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ADJUSTABLE LOUVER ACTUATOR SELECTION AND SET-UP

Adjustable louvers provide performance similar to their stationary counterparts. As a "rule of thumb" full open pressure drop and water penetration performance for adjustable louvers is approximately 90% as good as the stationary louver values at the same free area velocity. Also, the maximum recommended free area velocity for an adjustable louver should be only .90 of the stationary counterpart's maximum recommended free area velocity. This decrease in performance is a result of construction unique to adjustable louvers; i.e., bearing clearances between the end of blades and the side jambs, top and bottom blade stops, non-drainable head, etc.

Adjustable louvers require a device to open and close the blades and to maintain the blades in the desired position (usually fully open or fully closed.) Normally this device is manually operated (wing-nut, hand crank, etc.), however, electric and pneumatic (air powered) actuators can be provided by AWV.

The purpose of this bulletin is to explain how to select and size various AWV provided actuators.

STEP ONE

Determine type of energy to be provided; manual, electric or pneumatic.

American Warming & Ventilating offers several individual panel manual operators as shown on Drawing 800 and various manual operators for multiple panel assemblies as shown on Drawing 800-1. The standard operator will be a sill mounted wing nut operator (similar to the type 6 operator on Drawing 800). This simple device will allow the louver blades to be positioned and locked anywhere between fully open and fully closed.

The Extruded and Fabricated Adjustable Louver Price Sheets list several electric actuators. To select this type of actuator you must know the voltage available, normally 120 volt, single phase AC power. Determine if the louver blades only need to be positioned either in the fully open or the fully closed position (two position) or will the blades be required to stop at locations between these two extremes of travel (modulating). If your customer requires precise positioning of the blades to regulate the volume of air, AWV suggests a fixed bladed louver backed-up with an opposed bladed control damper. The vast majority of electric actuators supplied by AWV are 120/1/60, two position, power open/spring close type (BC MA-418, BC MA-405 or MP 2747B). The advantage of a spring return actuator is that the

electric wiring is simple, only two leads and a ground are required and the control circuitry is a basic switch (which can take the form of a thermostat, etc.) where the louver is held open by the actuator so long as the actuator is energized. When electrical power is shut off, the actuator's internal spring will fail the louver to the fully closed position. When specified, most louvers with spring return actuators can be factory set-up to power close/spring fail open. The disadvantage of a spring return actuator is that its torque is limited when compared to power open/power closed actuators (like the BC MC-431). Power open/power closed actuators typically require three electrical leads plus a ground. This can be a problem if the wiring is already in place and it contains only two leads and a ground. If a modulating actuator is being selected, the customer's supply voltage as well as his control signal must be known. The control signal can be a variable DC voltage, a variable current, etc.

Drawing 22245 illustrates the standard single panel electric actuator set-up. Drawing 29250 shows an inexpensive two position spring return actuator for small size louvers.

The least often requested type of actuator is the pneumatic type. Typically these actuators are spring return, 20-25 psi air supply, two position type. Most of these actuators can be provided for modulating operation with the addition of a pilot positioner. Drawing 22307 illustrates the standard single panel pneumatic actuator set-up.

STEP TWO

Determine model and quantity of actuators.

Once the type of actuator has been determined (step one) the next step is to select an actuator which will provide sufficient force or torque to cycle the louver. The force or torque required is dependent on several factors:

- A. Louver model
- B. Louver size
- C. Number of louvers to be driven by a single actuator
- D. Seals or no seals
- E. Approach air velocity
- F. Static pressure
- G. Safety factor required

Louvers are normally operated by applying a force to the blade-to-blade linkage whereas dampers are driven

through the blade axles. Because of this fact, simple operating torque cannot be published. American Warming & Ventilating has devised a method of matching an actuator's rotational torque to the louver's linear force requirements. This method takes into account the required force to open and close the louver, the effective lever arm provided by the linkage brackets and the distance that these lever arms travel. The motor is analyzed based on its torque, degrees of shaft rotation and angular relationship between the motor crank arm and the louver connecting linkage. All of these factors are grouped into a dimensionless value that we call a force factor.

A 48" x 48" Model LE-47A with full seals requires a 120-volt actuator capable of producing a minimum force factor of 248 (from the back side of the LE-47A Submittal Sheet).

After the louver force factor has been determined, select an actuator from the "Adjustable Louver Optional Actuator Price List" that has a force factor equal to or greater than 248. The Barber Colman MA-405 is rated at 455 and will provide adequate power to cycle the louver under normal conditions.

This second sizing example will introduce jackshifting into the actuator sizing procedure. A 126" wide by 36" high Model LE-66C will be built as three 24" x 36" panels. Each panel requires a force factor of 78. These three panels can be interconnected together with AWV supplied one inch diameter jackshifting. As stated on the LE-66C Submittal Sheet, jackshifting reduces the required force factor by .50. The equation becomes:

force factor per panel of 78 x 3 panels x .50 jackshaft reduction factor = assembly force factor of 117

Per the Optional Actuator Price List, one Barber Colman MA-418 will be adequate since it has a force factor rating of 185. Please note that the .50 force factor reduction is only available when the AWV supplied one-inch diameter jackshaft pipe is used.

American Warming and Ventilating has successfully sized louver actuators using the force factor method for many years. Our tables are based on actual tests and calculated values. The air flow rates are based on the louver's maximum recommended free area velocity at a pressure of 1-inch wg (.5-inch wg for the Model LE-66C). One of the few actuator sizing problems that AWV has experienced pertains to the end pivoted, tight shut-off Model LE-66C when used in emergency generator enclosures. These generator sets typically start immediately upon interruption of normal electrical power. The propeller fan that provides ventilation and combustion air can draw several inches of static pressure at low flow conditions (tightly closed LE-66C Louver). This high negative pressure will tightly "suck" the intake louver blades closed with more force that the actuator can produce to open up this end pivoted louver. When selecting louvers and actuators for emergency generator enclosures, AWV suggest that we be contacted to discuss louver and actuator options.

STEP THREE

Determine how to connect the actuator to the louver panel(s).

In step two you were shown how to utilize the force factor reduction, when using AWV supplied horizontal jackshifting. Drawings 28774 and 28774-1 illustrate standard jackshaft and other interconnect details for various setups. To use these two drawings, one needs to know what type of actuator will be used (step one) and know how many panels will be driven by a single actuator (step two).

For example, if it has been determined that a BC MC-431 electric actuator will be used to drive a two-panel wide by two-panel high assembly, Drawing 28774-1 directs you to Drawing 28890 which shows in detail how this actuator is set-up. Drawing 17535 is also referenced which details the jackshaft installation. These same drawings are provided with the shipment to serve as installation instructions and as a packing list for shipped loose parts. To avoid shipping damage, actuators and jackshifting are shipped loose for field attachment to the louver.

By utilizing this three step approach you can confidently provide actuators that will meet your customer's requirements.

Step One

Determine type of energy to be provide; manual, electric or pneumatic.

Step Two

Determine model and quantity of actuators.

Step Three

Determine how to connect the actuator to the louver panel(s).

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