Positioning of Air Cooled Condensers

The purpose of this Technical Bulletin is to give guidance on the positioning of Air Cooled Condensers and also for Condensing Units with on board condensers.

The guidelines are also appropriate for dry air cooler applications.

For contract specific advice, contact the Technical Department.

1.0 Introduction

We have had difficulties with reduced condenser capacity due to effects from adjacent buildings, air recirculation etc.

The positioning guidelines below are based on multiplication factors on the condenser length L and width W.

The guidelines give recommended minimum dimensions for condensers sitting side by side. It is possible to fit condensers closer together provided that the building/support design allows unrestricted air intake e.g. the condensers could by installed at high level on an open mesh platform.

Multiple condensers can be installed end to end with a minimum 750mm gap between them to allow access to pipe headers for repair.

2.0 Air Cooled Condensing Units

We use condensing units with built on condensers for low capacity applications. The condensers, selected by the manufacturers are usually based on condenser temperatures of at least 17K above the ambient air on temperature, therefore careful positioning is required to allow the units to operate in summer conditions.

2.1 Outdoor Units

The condenser fans draw air in through the fins and discharges over the compressor. When the units are located outdoors in weatherproof housings, the recommended minimum distance between units is 0.5 x L, the air intake should be at least 0.9x L and the air discharge at least 4.0 x L away from any solid obstructions.

Solid obstructions to a maximum of 3-sides can be catered for. If the units are enclosed by solid objects on 4-sides then alternative sites should be sought or compressor/receiver units with larger condensers mounted off the unit should be specified.

Refer to Fig 1.
2.2 **Single Air Cooled Condensing Units**

Single air cooled condensing units positioned indoors may operate effectively without the need for fresh air supply and extract provided the unit can take and discharge air to a large area e.g. a warehouse roof void.

If in doubt, a fresh air louver or duct with free area equivalent to the condenser face area and a local extract fan sized for the condenser air flow should be installed. The extract fan should be controlled by a thermostat.

2.3 **Multiple Indoor Units**

When multiple condensing units are installed indoors, the recommended guidelines are:

- Space between units 0.5x L minimum
- Air intake louver(s) to be fitted with free area equivalent to the total condenser cross-section area.
- An air intake plenum is required.
- Extract fan(s) sized for a minimum of 80% of the total condenser air flow should be installed and controlled by thermostat(s).

Refer to Fig.2.

3.0 **Standard Air Cooled Condensers**

Standard air cooled condensers with horizontal coil/vertical air flow and standard fans with 4 or 6 pole motors will present little problems if sited as shown on attached Figs. 3-9.

Multiple condensers mounted side by side (Figures 4 to 9) can be butted together on the long side, or placed with a solid gantry (say 1m wide) between them as long as they are high enough (say ≥ 2m between the air on face and ground level) and the free area for air to get in below the condensers is ≥ 1.5 times the condenser air on face CSA.

4.0 **Low Velocity Air Cooled Condensers**

Condensers with low velocity fans (8/10/12/16 pole motors) require more careful consideration. When in any doubt concerning the positioning of low velocity condensers, air straighteners should be fitted. Refer to Figs 4, 10, 12 and 13.

Note that the air tends to come off low velocity fans in a 45° cone hence air straighteners can dramatically reduce re-circulation.

4.1 **Low Velocity Horizontal Coil/Vertical Air Flow**

A single low velocity condenser positioned to comply with the guidelines for standard condensers will normally function satisfactorily but if in doubt, increase the leg height and fit air straighteners to improve the discharge air throw and to reduce air recirculation.
When multiple low velocity condensers are to be installed they should be specified with increased leg height and air straighteners and positioned with double the minimum W and L distances when compared to standard units.

Refer to Figs 3-10.

These condensers can also be butted together on the long side as described in section 3.0.

4.2 Low Velocity Vertical Coil/Horizontal Air Flow

Vertical coil units are best avoided as even moderate winds can overcome the fan motors, especially when low velocity motors are fitted.

However if required Refer to Fig.11 for recommended positioning of vertical coil condensers.

5.0 V-Block Condensers

V-Block condensers normally provide an economic selection but very high air volumes are typically required to achieve the duty. Air is drawn in from both sides of the condenser and discharged vertically.

When multiple V-block condensers are installed, the L & D minimum guidelines for standard condensers should be doubled.

Refer to Figs 3-9.

6.0 EcoMesh

Condensers fitted with EcoMesh or alternative adiabatic systems can have increased width in the case of Vertical Coil or V- Block condensers or standard condensers can have increased height, the dimensions L and W used in the figures are to include the extra space required for EcoMesh.

7.0 Situations to Avoid

Refer to Fig. No’s 14 – 17 in this section which highlight locations which can lead to air recirculation and reduced capacity.

8.0 Design Checks

Designers should check the following on each contract:

- Minimum guidelines satisfied or alternative design approved
- Louvre free area checked
- Check that louvres are not blanked off e.g. for cosmetic/security reasons
- Plantroom extract fan(s) rated for a minimum of 80% of condensing unit airflow when discharge is into room
- Safe access allowed for condenser maintenance to fan & fin sides
- Space allowed for access scaffold if fans are high
9.0 **Installation and Location Guidance**

Other adjacent plant either requiring an air supply or dissipating air will affect the air flow/temperature onto the condenser. Adjacent building styles, plant and prevailing wind can cause air currents and down draughts forcing the discharge air back down into the air intake, causing high air entering temperatures and subsequent loss of performance.

Vertical units must not be installed when low velocity motors are employed as the prevailing wind can overcome the power of the motor, making it impossible to start. When vertical units are to be installed, they should be orientated so that the air flow direction is similar to that of the summer prevailing wind. Also, the coil should be, as far as is practical, shaded from direct sunlight.

Note: V-block units with high airflows, the minimum distance requirement in Figs 3-10 should be doubled.
FREE CSA OF LOUVRE ≥ TOTAL CONDENSER CSA

INDOOR CONDENSING UNITS

Fig. 2

SINGLE UNIT WITH NO RESTRICTIONS WITHIN THE UNITS LENGTH HAS NO LIMITATIONS IN USE.

Fig. 3
MULTIPLE UNITS WITH NO RESTRICTIONS

Fig. 4

MULTIPLE UNITS ADJACENT TO SOLID WALL

Fig. 5

SOLID OBSTRUCTIONS ALONG ANY TWO WALLS

Fig. 6

MULTIPLE UNITS WITH NO RESTRICTIONS WITHIN A DISTANCE EQUAL TO THE UNITS LENGTH HAVE NO LIMITATIONS. HOWEVER, THE DISTANCE BETWEEN UNITS WHEN MORE THAN 2 UNITS IN LINE ARE REQUIRED IS MORE CRITICAL. IN THIS INSTANCE, IT IS WORTH CONSIDERING INCREASING THE HEIGHT TO GIVE IMPROVED AIR CIRCULATION.

FLOW STRAIGHTNERS (WHEN REQUIRED)

EXTENDED LEGS (WHEN REQUIRED)
WHERE MULTIPLE UNITS ARE LOCATED, THE OPEN SIDE MUST GIVE FREE AIR ONTO EACH UNIT. RAISING UNITS ON EXTENDED LEGS OR PLINTHS WILL IMPROVE AIR CIRCULATION, AND IS RECOMMENDED FOR 8, 10, 12, & 16 POLE UNITS.

SOLID OBSTRUCTIONS ALONG ANY 3 SIDES OF UNITS

Fig. 7

THE TOTAL DISTANCE BETWEEN CONDENSER AND LOUVRES B + C + D MUST BE ≥ 1.5L. FAN DISCHARGE SHOULD BE LEVEL WITH TOP OF THE LOUVRES.

ONE SOLID OBSTRUCTION & 3 LOUVRED SECTIONS

Fig. 8

THE TOTAL DISTANCE BETWEEN CONDENSER AND LOUVRES C + D MUST BE ≥ 1.3L. FAN DISCHARGE SHOULD BE LEVEL WITH TOP OF THE LOUVRES.

TWO SOLID OBSTRUCTIONS & TWO LOUVRED SECTIONS

Fig. 9
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**Fig. 10**

Parapet wall and solid obstruction on other side

Parapet wall is not restrictive in this arrangement if the distance \( Y \) provided is \( \geq 2X \)

SOLID OBSTRUCTION EG. DUCT, PLANT, WALL, ROOF

**Fig. 11**

Vertical coil / horizontal air flow

**Fig. 12**

Parapet wall and atrium on other side

Parapet wall is not restrictive in this distance is provided \( Y \geq 2X \)

**Fig. 13**

Maintenance access when required

Use air straighteners

Chequered plate platform complete with access ladder

Use air straighteners

Maintainance access when required
SITUATIONS TO AVOID

Fig. 14

ROOF OVERHANG CAUSES RE-CIRCULATION WHEN WIND IS IN DIRECTION SHOWN.
WIND IN THE OPPOSITE DIRECTION CAN CAUSE RE-CIRCULATION IN THE OPPOSITE DIRECTION

Fig. 15

NOT ENOUGH SPACE TO ALLOW AIR OFF THE CONDENSER TO DISSIPATE. RE-CIRCULATION OCCURS AFTER HITTING WALL.

Fig. 16

NOT ENOUGH FREE SPACE TO ALLOW A GOOD FRESH AIR SUPPLY TO THE CONDENSER SO AIR FLOW IS REDUCED AND RE-CIRCULATION OCCURS.

Fig. 17

MULTIPLE CONDENSING UNITS WITHOUT A PLENUM. AIR RECIRCULATING TO INTAKE

Date | Issue | Changes | Originator
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10/09/04 | A | | CJF