

SECTION 11010 – COMMERCIAL VEHICLE WASHING SYSTEMS

Project Number 14-5005-39

Project Title Kansas City Area Transportation Authority
 Bus Wash Equipment Replacement

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Specifications for a complete and operational Hybrid High Pressure Spray and Brush wrap-around drive through commercial vehicle washing system. This includes, but is not limited to, all interconnecting piping, wiring and components whether specifically indicated or specified.

- B. Related Requirements – Refer to the following sections for additional information as it relates to systems, equipment, materials, installation and execution unless indicated by this section:

- 1. Section 15 000 – Basic Mechanical Requirements
- 2. Section 15 030 – Electrical Provisions of Mechanical Work
- 3. Section 15 057 – Common Motor Requirements for Plumbing Equipment
- 4. Section 15 061 – Hangers and Supports for Plumbing and Equipment
- 5. Section 15 073 – Vibration Controls for Plumbing Piping and Equipment
- 6. Section 15 076 – Identification for Plumbing Piping and Equipment
- 7. Section 15 085 – Plumbing Piping Insulation
- 8. Section 15 097 – Escutcheons for Plumbing Piping
- 9. Section 15 111 – General Duty Valves for Plumbing Piping
- 10. Section 15 126 – Meters and Gages for Plumbing Piping
- 11. Section 15 140 – Domestic Water Piping
- 12. Section 15 145 – Domestic Water Specialties

13. Section 15 150 – Sanitary Waste and Vent Piping
14. Section 15 155 – Sanitary Waste Piping Specialties
15. Section 15 156 – Sanitary Waste Interceptors
16. Section 15 211 – General Service Compressed Air Piping
17. Section 15 441 – Domestic Water Pumps
18. Section 15 446 – Sump Pumps
19. Section 15 450 – Potable-Water Storage Tanks
20. Section 15 469 – Domestic Water Softeners
21. Section 16 000 – Basic Electrical Requirements
22. Section 16 060 – Grounding and Bonding for Electrical Systems
23. Section 16 073 – Hangers and Supports for Electrical Systems
24. Section 16 075 – Identification for Electrical systems
25. Section 16 120 – Low Voltage Electrical Power Conductors and Cables
26. Section 16 121 – Voltage Electrical Power Cables
27. Section 16 130 – Raceways and Boxes for Electrical Systems
28. Section 16 491 - Fuses

1.3 PERFORMANCE - GENERAL

- A. Contractor shall be responsible for the design of a wash system that satisfactorily washes the Owner's fleet of busses. The requirements listed below are typical minimum performance criteria, however KCATA reserves the right to consider an alternative system judged to meet their overall performance level and evaluation criteria.
 1. Washer shall remove all visible, heavy dirt accumulation and road film from all surfaces including front and rear of the Owner's vehicles.
 2. Amount of cleaning agent require to perform the cleaning as specific shall be set to manufacturer's factory specifications.
 3. Supplier and installer of wash system shall coordinate activities with the Owner and general contractor responsible for the modifications to the KCATA Wash Facility.

1.4 CONTRACTOR RESPONSIBILITIES AFTER AWARD

- A. Contractor must respond to each area of responsibility in their Proposal.
 1. Contractor shall be responsible for the design and to include all necessary equipment and material for a complete operational system including but not limited to all field electrical, plumbing and mechanical requirements of the system.

2. Contractor shall provide a System Project Plan and Schedule for the new system installation.
3. After installation, Contractor shall demonstrate to KCATA that the system operates in full accordance with the intent and meaning of the Drawings, Specifications and recommendations.
4. After installation, the Contractor shall provide a manufacturer's technical representative to provide training to owner's maintenance personnel in operation and maintenance of specified equipment.
5. Contractor shall agree to a 90-day operational acceptance period.
6. Contractor shall provide to KCATA a minimum one-year warranty. The warranty period shall be one year beyond the 90-day evaluation period. Warranty period will be longer for specific components as stated herein. Warranty shall include but not limited to work against defects in material, functions, and workmanship. Warranty shall include all materials and labor necessary to correct defects. Defects shall include but not limited to noisy, rough or substandard operation, loose, damaged and missing parts and abnormal deterioration of finish.
7. Contractor shall have a service technician on site within 48 hours or less after a request of warranty service in "system down" situations. Regular warranty service shall be provided within 5 business days after request for service by KCATA.
8. Contractor shall provide to KCATA free technical support for the lifetime of the equipment. Any limitation on technical support shall be specifically noted in the Proposal.
9. Contractor shall provide KCATA with free software upgrades for 5 years.
10. Contractor shall provide KCATA for its sole use, all equipment, hardware, software, equipment, cables installation and operating instructions, licenses, permits, and other support and support related items for the operation of the system. Such information shall include completed "as-installed" piping, wiring, and equipment drawings supplied by the system manufacturer. Such information shall include 3 sets of Operating, Parts and Maintenance Manuals.
11. The Proposer will be required to provide a Performance Bond in the amount of the Proposers bid to be effective until the warranty expires.

1.5 INSTALLER QUALIFICATIONS

- A. Installer of Wash System must have a minimum of 5 years' experience in the installation of commercial vehicle wash systems of the manufacturer proposed in their submittal.
- B. Installer shall provide the Owner with a letter, on the letterhead of the wash system manufacturer indicating their acceptance and approval of the installing contractor.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, and dimensions of individual components and profiles. Include

rated capacities, operating characteristics, electrical characteristics, utility consumption, and furnished specialties and accessories.

- B. Installer Qualifications: Provide installer qualifications and experience.
- C. Warranty Information: Submit warranties in accordance with Division 1 – General Requirements.
- D. Operations and Maintenance Manual: 3 Sets
- E. Shop Drawings: Submit Shop Drawings in accordance with Division 1 – General Requirements.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Service: Do not interrupt any water, electrical, and compressed air service to facilities occupied by Owner unless permitted under the following conditions and then only after arranging to provide temporary service(s) according to requirements indicated:
 - 1. Notify Owner no fewer than five days in advance of proposed interruption of water, electrical, and compressed air service.
 - 2. Do not interrupt services listed without Owner's written permission.
 - 3. Arrange and provide temporary service(s) for all locations identified as required by owner prior to interruption.

PART 2 - PRODUCTS

2.1 Hybrid High Pressure Water / Brush wrap-around drive through commercial vehicle washing system.

- A. Basis-of-Design Product: Subject to compliance with requirements of this specification and related sections, provide Basis of Design indicated on Drawings:
- B. Manufacturers: Subject to compliance with requirements of this specification and related sections, and must meet or exceed the elements included in the Basis of Design Product below:
 - 1. Equipment shall be produced by a manufacturer of established reputation with a minimum of 5 years' experience supplying commercial vehicle washing systems similar to that proposed.
- C. Approved equivalents to provide a complete commercial vehicle washing system while meeting the following minimum requirements to the satisfaction of the client.
 - 1. Utilize water recycling without exceeding 100 gallon of domestic water supply per wash cycle.
 - 2. Utilize water recycling without exceeding 1 kwh per wash cycle.
 - 3. Total vehicle wash time to be approximately 90 seconds.

4. System capable of washing approximately 30 vehicles per hour.

Retain option in first paragraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

- D. Description: Stationary hybrid drive through vehicle wash capable of optimally washing a high volume of various sizes and styles of vehicles completely and satisfactorily. The system to be manufactured in accordance with quality assurance standards of ISO 9001 and environmental standards of ISO 14001. The system shall be capable to wash front and rear of vehicle several times in one pass. System to include features to avoid damage to vehicle including but not limited to mirror protection and brush pressure control. The system shall control the wash process automatically. System operations to be controlled by optical sensing devices such as infra-red or similar and to NOT be controlled by mechanical actuating devices initiated through physical contact with vehicle. System to include water recycling accessories utilizing water disinfecting equipment. System to provide operating information to user including be not limited to alarms, utility consumption, and wash duration. System shall be able to report all operating information to building management systems utilizing BACnet or similar as specified by owner. All electrical components and accessories to be UL listed. All components to include NEMA rated enclosures to prevent damage from water and detergent. The system to be provided as a complete product with all components necessary for proper function.
- E. Operation: Vehicle enters wash area to initiate system. Vehicle data is entered into the Owner's Fleet Watch system. Upon the direction by the stop/go fuel light, the vehicle passes under the detergent/pre-soak arch. Vehicle to be pre-rinsed and/or coated with detergent agent covering front, sides and rear completely. Vehicle moves into the primary wash/brush section and is directed to stop by the stop/go traffic light. Once the Vehicle stops, it initiates the brushes and sprayers washing the vehicle beginning with the front. System motion shall repeatedly wash front surface per reprogrammable user preference providing contact with surface area in an overlapping pattern utilizing two or more brushes. Once complete, system to begin optimally washing the sides and roof of the vehicle as it passes. When the rear of the vehicle moves into the primary wash/brush section, it is directed to stop by the stop/go traffic light. Once the Vehicle stops, it initiates the brushes and sprayers washing the rear. System motion shall repeatedly wash rear surface per reprogrammable user preference providing contact with surface area in an overlapping pattern utilizing two or more brushes. After vehicle leaves the primary wash/brush section, the vehicle proceeds over the front/wheel spray and to the under-carriage wash. Once washing is complete, system to provide final vehicle rinse. After rinsing, system to utilize forced air drying system to remove residual water. System devices including but not limited to brush and high-pressure water booms to operate automatically to optimally wash while considering unique vehicle geometries during entire washing cycle. The system shall NOT require the driver to steer vehicle directly into components. System to provide indicators for driver to stop, go or slow. Once system senses the vehicle is properly positioned, system automation to occur.
- F. High Pressure Water System:

1. High Pressure Water Pump to draw water from High Pressure Buffer Tank delivering water to High Pressure Water Booms and Under Chassis / Wheel Washing System.
2. System to control position of three-way valve to divert water to High Pressure Water Booms or Under Chassis / Wheel Washing System based on sensed vehicle location.
3. High Pressure Water Pump:
 - a. 316-Stainless steel vertically staged multi-impeller centrifugal booster pump, with necessary accessories to be mounted vertically.
 - b. Direct drive electric motor with combination motor starter and disconnect.
 - c. Motor rated at; 480 volt, 3-phase, & 60 hertz.
4. High Pressure Buffer Tank:
 - a. Fusion welded polyethylene plastic.
 - b. Tank retention capacity to be a minimum of the equivalent of 2 wash cycles.
 - c. Corrosion resistant solenoid valve operates to fill tank controlled by tank mounted level indicator.
 - d. Bypass leg with shut-off valves.
 - e. Service drain pipe connection with manual drain valve to be included.
5. Under Chassis / Wheel Washing System:
 - a. Under chassis wash provided by 1-1/2" hot dipped galvanized pipe, 9'-2" long, installed perpendicular to direction of vehicle travel.
 - b. Wheel washing system provided by 1-1/2" hot dipped galvanized pipe, vertically positioned on each side of lane, at least 14" tall.
 - c. Under chassis pipe to be recessed into drive surface.
 - d. Removable load rated grate to cover and protect pipe without limiting spray pattern.
 - e. High pressure water piping to attach to chassis wash pipe and wheel washing pipe with pressure rated coupling. Trench encapsulating coupling to provide service clearance at attachment location.
 - f. Provide 10% extra brass nozzles.
6. High Pressure Water Booms:
 - a. System to include at least two (2), one per vehicle side, vertical, self-adjusting, electro-mechanically controlled, high pressure booms.
 - b. Booms to be 1-1/2" hot dipped galvanized piping with brass spray nozzles.
 - c. Booms to be vertical and span largest vehicle's full height as indicated by client based on current and future vehicle fleet requirements.
 - d. Booms to be controlled by electrically driven motor and worm gear box assemblies.
 - e. Boom motion capable of 180 degrees of vertical rotation with stops at 0, 45, 90, 135, and 180 degrees.
 - f. System to respond automatically through infra-red photo cell responses. System to include features to not respond to pedestrian traffic.
 - g. Provide 10% extra brass nozzles.
7. Three-way valve:
 - a. Stainless steel construction.
 - b. Valve located for maintenance access.
 - c. Valve controller provided with protected from spray.

G. Detergent Application System:

1. Detergent Storage Tank to maintain a mixture of water and detergent. Detergent mixing system to circulate mixture inside tank. Tank less hot water heater to heat incoming water supply. Detergent Pump to deliver mixture to Pre-soak detergent arch.
 2. Automatic Detergent Mixer and Storage Tank:
 - a. A fusion welded polyethylene buffer tank with minimum capacity of 2 wash cycles for mixing detergent and water.
 - b. Detergent inlet valve and water inlet valve controlled by tank mounted float.
 - c. Multiple detergent suction hose nozzles to be included for modular control of mixture.
 - d. Bypass pump to circulate mixture when equipment is inactive.
 - e. Hot dipped galvanized steel floor stand supports buffer tank above detergent pump below in vertical arrangement.
 3. Detergent Pump:
 - a. 304-Stainless steel corrosion-resistant horizontal multi-stage centrifugal pump.
 - b. Direct drive electric motor with combination motor starter and disconnect.
 - c. Motor rated at; 480 volt, 3-phase, & 60 hertz
 - d. Relief valve with bypass to be included.
 4. Pre Soak / Detergent Applying Equipment:
 - a. All frame and structural members to be hot dipped galvanized steel.
 - b. Detergent applying spray pipes to be 304-stainless steel.
 - c. Spray tips shall be brass and attached by quick disconnect devices.
 - d. Spray tips shall include anti-siphon valves.
 - e. Provide 10% extra brass spray tips.
 - f. Equipment shall be able to provide optimal coverage of front, sides and rear of vehicle as indicated by client based on current and future vehicle fleet requirements.
 - g. Detergent application amount to be modified as necessary per user requirements.
- H. Brush Wash System:
1. Wash water pump to deliver water from High Pressure Buffer Tank to Brushes.
 2. Brush Machine Housing:
 - a. Frame structures to be hot dipped galvanized steel.
 - b. Housing to support brushes, motors and all associated accessories.
 3. Brush Wash Section:
 - a. System to include at least two (1), one per vehicle side, vertical, self-adjusting, electro-mechanically controlled, vertical brushes.
 - b. Brush to span largest vehicle's full height as indicated by client based on current and future vehicle fleet requirements.
 - c. Brush motion controlled by electro-mechanical device and should be able to provide multiple contact passes of front and rear vehicle surfaces.
 - d. Two brushes in conjunction to provide overlapping contact of washed front and rear surface area.
 - e. Bristles shall be polyethylene with cross hatched grooving.
 - f. All brush sections to be full density.
 - g. Brush sections to be driven by 3-phase electric motor connected to worm gear assembly controlling brush motion. Belt, pneumatic, gravity, or hydraulically driven motion controllers are not acceptable.

- h. Amperage meter to be provided and signal to be relayed to control panel for the purpose of monitoring applied brush pressure to vehicle surface.
 - i. $\frac{3}{4}$ " Hot dipped galvanized piping with brass spray tips to deliver water and detergent mixture directly to brushes.
 - j. Provide 10% extra brass spray tips.
 - k. System to respond automatically through infra-red photo cell responses to protect damage to mirrors, racks, and other external vehicle components. System to include features to not respond to pedestrian traffic.
 - 4. Wash Water Pump:
 - a. Multi-stage vertical stainless steel centrifugal pump
 - b. Direct drive electric motor with combination motor starter and disconnect.
 - c. Motor rated at; 480 volt, 3-phase, & 60 hertz.
 - I. Final Rinsing Equipment:
 - 1. Final Rinse Water Pump to deliver water from Rinse Water Buffer Tank to Final Rinsing Equipment. Optional Rinse Aid System to deliver chemical downstream of Final Rinse Water Pump.
 - 2. Equal size rinse aid connection tee, valve, pipe cap, and label to be provided regardless of Rinse Aid equipment approval.
 - 3. Final Rinse Water Pump:
 - a. Stainless steel vertical multi stage impeller centrifugal style pump
 - b. Motor rated; 480 volt, 3-phase, & 60 hertz.
 - 4. Rinse Aid System (To be included as optional item):
 - a. 55 gallon drum of rinse aid supply
 - b. Stainless steel dosing pump .
 - 5. Final Rinsing Equipment:
 - a. Final rinse provided by arch or boom system constructed from $\frac{3}{4}$ " hot dipped galvanized pipe capable of providing complete coverage of vehicle front, sides, rear, and roof as indicated by client based on current and future vehicle fleet requirements.
 - b. System to be supported by hot dipped galvanized frame.
 - J. Water Recycling System:
 - 1. Water recycling pump to deliver water to High Pressure Buffer Tank. Ozone Generator to purify water stream prior to reaching High Pressure Buffer Tank. Recycling system to operate based on tank and pit level sensors. Domestic water make-up with motorized valve to be provided to prevent low water condition.
 - 2. Water Recycling Pump:
 - a. Submersible pump to be mounted in pit.
 - b. Submersible pump is stainless steel 0.75KW 1hp 480/3/60
 - c. Submersible pump to operate at 72 gallons per minute at 20 psi.
 - d. System pumps specific for dirty water utilizing oil resistant gaskets and rubbers with ceramic seals.
 - 3. Ozone Generator:
 - a. System to purify down to particle size 10 micron with dirt load of 1 gram per liter.
 - b. Recycling system to operate based on mechanical float sensors interfaced with control panel.
 - c. Ozone generator to produce 5 grams of ozone per hour.

- K. Motors:
 - 1. Motors to be Totally Enclosed Fan Cooled (TEFC)
 - 2. Motor ratings to match requirements listed by component description
 - 3. All motors to be NEMA rated high-efficiency
- L. Roof Mop:
 - 1. Roof mops to hang behind detergent arch.
 - 2. Roof mop to hang from stationary support structure and not oscillate.
 - 3. Section to include at least two (2) rows of hanging room mops.
 - 4. Mops to be made of mildew mold resistant cloth material
 - 5. All framing and supports to be hot dipped galvanized steel.
- M. Blower Dryer System
 - 1. System shall be automatically activated.
 - 2. Shall have minimum of (2) blowers per each side of bus.
 - 3. Frame shall be constructed of hot dipped galvanized steel.
 - 4. Blower housing shall be stainless steel or powder coated metal.
- N. All accessories, supports, and vibration isolation for proper operation, mounting and support of complete system to be included and be made of corrosion resistant. Dielectric insulators to be provided at all contact locations of dissimilar metals.
- O. User Indicating Devices:
 - 1. System to include at least two (2) LED-traffic signals utilizing Red, Yellow, and Green color. One per lane.
 - 2. Traffic Signals to use common vertical traffic signal configuration as approved by the Department of Transportation.
 - 3. Traffic Signals to include color hues to reduce impact of color blindness.
 - 4. Traffic Signals to utilize 8" diameter LED light modules.
 - 5. Traffic Signals to be contained in watertight enclosure.
 - 6. Location of Traffic Signals to be based on manufacturer's recommendation.
 - 7. Traffic Signals to interact and function based upon input from control system.
- P. Controls:
 - 1. System shall include self-diagnosing, self-alarming, automation executing control panel.
 - 2. Control panel to include LCD control panel able to display all operational and alarming information. LCD control panel to utilize three color backgrounds which identify the status of the vehicle washing system.
 - a. Red: Emergency Stop
 - b. Orange: Alarm present
 - c. Green: Operating Normally
 - 3. Control panel to be able to record and report the number of washes performed, per vehicle defined program and in total.
 - 4. System to be able to perform at least 10 of unique defined wash programs. Specific wash program should be available for selection by vehicle operator at control panel prior to wash.
 - 5. All wash component operation and vehicle location feedback to be provided by infra-red sensors. Sensors to be located per manufacturer's instructions. Sensors to be able to be easily cleaned and replaced. Sensors to generate the

- ability for wash system response to the unique vehicle geometries without impact to wash effectiveness.
6. Main control panel to include Ethernet module to interface with facility network connection.
 7. Control shall utilize five (5) emergency stop push buttons to force immediate stop. Four (4) button shall be enclosed in water tight enclosures and with one (1) located at the every corner of the system. One push button shall be located on the control panel or within 3ft proximity. Control Panel shall be capable of receiving emergency stop signal from three (3) additional push buttons. Additional push buttons shall be provided at user's request.
 8. Control panel to execute the following functions:
 - a. Wash programs including but not limited to or any combination within:
 - 1) Pre-defined
 - 2) Touch less for small vehicles or similar as defined by user.
 - 3) User Defined Combination including but not limited to:
 - a) Vehicle with exterior accessories such as bike rack or similar.
 - b) Vehicle without exterior accessories
 - c) Sides Only
 - d) Sides and Rear Only
 - 4) Drive through without wash
 - 5) Wash with or without Brushes
 - 6) Wash with or without High Pressure Booms
 - 7) Wash with or without Detergent Arch
 - 8) Wash with or without Chassis Wash
 - 9) Wash with or without Blower Dryer
 - b. Emergency Stop
 - c. Emergency Stop Reset
 9. Manual controls located on face of control shall be able to lock out automation as well starting and stopping any wash system equipment.

PART 3 - EXECUTION

3.1 PIPING AND EQUIPMENT INSTALLATION

- A. Refer to related sections based on system for installation execution requirements.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of EQUIPMENT, PIPING, CONNECTIONS, and SPECIALTIES.
- B. When installing EQUIPMENT, PIPING, AND SPECIALTIES adjacent to NEW, RELOCATED, AND/OR EXISTING equipment, machines, and piping routings allow space for service and maintenance of all items. Refer to associated manufacturer for acceptable equipment clearances if not clearly indicated.
- C. Comply with requirements for piping specified in Section 15140 "Domestic Water Piping" and Section 15150 "Sanitary Waste and Vent Piping", unless otherwise

indicated by this section. Drawings indicate general arrangement of piping, fittings, and specialties.

- D. Connect piping to wash pumps, tanks, sprayers and associated accessories as indicated by manufacturer for proper operation. Install suction and discharge pipe equal to or greater than size of system suction and discharge piping.
 - 1. Install shutoff valves on piping connections to equipment at inputs and outputs. Install ball, butterfly, or gate valves same size as suction and discharge piping. Comply with requirements for general-duty valves specified in Section 15111 "General-Duty Valves for Plumbing Piping", unless otherwise indicated by this section.
 - 2. Install union, flanged, or grooved-joint connections on suction and discharge piping at connection to water piping. Comply with requirements for unions and flanges specified in Section 15140 "Domestic Water Piping."
 - 3. Install valve bypass, same size as and between piping, at connections to pump and equipment suction and discharge piping as indicated by system manufacturer. Comply with requirements for water piping specified in Section 15140 "Domestic Water Piping."
 - 4. Install flexible connectors, same size as piping, on piping connections to pump suction and discharge piping. Comply with requirements for flexible connectors specified in Section 15140 "Domestic Water Piping."
 - 5. Install piping adjacent to pumps and equipment to allow service, maintenance, and without impact to general movement to washing equipment.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 15076 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required. Reports shall include discrepancies and resolutions.

- B. Piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.6 CLEANING

- A. Clean non-potable water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of water piping system. Remove dirt and debris as work progresses.
- D. Touch-up damage to painted finishes.
- E. Wipe and clean equipment of oil, grease, and solvents, and make ready for use.
- F. Clean area around equipment installation and remove packing and installation debris from job site.

3.7 INSTALLATION

- A. Equipment Mounting: Install pumps associated with washing equipment on concrete floor or washing equipment framing supports using elastomeric pads or elastomeric mounts.
 1. Minimum Deflection: 1/4 inch (6 mm).
 2. For supported equipment, install hot dipped galvanized or stainless steel anchor bolts, with cathodic protection for contact of dissimilar metals, anchored into structural concrete floor.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Support connected piping so weight of piping is not supported by booster pumps.

END OF SECTION - 11010