

MIL-S-29412C(MC)
11 January 1994
SUPERSEDING
MIL-S-29412B(MC)
20 January 1988

MILITARY SPECIFICATION
SHELTER, COMPLEXING KIT FOR

This specification is approved for use by the United States Marine Corps, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements for the manufacture and acceptance of the Complexing Kit. This kit has all the components necessary to complex two (2) shelters (either rigid or knockdown) side-to-side or two (2) knockdown shelters end-to-end. This kit will also complex three (3) shelters (two (2) side-by-side and the third (3rd) end-to-end). The end-to-end shelters must be knockdowns.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this specification as specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Program Support Directorate (PSE-C), MARCORSYSCOM, 2033 Barnett Ave., Suite 315, Quantico, VA 22134-5010 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

Figure 1

AMSC- N/A

FSC 5411

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SPECIFICATION

MILITARY

MIL-C-5541 Chemical Film and Chemical Film Materials for Aluminum and Aluminum Alloys

STANDARDS

MILITARY

MIL-STD-129 Marking for Shipment and Storage
 MIL-STD-810 Environmental Test Methods
 MIL-STD-831 Test Reports, Preparation of
 MIL-STD-907 Engineering and Design Criteria for Shelters, Expandable and Nonexpandable

2.1.2 Other Government documents, drawings and publications.
 The following other Government documents, drawings, and publications form a part of this specification as specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

DRAWINGS

MARINE CORPS

DL80A5022A0164 Shelter, Complexing Kit
 80A5022A0234 Seal Assembly, Ridge Cap
 80A5022A0235 Bracket Assembly, Seal
 80A5022A0236 Bracket Assembly
 80A5022A0237 Seal Assembly
 80A5022A0239 Faring Assembly, Corner Post
 80A5022A0247 Seal Assembly, Corner
 80A5022A0250 Plate Assembly, Center
 80A5022A0250 Cable Assembly, Electric
 80A5022A0264 Seal Assembly, Threshold
 80A5022A0345 Cap Assembly,
 80A5022A0396 Plate Assembly, Center
 80A5022A0510 Adapter Assembly, Jack

(Copies of specifications, standards, handbooks, drawings and publications required by manufacturers for specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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2.2 Order of precedence. In case of a conflict between the text of this specification and the references cited herein (except associated detail specification, specification sheets or MS Standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample unit shall be subjected to first article inspection and testing (see 4.4 and 6.3). The first article models shall be built in accordance with this specification and requirements of DL80A50220164. The quantities of each component shall be sufficient to complex shelters side-by-side and end-to-end.

3.2 Materials. Materials and components shall conform to the specified requirements and Data List DL 80A50220164.

3.3 Design and construction.

3.3.1 Seal assembly, ridge cap. One (1) each of the following seal assemblies shall be fabricated in accordance with Drawing No. 80A5022A0234 and supplied as part of the complexing kit.

80A5022A0234-1 Seal Assembly, ridge cap
 80A5022A0234-2 Seal Assembly, ridge cap
 80A5022A0234-3 Seal Assembly, ridge cap

The dash 1 assembly is the outer covering for the roof seal between two knockdown shelters complexed end-to-end. The dash 2 and 3 assemblies are combined to form the roof seal between two shelters complexed side-by-side.

3.3.2 Bracket assembly, seal. The following bracket assemblies shall be fabricated in accordance with Drawing No. 80A5022A0235 in the quantities indicated and supplied as part of the complexing kit.

80A5022A0235-1 Bracket assembly, seal 2 each
 80A5022A0235-2 Bracket assembly, seal 1 each

The dash 1 assembly when used with an identical assembly is to close the gap in the ceiling (interior) of two shelter complexed side-to-side. The dash 2 assembly is to close the gap in the ceiling between two knockdown shelters complexed end-to-end.

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3.3.3 Bracket assembly. The bracket assembly shall be fabricated in accordance with Drawing No. 80A5022A0236 with four (4) each of the bracket assembled supplies as part of the complexing kit. The bracket assembly is to be used to seal the gaps in the vertical sides and ends of the complexed shelters.

3.3.4 Seal assembly. The seal assembly shall be fabricated in accordance with Drawing No. 80A5022A0237 with four (4) each of the seal assemblies supplied as part of the complexing kit. The seal assembly is to be used to seal the interior vertical gap between complexed shelters.

3.3.5 Fairing assembly, corner post. The fairing assembly shall be fabricated in accordance with Drawing No. 80A5022A0239, with eight (8) each of the fairing assemblies supplied as part of the complexing kit. The fairing assembly is to be used to cover the corner posts of shelters at the vertical intersection between complexed shelters and installed before the seal assembly.

3.3.6 Plate assembly, center. The plate assembly shall be fabricated in accordance with Drawing No. 80A5022A0250 with one (1) each plate assembly supplied as part of the complexing kit. The plate assembly is to be used to align the complexed shelters at the point where four (4) individual corners meet. The plate fits into the bottom hole of the bottom corner fitting of each complexed shelter at the intersection of the four (4) corners. It may be used either end-to-end or side-to-side when only two (2) shelters are complexed.

3.3.7 Cable assembly, electrical. The following cable assemblies shall be fabricated in accordance with Drawing No. 80A5022A0251. One (1) each shall be supplied as part of the complexing kit.

80A5022A0251-1 Cable assembly, electrical

80A5022A0251-2 Cable assembly, electrical

The dash 1 assembly shall be used to distribute power from one shelter to another when the shelters are complexed side-to-side. The dash 2 cable assembly shall be used to distribute power from one shelter to another when the shelters are complexed end-to-end. The electrical cable assemblies shall be capable of handling 120/280 volt (V), 3-phase, 5-wire, wye-connected power up to 60 amperes (A) per phase. The terminations (ends) shall be as specified on Drawing No. 80A5022A0251. The phase rotation shall remain constant from input to output. Insulation resistance between any two (2) conductors shall be at a minimum 1.0 megohm.

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3.3.8 Seal assembly, threshold. The following threshold seal assemblies shall be fabricated in accordance with Drawing No. 80A5022A0264 in the quantities indicated and supplied as part of the complexing kit.

80A5022A0264-1 Seal assembly, threshold 2 each
80A5022A0264-2 Seal assembly, threshold 1 each

The dash 1 assembly, when used in pairs, is to close the gap in the floor between two shelters complexed side-to-side. The dash 2 assembly is to close the gap in the floor between two (2) knockdown shelters complexed end-to-end.

3.3.9 Cap assembly. The following cap assemblies shall be fabricated in accordance with Drawing No. 80A5022A0345 in the quantities indicated and supplied as part of the complexing kit.

80A5022A0345-1 Cap assembly 1 each
80A5022A0345-2 Cap assembly 2 each
80A5022A0345-3 Cap assembly 2 each

The dash 1 assembly is to close the gap in the roof where four shelter corners meet in a two deep by two (or more) shelters wide complex. The dash 2 assembly is to close the gap in the roof where two corners of knockdown shelters meet along the 40-foot (ft) outside wall of the complex. The dash 3 assembly is to close the gap in the roof where two shelter corners meet along the endwalls (side-to-side complexing).

3.3.10 Plate assembly, center. The following plate assemblies shall be fabricated in accordance with Drawing No. 80A5022A0247 with two (2) each supplied as a part of the complexing kit.

80A5022A0396-1 Plate assembly, center
80A5022A0396-2 Plate assembly, center

The dash 1 assembly is to be used to space two shelters when complexed side-to-side. The dash two assembly is to be used to space two shelters complexed end-to-end or along the outside of groups of shelters complexed end-to-end.

3.3.11 Seal Assembly, corner. The seal assembly corner shall be fabricated in accordance with Drawing No. 80A5022A0247 with one (1) each seal assembly being supplied as a part of the complexing kit. The seal assembly corner is a vertical closeout to be used on the 90° corner formed by three (3) shelters being complexed together, two (2) side-by-side and the third end-to-end.

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3.3.12 Jack adapter assembly. The jack adapter assemblies shall be fabricated in accordance with Drawing No. 80A5022A0510 with two (2) each of the jack adapter assemblies supplied as part of the complexing kit. This adapter is to be used to raise the center of the two (2) shelters complexed side-to-side during leveling operations.

3.3.13 Metal fabrication. Metal used in the fabrication of equipment shall be free from kinks and sharp bends. The straightening of material shall be done by methods that will not cause injury to the metal. Shearing and punching shall be done neatly and accurately. Corners shall be square and true. All bends of a major character shall be made with controlled means to ensure uniformity of size and shape.

3.3.14 Bolted and riveted connectors. Bolt and rivet holes shall be accurately punched or drilled. All bolts and rivet connectors shall have the burrs removed. Washers, lockwashers, or locknuts shall be provided where necessary and all bolts, nuts and screws shall be tight. Rivet heads, when not countersunk or flattened, shall be of uniform size and shape for the same diameter rivet, concentric with the rivet holes, and in full contact with the surface of the members.

3.3.15 Welding. The surface of the parts to be welded shall be free from rust, scale, paint, grease or other foreign matter. Weld penetration shall be such as to provide transference of maximum design stress through the base metal structure. Fillets shall be as specified on the applicable drawings.

3.3.16 Castings. Castings shall be sound and free from patching, misplaced coring, warping or defects which might render the castings unsound for use.

3.3.17 Seals. Seals shall be installed so the fit within the retaining track is snug and continuous contact is maintained with mating seal faces. Metered end junctions of vertical and horizontal seal runs shall be accurate. Gaps shall be sealed as specified on the applicable drawings.

3.4 Environmental requirements.

3.4.1 Rainfall. The complexing kit, when used to complex shelters either end-to-end to side-to-side, shall withstand rainfall up to and including 5 in per hour (in/hr) (127 millimeters per hour (mm/hr)) without leakage at any location.

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3.4.2 Temperature-humidity. In storage, the complexing kit shall be capable of withstanding exposure to temperatures of -70°F (-56.7°C) to 160°F (71.1°C). In transit, the complexing kit shall be capable of withstanding exposure to temperatures of -65°F (-53.9°C) to 160°F (71.1°C) with personnel access at low end of range. Operational temperature of complexing kit shall be -65°F (-53.9°C) to 125°F (51.7°C) plus solar load (see 3.5.8). The complexing kit shall withstand daily exposure of up to 97 percent relative humidity for 20 hours and exposure of 100 percent relative humidity (with condensation) for 4 hours.

3.4.2.1 Thermal shock. The complexing kit shall withstand sudden temperature changes from 160°F (71.1°C) to -70°F (-56.7°C) without separation, delamination, cracks or degradation of physical properties.

3.4.3 Wind. When installed on complexed shelters, the complexing kit shall be capable of functioning in accordance with the requirements specified herein in winds of up to 65 miles per hour (mph) (104 kilometers per hour (km/hr)) and gusts up to 120 mph (192 km/hr).

3.4.4 Sunshine. The complexing kit shall withstand the effects of ultraviolet radiation (sunshine) without significant degradation of the intended use of the kit's components or materials during the service life of the complexing kit.

3.4.5 Solar load. The complexing kit shall withstand, when installed on complexed shelters, a solar heat load on its roof sufficient to raise the outer skin to at least 200°F (93.3C) without any evidence of permanent deformation.

3.4.6 Marine environment. The complexing kit shall be fully serviceable when exposed to sea-salt fallout equivalent to 12.5 pounds/acre/year ($1.4\text{ gm/m}^2\text{/year}$). All fasteners, seals, or other hardware shall show no evidence of corrosion or degradation.

3.4.7 Blackout. The complexing kit, when installed on complexed shelters side-by-side and end-to-end, shall prohibit the exit of light from the complexed shelters except a small amount which will be visible at the bottom of the blackout curtain.

3.5 Finish.

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3.5.1 Surface preparations. All surfaces shall be prepared for painting as specified on the applicable drawings. All aluminum alloy materials shall be protected by a chemical film conforming to MIL-C-5541 even if a final finish is not applied.

3.5.2 Priming. All surfaces to be painted shall be primed as specified on the applicable drawing, and protected from corrosion by a chemical conversion coating in accordance with MIL-C-5541, Class 3.

3.5.3 Final finish. Painted surfaces shall be as specified on the applicable drawings.

3.6 Workmanship. All parts, components and assemblies of the complexing kit, including casting, forgings, molded parts, stampings, seals and sealing agents, machined surfaces and welded parts shall be clean and free from any defects that will reduce the capability of the complexing kit to meet the requirements specified herein. Any components and assemblies which have been repaired or modified to overcome deficiencies of deficient components or assemblies which are determined to be used "as is" shall not be used unless authorized by the contracting agency. External surfaces shall be free from burrs, slag, sharp edges, and corners, except where sharp edges and corners are required.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor shall perform all inspections specified herein. The contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government or otherwise specified. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are thought necessary to assure supplies and services conform to prescribed requirements.

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

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

- a. First article inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)
- c. Individual inspection (see 4.6)

4.3 Inspection conditions. Unless, otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.4, 4.5, and 4.6.

4.4 First article inspection. Before beginning production of the complexing kit, the contractor shall fabricate one complexing kit and subject it to the test specified in Table I.

4.5 Quality conformance inspection. From each shipping lot as defined in the contract, a single complexing kit shall be chosen at random by the Government and subjected to the tests specified in Table I. Failure of any test shall be cause for inspection of the entire lot at the contractor's expense for similar defects. Defective kits and components shall not be delivered without correction of the deficiency and then only with the permission of the contracting officer.

4.6 Individual inspection. Each complexing kit shall be subjected to the inspections and test specified in Table I. Failure to meet the requirements of the drawings and this specification shall be cause for rejection. No complexing kit shall be reworked and retested without the expressed permission of the contracting agency.

4.7 Inspections and tests.

TABLE I. Tests.

INSPECTION	REQ PARA	TEST PARA	1ST ART	QUAL CONF	IND
Electrical	3.3.7	4.7.1	X	X	X
Watertightness	3.4.1	4.7.2.1	X		
Temperature-Humidity	3.4.2	4.7.2.2	X		
Sunshine	3.4.4	4.7.2.3	X		
Solar load	3.4.5	4.7.2.4	X		
Marine environment	3.4.6	4.7.2.5	X		
Blackout	3.4.7	4.7.3.1	X		

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4.7.1 Electrical. Each cable assembly shall be subjected to a 1,000-V dc Megger between each conductor. The minimum acceptable resistance is 1,000,000 ohms. The electrical connectors shall be verified using an appropriate light or bell circuit assuring the pin connections are in accordance with Drawing No. 80A5022A0251.

4.7.2 Environmental tests.

4.7.2.1 Watertightness. The complexing kit under test shall be used to complex two shelters side-to-side. These complexed shelters shall be subjected to watertightness tests in accordance with MIL-STD-907. Any leakage at the complexing seams shall be cause for failure.

4.7.2.2 Temperature-humidity. The complexing kit, disassembled, shall be subjected to tests in accordance with MIL-STD-810, Method 507.1, Procedure II, excluding steps 2-4, 7, and 8. After cycling, the complexing kit shall be examined for evidence of cracking, corrosion, and deterioration.

4.7.2.3 Sunshine. Representative samples of all gaskets and seals shall be subjected to MIL-STD-810, Method 505.1, Procedure I. Upon completion of this test, the samples shall be examined and any evidence of degradation of physical properties shall constitute failure of this test.

4.7.2.4 Solar load. The complexing kit under test shall be used to complex two shelters side-by-side. The complexing kit shall be subjected to solar load test-assembled shelter in accordance with MIL-STD-907.

4.7.2.5 Marine atmosphere. One representative sample of each fastener, seal, and other hardware which will be exposed to the atmosphere in the operation modes shall be finished in accordance with the applicable drawings and subjected to tests as described in MIL-STD-810, Method 509.2, except that the salt solution shall have a concentrate of 5 percent and the exposure period shall be 96 hours. The test items shall show no evidence of corrosion upon completion of the test.

4.7.3 Construction and assembly tests.

4.7.3.1 Blackout. The complexing kit under test shall be used to complex two shelters side-by-side. These complexed shelters shall be placed in an area of complete darkness, connected electrically to the appropriate power source and the lights energized. With all apertures closed and latched, if applicable, and all internal light fixtures operating, no light shall be visible from outside the shelter in any direction. This shall be verified by an observer from all sides including the top. When

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the door is used to enter and exit the shelter a small amount of light may be visible where the curtain meets the floor per Par 3.4.7. Any visible light shall be recorded. This procedure shall be repeated with the shelters complexed end-to-end.

4.8 Test Reports. The results of all testing shall be reported and written in compliance with MIL-STD-831 fully describing and illustrating the test procedures and test results.

5. PACKAGING

5.1 Preservation. Each complexing kit shall be preserved in accordance with Drawing No. 80A5022A0352.

5.2 Packing. Each complexing kit shall be packaged in accordance with Drawing No. 80A5022A0352.

5.3 Marking. The packaged complexing kit shall be marked for shipment in accordance with the requirements of MIL-STD-129.

6. NOTES

6.1 Intended use. The complexing kit covered by this specification is intended for use solely to join two rigid or knockdown shelters in a side-by-side configuration or to join two knockdown shelters in an end-to-end configuration. These shelters are intended for use by air and ground U.S. Fleet Marine Forces to house and support tactical military equipment and operations in the field.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. First article testing required (see 3.1).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by and approve Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirement List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data -

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required by this specification are cited in the following paragraphs.

Para No.	Data Requirements Title	Applicable DD No.	Option
4.8	Test procedures and reports	DI-T-4909	N/A

(Data item descriptions related to this specification and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 First article. The first articles shall be examined and tested for approval at the contractor's plant or at an independent commercial testing laboratory acceptable to the procuring activity. First article tests shall be witnessed by a Government representative of the procuring activity. Approval of the first articles shall be by the procurement contracting officer.

6.4 Quality conformance. When a quality conformance inspection is required, the items to be tested should be a single complexing kit from each shipping lot. No lot should be accepted until the quality conformance tests have been successfully completed as required by 4.5.

6.5 Subject Term (Keyword) Listing.

Assembly, Bracket
 Assembly, Cable, Electrical
 Assembly, Cap
 Assembly, Fairing, Corner Post
 Assembly, Plate
 Assembly, Seal
 Kit, Complexing

6.6 Changes from previous issue. Asterisks are not used in this revision to identify changes from the previous issue due to the extensiveness of the changes.

Preparing activity:
 Navy-MC
 Project No. 5411-N040

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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

1. RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-S-29412C	2. DOCUMENT DATE (YYMMDD) 940111
3. DOCUMENT TITLE SHELTER, COMPLEXING KIT FOR		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. QUANTITIES		
7. DATE SUBMITTED		
8. PREPARING ACTIVITY		
a. NAME COMMANDER	b. TELEPHONE (Include Area Code) (1) Commercial (912) 439-6560	(2) AUTOVON 567-6560
c. ADDRESS (Include Zip Code) MARINE CORPS LOGISTICS BASES, CODE 855, 814 RADFORD BOULEVARD ALBANY GA 31704-1128	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	