


INFRA**RED**
ANALYZERS INC
Certified Thermographers

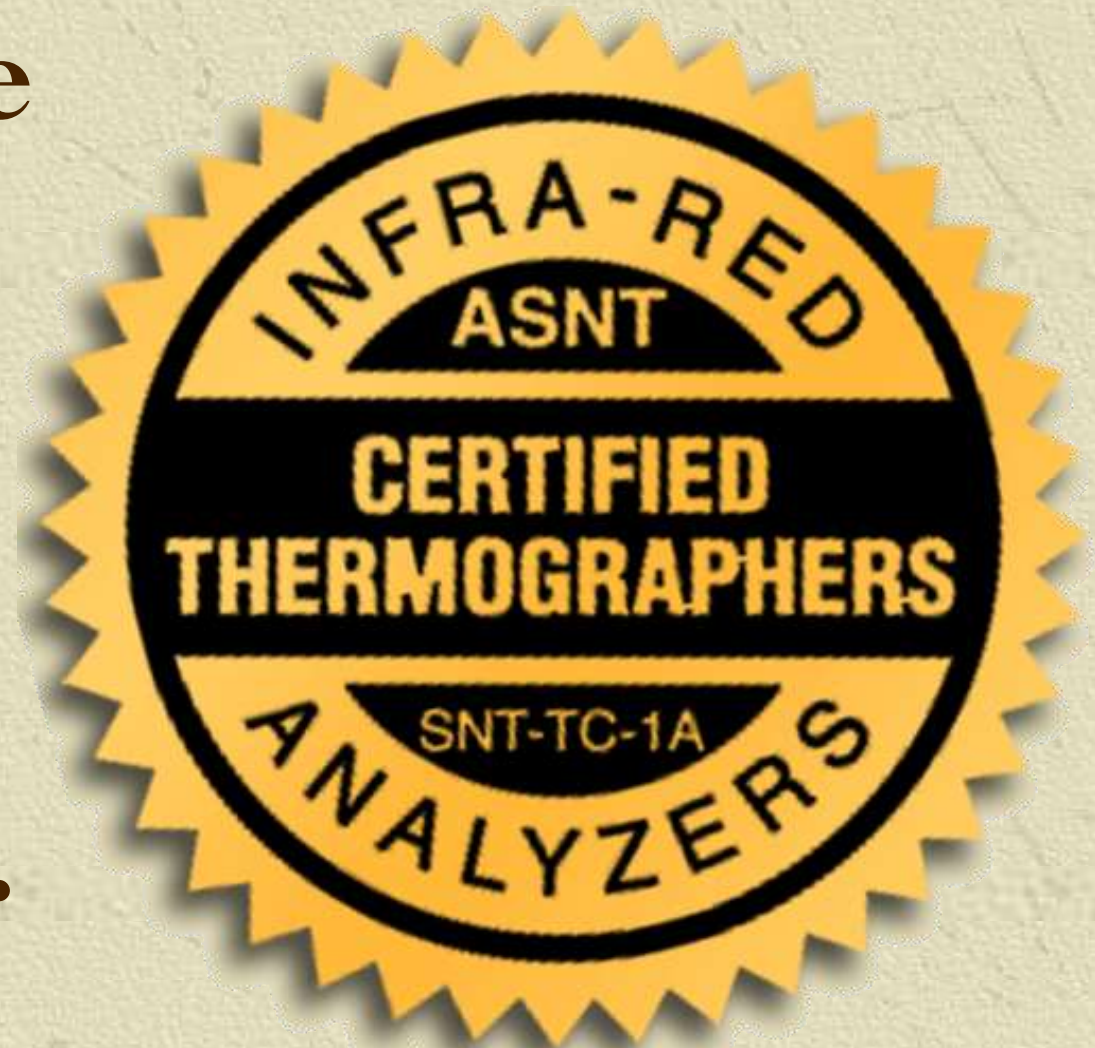
Vector**Mapping**
IR**ANALYZERS**



Founded in 1984, we are an independent consulting firm serving thousands of commercial and institutional clients, including Fortune 500 companies such as GE, IBM, General Dynamics, UPS, International Paper, Wyeth, and Anheuser-Busch, and Lincoln Center, MIT, Brown University, and Dartmouth College.

All of Infra-red Analyzers' Certified Thermographers have completed courses of study and passed examinations as specified by ASNT.

In addition, we provide ongoing training and support to our staff in all applications of thermographic testing.



Committed to Energy Efficiency and Green Building Practice

Infra-red Analyzers is proud to be a member of the U.S. Green Building Council, which promotes environmentally responsible buildings and communities that are profitable, healthy places to live and work.



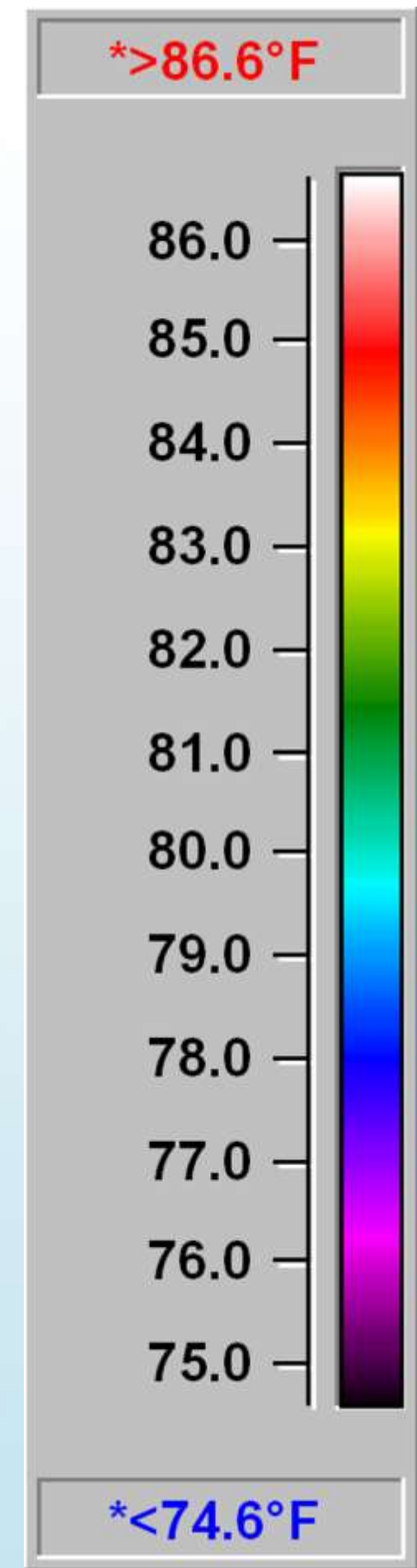
ThermaCAM™ PM390



- **Digital state-of-the-art focal plane array short wave camera**
- **Over 65,000 individual detectors**
- **Sensitive to less than 0.1°C**
- **Hard copy documentation with videotape, computer disk or photograph (thermogram)**

Thermogram Interpretation

- Thermograms are digital heat images. The infrared camera is calibrated by the thermographer to represent the desired temperature range in a full spectrum of colors.



Watch video of infrared
thermography documenting
heat loss through building
envelope, interior view

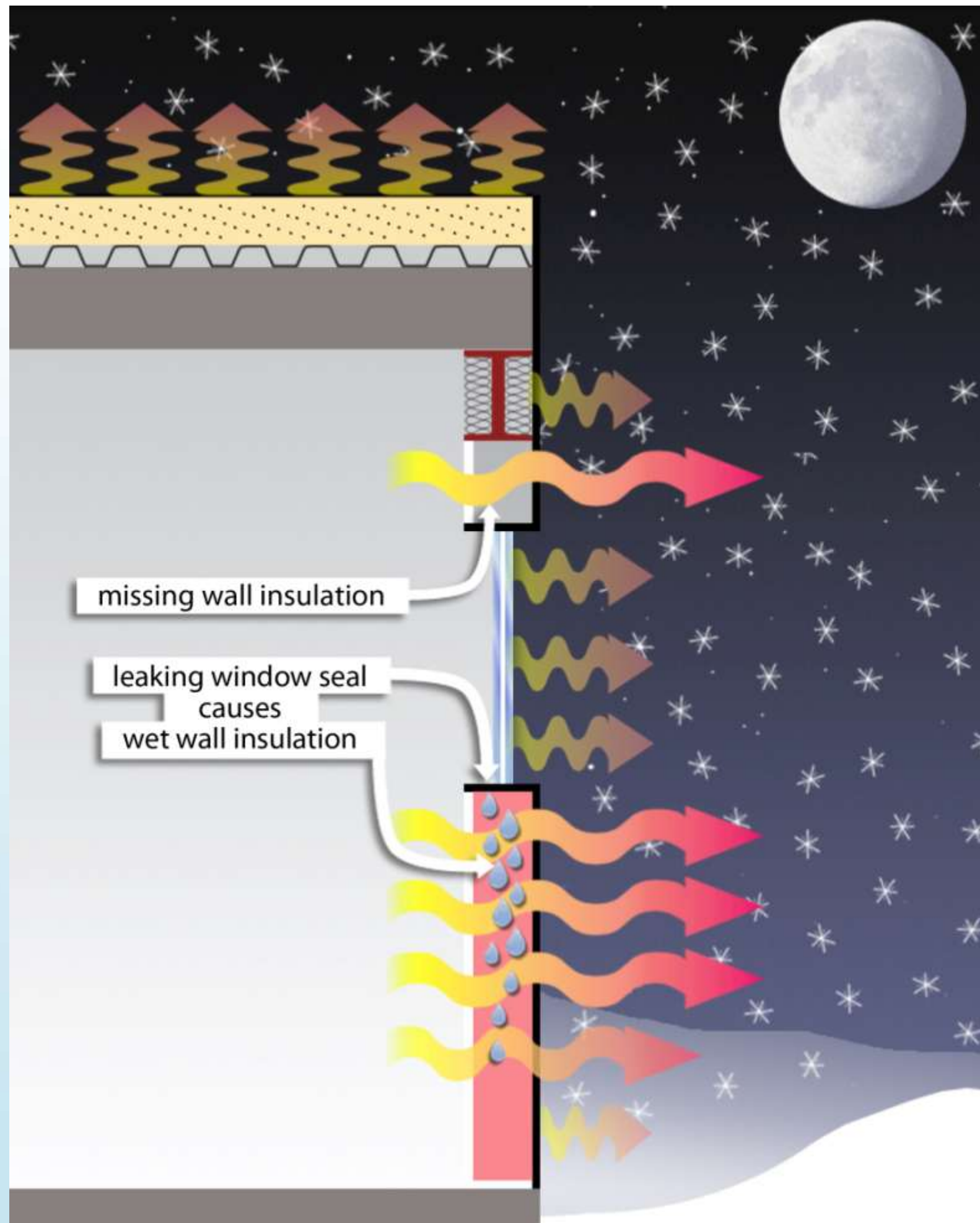
Building Envelope Analysis

Infrared Thermography is the only non-destructive and complete system for locating moisture damage, excessive air leakage, and conduction losses in all types of building envelopes.

Many buildings have hidden construction problems that significantly reduce energy efficiency and the integrity and performance of the building envelope.

Impacts of Building Heat Losses

- Drafts, cold and hot spots, occupant discomfort
 - Escalating heating and cooling costs
- Condensation build-up inside walls, roofs, on building surfaces
 - Insulation damage and reduced R-values
 - Wood rot, metal corrosion, staining of bricks and concrete
 - Ice dams, frozen pipes
 - Mold growth
 - Failure of critical structural components

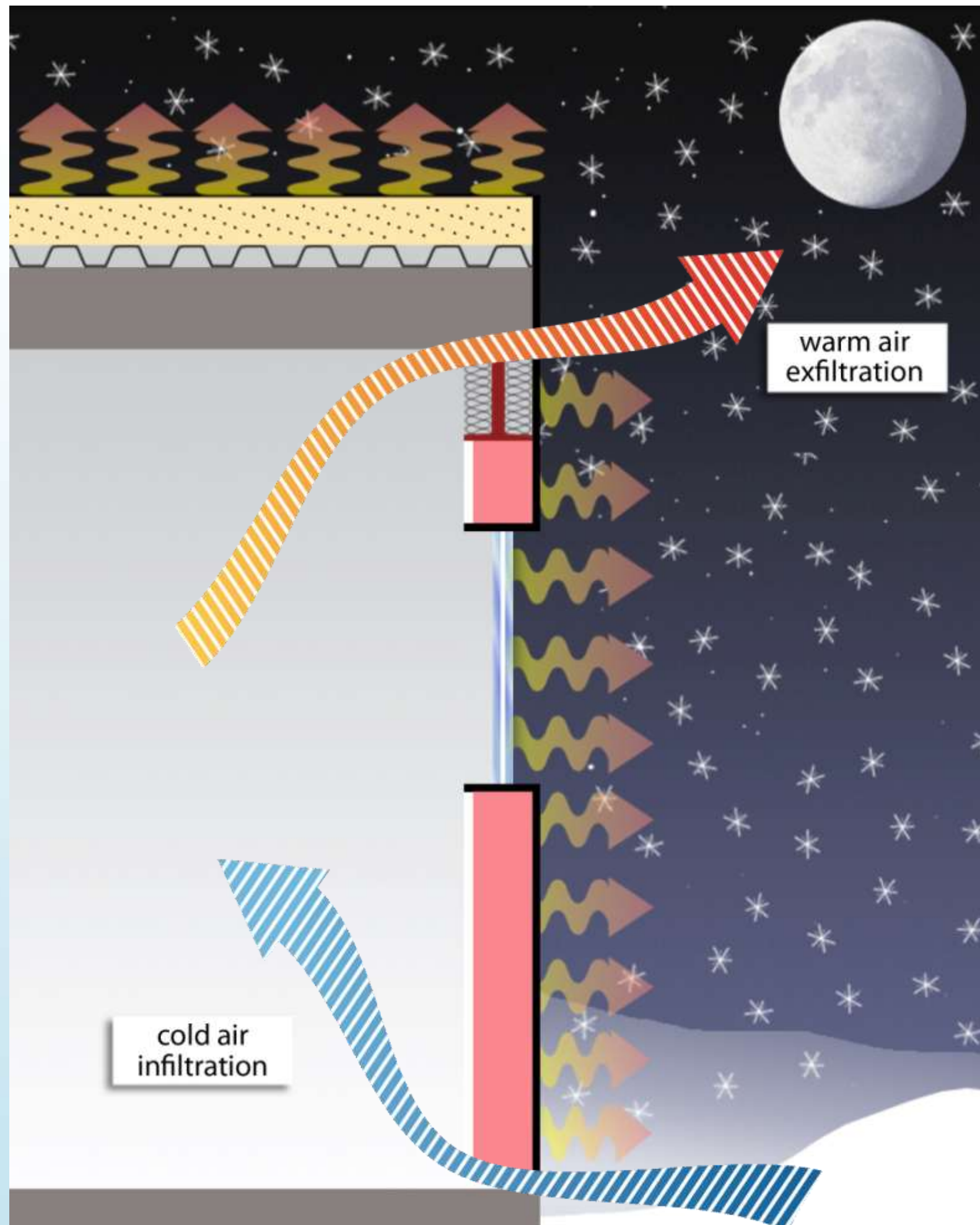


Building Heat Losses

Buildings lose heat two ways:

- **1) Conduction: Transfer of heat through solid materials**
- **Wet materials conduct heat much more rapidly than dry materials.**
- **Tiny pockets of still air give insulation its ability to retard heat flow (R-value).**
- **R-value is drastically reduced when air pockets are filled with moisture.**

Watch video of infrared
thermography documenting
heat loss through building
envelope, exterior view



Stack Effect

- Cold air infiltration near bottom of building and warm air exfiltration near the top.
- As warm air escapes it must be replaced, so cold outdoor air is pulled into the structure near the bottom.
- Rising warm air creates positive pressure near top of building and negative pressure near the bottom.
- Stack effect substantially reduces occupant comfort and increases heating costs.

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envelope, exterior view

Watch video of infrared
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heat loss through building
envelope, interior view

Forensics - Troubleshooting Infrared Testing Pinpoints Causes of:

- **Moisture damage**
 - **Frozen pipes**
 - **Ice dams and water intrusion**
- **Missing, wet, or disturbed insulation**
 - **Cold or drafty living spaces**
 - **High heating and cooling costs**
- **Mold infestations (does not actually “see” mold)**

Watch video of infrared
thermography documenting
heat loss through building
envelope, exterior view

Energy Efficiency

Building Owners and Managers are increasingly focused on reducing their heating costs and carbon footprint.

LEED certification is rapidly being adopted by many of the players.

- **Infrared Testing is the first step in developing a comprehensive and cost-effective plan**
- **Complements but does not replace the need for quantitative calculations**
- **Reveals building performance issues not detectable with traditional techniques**
- **Finds opportunities nobody knew existed**
- **Focuses on actual energy losses and cost-effective solutions**

Watch video of infrared
thermography documenting
heat loss through building
envelope, exterior view

Pre-Construction Assessments: Rehabs & Renovations

- **Accurate evaluation of existing conditions.**
- **How is the insulation actually performing?
Hidden problems in many wall systems cause
poor performance, even though they
are fully insulated.**
- **Prioritizes different construction
techniques and vintages.**

Watch video of infrared
thermography documenting
heat loss through building
envelope, exterior view

Rehabs & Renovations

- **Pinpoints moisture problems to avoid unanticipated mold and water damage costs.**
- **Focuses on the most cost-effective retrofits**
- **Infrared Testing is the first step because it reveals actual performance of the building:**
 - **What needs attention?**
 - **What already works?**

Watch video of infrared
thermography documenting
heat loss through building
envelope, exterior view

Post-Construction Evaluation

- **Acceptance Testing**
- **Building Commissioning**
- **LEED Certification**
- **Warranty Verification**

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thermography documenting
heat loss through building
envelope, exterior view

- **Post-construction verification of materials & workmanship**
- **Evaluates windows, doors, wall systems, roofing and foundation**
- **Verifies and documents actual performance of the building – not the assumed or designed performance**
- **Makes sure clients get the quality and performance they paid for**

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thermography documenting
heat loss through building
envelope, interior view

Recommendations & Priorities

We track down the sources of your problems and recommend cost-effective strategies to correct them.

Our Certified Thermographers prioritize the areas causing your problems to help maximize your return on investment.

Blower Door Testing



- **Measures the degree of a building's air tightness**
- **Powerful variable-speed fan units mounted in adjustable panels, with pressure gauges to measure the rate of airflow**
- **A highly accurate and cost-effective method for determining a building's air leakage performance**

Blower Door Testing

- Enables the technician to measure how much building airflow is required to maintain a certain pressure differential between indoors and outdoors
- Number of air changes per hour reveals the building envelope's air leakage profile
- Can also be used to estimate the building's air infiltration rate
- Our blower door systems and methodology meet the latest ASTM standard (E779-03)

Advantages of Infrared Building Envelope Testing

- **Practical Information: Documents actual building performance versus assumed or designed performance**
- **Fast, accurate, and cost-effective**
- **Independent, professional service utilizing objective instrumentation**
- **Motivates client action**

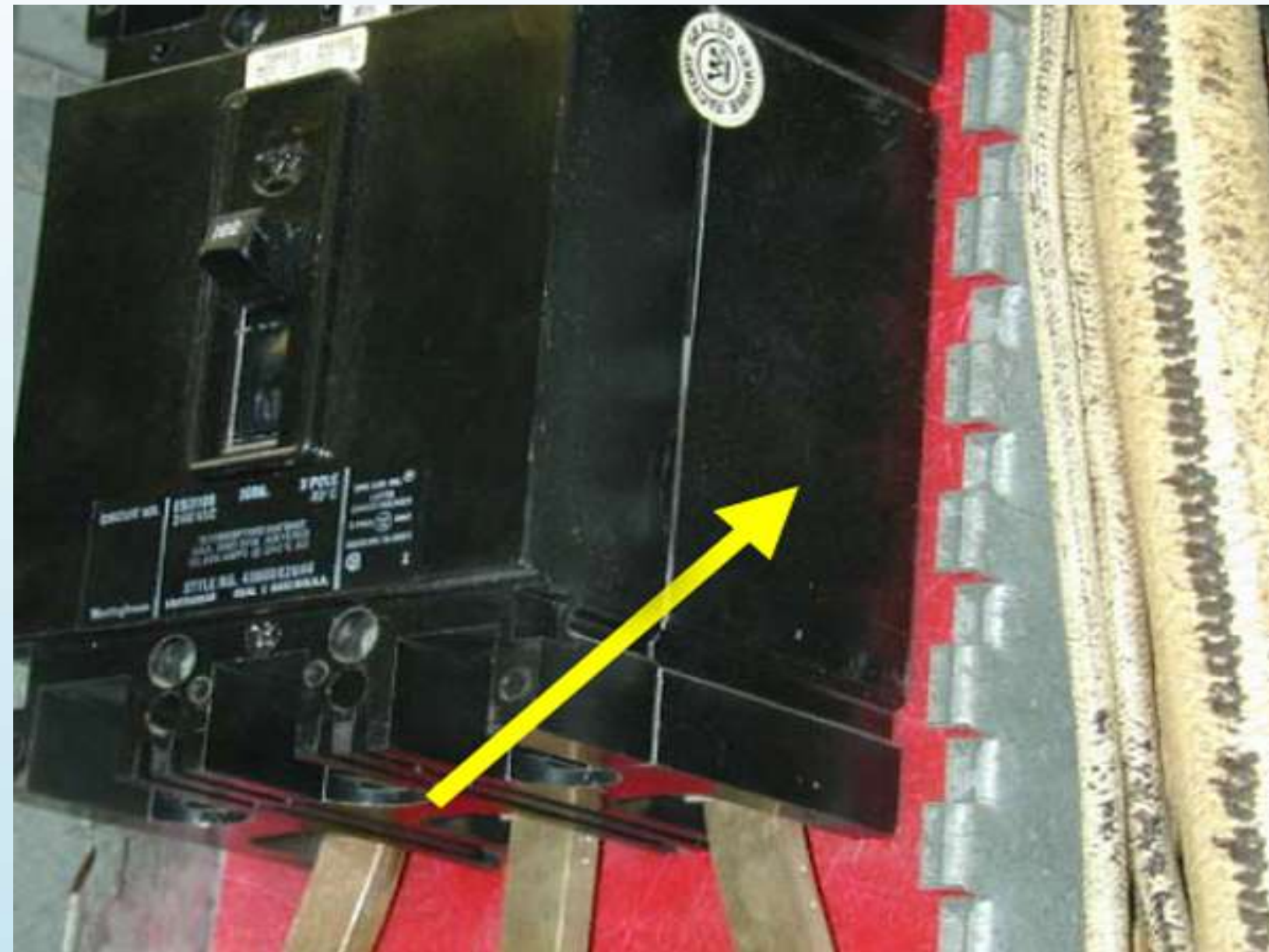
Comprehensive Report

Your full-color bound report pinpoints, documents and prioritizes all faults found in building envelope performance.

Includes in-depth analysis of all findings from our visual and thermographic inspection, with color thermograms and control photographs of problem areas.



Infrared Electrical & Mechanical Inspections



Watch video of infrared
thermography documenting
underground steam leak

Roof Moisture Surveys



Roof Moisture Analysis: Infrared & Nuclear

Nondestructive Testing that locates and documents water-damaged insulation in all types of roofing systems:

- **Smooth Surface**
- **Graveled**
- **Ballasted**

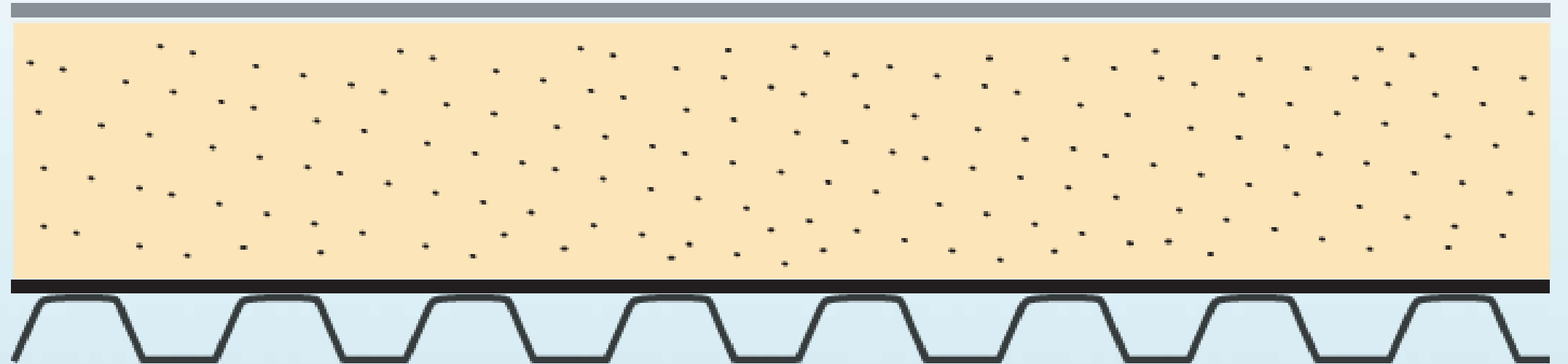
Roof Construction Details

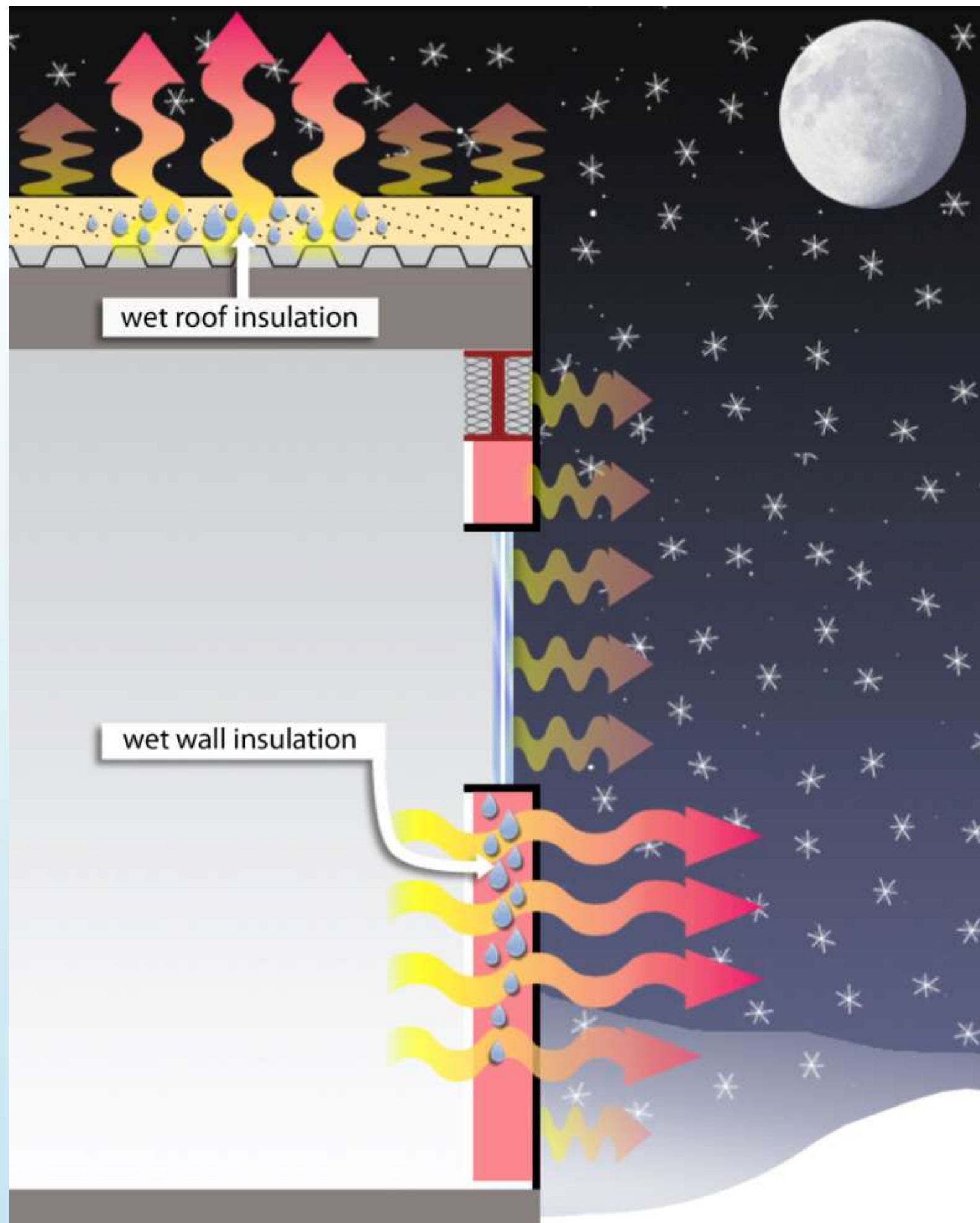
Single-ply membrane

Insulation

Vapor Barrier

Deck

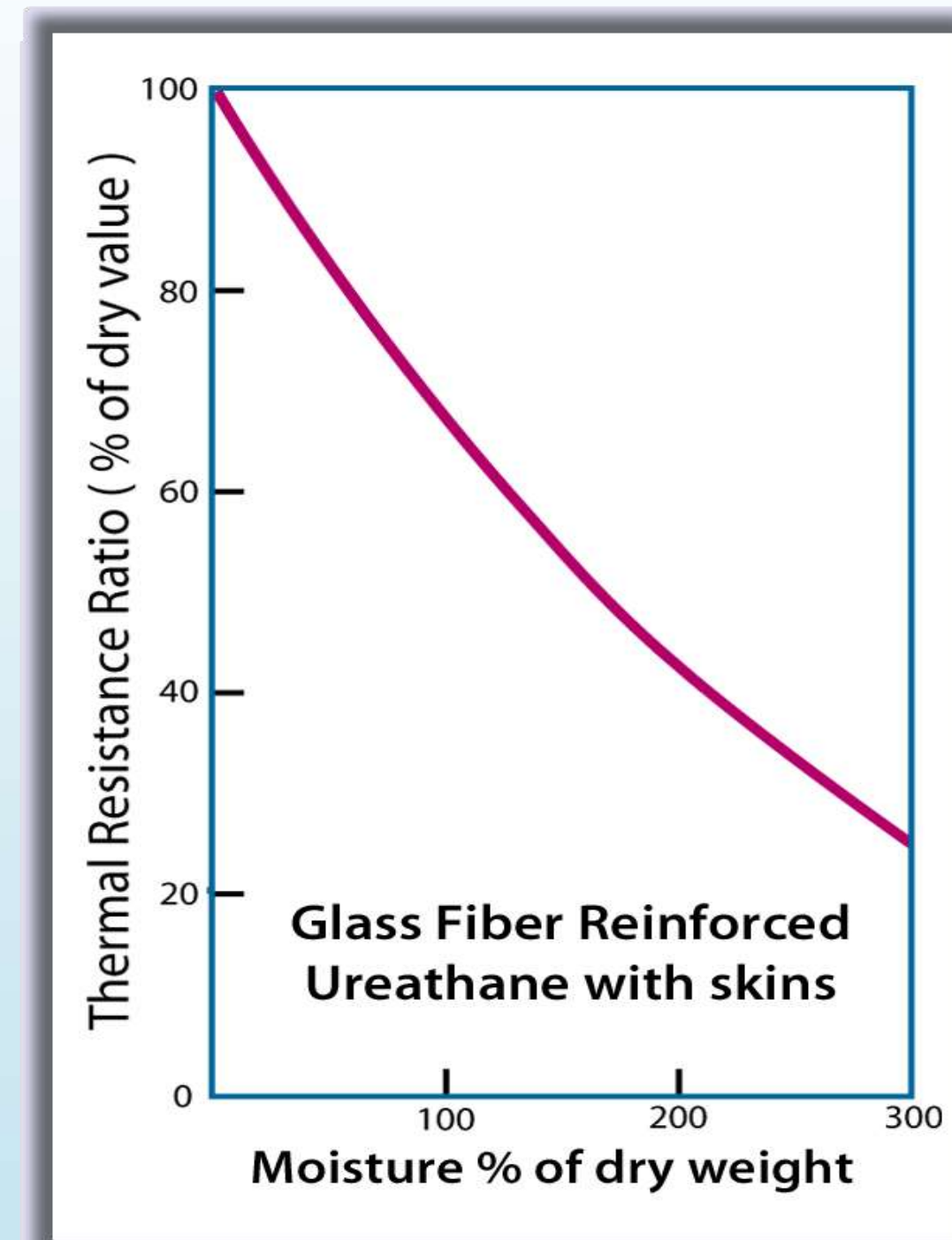
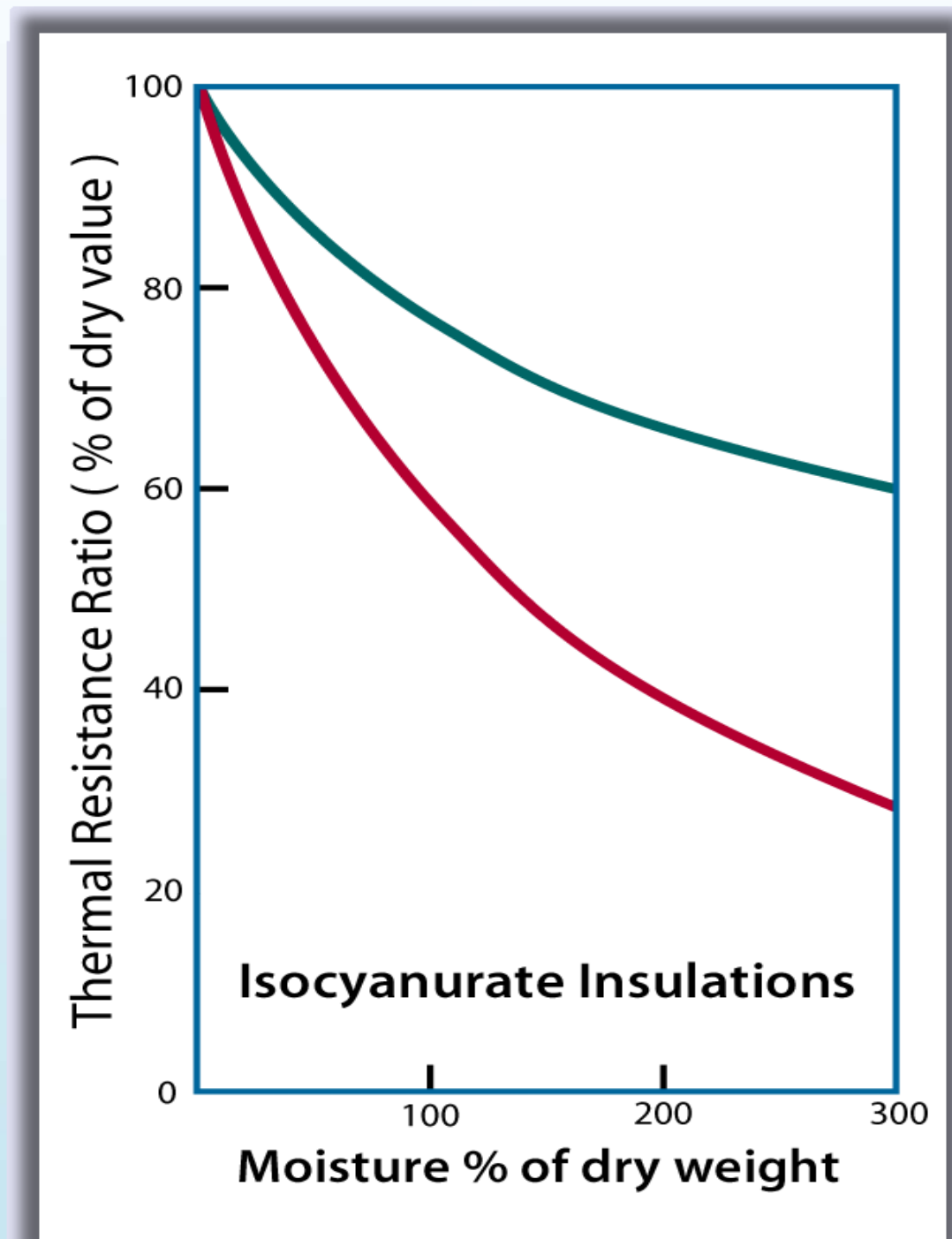




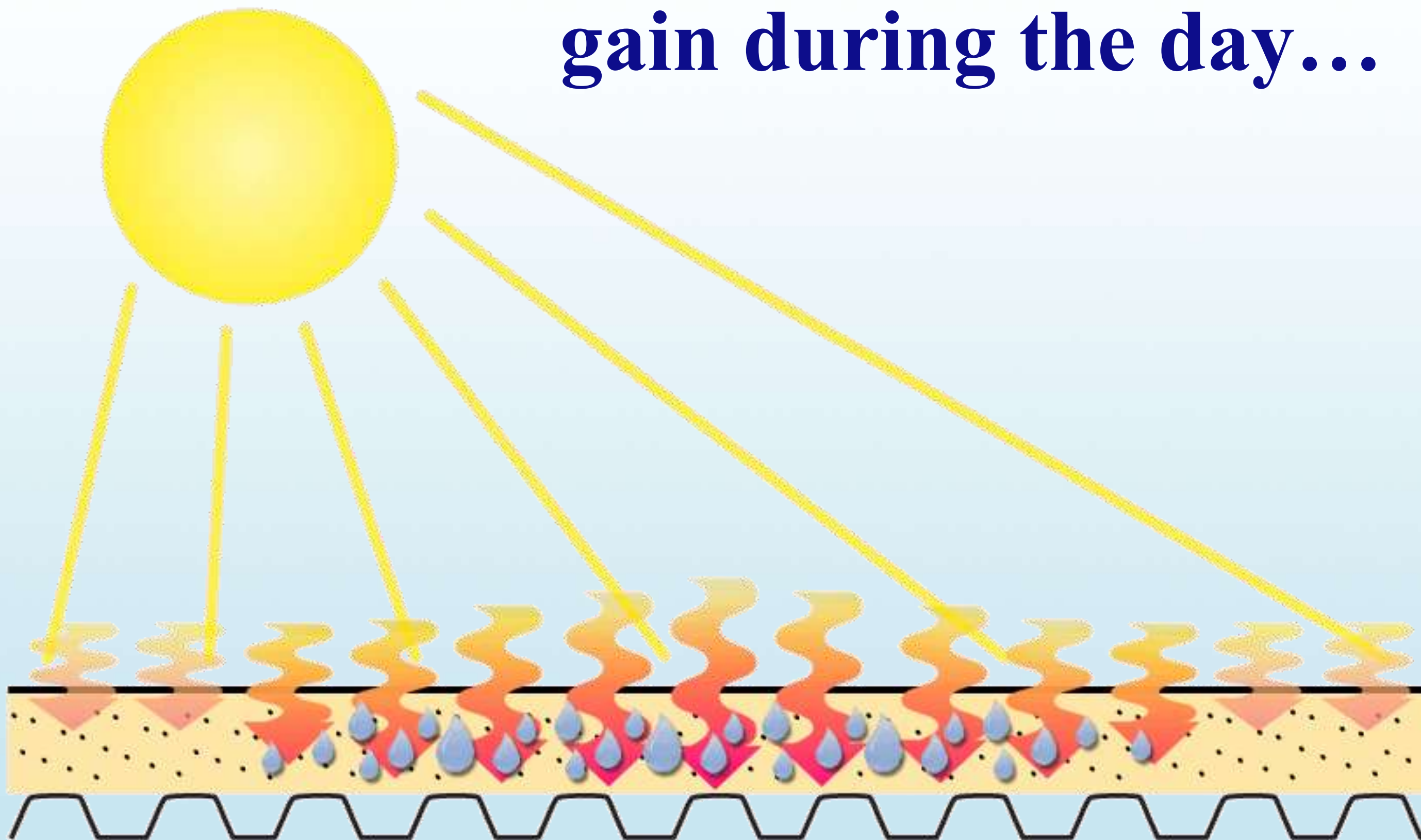
Building Heat Losses: Roofs

- **Wet roof insulation increases conduction losses.**
- **Moisture in the insulation substantially reduces its R-value and increases heating and cooling costs.**

Thermal Resistance vs Moisture Content

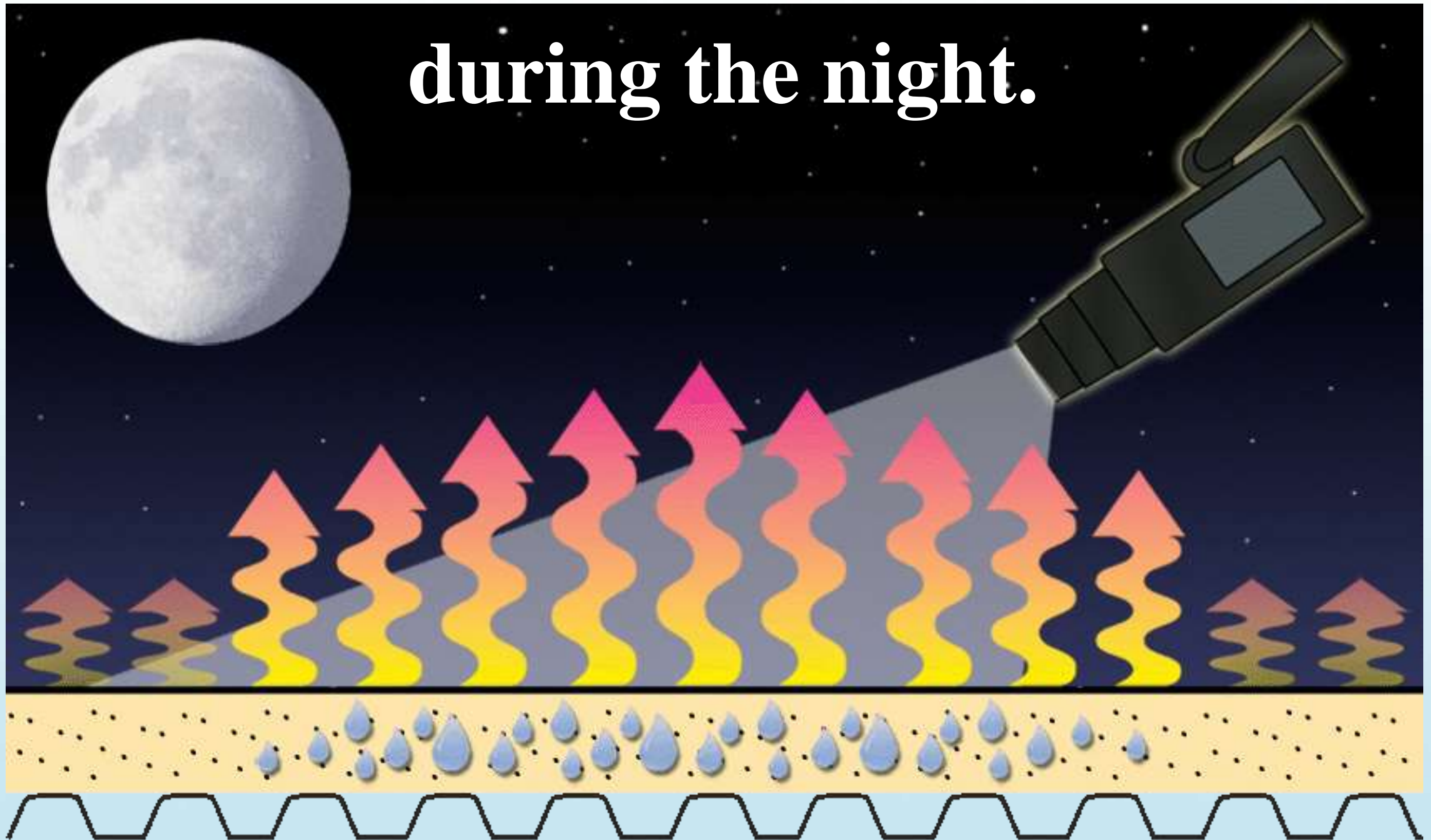


Wet insulation absorbs more solar gain during the day...



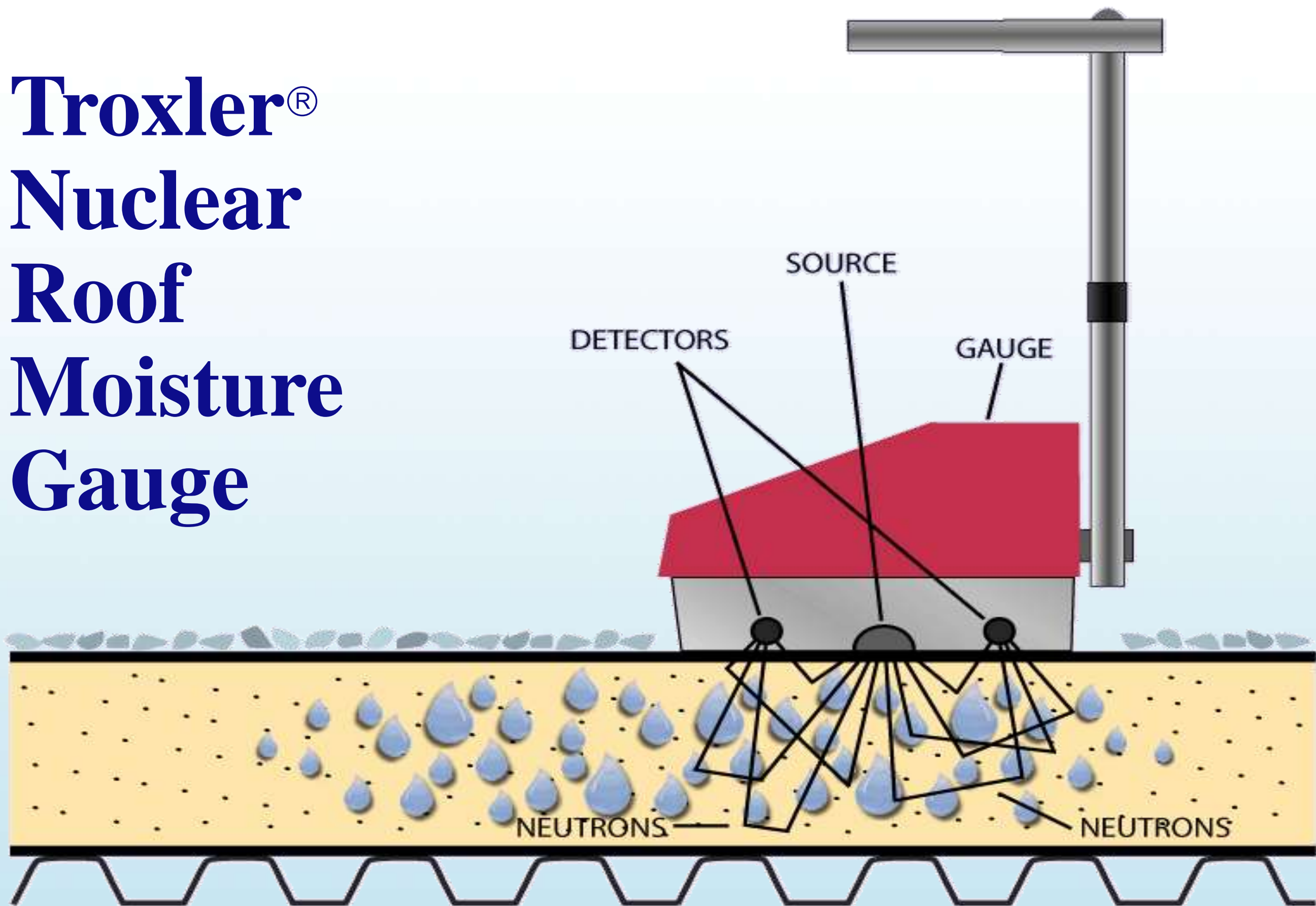
..and it releases more stored solar heat

during the night.



Watch video of thermographer
using infrared camera to pinpoint
moisture damage in roof system,
perform core cut verification, and
mark out and measure moisture
damaged areas

Troxler® Nuclear Roof Moisture Gauge



Technician Using Nuclear Roof Moisture Gauge



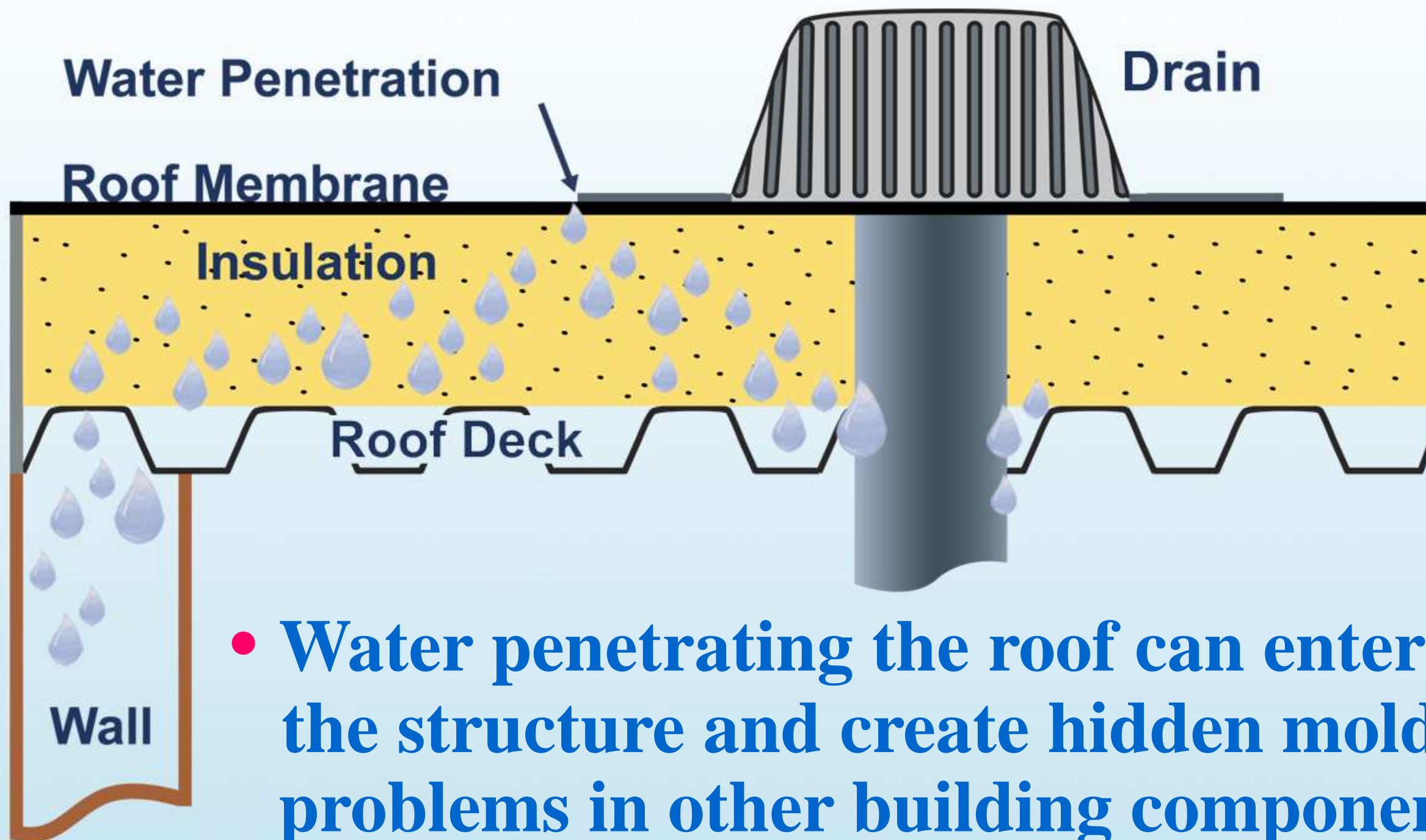
1. The only proven scientific method for evaluating the roof's condition

- The survey is independent and unbiased. We do not sell or install any roofing materials.**
- Our only goal is to give the owner accurate information about the condition of the roof.**

2. Pinpoint areas of mold growth

- **Wet roofing provides an excellent environment for mold. Mold requires three things for growth:**
 - 1. Nutrient Source: Roof insulations**
 - 2. Moisture: Leaky roofs feed the problem**
 - 3. Optimum Temperature: Roofs are at excellent temperatures for mold growth during much of the year**

3. Targets Sites of Moisture Infiltration



- **Water penetrating the roof can enter the structure and create hidden mold problems in other building components; floors, ceilings and walls.**

4. Reduces energy costs

- Moisture in roof insulation significantly reduces its insulating properties and increases energy loss.**
- Wet insulation contributes to higher heating costs in winter and increased cooling costs in the summer.**

Watch video of infrared
thermography documenting
moisture damage in low slope
roof system

5. Infrared surveys provide excellent information at low cost

- Infrared Surveys typically cost less than 1% of the cost of new roofing; 2-6 cents/sf versus \$6.00–\$10.00/sf for roof replacement.**
- Roofing decisions involve tens or even hundreds of thousands of dollars. Accurate, scientific information gives customers the confidence to make the right decision.**

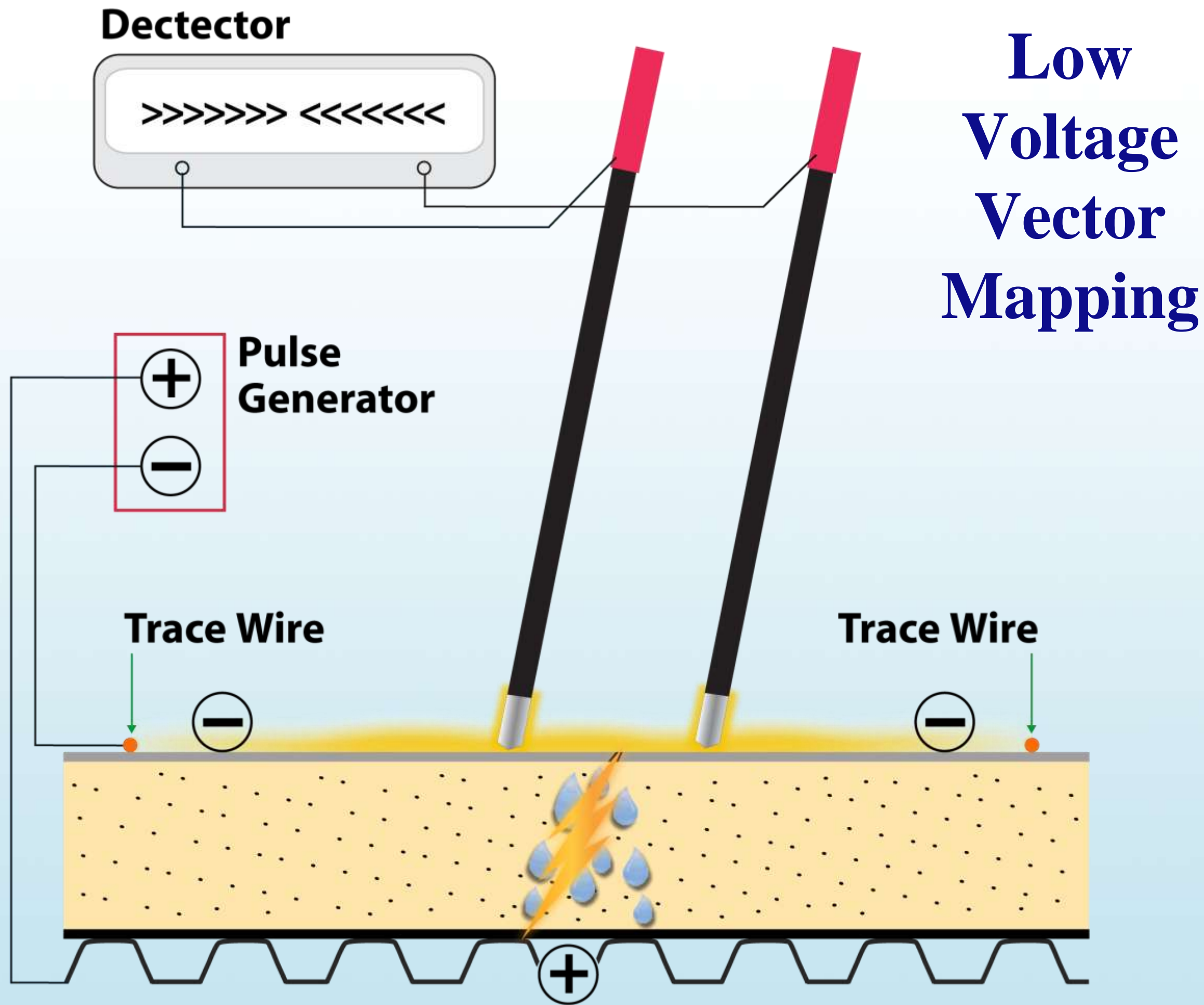
Electronic Leak Detection



A Better Way to Find Leaks

First developed in Europe, electronic leak detection is rapidly redefining the process of finding leaks in commercial roofing and waterproofing systems.

Electronic leak detection uses a procedure known as Vector Mapping to pinpoint membrane breaches by tracing the flow of an electric current across the membrane surface.





Low voltage vector mapping equipment includes pulse generator, trace wire spool, test probes, mobile detector unit and related accessories.

Vector Mapping is Ideal for

- **Quality assurance testing of new roofs**
- **Pinpointing leaks in existing membranes including most green roof systems**
- **Verifying green roof membranes prior to installing overburden**
- **Integrity testing of waterproofing membranes**
- **Warranty verification**

VM Applications

- Insulated and non-insulated low-slope roof systems
- Ballasted roofs (LV)
- Quality Assurance
- Warranty Verification
- Horizontal and vertical waterproofing membranes
- Ponded and flooded roofs (LV)
- Pools, parking garages, liners
- Membrane integrity testing
- Green Roofs
- Plaza Decks

Not Suitable For

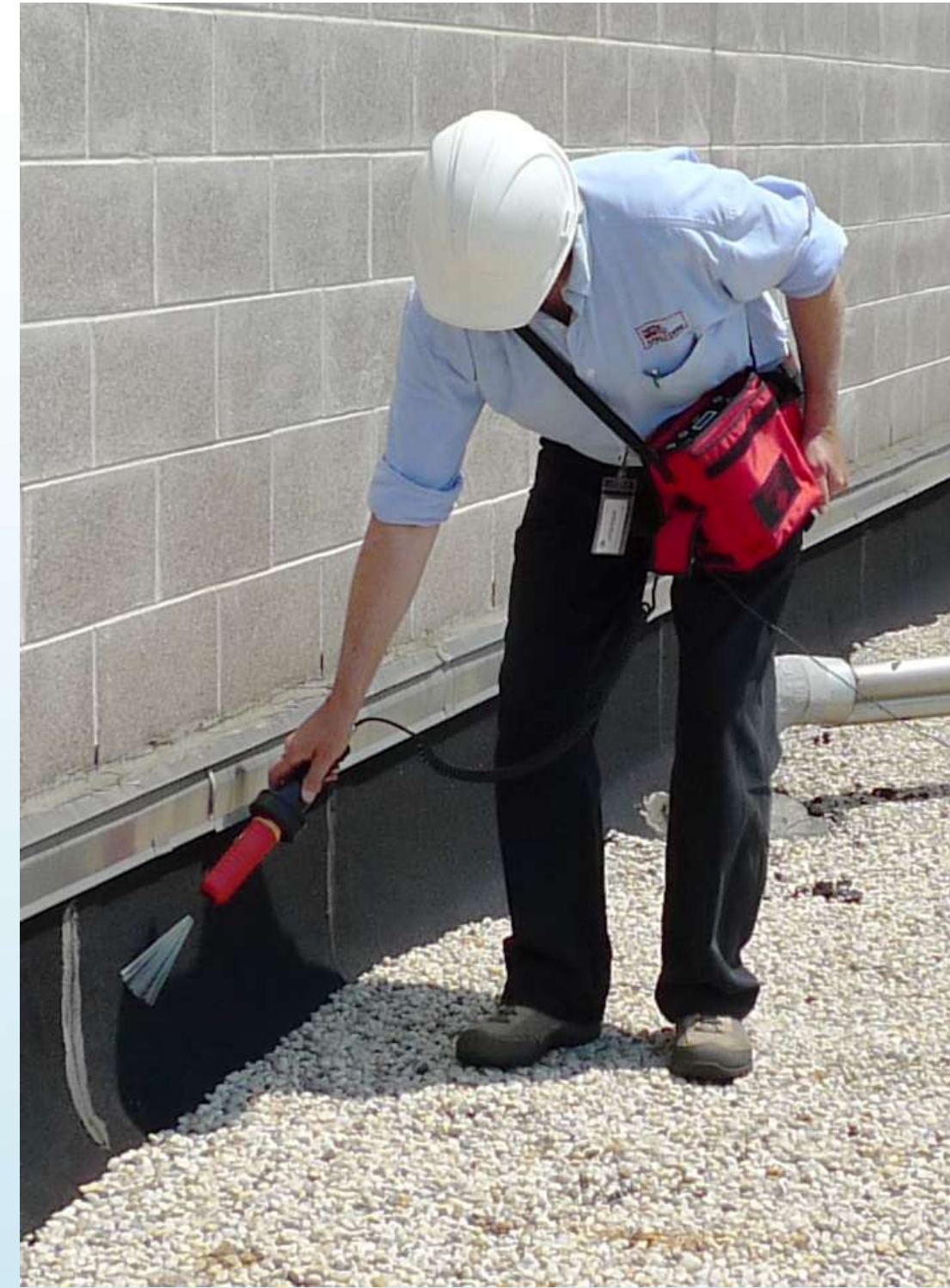
- **Metal-coated and carbon black EPDM membranes**
- **Non-conductive decks**
- **Systems with an electrically insulating barrier between the membrane and the structural deck, unless there are active leaks**

Vector Mapping Benefits

- **Pinpoints membrane defects for efficient repairs**
- **Repairs can be immediately re-tested**
- **Green roofs can be tested with soil in place (LV)**
- **Direct (non-interpretive) detection of breaches**
- **Sloped roof systems & flashings can be tested (HV)**
- **Less expensive, faster, safer, more reliable, and more accurate than flood testing**

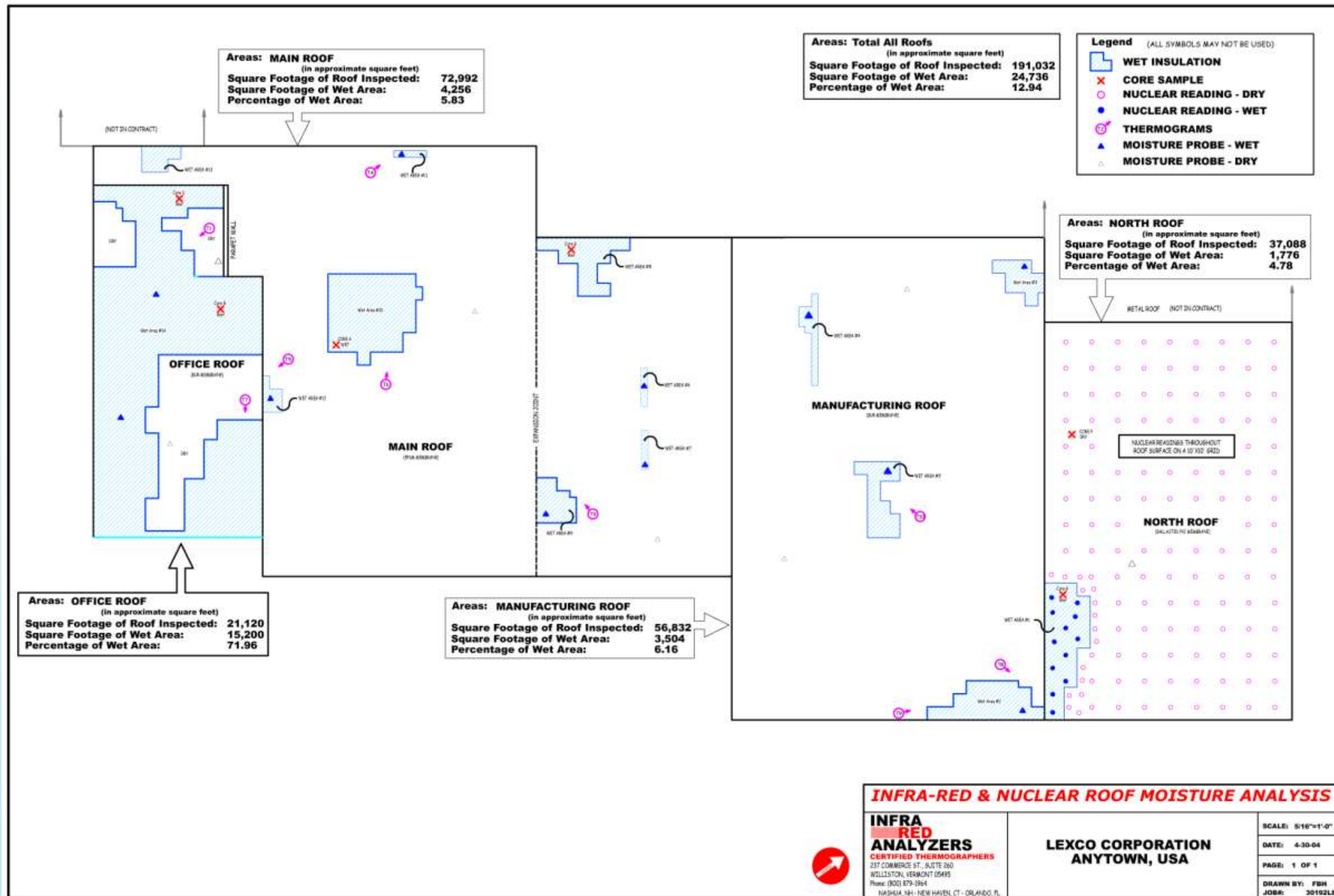


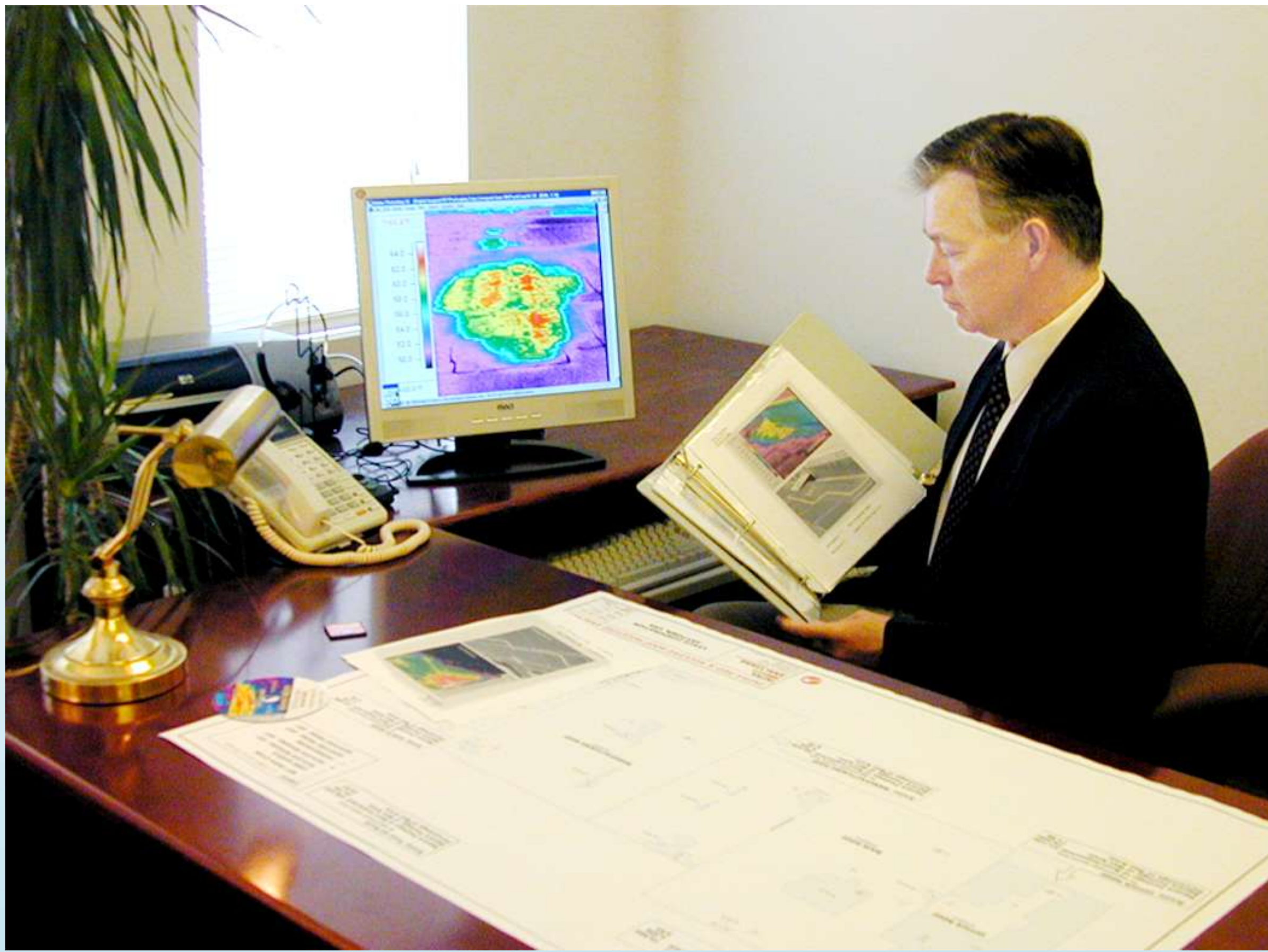
Low voltage vector mapping can be performed on ballasted and gravel surfaced roofs.



High voltage vector mapping can be used to test flashings and other vertical surfaces.

Report Documentation





Thank you!