

INCH-POUND

MIL-DTL-23581B(SH)

13 August 2009

SUPERSEDING

MIL-T-23581A(SH)

3 August 1992

DETAIL SPECIFICATION

TUMBLER, DRYING, LAUNDRY, COMMERCIAL (SUBMARINE SERVICE)

Reinstated after 13 August 2009 and may be used for new and existing designs and acquisitions.

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers 16-pound (minimum) capacity commercial laundry drying tumbler machines for use aboard submarines.

1.2 Classification. Drying tumblers are of the following types, as specified (see 6.2).

Type I – Shock qualified (see 3.7.5)

Type II – Not shock qualified (see 3.7.5)

1.3 Part or Identifying Number (PIN). PINs to be used for drying tumblers acquired to this specification are created as follows:

M	23581	-	X
Prefix for Military Specification	Specification Number		Type (see code below)
Code	Type		
1	- Type I: Shock qualified		
2	- Type II: Not shock qualified		

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05M2, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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DEPARTMENT OF DEFENSE SPECIFICATION

MIL-S-901 - Shock Tests. H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)

MIL-STD-740-1 - Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment

MIL-STD-740-2 - Structureborne Vibratory Acceleration Measurements Acceptance Criteria of Shipboard Equipment

MIL-STD-1399-300 - Electric Power, Alternating Current

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 45 - Electric Installation on Shipboard.

(Copies of this document are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331 or online at www.ieee.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Materials. Materials shall be as specified in 3.3.1 through 3.3.6.

3.3.1 Structure. Frame, base, and strength members shall be constructed of malleable iron, ductile iron, or steel and shall be hot dipped galvanized for corrosion protection. Gray cast iron or other brittle materials shall not be used for these parts. For Type I drying tumblers, gray cast iron may be used for components other than the frame, base, and strength members provided a machine so equipped meets the shock requirements specified in 3.7.5.

3.3.2 Housing. The housing shall be not less than 18 gauge sheet steel panels. Air guide baffles shall be not less than 22-gauge galvanized sheet steel.

3.3.3 Cylinder. Cylinder shall be galvanized steel sheet of not less than 18-gauge thickness.

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3.3.4 Resistance wire. Resistance wire for heating elements shall conform to the following requirements:

a. Chemical composition (nominal approximate):

Nickel	-	76.0 to 79.0 percent
Chromium	-	19.0 to 21.0 percent
Iron	-	1.0 (max.) percent
Manganese	-	2.5 (max.) percent
Carbon	-	0.25 (max.) percent
Silicon	-	0.75 to 1.50 (max) percent
Sulfur	-	0.03 (max) percent

b. Mechanical properties:

Tensile strength pounds per square inch – 100,000 minimum

Elongation in 10 inches – 15 percent minimum

3.3.5 Insulation. Insulation shall be of the rigid type or of fibrous glass batt type supported by cover panels.

3.3.6 Restricted materials. The drying tumbler shall be free from asbestos, wood, and cadmium materials.

3.4 Design.

3.4.1 General design. The drying tumbler shall be non-reversing, open end, once through, end loading type arranged so as not to recirculate the heated air. The tumbler shall be electrically heated and provided with a thermostat that can be varied by the operator. The drying tumbler shall meet the following disassembly and reassembly requirements:

a. The drying tumbler shall be constructed so that it can be readily disassembled into sections or parts that can be passed through a 30-inch diameter by 60-inch long cylinder and reassembled with a minimum of effort in the submarine laundry space.

b. Cutting of parts by torch or similar means to accomplish disassembly at the site, and reassembly of parts by welding or similar method, shall not be permitted.

3.4.2 Capacity. The machine shall accommodate or hold a load of not less than 16 pounds dry weight minimum capacity preload cotton clothing (see 6.2).

3.5 Construction.

3.5.1 Metal joints. Rivets, bolts, screws, nuts, and washers shall be of steel, except when brass or corrosion-resistant steel is fastened, in which case they shall be of brass or corrosion-resistant steel. Where dissimilar metals are fastened, rivets, bolts, screws, nuts, and washers shall be galvanically compatible with materials being joined. Electrodes or welding rods used for welding parts shall deposit material similar to the part base metal. Nuts subject to shock or vibration shall be self-locking.

3.6 Details of units or parts.

3.6.1 Frame. When assembled, the frame shall provide a rigid and durable support for the housing, cylinder, heating coils, fan, motor, and driving mechanism.

3.6.2 Housing. The entire unit shall be enclosed in a housing of sheet steel panels. Except for the air inlet, air outlet, door opening and access plates, the housing enclosing the cylinder shall be sealed to prevent air leakage. When closed or in place, door and access plates shall be sealed to prevent air leakage or disruption of air flow when the drying tumbler is in operation. Doors or access plates shall be provided for maintaining machinery and cleaning the machine. The upper and lower front panels of the drying tumbler shall be constructed and secured so that they are readily removable without the use of special tools or the need to disconnect wiring from component parts other than parts with plug type connectors, to facilitate lint removal between the cylinder and the housing and from the heating elements.

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3.6.3 Door. A loading door concentric with the cylinder opening shall be provided at the front of the housing. The door shall be insulated and configured to act as a baffle for retaining the load within the cylinder. The door shall be hinged and fitted with a latching handle and an electrical interlock to prevent operation of the cylinder when the door is not latched.

3.6.4 Cylinder. The cylinder shall be circular in shape and formed from perforated galvanized steel sheet. Perforations shall be staggered and not larger than $\frac{1}{32}$ -inch diameter. Perforations in the cylinder shall be free from burrs or imperfections that will damage clothing. The back of the cylinder shall be solid and the front end of the cylinder shall have a circular opening to match the recessed section of door in housing. The cylinder shall have an approximate diameter of 24½ inches and a length of 28 inches. Cylinder shall be driven through a steel gudgeon welded to a steel transmitter, which in turn is securely bolted to the rear cylinder head. The cylinder shall be fitted with lifting ribs of adequate number and size to properly tumble the clothing. Through tie-rods shall be installed within the lifting ribs to increase the rigidity of the cylinder.

3.6.5 Transmitter. The transmitter shall be made of steel, shall have spiders of sufficient number and length to support the cylinder under full load conditions, and shall be securely bolted to back sheet of cylinder and welded to the gudgeon.

3.6.6 Gudgeon. The gudgeon shall be made of steel of suitable strength and hardness to ensure safe and durable operation under full load conditions. The gudgeon shall be machined for proper fit with bearing sleeves at back of machine.

3.6.7 Cylinder bearings. The cylinder shall be supported at the rear by two widely spaced, heavy duty, ball or roller bearings. The bearings shall be of a readily renewable type and of sufficient capacity and durability to provide vibrationless rotation of the cylinder under full load conditions for not less than 5000 hours.

3.6.8 Fan. A fan of sufficient capacity to meet the drying requirements of 3.7.1 shall be provided.

3.6.9 Air ducts. Air ducts shall be sized to meet the requirements of 3.7.1.

3.6.10 Exhaust. An exhaust duct opening of ample size shall be provided for exhausting air after passage through the tumbler. The opening shall be provided with suitable fittings for connecting an exhaust air duct. The exhaust air flow capacity shall be 355 cubic feet per minute exhausted through a 6-inch diameter vent duct connection. The exhaust duct shall be located on the back left side of the machine, below center, when facing the back of the drying tumbler.

3.6.11 Drive adjustments. A means shall be provided for adjusting belts or chain drives.

3.6.12 Insulation. Except for external surfaces touched by the operator to operate the drying tumbler (e.g., door handle, control panel), external surfaces shall be insulated from the internal heat source so that not more than 15 percent of the outer housing surface exceeds a temperature of 35 °F above the ambient air temperature during the test (see 4.3.3.10). External surfaces touched by the operator to operate the drying tumbler shall not exceed 35 °F above the ambient air temperature during the test (see 4.3.3.10). Insulation shall be encased to hold the insulation in place and to prevent settling, crumbling, or flaking within the housing.

3.6.13 Size. Excluding appendages such as the door handle, knobs, etc., the overall maximum dimensions shall not exceed 26 inches wide by 40 inches deep by 40 inches high.

3.6.14 Electrical requirements. Unless otherwise specified in the contract or order, all electrical equipment shall conform to the requirements in IEEE 45 for electrical shipboard installation. Electrical equipment shall be designed for operation on a Type I electrical system as required in MIL-STD-1399-300. The control panel shall be dripproof. Pushbuttons and switches shall be arranged for safe and convenient operation. Wiring shall be arranged, protected, or insulated so that temperatures within the tumbler will not result in deterioration of the insulation and cause short circuits to occur. The machine shall operate on 440-volt, 3-phase, 60 Hertz electrical service. Electrical load shall be not greater than 19.5 kilowatts.

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3.6.14.1 Heating unit. Heating unit shall be electric and of sufficient capacity to durably and efficiently accomplish the drying requirements of 3.7.1. Heating elements shall be of the enclosed conduction type securely fastened in place to withstand vibration. The elements shall be embedded in a refractory material, preferably magnesium oxide. The resistance wire and the refractory material shall be enclosed in a seamless tubular corrosion-resisting metal sheath which shall firmly hold the wire and refractory material in place. The sheath material may be a nickel-chromium-iron alloy. The refractory material shall be tightly packed to prevent the wire from grounding to the sheath when subjected to bending, forming, shock, or vibration at points where connections are made. A length shall be left unheated to prevent damage to the connections and wire by overheating. The ends of the heating elements shall be effectively sealed and protected to prevent the entrance of moisture. Connections to the elements shall have locknuts and lockwashers or, if plug-in type elements are used, they shall be firmly secured in such a manner that they will not break loose because of heat expansion and contraction.

3.6.14.1.1 Heater voltage. Unless otherwise specified (see 6.2), heater elements shall be suitable for operation on 440-volt, 3-phase, 60 Hertz alternating current. Elements capable of operation on 220 volts, are permissible if two elements of equal resistance are wired in series. The use of a transformer to obtain necessary voltage shall be avoided. Heater elements shall be balanced on all three phases at rated voltage; watts input shall be within 5 percent of the heater's nominal rated capacity.

3.6.14.2 Motors. Motors shall be of dripproof construction and of such design and capacity to operate the equipment continuously at required speeds, under load, without exceeding allowable motor insulation temperature requirements.

3.6.14.2.1 Motor voltage. Unless otherwise specified (see 6.2), motors shall be suitable for operation on 440-volt, 3-phase, 60 Hertz alternating current.

3.6.14.3 Controls. Controls shall be conveniently located for the operator and shall be of dripproof construction. Conductors and contactors shall be of a size and design to adequately handle current loads to which subjected and provide durable service. Overload and low voltage protection shall be provided.

3.6.14.3.1 Temperature control. A thermistor type temperature controller shall control the temperature of the air within the drying chamber by cycling the heating elements ON when the temperature falls not greater than 10 °F below the set temperature setting and cycling the heating elements OFF when the set point temperature is attained. The controller temperature settings shall be variable from a minimum setting of 120 °F to a maximum setting of 185 °F. The thermistor shall be securely mounted and located immediately downstream of the cylinder exhaust air flow. A temperature display shall be provided for observation of the actual drying temperature. An indicator light shall be provided to indicate when the heating elements are energized.

3.6.14.3.2 Timer. A timer shall control the length of the drying cycle. The timer shall have a variable setting from 0 to 80 minutes. The timer shall either de-energize the heating elements for the last 5 minutes of the drying tumbler cycle, or at timer completion, thermostatically control drying tumbler cooldown until the drying chamber temperature drops to 135 °F before ending the drying cycle.

3.6.14.3.3 Safety thermostat. A high limit safety thermostat shall be installed immediately upstream of the exhaust duct to sense the temperature of the air leaving the drying tumbler. The thermostat shall be wired such that it will break power to the heating elements to prevent the heated air from exceeding 205 °F. The thermostat shall automatically restore power to the heating elements when the drying tumbler conditions are safe.

3.6.14.4 Machine wiring. All machine wiring connecting components between the front cover/face plate and devices internal to the drying tumbler shall be wired using plug connectors in order to provide convenient removal of the front cover/face plate for disassembly/re-assembly, maintenance, and repair.

3.6.15 Machine mounting. The machine shall be mounted to a deck foundation. Resilient mountings or springs shall not be used.

3.6.15.1 Machine mounting bolts and bolt holes. Bolt holes for mounting the Type I and Type II drying tumblers to the deck shall be located on the machine base and bolts shall be provided. Type I drying tumbler bolt holes and bolts shall keep the machine secured to the deck when subjected to the shock requirements specified in 3.7.5.

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3.6.16 Lint tray and screen. A lint tray shall be designed with a corrosion resistant lint screen. The screen mesh size shall be approximately no. 14. The screen shall be installed between the air exhaust flow from the drying cylinder and the fan. The screen shall be accessible and cleanable from the front of the drying tumbler.

3.7 Performance characteristics.

3.7.1 Drying efficiency. The drying tumbler shall remove moisture from the maximum load capacity soaked with water to a wet weight of 150 percent of the maximum bone-dry weight at a temperature of 70 ± 2 °F. The drying tumbler shall remove 95 ± 1 percent of the water from the load with a drying rate of 0.4 pound of water per minute (see 4.3.3.6).

3.7.2 Inclined operation. The machine shall operate normally up to and including 30 degrees of inclination when tested as specified in 4.3.3.2.

3.7.3 Vibration. The machine shall operate normally while being subjected to normal vibration levels, both internally and externally excited when tested as specified in 4.3.3.3. The machine shall be capable of performing its principle function after testing.

3.7.4 Airborne noise and structureborne vibration. The drying tumbler airborne noise shall be not greater than the acceptance criteria specified in table I of MIL-STD-740-1 for Grade D equipment. The drying tumbler structureborne vibratory acceleration shall be not greater than the acceptance criteria specified on figure 2 of MIL-STD-740-2 for Type III equipment.

3.7.5 Shock (Type I only). Drying tumblers shall meet the Grade B shock requirements of MIL-S-901 when tested as specified in 4.3.3.5 (see 6.2).

3.8 Finish and color. Exposed surfaces of the drying tumbler shall be painted with a heat resistant paint of a color and quality normally furnished on the manufacturer's commercial machines.

3.9 Identification plate. An identification plate shall be made of commercial corrosion-resisting steel or brass. All markings shall be legible.

3.9.1 Mounting. The identification plate shall be securely affixed to each machine in a conspicuous place.

3.9.2 Identification plate data. Data marked on the identification plate shall include the following:

- a. Manufacturer's name, type or model number, serial number, contract or order number, and date of manufacture.
- b. Salient design features including size, speed, voltage, current, and capacity in pounds-dry weight per load.
- c. PIN and National Stock Number (see 6.2).
- d. Component identification number (CID). The component identification number entry shall consist of the letters "CID", followed by a nine (9) digit number, which will be furnished upon receipt of provisioning technical documentation (PTD). No equipment shall be shipped without the CID number for the drying tumbler, and its associated components shall also be recorded on the packing list.

3.10 Workmanship. In general, workmanship shall be in accordance with industry practices and shall meet the following:

- a. Welds are cleaned and ground to present a uniform and smooth finish.
- b. All parts are tight and of rigid construction, including housing panels, so that the machine does not vibrate during operation.
- c. Cylinder both with load and without load does not wobble during operation.
- d. Access plates and doors are provided as necessary for proper maintenance, cleaning, and lubrication, and are of suitable size and properly located.
- e. Controls and door handles are suitably located and hazard free to the operator.
- f. All surfaces, including interior of cylinder, are free from burrs and sharp edges.
- g. Safety guards are configured and located to prevent injury to operating and maintenance personnel.

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- h. Chain and/or belt drive adjustment mechanisms are configured to provide proper tension and prevent slippage under normal operation.
- i. Bearings, gears, and shafts are properly designed, aligned, and fitted for durable operation.
- j. Lubrication fittings are fitted where necessary and are adequate for purpose intended.
- k. Fastenings are adequate and accomplish the purpose for which intended.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Conformance inspection (see 4.4).

4.2 Inspection conditions. Unless otherwise specified in the contract or order, all inspections shall be performed in accordance with the test conditions specified in this specification.

4.3 First article inspection. First article inspection shall be performed on the drying tumbler when a first article sample is required (see 3.1). First article inspection shall consist of the examinations specified in table I and tests specified in 4.3.2 and 4.3.3.

TABLE I. Classification of defects.

Examine	Defect (requirement)	Classification	
		Major	Minor
Material	Construction materials not as specified (see 3.3 & 3.5.1).	X	
Design, general	Design not as specified (see 3.4.1 and 3.4.2).	X	
Temperature control	Not as specified (see 3.6.14.3.1).	X	
Indicator light	Not provided, not as specified (see 3.6.14.3.1).	X	
Timer	Not provided, not as specified (see 3.6.14.3.2).	X	
Door interlock	Not provided, not as specified (see 3.6.3).	X	
Timed cooldown	Not provided, not as specified (see 3.6.14.3.2).	X	
Capacity and size	Machine not designed for 16 pounds dry weight capacity (see 3.4.2).	X	
	Machine exceeds dimensions (see 3.6.13).	X	

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TABLE I. Classification of defects – Continued.

Examine	Defect (requirement)	Classification	
		Major	Minor
Construction/ mechanical	Frame not as specified (see 3.6.1).	X	
	Housing not as specified (see 3.6.2).	X	
	Door not as specified (see 3.6.3).	X	
	Cylinder not as specified (see 3.6.4).	X	
	Transmitter not as specified (see 3.6.5).	X	
	Gudgeon not as specified (see 3.6.6).	X	
	Cylinder bearings not as specified (see 3.6.7).	X	
	Fan not as specified (see 3.6.8).	X	
	Air ducts not as specified (see 3.6.9).	X	
	Exhausts not as specified see (3.6.10).	X	
	Drive adjustments not as specified (see 3.6.11).	X	
	Insulation not as specified (see 3.6.12).	X	
	Heating assembly not provided as specified (see 3.6.14.1 and 3.6.14.1.1).	X	
	Machine mounting not as specified (see 3.6.15 and 3.6.15.1)	X	
	Lint tray and screen not provided, not as specified (see 3.6.16).	X	
Construction/ electrical	Electrical requirements are not as specified (see 3.6.14).	X	
	Motor not as specified (see 3.6.14.2 and 3.6.14.2.1).	X	
	Controls not as specified (see 3.6.14.3)	X	
	Machine wiring not as specified (see 3.6.14.4)	X	
Safety features	Safety thermostat not as specified (see 3.6.14.3.3).	X	
Identification	Identification plate not of specified material (see 3.9).		X
	Marking illegible (see 3.9).	X	
	Identification plate not provided, as specified (see 3.9).	X	
Workmanship	Surfaces of cylinder are not free of burrs and sharp edges (see 3.10).		X
	Welds not buffed (see 3.10).		X
	Surfaces are not free from burrs, sharp edges (see 3.10).		X

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4.3.1 First article sample. Prior to the start of production and within 30 days after the date of award of the contract or order, one machine of each design and size shall be made ready for approval of the contracting officer or his authorized representative to conduct the tests and examinations specified in table I and 4.3.2 and 4.3.3 (see 6.3). Approval of the tested sample by the contracting officer or his authorized representative shall not relieve the supplier of the responsibility of compliance with the requirements of this specification. Disposition of first article sample shall be in writing at the direction of the contracting officer or designated representative (see 6.2).

4.3.2 Contractor tests. Prior to the submission of the first article sample for inspection, the manufacturer shall subject the machine to the test of 4.3.3.9 (see 6.3).

4.3.3 Inspection tests.

4.3.3.1 Disassembly. Prior to conducting the inspection tests the sample machine shall be disassembled to the extent required and the component parts passed through a 30-inch diameter by 60-inch long cylinder. Machine shall then be reassembled for testing.

4.3.3.2 Inclination. The machine shall be inclined and operated at an angle of 30 degrees to each side of two vertical planes at right angles to each other. The machine shall operate satisfactorily in each of the four positions.

4.3.3.3 Vibration tests. The machine shall be tested without packaging or crating.

4.3.3.3.1 Vibration testing. The drying tumbler under full load conditions shall be subjected to Type I vibration test in accordance with MIL-STD-167-1, except the variable frequency tests are not required.

4.3.3.4 Airborne noise and structureborne vibration. Unless otherwise specified, the airborne noise and structureborne vibration acceleration testing shall be conducted in accordance with MIL-STD-740-1 and MIL-STD-740-2, respectively. The unit shall be tested on a single layer of Distributed Isolation Material (DIM) mount, designed in accordance with guidance provided by NSWCCD Code 9840, in lieu of the low frequency resilient mounts described in 5.5.1 of MIL-STD-740-1 and 5.6.1 of MIL-STD-740-2.

4.3.3.5 Shock testing (Type I only). One configuration of the drying tumbler being qualified shall be subjected to a shock test in accordance with MIL-S-901 as follows:

- | | | |
|-----------------------|---|--|
| a. Shock grade | - | Grade B |
| b. Equipment class | - | Class I |
| c. Test category | - | Medium weight |
| d. Shock test type | - | Type A |
| e. Failure definition | - | Any part of drying tumbler coming adrift or separating from tumbler constitutes failure of test. |
| f. Mounting | - | Drying tumbler mounting location, plane, and orientation for testing on the test fixture shall simulate the most severe mounting condition likely encountered in an actual shipboard installation as recommended by the contractor and approved by the accepting government authority. |
| g. Mode | - | Equipment shall not be energized or operating during test. |
| h. Disposition | - | Equipment to be disposed by contractor, and not delivered as part of this contract. |
| i. Quantity for test | - | 1 each |

4.3.3.6 Drying efficiency. Test cloths shall be prepared from a white cotton fabric of uniform texture and permanent finish, having a warp of 48, a weft of 48, and weighing not less than 0.33 pound per square yard. Permanent finish, sanforized, white cotton cloth, known as Indianhead cloth may be used. The test cloths shall be cut to 24 by 36 inches and shall be double-hemmed to a finished size of 22 by 34 inches. A test load shall consist of 16 pounds dry weight of test cloths soaked with water to a wet weight of 150 percent of the dry weight. The dry weight of test cloths shall be determined at a temperature of 70±2 °F. An average of 10 runs shall be used to evaluate the drying efficiency of the machine (see 3.7.1). The ambient conditions where the tests are to be conducted shall be 75±10 °F and 60±20 percent relative humidity.

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4.3.3.7 Overall construction and performance. The drying tumbler shall be tested to determine conformance to the following requirements:

- a. Timer - 0 to 80 minutes operation (see 3.6.14.3.2).
- b. Cooldown - Automatic to 135 °F (see 3.6.14.3.2)
or
Last 5 minutes of timer operation (see 3.6.14.3.2).
- c. Thermostat - 120 to 185 °F operation (see 3.6.14.3.1).
- d. Temperature display - Operation (see 3.6.14.3.1).
- e. Door interlock - De-energizes cylinder drive motor when loading door is opened (see 3.6.3).
- f. Door - Configuration adequate to retain clothing within the cylinder (see 3.6.3).

4.3.3.8 Power input. Motors shall not draw in excess of rated current after accelerating to full speed.

4.3.3.9 Insulation. The insulation resistance of each motor, electric component and connecting cable shall be measured by a 500-volt direct current insulation resistance tester. Insulation resistance of each component shall be not less than 10 megohms.

4.3.3.10 Surface and handle temperature test. Each exterior surface of the drying tumbler shall be divided into 6- by 6-inch equal areas on each panel. Areas less than 18 inches squared should be combined with the adjoining 6- by 6-inch area. Areas equal or greater than 18 inches squared shall be treated as a full 6- by 6-inch area. Surface temperatures shall be measured at the center of each area, and the areas explored for the maximum temperature. The temperatures of all exterior surfaces contacted by the operator shall also be measured (e.g., handles, latches, controls, etc.) Temperature measurements shall be taken by a calibrated indicator potentiometer connected to a J or K type thermocouple. The drying tumbler shall be loaded with test loads as specified in 4.3.3.6. Each test load shall be dried at the maximum temperature and for the maximum time. Just before the thermostat functions off for the third load, temperature readings shall be taken. The ambient air temperature for the test shall be between 65 and 75 °F (see 3.6.12).

4.3.3.11 Limiting devices. A thermocouple shall be mounted in the exhaust outlet. For the tests specified herein, the drying tumbler indicator light shall be used to indicate when the heating elements are energized (ON) and de-energized (OFF) during the tests. The drying tumbler shall be placed into operation at the maximum temperature setting with a full test load as specified in 4.3.3.6. The thermistor temperature controller shall cycle the heating elements ON when the temperature falls not greater than 10 °F below the maximum temperature setting and shall cycle the heating elements OFF at the maximum temperature setting. After one full operation at the maximum temperature setting, the drying tumbler shall be placed into operation at the maximum temperature setting with a full test load as specified in 4.3.3.6. The drying tumbler shall be placed into failure of primary drying thermostat operational condition until the heating elements are automatically de-energized by the safety thermostat. The time and thermocouple temperature at which the drying tumbler heating elements are de-energized shall be recorded. Record the time and thermocouple temperature at which the safety thermostat automatically energizes the heating elements following their automatic shutdown. The thermocouple temperature shall not exceed 205 °F during any part of the test runs. Upon conclusion of each test, a visual inspection of the test load shall be conducted. The test load shall be free of any scorching damage.

4.4 Conformance inspection. Conformance inspection shall consist of the examinations of 4.4.2 and the tests of 4.4.3.

4.4.1 Lot. For the purpose of quality conformance inspection and test sampling, a lot is defined as all the machines of one type, produced in one facility, using the same material and production processes, and being offered for delivery at one time.

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4.4.2 Sampling for visual and mechanical examination. A random sample of machines shall be selected in accordance with table II and examined in accordance with table I. If one or more major defects are found in any sample, the entire lot shall be rejected. The contractor has the option of screening the lot 100 percent for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with the sampling plan contained herein.

Table II. <u>Sampling for visual and mechanical examination and operational tests.</u>	
Lot Size	Sample Size
2 to 8	All
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27

4.4.3 Sampling for operational tests. A random sample of machines shall be selected in accordance with table II and tested in accordance with 4.4.3.1 and 4.4.3.2. If any machine fails any of the tests specified in 4.4.3.1 or 4.4.3.2, the entire lot shall be rejected. The contractor has the option of screening the lot 100 percent for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with the sampling plan contained herein. The contractor shall maintain all records of inspections, tests, and any resulting rejections for a period of three years after contract completion.

4.4.3.1 Operational testing. Each tumbler shall be connected to power and operationally tested without garments or laundry. The following items and operations shall be checked:

a. Manual selection of temperatures in accordance with requirements of 3.6.14.3.1 shall be verified by conducting tests at the minimum setting, maximum setting, and 4 randomly selected settings between the maximum and minimum temperature settings. Verification of temperature compliance at each of the six test settings shall be by visually observing the temperature display and indicator light to determine that the set point temperature is attained and that the heating elements are not energized above the set point temperature. The temperature setting, maximum display temperature observed during the test, and whether the heating elements were energized above the set point temperature shall be recorded for each test.

b. Selection of drying times in accordance with requirements of 3.6.14.3.2 shall be verified by conducting tests at the minimum setting, maximum setting, and 4 randomly selected settings between the maximum and minimum timer settings. Verification of timer compliance at each of the six test settings shall be checked using a stopwatch to measure the time between the start and stop of the drying tumbler. The timer setting and the actual run time shall be recorded for each test.

4.4.3.2 Insulation testing. Insulation resistance testing shall be conducted on each machine. Insulation resistance of motor, controller, and connecting cable shall be measured by a 500-volt direct current insulation resistance tester. Insulation resistance for each component shall be not less than 10 megohms. Failure to pass the insulation resistance test is cause for rejection of the entire lot.

4.5 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Commercial laundry drying tumblers acquired under this specification are intended for submarine service. Type I drying tumblers are for use in applications requiring underwater explosion shock resistance and may also be used in Type II drying tumbler applications. Type II drying tumblers are for use only in applications that do not require underwater explosion shock resistance. Commercial machines offered to the Government may require alteration to meet specification requirements, such as, mounting provisions, electrical power, and materials.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type required (see 1.2)
- c. First article, when required (see 3.1).
- d. Capacity and size of machine required (see 3.4.2 and 3.6.13).
- e. Electrical characteristics (see 3.6.14.1.1 and 3.6.14.2.1).
- f. Disposition of first articles (see 4.3.1).
- g. Shock test, when required (see 3.7.5).
- h. National Stock Number (NSN) (see 3.9.2.c).
- i. Packaging (see 5.1).
- j. Provision Technical Documentation (see 6.5).

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3.1. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 NAVSEA approval and direction. Deviations from specified materials, procedures, and requirements and selection of specific alternative materials and procedures require NAVSEA approval or direction. Request should include supporting documentation.

6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract (see 6.2). When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

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6.6 Subject term (key word) listing.

Clothes dryer

End loading

Resistance wire

Temperature control

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:

Navy – SH

(Project 3510-2008-008)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.