Flame/Shield

Adjustable Coated Baffle Grease Filter Cells

Features and Design Guide

Non grease loading adjustable coated baffles that restrict the passage of flame, provide continuous grease removal and permit air system balancing.

Choice of three filter unit sizes.

Assessment on fire performance undertaken by The Loss Prevention Council.

actionair

Dampers Controls Fancoils

Ruskin Air Management Limited
www.ruskinuk.co.uk

Introduction

Statistics indicate the large percentage of fires that occur in hotels, restaurants and similar locations actually start in the ventilating hood systems located adjacent to the cooking equipment.

Here we have all the ingredients for a potential fire – a heat source, flammable grease and moving air. Many fires are probably 'triggered' by the grease filtering equipment itself, and not necessarily dirty filters either, though this would more often be the case. Substantial quantities of grease can be accumulated within conventional corrugated metal mesh filters in a matter of hours and since these have a very low resistance, have little or no tendency towards 'holding back' a flame. As a result, when fire 'flare-up' occurs with a piece of cooking equipment, the flame from the 'flare-up' is immediately pulled through the conventional filter and ignites the accumulated grease in the filter and we have the heat source established for a grease duct fire.

Flame/Shield grease filters reduce this fire hazard with their unique design concept of non grease loading and strategic arrangement of overlap baffles to restrict the passage of flame into the ductwork.

They should be included in any newly designed hoods and incorporated in remodelled hoods. Flame/Shield grease filters play an important role in the overall effectiveness, hygiene and safety of the entire restaurant exhaust system.

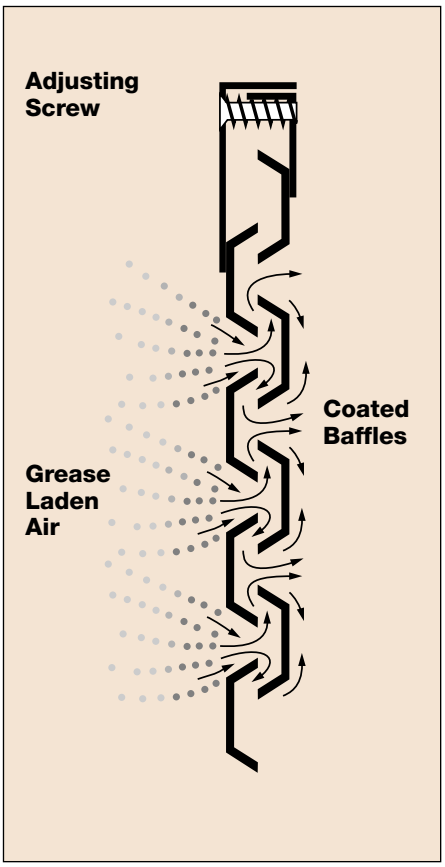
Since their introduction into Europe in 1974 there has never been a hood or duct fire reported where Flame/Shield grease filters are used.

Flame/Shield Grease Filter Cells

Perhaps no area of product design has suffered more from inattention over the years than the non-mechanical, apparently simple grease filter for use in restaurant exhaust hoods. The demands on a grease filter are straightforward. It should take the grease-laden air that rises from hot cooking fat, extract the grease particles, and pass the cleansed air into the exhaust system.

The traditional corrugated metal mesh grease filters will do that to some degree of cleanliness and efficiency. It is the nature of these conventional filters to trap the grease within the metal mesh. The longer in use, the more grease is trapped, and the less efficient they become. They must be thoroughly cleaned to regain efficiency. The unique design concept of the Flame/Shield grease filter overcomes these drawbacks plus having other important advantages. The basic principle begins, of course, with extraction of the grease; with the use of coated baffles, the extracted grease flows away into a trough, and to a removable grease collector.

The effluent from cooking processes consists of aerosols of water vapour mixed with evaporated fat or oil. These are carried from the cooking surface by the moving air being drawn into the exhaust hood. Although each aerosol is small, it is much heavier than the air molecules surrounding it. Thus, when the air stream containing these aerosols strikes the blank wall created by the Flame/Shield baffle system, the inertial force of the moisture-grease aerosol is considerably greater than that of the air molecule. While the air molecule changes direction easily, as shown in the diagram opposite, the aerosol strikes the baffle with considerable force, causing it to 'splatter' on the surface. Because this surface is coated, the grease slides down the baffle to the trough and thence to the collecting container. Whereas, the heaviest aerosols, because of their greater inertial force, impinge on the surfaces of the baffles facing and perpendicular to the air flow, the lighter ones remain in the air stream. As the air stream is drawn through the baffle system, as shown in the diagram above, the restrictions in area created by the baffles causes the air to increase in velocity while

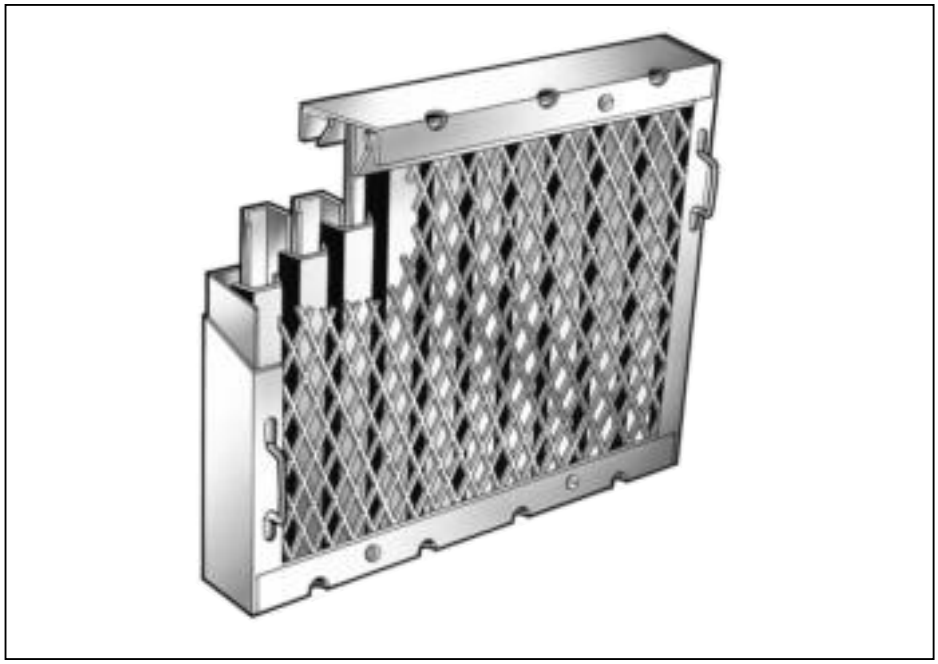


changing direction by 180°. Since the inertial force is a product of mass and the square of the velocity, this increase in velocity serves to increase the inertial force of the remaining smaller aerosols, causing them to impinge on the inner surfaces of the baffles in the same manner as the heavier aerosols impinged on the entering surfaces.

The design of the baffle system allows several impingement surfaces and two rapid 180° direction changes. Because Flame/Shield grease filters remove grease aerosols from the air stream and drain it away instead of retaining it, there is no build-up of grease in the path of the air. Flame/Shield grease filters therefore, ensure a constancy of air flow never before achievable with conventional metal mesh-type filters.

Adjustability

Flame/Shield grease filters have a unique feature: adjustable baffles that allow air system balancing regardless of where the filters are located relative to the exhaust fan. This will enable designers and operators to actually balance the ventilation required over various types of cooking equipment after the entire installation has been completed, allowing more exhaust where more is required, and less where less is required, to meet varying cooking conditions, and even more important, retaining the unbalanced condition once the Flame/Shield filters have been adjusted to create it.



Application Parameters

The key criterion determining ventilation requirements in most commercial kitchens and restaurants is the exhaust rate needed to provide 'capture velocity' for the various appliances. This refers to the air velocity required at a given point near the cooking surface that is required to entrain heat, vapour, mist, grease or smoke and odours in the ventilation air stream. Entrainment occurs as air flows near the appliance and exhausts through the hood. The following illustrates how velocities in the capture zone are necessarily lower than at the hood face and in practice it has been proven that a velocity of 0.152m/s along the edge of the cooking equipment would develop adequate capture.

The velocities, as shown on the following table, will ensure efficient removal of cooking contaminants.

Number of Exposed Sides	Air Velocity Across Area of Hood
4 canopy-island	0.761m/s
3 canopy-wall	0.507m/s
2 canopy-corner wall	0.507m/s
1 canopy-apron protected	0.507m/s

It is essential to place hoods above all roasting, grilling, frying, steaming and vapour producing appliances, and good practice to supply hoods for tea making equipment and boilers, to localise the escape of cooking odours and convected heat, and also to protect decor.

The dimensions of the base of the hood should be larger than the cooking surface it covers to adequately remove the contaminants generated in the cooking process. A general rule that has proved very satisfactory is summarised as follows: The length and width of the hood base should equal the overall dimension of the appliances it covers plus 300mm minimum overhang on each side of the equipment that is not enclosed by an apron or adjacent wall. The distance from the base of the hood to the cooking surface will normally be 900mm to 1200mm since the kitchen employees must work underneath the hood.

Excessive clearance between the cooking surface and hood hampers the effectiveness of the exhaust system and should be avoided.

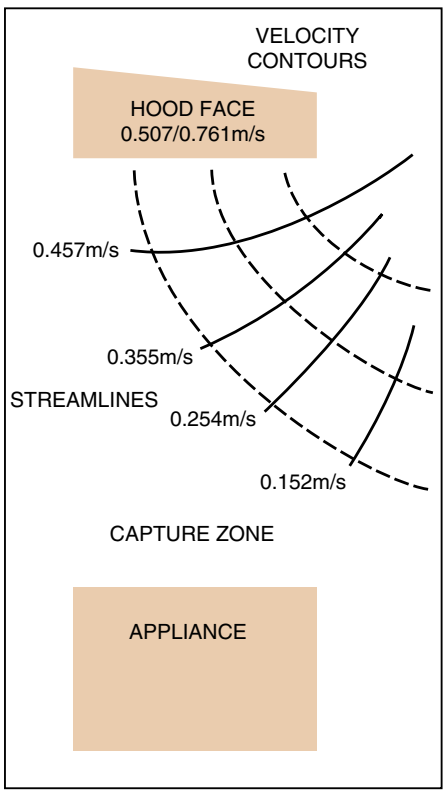
The hood itself must be deep enough to permit the installation of grease filters at a minimum 45° angle from the horizontal.

The minimum height from the cooking surface to the lower edge of the grease filter should not be less than:

a. No exposed flames – grills, french fryers, etc. – 750mm.

b. Exposed charcoal and charcoal type fires – 1350mm.

c. Exposed fires other than **b.** – 1100mm.



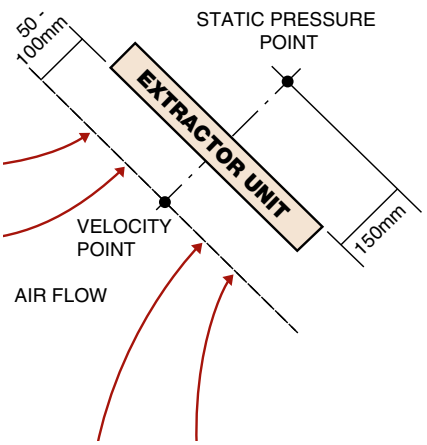
Selection

1.The information provided here will enable the designer to select, apply and efficiently use Flame/Shield grease filters. For optimum performance we recommend that selections and adjustments are only made from the shaded portions of the graphs.

2. All static pressures indicated are measured 150mm approximately behind the Flame/Shield filters and with the baffles in a fully open position.

3. The static pressure loss of conventional metal mesh grease filters should be based on their operational resistance under maximum recommended grease loading conditions; usually, at least, twice the initial resistance. Whereas, Flame/Shield filters, with their unique design concept of non grease loading and constancy of airflow characteristics, the initial resistance is also the operational resistance.

Standard Sizes



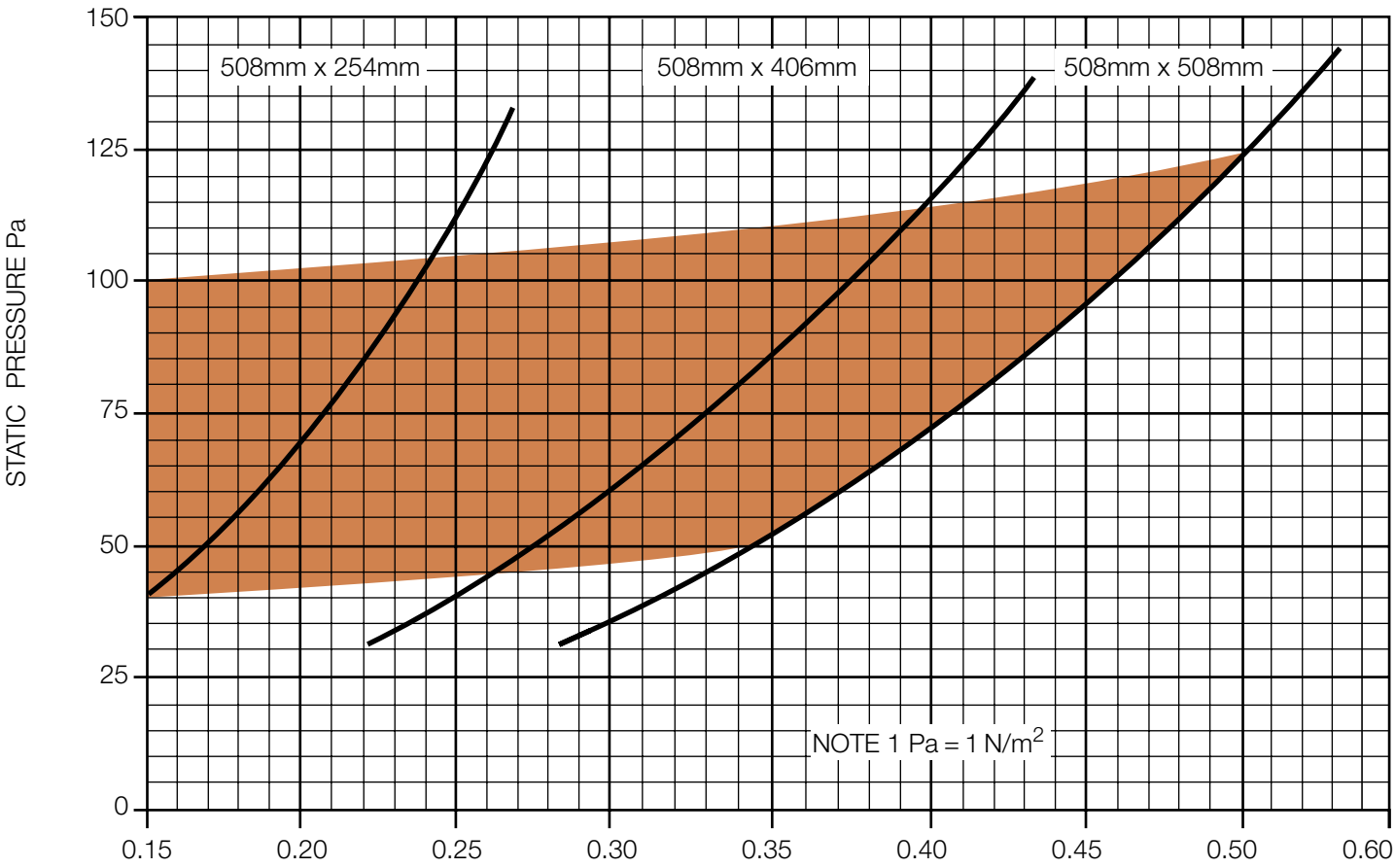
Nominal Size (mm) Width x Height x Depth	Actual Size (mm) Width x Height x Depth
508 x 254 x 50	495 x 241 x 48
508 x 406 x 50	495 x 394 x 48
508 x 508 x 50	495 x 495 x 48

Free Area (Inside Frame) Nominal		Weight (Kg) Cell Only
508 x 254	441 x 187	3.3
508 x 406	441 x 340	4.5
508 x 508	441 x 441	5.3

Regenerated Sound Power Level (dBW)

Unit Size in mm	Static Pressure in Pa	Frequency Hz 125	250	500	1k	2k	4k
508 x 254	50	45.5	46.0	43.0	42.0	40.5	22.0
508 x 254	100	52.5	53.5	52.5	52.5	52.0	36.5
508 x 406	50	45.5	46.5	44.5	44.0	43.5	27.0
508 x 406	110	51.0	52.5	52.0	52.0	52.5	39.0
508 x 508	50	45.5	46.5	45.5	44.0	43.5	26.5
508 x 508	120	52.5	55.0	54.5	53.0	54.0	50.5

Single Cell Air Capacity Data (Baffles Fully Open)

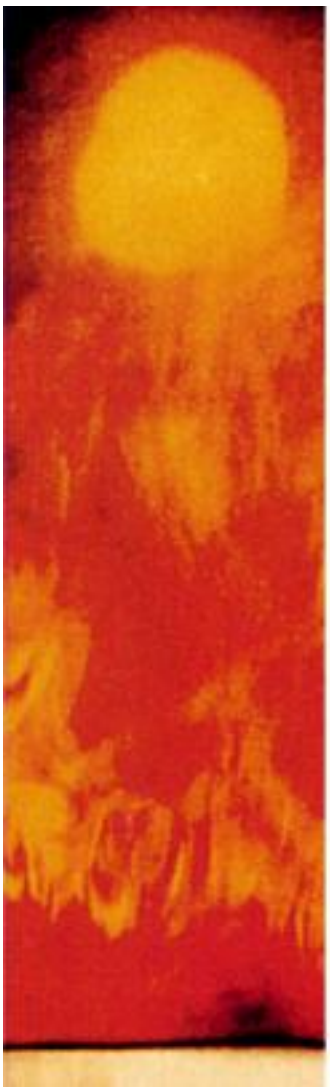


Performance Comparison

These photographs illustrate the difference between Flame/Shield Grease Filters and conventional mesh filters under fire conditions.
Here the fire has reached a maximum intensity of 1093°C.
Flame/Shield is intact while the conventional filter has burned through.
The fire has been tempered to show the gaping hole in the conventional filter which has allowed flame to race through the hole and three metres into the duct system.

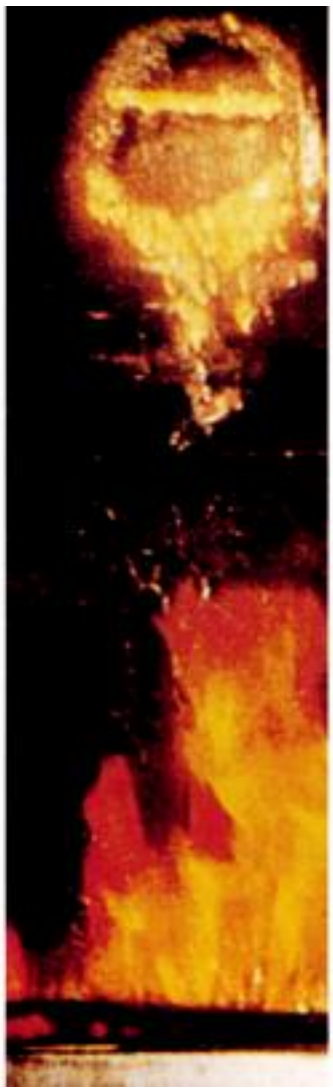
Flame/Shield confines fires to the cooking area. The photographs were taken using conventional metal mesh grease filters and Flame/Shield Grease Filters side by side.
Prior to the fire, 1.35Kg of cooking oil was evaporated through the system so that any grease accumulations on the conventional and Flame/Shield grease filters would be typical of a normal installation. The metal mesh filter collected grease particles, creating a dangerous fuel cell, which is easily ignited and can expand small cooking flare ups into catastrophes. The Flame/Shield Filter extracted the grease which ran-off to a container.
The fire was produced by 0.5 litre of oil poured into a shallow pan on a gas fired cooking appliance.
In the first picture, the fire has reached maximum intensity of 1093°C and the hot spot in the conventional metal mesh filter is very apparent with the Flame/Shield not being affected. In the second picture, a steel plate has been placed over the shallow pan containing the burning oil, so as to reduce the flames. A large hole has burned through the conventional filter and the Flame/Shield filter is still not affected.

The flames burning through the metal mesh filter caused a shower of molten metal to fall into the cooking appliance and area below. The flames then raced through the hole and upward into the duct system above the metal mesh filter for a distance of approximately 3 metres and observers also noted sparks being projected into the duct by the filter; no sparks were noted coming from the Flame/Shield filter.

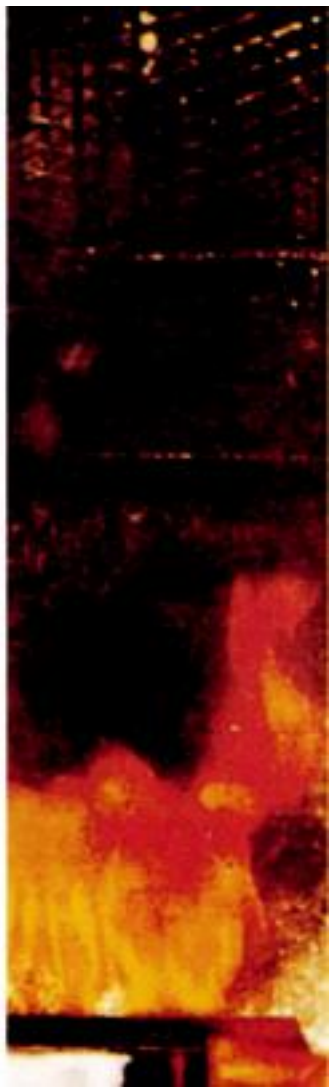


Mesh Filter

Flame/Shield



Mesh Filter



Flame/Shield

Specification

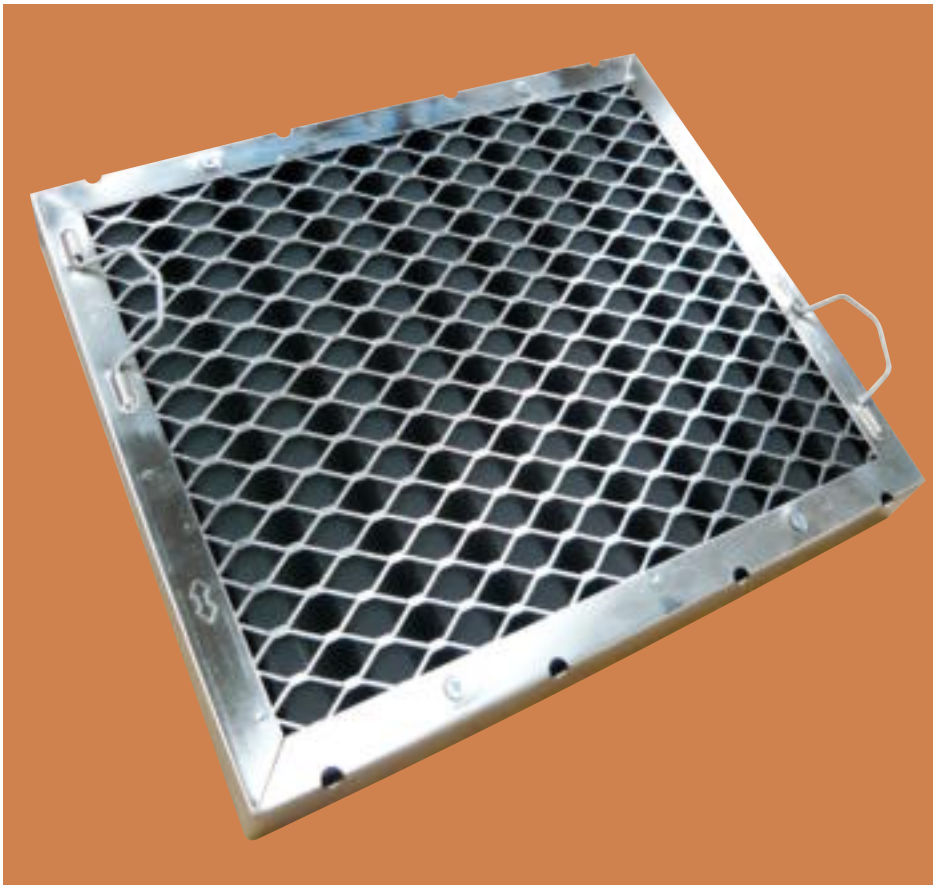
Flame/Shield adjustable coated baffle grease and casing assemblies shall be fixed where indicated and to the requirements of the relevant fire regulations the flame/shield grease filters shall have non grease loading and constancy of air flow characteristics and with a strategic arrangement of adjustable overlap baffles to restrict the passage of flame into ductwork.

Each filter shall comprise of a telescoping outside front and rear frame, containing weep holes for grease drainage, and welded to a protective face of expanded metal, all manufactured from nickel plated mild steel.

Two opposing baffle assemblies manufactured from Electroplated Zinc Steel and coated shall be mounted within the frames, reversed one to the other in staggered alignment and separated by four adjusting screws and springs holding the unit together to permit air flow regulation.

A pair of handles shall be provided on each filter cell for ease of removal and replacement.

The Flame/Shield grease filter cells shall be as supplied by ACTIONAIR.



Cleaning: Flame/Shield grease filter cells should be cleaned on a regular cycle basis relevant to site conditions, in a solution of hot water and household detergent – **Caustic Soda based solutions and/or Abrasives should never be used.**

Ordering Information

Example

Quantity	Series	Duty m^3/s / Cell	Size (mm)
4	Flame/Shield	0.35	508(W) x 508(H) x (D)50
Number of units required	Flame/Shield	Air Volume m^3/s	508 x 254 x 50 508 x 406 x 50 508 x 508 x 50

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company.

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