CIVIL AND ENVIRONMENTAL ENGINEERING

AMMIN/DISEG - Improving the reliability of load-bearing glass members under dynamic loadings

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Context of the research activity	Reliability of glass structural elements in buildings: mechanical response of load-bearing members subjected to dynamic loads such as crowd loads, impacts and blasts, wind pressure, and earthquake excitation.
Objectives	Load-bearing glass members in buildings take the form of columns, beams, fins, plates and stand-alone complex assemblies, where glass interacts with other construction materials, such as unitized curtain walls. An intrinsic high flexibility and a low energy dissipation capacity make their design very challenging in the framework of current design approaches and Standards, which highly rely on ductility. Considering these peculiarities, the mechanical response of glass members in dynamic regime, such as under the action of crowd loads, impacts and blasts, wind pressure, and earthquake excitation, is of particular concern. Among others, main issues are the interaction between dynamics and elastic instabilities, the detrimental interplay of repeated loadings with stress corrosion, the post-fracture behaviour, the limited tendency to develop dissipation mechanisms. In addition, the dynamic response of laminated glass, the most used in the structural field, is further complicated by a combination of various aspects such as the sensitivity of common interlayers to vibration frequency, and the ageing and damage phenomena, like the presence of delamination. The target of the present project is to analyse the mechanical response of load-bearing glass members in dynamic regime aiming at identifying design strategies to improve their reliability. The main focus is on facade elements, where glass is most widely used today. The facade is probably the most complex component of a building, the result of a design that takes into account the numerous and different functions performed: aesthetic, structural, thermal and acoustic insulation, protection from atmospheric agents, etc. Their economic value and environmental impact are very high and, therefore, maintaining the design performances even after serious load events is of paramount importance. The research is conducted with a multidisciplinary approach, which allows

	the structural issue to be addressed taking into account requirements for the other functions and the most recent technologies used to achieve them. A combination of analytical, numerical and experimental methods will be exploited.

Skills and competencies for the development of the activity	Background in architecture or civil engineering or building engineering. The candidate should have knowledge of structural mechanics, hands-on experience in the finite element method, skills in architectural and structural design of glass elements and/or facades units, basic knowledge of building physics.