



## **HEAT TRANSFER PACKAGED PUMPING MODULE**

Furnish a pre-fabricated packaged pumping module that is completely assembled, piped, wired, tested, and painted. The entire assembly will be mounted on a welded steel skid.

The system will include but is not limited to the following items listed below:

1. System Logic and Control Panel with Single Point Power Supply.
2. Variable Frequency Drives (option)
3. Motors
4. Pumps
5. Piping, Valves, Components, and Fittings
6. Structural Steel Skid

## **GENERAL REQUIREMENTS**

The packaged pumping module assembly will include and meet all of the conditions outlined in this specification or as shown on the drawings.

The manufacturer, manufacturer's representative, and / or supplier of the packaged pumping modules can offer a total price for the modules only. If the manufacturer, manufacturer's representative, and / or supplier incorporate the packaged pumping module pricing with other major equipment ("lump bid") in an effort to force a contractor into purchasing all the equipment from one source, then that manufacturer, manufacturer's representative, and / or supplier's brand of equipment have been specified as the basis of design. This same policy will apply to any other major equipment that may be specified on this project such as: "boilers", "chillers", "coils and air handlers", "condensate and feed water equipment", and "building management control system".

The electrical contractor will be responsible for connecting the electric power to the packaged pumping module in accordance with the National Electric Code. The electrical contractor will supply and connect all communication and / or power wiring to any remote sensing devices that may be supplied as part of the packaged pumping module. The communication wire will be 22 gauge or larger shielded twisted pair for 4-20 mA DC Signal.

The electrical power supply to the pumping module will be ----- Volt ----- Phase -----HZ.

The entire assembly will be U.L.-listed. All electrical components will be U.L.-listed. The pumps will be U.L.-listed. U.L. certification cards covering the entire assembly will be supplied as part of the submittal package.

## **STANDARDS**

1. ANSI American National Standards Institute.

2. ASME American Society of Mechanical Engineers.
3. ASTM American Society for Testing and Materials.
4. BOCA Building Officials and Code Administrators International, Inc.
5. NEC National Electric Code.
6. NEMA National Electrical Manufacturers Association.
7. NFPA National Fire Protection Association.
8. UL Underwriters Laboratory.  
Hydraulic Institute.

## QUALITY ASSURANCE

1. The Packaged Pumping Module Manufacturer will have a quality assurance program to assure the quality of all materials furnished. These standards will be available for inspection upon Request.

- The Packaged Pumping Module Manufacturer will have a Certified and Sealed Welding
- Procedures Manual in place. All welders must be certified for "MIG", "TIG", and "STICK" welding.
- The control panel will be constructed to NEMA standards and the control panel will be U.L.-
- 508 listed. The U.L.-508 label with its serial number will be attached to the inside of the control panel door.
- The entire Packaged Pumping Module will be U.L.-listed for factory-assembled pumping
- Systems.
- The module manufacturer will have a minimum of fifteen years manufacturing and
- Application experience and be responsible for the proper flow and pressure performance of the entire pumping system.
- The complete Packaged Pumping Module will be hydrostatically tested for a minimum of one hour. The hydrostatic test will be at a minimum of 150 psi(g) and / or 50 psi(g) greater than the system design pressure when the system design pressure is greater than 100 psi(g). If any leaks are found, they will be repaired and the hydrostatic test will be repeated for a duration of one hour.
- The control system will be tested for proper sequence of all systems and the alarms will be
- Simulated during the sequencing test.

## SUBMITTALS AND OPERATIONS MANUALS

Submittal data will be provided and will include the following (as a minimum):

- System drawings with dimensions.
- System electrical ladder wiring diagrams.
- Pump selection design data with pump curves showing motor horsepower requirements at duty point, and the horsepower requirements at the non overloading point on the pump curve. If the pumps are operated in parallel and at a constant speed then a computer printout must be submitted showing that the pumps will work properly without cavitations or overloading. The printout must show horsepower required for both duty point and non-overloading at any point on the pump curve.
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- Pump Construction Drawings. Catalog data covering Valves, Strainers, Flex Joints, Air Vents, and any other Control Components.
- Motors Logic Control Panel and all of the components required to provide a complete working system.

- Description of the systems operation.

All data must address specific subjects and should not be generic in nature.

Provide ----- copies of submittals to the consulting engineer for review and approval.

Operation and maintenance manuals will be provided and will include the following (as a minimum):

- System Drawings.
- System Electrical Ladder Wiring Diagrams.
- Description of the System's Operation.
- Motors Operation and Maintenance Instructions.
- Bill of Materials.
- Pump Operation and Maintenance Instruction.
- Special Electrical Components Operation and Maintenance Instruction.

Provide ----- copies of the Operation and Maintenance Manuals to the owner's representative prior to start up.

The Submittal and the Operations and Maintenance Manuals will be assembled with a front and back cover. The title page will show the Job Name, Location, Specification Numbers, and the Name of the Equipment.

## DELIVERY OF EQUIPMENT

After the entire module has been tested, it will be prepared for shipment. The module will be disassembled into subassemblies to facilitate handling at the job site if required. The module re-assembly is the responsibility of the installing contractor.

Drain plugs will be removed from equipment. A label will mark the location where the drain plugs have been removed. The drain plugs will be placed in a container, and marked "Drain Plugs".

The Packaged Pumping Module will be supplied with lifting lugs. The manufacturer will make load spreader beams available to the installing contractor. The installing contractor is responsible for the freight expense to and from the job for the spreader beams. The cost of Rigging, Unloading, and Moving of the Module at the job site will be the responsibility of the contractor. The Rigging, Unloading, and Moving of the Module will be in accordance with the manufacturer's instructions.

## F. MANUFACTURER

Base Bid

NAMCO DIV.

2. Alternate Manufacturer

Systecon, Inc.

Any manufacturers not mentioned, and wished to bid as an alternate to the named manufactures, must submit within ten (10) days prior to the bid date a written request that their name be added to the approved bidders list. The request to bid should include the following data for the engineer's evaluation, consideration, and approval.

- Current list of similar installations with names of people to contact and their phone numbers.
- System Drawings.
- System Electrical Drawings.
- Pump Curves and Literature describing the equipment that is being proposed.
- System Performance Data.
- A complete description of the Operating System and step-by-step ladder logic printout of the Operating System.
- Itemize any exceptions taken to the base bid.

If a manufacturer's request to have their name added to the approved vendor's list is granted, However the approval does not grant permission to deviate from the specification.

## PACKAGED PUMPING MODULE

Furnish and install a factory assembled, constant speed, or a variable speed packaged pumping module equal to a NAMCO Div. Series "HTM", (as scheduled). The module will require only suction and discharge pipe connections and one electrical connection to the power distribution panel that will be located on the module. Should the module manufacturer supply remote control devices, the devices will be installed by the contractor and connected to the necessary electric control terminals. The building management system will be connected to the module and / or the remote control devices if required. The unit shall be capable of pumping capacity and heat transfer duty as scheduled on project drawings.

The Packaged Pumping Module will consist of a System Skid Base, Pumps, Electric Motors, Suction Diffusers, Check Valves, Necessary Piping, Isolation Valves at each Pump, and all other components to make a complete operating system.

## H. MODULE SUBASSEMBLIES

The subassemblies shall be mounted on the skid assembly as outlined in the following specifications:

### SKID.

The skid shall be fabricated from structural steel and welded together to form a complete assembly. The structural steel shall be ASTM-A36 "W" shaped wide flanged steel beam or ASTM-A36 "C" shaped steel channel beam. The size and weight of the steel beam shall be based on the total operating weight of the module and a maximum deflection of 1/360 of the span between lifting points. Lifting points shall be arranged to prevent any undue stress on the skid or on the piping during loading, unloading, or setting in place at the job.

### *BLIND NOTE: Option*

*The skid shall be an "Inertia Type". The skid construction shall be designed to support all the weight of the equipment mounted on the skid as well as the weight of the concrete used to fill the interior of the base. The beams shall have a minimum depth of 6" and the maximum depth shall be 12". Mason Industries Series SLFH spring isolators shall be provided with mounting angle clips welded to the outside of the skid. The spring isolators shall be spaced so that the distance between spring isolators is a maximum of 1/12 the depth of the beam. The spring isolators and brackets shall be arranged for a 1" operating clearance between the bottom of the base and the*

*floor. The spring isolators shall be adjustable type so that the operating clearance can be achieved. The concrete shall be reinforced using 5/8" concrete reinforcing rod (re-bar). The re-bar shall be laid out on a 6" square grid and welded at each end to the walls of the skid. The interior grid crosses shall be wire tied. The re-bar shall be located 1½" above the bottom of the skid. The re-bar shall be primed after it has been put in place to prevent corrosion.*

All the headers shall be supported with a minimum of 3" ASTM-A36 C-shaped channel. The header support shall have two legs and an overhead cross bar. The headers shall hang below the cross bar and supported with "U" bolts. There shall be a minimum of 2" clearance between the headers and the supports to allow for insulation. The supports shall be welded to the skid and crossed braced where required to insure total stability in all directions. The Skid, Pipe Supports, and Bracing shall comply with the Seismic Zone Requirements for the area of installation. For Seismic Zone 4, Seismic calculations shall be supplied to consulting engineer.

## PUMPS

All pumps must be U.L.-listed. The pumps' castings shall be cast iron. The impellers shall be bronze and with bronze wear rings. Bronze shaft sleeves shall be provided on pumps. Where the shaft assembly is the dry shaft design and water is never in contact with the shaft then a carbon steel shaft is acceptable. If the shaft is not a dry type design then the shafts must be stainless steel. The pumps shall be equipped with John Crane #21 mechanical seal or equal. The pumps shall be mounted on bases with a drip lip and with drain connections. The pump base shall be free of distortion caused by flexing of the system base or of the piping. The bases shall be provided with grout holes. The bases will be grouted-in by the mechanical contractor. The pumps shall be mounted on the pump base with the proper flexible coupling for the rated horsepower. The pumps and motors shall be aligned and tested at the factory. The mechanical contractor shall realign the pumps and motors after the Packaged Pumping Module is received at the job and before the system is put into service.

The pumps shall be of end suction type. The end suction pumps shall be the rear pull out type with flanged suction and discharged connections. The discharge shall be at the centerline of the pump. The pumps shall be designed for 175 psi(g) and a temperature of 250 degrees Fahrenheit. The pump case shall be ASTM A48 Class 35 Cast Iron.

## MOTORS

All motors shall be open drip-proof type with a minimum service factor of 1.15. All motors shall be premium efficient type and comply with the 1997 Federal Standards. The motor efficiency shall be derived from test in accordance with NEMA standard MG1 IEEE Standards. Motor size shall be selected so that the pump will not overload the motor at any point on the pump curve. The motor size shall not require the use of the service factor at any time to meet the pump non-overloading requirements.

## VARIABLE FREQUENCY DRIVES (OPTION)

Refer to separate section, VARIABLE FREQUENCY DRIVES.

## 5. PIPING

The Packaged Pumping Module Piping shall be constructed using ASTM A53 steel. The piping shall consist of fabricated welded steel headers. The fittings can be steel or cast iron. Any steel flange

mating to a cast iron flange shall have flat face. All other flanges shall be ANSI raised face flanges rated for 150 psi(g).

Pipe velocities shall not exceed:

- Suction pipe to the pumps = 7.5 FPS. The Pump Suction Isolation Valve shall be the same size as the suction pipe.
- Discharge Pipe from the pumps = 8.5 FPS. The Pump Isolation Valves and
- Check Valves shall be the same size as the discharge pipe.
- All other pipe = 10.0 FPS, and / or a maximum pressure drop of 3.7 PSI, whichever is the smallest.
- The branch piping to the pumps shall be based on the capacity of the pumps. The branch piping to the pumps shall be supported independently of the pump connections. The pipe supports shall be arranged to permit the field installation by the contractor of ----- inches of pipe insulation.

## 6. BUTTERFLY VALVES

A lug style butterfly valve shall be used on all valves 2½" and larger. The butterfly valves shall be installed on the inlet and outlet piping of each pump and any other location indicated of the drawings. The butterfly valves shall be Cast Iron Bodies, EPDM Seats, Stainless Steel Shaft, Bronze Disc, and Bronze Bearings. Butterfly valves 6" and smaller shall have lever handles. Butterfly valves 8" and larger shall have gear operators with hand wheels. Butterfly valves shall be rated for 200 psi(g) dead end service.

## 7. SUCTION DIFFUSERS

Suction diffusers shall be installed on the suction to each pump. The suction diffuser shall have a 175 psi(g) ANSI B16.1 cast iron body with a stainless steel or bronze strainer. When the suction diffuser is larger than 10" X 8", A "Y" type strainer will be used. The "Y" strainer shall be the full size of the suction piping to the pump. Each suction diffuser or "Y" strainer shall have a ball type blow down valve. The discharge side of the ball valve shall be plugged with a pipe nipple and cap.

**BLIND NOTE:**

*You may want to have the strainer blow down valve "PIPED TO A FLOOR DRAIN," if so substitute in this statement and delete the phrase "PLUGGED WITH A PIPE NIPPLE AND CAP."*

## GAUGE VALVES

All gauge valves shall be ball type ¼" N.P.T. bronze design for 600 psi(g) W.O.G. working pressure with a chrome plated bronze ball and TFE seat. Gauge valves will be provided at all pump suction and discharge flanges and all instrument pressure taps. All pressure gauges will be remote mounted on a gauge bar. A gauge valve shall also be provided at the pressure gauge.

## PRESSURE GAUGES

All pressure gauges shall be mounted in a central location over the main control panel. All pressure sensors shall be consolidated in a central location that is accessible at the control panel area. Each gauge and pressure sensor will have a nameplate showing its service. All pressure gauge and pressure sensors shall be piped using Tennessee Eastman heavy wall high-pressure black nylon tubing. When the tubing is run horizontally for more than 24" the tubing shall be placed into a "U" shaped steel support rail (such as uni-strut). The support rail shall be large enough to accommodate the consolidation of all the tubing into one support rail assembly. The pressure gauge shall be a minimum of 3½" diameter and housed in stainless steel case. The pressure gauges accuracy shall be 1% and a gauge valve shall be provided at each pressure gauge connection.

#### FLEXIBLE CONNECTORS (OPTION)

Flexible connectors shall be provided with control rods. The flexible connectors shall have a working pressure range of 16" HG to 125 psi(g). The flexible connectors shall be constructed with steel flanges or steel back up rings. The bodies shall be constructed of neoprene and nylon.

#### INERTIA TYPE MODULES SKID

Flexible connectors with control rods shall be provided at the package pumping module system suction and discharge headers when inertia-type bases with spring isolators are specified.

*THE MECHANICAL CONTRACTOR SHALL SUPPLY THE FLEXIBLE CONNECTORS AND CONTROL RODS FOR THE HEADERS.*

#### STANDARD MODULE SKID

If a standard steel skid is to be provided, the all pumps will have flexible connectors with control rods. The suction and discharge flexible connectors shall be the same size as the suction and discharge pipe to and from the pumps.

#### BLADDER TYPE EXPANSION TANKS

Bladder type expansion tanks shall be the partial or full acceptance type and shall be constructed to ASME Code Section VIII, Div.1 for 125 psi(g) and 240 degrees Fahrenheit. The bladder shall be constructed of heavy-duty butyl rubber; no other bladder material will be accepted. The bladder shall be field replaceable without having to move or reposition the tank. The tank shall be designed for vertical or horizontal mounting. An automatic air vent shall be provided at the inlet to the expansion tank. The capacity of the expansion tank shall be as scheduled.

#### AIR SEPARATOR

The air separators shall be constructed to ASME Code Section VIII, Div. 1 for 125 psi(g) and 335 degrees Fahrenheit. The separator shall have a filter type stainless steel screen so positioned so that it will brake up the inlet water to assist in liberating the free gases and the dissolved oxygen in the water. The size of the air separator will be the same size of the header manifold. The air separator shall have an automatic air vent on the top of the vessel.

#### CHEMICAL FEED POT

The chemical feed pot shall have a 5-gallon capacity and a MAWP of 150 psi(g). The chemical feed pot shall have a large mouth opening for filling. The chemical feed pot isolated and drain valves shall be ball type valves. The drain connection shall be piped to a floor drain by the mechanical contractor. The chemical feed pot shall be positioned not more than 3 feet above the floor of the skid.

#### RELIEF VALVE

A ¾" ASME Pressure relief valve set at 125 psi(g) shall be provided on the packaged pumping module. The relief valve shall be equal to a Watts #174A.

#### HEAT EXCHANGER

##### A. PLATE AND FRAME HEAT EXCHANGER

The plate and frame heat exchanger shall be designed for 150 psi(g) ASME Section VIII, Div. 1 at 250 degrees Fahrenheit. The plates shall be a minimum of 304 stainless steel all the service

connections shall be flanged. The plate and frame heat exchanger manufacturer shall also provide an insulated stainless steel jacket.

#### B. SHELL & TUBE HEAT EXCHANGER

The unit shall be provided with a shell & tube style heat exchanger. The heat exchanger shall be constructed and stamped in accordance with ASME Section VII. The tubes shall be of U-Tube construction. Design shall be of 2 or 4 pass flow arrangement on tube side of exchanger. The tubes shall be constructed of 3/4" 20 BWG gauge copper, and shall be rated to 150 psi(g) working pressure. Test pressure of the exchanger shall be 300 psi(g) and its maximum working temperature shall be 375°F. Tube-Side connections greater than 3" shall be 150# flanged, 3" or less shall be female threaded. The steam inlet connection on the shell side of the exchanger greater than 2 1/2" shall be flanged. The condensate drainage connection on the shell side of the heat exchanger shall be female threaded, or if hot water is used as heating medium, a 150# flanged shell discharge connection shall be provided. With steam as heating medium: a threaded tap shall be provided on the top of the shell, parallel to the steam inlet connection, and on opposite ends of the shell, for the express purpose of providing a means for breaking of vacuum conditions in the shell in the event of a system stall condition. The head construction shall be of cast iron on exchangers of diameter 8" or less, and of fabricated steel on exchangers greater than 8" in diameter.

#### GLYCOL FEED SYSTEM (OPTION)

A glycol feed system complete with a 50-gallon mixing tank, feed pump, low level control, pressure switch, control panel, isolation valves, pressure and relief valve shall be provided (if required). The tank shall be constructed of polyethylene with a 1/3 hinge cover. The polyethylene tank shall be fully supported by a carbon steel bottom stand. The control panel shall be a NEMA 4X panel with a power switch, H.O.A. selector switch, pump run indicator panel, a red low level light, and fuses for the pump. The control panel shall be mounted on the feed tank stand. The complete assembly shall be mounted on the Packaged Pumping Module Skid, Piped, and Wired. The glycol feed shall have a capacity of 1.3 GPM at 100 PSIG. The glycol feed system shall be equal to a J.L. Wingert Company, Deluxe Model # GL50-D.

#### STEAM TRAPS

Steam trap or traps shall be provided with a heat transfer unit in which steam is utilized as the heating medium. Trap shall be a float and thermostatic type. Bucket/inverted bucket type steam trap or traps will not be accepted. The trap should be sized for a minimum service factor of one and one half times the duty point capacity required. If multiple traps are used in parallel to provide proper capacity, traps must be oriented at minimum 6" elevation difference for proper evacuation of condensate. The steam trap or traps shall be equal to an Armstrong Series 'A', 'B', 'J', or 'L' Series.

#### ACCESSORIES

Steam control valve for product temperature with temperature pilot, sensor, well, bypass, and accessories, minimum 3 1/2" pressure gauges, 9" thermometers and wells, air vents, and vacuum breaker shall be provided.

#### ASME PAPERS



ASME and National Board Certificates shall be provided to the owner's representative after the systems are shipped.