Horizontal Air Flow Condensers
FCB/WSS/DVT and "Reach" Style

By Charles Tice, Sales Engineering Support, Post-Sales Specialist

Refrigeration systems are comprised of various pieces of equipment: evaporators, condensing units, expansion valves, etc. One of these pieces of equipment is the remote outdoor air-cooled condenser. It is generally used with racks on supermarkets, but can also be used on single condensing units as small as ½ horsepower.

The purpose of an air cooled condenser is threefold:

a) it desuperheats the refrigerant from the compressor,
b) it condenses the refrigerant,
c) it subcools the liquid refrigerant and returns it to the system.

These events occur in both the vertical and the horizontal air flow positions. As long as air can be forced across the condenser coil surface, heat is removed, and condensing can occur. However, there are some limits and concerns when condensers are used in a horizontal air flow position instead of the usual vertical discharge position. These include unit orientation, air clearances, noise considerations, protection from severe weather and electrical safety.

Orientation

The first consideration is the orientation of the condenser. Care must be taken with interpreting the term "horizontal" application. The most common interpretation is where the unit is rotated 90 degrees clockwise when viewed from the header end, Fig. 1.

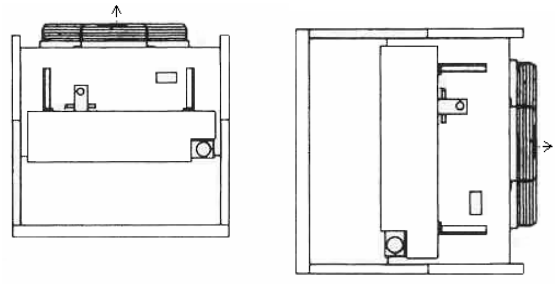


Fig. #1 Usual unit rotation

However, there is another interpretation, Fig. 2:

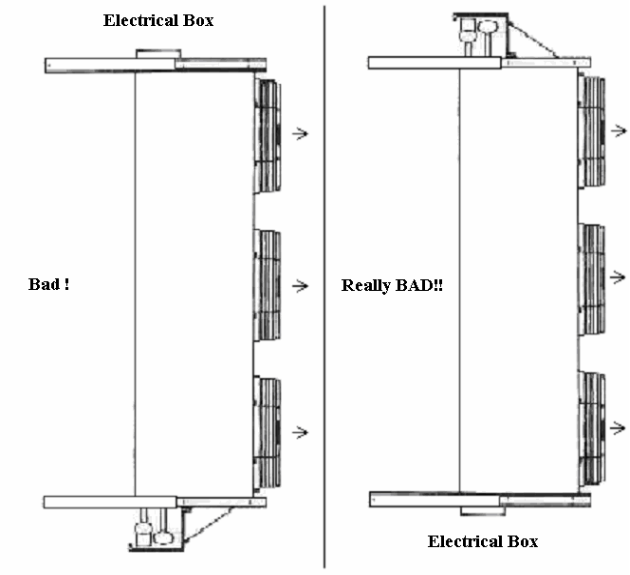
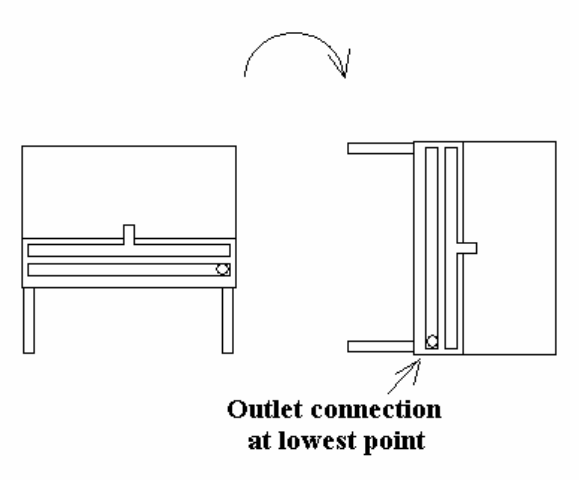


Fig. 2: Improper orientation

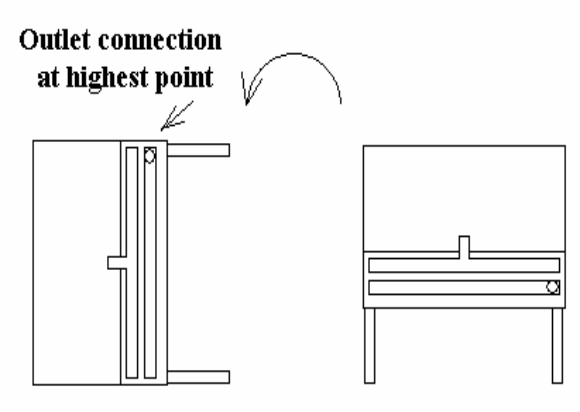
This is not what we have in mind by 'horizontal airflow'!! There are 2 immediate problems with this orientation. The first problem is that both refrigerant and oil are easily trapped (even with the header on the bottom!!) This increases the pressure required to move the mixture from the coil and forces the compressor to do unnecessary work (possibly to the point of failure). The second problem is access to the electrical components. Condensers range in size from approximately 48" to as long as 130" (in the case of the FCB/WSS/DVT's). This puts the electrical box either very close to the ground or as high as 10 feet in the air. To resolve this situation, the control box would need to be relocated to a more convenient location and the motor/control wiring re-routed.

This type of condenser orientation should be avoided at all costs. The amount of time and money required to make a situation workable typically exceeds the cost of the unit. Other alternative solutions should be investigated.

Going back to our original horizontal condenser, let us examine some installation considerations. When the condenser is rotated on it's side, it is critical that the header outlet connections are at the lowest possible position. This allows for free draining of refrigerant and oil away from the condenser.



Failure to do this will result in trapping oil and refrigerant in the condenser, possibly all the way back to the compressor (much akin to the situation described in the previous section).



Clearances

Now that the unit is correctly rotated and the connections correctly orientated, we need to consider the unit's location. Since the unit is now on it's side, it is very close to the ground/roof. Care must be taken that the condenser does not lie directly on the ground or roof surface. The condenser is to be placed on a steel (or similar) support structure and secured appropriately. If left in direct contact with the surface, the suction draft created by the fan cells will draw dirt, trash, etc. into the lower portion of the coil surface and clog it. While this does not directly damage the coil, it does reduce the effective amount of condensing surface thus raising the condensing TD of the refrigerant and lowering the efficiency of the system. Additionally there is an accelerated corrosion of the metal panels that are in contact with the surface. Any water or moisture under the unit is trapped and evaporates at a very low rate. This creates an ideal situation for corrosion to occur.

Clearances around the unit are different when the unit is on its side. It is now very important that nothing impedes the discharge airflow. In order to avoid 'short cycling" of the discharge air, walls or fences should not be any closer than 10 feet to the unit. The fences/walls cannot be taller than the height of the unit and should have approximately 50% free area for the discharge air to pass through. Otherwise, you've just created a pit for the unit to operate within and with it, a whole new set of operating concerns.

The intake air side should have at least 3 feet of free space behind it to allow unobstructed air. The remaining two sides are not as critical. As long as sufficient room is allowed for wiring and brazing maintenance, you can be as close as 2 feet to a wall or fence (but that's real snug when you're trying to work on a unit!).

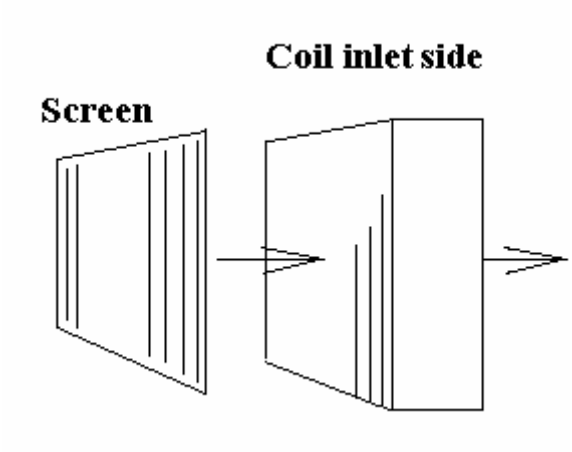
Noise Considerations

Noise considerations are becoming increasingly important these days. Grocery stores and mega-marts that used to be constructed in stand alone strip malls are now in very close proximity to suburban dwellings.

There are typically local codes that limit the amount of noise in a neighborhood. These codes can be very restrictive and may require the use of slower rpm motors and fanblades or sound attenuating fencing in order to be in compliance. It is the responsibility of the installing contractor to abide by the local codes.

Weather Concerns

When the unit on its side, the coil surface is now exposed to possible damage from severe weather. While it is not required, it may well be worth the insurance of installing a hardware cloth/chicken wire material on the entering airside of the coil.



This will lessen the effects of hail, falling branches, or debris from damaging the coil. It will also help to reduce the amount of trash being sucked into the coil during regular operation. Make sure that the screen is easily removed for routine and seasonal maintenance.

High winds can be another area concern. This is not normally a problem with the small condensers (FCB/WSS/DVT) since they are only a single fan width of 43". Their orientation allows for direct mounting of the legs to steel rails secured to the roof (or ground). The 'Reach' units were not designed for horizontal discharge application; the legs cannot simply be removed and reattached as in the case of the small condensers. With its larger profile surface, it is very prone to high winds. It is the responsibility of the installing contractor to contact an engineer familiar with the local codes concerning such mountings and abide by their recommendations. This may involve additional strapping or rigid supports to proper secure the unit from tipping over.

Electrical Safety

In the case of the small condensers (FCB/WSS DVT), rotating the unit on its side has no adverse effect on the electrical box. It has been rain tested by UL and is approved for operation in this position. This is not the case for the 'Reach' condensers. When rotated into the horizontal discharge position, the electrical box is no longer weather resistant. Caulking the seams lessens the effects of water infiltration, **but does not eliminate them entirely!** The box needs to be pulled off of the unit and either mounted to a surface in it's normal orientation or a rain shield/cover fabricated and placed over the entire length of the electrical box. Since Heatcraft does not make a rain cover, it is left to the installing contactor/user to fabricate. **Without the rain cover, the electrical box and unit can become unsafe electrically to operate and a hazard to human contact!!**

This is not meant to be an exhaustive article, but it does highlight the major concerns of horizontal draft condensers. This is not just a simple rotation of the unit. There are engineering and refrigeration concerns that must be addressed before attempting such an installation. When in doubt, call an Application Engineer for assistance.