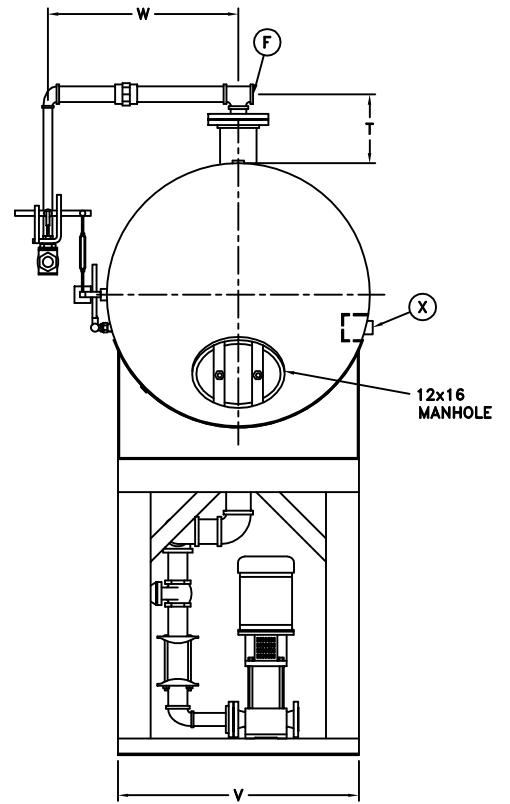


FRONT VIEW



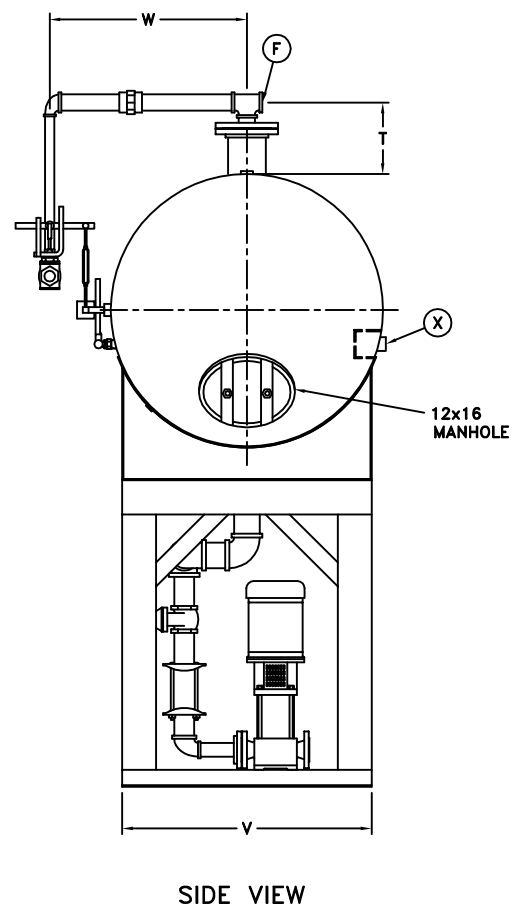
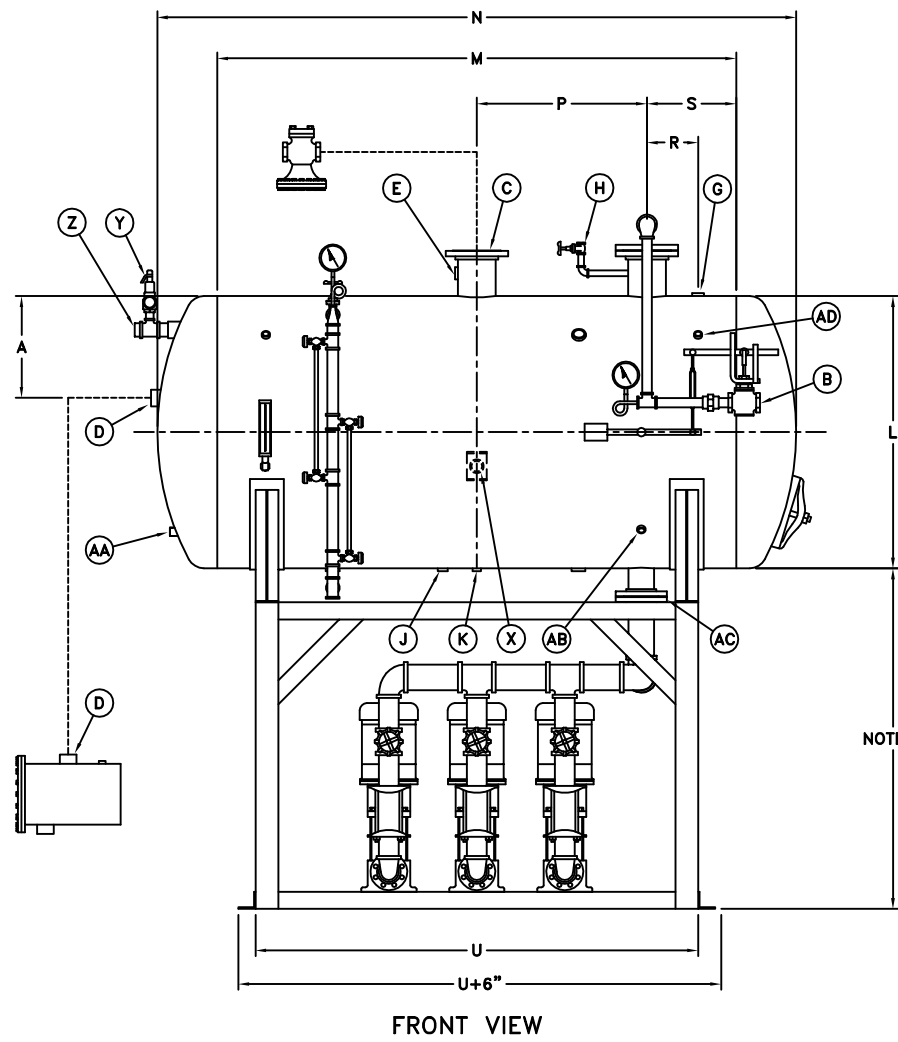
SIDE VIEW

NOTE 1

NOTES

1. DETERMINED BY SPECIFIC PUMP REQUIREMENTS.
2. STORAGE CAPACITY TO OVERFLOW.
3. 'X' LOCATED FAR SIDE.
4. ALL DIMENSIONS IN INCHES.
5. THIS DRAWING NOT FOR CONSTRUCTION PURPOSES.

MODEL NO.	3.5MS	5MS	7MS	9MS	11MS	14MS	18MS	21MS	24MS	30MS	40MS	50MS	70MS	80MS	90MS	100MS	125MS	
CAP-LBS/HR	3,500	5,000	7,000	9,000	11,000	14,000	18,000	21,000	24,000	30,000	40,000	50,000	70,000	80,000	90,000	100,000	125,000	
STORAGE CAPACITY (NOTE 2)	MINUTES	21	16	11	12	10	20	15	13	12	11	12	10	11	10	10	10	11
	GALLONS	155	155	155	234	234	563	563	563	563	686	1024	1024	1627	1627	1964	1964	2850
A STEAM SPACE	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	
B WATER INLET CONTROL VALVE	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	2	2	2	2
C STEAM INLET	3	3	3	3	3	6	6	6	6	6	8	8	8	10	10	10	10	
D OVERFLOW TRAP	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	4	
E HIGH TEMP RETURNS	1	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	
F LOW TEMP RETURNS	1	1	1	1	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	4	4	
G MEDIUM TEMP RETURNS	1	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	
H VENT	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	
J VESSEL DRAIN	3/4	3/4	3/4	3/4	3/4	1	1	1	1	1	2	2	2	2	2	2 1/2	2 1/2	
K SCRUBBER DRAIN	—	—	—	—	—	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	
L DIAMETER	36	36	36	36	36	48	48	48	48	48	60	60	72	72	72	72	84	
M STRAIGHT LENGTH	60	60	60	96	96	96	96	96	96	120	96	96	96	96	120	120	120	
N (APPROX)	78	78	78	114	114	117	117	117	117	147	128	128	130	130	154	154	156	
P	20	20	20	20	20	30	30	30	30	30	30	30	30	30	36	36	36	
R	9	9	9	9	9	9	9	9	9	9	15	15	15	15	18	18	18	
S	31	31	31	45	45	18	18	18	18	30	24	24	24	24	30	30	24	
T (APPROX)	14	14	14	14	14	12	12	12	12	12	16	16	21	21	21	22	22	
U STAND LENGTH	58	58	58	58	58	78	78	78	78	84	84	84	84	84	96	96	96	
V STAND WIDTH	30	30	30	30	30	44	44	44	44	44	56	56	66	66	66	66	66	
W (APPROX)	33	33	33	33	33	39	39	39	39	39	45	45	51	51	51	51	57	
X RECIRC	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	
Y SENTINEL RELIEF VALVE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Z VACUUM BREAKER	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	
AA CHEMICAL INJECTION	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	
AB SAMPLE	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	
AC PUMP SUCTION	3	3	3	3	3	4	4	4	4	4	6	6	6	6	6	8	8	
AD PRV SENSING	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	



MODEL NO.	3.5MS	5MS	7MS	9MS	11MS	14MS	18MS	21MS	24MS	30MS	40MS	50MS	70MS	80MS	90MS	100MS	125MS
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STORAGE CAPACITY (NOTE 2)	MINUTES	21	16	11	12	10	20	15	13	12	11	12	10	11	10	10	11
	GALLONS	155	155	155	234	234	563	563	563	563	686	1024	1024	1627	1627	1964	2850
A STEAM SPACE	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
B WATER INLET CONTROL VALVE	3/4	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	2	2	2	2
C STEAM INLET	3	3	3	3	3	6	6	6	6	6	8	8	8	10	10	10	10
D OVERFLOW TRAP	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	4
E HIGH TEMP RETURNS	1	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2
F LOW TEMP RETURNS	1	1	1	1	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	4	4
G MEDIUM TEMP RETURNS	1	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2
H VENT	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2
J VESSEL DRAIN	3/4	3/4	3/4	3/4	3/4	1	1	1	1	1	2	2	2	2	2	2 1/2	2 1/2
K SCRUBBER DRAIN	—	—	—	—	—	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
L DIAMETER	36	36	36	36	36	48	48	48	48	48	60	60	72	72	72	72	84
M STRAIGHT LENGTH	60	60	60	96	96	96	96	96	96	120	96	96	96	96	120	120	120
N (APPROX)	78	78	78	114	114	117	117	117	117	147	128	128	130	130	154	154	156
P	20	20	20	20	20	30	30	30	30	30	30	30	30	30	36	36	36
R	9	9	9	9	9	9	9	9	9	9	15	15	15	15	18	18	18
S	31	31	31	45	45	18	18	18	18	30	24	24	24	24	30	30	24
T (APPROX)	14	14	14	14	14	12	12	12	12	12	16	16	21	21	21	22	22
U STAND LENGTH	58	58	58	58	58	78	78	78	78	84	84	84	84	84	96	96	96
V STAND WIDTH	30	30	30	30	30	44	44	44	44	44	56	56	66	66	66	66	66
W (APPROX)	33	33	33	33	33	39	39	39	39	39	45	45	51	51	51	51	57
X RECIRC	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2
Y SENTINEL RELIEF VALVE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Z VACUUM BREAKER	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3
AA CHEMICAL INJECTION	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
AB SAMPLE	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
AC PUMP SUCTION	3	3	3	3	3	4	4	4	4	4	6	6	6	6	6	8	8
AD PRV SENSING	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4

- NOTES
1. DETERMINED BY SPECIFIC PUMP REQUIREMENTS.
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bfs INDUSTRIES, LLC
 BUTNER, NORTH CAROLINA

DIMENSIONS CLASS "S"
 PACKAGED SPRAY TYPE DEAERATOR

CLASS "S" – SPRAY TYPE

MECHANICS OF DEAERATION

Extensive research proves that to inhibit corrosion in a steam system, the oxygen content must be limited to a maximum level of .01ppm (.0075 cc/l). A true deaerator will reduce the oxygen to the .005 cc/l level and the carbon dioxide to zero. A further benefit of this process is the simultaneous pre-heating of the feed water. More rapid removal of gas occurs when the liquid is sprayed in a thin film and then violently scrubbed by the incoming steam.

The modern spray-type deaerator has evolved into a two stage device, the pre-heater and the scrubber where water and steam are mixed at controlled velocities. It is essential that the first stage (pre-heater) heat the feed water to a temperature approaching that of the operating steam pressure.

The effluent then enters the second stage (scrubber) where it is vigorously boiled and scrubbed with fresh steam. This forces the remaining traces of oxygen and carbon dioxide to the surface of the liquid, where they are liberated from the water.

Non-condensable gases must be evacuated from the deaerator at a rate equal to their liberation. A vent condenser is utilized to concentrate these gases and condense the carrier steam, thereby avoiding unnecessary steam venting.

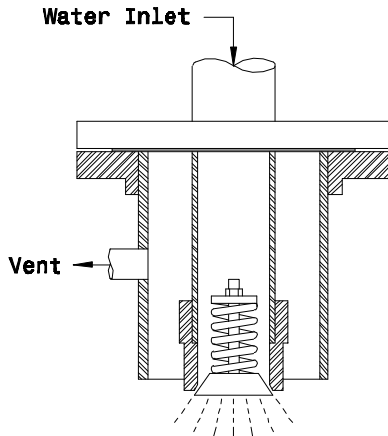
OPERATION

Incoming water first enters the deaerator through the spray valves, directed downward into the steam atmosphere in the first stage pre-heater section. There the water is heated to within two degrees of the steam temperature in the deaerator. This is accomplished by spraying water through self-adjusting spray valves designed to produce a uniform, thin, continuous film thru all load conditions. These efficient valves assure a constant temperature and uniform gas removal.

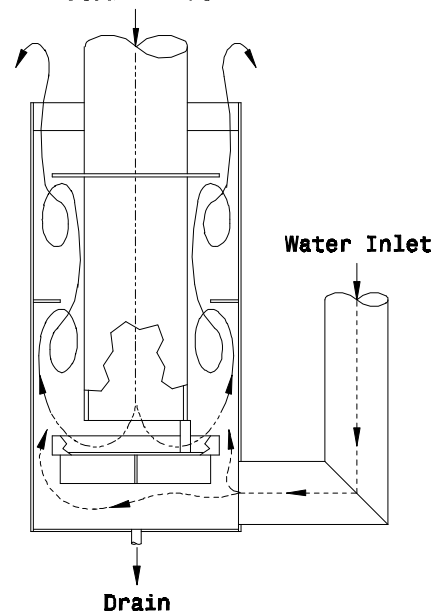
From the first stage the pre-heated water, containing traces of dissolved gasses flows into the second stage, scrubber section. Here the water is brought into direct contact with an abundance of fresh, gas-free steam. The steam enters this stage at the base of the scrubber and is vigorously mixed with the pre-heated water. This direct physical contact shakes loose the dissolved gasses, separating them from the effluent. Very little steam is condensed here, as incoming pre-heated water has a temperature approaching that of the steam. The water leaving this stage, now completely deaerated and heated to the steam temperature corresponding to the pressure within the vessel, spills into the storage section where it remains ready for use.

A reduction in temperature and pressure in the vent condenser is created as the entering water condenses the steam atmosphere. This causes a steam flow toward the vent condenser, carrying with it the liberated gasses. Here most of the steam is condensed, and the remainder carries the residual gasses through the vent to atmosphere.

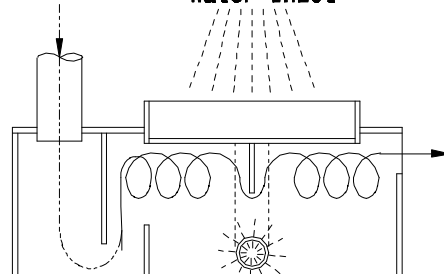
SPRAY VALVE AND INTERNAL VENT CONDENSER ASSEMBLY
 Capacities over 30,000 lbs./hr. will have multiple spray valves
 Water Inlet

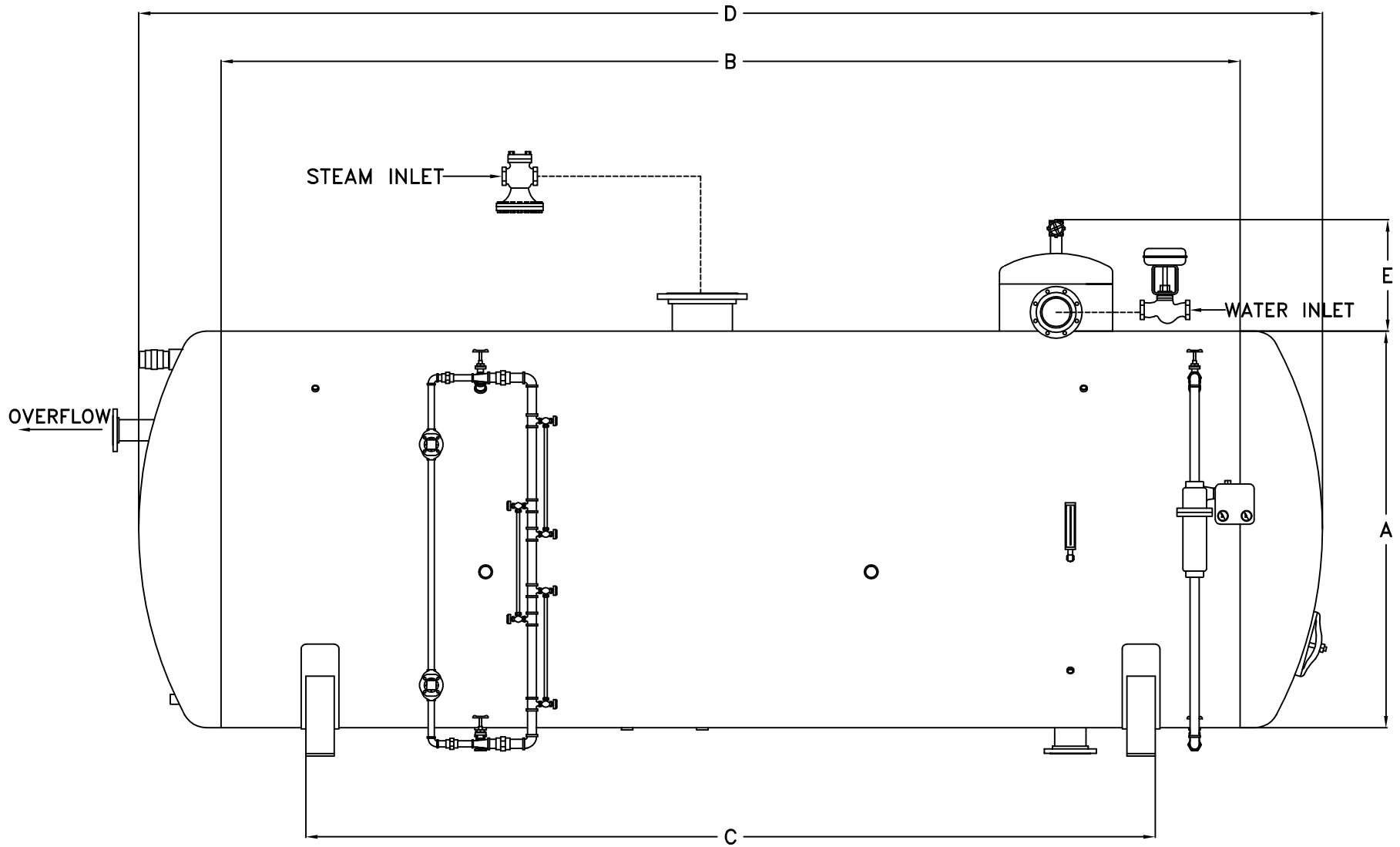


VERTICAL SCRUBBER
 Capacities 14,000 lbs./hr.-up
 Steam Inlet



HORIZONTAL SCRUBBER
 Capacities up to 11,000 lbs./hr.
 Steam Inlet Water Inlet





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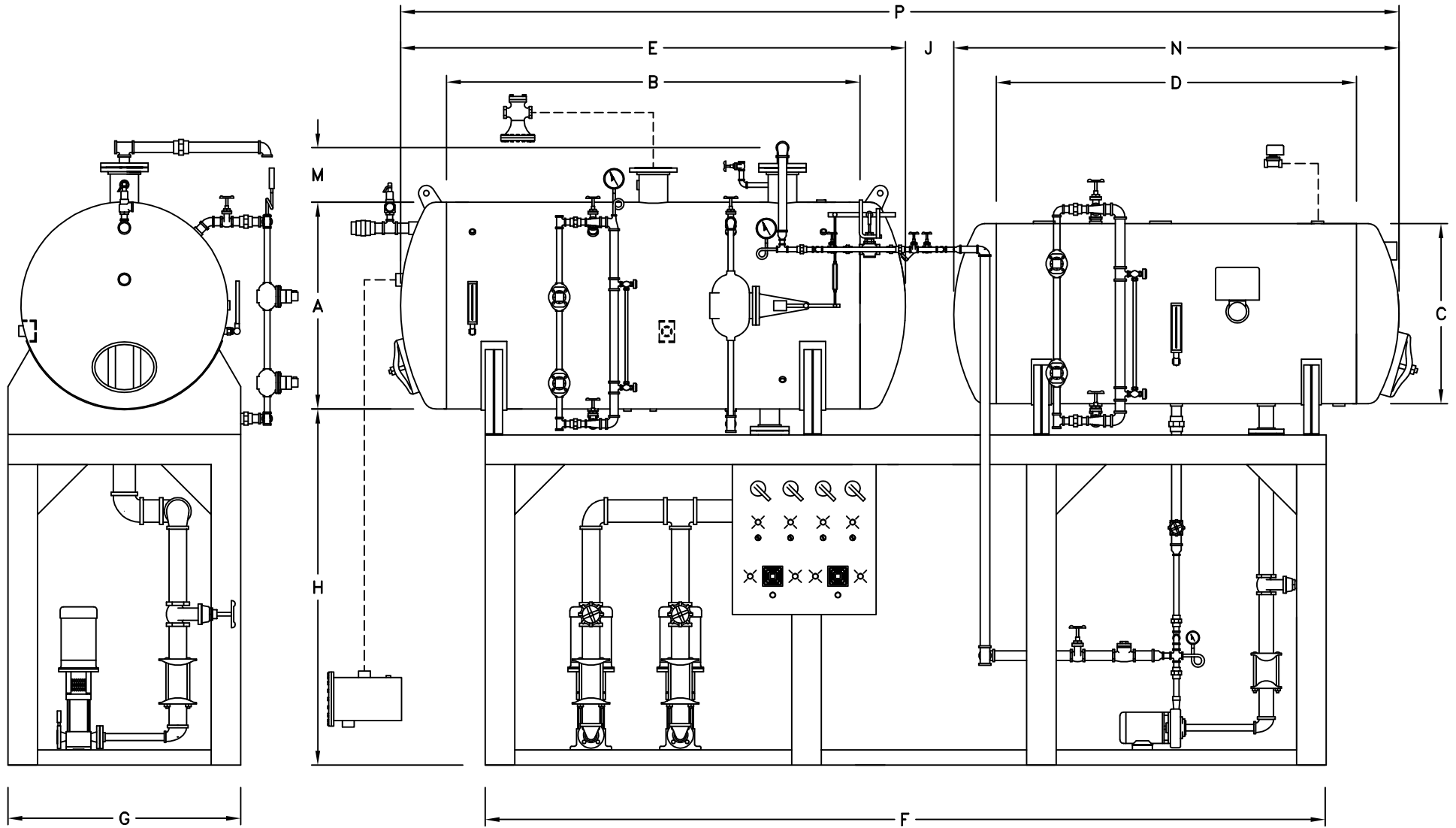
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 E: _____

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BFS INDUSTRIES, LLC
 BUTNER, NORTH CAROLINA

CLASS 'S' SPRAY TYPE DEAERATOR

THIS DRAWING IS PROVIDED FOR GENERAL LAYOUT USE
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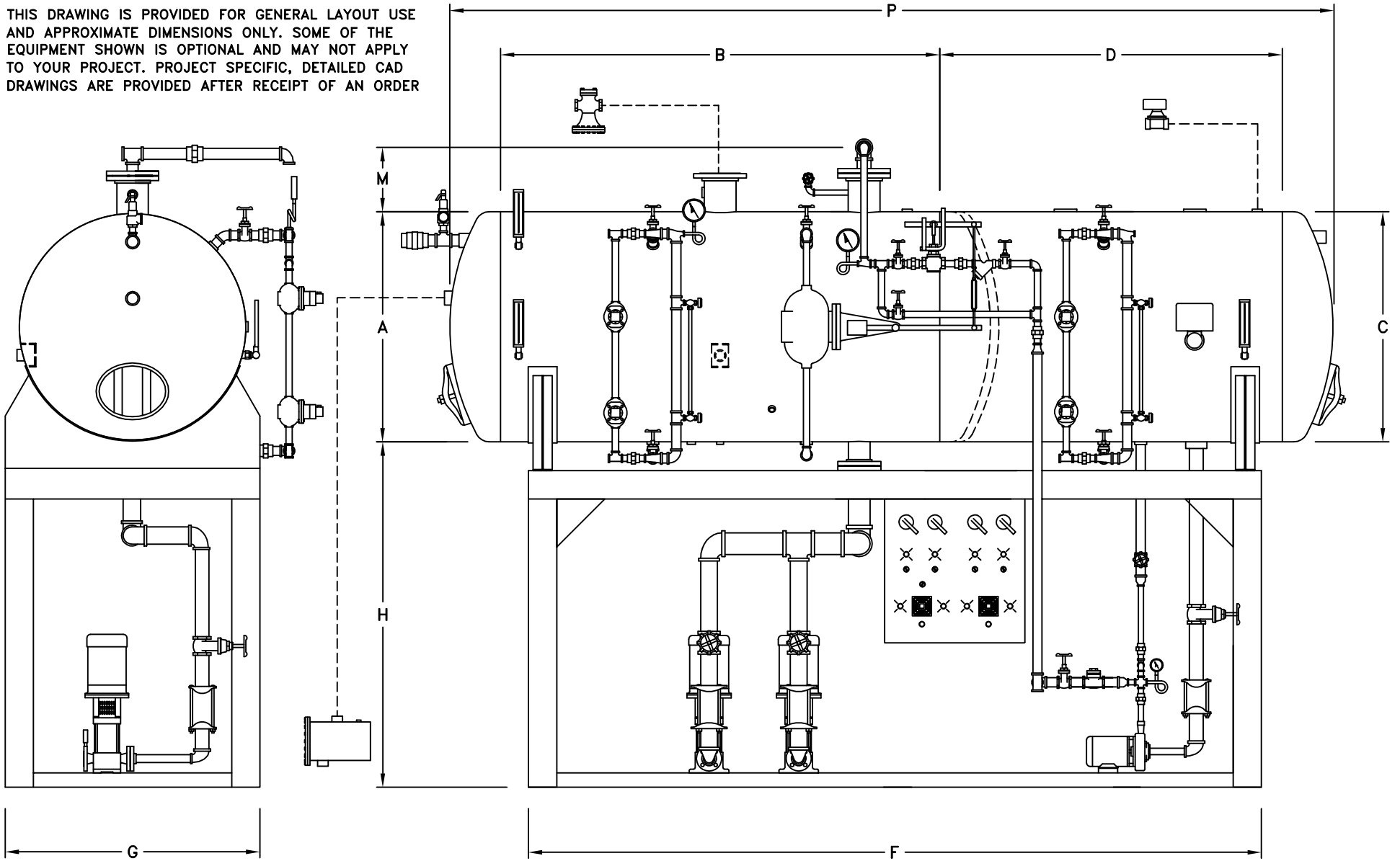
A: _____	D: _____	G: _____	M: _____
B: _____	E: _____	H: _____	N: _____
C: _____	F: _____	J: _____	P: _____

BFS INDUSTRIES, LLC
 BUTNER, NORTH CAROLINA

PACKAGED SPRAY TYPE END TO END
 DEAERATOR AND SURGE

R0

THIS DRAWING IS PROVIDED FOR GENERAL LAYOUT USE AND APPROXIMATE DIMENSIONS ONLY. SOME OF THE EQUIPMENT SHOWN IS OPTIONAL AND MAY NOT APPLY TO YOUR PROJECT. PROJECT SPECIFIC, DETAILED CAD DRAWINGS ARE PROVIDED AFTER RECEIPT OF AN ORDER



A: _____

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D: _____

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M: _____

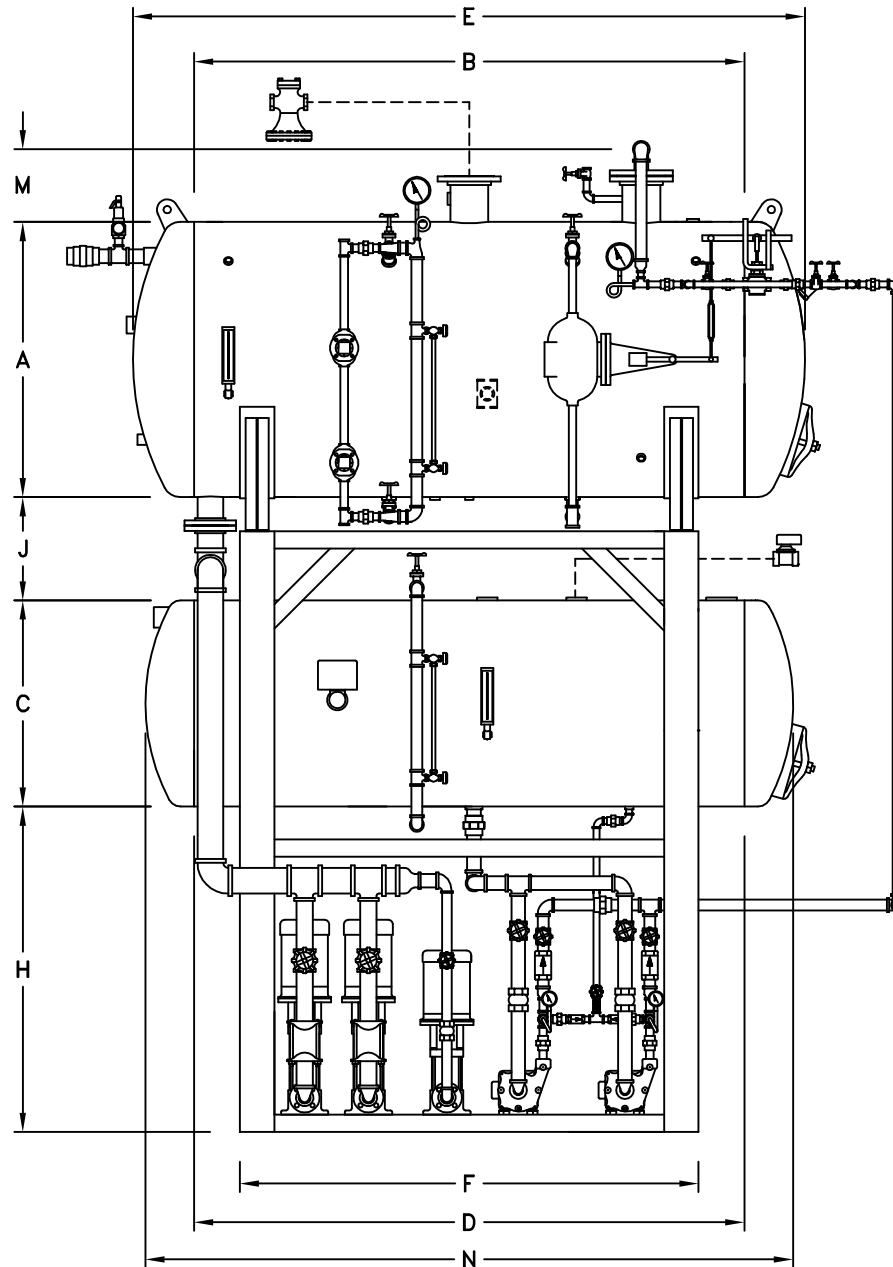
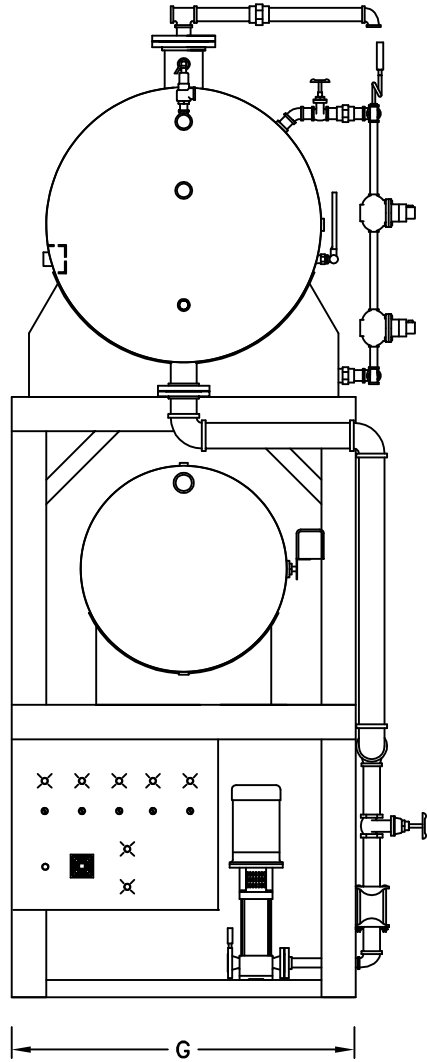
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BFS INDUSTRIES, LLC
BUTNER, NORTH CAROLINA

PACKAGED SPRAY TYPE DUAL COMPARTMENT
DEAERATOR AND SURGE

R0

THIS DRAWING IS PROVIDED FOR GENERAL LAYOUT USE AND APPROXIMATE DIMENSIONS ONLY. SOME OF THE EQUIPMENT SHOWN IS OPTIONAL AND MAY NOT APPLY TO YOUR PROJECT. PROJECT SPECIFIC, DETAILED CAD DRAWINGS ARE PROVIDED AFTER RECEIPT OF AN ORDER



A: _____

D: _____

G: _____

M: _____

B: _____

E: _____

H: _____

N: _____

C: _____

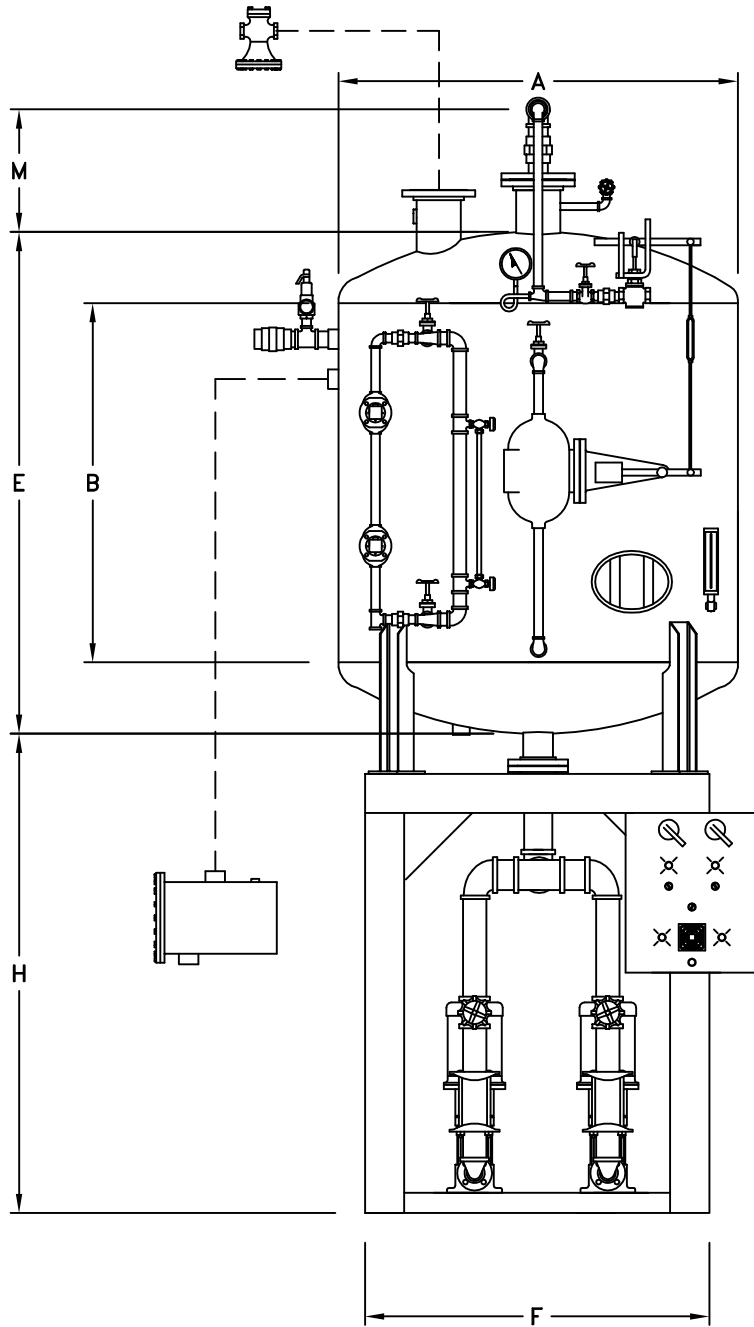
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J: _____

BFS INDUSTRIES, LLC
BUTNER, NORTH CAROLINA

R0

PACKAGED SPRAY TYPE OVER/UNDER
DEAERATOR AND SURGE



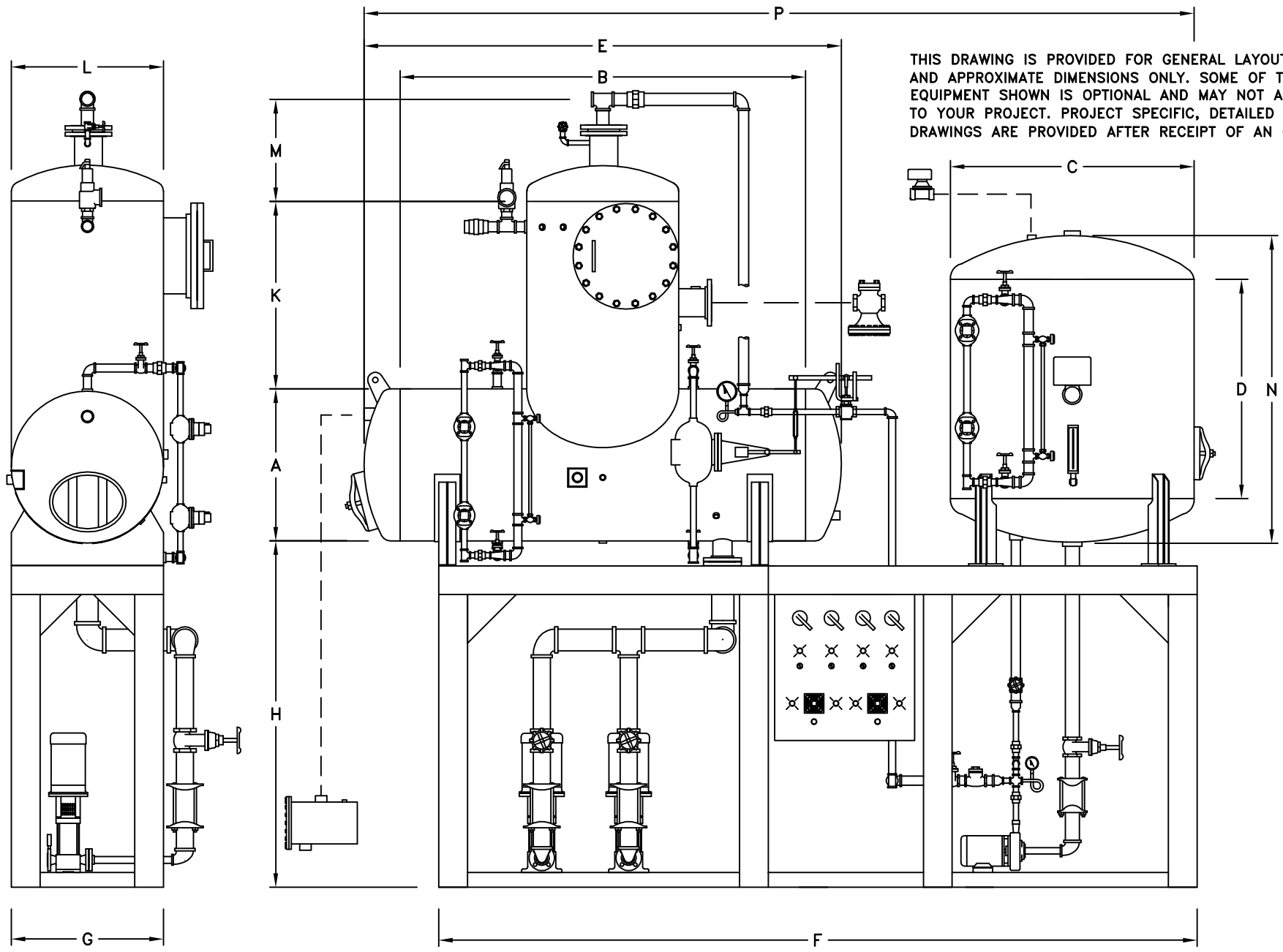
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A: _____ F: _____
 B: _____ H: _____
 E: _____ M: _____

LFS INDUSTRIES, LLC
 BUTNER, NORTH CAROLINA

RO

PACKAGED SPRAY TYPE VERTICAL DEAERATOR



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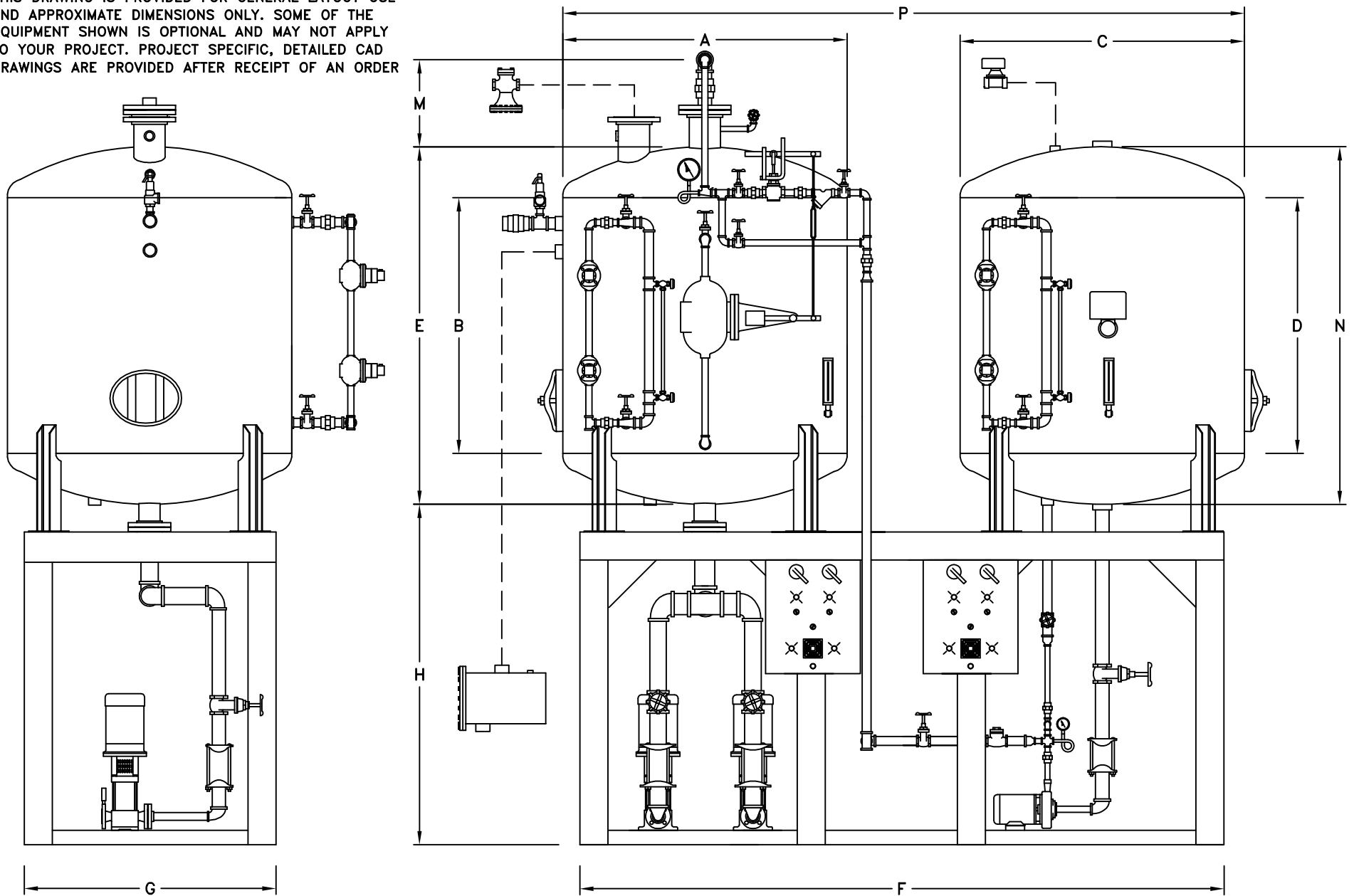
- | | | | | |
|----------|----------|----------|----------|----------|
| A: _____ | D: _____ | G: _____ | L: _____ | P: _____ |
| B: _____ | E: _____ | H: _____ | M: _____ | |
| C: _____ | F: _____ | K: _____ | N: _____ | |

BFS INDUSTRIES, LLC
 BUTNER, NORTH CAROLINA

PACKAGED TRAY TYPE END BY SIDE
 DEAERATOR AND VERTICAL SURGE

R0

THIS DRAWING IS PROVIDED FOR GENERAL LAYOUT USE AND APPROXIMATE DIMENSIONS ONLY. SOME OF THE EQUIPMENT SHOWN IS OPTIONAL AND MAY NOT APPLY TO YOUR PROJECT. PROJECT SPECIFIC, DETAILED CAD DRAWINGS ARE PROVIDED AFTER RECEIPT OF AN ORDER



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B: _____

C: _____

D: _____

E: _____

F: _____

G: _____

H: _____

M: _____

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P: _____

BFS INDUSTRIES, LLC
BUTNER, NORTH CAROLINA

RO

PACKAGED SPRAY TYPE SIDE BY SIDE
VERTICAL DEAERATOR AND VERTICAL SURGE