Roof Venting 101: Vent the Attic Space

Proper attic area ventilation is an important performance consideration for a home or building with a steep slope roof. Typically, building codes include minimum attic space ventilation requirements, as well as the roofing industry weighing in on practical guidelines. This PK topic provides commonly accepted ventilation practices compatible with a DECRA roof system installation.

Poor ventilation practices under the roof deck can lead to excessive energy loss, ice dams, mold, and even rot.

Optimal Ventilation: Cold Climate

Ventilation seeks to maintain a cold roof temperature to avoid ice dams created by snow melt – and to vent any moisture that passes from the conditioned living space to the attic.

Optimal Ventilation: Hot Climate

Ventilation's purpose is to expel sun-heated hot air from the attic or roof, so that the building's cooling load is reduced, relieving strain on the living space air conditioning system to improve interior home comfort

Ventilation and the Building Code

Most residential building codes require enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing to have cross-ventilation for each separate space:

The Net Free Vent Area (NFVA) shall not be less than 1:300 of the area of the space being vented. The U.S. Federal Housing authority recommends a minimum of at least 1 square foot of attic ventilation (evenly split between intake and exhaust) for every 300 square feet of attic floor space. It is common for many homes that provide up to a 1:150 NFVA calculation of the attic area being vented. Adjust your NFVA calculation accordingly to verify that proper balance of intake-to-exhaust venting is provided.

Building codes suggest balancing the attic ventilation intake and exhaust ventilation. In all cases, we want to avoid an attic space that becomes depressurized – by having equal, or slightly more intake venting than exhaust venting – an even balance would be a 50/50 split between the eaves and the ridge exhaust point. A slightly pressurized attic space (a 50/50 to slighty greater ratio of eave inlet vent area-to-ridge vent exhaust area) further helps prevent a depressurized condition that can suck conditioned air out of the home, thus wasting air cooling money.

Mr. Smith has an attic space measuring 25 feet by 45 feet, for a total area of 1,125 square feet. He then divides this measurement by 300, for a total of 3.75 square feet of total ventilation space needed to properly vent his attic.

Mr. Smith then converts this figure to square inches: 3.75 NFVA x 144" per sq. ft. = 540 sq. inches of NFVA.

Mr. Smith then splits this NFVA total area between the soffit vent need and the roof ridge vent need: 50% of 540 sq. in. = 270 sq. in. for the soffit vents — 50% of 540 sq. in. = 270 sq. in. for the ridge vents (provide NO LESS than a 50/50 balance between eave and ridge vent area – up to a 55/45 to 60/40 ratio to prevent a depressurized attic space.

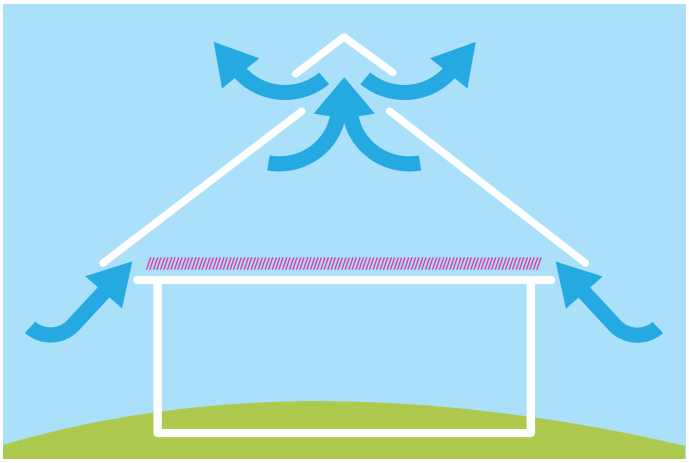
Mr. Smith has a simple roof with 2 gable ends. His soffit vents provide 9 NFVA per running foot of installation: 270 sq. in. divided by 9 = 30 lineal feet of soffit vent intake; or, 15 lineal feet of soffit intake vent total per front side and back side of his home (soffit runs along the front and back of the home – not the sides – with gable ends).

His ridge vent material provides 12 NFVA per foot rating: 270 sq. inches divided by 12 = 22.5 lineal feet of ridge vent exhaust run.

Air space of no less than 1" minimum must be provided between any applied attic insulation and the roof sheathing. Yet, ideally this should be a 2" minimum airspace between the back of the roof sheathing and the top of the insulation, to ensure sufficient airflow thru the roof assembly. Use of a rigid foam ventilation baffle at the attic eave area will avoid the situation where attic insulation often restricts ventilation flow from eave to ridge, thus inhibiting proper exhaust flow out of the attic space.

Ventilation openings must be protected to prevent rain or snow infiltration.

In wildfire-prone areas, additional care is necessary to prevent air-borne burning embers from entering thru vent screens, especially in the eave/soffit vent units. Make sure that vent units in this situation are constructed of flame resistant materials that won't allow embers to pass through to the attic space.



Make every attempt to seal the attic floor/interior ceiling completely – air leaks around light fixtures, plumbing vent pipe penetrations and thru attic space HVAC duct leaks are major contributors to energy loss in all climates, while being a primary contributor to roof ice dams in cold climates.

Soffit vents should be located as far to the outside edge of the soffit as possible. Otherwise, warm air next to the heated siding can rise, enter the vent, melt snow, and contribute to ice dams forming.

Dissimilar Metal and Chemical Compound Corrosion

Most metals used in construction projects are chosen for their strength, corrosion resistance and longevity. However, some metals do not perform well when placed in contact with certain other metals or exposed to certain chemical compounds. Awareness of these situations is critical to understand how dissimilar metal and chemical compound corrosion can affect a DECRA roof system installation.

Common causes for accelerated metal roof corrosion include:

- Galvanic reaction due to dissimilar metals
- Trapped moisture
- Excessive contact with chemically contaminated water

What Is Dissimilar Metal Corrosion?

Galvanic corrosion – also known as "Electrolytic Corrosion" or "Bimetallic Corrosion" – refers to accelerated corrosion induced when two dissimilar metals are coupled by an electrolyte. When this coupling effect forms, one of the metals in the couple becomes the anode and corrodes faster than it would by itself. The other metal becomes the cathode and corrodes slower than it would alone.

For dissimilar metal corrosion to occur, two conditions are required:

1. The different metals (or their oxide layers) are galvanically incompatible with each other
2. Metals are in electrolytic contact – joined to each other by moisture

Galvanic Incompatibility

Putting two different metals in electrolytic contact with each other can create an electrochemical reaction. This is where the "less noble" metal acts as an anode and the "more noble" metal acts as a cathode. The anode passes electrons through the electrolyte to the cathode, causing oxidation. When this happens, the anode loses mass – corrosion occurs. Thus, the weaker, anode metal (or metallic coating) fails via corrosion.

Metals in Electrolytic Contact

An electrolyte is simply a fluid that conducts electricity. Almost any fluid falls into this category, including rainwater and snow-melt water. For galvanic activity to occur there must be moisture present that couples the two metals electrically. Accelerated corrosion occurs when rainwater becomes more acidic – sulfurous and nitrous oxides from air pollution mixing with rainwater can accelerate corrosion.

Also, chlorides contained in seawater or de-icing salt create strong electrolytes that also accelerate corrosion.

Precautions

When installing a DECRA roof system, use extreme caution to avoid contact of the DECRA roof system components with copper. This includes exposure to pressure-treated wood (when treated with chemicals containing copper-ion solutions), water runoff from copper plumbing such as HVAC copper pipe drains, copper flashing, copper downspouts and other copper-containing products. Copper salts can quickly stain and corrode the roof surface.

Chemical corrosion can also occur when no metals appear to be involved. For example, wood treated with copper-ion chemical compounds provides corrosive copper salts. When the treated wood becomes wet, the corrosive solution becomes water-borne and will attack the roof metal.

With DECRA roof system components using steel coated with an aluminum-zinc alloy, the aluminum in the coating is extremely sensitive to chemical compounds containing strong alkalis – such as what is found in highly alkaline cleansers often used to clean HVAC components. Also, cementitious materials, such as stucco mix and mortar mix, when still wet and not yet cured, contain highly alkaline chemistry that pose a severe threat to DECRA roof system components. This is apparent by a conspicuous black and/or white stain on the roof metal surface, which will be then followed by red rust. When fully cured and freely draining, cement mortars do not seem to be a chemical problem, but should be allowed to cure and dry out completely to avoid any electrolytic reaction. Any masonry work near the roof area should be completed and well dried before roof materials are installed. Alkali spills should be immediately flushed with water to prevent damage.

Even if two dissimilar metals are not in direct physical contact, dissimilar metal corrosion can still occur. Water runoff from the cathodic metal (like copper) onto the anodic metal (like a DECRA roof system component), can cause staining and eventual corrosion on the roof metal

DECRA Fasteners: Design Features and Lab Test Protocol Validate Severe Environment Performance

DECRA provides a #10 x 1.5" corrosion-resistant fastener with a ¼" drive hex bolt head. This fastener is even approved for use in Miami-Dade County, Florida building code jurisdiction – the toughest code jurisdiction in the United States due to both high wind potential and corrosive environment near saltwater. That's fine, but what makes the DECRA fastener so good? And how do we test performance to verify its function? This PK topic reviews performance features and the associated benefits for use in our roof system.

Design and Material Characteristics

- T17 Cut Point
- High-Low Threads
- C1022 Steel Alloy
- 14 Thread-Count per Inch
- Head Flute Reinforcement
- L3 Dura Protec™ Anti-Corrosion Coating Process

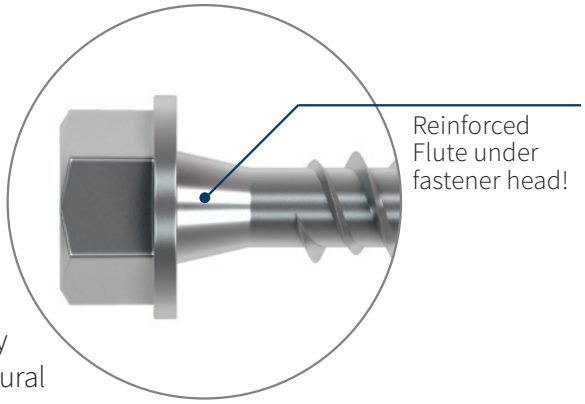
Product Performance Test Methods

ASTM D1761 – 06	Standard Test Methods for Mechanical Fasteners in Wood • Fastener Withdrawal • Lateral Shear
ASTM G85 – 11	Standard Practice for Modified Salt Spray (Fog) Testing
TAS 114 – 95	Test Procedure for Corrosion Resistance of Fasteners

Fastener Design and Material

The **T17 cut point design** allows for the DECRA fastener to quickly penetrate our metal panels and accessories for easier, faster fastener installation. The **high-low thread design** configuration aids in speeding up the installation speed into wood substrate – solid wood, plywood and oriented strand board (OSB).

The **engineered head flute**, located under the fastener hex head, provides reinforcement for high torque environments. This allows the fastener to be installed without snapping the hex head off of the screw shank when high-torque battery-operated screw guns are used – this includes impact drive screw guns.



C1022 steel coil used in the manufacture of the DECRA fastener is a low-carbon steel, ideal for fastener use due to its greater strength characteristics, good ductility and machinability for quality fastener fabrication, and noted for its benefit in structural applications. Maximum carbon content is 0.23%.

The **L3 Dura Protec™** corrosion resistance coating finish on the DECRA fastener is a high-grade metal surface process technology. The coating finish consists of three layers:

1. Metallic zinc layer
2. High-grade anti-corrosion chemical conversion film
3. Baked ceramic surface coating

The **L3 Dura Protec™** coating system distinguishing feature is the tight joining of the baked ceramic surface coating and the chemical conversion film. These layers are bonded together through chemical reactions, and this unique method of combining layers results in a rigid combination of the coating films. This system doesn't attribute its anti-corrosion properties to just a single material, but the synergy of the three layers, which combined have excellent rust proof properties.

L3 Dura Protec™ coating system benefits:

- Excellent corrosion resistance – saltwater, gas, weathering
- Corrosion resistance against scratches, due to the composite layers
- Electrolytic corrosion resistance – less contact corrosion with other dissimilar metals
- Low processing temperature – protects the fasteners from metallurgic changes during manufacture

Precautions

Two key attributes are tested for roof fasteners: Withdrawal resistance force and lateral shear force. Both attributes are tested per **ASTM D1761**.

For the **Withdrawal Test**, five fasteners are used for this evaluation. The fasteners are screwed into Spruce-Pine-Fir (SPF) 2x4 lumber, leaving sufficient head offset for gripping the fastener withdrawal fixture. For our DECRA fastener, a peak load average "pounds of withdrawal force" of 631.1 was recorded. Depending on the density of the pine lumber, a withdrawal extraction force has been recorded in lab as high as 1,105 pounds of pull force. Further testing on ½" thick exterior plywood yielded a withdrawal force of 425 pounds of pull, and OSB sheathing recorded a withdrawal force of 325 pounds.

Solid wood battens provide the most resistive withdrawal force using DECRA fasteners, as long as the battens are securely anchored to the roof rafters per wind uplift installation requirements. All recorded values are more than substantial when fastening DECRA roof panels to a steep slope roof application to wood battens, plywood or OSB roof sheathing. Plywood and OSB sheathing panels must be installed per building code requirements for fastener type and spacing.

Lateral Shear Force is a fastener failure when a force is applied to the side of the fastener head in the upward direction until a distinct load drop-off of at least 75% occurred. Again, five fasteners are tested in SPF lumber. The average shear force at failure was recorded at 342.0 pounds of force. Again, this force is more than adequate to withstand the forces at play in a high wind uplift situation on a DECRA roof panel fastened per ***DECRA Installation Guide*** detail.

Corrosion resistance is tested via **Testing Application Standard (TAS) 114:** Salt Spray Corrosion. A salt solution containing an electrolyte solution of sodium chloride and ammonium sulfate is administered in a sealed chamber containing the test fasteners. The "salt fog" spray is applied in one hour cycles of fog followed by one hour of dry-off period at a temperature of 95 degrees F. 140 full cycles are run on the fasteners. All fastener samples completed the test with a **PASS** rating – no red rust is exhibited after this corrosive environment exposure.

Intertek / ATI – York, PA laboratory conducted the fastener performance testing, as recorded in Report No. E1036.01-106-18; Report Date: 12/02/2014. Miami-Dade Notification No. ATI 14047

Performance Test Reviews

Test Procedure	Testing Method	Test Result
Hardness	Pencil Hardness	**Over 4H**
Adhesion	Peel Test – Tape	**Pass**
Acid Resistance	24 hrs in 5% Sulfuric Acid	**Pass**
Alkali Resistance	72 hrs in 5% Sodium Hydroxide	**Pass**
Heat Resistance	Expose to 250° C for 1 hr	**Pass**
Accelerated Weathering	Salt Spray Chamber – 1,000 hrs	**Pass**
Accelerated Weathering +	Salt Spray Chamber – 1,500 hrs	**(0% Visible Red Rust)**
Corrosion – Other Metals	Contact w/ Other Metal – Salt Spray	**Pass**

Precautions

The DECRA roof panel fastener is approved by the Miami-Dade County, Florida Code Administration - Product Control Section for use in area roofing projects – **Notice of Approval (NOA) 15-0423.02.**

Further, our fastener is listed in the **Miami-Dade County, Florida – *Roofing Fastener and Batten Plate Listing as of May 17, 2019.***

DECRA #10 x 1.5" hex head fasteners are thoroughly vetted as an ideal fastener choice to install a DECRA roof system, in any panel style, offered by our company.

ISO Certification: DECRA's Commitment to Quality

What is ISO?

ISO is the International Organization for Standardization. ISO creates documents that provide requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose. ISO is an independent, non-governmental organization with a membership of over 160 national standards bodies supporting innovation and solutions to global challenges.

ISO is not an acronym; instead, the name derives from the Greek word **iso**, which means equal. Founded in 1946, **ISO** is an international organization composed of national standards bodies from over 75 countries. For example, ANSI (American National Standards Institute) is a member of **ISO**. To date, there are more than 22,000 international standards within the ISO organization.

A quality management system defines how a business can meet a customer's requirements along with other stakeholders of the business.

- The **ISO 9001** standard establishes requirements for a company's quality management system to become more efficient and improve customer satisfaction.
- Other ISO standards look at other types of management systems, such as **ISO 14001** for environmental management, or **ISO 45001** for occupational health and safety management.
- Note: **ISO 45001** has just recently been established to supersede the former OHSAS 18001 standard.

ISO 9001:2015

A management system defines an organization's operations to help it meet its objectives. Under **ISO 9001**, a quality management system defines how an organization can meet a customer's requirements.

ISO 9001 is based on the concept of continual improvement – designed to be flexible enough for use by many types of businesses. It doesn't specify what the specific objectives of "quality" or "meeting customer needs" should be. Instead, it requires us to define our objectives ourselves and continually improve our processes to reach them. And, once a target has been reached, we must reassess that objective: a quest for continual improvement.

DECRA has a quality management system that helps us to:

- Assess the overall context of our company to define who is affected by our work and what they expect from us. This helps us to clearly state our objectives and identify our business opportunities.
- Put our customers first – making sure we consistently meet their needs and enhance their satisfaction. This will lead to both repeat and new business for DECRA.
- Work more efficiently, as all of our processes will be aligned and understood by everyone in the company. This increases both productivity and efficiency, reducing our internal costs.
- Meet our necessary statutory and regulatory requirements.
- Identify and address the risks associated with our business.

ISO 9001 certification is not a requirement – we can use the standard to improve the way we work without being certified. However, third-party certification – when an independent certification body audits our practices against the standard's requirements – signals to our customers and suppliers that we have implemented the standard properly.

ISO does not perform certification. The compliance firm, American Global Standards LLC, assesses and approves DECRA's Quality Management System and that it conforms to the ISO 9001 standards.

ISO 14001:2015

ISO 14001 is an international standard that sets requirements for an environmental management system. It helps companies, like DECRA, to improve our environmental performance through more efficient use of resources and reduction of waste. Our system helps us to identify, manage, monitor and control environmental issues in a "holistic" manner.

ISO 14001 requires us to consider all environmental issues relevant to our operations – such as:

- Air pollution
- Waste management
- Waste water recycling
- Resource use and efficiency

Further **ISO 14001** includes our need for continual improvement of our systems and approach to environmental concerns.

ISO 45001:2018

Health and safety in the workplace are the number one concern for businesses, yet still deaths and injuries occur. **ISO 45001** sets the minimum standard of practice to protect employees worldwide.

ISO 45001, Occupational Health and Safety Management Systems, is the world's first international standard for occupational health and safety (OH&S). This standard provides a framework for DECRA to increase safety, reduce our workplace risks and enhance health and well-being at work, enabling us to proactively improve our OH&S performance.

Key benefits from our use of this standard include:

- Reduction of workplace incidents
- Reduced absenteeism and staff turnover, leading to increased productivity
- Reduced insurance premiums
- Creation of a health and safety culture, encouraging employees to take an active role in their OH&S
- Reinforced leadership commitment to proactively improve OH&S performance
- Meet legal and regulatory requirements
- Improve staff morale

ISO 45001 adopts a risk-based approach that ensures it is effective and undergoes continual improvement to meet our ongoing needs and challenges.

Lightning and Metal Roofing

We live in an electronic age, surrounded by electronics. Whether it is our television, computer or even the lights we read by, our lives are dependent on electricity in both our homes and workplace. Taking this into consideration, a lightning strike on an occupied building is a concern not only for the electronics surrounding us, but for the risk of fire caused by that strike. Concern over the use of metal roofs in construction has raised the issue of whether metal roofs attract lightning strikes more than other roof material types.

Research provides us verifiable detail that the material used in roof construction does not influence the risk of a lightning strike. There are several other factors that may influence the risk of a lightning strike, including detail where a metal roof may actually be beneficial in a lightning strike scenario.

In general, lightning is a flow of negatively charged electrons from the clouds seeking a path of least resistance to the positively-charged earth surface. While lightning's drama is the flash of light, the average length of a lightning flash is only about 30 microseconds. While short in duration, the impact of a strike can be tremendous. If the electrical charge is strong enough and no continuous direct path is available, lightning can also arc from one material to another. Resistance to this electrical flow generates heat energy that may cause explosions, fires, and other significant damage.

Considerable research has gone into the science of lightning protection. Most notable is the creation of a standard to determine the hazard level and where lightning protection is most required and how lightning protection should be installed.

In assessing lightning strike risk, two areas of concern are:

- **Probability** of a lightning strike
- **Consequence** of a lightning strike

Lightning Strike Probability

Building strike probability is influenced by several factors:

Area Topography

Lightning strike probability increases when the building sets on an elevated site — such as a hilltop — as lightning is drawn towards the highest object in a strike area.

Building Height

A tall building, relative to other structures nearby, is more likely to receive a lightning strike. The presence of a tall structure close to a lower height building will tend to reduce the strike chance to the smaller building.

Building Size

Buildings covering a larger surface area provide a more accessible lightning strike target.

Thunderstorm Frequency / Severity

Certain geographic areas are more prone to storms that lead to lightning activity.

Summary

Based on all available evidence, a metal roof is no more likely to be struck by lightning than any other roofing material type. In fact, the largest benefit of using metal roofing related to a lightning strike is that the roof material performs as a noncombustible material, so the risks associated with the use of metal roofing during a lightning event make it one of the most desirable roofing construction materials available. As an electrical conductor and a noncombustible material, the risk associated with a metal roof use may even be a more desirable construction option. A metal roof spreads the force of the electricity out, rather than concentrating it all in one place.

A lightning protection grounding system may be considered for highly storm-prone regions. A grounded metal roof, in accordance with the National Fire Protection Agency requirement — NFPA 780 (Standard for the Installation of Lightning Protection Systems; 2017 edition), will make any building less prone to lightning strike damage. A lightning protection system gives electrical discharges an easy path to earth, usually routing it around the outside of a structure. Lightning rods (air terminals, terminals, or strike termination devices are trade terms) are commonly made of copper or aluminum.

NOTE: Use only aluminum lightning protection system components with a DECRA roof system to avoid galvanic corrosion — Copper MUST NOT come in contact with a DECRA roof, as well as rainwater running over copper and onto a DECRA roof.

Building location and materials used are factors that should always be discussed with a professional installer and considered when considering a lightning protection system in accordance with NFPA 780. Lightning protection is a highly specialized trade that is governed by industry safety standards. There are many requirements that dictate an installer's qualifications along with a host of NFPA, Underwriters Laboratories (UL) and International Electrotechnical Commission IEC standards to which adherence is necessary. Ongoing lightning protection system maintenance is required to make sure all connections are secure and that system electrical continuity is maintained.

13 Physical Properties Tests Clearly Separate DECRA from the Competition

Stone-coated steel roofing systems are largely known for their strong performance in passing national building code compliance tests involving primarily wind and fire to satisfy U.S. International Residential Code (IRC) and International Building Code (IBC) requirements. DECRA goes one step further – undertaking extensive DECRA roof panel physical properties testing – going well beyond core U.S. national building code minimum required test standards.

DECRA prescribes to the following physical properties test methodology, conducted at independent laboratories, for its stone coated steel roof panels:

Roof Panels Using Aluminum-Zinc Alloy Coated Steel Base Material

Test Procedure	Testing Method	DECRA Panel Test Result
Material Thickness	Micrometer or Vernier Caliper	**Pass**
Aluminum-Zinc Alloy Thickness	ASTM A653	**Pass**
Coating Quality	CAN/CGSB-93.3 Section 6.2	**Pass**
Coating Thickness	AN/CGSB-93.3 Section 6.2 | Thickness measured per ASTM D1005	**Pass**
Film Adhesion	CAN/CGSB-93.3 Section 6.5.1	**Pass**
Hardness	CAN/CGSB-93.3 Section 6.7.1 | Test per ASTM D3363	**Pass**
Flexibility	CAN/CGSB-93.3 Section 6.8	**Pass**
Humidity Resistance	ASTM D2247	**Pass**
Salt Spray Resistance	ASTM B117	**Pass**
Durability	CAN/CGSB-93.3 | Test per ASTM G155	**Pass**
Granular Mineral Surfacing – Loss of Adhesion	ASTM D4977	**Pass**
Traffic Load	ASTM E661	**Pass**
Uniform Load	APA Test S-2 in APA PRP-108	**Pass**

Test Standards

APA PRP-108: American Plywood Association – Engineered Wood Systems (APA-EWS)

ASTM: American Society for Testing and Materials International

CAN/CGSB: Canadian General Standards Board (Version 93.3: Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet)

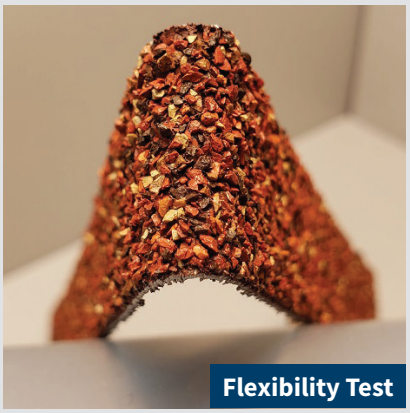
Physical Properties Test Summary

DECRA Roofing Systems manufactures top-quality stone coated steel roofing, backed by independent laboratory tests that verify performance standards to withstand long term weather exposure, even in the harshest climates. DECRA stands well ahead of the competition when committing to extensive physical properties testing. The decision to purchase a stone coated steel roof is an important investment – protecting both life and property. Trust DECRA to a higher standard of performance – guaranteed.

Test Lab Photos


Salt Fog Resistance Test


Coating Quality Test


Flexibility Test


Uniform Load Test


Traffic Load Test

Durability Test

Reduce Solar Heat Gain by Improving Thermal Resistance Performance

Installing a DECRA Metal Roof provides an excellent opportunity for a homeowner or building owner to significantly reduce solar heat gain on their interior conditioned space. This action will, in turn, reduce the building's overall cooling expense. To quantify this DECRA Metal Roof insulation advantage, we contracted with R&D Engineering, Cookeville, TN* to calculate thermal resistance performance (expressed as the R-Value) for each of our DECRA Metal Roof panel styles used in an installed roof system. R&D Engineering is an internationally recognized lab focused on thermal resistance research for building products.

Reference Report RD19798 – **Technical Report: Thermal Resistance and U-Values for Six DECRA Roof Panels; conducted by David W. Yarbrough, PhD, PE – September 25, 2019*

Below are the results of the R&D INSULATing thermal resistance analysis:

A DECRA Metal Roof panel provides an enclosed insulating air space between the roof panel and the roof deck. This advantage factors in the positive thermal emittance property provided by the DECRA Metal Roof panel underside surface. This enclosed air space is further enhanced for DECRA roof panels that install on a batten system. Thermal resistance performance is calculated across the entire roof assembly. A roof assembly includes:

- Roofing Material
- Roof Deck Sheathing (7/16" oriented strand board (OSB) or 1/2" CDX plywood)
- Roofing Underlayment
- Air Film (on both the exterior and interior roof system surfaces)
- If using a batten system: includes the portion of the roof covered by Wood Battens

First, let's establish a competitive roof "base case" by calculating the R-Value thermal resistance performance of a 3-tab asphalt shingle roof assembly:

Material	R-Value
3-tab asphalt roof shingles	0.44
½" sheathing	0.68
15 lb asphalt roof felt	0.15
Air film – exterior/interior	1.01
Total Assembly R-Value:	**2.28**

DECRA Metal Roof assembly R-Value calculations, *using the same roof materials as the 3-tab asphalt shingle roof assembly* ***with 15 lb asphalt felt underlayment***:

Material	Install Method	R-Value	% Improvement vs. 3-Tab Asphalt Roof Assembly
DECRA Shake XD	direct	2.71	+ 18.9%
DECRA Shingle XD	direct	2.47	+ 8.3%
DECRA Villa Tile	direct	2.61	+ 14.5%
DECRA Villa Tile	on 1x4 battens	3.14	+ 37.7%
DECRA Tile	on 2x2 battens	3.39	+ 48.7%
DECRA Shake	on 2x2 battens	3.37	+ 47.8%
DECRA Shingle Plus	direct	2.76	+ 21.1%
DECRA Shingle Plus	on 2x2 battens	3.39	+ 48.7%

The DECRA roof assembly provides optimal thermal resistance performance when a radiant barrier roof underlayment material is used in place of 15 lb asphalt roof felt. A radiant barrier roof underlayment is only effective at reducing solar heat gain (improving thermal performance) IF the roofing material provides an enclosed air space between the underside of the roof panel and the roof deck. DECRA Metal Roof panels, formed with an integral airspace molded into the panel profile, provide the perfect scenario to leverage radiant barrier roof underlayment performance.

DECRA roof assembly R-Value calculations, substituting 15 lb asphalt roof felt underlayment ***with a radiant barrier underlayment*** consisting of a synthetic fabric underlayment bonded with an aluminum foil-faced reflective surface:

Material	Install Method	R-Value	% Improvement vs. the 3-Tab Asphalt Roof Assembly
DECRA Shake XD	direct	2.97	+ 30.3%
DECRA Shingle XD	direct	2.69	+ 18.0%
DECRA Villa Tile	direct	2.97	+ 30.3%
DECRA Villa Tile	on 1x4 battens	4.85	+ 112.7%
DECRA Tile	on 2x2 battens	6.15	+ 169.7%
DECRA Shake	on 2x2 battens	6.06	+ 165.8%
DECRA Shingle Plus	direct	2.88	+ 26.3%
DECRA Shingle Plus	on 2x2 battens	5.63	+ 146.9%

Material	Install Method	% Improvement Comparing DECRA with Radiant Barrier Underlayment vs. DECRA with 15 lb Asphalt Felt Underlayment
DECRA Shake XD	direct	+ 9.6%
DECRA Shingle XD	direct	+ 8.9%
DECRA Villa Tile	direct	+ 13.8%
DECRA Villa Tile	on 1x4 battens	+ 54.5%
DECRA Tile	on 2x2 battens	+ 81.4%

DECRA Shake	on 2x2 battens	+ 79.8%
DECRA Shingle Plus	direct	+ 4.4%
DECRA Shingle Plus	on 2x2 battens	+ 66.1%

Why Use a Radiant Barrier Roof Underlayment:

A radiant barrier blocks radiant heat energy, unlike traditional insulation products that are designed to slow down heat transfer by absorbing it. A radiant barrier can also reduce heat transfer through the roof assembly by blocking convective air flow.

How Does a Radiant Barrier Work?

An aluminum-faced radiant barrier roof underlayment uses two physical properties to reduce radiant heat transfer through a roof assembly:

1. **Reflectivity:** The natural reflective property of a reflective surface facing a heat source across an air space allows the aluminum surface to reflect radiant heat back to the direction from which it came.
2. **Emissivity:** All materials have an emissivity rating from 0% - 100%. The lower the emittance percentage, the lower the amount of radiant heat radiated from its surface. The naturally low emissivity property of a reflective surface – facing an air space – results in very low emittance of heat from itself. It radiates very little of its own heat.

A radiant barrier reflects radiant heat that strikes its surface across an open air space from a heat source. Conversely, it emits very little radiant heat from its surface across an air space opposite a heat source.

Why Is An Air Space Required for a Radiant Barrier to Perform?

For a radiant barrier roof underlayment to perform, it must have an air space of at least ¾” to be effective at blocking radiant heat. All DECRA Metal Roof panels provide that minimum average air space – allowing a radiant barrier roof underlayment to perform. The purpose of the air space is to prevent conductive heat transfer through the roof assembly. The existence of an air space eliminates, almost entirely, the pass-through of radiant heat.

If the minimum air space requirement is not met, heat will conduct from the surface touching the radiant barrier, through the radiant barrier, and then transfer to the next surface touching the radiant barrier on the opposite side – thus providing no protection against the heat you intend to block. That is why a radiant barrier roof underlayment is not effective when used in conjunction with an asphalt roof assembly. In the absence of the air space requirement between the roofing material and the roof deck, a radiant barrier cannot function to protect against the heat you intend to block.

How Conventional Insulation Works

Traditional insulating materials such as fiberglass, foam board, rock wool – absorb or slow down convective and conductive heat transfers, thus insulating a building. These insulation types do not block heat – only slow it down. Thus, after a period of time, 100% of the heat absorbed would eventually transfer through the insulation. The rate in which this heat eventually transfers through an insulation material is the material’s R-Value. Insulation products, such as spun fiberglass batts, are manufactured with air spaces within the material that reduce heat conduction through the insulation. They also restrict heat transfer by convection by trapping air flows and lowering air circulation.

ADDENDUM 1: Installing a foil-faced radiant barrier insulated roof underlayment

Through the research conducted by R&D Engineering*, we have compiled R-Value improvements to a DECRA Roof System installation using radiant barrier roof underlayment products that also provide an insulating layer via closed-cell foam or fiberglass woven mat construction.

Two insulating radiant barrier roof underlayment products were tested in a DECRA roof assembly:

1. **Low-E Therma Sheet** roof underlayment – manufactured by **Environmentally Safe Products, Inc**.
2. **Sol-R-Skin Thermal Underlayment** – manufactured by **International Insulation Products, LLC**

Here are the results:

Assembly 1: *Uses Low-E Therma Sheet with 1/8" closed cell foam core & radiant barrier skin*

Material	Install Method	R-Value	% Improvement vs. the 3-Tab Asphalt Roof Assembly	% Improvement vs. DECRA w/ 15 lb Asphalt Felt Roof
DECRA Shake XD	direct	3.66	+ 60.5%	+ 35.1%
DECRA Shingle XD	direct	2.91	+ 27.6%	+ 17.8%
DECRA Villa Tile	direct	3.66	+ 60.5%	+ 40.2%
DECRA Villa Tile	on 1x4 battens	5.54	+ 143.0%	+ 76.4%
DECRA Tile	on 2x2 battens	6.69	+ 193.4%	+ 97.3%
DECRA Shake	on 2x2 battens	6.64	+ 191.2%	+ 97.0%
DECRA Shingle Plus	direct	3.56	+ 56.1%	+ 29.0%
DECRA Shingle Plus	on 2x2 battens	6.18	+ 171.1%	+ 82.3%

Assembly 2: *Uses Low-E Therma Sheet with 5/16" closed cell foam core & radiant barrier skin*

Material	Install Method	R-Value	% Improvement vs. the 3-Tab Asphalt Roof Assembly	% Improvement vs. DECRA w/ 15 lb Asphalt Felt Roof
DECRA Shake XD	direct	4.11	+ 80.3%	+ 51.7%
DECRA Shingle XD	direct	3.11	+ 36.4%	+ 25.9%
DECRA Villa Tile	direct	4.11	+ 80.3%	+ 57.5%
DECRA Villa Tile	on 1x4 battens	6.02	+ 164.0%	+ 91.7%
DECRA Tile	on 2x2 battens	7.08	+ 210.5%	+ 108.9%
DECRA Shake	on 2x2 battens	7.05	+ 209.2%	+ 109.2%
DECRA Shingle Plus	direct	4.00	+ 75.4%	+ 44.9%
DECRA Shingle Plus	on 2x2 battens	6.58	+188.6%	+ 94.1%

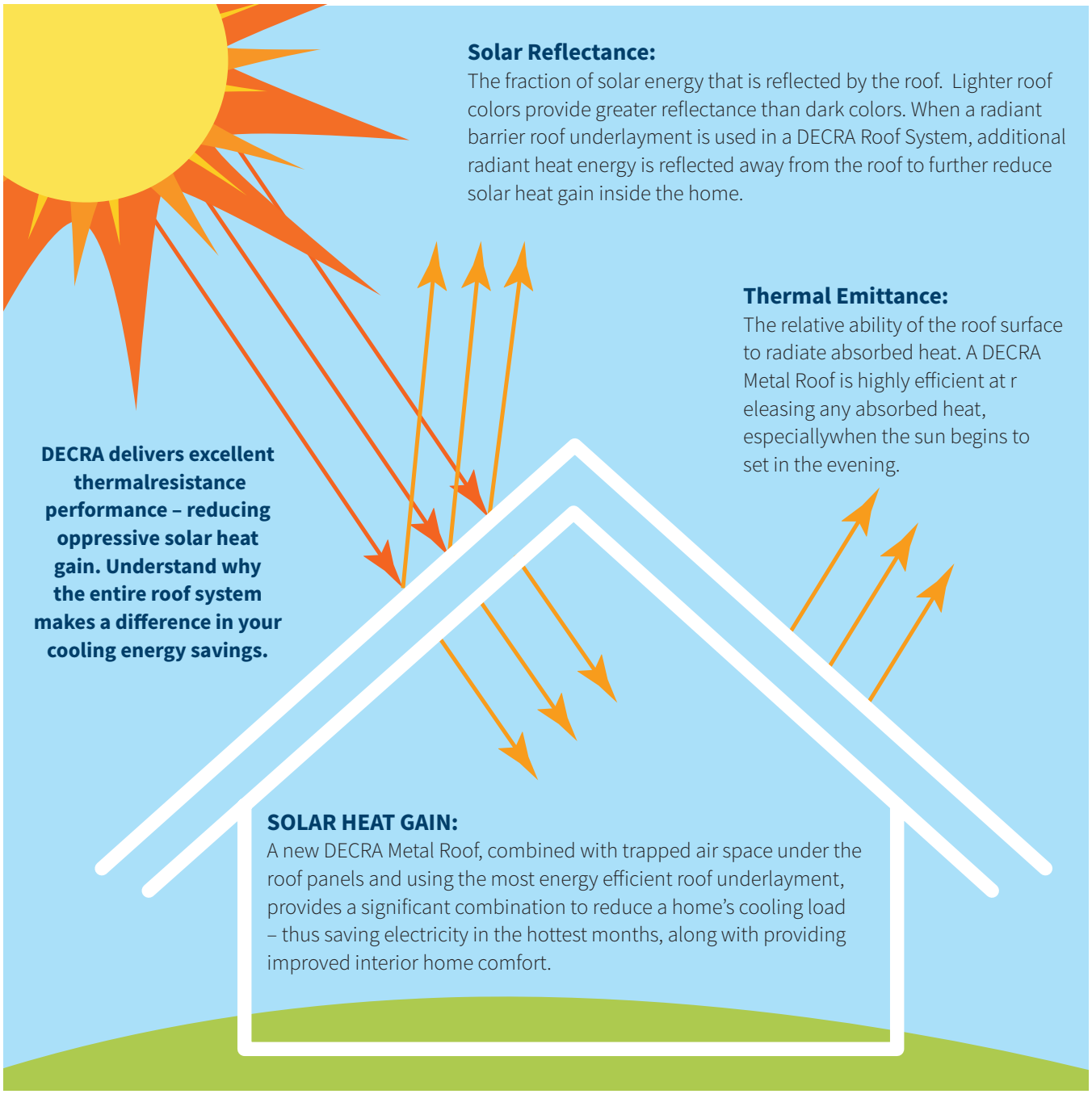
Assembly 3: *Uses Sol-R-Skin Thermal Underlayment with fiberglass mat core & radiant barrier skin*

Material	Install Method	R-Value	% Improvement vs. the 3-Tab Asphalt Roof Assembly	% Improvement vs. DECRA w/ 15 lb Asphalt Felt Roof
DECRA Shake XD	direct	4.65	+ 103.9%	+ 71.6%
DECRA Shingle XD	direct	3.34	+ 46.5%	+ 35.2%
DECRA Villa Tile	direct	4.64	+ 103.5%	+ 77.8%

DECRA Villa Tile	on 1x4 battens	6.38	+ 179.8%	+ 103.2%
DECRA Tile	on 2x2 battens	7.25	+ 218.0%	+ 113.9%
DECRA Shake	on 2x2 battens	7.22	+ 216.7%	+ 114.2%
DECRA Shingle Plus	direct	6.76	+ 99.6%	+ 64.9%
DECRA Shingle Plus	on 2x2 battens	5.63	+ 196.5%	+ 99.4%

Reference Report RD19798 – **Technical Report: Thermal Resistance and U-Values for Six DECRA Roof Panels; conducted by David W. Yarbrough, PhD, PE – September 25, 2019).*

DECRA Metal Roofing: Your Best Weapon to Reduce Solar Heat Gain



CERTIFICATE OF REGISTRATION

DECRA ROOFING SYSTEMS, INC.

1230 Railroad Street
Corona, California 92882 USA

American Global Standards, LLC issues this certificate to the firm named above, Having assessed and approved the firm's environmental management system and finding the system conforms to the standards of:

ISO 14001:2015

The environmental management system is applicable to the following:

The Environmental Activities & Supporting Processes Associated with the Manufacture of Stone Coated Steel Roofing Panels of their Products & Services.

This approval is subject to the firm maintaining its system to the required standards, which will be monitored by AGS. In the issuance of this certificate, AGS assumes no liability to any party other than the firm named above, and then only in accordance with the agreed upon Environmental System Assessment Agreement.

Certification Number:	**AGS-USEMS011517-2/2**
Original Approval:	**October 04, 2003**
Date of Issue:	**January 15, 2020**
Date of Expiration:	**January 14, 2023**

For and On Behalf of American Global Standards, LLC
Stephen Keneally, President

USA Office: 1187 Coast Village Road, Suite 495, Montecito, CA 93108 USA Tel: 617-838-4648
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AIAO-BAR EMS ACCREDITED

CERTIFICATE OF REGISTRATION

DECRA ROOFING SYSTEMS, INC.

1230 Railroad Street
Corona, California 92882 USA

American Global Standards, LLC (AGS) issues this certificate to the firm named above, having assessed and approved the firm's Occupational Health and Safety Management system and finding the system conforms to the standards of:

ISO 45001:2018

The Occupational Health and Safety Management System is applicable to the following:

The Occupational Health & Safety Activities & Supporting Processes Associated with the Manufacture of Stone Coated Steel Roofing Panels of their Products & Services.

This approval is subject to the firm maintaining its system to the required standards, which will be monitored by AGS. In the issuance of this certificate, AGS assumes no liability to any party other than the firm named above, and then only in accordance with the agreed upon Occupational Health and Safety System Assessment Agreement.

Certification Number:	AGS-US011517-3-2
Original Approval:	July 05, 2008
Date of Issue:	January 15, 2020
Date of Expiration:	January 14, 2023

For and On Behalf of American Global Standards, LLC
Stephen Keneally, President

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CERTIFICATE OF REGISTRATION

DECRA ROOFING SYSTEMS, INC.

1230 Railroad Street
Corona, California 92882 USA

American Global Standards, LLC (AGS) issues this certificate to the firm named above, having assessed and approved the firm's Quality Management system and finding the system conforms to the standards of:

ISO 9001:2015

The Quality Management System is applicable to the following:

The Manufacture of Stone Coated Steel Roofing Panels.

This approval is subject to the firm maintaining its system to the required standards, which will be monitored by AGS. In the issuance of this certificate, AGS assumes no liability to any party other than the firm named above, and then only in accordance with the agreed upon Quality System Assessment Agreement.

Certification Number:	**AGS-US011517-1/3**
Original Approval:	**November 20, 1997**
Date of Issue:	**January 15, 2020**
Date of Expiration:	**January 14, 2023**

For and On Behalf of American Global Standards, LLC
Stephen Keneally, President

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