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## Roof Repair in Croatia Applying Modern Technologies

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### Summary

Extensive repair works on collective housing buildings need to be undertaken in Croatia, a Central European transition country. The adjustment of national building codes to the market economic management of residential buildings is being speeded up. The results of the cost analysis show that the largest share of the investments can be expected for the repair of roofs (flat and mildly pitched), since their quality currently does not meet the ISO and EN standard requirements. It is concluded that the scientific knowledge and available state-of-the-art technologies and materials are not sufficient guarantee for the establishment of an integral quality management and control system in the repair project without the dedicated involvement of all relevant factors. Furthermore, the paper discussed the personal experience of the authors, as designers, supervisors and contractors, acquired on roof repair works in Croatia.

**Keywords:** construction, maintenance, rehabilitation, roofs, waterproofing, thermal insulation, materials and technology

### 1. PRIVATE OWNERSHIP - BASIS FOR GOOD MAINTENANCE

The task of building maintenance should be approached by taking into account the interests of the investor (user), organisational dynamics of the maintenance system, environmental and legislative aspects, and the scientific and professional developments. The user normally oversees the factors influencing the quality of the building's functioning and its protection against gradual decline. The investor evaluates the loss of the investment value of the invested capital. The criterion of the return of invested capital should be selected between the two extremes which, for instance, can be found in *Porfolio* or *Facility* management. The following should be always considered:

- The dynamics of the maintenance system organisation should envisage possible modifications on the existing building to meet future needs of the user, either periodical (planned) modifications, or even final demolition and erection of a new building on the same location. Here, the functional life of the building (within which a satisfactory functioning is maintained without the replacement of structural elements) should be clearly

differentiated from its technical life (within which the building still meets all designed technical characteristics and conditions). Due to the expected increasing needs of the user for comfort in usage, as well as the developments in the legislature which set more strict additional conditions on protection and safety in a building and its surroundings, it is realistic to expect an increased level of general technical properties of a building during its usage. Here, the economical life of the building, within which it is still a sound investment or where the income (rent) is higher than the maintenance costs, must seriously be taken into account.

- The general environmental public consciousness of the need to preserve the natural resources and the environment encourage the enactment of positive legal measures which “force” the owners of buildings to continuously care for them. This postpones their end of life or the need for their complete removal and eventual erection of a new and more profitable building.
- Scientific and professional developments include new maintenance strategies, normativisation and decision making systems. This primarily implies the introduction of the ISO and EN quality control systems, which modern types of artificial materials completely meet.
- Rapid development of the information technology and its increasing presence in this field contributes to the creation of new (and faster) decision making models based on the balance between quality and maintenance costs, and their eventual optimisation based on quality databases of the available buildings park.

## **2. BUILDINGS MAINTENANCE SYSTEM AND ROOF REPAIR IN CROATIA**

Croatia, as a relatively young country, in the transition of its social and economic relationships, strives to develop its own national legislation, respecting the positive European guidelines and experience, and increase the level of public care for maintenance, consciously directing the management of buildings towards a market economy. In a short period of only several years, numerous laws have been enacted, regulating the issue of the mandatory quality of the primary technical characteristics of each building, the transformation of business entities and the privatisation of ownership, the right of purchase of state-owned flats, economical management of buildings, and environmental protection. The aim of this approach, as in the majority of Central and East European countries in transition of their political systems, is the return of the institution of ownership and the creation of the legal prerequisites for their management and maintenance using economically realistic sources for a maximal upgrading of their quality of usage. According to the current conditions and practice, in Zagreb, Croatian capital and central sample for the whole country, and based on 1996 data provided by the Municipal Housing Enterprise (currently the only one), a total of amount of some 31.5 mil. DEM were spent on buildings maintenance, of which approximately 39% for extensive renewals, of which 53% on different types of roof repairs. After the enactment of the new Law which regulates the buildings management issue, at least 4 time more money will be collected to enable a higher level of maintenance of residential and office buildings, particularly their roofs, applying state-of-the-art materials and technological procedures of renowned international manufacturers. It is particularly important to establish a strictly controlled renewal cycle involving manufacturers, designers, contractors, supervisors and investors, with the enforcement of ISO and EN quality management systems. Authors' rich experience in the application of modern technologies on numerous repairs of flat and mildly pitched roofs points to possible flaws which can occur in newly established European markets.