

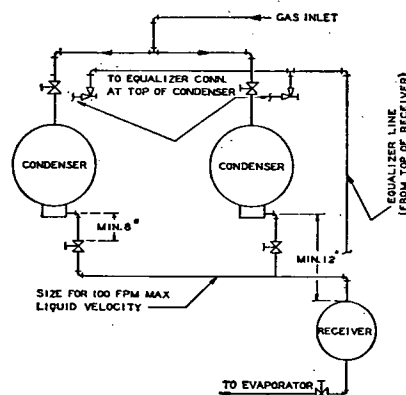


Fig. 14 Parallel Water-Cooled Condensers with Through-Type Receiver

densate drain line to the condenser outlet, or by an external equalizer back to the condenser inlet or outlet.

Fig. 16 shows a single circuit evaporative condenser and receiver, with the receiver being vented back through the condensate drain line. For this arrangement to work, the line must be generously sized for two-way flow. The line must be full size of the condenser outlet to the first elbow turning down. The rest of the drain line should be sized for not over 100 fpm liquid velocity, and any horizontal section should be pitched toward the receiver at least $\frac{1}{4}$ in. to the foot. There should be no trap in the line. If a valve is located in this line,

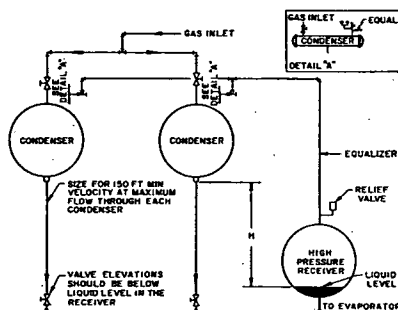


Fig. 15 Parallel Shell-and-Tube Condensers with Surge-Type Receiver

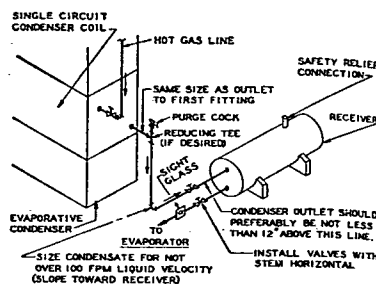


Fig. 16 Single Circuit Evaporative Condenser and Through-Type Receiver

it should be in the horizontal line at the receiver and be installed with stem in the horizontal position to avoid forming a trap. If the valve is in a vertical line it must be located at least 12 in. below the condenser outlet to assure sufficient head above the valve to overcome the friction head through the valve without backing up into the condenser.

The best place to purge an evaporative condenser is at the coil outlet during operation because most of the air accumulates at this point. Hence the noncondensable collecting standpipe and purge valve shown at this point. For systems with non-vented receivers, another purge valve should also be located at the top of the receiver.

Where a liquid subcooling coil is used, it should be piped as shown in Fig. 17, between the receiver and the evaporator for best liquid subcooling benefits.

Multi-circuit condensers or multiple interconnected evaporative condensers require different piping arrangements than for single circuit units. There are two problems to deal with: (1) pressure drops through the condenser coils will seldom

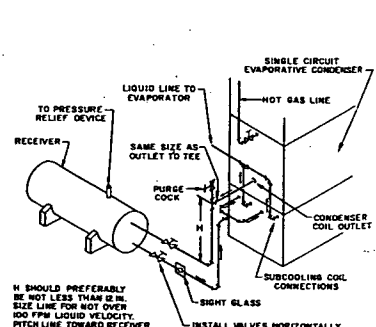


Fig. 17 Single Circuit Evaporative Condenser with Receiver and Liquid Subcooling Coil

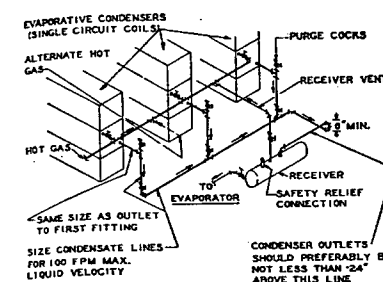


Fig. 18 Multiple Evaporative Condensers with Equalization to Condenser Inlets

be equal at full load and (2) one or more condensers may be shut off for maintenance of head pressure control.

As the result of unequal pressure drops through the various parallel coils, gas will tend to blow through the idle or low pressure coil and hold liquid back in the others. To offset this situation it is necessary to allow sufficient height below the coil outlet in each liquid drain line, to permit liquid to back up in it to balance off unequal condenser pressure drops without letting liquid back up into the coil itself, before joining into the common condensate header.

Since it is necessary to allow for establishing liquid legs in the drain lines from one or more of the interconnected condensers it is not practical to vent the receiver back to the condensers through the condensate drain lines. On all multiple evaporative condenser systems, an external equalizer connection must be made for this purpose, connecting the top of the receiver to either condenser coil inlets or outlets.

In Fig. 18 the receiver vent (equalizer) line is connected to the hot gas header at the condenser coil inlets. When this is done it is not only necessary to allow for liquid legs in the drain lines to offset unequal condensing pressures, but also additional height of liquid leg must be permitted to offset the actual pressure drop through the coil since the receiver is now equalized to the pressure existing at the coil inlet. A small trap in the condensate header prevents gas blow-back from the receiver and insures solid liquid legs in the drain lines for maximum effect in offsetting coil pressure drop.

The arrangement in Fig. 18 is practical with condensers having a very low pressure drop, such as full circuited, large tube, prime surface coil units. If the full load pressure drop through each coil does not exceed around one psi, then a 24 in. minimum height from coil outlet to receiver inlet is usually satisfactory to establish required liquid legs without backing liquid up into the coils. Where the coil pressure drops are greater than this the allowable vertical heights in the liquid drain lines must be increased accordingly, about two more feet of height for every extra pound pressure drop in the coil. Drain lines should be sized liberally; not over 100 fpm liquid velocity.

Where height is limited for liquid leg allowance, some height can be saved by using the receiver in a surge type arrangement, as shown in Fig. 15.

Where it is not possible to allow the required liquid drop

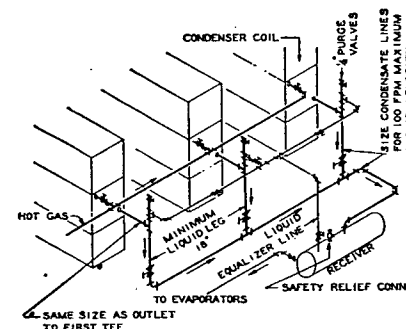


Fig. 19 Multiple Evaporative Condensers with Receiver Equalization to Condenser Outlets

leg height for coils having more than 1 psi pressure drop, the equalizer line from the receiver can be run to the coil outlet connections, providing they are large enough to allow gas to flow back into the coil, as shown in Fig. 19. Here the liquid drain leg heights do not have to offset coil pressure drop or differences in coil pressure drop. Their only requirement is to overcome the friction loss in the drain lines, fittings and valve. With the drain lines sized for 100 fpm maximum liquid velocity, a minimum height from coil outlet to receiver inlet of 18 in. is usually satisfactory. The arrangement in Fig. 19, however, is practical only if the following conditions are met:

1. The condensers must all be the same size.
2. They must all run, when a compressor is in operation. One unit cannot be shut off with others running unless it is valved off, because discharge pressure would equalize to the operating coil outlets through the idle coil.
3. Any condensing pressure control used would have to be applied simultaneously to all units to avoid unequal operating pressure drops.

The arrangement in Fig. 18 is the preferred method where sufficient liquid leg heights are available.

PIPING AT MULTIPLE COMPRESSORS

Multiple compressors operating in parallel must be carefully piped to insure proper operation.

Suction Piping

Suction piping at paralleled compressors should be designed so that all compressors run at the same suction pressure and so that oil is returned, in equal proportions, to the running compressors. All suction lines should be brought into a common suction header, in order to return the oil to each crankcase as uniformly as possible.

The suction header should be run above the level of the compressor suction inlets so that oil can drain into the compressors by gravity. The header should not be below the compressor suction inlets because it can become an oil trap.

Branch suction lines to the compressors should be taken off from the side of the header.

Care should be taken that the return mains from the evaporators are not connected into the suction header so as