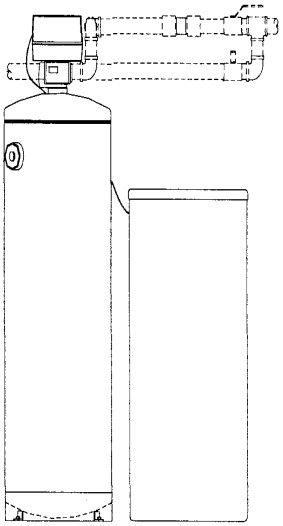
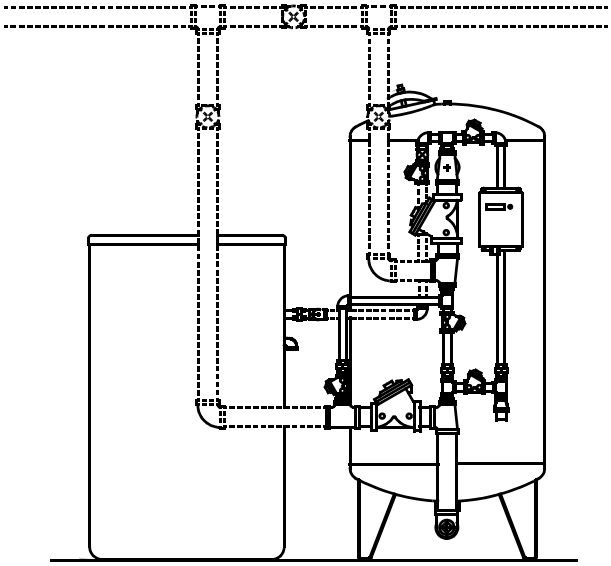
Section H9

SOFTENERS



Models SSE & FSE



Model SMR

CONTENTS

ILLUSTRATIONS

TABLES

This section contains information on Cleaver-Brooks cation, ion exchange, and water softeners available in package designs for virtually any commercial or industrial application. Softeners should be used whenever raw water hardness exceeds 5 ppm.

Cleaver-Brooks water softeners remove hardness, preventing scale buildup on heat transfer surfaces, while maintaining peak boiler efficiency. Removing hardness also reduces the need for chemical treatment used to control scale.

MODELS SSE & FSE FEATURES AND BENEFITS

Quality Constructed Tanks:

- Two types of softener resin tanks are available to meet environmental requirements. Both rugged lined steel or fiberglass (FRP) vessels are available.
- Exclusive Polybond® tanks are made of industrial grade steel. The tank interior is lined with a heat-fused virgin polyethylene lining, creating a 40-60 mil thick, resilient, and non-corrosive tank within a tank. The lining material is Food and Drug Administration (FDA) listed. All surfaces that contact water during system operation, including valve flanges and openings, are covered with the lining material, so that water never touches bare steel, providing maximum protection against rust and corrosion. In addition, gasketed tank openings provide dry thread closures, eliminating coated threads which can be weak spots in tank linings.
- All tanks are 100% spark tested to ensure the integrity of the tank lining.
- All steel tanks up to 48" in diameter are hot-quench phosphatized prior to the application of a 4- 6 mil thick exterior epoxy coating for further protection against rust and corrosion, providing years of good appearance on the job. Tanks over 48" diameter are coated with a zinc oxide-rich protective coating, suitable for field painting where desired.
- Fiberglass tanks are available for applications where environmental conditions or budgetary constraints prevail. They are especially useful in providing rust and corrosion protection. All FRP tanks are provided with a minimum of 5 year warranties.

Electronic Demand Programmable (ED) Controls

- ED controls offer precise control over water softener operation. All controls have state-of-the-art electronics, and are microprocessor-based and completely programmable. Operating efficiency combines with ease of use -- a 4-button keypad and alphanumeric LCD display permit easy programming and observation of system functions (no complicated jumper pins or dip switches to set). Simple programming prompts the operator through set-up. Model code programming makes set-up as easy as selecting model, pipe size, salt dosage, water hardness, and time. Controls perform all calculations to minimize set-up errors.
- An EEPROM memory retains all programmed and accumulated data, eliminating the need to re-program the control after a power loss. A capacitor operates the microprocessor in case of short term power loss.
- An easy-to-read LCD display continuously displays system status and allows instant access to current operating conditions, including flow rate, total treated flow, remaining capacity, valve position and many more important features. The display is illuminated for easy reading, even in low-light conditions. Self-diagnostic electronics provide 24-hour per day review of the system, and stores historical data to allow system optimization and simplify troubleshooting. A built-in speaker can transmit this System Performance Analysis (SPA) data via regular telephone lines to a remote service center for computerized troubleshooting, or, data can be recorded for later transmission.
- Controls have a look-ahead feature. The main memory monitors operation, tracks data, then adjusts regenerations automatically for high- and low-water use periods.
- All controls are designed for use with Fleck® regeneration valves as well as traditional valve nest operated systems. Pre-wired components with indexed cables make installation quick and simple, and eliminate the need for complicated wiring diagrams and wiring connection instructions. Low voltage 24-volt operation simplifies installation and minimizes electrical hazards.

- Two models are available to meet varying needs: EDS/EDT, and VF.
- EDS/EDT controls are capable of operating one or two softener tanks in single, parallel, or alternating modes.
- VF controls can operate two, three, or four softener tanks in parallel, alternating, or variable flow mode. Each tank has its own flowmeter, so that the control knows how much softening capacity remains in each tank. If water demand increases, the system can be expanded by adding more softener tanks, and the control can be reprogrammed to handle the larger system. If one softener tank is taken of-line, the VF control adjusts the remaining tanks to maintain the same system flow rate. It also staggers tank regeneration to prevent all tanks from being exhausted simultaneously, thus maintaining sufficient softened water flow to the boiler or process need.
- In variable mode, the VF control monitors flow rate and switches tanks into service to meet changes in system demand, thus making sure that sufficient softened water is available, and that each tank is efficiently used.

Versatile Control Valve:

- Each softener control valve is a low-lead brass, mechanically actuated, hydraulically balanced, self-cleaning six (6) position type to accomplish the regeneration steps of backwash, brine draw, slow rinse, fast rinse, and tank refill. Separate rinse and timed refill positions are used to reduce regeneration water use.
- The valve is fitted with a fixed orifice eductor nozzle and self-adjusting backwash flow control. The bypass body, like the main control valve, is actuated by a mechanical drive. The valve is capable of stepping through all regeneration phases without electrical power.

Brine System and Salt Storage

- Positive action brine piston eliminates the need for constant line pressure at the salt storage tank, minimizing brine tank overflows.
- Timed tank refill provides highly reliable brine levels and salt usage. Salt dosage is easily changed from the system control, eliminating the need to empty salt tanks.
- Simple protected brine well design eliminates the need for gravel subfill and minimizes brine tank maintenance.
- High density FDA approved polyethylene tank and cover provide maximum strength and corrosion resistance.

High Quality Softener Resins

- All water softeners contain a high-quality, high-capacity, solvent-free synthetic ion exchange resin, that exchanges the hardness minerals of calcium and magnesium ions with soluble sodium ions, a soft and non-scaling mineral that does not build up on pipes to cause hot spots and weaknesses. All resins have a minimum exchange capacity of 30,000 grains per cubic foot when regenerated with 15 pounds of salt per cubic foot. Resins provide efficient exchange capacity at lower salt dosages (20,000 grains per cubic foot at 5 pounds of salt per cubic foot). In addition to softening water, resins also provide iron and manganese removal from the water. Softener resins are stable over the entire pH range.
- They are suitable for high flow rates and high hardness waters, and are physically stable at high temperatures. Resins feature low attrition loss, and minimum backwash water is required.

- All resins are in solid bead form with uniform particle size, clean and free of dirt and extraneous matter which might interfere with the ion exchange process.
- All resins rest on a bed of quartz particles that have been screened not to exceed 16 mesh size by 3/16-inch particle size. The quartz bed is at least two inches in depth and is placed above the softened water distributor mounted in the bottom of the tank. The quartz is washed and dried to remove debris and fines.

Automatic Self-Adjusting Backwash and Rinse Controls

- This feature assures maximum cleansing of the resin bed during backwash, and prevents loss of resin across the entire operating range of 30-100 PSIG. The flow control eliminates the need for troublesome and time-consuming field adjustments.

Availability:

- All softener systems are available from stock, with short lead times.

Optional Skid Mounting:

- Tanks may be ordered skid-mounted for easy handling and easier and lower-cost field installation.

Efficient Water Distributors:

- Inlet water distributors are designed to produce uniform flow through the entire resin bed and thus ensure maximum exchange capacity with low pressure loss.

MODELS SMR FEATURES AND BENEFITS

Automatic Control Center Engineered for Efficient Trouble-Free Service Includes:

- Industrial grade multi-valve with integral brine injector.
- Electrically operated cycle controller with position indicator.
- Automatic backwash flow control.
- The exclusive multi-valve design, features five hydraulically-operated diaphragm valve assemblies conveniently arranged. The valve seats are positioned vertically in the valve casting, reducing the possibility of dirt or debris lodging in the seat area. This design provides a positive shut-off with no leaking or dripping, as is often the case with horizontally-positioned valve seats.
- Single unit softeners are provided with an automatic bypass valve that provides service water during regeneration. Cycling of the diaphragm assemblies is smooth and entirely free of water hammer.

Automatic Self-Regulating Brine Injector:

- Assures efficient brining without time-consuming field adjustments.

Automatic Brine Maker, Includes Heavy Gauge Polyethylene Brine Tank for Maximum Strength and Corrosion Resistance:

- Platform brine system allows use of pure, clean, efficient salt pellets or nuggets, eliminating costly and time consuming brine tank cleaning.
- The system eliminates need for gravel subfills, reducing shipping weight and freight costs.
- Automatic brine valve provides reliable refill of the brine system with fresh water and is fully serviceable. All critical seal areas of the brine valve are designed to prevent corrosion or scaling to assure trouble-free operation.

High Capacity Resin, Adaptable to Wide Range of Applications:

- High exchange capacity (30,000 grains per cubic foot at 15 lbs. salt dosage).
- Efficient exchange capacity at lower salt dosages (20,000 grains per cubic foot at 6 lbs. salt).
- Iron and manganese removal.
- Stability over entire pH range.
- Suitable for high flow rates.
- Suitable for high hardness waters.
- Physically stable at high temperatures.
- Low attrition loss.
- Minimum backwash water required.

Automatic Self-Adjusting Backwash And Flush Controls:

- Assures maximum cleansing of the resin bed during backwash and prevents loss of costly resin across the entire operating range of 30-100 psig.
- Eliminates the need for troublesome and time consuming field adjustments because the flow control is pre-sized at the factory.

Available From Stock:

- Short lead time or minimum down time.

Optional Skid Mounting:

- Ease of installation in the field; lower installation cost.

System of Non-Clogging Strainers Arranged in a Radial Network:

- Assures uniform flow through the entire resin bed, resulting in maximum exchange capacity from the resin with low pressure loss.
- Eliminates wasted capacity in the bottom area of the resin tank.

PRODUCT OFFERING

Water softeners require periodic regeneration with salt brine.

Standard Equipment - SSE & FSE

Single, duplex, triplex, or quadraplex unit systems include resin tank(s), brine tank, resin, piping, multi-position piston valves, flowmeters and electronic demand controller.

- Single tank exchange capacities: 30,000 to 1,200,000 grains.
- Tank sizes: 9” to 48” diameter standard (larger diameters available).
- Operating temperatures: 40° to 100° F.
- Water meter for automatic regeneration.
- 24 Volt operation.
- Heat fused polyethylene lined steel or FRP tanks.

Standard Equipment - SMR

Single, twin, or triple unit system includes resin tank(s), brine tank, resin, face-piping, diaphragm, valve nest and cycle controller.

- Size range in capacities: 30,000 to 2,100,000 grains.

- Tank sizes: 20" to 42" dia.
- Operating temperatures: 40 °F to 100 °F.

Optional Equipment - SSE & FSE

- ASME Code tank construction.
- Alternating Parallel or Variable Flow operation.
- Skid mounting, pre-wired and pre-piped.
- High temperature operation.
- Alternate linings and external coatings.

Optional Equipment - SMR

- ASME Code tank construction.
- Water meter for automatic regeneration.
- Alternating operation.
- Skid mounting, pre-wired and pre-piped.
- External corrosion protection.

Operating Specifications

- Pressure Range: 25 to 100 psig.
- Temperature: Standard equipment suitable for water up to 100 °F. Above 100 °F, special fitted valves are available. Specify water temperature when ordering.
- Electrical: 120 Volt, 60 Hz is standard. Alternate voltages and frequencies available. Specify electrical requirements when ordering. Transformers for control operation voltage will be supplied with the SSE &FSE, SMR with MX controls.
- Power: 6 Watts per cycle controller.

DIMENSIONS, RATINGS AND SIZING

Dimensions

Dimensions for the SSE Model Polybond lined Steel Softeners (sizes 30 - 1200) are shown in Figure H9-1.

Dimensions for the FSE Model FRP Softeners (sizes 30 - 600) are shown inFigure H9-2.

Dimensions for the Model SMR Softeners (sizes 150-1050) are shown in Figure H9-4.

Ratings

Softener capacity and flow ratings are shown in Table H9-1, Table H9-2,Table H9-3 and Table H9-4.

Sizing

Five things are required to size a softener:

1. Flow Rate/Pressure Loss

Softeners have two published flow rates:

Continuous - Used for sizing when actual flows are known. This rating of a softener will generally produce a pressure loss of 15 psig.

Peak - Used to establish the absolute upper limits of a softener. This rating of a softener will produce a pressure loss of 25 psig.

2. Time On-Line

Single softeners should be sized to stay on-line for at least one day. For continuous usage when an alternating twin softener is used, each tank should be sized to stay on-line for 8-12 hours.

3. Water Hardness

To size the softener, the total water hardness must be determined in grains per gallons. If the analysis report is in terms of parts per million or milligrams per liter (these are equal), divide by 17.1 to convert to grains per gallon.

4. Water Usage

When the flow rate is constant, multiply the flow rate (gpm) by minutes on line. For example, 50 gpm for 480 minutes (8 hours) = 24,000 gallons. When the flow rate is not in constant use, use actual gallons used, or calculate gallons used based on boiler make-up rates.

5. Exchange Capacity

Exchange rate is expressed in grains, and varies with salt dosage as follows:

15 pounds of salt per cu-ft = 30,000 grains capacity (best water quality, least efficient).

10 pounds of salt per cu-ft. = 25,000 grains capacity (good water quality, medium efficiency).

6 pounds of salt per cu-ft. = 20,000 grains capacity (poorest water quality, most efficient). For boiler make-up water, the higher water quality - 15 pounds salt dosage per cu-ft. - is recommended.

Sizing Calculations

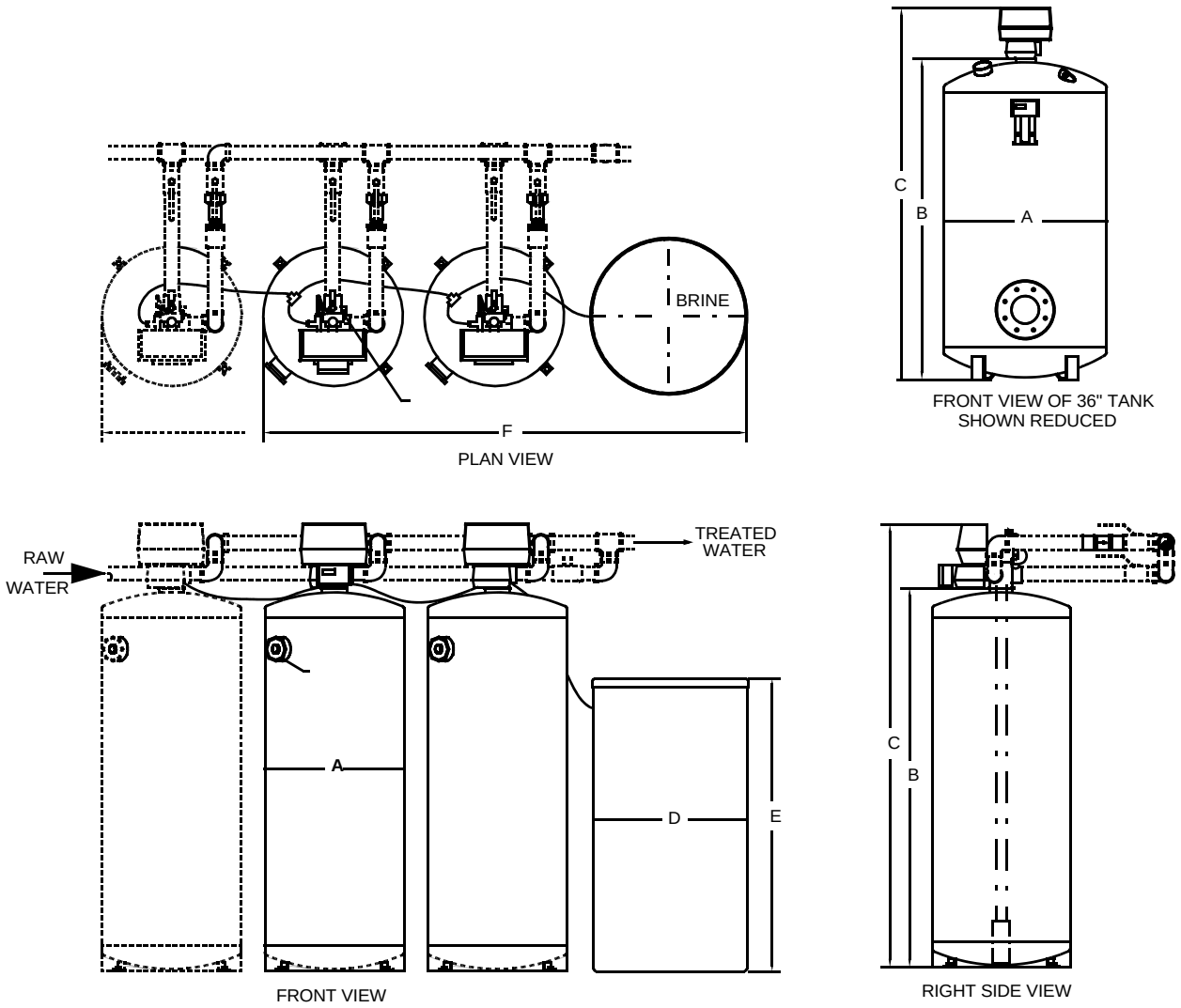
l. Single Softener. (Water usage per day x water hardness = capacity required.) For example:

- 10,000 gallons per day x 15 gpg hardness = 150,000 grains per day capacity required.
- Select a Model (SSE 150) from the literature. Then select the pipe size to meet flow rate requirements.

2. Alternating Twin Softeners

Flow rate x hardness x minutes on line = capacity required. For example:

- Flow rate = 40 gpm. Hardness = 15 gpg. 40 x 15 x 480 minutes on line = 288,000 grains.
- Select a Model (SSE 300) from the literature. Then select pipe size based on flow rate requirements. When the gallons of make-up is not known, use Figure H9-5 to calculate softener capacity required per hour. When less than 6 hours is expected between regeneration of a twin softener, two brine makers are required.



Dimensions (next page) are given in inches.

Figure H9-1. SSE Models (Size 30-1200) Softener Dimensions - Page 1 of 2

MODEL NUMBER SSE	A (in.)	B (in.)	C (in.) ***	D (in.) SINGLE TWIN	D (in.) TRIPLE QUAD *	E (in.) SINGLE TWIN	E (in.) TRIPLE QUAD *	F (in.) SINGLE	F (in.) TWIN	F (in.) TRIPLE	F (in.) QUAD **	INLET/ OUT-LET (in.)	DRAIN SIZE (in.).
30-1	10	40	46	18	18	40	40	32	46	60	74	1	3/4*
60-1	12	52	58	18	18	40	40	35	75	47	83	1	3/4*
90-1 90-1 1/2	14	66	72	18	24	40	41*	36	54	82	100	1 1 1/2	3/4*
120-1 1/2 120-2	18	66	72 77	24	24*	41	41	46	68	90	112	1 1/2 2	3/4*
150-1 150-1 1/2	18	66	72 77	24	24	41	41	46	68	90	112	1 1 1/2	3/4”
210-1 1/2 210-2	24	6	72 77	24	24	50	50	52	80	108	136	1 1/2 2	1*
300-1 1/2 300-2	24	66	72 77	24	24	50	50	52	80	108	136	1 1/2 2	1*
450-2 450-3	30	66	77 86	30	30*	50	50*	65	99	133	167	2 3	1 1/2*
600-2 600-3	36	71	82 86	39	39	48	48	80	120	160	200	2 3	1 1/2
900-3	42	71	86	39	39*	48	48*	85	131	177	223	3	2
1200-2	48	71	86	52	52*	60	60*	104	156	212	268	3	2

* Recommend two (2) brine tanks on quad systems.

** When using two brine tanks on quad systems, add the diameter of the brine tank plus 4 inches to the overall length.

*** Total height of the unit will increase when using ASME code tanks. All ASME tanks (18-inch diameter through 48-inch diameter) are 70-1/2 inches in height plus the height of the control valve.

Figure H9-1. SSE Models (Size 30-1200) Softener Dimensions - Page 2 of 2

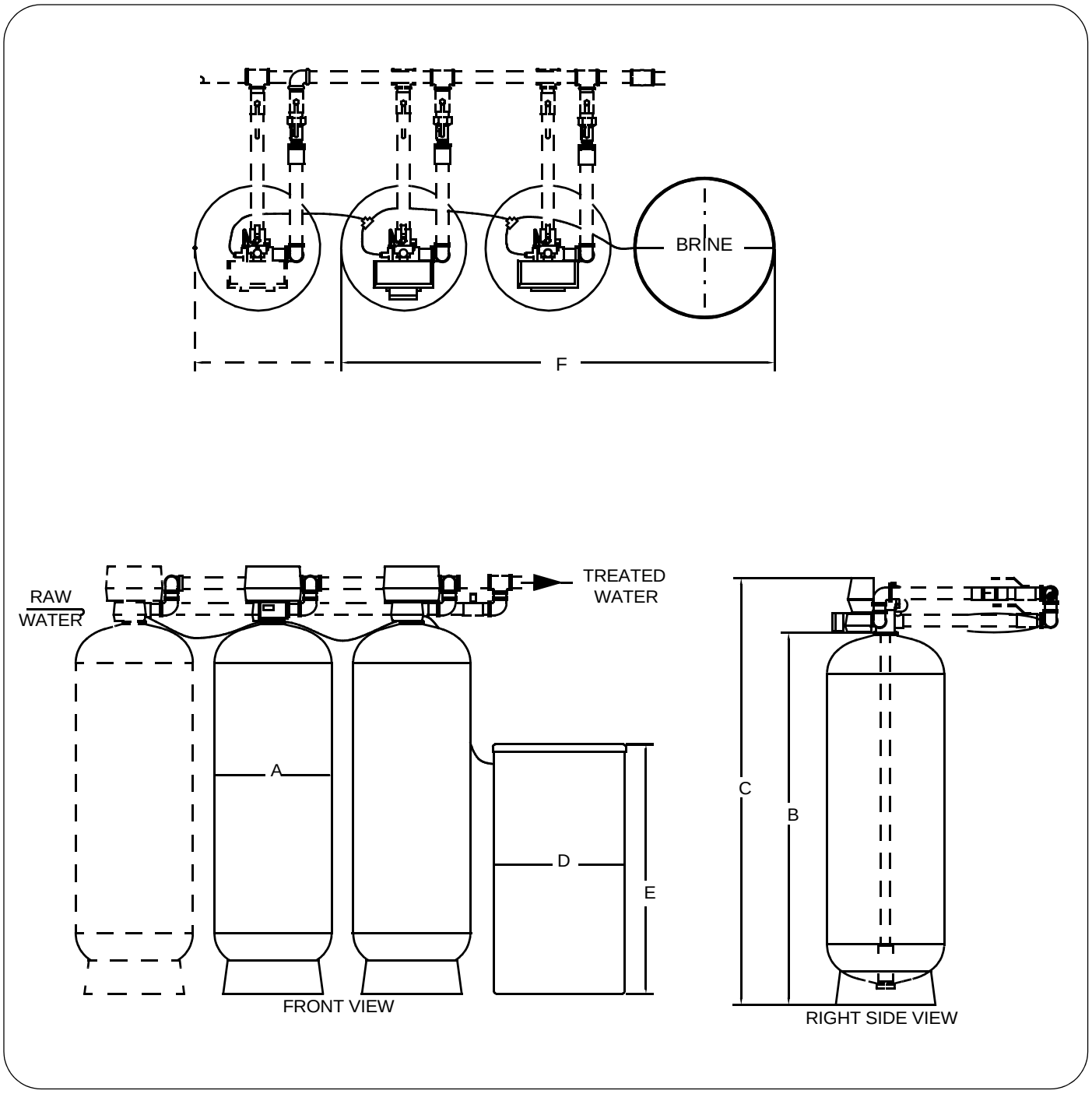


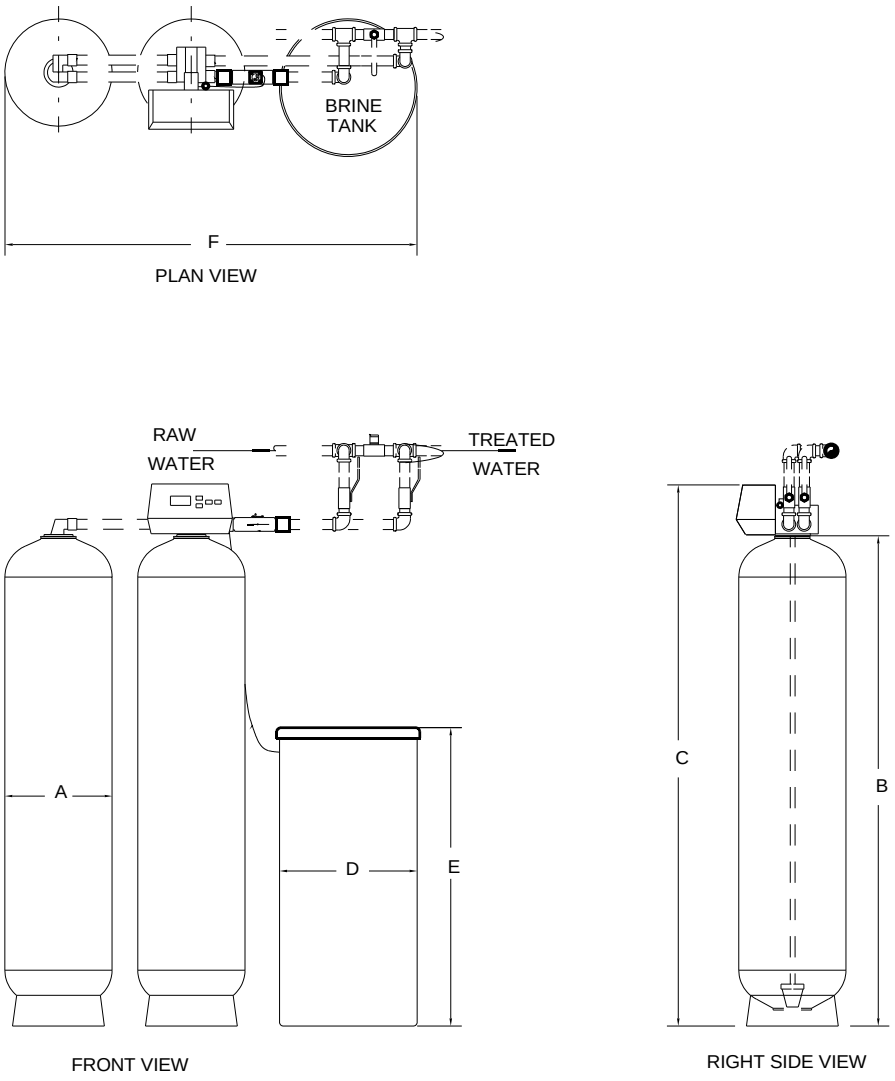
Figure H9-2. (1 of2) Model FSE (Size 30-600) Softener Dimensions

MODEL NUMBER	A (in.)	B (in.)	C (in.)	D (in.)		E (in.)		F (in.)				PIPE SIZE (in.)	
FSE				SINGLE TWIN	TRIPLE QUAD*	SINGLE TWIN	TRIPLE QUAD*	SINGLE	TWIN	TRIPLE	QUAD**	INLET/ OUTLET	DRAIN SIZE
30-1	9	48	54	18	18	40	40	31	44	57	70	1	3/4
60-1	12	52	59	18	18	40	40	34	50	66	82	1	3/4
90-1 90-1 1/2	14	65	71	18	24*	40	41*	36	54	82	100	1 1 1/2	3/4
120-1 1/2 120-2	17	72	72	24	24	41	41	45	66	87	100	1 1/2 2	3/4
150-1 150-1 1/2	17	72	80 84	24	24	41	41	45	66	87	100	1 1 1/2	3/4
210-1 1/2 210-2	24	72	82 87	24	24	50	50	52	80	108	136	1 1/2 2	1
300-1 1/2 300-2	24	72	82 87	24	24	50	50	52	80	108	136	1 1/2 2	1
450-2	30	72	92	30	30*	50	50	64	98	132	166	2	1
600-2 600-3	36	72	92 96	39	39*	48	48	79	119	159	199	2 3	1 1/2

"* Recommend using two (2) brine tanks on quad systems.

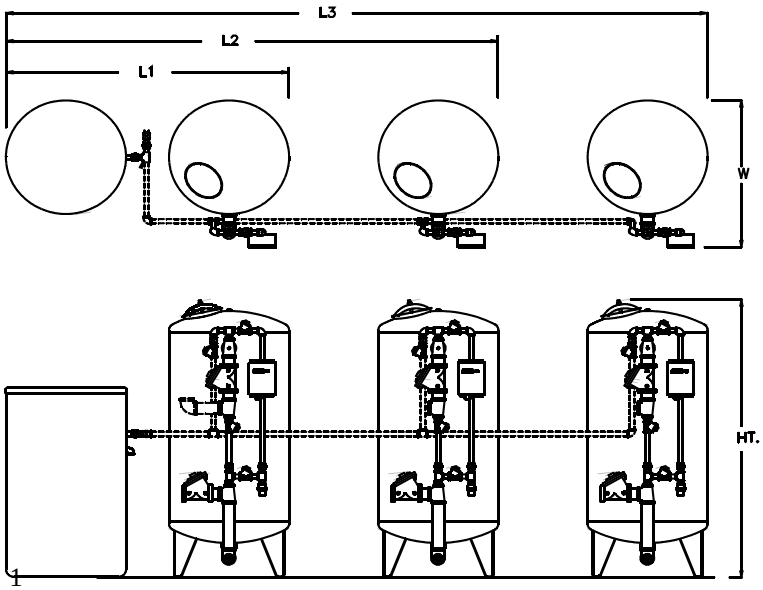
** When using two (2) brine tanks on quad systems, add the diameter of the brine tank plus 4-inches to the overall length.

Figure H9-2. (2 of 2) Model FSE (Size 130-600) Softener Dimensions



MODEL NUMBER CRS	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	PIPE SIZE (in.)	
							INLET/ OUTLET	DRAIN
30-1	9	48	54	18	40	46	1	3/4
60-1	12	52	59	18	40	52	1	3/4
90-1 90-1 1/2	14	65	71	18	40	54	1 1 1/2	3/4
120-1 1/2	16	65	72	24	41	67	1 1/2	3/4
150-1 1/2	17	72	80	24	41	68	1 1/2	3/4
210-1 1/2	24	72	82	24	50	80	1 1/2	1
300-1 1/2	24	72	82	24	50	80	1 1/2	1

Figure H9-3. CRS Crossover Twin Dimensions (Size 30-300)



MODEL NUMBER	HEIGHT (IN)	WIDTH (IN)	SINGLE LL1	TWIN L2	TRIPLE L3
SMR-150-1	72	29	50	88	126
SMR-150-1 1/4		30			
SMR-150-1 1/2		30			
SMR-150-2		34			
SMR-210-1 1/4	73	32	54	96	138
SMR-210-1 1/2		32			
SMR-210-2		36			
SMR-210-2 1/2		37			
SMR-300-1 1/2	76	38	60	108	156
SMR-300-2		42			
SMR-300-2 1/2		43			
SMR-300-3		44			
SMR-450-1 1/2	82	38	66	114	162
SMR-450-2		42			
SMR-450-2 1/2		43			
SMR-450-3		44			
SMR-600-1 1/2	89	44	81	135	189
SMR-600-2		48			
SMR-600-2 1/2		49			
SMR-600-3		50			
SMR-750-2	101	48	81	135	189
SMR-750-2 1/2		49			
SMR-750-3		50			
SMR-900-2	94	54	90	150	218
SMR-900-2 1/2		55			
SMR-900-3		56			
SMR-1050-2	106	54	98	158	218
SMR-1050-2 1/2		55			
SMR-1050-3		56			

Figure H9-4. SMR Dimensions (Size 150-1050)

Table H9-1. SSE Water Softener Ratings Polybond Lined Steel

MODEL NUMBER	EXCHANGE CAPACITY		RESIN QYT	CONT SERV FLOW	PRESS DROP	PEAK SERV FLOW	PRESS DROP	BACK-WASH FLOW	TANK DIMENSIONS		MANIF PIPE SIZE	FLOW SENSOR SIZE	SALT STORAGE CAPACITY
SSE	MAX GR	MIN GR	CU-FT	GPM	PSI	GPM	PSI	GPM	SOF'R (in.)	BRINE (in.)	(in.)	(in.)	(lbs)
30-1	30,000	20,000	1	8	5	12	10	2	10x40	18x40	1	1	400
60-1	60,000	40,000	2	16	10	24	20	3	12x52	18x40	1	1	400
90-1 90-1-1/2	90,000	60,000	3	21 24	15 9	29 36	25 16	5	14x66	18x40	1 1-1/2	1	400
120-1-1/2 120-2	120,000	80,000	4	32 32	12 7	48 48	22 12	7	18x66	24x41	1-1/2 2	1-1/2 2	700
150-1-1/2 150-2	150,000	100,000	5	40 40	13 6	52 60	25 11	7	18x66	24x41	1 1-1/2	1-1/2 2	700
210-1 1/2 210-2	210,000	140,000	7	45 56	15 8	60 84	25 15	15	24x66	24x50	1-1/2 2	1 1/2 2	1,000
300-1 1/2 300-2	300,000	200,000	10	45 77	15 15	58 107	25 25	15	24x66	24x50	1-1/2 2	1 1/2 2	1,000
450-2 450-3	450,000	300,000	15	87 140	15 15	118 200	25 25	20	30x66	30x50	2 3	2 3	1,500
600-2 600-3	600,000	400,000	20	94 160	15 15	125 240	25 25	25 30	36x71	39x48	2 3	2 3	2,500
900-3	900,000	600,000	30	200	15	270	25	40	42x71	39x48	3	3	2,500
1200-3	1,200,000	800,000	40	210	15	280	25	50	48x71	52x60	3	3	4,500

Flow rates and resin capacities are based on a single tank.

Table H9-2. FSE Water Softener Ratings, Fiberglass Softeners

MODEL NUMBER	EXCHANGE CAPACITY		RESIN QYT	CONT SERV FLOW	PRESS DROP	PEAK SERV FLOW	PRESS DROP	BACK-WASH FLOW	TANK DIMENSIONS		MANIF PIPE SIZE (in.)	FLOW SENSOR SIZE (in.)	SALT STORAGE CAPACITY (lbs)
FSE	MAX GR	MINGR	CU-FT	GPM	PSI	GPM	PSI	GPM	SOF'R (in.)	BRINE (in.)			
30-1	30,000	20,000	1	8	5	12	10	2	9X48	18x40	1	1	400
60-1	60,000	40,000	2	16	10	24	20	3	12x52	18x40	1	1	400
90-1 90-1-1/2	90,000	60,000	3	21 24	15 9	29 36	25 16	5	14x65	18x40	1 1-1/2	1 1-1/2	400
120-1-1/2 120-2	120,000	80,000	4	32 32	12 7	48 48	22 12	7	16X65	24x41	1-1/2 2	1-1/2 2	700
150-1-1/2 150-2	150,000	100,000	5	40 40	13 9	52 60	25 16	7	17X72	24x41	1-1/2 2	1-1/2 2	700
210-1 1/2 210-2	210,000	140,000	7	45 56	15 8	60 84	25 15	15	24x72	24x50	1-1/2 2	1-1/2 2	1,000
300-1 1/2 300-2	300,000	200,000	10	45 77	15 15	58 107	25 25	15	24x72	24x50	1-1/2 2	1-1/2 2	1,000
450-2	450,000	300,000	15	87	15	118	25	20	30x72	30x50	2	2	1,500
600-2 600-3	600,000	400,000	20	94 160	15 15	125 240	25 25	25 30	36x72	39x48	2 3	2 3	2,500

Flow rates and resin capacities are based on a single tank.

Table H9-3. CRS Water Softener Ratings, Fiberglass Softeners with Crossover Controls

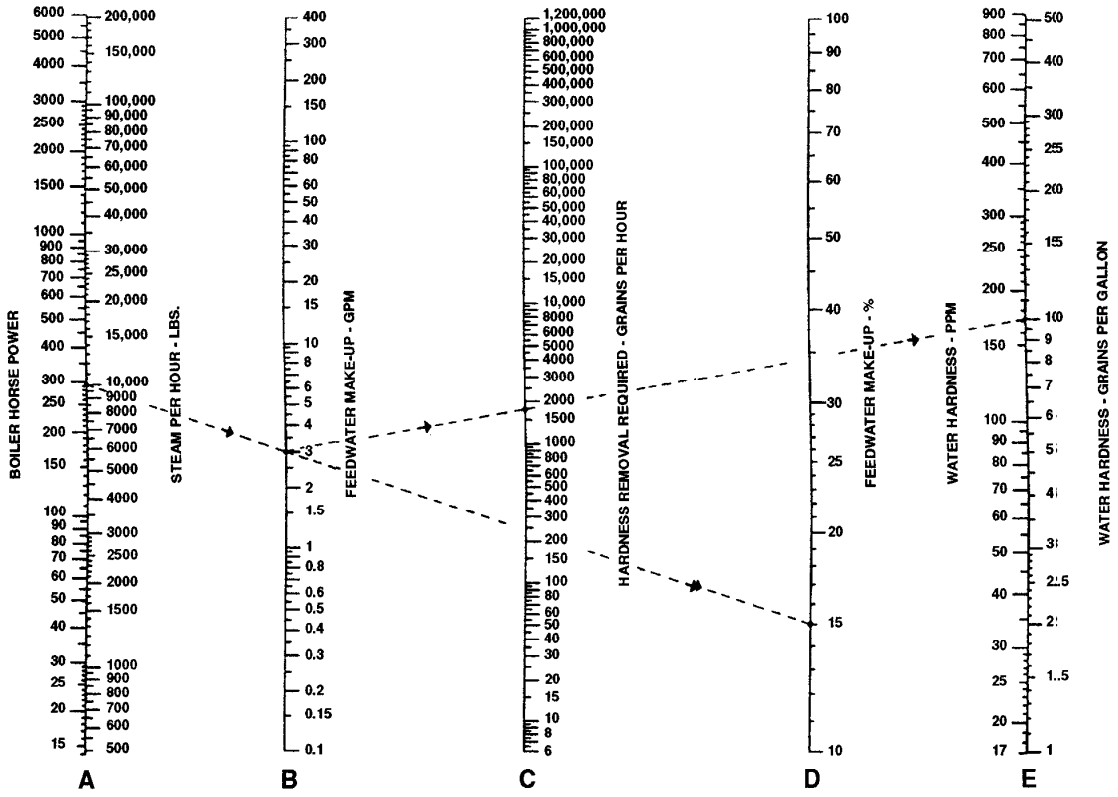
MODEL NUMBER	EXCHANGE CAPACITY		RESIN QYT	CONT SERV FLOW	PRESS DROP	PEAK SERV FLOW	PRESS DROP	BACK-WASH FLOW	TANK DIMENSIONS		MANIF PIPE SIZE (in.)	FLOW SENSOR SIZE (in.)	SALT STORAGE CAPACITY (lbs)
CRS	MAX GR	MINGR	CU-FT	GPM	PSI	GPM	PSI	GPM	SOF'R (in.)	BRINE (in.)			
30-1	30,000	20,000	1	8	5	12	10	2	9x48	18x40	1	1	400
60-1	60,000	40,000	2	16	10	24	20	3	12x52	18x40	1	1	400
90-1	90,000	60,000	3	21	15	29	25	5	14x65	18x40	1	1	400
90-1 1/2	90,000	60,000	3	24	9	36	16	5	14x65	18x40	1 1/2	1 1/2	400
1201 1/2	120,000	80,000	4	32	12	48	22	7	16x65	24x41	1 1/2	1 1/2	700
150-1 1/2	150,000	100,000	5	40	13	52	25	7	17x72	24x41	1 1/2	1 1/2	700
210-1 1/2	210,000	140,000	7	45	15	60	25	15	24x72	24x50	1 1/2	1 1/2	1,000
300-1 1/2	300,000	200,000	10	45	15	58	25	15	24x72	24x50	1 1/2	1 1/2	1,000

Flow rates and resin capacities are based on a single tank.
(CRS Crossover Systems Are Only Available In Twin Alternating Configurations.)

Table H9-4. SMR Water Softener Ratings

MODEL NUMBER	EXCHANGE CAPACITY		RESIN	MANIF PIPE SIZE	CONT SERV FLOW	PEAK SERV FLOW	BACK-WASH FLOW	TANK DIMENSIONS		SALT CAPACITY BRINE MAKER (LBS)	SALT PER REGEN		REC WATER METER SIZE	DRAIN PIPE SIZE (in.)
SMR	MAX GR	MIN GR	CU-FT	IN.	GPM	GPM	GPM	SOF'R (in.)	BRINE (in.)		MAX LBS	MIN LBS	(in.)	
150-1 150-1-1/4 150-1-1/2 150-2	150,000	100,000	5	1 1-1/4 1-1/2 2	32 43 55 69	42 57 70 97	10.0	20x54	24x50	700	75	30	1 1-1/4 1-1/2 2	1
210-1-1/4 210-1-1/2 210-2 210-2-1/2	210,000	140,000	7	1-1/4 1-1/2 2 2-1/2	41 64 80 115	57 86 110 160	15	24x54	24x50	600	105	42	1-1/4 1-1/2 2 2-1/2	1
300-1-1/2 300-2 300-2-1/2 300-3	300,000	200,000	10	1-1/2 2 2-1/2 3	65 82 140 165	92 125 190 230	20.0	30x54	24x60	600	150	60	1-1/2 2 2-1/2 3	1
450-1-1/2 450-2 450-2-1/2 450-3	450,000	300,000	15	1-1/2 2 2-1/2 3	63 82 120 140	90 115 170 190	20.0	30x60	30x60	1000	225	90	1-1/2 2 2-1/2 3	1
600-1-1/2 600-2 600-2-1/2 600-3	600,000	400,000	20	1-1/2 2 2-1/2 3	72 110 140 175	94 125 190 250	30.0	36x60	39x60	1900	300	120	1-1/2 2 2-1/2 3	1 1/2
750-2 750-2-1/2 750-3	750,000	500,000	25	2 2-1/2 3	90 140 160	116 190 230	30.0	36x72	39x60	1700	375	150	2 2-1/2 3	1 1/2
900-2 900-2-1/2 900-3	900,000	600,000	30	2 2-1/2 3	105 150 188	133 218 274	45.0	42x60	42x60	1900	450	180	2 2-1/2 3	2
1050-2 1050-2-1/2 1050-3	1050K	700K	35	2 2-1/2 3	95 145 175	124 210 259	45.0	42x72	50x60	2300	525	210	2 2-1/2 3	2

A. Continuous service flow at a pressure loss not exceeding 15 psig.
B. Peak service flow at a pressure loss not exceeding 25 psig.
"T" denotes turbo type water meter.



ITEMS THAT MUST BE KNOWN
1. Capacity of generator in lbs of steam per hour.
2.% Make-up.
3. Water hardness.
4. Hours operated each day.

PROCEDURE
1. Lay a straight edge from lbs steam/hour (line A) to the% make-up (line D) and obtain the DBMS make-up flow from line B.

2. Lay a straight edge from the gpm make-up (line B) to the water hardness (Line E) and obtain the hardness removal required for each hour of generator operation from line C.

3. Calculate the hardness removal required each day by multiplying the value obtained in step 2 by the hours operated each day.

NOTE: In situations where softened water is required for loads in addition to boiler requirements, the total gpm flow for the softener is the total of both requirements. Then using lines B and E, the required grain removal per hour can be determined.

EXAMPLE
10,000 lbs steam/hour
15% make-up
8 hours daily operation
Water hardness 10 grains per gallon

FROM NOMOGRAPH
Feedwater make-up is 3 gpm.
Hardness removal required is 1800 grains per hour.

Hardness removal required each day - 8 x 1800 - 14,400 grains.

SOFTENER SELECTION
Select a softener that will meet both flow rate and exchange requirements. For 24 hour operation and to provide a continuous supply of soft water, a twin unit is required. For the above example, an SSE-60-1 Twin could be used to provide 24 hour operation. This model would provide 1 day operation between regeneration periods. To provide 8 hour a day operation, the SSE-60-1 single unit would permit 3 days between regeneration periods.

Figure H9-5. Water Softener Sizing Chart

Section H9

Softeners (SSE/FSE)
Sample Specifications

SAMPLE SPECIFICATIONS (SSE/FSE)

The following sample specifications are provided to you by Cleaver-Brooks to assist you in meeting your customer’s requirements.

PART 1 GENERAL

11 GENERAL

Furnish, install, and place in operation an Automatic Water Softener System similar or approved equal to Cleaver-Brooks Model (SSE: lined steel tank/ FSE: fiberglass reinforced plastic tank)_____, having _____tank(s) with _____cu-ft. of ion exchange resin per tank. Soft water output to be _____gallons (cu-meters) per tank per regeneration with_____lbs(kg) of salt, based on _____ grains per gallon compensated hardness. Service flow rate per tank_____ gpm (lpm) at a pressure loss through softener system not exceeding _____ psig (bar).

PART 2 PRODUCTS

21 EQUIPMENT

A. Tanks 10" Through 36" Diameter (Steel Polybond: Standard SSE)

1. Softener tanks shall be made of butt-welded industrial grade carbon steel designed for a working pressure of 125 psi (____bar) dynamic and hydrostatically tested at 50% excess of the working pressure. Each tank shall be _____ m) diameter with a _____ m) overall tank height. Tank support(s) shall be of a skirt-ring type welded to the tank(s) lower head. The tank(s) shall be equipped with a resin loading port and a drain/ resin removal port (14" and larger).
2. Steel tank(s) shall be provided with a Polybond® lining of inert non-leachable virgin polyethylene material at least 40-60 mils thick permanently bonded to the tank interior by heat fusion. The tank lining shall meet the requirements of the United States Food and Drug Administration (USFDA). The tank lining shall be chemically inert so as not to react with water, media, acids, caustic soda, chemicals or water-borne contaminants. The tank exterior shall be degreased, pre-cleaned, and phosphatized and shall have an exterior coating of high gloss epoxy enamel 4 to 6 mils thick. Tank openings shall be fitted with O-ring seals that seat firmly on the tank interior lining to prevent holidays due to thread tapping and eliminate water to thread contact.
3. Steel tank linings shall be tested for lining integrity by a 2,500-volt spark test, and the test certified with the shipping papers for the system (if requested at the time of order). The spark test shall be capable of detecting the most minute imperfection. The tank(s), with linings in place, shall be water tested under pressure for leaks.
4. 2.1 Tanks 42" Through 48" Diameter (Steel Polybond: Standard SSE)
5. Softener tanks shall be made of butt-welded industrial grade carbon steel designed for a working pressure of 100 psi (____bar) dynamic and hydrostatically tested at 50% excess of the working pressure. Each tank shall be _____ m) diameter with a _____ m) overall tank height. Tank support(s) shall be strap-type steel legs permanently welded to the lower tank head. The tank(s) shall be equipped with a resin loading port and a drain/resin removal port.

6. Steel tank(s) shall be provided with a Polybond® lining of inert non-leachable virgin polyethylene material at least 40-60 mils thick permanently bonded to the tank interior by heat fusion. The tank lining shall meet the requirements of the United States Food and Drug Administration (USFDA). The tank lining shall be chemically inert so as not to react with water, media, acids, caustic soda, chemicals or water-borne contaminants. The tank exterior shall be degreased, precleaned, and phosphatized and shall have an exterior coating of high gloss epoxy enamel 4 to 6 mils thick. Tank openings shall be fitted with O-ring seals that seat firmly on the tank interior lining to prevent holidays due to thread tapping and eliminate water to thread contact.
7. Steel tank linings shall be tested for lining integrity by a 2,500-volt spark test, and the test certified with the shipping papers for the system if requested at the time of order. The spark test shall be capable of detecting the most minute imperfection. The tank(s), with linings in place, shall be water tested under pressure for leaks.

B. Tanks 9” Through 36” Diameter (Fiberglass Reinforced Plastic: Standard FSE)
1. Softener tank(s) shall be made of fiberglass reinforced ABS plastic. The exterior sideshell shall be reinforced by a continuous roving glass filament overwrap of the same color as the tank shell. The tank(s) shall be supported by a molded polypropylene structural base. Including the base, each vessel shall have the dimensions of _____ inches diameter and _____ inches height.

C. Tanks 20” Through 42” Diameter (SMR Standard)
1. Option - Pressure vessels shall be provided in accordance with ASME Section VIII. Working pressure will be 100, 125 or 150 psig and hydrotested to 150% of stamped and certified rating.
2. Option - Provide tank with high temperature internal epoxy lining at 8-10 mil DFT. Exterior tank surface will be cleaned and coated with a corrosion-resistant zinc-rich primer suitable for epoxy coating in the field.
3. Option - Provide tank with a baked phenolic internal epoxy lining at 8-10 mil DFT. Exterior tank surface will be cleaned and coated with a corrosion-resistant zinc-rich primer suitable for epoxy coating in the field.
4. Option - Provide tank with an external coating of a high gloss epoxy paint 2-4 mil DFT.

D. Distribution System - Models SSE & FSE
1. The soft water collector and backwash water distributor shall be non-clogging design with slot size slot 0.010 inch in width. Single point and hub radial laterals will be used to ensure adequate distribution of flow during service, backwash and regeneration. Laterals will be made of Schedule 80 PVC and designed for low pressure drop-in service.

2. The distributor system will be fully covered by a minimum of 2 inches of quartz underbedding. The quartz shall be washed and dried to remove debris and fines, and screened not to exceed 16 mesh size by 3/16-inch particle size.

E. Main Operating Valve SSE / FSE 30 to 1200

1. The control valve shall have _____inch _____ cm) NPT (BSP) inlet and outlet connections. It shall be a low lead brass mechanically-actuated, hydraulically-balanced, self-cleaning piston six-position type to accomplish the regeneration steps of backwash, brine draw, slow rinse, fast rinse, and refill. Separate rinse and timed refill positions will be provided to reduce regeneration water use. The valve shall contain fixed orifice eductor nozzle and self-adjusting backwash flow control. The valve will be capable of being manually stepped through regeneration without electrical power.

F. Brine System and Salt Storage

1. The brine system shall be designed to minimize possible overflow conditions by eliminating line pressure to the salt storage tank at all times except during refill. Timed tank refill will be used to utilize salt and regeneration water efficiently and the regeneration salt dosage shall be adjustable from 5 to 20 lbs _____ to___ kg) per cubic ft. (m) from the system control without the need for emptying salt tanks or moving fill plugs.

2. A combination salt storage tank with cover and brine tank well shall be supplied as part of the system. The tank shall be sufficient size to hold salt for at least _____ regenerations between refills. The tank(s) shall be made of corrosion-free one-piece molded polyethylene or fiberglass reinforced plastic material. The tank(s) shall have a nominal diameter of _____ inches (_____cm) and a height of _____ inches (_____cm) and have a storage capacity of _____lbs (kg). All brine systems will include a float operated plastic brine pick up designed to provide positive shut off to prevent air from entering the system.

3. Option - A pressurized brine control system will be provided to introduce brine into the softener vessels. A timed brine controller, non-corrosive self-adjusting flow controls and pilot-operated diaphragm valve will be provided for integration into the facilities pressurized brine source. Salt dosage shall be field adjustable through the timed brine module.

G. Resin

1. Each softener tank shall be provided with _____ cubic feet of high capacity sulphonated styrene divinylbenzene based synthetic ion exchange resin having a minimum exchange capacity of 30,000 grains per cubic foot when regenerated with 15 pounds of salt per cubic foot. The resin shall be solid, with uniform particle size, clean and free of dirt and extraneous matter that might interfere with flow of water through the resin or that might interfere with the ion exchange process. All resin shall be FDA compliant under the Code of Federal Regulation No.21 paragraph 173.25.

H. Flow Control

1. Automatic backwash and brine refill flow control shall be provided to maintain proper backwash, rinse and brine flow rates over wide fluctuations of operating pressure. The controller will contain no moving parts and require no field adjustment. All flow controls will be connected for ease of removal for inspection and service as needed.

I. Piping

1. Contractor shall furnish and install all interconnecting pipe and isolation valves. Drain connections from the control valve shall have an air gap conforming to local codes and to permit observation and sampling of backwash and regeneration water.

J. Gauge and Sample Valve Option

1. Manufacturer shall provide two pressure gauge and sample valve assemblies or contractor installation in the inlet and outlet piping. Pressure gauges and sample valves will be stainless steel or other non-corrosive design.

K. Control Options

1. Single Units EDS Control

a. The softener system will be controlled by a single computer-based demand (meter) initiated controller. The controller shall be capable of operating either 1 or 2 units in single, twin alternating, or parallel configurations allowing easy expansion as soft water demand increases without the need for rewiring or adding additional controllers. The control will utilize alphanumeric, self-prompting programming for simple start up. EEPROM memory shall store program data eliminating need for battery back-up or configuration input after power loss. The control shall be pre-wired and includes twist lock electrical end connectors for installation ease.

b. The controller will constantly monitor current operating condition and be capable of displaying instantaneous flow rate through the system. A resettable totalizing flow counter will be included to measure total water processed.

c. The control shall be self-diagnostic and capable of emitting an audible signal and error specific messages if it detects a system problem. Control diagnostics can be transmitted over telephone lines for troubleshooting or review of historical operational data to allow system optimization through evaluation of actual water usage. Valve and control operation will be 24V, 60Hz, 1ph A suitably sized UL/CSA listed transformer(s) will be provided to convert 120V, 60Hz, 1ph power for system operation. Control printed wiring assemblies will be conformally coated to MIL specifications suitable for use in humid environments. A water-tight enclosure will be used to house he control.

L. Duplex Twin Alternating Units EDT Control

1. The softener system will be controlled by a single computer-based demand (meter) initiated controller. The controller shall

be capable of operating 2 units in twin alternating, or parallel configurations allowing the units to easily both be put on-line to handle peak start up flows and returned to alternating operation during normal use periods without the need for rewiring, or extensive reprogramming or adding additional controllers. Although the control will allow two units to be put on-line simultaneously, a built-in lockout prevents both units from regenerating at the same time. The control will utilize alphanumeric, self-prompting programming for simple start up. EEPROM memory shall store program data eliminating need for battery back-up or configuration input after power loss. The control shall be pre-wired and includes twist lock electrical end connectors for installation ease.

2. The controller will constantly monitor current operating condition and be capable of displaying instantaneous flow rate through the system. A resettable totalizing flow counter will be included to measure total water processed.

3. The control shall be self-diagnostic and capable of emitting an audible signal and error-specific messages if it detects a system problem. Control diagnostics can be transmitted over telephone lines for trouble shooting or review of historical operational data to allow system optimization through evaluation of actual water usage. Valve and control operation will be 24V, 60Hz, 1ph A suitably sized UL/CSA listed transformer(s) will be provided to convert 120V, 60Hz, 1ph power for system operation. Control printed wiring assemblies will be conformally coated to MIL specifications suitable for use in humid environments. A water-tight enclosure will be used to house the control.

M. Variable Flow Multiple Tank Systems VF Control

1. The system will be supplied with a single computer-based demand (meter) initiated controller capable of operating systems with 2 to 4 units. In addition to traditional parallel or alternating operating conditions, the control can operate in a variable flow mode which has the ability to bring units on and off-line depending on current service flow. The control will utilize alphanumeric, self-prompting programming for simple start-up. EEPROM memory shall store program data eliminating need for battery back-up or configuration input after power loss. It is pre-wired and includes twist lock electrical end connectors for installation ease.

2. The controller will constantly monitor current operating condition and be capable of displaying instantaneous flow rate through the system. On multiple vessel systems flow and operational data for each unit shall be independently displayable. A resettable totalizing flow counter will be included to measure total water processed.

3. The control shall be self diagnostic and capable of emitting an audible signal and error-specific messages if it detects a system problem. Control diagnostics can be transmitted over telephone lines for troubleshooting or review of historical operational data to allow system optimization through evaluation of actual water usage. If an error is detected the controller will be capable of automatically readjusting the operating program to place the maximum number of tanks on-line and recalculate regeneration frequency to provide optimum treatment flow capacity until service is provided. Valve and control operation will be 24V, 60Hz, 1ph A suitably sized UL/CSA listed transformer(s) will be provided to convert 120V, 60Hz, 1ph power for system operation. Control printed wiring assemblies will be conformally coated to MIL specifications suitable for use in humid environments. A water tight enclosure will be used to house the control.
4. This meter-initiated system allows all units to be in service at the same time. Regeneration is immediate based on a batch count. A built in interlock does not allow more than one unit to be in regeneration at a time.

N. Cross Over Twin Units CSR Control

1. The softener system will be supplied with a computer-based demand (meter) initiated controller. The control will utilize alphanumeric, self-prompting programming for simple start-up. EEPROM memory shall store program data eliminating need for battery back-up or configuration input after power loss.
2. The controller will constantly monitor current operating condition and be capable of displaying instantaneous flow rate through the system. A resettable totalizing flow counter will be included to measure total water processed.
3. The control shall be self-diagnostic and capable of emitting an audible signal and error specific messages if it detects a system problem. Control diagnostics can be transmitted over telephone lines for troubleshooting or review of historical operational data to allow system optimization through evaluation of actual water usage.
4. Valve and control operation will be 24V, 60Hz, 1ph A suitably sized UL/CSA listed transformer(s) will be provided to convert 120V, 60Hz, 1ph power for system operation. Control printed wiring assemblies will be conformally coated to MIL specifications suitable for use in humid environments. The control will be mounted directly in the valve cover. Electrical installation will only require plugging in the transformer and connecting the flowsensor cable.

O. Time Clock Units TC Control

1. The softener(s) will be provided with a 7 day timer allowing recharge to occur at a user adjustable time of day or night. The timer shall be capable of being set to skip one or more days between regenerations. Electrical operation is 120V, 60Hz, 1ph.

P. Flowsensors 1” Models

1. _____ Hall effect tubo flow sensor(s) will be provided. These

sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer-type with a self-lubricated shaft riding on a sapphire bearing. The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 1 inch (_____cm). It shall have a minimum flow of 1 gpm (___lpm), and a peak flow of 40 gpm (____lpm). Flow rate normal range is 1/2 to 30 gpm. The flowmeter housing shall be brass.

Q. Flowsensors 1.5” x 2” Models

1. _____ Hall effect tubo flow sensor(s) will be provided. These sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer-type with a self-lubricated shaft riding on a sapphire bearing. The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 1.5 inch (_____cm) x 2 inch _____ cm). It shall have a minimum flow of 2 gpm, flow rate normal range is 1-1/2 to 60 gpm (____lpm), and a peak flow of 125 gpm (_____lpm). The flowmeter housing shall be brass.

R. Flowsensors 3” and Larger

1. _____ Hall effect paddle wheel flow sensor(s) will be provided. These sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer type with a self lubricated PVDF paddlewheel riding on a titanium shaft The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 3 inch (_____cm). It shall have a minimum flow of 7 gpm (____lpm), and a peak flow of 230 gpm (_____lpm) [for 3 "]. Flow rate for 3" - normal range is 7 to 200 gpm, _____12 gpm (____lpm), 395 gpm (_____lpm) [for 4"]. Flow rate for 4" - normal range is 12 to 350 gpm. 25 gpm (____lpm) 999 gpm (_____lpm) [for 6"].3

PART 3 EXECUTION 3.1 EXECUTION

A. Instructions

1. The softener system will be supplied with a computer-based demand (meter) initiated controller. The control will utilize alphanumeric, self-prompting programming for simple start-up. EEPROM memory shall store program data eliminating need for battery back-up or configuration input after power loss.
2. The controller will constantly monitor current operating condition and be capable of displaying instantaneous flow rate through the system. A resettable totalizing flow counter will be included to measure total water processed.
3. The control shall be self-diagnostic and capable of emitting an audible signal and error specific messages if it detects a system problem. Control diagnostics can be transmitted over telephone lines for troubleshooting or review of historical operational data to allow system optimization through evaluation of actual water usage.

4. Valve and control operation will be 24V, 60Hz, 1ph A suitably sized UL/CSA listed transformer(s) will be provided to convert 120V, 60Hz, 1ph power for system operation. Control printed wiring assemblies will be conformally coated to MIL specifications suitable for use in humid environments. The control will be mounted directly in the valve cover. Electrical installation will only require plugging in the transformer and connecting the flowsensor cable.

B. Time Clock Units TC Control

1. The softener(s) will be provided with a 7 day timer allowing recharge to occur at a user adjustable time of day or night. The timer shall be capable of being set to skip one or more days between regenerations. Electrical operation is 120V, 60Hz, 1ph.

C. Flowsensors 1" Models

1. _____ Hall effect tubo flow sensor(s) will be provided. These sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer-type with a self-lubricated shaft riding on a sapphire bearing. The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 1 inch (_____cm). It shall have a minimum flow of 1 gpm (___lpm), and a peak flow of 40 gpm (____lpm). Flow rate normal range is 1/2 to 30 gpm. The flowmeter housing shall be brass.

D. Flowsensors 1.5" x 2" Models

1. _____ Hall effect tubo flow sensor(s) will be provided. These sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer-type with a self-lubricated shaft riding on a sapphire bearing. The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 1.5 inch (_____cm) x 2 inch _____ cm). It shall have a minimum flow of 2 gpm, flow rate normal range is 1-1/2 to 60 gpm (____lpm), and a peak flow of 125 gpm (_____lpm). The flowmeter housing shall be brass.

E. Flowsensors 3" and larger

1. _____ Hall effect paddle wheel flow sensor(s) will be provided. These sensor(s) shall be made with no packing glands or rotating shaft seals and will be solid state proximity transducer type with a self lubricated PVDF paddlewheel riding on a titanium shaft The sensor shall be made in such a way that it can be installed and removed with simple hand tools. Pipe size of the sensor(s) shall be 3 inch (_____cm). It shall have a minimum flow of 7 gpm (____lpm), and a peak flow of 230 gpm (_____lpm) [for 3 "]. Flow rate for 3" - normal range is 7 to 200 gpm, _____12 gpm (____lpm), 395 gpm (_____lpm) [for 4"]. Flow rate for 4" - normal range is 12 to 350 gpm. 25 gpm (____lpm) 999 gpm (_____lpm) [for 6"].3

F. Instructions

1. A complete set of instructions for installation and operation of the softener system will be included.

G. Skid Mounting Options

1. The softener system will be provided skid-mounted with all units pre-piped by the manufacturer. Each unit will be isolatable and a system bypass valve shall come installed in the plumbing header. Inlet and outlet connections will terminate in convenient locations near the skid edge. All plumbing shall be supported by Unistrut or equivalent anchors and members.
2. Inter-tank hydraulic tubing and fittings will be installed as part of the skid package. All mineral tanks will be bolted to the skid members to allow removal. Permanent mounting or welding is not acceptable. All skids will be completely assembled, and hydraulically and electrically tested before shipment. Prior to shipping, the system will be drained before packaging. Partial disassembly may be required for shipment. All assemblies will be marked to allow simple reconnection.

H. Steel Softeners Model 30 to 300

1. Tanks 10” to 24” diameter will be mounted on a 4” channel iron skid (5.4 lb. per foot, ASTM grade A-36) The skid will be cross-braced with similar 4” channel or angle iron. All steel surfaces will be cleaned and painted with a high gloss epoxy top coat matching the softener vessel color.

I. Steel Softeners Model 450 to 600

1. Tanks 30” to 36” diameter will be mounted on a 6” channel iron skid (8.2 lb. per foot, ASTM grade A-36) The skid will be cross-braced with similar 6” channel or angle iron. All steel surfaces will be cleaned and painted with a high gloss epoxy top coat matching the softener vessel color.

J. Steel Softeners Model 750 to 1200

1. Tanks 42” to 48” diameter will be mounted on a 6” channel iron skid (8.2 lb. per foot, ASTM grade A-36) The skid will be cross-braced with similar 8” channel (11.5 lb. per foot) channel or angle iron. All steel surfaces will be cleaned and painted with a high gloss epoxy top coat matching the softener vessel color.

K. Guarantee

1. Attrition loss of mineral is guaranteed not to exceed 3% per year for a period of 3 years.
2. All mechanical equipment is guaranteed for 1 year against any defects in workmanship or materials. All EDS, EDT, and VF controls are guaranteed for 1 year against M & W. Consult specific product warranty for mineral and brine tank information.
3. The manufacturer guarantees that under actual operating conditions, the mineral shall not be washed out of the system during service or backwash cycles when operated under the instructions and guidelines set forth in the operation manual.

Section H9

Softeners (SMR)
Sample Specifications

SAMPLE SPECIFICATIONS (SMR)

The following sample specifications are provided by Cleaver-Brooks to assist you in meeting your customers' requirements.

PART 1 GENERAL

1.1 GENERAL

Furnish, install, and place in operation an Automatic Water Softener System similar or approved equal to Cleaver-Brooks Model SMR_____, having tank(s) with _____ cu-ft. of ion exchange resin per tank. Soft water output to be _____ gallons per tank per regeneration with _____ lbs of salt, based on _____ grains per gallon compensated hardness. Service flow rate per tank _____ gpm at a pressure loss through softener system not exceeding _____ psig.

PART 2 PRODUCTS

2.1 EQUIPMENT

2.1 Tanks

Softener tank(s) shall be of welded construction of tank quality carbon steel. Each tank shall be _____ “diameter with a _____ “straight side shell height. The tank(s) shall have threaded openings for pipe connections and an 11" x 15" manhole in the top head (for tanks 30" diameter and smaller; two 4” x 6” handholes should be provided in the top head and lower side shell). The tank(s) shall be rated for 100 psig working pressure and 150 psig test pressure. Support legs will be the strap-type permanently welded to the lower tank head. The tank(s) shall have their exterior and interior protected with a hot dipped galvanized application after fabrication. A minimum freeboard of 50% shall be provided for backwash expansion above the normal ion exchange resin bed level.

2.2 Tank Option

Provide pressure vessel in accordance with ASME Section VIII. Working pressure to be 100, 125 or 150 pounds, hydrotested to 150, 187.5, or 225 psig, stamped and certified.

2.3 Tank Option

Provide cold-set epoxy internal lining 10-12 mils DFT, with rust resistant prime coat, external coating 2-3 mils DFT.

2.4 Tank Option

Provide baked phenolic internal lining 4-5 mils DFT, with rust resistant prime coat, external coating 2-3 mils DFT.

2.5 Tank Option

Provide Safety Blue epoxy finish paint 6-8 mils DFT over exterior tank and valve surfaces. To be applied on channel iron surface if applicable.

2.6 Upper Distributor

The upper distribution system shall be a single point baffle constructed of Schedule-40 galvanized steel pipe and fittings.

2.7 Lower Distributor

The lower distribution system shall be of the hub end radial type constructed of PVC with slotted full flow non-clogging replaceable ABS strainers and covered with a subfill of 1/8” x 1/16” washed gravel.

2.8 Main Operating Valves

The main operating valves shall be a nest of individual diaphragm valves. The valves shall have cast iron bodies with Buna-N diaphragm and stainless steel and brass internal parts. The valves shall be slow opening and closing, and free of water hammer. There shall be no contact of dissimilar metals within the valves and no special tools shall be required to service the valves. Valves can be operated either

hydraulically or pneumatically.

2.9 Brine System

The brine system shall be platform type with dry salt storage compartment, sufficient for at least four regenerations at full salting and a saturated brine compartment. The tank shall be of polyethylene construction. It shall be equipped with a float operated plastic brine valve and allow for simple adjustment of salt dosage without removing the brine valve. It shall be _____ "diameter x _____ "shell height and have a storage capacity of lbs of salt.

2.10 Resin

Resin shall be of a premium grade high capacity synthetic sulfonated styrene divinylbenzene type, to be furnished in the sodium form. It shall be stable over the entire pH range, have good resistance to bead fracture, and be insoluble in all common solvents. The resin shall be capable of 30,000 grains per cubic foot capacity when regenerated with 15 lbs NaCl.

2.11 Flow Control

An automatic backwash control shall be provided to maintain a proper backwash and fast flush flows over wide variations of operating pressure. Controller to contain no moving parts, and requires no field adjustment.

2.12 Piping

The main operating valves and manifold piping shall be Schedule 40 galvanized steel. Galvanized fittings shall be standard class 150 threaded malleable iron.

PART 3 EXECUTION

3.1 REGENERATION INITIATION

A. Control

1. A NEMA 12rated factory mounted and wired electrical enclosure with all timing and sequencing controls for each softener shall be manufactured and provided by the same vendor providing the water treatment hardware.
2. The controls shall include an automatic regeneration sequencer having the capability of providing site adjustable regeneration steps of backwash brine injection, brine displacement, flush and return to service. An indicator on the pilot stager points to the cycle of operation at all times. Complete function and control of all regeneration steps can be performed by manual operation of the pilot stager.
3. The 12-Day electrical time clock controller shall be fully adjustable to initiate regeneration at any hour of the day and any day of the week.

B. Control Option

1. Single Automatic Reset Meter and Alternator (Twin Softeners Only)

2. The twin water softener shall be equipped with a single _____ "(disc) (turbo) water meter, AWWA rated, in the common outlet header. At a pre-set gallonage the automatic reset head of the meter will send a 120 volt signal to an alternator that will direct the signal to regenerate the unit presently on-stream. Upon completion of regeneration, that softener will remain off stream in the stand-by position. This sequence will repeat on an alternating basis each time the preset gallonage of soft water has passed through the meter. A lockout shall be provided to allow only one unit to regenerate at any one time.

C. Control Option

1. MX Electronic Programmable Controls – (Two or Three Tanks)
2. The system will operate with two or three media tanks each having a dedicated paddle wheel type flow sensor and operate in either of these modes, one of which will be on-line while the other is regenerated and user selected modes.
   a. Alternating – One media tank will be in the standby or regeneration and one (1) or two (2) media tanks will be on-line. At a user specified volume the standby tank will go on line and the exhausted tank will go into regeneration. After regeneration this tank will go into standby until its rotation to go back on-line
   b. Parallel - All media tanks are on-line simultaneously. As each media tank's user specified volume is reached it shall immediately be taken off-line, regenerated, and placed immediately back on-line.
   c. Additive Flow - One (1) media tank, designated as the primary, will remain on-line at all times. Variation of treated water flow demand shall automatically cause (one additional media tank) (up to two additional media tanks) to change status from standby to on-line and back to standby as needed.
3. When the primary media tank regenerates the next media tank in sequence shall become the primary.
4. As each media tank's user set volume is reached it will immediately be taken off-line, regenerated, and placed immediately back on-line or standby depending on treated water flow demand.
5. The controller shall be capable of continuously determining the exhaustion rate of each media tank thus automatically avoiding the possibility of a simultaneous regeneration attempt. Simultaneous regenerations are not possible.
6. The exchange capacity of each softener can be the same or different. Flow or peak flow rate indication shall be continuously displayed for each unit. The continuous flow range is 0-999 flow units per minute (gallons, cu.ft., liters, cu-m, etc.). Cumulative volume totalization to eight (8) digits shall be continuously displayed for each unit.

D. Instructions - A complete set of installation instructions and operating instructions shall be furnished.

E. Skid Mounting (Pre-pipe and Pre-wire)

1. Mineral Tank skid mount Option.
2. The softener mineral tanks shall be shall be mounted on a 4" channel iron skid (7.25 lbs per foot, ASTM grade A-36). The skid shall be cross-braced with a 4" channel or angle iron,. All steel surfaces shall be prime coated. All interconnecting piping shall be the same material as the valve nest manifold piping and shall be assembled by the manufacturer. This shall include inlet and outlet bronze isolation valves for each tank, and a bronze system bypass valve. Inlet and outlet headers shall be installed and terminate at the skid edge. All piping shall be suitably supported by Unistrut supports anchored to the skid. Electric wiring, where applicable, shall be complete between all inter unit controls and require only a single power source connection. The inter unit wiring shall be contained in Flextite flexible, waterproof conduit. All inter-tank hydraulic or pneumatic tubing shall be installed as part of the skid package. The mineral tanks are to be bolted to the skid. Permanent attachment, or welding, will not be acceptable. The entire skid mounted system shall be both leak and electrically tested as a unit by the manufacturer before shipment

F. Guarantee

1. Attrition loss of mineral is guaranteed not to exceed 3% per year for a period of 3 years.
2. All mechanical equipment is guaranteed for 1 year against any defects in workmanship or materials. Any part proving defective will be replaced or repaired within this period.

Notes