What is the difference between Equivalent Area (EA) and Geometric Free Area?

The primary difference between Equivalent Area (EA) and geometric Free Area is that Equivalent Area is a measure of a ventilator's actual aerodynamic performance, while Free Area is simply a measure of its physical opening size. In the UK, particularly under the **Building Regulations Approved Document F (Ventilation)**, the **EA** is the required, more accurate metric for sizing background ventilators, such as **trickle vents**, because it reflects the true airflow efficiency.

Understanding the UK Ventilation Metrics: Equivalent Area vs. Geometric Free Area

When grappling with **Building Regulations Approved Document F** in the UK, particularly concerning **background ventilators** like **trickle vents**, you'll inevitably encounter two distinct, yet often confused, terms: **Equivalent Area (EA)** and **geometric Free Area**. As a responsible property developer or refurbisher, understanding the profound difference between these metrics isn't merely an academic exercise; it's essential for achieving compliance and, more importantly, ensuring genuine, effective ventilation.

Equivalent Area (EA): The Gold Standard for Airflow

The **EA** is the modern, scientifically sound metric for assessing a ventilator's performance. It acknowledges a fundamental truth: a hole's size is not the same as the air that can actually pass through it.

What Exactly is EA?

Equivalent Area is a measure of the **aerodynamic performance** of a ventilator. It factors in all the real-world impediments to airflow, such as the air friction and resistance created by the vent's internal components—think louvres, baffles, and vital insect screens.

- **Definition:** The EA is the theoretical cross-sectional area of a **perfect, sharp-edged circular orifice** that would allow the **exact same volume flow rate** of air to pass through it as the ventilator itself, under an **identical applied pressure difference**.
- **UK Standardisation:** In the UK, this performance is rigorously tested according to standards like **BS EN 13141-1**, typically at a pressure difference of **1 Pascal (Pa)**.
- **The Regulatory Imperative:** The current UK Building Regulations (Approved Document F: Volume 1 – Dwellings, 2021 edition) mandates that all background ventilators be sized using their **Equivalent Area**, often denoted as mm2 EA or mm2 EQA. This shift happened because EA provides a demonstrably more accurate indication of the airflow delivered to the room.

For new dwellings, the minimum requirements are clearly set in EA:

- **Habitable rooms** and **kitchens** must achieve a minimum of **8,000 mm2 EA**.
- **Bathrooms** have a slightly lower minimum requirement of **4,000 mm2 EA**.

Choosing a ventilator based on its **EA** therefore guarantees compliance and a minimum level of

necessary airflow to combat poor ventilation, damp, and mould.

Geometric Free Area: The Simpler, Less Accurate Measurement

The **geometric Free Area** is the older, simpler concept. It's what you might calculate with a ruler: the raw, physical size of the opening.

What is Geometric Free Area?

The **Free Area** is simply the **total unobstructed cross-sectional area** of the physical hole or aperture.

- **Definition:** It's measured in the plane where the cross-sectional area is smallest and at a right angle to the air direction. It's essentially the pure, unhindered physical space available.
- **Calculation:** You calculate it by multiplying the width and height of the hole and subtracting the physical area of any non-functional components, like the surrounding framework.
- **The Flaw in the Measure:** Critically, the **Free Area does not** take into account **aerodynamic drag**. It completely ignores the resistance and turbulence created by internal components such as baffles, grilles, or cowls. Therefore, a ventilator with a large geometric Free Area can still deliver poor airflow because of a convoluted internal design.

Why EA is Always Less Than Free Area

A universal rule in ventilation is that the **Equivalent Area will almost always be less than the geometric Free Area** for any practical ventilator (i.e., any product that isn't just a simple, perfect hole in a wall).

Think of it this way: the Free Area is the size of the road, but the EA is the actual number of cars that can get through it every minute. If you put speed bumps, traffic lights, and tight turns on that road (the louvres and baffles of a vent), the physical size of the road stays the same, but the traffic flow (the airflow) drops dramatically.

The relationship is governed by the **discharge coefficient (Cd)**, where EA is essentially Free Area multiplied by Cd. Since the discharge coefficient for a complex vent is typically well under 1, the **EA** is reduced.

Feature	Equivalent Area (EA)	Geometric Free Area
Measurement Focus	**Aerodynamic Performance** (Actual Airflow)	**Physical Aperture Size** (Geometric Space)
Airflow Resistance	**Accounts for** all internal resistance and turbulence.	**Ignores** internal resistance and turbulence.
UK Regulation Metric	**Required** for sizing background vents under Approved Document F.	An older, less accurate figure, generally insufficient for compliance.
Relationship	Always **less than** the Free Area (for a typical vent).	Always **greater than** the EA (for a typical vent).

The VENTI Perspective: Going Beyond the Hole

As a leading supplier of residential ventilation systems, VENTI's mission is to empower you to breathe freely. We champion **Equivalent Area** because we know that effective ventilation is the bedrock of a healthy home. Choosing a vent purely based on a large Free Area figure is a common,

yet critical, pitfall that can lead to inadequate air changes, leaving properties vulnerable to damp, condensation, and ultimately, mould growth.

For example, our continuous decentralised extract systems like the **ARIA** range or the ductless heat recovery units such as **FLUXO** and **AUREN** are designed to provide controlled, continuous, and measurable air movement that far surpasses the unpredictable, performance-sapping nature of a poorly specified trickle vent based on Free Area. These systems are about **enhanced air quality**—filtering pollutants and particulate matter—not just moving air around a blockage.

When specifying for retrofit or new build projects, always demand the **EA** figure from your supplier. This data is the only reliable metric to ensure that the ventilation capacity meets the specific requirements of the Building Regulations and, crucially, the actual needs of the occupants. A simple measurement of a hole just doesn’t cut it when it comes to healthy living.

Always insist on the Equivalent Area (EA) figure when specifying background ventilators to ensure regulatory compliance and guarantee genuine, effective airflow for a healthier home.