MID ATLANTIC INFRARED SERVICES, INC.
5309 Mohican Rd. Bethesda, Md. 20816 • 301-320-2870
www.midatlanticinfrared.com • 301-320-2873 fax

Roof Testing Report

CLIENT: ENLIGHTENED MANAGEMENT, INC.

ADDRESS: 10,000 Oak Grove Drive
Wilkensburg, MD 20715

DATE: May 25, 2010
SUBJECT: Roof evaluation of Oak Grove Square

Note: The initial inspection of this roof was conducted in 1997. Following the inspection, the recommended interim repairs were made. Annual infrared inspections have identified new membrane failures, which were then repaired. As a result of the minor expenditures to date, no leaks to the interior have occurred and roof replacement has been postponed indefinitely. The cost savings through this program of timely detection, ongoing minor repairs and follow-up testing have presently yielded savings of over $50,000, with additional savings being realized with each year of additional roof life gained by the program.

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April 4, 1997

Fred Gabor
Property Manager
Enlightened Management, Inc.
10000 Oak Grove Road
Wilkensburg, MD 20850

Dear Mr. Gabor:

This document presents the results of our inspection of the roof at Oak Grove Square, located at the above address. The objective of the inspection was to locate and recommend remedial actions for deficiencies in the roofing system.

The moisture content of the roof was evaluated by means of infrared, nuclear, capacitance and core testing. Four core tests were taken to confirm the test results. A visual inspection was also conducted.

The moisture inspection and confirming core tests indicated that 6% of the roof area contains high levels of moisture penetration. Additionally, 28% of the roof areas contain low level moisture penetration. The visual inspection identified a number of serious deficiencies for the membrane and related components.

We recommend that the several temporary repairs be made to this roof. The cost of the temporary repairs will be less than $6,000. We further recommend that this roof be scheduled for replacement in the within the next two years. We suggest that a four ply IRMA built up roof be installed. Annual moisture testing should be undertaken to monitor roof condition and extend the life of the present roof as long as possible.

The approximate cost of the new roof is estimated to be $ 280,000.

Our findings are presented in detail in the following pages. If you have any questions concerning this inspection or any of our services, please give me a call. We look forward to working with you in the future.

Very truly yours,

Stephen A. Seeber

ROOF DESCRIPTION

BUILDING NAME: Oak Grove Square

BUILDING LOCATION: 10000 Oak Grove Road
Wilkensburg, Maryland

ROOF AREA: 43,722 square feet

ROOF CONSTRUCTION:

BALLAST- None

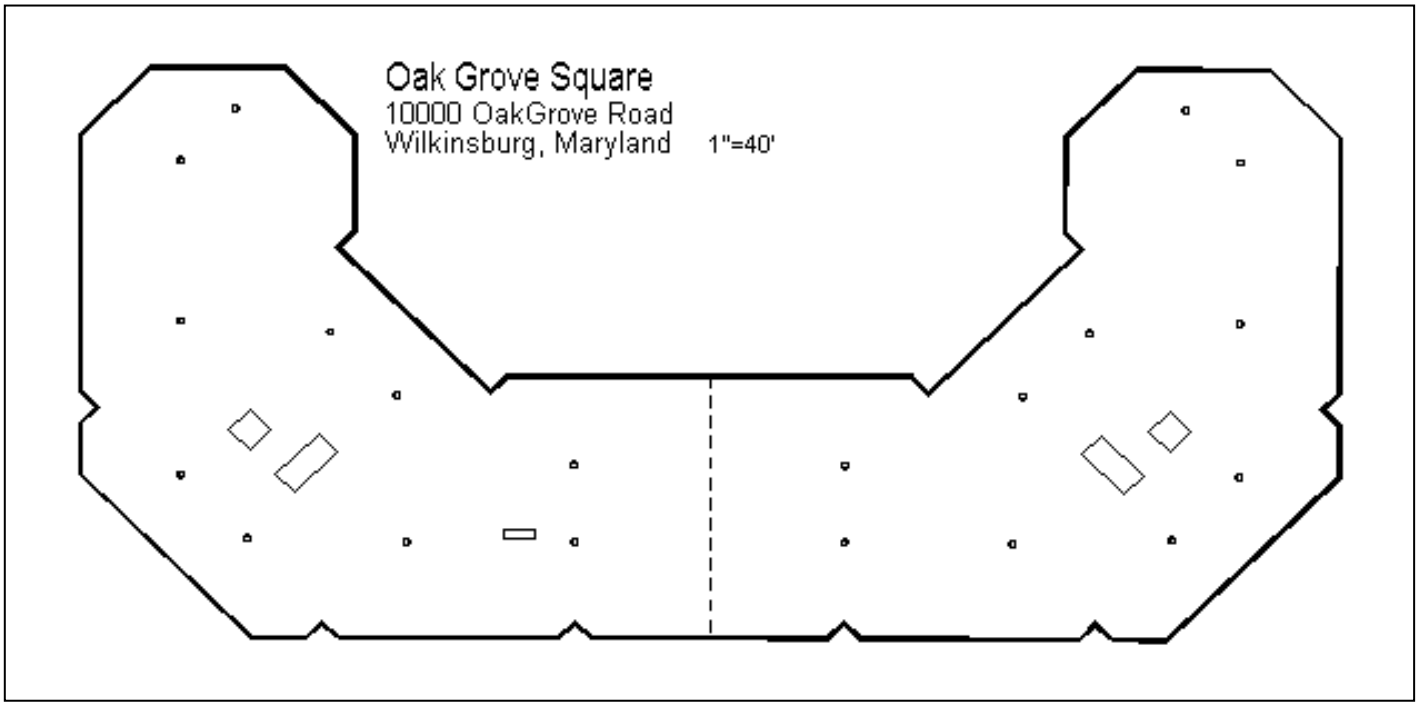
MEMBRANE- Four ply fiber glass felts in asphalt

INSULATION- 1" perlite over 2" isocyanurate

METAL WORK- Aluminum copings and gravel stops

DECK- Concrete

A sketch of the roof plan follows.



MOISTURE INSPECTION RESULTS

The roof moisture survey uses a selection of non-destructive and destructive tests to locate moisture accumulations in the roof system. The non-destructive tests include infrared, nuclear and capacitance. The destructive tests include Delmhorst and core testing. All tests are described briefly, below.

TEST INSTRUMENT DESCRIPTION

INFRARED TESTING--The infrared roof survey locates moisture in a roof by seeking areas of increased surface temperatures. 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 sunsets.

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 bottom of color images. As colors progress to the right, 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 cores and other non-destructive tests. Wet areas found by infrared testing are illustrated with thermograms (photographs of infrared images) that follow this report section).

CAPACITANCE TESTING--The capacitance meter looks like a three foot wide carpet sweeper. It is mounted on wheels and pushed over the roof surface. This meter emits a low energy electric field from two electrodes. When an area of high electrical conductivity is placed within the field, the electric circuit is completed. Moisture in the roof provides areas of higher conductivity than dry roofing elements. This is the most sensitive moisture test and is excellent for locating moisture accumulations in the roofing membrane. The instrument produces a continuous reading, as it is pushed along. Typically, the readings are taken at strips spaced at 10-20 feet.

NUCLEAR TESTING--The device is a small box, approximately 1 foot square. When placed on the roof surface, it emits neutrons into the roof. Roof areas containing moisture reflect these neutrons back to the gauge at a reduced rate of travel. The gauge counts the reflected neutrons. As moisture content increases, the number of reflected neutron count also increases. This produces a higher gauge reading. Readings are taken with this instrument on a grid pattern. When used in conjunction with the infrared test, readings are generally spaced at 20-foot intervals. When used

alone or in conjunction with the capacitance test, readings are taken at 10-foot intervals.

The results of the nuclear test are displayed on the roof drawing. In general, low readings will correspond to dry areas. High readings will correspond to wet area. Occasionally, a reading will be taken at an area of ponded water. This reading will be designated generally by a "p". Some higher counts may be found on the drawing that are not marked as wet. Elevated counts may result of thicker sections of the roof membrane or several other factors. Alternative verification tests are used to identify areas of elevated counts that do not contain wet roofing materials.

DELMHORST TESTING--The Delmhorst moisture meter test is a destructive test because two small electrodes must be driven through the roof membrane. The electrodes induce a small current and measure the electrical resistance of the surrounding roofing materials. Wet areas exhibit lower electrical resistance than dry areas. This instrument permits the location of moisture in the roof sandwich to be determined accurately.

CORE TESTING--Core samples consist of cuts through the roof membrane down to the roof deck. The cuts consist generally of 4" diameter cylinders extracted using a specially made core cutter. The samples provide an absolute test of moisture content and location. The core cuts also permit the constituents of the roof system, and their condition, to be determined. The Delmhorst meter is sometimes used on the roof in conjunction with core samples to confirm the presence of moisture when moisture levels are too low to be perceived by feeling the sample. Core samples may be weighed, dried and reweighed to provide a quantitative measure of moisture content.

TEST PROCEDURES

On the present roof, the moisture inspection used nuclear readings spaced at 20-foot intervals, capacitance testing at alternate 20 or less foot intervals and infrared testing over the entire surface.

TEST RESULTS

The nuclear test identified two areas with high level wetting and one area with moderate wetting. These are wet areas 1, 6 and 2. Infrared and capacitance testing confirmed these areas.

The capacitance test identified extensive wet areas. These areas typically exhibited very low nuclear readings, suggesting low levels of wetting. Cores A, B, C and D were taken in such areas to verify the wetting levels. The core results are as follow:

Core ID	Nuclear Reading	Comments
A	16	Low level wetting in foam
B	16	Low level wetting under membrane and perlite insulation, ridge in insulation
C	15	Low level wetting in perlite, ridge in insulation
D	21	Low level wetting in foam

In each case, low level wetting of the insulation, either perlite or foam, was tangible. Low level wetting, i.e., high capacitance readings with low nuclear readings, are present on about 28% of the roof. These areas are marked on the roof with yellow paint.

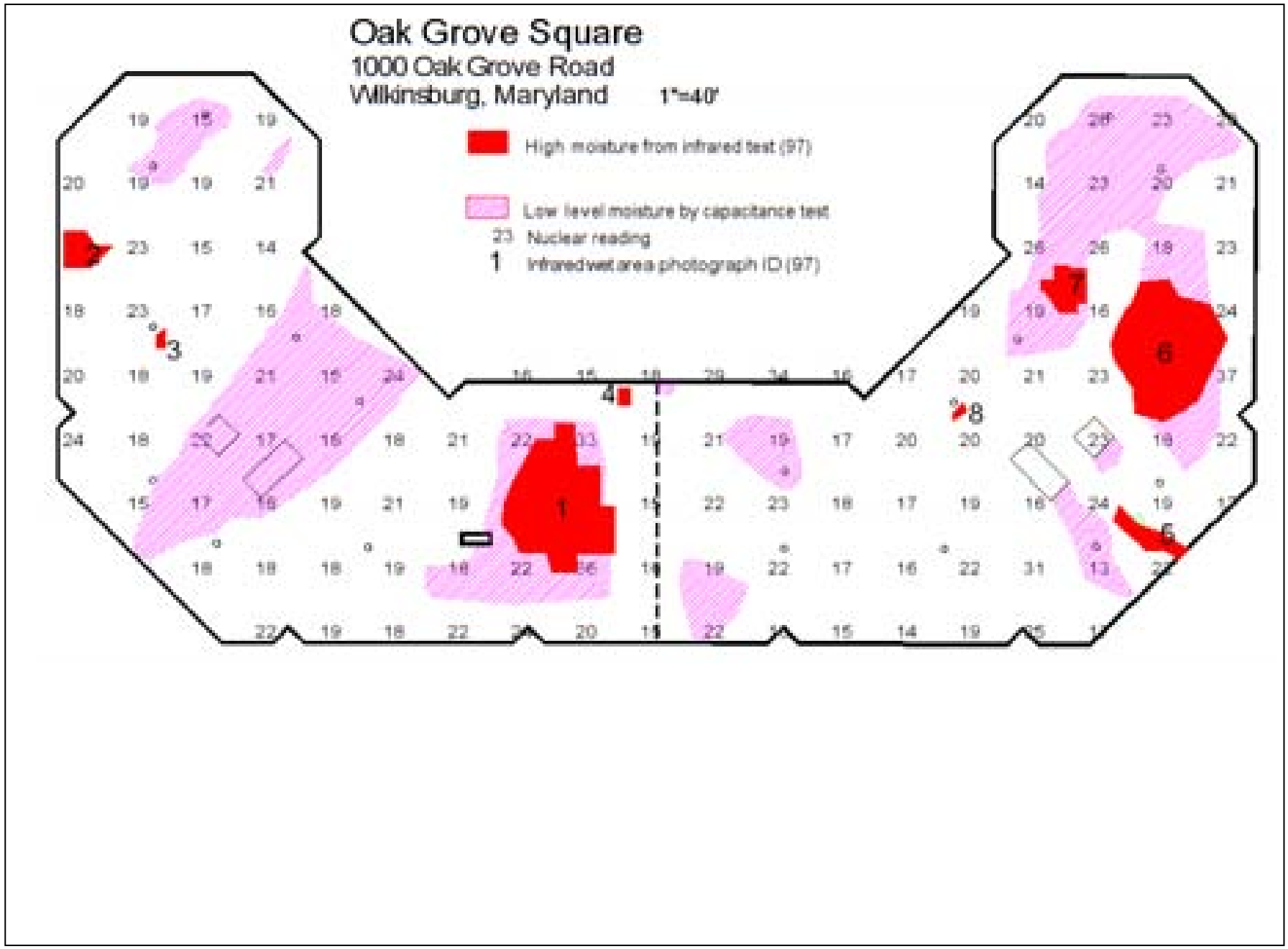
The infrared test identified a total of eight wet areas. Moisture levels varied in these areas as indicated both the temperature of the images (seen at the end of this section) and the nuclear readings. The maximum nuclear reading and approximate size for each area is as follows:

Wet Area	Nuclear Reading	Approximate Area (ft2)	Leak Source
1	79	1052	Likely membrane defects, membrane split and hole at lead drain flashing
2	41	126	Likely membrane defect
3	44	18	Likely membrane defect
4	34	8	Hole in membrane
5	57	123	Hole in membrane
6	61	1081	Prior major split
7	53	157	Likely membrane defect
8	46	10	Drain flashing open

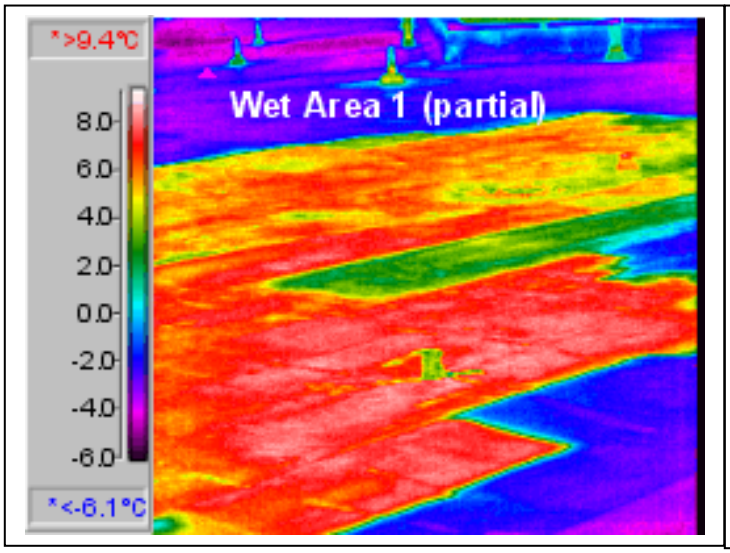
Wet areas identified by both nuclear and infrared testing cover approximately 6% of the roof area.

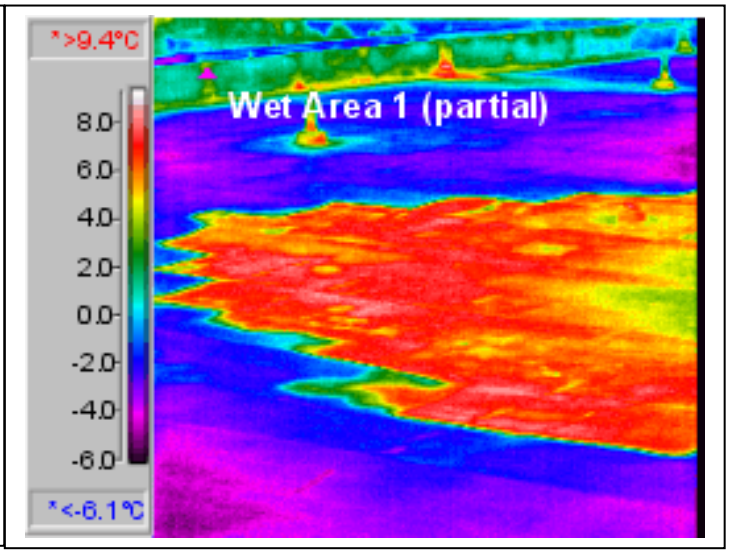
The approximate size and location of all wet areas is shown on the roof drawing, below.

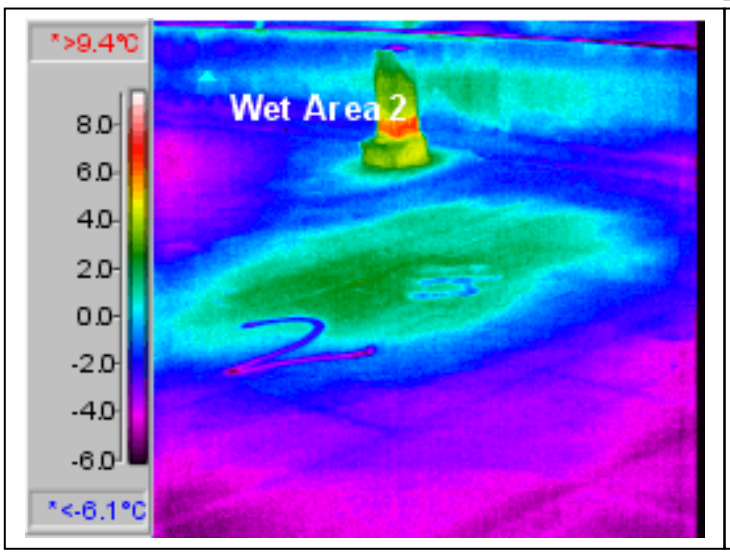
Thermal images for each area follow this roof drawing.

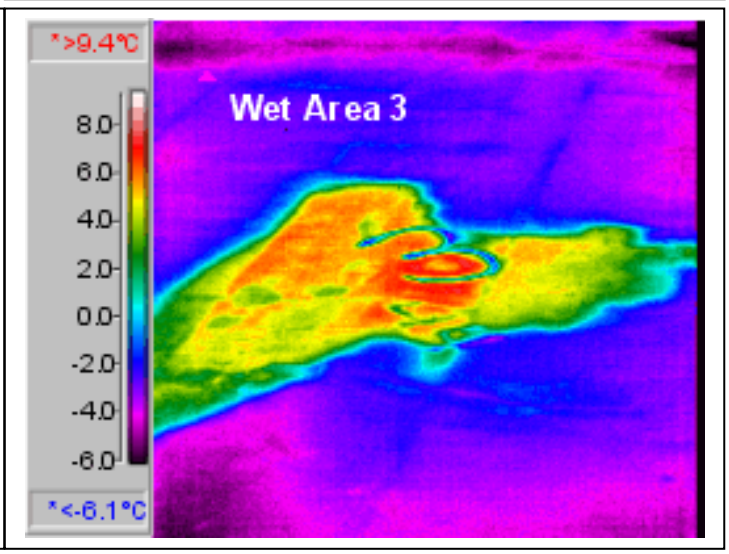

Oak Grove Square
1000 Oak Grove Road
Wilkinsburg, Maryland
1"=40'
High moisture from infrared test (97)
Low level moisture by capacitance test
23 Nuclear reading
1 Infrared wet area photograph ID (97)

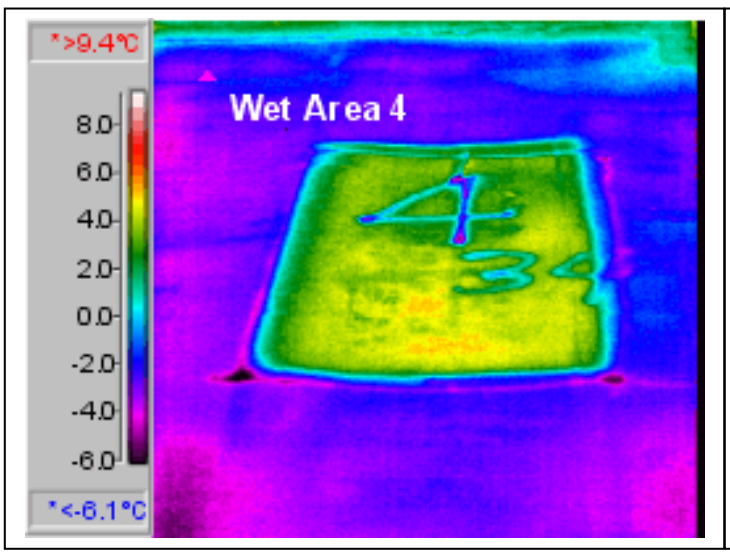
Roof Moisture Images

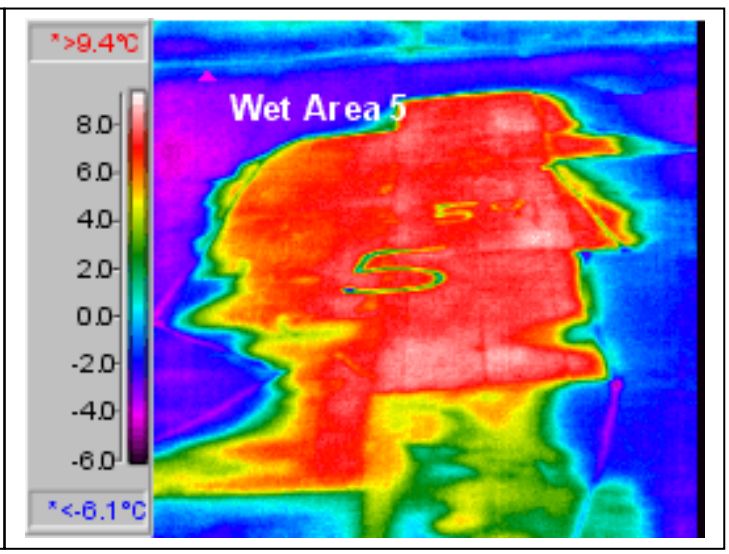












VISUAL INSPECTION RESULTS

A detailed visual inspection of all key roof components revealed a number of roof deficiencies. Some of these problems are currently contributing to moisture intrusion to the underlying insulation. Others are potential sources of leakage in the near future. The problem areas are described below.

Membrane Base Flashings

Overall, membrane flashings are in good condition. However, many cuts and other defects are present. Several corners have cuts that appear to produced by ropes. These cuts are probably the result of ropes used by window washers. A likely rope cut is shown in photograph 1. Various other holes and penetrations were noted. These problems were circled on the roof with red spray paint.

Base flashings at two of the penthouses contain water. Photograph 2 shows water running from a flashing when pressure was applied. Water may be entering the walls as a result of improperly installed scuppers on the elevator penthouses. This will be discussed below.

Numerous pitch pockets are used on this roof at window washer supports. These pitch pockets are stripped with membrane material. The moisture inspection revealed low level moisture around several pitch pockets. One pitch pocket is shown in photograph 3. The strippings are open at two points. When pressure is applied air is released at the fishmouth. The roof insulation in this area contains low level moisture. These stripping defects are the likely water sources.

Pitch Pockets

As stated above, numerous pitch pockets are present on this roof. Many pitch pockets have low fill. Pitch pockets lacking proper fill will trap water and can permit water penetration. Photograph 4 illustrates a low pitch pocket.

Membrane

The membrane consists of four plies of fiber glass felts set in hot asphalt. Visual inspection of the membrane reveals numerous installation defects. These are as follow:

1) The roof contains numerous ridges. Photograph 5 shows a clip board placed on a ridge. This photograph shows the size and steepness of a ridge. These ridges are located at both high and low spots in the roof. Ridges may contain wet or dry insulation. The ridges have been reported to be the location of prior roof splits (for example, wet area 6 resulted from a split at a ridge). We made a total of three test cuts

at ridges. Photographs 6 and 7 show two of the cuts. A third cut was made where a roof split was found (in wet area 1). In each case, the underlying isocyanurate insulation is not adhered to the concrete deck. The deck was primed but little or no asphalt was applied between the deck and insulation.

Based on these areas, we believe that the roof insulation is not properly secured to the deck. This is permitting differential movement between the insulation and membrane as the roof membrane heats and cools. This movement is causing the insulation to bend upward in response to stresses imposed by the moving membrane. As past splits have demonstrated, the forces imposed on the membrane at the ridges can produce disastrous roof splits. We expect that movement of the membrane will continue to produce more and larger ridges and produce ongoing roof splits.

2) The membrane felts are improperly installed. When the membrane felts are installed, wrinkles can form as the felts are unrolled unevenly. When this occurs, the felt is cut to remove the wrinkle. Next, the felt installation continues, lapping, the cut at the former wrinkle. On the present installation, there is little evidence that wrinkles were corrected during installation. The roof membrane contains numerous fishmouths. These fishmouths are the result of wrinkles in the membrane felts. Where the wrinkles extend to the edge of the top ply, water can enter between the plies Many fishmouths are present that extend under several plies. Photograph 8 shows a fishmouth that extends through 6 plies. Photograph 9 shows a fishmouth that extends through at least two plies. Fishmouths on this roof are widespread, providing ample evidence of a improperly installed membrane with many opportunities for water penetration.

3) Asphalt bitumen was improperly applied. The asphalt bitumen is the water-proofing element of the membrane. The fiber glass felts provide strength. If asphalt is improperly applied, the membrane will have diminished water proofing characteristics. Inspection of the roof reveals that numerous felt laps do not contain minimal asphalt bitumen. At these laps, the felts may be readily lifted, exhibiting little or no adhesion to the underlying felt. At several core samples, we pulled the felts apart. We found little asphalt betweeen the felts. In addition, the felts were brittle and weak. We believe that the asphalt on this roof was applied at excessively high temperature. Excessively high application temperatures result in a thin, runny asphalt. When mopped, the asphalt is easily spread spread too far, producing a water proofing layer of inadequate thickness. The high temperatures can damage the felts, producing a brittle, weakend, material. Thus, as a result of excessively hot asphalt, inadequate quantities of bitumen will be present between each ply, producing insufficient adhesion and diminished water-proofing. Evidence of this problem is widespread. Photograph 10 shows one of several areas where the top felt was ripped away, exposing the underlying felts. Photographs 11 and 12 show numerous open laps. When properly mopped, asphalt will extend beyond the laps. Photograph 13 shows another area of unadhered felt.

4) The roof membrane was surfaced using a coating rather than aggregate. Aggregate surfacing provides a better wear and traffic surface and provides improved protection against damaging ultraviolet radiation. Aggregate is generally the preferred surfacing

for a built up roof. When aggregate surface is not feasible, then a smooth surfacing coating material can be applied. These coatings wear over time and require periodic renewal. These coating on this roof has become very thin. In several areas, the fiber glass fibers of the roofing felts are visible. This is seen in photograph 14.

We believe that inadequate moppings of asphalt and widespread fishmouths are responsible for much of the low level wetting found by the roof moisture survey. These types of defects are probably responsible for high level moisture penetration at wet areas 2, 3 and 7.

Roof Drains

Roof drain flashings are compromised at several areas. Photograph 15 shows a hole in the lead flashing at a drain. This is located at a drain in wet area 1. Photograph 16 shows a split in the strippings at the drain adjacent to wet area 8. Loose drain flashings were noted at several drains. Drain flashings are critical. During heavy rains, water levels at the drain will rise. Defects and flashings and strippings can permit water to penetrate to the underlying insulation.

Expansion Joints

An expansion joint is present on this roof. The joint is actually a control joint, since it has no provision for expansion (no bellows or other type of mechanical expansion mechanism is present. According to the structural drawings, there is no expansion joint in the slab under the expansion joint. Thus, although the roof extends approximately 400 feet from end to end, there is no provision for expansion control.

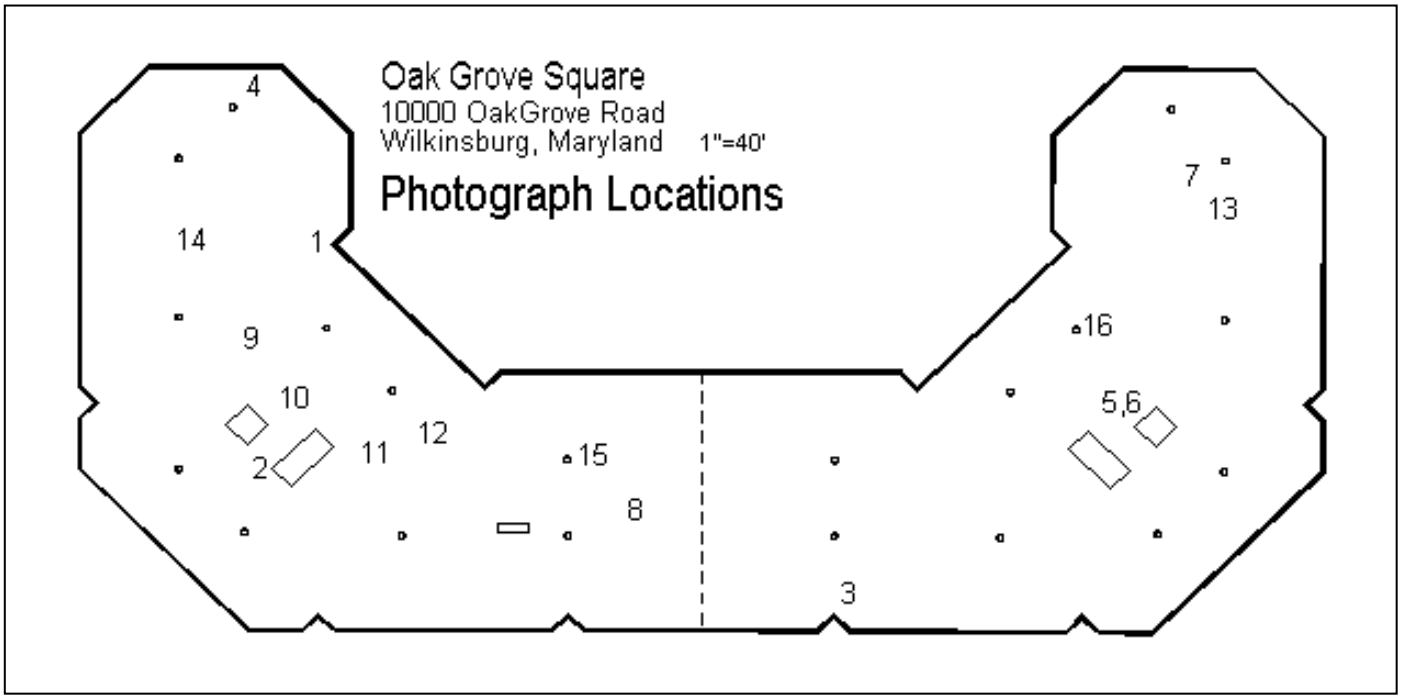
Metal Work

Metal work is in generally acceptable condition.

Other Items

The elevator penthouse are drained through scuppers. The scuppers are formed from lead drain flashings. These scuppers are improperly formed and sealed. Open gaps are visible in the gravel stops under the edges of the lead scuppers. If the penthouse walls are block construction, water can flow down the blocks. This may explain the presence of water trapped behind some of the elevator penthouse flashings (see photograph 2).

Photographs

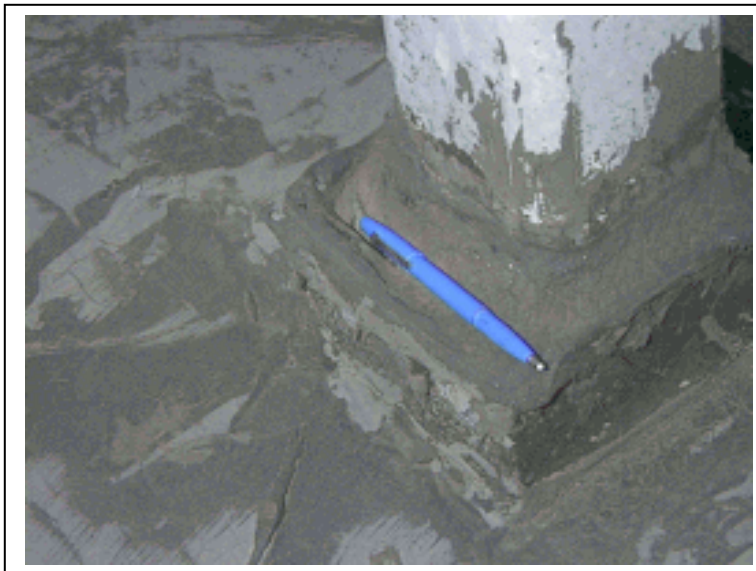


Photographs

Photograph 1-Rope cut in flashing

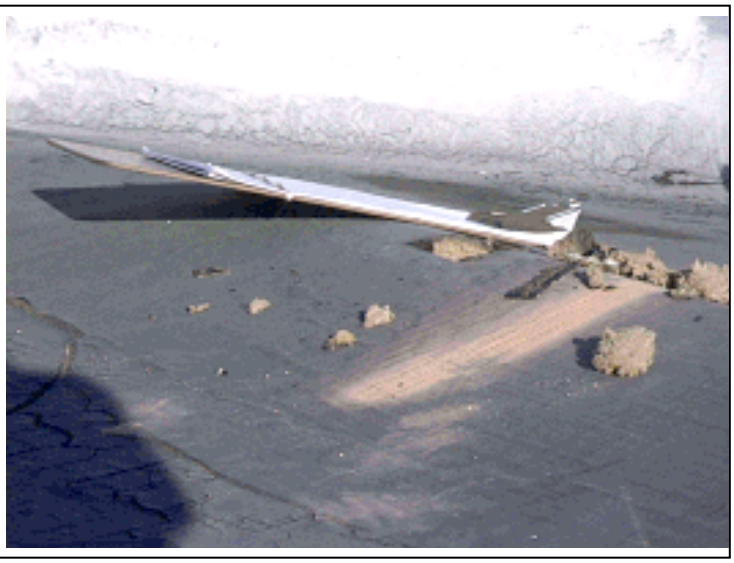
Photograph 2-Water trapped behind flashing

Photograph 3-Penetrations at pitch pocket stripping



Photograph 4-Low pitch pocket fill

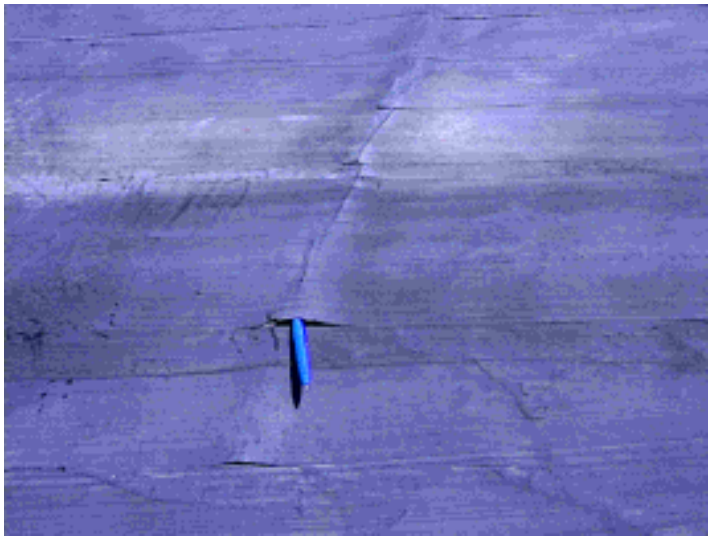
Photographs



Photograph 5-Ridge in insulation

Photograph 6-Void under insulation at ridge

Photograph 7-Void under insulation at ridge



Photograph 8-Fishmouth through several plies

Recommendations

The roof evaluation has revealed several significant problems in this roof, all resulting from improper installation. These are summarized below:

1) The roof insulation is not properly secured to the deck. As a result, expansion and contraction of the membrane has caused the insulation to bridge at various areas. This in turn has placed excessive forces on the membrane, causing membrane splits. We expect that this condition will continue to develop and cause additional roof failures.

2) The membrane is improperly installed. The felts were installed without correcting wrinkles in the plies. This has resulted in many fishmouths that span one or more plies and can permit water penetration. In addition, the asphalt bitumen appears to have been applied at excessive temperatures. This has resulted in poor adhesion between plies, poorly sealed end laps and undoubtedly reduced water proofing qualities. We believe that membrane installation errors are responsible for low level water penetration found throughout the roof.

The major deficiencies on this roof cannot be economically corrected. In the short term, the most serious threats to the roof are posed by splits at the membrane ridges. In the long term, we expect the rate of water penetration to increase at membrane defects.

We recommend that immediate steps be taken to reinforce the roofing at all ridged areas. At each ridge, we recommend that a reinforcing patch consisting of a full roll width of modified bitumen roofing be torched over the existing ridge. The material will be Nordpoly 4B or equivalent. The existing membrane will be cleaned and primed with asphalt primer prior to installation of the reinforcing patches.

We also recommend that the drain flashings at wet area 1 (hole in the lead flashing) and wet area 8 be repaired. The membrane punctures at wet areas 4 and 5 should be repaired. Cuts in the flashings can also be repaired. All of these can be temporarily repaired with patches of fabric and asphalt based roof cement.

We estimate that the cost of reinforcing patches and minor repairs will be less approximately $5,500.

At this time we recommend no further repairs for this roof. We believe that further membrane failures will occur due to the membrane installation deficiencies. The only long-term solution for these deficiencies is roof replacement. We recommend that roof replacement be undertaken in the next 2 years.

Prior to replacement, moisture surveys should be undertaken annually to monitor degradation. The surveys may permit timely repairs and extend the useful life of the present roof beyond two years.

We recommend that a 4-ply fiber glass membrane be installed in an Inverted Roof Membrane Assembly (IRMA) configuration. With an IRMA configuration, the membrane is adhered in asphalt directly to the concrete roof deck. The membrane is covered with Dow RM (or equal) polystyrene insulation. The insulation and covered with filter fabric and entire assembly is covered with rock ballast. The IRMA membrane offers several advantages:

1) The membrane is solidly adhered to the concrete deck. Thus, even if the membrane were punctured, the water could not travel under the membrane and a leak to the interior would be extremely unlikely.

2) Since the membrane is covered with insulation, it is not subject to heating and cooling from solar loads or temperature swings. The membrane is maintained year round at approximately building temperature. This minimizes or eliminates thermally induced movement forces on the membrane. This is very important for this roof, given the large roof expanses with no expansion joints.

3) The insulation and rock completely protect the roof membrane from foot traffic and exposure to ultraviolet radiation.

The roof will be installed as follows. This is a directive type specification to outline the installation procedures. Upon request, we can provide a complete bid package containing detailed specifications and all bid documents.

1) Lower all existing roof drains to be flush mounted with the structural concrete deck.

2) Completely remove the existing membrane and insulation down to the structural deck.

3) Apply a quick drying asphalt concrete primer to the exposed deck.

4) Install four plies of fiberglass felts set in 30-pound moppings of type II asphalt.

5) Remove existing metal cap flashings, gravel stops and copings. Install new cant strips. Install modified bitumen base flashings at all curbs and parapets. Parapet flashings will run up the parapet wall and 4" over the top of the parapet. The flashing will be nailed along the top of the parapet at 6” intervals. The existing wood nailer may be retained for fastening the flashing.

6) Install new lead flashings at all drains.

7) Install new stainless steel pitch pockets where necessary.

8) Remove existing elevator penthouse gravel stops. Install new stainless steel gravel stops using the original gravel stop as a continuous runner.

9) Install new scuppers, downspouts and splash blocks at elevator penthouses.

10) Install new Kynar finished aluminum copings. Finish will match existing as closely as possible. Copings should be installed in continuous runners.

11) Apply a 30-pound glaze coat over the entire roof surface.

12) Install R-10 extruded polystyrene insulation over the entire roof.

13) Install filter fabric over the insulation.

14) Install 3" river rock ballast at a rate of 12 pounds per square foot.

15) Install concrete pavers to provide walk surfaces. Locations of pavers will be determined. Pavers shall be 2' by 2' by 2" and rated for at least 2500 psi.

16) Provide a 10-year manufacturer's material and labor warranty.

Note 1: Roofer should have on hand a drying apparatus to dry exposed concrete where wet insulation is present. A propane torch is acceptable.

Note 2: Only remove as much existing roofing each day as can be replaced each day. A water cut-off will be installed at the end of each day, sealing off the new roofing from the existing roofing.

Note 3: All debris will be removed from the property each day.

Approximate cost of new roof: $280,000.