ROOFING SURVEY AND EVALUATION

AT

POE ELEMENTARY SCHOOL

10538 S. LANGLEY AVENUE

CHICAGO, IL

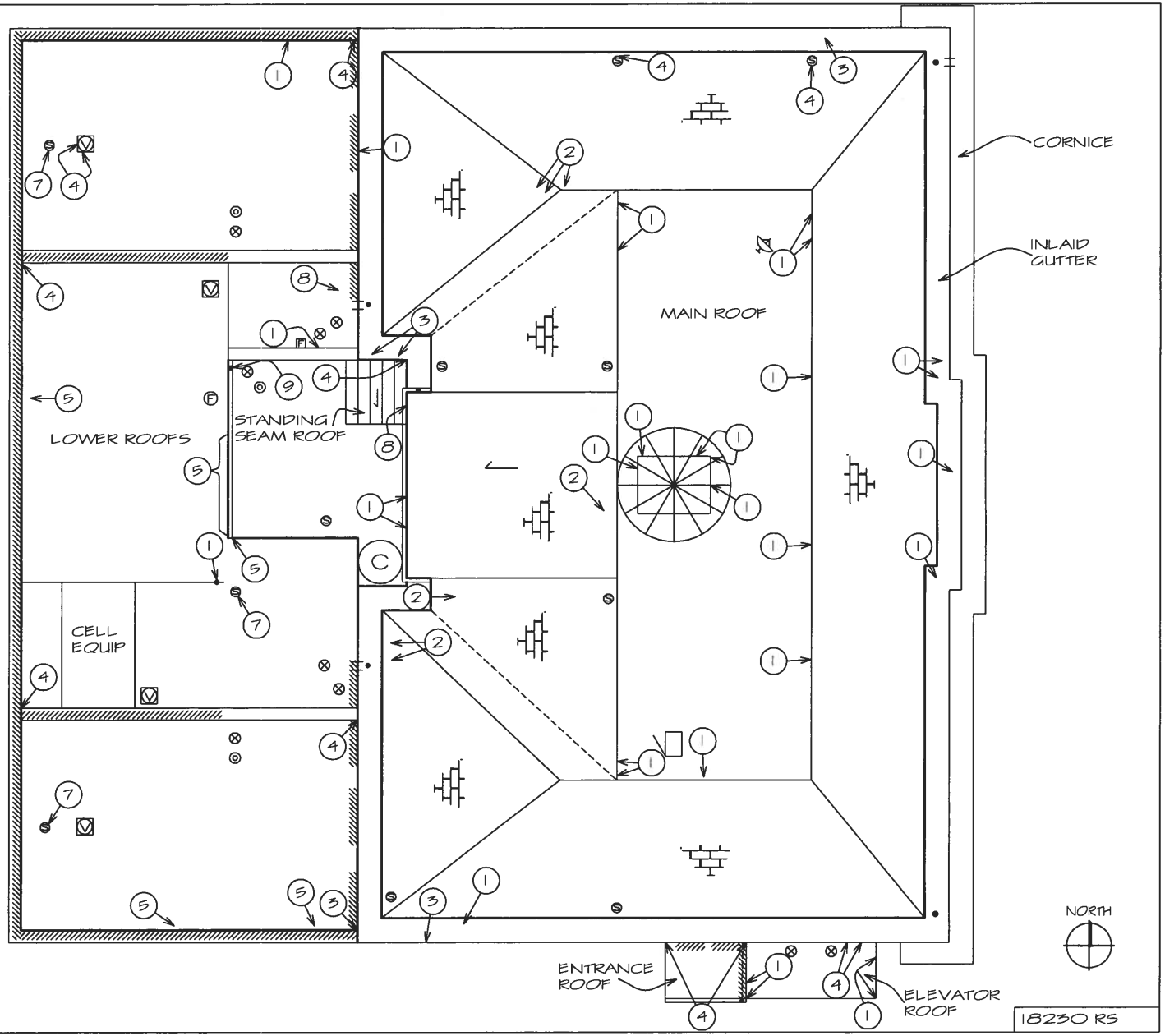
IRCA JOB NO. 18230

ILLINOIS ROOF CONSULTING ASSOCIATES, INC.
4302-G CRYSTAL LAKE ROAD
MCHENRY, IL 60050
(815) 385-6560
FAX 385-3581

OCTOBER 31, 2018

(n) INDICATES SCOPE OF WORK ITEM NUMBER

LOW FLASHING



LEGEND

- SCUPPER
- DRAIN
- OVERFLOW DRAIN
- VENT
- FLUE STACK
- SOIL STACK
- SATELLITE DISH
- CHIMNEY
- HATCH
- EXPANSION JOINT
- GUTTER
- DOWNSPOUT

IRCA

PROJECT: POE ELEMENTARY SCHOOL 10538 S. LANGLEY AVENUE CHICAGO, ILLINOIS		DRAWING TITLE: ROOF SKETCH	
PROJECT #: 18230	DATE: 10/18	SCALE: 1" = 20'-0" 0 5' 10' 20'	DETAIL #: RS - 1

SCOPE OF WORK

Poe Elementary
Chicago, IL

Roof Repairs to be performed only to stop leaks:

1. Install roof cement and fabric mesh repair. Install modified bitumen repairs on Elevator and Entrance roofs.
2. Install new shingle tab and seal down with roof cement.
3. Cut blister, allow to dry, install modified bitumen repair.
4. Install sealant.
5. Install roof cement.

Roof Repairs to be performed regardless of replacement date:

6. Remove all debris from all roof areas.
7. Rod out soil stack to catch basin (Allow for 3 locations).
8. Repair or replace screen (Allow for 2 locations)
9. Install splash block on roof pad (Allow for 1 location).

Roof Replacements:

Low-slope areas:

- Demolish roof system and sheet metal accessories in their entireties, down to the structural roof deck.
- Perform roof deck repairs on a Unit Price basis.
- Install one layer of red rosin paper (wood deck areas only).
- Mechanically fasten a 5/8" gypsum substrate board (wood and metal deck areas only).
- Install a temporary roof/vapor barrier, fully adhered.
- Perform masonry repairs throughout the school.
- Repair/replace cornice.
- Address low flashing height areas.
- Replace roof hatch.
- Install two layers of 2.6" polyisocyanurate, fully adhered.
- Install a 0.5" gypsum coverboard, fully adhered.
- Install a modified bitumen base sheet, fully adhered.
- Install a Fire-Rated, Energy Code compliant modified bitumen cap sheet, fully adhered.
- Install all-new flashings and sheet metal accessories.

Shingle Area Replacement:

- Demolish shingles, sheet metal accessories, inlaid gutters, and underlayment in their entireties down to the structural deck.
- Repair structural deck on a Unit Price basis, as required.
- Install new ice and water shield and underlayment.
- Install new copper inlaid gutter system.
- Install all new roof drains with positive attachment to the interior plumbing lines.
- Install new heavyweight architectural laminate shingle system.
- Install new sheet metal accessories.

IRCA

Certified Consultants and Specifiers

Roof Condition Evaluations

Moisture Testing

Quality Compliance Inspection during roof construction

October 31, 2018

Mr. Gabriel Alvarez
Chicago Public Schools
42 W. Madison Street
Chicago, IL 60602

RE: Poe Elementary

Dear Mr. Alvarez,

Illinois Roof Consulting Associates, Inc. (IRCA) was authorized to conduct a non-destructive moisture survey and visual inspection of roofing at the referenced location. Our survey and examination were conducted on October 24, 2018.

Having completed the laboratory testing and data analysis necessary to ensure accurate evaluation, we submit the enclosed report of our detailed findings and recommendations. To summarize our conclusions, we have found that the physical condition of the visible materials is unsatisfactory and that latent moisture is not a significant problem on the roofing we examined. Therefore, we advise that total roof replacement would be the most appropriate course of action at this time. The only exception to this is the Elevator and Entrance roofs which are in fair condition. A thorough explanation of our conclusions and relevant budget figures are contained in the report.

Should you have any questions regarding our findings or recommendations, please call me. We are looking forward to a continuing association with you and the Chicago Public Schools.

Sincerely,

ILLINOIS ROOF CONSULTING ASSOCIATES, INC.

James C. Gruebnau, RRC
Project Manager

Robert Heideman
Project Coordinator

JCG/jr
18230.mst.sur

cc: Ms. Jennie Miller

Attachments

Illinois Roof Consulting Assoc., Inc.
4302-G Crystal Lake Road
McHenry, Illinois 60050
(815) 385-6560
FAX (815) 385-3581
www.irca.com

TABLE OF CONTENTS

INTRODUCTION

Project Identification and Historical Data

The roofing subject to inspection and evaluation under this report is identified as “Poe Elementary". It is also labeled "Main Roof, Lower Roofs, and Shingles" on the enclosed Roof Sketch.

The field work was conducted on October 24, 2018. During moisture surveying, the average temperature was 48 degrees Fahrenheit and the approximate relative humidity was 15 percent.

Purpose of Survey

Our goal in conducting this work has essentially been threefold:

- To establish the location and degree of moisture within the subject roofing components.
- To determine the physical conditions of roofing components and evaluate their effect on roof life.
- To recommend the most cost effective manner to address the conditions revealed by the inspection and survey.

In order to best fulfill the project's needs, it was decided that a thorough visual inspection and a non-destructive radioisotopic moisture survey would be conducted. Observations noted about the physical conditions of roofing and roof related materials are contained in Section 2 of this report. Survey information is presented in Section 3.

Moisture Detection Method

The testing device which IRCA uses in radioisotopic surveys is the Troxler Model 3216 Roof Moisture Gauge. Gauge operators complete State and manufacturer approved training and must be certified. IRCA is permitted to use and maintain its gauges by the State of Illinois under license number IL-01713-01.

Essentially, each gauge houses a small, capsulated radioisotopic source and a frequency counter. As a source emits neutrons and they react with molecules containing hydrogen in the roofing materials, backscatter particles are recorded on the gauge's counter. The greater the number of molecules with hydrogen in the roofing, the higher the gauge's readings would be. Of the hydrogen containing molecules which may occur in roof assemblies, backscatter is strongest from assembly components which have absorbed water.

The steps used to conduct the fieldwork were straightforward. First, we established the building's orientation. For purposes of this survey, the side of the building which runs along E. 105th Place was designated as facing North. Second, because all survey measurements are relative to a starting spot, we selected a reference point. The building's shape and proportions led us to choose multiple reference points.

From the reference point, a grid with ten foot square sections was laid out on the roof surface. Grid intersections were marked on the roof with paint.

In this report, a specific location on the roof may be identified by "X/Y coordinates". This describes a position relating to the survey's reference point (X=0/Y=0). On the Roof Contour Map, the reference point is in the upper left hand corner. The X axis is the scale that runs from left to right across the top of the map. The Y axis is the scale down the left side of the map. Therefore, a position identified as X=90/Y=120 could be found by locating the point which is 90 feet to the right of the RP and 120 feet down from the top of the map.

Our next step was to take a moisture reading with the gauge at each of the marked grid intersections. We recorded 103 primary readings. In addition, secondary readings were taken where hydrogen in forms other than water may have been suspected and where operators attempted to trace reported roof leaks to their sources.

The final step in this portion of the survey was to collect two (2) roof system samples. Locations for samples or core cuts were selected on the basis of varying moisture levels and construction materials. Once removed, the cores were labeled, sealed in airtight containers and transported to our laboratory for analysis. Each core cut hole was immediately refilled and patched with compatible roofing materials.

Data Quantification

When the core cuts arrived at our laboratory, a technician logged them and recorded their weights. They were placed in a drying chamber for at least 5 hours at 220 degrees Fahrenheit. The dried samples were reweighed and their moisture contents by weight were calculated (see Exhibit D). An essential part of our analysis involves correlating the samples' moisture contents with the gauge readings collected in the field. This procedure is discussed in Section 3 of this report.

Reports and Files

This bound report with enclosures is the final product of our work on this project. It is our practice to retain a copy of this report, the survey's field data plan and digital photographs taken on site for a period of seven years. Core samples are not saved.

Non-destructive roof moisture testing (NDT) methods were developed in response to facility operators who needed to know the likely extent of latent moisture in their roofs. Previous to NDT, random core sampling was the only method available. Though not perfect, non-destructive radioisotopic and infrared testing are the most reliable ways to cost-effectively detect conditions associated with latent roof moisture.

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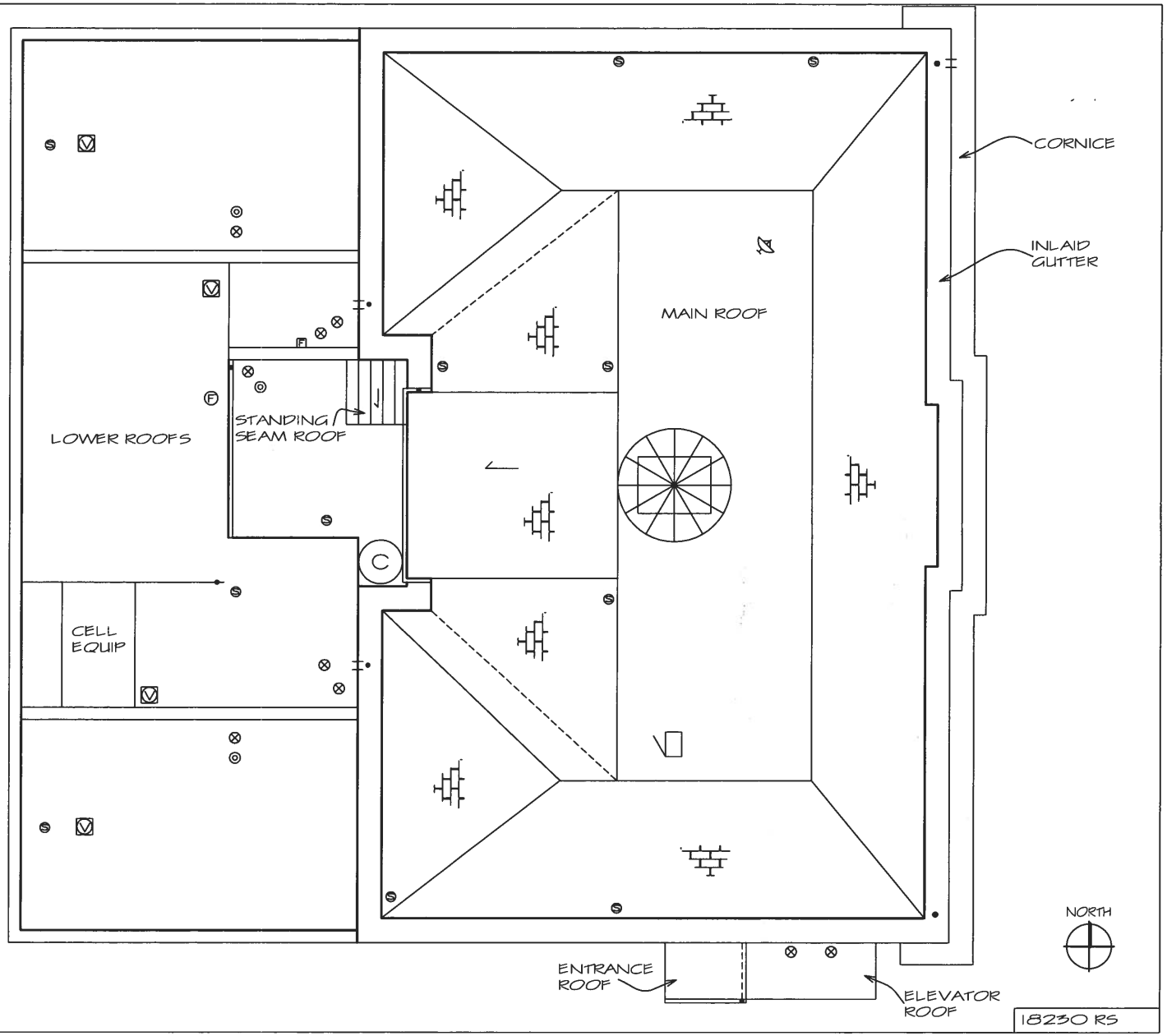

LEGEND

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IRCA

PROJECT: POE ELEMENTARY SCHOOL 10538 S. LANGLEY AVENUE CHICAGO, ILLINOIS	DRAWING TITLE: ROOF SKETCH
PROJECT #: 18230	DATE: 10/18
SCALE: 1" = 20'-0" 0 5' 10' 20'	DETAIL #: RS - 1

ROOF CONDITION EVALUATION
REPORT #1 OF 3

Roof ID: Main Roof **Area:** 1,752 sq. ft. **Stories:** 4 **Access:** Interior

HISTORICAL INFORMATION		
BLDG. AGE: 1905	INSTALLER: Unknown	CURRENT ROOFER: Unknown
ROOF AGE: 1999 (Est)	GUARANTOR: Unknown	ROOFER'S PHONE NO.: Unknown
RECOVER AGE: N/A	GUAR. TERM: Unknown	LAST REPAIRS: Unknown

CONDITION SUMMARY	
OVERALL PHYSICAL CONDITION OF SYSTEM: Unsatisfactory	OVERALL PERFORMANCE OF SYSTEM: Unsatisfactory
IMPACT OF ANOMALIES: Minimal	REPORTED LEAKAGE: None

EXISTING ROOF SYSTEM	OBSERVATIONS	EVALUATION
BITUMEN: Asphalt		CONDITION: Marginal
MEMBRANE: Modified bitumen	Granule loss	CONDITION: Marginal-Unsat.
INSULATION: Bottom Layer – ¾" perlite Top Layer – ¾" perlite		
INSULATION ATTACHMENT: Adhered		
VAPOR RETARDER: Yes		
FLASHINGS: Modified bitumen – granule surface	Open laps	CONDITION: Marginal
DRAINAGE: Direction, sloped to edge Saddles – No		CONDITION: Fair
EXISTING LEAKS: None reported		
EXISTING REPAIRS/PATCHES: Minor flashing and seam repairs		
ELEVATOR AND ENTRANCE ROOFS: Modified bitumen	Open seams	CONDITION: Fair

DETAILS – PERIMETER & TERMINATION	OBSERVATIONS	EVALUATION
EDGE DETAIL: Gravel stop Elevation – Flat Fascia height – 5 inches Fascia cleats – Yes		CONDITION: Fair-Marginal CONSTRUCTION: Acceptable

DETAILS – ROOF FIELD	OBSERVATIONS	EVALUATION
BOX CURBS: Types – Vent, scuttle Elevation – 4 inches		CONDITION: Fair CONSTRUCTION: Acceptable
SCUTTLE: Non-standard	Damaged metal	CONDITION: Marginal CONSTRUCTION: Acceptable
SURFACE MOUNTED SATELLITE DISH: Base frame – Metal Ballast – Concrete block Cover – No		CONDITION: Fair-Marginal CONSTRUCTION: Inadvisable

GENERAL INFORMATION	OBSERVATIONS	EVALUATION

EXTERIOR BUILDING FACES: Masonry

DECK SUPPORT CONSTRUCTION
Joist – material, Wood

Beams – material, Wood

DECK TYPE: Wood plank

Continued…

ROOF CONDITION EVALUATION
REPORT #2 OF 3

Roof ID: Lower Roofs **Area:** 4,855 sq. ft. **Stories:** 1 **Access:** Exterior

HISTORICAL INFORMATION		
BLDG. AGE: 1905	INSTALLER: Unknown	CURRENT ROOFER: Unknown
ROOF AGE: 1999 (Est)	GUARANTOR: Unknown	ROOFER'S PHONE NO.: Unknown
RECOVER AGE: N/A	GUAR. TERM: Unknown	LAST REPAIRS: Unknown

CONDITION SUMMARY	
OVERALL PHYSICAL CONDITION OF SYSTEM: Unsatisfactory	OVERALL PERFORMANCE OF SYSTEM: Unsatisfactory
IMPACT OF ANOMALIES: Substantial	REPORTED LEAKAGE: None

EXISTING ROOF SYSTEM	OBSERVATIONS	EVALUATION
SURFACE: Gravel – size, 5/8”		ADHESION: Marginal CONDITION: Marginal
BITUMEN: Coal tar		CONDITION: Marginal
MEMBRANE: Organic	Base sheet plus 4 plies, exposed felts	CONDITION: Unsatisfactory
INSULATION: Bottom Layer – 1” polyisocyanurate Middle Layer – 1” polyisocyanurate Top Layer – ½” perlite		
INSULATION ATTACHMENT: Adhered		
VAPOR RETARDER: Yes		
FLASHINGS: Modified bitumen – smooth surface	Open laps	CONDITION: Marginal
DRAINAGE: Direction, sloped to drain		CONDITION: Fair
DRAINS: 10 internal drains		CONDITION: Fair
GUTTERS: Flanged Stripping: Felts	Deteriorated felts, missing splash block	CONDITION: Marginal
OVERFLOW DRAINS: Internal	Missing strainers	CONDITION: Fair CONSTRUCTION: Acceptable
EXISTING LEAKS: None reported		
EXISTING REPAIRS/PATCHES: Flashing repairs		

DETAILS – PERIMETER & TERMINATION	OBSERVATIONS	EVALUATION
INTERIOR PARAPET WALLS: Construction – Masonry	Deteriorated masonry	CONDITION: Marginal
Coping – Metal, tile		CONDITION: Fair CONSTRUCTION: Acceptable
Flashing termination – Counterflashing – type, raggle-mounted		CONDITION: Fair-Marginal CONSTRUCTION: Acceptable

DETAILS – ROOF FIELD	OBSERVATIONS	EVALUATION
BOX CURBS: Types – Vent, flue Elevation – 6+ inches	Open sealant	CONDITION: Fair CONSTRUCTION: Acceptable
SOIL STACKS: Material – Iron Flashings – Lead	Clogged stacks	CONDITION: Fair-Marginal CONSTRUCTION: Acceptable
FLUE STACKS: Material – Steel Flashings – Metal Storm collars – Yes Sealant – Caulk		CONDITION: Fair CONSTRUCTION: Acceptable
PIPE PENETRATIONS: Direct pipes – I-beam support	Improper seal at roof	CONDITION: Fair-Marginal CONSTRUCTION: Inadvisable

DETAILS – MECHANICAL	OBSERVATIONS	EVALUATION
POWERED VENTILATORS: Type – Motor in-board		CONDITION: Fair-Marginal CONSTRUCTION: Acceptable

GENERAL INFORMATION	OBSERVATIONS	EVALUATION
EXTERIOR BUILDING FACES: Masonry		
DECK SUPPORT CONSTRUCTION Joist – material, Wood		
Beams – material, Wood		
DECK TYPE: Wood plank		

Continued…

Illinois Roof Consulting Associates, Inc. 4302-G Crystal Lake Road McHenry, IL 60050 (815) 385-6560 (Fax) 385-3581	PROJECT: Poe Elementary School			JOB NO.: 18230
	ROOF AREA: 5,939 square feet	ROOF AGE: ≈2000	BLDG TYPE: School	ROOF SLOPE: 6 / 12

CONDITION SUMMARY

OVERALL PHYSICAL CONDITION OF SYSTEM: Marginal OVERALL APPEARANCE: Marginal

REPLACEMENT YEAR: 2019

SYSTEM/DETAILS:

Shingles: Fiberglass 3-tab Color: Brown Attachment: Nailed Underlayment: Felt	Missing tabs	MATERIALS: Marginal WORKMANSHIP: Fair CONSTRUCTION: Acceptable GRANULE ADHESION: Fair
Ridges: Shingled, not vented		MATERIALS: Fair WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Valleys: Closed cut	Sealant repairs	MATERIALS: Marginal WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Flashings: Baby tins at walls		MATERIALS: Fair WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Drip edge: Deck nailed metal edge		MATERIALS: Fair WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Rake edge: Metal edge		MATERIALS: Fair WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Venting: Upper field vent only		MATERIALS: Fair WORKMANSHIP: Fair CONSTRUCTION: Acceptable
Penetrations: 7 soil stacks	Open sealant	MATERIALS: Fair WORKMANSHIP: CONSTRUCTION: Acceptable
Gutters: Traditional design, inlaid gutter		MATERIALS: Fair-Marginal WORKMANSHIP: Fair CONSTRUCTION: Acceptable

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SECTION 3.

MOISTURE TESTING

ANALYSIS OF ROOF MOISTURE SURVEY DATA

AND ROOF MOISTURE PLAN

Data Compilation

Once all the survey's field data was collected, we submitted the roof's parameters, structures, and roof gauge readings for data processing. Our proprietary moisture program then compiled the data and divided the gauge readings into five groups representing relative moisture levels. The end product of this process is a document titled the Roof Moisture Survey Data or "Data" for short. The Data for this project is enclosed in the Exhibits section of this report. For each surveyed roof of different construction, this document contains three major parts.

The first part is the Roof Contour Map (Exhibit A). This is the computer generated topographic map showing the five relative moisture levels detected under the roof's surface. The areas with the most dark appearing symbols represent the roof areas of highest latent moisture. Areas within the depicted structure which lack uniformly printed symbols represent areas of lowest moisture content.

The second part (Exhibit B) of the Data document consists of two charts plus supporting data. One chart lists the range of gauge readings, the map symbol, the area in square feet and the percent of the total roof area which belongs to each of the five relative moisture levels. The other chart is called a histogram. It depicts the distribution curve of roof gauge readings. The first function of this graph is to indicate the range and frequency of those readings. The second function is to illustrate the relative degree of moisture levels in the roof assembly. The heights of the columns form a curve on the graph. If a curve were to begin high on the left axis and fall dramatically, it would ordinarily indicate a relatively dry roof. The further to the right that the high point of the curve would occur, the wetter the materials would be. A broad scattering of readings and lack of dramatic curve height generally would indicate that a roof has been subject to widespread repairs. The histogram for the Main Roof indicates a dry roof system. The histogram for the Lower Roofs indicates a roof system with isolated wet areas. The final part (Exhibit C) is the record of readings registered by the roof gauge during this survey. These readings along with wall locations and other structural coordinates are the base data used to generate the entire computerized document.

Quantification of Moisture

We know from our laboratory testing that the cores taken at distinct gauge readings contain certain levels of moisture. Our next step was to integrate these specific values with the survey's relative data. The moisture level table in Exhibit B lists the areas of relative roof moisture intrusion. The quantified information generated from the cores establishes the percent of moisture content in each level.

As a result of testing by the National Bureau of Standards (now the National Institute of Standards and Testing), the normal moisture content of many building materials has been established. This standardized value or range of value is called the Equilibrium Moisture Content (EMC) and can be expressed as the percent of water content by weight of the subject material. We know the EMC values of the components of roofing involved in this survey. They are listed in Exhibit D.

As discussed in the next section of this report, moisture contents in excess of normal ranges alter the properties of the materials. The problems caused by excessively wet roofing are dependent upon the role of the component in the system. At this point, it is sufficient to say that a component which contains moisture above its EMC deteriorates at an accelerated rate and typically transmits deleterious moisture to adjacent components. It is important, therefore, that a roof material which contains moisture in excess of its EMC should be considered for timely removal. This can limit its effect on the rest of the roof system and structural deck. With this in mind, we present our survey's finished data.

Main Roof

Moisture Level	Membrane Moisture*	Insulation Moisture*	Area in Square Feet
1 (low)	1.1 %	1.7 %	759
2	1.1 %	1.7 %	582
3	1.1 %	1.7 %	188
4	1.1 %	1.7 %	41
5 (high)	1.1 %	1.7 %	26

* Expressed in percent of moisture by weight.
X Areas under which excess moisture detected.

Lower, Elevator and Entrance Roofs

Moisture Level	Membrane Moisture*	Insulation Moisture*	Area in Square Feet
1 (low)	<1.0 %	<5.3 %	449
2	<1.0 %	<5.3 %	2,865
3	<1.0 %	<5.3 %	1,382
4	1.0 %	5.3 %	462
5 (high)	6.6 %	33.0 %	81 X

* Expressed in percent of moisture by weight.
X Areas under which excess moisture detected.

Summary

From the moisture detection portion of our work on this project, we have determined that no significant quantities of the roofing materials surveyed contain moisture which is considered excessive and deleterious to the assembly. In order to draw balanced conclusions, the survey findings must be examined along with the results of our visual inspection. This process begins with a review of material and defect properties in the next Section.

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SECTION 4.

DISCUSSIONS

Deterioration of roof systems occurs on two planes, namely, on the exposed surface of the roof and within the components of the roof assembly. Visible or latent defects would include anomalies such as membrane blistering and open laps on wall flashings. The most common of the unseen or latent defects is excess moisture absorbed by roofing insulations and membranes.

Latent Moisture

Water is a necessary ingredient in man's manufacture of products. Building materials are no different. As noted in the previous section, there are naturally occurring quantities of moisture in all building products. The norms for many of these have been established by the National Bureau of Standards. Some materials, however, can readily absorb and retain additional amounts of moisture from water vapor in air or other gases and from liquid water and condensation. These products are described as being hygroscopic. Most common roofing materials and all thermal insulators fall into this category.

The component which provides waterproofing of roof assemblies depends upon the type of system. In built-up roofing (BUR), it is the bitumen. When the roofing is constructed, mopped layers of hot liquid asphalt or coal tar are separated by sheets called felts or mats. A three ply BUR consists of three separated layers of bitumen; a four ply, four layers. The top sheet on a BUR is generally protected with a heavy application of bitumen. Because bitumen is somewhat sensitive to solar degradation, exposed asphalt or coal tar should be covered with aggregate or coated with an emulsion or paint. In a modified bitumen system (MB), it is primarily the MB sheet. This thick ply is a laminate consisting of two or three layers of modified asphalt separated by synthetic mats. These systems are often applied over one to three ply asphalt built-up roofs. If a breach in the roof membrane system were to occur, leaking water would damage more than the building's contents. All materials contacted by the traveling water would be affected, too. If the puncture is small and in the line of roof drainage, a great deal of water could be absorbed within the roofing before dripping may be noticed by building occupants. A highly hygroscopic insulation on a concrete roof deck may become completely saturated before giving a visible clue that a major problem exists.

There is a direct correlation between excess latent moisture and building material deterioration. The longer a material is wet and the wetter a material becomes, the more rapid and widespread damage will be. Built-up modified bitumen roof membranes lose tensile strength and face increased thermal and moisture induced dynamic stresses. Fully adhered roof membranes lose their bond to underlying materials and blistering increases. Potential physical damage due to freeze/thaw cycling is increased. The thermal resistance of insulation decreases and compressive strength is sacrificed.

Once the components within a roof system absorb significant quantities of water, there is usually no appropriate solution other than their removal. Some very elaborate and costly roof "venting" schemes have been developed and are currently promoted. Their successful applications, however, are very limited. Testing by the U.S. Army Corps of Engineers at the Cold Climate Regions Laboratory has demonstrated that one-way, two-way and solar powered roofing "vents" do not effectively dry out wetted insulation during the lives of most typical roof systems.

The most frequent sources of excess moisture within roofs are not simply old and dried out materials. They are premature physical failures or malfunctions in the roof assembly. Chief among common defects are flashing failures and membrane blistering, ridging and splitting.

Flashings are the materials which waterproof the transitions between the plane of the roof and vertical walls or penetrations. On the subject area, the principal flashing product used is granule surfaced SBS modified bitumen sheets.

By far, the most common sources of roof leakage are at flashings. This occurs because of the variety of forces to which they must stand up during their service life. A typical section of flashing is adhered to three different materials, namely, a roof membrane, a wall or subject penetration, and an adjoining section of flashing. Each of these materials has its own characteristic movement and surface condition. To assist flashings to resist failure, the following steps should be taken: 1) mechanically attach top edges and protect with metal counterflashings; 2) seal side laps along exposed edges; 3) apply surface coatings or aggregate to reduce thermal stress and solar induced oxidation of exposed asphalts. For these reasons, flashings require frequent inspections and annual maintenance.

In addition to the impact of structural and construction variables, roofing should be designed to cope with local climatic and environmental conditions which affect roof life.

Both asphalt and coal tar as roofing bitumens are sensitive to ultraviolet exposure. For this reason and to offer external fire resistance, typical BUR systems are surfaced with a protective layer or treatment. In the subject roofing's case, this function is fulfilled by gravel ceramic granules. The most frequently occurring forces which work on roof surfaces are wind, ponding water and the sun.

As wind strikes vertical building surfaces and blows across roofing, it acts to erode the roofing's protective layer. This action is greatest near building corners. Once the surfacing wears away, the bitumen is exposed to sunlight and material oxidation accelerates. The bitumen shrinks, cracks and eventually diminishes to the point where it too erodes away. The action of the wind and sun then continues to speed the deterioration of the system by attacking the roofing felts and interply bitumen. If left untreated, roof failure will occur at spots where erosion is not corrected.

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SECTION 5.

RECOMMENDATIONS

Summary of Findings

Condition: We would rate the overall physical condition of the roofing as unsatisfactory. As pointed out in Section 2 of this report, the most deteriorated elements are the membranes.

Construction: By current standards, we would rate the overall roofing and accessory construction as acceptable.

Performance: From the historical data presented to us and from our own on-site observations, we would rate the subject roofing's performance as unsatisfactory.

Latent Moisture: The results reported in Section 3 of this report indicate that the roofing in question is essentially dry. Approximately 81 square feet or 1.2% of the roof system materials appear to contain levels of moisture which exceed accepted standards.

Conclusions

For the purposes of this report we are using an evaluation key that includes: Satisfactory, Fair, Marginal and Unsatisfactory. The roof system has an expected usable and serviceable life cycle and, depending on the type of roof, this cycle varies in length; it could be as short as 10 years and as long as 100 years.

- *The term "satisfactory" refers to the roof's first third of its life cycle.*
- *The term "fair" refers to the middle third of the roof's life cycle.*
- *The term "marginal" refers to the last third of the roof's life cycle.*
- *The term "unsatisfactory" means the roof is in the failure mode and requires replacement.*

These evaluations are also based on the physical condition of the roof system at the time of the inspection, which affects how the roof's condition is graded. For example, a roof system in the last third of its cycle may be downgraded to unsatisfactory based on its physical condition. Conversely, however, this does not mean a roof system in the last third of its life cycle can be upgraded from marginal to fair even if there are no current defects at the time of the inspection, because we know that roofs have a maximum useful service life that cannot be exceeded.

The roof systems in place at this school have failed and should be replaced as soon as possible. The drains in the inlaid gutter system should be reworked so that they are positively attached to the interior plumbing lines. Deteriorated masonry should also be addressed along with the Roof Replacements.

The exceptions to this are the Elevator and Entrance roofs on the south side of the building. These roofs appear to be approximately 8 years old and are in fair condition. If they are properly maintained these roofs could remain serviceable for another 10 years.

The roof should be scheduled for replacement in 2019 and at that time the replacement cost based on current U.S. dollars will be approximately 12,424 square feet times $25.00 per square foot, or $310,600.00. In the interim, $3,500.00 should be budgeted for current repairs.

This concludes our report on this project. We appreciate the opportunity to assist you in the management of this property's roofing. Please call if we may be of further assistance.

Sincerely,

ILLINOIS ROOF CONSULTING ASSOCIATES, INC.

James C. Gruebnau, RRC
Project Manager

Robert Heideman
Project Coordinator

JCG/jr

18230.mst.sur

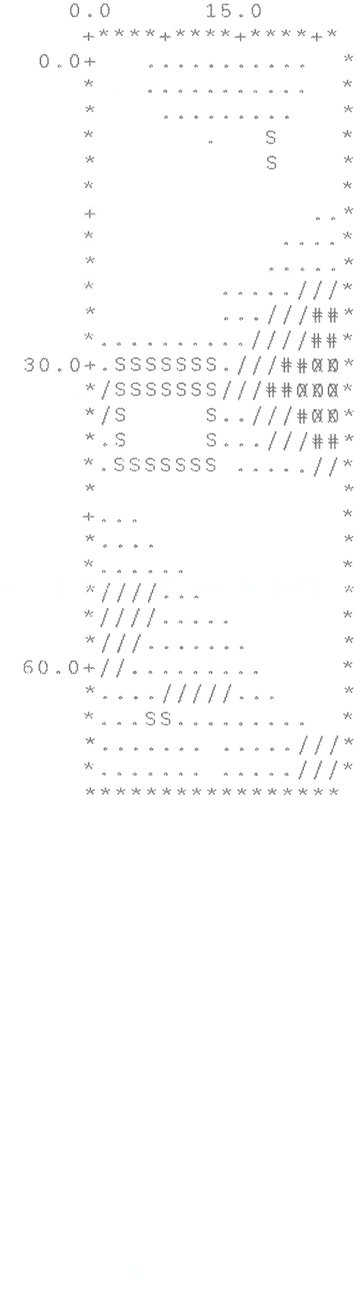
* OUTLINES THE ROOF PERIMETER
J REPRESENTS AN EXPANSION JOINT OR CONSTRUCTION JOINT
P OUTLINES A PATCH
D SHOWS THE LOCATION OF A ROOF DRAIN

EXHIBIT A

BUILDING : EDGAR ALLAN POE CLASSICAL SCHOOL - MAIN ROOF

X SCALE= 15 FT/IN
Y SCALE= 15 FT/IN

LENGTH OF MAP (DOWN THE PAGE) IS 70 FT WIDTH OF MAP (ACROSS THE PAGE) IS 24 FT

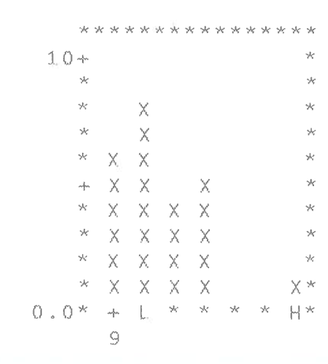


RELATIVE MOISTURE RANGES			SYMBOL	PERCENT OF ROOF	SQUARE FEET OF ROOF
		LESS THAN 10	BLANK	47.5	759
GREATER THAN OR EQUAL TO	10	BUT LESS THAN 11	.	36.5	582
GREATER THAN OR EQUAL TO	11	BUT LESS THAN 13	/	11.8	188
GREATER THAN OR EQUAL TO	13	BUT LESS THAN 14	#	2.6	41
GREATER THAN OR EQUAL TO	14		@	1.6	26

TOTAL ROOF AREA= 1596 SQUARE FEET

EXHIBIT B

BUILDING- EDGAR ALLAN POE CLASSICAL SCHOOL - MAIN ROOF
10538 S. LANGLEY AVE., CHICAGO,IL
DATE- 10/24/2018
WEATHER- 48 DEG. F., 15% RH
TYPE OF CONSTRUCTION- STRUCTURAL WOOD DECK. A BASE SHEET MECHANICALLY ATTACHED TO THE DECK BELOW. 2 LAYERS OF 0.75 INCH THICK PERLITE INSULATION. A MEMBRANE CONSISTING OF 2 PLIES OF MODIFIED BITUMEN BASE AND CAP SHEETS.
(IRCA JOB # M18230-2)
COMPUTER MAP PREPARED BY ILLINOIS ROOF CONSULTING ASSOC., INC., MCHENRY, IL 60050



MAXIMUM MOISTURE READING= 15 MINIMUM MOISTURE READING= 9
AVERAGE MAXIMUM MOISTURE VALUE = 15 (SHOWN BY AN H ON THE HISTOGRAM)
AVERAGE MINIMUM MOISTURE VALUE = 10 (SHOWN BY AN L ON THE HISTOGRAM)
VERTICAL SCALE IS THE ACTUAL # OF METER READINGS
HORIZONTAL SCALE IS METER READING IN COUNTS/MINUTE

BUILDING : EDGAR ALLAN POE CLASSICAL SCHOOL - MAIN ROOF

EXHIBIT C

TABULAR DATA OF ROOF MOISTURE READINGS
PAGE 1 OF 1

THE TOP ROW OF NUMBERS INDICATES THE HORIZONTAL DISTANCE (IN FT.) TO THE RIGHT ON THE PLOT
THE FIRST COLUMN ON THE LEFT INDICATES THE VERTICAL DISTANCE (IN FT.) ON THE PLOT
BLANK SPACES IN THE DATA ARRAY INDICATE THAT NO READING WAS TAKEN AT THIS LOCATION

0.0	2.0	12.0	22.0
2.0	10	11	10
12.0	10	9	10
22.0	9	10	12
32.0	12	11	15
42.0	10	9	9
52.0	12	10	9
62.0	11	12	9
68.0	11	10	12

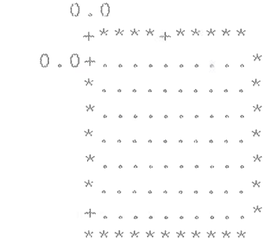
* OUTLINES THE ROOF PERIMETER
J REPRESENTS AN EXPANSION JOINT OR CONSTRUCTION JOINT
P OUTLINES A PATCH
D SHOWS THE LOCATION OF A ROOF DRAIN

EXHIBIT A

BUILDING : EDGAR ALLAN POE CLASSICAL SCHOOL - ENTRANCE ROOF

X SCALE= 15 FT/IN
Y SCALE= 15 FT/IN

LENGTH OF MAP (DOWN THE PAGE) IS 16 FT WIDTH OF MAP (ACROSS THE PAGE) IS 15 FT



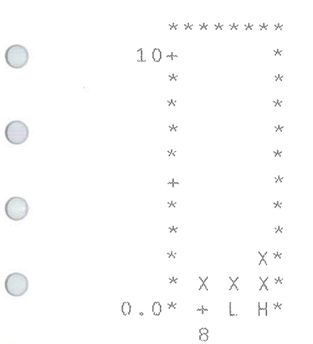
RELATIVE MOISTURE RANGES		SYMBOL	PERCENT OF ROOF	SQUARE FEET OF ROOF
	LESS THAN 8	BLANK	0.0	0
GREATER THAN OR EQUAL TO 8	BUT LESS THAN 11	.	100.0	240
GREATER THAN OR EQUAL TO 11	BUT LESS THAN 13	/	0.0	0
GREATER THAN OR EQUAL TO 13	BUT LESS THAN 16	#	0.0	0
GREATER THAN OR EQUAL TO 16		⊠	0.0	0

TOTAL ROOF AREA= 240 SQUARE FEET

EXHIBIT B

BUILDING- EDGAR ALLAN POE CLASSICAL SCHOOL - ENTRANCE ROOF
10538 S. LANGLEY AVE., CHICAGO, IL
DATE- 10/24/2018
WEATHER- 48 DEG. F., 15% RH
TYPE OF CONSTRUCTION- CONSTRUCTION NOT DETERMINED.
A MEMBRANE CONSISTING OF 2 PLIES OF MODIFIED BITUMEN BASE AND CAP SHEETS.

(IRCA JOB # M18230-4)
COMPUTER MAP PREPARED BY ILLINOIS ROOF CONSULTING ASSOC., INC., MCHENRY, IL 60050



MAXIMUM MOISTURE READING= 10 MINIMUM MOISTURE READING= 8
AVERAGE MAXIMUM MOISTURE VALUE = 10 (SHOWN BY AN H ON THE HISTOGRAM)
AVERAGE MINIMUM MOISTURE VALUE = 9 (SHOWN BY AN L ON THE HISTOGRAM)
VERTICAL SCALE IS THE ACTUAL # OF METER READINGS
HORIZONTAL SCALE IS METER READING IN COUNTS/MINUTE

TABULAR DATA OF ROOF MOISTURE READINGS
PAGE 1 OF 1

EXHIBIT C

THE TOP ROW OF NUMBERS INDICATES THE HORIZONTAL DISTANCE (IN FT.) TO THE RIGHT ON THE PLOT
THE FIRST COLUMN ON THE LEFT INDICATES THE VERTICAL DISTANCE (IN FT.) ON THE PLOT
BLANK SPACES IN THE DATA ARRAY INDICATE THAT NO READING WAS TAKEN AT THIS LOCATION

0.0	2.0	12.0
2.0	10	10
12.0	9	8

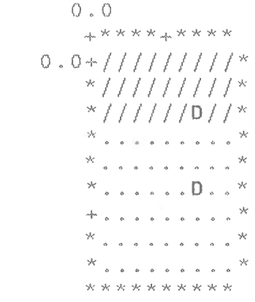
* OUTLINES THE ROOF PERIMETER
J REPRESENTS AN EXPANSION JOINT OR CONSTRUCTION JOINT
P OUTLINES A PATCH
D SHOWS THE LOCATION OF A ROOF DRAIN

EXHIBIT A

BUILDING : EDGAR ALLAN POE CLASSICAL SCHOOL - ELEVATOR PENTHOUSE

X SCALE= 15 FT/IN
Y SCALE= 15 FT/IN

LENGTH OF MAP (DOWN THE PAGE) IS 20 FT WIDTH OF MAP (ACROSS THE PAGE) IS 13 FT



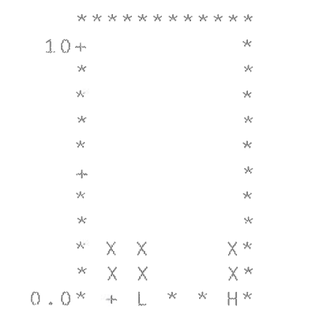
RELATIVE MOISTURE RANGES		SYMBOL	PERCENT OF ROOF	SQUARE FEET OF ROOF
	LESS THAN 8	BLANK	0.0	0
GREATER THAN OR EQUAL TO 8	BUT LESS THAN 11	.	67.1	174
GREATER THAN OR EQUAL TO 11	BUT LESS THAN 13	/	32.9	86
GREATER THAN OR EQUAL TO 13	BUT LESS THAN 16	#	0.0	0
GREATER THAN OR EQUAL TO 16		Ø	0.0	0

TOTAL ROOF AREA= 260 SQUARE FEET

EXHIBIT B

BUILDING- EDGAR ALLAN POE CLASSICAL SCHOOL - ELEVATOR PENTHOUSE
10538 S. LANGLEY AVE., CHICAGO, IL
DATE- 10/24/2018
WEATHER- 48 DEG. F., 15% RH
TYPE OF CONSTRUCTION- CONSTRUCTION NOT DETERMINED.
A MEMBRANE CONSISTING OF 2 PLIES OF MODIFIED BITUMEN BASE AND CAP SHEETS.

(IRCA JOB # M18230-3)
COMPUTER MAP PREPARED BY ILLINOIS ROOF CONSULTING ASSOC., INC., MCHENRY, IL 60050



MAXIMUM MOISTURE READING= 12 MINIMUM MOISTURE READING= 8
AVERAGE MAXIMUM MOISTURE VALUE = 12 (SHOWN BY AN H ON THE HISTOGRAM)
AVERAGE MINIMUM MOISTURE VALUE = 9 (SHOWN BY AN L ON THE HISTOGRAM)
VERTICAL SCALE IS THE ACTUAL # OF METER READINGS
HORIZONTAL SCALE IS METER READING IN COUNTS/MINUTE

TABULAR DATA OF ROOF MOISTURE READINGS
PAGE 1 OF 1

EXHIBIT C

THE TOP ROW OF NUMBERS INDICATES THE HORIZONTAL DISTANCE (IN FT.) TO THE RIGHT ON THE PLOT
THE FIRST COLUMN ON THE LEFT INDICATES THE VERTICAL DISTANCE (IN FT.) ON THE PLOT
BLANK SPACES IN THE DATA ARRAY INDICATE THAT NO READING WAS TAKEN AT THIS LOCATION

0.0	2.0	10.0
2.0	12	12
12.0	9	9
18.0	8	8

```
*    OUTLINES THE ROOF PERIMETER
J    REPRESENTS AN EXPANSION JOINT OR CONSTRUCTION JOINT
P    OUTLINES A PATCH
D    SHOWS THE LOCATION OF A ROOF DRAIN

BUILDING : EDGAR ALLAN POE CLASSICAL SCHOOL - LOWER ROOFS

X SCALE=  15   FT/IN
Y SCALE=  15   FT/IN

LENGTH OF MAP (DOWN THE PAGE) IS  111 FT        WIDTH OF MAP (ACROSS THE PAGE) IS   54 FT
    0.0      15.0      30.0      45.0
     +****+****+****+****+****+****+****+**
  0.0+...../////////////######ØØ**********
     *...../////////////######ØØ*        **
     *...../////////////######ØØ*        **
     *...../////////..//////###*         **
     *.....SSS////.....//////#*          **
     *.....SSS//.....  ...../*           **
     +.....////////.........//*          **
     *...////////////////D////////*      **
     *//////##############D#//////*      **
     *JJJJJJJJJJJJJJJJJJJJJJJJJJ*       **
     *.....////...*       **
     *.............SSS...////D/*         **
 30.0+..... .....SSS..///////*           **
     *..          ...../////D/#*         **
     *            ...../////###*         **
     *            ...../#######*         **
     *          ..... ../#########*******
     *................JJJJJJJJJJ/SSSSSSS*
     +................JD##ØØ####//SSSSSSS*
     *................J/D#####////////////*
     *................J/////////////////////*
     *................J.....................//*
     *................J.....................///*
     *................J...../////////*
 60.0+.............. ..J/////////////////..*
     *////.....       J/////////////////..*
     *////.....       JJJJJJJJJJ*****....*
     *##/////.....     ....//////#**********
     *###SSSSSSSSS..    ...//////#*        **
     *ØØØSSSSSSSSS...    ..////##*         **
     +ØØØS       S...    ..//////#*        **
     *###S       S..     ..///D/#*         **
     *///S       S..      ..////#*         **
     *...S       SSS      ...//D/*         **
     *ØØ#SSSSSSSSSS... ...//####Ø*         **
     *JJJJJJJJJJJJJJJJJJJJJJJJJ*          **
 90.0+.....////////####DØØ######/*         **
     *.....  ...//######D#ØØ###//*         **
     *.....SSS...///##########///*         **
     *.....SSS....////////////////*         **
     *.............////////////.*           **
     *.....................  .....*         **
     +.....................  .....*         **
     *.............................*         **
     *.................  .........**********
     ***********************************
```

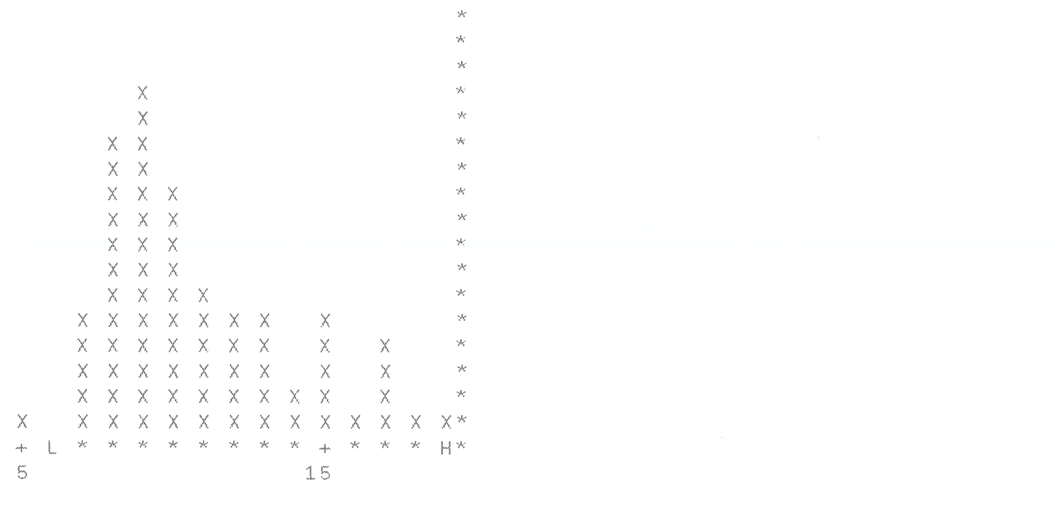
EXHIBIT A

RELATIVE MOISTURE RANGES	SYMBOL	PERCENT OF ROOF	SQUARE FEET OF ROOF
LESS THAN 8	BLANK	9.5	449
GREATER THAN OR EQUAL TO 8 BUT LESS THAN 11	.	51.7	2451
GREATER THAN OR EQUAL TO 11 BUT LESS THAN 13	/	27.3	1296
GREATER THAN OR EQUAL TO 13 BUT LESS THAN 16	#	9.7	462
GREATER THAN OR EQUAL TO 16	Ø	1.7	81

TOTAL ROOF AREA= 4739 SQUARE FEET

EXHIBIT B

BUILDING- EDGAR ALLAN POE CLASSICAL SCHOOL - LOWER ROOFS
10538 S. LANGLEY AVE., CHICAGO, IL
DATE- 10/24/2018
WEATHER- 48 DEG. F., 15% RH
TYPE OF CONSTRUCTION- STRUCTURAL WOOD DECK. A BASE SHEET/VAPOR RETARDER MECHANICALLY ATTACHED TO THE DECK BELOW. 2 LAYERS OF 1.0 INCH POLYISOCYANURATE INSULATION. 0.5 INCH THICK PERLITE INSULATION. A MEMBRANE CONSISTING OF 5 PLIES OF COAL TAR PITCH BUILT-UP ROOF WITH GRAVEL. (IRCA JOB # M18230-1)
COMPUTER MAP PREPARED BY ILLINOIS ROOF CONSULTING ASSOC., INC., MCHENRY, IL 60050



MAXIMUM MOISTURE READING= 19 MINIMUM MOISTURE READING= 5
AVERAGE MAXIMUM MOISTURE VALUE = 19 (SHOWN BY AN H ON THE HISTOGRAM)
AVERAGE MINIMUM MOISTURE VALUE = 6 (SHOWN BY AN L ON THE HISTOGRAM)
VERTICAL SCALE IS THE ACTUAL # OF METER READINGS
HORIZONTAL SCALE IS METER READING IN COUNTS/MINUTE

EXHIBIT C

TABULAR DATA OF ROOF MOISTURE READINGS
PAGE 1 OF 1

THE TOP ROW OF NUMBERS INDICATES THE HORIZONTAL DISTANCE (IN FT.) TO THE RIGHT ON THE PLOT
THE FIRST COLUMN ON THE LEFT INDICATES THE VERTICAL DISTANCE (IN FT.) ON THE PLOT
BLANK SPACES IN THE DATA ARRAY INDICATE THAT NO READING WAS TAKEN AT THIS LOCATION

	2.0	12.0	22.0	27.0	32.0	40.0	42.0	52.0
0.0								
2.0	9	10	13		15	17		
12.0	8		8		9	11		
21.0	12	14	15		13	11		
22.0								
23.0								
24.0	9	10	10		11	10		
32.0	8	5	10		12	14		
40.0					15	15		
42.0	9	8	10					
44.0					17		13	
52.0	8	8	9		8		9	11
62.0	12	8	7		13		13	10
64.0	12	8	7					
72.0	19		8		11	15		
82.0	9		7		10			
85.0	17		9		12	18		
87.0								
92.0	9	7	16		17	11		
102.0	9	9	8		7	10		
110.0	9	10	8		9	9		

EXHIBIT D

CORE DATA SHEET AND LABORATORY REPORT

A. CORE SAMPLE LOCATION

Core Sample	X-Axis	Y-Axis	Reading	Roof Area
C1	2	40	17	Lower
C2	2	52	12	Main

B. GRAVIMETRIC MOISTURE CONTENT LOG

	Membrane			Insulation		
Sample	Wet	Dry	Content %	Wet	Dry	Content %
C1	37.3 g.	35.0 g.	6.6 %	82.6 g.	62.1 g.	33.0 %
C2	55.8 g.	55.2 g.	1.1 %	67.5 g.	66.4 g.	1.7 %

("g" is weight in grams; "%" is moisture content by weight of tested sample)

C. EQUILIBRIUM MOISTURE CONTENT AND MAXIMUM MOISTURE ABSORPTION

Material	Content by weight	Saturation point
Perlite insulation	2.5 - 3.5%	464%
Polyisocyanurate insulation	2.0 - 4.0%	N/A
Organic felts	2.5 - 4.0%	75%
Fiberglass felts	0.1 - 1.0%	615%

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EXHIBIT E

GLOSSARY OF TERMS

Generally, technical terms used or abbreviated in this report are explained upon the occasion of their first use. A few additional words or phrases which may be ambiguous or may have very specific applications are listed below.

- aggregate: gravel, cinder, slag or ceramic granules adhered to roofing surfaces in order to provide protection of the roof membrane from solar degradation and from exterior fire threat.

- anomalies: defects.

- bitumen/bituminous: black to brown color, low melting point, plastic-like material used as the waterproofing component in built-up roofing and waterproofing. Available in a variety of grades or types, the two principle substances referred to as bitumen are coal tar and asphalt.

- BUR: Built-up roofing; roof system consisting of three or more layers of bitumen separated by three of more porous or semiporous felts or mats.

- deck or decking: the structural diaphragm or platform permanently installed over roof joists, beams or purlins. The building component that serves as a substrate for insulated and uninsulated roofing.

- defects, as in roof defects: flaws in the application or existing condition of a particular construction.

- details, as in roof details: elements that interrupt the continuation of roofing. Examples: roof edges, drains, pipes, walls, scuttles, skylights, mechanical units, flashings and metal accessories.

- elastomeric: property that describes a material's ability to stretch and return to near normal dimension.

- felts: rolled roofing goods made from asphalt saturated, coated or impregnated mats make from paper, fiberglass or polyester.

- pond or ponding: water of a depth of one-quarter of an inch or greater that remains on a roof surface 48 or more hours after a rainfall stops.

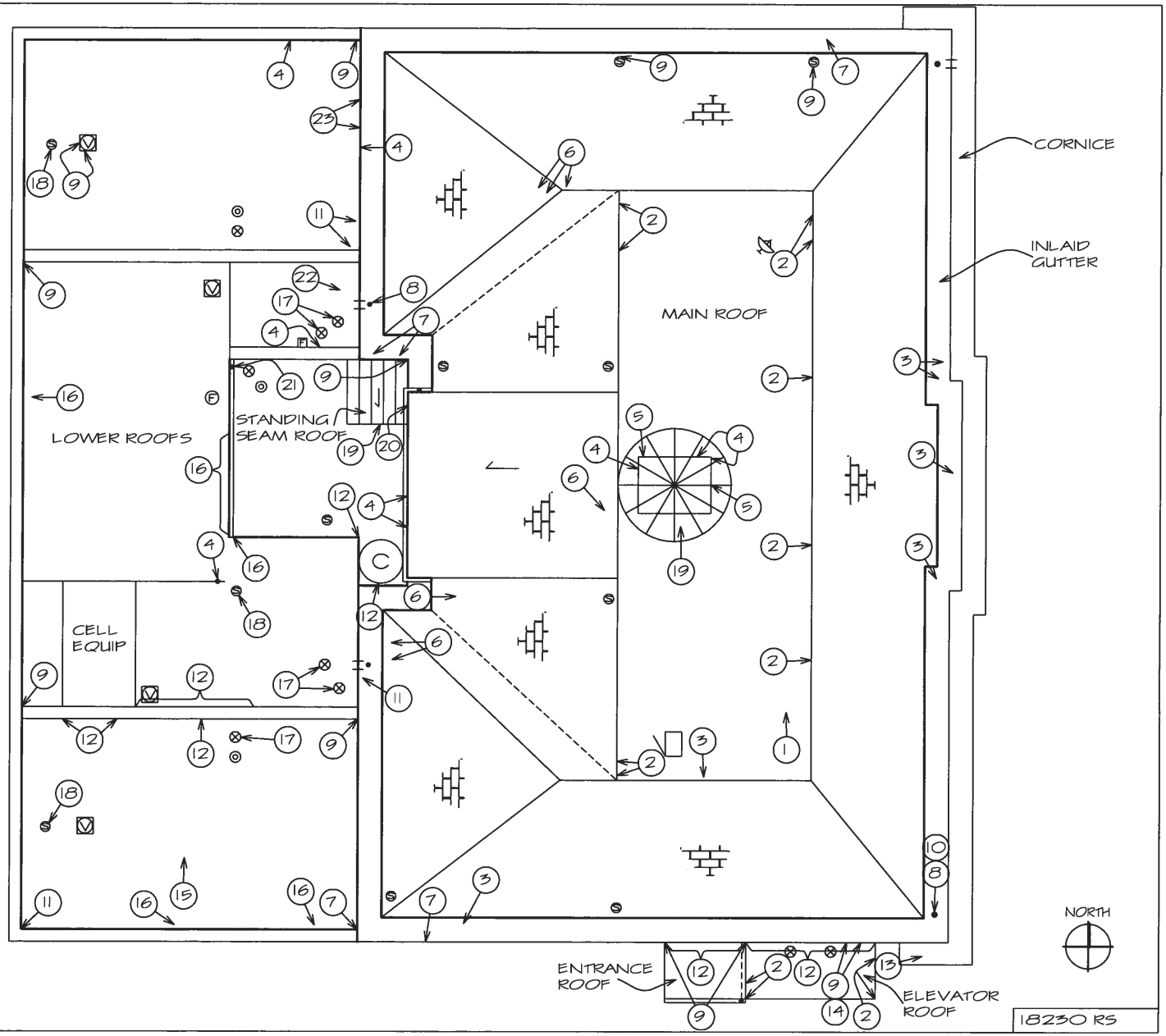
- preventive maintenance: providing regular and predictable renewal service on minor building components. Examples: filling sealant pans, cleaning and recaulking metal joints, cleaning roof surfaces, drains and gutters.

- roof assembly: the roof system plus the structural deck and horizontal supporting components.

- roof system or roofing system: insulated or uninsulated waterproofing components installed immediately over the structural deck.

STANDING SEAM ROOF	60	SQ. FT.
SHINGLE ROOF	5,939	SQ. FT.
MAIN ROOF	1,752	SQ. FT.
LOWER ROOFS	4,673	SQ. FT.
ENRANCE ROOF	70	SQ. FT.
ELEVATOR ROOF	112	SQ. FT.
TOTAL	12,606	SQ. FT.

(n) DENOTES PHOTO NUMBER



LEGEND

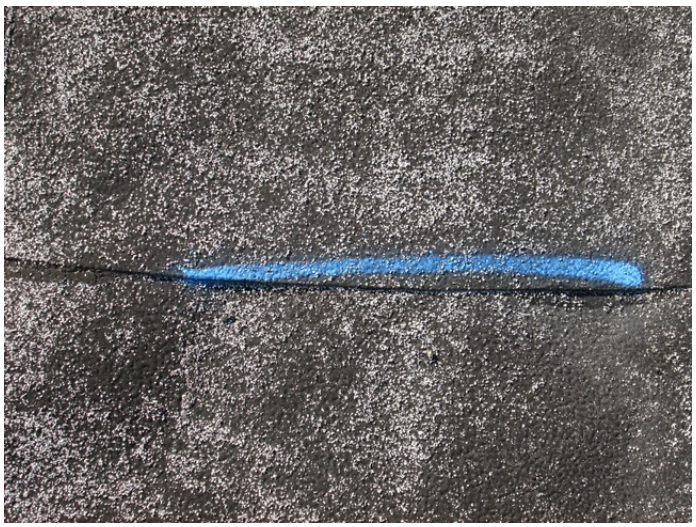
- SCUPPER
- DRAIN
- OVERFLOW DRAIN
- VENT
- FLUE STACK
- SOIL STACK
- SATELLITE DISH
- CHIMNEY
- HATCH
- EXPANSION JOINT
- GUTTER
- DOWNSPOUT

IRCA

PROJECT: POE ELEMENTARY SCHOOL 10538 S. LANGLEY AVENUE CHICAGO, ILLINOIS		DRAWING TITLE: ROOF SKETCH
PROJECT #: 18230	DATE: 10/18	SCALE: 1" = 20'-0" 0 5' 10' 20'
		DETAIL #: RS - 1

1. OVERVIEW OF MAIN ROOF

2. OPEN STRIP-IN PLY



3. OPEN SEAM

4. OPEN FLASHING

5. DAMAGED METAL FLASHING

6. MISSING SHINGLE

7. WATER BLISTER

8. INADVISABLE DETAIL (TYPICAL)

9. OPEN SEALANT

10. ORGANIC DEBRIS

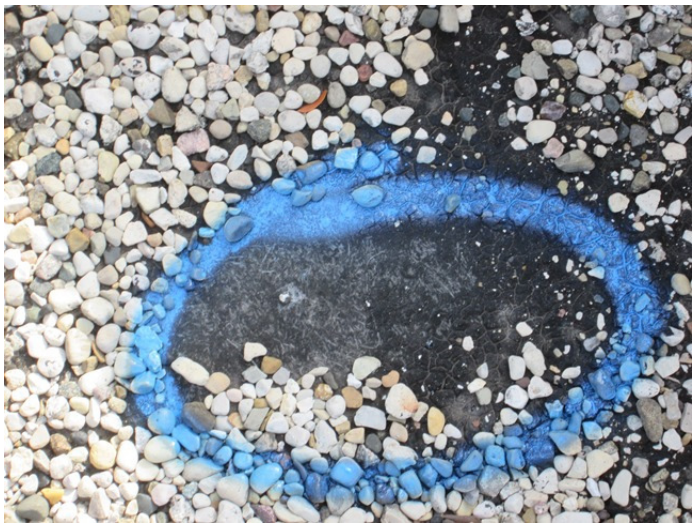
11. ORGANIC GROWTH

12. DETERIORATED MASONRY

13. DETERIORATED CORNICE (TYPICAL)

14. DAMAGED COPING TILES

15. OVERVIEW OF LOWER ROOFS

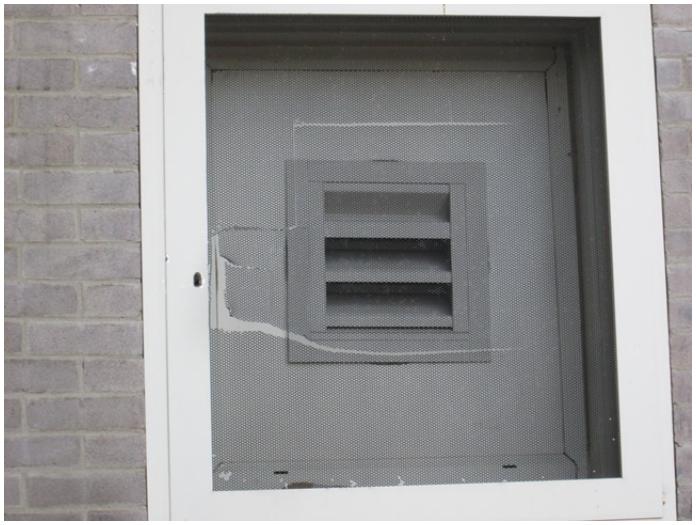


16. EXPOSED / DETERIORATED FELTS

17. MISSING DRAIN STRAINER

18. CLOGGED SOIL STACK

19. CORROSION



20. DAMAGED SCREEN

21. MISSING SPLASH BLOCK

22. FALLEN SCREEN

23. CRACKED MASONRY