CHAPTER 4: Drawdown Storage Tanks

SECTION I: APPLICATION

Tanks are to be used in systems that do not have a continuous water demand. (i.e. no make up water or Air conditioning etc..)

- Do Not assume that tanks will keep up with any appreciable service loads.

Tanks should not be sized according to booster size.

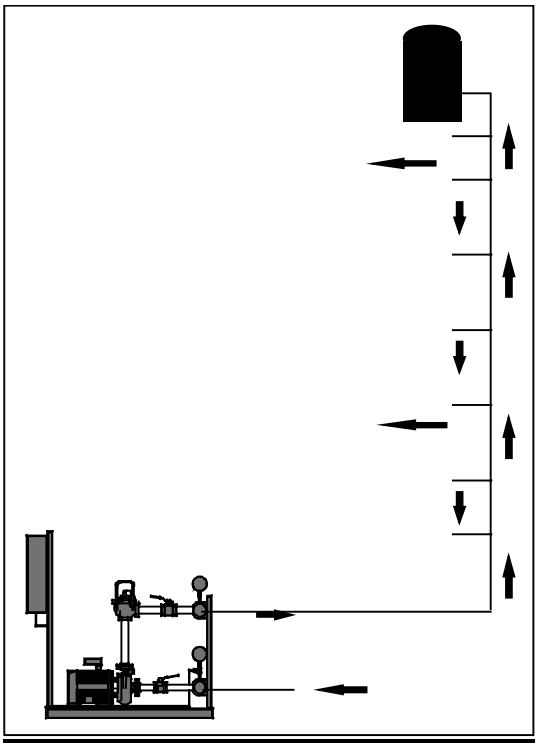
- Tanks should be sized to store 20 - 30 Gallons of water (2 - 3 GPM leak loads)
- The capacity of the tank is determined by the cut-in and cut-out pressure of the booster system as well as the tank precharge pressure. (See Fig. # 8)
- Tank pre-charge is determined based on the mounting location of the tank. (See Fig.'s # 9 - 12)

Tanks maintain pressure in piping system and supply small demands allowing pumps to be shut down.

- Based on 20-30 Gallons of useable storage, the system will achieve a minimum shutdown of about 5 minutes based on a tank flow capacity of 2-3 GPM.

PUMP STOP PRESSURE																						
psig	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125
20	0.126	0.224	0.302	0.366	0.419	0.464	0.502	0.535	0.565	0.590	0.613	0.634	0.652								
25		0.112	0.201	0.274	0.335	0.386	0.430	0.469	0.502	0.531	0.557	0.581	0.602								
30			0.101	0.183	0.251	0.309	0.359	0.402	0.439	0.472	0.502	0.528	0.552	0.573	0.593						
35				0.091	0.168	0.232	0.287	0.335	0.376	0.413	0.446	0.475	0.502	0.525	0.547	0.567	0.585	0.601			
40					0.084	0.155	0.215	0.268	0.314	0.354	0.390	0.422	0.451	0.478	0.501	0.523	0.543	0.561	0.578	0.594	0.608
45						0.077	0.143	0.201	0.251	0.295	0.334	0.370	0.401	0.430	0.456	0.480	0.501	0.521	0.540	0.557	0.573
50							0.072	0.134	0.188	0.236	0.279	0.317	0.351	0.382	0.410	0.436	0.459	0.481	0.501	0.520	0.537
55								0.067	0.125	0.177	0.223	0.264	0.301	0.334	0.365	0.392	0.418	0.441	0.463	0.483	0.501
60									0.063	0.118	0.167	0.211	0.251	0.287	0.319	0.349	0.376	0.401	0.424	0.445	0.465
65										0.059	0.111	0.158	0.201	0.239	0.273	0.305	0.334	0.361	0.386	0.408	0.429
70											0.056	0.106	0.150	0.191	0.228	0.262	0.292	0.321	0.347	0.371	0.394
75												0.053	0.100	0.143	0.182	0.218	0.251	0.281	0.308	0.334	0.358
80													0.050	0.096	0.137	0.174	0.209	0.241	0.270	0.297	0.322
85														0.048	0.091	0.131	0.167	0.200	0.231	0.260	0.286
90															0.046	0.087	0.125	0.160	0.193	0.223	0.251
95																0.044	0.084	0.120	0.154	0.186	0.215
100																	0.042	0.080	0.116	0.148	0.179

The chart above is a drawdown calculation chart. The numbers along the left side represent the call on pressure switch setting of the booster system. The top values represent the shut-off (shut-off = Pump shut-off pressure plus maximum suction pressure - best case) The corresponding intersection between any cut-in and cut-out value will give you the actual storage when multiplied by the total tank capacity.

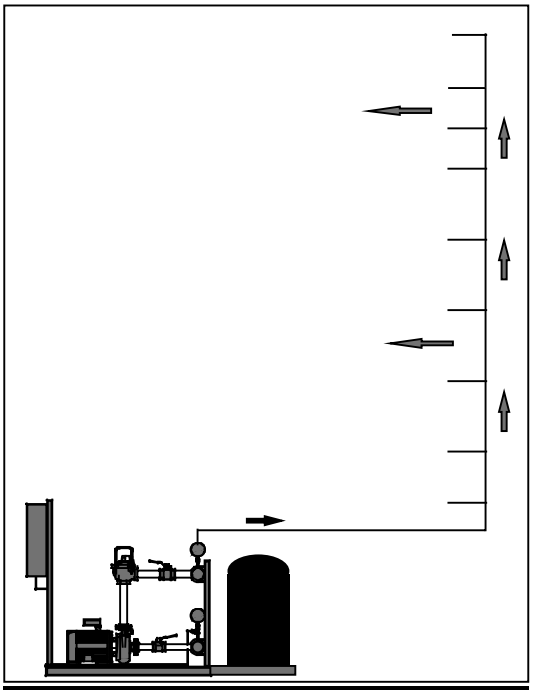


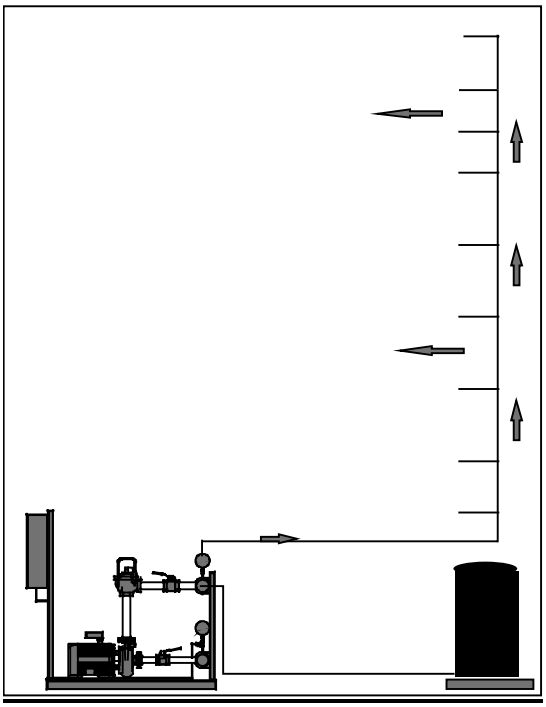
Remote Mounted Tank

When a tank is mounted at the top of the system, it can be pre-charged to the system pressure AT THE LOCATION OF THE TANK. This means that, if the system is rated for a 30 PSI residual pressure at the top of the building, the tank would only need to be charged at 28 PSI (we deduct 2 PSI just to verify that the tank is not overcharged. In addition, there is no need for a tank PRV since the tank is on the SYSTEM side which is REGULATED. In this case, we use the friction loss in the piping system to charge the tank. As the system begins to move toward shut-off, pressure increases in the piping due to the lack of friction, it is this increase that will charge the remote tank. Mounting the tank at the top of the system lowers the tank pre-charge allowing the use of a smaller or less costly non-code tank (if acceptable).

Skid Mounted Tank

When the tank is mounted onto the system skid, it must be regulated separately. A Tank piping connection is required (see Fig. #12) which will connect the “high” side of the pump to the tank. The connection will then “T” off to the discharge manifold with a separate tank PRV. This PRV is set 2 PSI higher than the system design pressure in order to assure complete exhaustion of tank contents. In cases where the tank is skid mounted, you should allow for about double the floor space required than for a remote mount or adjacent mount setup. Remember that the tank pressure will need to take into account System Pressure plus pump shut-off pressure, so this could force the selection into a “code rated” storage tank.

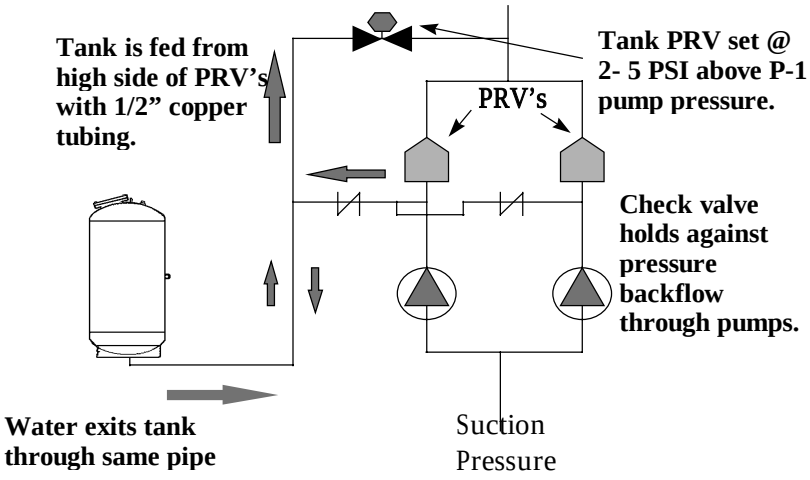




Adjacent Mounted Tank

This seems to be the most popular method today of configuring the drawdown tank. The tank is mounted somewhere at the same level of the system (usually directly next to it, nearly always in the same room.) The tank piping and PRV are still required, but the tank connection is made in the field by the contractor rather than at the factory. The System Pressure plus pump shut-off must still be considered when considering the pressure rating, but the additional space required by the skid mounted tank can be partially avoided. Maneuverability and installation are also simplified. Piping connection is also mounted as in Fig. #12. Some advantages of this are that the system skid size is much more manageable and small versus the skid mount package.

SECTION II: PIPING CONFIGURATIONS



Tank Piping Schematic (Adjacent and Skid Mounted Tanks)

Tank feed line is piped into the "High" (pump) side of the Pressure Reducing Valves allowing full pump pressure plus suction pressure to enter the drawdown tank. When system is satisfied and pumps rise to shut-off, the thermal re-circulation line tells system to shut down. System "leak loads" are now provided for by the pressure tank through the separate tank PRV which is mounted to the discharge manifold**.**

TIP: There is a drawdown calculator located at the far right tab of ArmCalc entitled "drawdown". Input the tank size in the top left cell. (Graph results will change when you press "Enter") Read across the top of the graph for the pump start pressure (this is the same as the system "on" pressure which the pump package is trying to maintain) On the left side of the graph read down for the pump stop pressure. (in the case of an adjacent or skid mount tank, this is equal to the maximum possible suction plus pump shut-off at zero flow; For remote tanks, use the start pressure as the tank pre-charge and the stop pressure as the piping friction loss calculation. This is typically 10% of Static Pressure)