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ROOF CONSULTANTS

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September 7, 2022

Darryl S. MacDonald, Manager of Court Facilities – Region 1
Commonwealth of Massachusetts Trial Court
Office of Court Management
Facilities & Capital Planning
Roderick L. Ireland Courthouse
50 State St.
Springfield, MA 01103

Subj: Roof Moisture Survey
Roderick L. Ireland Courthouse
50 State St.
Springfield, MA

Dear Mr. MacDonald:

On July 26, 2022 we conducted a roof moisture survey of the main roof area totaling utilizing a Flir E-95 infrared camera, and a Tramex RWL capacitance meter. We returned to the site to conduct a capacitance moisture survey of the main penthouse on August 25, 2022 and of the lower east canopy roofs on September 1, 2022. Total roof area surveyed: 55,401 sq. ft. (Photos 1-3).

Weather conditions of infrared survey (7/26/22):

- Beginning: Clear, 79°F, NW8, Dew Point - 55°F1.
- End of Survey: Clear, 71°F, NW3, Dew Point - 58°F.

Roof Assembly: According to plans developed by Gale Engineering for the 2005 reroof and confirmed by our test cuts and ultra-sonic measurements, the roof assembly is composed of a reinforced 60 mil PVC membrane (actual thickness 0.050 in.) adhered to a ½ in. thick glass-reinforced gypsum coverboard. The coverboard is adhered to one layer of 3 in. thick polyisocyanurate insulation with beads of low-rise foam adhesive. The insulation is adhered to a bituminous vapor retarder which is adhered directly to a concrete roof deck with hot asphalt. Current aged insulation "R" value of 3 in. thick insulation is 17.4.

Warranty Information
Roof manufacturer: FiberTite, Wooster, OH
Warranty Number: 20060234
Warranty date: 4/11/2006
Warranty length: 15 years
Contractor: Titan Roofing Inc., Springfield, MA

Survey Findings. During our surveys we located 9 areas containing anomalies – indicating at the time of the survey moisture was present within the assembly totaling 824 sq. ft. or 1.5% of the total roof area (Photos 4-19). A test cut into Wet Area #2 (southeast corner) indicated that the coverboard was wet and decomposing (Photo 20); but the insulation below was dry. A patch had been installed over a previous puncture within the wet area.

In addition to wetted areas, we observed a small section of roof (northeast section of balcony roof) has become unadhered to due wind uplift (Photo 21). Capacitance readings indicated that the coverboard below the membrane was dry. As a preventive measure, we recommend mechanical attachment of this area with two 1 in. wide termination bars attached to the deck on 6 in. centers, 3 ft. apart. Bars would be stripped watertight with PVC membrane heat welded to the existing membrane.

After two inches of continuous rain on September 7, 2022, Mr. Leibinger and I toured previous leak areas. We did not find any leakage associate with the roof. However, we did discover a leak at a center horizontal mullion along the shed skylight installed along the east elevation in the Probate administrative area (Photo 22).

Observations.

- Positive drainage within all areas of main roof/penthouse (some ponding on sections of balcony roof). 55 roof drains with 4 in. outlets (Photo 23).
- All drain bowls appear to have been replaced during 2005 reroof. Polyethylene dome strainers (Photo 23).
- Secondary drainage through parapets installed during 2005 reroof (Photo 24).
- Small section of 0.040 aluminum coping cap unlocked from cleat on west elevation of mechanical room penthouse (Photo 25).
- Numerous patches made on uncleaned membrane. Patches appear to be working despite lack of cleaning (Photo 26).
- Numerous column caps have been reflashed as well as several areas along perimeter parapet (Photo 27).
- Insulation sumps at roof drains caused installing contractor to cut roof membrane (to remove possible wrinkles) and patched. All patches functioning watertight. (Photo 28).
- Surface mounted counterflashing at rising wall flashings (Photo 29).
- Two condensers at north elevation have piping entering building through one pitch pan (Photo 30).
- Condenser not mechanically attached to structure (Photo 30).
- Fixed ladder leading to roof hatch of mechanical room penthouse roof has rungs spaced at 14 in. instead of normal 12 in. ((Photo 31). Uncomfortable and unsafe.
- Self-retracting gate missing on safety railing surrounding roof hatch (Photo 32).
- Stairs leading from four access to canopy roof cover drains preventing debris cleaning (grating must be removed to facilitate any cleaning) (Photo 33).
- Stair bottom bolted to 2x blocking setting on walkpad (Photo 34). Construction blocks drainage.
- Trench drain grating on main entrance plaza (before stairs) require cleaning. Most openings blocked (Photo 35).

Roof Condition/Recommendation. Overall, the roof is in good condition despite its age. If repairs are made, one could reasonably expect the service life of the roof could be extended an additional 15-20 years.

We recommend the following repairs:

- Removal and replacement of coverboard and insulation within 9 wetted areas.
- Mechanically attach membrane roofing to deck with termination bars on northeast portion of balcony roof.
- Replace fixed ladder leading to roof hatch.
- Replace roof hatch safety railing.
- Replace polyethylene drain strainers with cast iron. Install roof drain markers at each drain (Photo 36).
- Cover existing patches over uncleaned membrane with either heat-welded patches or addition PVC membrane adhered to existing roof. All edges to be heat welded to existing membrane.
- Mechanically attach condensers to sleepers and attach sleeps to roof deck.
- Replace pitch pan with roof penetration housing (Photo 37).

Budget.
Estimated budget for recommended repairs: $60,000-70,000.

Please call if you have any questions.

Sincerely yours,

Thomas A. Ewing, RRC
IIBEC Registered Roof Consultant

PHOTO 1

General view of main roof looking west/north from southeast corner.

PHOTO 2

General view of nechanical room penthouse roof looking east.

PHOTO 3

Capacitance meter indicating wetted material below membrane.

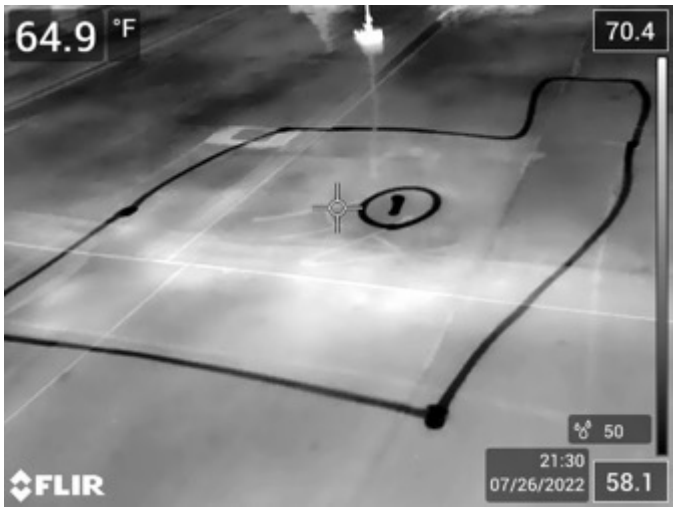

PHOTO 4

Thermogram. Wet Area #1.

PHOTO 5

Daylight photo Wet Area #1.

PHOTO 6

Thermogram. Wet Area #2.

PHOTO 7

Daylight photo Wet Area #2.

PHOTO 8

Daylight photo Wet Area #3.

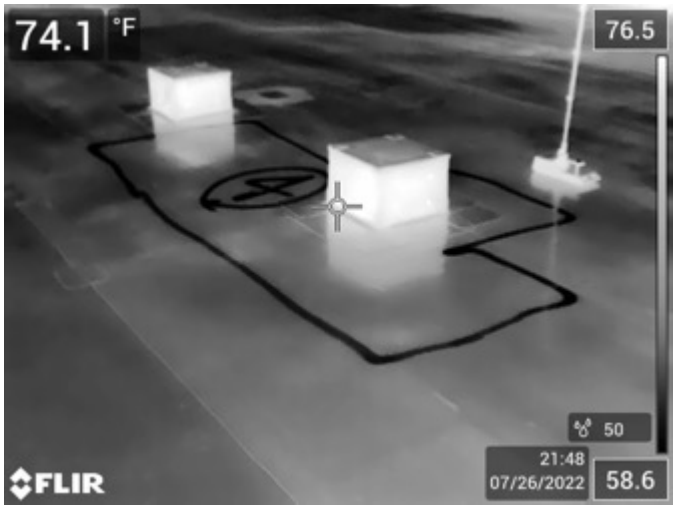

PHOTO 9

Thermogram. Wet Area #4.

PHOTO 10

Daylight photo Wet Area #4.

PHOTO 11

Thermogram Wet Area #5.

PHOTO 12

Daylight photo Wet Area #5.

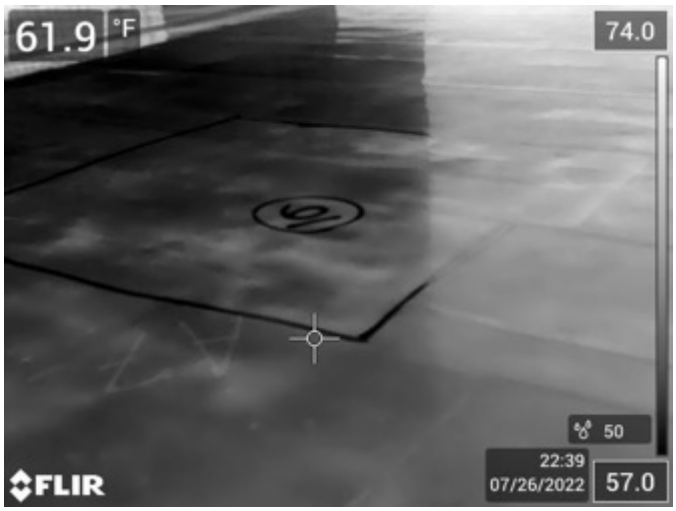

PHOTO 13

Thermogram. Wet Area #6.

PHOTO 14

Daylight photo Wet Area #6.

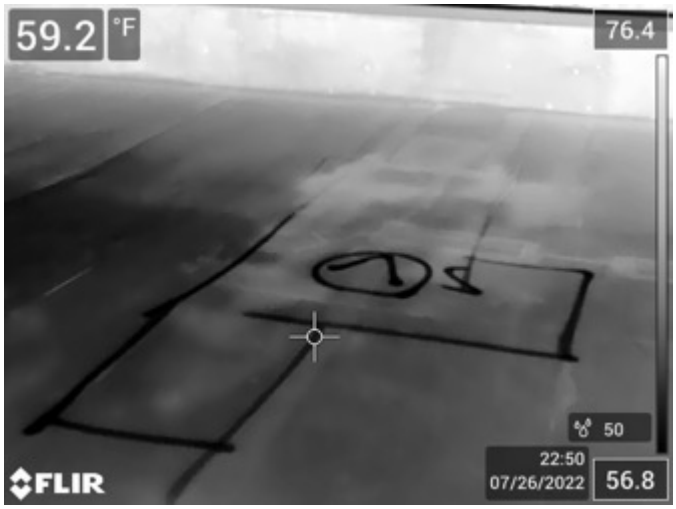

PHOTO 15

Thermogram. Wet Area #7.

PHOTO 16

Wet Area #7.

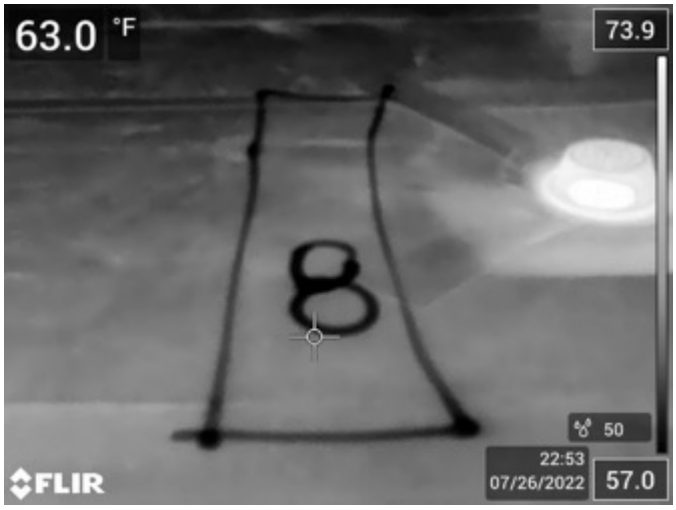

PHOTO 17

Thermogram. Wet Area #8.

PHOTO 18

Wet Area #8.

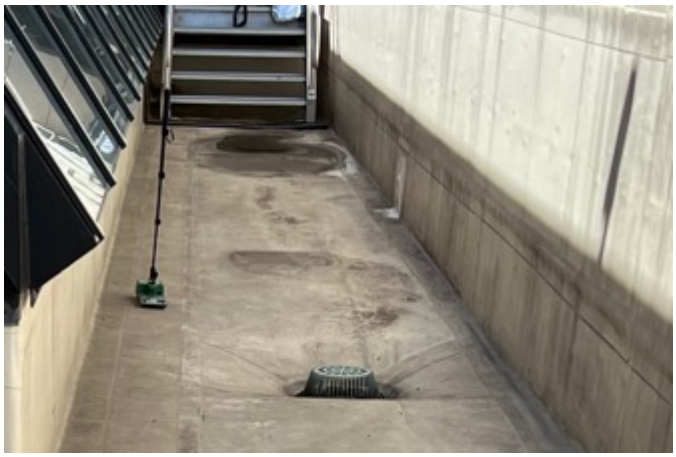

PHOTO 19

Wet Area #9 beginning at meter pole (slight beyond drain) to wall (under stairs).

PHOTO 20

Decomposing coverboard due to moisture infiltration.

PHOTO 21

Unadhered membrane at north end of canooy roof. Note membrane at corner.

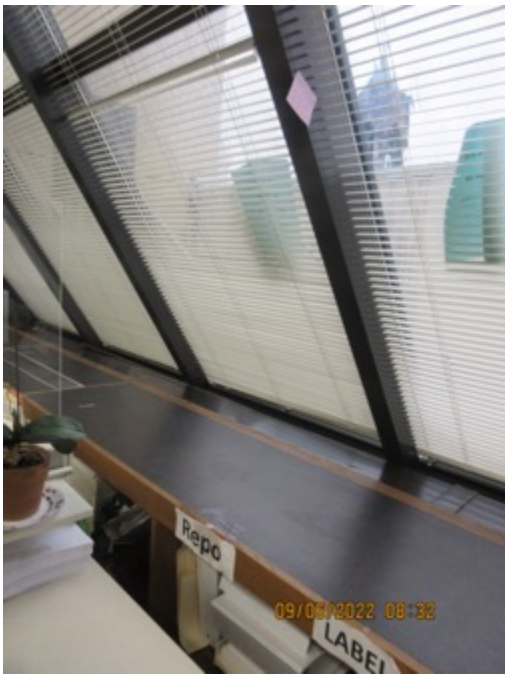

PHOTO 22

Leak at shed window along east elevation of canopy roof.

PHOTO 23

General infrared view of rear of roof looking north.

PHOTO 24

Typical secondary drain through parapet.

PHOTO 25

Loose coping metal (west elevation penthouse roof).

PHOTO 26

Patch made over membrane not properly cleaned.

PHOTO 27

Column caps reflashed.

PHOTO 28

Membrane sliced and patched to accommodate membrane transition to deep insulation drain sump.

PHOTO 29

Surface-mounted counterflashing.

PHOTO 30

Condensers with pitch pan at roof entry.

PHOTO 31

Fixed ladder to penthouse roof hatch. Rungs spaced at 14 in. instead of normal 12 in.

PHOTO 32

Penthouse roof hatch without self-retracting gate.

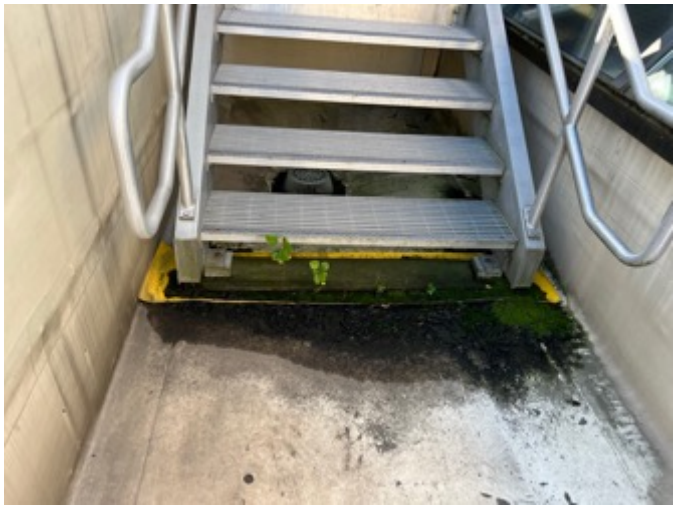

PHOTO 33

Roof drains located under stairs on canopy roof.

PHOTO 34

Canopy roof. Stair bottom bolted to 2x blocking setting on walkpad. Construction blocks drainage.

PHOTO 35

Plaza drain grate openings clogged.

PHOTO 36

Roof drain marker.

PHOTO 37

Typical pipe penetration housing.