SPECIFICATION

FOR

LOCAL STANDARD CAPACITY MEASURES

AND

TESTING EQUIPMENT

GLASS DELIVERY MEASURES

(Glass pipettes)

In accordance with the provisions of sections 4(2) and 5(5) of the Weights and Measures Act 1985, the Secretary of State hereby approves the material and form of local standards of capacity and testing equipment conforming with this specification.

This specification supersedes SWM 263 (January 1971).

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STD 4827

SPECIFICATION FOR LOCAL STANDARD CAPACITY MEASURES AND TESTING EQUIPMENT GLASS PIPETTES

Note: Pipettes made to BS 1583 (1986) and BS 700 (1962) and OIML IR 40 comply with this specification in so far as they relate.

NOMINAL CAPACITIES

1 The local standard pipettes specified shall conform to BS 1583 (1986) and shall have nominal capacities of:

1 ml, 2 ml and 5 ml.

The testing equipment pipettes specified shall conform to BS 700 (1962) or OIML IR 40 and shall have nominal capacities of:

1 ml, 2 ml, 5 ml, 10 ml, 25 ml

Alternatively, existing pipettes conforming with BS 700 may continue to be tested and certified as local standards.

DEFINITION OF CAPACITY

2 The capacity is the volume of water at 20 °C delivered by a pipette when the top of the scale mark is tangential to the bottom of the meniscus when emptied as specified in Appendix A.

MATERIAL

3 The pipettes shall be constructed of good quality clear glass, shall be well annealed and free from any defects that would adversely affect their performance. There shall be no visible defects in the vicinity of the scale marks.

GENERAL CONSTRUCTION

4 The pipettes shall be of cylindrical form and of the general design shown in Figure 1.

5 The top of the pipette shall be finished at right angles to the axis and shall be free from any blemishes which would interfere with the required accurate control by finger in setting the water meniscus. The top shall be either smoothly ground with a slight bevel on the outside or lightly flame polished.

6 The lower end of the pipette shall terminate in a delivery jet having a gradual taper as shown in Figure 2 without any sudden constriction at the orifice. The end of the jet shall be smoothly ground at right angles to the axis and slightly bevelled on the outside.

7 The pipettes shall comply with the dimensions in Table 1. These are the only mandatory dimensions but it is recommended that the pipettes should also comply with the dimensions in Table 2, which have proved satisfactory in use.

GRADUATIONS

8 The scale marks shall be clear, permanent lines of uniform thickness not exceeding 0.3 mm lying in planes at right angles to the axis of the pipette. Scale marks shall be omitted at the jet, the lowest scale mark being as shown in Table 3.

9 There should be no irregularity in the spacing of the scale marks and the spacing shall be such as to give scale lengths within the limits specified in Table 1.

The delivery time thus determined shall not be less than 10 seconds or greater than 40 seconds.

INSCRIPTIONS

10 The following inscriptions shall be marked permanently and legibly on the pipettes:

(a) The nominal capacity - eg '25 ml'

(b) The abbreviation 'EX 20 °C' to indicate that the pipette has been adjusted 'to deliver' at the reference temperature of 20 °C.

(c) The maker's or supplier's name or mark and the name of the local authority may also be marked.

LIMITS OF ERROR

11 The permissible limits of error in the purported volume of water delivered by a pipette at 20 °C shall not exceed the amounts specified in Regulations made under sections 4(5) and 5(9) of the Weights and Measures Act 1985, as shown in Table 4.

TABLE 1
MANDATORY DIMENSIONS

Dimension	Nominal capacity				
	1 ml	2ml	5 ml	10 ml	25 ml
	mm		mm		
Distance from highest to lowest scale mark	140-200		160 - 200		
Minimum distance from highest scale mark to top of pipette	100		100		

TABLE 2
RECOMMENDED DIMENSIONS

Dimension	1 ml mm	2 ml mm	5 ml mm	10 ml mm	25 ml mm
Minimum overall length	**360**	360	360	360	360
Length of tapered portion forming jet	15-25	15-25	20-30	20-30	25-35
Minimum length of suction tube	-	-	25	25	25
External diameter of graduated tube	6.5-7.5	7-8	-	-	-
External diameter of suction tube	-	-	5.5-6.5	6.5-7.5	6.5-7.5
External diameter of jet at top of bevel	2-3	2-3	2.5-3.5	2.5-3.5	3.5-4.5
Minimum wall thickness	2	2	1	1	1

TABLE 3
ARRANGEMENT AND NUMBERING OF SCALE MARKS

Nominal capacity	Numbered at every	Lowest scale mark
1 ml	0.1 ml	0.1 ml
2 ml	0.2 ml	0.2 ml
5 ml	0.5 ml	0.5 ml
10 ml	1 ml	1 ml
25 ml	2 ml	2 ml

In the case of the 25 ml pipette the topmost scale mark shall be numbered.

TABLE 4
LIMITS OF ERROR

Nominal capacity	Limits of error ± ml	
	Local standard	Testing equipment
1 ml	0.04	0.1
2 ml	0.04	0.1
5 ml	0.06	0.2

10 ml	-	0.2
25 ml	-	0.2

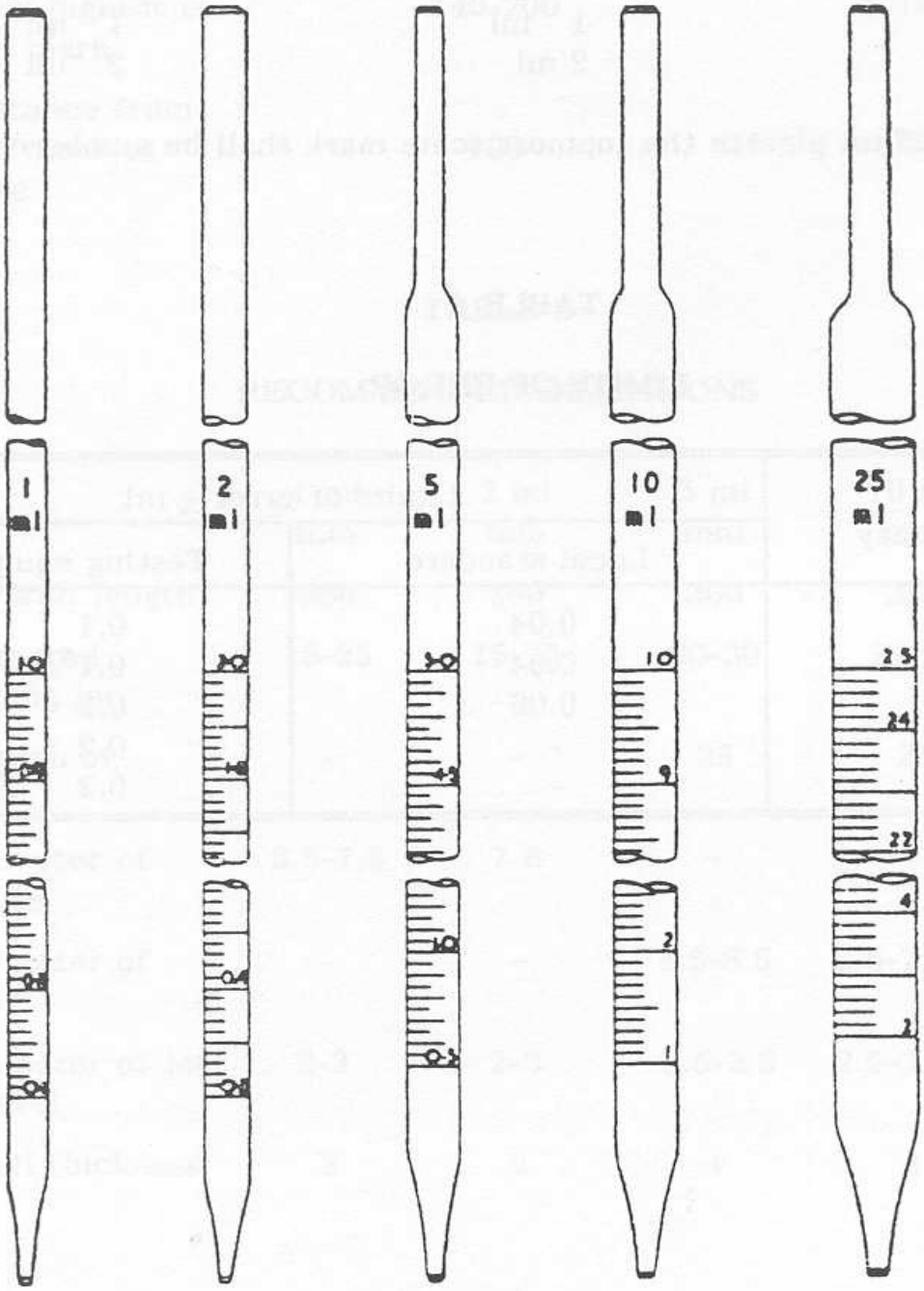
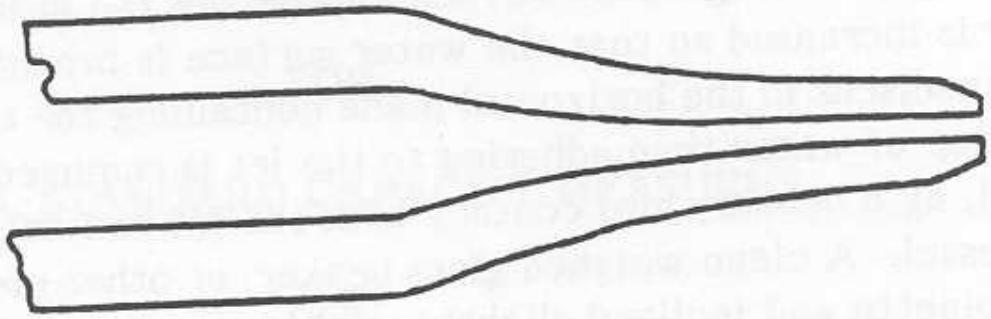
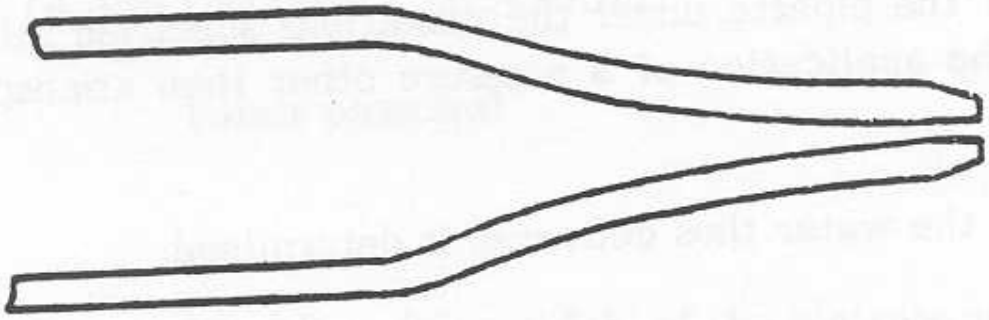


Figure 1



1 and 2 ml



5, 10 and 25 ml

DELIVERY JETS

Figure 2

APPENDIX A

METHOD FOR THE DETERMINATION OF DELIVERED CAPACITY

When determining the capacity of a pipette the following procedure is to be observed, the pipette having first been thoroughly cleaned.

The pipette in a vertical position shall be filled with distilled water to a short distance above the graduation mark, the water being retained in the pipette by pressing a finger on to the top of the suction tube. The outside of the delivery jet is wiped free from water with a cloth. By reducing the pressure of the finger, water is allowed to run out slowly. As the descending water surface approaches the graduation mark the pressure of the finger is increased so that the water surface is brought to rest with the lowest point of the meniscus in the horizontal plane containing the top edge of the graduation mark. The drop of water then adhering to the jet is removed by bringing the inside of a glass vessel, eg a beaker, into contact with the jet and detaching the drop on to the side of the vessel. A clean weighed glass beaker, or other convenient vessel, is placed beneath the pipette and inclined slightly so that the tip of the jet of the pipette is in contact with the inside of the vessel. The finger on the top of the pipette is then removed and the pipette allowed to empty. In order to ensure delivery of the true capacity, the tip of the pipette is kept in contact with the inside of the receiving vessel for approximately 3 seconds after movement of the meniscus appears to have ceased. The small quantity of water remaining in the jet is not expelled, nor the natural rate of delivery of the pipette under the conditions specified influenced in anyway, for example by the application of a pressure other than atmospheric to the top of the pipette.

The weight of the water thus delivered is determined.

All operations are to be carried out at room temperature. The volume of water delivered by the pipette at 20°C is calculated from the weight thus determined, by applying a correction for water temperature and, where necessary, air temperature and pressure (see BS 1797).

The method of delivery described above leaves a small quantity of water remaining in the jet of the pipette and, when using the pipette, no method of emptying, such a blowing out, should be used which expels liquid completely from the jet or increases the natural rate of delivery.