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**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.**

**NATIONAL AEROSPACE STANDARAD
1638
CLEANLINESS REQUIREMENTS
OF FLUID USED IN
HYDRAULIC SYSTEMS**

14-67-09

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON 6, D. C.

1. SCOPE: This specification establishes the acceptance cleanliness limits of hydraulic fluid wetting internal surfaces of parts, assemblies, lines, and fittings for use in hydraulic systems prior to storage and/or assembly.

1.2 CLEANLINESS LIMIT: The cleanliness limits are specified by classes.

EXAMPLE: NAS XXX, Class 5, (Ref. Table I)

or NAS XXX, Class 103, (Ref. Table II)

2. APPLICABLE DOCUMENTS

2.1 FUNDAMENTALS: The following documents form a part of this specification to the extent specified herein.

Unless otherwise indicated the issues on date of invitation of bids shall apply.

Society of Automotive Engineers, Inc.

Aerospace Recommended Practice 743; Procedure for the determination of Particulate Contamination of Air in Dust controlled spaces by the Particle Count Method.

Aerospace Recommended Practice 785; Procedure for the determination of Particulate Contamination of Hydraulic Fluids by the Control Filter Gravimetric Procedure.

Aerospace Recommended Practice 598; Procedure for the determination of Particulate Contamination of Hydraulic Fluids by the Particle Count Method.

(Copies of S.A.E. ARP 598, ARP 785 and ARP 743 may be obtained from the Society of Automotive Engineers, Inc., 405 Lexington Ave., New York 17, New York.)

3. REQUIREMENTS

3.1 MATERIALS: Materials used in cleaning and processing shall conform to the applicable specifications as specified herein. Materials which are not covered by applicable specifications, or not specifically described herein, shall be suitable for the purpose intended.

3.2 CLEANLINESS STANDARD: The cleanliness limit of the representative fluid sample from parts, assemblies, lines and fittings shall not exceed the permissible maximum contamination limits of the specified class given in Table I and Table II. An evaluation of the fluid sample shall utilize only one table, either Table I or Table II.

3.2.1 The fluid sample size shall be proportional of the total volume of fluid contained in the device being checked. (Arithmetic results shall be factored to 100 ML and sample size noted in each instance.) It is the prerogative of each company to establish its own counting method; however, particle size ranges shall be in accordance with ARP 598. The sampling procedure shall provide a method of applying motion to the item being checked which will result in fluid agitation within, so that a reasonable assumption shall be made that the fluid withdrawn for contamination analysis will be representative of particle dispersion in the total fluid volume.

TABLE I. MAXIMUM CONTAMINATION LIMITS (BASED ON A 100 ML SAMPLE SIZE)

Particle Size Range (MICRONS)	Classes													
	00	0	1	2	3	4	5	6	7	8	9	10	11	12
5 to 15	125	250	500	1,000	2,000	4,000	8,000	16,000	32,000	64,000	128,000	256,000	512,000	1,024,000
15 to 25	22	44	89	178	356	712	1,425	2,850	5,700	11,400	22,800	45,600	91,200	182,400
25 to 50	4	8	16	32	63	126	253	506	1,012	2,025	4,050	8,100	16,200	32,400
50 to 100	1	2	3	6	11	22	45	90	180	360	720	1,440	2,880	5,760
Over 100	0	0	1	1	2	4	8	16	32	64	128	256	512	1,024

* Same as ARP 598

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PROCUREMENT
SPECIFICATION

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TITLE
CLEANLINESS REQUIREMENTS OF PARTS
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AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF THIS STANDARD AND DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS

THIS DRAWING SUPERSEDES ALL PRECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT, AND SHALL BE OBSOLETE ON THE DATE OF APPROVAL SHOWN HEREON

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Table II. Weight of Particles for 100 ML Based on New Weight (ANP 785)

(Total Weight minus Extraneous Weight L.A., Tare, Etc.)

Class	100	101	102	103	104	105	106	107	108
Weight (mg)	0.02	0.05	0.10	0.30	0.50	0.70	1.0	2.0	4.0

CLASSES 100, 101 and 102 will require samples larger than 100 ML.

NOTE: A correlation between Table I and Table II is neither expressed nor implied.

3.3 ENVIRONMENTAL CONDITIONS

3.3.1 The cleaning and cleanliness sampling of parts, assemblies, lines, and fittings shall be accomplished in a closed area under controlled environmental conditions compatible with the requirements of the parts.

3.3.2 **CLEANING SOLUTIONS:** Cleaning solvents shall be controlled to a level necessary to obtain cleanliness specified for the parts being processed.

3.4 **Cleaning Method for Parts, Assemblies, lines, and Fittings:** It is the prerogative of each company to establish its own process method subject to the approval of the procuring activity that will satisfy the cleanliness requirement of the finished part as specified.

4. QUALITY ASSURANCE PROVISIONS

4.1 Records of all samples and tests shall be made by the cleaning activity and be subject to review, approval and submittal as negotiated by the procuring activity.

5. **PREPARATION FOR DELIVERY:** Packaging and handling of cleaned parts, assemblies, lines and fittings shall be accomplished in a manner that maintains the specified cleanliness limit.

6. NOTES

6.1 **CLEANING MEDIA:** The cleanliness of cleaning solvents and drying gas may be determined as follows:

6.1.1 **Cleaning Solvent:** A 100 milliliter plus or minus 5 milliliter sample may be taken from the cleaning or finishing baths and analyzed per ANP 598.

6.1.2 **Drying Gas:** A ten cubic foot sample of dry air may be passed through a membrane filter retained in a closed (in line) aerosol filter holder. The method of counting the particles shall conform to ANP 743 and may be corrected for the blank to obtain the corrected particle count of the drying gas.

6.2 DEFINITIONS

6.2.1 **Part:** One piece, or two or more pieces joined together, which are not normally subject to disassembly without destruction of designed use.

Assembly: A number of parts or subassemblies or any combination thereof joined together to perform a specific function.

Line: A tube, pipe or hose assembly which acts as a conductor of hydraulic fluid.

Fitting: Those pieces normally employed in connecting lines and/or parts together.

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