

## 2008-09 NEW YORK ENERGY STAR<sup>®</sup> LABELED HOMES Ventilation System Guidelines

There are several options available to meet the New York ENERGY STAR Labeled Homes (NYESLH) program requirements for whole-house mechanical ventilation. To determine the volume of airflow required for a home, refer to the *NYESLH Technical Specifications*.

- A. Bath Fan System:** An ENERGY STAR labeled bathroom exhaust fan designed for continuous operation, combined with an appropriate timer or control, or hard wired to provide the required rate continuously. Fans used for this purpose should be quiet (less than 1.0 sone). The fan must be ducted to outdoors, with an air tight insulated duct and a damper at the building envelope. Fan controls shall consist of a 24-hour timer, variable speed control, or both, in the electrical circuit, so the fan can run full time or part time to provide the required flow; in this case, provide a switch or wind-up timer in the bathroom so the fan may be used on-demand regardless of the control settings. Some products provide timer, variable-speed control, and override functions in a single package. Separate local exhaust (“spot” ventilation) is still strongly recommended for remaining bathrooms and kitchen; it is required by NY State code in any bathroom that does not have a window.
- B. Central Exhaust System:** A multi-port in-line exhaust fan, combined with an appropriate timer or control, typically ducted to exhaust air from one or more bathrooms and kitchen, and sometimes laundry or work rooms. These fans typically have a variable speed control to set continuous flow rates, and an override switch (or wind-up timer switch) in bathrooms to run the fan intermittently on full speed on-demand.
- C. Central Supply System:** A multi-port supply ventilation fan with supply ventilation flows typically ducted to bedrooms. These fans may have a variable-speed control or timer to determine continuous flow rates. In these cases, no local exhaust ventilation in bathrooms occurs. It is recommended to supplement a central supply system with local exhaust, or to combine with central exhaust from bath(s) and/or kitchen to provide a balanced system. Tempering supply air in a mixing box can reduce the likelihood of cold draft complaints.
- D. Return Air System:** Return air systems pull fresh air into the home through the return duct of a forced-air distribution system. To work properly, these systems must have a motorized damper at the air inlet hood to avoid over ventilation when heating or cooling loads call for long run-times, AND a timer or controller capable of initiating fan-only cycles when heating or cooling loads are small (see [www.fancydler.com](http://www.fancydler.com)). To qualify, timers must take advantage of heating/cooling fan run-time whenever possible, and initiate ventilation-only cycles only when necessary. Note that care must be taken to account for the mixed return air temperature at the furnace in very cold and very hot, humid weather.
- E. Balanced System with heat or energy recovery (HRV or ERV):** Supply air can be ducted directly to bedrooms and living areas or existing central air-handling systems can be used for distribution. Exhaust is typically drawn from Ducting the supply and exhaust air of HRV or ERV systems to a central air-handling system is common, but improper design or installation can greatly reduce the system’s ability to effectively provide fresh air. These systems also provide transfer of heat (HRV), or heat and moisture (ERV) between the supply and exhaust air streams, saving energy while providing fresh air. These systems typically are installed in premium new construction, in very airtight homes, or homes where the occupants have particular air quality concerns. Multiple control options are available including continuous low speed, with high on demand. Intake grilles, filters, and cores require periodic cleaning; an

annual checkup with balancing is recommended.

**General design principles:**

- Design flow rates:** It's a good idea to design the system to provide more than the minimum required flow rate (an extra 25-50%) to allow for varying occupant needs. In addition, note that most fan CFM ratings are rather optimistic, and require careful attention to duct design and installation to achieve (see table below). Most fans, when they are actually connected to ducts, have flow rates that are often 50-80% less than the fan's "rating". Also, note that in many homes, it may be acceptable to set the initial ventilation flow rates at 50-75% of the required flow in order to provide acceptable air quality and wintertime humidity control. However, the system must be designed to be capable of providing at least the required minimum flow rates. To achieve manufacture's rated flow, it is recommended to properly size ducts using the following table or using manufacturer-approved duct design.

Rated CFM@ 0.25 in. w.g.	Flex duct				Smooth Duct			
	50 CFM	80 CFM	100 CFM	125 CFM	50 CFM	80 CFM	100 CFM	125 CFM
Duct Dia.	Maximum Length (ft) – Assumes no elbows. Deduct 15 feet from Max length for each 90 elbow or turn.							
3"	X	X	X	X	5	X	X	X
4"	70	3	X	X	105	35	5	X
5"	No limit	70	35	20	No limit	135	85	55
6"	No limit		125	95	No limit			145
7"	No limit							

X in table means this duct diameter is not allowed at the flow rate specified. (Adapted from ASHRAE 62.2-2004, Table 7.1)

- Ducts:** Be sure to run ducts as directly as possible, using a minimum of bends or fittings. Smooth, hard metal duct has lower friction losses and provides more airflow than flexible duct. A duct design is strongly recommended. Supply or exhaust ducts in unconditioned areas, or conducting outdoor air, shall be air tight and insulated to manufacturers recommendations.
- Continuous operation:** The need to provide both "continuous" operation and an adjustable flow rate can be accomplished with a variable-speed control, a multi-speed fan, or with a timer to vary the run-time (or more than one). Timers are commonly used; when a timer is used, the fraction of run-time is multiplied by the actual fan flow to get the required CFM. (**Example:** If the required CFM is 60 and the ventilation fan moves 120 CFM, the fan may be run by a timer for 30 minutes out of every hour.  $30 \text{ minutes} / 60 \text{ minutes} \times 120 = 60$ . If the desired rate were 90 CFM, the timer would need to run the fan 45 minutes each hour). The timer must provide the average required CFM every hour.
- Combination of whole-house and local exhaust:** In many whole-house systems, the ventilation system may also provide local ("spot") exhaust ventilation in one or more bathrooms. An override control that switches the fan on (regardless of whole-house timer program), or boosts the fan to full speed (regardless of variable-speed control), for a limited period of time to meet ventilation requirements for local ventilation is required. This may be part of the same controller, or a

separate “bypass” switch. The fan flow rates for these two functions need not be added together, but the requirements for each must be met.

**Example 1:** A “bath fan” system with a 24-hour pin timer is used to provide required 75 CFM continuous ventilation for the whole-house requirement. It utilizes a 100 CFM ceiling fan with properly sized ductwork, and the pin timer is set to run the fan for  $\frac{3}{4}$  of every hour (75/100). The recommendation for local “spot” exhaust ventilation is either 20 CFM continuous or 50 CFM intermittent; this fan at 100 CFM meets the 50 CFM intermittent requirement, but only by providing an “on” switch in the bathroom so it can be run at any time for that purpose. A separate range hood that exhausts 100 CFM to outside is also recommended.

**Example 2:** A ducted HRV system, with manufacturer-provided controls, is used to provide the required 75 CFM continuous. The HRV unit is rated at 200 CFM, and is ducted to 3 bathrooms, a kitchen, and laundry room; due to duct friction losses the total flow is about 160 CFM. The fan is set at the lowest of three speed settings, roughly 50% of full rated speed for continuous operation, which provides 80 CFM total, meeting the whole house requirement at low speed. Flow at each of the five outlets averages 32 CFM (160/5) on high speed, and only 16 CFM on low speed; neither the 50 CFM intermittent nor the 20 CFM continuous recommended for local “spot” exhaust can be met. The system should either be sized larger to accommodate the local exhaust requirements, or additional bathroom exhaust fans should be added to meet the spot ventilation. A separate range hood that exhausts 100 CFM to outside is also recommended.

- **Kitchen Exhaust** registers in multi-point (central exhaust or balanced HRV/ERV) systems are typically **not** capable of handling cooking grease and should **not** be located over cook stoves. They may be used to provide continuous exhaust ventilation in kitchens, but are not a substitute for ducted range hoods. Ventilation fans and ductwork not listed for use over stoves or exhaust grilles attached to unlisted fans, should be kept out of the area above the range top, and outside an arc extending upwards at a 45 degree angle from the upper edges of the range top. Only rated metal ductwork connected to rated fans are recommended over kitchen ranges. Consult manufacturer’s instructions to determine acceptability. (Note: NY State code has additional requirements for exhaust systems for oven-top broilers.)
- **Further help:** For more information on system certification or design, guidance may be found at:

**HVI - Home Ventilating Institute**, 1000 N Rand Rd. Suite 214, Wauconda, IL 60084; (847) 526-2010, [www.hvi.org](http://www.hvi.org) Directory listings of ventilation equipment.

**HRAI – Heating, Refrigerating and Air Conditioning Institute**, 2800 Skymark Avenue, Building 1, Suite 291, Mississauga, Ontario, Canada; (800) 267-2231, [www.hrai.ca](http://www.hrai.ca)  
**Residential Ventilation Systems (U.S.)** design manual

## EXAMPLES OF CONTROLLERS

### **PLEASE NOTE:**

- The following pages contain descriptions of some controllers available in the marketplace that are designed to handle whole house and spot ventilation. These are *examples only*; the program does NOT promote nor will it recommend any product over the others. It is the responsibility of program participants to determine the right system design and control strategy model to meet the needs of individual homes and clients.
- Additionally, prices for these products vary depending on distributor and quantity purchased.
- Suitability of any control for a particular fan or blower application must be determined by the installer. Please consult with fan manufacturer to ensure compatibility.

### **Grasslin Mechanical Timers**

These time switches will provide automatic control of lighting, fans, pumps, appliances, or small office machines. They have 72 captive trippers with a 20 minute switching interval to provide up to 36 on/off events during a 24 hour period. The timers have reliable and accurate synchronous drives. The time switches offer an off/auto/on override switch. The color is white. Three models are available, each of which comes with a switch plate cover for the appropriate size electrical box (the timers themselves are identical).

Capacity: 20A Resistive, 8A Inductive, 1 HP Motor, 1350 watts

Power Specification: 120 Volt AC, 60 Hz

Switch: single pole double throw (SPDT)

Packaging: English

Approvals: UL Listed

Manufacturer Warranty: One year

### **Product Name**

Grasslin KM2 ST 24 Hour Timer (1 Gang Toggle) 04211

Grasslin KM2 ST 24 Hour Timer (2 Gang Toggle) 04311

Grasslin KM2 ST 24 Hour Timer (3 Gang Toggle) 04321

### **Leviton Programmable Timer**

Turn lights, fans, or pool filters on and off automatically - whether you are home or not. This wall switch timer allows you to program the on-off schedule in 30 minute increments (up to 48 on/off settings per day), and has an internal memory backup in the event of a power failure. The LCD display is backlit, making it easy to read even in dim light. If you need to override the schedule manual on-off buttons are accessible on the face of the unit. A neutral wire is required for installation, and it is compatible with electronic ballasts. Wire nuts and screws are included.

Maximum Load: 1200 watts incandescent, 1200VA inductive

Power: 120 Volts AC, 60 Hz

UL Motor Rating: 1 hp (United States)

CSA Motor Rating: 3/4 hp (Canada)

Packaging: English & Spanish

Approvals: UL, CSA

Manufacturer Model #: 6124H-W (white), 6124H-I (ivory)

Manufacturer Warranty: 2 Years

Origin: China

### **Product Name**

Leviton Programmable White Timer 601-6124H-W

Leviton Programmable Ivory Timer 601-6124H-I

## EXAMPLES OF CONTROLLERS (*cont.*)

### **Tamarack Airetrak Ventilation Controls**

The Airetrak Ventilation Controls from Tamarack Technologies are programmable solid state speed controls that are ideal for use with exhaust fans in which specific ventilation rates are required. Two models are available, one of which will run a fan continuously a low speed and offer a push button on/off boost option, and the other which will automatically control the fan speed during a timed cycle, while providing easy selection to a full-speed 20 minute boost cycle.

These fan controls fit into a single gang electrical box, utilize standard toggle switch plate covers, and can be programmed in under two minutes. All controls except for the boost switch remain hidden under the switch plate cover. The air flow rate is adjustable from 40 percent to 100 percent of fan capacity. The model with the built-in timer can be programmed to operate the ventilation equipment in from 5 to 60 minutes (in 5 minute increments) during a 12 or 24 hour cycle. The lithium backup battery will remember the control settings for up to 400 hours in the event of a power outage. (Note that these timers should not be used in conjunction with stand-alone photovoltaic power systems.)

Dimensions: 3.625" x 1.625" x 1"

Input Power: 120 volts AC, 60 Hz

Maximum Load: 180 watts, 1.2 amps

Switching: SPST

Approvals: UL, CUL

Origin: United States

Manufacturer Warranty: One Year

### Product Name

Tamarack Airetrak Timer Ventilation Control

Tamarack Airetrak Continuous Ventilation Control