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BUILDING DIAGNOSTICS INSPECTION

CLIENT: Enlightened Management

ADDRESS: 1000 Main Street
Bethesda, MD

DATE: December 15, 2010

SUBJECT: Building diagnostics evaluation

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December 15, 2010

We are pleased to submit this report describing our building diagnostics evaluation of Enlightened Towers..

If you have any questions about this report, or any of our services, please give me a call.

We look forward to working with you on future projects.

Very truly yours,

Stephen A. Seeber
President

Building Diagnostic Evaluation of Enlightened Towers

I. Introduction

Mid Atlantic Infrared Services, Inc. was retained to conduct an infrared survey of Enlightened Towers. The objectives of the survey were 1) identify areas of significant energy losses; 2) identify areas of infiltration/exfiltration that would adversely affect occupant comfort or building operation and 3) identify areas of infiltration/exfiltration that could damage building equipment and components as a result of moisture accumulations or extremely cold temperatures.

II. Summary of Findings

1. Substantial infiltration occurs at virtually all soffit areas. Soffits are located on B1, 3 and the top of the atrium.
2. A number of structural columns penetrate soffits and extend to the ground outside of buildings. These columns permit infiltration to interior spaces.
3. It appears likely that this building operates under negative pressure. Negative pressurization will faciliate and increase infiltration through the deficiencies identified in this report.
4. Infiltration rates associated with these deficiencies will have clear impacts on tenant comfort and building energy efficiency.

III. Survey Methodology

Detection of Thermal Anomalies with an Infrared Imager

An infrared imager can be thought of as a television camera that sees heat rather than visible light. When the temperature of a surface increases, the surface emits more infrared energy. The infrared imager senses the various energy levels and transforms them to a black and white or color picture. Color images are presented in this report. A temperature/color scale is found on the right of each image. Color shades changes from bottom to top of the color scale correspond to increasing temperatures.

The temperature range of each image is indicated by the high and low temperatures located to the left of the color or gray scale bar.

The infrared survey is useful for identifying areas of infiltration/exfiltration and damaged or missing insulation.

Exfiltration can cause exterior building surfaces to become heated, so the location of these areas may be spotted by an exterior inspection. Generally, infiltration cools interior surfaces, but has no impact on exterior surface temperatures. Thus, infiltration cannot be viewed by the exterior infrared survey. It can only be viewed from the interior. The impact for infiltration/exfiltration can be enhanced for survey purposes by operating the building at positive pressure for observing exfiltration from the exterior or negative pressure for observing infiltration from the interior.

The best way to identify infiltration/exfiltration sites is to observe interior surfaces during high wind/cold temperature periods. Such an observation will tend to identify deficiencies on the windward side of the structure. However, identified deficiencies can be extrapolated to similar construction details on other building orientations.

Survey Procedure

The interior survey was conducted on December 13, 2010, beginning at about 6:00 PM and continuing to about 11:30 PM. The sky was partly cloudy during the survey. The outside temperature was approximately 25^{o}F Winds were from the west at about 16 mph. Building interior temperatures were approximately 70^{o}F. The building HVAC system was under normal operation during the survey.

Interior perimeter building surfaces on selcted floors were examined using a FLIR SC660.

In each office location, the exterior wall, adjacent interior wall, floor and ceiling areas were imaged looking for any thermal anomalies.

Photographs were taken for each suspected deficiency.

IV. Results

Survey results are presented in a uniform format. Each report page presents a specific anomaly. A brief written discussion provides the anomaly location and describes critical thermal features. A color photograph illustrates the location of the anomaly. Color thermal images are provided for each anomaly.

Specific Issues

Most of the problems found for this building were found on floors B1-3. These problems have at least one of two primary deficiencies as sources.

1) Extensive areas of soffits on the 3rd floor and at the atrium. Soffits are also present on the B1 level. The soffits are inadequately sealed and insulated.

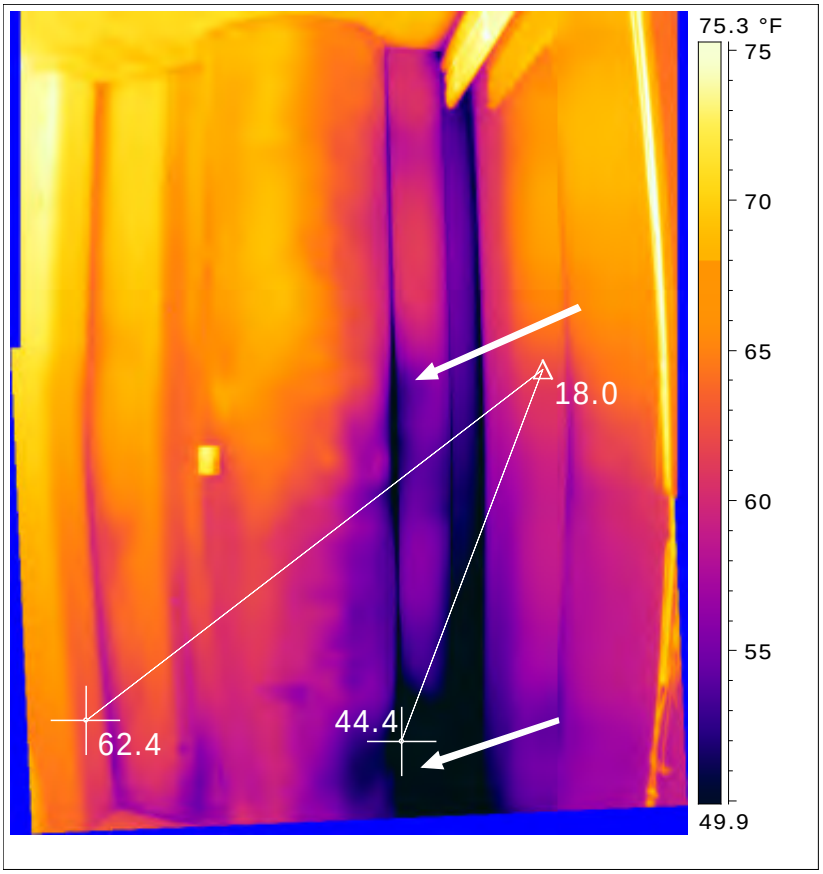
2) Exterior columns on the bottom levels that enter the building at soffits. The columns are clad with fascia. Air can penetrate into the space between the actual column and fascia at the bottom of the columns and any unsealed fascia joints. This air is then delivered to interior where the columns enter conditioned space.

Each of these details contributes to what appears to be significant infiltration rates. In some locations, infiltration has resulted in tenant complaints and implementation of corrective measures by building management. This study identified additional areas that require sealing/insulation to correct infiltration deficienies.

MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	1
FLOOR	2	**ROOM**	2036	**WALL ORIENTATION**	North
LOCATION ALONG WALL	West end	**ADDITIONAL LOCATION**			

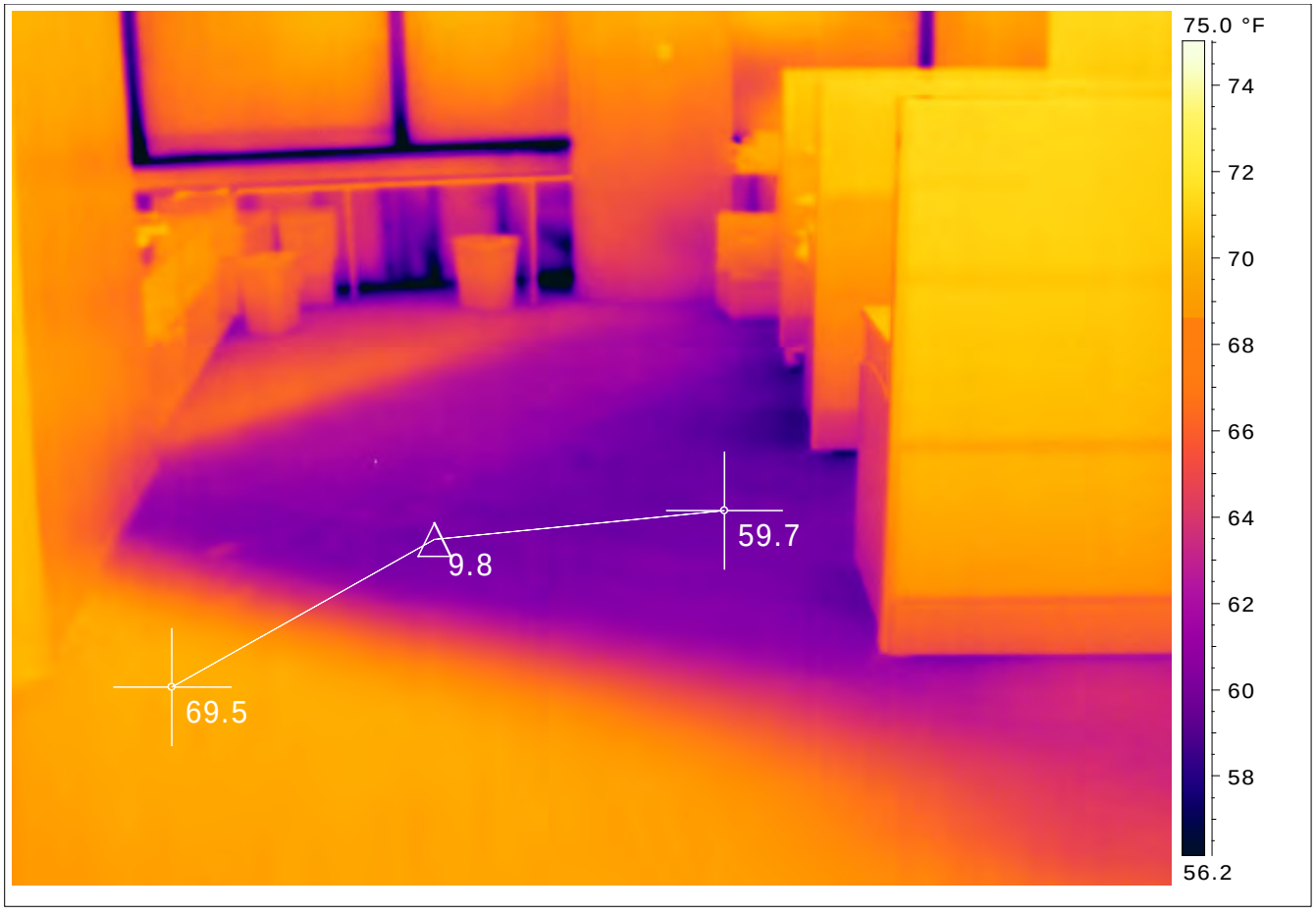
PROBLEM DESCRIPTION Cold temperatures are present at the bottom of this column. Infiltration into the room occurs at the two areas (see arrows). This column extends through a soffit and then to ground, on the building exterior. Air infiltration into the columns may be occuring at the column base cover or the underlying soffit.



MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	2
FLOOR	2	**ROOM**	2018C	**WALL ORIENTATION**	East
LOCATION ALONG WALL	North end	**ADDITIONAL LOCATION**			

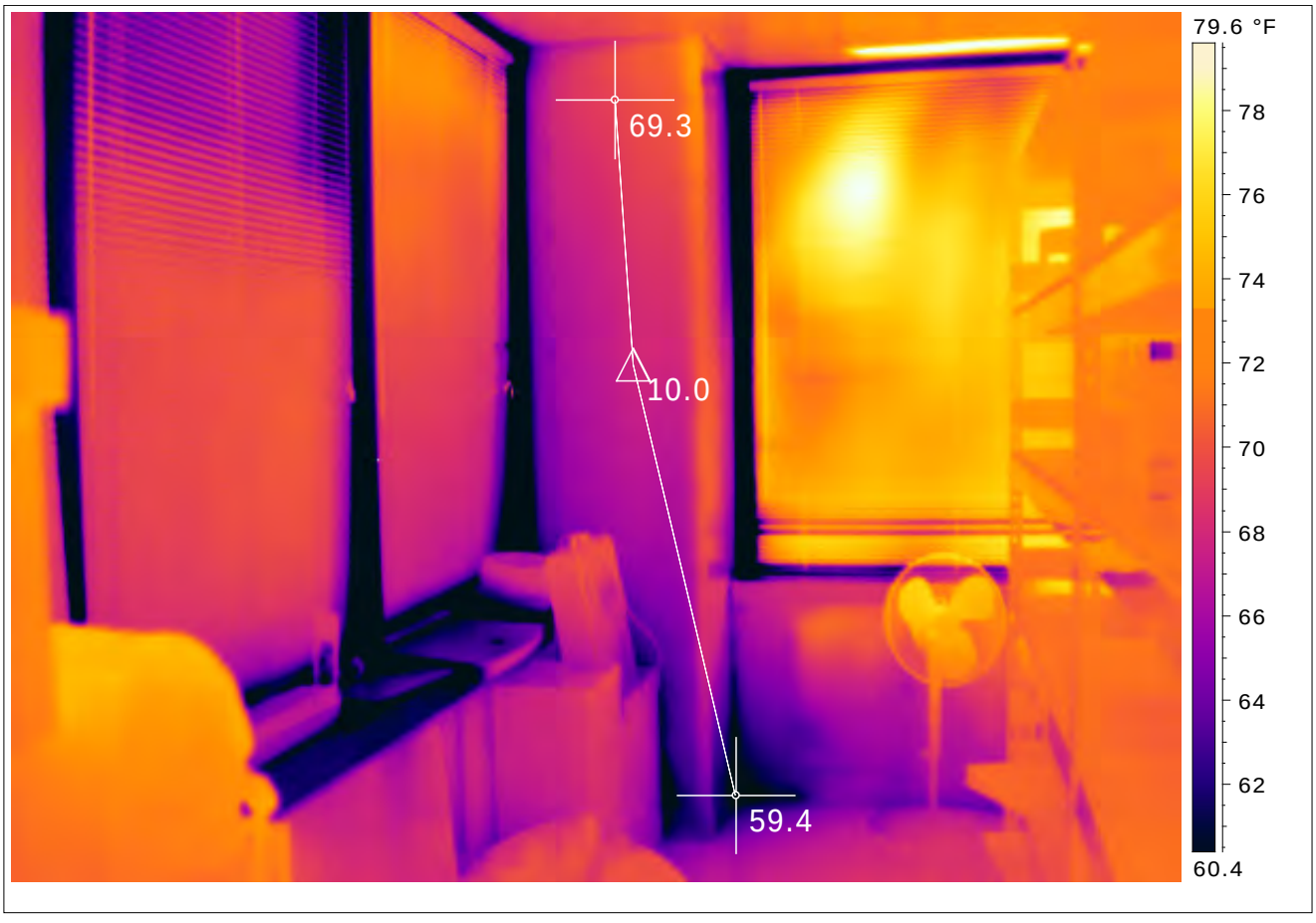
PROBLEM DESCRIPTION A soffit and loading dock area runs from this location around to the entrance bridge. The floor over this area is sharply colder as a result of air infiltration into the soffit area. This area must be sealed and/or insulated.



MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	4
FLOOR	2	**ROOM**	File room	**WALL ORIENTATION**	South
LOCATION ALONG WALL	East end	**ADDITIONAL LOCATION**			

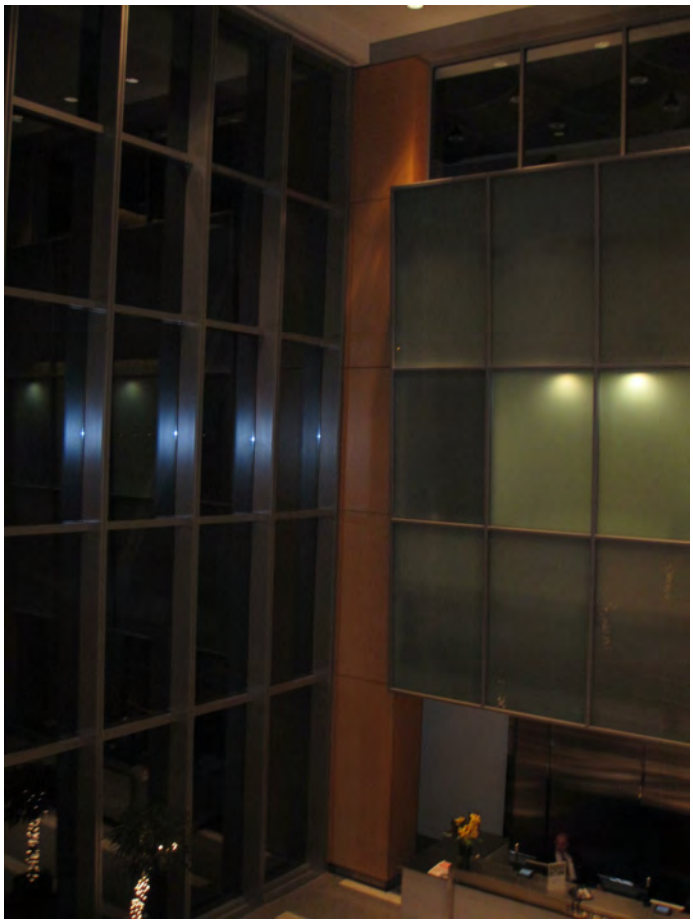
PROBLEM DESCRIPTION Cold temperatures are present at the base of the column. Infiltration from the exterior column base is likely.

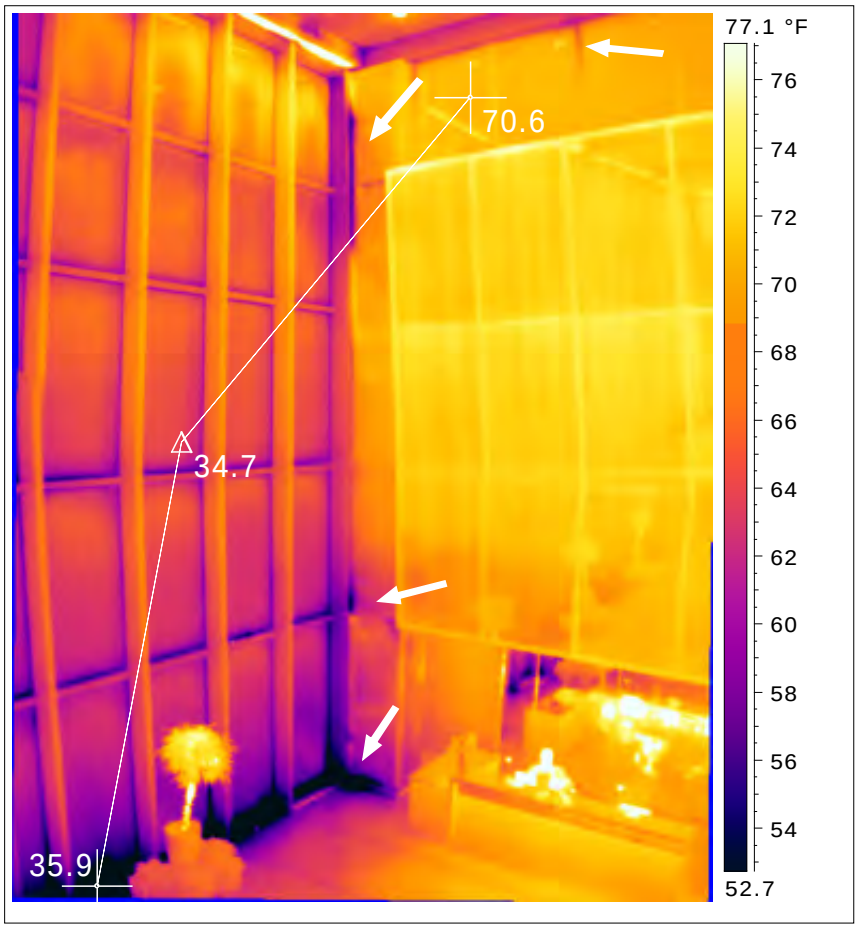


MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management			**BUILDING**	Enlightened	**PROBLEM #**	5
FLOOR	1	**ROOM**	Lobby by guard desk	**WALL ORIENTATION**		West	
LOCATION ALONG WALL	Center			**ADDITIONAL LOCATION**			

PROBLEM DESCRIPTION Six exterior columns are located outside the attrium. The columns run from ground level and terminate in a soffit at the top of the 3rd floor. The columns tie into the floor level of the atrium through a horizontal bridge structure. The north most column ties into the wood covered vertical bulkhead shown here. Air infiltrates into the column and flows into the wood covered bulkhead through the horizontal bridge structure. The air travels up the bulkhead and into the horizontal beam at the top of the atrium. The air flows into the adjacent office area in the ceiling. Arrows show infiltration from the bulkhead and beam into the atrium. Infiltrating air from the columns is likely flowing laterally, along the base of the glazing in a louvered structure at floor level, producing extremely low temperatures,

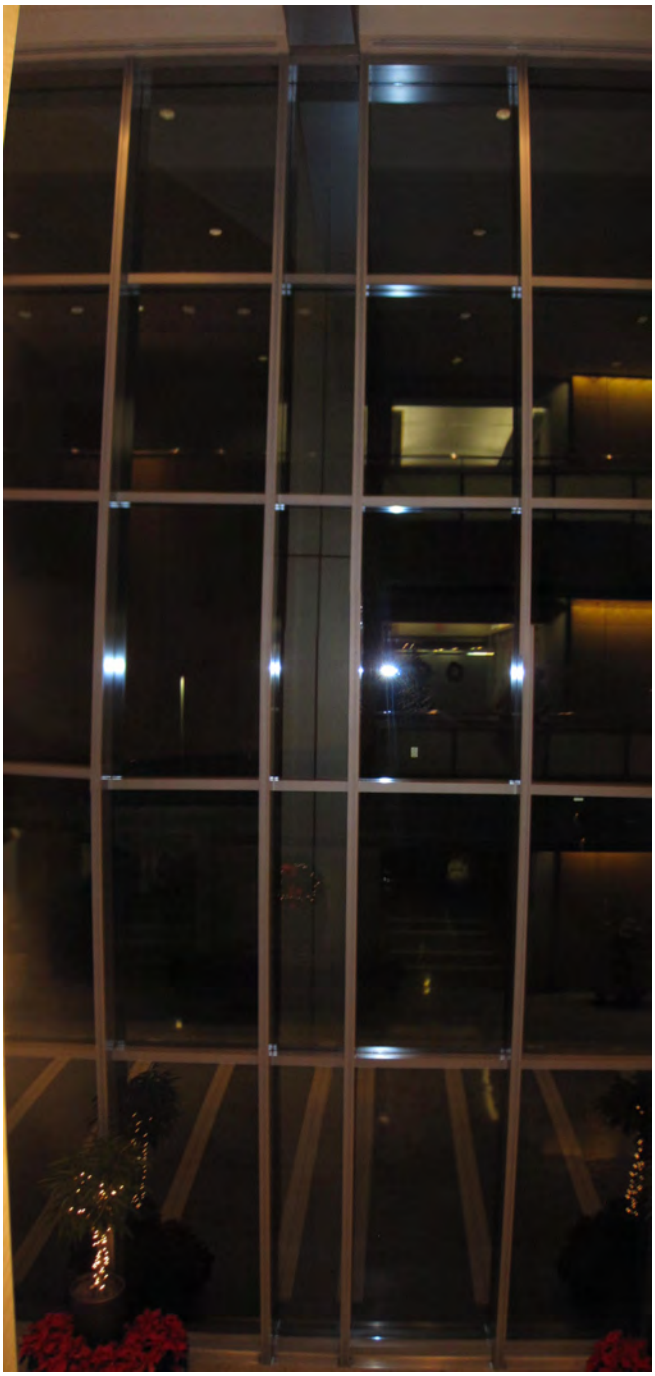


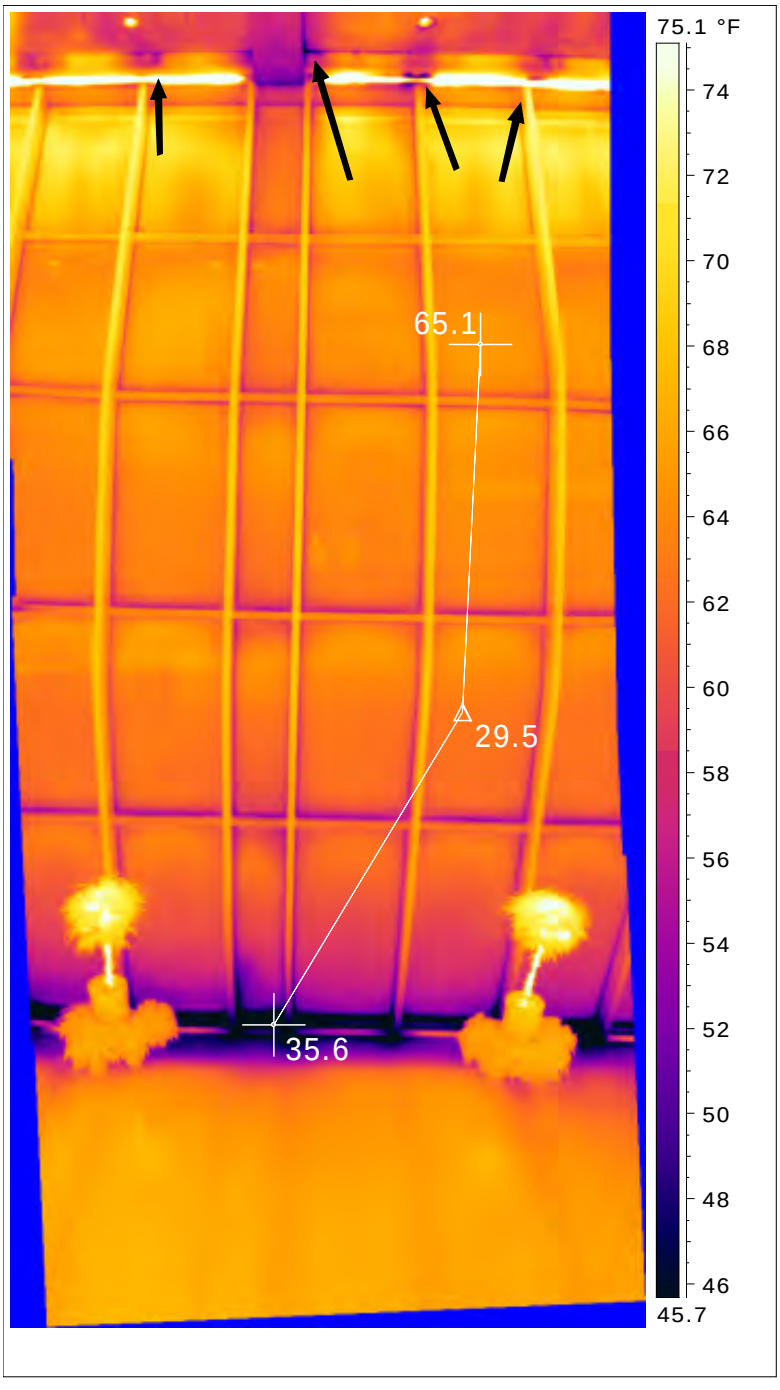


MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	6
FLOOR	1	**ROOM**	Lobby. column A7	**WALL ORIENTATION**	West
LOCATION ALONG WALL	Center	**ADDITIONAL LOCATION**			

PROBLEM DESCRIPTION This image shows the impact of column A7. Infiltration occurs at floor level from the horizontal bridge structure. This produces very low temperatures at floor level. The column terminates at a soffit area. Infiltration from the column and/or soffit is causing cold air to enter the building at the atrium ceiling. Infiltration is seen at the enclosed beams and along the glazing reveal (black arrows). This air can be seen flowing above the ceiling and entering adjacent conditioned spaces.





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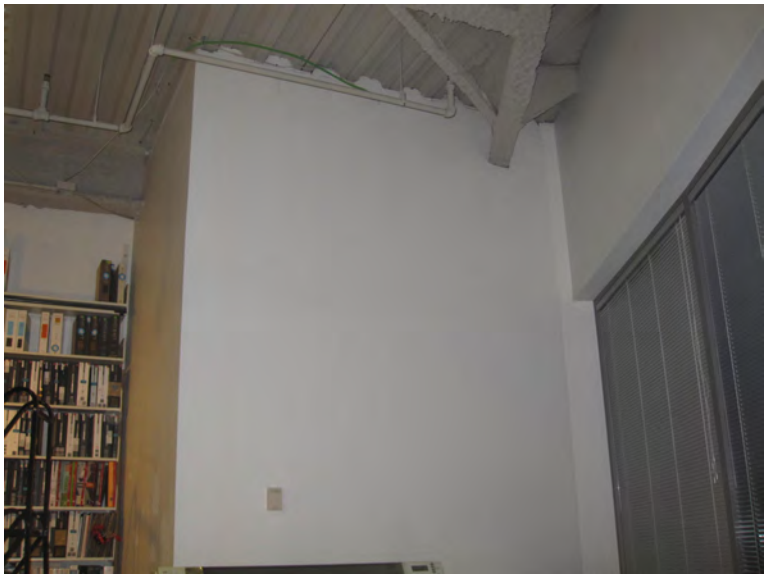
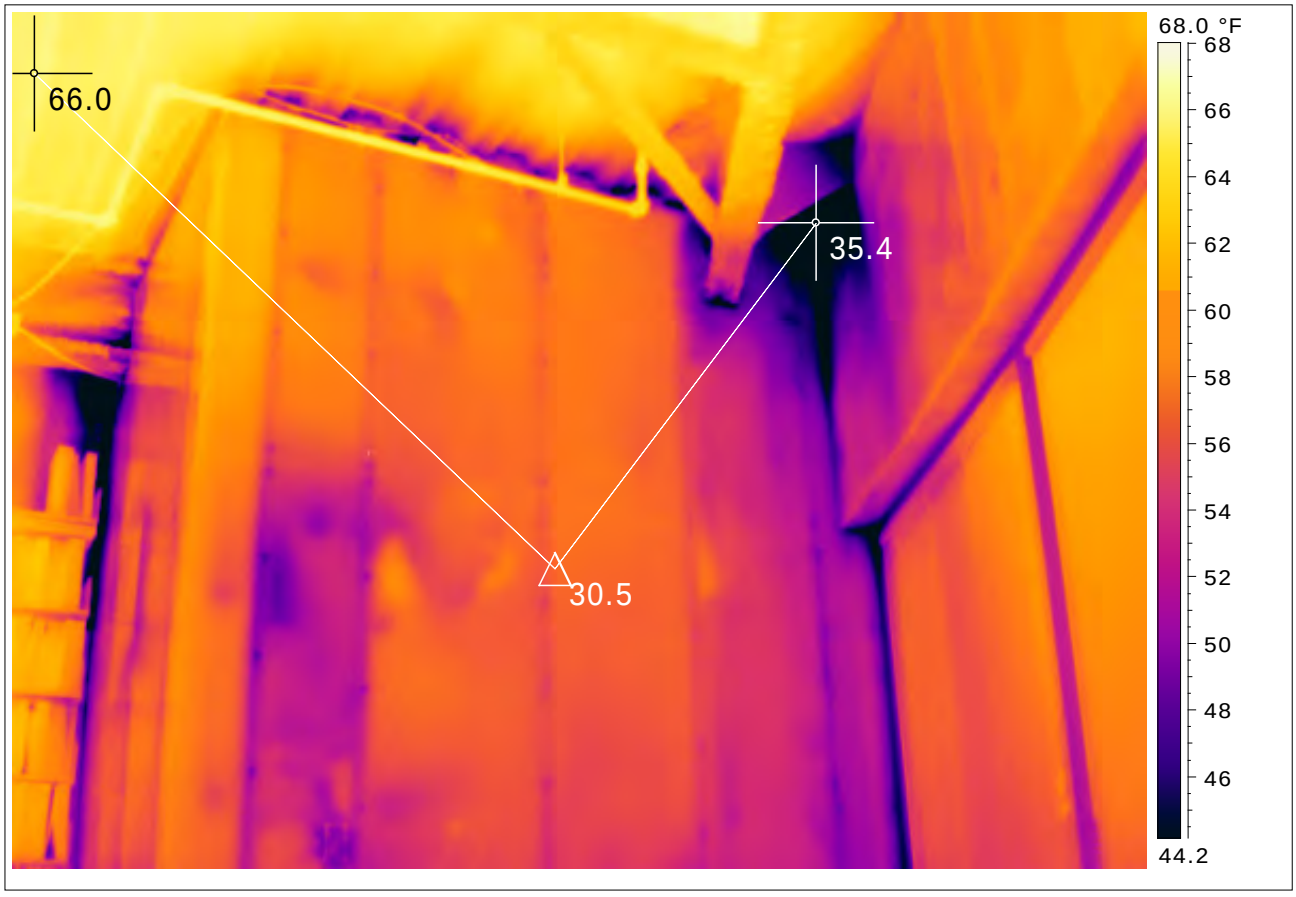
CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	7
FLOOR	1	**ROOM**	Suite 101	**WALL ORIENTATION**	South
LOCATION ALONG WALL	East end	**ADDITIONAL LOCATION**			

PROBLEM DESCRIPTION This bulkhead is part of the entry vestibule at the end of the bridge on the east side of the building. The east elevation on floors 1-3 forms a semi-circle. The bottom of the 2nd floor of this area is soffit and loading dock. This soffit has produced infiltration problems that have resulted in tenant complaints. Infiltration from the soffit appears to flow into suite 101 thorugh this bulkhead. Substantial volumes of air are flowing into the space: Infiltration velocity at this corner was measured to be 381 fpm.

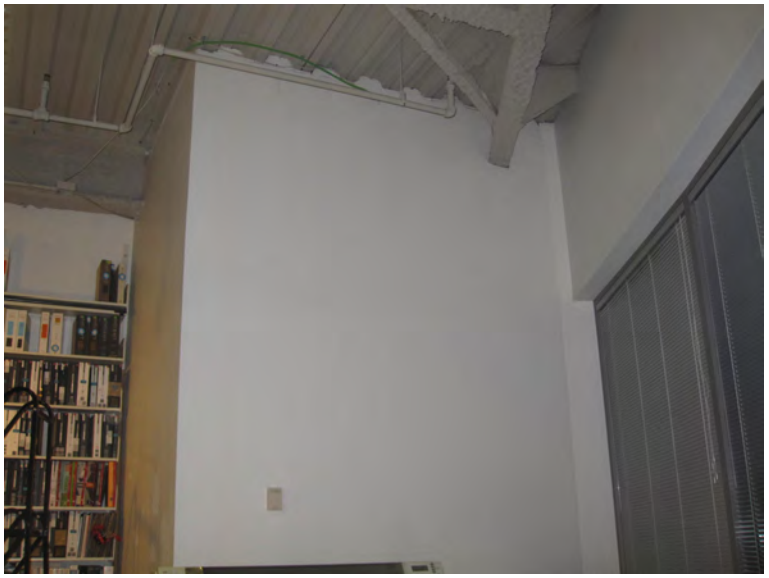


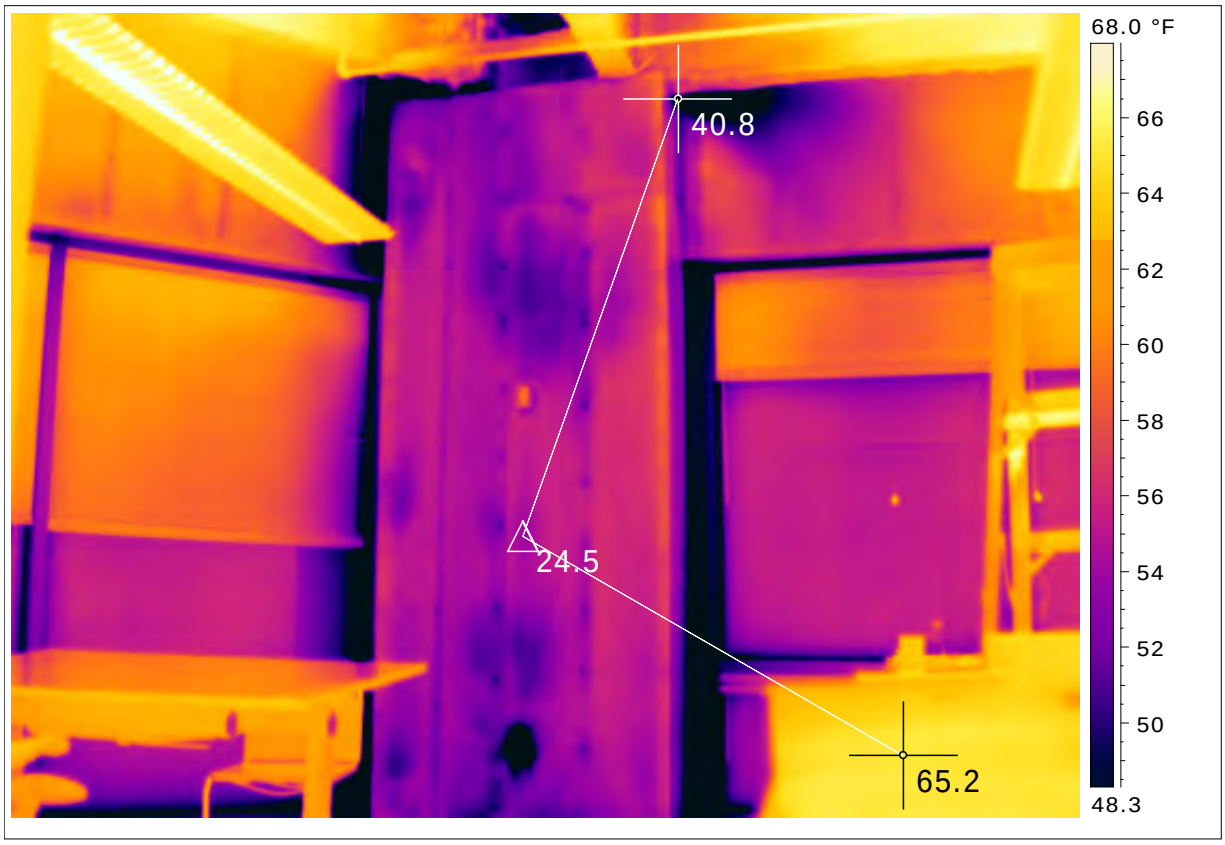


MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	8
FLOOR	1	**ROOM**	Suite 101	**WALL ORIENTATION**	South
LOCATION ALONG WALL	East end			**ADDITIONAL LOCATION**	S.E. column

PROBLEM DESCRIPTION Infiltration is seen at the top of the column bulkhead. The column enclosure is open both to the interior and the back of the precast. The infiltration source may be the 2nd floor roof parapet.

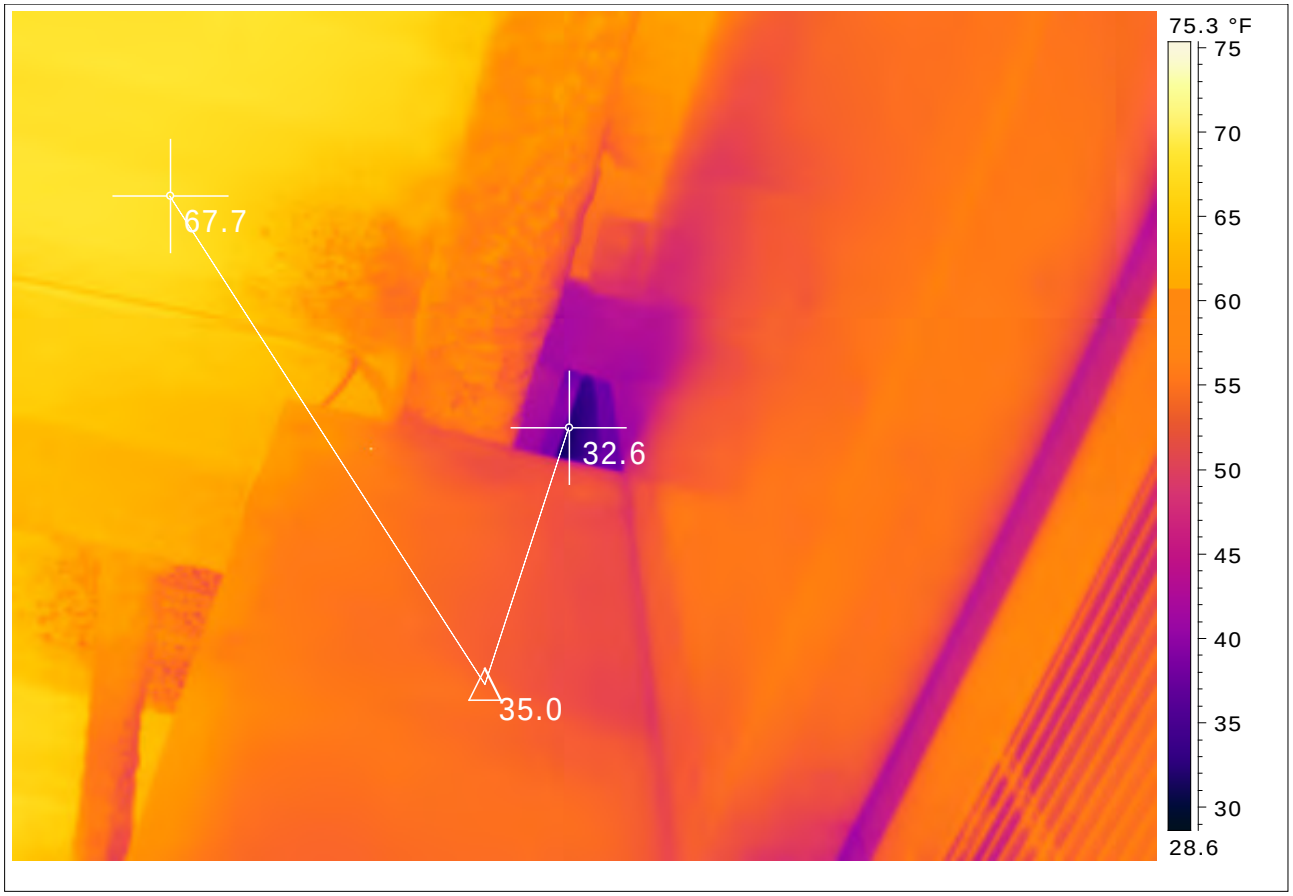




MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	9
FLOOR	1	**ROOM**	Suite 101	**WALL ORIENTATION**	South
LOCATION ALONG WALL	East end	**ADDITIONAL LOCATION**	S.E. Column		

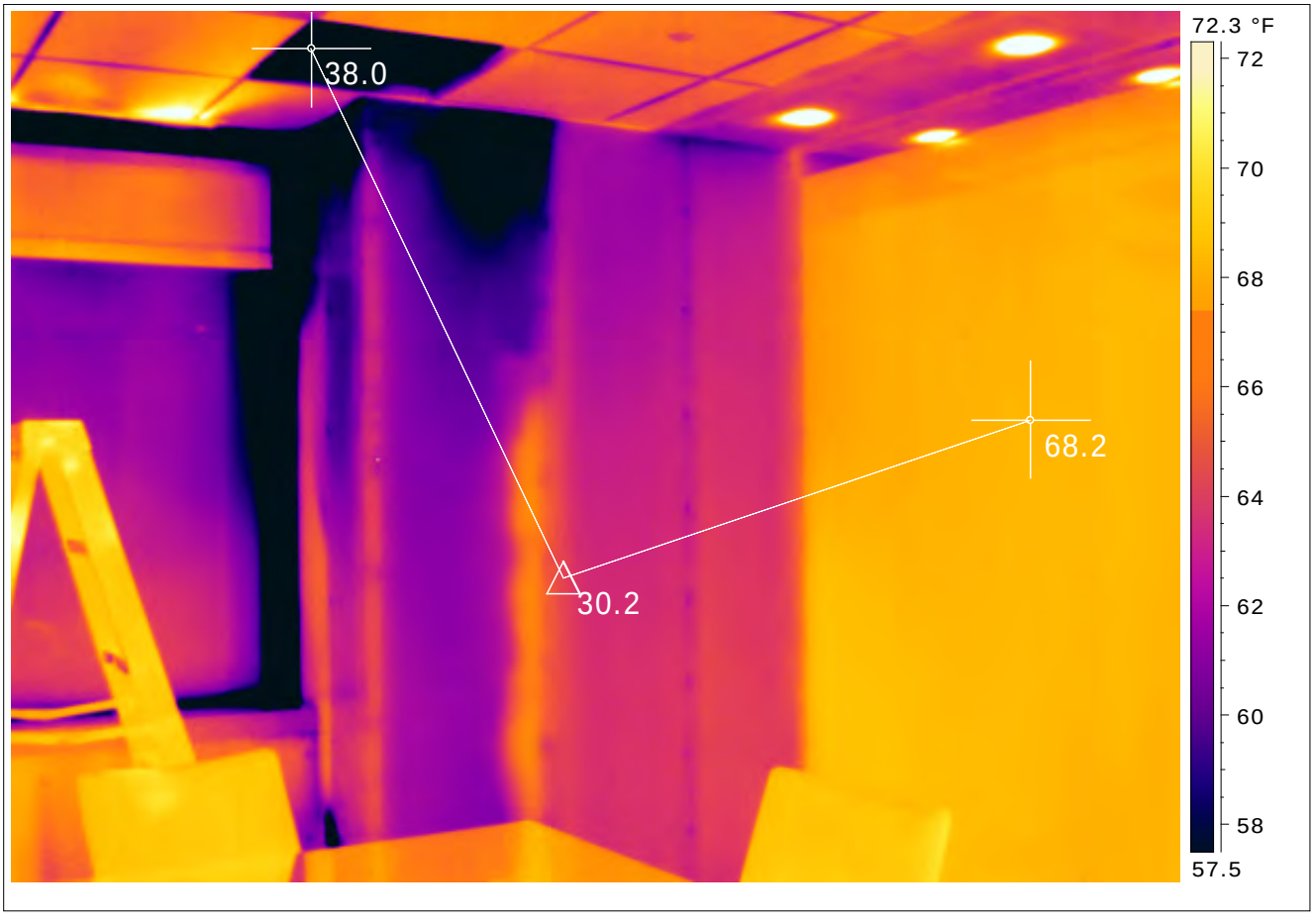
PROBLEM DESCRIPTION Top of column bulkhead shown in problem 8. The back of the precast is visible. A strong down ward air flow can be felt at the open metal edge on the right.



MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	10
FLOOR	3	**ROOM**	Conference room 3F	**WALL ORIENTATION**	West
LOCATION ALONG WALL	South end	**ADDITIONAL LOCATION**			

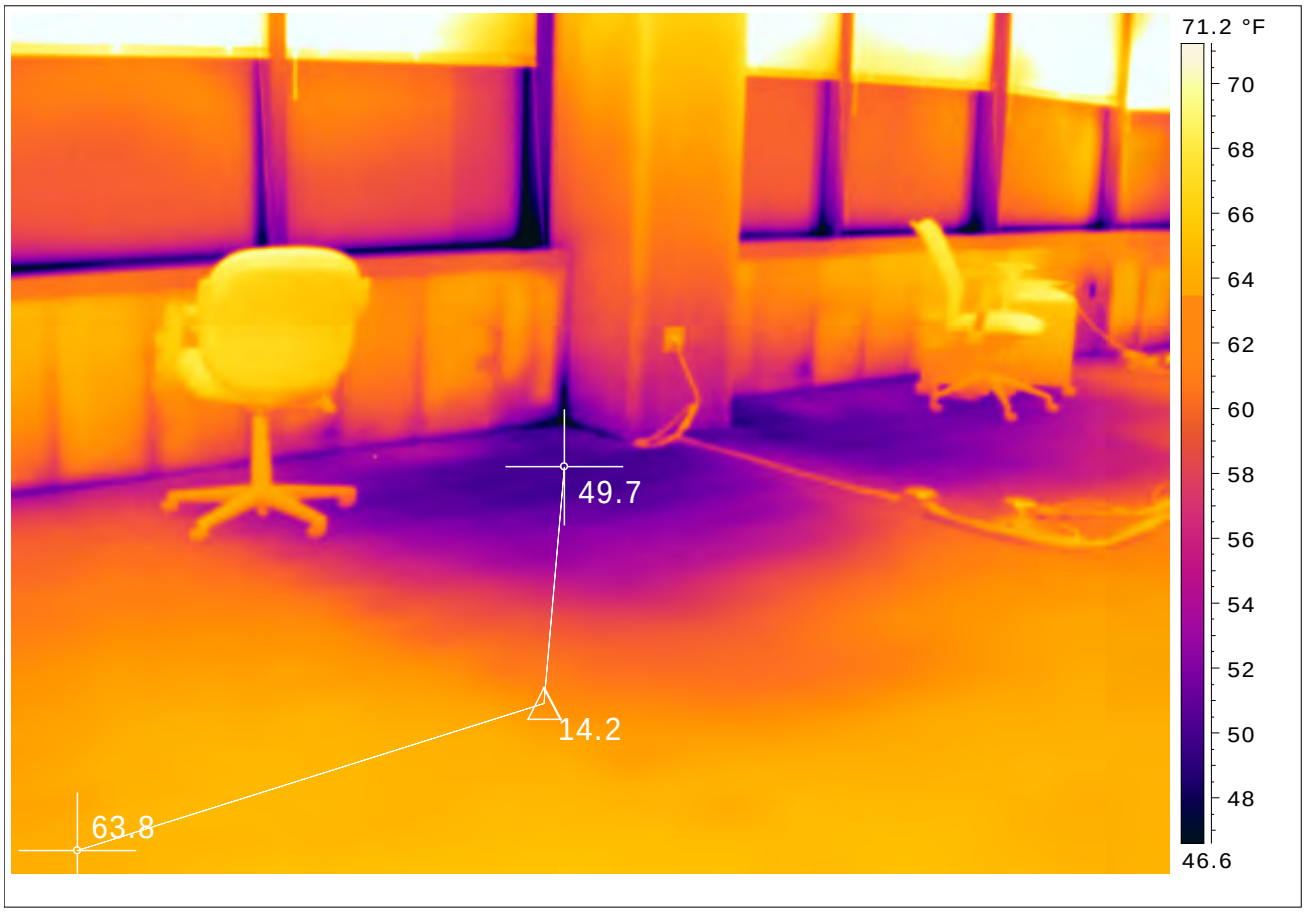
PROBLEM DESCRIPTION Cold air is present at this interior column bulkhead. This bulkhead is open to the soffit that extends from the atrium ceiling. Infiltrating air from the soffit is flowing into this bulkhead.



MID ATLANTIC INFRARED SERVICES INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	11
FLOOR	4	**ROOM**	A7 column	**WALL ORIENTATION**	West
LOCATION ALONG WALL	Center	**ADDITIONAL LOCATION**			

PROBLEM DESCRIPTION This floor area is located above the soffit on the west side of the atrium. This column extends to ground level and is a likely infiltration conduit. The floor around the columns are cooled by air traveling up the columns or entering at the soffit and impinging on the bottom of the pan deck. The infiltrating air then mixes with the return air in the ceiling plenum.



MID ATLANTIC INFRARED SERVICES

INFRARED ANALYSIS

CLIENT	Enlightened Management	**BUILDING**	Enlightened	**PROBLEM #**	12
FLOOR	4	**ROOM**	Break room	**WALL ORIENTATION**	South
LOCATION ALONG WALL	East end	**ADDITIONAL LOCATION**	Column 11D		

PROBLEM DESCRIPTION Cold air is infiltrating at an open joint along the window frame. The air source is like behind the column and the underlying soffit. Visual inspection of the exterior fascia from a nearby window revealed an open horizontal joint.