hotbox)

• Sampled by QMA tech. or CPI on QMA projects.

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• All the backups should be kept at the Plant site until the Monitor tells the CPI which ones they can throw.

• On Daily Asphalt Plant Report-Form E241 or M241 (handwritten one), there is a location for the Monitor to enter their Gradation results.

• The Monitor still needs to report their Gradations on Form E201 or M201.

Put Monitor's results, and then directly below, put the CPI's results. Then do the Gradation comparison, according to I.M. 216.

BOOKS:
LOOSELEAF AND COMPUTER

* MUST BE KEPT UP DAILY

CHARTS
(QMA LAB TECH)

- *Must be kept up daily.*

- *Everyone looks at these when they come to the Lab.*

- *The charts provide information on the quality of the Mix.*

- *They show moving averages.*

- *If the moving average goes out on the voids, the Contractor needs to stop and make a change to try to bring the average back in.*

- *If no change is made and they keep running, knowing the moving average is out, shut them down, and it is a 50% penalty of the mix laid.*

DENSITY CORES

- *CPI weighs the Cores and calculates the Densities.*

- *As a Monitor, observe the process at least once a week.*

- *CPI gets the Cores ready to be sent to the Materials Lab.*

- *Remember, a copy of the Report must be sent in with the Cores.*

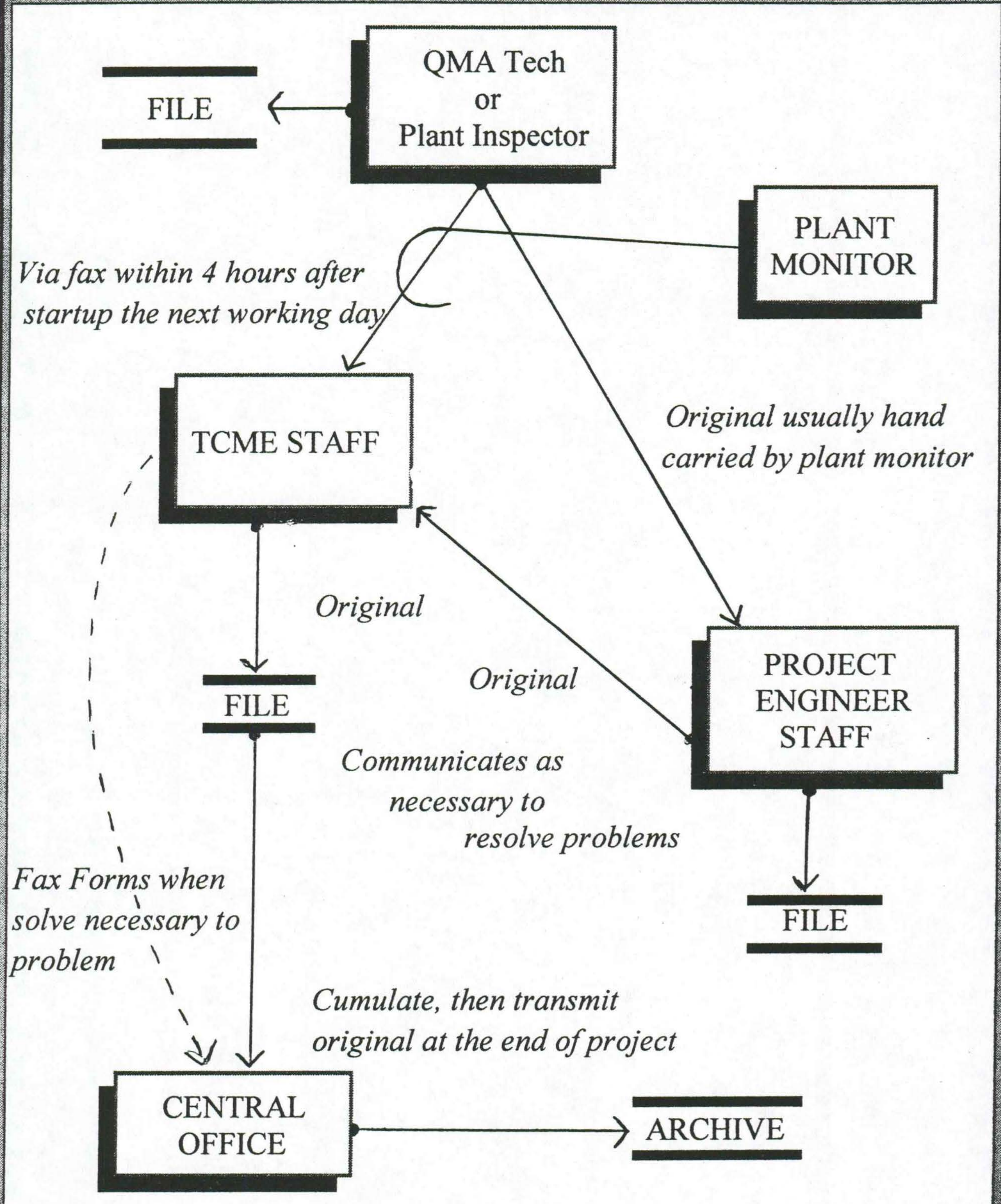
MIX

- *The QMA Lab Tech. will get four boxes daily (depending on tonnage).*

- *They will break these down in their Lab Trailors. Some sort of sample needs to go to the Materials Lab for correlation testing everyday.*

- *Each area may be different in what they want sent in, so you will have to call and find out what they want.*

- *Always keep in touch with your Materials Lab. If they are having problems, they may want more.*



Flowchart for ACC Plant Page (e241 or m241)

QUESTIONS

PROBLEMS

EXPERIENCES

METHOD OF TESTING THE STRENGTH OF PORTLAND CEMENT CONCRETE USING THE MATURITY METHOD

GENERAL

This I.M. outlines the procedure for using the maturity concept as a non-destructive method to determine concrete strength.

This is a two step procedure. First, a relationship must be established between the maturity values and the concrete strength as measured by destructive methods (that is, through testing of beams or cylinders). The development of the maturity-strength curve shall be done in the field at the beginning of construction using project materials and the project proportioning and mixing equipment. The second step is the instrumentation of the concrete to be measured. Temperature probes are installed in the concrete and the temperature is measured. From those measurements, along with the age at which the measurements were taken, maturity values are determined. A maturity meter or temperature measuring device and a computer or calculator may also be used to determine the maturity values.

The Contractor and the Agency shall jointly develop a plan for performing the maturity testing. The plan shall include:

1. The Contractor shall be responsible for the development of the maturity curve. The curve development shall be monitored by the Contracting Agency.
2. The temperature monitoring process of the constructed pavement shall be the responsibility of the Contractor and monitored by the Contracting Agency.

For concrete furnished from a construction or stationary mixer which is in place prior to construction of the specified project, a maturity curve may be established ahead of actual construction of the specified project. The test specimens shall be cast with concrete made from the same plant and using the same materials source as will be used in the specified project. The Agency shall be informed and have an opportunity to observe the development of the maturity curve.

THE MATURITY CONCEPT

The hydration of cement and gain in strength of the concrete are dependent on both curing time and temperature. Thus, the strength of the concrete may be expressed as some function of time and temperature. This information can then be used to determine the strength of concrete without conducting physical tests. The time-temperature function commonly used is the maturity concept proposed by Nurse-Saul (ASTM C1074),

$$M(^{o}C \times hours) = \sum[(T - T_0)\Delta t] \qquad (1)$$

where M is the maturity in degree °C-hours [M is also termed the time-temperature factor (TTF)], Δt is the time interval in hours (or days), T is the average concrete temperature during the time interval Δt, and T_0 is the datum temperature at which concrete ceases to gain strength with time. The value of T_0 = -10°C (14°F) is most commonly used. As a result, Eq. (1) becomes

$$M(^{o}C \times hours) = \sum[(T + 10)\Delta t] \qquad (2)$$

ESTABLISHMENT OF MATURITY-STRENGTH RELATIONSHIP

To establish a maturity-strength relationship for a concrete mix, a maturity meter or a thermal meter and a hydraulic testing machine are needed. The following procedure shall be used:

1. Cast a minimum of twelve (12) 152 mm X 152 mm X 508 mm (6 in. x 6 in. x 20 in.) beams, as per I.M. 328. Test the entrained air content and slump of the concrete being used to cast the beams, as per I.M. 327. Record these values. The concrete shall meet specifications. The beams shall be cast from a batch of at least 3 cubic yards.

2. Embed a thermal couple wire near each end of a test beam (when flexural strength is to be determined) to monitor the temperature. This beam will be the last to be tested. A probe shall be inserted near each of the beam ends to the approximate mid-depth and such that they are approximately 75 mm (three in.) from each side and each end. Loop the wire around the beam box handles to prevent the wire from being inadvertently pulled out of the beam. The average of the two readings will be used in the development of the maturity-strength curve. When the thermal meter is used, the measured temperature should be substituted into Eq. (2) to obtain values of maturity. The Maturity Data Recording Sheet at the end of this I.M. may be used in this determination. When a maturity meter is used, the values are computed by the meter. Twelve (12) test specimens shall be tested as described in #4 below.

3. Cast, cure, and test the beams at the plant site. Test in accordance to I.M. 316. This will allow a maturity meter to be protected from the weather and theft. The meter can be stored in a lab trailer or vehicle with the probes run outside to the beam in the sand pit. The beams shall be covered with plastic immediately after casting and prior to form

removal. If possible, wet burlap should be placed over the surface of the beams under the plastic. The forms shall be removed the following day. Cure all beams in a pit of wet sand after form removal, until they are tested.

4. Determine maturity values and strength at four different ages. Test three specimens for strength at each age and calculate the average strength at each age. The maturity value shall be calculated from a temperature reading at the time the specimen is tested for strength. The tests shall be spaced such that they are performed at somewhat consistent intervals of time and span a range in strength that includes the opening strength desired. The table below gives suggested maturity values for each test of three standard mixture classes. This is only a guide and may need to be modified, depending on specific mixtures and conditions.

Approximate Maturity Values (TTF)

	Test 1	Test 2	Test 3	Test 4
A Mix	750	1500	2500	3500
B Mix	1500	3500	5500	7500
C Mix	750	1500	2500	3500
F Mix	500	1000	1500	2500
FF Mix	500	1000	1500	2000
M Mix	600	1200	2000	3000

These values assume opening strength of 3.45 MPa (500 psi) for the A, B and C mixtures, 2.80 MPa (400 psi) for F mixtures, 2.40 MPa (350 psi) for FF mixtures, and a five hour opening for the M mixture with calcium chloride. If the maturity curve is intended to be used to determine the time to begin joint sawing, testing must begin at lower maturity values.

The first test (Test 1), for Class C mixes, normally would be performed at an age of approximately 12 hours when hot, summer temperatures prevail. During cooler conditions, the first test may be performed at the beginning of the day following casting of test specimens.

Additional test specimens may be cast at a later time and tested at earlier ages to add data to the strength-maturity relationship as an aid to determining the appropriate time to saw.

5. Plot the measured strength against the corresponding values of maturity at different ages,

as determined by the maturity meter or by hand methods. Use a computer program provided by the Transportation Center Materials Concrete Technician to determine maturity-strength relationship. The TTF number corresponding to the opening strength shall be used to determine when the pavement has reached opening strength. An example of the Maturity-Strength Development form, generated by the computer program, is included at the end of this I.M. This form shall be signed by the contractor/contractor representative and reviewed by the TCME. Copies will be provided to the Project Engineer, TCME, Central Materials, Pavement Materials Engineer, and Contractor.

Since the influence of maturity on strength of concrete is somewhat different for various mixes, a maturity-strength relationship established for one mix shall not be used for another mix.

FIELD PROCEDURE

Equipment

1. 12 - 152 mm x 152 mm x 508 mm (6 in. x 6 in. x 20 in.) beam molds.
2. 1 each shovel (square point), rubber hammer or equivalent, and wood float or equivalent.
3. 1 each hydraulic testing machine
4. 1 each maturity meter
5. 1 each hand-held thermometer
6. Type T thermocouple wire
7. Connectors

The following equipment has been used in this work and the manufacturer's address and phone numbers are provided for information purposes. Similar equipment is available from other manufacturers.

Maturity Meter Model H-2680	Humboldt Mfg. Co. 7300 W. Agatite Avenue Norride, IL 60656 (708)456-6300
Hand-held Thermometer Model HH-25TC	Omega Engineering, Inc. One Omega Drive Box 4047 Stanford, CT 06907-0047 (203)359-1660
Type T Thermocouple Wire	Watlow-Gordon Richmond, IL 60071 (815)678-2211

Placement of the temperature probes
Strip the coating from each end of the two wires and twist the ends together before inserting them into the fresh concrete. Insert the temperature probe into the concrete until the end is at approximately the pavement mid-depth and 0.5 m (1.6 ft) from the edge of the pavement. The wire ends are the point at which the temperature measurement is taken. Insertion may be accomplished by attaching the wire ends to a wooden dowel and embedding it into the slab. Check to ensure the concrete is consolidated around the dowel. The portion of the dowel that protrudes above the pavement should be cut or broken off after the testing is completed.

Probes may be placed at any point along the pavement slab. A minimum of two probes shall be placed in each day's placement. On days when there is a large difference between daytime high temperatures and nighttime low temperatures, placing additional probes near the beginning of the day's run and at a point near the midday location would provide helpful information. This would be helpful to those sawing the pavement as well as those determining the opening time. It has been found that the concrete does not always gain strength at the same rate. Therefore the concrete placed during the middle of the day can gain strength faster than the concrete placed at the beginning of the day.

Data Collection
The other probe wire ends, not placed in the concrete, shall be connected to a plug, unless the temperature measuring device must be connected to the probe directly with bare wires. The plug is then inserted into the maturity meter or thermal meter. Normally a thermal meter can be used to collect field data. Be careful to connect the copper wire to the copper plug prong (+).

When a thermal meter is used, the wire is connected to the meter each time a temperature is taken. Then the wire is disconnected and the value recorded. A Maturity Data Recording Sheet is provided at the end of this Materials I.M. which may be used to record the temperature readings and calculate the maturity values.

Do not disconnect the wire from the maturity meter until the test is completed. The data collection must be uninterrupted. Also the maturity meter must by protected from rain or water. If water finds its way inside the meter, permanent damage will result.

Once the wires are placed, an initial temperature of the concrete shall be taken and recorded, when a thermal meter is being used. Temperature readings should be taken in the morning and late afternoon, when one first arrives on the project and before one leaves for the day, <u>as a minimum</u> for standard A, B and C mixtures. For the fast setting mixtures, readings should be taken every few hours, depending on weather conditions and mixture. If a maturity meter is being used, it should be connected to the probe as soon as possible to begin data collection.

Measuring the maturity
The maturity number can be read directly from the maturity meter or calculated from the

temperature readings obtained by the thermal meter. This number is then used to enter the strength-maturity chart that was established as described above and a strength is then determined. Note: An instruction sheet will accompany each maturity meter. It is important to follow these instructions to initialize the instrument.

Validation
Once per month, validation tests shall be conducted to determine if concrete strength is being represented by the current maturity curve. Cast and cure three (3) beams using the same procedure and manner as used to develop the current maturity curve. Test all three beams as close as possible to the maturity value which was determined to represent the opening strength of the pavement. If the average of these tests is within 0.34 MPa (±50 psi) of the original curve at the TTF the validation beams were tested, the original curve shall be considered validated. If the average value is less than 0.34 MPa (50 psi) of the original maturity curve at the TTF the validation beams were tested, a new maturity curve shall be developed. If the average value is greater than 0.34 MPa (50 psi) of the original maturity curve at the TTF the validation beams were tested, a new maturity curve may be developed. An example of the Validation of Maturity Curve is included at the end of this I.M. Signed copies shall be provided to the RCE, TCME, Central Materials, Pavement Materials Engineer, and Contractor.

MATURITY DATA RECORDING SHEET

Project No.: ______________________ County: ________________

Pavement Thickness: __________

TTF for Traffic Opening	Station: ____________	Station: ____________
	Air (%): ____________	Air (%): ____________
	Slump: ____________	Slump: ____________
	Air Temp: ____________	Air Temp: ____________

Date	Time	Site 1				Site 2			
		Age (hour)	Temp (°C)	ΔTTF (°C-h)	TTF	Age (hour)	Temp (°C)	ΔTTF (°C-h)	TTF
		0				0			

$$TTF_i = \left(\frac{Temp_i + Temp_{i+1}}{2} + 10 \right) (Age_i - Age_{i-1})$$

SAMPLE

MATURITY DATA RECORDING SHEET

Project No.: FM-67(25)--55-67 County: Monona

Pavement Thickness: 8 in.

TTF for Traffic Opening		
7500 °C-hour	Station: 1100 Air (%): 6.5 Slump: 2 in. Air Temp: 75 °F	Station: Air (%): Slump: Air Temp:

Date	Time	Site 1				Site 2			
		Age (hour)	Temp (°C)	ΔTTF (°C-h)	TTF	Age (hour)	Temp (°C)	ΔTTF (°C-h)	TTF
8/12/85	9:00 am	0	31	0	0	0			
	10:00 am	1	31	41	41				
	1:00 pm	4	36	131	172				
	4:00 pm	7	33	134	306				
8/13/95	9:00 am	24	28	689	994				
	4:00 pm	31	42	315	1309				
8/14/95	9:00 am	48	37	842	2151				
	4:00 pm	55	38	333	2483				
8/15/95	9:00 am	72	22	680	3163				

$$TTF_i = \left(\frac{Temp_i + Temp_{i+1}}{2} + 10 \right) (Age_i - Age_{i-1})$$

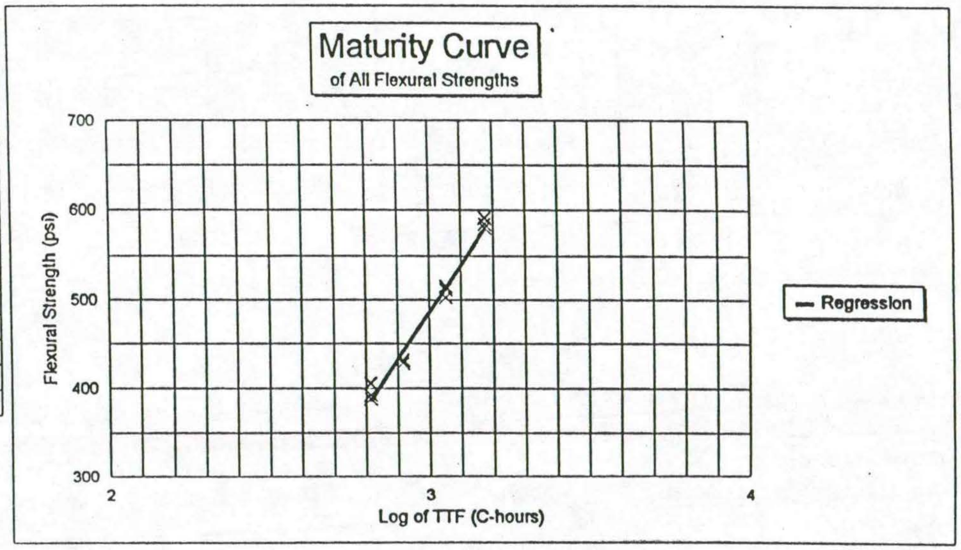
MATURITY - STRENGTH DEVELOPMENT

CURVE #:
PROJ. #:
MONITOR:
REP/CONTRACTOR:
INSPECTOR:
DATE:

BEAM #	INDICATED LOAD (lbs)	ACTUAL LOAD (lbs)	BREAK LOCATION (in)	DEPTH (in)	WIDTH (in)	FLEXURAL COEFFICIENT	FLEXURAL STRENGTH (psi)	AGE AT BREAK (hours)	TTF CH 1	TTF CH 2	AVERAGE TTF
	Enter	*Enter*	*Enter*	*Enter*	*Enter*			*Enter*	*Enter*	*Enter*	
1	3000	3100	0.5	5.98	6.02	0.125419	389		650	650	650
2	3100	3250	0.5	6.00	6.01	0.124792	406		650	650	650
3	3050	3150	0.5	6.00	6.02	0.124585	392		650	650	650
4	3450	3400	0.5	5.98	6.00	0.125838	428		800	850	825
5	3550	3450	0.5	6.00	6.00	0.125000	431		800	850	825
6	3500	3425	0.5	6.00	6.00	0.125000	428		800	850	825
7	4000	4100	0.5	5.98	6.00	0.125838	516		1100	1150	1125
8	3990	4000	0.5	5.98	6.00	0.125838	503		1100	1150	1125
9	4000	4100	0.5	6.00	6.00	0.125000	513		1100	1150	1125
10	4600	4650	0.5	6.00	6.00	0.125000	581		1500	1500	1500
11	4700	4680	0.5	6.00	6.00	0.125000	585		1500	1500	1500
12	4750	4700	0.5	5.98	6.00	0.125838	591		1500	1500	1500

MIX INFORMATION	*Enter*
AIR:	9.4 %
SLUMP:	2 1/2"
W/C:	0.41
INITIAL TEMPERATURE OF BEAMS:	
MIX NUMBER:	C3WRC20
FLY ASH SOURCE:	Council Bluffs
CEMENT SOURCE:	Ash Grove
COARSE AGGREGATE SOURCE:	Durham Mine
FINE AGGREGATE SOURCE:	Vandalia
WATER REDUCER BRAND:	Daratard 17
ADD. RATE:	2 oz. /100 lbs
AIR ADMIXTURE BRAND:	Daravair 1400
ADD. RATE:	6 oz. /100 lbs.
METHOD OF DEVELOPMENT:	Maturity
Required Flexural Strength (MOR):	500 psi

REQUIRED TTF: **1062**



Certified Maturity Contractor Representative - ____________________
Signature

Maturity Curve Reviewed - ____________________
T.C. Materials Engineer

Comments:

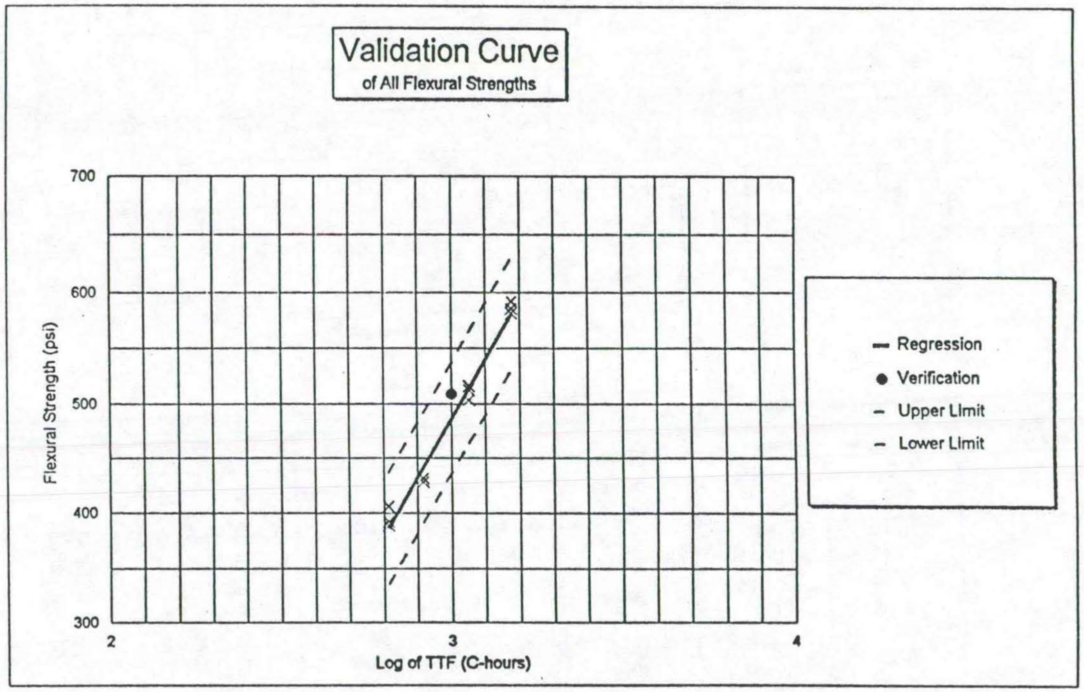
cc: RCE, TCME, Central Materials, Pavement Materials Engineer, Contractor

VALIDATION OF MATURITY CURVE

CURVE #:	0	MONITOR:	0	INSPECTOR:	0
PROJ. #:	0	CONTRACTOR:	0	DATE:	0

BEAM #	INDICATED LOAD (lbs)	ACTUAL LOAD (lbs)	BREAK LOCATION (in)	DEPTH (in)	WIDTH (in)	FLEXURAL COEFFICIENT	FLEXURAL STRENGTH (psi)	AGE AT BREAK (hours)	TTF CH 1	TTF CH 2	AVERAGE TTF
	Enter	*Enter*	*Enter*	*Enter*	*Enter*			*Enter*	*Enter*	*Enter*	
1	4000	4100	0.5	6.00	6.00	0.125000	513		1000	1000	1000
2	3990	4000	0.5	6.00	6.00	0.125000	500		1000	1000	1000
3	4000	4100	0.5	6.00	6.00	0.125000	513		1000	1000	1000

MIX INFORMATION	*Enter*
AIR:	9.4 %
SLUMP:	2 1/2"
W/C:	0.41
INITIAL TEMPERATURE OF BEAMS:	
MIX NUMBER:	C3WRC20
FLY ASH:	Council Bluffs
CEMENT:	Ash Grove
COARSE AGGREGATE:	Durham Mine
FINE AGGREGATE:	Vandalia
WATER REDUCER:	Daratard 17
ADD. RATE:	2 oz. /100 lbs
AIR ENTRAINER:	Daravair 1400
ADD. RATE:	6 oz. /100 lbs.
METHOD OF DEVELOPMENT:	Maturity



CURVE VALIDATION	
TTF @ Break	1000
Beam 1 MOR (psi)	513
Beam 2 MOR (psi)	500
Beam 3 MOR (psi)	513
Beam Avg. MOR (psi)	508

Calculated psi @ TTF	486	Range Minimum	436
		Maximum	536

Curve Validation - OK

Comments:

Certified Maturity Contractor Representative - ______________________
Signature

Maturity Curve Validation Reviewed - ______________________
T.C. Materials Engineer

cc: RCE, TCME, Central Materials, Pavement Materials Engineer, Contractor

MATVER.WK4
6/97

MATURITY

- ***Fresh concrete gains strength as a result of the exothermic reactions between water and cement or cement hydration.***

- ***The extent of cement hydration in a concrete mixture, and therefore strength, is a function of the temperature history of the concrete mixture. This relation of time and temperature is maturity or the time-temperature factor (TTF).***

Maturity Method

Maturity is a technique for estimating concrete strength based on the assumption that samples of a given concrete attain equal strength if they attain equal maturity values. There are three steps involved in the maturity method.

1. ***Development of Strength-Maturity Relationship***
2. ***Determination of Maturity Value for Opening Strength***
3. ***Determination of Maturity Value in Slab or Structure***

Estimates of Strength are Based on Two Important Assumptions

1. ***There is always sufficient moisture for continued hydration-ie. Proper curing procedures.***

2. ***The concrete in the structure is the same as that used to develop the strength maturity relationship.***

Maturity Function

Mathematical expression for evaluating maturity or time-temperature factor (TTF) from the recorded temperature history of the concrete

Nurse-Saul Equation (ASTM C1074)

$$\text{Maturity or TTF } (^\circ C \bullet hrs) = \sum (T - T_o) \bullet \Delta t$$

where,

T = average temperature over time interval Δt

T_o = -10 °C, datum temperature at which concrete ceases to gain strength

Δt = time interval in hours

Rewritten as

$$\text{Maturity or TTF } (^\circ C \bullet hrs) = \sum (T + 10) \bullet \Delta t$$

Establishing Strength Maturity Relationship

(I.M. 383)

- *Cast twelve (12) 152x152x508 mm (6"x6"x20") beams*

- *Place two thermocouple wires, one near each end of one beam to approximately mid-depth. Loop the wire around the beam box handles to prevent the wires from inadvertently being pulled out. Begin recording temperature with the maturity meter.*

- *Beams should be covered with wet burlap or plastic until they are able to be stripped from the forms and cured in a wet sand pit.*

- *At four different ages test three(3) beams for flexural strength and record the TTF reading from the maturity meter before testing each specimen. For Class C mixes, the first set of beams will need to be tested the following day after casting (~18-24hrs.). During hot summer weather, the first set may need to be tested earlier (~12hrs.).*

Establishing Strength Maturity Relationship

(I.M.383) continued

- *Test the remaining beams at the approximate maturity values given in I.M. 383, or ~12-24hrs. between tests depending on weather conditions. Be sure that the tests are spaced over intervals of time that span a range in strength that covers the desired target strength. Some adjustment of the testing intervals may be required to ensure that the target strength is covered.*

- *Plot the TTF values vs. the strength values. Determine the TTF value which corresponds to the target strength. The TTF may also be calculated, using a calculator or computer, by performing a linear regression between the strength and log (TTF).*

MATURITY METER
CURVE #4

PROJECT #: STP-5-4(27)--2C-91 DATE BEAMS MADE: 08/20/96

BEAM #	LOAD AT BREAK (lbs)	TABLE VALUE (lbs)	BREAK LOCATION (in)	WIDTH (in)	DEPTH (in)	FLEXURAL COEFFICIENT	FLEXURAL STRENGTH	AVERAGE FLEXURAL STRENGTH	AGE AT BREAK (DAYS)	TTF CH 1	TTF CH 2	AVERAGE TTF
1	3450	3400		5.98	6.02	0.124586	424	427		750	800	775
2	3550	3450		6.00	6.01	0.124584	430	427		750	800	775
3	4000	4100		6.00	6.02	0.124171	509	505		1100	1150	1125
4	3990	4000		5.98	6.00	0.125418	502	505		1100	1150	1125
5	4600	4650		6.00	6.00	0.125000	581	581		1500	1500	1500
6	4600	4650		6.00	6.00	0.125000	581	581		1500	1500	1500
7	5100	5150		5.98	6.00	0.125418	646	652		1900	1950	1925
8	5150	5200		5.98	6.00	0.125418	652	652		1900	1950	1925
9	5200	5250		5.98	6.00	0.125418	658	652		1900	1950	1925

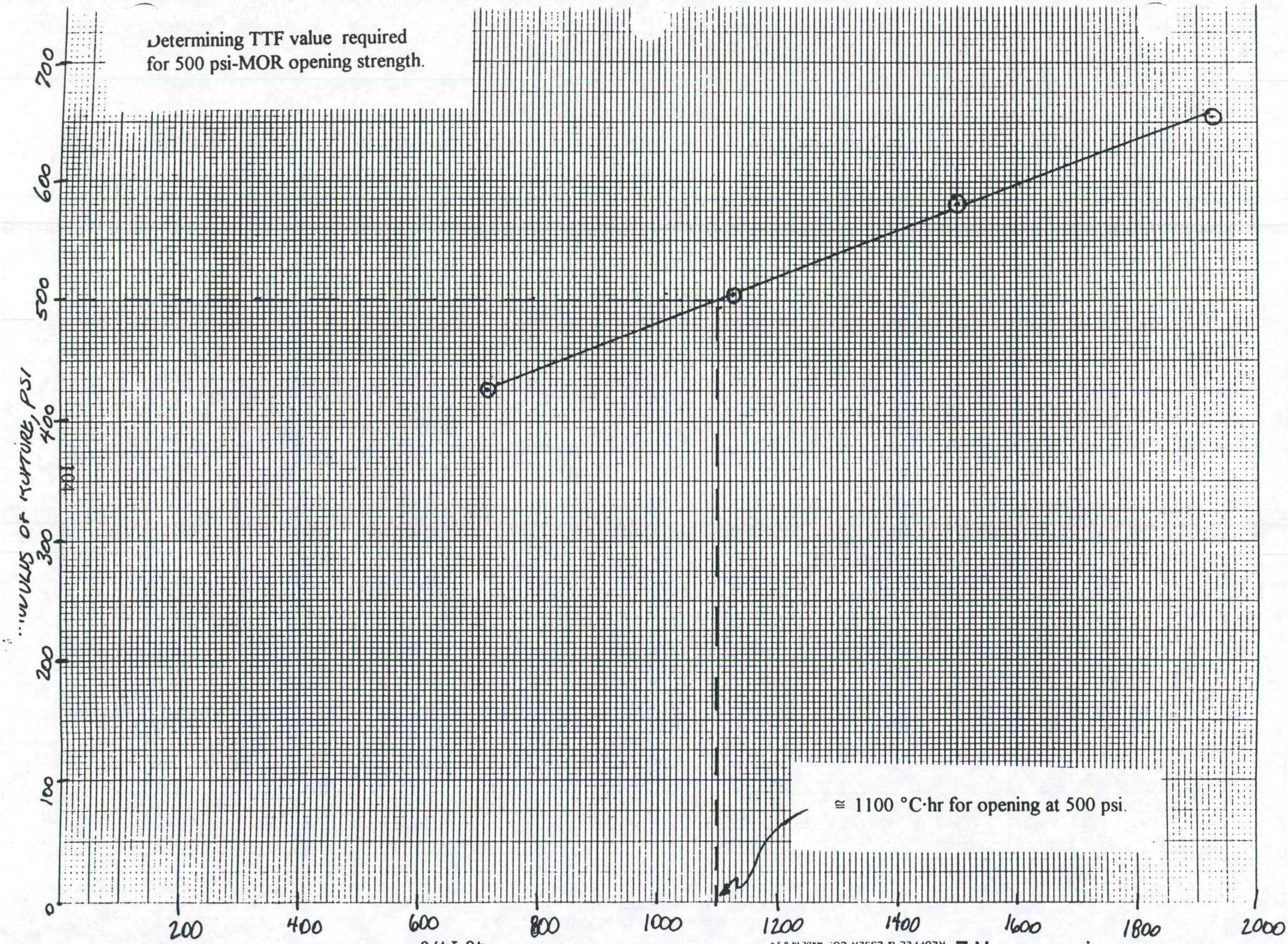
AIR: 9.4 %
SLUMP: 2 1/2"

MIX: C-3WR-C20
FLY ASH: COUNCIL BLUFFS
CEMENT: ASH GROVE
COARSE AGGREGATE: KASER CORP @ DURHAM MINE
FINE AGGREGATE: HALLET MATERIALS @ VANDALIA
WATER REUDCER: DARATARD 17
AIR ENTRAINER: DARAVAIR 1400
TTF FOR 500 PSI: 1065

MATERIALS STAFF: ERIC COWLES
SHANE TYMKOWICZ

INSPECTOR: STEVE HUBLER

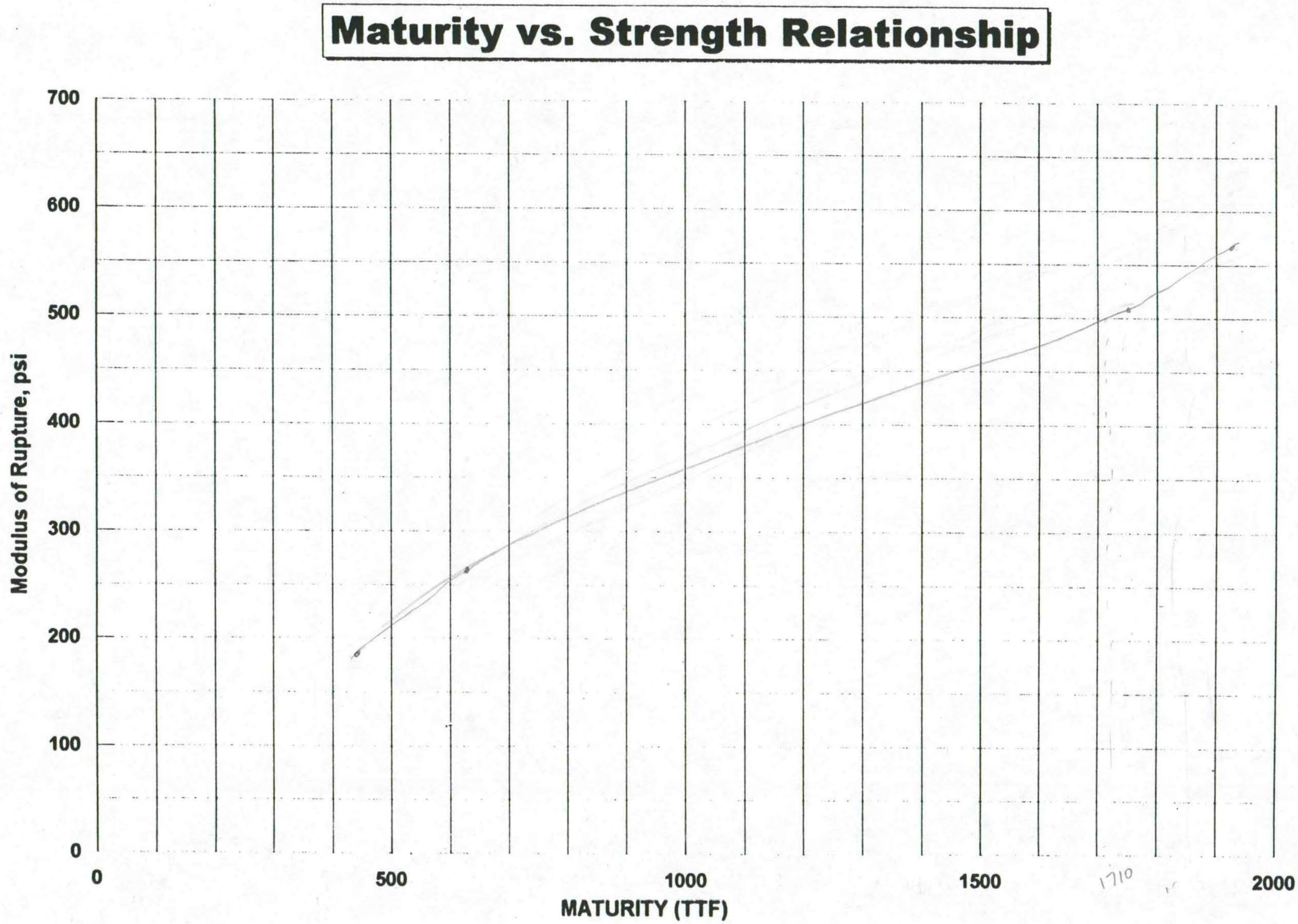
CONTRACTOR: CEDAR VALLEY


Determining TTF value required
for 500 psi-MOR opening strength.
ODULUS OF RUPTURE, PSI
0
100
200
300
400
500
600
700
200
400
600
800
1000
1200
1400
1600
1800
2000
≅ 1100 °C·hr for opening at 500 psi.

Given:

Maturity Values (TTF)	*Average Flexural Strengths (psi)*
435	*180*
616	*363*
1749	*509*
1922	*565*

Plot the Maturity vs. Strength curve and determine the TTF value for opening strength of 500 psi.


Maturity vs. Strength Relationship
Modulus of Rupture, psi
700
600
500
400
300
200
100
0
0
500
1000
1500
2000
1710
MATURITY (TTF)

Determing Maturity (TTF) in Slab Using Temperature Data

- *Maturity (TTF) of the slab or structure may be calculated using a hand held digital thermometer. The procedure is the nearly the same as that using the maturity meter except that the maturity value (TTF) is calculated.*

- *Place the thermocouple wire mid-depth into the slab approximately 1 foot in from the edge. Record the initial temperature and time.*

- *Continue to monitor the temperature at some interval of time and calculate the TTF. It would be preferable to monitor the temperature hourly, but realistically the temperature should be monitored 2 to 3 times per day.*

- *When the calculated TTF value reaches the required TTF for 500 psi, as determined with the strength maturity relationship, it may be assumed that the strength in the structure is sufficient to open.*

Maturity or TTF (°C• hr)

$$= \sum(((Temp_1 + Temp_2)/2)+10) \times \Delta t_{hrs})$$

= Sum of (Average Temperature in °C + 10) x (time, hrs in hours)

Readings

Age (hrs.)	*Temp , °C*	*TTF*	*Sum of TTF*
0	*34.6*	*0*	
12	*34.6*	*535*	*0 + 535=535*
23	*42.9*	*536*	*535 + 536=1071*
37	*30.7*	*655*	*655 + 1071=1726*

TTF@ 12 hours = ((34.6 + 34.6)/2 +10) x (12-0)
= (34.6 + 10) x 12
= 535

TTF@ 23 hours = ((34.6 + 42.9)/2 + 10) x (23-12)
= (38.75 + 10) x 11
= 536

TTF@ 37 hours = ((30.7 + 42.9)/2 + 10) x (37-23)
= (36.8 + 10) x 14
= 655

Project : STP-5-4(27)--2C-91
County : Warren
Date Paved: 08/03/96
From Sta: 119+95 To Sta:

%Air : 6.5
Slump : 2.25
Mix: C3WRC20

Cement: Ash Grove
Fly Ash: Council Bluffs
Coarse: Durham
Fine: Vandalia
WR: WRDA-82

TTF Required to Open : 1150

Date	Time	Age (hours)	Temp (deg C)	TTF at age (deg C-hr)	Sum TTF (deg C-hr)
		0.00	34.6		0
		12.00	34.6	535	535
		23.00	42.9	536	1071
		37.00	30.7	655	1727
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0
				0	0

TTF 1727

Value in box should be equal to or greater than required TTF.

Given:

Temp (°C)	**Age (hrs)**	Interval	TTF	Sum TTF
22.2	*0.0*			0
19.0	*16.5*	16.5	505	505
26.5	*23.5*	7	229	734
15.9	*39.5*	16	499	1233
20.2	*46.0*	6.5	182	1415
14.8	*63.0*	17	468	1883

Calculate the maturity value (TTF) for each time interval and the TTF sum value.

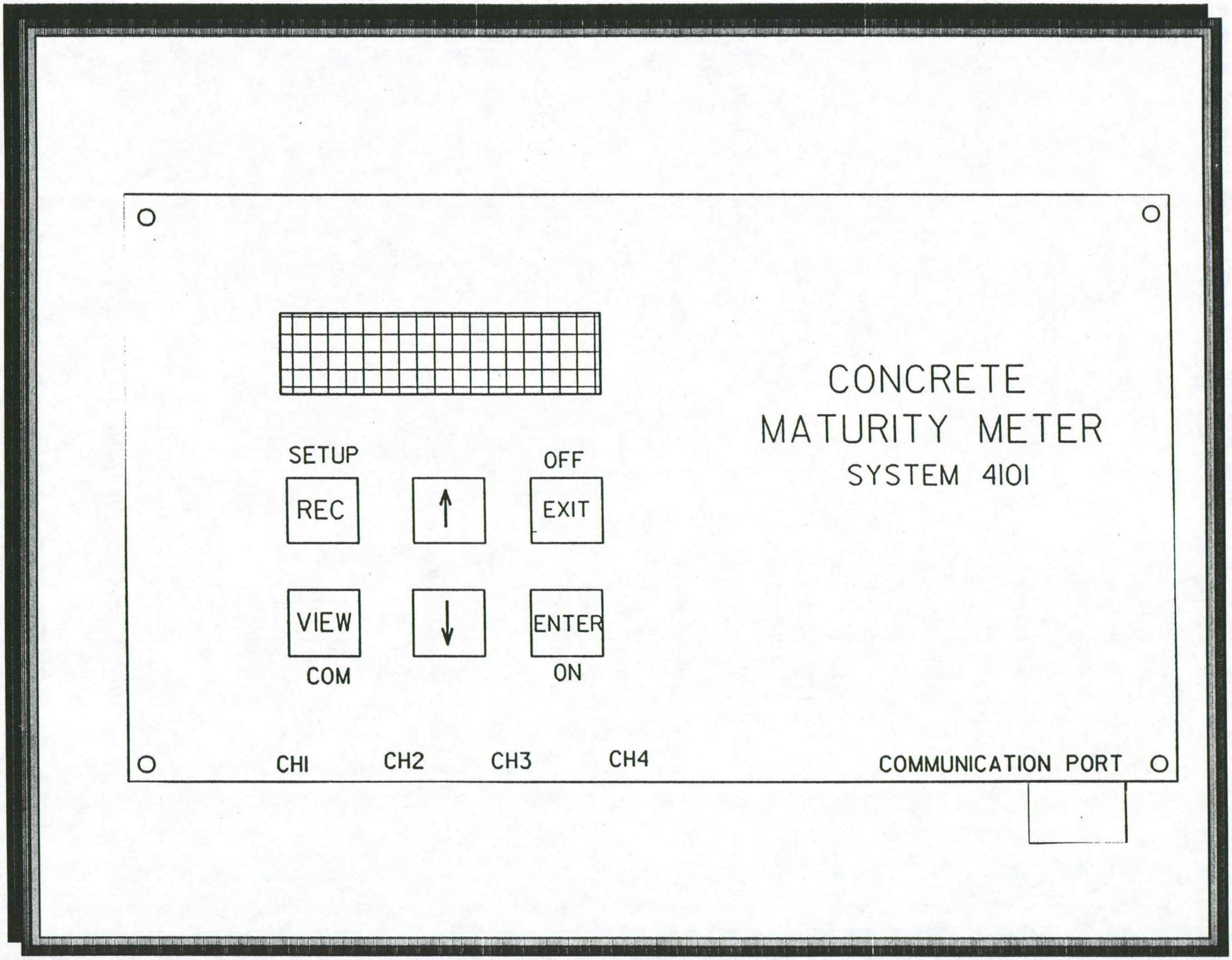
Given:

Temp (°C)	***Age (hrs)***
22.2	*0.0*
19.0	*16.5*
26.5	*23.5*
15.9	*39.5*
20.2	*46.0*
14.8	*63.0*

Calculate the maturity value (TTF) for each time interval and the TTF sum value.

HUMBOLDT 4101
MATURITY METER

Operating Instructions


CONCRETE
MATURITY METER
SYSTEM 4101
SETUP
REC
↑
OFF
EXIT
VIEW
↓
ENTER
COM
ON
CH1
CH2
CH3
CH4
COMMUNICATION PORT

Humbolt 4101 Maturity Meter-Operation

To display current TTF

	<u>Displays</u>
Press **Enter**	Current Values
	Ch.1 Temp:
Press **Enter**	Ch.1 TTF:

Press ↑ to display other channels 2, 3, & 4.
Press **Exit** at any time to turn off display or **return** to previous display.

To begin Recording

	Displays
Press **Enter**	Current Values
	Ch.1 Temp:
Press **REC**	1. Start
Press **Enter**	Recording On...

To Stop Recording

	Displays
Press **Enter**	Current Values
	Ch.1 Temp:
Press **REC**	1. Start
Press ↑	2. Stop
Press **Enter**	Recording Off...

To Erase Data

	Displays
Press Enter	Current Values
	Ch.1 Temp:
Press REC	1. Start
Press↓	3. Erase Data
Press Enter	Erasing Data...

Humboldt 4101 Maturity Meter-Operation cont'd.

To View Recorded Data

	Displays
Press **Enter**	Current Values Ch.1 Temp:
Press **View** Press **Enter**	1. Recorded Data

Press ↑ to scroll through data.

To View Meter Status

Press **Enter**	Current Values Ch.1 Temp:
Press **View** Press ↑	1. Recorded Data 2. Meter Status
Press **Enter**	**Displays Days Available and Battery Voltage should be checked each time before recording to determine available memory and battery voltage (should be greater than 5.5 volts).**

Procedure To Download Data From Humboldt 4101 Meter Windows 3.1

1. Plug 9 pin connector (for IBM PC's) into serial port in computer and other end into communication port on the Maturity Meter.

Computer

2. Under ***Accessories***-select ***Terminal***

3. Under ***Terminal***-select ***Settings-***
   Communications

4. Select ***COM1***
   Display should be set to the following:

Baud Rate	9600
Data Bits	8
Stop Bits	2
Parity	None
Flow Control	Xon/Xoff

   Click ***"OK"***

5. Select ***Transfers***
   Receive Text Files

6. Box will display-Select or create file in desired directory.

7. Box will display with-***Receiving:"filename.txt"*** in lower right corner.

Maturity Meter

8.

Press **Enter**	Displays "PRESENT VALUES"
Press **View** Twice	Displays "1. OUTPUT DATA"
Press **Enter**	Data from each channel will display in box on terminal display.

Computer

9. Select **Stop** on lower left corner.
   Select **File**
   Save

APPENDIX A
FORMS

PLANT MONITOR DOCUMENTATION

PLANT INSPECTOR ______________________ CERTIFICATE # ____________

ACC PLANT ___________ PCC PLANT _________

COUNTY _________________________ PROJECT NUMBER ___________

CONTRACTOR ___________________________________

PLANT LOCATION_________________________________

DATES OF PLANT INSPECTION

FROM ____________________ TO _____________________
TOTAL DAYS _____________

DISCREPANCIES (Improper procedures, unresolved test discrepancies, or failure to perform inspection duties):

____

____

____

____

____

____

____

____

____

____

____

____

Corrective action taken by contractor for discrepancies:

____

____

____

____

____

____

____

____

____

____

____

____

__________________ __________
Plant Monitor Date

* If there are no comments above, plant inspection will be considered acceptable.

1 copy - Transportation Center Materials

TECHNICAL TRAINING AND CERTIFICATION PROGRAM
(DAILY WORK HISTORY)

Name ____

Address ____

City ____________________ **State** ________ **Zip Code** __________

Telephone ________________ **Cert No.** ________________

ACC ________

PCC ________

WORK HISTORY

Location Of Plant: ____

Duties Performed: **Hours**

____ ______

____ ______

____ ______

____ ______

____ ______

____ ______

____ ______

Date Duties were performed: ______________________________

Supervisor (Certified Plant Inspector): ______________________________

Agency: ______________________________

Remarks: ______________________________

____

____

FORWARD TO THE TRANSPORTATION CENTER-MATERIALS

UNSATISFACTORY PERFORMANCE NOTICE

Issued To: ______________________________ *Date:* ____________________

____

____

This notice is to inform you that your performance as a Certified Inspector/Technician was unsatisfactory for the reason listed below. After receipt of two such notices you may be given a three month suspension. After three notices, you are subject to decertification (I.M. 213).

This notice will be placed in your permanent file with the Transportation Center in which you reside. It will also be placed on the statewide computer file.

The goal of the Technical Training and Certification Program (TTCP) is to work with contractors, producers, cities, and counties to continually improve the quality on Iowa construction projects. We hope you will work with us to achieve this goal.

UnsatisfactoryPerformance: ____

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____

Transportation Center Materials Engineer

cc: Program Director
TCCP Coordinator

CERTIFIED AGGREGATE TECHNICIAN EVALUATIONS

Name ______________________ **Certification No.** __________ **Date** __________

Location ______________________ **Producer** ______________________

Material ______________________ **Intended Use** ______________________

Lab No.	Identification of Samples		Sieve Analysis--Percent Passing											
			_ mm _ in.	26.5 mm 1 in.	19 mm ¾ in.	13.2 mm ½ in.	9.5 mm ⅜ in.	4.75 mm No. 4	2.36 mm No. 8	1.18 mm No.16	600 µm No. 30	300 µm No. 50	150 µm No. 100	75 µm No. 200
Production Limits		Max.												
		Min.												

	YES	NO
1. Does Tech have proper equipment?	____	____
2. Does Tech have current specifications?	____	____
3. Is Tech familiar with Form 821278?	____	____
4. Is Tech familiar with WHS procedures?	____	____
5. Is Tech knowledgeable of I.M.s? I.M.-204-209-301-302-303-304-306, etc.	____	____

	GOOD	FAIR	POOR
1. Proper care of equipment	____	____	____
2. Sampling Procedure	____	____	____
3. Splitting Procedure	____	____	____
4. Sieving to completion	____	____	____
5. Computing gradations	____	____	____
6. Report preparation & distribution	____	____	____

COMMENTS ____

____

____

cc: Technician
Transportation Center
Area Inspector
Producer

Signature ______________________

PRE CONSTRUCTION MEETING FOR ASPHALT

DATE______________ PROJECT(S)______________________________________

COUNTY______________________CONTRACTOR______________________
CONSULTANT OR RESIDENT ENGINEER______________________
PROJECT INSPECTOR______________________
CERTIFIED PLANT INSPECTION REQUIRED? YES__________NO__________
PLANT INSPECTOR______________________MONITOR______________________
AGG ACCEPTANCE TESTING BY______________LOCATION______________
STARTING DATE______________CALIBRATION DATE______________
SUBCONTRACTOR______________________WORK______________________
SUBCONTRACTOR______________________WORK______________________
SUBCONTRACTOR______________________WORK______________________
CONCRETE SOURCE, MIX, & USE______________________
PROJECT SUPERINTENDENT______________________
PLANT TYPE______________________POLLUTION CONTROL______________
WEIGHING SYSTEM:AUTO________SEMI AUTO_______WEIGH MASTER__________
PLANT SITE______________________

MATERIALS IN MIX INCLUDING R.A.P.

MATERIALS COMPLY WITH SHALE, ABSORPTION, AND SKID REQUIREMENTS

SIZE__________**MIX TYPE**__________**CLASS**__________**COURSE**__________

%IN MIX	MATL.& SIZE	PRODUCER	SOURCE	BEDS

COMPACTION REQUIREMENT? CLASS 1____________ CLASS 2____________

SIZE__________**MIX TYPE**__________**CLASS**__________**COURSE**__________

%IN MIX	MATL.& SIZE	PRODUCER	SOURCE	BEDS

COMPACTION REQUIREMENT? CLASS 1____________ CLASS 2____________

SPRINKLE AGGREGATE SOURCE______________________
ASPHALT CEMENT SOURCE______________________
ASPHALT TACK SOURCE______________________
OTHER AGG SOURCES FOR PROJECT______________________

MISCELLANEOUS INSPECTION NEEDED(TREES,LIGHTING,INTAKES,PIPE,ETC)

ADVANCE NOTICE TO ASSURANCE OF ANY SCHEDULED CONCRETE POURS
GRADATIONS, BOX SAMPLES, AND DENSITY CORES TO MASON CITY **ASAP**
DOES SMOOTHNESS SPEC. APPLY? YES ____________ NO ____________
PROFILOMETER TESTING BY______________________

DOT Monitoring Program for Asphaltic Concrete Paving Plant Inspection and Quality Management Asphalt (QMA)

The A.C. Plant Inspector's Guide provides an overview of the duties and responsibilities of A.C. Plant Inspectors or certified Bituminous Lab Technician when ***SS-5127*** applies. It is intended to provide a general outline of inspection activities. ***IT IS ESSENTIAL THAT ANYONE USING THIS GUIDE REFER TO THE SPECIFICATIONS, IM'S, AND CONSTRUCTION MANUAL SECTIONS FOR A COMPLETE DESCRIPTION OF REQUIREMENTS.***

Before production begins, the contractor's certified plant inspector and the ***Engineer*** should discuss these duties, documentation, sampling and testing plans to ensure compliance with Article 2521 and/or SS-5127 and IM 214. Any noncompliance or work quality deficiency shall be immediately reported to the contractor's superintendent and the resident construction engineer. The contractor shall be required to take corrective action. The monitoring requirements are minimum and should be increased if deficiencies occur until the problems are resolved. ***Monitoring activities identified by an asterisk'' to be performed by the Transportation Center Materials AC technician. Construction and materials personnel, upon mutual agreement may shift monitoring responsibilities between each other to accommodate problems with personnel availability through greater schedule flexibility.***

Certified Plant Inspection/QMA	Minimum Monitoring Requirement	References
Stockpiles Observe construction of stockpiles to prevent segregation, contamination, and intermingling.	* Inspect before construction begins and during plant monitor visits.	Article 2303.04 2303.02 IM 508
Plant Erection Inspect material bin foundations. Assure sampling locations are safe & convenient.	* Inspect prior to calibration and monitor visits. Visually inspect for safety concerns.	Article 2001.06 1107.07
Plant Equipment Check interlocks on aggregate feeders & AC delivery systems, screens for removal of oversize material. AC storage tank, tank stick & general condition of all plant equipment.	* Inspect all plant & testing equipment prior to or at the time of calibration (including lab trailer & QMA equipment).	Article 2001.22 *2303.02 *2520 *2521 IM 508, App A
Perform check weighing & verification weighing as per prescribed frequency.	Monitor first day & once a week thereafter. *Check truck tare weights the first day a truck is used on the project when platform scales are used.*	Const.Man.3.50 Article 2001.07 IM 508

"*"Indicates the activity is the responsibility of Materials personnel.

DOT Monitoring Program for Asphaltic Concrete Paving Plant Inspection and Quality Management Asphalt (QMA)-Continued

Certified Plant Inspection/QMA	Minimum Monitoring Requirement	References
Plant Calibration Observe calibration & obtain-copy of all calibration data.	* Observe calibration	IM 508
Obtain copy of job mix formula & "Proportions and Production Limits" (Form 820955).	* *Review calibration data and job mix formula.*	
Check cold feed bins for method of adjustment.	* Inspect method for securing bin gate settings.	
Discuss mix designs & plant controls with Transportation Center Materials personnel.	* Participate in discussion	
Plant Sampling & Testing Obtain 3 aggregates samples per lot. Split only the sample to be tested, determine & record process control gradation. Forward split samples to Transportation Center Materials Lab with Form 820193. Determine moisture content of all aggregate including RAP.	(Witness at least 1 of first 3 process samples of each mix design & minimum of 10% of remaining samples.) * Perform acceptance testing frequency as per I.M. 204. Monitor for correlation.	Const. Man .3.21 Const. Man. 3.22 Article 2534 IM 508, IM 216
Obtain AC samples & forward to Transportation Center Materials Lab	* Observe sampling during monitor visits.	IM 204
Monitor condition of density cores & core thickness.	Identify random core locations, observe core cutting, transport to field lab, determine & record core densities, and Q.I. Issues non compliance if necessary. Forward cores to Transportation Center Materials Lab with Form 820193.	Article 2303.12 IM 320 IM 321
QMA Only Determine and record core densities and Q.I. Properly store cores for random checking by Transportation Center Materials personnel.	(Witness first density determination & minimum 10% of remaining sets. * Transportation Center Lab to test first density set and one additional set per week at random.	Article 1201 IM 320 IM 321

DOT Monitoring Program for Asphaltic Concrete Paving Plant Inspection and Quality Management Asphalt (QMA)-Continued

Certified Plant Inspection/QMA	Minimum Monitoring Requirement	References
Documentation Prepared daily plant report (Form 800241). ***Fax a copy to the TCME.***	***Review entries the first day and weekly thereafter.***	IM 508
Document all check, tests, & quantities in field book in format provided by residency.	***Review entries the first day and weekly thereafter.***	
Determine & calculate asphalt pay quantity daily.	***Review entries the first day and weekly thereafter.***	IM 509
Maintain & monitor control charts.	* Monitor daily during monitor visit	IM 508
Check for approval sources & certifications for all materials (including material transferred from other projects) & document deliveries.	* Check sources at times of calibration & monitor any changes.	
Assure total certified quantities are sufficient for tons produced.	Check once a week	
Maintain file of all certified materials tickets, worksheets, and form submitted ***to be made available to the agency upon request.***	Obtain file of plant reports and controls charts at end of project.	Article 2521
Maintain control charts & data sheets. Document all mix control changes. Document correlation results. ***Fax a copy of the Summary sheet to the TCME daily.***	* Monitor summary sheet, during monitor visits. Obtain copies of control charts and summary sheets at the end of the project.	Article 1201
Mix Control Monitoring coating of aggregates & mixing time.	* Observe each day of production by monitor	Article 2303.04 IM 508
Monitor & record air, AC & mix temperature on 2-hour intervals.	* Check during monitor visits.	Article 2303.04 2303.09
Monitor truck loading procedure, amount of mix maintained in silo & operation of hopper/silo gates to avoid segregation.	* Check during monitor visits.	Article 2303.09 IM 508
Check aggregates proportions, interlocks, & cold feed bin gate settings daily.	* Monitor at calibration and during visits.	IM 508 IM 511

DOT Monitoring Program for Asphaltic Concrete Paving Plant Inspection and Quality Management Asphalt (QMA)-Continued

Certified Plant Inspection/QMA	Minimum Monitoring Requirement	References
Inspect trucks for proper/improper use of cleaning fluids	Monitor at ***random***	Article 2001.01
Prepare boxes & Form 820193 (Samples Submitted) & send to road for hot samples.		IM 508
Asphalt Delivery Determine quantities on hand & calculate ACC added by tank stick or weighing. Compare with brodie meter daily.	Monitor ***1st day & once per week at random***	IM 509 Article 2302.26B 2303.25B
ACC Mixture Sampling (QMA) Responsible for proper and random sampling of hot ACC mixture behind paver. Sampling frequency in accordance with Article 1201.	***Monitor daily by plant monitor or grade inspector.***	IM 322

DOCUMENTATION SAMPLE

PLANT INSPECTION DUTIES	DATE MONITORED	DISCREPANCIES AND CORRECTIVE ACTION BY DATE OF INSPECTION
List Duties Per IM214	Check Items Monitored	Date Monitored By:

Form 820916

Iowa Depa[redacted]ment [redacted]

CALIBRATION OF PLANT EQUIPMENT

Cold Feed and Asphalt Cement Delivery

(Continuous - Batch - Drum)

County ______________________

Project ______________________

Contract No. ______________________

Date ______________________

Proj. Eng. ______________________

Contractor ______________ Plant Location ______________ Material ID ______________ & %______ Moisture ______%

Plant Type and Name ______________ Pollution Control ______________ Material ID ______________ & %______ Moisture ______%

Mix Type ______________ Class ______________ Mix Size ______________ Material ID ______________ & %______ Moisture ______%

Asphalt Type and Grade ______________ RPM Feeder/ RPM Plant/Master ______________ Plant Set For ______________ TPH Material ID ______________ & %______ Moisture ______%

Bin Number Material ID												
Pump vernier setting/gate opening in inches/Dial setting												
Run number	1	2	3	1	2	3	1	2	3	1	2	3
Revolutions delivered/Time delivered												
Total wet weight aggregate delivered/TPH wet												
Total weight A.C. delivered Total dry weight aggregate delivered/TPH Dry												
Dry weight per revolution												
Dry weight per minute												
Average dry weight per (Minute-Rev.)/Tach set point												

Date scale was certified ______________________

The above data is furnished as set forth in the Standard Specifications for plant operations, for informational purposes only. The Contracting Authority makes no representations as to accuracy, either expressed or implied, which are to be construed to relieve the Contractor from the responsibiity to comply with the specifications.

Calibrated by ______________________ Witnessed by ______________________

Name Name

Contractor ______________________ Title ______________________

Distribution: White Copy - Plant Inspector; Canary Copy - Contractor; Pink Copy - District Materials Engineer; Goldenrod Copy - Project Engineer

Send Copy To: Central Materials on City and County Projects.

[redacted]
5-95

Iowa Department of Transportation

CALIBRATION OF PLANT EQUIPMENT
(DRUM MIX PLANT)

[redacted] ____________________

Project ____________________

Date ____________________

Proj. Eng. ____________________

Contractor ____________________ Plant Location ____________________

Plant Type and Name ____________________ Pollution Control ____________________

Mix Type ____________________ Class ____________________ Mix Size ____________________

Asphalt Type and Grade ____________________ Temperature °F ____________________ A.C. kg/L (lb/Gal) ____________________

WEIGHT BELT				A.C. PUMP				WEIGHT SILO			
Run Number	1	2	3	Run Number	1	2	3	Run Number	1	2	3
Span				Meter Er. liters (Gals.)							
Fine Zero				Corrected liters (Gals.)							
Total weight aggregate kg (lbs.)				Metered kg (lbs.)				Total weight kg (lbs.)			
Truck total weight aggregate kg (lbs.)				Truck kg (lbs.)				Truck kg (lbs.)			
Difference				Difference				Difference			
% Error				% Error				% Error			

Date scale was certified ____________________

____

____

____

The above data is furnished as set forth in the Standard Specifications for plant operations, for informational purposes only. The Contracting Authority makes no representations as to accuracy, either expressed or implied, which are to be construed to relieve the Contractor from the responsibiity to comply with the specifications.

Calibrated by ____________________ Witnessed by ____________________
Name Name

Contractor ____________________ Title ____________________

Distribution:
White Copy - Plant Inspector
Canary Copy - Contractor
Pink Copy - Transportation Center Materials Engineer
Goldenrod Copy - Project Engineer

Send copy to Central Materials on city and county projects.

Form 820009
12-92

Iowa Department of Transportation

HIGHWAY DIVISION

Reclaimed Asphalt Certified Report

Date ______________________________

Owner of RAP ______________________________

Material Description:

Salvaged from Highway No. ______________________ Dates of Removal ______________________

From ______________________ To ______________________

Original Project No. ______________________ Year Built ______________________

Surface Course: Size ____________ Type ____________ Class of Mix ____________ Depth ____________

Base or Binder: Size ____________ Type ____________ Class of Mix ____________ Depth ____________

Stockpile Description:

Location: ____

____

Section ____________ Township ____________ Range ____________ County ____________

Lab No.	Identification of Sample	% A.C. Extract	Gradation: 1/1000 T Minimum 3 Tests									
			19mm (¾)	13.2mm (.0530)	9.5mm (⅜)	4.75mm (4)	2.36mm (8)	1.18mm (16)	600 µm (30)	300 µm (50)	150 µm (100)	75 µm (200)
Average of Samples												

Note: Use additional sheets if necessary for complete gradation information.

Stockpile Photo *(Optional)*

Note: Stockpile photo will be used for future identification and should show stockpile size, shape, and relation to surroundings. Larger photos may be attached to the back of this form. All photos should have location printed on the back.

Tons in Stockpile ______________________ Weighed ____________ Estimated ____________

Direction of Picture ______________________

Type of Protection ______________________

Certified by ______________________

____

Verified by ______________________
Iowa DOT Inspector

Copies to: Owner; District Materials; Area Inspector; Project Engineer.

800241E - 01/98

DAILY ACC PLANT REPORT

Project No.: ____________ County: ____________ Class: ________ Report No.: ________

Contract ID: ____________ Contractor: ____________ Size: ________ Design Blows: ________

Mix Design No.: ____________ Recycle Source: ____________ Mix Type: ________ Design Gyrations: ________

Hot Box ID No.:						
Date Sampled:						
Gradation ID:	Specs					
1" Sieve						
3/4" Sieve						
1/2" Sieve						
3/8" Sieve						
* #4 Sieve						
* Moving Average						
* #8 Sieve						
* Moving Average						
#16 Sieve						
* #30 Sieve						
* Moving Average						
#50 Sieve						
#100 Sieve						
* #200 Sieve						
* Moving Average						
Compliance (Y/N)						
Intended Added, % AC						
Actual Added, % AC						
Intended Total, % AC						
Actual Total, % AC						
Gmb:						
Gmm:						
Pa:						
Moving Average						
Time						
Station						
Side						
Sample Tons						
Sublot Tons						
Tons to Date						
Fines / Bitumen Ratio						

Gsb: ________ Gb: ________ Effective % AC: ________

Mix Change Info: ____________________

Time	7:00	9:00	11:00	1:00	3:00	5:00	7:00
Air Temp. (°F)							
A.C. Temp. (°F)							
Mix Temp. (°F)							

Date Placed: ________ Date Tested: ________

Course Placed: ________ Tested By: ________

Density Record

Core No.:	1	2	3	4	5	6	7
Station							
CL Reference							
W 1 Dry							
W 2 in H20							
W 3 Wet							
Difference							
Field Density							
% Density							
% Voids							
Thickness							

Gmb (Lot Avg.): ________ Avg. Field Density: ________

Gmm (Lot Avg.): ________ Avg. % Density: ________

TC Labs Pa: ________ Avg. % Field Voids: ________

Target % RAP: ________ Specified % Density: ________

Q.I. = ________ – ________ = ________

Low Outlier: ________ High Outlier: ________ New Q.I.= ________

Film thickness (FT): ________ VMA: ________

Remarks: ____________________

C.P.I.: ____________ Cert. No.

QMA Tech: ____________ Cert. No.

Distribution: ____ Central Materials ____ TC Materials ____ Proj. Engineer ____ Contractor ____ Plant

800241M - 01/98

DAILY ACC PLANT REPORT

Project No.: ______________ County: ______________ Class: ________ Report No.: ________

Contract ID: ______________ Contractor: ______________ Size: ________ Design Blows: ________

Mix Design No.: ______________ Recycle Source: ______________ Mix Type: ________ Design Gyrations: ________

Hot Box I.D. No.:						
Date Sampled:						
Gradation ID:	Specs					
25mm Sieve						
19mm Sieve						
12.5mm Sieve						
9.5mm Sieve						
* 4.75mm Sieve						
* Moving Average						
* 2.36mm Sieve						
* Moving Average						
1.18mm Sieve						
* 600um Sieve						
* Moving Average						
300um Sieve						
150um Sieve						
* 75um Sieve						
* Moving Average						
Compliance (Y/N)						
Intended Added, % AC						
Actual Added, % AC						
Intended Total, % AC						
Actual Total, % AC						
Gmb:						
Gmm:						
Pa:						
Moving Average						
Time						
Station						
Side						
Sample Mg's						
Sublot Mg's						
Mg's to Date						
Fines / Bitumen Ratio						

Time	7:00	9:00	11:00	1:00	3:00	5:00	7:00
Air Temp. (°C)							
A.C. Temp. (°C)							
Mix Temp. (°C)							

Date Placed: ________ Date Tested: ________

Course Placed: ______________ Tested By: ______________

Density Record

Core No.:	1	2	3	4	5	6	7
Station							
CL Reference							
W 1 Dry							
W 2 in H20							
W 3 Wet							
Difference							
Field Density							
% Density							
% Voids							
Thickness							

Gmb (Lot Avg.): ________ Avg. Field Density: ________

Gmm (Lot Avg.): ________ Avg. % Density: ________

TC Labs Pa: ________ Avg. % Field Voids: ________

Target % RAP: ________ Specified % Density: ________

Q.I. = ________ – ________ = ________

Low Outlier: ________ High Outlier: ________ New Q.I. = ________

Film Thickness (FT): ________ VMA: ________

Remarks: ______________________________

Gsb: ________ Gb: ________ Effective % AC: ________

Mix Change Info: ______________________________

C.P.I.: ______________ Cert. No.

QMA Tech: ______________ Cert. No.

[redacted]

PRE CONSTRUCTION MEETING FOR STRUCTURES AND P.C. PAVING

DATE__________________ PROJECT_____________________________________

DESIGN ____________________________CONTRACT_________________________

COUNTY_____________________ CONTRACTOR___________________________________

CONSULTANT OR RESIDENT ENGINEER___________________________________

PROJECT INSPECTOR____

CERTIFIED PLANT INSPECTION REQUIRED? YES_________NO______________

PLANT INSPECTOR___________________MONITOR INSPECTOR_______________

AGG ACCEPTANCE TESTING BY_________________LOCATION_________________

TYPE OF WORK (STRUCTURE)____________(P.C. PAVING)_________________

SUBCONTRACTOR________________________WORK____________________________

SUBCONTRACTOR________________________WORK____________________________

SUBCONTRACTOR________________________WORK____________________________

ASPHALT MIX AND PLANT? ____

STARTING DATE____

READY MIX OR PAVING PLANT LOCATION__________________________________

IF PAVING QUANTITIES TOTAL MORE THAN 6000 SQ. FT. AUTOMATIC CEMENT BATCHING IS REQUIRED!!!_______________________________________

PROJECT SUPERINTENDENT____

MIXES____

APPROXIMATE CALIBRATION DATE____

MATERIALS IN MIXES

COARSE AGG SOURCE________________________________DURABILITY__________

FINE AGG SOURCE____

CEMENT SOURCE____

FLY ASH SOURCE____

MIXING WATER SOURCE____

OTHER AGG SOURCES FOR PROJECT____

____

____

MISCELLANEOUS INSPECTION NEEDED (TREES,LIGHTING,INTAKES,PIPE,ETC)

____

____

NOTIFY AREA INSPECTOR FOR MONITOR OF STEEL (BLACK,EPOXY)
NOTIFY INSPECTOR FOR MONITOR OF PILING, GUARD RAIL, GALVANIZING
ADVANCE NOTICE TO ASSURANCE OF SCHEDULED POURS & TO WITNESS CORES
ADVANCE NOTICE TO ASSURANCE OF ANY SCHEDULED ASPHALT WORK
WILL THERE BE A PRE POUR? PLEASE NOTIFY IF YES
ADMIXTURE TESTED IF HELD OVER THE WINTER
WILL CORE LOCATIONS BE REQUIRED?
DOES SMOOTHNESS SPEC APPLY? YES ______________ NO_________________
PROFILOMETER TESTING BY____

DOT Monitoring Program for Portland Cement Concrete Paving Plant Inspection

Plant Inspection Duties per IM 214 and 527	Minimum Monitoring Requirements by Construction Personnel
Stockpiles 1. Proper stockpiling procedures 2. Prevention of intermingling of aggregates 3. Prevention of contamination 4. Prevention of segregation	Inspect before production starts and weekly thereafter
Plant Facilities 1. Assures plant safety 2. Check for equipment compliance 3. Proper laboratory location and facilities	Inspect before calibration. (Check that plant inspector has the proper batch weight tables, current manuals, instructions, and specifications. Inspect transit mixers.)
Calibration 1. Be present during calibration 2. Have appropriate batch weights	Plant calibration is observed by Transportation Center Materials personnel and plant monitor
Cement, Fly Ash, and Aggregate Delivery and Admixtures 1. Check for proper source and certification 2. Document quantities delivered 3. Monitor condition of shipments	Audit before production starts and weekly thereafter
Plant Sampling 1. Check aggregate gradations 2. Check aggregate moisture 3. Check aggregate specific gravity	1. Witness sampling and splitting of at least 1 of the first 3 samples of each aggregate and a *minimum* of 10% of the remaining samples. Provide documentation of these witnessed samples on Form 820193. Perform acceptance testing frequency as per I.M. 204. Also verify that the sampling and testing plan is in compliance with Construction Manual 3.22. 2 & 3. Witness once during first week of production. If problems develop, run one test to verify the plant inspector's results.

DOT Monitoring Program
for
Portland Cement Concrete Paving Plant Inspection (Continued)

Plant Inspection Duties per IM 214 and 527	Minimum Monitoring Requirements by Construction Personnel
Proportion Control	
1. Check scale weights and scale operation	Audit and/or observe weekly
2. Check admixture dispensers	
3. Check mixing time and revolutions	
4. Check cement yield	
Concrete Tests	
1. Cure flexural test specimens	1. Observe curing facility weekly
2. Test flexural specimens	2. Observe one beam break weekly
Test Equipment	
1. Clean and maintain scales, screens, pycnometers, beam molds, and laboratory facility	Examine weekly
Documentation	
1. Prepare daily plant reports	1. Audit daily
2. Document all checks and test results in field book	2 & 3. Audit weekly Separate diary to be maintained on items monitored
3. Maintain daily diary of work activities	

DOT Monitoring Program for Structural Concrete Plant Inspection

Plant Inspection Duties per IM 214 and 528	Minimum Monitoring Requirements by Construction Personnel
Stockpiles 1. Proper stockpiling procedures 2. Prevention of intermingling of aggregates 3. Prevention of contamination 4. Prevention of segregation	Inspect weekly during production
Plant Facilities 1. Assures plant safety 2. Check for equipment compliance 3. Proper laboratory location and facilities	Inspect once during first week of production. (Check that the plant inspector has current manuals, instructions, and specifications. Inspect transit mixers.)
Calibration 1. Have appropriate batch weights 2. Check plant calibration 3. Plant monitor involvement	Plant calibration is observed by Transportation Center Materials personnel
Cement, Fly Ash, and Aggregate Delivery and Admixtures 1. Check for proper source and certification 2. Document quantities delivered 3. Monitor condition of shipments	Audit weekly during production
Plant Sampling 1. Check aggregate gradations 2. Check aggregate moisture 3. Check aggregate specific gravity	1. Witness sampling and splitting of at least 1 of the first 3 samples of each aggregate and a *minimum* of 10% of the remaining samples. Provide documentation of these witnessed samples on Form 820193. Perform acceptance testing frequency as per I.M. 204. Also verify that the sampling and testing plan is in accordance with Construction Manual 3.22 2 & 3. Witness once during first week of production. If problems develop, run one test to verify plant inspector's results

DOT Monitoring Program for Structural Concrete Plant Inspection (Continued)

Plant Inspection Duties per IM 214 and 528	Minimum Monitoring Requirements by Construction Personnel
Proportion Control 1. Check scale weights and scale operation 2. Check admixture dispensers 3. Check mixing time and revolutions	Audit weekly during production. (Check batch weights during initial inspection.)
Concrete Tests 1. Cure flexural test specimens	1. Observe curing facility weekly 2. Test flexural specimens
Test Equipment 1. Clean and maintain scales, screens, pycnometers, beam molds, and laboratory facility	Inspect weekly during production
Documentation 1. Prepare weekly 211B reports 2. Document all checks and test results in field book 3. Maintain daily diary of work activities	Audit weekly during production. Maintain a separate diary of items monitored.

Form 820150 12-94

☐ Materials
☐ Transportation Center
☐ Project Engineer
☐ Contractor

Iowa Department of Transportation
OFFICE OF MATERIALS

PORTLAND CEMENT CONCRETE

County ____________________

Mix. No. __________ Wt. Cement (kg/m³) (lbs/cy) __________ Project ______________________________

Adjusted Cement (kg/m³) (lbs/cy) __________ Source ____________________ Sp. Gr. __________

IM491.17 Fly Ash (kg/m³) (lbs/cy) __________ Source (C/F) ____________________ Sp. Gr. __________

IMT-203 Fine Aggr. Source ______________________________ Sp. Gr. __________

IMT-203 Coarse Aggr. Source ______________________________ Spr. Gr. __________

Water (kg/m³) (lbs/cy) = Design w/c (wt cement + wt Ash)

Absolute Volumes

Cement	(kg/m³) ÷ (Sp. Gr. x 1000) (lbs/cy) ÷ (Sp. Gr. x 62.4 x 27)	= 0. __________
Fly Ash	(kg/m³) ÷ (Sp. Gr. x 1000) (lbs/cy) ÷ (Sp. Gr. x 62.4 x 27)	= 0. __________
Water	(kg/m³) ÷ (Sp. Gr. x 1000) (lbs/cy) ÷ (1.00 x 62.4 x 27)	= 0. __________
Air		0.060
	Subtotal	0. __________
	1.000 - Subtotal	= 0. __________
	Total	= 1.000
	Fine Aggregate (1.000 - Subtotal) x % in mix	= 0. __________
	Coarse Aggregate (1.000 - Subtotal) x % in mix	= 0. __________
	Aggregate Total	0. __________

Aggregate Weights

Fine Aggr.	(abs vol.) x Sp. Gr. x 1000 (abs vol.) x Sp. Gr. x 62.4 x 27	= __________ kg/m³ lbs/cy
Coarse Aggr.	(abs vol.) x Sp. Gr. x 1000 (abs vol.) x Sp. Gr. x 62.4 x 27	= __________ kg/m³ lbs/cy

Summary

Cement ____________________ kg/m³ (lbs/cy)
Fly Ash ____________________ kg/m³ (lbs/cy)
Water ____________________ kg/m³ (lbs/cy)
Fine Aggr. ____________________ kg/m³ (lbs/cy)
Coarse Aggr. ____________________ kg/m³ (lbs/cy)

800240E - 01/98

PCC Plant Report

Project No.: ____________ Contract ID.: ____________ Report No.: ________

Plant Name: ____________ County: ____________ Date This Report: ________

Contractor / Sub: ____________ Temp.(°F) Min.: ________ Date Of Last Report: ________

Weather: ____________ Temp.(°F) Max.: ________ Design No.: ________

Check Mix (x)		Check Type (x)		
Central		Paving		(Send Daily or End of Lot)
Ready		Structure		(Send Weekly or End of Lot)
		Incidental		(Send Weekly or End of Lot)
		Patching		(Send Weekly or End of Lot)

Date	Mix	Time		Batched	% of Est.	Fine Aggregate			Coarse Aggregate			Actual Quantities Used Per CY (in pounds)							Avg.	Max.
																Water			W/C	W/C
Mo / Day	Number	Start	Stop	(CY)	Used	Moist. (%)	T-203 Sp. G.	Dry Wt. (lbs)	Moist. (%)	T-203 Sp. G.	Dry Wt. (lbs)	Cement	Fly Ash	Fine	Coarse	In Agg.	Plant	Grade	Ratio	Ratio

COARSE SAMPLE

137

	Sieve Accuracy=				Sieve Accuracy=				Sieve Accuracy=					
	Orig. Dry Weight (OD Wt.):				Orig. Dry Weight (OD Wt.):				Orig. Dry Weight (OD Wt.):					
	Dry Wt. Washed (D Wt. W):				Dry Wt. Washed (D Wt. W):				Dry Wt. Washed (D Wt. W):					
Sieve Size	Wt. Retd.	% Retd.	% Retd.	% Psg.	Wt. Retd.	% Retd.	% Retd.	% Psg.	Wt. Retd.	% Retd.	% Retd.	% Psg.	Specs.	Avg.
1 1/2 "														
1 "														
3/4 "														
1/2 "														
3/8 "														
#4														
#8														
Pan														
Total														
#200														

Wash

Wash Loss		OD Wt.:			OD Wt.:			OD Wt.:	
Pan		D Wt. W.:			D Wt. W.:			D Wt. W.:	
Total									

Batched	Today	Week	To Date
Check One (x):			Total
Concrete (CY):			
Cement (Tons):			

	Brand / Source	Rate	Lot No.
Air Ent:			
Wat. Red:			
Retarder:			
Cal Chlor:			
Superplas:			

Concrete Treatment (x)		lbs / CY
Ice		
Heated Water		
Heated Materials		

FINE SAMPLE

	Sieve Accuracy=				Sieve Accuracy=				Sieve Accuracy=					
		Orig. Dry Weight:				Orig. Dry Weight:				Orig. Dry Weight:				
		Dry Wt. Washed:				Dry Wt. Washed:				Dry Wt. Washed:				
		Washing Loss:				Washing Loss:				Washing Loss:				
	Wt.	% Retained		%	Wt.	% Retained		%	Wt.	% Retained		%		
Sieve Size	Retd.		Final	Passing	Retd.		Final	Passing	Retd.		Final	Passing	Specs.	Avg.
3/8 "														
#4														
#8														
#16														
#30														
#50														
#100														
#200														
Wash														
Pan														
Total														
Sample ID:					(ID):				(ID):					
Tested By / Cert. No.:					(TB/CN):				(TB/CN):					

	Type	Sp. Gr.	Source
Cement:			
Fly Ash:			

	T-203 A - #	Grad. #
Rock:		
Sand:		

Remarks

C.P.I.: ____________ Cert. No. ________

Monitor: ____________ ________

Distribution: ____ Central Materials ____ TC Materials ____ Res. Engineer ____ Contractor ____ Plant

800240M - 01/98

PCC Plant Report

Check Mix (x)		Check Type (x)		
Central		Paving		(Send Daily or End of Lot)
Ready		Structure		(Send Weekly or End of Lot)
		Incidental		(Send Weekly or End of Lot)
		Patching		(Send Weekly or End of Lot)

Project No.: ______________ Contract ID: ______________ Report No.: ________

Plant Name: ______________ County: ______________ Date This Report: ________

Contractor / Sub: ______________ Temp.(°C) Min.: ________ Date Of Last Report: ________

Weather: ______________ Temp.(°C) Max.: ________ Design No.: ________

Date	Mix	Time		Batched	% of Est.	Fine Aggregate			Coarse Aggregate			Actual Quantities Used Per m3 (in kilograms)							Avg.	Max.
						Moist.	T-203	Dry Mass	Moist.	T-203	Dry Mass					Water			W/C	W/C
Mo / Day	Number	Start	Stop	(m3)	Used	(%)	Sp. G.	(kg)	(%)	Sp. G.	(kg)	Cement	Fly Ash	Fine	Coarse	In Agg.	Plant	Grade	Ratio	Ratio

		Sieve Accuracy=				Sieve Accuracy=				Sieve Accuracy=					
		Orig. Dry Mass (OD Mass):				Orig. Dry Mass (OD Mass):				Orig. Dry Mass (OD Mass):					
		Dry Mass Washed (Dry M W):				Dry Mass Washed (Dry M W):				Dry Mass Washed (Dry M W):					
C O A R	Sieve Size	Mas. Retd	% Retd.	% Retd.	% Psg.	Mas. Retd	% Retd.	% Retd.	% Psg.	Mas. Retd	% Retd.	% Retd.	% Psg.	Specs.	Avg.
S	37.5mm														
E	25mm														
	19mm														
S	12.5mm														
A	9.5mm														
M	4.75mm														
P	2.36mm														
L	Pan														
E	Total														
W	75um														
a	Wash Loss		OD Mass:				OD Mass:				OD Mass:				
s	Pan		Dry M W:				Dry M W:				Dry M W:				
h	Total														

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Batched	Today	Week	To Date
Check One (x):			Total
Concrete (m3):			
Cement (Mg):			

	Brand / Source	Rate	Lot No.
Air Ent:			
Wat. Red:			
Retarder:			
Cal. Chlor:			
Superplas:			

Concrete Treatment (x)		kg / m3
Ice		
Heated Water		
Heated Materials		

		Sieve Accuracy=			Sieve Accuracy=				Sieve Accuracy=					
		Orig. Dry Mass:				Orig. Dry Mass:				Orig. Dry Mass:				
		Dry Mass Washed:				Dry Mass Washed:				Dry Mass Washed:				
		Washing Loss:				Washing Loss:				Washing Loss:				
		Mass	% Retained		%	Mass	% Retained		%	Mass	% Retained		%		
F	Sieve Size	Retd.		Final	Passing	Retd.		Final	Passing	Retd.		Final	Passing	Specs.	Avg.
I	9.5mm														
N	4.75mm														
E	2.36mm														
	1.18mm														
S	600um														
A	300um														
M	150um														
P	75um														
L	Wash														
E	Pan														
	Total														
	Sample ID:					(ID):				(ID):					
	Tested By / Cert. No.:					(TB/CN):				(TB/CN):					

	Type	Sp. Gr.	Source
Cement:			
Fly Ash:			

	T-203 A - #	Grad. #
Rock:		
Sand:		

Remarks

Cert. No.

C.P.I.: ______________ ________

Monitor: ______________ ________

Distribution: ____ Central Materials ____ TC Materials ____ Res. Engineer ____ Contractor ____ Plant

Form 820912M
5-95

Iowa Department of Transportation

Office of Materials

Page ______ of ______

Report No. ______

Date ______

PORTLAND CEMENT SHIPMENT YIELD REPORT

County ______ Source ______ Contract No. ______

Project ______ Contractor ______

Plant Location ______

	Date	Type	Invoice No.	Mass Billed *(Mg)*		Date	Type	Invoice No.	Mass Billed *(Mg)*		Date	Type	Invoice No.	Mass Billed *(Mg)*
1					21					41				
2					22					42				
3					23					43				
4					24					44				
5					25					45				
6					26					46				
7					27					47				
8					28					48				
9					29					49				
10					30					50				
11					31					51				
12					32					52				
13					33					53				
14					34					54				
15					35					55				
16					36					56				
17					37					57				
18					38					58				
19					39					59				
20					40					60				

Mix No.	kg Cement per m^3	m^3 Batched	Cement Batched *(Mg)*
Left in Scale *(Mg)*	This Check (+)		+
	Previous Yield Check (-)		-
	Total Weighed *(Batch Scale)*		

Total Billed Mass *(Mg)*:

$$\text{Yield Percent} = \frac{\text{Total Mg Batched}}{\text{Total Mg Billed}} \times 100$$

$$\frac{(\quad\quad)}{(\quad\quad)} \times 100 = \_\_\_\_\_ \%$$

______

Plant Inspector

Distribution: White Copy-Materials Office; Yellow Copy-Transportation Center Materials Office; Pink Copy-Project Engineer; Goldenrod-Inspector

Form 820020
6-83

Iowa Department of Transportation

MOBILE MIXER CALIBRATION

Contractor/Owner ____________ County ____________ Calibrated By: ____________
Mixer Serial No. ____________ Project No. ____________ Date ____________
Operating Speed ____________ Design No. ____________ Inspector ____________

MATERIALS AND SETTINGS

Material	Source	Sp. Gr.	Dry Weight	Wet Weight	Gate Setting
Cement					
*Sand					
*Rock					
Water					
Water Reducer					
Air Entraining Agent					

* *(Optional moisture content - Sand 3% Rock 0.5%)*

Determine **CEMENT METER COUNT.** *Run: 50 count ± Model 60 Magnum unit*
100 count ± Standard unit

Trial	1	2	3	4	5	Totals
Counts						
Gross Weight						
Tare Weight						
Net Weight						
Time (sec.)						

$\frac{\text{Total Pounds}}{\text{Total Count}} = \frac{(\quad)}{(\quad)} = \_\_\_\_ \frac{\text{Lb.}}{\text{Meter Count}}$ $\frac{\text{94 lb. cement}}{\text{Lb./Meter Count}} = \frac{\text{94 lb.}}{(\quad)} = \_\_\_\_ \frac{\text{Counts}}{\text{Bag}}$

AIR ENTRAINING AGENT DILUTION RATE ____________

Admixtures

Time per bag = (Counts/Bag) x $\frac{\text{Total seconds}}{\text{Total counts}}$ = ______ Sec./Bag

Water Reducer

Dosage Required (oz./bag) ______
Dilution rate ______
Dilution Req'd (total oz./bag) ______

$\frac{\text{Sand weight}}{\text{1 Bag}} = \frac{\text{Wet weight}}{8.75} = \frac{\_\_\_\_}{8.75} = \_\_\_\_ \frac{\text{Lb.}}{\text{Bag}}$

Divide this by the Count/Bag from Step 1.

$\frac{(\quad) \text{ Lb./Bag}}{(\quad) \text{ Count/Bag}} = \_\_\_\_ \frac{\text{Lb.}}{\text{Count}}$

This is the target value.

The tolerance limits are:

Upper = ( ) x 1.02 = ______
Lower = ( ) x 0.98 = ______

The calibration check average is:

$\frac{\text{Sum of checks}}{\text{No. of checks}} = \frac{(\quad)}{(\quad)} = \_\_\_\_ \frac{\text{Lb.}}{\text{Count}}$

Trial	1	2	Check	Check	Check	Check
Setting						
Counts						
Gross weight						
Tare weight						
Net weight						
Time (sec.)						
Lb./Count						

$\frac{\text{Rock weight}}{\text{1 Bag}} = \frac{\text{Wet weight}}{8.75} = \frac{\_\_\_\_}{8.75} = \_\_\_\_ \frac{\text{Lb.}}{\text{Bag}}$

Divide this by the Count/Bag from Step 1.

$\frac{(\quad) \text{ Lb./Bag}}{(\quad) \text{ Count/Bag}} = \_\_\_\_ \frac{\text{Lb.}}{\text{Count}}$

This is the target value.

The tolerance limits are:

Upper = ( ) x 1.02 = ______
Lower = ( ) x 0.98 = ______

The calibration check average is:

$\frac{\text{Sum of checks}}{\text{No. of checks}} = \frac{(\quad)}{(\quad)} = \_\_\_\_ \frac{\text{Lb.}}{\text{Count}}$

Trial	1	2	Check	Check	Check	Check
Setting						
Counts						
Gross weight						
Tare weight						
Net weight						
Time (sec.)						
Lb./Count						

Form 820907
4-94

Iowa Department of Transportation

TRANSIT MIXER
CONDITION CERTIFICATION

In accordance with requirements of Iowa Department of Transportation Standard Specifications Section 2001.21B this certifies the herein described transit mixer was examined on the date shown and was found to be in proper working condition, the fins and blades were not damaged or worn excessively, and the drum interior was free of hardened concrete buildup.

Unit Identification No. ____________________

Home Base ____________________

Owner ____________________

Mixer Manufacturer ____________________

Serial Number ____________________

MMB Rating (Mixing, Cu. Yd.) ____________ Year New ____________

Truck Manufacturer ____________________

Model ____________________

Year ____________ Color ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

Date ____________ Signature ____________

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Date ____________ Signature ____________

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