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INFRARED and MOISTURE DIAGNOSTIC REPORT

ABLE INSPECTION CO and INFRARED SERVICES

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Houston, Texas 77282

(713) 465-0000

CLIENT:

PROPERTY SURVEYED:

EMAIL:

DATE:

In accordance with your instructions, and in your presence, I made a limited visual examination and use of a FLIR System T620 Infrared Camera of the above referenced property. At the time of the visual inspection the home was occupied with furniture, pictures, stored and personal items etc. (obstruct thorough viewing). The weather conditions were cloudy and dry approximately 66 degrees F at 8:30am. Interior temperature was 72 degrees F with 6 degrees F delta.

HOUSE DESCRIPTION

This building is a two structure with 5 bedrooms. This home generally faces East. The home is constructed of a wood frame stone cladding and cedar shingles and wood soffit and fascia.

The age of the structure, as I understand it, is approximately 32 years old.

INTRODUCTION

Enclosed is your Infrared Inspection Report, photos and thermograms (electronic pictures/map of thermal energy). This Infrared inspection technique is a powerful, definitive and non-invasive means of monitoring and diagnosing the current condition of the building envelope.

Consisting of wall materials that separate the environmentally controlled interior from the outdoors by examining this residence, with a non-contact Thermal Imaging System (T620) used to detect electromagnetic radiation.

This camera will “look” at heat. Heat is the transfer of energy from one object to another. We monitor this transfer by “measuring” the temperature of the object with infrared. Heat flows from a hot object to a cool object. Unexpected temperature changes may indicate design flaws, poor workmanship sub-standard building materials or damaged components. Excessive temperatures change often exist just before material failure.

For many homeowners, the first signs that they have a moisture problem may be “standing” water on the floor, discoloration of the ceiling, or a persistent musty odor. Some of these early warning signs of excess moisture can be difficult to spot early on, which is why it is important to inspect a building for moisture, particularly after a major storm or other event that can cause damage to the integrity of a structure.

WOOD AND MOISTURE INFORMATION

Wood is a “Hygroscopic” material that can take on and give off moisture. Once moisture level on our meters reaches the highest % on the range of the meter, any higher readings will read not read correctly. If the moisture range is 6-40%; the meter will not read actual percent MC higher than its range. Resistance type moisture meters (pin meters) express moisture content as a percentage of the oven-dry weight of the wood. These meters work best from the range of fiber saturation point of wood (25-30 percent) down to around 6%.

Although the humidity levels in our geographic location will affect the MC% level at which your wood acclimates, please keep in mind that the fiber saturation point of wood averages approximately 28%. Readings generally beyond 30%, therefore, are only relative or comparison readings, indicating that the material is taking on or losing moisture, and not a true moisture content percent of the wood.

Once our readings are close to the 28-30% fiber saturation point, you have reached the fiber saturation threshold and any higher readings that appear on a meter made with a range higher than 40% are for comparative information only. Therefore, a meter that reads beyond 30 or 40% will not provide information about the moisture content of your wood beyond that which you already know based on the readings you have obtained with a Delmhorst wood meter.

PURPOSE OF INSPECTION

The purpose of this IR inspection on this building envelope is to locate and document abnormal patterns of infrared radiation from the building envelope materials that can be or lead to potential problems:

- a)** Conductive anomalies are usually caused by insufficient, improperly installed, damaged or water saturated insulation and/or structural building components.
- b)** Convection anomalies are usually caused by cracks and holes that permit the uncontrolled movement of air across the building envelope.

- c) Qualitative gatherings will include information of the structure and building materials, location of anomaly, temperatures, relative humidity and weather condition and recording and presenting information. **Using an Amprobe THWD-3 digital Temp/Psychrometer**
- d) Quantitative gatherings will include measuring temperatures of the observed patterns of infrared radiation, distance of camera from anomaly, emissivity, reflective and surface temperature. **Using a Multi pattern infrared Raytex and Cooper SRH77A Digital thermometer**
- e) Inspections will be performed when environmental and physical conditions such as solar gain, rain, wind, surface and atmospheric moisture and heat transfer are favorable to gathering accurate data. This thermographer may recommend earlier morning or later evening infrared diagnostic to obtain "signature" IR images of suspect areas, which will include additional fees of travel and time.

LIMITATIONS OF LIABILITY

Inspector will not be responsible for the movement of furniture, wall hangings, stored boxes, personal items or other objects that may prevent thermographer from examining interior and exterior surfaces.

Because this is a limited non-destructive inspection, we make no guarantee, express or implied, that our observations and reporting offer conclusive evidence that no installation discrepancies or moisture anomalies exist, or that any documented problems found are all-inclusive. Client will take full responsibility for consequences resulting from actions taken, or not taken, as a result of information provided by this thermographer and company.

This inspection company, its employees and any divisions shall not be liable for non-visual defects, unseen defects, mold identification and hidden mold propagation, unspecified defects or hidden damage and conditions existing on the subject property and hereby disclaims any liability or responsibility thereof. All parties concerned, agree to hold harmless and indemnify, this thermographer and inspection company involved with any liabilities that may result.

Thermal imaging produces images of invisible heat energy from objects and systems in the home. This can usually, but not always identify and document, heat/cooling loss and air infiltration in walls, ceilings, floors, windows & doors, moisture intrusion, malfunctioning radiant heat, missing/damaged/wet insulation, electrical faults, plumbing leaks, and duct faults **at the time of the inspection.**

These can all be recorded in vivid color images using Thermography. Anomalies found in temperature/thermal differentiations while performing the thermal image scan will be shown to the client at the time they are identified and will be shown in a written report if said report was requested by the client at the time of making the appointment for the scan. Thermal images can only be taken of areas that are **readily accessible** to the thermographer without endangering the thermographer or causing harm to the building or its components. (Note: furniture, artwork, wall coverings, under floors and thru concrete and tile, curtains, storage items are not moved by the thermographer.)

Any photo images provided at the time of this inspection are intended to assist the client in the understanding of certain defects or conditions as noted during this inspection.

However, these photos **do not** represent every technical concern reported from this inspection, and the photos provided should only be considered as a supplement to the final report, with the final written inspection report taking precedence over any photos provided.

THERMOGRAPHERS TEST EQUIPMENT

FLIR System Non-Invasive T620 Infrared Camera:

Powerful 640x480 pixel array and provides 307,200 picture elements in each image.

Temperature is one of the first observable parameters to indicate the health of a component, building, system, or process. We utilize state-of-the-art, fully-radiometric, infrared camera technology to provide superior imaging quality in displaying temperature variations and to help you accurately evaluate non-optimal conditions before failure occurs. Because thermal imaging (infrared thermography) is a highly-effective, non-contact, non-destructive testing method, it is used for a wide range of applications.

Although infrared is not detectable by the human eye, an infrared camera can convert this infrared radiation to a visible image that allows us to evaluate thermal variations across an object or scene. This non-invasive, non-destructive testing method is known as Infrared Thermography. During an infrared inspection, components are analyzed and equipment performance is evaluated in a real operating environment.

This allows us to see distinctive heat patterns and provides us with a powerful, versatile, and highly accurate diagnostic method for uncovering a wide range of problems before damage or failure occurs.

Tramex Wet Wall Non-Invasive Moisture Detector (dielectric meter):

Detects moisture by transmitting alternating (radio frequency) signal through most materials. As water concentration increases so does the "capacitance" of this signal. By measuring this signal, the "relative" moisture content can be read. This Instrument can also identify water pathways and areas of entrapped water within a roof construction. This technique is based on the ability of a material to store electrical energy.

This involves placing this moisture meter on the surface of the wall, ceiling or floor to send a safe electrical current into these materials without penetrating the particular membrane. If the material is wet, the dielectric properties of the material would produce a higher reading than it would if the material were dry.

Delmhorst Moisture Probe "Invasive" Detector (conductance meter):

Detects moisture by measuring the ionic conductance between two electrodes. Pins and probes used are of 1/4", 4" and 6" to assist in penetrating into substrate wood and other building material.

These testing equipment's are "tools" to assist in locating and measuring temperatures in many different building materials.

There are times in which these tools can give "false reading" or no readings at all, due to unusual wall finishes and interior materials, electric wiring, other metals etc. Positive readings do not always represent a problem, nor does negative readings necessarily represent there is **not** a problem.

DEFINITIONS AND EXPLANATIONS FOR RESIDENTIAL IMAGING

1. Non-invasive exam: means a visual exam of the interior of the building using an infrared camera which does not involve any marring or destruction of any surfaces within the building. An infrared camera measures heat variable and can "see" what the naked eye cannot see – behind walls, ceilings, some floor coverings, roofs, etc. The camera produces colorful images showing temperature differences without harming any object or surface. These temperature (radiant) differences can indicate small cracks and crevices that cause drafts, insulation that has settled or is missing, moisture intrusion from the exterior or plumbing leaks, potential electrical problems, etc.

2. Safely & Readily Accessible: means areas that are easily and safely available for thermographer and camera during the thermal scanning process without the potential for harm to the building, its components, contents, or to the thermographer. While the thermographer will make every reasonable attempt to scan all areas, the determination of whether an area is safe and readily accessible is at the discretion of the thermographer.

Client has the right to move their personal property at their own discretion (in their own home), if doing so will result in a more thorough scan. These items might include draperies around window casings, storage covering walls & floors of a closet, a sofa covering most of an exterior wall, etc.

However, due to bonding and insurance restrictions, the thermographer is not allowed to move personal property and cannot be held liable if client moves something which then causes damage to the object being moved or to the surrounding area.

Areas considered Inaccessible:

Access to attic which are too small for the thermographer to pass through safely.

Attic areas without flooring to walk on safely.

The interior of electrical panel boxes whose cover plates are painted shut or rusted to the point of breakage.

Areas concealed behind appliances and large pieces of furniture.

Areas above a "dropped ceiling" if there are no tiles that can safely be removed and replaced without damage.

3. What Thermography cannot do:

While the camera can detect areas of moisture, it **cannot detect mold** (or the type of mold) is present. **Consult with Environmental Air Specialist for this service.**

Window, wall and floor coverings (concrete, tile, stone, brick) may prevent accurate assessment of these areas by the camera.

It cannot detect toxic substances, materials or environmental hazards such as radon, lead, asbestos, airborne particulates, etc. It cannot detect the presence of mildew, fungus, animal or insect infestation.

FURTHER TESTING (DESTRUCTIVE) INVESTIGATION

We are performing non-invasive survey to minimize damages to your home. However, there may be times when "destructive" measures (small probes less than ¼" diameter with 1½" probes and if necessary 4-6-inch probe pins) will be suggested to further evaluate an area or areas for necessary confirmation on water content in the substrate.

It is difficult to determine the structural integrity of this building material without this probing (Delmhorst meter utilized) and holes will be filled with a quality sealant. This test will not be performed without approval from you.

CUSTOMER ASSIGNMENT

Client has concerns for us to locate reasons for "mold/musty" odors inside original south side of residence that was not affected from previous fire initiated in north family room area.

CURRENT FINDINGS

Thermographer observed the following:

- **No existing evidence of thermal water anomalies on ceilings and walls (no rain during or before inspection – rain forthcoming)**
- **Significant black organic matter inside of 2nd level south bedroom HVAC closet double doors**
- **Significant odor of mold/plant mold when HVAC equipment doors opened**
- **Significant black organic matter/plant mold on South HVAC equipment, ducts, plenums, blanket insulation and wood framing**
- **No air supply at two large horizontal air registers on wall of South Family room**
- **Drywall has covered over one air register in north hallway ceiling between kitchen and family room (marked with blue tape)**
- **Mold propagation on drywall in 1st level south east bedroom wall under window (with odor) with removed wood paneling**
- **Sprinkler risers and spray heads close to exterior 1st southeast bedroom window system**

- Stains inside 2nd level south bedroom circular window with removed paneling below in 1st bedroom from apparent previous leaks
- Peeling “blue paint” on 2nd level southeast bedroom door casing for reason unknown

SUMMARY AND RECOMMENDATIONS FOR REPAIR

Thermographer recommends the following:

- Owner may option to retain services of Air Quality Specialist to perform air samples and swabs to this residence to determine type of mold for proper remediation
- Consult with reputable HVAC contractors to remove 2nd level south HVAC equipment, ducts, plenums from closet
- Remove all contaminated insulation and ductwork
- Treat all walls, flooring, ceilings and framing with a quality Microbial solution
- Consult with HVAC trade to correct air supply at family room and north ceiling
- Consult with contractor to examine upper south bedroom oval window and or equivalent for necessary repairs to minimize leakages into bedroom below
- Consult with reputable Irrigation trades to relocate “ALL” sprinkler heads within close proximity of exterior building materials, windows and doors to minimize water intrusion
- Remove drywall, insulation and treat under 1st level southeast bedroom window affected with water intrusion and existing mold propagation

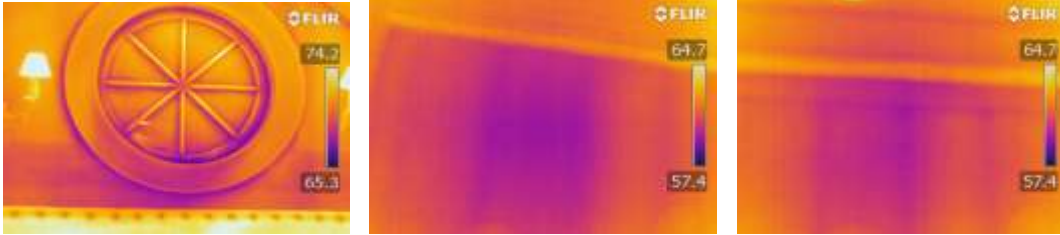
VISIBLE PHOTO IMAGES AND IR THERMOGRAMS



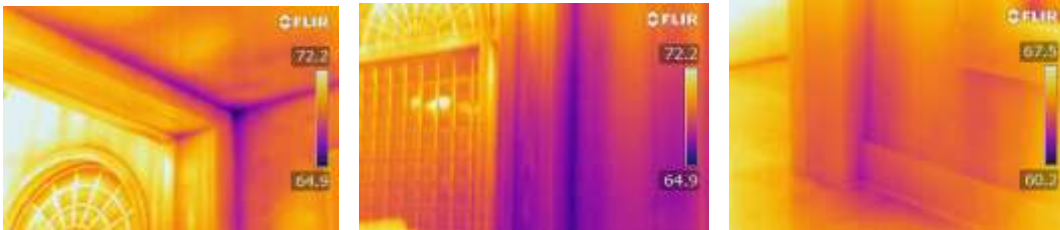
No anomalies on ceiling and walls of family room



No anomalies on ceiling and walls in family room



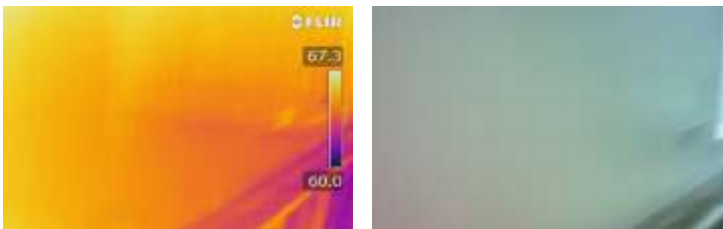
No anomalies at stained oval window and bedroom wall below



No anomalies at 2nd level south door casing and wall with peeling paint



Image of covered air register with drywall in north hallway



No air supply from one of two south lower family room registers



No air supply from one of two south lower family room registers



Mold propagation on drywall under 1st southeast bedroom window



Black organic matter inside of double doors in 2nd south bedroom HVAC



Black organic matter on 2nd level south HVAC ducts and equipment



Black organic matter on 2nd level HVAC ducts and plenums...missing cover on jbox



Sprinklers close to exterior building

REPAIR FOLLOW-UP/YEARLY EXAMINATIONS

A follow-up examination should be conducted within six - twelve months. Annual inspections should also be scheduled to ensure that your building envelope system remains dry.

Testing and maintaining your home on a regular basis is the best way to prevent costly repairs associated with moisture damage. Also, should you decide to sell your home, annual inspections and maintenance documentation will be a valuable selling tool, providing evidence to show that your home has been examined and maintained on a regular basis by a reputable and qualified firm.

Thank you for choosing **ABLE INSPECTION COMPANY AND INFRARED SERVICES** to perform this important Infrared evaluation inspection for you. After reviewing this narrative report carefully, if you have any questions regarding this examination or opinions of this thermographer, please contact our office.

Very truly yours,

ABLE INSPECTION COMPANY AND INFRARED SERVICES

Inspecting Homes Since 1976

Larry J. Malloy

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Certified Infrared Building Science Thermographer
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