REPORT FOR:

Seven Oaks Pool
444 Adsum Drive
Building Condition Assessment

Submitted to:	City of Winnipeg Planning, Property, and Development Department Accommodation Services
Attention:	Mr. Lou Chubenko
Date:	April 4, 2019
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Crosier Kilgour & Partners Ltd.™

CONSULTING STRUCTURAL ENGINEERS

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Executive Summary

At the request of the City of Winnipeg Planning Property & Development Department, a structural and building envelope assessment of Seven Oaks Swimming Pool was completed by Crosier Kilgour & Partners personnel.

Short term priorities include structural concrete repairs to the pool tank to address corrosion-related deterioration; sealing of leaking cracks within the pool tanks; and replacement of the existing roofing system. A structural assessment of the pool tanks and mezzanine columns are also recommended.

Medium term priorities include structural concrete repairs; repair and coating of steel access platforms; masonry repairs; and replacement of the curtain wall glazing and storefronts.

Long term priorities include remediation of the exiting crawlspace remediation; replacement of the pool deck and tank tile and waterproofing; and re-cladding of the building exterior.

Category	Estimate
Total Short Term Recommendations (within 1 year)	$689,000
Total Medium Term Recommendations (Year 1 to 5)	$393,000
Total Long Term Recommendations (Year 5 to 10)	$1,850,000
Total of All Recommendations	**$2,884,000**

1. Introduction

At the request of the City of Winnipeg Planning Property & Development Department, a structural and building envelope assessment of Seven Oaks Swimming Pool was completed by Crosier Kilgour & Partners personnel. The purpose of the investigation was to provide an opinion as to the current condition of the structure, cladding, windows and roofing, identify areas of distress, and provide recommendations aimed at extending the service life of the structure and building envelope components.

The following report details the review methods utilized, problem background and provides a summary of our observations and findings, as well as opinions regarding the condition of the structure and building envelope. Recommended repairs and estimates of budget construction costs are also provided where appropriate.

1.1 Limitations

Our assessment is based on a visual examination of representative portions of the building under review which were easily visible, exposed and could be examined. We cannot warrant any different conditions that may exist, but which are covered by finishes, or other materials, or not accessible at the time of the site visit. It should be further acknowledged that our foundation evaluation is based on the present condition only and that we cannot guarantee that future foundation movements will not occur due to movements in the subsoil

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1.2 Scope of Investigation

The intent of this project is to complete a non-destructive condition assessment of the structure and building envelope, and provide recommendations for immediate, short and long-term repairs.

The investigation included, a review of available documentation such as original construction drawings, engineering reports, roofing reports, maintenance reports, and discussions with personnel familiar with the structures.

A visual review of representative portions of the building structure, envelope, and roof(s) which were exposed and readily accessible including common public areas such as entrance foyer, corridors, stairwells, and representative non-public areas such as accessible crawlspaces, and mechanical rooms.

The results of our investigation are summarized in this final report will includes recommendations, and a Class 4 (-30% to +60%) estimate of probable construction costs for the property.

1.3 Priority of Recommendations

All recommendations for building systems or components identified in the following sections have been assigned a priority based on the following criteria for the purposes of scheduling and budgeting in accordance with the following:

- Required Repairs (within 3 months) – Repairs necessary to address specific safety issues. Repairs required within 3 months.
- Short Term Recommendations (within 1 year) – High priority for repairs/maintenance including code and regulatory issues.
- Medium Term (Year 1 to 5) – Repairs required to address ongoing or low-risk deterioration, replacement of end of service-life building components.
- Long Term (Year 5 to 10) – Repairs required to address ongoing or low-risk deterioration, replacement of end of service-life building components.
- Long Term Considerations/Recommended Improvements (not time critical) – Optional work including recommended improvements presented for future consideration and planning.
- Maintenance (ongoing) – Repairs required to address ongoing, or routine maintenance.

1.4 Opinion of Probable Construction Costs

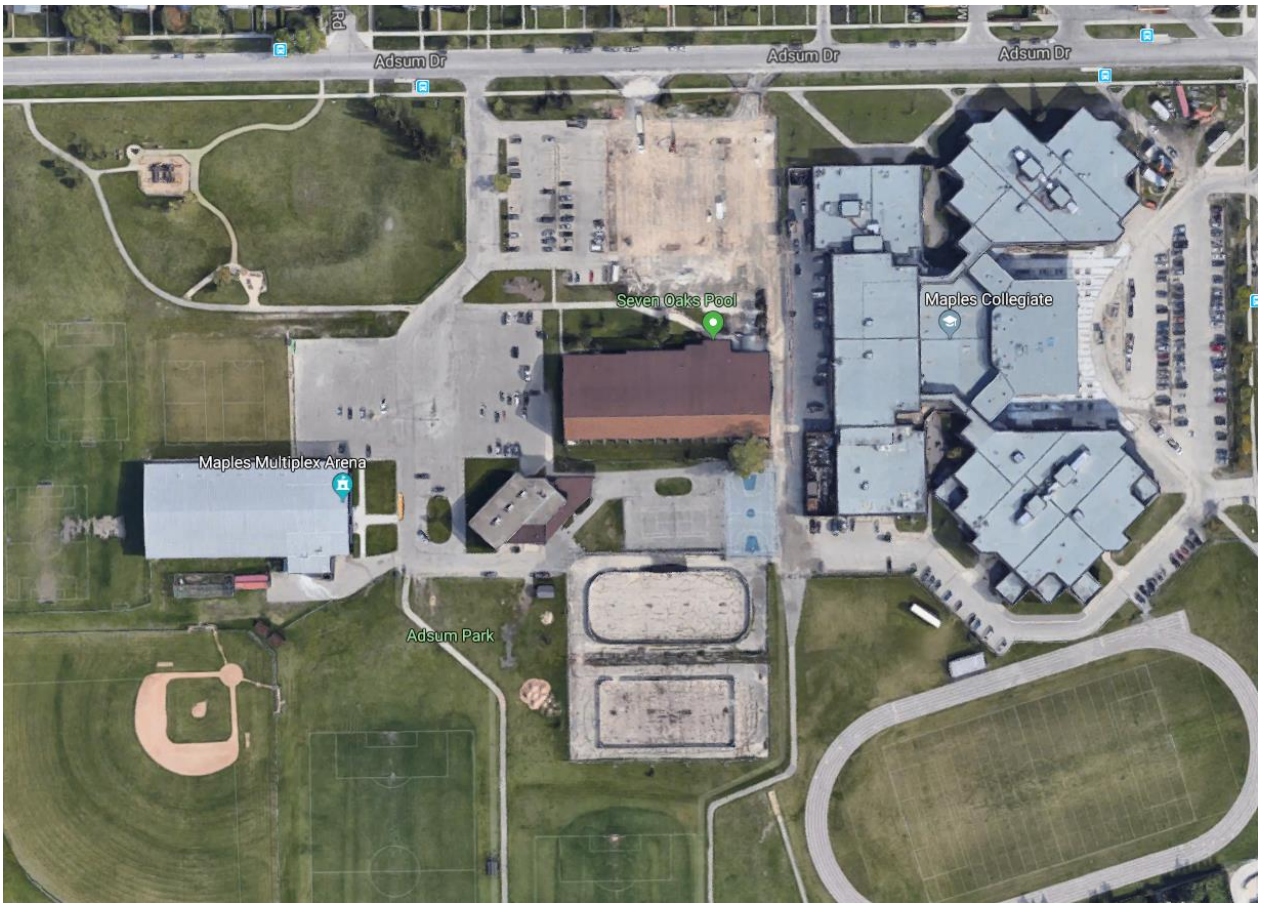
Accurate estimation of construction costs for remediation projects is difficult to provide because of the inherent number of variables associated with working on an existing structure. Hidden conditions inevitably exist which can result in increases in the overall cost of repairs. Based on the level of investigation and available information, the budget is considered a Class 4 (-30% to +60%) estimate in accordance with the city of Winnipeg budget classification system. The cost estimate is a preliminary estimate used in developing long term capital plans and for preliminary discussion of proposed capital projects.

2. Property Description

The following description is based on a review of the existing architectural and structural drawings, visual observations made during the site reviews, and the City of Winnipeg, Asset Detail Report. A satellite image of the site is shown in Figure 1 below. The following drawings were available for review:

- Architectural drawings A1 through A16 by Number Ten Architectural Group and dated 1975.
- Architectural drawings A0, A2 through A8 by Prairie Architects Inc. and dated 2016.
- Structural drawings S1 through S7 by Crosier, Greenberg and Partners and dated 1975.
- Structural drawings S1 through S11 by Wolform Engineers Ltd. and dated 2016.

Figure 1 – Site Plan



2.1 General

The Seven Oaks Indoor Pool (Building Number PI-03) is a recreational pool facility located at 444 Adsum Drive, Winnipeg, Manitoba. According to information supplied by the City of Winnipeg, the facility has a total floor area of 45,908 square feet, was constructed in 1977 and comprises a Mezzanine floor, Main Floor, and Basement. The building envelope was upgraded in 1995 and

included new roof finishes and new wall assemblies including windows. In 2010 a family change room was added to the main floor at the west end of the pool.

2.2 Building Structure

The Seven Oaks pool building was designed in 1975 and constructed shortly thereafter. The original building is a two storey structure with a partial basement and crawlspace. The roof structure consists 4" tongue-and-groove wood decking spanning approximately 15'-0" to 6-3/4" x 31-1/2" glue-laminated (glulam) roof beams. The glulam roof beams span in the north-south direction and are supported on the south elevation by cast-in-place concrete buttresses (Photograph 3.1.2.3-1). The north end is supported on a 12" x 12" short concrete pier on a concrete masonry unit (CMU) wall. An intermediate support line consisting of HSS 4" x 4" x 0.25" steel columns are located along Grid Line C which corresponds to the south edge of the mezzanine. The lateral forces created by the roof beams are resisted by steel tension ties located within the mechanical room on the second floor (Photograph 3.2.4.2-2).

The second floor structure consists of 12" precast, prestressed hollowcore floor slabs spanning in the north-south direction and are supported on an 8" CMU wall on north end and a 27" x 24" cast-in-place concrete beam on the south end. The hollowcore panels cantilever approximately 3'-0" beyond the midline of the concrete beam to an 8" x 24" spandrel beam the also supports the CMU balustrade.

The main floor structure in the common spaces at the north side of the building consists of 12" precast, prestressed hollowcore floor slabs spanning in the north-south to direction and are supported on a 12" concrete foundation wall on the north end and a 27" x 24" cast-in-place concrete beam on the south end.

The pool deck and tanks are constructed of conventionally reinforced cast-in-place concrete. The pool decks are combination of one-way thick concrete slabs and concrete joist construction. The pool decks along the north and south sides of the pool consists of a 6" thick conventionally reinforced concrete slab spanning between the 27" x 24" concrete beam and tank wall. The pool deck at the east and west ends of the pool are concrete joist construction. The east deck is 15" thick (3" slab + 12" joists) and the west end is 13" thick (3" slab + 10" joists). The joists are typically 5" thick and spaced at 12" on-centre. The joists span between the 12" foundation wall and tank walls.

The pool tank is constructed of conventionally reinforced concrete construction. The tank bottom is constructed of a 9" thick, two-way spanning concrete slab with 6'-0" x 6'-0" x 6" drop panels over supports. The tank is supported directly on the pile foundation. The tanks walls consist of 12" thick cast-in-place concrete walls.

The lower level includes occupied spaces for mechanical and electrical services, as well as storage and staff rooms. The basement floor slab consists of a 5" slab-on-grade on 6" compacted granular fill. The drawings indicate that a 4 mil polyethylene vapour retarded was provided below the slab.

The remaining basement areas is unfinished crawlspace. Drawings do not indicate if a vapour retarder was included in the original design.

The building is founded on a deep foundation system consisting of precast driven piles.

The building is currently undergoing a major addition and renovation. The addition is beyond the scope of this investigation and has not been reviewed.

2.3 Building Envelope and Cladding

The majority of the exterior wall along the North, East and West elevations were brick veneer mounted on concrete masonry block back-up at the lower level and prefinished metal cladding at the upper level of the pool building. Along the South elevation, curtainwall system in between concrete buttresses were utilized for natural lighting to the swimming pool area.

Review of the exterior wall systems is based on visual review of the pool building only with no invasive inspection. Review of the existing drawings provided by the City of Winnipeg was also completed. There were elements of the wall system that were concealed from view and should be confirmed during the repair or renovation work.

2.4 Roofing

Seven Oaks pool roof footprint is approximately 28,700 square feet and comprises of two roof facets. The main roof facet is a typical SBS modified bitumen 2-ply membrane system. The main roof assembly consists of 2-ply SBS base and granulated cap membranes, ½" plywood sheeting on wood strapping infilled with extruded polystyrene insulation and a bituthane vapor barrier on T&G wood deck. The steep roof facet is an asphaltic architectural shingle fastened to ½" plywood sheathing, 2" insulation and poly vapor barrier on T&G wood deck.

- Main roof = 19,800 square feet total area
- Steep roof = 8,900 square feet total area

3. Summary of Findings

The following sections summarizes the significant findings, recommendations, and estimates of probable construction costs.

3.1 Site

3.1.1 Sidewalks and Pavements

.1 Minor concrete deterioration was observed on the on concrete loading dock and exterior stairs on the east elevation was observed.

Photograph 3.1.1.1-1: Partial view of east loading dock.

Recommendation 3.1.1.1-1: Localized concrete repairs are required to address existing deterioration. Repairs are relatively limited at present and are considered normal maintenance.

Estimated Cost: $3,000

Priority: Medium Term, recommended within 1 to 5 years.

3.1.2 Grading

.1 The east and south elevations consist of hard landscaping surfaces such as concrete and asphalt. No obvious deficiencies were noted.

.2 Access to the west elevation was limited due to construction process.

.3 Access to the south elevation was not available at the time of the site visit. Landscaping on the south elevation is consists of sod (Photograph 3.1.2.3-1). The grade appears to slope away from the building.

Photograph 3.1.2.3-1: Partial view of south elevation.

.4 A visual review of the concrete buttresses showed evidence of concrete deterioration (Photographs 3.1.2.4-1). The pattern and location of deterioration is consistent with freeze-thaw deterioration caused by repeated exposure to roof runoff from the rain water leaders which direct water down the formed in channel along the top edge of the buttress.

Photograph 3.1.2.4-1: Partial view of concrete buttress.

Recommendation 3.1.2.4-1: Concrete repairs are required to address existing deterioration. Modification and extending the rainwater leaders is also recommended to direct roof runoff away from the buttress and structure.

Estimated Cost: $40,000

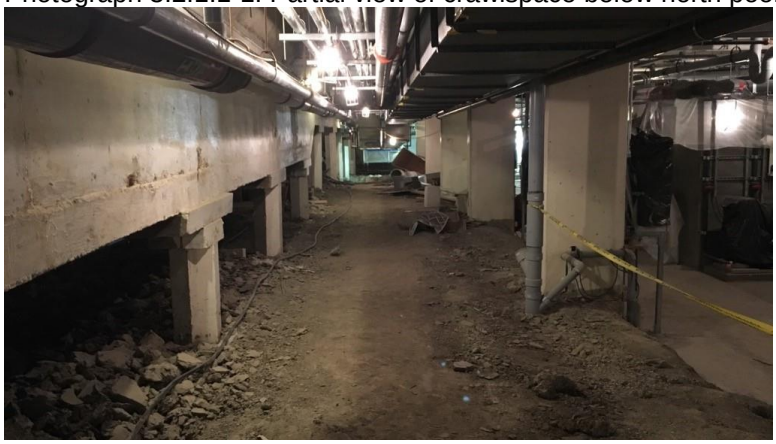
Priority: Short Term, recommended within 1 year.

3.2 Structural

3.2.1 Basement/Crawlspace

.1 A crawlspace is located below the pool deck and tanks. The existing vapour retarder is was not observed over large portions of the crawlspace including the north side (Photographs 3.2.1.1-1) and below the pool tank (Photograph 3.2.1.1-5 and 3.2.1.1-6). Where a polyethylene vapour retarder was visible, it was generally discontinuous and in poor condition (Photograph 3.2.1.1-1).

Photograph 3.2.1.1-1: Partial view of crawlspace below north pool deck.



Portions of the original crawlspace were converted to service space to accommodate new equipment required for the addition (Photograph 3.2.1.1-2). Review of building components associated with the addition was not completed and beyond the scope of this assessment.

Photograph 3.2.1.1-2: Partial view of new mechanical equipment.

Photograph 3.2.1.1-3: Partial view of crawlspace below the west pool deck.

Photograph 3.2.1.1-4: Partial view of crawlspace below the west pool deck.

The elevation of the existing grade below the pool tank drops at the east end to accommodate the deep end of the pool (Photograph 3.2.1.1-5). The ground in below the deep end of the pool (east) was damp with evidence of crystal growth, possibly from sulphates, on the surface the soil

Photograph 3.2.1.1-5: Partial view of crawlspace below pool tank.

Photograph 3.2.1.1-6: Partial view of crawlspace showing typical ground cover.

Recommendation 3.2.1.1-1: The crawlspace does not have a functioning vapour barrier. Remediation of the crawlspace is required including grading of the existing soil to direct water away from structural members, installation of a new drainage system and sump pits (if required, see mechanical), and installation of a vapour retarder and sand cover. Installation of new sub-surface drainage, vapour barrier, and sand cover is recommended within 5 years.

Estimated Cost: $400,000

Priority: Long Term, recommended within 5 to 10 years.

.2 Evidence of leakage was observed in the hollowcore panels below the locker rooms. Site personnel have also reported that water has been trapped in the hollow core floor slabs and weep holes were added to allow water to drain from the cores. Although the source water was not determined it is presumably from the locker rooms and showers. The existing tile has been replaced within the locker rooms as part of the ongoing renovations. It is our understanding that a waterproofing membrane has been installed as part of the tile replacement. No repairs are currently recommended.

.3 Evidence of water seepage was observed through the foundation walls at the northwest stair (Photograph 3.2.1.3-1). It is our understanding that renovation work will include renovations to the exterior which may address leakage. No repairs are currently recommended.

Photograph 3.2.1.3-1: Partial view of crawlspace showing typical ground cover.

.4 The pool filtration tank at the northeast corner of the building have evidence of concrete deterioration. Site personnel indicated that concrete repairs will be completed as part of the renovation.

.5 A raised steel grate floor is provided around the filtration tank. Minor to moderate corrosion was observed on the steel framing members. visible.

Photograph 3.2.1.5-1: Corrosion on steel framing supporting filtration room platform.

Recommendation 3.2.1.5-1: Sandblast and coat existing steel platform.

Estimated Cost: $25,000

Priority: Medium Term, recommended within 1 to 5 years.

.6 An exterior stair provides egress from the east end of the basement. The concrete stair treads appear to be in good condition. Shallow surface spalling and exposed reinforcing steel was observed along the soffit of the concrete roof over the stair (Photograph 3.2.1.6-1).

Photograph 3.2.1.6-1: Corrosion of reinforcing stell and shallow surface spalling

Recommendation 3.2.1.6-1: Complete localized concrete repairs.

Estimated Cost: $10,000

Priority: Short Term, recommended within 1 year.

3.2.2 Swimming Pool and Pool Deck

.1 Cracking, water seepage, efflorescence and concrete delamination of the underside of the concrete pool tank and decks was observed at numerous locations from within the crawlspace.

Shallow delamination and surface spalling was observed along north edge of pool basin where it transitions to the deep end (Photograph 3.2.2.1-1) The delamination is a result of water seepage and is made worse by exposure to chlorinated water and insufficient cover over reinforcing steel. Efflorescence also visible along slab soffit.

Photograph 3.2.2.1-1: Soffit delamination and spalling at pool tank drain.

Cracking in the pool basin with evidence of leakage and efflorescence was visible in numerous areas. Attempts to address leakage by injecting the cracks with a urethane resin were visible in some areas (Photograph 3.2.2.1-2). It could not be determined if the repairs were successful at stopping leakage. Is reported that the cracks repaired by injection in 2010. Cracking and delamination of the concrete was observed despite the injection work which indicates that corrosion is continuing.

Photograph 3.2.2.1-2: Soffit delamination along injection repair.

Evidence of significant leakage was observed at the transition from shallow end to deep end (Photograph 3.2.2.1-3). The leakage is presumably occurring through a construction joint in the slab. Similar conditions were observed along the construction joint between the pool walls and deck.

Hammer soundings did not detect any evidence of delamination. Based on the observed conditions combined with exposure to chlorides from the pool water, the likelihood of that corrosion of the reinforcing steel is occurring is very high and is expected that concrete delamination will occur over the short to medium term.

Photograph 3.2.2.1-3: Leakage and efflorescence along construction joint in pool tank.

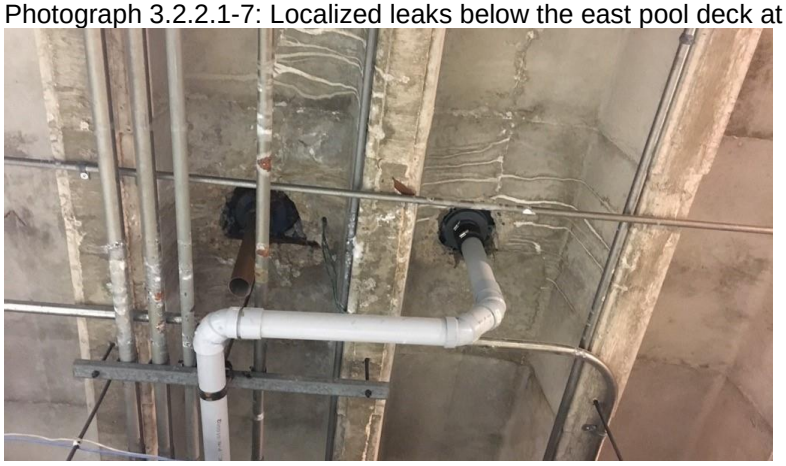
Photograph 3.2.2.1-4: Leakage and efflorescence in pool tank.

Photograph 3.2.2.1-5: Efflorescence at leak in pool tank.

Photograph 3.2.2.1-6: Efflorescence at crack in pool tank wall.

Evidence of leakage was also observed at cracks and penetrations in the concrete joist framing at the east and west pool decks (Photographs 3.2.2.1-5 and 3.2.2.1-6).

Photograph 3.2.2.1-7: Localized leaks below the east pool deck at a mechanical line.



Overall, the leakage and deterioration of the concrete pool decks and tanks are is directly related to water seepage and indicates that the existing tile is not providing an effective waterproof barrier.

Recommendation 3.2.2.1-1: Structural concrete repairs are required to address existing deterioration. Given the extent of leakage and the fact that the pool water contains chlorine which enhances corrosion, the likelihood of a rapid increase in corrosion and delamination is very high. Repairs are therefore required in the short term to address existing deterioration. Repairs will include removal of all loose concrete down to a sound substrate, exposing all corroding reinforcing steel, sandblasting existing concrete and reinforcing steel, and infilling with a proprietary concrete repair material.

For the purposes of budgeting, it is assumed that 2% of the surface area of the pool deck and tank soffit will require repair. Additional investigation beyond the scope of this report is required to identify and quantify repair areas.

Estimated Cost: $75,000

Priority: Short Term, recommended within 1 year.

Recommendation 3.2.2.1-2: A structural assessment of the pool deck and tank is recommended to identify and quantify existing repair areas.

Estimated Cost: $10,000

Priority: Short Term, recommended within 1 year.

.2 A visual inspection with localized chain drag soundings was completed on the top surface of the pool decks. Localized areas of debonding of the tile was observed within the pool tanks. Water seepage through the pool slabs and walls indicating that the existing tile is not providing an effective waterproof barrier. It is our understanding that localized repairs are being completed as part of the ongoing renovations and were ongoing during the site visit (Photograph 3.2.2.2-1). Localized repairs are considered a short term repair.

Photograph 3.2.2.2-1: Soffit delamination and spalling at pool tank drain.

Recommendation 3.2.2.2-1: Over the long term, to address the root cause of the concrete deterioration and extend the service life of the repairs, it is recommended that the existing tile be removed and replaced with a new pool lining and tile finish.

Estimated Cost: $600,000

Priority: Long Term, recommended within 5 to 10 years.

Recommendation 3.2.2.2-2: As an interim measure, injection of the cracks using a hydrophobic urethane resin can be completed to allow repairs to be deferred. It is anticipated that repairs will be required periodically until the tile is replaced

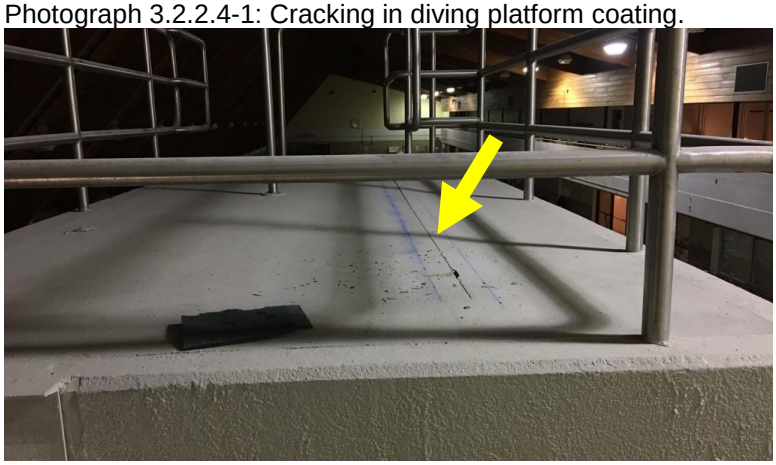
Estimated Cost: $25,000

Priority: Short Term, recommended within 1 year.

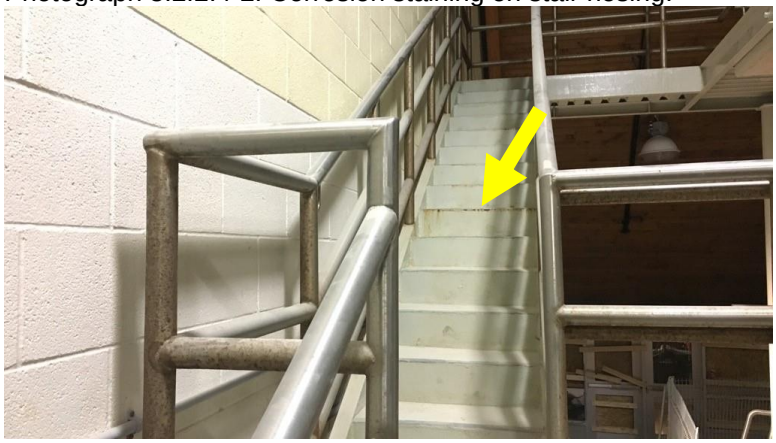
.3 Structural concrete repairs had been completed along the soffit of main floor beams on Grid C between 2 and 3 and Grid 2 between B and C. Repairs appear sound.

.4 The diving platform is constructed of cast-in-place concrete. The platform and stair treads have been are covered with a surface coating. The type of coating could not be determined. Evidence of cracking in the surface coating was visible on top diving platform (Photograph 3.2.2.4-1). Corrosion staining was also visible on the stair nosings (Photograph 3.2.2.4-2). Concrete repairs were underway at the time of the site visit and it was reported that the coating will also be repaired as part of this renovation.

Photograph 3.2.2.4-1: Cracking in diving platform coating.



Photograph 3.2.2.4-2: Corrosion staining on stair nosing.



.5 Exposed concrete framing appears to be in good condition. Minor deterioration at bottom of column at northwest corner.

Photograph 3.2.2.5-1: Deterioration of concrete column.

Recommendation 3.2.2.5-1: Complete localized concrete repairs.

Estimated Cost: $3,000

Priority: Short Term, recommended within 1 year.

3.2.3 Main Floor and Mezzanine Common Areas

.1 The main floor common areas were under renovation at the time of the site visit. Renovations included replacement of finishes including tile flooring with the locker rooms.

.2 The existing stairs to the mezzanine are covered with a vinyl flooring. The condition of the treads could not be determined however no obvious evidence of deterioration was observed.

.3 A viewing mezzanine is located along the north side of the pool. The concrete floor is covered with flooring material. The condition of the floor could not be determined however no obvious evidence of deterioration was observed. The concrete masonry unit (CMU) walls, CMU balustrade, and steel columns along the mezzanine are also in good condition.

3.2.4 Building Superstructure

.1 The existing roof structure consists of glulam beams supporting 4” tongue and groove decking. A visual review from ground level and diving platform was completed. Evidence of past repairs to the beams was visible. The glulam beams and wood decking appeared to be in good condition.

.2 The glulam beams are supported on exposed concrete buttress on the south side of the building (Photograph 3.2.4.2-1) and the exterior concrete block wall on the north side. A tension tie is provided on the north connection to resist the horizontal loads created by the

glulam roof beams. The tension ties were reviewed and appear to be in good condition (Photograph 3.2.4.2-2). The tension ties cross a walking aisle in the mechanical room. The tension ties have been painted yellow as a warning.

Photograph 3.2.4.2-1: Glulam tension tie at north support.

Photograph 3.2.4.2-2: Glulam tension tie connection to floor structure.

Two of the glulam beams at the entrance lobby are omitted and was part of the original design. Evidence of lateral movement of two of the two HSS columns supporting the two glulam beams where the tension ties have been removed was observed (Photograph 3.2.4.2-3). The cause of the displacement could not be determined. Further investigation beyond the scope of this assessment is warranted.

Photograph 3.2.4.2-3: Lateral deflection of HSS columns.

Recommendation 3.2.4.2-1: Complete further investigation to assess cause of apparent column displacement.

Estimated Cost: $10,000

Priority: Short Term, recommended within 1 year.

3.3 Building Envelope

3.3.1 Walls and Cladding

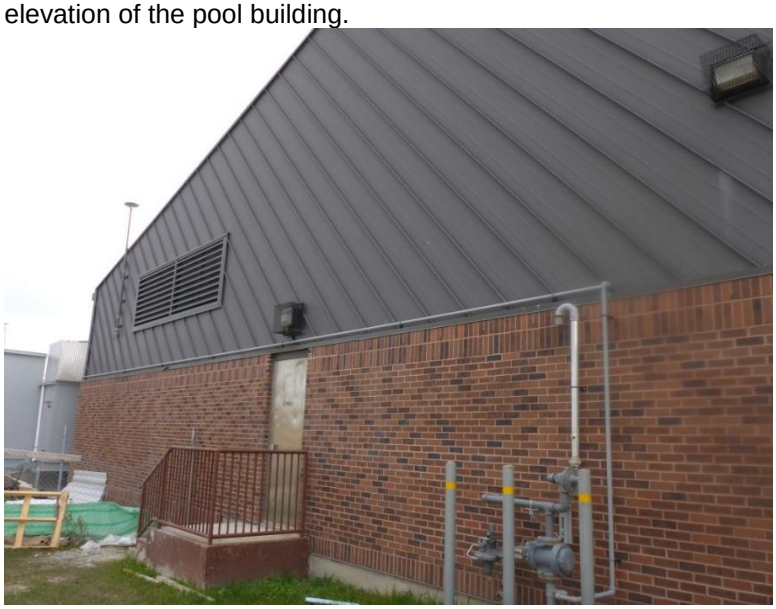
.1 The diagonal prefinished metal cladding appears to be in performing adequately. However, thermal anomalies caused by air leakage was observed at the metal cladding control joints, at cladding supporting steel girts and at cladding/brick wall joint interface during the thermographic scanning of the building walls.

.2 Localized mortar joint deterioration was observed adjacent to the masonry control joint along the East side of the pool building. Slightly displaced brick masonry units were observed at the top door jamb section.

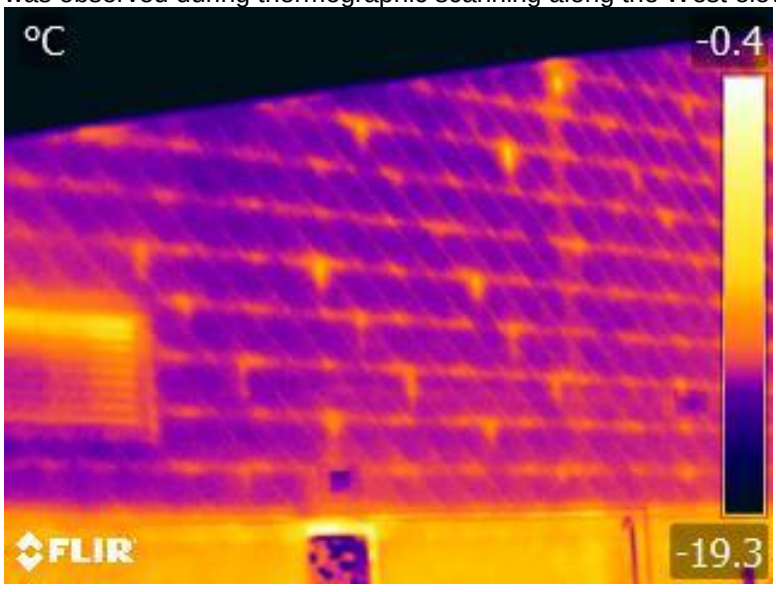
.3 Typical sealant deterioration/debonding at the existing masonry control joints was observed through-out the entire building. Thermographic scan confirmed the thermal anomalies at the prefinished metal panel/brick wall joint interface.

.4 During the review, cracking was observed at the interior face of the existing masonry block back-up wall. However, it appears that previous repair work was completed at the interior wall cracking. Further investigation of the masonry cracking is recommended to determine the possible cause of the cracking/movement.

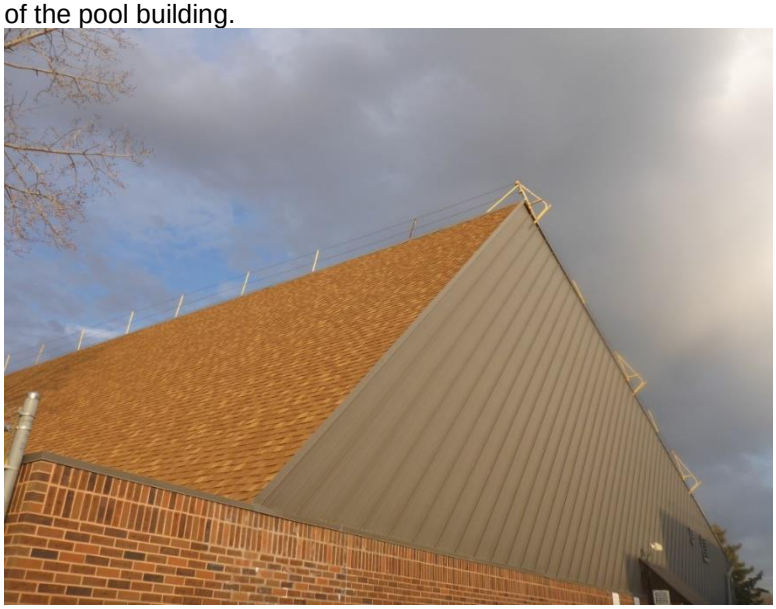
Photograph 3.3.1.4-1: General view of the existing metal cladding along the West elevation of the pool building.



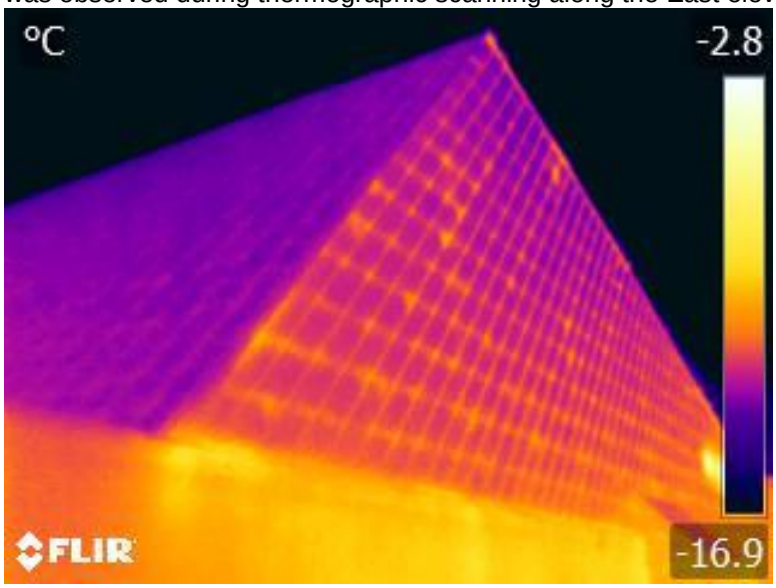
Photograph 3.3.1.4-2: Thermal bridging at the existing metal cladding steel girt support was observed during thermographic scanning along the West elevation.



Photograph 3.3.1.4-3: General view of the existing metal cladding along the East elevation of the pool building.



Photograph 3.3.1.4-4: Thermal bridging at the existing metal cladding steel girt support was observed during thermographic scanning along the East elevation.



Photograph 3.3.1.4-5: Localized mortar joint and brick deterioration was observed at the top corner of the door opening.

Photograph 3.3.1.4-6: Localized mortar joint deterioration at the bottom ledger course of the brick cladding and caulking debonding at the brick masonry control joint was observed.

Photograph 3.3.1.4-7: Cracking observed at the interior face of the existing masonry block back-up adjacent to the control joint.

Photograph 3.3.1.4-8: Corner cracking observed at the interior face of the existing masonry block back-up.

Recommendation 3.3.1.4-1: Repointing of localized deteriorated/cracked brick mortar joint is anticipated as original mortar joint work becomes aged and breaks down due to exposure to the elements. Assume 20% of the existing mortar joint.

Estimated Cost: $60,000

Priority: Medium Term, recommended within 1 to 5 years.

Recommendation 3.3.1.4-2: Removal of existing caulking and re-caulking of all existing brick masonry control joints.

Estimated Cost: $45,000

Priority: Medium Term, recommended within 1 to 5 years.

Recommendation 3.3.1.4-3: Removal and replacement of existing metal cladding and brick veneer to upgrade vapour permeable air-barrier membrane and insulation.

Estimated Cost: $1,250,000

Priority: Long Term Considerations/Recommended Improvements (not time critical)

3.3.2 Glazing

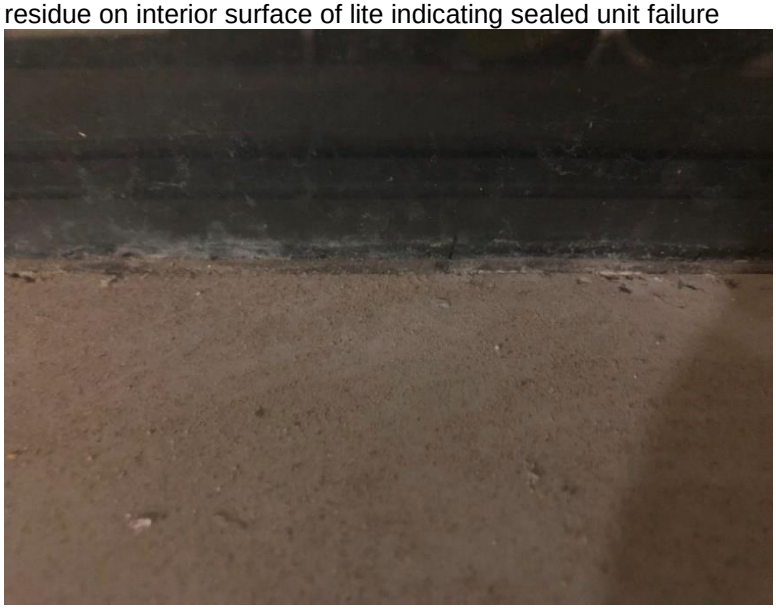
.1 All of the windows within the existing pool facility are aluminum framed exterior glazed curtainwall windows consisting of dual pane, 6mm interior with low-e coating on surface 2, 6mm clear glass exterior lite, sealed units with 14mm PVC spacers. Individual curtain wall units consist of two glazing panels separated by a horizontal rail. 42 such units span the length of the south elevation, 14 of which had been broken by vandalism at the time of this investigation. All windows are fixed and have no operable components. No visible date stamps were observed and thus the age of the units is unknown.

Photograph 3.3.2.1-1: Partial interior south elevation showing glazing unit configuration within the curtain wall framing. Boarded up units were broken by vandalism.

All sealed units exhibited evidence of seal failure including significant fogging, condensation, streaking, and accumulation of desiccant residue on interior surfaces of lites. Four of the remaining unbroken sealed clerestory units underwent frost point testing, which confirmed failed seals in all instances.

No visible cracks were observed in any of the sealed units. The condition of the exterior gaskets could not be observed due to inaccessibly of the south elevation. Interior gaskets were dry and stiff. Evidence of condensation and water staining was visible on the frames and surrounding surfaces.

Photograph 3.3.2.1-2: Typical example of dry and stiff interior gasket and desiccant residue on interior surface of lite indicating sealed unit failure



Photograph 3.3.2.1-3: Typical example of condensation and water staining on the aluminum frames.

Photograph 3.3.2.1-4: Typical example of condensation and water staining on the aluminum frames and surrounding surfaces.

Recommendation 3.3.2.1-1: Existing aluminum curtainwall windows, a third of which have been broken by vandalism, are exhibiting sealed unit failure. Short term replacement is recommended to increase thermal performance, visibility, and occupant comfort. It is recommended that associated flashing and sealant replacement and repairs be conducted simultaneously to increase the performance and durability of the window tie in to the overall envelope system.

Estimated Cost: $225,000

Priority: Medium Term, recommended within 1 to 5 years.

.2 All entrances consist of glazed aluminum doors complete with aluminum curtain wall framed exterior glazed sidelights. Both door and window glazing consist of dual pane 6mm interior and exterior lite, clear glass, sealed units with 10mm PVC spacers. All windows are fixed and have no operable components. Doors bear Kawneer manufacturer label. No visible date stamps were observed.

Photograph 3.3.2.2-1: Partial interior south elevation showing one of two entrances, complete with glazed aluminum doors and aluminum curtain wall framed exterior glazed sidelights.

Photograph 3.3.2.2-2: North elevation entrance showing glazed aluminum door and aluminum curtain wall framed exterior glazed sidelight.

The sealed units did not exhibit visible evidence of seal failure, frost point testing of two of the four window units indicated failed seals.

No visible cracks were observed in any of the sealed units. Being situated below the entrance canopy and somewhat protected from the elements, the exterior gaskets of the north entrance units were intact. The condition of the exterior gaskets of south elevation entrances could not be observed due to inaccessibly of the south elevation.

Recommendation 3.3.2.2-1: Existing aluminum doors and associated curtain wall framed entrance windows are near the end of their expected service life and exhibiting sealed unit failure. Short term replacement is recommended to increase thermal performance, visibility, and occupant comfort. It is recommended that associated flashing and sealant replacement and repairs be conducted simultaneously to increase the performance and durability of the window tie in to the overall envelope system.

Estimated Cost: $35,000

Priority: Medium Term, recommended within 1 to 5 years.

3.3.3 Roofing

.1 Overall, our observations of the existing main roof system the condition is poor. Thorough out the 2-ply membrane blistering and wrinkles were observed. Photograph 3.3.3.1-1. The importance factor is significant and may cause further deficiencies and performance of the membrane in the future. A test cut had been performed and we observed water on the existing vapor barrier as well as saturation on in the plywood support panel. Photograph 3.3.3.1-2 and 3.3.3.1-3. The presence of water and moisture is often attributed to the materials installation methods used and, by fastening the assembly and piercing the vapor barrier. Photograph 3.3.3.1-4.

Recommendation 3.3.3.1-1: Roof replacement required.

Estimated Cost: $560,000

Priority: Short Term, recommended within 1 year.

Photograph 3.3.3.1-1: View of random blistering.

Photograph 3.3.3.1-2: View water on existing vapor barrier.

Photograph 3.3.3.1-3: Showing saturated plywood support panel.

Photograph 3.3.3.1.4: View rusted fastener.

.2 Our observations of the existing steep slope roof system the condition is good and is performing as intended. Photograph 3.3.3.2.-1. Drainage on the roof is excellent due to the 45-degree slope. The existing 8" steel gutter leads the water flow to the various rain leaders. Photograph 3.3.3.2-2. Overall the roof is expected to reach its intended lift cycle including the pre-finished metal flashings and trims.

Recommendation 3.3.3.2-1: Annual maintenance required. Including steel gutters.

Estimated Cost: N/A – Non-capital expense

Priority: Annually, 12 months.

Photograph 3.3.3.2-1: Showing shingled roof facet.

Photograph 3.3.3.2-2: View roof metal gutter.

4. Estimates of Probable Construction Costs

The following table summarizes our estimate of probable construction costs by category. All costs presented are in 2019 dollars and are before taxes, contingencies, and consulting fees.

Category	Section	Recommendation	Description	Estimate
Short Term	Site	3.1.2.4-1	Buttress repairs/RWL modification	$40,000
	Structural	3.2.1.6-1	Exterior stair concrete repairs	$10,000
		3.2.2.1-1	Pool tank concrete repairs	$75,000
		3.2.2.1-2	Structural assessment	$10,000
		3.2.2.2-2	Pool tank crack injection	$25,000
		3.2.2.5-1	Column concrete repairs	$3,000
		3.2.4.2-1	Mezzanine column investigation	$10,000
	Building Envelope	3.3.3.1-1	Roof replacement	$560,000
Total Short Term Recommendations (within 1 year)				**$733,000**
Medium Term	Site	3.1.1.1-1	Exterior stair concrete repairs	$3,000
	Structural	3.2.1.5-1	Coating of filtration room platform	$25,000
	Building Envelope	3.3.1.4-1	Masonry repairs	$60,000
		3.3.1.4-2	Masonry control joint replacement	$45,000
		3.3.2.1-1	Curtain wall glazing replacement	$225,000
		3.3.2.2-1	Store front replacement	$35,000
Total Medium Term Recommendations (Year 1 to 5)				**$393,000**
Long Term	Structural	3.2.1.1-1	Crawlspace remediation	$400,000
		3.2.2.2-1	Pool deck/tank tile replacement	$600,000
	Building Envelope	3.3.1.4-3	Exterior re-cladding	$1,250,000
Total Long Term Recommendations (Year 5 to 10)				**$2,250,000**
Total of All Recommendations				**$3,376,000**

5. Closure

At the request of the City of Winnipeg Planning Property & Development Department, a structural and building envelope assessment of Seven Oaks Swimming Pool was completed by Crosier Kilgour & Partners personnel. The purpose of the investigation was to provide an opinion as to the current condition of the structure, cladding, windows and roofing, identify areas of distress, and provide recommendations for immediate, short and long-term repairs.

We trust that this report provides the information you require. Upon your review, please contact our office at your convenience to discuss this report in further detail.

Structural
CROSIER KILGOUR & PARTNERS LTD.

PROVINCE OF MANITOBA
D. J.
MIZAK
Member
20801
APR 4, 19
REGISTERED PROFESSIONAL ENGINEER

Derek J. Mizak, P.Eng.

Building Envelope
CROSIER KILGOUR & PARTNERS LTD.

PROVINCE OF MANITOBA
S. E.
ZUBRISKI
Member
30947
APR 4, 2019
REGISTERED PROFESSIONAL ENGINEER

Stephanie E. Zubriski P.Eng.
M.Sc. LEED AP BD+C

Appendix A

Thermographic Report

THERMOGRAPHIC SURVEY FOR:

Seven Oaks Pool
444 Adsum Drive
Building Condition Assessment

Submitted to:	City of Winnipeg Planning, Property, and Development Department Accommodation Services
Attention:	Mr. Lou Chubenko
Date:	April 4, 2019
Submitted by:	Crosier Kilgour & Partners Ltd. 300-275 Carlton Street Winnipeg, Manitoba R3C 5R6 Phone: 204.943.7501 Fax: 204.943.7507 Website: www.ckpeng.com
Contact:	Chris Richter, C.E.T.
CKP File No.	2018-0222

Crosier Kilgour & Partners Ltd.™

CONSULTING STRUCTURAL ENGINEERS

Table of Contents

1. Disclaimer and Limitations

This report has been prepared for the sole benefit of the City of Winnipeg. This report may not be reviewed, referred to or relied upon by any other person or entity without the prior written permission of Crosier Kilgour & Partners Ltd. and the City of Winnipeg.

While Infrared cameras can detect minute temperature variations on materials surfaces, there are numerous factors that can affect the readings. These factors musts be understood and accounted for when interpreting the images. Factors include but are not limited to:

- Wind
- Solar loading
- Positive/negative indoor air pressure
- Adjacent buildings or structures
- Surface moisture
- Reflections
- Low emissivity materials

2. Equipment

Infrared Scanner:	Calibrated radiometric FLIR B360 thermal imaging camera. The camera is equipped with a standard 25° wide (viewing angle) lens. For select images, the thermal camera was fitted with a 45° wide angle lens. All thermal images were recorded to an internal Compact Flash memory card.
Visible Light Camera:	Integrated visible light camera in FLIR B360 thermal imaging camera.
Temperature / Relative Humidity:	Kestrel 3000 handheld weather station.

3. Satellite Image

Figure 1: Satellite view of the Seven Oaks Pool prior to renovations (highlighted).

4. Background Information, Observations and Discussion

At your request, a thermographic scan of the exterior of the Seven Oaks Pool located at 444 Adsum Drive was completed as part of a building envelope assessment. The scan was completed by Chris Richter, C.E.T., a Certified Level III thermographer on November 27, 2018 starting at approximately 8:00 p.m. to minimize the effect of solar radiation on the exterior cladding assembly. At the time of the scan the temperature was -12°C and the relative humidity was 74%. The wind was from the south southeast at 8 km/h and the sky was mainly clear. A copy of the weather data from Environment Canada has been included in Section 6 of this report for reference. It should also be noted that building was unoccupied at the time of the scan as extensive renovations were underway. We are unsure what if any building mechanical systems were in operation at the time of the scan.

The thermographic scan uses infrared sensing photographic equipment to “observe” and record variations in the temperature of the exterior of the building. Thermal patterns created by such things as air leakage, thermal bridging, missing insulation or moisture within the wall assembly can be identified.

Thermal anomalies caused by air leakage are typically random in appearance. These anomalies can appear as intense bright spots where a concentrated air leak occurs. Alternately, they can appear as plumes, fingers or irregular shapes where the leakage is more disbursed. An example of concentrated air leakage anomalies is shown in Figure 1 below. A concentrated air leak appears as a relatively intense light source at the wall and mullion terminations and along the head of the door. Figure 2 shows an example of anomalies caused by diffused air leakage behind wall cladding panels.

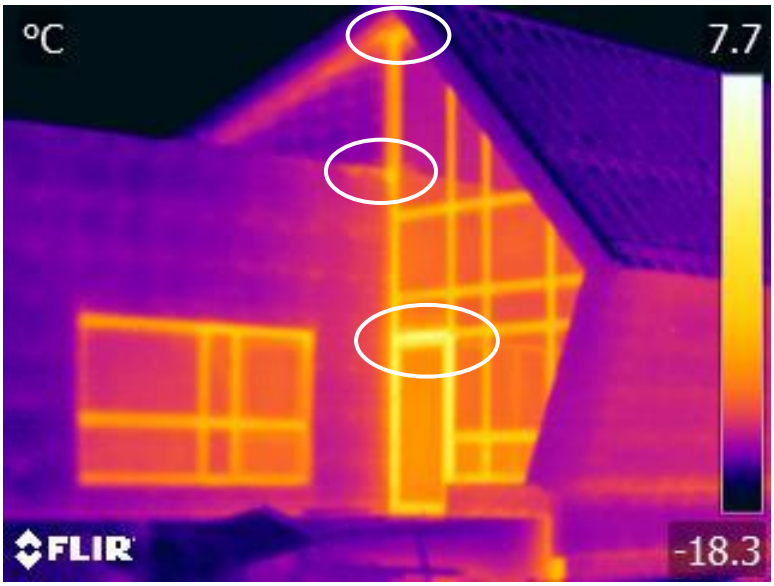


Figure 1: Partial east elevation showing anomalies caused by air leakage at the top of the wall and along the head of the door.

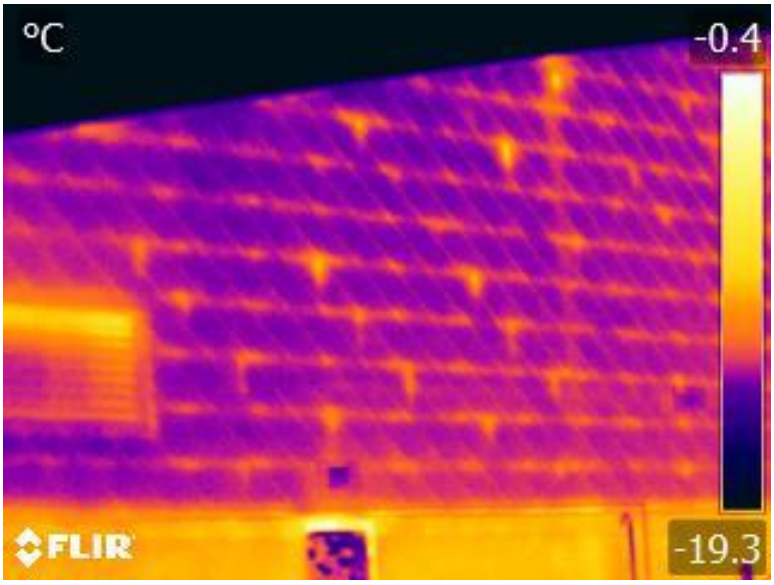


Figure 2: Overall view of anomalies likely caused by diffused air leakage at gable wall cladding.

Thermal bridging occurs at locations where members of the wall assembly span between the warm interior and cold exterior surfaces. These thermal bridges create a more direct path for heat flow and cause elevated temperatures on the exterior surface of the cladding during cold weather. The thermal anomalies created by these members are usually linear and relatively uniform in appearance. In Figure 3 below and Figure 1 previously, thermal bridging is occurring at the framing members of the curtainwall assemblies. Figure 4 shows thermal bridging at cladding supports on the east wall.

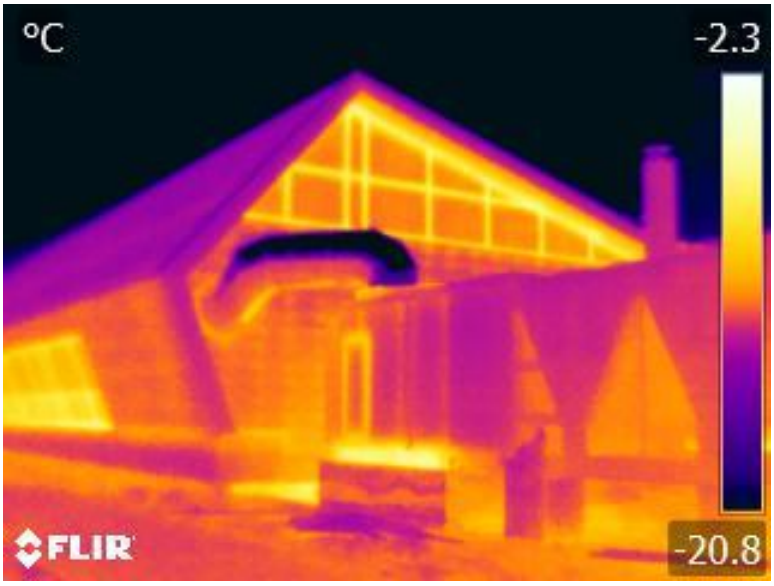


Figure 3: Detailed view of west soffit area. Note numerous thermal anomalies caused by air leakage and thermal bridging.

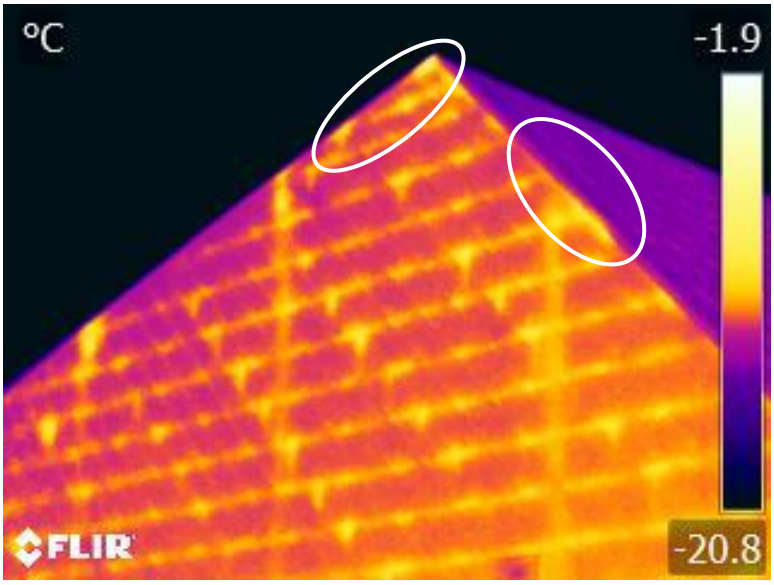


Figure 4: Detailed view of east gable wall showing thermal bridging at horizontal cladding supports as well as apparent air exfiltration at numerous cladding and fascia locations.

Based on the results of the thermographic scan, it appears that air exfiltration is occurring at numerous locations around the envelope particularly on the gable walls and at one location on the south roof. It is difficult to confirm that these are the only leakage locations given that the building is under construction at this time. A follow-up scan when the building is in operation just prior to occupancy is recommended to better assess the overall condition of the envelope assembly.

The thermal bridging observed on the gable walls is expected as we believe this construction is original to the facility. While current construction techniques are designed to minimize thermal bridges, they can never be completely eliminated.

We trust this provides the information you currently require. Should you have questions or if you require additional clarification, please call.

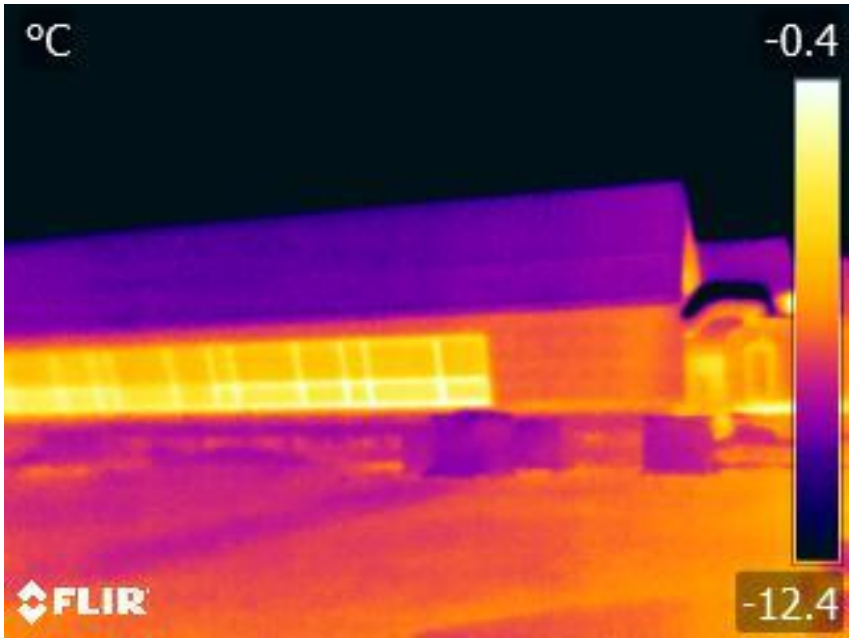
Yours truly,

Chris Richter, C.E.T.

5. Thermographic Scan

Photograph #1:

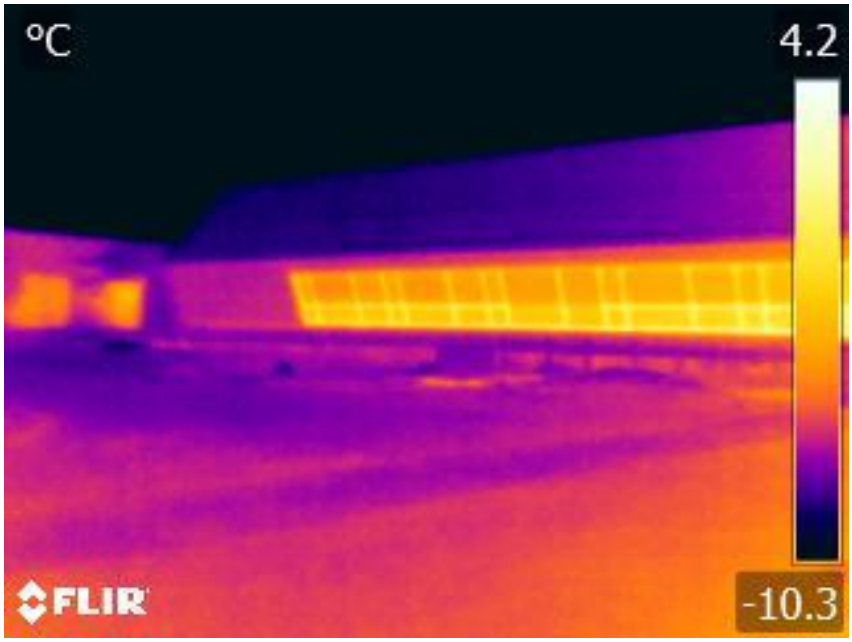
Overall view of north elevation.



Photograph #2:

Photograph #3:

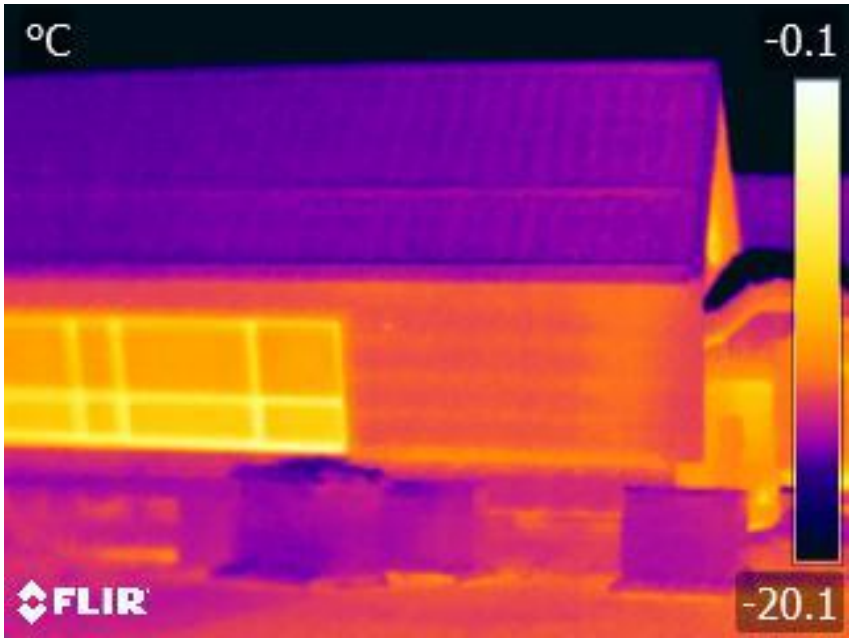
Overall north elevation.



Photograph #4:

Photograph #5:

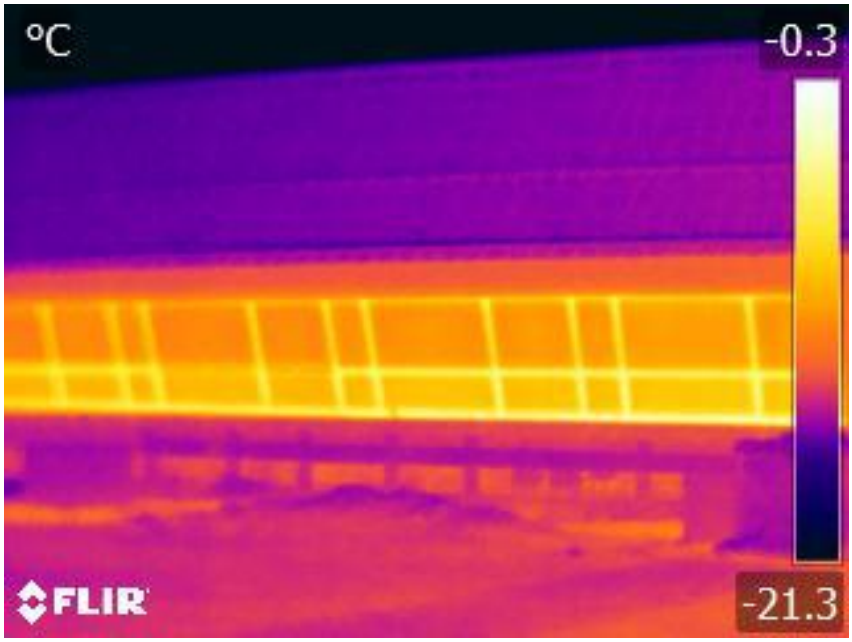
Detail view of west end of north elevation.



Photograph #6:

Photograph #7:

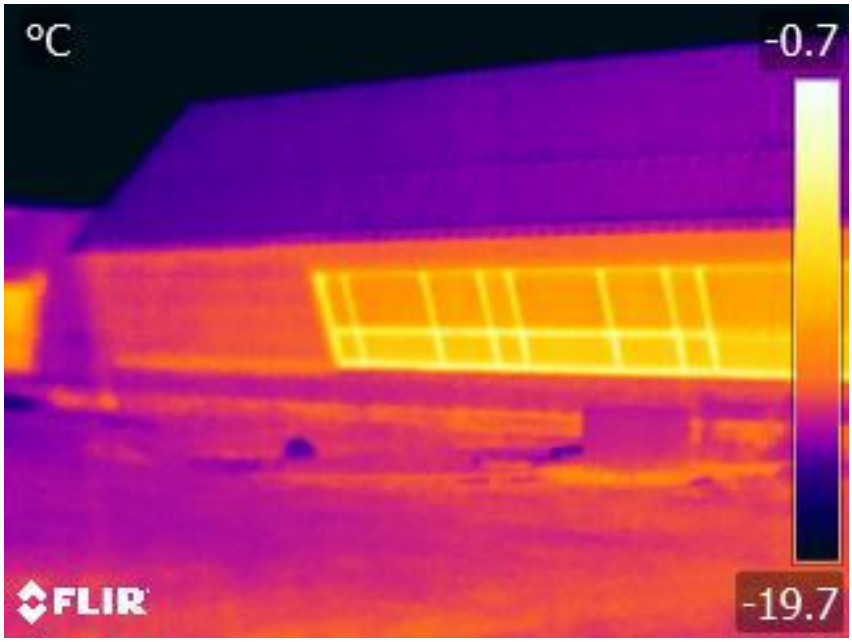
Detail view of centre portion of north elevation.



Photograph #8:

Photograph #9:

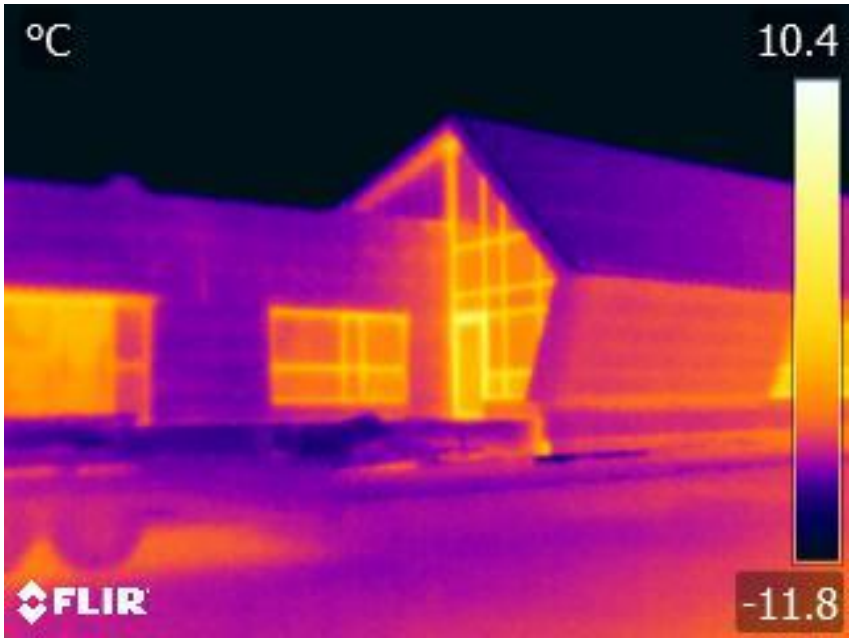
Detail view of east portion of north elevation.



Photograph #10:

Photograph #11:

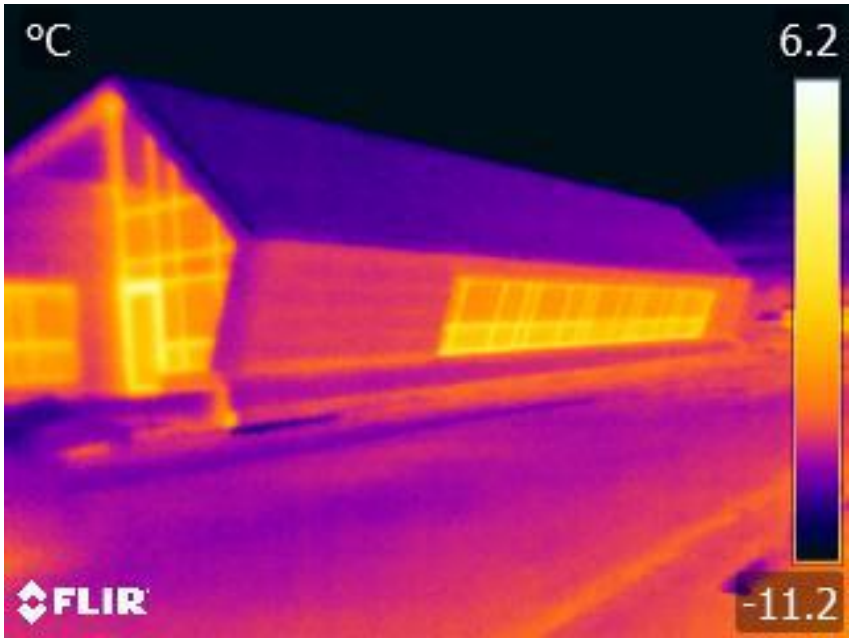
Detail view of partial east elevation.



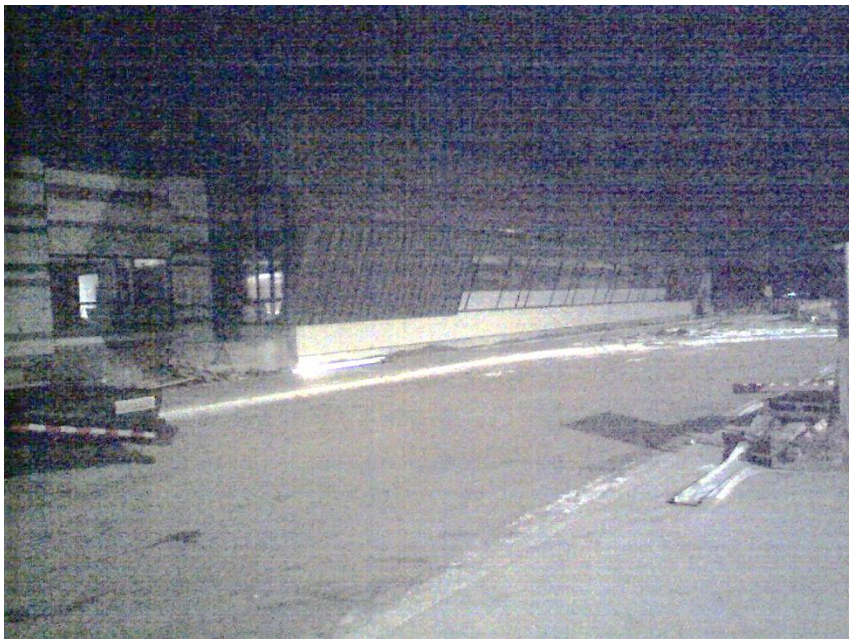
Photograph #12:

Photograph #13:

Overall view of north elevation.

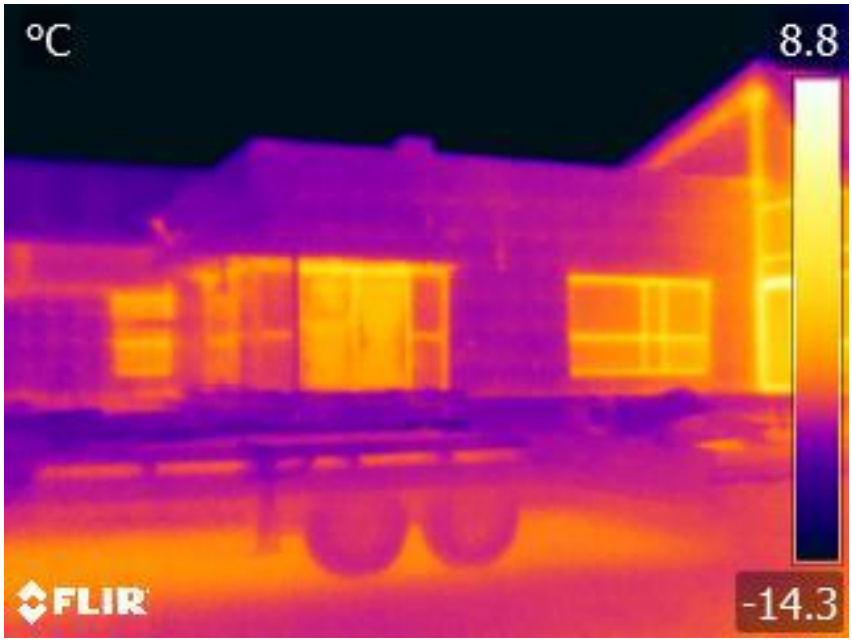


Photograph #14:



Photograph #15:

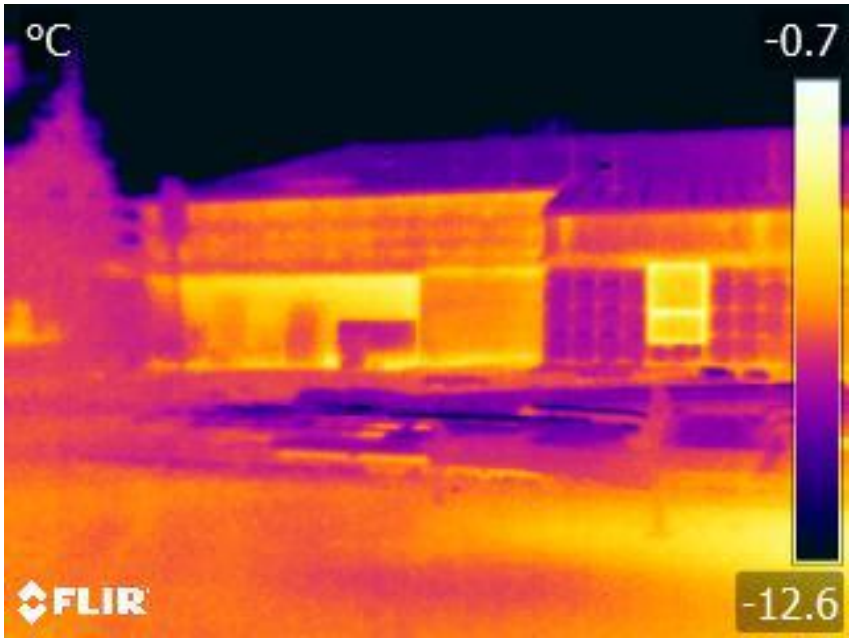
Detail view of east portion of north elevation



Photograph #16:

Photograph #17:

East portion of north elevation.



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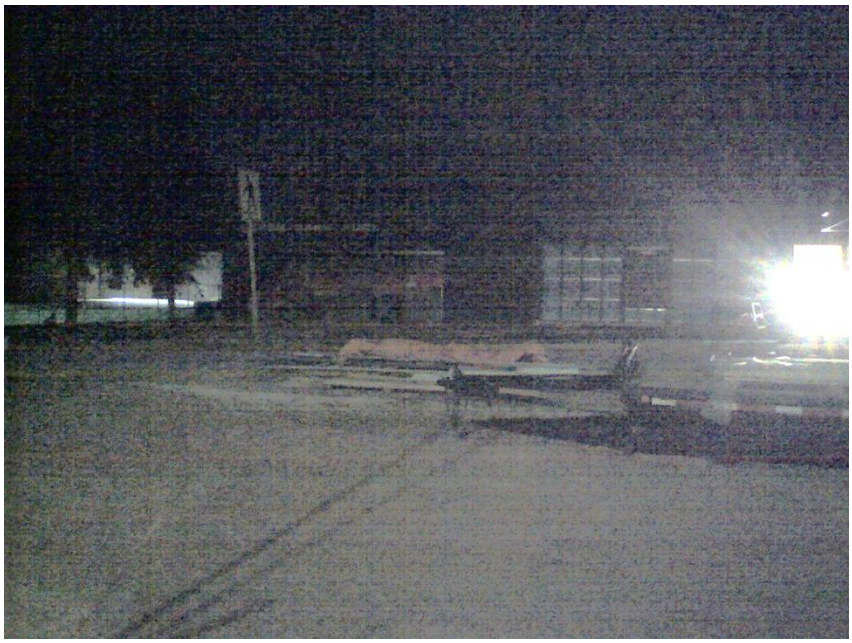
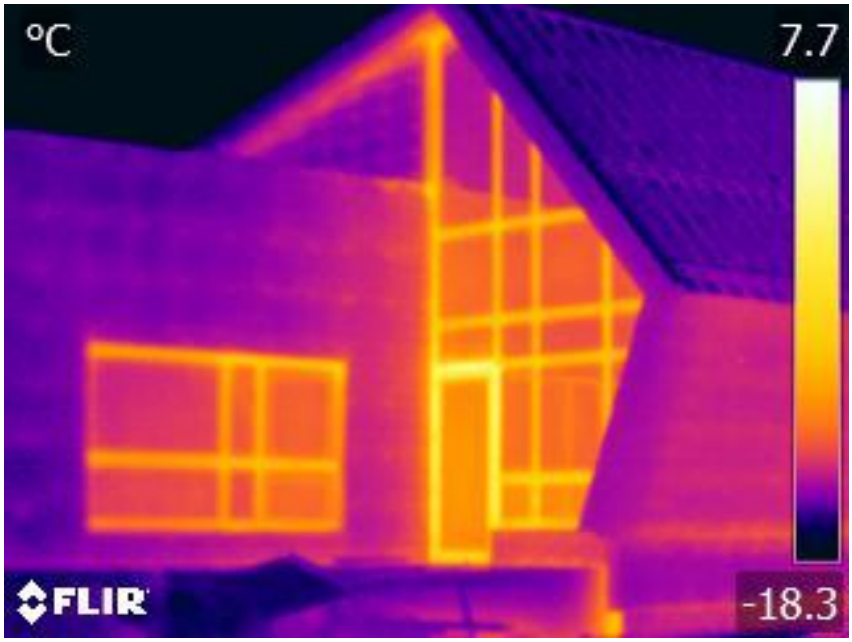


Photograph #19:

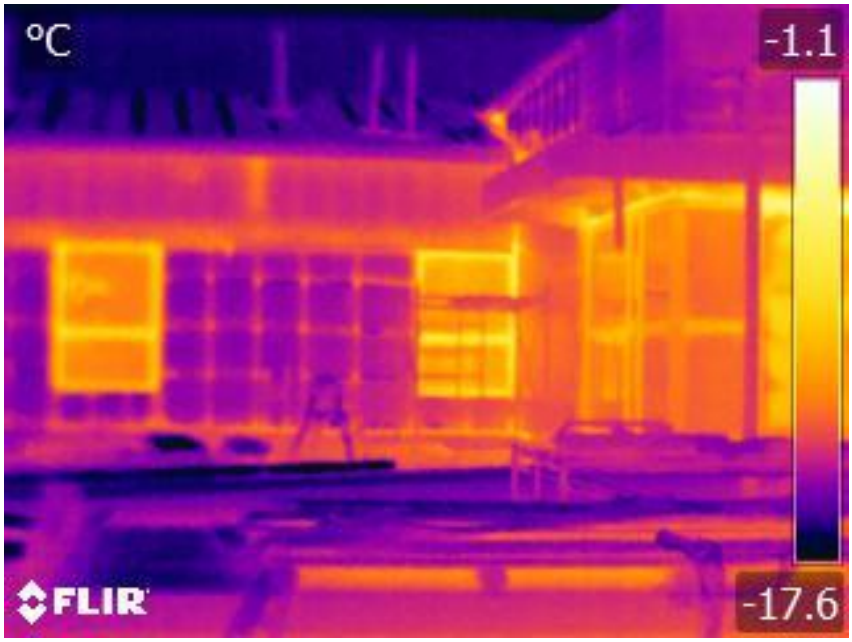
Partial east elevation. Note thermal bridging at curtainwall mullions.



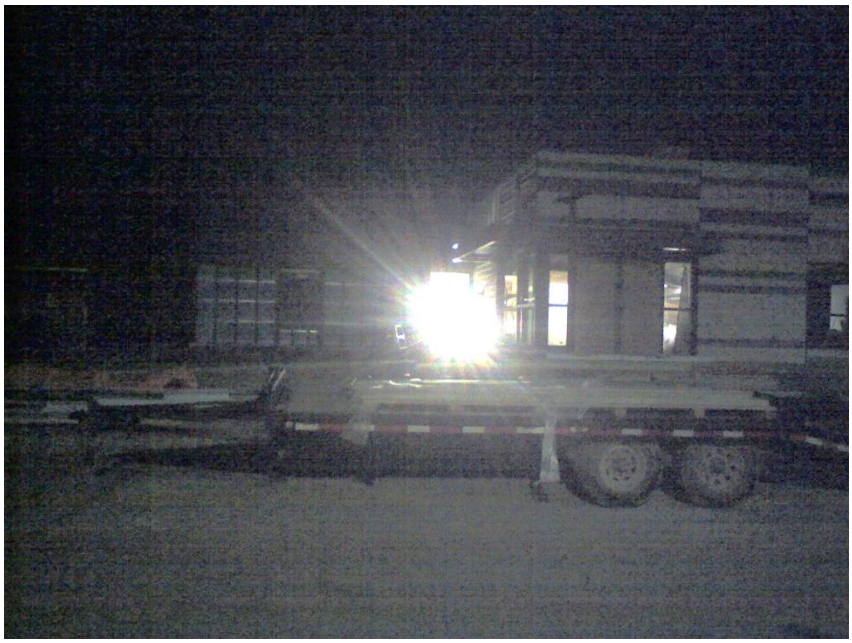
Photograph #20:

Photograph #21:

Detail view of east portion of north elevation. Note thermal bridging at cladding supports.

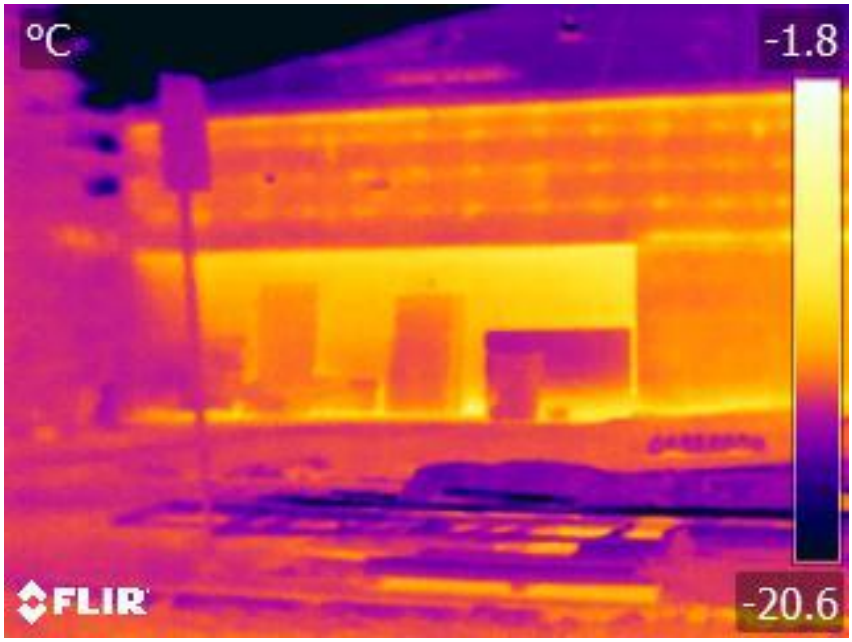


Photograph #22:



Photograph #23:

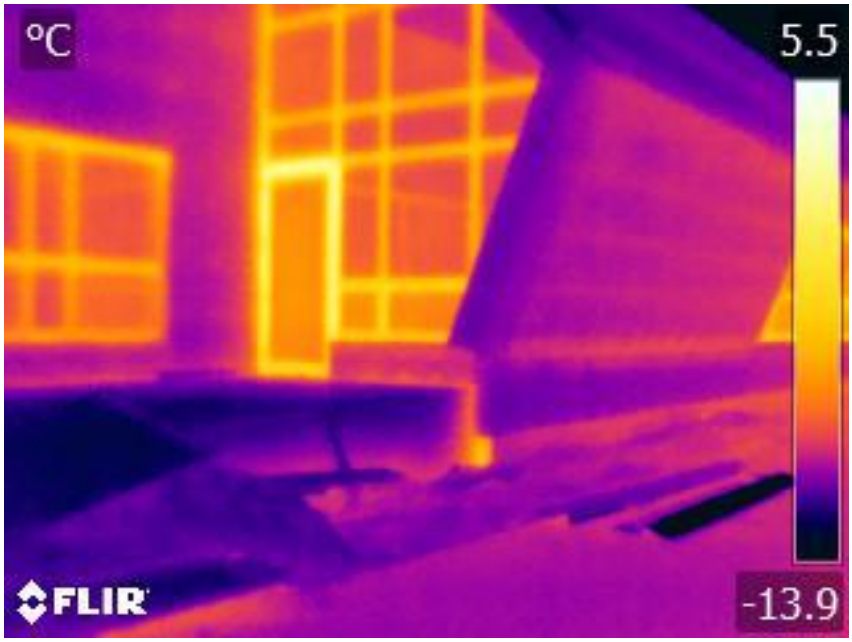
Detail view of east portion of north elevation. Note thermal bridging at cladding supports.



Photograph #24:

Photograph #25:

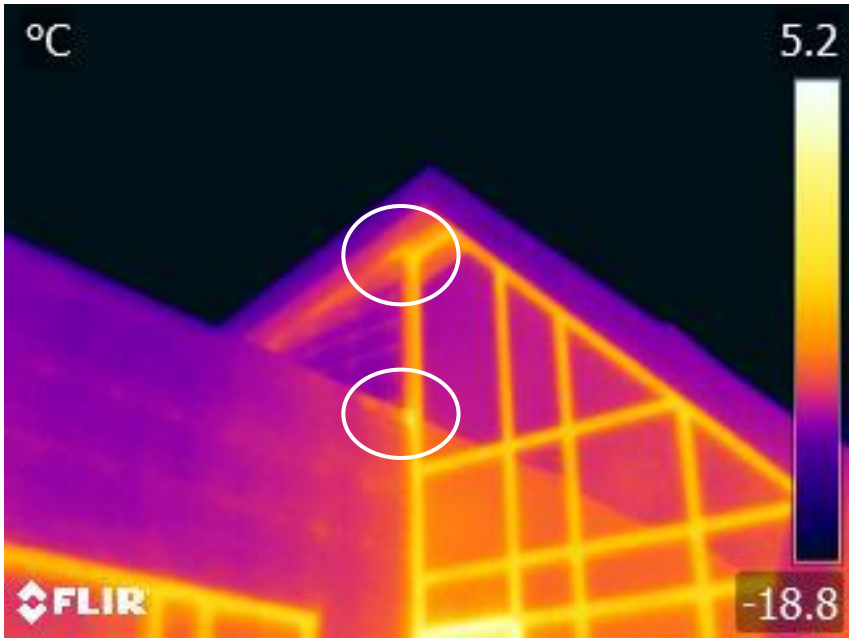
Detail view of partial east elevation. Note thermal bridging at curtainwall mullions. Also note apparent air leakage around door.



Photograph #26:

Photograph #27:

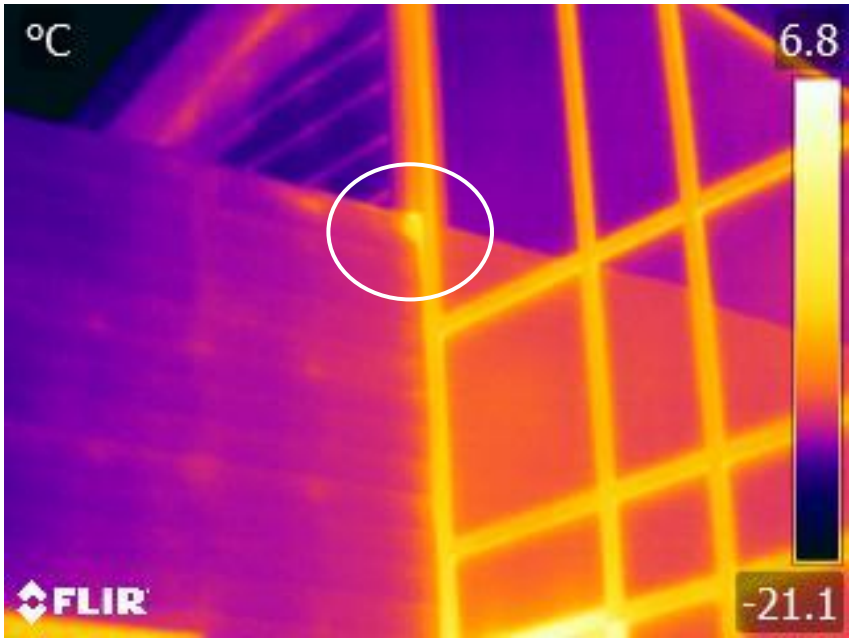
Detail view of curtainwall on east elevation. Note possible air leakage locations at transitions (highlighted).



Photograph #28:

Photograph #29:

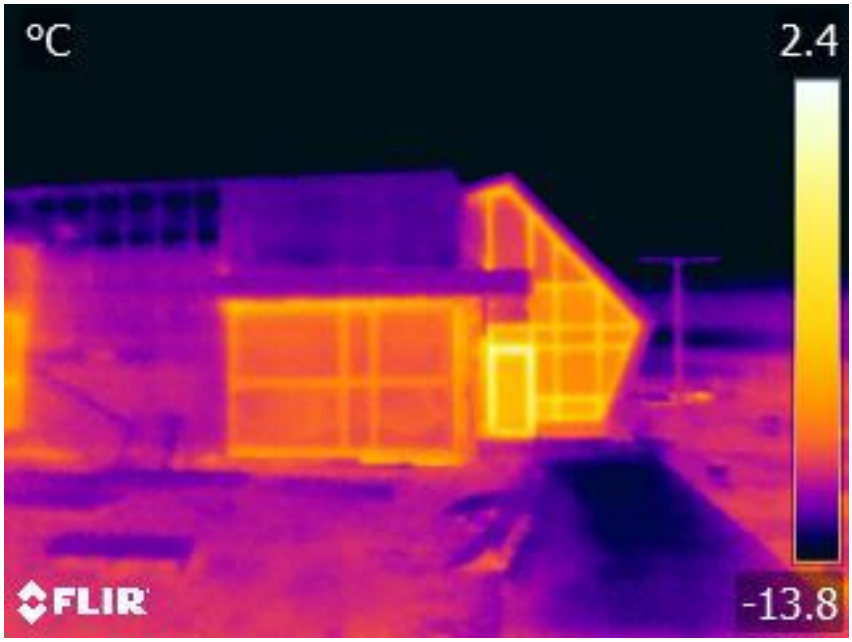
Detail view of curtainwall on east elevation. Note possible air leakage location (highlighted).



Photograph #30:

Photograph #31:

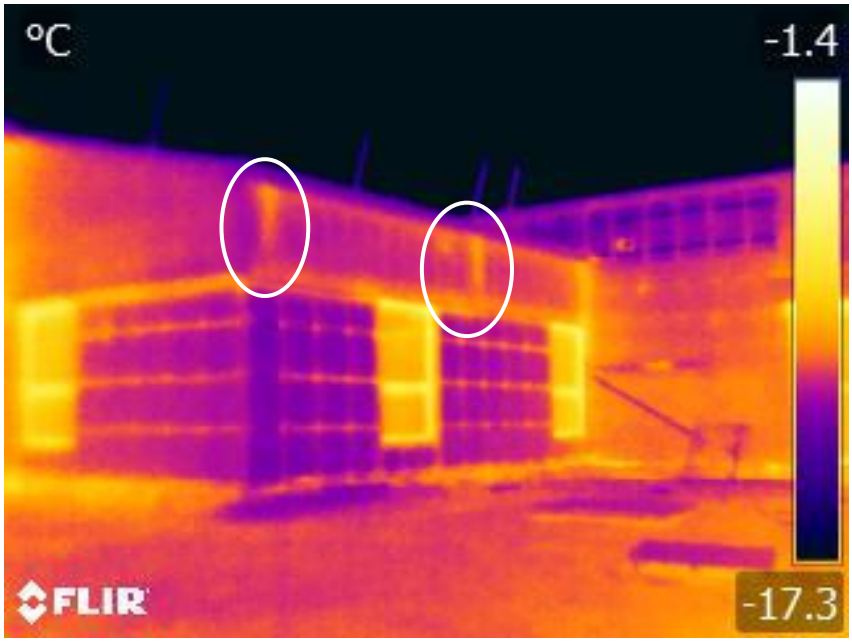
Overall east elevation.



Photograph #32:

Photograph #33:

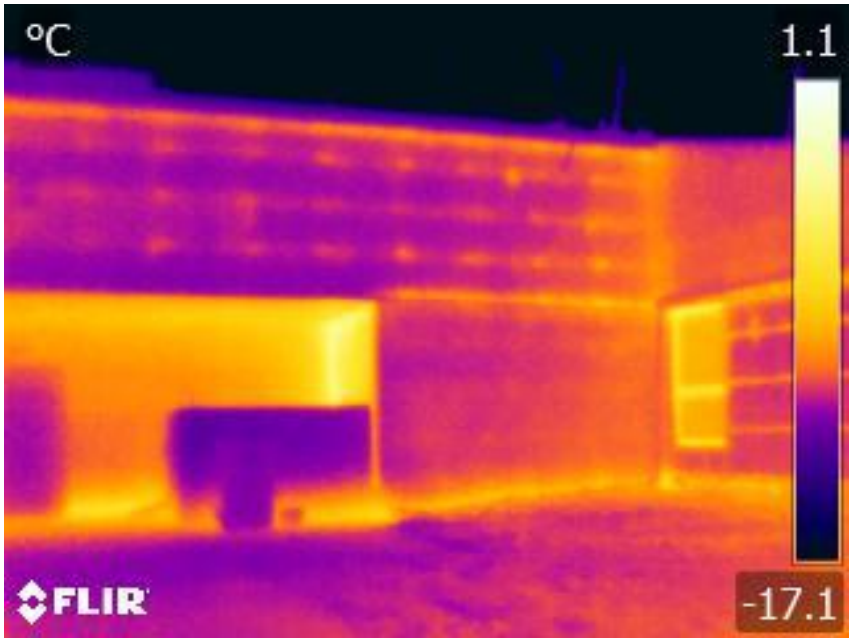
Partial north and east elevations. Note thermal bridging at cladding supports. Also note thermal anomalies in fascia.



Photograph #34:

Photograph #35:

Partial north elevation. Note thermal bridging at cladding support locations.



Photograph #36:

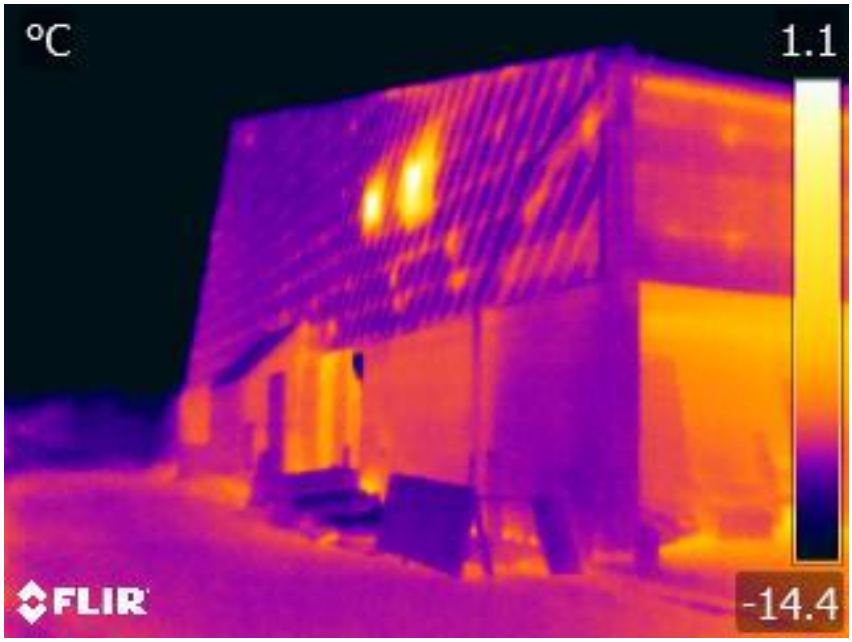
Photograph #37:

Partial north elevation. Note thermal bridging at cladding support locations.

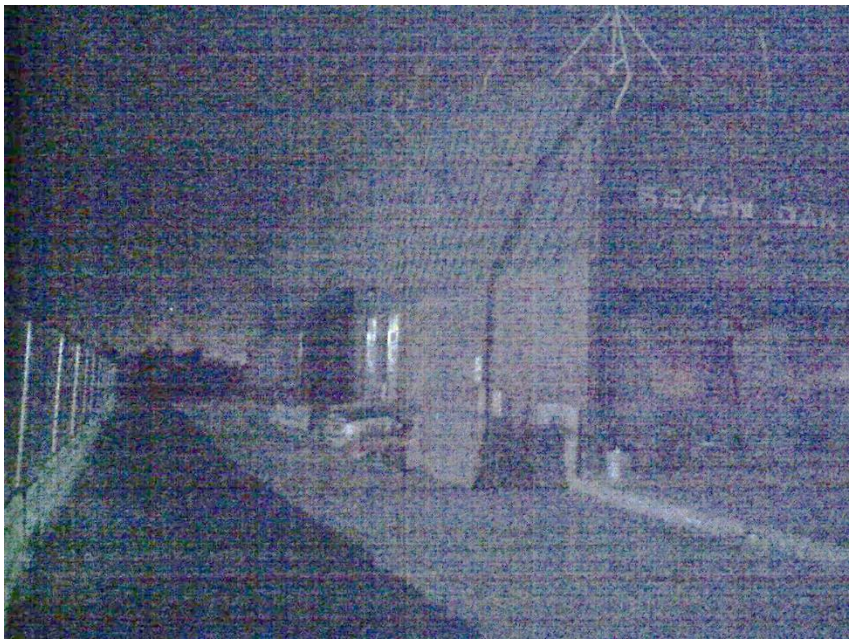
Photograph #38:

Photograph #39:

Partial east elevation. Note thermal anomalies at diagonal cladding.

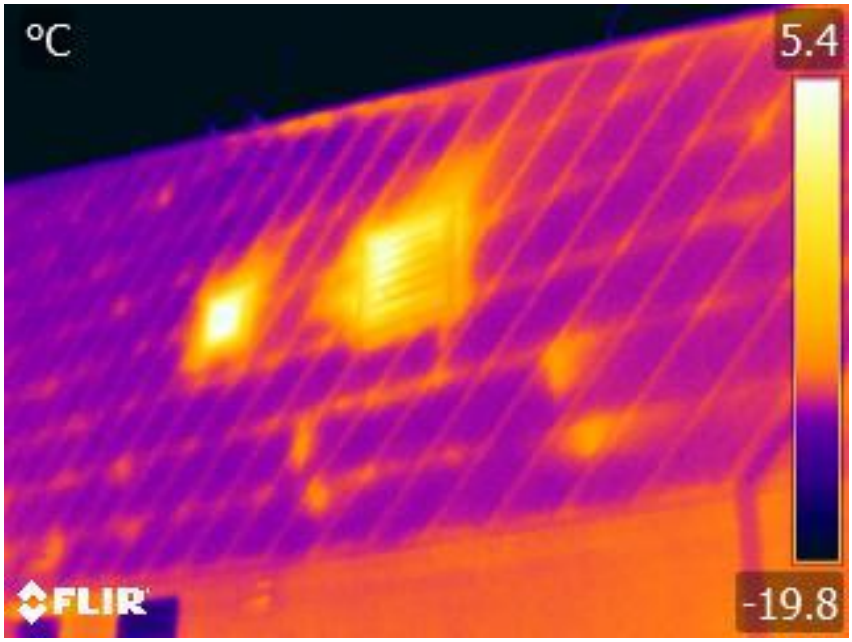


Photograph #40:

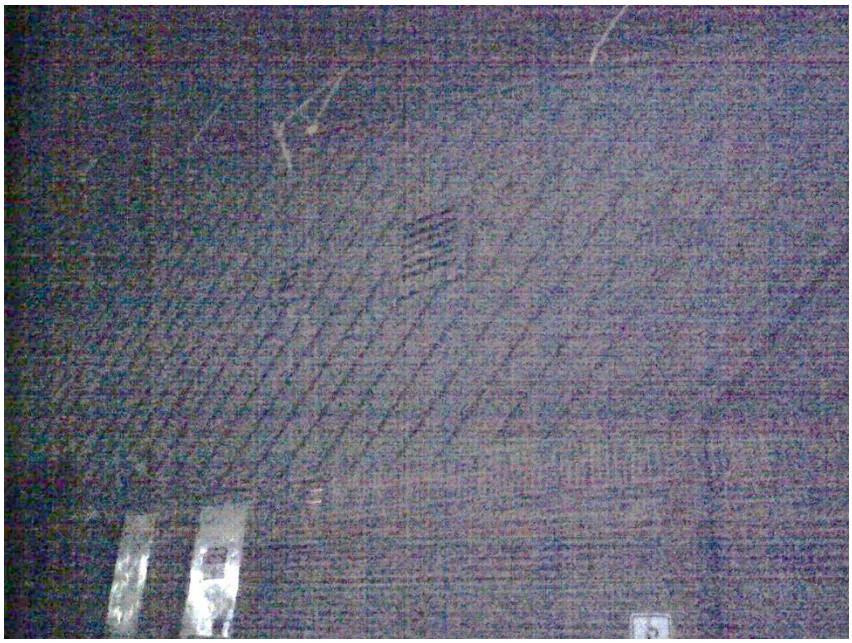


Photograph #41:

Partial east elevation. Note thermal anomalies at diagonal cladding caused by thermal bridging and air leakage.

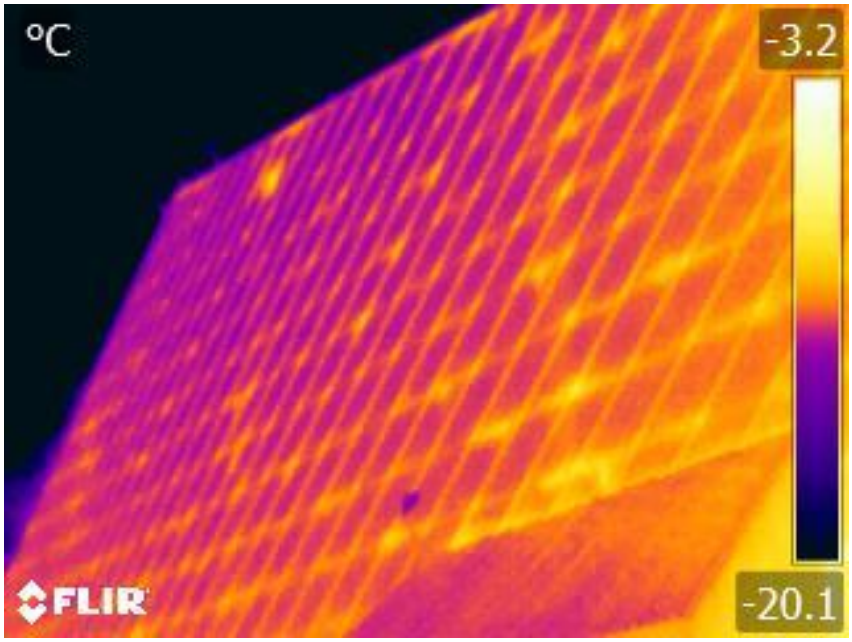


Photograph #42:

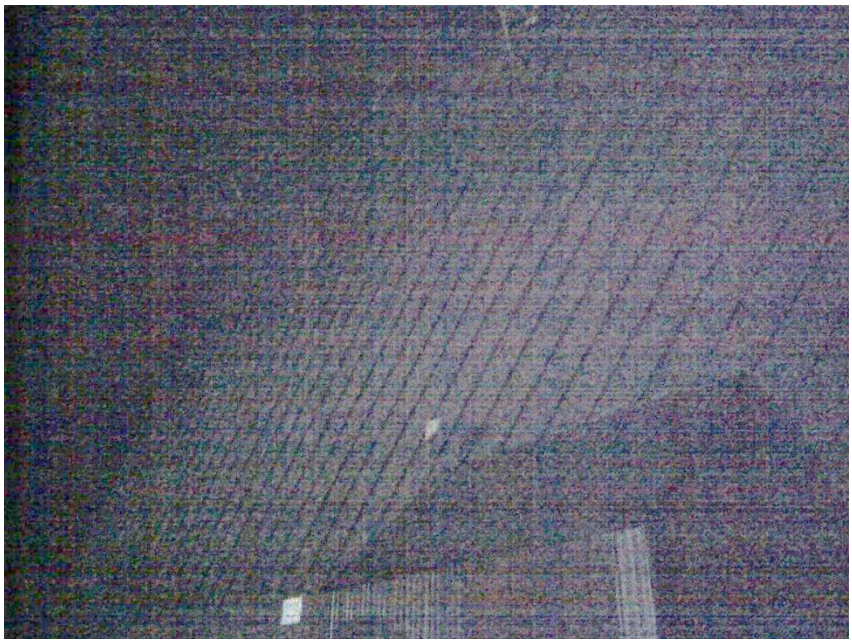


Photograph #43:

Partial east elevation. Note thermal anomalies at diagonal cladding caused by thermal bridging and air leakage.

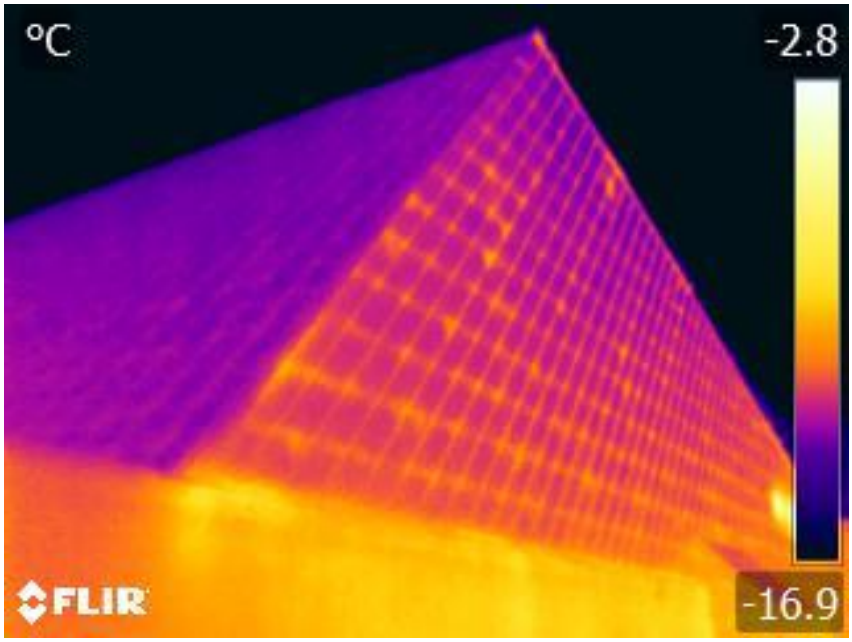


Photograph #44:

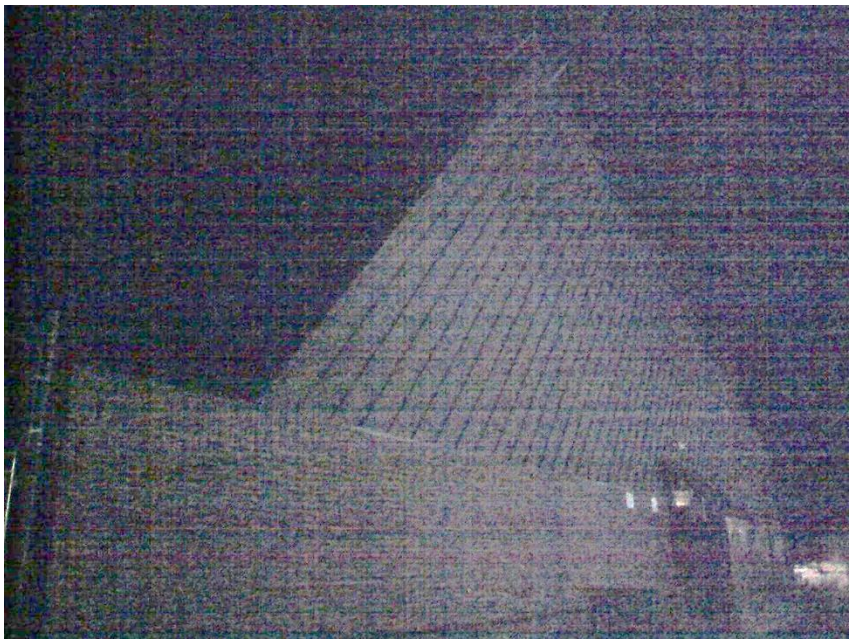


Photograph #45:

Partial east elevation. Note thermal anomalies at diagonal cladding caused by thermal bridging and air leakage.



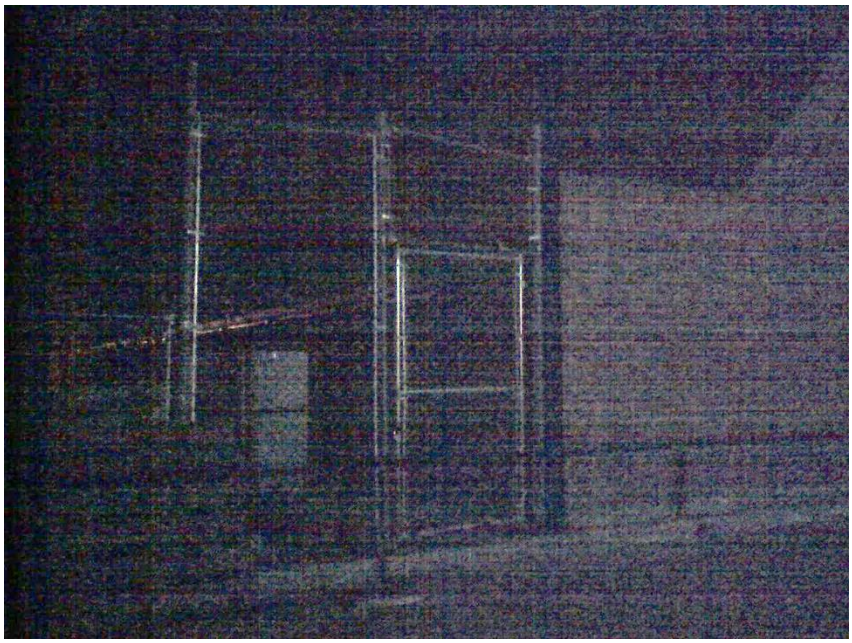
Photograph #46:



Photograph #47:

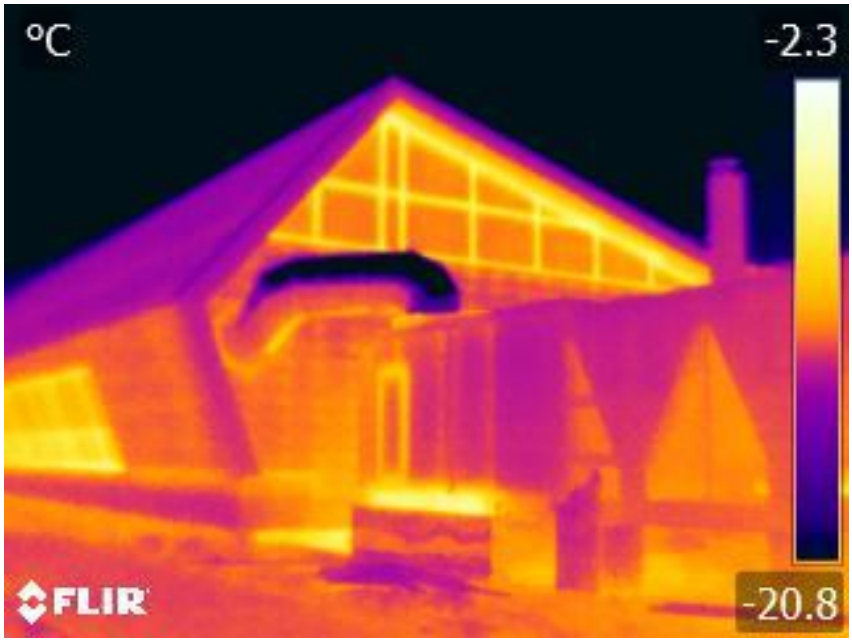
Overall view at south east corner. note thermal anomaly on roof.

Photograph #48:

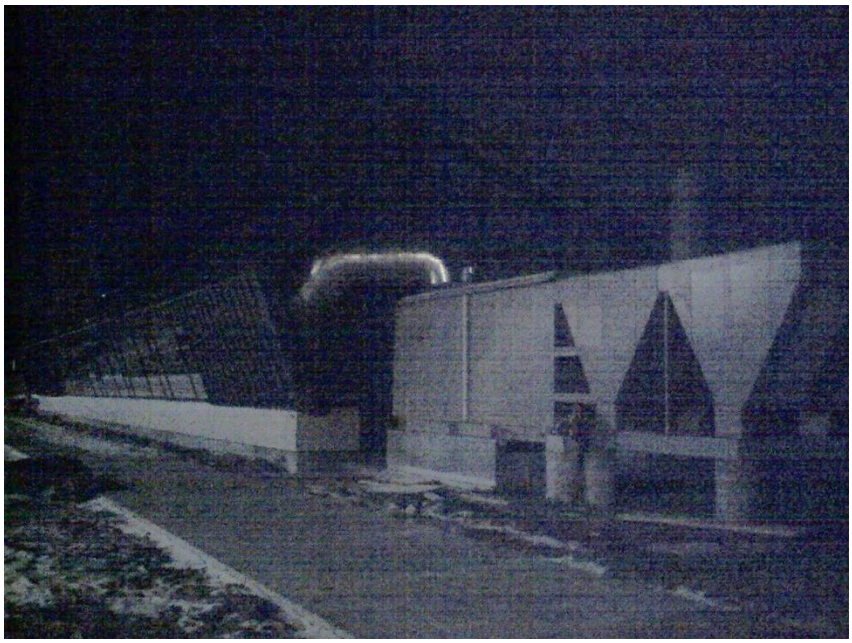


Photograph #49:

Partial west elevation. Note thermal bridging at curtainwall mullions.

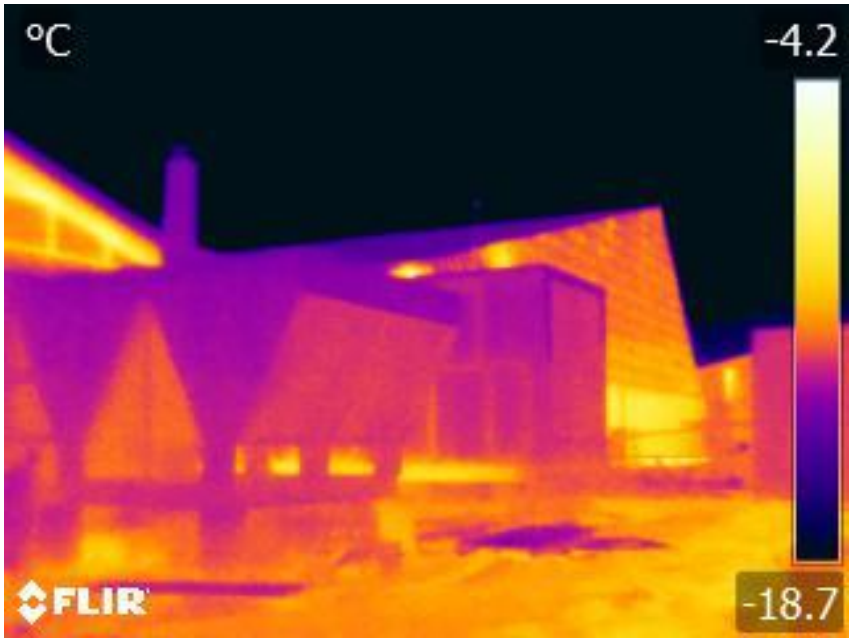


Photograph #50:



Photograph #51:

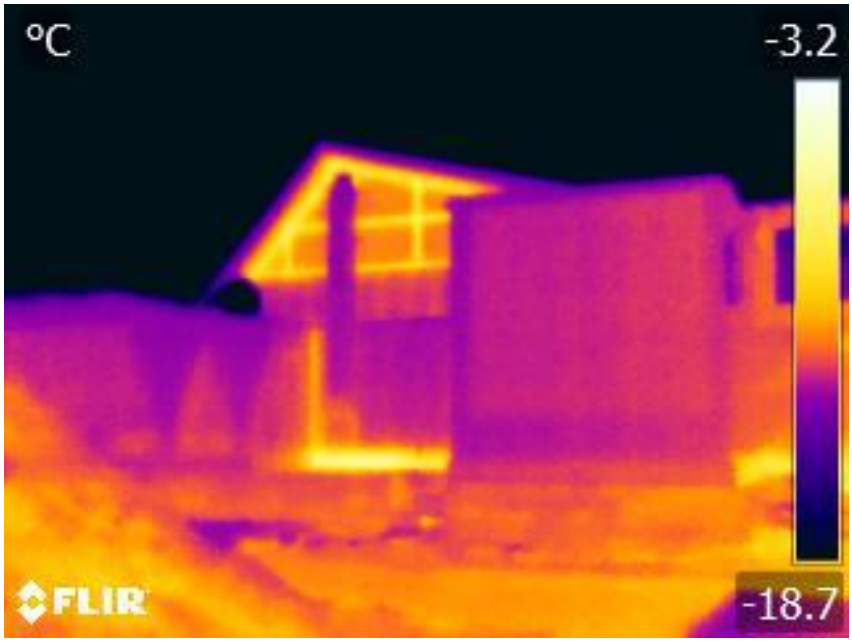
Partial west elevation.



Photograph #52:

Photograph #53:

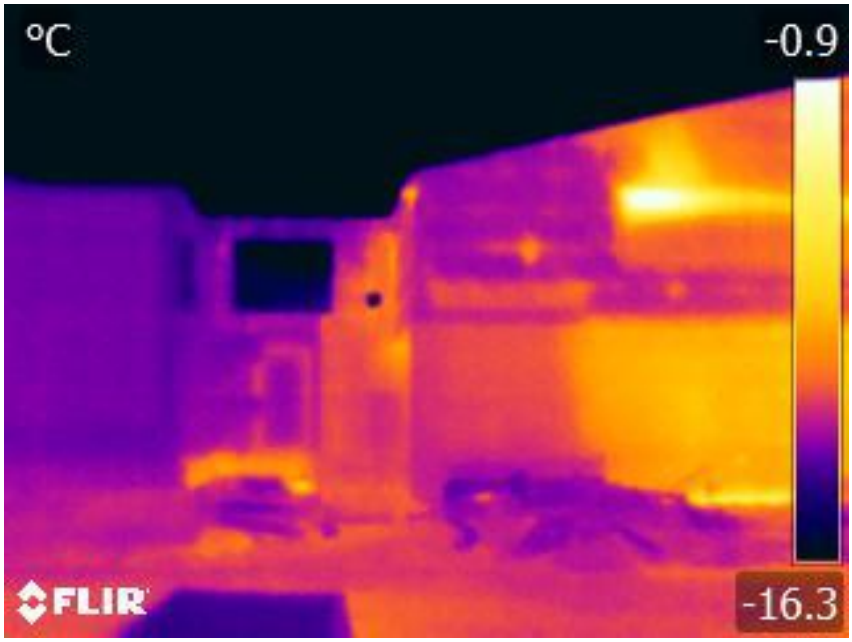
Partial west elevation. Note thermal bridging at curtainwall mullions.



Photograph #54:

Photograph #55:

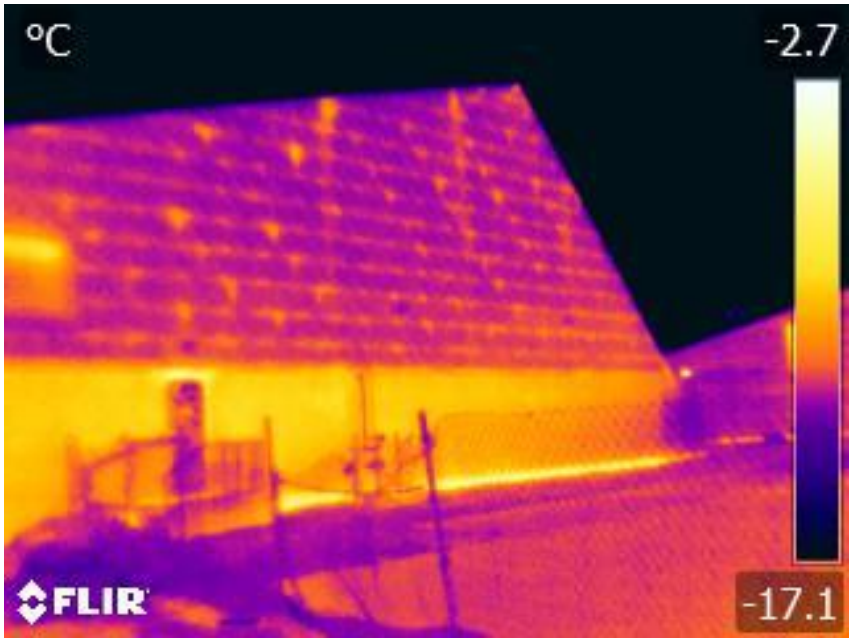
Partial west elevation.



Photograph #56:

Photograph #57:

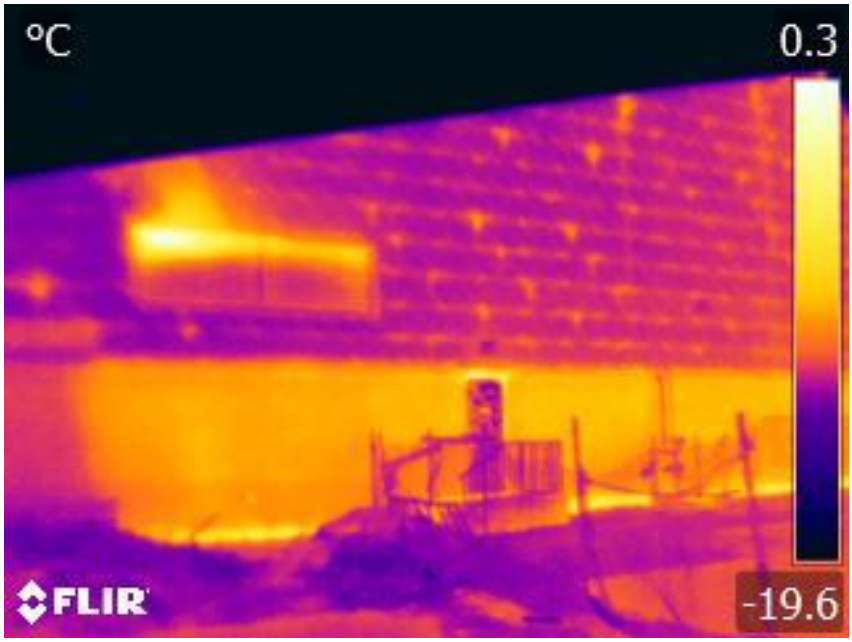
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #58:

Photograph #59:

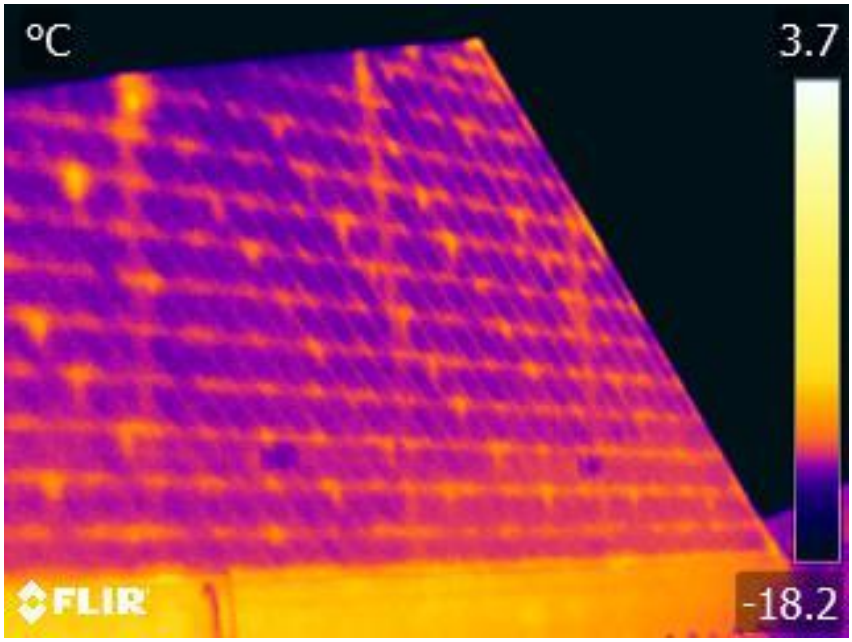
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #60:

Photograph #61:

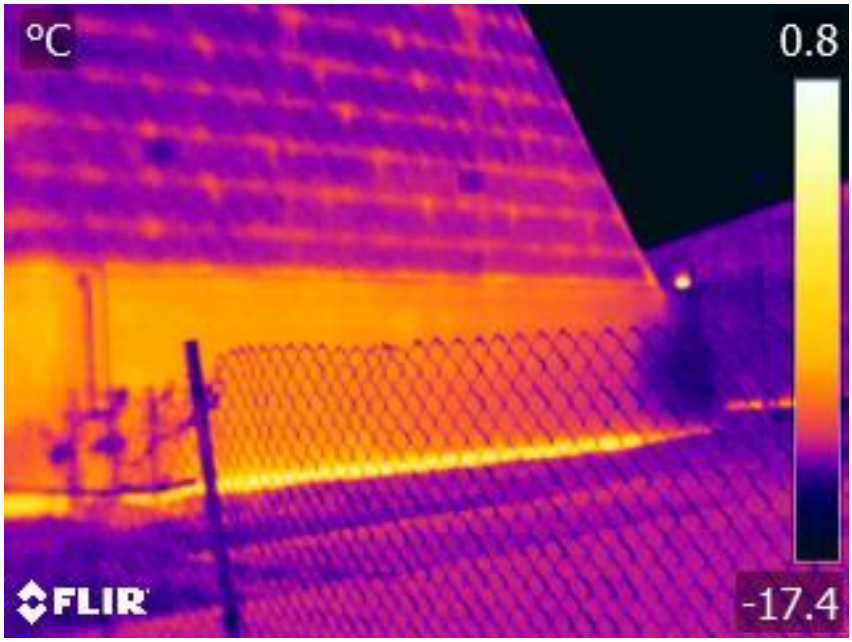
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #62:

Photograph #63:

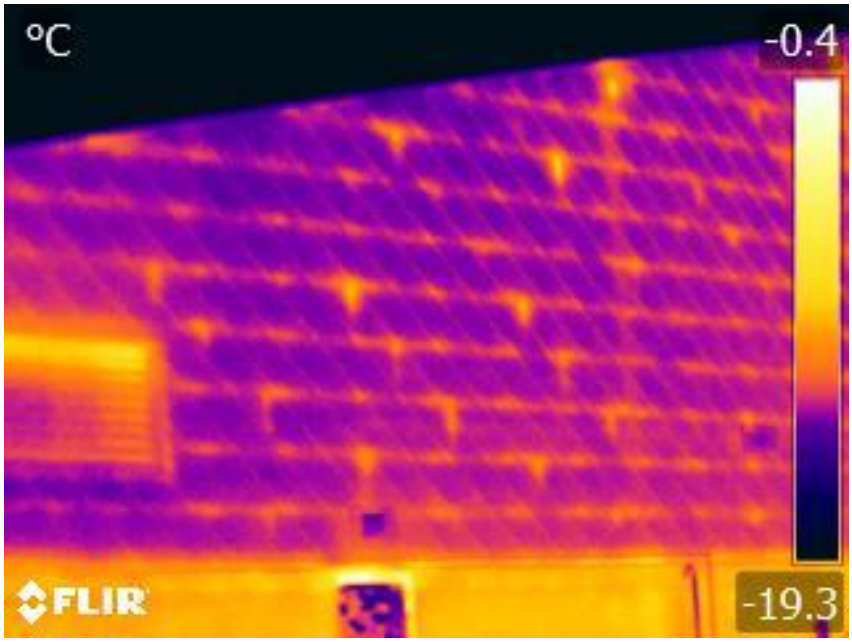
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #64:

Photograph #65:

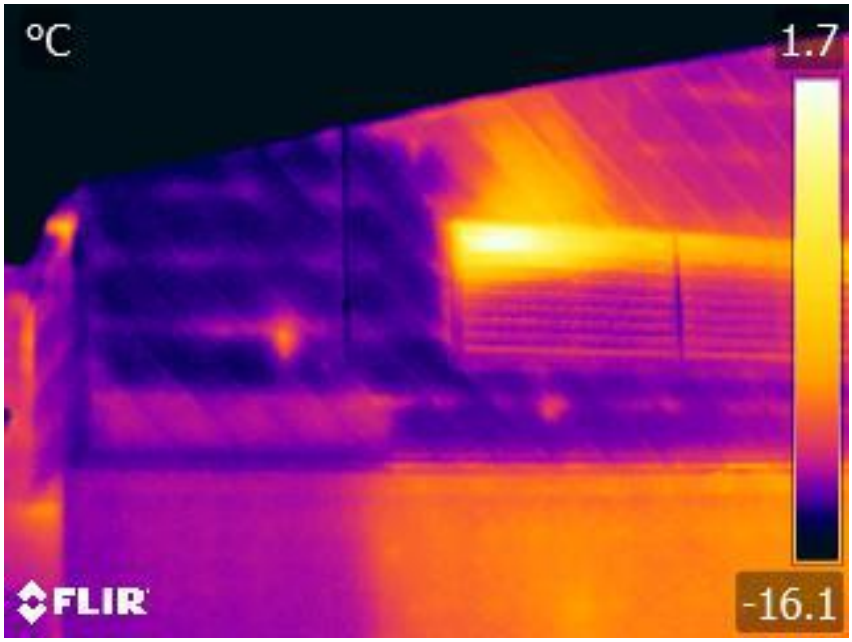
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #66:

Photograph #67:

Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #68:

Photograph #69:

Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.

Photograph #70:

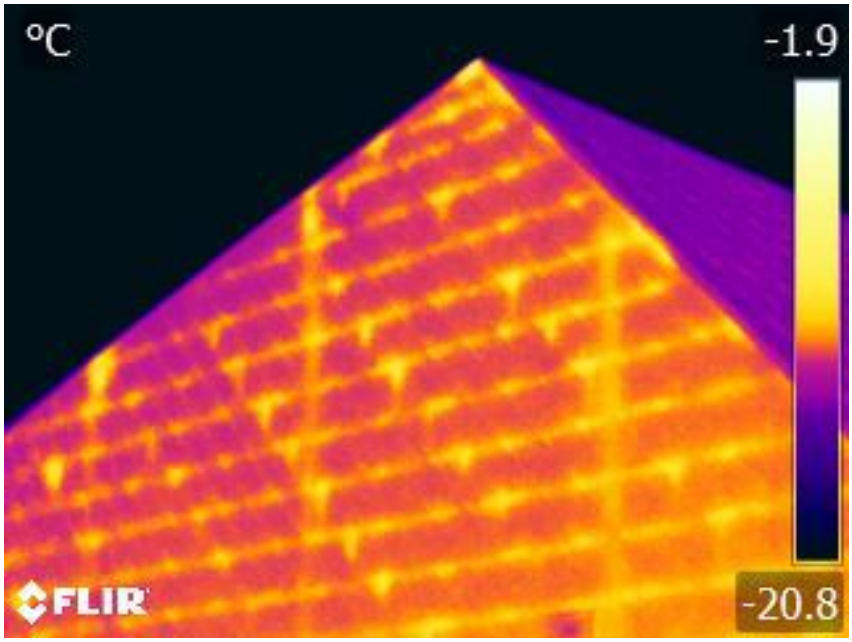
Photograph #71:

Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.

Photograph #72:

Photograph #73:

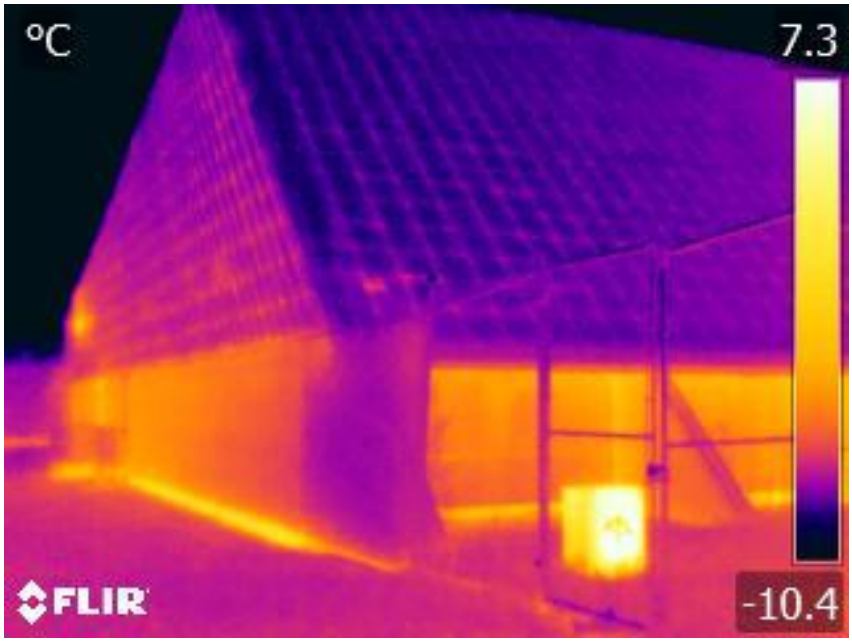
Partial west elevation. Note anomalies on diagonal cladding caused by thermal bridging and air leakage.



Photograph #74:

Photograph #75:

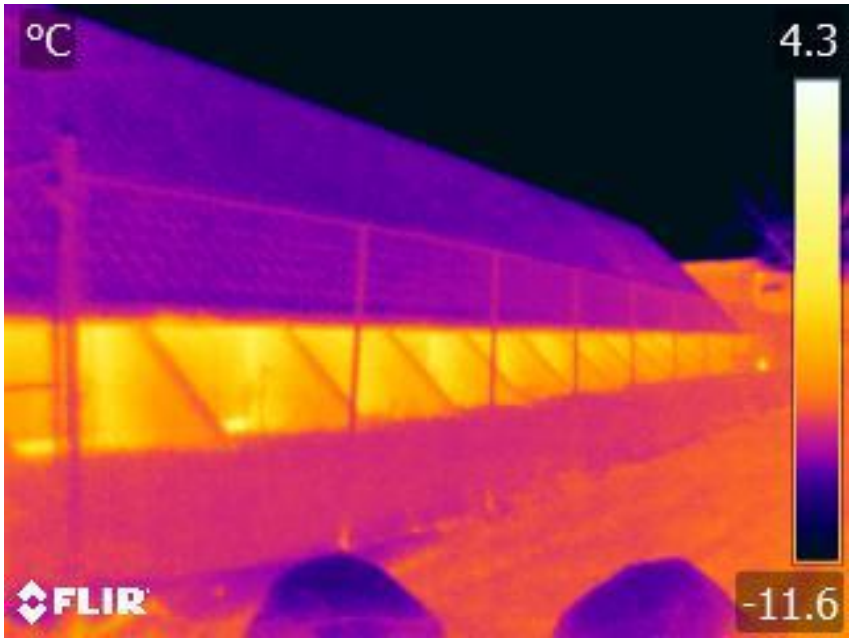
Partial west and south elevations.



Photograph #76:

Photograph #77:

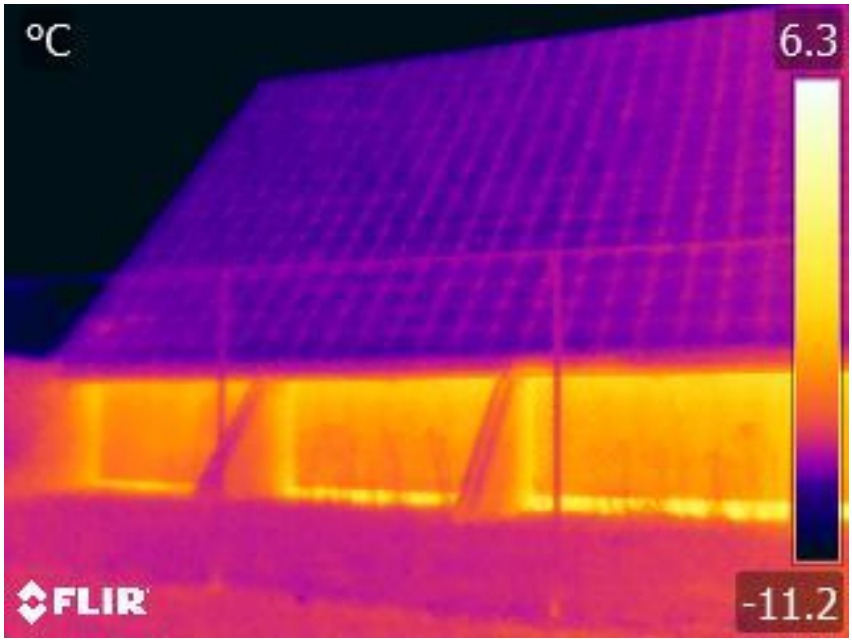
Overall south elevation.



Photograph #78:

Photograph #79:

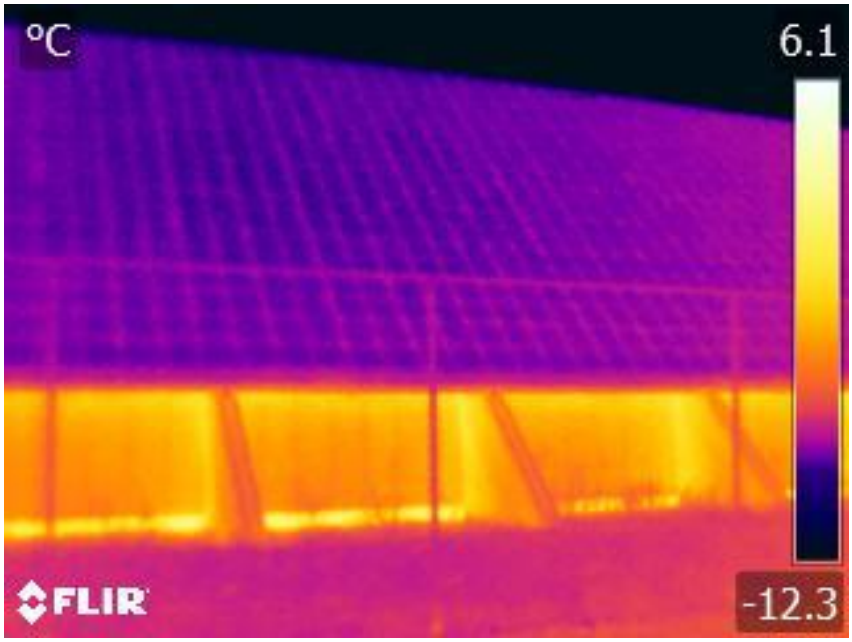
Partial south elevation. Note thermal bridging at roof cladding supports.



Photograph #80:

Photograph #81:

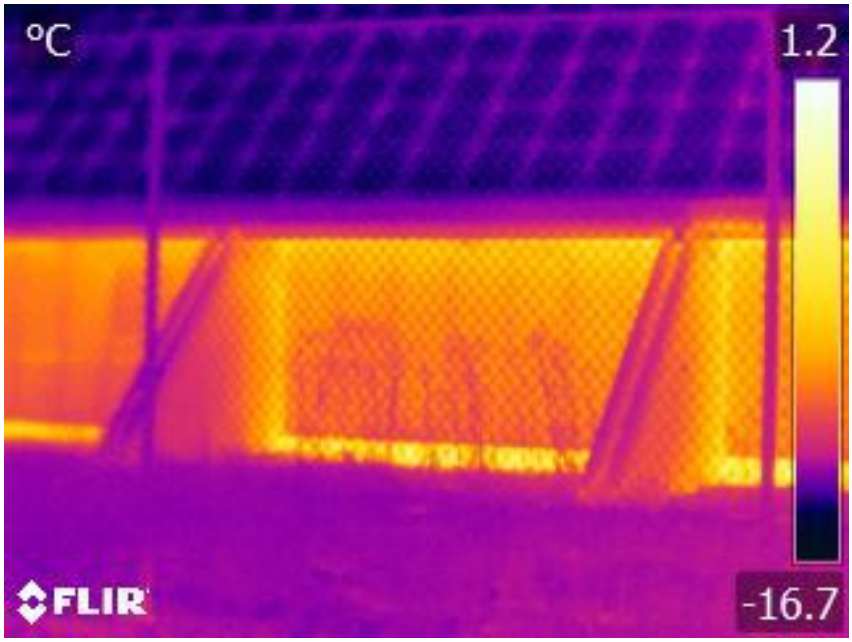
Partial south elevation. Note thermal bridging at roof cladding supports.



Photograph #82:

Photograph #83:

Partial south elevation. Note thermal bridging at roof cladding supports.



Photograph #84:

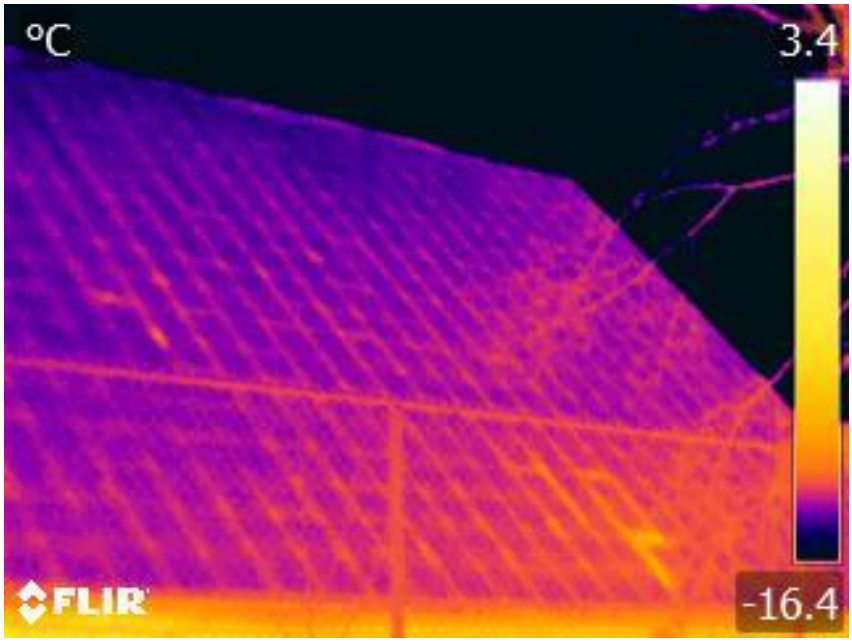
Photograph #85:

Detail view of east portion of south elevation. Note anomaly at roof panel likely caused by air leakage.

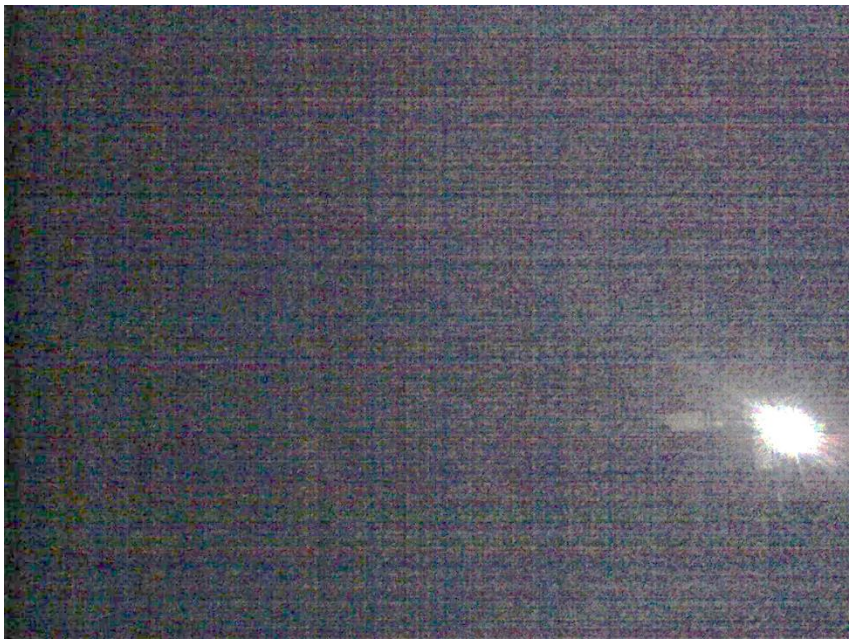
Photograph #86:

Photograph #87:

Detail view along south portion of building.

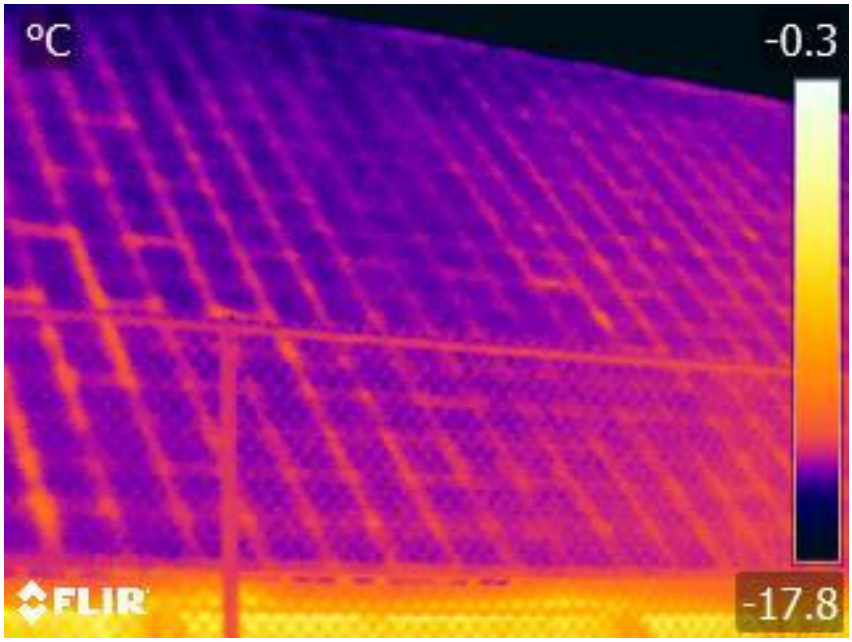


Photograph #88:

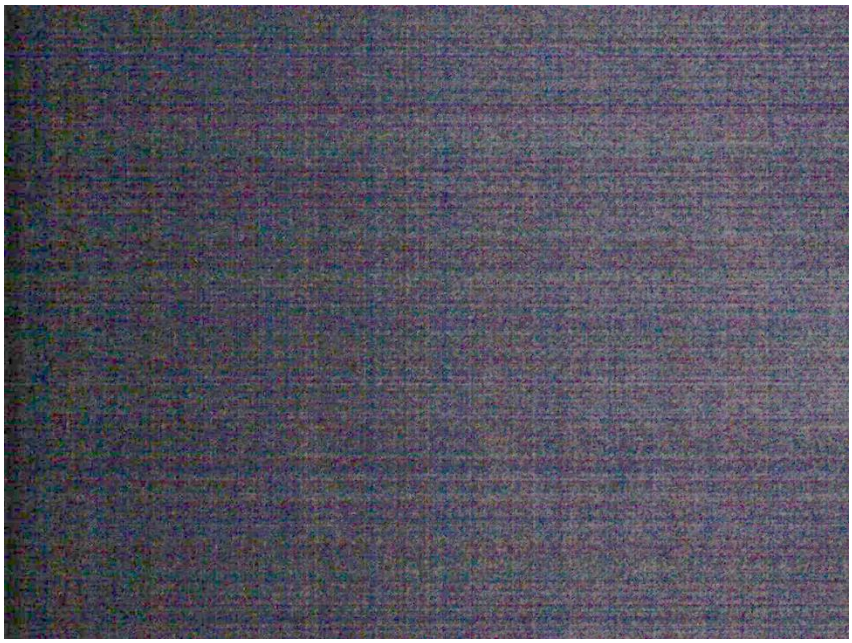


Photograph #89:

Detail view along south portion of building.

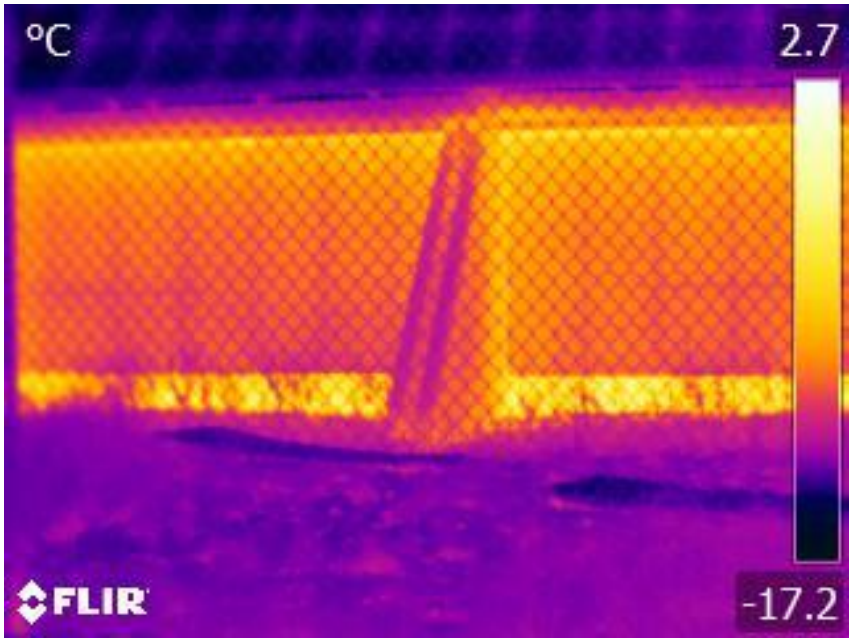


Photograph #90:

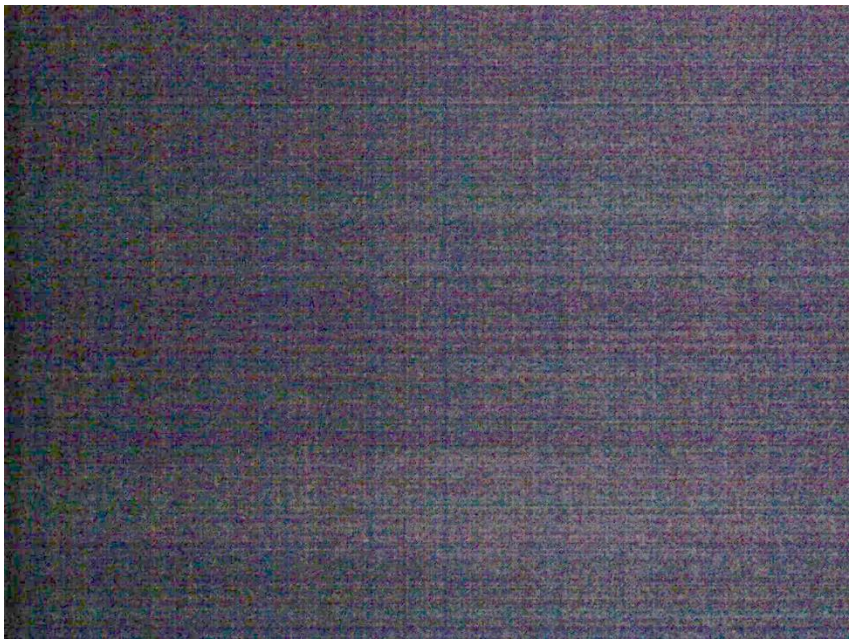


Photograph #91:

Detail view along south portion of building. Note thermal anomalies on soffit.

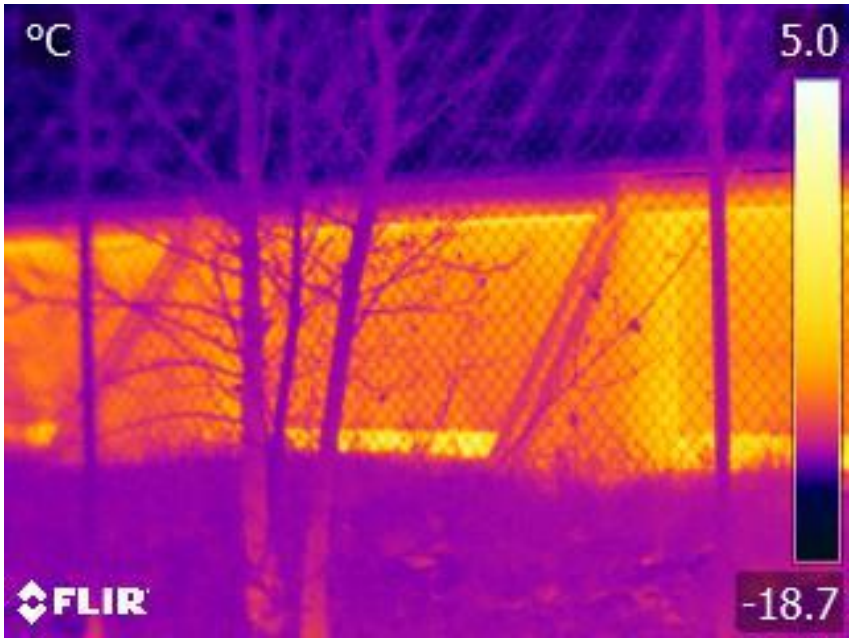


Photograph #92:

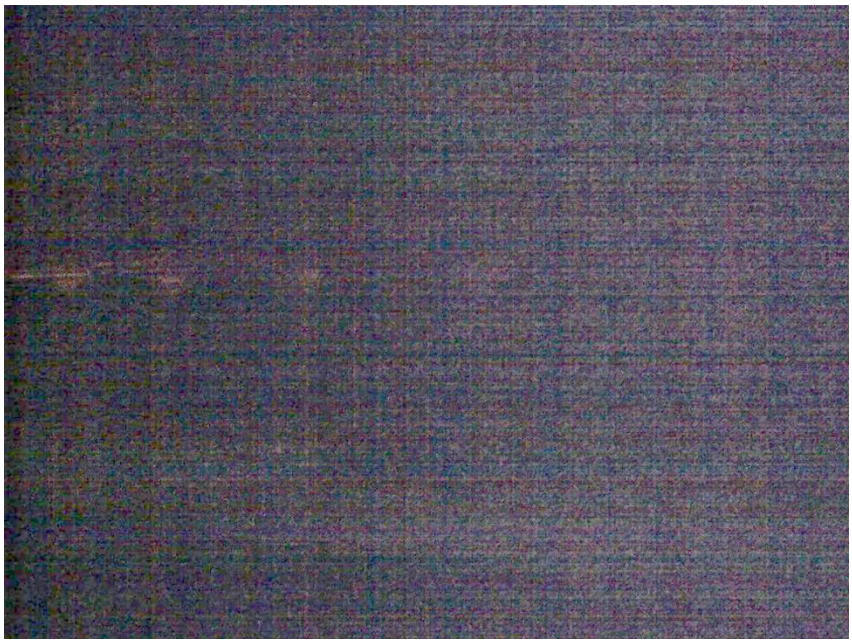


Photograph #93:

Detail view along south elevation.

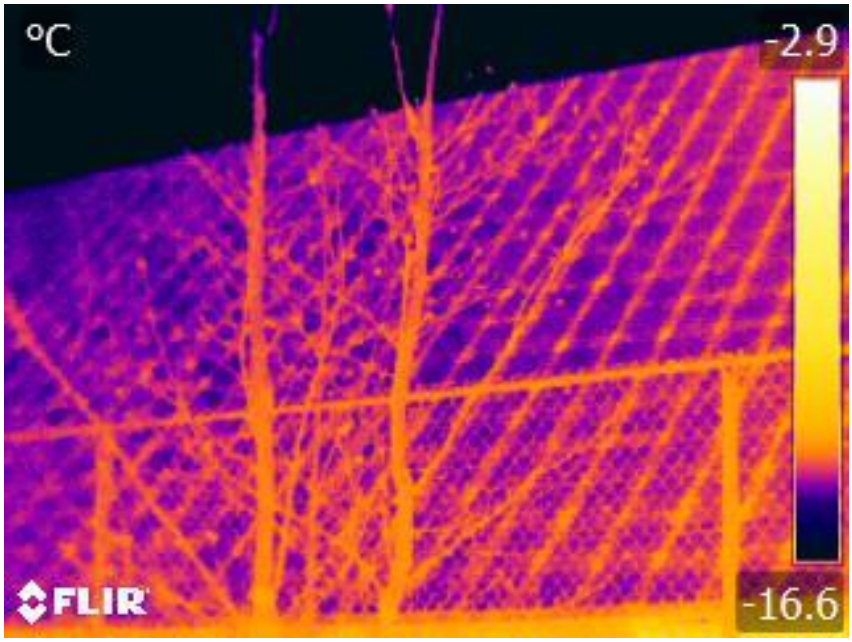


Photograph #94:

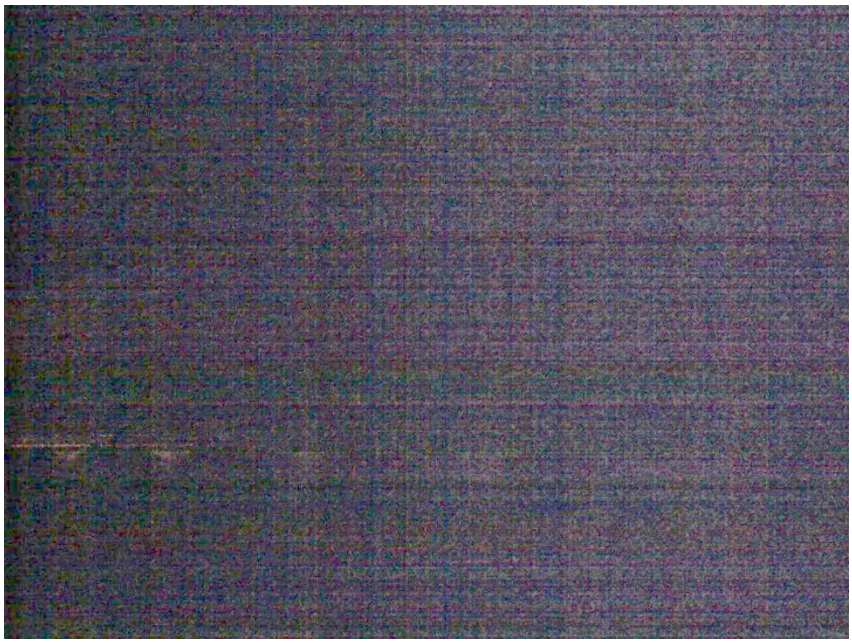


Photograph #95:

Detail view along south elevation.

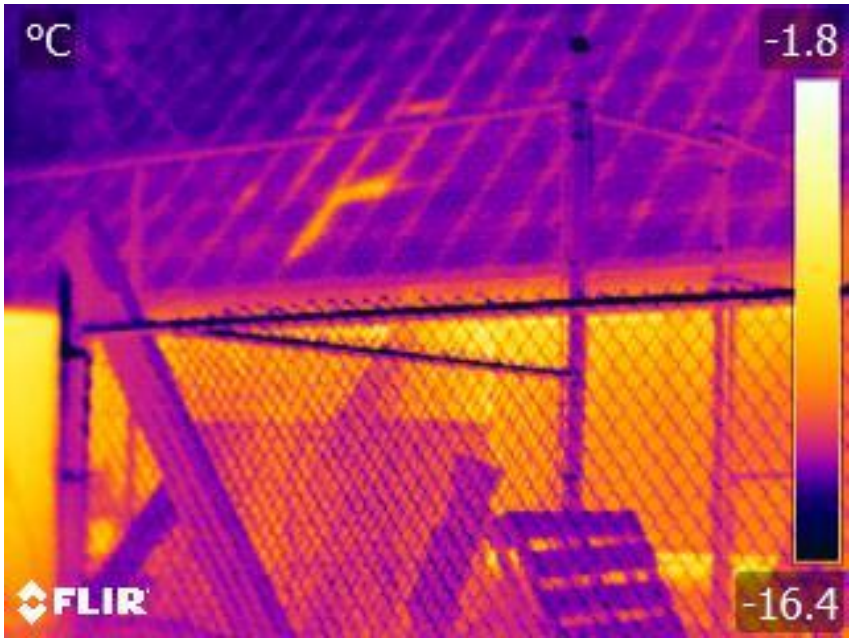


Photograph #96:

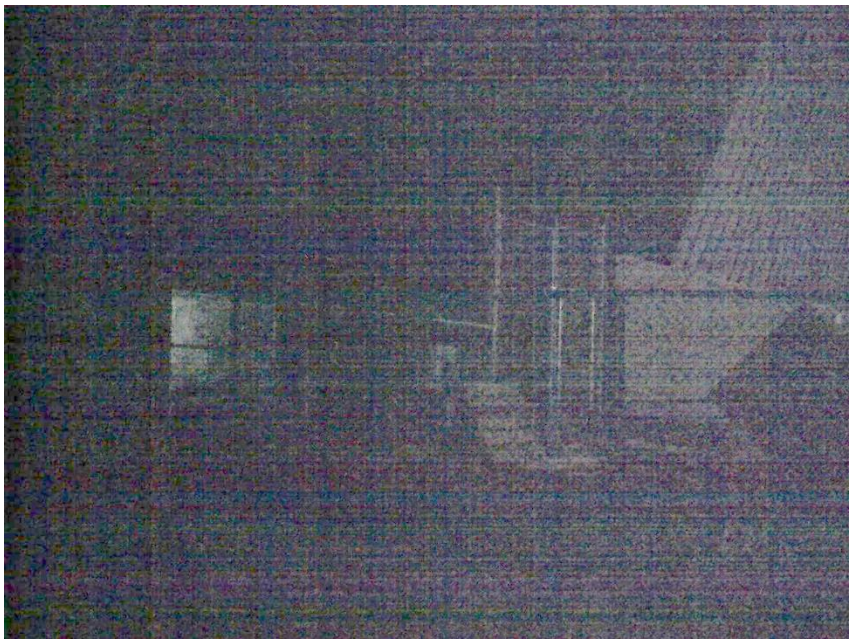


Photograph #97:

Detail view at east end of south elevation. Note anomaly likely caused by air leakage at roof panel.

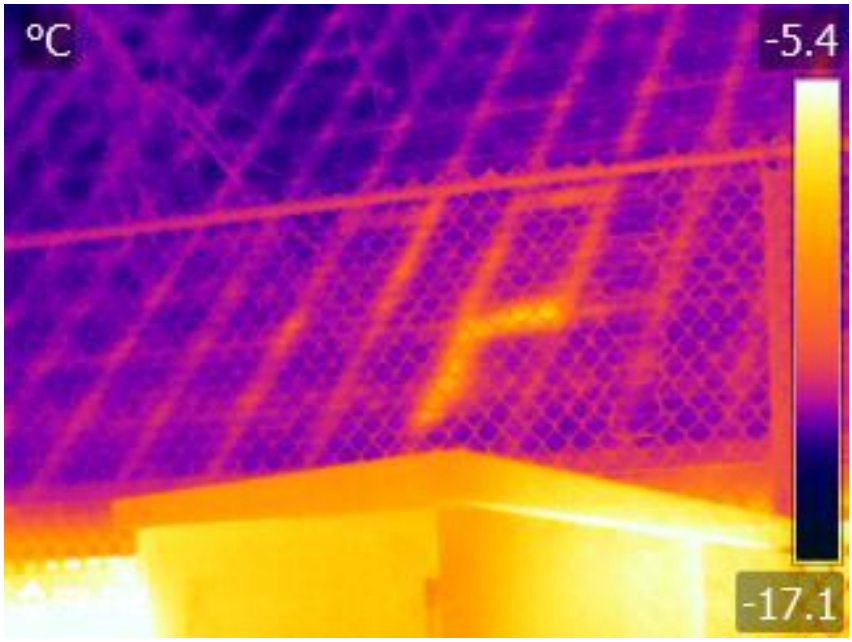


Photograph #98:

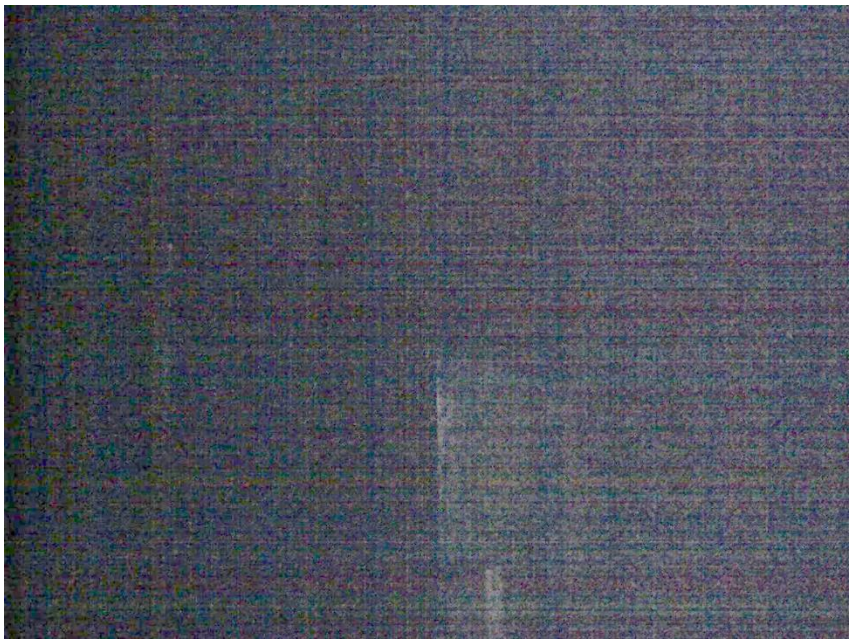


Photograph #99:

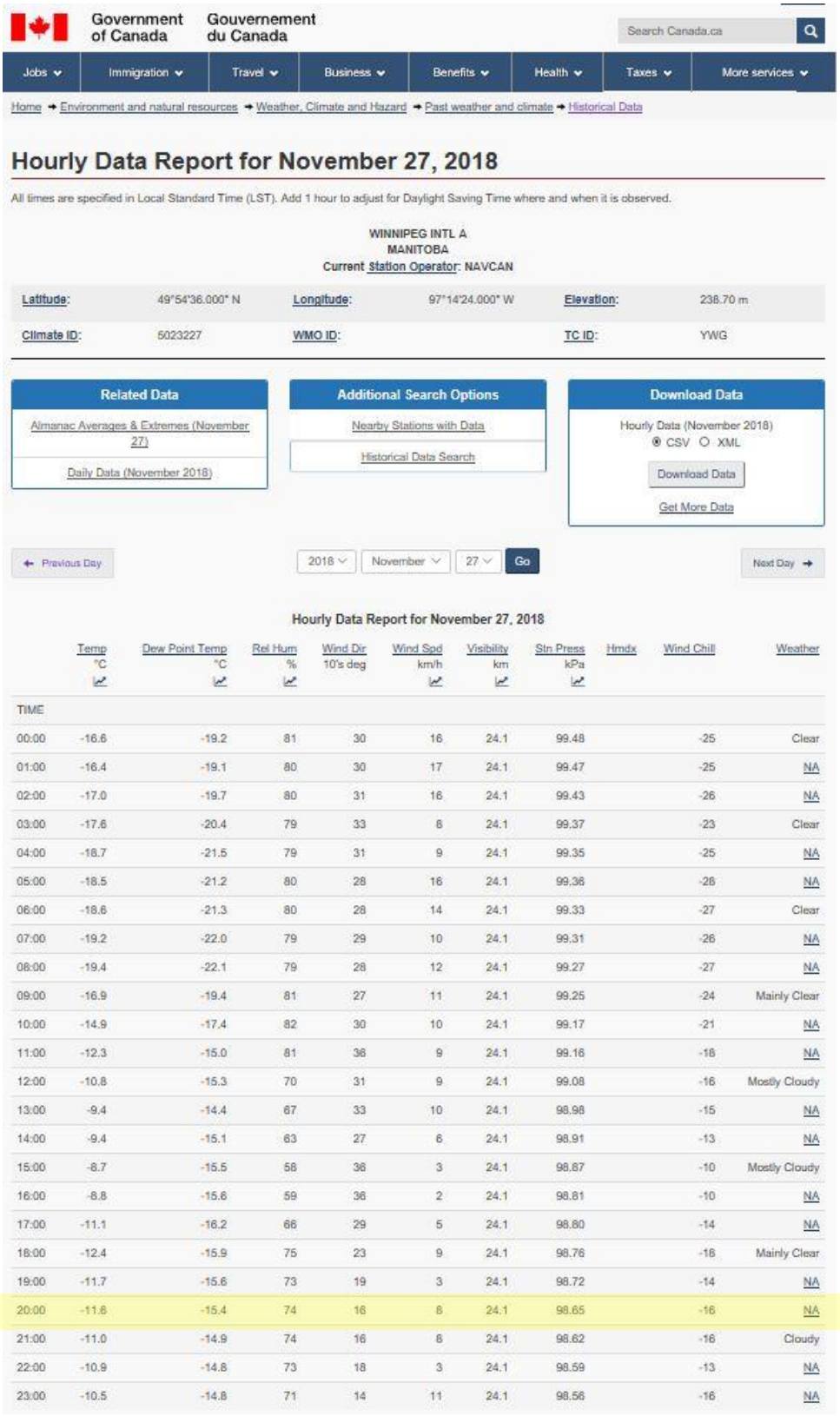
Detail view at east end of south elevation. Note anomaly likely caused by air leakage at roof panel.



Photograph #100:



6. Weather Data



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Hourly Data Report for November 27, 2018

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

WINNIPEG INTL A
MANITOBA
Current Station Operator: NAVCAN

Latitude:	49°54'36.000" N	Longitude:	97°14'24.000" W	Elevation:	238.70 m
Climate ID:	5023227	WMO ID:		TC ID:	YWG

Related Data
- Almanac Averages & Extremes (November 27)
- Daily Data (November 2018)

Additional Search Options
- Nearby Stations with Data
- Historical Data Search

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Hourly Data (November 2018)
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Hourly Data Report for November 27, 2018

	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
TIME										
00:00	-16.6	-19.2	81	30	16	24.1	99.48		-25	Clear
01:00	-16.4	-19.1	80	30	17	24.1	99.47		-25	NA
02:00	-17.0	-19.7	80	31	16	24.1	99.43		-26	NA
03:00	-17.6	-20.4	79	33	8	24.1	99.37		-23	Clear
04:00	-18.7	-21.5	79	31	9	24.1	99.35		-25	NA
05:00	-18.5	-21.2	80	28	16	24.1	99.36		-26	NA
06:00	-18.6	-21.3	80	28	14	24.1	99.33		-27	Clear
07:00	-19.2	-22.0	79	29	10	24.1	99.31		-26	NA
08:00	-19.4	-22.1	79	28	12	24.1	99.27		-27	NA
09:00	-16.9	-19.4	81	27	11	24.1	99.25		-24	Mainly Clear
10:00	-14.9	-17.4	82	30	10	24.1	99.17		-21	NA
11:00	-12.3	-15.0	81	36	9	24.1	99.16		-18	NA
12:00	-10.8	-15.3	70	31	9	24.1	99.08		-16	Mostly Cloudy
13:00	-9.4	-14.4	67	33	10	24.1	98.98		-15	NA
14:00	-9.4	-15.1	63	27	6	24.1	98.91		-13	NA
15:00	-8.7	-15.5	58	36	3	24.1	98.87		-10	Mostly Cloudy
16:00	-8.8	-15.6	59	36	2	24.1	98.81		-10	NA
17:00	-11.1	-16.2	66	29	5	24.1	98.80		-14	NA
18:00	-12.4	-15.9	75	23	9	24.1	98.76		-18	Mainly Clear
19:00	-11.7	-15.6	73	19	3	24.1	98.72		-14	NA
20:00	-11.6	-15.4	74	16	6	24.1	98.65		-16	NA
21:00	-11.0	-14.9	74	16	6	24.1	98.62		-16	Cloudy
22:00	-10.9	-14.8	73	18	3	24.1	98.59		-13	NA
23:00	-10.5	-14.8	71	14	11	24.1	98.56		-16	NA