

Historical buildings sharing structural walls

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In historic centers of urban nuclei the structures are not simply in contact but they also share the adjacent walls in such a manner that the structural boundary of a building complex rather than a single building is extremely difficult to be distinguished. It was the rule and not the exception during the erection of a building between existing ones, only the front and rear structural walls to be built without any bond with the existing lateral ones. A more or less same condition is observed when an existing building is expanded, even not in urban nuclei. The newer part is consisted of only three perimeter structural walls resulted in a U shape- plan, the fourth wall being the existing adjacent one. In the present study results of FEM analysis in terms of displacements are presented for the following two cases examined:

a) In first case the addition of a part in contact to an existing water mill is studied. Three alternatives are adopted for the modeling of the structure:

a1) The adjacent structural walls are bonded; it results a unique building

a2) The adjacent structural walls are in contact; it results two separate buildings

a3) The arrangement of the structural walls of the new building is of U shape in plan.

Two analysis methods were applied, lateral force method and modal analysis taking into consideration either mode superposition or fundamental mode. The maximum displacement of each wall depends on both the configuration and modeling and varies according to the method of analysis as well.

b) In the second case, the erection of a building between the existing lateral ones sharing the adjacent structural walls is studied. The lateral force analyses performed were considered:

b1) only the building into consideration

b2) the building into consideration along with both the adjacent ones

b3) the building into consideration along with the adjacent left one

b4) the building into consideration along with the adjacent right one

The difference of calculated displacements is up to 500% among the cases examined and depends on the stiffness of the adjacent buildings relative to the considered one.

The conclusions of these comparative studies are useful to understand that in cases similar to the ones described herein results in terms of displacements are strongly influenced not only from the existence of the adjacent buildings but also by the degree of cooperation and the modeling too.