

Publication
GRILLES
section 1

PART A

MARCH 2013

Aluminium Grilles

supply, exhaust and transfer
ventilation systems

introduction and technical overview



Brooke Air[®]

Grilles

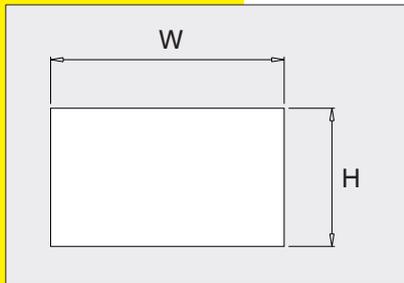
GENERAL INTRODUCTION

introduction

The range of grilles detailed in this literature have been developed by Brooke Air to satisfy the most demanding engineering requirements. The products are widely specified by Architects and Building Service Engineer interested in product quality, competitive pricing, performance and customer service.

description

Standard Brooke Air grilles follow the traditional market demand for aluminium louvred fabrications in square and rectangular formats. A variety of border and core styles can be configured to suit both architectural and functional requirements. In addition, Brooke Air can also offer products in stainless steel or brass. Special shapes such as circular, curved or triangular can be manufactured for most grille types to suit architectural features.



Grilles are conventionally ordered in sizes configured to the building aperture or duct size. This information should be provided in the form "width (mm) x height (mm)" so that blades run in the correct plane.

In general, grilles are fitted with a rear mounted opposed blade damper to allow site air flow regulation. If this is not practical for any reason, then an alternative solution is usually possible.

manufacture

Unless specifically indicated, the range of grilles and dampers are manufactured from purpose designed extruded aluminium sections to BS 1474 HE9 specification. Fabrication techniques include well proven mechanical corner cleating, welding, tube expansion and rivet / screw joints.

finish

Standard finish is natural anodised aluminium (AA5 micron) but a wide variety of optional finishes are also available including stove enamel, colour anodising, mill and primer coat.

fixings

The standard fixing method on most grille types is by countersunk screw through the flange, although various other methods such as concealed spring or backstrap are also available. Our fixed blade grilles easy removable core allows frame to be fixed prior to insertion of core.

Grilles

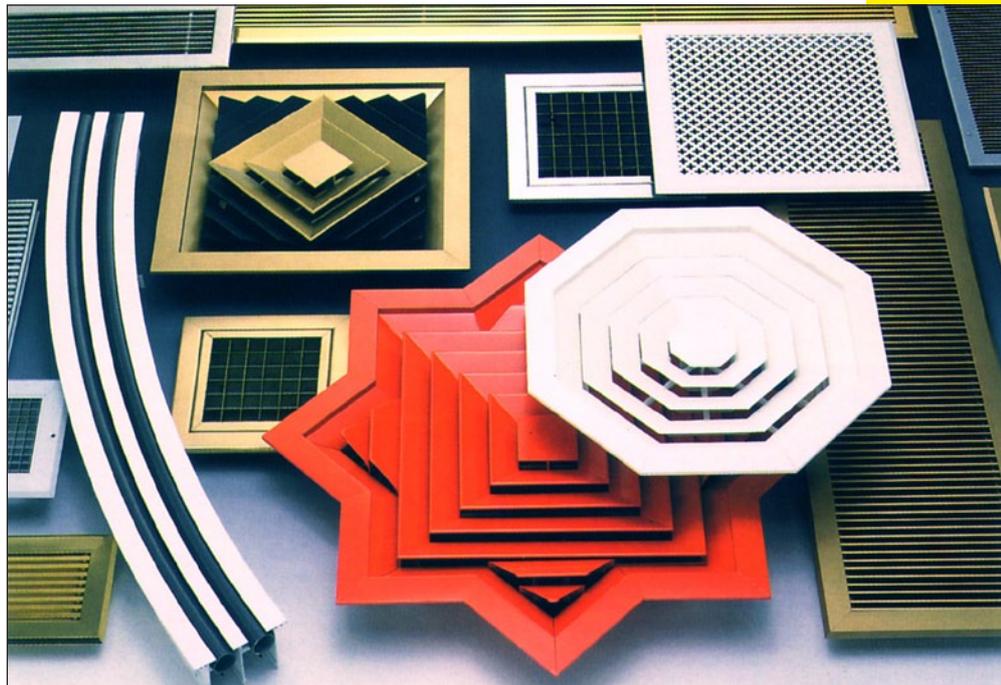
RANGE DESCRIPTION

The range includes grilles suitable specifically for supply, exhaust and transfer air ventilation systems, although considerable flexibility is possible in application. Grilles are generally selected for sidewall, cill and floor applications, but can also be installed in certain ceiling installations for supply and most exhaust air requirements.

The high quality and robust nature of the range makes it suitable for commercial, industrial and residential projects.

A variety of accessories are available including plenum boxes, dampers, air controls and many installation options.

applications



Grilles

AIR DIFFUSION PRINCIPLES AND PRODUCT SELECTION

introduction

Air Terminal devices, commonly known as grilles and diffusers, are used to supply or exhaust air from rooms in order to control the thermal environment. This may be to satisfy human thermal comfort criteria, as in the case of offices and other commercial buildings, or simply to offset heat loads generated by processes, equipment or plant.

The overall effectiveness of the conditioning system will be determined by the choice and selection of the air terminal device. We therefore recommend that advice is obtained from Brooke Air. If any doubt exists regarding the correct type and size of grille.

selection criteria

Air terminal devices are generally selected to satisfy one or more of the following criteria:

AIR JET THROW

ROOM AIR MOVEMENT

TEMPERATURE GRADIENT

MAXIMUM NOISE LEVEL

MAXIMUM PRESSURE LOSS

ARCHITECTURAL / INTEGRATION NEEDS

In some circumstances grilles will be selected entirely for aesthetic or integration reasons and possibly the location will be determined by similar architectural constraints.

selection principles

Wherever practical, conditioned air should be discharged outside the normally occupied zone so that the supply air jet can entrain and mix with the room air. This process ensures that when the original temperature differential is fully diffused the jet can enter the occupied zone without causing draughts or discomfort.

Supply outlets should ideally have adjustable vanes to control jet spread and direction as this will allow for refinements on site. Grille sizing and selection is generally optimised for the more critical cooling cycle although any application involving heating differentials over 10°C requires careful product selection to ensure adequate jet purging to low levels.

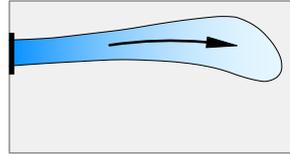
Selections based on terminal velocities in the range 0.3 - 0.6 m/s will generally result in room air movement in the range 0.11 - 0.25 m/s within the occupied zone.

Grilles

AIR DIFFUSION PRINCIPLES AND PRODUCT SELECTION

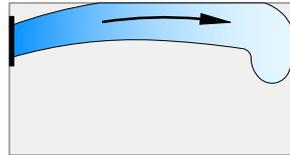
To assist with grille selections the following symbols are used as a guide throughout the catalogue.

Room air can be entrained from all sides of the jet resulting in a shorter throw. The jet should generally be more than 500mm from any surface to prevent attachment.



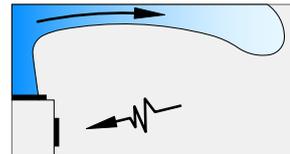
sidewall - free jet

Air is induced from below only, resulting in a longer throw. This arrangement is essential for cooling applications as the jet attachment is stabilised against the ceiling.



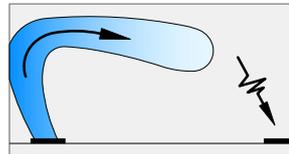
sidewall
ceiling effect jet

Air is directed vertically upwards and is made to attach to the ceiling. A perimeter zone of up to 6m deep can usually be conditioned by this method.



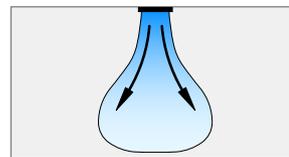
cill supply jet

Usually small, discreet floor outlets with a turbulent high induction affect for short throw. Outlet location must be carefully considered to avoid occupancy discomfort.



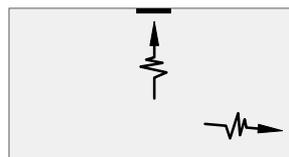
floor supply jet

Generally free jet applications with high ceilings where it is necessary to project warm air into the occupied zone or spot cool.



ceiling supply jet

Exhaust outlets do not generally affect room air movement produced by a supply grille. Air movement more than 500mm away from an exhaust grille will be very low, even with relatively high extract velocities. It is however usually helpful to exhaust air close to heat sources or pollution generators.

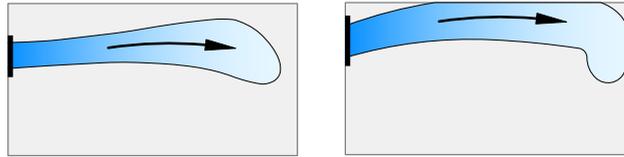


exhaust

throw corrections

The selection data shown for each product type will be presented with a specific basis as indicated on the nomograms. However, depending on the application, it may be necessary to correct for grille location, temperature differential or jet spread. The following general guidelines summarise the influence of application and installation on grille performance.

Throw corrections due to surface proximity.



$$\begin{aligned} \text{Free Jet} \times 1.4 &= \text{Surface Jet} \\ \text{Surface Jet} \times 0.7 &= \text{Free Jet} \end{aligned}$$

Throw corrections due to temperature differentials.

Throw data is presented in terms of isothermal or 10°C cooling conditions. Where necessary, the following corrections may be applied.

$$\begin{aligned} T_{\text{ISO}} &= T_{\text{IO cooling}} \times 1.1 \\ T_{\text{IO cooling}} &= T_{\text{ISO}} \times 0.9 \\ T_{\text{IO heating}} &= T_{\text{ISO}} \times 1.1 \end{aligned}$$

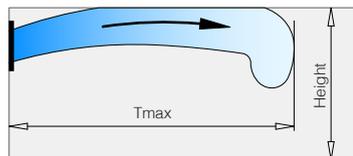
Throw corrections due to jet spread.

Where blade adjustment is used to spread air from small individual grilles, the following throw corrections should be applied.

Spread Angle	Throw Multiplier
0 deg	1.0
25 deg	0.75
45 deg	0.55

Maximum throw for grilles is in part determined by the mounting or ceiling height.

Max throw = T_{max}



Height (m)	2.5	2.7	3.0	3.5	4.0
T _{max}	2.5	3.5	4.8	6.5	9.0

Individual grilles using horizontal spreading vanes should be spaced so that jets do not interact until jet velocity is below 0.5m/s.

Grilles

GENERAL PERFORMANCE APPLICATION DATA

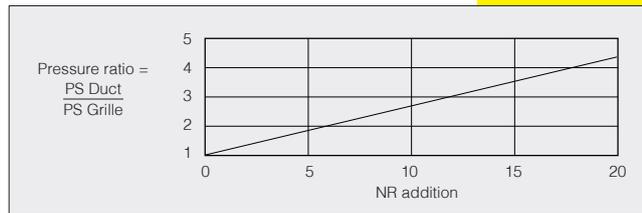
When fitted with an open damper noise levels will increase depending on grille size as follows (dB)

Height (mm)	Noise increase dB				
	width (mm)				
	100	200	400	700	1000
100	+10	+7	+4	+3	+2
200	+8	+5	+3	+2	+1
400	+6	+4	+2	+1	
700	+3	+2	+1		
1000	+2	+1			

grilles with dampers

Dampers mounted behind grilles are convenient for system balancing but can increase air noise levels if they are used to throttle excessive pressures. For example, the table below shows that if the duct pressure is double the grille pressure loss at the design air flow rate, the effect of throttling the excess pressure will be to increase the noise level by 6dB. Similarly, if the duct pressure is four times greater, then noise levels will be increased by 17dB.

damper throttling noise



Nomogram noise levels are presented in terms of The Noise Rating (NR) method, and are based on the sound power level of the grille less an allowance of 8dB for room absorption.

noise rating

Pressure loss data is based on the static pressure loss (Ps) of the grille with a normal ducted inlet or outlet.

pressure loss

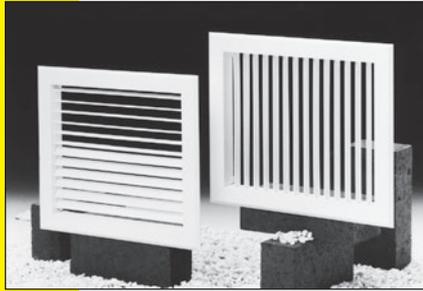
Except where stated otherwise, nomogram throws are based on a terminal jet velocity of 0.5 m/s. Where appropriate, correction factors can be applied for other terminal velocities as indicated on the nomograms.

throws

Selections based on terminal velocities in the range 0.3 - 0.6 m/s will generally result in average room air velocities of 0.1 - 0.25 m/s within the occupied zone, although ultimately, the uniformity of air movement will be dependant on factors such as grille position, ceiling profile and localised heat sources. If either of these are likely to present problems, then Brooke Air can offer advice on appropriate selections.

Grilles

RANGE SUMMARY



Adjustable Blade, Supply Air

type SD - DD
type HD / SD - HD / DD
type RCSD - RCDD
type CD
section B



Fixed Blade, Exhaust Air

type R
type E5C - EXP - PER
section C



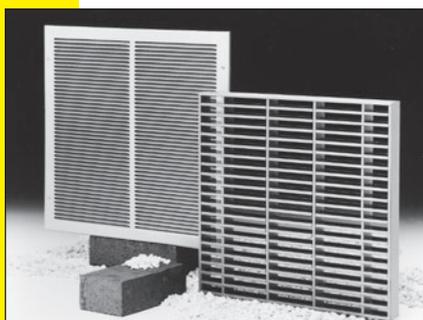
Continuous Linear, Supply / Exhaust Air

type FB - FN
section D



Cill and Floor, Supply / Exhaust Air

type FR / FB - F / FB
section E



Sight / Lightproof & Fireproof

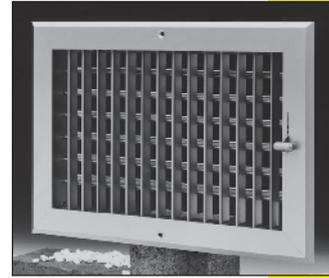
type TG - T / TG
type SG / BV60
section F

Grilles

RANGE SUMMARY

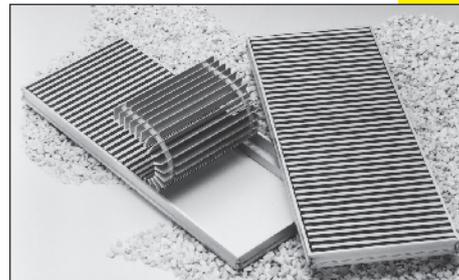
Domestic Grilles

type SDV / MD
type SDH / MD
section G



Rigidcore & Flexicore Grilles

type RGD
type FLX
section H



Spot Louvres

type SL
type SLD
section I



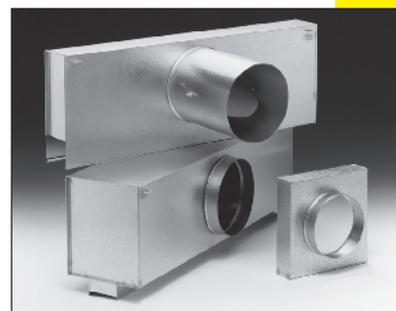
Flow Control / Equalisation & Pressure Regulating

type OB
type SV
section J



Plenum Boxes & Pan Adaptors

type PHB
type PBL
type PA
section K



Grille programme literature

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part G	Domestic Grilles.
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part K	Plenum Boxes & Pan Adaptors.
part L	Control / Frame / Fixing / Finish options & Jet Drop Characteristics.



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