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FEDERAL SPECIFICATION

DISHWASHING MACHINES, COMMERCIAL (RACKLESS CONVEYOR)

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers fully-automatic, multiple-tank, spray-type dishwashing machines equipped with rackless conveyors for holding dishes and trays in an inclined position without prior racking. The machines shall also be capable of accommodating standard dishwashing racks when preracking of cups, glasses, and flatware cylinders is desired or required.

1.2 Classification.

1.2.1 Types, sizes, styles, groups, and feed directions. The dishwashing machines shall be of the following types, sizes, styles, groups, and feed directions, as specified (see 6.2):

Type I - Multiple tank without prewash
Type II - Multiple tank with recirculating prewash
Type III - Multiple tank with high-capacity, recirculating prewash

Size 7500 - Nominal operating capacity of 7500 dishes per hour
Size 9250 - Nominal operating capacity of 9250 dishes per hour
Size 10250 - Nominal operating capacity of 10250 dishes per hour
Size 11500 - Nominal operating capacity of 11500 dishes per hour
Size 13000 - Nominal operating capacity of 13000 dishes per hour
Size 15000 - Nominal operating capacity of 15000 dishes per hour
Size 18000 - Nominal operating capacity of 18000 dishes per hour

Style 1 - Steam heated.
Style 2 - Electrically heated

Group 1 - 20- to 31-inch conveyor width, inclusive
Group 2 - 20- to 26-inch conveyor width, inclusive
Group 3 - 27- to 31-inch conveyor width, inclusive

Feed direction LR - Conveyor feed left to right
Feed direction RL - Conveyor feed right to left

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

P-D-1800 - Dishwashing Compound, Machine
QQ-N-281 - Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections
QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings
WW-V-51 - Valve, Angle, Check, and Globe Bronze (125, 150, and 200 Pound; Threaded End, Flanged Ends, Solder Ends, and Brazed Ends for Land Use)
WW-V-54 - Valve, Gate, Bronze (125, 150, and 200 Pound, Screwed, Flanged, Solder End, for Land Use)

Federal Standards:

FED-STD-H28 - Screw Threads for Federal Services
FED-STD-123 - Marking for Shipment (Civil Agencies)

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-V-173 - Varnish, Moisture-and-Fungus-Resistant, (for Treatment of Communications, Electronic, and Associated Equipment)
MIL-V-1202 - Valve, Globe; Valve, Angle; Valve, Cross; Bronze, Regrindable-Renewable Types
MIL-M-11495 - Meter, Detergent Concentration for Dishwashing Machines

MIL-R-24039 - Racks and Cylinders for Mechanical Dishwashing Machines
MIL-I-43728 - Injector, Rinse, Automatic, for Commercial Dishwashing Machines
MIL-D-43729 - Dispensing Unit, Detergent, Automatic, for Commercial Dishwashing Machines
MIL-K-43875 - Kitchen Equipment, Including Unit Assemblies, Repair Parts and Tools; Preparation for Delivery of

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

(Copies of military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Federal Regulations:

Occupational Safety and Health Administration (OSHA):

Title 29, Code of Federal Regulations, Chapter XVII: Part 1910. Occupational Safety and Health Standards

"(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)"

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.

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI):

ARI 410 - Standard for Forced Circulation Air Cooling and Air Heating Coils

(Application for copies should be addressed to the Air-Conditioning and Refrigeration Institute, 1815 North Fort Myer Drive, Arlington, VA 22209.)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI):

S1.4 - Specification for Sound Level Meters
S1.13 - Methods for the Measurement of Sound Pressure Levels

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME):

Section 8 Pressure Vessels, Division I

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A120 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless for Ordinary Use
B164 - Nickle-Copper Alloy, Rod and Bar
B167 - Stainless and Heat Resisting Chromium Nickel Steel, Plate, Sheet and Strip
B302 - Threadless Copper Pipe
C553 - Mineral Fiber Blanket and Felt Insulation (Industrial Type)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

ICS 2 - Industrial Control Devices, Controllers and Assemblies
MG 1 - Motors and Generators

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street, N.W., Washington, DC 20037.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

No. 70 - National Electrical Code

(Application for copies should be addressed to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.)

NATIONAL SANITATION FOUNDATION (NSF):

No. 3 - Spray-Type Dishwashing Machines
No. 5 - Hot Water Generating Equipment for Food Service Establishments Using Spray-Type Dishwashing Machines

(Application for copies should be addressed to the National Sanitation Foundation, NSF Building, 3475 Plymouth, Ann Arbor, MI 48106.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE):

J534 Lubrication Fittings.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

UNDERWRITERS LABORATORIES INC. (UL):

Electrical Appliance and Utilization Equipment List
73 - Motor Operated Appliances
921- Commercial Electric Dishwashers

(Application for copies should be addressed to the Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.)

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Description. The dishwashing machines shall be of the multiple-tank without prewash, rackless conveyor-type consisting essentially of a loading section, a pumped wash section, a pumped rinse and final rinse section, and an unloading section. In addition, type II and III machines shall include a recirculating prewash section. The identification of the sections specified herein shall be established on the basis of the functions performed. Reference to sectional construction does not imply that machines must necessarily consist of identifiable, individual, separable sections assembled to form a composite machine. Each dishwashing machine shall include a rackless conveyor system and all tanks, pumps, motors, piping, valves, controls, and appurtenances necessary to form a complete, automatic, dishwashing machine. The conveyor widths for the dishwashing machines shall likewise be within the specified ranges; the particular width within the applicable range to be in accordance with the manufacturer's standard practice. Other options, such as style, size, and feed direction shall be as specified in the contract or order. When specified (see 3.13, 6.2, and 6.3.4), a blower/dryer shall be provided.

3.2 First article. When specified (see 6.2), the contractor shall furnish a complete diswashing machine for first article inspection and approval (see 4.2.1 and 6.4).

3.3 Safety and health requirement. The machine shall be equipped with safety devices for all parts that present safety hazards. The devices shall include cover and guards for moving parts and shockproof controls for protection from mechanical and electrical hazards to personnel. All guards shall provide easy access to guarded parts and shall not interfere with operation of the machine. Except as otherwise specified by the procuring activity, the machine shall comply with standards promulgated under OSHA, Title 29, Code of Federal Regulations, Chapter XVII: Part 1910, which are applicable to the machine itself.

3.4 Standards compliance. Dishwashing machines shall conform to UL 73, UL 921, NSF No. 3 and No. 5. Steam coils in the blower/dryer used for heating air shall be in accordance with ARI 410.

3.4.1 Certification. Prior to approval of the first article, if one is submitted or prior to approval of the first shipment, the contractor shall submit satisfactory evidence to the contracting officer or his authorized representative that the dishwashing machine he proposes to supply under this specification meets the requirements of UL 73, UL 921, NSF No. 3 and No. 5, and the steam coils meet the requirements of ARI 410.

3.4.2 UL certification. Acceptable evidence of meeting the requirements of UL 73 and UL 921 shall be the UL label, listing in the UL Electrical Appliance and Utilization Equipment List, or a certified test report from a nationally recognized independent testing laboratory, acceptable to the contracting officer, stating that the dishwashing machine offered has been tested and conforms to UL 73 and UL 921.

3.4.3 NSF certification. Acceptable evidence of meeting the requirements of NSF No. 3 and No. 5 shall be the NSF seal on the finished dishwashing machines, inclusion in the current edition of the NSF Listing of Food Service Equipment, or a certified test report from a recognized independent testing laboratory acceptable to the medical department of the service for which the dishwashing machines are being procured, indicating that a dishwashing machine of the same model that is being furnished under this specification has been tested and conforms to NSF No. 3 and No. 5.

3.4.4 ARI certification. Acceptable evidence of meeting the requirements of ARI 410 shall be the ARI seal on the blower/dryer, indicating that the steam coils for heating air have been tested in accordance with ARI 410.

3.4.5 Applicability. The dishwashing machines shall meet the dimensional requirements, tank capacities, pumping rates, conveyor characteristics, and all other requirements of this specification. The contractor shall select the machine to be offered as meeting these requirements from his models which have an NSF-approved operating capacity not less than the nominal capacity specified herein. This capacity shall be attainable without exceeding the listed conveyor width or speed under which the NSF approval was granted. Machines which have NSF-approved hourly dish handling capacities complying with this specification but which in other respects do not meet the requirements herein will not be acceptable.

3.5 Interchangeability. All dishwashing machines of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

3.6 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw

materials. None of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification unless otherwise specified.

3.6.1 Corrosion-resistant steel. Corrosion-resistant steel shall meet the requirements of ASTM B167 stainless steel type 300 series.

3.6.2 Nickel-copper alloy. Nickel-copper alloys shall meet the requirements of QQ-N-281, QQ-N-288, or ASTM B164.

3.6.3 Copper-nickel alloys. Copper-nickel alloys shall contain not less than 14 percent nickel and 60 percent copper.

3.6.4 Nickel-bearing cast iron. Nickel-bearing cast iron shall be a high alloy, corrosion-resistant cast iron containing not less than 14 percent nickel.

3.6.5 Galvanized steel. Galvanized steel pipe shall meet ASTM A120.

3.7 Design and construction. The dishwashing machines shall meet the design and construction requirements of NSF No. 3 and No. 5. The design shall also insure compliance with the performance requirements of this specification. The machines shall be so designed and constructed that pumps, conveyor motors, steam boosters, and blower/dryers, when furnished, do not extend beyond the limits of the loading or unloading sections. The dishwashers shall have a vertical clearance of at least 18 inches above the part of the conveyor on which the dishes and trays are supported and at least 15 inches above the top of the peg links unless otherwise specified (see 6.2). Other dimensions of the machines shall be as specified in table I. The dishwashing machines shall be designed and equipped to automatically maintain the following water temperatures during washing operations:

a. Prewash (types II and III) - 110 degrees Fahrenheit (°F) to 140°F
b. Pumped wash - 150°F to 160°F
c. Pumped rinse - 160°F to 180°F
d. Final rinse - 180°F to 195°F

The machines shall be so constructed that water will not splash or overflow to the outside of the machine, either around the doors, other access openings, or the ends of the machine.

3.8 Performance. The dishwashing machines shall be capable of effectively washing and sanitizing dishes by means of the spray wash and rinse cycles, and when applicable, the prewash cycles specified herein. The machines shall meet the performance requirements of table II and shall comply with the applicable functional requirements of NSF No. 3 not specifically covered herein. The specified performance (see 4.5.1) shall be attained under the following applicable operating conditions prevailing at the site:

a. Water supply pressure: In the range of 35 to 60 pound-force per square inch gauge (psig) unless otherwise specified (see 6.2).
b. Hot service water temperature: 140°F unless a higher temperature is specified (see 6.2).

c. Steam pressure: 10 to 15 psig unless high pressure steam in the range of 16 to 50 psig is required for shipboard applications (see 6.2).

3.8.1 Prewash. The prewash section on type II and III machines shall be of the recirculating type and shall be designed and equipped to remove food particles and excess grease from dishes prior to their entry into the wash zone. Makeup water to the prewash tank shall be supplied primarily from the wash tank overflow to provide some degree of detergent concentration in the prewash tank. Additional makeup water may be supplied by overflow from the pumped rinse tank. The total makeup water to the prewash tank shall be at least 2 gallons per minute (gpm). When specified (see 6.2 and 6.3.5), the prewash section shall be equipped with an automatic tempering valve designed to provide a flow of cold water to the prewash tank to maintain the water therein at a specified temperature in the range of 80°F to 120°F.

3.8.2 Pumped wash and pumped rinse. The pumped wash and pumped rinse on all machines shall meet the applicable performance requirements of NSF No. 3 and No. 5 with respect to pressures, cycle times, and spray patterns. Pumping rates shall meet or exceed the minimum volumes specified in NSF No. 3 and No. 5 and shall be in accordance with table II. Makeup water for the wash and rinse tanks shall be supplied directly from the piping system supplying the fresh water rinse from the used final rinse supply piping and shall not exceed 2 gpm. An adjustable device shall be furnished in the final rinse supply system to automatically control the makeup flow rate to the wash and rinse tanks.

3.8.3 Final rinse. The final rinse shall be supplied with fresh water from a source external to the machine. The required rinse water shall be supplied through a hot water heater capable of maintaining a water temperature measured at the final rinse manifold of 180°F to 195°F (see 3.10). The final rinse section shall be equipped with a device, referred to commercially as a rinse saver, which shall cause the rinse spray to operate only when dishes or other tableware items are passing through the machine.

3.8.4 Noise level. Unless otherwise specified (see 6.2 and 4.5.3), equipment noise level shall conform to current industry standards except that the noise exposure for 8 hours shall not exceed 80 decibels at the operator's position when measured in accordance with ANSI S1.13 on the A scale of a sound level meter conforming to ANSI S1.4. The operator's position shall be 1-1/2 feet from the loading or unloading end of the dishwasher and 5 feet above the floor.

3.9 Details of components. The dishwashing machines shall consist essentially of the following basic components and assemblies:

a. Base with legs and adjustable feet
b. Hood enclosure for wash, rinse, and when applicable, prewash sections
c. Access doors
d. Loading section
e. Unloading section
f. Tanks
g. Tank heaters

h. Booster heaters
i. Pumps
j. Conveyor system
k. Spray assemblies
l. Scrap trays
m. Splash curtains
n. Vent connections

3.9.1 Base, legs, and feet. Each machine shall include a leg-mounted base to support other components and segments of the machine, such as the upper framing, hood, tanks, pumps, controls, and steam booster heaters. The base shall be constructed of solid steel plate; heavy gauge structural, seamless, or electric resistance welded steel tubing; structural steel angle, channel, or other structural shape; or of any combination of these elements. The base shall be supported on corrosion-resistant steel legs with adjustable corrosion-resistant steel feet. Both the legs and feet shall be of NSF-approved construction.

3.9.2 Hoods and doors. The wash, power rinse, final rinse, and when applicable, prewash sections of the dishwashing machines shall be completely enclosed by a corrosion-resistant steel hood with access doors. The hood shall extend from the base as described in 3.8.1 to the top of the machine. The pre-wash, wash, and rinse sections shall each be provided with a separate access door, the wash and rinse doors each to be not less than 18 inches wide. Separate access openings shall be furnished as necessary to meet the cleanability requirements of NSF No. 3 and No. 5 and to provide access for servicing, maintenance, and lubrication of the machine. Doors shall be of the hinged or vertical sliding type and shall be equipped with rigid, non-absorbent, low-heat-conductive handles. A slotted or perforated drain channel shall be provided under sliding doors. Unless counterbalanced, doors shall be equipped with positive-latching safety catches to hold the doors in the open position when access to a section for inspection or cleaning is required. All hoods, doors, and other access openings shall be fabricated of corrosion-resistant steel of a thickness not less than 16 gauge, except that doors of box-type construction may be 20 gauge.

3.9.3 Loading and unloading sections. Each machine shall be furnished with a loading and an unloading section. Unless otherwise specified (see 6.2), the length of the loading section shall be not less than the applicable dimensions specified in table I. Unloading sections shall be furnished in the standard length applicable to the size of machine being furnished as specified in table I unless a longer length is specified in the contract. The loading section shall be equipped with a suitable strainer tray, means for drainage, and clean-out access doors. The unloading section shall be equipped with an access door and a shut-off bar to automatically stop the conveyor in the event a dish, tray, or other item is not unloaded and makes contact with the shut-off bar. The height of the loading and unloading sections at the extremities shall be within the range 34 to 37 inches to facilitate ready adaption of the conveyor system for use with standard dish tables. Dish-stacking platforms at the ends of the loading and unloading sections which raise the height above 37 inches shall be removable. The loading and unloading sections shall be enclosed on the sides and ends by a corrosion-resistant steel sheet not less than 16 gauge thick.

3.9.4 Tanks. Tank capacities shall be as specified in table II and shall be measured up to the fill level recommended by the manufacturer, but in no case above the overflow level. Tanks shall be constructed of corrosion-resistant steel not less than 16 gauge thick. The pumped wash and pumped rinse tanks shall be equipped with an automatic fill valve with manual bypass. Over-flow pipes in the wash, rinse, and when applicable, the prewash tanks shall provide a skimming perimeter of at least 10 inches and shall either be removable or equipped with a removable cover. The top of the overflow pipe shall be at least 1 inch below the bottom of the scrap trays or strainers. All interior tank fittings shall be a corrosion-resistant metal or a plastic material normally used by the manufacturer on his NSF-approved machines.

3.9.5 Tank heaters. Steam injectors shall be corrosion-resistant steel, nickel-copper alloy, copper-nickel alloy, or nickel-bearing cast iron. Electric immersion heaters shall be corrosion-resistant steel sheathed. All tank heaters shall be thermostatically controlled to automatically maintain the specified tank water temperatures. The circuits for electric immersion heaters shall include a magnetic contactor and an automatic, low-water, cutoff. When specified (see 6.2), corrosion-resistant steel, thermostatically-controlled steam coils shall be furnished on style 1 machines for tank heating in lieu of steam injectors. The steam coil piping shall include a steam trap for removal of air and condensate. The total rated capacity of all electric immersion heaters furnished on one machine shall be not less than 30 kilowatts (kw) and not more than 50 kw.

3.9.6 Booster heaters. Booster heaters shall automatically maintain the required final rinse water temperature without producing steam either within the heater or the piping connected to the heater. The booster heaters shall be mounted in the unloading section or other section to form an integral component of the machine unless separate mounting is specified (see 6.2). The booster heaters shall be equipped with means for complete drainage. When separate, stand-mounted boosters are specified, the exterior shell shall be covered by not less than a 1-inch thickness of insulation conforming to ASTM C553 type 1 class B-3 and have a protective sheet metal jacket. Booster heaters shall conform to the requirements of NSF No. 5.

3.9.7 Pumps. Each wash, rinse, and prewash section shall be individually equipped with an electric motor driven, centrifugal recirculation pump. Pumps shall be furnished with mechanical seals and removable inspection and cleanout plates. Pumps shall meet the capacity requirements of table II, and shall be capable of maintaining sufficient pressure in the spray manifolds to meet the cleanability criteria of NSF without dislodgment of dishes, trays, and other items from the normally inclined washing position. Pumps and associated piping shall either be self-draining or equipped with means for draining. Pump casings shall be cast iron or nickel-bearing cast iron. Pump shafts shall be corrosion-resistant steel or nickel-copper alloy. Impellers shall be of the semiopen or open, nonclogging type, shall be corrosion-resistant steel, nickel-bearing cast iron, nickel-copper alloy, or copper-nickel alloy, and shall be statically and dynamically balanced. The pump or motor shall be marked to indicate the correct direction of rotation. The pump suction intake in the tank shall be equipped with a corrosion-resistant steel strainer or a strainer of suitable corrosion-resistant material. Each pump and motor assembly shall be equipped with at least two antifriction bearings.

3.9.8 Conveyor. Conveyors shall be designed to hold dishes and trays in an inclined position and shall also be designed or equipped to permit use of standard dishwashing racks, when desired, for cups, glasses, silverware cylinders, and other small items. The maximum conveyor speed shall be as specified in table II. Conveyor width shall be in accordance with 1.2 and 3.1. The conveyors shall consist essentially of rods, rollers, side links, and dish-supporting peg links. The rods and side links shall be corrosion-resistant steel or nonferrous nickel alloy. Rods normally in contact with dishware shall be plastic-coated or encased in plastic sleeves to prevent chipping of tableware. Rollers shall be corrosion-resistant steel or plastic. Peg links shall be all plastic or, at the option of the supplier, formed of corrosion-resistant steel wire. Plastic used for peg links, rollers, and rod encasement shall be an acetyl resin, a nylon molding resin, polypropylene, polyethylene, or other nonchipping impact-resistant plastic which is resistant to heat and detergents, nontoxic, and proven satisfactory for the specific application under extended commercial usage. Peg links shall be equipped at regular intervals with upper, plastic-encased cross rods or corrosion-resistant steel outer brackets to support standard, fully-loaded dishwashing racks. Conveyors shall be driven through a mechanical or hydraulic speed-reducing unit by a separate motor rated not less than 1/2 horsepower (hp). Mechanical or electrical means shall be provided for automatic release or disconnection of the drive or the driving motor when the conveyor driving torque exceeds a present limit as a result of jamming. This feature shall be supplementary to the stop bar specified in 3.10.3 for the unloading section. Shear pins or other mechanisms requiring replacement of any part will not be acceptable as an emergency means for disconnecting the drive. Exposed gears and sprockets inside the hood and loading section of the machine shall be corrosion-resistant metal. All gears, sprockets, chains, belts, and other components of the conveyor drive system shall be guarded from contact by operating personnel by the sheet metal panels of the machine enclosure. Conveyors shall in other respects meet the requirements of NSF No. 3 and No. 5.

3.9.9 Pumped spray assemblies. Spray arms, spray arm manifolds, and spray boxes shall be corrosion-resistant steel. Spray patterns shall be formed by slotted openings or spray nozzles. Spray nozzles shall be metal or plastic. Metal nozzles shall be corrosion-resistant steel or nickel-copper alloy; plastic for nozzles shall be heat and impact resistant, and shall have been proven satisfactory for this purpose by extended commercial usage, and shall have been used on units approved as complying with NSF requirements. All spray assemblies, except for the final rinse, shall be readily removable without use of tools for cleaning or shall be easily cleaned in place. Final rinse spray arms shall be removable for deliming, descaling, and similar periodic maintenance. The spray assemblies shall otherwise meet the requirements of NSF No. 3 and No. 5. Three brushes for cleaning the spray assemblies shall be furnished with those machines on which the design of the spray assembly requires the use of brushes to provide access to interior surfaces of the assembly.

3.9.10 Scrap trays. Each machine shall be equipped with scrap trays or strainers to prevent food particles from passing into the tanks. The trays or strainers shall be fabricated of corrosion-resistant steel of a thickness not less than 18 gauge. The area of the openings shall be not greater than the area of a 1/8-inch diameter hole. Any opening around or between scrap trays shall be no larger than the openings in the scrap tray. The ledges on which

the scrap trays or strainers rest shall be so designed, located, and sized that surfaces below the ledges are readily accessible for cleaning when the trays are removed. In other respects, trays or strainers shall meet the requirements of NSF No. 3 and No. 5.

3.9.11 Splash curtains. Each machine shall be equipped with readily removable splash curtains at the entrance and exit of the hood. Splash curtains, baffles, or both shall be provided between prewash, wash, and rinse zones to prevent excessive splash and spray carryover. Splash curtains shall be furnished with as many slits as necessary to assure maximum reduction in carry-over without impeding conveyor movement or the washing process. The curtains shall be nylon, vinyl, or plastic-impregnated fabric. When trays projecting 15 inches above the top of the conveyor are washed, the curtains shall not mask any of the wash or rinse spray.

3.9.12 Vent connections. Each machine shall be equipped with two steam vent connections, one located on the hood of either the loading section or the adjoining dishwashing section and the other on the hood of either the unloading section or final rinse section. The vents shall be fabricated of corrosion-resistant steel not less than 16-gauge thick and shall be sized to be affixed to rectangular sheet metal duct furnished by others. Each vent shall be equipped with an adjustable damper. In addition, the vent at the unloading end shall be designed or equipped to prevent condensate formed in the ductwork from dripping onto clean dishware passing on the conveyor.

3.10 Piping and valves. All water, drainage, and steampiping shall be installed on the machine by the manufacturer. Except as otherwise provided for under 3.10.2, all piping shall be interplumbed to the maximum practicable extent to provide a minimum of connections to external piping. The systems shall include all required piping, tubing, fittings, valves, and such accessories as strainers and vacuum breakers. Manually-operated gate or globe valves shall be positioned in line with stems in a horizontal plane and shall be conveniently located in readily accessible positions on the machines. The piping systems shall be so designed that, when the machine is shut down and all tanks drained, no pockets of water will remain in any piping to provide potential sources of bacterial development.

3.10.1 Supply piping. Corrosion-resistant steel piping, copper tubing, or a copper alloy piping shall be used on the machine for water and steam distribution and shall be suitable for the washing pressures and temperatures encountered in the dishwashing system. The pump suction and discharge lines in the wash and prewash compartments shall be corrosion-resistant steel, nickel-bearing cast iron, nickel-plated copper, or chromium-plated copper. The water and steam distribution piping on the machine shall be of sufficient nominal pipe or tubing size to meet the flow requirements of NSF No. 3 and No. 5 except as otherwise specified herein. The nominal size of water pipe shall be not less than 1/2 inch. Unless otherwise specified (see 6.2), the nominal size of steam pipe shall be not less than 3/4 inch. Fresh water supplies to the tanks shall be connected so as to discharge not lower than 2 inches above the maximum flood level rim or a vacuum breaker shall be installed in the supply line to prevent backflow. The final fresh water rinse line shall be equipped with a vacuum breaker. In other respects, supply piping shall meet the requirements of NSF No. 3, No. 5, and ASTM B302.

3.10.2 Drainage piping. Drainage piping shall be corrosion-resistant steel, copper, brass, or galvanized steel. Drainage piping shall be provided on the wash, rinse, prewash, and unloading sections. Drainage piping shall also be included in the loading section unless this section drains into the prewash tank. Unless otherwise specified (see 6.2 and 6.3.6), all individual drains, except the loading section drain, when furnished, and steam traps shall be connected into a 2-inch main drain. The main drain shall be located longitudinal under the machine with threaded connections at each end to permit connection of one or both ends to the facility drainage system.

3.10.3 Valves. Manually-operated steam valves shall be of the full plug, globe type conforming to style C of MIL-V-1202. Manually-operated, main shut-off service water valves shall be bronze, gate valves conforming to WW-V-54 type II, class A or shall be type I or II class A of WW-V-51 or MIL-V-1202 or suitable ball valves of stainless construction with seat of nylon or corrosion resisting material. Drain valves shall be quick-opening, wheel or lever-operated and shall be marked to show the "open" and "closed" positions. Valves shall be either located in a recessed enclosure on the machine, or if extending beyond the sides of the machine, shall be protected by a suitable extension of the machine enclosure. Metal, plastic, or cardboard tags relating by name or number the identification of each valve to operating instruction plates and manuals shall be provided. This requirement applies only to valves which must be manually operated during the startup or shutdown process and is not applicable to automatic tank-fill valves, thermostatically-controlled steam valves, electrically-operated final rinse valves, or similar automatic closure devices. The final rinse supply system on each machine shall be equipped with a water pressure reducing valve. The valve shall have a bronze body and shall be designed for the system inlet pressure specified under 3.9(a), and shall be adjustable as required to provide a delivery pressure of 20 psig at the final rinse manifold. The valve shall be of suitable size to insure that the flow rate through the valve at the minimum operating differential pressure recommended by the valve manufacturer will not be less than the final rinse flow rate specified in NSF No. 3, No. 5, and ASME section 8 division I. The valve shall be installed on the discharge side of the booster heaters and shall be suitable for a water temperature of at least 200°F.

3.10.4 Thermometers. Each machine shall be equipped with thermometers to indicate the temperature of the final rinse water as it enters the spray arm or manifold, the temperature of water in the wash and rinse tanks, and on type II and III machines, the prewash tank. Dishwashing machines shall be fitted with easily replaceable dial-type, watertight thermometers readily visible from the front of the machine and positioned to prevent breakage. Thermometers shall otherwise meet the requirements of NSF No. 3 and No. 5.

3.10.5 Pressure gauge. The final rinse water supply line shall be equipped with an easily replaceable, watertight, 3 inch or larger dial-type pressure gauge equipped with pulsation dampener. The pressure gauge shall be mounted on the low pressure side of the pressure-reducing valve.

3.11 Heating. The dishwashing machines shall be steam heated or electrically heated in accordance with the style specified (see 1.2). Style I machines shall be equipped with thermostatically controlled steam coils for wash and rinse tank heating except for Veterans Administration (VA) use. When

specified for VA use only (see 6.2), steam injectors shall be provided. The steam injectors shall be stainless steel or nickel bearing iron. Steam coils shall be corrosion-resisting steel. Electrically-heated, style 2 machines shall be equipped with electric immersion heaters for tank heating and an electric booster heater for the final rinse water. Tank heaters shall be sized and rated to maintain the temperatures specified in 3.7. Booster heaters shall be rated on the basis of a 50°F temperature rise and shall be sized to meet the temperature requirements of 3.7 and the volume requirements of NSF No. 3 and No. 5. When specifically stated in the contract or purchase order (see 6.2 and 6.3.7), booster heaters shall not be furnished.

3.11.1 Steam. Steam boosters shall be shell and tube type instantaneous water heaters. Steam boosters shall be provided to increase the temperature of the final rinse water. The heat exchanger shall automatically maintain the required final rinse water temperature to the machine by an automatic thermostat of steam to the heat exchanger booster. The booster shall not produce steam in the water supply piping or in the heat exchanger. The heat exchanger shall be provided with, but not limited to, controls and safety equipment as follows; line strainers in the steam line and the hot water line, steam traps, relief valve, hot water pressure regulator, pressure and temperature guages, and a thermostatically controlled electric solenoid valve or a thermostatically controlled mechanical valve. Unless otherwise specified (see 6.2), required valves and regulators shall be accessible and adjustable from the front of the machine. Valves and pipe unions shall be installed on the heat exchanger where steam and water lines enter the unit. Sensing unit control wires shall be protected by corrosion-resisting armored flexible tubing or the equivalent.

3.11.2 Electric. Electric booster heaters shall be of welded steel construction with all required pipe fittings. The booster tank shall be furnished complete with thermostat, low-water cutoff, high temperature limit switch, pressure-temperature relief valve, and contactor. Electric boosters shall be UL approved.

3.12 Wash and rinse additive systems. Unless otherwise specified (see 6.2), each dishwashing machine shall be equipped with an automatic detergent dispenser. When specified (see 6.2), machine shall be furnished with a drying agent injector.

3.12.1 Automatic detergent dispenser. The detergent dispenser shall conform to MIL-D-43729. The detergent reservoir shall be mounted in a convenient position and shall be capable of holding a supply of powdered dishwashing compound (type I of P-D-1800) at least equal to the amount used in normal dishwashing operation for one meal (2-11 pounds).

3.12.2 Drying agent injector. The drying agent injector conforming to MIL-I-43728 shall be supplied with each dishwashing machine and shall be installed without causing interference with operating maintenance or cleaning procedures.

3.12.3 Detergent concentration meter. When specified (see 6.2), a detergent concentration meter conforming to MIL-M-11495 and all accessories necessary for proper operation shall be supplied with each machine but not installed. The machine shall be drilled for mounting the electrodes in the

wash tank and the meter on top of the machine, as illustrated in MIL-M-11495. This requirement is intended to apply to machines procured for remote installation sites where service support for automatic detergent dispensers would not be available and manual addition of washing compounds is anticipated.

3.13 Blower/dryer. When specified (see 3.1, 6.2, and 6.3.4), a blower/dryer shall be furnished to provide complete rapid drying of tableware and trays by forced circulation of high velocity heated air through a hooded chamber at the unloading end of the dishwashing machine. The blower/dryer shall be integral with the dishwasher. The chamber shall be not less than 16-gauge thick corrosion-resistant steel. The heated air shall be directed vertically downward toward the drying area covering the full width of the conveyor. Baffles under the conveyor shall redirect the heated air upward within the drying area to prevent heating the takeoff area and hot air contact with the clean dish operator. The blower/dryer shall include a heater, fan, motor, controls, and enclosure.

3.13.1 Heater. The heater shall be a steam or electric unit having a capacity to adequately dry the tableware and trays. The steam unit shall contain two double-row, heavy duty, high efficiency, finned tube, nonfreeze type heat exchangers set in tandem, having copper tubes and aluminum or copper fins with steel frame, and minimum 1-inch male iron pipe size steam and 3/4-inch condensate return connections. A steam trap shall be furnished on the condensate drain line. The electric unit shall contain three staggered rows of finned tubular heaters.

3.13.2 Blower fan. The blower fan shall be a heavy-duty squirrel cage type industrial fan. The fan shaft and wheel assembly shall be statically and dynamically balanced.

3.14 Electrical requirements. Each dishwashing machine and blower/dryer shall be furnished complete with motors, controls, and wiring. The electrical components shall be designed for operation on a 3-phase power supply having the voltage and frequency specified (see 6.2).

3.14.1 Motors. Motors shall be designed and rated for continuous duty in an ambient temperature of 50 degrees celsius (°C), they shall conform to NEMA M G1 and shall be of the energy efficient type. Motors shall be of the splashproof or dripproof design with encapsulated windings, except where compartmentation on the machine affords sufficient protection during operation and hosing down of the machine to permit use of standard dripproof motors. Polyphase motors shall be of the squirrel-cage type. The continuous hp ratings of the dishwasher motors shall be sufficient to meet the pumping rates specified in table II at the head pressure in the spray assemblies necessary to meet the washing and rinsing action required under NSF No. 3 and No. 5. In no case, however, shall motors having the following continuous hp ratings be applied at pumping rates exceeding the limits indicated:

a. 1/2 hp - 115 gpm maximum
b. 1 hp - 190 gpm maximum
c. 1-1/2 hp - 240 gpm maximum
d. 2 hp - 280 gpm maximum
e. 3 hp - 360 gpm maximum

The hp rating of the blower motor shall be sufficient for continuous blower operation at rated blower air moving capacity without overheating. Motors shall be equipped with suitable antifriction bearings for radial loads and for thrust bearings unless the pumps are equipped or designed to absorb hydraulic thrust.

3.14.2 Controls. Each dishwashing machine shall be equipped with integrally mounted controls locatd at the loading end or unloading end of machine, or on the top of the machine. The controls shall include an individual magnetic motor controller for each motor or a single controller for all motors with individual motor overload protection. In either case, actuation of the on-off switch for the machine shall insure that all pump motors are energized. A start-stop station shall be located at both ends of the machine. Electrical contactors and switches for tank immersion heaters shall be included in the control center of style 2 machines. All control equipment shall be designed and rated in accordance with NEMA ICS2 for operation in an ambient temperature of 50°C. The controls shall be mounted in NEMA type 12 enclosures. Magnetic motor controllers shall be of the across-the-line type with thermal overload protection and undervoltage release. When specified (see 6.2), the complete control center or designated components thereof shall be furnished separate from the machine for remote wall mounting at the site of installation.

3.14.3 Wiring. All wiring between electrical components of the dishwashing machine shall be complete up to the control center so that only one connection to the electrical power supply is required. On style 2 machines, however, the electric booster heater and the tank immersion heaters may be installed to require a separate power supply connection. All wiring and circuit devices shall meet the requirements of and be installed in accordance with NFPA No. 70. Controls and switches shall be so wired that all line leads will be open when the controls and switches are in the off position.

3.15 Accessory equipment.

3.15.1 Racks and cylinders. When specified (see 6.2), racks and cylinders shall be furnished. The racks and cylinders shall conform to the applicable requirements of MIL-R-24039. The types and quantities to be furnished shall be as indicated in the contract. For Army use only, racks and cylinders shall be of the types and in quantities indicated in table III.

3.15.2 Interior illumination. When specified (see 6.2), the machines shall be equipped with lights of sufficient wattage and number to fully illuminate the interior of the machine for inspection, cleaning, servicing, and maintenance. Unless otherwise specified (see 6.2), the lights shall be located either inside or outside the machine. The interior lights shall be of the enclosed and gasketed type or of equivalent construction to provide a vapor-tight seal against the entrance of water and steam. Outside lights shall illuminate through vaporproof transparent porthole at the top of the machine. The light fixture shall be equipped with a heat-resistant and guarded or impact-resistant globe or lens and shall be designed to accommodate up to a 100-watt bulb. The interior lights shall be so designed and installed as not to reduce the dish clearance specified in 3.7.

3.16 Lubrication. Unless otherwise specified (see 6.2), means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high pressure lubricating equipment, 1,000 pound-force per square inch or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location.

3.17 Finish. The dishwashers shall meet the surface finish requirements of NSF No. 3 and No. 5. All surfaces of the machine other than corrosion-resisting metal shall be protected against corrosion and present a neat appearance.

3.18 Identification marking. Identification shall be permanently and legibly marked directly on the dishwashing machine or on a corrosion-resisting metal plate securely attached to the machine at the source of manufacturer. Identification shall include the manufacturer's model and serial number, name and trademark to be readily identifiable to the manufacturer. In addition, information required by UL 921 shall be included on the dishwasher or on the plate.

3.18.1 Identification plate. An identification plate will be furnished by the contracting officer for each dishwasher. The contractor shall stamp all necessary data in the blank spaces of the plate provided for that purpose, and securely affix a plate to each dishwasher in a conspicuous place with brass screws or bolts not less than 1/8 inch in diameter. The applicable nomenclature contained in the contract item description shall be placed in the top blank.

3.19 Instruction plate. An instruction plate of corrosion-resisting metal, chrome-plated brass, or laminated mylar shall be attached to each machine at a height readily visible to the operator. The plate shall provide numbered, step-by-step instructions for operating and cleaning the dishwasher. Numbers or other means of identification corresponding to those on the instruction plate shall be attached on the machine, at a location adjacent to the operating positions. The instruction plate shall list the required water temperatures for each section and the tank capacities.

3.20 Electromagnetic compatibility. When specified (see 6.2), dishwashers procured under this specification shall be designed and equipped to meet the electromagnetic interference control requirements and test limits for class C3 group III equipment as specified in MIL-STD-461.

3.21 Fungus resistance. When specified (see 6.2), electrical components and circuit elements, including terminal and circuit connections, shall be coated with varnish conforming to MIL-V-173, except that:

a. Components and elements inherently inert to fungi or in hermetically sealed enclosures need not be coated.
b. Current-carrying contact surfaces, such as relay contact points, shall not be coated.

3.22 Commercial publications. When specified (see 6.2), manufacturer's standard commercial publications shall be furnished (see 6.2).

3.23 Service parts. When specified (see 6.2), service parts shall be furnished and shipped with each machine. The service parts required and the quantity thereof shall be as specified in the contract, or when applicable, shall be determined in accordance with the provisioning procedures of the contract.

3.24 Workmanship.

3.24.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to insure uniformity of size and shape.

3.24.2 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

3.24.3 Solder. All surfaces to be soldered (when applicable) shall be thoroughly cleaned prior to soldering. Solder joints shall be smooth with no pin holes.

3.24.4 Threaded fasteners. Threaded fasteners shall not be loose or missing. Threads shall not be missing, stripped, or broken and conform to FED-STD-H28.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or 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.

4.1.1 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

4.1.2 Standards compliance. The contractor shall make available to the contracting officer or his authorized representative evidence of compliance with the applicable standards cited in 3.4.

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

a. First article inspection (see 4.2.1).
b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one complete dishwashing machine when a first article is required (see 3.2, 6.2 and 6.4). This inspection shall include the examination of 4.4 and the tests of 4.5. The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5.1 through 4.5.3, and the packaging inspection of 4.6. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. All dishwashing machines offered for delivery at one time shall be considered a lot for the purpose of inspection. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for a complete reinspection. Resubmitted lots shall be reinspected using tightened inspection. If the rejected lot was screened, reinspection shall be limited to the defect causing rejection. If the lot was reprocessed, reinspection shall be performed for all defects. Rejected lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.3.1 Sampling for examination. Examination shall be based on inspection level II and an Acceptable Quality Level (AQL) of 2.5 percent defective for major defects and 4.0 percent defective for minor defects.

4.3.2 Sampling for tests. Test shall be based on inspection level S-4 and an AQL of 2.5 percent defective.

4.4 Examinations.

4.4.1 In-process examination. The dishwashing machines shall be examined during fabrication and assembly in accordance with the manufacturer's established quality control program. The quality control methods and procedures shall assure compliance with the requirements of this specification throughout all areas of contract performance including the receipt and identification of material; fabrication of the base, frame, hood, doors, and vents; plating or painting of parts; installation of electrical components and circuitry; fabrication and installation of the conveyor system; assembly and installation of controls, instrumentation, spray assemblies and piping systems; and final operational checkout of the machine including the motors and controls. The quality control program shall be subject to surveillance by the procuring agency or designated representatives thereof. Failure of the manufacturer to demonstrate that adequate quality control was applied to lots submitted for acceptance by the Government may be cause for rejection of the lots.

4.4.2 End-product examination. The first article sample, if furnished, and sample units selected in accordance with 4.3 shall be visually examined to

determine conformance with this specification. Each dishwashing machine selected shall be examined for defects listed in table III.

4.5 Tests.

4.5.1 Operational test. Each sample machine shall be operated at least 1 hour without dishes or racks to determine compliance with the requirements of this specification. The test shall reveal that the assembly of component parts is complete and properly interrelated; that moving parts evidence no undue vibration, noise, or overheating of bearings, and that controls operate smoothly and positively.

4.5.2 Leak test. The sample dishwashing machines shall be filled with water as required and operated in accordance with manufacturer's instructions for a period of at least 10 minutes. The tanks, pipes, valves, traps, strainers, and fittings shall show no evidence of leakage. This test may be performed concurrently with the test of 4.5.1.

4.5.3 Noise level test. Compliance with the noise level limits of 3.8.4 shall be verified by measurement. Noise levels shall be measured using a sound level meter in accordance with ANSI S1.4, type 1. The meter shall be set for the A-weighting "slow" mode of operation. The noise level test shall be set up and conducted in accordance with the guidelines specified in ANSI S1.13 for the "Field" measurement method. The dishwashing machine shall be operated with maximum numbers of dishes and loaded racks as per manufacturers recommended maximum.

4.5.4 Electromagnetic interference control tests. When electromagnetic interference control is required, the first article sample, equipped for the reduction of electromagnetic interference in accordance with 3.18, shall be tested by the supplier in accordance with test methods UM05 requirements of MIL-STD-461. The supplier shall furnish the contracting officer, for approval, the interference control plan, the EMI-EMC test plan, and the test report required in MIL-STD-461. Upon approval of the test report by the contracting officer and provided all other requirements of the specification are met, the first article sample shall be used as a model for all other units.

4.6 Preparation for delivery inspection. The inspection of the preservation, packing, and marking shall be in accordance with the requirements of section 4 of MIL-K-43875.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packing. Preservation and packing shall be in accordance with the requirements of MIL-K-43875 with the level of preservation and the level of packing as specified (see 6.2).

5.2 Marking.

5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

6. NOTES

6.1 Intended use. The dishwashing machines covered by this specification are intended for use in mess halls, cafeterias, and other food serving establishments where it is desired to clean and sanitize dishes, trays, and other tableware items on a continuous basis without prior racking.

6.2 Ordering data. Purchasers shall select the preferred options permitted herein and include the following information in procurement documents:

a. Title, number, and date of this specification
b. Type, size, style, group, and feed direction required (see 1.2.1, 3.1, 6.3.2, and 6.3.3)
c. When a blower/dryer is required (see 3.1, 3.13, and 6.3.4)
d. When a first article is required for inspection and approval (see 3.2, 4.2.1, and 6.4)
e. When the length of the unloading section shall be longer than the standard unloading section and the length required (see table I and 6.3.3)
f. When dimensions are other than specified (see 3.7)
g. Water supply pressure, hot water supply temperature, or steam pressure if other than as specified (see 3.8)
h. When a tempering valve is required on type II and III machines in the prewash section and the temperature to be maintained (see 3.8.1 and 6.3.5)
i. When noise level is other than specified (see 3.8.4)
j. When length of the loading section is other than specified (see 3.9.3 and table I)
k. When the thermostatically-controlled steam coils are required (see 3.9.5)
l. When booster heaters shall be separately mounted (see 3.9.6 and 6.3.7)
m. When the nominal size of steam pipe is less than 3/4 inch (see 3.10.1)
n. When drain connections shall be other than as specified (see 3.10.2 and 6.3.6)
o. When steam injector shall be provided for VA use (see 3.11)
p. When other location of hook-up of valves and regulators is stated (see 3.11.1)
q. When a drying agent injector is required (see 3.12)
r. When a booster heater is not required (see 3.11 and 6.3.7)
s. When an automatic detergent dispenser is not required (see 3.12)
t. When a detergent concentration meter is required (see 3.12.3)
u. When a blower/dryer is required (see 3.13 and 6.3.4)
v. Voltage and frequency of 3-phase electrical power supply (see 3.14)
w. When control center or certain components of the control center shall be furnished for remote wall mounting (see 3.14.2)
x. Type and number of dishwashing racks and cylinders, if required (see 3.15.1)
y. When interior illumination is required (see 3.15.2)
z. When other means for lubrication are required (see 3.16)
aa. When electromagnetic interference control is required (see 3.20)
bb. When fungus resistance coating of electrical circuit elements is required (see 3.21)

cc. When commercial publications are required (see 3.22)
dd. Type and quantity of service parts, if required (see 3.23)
ee. Level of preservation and packaging and level of packing required (see 5.1)

6.3 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423 Contract Data Requirements List (CDRL) and invokes the provisions of paragraph 7-104.9(n) of the Defense Acquisition Regulations (DAR), the data requirements will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL (DD Form 1423) incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data shall be delivered in accordance with the contract requirements.

6.3.1 Operating capacity. The nominal operating capacity specified herein for dishwashing machines affords a basis for relating the general size and performance of one machine to another. It is not intended as a precise indicator of machine output due to such variables as dish sizes and utilization factors. For planning purposes, a correlation between the capacity in dishes per hour and the capacity in persons per hour can be approximated by using a factor of 5 to 7 dishes per person per meal. For purposes of planning plus cost analysis, the relative production rates of rack type machines sized on the basis of racks per hour and rackless type machines can be estimated by assuming one 20-inch by 20-inch rack will accommodate 20 to 25 dishes and accordingly will handle 3 to 5 persons.

6.3.2 Conveyor width. Group 1 conveyor widths embrace all currently available machines and affords the widest procurement base. Group I should therefore be specified whenever possible. The majority of dinner plates used by the military services are either 9 or 9-1/8 inches in diameter with a few having diameters in the range of 9-1/2 to 10-1/2 inches. The principal distinction between groups 2 and 3 is that group 2 conveyors will normally accommodate two plates abreast and group 3 will accommodate three. If a significant portion of the dishware will be preracked in standard 20-inch by 20-inch racks, then group 2 machines would afford more effective conveyor utilization. Other factors to be considered in determining which group to specify include the size and arrangement of associated dish tables and dish tray conveyors, if used, plus the location and number of loading and unloading stations and personnel.

6.3.3 Unloading sections. The NSF advises that after dishes have been washed, rinsed at the prescribed temperatures, and subjected to proper concentrations of detergent and drying agent, the drying time of properly racked dishes in an adequately ventilated room is approximately 45 seconds. The standard lengths of unloading sections have been specified accordingly, based on the maximum allowable conveyor speeds of table II. Longer lengths have been included in table I on an optional basis to cover installations where other than the previously described ideal drying conditions prevail or for installations where a longer length may be necessary to permit adapting the machines to a specific unloading layout.

6.3.4 Blower/dryer. The Sanitarian, Environmental, and Industrial Hygiene Section of the Public Health Service, Department of Health, Education, and Welfare recommends that the blower not be included for washing and sanitizing

eating and drinking utensils (see 3.1 and 3.14). The opinion of the Sanitarian is that the blower would contaminate clean utensils with lint or dust.

6.3.5 Tempering valve. NSF No. 3 recommends that the temperature of water for prewashing be not less than 110°F nor more than 140°F except where scrapping is directly into a food waste disposer in which case an 80°F maximum temperature is recommended. When specified (see 3.9.1), a tempering valve will provide the cooling water necessary to reduce the 150°F to 160°F wash tank overflow to the required 80°F in the prewash tank. It is also contended that prewash water exceeding 120°F tends to set (bake) some food soils, especially calcium base types, thereby making it difficult or impossible to effect removal in subsequent sections of the machine. A tempering valve serves to eliminate this problem by maintaining the recommended 120°F prewash temperature.

6.3.6 Drain connections. A main drain is specified herein to minimize plumbing connections at the site. The loading section drain is exempted from this provision, unless otherwise specified (see 3.11.2), to permit direct connection to a food waste disposer if required. It may also be expedient to exclude the wash tank drain on type I machines and the prewash tank drain on types II and III if a separate connection to a grease trap or grease disposal system is desired or required.

6.3.7 Booster heaters. It is mandatory that booster heaters be furnished with each machine to insure that 180°F to 195°F water is available at the final rinse manifold. Contracts indicating that booster heaters are not required (see 3.12), should be limited to cases where a separate source at the site can supply hot water which will have a temperature, after delivery to the machine, of at least 180°F. This means that the distance from water heating equipment producing 180°F water must be minimal to avoid piping heat losses. The final rinse, subject to automatic control of the rinse-saver device, will undergo intermittent periods in which no flow occurs. During these periods, piping heat losses could cause a temperature reduction, so that when flow is reestablished, the water initially sprayed on the dishes will be less than the required 180°F minimum. The same conditions apply to separately mounted booster heaters unless the distance from the machine to the heater can be kept to a minimum (5 feet is the recommended maximum). In order to avoid piping losses in these cases, piping insulation, a recirculation loop, or both should be provided by the installing activity.

6.3.8 Drawings and technical services. When drawings are required for installation purposes, the contracting officer should include appropriate provisions in the contract requiring that the successful bidder furnish such drawings showing the exact dimensions of the dishwashing machine, the overall space requirements for access and servicing, the location and sizes of inlet and outlet piping connections, the point or points at which electrical connections are to be made, and the electrical characteristics of all motors and other electrical equipment. When technical services of the contractor will be required to supervise the installation of the machine and to demonstrate operating and maintenance procedures to personnel at the using activity, the contracting officer should include pertinent provisions in the contract as part of the total bid or as a separate bid item. In such cases, contractual information should include the proposed location of the machine, the approximate date or dates the technical services will be required, the person or office to report to, and whether any accommodations, services, or

any assisting personnel or work crews will be provided by the activity at which the machine will be installed.

6.4 First article. When a first article inspection is required (see 3.2, 4.2.1, and 6.2), one dishwashing machine will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of one complete dishwashing machine. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

6.5 Changes from previous issue. The margins of this specification are marked with an asterisk 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.

MILITARY INTEREST:

Custodians

Army - GL
Navy - YD
Air Force - 99

Review Activities

Army - TS, MD
Navy - SA, MS
Air Force - 84

User Activities

Army - CE
Navy - CG, MC

CIVIL AGENCY COORDINATING ACTIVITIES

GSA - OPP
VA - OSS
HHS - FDA

PREPARING ACTIVITY:

Navy - YD

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TABLE I. Dimensional requirements.

Size	Total length of machine between loading and unloading extensions, feet, minimum 1/						Loading section feet, Minimum	Unloading section, feet	
	Conveyor widths 20 to 26 inches, inclusive			Conveyor widths 27 to 31 inches, inclusive				Std. Length	Optional length, as specified (see 6.2)
	Type I	Type II	Type III	Type I	Type II	Type III			
7500	6	8	9	5	7	8	2.5	6	7, 8, 9, 10
9250	8	10	11	6	8	9	2.5	7	8, 9, 10, 11, 12
10250	8	10	11	6	8	9	2.5	7	8, 9, 10, 11, 12
11500	8	10	11	6	8	9	2.5	8	9, 10, 11, 12, 13, 14
13000	9	11	12	7	9	10	2.5	8	9, 10, 11, 12, 13, 14
15000	9	11	12	7	9	10	3	8	9, 10, 11, 12, 13, 14
18000	10	12	12	8	10	10	3	10	9, 10, 11, 12, 13, 14

1/ Pumped wash section, pumped rinse section, final rinse section and (for types II and III) prewash section.

TABLE II. Performance requirements.

Size	Conveyor speed, fpm, maximum	Tank capacities, U.S. gallons, minimum				Pump capacities, U.S. gpm, minimum, under operating conditions			
		Prewash		Pumped wash	Pumped rinse	Prewash		Pumped wash	Pumped rinse
		Type II	Type III			Type II	Type III		
7500	7	12	14	18	18	75	150	150	150
9250	8.5	15	17	22	22	90	185	185	185
10250	8.5	17	20	25	25	100	205	205	205
11500	10	19	22	28	28	115	235	235	235
13000	10	23	25	32	32	130	260	260	260
15000	10	25	30	37	37	150	300	300	300
18000	12	30	36	45	45	180	360	360	360

NOTE: The specified tabular values for prewash pump capacities on type II machines may be reduced, at the option of the manufacturer, provided the total capacity of the manufacturer's prewash, wash, and rinse pumps will be equal to or exceed the total output obtained by adding the present tabular values for these three pumps. However, in no case shall the reduction in the prewash pump capacity exceed 15 percent of the specified tabular value. No decrease in the specified capacities for wash or rinse pumps or for type III prewash pumps will be permitted.

TABLE III. Classification of Defects.

Classification	Defects	Requirement paragraph
Major:		
101	Dishwashing machines not of specified classification	3.1
102	Units in a lot not identical to the extent required to insure interchangeability of support parts	3.5
103	Material not of type specified (see 4.6)	3.6
104	Defects in materials affecting usability of the unit	3.7
105	Design not as specified	
106	Dimensions not within specified limit	3.7
107	Part missing or not specified type or size	3.7
108	Part fractured, split, punctured, dented, deteriorated, bowed, malformed, or otherwise impaired	3.7
109	Part misplaced, loose, or not in proper alinement affecting serviceability	3.7
110	Operation omitted or not properly performed	3.7
111	Adjustable assembly that cannot be adjusted to perform the function intended	3.7
112	Component not properly assembled or secured affecting serviceability; e.g., tubing creased at bend restricting or partially restricting interior flow	3.7
113	Not in conformance with applicable requirements	
114	Lubrication means for not provided or inaccessible	3.16
115	Fungus resistance not applied when specified	3.22
116	Service parts not furnished when specified	3.24
117	Missing, incomplete, burn holes, cracked, fractured, or otherwise not fused	3.25.2
Minor:		
201	Functioning component requiring abnormal force to operate	3.7
202	Components not connected or joined as specified or poorly accomplished	
203	Component not readily accessible for servicing where required	
204	Finish application incomplete or not as specified	3.17
205	Marking missing, incomplete or illegible	3.18
206	Instruction or identification plate missing, incomplete or illegible	3.18,3.19
207	Publications not furnished or incomplete	3.22