



ROOF SENTRY

Demo High School Report



RE: Demo High School Report

We arrived in the local area to perform a series of roof moisture inspections on 07/30/2022 at approximately 5:30 PM. The purpose of our visit was to conduct a series of airborne and walk-on infrared roof moisture inspections to determine the overall condition of the roof systems on the school facility and determine the extent of moisture infiltration into the various roof sections.

The weather had been nearly ideal for the roof moisture surveys - it had been sunny for most of the day with the temperature in mid-to upper eighties. This allowed for good solar loading and transfer of thermal energy into the roof system. The weather had been particularly warm for this time of year. It had not rained for 3-4 days prior to the roof moisture inspections.

We arrived at the project site at about 5:30 PM local time to acquaint ourselves with the layout of the roof system and to see the process to gain access to the various roof sections. We prepared our DJI M600 drone and began a preliminary daylight photo flight at approximately 7:00 that evening. A series of about 200 daylight photos were taken by the drone as a reference for later comparison with the thermal imagery we would be gathering later that evening. Based on the ambient temperature, we left the project site to allow the sun to completely set and the roof system to cool down to the proper levels. Nighttime operations commenced with an initial airborne thermal survey at about 9:15 P.M. local time with winds calm at less than 3 MPH. We flew our drone in an automated grid pattern to gather a series of nighttime photos that would be analyzed and turned into a mosaic to form one continuous high resolution thermal image. A thermal imaging system was used to perform the aerial IR portion of the roof survey of the entire building complex. Flight operations were conducted above the building at about 300ft AGL in a manner to allow us to remain in compliance with all relevant FAA rules & guidelines during the course of our flight. This infrared imagery was used to help analyze and compare the thermal data gathered from the subsequent rooftop IR survey. Upon completion of the preliminary aerial thermal inspection, we landed the aircraft, reviewed the thermal imagery, and commenced the rooftop phase of our investigations.

From the aerial imagery the roof construction across the various roof sections appeared to be white single ply membranes. As we visually inspected the roof (on the roof-top) we determined that there were at least two different membrane types and/or manufactures of the roofing membranes, but the top layer of roofing appeared to be predominantly made by Duro-Last.

Roof Sections: "D" & "E"

As we began our rooftop infrared moisture inspection, we confirmed that the roof surface was in fact a PVC or TPO single-ply roof system. Our walk-on thermal IR & capacitance inspections began on the upper roof sections to the NE corner of the project. These roof sections are shown on the attached drawing as sections "D" & "E" which are on the oldest portion of the building. Access to these sections was through the small roof hatch on the third floor. The rooftop infrared inspection was conducted in a methodical grid-like pattern across each of the roof areas to ensure detection of any wet regions that might have been obscured from our view by any rooftop equipment or oblique camera angles.

We were able to quickly locate several areas of moisture infiltration into the roof system as shown on section "D". At this point we utilized our Trammex capacitance meter to verify the results of the infrared thermal imaging system. We used the capacitance meter as a secondary non-destructive test to verify that we had found moisture in the roof system. This electronic capacitance / conductance testing did confirm each of the suspected wet roof areas which had thermal signatures indicating moisture or the presence of trace amounts of moisture in between the roof plies in the adjacent locations. Approximately 150 - 200 individual locations were tested or verified on these roof areas. There were varying degrees of moisture throughout about half of roof section "D". We painted the wet regions with red paint on the surface of the roof. Dashed lines were sometimes utilized on the roof surface where there were sporadic or lower quantities of moisture. The wettest areas of roof insulation are marked in red on the CAD drawing and the damp regions of insulation are marked in yellow. As part of our verification process, we took test cuts in several of the roof sections to determine the number of roofs and the type of materials used on each. On roof section "D" we found moisture in the test cut area and observed two roofs in place with roof insulation that was damp, soft, and crumbled. We believe that the roof deck on section "D" was concrete. Roof section "E" had two relatively small wet regions of insulation.

We found that there were two separate roof systems in place on each of the roof sections on which we made test cuts. Based on the standard building code, having two roof systems would generally make it necessary to tear-off each of the roof sections prior to undertaking any extensive re-roofing projects. This is where being able to utilize roof coatings would be a very cost-effective option for a roof repair or maintenance program .

Roof Sections: “J”, “K” & “L”

We then focused our attention on the new roof sections “J”, “K” & “L” on the SW corner of the campus. These roof areas appeared to have TPO roof membranes on them. We did not find any regions of trapped moisture on sections J,K or L. We ran the Trammex meter extensively on each of these roof areas, particularly around the outside wall flashings and near the perimeter of most of the

rooftop equipment. All told, we probably tested over 200 separate locations on these three roof areas alone. No core cuts were taken on these three roof sections due to the fact that they were most likely covered under a manufacturer’s warranty.

Roof Section: “A”

Roof section “A”, located in the NW most corner of the project, was the next roof area that we surveyed for moisture damage. Based on the unique pressure relief vents that are part of this system, we believe that this roof section is also a Duro-Last white PVC roof system. We were able to find numerous small locations of wet roof insulation on this roof section. On a particular note, most if not all of the wet regions of insulation were found at or near the perimeter wall flashings of the roof system. This would seem to indicate that there was an issue with the wall flashing terminations or possibly water seeping through the bricks and entering the roof behind the wall flashings near building section “B”. During survey on this roof area, we did not take any test cuts but believe this roof assembly has 2 roofs like most of the other areas (G,I,M,NC,F,H).

Roof Sections: M,I,G

As the roof moisture survey progressed, we moved our ladders to section “M” so we could access the remainder of the different roof sections. All of these roof areas were also Duro-Last mechanically attached PVC roofs over top of a second (original) roofing system. Based on our core cuts, some of the underlying roof systems varied slightly but we are confident that there were at least two roof on each of the sections.

As can be seen on the drawings and aerial photographs, there are a number of small areas of moisture infiltration scattered across the various roof systems. We compiled a list of the separate roof sections listing their physical square footage and showing the amount of wet area for each roof section inspected. In the far right column labeled “Repair Area”, we have included a listing of the approximate area of potential repairs that could be undertaken to fix or remediate the moisture entry in each of the listed school building sections.

List of Roof Areas School Complex w/ Wet Regions

Roof	Sq Ft	Wet Area	No. Wet Areas	Percent Wet	Repair Area
A	7,021 sq ft	188 sq ft	22 areas	2.70 %	1,200 sq ft
B	9,523 sq ft	81 sq ft	2 areas	< 1 %	250 sq ft
C	417 sq ft	72 sq ft	1 area	17.20 %	150 sq ft
D	8,218 sq ft	1,536 sq ft	9 areas	18.70 %	6,600 sq ft
E	5,404 sq ft	47 sq ft	2 areas	< 1 %	250 sq ft
F	378 sq ft	16 sq ft	2 areas	4.23 %	100 sq ft
G	2,338 sq ft	489 sq ft	4 areas	21.00 %	200 sq ft
H	1,057 sq ft	79 sq ft	8 areas	7.50 %	325 sq ft
I	3,265 sq ft	389 sq ft	1 area	12.00%	750 sq ft
J	246 sq ft	0 sq ft		0.00%	
K	1,676 sq ft	0 sq ft		0.00%	
L	6,293 sq ft	0 sq ft		0.00%	
M	7,975 sq ft	193 sq ft	7 areas	2.70 %	200 sq ft
N	5,985 sq ft	0 sq ft			
O	10,086 sq ft	0 sq ft			

Roof Section: “M”

Roof system “M” we believe to be a Duro-Last white PVC roof system as well. We discovered seven small regions of moisture infiltration into this roof section. The wet insulation that was found did not have strong thermal signatures in most of these locations which would indicate that the insulation was not completely saturated. We utilized the secondary capacitance moisture testing on this roof section and tested about 75 individual locations on this roof area.

Roof Section: "I"

Roof system "I", also a Duro-Last white PVC roof system, had one medium-sized region of moisture infiltration. This wet area had a weaker thermal signature indicating that the insulation was not fully saturated. It could have been a newer leak location that was just starting to take on water or an area that had been previously repaired. Again, we utilized capacitance moisture testing on this roof section and tested about 60-75 individual locations on this roof area.

Roof Section: "G"

Roof system "G", also a Duro-Last white PVC roof system, had a number of medium sized regions of moisture infiltration. These wet areas represented about 22% of the entire roof surface of this section. The thermal signatures on this roof section were more pronounced, indicating that the roof system had higher levels of moisture content. Capacitance moisture testing was utilized on this roof section and we tested about 40 separate locations on this roof.

Roof Section: "B"

Roof system "B", also a Duro-Last white PVC roof system, had two small regions of moisture infiltration near the chimney on the southern wall. These wet areas represented less than 1% of this section. The thermal signatures on this roof section were more pronounced, indicating that the roof system had higher levels of moisture content. Capacitance moisture testing was utilized on this roof section and we tested about 60 separate locations on this roof.

Roof Sections: "C", "F", "H"

Roof systems "C", "F" & "H" also appeared to be Duro-Last white PVC roof systems. These smaller connector roofs have about 12 small regions of moisture infiltration distributed across the three roofs. These wet areas are small and are listed in the attached table #1. The thermal signatures on this roof section were moderate, indicating that the roof system did have elevated levels of moisture content. Capacitance moisture testing was utilized on this roof section and we tested about 65 separate locations on these 3 roofs.

Roof Section: "N"

Roof system "N" is a Duro-Last white PVC roof system. This roof section was dry; we did not observe any thermal signatures on this roof indicating elevated levels of moisture content. We used a Trammex capacitance moisture meter to test this roof as well, and we tested about 80 separate locations on this roof.

Roof Section: "O"

Roof system "O" is a Duro-Last white PVC roof system. This roof section was dry; we did not observe any thermal signatures on this roof indicating elevated levels of moisture content. We used a Trammex capacitance moisture meter to test this roof as well and tested about 10 separate locations on this roof. We then decided to make a test cut on the roof and determined that the PVC was directly laid over top of an EPDM roof which is conductive and effectively blocks the capacitance system from working properly on this type of roof.

Conclusion:

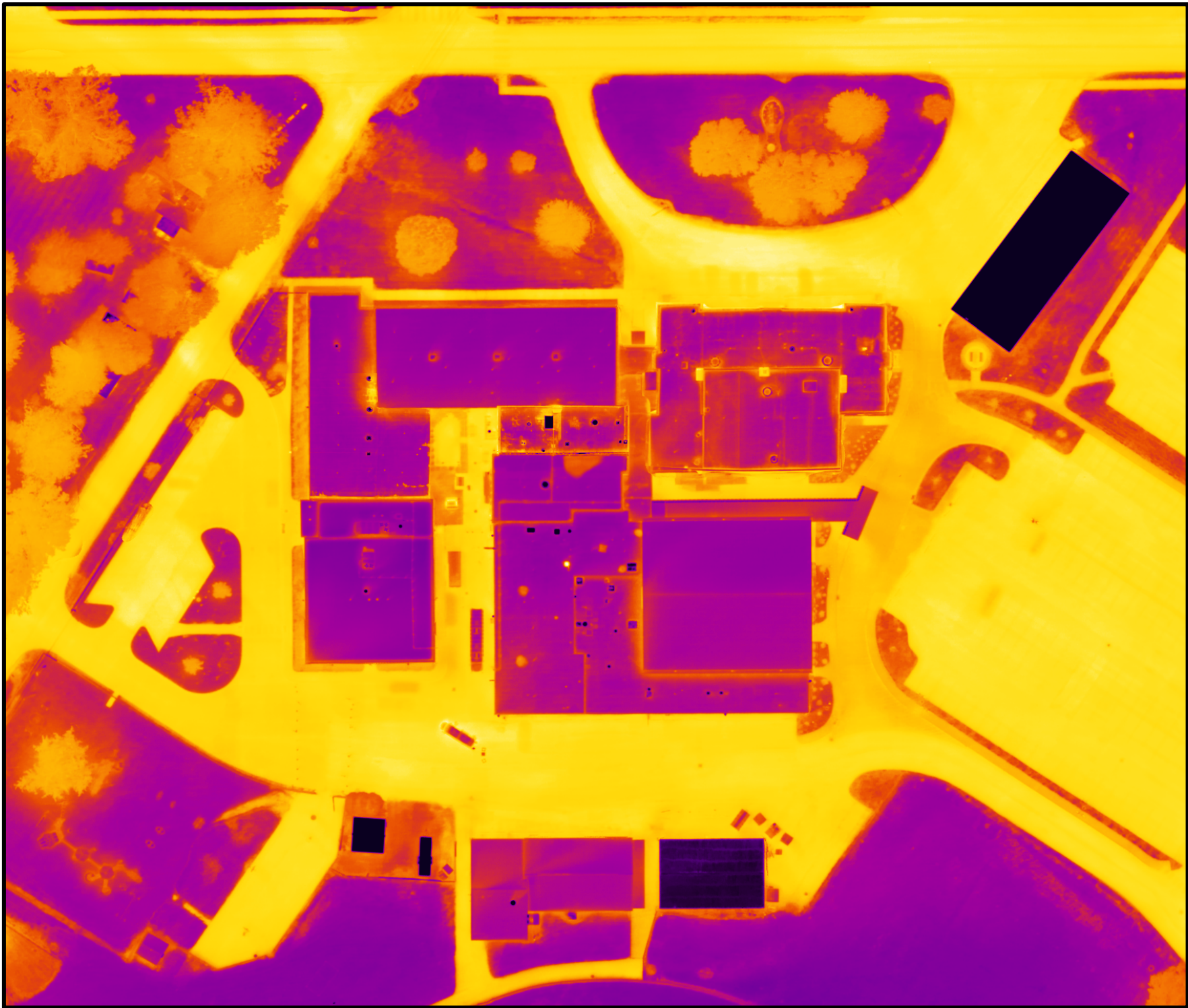
During our series of roof moisture inspections, we were able to detect numerous thermal patterns indicating extensive regions of wet roof insulation. The wet regions of roof insulation found during our inspections were marked on the roof surface with white spray paint and/or shown on the attached CAD drawings. We documented our inspections of the facility by taking aerial infrared photos of the entire roof area. Roof-top photos and thermographs were also taken to show the results of our surveys. The approximate size of the entire facility was 71,278 sq ft. Analysis of the imagery indicates that we found about 2,229 sq ft of wet and 861 sq ft of damp roof insulation, or just over 4% of the entire roof area.



Demo High School Report

June-2022

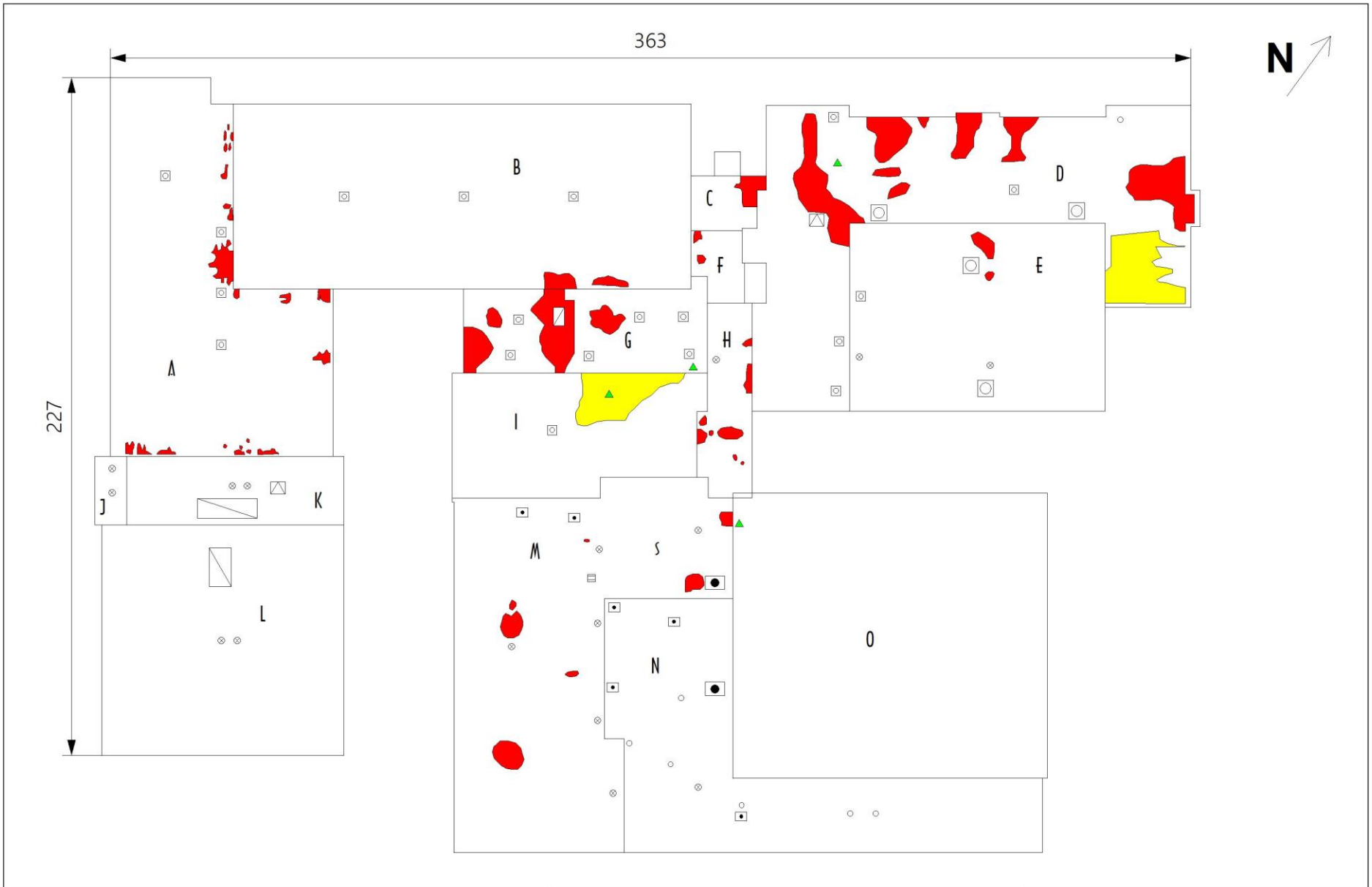




Demo High School Report

June-2022





- Legend:**
- ☐ A/C On Sleepers ☐ HVAC ■ Probable Wet: 2,229 Sq. Ft.
 - ⊗ Exhaust Fan ● Vent Hood ■ Probable Damp: 861 Sq. Ft.
 - Vent Stack ⊗ Drain ▲ Core Cuts

Building: Demo High School Report

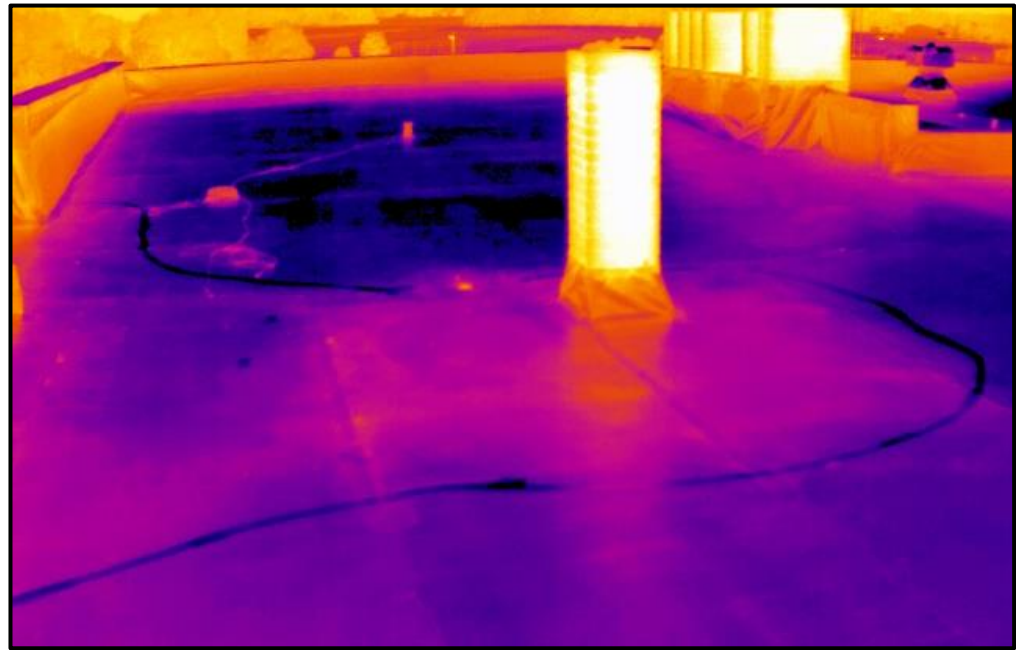
Roof Area: 71,278 Sq. Ft.

Date: June 2022





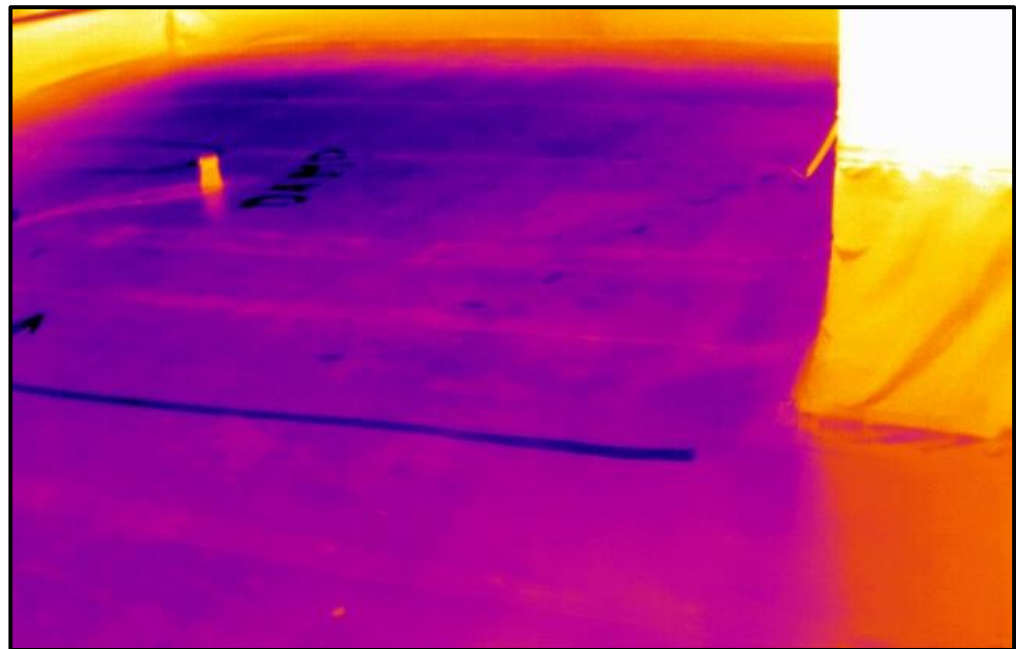
Daylight Image 1



Infrared Image 1



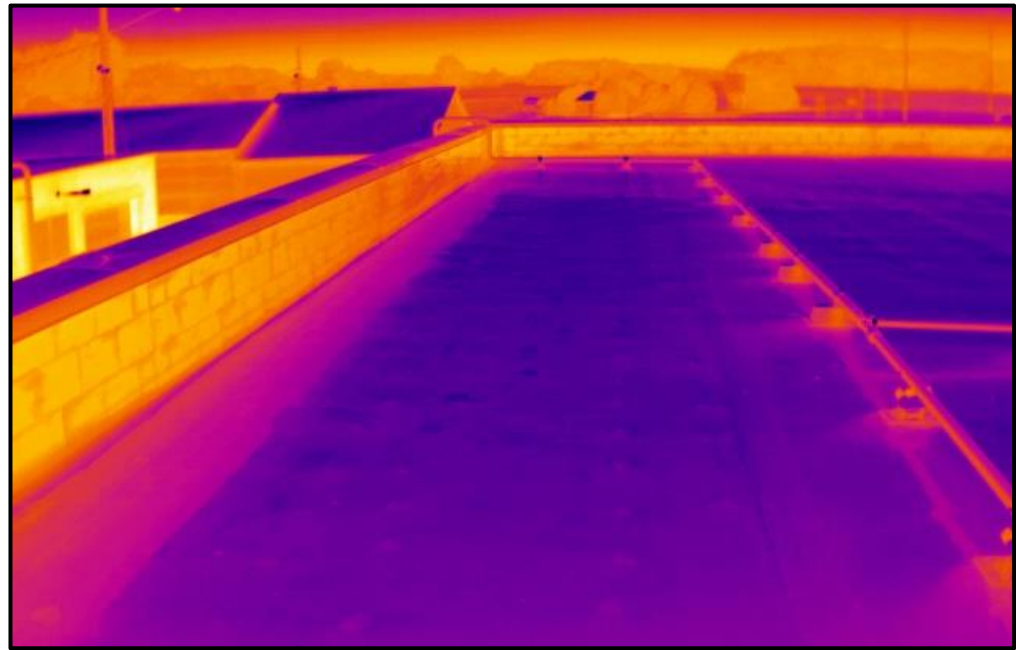
Daylight Image 2



Infrared Image 2



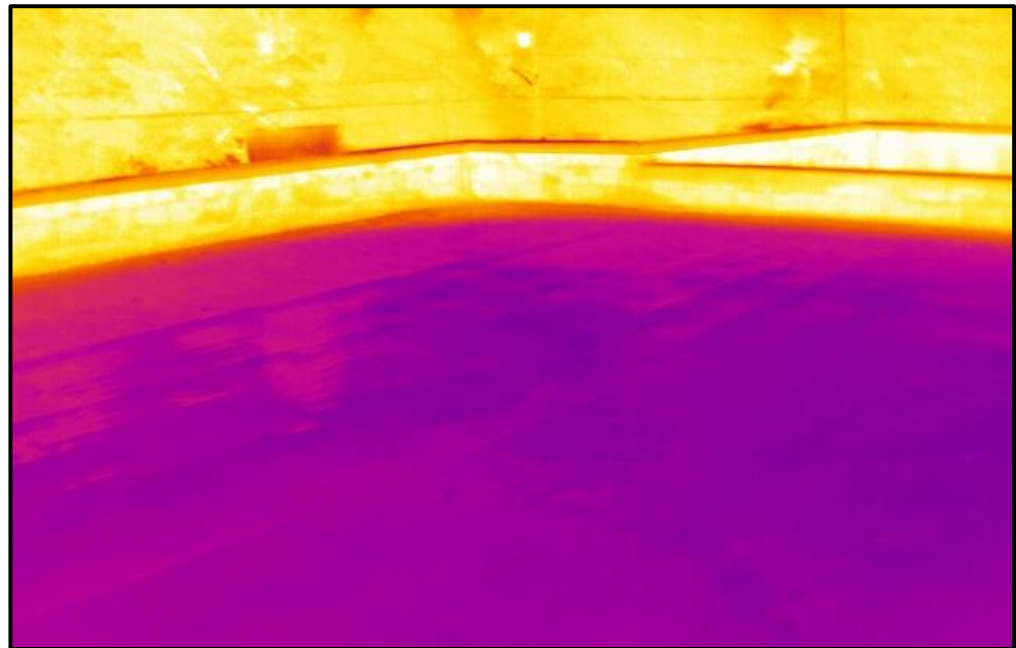
Daylight Image 3



Infrared Image 3



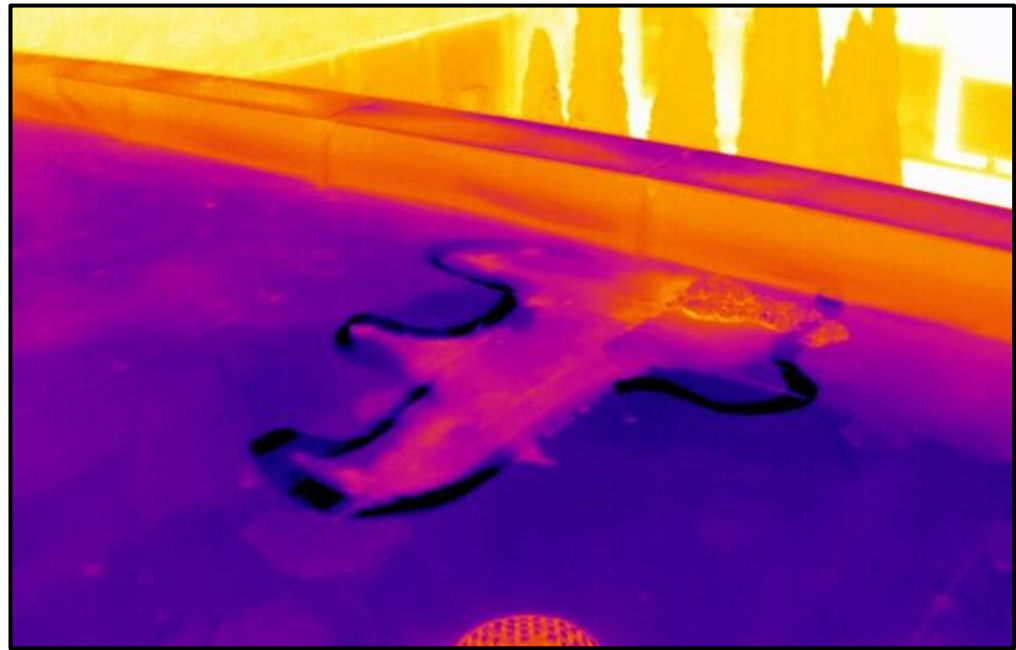
Daylight Image 4



Infrared Image 4



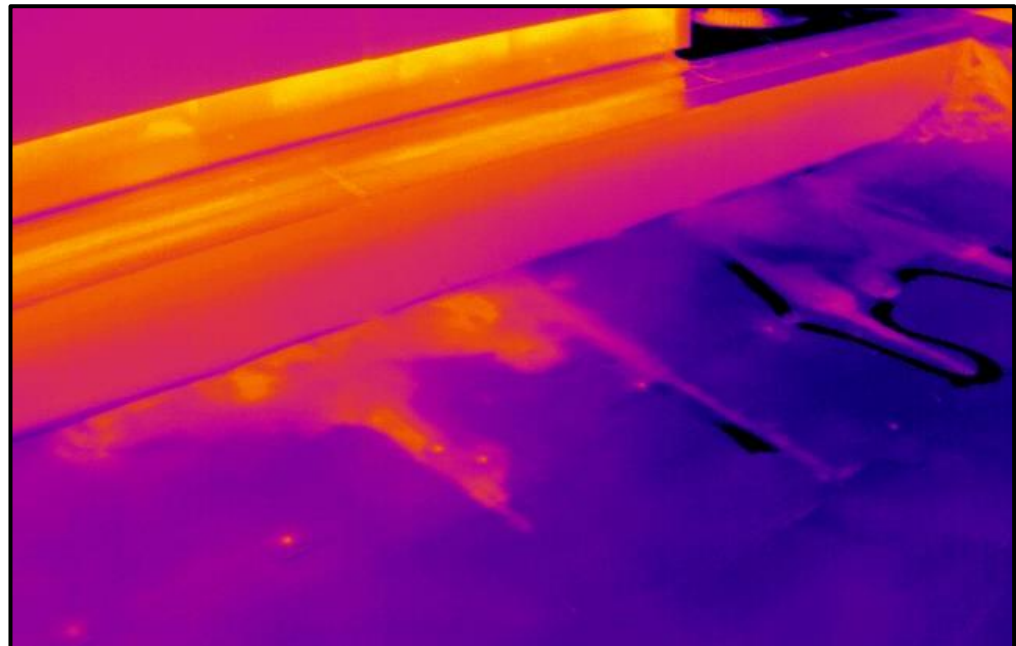
Daylight Image 5



Infrared Image 5



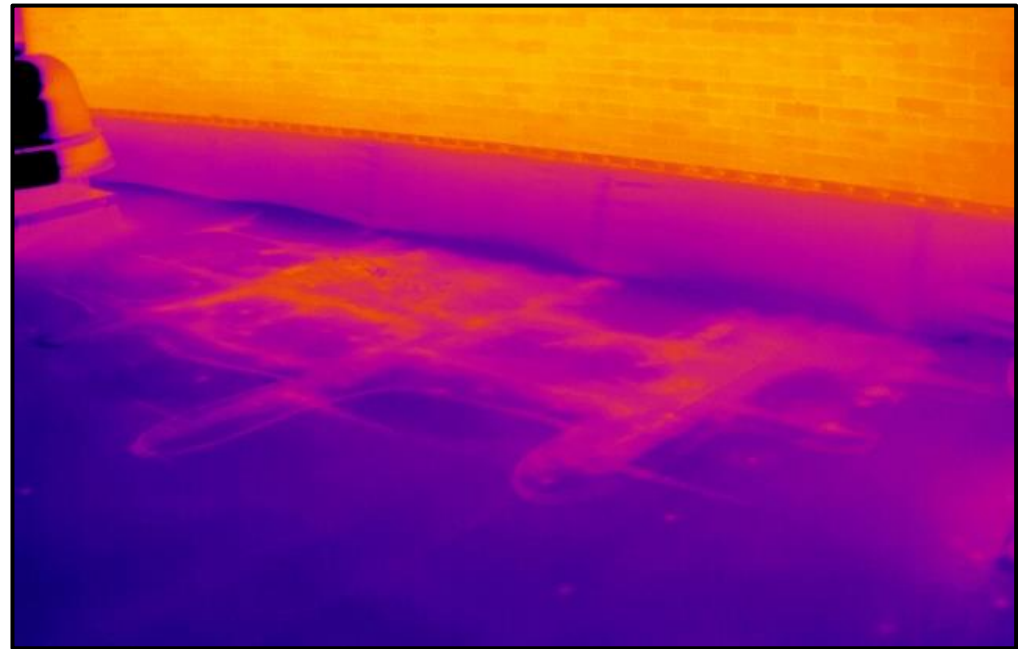
Daylight Image 6



Infrared Image 6



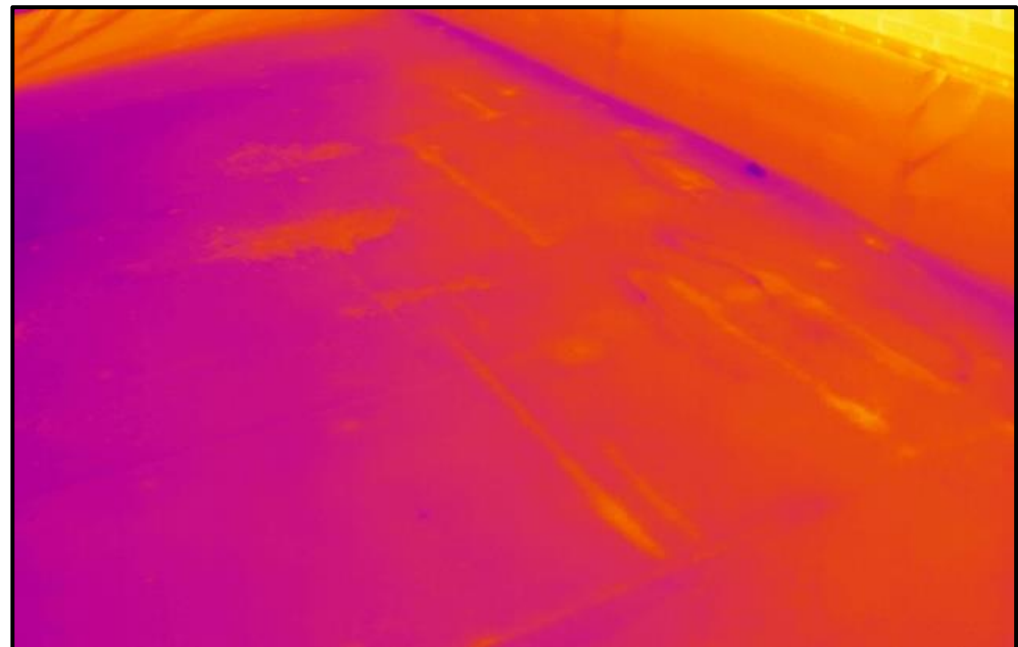
Daylight Image 7



Infrared Image 7



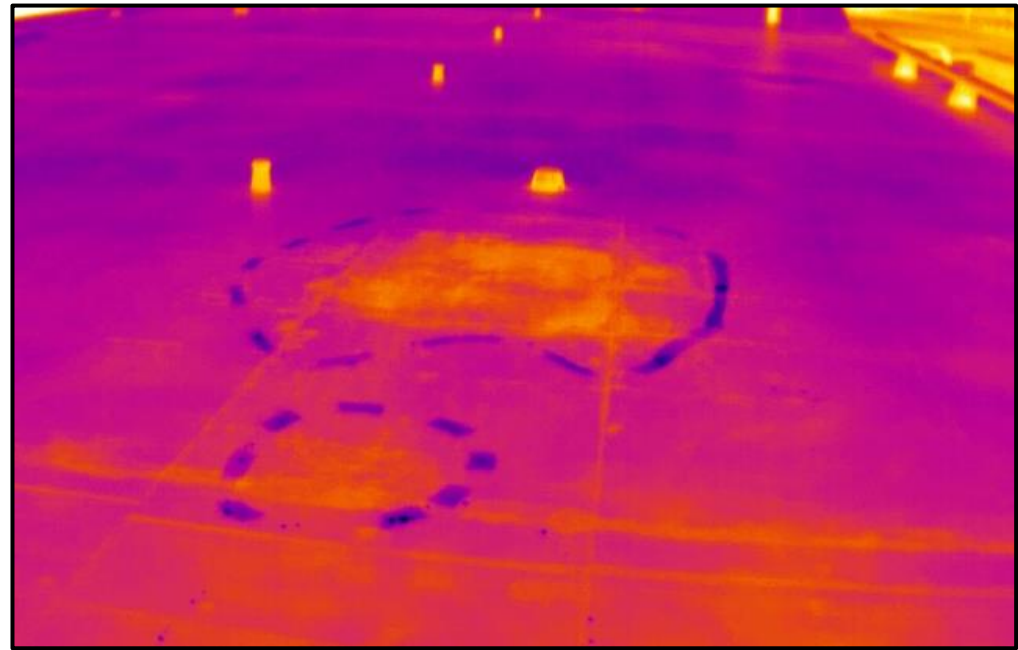
Daylight Image 8



Infrared Image 8



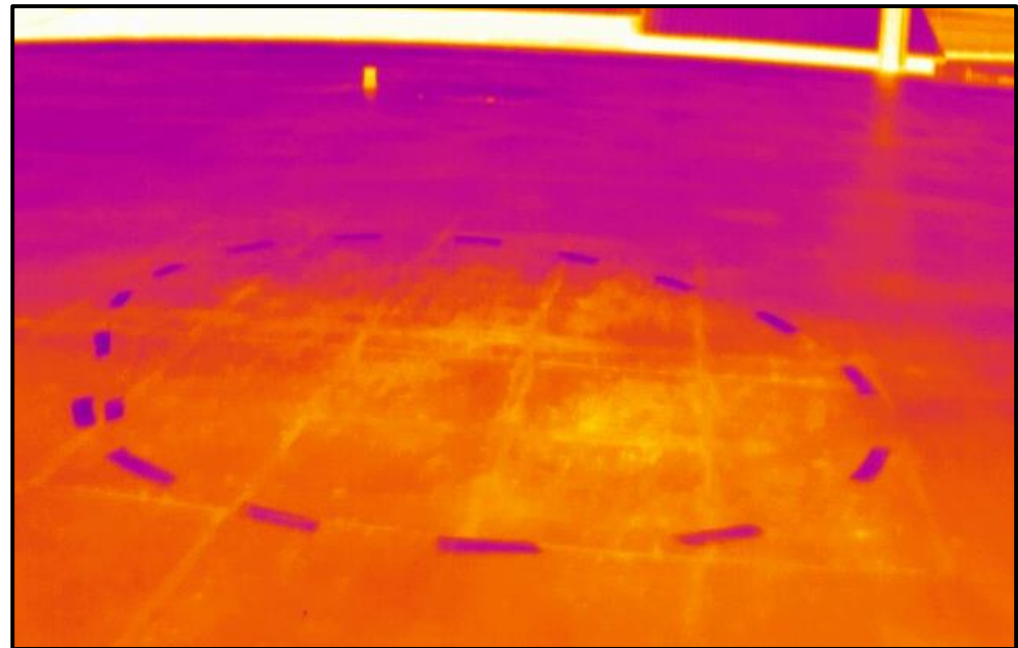
Daylight Image 9



Infrared Image 9



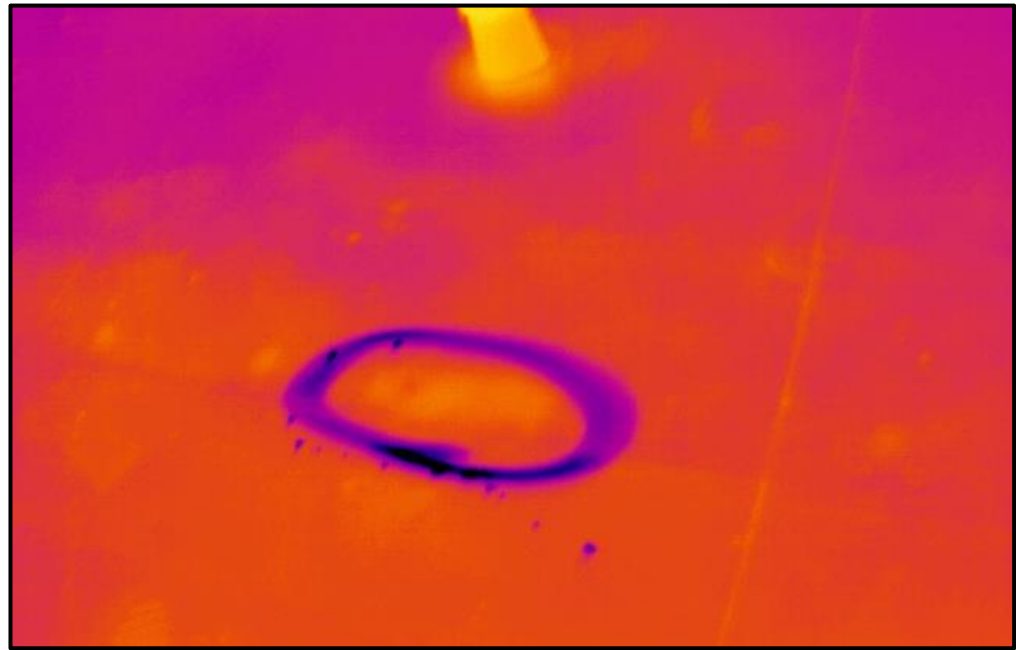
Daylight Image 10



Infrared Image 10



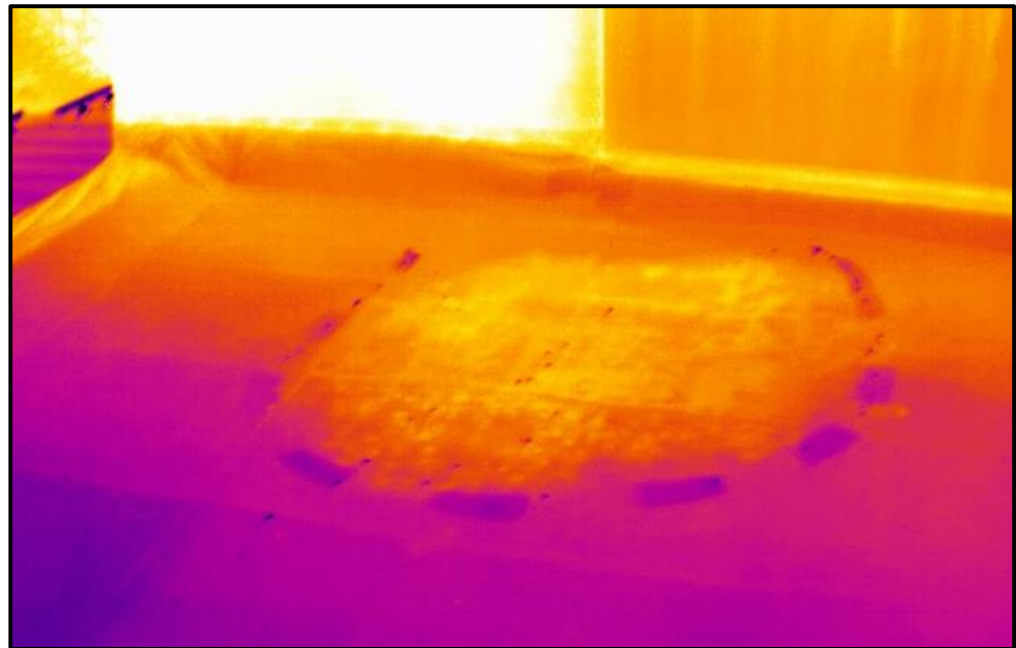
Daylight Image 11



Infrared Image 11



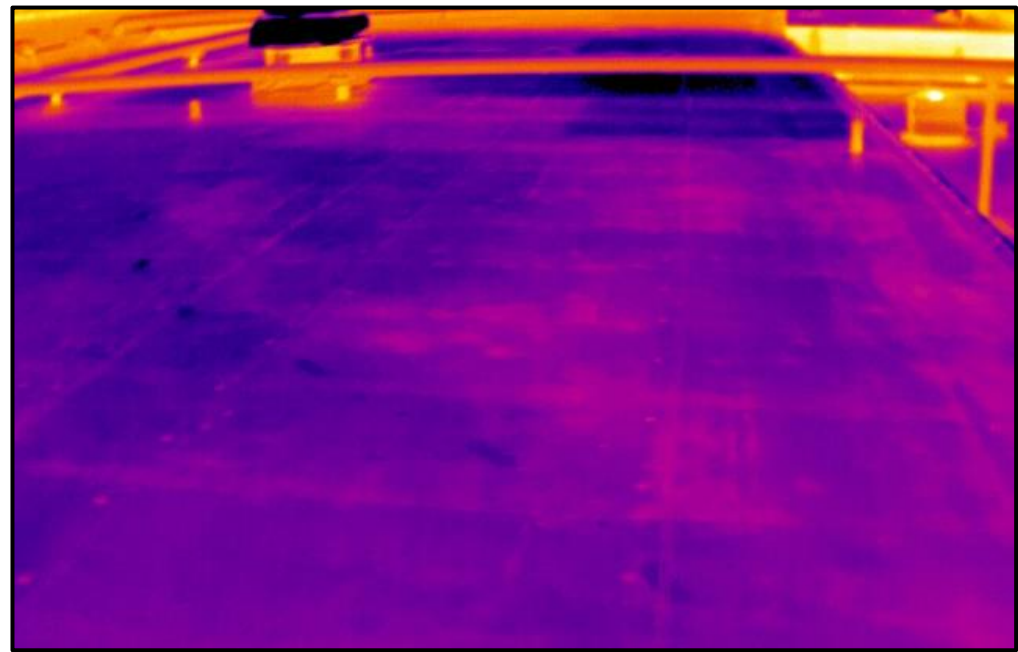
Daylight Image 12



Infrared Image 12



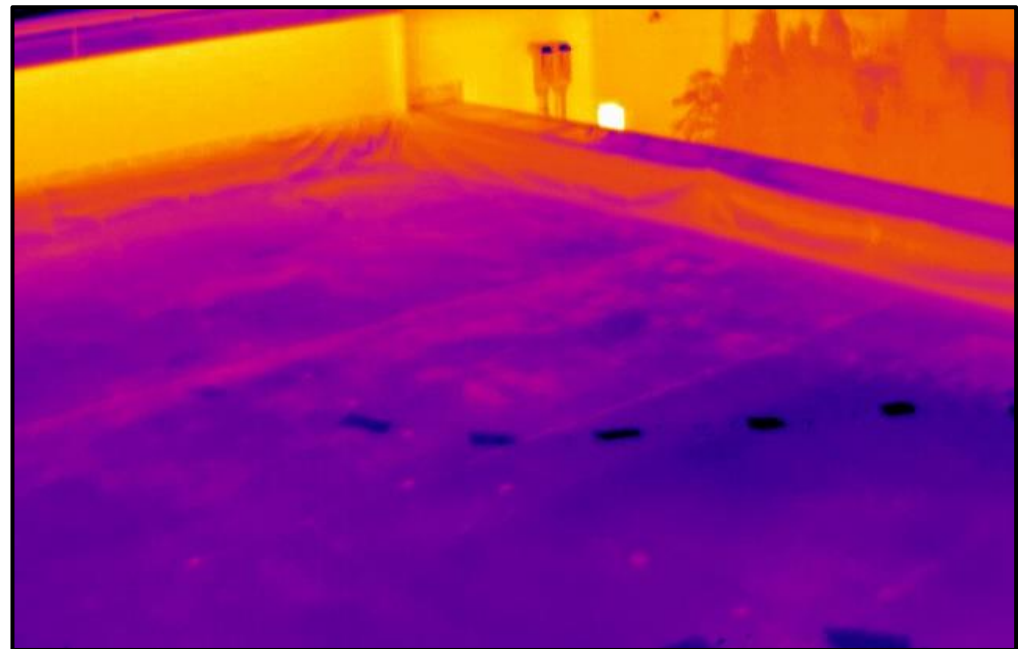
Daylight Image 13



Infrared Image 13



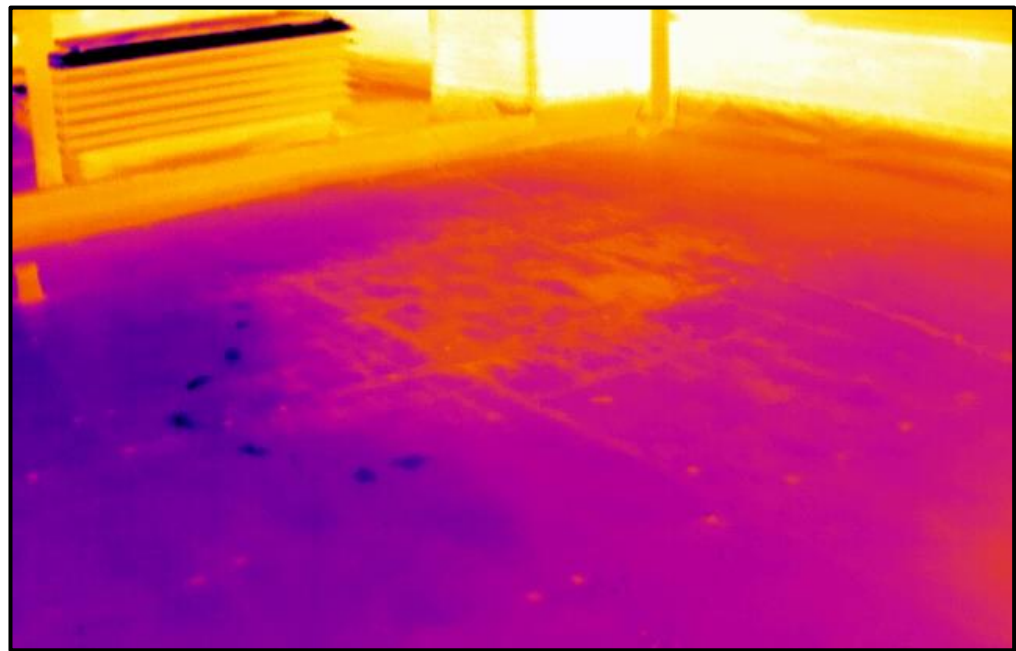
Daylight Image 14



Infrared Image 14



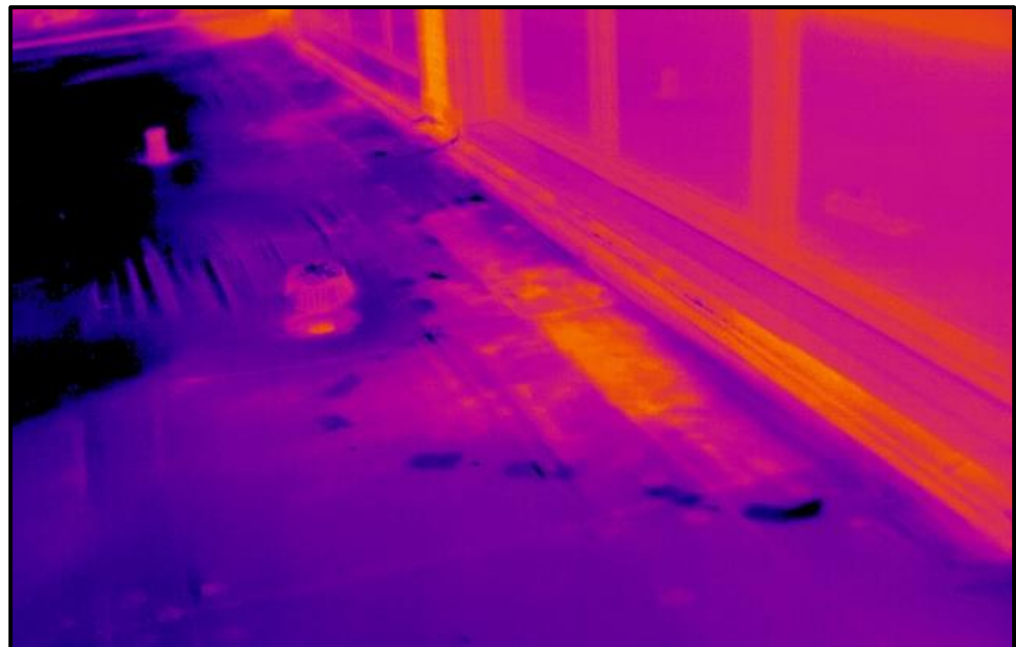
Daylight Image 15



Infrared Image 15



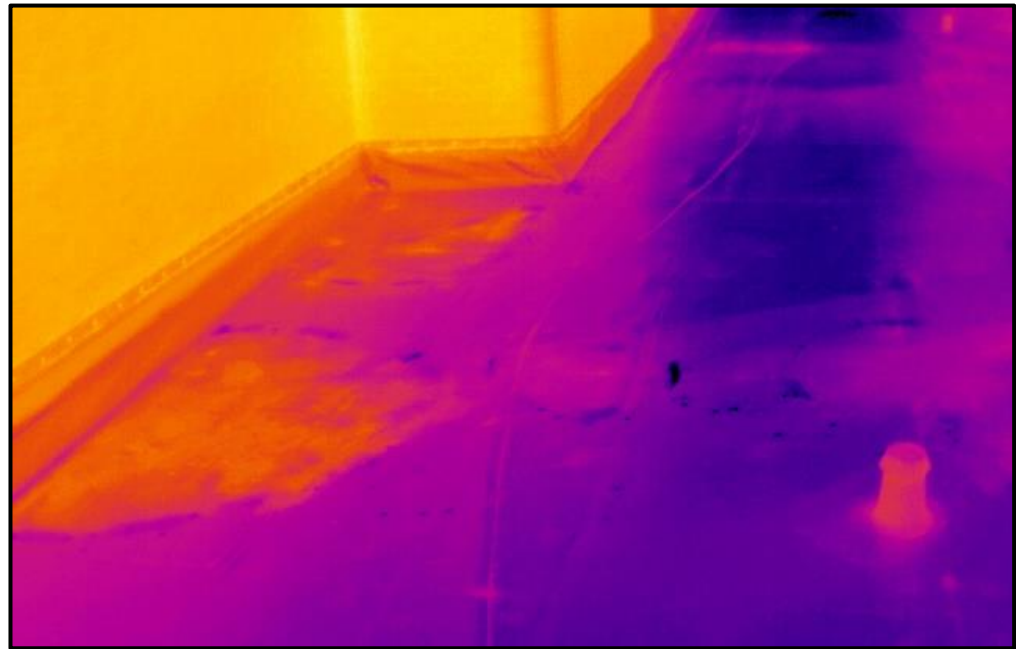
Daylight Image 16



Infrared Image 16



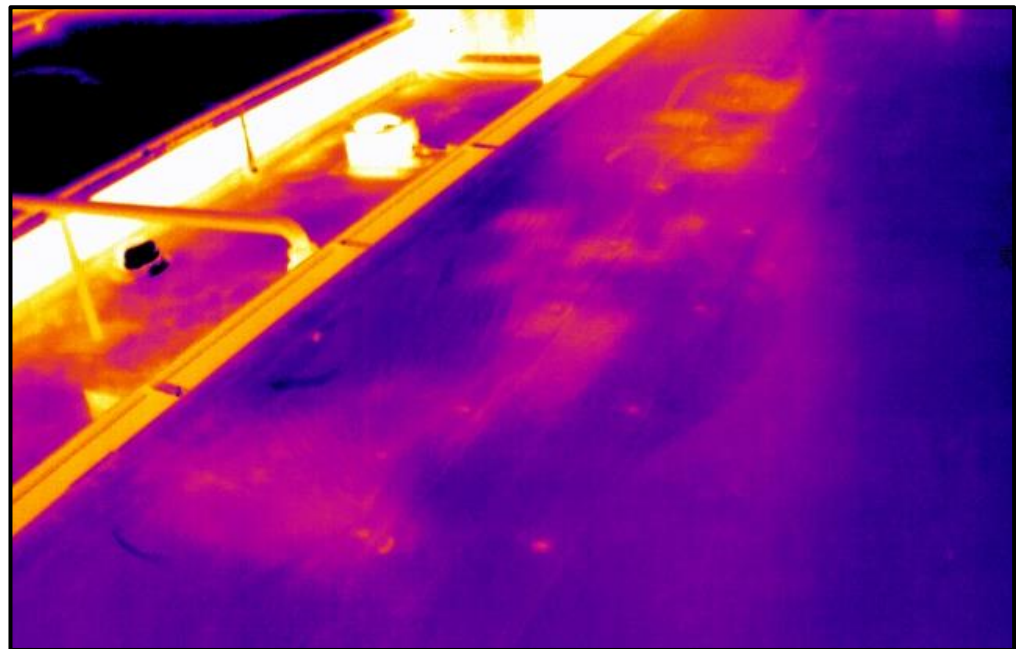
Daylight Image 17



Infrared Image 17



Daylight Image 18



Infrared Image 18



Daylight Image 19



Daylight Image 20



Daylight Image 21



Daylight Image 22