

INCH-POUND

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SUPERSEDING  
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## MILITARY SPECIFICATION

## SHELTER, TACTICAL, EXPANDABLE, TWO-SIDE

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

## 1. SCOPE

1.1 Scope. This document covers a rigid wall, two-side expandable shelter constructed of aluminum faced, nonmetallic honeycomb sandwich panels, and meeting the International Organization for Standardization (ISO) Cargo Container specification in the transport mode. Nominal dimensions when closed (container mode) are: height 8 feet, width 8 feet and length 20 feet. Approximate dimensions, when expanded (shelter mode) are: height 8 feet, width 22 feet and length 20 feet.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5017 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5411

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SPECIFICATIONS

MILITARY

MIL-Q-9858 - Quality Program Requirements

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection  
by Attributes  
MIL-STD-810 - Environmental Test Methods and Engineering  
Guidelines  
MIL-STD-907 - Engineering and Design Criteria for Shelters,  
Expandable and Non-Expandable  
MIL-STD-1595 - Qualification of Aircraft, Missile and Aerospace  
Fusion Welders  
MIL-STD-2219 - Fusion Welding for Aerospace Applications

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

US ARMY NATICK RESEARCH AND DEVELOPMENT LABORATORIES

5-4-3118 - Shelter Assembly, Two Side Expandable - 60 amp  
5-4-3201 - Shelter Assembly, Two Side Expandable - 100 amp

(Copies of drawings required by contractors are available from the U.S. Army Natick Research, Development, and Engineering Center, ATTN: STRNC-UX, Natick, MA 01760-5017.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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International (ISO) Freight Container, Specification for ISO

- 1161 Series 1 - Freight Containers-Corner Fittings, Specification  
1496/1 Series 1 - Freight Containers Specification Testing, Part I,  
General Cargo Containers

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- E 864 - Surface Preparation of Aluminum Alloys to be  
Adhesively Bonded in Honeycomb Shelter Panels  
E 865 - Standard Specification for Structural Film  
Adhesives for Honeycomb Sandwich Panels  
E 866 - Standard Specification for Corrosion-Inhibiting  
Primer for Aluminum Alloys to be Adhesively Bonded  
in Honeycomb Shelter Panels  
E 874 - Standard Practice for Adhesive Bonding of Aluminum  
Facings to Nonmetallic Honeycomb Core for Shelter  
Panels  
E 990 - Core-Splice Adhesive Film for Honeycomb Sandwich  
Shelter Panels  
E 1091 - Non-Metallic Honeycomb Core for Use in Shelter  
Panels

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

(Non-Government standards and other publications are normally available from organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Alternate components. When this document or the referenced drawings specify use of a specific component "or equal", the contractor may substitute a component equal to the specified component provided that the contractor complies with the following requirements. Prior to manufacture of the first article, or if none is required, prior to commencing production, the contractor shall submit for the contracting officer's approval, a list

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identifying each proposed "or equal" component together with proof that each listed component is functionally equal to the specified component and is compatible with the end item covered by this document. The contracting officer, at his option, may require a physical sample of any "or equal" component. Approval of the submitted listing and supporting data authorizes the commencement of fabrication of the first article or of production, as applicable, but does not relieve the contractor of the responsibility that the "or equal" components perform in accordance with specified requirements when incorporated into the end item.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3), in accordance with 4.3.

3.3 Inspection comparison testing sample. When specified (see 6.2), the contractor shall furnish a sample for comparison inspection and approval (see 4.4 and 6.4).

3.4 Materials and components. Materials and components shall conform to the documents listed in section 2 and as specified herein. Any change to the proposed materials or processes must be approved by the contracting officer. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.5 Design and construction. Design and construction for the expandable shelter shall conform to the requirements specified on Drawing 5-4-3118 or 5-4-3201 as applicable and all subsidiary drawings and parts lists and hereinafter. The shelter shall be free of panel delaminations and shall meet all physical and environmental requirements specified herein.

3.5.1 Container mode. The shelter in the closed or transport mode shall be referred to as a container, for purpose of definition. The shelter, in the container mode, shall be an article of transport equipment meeting ISO freight container requirements related to cargo containers. The shelter shall show no structural damage when tested as specified in 4.6.16, 4.6.18, 4.6.19, 4.6.24 through 4.6.31 and shall show no leakage when tested as specified in 4.6.20. The contractor shall assure that the shelter receives Coast Guard Certification for ISO Containers. The container overall dimensions shall be in accordance with ISO freight container designated IC and are as follows:

Type	<u>Height</u>				<u>Width</u>				<u>Length</u>			
	Ft.	In.	Tol.	In.	Ft.	In.	Tol.	In.	Ft.	In.	Tol.	In.
IC	8	0	+0	-0.1875	8	0	+0	-0.1875	19	10.5	+0	-0.25

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**3.5.2 Panels.** The panels used as structural members in the container configuration shall structurally meet all transportation and environmental requirements specified herein. Each panel shall be fabricated with aluminum extrusions bonded about the panel perimeter during panel bonding. The inner and outer skins on all joints shall be sealed to provide a water barrier against the entrance of moisture to the core material and to the interior of the shelter. The water barrier is to be maintained intact at all panel cross-sectional openings. All joints and edges shall be assembled and sealed in a manner to prevent collection and retention of moisture. Particular emphasis shall be placed on the sealing of all mitered corners. Rivet shafts shall be coated with sealing compound before insertion. The sealer shall be as indicated on the drawings. The contractor shall have the appropriate equipment and facilities, use the correct procedures in accordance with ASTM E 874 and ASTM E 864, and use qualified panel components (i.e., structural film and core splice adhesives, corrosion-inhibiting adhesive primer, structural resin impregnated kraft paper honeycomb core, and as specified in 5052-H34 or 6061-T6 aluminum skins, FRP barrier strips, 6061-T6 panel extrusions). Prior to use, all critical panel component materials must be qualified to ASTM standards E 865, E 866, E 990, and E 1091. There shall be no skin splices in the panels except where noted on the drawings. Unless otherwise specified (see 6.2) prior to award of contract, the contractor shall submit to the contracting officer a certified copy of a laboratory test report and a copy of their process specification covering fabrication of the metallic-faced, paper honeycomb core sandwich panels they propose to use in the construction of the end item. Using their process specification, the contractor shall fabricate qualification test sandwich panels and structural film adhesive floating roller peel test specimens, and shall perform tests in accordance with ASTM E 865 and ASTM E 874 (see 6.2).

**3.5.2.1 Panel processing.** The shelter panels shall be processed and inspected as specified in ASTM E 864, ASTM E 866, ASTM E 874, ASTM E 990 and ASTM E 1091. The shelter panels shall be inspected for dimensions and flatness in accordance with the "Dimensional and Flatness Inspection of Panel" paragraph of ASTM E 874 (see 4.5.2).

**3.5.2.2 Panel watertightness.** Panel assemblies shall not permit the entry of water (see 4.5.3.1) when tested as specified in 4.6.14.

**3.5.2.3 Resistance to thermal shock.** Panels shall be resistant to thermal shock, when tested as specified in 4.6.1.

**3.5.2.4 Panel interchangeability.** All panels and panel assemblies bearing same part numbers shall be functionally and dimensionally interchangeable without modification or rework. Individual assemblies shall not be hand picked for fit or performance, when tested as specified in 4.6.2.

**3.5.2.5 Delaminations.** Shelter panels shall have no delaminations when tested as specified in 4.5.3.4.

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3.5.2.6 Panel frame air tightness. Welded panel frames shall be air tight when tested as specified in 4.5.3.2.

3.5.3 Inserts. When tested as specified in 4.6.3, the following sized inserts, where used, shall withstand the torque and pullout loads as specified in table I, without failure of the inserts, panel, or potting compound.

TABLE I. Insert strength (proof loads)

Insert (Dia. thrd size)	Pull-out (pounds)	Torque (ft-lbs)
10 - 32	1000	10
1/4 - 28	1000	20
5/16 - 24	2000	20
3/8 - 24	2000	40

3.5.4 Payload. The unit is designed to carry a maximum payload of 8050 pounds during transport.

3.5.5 Corner fittings. The container shall be equipped with corner fittings at the top and bottom corners in accordance with the dimensional requirements for corner fittings for series-1 freight containers as stipulated in ISO-1161 requirements for commercial containers. The upper faces of the top corner fittings shall protrude above the top of the rest of the container by a minimum of 1/4 inch. The lower faces of bottom corner fitting shall protrude below the bottom of the container by a minimum of 7/16 inch.

3.5.6 Shelter mode. The shelter in the erected mode shall be referred to as a shelter herein for the purpose of definition. Hinged shelter panels shall be attached in a manner to insure compliance with the environmental test requirements as specified in 4.6.1, 4.6.9 through 4.6.13, 4.6.20 and 4.6.22.

### 3.5.7 Lighting.

3.5.7.1 Exterior. One area lighting fixture, as shown on the drawings, shall be provided with each shelter.

### 3.5.8 Shelter electrical system.

3.5.8.1 General. The system shall have all equipment, cabling and other hardware necessary to receive three phase 120/208 volt, 60 hertz power from the base electrical distribution system, and distribute it to lighting fixtures and receptacles as indicated on the drawings. The 60 Amp shelters shall be in accordance with Drawing 5-4-3118 and all subsidiary drawings and



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parts lists. The 100 Amp shelters shall be in accordance with Drawing 5-4-3201 and all subsidiary drawings and parts lists. All parts of the electrical system shall operate when tested for electrical continuity as specified in 4.6.4.

3.5.8.2 Operating temperature. The wiring system and all individual hardware items shall be capable of operating at their required capacity within an ambient temperature range of  $-25^{\circ}\text{F}$  to  $125^{\circ}\text{F}$ , except that the fluorescent lights shall operate from  $0^{\circ}\text{F}$  to  $125^{\circ}\text{F}$ , when tested as specified in 4.6.10 and 4.6.11.

3.5.8.3 Current rating. All conductors and appropriate hardware shall be rated for current carrying capacity in accordance with the applicable Industry Standards as specified on the drawings. De-rating of components may be necessary for an operating ambient temperature of  $125^{\circ}\text{F}$ .

3.5.8.4 Finish. Panel boards and all other exposed metallic items shall have finishes as indicated on the drawings (see 3.7.5).

3.5.8.5 Panel board. The panel board used will be as indicated on the drawings. It will be of dead front construction and have a solid neutral bus, a ground bus, and a 60 amp or 100 amp three phase main breaker as specified (see 6.2). The panel will have a NEMA-1 inclosure with conduit hubs as necessary and at least 18 breaker spaces excluding the main breaker. The panel board bus feed will be by rigid conduit and conductors; the conductor having a current carrying capacity of at least 100 amps at  $125^{\circ}\text{F}$  ambient temperature. The bus feed cables will terminate in a connector mounted on the exterior of the shelter. Conductors running from panel board circuits to fixtures or receptacles shall be inclosed in rigid conduit or shall be specified flexible cable for the expandable portion of the shelter. The current carrying capacity of the conductors shall be 20 amps minimum, based upon an ambient temperature of  $125^{\circ}\text{F}$  and NEC rating procedures. All circuit breakers used in the system shall be bolt-on type and have a minimum interrupting capacity of 10,000 amps RMS symmetrical.

3.5.8.6 Cabling. Flexible cables shall be used to feed all relocatable lighting fixtures and receptacles. These cables shall be as indicated on the drawings.

3.5.8.7 Switches. Switches used shall be as indicated on the drawings.

3.5.8.8 Grounding. All noncurrent carrying metal components shall be solidly grounded using the green ground wire within the wiring system as indicated on the drawings.

3.5.8.9 Receptacles.

a. Electrical power service entrance. The electrical power service entrance shall be as shown on the drawings.

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b. Convenience outlets. The shelter shall contain duplex convenience outlets as indicated on the drawings. All outlets shall be electrically grounded.

c. Air conditioning. Power for heating and cooling equipment shall be provided from the distribution panel in the shelter to an electrical connector mounted in the service entrance recessed pan on the outside of the shelter, as indicated on the drawings.

d. External outlets. Power distribution shall be provided from the distribution panel box in the shelter to outlets mounted in the service entrance recessed pan on the outside of the shelter as indicated on the drawings.

3.5.8.10 Communications. The shelter shall have four (2 pairs) circuits through the wall telephone and intercom utility connections terminating in four protected terminals inside and outside the shelter, as indicated on the drawings.

3.5.8.11 Tools. Tools provided with the shelter shall be readily accessible to personnel when the shelter is in both the container and shelter configuration.

### 3.6 Performance characteristics.

3.6.1 Floor loads. The shelter floor shall be capable of supporting a uniform load of 65 pounds per square foot. The shelter floor shall be capable of supporting a concentrated load of 2,000 pounds over a 4 square foot area at the center of the floor. The floor shall also be capable of supporting a point load of 125 pounds per square inch. Loads shall not cause any permanent deformation of the floors or cause any deflection that interferes with proper shelter operation, when tested as specified in 4.6.5.

3.6.2 Roof loads. The roof assembly of the shelter shall withstand a snow load of 40 pounds per square foot and a personnel load of 660 pounds static over 2 square feet when tested as specified in 4.6.6.

3.6.3 Door loads. Container doors shall be tested to withstand the following loads without deformation or impairment of function:

a. Static door (hinge) load: The doors, frames and hardware shall be capable of supporting 200 pounds applied to the door at the edge opposite the hinge pivot line with the door open to approximately 90 degrees when tested as specified in 4.6.7.

b. Wind gust door (stop) load: The doors, frames and hardware shall withstand a wind gust of 60 mph in any direction when the door is secured in its open position by its door stop device when tested as specified in 4.6.7.



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3.6.4 Step assembly. The completely mounted step assembly shall withstand a vertical load of 500 pounds applied to the outer section without deformation of the assembly or supporting structure when tested as specified in 4.6.8.

3.6.5 Airtightness. The shelter shall not permit air leakage beyond specified limits in either container or shelter configuration when tested as specified in 4.6.9.

3.6.6 Temperature range.

a. Nonoperating temperature. The container mode configuration shall withstand exposure to a temperature range of  $-60^{\circ}\text{F}$  to  $160^{\circ}\text{F}$ .

b. Operational temperature. The shelter shall be dependable and operable in an ambient temperature range of  $-60^{\circ}\text{F}$  (except electrical (see 3.5.8.2)) to  $125^{\circ}\text{F}$  plus a solar load such that the outer skin reaches a temperature of  $200^{\circ}\text{F}$ , when tested as specified in 4.6.10, 4.6.11 and 4.6.22.

3.6.7 Humidity and temperature aging (components). The shelter components shall be capable of withstanding the conditions of a minimum 95 percent relative humidity at  $200^{\circ}\text{F}$ . There shall be no evidence of delamination, cracking, corrosion or deterioration when tested as specified in 4.6.12.

3.6.8 Blackout. There shall be no internal light visible from outside of the unit in the shelter mode when tested as specified in 4.6.13.

3.6.9 Insert strength. When tested as specified in 4.6.15, the inserts indicated in table I shall withstand loads equal to 80 percent of the applicable strengths shown in table I without failure and as indicated in table II.

TABLE II. Insert strength (working loads)

Insert (Dia. thrd size)	Pull-out (pounds)	Torque (ft-lbs)
10 - 32	800	8
1/4 - 28	800	16
5/16 - 24	1600	16
3/8 - 24	1600	32

3.6.10 Rail transportability. The shelter when tested as specified (see 4.6.16) shall be capable of withstanding, without damage, the shocks normally induced by rail transport.

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3.6.11 Impact resistance. The shelter panel shall be impact resistant when tested in accordance with 4.6.17.

3.6.12 Drop test. The shelter when tested as specified in 4.6.18 shall show no evidence of damage as a result of the drop test.

3.6.13 Towing. The shelter shall show no evidence of damage when tested as specified in 4.6.19.

3.6.14 Water leakage. The shelter shall show no evidence of leakage when tested as specified in 4.6.20.

3.6.15 Fluorescent light temperature. Shelter fluorescent light assemblies shall show no failure when tested as specified in 4.6.21.

3.6.16 Solar load. The shelter shall withstand a solar load test when tested as specified in 4.6.22.

3.6.17 Operational fitness. The shelter shall prove functional when tested as specified in 4.6.23.

3.6.18 Heat transfer. The overall coefficient of heat transfer of the shelter shall not exceed 0.35 British thermal units (BTU's) per hour per square foot per degree Fahrenheit (see 4.6.32).

3.7 Workmanship.

3.7.1 General. The shelter, including all parts and accessories, shall be constructed and finished in a workmanlike manner with particular attention given to removal of burrs and sharp edges, accuracy of dimensions, thoroughness of soldering, welding, painting, alignment of parts and assemblies, and the tightness of screws, bolts etc. Gaskets shall not be torn or split and shall be free of finish. Cloth components shall be clean and free of holes, cuts or tears. All latches utilized for erection and closing of the shelter shall be properly adjusted before the shelter is prepared for delivery to the Government.

3.7.2 Riveting. Riveting joints shall be tight. The joined parts shall be undamaged, and the rivet heads shall be properly seated and tight against the bearing surfaces. All rivets, except those used in panel bonding, shall be dipped in polysulfide sealant just prior to insertion. However, a dab of polysulfide sealant shall be applied to the head of each rivet.

3.7.3 Cleaning. After fabrication, parts shall be cleaned in accordance with the drawings.

3.7.4 Welding. Welded joints shall be such that grinding of the finished weld shall not be a requirement except when specified on the drawing. Spot, stitch, and seam welds shall be as indicated on the drawings. All surfaces

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to be welded shall be cleaned free from scale, paint, grease, and other foreign materials. Welds shall have thorough penetration, good fusion and shall be free from scabs, blisters, abnormal pock marks, cracks, voids, slag inclusions, and other harmful defects. Welded assemblies shall be cleaned to remove any scale, oxidation products, and excess flux. Any acid used in cleaning shall be completely neutralized and removed. Welders shall be certified in accordance with MIL-STD-1595. Welding equipment and procedures shall conform to MIL-STD-2219.

3.7.5 Finish. Coatings shall level out to an adherent, continuous and uniform film without runs, wrinkles, streaks, or areas of no film. Any coating damaged during assembly or examination shall be touched up. There shall be no areas of rust. Finish shall be free of blistering, peeling and chips.

3.7.5.1 Adhesion of paint. The shelter shall be capable of withstanding, without degradation to the finish, the tests as specified in 4.6.33. Note: After top coat application, the shelter in the deployed mode shall be stored for a minimum of one hundred and sixty eight hours at a minimum of 70°F prior to performing this test.

3.7.5.2 Color. The color of the paint film shall conform to the appropriate color chip for the paint specified.

3.7.5.3 Thickness. Thickness of the paint film shall be checked as specified in 4.6.35.

3.8 Other requirements. Requirements and testing for lifting, six high stacking, longitudinal restraint, racking, lashing, endwall strength, sidewall strength and lifting from fork lift pockets shall conform to ISO 1496/1 when tested as specified in 4.6.24 through 4.6.31.

3.9 Finish and color. Surfaces shall be of the color, treatment, and finish as shown on the drawings. Top coat painting shall be performed on the fully assembled shelter, so as to prevent mismatch of color shading, unless other control techniques are approved by the contracting officer. After top coat application, the shelter in the deployed mode (i.e., expanded) shall be stored in a 70°F minimum temperature indoor facility for a minimum of thirty-six hours to assure adequate coating(s) cure. During this storage period the shelter doors and vents shall be opened to permit air circulation within the shelter.

3.10 Nameplates and product marking. All markings shall conform to the drawings. Each shelter shall be serially numbered and provided with a nameplate in accordance with applicable drawings (see 6.2).

3.10.1 Interior markings. Interior markings shall be as shown and in the locations shown on the applicable drawings.

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3.10.2 Exterior markings. The shelter shall be provided with specific exterior markings as shown on the applicable drawings.

3.11 Manuals. Unless otherwise specified (see 6.2), technical manuals shall be provided with each shelter. Stowage provision for the manuals shall be located as shown on the applicable drawings.

3.12 Workmanship. The finished shelter shall conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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 document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspections set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the document shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for assuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, the inspection shall be made at any point, or at all points in the manufacturing process necessary to assure compliance with all dimensional requirements.

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

- a. First article inspection (see 4.3).
- b. Comparison sample inspection (see 4.4).
- c. Quality conformance inspection (see 4.5).

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4.3 First article inspection. When a first article is required (see 6.3), it shall be examined for visual defects in table IV, dimensions specified, and tested as specified and in the sequence specified, in table III. All inspections shall be performed on the same shelter. The presence of any visual defect, any dimension not within specified requirements, or failure of any test shall be cause for rejection of the first article.

4.3.1 First article panel specimen inspection. Prior to fabrication of any panels, a panel specimen shall be fabricated for torque and pullout testing to demonstrate strengths of potted inserts. The panel specimen shall be fabricated using the same techniques and materials used to fabricate production panels, except aluminum facing thickness shall be nominal 0.040 inch and overall thickness shall be nominal 2 inches thick. The edges of the specimen are not required to be sealed. The specimen shall be sized to accept 16 inserts (four each size specified in table I) located a minimum of 6 inches from panel edges and 6 inches on center from each other. The inserts shall be installed in accordance with the process to be used for production panels. Eight (two of each size) inserts shall be installed within the panel in a vertical plane and eight (two of each size) inserts shall be installed within the panel in a horizontal plane, and so identified i.e., H, or V. Failure of one or more inserts to pass the tests specified in 4.6.3.1 and 4.6.3.2 shall be cause for rejection of the installation process. This test shall be repeated until an insert installation process has been developed to pass the strength test.

TABLE III. First article test sequence

Inspection	Requirement	Test
Panel frame airtightness	3.5.2.6	4.6.36
Panel watertightness	3.5.2.2	4.6.14
Panel delamination	3.5.2.5	4.6.34
Visual Defects	4.3	4.5.4
Thickness	3.7.5.3	4.6.35
Adhesion of Paint	3.7.5.1	4.6.33
Operational (first time)	3.6.17	4.6.23
Thermal shock	3.5.2.3	4.6.1
Panel interchange	3.5.2.4	4.6.2
Insert proof load	3.5.3	4.6.3
Electrical system	3.5.8	4.6.4
Floor load, static	3.6.1	4.6.5
Roof load	3.6.2	4.6.6
Door load	3.6.3	4.6.7
Step	3.6.4	4.6.8
Airtightness	3.6.5	4.6.9
Low temperature	3.6.6	4.6.10
High temperature	3.6.6	4.6.11
Humidity and temperature aging	3.6.7	4.6.12

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TABLE III. First article test sequence (cont'd)

Inspection	Requirement	Test
Heat transfer	3.6.18	4.6.32
Insert working load	3.6.9	4.6.15
Rail transportability	3.6.10	4.6.16
Impact resistance	3.6.11	4.6.17
Drop	3.6.12	4.6.18
Towing test	3.6.13	4.6.19
Fluorescent light temperature	3.6.15	4.6.21
Lifting	3.8	4.6.24
Six-high stacking	3.8	4.6.25
Longitudinal restraint	3.8	4.6.26
Racking	3.8	4.6.27
Lashing	3.8	4.6.28
Endwall strength	3.8	4.6.29
Sidewall strength	3.8	4.6.30
Lifting from forklift pockets	3.8	4.6.31
Blackout	3.6.8	4.6.13
Water leakage	3.6.14	4.6.20
Solar load	3.6.16	4.6.22
Operational test (second time)	3.6.17	4.6.23

4.4 Comparison sample inspection. When a comparison sample is required (see 6.4), it shall be inspected and tested as specified in 4.3.

4.4.1 Comparison sample panel specimen inspection. Comparison sample panel specimen inspection shall be performed in accordance with 4.3.1.

4.5 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105. The contractor shall have a quality control system in accordance with MIL-Q-9858.

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

4.5.2 In-process examination. Examination shall be made of the following fabrication operations to establish conformance with specified requirements.

- a. That panel materials are as specified.
- b. That the panels are processed, fabricated and inspected in accordance with the requirement of ASTM E 864, ASTM E 865, ASTM E 866, ASTM E 874, ASTM E 990 and ASTM E 1091 (see 3.5.2.1).



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- c. That electrical assemblies and wiring are fabricated in accordance with applicable drawings and industry standards.
- d. That rivet heads are sealed and tight for conformance with 3.7.2.
- e. That parts are cleaned and free of adhesive sealer and other foreign materials for conformance with applicable drawings.
- f. Prior to assembling other components over any welded area or prior to priming for painting, that welding processes and welded assemblies conform to referenced documents, when specified on the drawings and to the requirements of 3.7.4.
- g. That the primer thickness, topcoat thickness, and topcoat color are as specified on the applicable drawings (see 3.7.5.2 and 3.7.5.3).

Whenever nonconformance is noted, correction shall be made to the items affected and the process.

#### 4.5.3 In-process testing.

4.5.3.1 Panel watertightness testing. Prior to assembly (i.e. fabrication of cutouts installation of inserts and hardware,...) one panel from every lot of both welded frame panels and unwelded frame panels shall be tested for watertightness as specified in 4.6.14. The lot size shall not exceed 100 panels. Panels to be tested shall be 8 foot by 20 foot panels. Failure of the test shall be cause for rejection of the panel lot represented.

4.5.3.2 Panel frame airtightness test. After welding, all welded panel frames shall be tested as specified in 4.6.36, and reworked, if required, as specified in 4.6.36.1.

4.5.3.3 Panel insert testing. Each type of shelter panel (roof, end wall, etc.) shall be tested for insert working load by first-piece inspection and by sample inspection of each lot of each type of panel. The inspection lot shall consist of all of one type of panels processed at one time. At the start of each panel and insert assembly operation, the first panel (first-piece) shall have all inserts tested for working load in accordance with 4.6.15 and failure of any insert shall be cause for rejection of the panel and the process. Each start-up of insert fabrication, change in type or formulation of adhesive or potting compound, or any change in the method of insert bonding shall be cause for necessary changes to the process and for repeat of the first-piece inspection. Inspection lots shall be evaluated using inspection level II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 10.0. Each sample panel shall have all inserts tested for insert working load in accordance with 4.6.15.

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4.5.3.4 Panel delamination testing. All panels coming out of the press shall be tested as specified in 4.6.34. Failure to pass this test shall be cause for rejection of that panel. The contracting officer shall be notified, within seventy-two hours, of any failures. In addition, a failure analysis report shall be prepared with corrective action defined.

4.5.4 End item visual examination. The end item shall be examined for the defects listed in table IV. The lot size shall be expressed in units of one shelter. The sample unit shall be one shelter. The inspection level shall be II and the AQL, expressed in terms of defects per hundred units, shall be 4.0 for major defects and 6.5 for total (major and minor combined) defects.

TABLE IV. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Finish	Not as specified, not finished where required	101	
	Not adherent, e.g., blistered, peeled		201
	Runs, wrinkles, streaks, or areas of no film		202
	Finish not dry, i.e., wet or tacky to touch		203
	Scratch, gouge, abrasion exposing prime coat or bare metal in accordance with the drawings		204
	Any area of rust		205
Design	Any characteristic not in accordance with specified requirement	102	
Construction and workmanship	Component or part fractured, split, punctured, dented, or malformed	103	
	Component missing, inoperative, or will not operate as intended	104	
	Component not properly assembled or secured	105	
	Any functioning component which requires abnormal force to operate		206
	Burr, rough or sharp edges, or sliver which may be injurious to personnel or cargo	106	
	Gaskets torn or split	107	
	Gaskets or seals painted		207
	Visible gaps between aluminum faces and extruded edges or panel cutout edge members	108	

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TABLE IV. End item visual defects (cont'd)

Examine	Defect	Classification	
		Major	Minor
Welding and brazing (where required)	Not type specified, missing where required	109	
	Incomplete, burn through area, pits, crack or fracture, or otherwise not fused	110	
	Slag inclusion, undercut, not smooth and uniform, scale or flux deposit not removed		208
Metal fasteners, bolts, nuts, screws, studs	Missing, not type specified, broken, stripped, or loose	111	
	Lockwasher missing where required		209
Rivets	Missing	112	
	Not type specified	113	
	Not sufficiently peened, not drawn tight, excessively peened		210
Cloth	Cut or tear longer than 1/8 inch	114	
	Hole larger than 1/8 inch diameter	115	
Marking	Missing, incomplete, not legible, not specified type or size, misplaced		211
Instruction plate; nameplate	Missing, incomplete, not legible	116	
Instruction manual	Missing, incomplete, not legible	117	

4.5.5 End item dimensional examination. The end item shall be examined for conformance to dimensions specified. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of one shelter. The sample unit shall be one shelter. The inspection level shall be I and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

#### 4.5.6 End item testing.

4.5.6.1 Electrical continuity testing. Every end item shall be tested as specified in 4.6.4. Any test failure shall be cause for rejection of the end item.

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4.5.6.2 Water leakage and operational testing. The first ten production units shall be tested as specified in 4.6.20, 4.6.20.1 and 4.6.23. If no failures are experienced, five of the next ten production units shall be tested. If no failures are experienced on the fifty percent sample, one of each twenty-five production units shall be tested thereafter. Any failure on sampled units shall be cause for rejection of that unit and repeat of the above procedure (starting with the units of that lot).

4.5.6.2.1 Water leakage (fully loaded). One out of every fifty production units shall be tested as specified in 4.6.20.2 and 4.6.20.3. The contracting officer shall be notified of any test failure within seventy-two hours. A failure analysis report shall be prepared with corrective action defined, and one out of the next ten production units shall be tested followed by one out of the next fifty if no failures occur.

4.5.6.3 Performance testing. One end item from each inspection lot shall be tested as specified in 4.6.9 (shelter mode only) and 4.6.22. After successful completion of these tests, the end item sample shall be tested as specified in 4.6.13. The size of the inspection lot shall not exceed twenty-five shelters. Any test failure shall be cause for rejection of the lot.

4.5.6.4 Paint adhesion testing. One of every forty production units shall be tested as specified in 4.6.33. This unit in the deployed mode shall be tested only after storage in a 70°F minimum temperature indoor environment for 168 hours minimum, after topcoat painting. The contracting officer shall be notified of any test failure within 72 hours. A failure analysis report shall be prepared with corrective action defined, and one out of the next ten production units shall be tested, followed by one out of the next forty if no failures occur.

4.5.7 Packaging examination. An examination shall be made to determine that preservation and packing comply with the section 5 requirements. Defects shall be scored in accordance with table IV. The sample unit shall be one shelter fully packaged except the mechanical seals on the doors may be omitted to facilitate inspection. When omitted for internal inspection, after acceptance of the lot for preservation, mechanical door seals shall be applied to the shelters and then the lot of shelters subsequently inspected for sealing. The lot shall be the number of shelters offered for inspection at one time. The inspection level shall be II and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

TABLE V. Packaging defects

Examine	Defect
Workmanship	Doors are not closed, latched, and mechanically sealed.
Exterior	Exterior electrical connections are not covered and covers are not secure (hand pressure).

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TABLE V. Packaging defects (cont'd)

<u>Examine</u>	<u>Defect</u>
Workmanship Exterior (cont'd)	Expandable wall corner post cam latch handles are not in locked position with pin in retaining hole. Puncture in exterior skin. Damage (such as bend, gouge, or dent) to frame ends or to fork lift opening. Steps are not folded closed. Any other protruding or not stowed part.
Interior	Equipment container is not secured in place. Parts in the equipment container are not in accordance with the list of parts. The four lift jacks are not secured on the doors. The four leveling jacks are not secured on the cargo door. The support struts are not secured with lock pin in place. The removable light fixtures are not secured to the fixed ceiling by four captive studs with stowage. Bracket plunger locked. The movable utility outlets are not secured to the hinged endwalls by their captive screws. The area light and cable are not secured to the interior of the personnel end panel with the retaining wing nuts secured (hand pressure). The area light does contain a bulb (bulb should be packaged and packed in the equipment container). Any circuit breaker not in the OFF position. The circuit breaker box keys are not inside the box. Air vents are not secured closed. Environmental control unit (ECU) panels are not stowed securely on the fixed ceiling. Any other loose or not stowed part.

4.6 Methods of inspection.

4.6.1 Thermal shock test. Within 30 minutes after exposure cycling of 4.6.12 has been completed, the panel specimens shall be subjected to -65°F environment for 4 hours to evaluate the effects of thermal shock. After thermal shock, the panel specimens shall be inspected for delamination (see 4.6.34), corrosion and material degradation. Any delamination, corrosion, or material degradation shall constitute a failure of the test.

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4.6.2 Panel interchange test. Two folding walls with the same part number and two fixed walls with the same part number, randomly selected from the first article or production lot of completed shelters, as applicable, shall be interchanged. The interchange shall be accomplished by removing the hinge pins or bolts as applicable, interchanging walls and reinstalling the hinge pins or bolts (see 3.5.2.4). Any wall that cannot be fully interchanged shall constitute a failure of the test.

4.6.3 Insert proof load test. Test fixtures shall be fashioned by the contractor and approved by the Government prior to its use, to evaluate the inserts using bolts of the applicable thread size. Loads shall be applied to the insert in a tightening and loosening direction and held at the specified torque for a minimum of five seconds. The test fixtures shall be fashioned to induce only a twisting load to the insert for the torque test and, primarily, only on axial tensile load through the centerline of the insert for the pull-out test. The reaction load from the panel outside of a three inch radius measured from the centerline of the insert. The reaction load from the insert pull-out fixture onto the test specimen panel, shall be applied to the panel outside of a 3 inch radius measured from the centerline of the insert.

4.6.3.1 Insert torque. To determine compliance with the torque requirements in 3.5.3, a torque load equal to the torque strength cited in table I should be applied to identical inserts of each size (1-H, 1-V) potted in the test specimen panel cited in 4.3.1 and 4.4.1. Inability of any insert to meet the specification requirements shall constitute a failure of the test.

4.6.3.2 Insert pull-out. To determine compliance with the pull-out requirements of 3.5.3, a tensile pull load equal to pull-out strength cited in table I should be applied to two identical inserts of each size (1-H, 1-V) potted into the test specimen cited in 4.3.1 and 4.4.1. Failure of the potting compound to hold the insert firmly in panel shall constitute failure of the test.

4.6.4 Electrical system test. To determine compliance with 3.5.8.1, the electrical system of the shelter shall be checked to verify continuity of all circuits of the electrical installation to ascertain electrical readiness of the shelter. All lights and electrically powered equipment shall be operated. Any evidence of incomplete circuits, nonoperating switches or damaged electrical components shall constitute failure of the test.

4.6.5 Floor loads test static load. The floor loads test-static load shall be as specified in MIL-STD-907.

4.6.6 Roof load test. The roof load test shall be as specified in MIL-STD-907.



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4.6.7 Door load test. The door load tests shall be as specified in MIL-STD-907.

4.6.8 Step test. A 500 pound weight shall be suspended from the outer end of the step assembly for 5 minutes and the load removed. Any permanent deformation or local delamination (see 4.6.34) shall constitute failure of this test.

4.6.9 Airtightness test. The shelter airtightness test shall be as specified in MIL-STD-907.

4.6.10 Low temperature test. The shelter in its container mode, with shelter components and maximum payload packaged within, shall be cold soaked at  $-60^{\circ}\text{F}$  temperature for a minimum of 24 hours in a mechanically refrigerated cold chamber. At the end of the 24 hour period and while at  $-60^{\circ}\text{F}$ , erect the shelter. Operate all hardware (e.g., latches, doors, knockout panels, etc.) and examine the shelter and its components for any damage. Do not move lights or electrical receptacles into position at this time. Return the shelter to closed/container mode and raise the chamber temperature to  $-25^{\circ}\text{F}$ . Allow chamber to stabilize at  $-25^{\circ}\text{F}$  for 4 hours. Next erect the shelter and hook up power source to shelter. Position ceiling fluorescent lights and electrical receptacles on expanded shelter sections. Operate circuit breakers, blackout emergency switch, and emergency incandescent light(s). The fluorescent ceiling lights shall not be operated at  $-25^{\circ}\text{F}$ , since they are rated for minimum of  $0^{\circ}\text{F}$  operation. The shelter shall next be returned to normal atmospheric conditions and all doors, electrical components and hardware cycled. After operation and inspection of all components, the shelter shall be closed for shipment and re-examined for component damage and material degradation. The finding of any material or panel degradation or the inability of any hardware to function properly during this test shall constitute failure of the low temperature test.

4.6.11 High temperature test. The shelter in its container mode, with shelter components and maximum payload packaged within, shall be subjected to a  $+160^{\circ}\text{F}$  storage test cycle and a  $125^{\circ}\text{F}$  operational test cycle. The shelter shall be soaked in a chamber for at least 6 hours at the storage test temperature and for 24 hours at the operational test temperature prior to initiation of the operating phase of the operational test cycle. At  $125^{\circ}\text{F}$ , the shelter shall be erected and circuit breakers, blackout emergency switch, emergency incandescent light, and fluorescent lights operated. All doors, vent openings, panel closeouts, and operational hardware shall be functioned. The shelter shall be returned to normal atmospheric conditions and all doors, electrical components, and hardware cycled. After operation and inspection of all components, the shelter shall be closed for shipment and examined for component damage and material or panel degradation. The finding of any material or panel degradation or the inability of any hardware to function properly shall constitute failure of the high temperature test.

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4.6.12 Humidity and temperature aging test. All hardware (latches, handles, hinges, jack, tools, struts, light fixtures, etc.) and a 4 feet by 8 feet specimen of each thickness composite panel (without edge members) shall be subjected to fifteen continuous 48-hours cycles of the moisture resistance test per Method 507 of MIL-STD-810. After cycling has been completed, any evidence of delamination, cracking, corrosion, or deterioration to any component, and any malfunction of any hardware or panel specimen shall constitute failure of the test.

4.6.13 Blackout test. The shelter shall be placed in a dark environment. A light source of two 100 watt bulbs operating at rated voltage shall be suspended from the ceiling brackets of the shelter. With all covers in place and doors closed, observe the unit at 25 feet distance to insure that no rays of lighting are visible to normal unaided eyesight. Visibility of any light at specified distance shall constitute failure of the test.

4.6.14 Panel watertightness test. The shelter panel shall be weighed and then floated horizontally, with the sealed side down, in a tank of water. Approximately 3/4 of the thickness of the floating panel shall be submerged in water, using hold down devices if necessary. The panel shall be sealed on the surface which is located on the shelter exterior when the shelter is in its open configuration. Panel sealing for the test panel shall be equivalent to the sealing performed on all production panels, excess sealant on rivet heads, panel edges, or areas not normally sealed in production shall not be allowed. The panel shall be submerged for 6 hours, at the end of this period it shall be removed from the water, hand dried, and reweighed within 15 minutes. The panel shall not gain more than 0.1% of its original weight upon reweighing. If a failure occurs, the source of the leak shall be determined and fixed. The panel shall then be retested using the above procedure. Upon passing this test all panels in the lot shall be checked for similar deficiencies and repaired in the same manner as the sample panel. The scale for determining panel weight shall be accurate to 0.1 pound.

4.6.15 Insert working load test. A working torque load and pull-out load shall be applied to all inserts incorporated in the shelter panels. This test shall be performed using torque and pull-out loads as specified in table II. The same devices used to perform test specified in 4.6.3, shall be used for this test. Failure of potting compound to hold any insert firmly in panel shall constitute failure of the test.

4.6.16 Rail transportability test. The shelter at a gross weight of 15,000 pounds shall be tested for rail transport as specified in MIL-STD-810. The test payload shall be secured to prevent shelter damage due to the load shifting on impact.

4.6.17 Impact resistance test. Test as specified in MIL-STD-907, except that the panel shall meet the following acceptance criteria: No rupture of the impacting and/or opposite skin is allowed. No delamination of opposite

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skin to core is allowed. Outside a three inch radius (except 3 1/2 inch radius for fixed floor panel) from the "center of impact" (which shall coincide with the approximate center of the test panel specimen), no delamination of impacting skin to core shall be allowed and crushing/collapsing of the core shall not be allowed. Outside a five inch radius from the "center of impact" (which shall coincide with the approximate center of the test panel specimen), core shear failure shall not be allowed.

4.6.18 Drop test. The shelter, in the container mode, and with a uniformly distributed payload such that the gross weight equals 15,000 pounds shall withstand drops of 6 inches onto a level concrete type surface. A quick release hook shall be utilized that insures the shelter falls freely the full 6 inches. Any evidence of splits, or tears on the bottom, deformation, buckling, delamination (see 4.6.34), or structural weakness to any part of the shelter; and doors and panels not operating properly during erection and striking shall constitute failure of the test.

(a) Flat drop. Lift shelter 6 inches high using a four cable sling and allow shelter to fall freely so that the bottom impacts onto a hard concrete surface.

(b) Rotational drop. A four inch high (nominal) board shall be placed under the ISO fittings at one edge of the shelter. The opposite edge of the shelter shall be lifted 6  $\pm$  1/4 inches from the ground. Measurements shall be taken from the outer edge of the ISO fittings at the 2 raised corners of the shelter. The range of the 2 measurements shall not exceed 1/4 inch. The shelter shall be released and allowed to fall freely such that the ISO fittings impact onto a hard concrete surface. After all 4 rotational drops the requirements of 3.6.12 shall be met.

4.6.19 Towing test. The shelter shall be loaded to a gross weight of 15,000 pounds and then towed from the leading edge lower ISO fittings for a minimum of 200 feet forward and 200 feet backward over rough plowed ground at a speed of 3 to 5 miles per hour. Two right angle turns shall be performed on soft dirt while the shelter is being towed. The initial position before each of the turns shall be such that the direction of travel of the towing vehicle is perpendicular to the longitudinal axis of the 20-foot side and the towing eye of the vehicle is in line with the leading edge of the shelter. Any panel delamination or structural deformation, except superficial base frame dents and scratches, as a result of towing shall constitute a failure of the test.

4.6.20 Water leakage test (shelter mode). The shelter in its expanded mode with jacks raised a minimum of two inches from ground level, shall be exposed to a simulated rainfall of 5  $\pm$  1 inches per hour, as measured by a U.S. Weather Bureau type gauge. Direction of the rainfall shall be angled at 45 degrees from the vertical and the nozzles so spaced to insure even dispersion over the test area. The roof with each of the major sides of the

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shelter in succession, shall be exposed to this angled rainfall for periods of 30 minutes. The rainfall shall be dispersed uniformly, over the entire test area. This test shall be performed for 2 hours with the shelter in the closed configuration and for 2 hours with the shelter in the erected configuration. All openings and doors shall be closed and latched. Upon completion of the test, any evidence of penetration of water into the shelter shall constitute a failure of the test. Alternately, the whole shelter shall be exposed for 30 minutes to the above test in lieu of exposing each section separately.

4.6.20.1 Water leakage test (container mode). The shelter shall be tested as specified in 4.6.20, except that it shall be in the container mode.

4.6.20.2 Water leakage test (shelter mode fully loaded). The shelter shall be tested as specified in 4.6.20, except that the maximum payload for the shelter shall be distributed uniformly on the fixed floor.

4.6.20.3 Water leakage test (container mode fully loaded). The shelter shall be tested as specified in 4.6.20.1, except that the maximum payload for the shelter shall be uniformly distributed on the fixed floor.

4.6.21 Fluorescent light temperature test. Three fluorescent light assemblies shall be randomly selected from all of the light assemblies of the sample shelters. These sample fluorescent light assemblies shall be tested for performance at 0°F and 125°F temperature extremes. Note, this light test may be performed as an extension of the high and low temperature shelter tests of this document. All of the sample lights shall be tested at one temperature extreme, normalized at ambient if acceptable, and then tested at the other extreme. The sample lights shall be soaked and performance tested in a chamber at no more than 0°F for the low temperature phase and at not less than 125°F for the high temperature phase. Each soak period shall be no less than 24 hours. While remaining in the chamber, at the completion of the soak period, the lights shall be turned on. If any light does not provide full, constant illumination within 1 minute, it shall be shut off for at least 1 minute and then turned on a second time. Inability of any light to provide fully, constant illumination within 1 minute after not more than two attempts and remain at full, constant illumination for at least 10 minutes shall constitute failure of the test.

4.6.22 Solar load test. The solar load test shall be as specified in MIL-STD-907.

4.6.23 Operational test. The shelter shall be placed on fairly level ground and a complete cycle of leveling, erecting, operating all components and closing shall be conducted. Any difficulty in operation experienced during the test (such as tools are required to operate latches, incomplete mechanical interface, interconnecting parts do not properly function, inability to erect the shelter using the tools stored within, etc.), failure of any component to function as intended, breakage or deformation of any component, or any panel delamination shall constitute failure of this test.

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4.6.24 Lifting test. The shelter, at a gross weight of 48,000 pounds (3.2g x 15,000 pounds), shall be subjected to lifting by first the top corner fittings followed by a second lift by the bottom corner fittings. The lifting shall be accomplished using appropriate slings such that minimal acceleration or deceleration forces are applied. The dummy load shall be evenly distributed over the entire floor area. The shelter shall be hoisted off the ground by means of a four-cable sling having cable lengths (about 15 feet) such as to form a single apex over the CG with the sling legs at 45 degree angles with the roof plane when attached to the top corner fitting of the unit. The shelter shall also be hoisted off the ground by means of a four cable sling with a spreader bar such as to form a 45 degree angle to the roof plane when attached to the lower corner fittings of the shelter. The container will be held suspended for 5 minutes for each lift. Any structural damage (cracks, deformation or delamination (see 4.6.34)) incurred in the shelter as a result of this test shall constitute a failure of the test.

4.6.25 Six high stacking test. The shelter in its container mode, loaded to a total gross weight of 30,000 pounds, shall be placed on four level pads, one under each bottom corner fitting. The pads shall be centered under the fittings and be substantially of the same plan dimensions (i.e., shelter fitting dimensions as taken in a plan view) as the fittings. A stacking load of 403,200 pounds shall be applied through four pads of the same plan area as the corner fittings, the load being equally divided among the four top fittings. Each pad shall be offset in the same direction, 1.5 inches in the longitudinal direction and 1.0 inch in the lateral direction. Four tests shall be conducted for offsets in each of the four longitudinal and lateral combinations. Alternatively, the corner structures on one end of the shelter may be tested simultaneously, and then the corner structures on the opposite end. In all cases, the loads shall be applied for not less than 5 minutes and any structural damage incurred in the shelter and the container dimensional requirements (see 3.5.1) not maintained as a result of this test shall constitute a failure of the test.

4.6.26 Longitudinal restraint test. The shelter in its container mode, loaded to a gross weight of 15,000 pounds shall be restrained longitudinally by securing the bottom corner fittings at one end to suitable anchor points through the bottom apertures. A force of 30,000 pounds shall be applied longitudinally to the shelter, equally divided through the bottom apertures of the bottom corner fittings at the opposite end of the shelter, first in compression and then in tension. Alternatively, a force of 15,000 pounds shall be applied to each side consecutively, first in tension and then in compression. In either case the loads shall be applied for not less than 5 minutes and any structural damage incurred in the shelter and the dimensional requirements (see 3.5.1) not maintained as a result of this test shall constitute a failure of the test.

4.6.27 Racking test. The shelter in its container mode shall be supported at all four bottom corner fittings on rigid pads lying in the same horizontal plane. The two bottom corners fittings diagonally opposite to the applied



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load which lie in the same face, perpendicular to the applied load, shall be totally restrained. The remainder of the bottom corner fittings shall be allowed to move only in the horizontal direction. The loads shall be applied and removed gradually and any structural damage incurred in the shelter and the dimensional requirements (see 3.5.1) not maintained as a result of this test shall constitute a failure of the test.

(a) Transverse racking. A compression and tension force of 33,600 pounds shall be applied to either of the two top corner fittings on one side of the container, the line of action of the force being horizontal and parallel to the ends of the container. Both ends shall be tested consecutively.

(b) Longitudinal racking. A compression force of 16,800 and a tension force of 16,800 pounds shall be applied to either of the two corner fittings on one end of the container, the line of action of the force being horizontal and parallel to the sides of the container. Both sides shall be tested consecutively.

4.6.28 Lashing test. The shelter in its container mode shall be secured by all four bottom corner fittings and subjected to an upper longitudinal tension load of 16,800 pounds. The loading shall be applied to the two corner fittings that are in line with the side of the shelter under test and induced through that face of the corner fittings, that are perpendicular to the sidewall. Any structural damage incurred in the shelter and the dimensional requirements (see 3.5.1) not maintained as a result of this test shall constitute a failure of the test.

4.6.29 Endwall strength test. Each endwall of the shelter in the container mode shall be subjected to an internal, uniformly distributed load of 3880 pounds, applied separately and arranged to allow free deflection of the wall. The loads shall be applied for not less than 5 minutes. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this document not maintained following the test shall constitute a failure of the test.

4.6.30 Sidewall strength test. Each sidewall of the shelter in its container mode shall be subject to an internal uniformly distributed load of 5820 pounds applied separately and arranged to allow free deflection of the wall. The loads shall be applied for not less than 5 minutes. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this document not maintained following the test shall constitute a failure of the test.

4.6.31 Lifting from fork lift pockets test. The shelter in its container mode shall have a load, as specified below, uniformly distributed over the floor and the shelter then shall be supported on two horizontal bars, each 8 inches wide, projecting 72-1/8 inches into the fork pockets, measured from



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the outside face of the side of the container. The bars shall be centered within the pockets. The container shall be supported for 5 minutes and then lowered to the ground. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this document not maintained following the test shall constitute a failure of the test.

(a) Outer forklift pockets. The gross weight of the container and payload shall equal 18,750 pounds.

(b) Inner forklift pockets. The gross weight of the container and payload shall equal 9375 pounds.

4.6.32 Heat transfer test. The heat transfer test shall be as specified in MIL-STD-907.

4.6.33 Adhesion of paint test. A portion of the painted surface(s) of the shelter assembly in the deployed mode (i.e., expanded) shall be tested. Areas to be tested shall be as follows:

- a. shelter wall exterior and interior surfaces
- b. shelter floor interior surface
- c. shelter base frame exterior surface
- d. shelter corner post exterior surface
- e. shelter fluorescent light fixture exterior surface
- f. latch pan exterior surfaces
- g. shelter ISO corner fitting exterior
- h. shelter breaker box exterior surface
- i. shelter internal panel latch surface
- j. shelter jack body exterior surface

Only a small area from one each of the above listed items shall be subjected to the following test:

Each painted surface shall be scraped with a sharp knife. The paint shall peel evenly from the surface rather than chip or flake. Lastly, the following test shall be performed: A piece of cloth shall be taped on the area under inspection, and the cloth kept soaked for 24 hours with tap or distilled water. Remove wet cloth and wipe dry with a soft dry cloth.

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Within one minute of wet cloth removal, make two parallel scratches 1 inch apart, through the coating to the metal with a stylus. Immediately thereafter, apply a one inch strip of flat back paper tape having an average adhesion of 80 oz./in width, to the painted surface, adhesive side down. Press the tape down employing a 2.0 Kg rubber covered roller, having a surface durometer of 70-80, 3.5 inches in diameter and 1.7 inches wide. The tape shall be pressed against the surface by passing the roller across the tape eight times. Remove the tape in one quick motion and examine the tested area for any paint damage, such as removal of paint at one of the layers of the paint system or removal of the entire system from the metal.

Acceptable shelters subjected to this testing may be delivered on contract after all visible damage to the tested painted surfaces is repaired and the repair is approved by the Government. Failure to pass any of these tests shall be counted as a major defect.

4.6.34 Panel delamination test. Panel shall be tap tested for delaminations in accordance with ASTM E 874. Any panel debonds or delaminations shall constitute failure of the test. The contracting officer shall be notified within seventy-two hours of any failures. In addition, a failure analysis report shall be prepared with corrective action defined.

4.6.35 Thickness test. The dry paint film shall be measured on each panel of each shelter tested. The paint thickness shall be measured at several places on each painted surface. Thickness may be determined by any method acceptable to the Government. Paint thickness shall be in accordance with the drawings.

4.6.36 Panel frame air tightness test. Each welded panel frame shall be air pressurized to 25-30 psig. Detergent/gas leak detector shall be applied to all welded joints. The presence of a bubble trail, indicating a weld defect, shall constitute failure of this test and shall require rework to the weld (see 4.6.36.1).

4.6.36.1 Weld re-work. Any welds which fail to pass the air tightness test specified in 4.6.36 shall be reworked as follows:

- a. Prior to depressurizing, rinse and dry the panel frame.
- b. Circle areas of weld failure and depressurize.
- c. Re-weld circled areas in accordance with 3.7.4.
- d. Re-test as specified in 4.6.36.

## 5. PACKAGING

5.1 Preservation. Preservation shall be level A.

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5.1.1 Level A preservation. All hardware necessary for erection and operation of the shelter shall be secured within the shelter as specified on the drawings. The equipment container shall be securely fastened with tiedown straps to the fixed floor and it shall contain all parts as specified on its parts list. The parts in the equipment container and in the shelter shall be secured and padded, as required, to insure that no damage shall occur to the parts, the equipment container, or to the shelter during shipment. All exterior electrical connections shall be covered and all expandable mechanisms (steps, latches, etc.) shall be secured.

5.2 Packing. Packing shall be level A.

5.2.1 Level A packing. The shelter shall be closed into its container mode and secured by means provided. Mechanical seals shall be placed on the doors to deter unauthorized entry to the shelter during initial transport to the user.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The two-side expandable shelter is intended for use as a general purpose shelter (e.g., administrative, maintenance shop set, hospital unit, kitchen, latrine).

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- c. When first article is required (see 3.2, 4.3 and 6.3).
- d. When a comparison inspection sample is required (see 3.3, 4.4 and 6.4).
- e. When test report, process specification and samples are not required (see 3.5.2).
- f. Electrical service required 60 amp or 100 amp (see 3.5.8.5).
- g. Serial numbers in accordance with 3.10 are as specified.
- h. When technical manuals are not required (see 3.11 and 6.5).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation (FAR) 52.209. The first article should be a preproduction sample or an initial production sample consisting of five complete shelters. The first article should include all hardware, a 4 feet by 8 feet specimen of each size composite panel (without edge members), 24

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inch square panel specimens per 4.6.7 and a composite panel specimen per 4.3.1. The contracting officer should include specific instructions in all acquisition documents regarding arrangements for selection inspection and approval of the first article.

6.4 Inspection comparison test. When a comparison test sample is required, the contracting officer should include specific instructions in all acquisition documents regarding arrangements for inspection and approval of the comparison test sample.

6.5 Manuals. Any requirements for equipment and instruction manuals for the expandable shelter covered by this document should be included in DD Form 1423, Contract Data Requirements List and cited in the contract. Unless otherwise specified, no end item shall be shipped minus operator manuals without approval of the contracting officer.

6.6 Subject term (key word) listing.

Container  
Hospital  
Kitchen  
Panels  
Protection  
Expandable

Custodians:

Army - GL  
Navy - MC  
Air Force - 99

Preparing activity:

Army - GL  
(Project 5411-0044)

Review activities:

Air Force - 80  
DLA - CS

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

Preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision should be given.

Submitter of this form must complete blocks 4, 5, 6, and 7.

Preparing activity must provide a reply within 30 days from receipt of the form.

This form may not be used to request copies of documents, nor to request waivers, or clarification of items on current contracts. Comments submitted on this form do not constitute or imply authorization to alter any portion of the referenced document(s) or to amend contractual requirements.

<b>IMEND A CHANGE:</b>	<b>1. DOCUMENT NUMBER</b>	<b>2. DOCUMENT DATE (YYMMDD)</b>
	MIL-S-44195A	1991 July 30
<b>TITLE</b>		
SHELTER, TACTICAL, EXPANDABLE, TWO-SIDE		
<b>CHANGE</b> (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		

## OR RECOMMENDATION

<b>a. First, Middle Initial</b>	<b>b. ORGANIZATION</b>	
<b>(Include Zip Code)</b>	<b>d. TELEPHONE (Include Area Code)</b>	<b>7. DATE SUBMITTED (YYMMDD)</b>
	(1) Commercial	
	(2) AUTOVON (if applicable)	
<b>8. ACTIVITY</b>		
Army Natick RD&E Center	b. TELEPHONE (Include Area Code)	(2) AUTOVON/DSN
	(1) Commercial	
	508-651-4531	256-4531
(Include Zip Code)	<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b>	
er, U.S. Army Natick RD&E Center	Defense Quality and Standardization Office	
STRNC-UXT	5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466	
MA 01760-5017	Telephone (703) 756-2340 AUTOVON 289-2340	