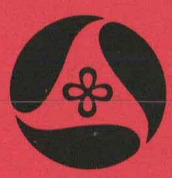
Asphalt Plant Inspection Supplement

1990



Iowa Department of Transportation

(1)

TABLE OF CONTENTS

3.09 REQUIREMENTS FOR MONITORING THE CERTIFIED PLANT INSPECTION PROGRAM

A. General

The monitoring requirements listed are intended to be the minimum for normal plant operation. Field problems may necessitate increased monitoring. All monitoring requirements will be performed by Construction personnel except for plant calibration which remains a Materials Office responsibility. See 3.20 for responsibilities of project acceptance sampling and testing. The plant monitor must be a certified plant inspector.

It is imperative that the Residencies maintain an adequate staff of trained, experienced certified plant monitors. This can be accomplished by having employees participate in the certified plant inspection training program and successfully passing the examination. The experience requirement for certification can be satisfied by performing plant monitoring duties under the direct supervision of a certified plant monitor. It will be important to be selective for projects on which monitors obtain their experience. For instance, the contractor's certified plant inspector must be experienced and certified. Also, a project on which the plant is in close proximity to the project is important so that the certified plant monitor is readily available for consultation with the inexperienced monitor.

Refer to current specification on certified plant inspection for work excluded from the certified plant inspector program.

The project proposal will indicate if the certified plant inspector requirements apply to the project. The requirements for certified plant inspection can be added by extra work order if the contractor requests and an acceptable cost can be negotiated.

The contractor may have a certified aggregate technician run gradation analysis for the plant inspector.

B. Portland Cement Concrete Paving Plant Monitoring

Exhibit A lists the monitoring requirements. A plant monitor will normally be assigned to each project with duties split between plant and grade inspection. The plant monitor should schedule work so that the plant can be visited daily during production. The amount of time spent at the plant will depend on the overall quality control at the production plant.

Test beams for determining flexural strengths are to be transported from the grade to the plant site by contracting agency personnel.

C. Structural Concrete Plant Monitoring

Exhibit B lists the monitoring requirements. Incidental concrete usually furnished in quantities less than 25 c.y. per day will not require contractor's certified plant inspection. The uses of incidental concrete excluded from inspection are listed in the specification for certified plant inspection. The engineer and the contractor should agree upon the anticipated quantities to be furnished before hand to determine if certified inspection will be required.

If it is agreed that certified inspection is not required, the engineer will furnish the necessary plant inspection in accordance with IM 528.

Ready mix tickets may be filled out by a non-certified person if directly supervised by the certified plant inspector.

Test beams for determining flexural strengths are to be transported from the grade to the plant site by contracting agency personnel. The certified plant inspector is responsible for curing and storage of the beams. Contracting agency personnel are responsible for testing and reporting results.

D. Asphaltic Concrete Paving Plant Inspection

Exhibit C lists the monitoring requirements. A plant monitor will normally be assigned to each project with duties split between plant and grade inspection. The plant monitor should schedule work so that the plant can be visited daily during production. The amount of time spent at the plant will depend on the overall quality control at the production plant. The project inspector will be providing production and placement information to be entered on the daily plant report. Visits of the project inspector to the plant laboratory for exchange of information and book work will normally be done daily. The plant monitor will be responsible for witnessing core sampling and performing density tests.

E. Plant Reports

The project engineer should make arrangements with the certified plant inspector for timely receipt of the plant reports. The original and all copies of the plant report shall be kept at the plant until all documentation is completed. Normally this will be the day following the end of the reporting period. Review and distribution of the reports will be made by the Resident Office. This distribution will include a copy to be returned to the certified plant inspector. Prompt consultation with the certified plant inspector and monitor shall follow any significant error or omission.

F. Documentation

A documentation sample for the plant monitor is contained in Exhibit D. A separate field book should be set up on each project to document plant inspection. Some flexibility in the suggested format may be necessary depending on the project size and type of plant. The important item is to document discrepancies, and corrective action taken by the contractor.

A copy of this documentation must be furnished to the District Materials Engineer at the time of project acceptance. Also include the certified plant inspector's name, certificate number, and statement from the monitor regarding the work performance of certified inspector. A sample format for providing this documentation is contained in Exhibit E.

All improper procedures, unresolved test discrepancies, or failure to perform inspection duties will be considered by the District Materials Engineer for possible decertification or other appropriate corrective action.

The role of the plant monitor is vital in assuring the District Materials Engineer is aware of any deficient or otherwise unsatisfactory work of the certified plant inspector.

G. Specification Violations

Failing test results are to be recorded on the daily plant report by the plant inspector. Verbal notification of such failing results shall precede completion of paper work to assure timely changes.

The plant monitor will convey to the responsible project inspector all specification violations, discrepancies in results with the plant inspector, and improper procedures and equipment used by the plant inspector. The project inspector will issue non-compliance notices for failing test results and inadequate testing procedure or equipment.

Testing discrepancies between the plant inspector and the monitor will need to be resolved on an individual basis. The District Materials Engineer should be advised of unresolved discrepancies or other problems of a serious or repetitive nature. They will investigate and take appropriate action.

H. Testing Equipment & Supplies

The Department has agreed to make available for purchase certain testing equipment from DOT stock. Producers should refer to ACC and PCC Plant Inspection Manuals for specific information and Central Materials Lab contacts. A list of equipment suppliers is included in the plant manuals.

The necessary plant inspection forms will be furnished to the producer at no cost. The producer can request these through the District Materials or Resident Offices. It is a good idea for the plant monitor to carry a supply of forms and make these available to the producers as needed.

The plant monitor can utilize the contractor furnished equipment for testing required at the plant site. However, the plant monitor should carry a set of sieves to use for gradation analysis run at the contractor's laboratory.

I. Samples

The plant inspector should be requested to indicate on the sample submittal form the telephone and hours that he can be reached for result information.

Section 3.22 includes requirements of construction inspection/monitor personnel for project acceptance sampling and testing for gradation. These responsibilities include witnessing of sampling and splitting of at least one of the first three samples of each aggregate or, in the case of ACC plants, each aggregate combination tested and a minimum of 10 percent of the remaining samples. All samples that have been witnessed shall be split and one-half of the sample forwarded to the District Materials Lab. The construction inspector/monitor that witnessed the sampling and splitting shall place his/her name on the Form 820193 and a large prominent "W" to indicate the sample was witnessed. This person is intended to be a certified aggregate inspector unless prior approval of the RCE is obtained.

Samples that are obtained by the certified plant inspector, but not tested, should not be split unless needed for further evaluation.. They shall be retained at the plant until the lot has been accepted.

If required by the contract documents, transportation of the split sample to the District Materials Lab will be performed by the contractor.

DOT Monitoring Program for Asphaltic Concrete Paving Plant Inspection

The attached A.C. Plant Inspector's Guide provides an overview of the duties and responsibilities of A.C. Plant Inspectors. It is intended to provide a general outline of inspection activites. 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 residency plant monitor should discuss these duties, documentation, sampling and testing plans to ensure compliance with Supplemental Specification 1057 and IM 214. Effective communications must be established and maintained throughout the project. While it is not explicitly stated for each responsibility, it shall be understood that any noncompliance or workmanship deficiency 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.

Certified Plant Inspection	Minimum Monitoring Requirement	References
Stockpiles		
Observe construction of stockpiles to prevent segregation, contamination, & intermingling.	Inspect before construction begins & once week thereafter.	Article 2303.05 " 2305.02 " 2205.04 IM 508
Plant Erection		
Inspect material bin foundations.	Inspect for evidence of settlement.	Article 2001.06
Assure sampling locations are safe & convenient.	Inspect prior to calibration.	" 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 calibration (including lab trailer).	Article 2001.22 " 2305.02 " 2520 SS 1057 IM 508, App A
Check scales for sensitivity & accuracy daily.	Check first day & once a week thereafter.	Const. Man. 3.42 Article 2001.07 IM 508

Certified Plant Inspection	Minimum Monitoring Requirement	References
Plant Calibration		
Observe calibration & obtain copy of all calibration data.	Observe calibration & review calibration data.	IM 508
Obtain copy of job mix formula & Form 955, Proportions and Production Limits.		
Check cold feed bins for method of adjustment.	Inspect method for securing bin gate settings.	
Discuss mix designs & plant controls with District Materials.	Participate in discussion.	
Mix Control		
Monitor coating of aggregates & mixing time.	Observe each day of production.	Article 2303.05 IM 508
Monitor & record air, AC, & mix temperatures on 2-hour intervals.	Check once each day of production.	Article 2303.05 " 2303.10
Monitor truck loading procedures, amount of mix maintained in silo, & operation of hopper/silo gates to avoid segregation.	Observe each day.	Article 2303.10 IM 508
Check aggregate proportions, interlocks, & cold feed bin gate settings daily.	Check first day & weekly thereafter.	IM 508 IM 511
Inspect trucks for proper/improper use of cleaning fluids. Prepare 3 boxes & Form 193 (Samples Submitted) & send to road for hot samples.	Monitor daily.	Article 2303.10
Asphalt Delivery		
Determine quantities on hand & calculate AC added by tank stick or weighing. Compare with brodie meter daily.	Monitor once per day.	IM 509 Article 2303.27

Certified Plant Inspection	Minimum Monitoring Requirement	References
Plant Sampling & Testing		
Obtain 3 aggregate samples per lot, split only the sample(s) to be tested, determine & record process control gradation. Forward split samples to District Materials with Form 193.	Witness at least 1 of first 3 samples of each mix design & minimum of 10% of remaining samples. Split samples for acceptance test.	Const. Man. 3.20 thru 3.22 SS 1059
Determine moisture content of all aggregates, including RAP.	Audit first day & once per week thereafter.	IM 508
Obtain AC samples & forward to District Materials Lab.	Observe first day & weekly thereafter. Submit monitor sample to District Materials.	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. Issue non-compliance if necessary. Forward cores to District Lab with Form 193.	Article 2303.14
Documentation		
Prepare daily plant report (820007).	Audit entries daily.	IM 508
Document all checks, tests, & quantities in field book in format provided by residency.	Audit entries daily.	Const. Man.
Complete tank stick sheet.	Audit daily.	IM 509
Maintain & monitor control charts.	Monitor daily.	IM 508
Check for approved sources & certifications for all materials (including material transferred from other projects) & document deliveries.	Audit once per week.	
Assure total certified quantities are sufficient for tons produced.	Audit once per week.	
Maintain file of all certified material tickets, worksheets, & forms submitted.	Obtain file at end of project.	SS 1057

DOCUMENTATION SAMPLE

PLANT INSPECTION DUTIES	DATE MONITORED	DISCREPENCIES AND CORRECTIVE ACTION BY DATE OF INSPECTION
LIST DUTIES PER IM 214	CHECK ITEMS MONITORED	DATE MONITORED BY:

EXHIBIT D

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 - District Materials

3.20 FIELD TESTS

3.21 FIELD TESTING ON CONSTRUCTION PROJECTS

A. General - I.M. 204

All sampling, measuring and testing for construction project control shall be performed as prescribed in the current Materials Department Instructional Memorandum I.M. 204, Inspection of Construction Projects - Sampling and Testing.

B. Project Acceptance Sampling and Testing

Construction inspection personnel are responsible for the field sampling and testing portion of Project Acceptance Tests. All gradation testing for aggregates shall be performed by certified aggregate inspectors. This will require that every construction office Resident Engineer keep a close check on proper inspector assignments and maintain a program of continuing recertification for present personnel and certification for additional employees if required. Samples taken by inspectors and submitted to district or central laboratories must be properly and completely identified on Form 820193 or other appropriate forms as required.

For projects that certified plant inspection is required, the certified inspector will be obtaining three gradation samples per lot (unless operations are prematurely shut down). All samples that are to be tested for gradation shall be split in accord with I.M. 336 prior to testing. One-half of the sample shall be bagged, tagged, and identified on Form 820193. The tag shall have, as a minimum, the following information: contractor's name, project number, county, date of sample, and the "W" if it represents a witnessed sample. This sample shall be transported to the District Lab not later than the next working day.

These samples will normally be tested by District Materials personnel unless the District Materials Engineer and Resident Construction Engineer approve other arrangements. Other arrangements may include having the plant monitor perform gradation testing at the plant or resident construction engineer office when gradation problems warrant more timely results or District Lab workload becomes excessive.

I.M. 204 shows the minimum required frequency of tests for various types of work.

Additional tests should be made as necessary for adequate project control.

All tests should be recorded in field books. Reports showing test results must include all tests made.

C. Non-Compliance Notice - Form 830245

Project Acceptance test results and workmanship of material which is incorporated in the work that fall outside the specification limits shall be reported by the project inspector on a Non-Compliance Notice (Form 830245).

1. The original copy shall be immediately delivered to the contractor with the carbon copy retained by the inspector for the project files.

2. The inspector should also immediately advise the Resident Construction or County Engineer when tests on work indicate non-compliance with the specifications.

   When non-complying tests occur before a material is placed, the material shall be rejected and a Form 830245 is not needed.

   A Form 830245 is issued when non-complying tests occur for work that is in progress or where material is being placed. Subsequent loads of material shall not be placed until it is determined to be complying.

   Where lot sampling and testing represent acceptance, such as in aggregate gradation, the Form 830245 is to be issued when a sample test result is non-complying. The material may continue to be placed until the remainder of the tests in the lot are completed. When the lot is non-complying, subsequent material shall not be placed until corrective action has been taken and it is complying.

D. Assurance Sampling and Testing

Materials Office I.M. 204 describes the responsibilities involved with this program, most of which lie with the Materials Office. Occasionally in the past, taking of assurance samples has not occurred on some projects because timely notification of ongoing work was not made. This seems particularly common in the case of test cylinders from bridge deck pours as well as culvert projects.

While the actual taking of assurance samples remains the responsibility of Materials personnel, it is of equal importance that Construction personnel provide timely notification regarding available dates for testing. Acceptance of this mutual responsibility will help make this program successful.

3.22 AGGREGATE GRADATION TESTING, SAMPLING & EVALUATION

A. General

The Standard Specifications require the engineer to determine if all construction is acceptable and within reasonably close conformity with the plans and specification. If the work is not in reasonably close conformity, the engineer is permitted to allow the work to remain in place if it is reasonably acceptable and to provide for an adjustment in the contract unit price for such work that is deficient.

When certified plant inspection is required, the gradation test results shown on the plant report will be from process control samples, advisory only. Gradation acceptance test results will be documented on Form 821283. If the acceptance test fails, it will be necessary to split and test the backup samples. The project engineer should compare the process control and acceptance test results and investigate differences that could be the result of improper splitting techniques, test procedures, or accuracy of equipment. IM 216 is a guide that provides reasonable tolerances of split sample test results. The engineer may use the tolerances as a basis for investigating discrepancies.

The certified plant inspector should also be aware that test results may vary and investigate the cause of differences. The primary responsibility for assuring that process control and acceptance samples are representative of the material incorporated in the project lies with the certified plant inspector.

However, the contractor may elect to remove the deficient work with no extra payment and replace it with construction that complies.

Unless otherwise specified, the gradation of aggregates for Portland Cement Concrete, Asphalt Concrete, Asphalt Treated Base, Bituminous Treated Aggregate Base, Cement Treated Granular Base, Granular Subbase, Crushed Stone Base, and Graded Stone Base shall be evaluated in accordance with Sec. 2.53.

Whenever deviations from the specifications limits or tolerances occur, whether the deviation is to the extent that payment adjustments will be made or not, the contractor shall take immediate corrective action that will insure subsequent compliance. If immediate corrective action is not taken, the inspector shall stop the work.

When test results are within the specifications but continuously near the limits or tolerances on any sieve, the inspector shall plainly inform the contractor that corrective action would be advisable and shall document this advice in the project diary. However, work shall not be stopped, pending such corrective action, unless non-compliance has occurred.

For small quantities of structural concrete (less than 5 cu. yd.), tests (slump and air) are not required if the same mix and plant has been used earlier in the week. A note in the project file shall be entered stating this fact.

B. Sampling

Obtain three samples, one from each one third of each lot. For construction operations that are carried on continuously, a lot is defined as a day's run or major portion of a day's run. Intermittent construction operations involving small quantities shall be grouped to establish a lot; the time period shall normally not be longer than one week or working days. For structural concrete operations, a lot should be a day's run or approximately 250 cubic yards, whichever is greater. If less than approximately 250 cubic yards are produced in one calendar week, that week's work shall be considered a lot.

C. Testing

1. ACC & PCC Aggregates

The first sample secured each day shall be tested for gradation. In addition, the following procedures are to be followed to select samples for testing: A die shall be cast for each lot and if the number showing matches the working day of that week, as counted starting with Monday, an additional sample shall be tested. A die shall be cast again to determine which additional sample is to be tested. The even numbers on the die shall designate the second sample and the odd numbers shall designate the third sample from the lot. If the test results on any of the foregoing samples do not comply, the remaining sample(s) for that lot shall be tested.

The certified plant inspector shall use this testing plan for all process control samples.

The contracting authority shall test the first 3 samples tested of each aggregate or ACC mix design and a minimum of 10% of the remaining samples. Preference should be given to witnessed samples and companion samples to failing process control samples for testing. If a test fails, the contracting authority shall require the certified plant inspector to split the remaining samples for that lot and forward to the District Lab. These samples shall be tested and averaged for compliance.

When small intermittent quantities are grouped to form a lot, the first day's operation shall be tested for gradation. In addition, the following procedure shall be used to select possible additional samples for testing: A die shall be cast for the lot and if the number showing matches the first working day of the group as counted starting with Monday (one in six probability) an additional sample shall be tested. A die shall be cast again to determine which additional sample is to be tested. The even numbers on the die shall designate the second sample and the odd numbers shall designate the third sample. If the test results on any sample (1st, 2nd or 3rd) do not comply, the remaining sample(s) for that lot shall be tested.

Even if the first process control sample tested indicates compliance, the other two samples in that lot should be taken and retained until the lot is accepted. A lot is accepted when an acceptance test result is determined to be in compliance. If an acceptance test is not performed on a lot, that lot will be evaluated on the basis of the next acceptance test results.

2. Other Aggregate Samples
Aggregate samples other than for A.C. and P.C. Concrete shall be selected for testing by casting a die for each lot. The numbers one and two on the die are designated to represent the first sample secured, three and four the second sample, and five and six the third sample. The die may be cast when the first sample is secured. If the test results on the sample selected do not comply, the other two samples for that lot shall be tested.

3. Partial Lots
In the case when construction operations are prematurely shut down or otherwise constrained and only one (1) sample is secured, it shall be tested. If two (2) samples are secured, a die shall be cast to determine which sample shall be tested. If the sample so selected does not comply, the remaining sample shall be tested.

D. Evaluation and Acceptance

When two or three test results are obtained, they are to be averaged. Partial lots represented by one test will be evaluated on the basis of the individual test result.

In the event the engineer finds the material or the finished product in which the material is used or the work performed is not in reasonable close conformity with the plans and specification and has resulted in an unsatisfactory product, the work or material shall be removed and replaced or otherwise corrected by and at the expense of the contractor.

3.23 WEEKLY REPORT OF DAILY TESTS

The "Weekly Report of Daily Tests of subbases, crushed stone bases and moisture density embankments" (Form 830255) is no longer required.

The information on this report is still needed in the Construction Office and Central Filing, therefore, copies of the field book pages should be made on a weekly basis and forwarded to the Construction Office and Central Filing.

Page 18 of the "Construction Records Guide," dated April of 1982, is an example of the field book set up for these tests.

Form 830255 will not be reprinted since it is no longer required.

SECTION 5

Calibration
Problem - Review
After Sec. 5

PLANT SETTINGS

Problem 1

½" Type A Surface Mix

Approved Job Mix Requires:

6.00% Asphalt Cement
65% Crushed Limestone
35% Sand

Contractors starting production rate - 250 TPH (mix)

(250 TPH) (0.06) = 15 T. A.C./Hr.

250 TPH Mix - 15 TPH A.C. = 235 T. Hot Aggr./Hr.

A. Determine the cold feed settings for this production rate (calculate or obtain from T-101). Use attached graphs.

1. ½" Cr. Lmst. - $\frac{(235)\ (0.65)\ (2000)}{60}$ = 5092 lbs/min.

Required Setting 67.5

2. Sand $\frac{(235)\ (0.35)\ (2000)}{60}$ = 2742 lbs/min.

Required Setting 36.5

B. Batch Plant - 10,000 lb. capacity

10,000 lb. batch to be used.

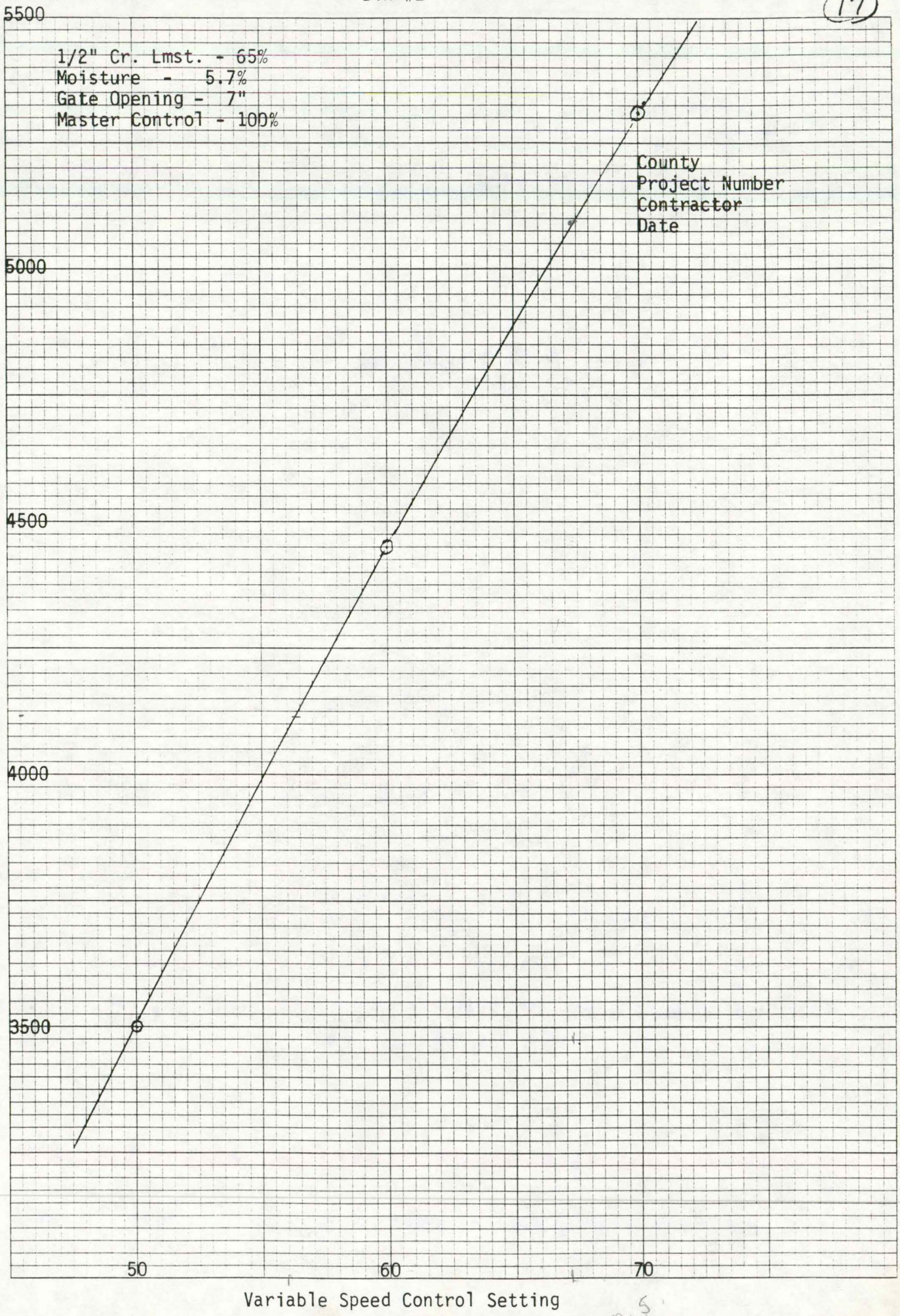
Scale Settings: Hot Aggregate 9400 lbs.

A.C. 600 lbs.

6.0 % AC x 10,000 =
.06 x 10,000 = 600
10,000 - 600 = 9400

Bin #2

(17)


5500
5000
4500
4000
3500
1/2" Cr. Lmst. - 65%
Moisture - 5.7%
Gate Opening - 7"
Master Control - 100%
County
Project Number
Contractor
Date
Pounds Dry Aggregate/Minute
50
60
70
Variable Speed Control Setting

(18

Problem 2

½" Type A Surface Mix

Approved Job Mix Requires:

5.00% Asphalt Cement
65% ½" Cr. Lmst.
35% Sand

Type Plant - Batch (Proportioning only) - 10,000 lb. capacity

Aggregate Scale - 10,000 X 10 lb. dial

Asphalt Cement Scale - 1000 X 1 lb. dial

Production Rate: 200 TPH (Mix)

$200 \times (0.05) = 10$ TACK
$200 - 10 = 190$

p. 269 of 416 IM 504

A. Determine the cold feed settings for this production rate (Use attached graphs)

$\frac{190 \times .65 \times 2000}{60} = 4117$ lbs/hr

1. ½" Cr. Lmst. - Cold feed settings 56.0

2. Sand Cold feed settings 31.0

$\frac{190 \times .35 \times 2000}{60} = 2217$ lbs/hr

3. With a 8,000 lb. batch, the scale settings would be:

Asphalt Cement 400 lb.

$.05 \times 8000 = 400$

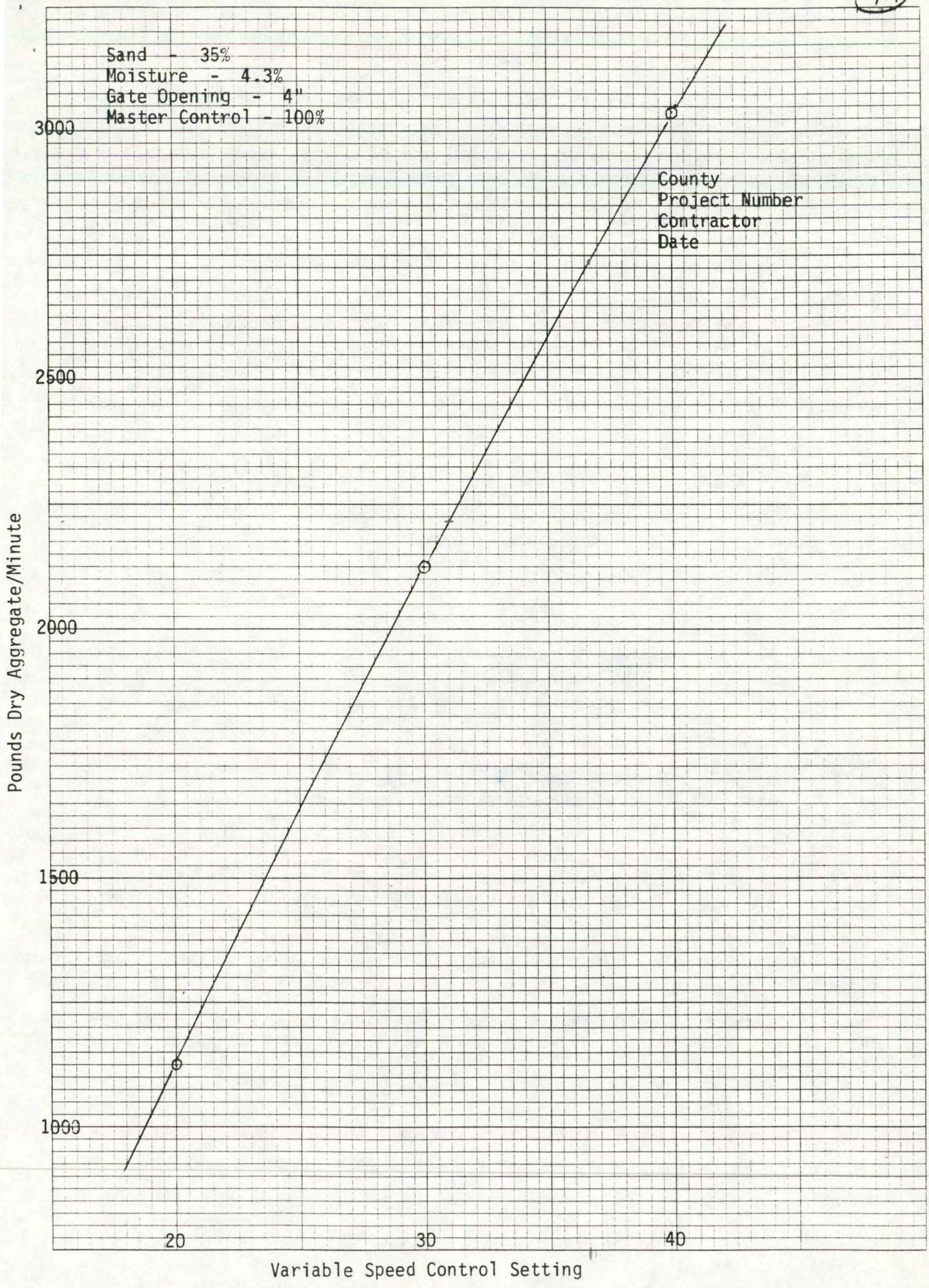
Hot Aggregate 7600 lb.

$8000 - 400 =$

4. To operate within our delivery tolerance limit, the asphalt cement weight per batch would have to be between _____ and _____ lbs.

5. The aggregate scale should be sensitive to a 5 lb. weight.

Bin #3


Sand - 35%
Moisture - 4.3%
Gate Opening - 4"
Master Control - 100%
County
Project Number
Contractor
Date
3000
2500
2000
1500
1000
Pounds Dry Aggregate/Minute
20
30
40
Variable Speed Control Setting

WEIGHING EQUIPMENT

Asphalt plant scales will be proportioning scales or pay quantity scales. The same scale may serve both purposes in a batch plant.

1. Proportioning scale - used to proportion a part of the material into the mixer. Examples are the Ramsey weigh belt in a drum mix plant or the asphalt weigh hopper scales in a batch plant.

2. Pay quantity scale - use to measure a weight for pay quantity. Examples are the truck platform scale to weigh loaded trucks or a storage silo discharge weigh hopper.

A plant inspector will generally be involved in the accuracy and sensitivity checks on scales. Examples are as follows:

Drum-mix plant

A. Ramsey weigh belt and A.C. delivery pump
   Accuracy = 1.5%
   Sensitivity = No specification
   (Article 2001.22F)

Batch plant

B. Proportioning scale
   Accuracy = 0.5%
   Sensitivity = 0.1% but not less than 1/2 graduation
   (Article 2001.22J)

Pay Quantity Scales
Accuracy = 2 lb. per 1000 (0.2%)
Sensitivity = 2 graduations not more than 20 lb.
(Article 2001.07)

There will be situations where the proportioning equipment acts as the pay quantity scale. This occurs in a batch plant which discharges mix directly into the trucks and the pay quantity is determined by counting the number of batches and multiplying by the weight per batch on the proportioning scale. In that case the proportioning scale and pay quantity scale are one and the same, and the scale must be accurate and sensitive to the tighter limits.

The plant inspectors should assure themselves at time of calibration that they know which scale systems are in use at the plant and what checks and documentation are required.

Accuracy | Sensitivity | Tolerance

DEFINITIONS:

Scale accuracy - A measure of how close the registered weight is to actual weight

Example: **Actual weight** = 10,000 lb.
Scale reads = 9,980 lb.
Difference = 20 lb.

20/10,000 = **0.002 = 0.2%**

If the example is a pay quantity scale it would comply with the allowable 0.2%. yes
Would it also comply with the allowable of 0.5% on a proportioning only scale? yes

Scale sensitivity - An indication of scale reaction to weight variation.

Example: Batch weight = 10,000 lb.
Scale graduations = 10 lb./grad.
Wt. needed to move scale = 20 lb.
Sensitivity = 2 graduations

Does Example comply with pay quantity requirements of 2 graduations and not more than 20 lbs.? yes
Does Example comply with proportioning scale requirements of 0.1% but not less than 1/2 graduations? no

Scale operating tolerance - **A limit above or below the target weight which is still acceptable.**

Example: Batch weight = 10,000 lb.
Operating tolerance = $\pm$ 1%

10,000 x 0.01 = 100 lb.

Batch = 10,150 lb. hopper should not discharge because it is beyond the 1% tolerance.

or

Total weight of mix for day = 100,000 lb.
Total weight of mix by proportioning scale = 101,500 lb.

Not within 1% operating tolerance.

Note: Operating tolerances are set in the plant controls as interlocks which prevent the plant from operating unless it is within the tolerances.

3.42 WEIGHING EQUIPMENT FOR DETERMINATION OF PAY QUANTITIES

A. Weighed Materials

General - Article 2001.07 of the Standard Specifications describes equipment and procedures to be used when payment for an item of the contract is based on actual weight. Aggregates are generally weighed in the delivery vehicle on a platform scale. Asphaltic mixtures may be weighed over platform scales, in silos on load cells, in weigh hoppers, or by counting batches. The specifications also provide for converting volume measurements to weight.

Scale Tickets - The contractor shall provide a scale ticket for each load showing the required weight information for the procedure being used, the project number or contract description, the truck number, the date, and the type of material.

The required data to be automatically printed on the scale tickets will vary according to the method of measurement (weigh hopper, silos on load cells, batch scales, or platform scales) and type of system (automatic or semi-automatic).

- For weigh hoppers, batch scales, or silos on load cells, all tickets printed automatically shall include the gross weight, empty weight of the hopper or weight not discharged, and net weight of material for each drop, and the total net weight for the load. When weighed under the semi-automatic procedure, the weighmaster may include on the ticket the calculated total net weight.

- For batch scales, the batch weight and batch count are to be automatically printed under both procedures. The total net weight may be printed with an automatic system or calculated by a weighmaster with a semi-automatic system.

- For truck platform scales with automatic weighing, all scale tickets shall be printed automatically with the gross weight, tare weight of the truck, and net weight of the load. For semi-automatic weighing, the weighmaster shall conduct all weighing and he may enter by hand or by printer the tare weight of the truck and calculate the true net weight.

- Manual Weighing of Loaded Trucks (Less than 10,000 tons)
  Scale equipment on truck platform scales may or may not include a mechanical ticket printer. A weighmaster shall include the gross and tare weights and calculate the net weight on the scale ticket. The engineer may arrange for weighing to be witnessed.

o Volume Measurements
The quantity of materials, paid for on the basis of volume measured in the vehicle, will be based on a load count by inspector at the point of delivery. The engineer or his inspector will convert the volume of the truck load to weight, using a weight per unit volume. This will be determined by weighing at least one struck off load in each truck. Thereafter, each truck load shall be struck off level and the inspector shall observe that the volume of each load of material delivered is not less than that claimed by the contractor. There shall be a ticket with each load indicating the volume or calculated weight. The inspector will maintain a daily log as a part of the permanent project record, showing the type of material delivered, identification and capacity of the haul vehicle, time of arrival of each load, and appropriate notations as to the use of the material.

The inspector will collect the accompanying load ticket for each load of material on its arrival at the work site and check to see that the ticket has been validated by the scale inspector when such scale inspection is required. The inspector will observe each load of delivered material to detect any obvious deficiencies in quality or in quantity and reject any loads which are unsatisfactory.

The inspector will sign or initial the scale ticket for each accepted load to verify the material was delivered and accumulate the tickets on a daily basis for determination of pay quantities. Quantities for each day's operation shall be totaled and checked against the contract records and any discrepancy promptly resolved.

The requirements that an inspector personally receive all load tickets at the time of delivery may be relaxed only in cases of very small quantities or intermittent deliveries under conditions where the Engineer or inspector can visually determine the approximate quantity delivered.

On asphalt projects, it is permissible for a contractor's employee to collect the tickets and place on a clipboard. An inspector must be present at the laydown operations at all times and observe the collection of the tickets.

B. Truck Platform Scale Approval

General - The specifications require that scales for weighing loaded trucks shall meet the requirements of the Iowa Department of Agriculture. A platform scale used for measurement of items such as crushed stone, base and subbase material, and asphaltic mixtures, contracted for and measured by the ton, shall be inspected by the State Department of Agriculture.

Permanent scales, so inspected, have an official stamp conspicuously displayed.

Temporary scales, so inspected, have the same official stamp or if the scale is at a temporary plant location or quarry the inspection may be identified by a certified report and affidavit. Use of the certified report and affidavit is subject to the following special limitations and with these limitations inspection is official by the State Department of Agriculture.

1. The scale is inspected by a bonded scale repairman and a report prepared that certifies the scale complies with the regulations of the State of Iowa. A copy of the report shall be forwarded to the Department of Agriculture.

2. It is effective for six months at the same location; however, the effective period does not extend beyond the spring thaw. Rather than reject the scale for this, it is the intention to reschedule inspection by a bonded scale repairman at that time providing for continuous use until then.

3. Inspections made in the spring are after frost leaves the ground.

4. The certified report and affidavit shall expire when the scale is moved.

C. Weigh Hopper, Batch Scales, & Load Cell Approval

Weigh hoppers, batch scales, and load cells will be checked for accuracy against truck platform scales that meet the requirements of the Iowa Department of Agriculture during calibration and during use as described below.

D. Scale Checks for Sensitivity

1. General - The contractor shall have available upon request at the job site, at least 10 standard 50 lb. test weights for the purpose of testing and calibrating weighing equipment. Whenever scales are checked with standard weights, the data showing scale readings versus increments of known standard loads should be recorded in the field notebook or on a calibration form and become a part of the permanent job record.

   It is the intention that contractor's personnel will be responsible for adding and removing the weights. Inspection personnel shall witness and document calibration or other scale checks.

2. Batch Scale, Hopper Scale, & Load Cells - The sensitivity should be checked at least once during a normal working day by placing a weight equal to one-tenth percent the batch weight on the fully loaded scales and observing the movement of the indicator. A properly sensitive scale will exhibit a visible indicator movement when so tested. If no indicator movement is visible, immediate corrective action must be taken by the contractor.

Specified scale tolerance limits should be checked by periodically witnessing the batch weighing operation. Each scale indicator should consistently indicate the required weight within the specified delivery tolerance and return to zero when unloaded within the specified 0.5 percent tolerance.

Refer to Materials I.M. 508 for automatic batch weighing equipment settings and/or adjustments.

3. Truck Platform Scales

The following paragraphs apply to permanent platform scales as well as portable platform scales.

a. The working parts of scales (platform and beam linkage) must operate freely to preserve the scales accuracy and sensitivity. The scale should be kept clean on and under the platform to assure accuracy.

b. Each scale should be checked for sensitivity initially and at least once each working day by carefully balancing the scale, then observing if movement of the equilibrium indicator is discernible upon application of a weight equal to two of the minimum gradations, but not more than 20 lbs.

E. Scale Checks for Accuracy

When automatic or semi-automatic weighing is used, continuous direct observation of the weighing process by a scale inspector is not required. When weighing is not continuously observed, sufficient random checks should be made to assure the project engineer that the contractor's weighing procedures are accurate, and the true net weight is recorded. This includes both verification weighing and check weighing.

Verification weighing is defined as a second weighing of the same load on the same scale, and they apply only to truck platform scales. At least one verification weighing should be made daily when the pay quantity is weighed on truck platform scales. Verification weighings are made to determine the repeatability of truck platform scales. The verification weight should not be less than the initial weight by more than 20 lbs.

Check weighing is defined as a second weighing of the same load on another certified truck platform scale. Check weighings shall be made to determine the accuracy for all types of weighing equipment. For check weighing of weigh hoppers, load cells or batch weight tickets, it will be necessary to also get the tare weight of the delivery truck and consider a suitable fuel adjustment to determine the accuracy of the total net weight. Recognizing that in a batch plant some material may remain in the mixing chamber after a drop (no effect on batch weight), the results of two check weighings may be averaged.

Check weighing for truck platform scales should not be less than the initial weight by more than 60 lbs. Check weighing for weigh hoppers, batch scales, and silos on load cells shall not be less than the initial weight by more than 100 lbs.

When weighing asphaltic mixes, at least one check weighing should be performed for each day of production. For aggregate weighing the engineer may approve less frequent check weighings, but a minimum of two per week should be performed.

If these check comparisons had been made for another project within the time stipulated, documentation in the project diary will be satisfactory and separate checks will not be required.

If the check shows weighings that compare within the tolerances allowed, the scales should be considered satisfactory.

If the check shows weighings that do not compare within the tolerances allowed, the scales should be considered satisfactory only after the following additional investigations show it as warranted.

(1) The scale can be checked against another platform scale.

(2) The deviation of each scale from the true weight can be determined from the scale calibration prepared during the inspection if available. The scale operator is given this calibration, but is not required to keep it. The tolerance to be maintained is two lbs. per 1,000 lbs.

If one scale is heavy just within this tolerance and the other scale is light just within this tolerance, a difference in compared weights for a 50,000 lb. load can be 200 lbs. and still be legal and satisfactory. Some allowance should be made for actual difference in weight because of gasoline (7 lbs. per gallon) if there is sufficient distance between scales.

Each truck shall be tared daily. Taring of trucks should be on a random basis during the day's operation, using the previous day's tare weight until a new tare weight for that day is determined. No truck may be used for hauling material paid for on a weight basis until tared.

For true verification and check weighing, selection of random loads shall be done without advance warning to the contractor. Allow a reasonable fuel adjustment, if appropriate. Where random checks show errors beyond the tolerances specified in the specifications, the project engineer should review the weighing procedures used by the contractor and may require that the scales be inspected. The contractor shall take prompt action to make necessary repairs. Should errors continue to be discovered, it will be necessary to suspend further weighing until the weighing procedures are correct and accurate. Further investigation is necessary when the error exceeds the tolerance in either the plus or minus direction.

F. Use of Weighmasters

1. General - In order to make more productive use of contract inspection personnel, a program has been implemented whereby contractors and/or producers will furnish weighmasters (Code of Iowa, Chapter 214, Section 6-8) to conduct the weighing of highway construction materials. The specifications presently limit the weighmaster requirement to weighing of asphaltic mixtures and aggregates under procedures for semi-automatic weighing and manual weighing of loaded trucks.

2. Weighmaster's Oath - To be certified, a weighmaster must sign an oath, a copy of which is included in this chapter. Personnel desiring to become a weighmaster may obtain such forms and procedures from the Iowa Department of Agriculture's Division of Weights and Measures, Des Moines, Iowa.

3. Responsibilities - The weighmaster must be the person actually operating the weighing and recording equipment. He/she shall include on the scale ticket the tare weight and the calculated true net weight. The weighmaster shall sign the ticket for the first weighing each day of a load and initial subsequent tickets. The engineer may arrange for weighing to be witnessed. If witnessed, the witness will also initial the ticket.

   Weighmaster will daily establish tare weights of all delivery vehicles weighed in a truck platform scale. These tare weights will be established at random times throughout the day in accordance with procedures set up with project inspection personnel. A list of these weights will be provided to the engineer on request. When weighing in trucks, the weighmaster shall enter the truck tare weight by hand or where this information can be entered directly to the automatic weigh recorder the information will be printed out.

   Misrepresentation of weights or weighing equipment that is known to be inaccurate will result in the removal of the weighmaster from the approved list maintained by the State Department of Agriculture. No further material will be hauled to the project from the site of the infraction until another certified weighmaster is provided or the equipment repaired to meet the standards of the Department of Agriculture Certification Program.

(78)

P I T L E S S O R P O R T A B L E S C A L E R E P O R T

Owner_____ Date_____

Office
Address_____
(Street)

_____ _____ Zip_____
(County) (State)

Scale Make_____ Model_____

Capacity_____ Platform Size_____

Location_____
(County) (Township) (Section)

Quarry Name_____

Remarks: Was scale found to meet the specifications and tolerance set by the Iowa Department of Agriculture?_____

If answer to above is "no", did you make necessary repairs to bring it into specification and tolerance of the Iowa Department of Agriculture?_____

A F F I D A V I T

The undersigned bonded scale repairman certifies that the above described Pittless/ Portable scale has been inspected and found to be within weight specification and tolerance specified under the laws, rules and regulations of the State of Iowa.

Signed:_____
(Scale Repairman)

Company:_____

I N S T R U C T I O N S

1. Materials producers will forward one signed copy of this report to Chief, Standard Weights and Measures Division of the Iowa Dept. of Agriculture, State Capitol Building, Des Moines, Iowa 50319.

2. One signed copy of this report must be posted in the scale house for observation by Iowa State Highway Commission Construction and/or Materials Dept. inspectors.

(2)

2/15/85 3.42

POST IN CONSPICUOUS PLACE NEAR SCALE

R. H. Lounsberry, Secretary
Iowa Department of Agriculture
Division of Weights and Measures
Des Moines, Iowa

OATH OF WEIGHMASTER

STATE OF IOWA

County of _____

I, _____, being first duly sworn on my Oath,
(type or print)

depose and say that I will perform my duties as WEIGHMASTER for the

_____
(company)

of _____, Iowa, to the best of my ability, that I will keep my scales correctly balanced, that I will record true weights, and that I will render a true and correct account to the person having weighing done.

Subscribed and sworn to before me by _____
(weighmaster's signature)

this _____ day of _____ 19___.

_____
Notary Public in and for

_____ County

_____, Iowa

Not transferable.

Send copy to Iowa Department of Agriculture.

IOWA DEPARTMENT OF TRANSPORTATION

District Construction Engineers
Resident Construction Engineers

Date April 30, 1986

Ref. No. 430

Harold Dowden

Construction

Questions Concerning Weighmaster Use

Construction Manual 3.42E dated 2/10/86 covers the use of weighmasters as provided for by Code of Iowa, Chapter 214, Section 6-8. There have been questions concerning the certification of weighmasters, which is the responsibility of the Department of Agriculture. This memo addresses the current questions, and by "reading between the lines" may assist in anticipating answers to future questions about the program.

1. A copy of the Oath of Weighmaster is included on page 3-31 of the Construction Manual. The signed oath has no termination date, does not need to be renewed, and is on file and applicable as long as all the information on the form does not change. (Reference Construction Manual 3.42E.2)

2. New applicants need only secure the form from the Department of Agriculture or duplicate the form on page 3-31 of the Construction Manual. The form needs to be filled out, signed, and notarized. Then a copy should be sent to the Department of Agriculture at the address shown. The original is posted in the scale house in full view of the weighing operation. (Reference Construction Manual 3.42E.2).

3. The indefinite period of the weighmaster oath creates a problem when weighmasters are terminated or assignments changed. The weighmasters employer (company) should file a notice with the Department of Agriculture to have registration (oath) cancelled.

4. At this time, there is no fee connected with the oath of weighmaster.

5. Construction Manual 3.42E.3 notes "that misrepresentation or inaccurate weighing will result in removal of the weighmaster from the approved list maintained by the Department of Agriculture." At this time there is no computer list of applicants, only a paper file and not an overwhelming eagerness to search the files to provide information.

We should continue to monitor the weighing activity as provided for in Construction Manual 3.42F.

HED:pc

cc: D. A. Anderson

Iowa Department

TANK MEASUREMENT &

			START OF PERIOD							ADDED				
1 Date	2 Time	3 Tank No.	4 Temp. (°F.)	5 Tank Stick Outage (Per-Cent Of Dia.)	6 T-104 Innage (Percent Of Capacity)	7 Tank Capacity	8 T-102 Temp. Corr. Factor	9 Correct Gallons	10 Total Correct Gallons On Hand	11 Total A.C. Added Weight	12 Corr. Gal.	13 Temp. (°F.)	14 Tank Stick Outage (Per-Cent Of Dia.)	15 T-104 Innage (Percent Of Capacity)
5-3-85	6:00	1	285	37.1	66,238	20,000	0.9236	12235		47,400	5515	285	57.2	40,869
	6:00	2	280	32.9	71,340	20,000	0.9253	13202	25437			280	74.9	19,662

SECOND DAY'S PRODUCTION

DATE 5/4/85

ONE ASPHALT CEMENT SHIPMENT SEE ADJACENT SHIPPING TICKET
(LOAD WAS WEIGHED AT PLANT, NET WEIGHT WAS 45,600 POUNDS)

STUCK TANKS AT 6:15 AM

1. AIR TEMP 60°
2. A.C. IN TANK # 1 = 290°; % OUTAGE OF DIAMETER WAS 57.1%.
3. A.C. IN TANK # 2 = 270°; % OUTAGE OF DIAMETER WAS 75.0%

A TOTAL OF 1,108,817 POUNDS OF MIX WAS MADE.

15.2 TONS LOAD WAS REJECTED FOR BEING TOO COLD

314.8 TONS WAS USED ON A PRIVATE PARKING LOT.

AVERAGE MIX TEMPERATURE WAS 265°

STUCK TANKS AT 7:30 P.M.

1. AIR TEMP 80°
2. A.C. IN TANK # 1 = 285°; % OUTAGE WAS 63.0%.
3. A.C. IN TANK # 2 = 280°; % OUTAGE WAS 80.5%

MIX DESIGN % ASPHALT = 6.10 %

EXTRACTED % ASPHALT = 5.95%

ent of Transportation

ASPHALT DETERMINATION

Project	
County	
Contr	
Type Mix	

– END OF PERIOD ⟶

16 Tank Capacity	17 T-102 Temp. Corr. Factor	18 15x16x17= 18 Correct Gallons	19 Total Correct Gallons On Hand	20 19-12-19= 20 Total Correct Gallons Used	21 Average Weight Per Gal.	22 20x21=22 Total Pounds Of A.C. Used	23 Tickets Total Pounds Of Mix Made	24 Total Pounds Of Mix Wasted	25 28x24=25 Total Pounds Of A.C. Wasted	26 22-25=26 Net Lbs. Of A.C. Used On Road	27 23-24=27 Net Lbs. Of Mix Used On Road	28 22÷23=28 Percent A.C. (Tank)	29 Percent A.C. (Extr.)
20,000	0.9236	7549											
20,000	0.9253	3639	11188	19764	8.5955	169681	2785000	10,000	610	169271	2,775,000	6.10	

BITUMINOUS MATERIAL AND SUPPLY COMPANY INC.
WEST DES MOINES, IOWA 50265

No. 012592

Date May 4 19 85

SOLD TO [illegible]
Weight at Elevator

SHIPPED FROM Algona Plant
SHIPPED TO Project No. FN-18-2(49)--21
County Dickinson
Location of Project Milford
Miles to Project 65

This is to certify that the below named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Additive Yes / No

Signature

Tractor No. 34 Trailer No. 21
Les
Driver

GROSS QUANTITY		DESCRIPTION	NET QUANTITY
73280	GROSS	☒ LIQUID ASPHALT AC-10	NET GALS
27660	TARE	☐ ASPHALT CUTBACK COMBUSTIBLE LIQUID NA-1999	
45620	NET	GRAV. 1.032 LBS/GAL 8.595 VIS. REB. ____ PEN. REB. ____	NET TONS

LEFT BMS PLANT 7:30 AM ☒ PM ☐
ARRIVED AT PROJECT 9:00 AM ☐ PM ☐
FINISHED UNLOADING / AM ☐ PM ☐
LOADED @ 260 °

I HEREBY CERTIFY THAT THE MATERIAL COMPLIES WITH IOWA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS AND THAT THE WEIGHTS SHOWN HEREON ARE TRUE AND CORRECT.
BITUMINOUS MATERIAL AND SUPPLY COMPANY
SIGNATURE [signature]
DATE 5/4/85 TANK NO. A-1

LESS 2:00 HRS. FREE TIME $
DELAY TIME @ $ PER HOUR $
PUMPED BY BMS CO. YES ___ NO ___ @ $ ___ per GAL/TON $

ALL claims and returned goods MUST be accompanied by this bill.
Rec'd By Evy Bel[illegible]

DEPARTMENT OF TRANSPORTATION COPY

FILLER BITUMEN RATIO CALCULATION

$$F/B = \frac{\% \text{ Minus } 200}{\% \text{ AC (Tank Stick)}}$$ cold feed

PROBLEM #1

Given: % AC by Tank Stick = 6.00
% Minus 200 = 6.8
F/B Spec = 1.20 Maximum

F/B = 1.13

PROBLEM #2

Given: % AC by Tank Stick = 5.60
% Minus 200 = 7.2
F/B Spec = 1.20 Maximum

F/B = * 1.28 * Does not comply

6.7% minus 200 to be in spec

To find out the maximum allowable Minus 200:

Formula: Tank Stick x F/B Spec = Max 200 Allowed

PROBLEM #3

Given: Tank Stick = 6.00
F/B Spec. = 1.20 Max

Maximum Minus 200 To Be In Compliance?

Maximum Minus 200 = 7.2

mean (2nd F) $\bar{x}$
Std. Deviation (2nd F) s_x

FORMULAS

Field Density of Sample = $\frac{W_1}{W_3 - W_2}$ Where W_1 = wt. of sample surface dry
W_2 = wt. of sample in water
W_3 = wt. of sample again in air

Percent Lab Density = $\frac{\text{field sample density x 100}}{\text{lab density}}$

Percent Voids V = $100 - \frac{(100 \times \text{field density})}{(\text{lab high pressure/Rice sp. gr.})}$

Q.I. (Density) = $\frac{\text{average density \% - specified density \%}}{\text{standard deviation density \%}}$

Standard Deviation = $\sigma = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n-1}}$ Where x = indiv. sample density %
$\bar{x}$ = average density %
n = number of samples

Formula for suspected high outlier = $\frac{\text{highest density \% - average density \%}}{\text{standard deviation density \%}}$

Formula for suspected low outlier = $\frac{\text{average density \% - lowest density \%}}{\text{standard deviation density \%}}$

Q.I. (Thickness) = $\frac{\text{average thickness - (design thickness - 0.5)}}{\text{maximum thickness - minimum thickness}}$

Filler Bitumen Ratio = $\frac{\text{\% of minus 200 material}}{\text{\% of asphalt in mix}}$ (on tank stick)

$$\text{\% A.C. (added)} = \frac{100\ (\text{total intended \% A.C.}) - (\text{\% RAP})\ (\text{\% A.C. in RAP})}{100 - (\text{\% RAP})\ (\text{\% A.C. in RAP} \div 100)}$$

$$\text{\% RAP (aggr.)} = \frac{(\text{\% RAP})\ [1.00 - (\text{\% RAP A.C.} \div 100)]}{\text{\% virgin aggr.} + (\text{\% RAP})\ [1.00 - (\text{\% RAP A.C.} \div 100)]} \times 100$$

$$\text{\% Virgin aggr.} = \frac{(\text{\% virgin aggr.})}{\text{\% virgin aggr.} + (\text{\% RAP})\ [1.00 - (\text{\% RAP A.C.} \div 100)]} \times 100$$

Total % A.C. = % A.C. added + % RAP (% A.C. in RAP)(0.01)
- % A.C. added (% RAP)(% A.C. in RAP) (0.0001)

Refer to I.M. 508, pages _____ for examples of the above formulas.
(Note decimal placement during calculations and reportings results.)

Rounding of Numbers (Examples)

Even (tenths)	Odd (tenths)	(hundredths)
6.65000 = 6.6	6.5500 = 6.6	1.3052 = 1.31
6.65001 = 6.7		1.2900 = 1.29
		1.2950 = 1.30

Spec 94.0%

1 ft - 11 ft from centerline

W1 ÷ W3 measure to nearest 1/8"

100 − (F Den x 100 / Rice Sp. Gr.)

Date Laid	Samp. NO.	Station Location	Dist. ℄	Orig. Dry Wt. W-1	Weight In H_2O W-2	2nd. Dry Wt. W-3	Diff. W3-W2	Field Core Dens.	Thickness	Lab. Dens.	% Lab. Dens.	% Air Voids	Rice Sp. Gr.	Insp.
9-28	1	1363+68	10' LT.	738.5	413.0	738.5	325.5	2.269	1 7/8"	2.400	94.542	8.2	2.473	C.P.
9-28	2	1378+80	8.2' LT.	693.0	389.5	693.5	304.0	2.280	1 3/4"	2.400	95.000	7.8		
9-28	3	1405+26	6.4' LT.	819.5	461.0	820.0	359.0	2.283	2"		95.125	7.7		
9-28	4	1420+38	10.0' LT.	725.5	411.0	726.5	315.5	2.300	1 7/8"		95.833	7.0		
9-28	5	1450+62	4.6' LT.	736.0	412.0	736.5	324.5	2.268	1 7/8"		94.500	8.3		
9-28	6	1480+84	8.8' LT.	740.0	415.0	740.5	325.5	2.273	1 7/8"		94.708	8.1		
9-28	7	1510+90	6.0' LT.	727.0	412.0	727.0	315.0	2.308	1 3/4"	✓	96.167	6.7	✓	

$\bar{x}$ 95.125

SX 0.646

$$\frac{95.125 - 94.00}{0.646} = 1.74$$

EXTRA EXAMPLE PROBLEMS - DENSITY AND QUALITY INDEX

Formula: $Q.I. = \frac{\text{Average Density \% - Specified Density \%}}{\text{Standard Deviation Density \%}}$

Data: Use a 7 sample lot and required density of 95%

Example #1 Given:

Lab Density	2.417
Average Field Density	2.330
Average % Lab Density	96.406

% Lab Density
97.311
97.352
94.125
96.028
96.318
96.318
97.393

96.406 − 95.000 / 1.158 = 1.21

1.158

96.406

Q.I. = 1.21

Example #2 Given: Lab Density 2.396

Field Core Density	% Lab Density
2.283	95.284
2.333	97.371
2.276	94.992
2.338	97.579
2.305	96.202
2.311	96.452
2.205	92.028

95.701 − 95.00 / 1.884 = .37

96.313 − 95 / 1.05 = 1.25

2.293

95.701 − 92.028 / 1.884 = 1.957 = 1.80

96.313

1.05

95.701

1.884

Q.I. = 1.25

Example #3 Given: Lab Density 2.429

Field Core Density	% Lab Density
2.365	97.365
2.351	96.789
2.346	96.583
2.327	95.801
2.385	98.189
2.315	95.307
2.353	96.871

96.701 − 95.000 / .9538 = 1.78

96.701

Q.I. = 1.78

Does Example #1 Q.I. result in a penalty?

Does Example #2 Q.I. result in a penalty?

Does Example #3 Q.I. result in a penalty?

Form 820007 11/87 H-1188

Form #7

Iowa Department of Transportation

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE

County _____
Project _____
Contract No. _____
Date _____
Report No. _____

Contractor _____ Plant Location _____
Plant Type _____ Make _____ Pollution Equipment _____ Resident Engineer _____
Mix Type _____ Class _____ Size _____ Crushed Aggr. Sources _____ Recycle Source _____ %
Asphalt Source & Grade _____ Sand Sources _____ Plant Operated _____ A.M. to _____ P.M. Mix No. _____

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING											
JOB MIX FORMULA - LIMITS														
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200

ADVISORY GRADATIONS

SAMPLES SUBMITTED		SAMPLES SUBMITTED	
Materials	Senders No.	Materials	Senders No.

LIST ALL SAMPLES SUBMITTED

Intended Added _____ % A.C.
Intended Total _____ % A.C. Tank Meas. ☐.☐☐ % A.C.

LAB. DEN. / DENSITY RECORD / SOLID DEN.

Course Laid	Station	¢ Refer	Date Laid	* (1)	Density	% Density	% Voids
				Actual Thickness			

Avg. Field Density Lot #1
Avg. Field Density Lot #2

Fines/Bitumen Ratio = SHOW CALCULATIONS
Ave. % Field Voids =
Lab % Voids = [redacted]
Q.I. (Density) = SHOW CALCULATIONS
(Show Calculation) REFER TO I.M. 508

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air						
A.C.						
Aggr.						
Mix						
Mat						

MATERIALS DELIVERIES

Type	Ticket No.	Quantity

LOG ALL SHIPMENTS
- AGGREGATE (TONS)
- ASPHALT CEMENT (TONS)
- TACK (GALLONS)

RECYCLED MIX ONLY

Total RAP Used Tons _____
Total Aggr. Used Tons _____
RAP Used % _____
Aggr. Used % _____

PRODUCTION AND PLACEMENT RECORD

* (2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
Int. Thickness			Refer to I.M. 508		
		Sprinkle			

1	¾	½	⅜	4	8	16	30	50	100	200

COMMENTS

USE THIS AREA TO CHECK FOR OUT-LIER IF APPROPRIATE

MAKE NOTATIONS OF ANY MIX CHANGES, TYPE OF CHANGE, TIME OF CHANGE, NON-COMPLIANCE ISSUED, DELAYS, MATERIAL SHORTAGES

(38)

COMMENTS: Delays, Breakdowns, Corrective Action, etc.

Form 821283
2-89

Iowa Department of Transportation

GRADATION TEST REPORT

County _____
Project _____
Contract No. _____
Design _____
Date _____
Contractor _____
Plant Location _____

☐ Process Control Sample
☐ Acceptance Sample
☐ Assurance Sample

P.C. Concrete
☐ Structure
☐ Paving

Asphalt Mix Design No. _____
Mix Change ☐ Yes ☐ No
Date of Change _____

Date Sampled	Sample Identification	Sampled Method	Tested By		Sieve Analysis Percent Passing —in.	1 in.	¾ in.	½ in.	⅜ in.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	Comp.	Remarks
Material _____ Grad. No. _____ T-203A No. _____			*Gradation Limits	Max.														
				Min.														
Material _____ Grad. No. _____ T-203A No. _____			*Gradation Limits	Max.														
				Min.														

Note to County and Resident Engineers—If County or Project Number is incorrect, please notify Inspector and Ames Office Promptly. Corrected Reports will be Issued.

Comments _____

Signed _____

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

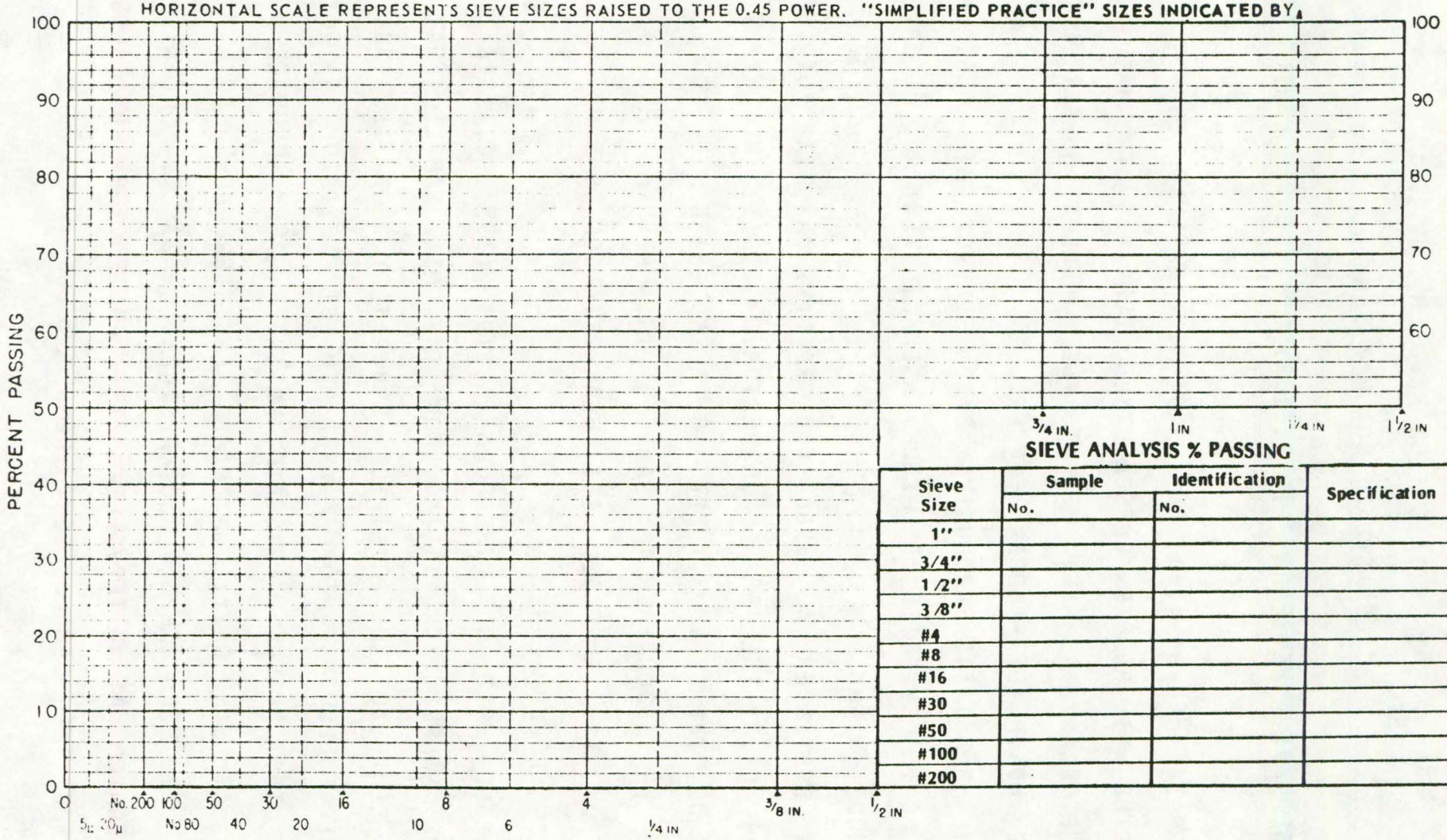
*AGREED by the contractor/producer

FORM 820925
8-75

IOWA DEPARTMENT OF TRANSPORTATION

GRADATION CHART

HORIZONTAL SCALE REPRESENTS SIEVE SIZES RAISED TO THE 0.45 POWER. "SIMPLIFIED PRACTICE" SIZES INDICATED BY ▲



SIEVE ANALYSIS % PASSING

Sieve Size	Sample No.	Identification No.	Specification
1"			
3/4"			
1/2"			
3/8"			
#4			
#8			
#16			
#30			
#50			
#100			
#200			

Co.	PROJECT NO.					TYPE CONST; LOCATION ON PROJECT	
TYPE, SOURCE, PRODUCER OF AGG.							
SAMPLED FROM	SAMPLED BY	DATE	QUANT. REPRESENTED	SIEVED BY	DATE	SIEVE METHOD	REMARKS

(74)

SAMPLE IDENTIFICATION PROBLEM (PART 1)

40 LB ASPHALT BOX MIX SAMPLE

YOU ARE THE PLANT INSPECTOR ON THE FOLLOWING PROJECT.

PROJECT FN-34-4(6), ON US 34 IN WAPELLO COUNTY. THE CONTRACTOR IS MORRIS CONSTRUCTION COMPANY, OTTUMWA, IOWA AND THE PLANT IS SET UP AT THE JOHNSON QUARRY LOCATED 1 MILE NORTH OF PODUNK CENTER.

THE PLANT IS PRODUCING 3/8" SURFACE MIX CONTAINING 5.75% AC-10 SUPPLIED BY KOCH ASPHALT TERMINAL LOCATED AT DUBUQUE, IOWA.

ON SEPTEMBER 4, 1986 YOU RECEIVE A MIX BOX SAMPLE (40 LB±) FROM THE GRADE INSPECTOR. IT IS THE FIRST SAMPLE OF THE DAY. THERE IS A NOTE IN THE BOX SHOWING THAT JOHN SMITH SAMPLED THE MATERIAL AND IT CAME FROM THE SURFACE LIFT NEAR STATION 948+00 ON THE WEST BOUND LANE.

PLEASE MAKE OUT THE FORM 820193 (193) "IDENTIFICATION OF SAMPLE FOR TEST", FOR THE MIX SAMPLE THAT IS TO BE SENT TO THE DISTRICT LABORATORY FOR TESTING.

THE FOLLOWING PEOPLE NEED TO BE ADVISED IN WRITING OF THE TEST RESULT. DISTRICT ENGINEER JOHN BLUNDER LOCATED AT SIN CITY: MATERIALS ENGINEER HARD ROCK LOCATED AT HEAD SHED, AND RESIDENT ENGINEER SNEAKY PETE LOCATED AT OTTERVILLE. THE CONTRACTOR HAS ALSO ASKED FOR THE SAMPLE TEST RESULTS FOR HIS FILE.

820193

(42)

Iowa Department of Transportation

Highway Division, Office of Materials, Ames, Iowa

Central Lab No. _____

IDENTIFICATION OF SAMPLE FOR TEST

(Read Instructions on back before taking sample and filling out form)

aterial Asphalt mix int. 5.75% AC Sender's Sample No. JS-1

tended Use Type A 3/8" surface mix Contract Number _____

ounty Wapello Project FN-34-4(6) Road No. US 34

roup No. _____ Design No. _____ Specification No. _____

ontractor Morris Construction Co. (Name) Ottumwa Ia (Address)

roducer _____ Brand _____

ocation of Producing Plant Johnson Quarry 1 mile North of

podunk center Sec. _____ Twp. _____ Range _____ Co. _____

Jnit of Material Represented 1st Sample of the day surface 1,st

sta 948+00 on west bound lane

_____ Quantity Represented _____

Sample by John Smith (Name) (Address)

Date Sampled Sept 9, 1986

Report to	John Blunder	Dist Engineer	Sin City	
	(Name)	(Title)	(Address)	(Phone)
Report to	Hard Rock	Matls Engineer	Head Shed	
	(Name)	(Title)	(Address)	(Phone)
Report to	Sneaky Pete	Res. Engineer	Otterville	
	(Name)	(Title)	(Address)	(Phone)
Report to	Contractor (Morris Const			
	(Name)	(Title)	(Address)	(Phone)
Report to				
	(Name)	(Title)	(Address)	(Phone)

Results need by: Date _____

Additional Detailed Information:

(For paint give analysis printed on container. For tile give grade specified, etc.)

40 lb sample

All required tests

marshall density

Lab voids

AC Content

(NOTE: A representative of the Department of Transportation shall select the sample.)

SAMPLE IDENTIFICATION PROBLEM (PART 2)

LIQUID ASPHALT SAMPLE

NOW THAT THE MIX SAMPLE HAS BEEN IDENTIFIED, IT IS NECESSARY FOR YOU TO SAMPLE THE AC-10 BEING USED ON THE PROJECT. THE SAMPLE IS OBTAINED IN A 3 OZ TIN. USING I.M. 204 DETERMINE THE PROPER SAMPLING FREQUENCY FOR AC-10 TO REPORT ON THE 193. LOOK UNDER TYPE "A" ASPHALTIC CONCRETE, PLANT INSP FIELD SAMPLING LABORATORY TESTING SECTION.

THE ASPHALT CEMENT IS VISCOSITY GRADED AND YOU MUST IDENTIFY ON THE SAMPLE WHAT TESTS YOU DESIRE TO BE RUN.

USING THE INFORMATION ABOVE AND THE INFORMATION IN PART 1 PLEASE COMPLETE FORM 820193.

n 820193

Iowa Department of Transportation

Highway Division, Office of Materials, Ames, Iowa

(44)

IDENTIFICATION OF SAMPLE FOR TEST

(Read Instructions on back before taking sample and filling out form)

terial AC 10 Sender's Sample No. JS-2

ended Use 3/8" Surface mix Type A Contract Number

unty Wapello Project FN-34-4(6) Road No. US 34

oup No. Design No. Specification No.

ntractor Morris Construction Co (Name) Ottumwa Ia (Address)

oducer Koch - Dubuque Brand

cation of Producing Plant Johnson Quarry 1 mi. N of Podunk Center

Sec. Twp. Range Co.

it of Material Represented ~~1-300~~ AC line sample - 1st sample of days run

Quantity Represented 40 Ton

mple by John Smith (Name) (Address)

te Sampled Sept 1, 1986

port to John Blunder (Name) Dist Engineer (Title) Sin City (Address)

port to Hard Rock (Name) Matls Engineer (Title) Head Shed (Address)

port to Sneaky Pete (Name) Res Const Engineer (Title) Otterville (Address)

port to Morris Const Co (Name) (Title) Ottumwa (Address)

port to (Name) (Title) (Address)

ditional Detailed Information:

(For paint give analysis printed on container. For tile give grade specified, etc.)

bs. VIS ~~open~~

NOTE: A representative of the Department of Transportation shall select the sample.)

PROJECT NO. _____ CONTRACTOR _____

CORE CALCULATIONS

Date Laid: Date Tested: Tested By:

Core No.	W1 Dry Weight	W2 Weight in Water	W3 Wet Weight	Difference	Field Density	% Lab Density	% Voids		Core Thick
1									
2									
3									
4									
5									
6									
7									
				Average					

GRADATIONS

	1"	3/4	1/2	3/8	4	8	16	30	50	100	200
Specs.											
Matl. Lab											
Advisory											

MATL. LAB INFORMATION

Lab Density = _____

Lab Sp. Gr. = _____

Lab Voids = _____

Lab % A.C. = _____

Quality Index =

Fines Bitumen =

Average Voids =

4. Transverse Grooves in Portland Cement Concrete Pavement, Bridge Decks, and Overlays

Refer to Construction Manual Section 10.43. Texture depths less than 1/16" shall be corrected by sawing in the transverse grooving. Texture depth exceeding 1/4" may require correction or price adjustment as directed by the engineer. Adjustments will be determined by the engineer on a case by case basis depending on the severity and surface area involved.

5. Traffic Control

The lump sum item for traffic control may be adjusted for failure to comply with the plans and specifications. Adjustments will be determined by the engineer based on the magnitude and frequency of the violation. It is recommended the minimum adjustment be $100.00.

Examples of situations where a price adjustment would be appropriate include:

a. Failure to maintain traffic control devices (costs incurred by the contracting authority may be recovered against this item)
b. Intentionally working without the proper traffic control setup
c. Unauthorized crossing of the interstate median
d. Use of non-specification items such as sign sheeting or floodlights.

It is not intended that minor deficiencies be price adjusted if corrected in a timely manner. In addition to a price adjustment, the engineer may suspend work for irresponsible and/or repeated failure to construct the project using proper traffic control procedures.

6. Asphalt

a. Liquid Asphalt

(1) Viscosity or Penetration
When non-complying tests occur, determine the quantity affected. Average all of the tests on the quantity affected and use the average in the following tables to determine the adjustment in payment, if any.

MC-70 AND RC-70 GRADE

Kinematic Viscosity (Cs)	% Payment
58.2 - 64.0	80
64.1 - 69.9	90
70 - 140	100
141 - 164	90
165 - 188	80
189 - 212	70

MC-800 GRADE

Kinematic Viscosity (Cs)	% Payment
668 - 733	80
734 - 799	90
800 - 1600	100
1610 - 1740	90
1750 - 1880	80
1890 - 1960	70

MC-3000 GRADE

Kinematic Viscosity (Cs)	% Payment
2480 - 2730	80
2740 - 2990	90
3000 - 6000	100
6010 - 6510	90
6520 - 7020	80
7030 - 7530	70

S-1 GRADE

Penetration Range	% Payment
65 - 82	80
83 - 99	90
100 - 200	100
201 - 218	90
219 - 236	80
237 - 254	70

SS-1H & CSS-1H (IOWA STD. SPEC. 4140.01)

Penetration Range	% Payment
60 - 75	80
76 - 84	90
85 - 100	100
101 - 108	90
109 - 116	80
117 - 124	70

SS-1H & CSS-1H (AASHTO M140 & M208)

Penetration Range	% Payment
30 - 34	80
35 - 39	90
40 - 90	100
91 - 95	90
96 - 100	80
101 - 105	70

CSS-1 & CRS-2 (AASHTO M208)

Penetration Range	% Payment
72 - 85	80
86 - 99	90
100 - 250	100
251 - 264	90
265 - 278	80
279 - 292	70

(2) Residue

The determination of compliance for emulsions used as prime and tack coats shall be based on residue percentage. Undiluted emulsion contains a minimum of 57% asphalt residue. Emulsion diluted with one part emulsion to one part water shall contain a minimum of 28.5% residue.

When non-complying tests occur, determine the quantity affected. Average all the tests on the quantity affected and use the average residue percentage in the following table to determine the adjustment in payment.

DILUTED EMULSION

Percent Residue	% Payment
28.5	100
28.4 - 27.5	95
27.4 - 26.5	85
26.4 - 25.5	75
25.4 -	No Pay

The price adjustment will apply to the liquid asphalt product only.

b. Asphalt Cement - Viscosity & Penetration

When non-complying viscosity or penetration tests occur, establish the quantity of material affected. This will normally be the day's run, unless intermediate measurements of quantities used have been made.

Average the tests for the quantity affected. A minimum of three test values shall be averaged. If only one test value is available for the quantity, include the recent individual test both prior to and following the applicable deviating value in the average. If two values are available, include the most recent value; when a single value must be chosen from the two, use the first following test value.

Use the following tables to obtain the applicable payment adjustment in accordance with Article 1105.05:

AC-2.5 VISCOSITY GRADED ASPHALT CEMENT

Viscosity Range	% Payment
320 - 311	95
310 - 301	98
300 - 200	100
199 - 195	98
194 - 186	95
185 - 168	80
167 - 145	60
145 minus	Requires Special Attention

AC-5 VISCOSITY GRADED ASPHALT CEMENT

Viscosity Range	% Payment
660 - 641	90
640 - 621	95
620 - 601	98
600 - 400	100
399 - 391	98
390 - 373	95
372 - 338	80
337 - 295	60
295 minus	Requires Special Attention

AC-10 VISCOSITY GRADED ASPHALT CEMENT

Viscosity Range	% Payment
1350 - 1250	95
1249 - 1210	98
1209 - 800	100
799 - 782	98
781 - 747	95
746 - 679	80
678 - 595	60
595 minus	Requires Special Attention

AC-20 VISCOSITY GRADED ASPHALT CEMENT

Viscosity Range	% Payment
2690 - 2490	95
2489 - 2410	98
2409 - 1600	100
1599 - 1560	98
1559 - 1480	95
1479 - 1340	80
1339 - 1160	60
1160 minus	Requires Special Attention

85-100 PEN. ASPHALT CEMENT

Penetration Range	% Payment
68 - 78	95
79 - 84	98
85 - 100	100
101 - 111	98
112 - 127	95
128 - 148	80
149 - 174	60
175 plus	Requires Special Attention

60-70 PEN. ASPHALT CEMENT

Penetration Range	% Payment
48 - 55	95
56 - 59	98
60 - 70	100
71 - 78	98
79 - 89	95
90 - 103	80
104 - 121	60
121 plus	Requires Special Attention

The price adjustment will be made on the quantity of asphalt mixture affected, but will apply to the asphalt cement item only.

The materials, both liquid asphalt and asphalt cement, are used on the basis of certification that they are complying. The follow-up tests are made to verify the compliance so work will not be delayed pending the test results. However, if the material has not been used and the tests indicate non-compliance, the material shall be rejected.

c. Asphalt Content

The determination for compliance with the specifications of the asphalt content control shall be made for periods not exceeding one day in length. Determinations shall be made for shorter time intervals when non-compliance for the shorter intervals has occurred.

The specifications for asphalt concrete construction require the contractor to maintain the asphalt content within plus or minus 0.3 percentage points tolerance of the percent intended (Articles 2303.02C and 2306.02C). The percent intended is given on the job-mix-formula sheet issued by the Ames Laboratory. Any necessary changes to the original percent intended asphalt content will be made and documented to the inspection forces by the district materials forces in accordance with I.M. 511.

If the tests indicate that non-complying results have been obtained and a price adjustment is necessary in accordance with article 1105.05, it is recommended that the following table be used to determine the amount of adjustment. The adjustment will be made on the quantity of asphalt mixture affected. It is <u>not</u> applied to the asphalt cement. No payment will be made for asphalt cement used in a mixture in excess of tolerance specified.

Guide for Adjustment in Contract Unit Price for Deviation in Asphalt Content

% of Deviation from Intended Asphalt Content	Base-Binder Course	Payment Surface Course
0.0 - 0.30	100	100
0.31 - 0.40	98	98
0.41 - 0.50	94	94
0.51 - 0.60	88	88
0.61 - 0.70	82	82
0.71 - 0.80	76	73
0.81 - 0.90	70	63
0.91 - 1.00	64	51
1.01 - 1.10	58	35

The table is intended to be used for tank-stick measurement results. However, the average of extractions on several representative samples may also be used to determine the degree of non-compliance. If the tonnage involved is 200 tons or less, tank-stick measurements would not be reliable enough for a basis.

In this case, the average of tank stick measurement results from the day before and after may be used with the hot mix extraction results providing further verification. Also, if there is uncertainty about the accuracy or uniformity of a particular tank-stick measurement, the average of extraction tests from at least three representative sample locations should be used to determine the amount of price adjustment, if any.

Extraction test results are usually reported to 0.1 (tenths) increments. In using the table for determining pay adjustments from extraction test results, it should be assumed that the second decimal figure, or hundredths, is zero.

The procedures listed in Materials I.M. 508 and 509 should be followed closely in making tank-stick measurement calculations.

The contractors are cautioned to observe the following procedures in order to help insure accuracy of the determinations:

(1) Keep the storage tank level and in good condition.
(2) Make sure that the asphalt in the surge tank is exactly the same level each time that measurements are made.
(3) Try not to drain the asphalt level in the tanks into the heater coil area when measurements are made.
(4) See that rail cars and transport trucks are completely unloaded or any asphalt that is returned unused is weighed or measured.

To eliminate misunderstandings and uncertainties, it is strongly urged that an authorized representative of the contractor observe all sampling and tank-stick measurements and check all calculations. He should also be requested to initial or sign the field book or record sheet containing the measurements and results as they are made.

d. Segregation in Asphalt Pavement

(1) General

When asphaltic mixture segregation occurs in the pavement such that the composition, quality and basic asphalt content of the mixture required by Articles 2303.09, 2303.10 and 2303.11 are not uniformly attained, the sections judged deficient may be required to be removed and replaced as defective work in accordance with 1105.05. An adjustment in contract price may be made for deficient work as stated in Article 1105.05 and 1109.04C for the cases described in the following schedule.

(2) Pavement Surface

The adjustments in contract price are to be applied to the entire paver lane width and lift thickness between extreme areas of segregation. Price adjustment shall apply only to the payment for the asphalt mixture and asphalt cement.

ADJUSTMENT SCHEDULE

Damage	% Payment

Case I — 80%

When uniform surface texture and mixture composition is evident (by visual observation) except for occasional and random areas of *segregation, it shall be subject to price adjustment if the area determined segregated equals or exceeds 1 sq. yard per paver width per station length (length determined by longitudinal distance both directions from segregated area).

Case II — 65%

When less uniform surface texture and mixture composition is evident (by visual observation) and there is a regular interval area of *segregation, it shall be subject to price adjustment if the areas (2 or more) determined segregated equals or exceeds 1 sq. yard per area and 2 or more areas per paver lane width per station length (length determined by longitudinal distance both directions from a segregated area).

Case III — 50%

When a non-uniform surface texture and mixture composition is evident (by visual observation) and there is a regular interval of numerous areas of *segregation connected or nearly connected with longitudinal traces of segregation, it shall be subject to price adjustment if the total area segregated exceeds 3 sq. yards per paver lane width per station length (length determined by longitudinal distance both directions from the extreme ends of areas of segregation).

More severe surface and mixture segregation may require corrective procedures as:
(a) full width thin layer (1" thick) resurfacing or
(b) removal of mixture course, with no extra payment and replacement with construction that fully complies.

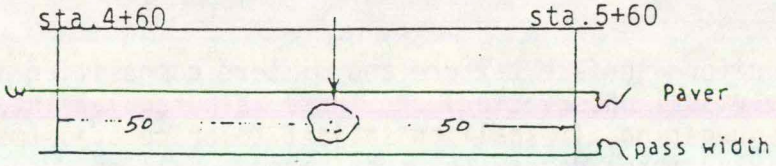
(3) Fillets & Runouts
This price adjustment procedure does not apply to fillets, bridge runouts, or other hand- worked areas outside of the normal paver lane width.

(4) Base & Binder Courses
The price adjustment percentages shall be reduced by ½ for all base or binder courses; except when such mixture is specified and used as the surface course.

*Note: Determination of segregation is to be by visual observation. The enginneer may consider further verification by tri-coring the approximate center of the affected area at several random locations. Deviations in gradation outside the specified tolerances from the job mix formula as determined by the extracted core samples or failure of the core samples to comply with specified density requirements will be considered evidence that the areas sampled are segregated and not in compliance with the requirements of Sections 2303.09 and 2303.10.

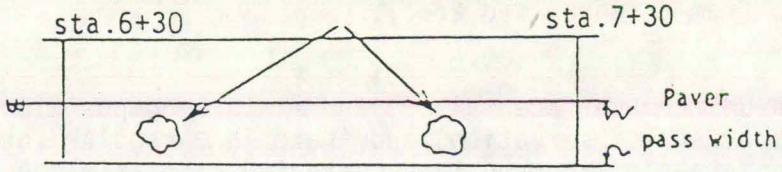
SEGREGATION CASE EXAMPLES

Case I (Visual Segregation - 1 sq. yd. or more)



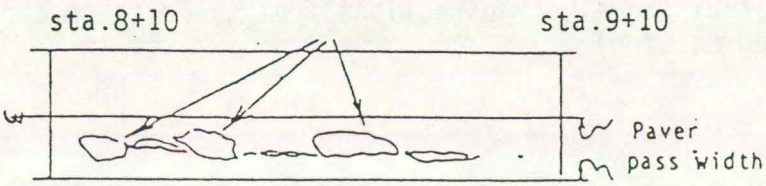
Price adjustment: 20%

Case II (Visual Segregation-1 sq. yd. or more each area with min. 2 sq. yds. total)



Price adjustment: 35%

Case III (Visual Segregation-1 sq. yd. or more each area with min. 3 sq. yds. total)



Price adjustment: 50%

Procedure to Determination of Penalty Quantities

The segregation case examples shown above illustrate a concept that may be used to define the severity of segregation and appropriate price adjustment factor. It is not required, however, to physically measure each area of segregation to determine a quantity of asphalt mix and asphalt cement that is subject to price adjustment. The intent is to define the quantity subject to price adjustment by identifying the number of truck loads in which segregated areas are evident. This obviously takes some judgment to decide how large or severe an area must be before it is penalized. The one square yard area shown above is a "rule-of-thumb". Most importantly, segregated areas that exhibit an obvious concentration of coarse aggregate that results in an open texture that is visibly different from the majority of the load should be penalized.

WHENEVER SEGREGATION OCCURS, THE CONTRACTOR SHOULD BE ADVISED IMMEDIATELY AND THE INSPECTOR MUST DOCUMENT THE DEFICIENT WORKMANSHIP WITH A NONCOMPLIANCE NOTICE. THE NONCOMPLIANCE NOTICE SHOULD REFERENCE ARTICLE 2303.10 AND INDICATE THE ENGINEER WILL REVIEW THE WORK TO DETERMINE THE ACCEPTABILITY OF THE WORK IN ACCORD WITH 1105.01 AND 1105.05.

Timeliness is important for two reasons. First, the contractor must take corrective action immediately. Failure to do so should result in suspension of work. Secondly, early identification of unacceptable work allows for resolution of any disputes before there is an "implied" acceptance. Construction Manual Section 1.12 discusses the enhancement of working relationships by timely notification of unacceptable work.

It is also desirable to quantify any penalty that may be assessed as quickly as possible. The following procedure can be used to provide a relatively easy and fast determination of the quantity of work affected.

(1) Place a small paint mark on the edge of pavement in areas where the segregation severity has resulted in a lack of fines leaving a concentration of coarse aggregate and a nonuniform open texture. Each of these areas will represent one truck load for Case 1 severity. Count the total number of areas marked.
(2) Determine the total number of loads of the mixture placed. Consider binder and surface separately.
(3) Divide the number of loads segregated (Step 1) by the total number of loads placed (Step 2).
(4) Apply the ratio (Step 3) to the total tons of mixture placed.
(5) The resultant quantity (tons) will be subject to adjustment.
(6) Both the mixture and liquid AC are subject to adjustment.

Normally this procedure should be repeated for each day from header to header on the day following placement. Each day's run can be tabulated showing a summary of affected tons subject to adjustment.

e. Filler-Bitumen Ratio

The filler/bitumen ratio is determined by dividing the percentage of material passing the #200 sieve by the percentage of A.C. used, as determined by tank stick or by actual weight of A.C. used. Maximum filler/bitumen ratios for the various asphalt mixtures are identified in section 2303.02C of the Standard Specifications.

For recycled mixes, the percentage A.C. is to be determined by addition of percent by tank-stick plus percent in salvaged material as set by job mix. (% intended less additional)

The determination for compliance with the specification shall be made for periods not exceeding one day in length. The average of all tests for the lot shall be used to determine the filler-bitumen ratio.

When the filler/bitumen ratio for an asphalt mixture exceeds the maximum established by specification for that material, the affected material will be considered non-complying and subject to price adjustment.

The following schedules are to be used as a guide for price adjustment of the quantity of material affected. The adjustment will apply to the mixture only.

Case I - Asphalt Treated Base - Maximum Filler/Bitumen Ratio 1.5

		Number of Tests		
		1	2	3
Maximum F/B 1.3 Filler/Bitumen Ratio	Maximum F/B 1.5 Filler/Bitumen Ratio	Pct.	Contract Unit Adjustment	Price
1.31 - 1.40	1.51 - 1.60	1	3	5
1.41 - 1.50	1.61 - 1.70	3	5	7
1.51 - 1.60	1.71 - 1.80	3	7	9
1.61 - 1.70	1.81 - 1.90	5	10	15
over 1.70	over 1.90		To be reviewed	

Case II - Type B ACC Base, and Type A and B Binder and Surface.

		Number of Tests		
		1	2	3
Maximum F/B 1.2 Filler/Bitumen Ratio	Maximum F/B 1.3 Filler/Bitumen Ratio	Pct.	Contract Unit Adjustment	Price
1.21 - 1.30	1.31 - 1.40	1	3	5
1.31 - 1.40	1.41 - 1.50	3	5	7
1.41 - 1.50	1.51 - 1.60	3	7	9
1.51 - 1.60	1.61 - 1.70	5	10	15
over 1.60	over 1.70		To be reviewed	

The above schedules are to be applied in lieu of the 200 mesh sieve adjustment for excess fines listed under Gradation. The adjustment for gradation will still apply for deviation on low side.

f. Smoothness - ½" bumps

In lieu of surface correction described in Article 2316.04, a price adjustment may be applied if it is concluded that rideability, quality and visual appearance of the roadway are less adversely affected by the existence of the surface irregularity in question than would be the case if corrected.

The Standard Specifications provide for a $600 penalty for each uncorrected 1/2" bump. This penalty applies to all pavement for which payment is based on Chart A or Chart B.

In addition, the Standard Specifications state no payment will be allowed for segments of interstate pavement if the 12 inch smoothness per mile is exceeded. This includes the asphalt cement quantity in those segments. Additional penalty for individual bumps will not be assessed when no payment is allowed.

To be consistent with the specification definition of correctable bumps, all irregularities exceeding ½" within a 25 foot span will be considered as a single bump.

It must be stressed that the price adjustment versus correction option is strictly that of the engineer and the decision for application must be based solely on the criteria described in paragraph one, not on factors such as contractor availability, timing of testing, etc.

The District office shall submit recommended adjustments to the Central Construction office for approval.

Smoothness Incentive Payments for Asphalt Cement Concrete

The intent of the smoothness incentive specification is to include the items of wedge, leveling, strengthening, binder and surface mixtures, and asphalt cement. On full-depth ACC paving projects, it also includes the Class 1, Type B base material. The items of prime, tack, and sprinkle treatment are not included.

For determining the quantities of these items subject to incentive payments, it is acceptable to simply calculate the ratio of the number of qualifying segments to the total number of potential segments. This ratio is then applied to the final pay quantities for the respective items. (Note: Plan quantities for fillets, turn lanes, side road connections, etc. must be deducted from final pay quantities before applying the ratio. It may also be necessary to deduct quantities placed in Divisions that the smoothness specification did not apply.)

Form 830245
3-80

S7

NONCOMPLIANCE NOTICE

Contractor _____ Project No. _____

County _____ Contract No. _____ Date _____ Time _____

To: _____ _____ _____
(Name) (Title) (Signature)

You are hereby notified that tests indicate that the _____

_____

_____

is outside our specification tolerances. The specification violated is Article _____

The test data value is _____

_____

_____

and the specification limits are _____

_____

Additional tests may be performed.

Noncomplying work may be required to be removed and replaced at no cost to the contracting authority.

You are to determine corrective action necessary.

You are to determine if you wish to discontinue operations until the additional tests confirm or refute this failing test.

Remarks: _____

_____

_____

Correction: _____

_____

_____

Signed: _____
Inspector - Iowa DOT

Distribution White Copy - Contractor Canary Copy - File Copy

DAILY PLANT PROBLEM #1

Yesterday was the first day of plant operation on this A.C. resurfacing project. The project requires 95% density and less than 1.20 fines/bitumen ratio.

The plant produced 514.2 tons. Your grade inspector reports 499.2 tons were laid from 532+00 to 483+00. He also reports that 15.0 tons of mix were wasted. The intended total A.C. percent is 5.85% and design thickness is 1½".

The following cores were brought to the field lab for testing, with weights as shown.

Station	Location	Thickness Inches	Original Dry Wt.	Weight in Water	2nd Dry Weight	W_3-W_2	Field Densities	% of Lab Density	Air Voids	QI
485+10	3' RT	1 5/8	1212.0	706.0	1213.0	507.0	2.391	99.501	2.8	
495+80	5' RT	1 5/8	1194.0	696.0	1195.0	499.0	2.393	99.584	2.8	
499+60	10' RT	1 1/2	1046.0	591.0	1047.0	456.0	2.294	95.464	6.8	
511+07	2' RT	1 1/2	1113.5	637.0	1114.0	477.0	2.334	97.129	5.2	
516+55	7' RT	1 1/2	1081.5	623.0	1082.0	459.0	2.356	98.044	4.3	
523+41	6' RT	1 1/2	1040.5	603.0	1041.5	438.5	2.373	98.752	3.6	
531+11	4' RT	1 7/8	1363.5	798.0	1364.0	566.0	2.409	100.250	2.1	
							2.364	98.389		
								1.659		

The District Lab reported to you that their lab density was 2.403 and the Rice specific gravity is 2.461. The nuclear A.C. content = 6.05%.

The following is the job mix for the project, the process control gradation you ran yesterday morning and the acceptance gradations from the three split samples submitted to the District Lab. Representing yesterdays lot. (See next page for Gradations Chart)

GRADATIONS (% PASSING)

Sieve	Job Mix	Process Control			Acceptance # 1	Acceptance # 2	Acceptance # 3	
1/2	100 - 2	100	100	100	100	100	100	
3/8	84 ± 7	90	91	91	88	90	90	
#4	67 ± 7	63	60	59	60	59	58	5
#8	54 ± 6	53	51	50	47	50	49	4
#16	---	43	42	40	41	42	40	41
#30	28 ± 5	33	29	30	31	30	31	31
#50	--	16	15	15	15	14	15	15
#100	--	9.9	10	9.7	9.9	9.8	9.9	
#200	49 ± 3	7.5	7.8	7.8	7.5	8.0	7.9	

The plant has one AC tank that holds 20,000 gallons. The 6:00 AM morning tank stick was 25% outage and temperature of the tank was 270°. The 7:30 PM evening tank stick was 29.8% outage and the temperature of the tank was 290°. During the day there was one load of asphalt cement delivered. Truck No. 107 arrived at 11:00 AM. It was weighed at the plant with a gross weight of 76,680 pounds and a tare weight of 26,400 pounds. You checked the temperature of the tr and it was 280°. The delivery ticket notes the weight per gallon is 8.38 and the specific gravity is 1.0101. Delivery ticket number is

You need to complete the Form 820007 and tank quantity sheet for the day. You must also determine if any non-compliance forms need to be issued.

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE

Project _____
Contract No. _____
Date _____
Report No. _____

Contractor _____ Plant Location _____
Plant Type _____ Make _____ Pollution Equipment _____ Resident Engineer _____
Mix Type _____ Class _____ Size _____ Crushed Aggr. Sources _____ Recycle Source _____
Asphalt Source & Grade _____ Sand Sources _____ Plant Operated 6 A.M. to 7:30 P.M. Mix No.

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING												
JOB MIX FORMULA - LIMITS						100-98	91-77	74-60	60-48	—	33-23	—	—	7.9-1.9
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
T1		YES				100	90	63	53	43	33	16	9.9	7.5
T2		YES				100	91	60	51	42	29	15	10	7.8
T3		NO				100	91	*59	50	40	30	15	9.7	7.8
AVG		YES				100	91	61	51	42	31	15	9.9	7.7

SAMPLES SUBMITTED		SAMPLES SUBMITTED	
Materials	Senders No.	Materials	Senders No.

Intended Added _____ % A.C.
Intended Total 5.85 % A.C. Tank Meas. 5.79 % A.C.

LAB. DEN. 2.403 **DENSITY RECORD** SOLID DEN. 2.461

Course Laid	Station	¢ Refer	Date Laid	* (1)	Density	% Density	% Voids
Surface	485+10	3' RT		1 5/8	2.391	99.501	2.8
	495+80	5' RT		1 5/8	2.393	99.584	2.8
	499+60	10' RT		1 1/2	2.294	95.464	6.8
	511+07	2' RT		1 1/2	2.334	97.129	5.2
	516+55	7' RT		1 1/2	2.356	98.044	4.3
	523+41	6' RT		1 1/2	2.373	98.752	3.6
	531+11	4' RT		1 7/8	2.409	100.250	2.1
					AVG	98.389	

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air						
A.C.						
Aggr.						
Mix						
Mat						

RECYCLED MIX ONLY

Total RAP Used Tons _____
Total Aggr. Used Tons _____
RAP Used % _____
Aggr. Used % _____

MATERIALS DELIVERIES

Type	Ticket No.	Quantity
AC	101	25.14T

Avg. Field Density Lot #1 2.364
Avg. Field Density Lot #2

* Fines/Bitumen Ratio = 7.7 / 5.79 = 1.33
Ave. % Field Voids = 3.9
Lab % Voids = 2.4 $1-\left(\frac{2.364}{2.461}\right)\times 100 = 3.94$
Q.I. (Density) = $1-\left(\frac{2.403}{2.461}\right)\times 100 = 2.356$
(Show Calculation)

$$\frac{98.389 - 95.000}{1.659} = 2.04$$

PRODUCTION AND PLACEMENT RECORD

* (2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
1½"	RT	Surface	532+00 to 483+00	499.2	499.2
			Produced	514.2	
			waste	15.0	
		Sprinkle			

1	¾	½	⅜	4	8	16	30	50	100	200

COMMENTS

1) NC - Bitumen Ratio
2) Acceptance NC #4 sieve
3) ~~lab~~ lab voids

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter % Moisture in % Voids Column

Signed _____ Cert. No.
Inspector

MATERIALS OFFICE-RECORDS CENTER COPY

Problem 1 (61)

Iowa Department of Transportation

TANK MEASUREMENT & ASPHALT DETERMINATION

1 Date	2 Time	3 Tank No	4 Temp (°F)	5 Tank Stick Outage (Per-Cent Of Dia.)	6 [illegible] Innage (Percent Of Capacity)	7 Tank Capacity	8 [illegible] Temp. Corr. Factor	9 [illegible] Correct Gallons	10 Total Correct Gallons On Hand	11 *Total A.C. Added Weight	12 *Total A.C. Added Corr. Gal.	13 Temp (°F.)	14 Tank Stick Outage (Per-Cent Of Dia.)

START OF PERIOD → ; ← ADDED →

Project

County

Contr

Type Mix

END OF PERIOD →

16 Tank Capacity	17 [illegible] Temp. Corr. Factor	18 [illegible] Correct Gallons	19 Total Correct Gallons On Hand	20 10+12-19= 20 Total Correct Gallons Used	21 Average Weight Per Gal.	22 [illegible] Total Pounds Of A.C. Used	23 [illegible] Total Pounds Of Mix Made	24 Total Pounds Of Mix Wasted	25 [illegible] Total Pounds Of A.C. Wasted	26 [illegible] Net Lbs Of A C Used On Road	27 [illegible] Net Lbs Of Mix Used On Road	28 [illegible] Percent A.C. (Tank)

Problem 1

(62)

Form 830245
3-80

NONCOMPLIANCE NOTICE

Contractor _____ Project No. _____

County _____ Contract No. _____ Date _____ Time _____

To: _____ (Name) _____ (Title) _____ (Signature)

You are hereby notified that tests indicate that the _____

_____

_____

is outside our specification tolerances. The specification violated is Article IM 311.

The test data value is lab voids 2.3

_____

_____

and the specification limits are minimum of 3.0

_____ _____

Additional tests may be performed.

Noncomplying work may be required to be removed and replaced at no cost to the contracting authority.

Your are to determine corrective action necessary.

You are to determine if you wish to discontinue operations until the additional tests confirm or refute this failing test.

Remarks: _____

_____

_____

Correction: _____

_____

_____

Signed: _____
Inspector - Iowa DOT

Distribution White Copy - Contractor, Canary Copy - File Copy

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT TREATED BASE, ASPHALT CONCRETE

Project _____
Contract No. _____
Date _____
Report No. _____

Contractor _____ Plant Location _____
Plant Type _____ Make _____ Pollution Equipment _____ Resident Engineer _____
Mix Type _____ Class _____ Size _____ Crushed Aggr. Sources _____ Recycle Source _____
Asphalt Source & Grade _____ Sand Sources _____ Plant Operated 6:00 A.M. to 7:30 P.M. Mix No.

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING												
JOB MIX FORMULA - LIMITS				100	100-98	94-80	74-60	52-38	38-28	—	22-14	—	—	6.8-2.8
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
	virgin	82.6		82.6	80.9	67.7	53.7	37.2	24.8	—	14.9	—	—	2.5
	rap	17.4		17.4	17.2	16.4	14.6	11.3	8.7	6.8	5.0	3.3	2.3	1.9
	total	Yes		100	98	84	68	48	34	6.8	20	3.3	2.3	4.4

SAMPLES SUBMITTED		SAMPLES SUBMITTED	
Materials	Senders No.	Materials	Senders No.

Intended Added 4.0 % A.C.
Intended Total 4.7 % A.C. Tank Meas. 3.84 % A.C.

LAB. DEN. 2.403 **DENSITY RECORD** SOLID DEN. 2.461

Course Laid	Station	¢ Refer	Date Laid	* (1)	Density	% Density	% Voids
Surface	485+10	3' RT		1 5/8	2.391	99.501	2.8
	495+80	5' RT		1 5/8	2.393	99.584	2.8
	499+60	10' RT		1 1/2	2.299	95.469	6.8
	511+07	2' RT		1 1/2	2.334	97.129	5.2
	516+55	7' RT		1 1/2	2.356	98.044	4.3
	523+91	6' RT		1 1/2	2.373	98.751	3.6
	531+11	4' RT		1 7/8	2.409	100.250	2.2

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air						
A.C.						
Aggr.						
Mix						
Mat						

RECYCLED MIX ONLY

Total RAP Used Tons 228.46
Total Aggr. Used Tons 1084.54
RAP Used % 17.4
Aggr. Used % 82.6

MATERIALS DELIVERIES

Type	Ticket No.	Quantity
AC	101	23.93

Avg. Field Density Lot #1 2.364
Avg. Field Density Lot #2

* Fines/Bitumen Ratio = $\frac{4.4}{4.54} = 0.97$
Ave. % Field Voids = 3.9
Lab % Voids = 2.4
Q.I. (Density) =
(Show Calculation)

$100 - \frac{100 \times 2.364}{2.461} =$

$\frac{98389 - 95.000}{1.659} = 2.04$

$100 - \frac{100 \times 2.403}{2.461} = 2.4$

PRODUCTION AND PLACEMENT RECORD

* (2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
1 1/2		Surface	532+00 to 483+00	1313	1313
			Produced	1318	
			Wasted	5	
		Sprinkle			

1	¾	½	⅜	4	8	16	30	50	100	200

COMMENTS

$(3.84) + 18(4.05)(0.01) - (3.84)(18)(4.05)(0.0001)$
$4.569 - 0.028 = 4.54$

or $(4.7 - 4.0) + 3.84 = 4.54$
if job mix doesn't change

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter % Moisture in % Voids Column

Signed _____
Inspector Cert. No.

MATERIALS OFFICE-RECORDS CENTER COPY

Iowa Department of Transportation

Problem 2

(66)

TANK MEASUREMENT & ASPHALT DETERMINATION

			START OF PERIOD							ADDED			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
				[illegible]	[illegible]		[illegible]	[illegible]					[illegible]
Date	Time	Tank No.	Temp (°F)	Outage (Per-Cent Of Dia.)	Innage (Percent Of Capacity)	Tank Capacity	Temp. Corr. Factor	Correct Gallons	Total Correct Gallons On Hand	*Total A.C. Added Weight	Corr. Gal.	Temp (°F.)	Outage (Per-Cent Of Dia.)

Project

County

Contr

Type Mix

END OF PERIOD												
16	17	18	19	20	21	22	23	24	25	26	27	28
	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Tank Capacity	Temp. Corr. Factor	Correct Gallons	Total Correct Gallons On Hand	Total Correct Gallons Used	Average Weight Per Gal.	Total Pounds Of A.C. Used	Total Pounds Of Mix Made	Total Pounds Of Mix Wasted	Total Pounds Of A.C. Wasted	Net Lbs Of A.C. Used On Road	Net Lbs Of Mix Used On Road	Percent A.C. (Tank)

(6.5)

DAILY PLANT PROBLEM #2

Yesterday was the first day of plant operation on this A.C. resurfacing project. The project requires 95% density and less than 1.20 fines/bitumen ratio.

The plant produced 1318 tons. Your grade inspector reports 1313 tons were laid from 532+00 to 483+00. He also reports that 5.0 tons of mix were wasted. The intended total A.C. percent is 4.7% and design thickness is 1½".

The job mix design specified 18% R.A.P. and 82% virgin aggregate. The A.C. content in the RAP material is 4.05%. The intended added A.C. is 4.0%.

The following cores were brought to the field lab for testing, with weights as shown.

Station	Location	Thickness Inches	Original Dry Wt.	Weight in Water	2nd Dry Weight	W_3-W_2	Field Densities	% of Lab Density	Air Voids	QI
485+10	3' RT	1 5/8	1212.0	706.0	1213.0	507.0	2.391	99.501	2.8	
495+80	5' RT	1 5/8	1194.0	696.0	1195.0	499.0	2.393	99.584	2.8	
499+60	10' RT	1 1/2	1046.0	591.0	1047.0	456.0	2.291	95.469	6.8	
511+07	2' RT	1 1/2	1113.5	637.0	1114.0	477.0	2.331	97.129	5.2	
516+55	7' RT	1 1/2	1081.5	623.0	1082.0	459.0	2.356	98.044	4.3	
523+41	6' RT	1 1/2	1040.5	603.0	1041.5	438.5	2.373	98.752	3.6	
531+11	4' RT	1 7/8	1363.5	798.0	1364.0	566.0	2.409	1.0.250	2.2	
							2.364	98.389		
								1.659		

The District Lab reported to you that their lab density was 2.403 and the Rice specific gravity is 2.461. The nuclear A.C. content = 4.75%.

The following is the job mix for the project, the RAP gradation from the job mix, and the virgin aggregate gradation results of both process control and acceptance testing.

98.389 - 1.659

$\frac{+7.271}{98.271} \times 100 = 17.4$

$\frac{(18)(1.00-(4.05\div100)}{(82)+(.18)[1.00-(4.05\div100]} \times 100$

18%

82%

$\frac{82}{82+(18)(1-(4.05\div100)} \times 100$

$2.68+18(4.05)0.01-$
$2.68(18)(4.05)(0.0001)$

$2.75 - 0.020 = 2.73$

$\frac{82}{99.271} = 82.6$

Problem 2 (64)

GRADATIONS (% PASSING)

		Process Control			Acceptance		
		Cold Feed 82.6		17.4			
Sieve	Job Mix	Virgin	RAP	Combined	Virgin	RAP	Combined
1"	100	100 82.6	100	17.4 100	100 82.6	100	17.4 100
3/4"	100 - 2	98 80.9	99	17.2 98.1	100 82.6	99	17.3 100
1/2"	87 ± 7	82 67.7	94	16.4 84.1	88 72.7	94	16.4 89.1
3/8"	67 ± 7	65 53.7	84	14.6 68.3	68 56.2	84	14.6 70.8
#4	45 ± 7	45 37.2	65	11.3 48.5	42 34.7	65	11.3 46.0
#8	33 ± 5	30 24.8	50	8.7 33.5	30 24.8	50	8.7 33.5
#16			39	6.8 6.8		39	6.8 6.8
#30	18 ± 4	18 14.9	29	5.0 19.9	17 14.0	29	5.0 19
#50			19	3.3 3.3		19	3.3 3.3
#100			13	2.3 2.3		13	2.3 2.3
#200	4.8 ± 2	3 2.5	11	1.9 4.4	3.5 2.9	11	1.9 4.8

The plant has one A.C. tank that holds 19,670 gallons. The 6:00 A.M. tank stick was 15.8% outage and temperature of the tank was 280°. The 7:30 P.M. tank stick was 46.2 outage and the temperature of the tank was 280°. During the day there was one load of asphalt cement delivered. Truck No. 107 arrived at 11:00 A.M. It was weighted at the plant with a gross weight of 76,680 pounds and a tare weight of 29,820 pounds. You checked the temperature of the truck and it was 280°. The delivery ticket notes the weight per gallon is 8.5125 and the specific gravity is 1.0101. Delivery ticket number is 101. 46860

You must determine the final combined recycled cold feed gradation and the final combined recycled acceptance gradation. Also you need to complete the Form 820007 and tank guantity sheet for the day. Calculate the total A.C. content in the mixture. Determine if any non-compliance forms need to be issued.

$$\frac{100(4.7) - 18(4.05)}{100 - 18(4.05 \div 100)} = \frac{397.1}{99.271} = 4.0$$

Problem 2 (67)

Form 830245
3-80

NONCOMPLIANCE NOTICE

Contractor _____ Project No. _____

County _____ Contract No. _____ Date _____ Time _____

To: _____ (Name) _____ (Title) _____ (Signature)

You are hereby notified that tests indicate that the _____

_____

_____

is outside our specification tolerances. The specification violated is Article IM 511.

The test data value is 2.4

_____

_____

and the specification limits are min voids @ 3.0%

_____ _____

Additional tests may be performed.

Noncomplying work may be required to be removed and replaced at no cost to the contracting authority.

Your are to determine corrective action necessary.

You are to determine if you wish to discontinue operations until the additional tests confirm or refute this failing test.

Remarks: _____

_____

_____

Correction: Adjust AC & reduce fines

_____

_____

Signed: _____
Inspector - Iowa DOT

Distribution. White Copy - Contractor, Canary Copy - File Copy.

(68)

SS-1059
New

Iowa Department of Transportation

SUPPLEMENTAL SPECIFICATION
For
DELIVERY OF SAMPLES

February 23, 1988

THE STANDARD SPECIFICATIONS, SERIES OF 1984, ARE AMENDED BY THE FOLLOWING ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS WHICH SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

1059.01 DESCRIPTION. This specification covers the delivery of project samples for testing purposes. This requirement is intended to apply to primary projects for which certified plant inspection is required or authorized. (Primary projects include interstate projects, in accord with definitions in 1101.03.) The provisions of this specification shall not apply to nonprimary projects for which certified plant inspection is required or authorized, unless specifically indicated in the contract documents.

1059.02 SAMPLE DELIVERY. The Contractor shall deliver to the Engineer samples for the purposes of acceptance, monitoring, and verification testing. Materials will include aggregates and asphaltic mixtures and may include samples of other materials. The samples shall be properly identified. Delivery shall be to the district materials laboratory for the district having jurisdiction over the contract, unless otherwise directed by the Engineer. The Contractor shall deliver the samples promptly, as determined by the Engineer.

1059.03 SAMPLE RECEIVING. The District Materials Engineer will take reasonable actions to cooperate in receiving and testing these samples, especially for work being done under an accelerated work schedule.

Not all samples are to be tested. The selection of samples to be tested will be made by the District Materials Engineer, based on Construction Office and Materials Office instructions. Samples initially identified for testing will normally be tested at least by the end of the working day following delivery. These test results will be available to the Contractor as soon as testing is completed.

1059.04 PAYMENT. The cost of preparing, identifying, and delivering samples shall be considered incidental to the cost of the material sampled, and no separate payment will be made therefore.

69

Iowa Department of Transportation

SUPPLEMENTAL SPECIFICATION
for
CERTIFIED PLANT INSPECTION

February 23, 1988

THE STANDARD SPECIFICATIONS, SERIES OF 1984, ARE AMENDED BY THE FOLLOWING ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS, AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

1057.01 GENERAL. This specification describes certified plant inspection for construction projects. This specification is intended for primary projects; it will apply to nonprimary projects only when specifically designated. Where this specification applies, the Contractor shall furnish or be responsible for certified plant inspection for his work, as specified herein, whether the inspection is by his own personnel or by his producers, suppliers, or consultants.

1057.02 REQUIREMENTS. Certified plant inspection shall be in accord with Materials IM 213 and 214, utilizing personnel certified for the type of inspection to be accomplished and utilizing prescribed test equipment furnished by the Contractor. The equipment shall also be available for use by the Engineer for monitoring purposes.

When a field laboratory is furnished, as provided in Section 2520, joint use by the Contractor and the Engineer for inspection purposes is intended.

Delivery of samples to the district materials laboratory may also be required. The provisions for this are detailed in a separate specification. If this delivery is to be required, that specification will be noted on the proposal.

1057.03 APPLICATION. This specification applies generally to mixtures furnished according to Sections 2114 (PCC or ACC), 2122, 2201, 2202, 2203, 2205 (using AC), 2212, 2213, 2215, 2301, 2302, 2303, 2304, 2305, 2306, 2309, 2310, 2503, 2507, 2511, 2512, 2515, 2516, 2517, 2403, and other sections requiring structural concrete.

Certified plant inspection will be required as follows:

A. PCC Pavement. Certified plant inspection is required for PCC mixtures for pavement work, including pavement, bridge approaches, overlays, medians, paved shoulders, bases, subbases, pavement widening, pavement repair, and base repair, except when excluded by a note on the proposal.

When required for these projects, certified plant inspection is also required for miscellaneous PCC mixtures and miscellaneous structural concrete required by the contract.

Certain types or quantities of mixture will be excluded according to Paragraph D.

B. ACC Pavement. Certified plant inspection is required for ACC mixtures for pavement work, including courses for pavement, overlays, resurfacing, medians, paved shoulders, bases, subbases, base widening, pavement repair, and base repair, except when excluded by a note on the proposal.

When required for these projects, certified plant inspection is also required for miscellaneous PCC mixtures and miscellaneous structural concrete required by the contract.

Certain types or quantities of mixture will be excluded according to Paragraph D.

C. Structures. Certified plant inspection is required for all structural concrete for bridge or other structure projects when the total quantity of structural concrete for the project or projects tied by the Contracting Authority is 200 cubic yards or more.

Certain types or quantities of mixture will be excluded according to Paragraph D.

D. Exclusions. Certified plant inspection will not be required for the following work.

1. PCC base, PCC pavement widening, PCC curb and gutter, pavement repair, base repair, temporary pavement, and structural concrete associated with pavement projects are excluded, when the quantity of each is less than 200 cubic yards of PCC or 500 tons of ACC for the project or for the total for projects tied by the Contracting Authority.
2. When certified plant inspection is required for the project, incidental concrete for the following purposes is excluded when furnished at a maximum rate of 25 cubic yards per day, whether from one or more sources.
   (a) Sign, signal, and lighting bases;
   (b) Slope protection;
   (c) Building floors;
   (d) Catch basins, intakes, and manholes;
   (e) Sidewalks and driveways;
   (f) Guardrail anchorages;
   (g) Similar items, as designated by the Engineer.

   These exclusions may be based on quantities planned by the Contractor several days ahead of placement, in which case the certified plant inspection may be as planned.
3. Slurry seal work and other cold-mixed asphaltic mixtures.
4. Flowable mortar.

For mixture so excluded, the Engineer will provide plant inspection he deems appropriate.

1057.04 PAYMENT. Payment for required certified plant inspection shall be included in the contract price for the item for which this inspection is required, and it will not be paid for separately.

1057.05 ADDITIONAL INSPECTION. If the Contractor is prepared to furnish certified plant inspection for a primary project for which this inspection was excluded because of the size of the project, 1057.03 A, B, and C, the Engineer will consider the Contractor's request for an extra work order to provide for certified plant inspection.

For similar nonprimary projects, consideration of such an extra work order will be an option of the Engineer.