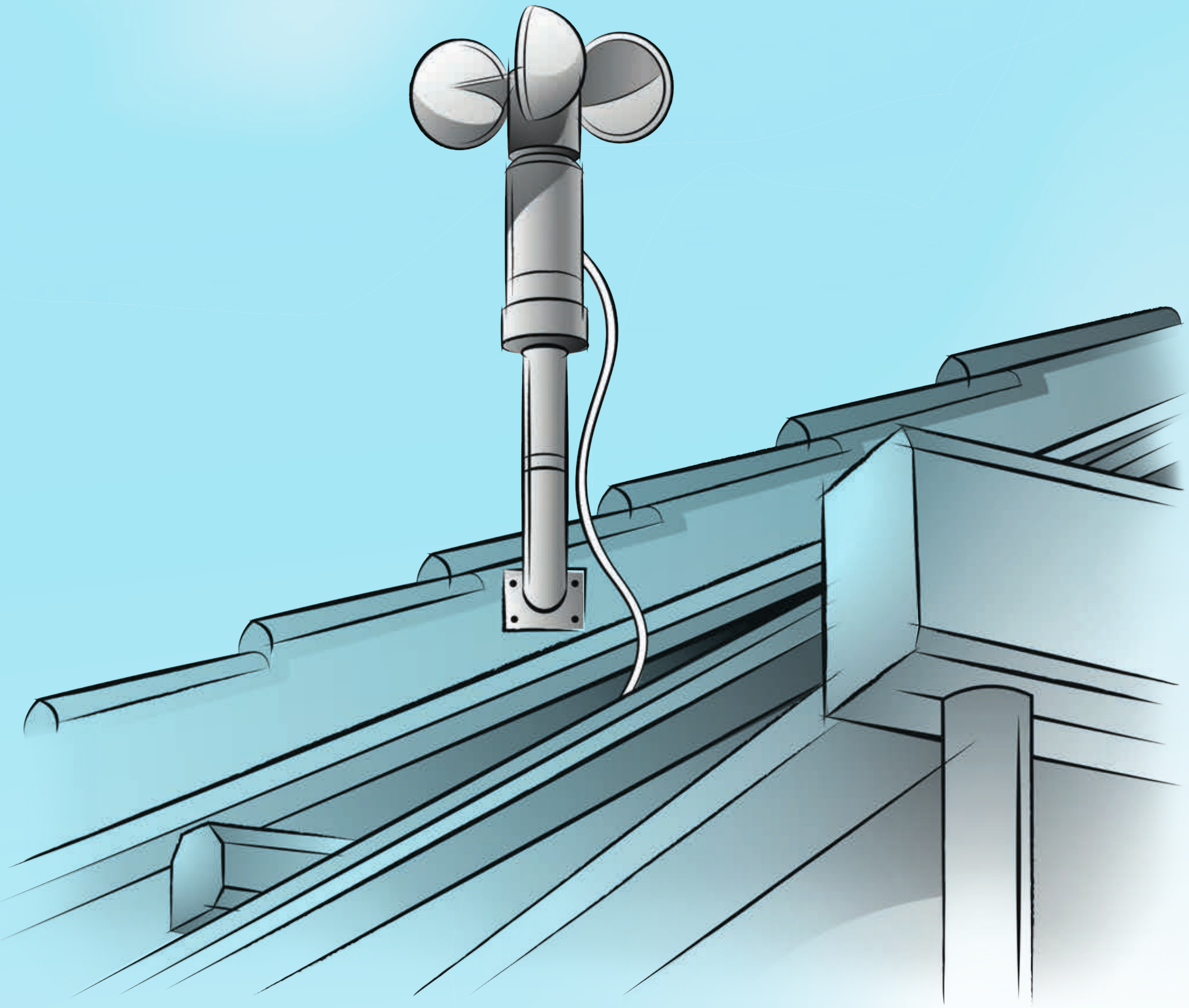
Guideline

for the use of wind monitors



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1. Foreword

The control of exterior sunblind systems under the influence of wind is an important aspect in the planning and implementation of buildings. In this context, wind monitors are important, tried-and-tested products that ensure the longest possible service life for sunblind systems in relation to the applicable wind speeds and thus also contribute to the conservation of energy.

This guideline will provide a basis for specialist dealers and fitters as they advise the user on product quality, technical limits and product-specific characteristics.

It will assist experts in evaluating the suitability limits of wind monitors. In addition, it should help prevent disputes and differences of opinion.

This guideline is therefore intended for planners, manufacturers, dealers, installation companies, electricians, users and operating companies.

We are especially grateful to Wacker Ingenieure GmbH, 75217 Birkenfeld, Germany www.wacker-ingenieure.de, without whose know-how and advice this guideline could not have been created.

WACKER INGENIEURE
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2. Basic principles

Wind monitors are designed to send a signal to move the sunblind systems to their protected position when excessive levels of wind occur. To enable the wind monitor to fulfil this task, it is necessary to choose an installation position that ensures that the wind monitor is exposed to exactly the same wind conditions as the sunblind systems. Alternatively, knowledge of the factor for converting the wind speed/wind direction on the wind monitor to the wind speed on the sunblind is enough to control the sunblind. Wind monitors are very often used in combination with a sun sensor. Another version is the combination of wind monitor/sun sensor/rain sensor.

Below we describe the three most commonly used wind monitor systems:

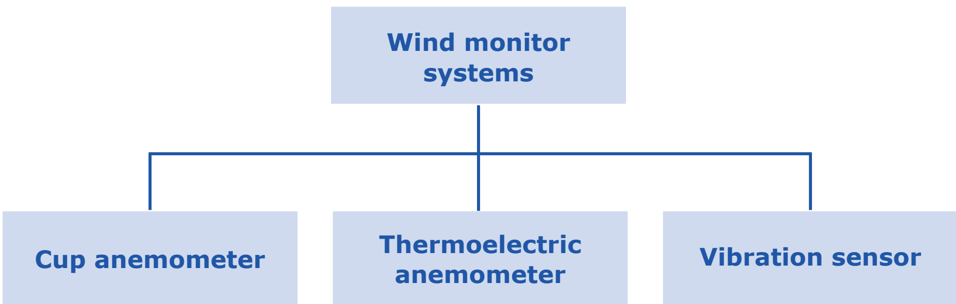


Fig.1

2.1 Cup anemometer

Design
The wind monitor is equipped with a cup with rotating bearings to which three vanes are attached. The inside of the cup is fitted with magnets. A reed switch is attached in such a way that the contact opens briefly when the magnets are guided past.

Functional principle
The cup moves at different speeds, depending on the wind levels.
The faster the cup turns, the more often it interrupts the reed contact – this is referred to as the switching rate. This switching rate is evaluated by a control unit. If the switching rate exceeds the set threshold value, a safety movement takes place.

Fig.2

Advantages:	Highly robust, tried-and-tested technology
Disadvantages:	Updrafts and downslope winds are not detected.
Areas of application:	Individual systems, group systems
Installation location:	Facade, roof
Measuring range:	Wind force 0-12 (depending on the version)
Versions:	Wire-connected, radio technology
Special versions:	Heated (supply voltage required)
Supply voltage:	Without, extra-low and low voltage, solar, battery
Signal/data transmission:	Wire-connected, radio
Inspection:	Annual visual inspection and function test (before the start of the season in case of seasonal use) and after special weather conditions, e.g. hail, storm
Maintenance/care:	Solar-powered wind monitor, annual cleaning of the solar panels, battery replacement
Environmental influences:	The manufacturer's specifications must be observed in this context.

2.2 Thermoelectric anemometer

Design
The wind monitor is equipped with a sensor that is permanently exposed to the wind. The inside of the housing contains an electronic system that processes the values from the sensor. The wind monitor has no moving parts.

Functional principle
The sensor changes its resistance in dependence on wind speed; the more wind there is, the more the value of the resistance changes. The electronic system constantly evaluates this value and compares it to a pre-set threshold value. When this value is exceeded, a safety movement takes place.

Fig.3

Advantages:	No wear of mechanical parts. Depending on the design, updrafts and downslope winds can be detected.
Disadvantages:	Requires a voltage supply, therefore low energy requirements
Areas of application:	Individual systems, group systems
Installation location:	Facade, roof
Measuring range:	Wind force 0-12 (depending on the version)
Supply voltage:	Extra-low and low voltage, solar, battery
Signal/data transmission:	Wire-connected, radio
Inspection:	Annual visual inspection and function test (before the start of the season in case of seasonal use) and after special weather conditions, e.g. hail, storm
Maintenance/care:	Annual cleaning
Environmental influences:	The manufacturer’s specifications must be observed in this context.

2.3 Vibration sensor

Design
The wind monitor is fitted with a sensor with or without additional incline detection, which constantly registers movements. It also contains an electronic system that processes the values from the sensor. The wind monitor has no moving parts.

Functional principle
The wind monitor is installed on the bottom rail of an extending-arm awning. If the bottom rail begins to vibrate or change its inclination, this is detected by the sensor and evaluated by the electronic system. When a set threshold value is exceeded, a safety movement takes place.

Advantages:	Direct measurement on the system
Disadvantages:	Only for extending-arm awnings
Areas of application:	Single systems
Measuring range:	Wind force 2-8 (system-specific adjustment required)
Versions:	Radio technology
Supply voltage:	Battery
Inspection:	Annual visual inspection and function test (before the start of the season in case of seasonal use)
Maintenance/care:	Battery replacement
Environmental influences:	The manufacturer’s specifications must be observed in this context.

3. Guidelines, standards, insurance

3.1 General information

The wind load on specific sections of a building or on individual sections is determined by the pressure coefficient Cp. The Cp value is determined from the difference between the internal pressure cpi and the external pressure cpe on the building or individual sections. In the case of sections that are permeable by air, the internal pressure cpi increases and thus reduces the Cp value. It should be noted that there is no preferred or main wind direction in Germany. Buildings and their parts must thus, as a rule, be designed to suit the most unfavourable case.

3.2 Special conditions for external Venetian blinds

In the case of external Venetian blinds, the value for Cp can fluctuate widely due to the dynamic movements of the blinds. For this reason, defining a wind speed based on static pressure that the external Venetian blind can withstand is not a suitable basis for assessment.
This essential definition is provided in Appendix A of DIN EN 13659. The ground and the distance from the facade/altitude/corner situation also affect the maximum possible wind speed and are not considered in the standard (DIN EN 1932:2013-09 External blinds and shutters - Resistance to wind loads - Method of testing and performance criteria), even though these factors have a significant impact on the wind resistance of the product.
DIN EN 1932 (8.2.3 Arrangement and dimensions of the test pieces) describes the test with the help of a defined reference value. (2,000 mm*2,500 mm) and a defined static pressure. This means it is hardly possible to apply the tested wind class (DIN EN 13659 Table 1 — Wind resistance classes) to diverging products even according to product standard DIN EN 13659. As a result, it is necessary to draw up application recommendations for the products (external Venetian blind) in order to enable the products to be deployed professionally.
Wind speeds are given in m/s in the following application recommendations.

Application recommendation for flat slats, rope-guided

Flat slat, rope-guided									
	Width								
Height	1000	1500	2000	2500	3000	3500	4000	4500	5000
1000	17	17	13	13	13	10	10	10	10
1500	17	17	13	13	13	10	10	10	10
2000	17	17	13	13	13	10	10	10	10
2500	17	13	13	13	10	10	10	10	10
3000	13	13	13	10	10	10	8	8	8
3500	13	13	10	10	10	8	8	8	8
4000	13	10	10	10	8	8	8	8	8
4500	10	10	10	8	8	8	5	5	5
5000	10	10	8	8	8	5	5	5	5
Given in m/s									

Table 1

Application recommendation for flat slats, rail-guided

Flat slat, rail-guided									
	Width								
Height	1000	1500	2000	2500	3000	3500	4000	4500	5000
1000	17	17	13	13	13	10	10	10	10
1500	17	17	13	13	13	10	10	10	10
2000	17	17	13	13	13	10	10	10	10
2500	17	17	13	13	13	10	10	10	10
3000	17	17	13	13	13	10	10	10	8
3500	17	17	13	13	13	10	10	10	8
4000	17	13	13	13	10	10	10	8	8
4500	13	13	13	10	10	10	8	8	8
5000	10	10	10	10	10	8	8	8	8
Given in m/s									

Table 2

Application recommendation for slats flanged on both sides, rope-guided

Slat flanged on both sides, rope-guided									
	Width								
Height	1000	1500	2000	2500	3000	3500	4000	4500	5000
1000	17	17	17	13	13	13	13	13	13
1500	17	17	17	13	13	13	13	13	10
2000	17	17	17	13	13	13	13	13	10
2500	17	17	13	13	10	10	10	10	10
3000	13	13	13	10	10	10	8	8	8
3500	13	13	10	10	10	8	8	8	8
4000	13	10	10	10	8	8	8	8	8
4500	10	10	10	8	8	8	5	5	5
5000	10	10	8	8	8	5	5	5	5
Given in m/s									

Table 3

Application recommendation for slats flanged on both sides, rail-guided

Slat flanged on both sides, rail-guided									
	Width								
Height	1000	1500	2000	2500	3000	3500	4000	4500	5000
1000	17	17	17	17	17	17	17	17	17
1500	17	17	17	17	17	13	13	13	13
2000	17	17	17	17	17	13	13	13	13
2500	17	17	17	17	17	13	13	13	13
3000	17	17	17	17	17	13	13	13	13
3500	17	17	17	13	13	13	13	13	10
4000	17	17	17	13	13	13	13	10	10
4500	17	17	17	13	13	13	10	10	10
5000	13	13	13	13	13	10	10	10	10
Given in m/s									

Table 4

3.3 Special conditions for awnings with fabric guided in side rails (ZIP)

The wind classes as per DIN EN 13561 do not allow conclusions to be drawn on the suitability (retracting/extending, interim positions) under an actual wind load. Therefore the manufacturer must define the maximum speed above which the awning must be retracted, with reference to the reduction ratios shown in the table. This wind speed must be specified in the technical documentation (e.g. operating manual). The conditions that must be met in order to fulfil the performance requirement are based on static loads and do not consider the dynamic effects of repeatedly applied loads (turbulences) that the fabric and frame are exposed to during actual use. It is therefore not possible to consult the static pressure in order to determine how the awnings should be anchored to the building. The ground and the distance from the facade/altitude/corner situation also affect the maximum possible wind speed and are not considered in the standard (DIN EN 1932:2013-09 External blinds and shutters - Resistance to wind loads - Method of testing and performance criteria), even though these factors have a significant impact on the wind resistance of the product.

Awnings with fabric guided in side rails

	Width										
Height	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
1000	24	24	24	24	21	21	21	21	21	17	17
1500	24	24	24	21	21	17	17	17	17	17	17
2000	24	24	21	21	17	17	13	13	13	13	13
2500	24	21	21	17	17	13	13	13	13	13	13
3000	24	21	17	17	13	13	13	13	13	13	10
3500	21	17	17	13	13	13	13	13	10	10	10
4000	21	17	13	13	13	13	13	10	10	10	10
4500	21	17	13	13	13	13	10	10	10	10	10
5000	21	17	13	13	13	10	10	10	10	10	10
5500	21	17	13	13	13	10	10	10	10	10	10
6000	21	17	13	13	10	10	10	10	10	10	10
Given in m/s Maximum speed for suitability											

Table 5

Levels						
24	21	17	13	10	7	4

Table 5 is only valid for a fabric distance < 100 mm from the glass surface.

The table values can be increased in the following cases:

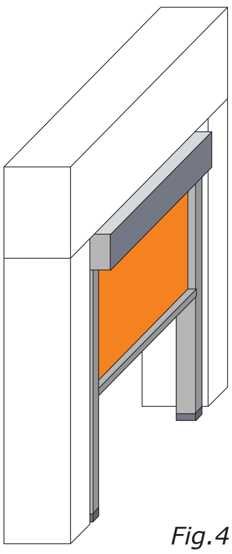


Fig.4

- In case of standard installation, the table value can be increased to the next higher table value (e.g. from 10 to 13; maximum value 24 m/s), up to a maximum width of 3,000 mm and a maximum altitude of 3,000 mm.

In the following cases, the table values must be reduced:

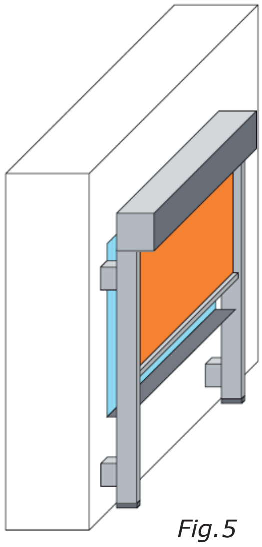


Fig.5

- For a blind distance > 100 mm ≤ 200 mm from the glass surface, the table value must be reduced by 2 levels (e.g. from 24 m/s to 17 m/s).

- For a blind distance > 200 mm ≤ 300 mm from the glass surface, the table value must be reduced by 3 levels (e.g. from 24 m/s to 13 m/s).

The table must not be applied if distances are larger or for free-standing systems.

In addition, the manufacturer's specifications must always be observed (e.g. number of guide rail holders, case mounting, guide rail mounting, professional installation with consideration of the tolerances). Deviations due to the installation situation may be possible after consultation with the manufacturer.

3.4 Insurance

The limit above which the insurer can pay for the storm damage lies at **wind force 8**. On the one hand, insurers base their claim adjustment on the information and observations provided by the Deutscher Wetterdienst (German Weather Service), and on the other, the typical storm damage in the neighbourhood is used to evaluate the gale force.

3.5 Effects of winds of force of 8 to 12 on land

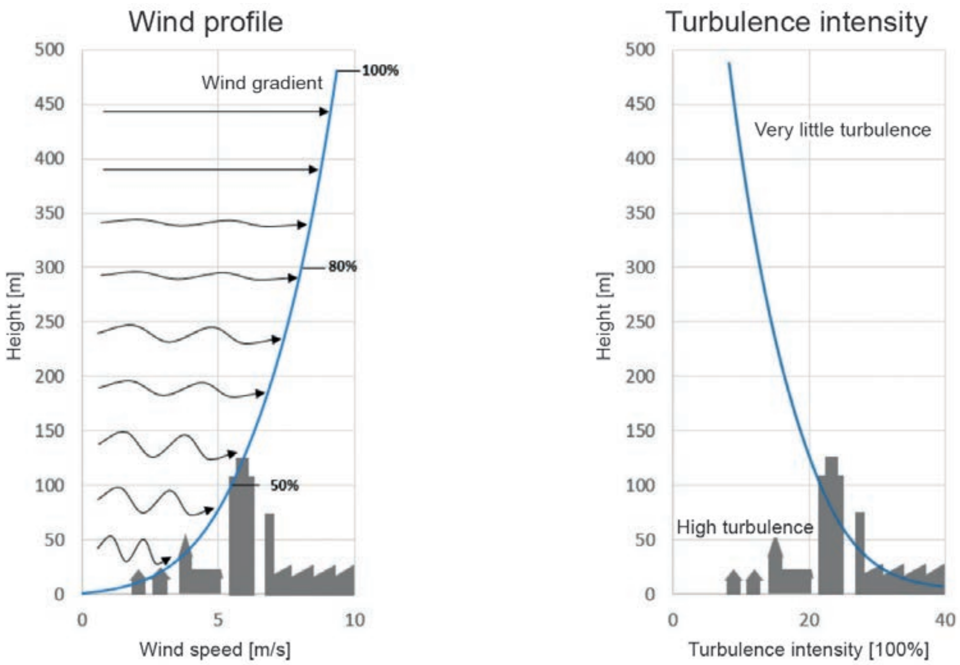
Wind force	Designation	Wind speed	Effects on land
8	Gale; fresh gale	62-74 km/h	• Large trees move. • Window shutters are opened. • Branches break off trees. • Pedestrians are severely impeded.
9	Strong/se-vere gale	75-88 km/h	• Limbs break off trees. • Minor damage to houses is possible. • Roofing tiles and chimney covers are lifted. • Garden furniture is thrown over and blown away. • Pedestrians are considerably impeded.
10	Storm, whole gale	89-102 km/h	• Trees are knocked over and uprooted. • Major damage to houses
11	Violent storm	103-117 km/h	• Violent gusts • Trees are knocked over and uprooted over large areas • Severe storm damage to houses • Unroofed houses • Cars are thrown from their lanes. • It is no longer possible to walk.
12	Hurricane force	from 118 km/h	• Very severe and wide-spread devastation of woods and buildings

Table 6 (source: Deutscher Wetterdienst)

4. Fluid mechanics

4.1 Characteristic of the wind (turbulence)

In meteorology, the term wind refers to air movements that are mainly the result of spatial pressure differences. In the area close to the ground, the air molecules stream from high pressure areas to low pressure areas. The wind flow is not uniform here, but rather depends on the levels of various characteristics. Fig. 6 shows a typical qualitative altitude-dependent progression of the wind speed of an atmospheric boundary layer flow (atmospheric boundary layer flow = wind flow in the area close to the ground up to an altitude of approx. 300 m to 400 m). In addition, the turbulence intensity (as a measure of turbulence) of the wind above the altitude is applied on the right.
Fig. 6 shows that the wind speed increases as the altitude increases, and that simultaneously the turbulence intensity of the wind decreases as the altitude increases. The wind flow in the area close to the ground is characterised by strong turbulence, which means strong speed fluctuations. As the altitude increases, the wind flow becomes more uniform and the wind speed increases.



➜ Average wind speed increases as the altitude increases
➜ Wind speed increases quickly in the lower altitude range

➜ Turbulence intensity decreases as the altitude increases
➜ The area close to the ground has strong turbulences

Fig. 6: Qualitative altitude-dependent development of the average wind speed (left) and turbulence intensity (right) of an atmospheric boundary layer flow

4.2 Circulation around the building

Buildings represent an obstacle to free and unimpeded wind flow. When wind strikes a building, it is displaced, deflected, accelerated or slowed by that building. As a result, various circulation effects result on the building itself and in the vicinity of the building. These can be made visible in a wind tunnel by means of smoke tests and are outlined in Fig. 6.1. The figures demonstrate the following effects:

1) **Stagnation area of the wind flow (stagnation point):** The flow strikes the building's facade frontally (at more or less a right angle) and is slowed heavily in the process. The maximum wind pressure and minimum wind speed on the facade occur at around 80% of the building's height (this applies to higher buildings against which the wind can blow without interruption).

2) **Downslope winds:** The flow is directed downwards below the stagnation point.

3) **Flow accelerations:** Especially on the corners of buildings and edges of roofs. Strong wind suction and high wind speed. Very high turbulent pressure and speed fluctuations.

4) **Turbulences and backflows:** in the downwind area of the building.

Note: The circulation effects shown in Fig. 6.1 are typical for a free-standing building. Surrounding buildings can cause the illustrated flow effects to overlap with other flow effects. These are discussed in chapter 6.3.

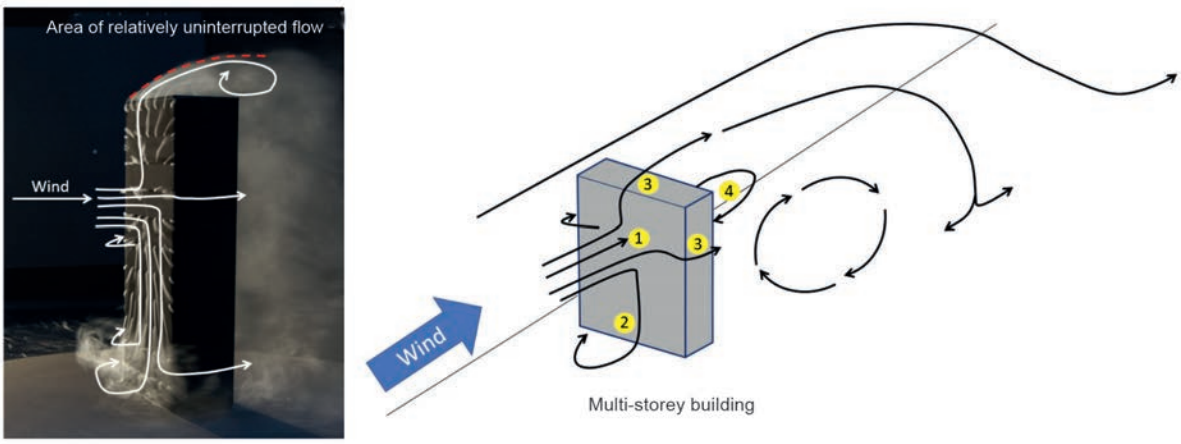


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Fig. 6.1: Visualisation of the circulation around a free-standing building (left: smoke test in a wind tunnel; right: sketch of circulation)

4.3 Wind pressure on the facade

The described circulation effects result in different local flow speeds and flow directions on the circulated building. Depending on the incoming flow, different areas of the facade are subject to different levels of pressure (+) or suction (-). High suction levels must be expected in particular at the edges. See also Fig. 6.2.

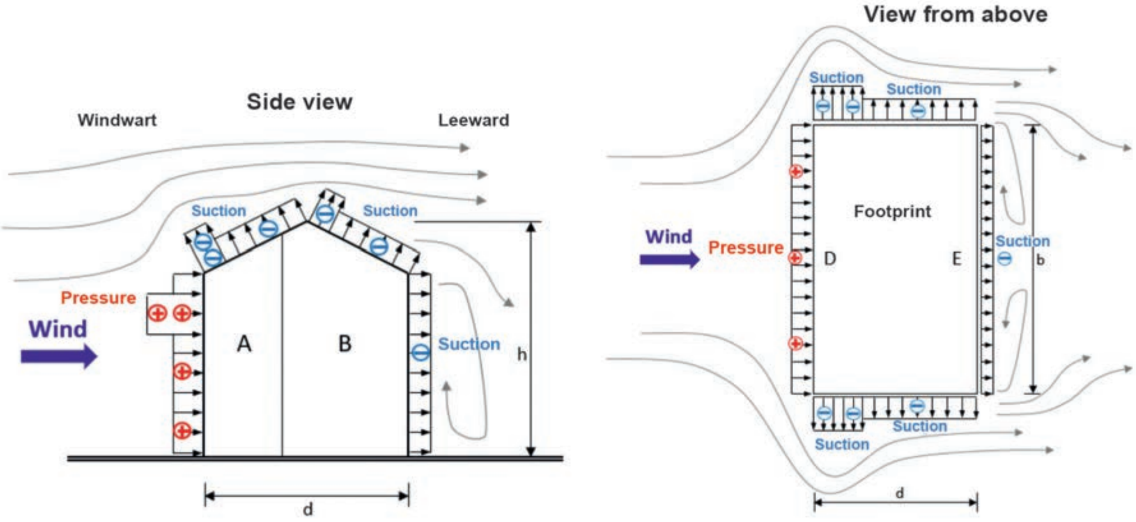


Fig. 6.2: Simplified illustration of circulation around a free-standing building as viewed from the side (left) and from the footprint (right) with pressure and suction areas on the roof and facade surfaces

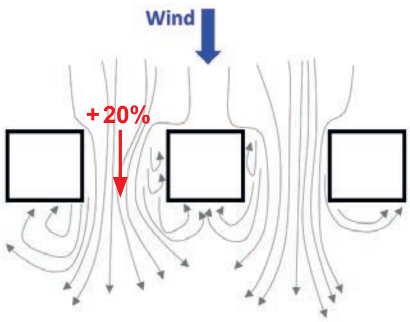
4.4 Influence of the surrounding buildings on the circulation around the building and the facade wind pressure

Surrounding buildings and dense building development have an additional effect on the circulation around a building and can make it extremely complex and difficult to predict. Fig. 6.3 shows examples of three typical effects caused by surrounding buildings:

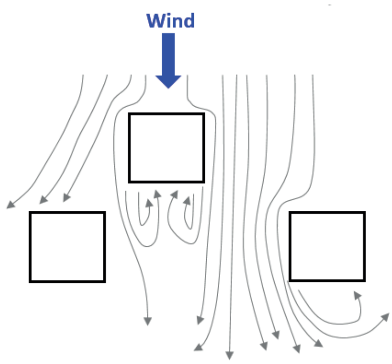
1) **Jet effect** (examples 1 and 4): Wind flow is channelled by impermeable neighbouring buildings. Significant flow acceleration in the lanes between the buildings.
Example 1: Building size W x L x H = 15 m x 15 m x 50 m, building distance 20 m, speed increase 20% (rough reference value)
Example 4: Building size of W x L x H = 15 m x 50 m x 50 m, building distance 20 m, speed increase near the facade up to 60% (rough reference value)

2) **Flow deflections** (example 2): Wind flow is deflected by a building situated in front. Increased wind load on the rear building and local change of the flow direction.

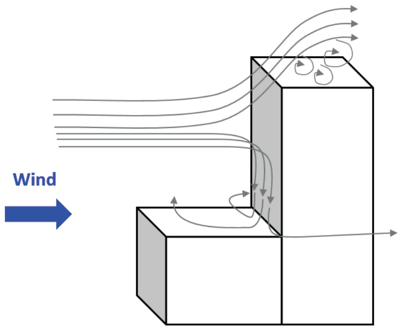
3) **Higher neighbouring buildings** (example 3): High-energy wind from higher layers is "captured" by the building and deflected downwards. Increased wind load on the lower building (section).



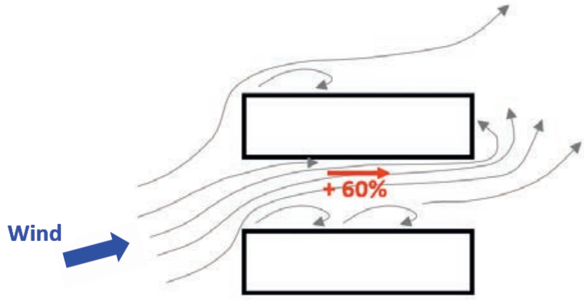
1) Jet effect



2) Flow deflections



3) Higher neighbouring buildings



4) Jet effect and flow deflections

Fig. 6.3: Simplified illustration of the circulation around a building, including surrounding buildings

4.5 Simulation of the wind, the circulation around the building and the facade wind pressures

The circulation around buildings is (even with seemingly simple cubages) often highly complex and can only be predicted to a limited extent without further examination. In the best case, it can be estimated approximately. One way to record the circulation around the building more precisely is to conduct computer-aided simulations of wind flow or (even better) wind tunnel tests. In the case of complex questions, wind tunnel tests are often the only reliable procedure for reproducing the circulation as precisely and realistically as possible and determining facade wind pressures.

One of the major advantages that wind tunnel tests have over stationary numerical flow calculations (computational fluid dynamics, CFD) is that the wind tunnel test also allows wind speed fluctuations (turbulences) on the facade to be considered. This considerably improves the quality of results, as temporary turbulences can be decisively significant to the sunblind fabrics in regard to wind damage.

To illustrate this, Fig. 6.4 shows a typical wind speed signal on a facade. It is clear that the wind speed is not a steady parameter. The wind speed close to the facade fluctuates around an average value with clearly recognisable wind peaks (gusts).

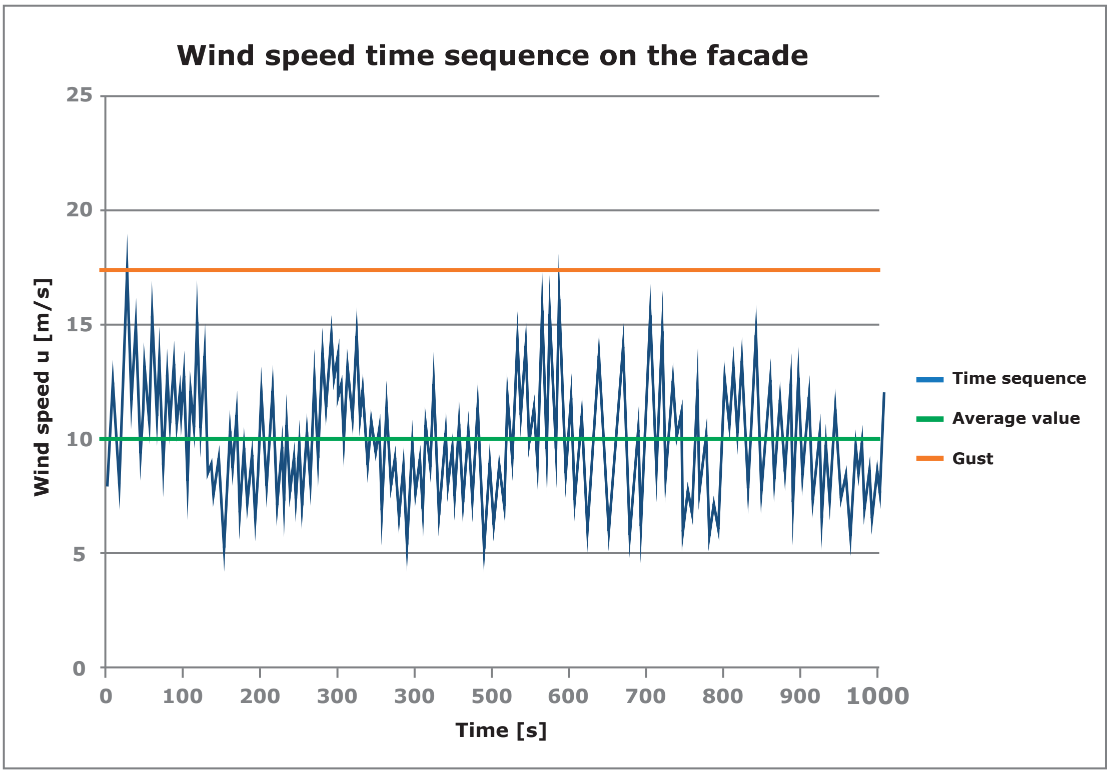


Fig. 6.4: Illustration of example measurement signal for wind speed on the building facade

5. Positioning the wind monitor on the building

5.1 Type of building

Building regulation law, the design of a building and the use of a building as a residential or non-residential building do not yield any requirements for the installation of wind monitoring systems in combination with products that are subject to DIN EN 13561 and DIN EN 13659.
On the manufacturer side, wind resistance is declared as an essential performance characteristic for the above products in the context of CE marking.
A determination according to the intended purpose results from this. Intended use is the duty of the specialist company performing the installation.
The professional operation of the above products is subject to the user's or operating company's own responsibility.

5.2 Planning the installation situation

It must be ensured that the wind resistance declared by the manufacturer for a product, and/or the specified maximum permitted wind speed, is not exceeded for the blinds and shutters installed on an object. To this end, the wind speeds and/or facade wind pressures that the building is actually exposed to must be recorded correctly. In general the manufacturer's specifications and recommendations must be taken into account.

5.3 Boundary conditions relevant to planning

During the planning of the wind monitoring system, and especially of the position of the wind monitor, the actual construction situation must be considered. On the building itself, various aerodynamic conditions occur in dependence on the following:

- The terrain and/or geographic features (e.g. location on a hillside, the open sea)
- The surrounding buildings (e.g. solitary or dense building coverage)
- The type of building
- The building's dimensions (height, width, length)
- Orientation in relation to the wind (downwind and upwind areas of the facade)

(see chapter 4).
This results in facades and facade areas being exposed to a corresponding load.

5.4 Positioning

A wind monitor must be positioned in such a way that the wind speed and direction can be recorded unambiguously. As soon as the limit speed is reached, the sunblind in the relevant facade zone is retracted. A facade zone is marked by the fact that similar wind conditions prevail there. These facade zones are the basis for the control concepts described below and must be determined in advance.

In general, two control concepts for the wind monitoring of the sunblind are common:

Local control: One or, if applicable, several wind monitors are installed on the facade in each defined facade zone. As soon as the limit speed on the wind monitor is reached or exceeded, the sunblind in the relevant facade zone is retracted.

Central control: The wind speeds and wind directions are recorded only by one, or possibly several, wind monitors on the roof area (no wind monitor on the facade). Based on the measurements of the central wind monitor on the roof, so-called transfer factors are used to calculate the wind speed in the different facade zones in dependence on the wind direction. As soon as the calculated speed reaches or exceeds the limit value, the sunblind in the relevant facade zone is retracted. The transfer factors, which are summarised in a transfer matrix, thus replace the local wind monitors on the facade surfaces. This control variant can only be implemented by means of wind tunnel tests. For both control concepts, the best possible definitions of facade zones and positioning of wind monitors can be defined on the basis of (wind tunnel) tests for the location-specific wind conditions.

Note: In addition, the wind-related theoretical outage times of the sunblind can be determined in order to provide greater planning reliability in advance regarding which sunblind product should be chosen with reference to wind stability.
A sunblind product with a higher wind resistance class results in fewer outage times.

In order to specifically identify the problems when positioning a roof wind monitor, Fig. 6.5 once more illustrates the flow over a building.
It shows the role that the distance between the building's edge and the height play when choosing the location of the roof wind monitor. The aim should always be to position the wind monitor in such a way that the measuring sensor/wind sensor is in the free uninterrupted wind flow as far as possible.

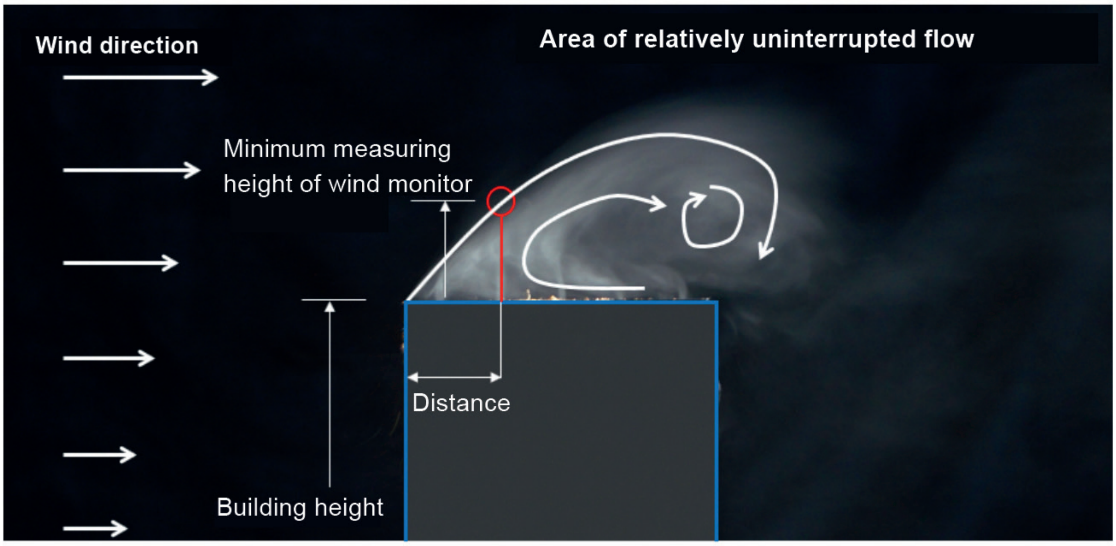


Fig. 6.5: Visualisation of the flow over a building in a wind tunnel with the required measuring height of a roof wind monitor

In general, the following points must be observed above all for the positioning of all wind monitors:

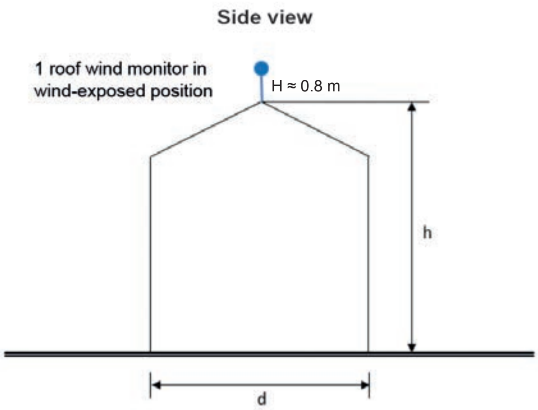
- Possibility of free flow and consideration of wind shielding due to physical structures on the building itself or due to objects in the surrounding area.
- The greatest speeds and turbulences occur on the corners of buildings and the edges of roofs.
- When the position is chosen, seasonal special features (e.g. leaves, frost, snow levels) should be considered.

The manufacturer's recommendations for positioning the wind monitors must be taken into account.

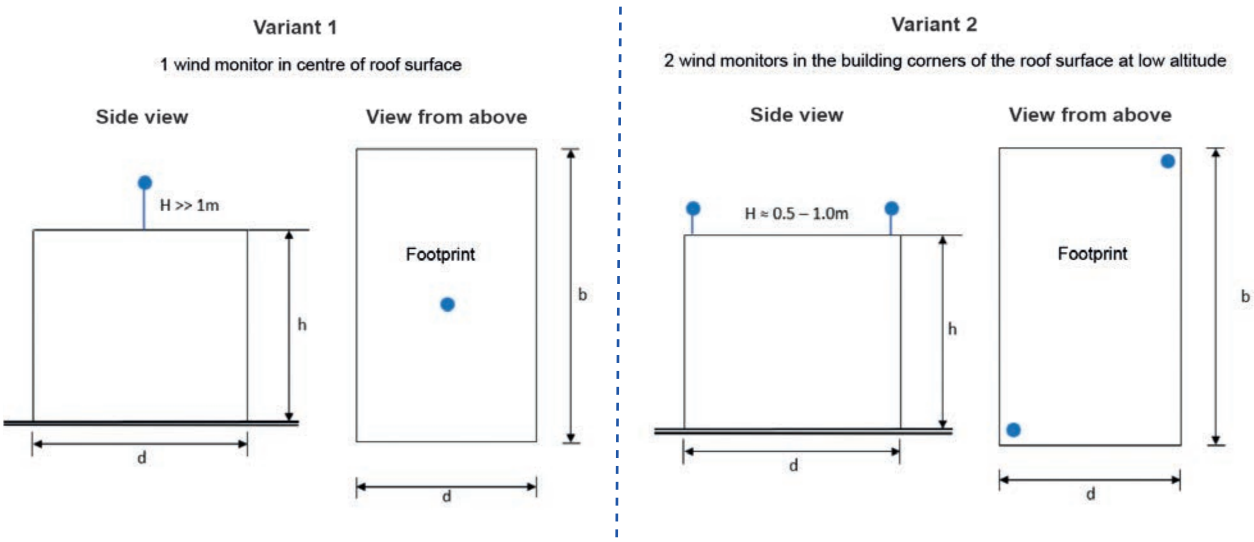
5.5 Case studies

Several case studies are collected below. Examples 1 to 4 represent standard cases, for which no project-specific tests are usually conducted in regard to the optimal wind monitor position. The wind monitor positions shown are provided only for orientation. Example 5 shows a larger, geometrically complex building closely surrounded by other buildings. In this case, project-specific flow simulations were conducted in the wind tunnel in order to optimise the wind monitors (quantity and position).
In case of uncertainty in any individual case, the expertise of wind specialists must be obtained.

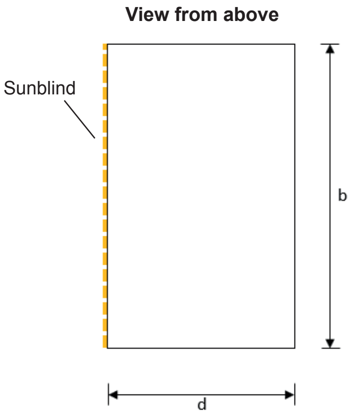
Example 1: *free-standing single-family house with pitched roof*



Example 2: *free-standing single-family house with flat roof*



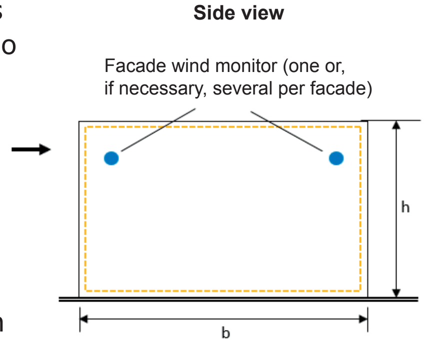
Example 3: *free-standing simple building; sunblind on only 1 facade*



Control via roof wind monitors as shown in examples 1 and 2 is also sensible here.

Important: The wind must be able to flow freely onto the wind monitors.

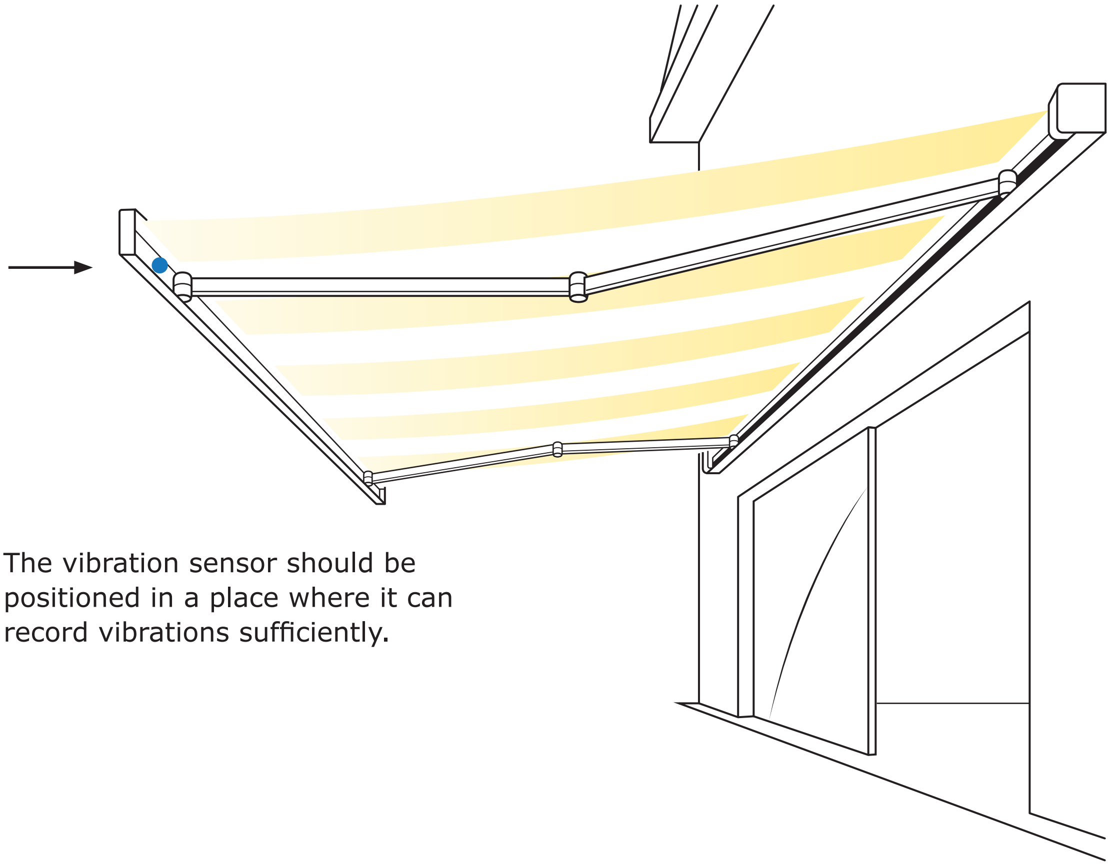
Alternatively (e.g. if the sunblind is fitted later), wind monitors can also be attached directly to the facade.



Example 4: *free-standing simple building; extending-arm awning*

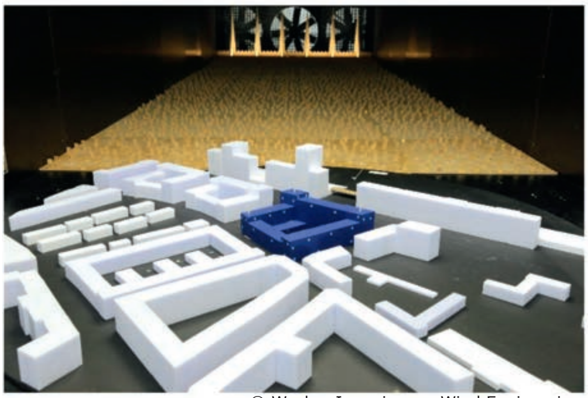
Control via roof wind monitors as shown in examples 1 and 2 is also sensible here.

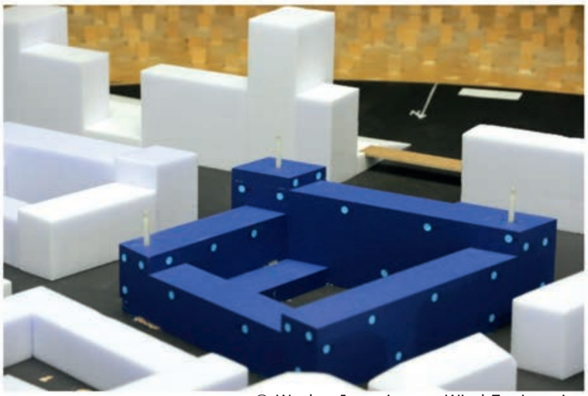
Note: Wind monitors attached to directly to the facade are not recommended. Due to the complex inconsistent flow conditions, it may be advisable to use vibration sensors. (see chapter 2.3)



The vibration sensor should be positioned in a place where it can record vibrations sufficiently.

Example 5: *Building complex in an inner-city location*


© Wacker Ingenieure – Wind Engineering


© Wacker Ingenieure – Wind Engineering

- Building complex in an inner-city location with neighbouring buildings that are equally high or higher
- Central control via roof wind monitors was not possible, as no uninterrupted signal on the roof wind monitor was possible due to the influences from the surrounding area
- Solution: local control with multiple facade wind monitors

Note: This construction project involved **16 facade wind monitors** in total, which separately control the facade areas (blue markings in the model indicate the measuring positions during wind tunnel tests).

5.6 Installing the wind monitor

Depending on the installation location and installation ground, suitable aids may be required (e.g. angle, mast, fastening material or similar).

The manufacturer's recommendations for installing the wind monitors must be taken into account.

6. Maintenance

6.1 Maintenance/care (instructions)

The sensors must always be kept clean and free from leaves, snow or similar, and should be tested for flawless function in the course of maintenance.

6.2 Test specifications

A battery-powered leaf blower can be used to test whether the wind monitor is functioning.

Safety instruction: A firm seat (securing the person conducting the test) must be ensured.
In addition, a minimum distance of 1 metre from the wind monitor is recommended.

7. Adjusting the controller

7.1 Priorities in the sensor system

Wind monitors always have priority over other sensor systems, e.g. for sun and rain, as well as over manual operation.

7.2 Delay times

A safety movement (retraction) takes place immediately after triggering. In order to prevent repeated wind-related safety movements at too-short intervals, the extension is delayed. The intervals typically last between 15 and 30 minutes.

7.3 Requirements for building automation

The control system should be able to manage multiple facade areas with different wind conditions and thus different threshold values.

Note: The wind warning functions always has priority in regard to the sunblind systems.

7.4 Position of the radio wind monitor relative to the radio receiver (actuator, drive)

Top priority: Determine exposed position of wind monitor in relation to system.
Second priority: Check radio signal to radio receiver and amplify if necessary.

It must be ensured that communications between the sensor and the centre or product are always ensured.

8. Responsibilities

8.1 Commissioning (basic setting)

Wind monitors must have an ex-works basic setting that is defined by the manufacturer and described in the installation instructions.

Note: The person conducting the commissioning must perform adaptations to the wind speed suitable for the building and product.

8.2 Specifying limit values

The permitted limit value must be determined by the planner/specialist partner for the installation height and installation situation. It is recommended that the devices register and/or save the wind peaks so that the data can be read out in the event of complaints.

Note: The Deutscher Wetterdienst provides precise information (https://www.dwd.de/)

9. Conclusion

Fundamentally, it should be noted that the relevant wind load on buildings must be examined on an individual basis. Corrections are required, for example, due to different conditions and/or the respective location of the property.

It must be ensured that the wind monitor

- is installed in the place under wind load if possible
- is completely free and not in the wind shadow if possible
- is installed at least 0.5 to 1 m from the upper edge of the pitch roof.

Country-specific requirements must be observed!

Important: The wind must be able to flow freely onto the wind monitor.

The wind monitor must be positioned in such a way that the measuring sensor/wind sensor is in the free uninterrupted wind flow.

Note: For more details, see the case studies under 5.5.

The following guidelines and recommendations are available from **IVRSA e.V.**:

- Guideline on Safety Instructions in Installation and Operating Instructions for Awnings
- Guideline on Technical Consultation, Sales and Installation of Extending-Arm Awnings
- Guideline on Cleaning and Care of Awning Cloth
- Association Recommendation for Use of Radio Technology in Building Automation
- Guideline for evaluating product characteristics of external Venetian blinds
- Guideline for the Evaluation of Product Characteristics of Awnings
- Instructional Content, Certificate, Order and Verification for Electrical Specialists for Specified Duties in the Field of Skilled Shutter and Sun Protection Work
- Association Recommendation for Load Assumptions Pertaining to Wind / Suction Forces that Must be Taken into Consideration for Manufacturing
- Sun protection along emergency evacuation routes
- Association Recommendation for Measuring Windows with Attached Shutter Boxes
- Guideline on product characteristics for insect protection
- Guideline on the maintenance of shutters and sunblind products

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