TNZ T/11: 2003

DETERMINATION OF THE PERMEABILITY OF HOT MIX ASPHALT PAVEMENTS

1. SCOPE

This method describes the use of the standpipe permeameter to assess the permeability of compacted hot mix asphalt pavement surfacings. This test measures the rate of ingress of water into surface using a falling-head permeameter.

This test provides the rate of ingress of water into a compacted bituminous surface. The test is based on a similar Australian method and is referenced in the Transit New Zealand P/18 Performance Based Specification for Hot Mix Asphalt.

The test is not designed to give a measure of the relative permeability of a hotmix not a measure in absolute units.

For dense graded mixes it is normally accepted that the layer will be impermeable if the air voids are below approximately 6%. Therefore on a well-compacted material the permeability should be zero. Any water flow into the material indicates that the desired impermeability state has not been achieved.

2. APPARATUS

- Permeameter baseplate as shown in Figure 1 made from aluminium or other suitable non-corroding metal. The baseplate shall have a suitable socket fitted with a waterproof seal to accept the standpipe, and a filling valve. The system illustrated in Fig 1 has been found suitable.
- Baseplate template comprising a 150-mm diameter wooden disk used during the preparation of the test surface. Any wood such as plywood or hardboard can be used.
- Water container, 4-5 litres capacity, fitted with a nominal 6-mm internal diameter, 1.5-m long flexible plastic or rubber hose close to the bottom.
- Base weight made of steel ring, suitable to provide a downward force against the uplift from the water pressure. Figure 2 illustrates a suitable design.
- Standpipe, 540-mm long, 12-mm external and 8-mm internal nominal diameter, made from clear tube graduated at 10-mm intervals. The top mark is located 440-mm from the top of the baseplate.

- Mist sprayer, to contain solvent for activating the surface under test.
- A stopwatch readable and accurate to ±1 second.

3. MATERIALS

Sealant, suitable for the provision of a watertight seal between the baseplate and the pavement surface. The sealant must be such that does not react with the surface. It has been found that Fosroc BM100, a filled butyl rubber supplied in 12 mm diameter x 500 mm long strips is satisfactory when warmed above 20°C.

Solvent, used to activate the pavement surface. White spirits has been found to be suitable.

4. PROCEDURE

Place a strip of sealant on the underside of the baseplate so that when compressed the ring of sealant lines up with the inside of the lip to within ± 5 mm. Where the ends of the strip come together, make sure that the joint is complete. To ensure that no leakage occurs at this location, place a short (50 mm long) strip of sealant on the outside of the complete ring, joining the two strips together by kneading the sealant.

Locate a test area and thoroughly brush to remove as much loose dust as possible.

Place the baseplate template over the test area and spray the solvent onto the surrounding surface using the mist sprayer.

Allow about 30 seconds for the solvent to partially evaporate then place the baseplate complete with sealant onto the bitumen surface. Stand on the baseplate for approximately 15 seconds to compress the sealant on to the surface to provide a watertight seal.

Place the base weight onto the baseplate and insert the standpipe into the top of the baseplate. Take care not to disturb the seal between the pavement surface and the base plate when fitting the standpipe.

Fill the container with water and add a few drops of detergent. With the container at ground level and the valve on the baseplate closed, pinch the tube with the fingers to prevent water escaping and attach the plastic tube onto the valve. .

Elevate the container and open the valve on the baseplate to allow water to fill the cavity and the standpipe. Close the valve when the water level is above the top mark. As in 4.5 above, exercise care when operating the valve so as not to break the waterproof seal between the baseplate and the pavement surface.

The water level in the standpipe will fall when the valve is closed. Measure the time required for the water level to drop from the top mark, Htop to a lower mark on the standpipe, Hlower to the nearest second. The actual position of the lower mark is not critical, but should be chosen such that the elapsed time is about 30 seconds. Record the lower level of the water column Hlower, mm and the elapsed time T, s.

Repeat steps 4.7 and 4.8 until two consistent measurements within 15% of each other are obtained.

5. CALCULATIONS

Calculate two rates of fall of the water column using the final consistent measurements recorded in 4.8: $R = \frac{H_{top} - H_{lower}}{s}$

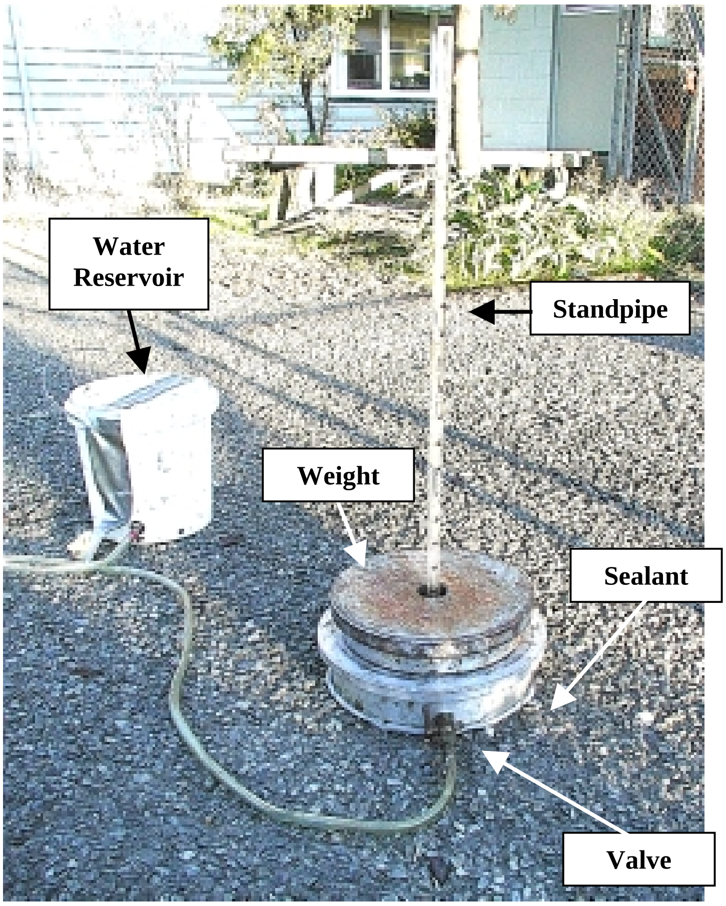
Calculate the average rate of fall of the water column.

6. REPORTING

Report test location and date of test.

Report the average rate of fall of the water column, R. in mm/sec

Report any external factors that may have influenced the test result, such as weather, surface contamination or damage, etc.



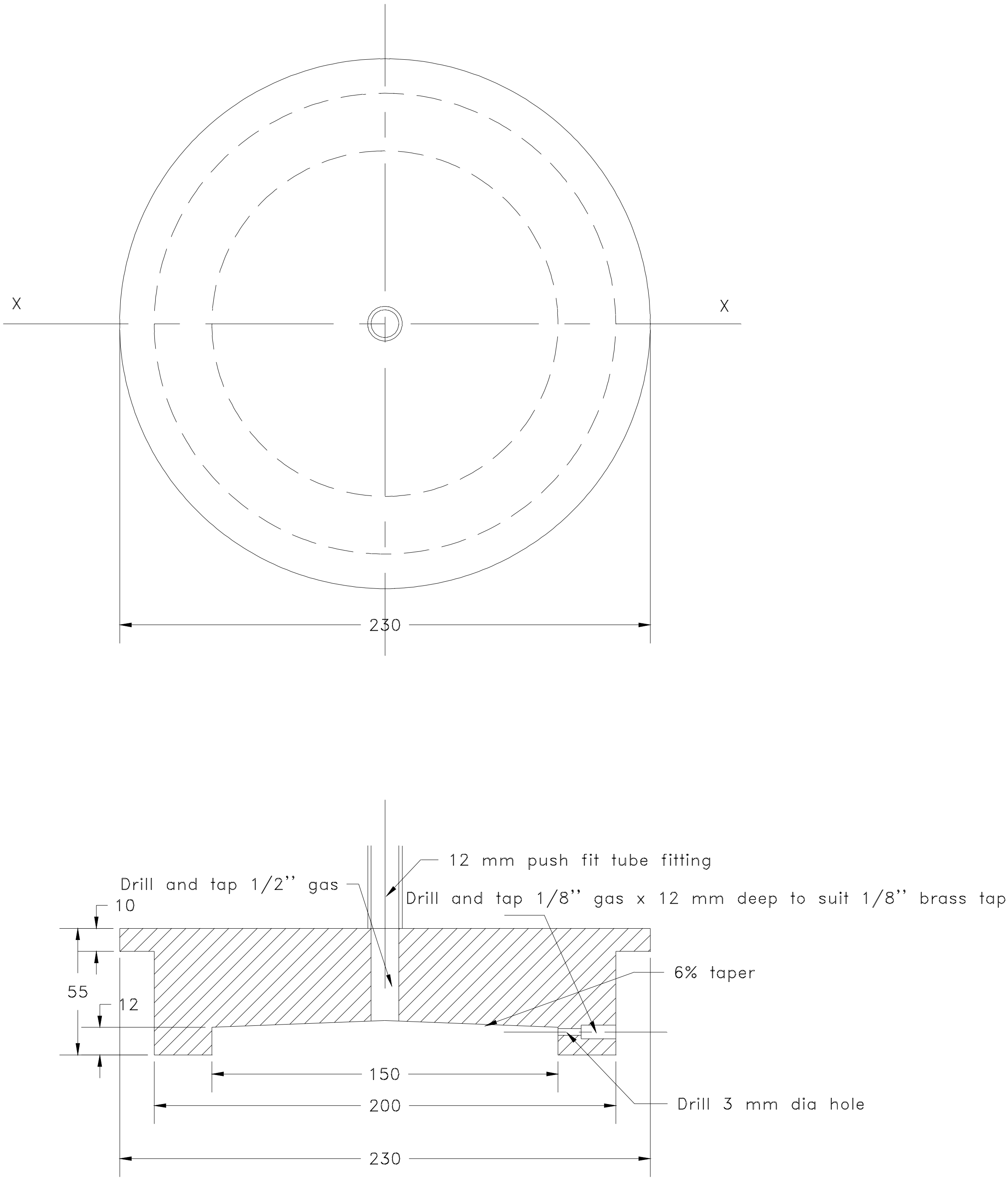


Fig 1: Permeameter Baseplate. Note all dimensions are approximate

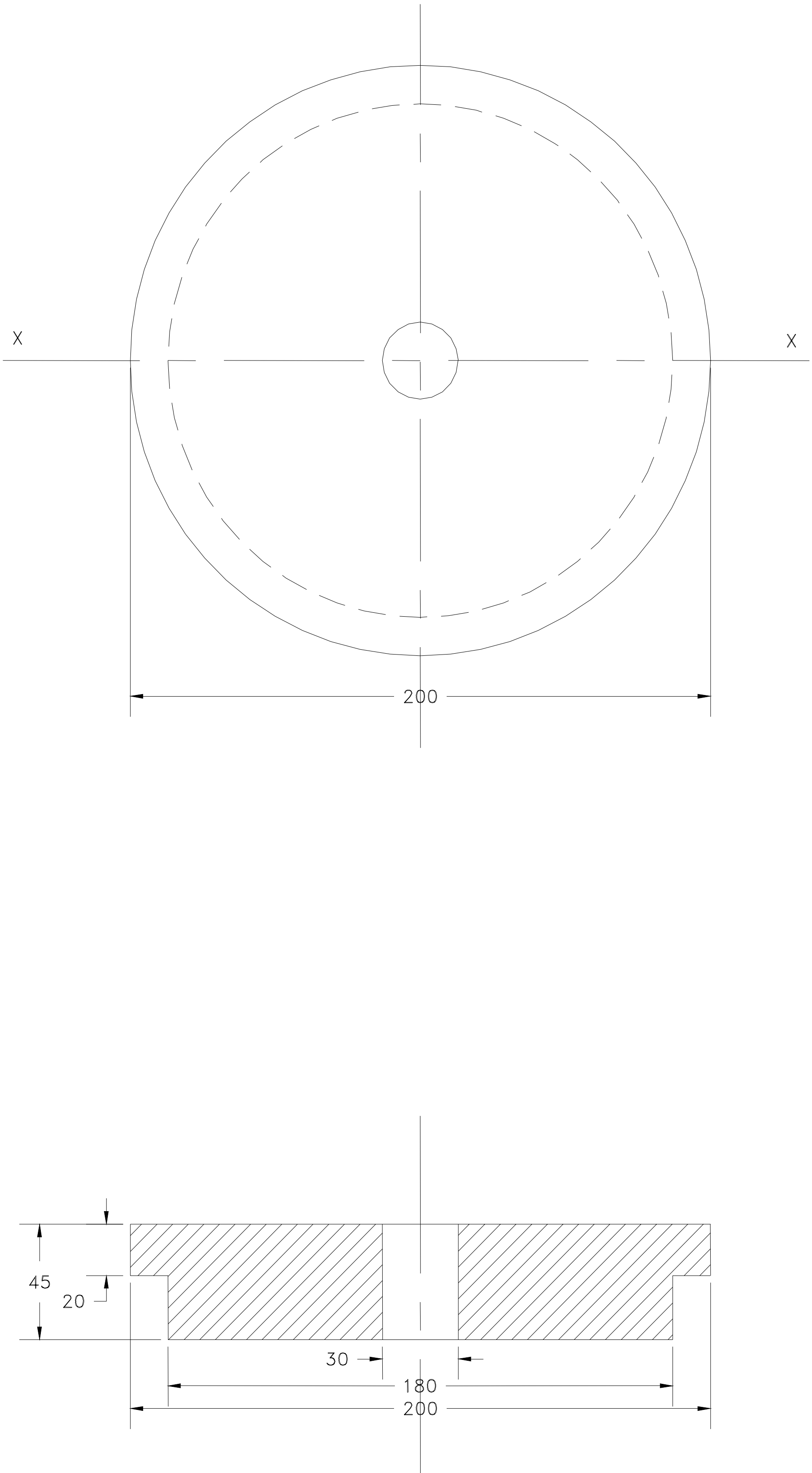


Fig 2: Base Weight. Note all dimenstions are approximate.