

**BUS WASH MODEL XJ-404**

**4X4 Wrap-Around**

**With Touchless Front and Top Wash Feature**

**TRANSIT AUTHORITY BUS WASH SYSTEM**

## **PART 1 GENERAL**

- A.** The general provisions of the Contract, including General and Supplementary Conditions apply to the work specified in this contract.

## **PART 2 RELATED WORK**

- A.** Site work
- B.** Concrete
- C.** Mechanical
- D.** Electrical

## **PART 3 QUALITY ASSURANCE**

- A.** The system shall be produced by a manufacturer of established reputation with a minimum of five (5) years experience supplying specified equipment in similar applications.
- B.** Installation: Provide a qualified manufacturer's representative to supervise work related to equipment installation, check out and start-up.
- C.** Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

## **PART 4 SUBMITTALS**

### **1 Product Data**

- A.** This bid is for the custom engineered vehicle wash system for the Transit Authority Bus Wash Bay. The intent is to install a combination friction / touchless bus wash system that is capable washing all of the owners' transit fleet vehicles. All systems and designs have to be prepared and engineered along the Owner set design and engineering parameters.
- B.** The above information must be complete in all details and must provide the Owner the basis for the proposed system evaluation. The submitted drawings shall be corrected for the details after the completion of the system installation for the as-built drawings.
- C.** Operation and Maintenance Manual
  - 1. Provide copies of the proposed system Operations and Maintenance Manuals.
  - 2. Assemble and provide copies of manual in 8.5 x 11 inch format. Fold out diagrams and illustrations are acceptable. Manuals to be reproducible by dry copy method.

### **2 Deviations From These Specifications**

- A.** These specifications are not designed to limit the competition or to limit the equipment to any specific bidder. The specifications can be modified and altered from the system specifications as listed herein as follows:
  - 1. The specified features, wash concepts and functions are mandatory and cannot be altered.

2. If the specifications call for “no substitution”, the item(s) is deemed to be equally available for all bidders and shall be provided as specified. If “no substitution item is erroneously specified for a patented item not available for the bidder or for an item not available for all bidders for other reasons, the bidder is encouraged to file a complaint with the Owner’s Engineer.
3. All specified **GPM and PSI** are listed as minimum and must be met or exceeded. All horse powers, dimensions of structural steel and other components that are stated as minimum must be met or exceeded.
4. All specified materials are minimums and must be met or exceeded. Lower grade material cannot substitute higher grade material. Material listing from lowest grade to higher grade is as follows:
  - (a) Galvanized steel (lowest acceptable for any application)
  - (b) Aluminum 6061 T6 Hard Coat Anodized
  - (c) Stainless steel 304
  - (d) Stainless steel 316
5. The number of equipment packages, modules, number of pumps, arches and all other components listed herein must be met or exceeded.
6. All wash equipment and water recycling performance functions are minimum that must be met or exceeded. All deviations from the specified equipment performance must be fully documented with the drawings, engineering calculations and clearly explained why the proposed system meets and exceeds to specifications. The responsibility to meet the specified performance shall be bidder’s.

### 3 **Supplier's Qualifications**

- A.** The equipment specified herein is based on the system specification as desired by the Owner’s operations people. The Owner shall not approve or provide approved equal status for any bidders, equipment packages or for various manufacturers (including any listed manufacturers). Any mentioning or listing of manufacturers (in these specifications) shall not be considered to be approval by the Owner or Owner’s Engineers for the named supplier equipment or equipment packages.
- B.** The brush wash system, high pressure cleaning systems, friction systems, pumping stations and all electrical controls shall be designed and supplied by one supplier.

### PART 5 **WARRANTY**

- A.** Warranty work specified herein is for one (1) year from substantial completion against defects in materials and in labor and workmanship.
- B.** Defects shall include, but not be limited to:
  1. Operation; Noisy, rough or substandard operation
  2. Parts; Loose, damaged and missing parts

3. Finish; Abnormal deterioration

**PART 6 SCOPE OF WORK**

- A.** To furnish a completely automatic, friction and touchless combination heavy-duty vehicle wash and water reclamation system which washes all types of transit vehicles used by fleet owners for front, roof, rear and both sides in drive-thru mode.
- B.** Sides and Rears of the vehicles shall be able to be washed with friction and fronts with touchless high pressure with an optional friction wash (by operator selection). Washing roofs of the vehicle shall be touchless and/or friction.
- C.** The supplier is to be responsible for the supply of necessary equipment, materials and service for the complete assembly and erection of the equipment so that it is ready for operation as per these specifications.

**PART 7 WASH SYSTEM OPERATION AND PERFORMANCE**

- A.** Operation mode – Transit Bus Wash
  - 1. The bus enters the wash and receives full soap on front, sides and rear. When bus enters the brush and high pressure system, the four brushes have an option to wash front, sides and rear with only the rotating brushes. If the bus has mirrors, bicycle racks or other protrusions the system can optionally wash the fronts of the buses with high pressure wash. High Pressure water volume and pressure are as follows: 150 GPM at 115 PSI.
  - 2. The supplier shall acknowledge the fact that rear washing of transit buses always has been and continue to be the problem area in any transit bus wash operations. Subsequently the activation of the rear wash activation for the side/rear brushes shall be precise. The brush on each side of the bus shall be independently controlled. Movement of the brushes shall be by an air over oil system, systems that rely on pneumatic or electric alone are not acceptable. The rear wash follow-up of the brush shall be by separately adjustable air pressure only for the rear follow-up feature. The activation of higher air pressure for the side/rear brushes must not take place while the brush(es) is on the side the bus and such activation must take place separately for each side/rear brush. The higher air pressure must be activated immediately as the bus rear corner has already passed each brush. The traffic light visible to the driver must indicate separately on each side and only for the period of time while the rear brush moves across of the rear of the bus. It is up to each supplier to select the method to achieve the above by using a series of photo eyes, sonar detectors, magnetic detectors, proximity sensors, lasers and or radars or other methods to achieve the desired results.
  - 3. If the supplier feels that his/her technical capabilities are not adequate to achieve the specified brush movement features or if he/she feels that such specified performance feature are impossible, he/she shall take an exception in his/her bid forms and state precisely with supporting technical

data the reasons for such.

- B. The supplier is responsible to design the equipment to satisfactorily wash up to 30 vehicles per hour.
- C. **The supplier is solely responsible for the equipment performance.** Should the equipment not perform, as per these specification requirements, the supplier shall modify, add and/or alter the equipment supplied at his own expense until the performance is satisfactory. The Owner shall approve all such changes. Should the performance criteria not be met after the changes, the supplier shall remove the system at no cost to the owner.
- D. The vehicle wash system to be capable of washing all vehicles up to 12' in height including the following:
  - 1. Vans, Para-Transit buses
  - 2. Transit Buses

## PART 8      **WATER RECLAMATION PERFORMANCE**

- 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. Prior to final acceptance of the system by the owner, the supplier shall demonstrate the continuous operating capacity of the reclamation system in relation to the truck wash system by running (on manual override) both the high pressure wash system and the water reclamation system for a period of 60 minutes (without a pause). During the 60 minutes test no manual adjustments or overrides are allowed and no solenoid shall be allowed to fill the reclamation tank with fresh water should the sump pump capacity be not able to keep the recycled water tank full.
- C. Regardless of technical specifications, the equipment supplier explicitly assumes the responsibility to design the water reclamation system for the intended purpose and has made himself familiar with all performance requirements prior to bidding.
- D. All equipment located outside the wash bay area including reclamation tank, high pressure pump, sump pump, aeration pump, booster pump, cyclonic separators and all float switches must be mounted **on a single modular skid assembly.**
- E. The equipment module shall be tested for all plumbing connections (**pressure tested**), all electrical circuitry, pump rotations and for all component functions at the factory prior to shipping.
- F. **The odors must be kept in total control without the use of any chemicals including ozone, enzymes, bacteria or masking agents.** Algae build-up in wash water that will results in objectionable odors is not acceptable to the Owner.

- G. The above ground tank or tanks must be of self-cleaning type and shall be designed not to accumulate any dirt build-up.
- H. 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 included and consist at least the following components:
  - 1. Enzyme dispensing system
  - 2. Accelerator dispensing system
  - 3. Dissolved oxygen and aeration system

#### **PART 9 MECHANICAL INTERCONNECTING PIPING**

- A. The equipment module including recycle tank, high pressure pump, sump pump, booster pump, aeration and pit dirt removal pump is to be pre-plumbed and pressure tested prior to shipment to the site.
- B. All field plumbing and mechanical work will be done by the bidder, including:
  - 1. Water and gas utilities up to and connecting to the equipment.
  - 2. Interconnecting piping between various equipment components located in the equipment room.
  - 3. Interconnecting piping between the equipment located in the equipment room and the equipment located in the wash bay.

#### **PART 10 ELECTRICAL INTERCONNECTING WIRING**

- A. The equipment module including electrical panel, tank float switches, high-pressure pump, sump pump, booster pump, aeration and pit dirt removal pump is to be pre-wired and tested prior to shipment to the site.
- B. All field electrical work will be done by the bidder:
  - 1. Electrical service up to and connecting to the equipment panel.
  - 2. Interconnecting wiring between various equipment components located in the equipment room.
  - 3. Interconnecting wiring between the equipment located in the equipment room and the equipment located in the wash bay.

#### **PART 11 WASH SYSTEM TECHNICAL SPECIFICATIONS**

##### **1 Chemical Arch Components**

- A. Timing of operation and position of the arch shall be determined by manufacturer to provide optimum detergent penetration before high-pressure / brush wash cycle.
- B. Detergent pumps (**total of two required**) shall be Inject-o-meter Model

- HVI82, ICE DN or engineer approved equal with variable volume output ratio from 1:10 to 1:100. The selected soap pump set up shall allow the owner to spray separately side and rear of the vehicle at ratios varying from 1:10 to 1:100 separately. The amount of detergent delivery (by the pump) has to be readable on the pump calibrated settings. The detergent pumps must be of positive displacement type.
- C. The system shall have 1 HP water booster pump to ensure even water pressure under all circumstances.
  - D. Chemical Arch(s) must be made of 1.25-inch **stainless steel** pipe compatible with used detergents and equipped with adequate number of nozzles to evenly apply detergent, hot water solution to front, rear, sides and roof of vehicle proceeding through the arch. The design of the detergent arch shall allow immediate activation of the nozzles upon arch activation by the vehicle. All arch piping and structures must be stainless steel – **no substitution allowed**. Piping from the equipment room to the soap arch to be made of PVC or stainless steel.
  - E. Intensified Rear Detergent Feature: The detergent for the rear of the vehicle shall be applied via a **separate**, stainless steel rear wash arch which is activated immediately after the vehicle has passed through the detergent arch. **The detergent concentration for the rear wash arch shall be individually adjustable and must have its own soap pump**. The intensified rear detergent arch shall be controlled and operated via its own vehicle sensing device, solenoid valves and chemical pumps as required for proper performance.
  - F. Activation: All system functions are activated by photo eyes.
  - G. The chemical spray components located in the equipment room must be assembled in a modular, wall mounted assembly containing the following components:
    1. Solenoid valves (2 required)
    2. Pressure gauge
    3. Pressure regulator
    4. In-line screen
    5. Isolator ball valves for all components
    6. Isolator ball valves to bi-pass water softener

## 2 The 4x4 Front/Side/Rear Brush System

- A. The system shall be equipped with a 4-brush wrap-around brush wash system. Two brushes shall have the option to wash the front of the bus and continue washing the sides and two brushes shall wash the sides of the bus and the rear of the bus.

- B. The brush wash system structure shall be made of heavy duty steel and shall be hot dip galvanized.
- C. The brush motors shall be maximum 2 hp each and shall be supported by bearing to the brush arm structure both on the top of the brush and at the bottom of the brush.
- D. The hanging roof mop shall wash the top of the bus and shall wash the upper part of the front window. The roof mop shall be designed as not to interfere with any mirrors or other protrusions of the buses/

### **3 High Pressure Arch Assemblies**

- A. The front wash shall be minimum 150 GPM.
- B. It is solely the suppliers responsibility to design and build the high pressure arches to meet the specified operational characteristics. All high pressure water shall be recycled water
- C. All bidders are notified and are aware of the fact that the sides of most transit buses are not well suited to be washed by high pressure due to the issues related to leaking (high pressure water penetrating inside of the bus). It is bidder's responsibility to design the system taking this into consideration.
- D. It is the suppliers responsibility to design the system to be safe for all buses and still be able to provide adequate cleaning performance on fronts, sides and rears of the buses.

### **4 Pumping Module**

- A. The high-pressure pump is of the centrifugal diffuser type as manufactured by Goulds Pump, Peerless or Carver with a flow rate of 150 GPM. Any pump selected by the bidder shall meet the performance of the specified pump.
- B. Impellers: The impellers are of the enclosed single suction type, hydraulically balanced to minimize axial thrust loads. Each impeller is individually keyed to the shaft. Impeller is bronze
- C. Stuffing box: Packed type stuffing boxes are equipped with a mechanical seal.
- D. Shaft sleeves: The shaft sleeve through the stuffing box is 1113% chrome stainless steel hardened to a minimum of 225 Brinnel and is keyed to shaft.
- E. Shaft: The shaft is standard carbon steel adequately sized for loads transmitted.
- F. Bearing: The bearings are designed for a average life of 50,000 hours. The outboard bearing is a deep groove type; the in board bearings are of the radial roller type with grease fittings.
- G. Base: A steel base plate contains the mounting of the pump and motor, which are carefully aligned and bolted in place prior to shipment. Final alignment will be checked and certified after installation and prior to operation by the user.



H. Coupling: The pumping module has a “Jaw” type coupling as manufactured by Lovejoy or equal and includes a coupling guard.

## 5 Electric Motor

A. The electric motor shall be of the squirrel cage induction type suitable for across the line starting. Motor shall operate on 460 Volt, 3phase, 60 cycle and be ODP with a 1.15 service factor.

B. The motor shall be sized so as not to exceed the name plate horse power during operation.

C. The motor shall be certified by the manufacturer for 30 activations per hour.

## 6 Final Rinse Arches

A. The final rinse arches shall use fresh water.

B. Timing of operation and position of the rinse arch shall be determined by manufacturer to provide optimum rinse penetration after wash cycle.

C. Final Rinse Arches shall be made of 1.25-inch **stainless steel** pipe and equipped with 25 pcs. of dual, adjustable Spraying Systems Swivel Nozzle Bodies QJ-8600 with Spraying Systems Diaphragm Check Valve Model 8360 to evenly apply fresh water rinse to front, rear, sides and roof of vehicle proceeding through the arch.

## 7 Electric Control Panel and Components

A. The panel and controls must be built according to these specifications. No substitutions shall be allowed. The control system shall be PLC based with separate HMI.

B. The PLC shall be the process application controller and provide near real time control of the entire wash system. It shall be connected to distributed I/O via an Ethernet network. The operator interface shall be through a separate HMI not integral to the PLC, connected to the PLC via Ethernet

C. The PLC shall be panel mounted in a 48”x36”x12” electrical enclosure, which also houses the electrical controls for the wash system. The PLC may be mounted in its own enclosure in an office environment. The PLC provides the centralized infrastructure to enable simple and complete integration with other systems.

D. The PLC and HMI programs shall be developed and provided by the bidder. These programs shall include the specified wash components and provide capacity for future expansion. The PLC program shall be provided in RSLogix 5000 v20 and the HMI program shall be provided in RSVIEW ME v6.1

E. PLC and HMI programs shall provide the following:

1. GUI shall be intuitive to use by people without computer experience. Little or no training should be required.

2. At program start up, all devices shall be initialized to a known state.

3. All system settings, such as baud rates, parity, comm. port configurations, etc shall be reconfigurable without necessitating recompiling the application software.
  4. All user configurable settings shall be stored in the PLC and/or HMI and saved to their respective SD cards. These include all timing set points, alarm settings, and communication settings.
  5. Periodic polling of I/O shall be every 20 ms or less.
  6. Alarms should have user configurable delays to prevent nuisance tripping.
  7. Latency: scanning interval for all closed loop processes should be executed <20 ms.
  8. Provide terminal windows for spying on any devices communicating to PC via Ethernet, RS232, etc. These will be used for troubleshooting communications problems.
  9. Failure of any single component shall result in disabling the entire wash. For example, the system will not be allowed to wash vehicles in a crippled state if a chemical pump motor overload trips.
- F. 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.
- G. The industrial Control Panel shall be designed for operation on a 460 Volt, 3 phase, 60 Hertz system, with a short circuit capacity of 65,000 amperes RMS Symmetrical available at the incoming line terminals of the control panel.
- H. 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).
- I. E-Stop related operator controls, all push buttons, selector switches, pilot devices, system control and access functions must be by Touch Screen Operator Interface Terminal.
- J. Electric Panels that are not UL approved are not acceptable.
- K. 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 water tight junction box equipped with built-in drainage holes.

## **8 Tire Guides**

- A. Tire guides must be installed for the full length of the wash bay starting at the earliest possible starting point and ending no more than 6" from the exit door frames.
- B. Tire guides shall be made of minimum 4" schedule 40 hot dip galvanized pipes.
- C. The system has 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" steel plate that are welded to concrete imbedded cleats or anchor bolted to the concrete.

- D. The system shall have stainless steel skid plates to allow misaligned bus to slide sideways for proper positioning.
- E. **The bidder must provide calculations and stress analysis of the tire guides with the bid package proving that they will be able to carry the heaviest possible single axel load of the Owner's fleet.**

## **PART 12 WATER RECLAMATION AND TREATMENT SYSTEM SPECIFICATIONS**

### **1 Sump Pump**

- A. 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.
- B. 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 bigger or equal to the high pressure wash water usage.
- C. The sump pump shall be designed to handle solids that will be found in wash water.

### **2 Cyclone Separators**

- A. **Two (minimum) cyclone separator systems 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. (no substitutions)
- B. Cyclone Centrifugal Separators shall provide second and third stage filtration.

### **3 Cyclone Solid Removal**

- A. Downflows (purge water from cyclone separators containing solids) from cyclones separators shall 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. Solid removal from cyclone separators by gravity alone shall not be acceptable.

### **4 Aeration System**

- A. 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. No odor masking deodorants or other chemical use to kill odors shall be allowed.

### **5 Stainless Steel Pump Intake Filter**

- A. Stainless Steel Intake Filter Screen to provide first stage filtration for sump pump intake. The pump intake filter shall be InterScreen or engineer approved equal and shall be sized 0.015" or smaller.

- B.** The intake filter shall be made of stainless steel and shall have slotted orifices, wire mesh filters are not acceptable. Intake filter shall prevent any dirt from clogging the recycled water spray nozzles under all circumstances.
- C.** 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.

## **6 Reclamation Tank**

- A.** 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.
- B.** The tank shall have conical bottom with minimum of 35-degree slope equipped with a 6" bottom manhole, float switch connections and other required fittings. The tank to be equipped with the steel support structure with ½" thick polyethylene continuous support for the cone part of the tank.

## **7 Enzyme-Catalyzed Water Treatment System**

- A.** 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.
- B.** 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.
- C.** 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.
- D.** The automatic product injection system shall consist of low-flow injector pumps that inject biological products on a continuous basis. The injector pumps shall be:
  1. Operating Temp - 35 – 110° F
  2. Product Flow rate - 0.5-1.5 liters per day, adjustable

3. Product Delivery - Up to 10 feet of 3/8-inch diameter polyethylene tubing
4. Two 3/8-inch NPT polyethylene check valves
5. Two 3/8-inch compression fittings

**PART 2**            **INSTALLATION, START-UP, TRAINING AND SERVICE**

- A.** Install equipment in accordance with manufacturers' supplied installation drawings.
- B.** Equipment supplier shall undertake the commissioning of the system and make all required adjustments to ensure proper operation.
- C.** The equipment manufacturer shall start-up the system. The owner shall have all operating personnel present during the start-up and equipment training.
- D.** The supplier shall arrange adequate amount of detergent for the performance testing.
- E.** The owner's personnel shall be trained for a minimum of 5 hours in the system operation and maintenance.
- F.** The supplier shall provide the owner the names and the addresses of all local service and maintenance personnel to assist in future service.