

Thermal Imaging Inspection

Expressway Span

By Thermal Images.ca London Ontario

12/3/2012

Infrared Thermal Imaging technology is based on temperature variations. Ideally there should be a temperature variation between the mass and the atmosphere of 10C. A warm sunny day to heat the main mass of the structure with a cool evening would be perfect for Infrared Thermal Imaging in the evening. The reflected temperature from the material being examined may be "modified" by excess moisture in the atmosphere.

The objective of the Thermal Imaging examination was to identify areas on the underside of the Expressway where the concrete has deteriorated by spall, delaminating or other factors.

The atmosphere will modify the temperature of the structure. Areas of the structure that have characteristics different than the main mass will have a different temperature; it could be higher or lower. Material within the structure may radiate heat or cold to the surface resulting in their image being recorded in the thermal image; such items could be rebar, reinforcement, water, voids, cracks, etc. These abnormal material or conditions on the surface or within the mass will have a temperature different than the main structure mass. These variations will identify areas of the substance that are not the same as the mass e.g. problem areas.

The imaging of the underside of the concrete deck of the Expressway **did identify** some abnormalities as shown in the attached reports.

Unfortunately conditions on December 2, 2012 were far from ideal.

1. It was a cool misty, foggy day with light rain
2. The underside of the concrete roadway temperature was 6 to 7 C
3. The atmospheric temperature was 8 to 9 C
4. The temperature of areas of deterioration ranged from 4C to 5C
5. The under surface of the concrete roadway was wet as a result of mist and fog

The center median of the structure exhibited different temperature than the main mass of the structure. In several areas water was flowing over the soffit and onto the underside of the deck from what appeared to be plugged or defective drainage systems.

The underside of the roadway was visibly in a poor condition this was reflected in the Thermal Images. The proximity to Lake Ontario did increase the moisture in the air and on the surface of the structure resulting in poor quality images.

The objective of the examination was to determine if Thermal Imaging could identify faults in the underside of the concrete roadway deck.

Faults were detected, had the environmental condition been better more problems would likely have been identified.

The examinations took place from under non vehicle travelled areas by walking under the structure. Examinations taken from/ in areas with vehicular traffic would / should be taken from a slow moving vehicle, there should be no need to close or seriously impede traffic.

Ideal conditions would be

1. Sunny bright day above freezing temperature
2. Early evening temperature 10C below the day time temperature
3. Thermal Imaging be undertaken in the evening while the differential between the temperature of the main mass of the structure and the atmosphere is 5C or more

Or

1. Cool dry night temperature above freezing
2. Early morning temperature higher than 10C above the nighttime temperature
3. As the morning temperature warmed up the underside of the main mass of the structure the voids and faults could be recorded by the Thermal Imaging instrument.



Section One

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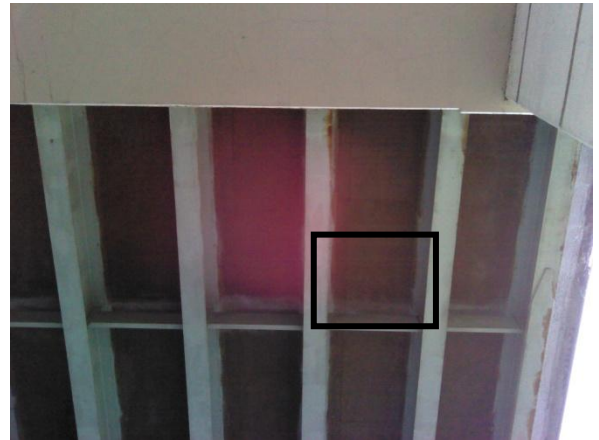
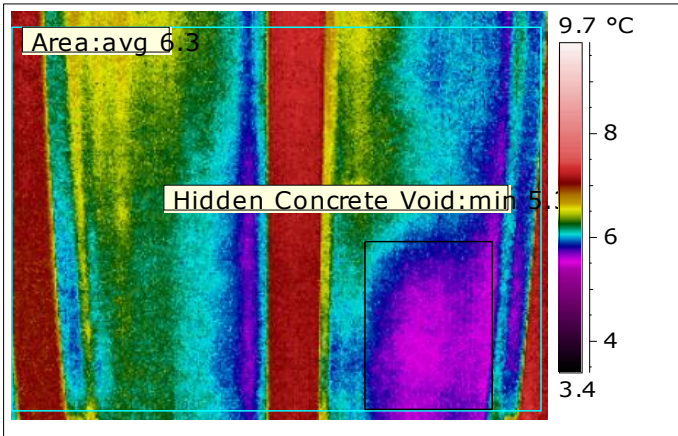


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Emissivity	0.95	Other remarks:	
Object Distance	12.0 m		
Atmospheric Temperature	8.7 °C		
Reflected Temperature	7.4 °C		
Ar2 Average Temperature	6.3 °C		
Hidden Concrete Void Min. Temperature	5.3 °C		
File name	IR_1633.jpg		

Comment: Void in concrete. Under east bound lanes. Second row of girders. First section from adjacent Bent

Recommendation: Concern level HIGH

Inspected by : _____ Signature:..... date:.....

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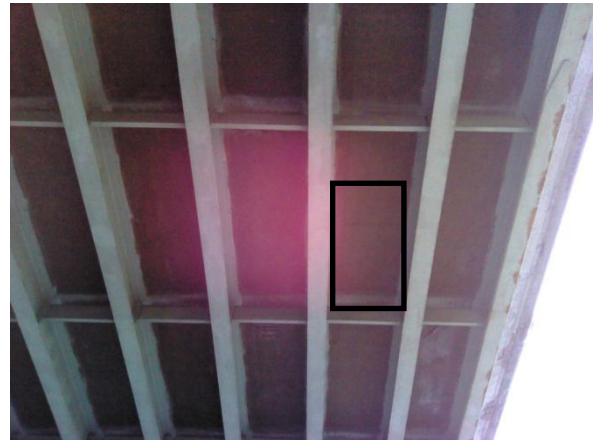


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Reflected Apparent Temperature	15.0 °C		
Atmospheric Temperature	8.7 °C		
Ar2 Average Temperature	5.8 °C		
Hidden Concrete Void Min. Temperature	4.7 °C		

Comment: Void in concrete. Under east bound lanes. Second row of girders. Second section from adjacent Bent

Recommendation: Concern Level HIGH

Inspected by :	Signature:.....	date:.....
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London, Ontario.

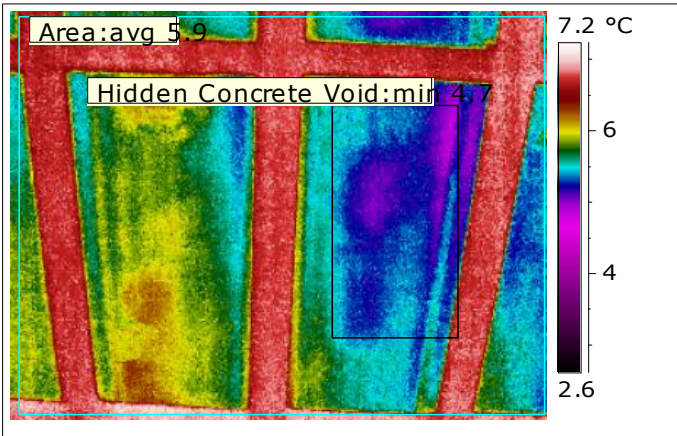


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Reflected Apparent Temperature	15.1 °C		
Atmospheric Temperature	8.7 °C		
Area Max. Temperature	7.2 °C		
Hidden Concrete Void Max. Temperature	6.9 °C		
File name	IR_1637.jpg		

Comment: Void in concrete. Under east bound lanes. Second row of girders. Second section from adjacent Bent

Recommendation: Concern Level HIGH

Inspected by : _____ Signature:..... date:.....

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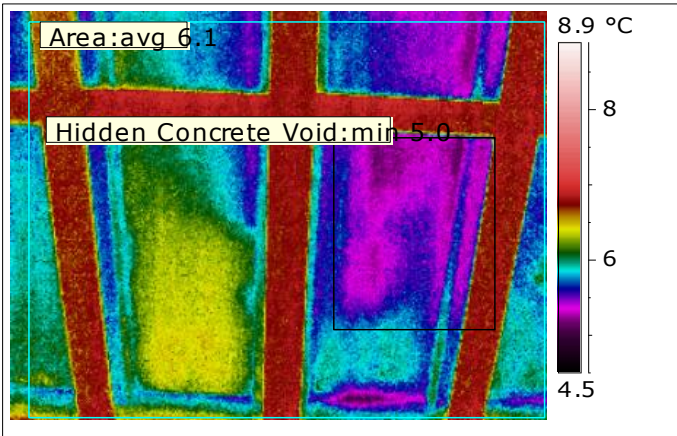


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Atmospheric Temperature	8.7 °C	
File name	IR_1639.jpg	
Ar2 Average Temperature	6.1 °C	
Hidden Concrete Void Min. Temperature	5.0 °C	

Comment: Void in concrete. Under east bound lanes. Second row of girders. First section from adjacent Bent

Recommendation: Concern level HIGH

Inspected by : Signature:..... date:.....

