RUSKIN

IAQ MANUAL

IAQ Damper/Monitor

Your guide to understanding indoor air quality and the application of Ruskin's IAQ Damper/Monitor

Indoor Air Quality Defined

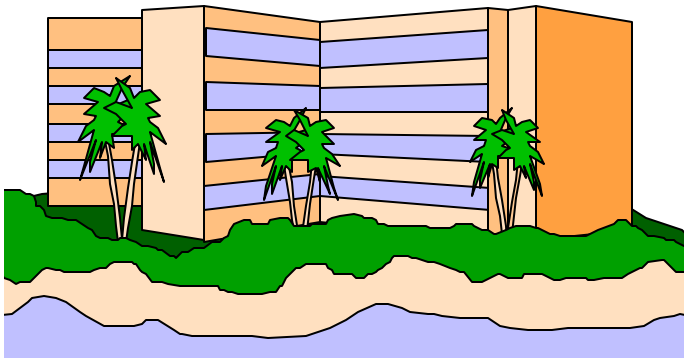
The IAQ Damper Solution from Ruskin

IAQ50 Opportunities and History

IAQ Product Literature

Installation and Maintenance Instructions

1. Indoor Air Quality



DEFINITIONS

1.1 *What is IAQ?*

The term IAQ is a popular acronym for 'indoor air quality'. One must understand how air has a 'quality' to understand fully what IAQ means. Determining the 'quality' of anything can be very subjective often relying on individual tastes and preferences combining to form a consensus. In some ways, the term indoor air quality is also a relative term. Any consideration of indoor air leads to an association with outside ambient air. A noticeable difference between the two is a varying level of contaminants that can be attributed to the concentration of human activity and manufactured goods within a closed, indoor space. The closed, indoor space of a building allows gaseous fumes, odors, germs, and even fungi to grow in concentration to the point that the indoor air is qualitatively different from the ambient air. It is at this point that it can even affect the health and comfort of a building's occupants.

ASHRAE Standard 62 defines indoor air quality and how to maintain it through fresh air ventilation.

The American Society for Heating and Refrigeration Engineers (ASHRAE) provides the following definition of 'acceptable indoor air quality': **"air in an occupied space toward which a substantial majority of occupants express no dissatisfaction and in which there are not likely to be known contaminants at concentrations leading to exposures that pose a significant health risk. "**

1.2 *Why is Indoor Air Quality important?*

IAQ is important because the health and the comfort of people working indoors are important. Building owners interested in IAQ make this a top priority today because a work environment that causes discomfort or health problems (often leading to absenteeism) results in a loss of productivity. Also, poor IAQ may cause tenants to look for building space elsewhere with a better indoor environment.

In order to understand how poor IAQ can happen, let us look at a building with little or no outside air ventilation. As air is recirculated within a building, not only does carbon dioxide grow in concentration from human occupancy, but so do odors, bacteria, viruses and germs both dependent and independent of human activity. Such a rise in indoor contaminants within a closed system can inspire acute effects, usually in the form of subjective symptoms such as respiratory system irritations or drowsiness. People will complain of fatigue, headaches and stuffiness. These signs of discomfort are difficult to confirm and generally disappear when the suffering occupant leaves the building. Referred to as 'Sick Building Syndrome', this situation is reliant on occupant perceptions. 'Building Related Illness' is a different term used to describe diagnosed conditions of illness caused by a chronic exposure to poor IAQ. However, many people confuse these terms and freely interchange them. What is important to remember is that in either scenario the health and comfort of a building's occupants are compromised.

Potential Contaminants in the Indoor Environment

- Biological: bacteria, mold, fungi
- Particulate: pollen, dust, tobacco smoke, man-made fibers.
- Gasses: radon, vapors from paints and adhesives, carbon dioxide and monoxide, human odors and grooming products.

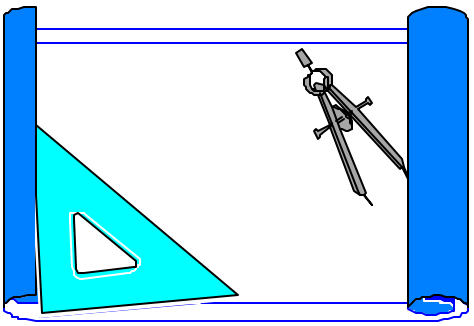
Additionally, building codes now include ventilation requirements of minimum outside air volumes. A consensus has formed around a prescriptive approach to ventilation developed by ASHRAE. This approach is ASHRAE Standard 62 and has become the point of reference for engineers and building owners interested in maintaining an appropriate indoor environment. ASHRAE and its standards have no coercive force by themselves. Today, however, portions of ASHRAE Standard 62 have been incorporated into almost every building code in the United States as well as many international codes.

If the indoor air quality is neglected, the health, comfort and productivity of building occupants become compromised.

Since compliance with building codes is compulsory, one can expect a controversy from a building being negligent in providing proper indoor air quality for its occupants. Such disputes have evolved into litigation against building owners as compliance with the standard comes into question. Damages from a lawsuit will easily surmount the expense of taking the initial engineering steps that would have assured compliance. Although building owners face this risk, many are not aware of potential IAQ hazards and the HVAC product solutions

available that create an acceptable indoor air quality environment. The issues of indoor air quality and compliance with the ASHRAE standard have spanned the pages of HVAC technical trade journals serving notice to such governing organizations as the EPA and OSHA as well as state and local officials. IAQ awareness is increasing and so to are the solutions.

CONTROLLING INDOOR AIR QUALITY



1.3 *What does ASHRAE Standard 62 say?*

Ventilation is the most important single element of an HVAC system to insure good IAQ. Generally speaking, what the standard says is that to insure good IAQ, one must maintain indoor air contaminants below a maximum acceptable threshold. One way to keep the level of contaminants down is by adequate ventilation. ASHRAE has set forth a schedule of outdoor air ventilation rates in CFM per person for a variety of different indoor spaces (see table 1-2). With a design occupancy load for a building, an engineer can easily determine a minimum ventilation rate to specify for the HVAC system. This ventilation rate procedure is set forth as one path to compliance with the standard. Although this method does not involve an actual determination of indoor air quality, the standard anticipates that if a building's HVAC system delivers the design level of outside air to the interior space, the building is in compliance and indoor air quality will not be degraded. Implicit here is the observation that these conditions specified by ASHRAE must be observed not only in design of the building but also in its operation. It is the latter which is most often to blame when there is an IAQ problem.

Table 1-1: ASHRAE Recommended Outdoor Air Ventilation Rates

Application	*Outdoor Air Requirements*
Dining rooms	20 CFM/person
Cafeterias, fast food	20 CFM/person
Bars, cocktail lounges	30 CFM/person
Laboratories	20 CFM/person
Libraries	15 CFM/person
Auditoriums	15 CFM/person
Office space	20 CFM/person
Gambling casino	30 CFM/person
Hospital operating rooms	30 CFM/person
Hospital patient rooms	25 CFM/person
Classrooms	15 CFM/person

1.4 *What practices affect IAQ?*

After investigating over 500 complaints of poor IAQ, NIOSH concluded that overwhelmingly the main cause was insufficient ventilation, often the result of improper operation and application of the HVAC system.

A good IAQ solution recognizes a need for compromise between efforts in achieving acceptable air quality and in minimizing energy consumption.

This reveals that the practices of HVAC equipment and controls contractors, as well as those of building managers, need to prioritize the minimum ventilation rates specified by design engineers to achieve good air quality. Look to the following issues as prevalent within the industry:

- Emphasis on energy savings: For many in the HVAC industry, a main priority in applying and operating HVAC equipment has been energy savings, a legacy from the energy crises of the 1970's. The introduction of outdoor air spells energy consumption as this air must be either heated or cooled to meet indoor temperature requirements. In a zeal for maximum energy efficiency, many buildings have restricted or fully closed the outside air intakes. It is important to remember, however, that energy conservation affects the bottom line for most buildings and thus rightly has a prominent role in HVAC decision-making. A good IAQ solution insures the proper ventilation in a very efficient manner, without causing unwarranted surplus energy consumption.

- Quick-fix maintenance: When the introduction of outside air strains the smooth operation of HVAC unit temperature controls, sometimes they are disabled, rather than fixed to perform properly. Air handling unit controls typically include temperature low limit thermostats which shut down equipment upon sensing freezing air. Equipment shutdown causes comfort complaints and encourages the closing of outside air dampers to prevent further shutdown. This quick fix thus maladjusts the system air balance and restricts the fresh air ventilation needed to maintain indoor air quality.

- Improper air system balancing: The initial air balancing test performed at the commissioning phase of the HVAC system installation is extremely important. It is at this time that a system balancing contractor is to correctly calibrate the ventilation equipment so it can meet minimum fresh air requirements. This task is more difficult when the HVAC system design incorporates air handling units with only one main outside air

damper that functions to provide fresh air not only for cooling but also for ventilation. Project specifications in this situation call for the main

outside air damper to modulate open to a minimum position during normal operation in order to bring in the right amount of outside air. The difficulties encountered here are locating this 'minimum position' and setting the controls to maintain it. Thus, there is a reliance on coordination between different contractors that have different responsibilities.

Avoiding problems with Indoor Air Quality requires long-term vision and planning.

During the construction of a building, top concerns are relatively short-term: getting the building up on-time and within budget. Unfortunately, problems with ventilation that lead to a 'sick building syndrome' or a 'building related illness' are long-term effects and become the responsibility of a building owner long after the construction is finished. Let us turn to a very common scenario from the project job site as an example. An outside air damper either arrives pre-installed in an AHU or is to be installed by a contractor at the job site. The controls team installs their controls field gear, including the OA damper actuators. In today's digital systems, the minimum position for the damper, the position that provides minimum fresh air, is programmed in software. Often the expedient decision is to program in an temporary arbitrary value (15% for example) and verify that the damper appears to open that much, leaving the damper ready for balancing. If the necessary coordination does not occur, the end result is that the outside air damper is left unattended and the actual ventilation rate is unpredictable. Compliance with the ASHRAE standard is uncertain.

- VAV unit volume changes: Even with a dedicated minimum outside air damper, sized to provide the right amount of fresh air per ASHRAE 62-1989, there is an additional complication--the reduction of air volume fan output in VAV systems as a part of normal operation, a configuration that generates energy savings . In a VAV system, as the interior spaces need less cooling and the VAV boxes correspondingly close off to the main unit's cool air supply, the main unit controls respond to the increase in duct static pressure by reducing the fan speed and thus the air volume. There is a corresponding drop in the pressure difference between the outside air and the mixed air plenum. The minimum outside air damper is sized according to the expected pressures at full flow. Thus, at lower speeds, the fan pulls less fresh air ventilation through the outside air damper. Because the damper in this situation does not respond to the fan speeds, the end result is that the actual fresh air ventilation rate could be anything. Again, the ASHRAE standard may not be met.

1.5 *What is available to assure compliance with the ASHRAE standard?*

The ASHRAE standard identifies the path to compliance applicable to the HVAC community: the **Ventilation Rate Procedure.** Design engineers and building owners need to prioritize implementing methods that assure that the design amount of fresh air enters the building via the ventilation system. Specifically, they must specify a means of measuring and controlling the incoming fresh airflow. Conventional methods include furnishing and installing three different products from potentially three different suppliers: an air flow monitor, a control damper, and a programmable controller. This results in higher product costs and difficult coordination efforts, which become significant enough to dissuade building owners and engineers from prioritizing indoor air quality through budget cuts.

Conventional IAQ solutions can be costly in terms of product cost, coordination time and project delays.

In addition, combining these products in the field and not in the factory has meant that a project-specific laboratory calibration, which guarantees performance, could not be achieved. Often, the use of three separate devices to measure and monitor the outside air results in custom air handling design which also adds to the overall project costs and schedule delays.

1.6 *Do CO_2 sensors and CO_2 control assures compliance?*

Interest in the use of CO_2 sensors to measure and control indoor air quality has increased dramatically in the past couple years. Although the information provided by CO_2 monitoring is valuable, merely controlling the level of CO_2 below some maximum threshold does not construe compliance with ASHRAE Standard 62. The reasons why are somewhat complicated because of confusion over the link between CO_2 and indoor air quality. Although ASHRAE has recognized CO_2 as a surrogate indicator of body odors and other bioeffluents affecting indoor air quality, the standard does not state that if CO_2 concentrations are maintained at acceptable levels then indoor air quality shall be considered acceptable. Rather, the standard declares that "indoor air quality shall be considered acceptable if the required rates of outdoor air...are provided for the occupied space." Advocates of CO_2 as an indicator of a ventilation rate argue that if one knows both the CO_2 concentration of outdoor air and the CO_2 consumption level of occupants, one can measure indoor CO_2 and derive the ventilation rate. This might be true if outdoor CO_2 and human consumption were constant. However, it is not possible to anticipate the various activity levels and breathing capacities of occupants. Thus,

any measured indoor CO_2 reading can not as accurately determine ventilation rates as an actual airflow measurement.

These same advocates also argue for CO_2 as an actual measure of IAQ. The assumption here is that if CO_2 levels are low, then whatever ventilation that is present is probably enough to remove all contaminants. The problem here is that CO_2 is an indicator of human activity and thus measures the human load, not the actual air quality. It does not account for chemicals and various bacteria, molds, and fungi that exist and propagate independently of human activity. Yet CO_2 monitoring does provide some valuable benefits. For example, one could use the sensors to trigger increased ventilation above minimum requirements at air monitoring stations due to poor mixing and/or extra capacity. We quickly see that the main bulwark of defense for building owners against "sick building syndrome" is continued compliance with the ASHRAE ventilation standard via the Ventilation Rate Procedure.

Ruskin's new IAQ50 damper/monitor provides the best weapon to fight your indoor air quality battles.

1.7 *What is the IAQ Damper solution?*

The IAQ damper from Ruskin is an integral air damper/monitor - a damper assembly where the damper also acts as an airflow monitoring station. Ruskin combines this assembly with a factory calibrated programmable controller specifically designed for this product to form one complete package. Turn now to the Section 2 to look at this unique product in more details and to discover its features and benefits.

2. The IAQ50 Damper Solution by

RUSKIN

2.1 *Introduction*

The IAQ50 integral air monitor/damper is the latest model in the new IAQ damper series from Ruskin and is designed to meet the current engineering demands for indoor air quality. The IAQ50 damper is an innovative combination of three different functions into one product: an airfoil control damper that regulates airflow, an airflow monitoring station, and a programmable controller. It is designed to provide HVAC system compliance with the ventilation standard as stated in ASHRAE Standard 62-1989. What is most unique about the IAQ50 is that the airflow monitor is *built into* the damper. Thus, this patented assembly is both narrow and compact and affords unmatched versatility. With a wide operating range and adjustable setpoints, the IAQ50 damper is poised to respond to future ventilation needs.

Maintaining Minimum Outside Air Requirements

2.2 *How the IAQ50 works*

The unique design of the IAQ50 incorporates air monitoring into the assembly of a high performance, aluminum airfoil blade control damper. A typical control damper consists of multiple blades which modulate in unison to regulate air flow for various applications. Ruskin has combined modulating blades with strategically placed airflow sensing blades of special construction. The special sensing blades designed by Ruskin possess pressure sensing ports located on the blade edge on both the air entering and leaving sides. The multiple pressure ports are connected to respective pressure chambers inside the body of the sensing blade for entering and leaving air. The difference between these two pressures corresponds to a velocity pressure of the airstream, and Ruskin's IAQ50 controller (located inside a control panel provided as part of the IAQ50 damper) converts the measurement of this pressure differential into a CFM value.

A differential pressure transducer is mounted inside the IAQ50 control panel. Tubing/ piping connections are made between the control panel and the monitor/damper frame (see control panel technical diagram for all wiring information) for this device. The transducer converts the pressure signals from the

tubing to a low-voltage analog 2-10VDC signal that connects with the controller analog input terminals. The calibration process readies the IAQ50 for the effects of the position of the modulating blades and the pressure characteristics of each

unique damper as it monitors this signal. The IAQ50 controller monitors blade position via a wiring connection to the feedback signal feature of the damper actuator.

Once the controller has computed a value for the CFM, it compares this value within its control logic programming to the CFM setpoint as determined by the particular mode of operation of the HVAC system. In normal operation, this setpoint will correspond to the minimum outside air ventilation required by the system design to meet ASHRAE Standard 62. Based on the difference between the actual CFM reading and the desired CFM setpoint along with other programmed control parameters, the controller will position the modulating damper blades as necessary to ensure that the actual outside air meets the desired level. Wiring connects a modulating 2-10VDC signal from analog output terminals on the IAQ50 controller to the damper actuator.

Finally, and most importantly, Ruskin calibrates and tests every IAQ50 damper at its factory prior to shipment. This ensures an easy and reliable start-up, and accurate performance.

2.3 *IAQ50 Configuration Choices:*

Ruskin offers two configurations in the IAQ50 damper family to meet your particular application needs:

1. Minimum Outside Air Damper Configuration
2. Full Size Outside Air Damper Configuration

The first design is the minimum outside air damper model IAQ50 for those units that have separate maximum outside air and minimum outside air dampers, with the minimum outside air damper designed to provide the minimum ventilation to the space as determined by ASHRAE Standard 62. (See Figure 2-1) Here the IAQ50 takes the place of the typically two-position minimum outside air control damper and modulates to maintain the actual CFM requirements. If the sequence of operation for the air handling unit calls for the use of outside air in cooling the space (referred to as air-side economizer), please note that under “free cooling” conditions, when the outside air temperature or enthalpy is low enough to be suitable for cooling the space, the AHU controls will modulate open the maximum outside air damper. As this happens, the IAQ50 damper is no longer involved in maintaining setpoint because the maximum outside air damper is now providing outside air ventilation which exceeds the ASHRAE standard requirements. The IAQ50 controller monitors a status switch (recommended, but not required) which signals that the main outside air damper is open. If the main damper is open, the IAQ50 overrides to 100% open and suspends minimum outside air control.

Many air handling units have only one main outside air damper, not two. In this application, the IAQ50 damper takes the place of the entire outside air intake

section (see figure 2-2). This is applicable to many AHU configurations in which the minimum fresh air ventilation is not conducted into the space by a single dedicated damper, but by controlling the outside air to open a fixed minimum percentage during unit operation. Here the IAQ50 will maintain its CFM setpoint at all times. If the AHU controls signal for free cooling during the economizer operation, the IAQ50 controller accepts this signal to open the damper further than necessary for minimum ventilation in order to satisfy cooling demands. During non-economizer unit operation, the IAQ50 will open to a position that provides the minimum outside air as required by system design. Finally, during unoccupied hours, the IAQ50 damper will shut down to fully closed.

figure 2-1

Minimum Outside Air Damper Configuration for the IAQ50

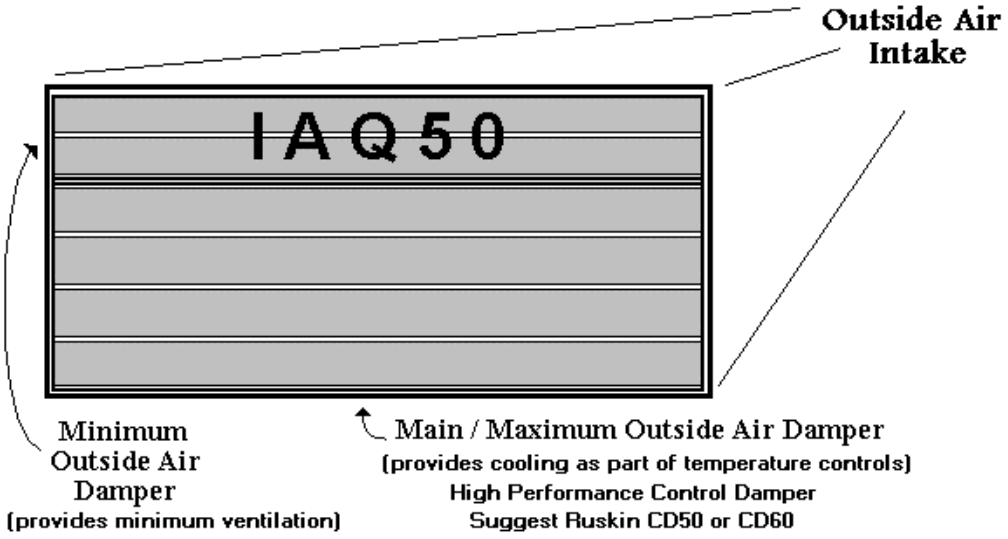
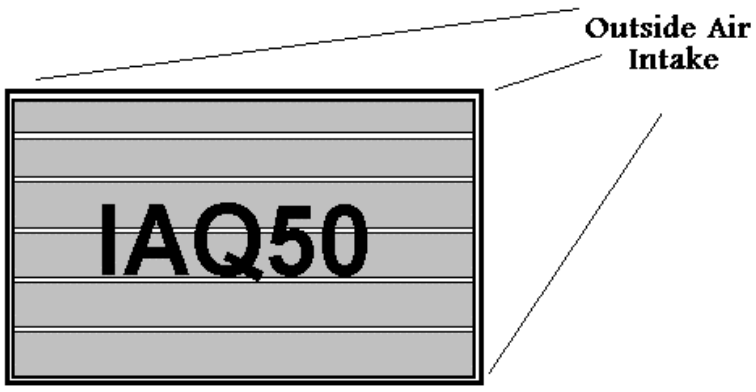


figure 2-2

Full-size Outside Air Damper Configuration for the IAQ50



Single Maximum/ Main Outside Air Damper
(IAQ Damper would replace entire section)

2.4 *IAQ50 Sequence Switches*

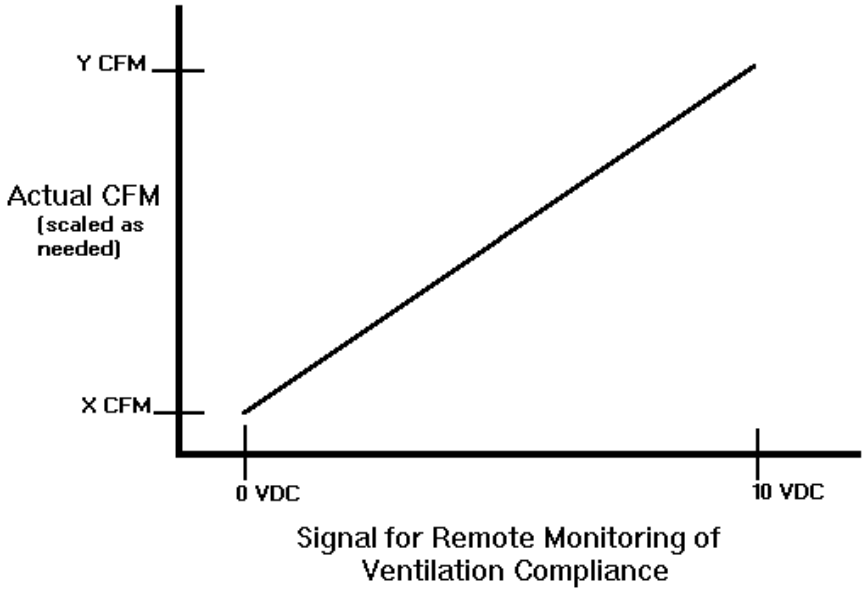
The IAQ50 outside air sequencing is accomplished using two switches located in the control panel. The IAQ50 can be driven closed for night mode or morning warm-up by opening switch S1. Likewise, for economizer operation, by opening S2, the IAQ50 will drive to the full open position. See IAQ50 Wiring Connections for more detail.

Universal Integration with Facility Management Control Systems

2.5 *Remote Monitoring*

A valuable feature of the IAQ50 is that it allows remote monitoring of its performance by any device or system that accepts a 0-10VDC analog signal. This would include not only programmable recorders and data loggers, but also any building automation system. The IAQ50 controller provides a 0-10VDC output signal scaled to a predefined CFM range (see figure 2-3). It is important that a building's HVAC maintenance personnel can observe the amount of ventilation that is entering a building in a convenient and precise fashion. The IAQ50 highlights these special benefits.

figure 2-3



Signal for Remote Monitoring of
Ventilation Compliance

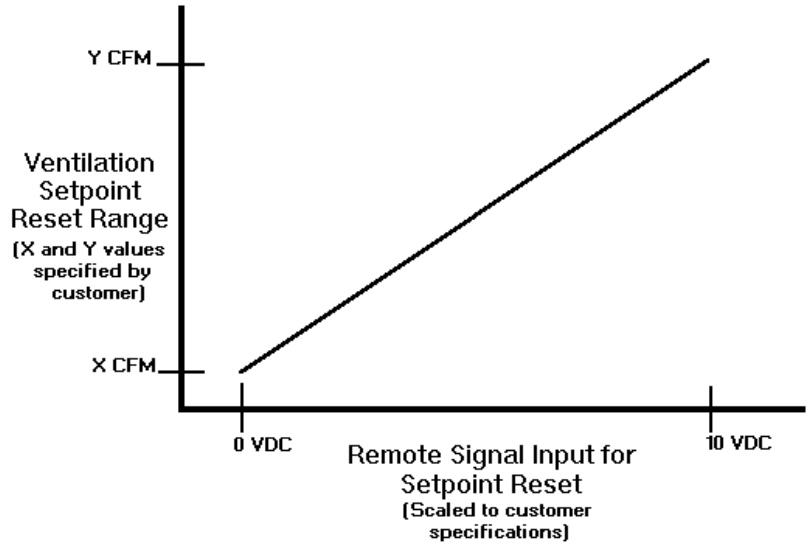
2.6 *Documented Compliance*

The ability to remotely monitor the performance of the IAQ50 allows a building owner a proactive role in IAQ compliance. As facility management control systems perform not only monitoring of analog signals, but also signal trend, history, and data storage, the utilization of the IAQ50 has benefits beyond those of precise HVAC control. By storing the IAQ50 performance data history on computer disk or paper, a building owner can document compliance with the ASHRAE ventilation standard and building codes.

2.7 *Changing Ventilation Needs*

Another important feature of an automated facility management system is that it allows building personnel to perform remote setpoint adjustments to the HVAC controls in response to changing system needs. Significantly, the IAQ50 accepts a 0-10VDC setpoint adjustment signal from a remote source that can change the ventilation rate controlled by the IAQ50 (see figure 2-4). Such a change may be necessary as building ventilation needs change due to such factors as changing occupancy levels in the occupied space or signal from carbon dioxide sensors. Indeed, the new ASHRAE Standard 62 coming in 1996 will confirm that as occupancy levels change, ventilation requirements may change, thus permitting more sophisticated outside air control strategies.

figure 2-4



Other Benefits of the Ruskin IAQ50

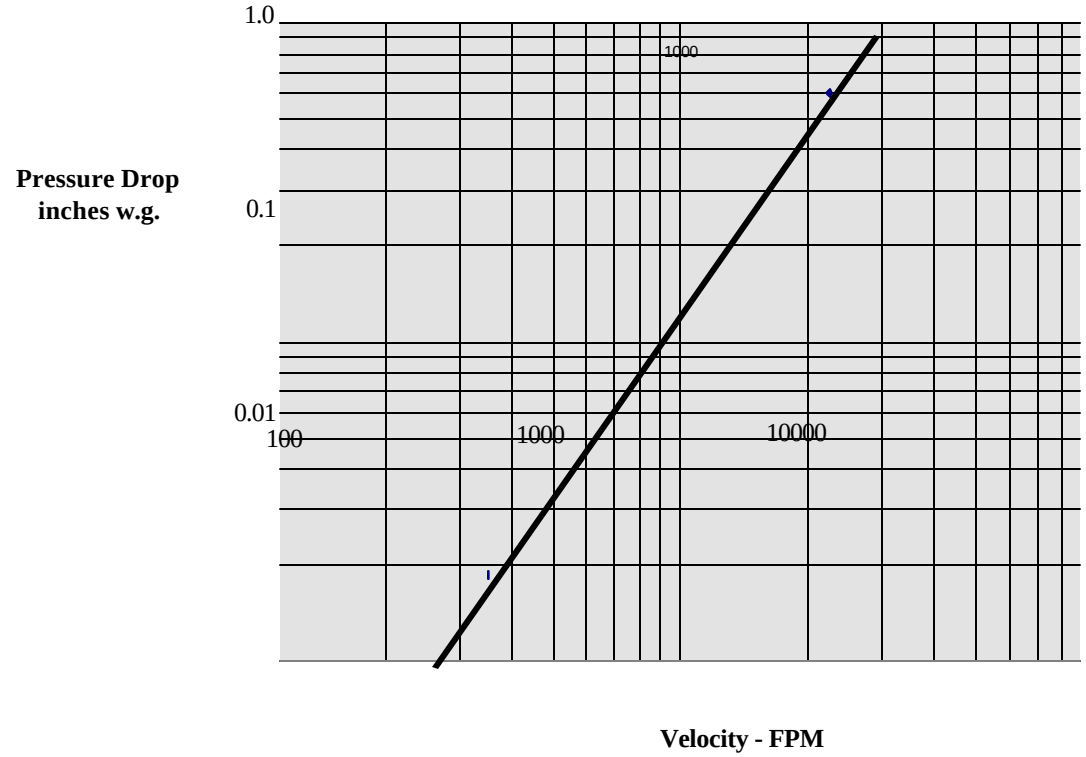
2.8 *Low Pressure Drop*

Because Ruskin has designed the IAQ50 with aluminum airfoil blades and a special frame allowing for maximum free area, the pressure drop performance of the damper is superb (see figure 2-5). Unlike other air measuring damper arrangements which have such a high pressure drop that designers must account for it within the design of the HVAC system, the performance of the IAQ50 allows system design to proceed without special considerations. Thus, the IAQ50 is designed around the HVAC system, not vice versa. The low pressure drop also

means that the required airflow can be accomplished with less fan power and consequently less energy consumption.

IAQ50 Pressure Drop Performance

figure 2-5



2.9 *Energy Savings*

A lack of control of the outside air stream means more than just the possibility of inadequate ventilation and non-compliance with the ASHRAE standard. Like any portion of the HVAC system that is not under control, the outside airflow can deviate above what is required. While this may not threaten indoor air quality, this extra ventilation results in extra energy consumption, as the extra outside air must be either heated or cooled to suit building temperature requirements. Sources of excess outside air ventilation range from the human element, like improper system balancing, to climatic influence, such as strong winds.

2.10 *Individual Factory Calibration*

One cannot overstate the value of the individual factory calibration afforded each IAQ50 damper. Besides symbolizing Ruskin's close attention and commitment to quality products on which customers have come to rely, the factory calibration also serves to save time and money. Not understood or detailed is the high cost of any field calibration of HVAC system components. The cold construction site or the cramped mechanical room are not ideal environments for

the attention to detail and precision available in Ruskin's AMCA registered

laboratory. Furthermore, field calibration takes longer because of coordination costs and the uncertainties of field circumstances. In sum, individual factory calibration means that the IAQ50 is ready to go upon arrival for the specific application for which it was designed.

2.11 *Automatic Adjustment to VAV System Changes*

Because it is a dynamic control, continuously monitoring the outside airflow, the IAQ50 is poised to respond to the airflow changes inherent in the popular VAV system design. As the supply fan of an air handling unit slows down in response to changing cooling demands within the HVAC system, the outside air plenum static pressure declines resulting in less outside airflow through the outside air damper. Not addressing this particular phenomenon can be one facet of a lack of compliance with ASHRAE Standard 62. With the full-size IAQ50 damper configuration style in service for example, the minimum ventilation is always maintained. The IAQ50 monitors the reduction in airflow and adjusts to it by opening further to the outside air. If necessary, the same signal that further opens the IAQ50 can be used to close down the return air damper, thus increasing the plenum pressure differential to bring in even more outside air.

2.12 *No Special Ducting Requirements*

One final, remarkable benefit of the IAQ50 is that the combination of its innovative design and its individual factory calibration precludes the necessity of any straight duct section requirements commonly found with conventional airflow stations. In new construction projects this means once again that the HVAC system design can proceed unhindered by the special considerations of a single component. As indicated above, the IAQ50 is designed around the HVAC system, and not vice versa, and this results in lowered costs as compared to convention methods. For example, standard AHU construction can be utilized in lieu of much more expensive custom designs. This feature has important ramifications for retrofit applications as well. Because an existing building's HVAC system may have structural constraints that preclude the use of conventional airflow stations, the IAQ50 serves as an ideal solution in that its narrow depth and damper design allows it to fit in tight spaces.

3. IAQ Opportunities/Case Studies

3.1 *Finding IAQ Opportunities*

The versatility of the IAQ50 both in terms of installation and available configurations makes it ideal for all HVAC applications in which an air handling unit is responsible for supplying some minimum level of outside air for ventilation. This goes for both new construction *and retrofits*. Just as the engineering community is responding to the demand for IAQ solutions in new building designs, owners and managers of existing buildings are likewise becoming aware of the need to address indoor air quality issues. Think of all the air handling units in service today without a means of monitoring the airflow from outside!

Look to these areas as ready to address indoor air quality:

- *Schools*: Good indoor air quality creates a healthy, comfortable, and productive learning environment. High-density indoor spaces are often the most at risk and warrant the close IAQ scrutiny that the IAQ50 affords.

- *Medical Facilities*: Engineers and building owners are committed to the health and safety of employees and patients in any medical facility. ASHRAE Standard 62 identifies good indoor air quality methods as critical in abating microbial contaminants.

- *Performance Contracts*: Under a performance contract, a building is renovated and retrofitted with current technologies and HVAC system strategies. Expected energy savings typically pay for these improvements. Engineers adopt a systemic approach in assessing an owner's needs and identifying opportunities to implement solutions to past HVAC problems. This is an ideal time prioritize indoor air quality and offer the IAQ50 as a solution to not only air quality concerns but also attendant building pressurization problems.

- *Clean Rooms*: Applications such as these beg for the precise control and monitoring capabilities that the IAQ50 provides.

- *Building Pressurization*: When a building has its inflows and outflows under stable control, true system balancing can easily be achieved and building pressurization difficulties can be addressed. Good indoor air quality is the beneficial result.

These are some suggested strategic action steps:

1. Develop an awareness in the local engineering community of ASHRAE Standard 62 and indoor air quality issues.

2. Work with building owners and those companies in consultation with building owners in order for them to realize that they are the caretakers of indoor air quality.

3. Adopt a consultative approach in asking the question, "are your clients interested in these issues?" and offering the IAQ50 as an available solution in the marketplace. Ruskin is not saying that people *should* have this device but is responding to the genuine needs and interests emanating from the engineering community.

4. When a potential customer is identified, show how the great long-term benefits of the many features of the IAQ50 far outweigh the initial cost of installing the unit.

5. Follow through with an investigation of the particular HVAC system needs and characteristics in order to provide an IAQ50 specially suited for the building in which it is to be installed.

3.2 *Case Studies*

Ruskin's IAQ Damper Ventilates Denver Hospital

This IAQ package by Ruskin included both the minimum IAQ damper as well as the maximum fresh air damper as detailed in section 2. The IAQ damper/monitor was calibrated at Ruskin for accuracy and then shipped as a complete assembly to the York facility for installation in the air handling unit.

This damper measures and monitors the amount of fresh air entering the building based on the ventilation rates established in ASHRAE Standard 62-89. Because the Ruskin IAQ damper automatically adjusts to maintain the desired CFM setpoint, energy consumption is saved in the process.

Ruskin's IAQ monitor/damper can be mounted in commercial air handling units, built-up air handling units, ductwork or behind louvers in the walls of your buildings. They can be utilized as part of a building management system or standalone and are compatible with anyone's DDC system.

Ruskin Proves To Be a Good Bet For Vegas Casino

In order to build a new way to access the casino, the 4 Queens Hotel and Casino needed a 48-foot air curtain. However, this curtain had to be designed around existing structural supports, providing a unique and challenging problem of air control. The air curtain not only had to prevent conditioned air from leaving the building, but it also had to provide comfort and not consume too much energy. Working together with Long and Associates and Harris Consulting Engineers, Ruskin combined their IAQ50 dampers with the air curtain, providing a custom designed job that maintained consistent airflow around the structural supports. This solution enabled the 4 Queens to open a new accessway, and caused them to exceed revenue projections.

Ruskin Helps Money Store Expansion

When the Money Store built a new headquarters, their architects employed a unique tiered design. Several Ruskin products were employed in the new building. The IAQ50 was installed in the outside air plenums in order to control the minimum outside air and report the information to the Building Automation System. They work in conjunction with Ruskin's CD36 low leakage damper, which were installed in the outside air openings of the plenums. This enables the building to precisely monitor and control outside air flow.

RUSKIN

CASE STUDY

The IAQ Damper Series

Indoor Air Quality at a Kaiser Medical Facility

Success for Ruskin's Integral Air Damper and Monitor

Thousands of Americans visit Colorado for its fresh, crisp air and beautiful outdoor scenery. This past year one of the nation's largest health care providers, Kaiser Permanente, took steps to insure that the indoor air at its Hidden Lake facility afforded the same comfort and freshness by using the new IAQ40 integral air damper/monitor from Ruskin. That Kaiser Permanente demands a healthy and comfortable environment should be no surprise. After all, at Kaiser, the health of its occupants is the issue.

Ruskin's IAQ damper is both an airflow station that measures the fresh air and a control damper that regulates it.

The RMH Group, a consulting engineering firm in Denver, designed the HVAC system to comply not only with industry standards and regulations, but also with the needs and priorities of Kaiser. Dave Kahn, mechanical engineer at RMH, said, "Because RMH is committed to meeting ASHRAE standard 62-1989 for ventilation and because Kaiser Permanente is committed to the health of its employees and patients, we share the position that indoor air quality is a priority." And installing Ruskin's IAQ40 integral damper/monitor helped fill the bill.

Interpreting and fulfilling the requirements of the ASHRAE standard can be challenging. "Many projects are budget-driven, which precludes the use of airflow monitoring stations. With Kaiser's support for indoor air quality, we were able to include the stations in the controls for the ventilation system," Kahn said.

Such stations are a critical component of the HVAC system in assuring both accurate control of ventilation and compliance with the ASHRAE standard. This is because one path to compliance with the standard is to provide a fixed amount of outside air to the interior space determined on a per occupant basis.

Although the amount of fresh air required for any building may be specified, all too often system designs rely on antiquated methods to determine the proper amount. This introduces guesswork and neglects, for example, the effects of pressure changes within the building and the air handling unit. "VAV systems like those used at Kaiser can pose a problem as the unit volume decreases unless some type of airflow control is present," notes Kahn. Too little air means inadequate ventilation; too much air results in extra energy consumption to maintain space temperature and humidity requirements. Ruskin's IAQ40 integral damper/monitor is both an airflow station that measures the amount of fresh air being drawn inside the Kaiser facility and a control damper that regulates the flow to the desired quantity.

Bob Padgett, commercial sales engineer at Long & Associates, Ruskin Manufacturing's representative for the Denver area, identified an opportunity to solve the ventilation design demands by integrating new

Compliance with ventilation standards should not be costly. The ability of Ruskin's IAQ40 damper to fit into a standard AHU design saved in cost and delivery lead time.

RUSKIN®

With Ruskin's new IAQ damper taking care of indoor air, hospital staff can focus on what they do best.

product technology into standard HVAC equipment. "Because the Ruskin IAQ40 is an airflow station and a control damper in one assembly, we were able to incorporate it in the York air handling unit's standard design," Padgett said. "York did not need to modify its standard air handler design since the IAQ40 damper fit into the existing outside air intake opening and did not require extended casings to provide the additional mixing box length that many airflow stations require. Our ability to utilize a standard air handler design saved about 30% in cost and shortened lead time." There were additional advantages besides initial cost. Because Ruskin designed the IAQ40 damper for mounting at the air handling unit factory, the burden of coordination and installation labor was shifted from the typically cold construction site found in Denver in January to the controlled environment of the York manufacturing plant in Albany, Missouri. "Field installations are often more costly and arduous," according to Dave Albertson of RK Mechanical, "than arranging to have everything ready to go at the factory. Such pre-planning has a positive impact on project management."

The Ruskin IAQ damper fits into existing AHU outside air intake openings and into standard AHU designs.

One final feature of the IAQ40 is that Ruskin designed it as a completely self-contained control that can interface with any building automation control system. The area branch office of Landis & Gyr Powers designed and installed the facility management system for the Kaiser multi-use clinic at Hidden Lake. According to Rick Love, project engineer at Landis & Gyr, this interface between the air damper/monitor and the control system "allows for continuous monitoring by the HVAC technical staff and building management team." With their monitoring capability the Kaiser staff can perform airflow data trend analysis and prepare date reports, as well as store the airflow data history for future reference. This information may be important in affirming continued compliance to the ASHRAE 62 ventilation standard.

The airflow information from the Ruskin IAQ damper is important in confirming continued compliance with ASHRAE standards.

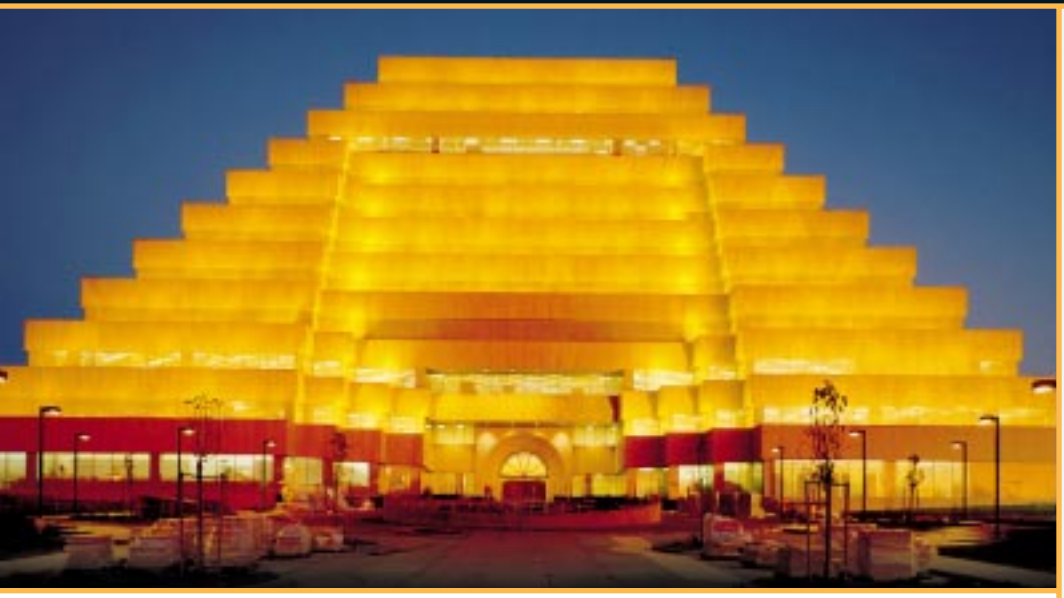
"Any control problems can be identified immediately, and if increased ventilation requirements are deemed necessary in the future, with the IAQ40, our system can now meet them with merely a keystroke."

Kaiser maintenance manager Libby Pitzlin feels that assuring indoor air quality is important in maintaining the quality healthcare provided by Kaiser. "Monitoring the ventilation systems and the air quality here in this building is instrumental to Kaiser and is among my top priorities," notes Pitzlin. Because of the proven performance of the IAQ40 at Kaiser, Pitzlin can now consider more complex air quality control strategies.

Densely populated environments are at greater risk from "sick building syndrome," a situation in which the health and productivity of a building's occupants are affected by odors and contaminants inadequately ventilated from the building. When NIOSH finds that a major cause of such a degraded indoor air quality is often the improper operation and application of the ventilation system, this is a call to the HVAC engineering community for some design solutions. Ruskin has stepped forward with an innovation that takes care of Kaiser's indoor air so Kaiser can take care of the patients it serves.

RUSKIN

Case Study
THE MONEY STORE



The Money Store Administrative Building, West Sacramento, CA

Headquartered in West Sacramento, California, The Money Store's existing facilities were inadequate for its growing staff. To help with its consolidation and expansion, The Money Store contracted with E.M. Kado and Associates to design a new facility to meet their needs. Wanting to complement and enhance the West Sacramento skyline, E.M. Kado and Associates designed the new building with a distinctive tiered appearance.

The mechanical systems in this unique building were designed and installed by Airco Mechanical, Inc. They selected several Ruskin products to control the ventilation system and provide the HVAC life/safety protection. Norman Wright Mechanical Equipment, Co., Ruskin's Sacramento representative, provided expert support to complete the design, installation and commissioning of the system.

The HVAC system includes chillers installed in the basement level. With two 74,000 CFM centrifugal fans, outside air and return air are directed to a large acoustical plenum. The system is designed with efficiency in mind and to meet ASHRAE 62-89 recommendations. The HVAC system also includes life safety protection which, in case of a fire, helps prevent flame spread and smoke migration within the building, including the four-story atrium.

Money Store Expansion Includes Several Ruskin HVAC Products

The Money Store building expansion project incorporates several Ruskin products that control the ventilation system and provide HVAC life/safety protection. These include:

- IAQ50 Air Flow Measuring Control Dampers
- CD36 Control Dampers
- CBS7 Fan Discharge Backdraft Dampers
- CD80VG2 Fan Discharge Dampers
- FSD36 Fire/Smoke Dampers
- FSD36C Corridor Fire/Smoke Dampers
- IBD40 Integral Sleeve Fire Dampers

Case Study

THE MONEY STORE

Airco selected the Ruskin IAQ50 air flow measuring and control damper to control the minimum outside air and report the information to the Building Automation System (BAS). The IAQ50 damper is installed in the outside air plenum. This is matched with Ruskin's CD36 low leakage dampers which are installed in the outside air openings of the plenum. The outside air dampers remain in the full closed position except when the building's controls signal a free cooling condition. When the outside air dampers open, the IAQ50's flow measuring and control functions are bypassed. When the outside air dampers close, the IAQ50 returns to measuring and controlling the minimum outside air. CD36 dampers are also installed in the plenum wall to control the return air path.

Ruskin CD80VG2 dampers are installed on the discharge of the return and supply air centrifugal fans to prevent air backflow if one fan is off-line for maintenance. A Ruskin CBS7 backdraft damper is installed on the discharge of the smoke exhaust fan located in the Penthouse. The damper prevents backflow into the smoke exhaust system when the system is not in operation.

To help protect the employees and provide a safer environment, Ruskin fire dampers and combination fire/smoke dampers are installed in HVAC penetrations of fire rated shaft enclosures, walls and corridors throughout the building.

All of the Ruskin combination fire smoke dampers include "Controlled Closure" design. This 3-15 second controlled closure design protects the HVAC system from instantaneous pressure shocks that occur without this important feature.

"Ruskin's complete product offering simplifies the HVAC design process," says Dean Schouweiler, Airco Mechanical Senior Project Engineer.

Bob Beyer, Norman Wright Mechanical Equipment, agrees. "Having the broad range of products Ruskin offers made this project a win-win for everyone involved. This job included a number of unique challenges and Ruskin provided the solutions."

These and many other Ruskin damper and louver products are available through our representatives. To learn more about our complete line of Ruskin products, or to locate the Ruskin representative nearest you, visit our website at *www.ruskin.com* or call us at **(816) 761-7476.**

RUSKIN®

DAMPERS AND LOUVERS
Specified by Many – Equaled by None

www.ruskin.com

3900 Dr. Greaves Rd., Kansas City, MO 64030
(816) 761-7476 Fax (816) 765-8955

RUSKIN

Case Study

FOUR QUEENS HOTEL AND CASINO

Four Queens Hotel and Casino, Las Vegas, NV

Ruskin's IAQ50 Air Flow Measuring Control Damper Solves Las Vegas Air Curtain Challenge

To improve access into the Four Queens Hotel and Casino in Las Vegas, Four Queens recently added a 48 foot air curtain. Built using Ruskin's IAQ50 air flow measuring and control dampers, the new air curtain efficiently and economically maintains the pressure in the building.

Designed to satisfy the needs of a variety of applications, the IAQ50 air flow measuring and control damper provides the perfect solution to difficult challenges.

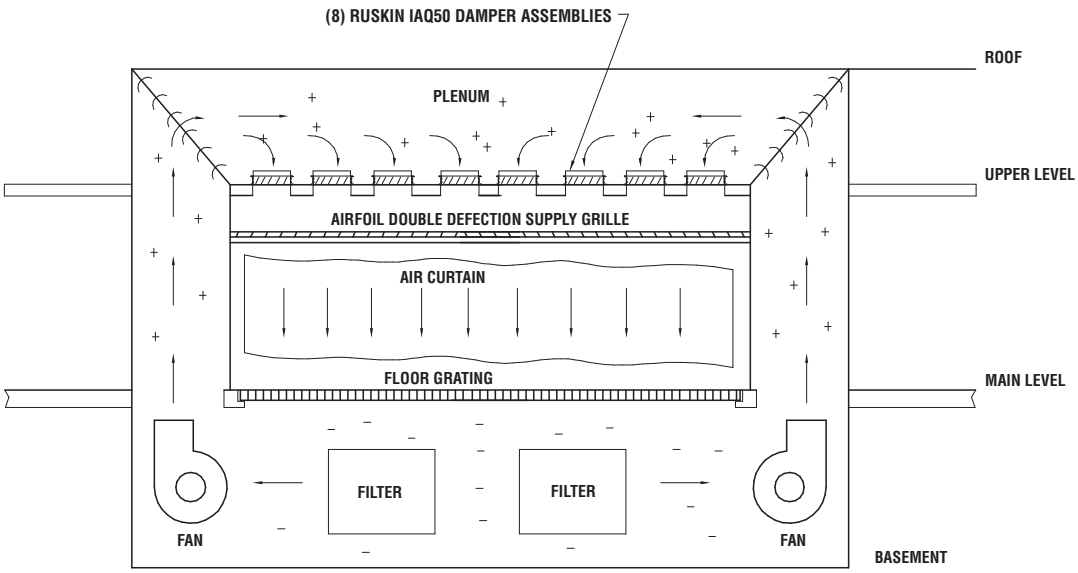
Downtown Las Vegas hasn't been the same since the completion of the Fremont Street Experience revived this popular gambling and tourist destination. This four-block project has successfully turned a city street into a large canopy-covered walkway that has substantially increased the tourist and gambling business in the downtown area.

The Fremont Street Experience which includes a mist evaporation system to protect the tourists from the sun and heat, and a laser light show presented several times nightly, created problems for the Four Queens Hotel and Casino.

Business at the Four Queens Hotel and Casino, located on Fremont Street, was suffering because the two existing air curtains on each end of the casino were limiting access into the hotel and casino from the sidewalk where the crowds stroll and gather to watch the light shows.

In order to share in the success of The Fremont Street Experience, the Four Queens Hotel and Casino contracted with Harris Consulting Engineers in Las Vegas to design an additional access opening. This new, 48 foot opening would be located between the existing entrances.

The hotel wanted the new entrance to open without doors. This required the design and building of an air curtain to separate the casino from the outside elements. Here's where the hotel encountered a problem. Because of the hotel's design, the air curtain would be obstructed by existing structural supports. And, in order to maintain proper building pressure, the air curtain had to provide precise control of the airflow around the obstructions



and down to the return air grate which is also the walkway into the casino.

In addition to maintaining the pressure in the building to prevent the loss of conditioned air from the casino, energy consumption and comfort were significant design criteria.

With the assistance of Long & Associates, Inc., Ruskin's Las Vegas representative, the Harris team responded to the challenge by designing a custom air curtain that provides precision air flow around the existing structural supports.

Built using Ruskin's IAQ50 air flow measuring and control dampers, the new air curtain successfully provides consistent airflow. The system includes two 65,000 cfm centrifugal fans installed in the space below the return air walkway grate. The air returns through the grate into the basement plenum and passes through two 144 square foot filter and coil banks. It is then ducted up from the fans into the plenum space above the air curtain supply opening. The air then passes through the IAQ50 air flow measuring/control dampers and is directed through an adjustable deflection type grille.

The individual IAQ50 dampers measure and control the airflow between the existing structural supports. This helps guarantee the air curtain maintains the required velocity and prevents conditioned air from escaping through the opening.

"Opening up the Four Queens to the Fremont Street Experience has been a tremendous success" says Max Proctor, Four Queens Building manager. "We are exceeding our revenue projections with this improved access to our casino."

"Ruskin's IAQ50 air flow measuring and control dampers are the key to the design of this custom air curtain," says Floyd Harris, principal of Harris Consulting Engineers. "Without the precision control of the air velocity around the structural obstructions, it would result in uneven flow through the supply grille and loss of the air barrier. That means conditioned air would have escaped into Fremont Street. The support given by Ruskin and Long & Associates throughout the design, installation and commissioning of this system was outstanding."

The IAQ50 air flow measuring control damper is designed to fit the needs of a variety of applications. It is this type of versatility that helped the project succeed.

Harris Consulting Engineers once again demonstrated their commitment to providing engineered solutions for their customers by incorporating this unique product into their custom air curtain design.

The Ruskin IAQ50 air flow measuring and control damper is one of many products available through Ruskin's network of representatives. To learn more about Ruskin's complete line of dampers and louvers, or to find the nearest Ruskin representative, visit our website at *www.ruskin.com* or call us at **(816) 761-7476.**

3.3 *Reassured customers: A Sampling of IAQ Damper Installations*

NAME OF PROJECT	CITY	BUILDING TYPE	PROJECT TYPE
BELLEVUE EDUCATION CENTER	BELLEVUE, WA	SCHOOL/ OFFICE	RETROFIT
ST. VINCENT'S HOSPITAL	PORTLAND, OR	HOSPITAL	RETROFIT
ACT THEATER	SEATTLE, WA	THEATER	NEW
BLUE CROSS BLUE SHIELD	CHICAGO, IL	OFFICE	NEW
GLENBROOK NORM HIGH SCHOOL	NORTHBROOK, IL	SCHOOL	RETROFIT
120 S. RIVERSIDE (NO NAME)	BROADVIEW, IL	OFFICE	RETROFIT
UNIVERSITY OF CHICAGO	CHICAGO, IL	ORIENTAL INSTITUTE	RETROFIT
JONES CENTER FOR FAMILIES	SPRINGDALE	MULTIPURPOSE	NEW
HILLCREST MEDICAL CTR PEDIATRICS	TULSA, OK	HOSPITAL	RETROFIT
NEW MEDICAL OFFICE BUILDING	SHREVEPORT, LA	MEDICAL OFFICE	NEW
WARREN HOSPITAL	PHILLIPSBURG, NJ	HOSPITAL	RETROFIT
DOUGLAS COUNTY COURTHOUSE	DOUGLASVILLE, GA	COURTHOUSE	NEW
TAMPA GENERAL HOSPITAL	TAMPA, FL	HOSPITAL	RETROFIT
EMPIRE FIRE & MARINE INS.	OMAHA, NE	OFFICE	NEW
HUMAN TOWERS	LOUISVILLE, KY	MEDICAL OFFICE	RETROFIT
SONY ELECTRONICS	SAN DIEGO, CA	MANUFACTURING	NEW
UNIV. OF TEXAS - BONE MARROW	GALVESTON, TX	HOSPITAL	NEW
IBM BUILDING	KINGSTON, NY	OFFICE	RETROFIT
UD SHROYER PARK	DAYTON	SCHOOL	NEW
FELICITY SCHOOL	FELICITY, OH	SCHOOL	RETROFIT
THE ALBERT KAHN BLDG.	DETROIT	OFFICE	RETROFIT
STANFORD UNIVERSITY	PALO ALTO, CA	SCHOOL	NEW
MICROWARE	URBANDALE	OFFICE	NEW
MAYTAG	NEWTON, IA	MFG.	RETROFIT
J.C. SMITH UNIV.	CHARLOTTE, NC	UNIV.	NEW
DEPT. OF PUBLIC SAFETY	SANTA FE, NM	OFFICE	NEW

NAME OF PROJECT	CITY	BUILDING TYPE	PROJECT TYPE
MEMORIAL HOSPITAL	BELLEVILLE, IL	HOSPITAL	NEW
STORAGE TEK	DENVER	OFFICE	RETROFIT
STORAGE TEK	BROOMFIELD, CO	MFG.	RETROFIT
IBM	BOULDER, CO	OFFICE	RETROFIT
DESERET NEWS BLDG.	SALT LAKE CITY	HIGH RISE OFFICE	NEW
COTTON WOOD CTR.	SALT LAKE CITY	HIGH RISE OFFICE	NEW
DEAN WITTER/DISCOVER CARD	SALT LAKE CITY	OFFICE	NEW
USU RESERVE TRAINING	SALT LAKE CITY	GOVERNMENT	RETROFIT
SUE MORROW ELEMENTARY SCHOOL	LAS VEGAS, NV	SCHOOL	NEW
4 QUEENS AIR DOOR	LAS VEGAS, NV	CASINO	RETROFIT
GVSU FIELDHOUSE	ALLENDALE, MI	UNIVERSITY	NEW
HOLLAND BOARD	HOLLAND, MI	WATER TREATMENT	NEW
NOTRE DAME SPORTS REC. FACILITY	NOTRE DAME, IN	SPORTS COMPLEX	NEW
FOREST HILLS MIDDLE SCHOOL	GRAND RAPIDS, MI	SCHOOL	NEW
ARROWHEAD	STORM LAKE, IA	MEDICAL	NEW
WICHITA CLINIC DAY SURGERY	WICHITA, KS	MEDICAL	NEW
PIONEER TELEPHONE	ULYSSES, KS	OFFICE	NEW

4. IAQ50 Product Literature and Specifications

4.2 *Specification Sheet (following)*
4.3 *Color Advertisements (following)*

RUSKIN®

3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8955

IAQ50 INTEGRAL AIRFLOW MONITOR/DAMPER

OUTSIDE AIR VENTILATION CONTROLLER FOR INDOOR AIR QUALITY

PATENT PENDING

STANDARD CONSTRUCTION

FRAME
Nominal 6" x 1 3/8" (152 x 35) 6063T5 extruded aluminum hat channel with 0.125" (3.18) wall thickness. Mounting flanges on both sides of frame.

BLADES
Airfoil shaped 6063T5 heavy gage extruded aluminum. Anodized monitoring blades are fixed within the damper frame and contain air pressure sensing ports.

SEALS
Jamb seals: flexible metal compression type.
Blade seals: Ruskiprene seal along control blade edges.

BEARINGS
Molded synthetic.

LINKAGE
Galvanized steel, concealed in frame.

AXLES
1/2" (13) plated steel hex.

OPERATING TEMPERATURES
-22˚F to +140˚F (-30˚C to +60°C) standard.
Optional actuator heater option allows -40˚F to +140˚F (-40˚C to +60°C).

POWER REQUIREMENTS
120VAC 50/60 Hz connection to IAQ50 control panel.
Consumption: 100VA.

ELECTRIC ACTUATOR(S)
Power: 24VAC, 50/60 Hz single phase (from control panel).
Signal: 2-10VDC modulating action.
Spring return: 20 sec.
Manual override: hex crank.
Torque: 133 in-lbs. (Operates 20 ft² damper area).
Position feedback signal: 2-10VDC.

DIGITAL CONTROLLER
Application Specific Controller designed for the IAQ50. Programming logic and calibration in a nonvolatile EPROM.

AIR STRAIGHTENER SECTION
Air straightener contained in 5" (127) long sleeve attached to damper frame.

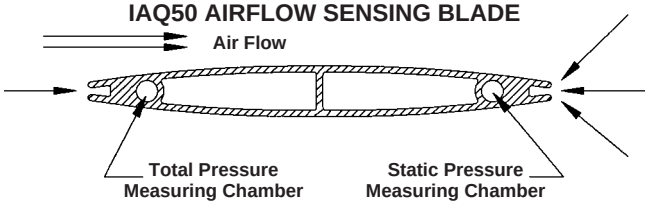
SIZES AVAILABLE
Minimum – 9" w x 9 1/2" h (229 x 241).
Maximum single section – 48" w x 84"h (1219 x 2134).
Maximum multiple section: Unlimited Size.

Note: Dimensions shown in parentheses ( ) indicate millimeters.

APPLICATION

The IAQ50 integral air monitor/damper is an outside air damper for flow measurement and control. It is ideally suited for both new and existing units, ductwork, and air plenum wall mountings.Typically sized to meet minimum fresh air requirements per system design, each IAQ50 is individually calibrated to proper airflow setpoints prior to shipment in Ruskin's AMCA registered laboratory. **Ruskin has designed the IAQ50 to help buildings meet or exceed the minimum ventilation requirements as stated in ASHRAE Standard 62.**

IAQ50 AIRFLOW SENSING BLADE



PERFORMANCE

The IAQ50 integral air monitor/damper incorporates the highest level of performance available in damper designs.

- **Ultra-low Leakage:** For a 48" x 48" closed IAQ50 damper, air leakage is a low 2.0 CFM/ft² at 1.0" static pressure.
- **Monitor Accuracy:** The IAQ50 measures, controls, and reports the airflow within an accuracy of 5%.
- **Airflow Range:** The acceptable range for operation is 300 fpm to 2000 fpm face velocity. This range makes the IAQ50 suitable for a wide variety of applications.
- **Pressure Drop:** The pressure drop across both the IAQ50 and the air straightener section is a low 0.13" w.g. for an air velocity of 1000 fpm.

VARIATIONS

The IAQ50 integral air monitor/damper is available with several options to better suit your building's specific needs.

- Filter option: If selected, the IAQ50 damper assembly will include a filter section attached to the air straightening sleeve. The filter section is designed to permit easy filter maintenance and replacement.
- Louver option: If selected, the IAQ50 damper assembly will include a low pressure drop louver (specify non-drainable or drainable) attached to the front of the straightening vanes sleeve section.
- Actuator heater option: If selected this unit will allow actuator operation in ambient temperatures to -40°.
- Stainless steel option: If selected, stainless steel bearings, linkage, and/or axles will be incorporated into the IAQ50 construction.
- Economizer damper option: If selected, Ruskin will mount the IAQ50 to an economizer control damper at the factory to form a single outside air assembly.
- Custom designs: If a special IAQ50 design is required, please consult the factory for application assistance and pricing.

QUANTITY	INTAKE OPENING		CFM REQUIREMENTS			IAQ50 CONFIG (Min or Full)	MOUNTING STYLE (FL or NF)	FLANGE DIM (FL STYLE ONLY)	MOTOR MOUNT (Ext or Int L or R)	VARIATION
	W	H	DESIGN SETPOINT	ADJUSTABLE CFM RANGE LOW LIMIT	ADJUSTABLE CFM RANGE HIGH LIMIT					

 ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

OPERATION

The unique design of the IAQ50 incorporates an air monitor into the assembly of a high performance, aluminum airfoil blade control damper. Ruskin has combined modulating airfoil blades with strategically placed airflow sensing blades to measure the airstream velocity pressure. Air tubing/piping connections connect the damper/monitor frame to a differential pressure transducer located in the IAQ50 control panel (provided as part of the IAQ50 damper). The IAQ50 controller also monitors the control blade position using the feedback signal feature of the damper actuator. With the signal from the pressure transducer and the blade position signal, the IAQ50 controller converts the pressure differential into an accurate CFM value.

After computing a value for the CFM, the controller compares this value to the CFM setpoint as determined by the particular mode of operation of the HVAC system. In normal operation, this setpoint will correspond to the minimum outside air ventilation required by the system design to meet ASHRAE Standard 62. Based on the difference between the actual CFM reading and the desired CFM setpoint, the controller will position the modulating damper blades as necessary to ensure that the actual outside air flow meets the desired level.

The IAQ50 provides a scaled 0-10VDC signal for remote monitoring of the actual ventilation rate in CFM. Additionally, the IAQ50 can receive a 0-10VDC setpoint adjustment signal if a ventilation range is desired.

FEATURES

The IAQ50 integral air monitor/damper incorporates many high quality features of Ruskin's industry leading damper designs.

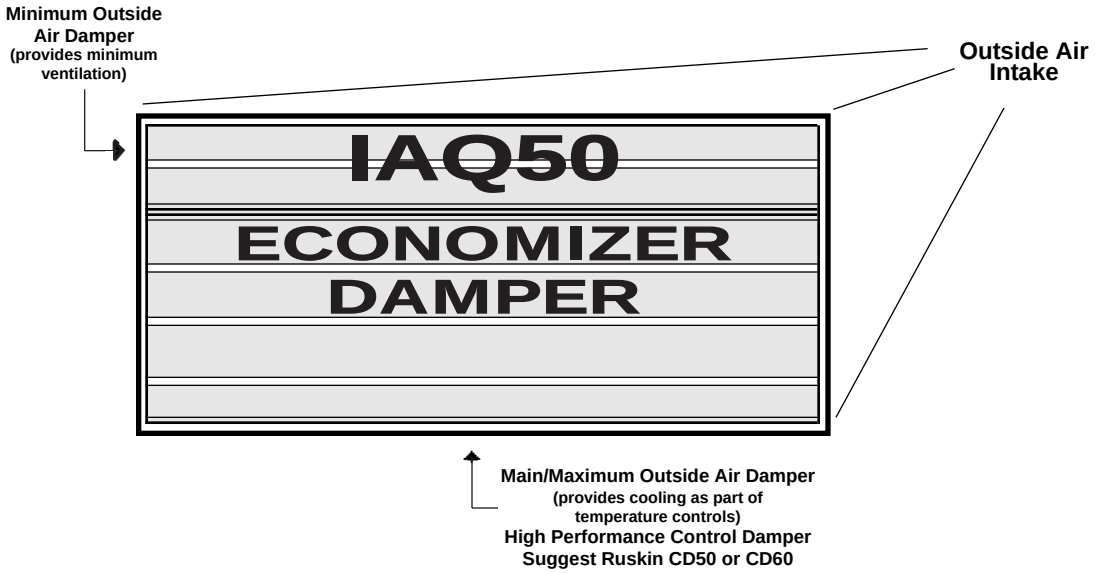
- Narrow total depth of 11" (279) (damper/monitor + air straightening vane section) means unparalleled versatility in both retrofit and new construction projects.
- The IAQ50 typically costs less than separate air monitoring stations, controls, and damper construction arrangements.
- Universal interface with building control systems for remote monitoring and setpoint adjustment.
- The IAQ50 also operates as a fully functional stand alone package.
- The response of the IAQ50 to airflow volume changes makes it suitable for use with VAV systems.
- Complete airfoil design allows for lowest possible pressure drop, and anodized sensing blades provide improved flow characteristics and added corrosion resistance.
- Concealed linkage is out of the airstream which requires less maintenance and reduced air turbulence.

IAQ50 CONFIGURATIONS

The IAQ50 integral air monitor/damper is available in two different configurations to suit your building's particular HVAC system.

- **Minimum** Outside Air Damper: The IAQ50 will always monitor airflow and control to minimum outside air requirements during building occupied hours (see **figure 1** below). The IAQ50 is sized for the minimum ventilation and encompasses only this portion of the outside air opening. In this configuration, another damper in the outside air intake section provides outside air for free cooling as necessary during economizer cycles (control by others).
- **Full-Size** Outside Air Damper: The IAQ50 will always monitor and control airflow in order to meet minimum outside air ventilation requirements during building occupied hours. In this configuration, the IAQ50 is sized to fill the entire outside air intake opening. A signal for free cooling from unit temperature controls (by others) will modulate the IAQ50 damper open beyond minimum position as necessary to satisfy temperature demands, thus increasing outside airflow above minimum requirements. The IAQ50 controller will not allow the airflow to fall below the minimum requirements during occupied hours regardless of the cooling signal.

Figure 1: IAQ50 CONFIGURATION - MINIMUM OUTSIDE AIR DAMPER



IAQ50 MOUNTING STYLES

The IAQ50 integral air monitor/damper is available in two different mounting styles to suit your particular installation:

- **Flanged Style (FL):** The IAQ50 can be designed to fit your outside air opening with a standard flange on the air straightener section as shown in **figure 2**. The flange width of the IAQ50 frame *is not included* within the dimensions of the intake opening. This is ideal for most wall and AHU mountings, and **maximizes the IAQ50's free area.** The minimum face velocity for this style is 400 fpm.
- **Non-flanged Style (NF):** The IAQ50 can be designed to fit your outside air opening as shown in **figure 3**. The flange of the IAQ50 frame is *included* within the dimensions of the intake opening. This is ideal for ducted and sleeved installations where mounting flanges are not required. Minimum face velocity for this style is 300 fpm.

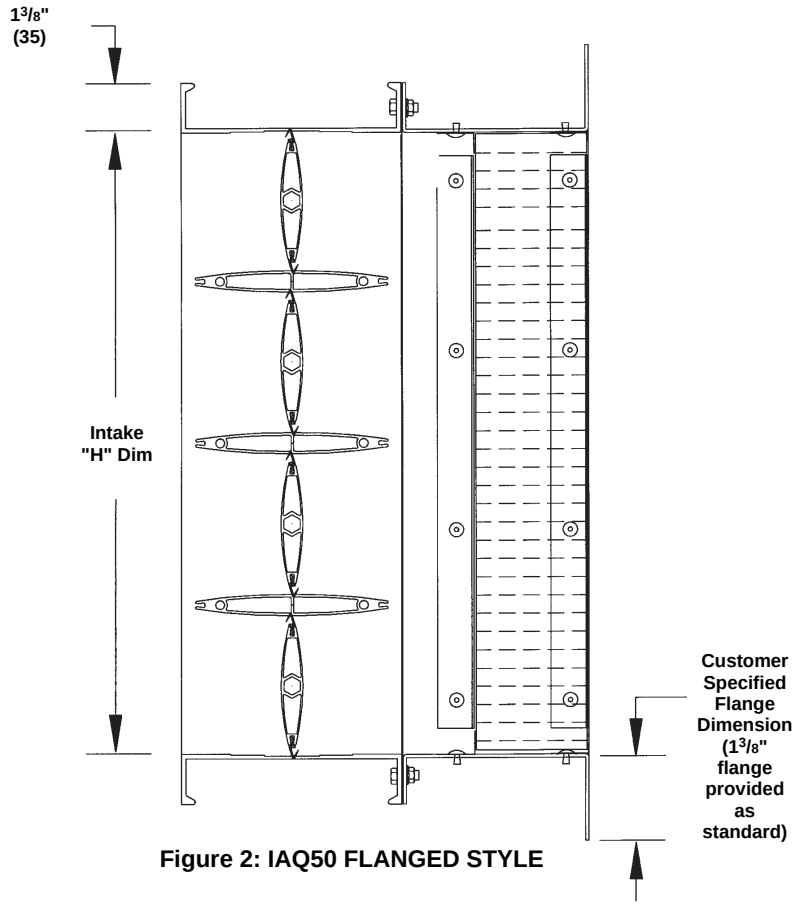


Figure 2: IAQ50 FLANGED STYLE

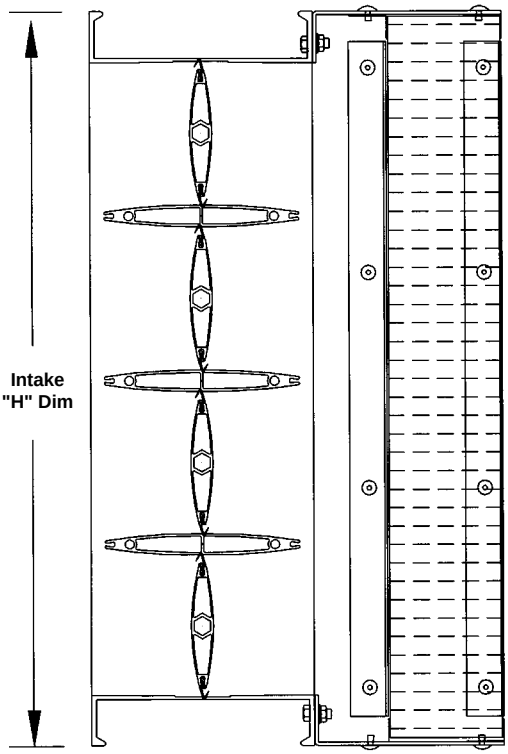
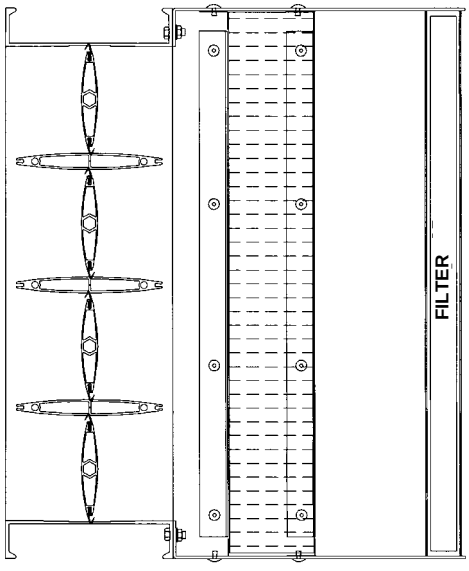
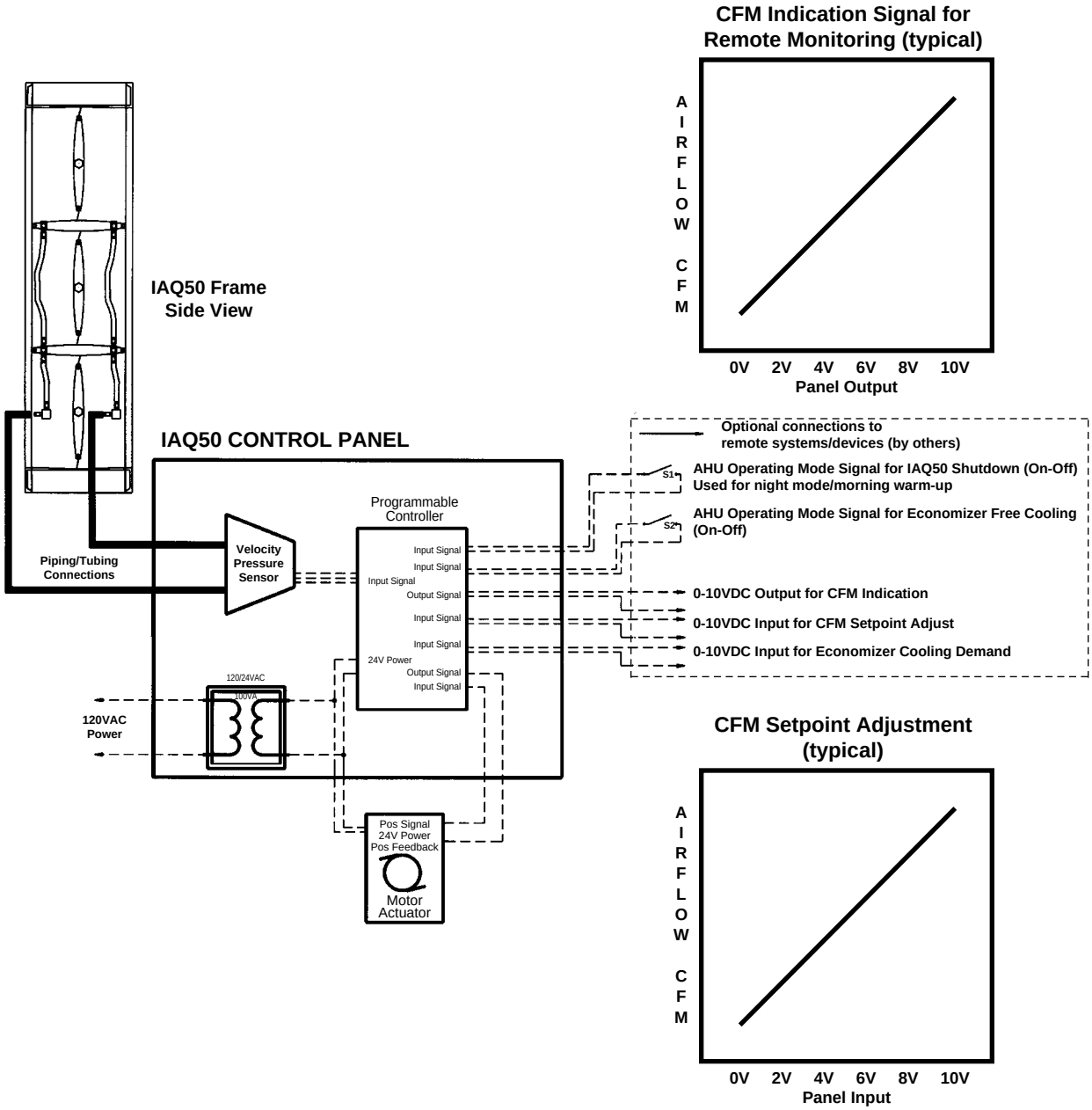


Figure 3: IAQ50 NON-FLANGED STYLE

Figure 4: IAQ50 SHOWN WITH OPTIONAL FILTER SECTION



TYPICAL IAQ50 WIRING AND PIPING SCHEMATIC



SUGGESTED SPECIFICATION

Furnish and install at locations shown on the plans, or as in accordance with schedules, an air monitor station integral to the minimum outside air damper. The integral air monitor/damper shall incorporate measuring ports built into the damper blades and shall control the minimum amount of outside air as recommended by ASHRAE Standard 62. The construction of the air monitor/damper shall be 6" x 1.375" x .125" (152 x 35 x 3.18) aluminum frame. The IAQ50 frame shall be designed for 4 bolt and flange cleat installation and shall provide maximum free area for lowest pressure drop performance. The damper blades shall be heavy gage aluminum airfoil type with Ruskiprene blade edge seals. Jamb seals shall be flexible metal compression type, and the linkage shall be concealed out of the airstream and located within the damper frame to reduce pressure drop and noise. The integral damper/monitor assembly shall incorporate an air straightener section to ensure proper airflow readings. The air straightener section shall be flanged as required by the application.

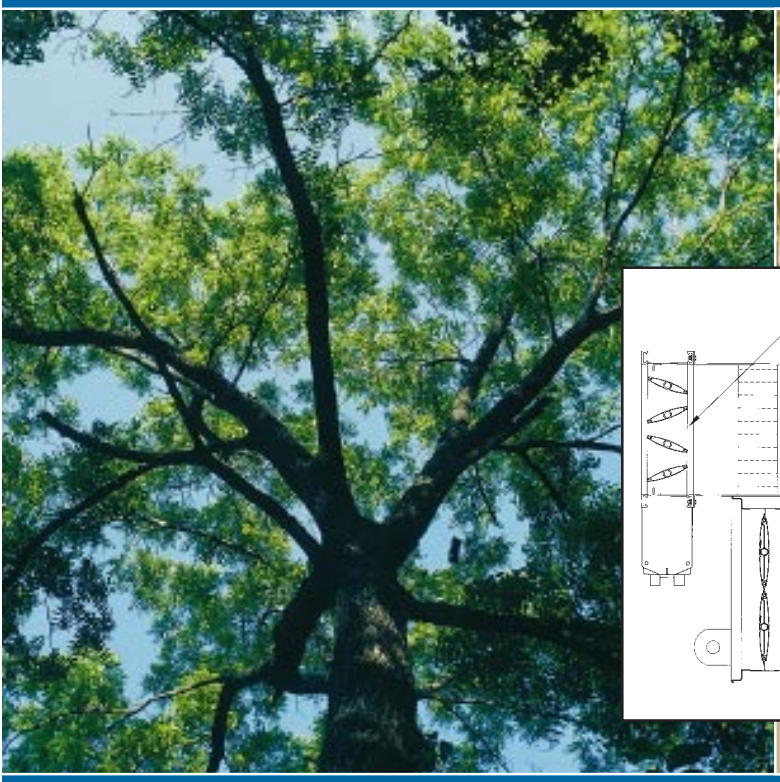
Each air monitor/damper shall include 24VAC electric modulating motor and an application specific controller designed for this application furnished by the damper manufacturer. Each integral air monitor/damper shall be calibrated in an AMCA registered laboratory and a certification chart shall accompany the air monitor/damper. The integral air monitor/damper shall be Ruskin's model IAQ50.

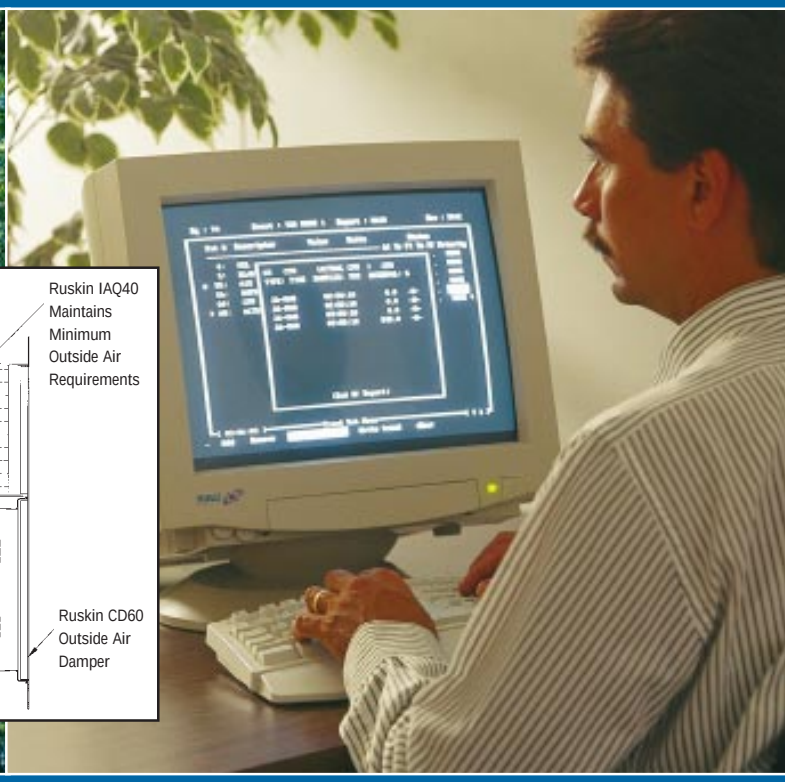
SPECIFIER SELECT OPTIONS

Where required or requested, the integral air damper/monitor shall be used in conjunction with Ruskin's 4" (102) wide louver.

RUSKIN®
3900 Dr. Greaves Rd.
Kansas City, MO 64030
(816) 761-7476
FAX (816) 765-8955

Only Ruskin provides the perfect mix





Introducing the IAQ integral air monitor/damper

Ruskin's new IAQ integral air monitor/damper provides a better way to look at the air you breathe. With the IAQ, you can monitor and maintain minimum outside air requirements to meet ASHRAE standard 62-89.

Ruskin's comprehensive design combines a factory calibrated air monitoring station with a low pressure drop damper. Designed to meet or exceed the minimum ventilation requirements, the IAQ has a narrow depth with precise control and can adjust automatically to maintain your desired CFM setpoint.

The IAQ is ideally suited for new air handling units or can be retrofitted in existing units or ductwork.

With advanced designs, like the IAQ, it's no wonder Ruskin continues to be...Specified by Many—Equaled by None.

RUSKIN®

DAMPERS AND LOUVERS

3900 Dr. Greaves Rd. Kansas City, MO 64030
(816) 761-7476, Fax (816) 765-8955

VISION
BY RUSKIN

IAQ50 Air Monitor Damper

When our customers face a tough issue like indoor air quality, only Ruskin has the vision to provide the solution – the IAQ50 Air Monitor Damper.

Ruskin's IAQ50 combines three functions into one product: accurate airflow measurement, high-performance airflow regulation and programmable control of cfm set point. Combining fixed sensing blades, low-leakage control blades, and an integral air straightener, the IAQ50 is designed to provide compliance with the ventilation standard in ASHRAE 62-89.

The IAQ50 is compact in design and individually calibrated to your specific performance criteria. Customers are successfully applying the IAQ50 on both new and retrofit installations.

For over 35 years Ruskin has produced the most innovative damper and louver designs in the industry…we make it happen for our customers! For more information on how to put Ruskin's vision to work for you, contact your local representative about our complete line of dampers and louvers.

We Make it Happen!

RUSKIN®

DAMPERS AND LOUVERS
Specified by Many – Equaled by None

www.ruskin.com

3900 Dr. Greaves Rd., Kansas City, MO 64030 • (816) 761-7476 Fax (816) 765-8955

4.3 *Frequently Asked Questions - IAQ50*

1. Can I put the IAQ damper before or after an elbow or any other transition in the ductwork? If so, what are the requirements?

- *Because the IAQ50 incorporates a honeycomb straightener section on the inlet side, direct upstream connections can be made. Airflow downstream requires a space equal to the radius elbow between the elbow when using an elbow or 30" minimum if using rectangular duct.*

2. What is the pressure drop through a fully open IAQ and straightener?

- *The straightener section also acts to reduce the pressure drop. See the pressure drop curve in section 2.8.*

3. If the IAQ sensing blades become plugged, the controller will open the damper, thus allowing more fresh air than necessary to enter the building. Does the IAQ controller send a signal telling of the plugged blade condition?

- *The IAQ50 incorporates a 0-10 vdc output for CFM indication. If plugging were to occur, the building's FMS could be pre-programmed to an alarm condition if CFM indication goes out of the user specified range. Trend logging these values on a daily or monthly basis is an excellent method to prevent plugging.*

4. Is there a formula I can use to size an IAQ50?

- *First identify the outside airflow range that the IAQ50 damper will monitor and control. This information, along with design velocity of the standard economizer air dampers, serves as a guide in sizing an IAQ50. The IAQ50 should be sized so that the airflow velocities over the desired airflow monitoring range are within the published limits and correspond to the design velocity of a standard outside air damper. This will help to ensure a similar pressure drop across each bank of dampers.*

5. Can I supply my own controller for the IAQ50?

- *Ruskin's IAQ50 design has 3 integral parts: the air measuring damper, the feedback actuator and Ruskin's exclusive DDC controller. Each component is necessary for a properly functioning factory calibrated product backed by Ruskin. Consult Ruskin for other air measuring devices if your job requirements differ.*

6. Can the IAQ be painted?

- *Yes, and these special finishes should only be applied in our factory. It should not be painted in the field.*

7. Can we get Stainless Steel IAQ's or any components in the airstream?

- *We offer stainless steel straightener and frame. This section is also completely removable for cleaning or replacing. We can also provide anodizing and other special finishes for the aluminum components at our factory.*

8. Are pneumatic actuators available?

- *No and here's why. Electronics are the key to the accurate measurement of the airflow. The inclusion of pneumatic actuators would not only be a design constraint, but a major cost increase would occur.*

9. Can I get other electric actuators besides Belimo brand?

- *Not at this time. Please refer back to question 5. The IAQ50 has been developed using this highly reliable and accurate actuator. Other direct-coupled motors may be available in the future.*

10. What is the maximum pressure(psi) when cleaning the sensing holes?

- *20-40 psi. Please disconnect the static pressure sensor (refer to maintenance instructions, section 5.6 in this manual).*

11. What are the minimum and maximum face velocities for the IAQ50?

- *Between 300 and 2000 fpm, we will guarantee an accuracy to +/- 5%. The IAQ50 is operational from 150 to 3000 fpm..*

12. Do I really need a straightener, or can I just use my existing louver?

- *The straightener is included in the price and improves accuracy at lower velocities.*

13. Can you give me a 4-20ma signal rather than the 0-10v reading?

- *Not without adding cost by utilizing an additional electronic control device.*

14. What happens if I remove and reinstall the actuator in the field?

- *Every IAQ50 control shaft and actuator clamp is permanently marked during calibration. Returning them to this exact location will ensure reliable readings if actuator is removed.*

15. How can I tell if my IAQ50 is working correctly?

- *Comparing the data from the Setpoint Adjustment and the CFM Indication signals is a simple way to determine proper operation.*

16. Can I use your output to directly control my return air damper?

- *Not directly. Depending on the IAQ50 configuration, full or minimum, the IAQ damper can interface with the economizer temperature or enthalpy control system and therefore dictate the return air damper action. See section 2.3 for more details.*

17. How does the IAQ50's performance stack up to an air monitoring station?

- *By incorporating a damper into the air measuring design, the IAQ50 is able to read at low velocities because the pressure signal (static and total) is amplified. Additionally, the IAQ50 utilizes a high quality dead-end pressure transducer that performs exceptionally well at these low velocities.*

18. Do I have to wire motor feedback to the control panel?

- *Yes, so that our controller will know the actuator and damper blade position.*

19. Can I change the setpoints in the field?

- *Yes, via a 0-10v (dc) input. Setpoints can be changed at any time the requirements change in the building.*

20. What is the response time on the control? It appears to be slow.

- *The response time of the IAQ50 control loop is tuned so as to prevent the actuator from hunting continuously. Maintaining and documenting minimum outside air does not require rapid response time. 5-10 minutes is typical.*

21. I need to access the straightener for periodic cleaning, can you provide an access door or slide-in tray?

- *Yes. This may require a custom configuration. Please allow extra time to consult with the Ruskin engineering department.*

22. What effect does water carry over have on the IAQ50?

- *In vertical applications, water carryover is not a factor. We do not incorporate flow-through sensors which could be susceptible to moisture. If mounting the*

IAQ50 horizontally, care should be taken to prevent water from falling on the sensing ports.

23. What type of differential pressure sensor do we use?

- *We use an instrument grade high quality dead-ended sensor with a 0-2" wg pressure range. Dead-ended sensors offer high accuracy and more flexibility in mounting, that is no tubing losses, because flow is not required for pressure reading.*

24. If it is a dead-end sensor, how often does one zero out the signal to correct the read out?

- *This sensor does not require an auto-correcting sequence. It does contain an on-board potentiometer, however, so that if a zeroing operation was desired the sensor could be measured against its original factory calibration settings. Consult Ruskin for the test procedure.*

25. What construction has been proven for coastal environments?

- *Anodized aluminum construction for the sensing blade, frame and damper blade.*

26. What are the temperature limitations?

- *-22°F to 140°F. With optional actuator heater, the low end temperature goes to –40°.*

27. Do the IAQ50 ports frost over?

- *They shouldn't because the temperature of the blades should be equal to the mixed air temperature which is above freezing. But, in the unlikely event that frosting occurs, and pressure readings are not possible, the damper will respond to the open position thus satisfying the requirements for minimum air.*

28. How far downstream should the IAQ be if installed on the supply side of the fan?

- *This is not designed for measuring air on the supply side of the fan.*

29. What happens to the output signal when the outside air damper opens?

- *It continues to show CFM output.*

30. Can the IAQ be used in a system to eliminate VAV boxes?

- *Please call us for consultation on these applications.*

31. If the actuators are replaced in the field, how is the unit recalibrated?

- *Recalibration is not necessary. There are two actuator clamps holding the actuator to the control shaft. Removal of the outside clamps only is required to remove the actuator. For other notes on the reinstallation, of the actuator, see question 14.*

IAQ50 Installation and Maintenance Instructions

(The IAQ50 Air Damper/Monitor unit and digital controller panel may ship in separate containers. Please verify the receipt of both prior to installation.)

5.1 *IAQ50 Air Damper/Monitor Installation Instructions*

1. Remove the IAQ50 Air Damper/Monitor from its shipping container and inspect for damage, rust or corrosion. Care must be taken in handling the unit. Always handle the IAQ50 Air Damper/Monitor by its frame. Do not lift it by the blade, linkage, axle, motor or jackshaft. Do not drop, drag, step on, or apply excessive bending, twisting or racking loads to the IAQ50.
2. Inspect the ductwork and/or opening where the IAQ50 Air Damper/Monitor assembly will be installed for any obstruction or irregularities that might interfere with blade or linkage rotation, or actuator mounting. If it is to be installed in ductwork, the ductwork should be supported in the area of the IAQ50 to prevent sagging due to the unit's weight.
3. The IAQ50 Air Damper/Monitor must be installed with the frames square and without twisting or bending. Unless specifically designed for a vertical blade application, the unit must be mounted with its blade axis horizontal. The damper blades, axles, and linkage must be able to operate without binding.
4. The best location for the extended shaft or jackshaft must be determined before installing the damper. The damper may be rotated to get the extended shaft on the correct side of the ductwork. After the damper is installed the shaft location cannot be changed without removing the damper. The jackshaft, if installed, will always be in the leaving air stream. Unlike other control dampers, which have no airflow orientation, the IAQ50 has a specified inlet and outlet. The outside air (or other controlled air stream) enters the unit through the air straightener section and exits the unit from the damper frame side.
5. Use appropriate shims between damper frame and duct opening to prevent distortion of the frame by fasteners holding it in place. If creating a multi-section assembly, be sure that all of the sections are fastened together on both sides.
6. The IAQ50 Air Damper/Monitor is factory calibrated and tested in order to perform correctly in its application immediately following installation. The electric actuator should not be moved, adjusted, or altered in any way to facilitate installation. Such modifications affect the factory calibration of the unit. If the actuator, linkage, or shafting present a problem for installation, please consult your local Ruskin representative or the Ruskin factory. The IAQ50 should be cycled after installation to assure proper operation.

5.2 *Digital Controller Panel Installation*

1. The controller enclosure should be mounted securely on an adjacent wall, attached to the air handling unit, or placed within some other suitable control panel. The panel should be mounted within 120 feet of the IAQ50 Air Damper/Monitor to prevent pressure signal variations from the IAQ50 to the control panel. If the enclosure must be mounted more than 120 feet from the IAQ50 damper frame, please consult your local Ruskin representative or the Ruskin factory.

2. Loosen the enclosure's cover screws and remove the cover.
3. Remove the appropriate knockouts for connection of the field wires to the enclosure's terminal blocks.
4. Fasten the enclosure to the wall or flat surface using the (4)1/4" dia. holes at the four corners.

5.3 ***IAQ50 Wiring and Piping Connections*** (refer to control panel wiring diagram)

IAQ50 Wiring Connections

1. Connect the 115VAC power supply to IAQ50 control panel terminals L1 and L2.
2. Connect the Belimo AF24-SR motor actuator 24VAC power wires 1 and 2 to control panel terminals 5 and 6, respectively.
3. Connect the motor actuator 0-10V control signal wire 3 to panel terminal 7.
4. Connect the motor actuator 2-10V position feedback signal wire 5 to panel terminal 8.
5. (Optional) Connect the 0-10VDC remote setpoint adjustment signal (by others) to control panel terminals 3 and 4. Terminal 3 is the positive terminal.
6. (Optional) Connect the wires to receive 0-10VDC actual CFM signal from the IAQ50 panel to terminals 1 and 2. Terminal 1 is the positive terminal.
7. (Recommended) Connect dry contact/switch to terminals 10 and 11 to activate the occupied/unoccupied function. A closed contact connection (default with jumper wire) places the IAQ50 digital controller into normal operation/day mode. An open circuit is a shutdown command, and the IAQ50 damper fully closes. Other applications for an open circuit command are night set-back and morning warm-up sequences, or any time the outside air damper should be closed.
8. (Optional) Connect dry contact/switch to terminals 9 and 10 to activate economizer override function. When operating in the normal/day mode, a closed circuit activates minimum fresh air control. A jumper is factory installed to set this default condition. If an open circuit is placed between the terminals, this is an economizer signal asking for free cooling. The IAQ50 travels to and remains 100% open.
9. (Optional) Connect the 0-10VDC remote outside air cooling demand signal (by others) to control panel terminals 12 and 13. Terminal 12 is the positive terminal. If this signal calls for more outside air than the minimum ventilation setpoint, the IAQ50 will modulate open beyond minimum position in response to this signal (0-10VDC scaled to 0-100% damper open). At no time will the IAQ50 digital controller allow airflow below the minimum CFM setpoint.

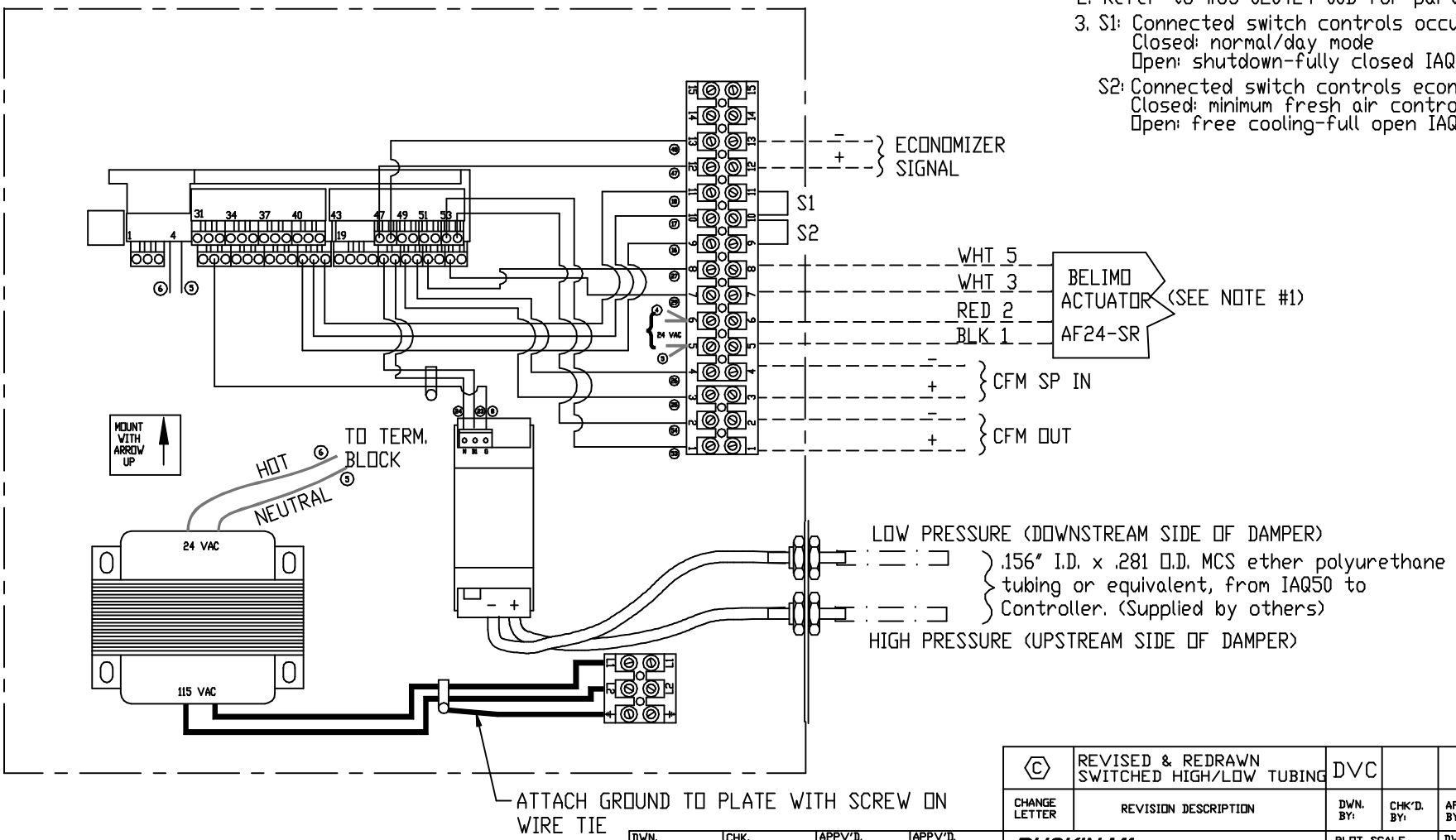
Switch S1	Switch S2	Result
CLOSED	**CLOSED**	**NORMAL DAY MODE**
OPEN	**OPEN**	**IAQ50 DRIVES CLOSED**
OPEN	**CLOSED**	**IAQ50 DRIVES CLOSED**
CLOSED	**OPEN**	**IAQ50 DRIVES OPEN**

IAQ50 Piping Connections

1. Connect the total pressure signal tubing (from upstream side of damper) labeled "**H**" to barbed fitting on the side of the IAQ50 control panel labeled "**H**".
2. Connect the static pressure signal tubing (from downstream side of damper) labeled "**L**" to barbed fitting on the side of the IAQ50 control panel labeled "**L**".

NOTES:

1. Field wiring between actuator and controller per local code.
2. Refer to #85-020424-00B for part description.
3. S1: Connected switch controls occupied mode.
   Closed: normal/day mode
   Open: shutdown-fully closed IAQ damper
   S2: Connected switch controls economizer mode.
   Closed: minimum fresh air control active
   Open: free cooling-full open IAQ damper



WIRED BY RUSKIN
FIELD WIRING
FIELD TUBING

CHANGE LETTER	REVISION DESCRIPTION	DWN. BY:	CHK'D. BY:	APPV'D. BY:	APPV'D. BY:	DATE
©	REVISED & REDRAWN SWITCHED HIGH/LOW TUBING	DVC				

DWN. BY:	CHK. BY:	APPV'D. BY:	APPV'D. BY:
DVC			
DATE: 7/15/96	DATE:	DATE:	DATE:

MODIFICATION OF 12 TERMINAL PANEL TO 15 TERMINAL PANEL

VERSION NO. 2.0

RUSKIN Mfg. Grandview, MO

PROPRIETARY INFORMATION

PLOT SCALE: NONE

DWG. CERTIFIED BY: _____ DATE: _____

TITLE: IAQ CONTROL PANEL WIRING DIAGRAM (MODIFICATION)

DWG. NO. 85-020425-00B

5.5 IAQ50 Inspection and Troubleshooting Instructions

IAQ50 Symptom	Possible Cause	Inspection	Action
IAQ50 remains closed and does not modulate.	Power failure (fail closed setup).	1.Check terminals L1 and L2 for 120VAC power supply. 2. Check terminals 5 and 6 for 24VAC power.	1. Restore power. 2. Replace transformer.
	Unoccupied mode in effect.	1. Check wiring connections to terminals 10 and 11 (S1 switch) for an open circuit.	1. Add jumper wire or external controls.
IAQ50 remains open and does not modulate.	Power failure (fail open setup).	1.Check terminals L1 and L2 for 120VAC power supply. 2. Check terminals 5 and 6 for 24VAC power.	1. Restore power. 2. Replace transformer.
	Economizer mode in effect.	1. Check wiring connections to terminals 9 and 10 (S2 switch) for an open circuit.	1. Add jumper wire or external controls.
	Insufficient airflow.	1. IAQ50 is responding properly to system conditions. Check for obstructions and fan problems.	1. Insure proper system operation.
	Pressure signal loss.	1. Check tubing/piping connection from IAQ50 frame to panel. Ports could be swapped. Piping may be leaking. 2. Check terminals B1 and M on pressure transducer for 0-10VDC signal (10V at 2”w.c.)	1. Repair piping connections. 2. Call Ruskin.
	Actuator feedback failure.	1. Check DC voltage at terminals 8 and 6 for 2-10VDC range.	1. Call Ruskin.
CFM Indication remains below setpoint with open damper.	Insufficient airflow/ inadequate system pressure.	1. Check supply fan and HVAC system operation. The IAQ50 should be fully open.	1. Return HVAC system to normal operation.
	Poor air	1. Check the straightener	1. Follow

	sensing.	section and sensing blades for excessive dirt and dust. The IAQ50 should be fully open.	maintenance procedures recommended by Ruskin.
	Electrical Problem.	1. Check the IAQ50 damper blade position. If not fully open, take action step indicated.	1. Conduct an *"IAQ50 Electrical Check"* procedure (directions follow).

IAQ50 Symptom	Possible Cause	Inspection	Action
IAQ50 CFM reading fluctuates wildly.	Fluctuation of HVAC equipment or system components.	1.Check and record the DC voltage between terminals B1 and M on the differential pressure sensor.	1. If this voltage is fluctuating, the IAQ50 is accurately reporting system conditions. 2. If this voltage is steady, call Ruskin. 3. Note: The IAQ50 CFM output is "real time" and does not average. Please use your BAS input filters if desired.
IAQ50 remains open with no CFM reading.	IAQ50 Signal Isolation Problem	1.Check and record the DC voltage between terminals 1 and 2. 2. Check and record the DC voltage between terminals B1 and M on the pressure sensor. 3. Disconnect the field wiring to terminals 1,2,3,4,12, and13. Repeat the voltage check between terminals 1 and 2. 4. Check the pressure drop across the damper with a manometer of 0.01"w.g. accuracy. Connect manometer high to '+' tube and manometer low side to	1. If it is greater than 0, then the unit is operational. No further action required. 2. If it is greater than 0, then the unit is operational. No further action required. 3. If it is greater than 0, there may be a signal isolation problem with the external connections. See *"Reported Problem: Signal Isolation"* note below. 4. If the measured pressure drop is less than 0.01 and the damper is

		the '-' tube.	open, there is insufficient system pressure. Reconfigure HVAC system to provide plenum pressure. If the measurement is above 0.01, the pressure sensor may be defective. Call Ruskin.

5.5a *Reported Problem: Signal Isolation*

A signal isolation problem usually presents with a damper that is "stuck" in any one position and does not move. Nothing seems to work as expected. Usually a building automation interface is connected to the IAQ50 control panel.

The IAQ50 system shares a common neutral between its 24 VAC input and its 0-10 VDC inputs and outputs. If the correct phasing (polarity on DC side) is not observed, or if distant neutrals having different resistance in relation to the hot side of the 24 VAC are connected to the inputs, then nothing will work.

Check the building automation system (BAS) outputs (in VDC) to the IAQ50 panel. If the VDC between + and - does not equal VDC between + and the IAQ controller mounting plate, then a voltage potential between distant neutrals is indicated. Both conditions and other group loop problems will require signal isolators to correct. The simplest method to check for signal isolation problems is to disconnect <u>all</u> inputs and outputs from the BAS to the IAQ50 panel and check the its operation. One can now begin a process of elimination to identify what signals require isolation. If the unit operates correctly now, reconnect the output to the BAS and check operation. If the unit and BAS operate correctly, isolation of output will not be required. Reconnect inputs to IAQ and check the operation. If failure occurs here signal isolation will be required, etc.

5.5b *IAQ50 Electrical Check*

One conducts this check if the IAQ50 presents a low CFM reading as compared to setpoint, yet is not fully open.

1. Check and record the AC voltage between terminal 5 and the panel mounting plate.

2. Check and record the AC voltage between terminal 6 and the panel mounting plate.

3. The latter reading (terminal 6 to plate) should be greater than the former (terminal 5 to plate). If not, reverse the 24 VAC transformer leads. If it is, go to step 3.

3. Check and record the DC Voltage between terminals 5 and 7 (control voltage to damper). This reading should relate to the actual damper position: 2 VDC or less, damper closed; 10 VDC damper fully open. If not, check the wiring to the damper and the Belimo actuator's position switch. If it does correlate, go to step 4.

4. Check and record the DC voltage between terminals 5 and 8 (feedback from the damper motor actuator). It should be approximately equal to the previous reading (control voltage to motor, terminals 5 and 7). If it does not, check the wiring to the damper and Belimo actuator's direction switch. Otherwise, the electrical connections are appropriate.

5.6 *IAQ50 Maintenance Instructions*

1. Semi-annually the tiebar linkage and the jackshaft or extended shaft bearings should be lubricated with a silicone lubricant.
2. Blade axle bearings do not normally require lubrication.
3. When dampers are installed where they will be exposed to heavy dust-laden air, frequent flushing of the axle bearings with water is recommended for extended bearing life.
4. The air straightener section and the damper blades should be annually inspected for particulate build-up. Use a damp cloth to wipe clean the damper blades. One can use water to clean and flush the air straightener section and the damper blades if deemed necessary. The air straightener section can be unbolted from the damper for ease of cleaning. Ruskin recommends using pressurized air to clear the sensing ports of water. See step 5.
5. Disconnect the piping connections between the IAQ50 Air Damper/Monitor frame and the control panel. Apply a clean, pressurized air source to the air piping connections on the IAQ50 damper frame in order to flush out the sensing ports on the fixed monitoring blade(s) of the IAQ50. **DO NOT connect this air source to the control panel, as this will damage the IAQ instrumentation**.
6. If the IAQ50 assembly contains the optional filter section, please replace this filter on a semi-annual basis or upon discretion. Excessive pressure drop caused by a dirty filter may affect IAQ50 operation.

RECOMMENDED SPARE PARTS LIST
IAQ50 Air Damper/Monitor

DESCRIPTION	PART NO.
Roto Clip	E-25
Blade Edge Seal - Opposed	80-020045-00B
Digital Controller	RCE93.1/HQ00 TEC**
Differential Pressure Sensor	QBM63/500**
120V/24V Transformer 85VA	T-202
Wire Terminal	324-HDS/12
Electric Actuator	AF24-SR(S)**
Rotation Limiter	ZBD-AF2

** Requires factory calibration. Consult Ruskin.

Contact Ruskin, Commercial Damper Sales, 3900 Dr. Greaves Road, Grandview, MO 64030 for information.
Telephone: 816-761-7476
