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## A HOMOGENIZATION TECHNIQUE APPLIED TO PERIODIC BUILDINGS

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## Abstract

Simplified models for the assessment of the dynamic response of buildings could be as accurate as many sophisticated models while reducing computational cost and providing reliable results. This work aims to present a dynamic characterization of periodic and reticulated structures (e.g. common reinforced concrete buildings made of identical stories) by implementing a homogenization technique. Two different scales are involved in this analysis; global and local scale. The "global scale" corresponds to the scale of the structure and the "local scale" corresponds to the scale of a story. The homogenization technique consists in describing the global behavior of the structure with an "equivalent beam" model according to the following process:

(i) Static analysis of only a story for the determination of the mechanical properties of the global model,

(ii) Dynamic analysis of the equivalent beam, which is a 1D analytical model,

(iii) Application of the macroscopic deformation on the model of a story in order to compute the internal forces of the structural elements.

The analytical formulation of the equivalent beam was rigorously developed in previous studies considering idealized buildings made of the repetition of a single frame. This formulation is a generalized form of the classical Euler-Bernoulli and Timoshenko descriptions adding a new mechanism: the inner bending of vertical elements. The present study investigates how these results can be extended to more complex structures. All the analytical results of this homogenization technique are verified using numerical models built in the finite element code Cast3m.

**Keywords:** Homogenization method, Periodic Structures, Characterization of Dynamic Response.