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Foreword

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Infill walls have attracted the attention of many researchers since the early 1950's, and much work has been undertaken to study their behavior and interaction with the surrounding frames. In addition, efforts have been made to utilize infill walls as a means of producing economic designs by reducing the sizes of the members of the bounding frames.

A large number of researchers have studied the behavior of infilled frames. It is evident through their studies that infill walls can provide both an economic and practical means for the lateral stability of framed structures and a viable alternative for retrofitting existing structures to resist seismic, wind, and blast loads. Despite this, there is reluctance from the engineering community to use this structural system widely and consider infill walls as structural elements due, firstly, to lack of knowledge concerning the composite behavior of infilled frames, and secondly, due to lack of practical methods for the stiffness and strength prediction.

Therefore, although the subject of infilled frames has been studied for more than sixty years, there are still no definitive answers either about their behavior and interaction with the bounding frame or about the estimation of their stiffness and strength. Some problems that make it difficult for practicing engineers to use infill walls as structural elements are the inherent nonlinearity, and degradability of infill walls, as well as their high degree of variability. The fact that infill walls exhibit completely different in-plane and out-of-plane behavior makes the problem even more difficult to tackle. The problem becomes even more complex when openings are present in infills that change their overall behavior, which is the rule rather than the exception. Consequently, two schools of thought in seismic resistant design have been formulated concerning infill walls. In the first, it is required that infills be effectively isolated structurally from the structural system, so that their structural effects can justifiably and correctly be neglected and in the second, infill walls are considered to be tightly placed and therefore, their interaction with the structural system to resist the effects of all kinds of excitations should be properly considered in the design, detailing and construction. Taking into consideration that a main principle for seismic-resistant design is: avoid unnecessary masses, and, if a mass is necessary, use it structurally to resist seismic effects, then the second philosophy offers more conceptual and practical advantages. Thus, if walls and partitions are needed and the economical material is masonry or concrete, attempts should be made to use these infills as structural elements. The proper use of infill elements can be of great practical value in the design of new or in the retrofitting of existing structures.

The large number of parameters that affect their behavior, the variability, nonlinearity and anisotropy of their properties, the large number of failure modes, which can be in-plane or out-of-plane and are affected by the presence of openings, the interaction with the bounding frame, which affects the failure mode of the overall system, as well as many other factors, makes the numerical modeling of these systems very difficult. Both macro-modeling and micro-modeling have been used to simulate the linear and nonlinear response of this complex system, in an effort to encapsulate its behavior and provide a tool for the analysis and design of such systems. Nevertheless, as yet, there is no definitive answer to the modeling of such systems, since the macro-models fail to follow the nonlinear sequence of failure of infilled frames and can therefore be used for obtaining upper or lower bound solutions, while the micro-models require too many parameters to be set, which are not always known, and are very computationally demanding to be used for everyday engineering work.

The above discussion reveals the difficulties associated with this problem and the need for more research to answer these long standing questions. Therefore, I consider timely the Special Issue on Infilled Frame Structures that the Open Construction & Building Technology Journal is publishing. The Co-Editor-in-Chief Panagiotis Asteris who has a significant contribution to the subject matter, has made an excellent effort in bringing together a group of distinguished scholars and researchers from several institutions in nine different countries located in three continents to present their work that covers the various aspects of infilled frames. I am certain that the present volume will lead to further insights, new research and developments in the subject area, thereby providing a valuable source of knowledge for students, researchers and practicing processionals.

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