

SECTION 11 11 26 - VEHICLE WASHING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- 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. Washer, bus, touchless/brush, hybrid with reclaim system and reverse osmosis system.
- B. Related Requirements:
 - 1. Section 01 23 00 "Alternates" for wash equipment bid alternate.
 - 2. Section 01 60 01 "Buy America Requirements" for special product requirements.

1.3 COORDINATION

- A. Coordinate size and location of recesses and inserts in concrete and masonry required for installation of equipment.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of blocking and backing required for installation of equipment attached to wall and ceiling assemblies.
- D. Coordinate locations and installation of vehicle wash equipment that may interfere with ceiling systems including lighting, electrical switches or outlets, and floor drains.
- E. Coordinate locations and requirements of utility service connections.
- F. Coordinate connection of wash equipment controls with other building elements and systems controls indicated to be interconnected.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

Revision 1 (R1) - Addendum 3 – November 27, 2023

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Clearly mark each submittal to show which products and options are applicable; do not include manufacturer's complete catalog when pertinent information is contained on a selected page(s). Include the following:
1. Manufacturer's model number.
 2. Accessories and components that will be included for Project.
 3. Clearance requirements for access and maintenance.
 4. Utility service connections for electrical power and controls, plumbing, compressed air, and other utility services as applicable. Include rough-in dimensions.
- B. Shop Drawings: For custom fabricated vehicle wash equipment, components, furnished specialties and accessories. Include plans, elevations, sections, rough-in dimensions, fabrication details, utility service requirements, and attachments to other work.
- C. Seismic Restraint Product Data: Equipment requiring seismic restraint are itemized under Part 2 Article "Performance Requirements."
1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component required.
 2. Include one of the following types of submittals, for each type of vehicle washing equipment, substantiating that seismic restraint is suitable for conditions indicated.
 - a. Preapproved Ratings: Documentation based on preapproved ratings are preferred. Ratings shall be based on horizontal and vertical load testing and analysis.
 - 1) Provide ratings from one of the following:
 - a) ICC-ES.
 - b) OPA number from OSHPD.
 - c) An agency acceptable to authorities having jurisdiction.
 - 2) For seismic anchorage with preapproved rating, restraint devices shall bear anchorage preapproval showing maximum seismic-restraint ratings by rating agency submitted.
 - 3) If preapproved ratings are unavailable, submittals based on independent testing are preferred.
 - b. Independent Testing: Ratings based on testing by a qualified independent testing agency.
 - 1) Documentation based on independent testing are preferred to ratings based on calculations.
 - c. Delegated Design: If preapproved rating documentation or independent testing documentation are not available, provide calculations. Calculations

Revision 1 (R1) - Addendum 3 – November 27, 2023

(including combining shear and tensile loads) to support seismic restraint designs must be signed and sealed by a qualified professional engineer.

- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each factory-applied color finish required, in manufacturer's standard sizes.
- F. Product Schedule: For vehicle wash equipment. Use same equipment number indicated in Specifications and on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For manufacturers' special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each vehicle wash equipment unit to include in operation and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include a product schedule for each vehicle wash equipment unit; include the following:
 - 1. Equipment number used in Specifications and on Drawings.
 - 2. Manufacturer's name and model number.
 - 3. Contact Information:
 - a. A list of factory-authorized service representative(s). Include street address, telephone number(s), and email address for each.
 - b. List of supplier(s) for repair parts. Include street address, telephone number(s), and email address for each.
 - 4. Description of system and components.
 - 5. Schematic Diagrams: For electrical power and controls, plumbing, compressed air, and other utility services as applicable.
 - 6. Operating Instructions: In writing by manufacturer.
 - 7. Preventative Maintenance: A written schedule of recommended procedures and frequency required to validate warranties. Failure to provide preventative maintenance information will indicate that it is not a condition for validation of warranties.
 - 8. List of manufacturer recommended maintenance materials required for 1 year of normal equipment operations.
 - 9. List of equipment manufacturer recommended brand name cleaning solutions and chemicals required for equipment operations.

Revision 1 (R1) - Addendum 3 – November 27, 2023

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cleaning Solutions and Other Chemicals: Of each type required for not less than 5,000 vehicle cleaning cycles.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm with not less than 5 years experience in manufacturing vehicle wash equipment units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
 - 1. Manufacturer's Service Center: Located within 100 miles of Project site; capable of providing training, parts, and emergency maintenance repairs.
 - 2. Technical or factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by vehicle washing equipment manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 - a. Service representative must be able to assist Owner with wash equipment malfunctions within 24 hours of notification during warranty period.
- B. Installer Qualifications: A firm or individual experienced in installing or assembling vehicle wash equipment units similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. The requirements for each type of vehicle wash equipment specify the minimum level of quality, features, performance, and construction; and originate from the basis of design product indicated.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging.
 - 1. Packaging shall be suitable for protection during shipment and storage in humid and dusty conditions.
 - 2. Outside of packaging shall be indelibly labeled with storage equipment description and number used in this specification, and with description of contents. Packaging within packaging shall be similarly labeled.
 - 3. Each equipment item shall be delivered complete in one shipment.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- B. Prior to acceptance, verify that delivery is not damaged from shipping and weather exposure. Compare packaged contents with packing list to verify complete receipt of equipment and accessories specified.
- C. Store materials, components, and equipment off the ground, under cover, and in a dry location.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install vehicle wash equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry.

1.12 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace vehicle wash equipment units that fail in materials or workmanship within specified warranty period.
- B. Failures include, but are not limited to:
 - 1. Operation or control system failure, including excessive malfunctions.
 - 2. Performances below specified ratings.
 - 3. Excessive wear, rough operation, premature parts damage, loosening or loss, all resulting from normal operations.
 - 4. Deterioration of metals, metal finishes, and other materials beyond normal wear.
 - 5. Unsafe conditions.
 - 6. Need for excessive maintenance.
 - 7. Abnormal noise or vibration.
 - 8. Rough and substandard operation.
 - 9. Loose, damaged, and missing parts.
- C. Water reclamation system shall produce no objectionable odors or unsafe gases. If such conditions occur, manufacturer shall take corrective action(s) necessary to reduce or eliminate the cause of the odors and gases to acceptable and safe levels; and such action shall not include the use of chemical solutions.
- D. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.
- E. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain vehicle wash equipment from single source from single manufacturer.

Revision 1 (R1) - Addendum 3 – November 27, 2023

2.2 SUBSTITUTION LIMITATIONS

- A. Comply with administrative and procedural requirements of Section 01 25 00 "Substitution Procedures."
 - 1. If substitutions are allowed, acceptance will be substantially based contractor's completeness in preparing comparative data (differences and similarities) between specified product or material and proposed substitution. Include attributes of specified product or material (i.e. description, reference standard, performance requirement) and corresponding attributes of substitution.

2.3 MAINTENANCE MATERIALS

- A. Repair parts for storage equipment shall be readily available from part suppliers located in the United States.
 - 1. Repair parts shall be available for no less than 7 years from date of Substantial Completion.
 - 2. Emergency parts orders shall be available for delivery within 24 hours.
 - 3. Routine parts orders shall be available for delivery within 72 hours.

2.4 REGULATORY REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 PERFORMANCE REQUIREMENTS

- A. Seismic Restraint:
 - 1. Vehicle washing equipment shall be installed with seismic-restraint devices.
 - 2. Seismic Performance: Vehicle washing equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - a. Component Importance Factor: 1.0.
 - b. Other Seismic Performance and Design Criteria. See Structural Drawings.
- B. Design each vehicle wash system to accommodate and effectively clean the types and quantity of vehicles indicated on the Drawings. The engineering and efficacy of each system provided shall take into account the location and climatic conditions under which the vehicles and wash systems operate.
- C. Cleaning Detergents:
 - 1. Quantity Required: Not to exceed 0.4 gallons per 45 foot long bus or equivalent.
 - 2. Ingredients: Detergents shall contains no acids containing fluorides (e.g. Hydrogen Fluoride/Hydrofluoric Acid (HF) or Ammonium-Bifluoride (ABF)).
 - 3. Effectiveness: Capable of removing most visible, heavy accumulations of dirt,

Revision 1 (R1) - Addendum 3 – November 27, 2023

and most road film from surfaces of vehicles without damage to vehicle when passing through vehicle wash at the rate of 50 ft/min. Effectiveness of dirt and film removal shall be determined after washing and drying cycles are complete.

- D. Water reclamation system shall not generate unpleasant odors or unsafe gases.

2.6 EQUIPMENT LABELING

- A. Label each major item of equipment with a non-corrosive label with the following information permanently applied:
 - 1. Manufacturer's name and address.
 - 2. Equipment model number and serial number.
 - 3. Pertinent utility and operating data.
- B. Label Material and Thickness: Either of following:
 - 1. Brass, 0.032-inch minimum thickness.
 - 2. Stainless steel, 0.025-inch minimum thickness.
 - 3. Aluminum, 0.032-inch minimum thickness.
 - 4. Anodized aluminum, 0.032-inch minimum thickness.
 - 5. Multilayer, multicolor, plastic for mechanical engraving, 1/8-inch minimum thickness.
- C. Label text shall contrast with label background and be easily readable from 24 inches distance.
- D. Factory attached label securely on equipment in a prominent location.

2.7 VEHICLE WASH EQUIPMENT, GENERAL

- A. Provide vehicle wash equipment systems and components indicated. Where components are not otherwise indicated, provide manufacturer's standard components as required for a complete system.
- B. Provide piping, wiring, and switching from equipment to utility rough-ins as required for a complete and fully operational system(s).
- C. Fasteners and Anchors: Furnish required fasteners and anchorage devices for installing storage equipment, and furnish other components of work where installation of devices is specified in another Section.
 - 1. Concrete Floor Anchors: Stainless steel, post-installed expansion anchors. Provide number per unit recommended by manufacturer unless additional anchors are required for conditions indicated.
 - 2. Wall Anchors: Stainless steel; suitable for securing storage equipment to adjacent wall. Provide number per unit recommended by manufacturer unless additional anchors are required for conditions indicated.
- D. Cleaning Chemicals: Provide enough quantity of soap and other solutions required to

Revision 1 (R1) - Addendum 3 – November 27, 2023

completely fill reservoirs of vehicle cleaning equipment at time of substantial completion, exclusive of extra materials required under Part 1 Article "Maintenance Material Submittals."

2.8 BUS WASHER, BRUSH, WITH RECLAIM SYSTEM AND REVERSE OSMOSIS SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Interclean Equipment, LLC (Ypsilanti, MI; 734-961-3300).
2. N.S. Wash Systems (Inglewood, CA; 800-782-1582).
3. Ross & White Company (Cary, IL; 847-516-3900).
4. Westmatic Corporation (Buffalo, NY; 866-747-4567).

B. The following requirements specify the minimum level of quality, features, performance, and construction.

C. General Description:

1. Wash System:

- a. The equipment shall satisfactorily wash up to 25 40-foot transit buses per hour, minimum.
- b. The bus enters the wash and shall receive full soap on roof, front, sides and rear. The undercarriage wash shall be activated for the entire length of the bus. The brushes shall be activated to wash the front, sides, and rear of the buses. After the bus passes the ~~high-pressure~~ brush station, it shall receive the pre-rinse, final rinse ~~and blowers~~. **R1**
- c. Each component of the bus wash system listed above shall be activated by a series of photo eyes or infrared sensors.
- d. The vehicle wash shall be able to remove most of the visible heavy dirt accumulation and the road film from the Owner's vehicles when they are driven thru the washer at 50 feet/minute. The cleaning performance shall match and/or exceed those standards that are prevailing in the bus wash industry. No acids containing fluorides (HF or ABF) shall be allowed. The evaluation of the system capability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.
- e. The vehicle wash system shall be capable of washing all vehicles up to 12 feet in height including the following:
 - 1) Standard Transit buses (40 to 45 feet)
 - 2) Articulated Transit buses (60 feet)

2. The wash system shall include a water reclamation system.

D. Capacities/Dimensions (nominal):

1. Bay length: See drawings.

Revision 1 (R1) - Addendum 3 – November 27, 2023

2. Bay width: See drawings.
3. Minimum clearance to building structure above: See drawings.

E. Features/Performance/Construction:

1. Detergent arch and components:
 - a. The detergent arch shall provide efficient and economical vehicle coverage to the roof, front, sides, and rear of the bus.
 - b. Amount of applied detergent shall be adjustable for seasonal or Owner's requirements.
 - c. Timing of operation and position of the arch shall be determined by manufacturer to provide optimum detergent penetration before high-pressure station or brush wash cycle.
 - d. The detergent pumps shall be sized with variable volume output. The selected soap pump set up shall allow the Owner to spray separately side and rear of the vehicle at varying ratios separately. The amount of detergent delivery by the pump shall be readable on the pump calibrated settings.
 - e. The system shall have a water booster pump to ensure even water pressure under all circumstances.
 - f. The design of the detergent arch shall allow immediate activation of the nozzles upon arch activation by the vehicle. All arch piping, structures, and anchors must be stainless steel.
 - g. ~~Detergent arch(es) shall be supplied soft, heated water, heated by an electric water heater supplied as a part of the equipment package. Tank shall be sized at 100 gallons and unit shall be capable of producing 190 gallons of water at 100 to 120 degrees F per hour. R1~~
 - h. All detergent arch water shall be reclaim water (primary source) or fresh water (secondary source if reclaim system is off or non-operational). **R1**
2. Brush System with Roof Mop:
 - a. The system shall be equipped with a counter rotating four-brush, minimum wash system in order to reach the door recesses and mirrors.
 - b. Brushes shall be controlled to automatically adjust the degree of brush pressure delivered to the bus to prevent damage to protruding objects such as mirrors. Should pressure become too high due to a malfunction or driver error, the system shall automatically shut down to prevent damage. The cause of the shutdown shall be indicated on a control panel. Reactivation of the system shall be achieved by resetting the alarm/breaker switch.
 - c. Two brushes shall be sized to wash the front of the bus and avoid damaging bike folded bike racks.
 - d. Two brushes shall be sized to wash the entire profile of the buses. Including the sides and rear of the bus. The rear wash follow-up of the brush shall be by separately adjustable air pressure only for the rear follow-up feature.
 - e. All brushes shall be able to be fixed side brushes ~~should the Owner decide to wash front and rear of buses in future using high-pressure arches. R1~~
 - f. The brush system support structure shall be hot dip galvanized with stainless steel anchors.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- g. The brushes shall be of Soft Foam Material known by trade names of Poly-Lite, Car-Lite or Neo-Text.
 - h. The brush motors shall be designed for a wet environment.
 - i. The roof mop shall be supported by the same structure as brushes. The roof mop shall be designed as not to interfere with any mirrors or other protrusions of the buses.
 - j. All brush water shall be reclaim water (primary source) or fresh water (secondary source if reclaim system is off or non-operational). **R1**
- 3. Undercarriage wash system:
 - a. The system shall be designed with optimized high-pressure spray pattern to clean the vehicle under body.
 - b. Galvanized steel high-pressure pipe (minimum 9-feet in length) mounted perpendicular to vehicle travel direction. Minimum 8 stainless steel spray nozzles. Includes traffic-rated hot dip galvanized steel cover plate grate with cut-outs for pipe connections.
 - c. All high pressure water shall be reclaimed water.
- 4. Final rinse arches:
 - a. The final rinse arches shall use fresh water processed through the Reverse Osmosis System (RO). There shall be two Arches. The first arch shall use reject water from the RO system. The second arch shall use RO water from RO water storage tank and shall be the spot free final rinse arch.
 - b. Timing of operation and position of the rinse arches shall be determined by manufacturer to provide optimum rinse penetration after wash cycle.
 - c. Final Rinse Arches shall be made of stainless steel pipe and equipped with dual, adjustable swivel nozzles and diaphragm check valves to evenly apply fresh water rinse to front, rear, sides and roof of vehicle proceeding through the arch.
- 5. Reverse Osmosis (RO) System:
 - a. RO system shall be controlled on the main bus wash control panel touch-screen. The RO system electrical system design shall be based upon the hardness test of city water supply and shall produce water quality that will provide spot free, non-etching quality rinse water for bus wash systems.
 - b. RO system shall include the following as standard equipment:
 - 1) Water softener.
 - 2) Filters.
 - 3) RO water tank.
 - 4) Piping and connection between equipment shall be provided as required for complete an operable system.
 - c. Water softener:
 - 1) The water softening system shall be used as a pretreatment system prior to delivering water to the RO system.
 - 2) Water softening system shall reduce the hardness to less than 3 grains of hardness.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- 3) Water softener shall be capable of handling a flow rate of required for the wash system at a continuous pressure of 50 PSI with a pressure loss not exceeding 15 PSI.
 - 4) The system shall have a softening capacity of not less than 60,000 grains of softening capacity per regeneration when a salt dosage of 18 pounds per tank is used.
 - 5) Resin tank shall be sufficient to allow adequate expansion of the resin during backwashing. Tanks shall be designed for an operating pressure up to 120 PSI.
- d. The single activated carbon filter shall be properly sized for the inlet flow rate of the RO assembly. The filter shall remove chlorine and prevent RO membrane damage. Automatic backwashing system removes the trapped contaminants within the filter and washes them down the drain.
 - e. Cartridge pre-filter shall be attached at the inlet of the RO system. The filter shall be rated for 5 micron nominal. The filter housing will include a built in pressure relief valve to collect any particles larger than 5 microns.
 - f. The pressure sensor at the inlet pump shall monitor the inlet pressure. If the flow drops below a certain value, it will cause the HP pump to stop. It will also trigger the inlet solenoid to stop the flow of water.
 - g. The pressure sensor at the outlet pump shall monitor the system pressure. The sensor shall stop the HP pump if the system pressure rises above 250 PSI. The minimum operating pressure should be no less than 200 PSI.
 - h. The inlet solenoid valve shall shut off/on the water supply to the RO system.
 - i. A pressure gauge shall be provided to monitor the pump outlet.
 - j. A pump throttle valve shall be included to control the pressure.
 - k. A flow control valve shall control the concentrate at the outlet of the RO system. The valve along with the pump throttle valve should be used to adjust the systems pressure and flow rate of concentrate and permeate.
 - l. The concentrate outlet solenoid valve open and closes during automatic flushes.
 - m. The flow meter shall measure the flow of permeate and concentrate at the product and concentrate line. The flow meter shall be panel mount type with horizontal connection, ranging 1 to 10 GPM.
 - n. The high pressure pump will be used to produce an operating pressure of 230 PSI at the inlet of the RO membrane.
6. Water reclamation and treatment system:
- a. The water reclamation system shall be capable of reclaiming water from the vehicle washer and process it by means of settling pits, in-line filters, centrifugal filter system and bio-remediation system. The system must be able to continuously supply adequate amount of water for high-pressure pump regardless of traffic volume through the washer.
 - b. The above ground tank or tanks shall be of self-cleaning type and designed not to accumulate any dirt build-up.
 - c. Bio-Remediation system shall be included in total system design. The bio-remediation system shall be designed to eliminate and/or reduce the total load of hydrocarbon loading within the recycled water body. The system shall include and consist at least the following components:

Revision 1 (R1) - Addendum 3 – November 27, 2023

- 1) Enzyme dispensing system.
 - 2) Accelerator dispensing system.
 - 3) Dissolved Oxygen Aeration system.
- d. The odors must be kept in total control without the use of any chemicals. The guarantee that the system is built to control odors must remain valid after the final acceptance for the period of three years. Algae build-up in wash water that will result in objectionable odors is not acceptable to the Owner.
- e. Sump pump:
- 1) Self-priming type for transferring water from sump pit to the above ground recycled water tank through the filtration system. Minimum capacity shall be 300 GPM of cleaned water.
 - 2) The capacity of sump pump shall allow for the pressure losses from two cyclone separators used in series and GPM after the pressure losses shall be higher or equal to the high pressure wash water usage.
 - 3) The sump pump shall be designed to handle solids that will be found in wash water.
- f. Cyclone separators:
- 1) Two cyclone separator systems shall be used in series, the cleaned water from the first cyclone shall pass through the second cyclone separator to ensure maximum solid removal performance. Two cyclone separators shall be provided in series with at least one of them being in-line.
 - 2) Cyclone Centrifugal Separators shall provide second and third stage filtration.
- g. Downflows (purge water from cyclone separators containing solids) from cyclones separators shall collected in sludge cart or pumped back to the exit end of the trench pit with a solid handling pump. The solid removal pumping shall be activated when cyclone separators need to be purged. **R1**
- h. The aeration system shall provide air into the trench pit to prevent algae and odor build-up. Aerated water shall be evenly distributed throughout the pit even when the wash system is not operational. The system shall be designed to have no odors from algae.
- i. Stainless steel intake filter:
- 1) Stainless Steel Intake Filter Screen shall provide first stage filtration for sump pump intake. The pump intake filter shall be sized 0.015 inch or smaller.
 - 2) The intake filter shall made of stainless steel and shall have slotted orifices. Intake filter shall prevent any dirt from clogging the recycled water spray nozzles under all circumstances.
 - 3) Intake Filter Screen shall be equipped with high-pressure air back wash system that is automatically activated by the reduced flow into the pump intake.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- j. Reclamation tank:
 - 1) Reclamation Tank shall be made of linear low-density polyethylene with a minimum holding capacity to allow recycling a minimum of 300 GPM continuous operational flow.
 - 2) The tank shall have a 6 inch bottom manhole, float switch connections and other required fittings.

- k. Enzyme-catalyzed water treatment system:
 - 1) A biological water treatment system shall be included in total system design. This water treatment system, the enzyme-catalyzed water treatment system, shall be designed to eliminate and/or reduce the total petroleum hydrocarbon loading within the recycled water body. When used in conjunction with the specified recycling equipment, the systems shall remove both organic contaminants and inorganic particulate from the reclaimed water stream.
 - 2) The Enzyme-Catalyzed Water Treatment System shall be equipped with an automatic product injection system for delivery of specialized biological products and enhancements. These biological products shall be specifically suited for wash water treatment applications, including degradation of petroleum hydrocarbon components commonly found in vehicle wash systems. This system will treat the reclaim wash water generated during the vehicle wash process. The bulk of the treatment process shall take place in the wash water pit, where continuous biological treatment of organic wastes in the vehicle wash water shall occur.
 - 3) The Enzyme-Catalyzed Treatment System shall deliver a constant supply of biological products, bio-enhancements, and oxygen to support degradation of organic constituents. The biological products and enhancements shall be injected directly into the circulation/aeration discharge pipeline of the recycling system, where they will then subsequently be discharged into the wash water pit. Oxygen shall be provided by the aeration pumping and mixing system.
 - 4) The automatic product injection system shall consist of low-flow injector pumps that inject biological products on a continuous basis. The injector pumps shall have:
 - a) Operating temperatures between 35 to 110 degrees F.
 - b) Product flow rate - 0.5 to 1.5 liters per day, adjustable.
 - c) Product delivery - Up to 10 feet of 3/8 inch diameter polyethylene tubing.
 - d) Two polyethylene check valves.
 - e) Two compression fittings.

7. Speed control:

- a. The Traffic lights shall be contained in a watertight enclosure and are DOT approved.
- b. Provide minimum two speed control devices at the following positions:

Revision 1 (R1) - Addendum 3 – November 27, 2023

- 1) Near the beginning of the wash to indicate the bus may enter the wash bay.
 - 2) A traffic light visible to the driver must indicate separately on each side and only for the period of time while each brush moves across the rear of the bus.
8. Tire guides:
- a. Tire guides shall be made of minimum 4-inch, Schedule 40 hot dip galvanized pipes.
 - b. The system shall have angled entry at the entrance. Ends of rails are capped and all headings are smoothly finished to prevent tire damage. Brackets supporting pipe shall be made of minimum of 3/8 inch steel plate that are welded to concrete imbedded cleats or anchor bolted to the concrete.
 - c. The system shall have stainless steel skid plates to allow misaligned bus to slide sideways for proper positioning.
9. Noise:
- a. Wash equipment shall not exceed 60 dbA at the lot line of adjacent properties.
- F. Controls:
1. The industrial Program Logic Controller (PLC) component is used as the HMI and process controller for proposed components and future vehicle wash systems. The application software provides near-real time control of the entire wash system. The PLC is connected to distributed I/O using ethernet network.
 2. The Process Controller (PC) shall be panel mounted onto the electrical enclosure, which also houses the electrical controls for the wash system. The PC may be mounted in its own enclosure in an office environment. The PC provides the centralized infrastructure to enable simple and complete integration with other systems, including modems, point-of-sale LANs, video, wireless internet, smart card readers, and other systems not yet developed.
 3. The application software shall be developed and provided by the manufacturer. This software shall include the specified bus wash components and cover all future expansions. The application software shall be written either for Linux or Windows-based systems. The wash software shall provide the following:
 - a. GUI shall be intuitive to use by people without computer experience.
 - b. At program start up, all devices shall be initialized to a known state.
 - c. All system settings, such as baud rates, parity, comm. port configurations, etc. shall be reconfigurable without necessitating recompiling the application software.
 - d. All user configurable settings shall be stored to disk using *.ini files, the windows registry, or a database to remember settings between reboots. These include all timing set points, alarm settings, and communication settings.
 - e. Data being logged to disk shall be buffered and only physically written to disk periodically to prolong the life of flash/hard drive.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- f. Alarms should have user configurable delays to prevent nuisance tripping. All user actions shall be logged to disk with a time and date stamp. User actions include timing changes, putting the system into auto/manual, changing options, or powering the system up/down.
 - g. Periodic polling of I/O may be initiated by either hardware or software interrupts. All real time processes, such as those required for closed loop control, shall be hardware interrupt driven.
 - h. A hardware watchdog circuit shall be used in case the PC locks up. Minimum timeout shall be 10 seconds. This circuit will be in series with the E-stop circuitry.
 - i. Error handling shall be provided for each and every line of code. It is not necessary to alert the user of all errors, but all handled errors shall be logged to disk.
 - j. Alarms shall have user configurable delays to prevent nuisance tripping.
 - k. Latency: scanning interval for all closed loop processes shall be executed less than 500 ms.
 - l. Provide terminal windows for spying on any devices communicating to PC via Ethernet, RS232, etc. These shall be used for troubleshooting communications problems.
 - m. Failure of any single component shall result in disabling the entire wash. For example, the system shall not be allowed to wash vehicles in a crippled state if a chemical pump motor overload trips.
- 4. The Industrial Control Panel shall be manufactured and evaluated in accordance with the Underwriters Laboratories, Inc. (UL) standard 508A (Industrial Control Panels). In addition, the panel shall be evaluated for high-capacity short circuit withstand and shall bear the appropriate UL marks including the short circuit withstand value mark as part of the official UL label.
 - 5. The industrial Control Panel shall be designed for operation on a 460 VAC, 3 phase, 60 HZ system, with a short circuit capacity of 65,000 amperes RMS Symmetrical, available at the incoming line terminals of the control panel.
 - 6. The Industrial Control Panel shall be designed to meet the requirements of the National Electric Code (NEC) Articles 430 and 670, also the National Fire Protections Association (NFPA) Standard 79 (Industrial Machinery).
 - 7. All push buttons, selector switches, pilot devices, system control and access functions shall be by Touch Screen Operator Interface Terminal.
 - 8. The main control box shall include a control panel with an LCD Touch Screen to provide the following standard functions:
 - a. Front, Sides and Rear Wash for Buses with Bike Racks (complete wash).
 - b. Sides and Rear Wash.
 - c. Sides only Wash.
 - d. Brushes 1 & 2 Off/On.
 - e. Brushes 3 & 4 Off/On.
 - f. Drive Through Without Wash.
 - g. Detergent Arch Off/On.
 - h. Chassis Wash Off/On.
 - i. ~~High Pressure Arch Off/On. R1~~
 - j. Alternate Wash Programs.
 - k. Emergency Stop.
 - l. Emergency Stop Reset.

Revision 1 (R1) - Addendum 3 – November 27, 2023

9. Electric Panels that are not UL approved shall not be acceptable.
10. The activation switches shall be designed to be activated by all fleet vehicles used by the Owner. Each activator shall be pre-mounted and wired to a watertight junction box equipped with built-in drainage holes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors and bases for suitable conditions where vehicle wash equipment will be installed.
- C. Examine walls and ceilings to which vehicle wash equipment will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Examine roughing-in for utility services and interconnected controls to which vehicle wash equipment will be connected for proper location and required type.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which vehicle wash equipment, of type covering floor, is to be installed.

3.3 INSTALLATION

- A. Install vehicle wash equipment according to manufacturer's written instructions and, if applicable, approved shop drawings. Unless indicated otherwise install equipment level, plumb, square, rigid, and true. Install free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 1. Install equipment anchored to substrate unless indicated otherwise.
 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support equipment loading and as required for stability.
 3. Anchor equipment using fasteners of type recommended by equipment manufacturer.
 4. Connect equipment to utilities specified.
 5. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
 6. Seismic Restraints: Install seismic-restraint devices using methods approved by preapproved ratings submittal, independent testing submittal, or delegated design submittal provided for each vehicle washing equipment type.

Revision 1 (R1) - Addendum 3 – November 27, 2023

- B. Arrange equipment so controls and devices are accessible for servicing.
- C. Arrange equipment so that piping can be installed a required slope.
- D. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.
- E. Fill equipment reservoirs and tanks with manufacturers recommended brand of cleaning chemicals (soap and other solutions) required for equipment operations.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform following field tests for each vehicle wash system.
 - 1. Vehicle Wash and Dry Test:
 - a. Consecutively wash and dry 5 vehicles of Owner's choosing in a time period not exceeding 15 minutes.
 - b. Washing and drying operations shall be conducted without the need of assistance by Owner's personnel (other than driver of vehicles), Contractor, Manufacturer's Representative, or others.
 - c. Vehicles must exit the system substantially dry. No more than [10%] [20%] of wash water may leave wash bay to reduce puddling.
 - d. Equipment shall not damage vehicles, including mirrors, windshield wipers and windows. Should damage occur, contractor shall compensate Owner for repairs.
 - e. Equipment shall not become damaged during washing and drying operations.
 - 2. Water Reclamation System Test:
 - a. Manufacturer's Representative shall continuously operate the water reclamation system for 60 minutes with the vehicle wash system active. During that time:
 - 1) No manual adjustments or overrides are allowed.
 - 2) No solenoid shall be allowed to fill the reclamation tank with fresh water should the sump pump be unable to keep the recycled water tank full.
- C. Vehicle wash equipment will be considered defective if it does not pass tests and inspections.
 - 1. Equipment failing tests shall be corrected within 5 days and re-tested.
 - 2. Equipment failing a second test shall be corrected within 5 days and re-tested.

Revision 1 (R1) - Addendum 3 – November 27, 2023

3. Equipment Failing Third Test: Owner reserves right to have defective vehicle wash equipment and associated water reclamation system removed from site at no cost to Owner.

D. Prepare test and inspection reports.

E. Adjust controls and safeties if required. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING AND PROTECTING

A. Clean finished surfaces and make ready for use. Remove residual oil, grease, solvents, and other contaminants using methods and products that will not damage equipment surfaces.

B. Touch up marred finishes or replace vehicle wash equipment that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by vehicle wash equipment manufacturer.

C. Replace vehicle wash equipment components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

D. Protect installed products from damage during remainder of the construction period.

3.6 DEMONSTRATION AND TRAINING

A. Engage a factory-authorized service representative to demonstrate operation of vehicle wash equipment to Owner's designated personnel.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the following vehicle wash equipment:

1. Bus washer: 8 hours minimum.

END OF SECTION 11 11 26