This procedure provides guidance on the calibration, automation, and recordation requirements for drum mix plants producing hot mix asphalt (HMA) using 100% RAP as follows:

1. **Rejuvenator.** The rejuvenator shall meet the requirements of Table 702-10 of the Standard Specifications Section 702, 9. Asphalt Rejuvenating Agent.

2. **Equipment for Rejuvenator.** Tanks for the storage of rejuvenator must be capable of heating and maintaining the required rejuvenator temperature. Where meters are used, the rejuvenator temperature at the meter must be within 25°F (15°C) of the temperature for which the meter is calibrated. The Producer shall have separate tanks and pipe lines for the rejuvenator.

All mixing plants shall have a sampling valve designed to be non-clogging, safe and completely divorced from any solvent clean-out operations. The sample valve shall be located in the line between the tank and the mixing plant. The valve must be clearly labeled “Sample Valve”. The type and location of the valve requires approval of the Regional Materials Engineer (RME).

3. **RAP Cold Feed Bins.** The Producer shall separate cold feed bins for each RAP size for the production of HMA mixes. RAP feed bins shall have adequate separation to keep RAP from overflowing from one bin to another. Configure the feed bins so that material in excess of 4 inches (100 mm) cannot be placed into the bin. Clearly label all feed bins to identify the RAP size used. The cold feed bins must be of sufficient size to maintain a continuous and uniform flow of material during HMA production. Each feed bin shall proportion RAP accurately and uniformly. The section of the bin that controls the feed rate flow must be adjustable and have a method to identify the opening. Interlock each feed bin to alert the operators within five seconds if any feed bin becomes empty or the flow is obstructed.

4. **RAP Weigh System.** The plant shall weigh the RAP continuously with a system meeting the requirements of National Institute of Standards and Technology Handbook 44. The weigh system will be tested as outlined in MP 401, Appendix A, Section II. C. 3. Scales, Continuous Weigh Systems and Meters. Provide means for diverting the RAP after passing over the weigh system and prior to entry into the drum for sampling. Other means of sampling may be approved by the RME. The weigh system must be readable to the nearest 0.01 ton during testing.

The Director, Materials Bureau will consider other weighing systems different from conventional designs. The following tolerances apply to all continuous weigh systems:

   a. **Acceptance Tolerance.** Acceptance tolerance is 0.5% of the test load and applies to initial installation of the weigh system, annual approval prior to production, and whenever the equipment is tested because it fails to meet the maintenance tolerance during production.
b. Maintenance Tolerance. Maintenance tolerance is 1.0% of the test load and applies during all times other than those where acceptance tolerance applies.

5. Rejuvenator Control Unit. The Producer shall provide a satisfactory means to add the proper amount of rejuvenator to the mixture. The Producer shall provide suitable means to maintain the required temperatures of the rejuvenator in the pipelines, meters, weigh buckets, spray bars, and other containers or flow lines. When a meter system is used, the plant equipment shall have a by-pass so that the rejuvenator quantity and flow rate can be checked and calibrated in accordance with MM 27, Section IV. Meters, such that the metered quantity is within a tolerance of ±1% of the recorded quantities.

6. Rejuvenator System. The plant shall continuously proportion rejuvenator at adjustable rates accurately and uniformly. The rejuvenator system must be interlocked to alert the operator within 5 seconds if the rejuvenator flow to the mixer unit ceases. A temperature compensating device shall be installed in conjunction with the meter to correct the quantity of rejuvenator at 60°F (15°C).

7. Proportioning Control. All drum mix plants shall proportion materials by an automatic proportioning system that will increase and decrease the production rate using a single input. The system shall be installed in a dust and weather protected area of at least 5 square yards (4.0 m²) with no internal dimensions less than 6 feet (2.0 m). The system shall accurately proportion various mixture components by mass or volume.

   a. RAP Feed Rate Control. The plant must have an adjustable feed rate control for the RAP bin feeder. The controls must maintain RAP flow accuracy such that the total variation of all materials being drawn per interval of time must not exceed an amount equal to 1.5 percent of total weight of HMA mixture per interval of time.

   The flow rate of RAP must be continuously displayed in the control room in tons per hour. The maximum resolution will be 0.1 ton per hour for dry RAP.

   b. RAP Weight Indicators. Weight indicators in the control room must display the weight of dry RAP in tons. They must continuously accumulate weights of material during the production period. The maximum resolution will be 0.1 tons for dry RAP. The indicators must be resettable to zero and have provisions to prevent manipulation.

   c. RAP Moisture Compensator. A moisture compensation device must be capable of electronically converting the wet weight of RAP to dry RAP weight. The moisture compensation may be input based on composite or individual RAP bin moisture. The maximum graduations on the compensator shall be 0.1 percent.

   d. Rejuvenator Control. The rejuvenator control unit shall either be as a rate (TPH) or as a percentage proportioning unit based on total weight of mixture. The rejuvenator delivery system must be linked with the RAP delivery system to automatically maintain the required proportions as the RAP flow varies. A positive no-flow interlock shall be incorporated into the rejuvenator introduction system such that it signals the operator if the condition is not remedied within 5 seconds. The production tolerance for rejuvenator is 0.1 percent based on the total HMA mixture weight. The flow rate of rejuvenator must be continuously displayed in the control room in tons per hour and have a maximum resolution of 0.001 ton per hour.

   e. Rejuvenator Quantity Indicator. The rejuvenator quantity indicator in the control room must display the quantity of the rejuvenator in tons and must continuously accumulate the quantity of rejuvenator during the production period in the day. The maximum resolution shall be 0.001 ton. The indicator must be resettable to zero and have provisions to prevent manipulation.

8. Recordation of Proportions. The mixing plant must be equipped with an automatic digital recording device approved by the Director, Materials Bureau, which simultaneously records the accumulated weights of RAP, in-line blended additives, and rejuvenator at five minute intervals during production and on demand. The recordation must include the rejuvenator content as a
percentage of the total HMA mixture weight. The maximum resolution will be 0.1 ton for RAP and 0.001 ton for rejuvenator, ± 0.1% of the target value of the design rejuvenator content. All recordation must show the day, month, year, and time to the nearest minute for each print. Provide a clear and legible copy of the recordation to the Department.

In-line blended additives (i.e. anti-strip, latex, warm mix asphalt technologies) shall be recorded according to Department directives.

Automation systems must clearly identify on the recordation when the mix is initiated without satisfying all conditions of fully automated production under these specifications. The recordation should also identify when the system is taken out of the fully automated mode during the mixing sequence.

9. Mixer Unit. The plant shall include a continuous mixer of a type approved by the Director, Materials Bureau, having an automatic burner control and being capable of producing a uniform mixture within the job-mix tolerances. Flights within the drum which are missing, loose, broken, bent, scalloped or worn excessively from their new condition shall be repaired or replaced to the satisfaction of the RME. The discharge of the HMA mixture into a HMA holding bin shall meet the requirements of MP 401, Appendix A, Section II. Hot Mix Asphalt Holding Bins.

10. Thermometric Equipment. All plants must have provisions to determine the rejuvenator temperature prior to entry into the mixing unit. Drum mix plants must have provisions to determine the HMA mixture temperature during discharge from the mixing unit. All temperature measuring devices must be accurate within 5°F (3°C).

11. Dust Collector. All plants shall be equipped with adequate dust collectors constructed to remove or return uniformly all or portions of the collected dust to the system.

12. Truck Scales. Truck scales used must meet the requirements of MP 401, Appendix A.

13. Safety Requirements. All mixing plants must be in compliance with all applicable state and federal safety requirements. Provide a platform(s) or other suitable device for accessibility to the top of truck bodies to obtain mix samples and mix temperatures.

14. RAP Delivery System. RAP, shall be introduced into the plant using equipment specifically designed for recycling. All RAP equipment requires approval of the Director, Materials Bureau. Scalping screens, grizzlies, or similar devices on RAP feed bins shall be installed and must be capable of removing foreign material in excess of 4 inches (100 mm).

15. Inspection Facilities. The inspection facility and the location require the approval of the RME. The inspection facility must meet the requirements of MP 401 Appendix A.

16. Gyratory Compactor. The gyratory compactor must meet the requirements of MP 401, Appendix A.

17. Holding Bins. The holding bins must meet the requirements of MP 401, Appendix A, Section II. Hot Mix Asphalt Holding Bins.