NEW JERSEY EXECUTIVE STATEHOUSE

SUMMARY LETTER

25 JANUARY 2017

A. PROJECT OVERVIEW

In January 2013, **H2L2** Architects and Planners - now **NELSON** – in association with **Preservation Design Partnership, LLC** [**PDP**] were selected to provide architectural and engineering services for the Restoration of the Exterior Building Envelope of the New Jersey Executive State House [**NJESH / DPMC Project No A 1150.00**].

In addition to Nelson and PDP, the team included the following key consultants:

- Silman: Structural Engineering
- Loring: Mechanical / Electrical / Plumbing Engineering
- AON: Code Analysis and Fire Protection Engineering
- [AON is now trading as Jensen Hughes]
- International Consultants Inc [ICI]

The Nelson / PDP team undertook a detailed program of building assessments, non-destructive evaluation [NDE], destructive examination, probing and analytical testing to understand the condition of the building envelope and validate the assumptions contained in the Request for Proposal, issued by DPMC on July 10, 2012.

The findings included the following:

a. Advanced deterioration was noted in several areas of the building. The deterioration raised concerns regarding life safety and preservation of valuable historic building fabric, both exterior and interior.

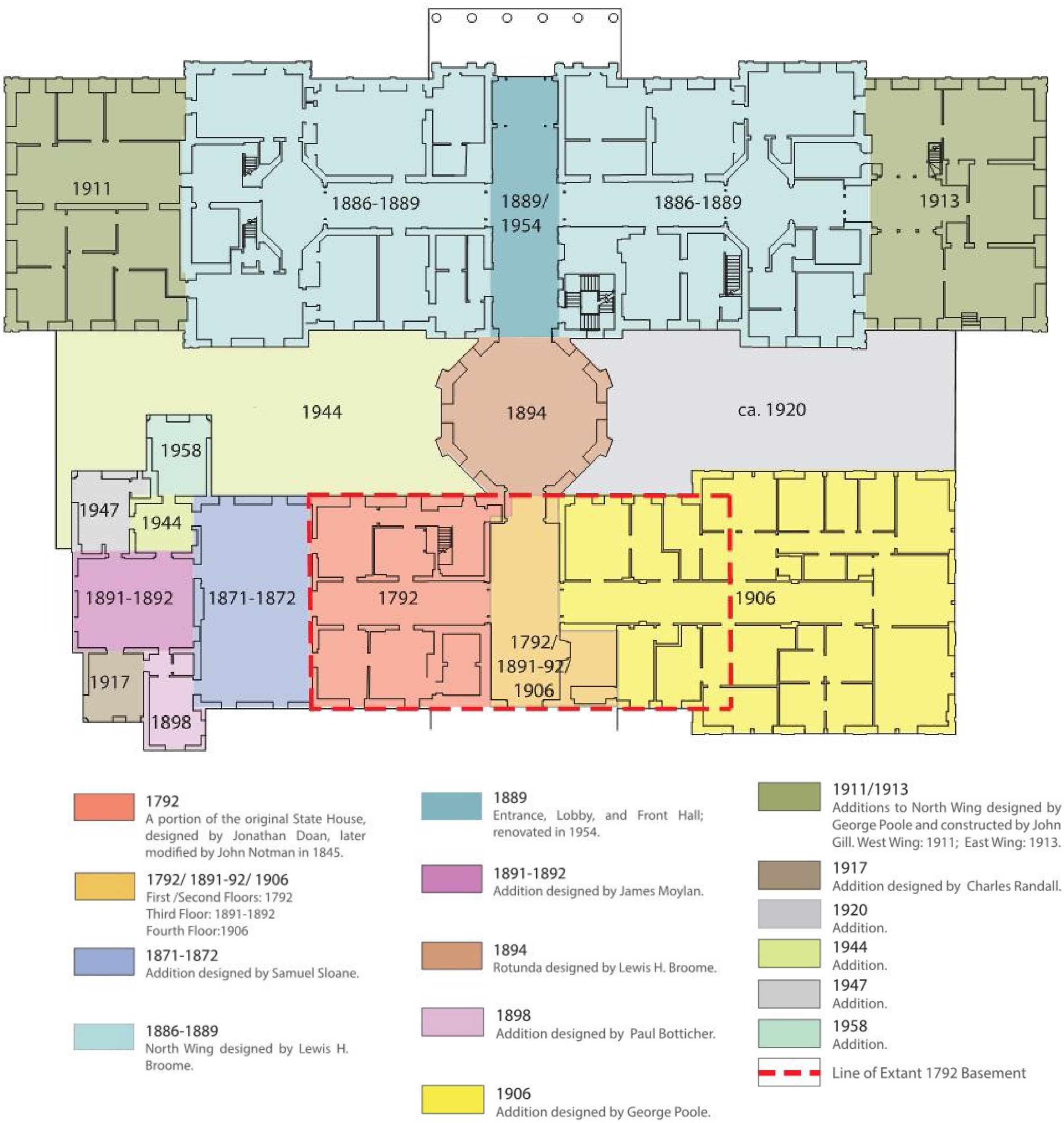
b. The restoration and repair needs of the exterior building envelope, the required construction logistics and the sequence of implementation, along with the directive that the construction work would be undertaken while the building remains occupied and fully operational, resulted in a construction cost that far exceeded the available funds.

At the conclusion of the Design Development Phase of the project [November 12, 2013 Draft Submission], the project was placed on hold, until further decisions were made by the State of New Jersey.

Since then, interim / “bridging” repairs are being undertaken to place a “band-aid” addressing the worst conditions today, until permanent repairs are authorized. These interventions do not provide any long term value, other than managing current risks. A limited, project-scope comparison of the findings from 2013 and 2015 can be found in the March 31, 2015 NJESH Emergency Repairs Report.

B. OVERVIEW OF FINDINGS

The NJESH was constructed, expanded and developed over 15 building campaigns from 1792 to 1958. It contains the oldest and most historic sections of the State House. The following diagram delineates the construction sequence of the ESH.



Based on information received from DPMC, while specific localized repairs have been made over the years, there has been no comprehensive renovation of the entire building, either exterior or interior, in over 60 years.

C. INTERIM REPAIRS

The Interim Repairs were organized into two projects:

a. Project 1:

Project 1 is currently underway and approaching completion. The work includes:

- Removal of Exterior Fire Stairs 1 and 2 and replacement with a new interim stair tower at the East Lightwell. This is an interim measure and the stairs will be removed when a comprehensive code compliance and evacuation plan is in place as part of a comprehensive renovation of the building.
- Exterior Stairs 3 and 4 are being shored, until a comprehensive renovation is undertaken.
- Cornice stabilization at the SE Wing.
- Localized stucco repairs and stabilization

Fire Escape 1.

Fire Escape 2.

New Temporary Single Fire Escape.

b. Project 2:

Project 2 is expected to commence and be completed in 2017. The proposed work will include the following items:

- Removal of eleven historic window sashes at risk of falling out of the frames. Currently, they are held in place with duct tape and clips. The historic windows will be safely stored and will be restored when the comprehensive renovation of the building is undertaken. Interim repairs will be made and temporary units will be installed in the window opening, until permanent repairs are made.

Existing Window.

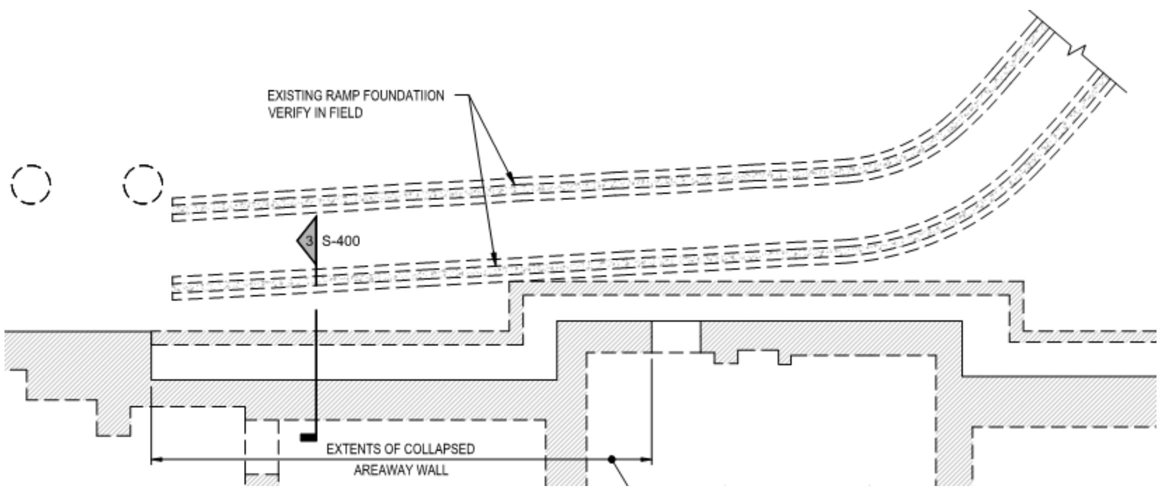
Cracks at Governor's Suite Offices.

- The office additions next to the Governor's Office were constructed in 1944, 1947 and 1958. Our survey confirmed that the walls of these additions bear solely on the roof structure and do not align with the structural beams and columns below but are supported on the concrete roof joists. The existing concrete joists were not designed for this additional load. The observed cracking of the masonry is a reflection of several issues, including:

  a. Water infiltration from the roof and roof parapet
  b. Water infiltration at cracks in masonry wall
  c. Poor masonry work of the wall construction
  d. Deflection of the lightwell roof joists due to loading
  e. Deflection of the lightwell roof joists due to long term concrete creep. Creep is deflection under sustained load where long term pressure on the concrete can make it change shape.

Shoring will be installed to provide a short term solution until a permanent structural repair is made.

- The decorative urns and the chimneys along the main roof of the front section of the ESH will be carefully dismantled and safely stored to be restored and reinstalled when the comprehensive renovation of the building is undertaken.
- The basement areaways of the north section of the building, several of which have collapsed, will be stabilized. These areaway walls support the soil that is to the north of the walls, the sidewalk slab on grade to the north of the walls, and the handicapped accessibility ramps. The extent of the collapsed areaway wall is located to the east of the north building entrance. A partial plan of this area is shown below. The collapsed section of areaway supports and is directly behind landscaping and is not readily accessible to the public. The collapse appears to have been caused by the undermining of the existing footing by the ramp foundation that was installed adjacent. The areaway walls themselves are suffering deterioration from their age and lack of maintenance.



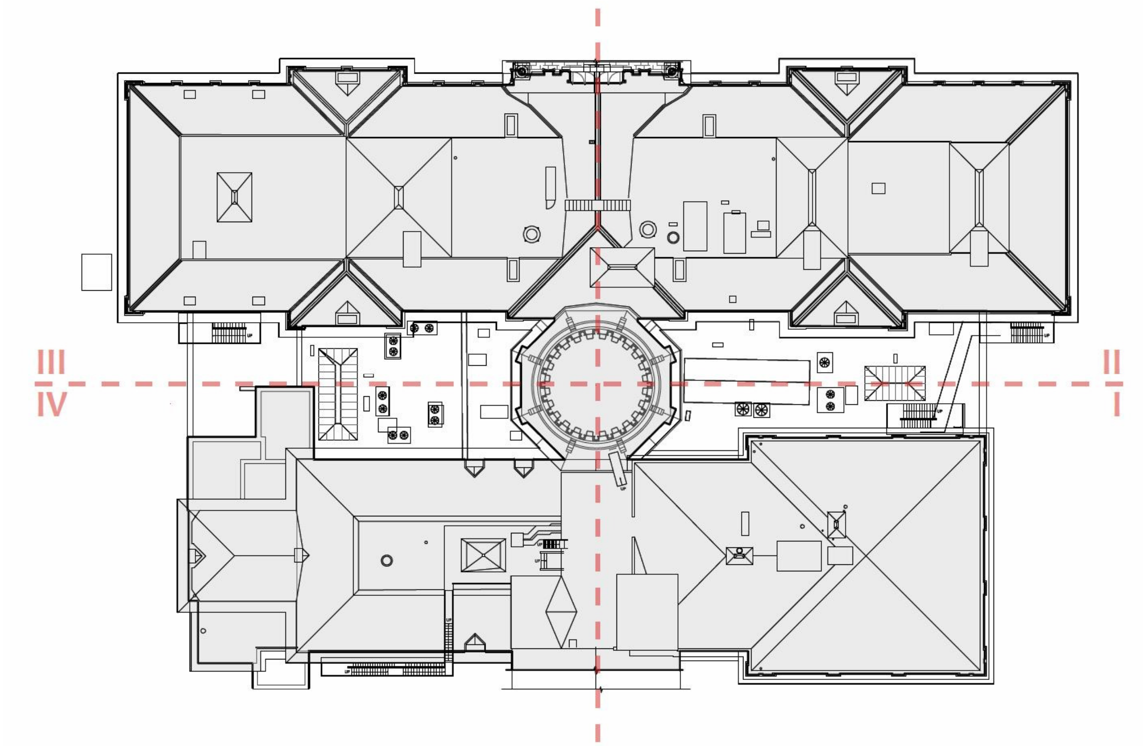
Extents of collapsed areaway wall

It is important to note that at the conclusion of Projects 1 and 2, approximately $3 million will have been spent to undertake these temporary measures, none of which will create any long term value.

This work is limited to management of present and known risks without addressing the on-going deterioration throughout the entire building.

D. BUILDING ASSESSMENT - EXTERIOR

While the ESH was constructed over multiple building campaigns, its organization is simple and straightforward. Its plan is an "H", creating four quadrants, with the historic Dome and Rotunda occupying the center of the "H".



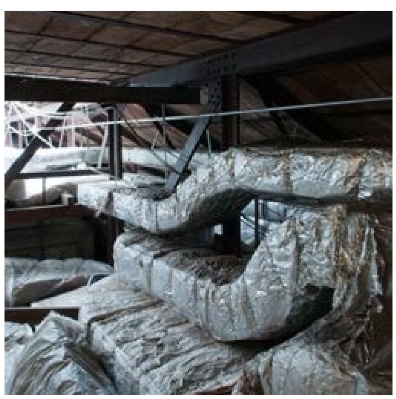
Starting with the top of the building, the following items need to be addressed on the exterior of the building:

1. **Historic Chimneys:**
   The mortar of the historic chimneys has deteriorated and disintegrated to total loss. The structural integrity of those elements is highly questionable. Under Project 2, the chimneys will be disassembled and the stones will be safely stored. A temporary roof will be installed over the openings. Under the comprehensive renovation, the chimneys will be reassembled and their structural integrity will be restored.

2. **Historic Urns on Front Pediment:**
   The same issues and approach as in the chimneys is followed for the historic urns.

3. **Skylights:**
   All skylights have severely deteriorated and corroded. Inappropriate mechanical interventions have further compromised the architectural integrity of the skylights and impacted the historic laylights

below. The skylights have far exceeded their safe and useful life and must be replaced with new assemblies, which will likely be stronger and heavier than the existing units.
[Note: The skylights were originally intended to provide natural light in the two monumental spaces at the east and west ends of the north part of the third floor. These highly decorative and historic spaces are still in place, in need of restoration.]
Before new skylights are installed, the existing trusses will require reinforcement to support the heavier assemblies, as well as to comply with contemporary code-requirements for snow and wind loading.



4. **Upper Roofs / North Section:**
The roof and cornices of the north section of the building are in need of total replacement and comprehensive repairs of the substrates. Significant water infiltration has taken place and buckets have been placed in several locations to collect the water.

5. **North Attic:**

In addition to the issues associated with water infiltration, the attic is an area of significant risk. HVAC ducts have been placed throughout the attic without a logic and / or a plan, as individual projects were undertaken over the last 60 years. In addition, the presence of combustible materials - remnants of past building campaigns, i.e. old roofs, etc. - represent a significant life safety risk since there are is no automatic sprinkler system providing full coverage throughout the building.

6. **Cornices:**

All cornices throughout the building require both surface and structural repairs. This is a particularly vulnerable area of the building that requires extensive repairs and intervention. The Southeast wing cornices present the most advanced deterioration and decay.

7. **Lower Roofs [Southeast and southwest wings]:**
   Comprehensive repairs and replacement are also needed for these roofs.
   [Note: While the Governor's Wing roof is in relatively good condition having been replaced approximately 15 years ago, repairs are needed along edges and gutters.].

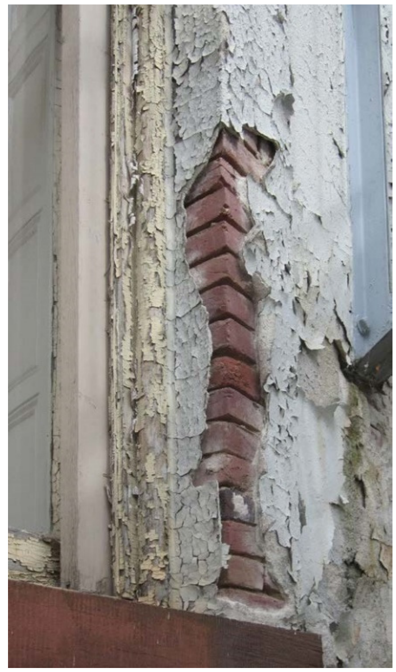
8. **Lightwell Roof Systems:**
   The east and west lightwells require complete replacement of the existing roofs. The issues associated with this work are as follows:
   - The roofs house several rooftop heating and air conditioning units serving several areas of the ESH. Any work associated with these roofs will require that these systems are "lifted", remain operational during construction and are reinstalled in the same locations.
   - Concrete core testing indicated that the existing concrete slabs have experienced some carbonation. Carbonation results from exposure to air and moisture and can spread over time. This causes the steel reinforcement to become more susceptible to corrosion, which can impact the slab capacity for supporting loads. [It is important to note that the slabs are already under-designed and they do not meet current code mandated load requirements]
   - Finally, since lightwell structures were an "afterthought' when they were constructed in 1920 and 1944, they were placed within the available dimensional allowances in relationship to the historic window sills, which do not allow for proper flashing and transitions. Replacing the roofing systems without addressing this issue will not address the water infiltration on a long term basis.

East Lightwell.

9. **Failed Stucco and Masonry Repairs:**

The building assessments indicated that:

- There is extensive stucco failure throughout the building. In addition, the exposed brick masonry has lost its mortar, allowing water to infiltrate throughout the building.
- The failed stucco should be removed carefully until sound stucco is found and brick masonry repairs should be made.



10. **Window Lintels:**

Several lintels throughout the building present severe deterioration, cracking and in some cases movement. Expensive repairs are required to correct this condition.

11. **Windows:**
All windows of the building require extensive repairs, restoration, weather protection and restoration of frames.

12. **Hazardous Materials:**
Hazardous materials were found in several areas of the building, both exterior and interior. On the exterior, hazardous materials were found in:
    - Roofing substrates and flashing
    - Parapet copings
    - Glazing compound
    - Caulk, etc.

In conclusion, the entire exterior of the building requires extensive repairs and restoration to manage risk associated with both life safety – i.e. to avoid failures that can have life safety implications, such as building pieces falling off – as well as loss of valuable and irreplaceable historic building fabric.

Performing this work while the building is occupied is possible; however, it comes with a steep price associated with significant staging and sequence logistics costs, as well as disruptions of building operations, which can be minimized, but not totally avoided, by performing a significant portion of the work during off hours and at very high labor rates.

E. BUILDING ASSESSMENT – INTERIOR

The observations regarding the interior of the building can be organized in the following categories:

- Code Compliance
- Security
- Accessibility
- Space Use

1. **Code Compliance**
An assessment of the ESH and its existing primary fire protection and life safety features was conducted to:

    - Identify the primary building occupant fire safety risk exposure created by noncompliant building conditions
    - Determine a strategy to evaluate occupant fire safety and identify improvements that meet the project stakeholders fire safety and risk management objectives.

    Since the building is an historic structure, strict compliance with the building code might not be appropriate or reasonable; therefore, fire safety goals and risk management objectives should be established to measure success.

The goals and objectives for the ESH should be the following:

- Protection of life
- Protection of historic resources
- Protection of contents

2. **Applicable Codes and Standards**

The applicable codes, as adopted by the State of New Jersey to which this assessment would be performed, include the following:

- 2015 New Jersey Building Code [NJBC]
  Adopts and amends the 2015 International Building Code [IBC]
- 2014 New Jersey Rehabilitation Code [NJRC]

These codes are prescriptive requirements and do not provide a framework for evaluating noncompliant building features like those found at the ESH.

Accordingly, **NFPA 914, Code for Fire Protection of Historic Structures / 2015 Edition** would also be applied. NFPA 914 provides the requisite framework for applying a performance-based approach of evaluating occupant fire safety and risk. NFPA 914 also provides guidance for determining improvement strategies for historic structures.

3. **Fire Protection and Life Safety Feature: Fire Containment and Compartmentalization**

The building was constructed in different phases and consists primarily of noncombustible construction, mostly of masonry, steel and concrete. The exterior walls are masonry load-bearing walls, and the building has a primarily steel frame.

As indicated earlier in this summary document, there are some small portions of the building that still have original construction from 1792 with wood framing in the attic and exposed heavy timbers in the ceiling of office space on the third floor. These areas are limited and represent less than 10% of the building.

The building is comprised of four stories above grade and a basement. Several unprotected floor openings are located throughout the building. The Rotunda, located in the center of the building is a large, vertical floor opening providing connection between the First, Second, and Third Floors. Similarly, an open stair located at the south of the building adjacent to the connection the Legislative State House, connects the First, Second and Third Floors, with a smaller exit access stair connecting to the Fourth Floor.

The Fourth floor is not open to the Rotunda; however, there are multiple unprotected floor openings to the Third Floor, including an open exit access stair, as well as stairs between offices and storage on the Fourth Floor.

As such, the bulk of the ESH is considered devoid of any fire-rated compartmentation. The building, in general, is considered as a single volume space and single fire area.

4. **Fire Protection / Life Safety Systems**
The fire protection and life safety systems are limited to complete building area smoke detection and a fire alarm system throughout the building. Alarm indicating appliances consisting of strobes and horns are provided throughout the building. There is no emergency voice / alarm communication capability in the building. The building is not protected with an automatic fire suppression [sprinkler] system.

5. **Means of Egress**
The building's means of egress on Floors 2 through 3 consists of an interior enclosed exit stair located adjacent to the Rotunda and a horizontal exit into the Legislative State House building. Floor 4 is served by an interior exit access stair that discharges into the Floor 3 rotunda corridor. The interior enclosed exit stair discharges onto Floor 1 into the main corridor near the building's main entrance.

Four exterior fire escapes leading to three stairs are located in the East and West Lightwells supplementing the interior exit stairs serving Floors 2 through 4.

Occupants of the First Floor have access to three primary means of egress – the main entry at the north end of the building, and exterior doors located on both sides of the building at the south end just prior to the connection to the Legislative State House, as well as a horizontal exit to the Legislative State house. Some of the offices have private exterior doors but these were not considered in the means of egress.

The Basement has three main means of egress – a partially enclosed exit access stair located at the West Lightwell, the fire exit stair located adjacent to the Rotunda, and an exterior door located at the East Lightwell. It was also observed that some of the spaces within the basement had additional means of egress either via an open exit access stair to the First Floor or private exterior doors. However, access and use of these spaces is restricted.

6. **Non-Compliance Issues**
Issue: The openness and connectivity of all floors to the Rotunda and the open interior stairway on the First, Second, and Third Floors creates a single fire area. Openness between floors allows for natural smoke migration and potential fire spread especially since the building is not protected throughout with automatic fire sprinkler system. Enclosing the Rotunda or providing other passive fire protection features / fire resistance rated enclosure construction to meet the prescriptive requirements of the pertinent building codes, would negatively impact the building's architectural and historic integrity.

Risk Mitigation Strategy: Utilize NFPA 914 and a performance-based fire safety assessment to evaluate probable fire events and their impact to occupant fire safety and building preservation. NFPA 101, Life Safety Code, 2015 edition will be used as the basis for determining appropriate fire scenarios. NFPA 101 identifies eight fire scenarios that should be evaluated as part of a performance-based assessment to determine the building's response and identify fire safety measures to achieve the fire safety goals. The fire scenarios will include a malicious act intended to compromise the building's primary means of egress.

Computer fire modeling analysis to predict fire growth and spread, and smoke transport within the building would be used to determine the available safe egress time for occupant evacuation.

Occupant evacuation modeling analysis to identify the required safe egress time would be used to determine and identify potential fire risk mitigation strategies to safeguard the occupants for various fire scenarios.

Building fire safety improvements, fire safety sub-systems, and their contribution to mitigating occupant fire safety risk to be assessed in the performance-based analysis include:

- Automatic fire sprinkler systems
- Automatic smoke detection and alarm / notification / emergency communications
- Smoke management and control (passive and mechanical)
- Building physical security measures

Success will be achieved when it is demonstrated that the building's fire safety sub-systems can maintain tenable egress conditions for safe occupant evacuation.

Past experience indicates that the performance based code analysis can provide options that can lead to safe occupant evacuation without impacting the architectural and historic significance of this landmark building.

7. **Security**
There are several areas of vulnerability that need to be addressed. A comprehensive assessment and list of issues can be available upon request; however, given the sensitivity of this matter, this information has been withheld at the request of the State of New Jersey.

8. **Accessibility and Restroom Fixture Count Compliance**
There are several areas of the building that do not meet current accessibility standards. In addition, based on the existing and projected occupant sensible loads, additional restrooms are required for the existing and proposed occupant sensible loads, men / women ratios, as well as ADA compliance.

F. BUILDING SYSTEMS AND INFRASTRUCTURE

Heating, Ventilation and Air Conditioning [HVAC] - General Overview

There is no "system" per se in the ESH. The building is served by a number of HVAC units creating multiple heating and cooling zones. Various types of supplemental heating, ventilation, and air-conditioning components have been added including window air conditioners, split units, and electric baseboard heating.

The end result is an accumulation of equipment, ductwork, and piping distribution of varying sizes, types and ages, organized rather haphazardly into zones, installed over the course of the years in an effort to address localized deficiencies.

1. **Heating**
   The heating distribution system is antiquated. Underground steam lines from the central power house provide steam to the building. Main distribution lines run in a trench in the basement to a vertical distribution network, which is connected to the numerous cast iron radiators in the building.

   Note: Approximately 25 years ago, when the Legislative State House was renovated, the steam system was replaced with a four pipe heat and chilled water system. While the same service was brought into the Executive State House, it was not put in service since there was no comprehensive renovation of the building.

   The piping for this steam system and the majority of the radiators have not been retrofitted and / or replaced for several decades, possibly since their original installation.

   The radiator controls vary, with some units without any controls and others with pneumatic control valves that tie-in to thermostats. Three sensors in the State House operate the steam control valve located in the central powerhouse. If any of the sensors drop below a specific set point, the steam control valve is opened and steam is released to the building.

   In a number of office locations, supplemental electric wall heaters and electric baseboard heat have been installed with steam heat. Additional electric baseboard radiation and electric wall heaters have been added over the years to supplement inadequate heating in many areas. Heating is not provided in some non-habitable spaces like interior hallways and storage spaces.

   A significant portion of these components have reached and exceeded the end of their useful lives and, as needs arise, they are replaced "in kind". Many of these heating and air conditioning components, in addition to the unsightly conditions they create, are primary avenues of moisture penetration and deterioration.

   Multiple HVAC components are located throughout the building, creating "service zones". There are several areas of the building that have no heating, ventilation and air conditioning support.

2. **Existing Cooling Systems**
   In the 1960's, air conditioning was added in areas of the building. The majority of cooling is accomplished using roof mounted condenser units. Most of the roof mounted systems have reached and exceeded their useful lives. As each unit is no longer serviceable, it is replaced "in-kind".

3. **Existing Air Handling Units (AHU's)**
   In addition to the cooling that is provided via split system air conditioning units or by window air conditioning units, cooling is accomplished using ducted air handling units.

   AHU's distribute both conditioned air and outside ventilation air to their respective zones. These systems serve approximately 70% of the building. Approximately 50% of the existing HVAC units are undersized, some significantly. The majority of the undersized HVAC units are those located in the East or West Lightwells. The existing HVAC units do not have any energy saving features.

   All units installed before 2012 have exceeded their useful life.

4. **Existing Rooftop / Outdoor Equipment**
   There are a number of mechanical units installed on the roof of the lightwells. These units serve areas in the basement and first floor. Two units serve small areas of the east and west sides of the third floor; their paired units are located in the attic of the north wing.

   A packaged unit serving the west end of the Basement is located on grade on the west side of the North wing. Supply and return ductwork from this unit is routed on grade and punches into the building and above the basement ceiling. Miscellaneous condensers serving the North and South Wings are also located on grade at the north, northwest, and the south side of the State House.

5. **Existing Window Air Conditioning Units**
   There is a total of 56 window air conditioning units, with 61% located in the southeast quadrant of the building. The remaining 39% are located throughout the other three quadrants of the State House. Most of these window air conditioners supplement an existing forced air system; the remaining, primarily the first and third floors of the southeast quadrant, are the primary source of cooling.

   The window air conditioning units are major contributors to the deterioration of the building. Inappropriate methods of installation, uncontrolled condensation and vibrations have contributed to the deterioration of the historic windows and sash.

6. **Existing Outdoor Ventilation**
   Outdoor ventilation is inadequate. In theory, natural ventilation is provided by operable windows. Since most of them are not operable, practically speaking, there is no ventilation in several areas of the building. Additionally, there is no ventilation in the hallways and Rotunda on all floors.

7. **Existing Building Automation System [BAS]**
   The State House does not have a Central Building Automation System to control the different zones of heating and cooling throughout the building. There are only partial central controls and minimal local temperature controls, which are ineffective. As a result, a significant amount of energy is being wasted in the operation of the systems, in addition to not being able to achieve occupant comfort.

   The current arrangement results in the following:

   - Significant waste of energy
   - Decreased plant reliability and life;
   - Increased cost and time during maintenance due to limitations in equipment trouble shooting capabilities.
   - Regular emergency repairs and replacement costs that are significant

   This arrangement does not allow for any meaningful individual control of environmental conditions, and is a constant issue in the daily lives of the building occupants.

In conclusion, a completely new heating, ventilation and air conditioning system needs to be installed.

In addition to the HVAC infrastructure, the building is in need of the following:

- A new electrical system to replace the existing distribution and terminal devices that are antiquated and inadequate
- A new low voltage system that would include:
  - ✓ Tele data
  - ✓ Security
- Full coverage with a fully automatic fire suppression [sprinkler] system.

Simply put, the entire building systems infrastructure needs to be replaced with new that meet contemporary code requirements and building performance expectations.

This work cannot be done while the building is occupied. In addition, the exterior and the interior work need to be coordinated to address all issues in a comprehensive manner.

Undertaking a comprehensive renovation of the building, both exterior and exterior, would:

- ✓ Address the long standing life safety issues
- ✓ Manage risks at multiple levels
- ✓ Eliminate waste in energy costs, crisis management and regular repairs
- ✓ Protect and restore the architectural and historic integrity of the landmark structure
- ✓ Create a long term value that has been deferred for several decades