APP-015: VentGrid overview

What is VentGrid?

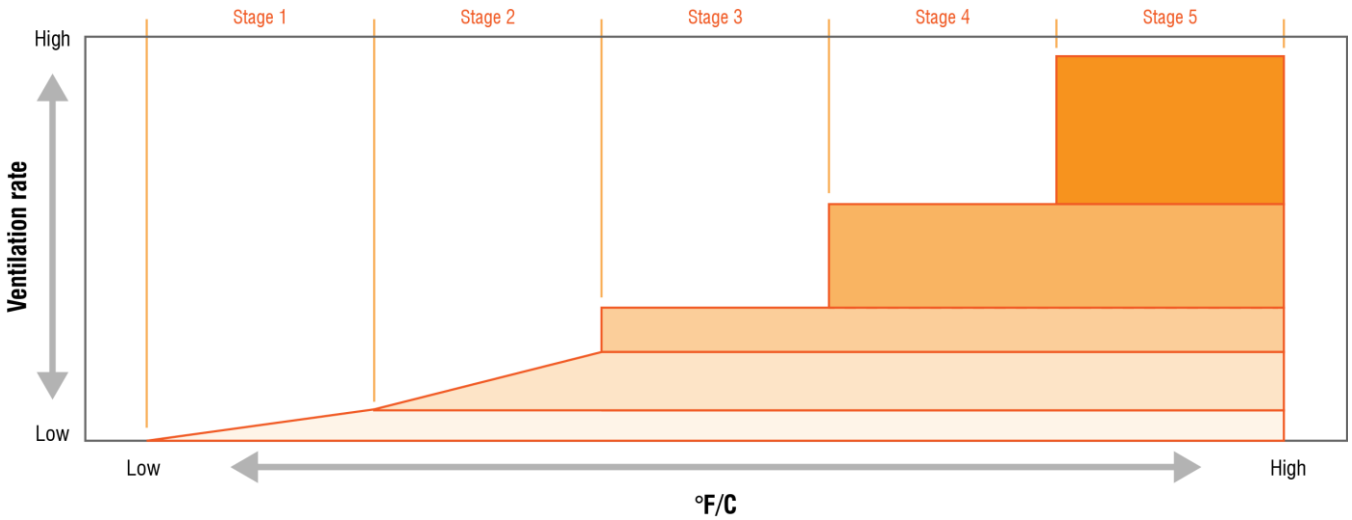
VentGrid is a comprehensive tool available in Phason's AutoFlex Connect and Touch Series controls. VentGrid allows you to design and implement your custom ventilation strategy the way you want. To explain how VentGrid works and how and why you can benefit from it, we will start with the traditional strategy—staged ventilation.

Staged ventilation

Staged ventilation is common throughout the industry and can satisfy most demands. Staged ventilation typically has two or more stages. A stage can be a variable or fixed-speed fan in coordination with an inlet (or vent). This is a 5-stage example with 2 variable and 3 fixed-speed fan stages.

Stage	Fans	Type
1	1 × 12 in.	Variable
2	2 × 12 in.	Variable
3	1 × 16 in.	Fixed
4	1 × 24 in.	Fixed
5	1 × 36 in.	Fixed

As the temperature rises, the stages come on and the ventilation rate increases, and the inlets open to allow more air into the building. The reverse happens as the temperature falls.



One of the drawbacks, as shown above in stages 3, 4, and 5, are large differences in ventilation rates when fixed-speed fans kick in.

The VentGrid concept

VentGrid uses the same stages as the traditional method, but gives you increased control and flexibility in programming. Instead of focusing on individual stages, VentGrid looks at the "big picture" — the amount of airflow in the zone, room, or building you are controlling.

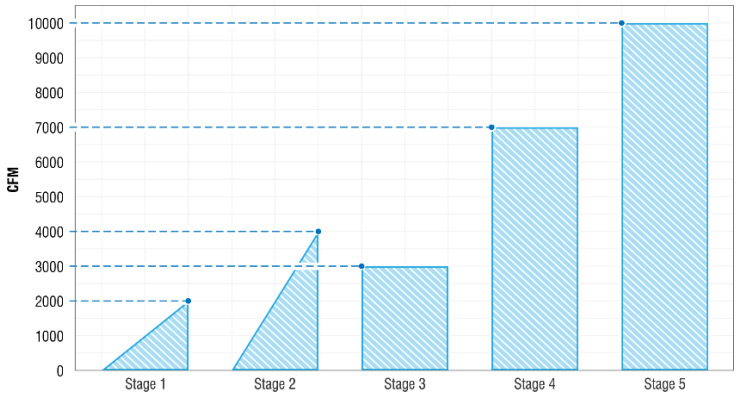
VentGrid uses steps that have minimum and maximum ventilation rates. Each step uses one or more of the same stages that the traditional method uses. This allows you to variably increase or decrease the ventilation rate between each step, creating smoother transitions, and using only the equipment that is required to maintain the ventilation rate.

The best way to explain how VentGrid works is to use an example. We will take the same five stages of equipment we used for the staged ventilation example and apply them to a VentGrid. Each fan stage is like a "building block" that has X amount of "potential" CFM (cubic feet per minute). We will use these building blocks to reach the maximum ventilation rate. The idea is to arrange the blocks to provide smooth, efficient transitions between the minimum and maximum ventilation rates.

Example

Here are the five fan stages from our staged mode example, this time including the potential CFM. We now have what we need to build a VentGrid.

Stage	Fans	Type	Potential CFM
1	1 × 12 in.	Variable	2000
2	2 × 12 in.	Variable	4000
3	1 × 16 in.	Fixed	3000
4	1 × 24 in.	Fixed	7000
5	1 × 36 in.	Fixed	10000
		Total	*26000*



NOTE: The CFM ratings are average values taken from various manufacturers' specification sheets. They are meant to provide a simple example only, not for use in facility calculations.

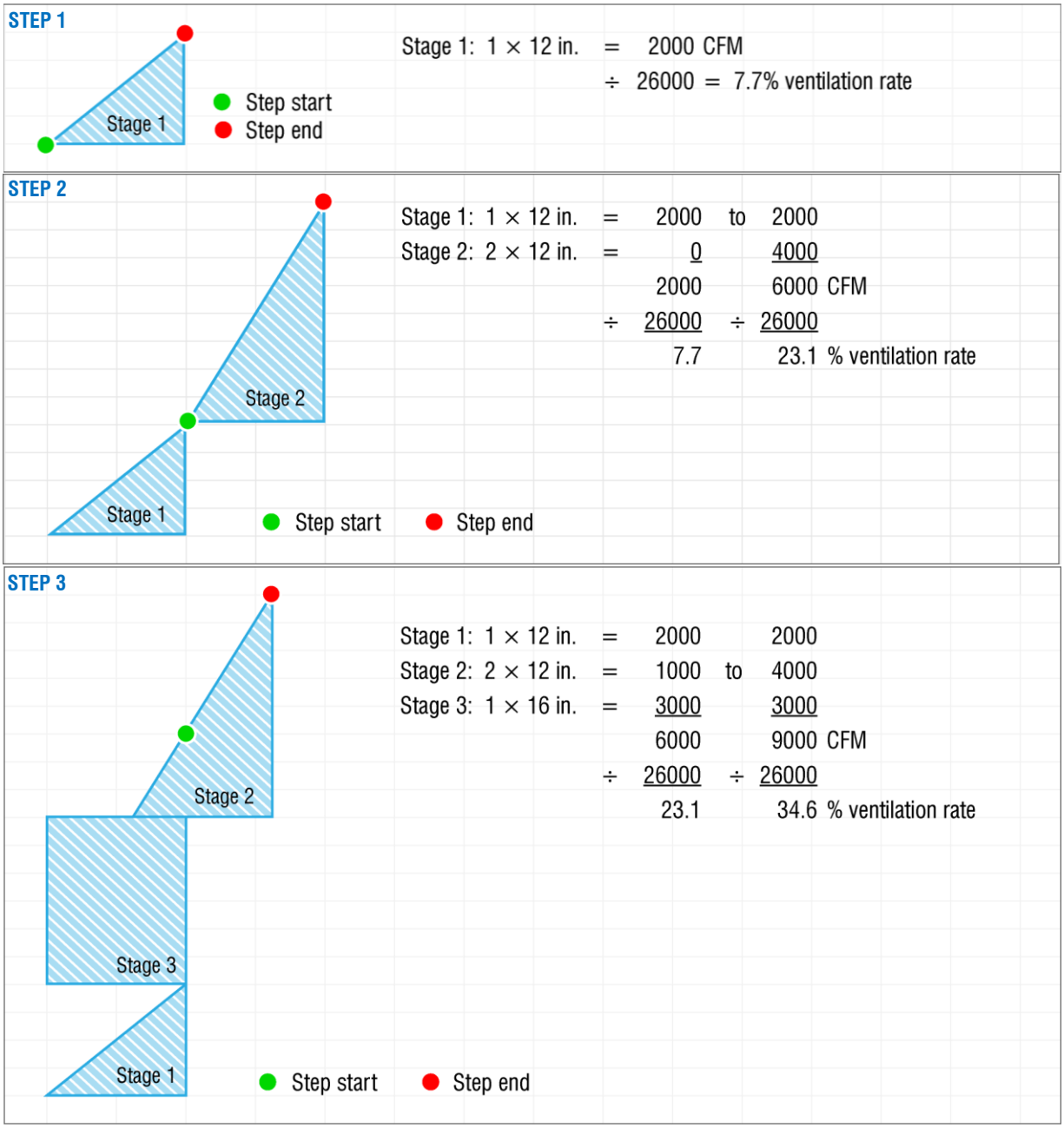
Things to note for variable stages

The percentage output on a variable speed fan **is not** the same as the percentage of expected CFM. There are many reasons why the actual performance of a fan and the percentage output can differ. It is best to test the performance of your fan(s) as you increase the fan output using manual override. This will give you a better idea of when the fan begins to move air and, if applicable, inlets or dampers open.

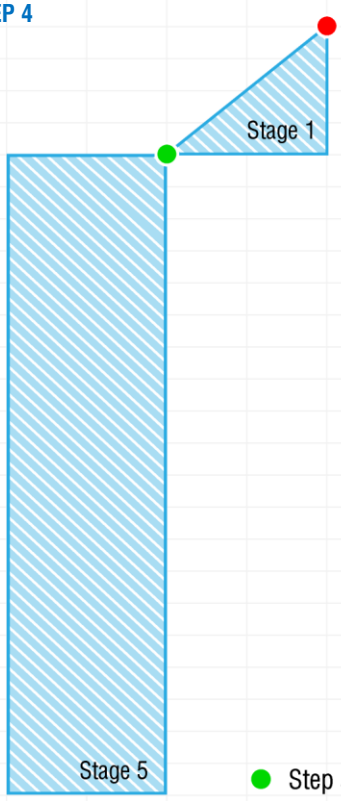
Where we use use a range of 0 to 100 percent for a variable stage, you would substitute the 0 for the percentage output where the fan(s) start moving air and opening dampers. For example, if the fan does not start moving air until 20 percent output, you would use 20 instead of 0. The reason for doing this is because below this value is a "dead zone" where there is little to no performance. If you use a value that is less than where the fan starts to move air, you risk unpredictable behavior and unnecessary wear on the motors.

Constructing the steps

This example is one of many ways to accomplish the same goal of transitioning your ventilation stages. I have constructed one example of this below:

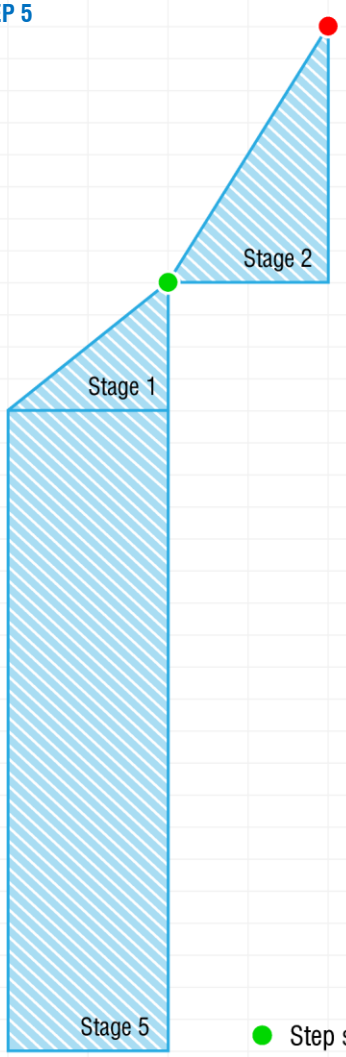


STEP 4



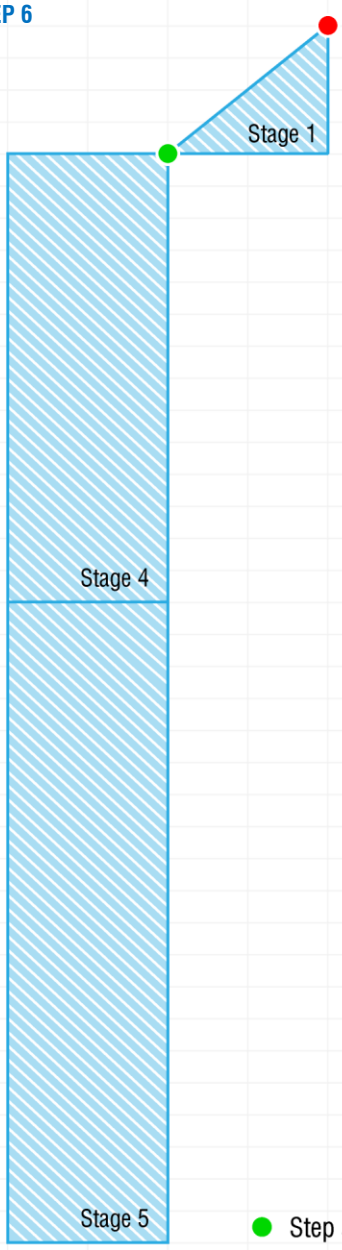
Stage 1: 1 × 12 in.	=	0	to	2000	
Stage 5: 1 × 36 in.	=	10000		10000	
		10000		12000	CFM
	÷	26000	÷	26000	
		38.5		46.2	% ventilation rate

STEP 5



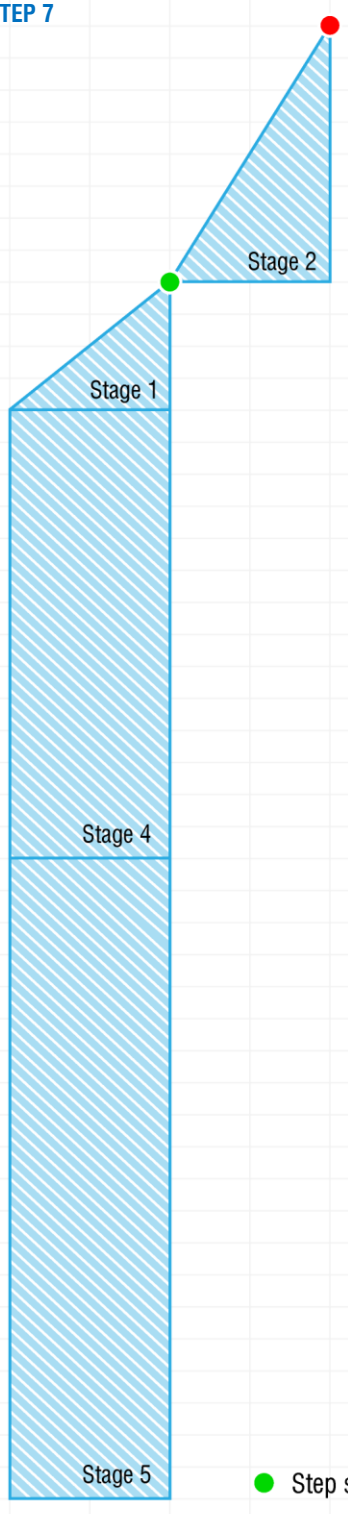
Stage 1: 1 × 12 in.	=	2000		2000	
Stage 2: 2 × 12 in.	=	0	to	4000	
Stage 5: 1 × 36 in.	=	10000		10000	
		12000		16000	CFM
	÷	26000	÷	26000	
		46.2		61.5	% ventilation rate

STEP 6



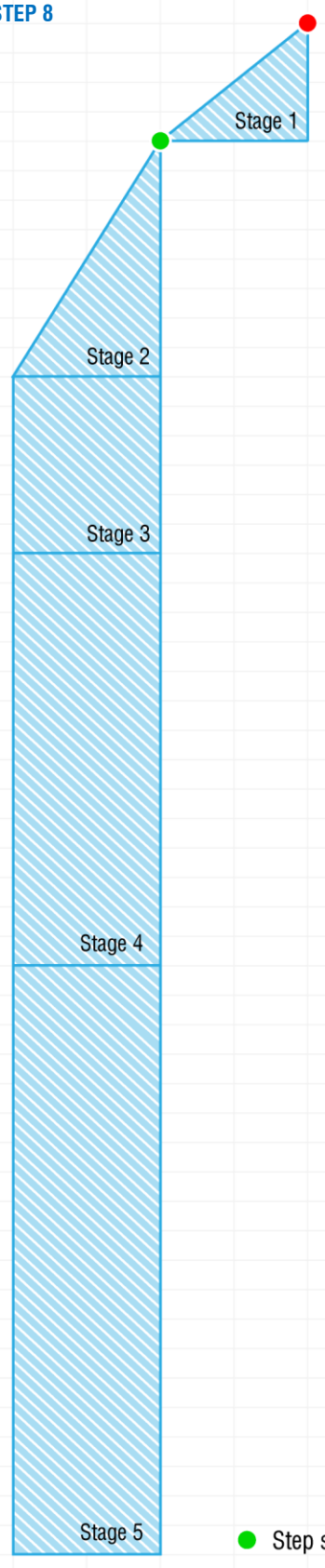
Stage 1: 1 × 12 in.	=	0	to	2000	
Stage 4: 1 × 24 in.	=	7000		7000	
Stage 5: 1 × 36 in.	=	10000		10000	
		17000		19000	CFM
	÷	26000	÷	26000	
		65.4		73.1	% ventilation rate

STEP 7



Stage 1: 1 × 12 in.	=	2000		2000	
Stage 2: 2 × 12 in.	=	0	to	4000	
Stage 4: 1 × 24 in.	=	7000		7000	
Stage 5: 1 × 36 in.	=	10000		10000	
		19000		23000	CFM
	÷	26000	÷	26000	
		73.1		88.5	% ventilation rate

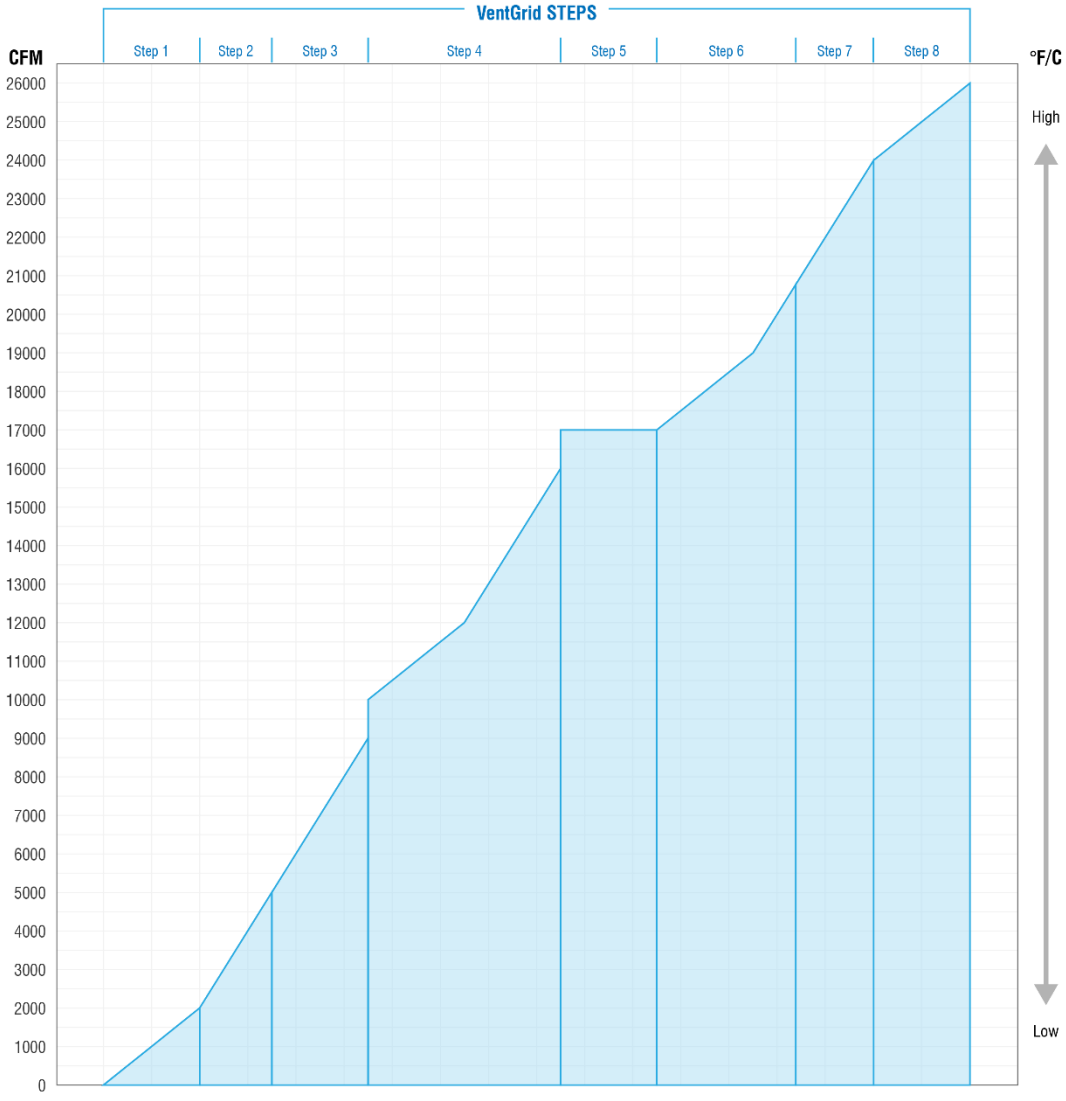
STEP 8



Stage 1: 1 × 12 in.	=	0000	to	2000	
Stage 2: 2 × 12 in.	=	4000		4000	
Stage 3: 1 × 16 in.	=	3000		3000	
Stage 4: 1 × 24 in.	=	7000		7000	
Stage 5: 1 × 36 in.	=	10000		10000	
		24000		26000	CFM
	÷	26000	÷	26000	
		92.3		100	% ventilation rate

Here is what our example looks like in a VentGrid in AutoFlex Connect:

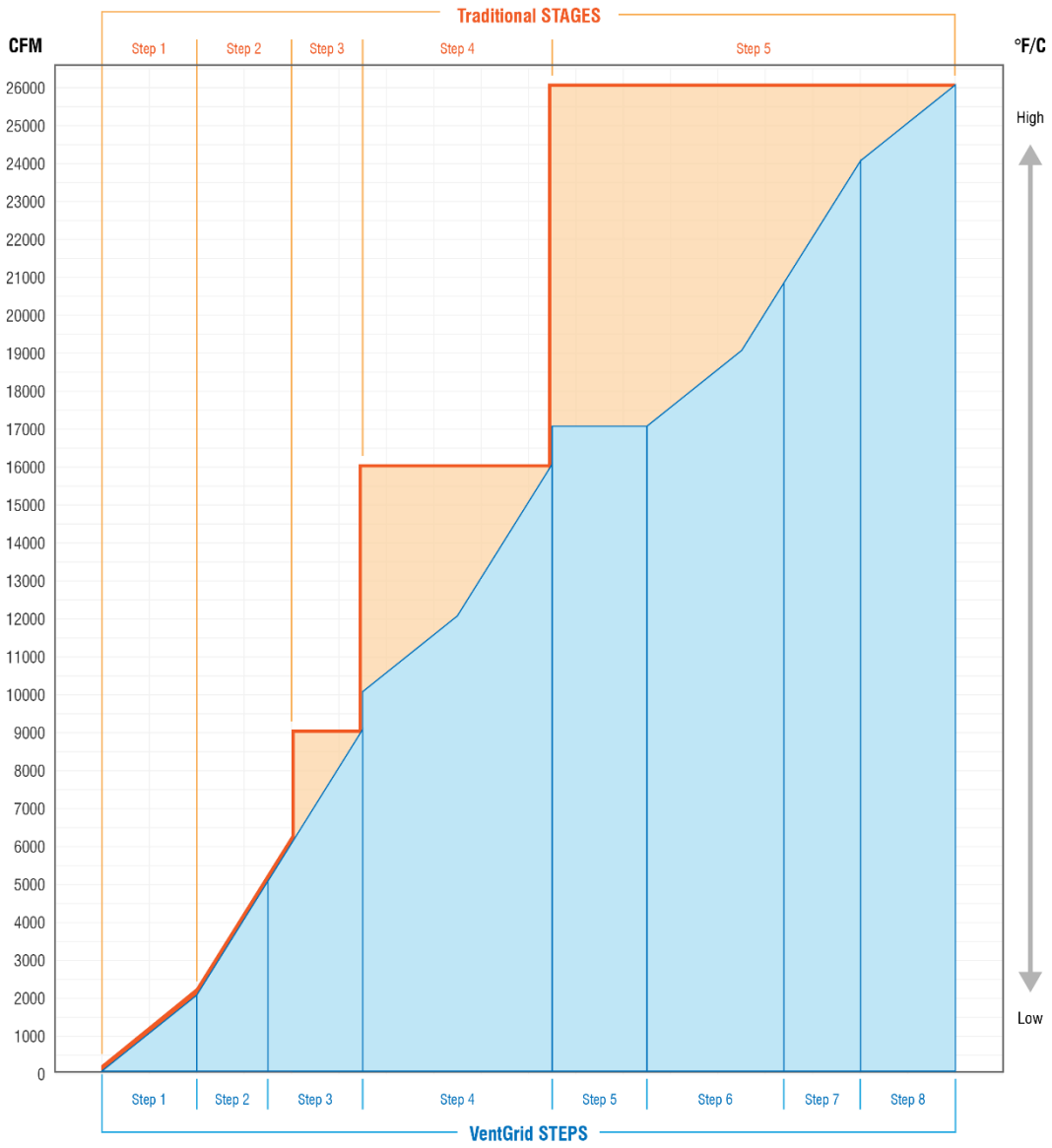
Steps					Variable				Fixed			Actuator	
	Vent Rate (%)		Set Points (°F)		STG1VAR (%)		STG2VAR (%)		STG3F	STG4F	STG5F	Inlets (%)	
Name	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Output	Output	Output	Start	Stop
#1	1	7.7	70.1	71.2	0	100	0	0	OFF	OFF	OFF	0	8
#2	7.7	23.1	71.2	73.4	100	100	0	100	OFF	OFF	OFF	8	23
#3	23.1	34.6	73.4	75.8	100	100	25	100	ON	OFF	OFF	23	35
#4	38.5	46.2	75.8	76.9	0	100	0	0	OFF	OFF	ON	39	46
#5	46.2	61.5	76.9	79.6	100	100	0	100	OFF	OFF	ON	46	62
#6	65.4	73.1	79.6	80.9	0	100	0	0	OFF	ON	ON	65	73
#7	73.1	88.5	80.9	83.3	100	100	0	100	OFF	ON	ON	73	89
#8	88.5	100	83.3	85	0	100	100	100	ON	ON	ON	89	100



Comparing traditional staged mode to VentGrid

The differences and advantages are clear when we overlap the staged and VentGrid options. The orange areas in the following chart show where **excess ventilation** is occurring **when using staged ventilation**. **VentGrid can reduce or eliminate excess ventilation**, thereby helping you:

- **Save money in energy costs**
- **Reduce wear and tear on equipment**
- **Increase animal health and productivity**



Other VentGrid topics

Steps and stages

- **Steps:** Steps are the the set points and transitions the control goes through as it adjusts the ventilation rate. Each step has its own settings: ventilation start and stop rates, output, and so on. Each step is one row in the grid.
- **Step start / step end:** Step start and step end define the range the step uses. Note that the option you chose for display (temperature or ventilation rate) is what you will use for the settings.
- **Variable / fixed / actuator:** Each equipment column lists the equipment of that type (variable, fixed, or actuator) assigned to the ventilation grid. Each piece of equipment has settings for each step. Variable stages and actuators have start and stop percentages. Fixed stages have start and stop outputs: on, off, or duty cycle.

Steps					Variable <<				Fixed <<		Actuator<<	
Name	Vent. Rate		Set Points		S36V-1		S36V-2		S28-1	S28-2	S-ACT	
	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Output	Output	Start	Stop
#1	1%	26%	75	77.5	0	65	0	0	Duty Cycle	Duty Cycle	10	35
#2	26%	51%	77.5	80	65	100	50	70	Off	Off	35	60
#3	51%	76%	80	82.5	60	60	70	100	On	On	60	80
#4	76%	101%	82.5	85	50	100	100	100	On	On	80	100

- When a row is highlighted in green, the grid is in **normal mode and** is using that step.
- When a row is highlighted in yellow, the grid is in **test mode** and is testing that step.

VentGrid modifiers

Low outside temperature bandwidth modifier

The low outside temperature bandwidth modifier lessens the effect of cold outside air coming in by reducing the ventilation rate when the outside temperature is below the set value.

Evaporative cooling modifiers

The evaporative cooling modifiers reduce the ventilation rate when an evaporatvie cooling cycle is active. This gives more time for the heat to transfer to the water molecules.

Static pressure modifier

The static pressure modifier adjusts the ventilation grid's actuator/inlet positions based on static pressure to maintain proper air speed.