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 SUPERSEDING
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MILITARY SPECIFICATION
 WIPERS, WINDOW, ELECTRIC, PENDULUM TYPE
 (MARINE SERVICE, HEAVY DUTY)

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

1. SCOPE

1.1 This specification covers the general requirements for the design and construction of single or multiblade electric window wipers for ships.

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 the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

FF-B-171 - Bearings, Ball, Annular, (General Purpose).
 QQ-A-591 - Aluminum Alloy Die Castings.
 QQ-A-596 - Aluminum Alloy Permanent and Semi-Permanent Mold Castings.
 QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings - Corrosion-Resisting.

MILITARY

MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting.
 MIL-S-901 - Shock Test, H.I. (High Impact) Shipboard Machinery, Equipment and Systems, Requirements For.
 MIL-E-917 - Electric Power Equipment, Basic Requirements For (Naval Shipboard).
 MIL-C-2212 - Controllers, Electric Motor, A.C. or D.C. and Associated Switching Devices, Naval Shipboard.
 MIL-L-3661 - Lampholders, Indicator Lights, Indicator-Light Housings, and Indicator-Light Lenses, General Specification For.
 MIL-L-3661/8 - Housings, Indicator-Light, Style LH76.
 MIL-L-3661/14 - Lenses, Indicator-Light, Dripproof, Style LC14.
 MIL-T-7928 - Terminals, Lug; Splices, Conductor: Crimp Style, Copper, General Specification For.
 MIL-C-15726 - Copper-Nickel Alloy, Rod, Flat Products (Flat Wire, Strip, Sheet, Bar and Plate) and Forgings.
 MIL-E-16400 - Electronic, Interior Communication and Navigation Equipment, Naval Ship and Shore: General Specification For.
 MIL-M-17185 - Mounts, Resilient; General Specifications and Tests For (Shipboard Application).
 MIL-M-17191 - Mounts, Resilient; Portsmouth Bonded Spool Type.
 MIL-M-17508 - Mounts, Resilient: Types 6E2000, 6E900, 6E900BB, 7E450, 7E450BB, 6E150, and 6E100.
 MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Repair Parts; Packaging and Packing of.
 MIL-M-17556 - Motor, Direct Current, Fractional HP (Shipboard Use).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Ship Engineering Center, SEC 6124, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-W-3459C

MILITARY Continued

- MIL-W-18445 - Windows, Non-Icing, Laminated Flat Glass, Electrically Heated, With Controls.
- MIL-M-19379 - Mounts, Resilient, Mare Island Types 11M15, 11M25, and 10M50.
- MIL-M-19863 - Mount Resilient: Type 5B5000H.
- MIL-C-20159 - Copper-Nickel Alloy (70-30 and 90-10): Castings.
- MIL-M-21649 - Mount, Resilient, Type 5M10,000-H.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-252 - Wired Equipment, Classification of Visual and Mechanical Defects.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-461 - Electromagnetic Interference Characteristics Requirements for Equipment.
- MIL-STD-740 - Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment.
- MIL-STD-1552 - Provisioning Technical Documentation, Uniform DOD Requirements for.
- MIL-STD-1561 - Provisioning Procedures, Uniform DOD.

(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 NATIONAL STANDARDS INSTITUTE (ANSI)

- S1.4 - Sound Level Meters.
- S1.6 - Preferred Frequencies and Band Numbers for Acoustical Measurements.
- S1.11 - Octave, Half-Octave, and Third-Octave Band Filter Sets.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Design.

3.1.1 General design. Wiper system shall consist of a totally enclosed drive mechanism, a separate control unit to operate the wiper, a heated arm and a blade, which when energized, follows a pendulum motion. All components of the system shall be suitable for heavy marine duty, compact and of such rugged construction that minimum repairs will be required, and shall be designed and constructed in such a way that when necessary, adjustments and repairs can be easily made by ship's force.

3.1.1.1 Materials. Parts exposed to the weather shall be made of 90-10 copper-nickel alloy in accordance with MIL-C-20159 or MIL-C-15726; or for arms and stuffing tube, corrosion-resisting steel in accordance with QQ-S-763, class 316. Drive mechanism housing shall be aluminum in accordance with QQ-A-596, alloy No. A356 or A214 or QQ-A-591, alloy No. A360, if for interior use only. Phenolic molding compound (MIL-M-14, type CFI-40) may be substituted. Dissimilar metals in contact with each other and the environment shall be compatible as defined in MIL-E-16400. Plastic sleeves and separators for penetration in ship's structure shall be provided to eliminate electrolytic corrosion between dissimilar metals in windshield wiper system and ship's structure. Spur and worm gearing shall be of steel conforming to QQ-S-763, class 416. Reclaimed materials shall be used to the maximum extent possible.

MIL-W-3459C

3.1.1.2 Protective treatment. Materials used in construction of windshield wiper systems that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage; shall be protected against such deterioration in a manner that will in no way prevent compliance with the requirements of this specification. Metals that are not inherently corrosion-resistant, as defined in MIL-E-917, shall be processed (treated, plated, or painted) in accordance with MIL-E-917 to provide corrosion resistance. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.1.1.3 Orientation. Components of the drive system shall be designed so that they are capable of satisfactory operation in any position.

3.1.1.4 Interchangeability. Parts, having the same manufacturer's part number, shall be directly and completely interchangeable with each other with respect to installation and performance.

3.1.1.5 Weight. Weight of a complete single blade wiper system shall be the minimum consistent with the state-of-the-art but shall not exceed 25 pounds. Weights of additional components necessary for multiblade systems shall be consistent with the weight of a single blade wiper system.

3.1.1.6 Dimensions, size. Wiper drive housing assembly, envelope dimensions, and mounting holes shall conform to the dimensions shown on figure 1. Control box, envelope dimensions, and mounting holes shall conform to the dimensions shown on figure 2.

3.1.2 Vibration. Wiper system shall conform to the type I vibration requirements of MIL-STD-167-1 and as specified in 4.4.12.

3.1.3 Shock. Wiper system shall conform to the grade B shock requirements of MIL-S-901 and shall be tested as specified in 4.4.13.

3.1.4 Airborne noise acceptance criteria. Wiper assembly shall be designed so that when operating, the assembly complies with airborne noise criteria of MIL-STD-740 and as specified in 4.4.14.

3.2 Mechanical equipment.

3.2.1 Wiper drive assembly housing. Wiper drive housing assembly (motor reduction gear and operating mechanism) shall be suitable for mounting either on the inboard (interior) or outboard (exterior) side of a ship's deck house structure, as specified (see 6.2.1). Inboard units, if phenolic (see 3.1.1.1), shall be marked "for interior use only". Wiper motor, filter, angle drive, or other linkage mechanism shall be contained within the housing assembly. Cover of housing assembly shall be removable and, when removed, shall expose all electrical, and mechanical components. Electrical leads and components shall not be attached to cover of housing. For electrical connection to cable from control box, a phenolic housing shall be provided with a metal insert threaded 3/4-inch iron pipe size (ips), conversely, a metal housing shall have a threaded hole this size. In either case, the threaded hole shall be sealed with a removable protective plastic cap having a push-in or screw thread configuration.

3.2.2 Installation and mounting. Inboard mounted drive assemblies shall only require one penetration hole. Wiper output shaft containing arm heater for attaching blade assembly shall pass through a single hole 1.375 inches nominal in diameter. A metal stuffing tube assembly capable of being attached to ship's structure by means of a locknut shall be provided. Stuffing tube shall be so packed and sealed to allow drive arm to rotate yet not allow water to enter ship's interior. Three mounting legs shall be provided and attached to wiper drive assembly housing. Wiper housing shall be provided with means for mounting housing assembly, above or below designated windows.

3.2.3 Drive system. The output drive shaft through mechanical linkage shall rotate in alternate directions so that it will cause drive arm to travel through reciprocating angle stroke. Stroke angles shall range from 38 degrees to 70 degrees. A separate mechanical converter shall not be used for obtaining a reciprocating blade motion.

MIL-W-3459C

3.2.4 Drive arm assembly. A wiper drive arm shall be provided to transmit drive shaft motion to the wiper blade. The upper wiper arm shall contain an encased electrical heating element. Means shall be provided for attaching and removing lower wiper arm assembly when required. When wiper assembly (drive mechanism) is mounted inboard and wiper drive arm assembly penetrates ship's structure, means shall be provided for replacing upper arm assembly without removing wiper assembly from its mounting.

3.2.4.1 Lower wiper arm assembly. A lower arm assembly constructed from material as specified in 3.1.1.1 shall be provided, unless otherwise specified (see 6.2.1). Lower arm assembly will transmit motion of upper drive arm to blade assembly. Lower arm shall be supplied with an approximate overall length of 20 inches, including all hardware. Instructions shall be provided for user to bend and cut lower arm to length required.

3.2.4.2 Blade action. The size and motion of the blade shall be adequate to wipe approximately 41 percent to 70 percent of the window glass. The wiper blade shall be held against the window by adjustable spring tension. Blade pressure shall be adjustable from approximately 1 pound minimum to 2 pounds maximum, means shall be provided to prevent the wiper blade and arm from interfering with the opening and closing of the window. When the window is opened it shall be possible to extend wiper arms outward without mechanical damage.

3.2.4.2.1 Blade assembly. Each wiper shall be provided with one straight back blade assembly with an overall length of 12 inches. Blades that have other even size dimensions example 6, 8, 10, 14, 16 inches, etc., shall be provided when specified (see 6.2.1). The wiping edge of the blade shall be formed of a neoprene rubber material having inherent resistance to the environmental conditions as well as resistance to the effects of ultra-violet rays (see 3.4). Wiping edge of blade shall not soften or stick to glass while under a maximum pressure of 8 pounds and surface temperature of glass is at 140°F. Blade material shall be such that no scratching, abrasion, or other damage to the windshield surface will occur as a result of operation of the windshield wiper system.

3.2.4.3 Clevis bracket. A clevis bracket shall be used to join the blade to the wiper arm. The clevis bracket shall be capable of rotating 360 degrees and locked at any angle selected. The clevis bracket shall not work loose during operation of wiper due to environmental conditions encountered. Use of quick-clip for attaching blade to clevis bracket shall be avoided. The blade, when attached to clevis bracket, shall have freedom of motion in a direction parallel to bracket.

3.2.5 Stroke speed. Wiper shall be capable of operating between a "slow" speed of 140 and a high speed of 240 strokes per minute. This shall be applicable to all lengths of drive arms and blades sizes. A stroke will be considered as motion of the wiper blade across the area of sweep from one extreme position to the other.

3.2.6 Travel adjustments. A travel adjustment shall be provided for adjusting angle of sweep from at least 38 degrees to at most 70 degrees. There shall be a minimum of 10 angular adjustment positions. Travel adjustment shall be simple and shall not require removing installed wiper from ship's structure.

3.2.7 Centering of wiper blade arm. Wiper blade arm shall be capable of being centered or placed in a bias position in relationship to sweep configuration. Wiper drive assembly housing cover, when open, shall provide access to adjustment for centering blade.

3.2.8 Glareproofing. Parts exposed to view of ship personnel shall be finished in such a manner as to eliminate reflections into the visual field of the personnel.

3.2.9 Multi-wipers. Two or more complete wiper drive assemblies may be installed on large size windows. A single wiper drive assembly may operate a remote or slave unit by means of a connecting rod. Remote or slave wiper unit must confine itself to window on which drive unit is installed.

3.2.10 Bearings. Bearings shall be grade 50 in accordance with FF-B-171, sealed, and permanently lubricated.

3.2.11 Gears. The design, manufacture, and assembly of gears shall be such as to provide smooth, continuous tooth contact without interference, tight spots, loose spots, or other irregularities. Every precaution shall be taken to reduce tooth pressure and keep backlash to a minimum. Gears fitted on shaft shall be secured thereto by means which will effectively prevent relative motion between gear and shaft.

MIL-W-3459C

3.3 Electrical equipment. Electrical design, processes, safety, and fabrication shall be in accordance with MIL-E-917 except as specified in this specification.

3.3.1 Motor. Motor shall be in accordance with MIL-M-17556 and shall have the following characteristics:

Rating	1/8 horsepower (hp), output at 3700 revolutions per minute (r/min) maximum
Voltage	115 volts, direct current (d.c.)
Winding	Permanent magnet
Speed classification	Adjustable
Enclosure	Open, i.e., mounted inside ship; otherwise, weathertight
Bearings	Ball, sealed, and permanently lubricated
Service	C
Insulation	Class B, F, or H

Notes:

1. A metal plate on motor shall contain above information and indicate direction of rotation. The plate shall be installed on motor where necessary for proper function of the equipment.
2. Filters for electromagnetic interference (EMI) shall be line-to-line type.

3.3.2 EMI suppression. EMI characteristics of the complete wiper unit during operation shall be in accordance with MIL-STD-461 for CEO3, RE01, and RE02 tests.

3.3.3 Controllers. Control equipment shall be in accordance with MIL-C-2212, (except an autotransformer may be used) and shall have the following characteristics:

Enclosure	Dripproof (metal)
Rating	Output 115 volts, d.c. and input 120 volts, alternating current (a.c.), 60 hertz (Hz)
Operation	Manual
Type	Full voltage
Function	Motor starting and speed regulation
Protection	Overload (OL)
Service	C
Motor speed control range	See 3.2.5
Openings for electrical cable entrance	None, user to drill as required
Indicator light	Individual heater energized

3.3.4 Control equipment. Control equipment, by means of a variable transformer and a full wave bridge silicon rectifier in accordance with MIL-E-917, shall convert 120 volts, a.c. 60 Hz single phase input power to approximately 115 volts, d.c. full wave power for motor operation. D.c. supplied wiper drive motor shall have a form factor of 1.1 or less. Electrical circuits shall not be grounded.

3.3.5 "ON" and "OFF" power switches. Each wiper shall be provided with a double pole control switch. The wiper control switch shall be marked with positions "ON" and "OFF" and "PARK". In the "PARK" position, the wiper blade shall be positioned so as not to obstruct normal vision through the viewing area. Manual park is acceptable. Heater control switch shall be marked "ON" and "OFF".

3.3.6 Protection. Overload and short circuit protection for the control equipment shall be as follows:

- (a) Circuit breaker in heater circuits.
- (b) Wiper motor shall be protected by an overload circuit breaker, the amperage rating of the circuit breaker to be approximately 10 percent over the running amperage rating of motor or sufficient to protect the motor from burn-out. Circuit breakers shall be single pole.

MIL-W-3459C

3.3.6.1 Protection method used shall prevent motor in a 50°C ambient from exceeding following values:

<u>Motor insulation class</u>	<u>Maximum temperature rise (locked rotor).</u> Degrees C
B	130
F	155
H	180

3.3.7 Heater. Heater shall be watertight and controlled by a double pole switch. Heater circuit shall operate on 120 volts, a.c., 60 Hz. Heater shall be contained within the "L" portion of the wiper drive arm assembly. With wiper in static position a temperature reading taken at the outside metal casing shall be between 300°F and 350°F at an ambient temperature of 72°F. Slip-rings shall not be used to supply electrical power to reciprocating arm heater. A heater indicator light to show when heater is in operation, shall be furnished. The light shall be mounted near the corresponding heater power switch. The light shall be illuminated when the heated arm is energized. Lens color shall be red and lamp shall be ANSI, type NE-51H. Lampholder shall have a built-in resistor, and shall conform to the requirements of MIL-L-3661, MIL-L-3661/8 and MIL-L-3661/14.

3.3.7.1 Wiper arm pivot heaters. Wiper arm pivot for multiblade type wipers shall be provided with a strip heater approximately 55 to 75 watts at 120 volts a.c. to prevent ice accumulation. Pivot heaters shall be provided on a hinged bracket with a cable lead approximately 3 feet in length. Users will provide bulkhead gland for cable entrance and mounting pad to fasten pivot heater to ship's structure adjacent to area to be heated. Interior mounted wiper drive assemblies which have an exterior pivot heater shall be designed so as not to interfere with wiper blade. When window is opened it shall be possible for arms to extend outward without mechanical damage. Heaters installed as one unit shall be connected to one heater switch in wiper control box. Total heater currents shall be used in calculating circuit protection for that system.

3.3.8 Wiring. Permanent internal wiring shall be copper. The size, stranding insulation of the wire and the dimensions, insulation and spacing shall be mechanically and electrically suited to the applications. Wires exposed to heat shall be insulated with 105°C thermoplastics, asbestos, and outer braid. The minimum wire size shall be AWG #18.

3.3.9 Terminating electrical wires. Connections in the wiper drive assembly and control box shall be soldered, except those terminating at terminal blocks. Wires at terminal blocks shall be terminated with preinsulated compression (crimps) type connectors in accordance with MIL-T-7928, type II, and shall firmly and completely grip the conductor and the wire insulation.

3.3.10 Wiring diagram and markings.

3.3.10.1 Control box. Terminal board connections shall be identified as follows:

Terminal point:

#1	Black (-)	- to wiper motor
#2	Red (+)	- to wiper motor
#3	Heater circuit	- arm heater
#4	To ship's supply	- 120 volts, a.c., 60 Hz
#5	To ship's supply	- 120 volts, a.c., 60 Hz
#6	Heater circuit	- arm heater

3.3.10.2 Wiper assembly. Terminal board connections shall be identified as follows:

Terminal point:

#1	Black (-)	- wiper motor
#2	Red (+)	- wiper motor
#3	Heater circuit	- arm heater
#4	Heater circuit	- arm heater

Wiper assembly shall contain a wiring diagram in control box. Switches, controls, and components shall be properly marked, identified, and functions indicated. Examples "SPEED LO-HI" increasing in a clockwise direction, also "HEATER" switch "OFF" and "ON" with a note clearly stating "UNDER ICING CONDITIONS, CLOSE HEATER SWITCH 15 MINUTES BEFORE OPERATING WIPER".

MIL-W-3459C

3.4 Performance. Each wiper shall be capable of withstanding the performance tests specified in 4.4 and shall operate satisfactorily under the following conditions:

- (a) Relative humidity to 100 percent, including conditions wherein condensation takes place in the form of both water and frost.
- (b) Winds up to 40 knots and ice accumulation rate of 6 inches per hour when installed on electrically heated window.
- (c) Exposure to salt-sea atmosphere.
- (d) Exposure to ultra-violet rays of the sun.

3.5 Identification plate. The identification plate shall contain the following information:

- (a) Electric window wiper.
- (b) Manufacturer's name and address.
- (c) Manufacturer's type or drawing number.
- (d) Serial number.
- (e) National stock number, if required (see 6.2.1).
- (f) Year of manufacture.
- (g) Contract or order number.
- (h) Technical manual number.
- (i) Allowance parts list number (APL) to be furnished by procuring activity.
- (j) Component identification number (CID), if available (see 6.2.1).

3.6 Technical data. The contractor shall prepare technical data in accordance with the data ordering documents included in the contract or order (see 6.2.2) and as specified in 3.6.1 and 3.6.2.

3.6.1 Drawings. In addition to the drawing content required by the data ordering document (see 6.2.2) the following unique features shall be included:

- (a) Complete outline and mounting dimensions, including size of bolt holes in inches and fractions of an inch, so placed on the drawings as to be read from the bottom or right hand side.
- (b) Salient design features, such as: capacity, speed, and power of driving motor, etc.
- (c) Finish of mounting surfaces.
- (d) Special tools. Special tools are defined as those tools not listed in the National Supply Catalog (copies of this catalog may be consulted in the office of the Defense Contract Administration Service (DCAS)).
- (e) Test report number and date of environmental tests, shock, vibration, noise, EMI, etc.

3.6.2 Technical manual. In addition to the general requirements covered by the data ordering document (see 6.2.2), the following shall be included as part of the content:

- (a) Title page.
- (b) Description of wiper.
- (c) Installation instructions.
- (d) Schematic and wiring information, as applicable.
- (e) A list of items requiring preventative maintenance, type of maintenance.
- (f) Safety precautions to be observed, electrical, mechanical, and thermal.
- (g) Special notes.
- (h) List of parts for the equipment complete with part numbers and National stock numbers (if known).
- (i) Reduced size drawing of wiper parts.
- (j) Exploded view showing assembly/disassembly.

3.7 Repair parts. Unless otherwise specified (see 6.2.1), provisioning technical documentation for repair parts shall be in accordance with MIL-STD-1552 and MIL-STD-1561.

3.8 Workmanship. The window wiper assemblies shall comply with the workmanship criteria of requirement 9 of MIL-STD-454.

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

MIL-W-3459C

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 conformance inspection.

4.2.1 Inspection lot. An inspection lot shall be as defined in MIL-STD-105 and shall include the complete assembled windshield wiper system as defined in 3.1.1.

4.2.2 Sampling for group A inspection. Sampling and inspection shall be in accordance with MIL-STD-105. The Acceptable Quality Levels (AQL's) shall be as specified in table I. Major and minor defects shall be classified in accordance with MIL-STD-252.

4.2.2.1 Group A inspection. Group A inspection shall consist of the examination and tests specified in table I.

TABLE I. Group A inspection.

Inspection	Requirement paragraph	Inspection paragraph	AQL defect per hundred units	
			Major	Minor
Visual and dimensional examination (wiper assembly)	3.1.1 through 3.1.1.6, 3.2.1 through 3.2.11, 3.3.1, 3.3.10, 3.5, 3.8	4.3	1.0	4.0
Visual and dimensional examination (controller)	3.3.1 through 3.3.10	4.3	1.0	4.0
Functional test	4.2.3 through 3.2.5, 3.3.4	4.4.1	2.5% level I	---

4.2.3 Sampling for group B tests. Sampling shall be in accordance with MIL-STD-105 for special inspection levels.

4.2.3.1 Group B tests. Group B tests shall consist of the tests specified in table II. The tests shall be performed on sample units that have been subjected to and have passed group A inspection unless it is more practical to select a separate sample.

TABLE II. Group B tests.

Tests	Requirement paragraph	Test paragraph	AQL percent defective	Inspection level
Room temperature	3.4	4.4.2	4.0	S-4
Low temperature	3.4	4.4.3	4.0	S-4
Power interruptions	3.4	4.4.4	4.0	S-4

4.2.3.2 Disposition of sample units. Sample units which have passed the group B tests shall be delivered on the contract or order.

4.2.4 Sampling for group C tests. One wiper assembly shall be selected every 12 months from each 12 month's production. No defectives shall be allowed. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.2.4.1 Group C tests. Group C tests shall consist of the tests specified in table III. The tests shall be performed on sample units that have been subjected to and have passed group A inspection.

MIL-W-3459C

TABLE III. Group C tests.

Tests	Requirement paragraph	Test paragraph
Endurance	3.4	4.4.5
Parking operation	3.4	4.4.5.1

4.2.4.2 Disposition of sample units. Sample units which have been subjected to the group C tests shall not be delivered on the contract or order.

4.2.5 Sampling for group D tests.

4.2.5.1 Subgroup 1. One sample unit shall be selected once every 6 months from 6 month's production. No defectives shall be allowed. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.2.5.2 Subgroup 2. One sample unit shall be selected every 24 months or whenever the basic design or a vital part of the equipment has been changed. No defectives shall be allowed. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.2.5.3 Group D tests. Group D tests shall consist of the tests specified in the sequence shown for each subgroup in table IV. Group D tests shall be performed on sample units that have passed group B tests. Shipment shall not be held up pending results of the tests.

TABLE IV. Group D tests.

Tests	Requirement paragraph	Test paragraph
<u>Subgroup 1</u>		
Water spray	3.4	4.4.6
Salt water immersion	3.4	4.4.7
Dry glass	3.4	4.4.8
Motor protection	3.3.6.1	4.4.9
Heated arm	3.3.7	4.4.10
<u>Subgroup 2</u>		
Electromagnetic interference suppression	3.3.2	4.4.11
Airborne noise measurements	3.1.4	4.4.14
Vibration	3.1.2	4.4.12
Shock	3.1.3	4.4.13

4.2.5.4 Disposition of sample units. Sample units which have been subjected to subgroup 2 of group D tests shall not be delivered on the contract or order.

4.2.5.5 Noncompliance. If a sample fails to pass group D tests; the contractor shall take corrective action on the material or process, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions; with essentially the same materials, processes, etc. and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action acceptable to the Government, has been taken. After corrective action has been taken, group D tests shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the Government.) Group A and B inspection may be reinstituted; however, final acceptance shall be withheld until group D reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and the corrective action taken shall be furnished the contracting officer.

4.3 Visual and dimensional examination.

4.3.1 External. Wiper assembly and controller shall be examined to verify that the materials, external design and construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.2, 3.3, and 3.8).

MIL-W-3459C

4.3.2 Internal. Wiper assembly and controller shall be disassembled and examined to verify that the materials, internal design and construction, and workmanship are in accordance with the applicable requirements (see 3.1, 3.2, 3.3, and 3.8).

4.4 Test methods.

4.4.1 Functional test. Windshield wiper system shall be tested for lubricant leaks, maximum blade speed, maximum blade travel, and power consumption. Nonconformance shall be cause for rejection.

4.4.2 Room temperature test. Sample wipers shall be mounted on a test stand and operated at room temperature 70°F to 85°F rated a.c. voltage at a speed of approximately 200 strokes per minute with the wiper blade at normal pressure against a wet glass for a period of 2 hours. The window shall be continuously sprayed with fresh water during the test. At no time during the test shall the motor frame exceed a temperature rise of 50°C and the gear case exceed a temperature rise of 70°C. Any wiper in the sample failing the operation test shall be cause for rejection of the lot.

4.4.3 Low temperature test. Sample wipers shall be operated in a cold room maintained at a temperature of 20°F, using a neoprene rubber wiper blade. An electrically heated window in accordance with MIL-W-18445 shall be used in connection with this test. The electrically heated window and wiper arm pivot heater should be turned on approximately 15 minutes before the test and should remain on for the test. A spray of fresh water shall be sprayed on the glass and the wiper operated for 30 minutes to determine its effectiveness in cold weather for removing rain and spray. Windshield wiper arm and pivot joint heater shall be examined for freedom from ice formation. Malfunction or ice formation shall be cause for rejection.

4.4.4 Power interruptions. Windshield wiper systems shall be subjected to the following tests:

- (a) With speed control set at high (fast speed), disconnect power source from control box. Reapply power. Repeat five times.
- (b) Repeat above test with speed control set at low (slow speed). No malfunctioning shall occur during or after test. Note: Time between applying and removing power shall be approximately 10 seconds.

4.4.5 Endurance test. One wiper shall be operated at room temperature ranging from 70°F to 85°F at a speed of 200 strokes per minute for a period of 1000 hours. Total length of arm from center of clevis bracket to center of wiper arm assembly shall be approximately 20 inches in length. A neoprene rubber wiper blade 16 inches long shall be attached to arm. Sweep angle shall be adjusted for a 60 to 70 degree sweep. A spray of 4 percent salt water solution (5.28 ounces of sodium chloride (salt) per gallon of water) shall be sprayed on the wiper and the glass throughout the test. Malfunctions, loose parts, erratic operation, or appearance of corrosion, etc. shall be cause for rejection.

4.4.5.1 Parking operation test. At the end of the endurance test (1000 hour period) (see 4.4.5), the windshield wiper system shall be tested for parking operation. This shall consist of a minimum of 100 cycles of parking operation at 5 second intervals. One cycle shall consist of operating the control from "OFF" to maximum speed, then through "OFF" to "PARK" and back to "OFF". Blade may be parked to right or left side alternately. No malfunction shall occur during or after test.

4.4.6 Water spray test. Windshield wiper drive housing assembly shall be mounted in a horizontal position (similar to usual installation position) and subjected to the following test:

- (a) With power applied and wiper operating, housing shall exclude at least 65 gallons per minute (gal/min) of fresh water from a 1-inch nozzle delivered from a distance not less than 10 feet for 5 minutes. Any malfunction of the system shall constitute a failure.

4.4.7 Salt water immersion test. Windshield wiper drive housing assembly for out-board installation shall be totally immersed in a tank of 4 percent salt solution at an approximate temperature of 70°F for a period of 5 minutes. After immersion test, voltage shall be applied to the wiper and it shall operate without malfunction. Wiper housing assembly shall then be opened and examined for presence of water. Amount of water in housing shall not exceed 5 cubic centimeters (cm³). Note: During immersion test, cable openings may be sealed. This test is not required for housing assemblies that are to be installed inboard.

MIL-W-3459C

4.4.8 Dry glass test. Wiper shall be operated on a dry window glass for 15 minutes or until the circuit breaker is activated to protect the motor at a speed of 200 strokes per minute without damage to the wiper. At the end of the test, wiper mechanism shall be disassembled and examined for wear and condition of lubrication. During above test, wiper blade may leave a minimal deposit of rubber on glass surface.

4.4.9 Motor protection test. The motor protection test shall be conducted as follows:

- (a) Place thermocouple or thermometer in contact with the stator insulation.
- (b) Record ambient temperature.
- (c) Energize motor via control equipment, with motor shaft prevented from rotating for 1 minute.
- (d) Set speed control knob for minimum speed.
- (e) Observe motor temperature rise and control equipment protective device for compliance with the requirements specified in 3.3.6.1.
- (f) Repeat at approximate midpoint setting of motor speed control.

4.4.10 Heated arm test. Drive arm assembly containing an encased electrical heating element shall be tested as follows:

- (a) While arm is clamped to a test fixture, 115 volts, a.c., 60 Hz power shall be applied to the heating element for a period of approximately 15 minutes. After this period of time a temperature indicating device shall be used to measure temperature of heated arm. Temperature shall comply with the requirements specified in 3.3.7.
- (b) While arm is hot and power removed, arm except leads shall be immersed in a tank of fresh water for a period of 10 minutes. After this period of time a megger reading (insulation reading using a 500 volt instrument) shall be taken between each lead and metal case. Readings shall be 5 megohms or greater.

4.4.11 EMI suppression test. Windshield wiper system shall be tested to determine compliance with the requirements of 3.3.2.

4.4.12 Vibration test. The first of identical units selected at the start of the contract from the first quality conformance inspection lot shall be tested in accordance with MIL-STD-167-1, type I vibration. Note: The type I vibration tests require that equipment be tested and that resonances be noted. Resonance is defined as that condition under which the vibration amplitude of the equipment under test is equal to or greater than 2.0 times the vibratory displacement values denoted as table amplitude. The total resonant frequency endurance test time shall be at least 2 hours. Thus, if a total of 12 resonant frequencies, as defined herein, are noted for the three test orientations, each of the 12 frequencies shall be endurance tested for at least 10 minutes.

4.4.13 Shock test. Windshield wiper system shall be shock tested in accordance with MIL-S-901, grade B. After completion of the test, the system shall be examined to determine that it conforms to grade B requirements.

4.4.14 Airborne noise measurements test. Windshield wiper system shall be subjected to airborne noise measurements and acceptance criteria as contained in MIL-STD-740 except as specified in 4.4.14.1 through 4.4.14.9.

4.4.14.1 Acceptance criteria. Airborne noise acceptance criteria are defined in terms of octave band sound pressure levels (see table V) that each item of equipment may be permitted to generate while operating at the maximum speed condition.

4.4.14.2 Octave band analysis instruments. Octave band sound pressure levels shall be measured with an omni-directional microphone and sound level meter conforming to ANSI S1.4 and ANSI S1.11, type E, class II (modified to conform to frequencies of S1.6), respectively. A combined sound level octave band analyzer conforming to the above requirements may be used. (If older instruments conforming to ANSI Z24.3 and ANSI Z24.10, respectively, are on hand, these may be used.) If tape recorders are used to preserve the broad-band noise output of transducers for later analysis, the complete system shall have a response known within plus or minus 2 dB over the required frequency range.

MIL-W-3459C

4.4.14.3 Airborne acceptance criteria. The octave band sound pressure levels specified in table V shall be used as a basis of acceptance for airborne noise of equipment. The contractor may perform narrower band analysis to identify any offending frequencies to aid in his corrective measures.

TABLE V. Airborne noise acceptance sound pressure levels dB.

Sound pressure level ref. 0.0002 microbar									
Center frequencies of standard octave bands									Hz
32	1/63	125	250	500	1000	2000	4000	8000	SL ^{2/}
	53	106	212	425	850	1700	3400	6800	value
27	81	76	73	The arithmetic average of the level in these three bands shall not exceed 61 dB			66	65	61

^{1/} These center frequencies are for use with octave band filter sets whose center frequencies do not conform to the ANSI S1.4 preferred numbers, but instead conform to ANSI Z24.10.

^{2/} Speech interference level.

4.4.14.4 Mounting equipment for test. For airborne measurements, equipment shall be oriented in a normal operating position. Resilient mounts may be used for the test. The resilient mounts must be contractor furnished. The vertical natural frequency of the mounted assembly shall be less than, or equal to, 1/4 of the lowest forcing frequency within the equipment. Resilient mountings conforming to MIL-M-17191, MIL-M-17508, MIL-M-19379, MIL-M-19863, or MIL-M-21649 shall be used where possible. The complete assembly should be supported on reinforced concrete or cast metal floor which is preferably in direct contact with the ground. Any pedestals required to accommodate the resilient mountings preferably should be of steel reinforced concrete. If mountings specified above cannot be used, the mountings used shall be in accordance with MIL-M-17185, and the command or agency concerned shall be advised of their use prior to the test.

4.4.14.5 Short report. A short report for each equipment tested is not required.

4.4.14.6 Drawing information. Drawing information necessary to restore wipers to designed level of quietness after overhaul, is not required.

4.4.14.7 Selection of unit. Airborne noise tests shall be conducted simultaneously with other quality conformance tests requiring operation of the equipment.

4.4.14.8 Shock protection. Shock protection requirements of MIL-STD-740 are not applicable.

4.4.14.9 Documentation. Documentation listing exceptions to the requirements which the bidder proposes in order to improve the quietness of the equipment, is not required. Outline of noise test facilities to be employed for airborne noise, and outline of any additional facilities proposed for installation to comply with the test is not required.

4.5 Test reports. The contractor shall prepare a test report in accordance with the data ordering document included in the contract or order (see 6.2.2).

4.6 Inspection of preparation for delivery. Preservation-packaging, packing, and marking shall be inspected for compliance with section 5 of this document.

5. PREPARATION FOR DELIVERY

5.1 Preservation-packaging, packing, and marking. Window wipers, accessories, attachments, manuals, and repair parts shall be preserved-packaged level A or C; packed level A, B, or C, and marked as specified (see 6.2.1) in accordance with MIL-E-17555.

MIL-W-3459C

6. NOTES

6.1 Intended use. Windshield wiper systems covered by this specification are intended to be used for clearing exterior surfaces of windows and windshields on ship's bridge, signal shelter, and other areas in ordinary and freezing weather conditions.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Mounting of wiper drive housing assembly either inboard or outboard (see 3.2.1).
- (c) Length of lower wiper arm assembly if other than overall length of 20 inches is desired (see 3.2.4.1).
- (d) Blade size required if other than 12 inches in length (see 3.2.4.2.1).
- (e) National stock number, if required (see 3.5).
- (f) Component identification number (see 3.5).
- (g) Repair parts required (see 3.7).
- (h) Level of preservation-packaging and packing required (see 5.1).

6.2.2 Data requirements. When this specification is used in a procurement which invokes the provision of the "Requirements for Data" of the Armed Services Procurement Regulations (ASPR), the data identified below, which are required to be developed by the contractor, as specified on an approved Data Item Description (DD Form 1664), and which are required to be delivered to the Government, should be selected and specified on the approved Contract Data Requirement List (DD Form 1423) and incorporated in the contract. When the provisions of the "Requirements for Data" of the ASPR are not invoked in a procurement, the data required to be developed by the contractor and required to be delivered to the Government should be selected from the list below and specified in the contract.

<u>Paragraph</u>	<u>Data requirements</u>	<u>Applicable DID</u>	<u>Option</u>
3.6.1	Drawings, engineering and associated lists	DI-E-7031	Level 2 Design activity designation-Contractor Drawing Number-Contractor Delivery of hard copies-Procuring activity Type I of MIL-M-15071
3.6.2	Technical manuals	DI-M-2050	
4.5	Test reports	DI-T-2072	-----

(Copies of data item descriptions required by the contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of the specification required to be performed to meet a data requirement may be waived by the procuring/purchasing activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item procured to this specification. This does not apply to specific data which may be required for each procurement regardless of whether an identical item has been supplied previously (for example, test reports).

MIL-W-3459C

6.3 Changes from previous issue. The margins of this specification are marked with "¶" to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Navy - SH
Air Force - 99

Review activities:

Navy - SH
Air Force - 85, 99

User activities:

Army - ME
Navy - CG

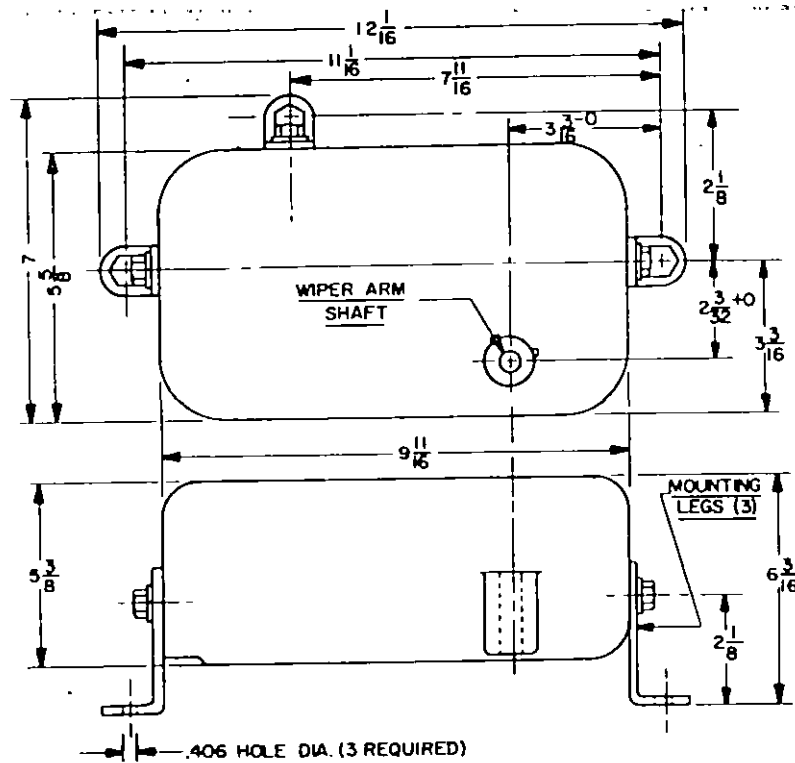
Preparing activity:

Navy - SH
(Project 2090-0072)

MIL-W-3459C

NOTES:

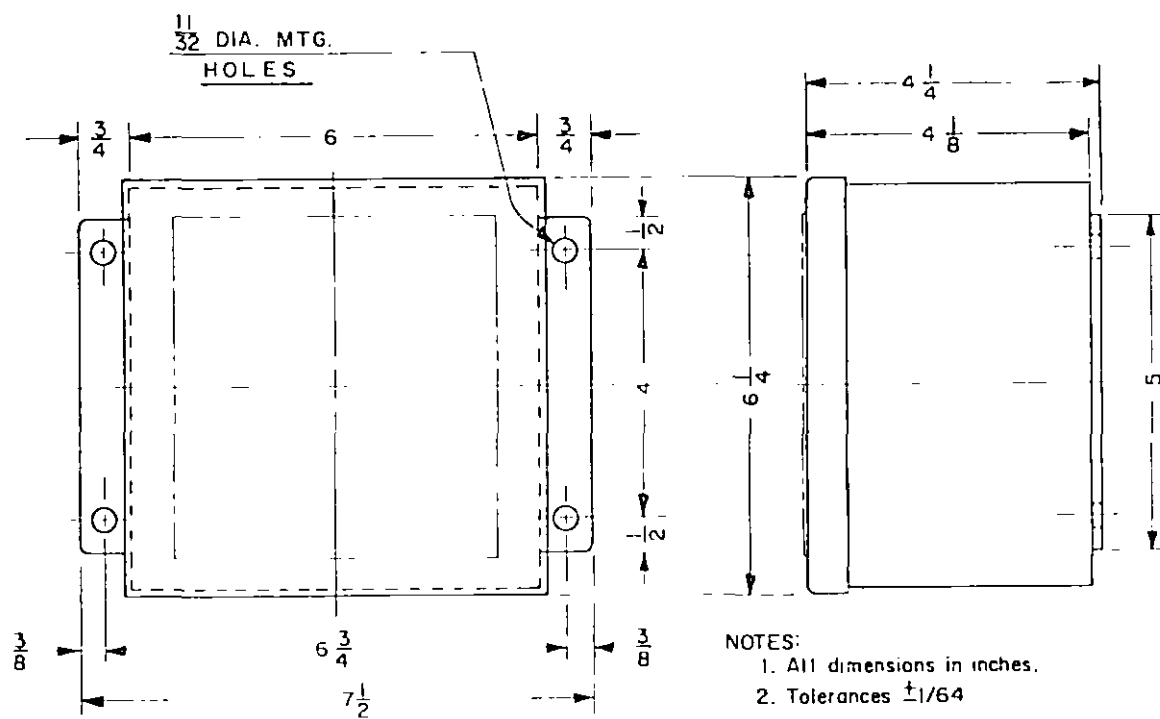
1. All dimensions in inches.
2. Tolerances within the envelope $\pm \frac{1}{64}$



SH 10702A

FIGURE 1. Wiper housing mounting holes and envelope dimensions.

MIL-W-3459C



SH 10703

U.S. GOVERNMENT PRINTING OFFICE: 1978 703 122/1733

FIGURE 2. Single control box mounting holes and envelope dimensions.

