



Standard Specification for Shelter, Tactical, Expandable, One-Side¹

This standard is issued under the fixed designation E 1977; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

^{€1} NOTE — Editorial corrections were made in August 2001.

1. Scope

1.1 This specification covers a rigid wall, one-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 ft, width 8 ft and length 20 ft. (2.4 by 2.4 by 6.1 m) Approximate dimensions, when expanded (shelter mode) are: height 8 ft, width 15 ft and length 20 ft (2.4 by 4.6 by 6.1 m).

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.3 The following precautionary statement pertains to the test method portion only. Section 7, of this specification; *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determines the applicability of regulatory limitations prior to use.*

¹ This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.53 on Materials and Processes for Durable Rigidwall Relocatable Structures.

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2. Referenced Documents

2.1 *ASTM Standards:*²

- E 864 Practice for Surface Preparation of Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels
- E 865 Specification for Structural Film Adhesives for Honeycomb Sandwich Panels
- E 866 Specification for Corrosion-Inhibiting Adhesive Primer for Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels
- E 874 Practice for Adhesive Bonding of Aluminum Facings to Nonmetallic Honeycomb Core for Shelter Panels
- E 990 Specification for Core-Splice Adhesive for Honeycomb Sandwich Shelter Panels
- E 1091 Specification for Nonmetallic Honeycomb Core for Use in Shelter Panels
- E 1749 Terminology Relating to Rigid Wall Relocatable Shelters
- E 1773 Practice for Sealing Rigid Wall Tactical Shelters with Polysulfide Based Sealants
- E 1826 Specification for Low Volatile Organic Compound (VOC) Corrosion-Inhibiting Adhesive Primer for Aluminum Alloys to Be Adhesively Bonded
- E 1925 Specification for Engineering and Design Criteria for Rigid Wall Relocatable Structures

2.2 *ISO Standards:*³

- ISO 1161-1980 Series 1-Freight Containers-Corner Fittings, Specification
- ISO 1496/1 Series 1-Freight Containers-Specification and Testing Part I-General Cargo Containers
- ISO 9001 Quality Systems—Model for Quality Assurance in Design, Development, Production, Installation, and Servicing

2.3 *Military Standards:*

- ~~MIL-Q-9858 Quality Program Requirements³~~
- ~~MIL-STD-129 Marking⁴~~
- MIL-STD-129 Marking for Shipping and Storage
- MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests
- ~~MIL-STD-1595 Qualification of Aircraft, Missile and Aerospace Fusion Welders³~~
- ~~MIL-STD-2219 Fusion Welding for Aerospace Appliances³~~

2.4 *ANSI/ASQC Standard:*

- ANSI/ASQC 21.4-1993 Sampling Procedures and Tables for Inspection by Attributes⁵
- 5-4-3200 Shelter, Assembly, One-Side Expandable-100 amp⁶

2.5 *Drawings:*⁶

- 5-4-2828 Shelter, Assembly, One-Side Expandable-60 amp

2.6 *SAE Standards*⁷

- SAE-AMS-STD-1595 Qualification of Aircraft, Missile, and Aerospace Fusion Welding
- SAE-AMS-STD-2219 Fusion Welding for Aerospace Applications

3. General Requirements

3.1 *Alternate Components*—When this specification 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 purchaser’s approval a list 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 specification. The purchaser, 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 *Materials and Components*—Materials and components shall conform to the documents listed in the Referenced Documents section and as specified herein. Any change to the proposed materials or processes must be approved by the purchaser. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.3 *Workmanship*—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,

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards*, Vol 04.11, volume information, refer to the standard’s Document Summary page on the ASTM website.

³ Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS; American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036; Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098

⁵ Available from American Society for Quality Control, 611 East Wisconsin Avenue, (ASQ), 600 N. Plankinton Ave., Milwaukee, WI 53204-3.

⁶ Copies of drawings are available from the U.S. Army Natick Research, Development, and Engineering Center, Attn: SSCNC-WST, Natick, MA 07160-5018.

⁷ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

painting, alignment of parts of assemblies, and the tightness of screws, bolts, etc. and so forth. 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 purchaser.

3.4 *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 the 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.

3.5 *Cleaning*—After fabrication, parts shall be cleaned in accordance with the drawings.

3.6 *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 to be welded shall be cleaned and 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 SAE-AMHS-STD-1595. Welding equipment and procedures shall conform to SAE-AMHS-STD-2219.

3.7 *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.

3.7.1 *Adhesion of Paint*—The shelter shall be capable of withstanding, without degradation to the finish, the tests as specified in 7.37. After top coat application, the shelter in the deployed mode shall be stored for a minimum of 168 h at a minimum of 70°F (21°C) prior to performing this test.

3.7.2 *Color*—The color of the paint film shall be compared with an appropriate color chip for the paint specified.

3.7.3 *Thickness*—Thickness of the paint film shall be checked as specified in 7.39.

3.8 *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 purchaser. After top coat application, the shelter in the deployed mode (that is, expanded) shall be stored in a 70°F (21°C) minimum temperature indoor facility for a minimum of 36 h to ensure adequate coating(s) cure. During this storage period the shelter doors and vents shall be opened to permit air circulation within the shelter.

3.9 *Manuals*—Unless otherwise specified (see 13.2), technical manuals shall be provided with each shelter. Stowage provision for the manuals shall be located as shown on the applicable drawings.

3.10 Terminology related to this Specification is defined in Terminology E 1749.

4. Design and Construction Requirements

4.1 *Design and Construction*—Design and construction of the expandable shelter shall conform to the requirements specified on the drawings, 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.

4.2 *Container Mode*—The shelter in the closed or transport mode shall be referred to as a container, hereinafter, for the 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 7.20, 7.22, 7.23, 7.28-7.35 and shall show no leakage when tested as specified in 7.24, 7.24.1-7.24.3. The contractor shall ensure 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 shown in Table 1.

4.3 *Panels*—The panels used as structural members in the container configuration shall meet structurally all transportation and environmental requirements specified herein. Each panel shall be fabricated as a net panel 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.

All of the above sealing procedures shall be accomplished in accordance with Practice E 1773.

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 Specifications E 874 and E 864, and use qualified panel components (that is, structural film and core splice adhesives, corrosion-inhibiting adhesive primer, structural resin impregnated kraft paper honeycomb core, and as specified 5052-H34 or 6061-T6 aluminum skins, FRP

TABLE 1 Container Overall Dimensions

Type	Height				Width				Length			
	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
	(2.438 m)		+0	(-5 mm)	(2.438 m)		+0	(-5 mm)	(6.058 m)		+0	(-6 mm)
	(2.438 m)		+0	(-5 mm)	(2.438 m)		+0	(-5 mm)	(6.058 m)		+0	(-6 mm)

barrier strips, 6061-T6 panel extrusions). Prior to use, all critical panel component materials must be qualified in accordance with Specifications E 865, E 866, E 990, E 1091 and E 1826. There shall be no skin splices in the panels except where noted on the drawings. Unless otherwise specified (see X1.2), prior to award of contract, the contractor shall submit to the purchaser 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 Specification E 865 and Practice E 874 (see 13.2).

4.3.1 *Panel Processing*—The shelter panels shall be processed and inspected as specified in Specifications E 864, E 865, E 866, or E 1826 depending upon which primer is being used, E 874, E 990, E 1091, and Practice E 1773. The shelter panels shall be inspected for dimensions and flatness in accordance with the “Dimensional and Flatness Inspection of Panel” Section of Practice E 874 (see 10.2).

4.3.2 *Panel Watertightness*—Panel assemblies shall not permit the entry of water (see 10.3.1) when tested as specified in 7.18.

4.3.3 *Resistance to Thermal Shock* —Panels shall be resistant to thermal shock, when tested as specified in 7.6.

4.3.4 *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 7.7.

4.3.5 *Delaminations*—Delaminations in shelter panels shall be tested as specified in 10.3.4.

4.3.6 *Panel Frame Area Tightness* —Welded panel frames shall be air tight when tested as specified in 7.40.

4.4 *Inserts*—When tested as specified in 7.8, the following sized inserts, where used, shall withstand the torque and pullout loads as specified in Table 2, without failure of the inserts, panel, or potting compound.

4.5 *Payload*—The unit is designed to carry a maximum payload of 9480 lb (4300 kg) during transport.

4.6 *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 ¼ in. (6 mm) The lower faces of bottom corner fittings shall protrude below the bottom of the container by a minimum of ⅞ in. (11 mm).

4.7 *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 ensure compliance with the environmental test requirements as specified in 7.6, 7.13-7.17, 7.24, and 7.26.

4.8 *Exterior Lighting*—One area lighting fixture, as shown on the drawings, shall be provided with each shelter.

4.9 *Shelter Electrical System:*

4.9.1 *General*—The system shall have all equipment, cabling and other hardware necessary to receive three phase 120/208 V, 60 Hz power from the base electrical distribution systems, and distribute it to lighting fixtures and receptacles as indicated on the drawings. The 60 A shelters shall be in accordance with Drawing 5-4-2828 and all subsidiary drawings and parts lists. The 100 A shelters shall be in accordance with Drawing 5-4-3200 and all subsidiary drawings and parts lists. All parts of the electrical system shall operate when tested for electrical continuity as specified in 7.40.

4.9.2 *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 –60 to 125°F (–51 to 52°C), except that the fluorescent lights shall operate from 0 to 125°F (–18 to 52°C), when tested as specified in 7.14 and 7.15.

4.9.3 *Current Rating*—All conductors and appropriate hardware shall be rated for current carrying in accordance with the applicable industry standards as specified on the drawings. Derating of components may be necessary for an operating ambient temperature of 125°F (52°C).

4.9.4 *Finish*—Panel boards and all other exposed metallic items shall have finishes as indicated on the drawings (see 3.7).

4.9.5 *Panel Board*—The panel board used shall be as indicated on the drawings. It shall be of dead front construction and have a solid neutral bus, a ground bus, and a 60 A or 100 A three phase main breaker as specified (see 13.2). The panel will have a NEMA-1 enclosure with conduit hubs as necessary and at least 18 breaker spaces excluding the main breaker. The panel board bus feed shall be by rigid conduit and conductors; the conductors having a current carrying capacity of at least 100 A at 125°F (52°C) ambient temperature. The bus feed cables shall terminate in a connector mounted on the exterior of the shelter. Conductors running from panel board circuits to fixtures or receptacles shall be enclosed 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 A minimum, based upon an ambient temperature of 125°F (52°C) and NEC rating procedures. All circuit breakers used in the system shall be bolt-on type and

TABLE 2 Insert Strength (Proof Loads)

Insert (Diameter Thread Size)	Pull-out, lb (kN)	Torque, ft-lb (N·m)
10-32	1000 (4.5)	10 (13.6)
¼-28	1000 (4.5)	20 (27.2)
⅝-24	2000 (9.0)	20 (27.2)
¾-24	2000 (9.0)	40 (54.2)

have a minimum interrupting capacity of 10 000 A RMS symmetrical.

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

4.9.7 *Switches*—Switches used shall be as indicated on the drawings.

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

4.9.9 *Receptacles*:

4.9.9.1 *Electrical Power Service Entrance* —The electrical power service entrance shall be as shown on the drawings.

4.9.9.2 *Convenience Outlets*—The shelter shall contain duplex convenience outlets as indicated on the drawings. All outlets shall be electrically grounded.

4.9.9.3 *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.

4.9.9.4 *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.

4.9.10 *Communications*—The shelter shall have four (two 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.

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

4.10 *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 X1.2).

4.10.1 *Interior Markings*—Interior markings shall be as shown and in the locations shown on the applicable drawings.

4.10.2 *Exterior Markings*—The shelter shall be provided with specific exterior markings as shown on the applicable drawings.

5. Performance Requirements

5.1 *Floor Loads*—The shelter floor shall be capable of supporting a uniform load of 65 lb/ft² (320 kg/m²). The shelter floor shall be capable of supporting a concentrated load of 2000 lb (910 kg) over a 4 ft² (0.4 m²) area at the center of the floor. The floor shall also be capable of supporting a point load of 125 lb/in.² (9 kg/cm²). 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 7.9.

5.2 *Roof Loads*—The roof assembly of the shelter shall withstand a snow load of 40 lb/ft² (200 kg/m²) and a personnel load of 660 lb (300 kg) static over 2 ft² (0.2 m²) when tested as specified in 7.10.

5.3 *Door Loads*—Container doors shall be tested to withstand the following loads without deformation or impairment of function:

5.3.1 *Static Door (Hinge) Load*—The doors, frames, and hardware shall be capable of supporting 200 lb (90 kg) applied to the door at the edge opposite the hinge pivot line with the door open to approximately 90° when tested as specified in 7.11.

5.3.2 *Wind Gust Door (Stop) Load* —The doors, frames and hardware shall withstand a wind gust of 60 mph (100 km/h) in any direction when the door is secured in its open position by its door stop device when tested as specified in 7.11.

5.4 *Step Assembly*—The completely mounted step assembly shall withstand a vertical load of 500 lb (225 kg) applied to the outer section without deformation of the assembly or supporting structure when tested as specified in 7.12.

5.5 *Airtightness*—The shelter shall not permit air leakage beyond specified limits in either container or shelter configuration when tested as specified in 7.13.

5.6 *Temperature Range*:

5.6.1 *Non-operating Temperature*—The container mode configuration shall withstand exposure to a temperature range of –60°F to 160°F (–51 to 71°C).

5.6.2 *Operational Temperature*—The shelter shall be dependable and operable in an ambient temperature range of –60°F to 125°F (–51 to 52°C) plus a solar load such that the outer skin reaches a temperature of 200°F (93°C), when tested as specified in 7.14, 7.15, and 7.26.

5.7 *Humidity and Temperature Aging (Components)*—The shelter components shall be capable of withstanding the conditions of a minimum 95 % relative humidity at 200°F (93°C). There shall be no evidence of delamination, cracking, corrosion or deterioration when tested as specified in 7.16.

5.8 *Blackout*—There shall be no internal light visible from outside of the unit in the shelter mode when tested as specified in 7.17.

5.9 *Insert Strength*—When tested as specified in 7.19, the inserts indicated in Table 2 shall withstand loads equal to 80 % of the applicable strengths shown in Table 2 without failure and as indicated in Table 3.

5.10 *Rail Transportability*—The shelter when tested as specified (see 7.20) shall be capable of withstanding, without damage, the shocks normally induced by rail transport.

5.11 *Impact Resistance*—The shelter panel shall be impact resistant when tested as specified in 7.21.

5.12 *Drop Test*—The shelter when tested as specified in 7.22 shall show no evidence of damage as a result of the drop test.

5.13 *Towing*—The shelter shall show no evidence of damage when tested as specified in 7.23.

5.14 *Water Leakage*—The shelter shall show no evidence of leakage when tested as specified in 7.24.

TABLE 3 Insert Strength (Working Loads)

Insert (Diameter Thread Size)	Pull-out, lb (Kg)	Torque, ft-lb (J)
10-32	800 (360)	8 (11)
¼-28	800 (360)	16 (22)
⅝-24	1600 (725)	16 (22)
¾-24	1600 (725)	32 (43)

5.15 *Fluorescent Light Temperature*—Shelter fluorescent light assemblies shall show no failure when tested as specified in 7.25.

5.16 *Solar Load*—The shelter shall withstand a solar load test when tested as specified in 7.26.

5.17 *Operational Fitness*—The shelter shall prove functional when tested as specified in 7.27.

5.18 *Heat Transfer*—The overall coefficient of heat transfer of the shelter shall not exceed 0.35 BTU per hour per square foot per degree Fahrenheit (2.0 watts per square metre per degree Kelvin) (see 7.36).

6. Other Requirements

6.1 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 7.28-7.35.

6.2 *First Article*—When specified, a sample shall be subjected to first article inspection (see 8.1, 13.1, and 13.3).

6.3 *Inspection Comparison Testing Sample*—When specified (see 13.2), the contractor shall furnish a sample for comparison inspection and approval (see 8.1 and 13.4).

6.4 *Manuals*—Unless otherwise specified (see 13.2), technical manuals shall be provided with each shelter. Stowage provisions for the manuals shall be located as shown on the applicable drawings.

7. Test Methods

7.1 *Electrical Continuity Testing*—Test every end item as specified in 7.40. Any test failure shall be cause for rejection of the end item.

7.2 *Water Leakage and Operational Testing*—Test the first ten production units as specified in 7.24, 7.24.1 and 7.24.3. If no failures are experienced, five of the next ten production units shall be tested. If no failures are experienced on the 50 % sample, one of each 25 production units shall be tested thereafter. Any failure on sampled units shall be cause for rejection of the lot and return to 1008 testing; repeat the above procedure (starting with the units of that lot).

7.2.1 *Water Leakage (Fully Loaded)*—Test one out of every 50 production units as specified in 7.24.2 and 7.24.3. Notify the purchaser of any test failure within 72 h. Prepare a failure analysis report with corrective action defined, and test one out of the next ten production units followed by one out of the next fifty if no failures occur.

7.3 *Performance Testing*—Test one end item from each inspection lot as specified in 7.13 (shelter mode only) and 7.26. After successful completion of these tests, test the end item sample as specified in 7.17. The size of the inspection lot shall not exceed 25 shelters. Any test failure shall be cause for rejection of the lot.

7.4 *Paint Adhesion Testing*—Test one of every forty production units as specified in 7.37. Test this unit in the deployed mode only after storage in a 70°F (21°C) minimum temperature indoor environment for 168 h minimum, after topcoat painting. Notify the purchaser of any test failure within 72 h. Prepare a failure analysis report with corrective action defined, and test one out of the next ten production units, followed by one out of the next forty if no failures occur.

7.5 *Packaging Examination*—Make an examination to determine that preservation and packing comply with the Performance Requirements section. Score defects in accordance with Table 4. 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, apply mechanical door seals to the shelters and then inspect the lot of shelters subsequently 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.

7.6 *Thermal Shock Test*—Within 30 min after the exposure cycling of 7.16 has been completed, subject the panel specimens to a –65°F (–54°C) environment for 4 h to evaluate the effects of thermal shock. After thermal shock, inspect the panel specimens for delamination (see 7.38), corrosion and material degradation. Any delamination, corrosion or material degradation shall constitute a failure of the test.

7.7 *Panel Interchange Test*—Interchange the 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. Accomplish the interchange by removing the hinge pins or bolts, as applicable, interchanging walls, and reinstalling the hinge pins or bolts (see 4.3.4). Any wall that cannot be fully interchanged shall constitute a failure of the test.

7.8 *Insert Proof Load Test*—The test fixtures shall be fashioned by the contractor and approved by the purchaser prior to use, to evaluate the inserts using bolts of the applicable thread size. Apply loads to the insert in a tightening and loosening direction and hold at the specified torque for a minimum of 5 s. Fashion the test fixtures 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. Apply the reaction



TABLE 4 Packaging Defects

Examine	Defect
Workmanship Exterior	Doors are not closed, latched, and mechanically sealed Exterior electrical connections are not covered and covers are not secure (hand pressure) Expandable wall corner post cam latch handles are not in locked position with pin in retaining hole Puncture in exterior skin Damage (such as bending, gouging, or denting) to frame ends or to fork lift opening Steps are not folded closed Any other protruding or not stowed part
Workmanship Interior	Equipment container is not secured in place Parts in the equipment container are not in accordance with the list of the parts The four lift jacks are not secured on the doors The two 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 units (ECU), panels are not stowed securely on the fixed ceiling Any other loose or not stowed part

load from the insert pull-out fixture onto the test specimen panel, to the panel outside of a 3 in. (75 mm) radius measured from the centerline of the insert.

7.8.1 *Insert Torque*— To determine compliance with the torque requirements in 3.5.3, apply a torque load equal to the torque strength cited in Table 2 to the two identical inserts of each size (1-H, 1-V) potted in the test specimen panel cited in 8.1.1 and 9.2. Torque load applied shall be equal to torque strength cited in Table 2 for applicable size. Inability of any insert to meet specification requirement shall constitute a failure of the test.

7.8.2 *Insert Pull-Out*— To determine compliance with the pull-out requirements of 4.4, a tensile pull load equal to pull-out strength cited in Table 2 shall be applied to two identical inserts of each size (1-H, 1-V) potted into the test specimen cited in 8.1.1 and 9.2. Failure of the potting compound to hold the insert firmly in panel shall constitute failure of the test.

7.9 *Floor Loads Test-Static Load* —The floor loads test-static load shall be as specified in Specification E 1925.

7.10 *Roof Load Test*— The roof load test shall be as specified in Specification E 1925.

7.11 *Door Load Test*— The door load test shall be as specified in Specification E 1925.

7.12 *Step Test*—Suspend a 500 lb (225 kg) weight from the outer end of a step assembly for 5 min and remove the load. Any permanent deformation or local delamination (see 7.38), shall constitute failure of this test.

7.13 *Airtightness Test*—The shelter airtightness test shall be as specified in Specification E 1925.

7.14 *Low Temperature Test*—Cold soak the shelter in its container mode, with shelter components and maximum payload packaged within, first at -60°F (-51°C) temperature for a minimum of 24 h in a mechanically refrigerated cold chamber. At the end of the 24 h period and while at -60°F (-51°C), erect the shelter. Operate all hardware (for example, latches, doors, knockout panels, etc.) and so forth) 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 the closed/container mode and then raise the chamber temperature to -25°F (-32°C). Allow the chamber to stabilize at -25°F (-32°C) for 4 h. Next, erect the shelter and hook up power source to shelter. Position the ceiling fluorescent lights and electrical receptacles on expanded shelter section. Operate circuit breakers, blackout emergency switch, and emergency incandescent lights. The fluorescent ceiling lights shall not be operated at -25°F (-32°C), since they are rated for a minimum of 0°F (-18°C) operation. Next, return the shelter to normal operating conditions and cycle all doors, electrical components, and hardware. After operation and inspection of all components, close the shelter for shipment and re-examine 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.

7.15 *High Temperature Test*—Subject the shelter, in its container mode, with shelter components and maximum payload packaged within, to a 160°F (71°C) storage test cycle and a 125°F (52°C) operational test cycle. Soak the shelter in a chamber for at least 6 h at the storage test temperature and for 24 h at the operational test temperature prior to initiation of the operation phase of the operational test cycle. At 125°F (52°C), erect the shelter and operate circuit breakers, blackout emergency switch,

emergency incandescent light, and fluorescent lights. All doors, vent openings, panel closeouts, and operational hardware shall be functional. Return the shelter to normal atmospheric conditions and cycle all doors, electrical components, and hardware. After operation and inspection of all components, close the shelter for shipment and then examine for component damage and material and 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.

7.16 Humidity and Temperature Aging Test—Subject all hardware (latches, handles, hinges, jacks, tools, struts, light fixtures, etc.) and so forth) and a 4 by 8 ft (1.2 by 2.4 m) specimen of each thickness composite panel (without edge members) to fifteen continuous 48 h 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 a failure of the test.

7.17 Blackout Test—Place the shelter in a dark environment. Suspend a light source of two 100 W bulbs operating at rated voltage from the ceiling brackets of the shelter. With all covers in place and doors closed, observe the unit at a 25 ft (7.6 m) distance to ensure that no rays of lighting are visible to normal unaided eyesight. Visibility of any light at specified distance shall constitute failure of the test.

7.18 Panel Watertightness Test—Weight and then float the shelter panel horizontally, with the sealed side down, in a tank of water. Submerge approximately three-fourths of the thickness of the floating panel in water, using hold down devices if necessary. Seal the panel on the surface that 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. Submerge the panel for 6 h. At the end of this period remove it from the water, hand dry, and reweigh within 15 min. The panel shall not gain more than 0.1 % of its original weight upon reweighing. If a failure occurs, determine the source of the leak and fix. Then retest the panel using the above procedure. Upon passing this test, check all panels in the lot for similar deficiencies and repair in the same manner as the sample panel. The scale for determining panel weight shall be accurate to 0.1 lb (50 g).

7.19 Insert Working Load Test—Apply a working torque load and pull-out load to all inserts incorporated in the shelter panels. Perform this test using torque and pull-out loads as specified in Table 3. Use the same devices used to perform the test specified in 7.8, for this test. Failure of potting compound to hold any insert firmly in panel shall constitute failure of this test.

7.20 Rail Transportability Test—Test the shelter at a gross weight of 15 000 lb (6875 kg) for rail transport as specified in MIL-STD-810. Secure the test payload to prevent shelter damage due to the load shifting on impact.

7.21 Impact Resistance Test—Test as specified in Specification E 1925, except that the panel shall meet the following acceptance criteria: No rupture of the impacting or opposite skin, or both, is allowed. No delamination of the opposite skin to core is allowed. Outside a 3 in. (75 mm) radius (except 3½ in. (90 mm) 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 or collapsing of the core shall not be allowed. Outside a 5 in. (125 mm) 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.

7.22 Drop Test—The shelter, in the container mode, and with a uniformly distributed payload such that the gross weight equals 15 000 lb (6875 kg) shall withstand drops of 6 in. (150 mm) onto a level concrete type surface. Utilize a quick release hook to ensure the shelter falls freely the full 6 in. (150 mm) Any evidence of splits or tears on the bottom, deformation, buckling, delamination (see 7.38), 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.

7.22.1 Flat Drop—Lift the shelter 6 in. (150 mm) high using a four cable sling and allow the shelter to fall freely so that the bottom impacts onto a hard concrete surface.

7.22.2 Rotational Drop—Place a 4 in. (100 mm) high (nominal) board under the ISO fittings at one edge of the shelter. Lift the opposite edge of the shelter 6 + ¼ in. (160 mm) from the ground. Take measurements from the outer edge of the ISO fittings at the two raised corners of the shelter. The range of the two measurements shall not exceed ¼ in. (6 mm). Release the shelter and allow to fall freely such that the ISO fittings impact onto a hard concrete surface. After all four rotational drops, the requirements of 5.12 shall be met.

7.23 Towing Test—Load the shelter, in its container mode, to a gross weight of 15 000 lb (6875 kg) and then tow from the leading edge; lower ISO fittings for a minimum of 200 ft (61 m) forward and 200 ft (61 m) backward over rough plowed ground at a speed of 3 to 5 mph (5 to 8 km/h). Perform two right angle turns 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-ft (6.1 m) 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.

7.24 Water Leakage Test (Shelter Mode)—Expose the shelter in its expanded mode with jacks raised a minimum of 2 in. (50 mm) from ground level to a simulated rainfall of 5 ± 1 in./h (125 ± 25 mm/h), as measured by a U.S. Weather Bureau type gage. Angle direction of the rainfall at 45 from the vertical and so space the nozzles to ensure even dispersion over the test area. Expose the roof with each of the major sides of the shelter in succession, to this angled rainfall for periods of 30 min. Disperse the rainfall uniformly, over the entire test area. Perform this test for 2 h with the shelter in the closed configuration, and for 2 h with the shelter

in the erected configuration. Close and latch all openings and doors. Upon completion of the test, any evidence of penetration of water into the shelter shall constitute a failure of the test. Alternately, expose the whole shelter for 30 min to the above test in lieu of exposing each section separately.

7.24.1 *Water Leakage Test (Container Mode)*—Test the shelter as specified in 7.24, except that it shall be in the container mode.

7.24.2 *Water Leakage Test (Shelter Mode Fully Loaded)*—Test the shelter as specified in 7.24.1, except that the maximum payload for the shelter shall be distributed uniformly on the fixed floor.

7.24.3 *Water Leakage Test (Container Mode Fully Loaded)*—Test the shelter as specified in 7.24; except that the maximum payload for the shelter shall be uniformly distributed on the fixed floor.

7.25 *Fluorescent Light Temperature Test*—Randomly select three fluorescent light assemblies from all of the light assemblies of the sample shelters. Test these sample fluorescent light assemblies for performance at 0°F and 125°F (–18 and 52°C) temperature extremes. Note that this light test may be performed as an extension of the high and low temperature shelter tests of this specification. Test all of the sample lights at one temperature extreme, normalize at ambient if acceptable, and then test at the other extreme. Soak and performance test the sample lights in a chamber at no more than 0°F (–18°C) for the low temperature phase and at no less than 125°F (52°C) for the high temperature phase. Each soak period shall be no less than 24 h. While remaining in the chambers, at the completion of the soak period, turn the lights on. If any light does not provide full, constant illumination within 1 min, shut is off for at least 1 min and then turn on a second time. Inability of any light to provide full, constant illumination within 1 min after no more than two attempts and remain at full, constant illumination for at least 10 min shall constitute failure of the test.

7.26 *Solar Load Test*— The solar load test shall be as specified in Specification E 1925.

7.27 *Operational Test*— Place the shelter on fairly level ground and conduct a complete cycle of leveling, erecting, operating all components and closing. 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.); and so forth), failure of any component to function as intended, breakage or deformation of any components or any panel delamination shall constitute failure of this test.

7.28 *Lifting Test*— Subject the shelter, in its container mode, at a gross weight of 48 000 lb (22 000 kg) (3.2 g by 15 000 (6875 kg)), to lifting by first the top corner fittings followed by a second lift by the bottom corner fittings. Accomplish the lifting using appropriate slings such that minimal acceleration or deceleration forces are applied. Evenly distribute the dummy load over the entire floor area. Hoist the shelter off the ground by means of a four-cable sling having cable lengths (about 15 ft (4.5 m)) such as to form a single apex over the CG with the sling legs at 45 angles minimum to the roof plane when attached to the top corner fitting of the unit. Hoist the shelter off the ground by means of a four cable sling with a spreader bar such as to form a 45° angle to the roof plane when attached to the lower corner fittings of the shelter. Hold the container suspended for 5 min for each lift. Any structural damage (cracks, deformation, delamination (see 7.38) incurred in the shelter as a result of this test, shall constitute a failure of the test.

7.29 *Six High Stacking Test*—Place the shelter, in its container mode, loaded to a total gross weight of 30 000 lb (13 600 kg), 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 (that is, shelter fitting dimensions as taken in a plan view) as the fittings. Apply a stacking load of 403 200 lb (183 000 kg) through four pads of the same plan area as the corner fittings, the load being equally divided among the four top corner fittings. Offset each pad in the same direction, 1.5 in. (38 mm) in the longitudinal direction and 1.0 in. (25 mm) in the lateral direction. Conduct four tests 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, apply the loads for not less than 5 min and any structural damage incurred in the shelter and the container dimensional requirements (see 4.2) not maintained as a result of this test shall constitute a failure of the test.

7.30 *Longitudinal Restraint Test* —Restrain the shelter, in its container mode, loaded to a gross weight of 15 000 lb (6875 kg) longitudinally by securing the bottom corner fittings at one end to suitable anchor points through the bottom apertures. Apply a force of 30 000 lb (13 600 kg) longitudinally to the shelter, equally divided through the bottom apertures of the bottom corner fittings at the opposite ends of the shelters, first in compression and then in tension. Alternatively, apply a force of 15 000 lb (6875 kg) to each side, consecutively, first in tension and then in compression. In either case, apply the loads for not less than 5 min. Any structural damage incurred in the shelter and the dimensional requirements (see 4.2) not maintained as a result of this test shall constitute a failure of the test.

7.31 *Racking Test*— Support the shelter, in its container mode, at all four bottom corner fittings on rigid pads lying in the same horizontal plane. Totally restrain the two bottom corner fittings diagonally opposite to the applied load which lies in the same face, perpendicular to the applied load. Allow the remainder of the bottom corner fittings to move only in the horizontal direction. Apply the loads and remove gradually. Any structural damage incurred in the shelter and the dimensional requirements (see 4.2) not maintained as a result of this test shall constitute a failure of the test.

7.31.1 *Transverse Racking*—Apply a compression and tension force of 33 600 lb (15 300 kg) 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. Test both ends consecutively.

7.31.2 *Longitudinal Racking*—Apply a compression force of 16 800 (7630 kg) and a tension force of 16 800 lb (7630 kg) to

either of the two top 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. Test both sides consecutively.

7.32 *Lashing Test*— Secure the shelter in its container mode by all four bottom corner fittings and subject to an upper longitudinal tension load of 16 800 lb. (7630 kg). Apply the loading to the two corner fittings that are in line with the side of the shelter under test and induce 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 4.2) not maintained as a result of this test shall constitute a failure of the test.

7.33 *End Wall Strength Test*—Subject each endwall of the shelter in its container mode to an internal, uniformly distributed load of 3880 lb. (1760 kg), applied separately and arranged to allow free deflection of the wall. Apply the loads for not less than 5 min. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this specification not maintained following the test shall constitute a failure of the test.

7.34 *Sidewall Strength Test*—Subject each sidewall of the shelter in its container mode to an internal uniformly distributed load of 5820 lb. (2640 kg) applied separately and arranged to allow free deflection of the wall. Apply the loads for not less than 5 min. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this specification not maintained following the test shall constitute a failure of the test.

7.35 *Lifting from Fork Lift Pockets Test*—The shelter in its container mode shall have a load specified as follows, uniformly distributed over the floor and shelter and then shall be supported on two horizontal bars, each 8 in. (200 mm) wide, projecting 72½ in. (1.83 m) into the fork pockets, measured from the outside face of the side of the container. Center the bars within the pockets. Support the container for 5 min and then lower to the ground. Any structural damage incurred in the shelter as a result of this test and the container dimensional requirements of this specification not maintained following the test shall constitute a failure of the test.

7.35.1 *Outer Forklift Pockets*—The gross weight of the container and payload shall equal 18 750 lb (8510 kg).

7.35.2 *Inner Forklift Pockets*—The gross weight of the container and payload shall equal 9375 lb (4260 kg).

7.36 *Heat Transfer Test*—The heat transfer test shall be as specified in Specification E 1925.

7.37 *Adhesion of Paint Test*—Test a portion of the painted surface(s) of the shelter assembly in the deployed mode (that is, expanded). Areas to be tested shall be as follows:

7.37.1 Shelter wall exterior and interior surfaces,

7.37.2 Shelter floor interior surface,

7.37.3 Shelter base frame exterior surface,

7.37.4 Shelter corner post exterior surface,

7.37.5 Shelter fluorescent light fixture exterior surface,

7.37.6 Latch pan exterior surfaces,

7.37.7 Shelter ISO corner fitting exterior,

7.37.8 Shelter breaker box exterior surface,

7.37.9 Shelter internal panel latch surface, and

7.37.10 Shelter jack body exterior surface.

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

7.37.11.1 Scrape each painted surface with a sharp knife. Peel the paint evenly from the surface rather than chip or flake. Finally, perform the following test: tape a piece of cloth on the area under inspection, and keep the cloth soaked for 24 h with tap or distilled water. Remove the wet cloth and wipe dry with a soft dry cloth. Within 1 min of the wet cloth removal, make two parallel scratches 1 in. (25 mm) apart, through the coating to the metal with a stylus. Immediately thereafter, apply a 1 in. (25 mm) strip of flat back paper tape having an average adhesion of 80 oz/in. (90 g/mm) 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 to 80, 3.5 in. (90 mm) diameter, and 1.7 in. (40 mm) width. Press the tape 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 units subjected to these tests may be delivered on contract after all visible damage to the painted surface is repaired and the repair is approved by the purchaser. Failure to pass any of these tests shall be counted as a major defect.

7.38 *Panel Delamination Test*—Tap test the panel for delaminations in accordance with Practice E 874. Any panel debonds or delaminations shall constitute failure of this test. Notify the purchaser within 72 h of any failures. In addition, prepare a failure analysis report with corrective action defined.

7.39 *Thickness Test*— Measure the dry paint film for each panel of each shelter. Measure the paint thickness at several places on each painted surface. Thickness may be determined by any method acceptable to the purchaser. Paint thicknesses shall be in accordance with the drawings.

7.40 *Electrical System Test*—To determine compliance with 4.9.1, check the electrical system of the shelter to verify continuity of all circuits of the electrical installation in order to ascertain electrical readiness of the shelter. Operate all lights and electrically powered equipment. Any evidence of incomplete circuits, non-operating switches or damaged electrical components shall constitute failure of the test.

7.41 *Panel Frame Air Tightness Test*—Each welded panel frame shall be air pressurized to 25 to 30 psig (1.8 to 2.1 kg/cm²). Apply a detergent/gas leak detector 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 7.41.1).

7.41.1 *Weld Rework*— Rework any welds that fail to pass the air tightness test specified in 11.41 as follows:

- 7.41.1.1 Prior to depressurizing, rinse and dry the panel frame,
- 7.41.1.2 Circle areas of weld failure and depressurize,
- 7.41.1.3 Reweld circled areas in accordance with 3.6, and
- 7.41.1.4 Retest as specified in 7.41.

8. First Article Inspection

8.1 *First Article Inspection*—When a first article is required (see 13.3), it shall be examined for visual defects in Table 5, dimensions specified, and tested as specified and in the sequence specified in Table 6. All testing 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.

8.1.1 *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

TABLE 5 End Item Visual Defects

Examine	Defect	Classification	
		Major	Minor
Finish	Not as specified, not finished where required	101	
	Not adherent, for example, blistered, peeled		201
	Runs, wrinkles, streaks, or areas of no film		202
	Finish not dry, that is, 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 silver which may be injurious to personnel or cargo	106	
	Gaskets torn or split	107	
	Gasket or seals painted		207
Welding and brazing (where required)	Visible gaps between aluminum faces and extruded edges or panel cutout edge members	108	
	Not type specified, missing where required	109	
	Incomplete, burn through area pits, crack or fracture, or otherwise not fused	110	
Metal fasteners, bolts, nuts, screws, studs	Stag inclusion, undercoat, not smooth and uniform, scale or flux deposit not removed		208
	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
Marking	Cloth cut or tear longer than 1/8 in.	114	
	Hole larger than 1/8 in. diameter	115	
	Missing, incomplete, not legible, not specified type or size, misplaced		
Instruction plate: nameplate	Missing, incomplete, not legible	116	
Instruction manual	Missing, incomplete, not legible	117	

TABLE 6 First Article Test Sequence

Inspection	Requirement	Test
Panel frame airtightness	4.3.6	7.41
Panel watertightness	4.3.2	7.18
Panel delamination	4.3.5	7.38
Visual defects	8.1	10.4
Thickness	3.7.3	7.39
Adhesion of paint	3.7.1	7.37
Operational (first time)	5.17	7.27
Thermal shock	4.3.3	7.6
Panel interchange	4.3.4	7.7
Insert proof load	4.4	7.8
Electrical system	4.9	7.40
Floor load, static	5.1	7.9
Roof load	5.2	7.10
Door load	5.3	7.11
Step	5.4	7.12
Airtightness	5.5	7.13
Low temperature	5.6	7.14
High temperature	5.6	7.15
Humidity and temperature aging	5.7	7.16
Heat transfer	5.18	7.36
Insert working load	5.9	7.19
Rail transportability	5.10	7.20
Impact resistance	5.1	7.21
Drop	5.12	7.22
Towing test	5.13	7.23
Fluorescent light temperature	5.15	7.25
Lifting	6.1	7.28
Six-high stacking	6.1	7.29
Longitudinal restraint	6.1	7.30
Racking	6.1	7.31
Lashing	6.1	7.32
Endwall strength	6.1	7.33
Sidewall strength	6.1	7.34
Lifting from forklift pockets	6.1	7.35
Blackout	5.8	7.17
Water leakage	5.14	7.24
Solar load	5.16	7.26
Operational test (second time)	5.17	7.27

techniques and materials used to fabricate production panels, except aluminum facing thickness shall be nominal 0.040 in. (1.0 mm) and overall thickness shall be nominal 2 in. (50 mm) thick. The edges of the specimen are not required to be sealed. The specimen shall be sized to accept 16 inserts (four each size as specified in Table 2) located a minimum of 6 in. (150 mm) from panel edges and 6 in. 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 that is, H, or V. Failure of one or more inserts to pass the tests specified in 7.8.1 and 7.8.2 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.

9. Comparison Sample Inspection

9.1 *Comparison Sample Inspection* —When a comparison sample is required (see 13.4), it shall be inspected and tested as specified in 8.1.

9.2 *Comparison Sample Panel Specimen Inspection*—Comparison sample panel specimen inspection shall be performed in accordance with 8.1.1.

10. Quality Conformance Inspection

10.1 *Quality Conformance Inspection* —Unless otherwise specified, sampling for inspection shall be performed in accordance with ANSI/ASQC Z1.4-1993. ~~The contractor shall have a contractor's quality control system in accordance with MIL-Q-9858 shall conform to ISO 9001.~~

10.1.1 *Component and Material Inspection* —In accordance with 7.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified or qualified in this specification or applicable purchase document.

10.2 *In-Process Examination*—Examination shall be made of the following fabrication operations to establish conformance with specified requirements:

10.2.1 That panel materials are as specified,

10.2.2 That rivet heads are sealed and tight for conformance with 3.4,

10.2.3 That parts are cleaned and free of adhesive sealer and other foreign materials for conformance with applicable drawings,
10.2.4 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 3.6,

10.2.5 That electrical assemblies and wiring are fabricated in accordance with applicable drawings and industry standards,

10.2.6 That the primer thickness, topcoat thickness and topcoat color are as specified in the applicable drawings (see 3.7.2 and 3.7.3), and

10.2.7 That the panels are processed, fabricated and inspected in accordance with the requirements of Specifications E 864, E 865, E 866, E 874, E 990, E 1091, and Practice E 1773 (see 4.3.1).

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

10.3 *In-Process Testing:*

10.3.1 *Panel Watertightness Testing*—Prior to assembly (that is, fabrication of cutouts, installation of inserts and hardware, ~~etc.~~) and so forth) one panel from every lot of both welded frame panels and unwelded frame panels shall be tested for watertightness as specified in 7.18. The lot size shall not exceed 100 panels. The panels to be tested shall be 8 ft by 20 ft (2.4 m by 6.1 m) panels. Failure of the test shall be cause for rejection of the panel lot represented.

10.3.2 *Panel Insert Testing*—Each type of shelter panel (roof, end wall, ~~etc.~~) and so forth) shall be tested for insert working load by first-piece inspection and by sample inspection of each lot of each type roof 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 7.19 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 formation 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 7.19.

10.3.3 *Panel Delamination Testing*—All panels coming out of the press shall be tested as specified in 7.18. Failure to pass this test shall be cause for rejection of that panel. The purchaser shall be notified, within 72 h, of any failures. In addition, a failure analysis report shall be prepared with corrective action defined for inserts tested.

10.3.4 *Panel Frame Airtightness Test*—After welding, all welded panel frames shall be tested as specified in 7.41, and reworked, if required, as specified in 7.41.1.

10.4 *End Item Visual Examination*—The end item shall be examined for the defects listed in Table 5. 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.

10.5 *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 II and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

11. Packaging

11.1 *Preservation*— Preservation shall be level A.

11.1.1 *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 tie-down 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 ensure 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.~~) and so forth) shall be secured.

11.2 *Packing*—Packing shall be Level A.

11.2.1 *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.

11.3 *Marking*—In conjunction with marking required in 4.10, the material shall be marked in accordance with MIL-STD-129.

12. Quality Assurance

12.1 *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 purchaser. The purchaser reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

12.1.1 *Responsibility for Compliance*—All items must meet all requirements of Sections 3-5. The inspections set forth in this specification 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 ensuring that all products or supplies submitted to the purchaser for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to acceptance of defective material.

12.1.2 *Responsibility for Dimensional Requirements*—Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring 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 ensure compliance with all dimensional requirements.

12.2 *Classification of Inspection* —The inspection requirements specified herein are classified as follows:

12.2.1 *First Article Inspection*—(See 8.1).

12.2.2 *Comparison Sample Inspection* —(See 9.1).

12.2.3 *Quality Conformance Inspection* —(See 10.1).

13. Notes

13.1 *Intended Use*— The one side expandable shelter is intended for use as a general purpose shelter (for example, administrative, maintenance shop set, hospital unit, kitchen, latrine).

13.2 *Acquisition Requirements*—Acquisition documents must specify the following:

13.2.1 Title, number, and date of this specification,

13.2.2 When a first article is required (see 8.1 and 13.3),

13.2.3 When a comparison inspection sample is required (see 9.1 and 13.4),

13.2.4 When test report, process specification and samples are not required (see 4.3),

13.2.5 Electrical service required, 60 A or 100 A (see 4.9.5),

13.2.6 Serial numbers in accordance with 4.10 are as specified, and

13.2.7 When technical manuals are not required (see 3.9 and 13.5).

13.3 *First Article*— 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 ft by 8 ft (2.4 m by 4.8 m) specimen of each size composite panel (without edge members), 24 in. (610 mm) square panel in accordance with 7.21, and a composite panel specimen per 8.1.1. The purchaser should include specific instructions in all acquisition documents regarding arrangements for inspection and approval of the first article.

13.4 *Inspection Comparison Test* —When a comparison test sample is required, the purchaser should include specific instructions in all acquisition documents regarding arrangements for inspection and approval of the comparison test sample.

13.5 *Manuals*—Any requirements for equipment and instruction manuals for the expandable shelter covered by this specification should be cited in the contract. Unless otherwise specified, no end item shall be shipped minus operator manuals without approval of the purchaser.

14. Keywords

14.1 adhesive bonded; aluminum; bonding; film adhesive; honeycomb sandwich panels; non-expandable; relocatable structures; rigid wall

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