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## Computational Mechanics Implementation of Performance Based Testing in Massive Concrete Structures

Gabriel Y. Riveros  
gyr4@msstate.edu

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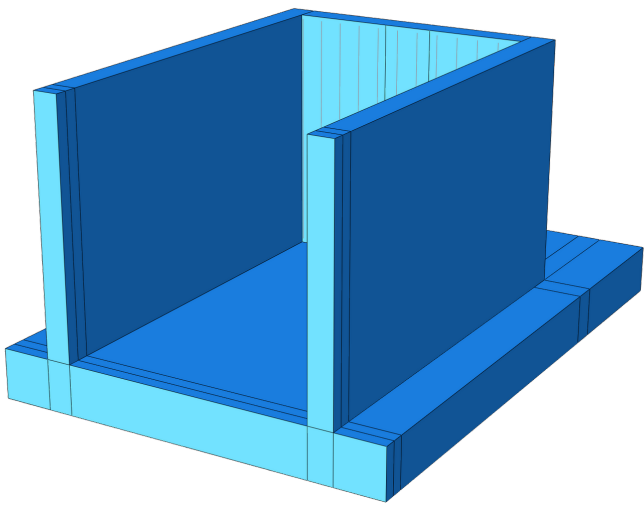
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# IDENTIFYING DAMAGE IN CONCRETE STRUCTURES USING PERFORMANCE BASED TESTING METHODS

GABRIEL Y. RIVEROS

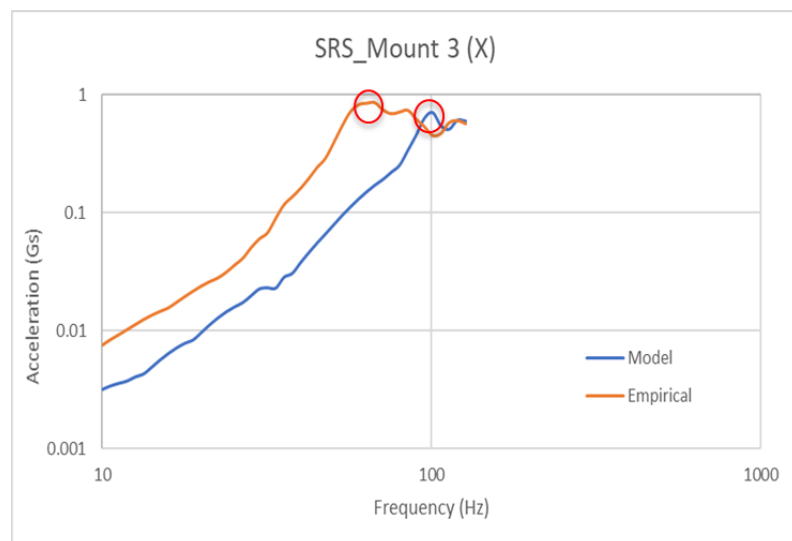


## 01 OBJECTIVE

To address the question regarding the performance of concrete structures that have been exposed to critical damage (i.e. cracking). A 3-D numerical model study of the structural performance was conducted to identify the changes in the natural frequency of the structure.

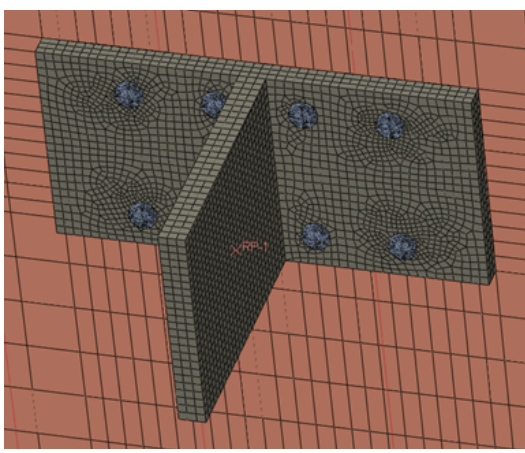
## 02 MODEL CALIBRATION

Shock Response Spectrum (SRS) analyses (typically used in the Aerospace industry) was used to validate the model using acceleration time history to obtain the structures natural frequency and identify the changes in stiffness. .



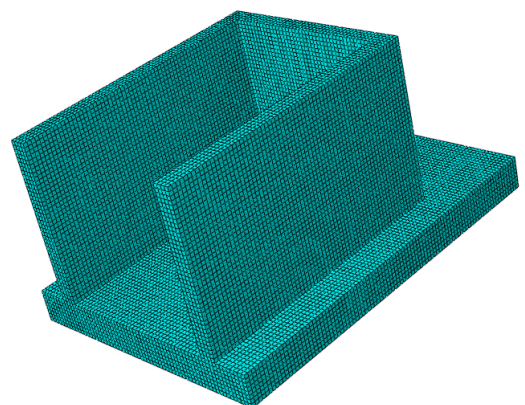
## 03 BOUNDARY CONDITIONS AND LOADINGS

The base of the foundation was assigned a fixed boundary condition and restrained from moving in all directions. A gravity load was applied to the entire structure as a static load. An impulse load was applied to the bracket using a simplified pulse load.



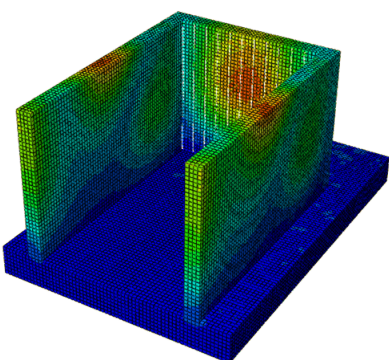
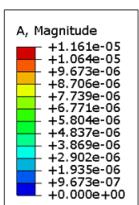
## 04 MESH

The concrete used linear hexahedral elements of type C3D8R and the rebar used linear line elements of B31. The model contained a total of 171,237 nodes and 156,456 elements. Several partitions were made in the model for the mesh to be applied efficiently and effectively.



## 05 DYNAMIC ANALYSIS RESULTS

The dynamic results were completed for one second at an interval of 0.001 seconds. The modal frequency were dominated on the walls. The maximum accelerations were observed in the walls.



## 06 STRUCTURAL RESPONSES

Using the probe tool, the acceleration with respect to time was plotted for a specific node to compare differences in the structures behavior.

