

State of Nevada
Department of Transportation
Materials Division

METHOD OF TEST FOR THE DETERMINATION OF THEORETICAL MAXIMUM SPECIFIC GRAVITY OF UNCOMPACTED BITUMINOUS PAVING MIXTURES (FIELD METHOD)

SCOPE

This test method covers the procedure to determine the theoretical maximum specific gravity of uncompacted bituminous paving mixtures using a vacuum pycnometer (Rice Pot) secured to a mechanical vibrating device. The theoretical maximum specific gravity determined by this test shall be used for determining relative percent compaction of bituminous paving mixtures in the field.

APPARATUS

1. Aluminum volumetric canister (pycnometer bowl) equipped with a solid lid, minimum 2000 g capacity 190 mm (7 1/2 in.) ID x 152 mm (6 in.) depth solid-wall cylinder.
2. Plexiglas vacuum lid, fitted with a rubber gasket, release valve and a connection for the vacuum line.
3. Mechanical vibrating device, equipped with a timer, vibration speed control and a detachable collar to which the vacuum pycnometer can be fastened.
4. Vacuum pump, capable of 27.5 ± 2.5 mm Hg and miscellaneous equipment necessary to evacuate air from the vacuum pycnometer.
5. Manometer, capable of 27.5 ± 2.5 mm Hg.
6. Balance, having a capacity of 12000 g and sensitive to 0.1 g.
7. Oven, capable of maintaining temperatures of $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$)
8. Thermometer, to measure and maintain a water bath temperature of $25 \pm 5^{\circ}\text{C}$ ($77 \pm 9^{\circ}\text{F}$)
9. Sieve, 6.3 mm (1/4 in.)

NOTE: See Figure 1 for example of correct configuration of testing apparatus.

SAMPLE PREPARATION

1. Obtain a representative sample of bituminous paving mixture per Test Method Nev. T200.
2. Obtain a representative sample in accordance with Test Method Nev. T203. The size of the sample shall conform to the following requirements:

Table 1 – Minimum Sample Sizes

Nominal Maximum Aggregate Size, mm (in.)	Minimum Sample Size, g
19 to 25 (3/4 to 1)	2500
12.5 (1/2) or smaller	1500

3. Using a 6.3 mm (1/4 in.) sieve, separate the particles of the representative paving mixture sample by hand, taking care to avoid fracturing the aggregate, so that the finer aggregate portions will pass through the 6.3 mm (1/4 in.). If the paving mixture sample is not pliable enough to be separated manually, place the material in a large sample pan and warm it in an oven until it can be separated as described above.
4. Cool the sample to room temperature. Recombine the coarse and fine aggregate particles and record its weight to the nearest 0.1 g (Mass of dry sample in air).

PROCEDURE

1. As necessary, clean and lightly lubricate the Plexiglas vacuum lid gasket using petroleum jelly.
2. On a smooth and level surface, completely fill the pycnometer bowl with water at 25 ± 3 °C (77 ± 5 °F). Lightly place the pycnometer lid on the pycnometer bowl, allowing it to settle into place by its own weight. To remove any entrapped air, gently push the pycnometer lid down until water is ejected from the aperture on the top of the pycnometer lid. Thoroughly dry the outside of the pycnometer and record its weight to the nearest 0.1 g (Mass of pycnometer and water).

NOTE: This weight should be verified periodically. Perform step 2 if parts of the pycnometer have been replaced or altered in any way.

3. Empty the pycnometer bowl.
4. Place the room temperature paving mixture sample into the empty pycnometer bowl and fill the pycnometer bowl with a sufficient amount of water 25 ± 3 °C (77 ± 5 °F) to completely submerge the sample. Place the bowl onto the mechanical vibrating device, affix the Plexiglas vacuum lid onto the pycnometer bowl and fasten the assembly together using the detachable collar.

5. Turn on the vacuum pump and close both the bleeder and monometer valves to remove the entrapped air in the sample by applying 27.5 ± 2.5 mm Hg of absolute pressure for 15 ± 2 minutes. Constantly agitate the container and sample using the mechanical vibrating device during the vacuum period.

NOTE: The speed control adjustment should be closely monitored as to avoid over-agitation and stripping of asphalt in the sample and that water is not drawn into the vacuum line.

6. At the end of the vacuum period and before turning off the vacuum pump, open the bleeder valve located on the Plexiglas vacuum lid and the monometer valve to release the pressure in the pycnometer. Remove the Plexiglas vacuum lid from the pycnometer bowl.
7. Adjust the contents of the pycnometer bowl by filling the pycnometer bowl with a sufficient amount of water at 25 ± 3 °C (77 ± 5 °F). If the temperature of the pycnometer bowl is found to be above or below 25 ± 3 °C (77 ± 5 °F), carefully remove a small amount of water and repeat the process until the contents of the pycnometer have stabilized to within the required tolerance.
8. The pycnometer bowl shall be completely filled with water at the end of step 7. Lightly place the pycnometer lid on the pycnometer bowl, allowing it to settle into place by its own weight. To remove any entrapped air, gently push the lid down until water is ejected from the aperture on the top of the pycnometer lid. Thoroughly dry the outside of the pycnometer bowl and pycnometer lid and record its weight within 10 ± 1 minutes of completing the vacuum procedure to the nearest 0.1 g (Mass of evacuated sample, pycnometer and water)

CALCULATIONS

Calculate the theoretical maximum specific gravity of the uncompacted bituminous paving mixture as follows:

$$\text{Specific Gravity} = A / [(A+B)-C]$$

Where:

A = Mass of dry sample in air

B = Mass of pycnometer and water

C = Mass of evacuated sample, pycnometer and water

REPORT

Specific gravity shall be reported to the nearest 0.001.

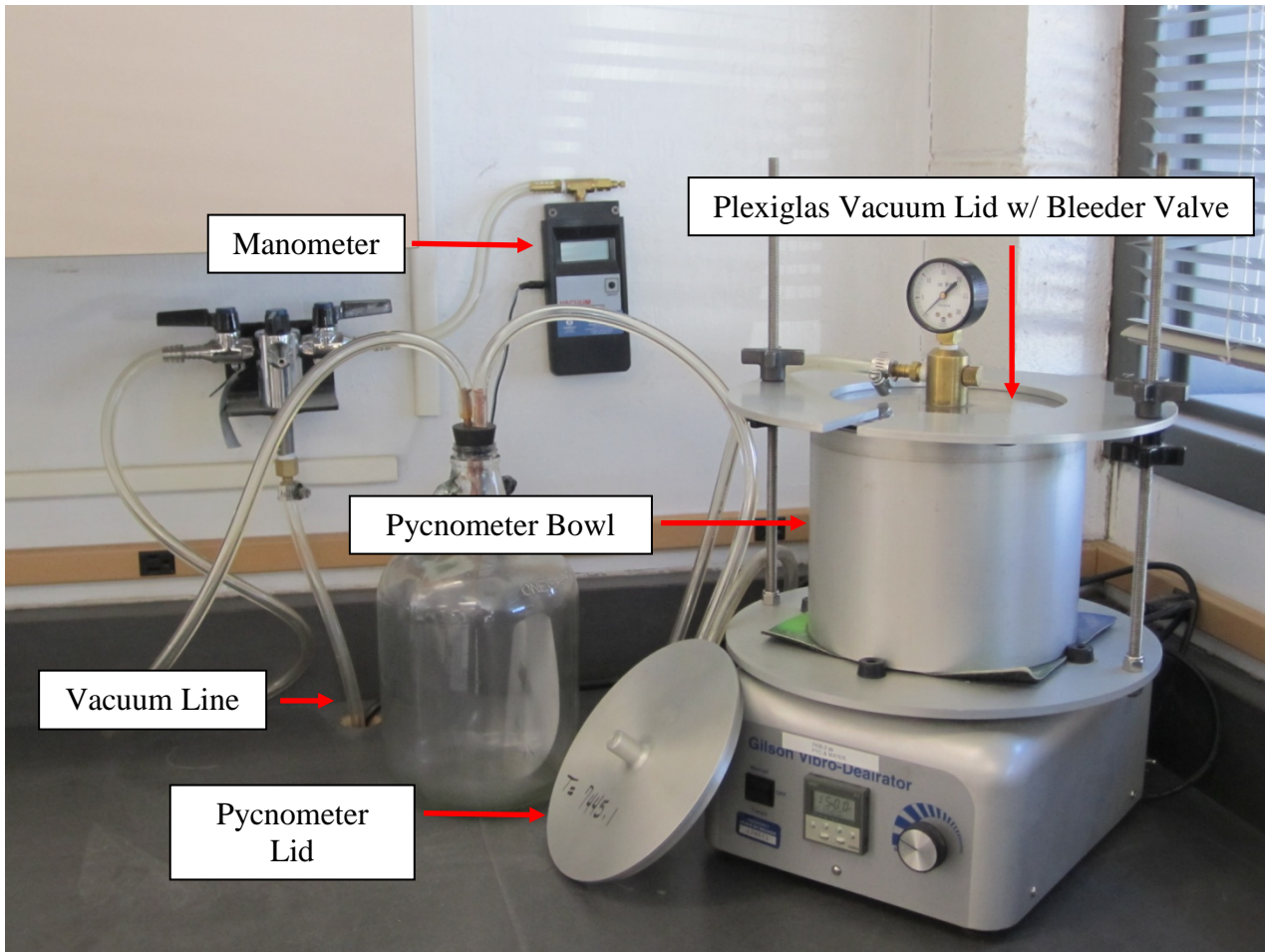


Figure 1