



Designation: E1978 – 18

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

This standard is issued under the fixed designation E1978; 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 U.S. Department of Defense.

1. Scope

1.1 This specification 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 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 22 ft, and length 20 ft (2.4 by 6.7 by 6.1 m).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- E864 Practice for Surface Preparation of Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels
- E865 Specification for Structural Film Adhesives for Honeycomb Sandwich Panels

- E866 Specification for Corrosion-Inhibiting Adhesive Primer for Aluminum Alloys to Be Adhesively Bonded in Honeycomb Shelter Panels
- E874 Practice for Adhesive Bonding of Aluminum Facings to Nonmetallic Honeycomb Core for Shelter Panels
- E990 Specification for Core-Splice Adhesive for Honeycomb Sandwich Structural Panels
- E1091 Specification for Nonmetallic Honeycomb Core for Use in Shelter Panels
- E1749 Terminology Relating to Rigid Wall Relocatable Shelters
- E1773 Practice for Sealing Rigid Wall Tactical Shelters with Polysulfide Based Sealants
- E1826 Specification for Low Volatile Organic Compound (VOC) Corrosion-Inhibiting Adhesive Primer for Aluminum Alloys to Be Adhesively Bonded
- E1925 Specification for Engineering and Design Criteria for Rigid Wall Relocatable Structures
- 2.2 ANSI/ASQ Standard:³
 - ANSI/ASQ Z1.4-2003 (R2013) Sampling Procedures and Tables for Inspection by Attributes
- 2.3 AWS Standard:⁴
 - AWS D17.1/D17.1M Specification for Fusion Welding of Aerospace Applications
- 2.4 ISO Standards:⁵
 - ISO 1161-1980 Series 1-Freight Containers-Corner Fittings, Specification
 - ISO 1496/I Series 1-Freight Containers-Specification and Testing Part
 - ISO 9001 Quality Systems—Model for Quality Assurance in Design, Development, Production, Installation, and Servicing
- 2.5 Military Standard:⁶
 - MIL-STD-810G Environmental Engineering Considerations and Laboratory Tests

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 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* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society for Quality (ASQ), 600 N. Plankinton Ave., Milwaukee, WI 53203, <https://www.asq.org>.

⁴ Available from American Welding Society (AWS), 8669 NW 36 St., #130, Miami, FL 33166-6672, <http://www.aws.org>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

2.6 Drawings:⁷

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

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

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/her 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 Section 2 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, painting, alignment of parts and assemblies, and the tightness of screws, bolts, 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 AWS D17.1/D17.1M. Welding equipment and procedures shall conform to AWS D17.1/D17.1M.

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 from blistering, peeling, and chipping.

3.7.1 *Adhesion of Paint*—The shelter shall be capable of withstanding, without degradation to the finish, the tests as specified in 11.37.

NOTE 1—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 11.39.

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 E1749.

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 not show structural damage when tested as specified in 11.20, 11.22, 11.23, and 11.28 – 11.35, and shall not show

⁷ Copies of drawings are available from U.S. Army Natick Soldier Research, Development, and Engineering Center, ATTN: RDNS-SEE-T, 15 General Greene Avenue, Natick, MA 01760-5018, <https://www.army.mil/info/organization/natick>.

TABLE 1 Container 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)

leakage when tested as specified in 11.24 and 11.24.1 – 11.24.3. The contractor shall ensure that the shelter receives Coast Guard Certification for ISO containers. The container’s 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 structurally meet 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 E1773. 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 Practices E874 and E864, and use qualified panel components (that is, structural film and core splice adhesives, corrosion-inhibiting adhesive primer, structural nonmetallic honeycomb core, and as specified 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 Specifications E865, E866, E990, E1091, and E1826. There shall be no skin splices in the panels except where noted on the drawings. Unless otherwise specified (see 13.2), prior to award of contract, the contractors 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, nonmetallic honeycomb core sandwich panels they propose to use in the construction of the end item. Using their process specification, the contractors shall fabricate qualification test sandwich panels and structural film adhesive floating roller peel test specimens, and shall perform tests in accordance with Specification E865 and Practice E874 (see 13.2).

4.3.1 *Panel Processing*—The shelter panels shall be processed and inspected as specified in Practices E864 and E874, and Specifications E865, E866, or E1826 depending upon which primer is being used, Specifications E990, E1091, and Practice E1773. The shelter panels shall be inspected for dimensions and flatness in accordance with the Dimensional and Flatness Inspection of Panel paragraph of Practice E874 (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 11.18

4.3.3 *Resistance to Thermal Shock*—Panels shall be resistant to thermal shock, when tested as specified in 11.6.

4.3.4 *Panel Interchangeability*—All panels and panel assemblies bearing same part numbers shall be functionally and dimensionally interchangeable without modification or reworking. Individual assemblies shall not be hand picked for fit or performance, when tested as specified in 11.7.

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

4.3.6 *Panel Frame Airtightness*—Welded panel frames shall be airtight when tested as specified in 11.41.

4.4 *Inserts*—When tested as specified in 11.8, 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 8050 lb (3650 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 1161-1980 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 7/16 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 11.6, 11.13 – 11.17, 11.24, and 11.26.

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 5-4-3118 and all subsidiary drawings and parts lists. The 100 A shelters shall be in accordance with Drawing 5-4-3201 and all subsidiary drawings and parts lists.

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)
5/16–24	2000 (9.0)	20 (27.2)
3/8–24	2000 (9.0)	40 (54.2)

All parts of the electrical system shall operate when tested for electrical continuity as specified in 11.40.

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 from -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 11.14 and 11.15.

4.9.3 *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. 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 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 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 will 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 will 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 have a minimum interrupting capacity of 10 000 A root mean square 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 in 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 13.2).

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/in² (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 11.9.

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 11.10.

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 11.11.

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 11.11.

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 11.12.

5.5 *Airtightness*—The shelter shall not permit air leakage beyond specified limits in either container or shelter configuration when tested as specified in 11.13.

5.6 *Temperature Range:*

5.6.1 *Non-operating Temperature*—The container mode configuration shall withstand exposure to a temperature range of -60 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 (except electrical (see 4.9.2)) 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 11.14, 11.15, and 11.26.

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 11.16.

5.8 *Blackout*—There shall be no internal light visible from outside of the unit in the shelter mode when tested as specified in 11.17.

5.9 *Insert Strength*—When tested as specified in 11.19, 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 11.20) 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 11.21.

5.12 *Drop Test*—The shelter when tested as specified in 11.22 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 11.23.

5.14 *Water Leakage*—The shelter shall show no evidence of leakage when tested as specified in 11.24

5.15 *Fluorescent Light Temperature*—Shelter fluorescent light assemblies shall show no failure when tested as specified in 11.25.

5.16 *Solar Load*—The shelter shall withstand a solar load test when tested as specified in 11.26.

5.17 *Operational Fitness*—The shelter shall prove functional when tested as specified in 11.27.

5.18 *Heat Transfer*—The overall coefficient of heat transfer of the shelter shall not exceed 0.35 Btu/h/ft²/F (2.0 W/(m² * °K) (see 11.36).

6. Other Requirements

6.1 Requirements and testing for lifting, six high stacking, longitudinal restraint, racking, lashing, endwall strength, sidewall strength, and lifting from forklift pockets shall conform to ISO 1496-1 when tested as specified in 11.28 – 11.35.

6.2 *First Article*—When specified, a sample shall be subjected to first article inspection (see 8.1, 13.2, 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. Quality Assurance

7.1 *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/her 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.

7.1.1 *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 this specification shall not relieve the contractor of the responsibility of assuring 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.

7.1.2 *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.

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

- 7.2.1 *First Article Inspection*—See 8.1.
- 7.2.2 *Comparison Sample Inspection*—See 9.1.
- 7.2.3 *Quality Conformance Inspection*—See 10.1.

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 4, dimensions specified, and tested as specified and in the sequence specified in Table 5. 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 techniques and materials used to fabricate production panels, except aluminum facing thickness shall be nominal

TABLE 3 Insert Strength (Working Loads)

Insert (diameter thread size)	Pull-Out, lb (kg)	Torque, ft-lb (J)
10–32	800 (360)	8 (11)
1/4–28	800 (360)	16 (22)
5/16–24	1600 (725)	16 (22)
3/8–24	1600 (725)	32 (43)

TABLE 4 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 sliver which may be injurious to personnel or cargo	106	
	gaskets torn or split	107	
	gasket or seals painted		207
	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	
	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 in.	114	
	hole larger than 1/8 in. diameter	115	
Marking	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 5 First Article Test Sequence

Inspection	Requirement	Test
Panel frame airtightness	4.3.6	11.41
Panel watertightness	4.3.2	11.18
Panel delamination	4.3.5	11.38
Visual defects	8.1	10.4
Thickness	3.7.3	11.39
Adhesion of paint	3.7.1	11.37
Operational (first time)	5.1.7	11.27
Thermal shock	4.3.3	11.6
Panel interchange	4.3.4	11.7
Insert proof load	4.4	11.8
Electrical system	4.9	11.40
Floor load, static	5.1	11.9
Roof load	5.2	11.10
Door load	5.3	11.11
Step	5.4	11.12
Airtightness	5.5	11.13
Low temperature	5.6	11.14
High temperature	5.6	11.15
Humidity and temperature aging	5.7	11.16
Heat transfer	5.18	11.36
Insert working load	5.9	11.19
Rail transportability	5.10	11.20
Impact resistance	5.1	11.21
Drop	5.12	11.22
Towing test	5.13	11.23
Fluorescent light temperature	5.15	11.25
Lifting	6.1	11.28
Six-high stacking	6.1	11.29
Longitudinal restraint	6.1	11.30
Racking	6.1	11.31
Lashing	6.1	11.32
Endwall strength	6.1	11.33
Sidewall strength	6.1	11.34
Lifting from forklift pockets	6.1	11.35
Blackout	5.8	11.17
Water leakage	5.14	11.24
Solar load	5.16	11.26
Operational test (second time)	5.17	11.27

0.040 in. (1.0 mm) and overall thickness shall be nominal 2 in. (25 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 specified in Table 2) located a minimum of 6 in. (150 mm) from panel edges and 6 in. (150 mm) 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 11.8.1 and 11.8.2 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/ASQ Z1.4-2003 (R2013). The contractor’s quality control system shall conform to ISO 9001.

10.1.1 Component and Material Inspection—In accordance with 7.1, components and materials shall be inspected in