

MIL-S-6144A
12 May 1966

Superseding
MIL-S-6144
21 April 1950

MILITARY SPECIFICATION

SOUND AND THERMAL INSULATION FOR AIRCRAFT GENERAL SPECIFICATION FOR THE INSTALLATION OF

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

1. SCOPE

1.1 Scope. This specification covers general requirements for the installation of sound and thermal insulation in aircraft.

1.2 Classification - The thermal-soundproofing installations covered by this specification are of the following types, as specified:

Type I - Blanket Installation (See 3.1.1)

Type II - Rigidized Interior Installation (See 3.1.2)

Type III - Rigid Interior Installation (See 3.1.3)

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-A-3316	Adhesives, Fire-Resistant, Thermal Insulation
MIL-F-5591	Fasteners, Panel
MIL-B-5924	Insulation. Glass Fibers

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SPECIFICATIONS (Continued)

Military

MIL-S-6033	Screws; Self-tapping Steel, Aircraft
MIL-P-6264	Plastic Sheet, Vinyl Copolymer, Thin
MIL-I-7171	Insulation Blanket, Thermal-Acoustical
MIL-F-10884	Fasteners, Snap
MIL-F-21840	Fasteners, Nylon Tape

Federal

FF-S-92	Screws, Machine, Slotted or Cross-recessed
V-F-106	Fasteners, Slide, Interlocking

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Other publications - The following documents form apart of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Aerospace Standards Committee

NAS 442	Latch - Flush Type
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(Application for copies should be addressed to the Aircraft Industries Association of America, Inc., 1725 De Sales St., Washington, D.C. 20036

3. REQUIREMENTS

3.1 Component Materials

3.1.1 Type I Installation - The component materials used for Type I installations shall be a-thermal-soundproofing blanket conforming to the requirements of MIL-I-7171. Fastening materials shall be as specified in 3.2.1.

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3.1.2 Type II Installation - The component materials used for Type II Installation shall substantially consist of rigidized fibrous glass insulation, equivalent or similar to that conforming to MIL-B-5924, suitably contained or otherwise protected (see 3.4 and 3.7) and installed with flexible trim material separately attached to the aircraft structure.

3.1.3 Type III Installation - The construction of the Type III Installation shall substantially consist of rigidized fibrous glass insulation, equivalent or similar to that conforming to MIL-B-5924 suitably contained or otherwise protected (see 3.5 and 3.8) and installed with rigid lining material separately attached to the aircraft structure. Alternately, rigid lining material may be attached over a Type I (blanket) Installation, as is typified in Figure 1 (a) for part of a cargo compartment installation, Figure 2 (a) depicts a typical installation in which the rigid trim is attached as a separate unit over insulating material, Figure 2 (b) depicts an alternate approach in which the insulating material is cemented to the rigid trim and, as a unit, is attached to the aircraft structure.

3.2 Attachment of Materials - The means used to affix, support or seal the thermal-soundproofing installation shall consist of one, or several, of the following:

- A. Mechanical Fasteners
 - 1. Quick Release
 - (a) Curtain (Style 1 of MIL-F-10884)
 - (b) Snap (Style 2 of MIL-F-10884)
 - (c) Slide (V-F-106)
 - (d) Quarter-turn (MIL-F-5591)
 - (e) Latch, Flush Type (NAS 442)
 - 2. Studs - Plastic, Serrated, with push-on clip.
 - 3. Screws, Machine - (FF-S-92 or Equivalent)
 - 4. Screws, Self-tapping - (MIL-S-6033 or Equivalent)
- B. Nylon Tape Fasteners (MIL-F-21840)
- C. Lacing, Nylon
- D. Adhesive (MIL-A-3316 or Equivalent)

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3.2.1 Fastening - Type I Installation

3.2.1.1 Fastening shall be principally to the existent structure with auxiliary support structure provided (such as brackets, crown rails, lattice webbing, etc.) if needed to minimize sag, maintain contours or to facilitate removal and replacement.

3.2.1.2 Curtain and snap fasteners shall be used to attach and support the thermal-soundproofing blanket. (See Figure 1 for typical installation). Fasteners shall be attached to the blanket only in areas which have been reinforced by the use of a durable and entirely suitable edging material cemented or stitched to the trim cloth, or by the use of large metal grommets.

3.2.1.3 Nylon tape fasteners may be used in lieu of curtain and snap fasteners when configurational details, such as blanket size and weight, and the type of available structure permit. A means for positive positioning of the thermal-soundproofing blanket fasteners shall be used in conjunction with nylon tape fasteners. This may be accomplished by providing several plain studs in the structure with corresponding grommets in the blanket or, as typified in Figure 4, by locating several curtain, quick release fasteners in the thermal-soundproofing blanket.

3.2.1.4 Interlocking slide fasteners shall be used for sealing local inspection openings, stowage packets, or inflight equipment access openings, within the installation. Alternate nylon tape fasteners or snap fasteners may be used if provision is made for adequate support around the access cutout behind the thermal-soundproofing blanket.

3.2.1.5 Fasteners intended for permanent installation such as screws, bolts, rivets, staples and snap pins shall not be used to attach and support the thermal-soundproofing blankets. Adhesive shall not be used to fasten the blanket to the aircraft structure, but may be used to fasten the blanket to another part of the installation which is separately attached and supported. The adhesive shall conform to MIL-A-3316.

3.2.1.6 Sufficient slack shall be inherent in the thermal-soundproofing blankets between fastening points such that stretching will not be necessary to position and fasten the blankets upon installation. Sag shall be prevented in the installation by optimum choice of fastener number and location, and by the use of auxiliary support methods (e.g. blanket support tabs, tufting, etc.), if necessary.

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3.2.2 Fastening - Type II Installation

3.2.2.1 The general requirements for fastening shall be as specified in 3.2.1.1. Curtain or snap fasteners shall be used to attach the flexible trim material to the aircraft structure. Fastener attachment shall only be made in areas in which the trim cloth is specifically reinforced by the use of a durable and entirely suitable material cemented or stitched to the trim cloth.

3.2.2.2 Nylon tape fasteners may be used in lieu of curtain and snap fasteners, when practicable, if the positioning requirements of 3.2.1.3 are satisfied. Figure 4 illustrates a typical installation.

3.2.2.3 Rigidized insulating material should be configured such that it is substantially self-supporting and held in place with a minimal number of fasteners.

3.2.2.4 Lacing may be used to retain the insulating material between frames where required. The lacing cord may be anchored at frame and stringer intersections by running the cord behind the frame and over the stringer section. or may be anchored to hooks fitted to the frame webs. The lacing cord shall not be threaded through holes made in the frame webs.

3.2.2.5 Provision shall be made within the installation for access to areas affected by inspection or maintenance procedures. The size of the section of insulation to be removed shall be as small as practicable, and contain the minimum number of fasteners. Due consideration shall be given to access requirements in confined areas. and the fastening method used therein shall permit removal and replacement with one-hand operation.

3.2.2.6 Fasteners intended for permanent installation such as screws, bolts, rivets, staples and snap pins shall not be used as fastening means for the trim cloth or rigidized insulating material. Adhesive conforming to MIL-A-3316 may be used for fastening the rigidized insulating material to the trim cloth, which is separately attached to the structure, but shall not be used for attaching and supporting the insulating material to the structure.

3.2.3 Fastening - Type III

3.2.3.1 Fastening shall be principally to the existent structure with auxiliary structure support and positioning structure provided to maintain the contours of the aircraft and facilitate removal and replacement.

3.2.3.2 Curtain. snap and quarter-turn fasteners shall be used to attach the rigid lining material to the aircraft structure.

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3.2.3.3 Curtain, snap, quarter-turn, nylon tape, or flush latch fasteners shall be used to attach and seal inspection panels within the installation. Where inspection panels cannot be provided, the requirements of 3.2.2.5 shall govern.

3.2.3.4 The requirements of 3.2.2.4 shall apply where the insulating material is provided enclosed in a bag or when in blanket form installed separate from the rigid liner.

3.2.3.5 The requirements of 3.2.2.3 shall apply when rigidized insulating material is installed separately from the rigid liner. Figure 2 (a) illustrates a typical installation.

3.2.3.6 The requirements of 3.2.2.6 shall apply for the Type III installation, except that the rigidized insulating material will be attached to the rigid liner in lieu of the trim cloth. A typical installation in which the rigidized insulating material is cemented to the rigid liner is illustrated in Figure 2 (b).

3.2.4 Appurtenant Fastening - Machine screws and self tapping screws may be used to fasten auxiliary support structure such as brackets, crown rail supports, and other similar items which need not be removed to effect removal of the thermal-soundproofing installation.

3.3 Continuity - Breaks occurring in the continuity of an installation such as a frame joint, shall be made acoustically leak-free with the minimum of appurtenant materials. Juncture areas in Type I Installation shall be effected by overlapping the edges of adjacent blankets and fastening per 3.2.1. Molding strips, or equivalent items, shall not be used. Fastening, spacing and locating shall be optimized so as to provide unaltered sealing characteristics after repeated removals and reinstallation. In Type II and Type III Installation the sealing shall be inherent in the configuration of the insulating material. Figure 2 illustrates optimum sealing techniques for two typical installations using rigidized insulating material. Where insulating material is provided in blanket form, blanket flaps of suitably enclosed insulation shall be provided to wrap the frames between blanketed bags. See Figure 3 (a). Installations not amenable to frame-wrapping with blanket flaps may utilize separate cap strips of suitably enclosed insulating material fastened to both sides of the frame web. See Figure 3 (b). Fastening means used shall permit removal of the cap strip without fastener or material damage.

3.4 Environment - Due consideration shall be given to the environment to which the thermal-soundproofing installation will be subject. Specifically the installation shall conform to the following requirements:

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3.4.1 Stability - The installation shall be designed to resist changes in form, dimensions, and appearance during handling, installation and service. Sufficient support and containment shall be afforded to prevent disintegration or packing of the insulating material due to vibration. The rigid lining material of the Type III installation shall be of the type that will not crack or craze when subjected to the vibration of its environment.

3.4.2 Moisture Resistance - A moisture impervious material shall be provided as a backing material to the installation and shall conform to the requirements specified in MIL-P-6264. Alternately, in Type III Installations utilizing rigidized insulating material, moisture resistant material may be sprayed on the rigidized insulating material.

3.4.3 Hydraulic Fluid, Oil, and Fuel Contamination - Sections of an installation having porous or perforated interiors shall not be used in areas subject to hydraulic fluid, oil, or fuel contamination. Sections of an installation located in these areas shall be protected from damage by completely enclosing the insulating material within the section with material impervious to, and unaffected by, these agents. Holes made in these sections by stitching, for fastening or otherwise, shall be sealed against fluid entry. The requirements of 3.4.2 are waived in these sections of an installation.

3.5 Corrosion and Toxicity - The component materials of the installation and the appurtenant materials used to fasten, support, seal, protect or otherwise used in the construction of the installation shall not themselves corrode, nor propagate corrosion of any aircraft material which they contact, nor emit corrosive vapors which will damage any portion of the aircraft. The component and appurtenant materials used in the installation shall be of the type which will not emit toxic or noxious vapors in concentrations that will hinder the efficiency or comfort of the aircraft occupants,

3.6 Fire Resistance - The individual components of the Type II and III Installations shall meet the fire resistance requirements of MIL-I-7171.

3.7 Damage due to Cargo and Personnel - In the design of the thermal-soundproofing installation due consideration shall be given to the damageability resultant from cargo handling, flight and maintenance personnel abuse.

3.7.1 Aircraft intended for cargo transport shall contain installations which are protected to withstand snagging? tearing and puncturing by cargo handling.

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3.7.2 Entryways, such as doors and hatches, shall have provided. at their periphery. a suitable, durable material to protect the thermal-soundproofing installation bordering thereon.

3.7.3 Sections of a thermal-soundproofing installation located in critical aircraft areas and therefore subjected to frequent handling by flight and maintenance personnel shall be configured and, if necessary, protected to withstand potential damage caused therefrom.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Reports - The contractor shall furnish to the Procuring Activity a report on each type aircraft, prior to acceptance, containing the following information on the thermal-soundproofing installation.

- (a) Drawings or sketches showing the type of installation employed, and its location in the aircraft.
- (b) Total weight of thermal-soundproofing materials.
- (c) Total weight and details of fasteners or fastening means employed.
- (d) Total weight and details of all auxiliary materials used in the installation.

5. PREPARATION FOR DELIVERY

5.1 Not applicable to this specification.

6. NOTES

6.1 Intended Use - This specification defines the general requirements for the installation of thermal-soundproofing insulation in Military aircraft in a manner intended for maximum durability, least interference with inspection and maintenance of the aircraft. and most readily serviceable.

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6.2 Changes from previous issue - Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Navy - AS
Air Force -11
Army - MO

Preparing Activity:

Navy - AS
DOD Project No. 1560-0018

Review Interest:

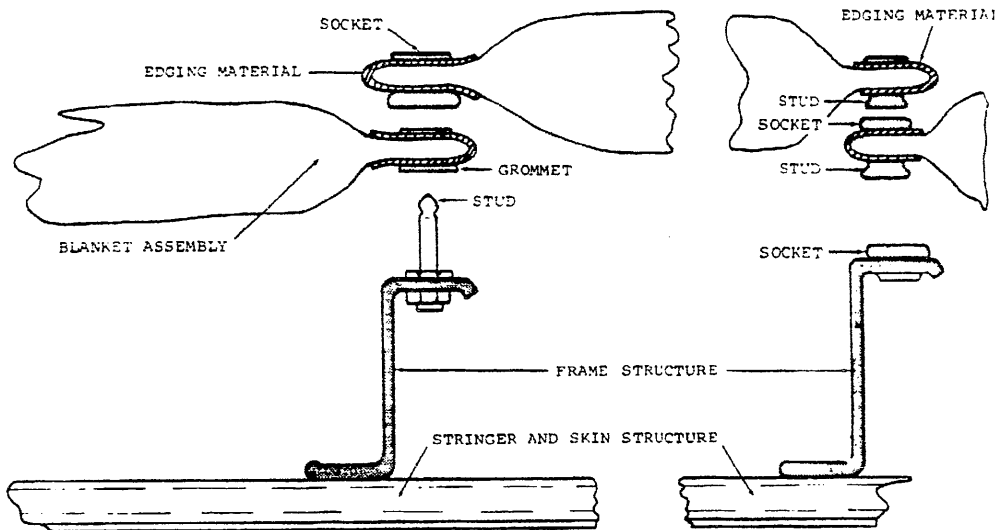
Navy - AS
Air Force - 11, 80, 82
Army - MO

User Interest:

Army - MI

NOTICE: Review/user interest information is current as of date of this document. For future coordination of changes to this document draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD standardization documents.

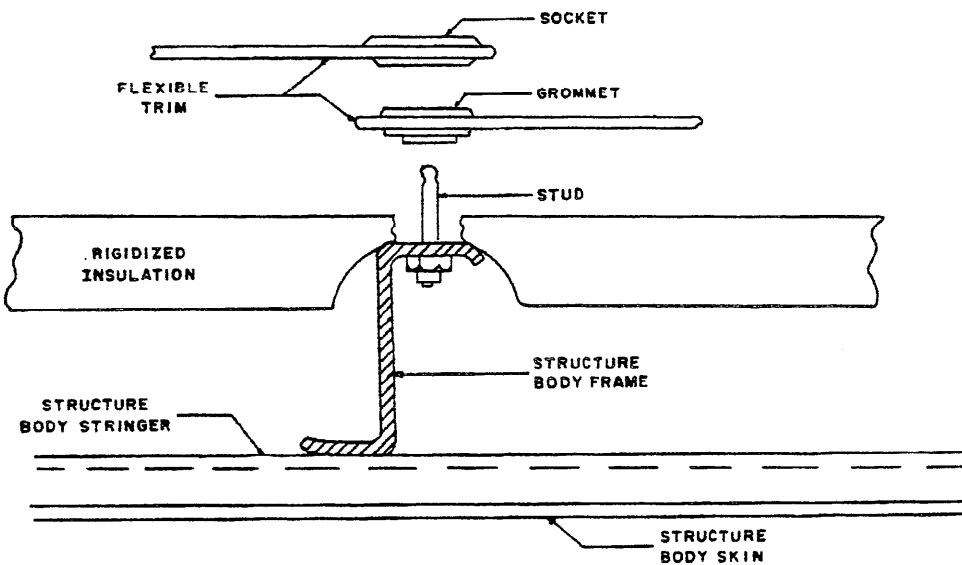
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SOFT BLANKET ATTACHMENT USING SNAP FASTENERS

TYPICAL TYPE I INSTALLATION

FIGURE 1A



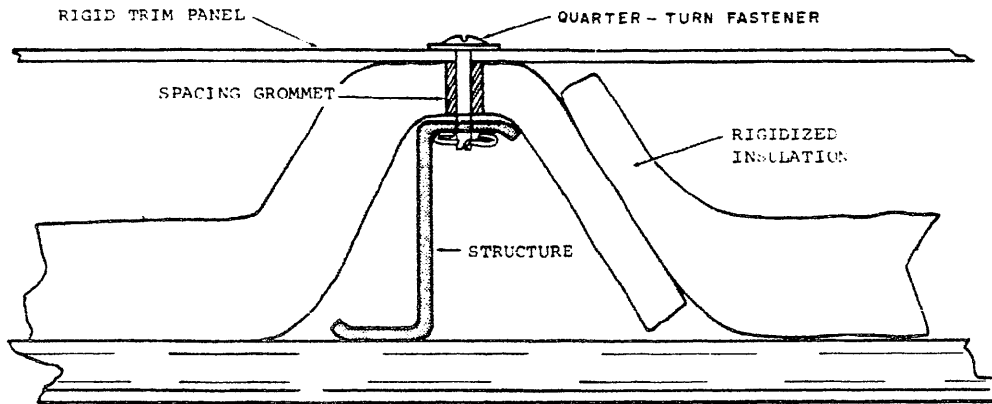
RIGIDIZED INSULATION ATTACHMENT USING SNAP FASTENERS

TYPICAL TYPE II INSTALLATION

FIGURE 1B

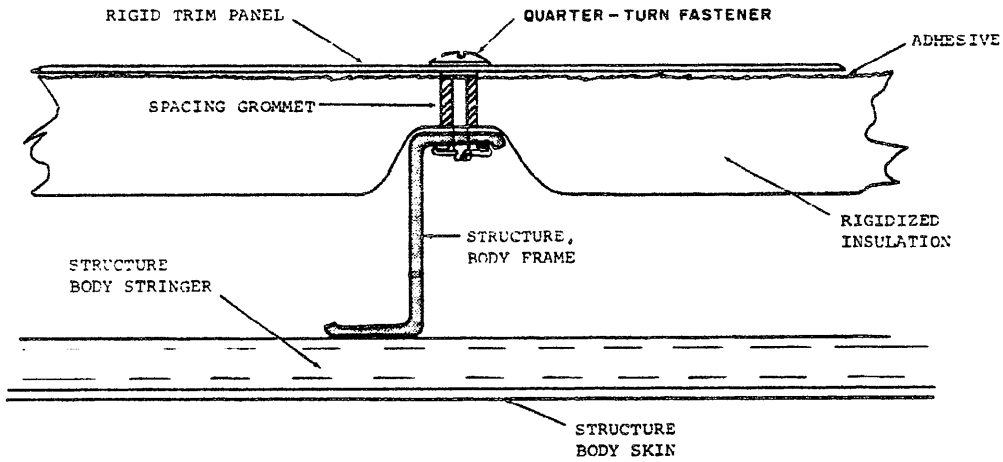
FIGURE 1 TYPICAL TYPE I and TYPE II INSULATION FASTENING METHODS

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(a) RIGIDIZED INSULATION WITH RIGID TRIM

FIGURE 2a

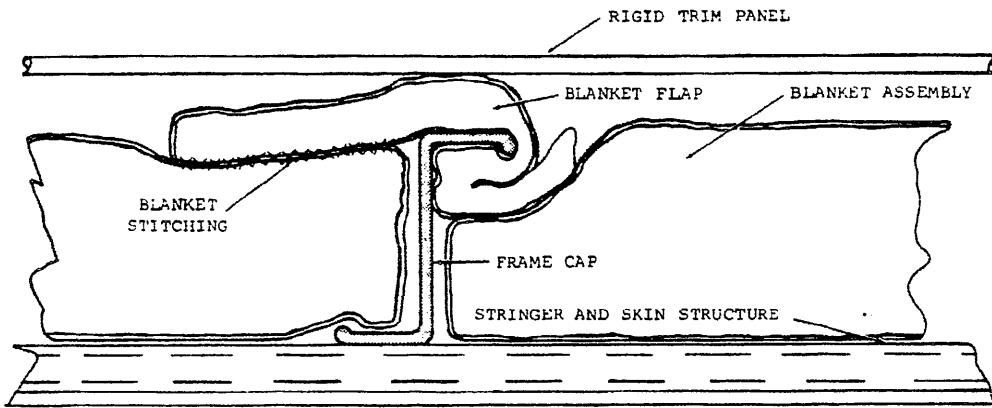


COMPOSITE PANEL ATTACHMENT WITH RIGID TRIM CEMENTED TO RIGIDIZED INSULATION

FIGURE 2b

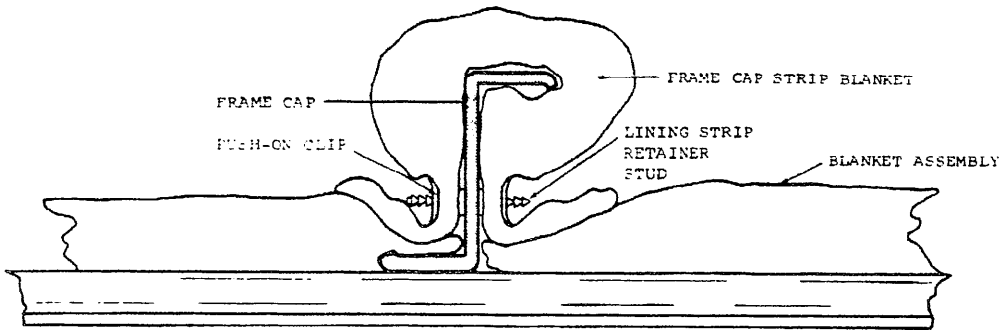
FIGURE 2. TYPICAL TYPE III RIGID INTERIOR (TRIM PANEL) INSTALLATION

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METHOD 1 - USE OF BLANKET FLAPS

FIGURE 3a



METHOD 2 - USE OF FRAME CAP STRIPS WITH STUD FASTENERS

FIGURE 3b

FIGURE 3 TYPICAL FRAME COVERING TECHNIQUES

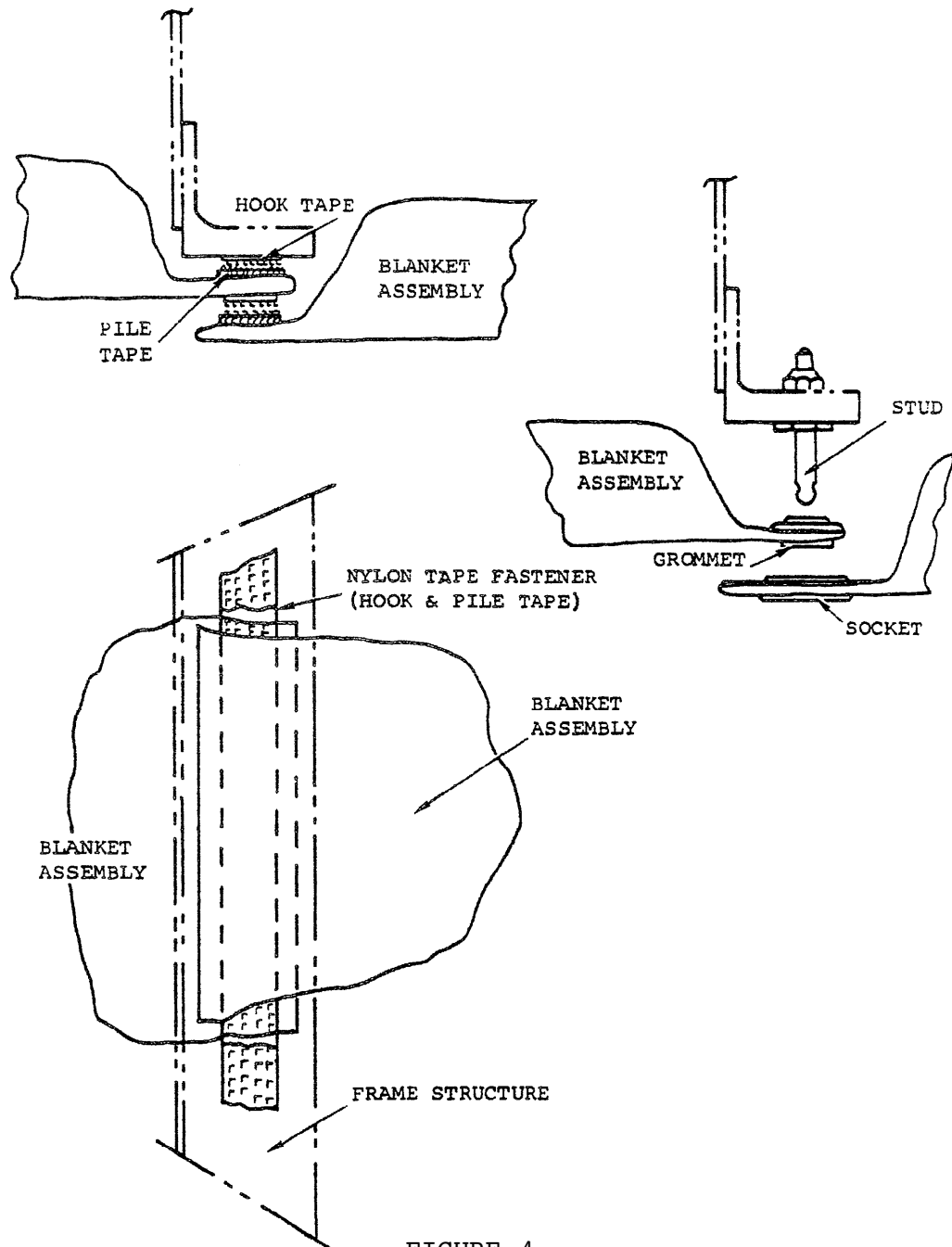


FIGURE 4
POSITIVE POSITIONING TECHNIQUE USING SNAP AND
NYLON TAPE FASTENERS.

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION MIL-S-6144A Sound and Thermal Insulation for Aircraft		
General Specification for the Installation of		
ORGANIZATION (of submitter)	CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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