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Ship Systems and Equipment—General Specification for Filter Elements—Hydraulic and Lube Oil Service

1. ***Scope—***This SAE Standard covers disposable hydraulic and lube oil filter elements. This document is a general performance specification for filter elements and identifies performance criteria and test methods. Associated specification sheets (SAE J2321-1, J2321-2, and J2321-3, etc.) define configuration and performance requirements for specific elements.

1.1 **Classification—**Sizes, configurations, and part identifying numbers for filter elements shall be as specified in the applicable specification sheets.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of the applicable publication shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone: (724) 776-4970, Web Address: http://www.sae.org.

SAE J1778—Ship Systems and Equipment—Hydraulic Fluids—Recommended Practice for Hydraulic Fluid Selection
SAE J2321-1—Disposable Hydraulic Filter Element—115 L/min Flow, 1.0 MPa Collapse Pressure, Filtration Ratio = 75 at 6 and 10 µm
SAE J2321-2—Disposable Hydraulic Filter Element—190 L/min Flow, 21 MPa Collapse Pressure, Filtration Ratio = 75 at 7 µm
SAE J2321-3—Disposable Hydraulic Filter Elements—21 MPa Collapse Pressure, Filtration Ratio = 75 at 10 µm, 75 - 175 L/min

2.1.2 NFPA PUBLICATIONS—Available from National Fluid Power Association, 3333 North Mayfair Road, Milwaukee, WI 53222. Telephone: (414) 778-3344, Web address: http://www.nfpa.com. Also available from ANSI (see 2.1.4).

NFPA T3.10.8.5—Hydraulic Fluid Power—Filter Elements—Verification of Collapse/Burst Resistance
NFPA T3.10.8.7—Hydraulic Fluid Power—Filter Elements—Method for Verifying Flow Fatigue Characteristics

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2.1.3 ASTM PUBLICATION—Available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Telephone: (610) 832-4585, Web address: http://www.astm.org.

ASTM A 342—Standard Test Methods for Permeability of Feebly Magnetic Materials

2.1.4 ISO PUBLICATIONS—Available from the American National Standards Institute, 25 West 43rd Street, New York, NY 10036. Web address: http://www.ansi.org. Also available from NFPA (see 2.1.2).

ISO 2942—Hydraulic fluid power—Filter elements—Verification of fabrication integrity and determination of the first bubble point
ISO 2943—Hydraulic fluid power—Filter elements—Verification of material compatibility with fluids
ISO 3448—Industrial liquid lubricants—ISO viscosity classification
ISO 3968—Hydraulic fluid power—Filters—Evaluation of pressure drop versus flow characteristics
ISO 12103-1—Road vehicles—Test dust for filter evaluation—Part 1: Arizona Test Dust
ISO 16889—Hydraulic fluid power—Multi-pass method for evaluating filtration performance of a filter element

2.1.5 ASQC PUBLICATION—Available from the American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202. Telephone: (414) 272-8575.

ASQC Z1.4—Sampling Procedures and Tables for Inspection by Attributes

3. Definitions—The following definitions apply throughout this specification.

3.1 Filtration Ratio—Filtration ratio is the ratio of number of particles greater than a given size (x) in the fluid entering the filter element to the number of particles greater than the same size in the fluid leaving the filter element. The minimum filtration ratio is the lowest filtration ratio reported for any one of the ten time intervals included in the multi-pass method for evaluating filter performance per ISO 16889, as modified in 5.6.2. (The filtration ratio reported for each time interval is determined by averaging the particle counts for the time interval.) The filtration ratio as used herein applies to the use of medium test dust in accordance with ISO 12103-1 A-3.

3.2 Dirt Holding Capacity—The apparent dirt holding capacity is the actual weight (grams) of the contaminant injected into the filter test system before the terminal pressure drop is reached. The retained dirt holding capacity is the mass of specific particulate contaminants effectively retained by the filter elements when terminal pressure drop is reached.

3.3 Rated Flow—The rated flow is the flow at which the element is tested for efficiency and dirt capacity. Unless otherwise indicated, the rated flow specified in the applicable specification sheet is the maximum recommended flow rate when using a fluid of the specified viscosity.

3.4 Terminal Pressure Drop—Terminal pressure drop is the maximum specified pressure drop permitted across the filter element to achieve the apparent dirt holding capacity of the element under test condition.

3.5 Pressure Drop—Pressure drop is the differential pressure across a filter element as measured under specified conditions.

4. Technical Requirements

4.1 Specification Sheets—The requirements for individual elements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

4.2 First Article Testing—Filter elements furnished under this specification shall be products which have been subjected to and successfully passed the First Article tests specified in Section 5 (see 5.1).

4.3 Materials—Unless otherwise specified in the specification sheet, the filter elements and seals shall be constructed of materials that are compatible with phosphate ester; water glycol; and petroleum base fluids used in ship systems. (See SAE J1778 for specifications and properties of fluids used in ship systems; aircraft phosphate ester fluid is not used in ship systems).

4.3.1 FLUID COMPATIBILITY—Filter element materials shall be compatible with fluids containing up to 2% water. Such contaminated fluid shall not cause degradation of element performance.

4.3.2 MAGNETIC MATERIALS—When specified in the applicable specification sheet, filter elements containing magnetic materials shall have a relative magnetic permeability of less than 2.0 when tested in accordance with ASTM A 342. (See 6.4)

4.4 Construction

4.4.1 FILTER ELEMENT CONFIGURATION—The filter element configuration shall be as specified in the applicable specification sheet. Unless otherwise specified, the element shall be designed for flow from outside in. The element shall consist of a filter medium that shall be supported to withstand the side and end loads imposed during testing.

4.4.2 DIMENSIONS—The filter elements and associated components supplied to this document shall comply with the dimensions specified in the applicable specification sheet.

4.4.3 ELEMENT COVERING—The element shall be constructed with a screen or perforated outer wrap to protect the filter media pack from damage during handling.

4.5 Performance

4.5.1 FABRICATION INTEGRITY (BUBBLE POINT)—The elements selected for filtration performance and clean pressure drop tests shall be based on bubble point values as identified in 5.3.3. The change in bubble point values before and after testing shall not exceed the amount identified in specific tests.

4.5.2 FILTRATION PERFORMANCE—The filter elements when tested as specified in 5.6.2 shall exhibit the following performance values:

4.5.2.1 Filtration Ratio—Filter elements when subjected to a multi-pass test in accordance with ISO 16889 as modified in 5.6.2 shall exhibit a minimum filtration ratio not less than that specified in the applicable specification sheet for particles of the size indicated in the specification sheet. See 3.1 for definition of minimum filtration ratio.

4.5.2.2 Dirt Holding Capacity—Apparent or retained capacity, as applicable, shall be equal to or greater than the value specified in the applicable specification sheet at a terminal pressure drop of a value specified in the applicable specification sheet when the element is subjected to a multi-pass test in accordance with ISO 16889 as modified in 5.6.2.

4.5.3 CLEAN ELEMENT PRESSURE DROP AT RATED FLOW—Pressure drop across the element shall be measured at the kinematic viscosity and rated flow identified in the applicable specification sheet and shall not exceed the maximum pressure drop specified. Pressure drop shall also be measured at a kinematic viscosity at least twice that identified in the specification sheet and again at a kinematic viscosity less than 50% of that identified in the specification sheet. Test measurements shall be made at standard ISO viscosity grades as identified in ISO 3448 so that suitability of the element can be easily determined for various ISO viscosity grade fluids.

4.5.3.1 Clean element pressure drop for production elements. For quality conformance inspection, the clean pressure drop need only be conducted at the viscosity in the applicable specification sheet.

4.5.4 FLOW FATIGUE—The filter element shall withstand, without damage, the number of flow fatigue pressure cycles specified in the applicable specification sheet when tested as specified in 5.6.4.

4.5.5 COLLAPSE PRESSURE—The filter element shall withstand a collapse pressure equal to or greater than the value specified in the applicable specification sheet when tested as specified in 5.6.5.

4.5.6 REVERSE FLOW—The filter element shall withstand, without visible structural damage or significant reduction of bubble point, reverse differential pressure surges and flow of a value specified in the applicable specification sheet when tested as specified in 5.6.6.

4.5.7 MEDIA MIGRATION UNDER VIBRATION CONDITIONS—Media migration and contaminants from the filter element shall not exceed value specified in the specification sheet when tested as specified in 5.6.7.

4.5.8 PULL TEST (MATERIAL COMPATIBILITY) REQUIREMENTS—The element shall withstand an axial pull test end load as specified in the applicable specification sheet without loss of fabrication integrity. The pull test end load values in Table 1 shall apply if the specification sheet does not identify a specific value:

TABLE 1—AXIAL PULL TEST END LOAD

Maximum Element Diameter	Minimum Axial Pull Test Values N	Minimum Axial Pull Test Values kgf	Minimum Axial Pull Test Values lbf
<25 mm	49 N	5 kgf	11 lbf
25 to 100 mm	98 N	10 kgf	22 lbf
>100 mm	147 N	15 kgf	33 lbf

4.6 Identification Marking—Each filter element shall be clearly, permanently, and correctly marked on the end cap and the following information shall be provided:

a. Filter element part number (as identified on the specification sheet)
b. Manufacturer's part or drawing number
c. Manufacturer's name or trademark
d. Identify as “Non-Cleanable”
e. Manufacturing date or Traceable Lot Number

4.7 Workmanship—The filter elements shall conform to this document and be free of sharp edges or defects that may affect their suitability for the service intended. Dimensions and tolerances shall be as identified in the specification sheet for individual element configurations.

5. Quality Assurance

5.1 First Article Inspection—Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all tests and inspection requirements as specified herein. Except as otherwise specified, the manufacturer may use its own or any other commercial facilities acceptable to the purchaser. The purchaser has the right to perform any inspection set forth in the specification whenever it is deemed necessary to assure that the item conforms to prescribed requirements. First article inspection shall consist of the examination and tests specified in Table 2 and shall be performed on the first article shipment of the product to a purchaser. For a given element, the test sequence shall be as shown in Table 2. The order of testing of the filter elements is not important. Six elements are recommended for first article testing. However, four elements may be used if two of the elements subjected to fluid compatibility are subsequently subjected to the filtration test prior to subjecting the elements to collapse tests.

TABLE 2—FIRST ARTICLE INSPECTION AND TESTS

Examination and Tests	Requirement Paragraph	Test Paragraph
All Elements		
Examination	4.4, 4.6, and 4.7	5.5
Bubble point (initial)	4.5.1	5.2, 5.6.1
Elements No. 1 and 2 (Phosphate ester and Water glycol fluid compatibility)		
Fluid compatibility	4.3, 4.3.1	5.6.8
Pull test	4.5.8	5.6.9
Bubble point	4.5.1, 4.5.8	5.6.1
Element collapse pressure	4.5.5	5.6.5
Element No. 3 (Petroleum base fluid compatibility)		
Fluid compatibility (petroleum base fluid)	4.3,4.3.1	5.6.8
Pull test	4.5.8	5.6.9
Bubble Point	4.5.1, 4.5.8	5.6.1
Clean element pressure drop test	4.5.3	5.6.3
Flow fatigue	4.5.4	5.6.4
Collapse pressure test	4.5.5	5.6.5
Element No. 4		
Magnetic permeability (when required)	4.3.2	5.7
Bubble Point	4.5.1	5.6.1
Media migration under vibration conditions	4.5.7	5.6.7
Reverse flow	4.5.6	5.6.6
Bubble point	4.5.1	5.6.1
Element No. 5 and 6 (Lowest bubble point elements not subjected to fluid compatibility tests)		
Filtration performance	4.5.2	5.6.2

5.2 First Article Bubble Point Tests—Tests shall be conducted in accordance with 5.6.1 as modified herein. For the three elements to be subjected to material compatibility in accordance with 5.6.8, the bubble point test for each element shall be conducted in the fluid in which the element is to be tested for fluid compatibility.

5.3 Quality Conformance Inspection—Sampling for quality conformance inspection shall be as specified (see 5.3.1, 5.3.2, 5.3.3, and 5.3.4). Except when otherwise required by this document, the requirements of ASQC Z1.4 for single sampling shall apply with an acceptance criteria of zero defective.

5.3.1 SAMPLING FOR EXAMINATION AND TESTS—For the purpose of sampling, a lot is defined as filter elements of the same part number produced at one facility, fabricated by the same process, which are constructed over a period of time not to exceed 90 days. As a minimum, the manufacturer shall select a random sample quantity from each lot of filter elements in accordance with Table 3 and inspect them in accordance with Table 4.

TABLE 3—SAMPLING FOR QUALITY CONFORMANCE INSPECTION

Lot Size	Sample Size Bubble Point and Examination	Sample Size Clean Element Pressure Drop(1)	Sample Size Filtration Performance(1)
1 to 3	All	1	1
4 to 15	4	1	1
16 to 29	6	1	1
30 to 50	8	1	1
51 to 90	10	1	1
91 to 500	20	1	1
501 to 1200	30	1	1
1201 to 3200	32	2	2
3201 to 10000	50	2	2

1. See 5.3.4.

TABLE 4—QUALITY CONFORMANCE INSPECTION

Examination and Tests	Requirement	Test Method
Examination	4.4, 4.6, 4.7, 5.3.2	5.5
Bubble point	4.5.1, 5.3.3	5.6.1
Clean pressure drop at rated flow	4.5.3, 4.5.3.1	5.6.3
Filtration performance	4.5.2	5.6.2

5.3.2 QUALITY CONFORMANCE EXAMINATION—If an element does not satisfy the examination requirements listed in Table 4, the element shall be rejected. The manufacturer then has the option of breaking the unexamined elements into two or more sub-lots and examining a number of elements from each sub-lot in accordance with Table 3 or conducting 100% inspection of all unexamined elements. This sampling procedure can be repeated until each sub-lot passes or 100% inspection of the elements within the sub-lot has been accomplished.

5.3.3 QUALITY CONFORMRNACE BUBBLE POINT TESTS—The elements selected for marking examination shall also be subjected to bubble point/fabrication integrity inspection in accordance with 5.6.1. Alternatively, an equivalent number of elements, randomly selected, may be subjected to the bubble point test. These bubble point tests shall be used to determine the specific elements to be subjected to quality conformance tests in accordance with 5.3.4.

5.3.4 QUALITY CONFORMANCE TESTS FOR CLEAN ELEMENT PRESSURE DROP AND FILTER ELEMENT PERFORMANCE—The number of elements randomly selected for this test shall be in accordance with Table 3. For this test, element(s) shall be subjected to the filter efficiency, dirt holding capacity, and clean element pressure drop tests as specified in 5.6.2 and 5.6.3. If one or more elements tested fails to meet a test requirement, three additional filter elements from the same lot shall be subjected to the test and if all three additional filter elements pass the test, the lot may be accepted. The sample(s) tested for filtration performance shall be the element or elements with the lowest bubble point of those sampled for bubble point and marking. The sample(s) tested for clean element pressure drop shall be the element or elements with the highest bubble point of those sampled for bubble point.

5.4 Test Conditions

5.4.1 TEST FLUIDS—For the clean pressure drop test, use a petroleum-based hydraulic fluid or fluids of a standard viscosity grade in accordance with ISO 3448 with a viscosity index of 95 or higher and a mass density of 0.850 to 0.900 kg/L (specific gravity of 0.850 to 0.900). For other tests, unless specified in specification sheets or referenced test procedures, selection of test fluids is at the discretion of the manufacturer. (Unless otherwise required by the specification sheet, viscosity for the multi-pass test shall be maintained at 15 $mm^2/s \pm 1$ mm^2/s). The viscosity of all test fluids shall be recorded for a temperature of 40 °C. The temperature at which the fluid for the multi-pass test has a viscosity of 15 mm^2/s shall be recorded.

5.4.2 TEST FLUID TEMPERATURE/VISCOSITY—The fluid temperature/viscosity shall be as specified in the applicable specification sheet, and the temperature shall be maintained at a temperature to maintain the viscosity. After determining the temperature for the specified viscosity, the temperature shall be maintained within the limits of +1 and –2 °C unless otherwise specified.

5.5 Examination—The filter elements shall be examined to determine compliance with the requirements specified in Table 4 with respect to construction design, dimensions, marking, and sharp edges or defects that may affect their suitability for the service intended. Marking shall be completely legible after all tests to which the element is subjected.

5.6 Test Methods

5.6.1 FABRICATION INTEGRITY (BUBBLE POINT)—Filter elements shall be tested as specified in ISO 2942 to determine the initial bubble point and subsequent bubble points as required by the applicable tests.

5.6.2 FILTER PERFORMANCE (FILTRATION RATIO AND DIRT HOLDING CAPACITY)—The filter elements shall be subjected to a multi-pass test specified in ISO 16889 modified as follows:

a. Unless otherwise specified in the applicable specification sheet, at least two filter elements shall be subjected to this test for first article inspection.
b. The dirt capacity shall be determined at a terminal pressure drop value specified in the applicable specification sheet. Because the elements are used in applications with fluid viscosity's much higher than the viscosity used in the multi-pass test, the dirt holding capacity in the specification sheet may be specified to a much lower differential pressure than the terminal pressure drop required for measurement of filtration efficiency.
c. The base upstream gravimetric level of contamination shall be 3 mg/L unless otherwise specified in the applicable specification sheet.

5.6.3 CLEAN ELEMENT PRESSURE DROP AT RATED FLOW TEST—Filter elements shall be tested to determine the clean element pressure drop in accordance with ISO 3968 as modified by and based on the requirements of 4.5.3 and 4.5.3.1. Table 3 identifies the quantity to be tested for quality conformance inspection. Other test conditions, not specified herein, shall be in accordance with ISO 3968.

5.6.4 FLOW FATIGUE—Filter elements shall be installed in filter housings and shall be subjected to pressure-flow cycles (see 4.5.4) in accordance with NFPA T3.10.8.7. The elements tested shall meet the criteria for acceptance of NFPA T3.10.8.7.

5.6.5 COLLAPSE PRESSURE TEST—Filter elements with minimum collapse pressure of 8.3 MPa (1200 lb/in^2) differential or less, shall be tested per 5.6.5.1; and elements with a minimum collapse pressure greater than 8.3 MPa (1200 lb/in^2) differential, shall be tested per 5.6.5.2.

5.6.5.1 Filter elements with minimum collapse pressure of 8.3 MPa (1200 lb/in^2) differential or less, shall be tested as specified in NFPA T3.10.8.5 to verify the collapse resistance pressure of the elements. The element shall meet the minimum collapse pressure identified in the specification sheet and the criteria of NFPA T3.10.8.5.

5.6.5.2 Filter elements with minimum collapse pressure greater than 8.3 MPa (1200 lb/in^2) differential, shall be tested as specified in NFPA T3.10.8.5 with the following modifications:

a. The test shall run at a minimum of 10% of the element rated flow rate and held constant up to 8.3 MPa (1200 lb/in^2) differential;
b. The pressure drop vs. contaminant added curve/calculations and slope change acceptance criteria of NFPA T3.10.8.5 shall be verified up to 8.3 MPa (1200 lb/in^2) differential;
c. Above 8.3 MPa (1200 lb/in^2) differential, continue to add contaminant until the differential pressure (at no specified flow rate) across the element is 102% of the minimum collapse differential pressure specified for the element; and then,
d. The visual inspection of the element and the fabrication integrity (bubble point) test acceptance criteria of NFPA T3.10.8.5 shall be verified. The bubble point of the element shall be no less than 50% of the bubble point prior to the collapse test.

5.6.6 REVERSE FLOW TEST—With at least 25% of rated flow (in the reverse direction from the element collapse test per 5.6.5, the element shall be loaded with test dust until a differential pressure of a value specified in 4.5.6 (see the applicable specification sheet) is obtained across the element. The element shall withstand the reverse flow differential pressure without visible structural damage, seal failure, or filter medium failure. In addition, the bubble point of the element after reverse flow testing shall be not less than 70% of the bubble point of the element prior to reverse flow testing.

5.6.7 MEDIA MIGRATION AND VIBRATION ANALYSIS OF FILTER ELEMENTS

5.6.7.1 *Preparation for Analysis*—The test element shall be installed in a filter housing or a special test housing with blanking connections installed. The housing shall be filled with hydraulic test fluid as specified in 5.4.1. The fluid shall be pre-filtered to reduce the contamination level to less than 1 mg/L.

5.6.7.2 *Vibration Test*—For vibration testing, unless otherwise specified, the rate of change of frequency shall be logarithmic. The following tolerances apply for vibration testing:

a. Amplitude: ±10%
b. Frequency: ±2%
c. Acceleration: ±10%

The filter housing head shall be secured to the testing machine so that the vibration input is centrally aligned along the longitudinal axis of the filter element. Both the response prominence search and endurance test shall be conducted as specified below. The test will then be repeated with the vibration input aligned along the transverse axis of the filter element.

a. Response Prominence Search—Response prominence frequencies shall be determined by varying the frequency of applied vibration slowly through the ranges specified in Tables 5A and 5B. The minimum test time for each octave will be 2 min. (For an octave, the ratio of the upper band edge frequency to the lower band edge frequency is equal to two (2); i.e., 4 to 8 Hz is one octave and 8 to 16 Hz is the next octave.) A response prominence frequency is defined as one in which the response exceeds the input by a factor of 2.0 or greater.
b. Endurance Test—The filter element shall be vibrated for a total period of at least 2 h. The test time shall be as indicated in Tables 5A and 5B at the response prominence frequencies (four most severe) as found in the response prominence search.

TABLE 5A—VIBRATION TEST PROCEDURE

Test	Vibration Level—Displacement or Acceleration Amplitude (peak-to-peak)	Frequency Range, Hz
Response	2.5 mm	2 to 16
Prominence	1.0 mm	16 to 32
Search	0.5 mm	32 to 64

TABLE 5B—VIBRATION TIME SCHEDULE

Endurance Test	Vibration Time Schedule (minimum Time Per axis in minutes)	Vibration Time Schedule (minimum Time Per axis in minutes)	Vibration Time Schedule (minimum Time Per axis in minutes)	Vibration Time Schedule (minimum Time Per axis in minutes)	Vibration Time Schedule (minimum Time Per axis in minutes)
No. response Prominences	0	1	2	3	4
Vibration time (minutes) at each prominence	0	120	60	40	40
No response prominences (test at 30 Hz)	120	0	0	0	0

5.6.7.3 Media Migration Analysis and Element Cleanliness—The port blanks shall be removed and the filter and housing shall be flushed with 3000 mL minimum of pre-filtered fluid and the effluent collected. (The contamination level of pre-filtered fluid shall be less than 1 mg/L.) The effluent shall be filtered through a membrane filter disk, absolute 0.8 µm, which has been previously washed with pre-filtered solvent. The membrane filter shall be weighed before and after the effluent is filtered and the initial and final weights recorded and compared to the allowable value specified in the specification sheet.

5.6.8 FLUID COMPATIBILITY—Each of three elements shall be tested for compatibility in accordance with ISO 2943 with a different one of the three fluids specified in 4.3. Each test fluid shall be thoroughly mixed with 2% water prior to testing. During the test, at intervals not to exceed 25 h, the fluid shall be stirred and water shall be added as necessary to make up evaporation losses. Elements shall be completely immersed in appropriate test fluids as designated previously, for 168 h at 85 to 90 °C. The temperature may be reduced to 75 °C minimum for water glycol fluid. After immersion and degreasing of the elements, there shall be no visible evidence of degradation or corrosion. Following the soak at high temperature, the elements shall be subject to a pull test (see 5.6.9) and then the element collapse test (see 5.6.5).

5.6.9 PULL TEST—Subject the element to an axial load as identified in 4.5.8. After applying the pull test, a fabrication integrity (bubble point) test shall be conducted in accordance with 5.6.1. The bubble point shall not be less than 70% of the initial bubble point of the element.

5.7 Magnetic Permeability—The filter element shall be subjected to a magnetic permeability test in accordance with ASTM A 342 to determine the element relative magnetic permeability.

5.8 Ordering Data—The following information is to be provided when ordering filter elements to this specification:

5.8.1 PART OR IDENTIFYING NUMBER (PIN)—The PIN from the applicable configuration specification sheet shall be identified. (See 2.1.1 for applicable specification sheets.)

5.8.2 NUMBER OF ELEMENTS FOR DELIVERY—The number of elements to be delivered shall be specified. It is the manufacturer's responsibility to manufacture the additional elements required for first article and quality conformance testing.

5.8.3 EFFECTIVE SPECIFICATION DATE—If an effective specification date is not specified, the latest edition of each reference applies. Because neither users nor manufacturers may be aware of the most recent specification revisions, it is recommended that an effective specification date be identified in the ordering data. A date between 60 to 180 days prior to the request for bid of ordering date is recommended. If SAE J2321 or the applicable SAE specification sheet has been revised within this specified period, then the specific revision of SAE J2321 or the specification sheet, as applicable, should be cited. The following illustrates a way of specifying the effective date:

"The effective date for specifications shall be 90 days prior to the date of this invitation for procurement (or order, as applicable). Later revisions may be used without (or with, specify as applicable) concurrence of the procuring activity."

5.8.4 DRAWINGS—The ordering data should indicate if an element drawing is required, the number of copies, when and to whom the drawings are to be delivered and if approval is required. If approval is required, the manufacturer should be advised of the time required for review. (See Appendix A for guidance.)

5.8.5 FIRST ARTICLE TEST REPORTS—First Article Test Reports should be required unless the procuring activity has previously approved a report for the same part number from the manufacturer, and the manufacturer has not revised the part in any way. If a procuring activity will accept / consider a first article test report approved by another activity, this should be identified in the ordering data. The ordering data should indicate the number of copies required, to whom the report is to be submitted for approval and the amount of time to allow for review of the report. (See Appendix A for guidance.)

5.8.6 QUALITY CONFORMANCE TESTS—The ordering data should indicate if it is necessary to submit copies of the production quality conformance tests and to whom the tests are to be submitted.

6. ***Notes—***This section contains information of a general or explanatory nature that may be helpful and may be required in a contract or purchase order, but are not requirements of the specification.

6.1 Intended Use—This specification is intended to replace several military specifications previously used to identify the requirements for hydraulic filter elements used on US Navy and US Coast Guard ships. In addition, this specification identifies standard industry test procedures which can be applied to hydraulic or lube oil filter elements. Recommended configurations of elements to be used are identified in the applicable specification sheets. The preparing committee will consider requests for additional configuration elements.

6.2 Drawing Requirements and First Article Testing—See Appendix A for recommendations regarding drawing and first article testing requirements.

6.3 For higher viscosity fluids and for fluids subject to low temperature, reduced flow rates may be necessary for satisfactory service.