



MATES

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ABC'S OF HOT MIXED ASPHALT - PART III BITUMINOUS PLANTS

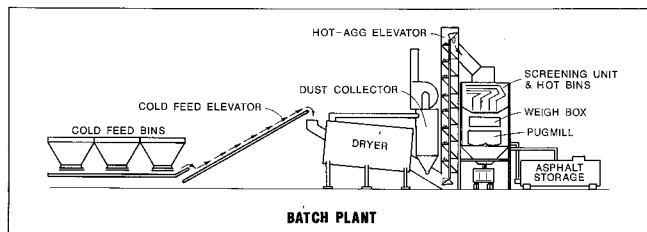
Introduction

Part II of this series (MATES Issue No. 4) discussed how MDOT determines, by a laboratory mix design, if the aggregates supplied by a contractor will provide a mix that meets our specifications when combined with an asphalt cement. It was noted that all testing and mix design is done under stringent laboratory conditions. Once complete, however, the laboratory mix design has to be applied in the field under much less controlled conditions.

Field mix is made in an assembly of mechanical/electronic equipment where aggregates are blended, heated, dried, and mixed with asphalt to produce a hot asphalt material meeting specified requirements. An asphalt plant may be small or large; it may be located at a permanent site or it may be portable. In general, most plants can be categorized as either a 'batch plant' or a 'drum mix plant.' The accompanying illustrations show the two general set-ups.

Batch Plant

The batch plant gets its name from the fact that it produces hot mix in batches; one batch at a time, one after another. The size of a batch varies according to the capacity of the plant's pugmill (the mixing chamber where aggregate and asphalt are blended). A typical batch is about 3 tons and batches can be processed successively to produce about 100 to 150 tons/hour.

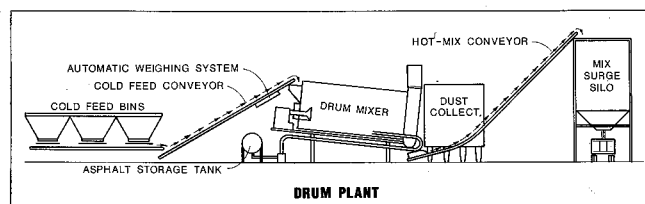


Certain basic operations are common to all batch plants. Aggregates are loaded from stockpiles into the cold feed bins from which controlled amounts are passed through a dryer where they are heated and dried. The aggregates then pass over a screening unit that separates them into different sized fractions and deposits them in bins for hot storage. The aggregates and mineral filler (when used) are then proportioned in controlled amounts and combined with asphalt in the pugmill, and thoroughly mixed in a batch. The completed mix is then either loaded directly into a truck or placed in a surge bin where several batches are accumulated for loading.

Drum Mix Plants

Drum mixing is a relatively simple process for producing asphalt hot mix. The mixing drum from which this type of plant gets its name is very similar in appearance to a

batch plant dryer drum. The difference between drum plants and batch plants is that, in drum plants, the aggregate is not only dried and heated within the drum, but also mixed with the asphalt cement. There are no screening units, hot bins, or pugmills in a drum plant.



Aggregate proportioning is controlled at the cold feed end only. The rotation of the drum provides the mixing action that thoroughly and continuously blends the aggregates, asphalt cement, and the mineral filler (when used) as the material passes through. Therefore, a surge bin is required to hold the mixture until it is eventually loaded into trucks. A typical rate of production is about 200 to 300 tons/hour, and rates up to 400 to 500 tons/hour are sometimes achieved. A plan is being developed for sampling aggregates off the cold feed belt in order to improve quality control.

The drum plant is becoming more widely used because of its greater efficiency in labor, production, equipment, energy savings, and overall cost. In 1978, there were about 104 batch plants in Michigan and only two drum plants. Today, there are about 70 batch plants and 45 drum plants.

Job Site Services

No matter which type of plant is selected for use on the job, Bituminous Technical Services personnel perform a pre-production plant check-out to assure that it complies with MDOT specifications and produces the material as specified in the laboratory mix design. Once the plant has been checked-out, a District Field Engineering plant inspector oversees daily operations and runs periodic tests on the material to see that its quality is maintained throughout the job. M&T personnel are in constant contact on a consulting basis to help in technical interpretation of the test data, and to provide assistance, as necessary, to the Project Engineer's plant inspector and the contractor, should problems arise. Another duty is to train new plant inspectors.

From this description of the plants, one can see that in order to duplicate a mix that was designed in a laboratory, extensive expertise and close cooperation are essential between Department and contractor personnel. Although it has been said many times by experts in the field, that dealing with bituminous mixtures is as much an art as a science, we are continually striving to increase the amount of science involved.

-Gary Chapman

Testing Laboratory
U of M 1913

Research Laboratory
MSU 1939

Investigation and Research Division
1924

Testing and Research Division
1933

Materials and Technology Division
1985

TECHADVISORIES

The brief information items that follow here are intended to aid MDOT technologists by advising or clarifying, for them, current technical developments, changes or other activities that may affect their technical duties or responsibilities.

MDOT RESEARCH PUBLICATIONS

Effects of Deicing Salts on Chloride Levels in Water and Soil Adjacent to Roadways, Research Report No. R-1279, by R. W. Muethel. In order to assess and monitor the effects of chloride run-off, 47 roadside locations, four streams, and 30 ground water wells throughout the state were surveyed from 1971 through 1984. The study found that roadside soils, surface waters, and ground water had chloride levels within published limits of tolerance for plant and animal life. The results of this investigation indicated that no remedial action was necessary at any of the sites; continued use of salt was recommended for deicing purposes, with emphasis on reduced usage by improving the control of spreading rates and greater use of sand-salt mixtures. The Research Laboratory will continue to monitor conditions at a few selected sites, and will issue further reports if the results from this monitoring warrant additional conclusions.

Bridge Barrier Rail-to-Guardrail Anchoring System, Research Report No. R-1280, by L. J. Pearson. The Department now constructs many bridges that have the expansion joints located at the abutments. This creates a problem in accommodating the combined movements of both the bridge barrier railing and the guardrail caused by thermal expansion and contraction. In an effort to reduce costs by eliminating the casting of a concrete barrier extension, which is fixed to the independent backwall, a guardrail expansion system was developed that could accommodate greater motion, be attached to the barrier atop the superstructure and utilize existing guardrail hardware. This report describes the development and testing of this new system, which is expected to save the Department some \$30,000 on each structure.

SCALE INSPECTIONS

Requests for inspections of truck or plant scales, as specified in Section 1.05.10 of the Standard Specifications, should be made by phone to Chris Helmer at (517) 322-1211 or Beverly Reynolds at (517) 322-5661. Change in contact person is due to retirement and reassignments.

The following information is to be furnished:

- 1) Project number
- 2) Project engineer
- 3) Owner of plant or scales
- 4) Location of scales. If portable plant or scale, specific driving instructions.
- 5) Name of person requesting scale inspection
- 6) Time (a.m. - p.m.) and date inspection required
- 7) Plant/scale owner's telephone number and contact person

Requests for concrete plant inspections or routine pavement coring should be made to Tom Green at (517) 322-5685, or leave a message with the receptionist.

MICHIGAN TEST METHODS

We are in the process of developing a file of "Michigan Test Methods." This file will cover most, if not all of the tests currently being used in the Lansing laboratories of the Materials and Technology Division. Copies of the tests and the Table of Contents are available on request from: Ellis Swartzel, P.O. Box 30049, Lansing, MI 48909. (517) 322-5687.

LOCAL GOVERNMENT TESTING

Counties and municipalities doing their own testing or using consultants will be required, by the years indicated below, to fulfill the following requirements:

1987 - Aggregate sampling and testing is to be done by, or under the direct supervision of a Certified Aggregate Technician.

1988 - Portland cement concrete field testing is to be conducted by a Qualified Concrete Technician, Michigan Level I.

1988 - Bituminous concrete mix inspection is to be conducted by a Certified Bituminous Technician.

These requirements will either be in the proposal as a Supplemental Specification or in the Federal-Aid Secondary Agreement. Certification for aggregate and bituminous technicians can be obtained by attending schools and passing the examinations at Ferris State College. The portland cement concrete certification can be obtained through the Michigan Ready Mix Concrete Association.

PREQUALIFIED EXPANSION ANCHORS

MDOT is changing the prequalified materials list for concrete expansion anchors - pre-drilled - flush type. (pp. 36 and 37, "Materials Sampling Guide"). The following devices are now approved:

- 1) Hilti, HDI and HVA
- 2) Ramset Dynaset, 5/8 and 3/4-in. and Ramset Trubolt Wedge Anchors
- 3) Rawl
- 4) Ackerman Johnson Internal Plug Drop-In Expansion Anchor

Those removed from the list may be satisfactory but they do not meet the 'made in America' requirements. Please remember that field pull-out testing should be done to check installation technique.

SPECIFICATION UPDATE

Hand Chipping, 5.09(8b), dated 12-23-86. (see MATES Issue No. 2) This revision deletes the change in the third sentence of Subsection 5.09.05-b of the 1984 Standard Specifications. In other words, the description of the work of Hand Chipping - Other Than Deck reverts back to the way it is in the book, which reads: "When reinforcing steel is exposed, the concrete shall be removed to a minimum depth of 3/4 inch below the steel." The reason for reverting back to the original is that in the FHWA's opinion a repair only to the midpoint of the bar would be a cosmetic repair, and thus not eligible for Federal participation.

ATTENTION PLEASE ALL FIELD ENGINEERS AND LOCAL GOVERNMENT ENGINEERS

For your Preconstruction Meetings: Please have the contractors send their New Testing Orders to the District Field Engineer. Many are still sending to the Lansing Laboratory. This only slows processing. Thank you.

Technology Transfer Unit
Materials and Technology Division
Michigan DOT
P.O. Box 30049
Lansing, Michigan 48909
Telephone (517) 322-1637

This document is disseminated as an element of MDOT's technical transfer program. It is intended primarily as a means for timely transfer of technical information to those MDOT technologists engaged in transportation design, construction, maintenance, operation, and program development. Suggestions or questions from district or central office technologists concerning MATES subjects are invited and should be directed to M&T's Technology Transfer Unit.