NUMERICAL SIMULATIONS FOR THE DESIGN OF REAL STRUCTURES

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This research line encompasses the application of advanced computational tools for the analysis and design of real structures. The current research activities address a wide range of issues, including:

- linear and nonlinear structural analysis of thin walled beams, with emphasis for cold-formed steel members, in which local phenomena such as section distortion require the use of beam models with enriched kinematics or three-dimensional shell models;
- numerical strategies for the design and verification of flexible falling rock barriers: passive protection measures for risk mitigation of potentially unstable rock slopes. Developed dynamic models are simple and produce an accurate prediction of all the relevant parameters for barrier design, such as anchorage forces, net panel elongations and residual heights;
- modelling of ceramic sanitary ware deformations during the production process;
- analysis of the effects of permanent ground deformation on underground and above ground pipe networks;
- analysis of waveguides dispersive properties;
- models to evaluate the influence of the deformability of a cracked pressurized pipe on leakage, with a focus on losses due to longitudinal splits. The purpose is to evaluate the opening area (leak area), while keeping the model as simple as possible;
- nonlinear analysis of masonry structures;
- modelling of tiles debonding due to shrinkage: substrate shrinkage or temperature variations can produce differential elongation/shortening between tiles and substrate. Consequently the tiling failure like mode I mechanism can occur.

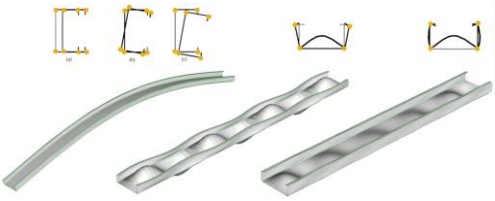

Fig. 1. Global, distortional and local buckling of a thin-walled beam (de Miranda).

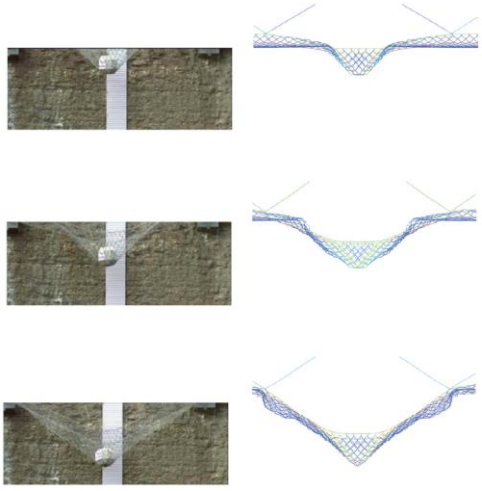

Fig. 2. Numerical simulation of the concrete block impact on a rockfall barrier (Gentilini).

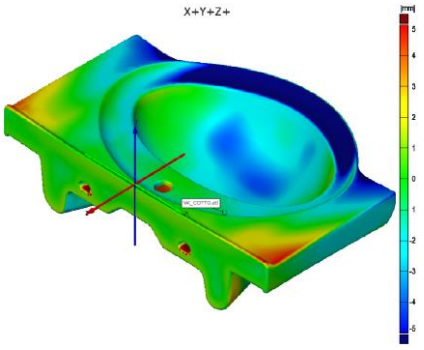

Fig. 3. Modelling of ceramic sanitary wares (Patruno).

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RESEARCH PROJECTS

Smart Manufacturing 2020 (2015-2016), Cluster Tecnologici Nazionali (www.fabbricaintelligente.it). UniBO coordinator: S. de Miranda.

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