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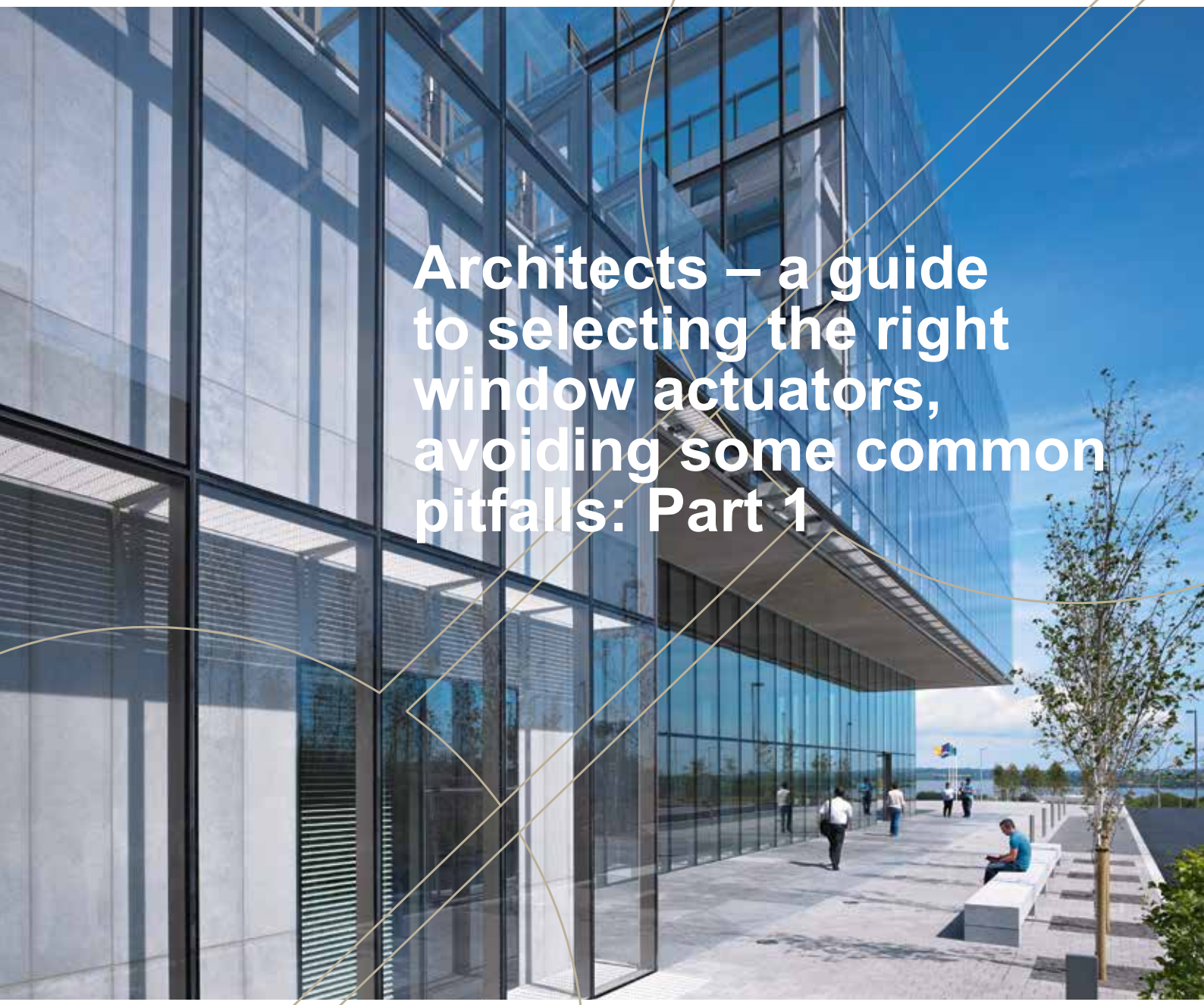


Architects – a guide to selecting the right window actuators, avoiding some common pitfalls: Part 1

Window actuators and their associated controls can form a critical element of modern building services. They make a significant contribution to the success – or failure – of a building's internal environment and energy performance. Equally, they are often a second thought, which can cause major headaches for designers, contractors and clients that have to pay to put them right, or live with the consequences for years to come

You may have spent a good deal of time selecting an appropriate curtain wall or window system and designing it into the fenestration of the building, which now has the dynamic and crisp lines you desire. Imagine turning up on site and finding that the inside of your high performance windows have been covered with containment to conceal wiring to noisy and poorly-operated actuators that don't seal the windows correctly, causing excessive cold draughts, heating load and complaints. All actuators are the same, right? Wrong. But before you can select the right ones for the job there are some fundamental points to consider:

Firstly, what is an actuator and why does it need to be there? They are not all the same so it is important to look at the different types available in relation to the needs of a particular project. Then, wiring routes and concealment need to be considered. Once these questions have been resolved, power options, opening areas and window orientation need to be factored in. Finally, you need to consider what it is – other than simply good looks – that is important to your client and compile a specification that includes all the important stuff that will help you to avoid headaches later.

What is an actuator and why does it need to be there?
Most façade window actuators are chain type. They are typically used for three main reasons. Firstly, they deliver automated ventilation – increasingly chosen to add 'intelligence' to the building's ventilation, helping it breathe more effectively on its own. Automated natural ventilation improves the indoor climate and comfort in the building through lower peak summer temperatures, enhances air quality and energy performance – and therefore productivity – while reducing running costs.

Secondly actuators are also used to provide ventilation via out of reach openings using keypad control where manual winding gear is either considered too intrusive, expensive or high maintenance. Thirdly, they may be used to provide smoke ventilation to improve building safety in the event of a fire.

Not all actuators are the same
There are an increasing number of actuators on the market of wildly varying quality and capability. This has a direct effect on building performance, overall costs and client comfort and satisfaction – which is often overlooked.

Most standard actuators have little or no intelligence. They consist of a glorified bike chain designed to bend only in the required planes, a motor and set of gears. Without any intelligence, they are often operated in large poorly controlled 'chunks' of opening distance – associated with heavier oscillations around comfort set points, hunting, uncomfortable draughts, excessive energy consumption and potentially shorter actuator life. In addition, many actuators do not have pressure safety functionality. Typically actuators have a closing force of around 200N, which is not inconsiderable when applied to the leading edges of two metal profiles, particularly when a hand or finger finds its way between those edges.

Most standard actuators also have a factory-set speed of operation, which in many instances can be noisy, disruptive and the cause of complaints and even systems having to be disabled / turned off after handover – leading to other widespread building performance issues. These cannot be easily adjusted for quieter operation once installed.

Choosing intelligent actuators, such as those with MotorLink® technology, allows essential functions such as speed control to minimize noise. Position feedback offers accurate positioning mm by mm to give the small openings commonly required for normal ventilation requirements as well as ensuring openings for night cooling remain within allowable security limits, and the potential to off-set costs by removing separate trickle vents fitted to windows. Pressure safety functions can also make the difference between a pinch and severe injury.

Wiring routes and concealment
Often the window profile can be used as a conduit for 24V actuator wiring. It may require some co-ordination during installation but the specification can offer the opportunity to do away with the ugly surface-mounted trunking that can spoil the overall look of the window system. If vents are at high level, just preparing the mullions to allow cables to be pulled through allows cables to be hidden on top of the transom thus limiting their appearance on the face of the façade or windows. Alternatively, a matching cover profile might be an option. Again, this is often overlooked during the specification and tender process but a little thought in the specification, and preparation in the factory, can reduce cost and improve aesthetics later.

Depending on the combination of window profile and actuator, the profile can also allow the actuator to be hidden i.e. VELFAC windows. Some other aluminium systems also allow this solution but low profile systems often offer little room to hide the actuators, which are therefore likely to be surface mounted. This is where you might also want to consider actuator colour and finishes in the specification.

On high load applications such as large roof lights with pitched opening, spindle actuators are usually used. The solid spindle housing hangs down into the space when closed, which many designers and clients find unsightly. New high capacity WMU 888 chain actuators from WindowMaster can address this issue and offer a powerful and neater solution.

Most actuators used for natural ventilation are 24V DC which give higher torque capacity and makes them electrically safer when using the window profile for containment. There are 240V actuators on the market, but these are generally designed for occasional use and are prone to overheating if used regularly, so are therefore normally avoided.

Opening areas
Actuators come with different standard chain lengths: 265, 400, 500, 600 and 1.000mm. Using the smallest actuator possible will keep the unit size and cost down. The longer the chain, the bigger the links need to be to maintain integrity and therefore the bigger the housing to hide it when it is withdrawn.
To reduce the size and cost and improve aesthetics, use a 265mm chain where possible.

There are many schools of thought on calculating the opening or free area. Generally, a typical profile will use around 40mm of chain to bridge the profile from the actuators fixings to the sash. Therefore, a 265mm chain will give around 225mm clear opening depending on the profile and mounting arrangement.

“Use a common sense approach for natural ventilation. The following tips should help.”

· Calculate the geometric free area just using the rectangle or throat at the leading edge of the opening sash first. If slightly bigger areas are required then consider the triangles at the sides if they are allowed to be included. For

example, a standard 265mm chain gives approximately 0.225m clear opening x 1m window width gives 0.225m^2 clear opening per opening window.

- Take into account any reveal or sill that might limit the real clear opening achieved (Building Regulations, Approved Document B, 2007). High level top-hung outward opening windows can avoid the reveal or sill limiting the achievable opening areas.

- Triangles at the side of the opening should not be included if it is a string of opening windows (adjacent open vents effectively cancel out the triangles).

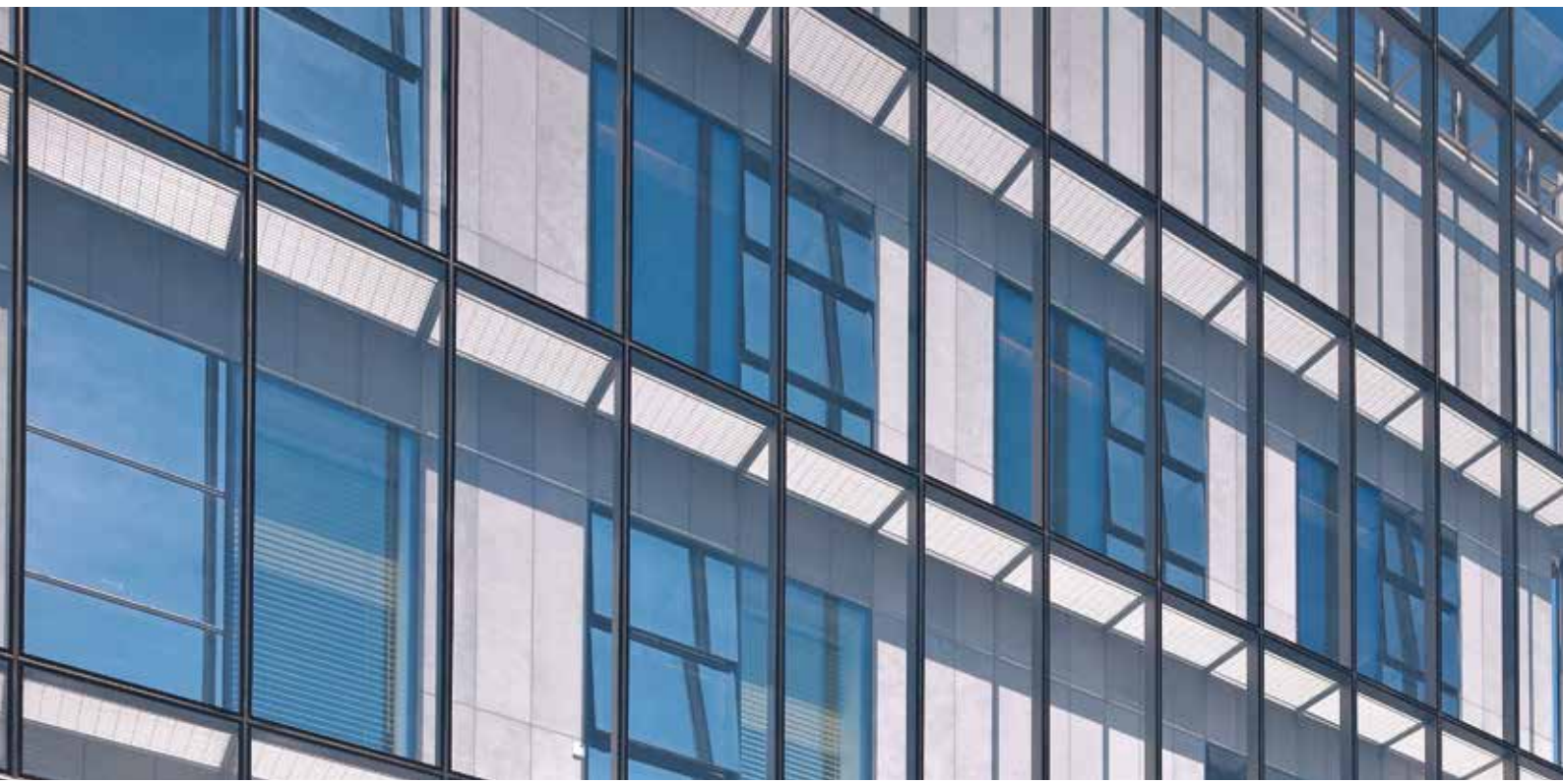
- Many window suppliers, or WindowMaster, offer support with these calculations.

Window orientation
Research suggests that high level (typically two metres and above from floor level) top-hung outward opening windows are the most effective overall solution for natural ventilation Their opening areas can be supplemented by manual low level windows if required for operation on hotter days. These are often limited to 100mm openings due to the risk of falling, and the risk of obstruction if opening onto a thoroughfare.

Selecting high level openings minimises a number of risks. Draughts when controlling CO_2 in winter are reduced because a small amount of cold air introduced at high level mixes with warm air and carries further into the room before falling to body height. Security risks are reduced because insurance companies generally prefer small openings at higher level if night cooling. The risks from entrapment are lowered because while intelligent actuators have pressure safety functionality, they can still pinch, so it's best to locate these at higher level.

Avoiding side-hung windows removes the risk of a scissor action at body height which can present a safety hazard. In addition, the lower element of the opening can introduce cold air at body height.

It is important to note that different window profiles have differing requirements for the number of operating handles. This applies to actuators too. This is normally associated with the rigidity, or flex of the window profile around the pull point(s) and the frame's capacity to maintain a seal around the perimeter of the vent. It is less associated with actuator power or opening/closing ability and is therefore dictated by the vent fabricator or profile supplier. The vent width limit for a single actuator can vary from profile to profile from 700mm to 1.500mm



(i.e. VELFAC @ 1.500), though for aluminium profiles 1.200mm is normally used as a rule of thumb. It is important to get confirmation of this if more actuators are required because this not only impacts on actuator costs but also on associated power supplies and wiring. If in doubt, consulting WindowMaster or fabricators early on may prove worthwhile.

Compiling a specification to avoid common complaints

Most quality actuators look similar but how the actuator looks, while aesthetically important, has no bearing on how successfully the actuator will deliver on its requirements. When creating the specification, any expectations you have for the benefit of the project and client should be made explicit. Decide which of the following points are important for the project and your client:

· Low noise during automation to minimise disruption
· Enhanced safety to help protect occupants in case of entrapment
· The capability for accurate control to prevent draughts and energy problems
· Minimsed visual impact of wiring/ cables on the windows
· Synchronised motors for wider windows to help protect the sash from distortion
· A special colour requirement
· Real time indication to the building owner of faults.

Multi speed operation

The actuator must provide two-way communication with the control panel to enable it to operate at a very slow speed when in the automatic mode, which can reduce noise and any potential impact or disturbance to the occupants. It can also enable the motors to operate at a faster speed when activated by the manual keypads, for example, in order to provide an immediate visual response to the user, and at full speed in the event of an alarm signal for smoke clearance.

Pressure safety function

The actuator must have the ability to monitor for entrapment on specified windows by communication via the microprocessors installed within the actuator and by monitoring in real-time the amount of electrical current being drawn and the precise position of the window to an accuracy of less than a millimetre. The MotorLink® actuator will detect if an object becomes trapped in the leading edge of the window and prevent it from closing by monitoring the amount of current being drawn and then reversing the actuator to release the obstruction.

The sensitivity of the pressure safety must be adjustable, as the pressure safety function is a factor of the closing force of the actuator combined with the size and weight of the window, as well as the configuration of the window, its hinges and the rigidity of the profile itself. Therefore the overall performance and sensitivity of the system is dependent on all these

factors combined and needs to be monitored and adjusted as the required forces can change during the life of the building.

Actuator position feedback
The actuator must provide two-way communication with the control panel to enable feedback to the control software on the exact position, for precision of opening and control (mm by mm) as well as a security indicator for open windows.

Wiring routes
The window or curtain walling fabricator should prepare the profiles for wiring routes with grommets and draw wires, using the frame as containment. If at high level a route should be provided through the mullions without having to bridge the inside face of the profile. If this cannot be avoided, consideration should be given to providing a matching cover profile.

Synchronised actuators
Where opening vents are about 1.200mm wide or more, the window or curtain walling supplier shall check whether two actuators are required. This should be checked with the profile systems house as it is dictated by frame flex and the capacity to achieve a seal at the edges with a single pull point. If required, the actuators must use MotorLink® to synchronise speed and time of operation.

The actuator must provide two-way communication with the control panel to enable feedback to the control software on the window status and an early indication of any errors with the actuator operation or the wiring.