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Series 148
Série des 148

WITHDRAWAL

June 2016

Standards in series Geosynthetics

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Juin 2016

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CAN/CGSB-148.1

Methods of testing geosynthetics

No. 1-94/ISO 9862:1990

Geotextiles — Sampling and preparation of test specimens (ICS 59.080.70)

No. 2-M85

Mass per unit area (ICS 59.080.70)

No. 3-M85

Thickness of geotextiles (ICS 59.080.70)

No. 4-94

Geotextiles — Normal water permeability under no compressive load (ICS 59.080.70)

No. 6.1-93

Bursting strength of geotextiles under no compressive load (ICS 59.080.70)

No. 7.3-92

Grab tensile test for geotextiles (ICS 59.080.70)

No. 10-94

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CAN/CGSB-148.1

Méthodes d'essai des géosynthétiques

N° 1-94/ISO 9862 :1990

Géotextiles — Échantillonnage et préparation des spécimens d'essai (ICS 59.080.70)

N° 2-M85

Masse surfacique (ICS 59.080.70)

N° 3-M85

Épaisseur des géotextiles (ICS 59.080.70)

N° 4-94

Géotextiles — Perméabilité à l'eau dans un sens normal sans charge de compression (ICS 59.080.70)

N° 6.1-93

Résistance à l'éclatement des géotextiles non sollicités en compression (ICS 59.080.70)

N° 7.3-92

Essai de résistance à la rupture des géotextiles — Essai d'arrachement (ICS 59.080.70)

N° 10-94

Géotextiles — Détermination du diamètre d'ouverture de filtration (ICS 59.080.70)

No. 14-93

Stiffness of geotextiles (ICS 59.080.70)

No. 100-95

Conditioning geosynthetics for testing
(ICS 59.080.70)

CAN/CGSB-148.2-M89

Geotextiles and geomembranes —
Definitions (ICS 59.080.70)

N° 14-93

Rigidité des géotextiles (ICS 59.080.70)

N° 100-95

Conditionnement des géosynthétiques
pour fins d'essais (ICS 59.080.70)

CAN/CGSB-148.2-M89

Géotextiles et géomembranes — Définitions
(ICS 59.080.70)

NATIONAL STANDARD OF CANADA

CAN/CGSB-148.1

No. 6.1-93

Methods of Testing Geotextiles and Geomembranes

Bursting Strength of Geotextiles Under No
Compressive Load



QUALITY

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**METHODS OF TESTING GEOTEXTILES
AND GEOMEMBRANES**

**BURSTING STRENGTH OF GEOTEXTILES UNDER
NO COMPRESSIVE LOAD**

Prepared by the
Canadian General Standards Board 

Approved by the
Standards Council of Canada 

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CGSB Ottawa Canada K1A 1G6	METHODS OF TESTING GEOTEXTILES AND GEOMEMBRANES	CAN/CGSB-148.1
	Bursting Strength of Geotextiles Under No Compressive Load	No. 6.1-93

1. PURPOSE AND SCOPE

- 1.1 This method determines the bursting strength of geotextiles. It is intended primarily for nonwoven geotextiles, although woven or composite fabrics may also be tested for specific applications.
- 1.2 The testing and evaluation of a product against this method may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this method has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any existing applicable regulatory requirements prior to its use.

2. PRINCIPLE

- 2.1 The test causes rupture of a geotextile specimen by means of a uniform pressure applied to its surface. A geotextile specimen and a rubber membrane are clamped between a circular base plate and a clamp ring, as shown in Figure 1 (Note 1). A volume of water is injected under the elastic membrane on which the geotextile rests. This generates a pressure "p", which bulges the specimen into the shape of a spherical dome (Figure 2), and which is gradually increased until the specimen is ruptured. The value of "p" at rupture, expressed in kilopascals, is denoted as the bursting strength.

3. APPLICABLE PUBLICATIONS

- 3.1 The following publications are applicable to this method:
 - 3.1.1 Canadian General Standards Board (CGSB)
CAN/CGSB-148.1 — Methods of Testing Geotextiles and Geomembranes:
No. 1 — Sampling and Preparation of Specimens.
 - 3.1.2 American Society for Testing and Materials (ASTM)
D 2240 — Test Method for Rubber Property — Durometer Hardness.
- 3.2 Reference to the above publications is to the latest issues, unless otherwise specified by the authority applying this method. The sources of these publications are shown in the Notes section.

4. APPARATUS

- 4.1 **Tap water** at $20 \pm 2^\circ\text{C}$ (Figure 5, number 1).
- 4.2 **Air supply** to provide suitable pressure and flow (Figure 5, number 2). Air pressure of 800 kPa is generally sufficient to permit a flow of water of 200 mL/min (see par. 4.3). The air is used to pressurize the water in the graduated cylinder, which applies pressure to the rubber membrane and to the geotextile.
- 4.3 **Graduated cylinder** with an airtight cover, consisting of a transparent tube of Plexiglas or other material, approximately 100 mm inside diameter, 500 mm high, and 6 mm thick (Figure 4 and Figure 5, number 3). It shall be able to withstand the pressures applied during the test (maximum 600 to 1000 kPa) without deformation. The manufacturer shall provide a safety margin by guaranteeing the cylinder up to approximately 1500 kPa (maximum pressure obtained for nonwoven geotextiles). The base of the cylinder has a water inlet/outlet of approximately

Note 1: The dimensions indicated in Figures 1 and 3 are not mandatory, except that the inside diameter of the clamp ring must be 150 mm. The inside face of the ring clamp must be sloped outwards at an angle of 15° (Figure 1).

9 mm diameter. The top of the cylinder has a two-way valve which can be used as an air inlet or as a vent. The cylinder has a safety release valve (A2) that opens up at 1000 kPa. The tube is graduated from 0 to 2000 mL in 50 mL increments. The loading rate is measured in terms of the lowering of the water level in the cylinder as a function of time. For convenience, this flow is set at 200 mL/min. This value shall be maintained and standardized. A flowmeter may be used to maintain this water flow (see par. 4.4).

- 4.4 **Flowmeter** designed for the ranges of flow and pressure used in the test. Valve E3 (Figure 5) requires a high quality, low sensitivity needle valve which can be adjusted throughout the test in order to maintain a constant flow rate through the flowmeter (Figure 5, number 4). The flowmeter monitors the flow rate (200 mL/min). Valve E2 makes it possible to return the water from the cell to the graduated cylinder more rapidly at the end of the test.
- 4.5 **Burst cell** made from a transparent cylinder (Plexiglas or other material), two plates (base plate and a top plate) and a clamp ring of corrosion-resistant metal with an inside diameter of 150 ± 2 mm (Figure 1 and Figure 5, number 5). The cylinder, which must resist the pressures applied during the test, is inserted between the top plate and the ring. O-rings ensure the water tightness of the cell at both ends of the cylinder. The base plate has a water inlet and outlet in the middle, the top plate has a two-way valve (A4) which can be used as an air inlet or as a vent and a safety release valve (A5). Six long stainless steel studs, 12 mm in diameter, hold the top plate and clamp ring together. The cell is held to the base plate by six short stainless steel studs passing through the clamp ring and tapped into the base plate.
- 4.6 **Pressure gauge** that records the water pressure applied beneath the specimen (Figure 5, number 6). It is connected to the water outlet in the middle of the base plate of the cell. It must be able to measure pressures from 0 to 1000 kPa, be accurate within 5 kPa and be able to note the maximum pressure.
- 4.7 **Pressure regulator** able to adjust the supply air pressure to the cell and hold it constant, if necessary (Figure 5, number 7).
- 4.8 **Rubber membrane** to transmit the water pressure to the geotextile (Note 2). It shall be more extensible than the geotextile to be tested, watertight, thin, soft, highly elastic and made of pure natural rubber (see Figure 1). The thickness shall be 0.3 ± 0.1 mm. The hardness shall be 35 to 40 when measured on a Type A durometer in accordance with ASTM D 2240. The membrane shall be calibrated by doing the test without the geotextile so that its eventual lack of extensibility can be taken into account in the test results.

5. TEST SPECIMENS

- 5.1 Sampling and specimen preparation shall be in accordance with CAN/CGSB-148.1 No. 1. Five specimens shall be tested.
- 5.2 **Specimen Size** — Using the outside of the clamp ring of the cell as a template, trace and cut out the specimens.
- 5.3 Cut the rubber membrane(s) in the same manner as the specimens.

6. PROCEDURE (Refer to Figure 5)

- 6.1 Evacuate air from all water ducts of the system, including the pressure gauge (number 6).
- 6.2 Close all valves except E1, A3 and vent A1.
- 6.3 When the graduated cylinder is filled with water to above the 0 mL mark, close valve E1.
- 6.4 Use valve E2 to adjust the water level in the graduated cylinder to the 0 mL mark.
- 6.5 Place the circular rubber membrane on the base plate of the cell. Apply the geotextile specimen on this membrane. Assemble the cell on the base plate by tightening the clamping nuts symmetrically and sufficiently to prevent any water leakage. A thin layer of grease may be spread between the rubber membrane and the base plate to ensure watertightness.

Note 2: If the membrane characteristics described are respected, the influence of extensibility on pressure is less than one percent, whatever the geotextile.

- 6.6 Vent valve A4 during the entire test. This permits the excess air in the cell (caused by the bulging of the geotextile) to be expelled.
- 6.7 Open "on line" valve A1. Open valve E3 slightly and regulate the water flow to 200 mL per minute using the water flowmeter or by timing the quantity of water that passes.
- 6.8 As the water is injected, read the pressure on the pressure gauge every 50 mL, until it is evident that rupture is imminent, that is if a reduced rate of pressure increase, corresponding to an increased rate of volume of water, is observed. At this point, begin to take readings every 25 mL. Rupture occurs at the maximum pressure recorded on the pressure gauge. At the same time, the fabric becomes distended and the rubber membrane passes through it.
- 6.9 As soon as the rubber membrane passes through the geotextile specimen, cut the water flow by closing valve E3 and A1 in that order.
- 6.10 Depressurize the graduated cylinder by venting valve A1. Open valves E2 and A4 in that order, causing the water in the burst cell to return to the graduated cylinder. Close all valves and vent A4 when water reaches the 0 mL mark.
- 6.11 Apply a correction to the measurements of the pressure, for pressure to distend the membrane, if necessary, by calculating the difference between the measurements with rubber plus geotextile and measurements with rubber only.

7. CALCULATION

- 7.1 Calculate the bursting strength as the difference between the pressure at rupture and the membrane correction pressure.

8. REPORT

Report the following information:

- 8.1 The average bursting strength of the five specimens.
- 8.2 Individual results.
- 8.3 The air pressure required for the test in kilopascals.
- 8.4 The temperature of the water in degrees Celsius.
- 8.5 The membrane correction factor, if calculated, in par. 6.11.
- 8.6 A table of the pressure applied to the geotextile as a function of the volume of water injected at every 50 mL.
- 8.7 The internal peak water pressure and the internal water pressure at rupture, if different, in kilopascals.
- 8.8 The number of this method: CAN/CGSB-148.1 No. 6.1-93.

9. NOTES

9.1 Related Publication

- 9.1.1 Bureau de normalisation du Québec (BNQ)
7009-450/85.10.28 — Géotextiles — Détermination de la contrainte circonférentielle de traction d'un géotextile.
- 9.1.2 Circumferencial tensile strength can also be determined by using this apparatus. The test is described in BNQ 7009-450/85.10.28.

9.2 Sources of Referenced Publications

- 9.2.1 The publication referred to in par. 3.1.1 may be obtained from the Canadian General Standards Board, Sales Centre, Ottawa, Canada K1A 1G6. Telephone 1-800-665-CGSB. Fax (613) 941-8705.

- 9.2.2 The publication referred to in par. 3.1.2 may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, U.S.A or photocopies are available from the CGSB Sales Centre (par. 9.2.1).
- 9.2.3 The publication referred to in par. 9.1.1 may be obtained from the Bureau de normalisation du Québec, 50 est, rue St-Joseph, Québec, Québec G1K 3A5.

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All dimensions are in millimetres.

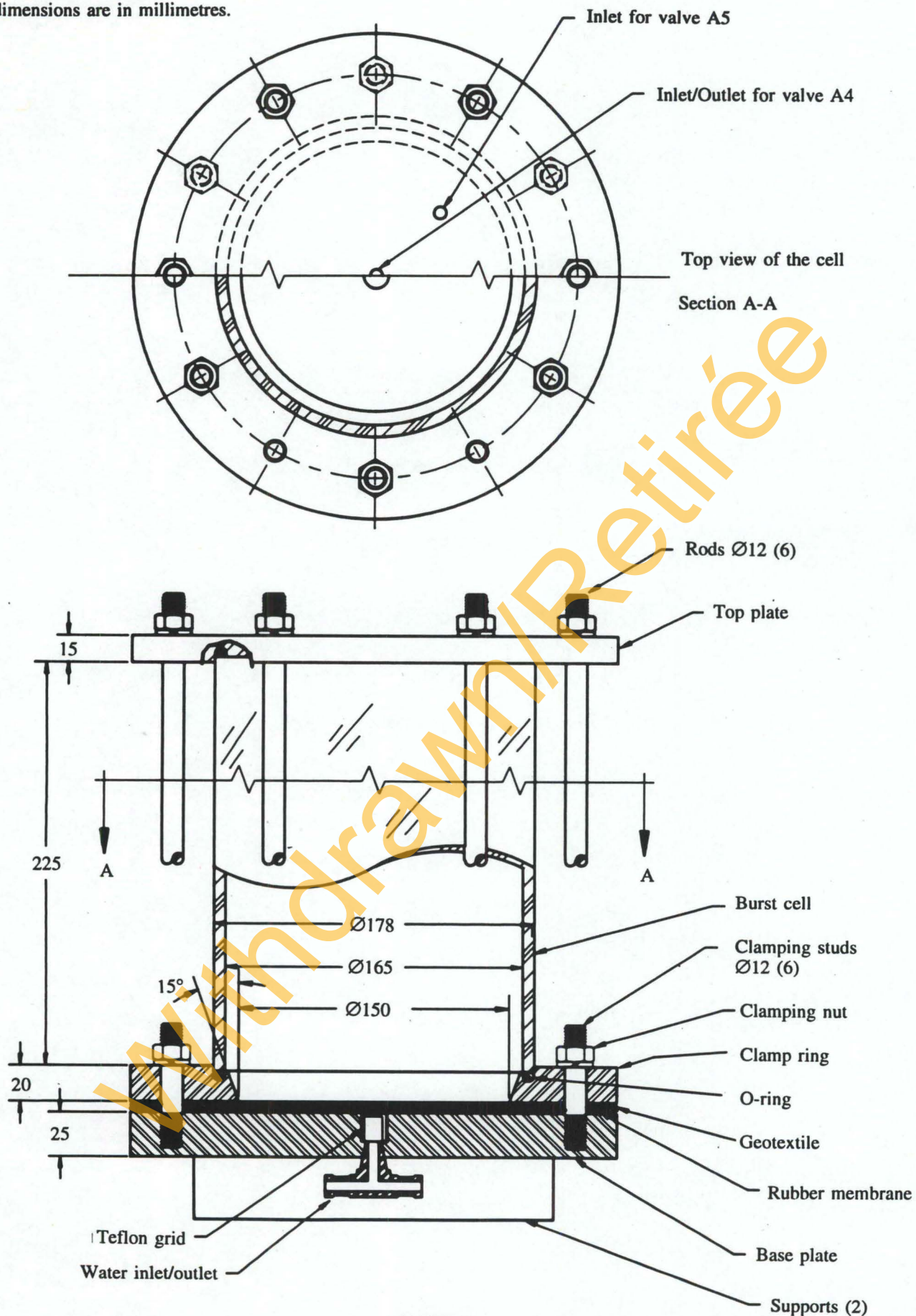


FIGURE 1
Burst Cell

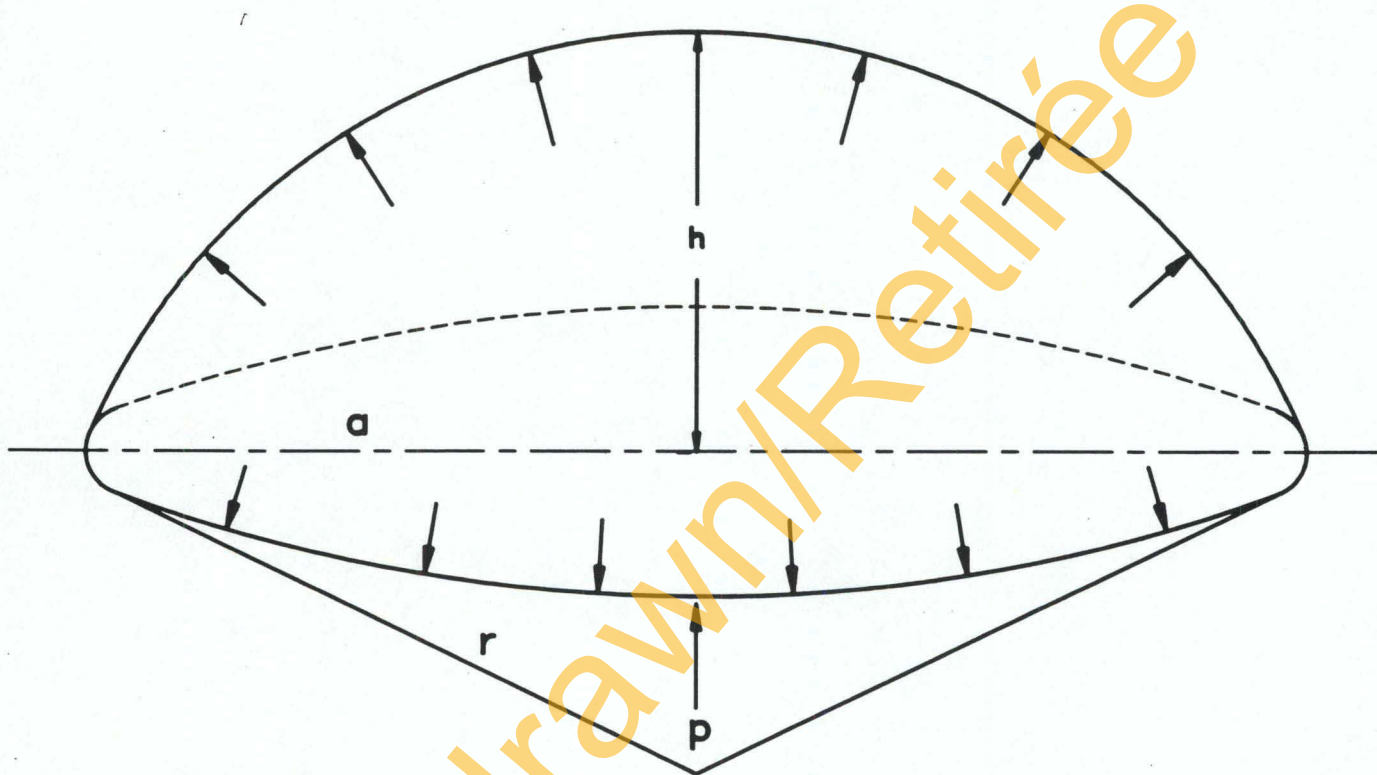


FIGURE 2
Dome Subjected to a Pressure

All dimensions are in millimetres.

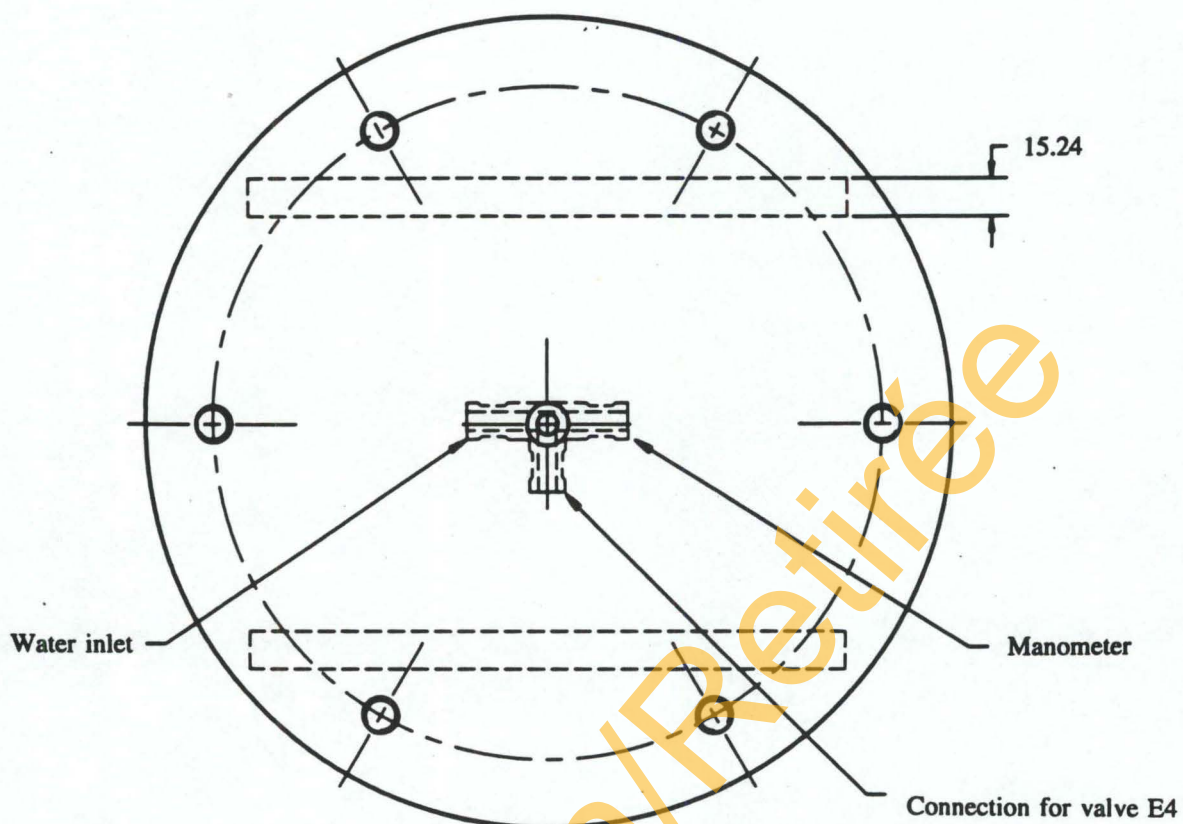
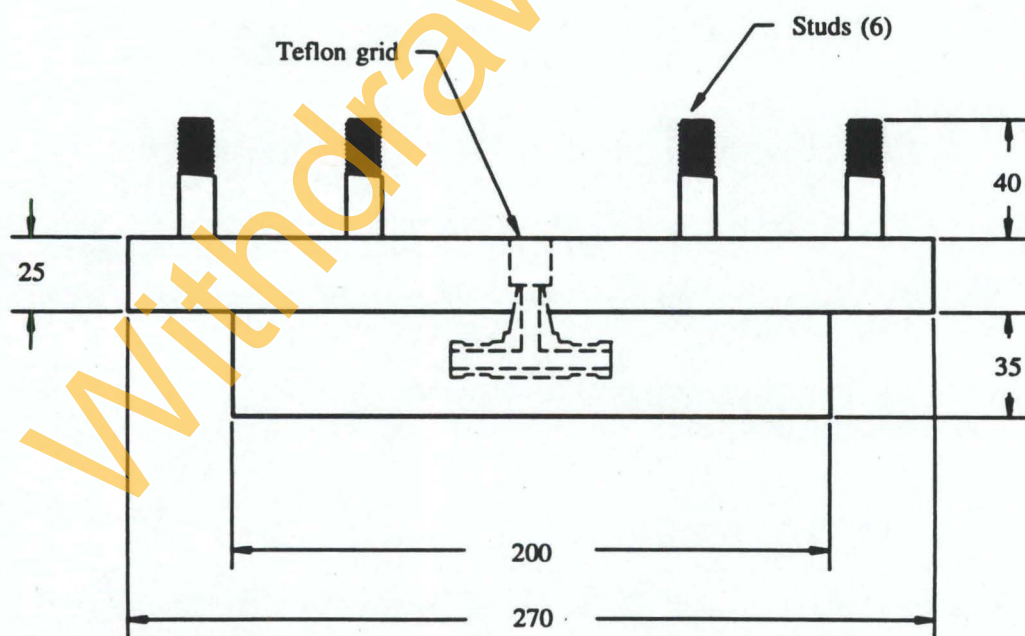


FIGURE 3
Base of Burst Cell

All dimensions are in millimetres.

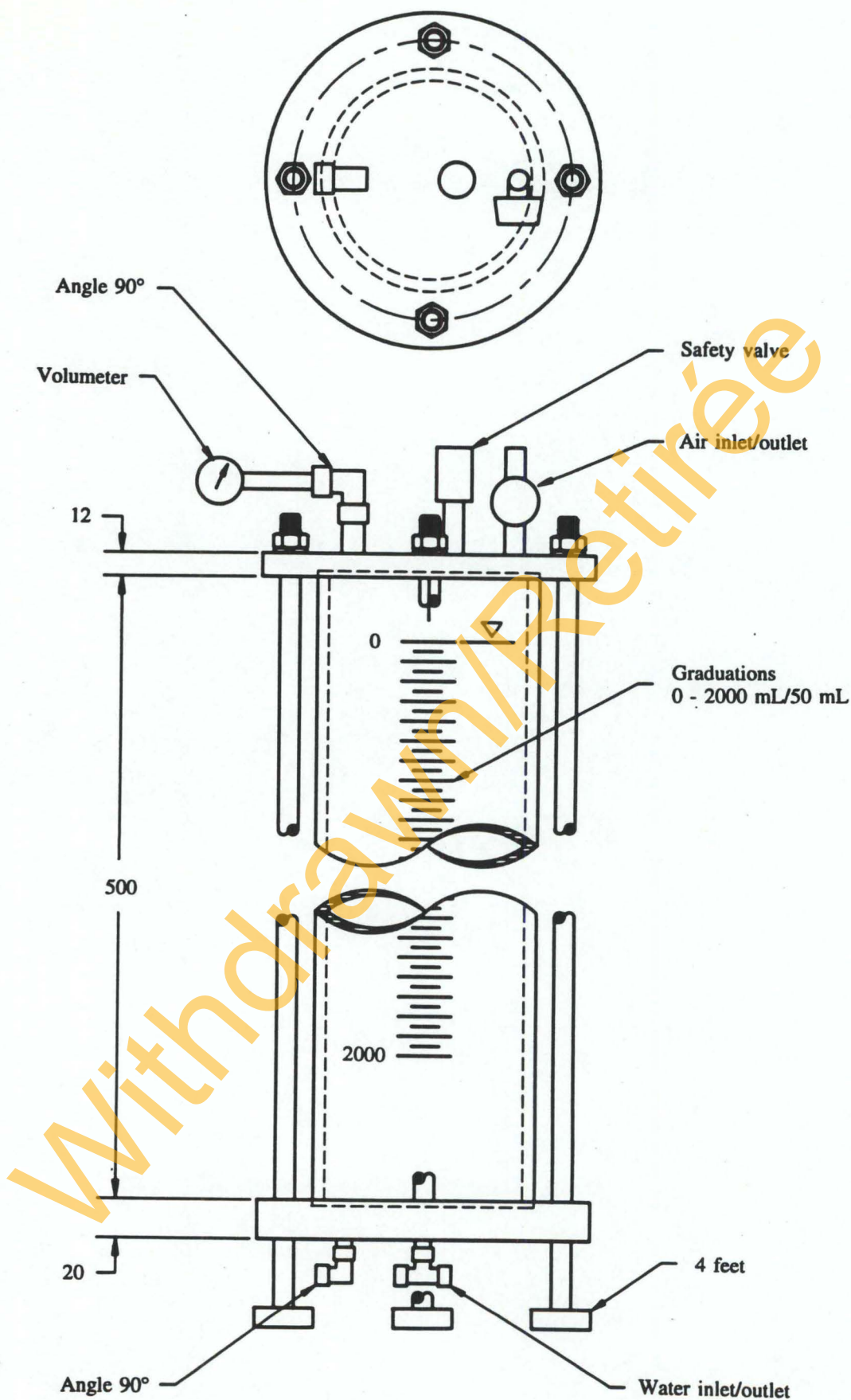
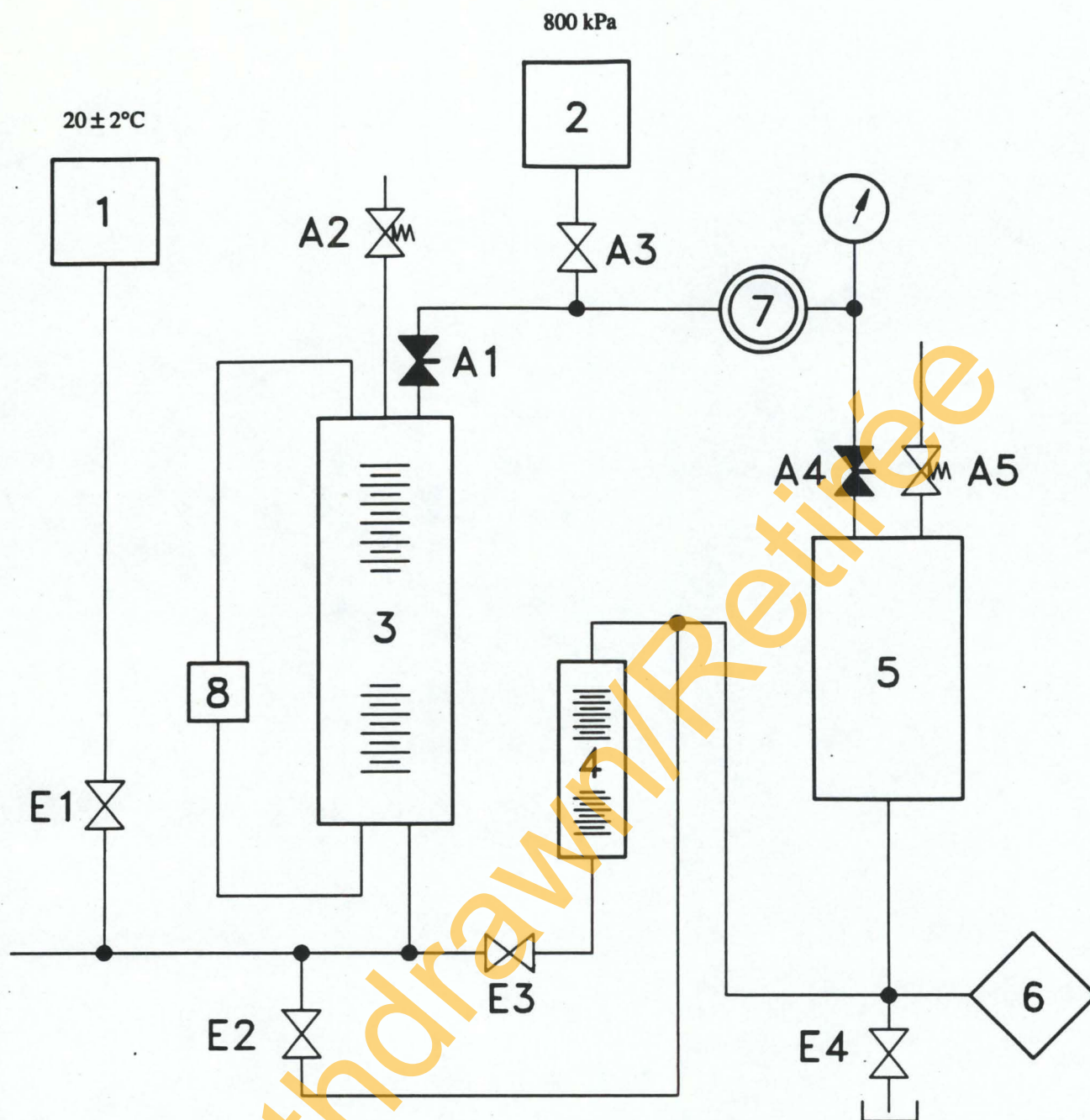


FIGURE 4
Graduated Cylinder



- 1 Water supply
- 2 Air supply
- 3 Graduated cylinder
- 4 Flowmeter
- 5 Burst cell
- 6 Pressure gauge
- 7 Pressure regulator
- 8 Volumeter

Legend:

-  = Safety valve
-  = Valve
- A = Air
- E = Water
-  = Two-way valve

FIGURE 5
Diagram of the Assembly

SPECIMEN TABLE OF RESULTS

Sample: _____ Specimen No.: _____

Date of Test: _____

VOLUME mL	PRESSURE kPa	TIME min
50		.25
100		.50
150		.75
200		1.00
250		1.25
300		1.50
350		1.75
400		2.00
450		2.25
500		2.50
550		2.75
600		3.00
650		3.25
700		3.50
750		3.75
800		4.00
850		4.25
900		4.50
950		4.75
1000		5.00
1050		5.25
1100		5.50
1150		5.75
1200		6.00
1250		6.25

p_p : internal pressure at peak
= _____ kPa

p_r : internal pressure at rupture
= _____ kPa

p_m : membrane correction pressure
= _____ kPa

p_a : tank air pressure
= _____ kPa

p_b : bursting strength
= _____ kPa

T° : water temperature
= _____ $^\circ\text{C}$



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