Asphalt Pavement Density

March 6, 2002

M. ....., Director of Highways
(State) Department of Transportation

....., Division Administrator
Federal Highway Administration

Attention: M. .....
Deputy Director of Highways

Dear M. .....:

Subject: 2002 Hot Mix Asphalt Density Review
Review Scope and Guidelines

Hot mix asphalt density was selected as a review topic for our 2002 joint review program. Attaining proper density of hot mix asphalt is critical to assuring the long-term durability of the completed pavement.

Our review scope, procedures, and guidelines are attached. Should you have any comments or questions, please do not hesitate to contact either of us.

Sincerely yours,

/s/ .....
....., (STATE)DOT
Review Co-Coordinator

/s/ .....
....., FHWA
Review Co-Coordinator

Hot Mix Density Review 2002

Objective, Scope, and Procedures

The objective of this review is to assess the current state of the practice at the (State) Department of Transportation to specify, measure, and achieve density in hot mix asphalt pavements and overlays constructed under quality assurance/quality control procedures. The review will principally involve visits to projects to obtain information on the implementation of the procedures and specifications in the field. Based on this assessment of current practice, the review will be carried through to recommend procedural or specification changes to address areas identified as needing improvement. The ultimate objective will be to improve overall quality and long-term durability of the product.

The team we have is an excellent mix of disciplines:
(team members listed)

In addition, two individuals from the Districts have been identified as resources for the team:
(District members listed)

Background issues prompting the need for an overall assessment of this topic:

1. **Quality**. Our continuing overall objective is to attain as high a level of quality as possible. Attaining compaction of asphalt mixtures is critical to the long-term durability of our hot mix asphalt overlays and pavements.
2. **The End Result Specification** (ERS) currently under development and trial has shown significant differences between the quality control density tests taken with the nuclear gauge and the cores taken as part of the ERS project. This brings into question the validity of our current procedures to accurately assess the level of density during construction.
3. **The Office of Quality review** of density results on three projects demonstrated a significant difference between the quality control testing and cores taken after the project was complete. This again brings into question the credibility of our current procedures for density measurement.
4. **Longitudinal joint** density has been an issue for many years and construction techniques were the subject of a review last year. There is some belief that measurement closer to the joint may motivate contractors to pay more attention to the joint area during rolling operations; however, because it is cooler and unconfined, it may not be possible to achieve the same density as in other areas of the mat. Ultimately, if we can improve density in the vicinity of longitudinal joints, we can improve the longevity of the overall pavement section.

These same factors have prompted an effort within the Department to form a committee headed by ..... of the Bureau of Materials and Physical Research. The group is a subcommittee of the QC/QA technical working group and is composed of a number of (STATE)DOT Central Office and District personnel. We have discussed this review with the personnel involved and will coordinate our activities to build on one another.

Procedures for this review will consist of the following:

1. Identify projects where hot mix asphalt is under construction.
2. Start-ups will be a focus to review the development of the rolling pattern and the level of effort required to attain the specification minimum.
3. Interviewing the QC manager at the plant and reviewing records related to production and density.
4. Observing the lay down, rolling operation, and density test procedures in the field.
5. Discussion of issues related to density with appropriate district personnel.
6. Discussion of review findings with the district.

The schedule will consist of conducting field reviews during May, June, July, and August. Problems or opportunities identified as a result of the field review will be coordinated with the Density Subcommittee group and specific recommendations will be developed and coordinated in October. A closeout is scheduled for

December 2, 2002. We will also coordinate our review with your Office of Quality and with your agreement, extend an invitation to them to participate in the closeout.

Projects suitable for the review have been identified in Districts ..., ..., ..., ..., and .... We will notify the Districts directly and request their assistance.

A guideline and report format describing the items that will be covered is enclosed. References to critical documents describing procedures for testing and control of density are also listed.

The product of this review will be an assessment of the current state of the practice and if appropriate, recommendations in a form that can be readily incorporated into current policies and specifications.

HMA Density Review

1. **District, Date, Contacts:**
2. **Project Description:**
3. **Mix Description:**
4. **Plant:**
    a. Description:
    b. Control chart review:
    c. Density results:
    d. QA results:
    e. Number of tests compared to that required:
    f. G_{mm}, G_{mb}, Voids:
    g. Ask for description of random number used to identify density location:
    h. Ask about the use of partial lots as in the specification:
    i. Review and obtain a copy of the nuclear/core correlation:

5. **Laydown:**
    a. Attend start up to review density target:
    b. Compare planned rolling pattern to actual and production rate:
    c. Review locations of tests and activities of tester:
    d. Evaluate effect on rolling if target density were increased:
    e. Evaluate overall density results:
    f. Check density in vicinity of longitudinal joint:

6. **District Discussion:**
    a. Discuss findings of the review to date and inform the District of the direction or recommendations being considered to share information and obtain feedback as early as possible.
    b. Ask about areas where current procedures for measuring density or the specification are not working well.
    c. Ask for suggestions to enhance the quality of the product.
    d. Discuss longitudinal joint density techniques and issues.
    e. Discuss thickness to nominal size issue and options.
7. **References:**

1. Special Provision for Quality Control/Quality Assurance of Bituminous Concrete Mixtures
2. Excerpt from Model Quality Control Plan regarding Density Control
3. Standard Test Method for correlating nuclear gauge densities with Core densities
4. Bituminous Concrete QC/QA Start-up Procedures
5. Determination of Random Density Test Site Locations