POLITECNICO DI TORINO
FIRST SCHOOL OF ARCHITECTURE
Master of Science in Architecture Construction City
Honors theses

High acoustic performances joints in the residential
technological analysis | installation techniques | alternative

by Matteo Pellis
Tutors: Arianna Astolfi
Co-tutors: Gianfranco Cavaglià

The problem

Acoustic comfort is a psychophysical condition of well-being threatened by traffic noise, industrial or construction sites, technical systems, users themselves. The harmful effects of this form of pollution are not limited to a decrease in hearing ability: relapses can occur on the nervous system, on the sleep cycle, on the circulatory, respiratory and digestive systems. Moreover may occur decline of attention and concentration, anxiety and irritability and induced accidents.

The causes

A cause of discomfort can be found in the twentieth century diffusion of framed structures, with relative weakening of the building envelope, lighter and with wide windows.

The current situation is characterized by semi-finished products and commodities with exceptional features: insulating glass, sound-absorbing materials and vibro-damping flexible joints. But if new buildings should respect the law with these technologies, in test phase they prove to be much less efficient. The reasons are a superficial nodes design, the deficiency of information about the union of the technical parts and the inadequate preparation of the operators involved in the construction.

The deficiencies are not repaired by the Italian regulatory system, often derived from the English light-buildings and frequently promoted by producers, who tend to legitimize the use of their products, deeply different from the traditional Italian buildings.

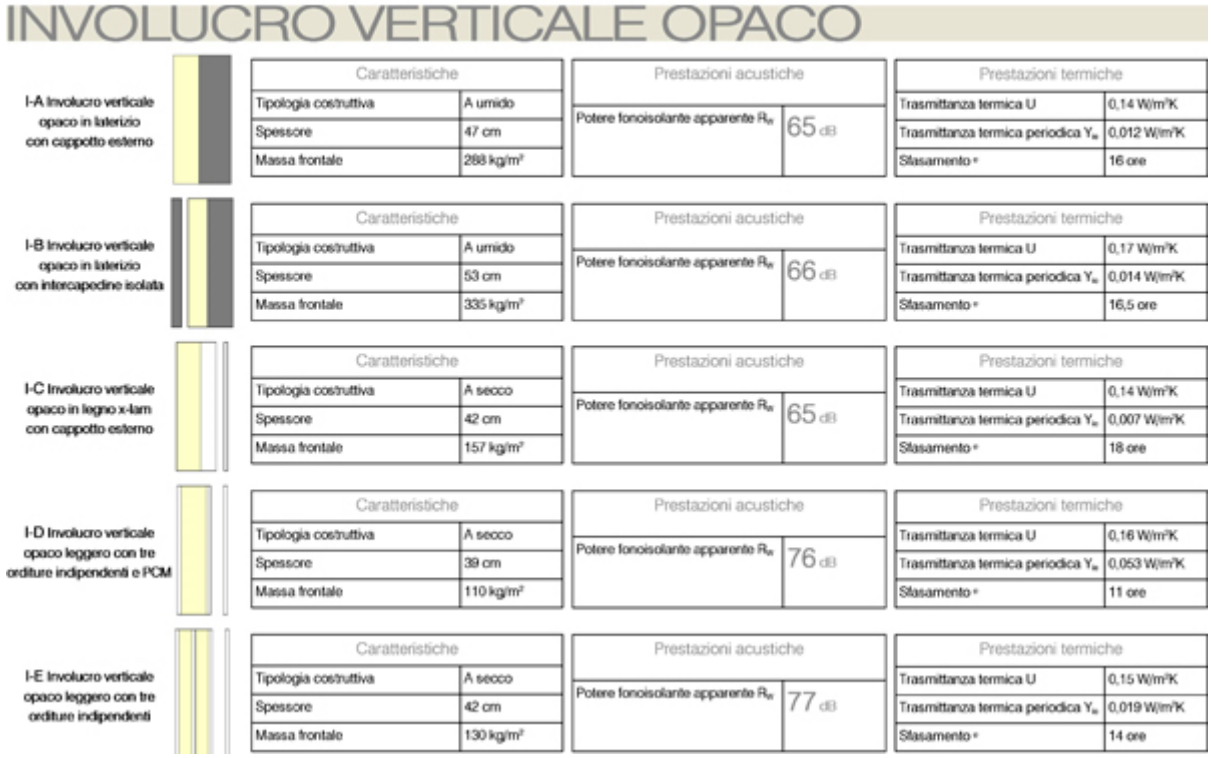
Purpose and structure of the work

The main goal of the work is to ensure the potential performances of a series of technical elements without performance falls during the installation. This research intends to study a series of alternatives to support designers, construction companies and all the figures involved in the construction process, helping them to choose with sensibleness.

The components

Some technical elements with high acoustic and thermal performances are chosen among wet (heavy) and dry (light) construction systems. Each component is described in every part and analyzed in the installation techniques. A performance analysis completes the description.

immagine 1 - esempi di componenti: involucro verticale opaco

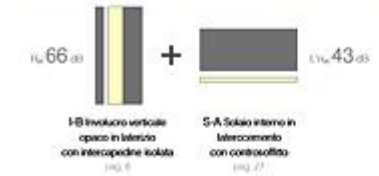


The joints

The components are combined between them to generate the joints, described graphically by technical drawings in plan and section and by axonometric projections about the techniques of installation. This process, which simulates the execution of parts of the building, allows to identify limits and potentials of the components, the mode of interaction and interference and the technical problems related to the construction.

immagine 2 - esempi di nodi: involucro verticale opaco + solaio interno

NODO I-B + S-A



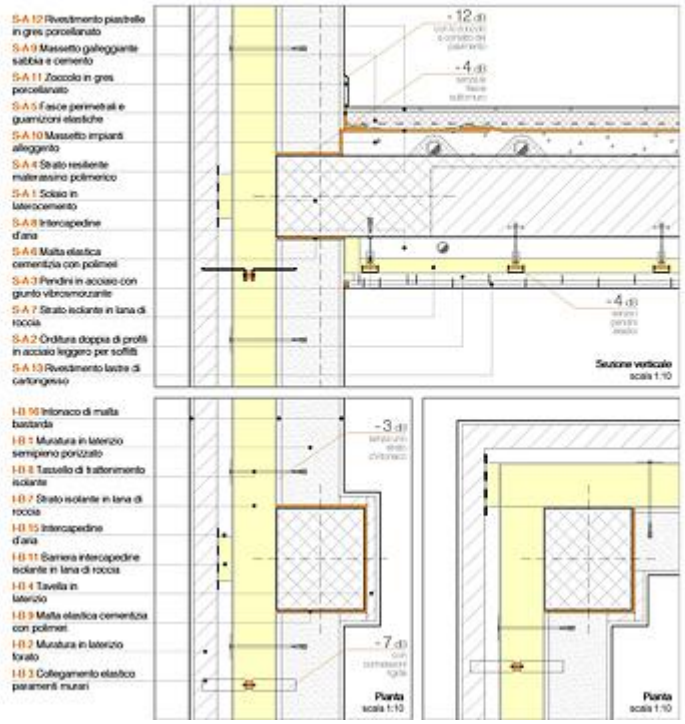
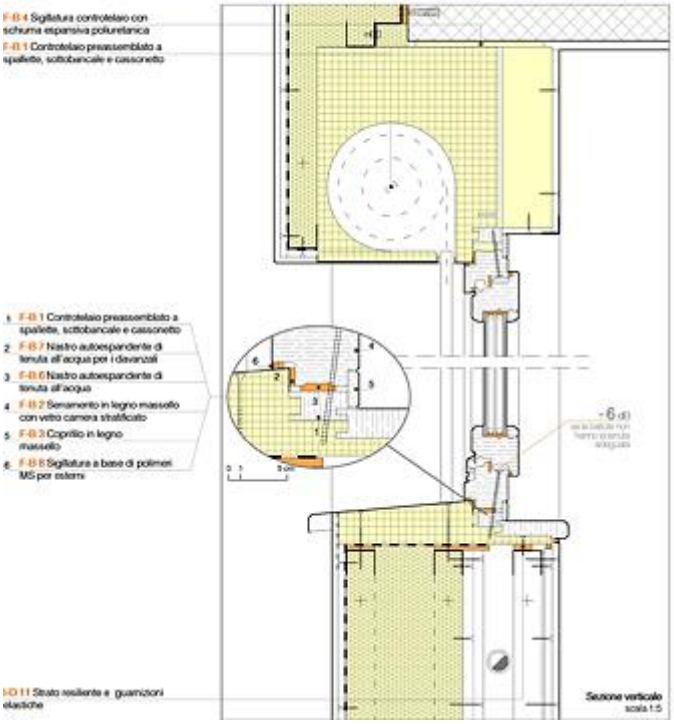
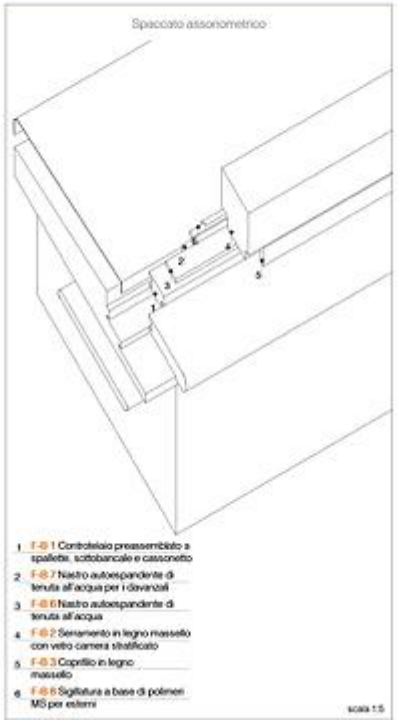


immagine 3 - esempi di nodi: involucro verticale opaco + serramento esterno

NODO I-D + F-B





Limits and conclusions

A motivation to realize this work was the lack of researches about the same subject: the similar works investigate only dry constructions and ignore the thermal and sustainability aspects. Therefore, it can be said that the research is unique.

Several conclusions are emerged about the requirement of “constructability”: 1) The wet joints provide good performances with simple attentions during the installation phases, except for the double layer wall with insulation, diffused in the last sixty years, which has the problem of the support of the bricks on the floors, cause of reduction of the thermal performances. 2) The dry joints have - potentially - much higher performances, which fall completely in the case of small imperfections in the installation. 3) The desolidarisation in wet systems breaks the connection by mortars and adhesives: so it’s necessary to find mechanical methods for the joints or use elastic mortars. 4) Desolidarize, acoustically “reinforce” and protect from the fire the metal beams and the pillars may generate difficulties during the installation.

For further information, e-mail:
Matteo Pellis: pellis.matteo@libero.it