HIGHWAY RESEARCH CIRCULAR

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COMMITTEE ACTIVITY

Committee on Construction Practices - Flexible Pavement
Department of Materials and Construction
Highway Research Board

REPORT ON SAMPLING HOT BINS
SURVEY OF STATE HIGHWAY DEPARTMENTS

This report was originally presented to the committee at their January 1965 meeting and subsequently revised and circulated to the entire committee for approval.

The study was initiated in response to a request from the Special Committee "Research Problems of Mutual Interest and Concern to Users and Producers of Asphaltic Materials" and has been previously submitted to this committee.

ACKNOWLEDGMENT

The major portion of this work was done by Subcommittee MC-C2(4), the members of which are noted in the committee list on page 7.

HIGHWAY RESEARCH BOARD
NATIONAL RESEARCH COUNCIL NATIONAL ACADEMY OF SCIENCES - NATIONAL ACADEMY OF ENGINEERING
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I. SUMMARY OF CURRENT PRACTICE

A. Results of Survey of State Highway Departments

1. Hot aggregate bin samples for gradation analyses are required for process control and/or acceptance by virtually all states.

2. Most states are not satisfied with current hot bin sampling procedures - some states admit that methods are not standardized throughout their state.

3. Sampling devices on batch-type plants range from unsatisfactory to good. On some plants, no sampling devices are furnished.

4. A slight majority of states (23 of 40) feels that sampling facilities on newer plants are "adequate".

5. Most states (33 of 41) feel there is a need for a uniform standard for hot bin sampling facilities.

6. Some states feel there is a need for a uniform standard, not only for sampling devices, but also for size of samples, frequency of samples, methods of utilizing test data for control, etc.

7. As far as can be determined, very few states are willing to accept or reject the final product for gradation solely on the basis of hot bin sampling and testing. Replies indicate that most states are dubious of the correlation between hot bin results and extraction results.

B. Other Comments

1. Hot bin sampling facilities on most continuous mix plants are satisfactory.

2. In most cases, gradation tests of hot bin samples are used for process control, not for acceptance or rejection of completed mixture, however, acceptance at the mixing plant may be justified under some circumstances.

3. Gradation is hypercritical with respect to finest aggregate fractions; i.e. material in No. 1 hot aggregate bin. No. 1 bin material covers widest range of particle sizes, has the bulk of surface area of the complete mix, and affects asphalt demand critically. No. 1 bin is normally the largest storage bin and has flatter slopes than other bins. Therefore, segregation in No. 1 bin is more likely to occur than in coarse aggregate bins. (Study by New York State Department of Public Works (*) showed greatest variability on the 1/8", No. 20, and No. 200 sieves).

(*) "Uniformity of Asphalt Concrete Plant Production", M.D. Graham, W.C. Burnett, and J.J. Thomas, New York State Department of Public Works. Presented at the 66th Annual Meeting of ASTM, June 1963.

4. Segregation in hot aggregate storage bin usually takes the form of stratification of fine to coarser material, the strata lying vertically at right angles to the flow of material across the screen protecting the bin. Therefore, it is important that samples incorporate material across the full dimension of the gate which is parallel to the flow of aggregate across the screen.

II. RECOMMENDATIONS

A. Minimum Standards for Hot Bin Sampling Facilities on Asphalt Mixing Plants

1. Safe and convenient means for access to the point of sampling should be provided, such as:

   (a) Stairways with railings or enclosed ladders providing access to the sampling platform.

   (b) When the point of sampling is not accessible from ground level, a sampling platform, enclosed by railings, of sufficient area and with adequate clearances to allow the sampling inspector to work safely and efficiently.

   (c) Access doors or ports which will permit convenient introduction and removal of the sampling devices.

2. Point of sampling for hot aggregate bins:

   (a) Batch-type plants:

   The streams of aggregate flowing from the hot aggregate storage bin(s) into the aggregate weigh hopper, immediately below the bin discharge gate.

   (b) Continuous-type plants:

   The streams of aggregates flowing from the hot aggregate storage bin(s) and discharging from the aggregate feeder(s), prior to the intermingling of the several streams in the conveying device which carries combined aggregates away from the aggregate feeders.

3. Sampling trays, containers, or chutes designed specifically for the purpose of obtaining hot bin samples should be provided with each asphalt mixing plant.

   (a) The devices shall be of such configuration and dimensions that the full width of the stream of aggregates discharging from the gate or feeder shall be interrupted and sampled in the container or chute. The width of the aggregate stream is defined as the dimension parallel to the flow of aggregates across the screen above the hot aggregate bin.

(b) Rails, guides, or other supports shall be provided upon which the sampling devices shall rest and/or slide, to insure consistent and uniform positioning of the devices during sampling operations.

(c) The sampling devices, together with their appurtenances, shall be so constructed that the sample may be taken after the discharge gate is fully open, and the stream of aggregates is flowing through the entire area of the opening.

(d) The sample container shall have sufficient capacity to accommodate the quantity required for each sample.

B. Size and Frequency of Samples

It is recommended that separate research be initiated and/or analyzed so as to determine the size and frequency of samples required to provide acceptable accuracy.

C. Ultimate Use of Hot Bin Sampling Results

It is further recommended that research be initiated as to the possibility of establishing hot bin sampling as a basis of acceptance for mix gradation, exclusive of minus 200 mesh material, in conjunction with an acceptable method of determining bitumen percentage.

The following is a resume of the 42 replies received from State Highway Departments:

QUESTIONNAIRE
ASPHALT PLANT SAMPLING
HRB SUBCOMMITTEE MC-C2(4)

1) What types of asphalt plants are permitted on state work?

(a) Continuous 41 (b) Batch 42

2) Is the contractor responsible for the initial plant setup or calibration?

Yes 28 No 15

3) Gradation tests for final acceptance are made on samples taken from
(a) Asphalt plant hot bin 17
(b) Coated mix in truckbed 20
(c) Roadway prior to compaction 12
(d) Roadway after final compaction 7
(e) Other 4

4) (a) Are extraction tests required for final acceptance of bituminous mixtures? Yes 29 No 14

(b) If Yes, (1) Where are samples taken? _____
(2) Frequency _____
(3) Method of Test _____
(4) Size of Sample for Test _____

5) (a) Are hot bin gradation analyses made for purposes other than final acceptance? Yes 34 No 7

(b) If Yes, explain: _____

6) (a) Do you use or specify a standard hot bin sampling device or procedure? Yes 12 No 31

(b) If Yes, describe: _____

7) What size hot bin aggregate sample is taken? _____

8) How often are hot bins sampled? _____

9) (a) Are gradation analyses made at the plant site?
Yes 40 No _____

(b) If Yes, give following details:

(1) Method of obtaining sample _____
(2) Size sample used _____
(3) Method of testing sample _____

10) Have you found hot bin sampling to be more representative from continuous plants than batch plants? Yes 12 No 18

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11) (a) Do you specify a maximum per cent of "carryover"?
Yes 22 No 21

(b) If Yes, what maximum? Min. 5 % Max. 20 %

12) (a) Are sampling facilities on the newer asphalt plants adequate?
Yes 23 No 17

(b) If No, elaborate _____

13) (a) Do you think there is need for a uniform standard for hot bin sampling facilities? Yes 33 No 8

(b) If Yes, elaborate _____

14) (a) What correlation have you found between hot bin and extracted aggregate gradation analyses? _____

(b) If you have found a significant difference, what do you attribute it to? _____

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* as of September 1965
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