

MIL-H-43964 (GL)  
31 March 1977

## MILITARY SPECIFICATION

### HONEYCOMB CORE, NON-METALLIC, SHELTER PANELS

This specification is approved for use by the US Army Natick Research and Development Command (GL), Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers the requirements for non-metallic honeycomb core for shelter panel applications.

1.2 Classification. The honeycomb core shall be of three types as specified in table I (see 6.2).

#### 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:

##### SPECIFICATION

###### FEDERAL

MMM-A-132 - Adhesives, Heat Resistant, Airframe Structural,  
Metal to Metal

##### STANDARDS

###### FEDERAL

FED-STD-191 Textile Test Methods

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Natick Research and Development Command, Natick, MA 01760 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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MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-401 - Sandwich Constructions and Core Materials; General Test Methods

(Copies of specifications and standards 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:

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- C 366 - Measurement of Thickness of Sandwich Cores
- C 481 - Laboratory Ageing of Sandwich Constructions
- C 578 - Preformed, Block-Type Cellular Polystyrene Thermal Insulation
- E 380 - Metric Practice Guide

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

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TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

Test Method T435-SU-68 - Hydrogen Ion Concentration of Paper  
Extracts, Hot Extraction Method

(Application for copies should be addressed to the Technical Association of the Pulp and Paper Industry, 1 Dunwoody Park, Atlanta, GA 30341.)

(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 First article. When specified (see 6.2), the contractor shall furnish a sample of the honeycomb core for first article inspection (see 4.3 and 6.3).

3.2 Materials. Materials shall be as specified herein. Materials not definitely specified shall be of the quality normally used by the contractor provided the completed item complies with all provisions of this specification.

3.3 Configuration. The honeycomb core (see Figure 1) shall consist of a non-metallic web material, suitably bonded so that, in its final expanded form, a uniform cellular shape is developed. The cell size shall not exceed 0.5 inches (12 mm). The size of the cell shall be determined in accordance with 4.4.2.2.

3.4 Flammability. The honeycomb core material shall be fire resistant when tested as specified in 4.5.12.

3.5 Dimensions The dimensions of the honeycomb core sheets W,L,T shall be as specified (see 6.2). Dimensional tolerances shall be as specified in 3.8.

3.6 Bond. There shall be not more than one unbonded node within any 10 inch by 10 inch (250 by 250 mm) area of the honeycomb core.

3.7 Honeycomb core properties.

3.7.1 Physical and mechanical. The physical and mechanical properties of the honeycomb core shall be in accordance with table I. For thermal conductivity, shear and compressive moduli, see 6.4.

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TABLE I. Honeycomb Core Material Properties

<u>Characteristic</u>	<u>Unit of measure</u>	<u>Type 1</u>	<u>Type 2</u>	<u>Type 3</u>
	English (SI)			
<u>Maximum density</u>	Lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	5.5(88)	4.4(70)	3.3(53)
<u>Compressive strength, 1/</u>	psi (MPa)			
Dry, minimum, 2/		464(3.20)	464(3.20)	232(1.60)
Wet, minimum, 3/		406(2.80)	232(1.60)	116(0.80)
At elevated temperature, 4/		394(2.72)	278(1.92)	139(0.96)
Cyclic ageing, minimum	psi (MPa)	363(2.50)	190(1.31)	104(0.72)
After fungus test 5/				
<u>Shear strength 1/</u>	psi (MPa)			
Dry, minimum				
TL Direction 2/		218(1.50)	118(1.50)	116(0.80)
TW Direction 2/		130(0.90)	116(0.80)	65(0.45)
Wet, minimum				
TL Direction 3/		203(1.40)	109(0.75)	58(0.40)
TW Direction 3/		116(0.80)	58(0.40)	33(0.23)
<u>Brittleness/Impact</u>				
Drop height, minimum	inch (mm)	40(1016)	30(762)	20(508)
Flatwise tensile, minimum 6/	psi (MPa)	406(2.80)	406(2.80)	203(1.40)
<u>Water migration resistance</u>				
24 hours, maximum	Number of cells	3	3	3

1/ 2 inch (51 mm) thick core with 0.05 inch (1.3 mm) facings, tested at 73 ± 2°F (22.7 ± 1°C) unless stated otherwise herein.

2/ At equilibrium with 73 ± 2°F (22.7 ± 1°C), and 50 ± 2 percent R.H.

3/ After soaking in water at 70 ± 5°F (21.1 ± 3°C) for 48 hours with perforated facings.

4/ After heating for 30 minutes at, and tested at, 176 ± 5°F (80 ± 3°C).

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- 5/ Values for compressive strength shall be not less than 85 percent of the dry compressive strength values (see 4.5.7).
- 6/ Tested at  $73 \pm 2^\circ\text{F}$  ( $22.7 \pm 1^\circ\text{C}$ ) with loading blocks bonded directly to each side of core specimen having a minimum area of  $9 \text{ in}^2$  ( $5806 \text{ mm}^2$ ).

3.7.2 Chemical neutrality. The honeycomb core material shall be chemically neutral ( $\text{pH } 7.0 \pm 0.5$ ) as determined by TAPPI Method T435-SU-68.

3.7.3 Fungus resistance. Compressive strength of the honeycomb core material after exposure to fungus conditions shall meet or exceed the requirements listed in table I ( see 4.5.7).

3.8 Tolerances. Unless otherwise specified, the following tolerance shall apply:

<u>Dimensions</u>	<u>Tolerance, inch (mm)</u>	
	<u>plus</u>	<u>minus</u>
Width (W)	2.0 (51)	0(0)
Length (L)	1.0 (25)	0(0)
Thickness (T)	0.008 (0.20)	0.008(0.20)

The cell size shall not vary more than 10 percent from the dimension specified within any one lot.

3.9 Density. The honeycomb core material shall be within plus or minus 10 percent of the manufacturer's specified density except that the maximum density shall not exceed the values shown in table I.

3.10 Workmanship. The honeycomb core material shall be free from excess resin accumulations, e.g., runs and sags, starved areas, e.g., lack of resin, and foreign materials. The cell wall edges of the core shall be clean cut with no broken edges.

#### 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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4.1.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

4.3 First article inspection. When a first article is required (see 6.2), the first article shall be examined for defects listed in table II, for dimensions as specified in 4.4.2.2, and tested as specified in 4.5.1 through 4.5.12.

4.3.1 Sampling. Sample sheets for the first article shall be taken at random from one of the first ten blocks of the first lot manufactured. A block is defined as a production item before slicing.

4.4 Quality conformance inspection. Except as otherwise specified herein, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced specifications, drawings and standards unless otherwise excluded, amended, modified or qualified in this specification or applicable purchase document.

4.4.2 End item inspection. The inspection lot shall consist of all honeycomb core sheets of the same type and density produced in a 72 hour period, but not to exceed 500 sheets. The sample unit shall be one honeycomb core sheet.

4.4.2.1 Visual examination. A visual examination shall be made for the defects listed in table II. The inspection level shall be II and the acceptable quality level (AQL) shall be 2.5, expressed in terms of defects per hundred units.

TABLE II. Defects

<u>Examine</u>	<u>Defect</u>
Bond	More than one unbonded node within a specified area of the honeycomb core.

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TABLE II. Defects (cont'd)

<u>Examine</u>	<u>Defect</u>
Workmanship	Excess resin accumulation, e.g., runs or sags. Starved area, e.g., lack of resin. Presence of foreign material. Cell wall edge of the core is not clean cut or has broken edges.

4.4.2.2 Dimensional examination. A dimensional examination shall be made to determine conformance with the requirements specified herein. The length, width and thickness dimensions of each sheet of honeycomb core selected for inspection shall be measured. The thickness shall be measured in accordance with ASTM C 366, Method B. Cell size shall be determined by taking the average distance between node bonds along the TW dimension for at least 60 cells selected at random in groups containing 10 adjacent cells. The inspection level shall be S-1 and the AQL shall be 2.5, expressed in terms of defects per hundred units.

4.4.3 End item testing. End item testing shall be performed as specified in 4.5.1 and 4.5.3 for the characteristics listed in table I. The inspection lot shall consist of all the honeycomb core sheets of the same thickness (see 6.2,c), fabricated from not more than ten production blocks. The sample unit shall be one honeycomb core sheet. Specimens for testing shall be cut from the honeycomb core sheet. Any failure of a test shall be cause for rejection of the lot represented by the specimens.

4.4.4 Packaging inspection. An examination shall be made to determine that preservation-packaging, packing, and marking comply with the section 5 requirements. Defects shall be as indicated in table III. The sample unit shall be one shipping container fully prepared for delivery. The lot shall be the number of shipping containers offered for inspection at one time. The inspection level shall be S-2 and the AQL shall be 2.5, expressed in terms of defects per hundred units.

TABLE III. Packaging inspection

<u>Examine</u>	<u>Defects</u>
Markings	Missing; incorrect; or illegible.
Workmanship	Bulged or distorted container.

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4.5 Tests. Unless otherwise specified herein, test specimens shall be bonded at a minimum of 257°F (125°C) for a minimum period of one hour and conditioned and tested under standard conditions of  $73 \pm 2^\circ\text{F}$  ( $22.7 \pm 1^\circ\text{C}$ ) and  $50 \pm 2$  percent relative humidity (R.H.).

4.5.1 Honeycomb core material density. The density of the honeycomb core material shall be tested for the requirements listed in table I and 3.9. The honeycomb core material density shall be determined in accordance with the core density and specific gravity method of MIL-STD-401 using two specimens, each at least 2.2 square feet ( $0.2 \text{ m}^2$ ) in area. The specimens shall be conditioned as specified in 4.5 for a minimum period of 48 hours. Each individual density value shall be recorded. The average density value of the two specimens shall be determined. Any average density value not meeting the requirements of table I and 3.9 shall be classified as failing the test.

4.5.2 Honeycomb core shear. Specimens shall be 15 inches (381 mm) by 3 inches (76 mm) by 2 inches (51 mm) cut from a bonded sheet. The skins shall consist of 0.05 inch (1.27 mm) thick perforated sheet of 5052 - H34 aluminum alloy. The perforated holes shall be 1/8 inch (3.2 mm) in diameter with 3/16 inch (4.8 mm) staggered centers.

4.5.2.1 Wet. Twelve specimens shall be soaked under a 12 inch (305 mm) head of water at  $70 \pm 5^\circ\text{F}$  ( $21.1 \pm 3^\circ\text{C}$ ) for a minimum period of 48 hours. When perforated skins are bonded to the core, the perforations shall be cleared of adhesive so that there is at least one hole into each cell through each skin. After removal from the water soak, the bonded specimens shall be shaken to remove excess water. The bonded specimens shall then be tested in accordance with the "Sandwich Flexure" test method of MIL-STD-401 using a 12 inch (305 mm) span, 2 - point loading system consisting of 2 inches (51 mm) by 3 inches (76 mm) by 1/4 inch (6 mm) loading blocks on 1/3 span. Six bonded specimens shall be tested in the TL plane and six in the TW plane. All individual shear strength values for each plane shall be recorded. Two or more of the six values of each plane not meeting the requirements of table I shall be classified as failing the test.

4.5.2.2 Dry. Twelve specimens shall be conditioned as specified in 4.5 for a minimum period of 48 hours, then tested as described in 4.5.2.1. At the option of the contractor, the skins specified in 4.5.2 do not necessarily have to be perforated. All individual shear strength values for each plane shall be recorded. Two or more of the six values of each plane not meeting the requirements of table I shall be classified as failing the test.



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4.5.3 Honeycomb core compression. Specimens shall be 4 inches (102 mm) by 4 inches (102 mm) by 2 inches (51 mm) cut from a bonded sheet. The skins shall consist of a 0.05 inch (1.3 mm) thick perforated sheet of 5052 - H34 aluminum alloy. The perforated holes shall be as specified in 4.5.2.

4.5.3.1 Wet. Six specimens shall be soaked under a 12 inch (305 mm) head of water at  $70 \pm 5^{\circ}\text{F}$  ( $21.1 \pm 3^{\circ}\text{C}$ ) for a minimum period of 48 hours. When perforated skins are bonded to the core, the perforations shall be cleared of adhesive so that there is at least one hole into each cell through each skin. After removal from the water soak, the bonded specimens shall be shaken to remove excess water. The bonded specimens shall then be tested in accordance with the "Core Compression" test method of MIL-STD-401. All individual compressive strength values shall be recorded. Two or more of the six values not meeting the requirements of table I shall be classified as failing the test.

4.5.3.2 Dry. Six specimens shall be conditioned as specified in 4.5 for a minimum period of 48 hours then tested in accordance with the "Core Compression" test method of MIL-STD-401. At the option of the contractor, the skins specified in 4.5.3 do not necessarily have to be perforated. All individual compressive strength values shall be recorded. Two or more of the six values not meeting the requirements of table I shall be classified as failing the test.

4.5.3.3 Elevated temperature. Six specimens shall be heated to  $176 \pm 5^{\circ}\text{F}$  ( $80 \pm 3^{\circ}\text{C}$ ) for a duration of 30 minutes and tested immediately at that temperature. The test procedure shall be in accordance with the "Core Compression" test method of MIL-STD-401. At the option of the contractor, the skins specified in 4.5.3 do not necessarily have to be perforated. All individual compressive strength values shall be recorded. Two or more of the six values not meeting the requirements of table I shall be classified as failing the test.

4.5.4 Cyclic ageing. Specimens shall be as specified in 4.5.3. When perforated skins are bonded to the core, the perforations shall be cleared of adhesive so that there is at least one hole into each cell through each skin. Six specimens shall be tested by the cycle A ageing test procedure of ASTM C 481. Each specimen shall be subjected to ten complete cycles of laboratory ageing except that the "heat" and "heat in dry air" procedures do not apply. Upon completion of the tenth cycle, shake the bonded specimens to remove excess water, store at  $73 \pm 2^{\circ}\text{F}$  ( $22.8 \pm 1^{\circ}\text{C}$ ) for 60 minutes and then test in accordance with the "Core Compression" test method of MIL-STD-401. All

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individual compressive strength values shall be recorded. Two or more of the six values not meeting the requirements of table I shall be classified as failing the test.

4.5.5 Brittleness/Impact. The specimen shall be 24 inches (610 mm) by 24 inches (610 mm) by 2 inches (51 mm) cut from a bonded sheet. The adhesive used for bonding the specimen shall conform to type I, class 2 of MMM-A-132 except that the minimum lap shear strength shall exceed 1500 psi (10.3 MPa) when tested at 200°F (93.3°C) after exposure of 14 days at 200°F (93.3°C) and 95 percent R.H. The skins shall consist of 0.05 inch (1.3 mm) thick sheet of 5052 - H34 aluminum alloy. The specimen shall be conditioned as specified in 4.5 for a minimum period of 48 hours. The bonded specimen shall be supported by, but not rigidly fixed to, a nominal 2 by 4 inch (51 by 102 mm) softwood frame resting on a flat concrete floor. A steel cylinder weight 67 pounds (30.4 kg) with 3 inch (76 mm) diameter hemispherical striking edge, shall be dropped the distance listed in table I onto the approximate center of the supported bonded specimen. The bonded test specimen shall be cross-sectioned through the impact area and visually examined. Localized crushing of the core is allowable. If the bottom facing skin delaminates during impact, the test shall be repeated on a new specimen with a better bond. Any evidence of shear fracture of the core shall be classified as failing the test.

4.5.6 Flatwise tensile. Six specimens, the thickness of the core, each having minimum dimensions of 3 by 3 inches (76 x 76 mm), shall be prepared for testing by bonding loading blocks directly to each side of the core. The adhesive used shall have sufficient bonding strength to ensure failure in the core and not between the core and block. The bonding technique shall be such that it does not affect the characteristics of the core. (Epoxide resin adhesives have been found useful for bonding the loading blocks at room temperature or at slightly elevated temperature.) The bonded specimens shall be conditioned as specified in 4.5 for a minimum period of 48 hours. The bonded specimens shall then be tested in accordance with the "Sandwich Tension" test method of MIL-STD-401. All individual tension strength values shall be recorded. Two or more of the six values not meeting the requirements of table I shall be classified as failing the test.

4.5.7 Fungus resistance. Twenty specimens of bare core material 4 inches (102 mm) x 4 inches (102 mm) x 2 inches (51 mm) thick shall be provided. All twenty specimens shall have the core cell ends reinforced in accordance with the specimen preparation procedures of the core compression test method of MIL-STD-401. Ten of these specimens shall be retained as control specimens and ten shall be exposed to the mildew resistance, soil burial test Method 5762 of FED-STD-191 for a period of 28 days except as follows:

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- a. Number of specimens shall be ten.
- b. Specimens shall be buried in the soil with the honeycomb cells perpendicular to the surface such that the core shall be filled with soil.

After exposure, the ten fungus specimens as well as the ten control specimens shall be conditioned as specified in 4.5 for a minimum period of 48 hours and then tested in accordance with the core compression test method of MIL-STD-401. All individual compressive strength values shall be recorded. The average compressive strength values of the ten control specimens shall meet or exceed the dry compression values shown in table I. At least seven of the ten specimens subjected to the fungus test shall meet or exceed 85 percent of the average compression strength values obtained from the control specimens.

4.5.8 Thermal conductivity. The bare core material specimens shall be 12 inches (305 mm) by 12 inches (305 mm) by 1 inch (25 mm) thick (T dimension). Three specimens shall be tested for thermal conductivity in accordance with ASTM C 578 and recorded as specified in 3.7.1.

4.5.9 Core shear modulus. Three dry specimens shall be tested for core shear moduli (TL and TW). The core shear moduli shall be determined in accordance with the core shear test method of MIL-STD-401 and recorded as specified in 3.7.1.

4.5.10 Core compressive modulus. Three dry specimens shall be tested for core compressive modulus. The core compressive modulus shall be determined in accordance with the core compression test method of MIL-STD-401 and recorded as specified in 3.7.1.

4.5.11 Water migration resistance. A minimum of two specimens of the core material shall be evaluated for water migration properties in accordance with the core water migration test method of MIL-STD-401. The water migration shall be expressed as the average number of cells filled in 24 hours. Any individual value exceeding the requirements of table I shall be classified as failing the test.

4.5.12 Fire resistance. The three specimens shall be 4.5 inches (114 mm) by 12.5 inches (318 mm) by 2 inches (51 mm) thick honeycomb core material bonded to 0.05 inch (1.3 mm) thick 5052 - H34 aluminum skins.

4.5.12.1 Test environment. Tests shall be conducted in a draft free sheet metal cabinet having a door with a glass insert for observation purposes. Baffled holes in the top or bottom of the cabinet is not permitted. A Bunsen or Terrill burner shall be used with a nominal 3/8 inch (9.5 mm) diameter tube

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adjusted to produce a 1-1/2 inch (38.1 mm) flame of a temperature of 1550°F (843°C). The lower edge of the specimen being tested shall be positioned 3/4 inch (19.1 mm) away from the flame.

4.5.12.2 Test setup. Specimen shall be clamped securely in a metal frame on three sides so that the exposed edge area is a minimum of 4 inches (102 mm) wide and 11-1/2 inches (292 mm) long in a vertical position.

4.5.12.3 Procedure. Lines shall be drawn 1-1/2 inches (38.1 mm) and 11-1/2 inches (292 mm) from one end of the specimen to indicate the area to be used as the timing zone for determining burn rate. Specimens shall be conditioned as specified in 4.5 for a minimum period of 40 hours. Specimen shall be mounted in the metal frame and shall be installed in the metal cabinet in the vertical position so oriented that the center line of the burner is in line with the face skin aluminum surface and the center of the specimen edge. The flame shall be applied for a period of 60 seconds then removed.

4.5.12.4 Burn rate. The burn rate shall be determined by using a minimum of 10 inches (254 mm) of the specimen for timing purposes. Approximately 1-1/2 inches (38.1 mm) must burn before the burning front reaches the timing zone. The average burn rate shall not exceed 4 inches (102 mm) per minute. If the specimen does not support combustion after the ignition flame is applied for a period of 60 seconds, or if the flame extinguishes itself, and subsequent burning without a flame does not extend into the undamaged area, the material is considered as having passed the fire resistance test.

## 5. PACKAGING

5.1 Preservation-packaging. Preservation-packaging shall be commercial.

5.1.1 Commercial. Honeycomb core material shall be preserved-packaged to afford adequate protection against physical damage during shipment from the contractor to the first receiving activity. The package and the quantity per package shall be the same as that normally used by the contractor for retail distribution.

5.2 Packing. Packing shall be commercial.

5.2.1 Commercial packing. Honeycomb core material, preserved-packaged as specified in 5.1, shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. The quantity per shipping container shall be the same as that normally used by the contractor for retail distribution. Container shall comply with Uniform Freight Classification or National Motor Freight Classification, as applicable.

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5.3 Marking. In addition to any special marking specified in the contract, interior package and shipping containers shall be marked in accordance with MIL-STD-129. Each shipping container shall also be marked with the following information:

Manufacturer's name and trademark  
 Specification number  
 Type, density and cell size  
 Dimension (W.L and T)  
 Date of production  
 Lot number

## 6. NOTES

6.1 Intended use. The honeycomb core covered by this specification is intended to be used in the fabrication of panels of military shelters with the cores being structurally bonded to metallic facings with a structural adhesive using temperatures in excess of 250°F (121°C).

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type required (see 1.2).
- (c) Dimensions required (see 3.5)
- (d) First article sample is required (see 3.1, 4.3 and 6.3).

6.3 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of ASPR 7-104.55 of the Armed Services Procurement Regulations. The first article should be a sample selected from the first lot manufactured. The first article should consist of a sample sheet of honeycomb core. The contracting officer should include specific instructions in all procurement instruments regarding arrangements for examinations, test and approval of the first article.

6.4 If the contractor publishes design information on thermal conductivity, shear and compressive moduli for use by the shelter designer, then the data shall be obtained in accordance with the respective tests cited in this specification.

6.5 Measurement. US units are the units of this specification but approximate SI (International System) are shown in parenthesis (see ASTM A 380).

Custodian:

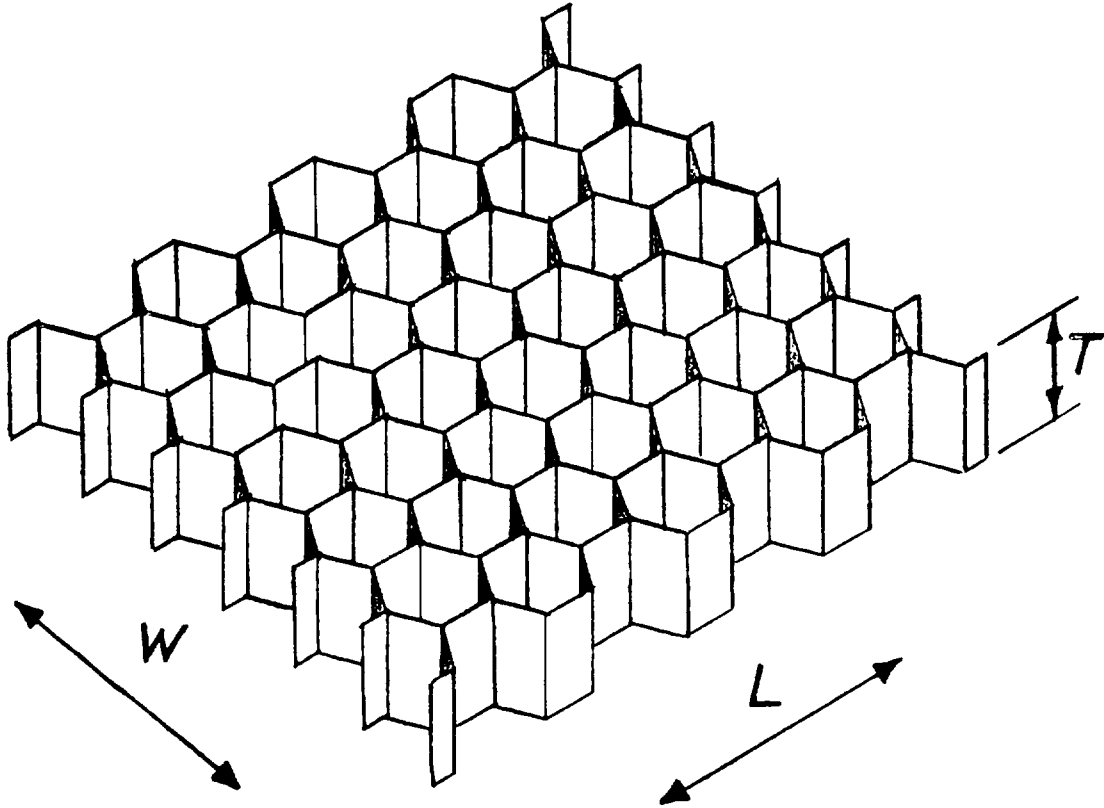
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# STANDARD DIRECTION NOTATIONS



*T* = CORE THICKNESS OR DEPTH

*L* = RIBBON DIRECTION OR LONGITUDINAL DIRECTIONAL OF CORE.

*W* = TRANSVERSE OR EXPANDED DIRECTIONAL OF CORE.

FIGURE 1



FOLD

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