



**Transport**  
Roads & Maritime  
Services

# Test method T541

Surface tension of tars and oils  
(Nellensteyn's method)

NOVEMBER 2012



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## Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added. Caution Note Altered	D.Dash	Jan 2000
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	November 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T541 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T541

## Surface tension of tars and oils (Nellensteyn's method)

### 1. Scope

This test method sets out the procedure for determining the surface tension of tars or oils which are used to calibrate the spraying nozzles of bitumen sprayers. The procedure is derived from "Asphalts and Allied Substances" Vol.4,6th ed.,p.144,145 by H Abraham.

### 2. Apparatus and Materials

- (a) The apparatus is illustrated in the attached diagram.
- (b) Liquids for standardization:

Liquids for Standardization	Surface Tension mN/m
Distilled Water	71.92
AR Benzene	28.23
AR Acetone	23.08
AR Nitrobenzene	43.28

- (c) Mercury - clean and dry.

### 3. Procedure

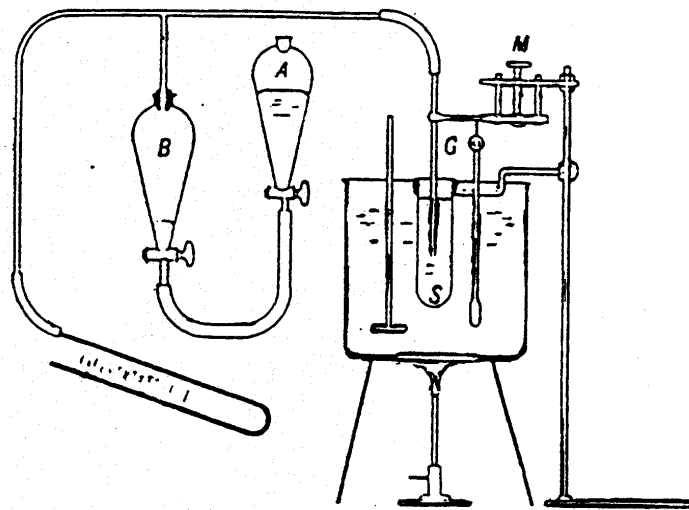
- (a) Set up the apparatus as shown in the attached diagram.
- (b) Pour the sample of liquid being tested into tube S to a height of about 50 mm and immerse in a constant temperature bath at the specified temperature until thermal equilibrium is attained.
- (c) Lower the glass tube G with a capillary size outlet until its tip just touches the surface of the liquid under test. Contact is adjustable by use of the screw clip M.
- (d) Adjust the stopcocks on the separating funnels A and B so that the mercury in funnel A slowly flows into funnel B, thus creating a pressure within the system. At a definite maximum pressure the air bubble formed at the tip of the glass tube will burst, thereby releasing part of the pressure in the system. The rate of bubble formation should not exceed two bubbles per minute.
- (e) On the inclined manometer mark the maximum pressure at which the air bubbles burst on the inclined scale.
- (f) Repeat the sequence of operations (a) to (e) on the standard liquids.

#### 4. Calculations and Reporting

- (a) Use the marked points derived from the liquids of known surface tension to calibrate the scale in a linear fashion. From this scale read the surface tension of the unknown liquid.
- (b) Report the surface tension in “mN/m (Nellensteyn's Method)”

#### 5. Techniques

- (a) The lower the slope on the inclined scale, the greater will be the length of scale produced.
- (b) The manometer tube must be scrupulously clean to allow free oscillation of the liquid with changes in pressure. The liquid consists of water containing a small amount of fluorescein.
- (c) The stopper on the sample tube S must have a breathing hole so that pressure does not build up in it.



Modified Apparatus for Surface Tension