



# Hurricane Resistant Curtain Wall

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## Introduction

This report emphasizes the immense propensity Puerto Rico has to experience hurricane threats due to its geographic location and climate changes, and the necessity of building construction soundness to survive stronger natural disaster. This concept is known as resilient building design and construction. Resilient construction takes into consideration not what has happened before, like Hurricane Hugo and George, it goes beyond what happened with Hurricane Maria. This concept is extremely valuable for Puerto Rico because is located in the pathway of all Atlantic Ocean threats.

## Objectives

The main purpose of this research project is to demonstrate that the system analyzed is resistant and is a secure alternative to be used in areas exposed to hurricane threats. The hurricane resistant curtain wall that was installed resisted Hurricane Maria's impact demonstrating to be a resilient design and construction.

## Methodology

This project incorporates as principal methodology a literature review based on a case study of a fitness center constructed in The San Juan Hotel as part of the hotel renovation. This structure is a new three-story building made with concrete foundations, structural steel, and structural purlin. The first and second floor are surrounded with the StormWallXL™ Hurricane-Resistant Curtain Wall, as part of the building envelope. The location of this new facility is in the hotel backyard, in front of the Olympic Pool, approximately 110 ft from Isla Verde beach.

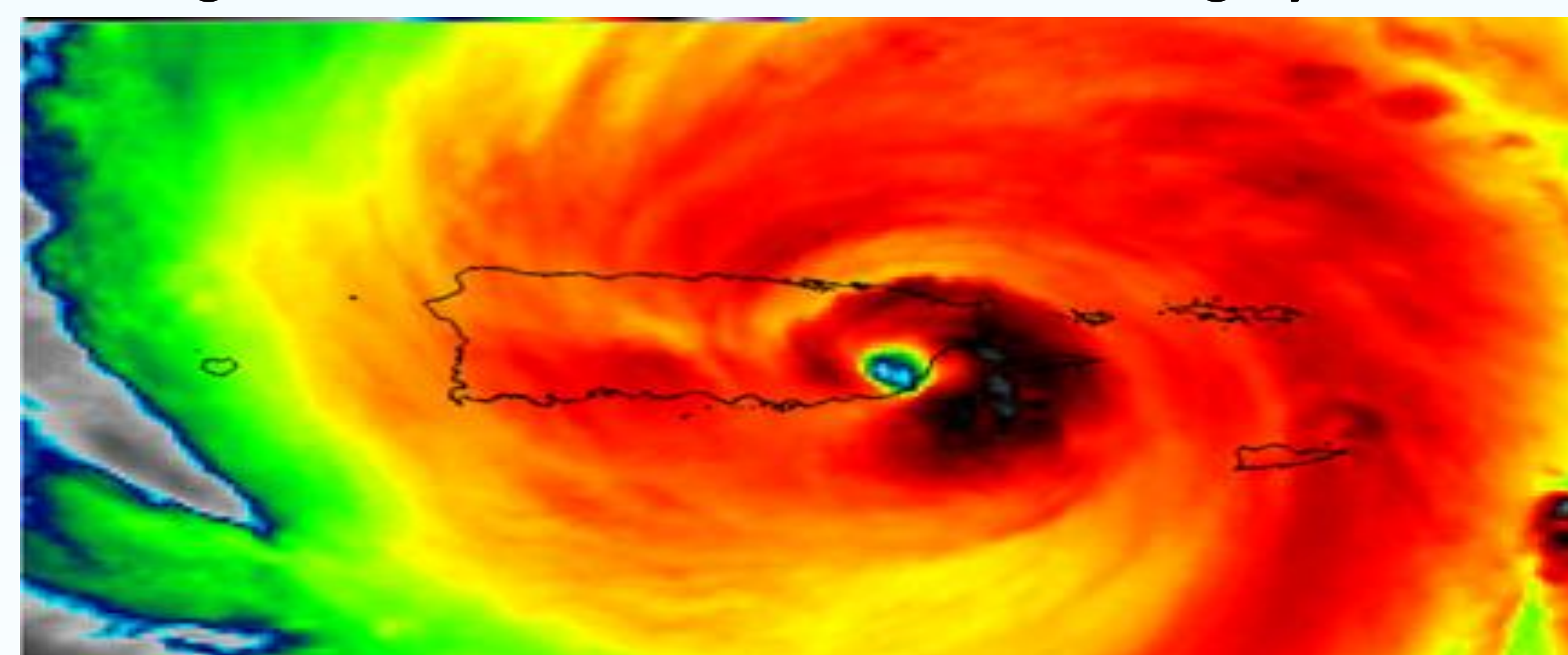


Figure No. 1  
Fitness Center  
Facilities

## Validation: Hurricane Maria's Impact

The construction of the fitness center finalized on May 2017 with the grand opening of the remodeled hotel. Four months later, on September 20, Hurricane Maria destroyed almost 80% of the renovated hotel, but the fitness center remained intact. The building envelope not only endured and resisted the hurricane's fury, but also protected all the interior facilities.

Figure No. 2 Hurricane Maria Satellite Imagery



Hurricane Maria, on Isla Verde Ave. Carolina, produced approximately 25 inches of rainfall, sustained winds of 155 mph and maximum wind gusts registered 175 mph up to 190 mph approximately. The maximum storm surge registered in this area was 2.35 ft above mean sea level. The San Juan buoy number 41053 reported on September 20, 2017 a significant wave height of 20 ft. The combined destructive power of storm surge and wave action from Maria produced extensive damage to buildings, homes, and roads along this avenue.

## Storm Wall XL Specification

Hurricane-Resistant Curtain Wall is designed to meet the most demanding performance requirements for areas exposed to hurricane and other severe weather. CR Laurence – U.S. Aluminum has introduced StormWallXL™ Hurricane-Resistant Curtain Wall. The curtain wall is engineered to provide steadfast protection against severe weather while meeting stringent building code requirements. It is NFRC-rated, has Florida Product Approval, Miami-Dade Certified (NOA), and is fully tested to ASTM and TAS Standards. This is an innovative system that meet unique regional requirements, presents a credentialed, impact-resistant glazing solution for coastal and vulnerable communities that completes a comprehensive product offering.



Figure No. 3  
Storm Wall XL System  
Assembly

## Analysis & Results

The San Juan Hotel remained closed a year and a half to complete all the repairs needed due to the damages caused by Hurricane Maria, after a major renovation investment. The fitness center was part of this renovation and was the only facility that was not affected by the disaster. This building resisted the hurricane's fury due to StormWallKL installed. It made the structure envelope strong enough to sustain winds beyond the design criteria of 145 mph. The performance obtained from this curtain wall system validated all the specifications and tests results obtained by the manufacturer.

## Conclusion

This achievement brings to mind the resilient building design. Resilient design is the ability to respond, absorb and recover from an event. A resilient structure is expected to be able to resist extreme events with minimal damages and functionality disruptions during and after the disaster. The product tested in this research complies with the resilient concept for extreme weather areas. This system provided a very well-sealed envelope to the building and adequate drainage solutions to the structure. In Puerto Rico, the resilient building design concept should be applied to all structures.

## References

1. "Drawings and Specification for facility design," CMA Architect & Engineers LLC, Guaynabo, PR, 2016.
2. StormWall XL – Manufacture Documents and Specification, C.R Laurence Co.
3. National Weather Service, "Major Hurricane Maria - September 20, 2017," National Weather Service. <https://www.weather.gov/sju/maria2017>.