

**TOUCHLESS RECYCLED WATER**  
**PUBLIC WORKS WASH SPECIFICATIONS**

## **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. Submit Product Data in strict accordance with requirements of these specifications.
- B. Submittal engineering drawings must have the Floor Plan Views and the Isometric Views with bill of materials separately for the following:
  - 1. Equipment general layout
  - 2. Electrical layout
  - 3. Mechanical layout
  - 4. Any related in-ground electrical or mechanical installation
  - 5. Provide UL listing card or equivalent document of Nationally Recognized Testing Laboratories 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.** Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- D.** 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 to be reproducible by dry copy method.

## **2 Deviations From These Specifications**

- A.** No deviations from these specifications will be allowed unless approved by the owner in writing prior to bid closing. All equipment and equipment functions must be built and designed to these specifications.
- 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 as per these specifications.

## **3 Supplier's Qualifications**

- A.** The equipment specified herein is based on the system model CENTRI\*SPINNER as supplied by InterClean Equipment, Inc. (800-468-3725) or engineer approved equal.
- B.** The wash system, high pressure cleaning systems, pumping stations and all electrical controls shall be designed and supplied by one supplier.
- C.** 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 years. All similar items shall be the products of one manufacturer. The equipment offered shall be the latest standard product, modified as necessary to meet the requirements of the specification, of a type that has been commercially available and in satisfactory use for at least five years.

- D.** All bidders shall submit with the bid package the following information for an approved equal status:
1. A complete list of spinner and touchless heavy duty vehicle wash system installations made by the bidder. This list shall include all such touchless vehicle wash installations made the bidder in the last five (5) years including the duration of the service and application. Should the reference list have more than 25 names, a list of last 25 installations shall suffice.
  2. Provide name of contact person at each location who is familiar with the operation and maintenance of the wash system.
  3. Based on the information supplied and discussions with 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 substantial completion against defects in materials and in labor and workmanship. All rotating spinners have 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 all types of street legal vehicles used by fleet owners for front, roof, rear, both sides and chassis in drive-thru 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.** Operation: 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 and related water recycling operations shall be automatically activated by the vehicle (driving through).
- B.** The supplier is responsible to design the equipment to satisfactorily wash up

to 40 vehicles per hour. **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/min.** The cleaning performance shall match and/or exceed those standards that are prevailing in the touchless retail car wash industry. The amount of detergent used per vehicle to remove road film shall not exceed 0.4 gallons. 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.

**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.

**D. The vehicle wash system to be capable of washing all vehicles up to 14' in height including the following:**

1. Cars, Pick-ups, Vans
2. Dump trucks, solid waste trucks, all street legal public works fleet vehicles
3. Buses, school buses
4. Utility Trucks with or without attached ladders and other equipment

## **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. Due to the safety feature that is built into the base program of a maximum cycle time of four minutes, the test will require resetting the system to continue the full 60 minute test. During the 60 minutes test no manual adjustments 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.** 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 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 mounted a skid (equipment module) assembly and shall be pre-plumbed and pressure tested prior to shipment to the site.
- B. All field plumbing and mechanical work will be done by others (Mechanical Contractor), including:
  - 1. Water and gas utilities up to and connecting to the equipment room.
  - 2. Interconnecting piping between various equipment components located in the wash bay and the single equipment module in the equipment room.
  - 3. Furnish and Installation of:
    - (1) Duct for Water Heater

(2) Backflow preventer

## **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 mounted on a single skid assembly (equipment module) and shall be pre-wired and tested prior to shipment to the site.
- B. All field electrical work will be done by others (Electrical 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 module in the equipment room and the equipment located in the wash bay.

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

### **4 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 wash cycle.
- B. Detergent injectors (**total of two required**) shall be Inject-o-meter , InterClean DM or engineer approved equal with variable volume output ratio from 1:20 to 1:100. The amount of detergent delivery (by the injector) has to be readable on the injector calibrated settings. The detergent injector must of positive displacement type.
- C. The system shall have 3 HP water booster pump to ensure even water pressure under all circumstances.
- D. Chemical Arch(s) shall be made of 1.25-inch **stainless steel** pipe compatible with used detergents and equipped with 25 pcs. of adjustable Spraying Systems Swivel Nozzle Bodies 4202-T with Spraying Systems **Diaphragm Check Valve** Model 8360 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.
- E. Intensified Rear Detergent Feature: The rear of the vehicle shall be applied detergent 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.** 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: The detergent arch is activated by limit switch assemblies system mounted on the adjustable height steel frame located at the front of the detergent arch. The limit switch assemblies shall be able to be activated by all sizes of the vehicles.
  - G. The chemical spray components located in the equipment room must be assembled in a modular, wall mounted assembly
  - H. Water softener for detergent arch - if the domestic water exceeds 3 grains of hardness, the equipment supplier shall include water softener as part of the package. Should the water softener not be needed, the supplier shall provide the owner testing results of water hardness being acceptable (3 grains or lower).
  - I. Water Heater for detergent arch – Chemical arch shall be supplied soft water, heated by a 199,000 BTU natural gas heater supplied as a part of the equipment package.

## 5 High Pressure Spinner Assembly

- A. High pressure cleaning is achieved using eight (12) rotating spinners mounted on one common self supporting arch assembly. Four spinners are mounted on each side of the arch for complete coverage of all shapes and sizes of vehicles including wheels and insides of the wheel.
- B. The high-pressure arch is made of 2 inch Schedule 40 galvanized pipe. The spinner(s) position in relation to the vehicle shall be adjustable vertically and horizontally.
- C. Three bottom spinners on both sides must be protected by 2" schedule 40 spinner protection guards. **Should the vehicle jump the tire guide, spinners shall be protected (by the guards) by being able to swing aside by the vehicle impact. The supplier shall demonstrate the owner the function of the spinner guard system.**

## 6 Chassis Wash System

- A. Chassis wash system shall have two of the specified, or engineer approved, spinners located in the center trench for effective under chassis cleaning. The chassis wash system shall consist of two spinners, normal spray nozzles - stationary or oscillating - are not acceptable.
- B. The chassis wash spinners shall be mounted in the pit trench by a removable (for cleaning purposes) modular skid assembly.
- C. The removable chassis wash assembly shall be equipped with a protective

plate at the bottom of the assembly to prevent a person accidentally stepping into the chassis wash spinner opening from further falling into the trench.

## 7 Spinners

- A. Spinners to be CENTRI\*SPINNER, Spraying Systems Spinner or engineer approved equal. All spinners submitted for the approved equal must have been tested and passed a 5,000 hour continuous test run.
- B. Each spinner to have 4 fully adjustable spray nozzles. The nozzles to be of zero degree type and be supported at the end of adjustable position elbows.
- C. The rotational speed of the spinner to be fully individually adjustable between 90 - 400 RPM. The rotational speed adjustment of the spinners to be arranged thru an internal oil pump. No free-floating oil pump gears without center shaft supports are acceptable.
- D. The high pressure water seal in the spinner to be of mechanical seal.
- E. The zero degree nozzles shall be standard Spraying Systems nozzle and shall be equipped with air jet nozzles. Zero degree water to pass thru the secondary orifice, which is a minimum of 3" long and has six (6) 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. **The spinners not equipped with air jet nozzles are not acceptable.**
- F. The spinner inlet hookup must be minimum of 1" (stainless steel). Spinners equipped with smaller inlet hook-ups are not acceptable. The spinner shall be protected by spinner guards as specified herein.
- G. Spinner assembly shall have no periodic maintenance or lubrication requirements.

## 8 Spinner Adjuster Tool

- A. The adjuster tool to set all four spinner elbows in an exact, pre-determined angle (position) shall be supplied with the system.
- B. Tool shall allow adjusting the spinner elbow angles in precisely same (angle to be determined) position without removing the spinners from the arch.

## 9 Intensified Rear Wash System

- A. The Intensified Rear Wash System shall be activated after the vehicle passes the high pressure spinner arch. The **separate** rear wash arch shall be made of minimum of 2" sch. 40 galvanized piping with an output of minimum of 250 GPM at 320 PSI.
- B. The supplier shall guarantee that the rear of the vehicle passing thru the system at the speed of 50 feet/min shall be cleaned equally effectively as the

rest of the vehicle.

- C. 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.
- D. The rear wash shall utilize a **co-axial 3-way valve** with the following features:
  1. The valve shall utilize a control tube that moves linearly along the same axis as the fluid flow
  2. The valve shall pressure balanced so that operation is unaffected by inlet pressure or pressure fluctuations
  3. Designed cycle life for the intended application shall be minimum of 500,000 cycles
  4. Adjustable switching time 150 –2,000 milliseconds
  5. Wear compensating seats
- E. 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.

## 10 Pumping Module

- A. The high-pressure pump is 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 300 GPM as determined by the nozzle sizes incorporated in zero degree spinners.
- B. Casing: The suction casing is 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 2.0 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 is equipped with external tie bolts to hold the radially split casing sealed by 'O' rings. The casing is capable withstanding the hydrostatic test pressure 150% of maximum pumping pressure under which the pump could operate at the designed speed.
- C. 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
- D. Stuffing box: Packed type stuffing boxes are equipped with a mechanical seal.

- E. Shaft sleeves: The shaft sleeve through the stuffing box is 11-13% chrome stainless steel hardened to a minimum of 225 Brinell and is keyed to shaft.
- F. Shaft: The shaft is standard carbon steel adequately sized for loads transmitted.
- G. 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.
- H. 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.
- I. Coupling: The pumping module has a "Jaw" type coupling as manufactured by Lovejoy or equal and includes a coupling guard.

## **11 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, 3-phase, 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. The motor should be a minimum of 75 HP.
- C. The motor shall be certified by the manufacturer for 25 activations per hour.

## **12 Final Rinse Arch**

- A. Timing of operation and position of the rinse arch shall be determined by manufacturer to provide optimum rinse penetration after high-pressure wash cycle.
- B. Final Rinse Arch 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.
- C. Activation: The rinse arch is activated by a limit switch assembly system mounted on an adjustable steel frame located at the front of the final rinse arch.

## **13 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 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 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 Symmetrical 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.

#### **14 Tire Guides**

- A. Fabricated from 4 inch diameter galvanized steel pipe headings supported at 5 feet intervals provide guide runs on both sides of the vehicle. The tire guide shall be for the full length of the wash system.
- B. 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 1/2" steel plate that are welded to concrete imbedded cleats or anchor bolted to the concrete.

### **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 separators 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.

**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 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 250 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.