

MIL-G-2860E  
30 December 1977  
SUPERSEDING  
MIL-G-002860D (SHIPS)  
4 December 1972  
(See 6.4)

# MILITARY SPECIFICATION

## GLASSES, SIGHT-FLOW, CLEAR, BOROSILICATE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 This specification covers thermally tempered borosilicate sight glasses for such services as viewing the operation in water evaporators and turbine oil sight-flow indicators where the temperatures do not exceed 400° Fahrenheit (F.) and 50 pounds per square inch (psi) pressure (see 6.2).

1.2 Classification. Borosilicate sight glasses covered by this specification shall be of the following types and grades, as specified (see 6.1):

Type I - Flat  
Type II - Cylindrical

### 2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### FEDERAL

PPP-B-566 - Boxes, Folding, Paperboard.  
PPP-B-576 - Boxes, Wood, Cleated, Veneer, Paper Overlaid.  
PPP-B-585 - Boxes, Wood, Wirebound.  
PPP-B-591 - Boxes, Shipping Fiberboard, Wood-Cleated.  
PPP-E-601 - Boxes, Wood Cleated-Plywood.  
PPP-B-636 - Boxes, Shipping, Fiberboard.  
PPP-T-60 - Tape, Packaging, Water-proof.

##### MILITARY

MIL-P-116 - Preservation-Packaging, Methods of.  
MIL-L-10547 - Liners, Case and Sheet Overwrap; Water-Vaporproof, or Waterproof, Flexible.

#### STANDARDS

##### MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection By Attributes.  
MIL-STD-129 - Marking For Shipping And Storage.

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Ship Engineering Center, SEC 6124, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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## UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Ratings, Rules, and Regulations.

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, Illinois 60606.)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C337-57 - Method of Test for Average Linear Expansion of Glass.

F-218 - Standard Method For Analyzing Stress In Glass.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.)

## 3. REQUIREMENTS

3.1 Sample for first article inspection. Prior to beginning production, a sample shall be tested as specified in 4.2 (see 6.3).

3.2 Material. Glasses shall be made of a borosilicate type clear glass containing at least 12 percent boric oxide ( $B_2O_3$ ), and shall have been thermally tempered to meet the requirements of this specification.

3.3 Shape and dimensions.3.3.1 Shape.

3.3.1.1 Type I - flat. Type I glasses shall be flat and shall be as shown on figure 1.

3.3.1.2 Type II - cylindrical. Type II glasses shall be cylindrical and shall be shown on figure 2.

3.3.2 Dimensions. The dimensions (diameter, thickness, height, as applicable) and tolerances shall be as specified (see 6.1).

3.4 Linear coefficient of expansion. The linear coefficient of expansion shall not exceed  $33.0 \times 10^{-7}$  per degree centigrade ( $^{\circ}C$ .) between temperature range of  $0^{\circ}$  and  $300^{\circ}C$ . (see 4.5.1).

3.5 Thermal shock resistance. Glasses subjected to the thermal shock test (see 4.5.3) shall not crack or spall.

3.6 Chemical solubility. Extractable  $Na_2O$  shall be not more than 0.013 percent by weight (see 4.5.5).

3.7 Strain pattern. When viewed under polarized light (see 4.5.2), the glass shall show either concentric colored or black rings or, a uniformly distributed colored or black strain pattern characteristic of heat tempered glass (see figure 3).

3.8 Impact resistance. Glasses subjected to the ball drop test (see 4.5.4) shall not break, spall, or chip.

3.9 Workmanship. Glasses shall be reasonably free from stria, bubbles, stones, wrinkles or other defects that would affect their visibility or impair their serviceability.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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4.2 First article inspection. First article inspection shall consist of the examination and tests specified in 4.4 and 4.5.

4.3 Sampling for quality conformance inspection.

4.3.1 Lot. For purposes of sampling, a lot shall consist of all glasses of one type produced in one plant under essentially the same conditions and offered for delivery at one time.

4.3.2 Sampling for visual and dimensional examination. A random sample of glasses shall be selected from each lot in accordance with table I for the examination specified in 4.4.1. The acceptable quality level (approximately) equals 2.5 percent defective.

TABLE I. Sampling for visual and dimensional examination.

Number of glasses in lot	Number of glasses in sample	Acceptance Number (defectives)	Rejection Number (defectives)
15 and under	7	0	1
16 to 40	10	0	1
41 to 110	15	1	2
111 to 300	25	1	2
301 to 500	35	2	3
501 to 800	50	3	4
801 to 1300	75	4	5
1301 and over	110	6	7

4.3.3 Sampling for tests. Three glasses shall be selected from each lot for the tests specified in 4.4.2.

4.4 Visual examination and tests.

4.4.1 Visual and dimensional examination. Each of the sample glasses selected in accordance with 4.3.2 shall be visually and dimensionally examined to verify compliance with the requirements of this specification. Any items in the sample containing one or more visual and dimensional defects shall not be offered for delivery, and if the number of defective items in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by the sample.

4.4.2 Tests. The glasses selected in accordance with 4.3.3 shall be subjected separately to each of the tests specified in 4.5.2 through 4.5.4 except as otherwise specified to determine that the samples conform to the requirements of this specification. If any one of the samples tested is found to be not in conformance with the requirements of this specification, this shall be cause for rejection of the lot represented by the sample.

4.5 Test procedures.

4.5.1 Linear coefficient of expansion. The linear coefficient of expansion of the glass shall be determined by ASTM publication C337-57 to verify conformance with 3.4.

4.5.2 Polariscopic examination. A polariscope such as specified in ASTM publication F-218 shall be used to examine the glasses qualitatively for the rings or strain patterns specified in the ASTM Publication F-218.

4.5.3 Thermal shock. Glasses shall be subjected to three successive temperature cycles consisting of a 3-minute immersion in boiling water followed by immediate immersion in cold water at a temperature of 32°F.

4.5.4 Impact test.

4.5.4.1 Type I glasses. Each of the Type I glasses, in turn, shall be placed flat on a hardwood board which has a cutout with a radius 1/8 inch less than the radius of the glass. A steel ball weighing 0.2 pound shall be dropped so that it hits the center of the glass, after having fallen 50 inches.

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4.5.4.2 Type II glasses. Each of the Type II glasses, in turn, shall be placed on flat hardwood board so that the axis of the cylinder is horizontal and parallel to the hardwood board. A steel ball, weighing 0.2 pound, shall be dropped so that it strikes the top of the arc of the cylinder at about the mid-point of its axis, having fallen 50 inches.

4.5.5 Chemical solubility test. The glass shall be tested to determine that the extractable  $\text{Na}_2\text{O}$  level is as specified in 3.6. When requested, the manufacturer shall furnish test data.

4.6 Examination of preparation for delivery. Preservation, packaging, packing and marking shall be examined to assure compliance with section 5 of this specification.

## 5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements.)

5.1 Packaging. Packaging shall be level A or C, as specified (see 6.1).

5.1.1 Level A. Glasses shall be cushioned and packaged in accordance with method III of MIL-P-116. One glass shall be packaged in a folding box, set-up box or two-piece corrugated flute side box conforming to PPP-B-566 or PPP-B-636.

5.1.2 Level C. Glasses shall be packaged in a manner that will afford protection against physical damage during shipment from supply source to the first receiving activity for immediate or early usage.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.1).

5.2.1 Level A. Glasses packaged as specified in 5.1.1 shall be packaged in overseas shipping containers conforming to PPP-B-576, PPP-B-585, PPP-B-591, PPP-B-601 or PPP-B-636. Containers shall be of uniform shape and size, minimum cube and tare consistent with the protection required and shall contain identical quantities. Containers shall be provided with a caseliner conforming to MIL-L-10547 and shall be sealed in accordance with the appendix thereto. The caseliner will not be required for container, PPP-B-636, class weather resistant when sealed at all joints and seams including manufacturers joints with tape conforming to PPP-T-60.

5.2.2 Level B. Glasses packaged as specified in 5.1.1 shall be packed in domestic shipping containers conforming to PPP-B-576, PPP-B-585, PPP-B-591, PPP-B-601 or PPP-B-636. Containers shall be of uniform shape and size, minimum cube and tare consistent with the protection required and shall contain identical quantities. Containers shall be closed and strapped in accordance with the applicable container specification or the appendix thereto.

5.2.3 Level C. Glasses packaged as specified in 5.1.2 shall be packed in a manner to insure acceptance by carrier for transportation at the lowest applicable rate and safe delivery to the first receiving activity. Shipping containers shall be in accordance with Uniform Freight Classification Rules or with regulations of other carriers applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract, interior and exterior containers shall be marked in accordance with MIL-STD-129.

5.4 Use of polystyrene (loose-fill) material.

5.4.1 For domestic shipment and early equipment installation and level C packaging and packing. Unless otherwise approved by the procuring activity (see 6.1), use of polystyrene (loose-fill) material for domestic shipment and early equipment installation and level C packaging and packing applications such as cushioning, filler and dunnage is prohibited. When approved, unit packages and containers (interior and exterior) shall be marked and labelled as follows:

### "CAUTION

Contents cushioned etc. with polystyrene (loose-fill) material.  
Not to be taken aboard ship.  
Remove and discard loose-fill material before shipboard storage.  
If required, recushion with cellulosic material bound fiber,  
fiberboard or transparent flexible cellular material."

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5.4.2 For level A packaging and level A and B packing. Use of polystyrene (loose-fill) material is prohibited for level A packaging and level A and B packing applications such as cushioning, filler and dunnage.

## 6. NOTES

### 6.1 Ordering data.

#### 6.2.1 Procurement requirements. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Dimensions and tolerances required (see 3.3).
- (d) Level of preparation for delivery (see 5.1 and 5.2).
- (e) Use of polystyrene material (see 5.4).

6.2 The temperature and pressure criteria for the glasses as specified in 1.1 is dependent upon the type of mounting assembly and the hardness of the gasket used.

### 6.3 First article inspection.

6.3.1 Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

6.4 Changes from previous issue. The symbol "#" is not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

#### Custodians:

None

#### Review activity:

DLA - GS

#### User activity:

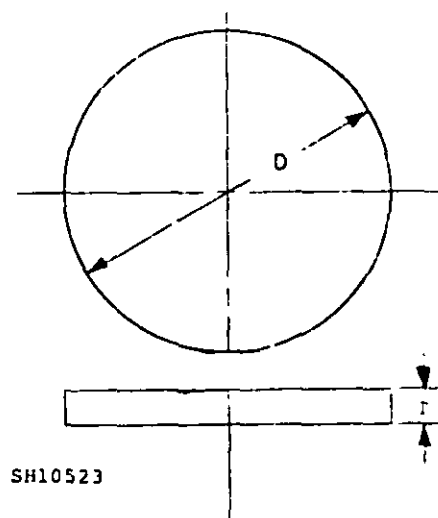
Army - ME

#### Preparing activity:

Navy - SH

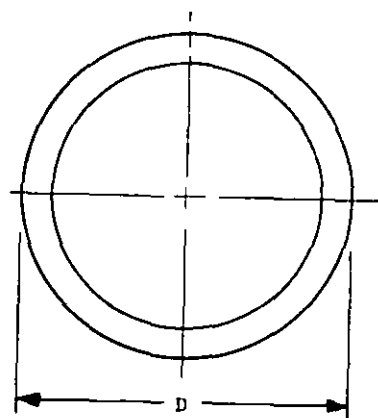
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T = Thickness, inch.  
D = Diameter, inch.

FIGURE 1. Shape of type I glasses.



T = Thickness, inch.  
D = Diameter, inch.  
H = Height, inch.

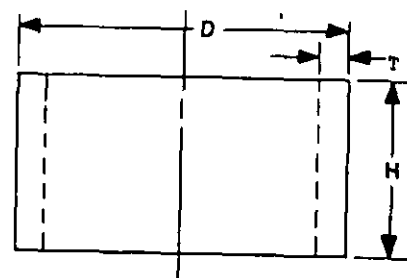


FIGURE 2. Shape of type II glasses.

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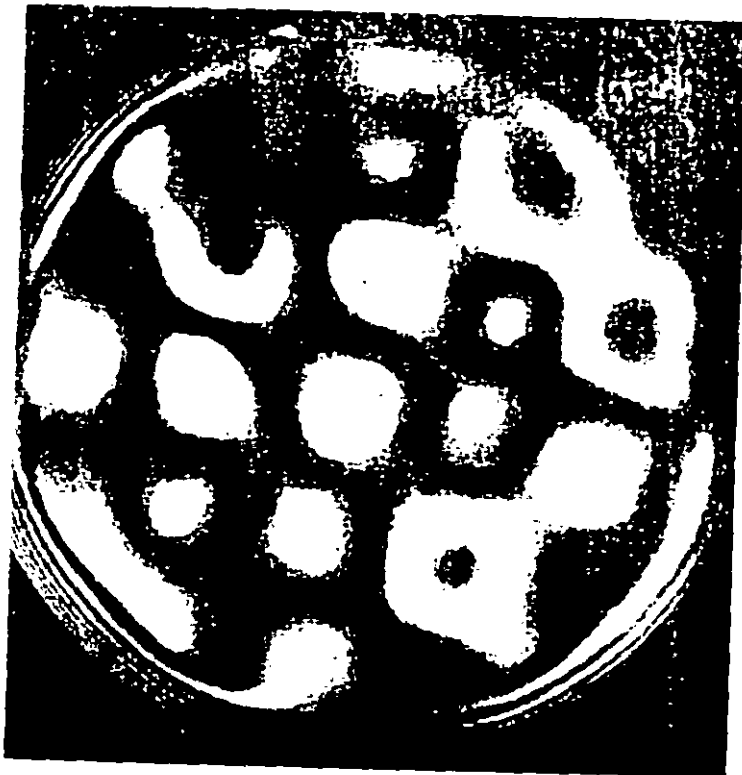


FIGURE 3. Strain pattern.

