METHOD FOR MEASURING PAVEMENT LIFT THICKNESS

1. SCOPE

1.1 This method describes the steps to follow when measuring lift thickness from cores of one or more lifts of pavement.

2. RELEVANT DOCUMENTS

MTO Laboratory LS–100, Rounding-off of Test Data and Other Numbers

MTO Laboratory LS–101, Calculation of Per Cent within Limits

3. DEFINITIONS

3.1 Lift Thickness: As determined through measurement, the thickness in millimetres of a placed and compacted lift of surface or binder course.

4. APPARATUS

4.1 THICKNESS MEASURING APPARATUS

4.1.1 Plate

The base of the prefabricated device shall consist of a cold rolled aluminium plate, a minimum of 6 mm thick. The plate shall be rigid enough to provide a flat working surface. The plate shall have minimum surface dimensions of 350 mm by 300 mm, to allow both the core and the height gauge to sit perpendicularly on the plate. The plate surface shall be marked with a central axis running parallel across the centre of the longer axis of the plate, to coincide with the centre axis of the scriber and height gauge. A set of crosshairs running perpendicular to the central axis, offset 0 mm, 25 mm, 50 mm, and 75 mm from the tip of the scriber shall also be marked on the plate, along the axis and away from the height gauge to assist in positioning the cores for measurement. See Figure 1 for a detailed diagram of the plate markings and Figure 2 & 3 for the layout of the plate.

4.1.2 Height Gauge

The height gauge shall be equipped with a tipped scriber. The base of the gauge shall be securely fixed to the plate with the height gauge's scriber located at the 0 mm crosshair mark, centred over the central axis, vertically perpendicular to the plate (see Figures 1, 2, and 4). The height gauge must be capable of measuring to an accuracy of 0.5 mm or 0. 02 inch.

4.1.3 Spirit Level

4.1.4 Right Angle

4.1.5 Calibration Blocks

4.1.6 Marker

Writing implement capable of applying a permanently visible mark on the side of an asphalt pavement core.

4.1.7 Test Core

The core sample should have a minimum diameter of 50 mm, and shall be representative of the pavement lift(s) being measured. The diameter of the core shall be greater (e.g. 100 mm or 150 mm) when identifying delineation between the pavement lifts cannot be determined with confidence. The core may include additional lifts of pavement from which it was removed or the underlying lifts may be split off. A damaged core shall not be used for measurement. The core shall be clean and brushed to remove any loose subgrade aggregate that might be present.

5. PROCEDURES

5.1 MEASURING LIFT THICKNESS OF CORE SAMPLES

5.1.1 Setting Up Apparatus

5.1.1.1 Once a desired location for positioning the apparatus is found, a spirit level should be used to ensure that the surface of the plate is reasonably level and a right angle shall be used to confirm that the height gauge is measuring perpendicular to the plate's surface.

5.1.1.2 After setting up the equipment and prior to taking any measurement, the accuracy of the height gauge shall be verified using a combination of calibration blocks to match the lift thickness that is specified in the contract. Any deviations in the accuracy shall be corrected prior to any readings being taken.

5.1.1.3 Ensure that the surface, markings, and engravings on the plate are clean and free of debris.

5.1.2 Preparing the Core

5.1.2.1 Using the marker make a random mark on the side of the core, near the top of the surface course.

5.1.2.2 Place the core with the top of the surface course on the plate (core upside down), with the core centred over the main centre axis with the mark made in 5.1.2.1 located adjacent to the 0 mm crosshair (identified as #1) beside the scriber, so the scriber can move vertically up and down freely without rubbing against the core.

5.1.2.3 The core must sit freely upon the plate. The core should not be tilted to make contact with the height gauge as this will result in a false measurement. Height measurements will be taken approximately perpendicular to the upper plane of the surface course.

5.1.3 Measurement and Recording

5.1.3.1 Measure and record the distance between the upper plane of the lift to be measured and the lower plane of the lift being measured. This is done placing the scriber at the upper plane of the lift, zeroing the height gauge, raising the scriber to the lower plane of the lift or construction demarcation line between the lift being measured and the underlying lift. When delineation between the pavement lifts cannot be determined readily, the technician shall use the best practices listed in Section 7. The

technician may move the core along the central axis, so the scriber does not rub against the core as it is raised vertically to the construction demarcation. The lift height shall be read to the closest 0.5 mm or 0.02 inch. If the height gage measures in inches, convert the reading to millimetres and record the Height Measurement on the "Lift Thickness Measurement Recording Form", Figure 5. Height measurements will be reported to 0.5 millimetres. The core is not to be rotated when making a height measurement for a specific point on the core.

5.1.3.2 The first reading taken at position #1 is H_1.

5.1.3.3 Once the first reading is taken, the core should be rotated counter clockwise, 90° at a time. Use the mark on the core, the crosshairs, and #2, #3, and #4 marked on the plate as a guide to obtain three additional measurements H_2, H_3, and H_4, as in 5.1.3.1 above, for a total of four height measurements located equal distance from each other around the core.

5.1.3.4 The core's lift thickness is determined by calculating the mean of the four height measurements (H_1, H_2, H_3, and H_4) according to LS-101. The core's lift thickness measurement will be reported in millimetres to the closest 0.5 mm in accordance with LS-100.

5.1.3.5 When the technician cannot determine delineation with confidence by employing any of the best practices, the thickness shall be recorded as "indeterminate".

6. REPORT

6.1 *Record data and information as detailed in section 5.1.3 (Height Measurement on the "Lift Thickness Measurement Recording Form", Figure 5).*

7. NOTES

7.1 Identification of the asphalt layers in a core sample, which is necessary to measure the thickness of the various layers, requires skill, judgement and experience. When paving is completed on a milled surface, delineation of the boundary between the milled surface and the new asphalt can be particularly difficult. MTO frequently uses small (2 inch) diameter cores, to minimize damage to the finished pavement, but this may make layer identification more difficult.

7.2 Best Practices to Differentiate Asphalt Layers in a Core

7.2.1 Surface dry the core sample. A low temperature oven or a hair dryer may be employed to dry the core. A dry sample may highlight aggregate and asphalt cement differences which will help delineate the layers.

7.2.1 Examine the coarse and then the fine aggregates for a change in either the rock type, size, colour, texture or shape.

7.2.3 Examine the asphalt mastic colour; new asphalt cement may display a darker and/or more polished appearance as a result of friction with the core bit.

7.2.4 Examine the proportion of asphalt mastic through the depth of the core. Different mix types may have different proportions of mastic;

7.2.5 When paving over a milled surface, the bond strength between the milled surface and the new asphalt may be weaker than the strength of either asphalt layer. To confirm a layer boundary, warm the core to approximately 40C and with hand pressure, gently try to bend the sample to separate the layers;

7.2.6 In uncertain situations, consult a colleague or Supervisor for a second opinion.

7.3 When none of the above best practices allow the technician to determine the interface between the pavement lifts, report the thickness as "indeterminate" and request a new 150 mm diameter core for measurement. .

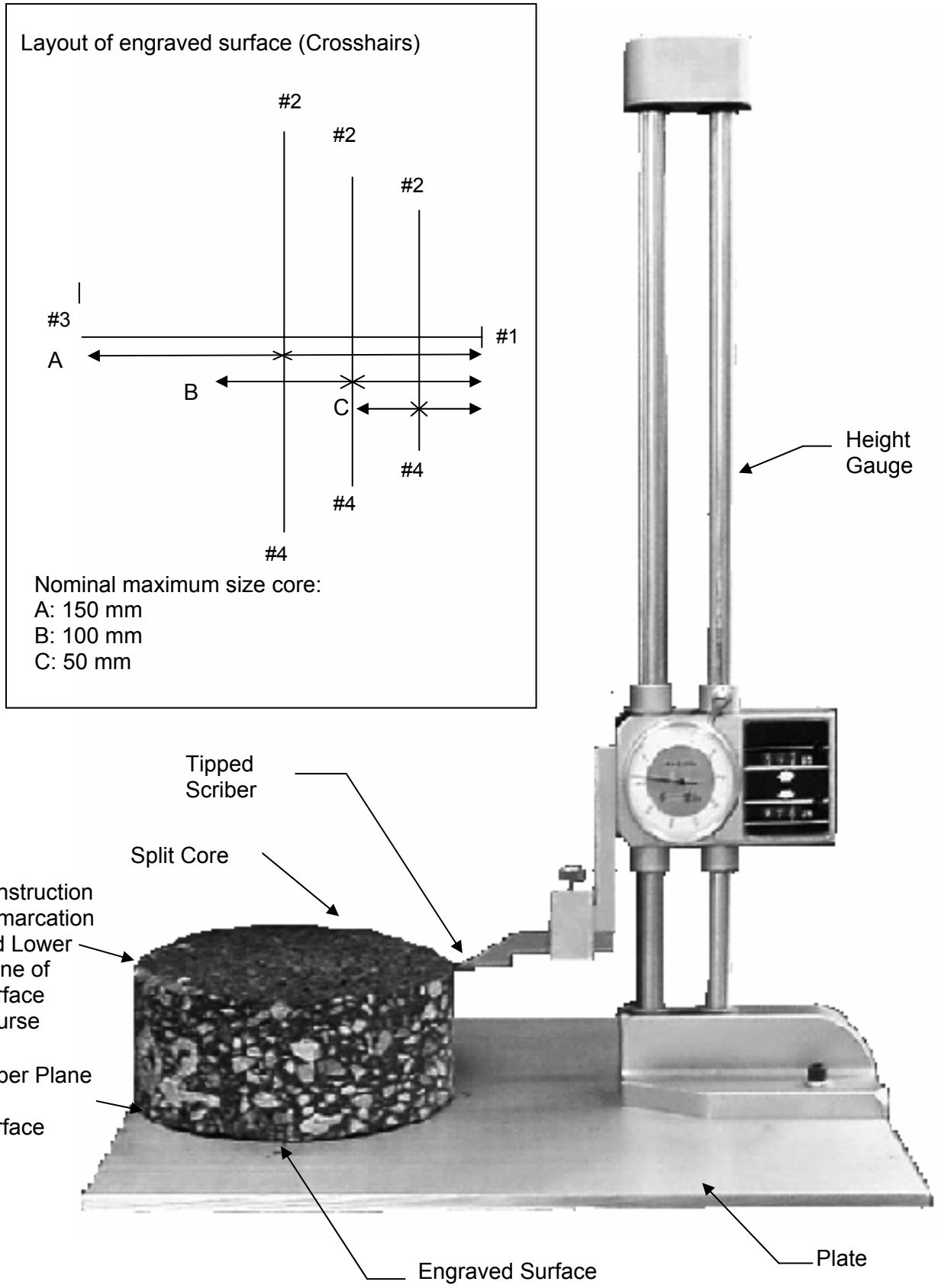

Figure 1: Detailed Side View of Thickness Measuring Apparatus with a Split Core

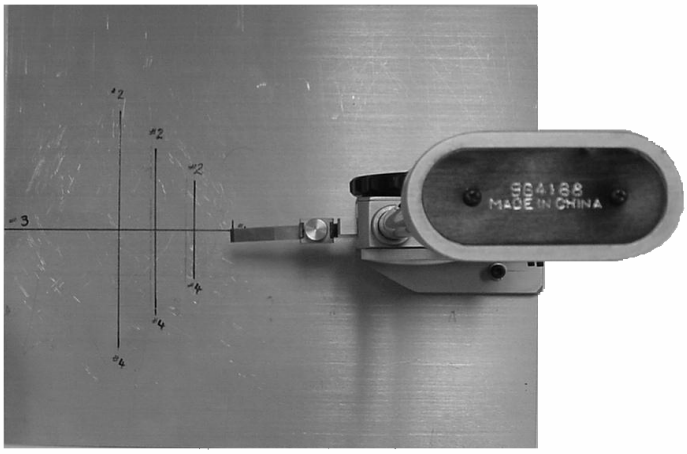

Figure 2: Top View of Plate and Height Gauge

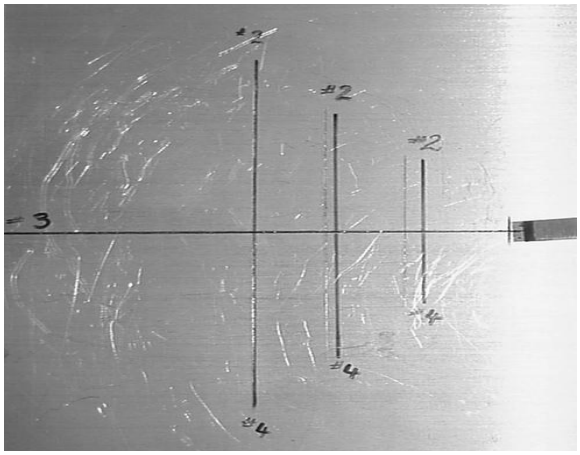

Figure 3: Top View Showing Cross Hairs and Tip of Scriber

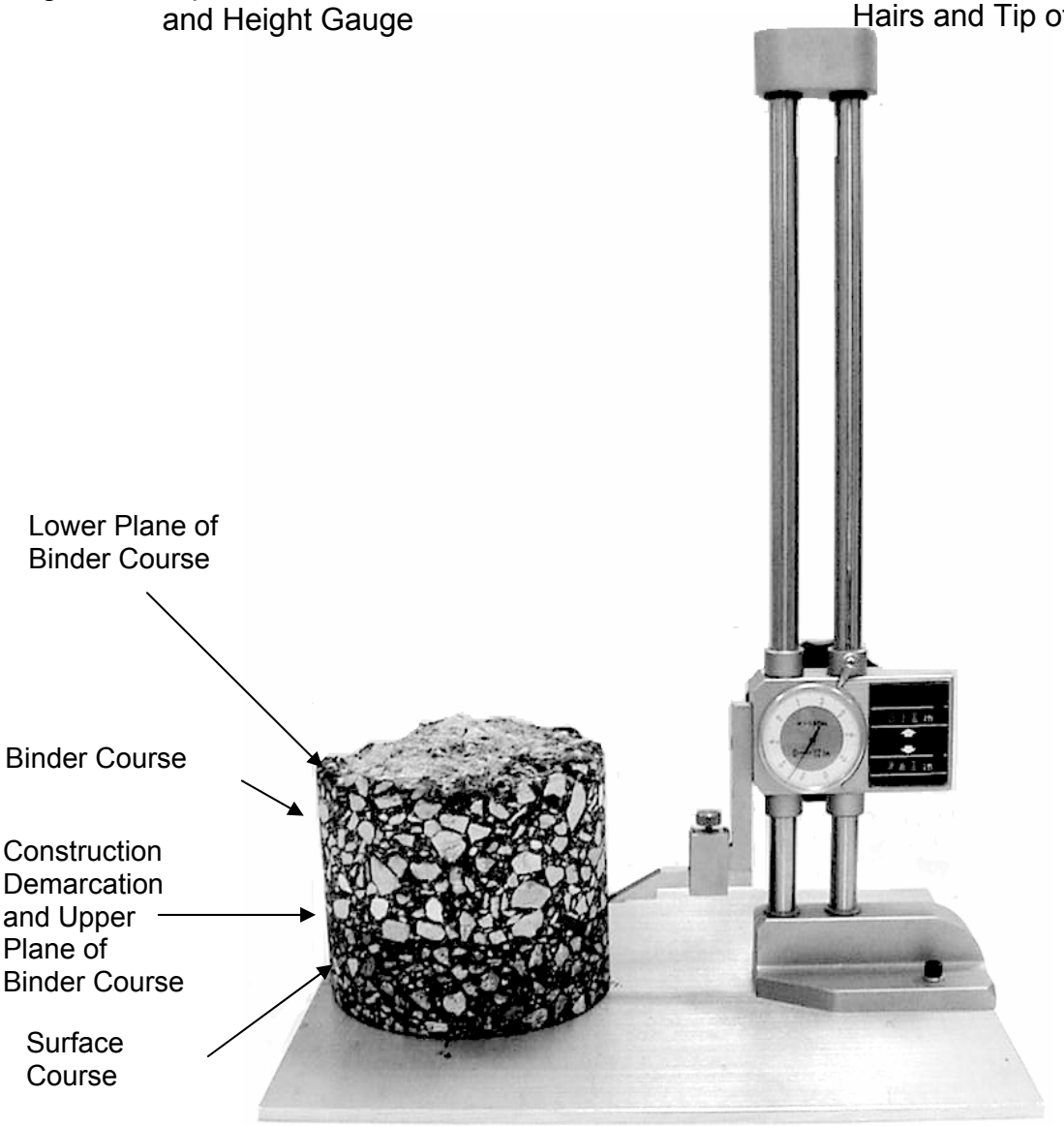

Figure 4: Side View of a Thickness Measuring Apparatus Measuring Binder Course

Lift Thickness Measurement Recording Form

Contract No.		Region		Lot No.	
Item No.		Highway		Lot Size	
Lift		Core Diameter		Number of Sublots	
Mix Type					

Sublot #	Station	Offset from **	Date Sampled (dd/mm/yy)	Time Sampled	Height Measurements (mm) H_1	H_2	H_3	H_4	*Lift Thickness Measuements (mm)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									

*Where:

Lift Thickness Measurement = (H_1 + H_2 + H_3 + H_4) / 4

** Note: Fill in where offset is taken from, ie. centreline, left or right pavement edge.

The Conctractor's representative was informed of the above, sublot numbers _____ to _____ on (Date) _____ at (time) _____

Ministry Rep. Signature _____ Contractor Rep. Signature _____

Comment: _____