periodica polytechnica

Architecture
41/2 (2010) 57–61
doi: 10.3311/pp.ar.2010-2.03
web: http://www.pp.bme.hu/ar

RESEARCH ARTICLE

The cost effectiveness of continuous maintenance for monuments and historic buildings

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Received 2011-04-07

Abstract

For cultural and aesthetic reasons, it seems obvious, that sustaining the high quality of historic buildings is a necessity. There are a number of organizations maintaining historic buildings by a monitoring system all over Europe, although there is no published data on the economic advantages of the practice.

The aim of our research is to show that besides the cultural and aesthetic arguments, there are sound economic reasons for continuous maintenance. Our study focuses on the costs by comparing the case of regular maintenance, to that of isolated renovation that takes place every 15 or 20 years after a long period of negligence. In our pilot we have monitored six typical historic buildings to identify the economic facts alongside the aesthetic and cultural arguments, in order to clarify the importance of keeping our built heritage in good condition.

Keywords

historic buildings · continuous maintenance · regular monitoring · cost effectiveness

Acknowledgement

This work is connected to the scientific programme of the "Development of quality-oriented and harmonized R+D+I strategy and functional model at BME" project. This project is supported by the New Hungary Development Plan (Project ID: TÁMOP-4.2.1/B-09/1/KMR-2010-0002).

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Introduction

The maintenance of monuments and historic buildings is obviously very important in order to preserve the original fabric of our cultural heritage. This kind of behaviour is supported by most basic principals of many international cultural heritage organizations. The idea of continuous maintenance (to keep our built environment in proper and sound condition on a day to day basis), has also been appearing in known literature for some while [1].

Known practice in most countries – some of those involved are those where monitoring services already exist – up to now has been questionable. For this reason a number of professionals deal with the problem of preventive conservation, analyzing the key factors as to why owners do not take the necessary precautions for their buildings [1]-[7], [10]. As a result, most of them agreed upon three key factors:

– the owners should be well informed on the technical details and the advantages of a continuous maintenance system

– special support from the authorities and available national grants for continuous maintenance is needed

– well qualified professionals are required.

These factors practically indicate the main areas for the future work of maintenance services.

Cost effectiveness is an essential supporting factor to convince owners and leaders of the community of the benefits of the maintenance system.

Organizations in the field of continuous maintenance

For a time now organizations for continuous monument monitoring have existed all over Europe providing services for owners of historic buildings, and making efforts to inform the public and the leaders of the communities on all the benefits of their systems. Some of them have been running for some time, with existing, properly operating systems, others are in an experimental phase.

As the earliest organization of its kind, the Dutch Monumentenwacht was an example for most of the later proposals.

It was founded in 1973 as an independent, non-governmental organization for maintenance monitoring, providing a service for owners of historic buildings. After joining the organization, the properties of the members are inspected every year by a group of expert monument technicians. The owners have to pay an annual sum for membership and another fee on the occasions of the inspections depending on the required time. The smaller failures (e.g. missing tiles on the roof) are repaired on-site at the time of the inspections, for further works prequalified monument-specialist contractors are recommended depending on need. Each visit results in an actual report of the state of the building, including the potential failures and the recommendations for the necessary repairs with their priorities [8, 10].

Being member of the Monumentenwacht organization is in many cases the precondition for making a bid for repair grants. Here owners can receive about 50% of the total sum of the restoration costs. Restoration works can be executed only by contractors accredited by the organization. After the restoration the Monumentenwacht checks the completed work and presents a report of adequacy [10].

In the Netherlands during the years of the operation of Monumentenwacht, owners' attitudes have continuously changed in a positive direction, and the grant system of the state and the local authorities have adopted the policy of continuous maintenance [8, 9]. For instance in the territory of Friesland, the local authority provides a particular level of subsidy for the Monumentenwacht for completing a clearly defined number of inspections, and only the further costs are financed from the subscriptions of the owners [10].

Utilizing the positive and negative experiences from the Netherlands, Monumentenwacht Vlaanderen in Belgium was established in 1991. The investigated buildings of this region are private, ecclesiastical or in state possession. As a consequence of the well-organized marketing, the proportion of the investigated private properties has doubled in the last few years. Although the number of members increases constantly, the number of regularly maintained properties hardly reaches a third of the historic buildings, because the grant system in Belgium still preferably supports occasional restoration projects rather than maintenance. Belgian state leaders are considering amending this to a system favouring maintenance.

In the historic English town of Bath in 2002 and 2003, a pilot project of systematic maintenance was carried as a co-effort of "Maintain Our Heritage", the University of West England and the Bath Preservation Trust. During this period they studied the operation of a temporary organization. Some 72 historic buildings were inspected in order to answer several important questions: inspection methods, competences, economic facts, opportunities for marketing, and the attitude of the owners.

Most of the interviewed owners were interested in the service and some of them believed that such a maintenance practice could be economically beneficial and attractive, especially if it was accompanied with governmental support e.g. tax reduction or a grant system for maintenance programmes.

Despite the success of the pilot itself, the executors of the programme faced some technical and financial difficulties. The pilot project was financed by English Heritage and some private foundations. Without the financial support of these organizations the maintenance service would not have been operable, but according to some results it has been assumed that in the case of a larger number of investigated buildings, the establishment of a self-supporting system could be possible. This also seems to be supported by the Danish Bygningsbevaring. This organization operates similarly to the Dutch one [15], but – in contrast with other foundations – it works without external support, collecting the total income exclusively from owners' fees [2].

In Germany the BAUDID (Bundesarbeitsgemeinschaft unabhängiger Denkmal- und Altbauinspektionsdienste in Deutschland) works as a federation for all the organizations in the field of monument preservation and maintenance [12]. In some German states there are organisations following the Dutch model, like the Monumentdienst in Lower Saxony [13], or the Monument Watch Brandenburg and Berlin [15].

The "Maintainer Network of Hungarian Monument and Building Foundation" (MAMEG) was established in 2006 as the first maintenance service in the Central European region. The pattern was the Dutch Monumentenwacht [9].

The aim of our research

The different publications of the organizations in most cases emphasize that continuous maintenance is financially more advantageous than the occasional restoration after years of negligence. Studying the sources, we found no data supporting this statement. Our research intends to provide evidence for this, comparing cases of maintained buildings to neglected ones. In this pilot the conditions for a larger scale research project have been tested.

Sampling and experimental techniques

Sampling

For the sampling of this pilot, six buildings were selected: a treadmill, a cottage, two villas, a traditional apartment-house, and a church, as typical historic buildings of different sizes with more or less different functions. Each building was in poor condition after years of negligence. According to their inhabitants or the owners, none of them have received any restoration work in the last 15 years. In each case visual diagnostics were applied and the present state was recorded (Table 1).

As a reference another sample of a medium sized public building was taken, where continuous annual maintenance has occurred over the last eight years. Table 2 shows annually the maintenance activities of the building.

Method of calculation

Based on the records of the buildings, a restoration plan was created for each one. Using the Calculation Handbook for

Tab. 1. The state reports of the different buildings

Damaged / deteriorated structures	Building type					
	treadmill	cottage	smaller villa	church	larger villa	apartment house
building installation systems		x	x	x	x	x
chimney wall			x			
clay lining on the slab	x					
concrete sidewalks	x			x	x	
electrical systems	x	x	x	x	x	x
flashing on the top of the attics						x
flashings at the windowsills					x	
flashings on the roof			x	x		
floor carpet		x				
floor tiling on the balconies/terraces			x		x	x
floor tiling on the side corridors of the yard						x
footing		x		x		x
interior wall and floor tiling		x	x	x	x	
iron column			x			
metal hatch			x			
painting of interior timber doors	x		x		x	
painting of the facade			x	x		
painting of the window frames	x	x	x	x	x	x
painting of the wooden parts of the gables and eaves	x	x	x	x	x	
painting of wooden porticus		x				
painting of wrought iron structures	x					
parquet		x	x			
paving (in the garden/in the yard)	x					x
plaster on the chimney		x				
plaster on the facade - cracking	x		x	x		x
plasters on cellar walls		x			x	
plasters on interior walls	x	x	x	x	x	x
rainwater goods			x	x	x	
roofing	x	x	x			
timber doors				x		x
timber roof structure (rafters)		x		x		x
timber slab	x					
wall carpet		x			x	
water insulation of the terraces/balconies		x	x		x	x
window glass	x	x	x	x	x	x
wrought iron railings			x			

Construction provided by the Hungarian Chamber of Architects (Építőipari Költségvetési Segédlet) [16], we carried out a calculation for the restoration in every case. In each case the damage was recorded, a necessary restoration activity was suggested and the volume of the necessary work was calculated with the appropriate cost of the activity. Table 3 shows the data of the treadmill as an example.

The "fictive" costs of the same buildings were then calculated on the basis of the realized maintenance activities of the reference building, simulating a case of continuous maintenance.

Finally, the average annual costs were calculated for each building, both in cases of long periods of negligence and in case of continuous maintenance. Table 4 shows the comparison of these average annual costs.

Remarks: It has to be mentioned here, that the financial costings obviously depend on the time point. In order to reach comparable figures, the Net Present Value should have been used. Since only the immediate renovation costs were available for our pilot project, we calculated the occasional 15 year renovation costs on the actual (2010) price. On the other hand the annual renovation costs were also calculated based on 2010 value. Since the inflation values of the particular renovation activities are not accessible, it is a reasonable estimation to assume that devaluation (financial) is almost equal to the inflation of construction work costs. In this way the total annual renovation costs are comparable with the calculated costs of isolated renovations.

Tab. 2. The annually maintenance activities of the reference building over the last 8 years

Maintenance work	Year							
	1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
controlling and maintaining building installation systems (ventilation, chimney, heating, warm water supply)	x	x	x	x	x	x	x	x
controlling and maintaining the electrical systems	x	x	x	x	x	x	x	x
regular interior wall repainting		x	x	x		x	x	x
exterior wall painting					x			
maintaining the installations of the building	x	x	x	x	x	x	x	x
cleaning gutters and downpipes	x	x	x	x	x	x	x	x
cleaning windows in special height	x	x	x	x	x	x	x	x
maintaining the plants around the building	x	x	x	x	x	x	x	x
lubrication of locks and hinges	x	x	x	x	x	x	x	x
repairing walking surfaces in the garden		x						
glazing (broken windows)		x						
installation bird wire meshes of the facades			x					
repair of the footing							x	
repair of the roof covering							x	

Tab. 3. Calculation of renovation costs in case of the treadmill

Recorded damage	Necessary restoration action	Volume	Unit	Cost norm (HUF/unit) (2010)	Cost (HUF)
Vertical cracking on the facade.	Lime mortar plastering on the whole facade.	35	m^2	5000	175 000
Wooden slab structure is damaged.	Repair of the slab structure.	28,8	m^2	10300	296 640
The clay lining on the slab is incomplete.	Preparation of clay lining on the slab.	0,2	m^3	40000	8 000
The roofing is damaged and incomplete. New roofing is necessary.	Reed roofing.	105	m^2	3600	378 000
Painting of the wooden parts of the gables and eaves are worn and stained.	Repainting of the planks on the gables and eaves.	30	m^2	800	24 000
The painting of the window frames and exterior doors are worn and partially missing.	Repainting of exterior wooden doors and windows.	2,88	m^2	1700	4 896
Some of the glasses are broken.	Glazing of the doors and windows.	0,5	m^2	5800	2 900
The painting of interior wooden doors is worn.	Repainting of interior wooden doors.	5,4	m^2	1700	9 180
Interior plasters are damaged.	Lime mortar plastering on the partition walls.	5	m^2	2600	13 000
Brick paving is worn and damaged.	Remove of the existing paving.	20	m^2	900	18 000
	Construction of brick paving.	20	m^2	10000	200 000
Interior walls are stained.	Lime wash on the interior surfaces.	35	m^2	700	24 500
Concrete sidewalks are damaged.	Construction of concrete sidewalks.	6	m^2	6000	36 000
The painting of the iron garden gate is worn.	Repainting of iron garden gate.	12	m^2	800	9 600
Electrical system is worn.	Total change of the electrical system	20	m^2	9120	182 400
	Total				***1 382 116***

Tab. 4. Comparison of costs in case of occasionally performed renovation and continuous maintenance

Building type	Annualized cost of the restoration after 15 years of negligence	Annual average costs in case of regular maintenance	Savings in HUF	Savings in percentage
treadmill	92 141	50 333	41 808	45%
cottage	648 674	367 667	281 007	43%
smaller villa	692 522	576 000	116 522	16%
church	309 138	198 667	110 471	36%
larger villa	1 263 996	230 666	1 033 330	82%
apartment house	702 724	115 333	587 391	84%

Results

Analysing the comparison of costs in Table 4, we can state that in no cases were the costs higher with continuous maintenance versus the case of the restoration costs after years of negligence. According to this pilot it seems very likely that continuous maintenance results in lower costs compared to the costs of occasional executed restorations.

The aim of our pilot project was to assess whether regular maintenance in contrast with isolated renovation could lead to economic benefits. It appears from the data, in each of the observed cases that regular maintenance is the economically better option.

Although as a consequence of the low number of samples the result is not statistically significant, all the six observed buildings positively support our initial hypothesis. Overall, the success of this provisional study encourages us to continue the research on larger scale.

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