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Standard Specification for Shelter, Electrical Equipment, Lightweight¹

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1. Scope

1.1 This specification covers two types of lightweight electrical equipment shelters designed for transport on the M1152A1 and the M1152A1 with B2 Armor Kit High Mobility Multipurpose Wheeled Vehicle (HMMWV). These shelters are transported by rail, air, marine and highway when mounted or dismantled from their vehicles.

1.2 *Classification*—The shelters will be of the following types, as specified (see 6.2).

1.2.1 *Type I*—Shelter, Electrical Equipment, Lightweight (w/o Tunnel, 17-2-0035-1).

1.2.2 *Type III*—Shelter, Electrical Equipment, Lightweight, Modified, General Purpose (w/ Tunnel, 17-2-0035-3).

1.3 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.

1.4 The following safety hazards caveat pertains only to the test required portion, Section 4, 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, health, and environmental practices and determine the applicability of regulatory requirements prior to use.*

1.5 *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

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.

E1851 Test Method for Electromagnetic Shielding Effectiveness of Durable Rigid Wall Relocatable Structures

E1925 Specification for Engineering and Design Criteria for Rigid Wall Relocatable Structures

2.2 *Commercial Standard*:³

SAE-AS8090 Equipment, Towed Aerospace Ground, Mobility

2.3 *Federal Standard*:⁴

FED-STD-595 Colors Used in Government Procurement

2.4 *Military Standards*:⁴

MIL-STD-209 Slings and Tiedown Provisions for Lifting and Tying Down Military Equipment

MIL-STD-810G Environmental Test Methods and Engineering Guidelines

MIL-STD-1366 Transportability Criteria

MIL-C-53072 Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection

2.5 *Military Handbook*:⁴

MIL-HDBK-1791 Designing for Internal Aerial Delivery in Fixed Winged Aircraft

2.6 *ACGIH Documents*:⁵

Threshold Limit Values

2.7 *Drawings*:⁶

17-1-8565 Extension Kit, Pintle

17-1-8584 Mounting Kit Shelter To HMMWV (For Reference Only)

17-2-0035 Interface Control Drawing for, Shelter, Electrical Equipment, Lightweight, Types I and III

13228E1639 Standard Camouflage, Pattern For Shelter, Lightweight, Multipurpose

3. General Requirements

3.1 *First Article*—When specified (see 6.3), a sample shall be subjected to first article inspection in accordance with 4.1.1.

³ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.

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

⁵ Available from American Conference of Governmental Industrial Hygienists (ACGIH), 1330 Kemper Meadow Dr., Cincinnati, OH 45240, http://www.acgih.org.

⁶ 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 Weight and Payload Capacity

Type	Maximum Shelter Weight	Minimum Payload Capacity	Mounting Kit Incl. Hardware	Pintle Extension Incl. Hardware
I	608 lb (275.8 kg)	3300 lb (1496.9 kg)	90 lb (40.8 kg)	50 lb (22.7 kg)
III	643 lb (291.7 kg)	3300 lb (1496.9 kg)	90 lb (40.8 kg)	50 lb (22.7 kg)

TABLE 2 Spare Parts

Part
HMMWV Mounting Kit
Pintle Extension Kit
Door Assembly
Rear Ladder
Steps

TABLE 3 Interface Parts

Part	Reference Part No.
Mounting Kit, Shelter To HMMWV Extension Kit, Pintle	17-1-8565-1

TABLE 4 Attaching Surface Resistance Load

Threaded Fastener Size (in.)	Torque (ft-lb)	Pull-out (lb)
10 to 32	8 (1.11 kg-m)	800 (362.9 kg)
¼ through ½	10 (1.38 kg-m)	1 000 (453.6 kg)

A first article is defined as a preproduction or an initial production sample consisting of one or more of each type of completed shelters.

3.2 Physical Performance Requirements:

3.2.1 Weight and Payload—The shelter weight and payload capacity of each shelter type shall be as listed in **Table 1**. The maximum shelter weight listed does not include the weight of the Mounting Kit and Pintle Extension and their attaching hardware. The shelter shall be capable of accepting the payload distribution specified in the contract or purchase order (see **6.2**). The Contractor shall fashion an appropriate simulated payload design to be used for all testing. This payload design shall be approved by the procuring agency prior to its use in any test.

3.2.2 Parts Interchangeability:

3.2.2.1 Spare Parts—The spare parts are listed in **Table 2** and are depicted on interface drawing number 17-2-0035. All spare parts and related assemblies shall be functionally and dimensionally interchangeable without modification or rework of the part, assembly, or shelter.

3.2.2.2 Interface Parts—The interface parts are listed in **Table 3**. All interface parts and related assemblies shall be functionally and dimensionally interchangeable, without modification or rework of the part, assembly, shelter, or vehicle, with the reference parts listed in **Table 3**.

3.2.3 Shelter Configuration—The shelter shall meet the configuration constraints specified on interface drawing 17-2-0035 for the shelter type specified.

3.2.3.1 Shelter Flatness and Squareness—Shelter surfaces shall be flat and square. Each surface of the shelter shall be flat within ⅛ in. (0.32 cm) per each 48 in. (122 cm) length. Adjacent surfaces shall be perpendicular within 0.10 degrees.

3.2.3.2 Shelter Dimensions—The shelter shall meet the dimensional constraints within the specified tolerances required by interface drawing 17-2-0035 for those dimensions, which are not provided for reference only.

3.2.3.3 Integration—The shelter shall be capable of accepting standard lightweight electrical equipment shelter integration configurations without significant modification or rework to the system integration designs. The shelter shall be capable of accepting integration configuration cutouts at various locations. The shelter surfaces, including the door, shall be capable of accepting the installation of individual pieces of equipment installed by system integrators at various locations. For installations where threaded mechanical fasteners are the preferred fasteners, the attaching surfaces shall be capable of resisting the loads listed in **Table 4** for the listed sizes of threaded mechanical fasteners, without damage or degradation to the shelter or fastener.

3.2.4 Chemical and Biological (CB) Resistance—All shelter surfaces, except weather seals and gaskets, shall be resistant to, and shall not absorb, chemical and biological agent contamination, decontamination fluids, and petroleum products. Weather seals and EMI gaskets shall either meet the requirements above or be easily replaceable.

3.2.5 Pressurization—The shelter shall be capable of being pressurized to withstand over pressurization of 1.2 in. water gauge (iwg) with an air leakage not to exceed 10 standard cubic feet per minute (scfm) for Types I and III.

3.2.6 Roof Loads—The shelter roof shall be capable of supporting, without damage or degradation: (1) a uniformly distributed load of 40 lb/ft² (0.0195 kg/cm²) over the entire surface and (2) a concentrated load of 660 lb (299.4 kg) over a 1 by 2 ft (30 by 61 cm) area, applied anywhere on the roof.

3.2.7 Floor Loads—The shelter floor shall be capable of supporting, without damage or degradation: (1) a uniformly distributed load of 65 lb/ft² (0.0317 kg/cm²) over the entire floor, (2) a concentrated load of 1 000 lb (453.6 kg) applied over a 1 by 2 ft (30 by 61 cm) area, and (3) a point load of 125 lb (56.7 kg), over 1 in.² (6.45 cm²).

3.2.8 Door:

3.2.8.1 Door Handle—From either side, the shelter door shall be capable of being opened and closed with a maximum force of 48 lb (21.8 kg) applied to the door handle. From inside the shelter, the shelter door shall be capable of being opened and closed with a maximum force of 48 lb (21.8 kg) applied to the door handle with the outside handle locked. The door shall be capable of being padlocked from the outside.

3.2.8.2 Door Structure and Hinge Assembly—The door and hinge assembly shall be capable of supporting a 200 lb (90.7 kg) static load applied parallel to the hinge line, along the door edge opposite the hinge, with the door open to 90 degrees, without degradation or damage to the door or door hardware and the door shall operate freely after such a load is applied.

3.2.8.3 Door Stop—The door shall include a doorstop capable of automatically latching the door, when opened, at 90

degrees. The stop shall automatically prevent the door from swinging beyond 90 degrees when engaged and allow the door to open 180 degrees when disengaged. The door stop shall be capable of being disengaged by personnel, while they are standing on the ground, when the shelter is mounted on the HMMWV and shall not obstruct entry/exit through the door. The doorstop shall be capable of withstanding a static load equal to 10 lb/ft² (0.0049 kg/cm²) times the largest surface area of the door. The load shall be applied normal to the door's largest surface and on the edge opposite the hinge, with the door latched at 90 degrees. The door and its hardware shall be capable of withstanding these loads without degradation, damage, or improper door operation.

3.2.8.4 Door Maintainability—The door shall not be removable from the exterior when locked and shall be easily removable with hand tools when unlocked. Hand tools are defined as those found in Tool Kit, General Mechanics, Automotive and Shop Equipment, Automotive Maintenance and Repair (NSN: 5180-00-177-7033 and 4910-00-754-0654, respectively).

3.2.8.5 Door Drip Edge—There shall be a drip edge over the entire width of the door. The drip edge shall prevent water rolling down the side of the shelter from entering the shelter.

3.2.9 Ladder—A ladder shall be provided to allow personnel carrying equipment, with a combined weight of up to 400 lb (181.4 kg), to enter and exit the shelter safely while the shelter is mounted on the vehicle without damage or degradation to the shelter or ladder. The ladder shall have a stowage location on the door as described on interface drawing 17-2-0035. The ladder must stow securely in all transportation modes (see 3.4).

3.2.10 Impact Resistance—The shelter shall be capable of withstanding, without damage, the impact of any of the hand tools as defined in 3.2.8.4, dropped onto the top of the floor surface from a height of 30 in. (76 cm).

3.2.11 Roof Access Steps/handholds—Roof access steps and handholds shall be provided for safe access to the roof. These steps/handholds shall be either built into the shelter or attached to the exterior. The steps/handholds shall be designed such that the vehicle/shelter combination does not (1) exceed the legal highway size limitations imposed by states and foreign countries, and (2) limit any other modes of transportation (that is, rail, air, ship). The roof access steps/handholds shall be designed for the 5th percentile female through the 95th percentile male military personnel and each step shall be capable of supporting 400 lb (181.4 kg) without deformation of the step or shelter.

3.2.12 Interface Requirements—The shelter shall conform to the interface requirements noted on interface drawing 17-2-0035.

3.3 Environmental Performance Requirements:

3.3.1 Marine Atmosphere—The shelter, in operational and storage mode, except for the mounting kit's shock isolator assembly, shall be fully operational when exposed to a marine environment equivalent to 25 lb/acre/yr (2.8 g/m²/yr). The shelter shall not corrode or degrade.

3.3.2 Electromagnetic Interference (EMI)—The shelter shall provide the minimum shielding effectiveness prescribed by

Specification E1925, Fig. 1, in any location of the shelter over the frequency range of 150 kHz to 10 GHz.

3.3.3 Climate Range:

3.3.3.1 Temperature Range—In storage, the shelter shall be capable of withstanding exposure to temperatures of –70 to 160 °F (–56.7 to 71.1 °C) with no evidence of corrosion or degradation of the fasteners, seals, or other hardware. In transit, the shelter shall be capable of withstanding exposure to temperatures of –65 to 160 °F (–53.9 to 71.1 °C). The operational temperature of the shelter shall be –65 to 125 °F (–53.9 to 51.7 °C) plus solar load.

3.3.3.2 Temperature Shock—The shelter shall withstand a temperature shock from an equilibrium state at 160 to –70 °F (71.1 to –56.7 °C) and from an equilibrium, state at –70 to 160 °F (–56.7 to 71.1 °C) without evidence of structural damage, degradation, or permanent deformation.

3.3.3.3 Solar Load—The shelter shall withstand a solar induced outer roof surface temperature of 205 °F (96.1 °C) while maintaining an internal temperature of 85 °F (29.4 °C), without evidence of structural damage, degradation, or permanent deformation.

3.3.3.4 Sunshine (Ultraviolet Effects)—The shelter shall show no evidence of structural damage, degradation, or permanent deformation as a result of exposure to ultraviolet effects.

3.3.3.5 Humidity—The shelter shall be capable of withstanding daily exposure of up to 97 % relative humidity, and exposure of 100 % relative humidity (with condensation) for short periods of time, without evidence of structural damage, degradation, or permanent deformation.

3.3.4 Heat Transfer—The shelter shall have an overall heat transfer coefficient of no more than 0.50 BTU/h/ft²/°F (0.24 cal/h/cm²/°C).

3.3.5 Blowing Dust/Sand—The external moving parts of the shelter shall be designed to resist the effects of blowing dust and sand without degradation. Blowing sand is defined as 150 to 1 000 micron particles in concentrations of 1.32 by 10^{–4} pounds per cubic feet (lb/ft³)(2.11 by 10^{–6} g/cm³) with a wind velocity of 1 750 ± 250 ft/min (533.4 ± 76.2 m/min).

3.3.6 Watertightness—The completed shelter, without the aide of supplementary sealing, caulking, taping, etc., shall be capable of withstanding a 40 psig (0.0195 kg/cm²) spray from nozzles located in accordance with Specification E1925. The shelter shall not allow water leakage into the shelter and shall not gain weight (see 4.2.1.1).

3.3.7 Detectability:

3.3.7.1 Color and Camouflage—Unless otherwise specified (see 6.2), the shelter shall be the standard color and pattern specified on drawing 13228E1639. The interior surface of the personnel door shall match the primary exterior color of the shelter. The color of the interior ceiling shall be painted semi-gloss white in accordance with Color Number 27875 in accordance with FED-STD-595. The interior walls and floor shall be painted semi-gloss light green in accordance with Color Number 24533 in accordance with FED-STD-595. All painting shall be in accordance with MIL-C-53072.

3.3.7.2 *Blackout*—The shelter, with the door closed, shall not permit a light source from within to emit detectable amounts of light.

3.4 *Transportability Performance Requirements*—The shelter and shelter/vehicle combinations shall not exceed the legal highway size limitations imposed by states and foreign countries and shall be capable of obtaining transportability approval from Military Traffic Management Command Transportability Engineering Agency (MTMCTEA) based on requirements for transport in the following modes.

3.4.1 *Rail Transport*—The dismantled shelter and shelter/vehicle combinations (using the M1152A1 with B2 Armor Kit HMMWV), with a simulated payload (see 3.2.1), shall: (1) meet the Gabarit International de Chargement (GIC) equipment gauge envelope as defined in interface standard MIL-STD-1366, and (2) shall be capable of withstanding multiple rail impacts without damage or degradation to the shelter or shelter/vehicle combination, and without damage to the tiedown cables, or blocking or bracing, (see 4.4.1).

3.4.2 *Fixed-wing Air Transport*—The dismantled shelter and shelter/vehicle combinations, with payload (see 3.2.1) shall be transportable in C-130 and larger Air Mobility Command (AMC) aircraft. The dismantled shelter shall be capable of being aircraft loaded while attached to a 463L pallet. The shelter mounted on the M1152A1 and M1152A1 with B2 Armor Kit HMMWV shall be capable of roll-on/roll-off loading at ramp angles of 15 degrees on C-130 and larger AMC aircraft without special handling procedures or equipment.

3.4.3 *Rotary Wing External Air Transport*—The dismantled shelter and shelter/vehicle combination, with payload (see 3.2.1) shall be capable of being externally transported by DoD rotary wing aircraft, CH-47 and larger. At maximum loaded weight, the dismantled shelter and shelter/vehicle combination shall be capable of meeting the external air transport requirements specified in Annex A1. The dismantled shelter with or without mission equipment shall also be capable of being flown under the UH-60 helicopter. The shelter, shelter/vehicle and shelter/vehicle/trailer combinations shall be structurally capable of meeting the requirements of interface standard MIL-STD-209 and withstanding the loads when flown in: single point, dual point, and tandem load configurations and shall show no signs of damage or degradation as a result of being flown.

3.4.4 *Ground Mobility*—The shelter/vehicle combination, with payload (see 3.2.1), mounted on an M1152A1 with B2 Armor Kit HMMWV, shall be capable of being driven over road courses as defined by the Perryman, Churchville, and Munson courses found at Aberdeen Proving Ground, Maryland, without damage or degradation to the shelter, or damage or degradation to the vehicle, caused by the shelter. The shelter/vehicle combination shall meet U.S. and NATO countries highway legal limits.

3.4.5 *Fording*—The dismantled Type I shelter shall be capable of being forded to a depth of 30 in. (76 cm) of water, measured from the lowest part of the shelter, without structural damage, water penetration into the shelter, weight gain, or signs of seal failure.

3.4.6 *Material Handling*—The dismantled shelter, with payload (see 3.2.1), shall be capable of withstanding flat and rotational drops from 6 in. (15 cm) without structural damage, permanent deformation, or degradation. The shelter shall also be capable of being placed on an unimproved surface without structural damage, permanent deformation, or degradation.

3.4.7 *Lifting and Tiedown Provisions*—The shelter shall be provided with lifting and tiedown provisions that meet the requirements of interface standard MIL-STD-209.

3.5 *Identification*—The exterior of the shelter shall be permanently marked to allow the user to identify the manufacturer, contract number, and production unit. The dimensions which locate the center-of-gravity of the shelter in the three planes; the gross weight and mission equipment payload of the shelter; and the bearing pressure on the bottom shock elements. This information shall be visible with the shelter either mounted or dismantled from the vehicle. The location of the center-of-gravity shall be determined by the contractor using the first article unit of production with simulated mission payload.

3.6 *Recycled, Recovered or Environmentally Preferable Materials*—Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.7 *Toxicity*—Materials used shall cause no skin irritations or other injuries and produce no vapor hazards, including the emission of toxic or noxious odors, to personnel, in or around the shelter, under all environmental conditions. Exposure of personnel to toxic substances shall not be in excess of the threshold values contained in the ACGIH Threshold Limit Values.

3.8 *Flame Resistance*—The shelter shall be designed to be fire resistant in accordance with Specification E1925.

4. Verification

4.1 *Classification of Inspections*—Alternative test methods, techniques, or equipment, such as the application of statistical process control, the contractor may propose tool control or cost effective sampling procedures. Acceptable alternative verification approaches, including the use of sample testing, shall be identified in the contract. The inspection requirements specified herein are classified as follows:

4.1.1 *First Article Inspection*—When a first article inspection is required, it shall be applied to the first article submitted in accordance with 3.1. Specific verifications to be performed shall be defined by the contract (see 6.2) and shall include verifications contained in Table 5.

4.1.2 *Conformance Inspection*—When a conformance inspection is required (see 6.2), specific inspections to be performed shall be defined in the contract (see 6.2) and shall include any verification contained herein.

4.2 *Physical Performance Verification:*

4.2.1 *Weight and Payload:*

4.2.1.1 *Weight*—Compliance with 3.2.1 shall be determined by weighing the shelter, the mounting kit, and the pintle

TABLE 5 Sequence Of First Article Verifications

Verification	Requirement Paragraph	Verification Paragraph
Flame Resistance	3.8	4.7
Color and camouflage	3.3.7.1	4.3.7.1
Identification	3.5	4.5
Weight	3.2.1	4.2.1.1
Spare parts	3.2.2.1	4.2.2.1
Interface parts	3.2.2.2	4.2.2.2
Door handle	3.2.8.1	4.2.8.1
Shelter	3.2.3	4.2.3
Flatness	3.2.3.1	4.2.3.1(1)
Squareness	3.2.3.1	4.2.3.1(2)
Electromagnetic interference (EMI)	3.3.2	4.3.2
Roof loads	3.2.6	4.2.6
Floor loads	3.2.7	4.2.7
Door structure and hinge assembly	3.2.8.2	4.2.8.2
Door stop	3.2.8.3	4.2.8.3
Door maintainability	3.2.8.4	4.2.8.4
Door drip edge	3.2.8.5	4.2.8.5
Ladder	3.2.9	4.2.9
Roof access steps/handholds	3.2.11	4.2.11
Interface requirements	3.2.12	4.2.12
Chemical and biological (CB) resistance	3.2.4	4.2.4
Pressurization	3.2.5	4.2.5
Temperature range	3.3.3.1	4.3.3.1
Toxicity	3.7	4.6
Humidity	3.3.3.5	4.3.3.5
Toxicity	3.7	4.6
Marine atmosphere	3.3.1	4.3.1
Temperature shock	3.3.3.2	4.3.3.2
Heat transfer	3.3.4	4.3.4
Blowing dust/sand	3.3.5	4.3.5
Sunshine (ultraviolet effects)	3.3.3.4	4.3.3.4
Solar load	3.3.3.3	4.3.3.3
Blackout	3.3.7.2	4.3.7.2
Payload	3.2.1	4.2.1.2
Fixed-wing air transport	3.4.2	4.4.2
Flat-drop	3.4.6	4.4.6.1
Rotational drop	3.4.6	4.4.6.2
Shelter placement	3.4.6	4.4.6.3
Lifting and tiedown provisions	3.4.7	4.4.7
Rotary-wing air transport	3.4.3	4.4.3
Rail transport	3.4.1	4.4.1
Ground mobility	3.4.4	4.4.4
Watertightness	3.3.6	4.3.6
Fording	3.4.5	4.4.5
Impact Resistance	3.2.10	4.2.10
Electromagnetic interference (EMI) (2nd time)	3.3.2	4.3.2
Shelter dimensions	3.2.3.2	4.2.3.2
Door handle (2nd time)	3.2.8.1	4.2.8.1
Integration	3.2.3.3	4.2.3.3
Torque	3.2.3.3	4.2.3.3(1)
Pull-out	3.2.3.3	4.2.3.3(2)

shelves, or attaching hardware) attributable to the shelter during the course of the test shall constitute failure of the test being performed.

4.2.2 Parts Interchangeability:

4.2.2.1 *Spare-parts*—Compliance with 3.2.2.1 shall be determined by selecting two shelters from the production lot of completed shelters. The parts listed in Table 2 shall be interchanged between the shelters. The interchange shall be accomplished by removing the fasteners, interchanging the parts and reinstalling the fasteners. Inability to interchange the parts or loss of functionality in accordance with 3.2.2.1 shall constitute failure of this test.

4.2.2.2 *Interface Parts*—Compliance with 3.2.2.2 shall be determined by selecting one of each of the parts listed in Table 3 from the production lot of completed shelters. The interchange shall be accomplished by removing the fasteners, interchanging the parts and reinstalling the fasteners with a government furnished shelter/vehicle combination. Inability to interchange the parts in accordance with 3.2.2.2 shall constitute failure of this test.

4.2.3 *Shelter Configuration*—The shelter shall be inspected to determine compliance with 3.2.3. Failure to meet the requirements of 3.2.3 shall constitute failure of this test.

4.2.3.1 *Shelter Flatness and Squareness*—The following flatness and squareness tests shall be performed to determine compliance with the requirements with 3.2.3.1. Failure to meet the requirements of 3.2.3.1 shall constitute failure of this test.

(1) *Flatness*—The flatness of the shelter panels shall be determined using a straight edge, that is at least 48 in. (120 cm) long, which is flat within 0.005 in. (0.13 mm) total. Two 1/8-in. (3.2 mm) shims shall be placed under the straight edge, one at each end. A series of measurements shall be taken along the length of the straight edge, in both the horizontal and vertical directions, across the shelter's interior/exterior surfaces to identify the largest cup or bow.

(2) *Squareness*—The shelter shall be tested in accordance with Specification E1925. For the purpose of this test, any horizontal surface shall be considered a roof/floor and any vertical surface shall be considered a wall. In those regions where a 36 in. (90 cm) square is impractical, a square of the appropriate size shall be used and the allowed gap shall be proportional.

4.2.3.2 *Shelter Dimensions*—Each non-reference dimension specified on the interface drawing 17-2-0035 shall be measured. Failure to meet the requirements of 3.2.3.2 shall constitute failure of this test.

4.2.3.3 *Integration*—The shelter shall be examined to determine compliance with 3.2.3.3. A standard LMS integration configuration shall be used to determine test weight insert locations in the primary First Article Test Unit. The threaded fasteners used to secure the test weights shall be tested. Test fixtures shall be fashioned to evaluate the shelter's ability to securely hold threaded fasteners (10–32 through 1/2 –20 bolts). The test fixtures shall be fashioned to induce only a twisting load to the shelter attachment point for the torque test and, primarily, only an axial tensile load through the centerline of the shelter attachment point for the pull-out test. Reaction forces applied by the pull-out test fixture onto the shelter

extension including their associated hardware. The scale used shall have 1 lb (453.6 g) or less graduation and shall have an accuracy of at least ± 1 lb (453.6 g). The scale shall have a current calibration, traceable to the National Institute for Standards and Technology. Any item exceeding maximum weight listed in Table 1 shall be considered a failure.

4.2.1.2 *Payload*—Racks, shelves, attaching hardware, and individual weights shall be installed in the shelter to simulate a payload of 3300 lb (1496.9 kg) (see 3.2.1) The simulated payload shall be distributed throughout the shelter (see 6.2). This simulated payload shall be used for all verifications which require a payload, and any failure of this payload (racks,

surface shall be outside a 3 in. (7.6 cm) radius measured from the center line of the fastener being tested. Failure to meet the requirements of 3.2.3.3 shall constitute failure of this test. In addition to sample panel testing, the Contractor will select a total of 50 test weight inserts on the primary First Article Test Unit and conduct both an Initial and Final Torque Test and Pull-out Test on each of the 50 inserts selected as part of First Article Testing. The Government shall approve the Contractor's selection of test inserts prior to the start of any testing.

(1) *Torque*—To determine compliance, a torque load equal to 8 ft-lb (1.11 kg-m) for the 10-32 bolt and 10 ft-lb (1.38 kg-m), for the other bolts shall be applied to all fasteners installed in the shelter, fasteners used to integrate the system (see 4.2.3.3) should be used wherever possible. Failure to meet the torque requirements of 3.2.3.3 shall constitute failure of this test.

(2) *Pull-out*—To determine compliance, a tensile load equal to 800 lb (362.9 kg) for the 10-32 bolt and 1 000 lb (453.6 kg) for the other bolts shall be applied to all fasteners installed in the shelter, fasteners used to integrate the system (see 4.2.3.3) should be used wherever possible. Failure of meet the pull-out requirements of 3.2.3.3 shall constitute failure of this test.

4.2.4 *Chemical and Biological (CB) Resistance*—To determine compliance with the requirements of 3.2.4, it shall be verified that the shelter is finished in accordance with MIL-C-53072.

4.2.5 *Pressurization*—Air shall be supplied to the shelter, in operational configuration, with all appropriate openings closed, and an internal pressure of 1.2-in. water gauge shall be obtained and maintained. The air pressure and air flow shall be stabilized. Any additional air supplied to maintain specified internal pressure shall be recorded to determine compliance with 3.2.5. Failure to meet the requirements of 3.2.5 shall constitute failure of this test.

4.2.6 *Roof Loads*—The shelter roof shall be subjected to a uniform load of 40 pounds per square foot (lb/ft²) (0.0195 kg/cm²) over the entire surface. After removal of the uniform load, a 660-lb (299.4 kg) load over a 1- by 2-ft (30- by 61-cm) area at the weakest area of the roof shall be applied. Each test shall be for a duration of 5 min. Failure to meet the requirements of 3.2.6 both during the test and subsequent removal of the load shall constitute failure of this test.

4.2.7 *Floor Loads*—The shelter's floor shall be uniformly loaded to 65 lb/ft² (0.0317 kg/cm²) for 30 min. Prior to removal of the uniform load, all moveable parts shall be operated to ensure no interference exists between components. After completion of the above test, the uniform load shall be removed and a concentrated 1 000 lb load shall be applied over a 1- by 2-ft (30- by 61-cm) area centered on the floor and left in position for 30 min. The 2-ft (61-cm) dimension shall be parallel to the shelter's sidewall. Prior to removal of the concentrated load, all movable parts shall be operated to ensure no interference exists between components. After completing both of the above tests, the concentrated load shall be removed and a load of 125 lb (56.7 kg), balanced on a 1 in.² (6.45 cm²)

block, shall be applied for 5 min to the center of the floor. Failure to meet the requirements of 3.2.7 shall constitute failure of this test.

4.2.8 *Door:*

4.2.8.1 *Door Handle*—The shelter door shall be securely closed. A 48 lb (22 kg) load shall be applied to the door handle in the direction which best facilitates opening the door. After it has been verified that 48 lb is adequate to open the door, the door shall be closed and a 48 lb (21.8 kg) force applied in the direction which best facilitates the securing of the door. After it has been verified that 48 lb (21.8 kg) is adequate to secure the door, the outer door handle shall be locked and the above procedure shall be repeated. Failure to meet the requirements of 3.2.8.1, shall constitute failure of this test.

4.2.8.2 *Door Structure and Hinge Assembly*—The door shall have a 200 lb (90.7 kg) static load applied parallel to the hinge line, along the door edge opposite the hinge, with the door open to 90 degrees. After 30 min the load shall be removed and the door examined. Failure to meet the requirements of 3.2.8.2 shall constitute failure of this test.

4.2.8.3 *Door Stop*—This test shall be performed with the door in the open position, held by the door stop mechanism. A fixture shall be attached to the midpoint of the edge of the door opposite from the hinge which shall permit the application of a load equivalent to 10 lb/ft² (0.0049 kg/cm²) times the largest surface area of the door, normal to the door's surface, using free running pulleys and a ¼ in. (0.635 cm) diameter steel cable to transmit the load. Failure to meet the requirements of 3.2.8.3 shall constitute failure of this test.

4.2.8.4 *Door Maintainability*—The door shall be inspected to ensure compliance with 3.2.8.4. Failure to meet the requirements of 3.2.8.4 shall constitute failure of this test.

4.2.8.5 *Door Drip Edge*—The door shall be inspected to ensure compliance with 3.2.8.5. Failure to meet the requirements of 3.2.8.5 shall constitute failure of this test.

4.2.9 *Ladder*—The ladder shall be attached to the shelter, which is mounted on an M1152A1 and M1152A1 with B2 Armor Kit HMMWV, or to a mounting surface which simulates the M1152A1 and M1152A1 with B2 Armor Kit HMMWV, according to the contractors attaching instructions. A 400 lb (181.4 kg) load shall be applied for 5 min in the location, which shall cause the greatest amount of stress to the ladder. The ladder shall not be damaged or deformed. Failure to meet the requirements of 3.2.9 shall constitute failure of this test.

4.2.10 *Impact Resistance*—A hand tool as defined in 3.2.8.4 shall be selected and shall be allowed to freefall from a height of 30 in. (76 cm) onto the floor surface of the shelter. Failure to meet the requirements of 3.2.10 shall constitute failure of this test.

4.2.11 *Roof Access Steps/handholds*—A vertical load of 400 lb (181.4 kg) shall be applied one step at a time to the outer most point of each deployed step and maintained for 30 s. The access steps/handholds shall be evaluated for compliance with 3.2.11. Failure to meet the requirements of 3.2.11 shall constitute failure of this test.

4.2.12 *Interface Requirement*—The interfaces shall be evaluated for compliance with the interface drawings listed in