

# Fresh Water, One Chemical, School Bus Wash

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## PART 1. **GENERAL**

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

## PART 2. **RELATED WORK**

- A. Site Work
- B. Concrete
- C. Mechanical
- D. Electrical

## PART 3. **QUALITY ASSURANCE**

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

## PART 4. **SUBMITTALS**

### A. **Product Data**

- 1. Submit Product Data in strict accordance with the requirements of these specifications.
- 2. Restrict submitted material to pertinent data. For instance, do not include a manufacturer's complete catalog when pertinent information is contained on a single page.
- 3. All bidders shall provide the spinner manufacturer's certified test results that the spinner to be supplied has passed the required 5,000-hour continuous test run. Such certified test results shall indicate the condition of the spinner and the spinner components after the 5,000-hour test run.

### B. **Engineering Drawings**

- 1. Submittal engineering drawings must include the following:
  - a) Equipment general layout
  - b) Electrical layout

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1. Provide UL listing card or equivalent document of a Nationally Recognized Testing Laboratory from the company building the electrical panel(s) and attach with the electrical drawings indicating that the electrical panels will be built to the required standards (see section 11.10 Electric Control Panel).

- c) Mechanical layout
- d) Floor plan view
- e) Isometric view with bill of materials
- f) Any related in-ground electrical or mechanical installation

## **C. Operation and Maintenance Manual**

1. Assemble and provide copies of manual in 8.5 x 11 inch format. Fold out diagrams and illustrations are acceptable. Manuals shall be reproducible by dry copy method.

## **D. Supplier Qualifications**

1. The supplier shall have been regularly engaged in the design and supply of the type of equipment specified herein, for a period of not less than five (5) years.
2. The wash system, high pressure cleaning systems, pumping stations and all electrical controls shall be designed and supplied by one supplier.
3. All similar items shall be the products of one manufacturer.

## **E. Approved Equal Status**

1. No deviations from these specifications will be allowed unless approved by the Owner in writing prior to bid closing.
2. All bidders with an "Approved Equal Status" shall submit the following with their bid package:
  - a) A complete list of spinner and touchless heavy duty vehicle wash systems manufactured and installed by the bidder. The list shall include all such installations made by the bidder in the last five (5) years, including the duration of service and application. Should the reference list have more than twenty-five (25) names, a list of the last twenty-five (25) installations shall suffice.
  - b) Provide the name of a contact person at each location that is familiar with the operation and maintenance of the wash system.

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- c) Based on the information supplied and discussions with the contact persons named, the engineer will determine the acceptability of the proposed supplier and the equipment.

## PART 5. **WARRANTY**

- A. Warranty work specified herein is for one (1) year from the date of substantial completion against defects in materials. All rotating spinners have a three (3) year full parts warranty.
- 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, touchless heavy-duty vehicle wash system which washes the front, roof, rear, sides and chassis of the Owner's school buses and other specified vehicles in drive-through mode.
- B. 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 PERFORMANCE**

- A. The equipment specified herein is based on the system model CENTRI\*-SPINNER LYUS-FB1 as supplied by InterClean Equipment, Inc. (800-468-3725), Spraying System of Chicago, IL, or engineer approved equal.
- B. Regardless of the Owner's approval for any deviations and/or changes, the supplier is solely responsible for the performance of the supplied equipment per these specifications. All equipment and equipment functions must be built and designed to these specifications.
- C. Should the equipment not perform as per these specifications, the supplier shall modify, add and/or alter the equipment supplied at his own expense until the performance is satisfactory.
- D. The equipment offered shall be the latest standard product, modified as necessary to meet the requirements of this specification, of a type

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that has been commercially available and in satisfactory use for at least five years.

- E. The vehicle washer shall be actuated in cycle sequence by vehicles driven in a fixed path between tire guides at a slow speed (50-60 feet / minute) through the washing system. All washing operations shall be automatically activated by the vehicle (driving through).
- F. The supplier is responsible to design the equipment to satisfactorily wash up to 30 vehicles per hour. The vehicle wash shall be able to remove all visible heavy dirt accumulation and most of the road film from the Owner's vehicles when driven through the washer at 50 feet / minute, using only alkaline detergents. The amount of detergent used per vehicle to remove road film shall not exceed 0.20 gallons. The evaluation of the system capability to remove road film shall be determined only after washing has been completed and the vehicles have dried.
- G. The vehicle wash system must be capable of washing specified vehicles up to 11' in height including the following:
  - 1. Cars, Pick-ups, Vans
  - 2. Buses, School buses
  - 3. Utility trucks with or without attached ladders and other equipment

## PART 8. **MECHANICAL INTERCONNECTING PIPING**

- A. All field plumbing and mechanical work will be done by licensed Mechanical Contractor under contract with the General Contractor, 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.
  - 4. Furnish and installation of:
    - a) Exhaust duct for water heater
    - b) Backflow preventer
    - c) Underground pipe for chassis wash
    - d) Grating for trench

## PART 9. **ELECTRICAL INTERCONNECTING WIRING**

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- A. All field electrical work will be done by a licensed Electrical Contractor under contract with the General Contractor, including:
  - 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.
  - 4. Furnish and installation of:
    - a) Underground conduits (if required) to be laid when concrete pad is being poured.

## PART 10. **WASH SYSTEM TECHNICAL SPECIFICATIONS**

### A. **Detergent Arch Components**

- 1. Timing of operation and position of the detergent arch shall be determined by the manufacturer to provide optimum detergent penetration before high-pressure wash cycle.
- 2. Detergent injector shall be Inject-O-Meter, InterClean DM or engineer approved equal with adjustable chemical injection ratio from 1:20 to 1:100. The ratio of detergent delivery (by the injector) must be readable on the injector calibrated settings. The detergent injector must be of the positive displacement type.
- 3. The system shall have a water booster pump to ensure even water pressure.
- 4. The detergent arch shall be made of 1.25 inch stainless steel pipe, compatible with selected detergents, and equipped with 25 pieces of adjustable Spraying Systems Swivel Nozzle Bodies 4202-T with Spraying Systems Diaphragm Check Valve Model 8360 to evenly apply hot water/detergent solution to front, rear, sides and roof of the vehicle proceeding through the arch. The design of the detergent arch shall allow immediate activation of the nozzles upon arch activation by the vehicle.
- 5. The chemical spray components located in the equipment room must be assembled in a modular, wall-mounted assembly.
- 6. The detergent arch shall have an Intensified Rear Detergent Feature. The application of detergent to the rear of the vehicle shall be done via a separate, stainless steel rear wash arch. This arch will be activated immediately after the vehicle has passed through the detergent arch. The detergent concentration for the rear wash

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arch shall be double that of the detergent arch. The Intensified Rear Detergent arch shall be controlled and operated by its own vehicle sensing device, solenoid valves and chemical pumps as required for proper performance.

7. The detergent arch shall be activated by a limit switch assembly. This assembly is to be mounted on the adjustable height steel frame located at the front of the wash. The limit switch assembly shall be able to be activated by all sizes of vehicles.
8. The detergent arch shall be supplied hot water through a gas fired hot water heater. The heater shall be a minimum of 199,000 BTU.
9. A water softener for the detergent arch is required to be included by the supplier if the domestic water exceeds 3 grains of hardness. Should the water softener not be needed, the supplier shall provide to the Owner testing results proving the water hardness is acceptable (3 grains or lower).

## **B. High Pressure Spinner Assembly**

1. High pressure cleaning shall be achieved using eight (8) rotating spinners mounted on one common self-supporting arch assembly. Four (4) spinners are mounted on each side of the arch for complete coverage for all shapes and sizes of vehicles including wheels and insides of wheel wells.
2. The high pressure arch shall be made of 2 inch Schedule 40 galvanized pipe. The spinner(s) position in relation the vehicle shall be adjustable vertically and horizontally.
3. The three bottom spinners on each side must be protected by 2 inch Schedule 40 galvanized spinner protection guards. Should the vehicle jump the tire guide, spinners shall be protected spinner guards which will allow the complete spinner arch assembly to swing aside when struck by a vehicle. Systems without protection for the spinners shall not be acceptable.

## **C. Chassis Wash System**

1. The chassis wash system shall have two of the specified or engineer approved spinners located in the center trench for effective under-chassis cleaning. Normal spray nozzles, stationary or oscillating, are not acceptable.
2. The chassis wash spinners shall be mounted in the pit trench by a removable (for cleaning purposes) modular skid assembly.

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3. The removable chassis wash assembly shall be equipped with a protective plate at the bottom of the assembly. This plate will prevent a person, who accidentally steps into the chassis wash spinner opening, from further falling into the trench.

## **D. Spinners**

1. Spinners are to be CENTRI\*SPINNER, Spraying Systems Spinner or engineer approved equal. All spinners submitted for approved equal must have been tested and passed a 5,000 hour continuous test run.
2. Each spinner is to have four (4) fully adjustable spray nozzles. The nozzles are to be of the zero degree type and be supported at the end by adjustable position elbows.
3. The rotational speed of each spinner is to be adjustable between 90 – 300 RPM. The rotational speed adjustment of the spinners is to be achieved through an internal oil pump. No free-floating oil pump gears without center shaft supports will be acceptable.
4. The rotational high-pressure water seal must be of the mechanical seal type.
5. The spinner inlet hookup must be a minimum of 1” stainless steel. Spinners equipped with smaller inlet hookups shall not be acceptable.
6. The nozzles are to be equipped with air jet nozzles. Zero degree water is to pass through the secondary orifice, which will be a minimum of three (3) inches long and have eight (8) openings for air intake at the joint of the spray nozzle and air jet nozzle. Air jets and nozzles must be made of stainless steel. Spinners not equipped with air jet nozzles are not acceptable.
7. The spinner assembly shall have no periodic maintenance or lubrication requirements.

## **E. Spinner Adjuster Tool**

1. The spinner adjuster tool, to set all four spinner elbows in an exact, pre-determined angle, shall be supplied with the system.
2. Adjustment of spinner elbow angles to a precise position by the adjustment tool shall be done without removing the spinners from the arch.

## **F. Intensified Rear Wash System**

1. The Intensified Rear Wash System shall be activated after the vehicle passes the high pressure spinner arch. The separate rear

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wash arch shall be made of a minimum of 2" Schedule 40 galvanized piping with an output minimum of 240 GPM at 300 PSI.

2. The supplier shall guarantee that the rear of the vehicle passing through the system at the speed of 50 feet/minute shall be cleaned as effectively as the rest of the vehicle.
3. The rear wash arch shall be activated only for the rear of the vehicle and shall immediately (automatically) shut off after the vehicle has passed.
4. The rear wash shall utilize a co-axial 3-way valve with the following features:
  - a) The valve shall utilize a control tube that moves linearly along the same axis as the fluid flow.
  - b) The valve shall be pressure balanced so that operation is unaffected by inlet pressure or pressure fluctuations.
  - c) The design life cycle for the intended application shall be a minimum of 500,000 cycles.
  - d) Adjustable switching time shall be 150 – 2,000 milliseconds.
  - e) The valve shall have wear compensating seats.
5. The rear wash arch shall use either rotating spinners, oscillating zero degree nozzles or other supplier selected method for effective rear wash arrangement. The rear wash arch shall be totally separate and independent from the high pressure spinner arch. The supplier is solely responsible for the performance warranty regardless of the chosen method.

## **G. Pumping Module**

1. Pump: The high pressure pump shall be of the centrifugal diffuser type as manufactured by ITT/Goulds Pump and shall be capable of producing pressures up to 320 PSI. The pump shall deliver a maximum flow of 240 GPM as determined by the nozzle sizes incorporated in zero degree spinners.
2. Casing: The suction casing shall be 3.0 inch 250 lb. ANSI flat faced flanged. It shall be oriented to right angles of the vertical center line when viewed from the drive end. The discharge is 2.5 inch 600 lb. ANSI raised face flange oriented on the vertical center line. The suction casing, discharge casing, stage casings and diffusers are made of ductile iron, free from blow holes, sand pockets, or other detrimental defects. Flow passages are smooth to permit maximum efficiency. Pump shall be equipped with external tie bolts to hold the



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radially split casing sealed by 'O' rings. The casing shall be capable of withstanding the hydrostatic test pressure of 150% of the maximum pumping pressure under which the pump could operate at the designed speed.

3. 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.
4. Stuffing Box: Packed type stuffing boxes shall be equipped with a mechanical seal.
5. Shaft Sleeves: The shaft sleeve through the stuffing box is 11-13% chrome stainless steel hardened to a minimum of 225 Brinnel and is keyed to shaft.
6. Shaft: The shaft is standard carbon steel adequately sized for loads transmitted.
7. Bearing: The bearings are designed for an average life of 50,000 hours. The outboard bearing is a deep groove type; the inboard bearings are of the radial roller type with grease fittings.
8. 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.
9. Coupling: The pumping module shall have a "Jaw" type coupling as manufactured by Lovejoy or equal and includes a coupling guard.

## H. **Electric Motor**

1. The electric motor shall be of the squirrel cage induction type suitable for across the line starting.
2. The motor shall operate on 460 Volt, 3 Phase, 60 Cycle and be OPSB with a 1.15 service factor.
3. The motor shall be sized to not exceed the name plate horse power during operation. The motor should be a minimum of 60 HP.

## I. **Electric Control Panel and Components**

1. 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.
2. 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

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be through a separate HMI not integral to the PLC, connected to the PLC via Ethernet

3. 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.

4. 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

5. PLC and HMI programs shall provide the following:

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

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 in the PLC and/or HMI and saved to their respective SD cards. These include all timing set points, alarm settings, and communication settings.

E. Periodic polling of I/O shall be every 20 ms or less.

F. Alarms should have user configurable delays to prevent nuisance tripping.

G. Latency: scanning interval for all closed loop processes should be executed <20 ms.

H. Provide terminal windows for spying on any devices communicating to PC via Ethernet, RS232, etc. These will be used for troubleshooting communications problems.

I. 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.

6. 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

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appropriate UL marks including the short circuit withstand value mark as part of the official UL label.

7. 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 Symetrical available at the incoming line terminals of the control panel.

8. 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).

9. 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.

10. Electric Panels that are not UL approved are not acceptable.

11. 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.

## **J. Tire Guides**

1. Tire guides shall be fabricated from 3 inch diameter painted steel pipe headings, supported at 5 foot intervals, to provide guide runs on both sides of the vehicle. The tire guides shall run the full length of the wash system.

2. The system shall have an angled entry. The ends of the rails are capped and all headings are smoothly finished to prevent tire damage. Brackets supporting the pipe shall be made of a minimum 3/8" steel plate that is welded to concrete imbedded cleats or anchor bolted to the concrete.

## **K. Water Holding Tank**

1. The system shall be equipped with 925 gallon polyethylene water holding tank equipped with high and low level float switches. The system holding tank shall be filled with water from the Owner's waste water treatment plant. Water for the detergent arch shall be either fresh city water or treated water from the waste treatment plant by the equipment supplier's choice. Should the treated plant water be used, it will be equipment suppliers responsibility to supply

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adequate filtering for the water purification as is required for the proper cleaning and film removing requirements.

2. The holding tank shall be filled via 2", slow closing solenoid valve activated by a high level float switch in the holding tank.

## PART 11. **INSTALLATION**

- A. Equipment shall be installed in accordance with manufacturer's 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 for an adequate amount of detergent to be available for the performance testing.
- E. The Owner's personnel shall be trained for a minimum of five (5) hours in the system's operation and maintenance.
- F. The supplier shall provide the Owner with the names and addresses of all local service and maintenance personnel to assist in future service.