• Division of Therma-Stor
• Established in 1977
• We specialize in dehumidification and heat reclaim products
• Our products are Made in America – Madison, WI
• We invented whole house dehumidification in 1996
Ventilation and Moisture Control in Spray Foam Homes

Spray foam insulation has been increasing in popularity over the last several years due to:
• Becoming more affordable
• Significant long-term energy savings

Sealing restricts air movement through the building envelope.
Air sealing also reduces the natural ventilation rate (or air leakage rate), further reducing heating and cooling loads.

Resulting is energy savings!
All sounds good, right? But natural ventilation dilutes the concentration levels of pollutants generated inside the home. Studies show that without it, dust, allergens, moisture, and other pollutants can build up to unhealthy and even dangerous levels.

POOR INDOOR AIR QUALITY!
Indoor air quality is increasing in importance because it directly affects the health and comfort of building occupants.

The three key components that impact air quality are:

- **Airborne materials** (pollutants), often referred to as the quality of the air
- **Moisture level** (contributing to humidity, condensation and mold)
- **Ventilation/air exchanges** (replenishing oxygen levels and diluting air pollutants impacting air changes and safety)
A key means of controlling indoor air quality is to control the air exchange rate/ventilation.

ASHRAE 62.2 is the national **MINIMUM** ventilation standard of design for all homes and up to three story multifamily buildings.

Table 4.1 from ASHRAE 62.2

<table>
<thead>
<tr>
<th>Floor Area (ft²)</th>
<th>0-1 Bedrooms</th>
<th>2-3 Bedrooms</th>
<th>4-5 Bedrooms</th>
<th>6-7 Bedrooms</th>
<th>&gt;7 Bedrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1500 ft²</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>1501 - 3000</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>3001 - 4500</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
</tr>
<tr>
<td>4501 - 6000</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
</tr>
<tr>
<td>6001 - 7500</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
</tr>
<tr>
<td>&gt; 7500 ft²</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
<td>165</td>
</tr>
</tbody>
</table>
Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the home – this can lead to health problems.
Therefore providing mechanical fresh air ventilation is especially important in spray foam houses.

Mechanical ventilation systems allow a constant flow of outside air into the home and can also provide filtration, dehumidification, and conditioning of the incoming outside air.
The mantra of the Spray Foam Industry is to “Build it Tight and Ventilate Right.”

“We also recommend to “Do No Harm” when we design and recommend ventilation for homes tightened with SPF. The SPF contractor must always install a proper ventilation system in a home air-tightened with SPF, or assure that the home owner’s or general contractor’s HVAC contractor has provided adequate ventilation.”
While most spray foam homes are required to have some form of mechanical ventilation (ASHRAE 62.2 Standard is recommended), there are many questions on how best to provide it:

- Exhaust
- Supply
- Balanced
Exhaust Ventilation
Exhaust ventilation systems pull stale air out of the home creating a negative pressure in the house and rely on make-up air leakage through the structure.

• In-line duct fans
• Bathroom fans
• Kitchen hoods
Exhaust Ventilation

Pros
• Generally easiest to install
• Can be used with any heating system
• Lowest electrical energy cost
• Simplest to understand
• Simplest to maintain
• Simplest installed system testing

Cons
• Puts house under negative pressure (Not good for AC climates)
• Unknown sources of makeup air
• Highest conditioned air cost
• Ventilation air is not distributed
Supply Ventilation
Supply ventilation systems push air into the home creating a slight positive pressure and provides make-up air for kitchen hoods and bathroom fans.

• Controlled mechanical damper
• Whole house ventilating dehumidifier
Supply Ventilation – Controlled Mechanical Damper

Controlled dampers work with the home’s central heating and cooling system to distribute outside air throughout your home. The furnace fan is used to draw and distribute the outside air throughout the home. Activates the furnace fan based on programmed times.
Supply Ventilation – Controlled Dampers

Pros
• Low initial investment
• Can bring in the required amount of fresh air

Cons
• Uses biggest motor in the home to move a small amount of air. The HVAC system typically moves 1000 to 2000 cubic feet per minute (cfm) of air, but most homes need only 50 to 100 cfm for ventilation.
• Brings in outside air at times when the heating or cooling system isn't operating – unconditioned air.
Supply Ventilation – Whole House Ventilating Dehumidifier

- Fresh Air Intake (optional)
- Indoor Air Return
- Motorized Damper
- UA Indoor Air Return
- Indoor Air Supply

Ultra-Aire™ Whole House Ventilating Dehumidifiers
Supply Ventilation – Whole House Ventilating Dehumidifier

Pros
• Utilizes dedicated fan to operate
• Brings in fresh air and conditions it
• Filters the air

Cons
• Initial investment
• Footprint of the units
Balanced Ventilation
Balanced ventilation systems use one fan to bring fresh air into the home and another to exhaust an equal amount to the outdoors.

- Energy Recovery Ventilator
- Heat Recovery Ventilator
ERVs and HRVs are balanced ventilation systems originally developed for northern climates. They bring air into the home and blow an equal amount of air out of the home. The ERV/HRV core transfers some heat and in an ERV moisture (energy) between the two air streams.
Balanced Ventilation – ERV & HRV

**Pros**
- Distributed airflow
- Low partially-conditioned air energy cost
- Mechanically balanced – doesn’t unbalance the house
- Known fresh air source

**Cons**
- Best with fully ducted ventilation ducting (High cost)
- System must be balanced on installation and checked periodically
- Requires filter maintenance
- Requires active homeowner involvement
Moisture Control
Airtight homes without fresh air ventilation become humid with moisture from the occupants in a couple days from:

- Cooking
- Showering
- Breathing
- Cleaning
- Dishwasher
- +80% RH, Rots wood & blisters paint
- +75% RH, Cups wood floors & stains walls and ceilings
- 60+%RH: Mold and mildew can grow
If the house is sealed tight with spray foam, it is much harder for this moisture to leave the house naturally. It builds up inside the home and can raise relative humidity to uncomfortable and even dangerous levels.

**Optimum relative humidity range to minimize harmful contaminants** *(a decrease in bar height indicates a decrease)*

*ASHRAE: American Society of Heating, Refrigeration & Air Conditioning Engineers in effect for each of the items*
Whole House Moisture Control Strategies

• Lowering thermostat temperature in order to remove humidity

• Variable Speed A/C

• Whole House Ventilating Dehumidifier
Lowering thermostat temperature in order to remove humidity

**Why is overcooling a problem?**

- Can create cold surfaces that actually lead to condensation, mold or other damage
- It is expensive, 10% higher per extra degree of cooling
- Wear and tear on the air conditioning unit - adds unnecessary run time to the equipment

To make matters worse, the air conditioner’s run time is reduced due to the spray foam’s effective thermal insulation, meaning less ability to remove moisture.
Variable Speed A/C

- Slows air conditioner blower down to remove more moisture
- A/C makes a smaller amount of colder air
- Colder surfaces (ducts, registers, etc.) may form condensation
- Does not solve 70°F/raining scenario
Whole House Ventilating Dehumidifiers

- Remove excess humidity
- Provide precise time & volume control of fresh air
- Match air filtering requirements to needs
- Are quiet and draft free
- Provide make-up air for exhaust devices
- Provide a slight positive pressure to house
Spray Foam Case Study

Why Ventilation and Moisture Control are Important for Spray Foam Insulation Homes
A common misperception is that hot, humid days are the most challenging days to control moisture in a home. But in these conditions the air conditioner runs a lot in order to cool the home, and removes moisture in the process.
A much more challenging condition is a warm, rainy day when there is no cooling load but very high humidity.

The air conditioner doesn’t run because there is no need for cooling, yet there is a need for moisture removal.

This is the condition where whole house dehumidifiers operate to maintain a healthy and comfortable indoor environment.
Whole House Dehumidification Vs. ERV

**Summer "Week of Rain" with Dehumidification**
- Partial air conditioning run time (75°-85°)
- Really high outside dewpoint (70°+)
- Inside relative humidity is consistently in the low 50’s.

**Spring "Week of Rain" with ERV**
- Partial air conditioning operation
- High outside dewpoint
- Relative humidity rising through upper 50’s to low 60’s.