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मानक

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IS 5428-4 (1985): Specification for Gauge Glasses, Part 4: Circular Sight and Light Glasses [MED 17: Chemical Engineering Plants and Related Equipment]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR GAUGE GLASSES

PART 4 CIRCULAR SIGHT AND LIGHT GLASSES

(First Revision)

1. Scope — Covers the requirements for circular sight and light glasses.

2. Definitions — For the definition of various terms used in the glass industry, refer to 2 of IS : 5428 (Part 1) - 1985 'Specification for gauge glasses : Part 1 Tubular glasses for level gauges (first revision)'.

3. Material — Circular sight and light glasses shall be made of soda-lime glass or borosilicate glass, either annealed or toughened, as required.

3.1 Circular sight and light glasses shall be free from defects that would interfere with vision or service, in particular, both faces shall be free from irregularities within the area required for jointing.

3.2 The following properties shall be decided between purchaser and manufacturer depending on working conditions and shall be specified along with requisitions :

- Chemical resistance to water, acid and alkalies with some minimum limits.
- Average co-efficient of thermal expansion.
- Chemical composition of glass.
- Tensile and bending strength at ambient and maximum operating temperature.

4. Dimensions — The preferred diameters of circular sight and light glasses shall be 50, 65, 75, 100, 125, 150, 175, and 200 mm for which the tolerance shall be ± 1 mm and 255 and 305 mm, for which the tolerance shall be $\pm \frac{1}{2}$ mm.

4.1 The preferred thicknesses and appropriate tolerances of circular sight and light glasses shall be as given in Table 1.

TABLE 1 PREFERRED THICKNESSES OF CIRCULAR SIGHT AND LIGHT GLASSES

Soda-lime Glass mm	Borosilicate Glass mm
6 \pm 0.2	6.35 \pm 0.8 (nominally 6)
10 \pm 0.3	9.53 \pm 1.6 (nominally 10)
12 \pm 0.3	12.70 \pm 1.6 (nominally 12)
15 \pm 0.5	15.7 \pm 1.6 (nominally 15)
19 \pm 1.0	19.0 \pm 1.6 (nominally 19)
25 \pm 2.0	24.40 \pm 2.4 (nominally 25)

4.2 Other dimensions and tolerances as agreed to between the purchaser and the vendor are permitted within this standard, provided that the glasses comply with the other clauses of the specification.

4.3 Glasses shall be flat (that is free from bow) within the limits specified in Table 2.

4.4 When glasses are required with thicknesses other than those given in Table 1, or diameters outside the range given in 4, the limits of bow shall be as given in Table 2 for the next size smaller and next size thinner in the same material.

5. Finish of Edges — All glasses including cut and moulded glasses shall be radiused or arrised to remove sharp corners; edges of cut glasses shall be ground smooth.

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Gr 4

6. Tests

6.1 Inspection under Polarized Light — Each toughened circular sight and light glass shall be examined under polarized light. Any glass which does not show a polarization pattern indicative of toughening shall be rejected. Hoop stress as seen by rotation of the glass in the strain viewer shall be of similar intensity around the complete periphery and shall not be interrupted by the incidence of surface cracks, heavy cord, or other defects.

6.2 Thermal Shock Requirements — Manufacturers shall certify that toughened circular sight and light glasses shall pass the thermal shock test and acceptance conditions as given in IS : 5428 (Part 1) -1985. The glass shall enter the water bath with an observation face parallel to the water surface.

TABLE 2 LIMITS OF BOW FOR CIRCULAR SIGHT AND LIGHT GLASS

(Clauses 4.3 and 14.4)

All dimensions in millimetres.

Material	50 to 100	101 to 150	151 to 200	201 to 300
Annealed glass (all thicknesses)	0.05	0.08	0.10	0.13
Toughened glass up to 12 mm thickness	0.13	0.25	0.38	0.64
Toughened glass above 12 and up to 25 mm thickness	0.10	0.20	0.25	0.38

6.3 Hydrostatic Test — The assembly shall be hydrotested at a minimum pressure of $1.5 \times$ Operating pressure \times Allowable stress of glass at ambient temperature/Allowable stress of glass at operating temperature.

7. Designation — The designation of a circular sight glass of diameter 100 mm and thickness 15 mm shall be:

Sight Glass 100 \times 15 IS : 5428 (Part 4)

8. Sampling — Two percent of the glasses (but not less than 10 or more than 30 glasses) shall be taken by random selection from each consignment. If more than 10 percent but not more than 20 percent of the glasses in the sample fail the test, a further sample of 2 percent shall be taken by random selection from the consignment and subjected to a second test. If annealed glasses are required to be tested for resistance to thermal shock, the temperature difference for the tests shall be as agreed to between the purchaser and the manufacturer. Glasses subjected to and passing the test may be put into service.

9. Marking — The circular sight and light glasses shall be permanently marked with the following:

- a) Manufacturer's identification or trade-mark; and
- b) The size of the circular sight and light glass.

9.1 ISI Certification Marking — Details available with the Indian Standards Institution.

9.2 Those marks shall not interfere with the function of the glass and shall preferably be placed so as to be visible when mounted.

10. Packing — The glasses shall be packed securely in suitable inner boxes, containing not more than 24 glasses and adequately cased for transit.

EXPLANATORY NOTE

This standard was originally published in 1969 in two parts. The present revision of the standards have been made as a result of further experience gained and development in this field and has been brought out in five parts as follows :

Specification for Gauge Glasses : Part 1 Tubular Glasses for Level Gauge [IS : 5428 (Part 1) 1985],

Specification for Gauge Glasses : Part 2 Protector Glasses for Tubular Gauges [IS : 5428 (Part 2) - 1985],

Specification for Gauge Glasses : Part 3 Through-vision and Reflex Glasses [IS : 5428 (Part 3) - 1985],

Specification for Gauge Glasses : Part 4 Circular Sight and Light Glasses [IS : 5428 (Part 4) - 1985], and

Specification for Gauge Glasses : Part 5 Port Gauge Glasses as Used in Fittings for Steam Boilers [First Revision of IS : 5428 (Part 5) - 1985].

In the preparation of this standard, assistance has been derived from BS 3463-1975 Observation and Gauge Glasses for Pressure Vessels, issued by the British Standards Institution.

The information and recommendation on glasses for pressure vessels is given in Appendix A.

APPENDIX A

(Explanatory Note)

RECOMMENDATIONS ON GLASSES

A-1. Circular sight and light glasses are not recommended for greater maximum working temperature and temperature differentials (ambient to fluid) than those given below. These figures have been adjusted so that they apply to the differential between the ambient and fluid temperatures, because of the impracticability of measuring actual glass surface temperatures under operational condition. The temperatures stated, however, ensure that, within the conditions covered by this standard the glasses will not be overstressed.

RECOMMENDED MAXIMUM WORKING TEMPERATURES AND TEMPERATURE DIFFERENTIALS FOR THROUGH-VISION AND REFLEX GLASSES AND CIRCULAR SIGHT AND LIGHT GLASSES		
Type of Glass	Maximum Working Temperature °C	Maximum Temperature Differential (Ambient to Fluid) °C
Annealed soda-lime	350	40
Toughened soda-lime	300	265
Annealed borosilicate	400	110
Toughened borosilicate	360	265

A-2. Recommended Maximum Pressures for Circular Sight and Light Glasses — Circular sight and light glasses are not recommended for pressures greater than those indicated in Fig. 1 to 4. The range of application of these graphs should be considered as limited to the largest preferred glass diameter 305 mm and greatest preferred thickness 25 mm of the circular sight and light glasses covered in this standard. For applications outside these limits, the manufacturer should be consulted.

A-3. Corrosion — Corrosion of glass on pressure vessels is sometimes a problem requiring consideration, because of the faster rate of chemical reactions at temperatures and pressures above atmospheric. Borosilicate glass is more resistant than soda-lime glass to attack by hot water and acids. Toughening does not increase the corrosion resistance of glass. For use under severe conditions, for instance in the presence of alkalis where the consequences of failure would be serious, the use of two glasses (each capable of withstanding the full pressure) is to be preferred. In boiler practice, the glass is frequently protected by mica; alternatively, corrosion may be minimized by control of the fluid circulation. The glass manufacturer should be consulted regarding the possible effect of corrosion on the properties of glass for pressure vessels wherever particularly adverse conditions are likely to be encountered.

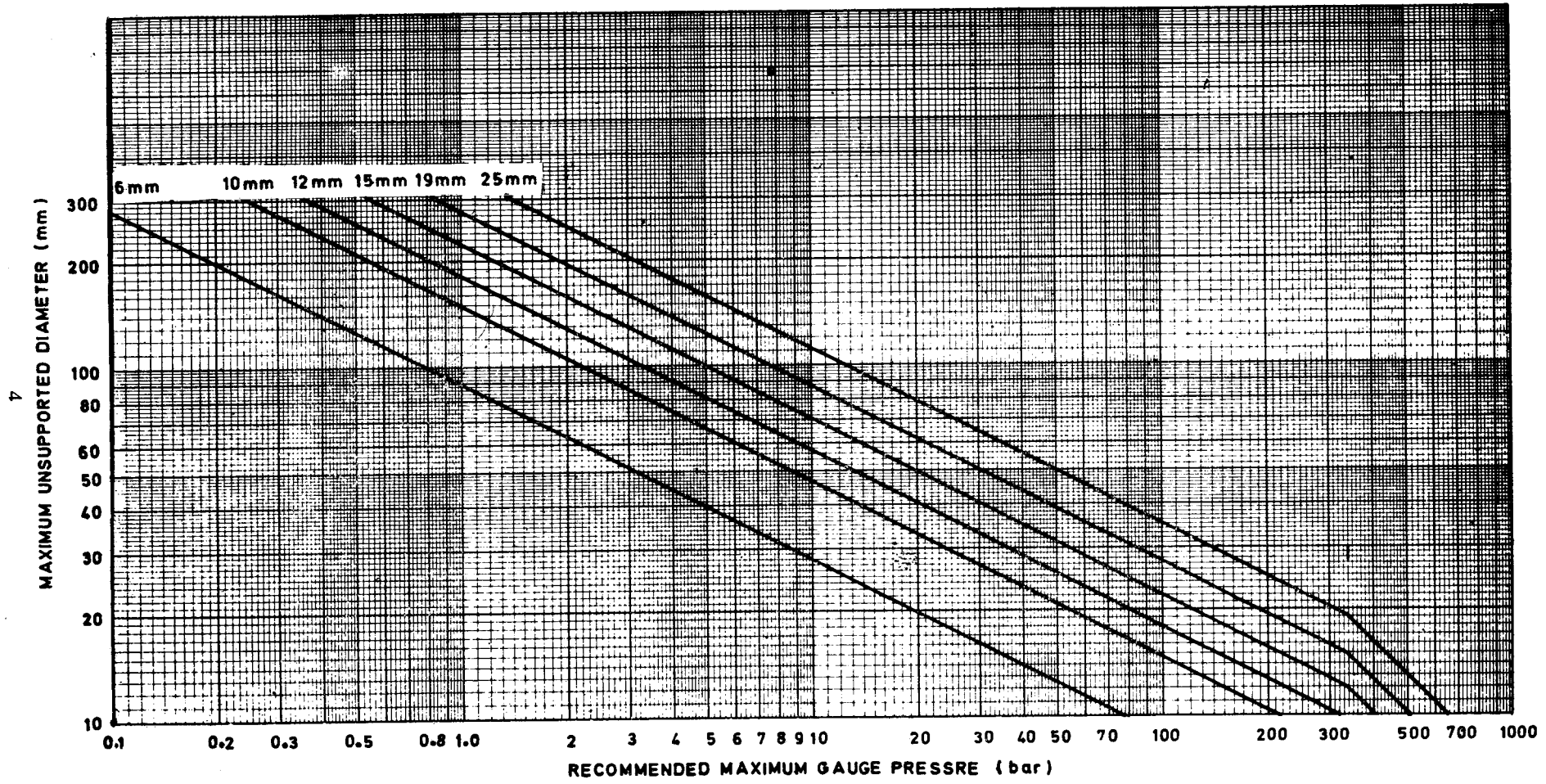


FIG. 1 ANNEALED SODA-LIME GLASS (DESIGN BENDING STRESS 7 MN/m²)

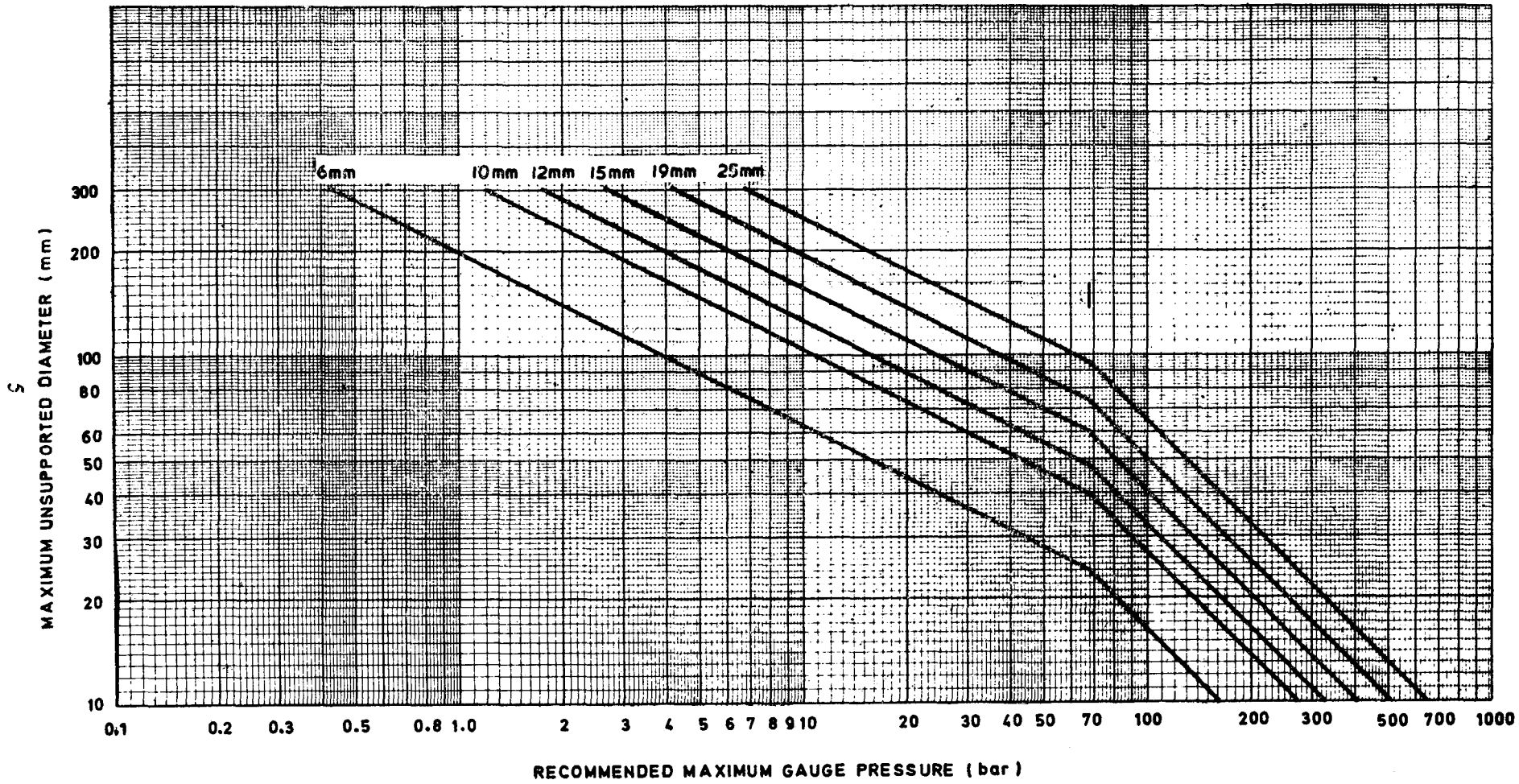


FIG. 2 TOUGHENED SODA-LIME GLASS (DESIGN BENDING STRESS 35 MN/m²)

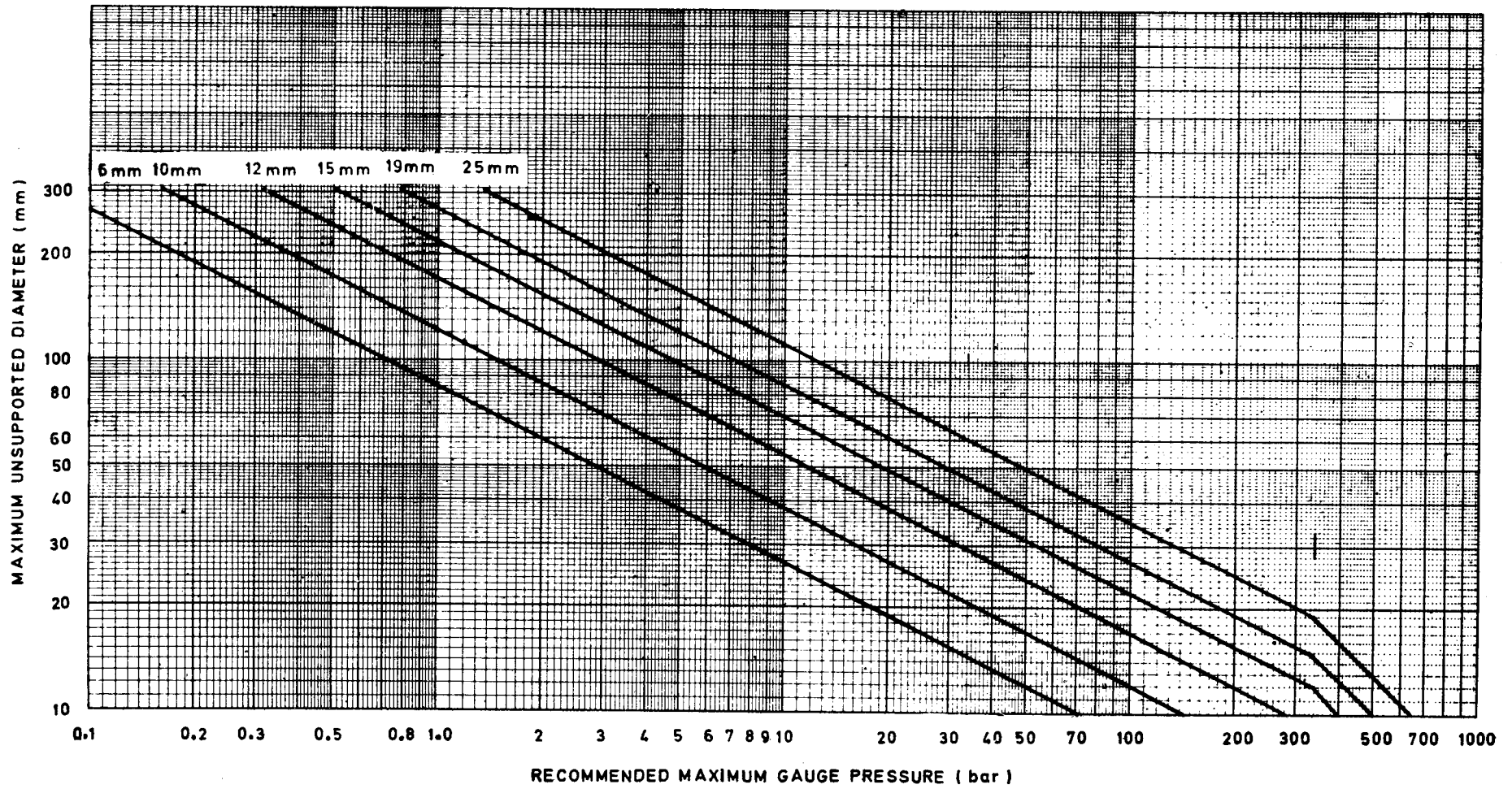


FIG. 3 ANNEALED BOROSILICATE GLASS (DESIGN BENDING STRESS 7 MN/m^2)

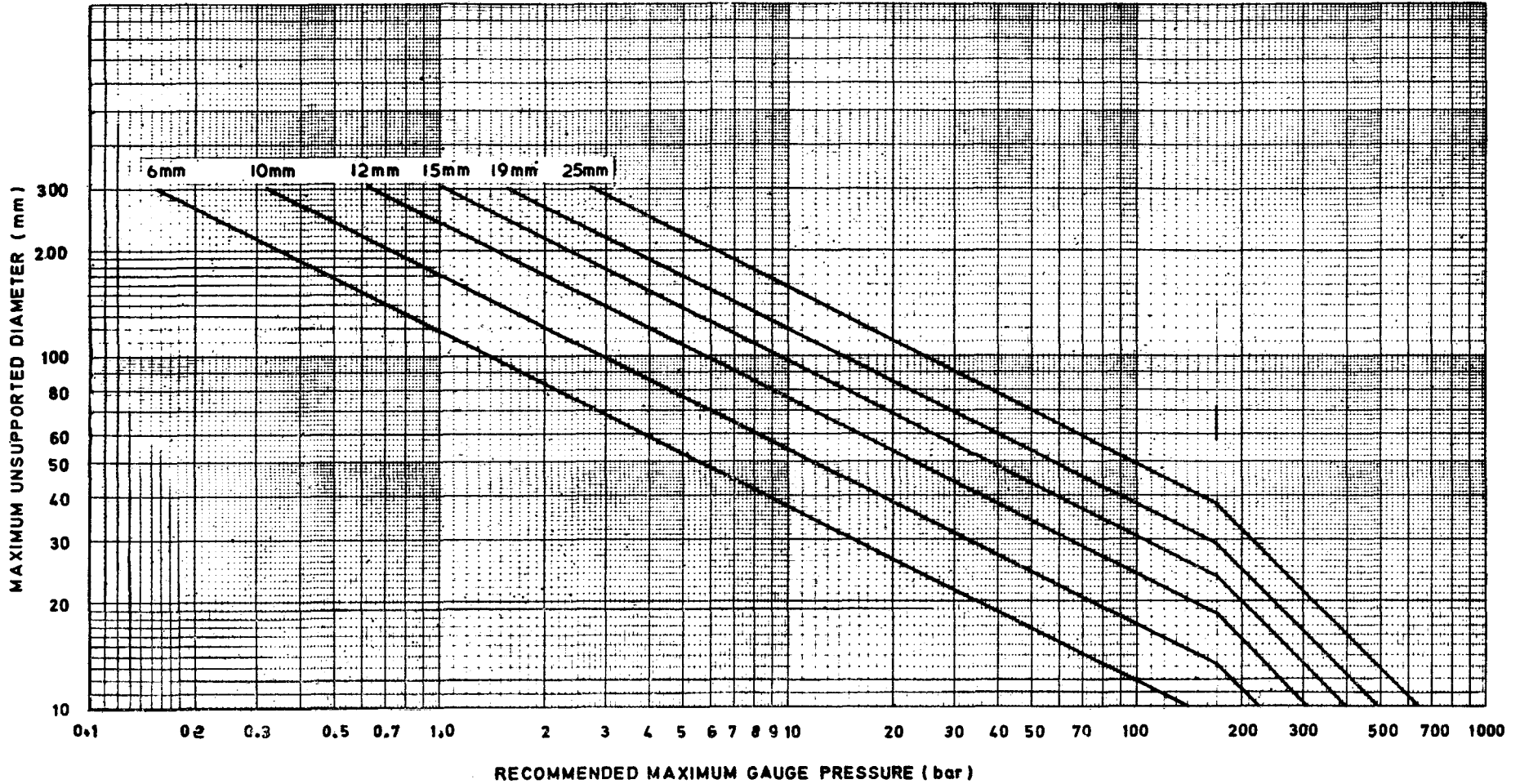


FIG. 4 TOUGHENED BOROSILICATE GLASS (DESIGN BENDING STRESS 14 MN/m²)