

Subject 1175

January 19, 2007

## **SUMMARY OF TOPICS**

*The following changes in requirements are being proposed:*

- 1. An editorial new Fourth Edition of the Standard for Buoyant Cushions, UL 1175.**

**STP BALLOTS DUE: March 20, 2007**

**COMMENTS DUE: March 20, 2007**

- 1. An editorial new Fourth Edition of the Standard for Buoyant Cushions, UL 1175.**

## **RATIONALE**

UL is proposing a new edition of UL 1175. The proposed new edition is a periodic re-issuance and includes the following type editorial revisions:

The units of measurement, undated reference, and component paragraphs which are common standard requirements have been added to the introduction;

Wording changes have been made in order to adhere to standards writing style; and

Sections, paragraphs, and corresponding references may have been renumbered.

If the new edition is accepted by the Standards Technical Panel for Personal Flotation Devices, STP 1123, and is adopted, the standard will gain first time approval as an American National Standard.

## **PROPOSAL**

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## INTRODUCTION

### 1 Scope

1.1 These requirements cover buoyant cushions using unicellular plastic foam, kapok, or fibrous glass flotation material that are intended to be used in accordance with the applicable regulations of the United States Coast Guard (USCG).

1.2 The buoyant cushions covered by these requirements are intended for USCG approval under 46 CFR 160.048 or 160.049.

1.3 These requirements do not cover buoyant cushions that employ entrapped air as the prime buoyant means.

### 2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

### 3 Undated References

3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

### 4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for that component.

4.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

4.5 A component used in a device covered by this standard shall comply with the applicable requirements in the Standard for Components for Personal Flotation Devices, UL 1191.

### 5 General

5.1 A buoyant cushion shall be of the box, rectangular, or trapezoidal type and shall have a top, a bottom, and sides. A pillow type cushion having a top and bottom cover only does not comply with the requirement.

5.2 A cushion shall be constructed so that within 1 minute a swimmer is able to be oriented to the device in such a manner that the face is out of the water without the necessity for constant use of either hand.

5.3 A device shall not incorporate means obviously intended for fastening or securing the device to a boat, nor shall instructions accompanying the device indicate such intent.

*Exception: A Type IV buoyant cushion may be provided with hook and pile fastener tapes, or the equivalent, on the cushion's bottom surface when the cushion complies with the requirements specified in the Release Test, Section 16, and is marked in accordance with 21.7.*

5.4 A device shall be constructed to reduce the likelihood of shifting or bunching of internal materials.

## 6 Glossary

6.1 For the purpose of this Standard, the following definitions apply.

6.2 BAR TACK – A type of stitching sewn in a zig-zag pattern that is at least 3/32 inch (2.4 mm) wide, 5/8 inches (15.9 mm) long, and 18 stitches of a lock type stitch, such as Type 301, Federal Standard 751.

6.3 DEVICE – Any buoyant cushion.

6.4 FOAM – Closed-cell foamed polymeric material.

6.5 GROUP APPROVAL – A single approval granted by the USCG for buoyant cushions using foam, kapok, or fibrous glass flotation materials; and that are in accordance with all of the applicable established dimensions and specifications of this standard.

6.6 INSERT – A quantity of buoyant material that has been cut or formed for insertion into a device.

6.7 JOINING SEAM – A seam that serves a functional purpose in the end product as distinguished from a decorative function.

6.8 LOCK TYPE STITCH – A stitch that will not unravel when a force is applied in the direction of the seam on any of the threads forming the stitch.

6.9 SCRAP FOAM – Material obtained from production remnants.

6.10 SEAM – A joint consisting of a sequence or series of stitches uniting two or more pieces of material.

6.11 SPECIAL APPROVAL – A single approval granted by the USCG for a buoyant cushion that is more than 2 inches (50.8 mm) thick, or has dimensions other than those covered in Tables 8.1 and 8.2.

## CONSTRUCTION

### 7 Material

7.1 Material used in a cushion shall be new.

7.2 Buoyant materials shall be fibrous glass, kapok, or foam.

7.3 Fibrous buoyant material shall be completely encased in flexible heat-sealed film complying with the requirements for plastic film in the requirements in the Standard for Components for Personal Flotation Devices, UL 1191, or be in accordance with the requirements of Federal Specification LP375C.

7.4 Flexible film shall comply with the requirements for flexible film in the Standard for Components for Personal Flotation Devices, UL 1191.

7.5 Kapok used shall be raw fiber, long, clean, lustrous, creamy white, free from discoloration and other fiber, and shall be in accordance with 46 CFR 164.003. The kapok shall be processed by the "Air-Blow" method and shall separate fiber from masses and leave no more than 5 percent by weight of sticks, seeds, or other foreign matter. Processing shall not break down the fiber or cause undue powdering or pulverizing.

7.6 Fibrous glass buoyant materials shall be in accordance with the requirements of Military Specification MIL-B-2766.

7.7 Welting, when used, shall be of a fiber or plastic material acceptable for the purpose.

7.8 Thread shall have a minimum breaking strength after 100 hours of accelerated weathering of 4.7 pounds-force (20.9 N), wet, dry, or both, as applicable, and shall be in accordance with the applicable requirements for thread in 46 CFR 160.048 and 160.049.

7.9 Cover materials shall have a minimum breaking strength after 100 hours of accelerated weathering of 105 pounds-force (467 N) in the direction of greater thread count and 70 pounds-force (311 N) in the direction of lesser thread count and shall be in accordance with the applicable requirements in 46 CFR 160.048 and 160.049 for cover materials.

7.10 Fabrics shall comply with the requirements for fabrics in the requirements in the Standard for Components for Personal Flotation Devices, UL 1191. Name, denier, thread count, weight per square yard, and type and mount of coating shall be used to identify fabrics.

7.11 In addition to the requirements in 7.10, the adhesion of the coating shall be such as to require no less than 8 pounds-force (35 N) to separate it from the cloth backing in accordance with the applicable requirements in 46 CFR 160.048 and 160.049 for coated cover materials.

7.12 Liquid elastomeric compounds employed as dip coatings shall be applied to all external surfaces of buoyant material to provide a minimum thickness of 0.010 inches (0.25 mm) and shall be in accordance with the applicable requirements in 46 CFR 160.049 for dip materials.

7.13 To determine compliance with the requirements of 7.12, a piece of glass or other equivalent material shall be dipped following the same procedure used to dip the personal flotation device. Glass or equivalent material is to be used so that the vinyl coating separates from the material and the thickness measured accurately.

7.14 No less than 48 hours after dipping, the vinyl is then to be peeled off the glass, and the thickness measured at the center and four points around the perimeter. The average of the five values shall be the value checked for compliance with the requirements of 7.12.

7.15 Adhesives shall be all-purpose waterproof vinyl type in accordance with Subpart 160.049.

7.16 When used for vinyl-dip coated cushions, reinforcing vinyl shall have a minimum thickness of 0.040 inch (1.02 mm) and shall be attached to the foam by adhesive. See 7.15.

7.17 Uncoated 70 denier fabrics shall:

- a) Have 3/4 inch (19.1 mm) seams; or
- b) Incorporate two rows of lockstitch, or the equivalent.

7.18 Thread used for structural seams shall comply with the requirements for thread in the requirements in the Standard for Components for Personal Flotation Devices, UL 1191. See 1.2.

7.19 Monofilament thread shall not be used for structural seams.

7.20 Thread and fabric combinations shall be compatible. Cotton threads shall be used only with cotton fabrics; synthetic threads may be used with all fabrics.

## 8 Kapok or Fibrous Glass Cushions

8.1 Kapok or fibrous glass cushions shall be in accordance with the construction requirements of 8.1 – 8.17.

8.2 Cushions shall have sufficient volume to provide at least 20 pounds-force (89 N) of buoyancy.

8.3 Kapok filled or fibrous glass cushions with group approval shall be constructed in accordance with Figure 8.1.

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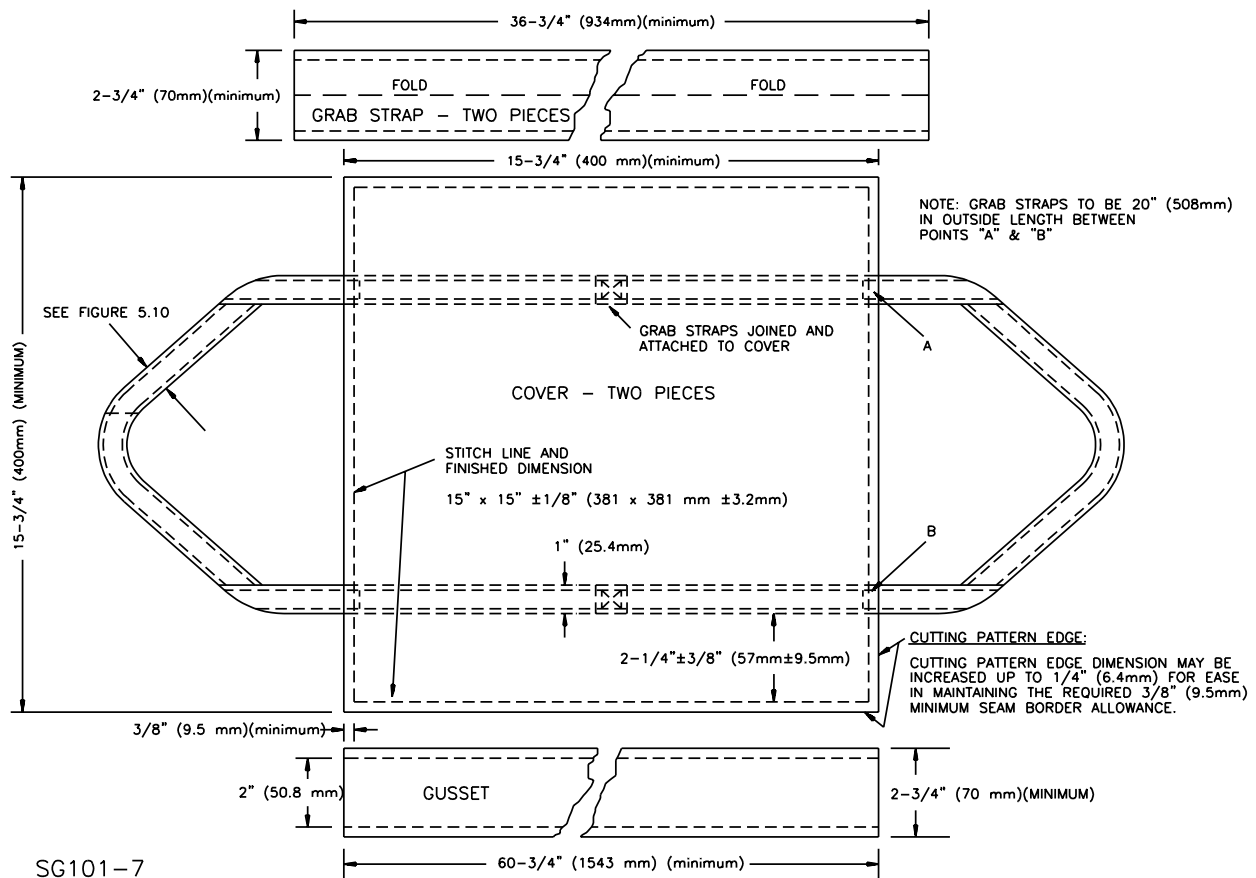
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**Figure 8.1**  
**Buoyant cushions kapok, fibrous glass, or unicellular plastic foam**



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NOTE 1 – Tolerances on all finished dimensions 6 inches (152.4 mm) or less shall be  $\pm 1/8$  inch ( $\pm 3.2$  mm) and shall be  $\pm 1/4$  inch ( $\pm 6.4$  mm) on dimensions greater than 6 inches (152.4 mm), unless otherwise specified.

NOTE 2 – Uncoated 70 denier cover fabrics, other than cotton, shall comply with 8.14 or 9.9. However, the stitching shall be no less than  $3/4$  inch (19.1 mm) from the edges of the cloth or shall be topstitched (see Figure 8.12).

NOTE 3 – Finished dimension on the gusset width for 15 by 15 by 2 inch (381 by 381 by 50.8 mm) cushions shall be 2, plus  $1/2$ , minus 0 inches (50.8, plus 12.7, minus 0 mm).

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8.4 Kapok or fibrous glass cushions shall have at least 225 square inches (1452 cm<sup>2</sup>) of top surface and shall have a thickness of not less than 2 inches (50.8 mm) nor more than 3 inches (76.2 mm). The width, length, and amount of kapok shall be as shown in Tables 8.1 and 8.2 for group approval. All special approval buoyant cushions 2 inches (50.8 mm) or thicker or those having a shape different from those covered in Tables 8.1 and 8.2 shall be filled with kapok or fibrous glass as determined by the equations in Tables 8.1 and 8.2.

**Table 8.1**  
**Minimum weight (ounce<sup>a</sup>) of kapok for cushions 2 inches thick<sup>d</sup>**

| Length<br>(Inches) <sup>a,b,c</sup> | Width (Inches) <sup>a,b</sup> |    |    |    |    |    |    |    |    |    |    |    |    |
|-------------------------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|
|                                     | 12                            | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 15                                  | —                             | —  | —  | 20 | —  | —  | —  | —  | —  | —  | —  | —  | —  |
| 16                                  | —                             | —  | —  | 21 | 23 | —  | —  | —  | —  | —  | —  | —  | —  |
| 17                                  | —                             | —  | 21 | 23 | 24 | 26 | —  | —  | —  | —  | —  | —  | —  |
| 18                                  | —                             | 21 | 22 | 24 | 26 | 27 | 29 | —  | —  | —  | —  | —  | —  |
| 19                                  | 20                            | 22 | 24 | 25 | 27 | 29 | 30 | 32 | —  | —  | —  | —  | —  |
| 20                                  | 21                            | 23 | 25 | 27 | 28 | 30 | 32 | 34 | 36 | —  | —  | —  | —  |
| 21                                  | 22                            | 24 | 26 | 28 | 30 | 32 | 34 | 35 | 37 | 39 | —  | —  | —  |
| 22                                  | 23                            | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | —  | —  |
| 23                                  | 25                            | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | —  |
| 24                                  | 26                            | 28 | 30 | 32 | 34 | 36 | 38 | 41 | 43 | 45 | 47 | 49 | 51 |
| 25                                  | 27                            | 29 | 31 | 33 | 36 | 38 | 40 | 42 | 44 | 47 | 49 | 51 | 53 |
| 26                                  | 28                            | 30 | 32 | 35 | 37 | 39 | 42 | 44 | 46 | 49 | 51 | 53 | 55 |
| 27                                  | 29                            | 31 | 34 | 36 | 38 | 41 | 43 | 46 | 48 | 50 | 53 | 55 | 58 |
| 28                                  | 30                            | 32 | 35 | 37 | 40 | 42 | 44 | 47 | 50 | 52 | 55 | 57 | 60 |
| 29                                  | 31                            | 34 | 36 | 39 | 41 | 44 | 46 | 49 | 52 | 54 | 57 | 59 | 62 |
| 30                                  | 32                            | 35 | 37 | 40 | 43 | 45 | 48 | 51 | 53 | 56 | 59 | 61 | 64 |
| 31                                  | 33                            | 36 | 39 | 41 | 44 | 47 | 50 | 52 | 55 | 58 | 61 | 63 | 66 |
| 32                                  | 34                            | 37 | 40 | 43 | 46 | 48 | 51 | 54 | 57 | 60 | 62 | 65 | 68 |
| 33                                  | 35                            | 38 | 41 | 44 | 47 | 50 | 53 | 56 | 59 | 62 | 64 | 67 | 70 |
| 34                                  | 36                            | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 | 63 | 66 | 69 | 73 |
| 35                                  | 37                            | 40 | 44 | 47 | 50 | 53 | 56 | 59 | 62 | 65 | 68 | 72 | 75 |
| 36                                  | 38                            | 42 | 45 | 48 | 51 | 54 | 58 | 61 | 64 | 67 | 70 | 74 | 77 |

<sup>a</sup> Conversion Factors: 1 inch = 25.4 mm, 1 ounce = 28.3 g

<sup>b</sup> Length and width in inches shall be within + 1/4 inch and minus zero inch.

<sup>c</sup> Length in inches as applied to the Table for a trapezoid is to be computed as follows: Length =  $(L_1 + L_2)/2$   
where:  $L_1$  and  $L_2$  are the unequal sides of the trapezoid.

<sup>d</sup> Rectangular or trapezoidal shaped cushions more than 2 inches thick and more than 36 inches long and/or 24 inches wide are to have a minimum weight of kapok as determined by the following:

1. Rectangular Cushion, weight (ounces) =  $(L \times W \times t)/22.5$
2. Trapezoidal cushion, weight (ounces) =  $[(L_1 + L_2) \times W \times t]/45$

Table 8.1 Continued

| Length<br>(Inches) <sup>a,b,c</sup>                                                                                                                                                                                             | Width (Inches) <sup>a,b</sup> |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|
|                                                                                                                                                                                                                                 | 12                            | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| <p>where:</p> <p><i>L</i> is the length in inches</p> <p><i>W</i> is the width in inches</p> <p><i>t</i> is the thickness in inches</p> <p><i>L</i><sub>1</sub> and <i>L</i><sub>2</sub> are unequal sides of the trapezoid</p> |                               |    |    |    |    |    |    |    |    |    |    |    |    |

**Table 8.2**  
**Minimum weight (ounces<sup>a</sup>) of fibrous glass for cushions 2 inches thick<sup>d</sup>**

| Length<br>(Inches) <sup>a,b,c</sup>                                                                                                                                                                                                                                                                                                                                                                                                            | Width (Inches) <sup>a,b</sup> |    |    |    |    |    |     |     |     |     |     |     |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12                            | 13 | 14 | 15 | 16 | 17 | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                             | —                             | —  | —  | 36 | —  | —  | —   | —   | —   | —   | —   | —   | —   |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                             | —                             | —  | —  | 38 | 41 | —  | —   | —   | —   | —   | —   | —   | —   |
| 17                                                                                                                                                                                                                                                                                                                                                                                                                                             | —                             | —  | 38 | 41 | 44 | 46 | —   | —   | —   | —   | —   | —   | —   |
| 18                                                                                                                                                                                                                                                                                                                                                                                                                                             | —                             | 37 | 40 | 43 | 46 | 49 | 52  | —   | —   | —   | —   | —   | —   |
| 19                                                                                                                                                                                                                                                                                                                                                                                                                                             | 36                            | 40 | 43 | 46 | 49 | 52 | 55  | 58  | —   | —   | —   | —   | —   |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                             | 38                            | 42 | 45 | 48 | 51 | 54 | 58  | 61  | 64  | —   | —   | —   | —   |
| 21                                                                                                                                                                                                                                                                                                                                                                                                                                             | 40                            | 44 | 47 | 50 | 54 | 57 | 60  | 64  | 67  | 71  | —   | —   | —   |
| 22                                                                                                                                                                                                                                                                                                                                                                                                                                             | 42                            | 46 | 49 | 53 | 56 | 60 | 63  | 67  | 70  | 74  | 77  | —   | —   |
| 23                                                                                                                                                                                                                                                                                                                                                                                                                                             | 44                            | 48 | 52 | 55 | 59 | 63 | 66  | 70  | 74  | 77  | 81  | 85  | —   |
| 24                                                                                                                                                                                                                                                                                                                                                                                                                                             | 46                            | 50 | 54 | 58 | 61 | 65 | 69  | 73  | 77  | 81  | 84  | 88  | 92  |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                             | 48                            | 52 | 56 | 60 | 64 | 68 | 72  | 76  | 80  | 84  | 88  | 92  | 96  |
| 26                                                                                                                                                                                                                                                                                                                                                                                                                                             | 50                            | 54 | 58 | 62 | 67 | 71 | 75  | 79  | 83  | 87  | 92  | 96  | 100 |
| 27                                                                                                                                                                                                                                                                                                                                                                                                                                             | 52                            | 56 | 60 | 65 | 69 | 73 | 78  | 82  | 86  | 91  | 95  | 99  | 104 |
| 28                                                                                                                                                                                                                                                                                                                                                                                                                                             | 54                            | 58 | 63 | 67 | 72 | 76 | 81  | 85  | 90  | 94  | 99  | 103 | 108 |
| 29                                                                                                                                                                                                                                                                                                                                                                                                                                             | 56                            | 60 | 65 | 70 | 74 | 79 | 84  | 88  | 93  | 97  | 102 | 107 | 111 |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                             | 58                            | 62 | 67 | 72 | 77 | 82 | 86  | 91  | 96  | 101 | 106 | 110 | 115 |
| 31                                                                                                                                                                                                                                                                                                                                                                                                                                             | 60                            | 64 | 69 | 74 | 79 | 84 | 89  | 94  | 99  | 104 | 109 | 114 | 119 |
| 32                                                                                                                                                                                                                                                                                                                                                                                                                                             | 61                            | 67 | 72 | 77 | 82 | 87 | 92  | 97  | 103 | 108 | 113 | 118 | 123 |
| 33                                                                                                                                                                                                                                                                                                                                                                                                                                             | 63                            | 69 | 74 | 79 | 84 | 90 | 95  | 100 | 106 | 111 | 116 | 121 | 127 |
| 34                                                                                                                                                                                                                                                                                                                                                                                                                                             | 65                            | 71 | 76 | 82 | 87 | 92 | 98  | 103 | 109 | 114 | 120 | 125 | 131 |
| 35                                                                                                                                                                                                                                                                                                                                                                                                                                             | 67                            | 73 | 78 | 84 | 90 | 95 | 101 | 106 | 112 | 118 | 123 | 129 | 134 |
| 36                                                                                                                                                                                                                                                                                                                                                                                                                                             | 69                            | 75 | 81 | 86 | 92 | 98 | 104 | 109 | 115 | 121 | 127 | 132 | 138 |
| <p><sup>a</sup> Conversion Factors: 1 inch = 25.4 mm, 1 ounce = 28.3 g</p> <p><sup>b</sup> Length and width in inches shall be within +1/4 inch and minus zero inch.</p> <p><sup>c</sup> Length in inches as applied to the Table for a trapezoid is to be computed as follows: Length = (<i>L</i><sub>1</sub> + <i>L</i><sub>2</sub>)/2<br/> where: <i>L</i><sub>1</sub> and <i>L</i><sub>2</sub> are the unequal sides of the trapezoid.</p> |                               |    |    |    |    |    |     |     |     |     |     |     |     |

Table 8.2 Continued

| Length<br>(Inches) <sup>a,b,c</sup>                                                                                                                                                                               | Width (Inches) <sup>a,b</sup> |    |    |    |    |    |    |    |    |    |    |    |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|
|                                                                                                                                                                                                                   | 12                            | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| <sup>d</sup> Rectangular or trapezoidal shaped cushions more than 2 inches thick and more than 36 inches long and/or 24 inches wide are to have a minimum weight of fibrous glass as determined by the following: |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| 1. Rectangular Cushion, weight (ounces) = (L x W x t)/12.5                                                                                                                                                        |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| 2. Trapezoidal cushion, weight (ounces) = [(L1 + L2) x W x t]/25                                                                                                                                                  |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| where:                                                                                                                                                                                                            |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| L is the length in inches                                                                                                                                                                                         |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| W is the width in inches                                                                                                                                                                                          |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| t is the thickness in inches                                                                                                                                                                                      |                               |    |    |    |    |    |    |    |    |    |    |    |    |
| L <sub>1</sub> and L <sub>2</sub> are unequal sides of the trapezoid                                                                                                                                              |                               |    |    |    |    |    |    |    |    |    |    |    |    |

8.5 Kapok or fibrous glass material shall not be contained in less than four waterproof, heat-sealed plastic insert envelopes which contain approximately equal amounts of the total required buoyant material.

8.6 Kapok or fibrous glass buoyant material shall be inserted directly into the plastic insert envelope or shall be packed in suitable cloth bags prior to enclosure in plastic insert envelopes.

8.7 Plastic film insert envelopes shall be constructed of vinyl film complying with the requirements for plastic film in the requirements in the Standard for Components for Personal Flotation Devices, UL 1191, or be not less than 0.008 inches (0.20 mm) in thickness in accordance with the applicable requirements for plastic film referenced in Chapter I, 46 CFR, Subpart 160.048-3(e). Heat-sealed seams of the envelope shall have an adhesion of not less than 8 pounds per inch (1.4 N/mm) using 1 inch (25.4 mm) wide test strips cut perpendicular to the seam being tested. Clamping jaws shall have a separation rate of 12 inches (305 mm) per minute. Alternatively, a mass of 8 pounds (3.6 kg) may be employed. This mass is to be gradually applied to the lower of the two jaws.

8.8 Prior to sealing, plastic insert envelopes shall be evacuated of sufficient air to prevent ballooning when subjected to external pressure.

8.9 Plastic insert envelopes for 15 by 15 by 2 inch (381 by 381 by 50.8 mm) cushions shall be cut approximately 12 inches (305 mm) wide by 12 inches (305 mm) long or approximately 8 inches (203 mm) wide by 18 inches (457 mm) long and shall have a sealed area approximately 125 square inches (806 cm<sup>2</sup>). They shall contain not less than 5 ounces (0.142 kg) of kapok or 9 ounces (0.255 kg) of fibrous glass each. The volume displacement of the individual heat-sealed pad inserts shall be 5-1/2 pounds-force (24.5 N) each,  $\pm 1/2$  pound-force ( $\pm 2.22$  N), at an atmospheric pressure of 29.92 in. Hg (101 kPa) and a temperature of 20°C (68°F) when tested in accordance with the requirements of 12.1 – 12.7, except that the pad covers shall not be slit open, and the period of submergence shall be only long enough for the insert to reach  $\pm 3^\circ\text{F}$  ( $\pm 1.7^\circ\text{C}$ ) of the water temperature and to determine the displacement of the pads.

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8.10 Results of the Volume Displacement Test shall be corrected to a pressure of 29.92 in Hg (101 kPa) and a temperature of 20°C (68°F), by use of the equation:

$$V_2 = \frac{V_1 \times P_1}{0.057 T_1 - 26.6}$$

where:

$V_2$  is volume displacement in pounds-force (N x 0.225), at a pressure of 29.92 inches Hg (101 kPa) and a temperature of 20°C (68°F),

$V_1$  is volume displacement in pounds-force, at the test temperature (°F) and pressure [inches Hg (kPa x 0.395)],

$P_1$  is pressure at time of test in inches Hg (kPa x 0.395), and

$T_1$  is temperature at time of test (°F).

8.11 Volume displacement of all cushions other than the 15 by 15 by 2 inch (381 by 381 by 50.8 mm) cushion, at a pressure of 29.92 in Hg (101 kPa) and a temperature of 20°C (68°F), shall be determined by using the following equation:

a) For kapok cushions;

$$V_2 = K_0 \times 1.10$$

b) For fibrous glass cushions;

$$V_2 = F_0 \times 0.61$$

where:

$V_2$  is volume displacement in pounds-force (N x 0.225),

$K_0$  is weight in ounces (kg x 0.035) of kapok in the pad insert, and

$F_0$  is weight in ounces of fibrous glass in the pad insert.

A tolerance of ±1/2 pound-force (±0.223 N) shall be applied to the value  $V_2$  at a pressure of 29.92 inches Hg (101 kPa) and a temperature of 20°C (68°F).

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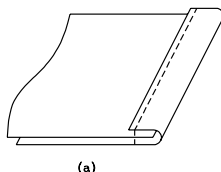


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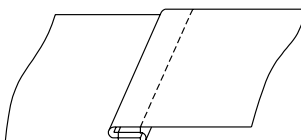
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8.12 The cover shall consist of a top and bottom, each one piece. One or more pieces may be employed provided they are for decorative purposes only, and the pieces are joined using a double row of stitching as described in 8.14 in one of the seam types as illustrated by Figure 8.2. The material for the cover shall be either cotton or coated cloth, or equivalent, in accordance with applicable requirements referenced in 46 CFR Subpart 160.048.

**Figure 8.2**  
**Seam types**

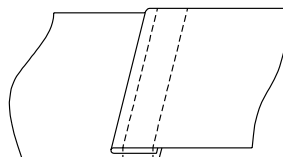


(a)



(b)

This type of seam shall be formed by: (a) superimposing two pieces of material, turning the edge of one ply of material over the edge of the second ply, and sewing with one row of stitches, and (b) turning back the body of the upper ply over the folded lower ply and sewing with one row of stitches.



This type of seam shall be formed by folding under the edge of one ply of the material overlapping it at the edge of another ply and sewing with one or more rows of stitches.

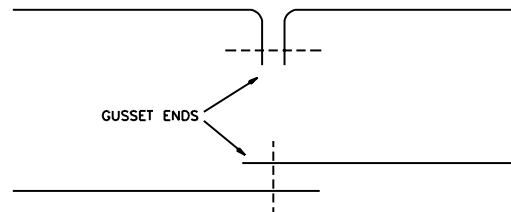
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8.13 Gusset or side cover shall be one or two pieces of cotton cloth, coated cloth, or equivalent. Provisions shall be provided on a cushion so that drainage will occur in accordance with the applicable requirements in 46 CFR Subpart 160.048 and 160.049, except that coated cloth or nonporous cloth shall be perforated or at least two 1/8-inch (3-mm) inner diameter drainage holes are provided on the gusset face adjacent to each grab strap loop. The holes shall be located at least 4-1/2 inches (114 mm) from the centerline of the cushion. When two pieces of coated cloth or nonporous cloth are used, they shall be joined using a double row of stitches in accordance with 8.14 and the seam type illustrated in Figure 8.3. The gusset shall be joined at the top and bottom covers using the seam type in Figure 8.3. The ends of a single piece gusset shall be joined by stitch types illustrated in Figures 8.4 – 8.7.

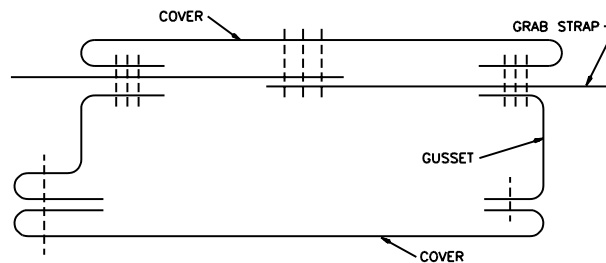
**Figure 8.3**  
**Stitching of gusset**

(broken lines show lock stitch)

**A. STITCHING FOR JOINING ENDS OF GUSSET**  
(Broken Lines Show Lock Stitch)



**B. STITCHING FOR SECURING GUSSET TO COVERS**  
(Broken Lines Show Lock Stitch)



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