

MIL-B-12673 (ORD)

5 May. 1953

SUPERSEDING [In part]

Army 57-208-1

23 November 1949

MILITARY SPECIFICATION

**BRAZING, OXYACETYLENE:  
OF BUILT-UP METAL STRUCTURES**

1. SCOPE

1.1 This specification applies to the oxyacetylene brazing of built-up metal structures fabricated either from ferrous or nonferrous base metal or combination thereof as accomplished by the use of suitably qualified flux and filler metal.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS AND OTHER PUBLICATIONS

2.1 The following specifications and standards, of the issue in effect on the date of invitation for bids, form a part of this specification.

SPECIFICATIONS

FEDERAL

QQ-M-151, Metals; General Specification for Inspection of

STANDARDS

MILITARY

JAN-STD-19 - Welding; Symbols  
MIL-STD-20, Welding; Terms and Definitions

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer. Both the title and identifying number or symbol should be stipulated when requesting copies.)

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### 3. REQUIREMENTS

#### 3.1 Contractor's recorded procedure for brazing joint.

(See 6.3 and App. A)

3.1.1 General requirements.- Prior to production of any structure, the contractor shall prepare a drawing or sketch of the structure showing the location of each joint to be brazed, and shall establish the brazing procedure required to cover all brazing to be performed under this specification.

3.1.2 Form and contents.- Each contractor's recorded brazing procedure shall contain a reference to the location of the joint as shown in the drawing, a detail<sup>d</sup> cross-section sketch of the joint, the factors listed in table I for the type of brazing being performed, and shall be in accordance with a form approved by the chief of the supply service involved.

3.1.3 Review.- Before starting qualification of procedures and brazers for the brazing of joints under this specification, recorded brazing procedures and drawings (see 3.1.1 and 3.1.2) shall be submitted in duplicate for review through the contracting officer to the chief of the supply service involved.

3.2 Procedure qualification.- All brazing performed on structures shall be in accordance with the brazing procedure which has been qualified by the contractor as specified in 4.2. When a major change has been made in any factor included in the qualified brazing procedure, the procedure shall be requalified as indicated in table I.

3.3 Brazer qualification.- Only brazers qualified by the contractor in accordance with the requirements of 4.2.2 of this specification shall be permitted to braze on structures being fabricated under this specification. When a major change has been made in any factor included in the qualification brazing procedure, the brazer shall be requalified as indicated in table I.

#### 3.4 Procedure control.-

3.4.1 Gas pressure.- Each gas line serving each torch shall be so fitted with a direct-reading pressure gage that the pressure on each line may be determined at any time.

**TABLE I**  
**OXYACETYLENE BRAZING PROCEDURE FACTORS & REQUIREMENTS**  
**FOR REQUALIFICATION**

Procedure Factor	When Factor is Changed, Brazing Procedure to be Revised and Requalified as Indicated	When Factor is Changed, Brazer to be Requalified as Indicated
1. Composition of base metal.	Yes: For change of basic type of base metal, i.e. Ferrous to Nonferrous or Vice Versa	Yes: For change requiring procedure requalification.
2. Thickness of base metal.	Yes: For change outside the range of thickness for which qualified	No.
3. Type of joint (including dimensions and tolerances thereof.)	Yes: For any change in joint type.	Yes: For change requiring procedure requalification.
4. Filler metal (Class or type)	Yes: For change of class or type.	Yes: For change of type.
5. Filler-metal form (wire, rod, strip, granular).	Yes: For change of form	No.
6. Flux (brand or type).	Yes: For change of brand or type or for addition or elimination of use of flux.	No.
7. Holding fixtures.	Yes: For any change in the type of fixtures used to hold parts in place during brazing operation which produces a difference in clamping either in direction or force applied.	No.
8. Size of torch tip. (Torch style, model No. or mfr.)	Yes: For change in tip size exceeding one size as manufactured by the same manufacturer.	No.
9. Number of flame tips	Yes: For changes in the number of tips being used from that qualified.	No.
10. Gas pressure	Yes: With each tip size qualified, when the pressure used varies more than plus or minus 10% from the average used for each diameter qualified.	No.
11. Type of Flame (neutral, oxidizing or reducing).	Yes: For any change of flame type.	Yes: For any change requiring procedure requalification.
12. Method of cleaning joint surfaces.	Yes: When method is changed from that used when qualified	No.

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3.5 Dimensions.--The contractor shall furnish structures which will finish to the dimensions shown in the drawings within the tolerances shown thereon without further straightening.

3.6 Base-metal preparation.--All metal surfaces that are to be brazed shall be smooth and free from grease, oil, dirt, or any other material which might have a harmful effect on the brazed joint.

3.7 Repairs.--Structures rejected because of unacceptable soundness conditions may be repaired and shall then comply with the applicable requirements of this specification.

3.8 Soundness.--(See 6.2)

3.8.1 Pressure tightness.--When tightness from either external or internal pressure is required of brazed joints, they shall withstand the pressure specified by the contracting officer for the procedure qualification samples.

3.8.2 Mechanical properties of brazed joints.--When mechanical properties are required of brazed joints, they shall meet the requirements specified by the contracting officer.

3.8.3 Visible characteristics.--The appearances of all brazed joints shall be equal to or better than that shown by acceptable workmanship specimens selected in accordance with 4.2.1.1.

#### 4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 General.-- Inspection shall be made in accordance with QQ-M-151.

4.1.1 Repair inspection.--All brazed structures requiring repair after inspection shall be reinspected after the repairs have been completed to determine compliance with the applicable requirements.

4.1.2 Data forms.--A complete record of each inspection shall be made on forms provided by the contractor and approved by the contracting officer. These forms shall provide spaces for all pertinent data relating to identification of brazed structures, defects found, and repairs made.

4.2 Qualification tests.--

4.2.1 Qualification of brazing procedure.--Unless otherwise specified, the qualification test of brazing procedures to be used in the manufacture of brazed structures under this specification shall consist of the making of at least three of each type of structure that is to be manufactured in production using the same type of materials and the same brazing technique that is to be used in production. They shall be as specified in 4.2.2.5.

4.2.1.1 Workmanship specimens.--One of each type of structure to be manufactured shall be selected by the inspector from the acceptable procedure qualification test specimens as a workmanship specimen. These specimens shall be available to the inspector for examination at all times.

4.2.1.2 Information furnished.-- The brazing procedure used for procedure qualification test specimens shall be reported in writing to the inspector. Symbols and terms used shall conform to JAN-STD-19 and MIL-STD-20.

4.2.2 Qualification of brazers.

4.2.2.1 Contractor's responsibility.--Each brazer shall be qualified by the contractor. Qualification of a brazer by one contractor shall not serve as qualification when the brazer is employed by another contractor.

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4.2.2.2 Qualification tests.-The brazer qualification test shall consist of the making of one of each type of structure that is to be manufactured by the brazer in work being done under the contract using the brazing procedure that has been qualified as specified in 4.2.

4.2.2.3 Retest specimens.-Any brazer who fails to qualify on the first test shall, upon the request of the contractor, be allowed to repeat the test once as soon as practicable. In case of a second failure to qualify, the brazer shall not be allowed to repeat the test within one month unless authorized by the contracting officer.

4.2.2.4 Requalification.-A brazer who has been properly qualified for brazing under any given brazing procedure by a contractor usually may not be required to requalify for that procedures unless:

- (1) He has done no brazing for a period of three months or more, or
- (2) He is employed by a different contractor, or
- (3) Inspection of his work shows that he is not producing acceptable results.

4.2.2.5 Tests of qualification samples.-

4.2.2.5.1 Pressure tightness.-When pressure tightness is required of the joints being brazed under the contract, the qualification test specimens shall be subjected to such pressure tests as may be specified or approved by the contracting officer. The amount of pressure used to test the specimens shall be as specified by the contracting officer.

4.2.2.5.2 Mechanical tests.-When mechanical properties are required of the joints being brazed under the contract, the qualification test specimens shall be subjected to such mechanical test as may be required by the contracting officer to demonstrate that the required mechanical properties are obtained.

4.3 Tests of production parts.-

4.3.1 Visual inspection.-Unless otherwise specified, all brazed structures shall be visually inspected for compliance with the requirements of 3.8.3.

4.3.2 Pressure test.-Unless otherwise specified, when brazed structures built under this specification are subject to pressure tests, the procedure used shall be as specified by the contracting officer for the procedure qualification samples. The number of production structures tested shall be as specified by the contracting officer.

4.3.3 Mechanical tests.-Unless otherwise specified, when brazed structures built under this specification are subject to mechanical tests, the procedure used shall be as specified by the contracting officer for the procedure qualification samples. The number of production structures tested shall be as specified by the contracting officer.

4.3.4 Reinspection of repairs.-When brazed structures require repair after the inspection provided for in 4.3.1, 4.3.2, and 4.3.3, they shall be submitted for reinspection after the repairs have been completed to determine compliance with 3.7.

4.4 Marking to designate repairs and indicate acceptance.-The system of marking used to designate repairs and to indicate acceptance shall be subject to the approval of the inspector.

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## 5. PREPARATION FOR DELIVERY

5.1 Shipping.--The shipping of test brazed assemblies shall be made as required in the course of qualification.

5.1.1 Packing.--Packing shall be such as to insure acceptance by common or other carrier for safe transportation at the lowest rate to the point of delivery.

5.1.2 Marking.--Each shipping container shall be clearly and indelibly marked with the name, brand or trademark of the contractor, the contract or order number, and such other marking as may be specified by the contracting officer.

## 6. NOTES

6.1 Intended use.--This specification is intended to cover a method constituting a group of welding processes whereby coalescence is produced by heating to a suitable temperature above 800°F by using nonferrous filler metal having a melting point below the ferrous or nonferrous base metal so that the filler metal will be distributed between closely fitted surface by capillary action as can be noted from the sketches shown in figures attached to Appendix A of the specification.

6.2 Soundness.--The soundness of brazed joints may be determined by radiographic inspection if required by the contracting officer. If this method is used, a careful consideration should be given to the function the part is to perform in service. When parts are to be subjected to either internal or external pressure in service, the service pressure should be taken into account in determining the pressure to be used in testing sample parts. The test pressure should usually be not less than twice the maximum working pressure, but never sufficient to exceed the yield point of the base metal. A hydrostatic test has been found to be very useful in determining the pressure tightness of brazed joints. A mechanical test is perhaps the simplest type to apply if the nature of the part lends itself to such a test. The type of mechanical test used should simulate as nearly as possible the type of mechanical stresses that the parts are likely to undergo in service.

6.3 Sample recorded brazing procedure.--(See Appendix A) It is emphasized that forms and arrangements shown herein represent suggestions only. Other forms or variations of these forms will be acceptable, provided they contain all the required information and provided the information is conveyed in a readily understandable manner.

6.3.1 Data fictitious.--The question is likely to arise as to how much of the material shown in Appendix A is the contractor at liberty to adopt. He may adopt the forms illustrated, but he will not be able to use the data shown, since these data are purely fictitious and are intended to illustrate only how the forms are to be filled in and what information should be furnished.

6.3.2 Character of illustrations.--A sketch or drawing (sheet 2, App. A) need be no more than a penciled outline using clear references to the joints; but it should be representative of the built-up structure to be manufactured, showing adequately the location of joints. (See sheets 4 and 5 of App. A.)

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NOTICE:-When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

CUSTODIAN:

Army-Ordnance Corps

Other Interest:

Army -- CEQT

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Appendix A

SHEET 1 of 5

RECORDED BRAZING PROCEDURE

FOR

DESIGN NO. T19

70-cu.ft. Purifying Unit

MODEL M4B

Intake Pipe

Manufactured by:

Allpure Mfg. Co.

Located at:

Norwalk, Mass.

Date of submittal 5 June, 1945

Signed for company:

*Joseph L. Smith*  
Joseph L. Smith  
Eng.

Manufactured under:

Military Specification

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CONTENTS:

Cover -----Sheet 1

Sketch Showing Joint Location -----Sheet 2

Summary of Material Types, Filler Metal, Heating Factors -----Sheet 3

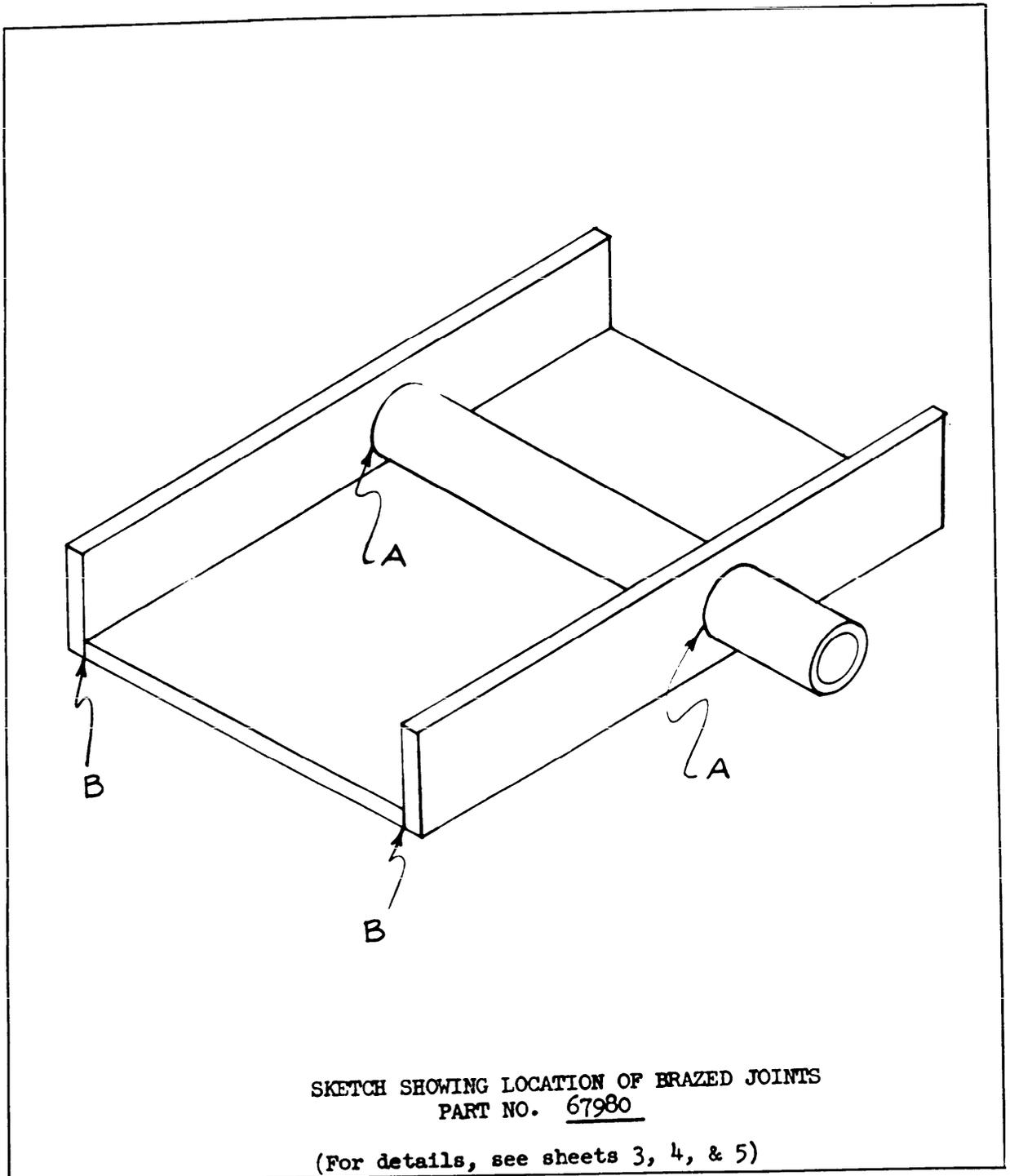
Recorded Brazing Procedures, Fabrication -----Sheets 4-5

FOR ILLUSTRATION ONLY

Appendix A

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**FOR ILLUSTRATION ONLY**

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Appendix A

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SUMMARYI. Material Types

Reference Designation	Type of Material
A	Monel Metal
B	Copper

II. Filler Metal

Reference Designation	Mfgr.	Brand Name	Qualified Under		
			Specification	Type	Class
X	Boston Bronze Co.	Hyperstrength	C-876	III	1
Y	BBB Weld Material	Statuff	C-959	V	2

III. Heating Factors

Filler Metal Dimensions	Torch Tip Size	Gas Pressure	Flame Type
1/8" dia. rod X	1/16"	50 lbs./sq.in.	Reducing
3/16" dia. rod Y	3/32"	60 lbs./sq.in.	Reducing

FOR ILLUSTRATION ONLY

Appendix A

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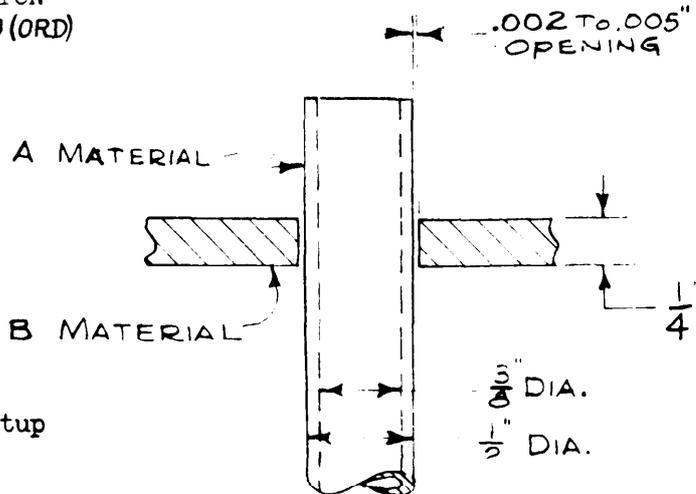
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Brazing Procedure

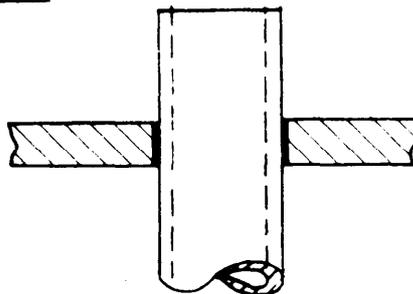
Record No. 1  
Joint A  
Date 5 June 1945  
Revision 1

Joint  
Sketch 1  
Showing Setup



1. Torch Tip Size 1/16" Gas Pressure 50 lbs./sq.in.
2. Flame Type Reducing
3. Joint Preparation None
4. Flux Surebraz
5. Filler-Metal Reference Designation X Dimension 1/8" dia. rod
6. Method of Joining brazing
7. Position of Brazing Flat

Joint Sketch Showing Finished Braze

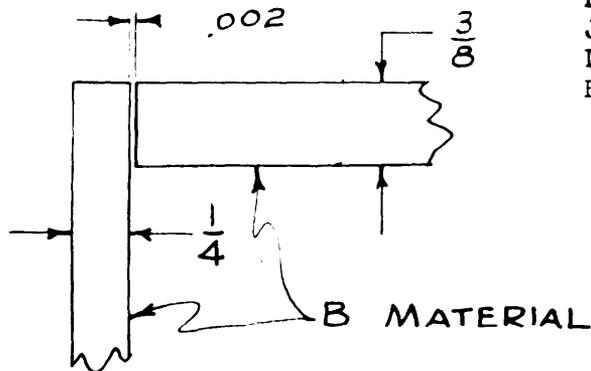


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Appendix A  
Sheet 5 of 5

Military  
Specification  
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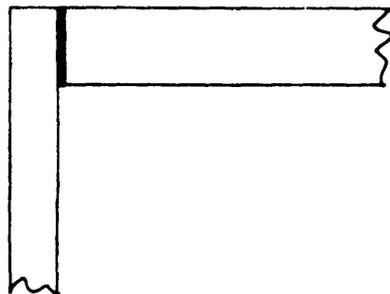
Brazing Procedure

Record No. 2  
Joint B  
Date 5 June 1945  
Revision No. 1

Joint Sketch 1  
Showing Setup

1. Torch Tip Size 3/32" Gas Pressure 60 p.s.i.
2. Flame Type Reducing
3. Joint Preparation Planed
4. Flux Neverfail No. 2
5. Filler Metal Y Dimension 3/16" dia. rod
6. Method of Joining Brazing
7. Position of Brazing Flat

Joint Sketch 2  
Showing Finished Braze



# FOR ILLUSTRATION ONLY

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<u>INSTRUCTIONS</u>		
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		
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

FOLD

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