

DESTRATIFICATION

Information Centre

ZOO FAN SDF

Destratification & Spot Cooling

During the heating season, rising heat results in thermal stratification that can make the area near the ceiling quite warm. As a result, the entire space must be overheated in order to maintain comfortable temperatures at floor level: See figure 1.

Overheating results in significantly more energy consumption than necessary and usually creates hot and cold spots in a building. A ZOO Fan creates a gentle, concise column of air that brings warm air down to floor level, destratifies the space and reduces the temperature differential to as low as 1° overall: See figures 2 and 3.

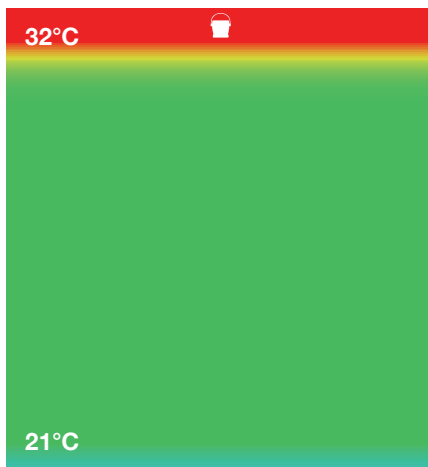


Figure 1

The above thermal image is from a CFD (Computational Fluid Dynamics) computer model of a 12.2m² space with a 7.6m flat ceiling deck and a ceiling-mounted heat source with a thermostat affixed 1.5m above the floor, set at 21°C.

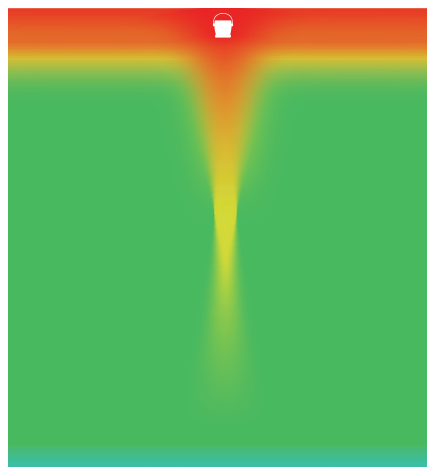


Figure 2

This shows what happens almost immediately to this built-up heat when a ZOO Fan (represented by the white silhouette) is turned on in this CFD Analysis.

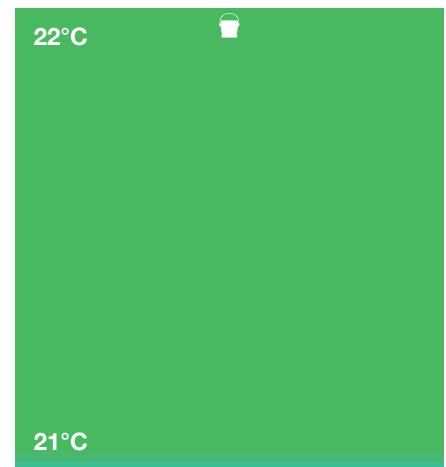


Figure 3

Destratification results in an even temperature throughout the Zone Of Occupancy. Creature comfort improves noticeably and energy consumption is reduced, often significantly.

Zone Of Occupancy™

Thermal stratification causes similar problems during the cooling season. Destratification of the occupied zone gives a uniform temperature throughout so no area needs to be over-cooled in order to maintain an acceptable temperature in other elsewhere.

The concentrated columns of air produced by ZOO Fans eliminate the need for physical duct work, gently forcing the cool, conditioned air down to the Zone Of Occupancy. The HVAC systems cycle less, the air handlers run less, introduction of outside air is reduced and the air keeps moving. ZOO Fans, hung in closer proximity, can also be used as spot coolers.

ZOO FAN SDF

Selecting a ZOO Fan

The calculations for destratification are worked out using the volume of air within the area, rather than the floor area.

1. Calculate volume in metres by multiplying the length, width and average height:

$$\text{Length} \times \text{Width} \times \text{Average Height} = \text{Volume in m}^3$$

2. Next, determine which fan to use based on ceiling height. ZOO Fans are currently manufactured in two sizes:

SDF250

AC: 0.265m³/s, EC: 0.423m³/s. Applications up to 9m height.

SDF300

AC: 0.532m³/s, EC: 0.656m³/s. Applications up to 20m height.

3. After selecting the fan size you are going to use (SDF250 or SDF300), use the following formula:

$$\text{Volume m}^3 \div 3600 \div \text{m}^3/\text{s} = \text{number of fans to install}$$

Volume of the space in m³ ÷ 3600 (seconds in an hour) ÷ m³/s (of the fan selected) = the number of fans that are required to achieve one (1) air turn in one (1) hour.

Every ZOO Fan is variable-speed controllable and can be angled easily, if need be, to direct the flow. This allows for ease of installation and control across a broad range of applications. By simply adjusting the speed of the fan, the two sizes and models shown above can effectively cover ceiling heights from 3m to 20m.

In most cases it is best to use the SDF250 for ceiling heights up to 9m and the SDF300 for anything higher than 9m (see 'Other Considerations' for additional information).

Example

1. A big box store with a length of 75m, 50m width and a height of 7m has the following volume:

$$75 \times 50 \times 7 = \text{Volume } 26,250\text{m}^3$$

2. As the ceiling height is less than 9m the SDF250 AC can be used:

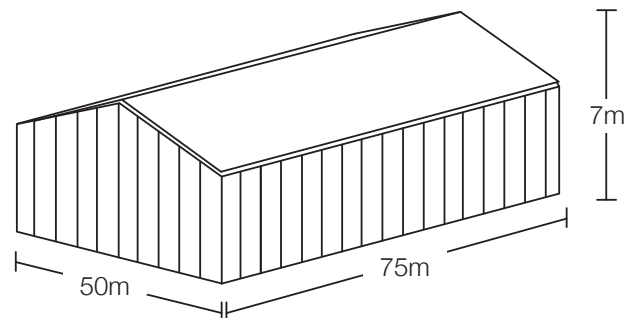
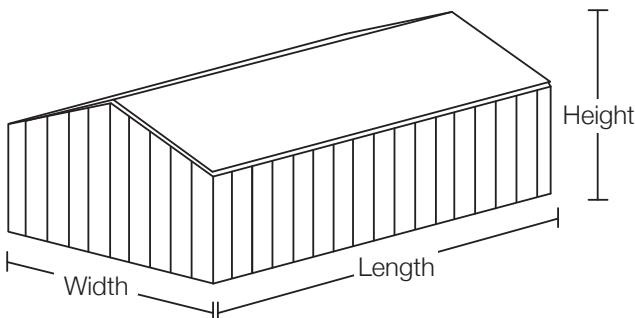
SDF250 AC

0.265m³/s. Applications up to 9m height.

3. Using the formula and rounding the number up, it shows 28 AC SDF250 fans would be required:

$$26,250 \div 3600 \div 0.265 = 27.52$$

Other Considerations: There are some instances where you may consider the 300mm unit for lower ceiling heights. For example, with a ceiling height of 8m in a warehouse that is not constantly occupied, or where racking system and overhead truck doors are evident, you would select the 300mm or EC model to have the option of delivering a higher volume of air at floor level. You would also select the 300mm model for applications where you want to use the fans for spot cooling. In a more constantly occupied space where your ceiling height is 9m or less, and higher air speeds might cause discomfort for the occupants, it's preferable to use the SDF200. Examples would be a grocery store or a car showroom. This would create less draught and still destratify the space effectively.



Building Services

Tel **+44 (0) 1384 275800**
Fax **+44 (0) 1384 275810**
Email **bs@eltafans.co.uk**

46 Third Avenue, Pensnett Trading Estate, Kingswinford,
West Midlands, DY6 7US United Kingdom

Applied Technology & Building Services Export

Tel **+44 (0) 1489 566500**
Fax **+44 (0) 1489 566555**
Email **at@eltafans.co.uk / export@eltafans.co.uk**

17 Barnes Wallis Road, Segensworth East Industrial Estate,
Fareham, Hampshire, PO15 5ST United Kingdom

eltafans.com



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