INCH-POUND

MIL-PRF-27260D
26 June 2013

SUPERSEDING
MIL-PRF-27260C
28 November 1998

PERFORMANCE SPECIFICATION

TIE DOWN, CARGO, AIRCRAFT, CGU-1/B

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

1. SCOPE

1.1 Scope.

This specification covers one type of flight safety critical aircraft cargo tie down assembly. The tie down has been designated CGU-1/B with a 5,000-pound capacity and is furnished in a minimum length of 240 inches.

2. APPLICABLE DOCUMENTS

2.1 General.

The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to AFLCMC/ENRS, 2145 Monahan Way, Bldg 28, Wright-Patterson AFB OH 45433-7017 or e-mailed to AFLCMC.ENEZ.Engineering.Standards@wpafb.af.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

AMSC N/A FSC 1670

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks.

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	Identification Marking of US Military Property
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests

(Copies of these documents are available online at http://quicksearch.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications.

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted)

(Copies of this document are available online at http://www.asq.org or from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

RTCA

RTCA/DO-160	Environmental Conditions and Test Procedures for Airborne Equipment

(Copies of this document are available online at http://www.rtca.org or from RTCA Inc., 1828 L Street, NW, Suite 805, Washington, DC 20036.)

2.4 Order of precedence.

Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification.

The tie downs furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 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.

3.3 Materials.
All materials shall be treated to resist corrosion due to electrolytic decomposition, fungus, salt spray, and any other atmospheric conditions that may be encountered during operational use or storage (see 4.6). The use of toxic chemicals, hazardous materials, or ODCs shall be avoided.

3.4 Design.
The tie down assembly shall be designed as an integral unit and shall not require attachment or assembly of separate parts for operation. The tie down assembly shall be designed so that no parts become loose while in service. The tie down assembly shall be designed so that, no portions of the tie down, which bear on the strap when in the operating position, shall not incorporate knurled, serrated, or other types of surfaces that would degrade the strap strength. The tie down shall be designed to allow easy operation by aircrew and ground support personnel while wearing standard work gloves (see 4.6). The tie down assembly shall be operable without the use of tools.

3.5 Components.
The tie down major components shall consist of a strap, a fixed hook assembly, and an adjustable hook assembly that has an integrated adjusting, tensioning and release mechanism (see 4.6) as shown on Figure 1.

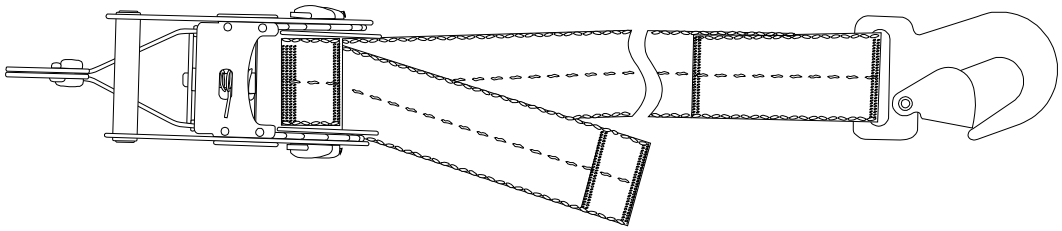

FIGURE 1. CGU-1/B tie down assembly.

3.5.1 Strap.
The strap shall incorporate a stop to prevent it from threading loose through the adjustable hook assembly as shown on Figure 2. The strap shall not have frayed ends (see 4.6). The strap shall not interfere with the operation and locking of the tensioning mechanism.

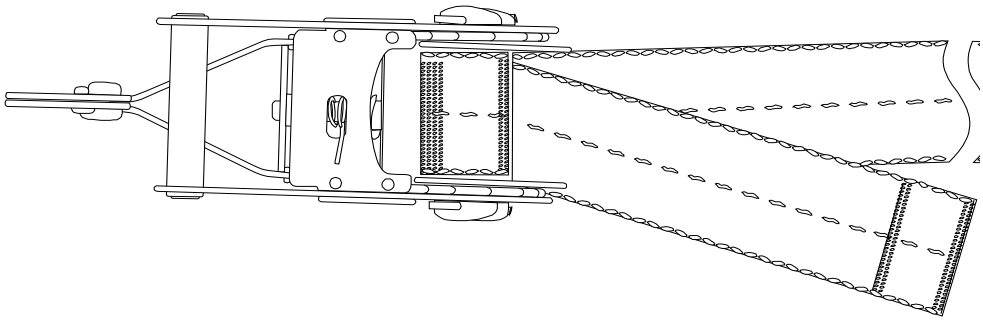

FIGURE 2. CGU-1/B strap.

3.5.2 Fixed hook assembly.

The fixed hook assembly shall have a non-swiveling hook with a mechanism on the hook to prevent inadvertent disengagement (see 4.6 and 4.7.1.3) as shown on Figure 3.

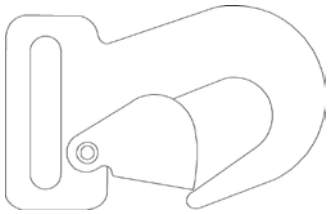

FIGURE 3. CGU-1/B fixed hook assembly.

3.5.3 Adjustable hook assembly.

The adjustable hook assembly shall have a non-swiveling hook, without an inadvertent disengagement mechanism (see 4.6) as shown on Figures 4 and 5.

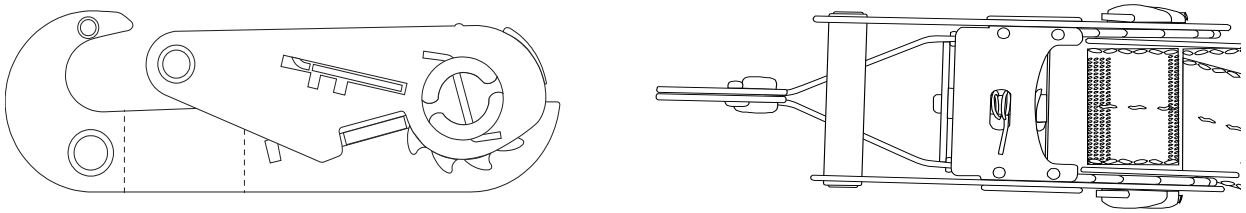

FIGURE 4. CGU-1/B adjustable hook assembly and tensioning mechanism.

3.6 Interface.

3.6.1 Tie down dimensions.

The overall dimensions of the tie down are shown on Figure 5.

3.6.2 Hook dimensions.

The hooks shall permit insertion of the tie down to aircraft tie down rings having a minimum clear opening of 0.75 inch diameter and a maximum cross section diameter of 0.875 inch (see Figure 5).

3.6.3 Weight.

The overall weight of the tie down assembly shall not exceed 3.75 pounds (see 4.6).

3.6.4 Strap color.

The color of the strap shall be natural white (see 4.6).

3.7 Operation.

The fixed hook assembly and the adjustable hook assembly shall attach to the aircraft tie down rings (see 3.6.2) without the use of tools or other supplementary devices. The adjusting, tensioning, and release mechanism requirements (see 3.8.3, 3.8.4, and 3.8.6) shall be accomplishable by aircrew and ground support personnel wearing standard work gloves. The

work gloves shall not cause interference with the operation of the tensioning and release mechanism (see 4.7.1.1).

3.8 Performance.

3.8.1 Proof load.
The tie down shall be capable of withstanding a proof load of 5,000 pounds for 30 seconds without slippage of the strap through the adjustment device. Damages such as broken stitching, torn or frayed strap, and deformation or rupture of hardware shall not be permitted. The tie down shall be fully operational at the completion of this test (see 4.7.4).

3.8.2 Ultimate load.
The tie down shall be subjected to an ultimate load of 6,000 pounds for 30 seconds. Damage such as broken stitching without complete separation, torn or frayed strap without complete separation of the strap, and deformation but not rupture of hardware will be permitted. The release mechanism shall be operable at the completion of this test (see 4.7.4.1).

3.8.3 Adjusting mechanism.
The tie down strap shall be capable of allowing the strap to be freely adjusted to any length within the limits as shown on Figure 5. It shall be possible to accomplish preliminary adjustments of the strap to the approximate length required in a maximum of 15 seconds. There shall be no inadvertent disengagement of the fixed hook assembly while securing the cargo (see 4.7.1.2).

3.8.4 Tensioning mechanism.
The tensioning mechanism shall be of the progressive take-up-ratchet type or similar mechanism and shall be capable of taking up a minimum of one foot of strap The tensioning mechanism shall be capable of applying a tension of not less than 150 pounds using an applied force not to exceed 50 pounds. No more than seven progressive take-ups shall be required to obtain 150 pounds of tension with 18 feet of strap between the hooks. The mechanical advantage of the mechanism shall not exceed a ratio of 5:1 in the tightened position; the tensioning mechanism shall lock in accordance with Figure 5, running approximately parallel with the hook. A lock shall be incorporated in the tensioning mechanism and shall automatically engage upon completion of the tensioning operation. The force required to disengage the lock shall not exceed 5 pounds (see 4.7.1.2).

3.8.5 Tensioning mechanism strength.
The tensioning mechanism shall be capable of withstanding a minimum applied force of 300 pounds without permanent deformation or malfunctioning of the mechanism. The tensioning mechanism shall be operable after completion of the test (see 4.7.1.2.1).

3.8.6 Release mechanism.
The release mechanism shall release the tensioning mechanism when actuated and shall produce sufficient slack in the strap to permit removal of the attachment hooks from the tie down rings. It shall be possible to manually release a tension load of 750 pounds with the applied force not exceeding 60 pounds (see 4.7.1.3).

3.8.7 Strap strength.
The strap shall have a minimum tensile strength of 9,500 pounds (see 4.7.2).

3.9 Environmental conditions.
The tie down shall be capable of satisfactory operation in various worldwide environmental conditions expected to be encountered during aircraft loading and unloading operations and long term storage to include the following conditions:

a. Fungus growth as may be encountered in tropical climates (see 4.7.3.1).
b. Humidity of 100% (see 4.7.3.2).
c. Salt spray as may be encountered in a salt sea atmosphere (see 4.7.3.3).
d. Exposure to blowing sand and dust as may be encountered in desert regions (see 4.7.3.4).
e. Vibration incident to service use (see 4.7.3.5).
f. A minimum low temperature of -65 °F (see 4.7.3.6).
g. A maximum high temperature of 160 °F (see 4.7.3.7).
h. Solar radiation as may be encountered in hot climates or from direct exposure to sunlight, showing no signs of degradation (see 4.7.3.8).

3.10 Durability.
The tie down shall be designed to perform in its intended environment (see 3.9) for a minimum of 30 years continuous use with no loss of function or safety (see 4.7.5).

3.11 Interchangeability.
All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable (see 4.6).

3.12 Item identification.
The tie down major components (strap, fixed hook, and adjustable hook assemblies) shall be permanently marked for identification in accordance with MIL-STD-130. The identification shall include the contract number, vendor, and contractor CAGE code (see 4.6). The following special marking shall be included:

5000 Lb. CAP (see 4.6).

3.13 Safety.
The tie downs shall be functional without sharp edges, burrs, or protrusions that might injure personnel or prevent the safe operation of the tie downs in areas of the aircraft with limited access or movement. Operation of the tie down assembly shall not present undue hazards to aircrew and ground support personnel during tie down of cargo while the cargo is secured, during the release of cargo restraint, or during removal or stowage of the tie downs. Normal operation shall not present cutting, pinching, stabbing, nor abrupt impact hazards to personnel. Tie down straps shall not have defects such as holes, cuts, tears, splices, or abrasions which may cause strap failure and result in injury to personnel or damage to cargo. The strap shall also be free of grease, oil, dirt, or any other foreign matter that is not removable without damaging the strap and degrading its strength (see 4.6).

3.14 Toxic chemicals, hazardous substances, and ozone depleting chemicals (ODCs).
The use of toxic chemicals, hazardous substances, or ODCs shall be avoided (see 4.6).

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.1.1 Sampling for inspection.
Unless otherwise specified, sampling shall be in accordance with ANSI/ASQ Z1.4.

4.2 Qualification inspection.
Qualification inspection shall be performed on three complete tie down assemblies (A, B, and C). The three tie down assemblies will be visually examined as specified in 4.6. The three complete tie down assemblies will then be subjected to the tests as specified in 4.7, in accordance with the sequence specified in Table I (see 4.7).

TABLE I. Testing sequence.

Test Paragraph	Test Article A	Test Article B	Test Article C
4.7.1 – 4.7.1.3	1		
4.7.1.2		6	4
4.7.1.3		7	5
4.7.2 (strap only)			6
4.7.3.1		2	
4.7.3.2		5	
4.7.3.3		3	
4.7.3.4		4	
4.7.3.5			1
4.7.3.6			2
4.7.3.7			3
4.7.3.8	2		
4.7.4	3		
4.7.4.1	4		
4.7.5		1	

4.3 Conformance inspection.
Conformance inspection shall include the inspections (see 4.6) and the tests as specified in 4.7.1 to 4.7.1.3.

4.4 Test conditions.
Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in RTCA/DO-160 for the applicable test.

4.5 Requirements cross-reference matrix.
Table II provides a cross-reference matrix of the Section 3 requirements tested or verified in the paragraphs below.

TABLE II. Requirements cross-reference matrix.

Requirement	Verification	Requirement	Verification
3.3	4.7.3.1 – 4.7.3.2	3.8.1	4.7.4 – 4.7.4.1
3.4	4.6	3.8.2	4.7.4.1
3.5	4.6	3.8.3	4.7.1.2
3.5.1	4.6	3.8.4	4.7.1.2.1
3.5.2	4.6, 4.7.1.3	3.8.5	4.7.1.2.1
3.5.3	4.6	3.8.6	4.7.1.3
3.6	4.6	3.9	4.7.3.1 – 4.7.3.8
3.6.1	4.6	3.10	4.7.5
3.6.2	4.6	3.11	4.6
3.6.3	4.6	3.12	4.6
3.6.4	4.6	3.13	4.6
3.7	4.7.1.1	3.14	4.6

4.6 Visual examination.
Unless otherwise specified, each tie down assembly shall be examined for compliance as shown in Table II.

4.7 Methods of inspection.

4.7.1 Sample configuration.
Unless otherwise specified, tests shall be performed with the tie down working length adjusted to 4 feet ± 3 inches.

4.7.1.1 Operations.
The tests shall be performed in conjunction with the adjusting and tensioning mechanism (see 4.7.1.2) and release mechanism (see 4.7.1.3) tests as specified in 3.7.

4.7.1.2 Tensioning test.
With the tie down connected between two fixed points 18.0 feet apart, the adjusting and tensioning mechanism shall be operated and examined for compliance with 3.8.3 and 3.8.4. There shall be no inadvertent disengagement of the fixed hook assembly during tie down operations.

4.7.1.2.1 Tensioning mechanism strength.
The tensioning mechanism shall be subjected to a minimum applied force of 300 pounds through the tensioning mechanism. The tensioning mechanism shall be operated and examined for compliance with 3.8.5. There shall be no permanent deformation or malfunctioning of the mechanism.

4.7.1.3 Release mechanism test.
The tie down shall be assembled in a testing machine and the release mechanism locked. A minimum load of 750 pounds shall be applied and the release mechanism shall operate by the application of not more than 60 pounds of force, while the tie down is sustaining the applied load. The slack in the strap produced by operation of the release mechanism shall allow removal of the attachment hooks. The release mechanism shall operate as specified in 3.8.6.

4.7.2 Strap strength.
The strap material shall be tested to failure in a tensile test machine at a constant crosshead rate of 3.0 ± 1.0 inches per minute in order to verify compliance with 3.8.7.

4.7.3 Environmental conditions.
Environmental testing shall be planned and conducted in accordance with RTCA/DO-160.

4.7.3.1 Fungus resistance.
The tie downs shall be subjected to the fungus resistance test in accordance with RTCA/DO-160, Section 13, Category F. The tie down shall be tested in accordance with 4.7.4 immediately after the fungus test is complete. Any evidence of failure during or after proof load testing shall be cause for rejection.

4.7.3.2 Humidity.
The tie downs shall be subjected to the humidity tests in accordance with RTCA/DO-160, Section 6, Category C. During this test, the tie down shall be subjected to the tests as specified in 4.7.1.2, 4.7.1.2.1, and 4.7.1.3.

4.7.3.3 Salt fog.
The tie down shall be subjected to the salt fog test in accordance with RTCA/DO-160, Section 14, Category S, 5% Salt Spray. At the conclusion of this test, the tie down shall be subjected to the tests as specified in 4.7.1.2, 4.7.1.2.1, and 4.7.1.3.

4.7.3.4 Sand and dust.
The tie down shall be subjected to the sand and dust test in accordance with RTCA/DO-160, Section 12, Category D. At the conclusion of this test, the tie down shall be subjected to the tests as specified in 4.7.1.2 and 4.7.1.3.

NOTE: If 140 mesh silica flour is used in accordance with RTCA/DO-160, local environmental laws and criteria shall be observed.

4.7.3.5 Vibration.
The tie down shall be kept under a tension of 200 pounds for a 24-hour period. While under tension the tie down assembly shall be subjected to a vibration test in accordance with RTCA/DO-160, Section 8, Standard Sinusoidal Vibration Test Procedure, Figure 8-4, Curve Y.

4.7.3.6 Low temperature.
The tie down shall be subjected to the low temperature test in accordance with RTCA/DO-160 Section 4, Category A3, Ground Survival Low Temperature Curve, at a temperature of -65 °F. During this test, the tie down shall be subjected to the tests as specified in 4.7.1.2, 4.7.1.2.1, and 4.7.1.3.

4.7.3.7 High temperature.
The tie down shall be subjected to the high temperature test in accordance with RTCA/DO-160 Section 4, Category A3, Ground Survival High Temperature Curve, except the maximum temperature shall be 160 °F. During this test, the tie down shall be subjected to the tests as specified in 4.7.1.2, 4.7.1.2.1, and 4.7.1.3.

4.7.3.8 Solar radiation.
The tie down shall be subjected to four cycles of 24-hour solar radiation testing in accordance with MIL-STD-810, Method 505.5, Procedure II, to simulate 10 days of continuous sunlight exposure.

Upon completion of the test, verification of this requirement shall be demonstrated by performing proof-load testing in accordance with 4.7.4.

4.7.4 Proof-load.
The tie down shall be subjected to a proof load of 5,000 pounds for 30 seconds as specified in 3.8.1.

4.7.4.1 Ultimate-load.
The tie down shall be subjected to an ultimate load of 6,000 pounds for 30 seconds as specified in 3.8.2.

4.7.5 Durability.
One tie down shall be rotated for one hour in a tumbler type test fixture as shown on Figure 6. One tie down shall be fully extended and suspended by 2 feet of strap inside the tumbler vessel with one hook attached to the center of an inside surface of the tumbler vessel, and the other end suspended freely in the tumbler vessel The dimensions of the tumbler vessel and orientation during testing shall result in the tie down being suspended at least 1 inch above the inside surface opposing the hook to tumbler vessel attachment point when the strap surface is rotated to its highest position above the ground. The tumbler shall be designed, configured, and operated in such a manner that causes the tie down to, at times, tumble against the inside surface(s), and other times only supported by the strap and hook. The tumbler and installed tie down shall be operated in this manner at a constant speed for 1 hour and approximately 7-10 revolutions per minute. At the conclusion of this test, all tie down mechanisms shall be inspected and the hook shall not have inadvertently released. The tie down will then be subjected to the tests specified (see 4.7.1.2 and 4.7.1.3).

5. PACKAGING

5.1 Packaging.
For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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

6.1 Intended use.
The CGU-1/B tie down covered by this specification is a flight safety critical aircraft item and is intended for use in securing cargo being transported in military aircraft.

6.2 Acquisition requirements.
Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Item identification (see 3.12).

c. Packaging requirements (see 5.1).

6.3 Qualification.

With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List (QPL) No. 27260 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from AFLCMC/ENRS, 2145 Monahan Way, Bldg. 28, Wright-Patterson AFB OH 45433-7017 or e-mailed to AFLCMC/EN_EZ_Engineering_Standards@wpafb.af.mil**.** An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Subject term (key word) listing.

140 mesh silica flour
Adjusting assembly
Hook
Ratchet
Strap
Tensioning assembly

6.5 Changes from previous issue.

Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

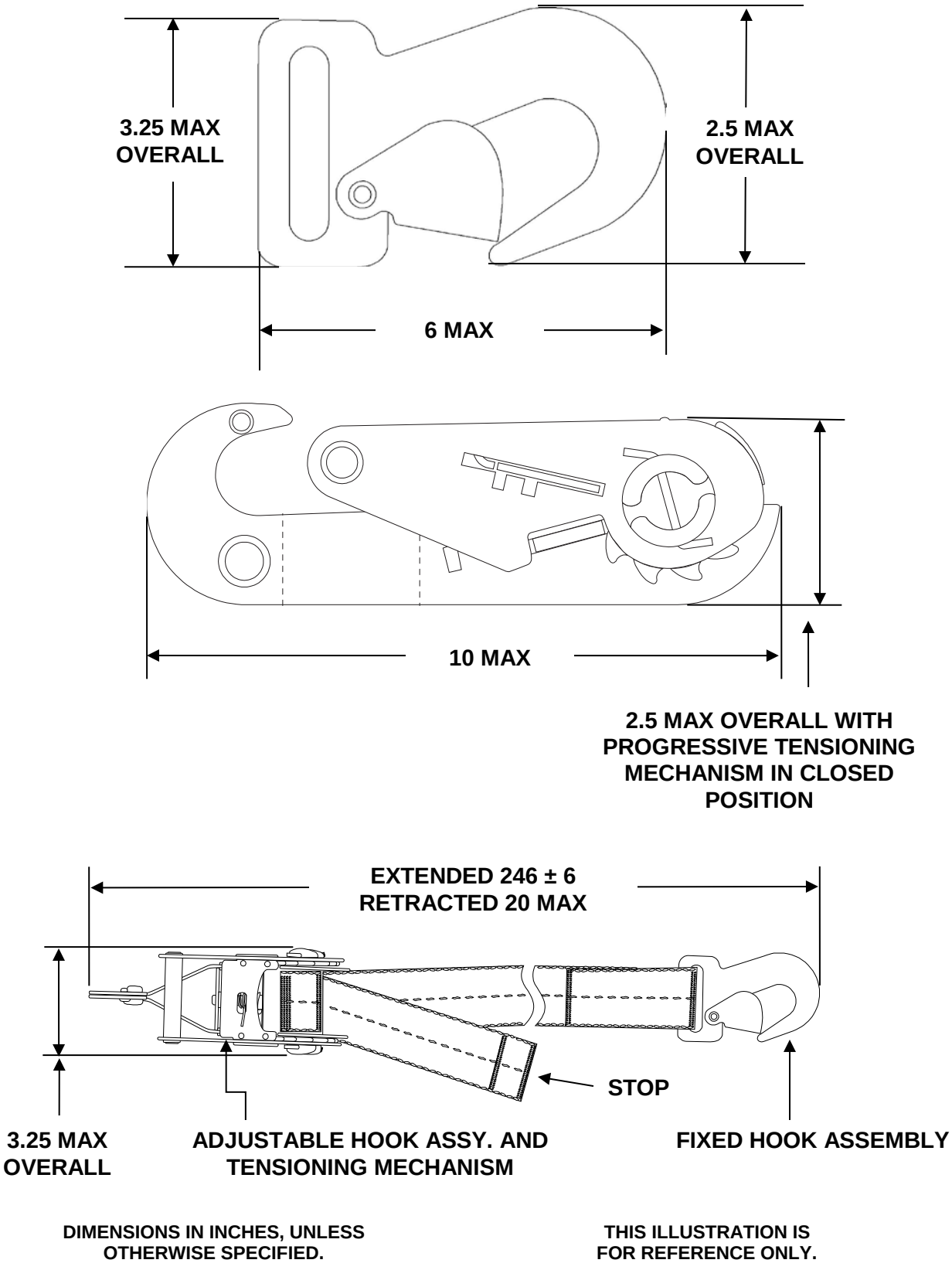

FIGURE 5. Tie down dimensions.

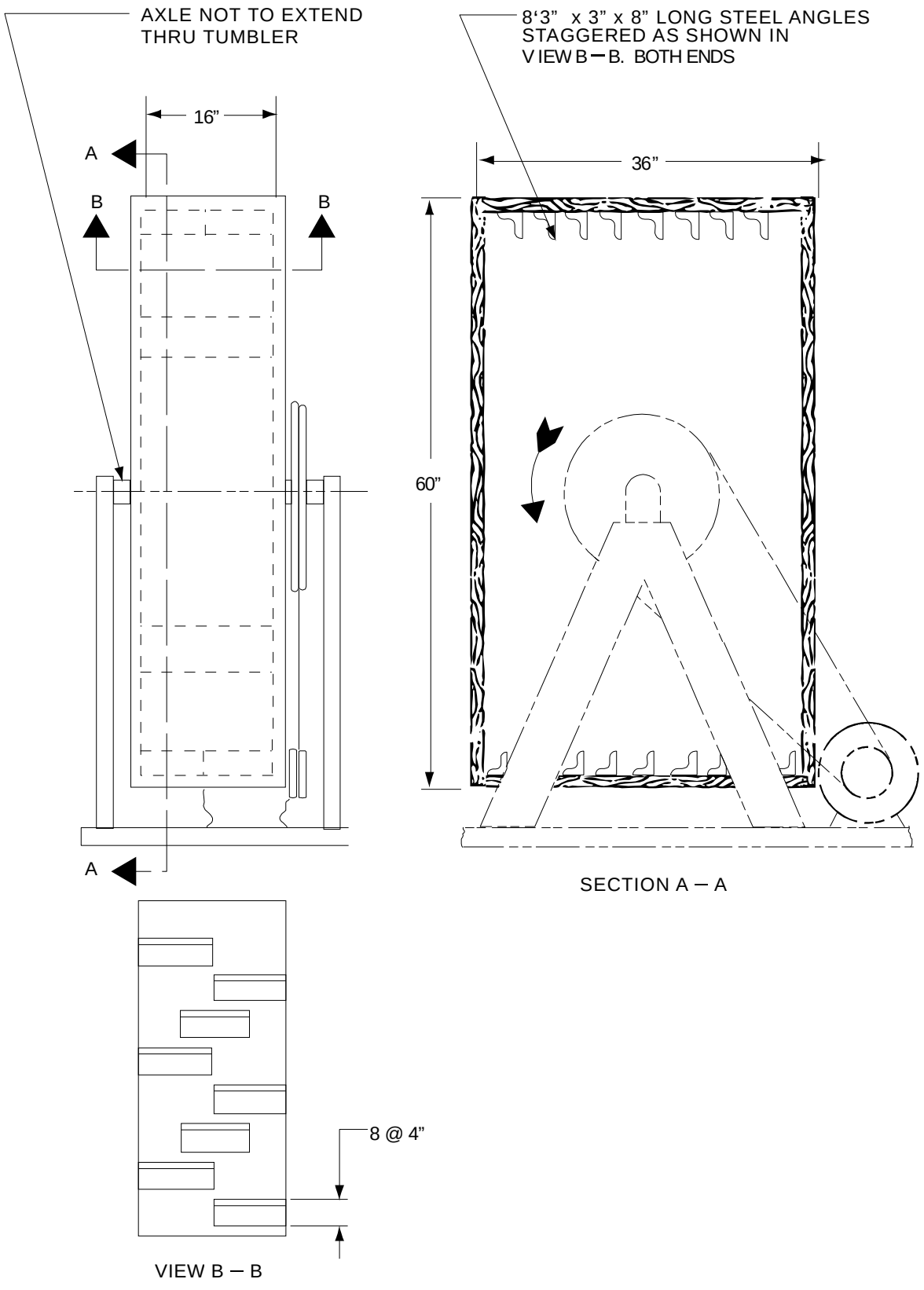

FIGURE 6. Tumbler test fixture.

CONCLUDING MATERIAL

Custodians:
Army – GL
Air Force – 11
DLA – GS

Preparing activity:
Air Force – 11

(Project 1670-2012-004)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.