



Mays Consulting & Evaluation Services, Inc.

A Professional Consulting & Evaluation Organization

INFRARED THERMOGRAPHIC SURVEY

JANUARY 30, 2009



Abstract

Mays Consulting and Evaluation Services, Inc., (Mays Consulting) was retained to conduct an Infrared Thermographic Survey. The Thermographic Survey was conducted on January 30, 2009. The survey was conducted in an effort to identify any insulation voids and or areas of air infiltration or exfiltration, which may adversely affect the thermal performance of the building envelope.

The basic tool of the Mays Infrared Survey is through Thermal Imaging. The Imager is able to distinguish between surface temperature differentials as minute as one-tenth of one (1) degree Fahrenheit. The Infrared Imager produces color imagery on the system monitor, with different colors indicating different surface temperatures. The infrared Thermographer can then interpret the thermogram images produced and identify and document any thermal anomaly areas present. Thermal Anomaly areas are created as thermal conduction occurs, when the cold exterior air is conducted through any deficient areas within the exterior wall elevation details. Typical causes of thermal anomalies include insufficiently insulated areas, or areas containing defective detailing such as insulation and sealant gaps or voids. When surveying from the conditioned (heated) interior, thermal anomalies are detected as the building components within the deficient areas are cooled relative to the surrounding areas, creating a thermal anomaly. The reverse process occurs when surveying from the exterior.

Weather conditions for the survey were ideal, with temperatures in the low 20° Fahrenheit range. The interior ambient temperature within the residence was approximately 68° Fahrenheit. It is required that a minimum temperature differential of 25 degrees Fahrenheit, be realized between the conditioned interior and the exterior of the building envelope.



Findings

Each exterior wall elevation of the Wingfield residence was surveyed with a thermal imager from both the interior and exterior. The following findings were identified during the survey. A recommendation for corrective action is also included.

Finding 1

Cold exterior air infiltration was identified in several locations within the Bonus Room located above the garage. The cause appears to be exterior air infiltration occurring through insulation gaps at the top of the knee walls. In addition, air infiltration was also identified at the floor line-to-knee wall intersection on the west elevation (see illustrations #1 thru #5).

Recommendation:

The insulation installation should be reviewed and corrected where accessible. In addition the gap below the floor line-to-knee wall intersection should be sealed.

Finding 2

Cold exterior air infiltration was identified within both the Great Room fireplace and at the base of the Kitchen bay window and adjoining floor area (see illustrations #6 and #7). Both locations include similar cantilevered framing details, which protrude from the north wall elevation.

Recommendation:

The insulation installation below the cantilevered areas should be reviewed and corrected as necessary. Any gaps should be sealed to prevent air infiltration from occurring

Finding 3

Cold exterior air penetration was observed within the basement band board cavities at numerous locations. The fiberglass batt insulation as installed is not uniform and poorly installed, allowing cold exterior air to enter through the band board framing details See illustration pages #8 thru #15).

Recommendation:

Any voids within the band board framing should be sealed using a quality monolithic sealant and or spray applied foam. This includes any utility penetrations. The band board framing should then be thoroughly insulated using fiberglass batt insulation.



Finding 4

Cold exterior air infiltration was identified within the window frame details at three (3) locations within the residence. These locations include Great Room-lower right side window, Den-lower right side window and Master Bath window (see illustrations #16 thru #18).

Recommendation:

The affected, poorly sealing window framing details should be reviewed and repaired as required.

Finding 5

Significant surface temperature differentials were identified within the window panes contained within two (2) window assemblies, in comparison to the surface temperatures of other like window assemblies installed at the residence. These locations include Bedroom #3 and Kitchen-east bay window (see illustrations #23 thru #25). The home owner indicated that the window assemblies identified were tested by others and do not contain low E (emittance) coating as specified. As thermal data contained within the illustrations indicate, the lack of the low E coating adversely affects the performance of the windows by allowing additional thermal transfer to occur.

Recommendation:

Apply low emittance coating to the identified windows.

Finding 6

The upper left side window within the Great Room north elevation was found to have a faulty seal (see illustrations #19 thru #22). As gas installed between the window pane leaks out through a faulty seal, the window panes compress, decreasing the R-value of the window. The result is substantially colder surface temperatures on the inside of the window in comparison to other like windows. This condition will also promote frost development on the inside of the window.

Recommendation:

The window assembly should be replaced.

Conclusion:



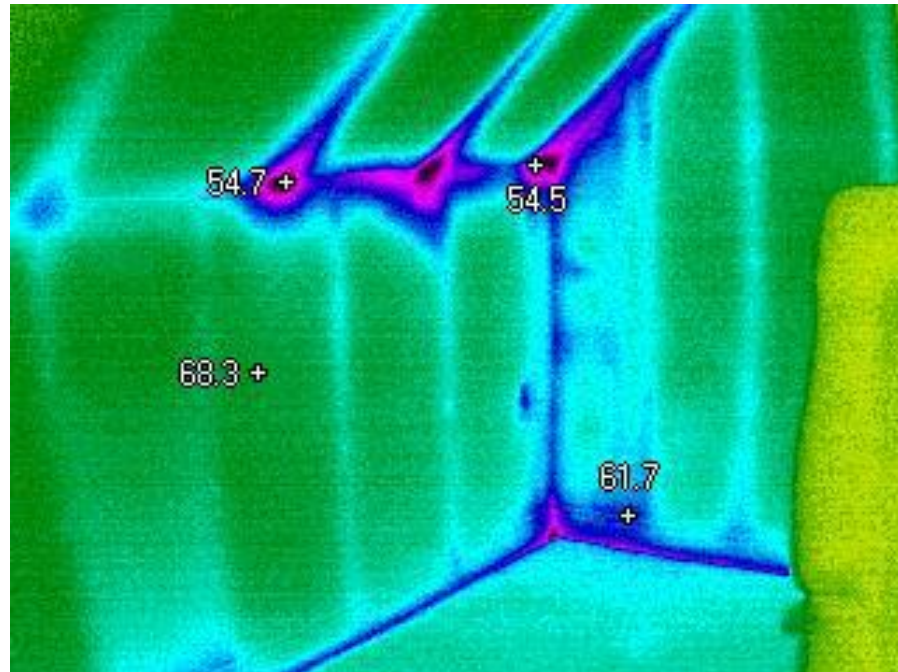
If the above recommendations are completed, the thermal performance of the residence will be improved through both reduced energy consumption and inhabitant comfort.

ILLUSTRATIONS

During the Infrared Thermographic Survey thermal (thermograms/infrared images) data was recorded and later processed to create the following sample thermograms illustrating the view as seen by the Infrared Thermographer. Digital sets of photographs depict one (1) sample area as a colorized thermogram and as a physical light photograph. The colorized thermogram depicts temperature-affected construction components (if any) as changes in color. The darker colors typically indicate colder temperatures, while the brighter colors typically indicate warmer temperatures. Note surface temperature data within the illustration pages.

The physical light photographs are generally taken from the same location as their corresponding thermograms and depict a similar field of view.

Illustration #1

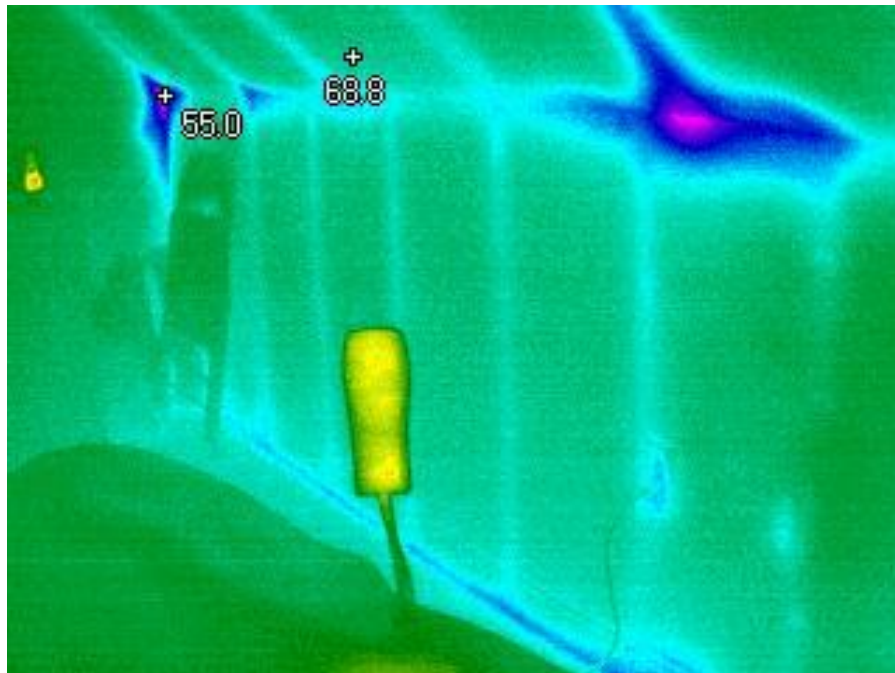


- A. Thermogram indicates cold air infiltration at top of knee wall elevation. Note surface temperature variations.



- B. Photograph indicates area in which above thermogram was recorded - Bonus Room, east elevation.

Illustration #2

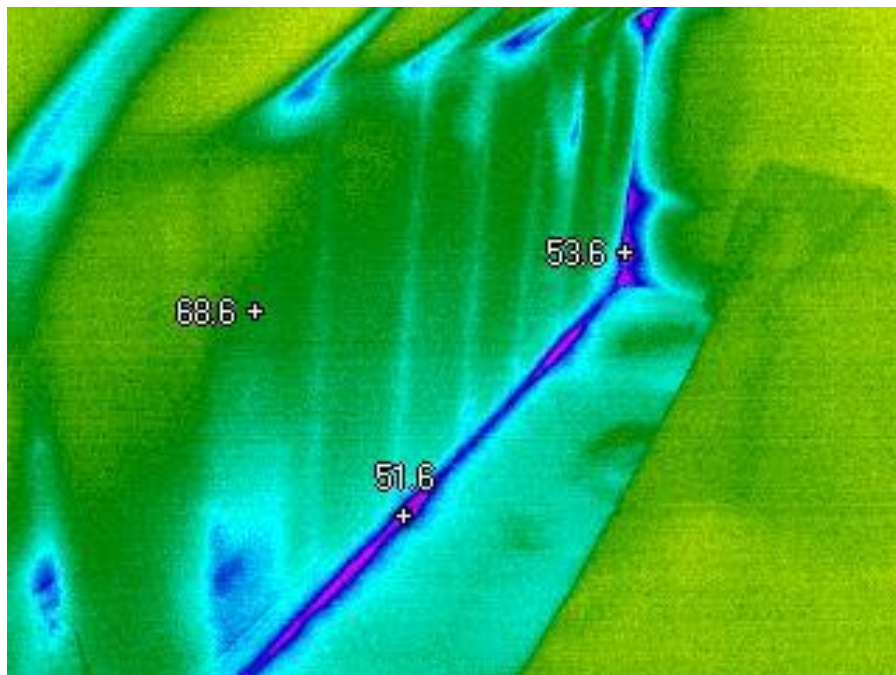


- A. Thermogram indicates cold air infiltration at top and bottom of knee wall elevation. Note surface temperature variations.

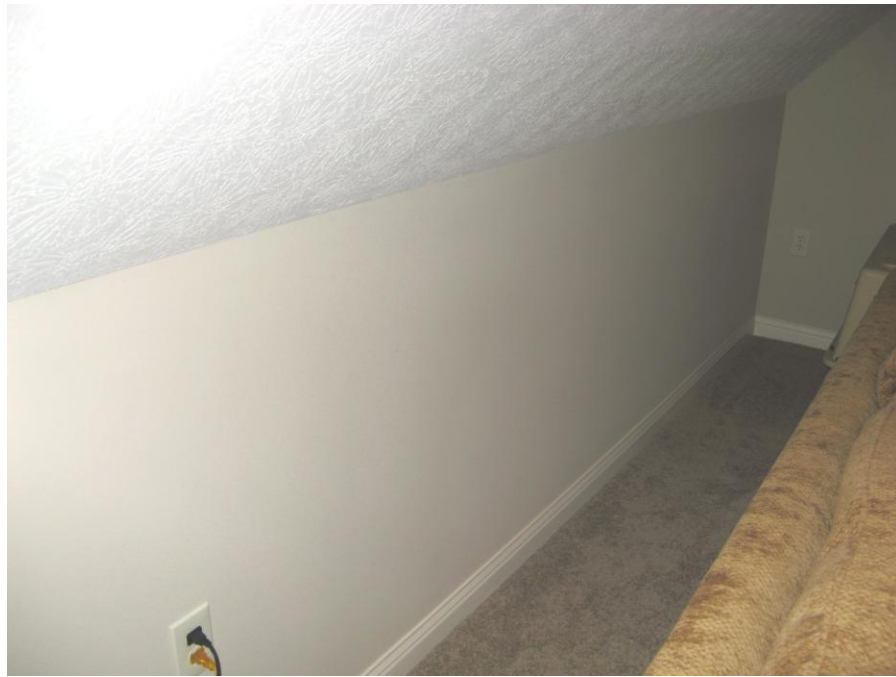


B. Photograph indicates area in which above thermogram was recorded - Bonus Room, east elevation.

Illustration #3

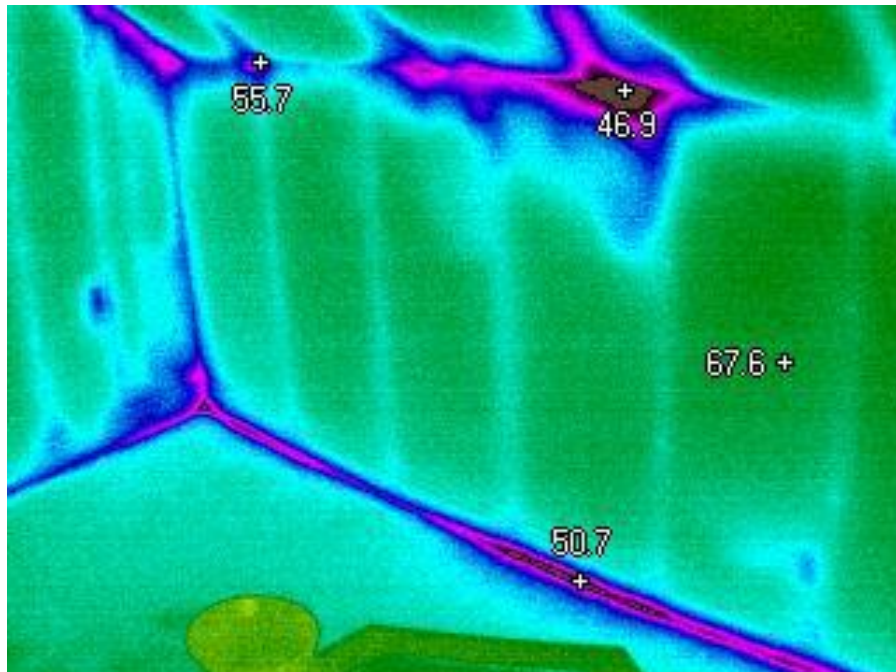


A. Thermogram indicates cold air infiltration at top and bottom of knee wall elevation. Note surface temperature variations.



B. Photograph indicates area in which above thermogram was recorded - Bous Rom, west elevation.

Illustration #4



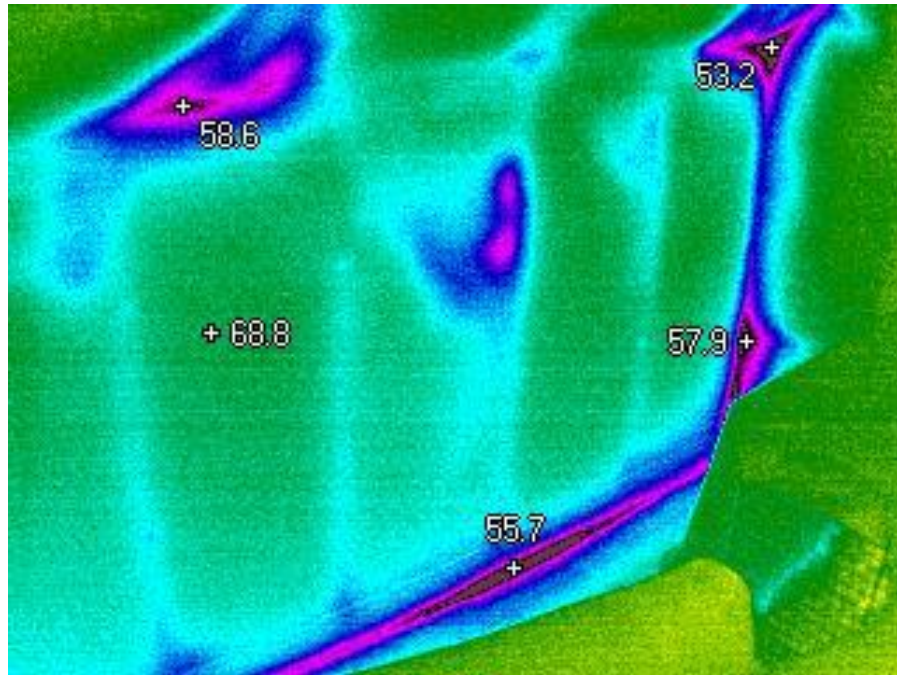


- A. Thermogram indicates cold air infiltration at top and bottom of knee wall elevation. Note surface temperature variations.



- B. Photograph indicates area in which above thermogram was recorded - Bonus Room, west elevation.

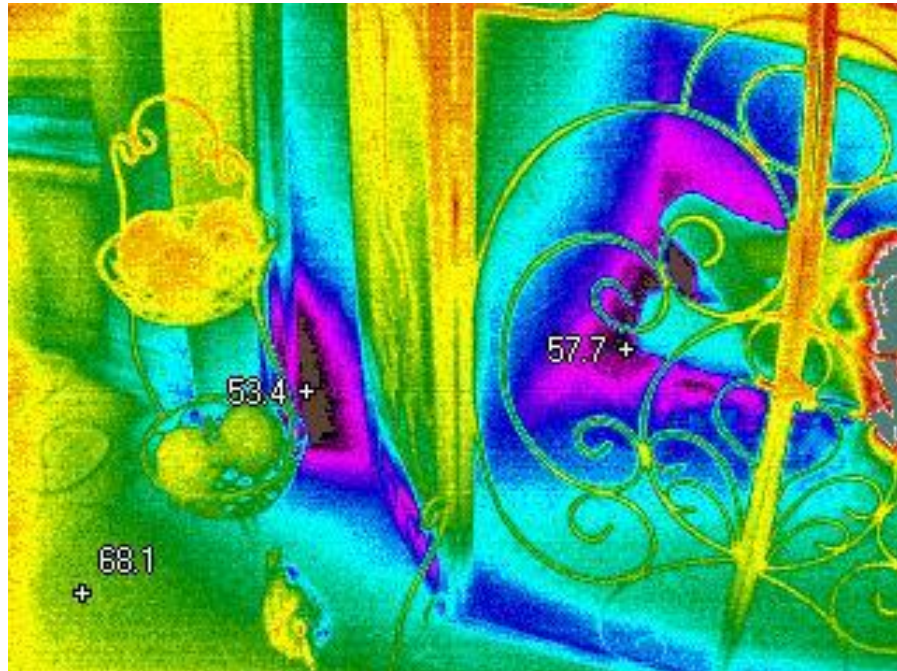
Illustration #5



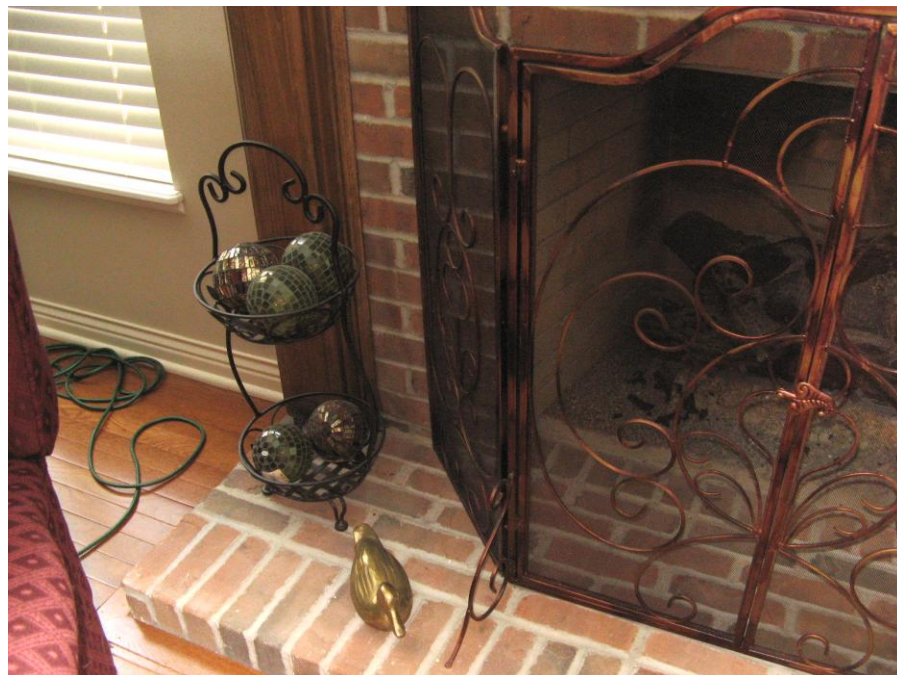
- A. Thermogram indicates cold air infiltration at top and bottom of knee wall elevation. Note surface temperature variations.



- B. Photograph indicates area in which above thermogram was recorded - Bonus Room, west elevation.

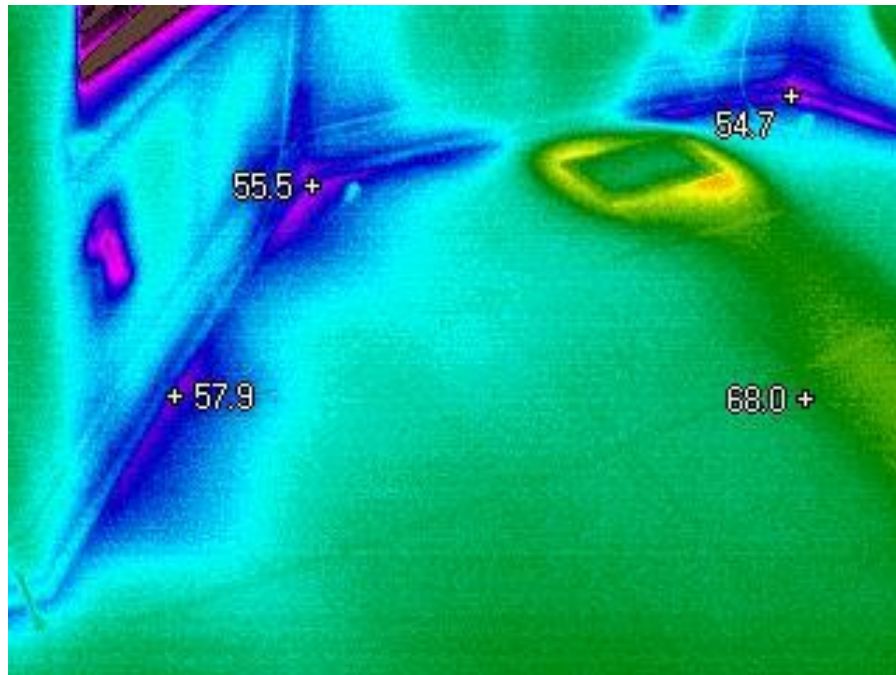


A. Thermogram indicates cold air infiltration occurring around cantilevered fireplace detail. Note surface temperatures.

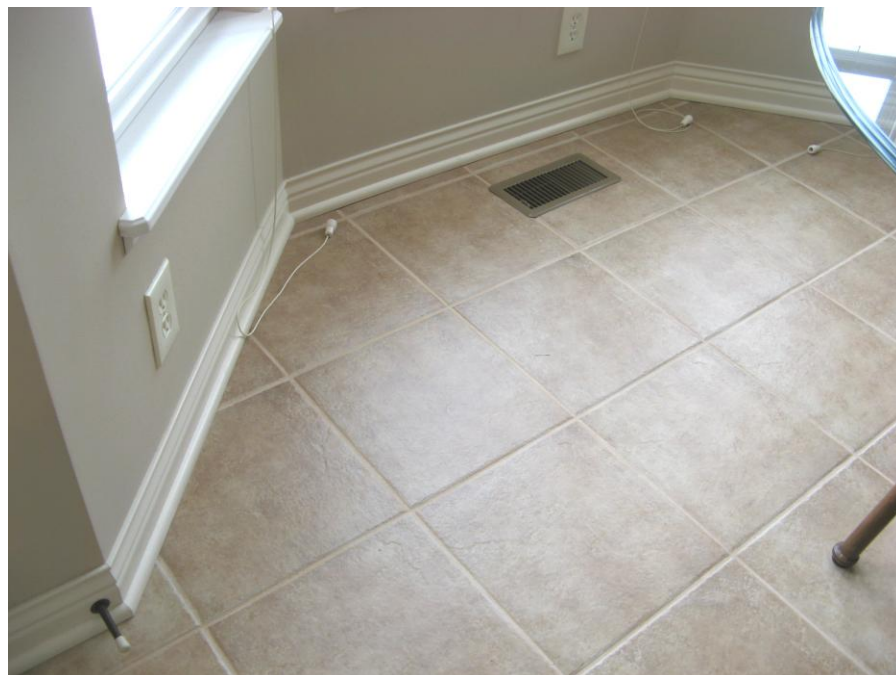


B. Photograph indicates area in which above thermogram was recorded - Living Room, north elevation.

Illustration #7

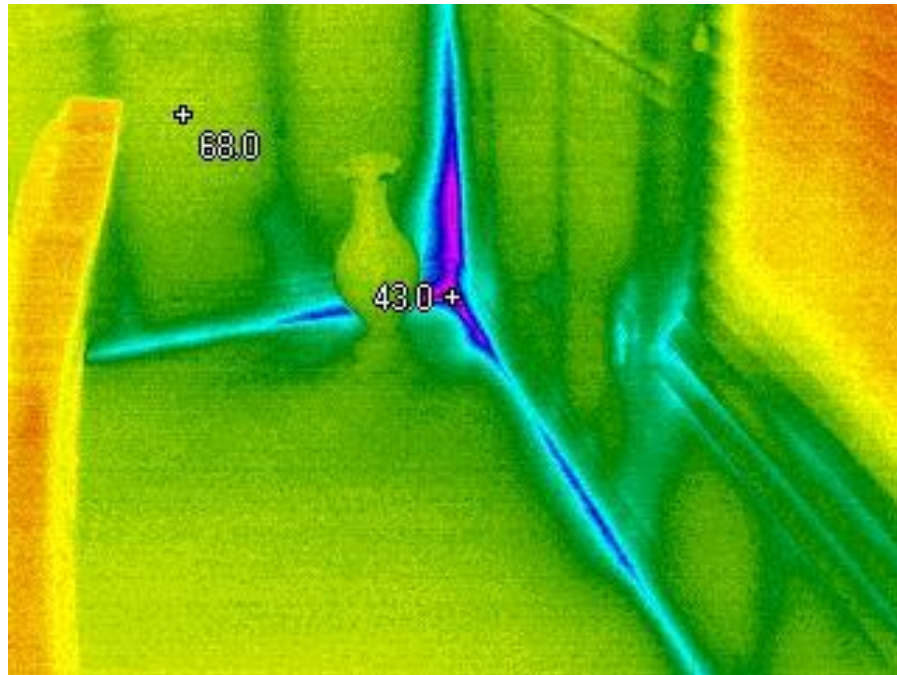


- A. Thermogram indicates cold air infiltration occurring under floor of cantilevered bay window detail. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Kitchen, north elevation.

Illustration #8

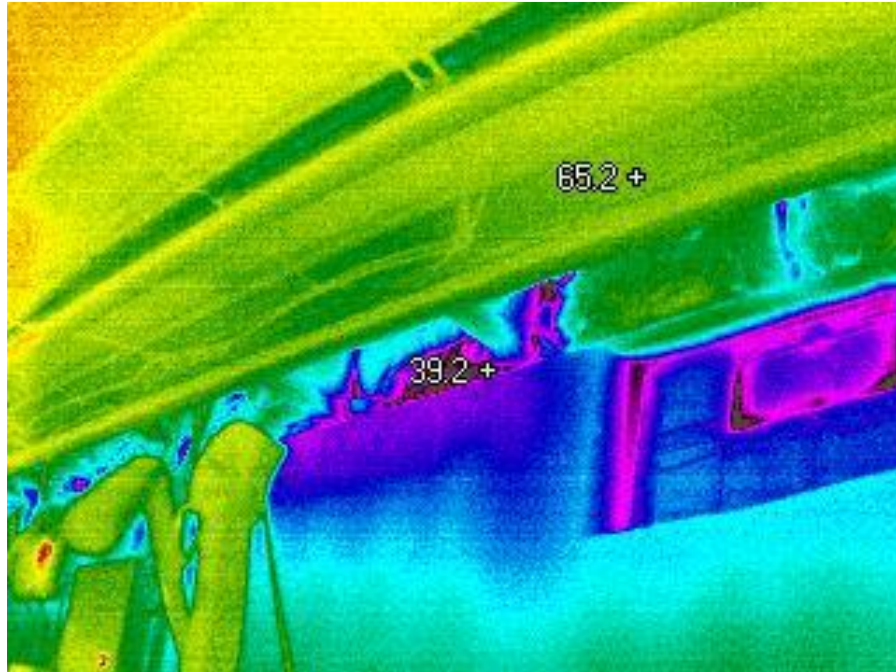


- A. Thermogram indicates cold air infiltration, which appears to be originating through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Dining Room, southeast corner..

Illustration #9

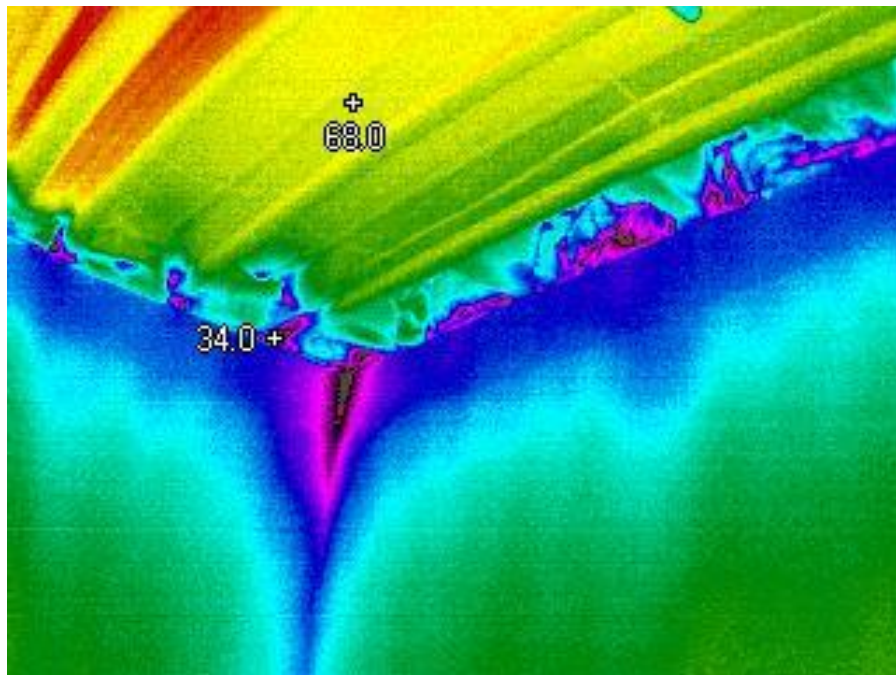


- A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Basement, east wall.

Illustration #10

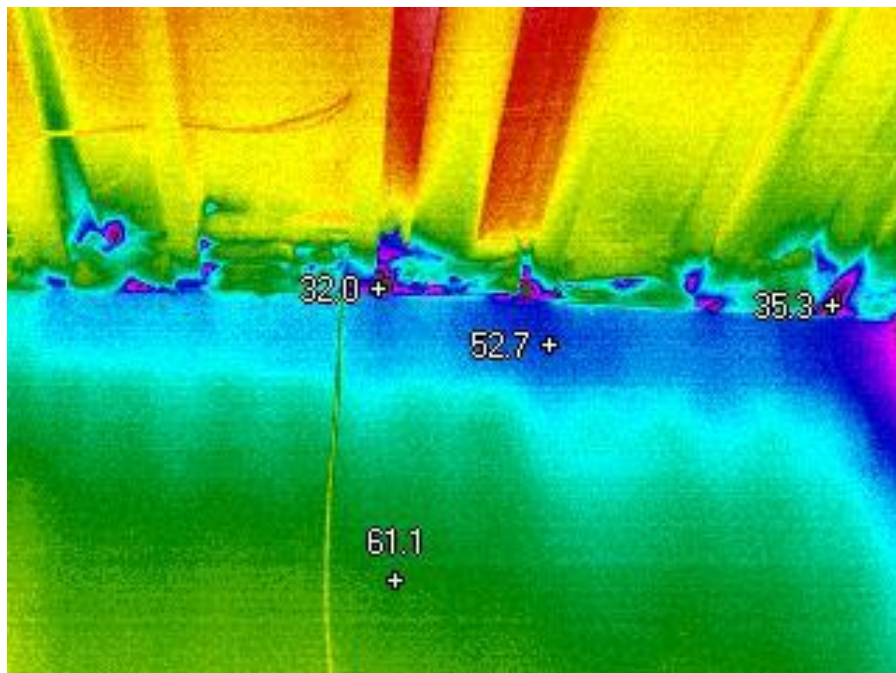


- A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



B. Photograph indicates area in which above thermogram was recorded - Basement, east wall.

Illustration #11

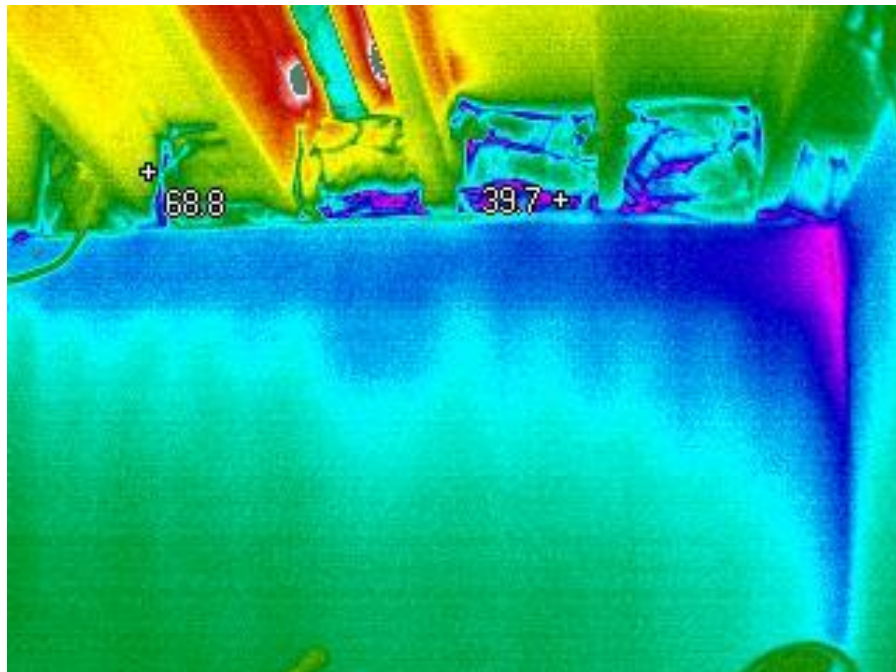


A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded -
Basement, north wall.

Illustration #12

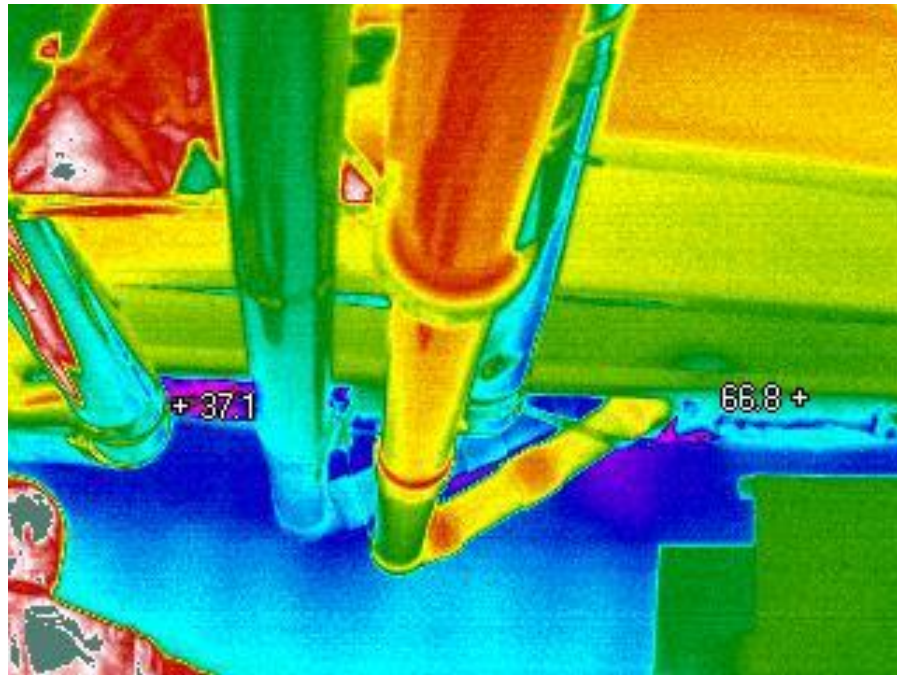


- A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Basement, north wall.

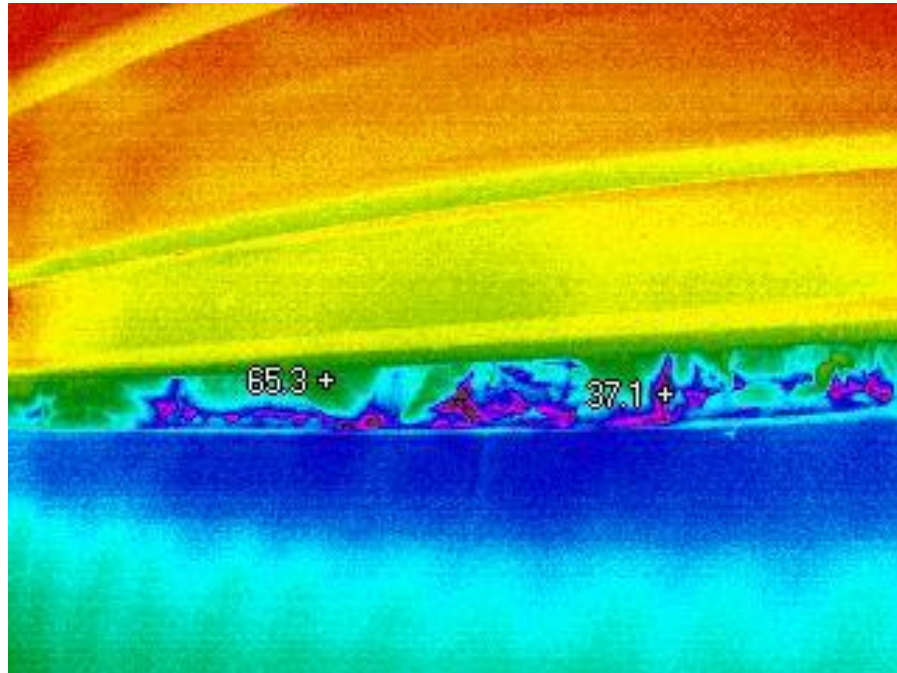
Illustration #13



A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



B. Photograph indicates area in which above thermogram was recorded - Basement, west wall.

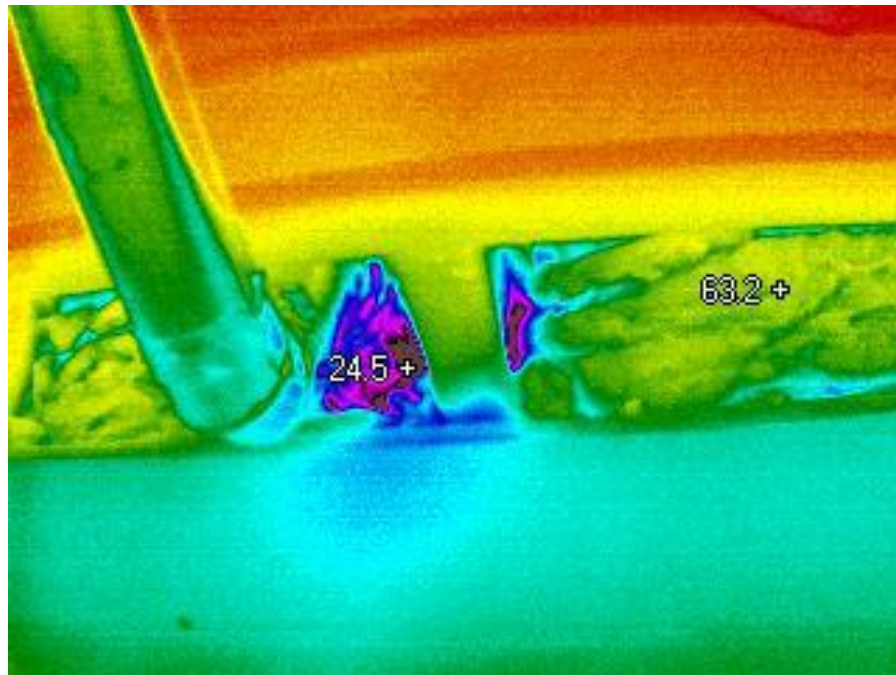


- A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Basement, west wall.

Illustration #15

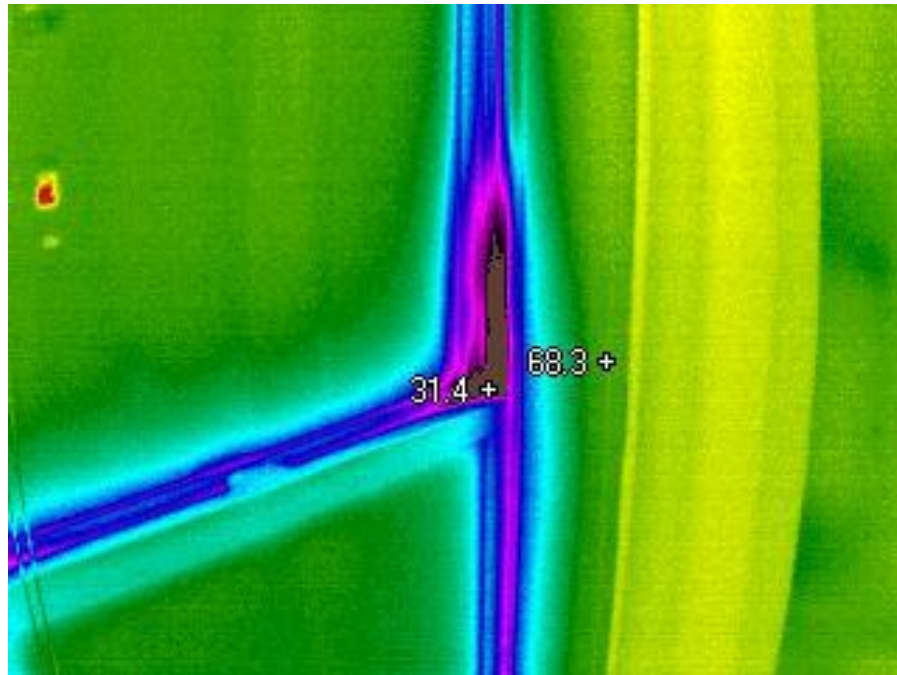


- A. Thermogram indicates cold air infiltration which is entering through Basement band board. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Basement, west wall.

Illustration #16

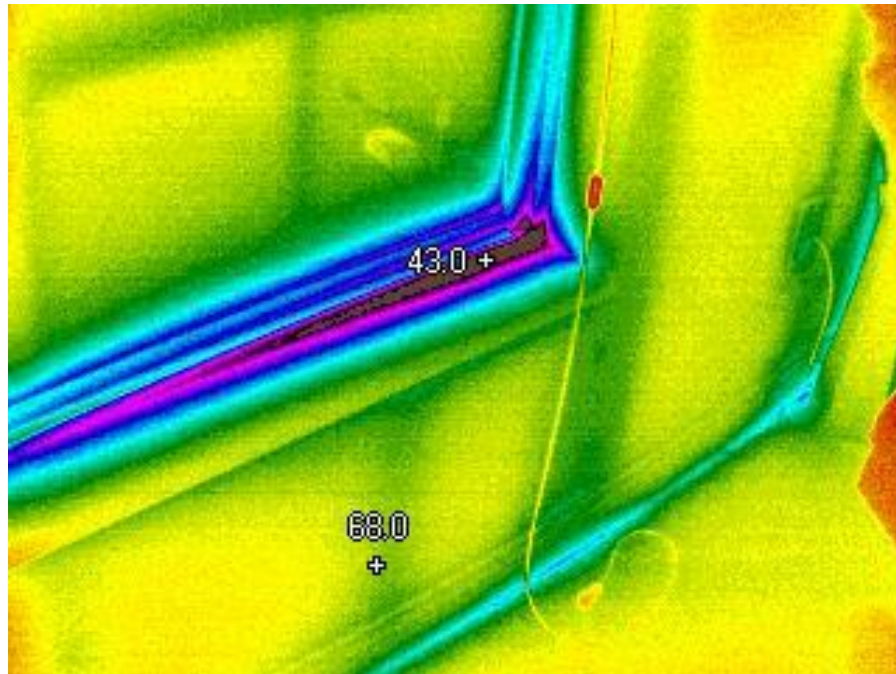


- A. Thermogram indicates cold air infiltration which is entering through a poorly sealed window detail. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Great Room, north wall.

Illustration #17

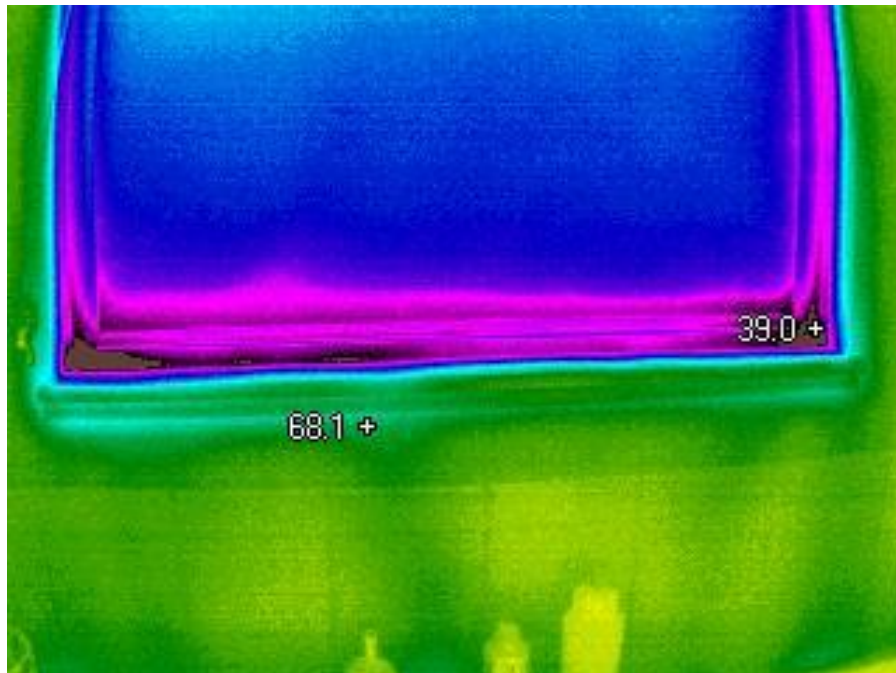


- A. Thermogram indicates cold air infiltration which is entering through a poorly sealed window detail. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Den, south wall.

Illustration #18

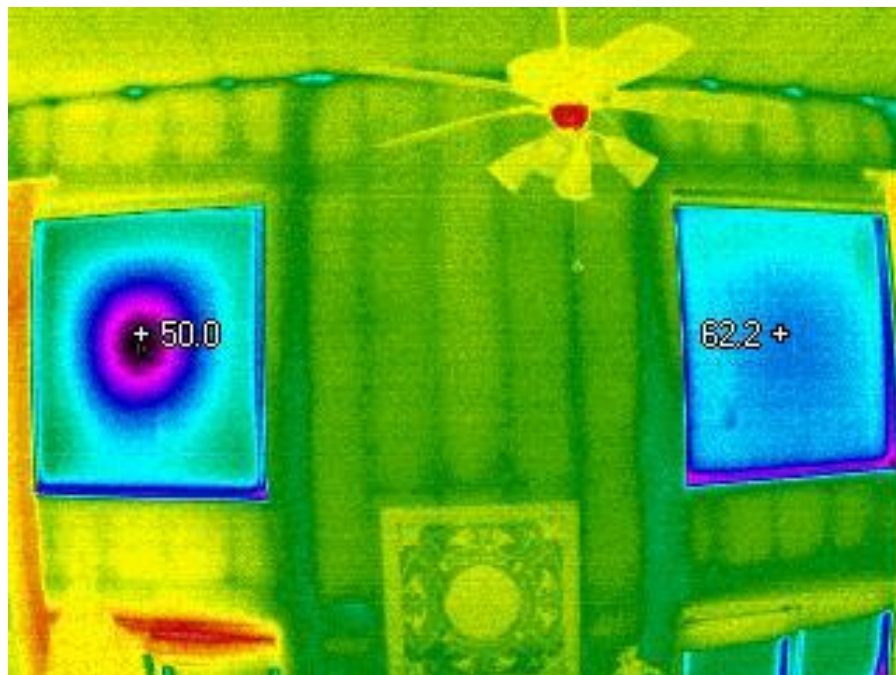


- A. Thermogram indicates cold air infiltration which is entering through a poorly sealed window detail. Note surface temperatures.



- B. Photograph indicates area in which above thermogram was recorded - Master Bath, west wall.

Illustration #19

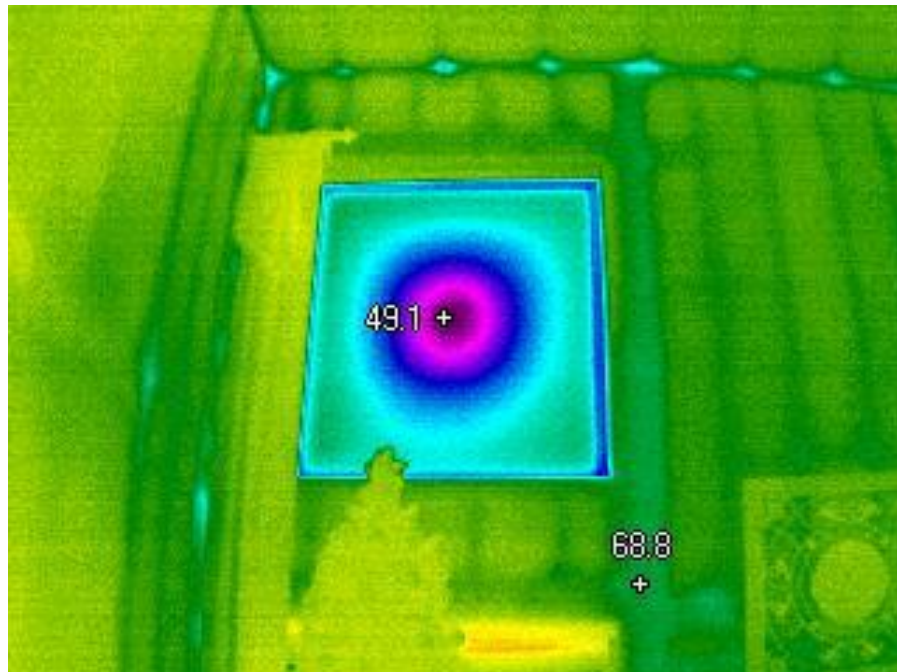


- A. Thermogram indicates damaged window seal within left window assembly.



B. Photograph indicates area in which above thermogram was recorded - Great Room, north elevation.

Illustration #20



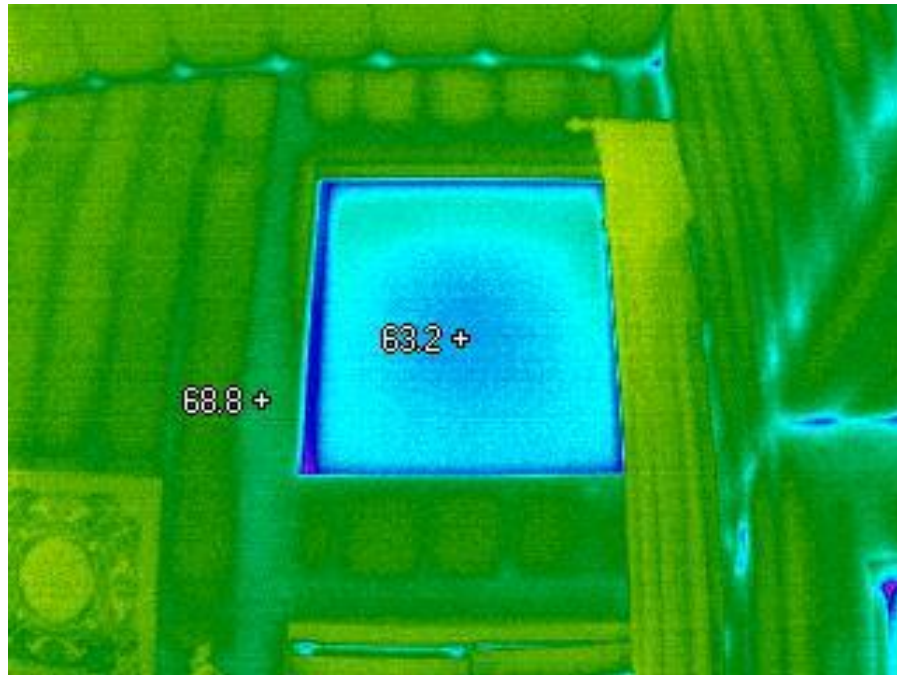


- A. Thermogram indicates damaged window seal within upper left window assembly.

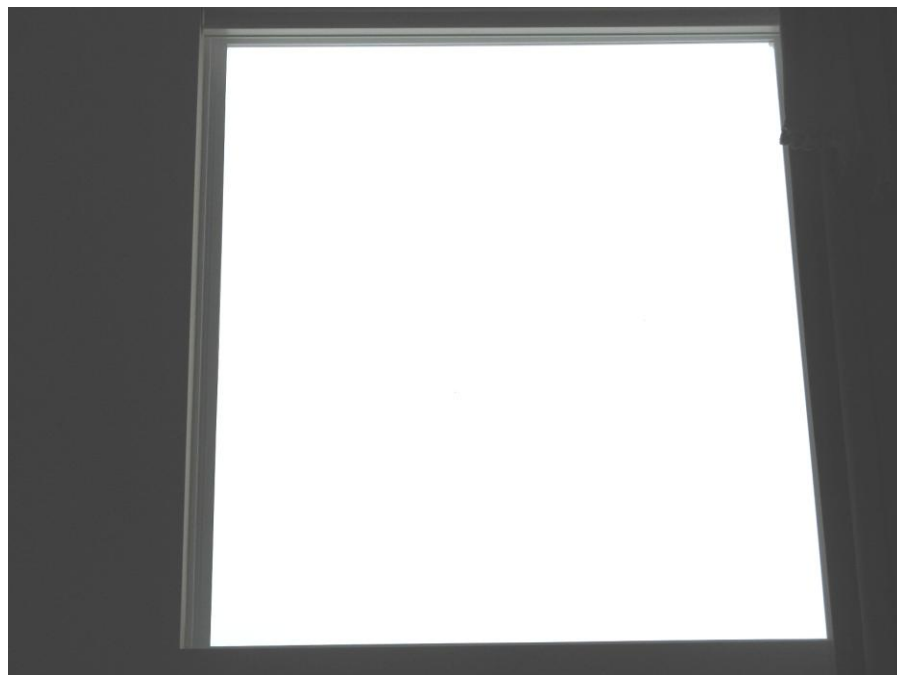


- B. Photograph indicates area in which above thermogram was recorded - Great Room, north elevation.

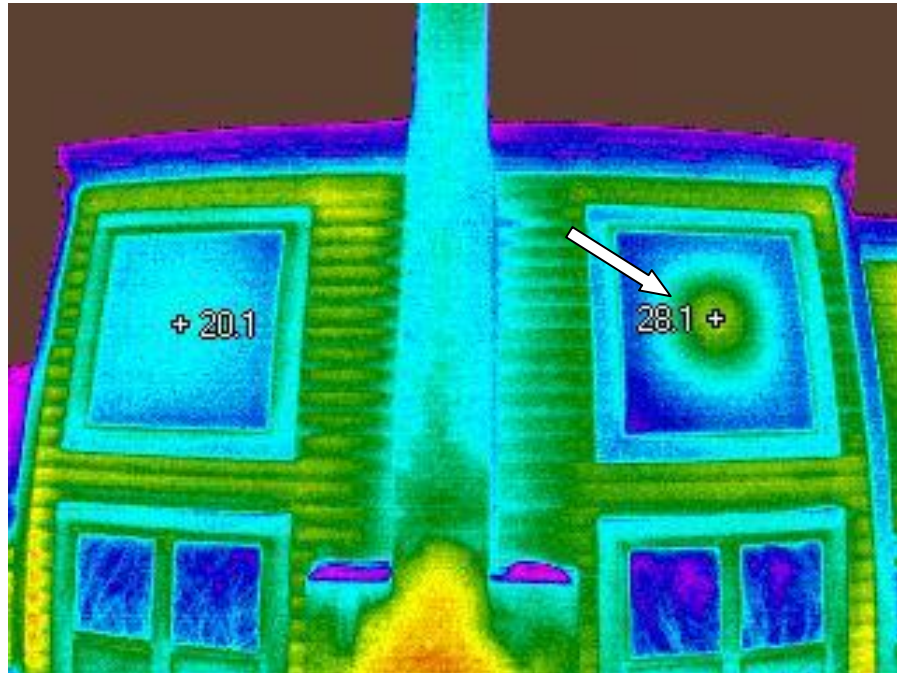
Illustration #21



A. Thermogram indicates properly functioning window assembly as compared to illustration #20.



B. Photograph indicates area in which above thermogram was recorded - Great Room, north elevation.

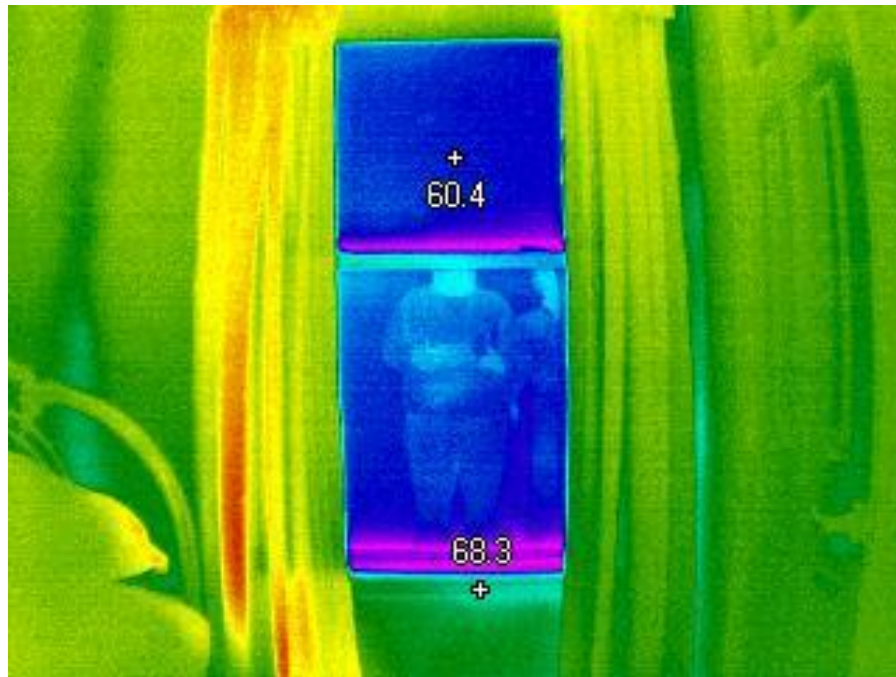


A. Thermogram indicates damaged window seal. Note image non-uniformity and surface temperature variations between windows.

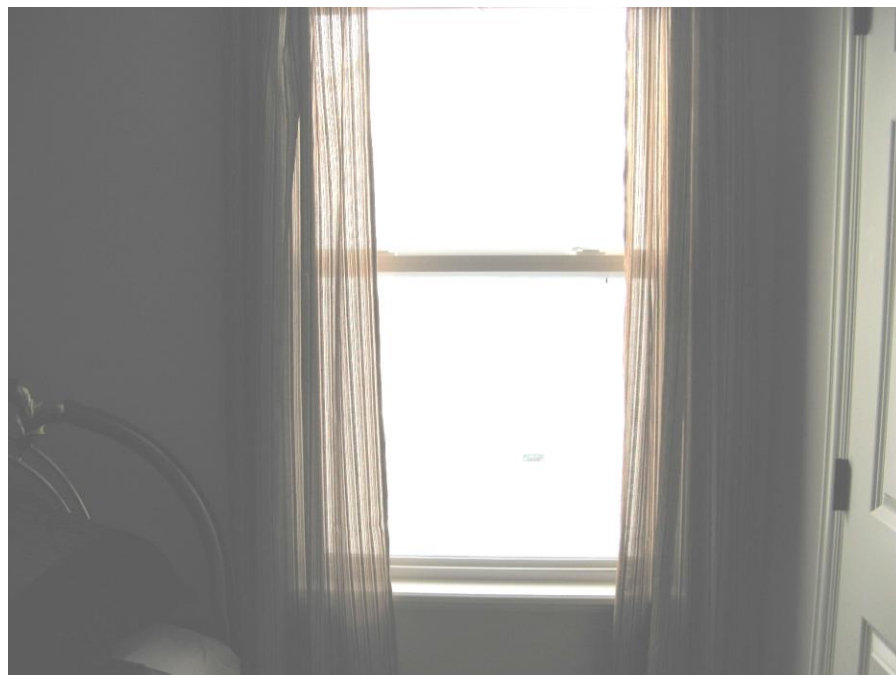


B. Photograph indicates area in which above thermogram was recorded - exterior, north elevation.

Illustration #23

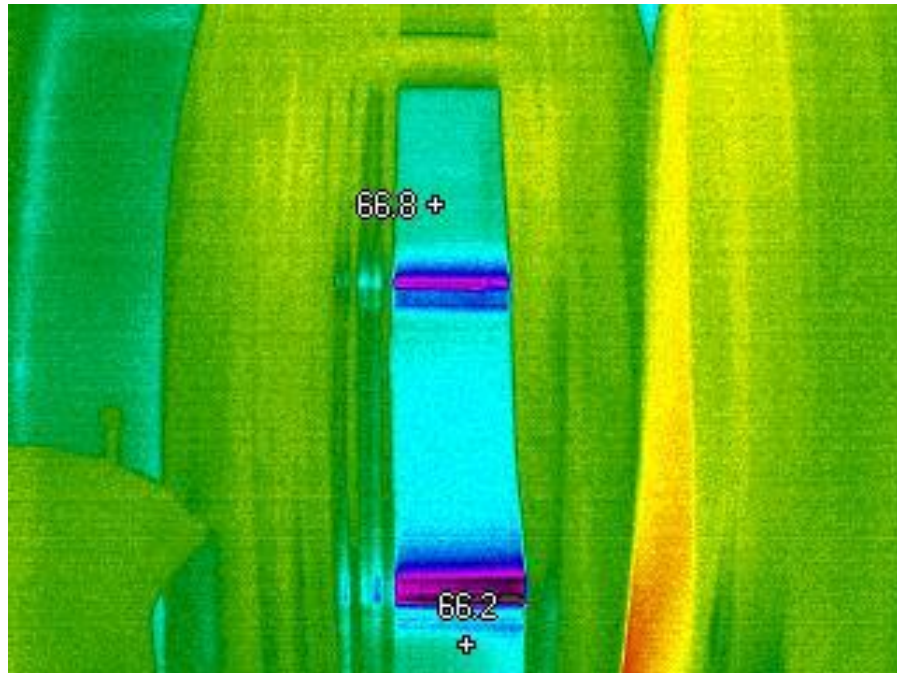


- A. Thermogram indicates window with no low E coating. Compare surface temperature differentials with illustration #23.

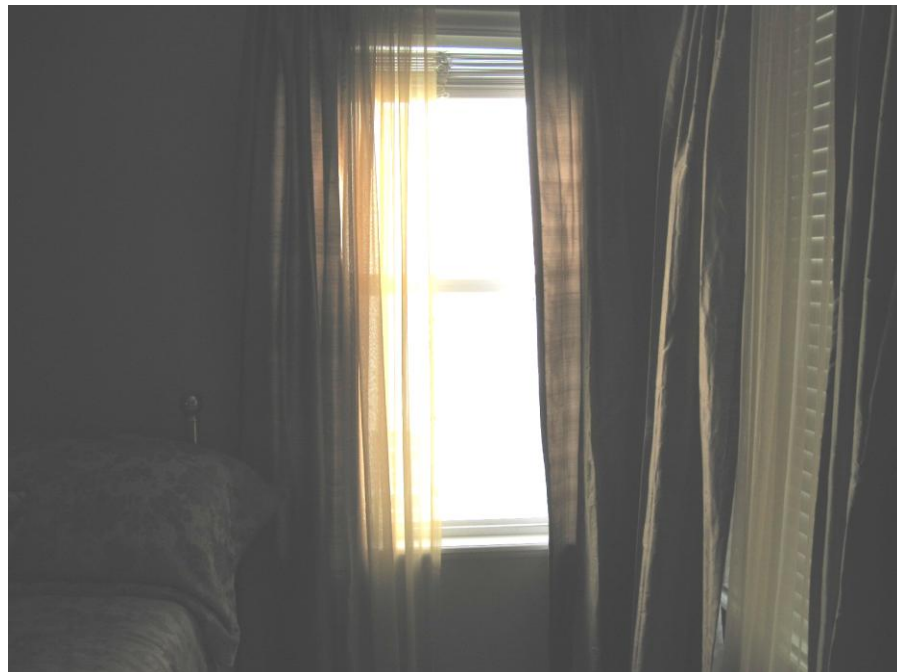


- B. Photograph indicates area in which above thermogram was recorded - Bedroom #3, west elevation.

Illustration #24

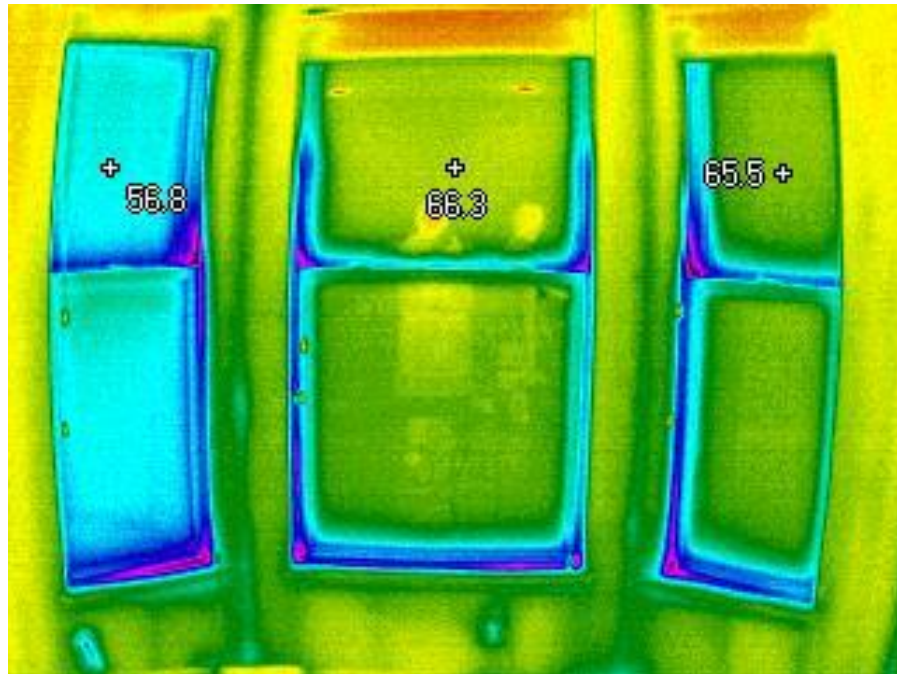


- A. Thermogram indicates window with low E coating. Compare surface temperature differentials with illustration #23.



- B. Photograph indicates area in which above thermogram was recorded - Bedroom #2, west elevation.

Illustration #25



- A. Thermogram indicates image non-uniformity and surface temperature variations between coated and non low E coated window (left side).



- B. Photograph indicates area in which above thermogram was recorded - Kitchen bay window.

QUALIFICATIONS

The Infrared Survey and report was conducted and prepared by Steven L. Mays. Mr. Mays has received Level 2 Infrared Thermography Certification from The Infrasppection Institute. Mr. Mays is also certified by the Exterior Design Institute.

The Infrared Survey was conducted using a Fluke Ti55 Thermal Imager Unit.