



**The science
of proper ventilation.**

70%

it's estimated that 70% of homes don't meet
basic ventilation requirements

01 | Ventilation Crisis

Research shows “most homes don’t meet basic ventilation requirements and are in violation of residential building codes” and, “approximately half of all U.S. homes have evidence of improper ventilation.” **The Lawrence Berkley Laboratory** states “poorly ventilated homes have been reported to be one of the leading causes of moisture build up, mold, mildew and rot in attics; which has contributed to alarming rise of many illnesses, including; asthma, allergies and other respiratory issues.”

Overheated. Dangerous. Damaging Air.

In order to have a balanced system you need more intake than exhaust

02 | Proper Ventilation

In order to prevent attic air from **overheating**, **pressurizing** and **drawing into the home**, there must be equal amounts (or more) air entering through soffits than exiting through roof vent systems.

The U.S. Department of Energy recommends using a continuous roof ventilation system at the rooftop, and a continuous vented soffit system that provides more intake or net free area (NFA) at the eave edge than what is offered through the roof vent system.

The problem is that most soffit panels today don't offer enough NFA to work with the amount of roof ventilation required for the majority of homes.

CODE

03 | Power of Proper Ventilation

Continuous Soffit and Ridge Vent

The Department of Energy and Habitat for Humanity states that “a combination of continuous ridge vent along the peak of the roof and continuous soffit vents at the eaves provides the most effective ventilation.”

1/150 Rule

The National Roofing Contractors Association recommends a minimum area of ventilation openings that is 1/150 fraction of the area of space ventilated. “Natural convection is responsible for initiating the upward flow of air through an attic. This air current can be maintained to aid in continuous circulation of air through the attic if intake vents placed low in the attic make colder air available to replace the heated air exhausted through vents placed high in the attic.”

Balanced Attic

“The international building code Sec. 1203.2 states, “The net free ventilating area shall not be less than 1/150 of the area of the space ventilated, with 50 percent of the required ventilating area provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet (914 mm) above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.”

1/150 Rule Equation:

Sq. Ft. of attic = (a) _____
Sq. Ft. of Code Required: (a)/150= (b) _____
Sq. In of Code-Required 144 x (b) = (c) _____
Sq. In NFA Needed Intake: (c)/2 = _____
Outtake (c)/2 = _____

Proper ventilation can reduce the temperature in your attic by

50°

04 | Power of Proper Ventilation

Proper ventilation (more in-take through soffits than exhaust through roof vents) according to the **U.S. Department of Energy** “can lower the attic temperature by as much as 50°f, which significantly reduces the home’s heating and cooling, demands.” **Just because a soffit product has vents doesn’t mean it works!** Typical one foot soffit overhangs should have at least an 11 NFA, so when used on both sides of the home will have a combined NFA of 22 to draw the air flow needed to work with a ridge vent system.

U.S. Department of Energy

http://www1.eere.energy.gov/buildings/openhouse/soffit_vents.html

Energy Costs

Experience \$4,300 in energy savings over the life of a 15 year mortgage

Calculations

Summer Assumption

- 2,000 sq ft attic
- Roof temp 175°
- 21 NFA vs 2
- Inside temp 65°
- Outside temp 95°
- .11\$/kWh

$$T(NFA) = T_{outside} + (T_{roof} - T_{outside})e^{-0.235(NFA)}$$

Winter Assumption

- 2,000 sq ft attic
- 20 R-Value vs 10 R-Value
- Outside temp 30°
- Inside temp 70°
- 80% Furnace rating
- .77 gas cost \$/ccf

$$Q = \frac{A \cdot (T_{inside} - T_{attic})}{R}$$

05 | Energy Costs

Residential Building Code requires proper ventilation through soffit systems that offers more net free area (NFA) for air flow, creating the updraft required to get air to exit through the ridge vents.

Disher Engineering has estimated energy savings on a 2,000 square foot attic to be **\$292 annually - \$4,380 over a 15 year mortgage.**

When evaluating the costs of ventilation systems, be careful not to be enticed by products that cost a little less up front and end up costing significantly more in both the short and long term!

	Initial Cost of Soffit	Year 1 Cost	Year 2 Cost	Year 3 Cost	Year 7 Cost	Year 15 Cost
QE Soffit	\$650	\$358 Initial Cost (\$650) minus Energy Savings (\$292)	\$66 Cost (\$358) minus Energy Savings (\$292)	-\$226	-\$1,394	-\$3,438
Soffit with Insufficient NFA	\$450	\$742 Initial Cost (\$650) plus Energy Costs (\$292)	\$1,034 Cost (\$742) plus Energy Costs (\$292)	\$1,326	\$2,786	\$5,122

Improve

Indoor Air Quality

06 | Indoor Air Quality

According to the EPA, “Indoor pollution sources that release gases or particles into the air are the primary cause of indoor air quality problems in homes. **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. Dampness and mold in homes are estimated to account for 21 percent of current asthma cases in the United States”

Based on the analysis of 49,130 indoor air quality tests conducted in homes across North America, Air Advice shows that, “people in 9 out of 10 American homes are breathing unhealthy indoor air. Over 91% of homes tested showed elevated particle allergen levels.”

IAQ in Homes

<http://www.epa.gov/iaq/homes/index.html>

Air Advice

http://www.airadvice.com/pr_article/indoor-air-report-62007/

Additional

Shingles

\$4,680

if your roof lasts 15 years
versus 30

Roof Deck

\$1,200

cost of replacing dry-rot on roof deck

07 | Building Material Life Cycle Costs

Improperly vented and overheated attics are a primary cause of premature aging of roofing materials which can be costly. The Asphalt Roofing Manufacturers Association states that “Recent research has reinforced the theory that prolonged exposure to extreme heat accelerates the aging of asphalt roofing products. By properly ventilating the underside of the roof deck, heat buildup and its related problems can be reduced.” **It’s one of the main reasons shingle manufacturer warranties are voided when proper ventilation is not present.** In financial terms, if a roof’s life is 15 years instead of 30 due to improper ventilation, and the average roof cost being \$9,360, it would produce an average cost of \$312 annually, or \$4,680 over 15 years for shingle replacement.

Asphalt Roofing Manufacturers Association
http://www.asphaltroofing.org/pdf/tb_209.pdf

Shingle Manufacturer Warranties VOID due to improper ventilation:

GAF: “What Is Not Covered. (1) Damages resulting from anything other than an inherent manufacturing defect in your shingles or accessories, such as: (c) Inadequate attic ventilation.”

CertainTeed: “Any shingles applied to inadequately ventilated or non-ventilated decks... are subject to a reduced limited warranty period of ten (10) years and do not qualify for SureStart Protection.”

OwensCorning: “Our warranty does not cover damage to the shingles due to any cause not expressly covered herein... 6. Inadequate ventilation or roof drainage.”

Savings

Insulation

\$5,505

increased energy costs associated with wet insulation over 15 year mortgage

Mold Remediation

\$3,000

average mold remediation claim

Improper ventilation is also a primary cause of increased moisture in the attic leading to potential insulation damage, mold, mildew and dry rot. Fiberglass loses up to 40% of its labeled R-value when outside temperatures fall to 20° F and loses 50% of its labeled R-value when outside temperatures exceed 85° F. On top of that, research shows as little as a **4% increase of moisture/humidity will reduce the effectiveness of fiberglass insulation by as much as 80%**; and cost as much as \$367 annually (\$5,505 over the life of a 15 year mortgage), not to mention the cost of mold remediation, poor indoor air quality and possible replacement of the roof deck.

The U.S. Department of Housing and Urban Development indicates that “inadequate ventilation will lead to fungus growth and very costly repairs.”

U.S. Department of Housing and Urban Development
<http://www.hud.gov/local/shared/working/r10/mf/seamfacp.cfm?state=id>

Assumption

- 2,000 sq ft attic
- 20 NFA
- Outside temp 95°
- Roof temp 170°
- Inside temp 65°
- .11\$/kWh
- w/moisture 50% reduction
- R-value on 2 NFA soffit
- 12 months (367 per year x12)

$$T(NFA) = T_{outside} + (T_{roof} - T_{outside})e^{-0.235(NFA)}$$

ROI

08 | ROI of Ventilation

ROI Formula

Take the difference in cost between soffit products (the one that works vs. the one that doesn't) and divide it by the annual savings for your ROI. For example, if the up front cost difference was \$89 and the savings was \$220, you would divide \$220 by \$89 which **would give you a 320% annual ROI the first year, and a 3,200% ROI by year ten.**

Payback Formula

Divide the annual saving by 12 which = Y and then divide the up front cost difference by Y for your pay back. For example if the up front cost difference was \$89 you would divide the annual savings of \$292 by 12 = 24. Then divide \$89 by 24 = 4 month payback.

	<u>Annual</u>	<u>15 Year Mortgage</u>
Energy Savings	\$292	\$4,380
Roofing Materials	\$312	\$4,600
Wet Insulation	\$806	\$9,672
Mold Remediation		\$3,000
Replace Roof Deck		\$1,200
Air Quality		Priceless

Estimates provided by Disher Engineering

In Review

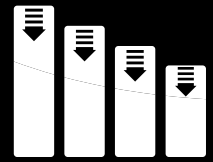
09 | The Benefits of Proper Ventilation



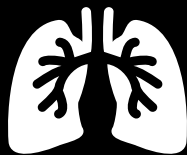
It **reduces** the temperature in the attic



Prolongs the life of your roof and other building materials



Reduces energy costs



Can help **improve** indoor air quality



It **saves** you money by reducing your energy bills and is a wise investment

When you enhance
ventilation you
enhance **everything.**

All full vent soffit is

not created equal

The first full vent soffit to work properly
with a ridge vent system

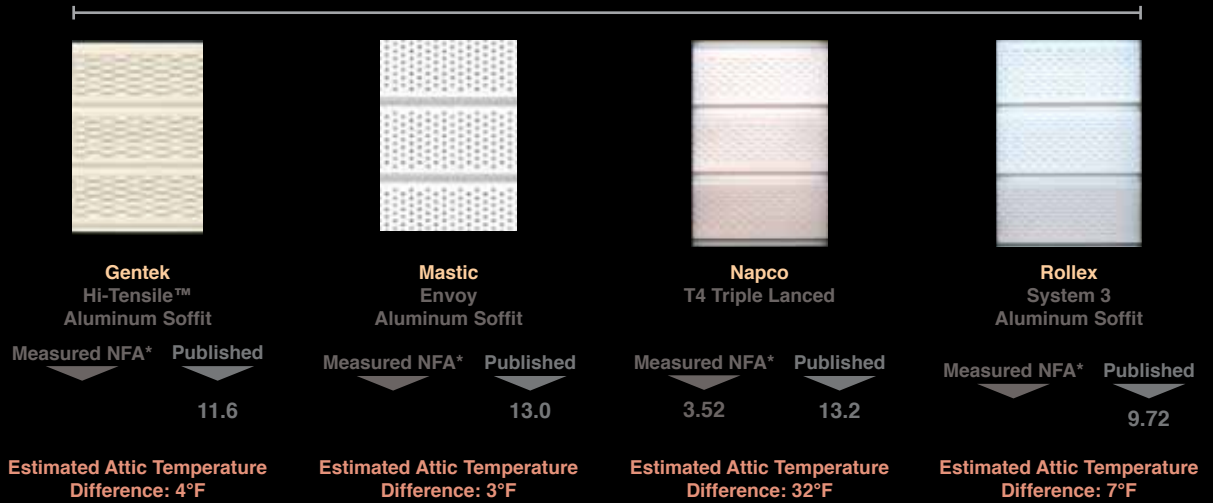


▶ 16": 19.1 NFA / 12": 19.6 NFA



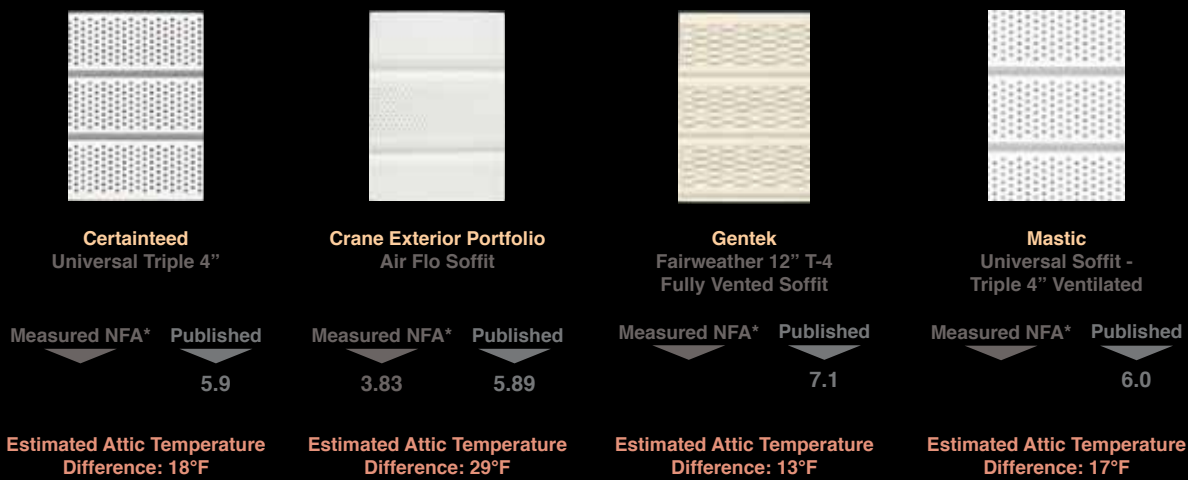
Aluminum

Average NFA: 10.04



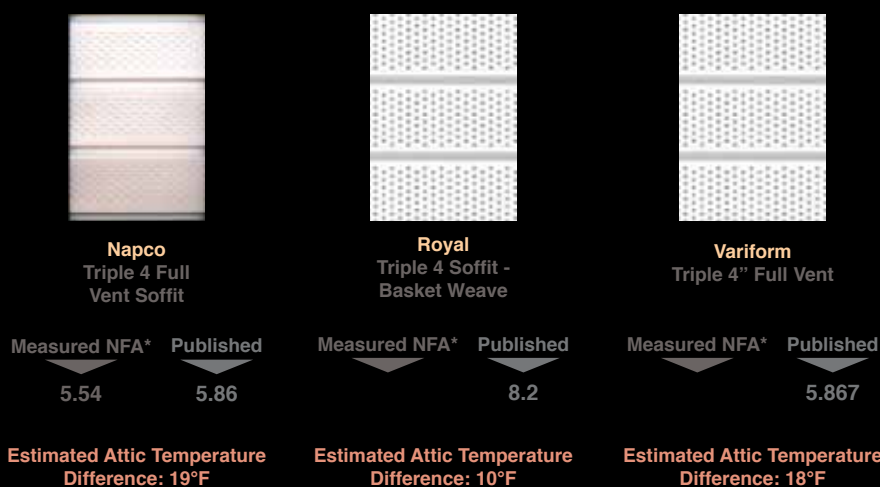
Vinyl

Average NFA: 6.22



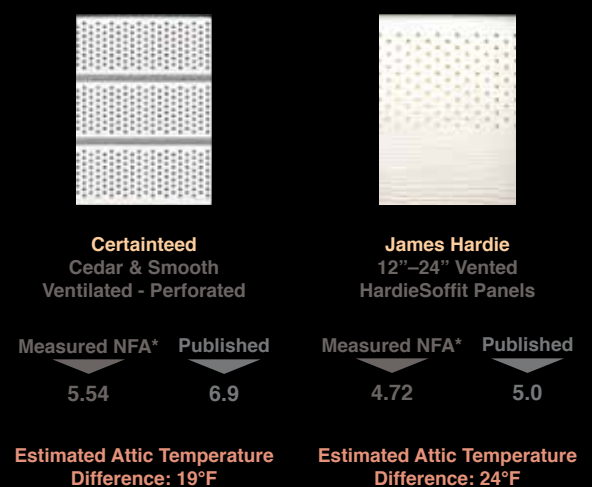
Vinyl Continued

Average NFA: 7.13



Fiber Cement

Average NFA: 5.13



*Measured by Disher Design & Engineering, Zeeland Michigan.
*All estimates are based on Disher Design & Engineering's formula.

All center vent soffit is

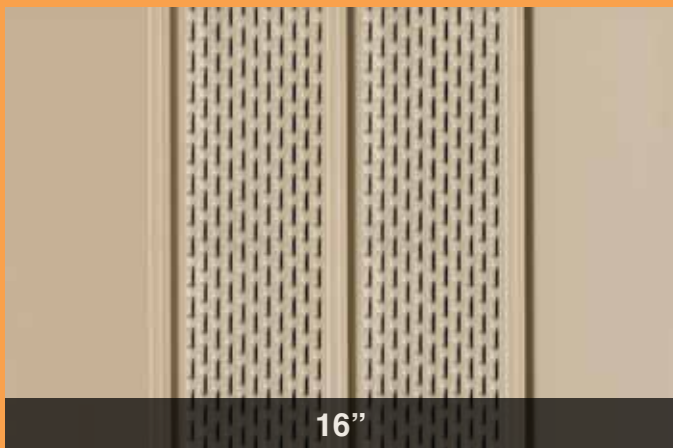
not created equal

Center Vent Soffit that works

Properly with a ridge vent system to ventilate a home



▶ 16": 9.9 NFA / 12": 5.9 NFA



If competitive full vent soffit doesn't offer enough air ...

Remember: a NFA of 10 or more is typically required to work properly with a ridge vent system.

then center vent certainly won't.

Aluminum

Average NFA: 3.885



Gentek
Hi-Tensile™
Aluminum Soffit

Measured NFA* Published
3.9

Estimated Attic Temperature Difference: 29°F



Mastic
Triple 4" Center Lanced

Measured NFA* Published
4.0

Estimated Attic Temperature Difference: 28°F



Napco
Commercial
Triple 4 Center Vent

Measured NFA* Published
4.4

Estimated Attic Temperature Difference: 46°F



Rollex
System 3
Center Vented

Measured NFA* Published
3.24

Estimated Attic Temperature Difference: 34°F

Vinyl

Average NFA: 2.06



Certainteed
Universal Triple 4"
Center Vent

Measured NFA* Published
2.0

Estimated Attic Temperature Difference: 46°F



Crane Exterior Portfolio
Air Flo Soffit
Center Vented

Measured NFA* Published
1.96

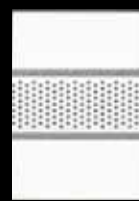
Estimated Attic Temperature Difference: 46°F



Gentek
Fairweather 12" T-4
Center Vented Soffit

Measured NFA* Published
2.3

Estimated Attic Temperature Difference: 43°F



Heartland by ProVia
Triple 4 Center-Vented

Measured NFA* Published
1.74

Estimated Attic Temperature Difference: 49°F



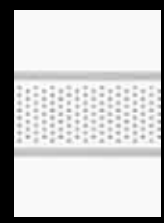
Napco
Triple 4
Center Vent

Measured NFA* Published
1.956

Estimated Attic Temperature Difference: 26°F

Vinyl Continued

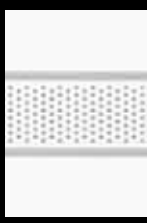
Average NFA: 2.06



Royal
Triple 4 Soffit -
Center Basket Weave

Measured NFA* Published
2.55

Estimated Attic Temperature Difference: 40°F



Variform
Triple 4" Center Vent

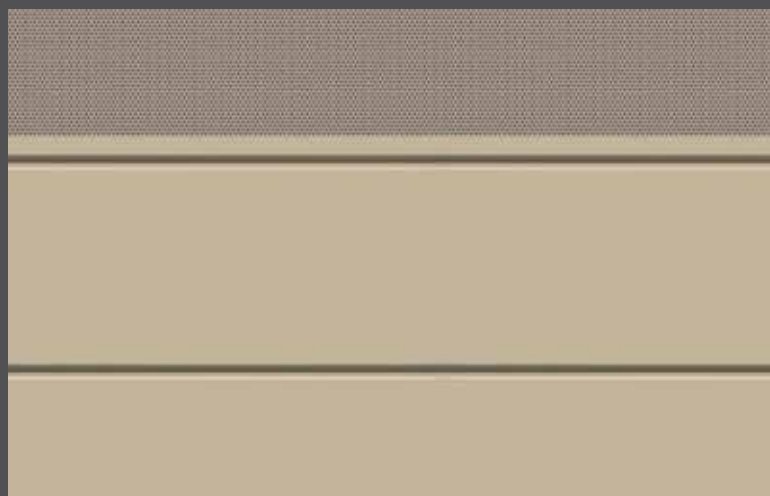
Measured NFA* Published
1.96

Estimated Attic Temperature Difference: 46°F

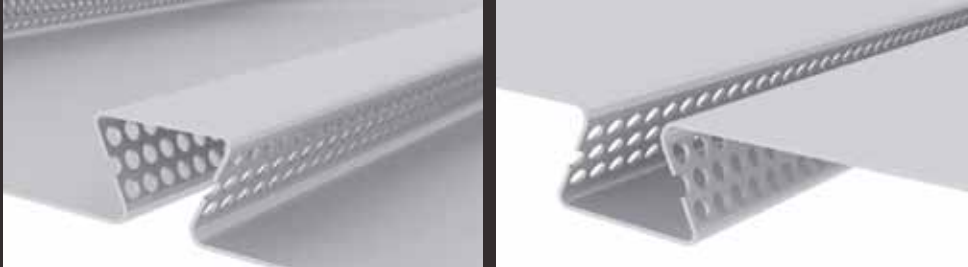
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More air, fewer visible vents

Ventilation is at its best when it draws the air you need, without attention to its source



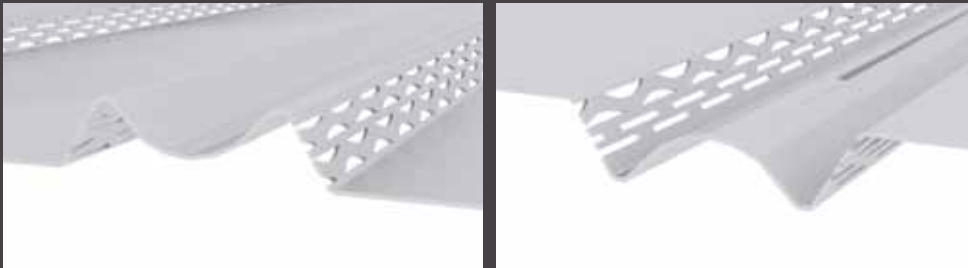
The Benefits of TruVent®



Hole Size [in^2]	Holes Per Foot	NFA
0.00975	1,386	11

- The unique I beam construction was engineered for optimum strength
- The trapezoidal cross sectional shape maximizes rigidity
- The patented angle slot design hides vent holes, while providing additional stiffness

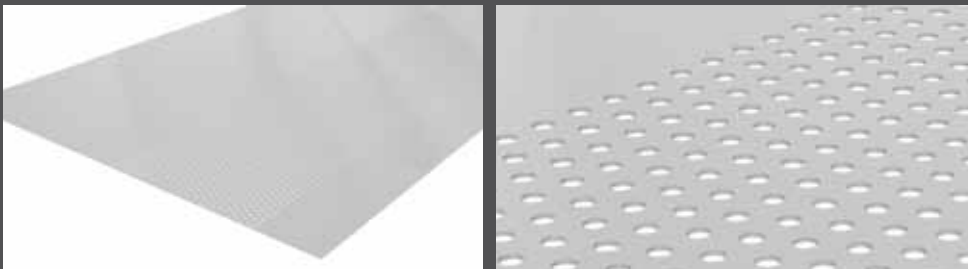
The Benefits of TruBead®



Hole Size [in^2]	Holes Per Foot	NFA
0.00975	594	10.2

- Patented Jet 45 airflow system provides as much or more airflow than many full vent soffit systems
- Provides the right amount of airflow while maximizing the architectural integrity of your overhangs
- Made from a titanium stabilized specially annealed high performance aluminum alloy to provide the maximum amount of strength to weight ratio

The Benefits of TruLegacy™



Hole Size [in^2]	Holes Per Foot	NFA
.1	1,296	11

- The first and only maintenance free parallel soffit
- Provides your home with the distinctive look of real wood soffit while allowing continuous ventilation
- Features patented components including a fascia system that is proud to the soffit - just like traditional wood fascia



Quality Edge soffit is made from aluminum, a 100% recycled and recyclable material.

qualityedge.com

VENTSCIBROCH 03/2013

