APPLIED SCIENCE INTERNATIONAL SUCCESS STORY

# PYNE GOULD CORPORATION BUILDING

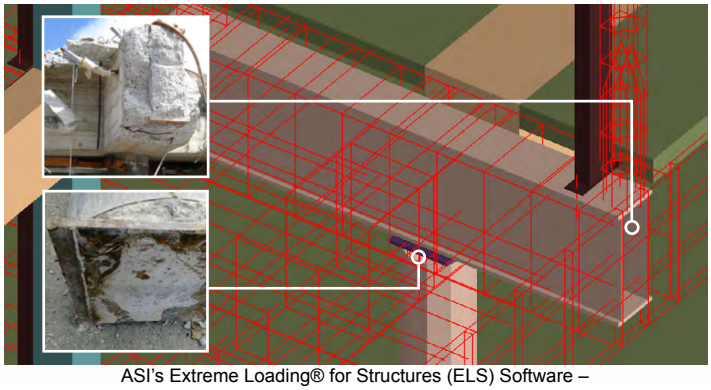
INACHUS FP7 Project, Task 3.2, Italy, 2016

## *Forensic analysis of the Pyne Gould Building, Christchurch, New Zealand*

The Pyne Gould Corporation (PGC) Building at 231-233 Cambridge Terrace, Christchurch, New Zealand collapsed during the Magnitude 6.3 earthquake on Tuesday, February 22nd, 2011. The building was designed in 1963 as a reinforced concrete frame with an internal shear core. The structure had undergone two previous earthquakes, however no significant structural damage was observed after the earthquakes on September 4th, 2010 or the magnitude 4.9 earthquake on December 26th, 2010. earthquake. During the earthquake on February 22nd, the building suffered a catastrophic progressive collapse, in which 18 people lost their lives.

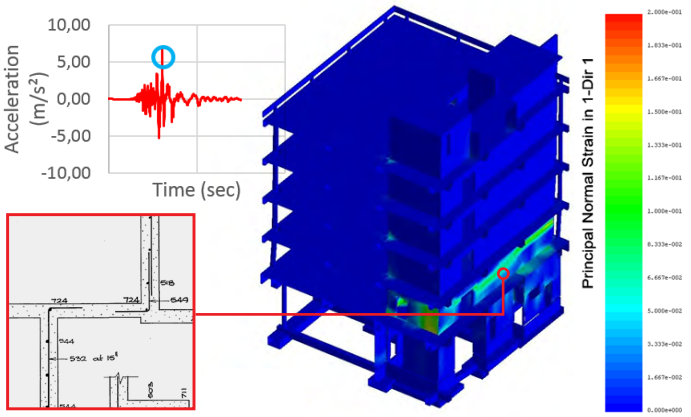

Pyne Gould Building photographed from the South-East elevation after the 4 September 2011 earthquake

ASI Europe, as partner of the INACHUS FP7 Project, performed a forensic study of the Pyne Gould Building in order to validate the capabilities of the Applied Element Method (AEM) implemented in Extreme Loading ® for Structures (ELS) software to accurately model dynamic collapse behavior. The non-linear dynamic analysis was performed with a time-history records of the actual 2011 earthquake to most accurately predict the behavior of the structure during the collapse. ELS software allows the user to easily build the model with real details such as all reinforcement details, steel plate connections, steel jackets in columns, rebar overlap, downpipe holes, and all the post-occupancy alterations like additional steel props and new openings.



ASI's Extreme Loading® for Structures (ELS) Software – Reinforcement details implemented in AEM model

The analysis highlighted that the collapse occurred due to compressive buckling failure in the shear core. The failure can be attributed to the presence of a discontinuity in the shear core.




ELS plot of the Principal Normal Strain in Direction-1 immediately after the earthqauke peak

The final shape of the PGC building at the end of the ELS analysis shows a good correlation with the actual shape of the collapsed building documented by photographs after the earthquake.

ELS Results compared to a picture of the PGC building after the collapse

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