PROJECT NO. CCIW-092
WSP PROJECT NO. 169-00325-01

BID DOCUMENTS AND SPECIFICATIONS

CCIW - 867 LAKESHORE ROAD, BURLINGTON
WTC ROOF REPLACEMENT

JUNE 15, 2018

VERSION: ISSUE FOR TENDER

PREPARED FOR:
CCIW – CANADA CENTRE FOR INLAND WATERS
867 LAKESHORE ROAD
BURLINGTON, ON L7S 1A1
ATTN: MR. DANIEL VENTURA

PREPARED BY:
ARCHITECTURE 49 INC.
WSP CANADA INC.

END OF SECTION

PROJECT TITLE CCIW – Canadian Centre for Inland Waters
Wastewater Technology Centre (WTC) Roof Replacement
867 Lakeshore Rd, Burlington, ON L7R 4A6

PROJECT NUMBER CCIW-092
WSP Project No. 169-00325-01

PROJECT DATE 2018-06-15 – Issue for Tender

END OF SECTION

Part 1 General

1.1 ROOF CONDITION ASSESSMENT REPORT

.1 The document following this specification section is for information only to the bidder. It does not form part of the contract between Departmental Representative and Contractor.

.1 IRC Building Sciences Group
August 10, 2016
IRC Project No. IRC-18455
W.O. No. HR16-219CR

Environment and Climate Change Canada
WTC Roof – Canada Centre for Inland Waters
867 Lakeshore Road, Burlington, ON

1.2 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

.1 The document following this specification section is for information only to the bidder. It does not form part of the contract between Departmental Representative and Contractor.

.1 Arcadis Canada Inc.
February 28, 2018
702345-009

Public Services and Procurement Canada
Designated Substances and Hazardous Materials Survey – Phase 0 Lab Modernization Program and Sprinkler System Upgrade
Canada Centre for Inland Waters
867 Lakeshore Road, Burlington, ON

END OF SECTION

ROOF CONDITION ASSESSMENT REPORT

Prepared for: **Environment and Climate Change Canada**
867 Lakeshore Road
Burlington, Ontario

Attention: Mr. Daniel Ventura

Project: **WTC Roof - Canada Centre for Inland Waters**
867 Lakeshore Road Burlington, ON

IRC Number: IRC-18455

W.O. Number: HR16-219CR

Report Date: August 10, 2016

Consultants: **IRC Building Sciences Group**
2121 Argentia Road, Suite 401
Mississauga, ON, L5N 2X4

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1 Introduction

1.1 Terms of Reference

In July of 2016, IRC Building Sciences Group was authorized by Environment and Climate Change Canada to conduct a site investigation and assessment of the roof assembly components at the Canada Centre for Inland Waters - WTC Building situated at 867 Lakeshore Road in Burlington, Ontario.

The objective of this analysis is to visually review the condition of the roof assemblies and related components, to assess their existing condition and to make recommendations on future repair and/or replacement options.

The site investigation consisted of a thorough visual examination of the visible roofing components, their current condition in addition to identifying areas requiring remedial attention. Perimeter flashing details, caulking, drainage, and surface anomalies were visually examined to identify signs of failure and potential future problem areas.

A roof plan was prepared showing all the designated roof areas, rooftop equipment, roof penetrations, etc., deficiencies, locations of test cuts if applicable, and other pertinent information. The roof plan is provided at the end of the report.

Budgetary costing estimates for corrective/replacement work identified from the visual review are also provided at the end of the report.

1.2 Scope of Work

The scope of work includes the following elements and techniques:

.1 On-site visual review of all accessible roof areas. Visual record of all potential sites for water entry into the building. Interior visual walk through survey to ascertain location of leakage into the building.

.2 Interviews with appropriate building occupants and managers, in conjunction with document review, if available.

.3 Core-cut testing for the purposes of determining roof system configuration and composition.

.4 Moisture analysis of system components at core cut locations utilizing the Delmhorst Moisture Meter for the purpose of moisture verification at the following locations:

i) Roof Interply System

ii) Insulation within the sub roof system.

.5 A survey of the roof membrane utilizing the Tramex Moisture Seeking Instrument was performed on roof areas 1.1, 2.1 and 3.1 to detect moisture within the roof system. The Tramex Moisture Seeking Instrument is an electronic capacitance meter which is a non-destructive tool used for the detection of moisture within the roof system.

.6 Preparation of a scale roof plan for reporting purposes.

1.3 Site Visit

The date of the site visit to review the roof system was August 2nd, 2016 and the outside weather conditions during the visit were sunny and warm with a temperature of 28 degrees Celsius. The assessment team consisted of Matthew Viola and Dave Ross from IRC.

1.4 Building and Roof System Description

For the purposes of the reporting and data assembly, each roof area is divided into identifiable sections according to the boundaries set out by such termination features as edges, height changes, control joints and/or expansion joints.

The Canada Centre for Inland Waters site is situated at the east end of Hamilton Harbour on the north side of the Burlington Bay Canal. The Wastewater Technology Centre (WTC) building is situated at the north end of the site and is a two storey reinforced concrete structure constructed in the early 1970's. An addition at the east end of the building was constructed in 1996.

The roof is subdivided into six (6) separate sections and totals approximately 28,254 square feet in area. All roofs on the original section of the building are of similar construction and consist of two ply modified bitumen roof systems which are estimated to be in excess of 20 years old (applied in the mid 1990's). The roof over the east addition (Roof Area 1.1) consists of a conventional built up bituminous assembly which is the original application, approximately 20 years old.

A small addition at the southeast corner of the upper mechanical room was being constructed at the time of our site visit.

1.5 Reported Leaks and Repair History

Ongoing active leaks were reported in various offices along the south west portion of the building. The following table outlines identified roof leaks. Please refer to roof plan for locations.

Roof Area (Refer to Roof Plan)	Leak Details
Roof Area 1.2 Room S203	Water stained drywall bulkhead above window (photograph 17).
Roof Area 1.2 Room S208	Missing ceiling tile along east wall due to ongoing roof leak (photograph 18). Leaks along high wall transition of stairwell. Review of roof above this location indicated significant moisture contamination of the insulation below the membrane (photograph 25).
Roof Area 1.2 Room S249	Ongoing leakage above central portion of the office (photograph 19). This location is directly below the ongoing construction of the mechanical room addition (photograph 20). Occupants noted that leaks did not exist prior to construction.
Roof Area 3.1 Mechanical Penthouse	Water entry evident around mechanical stacks (photograph 74). Investigation of this roof indicated that there is widespread moisture contamination of the insulation throughout the entire roof area.

1.6 Limitations of the Study

IRC prepared this report solely for the client named. The responsibilities of IRC are as described in the Terms of Reference and the Scope of Work. The material in this report reflects the opinion of IRC at the time of preparation and within the terms of reference as agreed. Any use, which a Third Party makes of this report, or any reliance on decisions based on it, are the responsibility of such Third Parties.

IRC does not warrant the accuracy of the identified information provided by others at the time of the report preparation. Unless provided in writing, but not limited to, mistakes, contacts, insufficient information or certification of such information is not the responsibility of IRC.

Only the specific information or locations noted in the report have been reviewed. Although every reasonable effort was taken to identify defects, latent and hidden defects may affect the accuracy of this report. No physical or destructive testing and no design calculations have been performed unless indicated elsewhere in this report.

The assessment provided is based on visually observed defects at a limited number of locations and our experience with similar types of buildings. Deficiencies may exist at other areas not referenced in this report or that are not visually apparent given the level of evaluation. No responsibility is therefore assumed concerning these matters, or for failure to carry out technical or engineering techniques which would be required to discover any inherent or hidden conditions of the property since such an investigation was not included in the scope of work.

Report prepared by,

IRC Building Sciences Group Inc.

Reviewed By

Dave Ross, B. Tech, RRO
Asset Manager

Albert Duwyn, RRC, FRCI
President

2 Roof Compositions

Roof Area	Estimated Age (Years)	Structure/Deck	Vapour Retarder	Insulation	Overlay Insulation	Membrane System	Surface	Perimeter Details	Approximate Thermal Resistance Above Deck (Insulation Dry)
1.1	20	Metal	1 Ply Kraft Paper	2.5" Polyisocyanurate	0.5" Fibreboard	4 Ply Fibreglass Felt	Pea Gravel	Parapet	16
1.2	20+	Gypsum Board on Metal	2 Ply Asphalt Felt	2.0" Polyisocyanurate	0.5" Perlite	2 Ply Modified Bitumen	Granule	Parapet	13.5
2.1, 2.2 & 2.3	20+	Concrete	2 Ply Asphalt Felt	2.0" Polyisocyanurate	0.5" Fibreboard	2 Ply Modified Bitumen	Granule	Parapet	13.2
3.1	20+	Gypsum Board on Metal	2 Ply Asphalt Felt	2.0" Polyisocyanurate	0.5" Perlite	2 Ply Modified Bitumen	Granule	Parapet	13.5

Photograph 1: Partial view of the front elevation of the WTC Building on the site of the Canada Centre for Inland Waters.

Photograph 2: View of the front entrance to the building showing the mechanical penthouse addition under construction.

Photograph 3: Roof Area 1.1 – Overall view looking south. This roof area is situated over the east addition to the building and consists of a conventional 4 ply built up bituminous membrane system installed in 1996.

Photograph 4: Roof Area 1.1 - Overall view looking west. The existing roof system on this area was assessed to be in serviceable condition requiring preventative maintenance in order to extend service life.

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Photograph 8: Roof Area 1.1 – View of cracked membrane flashings at the south end of the expansion joint.

Photograph 9: Roof Area 1.1 – Various pieces of new mechanical equipment have been installed in the northeast corner of the roof and appear to have been flashed into the existing roof using acceptable materials and installation methods.

Photograph 10: Roof Area 1.1 – Electrical conduit penetrations at the new equipment have been fed through the sides of the support curbs which will tend to be an ongoing maintenance item.

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Photograph 12: Roof Area 1.1 – Unused cone penetrations are evident in various locations and should be removed at the time of the next roof replacement.

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Photograph 18: Roof Area 1.2 (Interior) – Missing ceiling tile along east wall of office S208 due to ongoing roof leak at transition with the central stairwell wall.

Photograph 19: Roof Area 1.2 (Interior) – Ongoing leakage above central portion of office S249. This location is directly below the ongoing construction of the mechanical room addition (see photographs 2 and 20). Occupants noted that leaks did not exist prior to construction.

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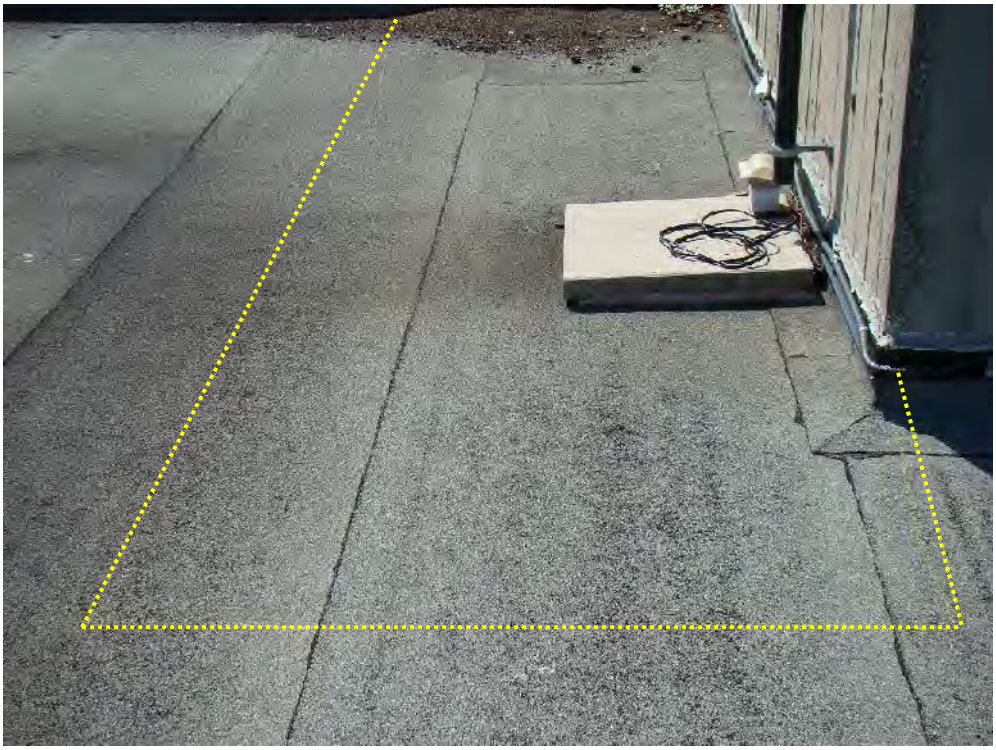
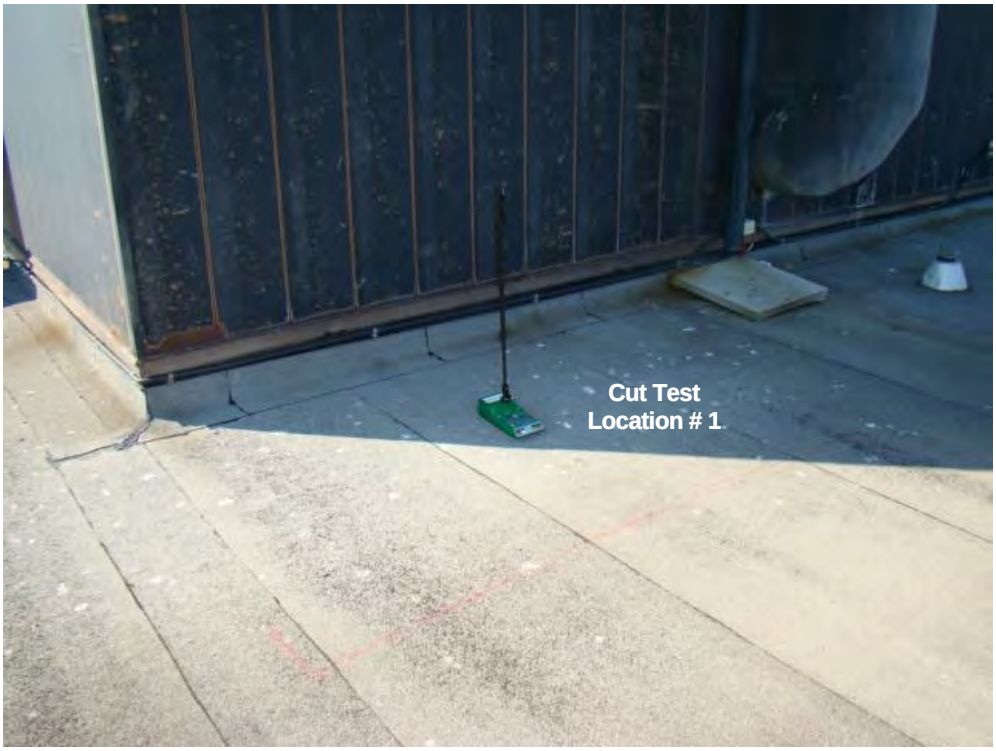
Photograph 26: Roof Area 1.2 – Openings in sealant along reglet flashing details may be contributing to leakage.



Photograph 27: Roof Area 1.2 – An area of moisture contamination was detected at the base of the southwest stairwell wall transition.

Photograph 28: Roof Area 1.2 – Open membrane flashings were observed to be causing moisture entry at the corner of the stairwell wall.



Photograph 29: Roof Area 1.2 – ***Test Cut #1*** - The first test location was in a suspected area of moisture contamination along the north penthouse wall transition.

Photograph 30: Roof Area 1.2 – ***Test Cut #1*** - Probes confirmed high readings of "70" to "95" within the thermal insulation layers below the membrane. All insulation layers at this location were visibly wet and moisture damaged. It was noted that an additional layer of tapered insulation was present at this first core test location in odder to provide back slope away from the wall.

Photograph 31: Roof Area 1.2 – ***Test Cut #2*** - The second test location was in the field of the roof adjacent to the west roof drain.

Photograph 32: Roof Area 1.2 – ***Test Cut #2*** - Probes taken at this location revealed no moisture present in the insulation layer or within the membrane interply.

Photograph 33: Roof Area 1.2– The membrane exhibits widespread and severe granule surface loss and weathering.

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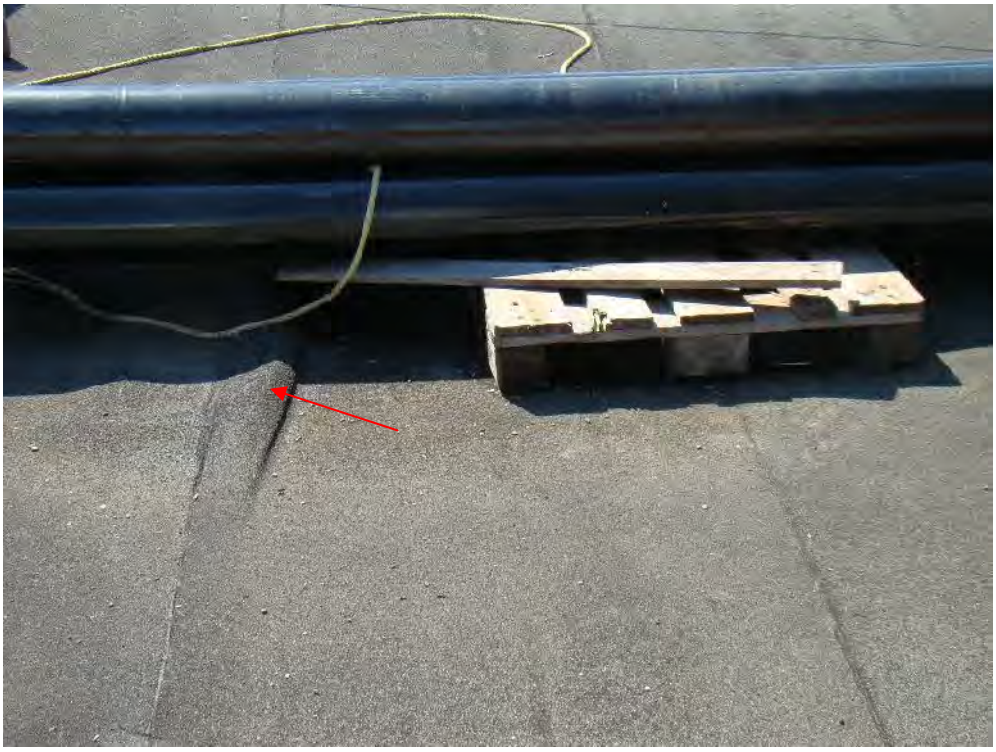
Photograph 37: Roof Area 1.2 – Widespread membrane blistering exists within the field of the roof and is indicative of poor adhesion of the membrane to the insulation substrate or delamination between the base and cap sheet membranes.

Photograph 38: Roof Area 1.2 – Severe blistering is causing developing membrane laps to delaminate and be susceptible to water entry.



Photograph 39: Roof Area 1.2 – Membrane blister has been crushed under the weight of construction materials stockpiled on the roof. This condition will likely cause membrane damage and water entry.

Photograph 40: Roof Area 1.2 – Delaminating membrane flashings were typically found at the corners of mechanical curb flashings.

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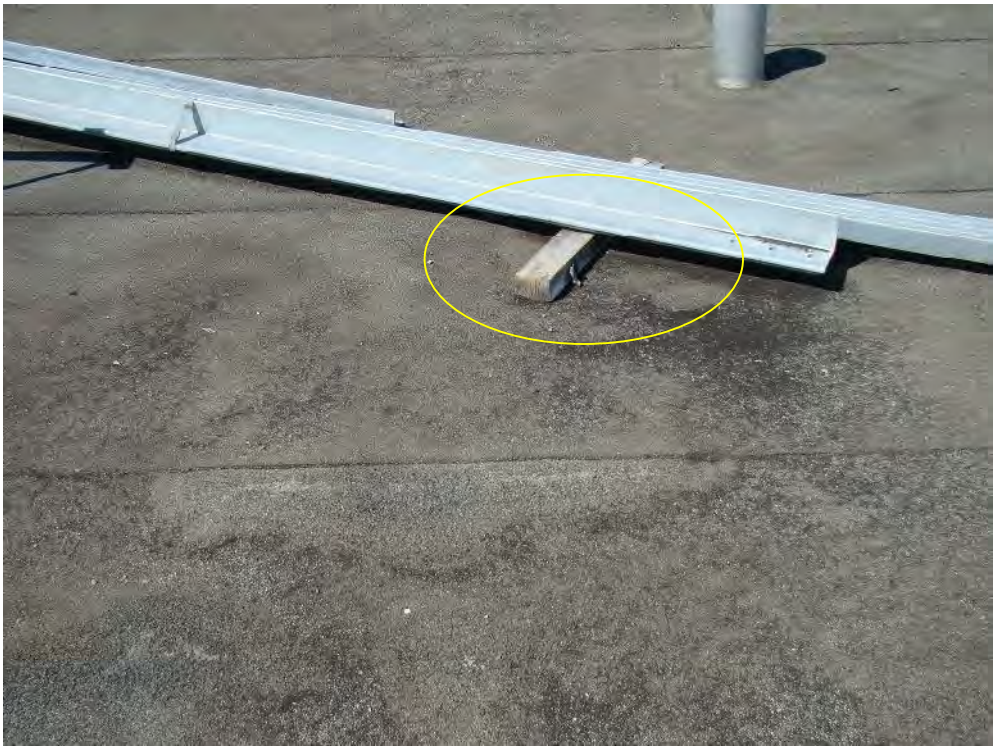
Photograph 43: Roof Area 1.2 – Evidence of water entry was observed along the base of the door into the stairwell which could be related to the sealant deterioration or due to inadequate weather stripping along the bottom of the door.

Photograph 44: Roof Area 1.2 – Heavy construction materials have been stockpiled on the membrane in the southeast corner of the roof area.

Photograph 45: Roof Area 1.2 – Inadequate protection has been provided under the materials which will result in damage to the membrane.



Photograph 46: Roof Area 1.2 – Wood support blocking under heavy steel material is sinking into the membrane.

Photograph 47: Roof Area 1.2 – Electrical cone flashings adjacent to HVAC units are poorly sealed and open to moisture entry.

Photograph 48: Roof Area 1.2– Deterioration of the filler material was evident at guy wire pitch pocket penetrations.

Photograph 49: Roof Area 1.2 - The existing waterproofing application over mechanical ductwork was assessed to be in poor condition (cracking, splitting) resulting in several instances of water infiltration and saturation of the underlying insulation.

Photograph 50: Roof Area 1.2 – Heavy organic debris and vegetation accumulation is present at corner transitions which have the potential to result in accelerated membrane deterioration.

Photograph 51: Roof Area 1.2 - Sealant at the gasline penetration through the north penthouse wall has failed resulting in water infiltration.

Photograph 52: Roof Area 1.2 - Polystyrene protection pads under various wood blocking supports have disintegrated due to UV exposure. The lack of adequate protection causes the wood blocks to damage the membrane.

Photograph 53: Roof Area 2.1 – This small roof area is situated over the west stairwell and consists of a modified bitumen membrane system installed in the early to mid 1990's.

Photograph 54: Roof Area 2.1 – Overall view at roof level showing general granule surface loss.

Photograph 55: Roof Area 2.1 ***Test Cut*** – High moisture levels were detected within the base layer of polyisocyanurate insulation.

Photograph 56: Roof Area 2.1 ***Test Cut*** – High moisture levels were detected within the top layer of fibreboard insulation.

Photograph 57: Roof Area 2.2 – This small roof area is situated over the central stairwell and consists of a modified bitumen membrane system installed in the early to mid 1990's. The addition to the mechanical room is situated directly to the east of this roof area.

Photograph 58: Roof Area 2.2 - The cap sheet membrane appears weathered and worn with general granule surface loss throughout.

Photograph 59: Roof Area 2.2 - The east parapet flashings have been removed to facilitate construction of the new addition. It appears that minimal protection from water entry has been provided along the edge.

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Photograph 61: Roof Area 2.2 – Construction debris is scattered throughout roof area.

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Photograph 63: Roof Area 2.3 – The cap sheet membrane appears weathered and worn with general granule surface loss throughout

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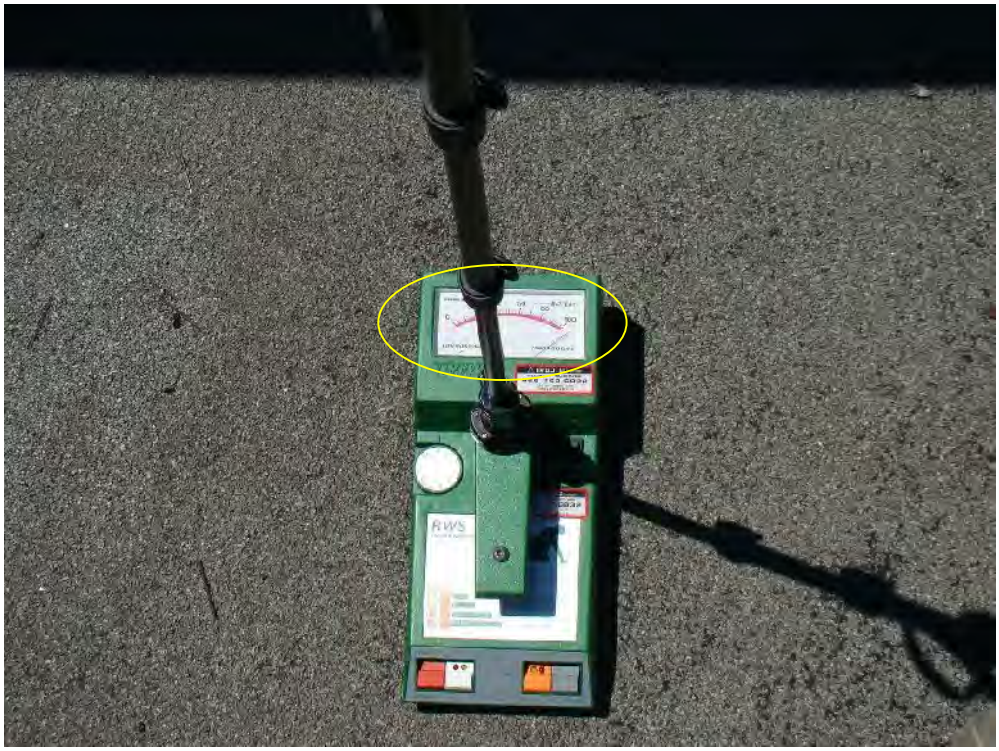
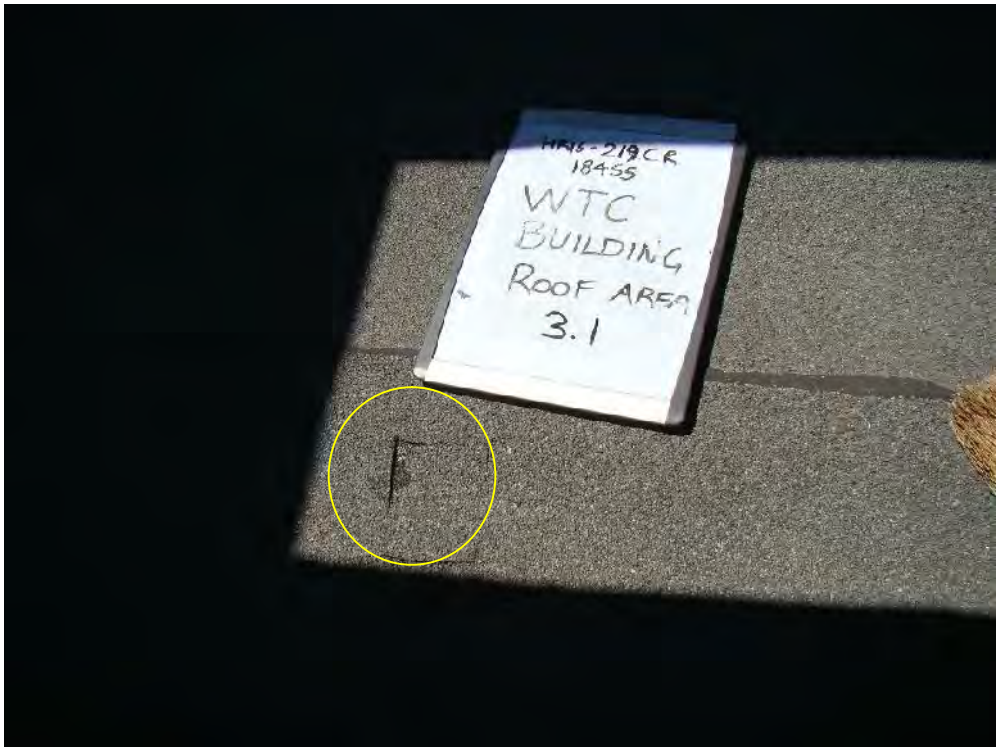
Photograph 67: Roof Area 3.1 – This roof is situated over the upper mechanical room and consists of a modified bitumen membrane system installed in the early to mid 1990's.

Photograph 68: Roof Area 3.1 – The roof is covered with a heavy concentration of mechanical equipment and ductwork which would tend to increase roof replacement costs significantly.

Photograph 69: Roof Area 3.1 – Testing with the Tramex Moisture Detection Instrument detected moisture contamination of the underlying insulation components throughout the entirety of the roof. The entire roof was noticeably "soft" under foot indicative of insulation which is saturated.



Photograph 70: Roof Area 3.1 – Closer view showing the high moisture readings typically recorded throughout the roof.



Photograph 71: Roof Area 3.1 ***Test Cut*** – Upon cutting into the membrane, water was observed exiting from the incision indicating saturation of the underlying insulation.

Photograph 72: Roof Area 3.1 ***Test Cut*** – Probes showed significant moisture readings of "100" within the insulation. Both the base layer of polyisocyanurate insulation and fiberboard layer were found to be saturated. The only component preventing widespread leakage is the presence of a sound 2 ply felt vapour retarder applied to the gypsum board substrate secured to the steel deck.

Photograph 73: Roof Area 3.1 – Vegetation was observed around the b-vent flashings at the northeast corner of the roof further confirming that the insulation below the membrane is filled with moisture and is supporting vegetation growth.

Photograph 74: Roof Area 3.1 – Water entry was visible from below around the b-vent chimneys. This is likely due to the saturated condition of the insulation causing water to infiltrate anywhere there are openings in the steel decking.

Photograph 75: Roof Area 3.1 – Overall drainage patterns appear inadequate with evidence of ponding throughout along with organic debris build up at perimeters.

Photograph 76: Roof Area 3.1 – The primary drainage for this roof area is provided by two – six inch scuppers along the north perimeter. Both scuppers are heavily obstructed by debris.

Photograph 77: Roof Area 3.1 – The cap sheet membrane appears weathered and worn with general granule surface loss throughout the roof area.

Photograph 78: Roof Area 3.1 – The existing stack penetration in the central portion of the roof is not adequately flashed into the roof system and is likely a major source of water entry. Construction debris from the adjacent construction was also observed scattered throughout the roof area.

Photograph 79: Roof Area 3.1 – The existing waterproofing application over mechanical ductwork was assessed to be in poor condition.

Photograph 80: Roof Area 3.1 – Severe deterioration of the ductwork waterproofing is resulting water infiltration and saturation of the underlying insulation (moss growth under waterproofing visible).

Photograph 81: Roof Area 3.1 – The guy wire chimney support along the east parapet has dislodged the existing metal flashings at its securement point. This has resulted in less than optimal support for the stack.

Photograph 82: Roof Area 3.1 – View of the small mechanical room addition. Roofing application was in progress at the time of IRC's site visit.

4 Summary of Observations

4.1 Roof Area 1.1 (East Addition)

This roof area (photographs 3 and 4) is situated over the east addition to the building and consists of a conventional 4 ply built up bituminous membrane system installed in 1996 (approximate). Investigation revealed the following:

1. The existing roof system on this area was assessed to be in serviceable condition requiring preventative maintenance in order to extend service life.
2. Overall drainage patterns appear very good due to a positively sloped substrate.
3. The membrane at the core cut location (photograph 5) appeared well bonded to the fibreboard substrate and adhesion between membrane layers was noted to be good. Probes taken at the core cut location revealed no moisture present in the insulation layer or within the membrane interply.
4. Membrane flashings where exposed for review appeared in serviceable condition with the asphalt glaze coating still in tact (photograph 6). Localized membrane flashing cracking was found at the south end of the west expansion joint (photographs 7 and 8).
5. Various pieces of new mechanical equipment have been installed in the northeast corner of the roof (photograph 9) and appear to have been flashed into the existing roof using acceptable materials and installation methods. Electrical conduit penetrations at the new equipment have been fed through the sides of the support curbs which will tend to be an ongoing maintenance item (photograph 10).
6. Deterioration of the filler material was evident at pitch pocket penetrations along mechanical ductwork supports (photograph 11).
7. Unused cone penetrations are evident in various locations (photograph 12) and should be removed at the time of the next roof replacement.

4.2 Roof Area 1.2 (Main Roof)

This roof area (overview photographs 13, 14, 15, and 16) is situated over the majority of the second floor level and consists of a modified bitumen membrane system installed in the early to mid 1990's. Investigation revealed the following:

1. The existing roof system on this area is assessed to be in poor condition with several areas of suspect moisture contamination below the membrane.
2. A general review of the membrane utilizing the Tramex Moisture Seeking Instrument revealed twelve (12) separate and distinct locations where moisture was detected under the membrane (refer to roof plan for locations). Moisture detected primarily was located along wall transitions and around equipment penetrations indicating leakage is related to membrane flashing detailing and deterioration (photographs 21, 22, 23, 24, 25, and 27)
3. Cut testing of the roof system was conducted in two locations. The following observations were made at the test locations:

   Cut Test #1 - The first test location (photographs 29 and 30) was in a suspected area of moisture contamination along the north penthouse wall transition. Probes confirmed high readings of "70" to "95" within the thermal insulation layers below the membrane. The insulation at this location was visibly wet and moisture damaged.

   Cut Test #1 was conducted along the base of the wall transition and confirmed that a tapered insulation back slope has been installed to provide positive drainage away from the wall. The back slope extends approximately 4 to 6 feet out from the wall.

Cut Test #2 - The second test location (photographs 31 and 32) was in the field of the roof adjacent to the west roof drain. Probes taken at this location revealed no moisture present in the insulation layer or within the membrane interply.

4. The membrane exhibits widespread and severe granule surface loss and weathering (photographs 33, 34, 35 and 36). This condition is related to advanced aging of the membrane, exposure to prolonged ponding and erosion due to regular foot traffic patterns and wind scouring (this roof would be exposed to high winds due to its proximity to open water).

5. Widespread membrane blistering exists within the field of the roof (photographs 37, 38 and 39) and is indicative of poor adhesion of the membrane to the insulation substrate or delamination between the base and cap sheet membranes due to moisture infiltration. Severe blistering is causing developing membrane laps to delaminate and be susceptible to water entry.

6. Delaminating membrane flashings were typically found at the corners of mechanical curb flashings (photograph 40).

7. Failed sealant repairs were observed at several corner transitions (photograph 41).

8. Failed sealant along the wall reglet details at raised stairwells is resulting in water entry (photograph 26).

9. Sealant failure exists at the door frame along the north wall of the east stairwell penthouse (roof area 2.3) (photograph 42). Evidence of water entry was observed along the base of the door into the stairwell (photograph 43) which could be related to the sealant deterioration or due to inadequate weather stripping along the bottom of the door.

10. Heavy construction materials have been stockpiled on the membrane in the southeast corner of the roof area (photograph 44). Inadequate protection has been provided under the materials which will result in damage to the membrane (photographs 45 and 46).

11. Electrical cone flashings adjacent to HVAC units are poorly sealed and open to moisture entry (photograph 47).

12. Deterioration of the filler material was evident at guy wire pitch pocket penetrations (photograph 48).

13. Membrane flashing and sealant failure was observed around the base of b-vent chimneys and pitch pockets at the west end of the roof. Moisture contamination under the membrane was detected by the Tramex Meter at these locations (photographs 23 and 24).

14. The existing waterproofing application over mechanical ductwork was assessed to be in poor condition (cracking, splitting) resulting in several instances of water infiltration and saturation of the underlying insulation (photograph 49).

15. Heavy organic debris and vegetation accumulation is present at corner transitions which has the potential to result in accelerated membrane deterioration (photograph 50).

16. Sealant at the gasline penetration through the north penthouse wall has failed resulting in water infiltration (photograph 51).

17. Polystyrene protection pads under various wood blocking supports have disintegrated due to UV exposure (photograph 52). The lack of adequate protection causes the wood blocks to damage the membrane.

4.3 Roof Areas 2.1, 2.2 and 2.3 (Stairwells)

These roof areas (photographs 53, 57 and 62) are situated over the three stairwells along the south perimeter of the building and consist of modified bitumen membrane systems installed in the early to mid 1990's. Investigation revealed the following:

1. The existing roof systems on these areas are assessed to be in poor condition with limited service life remaining.
2. Cut testing of the roof assembly over the west stairwell (roof area 2.1) reveled moisture contaminated insulation below the membrane (photographs 55 and 56).
3. The cap sheet membrane appears weathered and worn with general granule surface loss throughout all roof areas (photographs 54, 58 and 63).
4. The east parapet flashings on roof area 2.2 have been removed to facilitate construction of the new addition. It appears that minimal protection from water entry has been provided along the edge (photograph 59). Construction debris is scattered throughout roof area 2.2 and is obstructing the drainage scupper (photographs 60 and 61).
5. Membrane wrinkling and blistering was evident on roof area 2.3 (photograph 64).
6. Evidence of moisture staining along the east wall indicates previous leakage (photograph 66).

4.4 Upper Mechanical Penthouse Area 3.1

This roof (photographs 67 and 68) is situated over the upper mechanical room and consists of a modified bitumen membrane system installed in the early to mid 1990's. Investigation revealed the following:

1. The existing roof system on this area is assessed to be in failed condition due to widespread water entry.
2. Testing with the Tramex Moisture Detection Instrument (photographs 69 and 70) detected moisture contamination of the underlying insulation components throughout the entirety of the roof.
3. Cut testing of the roof assembly over the west portion of the roof confirmed significant moisture readings of "100" within the insulation (photograph 72). Upon cutting into the membrane, water was observed exiting from the incision (photograph 71). Both the base layer of polyisocyanurate insulation and fiberboard layer were found to be saturated. The only component preventing widespread leakage is the presence of a sound 2 ply felt vapour retarder applied to the gypsum board substrate secured to the steel deck.
4. Vegetation was observed around the b-vent flashings at the northeast corner of the roof (photograph 73), further confirming that the insulation below the membrane is filled with moisture and is supporting vegetation growth.
5. Water entry was visible from below around the b-vent chimneys (photograph 74). This is likely due to the saturated condition of the insulation causing water to infiltrate anywhere there are openings in the steel decking.
6. Overall drainage patterns appear inadequate with evidence of ponding throughout along with organic debris build up at perimeters and at scuppers (photographs 75 and 76).
7. The cap sheet membrane appears weathered and worn with general granule surface loss throughout the roof area (photograph 77).
8. The existing stack penetration in the central portion of the roof is not adequately flashed into the roof system and is likely a major source of water entry (photograph 78).
9. Construction debris from the adjacent construction was also observed scattered throughout the roof area (photograph 78).

10. The existing waterproofing application over mechanical ductwork was assessed to be in poor condition (cracking, splitting) resulting in several instances of water infiltration and saturation of the underlying insulation (photographs 79 and 80).

11. The guy wire chimney support along the east parapet has dislodged the existing metal flashings at its securement point (photograph 81). This has resulted in less than optimal support for the stack.

5 Conclusions/Recommendations

The modified bitumen membrane roof systems over the original building (Roof Areas 1.2, 2.1, 2.2, 2.3 and 3.1) are assessed to be in poor to failed condition due to general deterioration of the membrane and related flashing systems along with confirmed water infiltration and moisture contamination of the thermal insulation. It is recommended that these roof systems be replaced as soon as possible n order to mitigate any further interior damage due to moisture entry.

As for the east addition, the BUR roof system is assessed to be in better condition and with appropriate maintenance and monitoring should have 3 to 5 years of service life remaining.

5.1 Roof Area 1.1 (East Addition)

Recommended initial preventative maintenance is as follows:

1. Repair cracked membrane flashings at the south end of the west expansion joint.
2. Seal electrical conduit penetrations at equipment curbs.
3. Replenish filler material at pitch pocket penetrations along mechanical ductwork supports.
4. Re-seal unused cone penetrations.

5.2 Roof Area 1.2 (Main Roof)

Due to the advance membrane deterioration exhibited along with moisture contamination of the underlying insulation, complete system replacement is recommended:

1. Remove all components to level of gypsum board/thermal barrier.
2. Replace moisture contaminated gypsum board as required and apply new membrane vapour retarder.
3. Install new tapered thermal insulation system to improve drainage.
4. Install high performance membrane system.
5. Install new membrane flashings ensuring complete coverage on parapets.
6. Install new metal flashings at perimeters and penetrations.
7. Replace pitch pockets, sleeves and cones at roof penetrations with appropriate maintenance-free flashings.
8. Install adequate membrane protection under roof top equipment supports.
9. Replace existing ductwork insulation and waterproofing.
10. Provide new guy wire supports for tall chimney exhaust stacks.

5.3 Roof Areas 2.1, 2.2, and 2.3 (Stairwells)

Due to the advance membrane deterioration exhibited along with moisture contamination of the underlying insulation, complete system replacement is recommended:

1. Remove all components to level of the concrete deck.
2. Install new vapour retarder.
3. Install new tapered thermal insulation to improve drainage.
4. Install high performance membrane system.
5. Install new membrane flashings ensuring complete coverage on parapets.
6. Install new metal flashings at perimeters and penetrations.
7. Replace drainage downspouts as required.
8. Replace skylight glazing dome on roof area 2.2.

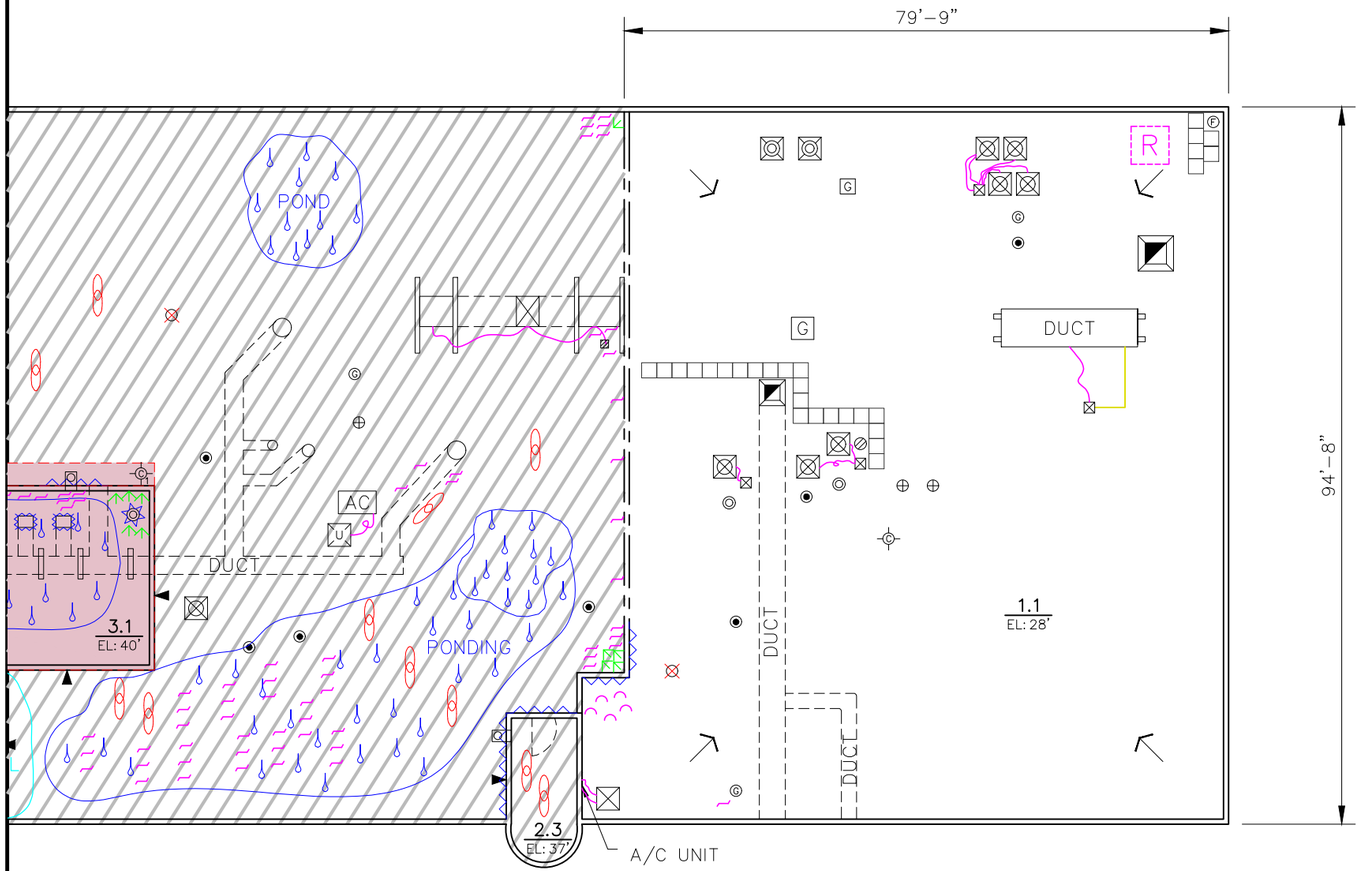
5.4 Upper Mechanical Penthouse Area 3.1

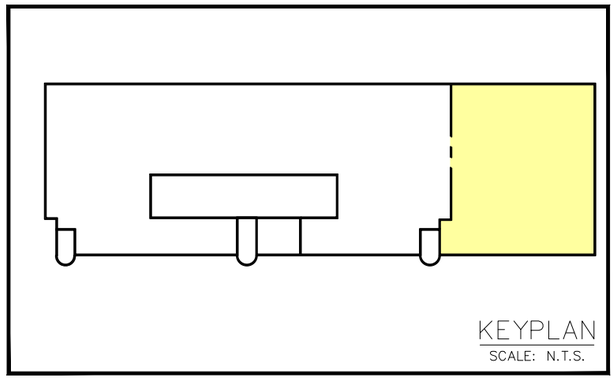
Due to the widespread moisture contamination of the underlying insulation and possibly the underlying gypsum board thermal barrier, complete system replacement is recommended:

1. Remove all components to level of the metal deck.
2. Install new thermal barrier/vapour retarder.
3. Install new tapered thermal insulation to improve drainage or add interior roof drainage.
4. Install high performance membrane system.
5. Install new membrane flashings ensuring complete coverage on parapets.
6. Install new metal flashings at perimeters and penetrations.
7. Replace pitch pockets, sleeves and cones at roof penetrations with appropriate maintenance-free flashings.
8. Install adequate membrane protection under roof top equipment supports.
9. Replace existing ductwork insulation and waterproofing.
10. Provide new guy wire supports for tall chimney exhaust stacks.

Appendix A

Roof Plan





EXISTING ROOF COMPOSITIONS

ROOF AREA(S) 1.1

METAL DECK
1 PLY KRAFT VAPOUR RETARDER
2.5" POLYISOCYANURATE INSULATION
0.5" FIBREBOARD INSULATION
4 PLY FIBREGLASS FELT MEMBRANE
PEA GRADE GRAVEL

ROOF AREA(S) 1.2 & 3.1

GYPSUM BOARD ON METAL DECK
2 PLY ASPHALT FELT VAPOUR RETARDER
2.0" POLYISOCYANURATE INSULATION
0.5" PERLITE INSULATION
2 PLY MODIFIED BITUMEN MEMBRANE
GRANULE

ROOF AREA(S) 2.1, 2.2 & 2.3

CONCRETE DECK
2 PLY ASPHALT FELT VAPOUR RETARDER
2.0" POLYISOCYANURATE INSULATION
0.5" FIBREBOARD INSULATION
2 PLY MODIFIED BITUMEN MEMBRANE
GRANULE

ROOF AREAS (SQ.FT.)

1.1 – 7,675
1.2 – 17,369
2.1 – 205
2.2 – 205
2.3 – 288
3.1 – 2,512

TOTAL = 28,254

LEGEND

- AREAS SHOWN ON OTHER DRAWINGS
- AREAS WITH MISCELLANEOUS DEBRIS
- AREAS WITH VEGETATION GROWTH
- MOISTURE DETECTED BY TRAMEX
- LEAK (L) AREA WITH LEAKS DETECTED OR REPORTED

ROOF PROJECTIONS:

- ANTENNA
- BREATHER
- CAPPED OFF / ABANDONED STACK
- CHANGE IN ELEV.
- C CHIMNEY
- CONDUIT LINE
- CONTROL JOINT
- DRAIN
- EXHAUST FAN ON CURB
- EXPANSION JOINT
- EXPLOSION HATCH
- (F) FLAGPOLE
- G GAS PIPELINE
- G (G) GOOSENECK VENT
- G (G) GOOSENECK VENT ON OVERSIZED CURB
- H HATCH
- HVAC HVAC UNIT
- HVAC HVAC UNIT ON CURB
- HVAC HVAC UNIT ON SLEEPERS
- LADDER
- LIGHT POST
- PIPE SUPPORT
- PITCH POCKET
- PLUMBING OR SOIL STACK
- RA ROOF ANCHOR
- SATELLITE DISH
- SCUPPER
- SECURITY CAMERA
- S SKYLIGHT
- SLOPE
- SQUARE VENT
- SQUARE VENT ON OVERSIZED CURB
- TALLCONE OR "B" VENT
- TALLCONE OR "B" VENT ON CURB
- U UNUSED OPENING
- WALKWAY PADS

ROOF ANOMALIES:

- BLISTER
- BLUEBERRIES
- CORE CUT
- FLASHING PROBLEM
- MASONRY PROBLEM
- 12 PROBE No.12: MEMBRANE: DRY, INSULATION: WET
- POND PONDING
- RIDGE
- R (R) REPAIR PATCH

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CLIENT:	ENVIRONMENT & CLIMATE CHANGE CANADA
PROJECT:	CANADA CENTRE FOR INLAND WATERS 867 LAKESHORE ROAD BURLINGTON, ON, L7S 1A1
IRC #:	18455
W.O.#:	HR16-219CR
SCALE:	1" = 20'
DATE:	AUG. 09/16
DRN. BY:	L.B.C.
CHK. BY:	S.C.P./T.K.C.
PROJECT NORTH:	(TRUE NORTH)
DWG.#:	R1

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0.5" PERLITE INSULATION
2 PLY MODIFIED BITUMEN MEMBRANE
GRANULE

ROOF AREA(S) 2.1, 2.2 & 2.3

CONCRETE DECK
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2.0" POLYISOCYANURATE INSULATION
0.5" FIBREBOARD INSULATION
2 PLY MODIFIED BITUMEN MEMBRANE
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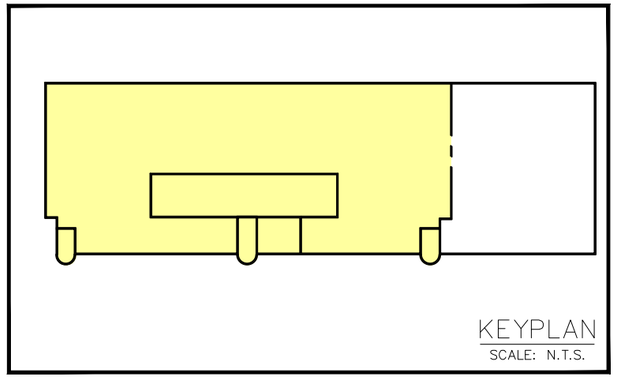

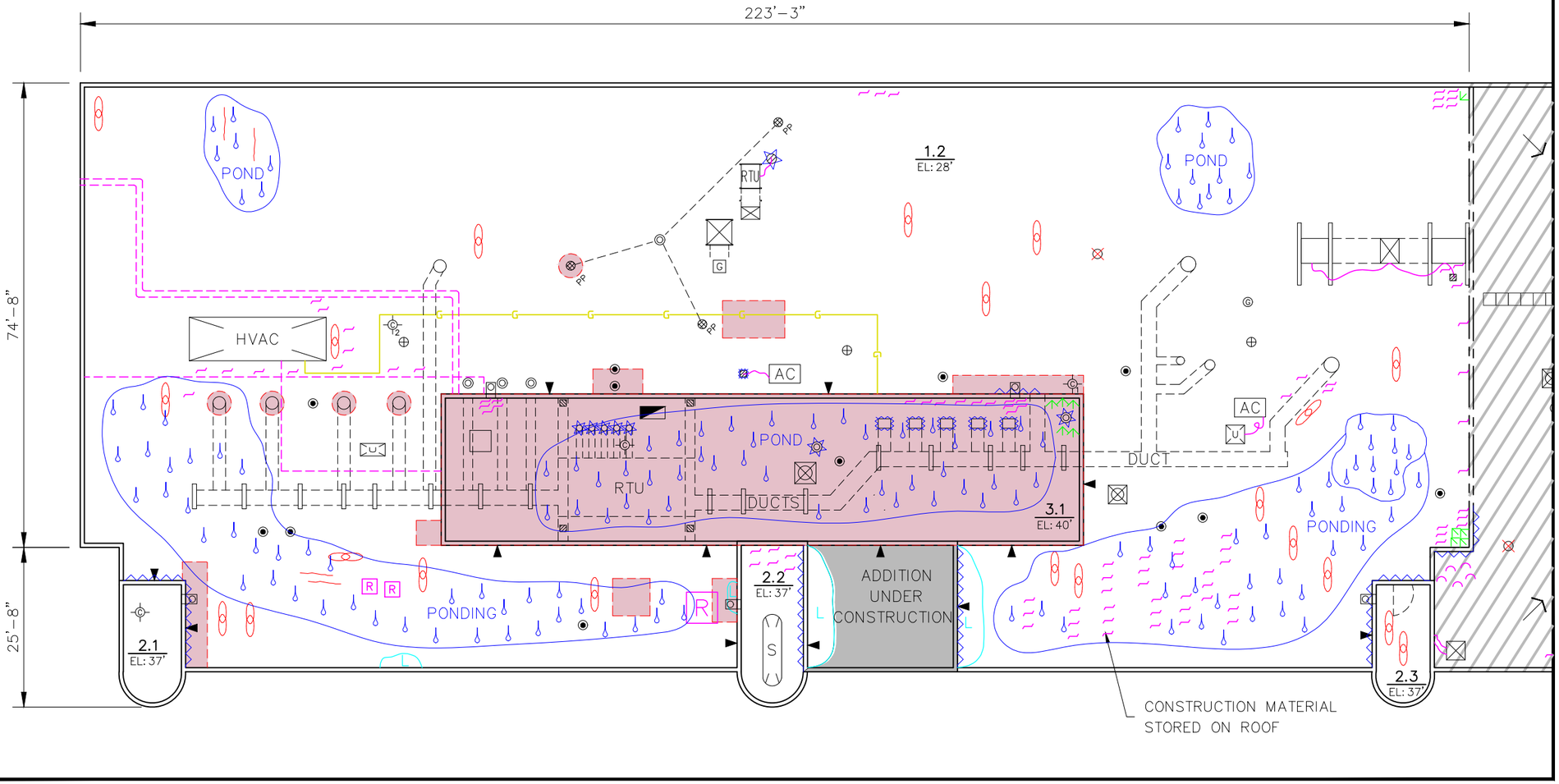

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PROJECT NORTH: (TRUE NORTH)

DWG.#: R2

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