



INFRARED
PREDICTIVE
SURVEYS
INCORPORATED

INFRARED ROOF INSPECTION

University of MD
School of Medicine

FOR:

University of Maryland-Baltimore
Rick Finn
220 Arch Street
Baltimore, MD 21201

DATE:

December 28, 2016

BY:

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SYNOPSIS

An infrared survey of the roofs has been made at the School of Medicine, 108 North Greene St., Baltimore, MD 21201. Visual observations have been made and the data has been documented.

INTRODUCTION

This report has been prepared for the exclusive use of University of Maryland-Baltimore, for the specific application of the roofs at 108 North Greene St., Baltimore, MD 21201.

Authorization

Authorization to perform this evaluation, analysis and Infrared roof scan was in the form of an agreement between Rick Finn at the University of Maryland-Baltimore and Infrared Predictive Surveys, Inc. (IPSI)

Scope

The scope of the roof survey included infrared thermography, capacitance and nuclear backscatter verification. Data from this survey has been incorporated into this final report.

Purpose

The purpose of the roof survey was to gain an overview of the condition of the roof areas.

General

Observations described in this report are based upon roof at the time of the survey and these conditions may change as the roof ages.

Infrared Predictive Surveys, Inc. warrants that these findings are published after being prepared in accordance with generally accepted practices of the construction industry. No other warranties are implied or expressed.

TEST INSTRUMENT DESCRIPTION

(Only testing that has been completed during your survey will be checked.)

Infrared Testing

The infrared roof survey locates moisture in a roof by seeking areas of increased surface temperature. Roof areas that contain moisture have higher thermal conductivity and capacitance than dry areas. During the heating season, heat from the building interior is lost at a greater rate through wet roof areas and their surface temperatures are elevated. Alternatively, during the cooling season, solar heat is absorbed into the wet area, and then retained for hours after the sun sets.

When viewed through the infrared imager, wet areas appear as brighter, lighter tones of gray in black-and-white images. Alternatively, in color images, wet areas will appear as hotter colors. A color scale appears at the side of color images. As colors progress upward, temperatures increase. In general, the higher the concentration of water, the higher the surface temperatures.

Because higher surface temperatures, and consequently hotter colors, may be produced by several phenomena not related to moisture intrusion, tests are made to verify the findings of the infrared inspection using destructive testing (core cuts) and other non-destructive tests (capacitance & nuclear). Wet areas found by infrared testing are illustrated with thermograms (photographs of infrared images).

Capacitance (Verification)

The Tramex capacitance meter is a mobile device that is used for detecting relative moisture content of roof areas. This non-destructive testing method is often combined with nuclear and thermal testing and/or moisture intrusion testing to accurately identify water entry pathways and areas of entrapped water. The Tramex moisture meter is designed for testing built up roofing and non-conductive single ply membrane. It provides instantaneous, clear indications of roof conditions and is able to detect as little as 2% excess moisture in roofing systems.

Core Sampling

Core samples consist of cuts through the roof membrane. The sample provides an absolute test of moisture content and location. The core cut also permits the constituents of the roof system, and their condition, to be determined. Core sample may be weighed, dried and reweighed to provide a quantitative measure of moisture content.

Cut into roof with two inch (2") circumference roof sampling tool. Repair core cuts with appropriate material.

Nuclear Backscatter

A radioactive isotope consisting of Americium-241 with a beryllium target is utilized. The measurement method relies on the thermalization (slowing) of fast neutrons by the hydrogen atoms in water. Since other hydrogen bearing materials also thermalize neutrons, a measurement survey is necessary to establish a relative base level before an analysis can be performed.

The meter used, Troxler 3216, is a portable instrument with a periodic counter to measure the rate of thermalization of neutrons.

FIELD SURVEY METHODS

Visual Observations

Visual observations were made by Infrared Predictive Surveys, Inc. (IPSI) personnel. These observations included roofing structure, roof drainage, roof surface conditions and other accessory items.

Photographic Documentation

Photographs were made by IPSI personnel. While these photographs were not intended to provide a complete record of the roof, they do provide a visual description of typical roof conditions or selected problem areas.

PROJECT IDENTIFICATION

Project Location

108 North Greene St., Baltimore, MD 21201.

Roof Construction Materials

Smooth BUR, Isocyanurate, Fiberboard and a concrete deck; per client. The Upper Roof was the same, but with a metal deck.

INFRARED ROOF SCAN

Date of Scan: December 13 & 21, 2016

These scans were performed in conjunction with the visual roof survey conducted the same day. The purpose of these scans was to locate areas of suspected subsurface moisture and determine the extent of the moisture migration.

Environmental Conditions

December 13, 2016- Maximum daytime temperature was 43°F with no wind.
December 21, 2016- Maximum daytime temperature was 48°F with no wind.

INFRARED CAMERA(S) USED

- Inframetrics-FLIR ThermaCAM SC1000. Temperature sensitivity is <0.1 degree C and a focal array of 256 x 256.
- NEC/Avio R500

FINDINGS AND RESULTS

Notes:

- Roof section delineations (“A-I”) were made by IPSI personnel for reporting purposes only.

Roof Section “A”

- Six (6) thermal anomalies were noted on this roof section.

Roof Section “B”

- One (1) thermal anomaly was noted on this roof section.

Roof Section “C”

- Two (2) thermal anomalies were noted on this roof section.

Roof Section “D”

- No thermal anomalies, consistent with moisture intrusion, were noted.

Roof Section “E”

- No thermal anomalies, consistent with moisture intrusion, were noted.

Roof Section “F”

- No thermal anomalies, consistent with moisture intrusion, were noted.

Roof Section “G”

- One (1) thermal anomaly was noted on this roof section.

Roof Section “H”

- No thermal anomalies, consistent with moisture intrusion, were noted.

Roof Section “I”

- No thermal anomalies, consistent with moisture intrusion, were noted.



If additional information is required, please do not hesitate to contact me. Thank you again for giving us the opportunity to provide our services.

Sincerely,

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APPENDIX

- Maintenance Program
- Survey Photographs
- Infrared Photographs
- CAD Drawing

MAINTENANCE PROGRAM

The following is a recommended minimum for roof maintenance:

1. Inspect the roofs twice a year, once in the spring and once in the fall. An inspection of the building should also be made to check for structural problems that may affect the performance of the roof.
2. These inspections should include, but not be limited to base flashings, pipe penetrations, gravel stops, drains, equipment supports, the field membrane, rising walls, visible deck, and any leaks.
3. Clean debris and trash from drains and associated piping.
4. Any problems noted during these inspections should be located and recorded on a roof plan. Then roof membrane defects should be reported to the roof membrane manufacturer and temporarily sealed until permanent corrective action is taken.
5. After the inspection has been completed, specifications should be prepared for any needed repair that is not covered by the roof membrane warranty.
6. After the specifications have been prepared, any specified work should be executed within a short period of time and when weather conditions are conducive to proper application by a qualified contractor.
7. *New Roofs Only*: In addition to the items described above, a roof moisture survey should be performed on these roofs before final payment is made on the new roof, six months prior to the expiration of the contractor's and the manufacturer's warranty, and at least once every two years. This survey will detect subsurface problems that would go unnoticed during a visual inspection.
8. Accurate records should be kept of the inspections and repairs.
9. The roof inspections should be conducted by professionals experienced in locating and recognizing any problems or potential problems that may exist and that need to be addressed.



108 N. Greene St, Baltimore, MD



University of Maryland-School of Medicine



Roof A-Overview, looking North



Roof A-Overview, looking East



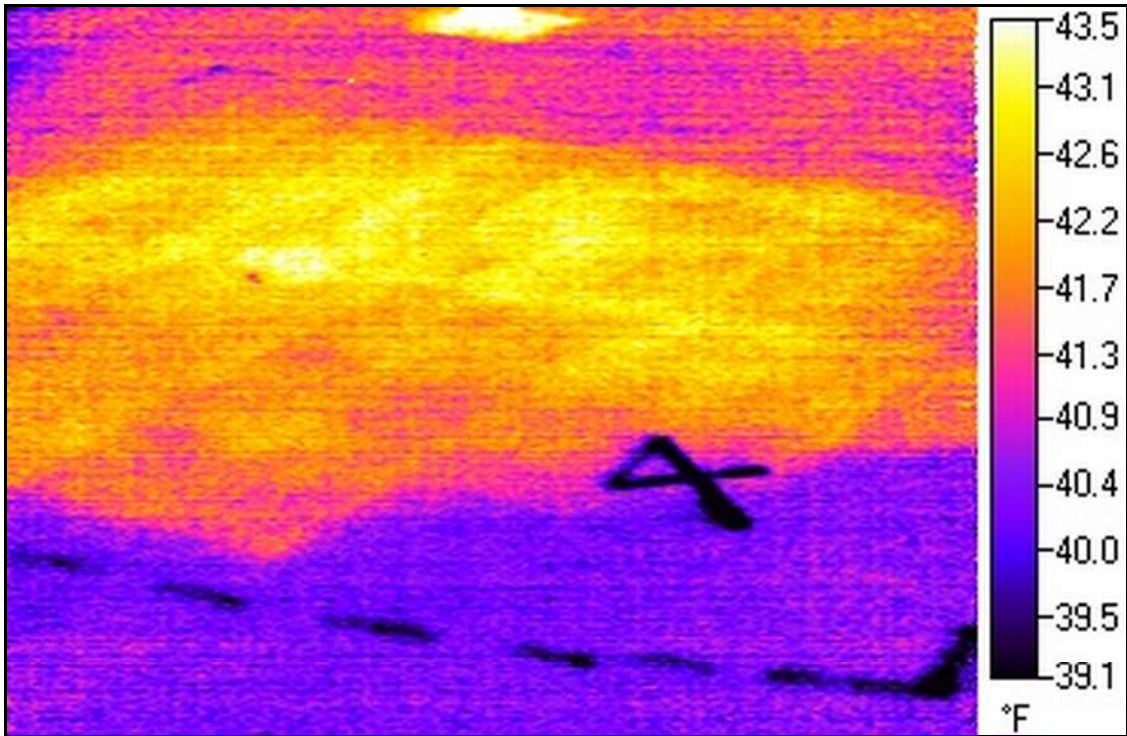
Roof A-Overview, looking South



Roof A-Overview, looking West



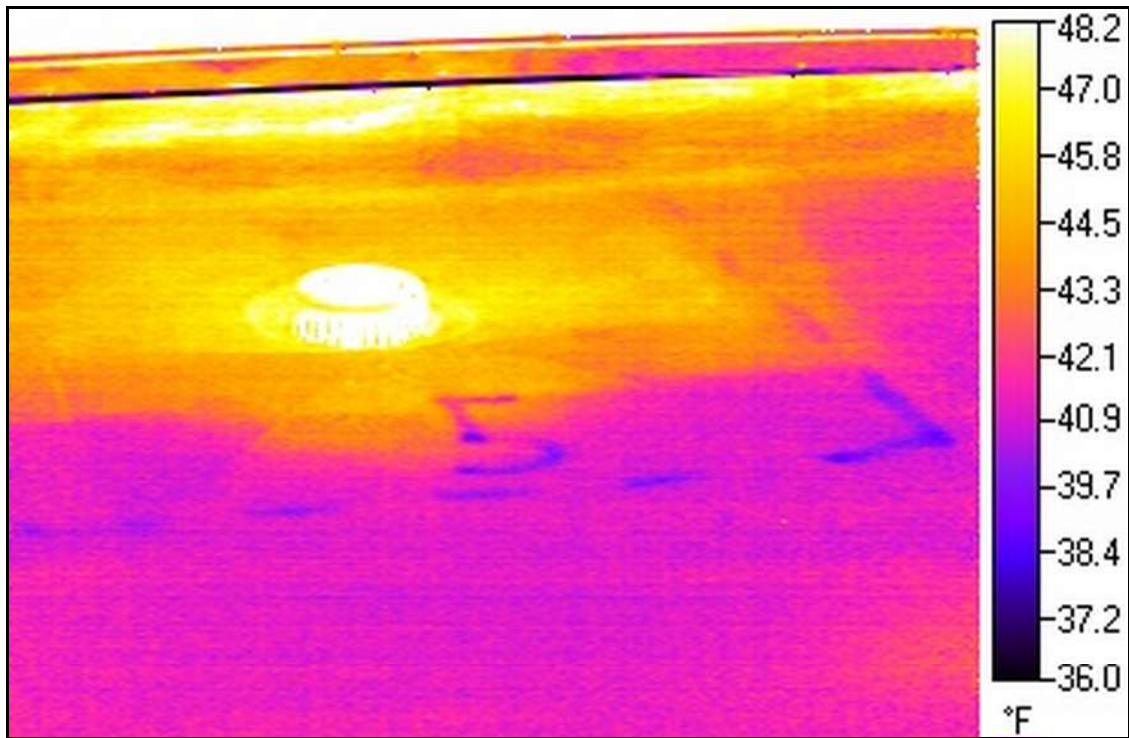
Roof A-Wet Area #4, looking South



Roof A-Wet Area #4, looking South



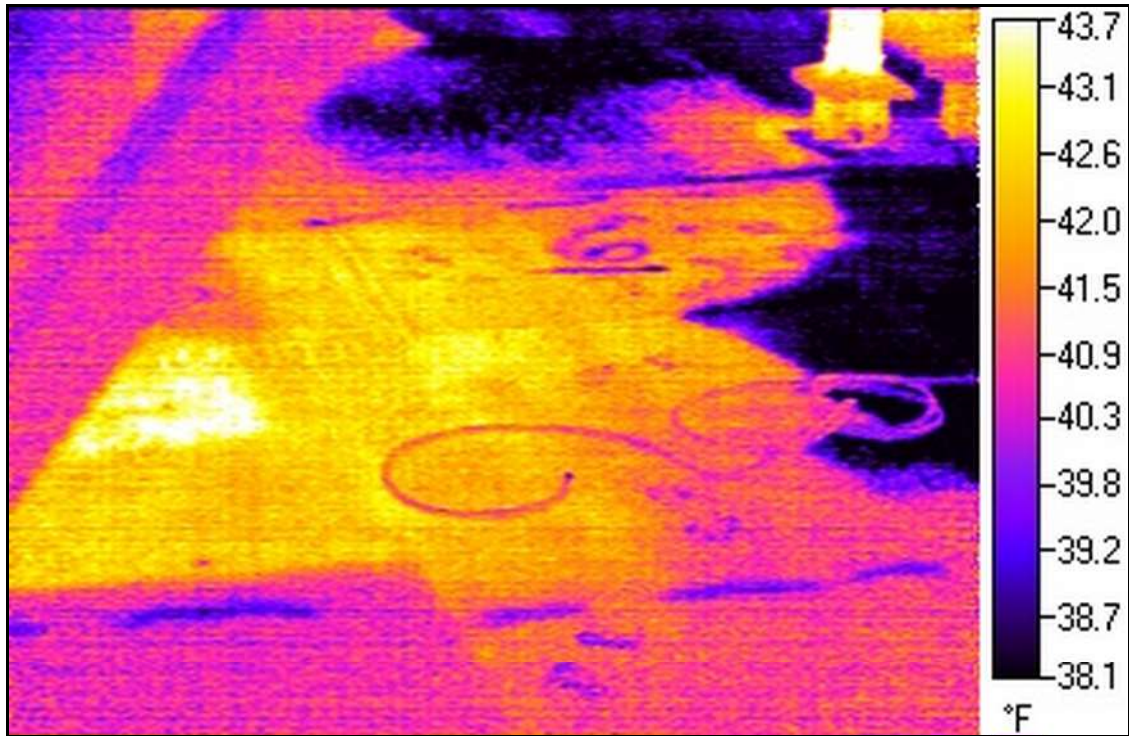
Roof A-Wet Area #5, looking East



Roof A-Wet Area #5, looking East



Roof A-Wet Area #6, looking North



Roof A-Wet Area #6, looking North



Roof A-Wet Area #7, looking South. This wet area was found using a Capacitance DEC Scanner and therefore there is no thermal image available.



Roof A-Wet Area 8, looking North. This wet area was found using a Capacitance DEC Scanner and therefore there is no thermal image available.



Roof A-Wet Area #9, looking North. This wet area was found using a Capacitance DEC Scanner and therefore there is no thermal image available.



Roof B-Overview, looking North



Roof B-Overview, looking East



Roof B-Overview, looking South



Roof B-Overview, looking West



Roof B-Wet Area #10, looking East. This wet area was found using a Capacitance DEC Scanner and therefore there is no thermal image available.



Roof B-Wet Area #10, looking West. This wet area was found using a Capacitance DEC Scanner and therefore there is no thermal image available.



Roof C-Overview, looking North



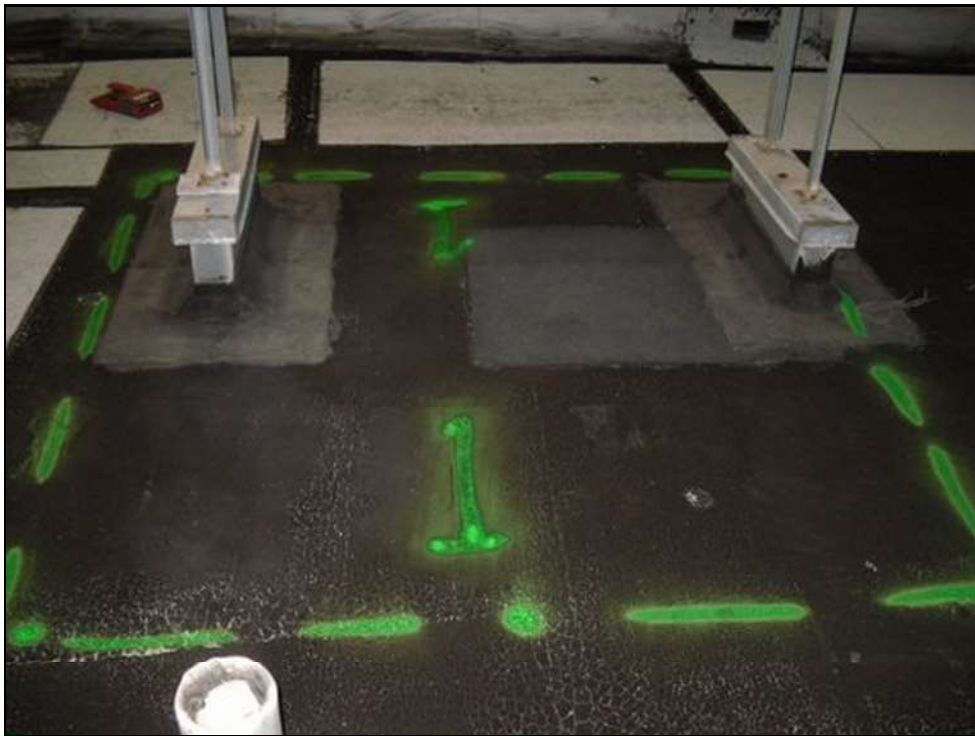
Roof C-Overview, looking East



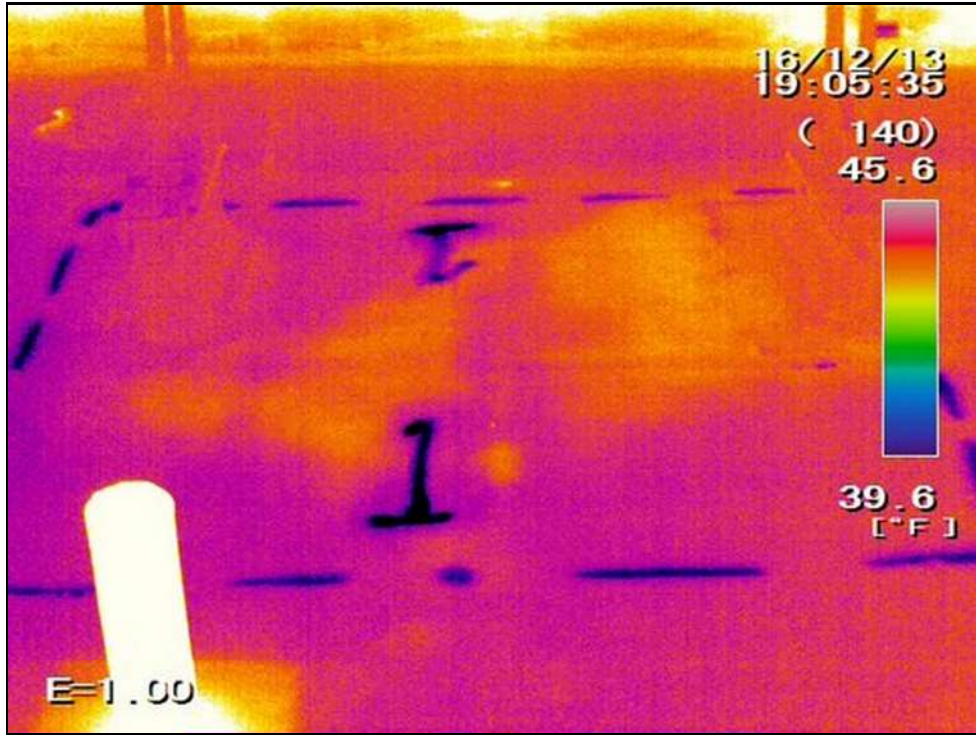
Roof C-Overview, looking South



Roof C-Overview, looking West



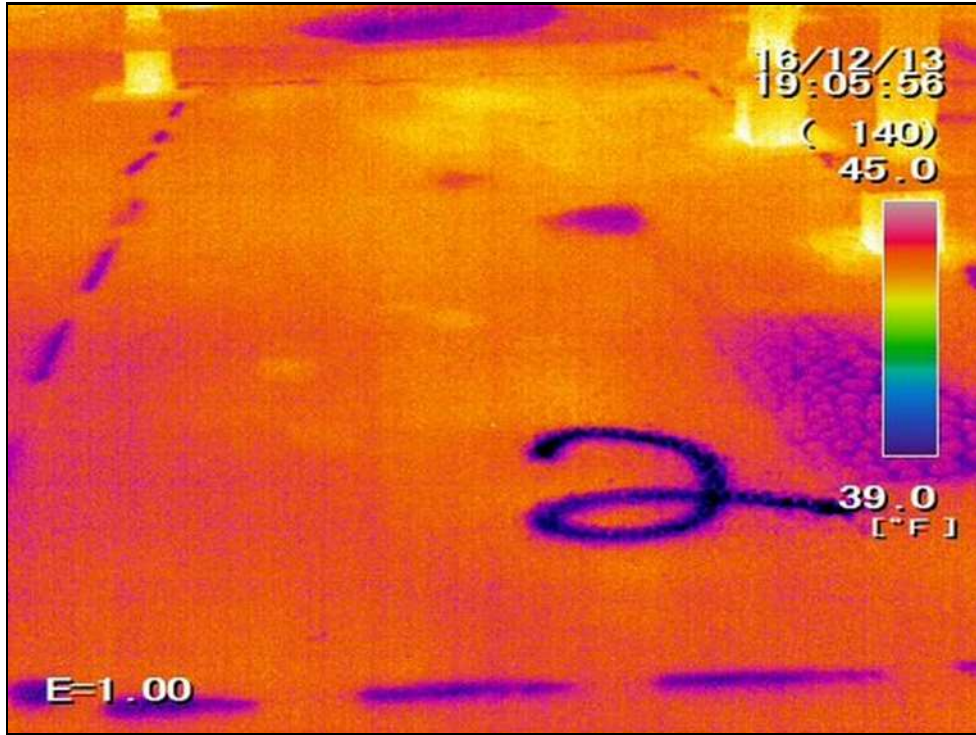
Roof C-Wet Area #1, looking North



Roof C-Wet Area #1, looking North



Roof C-Wet Area #2, looking South



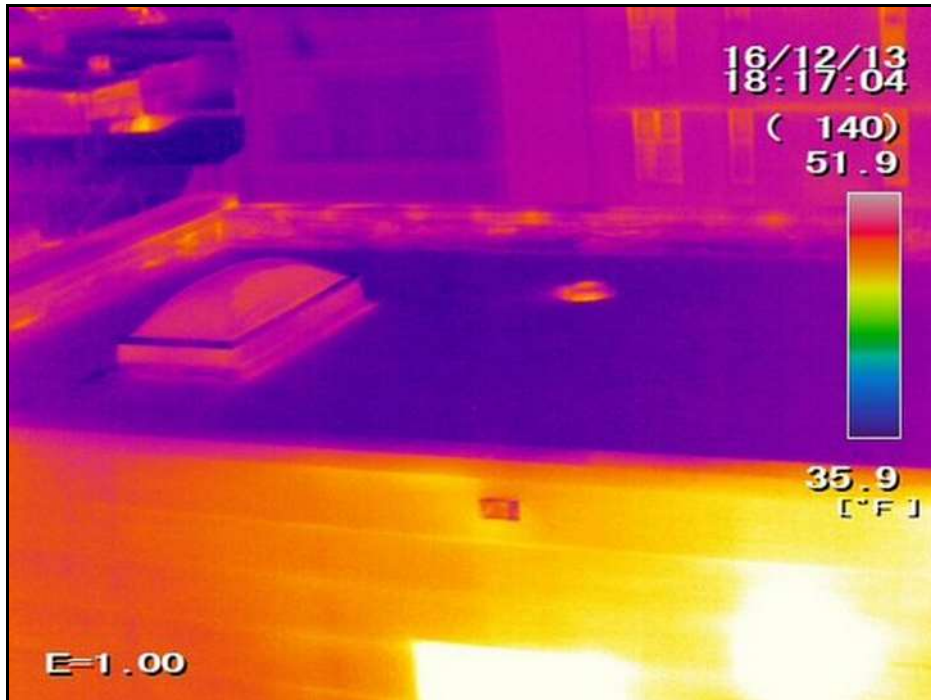
Roof C-Wet Area #2, looking South



Roof D-Overview, looking North



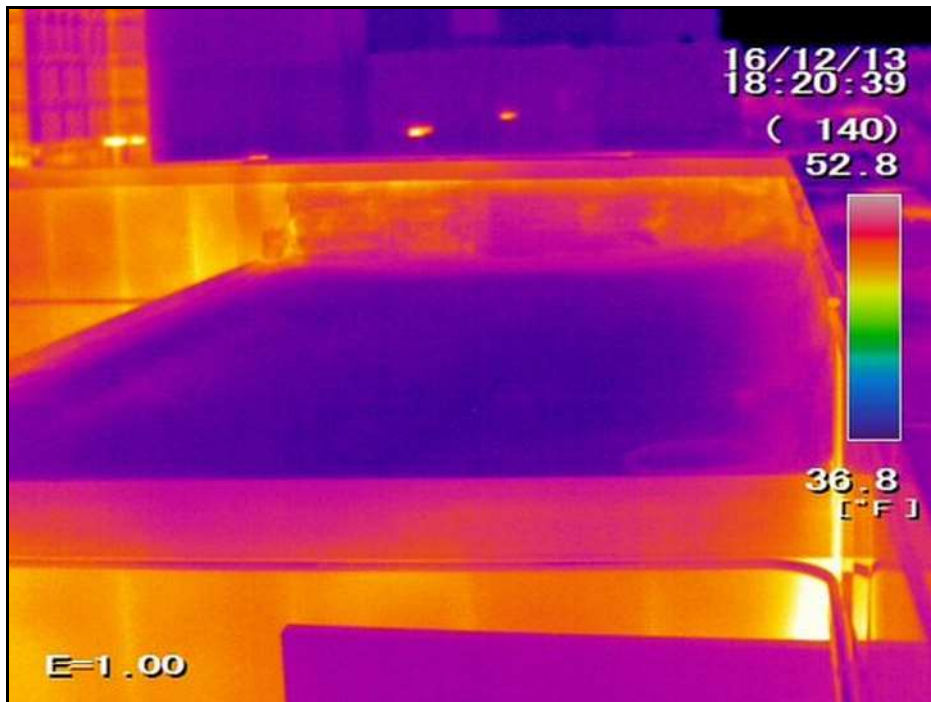
Roof D-Overview, looking South



Roof D-Overview, looking East. No thermal anomalies, consistent with moisture intrusion, were noted.



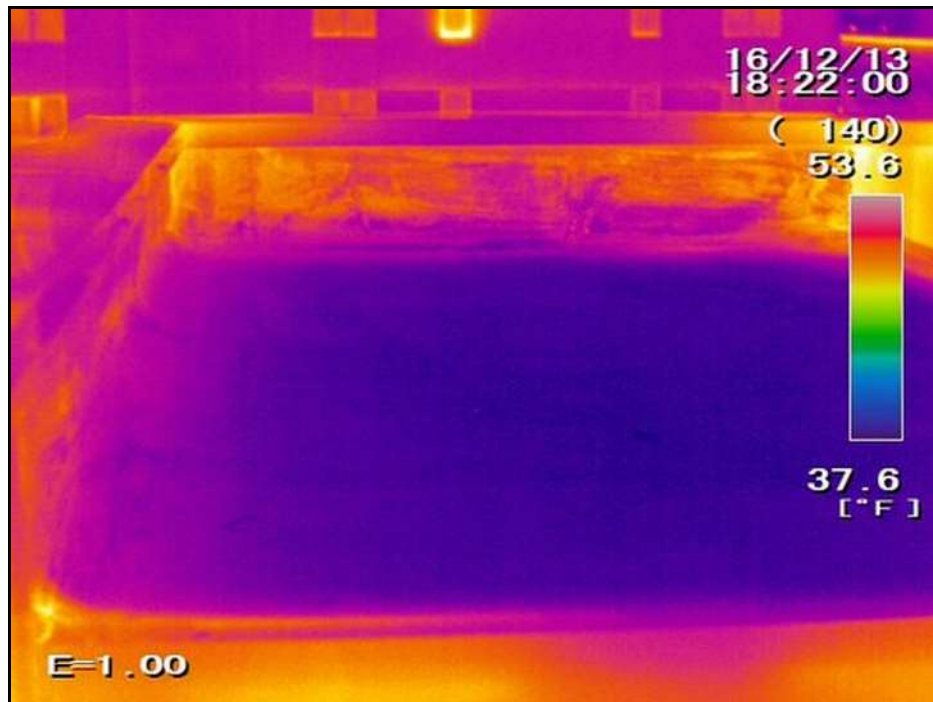
Roof E-Overview, looking North



Roof E-Overview, looking West. No thermal anomalies, consistent with moisture intrusion, were noted.



Roof F-Overview, looking North



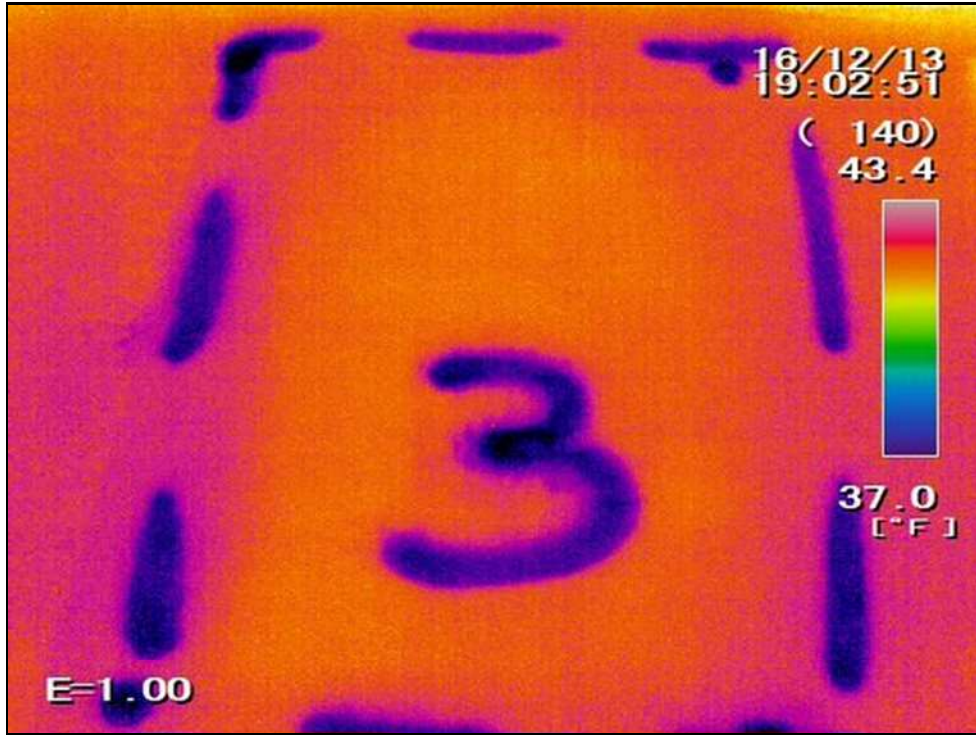
Roof F-Overview, looking East. No thermal anomalies, consistent with moisture intrusion, were noted.



Roof G-Overview, looking South



Roof G-Wet Area #3, looking West



Roof G-Wet Area #3, looking West



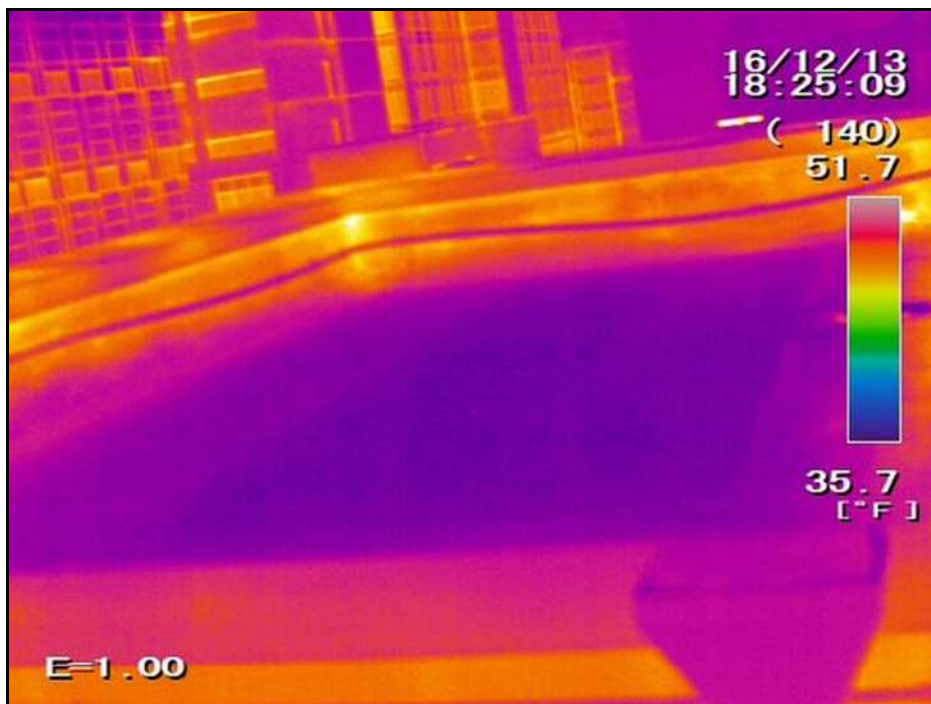
Roof H-Overview, looking South



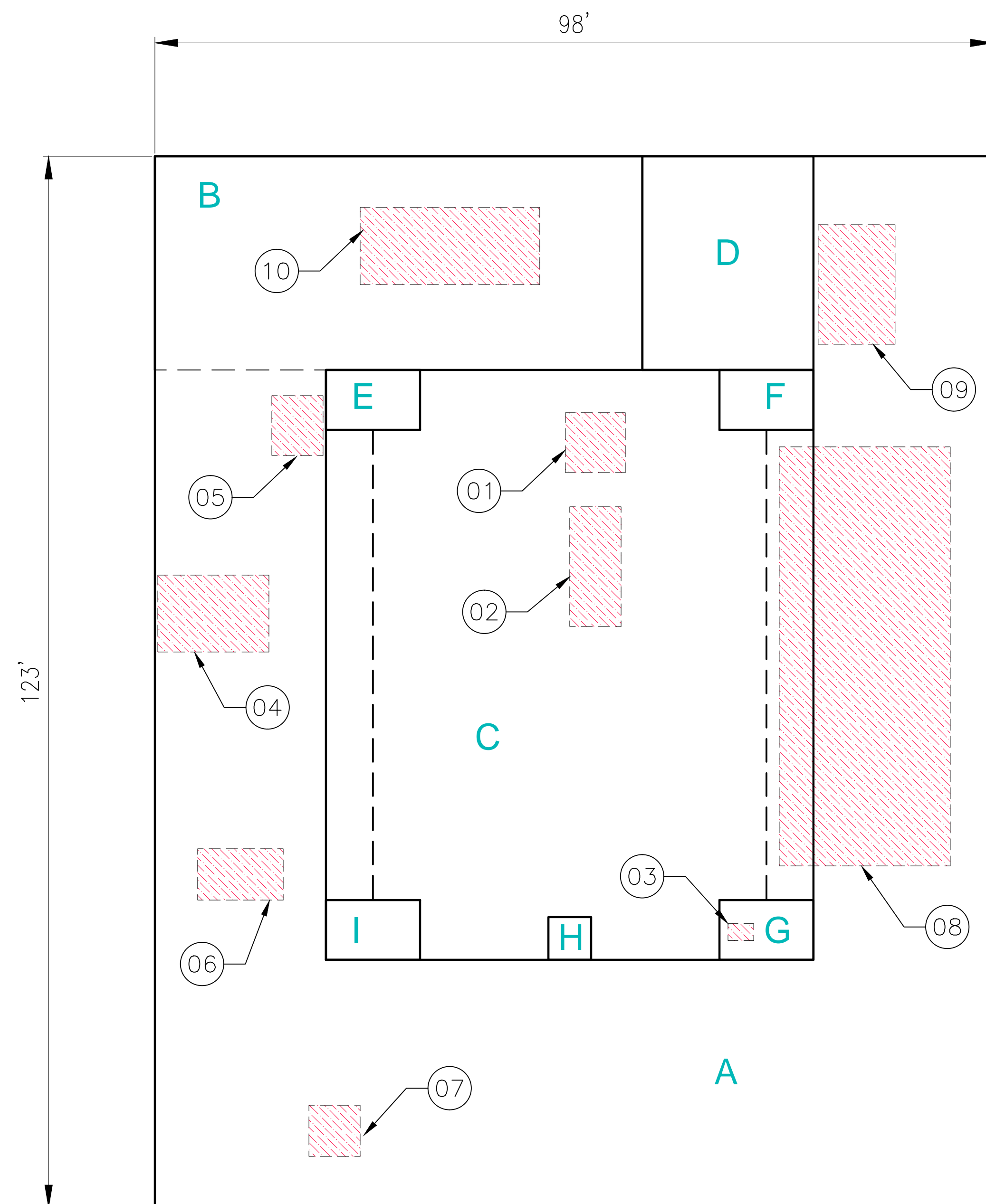
Roof H-Overview, looking East. No thermal anomalies, consistent with moisture intrusion, were noted.



Roof I-Overview, looking South



Roof I-Overview, looking West. No thermal anomalies, consistent with moisture intrusion, were noted.



SUSP. WET AREA = 1689 SQ FT

Area 01:	7' x 7'	= 49 SQ FT
Area 02:	6' x 14'	= 84 SQ FT
Area 03:	3' x 2'	= 6 SQ FT
Area 04:	13' x 9'	= 117 SQ FT
Area 05:	6' x 7'	= 42 SQ FT
Area 06:	10' x 6'	= 60 SQ FT
Area 07:	6' x 6'	= 36 SQ FT
Area 08:	20' x 49'	= 980 SQ FT
Area 09:	9' x 14'	= 126 SQ FT
Area 10:	21' x 9'	= 189 SQ FT

BUILDING ROOF OVERVIEW

- INFRARED SCAN NOTES:
- SUSPECTED MOISTURE AREAS ARE SHADED IN RED
 - CCx = CORE CUT

**UNIVERSITY OF MARYLAND
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TITLE: **ROOF OVERVIEW - INFRARED SCAN**

	INFRARED PREDICTIVE SURVEYS INCORPORATED	DRAWN BY:	DATE DRAWN:	REV:	SHEET NO.
		AJR	12/29/16	0	356A