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MAINTENANCE PLANNING FOR HISTORIC BUILDINGS

BY

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Abstract. The key to good maintenance of historic buildings is a long-range maintenance plan. Long-range planning recognizes a responsibility to the future to prolong the useful life of a building by preserving it in its present condition and preventing or slowing deterioration and damage from natural or other causes.

Key Words: Historic Building; Maintenance; Preservation.

1. Introduction

Designing a good maintenance plan for a historic building is not hard, but it does require some thought. For instance, it requires being aware of the specific architectural character of the building. Every historic building has certain character-defining architectural features and building elements like: doors, windows, roofs, and ornamental detailing are obvious ones. These elements tell us much about when it was built and why and sometimes even who designed it and for whom it was built. When such features are lost or changed, the building is said to have lost its architectural or historic integrity.

Its essential character is gone. It may still be a good, useful, and even beautiful building, but it is no longer the same building.

Standard modern repair and maintenance techniques and materials are often acceptable for use on historic buildings, but they sometimes do more harm than good. Using wrong materials or methods to maintain or repair (or, when necessary, replace) important features can destroy the integrity of the building and may even shorten its useful life. Each case must be carefully thought through. The earlier the planning takes place, the more likely it is to have a good effect.

An experienced preservation architect may usefully be brought in from outside the government to assist with scoping, plan review, specification writing and construction supervision. This may be accomplished by means of an Indefinite Quantity Contract, or in some instances through the good offices of the Romanian Association of Architects, which can sometimes arrange for professional volunteers or at least minimum cost assistance.

2. Historic Structure Report

A historic structure report is the best place to begin in setting up a long-range maintenance plan. The report is a thorough analysis of the existing structure by a specialist in the field of historic preservation. It should

a) record the existing condition of the structure;

b) point out which materials building are original and which features of the which ones date from later repairs; alterations, or additions (building materials and features are often referred to as the ”fabric” of the building);

c) identify both original and early (over 50 years old) building elements, in order to avoid unintentional future changes to historic fabric;

d) identify structural or environmental conditions that may contribute to deterioration; and provide information from which to develop a schedule of regular maintenance procedures.

Buildings deteriorate because of physical, chemical, or biological factors, or a combination of all three. Some of these factors were built into the structure itself, as a natural result of design or building materials chosen. Others come from environmental factors such as temperature, sunlight, humidity, or mechanical equipment vibrations.

Chemical pollutants in the air or solvents used in normal cleaning processes can gradually dissolve or break down building materials. Vegetation, insects, or vermin may take advantage of these conditions and do further damage. A well-planned maintenance program makes it possible to monitor and control conditions in the building in order to slow down deterioration and delay the need for replacement or repair, as well as to predict future problems.

A good maintenance program identifies all the present causes of deterioration, predicts problems that are likely to come up in the future, and sets up an effective treatment program for the entire structure.

3. Other Sources of Help in Maintenance Planning

In addition to the historic structure report, accurately measured architectural drawings and photographs are helpful to record the original fabric of the building, later alterations, and the present physical conditions. These records are sometimes available from regional agencies, such as the Romanian’s National Archives or from local or regional archives in libraries and historic or preservation societies. Current drawings and photographs may be needed to supplement historic data (Fig. 1).

Fig. 1. – V. Alecsandri Theatre, Jassy.

4. Building Use and Maintenance Priorities

Maintenance priorities must take into consideration the buildings use. A building used by the public will face higher levels of stress and different threats to its historic integrity than one used as a private residence.

4.1. Special Considerations

Even on military facilities, maintenance planning may need to include protection from vandalism and control of tourist traffic, which can speed up normal deterioration. Exposed surfaces in high-traffic areas such as stairs and hallways may need extra protection from wear and tear, as well as from fire and vandalism. It may be necessary to establish visitor traffic patterns to reduce structural strains.

5. Maintenance Scheduling

Maintaining an older building is not necessarily complicated or expensive. (In fact, it is usually much cheaper than rehabilitating or demolishing it). However, some maintenance and repair procedures require prolonged testing before they are implemented, and they should not be done hastily.

Delivery schedules for special supplies or replacement materials need advance planning. A realistic maintenance schedule will allow for all these factors.

5.1. Inspections

Careful, systematic inspection of existing conditions at regular intervals can be used to predict the rate of deterioration and the timing of necessary repairs. Control of existing problems can delay the need for repair and replacement.

Continuous monitoring can verify the initial analysis and provide further information on rates of decay.

How often inspections and maintenance procedures need to be done will vary, depending on the materials and methods of construction, the age of specific building components, and the stresses placed on the building by its use and environment.

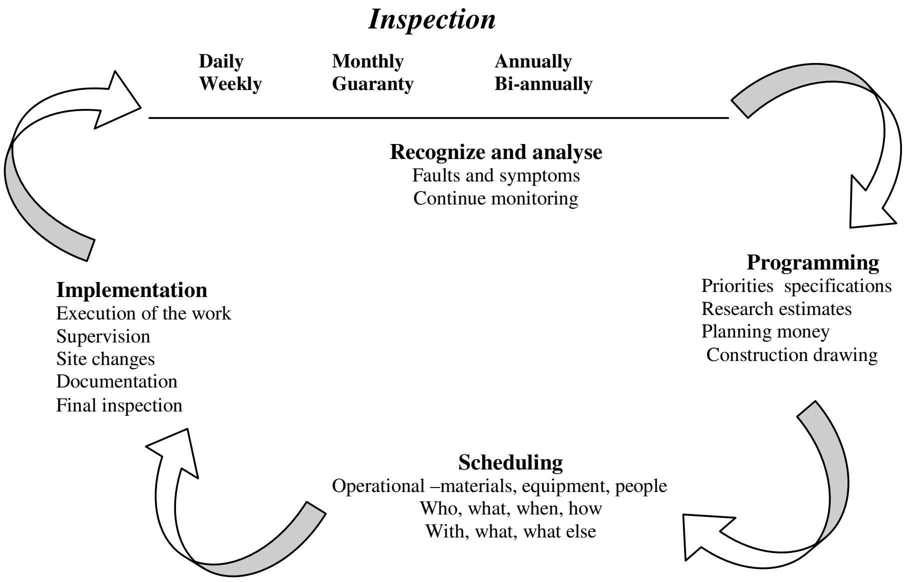

Fig. 2. – The maintenance cycle.

5.2. Training and Supervision

It is vital for maintenance workers to understand and appreciate the importance of historic structures and any original materials that still remain. Their enthusiasm can spell the difference between long life and early decay for these important resources. But workers also need to be trained in the care of old buildings, to ensure that repairs and maintenance will be performed by qualified persons using the best methods possible. An alert supervisor will find many training opportunities for interested staff members; for example, specialized publications and workshops in specific maintenance techniques for historic buildings organized by historic preservation agencies and organizations.

A maintenance manual that details materials and methods to be used, an outline schedule of regular routine procedures, and time and budget allotments are essential to keeping maintenance on track. (Fig. 2)

6. Control Inspections

Inspection is the first step in identifying deficiencies; it provides the benchmark for starting maintenance work. From the four types of inspections (operator, preventive maintenance, controls, and specialized) the control inspection is performed by skilled planners who can recognize potential deficiencies and have the abilities to address problems before they happen.

The objective of the control inspection is to provide a baseline for a successful maintenance plan. The control inspection should describe the items of work in detail and assign them priorities (Figs. 3 and 4). Historic facilities, if they are properly maintained, should cyclically cost no more per year of life than non-historic facilities.

Fig. 3. – Building rehabilitation (Jassy, 2008).

While using the steps to doing control inspections it may be desirable to increase the duration for inspection of older mechanical systems because of the potential for worn parts or material. The additional time gained by early detection will allow for replacement of equipment rather than crash repair. Advance planning for maintenance also may allow for consideration of more replacement alternatives than would be possible when performing emergency/breakdown maintenance.

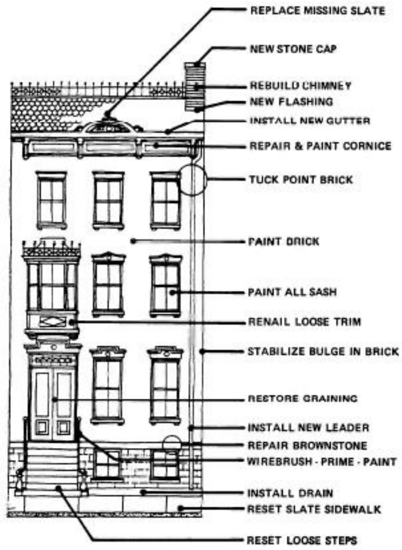

Fig. 4. – Typical work involved in rehabilitating a historic structure.

7. Life-cycle Costing

Life-cycle cost is the total cost of acquiring and owning an asset over its full life time. For a facility or property, it includes the costs of acquisition, development, maintenance, operation, support and, where applicable, disposal. The process is no different for a historic facility than a new facility, except that the life of a historic facility typically is "forever." Therefore, the purpose of an economic analysis for a historic resource is to decide which material or method will provide the best service "forever."

In a typical economic analysis, the three factors that limit the economic life of the resource are

a) Mission life, or the period in which a need for the resource is anticipated.

b) Physical life, or the period in which the resource can be expected to last physically.

c) Technological life, or the period before obsolescence would dictate replacement of the existing asset.

Under the preservation guidelines established for historic facilities, the mission life of the resource is "forever." The technological life of the resource is also a part of the historic fabric which will be preserved "forever." Therefore, the limiting economic factor for evaluating life cycle costs is the physical life of the resource. Many traditional, but expensive, building materials, such as copper, slate, or granite have unusually long lifetimes that may make them economically feasible for use in historic buildings which also have indefinite life expectancies.

One key to successful funding of historic facilities is to offer priority to maintenance areas in terms of their maximum life benefit to an asset, for instance

a) Roof.
b) Exterior skin.
c) Exterior finish coatings.
d) High use spaces and surface (especially floors).
e) High use/high exposure wall areas.

8. Building Regulations

Building codes are intended to protect life and property by regulating the design and construction of buildings. They are written specifically for new building projects and modern construction practices.

Since most historic buildings were constructed before the introduction of building codes, they often do not comply with modern standards of safety and security, energy conservation, fire protection, or handicapped access. If strictly applied, standard codes may call for alterations that damage the historic or architectural character of a historic building.

Basically, building codes provide for two types of standards namely

a) Prescriptive standards spell out precisely what materials and methods of construction must be used to reach a particular safety goal. They concentrate on the means of making the building safe for people to live or work in.

b) Performance standards specify the result to be achieved (the level of safety or protection) without giving rigid instructions about how to get there. They focus on the desired ends of safety planning. Generally, it is better to use performance standards for historic buildings, since they will allow greater flexibility in finding ways to protect both the historic structure and life and property. Life safety is always the most important consideration. However, considering the intent of building regulations may suggest ways to make the building safe for human occupancy without destroying its character.

9. Fire and Life Safety

Complying with modern standards for fire and life safety may present the greatest challenge to successful preservation and continued use of historic buildings.To some degree most historic buildings fail to meet modern code requirements for materials, methods of construction, and exit systems. on the building's use and the number of occupants.

Normally, there must be two widely separated, enclosed, and fire-protected means of exiting from any point in a building.

Safe access must be provided to fire-protected vertical and horizontal circulation routes leading to the outside of the building. Following prescriptive standards might require enclosing existing open stairways, widening corridors or doorways, or reversing door swings. But these actions would change the historic appearance and architectural character of the building. Rethinking the problem in terms of performance standards could lead to safe, workable alternatives that preserve the building. For instance, one or more new fireproof stair towers might be added in less visible locations.

Automatic fire detection and suppression systems can lower the risk caused by inadequate exit provisions or obsolete construction materials. However, the system should be carefully selected and installed in a way that will have as little impact as possible on the historic fabric of the structure.

”Archaic” building materials are those which are considered to have been out of general use for at least 30 years. They are not necessarily unsafe. Usually they have gone out of use for economic or technical reasons.

10. Health Hazards

Old buildings that appear to be in good condition may actually be hiding a variety of threats to the health of occupants and maintenance personnel. Becoming aware of these potential hazards is an important part of any safe and effective historic preservation maintenance program. The use of some building materials commonly found in older buildings, such as asbestos, is no longer allowed because the materials have been found to be dangerous to humans. Some restoration techniques use chemical or abrasive cleaners that have to be handled carefully in order not to create hazardous conditions. Old chimneys and flues that are blocked or left uncleaned may prevent ventilation from the heating system. Some old buildings are sealed so tightly with heavy insulation, weather-stripping, and vapour barriers that the indoor air quality is harmed by inadequate ventilation.

With sensible precautions, renovation and preservation maintenance procedures can be performed safely. Be alert to possible hazards; provide adequate ventilation, either natural or mechanical; and wear protective masks or clothing, as needed.

Before beginning any maintenance project, identify and analyse the potential level of risk from hazardous conditions within the structure. Samples of any doubtful materials found should be taken to a qualified laboratory for analysis.

Some of the more typical hazardous materials and their handling are discussed below.

10.1. Asbestos

Asbestos is a naturally occurring mineral that once was considered almost the ideal building material, but is now known to be dangerous to human health. Between 1890 and the early 1970s, it was commonly used as insulation in houses and in as many as 3,000 other products, from spray-on fireproofing, sound proofing, piping and vessel insulation, vinyl asbestos floor tiles, ceiling tiles, and some types of shingles, to ironing board covers.

When asbestos-containing materials become friable (that is, powdery or easily crumbled), dangerous asbestos fibers may be released into the air. The fibers can then be carried through the entire building by way of the ventilating system. Whenever the presence of asbestos is suspected, it should be reported and tested immediately. Coordinate with the base asbestos control program to determine treatment.

Asbestos can only be positively identified by laboratory tests of samples. There are some clues to watch for, however,

a) Insulating coatings on old boilers: off-white, smooth-surfaced, usually cracked.

b) Cloth-wrapped steam and hot water pipe lagging, especially if the edges look like light-gray corrugated cardboard.

c) Asbestos paper on heating pipes, forced-air ducting, beneath asphalt and linoleum flooring, behind kitchen wallpaper: off-white, usually textured, chalky-feeling.

d) Asbestos-cement shingles used to re-side older framed houses from the 1930s through the 1970s: any colour, cracked and chipped along the edges in high-traffic areas. Asbestos-cement roof shingles used from the 1940s through the 1960s: usually gray, often with brownish-white streaks in areas where water stands, very hard (pebbles tossed against them make a pinging sound).

e) Asbestos-cement board: usually gray, 0.5…0.8 cm thick, brittle, easily broken, often found on joists above a furnace or boiler, around and beneath wood stoves, behind ceramic tile in a bathroom.

10.2. Radon

Radon is a colourless, odorless, radioactive gas that occurs when uranium, a natural element, breaks down.

Public Direction of Health declare the link between some types of cancer and long-term exposure to radon gas.

Buildings in areas where the earth contains large uranium deposits are more likely to have radon contamination.

Since radon rises through the soil, it is most often found in basements, but it can be distributed throughout a building by the ventilation system. Old houses actually are somewhat less likely than newer ones to have radon contamination above the basement level because they have more cracks and better natural ventilation. Detection kits containing charcoal filters can be used to test the presence of radon, but they must be analysed by a qualified laboratory. Corrective measures for radon include sealing cracks in foundation walls and insulating basement areas to keep the gas from rising to the upper floors.

10.3. Lead Paint and Chemical Paint Removers

Almost all structures built before 1940 contain lead paint, whose removal may create health hazards. If the paint is not peeling and remains tight to the surface, it is not a threat. However, paint particles loosened by scraping or sanding can be inhaled, swallowed, or absorbed through the skin to cause lead poisoning and permanent damage to the central nervous system. Chemical removers are considered the safest way to remove lead paint. However, the chemicals themselves release toxic fumes that can cause permanent lung damage with long-term exposure. Most paint-removing solvents contain hazardous chemicals such as: benzene, acetone, and methylene chloride. Many solvents are flammable, and their vapour may cause fire hazards in poorly ventilated spaces.

10.4. Blowtorches

There may be a temptation to try to hurry the process of paint removal by using blowtorches. Blowtorches should never be used on historic structures. The high heat produced by an open flame releases vapours that may contain lead. Blowtorches also pose a serious threat of fire, even when they do not cause visible surface scorching. They can superheat the air inside columns, siding, cornices, and other hollow building elements, igniting debris, such as leaves, birds' nests, and even dust, causing fires to break out long after workmen have left the scene. Electric hot-air blowers and heat plates are considered safer for paint removal because they operate at a temperature that is lower than that required to vaporize lead or cause fires. After removal lead paint residue is hazardous waste that must be disposed of under the hazardous waste disposal program.

Treated surfaces should be damp mopped after cleaning to reduce dust that might contain lead. Most vacuum cleaner filters are too coarse to trap the tiny particles that are a hazard.

10.5. Bird and Bat Deposits

Many old buildings contain large amounts of bird or bat droppings in attic or roof areas. These deposits can cause a number of infectious and potentially fatal diseases of the lungs and central nervous system. Removing the deposits requires special procedures in order to decontaminate the area without risking infection. When entering such areas, wear breathing masks and protective clothing are necessary. A sample of the material should be tested before work begins in order to determine what level of risk exists and decide what precautions should be taken.

10.6. Other Hazards

A. Carbon monoxide gas produced systems. Indoor air quality adversely by inefficient heating affected by the presence of various pollutants released from building - materials, pesticides, or other chemicals used in and around the facility.

Some foam insulations and particle boards contain formaldehyde, a chemical preservative that slowly evaporates out of the material and enters the building air supply.

B. Likewise, some fertilizers and pesticides used around the exterior of the building foundation may infiltrate the building and enter the air supply. There are detection kits that can be used to test indoor air for the presence of various pollutants. However, most indoor air pollution problems can be remedied by an efficient mechanical ventilation system that has exterior air intake vents located away from pollutant sources.

C. Structural hazards, such as joists and beams damaged by termites or by careless plumbers and electricians.

D. Outdated wiring and electrical systems (knob-and-tube), or plumbing systems with lead or lead-soldered pipes.

11. Conclusions

The longer maintenance is ignored, rejected or postponed, the more the advantages of the approach are lost to building owners and managers. It is worth rehearsing what these advantages are. For the owner, maintenance retains the building's appearance and value and safeguards the investment. Clearing gutters or fixing a slipped tile avoids costly problems later.

In social terms, maintenance reduces the cost and disruption to occupants that flow from building failures and from occasional large-scale restoration. In environmental terms, maintenance means less material is used and consequently it reduces extraction, processing, transport, waste and energy use. It prolongs the use of the embodied energy in the built fabric. It contributes to sustainable development and urban and rural regeneration, and reduces the pressure for new build on green field sites.

In cultural terms, maintenance safeguards historic fabric because less material is lost in regular, small-scale repair than in disruptive and extensive restoration. Maintenance is central to protecting cultural significance or value because it is the least destructive of all the 'interventions' which inevitably occur in the process of conserving historic buildings.

In economic terms, maintenance brings business that is steady and counter-cyclical and that particularly boosts small and medium-sized reputable enterprises.

In addition, well-maintained historic buildings improve the quality of life for everyone, help to attract investment to an area, contribute to regeneration and provide a source of local pride and sense of place.

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MENTENANŢA CLĂDIRILOR ISTORICE

(Rezumat)

Gradul de intervenţie asupra unui monument variază de la simple lucrări de întreţinere şi conservare, trecând prin acţiuni de protecţie, consolidare şi întregire şi ajungând la intervenţii complexe de restaurare şi recompunere, de dezasamblare şi reasamblare, sau, în cazuri extreme, de translare sau reconstruire parţială. Documentaţia de restaurare trebuie să cuprindă consemnarea, mai ales prin imagini şi desen, a stării iniţiale de la care s-a pornit restaurarea, cu ce s-a intervenit şi de ce, precum şi, detaliat, modul şi locul în care se fac intervenţiile. Aşa cum nu există arhitectură fără desen, nu există nici restaurare ”vorbită”. Monumentele istorice trebuie menţinute în permanenţă într-o stare de funcţionare perfectă, fie prin păstrarea, dar şi modernizarea funcţiunilor lor iniţiale, fie prin acordarea de funcţiuni noi, viabile, compatibile cu natura, structura şi/sau valoarea lor. Un monument ”exploatat”, dar şi întreţinut permanent, menţinut viu, se conservă mult mai bine decât altul, fie şi consolidat şi restaurat, dar neutilizat.