March 26, 2015

International Concrete Repair Institute

High-Rise Roofing and Waterproofing

SUPERSTRUCTURES + ENGINEERS ARCHITECTS

Presented by:
Michael Stripunsky, RA & Barry Drogin

SUPERSTRUCTURES
+ ENGINEERS
ARCHITECTS

High-Rise Buildings

HIGH-RISE BUILDINGS: LIST OF CITIES

Rank	City	Country	Buildings	Population
1	Hong Kong	Hong Kong	7,740	7,061,200
2	**New York City**	**United States**	**6,053**	**8,336,697**
3	São Paulo	Brazil	5,734	11,316,149
4	Moscow	Russia	5,360	11,503,501
5	Singapore	Singapore	4,560	5,312,400

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

High-Rise Roof Replacement Challenges

Solutions to These Challenges

Design Phase:

- Thorough Investigation
- Optimal Repair/Replacement Selection
- Comprehensive Construction Documents

Bid Phase:

- Selecting Qualified Contractor

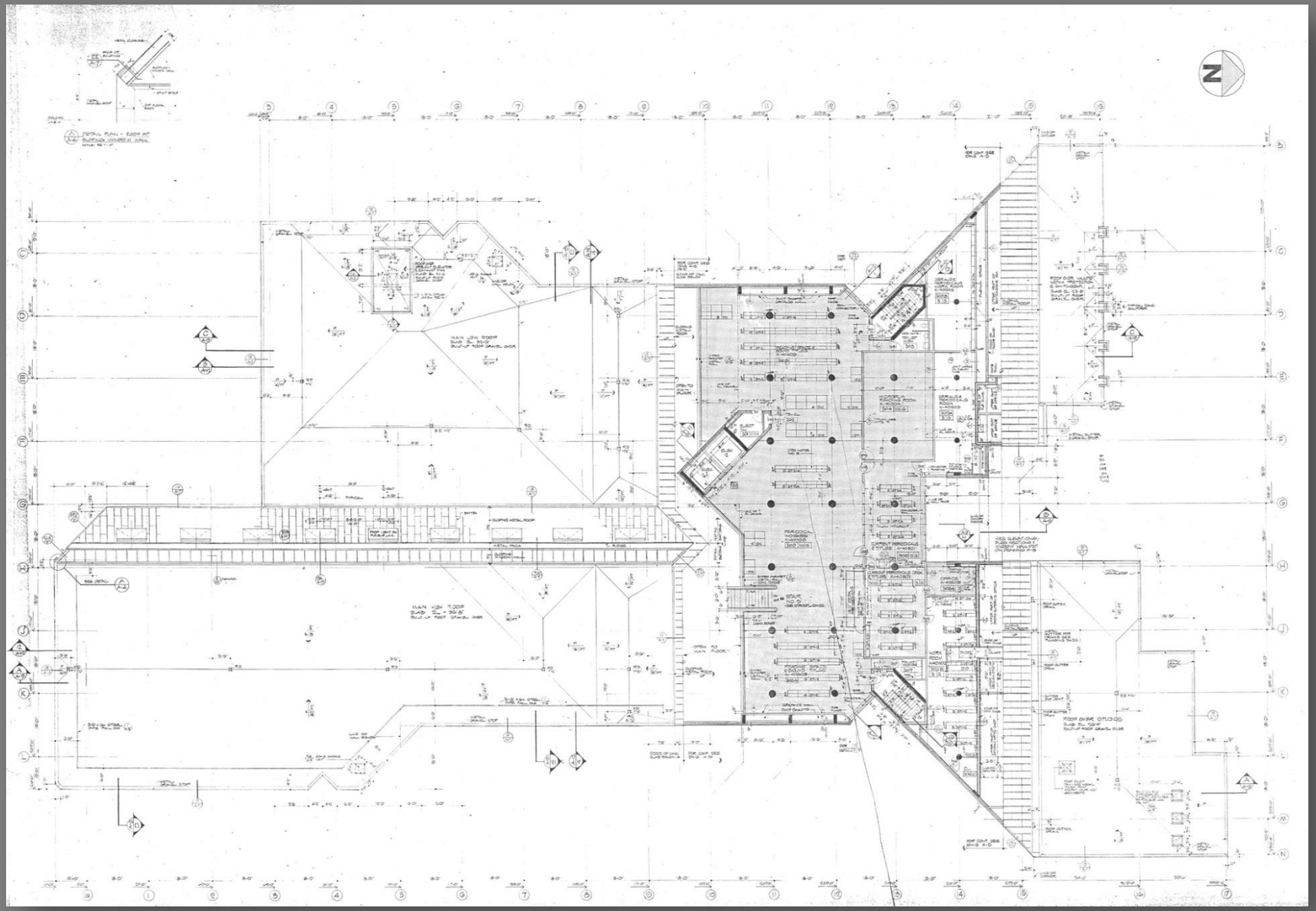
Construction Phase:

- Planning and Sequencing of the Work

Thorough Investigation

- Data Collection
- Field Survey, Probes, and Testing
- Comprehensive Report

Data Collection



Field Survey, Probes, and Testing

ROOF INVESTIGATION

Building:_____

Preliminary Inspection Check List

Roof Area:_____

Identify Existing Roof Type:	
Conventional Ballasted	
Built-up	
SBS	
Single Ply	
Other	
Overburden Type (Pavers / Gravel Ballast / Wood Decking, etc)	

Identify Existing Roof Pitch:	
Sloped Roof Deck / Fill	
Tapered Insulation	

Identify Existing Roof Deck Type:	
Concrete	
Metal	
Wood	
Other	

Observed Roofing System and Deck Deficiencies:

Observed Wall / Parapet Deficiencies above Counterflashing Level:

ON ROOF PLAN

Identify Roof Drains / Scuppers:	**Identify Roof Penetration:**	**Identify Perimeter Conditions:**
Types	Types	Wall / Parapet / Roof Edge Construction
Sizes	Hot / Cold	Parapet Height (Railing if any). Does it Comply with NYC BC Height Requirements (42")?
Material	Shape (Regular / Irregular)	Existing Metal Flashing Type (Through-wall / In-wall / Reglet / Surface Mounted) and Material (SS / Galv Steel / Copper / Lead Coated Copper / Aluminum)
Condition	Existing Flashing Type and Height	Existing Metal Flashing Height
Location	Condition (Rusted Steel, Damaged Insulation, etc)	Existing Metal Flashing Condition

ON ROOF PLAN --

Identify Door Conditions:	**Identify Type and Location of Existing Roof Skylights:**
Existing Door Saddle Condition	Frame and Glass Type
Existing Door Flashing Type, Height, and Condition	Frame and Glass Condition
Door Type and Height	Flashing Type and Height

Identify Type and Location of Existing Roof Top Equipment (Mechanical Units, Telecommunication Equipment, Electrical Conduits, etc)

Record Existing Paving / Walkway Layout

Record Locations of Existing Access Doors / Hatches / Ladders

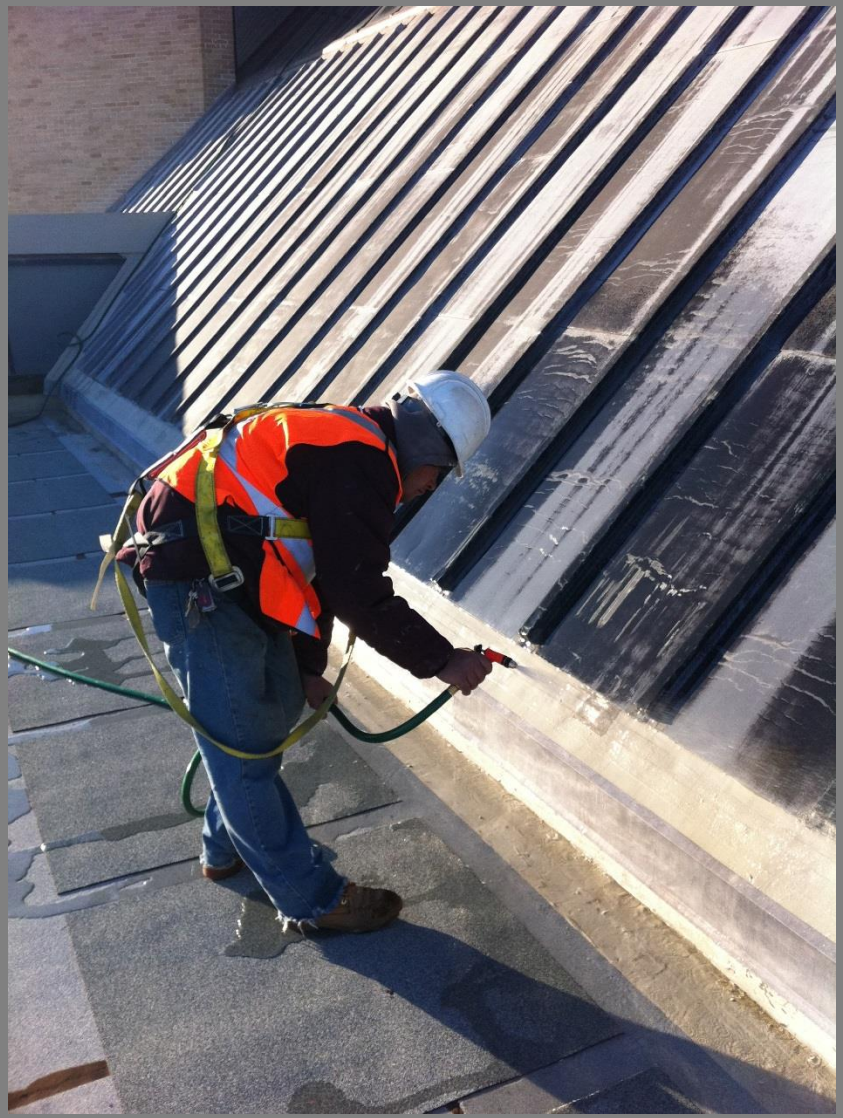
Identify any Roof / Flashing Low Clearance Conditions

Identify any Roof "Irregularities" (Elevated Platforms, Abandoned Equipment, Previous Repair Attempts, Areas of Ponding Water, etc)

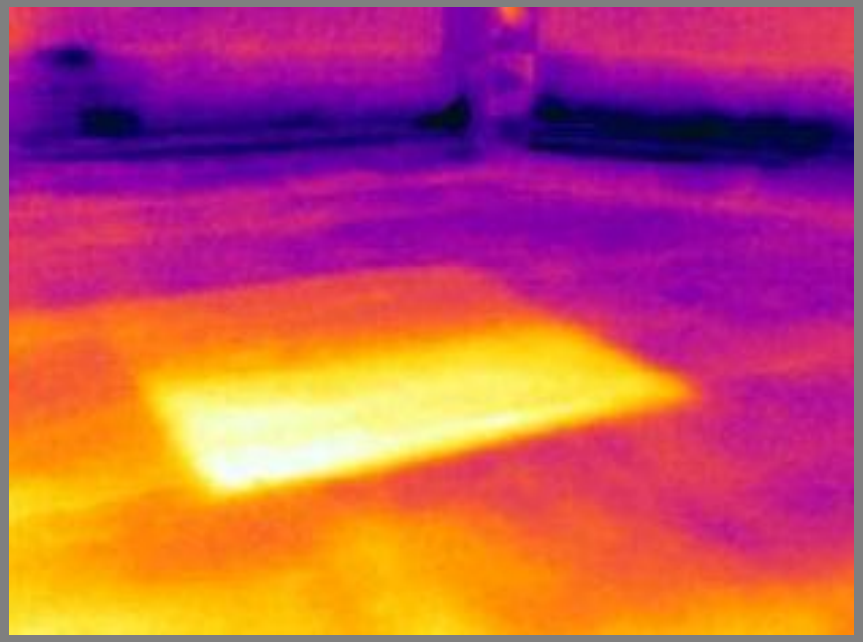
Determine Areas of Roof / Flashing Probes. Take Photo of Each Probe Area

Record Locations of Existing Water Leaks:	
Active	
Previous	

Field Survey, Probes, and Testing



Field Survey, Probes, and Testing

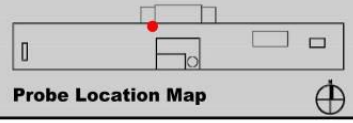


Field Survey, Probes, and Testing

Field Survey, Probes, and Testing

Probe 01

Adjacent to Roof Drain



Probe Location Map

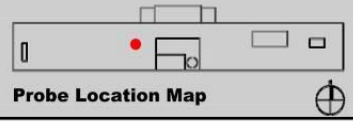
Photographs

Probe Observations

- Complete through-panel core. Hollow panel is approximately 6” high with a 1” thick shell
- Sloped concrete fill appears to be near 0” in depth.

Probe 02

Near High Point of Roof Slope



Probe Location Map

Photographs

Probe Observations

- Sloped concrete fill had an approximate depth of 4” +/- above the block shell.

Following the graph provided by the manufacturer of the model Original Schmidt concrete rebound hammer used, the compressive strength of the substrate for Location1 is calculated as 2000 psi ± 750.

Location 2

Concrete Rebound Hammer Testing

Concrete rebound hammer, serial no. 161146, ID no. N-34-1 was used for all tests.

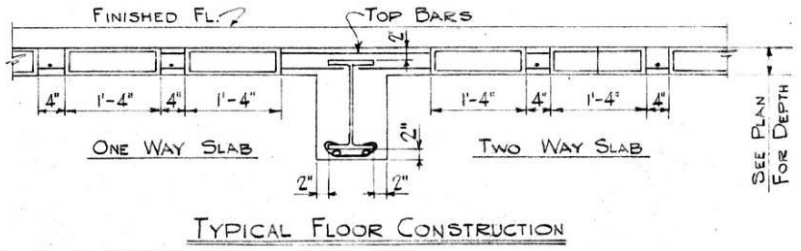
The 10’ X 10’ roof substrate at Location 2 was tested. The test area at Location 2 had the following observed conditions:

Condition	*Observation*
Surface	Concrete Substrate
Grinding	Required
Form	Dry
Curing	Cured
Exposure	Outdoor

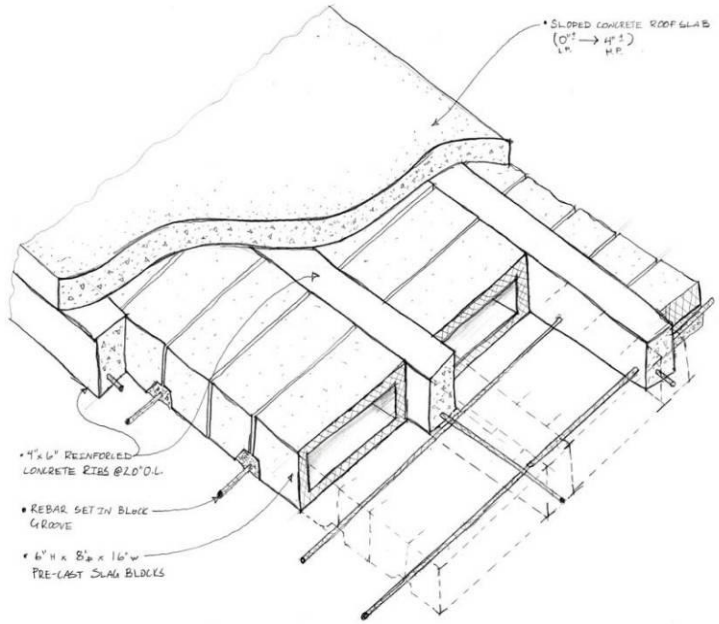
Concrete rebound hammer testing was performed as follows:

Characteristic	*Observation*
Orientation	Vertical (downwards)
Discarded Readings	None
Average Rebound Number	35.00

Field Survey, Probes, and Testing

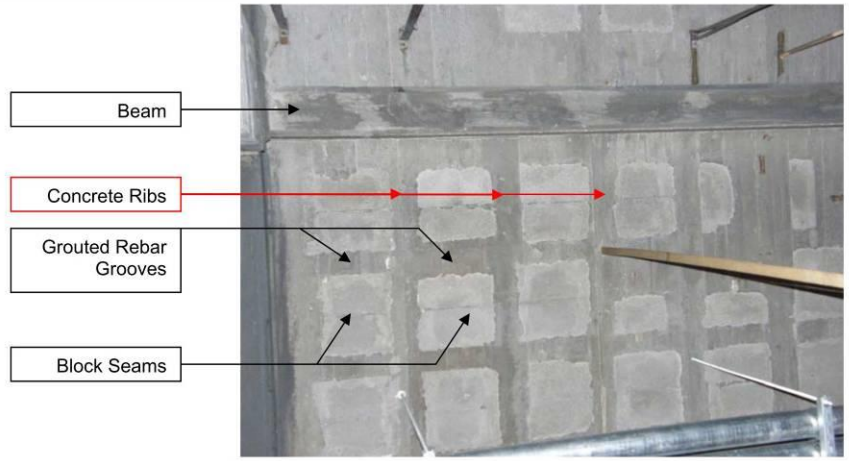


From drawing 52/226, Basic Sciences Building, 1952.

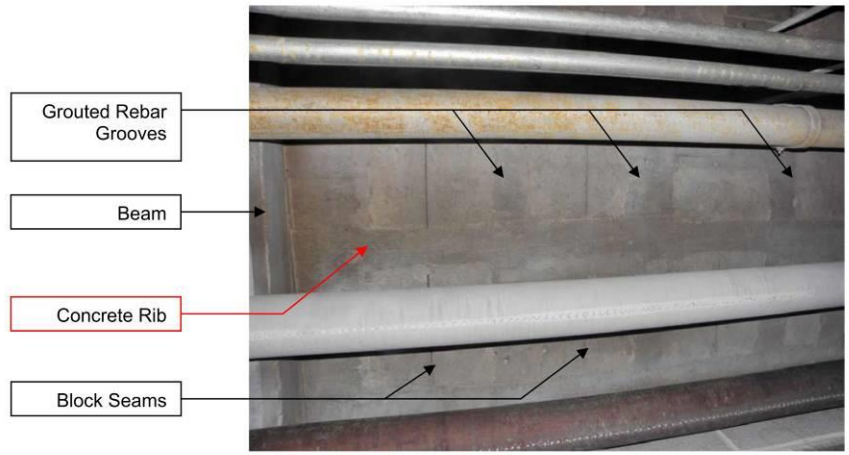


Sketch indicating approximate roof deck slab construction assembly.

Under West End of Roof Deck

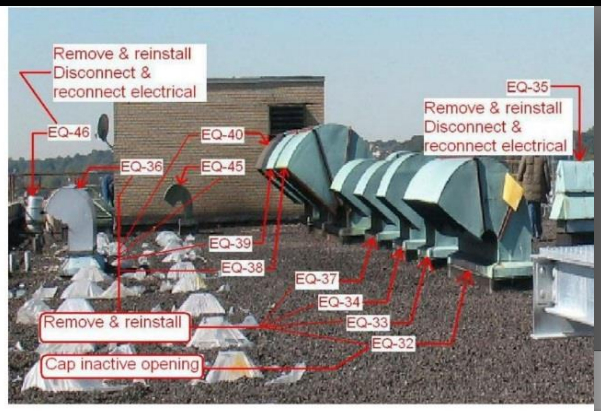


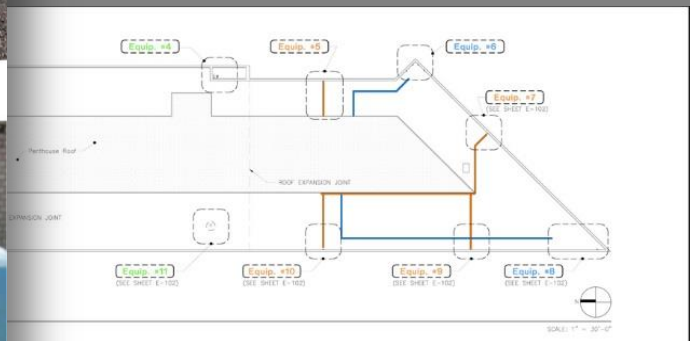
Under East End of Roof Deck

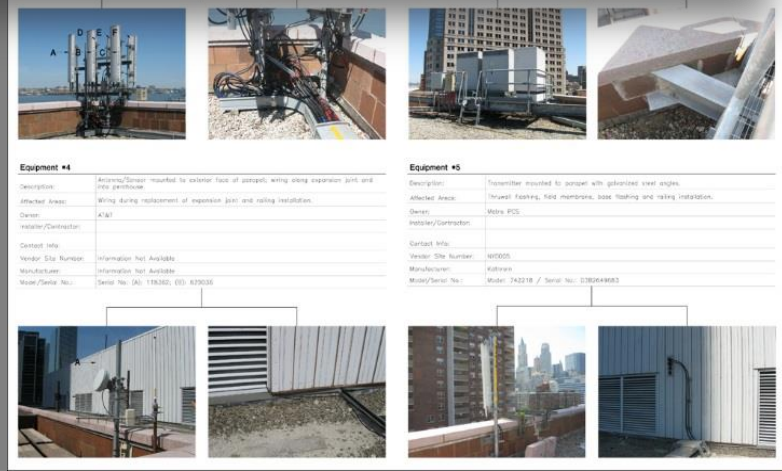


Field Survey, Probes, and Testing

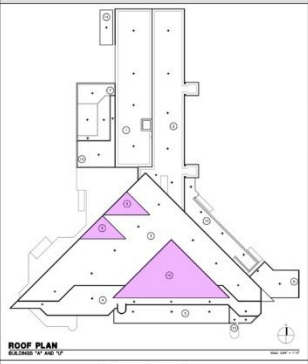
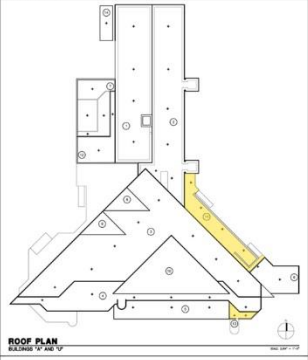
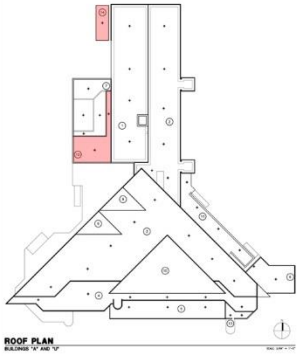
Field Survey, Probes, and Testing

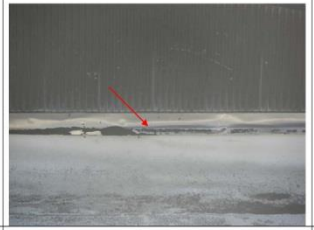
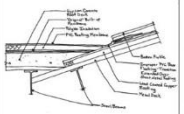






Comprehensive Report

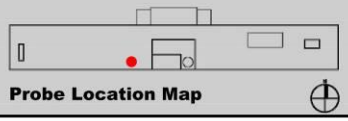
Item No.	Observed Conditions	Sketches / Representative Photographs	Recommendations
4	**Roof Areas 8, 9 and 10:** **Sloped lead coated copper batten seam roofing over slip paper, underlayment, and plywood secured to metal deck.**		**The existing roofing system appears to be in good condition and requires only localized repairs including but not limited to:** ▪ Partial replacement of batten profile sheet metal (roof area 10) ▪ Localized sheet metal patching ▪ Installation of vented roofing assembly at roof base ▪ Installation of new ridge cap flashing system
5	**Roof Areas 11 and 13:** **Improper concrete terrace waterproofing assembly. Concrete topping slab is installed directly over built-up waterproofing membrane. This condition does not permit proper drainage. Standing water at waterproofing level was observed at probe areas.** **MEM 03**		• **Remove existing concrete topping slab and waterproofing membrane.** • **Repair existing concrete structural deck.** • **Install new liquid applied terrace system of the following composition:** ▪ Reinforced liquid applied roof membrane over existing structural concrete ▪ Drainage mat ▪ New concrete topping slab matching existing configuration
6	**Roof Areas 12 and 14:** **Concrete pavers over defective single ply PVC membrane and flat 2" thick insulation over "original" built-up roofing over sloped concrete fill over composite metal / concrete deck.** **MEM 04**		**Roof Area 12:** • **Remove existing pavers, PVC membrane, insulation, and "original" built-up roofing down to concrete fill** • **Repair existing concrete fill.** **Roof Area 14:** • **Remove existing pavers, PVC membrane, insulation, "original" built-up roofing, and existing deteriorated fill down to concrete roof deck.** • **Apply new sloped fill to provide positive membrane slope to drains.** **Roof Areas 12 and 14:** • **Install new liquid applied terrace system of the following composition:** ▪ Reinforced liquid applied roof membrane over existing / new sloped fill ▪ Drainage mat ▪ Flat polystyrene insulation to achieve R-Value as required by NYC Energy Code ▪ Filter fabric over insulation, ▪ Lightweight concrete pavers Refer to **Proposed Project Scope** and **Roof Replacement System** section of this Report for more information.

Item No.	Observed Conditions	Sketches / Representative Photographs	Recommendations
12	**FLA 12** Perimeter flashing at clearstory brick wall.		Remove three courses of brick masonry above existing in-wall flashing. Provide new two-piece in-wall type counter flashing, at existing flashing level, with vertical return properly secured to CMU backup masonry. Provide new brick with weep holes atop flashing. Apply new liquid applied base flashing.
13	**FLA 13** Perimeter flashing at clearstory wall panels.		Lift existing metal flashing to allow for base flashing installation. Provide new liquid applied base flashing extended onto back side of metal flashing. Bring metal flashing to its original position. Provide stainless clips with hidden fasteners to keep it in place. Seal horizontal joint above flashing with silicone sealant. Provide weep tubes at regular interval.
14	**FLA 14** Improperly installed sheet metal roof base flashing. Existing PVC transition flashing between sloped and flat roofs is not terminated properly. This condition allows water infiltration into flashing / roofing system. Water damaged insulation was observed at probes opened at sheet metal base. Water damaged interior finishes, evidence of water infiltration, was observed in areas directly below roof base. 	 	We recommend installation of self terminated liquid applied flashing as a transition between sloped and flat roofs. In addition to that we recommend providing of an isolated (by extending initial membrane vertically) section of new SBS roofing (along sheet metal roof base), which will function as a vented assembly. Any moisture related to sheet metal deficiencies will not accumulate at the roof base but evaporate through roof vent system.
15	**FLA 15** Pitch pocket flashing at railing post penetrations.		Remove existing pitch pockets and install new liquid applied base flashing extended to height specified by roofing system manufacturer. .

Comprehensive Report

Probe 03

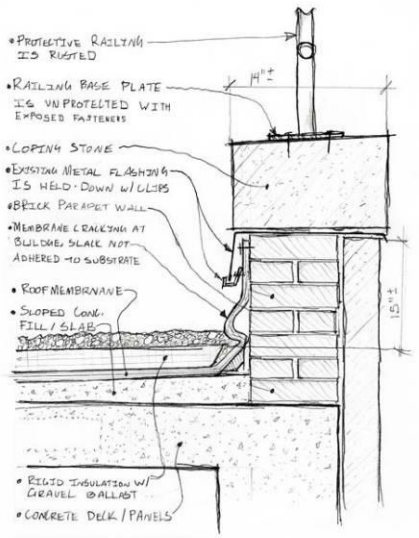
Parapet Investigation



Probe Location Map

Photographs

Probe Sketch



Probe Observations & Results

- The height of the existing base flashing is approximately 15”
- The vertical substrate / brick masonry appears to be in fair condition.
- Roof membrane is cracked at bulge/excess slack on vertical surface.
- Protective railing is rusted
- Railing base plate is unprotected and has exposed fasteners.

FLA 11 — **Adversely Altered Parapet & Coping**

Observations

Altered coping stone and inner face of brick masonry at parapet. Missing base and counter flashing.

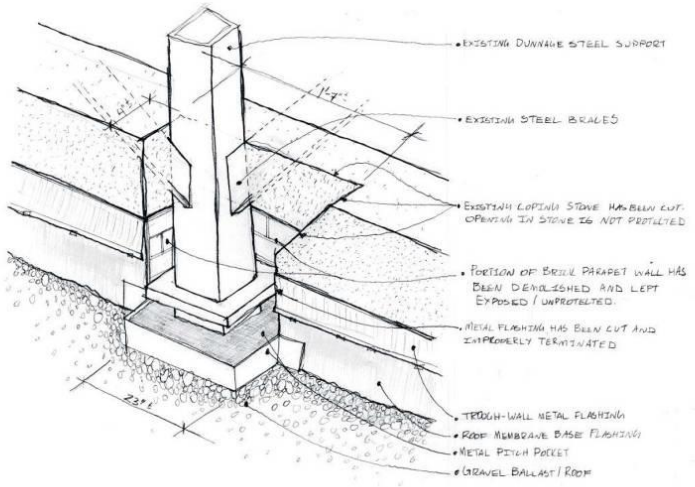
Photographs

Photo 1 Cut Coping at Dunnage

Photo 2 Cut Parapet & Flashing

Analysis

Damage and removal of the existing parapet assembly by the installation of dunnage steel supports allows for water infiltration into the wall and roofing systems.



Recommendations

Repair and clean the substrate behind the steel dunnage. Install reinforcement / anchorage for the exterior face brick masonry. Provide proper base flashing and provide new counter flashing at post.

Replacement System Selection

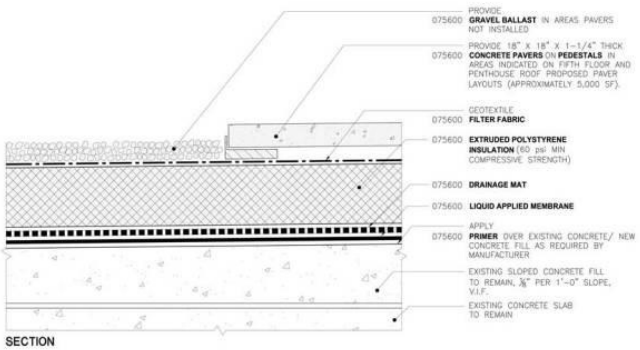
ROOFING SYSTEM OPTION:

Liquid Applied Membrane

SYSTEM DESCRIPTION

A protected liquid applied membrane roof system has the following composition:

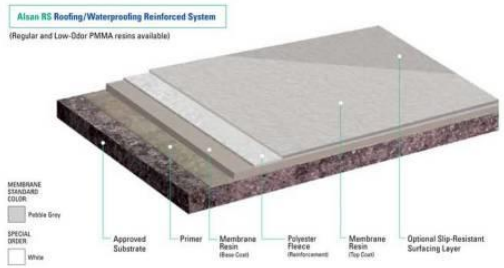
- Ballast: Pavers, gravel, or NYS DOT Gradation 3A
- Filter Fabric
- Extruded Polystyrene Insulation
- Drainage Mat
- Odorless reinforced liquid applied roof membrane applied directly onto the deck substrate



SECTION

MEM 01

ROOF SYSTEM: LIQUID APPLIED MEMBRANE OVER CONCRETE (SF) SCALE: 3" = 1'-0"



ADVANTAGES

- UL Class A rating for exposure to external fire source.
- Membrane is well protected and is not exposed to the elements
- Seamless, monolithic water-proofing can be installed in sections
- Product and installation is odorless
- Self-terminating and self-flashing
- Tolerates ponding water
- Adheres to any substrate
- Cold Applied system eliminates fire hazards of kettles and torches.
- High strength, durable membrane reinforcement.
- Thermal shock resistant
- Membrane Flexibility
- Rot and UV resistant
- Fully adhered system makes finding leaks easy.
- Low membrane level eliminates many low flashing conditions.
- Requires less modification to perimeter and penetration conditions

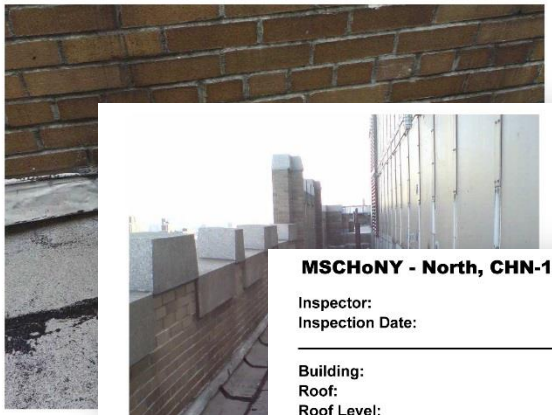
DISADVANTAGES

- Protected Membrane Roofs (PMR) may be more labor-intensive to remove at time of replacement
- Material cost is higher than SBS
- System can not be installed in temperatures below 40° F.

SUPERSTRUCTURES + ENGINEERS ARCHITECTS

32 Avenue of the Americas | New York, New York 10013

Investigation - Urban Campus



Trapped mois

Infrared image show
more information).

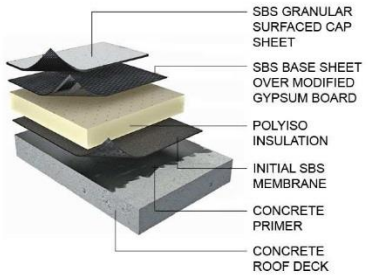
Report ID: General R
Print Date: 12/12/20

Report ID: General Roof Ass
Print Date: 12/12/2014

MSCHoNY - North, CHN-13-R1392

Inspector:	BM
Inspection Date:	11/05/2014
Building:	MSCHoNY - North
Roof:	CHN-13-R1392
Roof Level:	13th Floor
Existing Roof System:	SBS
Roof Deck Type (if known):	Sloped Concrete Deck
Access Type:	Door
Roof Area:	755 SF
Program Below:	Clinical
Drawing Number:	A104
Age of Roof (approx.):	20+ years
Reported Leaks:	Thermal imaging anomalies. Probes found water damaged insulation and wet deck.
Roof Replacement Priority: (see legend below)	1
Proposed Roofing System:	Protected Liquid-Applied Membrane
Asbestos Containing Materials (ACM):	Present (confirmed by testing)
Extended Construction Cost: (including ACM abatement)	$88,270

Representative Photo and Proposed Roof System:



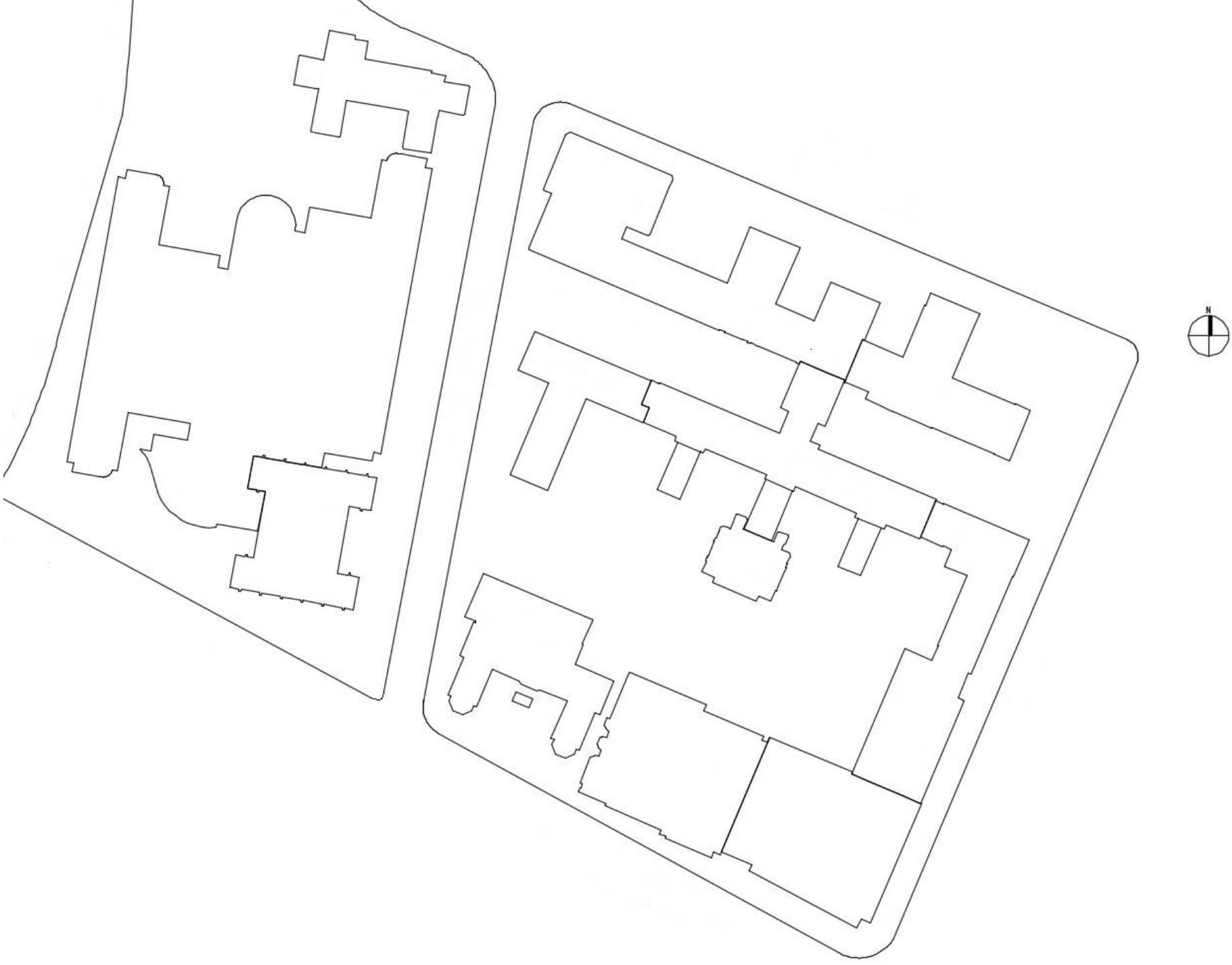
Roof Replacement Priority Legend:

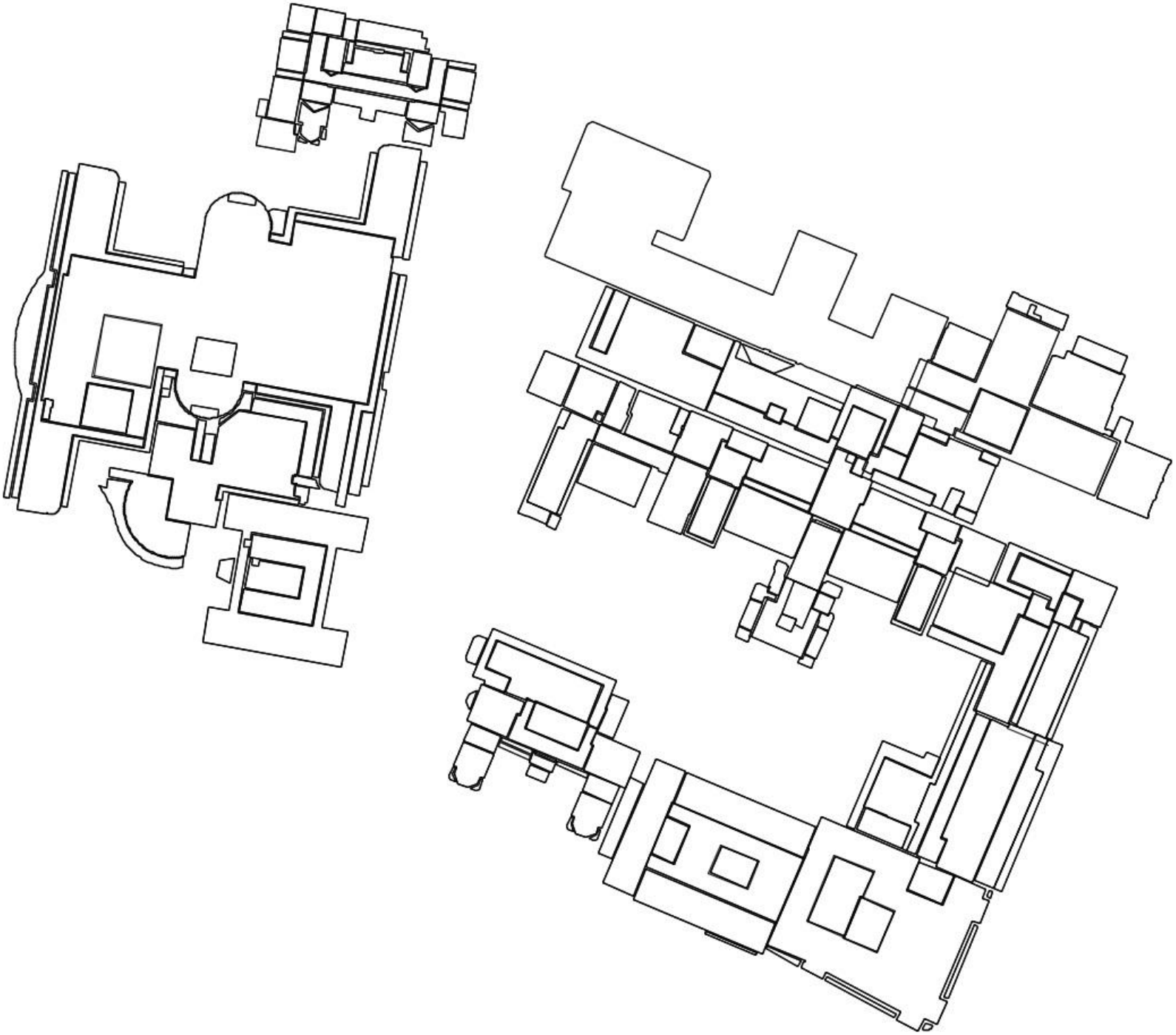
1 – Failed or exceeded its anticipated service life; roofing system is above clinical space.
2 – Failed or exceeded its anticipated service life; roofing system is above mechanical or administrative space.
3 – Approaching the end of its service life; roofing system is above clinical space.
4 – Approaching the end of its service life; roofing system is above mechanical or administrative space.
5 – Less than 10 year old roofing system with no signs of failure.

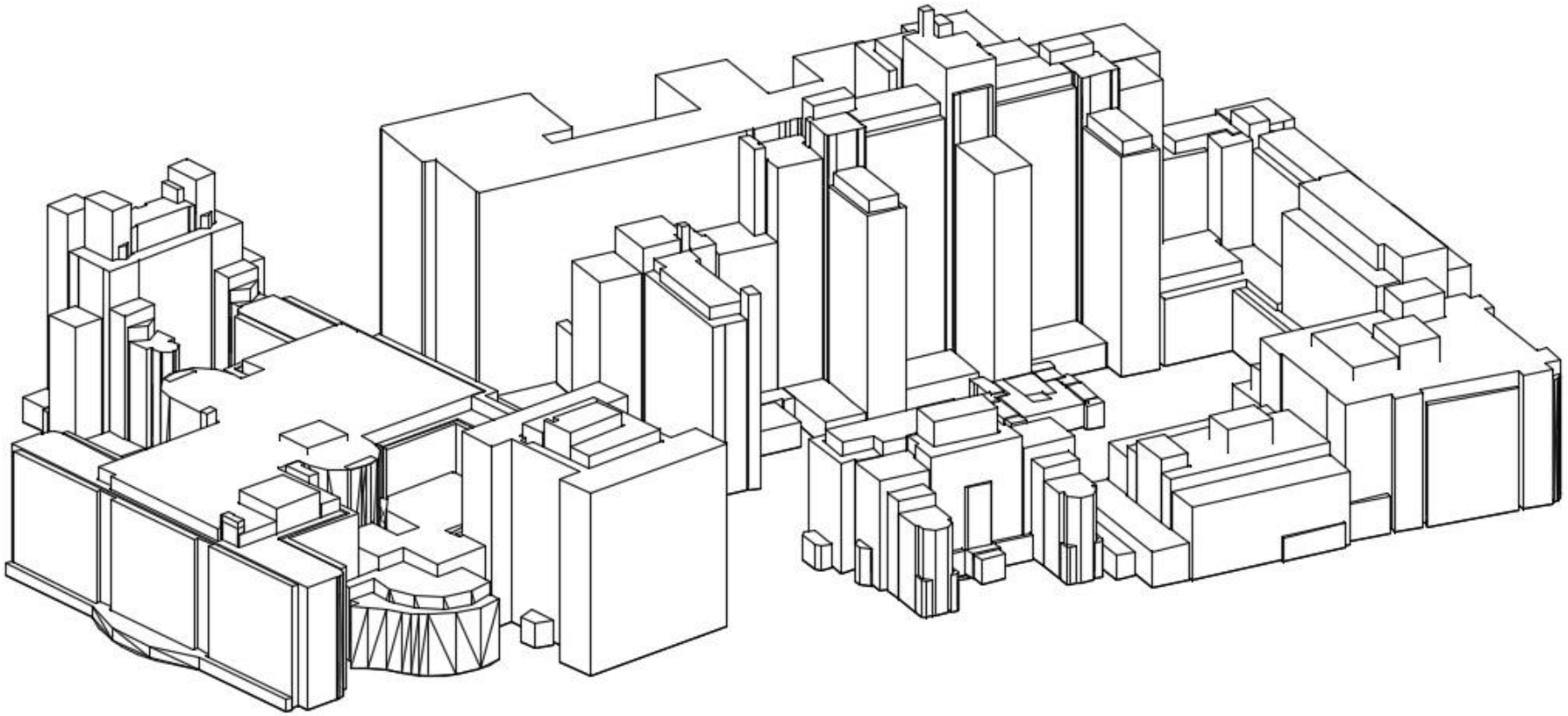
Report ID: General Roof Assessment
Print Date: 12/12/2014

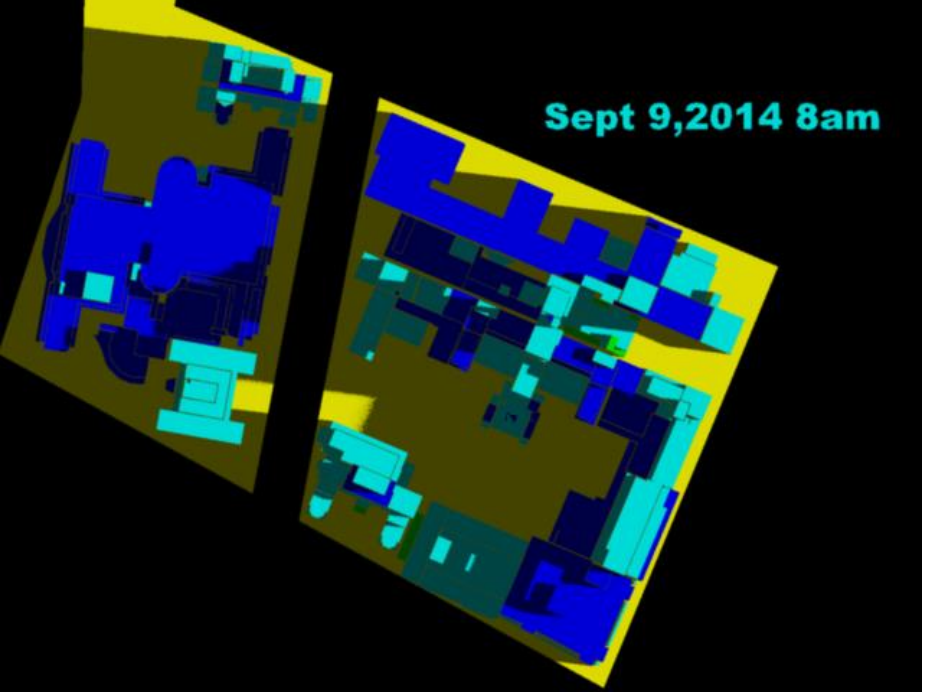
05052: NY Presbyterian Roof Survey

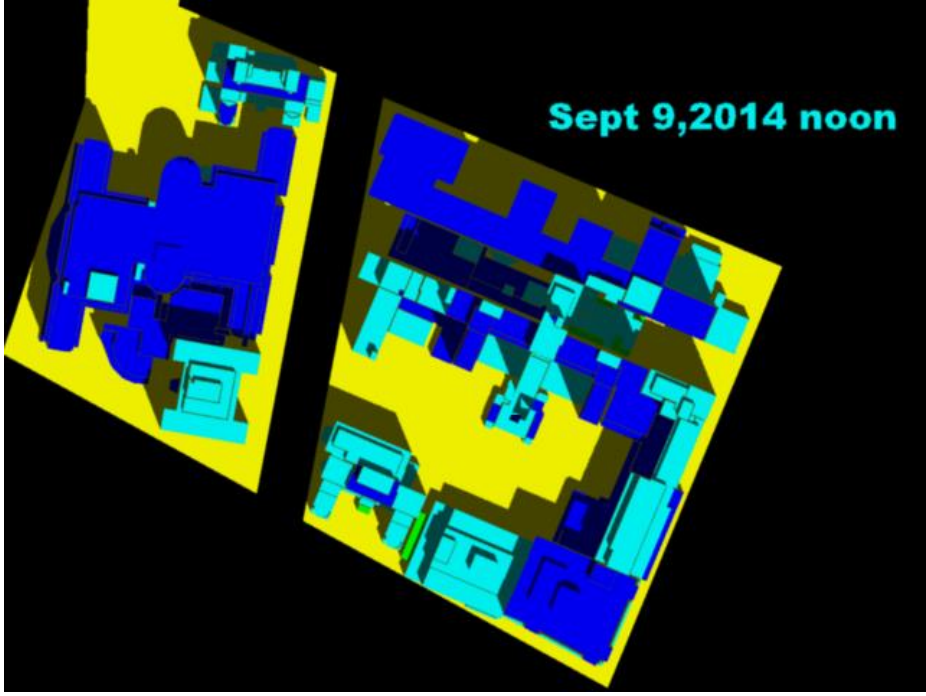
Investigation - Urban Campus

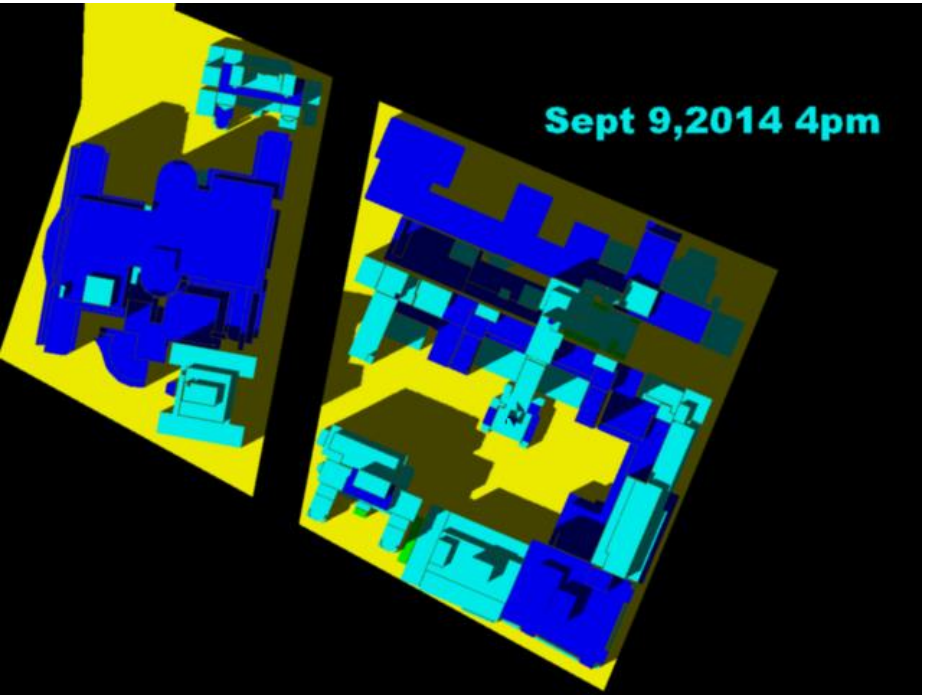


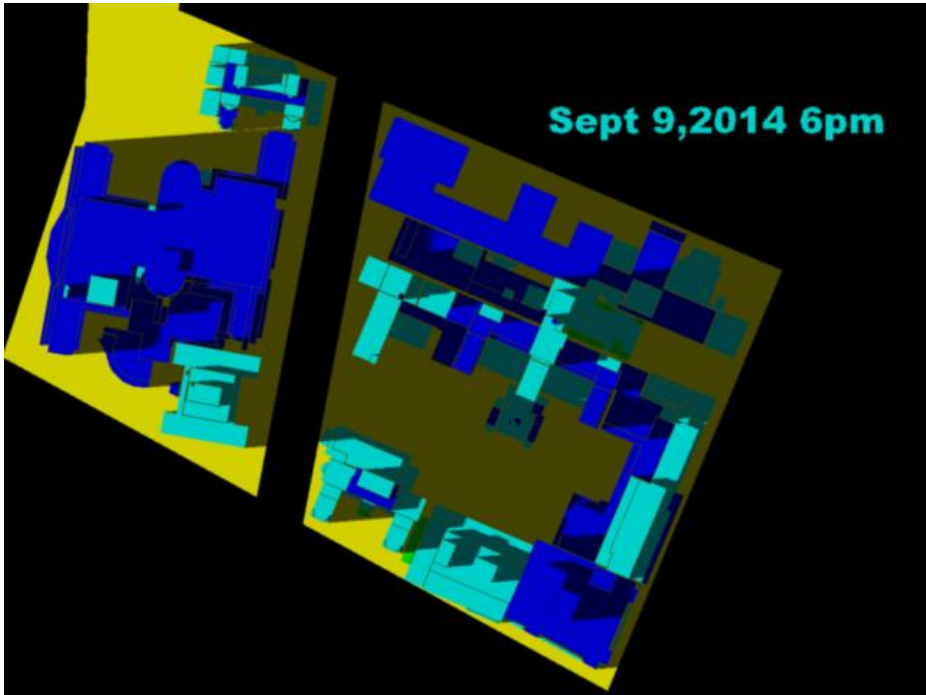


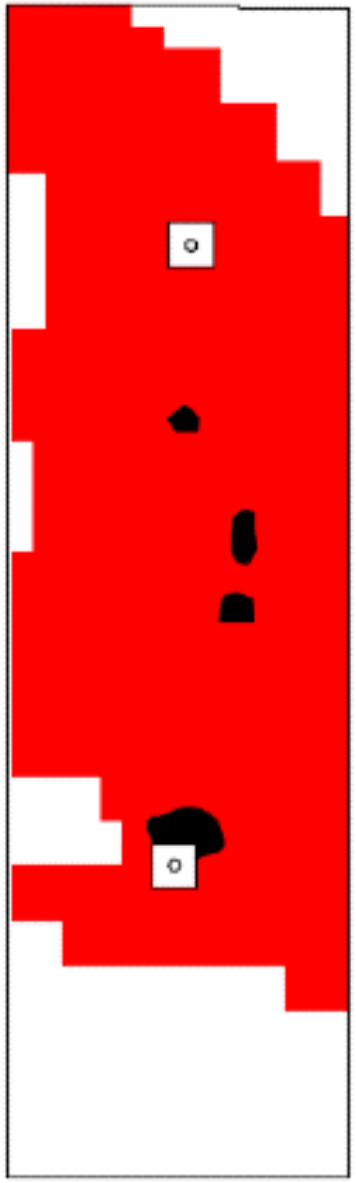


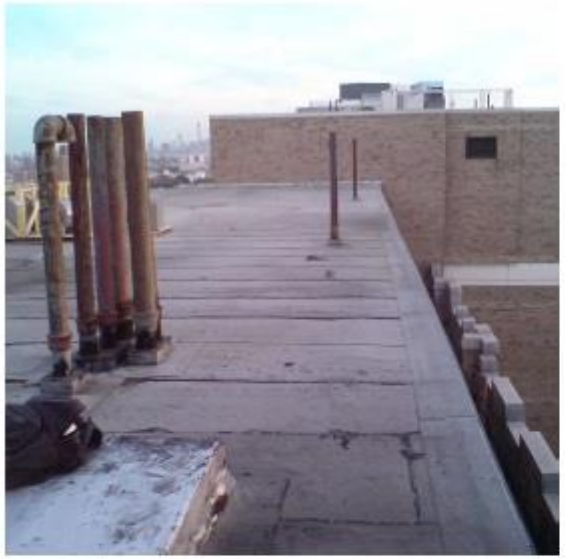

Sept 9,2014 8am

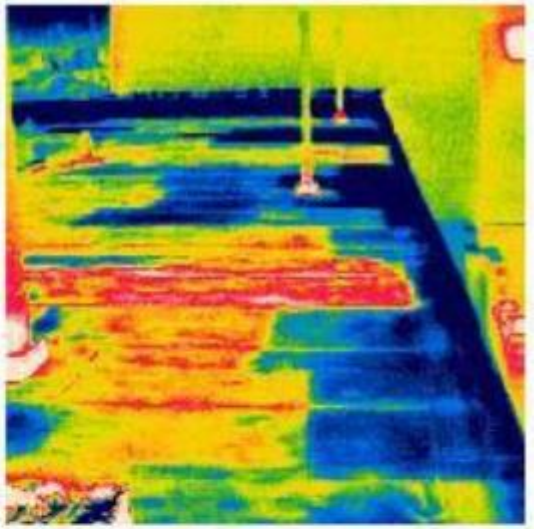

Sept 9,2014 noon

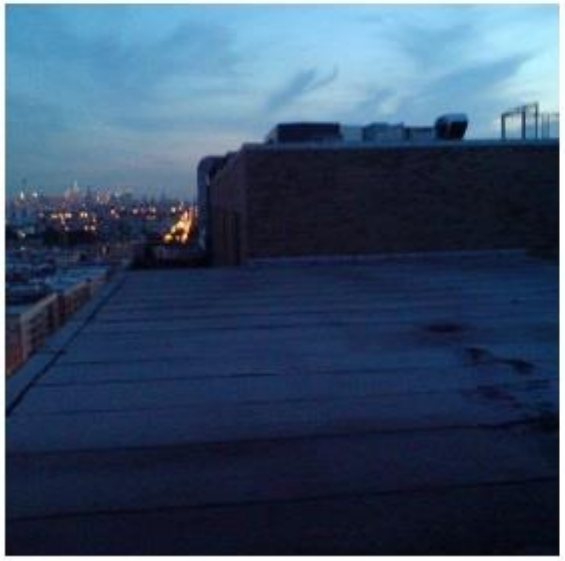

Sept 9,2014 4pm

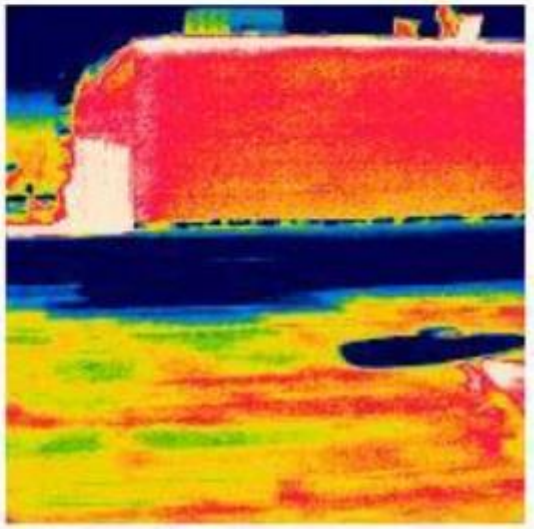

Sept 9,2014 6pm











This concludes our presentation on High-Rise Roofing and Waterproofinng

Thank You….
...Questions?

SUPERSTRUCTURES
+ ENGINEERS ARCHITECTS

www.superstructures.com

info@superstructures.com