SECTION H3
TRAYMASTER SERIES DEAERATORS

SAMPLE SPECIFICATIONS

The following sample specifications are provided by Cleaver-Brooks to assist you in specifying your customer's specific needs and application.

PART 1 GENERAL

1.1 PACKAGED DEAERATOR SPECIFICATION

A. Provide one Cleaver-Brooks Model TM _____ tray type, pressurized, deaerator rated at _____ pounds per hour. The system shall be of the two tank design and shall guarantee oxygen removal to not more than 0.005 ccs/liter (7 ppb) in the effluent throughout all load conditions between 5 and 100 percent. The deaerator shall be designed for operation at 5 PSIG, but shall be suitable for use from 2 to 15 PSIG.

PART 2 PRODUCTS

2.1 DEAERATOR

A. A vertically oriented deaerator section shall be **Y ft. -Y.1 in. x Z ft. - Z.1 in.** shell length. The deaerator shall be of the counter flow design. Undeaearated water shall enter through the top of the column into a true Internal Direct Contact Vent Condenser. **Units not implementing a True Internal Direct Contact Vent Condenser shall not be accepted.** The water shall be evenly sprayed through a spring-loaded, self-cleaning, adjustable stainless steel spray valve(s) over the trays. The valves shall be constructed of type 304 stainless steel material. Trays shall be all riveted construction using 16 gauge type 430 Stainless Steel material. **Welded trays shall not be accepted.** Trays shall be stacked within a stainless steel tray box with a minimum thickness of 1/4". The tray box shall be constructed using type 304 Stainless Steel material. The tray box shall include a wear plate at the saturated steam inlet area to ensure durability. The tray box shall have an access door for ease of inspection of the trays. This access area to the tray box shall be through a **X in.** round davited manhole located on the shell of the deaerator. The tank shall be designed in accordance with ASME, Section VIII of the Pressure Vessel Code for 50 PSIG at 650°F and stamped accordingly. Connections shall include steam inlet, vent, water inlet, high temperature return, and downcomer to the storage vessel. Unit shall provide proper internal vent condensing and water distribution at any load between 5 and 100 percent of rated capacity.

B. All internal surfaces, which come in contact with un-deaerated water, shall be constructed of stainless steel. Automatic vent valve shall be thermostatically controlled to provide a fast means of venting when a sudden buildup of gases occurs, such as seen at start up. The manual vent valve shall have an orifice for continuous minimum venting. Venting rate shall not exceed 0.1 of 1% of the rated deaerator capacity at 5 PSIG.

2.2 DEAERATOR VESSEL

A. The deaerated water storage tank shall have _____ minutes of storage and have a capacity of _____ gallons measured to overflow. The tank shall be _____ diameter x _____ long. An 12 x 16 elliptical manhole shall be provided for access. All nozzles 3" and under shall be 3000 lbs forged steel couplings and over 3" shall be 150 LB. flat face flanges. Heads to be ASME torispherical type constructed of ASTM A516 GR 70 carbon steel with a minimum thickness of 0.25 inches. Shell plate to be fabricated of ASTM A36 carbon steel with a minimum thickness of 0.25 inches. The tank shall be designed in accordance with ASME, Section VIII of the Pressure Vessel Code for 50 PSIG at 650 °F and stamped accordingly. Certification shall be required. Joint efficiencies to be 70% circumferential per Table UW-12, which does not require stress relieving or nondestructive examination.

The tank shall be factory-insulated and lagged with blanket insulation, pins, clips, and a durable steel jacket. The blanket insulation is to be fiberglass, 2" thick, 1 LB/ CU-FT, and have a rating of R3.85. Pins are to be located on 18" centers and holding clips attached. The steel jacket or lagging shall have a shell thickness of 22 gauge (0.299") minimum and head thickness of 12 gauge (0.1046") minimum.

The magnesium or sacrificial anode shall provide cathodic protection against galvanic corrosion. This rod shall be 1-5/16" diameter with a 1/4" steel core to assure a good electrical contact and added strength. The design shall have a small weep hole to signal it has been consumed.

The high temperature diffuser or sparge tube shall be located beneath the normal tank water level. The tube shall be constructed of 2-1/2 inch pipe. This tube shall provide even distribution and blending of high-temperature condensate returns.

The chemical feed quill shall be located beneath the normal tank water level. The quill material shall be constructed of stainless steel. The tube shall provide even distribution and blending of chemical.

2.3 DEAERATOR LOAD SPECIFICATION

The surge tank loads shall be as specified in the following table.

LOAD	PERCENTAGE	LBS/HR	TEMP	PRESSURE
Make up				
Low Temp Returns (<210°F)				
Medium Temp Returns (211 – 230°F)				
High Temp Returns (>230°F)				

2.4 DEAERATOR STANDARD TRIM AND ACCESSORIES

A. The basic deaerator shall be equipped with the following trim and accessories. Piping on packaged units shall comply with ASME Power Piping Code B31.1.

2.5 DEAERATOR MAKE-UP VALVE AND CONTROLLER

A. _____" inlet water regulating lever valve with _____ body and _____ connections. Rated for _____ GPM at _____ PSIG inlet pressure. This valve shall be suitable for temperatures up to 300 °F. The valve manufacture shall be _____, Model _____. This valve shall be mechanically controlled by an external float cage with cast iron body and 8" stainless steel float. The float cage manufacturer shall be _____, Model _____. A McDonnell & Miller 93-7B level controller shall electronically control the make-up valve.

B. _____" inlet water motorized regulating valve with steel body and threaded NPT connections. Motor shall be 110V bi-directional, with a permanently lubricated gear train, and be directly coupled to the valve stem. Rated for _____ GPM at _____ PSIG inlet pressure. This valve shall have teflon seats and be suitable for temperatures up to 300°F. The motorized valve manufacturer shall be _____. This valve shall be electronically controlled by a solid state control with internally mounted capacitance probes. The electronic solid state control shall be able to set desired level point and acceptable deviation. The electronic solid state control shall include a selection for automatic and manual operating mode. The internals shall include two additional probes for high and low water alarm. The controller manufacturer shall be Model TW82.

C. _____" inlet water diaphragm actuated regulating valve with cast iron body and _____ connections. The valve shall be globe type with proportional control and a spring opposed diaphragm actuator arranged for 3 – 15 PSIG operating signal. The valve shall be normally open on loss of air. Rated for _____ GPM at _____ PSIG inlet pressure This valve shall have stainless steel trim with TFE packing and be suitable for temperature up to 410 °F. The diaphragm actuated valve manufacturer shall be _____, Model _____. This valve shall be pneumatically controlled by an external proportional type sensor. The sensor shall be a 14" displacer that produces a pneumatic output signal. The controller manufacturer shall be _____, Model _____. A filter regulator is to be provided to reduce 50 PSIG instrument air supply to 3 – 15 PSIG for proper operation.

D. The make up valve shall include a ANSI Class 125 LB three-valve bypass with inlet Y-type cast iron strainer. Strainer screen to be removable and of stainless steel construction.

2.6 DEAERATOR STEAM PRESSURE REDUCING VALVE (PRV) STATION

A. _____ steam pressure reducing valve with cast iron body and _____ connections. The valve shall be a self-contained unit capable of reducing _____ PSIG saturated steam to the operating pressure of the deaerator at a flow rate of _____ LB./HR. The valve shall be 250 lb class with stainless steel trim and an adjustable pilot. The valve manufacturer shall be _____, Model _____.

B. _____ " diaphragm actuated steam pressure reducing valve with cast iron body and _____ connections. The valve shall be globe type with proportional control and a spring opposed diaphragm actuator arranged for _____ PSIG operating signal. The valve shall be normally closed on loss of air. The valve shall be capable of reducing _____ PSIG saturated steam to the operating pressure of the deaerator at a flow rate of _____ LB./HR. This valve shall be 250 LB class and have stainless steel trim. The diaphragm actuated valve manufacturer shall be _____, Model _____. This valve shall be pneumatically controlled by an external transmitter. The transmitter set pressure shall be adjustable. The transmitter manufacturer shall be _____, Model _____.

C. The steam pressure reducing valve shall include a three valve bypass with Y-type cast iron strainer. Strainer screen to be removable and of stainless steel construction.

2.7 DEAERATOR SAFETY RELIEF VALVE(S) (SRV)

A. Quantity _____ , _____" relief valves sized to relieve full capacity of the pressure reducing valve in the event of its failure. Valves to meet Paragraph UG-125 of ASME Unfired Pressure Vessel Code, Section VIII. Valve body to be of _____ construction. Relieving set pressure to be 50 PSIG. Relief valve manufacturer to be _____, Model _____.

2.8 DEAERATOR WATER LEVEL ALARMS

A. **High Level Alarm -** NEMA 1 This shall be an externally mounted float type switch. The switch shall make contact on rise and break on fall. The float cage construction shall be cast iron.

B. **Low Level Alarm -** NEMA 1 This shall be an externally mounted float type switch. The switch shall make contact on fall and break on rise. The float cage construction shall be cast iron.

2.9 DEAERATOR OVERFLOW DRAINER

A. _____" overflow drainer sized to relieve full capacity at the operating pressure of the deaerator. The overflow drainer shall be a float type trap. The construction is to be a steel housing with stainless steel float ball. The overflow drainer manufacturer shall be _____, Model _____.

2.10 DEAERATOR SUCTION PIPING

A. Suction piping for pumps shall consist of a _____" gate valve, cast iron Y-type strainer with replaceable stainless steel screen and flexible connector or hose. This piping assembly shall be 125 LB class construction. The vortex breaker shall be located in the tank nozzle.

2.11 BOILER FEEDWATER PUMP AND MOTOR SET

A. **Intermittent -** Intermittent Quantity _____, turbine type boiler feedwater pump and motor set. Pump to be rated for _____ GPM at _____ feet TDH with _____ feet NPSH required. Pump to be _____ materials of construction and have _____ seals for a maximum water temperature of 250 °F. Pump impeller to be hydraulically balanced. The pump shall be mounted on a steel baseplate and flexibly coupled with an OSHA type coupling guard to a _____ HP, _____ phase, _____ Hz, _____ Volt, _____ RPM, _____ enclosure motor. Motor to be non-overloading at the rated condition without using any portion of the service factor. Pump and motor set to be factory aligned prior to shipment. Pump manufacturer to be _____, Model _____, size _____" x _____".

B. **Continuous -** Continuous Quantity _____, centrifugal type boiler feedwater pump and motor set. Pump to be rated for _____ GPM at _____ feet TDH with _____ feet NPSH required. Pump to be _____ materials of construction as defined by the Hydraulic Institute and have _____ seals for a maximum water temperatureof 250°F. Pump impeller to be hydraulically balanced. The pump shall be mounted on a steel baseplate and flexibly coupled with an OSHA type coupling guard to a _____ HP, _____ phase,_____ Hz, _____ Volt, _____ RPM, _____ enclosed motor. Motor to be non-overloading at the rated condition without using any portion of the service factor. Pump and motor set to be factory aligned prior to shipment. Pump manufacturer to be _____, Model _____, size _____ " x _____ ".

A stainless steel recirculation orifice is to be supplied with the pump and shipped loose for field installation to provide minimum bypass flow.

2.12 DEAERATOR SUPPORT STAND

A. The _____ feet high stand shall elevate the deaerator tank to provide the net positive suction head required by the pump at the rated condition to prevent cavitation plus a 1-1/2 foot safety factor. The stand shall be constructed of heavy square steel tubing for the legs and 1/4" steel plate covering the floor.

2.13 DEAERATOR CONTROL PANEL

A. Control panel shall be in a NEMA 1 enclosure and wired to the National Electric Code. The wire shall be black number coded. The assembly is to contain individual motor starters with 120 Volt holding coil and fuse protection. Individual green oil-tight pump run lights shall be provided. All switches and lights to have nameplate identification. The assembled panel shall be given a factory continuity test prior to shipment.

2.14 ELECTRIC COMPONENTS

A. Audible and visual high and low water alarm function shall be provided by a bell or horn with silence switch and individual red oil- tight lights. Control circuit transformer to supply 110-120 Volts, single-phase power supply. The transformer shall be mounted, wired and fused. Auxiliary contacts shall be furnished for chemical feed pump initiation. Contacts shall be normally open.

B. The deaerator shall have a gauge glass assembly that covers the entire tank diameter. The gauge glass shall be quartz, 0.625 inch diameter by 24 inch maximum length. Each length of glass shall be furnished with a bronze gauge cock set and protector rods. The deaerator shall be supplied with a pressure gauge that has a 4-1/2 inch dial with a 0-60 PSIG range and a thermometer with a 50 to 300 °F range. Packaged units are required to have both gauges bracket-mounted at eye level.

2.15 DEAERATOR PREPARATION AND PACKAGING

A. The deaerator is to be hand cleaned with a solvent to SSPC- SP-1 standards prior to painting. Prime coated to not less than 1 mil thick and finish coated with an enamel paint to not less than 1 mil thick prior to shipment.

B. Unit is to be knocked down for shipment. Piping is to be matched marked.

2.16 DEAERATOR MANUALS AND WARRANTY

A. Three, bound, Operating and Maintenance manuals to be provided. Warranty period to be twelve months after start-up or eighteen months after shipment, whichever comes first.