Percentage Free Open Area, Is it relevant to louvre performance?

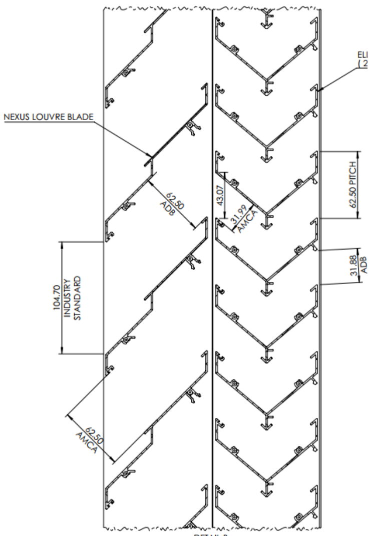
Although many commercial and industrial buildings require louvres, either for ventilation or simply as a vision screen, there is often insufficient consideration given to exactly what the system is required to achieve. This is particularly common when it comes to “Performance Louvres” and the need to exclude wind driven rain.

Ultimately, everyone wants 100% rain defence and 100% air flow. However, this is not always achievable and there is always be a compromise between the two performance factors. In Australia AS/NZS 4740:2000 sets out the test method and standard required for testing natural ventilators.

When specifying a louvre the information below must be taken into consideration.

Measuring ‘Percentage Free Open Area’

AMCA, ADB and ‘Industry Standard’ each of these ‘standards’ measure free open area differently so how do we know which is correct and is it even relevant to louvre performance?



Confused???

METHOD	SINGLE STAGE	2 STAGE
ADB	0.5	0.510
AMCA	0.5	0.511
INDUSTRY	0.837	.688

To add to the confusion, there are many varying terms and test data published by competing louvre manufacturers when describing louvre performance. Free area velocity, throat velocity and face velocity are a few of the many, making it unclear and difficult to compare like for like.

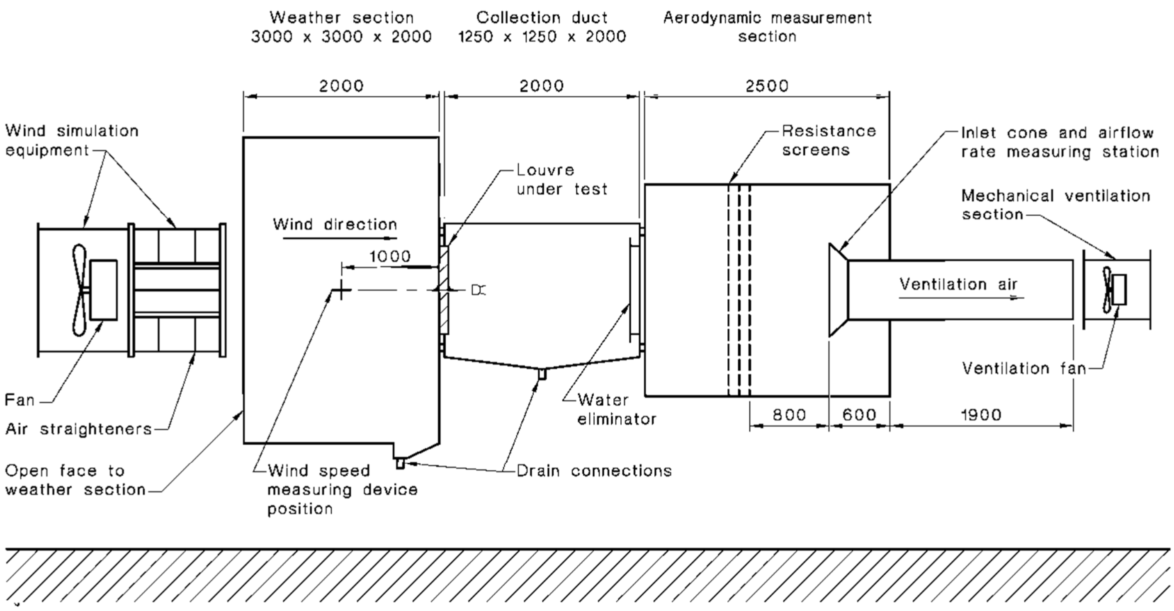
Without being a louvre expert, how do we ensure that what is calculated is accurate and beneficial to us when selecting the correct louvre?

No matter which of these methods you choose to use, not one of these take into consideration any specific air flow rate or pressure drop (Pa) unique to that louvre profile, nor do they consider the weather performance characteristics of the louvre. On this basis we can easily conclude that Percentage Free Open Area is not the most accurate way to measure louvre performance.

In order to accurately compare like with like, a louvre must be tested to the Australian standard, AS/NZS 4740:2000.

AS/NZS 4740-2000 sets out all the guidelines for performance testing and provides the classification system for natural ventilators. This method of testing and performance classification provides "comparative" performance data for both Rain Defence and Airflow, offering protection to the specifier and a clear guide to the contractor regarding` project requirements and performance expectations.

This test can be conducted as either a physical test or through Computational Fluid Dynamics (CFD). The AS/NZS 4740:2000 test requires the dimensions of the test louvre to be 1mx1m which is then tested to at least five different air velocities. From this we assess the effective aerodynamic area and the coefficient of discharge (Cd) for that louvre profile. For the rain defence test, the louvre panel is then subject to 75 L/hr m^2 of wind driven rain at a velocity of 13m/s.



Laboratory Set up as per AS/NZS 4740:2000

FIGURE B1 AERODYNAMIC WEATHER LOUVRE TEST FACILITY

Part 1: Louvre Rain Resistance Effectiveness (or Penetration Class)

This classification allocates the "Rain Resistance Effectiveness" Class of each weather louvre against water (rain) penetration. Each class covers a specific range and it can be seen from the table below that Class A is the highest rating achieving up to 99% effectiveness, which is significantly more effective than Class B below it:

Characteristic	Performance Level	Summary
Rain Resistance	Class A	1 to 0.99% effectiveness
	Class B	0.989 to 0.95% effectiveness
	Class C	0.949 to 0.80% effectiveness
	Class D	Below 0.80% effectiveness

NB: Louvre performance is dependent on the intake velocity. i.e. a Louvre may be class A with an intake velocity of 0m/s but at 3.5m/s it might be a D.

Part 2: Effective Aerodynamic Area Class

This classification rates the louvres ability to allow air to pass through it and is determined by establishing the Discharge Loss Coefficient (DLC) at various airflow velocities. Each class covers a specific range, as can be seen in the table below. The higher the DLC the less resistant to air the louvre is, with a DLC of 1 being ideal. In simple terms, a hole in the wall with no louvre would have a DLC of 0.7 or above depending on the size of the hole. This airflow class provides a guide for mechanical consultants and building designers on how the louvre performs at various ventilation rates, while the DLC figure is used to establish the correct actual area of louvre required.

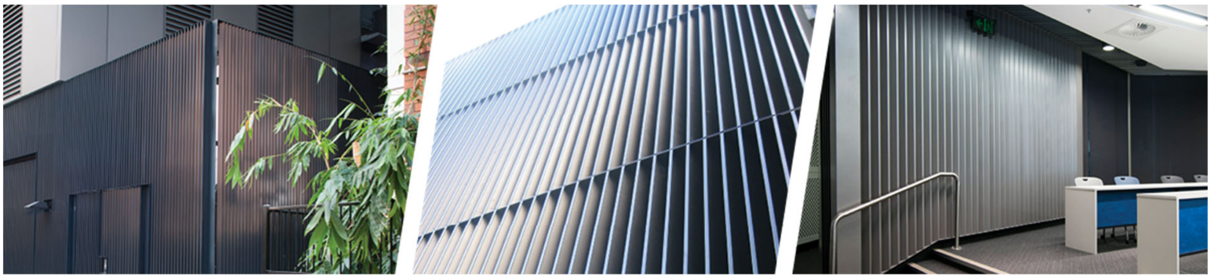
Characteristic	Performance Level	Summary Discharge Loss Coefficient (Cd)
Effective Aerodynamic Area	**Class 1**	Cd = 0.7 & Above
	Class 2	Cd = 0.5 to 0.699
	Class 3	Cd = 0.3 to 0.499
	Class 4	Cd = 0.1 to 0.299

Please note that although the test method used in the British Standard BS EN 13030 is the same, the parameters of the classification system are rather different when it comes to the aerodynamics. Please see table below.

BS EN 13030: Effective Aerodynamic Area Class

Characteristic	Performance Level	Summary Discharge Loss Coefficient (Cd)
Effective Aerodynamic Area	**Class 1**	Cd = 0.4 & Above
	Class 2	Cd = 0.3 to 0.399
	Class 3	Cd = 0.2 to 0.299
	Class 4	Cd = Below 0.2

As you can see, what may be a Class 1 according to BS EN 13030 would be Class 3 according to AS/NZS 4740:2000. Therefore, it is advised you check which standard the louvre has been tested to in order to fully understand the louvres performance.



We can now prove that the Percentage Free Open Area of a louvre is not the most accurate way to measure louvre performance.

To ensure you specify the right performance louvre for your project, you can use the following process:

1. Confirm that the louvre is tested to AS/NZS 4740:2000.
2. Mechanical engineer defines the required Volume Flow Rate (m3/s) for mechanical plant or passive ventilation.
3. Mechanical engineer defines the maximum allowable pressure drop (Pa) across a louvre before fan performance suffers.
4. The architect and engineer balance the louvre façade area (m^2) against the effective aerodynamic area of any louvre selections and the required rain resistance rating, to get a mutually workable outcome.
5. Specify the louvre that works for your design aesthetically while also achieving the performance Classification required for both Aerodynamics and Rain Defence.

   For example: Jupiter Series 2 Stage Louvre - Class A3

   (Example schedule available on draft specification)

For more information please call Louvreclad and one of the team will be happy to answer any further questions you may have.