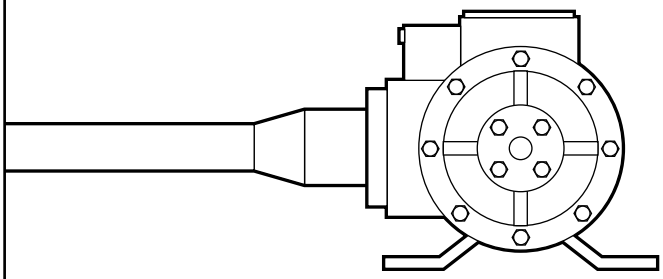
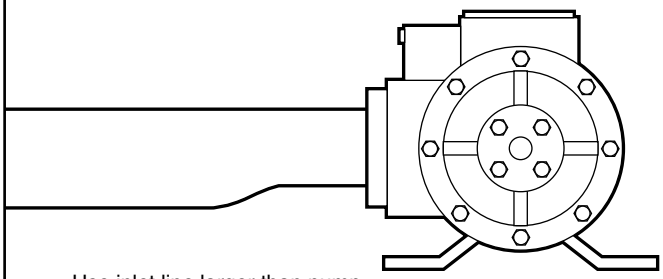
1 No!



Don't use restricted inlet line!

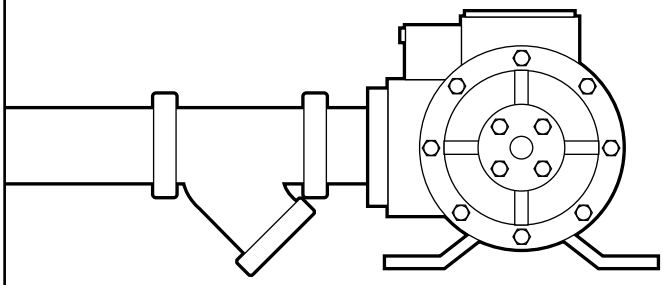
2 Yes!



Use inlet line larger than pump suction nozzle. Same size as nozzle OK on short runs.

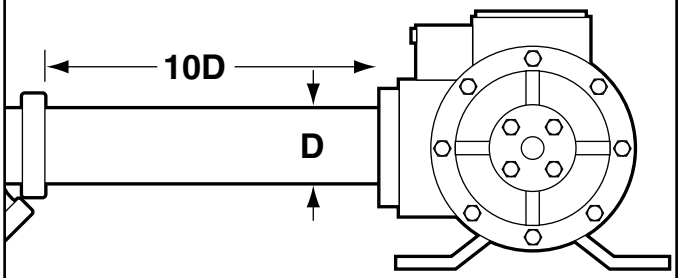
Pressure drop caused by restriction in suction line will cause vaporization and cavitation.

3 No!



Don't locate restrictive fittings or elbows close to pump inlet.

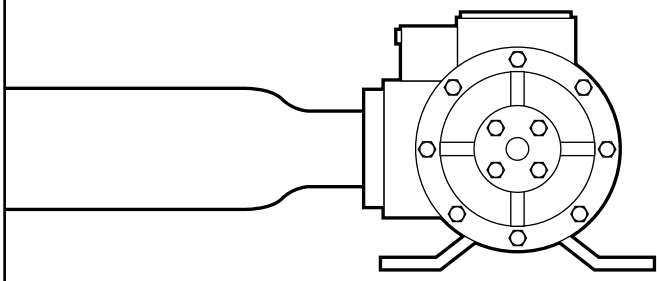
4 Yes!



Best rule is 10 pipe diameters straight pipe upstream from pump! (not always possible)

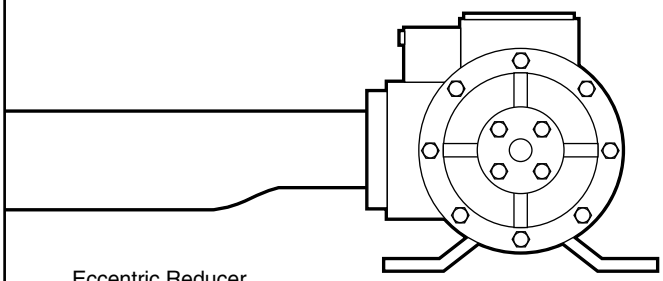
Turbulence caused by flow interference close to the pump accentuates incipient cavitation.

5 No!



Concentric Reducer.

6 Yes!



Eccentric Reducer.

An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.

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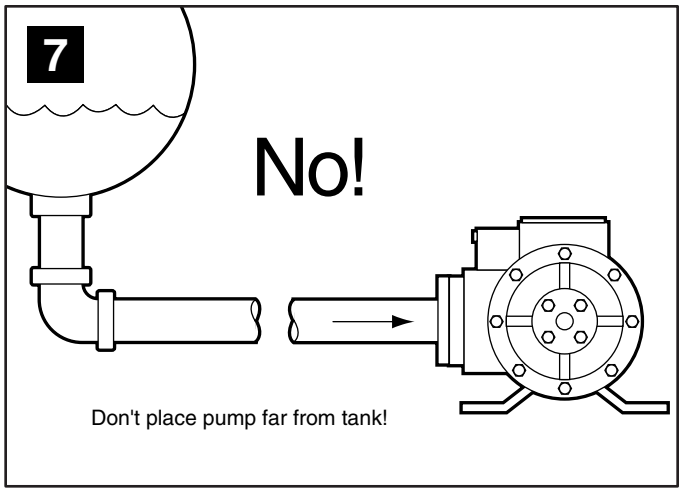
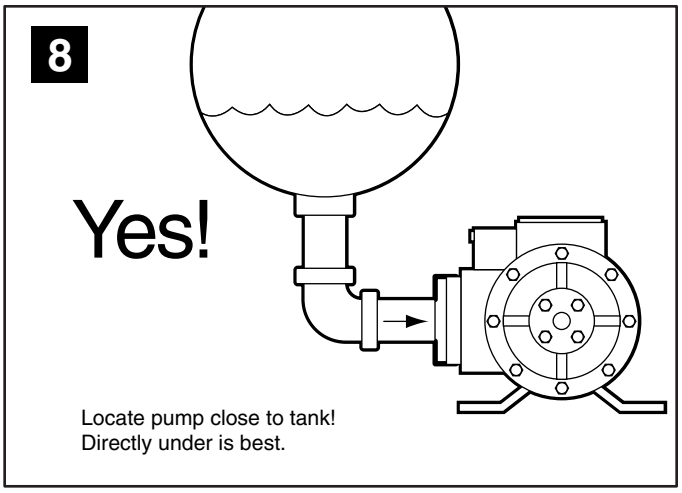
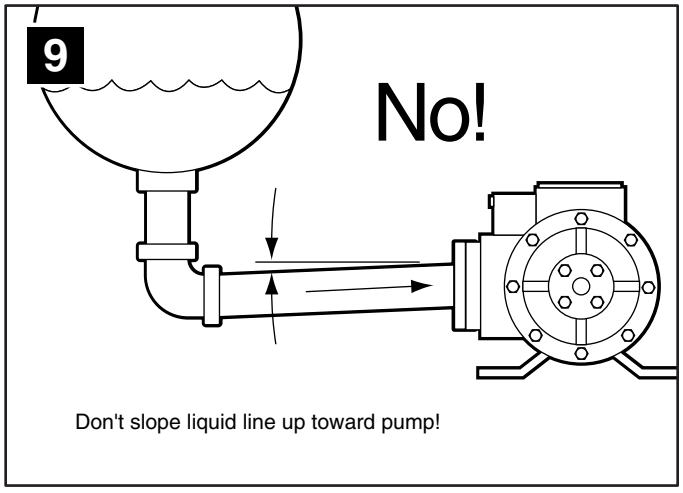
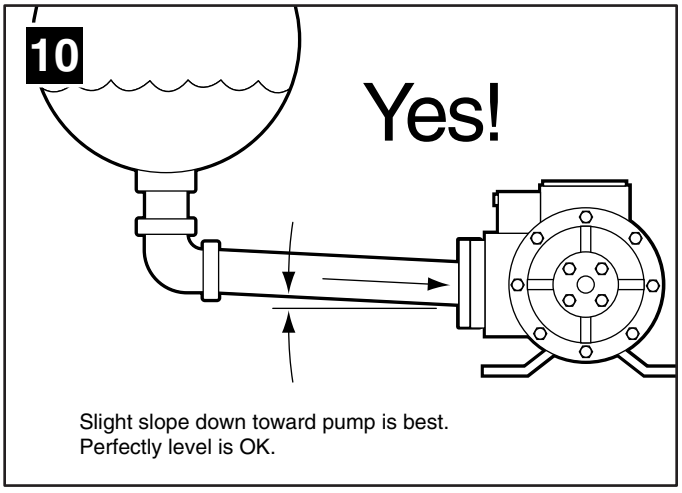


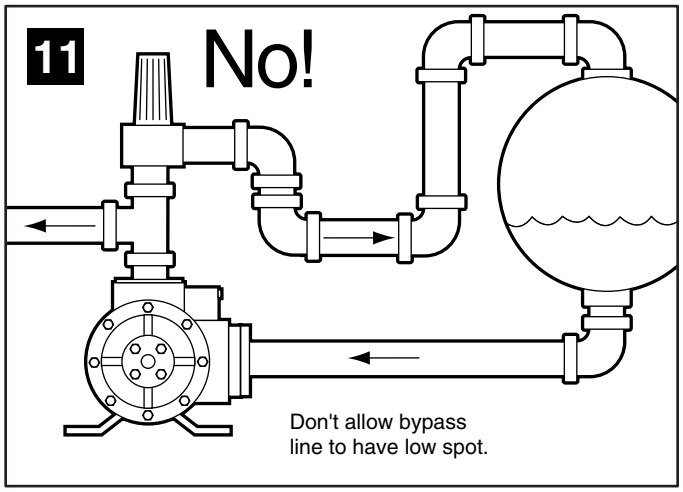


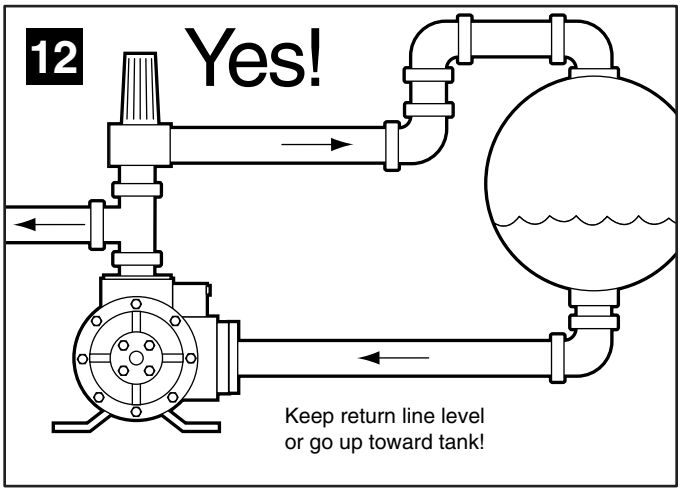
It is best to allow the pump to be fed by gravity flow to give stable, trouble-free operation.



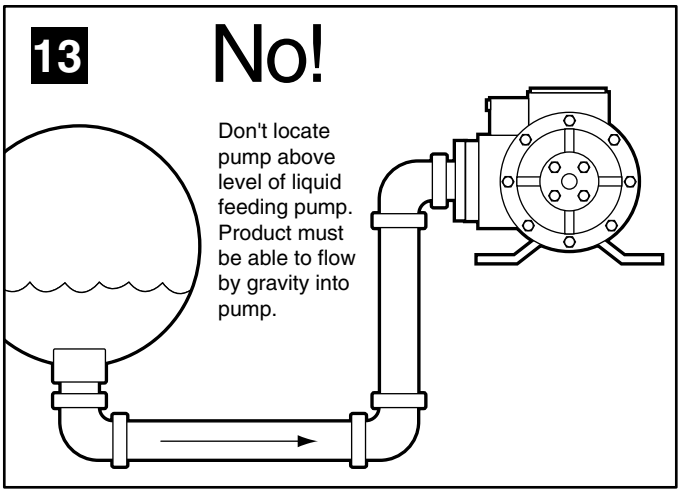


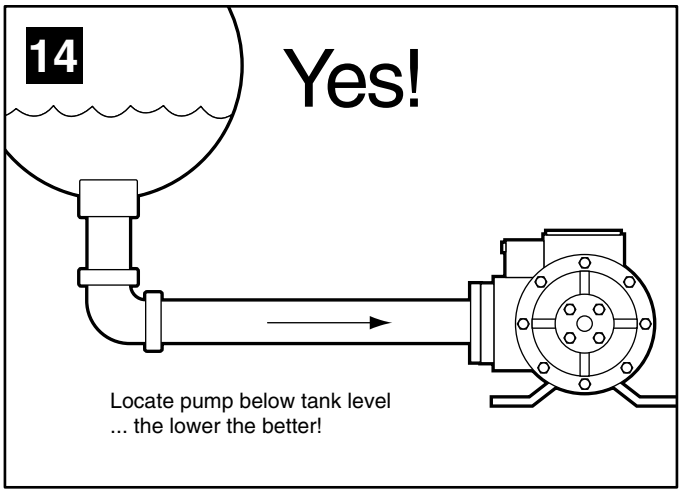
Vaporization in the pump inlet line can displace liquid in the pump so that pump may start up in a dry condition. A slope toward the pump of only an inch or two in a 10 foot run will allow vapor to gravitate back into the tank and be replaced with liquid.



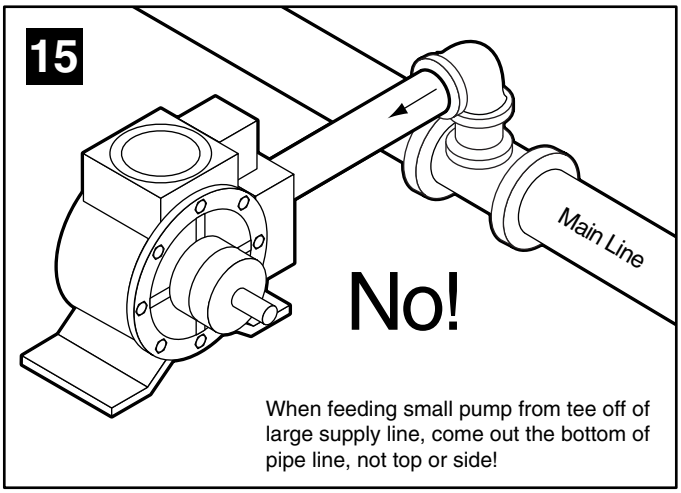


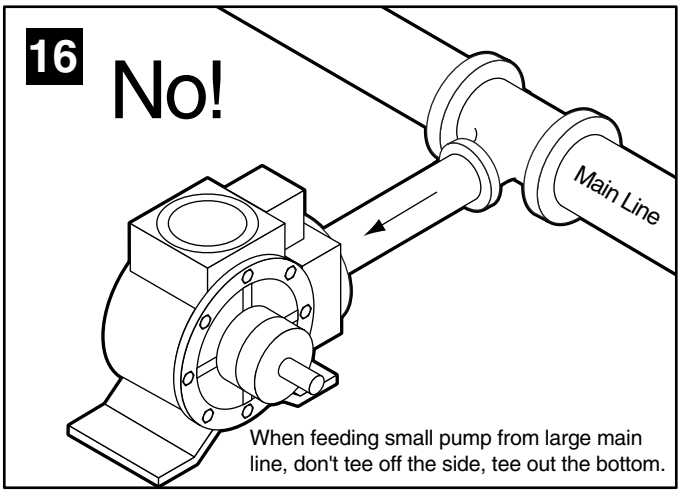
Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required.



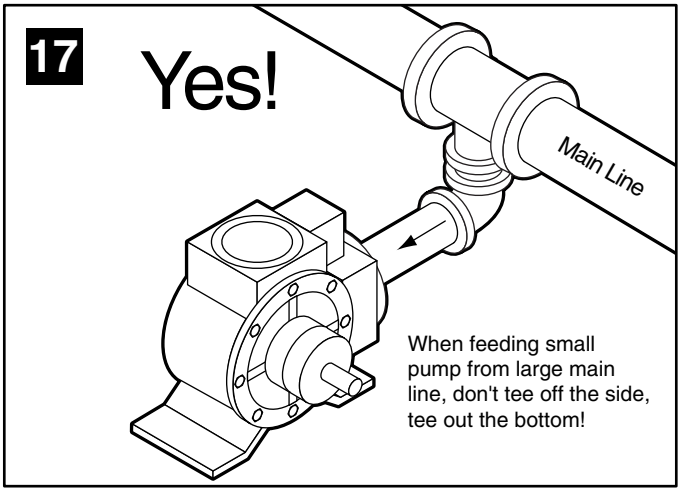


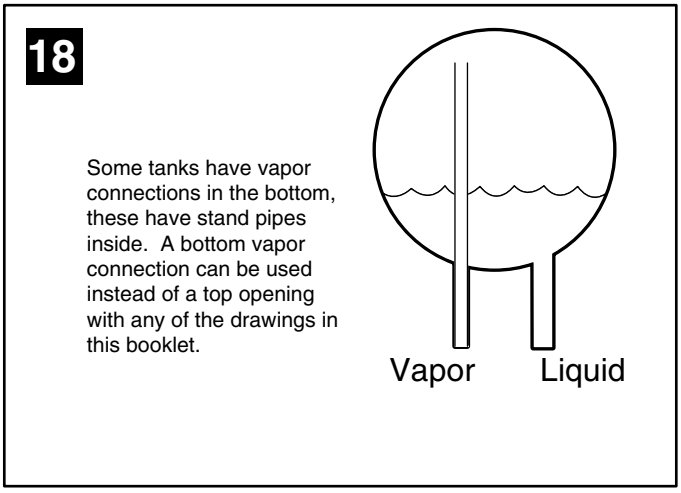
Since liquefied gases boil when drawn into a pump by its own suction, the pump must be fed by gravity flow to give stable, trouble-free operation.

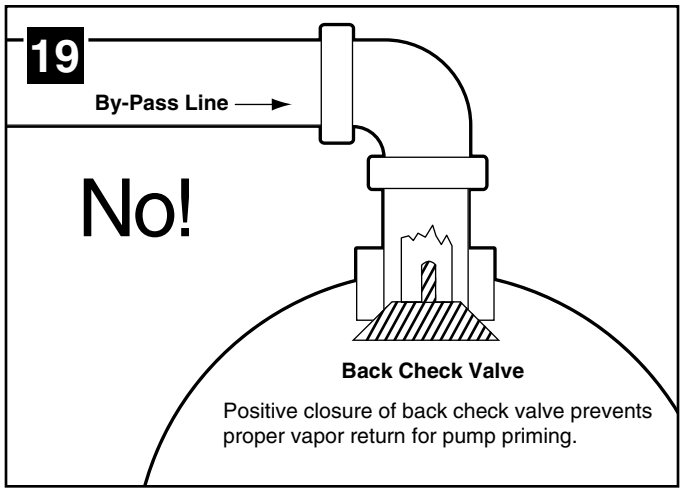


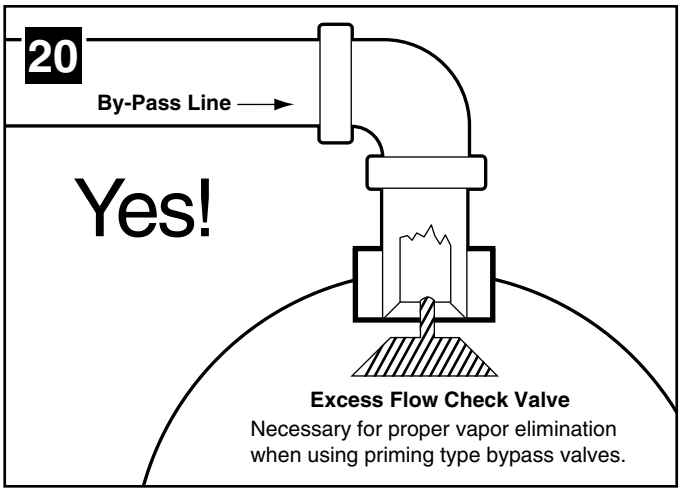


Low capacity flow through large lines often does not sweep out vapor. Flow occurs like liquid in a flume. Drawings 15 and 16 would allow vapor slugs to be drawn into the small pump causing erratic performance. Drawing 17 shows the best chance for stable feed into a small pump from a large line.

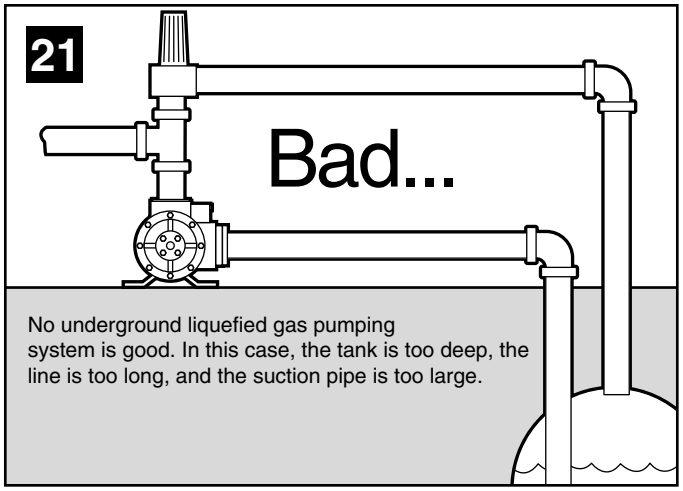


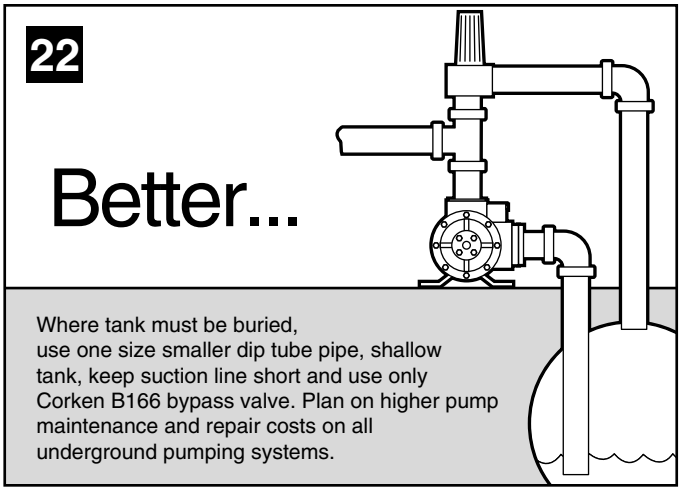




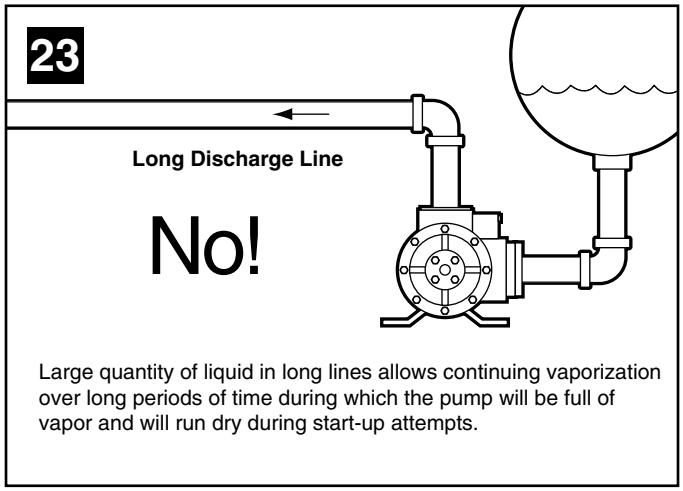


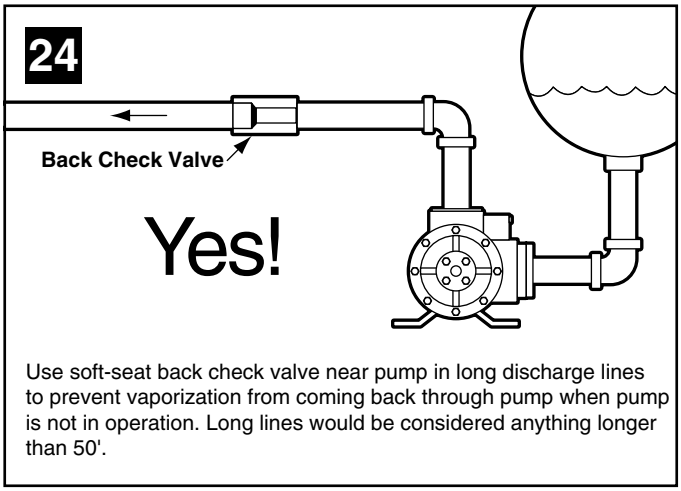
This is not a problem where vapor elimination is not required.





Where pumping from underground storage must be done, consult instruction book IF103.





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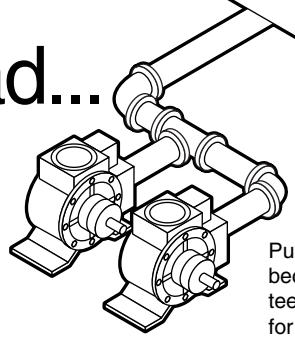
25

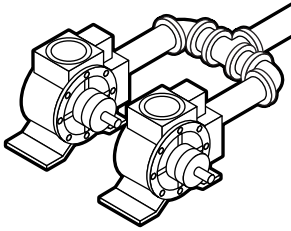
Bad...



Pump No. 1 is starved because of venturi action at tee. This would be acceptable for installations where both pumps would never operate at the same time.

26

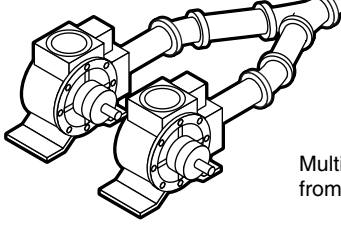
OK...



Pumps operating in parallel.

27

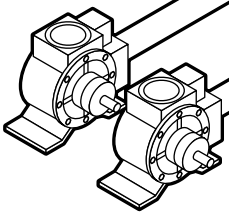
Good...



Multiple pumps fed from same main line.

28

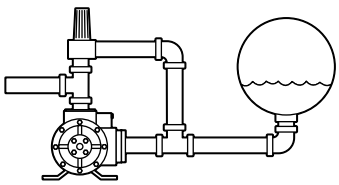
Best...



Parallel piping of liquefied gas pumps.

Inquire about Corken's duplex-series pump set.

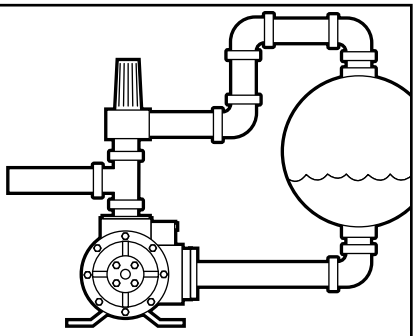
29 No!



Don't pipe bypass line back into suction piping! Heat buildup in recirculated products causes flashing of liquid to vapor with immediate cavitation and ultimate dry-running. This is why the bypass relief valves which are built into many positive displacement pumps should not be used for normal bypass action when handling liquefied gases. The internal valve should be considered to be a back-up safety relief in addition to a back-to-tank bypass valve and should be set to relieve at a pressure 10 to 20 psi higher than the working bypass. Some built-in bypass valves have the capability of being piped back-to-tank so check with the pump manufacturer.

30

Yes!



Always pipe bypass back to tank! Make sure bypass line is large enough to handle full pump flow without excessive pressure build-up. Note that bypass line must be capable of bypassing full pump capacity without excessive pressure build-up. High pressure rise can cause bypass valve to chatter and vibrate.

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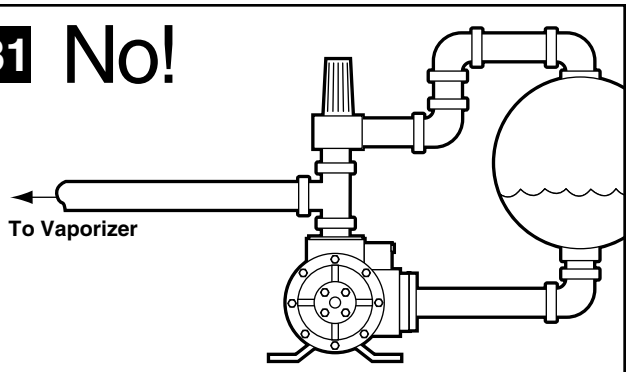
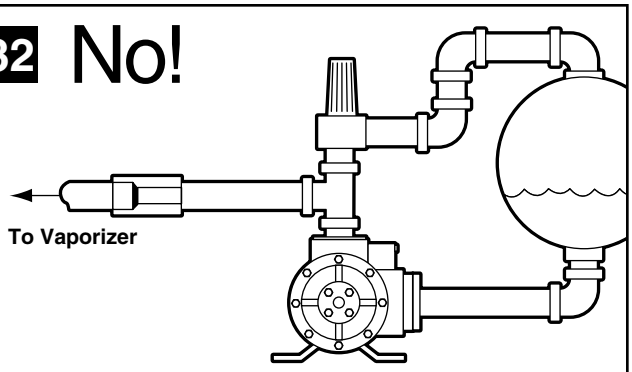
31 No!



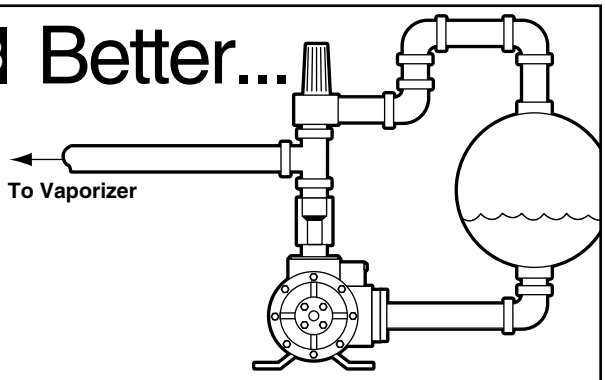
On vaporizer feed pumps, a back check valve should be installed between the pump and to prevent back-flow of vapor from entering pump.

32 No!



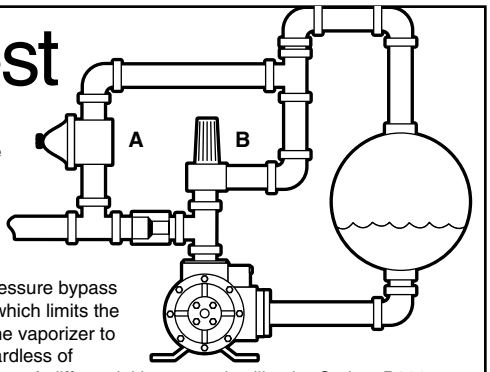
Back check must be located to allow back-flow into tank from vaporizer.

33 Better...



Back check valve protects pump but allows back flow through bypass valve into storage tank. **Use back check without spring loaded valve to allow normal vapor elimination.**

34 Best



Where A is a constant pressure bypass control valve and B is Corken B166 bypass and vapor elimination valve.

Valve A is a fixed pressure bypass like the Fisher 98H which limits the feed pressure into the vaporizer to a specific value regardless of system vapor pressure. A differential bypass valve like the Corken B166, T166, or B177 controls a fixed difference in pressure between the pump discharge and the tank. Differential valve B must be set to the maximum acceptable differential of the pump while fixed pressure valve A is set for the vaporizer pressure requirement.

35

Corken B166 Bypass Valve Functions.

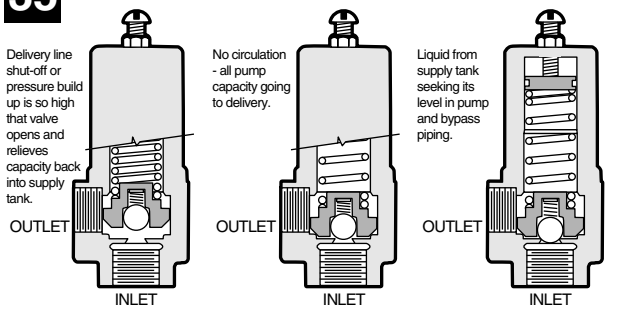


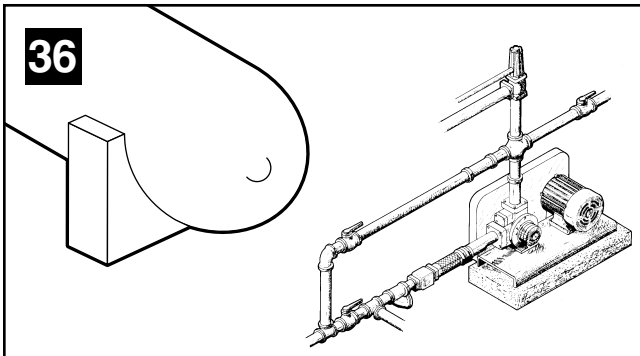
FIG. 1 Relieving Operation OPEN

FIG. 2 Pumping Operation CLOSED

FIG. 3 Priming Operation OPEN

For pump capacities under 100 GPM, use a bypass valve with built-in vapor elimination where possible, like Corken's B166 or T166 valves.

36



Some bypass valves, like the Corken B177, require tank pressure sensing lines. Check instructions for your valve.

Summary

1. Minimize pressure losses in pump suction line. Pressure drop causes increased vaporization which, in turn, causes decreased pump performance and increased pump maintenance.
2. Avoid vapor traps in pump suction line and liquid traps in pump bypass lines. Vapor pockets in the pump inlet cause erratic pump performance and liquid pockets in bypass lines interfere with vapor elimination from the system.
3. Control vapor from backing up into pump from the discharge line.
4. Minimize heat buildup in the pumping system by piping bypass liquid back to the tank rather than directly to the pump inlet.
5. Maximize the elevation difference between the tank and the pump.
6. Always use equipment approved for use with LP-gas and carefully follow the requirements of NFPA.
7. Do not pipe a plant from the drawings shown here. They are schematic only and intended to illustrate specific piping principles.

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