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ABSTRACTS

THE ‘COLLECTIONS RISK MANAGEMENT’ PROGRAM AT THE AMERICAN MUSEUM OF NATURAL HISTORY

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In addition to the wear and tear of time and exposure that normally endanger museum collections, events such as September 11, 2001, the Northeast Blackout of 2003, and Hurricane Katrina have emphasized the threats to collections and underscored the importance of a comprehensive approach to risk-related planning. In recent years, the American Association of Museums’ Accreditation Commission has released expectations regarding collections stewardship, stating that accreditable museums must have appropriate measures to protect against potential risk and loss, and specifically demonstrate that risks to collections are accurately identified and assessed and that resources are appropriately allocated to have the greatest effect on reducing risk to facilities and collections.

In response to these demands, the American Museum of Natural History (AMNH) has been steadfastly committed to identifying a comprehensive picture of its collections priorities, and is accomplishing—through the collaborative efforts of Science, Exhibition, Conservation, and Operations staff—an overall risk assessment of its research collections, its exhibit collections and the library and archival materials that support these collections. Funded by the Institute for Museum and Library Services (IMLS), these assessments have allowed for the development of an institution-wide quantitative model that serves as a guide to effective, coordinated risk mitigation. The assessment model used for this three-phase project is based on the Cultural Property Risk Analysis Model (CPRAM) developed by the Canadian Museum of Nature and adapted to accommodate the specific needs of a large, complex institution.

The development of a wide range of tools were critical to the working success of the risk management program, particularly a customized piece of software to store, organize and analyse the data in an efficient manner - the Scientific Collections Risk Evaluation (SCoRE) software. SCoRE is built in both Microsoft Access and MySQL and can be used as a data repository for all collection, location and risk estimation data, and allows users to view data by collection type, building, floor, specific risk, and so forth. The database generates reports that enable prioritizing of collections needs and deciding how to allocate resources effectively. One of the key features is the ability to export processed data into Excel for further analysis allowing for generation of customized charts and graphs depending upon the audience – collections staff, facilities/operations staff or museum administration. Both the Access and the MySQL applications have been developed in a manner that allows AMNH to extend distribution-friendly versions with user documentation.

The product of the collections risk assessment is a robust set of data, which identifies which collections in which locations are exposed to the greatest risks. This data has had far-reaching benefits, as it has provided AMNH administrators with information crucial to making long-term strategy and policy decisions about reducing and mitigating these risks. In fact, the Museum added risk assessment to its overall collections management policy (June 2008) thus emphasizing the need for proactive risk mitigation tactics instead of reactive, impulsive decisions.

Keywords

collections risk assessment

RISK ASSESSMENT AND TREATMENT FOR THE PERMANENT EXHIBITION OF THE NATIONAL ARCHAEOLOGICAL MUSEUM IN SOFIA, BULGARIA

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The permanent exhibition of the National archaeological museum in Bulgaria consists of approximately 4000 objects of different materials - stone, ceramic, metal, mosaics, frescoes, icons, paper and parchment, paleontology specimens, flint, ivory, bone and leather. The collection of the museum is defined as one of the richest collections in the Balkans and is placed inside the oldest building of its kind in Sofia – the 15-th century Buyuk Mosque (The Great Mosque). The present research is a comprehensive assessment for the ten agents of deterioration which influence the permanent exhibition of the museum and the building of the museum itself.

When the assessment was started, many problems were already visible but it wasn't clear which agents of risks affected the objects most. The main purposes of the assessment were determining the agents of risk with higher magnitude and biggest affect and pointing attention to collections in display.

The method of risk assessment was applied for first time in Bulgaria. Not surprisingly, given that preventive conservation has never been a priority in Bulgaria, all ten agents of deterioration were identified to affect the exhibited objects. The magnitude of risk of every agent was scored according to its frequency, effect on the specific objects, and percent of collection affected. Scoring of risk magnitude was done after dividing the objects of the collection in categories according to their significance and value (historical, scientific, perceptual, emotional value).

Currently, a small group of people is engaged in risk treatment of some of the identified risks. After deciding what risks should be treated first, the working group started to treat several agents of deterioration at the same time - pollutants, pests, dissociation and light.

The main objective in the future will be to appropriately treat risks not only to the objects on display but also to those in storage.

Keywords

risk assessment, risk treatment, agent of deterioration, magnitude of risk

THE STEDELIJK MUSEUM AMSTERDAM'S COLLECTION MOVE: APPLYING RISK MANAGEMENT TO THE RE-HOUSING OF COLLECTIONS

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When re-housing entire collections, one will inevitably need to take into account potential risks and how to deal with them at a very early stage. In 2010, the Stedelijk Museum Amsterdam moved all its collections from three storage buildings to one. The principles of risk management and collection care were applied during the preparatory phase and were consequently integrated into the actual move process.

As part of the project plan for the move, two risk mapping techniques for different levels of decision making were developed. The first risk map aimed at determining and analyzing the main risks at a collection management and organizational level. The second, based on the ten agents of deterioration, addressed specifically the magnitude estimation of potential risks for the collections and ranked these risks by priority. Both enabled the development of a framework of procedures and planned activities prior to the move, during and after the move.

These frameworks, aimed at mitigating risks address a number of issues, such as:

- how to create a valid planning framework which would allow the move to be managed adequately in the event of political pressures to reduce time and costs of the move;
- which remedial conservation measures needed to be taken before the move and how to deal with those which may arise during the move;
- which preventive conservation measures needed to be taken before the move, and how to deal with new concerns during the move;
- how would pest management be organized and implemented before and during the move, and which protocols needed to be in place in the new storage building prior to the move;
- which specific structural and environmental measures needed to be taken into account in the current storage buildings and in the new storage building;
- how to deal with security issues at all times;
- Which procedures needed to be set-up in order to ensure clarity for all staff involved in the move;
- what kind of staff training was required and at what levels;
- which measures could not be taken before the move, due to lack of time and the necessity of broader consensus within the institution and how could these be planned and implemented after the move.

It was necessary to modify some planned procedures during the physical move. The procedure frameworks resulting from the risk maps proved to be essential for the management and quality control of the move at all stages. It enabled the level of damage to be reduced to a minimum: in total 0,001% of the collection suffered limited damage; the main damages in fact issuing from old repairs to objects.

Acknowledgment

All my thanks to Agnes Brokerhof (ICN) for having pointed me in the right direction in figuring out the two risk maps.

Keywords

risk mapping, risk management, re-housing collections, collection care, mitigating risks.

RISKS AND LESSONS LEARNED DURING THE BIRTH OF A NEW MUSEUM STORAGE: THE ASTRA CENTER FOR HERITAGE

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ASTRA National Museum Complex in Sibiu, Romania, is an ethnographic museum responsible for about 160,000 objects and 300 ethnographic monuments. Objects are stored in seven locations. A detailed evaluation of object preservation over time and risk assessment of the collections in existing storage conditions revealed a high overall magnitude of risk.

Cost benefit considerations indicated that the optimal solution to reduce risks to the collections was the building of new, properly designed joint storage facilities and conservation studios. The design process of the new ASTRA Center for Heritage was based on teamwork that succeeded in including the most recent knowledge on risk prevention and mitigation in the building design. Sustainability was also a high priority of the design process, so passive climate control and lowest possible running costs were goals.

Aware of the lack of knowledge and experience in storage design, the design team applied for external consulting. An expert team of the National Museum of Denmark, coordinated by Morten Ryhl-Svendsen, used building climate computer simulations to investigate and optimize building design toward a low-energy and low-complexity solution.

In 2008 the museum successfully applied for external non reimbursable funds to the European Economic Area - EEA Financial Mechanism - a program financed by Iceland, Liechtenstein and Norway – and obtained a grant of almost 3 million Euros for the building of ASTRA Heritage Center. The construction work had started in September 2009 and will be completed in April 2011. Images of the site as it appears on the 5th of November (Inauguration of the construction) are shown in Fig.1 and Fig.2.

The paper presents the steps in the design and execution of the new building, the problems encountered at each level, and the solutions found by the project team. Many changes and decisions still have to be made during the implementation of this project. Successful decisions require complex interdisciplinary work between architects, engineers and conservators as well as a good understanding, cooperation, and coordination among the project team members. The generous endowments will definitely provide excellent conditions for the preservation of ASTRA Museum ethnographic collections.

Acknowledgment

The project "Conservation and Restoration of Ethnographic Heritage in ASTRA Open Air Museum" would not have been possible without the support granted by the EEA Financial Mechanism.

Keywords

risk assessment, storage facility design, conservation studio design, communication

UNIVERSITY OF CALIFORNIA RISK CALCULATOR FOR LIBRARY COLLECTIONS

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The University of California Office of Risk Management, working with consultants from Bickmore Risk Services, Sacramento, CA, and the UC Berkeley Library Preservation Department, developed a library risk calculator to minimize risks of collection loss and to maximize return on UC's investment in information assets. The calculator allows users to evaluate risks to collections spanning a wide variety of common library media in order to set priorities for implementation of "controls," i.e., actions to reduce risk. Users evaluate pre- and post-control conditions to estimate the cost-benefit of each risk's controls, enabling resources to be deployed cost-effectively.

The risk calculator, PRISM (Preservation Risk Information System Model) is a member of a suite of tools on the University of California's Enterprise Risk Management Information System (ERMIS) website (<http://www.ucop.edu/riskmgmt/erm/libcollwb.html>). PRISM is a Microsoft Excel workbook with customized screens to guide users through inputting data to characterize the elements of risk to the collections and the controls used to manage those risks.

Similarly to the way a prism breaks up light into its spectrum, PRISM breaks up risk into a range of risk events, media at risk, and risk factors. Data are required for each combination of risk event and medium on which information is stored because risks are different for different combinations. For example, the levels of risk associated with a water leak can be different for paper and for online digital media.

PRISM introduces three stages of risk evaluation. Each stage assesses three risk factors and calculates "ratings" for all named risk events for all library collection media. At the first stage, PRISM asks for data about the following risk factors in the absence of controls:

- frequency of the risk event
- recovery time from the risk event
- recovery cost from the risk event

PRISM's second stage evaluates controls already in place to help manage risks to collection loss, e.g., fire suppression systems. With data on the impact of current controls on the above risk factors, PRISM revises the relative levels of risk to incorporate the benefits derived from current controls and the financial commitments they represent.

PRISM's third and final stage evaluates costs and benefits from controls proposed to further reduce risk. With data on cost and predicted effectiveness of proposed controls, the following concerns and business decisions can be addressed:

- Have significant risks been overlooked?
- Are some risks too high to continue to accept, even with current controls?
- Are some existing controls reducing risks to levels well below other risks, suggesting that resources spent on these controls might be spent more effectively addressing other risks?
- Among competing proposed controls, which most effectively reduce risk relative to their cost?
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PRISM is a fully modeled tool for analysis and decision-making. Work currently is underway to assemble actuarial and cost data to inform PRISM's calculations and to "run" several scenarios in order to verify the findings of PRISM against expert experience.

Keywords

PRISM, risk calculator, library collections, risk assessment, risk reduction

RECENT REFINEMENTS IN THE CCI RISK ASSESSMENT DATABASE TOOL: BENEFIT-COST ANALYSIS OF RISK REDUCTION OPTIONS; AND THE USE OF HIGH, LIKELY, AND LOW ESTIMATES TO CALCULATE RISK

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The Canadian Conservation Institute has completed two pilot risk assessments for a service we will offer to Canadian museums. Extensive discussions within CCI and with the pilot museums established that the report must focus on prioritized options for mitigation, not assessment. This paper focuses on our option analysis.

We use the risk assessment method developed during collaboration with ICCROM and the Netherlands Conservation Institute for the course Reducing Risks to Collections. The method analyses three components: frequency/rate, loss of value to each affected object, and fraction of collection affected. Fractional values of each component are converted to a five point order of magnitude scale, where 5 is the highest score. Magnitude of risk is the sum of the three component magnitudes. In 2009, we created a database tool that permits entry of the three components in whichever units the assessor prefers. These are converted to the 5 point scales, using one decimal place for display, e.g., “3.7”.

Up to five options are entered for mitigation of each risk, with initial and annual costs. Options are assessed for remaining risk after implementation. Initial cost is distributed over the museum’s selected time horizon (usually 30 years). The database calculates the risk reduction (benefit) to cost ratio over the course of the time horizon, i.e., fraction of collection saved per year, per dollar spent per year.

Rank order of options based on their benefit/cost ratios is not the same as the the rank order of the risks they address. For example, a historic house museum had a very high fire risk, and only a moderate risk of earthquake damage but the benefit/cost ratio for securing ceramics with museum wax was much better than that of a fire suppression system. The fire suppression option, however, offered the greatest risk reduction of any option on any risk, so it became our primary recommendation. Low cost can also be deceptive: we discovered that some traditional low cost conservation advice can have poor cost effectiveness if it addresses a risk that is already very small. Communicating the results of risk assessment and benefit/cost analyses of options to the museum thus requires a balance between addressing the biggest risks and using limited resources cost-effectively.

Benefit-cost analysis also uncovered a flaw in our use of only the “likely” estimates to calculate risk. Previously, high and low estimates had been used only to gauge uncertainty. We discovered that often options reduced the high estimate (“worst case scenario”) but not the likely estimate, so calculations based on only the likely estimate showed no risk reduction. For example, quarterly inspections of artworks highly susceptible to pests was assessed as greatly reducing the high estimate of risk (an infestation left undetected for years) but it was not assessed as changing the likely risk (considering current collection care practices and the type of objects in the collection). One approach would be to disaggregate such risks, but we chose to make use of the high, likely, and low estimates in calculation of the average (expected) risk, using a triangular distribution on a logarithmic scale.

Keywords

risk assessment, risk analysis, museums, collections, benefit cost analysis

INSTALLATION ART SUBJECTED TO RISK ASSESSMENT – JEFFREY SHAW’S 'REVOLUTION' AS CASE STUDY

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This paper describes the application of a risk assessment approach to an installation made by Jeffrey Shaw and Tjebbe van Tijen, 'Revolution. A Monument for the Television Revolution' (1990) to prioritise preservation options. Its significance was described, a description of its anatomy and identity was made and the contribution of the various components to the significance of the whole 'ensemble' was described. Risks were identified and scenarios developed describing expected loss of cultural value in the future. Since replacement, migration and emulation are common conservation strategies for installation art, the possibility to include recoverability of lost value in the assessment was explored. Compared with decisions curators and conservators would make based on their individual knowledge and experience, the rational, collaborative and structured risk assessment methodology provided increased insight in identity of the work and a ranking of the risks.

Reference

This paper is published in: T. Scholte and G. Wharton (eds.), 2011, 'Inside Installations; Theory and Practice in the Care of Complex Artworks', Amsterdam University Press, pp 91-101.

Keywords

risk assessment, installation art, significance, preservation, decision-making

SYNERGY IN AGENT-BASED APPROACHES TO RISK ASSESSMENT

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This paper examines issues related to the synergistic action of different hazards on cultural heritage, and how this is dealt with in risk assessment methodology.

Representing risk and potential deterioration requires a number of conceptualizations which affect the way reality (and therefore potential for damage) is understood. The way that heritage professionals assess, analyse and document risk provides a method to compare events and possibilities that operate in different ways, on different time scales, to different items. However, we do pay a price for this ability to take an overview.

Every time something is represented, simplifications are required. When the future is predicted, we do not have a territory to move through so we have to create a map from what we know now, which inevitably has repercussions on how a situation is understood. Choosing the map with the least misrepresentations is the wisest choice, but one must be aware of the difference between the map and the territory.

The practice of identifying risk has largely been connected to the ‘ten agents of deterioration’ (<http://www.cci-icc.gc.ca/crc/articles/mcpm/index-eng.aspx>). This agent-centred approach has been one of the most established elements of risk assessment partly because of its applicability to different situations. However, every category set has its strengths and blind spots. I would like to discuss a few of the blind spots.

Agents are not causes or effects, they are the ‘channels’ through which risks operate. Fire is an agent with quite different causes, such as faulty electrics, contractor error and arson. Methods for fire mitigation and recovery can be very similar, but methods to avoid it can be very different. For many reasons, fire is treated as a single issue, but when looking at the cause of fire, its status as an agent becomes clear. A single cause may affect several agents at the same time: an exploding boiler may cause damages associated with Fire, Incorrect Temperature, Incorrect Relative Humidity, Pollutants, and Physical Forces.

When we look at causal associations, the synergistic action of different agents is evident. This is a reality that can easily be lost sight of when defining risks categorically by agents, which is a reductive process. The agents we recognise have never acted in isolation.

One could also argue that there is a hierarchy of influence amongst the agents. Light (or visible and ultra-violet radiation) may cause insolation in a room (due to neglect or ignorance), which may raise the temperature, which may lower the humidity, which may affect pest habitation or the deposition rate of pollutants. Agents can have a secondary role that reveals a complex structure of agents in a dynamic system. What happens in reality is too difficult to represent, but we must ensure it adequately affects our understanding of what happens, and how to deal with it.

The paper will discuss approaches to acknowledging these issues that can complement risk assessment of cultural heritage, including fault-tree analysis and construct analysis. The implications of mixing cause- and agent-centred approaches in risk assessment will also be mentioned.

Keywords

synergy, agent, cause, effect, representation

AIR POLLUTION IN LIBRARIES AND ARCHIVES - MODELLING RISK WITH THE POLLUTION PATHWAY METHOD

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The purpose of risk modelling is to predict the future effects of preservation strategies, thus allowing the comparison of their efficacy. Despite increasing popularity, the actual application of risk-based decision making is rather limited in the field of cultural heritage. One reason for this is that the methodology is not focussed on risk treatment and provides cultural institutions with too little information to assess the effectiveness of their current mitigation strategies and how further reduction of the dominant risks can be achieved. In this paper we present a new method for the analysis of the risks connected to indoor air pollution.

Our work originated from the need to establish if the effect of gas filters in libraries and archives in reducing paper degradation is worth the investment of initial installation, maintenance and energy consumption of these filters. Beside filters, paper-based institutions can apply alternative mitigation measures. These measures may not target pollution directly but contribute to the reduction of its effects, as for instance the use of boxes and/or the application of deacidification treatment. One of the questions we want to answer is how these alternative measures compare with the use of gas filters in terms of cost-effectiveness.

One difficulty encountered when comparing different mitigation measures is that they are applied at very different levels within the institutions. They might decrease the concentration of pollutants in air directly, they might reduce the rate of paper degradation due to pollutants, or they might limit the frequency of use of objects already deteriorated as a consequence of pollutants. The solution to this problem is offered by a method allowing the comparison of mitigation measures by balancing their estimated reduction effect on the loss of collection value.

The next challenge is how to connect systematically risk reduction measures to the loss of collection value. We observe that pollutants are first transported in air from their source to the collection, subsequently they react within the paper leading to chemical degradation and finally it is the actual use, the handling of the object, which leads to loss of value. Along this chain of mechanisms each institution may have in place a number of mitigation measures. An effective way to describe and connect all relevant factors systematically is to represent this chain of causal mechanisms in a diagram, which we call Pollution Pathway Diagram (Figure 1), and to join pollution sources to loss of value and to insert risk reduction measures as barriers along the chain.

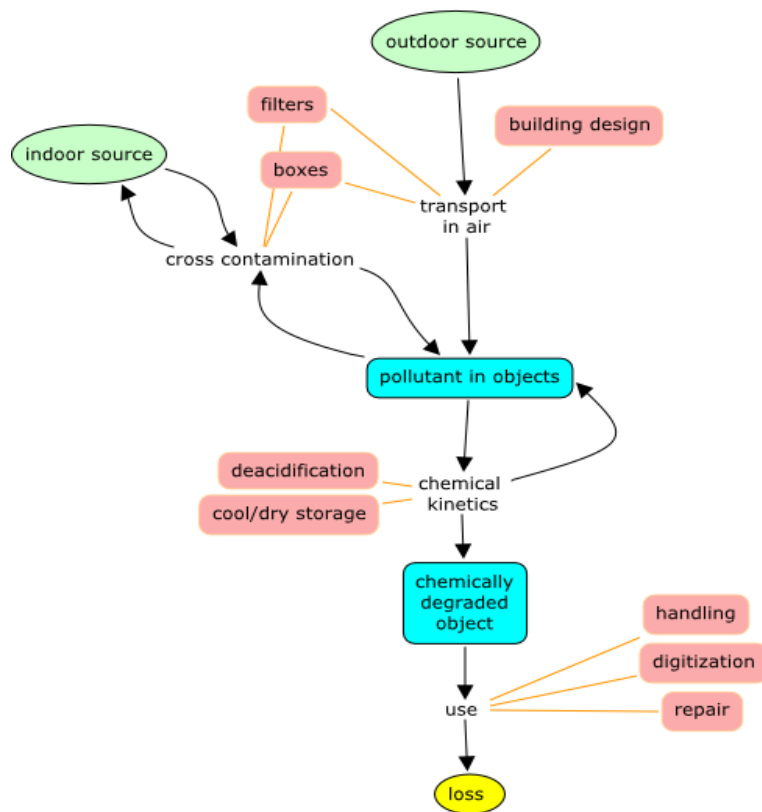


Figure 1. Pollution Pathway Diagram.

While the diagram is the visual representation, the core of the method is a mathematical model describing the mechanisms of transport of pollutants in air, chemical reactions in the paper and use of objects. Central questions in the mathematical model are how the rate of degradation of paper is influenced by the absorption of air pollutants and how the uptake of pollutants by the collection is influenced by indoor sources such as books which emit volatile organic compounds (voc's).

We show how to model these two phenomena, and demonstrate the application of the Pollution Pathway Method to Swiss and Dutch national institutions.

Keywords

indoor air pollution, paper collections, risk assessment, risk model, archive

INTEGRATED VULNERABILITY ASSESSMENT METHODOLOGY FOR HERITAGE BUILDINGS AND CONTENTS UNDER CATASTROPHIC HAZARD

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There are currently a large number of methodologies for the assessment of building safety considering different types of catastrophic hazards (e.g. earthquakes, fire, floods). From the engineering point of view, these methodologies offer different degrees of refinement depending on the level of detail that is required, on the hazard under consideration and on the building typology under assessment. These methodologies can be divided into two groups: the first one includes methods requiring extensive numerical simulation of the behaviour of the construction, and the second one involves safety assessment methods dedicated to global and rapid safety analysis, based on empirical vulnerability indicators that are established using information obtained from local surveys of the construction. With respect to this latter group, such methodologies are not appropriate for every type of building configuration. More importantly, they are not able to account for some of the architectural particularities common to heritage buildings such as churches.

With respect to the building contents, namely movable heritage pieces and collections, existing vulnerability assessment methodologies consist of simplified approaches based on a few globally estimated measures (the probability of occurrence of the hazard, estimates of the percent loss for the objects and estimates of the percentage of objects affected). Measures to account for the expected extent of damage or loss based on, for example, the type of display, the type and efficiency of existing protective measures, the possibility of evacuating the objects, etc., or building-related information (e.g. existing damage in the building, expected building behaviour for the hazard under consideration, etc.) are missing in some simple methods and may be underutilized in others. Such simplified approaches may also imply that the estimated vulnerability score depends only on the criteria selected by the analyst, which are defined based on his knowledge and experience about a given hazard scenario.

Based on the existing methods for vulnerability assessment of buildings to earthquake and fire hazards by survey of empirical indicators, a wide-scope approach is proposed for vulnerability assessment of heritage buildings which integrates data related to both the building and the heritage contents. The implementation of such methodology is presented herein for the case of churches along with a detailed discussion about the selected building- and content-related parameters entering the vulnerability quantification. Furthermore, parameters related to the surroundings of the building are also considered (e.g. the type of street access to the building, the existence of additional sources of hazard in the vicinity of the building, etc.). Example applications of this methodology are presented and discussed to determine the potential of this approach.

Keywords

vulnerability assessment, heritage building, heritage contents, risk, hazard, church

RISK ASSESSMENT AND PREVENTIVE CONSERVATION PROGRAM OF THE LIMESTONE QUAY “CAIS DAS COLUNAS”, LISBON, PORTUGAL

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The ‘Cais das Colunas’ is located on the border of Tagus River, integrating the ‘Terreiro do Paço’ - the royal square of the historical centre of Lisbon – and the ‘Baixa Pombalina’. The quay, erected after the great Lisbon earthquake of 1755, is an historical place and tourist mark of the Portuguese capital.

Due to the expansion of the underground lines of the city of Lisbon, the coastal monument was partially removed in 1997, in order to construct a tunnel beside its foundations. The deconstruction, or partial removal, took four months, in the Spring/Summer of 1997. During the deconstruction, each one of the 1500 limestone blocks was carefully removed, marked with a number and then transported to a safe place. Later, it was applied urgent cleaning treatments on part of the limestone blocks. The reconstruction project was initially planned to be completed in 1999, but accidents, during the construction of the new underground line, resulted in its postponement. During the summer of 2008 the historic quay was finally reconstructed. The monument was reconstructed using modern techniques and materials. Structural corrections were made but each of the stone blocks was replaced in its original localization.

Before the removal of the blocks, the main pathologies were identified, classified and mapped. Through macroscopic observation, 17 distinct pathologies affecting stone, mortar or metallic elements were identified and classified. From these, the most significant, in terms of occurrence, were mapped grouping the pathologies in four maps. Results demonstrate that the marine environment is responsible for most of the pathologies. East and west elevations reveal a different distribution of weathering forms, showing wind and solar radiation effects. Of particular relevance are the river polluted water and the biological attacks, as well as effects of air pollutants.

Since the quay’s reconstruction, which ended on August 2008, three years have passed. It is now time to evaluate the new materials and construction systems used on the XXIth century (re)construction. Do they contribute to increase the “durability” of the limestone quay? Or will they accelerate its degradation? Is Cais das Colunas a monument at risk? A “preventive conservation program” is being prepared. This includes systematic evaluation and monitoring procedures. The aim is to evaluate the effects of the marine environment on the weathering of the quays’ materials and structure and to clearly identify mechanisms and critical factors, in order to act preventively.

Acknowledgment

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Keywords

‘Cais das Colunas’, limestone, Lisbon, risk assessment, weathering

RISK LEVEL ASSESSMENT AND BUILDINGS AT RISK: THE CASE OF THE SEASIDE ARCHITECTURE (1860-1925) OF OEIRAS, PORTUGAL

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The “Seaside Architecture Inventory of Oeiras” was developed between 2004 and 2008, as part of a doctorate thesis in the scientific area of architecture. It includes fifty single family houses, built for seaside vacations. They were built between 1860 and 1925 in the territory of the current Oeiras’ municipality.

This is a pioneer study for the quoted region which takes a multidisciplinary approach, to the systemization, the description of the buildings, as well as assessment of risk levels. The main goal of this research project was to define the correct program of conservation, safeguarding and revitalizing of these eclectic and historic buildings. This research involved field work in addition to documentary and bibliographical research. Each one of the dwellings was individually studied to: gather historical, administrative and technical data; provide a physical description; evaluate it’s the state of conservation and present recommendations for intervention.

The evaluation of the state of conservation of each building was done through a two phase method:

- 1) The evaluation was preceded by definitions of anomalies to be noted (the so-called typifying anomalies), which formed a basis for a check-list. Nine structural anomalies and 25 non-structural anomalies, such as finishes and coatings, were typified. The state of conservation for each building was summarized on a scale from 1 (very bad) to 4 (good).
- 2) The second phase was the assessment of risk. Based on the principle that the general state of conservation of a building is influenced by its kind of occupation, six risk levels, from 1 (extreme risk) to 6 (null risk) were defined.

The assessment of the general state of conservation of each building revealed that 46% (n=23) are in good condition but 12% (n=6) are in a very bad and 16% (n=8) in a bad state of conservation. This approach revealed that 44% (n=22) of the inventoried houses have null risk. Six buildings are in extreme risk, four buildings are in serious risk and seven buildings are in high risk. T, 34% (n=17) of the historic holiday seaside houses of the municipality of Oeiras are at risk, based on the definitions of risk levels 1 to 3.

“Seaside Heritage of Oeiras” was the theme of European Heritage Days of Oeiras, which occurred on 25th September 2010. It is in recognition of the importance of this Heritage, which is in danger of disappearing.

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Keywords

architectural preservation, historical buildings, risk assessment, seaside architecture

COLLECTIONS RISK ASSESSMENT AT THE ROYAL BC MUSEUM AND ARCHIVES

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The Royal British Columbia Museum (RBCM) has a large and valuable collection of archival records, artifacts, specimens, and associated information pertaining to the human and natural history of the Province of British Columbia, Canada. In 2005 the RBCM conducted a comprehensive risk assessment to identify and quantify the potential impact of various threats to the collections (Risk Assessment & Mitigation at the RBCM, Brewer 2006). In 2010, those efforts were repeated, once again using the Cultural Property Risk Analysis Model (CPRAM; Waller 2003), in order to document risk reduction and identify new and emerging risks to the collections.

The exercise proved challenging and enlightening for those involved. The Manager of Conservation Services led a team of preservation staff, collection managers and facilities specialists, eventually including over 30 staff members, and completing the project over a period of seven months. Accurate inventories of collections and associated documentation were completed. Some risk related assumptions were confirmed and new issues came to light.

As a result of the 2010 risk assessment, a Risk Management Implementation Plan has been developed to address the most serious and imminent threats to the collections. Staff work plans have been modified to focus on risk reduction in these areas. Options for funding major risk mitigation projects are being explored and a plan devised to secure outside resources. Most timely, however, is the contribution that this information has made to the planning of a new collections storage facility, scheduled to open on the same site in 2017.

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Keywords

RBCM, CPRAM, risk assessment, risk analysis, mitigation

DISASTER RISK ASSESSMENT METHODS AND RESPONSE PLANS FOR CULTURAL HERITAGE IN TAIWAN

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In recent years, cultural heritage and historical buildings have been damaged due to both manmade causes (management negligence and arson) and natural factors (earthquakes and floods). These events expose Taiwan's weakness in disaster prevention, hazard assessment, and emergency planning for historic architectures. Despite cooperation between the official and applied fields, a complete and coherent disaster risk assessment and management approach is lacking.

Precaution and preparation are essential for disaster prevention and heritage protection. Plans must be made based on an overview evaluation of cultural heritage assets, including their buildings, structures, surroundings and landscapes. These are common, basic viewpoints shared worldwide. However, the current legislation (Cultural Asset Preservation Law) and related regulations in Taiwan, do not fully enable Taiwan to achieve the goal of preserving cultural heritage. In some cases the requirements for preservation given the actual hazard situation are not met. To correct this situation, precaution and preparation must link detailed hazard assessment with damage-control management strategies to have a thorough plan for preventing damage to cultural heritage.

This project analyzes hazard assessment for historical architectures, including fire, flood, earthquake and compound disasters as well as preservation techniques in cultural heritages. Then, applying the damage prevention plans as a standard module and supplement, management of a cultural heritage property, as well as of related organizations, are able to construct a disaster prevention and damage control plan that is suitable to a specific case (or region), its historical buildings, surroundings, people and its urban characteristics. In this way, the goal of heritage preservation and damage prevention can be fulfilled.

This study is a long-term development project. Currently this study focuses on Taiwan's cultural heritage features and the present disaster prevention systems. This study's preliminary results are listed below:

Establishment of a classification system for cultural heritage based on the viewpoint of disaster risk assessment using categories such as construction based, environmental based and response-rescue based, in which different categories would have different demands for their response plans or different parameter weights used for its risk evaluation.

Establish risk assessment guidelines for different types of heritage buildings (according to construction, regional, and management characteristics) to help propose reasonable prevention measures and countermeasures that meet the demands and probable scenarios of each type of heritage property.

This study further proposes a policy and technology based analysis using a risk assessment approach. In addition, in promoting incorporation of all local stakeholders (manager, local community groups, cultural and firefighting units) into the response plan, this study formulated a disaster response guideline using case studies to serve as a supplement to help heritage managers, users, and related units reach its heritage preservation and risk prevention goals.

Keywords

cultural heritage, hazard assessment, disaster risk management, damage-control management

A TALE OF TWO SYSTEMS: SYNERGY IN MANAGING RISKS TO PEOPLE AND TO COLLECTIONS

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The two systems of managing health and safety and of managing preservation of cultural property have many parallels. Either, or both, can exist as predominantly habit-based systems. However, when managed from a proactive perspective, they can be considered goal-directed systems. In the first case, the goal is to maintain health and avoid accidents to people. In the second case, the goal is to avoid damage and loss to cultural property. Both goals are clear, widely accepted, and even inarguably noble and worthy, seemingly a great advantage for both systems.

Habit-based and goal-based approaches are not mutually exclusive. A well-managed goal-based system will foster adoption of good habits that then allow the systems to operate effectively and economically. Both health and safety and cultural property preservation systems will operate best when they are mutually supportive. In many instances, this mutual support arises automatically as a consequence of the basic similarities of the systems—both strive to avoid any unnecessary and harmful interaction of people, energy and materials.

As a simple example, wearing appropriate gloves while handling objects protects the wearer as well as the collection object/specimen from contamination. Similarly, avoiding abrasion and decrepitation of inherently toxic collection objects has clear benefit both to the objects and people that are near them. There are many such examples of complete correspondence of purpose between the health and safety and preservation systems. In these cases both systems will naturally be mutually supportive.

Not all potential intersections of the two systems align automatically. As an example, most institutions that care for cultural property conduct regularly scheduled health and safety inspections of all work areas. Few institutions have a similar routine comprehensive inspection for collection preservation issues. The management of risks to collections could benefit from including a collection care specialist in the team conducting a health and safety inspection. That specialist would be tasked to look for and document situations that pose, or exacerbate, risks to collections. This would both ensure the regularity of such inspections and foster synergism between the two systems to produce an integrated risk management system.

Some examples of conflicts between the two risk management systems can also be found. For instance, an old collection of pharmaceuticals can pose many risks. From a health and safety perspective, disposal seems the obvious solution. From a curatorial perspective, keeping contents intact for future analysis may be important. The exercise of developing a creative solution that protects both people and collections can lead to improved understanding among all parties.

Viewing health and safety and cultural property preservation as parallel and closely related risk management systems opens the way to improvements in both. Combining the two encourages synergies that can lead to effective risk management and resource allocation by custodians of our collected heritage.

Keywords

risk management, health and safety, preservation, goal-directed management

RISK ANALYSIS APPLIED TO A PORTUGUESE ARCHIVE

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The work here presented refers to a preservation risk analysis for the paper-based collection existing in Arquivo Histórico Ultramarino (Lisbon, Portugal) which gathers in its premises archival documentation spanning 500 years. The main objective of the risk analysis was to determine the mathematical magnitude of the risks observed in this Archive which made it mandatory to evaluate physically and environmentally the building itself and also to understand the human practices involved. The methodology was based on the Cultural Property Risk Analysis Model (CPRAM; Waller 2003) and constituted a practical and useful application of this model to a Portuguese archive. In this work the above mentioned model was for the first time applied to a Portuguese cultural institute.

During this risk assessment it was necessary to adjust the model, namely in the matter of the Value attributed to the collection in study and the decrease in this parameter once the collection was submitted to any level of damage. This work allowed the team and the Archive to identify the two main risks opposing the collection - Physical Forces and Fire – though the dramatic yet possible scenarios considered for these two agents of deterioration were major contributors for the high values encountered. Still according to our study, among the more manageable agents – and manageable is not a definition of less dangerous! – illumination and environmental settings were found as those that the institution could act on quickly and this action could increase dramatically the collection's life span.

Using the CPRAM mathematical approach it was possible to point out which risks were the most relevant, and direct the institution towards solving them first. The risk analysis performed this Archive, besides acting as the support for the remedial and preventive measures towards the fire and physical forces issues (the ones with higher Magnitude of Risk (MR) values) resulted also in an enriched experience in the field of conservation in general and preventive conservation in particular. Constructed around a mathematical plot it is easy to deem it too complex and one can, at a first glance, consider more urgent a more practical preservation-related activity. Ironically, in a world ruled by financial constraints, this model is as practical as it gets. Further, use of the model not only helped to make conscious decisions but also to better understand both the collections as the building housing them.

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Keywords

risk analysis, archive, cultural heritage, CPRAM

RISKS TO INTANGIBLE VALUES IN SAFEGUARDING CULTURAL HERITAGE

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Generally, preventive conservation involves study and work with the built form, building codes and regulations and with materials analysis. These are the quantifiable and tangible aspects of safeguarding heritage sites. These aspects define the traditional approach to preservation. However, preservation should also honour intangible values, which cannot be studied or evaluated with traditional tools and methods.

This research focuses on the risks of negligence of sense of place in the process of preservation. Following our research, we observed that when we ignore the sense of place, intervention in heritage sites often has negative impacts. Further, international charters suggest a need for considering diverse interpretations and senses of significance in each place.

Rehabilitation of heritage fabrics and complexes is often accompanied by offerings of new functions. During this process, we try to preserve the physical structure of urban or rural tissue prudently but the spirit of place may not be properly considered.

This paper demonstrates two categories of risk resulting from interventions: risk to 1) tangible, and 2) intangible values. The first category of risk consists of all changes in value associated with changes in materials and physical structure. The impacts of these changes are usually found directly and rapidly, so they are relatively straightforward to analyze and mitigate.

The second category of risk is not tangible but is sensible. This kind of risk threatens values associated with the sense of place even while materials and physical structures remain intact. In this case, it is the authenticity of space that is in danger. If interventions required for preservation of tangible features will allow inhabitants to retain the sense of place then this second category of risk, non tangible, is low and the operation will be successful. Therefore, in terms of preserving cultural heritage, it is critical to understand the significance of place and sense of place. This enables a conception of meaning of cultural heritage not only as representation of the past, but also as the medium in which present human experience of the place is constructed. It enables preservation of identity and sense of belonging. It nurtures relationship between the past lives of our ancestors and our present lives.

This paper presents case studies of interventions in Iran that have either changed or maintained the sense and spirit of place. This research leads to the conclusion that successful preservation of cultural heritage in rural and urban areas requires assessment and management of risks to intangible values as well as tangible values.

Keywords

sense of place, preservation, Iran, Heritage, risk to intangible value

PRESERVATION METRICS: A PRESERVATION ANALYSIS TOOL FOR RISK ANALYSIS IN PREVENTIVE CONSERVATION

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This poster paper presents the use and application of the Image Permanence Institute's (IPI) Preservation Metrics. These are sets of algorithms that process gathered temperature and relative humidity data and yield numerical estimates of the risks of environmentally induced decay. Their use constitutes a powerful method for risk analysis in preventive conservation.

Preventive conservation professionals have long been aware of types of environmentally induced decay that threaten our cultural collections including spontaneous chemical degradation, mold, corrosion, and mechanical damage caused by changes in moisture content of objects. These same professionals are equally aware of the need to monitor temperature and relative humidity as the factors which drive those threats. The challenge has been quantifying the rate at which, or likelihood that, decay would occur.

The metrics include the preservation index and time-weighted preservation index (chemical decay), mold risk factor, percent maximum equilibrium moisture content (metal corrosion) and maximum and minimum percent equilibrium moisture content and percent dimensional change (mechanical damage) – are quantitative preservation risk analysis tools that allow us to qualitatively assess the conditions of our preservation storage environments from a material impact perspective. Gathered and trended over time, the data and metrics become a base of fundamental information which can be referred to over and over again – as one partner has stated, “this information provides the valid basis on which all of our decisions must lie and rationally supports the need for any improvements that we request.” The information provided by the metrics allows for the strategic management storage environments for collection preservation.

The preservation metrics allow us to document unfavorable conditions, analyze their causes, and finally, prioritize our efforts based on their relative threat, creating a powerful tool in the conservator's kit. The poster describes the use of the metrics to analyze the relative risks to assorted media posed by various environments, provides examples of applications of the data, and demonstrates the tools used by IPI to calculate, organize, and present these metrics.

Keywords

preservation metrics, preventive conservation, preservation environments, risk analysis, decay, management

COLLECTIONS RISK ASSESSMENT AT THE DENVER MUSEUM OF NATURE & SCIENCE

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The Denver Museum of Nature & Science (DMNS) received funds from the Institute of Museum and Library Services-Museums for America program to complete a risk assessment of collections in storage. The goal of the project was to develop a preservation strategy based on a systematic and quantitative evaluation of risks to the collection.

The DMNS collections contain more than one million objects in diverse areas including anthropology, earth and space sciences, zoology, and library and archives. Collections are dispersed among 49 locations, of which only one meets optimal museum standards. The other 48 locations are crowded and lack one or more important features such as fire detection and suppression systems, centralized security, or temperature and relative humidity controls. These conditions jeopardize long-term preservation, restrict public access, and place human safety at risk.

Risks to collections had been identified in previous conservation assessments. Still, the DMNS lacked a comprehensive and balanced understanding of all risks affecting collections. A more holistic understanding is required for daily operational preservation funding. It is critical for the inevitable trade off decisions that will occur in the value engineering phases of facility design as the Museum prepares to build a new collection storage facility in 2011. For example, when cost savings must be found and the Museum is presented a choice of reducing investment in security, climate control, or fire protection, then which choice will have the least impact on expected long term loss of collection values?

This poster discusses the process and outcomes of the risk assessment as it occurred at the DMNS. Participating staff included Research and Collections, Security, Facility Operations, and the Board Champion for Collections. Staff identified 31 collection units to evaluate. A comprehensive list of risks was developed based on the Cultural Property Risk Analysis Model (CPRAM; Waller 2003). In this model, the magnitude of risk is measured as the product of fraction susceptible, loss in value, probability and extent ($MR=FSxLVxPxE$). The DMNS identified an average of 91 specific risks for each collection unit. These risks were grouped into three types: rare, sporadic, and continual. For examples, a major earthquake would be a rare event in Denver, Colorado, while light exposure and damage is continual for some objects on permanent exhibit. Staff identified three kinds of value in which loss in value (LV) might occur; these values are discipline, historic, and public access.

The technical result of the risk assessment exercise is a comprehensive accounting of all identifiable risks to the collections. This will serve as a basis for rational preservation resource allocation both in ongoing collection care and in new facility design. The less tangible but equally important result is a vastly improved mutual understanding of collection preservation issues among all parts of the Museum.

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Keywords

risk assessment, risk management, museum collection, preventive conservation, CPRAM

ASSESSMENT OF RISKS AND MITIGATION PROPOSALS APPLIED TO THE CULTURAL HERITAGE OF THE HUICHOL INDIGENOUS PEOPLE OF MEXICO

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This paper considers the risks to the cultural heritage of the Huichol Indigenous People in Mexico as well as proposals for risk mitigation. In the case of the Indigenous People in Mexico the major risks posed are manmade and linked to a latent discrimination towards their cultural heritage. In the specific case of the Huichol group, risks are not so evident as with natural disasters, but are rather hidden behind non-comprehensive programs such as those based in an unsustainable ecotourism. These risks are stressed by globalization, integration policies permeated by intolerance, the expansion of trade, access to markets, and private contracts that generate displacement and reallocation. This leads to the urbanization and forced assimilation and ultimately to impoverishment and loss of the Huichol cultural heritage. This constitutes a violation of their cultural property rights.

Therefore this paper proposes the integration of a framework of risk assessment and management for the Huichol cultural heritage, based on an understanding of the local context. This will require the integrated effort of the local government and the private sector, as well as the need of inclusion of the Huichols in the decision-making processes. By including their traditions and values, and listening to the group claims it is possible to achieve an impact in long-term patterns of discrimination. This inclusion also considers the customary ownership still relevant to the Huichol Indigenous Peoples in order to achieve a durable solution concerning the promotion and protection of their cultural heritage. The Huichol cultural heritage is an important asset in providing opportunities for their long-term social development and integration, as well as economic opportunities based in their traditional means of subsistence. This will lead to a sustainable situation that does not compromise their cultural identity or their intrinsic relationship with nature.

Keywords

Huichol cultural heritage, risk assessment, cultural sustainability

PLANNING FOR DISASTER RECOVERY IN HIGH-DENSITY, HIGH-BAY LIBRARY STORAGE

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Although planning for response and recovery of library materials after a disaster has been practiced by preservation and conservation professionals for many decades, many libraries that now have “high-density” storage facilities for low-use book storage are finding that our standard plans for disaster response are completely inadequate in an environment where books are shelved 9 to 12 metres high, ordered on shelves by size to maximize space, and findable only by a series of barcodes in a database linking row numbers to shelf numbers to box numbers to item number. Not only does this situation present enormous physical challenges for the rapid removal of materials, but also presents significant challenges to maintaining intellectual access to materials during and after the recovery effort.

The University of Illinois at Urbana-Champaign in the United States has drafted a disaster response and recovery plan specific to this high-density book, manuscript, and media storage environment and is seeking to share our perspectives and encourage dialog with other cultural heritage institutions about how to best plan for disaster recovery from such a challenging material storage environment.

Keywords

books, disaster recovery, storage, high-density, disaster planning

CAN WE LEARN FROM LECTURE OF EARTHQUAKES?

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In the last two years many catastrophic events have happened throughout world. The magnitude of earthquakes and their damages have increased awareness of local seismic risks and seismic sensitivity of cultural properties. In addition, the importance of respect for rules and best practices for building construction and maintenance for preventing harm to people and things has become more evident.

Collecting some simple and expeditious data of recent earthquakes (l'Aquila, Italy; Haiti, USA; Darfield, New Zealand; Sumatra, Indonesia) and analyzing the disaster parameters of risk (like height of buildings, width of the roads, materials and construction techniques of the city, conservation condition and use of buildings) is clear that the number of victims and the number of buildings completely destroyed do not coincide with the seismic magnitude, and can never be assumed.

The aim of this report is to identify those construction characteristics and building codes that have led to such different damage scenarios in different territories and cities and to recommend the best practices to avoid or to reduce loss of property and lives.

We formulated a “prevention check-list” that can help to analyze the city’s structure of Reggio Calabria, re-built in the same place of its wrecking, after the catastrophic earthquake called Reggio – Messina Earthquake which occurred the 28th of December 1908.

In the centenary anniversary of that sad event, the Department of Architectural and Urban Heritage of Mediterranean, University of Reggio Calabria, has studied all the aspects of the 1908 earthquake: damages (number of victims and collapses of constructions and infrastructures); reconstruction choices (technologies, engineering materials and systems); national and international humanitarian aid; time lines, laws (general and technical) and economic supports related of this event.

The studies published in 2008 show that the first city of Reggio Calabria (built between 1909 and 1936) despite its progressive decline of both architectonic and technical quality, was a prototype of anti-seismic quake proof model for a 21st century city. We could define Reggio Calabria and Messina as “XI Mercalli” cities. Unfortunately, year by year the memories of that event became more and more faded: today the citizens think about 1908 only as a historic legend, a sad tale of the past.

On the contrary, the local seismic history of Calabria region, presents a 100 – 130 year return period of destructive seismic events. This should incite us to accelerate and improve research and studies to estimate the real conditions of safety and vulnerability of the built heritage including buildings (historic and modern ones) and the entire infrastructure nets of the city.

The professional and technical experiences of the last two years in Abruzzo after the 6th of April earthquake of Aquila, drive us to elaborate a cooperative research project, which needs to be effective. For this reason we are going to project together with fireman national corps, civil protection department, other university research departments and local government an anticipatory plan of the estimation of the city’s vulnerability with suggestions, guide lines, examples and building maintenance and upgrade requirements.

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Keywords

prevention and Protection, Seismic Culture, Best practice, Urban vulnerability and seismic damage

SETTING PRIORITIES IN CASE OF AN EMERGENCY SITUATION

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Past experience has shown that setting priorities is essential for effective emergency planning. A comprehensive emergency plan should address priorities and take into account both preventive measures aiming to protect people and collections as well as recovery and rehabilitation actions.

A complete emergency plan forecasts all possible scenarios that can cause an emergency situation. Simplicity, realistic objectives and flexibility are important characteristics. The plan should commence with instructions on how detailed inspections of the building and its surroundings can be conducted, considering all possible factors of damage and also the appropriate salvage procedures. Ensuring health and safety of personnel is of primary importance. Employees should be aware of safety precautions and procedures, emergency actions and the location of safety equipment. Response through early warning procedures along with a comprehensive and updated evacuation plan can actively prevent injuries or the loss of human lives. Evacuation planning of holdings from their storage depots can then proceed, following certain guidelines. Immediate access to basic emergency equipment is crucial. Collections of high value and vulnerability have priority. Seeking resources such as material suppliers, technical support, remote storage areas and cooperation with other institutions can facilitate salvage efforts.

Establishing a plan of regular checks in regard to the condition of the building and its surroundings can identify maintenance needs that may assist in avoiding greater disasters.

In case of a disaster, first reactions should be the communication between staff and rescue teams, tasks allocation, and response to issues of high priority. Providing support to injured and shocked people is essential during such an incident. Securing of databases and evacuation of holdings from exhibition and storage rooms can then follow. Conducting rescue actions based on clear priorities will enhance the retrieval of holdings without wasting time. Record-keeping of all salvage procedures and relocation of objects will then simplify the re-ordering of collections.

In cases of vast disasters, for example after the complete collapse of a building, the implementation of a standard emergency-rescue plan is not sufficient. Under those circumstances, priorities change and removal of objects from the ruins should begin with the most exposed items and with those that impede further access to the building. Peoples' safety and stability of the site are of outmost priority. Until these safety precautions are fulfilled, further attempts to rescue objects regardless of value should not proceed.

Knock-on effects that may follow a devastating situation should be also taken into consideration, estimating the probability and severity of effects that may come after the first disaster. Damage in cultural property may occur at any time. In an emergency situation, it is critical to evaluate the level of risk associated by the corresponding hazard and to decide what precautions can be taken first, in order to mitigate the risk both for people and collections. A comprehensive business continuity plan will guide and assist the institution in resuming its normal operations.

Keywords

emergency plan, disaster preparedness

MONUMENTS, THE “UNDISCOVERED” TARGETS - AN OVERVIEW OF SECURITY MEASURES IN THE MONASTERY OF ALCOBAÇA

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A monument is part of a country's National Critical Infrastructures (Commission of the European Communities 2004), and must be protected and intact for future generations. Further, being a place of public access, all actions concerning the building and its staff and visitors, should strive for an appropriate balance between security, ease of public access, and aesthetics.

Given the importance of a monument's architectural characteristics, the adaptation of modern surveillance and hazard detection instrumentation to be both effective and unobtrusive is an ongoing challenge for security system specialists. Due in part to this challenge, minimum requirements for security observation in listed buildings are usually admitted.

However, the implementation of security measures in historical patrimony, including monumental buildings inscribed on UNESCO's World Heritage List, is critical, considering the Instituto de Gestão do Património Arquitectónico e Arqueológico's (IGESPAR) mission of safeguarding and preserving Portugal's listed architectural and archaeological heritage. Fire, floods, robbery and vandalism threats are ever-present concerns at these heritage sites. Following the legislation for fire security protection, adapted in Portugal in 2008, these threats constitute the main justifications for implementing security plans.

In the particular case of the Monastery of Alcobaça, having suffered multiple intense risk events since the XII century, it is our concern that the following measures are implemented as an effective system of security and safety in the building:

- Installation of CCTV, fire detection, intrusion detection systems in both cable and wireless signal transmission.
- Conducting and updating risk assessments.
- Raising security awareness through guidance programs, documents, and plans.
- Maintaining emergency preparedness and business continuity plans.
- Interface with local law enforcement / emergency services agencies.
- Participating in exercises to enhance emergency preparedness.

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Keywords

security measures, Surveillance instrumentation, threats, legislation, safety plans, critical infrastructure

KLIMAATWERK: NEW DUTCH CLIMATE GUIDELINES

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Based on the recently published book *Klimaatwerk* (Ankersmit, 2009), aspects of a decision making process concerning the management of climate-related risks in museums and historic houses are presented and structured. In particular, considerations that must be made before developing risk mitigation strategies are identified and organized. Based on the process and considerations a guideline for climate decision making is presented.

The goal of the guideline is to assist collection managers and caretakers by providing information needed for responsible, well-considered decisions about the museum indoor climate. The focus is not only on final decisions, but also on the equally important process that leads to decisions. The stepwise process results in documentation of current understanding of the needs of movable and immovable heritage. This documentation within a framework, promotes transparent decision making, and facilitates information exchange and collaboration among stakeholders. Here lies a big challenge, since in practice it is not easy to bring together all the necessary areas of expertise to develop an optimal solution. In reviews of three former national museums carried out by the Dutch Cultural Heritage Inspectorate it was shown that the actual indoor climates were far from the desired specifications. The underlying documentation that should serve as a basis for decision making and choice of measures was not available. Documenting the process and the decisions made, including the corresponding arguments, is essential to ensure that the next generations will have a clear understanding of today's choices.

The decision making process to determine the requirements for the museum indoor climate includes four steps:

Step 1. The process starts by making the significance of the building and the movable collection explicit. Altogether, these values and significances provide the framework within which to consider options for modifying the building and/or the environment around the objects.

Step 2. A building provides an (natural) environment with a certain indoor climate. This climate must be known in order to determine which of its aspects should and could be improved to reduce risks to the collection.

Step 3. The collection needs are defined. Depending on the sensitivity of the objects, larger or smaller fluctuations around an annual average will constitute a large or small risk of damage. The collection can be divided into sensitivity categories containing materials/objects that have different environmental needs. Subsequently, the climate-related risks that must be reduced are determined for each category.

Step 4. Within the value framework established in Step 1, the options to improve the indoor climate (analyzed in Step 2) are considered and selected. A strategy for the efficient and sustainable realization of climate control is then developed.

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Keywords

collection risk, indoor climate, risk management, museum climate, climate specification

CRITICAL KNOWLEDGE GAPS IN ENVIRONMENTAL RISK ASSESSMENT AND PRIORITISING RESEARCH

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Type 2 and 3 risks, inappropriate RH, T light, pollutants, generally act in the medium term, although rapid deterioration can occur (cracking of wood at low RHs, rapid corrosion episodes). This paper will assess the present state of knowledge and identify critical knowledge gaps.

For example, the scientific underpinning for the effects of environment on highly transformed archaeological materials is weak. Archaeological iron has been intensively studied recently, but the three publications about copper alloys disagree on critical RH thresholds and no work on pollutant effects has been published. There is little information on archaeological bone and the recommendations for ivory depend on a single study.

The effects of Volatile Organic Compounds (VOCs) on organic materials have received very little attention. Recent work has shown that ten VOCs emitted from paper and paper storage products can accelerate the deterioration of certain types of paper. It is likely that this issue affects many organic material types with preliminary studies identifying affects at high VOC levels for parchment and canvas also. A recently started European Commission partly funded project, MEMORI, will address this issue. The effects of acetic acid and other VOCs on pigments, cellulosic and textile materials, parchment, leather and varnish will be assessed. A more economic measurement system will be developed to address the cost barrier presently impeding VOC analyses in heritage atmospheres.

A combined risk and damage audit has contributed to the formulation of a research plan to address these gaps. It has identified both the most damaged materials in English Heritage's 500,000 objects spread over 120 sites and the most damaging risk factors. This information has been used to prioritise English Heritage's collections conservation research program.

The balance of these risks may change in the future under the influence of climate change. Investigations to predict the changes inside buildings are underway. Ensembles of climate models are used to generate distributed external temperature and RH predictions. Transfer functions for particular rooms in buildings are calculated and the internal T and RH are predicted. Combined with pollution predictions and damage functions, the relative future magnitudes of type 2 and 3 risks are predicted. For example the crystallisation cycles of several salt species are predicted to increase in many properties. This information is crucial to prioritise future research to fill the gaps identified and formulate suitable, sustainable mitigation strategies.

Keywords

Volatile organic compounds, pollutants, climate change, risk assessment, damage audit

IN AND OUT OF LIMITS: ENVIRONMENTAL STANDARDS AS A RISK MANAGEMENT TOOL

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A range of published standards are available which are usefully applied to collection management and conservation activities. Whether intended to serve a national, international, or professional audience, or designed to meet legal or technical regulations, standards offer a critical starting point, a measurable benchmark against which performance can be evaluated. Since standards are based upon the collective view of experts and the synthesis of research they have widespread credibility and applicability as a risk management tool. Published standards are widely seen as authoritative and hence can be a powerful tool for conservators and collection care managers.

Recently, environmental standards developed within the last ten years in the UK have been criticised for being overly prescriptive and heavily reliant on energy intensive heating, ventilation and air-conditioning systems. A statement issued by the UK National Museum Directors' Conference (NMDC) that 'museums need to approach long-term collections care in a way that does not require excessive use of energy, whilst recognising their duty of care to collections', supports this view. This claim was further debated in 2009 through an AHRC/EPSRC Science and Heritage Programme research cluster 'Environmental Guidelines: Opportunities and Risks (EGOR)'. In response to these events a project was initiated to develop an environmental standard for the UK to help users make judgements about specifying safe environmental conditions which meet the requirements of particular collections while taking account of the need to reduce energy use. It is against this background that the British Standards Publically Available Specification 198 (PAS 198) has recently been developed.

This presentation provides an overview of PAS198 drawing particular attention to how scientific research projects currently underway will provide critical evidence to underpin environmental standards. A prospective view is offered of how interdisciplinary scientific research projects currently underway in the UK has the potential to improve and deliver a next generation of environmental standards in particular and collection risk management generally.

Keywords

environmental guidelines, environmental standards, risk management, British Standards PAS 198 collections demography

RISK ESTIMATION FOR INDOOR CLIMATE IN CHURCHES

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Defining the ideal target indoor climate in historic buildings housing sensitive artifacts can be treated as a risk/benefit optimization problem. The risk side is mainly about loss of value to the collection. This loss of value, which only to some extent can be captured in monetary terms, is caused by a change of state of various materials, induced by degradation mechanisms accelerated by unfavorable microclimates. The decision-maker has to make risk/risk trade-offs in order to prioritize resource allocation and to choose between mitigation strategies. Almost exclusively, risk estimations in this context are made on the basis on materials science or personal experience. With the aim of providing an improved basis for risk estimation of damages caused by the indoor climate, a new methodology is tested in a pilot-study of 92 churches on the island Gotland, Sweden. The costs for different active conservation measures are statistically surveyed for the last ten years. We assume that when active conservation is performed, there has been unacceptable damage to the object. Given that assumption, the cost for conservation can be regarded as a proxy for loss of value to the collection. By analyzing the cost for conservation in different categories, we use the gathered data to estimate the magnitude of climate-induced risks. A discussion is held about the usefulness of the methodology, the validity of the data and if there is a potential for improvement.

Keywords

Indoor climate, loss of value, church, microclimate, risk assessment

RISK ASSESSMENT AND SUSTAINABILITY: IDENTIFYING AND MITIGATING RISK IN MECHANICAL SYSTEM SHUTDOWNS

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While heating, ventilating, and air-conditioning (HVAC) equipment shutdowns have long been recognized as a strategic option for institutions to achieve energy savings, the particular requirements of preservation environments for cultural collections often make such strategies difficult to implement without careful risk management. Research shows that environmental conditions (temperature and relative humidity) can be the most significant factors that impact the lifespan of collections materials held by cultural institutions. Altering these conditions through changed HVAC operating schedules is a risk many collections professionals and institutions are hesitant to take. This paper introduces the methodology and early findings of a three-year project, federally funded in the United States by the Institute for Museum and Library Services, and conducted by the Image Permanence Institute (IPI) at the Rochester Institute of Technology. This project investigates and documents a promising method for libraries to achieve significant reductions in energy use without compromising the preservation quality of collection environments. This presentation concentrates on identification and mitigation of risks associated with the shutdown procedure.

Shutdown experimentation requires careful observation and judgment at multiple stages in the process – initial observations, while enough to rule out a candidate, cannot sufficiently determine risk. Because mechanical systems that serve collections environments are often designed for continuous operation, identifying appropriate candidate spaces and air handling systems for energy-savings via shutdowns involves assessing, both qualitatively and quantitatively, the environmental change, if any, that could or does occur during system downtime. Environmental influences such as adjacent (both horizontally and vertically) conditioned spaces, exposure to exterior walls or roofs, seasonal weather conditions, lights or other heat-generating equipment within the space, the behavior of the air-handling unit itself upon shutdown, or the influence of the shutdown on other mechanical units, must all be accounted for, either previous to any experimental shutdown, or during a trial period. In addition, the assessment must account for variables such as length of shutdown time, potential impact on occupants of the space, and ability of the equipment to withstand repeated shutdowns and startups.

Responsible procedure requires measuring the potential risk, due to the listed factors, of the HVAC shutdown to cultural collections, weighed against the potential gain in reduced equipment operation costs, reduction in fossil fuel or other energy usage, and other benefits, whether political, administrative, or otherwise. Certain risks can be mitigated through operational procedure or mechanical adjustment once the characteristics of the collections storage area and the operational sequence of the mechanical system are understood. Once the potential risk is observed, cautious management requires that trials be conducted, shutting down the mechanical systems while carefully monitoring the preservation environment, to quantitatively analyze the actual changes observed in the collections storage area.

This paper illustrates IPI's early findings that assessment of risk based on knowledge of collections degradation, preservation environments, and the operation of mechanical systems, coupled with careful monitoring of environmental conditions and communication of the findings, can identify opportunities for energy-savings in collections storage areas without compromising the preservation environment.

Keywords

sustainability, preservation environment, shutdowns, energy savings, mechanical systems, risk analysis

ESTABLISHING SUSTAINABLE PRESERVATION ENVIRONMENTS AT THE LIBRARY OF CONGRESS

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The need to balance cost, sustainability and preservation stewardship is a primary concern at collecting institutions throughout the world. The US Library of Congress is addressing this concern by evaluating environmental requirements for collections storage throughout the institution, while identifying opportunities to adjust mechanical system operations to reduce energy consumption without compromising long-term collections preservation.

Since January 2010, the US Library of Congress Preservation Directorate has worked collaboratively with facility managers and external consultants, to conduct a trial mechanical system modification in one large stack area of the John Adams Building, which houses approximately 6,000,000 volumes on 12 deck levels. By piloting a programmed shut-down of all mechanical system operations for 7.5 hours each night, coincident with automated lighting shut-off, we have identified an opportunity to save 31% on operating costs per year (nearly \$75,000)* without significantly reducing long-term preservation or exposing the collections to immediate risks associated with climate extremes. When the HVAC units are shut down 24 hours on Sundays the potential yearly operating savings per stack can be extended to 41% (\$97,000). This yearly savings can be doubled if the shut down is extended to the mirror stack area on the north side of the building. The results of adding the additional space and hours will be evaluated to determine whether preservation objectives can be achieved while increasing energy and cost savings.

This paper will present an overview of the environmental assessment program in place at the Library of Congress and show how data collected over time was used to identify locations for the intentional trials described and to weigh the preservation consequences of mechanical adjustments. The presentation will also provide details of critical factors investigated before and during the trial, describe how we achieved the level of interaction needed between preservation and facility staff, and discuss our method of projecting preservation outcomes.

The Library has just started modified operation in the north stack; and included a 24-hour Sunday shut-down in the original south stack trial location in December 2010. We are actively seeking other suitable trial locations throughout the Library's Capitol Hill collection stacks. Results of including the north stack in nightly shut-downs and increasing shut-down hours for the South stack will be available in September 2011.

*Savings calculated by measuring air volumes that are moved, heated, and cooled. BTUs of heating and cooling were calculated and applied to known dollar costs for these utilities.

Fan amps measured directly from the operation of the circulation fan were converted to kilowatt hours to calculate energy usage—the hours of shut down were proportionally deducted from the calculated operating costs.

Keywords

preservation environment, sustainability, HVAC operation, collections, risk assessment

CREATIVE CONSERVATION RISK MANAGEMENT: EVOLVING A COLLECTIONS RISK MANAGEMENT STRATEGY AT A MAJOR HERITAGE ATTRACTION

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In 1998 Historic Royal Palaces (HRP), which manages five British historic royal palaces, became a self-funded charitable trust. It has since been transforming its visitor programmes to be experiential (physically and emotionally engaging) and developing multi-source revenue streams, with functions and events playing an important role. The variety and quantity of activities within the delicate historic interiors -- where a vast and diverse centuries-old collection is on open display-- have increased significantly and will continue to do so as the business develops. As a result, collection risk management has become more challenging, and strategies have had to evolve in concert with the ever-changing array of activities.

HRP has a comprehensive collections risk management programme, similar to other heritage sites. This has the elements of generated risk data from monitoring and observation, and analysis and profiling of environmental and physical risks (organised by the nine agents of the Canadian Conservation Institute's Framework for the preservation of Museum Collections). Based on risk priorities, procedural and physical solutions have been put in place to minimise or eliminate risks to the five palaces and their collections.

However, to implement this programme effectively HRP conservators have had to devise a unique approach that supports on-site business activities. Case studies are presented using specific conservation risk management projects to explain this approach, which can be characterised in three main ways.

Firstly HRP has a unique governance structure, called the 'Agents of Decay Group', which brings together conservators and staff from various internal teams to agree, authorise and resource mitigating measures. Collections risk management has also been integrated in to HRP's business and its annual operation plans for projects and visitor or commercial activities. The collection risk management strategy has been adopted by the Trustees of the HRP and conservators report to the Trustees on the progress through key performance indicators (KPIs) for RH/T, dust, and light (visible and UV). Staffs are encouraged by bonus targets set through the strategy.

Secondly, conservators have become trained and empowered as members of the commercial teams, able to negotiate mitigating measures. Conservators now work towards low-risk, solutions that still satisfy the creative requirements of various activities like feature filming, dinners, receptions and theatre performances. These solutions are based on mutually agreed principles, rather than a policy of fixed, prohibitive rules that was applied in the past.

Thirdly, risk management now happens at a finer grained level. Each risk scenario is analysed in detail to pinpoint problems, which can then be monitored and addressed through object-specific mitigating measures. The focus is on targeted and bespoke mitigating solutions for which incident and environmental data and the condition survey analysis of objects show the true impact of the risk.

The breadth of the HRP collection assets and type of on site programming in the display areas allow HRP's approach to managing its collection risks to be a model for diverse risks in heritage sites.

Keywords

management, risk, communication, preventive conservation

BENCHMARKING AND RISK ANALYSIS AT THE NATURAL HISTORY MUSEUM, LONDON

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The Natural History Museum (NHM) has undertaken a number of traditional collections based risk and conservation reviews to identify the major factors causing loss in data from the museum collections and to review collections management performance. Risk reviews have also been undertaken to assess risks in building projects and to help develop better models for collection preservation projects across the institution. The surveys and reviews undertaken use a range of specimen, room and building based methodologies however the institution has been developing the SYNTHESYS Network Activity C (NAC) Benchmarking methodology to assess collection management risks. The NAC benchmarking survey was developed to benchmark standards of collection management across Europe and to help build a model of baseline standards for collection care and management (for Natural History Museums). The NAC methodology categorizes levels of performance from D (low) to A (high), with Level C being assessed as the baseline that all institutions should attain and equivalent to accreditation in the UK. The methodology highlights strengths and weakness in collection management and identifies where an institution may need to improve areas of implementation of policies and procedures.

The Natural History Museum has developed the model Collections Standards Project (CSP) so that it can be applied at departmental level and used to compare the impact of perceived and real implementation of collection management policies and procedures across the NHM's collection management teams.

To assess the risk to an institution of not achieving a standard benchmark or particular levels of the benchmarking system a risk calculation was developed to assess the risk of an institution not delivering a policy or procedure as part of their collection management strategy. This risk calculation is displayed as a traffic light system and used alongside environmental monitoring programs to show the risk performance of an institution. The methodology of comparing the benchmark level of performance with a risk calculation is allowing the NHM to identify areas of strengths and weakness within its collection management teams and to help them improve their collection management programs. In particular, the data gathered from the CSP project was used to help departments develop their current 5 five year collection management plans.

This paper assesses discusses the relative merits of a benchmarking approach to assessing the performance of an institution against a risk-based approach for prioritization of risks to the management and development of an institution and its collections. The Paper also reviews the integration and interpretation of risk, benchmarking and environmental data in a large institution as a tool for modelling specimen data loss and preservation strategies.

Keywords

collection management , benchmarking, risk assessment

THE MARRIAGE OF RISK ASSESSMENT AND SIGNIFICANCE ASSESSMENT: CAN IT REALLY WORK?

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The results of risk assessments and significance assessments can help collecting organisations set work priorities. However, the complementary nature of the two methods, deriving from different professional traditions, means that recommended priorities are likely to differ.

The desire of cultural heritage risk analysts to include significance determinations in their workings is both logical and brave. In the more comprehensive risk analysis systems this inclusion depends on the quantification of changes in significance due to changes in states of objects or collections, which can be difficult to deliver. Significance assessment purists reject the reduction of complex, shifting meanings to numerical values because of the apparent rigidity and certainty this implies.

The purpose of this presentation is to provoke discussion. Should risk assessment or significance assessment come first when decision-making for collections? Who has the power of veto if opinions differ? Do concepts of 'value', as opposed to significance, assist? Will professional demarcation doom the marriage of these two hopefuls?

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Keywords

risk, significance, assessment, professional, quantification.

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