



# KINGSTON PUBLIC HOSPITAL

Structural Survey on Mary Seacole Ward

Done by:

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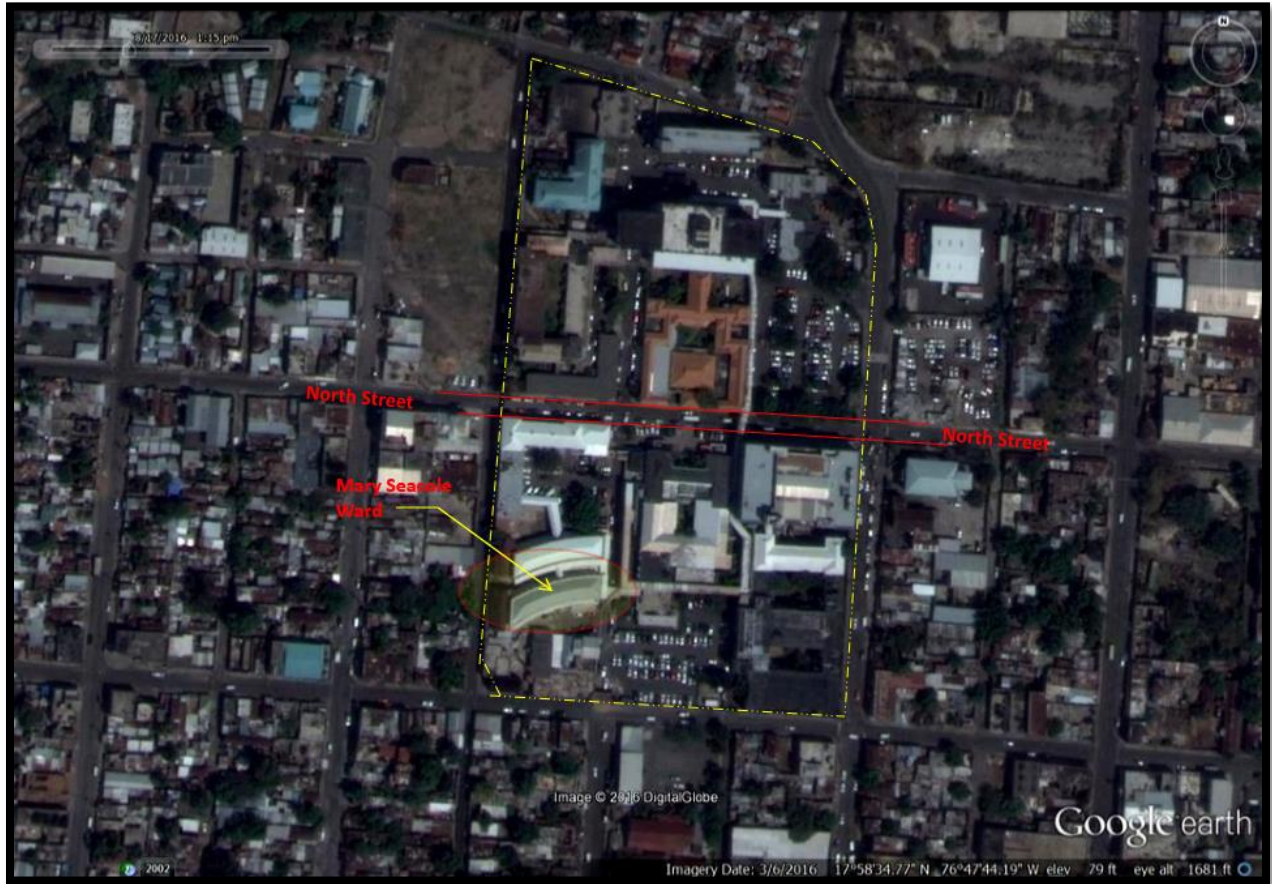
## **Introduction**

The Engineer of record (Dr. Nicolas McMorris) was requested by Mr. Richard Rannie acting on behalf of Kingston Public Hospital (KPH), to conduct a structural inspection of the Mary Seacole Ward located at Kinston Public Hospital, North Street Kingston.

The purpose of this inspection is to assess the structural integrity of the building and make recommendations on any structural repairs that can be done to increase structural integrity. The information used in the report was obtained through visual analysis and non-destructive testing. Focus was placed on the key structural components, namely: floor, roof, beams, columns and walls.

Due to the unavailability of blueprints for the building, a measured survey was done using a measuring tape to get an accurate representation of the building showing all the structural elements. Photographs were taken to use as reference.

## Site Location



Google Earth image showing location of Mary Seacole Ward

## **Property Information**

Name of Building: Mary Seacole Ward

Owner: Kingston Public Hospital

Address: North Street, Kingston

Date of Construction: N/A

## **Purpose of Report**

Survey undertaken to help property owners understand the condition of the property, recording risks and potential expenditure that may be required, enabling them to develop the appropriate remedial maintenance plans.

## Terms of Reference

### Scope of Works

- Perform a condition assessment of the property from a structural point of view.
- Identifying causes of past, or ongoing, deterioration.
- Identifying issues that need attention to prevent serious damage.
- Identifying things that need further enquiries to pre-empt problems in the future.
- Presenting sustainability and maintenance recommendations.

### Limitations

While conducting the survey, the team faced some level of difficulty which resulted in the following limitations.

- The survey was done using visual inspections of the material, thus the data obtained from the survey may not accurately represent the structural properties of the materials.
- Due to the age of the building, the pre-construction and as built drawings for the structure could not be located thus making it challenging to determine if a feature was built/renovated after original construction.

- Upon entering the building, it was observed that sections of the structure were painted and previous cracks have been filled. Due to the visible cosmetic improvements, it was assumed that some areas of concern may not have been seen.

## **Main Report**

### **Property Description:**

The Kingston Public Hospital is one of several health facilities across the island that facilitates many surgeries and treatments for patients. Thus, it was necessary to construct a facility to house the patients that are not fit to go home and need constant care by a doctor or nurse.

Due to the age of the building, detailed information about the structure (its construction and renovations) was difficult to find. The facility was constructed using a combination of concrete masonry blocks, steel reinforcement, wooden beams, drywall and brick.



## Method of Inspection

The survey was conducted on the 17<sup>th</sup> of July 2018 at midday by Dr. Nicolas McMorris (Civil Engineering programme leader at Mona School of Engineering) and Rickconie Johnson (student intern from Mona School of Engineering).

The tools used to conduct the survey include an 8m (26ft) measuring tape, a digital camera, pencils and a sheet of paper. The tasks to carry out included: visual inspection, recording data, taking pictures and measuring the dimensions of the building (interior and exterior). In addition, simple impact-echo tests was done to evaluate the materials.

Thorough observation of the environment above, below, beside and around each tasks were conducted to determine the possible cause of each failure/defect. After the defects were identified, photographs were taken to serve as reference for later analysis and to visually represent defects in the structural report.

It should be noted that an interview was conducted with the maintenance personnel to learn about the building's history and maintenance schedule.

## Building Assessment

### Roof

The building is a two story structure; Mary Seacole Ward is on the ground floor. The building has flat roof which slopes (less than 10 degrees) for water drainage as seen in figure 1 below. The roof spans 114 feet by 51 feet. The roof is made from timber beam and trusses to support the Roof loads. The first floor was also made from timber beams and trusses and is seen to be in a poor condition.



Figure 1. Showing the angled roof

## Drainage

Drainage systems were seen at the site, also rainwater is channelled from the roof which flows in man-made channels. Cracks were seen in the drainage structure which could result in water seeping under the building. All drains should be inspected, clean and repaired if necessary.



Figure 2. Water seeping into the cracks in the drain.

## Framework

The Mary Seacole Ward has an approximate base area of 5800 square feet. The framework of the building consists of Reinforce Concrete beams, Timber beams and Reinforce Concrete columns in a regular rectangular pattern as shown in the drawing on Page 19. There are noticeable deteriorations which could be a result based on age of the building.



Figure 3. Structural frame of external corridor

### Survey of Loading on the Building Structure

The loading on the building includes the dead loads from the roof including ceiling, light, MEP ect. The present live loads are the beds, the furniture and people. The Mary Seacole Ward accommodates up to an average of 40 people in a designated area, this includes patients, visitors, Nurses and Doctors.



Figure 4. Loading on building structure

### Classification of Defects



Location: Beam (exterior)

Type of defect: Cracks

Direction: N/a

Possible reason for failure: Cracks in concrete beams due to corrosion or insufficient concrete cover.

Recommendation:

- Remove any loose or unstable concrete.

Clean or smooth cut surface in preparation for:

- Sand blast rebar if exposed.
- Recast with fresh 3000psi concrete.



Location: Roof

Type of defect: Leakage (Spalling)

Direction: N/A

Type of defect: Water Damage and Cracks

Possible reason for failure: Water settles on top of concrete which may have a crack. Then it starts to penetrate and cause the concrete to deteriorate at the bottom.



Location: Beam (exterior)

Defect: Cracks

Direction: Horizontal

Reason of Failure: Cracks parallel to main steel are likely due to corrosion in beams.

The cause of this corrosion is also due to provision of insufficient reinforcement cover which leads to corrosion of main reinforcement.



Location: Beam (exterior)  
 Type of defect: Cracks  
 Direction: N/A  
 Possible reason for failure: Insufficient Cover  
 Recommendation:  
 • Remove any loose or unstable concrete.  
 Clean or smooth cut surface in preparation for:  
 • Sand blast rebar if exposed.  
 • Recast with fresh 3000psi concrete.



Location: Beam (exterior)  
 Type of defect: Exposed Rebar  
 Direction: N/A  
 Possible reason for failure: Poor construction methods or poor concrete quality.  
 Recommendation:  
 • Remove any loose or unstable concrete.  
 Clean or smooth cut surface in preparation for:  
 • Sand blast rebar if exposed.  
 • Recast with fresh 3000psi concrete.





Location: Columns (exterior)  
 Type of defect: Crack  
 Direction: Horizontal  
 Possible reason for failure: This column may have high enough bending to cause tensile forces in the outside face. This condition would produce horizontal cracks which would disappear on the inside face.  
 Recommendation: Observe six (6) month intervals.



Location: Column (exterior)  
 Type of defect: Spalling  
 Direction: Vertical  
 Possible reason for failure: This is the result of water entering concrete. It forces the surface to peel, pop out, or flake off. It's also known as flaking. This could also be as a result of poor construction.  
 Recommendation:

- Remove any loose or unstable concrete.

Clean or smooth cut surface in preparation for:

- Sand blast rebar if exposed.
- Recast with fresh 3000psi concrete.



Location: Column (interior)  
Type of defect: Splitting Cracks in Reinforced Concrete Column  
Direction: Vertical  
Recommendation: Observe at six (6) month intervals.



Location: Column (exterior)  
Type of defect: Exposed rebar.  
Direction: Horizontal  
Possible reason for failure: Inadequate cover.  
Recommendation:

- Remove any loose or unstable concrete.

Clean or smooth cut surface in preparation for:

- Sand blast rebar if exposed.
- Recast with fresh 3000psi concrete.

## Conclusion

The Mary Seacole Ward is approximately 60 years old and due to the test of time and other factors such as the weather, the building has significant cracks in beams and columns and as a result suffers from spalling cause by water damage. It was also observed that rebar in the concrete masonry suffered from corrosion due to exposure to the weather.

One of the biggest consequences of water damage for health is the growth of mold and fungi. When left in dry areas spores can lay dormant for decades and never cause a problem. However, when spores come into contact with water their growth is triggered. In the presence of water, mold spores can proliferate filling the affected area with unsightly and unhealthy mole growth and producing additional spores that begin to pollute the air.

It can be safely concluded that the failures observed at the Mary Seacole Ward is because of little to no maintenance over its lifespan. In this case, the defects pose a greater danger to patient's life than usual due to the vast numbers of visitors that come on a daily basis to check on family or friend. No imminent failure. However, several cosmetic and minor structural defects that need to be addressed urgently.

## Recommendations

### Mary Seacole Ward

- Repair and replace all faulty material that facilitate leakage
- Ensure that no other additional load is added to the structure (due to its age and the current failures observed)
- Clean and repair roof then add a waterproofing membrane to prevent further leakage
- Redo all defective concrete masonry works
- Conduct regular maintenance checks
- Inspect, clean and seal cracks for the drainage system

It is also recommended that

- The roof is to be refurbished as done on the ward adjacent to Mary Seacole Ward



Figure 5. Showing ward adjacent to Marry Seacole.

- The first floor of the building should be strengthened as occupants complain of “squeaking sounds” heard whenever they walk on it.