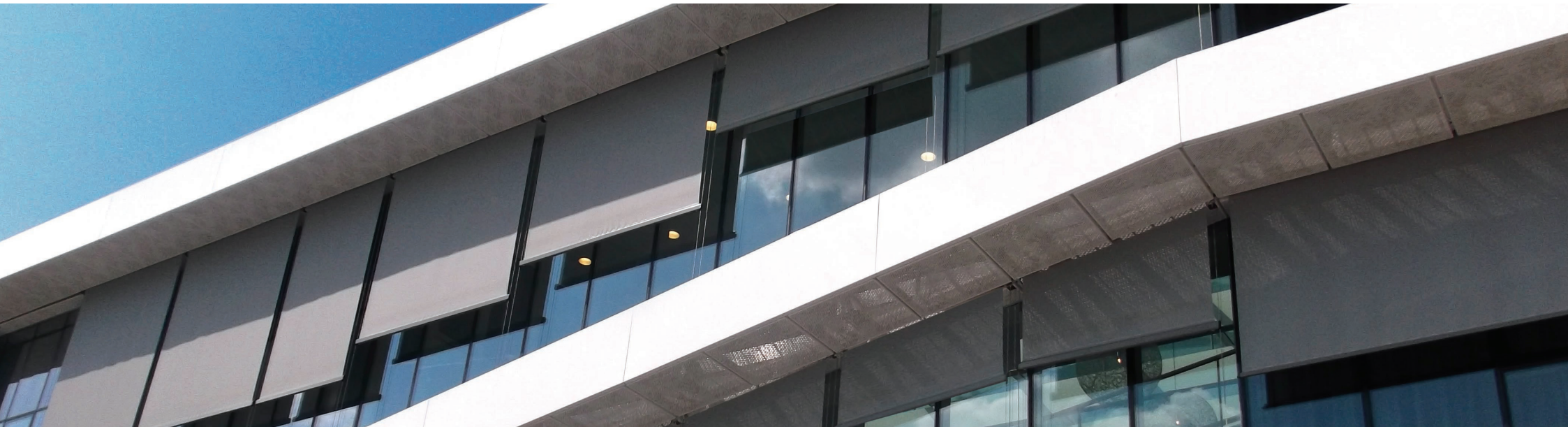


WIND RESISTANCE FOR EXTERNAL BLINDS

Guthrie Douglas



Ask any shading expert or building physicist for their advice on the best solution for reducing solar heat gain and they will immediately tell you to put the blinds on the outside.



External shading systems can reduce heat gain to almost zero, eliminate glare, and result in savings of more than some 65% on air conditioning costs. They remove the internal clutter of boxes or rollers around your windows, and can even provide insulation in winter. There is only one problem: the weather. For external systems to perform well, they must withstand precipitation, extreme temperatures and, most crucially, strong winds.

In recent years, thanks to the growing recognition of external blinds amongst specifiers, it has become harder to escape noisy sales messages about wind resistance and increasingly bold statements about wind speeds and product

thresholds. At European level, a number of interrelated and complex standards have now been harmonised or updated to regulate this area.

Here we unravel the red tape of the relevant product standards, cut through the marketing jargon and claims about wind resistance, and offer our top 4 tips for specifying wind-resistant external fabric shading.

Or, if you are less fascinated than we are in the finer details of wind speed analysis and performance testing, but have a project where it is relevant, let us do the analysis for you: projects@guthriedouglas.com.

THE WIND

The wind is a powerful force. Even modern wind turbines are designed to be switched off at 100 km/h. In fact, during high winds, wind farms are evacuated and nearby footpaths and roads are closed.

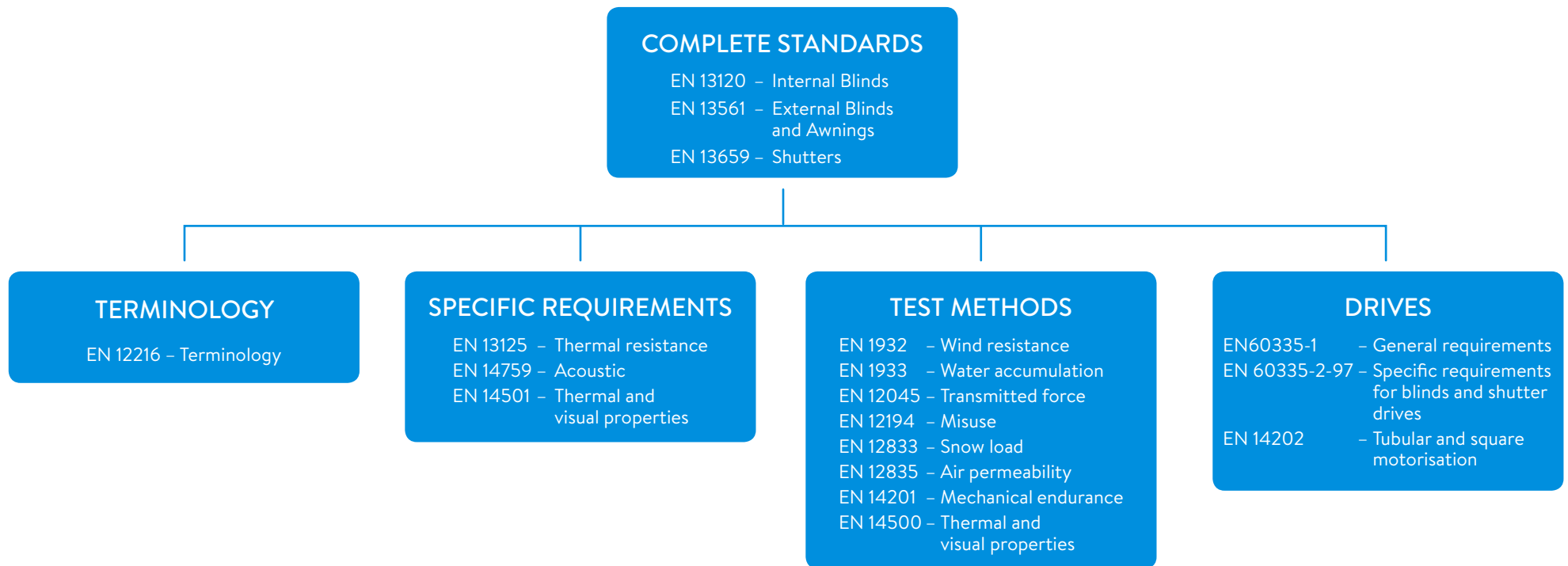
If this is the effect the wind can have on structures designed to harness its force, imagine its potential effects on a sheet of fabric attached to the side of a building. It is for good reason that external shading systems are therefore regulated by European Norms under the Construction Related Products regulations (CPR), with mandatory CE marking of these products introduced in June 2013.

Whilst it is crucial for architects and design teams to have an awareness of the key points when specifying shading solutions, the plethora of interrelated standards that regulate shading systems does not exactly make for light bedtime reading. Here we seek to demystify and summarise the critical considerations on wind resistance of shading systems.



THE STANDARDS

The collection of European standards which regulate shading systems are shown below [Source: BBSA]. These deal with a wide variety of important issues including user safety, aesthetics after repeated use, light and solar energy transmittance. Here we focus on the sections of EN13561:2015 that set out requirements for the operation of systems in climatic conditions, specifically wind resistance testing.





‘Nominal wind pressure’ is defined as the pressure that the blind can withstand and then continue to work correctly (referred to here as ‘working pressure’). ‘Safety pressure’ is defined as the force the blind can withstand without presenting a danger to bystanders.

Wind resistance is measured in pressure (N/m² or Pa), and classified as follows:

CLASS	1	2	3	4	5	6
NOMINAL WIND PRESSURE (N/M ²)	40	70	110	170	270	400
VELOCITY (M/S)	7.6	11.2	13.9	16.1	20.1	25.9
BEAUFORT SCALE	4	5	6	7	8	10

In Europe, product manufacturers must:

- CE mark external blinds to these classifications, or specify that they are not classified.
- Define a windspeed over which blinds must be retracted.
- Verify that non-retractable parts of their products can withstand 800 N/m² without deformation.



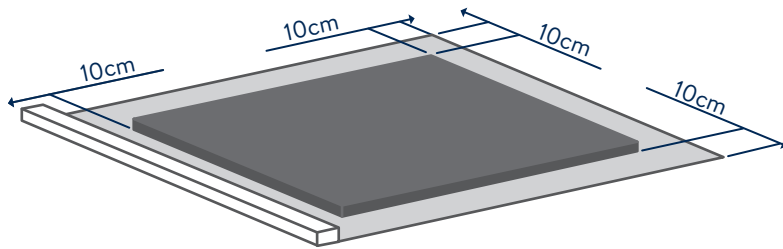
MARKETING CLAIMS

Wind class 6, the highest classification added to the standards in 2015, equates to level 10 on the Beaufort scale, described as 'seldom experienced on land. Trees uprooted. Significant structural damage'. Yet it is not uncommon for product manufacturers to claim that their blinds meet this classification. At its most extreme, some manufacturers will display blinds of over 20m² at trade shows and claim wind resistance of 130kph or even higher. To put this into context, the maximum windspeed on the Beaufort scale is 116 kph (level 12), at which point massive and widespread damage is inflicted on buildings.

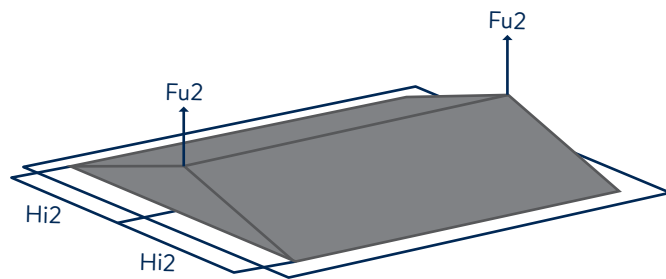
Given how implausible it seems for an external blind to remain fully functional when the building it is attached to has been devastated, how can design teams cut through such claims to reach a sensible and realistic specification?

To answer this question, it is necessary to understand how product manufacturers test for wind resistance, and how the subsequent product classifications are justified.

TEST METHODS



The mattress test



The bar test

EN12216 defines a blind as 'an awning with guide rails', distinguishing between those blinds where 'the hem bar and fabric are laterally guided' (referred to here as a 'zip screen'), and where 'only the bottom rail is guided' (a rail or cable guided blind, referred to here as a 'guided screen').

Test methods vary depending on product type. Two typical methods include the 'mattress test', used for most systems without tension, where a uniformly distributed load is applied

to a product by distributing weights equally on top of a 'mattress'; and the 'bar test', used for most tensioned screens, where a load is applied across one point of the system by pulling or pushing on it with a bar, and then releasing one end. Products are typically tested by applying gradually increasing pressure and observing when faults and ultimately total failure occur.

BACK TO REALITY

Whilst this type of regulated testing is necessary in order to establish a consistent framework that can serve as the basis for product standards, it has two significant limitations which limit the translation of test results into real world scenarios.

The first is that products are tested with static pressure and in a uniform direction. In the real world, turbulence and other factors mean that wind would apply unequal and constantly variable pressure across the fabric and the system. In reality, a product might not achieve a high wind classification when tested with static pressure, but could out-perform other products when faced with gusts of wind on the outside of a building, or a particular wind direction eg. as part of a partially open façade system.

The second limitation is the variation of the test methods and their interpretation according to system type. For example, in certain test conditions, venetian blinds can be 'framed' to support the structure of the guide system, and in many cases test results for smaller samples may be used to market larger products.

The combination of these limitations creates grey areas which can be exploited when test results move from engineering to marketing departments. Pressure testing in artificial conditions may be translated into statements about wind resistance which do not necessarily apply in the real world, despite the products having been correctly tested according to the standards.

In reality, shade material and product are exposed to dynamic and turbulent wind loading in the form of pressure and speed. Pressure testing to achieve a CE mark is relatively straightforward and easy to understand. Marketing messages which imply that systems have been tested to certain wind speeds can be misleading and should be interpreted with caution.



EFFECTIVE SPECIFICATION

Of course any commercial product manufacturer in any industry will present their products in the best possible light in relation to the standards, and this does not detract from external blinds as an extremely effective shading option for many projects, so how can design teams put forward a high performance, realistic specification?

1

USE THE STANDARDS

Ask for a product that meets all the relevant parts of EN13561, such as reliability cycle testing, not just the mandatory criteria. Product manufacturers should be able to submit product specifications that set out which elements of the standard are met, to suit the project. Rather than stating a specific required wind classification, state an expected typical windspeed for the project location, and ask contractors to respond with a proposed wind class for the product, taking into account the size of the systems, along with a proposed windspeed at which the shading systems will be automatically retracted. Wind class 2 or 3 along with a retract limit of 11-14 meters per second is usually sufficient in the UK.

2

DON'T JUST USE THE STANDARDS

Talk to a specialist shading engineer or technical product manufacturer early in the design process. They will apply the relevant parts of the standards and will help to narrow down the product selection to make sure that an effective product is specified, without ruling out innovative products that may not fit neatly into the classifications listed in the standards. They may choose to add wording to the specification to ensure that the end product can stand up to realistic, dynamic wind environments rather than simply the static pressure test levels in the standard, and they should be able to suggest special measures that can be taken to increase the wind resistance of products if necessary.

3

CONSIDER A TENSIONED SYSTEM

Whilst tensioned blinds are inherently stronger than standard external systems, this is not necessarily reflected in the wind classification, because in many cases the test methods are not appropriate for this type of specialist system. They have the additional benefit of flexibility, using engineered springs to dampen the effect of the wind, adapt to changing wind conditions, and prevent overloading in strong winds or gusty environments. They are often used to cover entire facades in exposed locations, where the client wants to minimise fabric movement in windy conditions, or for the upper floors of projects where standard systems are acceptable for the more protected floors below.

4

SEEING IS BELIEVING

Ask to see long standing examples of the proposed product in use in a number of different environments, and the details of their maintenance regimes. If you can spare the time, go and see an existing project. Standards and test methods play a useful role in regulating the shading industry, but there is no better proof of reliability and effectiveness than reality.

We are a team of specialist engineers with the sole focus of creating technical shading systems for extraordinary spaces. We collaborate with designers who share our love of inspirational and sustainable architecture.

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