

AUTONOMOUS LOAD-BEARING FRAMEWORK TECHNOLOGY

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Summary: This paper presents a technologically advanced and cost-effective solution for redevelopment of territories and renovation of buildings. A new autonomous load-bearing framework entails building horizontal extension and vertical addition. In that way a new residential areas is added.

Keywords: load bearing framework, building upgrade, construction

1. PROBLEM

Residential and commercial multi-storey building stock in the US/Canada market is rapidly aging, a gap is widening between its current condition and the requirements of modern dwelling standards (energy efficiency, convenience, internal engineering infrastructure, community space, recreational/ sports areas, playgrounds, parking space). As an example, out of the 2,547 residential buildings that NYC Housing Authority manages 85% is 30 years and older (more than 50% of those is 50 years and older) When the time for renovation comes owners of property tend to minimize their investment (the rent increase can negatively affect their business). As a consequence in most cases problems gets swept under the rug.

2. CURRENT SOLUTION IN THE MARKET

There is a standard “demolish-then-build” solution: acquisition of property available in the market, demolition and then a new construction. Its disadvantages/difficulties:

- acquisition costs in locations attractive for investment tend to rise;

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- scarce appropriate building stock that gets even less available because quality of construction had been significantly improved since the middle of the 20-th century;
- high capital costs;
- comparatively long project times;
- often far from being smooth processes of getting approvals from city authorities and consent from the local community

It does not make sense to demolish those buildings (structurally they are in a good condition) but it does make sense to renovate them and make capital repairs/ upgrade to the modern dwelling standards.

3. NEW – PROPOSED SOLUTION

Our proposed solution is a full renovation and extension of a building using our Autonomous (load-) Bearing Framework technology (“ABF technology”). The ABF Technology entails building horizontal extension and vertical addition. The added new foundation around the existing building footprint consists of CFA (Continuous Flight Auger) piles supporting piers and columns. They form the base for autonomous bearing framework arising around the building to support a rigid platform that bridges over the existing building. The new superstructure construction and vertical enlargement rises from that level. Enlargement of building footprint depends on a site size, configuration and zoning requirements. With creation of new residential areas (available for rent or purchase) and public and commercial spaces, our solution ensures financial flows necessary for the maintenance and upgrade of infrastructure and neighborhood improvement. Monolithic poured concrete construction is suggested as a standard construction method for the ABF technology. Pictures on Fig. 1 presents ABF Technology visualized.



Figure 1. Visualization of ABF technology

Left picture shows Existing building constructed in the 50s of the 20th century: no elevators, no central AC and ventilation, no fire protection system, obsolete appearance, low energy efficiency. Apartments need repairs/ upgrade.

Middle picture shows Phase I of Reconstruction. A new foundation added. Footprint consists of piles supporting piers and columns. They form the base for ABF arising around the building to support a rigid platform that bridges over the existing building. The new superstructure construction and vertical enlargement rises from that level.

Right picture shows Phase II (Final). A new, energy efficient building with a modern appearance. Elevator(s) added, new HVAC, electrical, plumbing and fire protection systems, smart building management system installed focusing on energy management, fire detection system, CCTV, access control system and lighting controls.

Reconstruction of an "old" building using the ABF technology (Autonomous Bearing Framework) advantages:

- full renovation of an existing building that extends a building's lifespan at least to one hundred (100) years;
- renovation project can run without relocation of inhabitants and demolition of an "old" building significantly decreasing construction costs (up to 30%);
- high investment attractiveness of renovation project: creation of additional housing units (2.0-3.0 multiplier to existing units' number, depending on zoning requirements).

ABF Technology is unique in a sense that it captures all positive experience and goes far beyond compared to the secondary development projects that were carried out in several countries such as USA, Japan, Israel and Russia and used the same principle but different technical solutions.

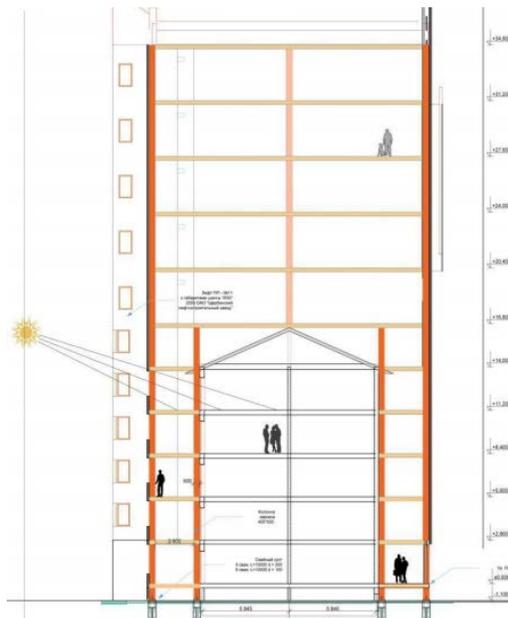


Figure 2. Cross section of the building with ABF technology

Up-to-date it is the most technically advanced and cost-effective technology. The key features it ensures are:

1. Full constructive autonomy - no additional loads to the existing building and its foundation;
2. Full renovation or installation of new HVAC, electrical, plumbing, and fire protection systems;

3. Sustainable design solution (energy efficient and leak free building envelope, ventilated space);
4. Relocation of inhabitants optional;
5. Creation of additional public areas (community, retail, recreational spaces, playgrounds, parking spaces).

4. ADVANTAGES OF ABF TECHNOLOGY

In the midst of growing deficit of attractive for investment property the ABF technology makes it easier to find a property in an attractive location for expansion and building new sellable areas. It makes a renovation project attractive for investor (IRR=50% and higher) through creation of additional housing units (2.0-3.0 multiplier to existing units' number, depending on zoning requirements), decreased capital requirements, development cost reduced by 20% to 30% due to reduction of the development project's lead time and less stringent requirements for qualification of construction workers (poured concrete construction methods is well mastered by contractors in the US/ Canadian construction market). It increases possibilities to receive consent/ support of local communities with creation of new residential areas, public and commercial spaces, it ensures financial flows necessary for the maintenance and upgrade of infrastructure to the modern standards and significant improvement of the social environment in neighborhoods. Innovativeness of the ABF technology confirmed by virtue of PCT publication and patent application in the USA. In 2009 Mr. Norifumi Konakawa (Japan), a technology leader in secondary development, admitted that ABF Technology proved its technical superiority versus a number of Mr. Konakawa's patents related to building's renovation methods whereby an existing building is expanded and integrated into a new one. Figures 3-6 presents some examples of ABF technology.



Figure 3. Visualization of ABF Technology 2



Figure 4. Visualization of ABF Technology 3



Figure 5. Visualization of ABF Technology 4



Figure 6. Visualization of ABF Technology 5

5. CONCLUSION

- The renovation market in the USA/Canada seems to be multi-billion and has a potential to grow: currently the housing market has a shortage of affordable units and communities strive for economical and effective solutions to renovate and modernize existing properties and neighborhoods.
- Annual rate of renewal of the multi-storey building stock in the USA/ Canada (the number of buildings that were added to the building stock in a year less the number of buildings that were taken out) is about 1%. In other words, if 40% of buildings that are old enough it will take at least 40 years to replace them. Moreover during this time a significant part of the stock will continue critically aging.
- In the privately owned property market about 25-30% of properties have a considerable part of not-used buildable areas. It would makes sense to re-capitalize those properties via renovation based on the ABF technology in order to increase the buildable area available for rent or purchase to the maximum allowed by the zoning requirements.
- In the property market owned and managed by non-private investors NYC Housing Authority's example is notable: out of the 2,547 residential buildings that it manages 85% is 30 years and older (more than 50% of those is 50 years and older).

ТЕХНОЛОГИЈА НЕЗАВИСНЕ НОСИВЕ РАМОВСКЕ КОНСТРУКЦИЈЕ

Резиме: Овај рад представља технолошки напредно и економично рјешење за обнову простора и обнову зграда. Нови независни носиви оквир укључује изградњу хоризонталног проширења и вертикалног додавања. На тај начин се додају нова стамбена подручја.

Кључне речи: Носиви оквир, надоградња, конструкција