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**31 December 1997**  
**SUPERSEDING**  
**MIL-A-83377B**  
**6 October 1978**

## DEPARTMENT OF DEFENSE

### HANDBOOK



## ADHESIVE BONDING (STRUCTURAL) FOR AEROSPACE AND OTHER SYSTEMS, REQUIREMENTS FOR

THIS HANDBOOK IS FOR GUIDANCE ONLY  
DO NOT CITE THIS DOCUMENT AS A REQUIREMENT

AMSC N/A

FSC 8040

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6 October 1978  
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24 June 1975

MILITARY SPECIFICATION  
ADHESIVE BONDING (STRUCTURAL) FOR AEROSPACE AND  
OTHER SYSTEMS, REQUIREMENTS FOR

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

**1. SCOPE**

**1.1 Scope.**

This document covers requirements applicable to structural adhesive bonding of metal, composites, and core material in any combination.

**1.2 Classification.**

The classification of adhesive bonded structures specified herein shall be as follows:

- Type I - Primary structure (see 6.3.4)
- Type II - Secondary structure (see 6.3.4)

**2. APPLICABLE DOCUMENTS**

**2.1 Issues of documents.**

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

FEDERAL

UU-P-268 Paper, Kraft, Wrapping

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Air Force Materials Laboratory, MXA, WPAFB, Ohio 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
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## MILITARY

MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-I-6870	Inspection Program Requirements, Nondestructive: For Aircraft and Missile Materials and Parts
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-A-83376	Adhesive Bonded Metal Faced Sandwich Structures, Acceptance Criteria

(Copies of specifications, standards, drawings, and publications required by contractors 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 a part 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.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D2674	Analysis of Sulfochromate Etch Solution Used in Surface Preparation of Aluminum
ASTM D2919	Determining Durability of Adhesive Joints Stressed in Shear by Tension Loading
ASTM D3433	Fracture Strength in Cleavage of Adhesives in Bonded Joints

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

## SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

ARP 1524	Surface Preparation and Priming of Aluminum Alloy Parts for High Durability Structural Adhesive Bonding, Phosphoric Acid Anodizing
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(Application for copies should be addressed to the Society of Automotive Engineers, Incorporated, 400 Commonwealth Drive, Warrendale, PA 15096.)

### **3. REQUIREMENTS**

#### **3.1 Policy.**

This document specifies two basic documentary requirements for contractors (and their subcontractors) manufacturing adhesively bonded parts and assemblies for aerospace use. These requirements are to provide a process specification and an engineering report. The process specification is required to insure that the control of quality and uniformity during fabrication of bonded assemblies is recorded. The engineering report is to provide the Government procuring activity a record showing which of the important technical areas necessary for the production of dependable quality bonded aerospace components have been considered by the contractor. (See 6.3). The process specification and engineering report shall be prepared and submitted to the contracting agency at the commencement of the production of material to which it applies and, thereafter, during the course of production for use by authorized Government and industry inspectors in the facility of the contractor, his subcontractors, or his vendors.

##### **3.1.1 Process specification.**

A detailed description of the manufacturing and fabricating process and methods of control of manufacturing variables in the form of a titled, numbered, and dated process specification shall be prepared by the prime contractor. The specific requirements, processes, inspection methods, and precautions specified shall be included and completely described.

##### **3.1.2 Engineering report.**

Unless the information is already included in the structural report, an engineering report shall be prepared describing all tests used as a basis for preparation of the process specification and the detail drawing requirements of adhesive bonded components. The engineering report shall contain a discussion of the effects on the strength of the adhesively bonded assemblies of various environment factors that may be encountered by the bonded parts during their operational life. With existing contracts where materials and processes have been well established, a limited engineering report may suffice. Following is a partial checklist of factors whose effects shall be considered, as applicable:

- (a) humidity
- (b) salt spray or other deleterious atmosphere
- (c) vibration
- (d) cyclic temperature and temperature extremes,
- (e) outgassing due to space vacuum
- (f) x-ray, gamma-ray, UV, IR, electrical, and other energies
- (g) toxicity of adhesive materials originally, and after exposure to environmental extremes

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- (h) thermal and chemical sterilization
- (i) stress durability, and
- (j) fatigue and fracture.

### **3.1.3 Approval of documents.**

Prior to commencement of production, the process specification and engineering report shall be submitted to the procuring activity for approval. Subsequent changes, such as to shop processes, which affect the validity of the approved document shall be made when considered necessary. However, the procuring activity shall be contacted immediately concerning the changes. Further, formal documentation of the changes shall be submitted to the procuring activity within 30 days of the initiation of the changes.

## **3.2 General requirements.**

3.2.1 The prime contractor shall assure adherence by his subcontractors to the provisions of this document. In the event of bonded assembly failures, the prime contractor shall be responsible for assisting in the resolution of any subcontractor problems.

3.2.2 The adhesives and primers used and their application procedures shall provide for the specified durability, integrity and minimum strength for the bonded parts during the proposed life of the bonded assembly and throughout exposure to all environmental factors that could reasonably be encountered during the anticipated life of the assembly.

3.2.3 All materials used in the adhesive bonding process shall conform to applicable Government or other specifications as stipulated by the procuring activity. Justification shall be presented in the contractor's engineering report when Government or Government approved material specifications cannot be used. Where Government or Government approved specifications are not completely adequate, contractor's material specifications shall specify, whenever possible, that the materials conform to the Government or Government approved document plus any additional requirements necessary.

3.2.4 For aluminum (other than core), bonding to a chemical film coating such as MIL-C-5541 or to any surface cladding which is anodic to the base metal is not recommended. The contractor's engineering report shall completely substantiate the need to employ this type of bonding and shall document the reliability of the bond.

3.2.5 Techniques or precautions required for proper storage and use of adhesives and associated materials, such as bondline thickness control, control of adhesive application, special temperature or humidity controls necessary during handling of adhesive and method of adhesive and primer application, which may be applicable to the particular adhesive or to the conditions of fabrication being employed shall be included in the process specification.

**3.2.4 Stress durability for materials and process selection.**

The selection of adhesive, primer and other bonding process procedures shall be based on the materials and processes which exhibit good stress durability in environments as determined by methods such as ASTM D2919, similar stressed lap shear tests, or ASTM D3433. The primary mode of failure in the environmental tests documented in the engineering report shall be cohesive within the adhesive rather than adhesive failure between the substrate and the primer or between the primer and adhesive. Cyclic stressed durability is preferred whenever possible. Environments should include the highest temperatures and humidities to be seen by the bonded assembly.

**3.2.5 Corrosion proofing of bond joint.**

All aluminum bond joint areas that can at any time be exposed to humidity, moisture, salt spray, or other corrosive environments shall be protected against delamination and corrosion by either phosphoric acid anodize per ARP 1524 or chromic acid anodize per MIL-A-8625 plus corrosion inhibiting primer (CIP) or a treatment determined to be equal to these in stress durability studies. Sealing or overcoating of the bond joint by sealants or coatings shall not be deemed sufficient protection to eliminate this requirement. All processes shall include corrosion inhibiting primer (CIAP), unless non-use is adequately substantiated by the contractor's engineering report.

NOTE: Phosphoric acid anodizing is the preferred method for all bonding of 250°F and lower temperature curing adhesives, and also for higher curing adhesives wherever compatibility has been established.

**3.2.6 Protection of bonded joints.**

Complete details of the materials and procedures to be used in the protection of bonded joints shall be included in the process specification. Bonded joints, such as at the exposed edges of sandwich components, access doors, and windows shall be protected against exposure to or entrance of liquids (water, fuel, oil, etc.) into the core of the sandwich. Bonded sandwich assemblies shall be tested for adequacy of sealing by leak tests specified in 4.2.3.4. All permanent fasteners penetrating bond joints shall be wet installed with sealant. Instructions for this operation shall be included in the contractor's process specification.

NOTE: Instructions for the drilling of holes for attachments through bonded joints in a manner that prevents bond line delamination and the installation of fasteners with sealant shall be included in the contractor's process specification.

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**3.2.7 Bonding personnel.**

Structural bonding operations shall only be performed by qualified personnel. Qualified personnel are those who have demonstrated the knowledge and practical proficiency to indicate they possess the skills and job knowledge necessary to ensure acceptable workmanship. A list of qualified prime or subcontractor bonding personnel shall be issued indicating qualification and level of proficiency, and requalification date. This list shall be available for review by Government personnel.

**3.3 Processing.****3.3.1 Bonding.****3.3.1.1 Process and assembly area.**

All application of adhesive and primers shall be conducted in a controlled area as specified in the contractor's process specification. If priming and cleaning areas are not immediately adjacent to each other, parts shall be moved into a controlled area within one hour maximum. Areas through which unprotected treated details are transported shall not contain dust, oily vapors, aerosols, or contaminants deleterious to bonding.

**3.3.1.2 Controlled area.**

The controlled area shall be maintained under positive pressure differential at all times by a continuously operating air handling system. The following conditions apply unless otherwise documented by engineering report:

- (a) air filtration - regular maintenance of filters
- (b) no eating or smoking in the area
- (c) maintain records of controlled area conditions
- (d) vehicles permitted in the controlled area must be nonpolluting in operation, such as electrically or hand propelled
- (e) no process or operation which produces uncontrolled spray, dust, fumes, or particulate matter is permitted in the controlled area.

**3.3.1.3 Temperature/relative humidity in controlled areas.**

ranging from 65 to 85°F (18.3 to 29.4°C) and a maximum relative humidity of 60 percent shall be the controlled conditions.

**3.3.2 Equipment.****3.3.2.1 Presses, bond forms, autoclaves, ovens and pressure equipment.**

The temperature and pressure requirements for bonding operations (including primer curing), and details of procedures to be followed shall be included in the process specification. All pressure and temperature equipment and gauges shall be tested and calibrated on a scheduled basis. Thermal qualification shall be certified only by qualified measurement personnel, not production personnel.

**3.3.2.2 Tool qualification.**

Each bonding tool shall be qualified prior to production by the verification film technique specified in 3.3.3.1, or by the destructive evaluation of the first bonded assembly, or by proof loading or other suitable means approved by the contracting agency. Succeeding parts will be selected for requalification based on the results of the Quality Control tests in 4.2.1, 4.2.2, and 4.2.3.1. Each bonding tool shall be subject to contractor engineering review to determine if requalification is necessary if any dimensional or thermal control changes are made to the tool. This includes changing the thickness or method of placement of bleeder cloth, shims, caul plates, etc., that could be reasonably expected to affect the thermal or dimensional characteristics of the tool.

**3.3.3 Detail parts.****3.3.3.1 Prefitting of parts.**

The detail parts of all structural assemblies shall be prefitted to assure that the detail parts fit together properly. This prefitting requirement may be waived where the assembly involves simple parts. Detail parts shall be free of burrs, waves, and other surface imperfections. All prefitted detail parts shall be kept together throughout subsequent cleaning operations or these parts shall be marked with an identification number to allow assembly in proper sequence. Assemblies shall have the fit of their detail parts verified by suitable means, such as dry prefit, commercial "verification" film or the use of 0.0015 Mylar (or equal) on each side of an adhesive film while the assembly is subjected to production processing, including regular heat and pressure cycles in accordance with a sampling plan to be established by the contractor and defined in the Manufacturing Process Specification. The verification film must be submitted to Quality Control inspectors for approval prior to final bonding of the assembly. Verification film records shall be retained for a minimum of six months following assembly, fabrication, and acceptance. Verification records, including the verification film or, a photograph of the verification film, shall be retained and available for a minimum period of five years for later examination in case of bonded assembly failure or other problems.

**3.3.3.2 Control of parts.**

Completed assemblies shall be so marked that they can be tracked and identified. Detail parts shall be controlled from the point of bonding prefit until they become an integral part of the assembly.



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### **3.3.4 Cleaning of materials for bonding.**

3.3.4.1 The process specification shall specify the procedure for treatment of faying surfaces of parts to be bonded, and precautions to be taken to eliminate contamination of treated surfaces awaiting application of adhesive or primer. The time that treated parts may remain uncoated shall also be specified, and substantiated by tests described in the contractor's engineering report. Silicone based cutting and forming fluids shall not be used when processing detail parts for bonded assemblies. Parts shall not be allowed to dry between any chemical operations.

#### **3.3.4.2 Control of cleaning solutions.**

Suitable process control tests, such as the wedge test or -65°F peel test, (using sensitive adhesives such as 250°F curing modified epoxies), shall be performed to assure that each assembly or cleaning line load has been satisfactorily surface treated. All surface preparation solutions in use shall be tested at least weekly and maintained at the proper concentration as specified in the process specification. After addition of make-up material or complete change of solution, cleaning solutions shall be retested and found acceptable before production use. (For analysis procedures reference ASTM D2674.)

### **3.3.5 Adhesive primer application.**

Adhesive primer shall be applied to aluminum detail parts to be bonded within 96 hours after cleaning. Steel parts must be primed within 4 hours after cleaning. Titanium parts must be primed within 16 hours of cleaning. Parts shall have been protected by paper or other wrapping or stored in the controlled area from time of cleaning through priming. Parts awaiting priming or adhesion application shall be handled in such a manner that no physical contact is made to any surface that will be bonded by touching the surface with hands, white gloves, paper, or other means. Surface rubbing, even with paper, must be avoided. The requirements to be followed for primer application shall be described in the process specification. The contractor's engineering report shall include data proving the procedure is adequate for the intended use. If compressed air is used, it shall be filtered free of oil and moisture at the application station by means of a replaceable cartridge type filter capable of satisfactory removal of oil and moisture. (NOTE: All shop air used on cleaned assemblies shall be similarly treated.) After primer application and drying, the coated parts shall be kept dry and free from dirt, grease, oil, wax or other contamination. Primed surfaces shall not be touched with bare hands or any equipment with a contamination potential.

### **3.3.6 Handling of cleaned and primed parts.**

Cleaned, or cleaned and primed parts shall not be handled with bare hands nor shall any contamination result from contact with supporting fixtures or mechanical handling equipment. One or two pairs of clean, white, lint-free gloves shall be worn by all persons handling cleaned parts, cleaned and primed parts or

adhesive films. After parts have been cleaned, dried, and primed, they shall be wrapped in clean neutral non-sulfur containing protective paper conforming to UU-P-268 or covered with clean plastic film, determined to have no contamination potential, as soon as they cool to room temperature, unless primed parts are stored in the controlled area and bonded within the time restrictions of the process specification. Low density polyethylene is not acceptable.

### **3.3.7 Control of adhesives and prepreg.**

Adhesive to be used in production bonding of parts shall be sampled and tested in accordance with the process specification for the adhesive involved. The faying surfaces of the test specimens shall be treated by the same method and materials as are used on production parts. All bonding materials stored in cold storage shall be allowed to warm to a temperature precluding moisture condensation before they are unwrapped. Adhesive shall not be released for production unless:

- (a) Receiving Inspection and control tests have been conducted and found to be acceptable in accordance with the applicable process specification.
- (b) It has been in proper storage since Receiving Inspection or Quality Control testing.

Temperature and method of storage after release for production shall be as determined for each material involved and shall be outlined in the contractor's process specification.

### **3.3.8 Adhesive application.**

3.3.8.1 The exact procedures to be followed, and equipment to be used in the application of the adhesive to the specific materials to be bonded shall be described in the process specification. The contractor's engineering report shall include data proving the procedure is adequate for the intended use. After application of the adhesive, the coated parts shall be kept dry and free from dirt, grease, oil, wax, or other foreign material and shall not be handled with the bare hands. The length of time adhesive coated parts are allowed to stand before bonding shall not exceed the open assembly life of the adhesive and shall be specified in the process specification. Precautions to be taken to eliminate physical contamination of the adhesive coatings shall also be specified therein.

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3.3.8.2 Primed detail parts shall be bonded within the time period specified in the process specification. After application, film adhesives shall not be wrinkled or distorted. Mixing of two-part adhesives shall preferably be accomplished by appropriate automatic apparatus designed to minimize air entrapment. Mix ratio shall be verified by a Quality Control representative on a periodic basis. Adhesive mixing shall be accomplished only by qualified personnel. If hand or open bucket mixing is used, measuring methods and equipment shall be prescribed by the contractor's process specification. All two-part, hand mixed adhesives, whenever possible, shall be degassed under vacuum before use. The vacuum shall be applied and released for the minimum time necessary to remove air bubbles, but not so long as to withdraw significant amounts of volatile curing agents, etc.

### **3.3.9 Assembly of parts.**

The process specification shall describe procedures to be used in the assembly of parts. Care shall be taken in assembling parts in the curing fixture or jig to assure that the adhesive is not disturbed and that excessive residual stresses are avoided. Use of aerosol type release agents is prohibited in controlled areas or other areas as specified in the process specification. Only non-contaminating films, tapes, etc., shall be used for release purposes. Shims and caul plates shall be used as much as necessary to ensure that every adhesive bondline has adequate support and pressure application. Clean-up solvent shall be prevented from entering or contacting the bondline.

### **3.3.10 Curing of adhesive.**

The process specification shall contain detailed curing procedures. However, heat curing cycles shall be chosen so that, as a result of processing through the maximum number of cycles that may occur during fabrication, there will be no reduction of mechanical or corrosion resistant properties of the materials being bonded to values below the minimum values of the applicable specification or drawing. All assemblies shall be cured as soon as possible after adhesive application within the open time specified in the process specification. Assemblies shall be reviewed by the contractor's engineers to determine the need for placing in a bond form or holding fixture while being held for bonding.

### **3.3.11 Multiple stage bonding.**

Bonded assemblies which are to be recleaned for multiple stage bonding shall be processed according to the applicable process specification, using recommended procedures to protect original bond joints and crevices from cleaning solution entrapment. If bonded subassemblies are to be bonded again into final assemblies, a description of precautions to be taken to assure that subsequent surface preparation and bonding operations have no detrimental effects on the initially bonded parts shall be included in the

process specification. Documentation of the fact that subsequent operations do not affect the bond integrity of the original subassembly shall be presented in the contractor's engineering report. This reporting shall include test data to substantiate that subsequent cure cycle exposures do not degrade the bond strength of any previous bonds or materials. Sufficient shims and caul plates shall be used to assure that proper pressure and alignment are maintained during secondary bonding operations.

#### **3.3.12 Rework or repair.**

Provision for rework or repair of defective parts shall be stated in the process specification and shall be subject to approval, on demand, by the prime contractor or procuring activity.

### **4. QUALITY ASSURANCE PROVISIONS**

#### **4.1 Responsibility for inspection.**

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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. 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 Quality control tests.**

##### **4.2.1 Quality control test panels.**

Destructive quality control test panels for manufacturing process control shall be required on a frequency as specified in the contractor's process specification.

##### **4.2.2 Preparation of extensions, coupons, or standard specimens.**

Production bonded parts, shall incorporate, where possible, extensions or coupons that may be cut from the parts after bonding and will be representative of the bonds obtained in the parts proper. Where extensions cannot be incorporated in the parts, standard test panel specimens shall be fabricated. These shall be cleaned and bonded at the same time, with the same adhesive, in the same equipment, and under the same conditions as the assembly they represent. The procedures for their incorporation or fabrication shall be included in the process specification. The number of extensions, coupons, or specimens shall be specified by the contractor in the process specification.

##### **4.2.2.1 Test method.**

Destructive quality control tests shall be made of the adhesive bonds in the extensions, coupons, or standard test panel specimens prepared as described in paragraph 4.2.2. The test procedures to be used and the acceptance criteria shall be specified in the process specification. If the test tab per assembly method is used, daily lap shear and/or peel tests, or crack extension specimens shall be included in the quality control system as a control of the cleaning process.

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### **4.2.3 Tests on complete assemblies.**

#### **4.2.3.1 Destructive inspection.**

Destructive inspection shall be made on parts selected in accordance with 4.2.1 to insure proper fabrication of parts through the production run. Any evidence of improper cure, adhesion, misalignment, etc., shall be immediately corrected by making necessary adjustment in the cure cycles or in tooling. (NOTE: Above sampling and testing procedures apply to bonded parts that do not use formal bonding tool or fixture.)

4.2.3.2 For short production runs of items (10 or less) destructive evaluation testing as outlined above may be waived providing 100 percent bond line verification is made prior to bonding of each assembly, and 100 percent nondestructive testing (NDT) inspection of each part is made as specified in 4.2.3.3.

#### **4.2.3.3 Nondestructive testing.**

4.2.3.3.1 The contractor shall submit a complete NDT process specification when required by MIL-I-6870 to evaluate the quality of adhesively bonded structures. The NDT process specification shall be submitted for approval by the Government prior to bonded assembly production. The contractor shall specify the type and size of defects that are acceptable. The size of the allowable defects must be correlated with the capability of the NDT method to be used, realizing that NDT methods and instrumentation have different capabilities for the testing of adhesive bonded structures. The application of these different NDT methods is limited by material types and design configuration. For aluminum honeycomb sandwich, the allowables of MIL-A-83376 may be used, if determined by the contractor to be acceptable minimums for the particular application.

**4.2.3.3.2** Nondestructive testing of adhesive bonded structures shall only be performed by qualified NDT personnel. Qualified NDT personnel are those who have demonstrated by passing written and practical proficiency tests that they possess the skills and job knowledge necessary to insure an acceptable level of performance in the nondestructive testing of adhesively bonded structures as required by MIL-I-6870. A list of qualified NDT personnel shall be maintained and made available to Government personnel for on-site review. Personnel qualifications shall be reviewed at least annually.

4.2.3.3.3 Unless otherwise agreed upon between the contractor and the procuring activity, bonds shall be inspected on the following minimum frequency as specified in Table I.

**Table I. NDT frequency.**

Bond Condition	Assembly Frequency		Area Frequency
	Type I	Type II <sup>1/</sup>	Types: I, II
Metal-to-metal	Each assy	AQL	<u>2/</u>
Face-to-core Sandwich Const.	Each assy	AQL	6" grid minimum

1/ Contractor to establish inspection plan based on mutually acceptable AQL.

2/ This information to be included in the NDT process specification as per 4.2.3.3.1

#### **4.2.3.4 Leak testing of sandwich assemblies.**

4.2.3.4.1 The first unit of each assembly shall be leak tested. The subsequent frequency shall be every Type I assembly and each fifth Type II assembly. (NOTE: Waiving of this requirement may be possible in specific instances to be negotiated.)

4.2.3.4.2 Assemblies shall be leak tested by submerging into 170°F ± 10°F water for one minute minimum, 2 minutes maximum, and observing for air bubbles along bond joints indicating leaks. Immediately upon removal of assemblies from water, the excess water on panel surface shall be removed by wiping with absorbent material. The assemblies shall not be submerged into water under more than a six foot head of water. An alternate method of leak testing may be utilized when approved by the procuring agency.

4.2.3.4.3 Bonded assemblies, sealed as specified in 3.2.8 shall be leak tested in accordance with 4.2.3.4.1 and 4.2.3.4.2. Leaking assemblies shall be dried, resealed and retested in the same manner. If the assembly leaks on second test, it shall be referred for Material Review Board action.

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4.2.4 The materials and processes covered by the contractor's process specification, the articles fabricated thereby, and the tests made thereon shall be subjected to the inspection and supervision of authorized Government inspectors. Reports of tests performed shall be furnished to the authorized inspectors.

## **5. PACKAGING**

This section is not applicable to this specification.

## **6. NOTES**

### **6.1 Intended use.**

It is intended that the requirements of this document be mandatory requirements for use by contractors to assure the reliability of adhesive bonded structural components used in aerospace and other systems. Structural adhesive bonding is a critical process that must be properly controlled to achieve the benefits in lighter weight, lower cost, and fatigue improvement not obtainable in other types of construction.

### **6.2 Joint design.**

Bonded joint design shall be carefully considered for all bonded assemblies. The bonded joint, where possible, shall make maximum effective use of the adhesive's properties. Peel and cleavage forces shall be designed out of all joints to the greatest extent possible.

### **6.3 Definitions.**

#### **6.3.1 Prime contractor.**

A prime contractor is a contractor fabricating items under direct contract with the Government. (Whenever the term contractor the appears in this specification, it will be construed to be the prime contractor.)

#### **6.3.2 Subcontractor.**

A subcontractor is a fabricator supplying items or components to a prime contractor.

#### **6.3.3 Process specification.**

Whenever the term process specification appears in this specification, it will be construed to be the contractor process specification prepared in accordance with this specification.

#### **6.3.4 Classification.**

The classification of adhesive bonded structures specified in this specification shall be of the following types:

- |          |   |
|----------|---|
| Type I - | Components which are fracture or fatigue critical as defined in MIL-I-6870, components the single failure of which would cause significant danger to operating personnel or would result in an operational penalty. This includes loss of major components, loss of control, unintentional release, inability |
|----------|---|

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to release armament stores, or failure of weapon installation components.

Type II - All components not classified as Type I.

**6.3.4.1 Structural classification.**

The structural classification, Type I or Type II shall be specified on the engineering drawing. All structures shall be considered Type I unless otherwise specified on the drawing.

Custodians:

Air Force - 11  
Navy - AS  
Army - MR

Preparing Activity:

Air Force - 11

Project No. 8040 - 0385

User Activities:

Navy - AS, OS



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**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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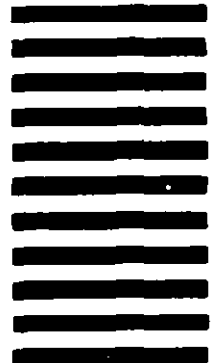
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