

New Environmental Guidelines at the Smithsonian Institution

The Smithsonian Institution has adopted new environmental relative humidity (RH) and temperature guidelines for its exhibition and general storage spaces. The new guidelines are 45% RH \pm 8% RH and 70°F \pm 4°F. These guidelines allow for a changing environment over the annual cycle. For example, in the wintertime it permissible for the RH to go as low as 37%, but it is most likely that the RH setting in the wintertime will be between 40% and 45%. In the summer, the environment can be reset for approximately 50% RH. Temperature settings are set by visitor comfort requirements. The reason for lowering of RH in the wintertime is to eliminate the condensation problems that have caused damage to the exterior walls of many of the museum buildings.

This not an isolated decision factoring the needs of the buildings alone, but a consequence of combining years of research on collections preservation with preservation of the buildings themselves. The research into collections preservation has shown that, when one considers all of the important parameters such as chemical, biological and mechanical degradation processes, the collections are better preserved at generally lower RH levels. A summary of the collections preservations research is shown in Illustration 1.

Some of the labeled bands such as **Biological Attack** are more obvious than others. Keeping the RH lower stops mold and fungal growth, but good air circulation can also be a considerable help in keeping mold growth down.

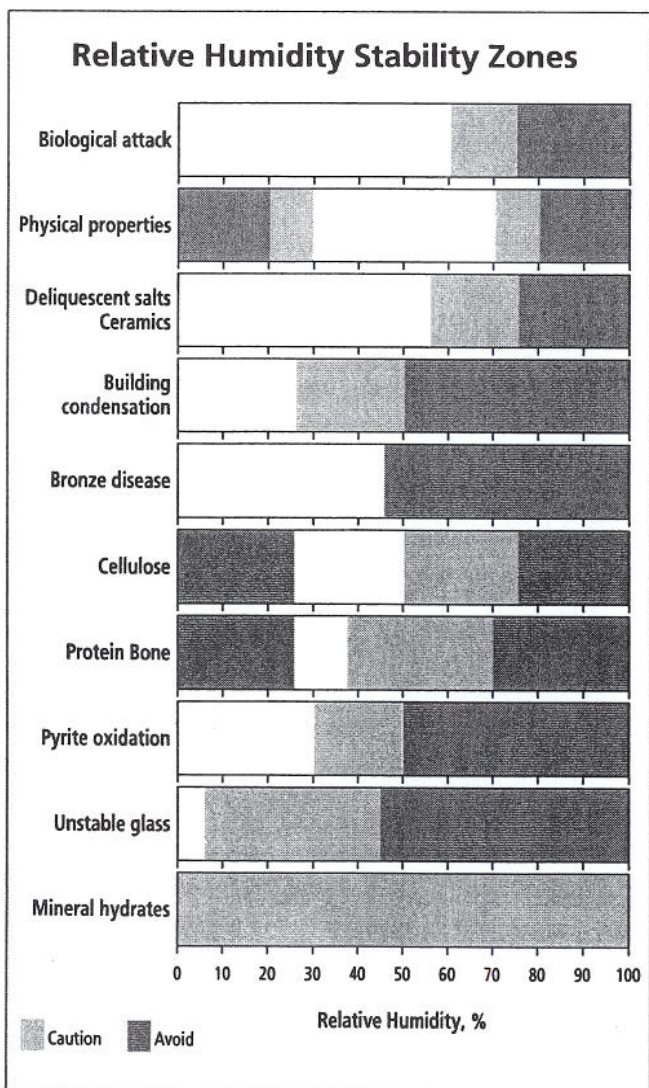
The band labeled **Physical Properties** includes the impact of RH on the cracking of paintings, either canvas- or wood-supported, furniture, inlays, veneers, other wood artifacts, and ivory. The real problem with these materials occurs when they are first cycled to very high RH levels and then allowed to be exposed to low RH levels. In that type of cycle, wood and ivory that are restrained from movement by their form and construction, will plastically deform or "compression set" and can crack upon drying. Most of the damage caused to paint and varnish surfaces is actually caused by temperatures below 32°F/0°C.

The band labeled **Building Condensation** refers to water condensing on exterior walls at the 45% RH levels and above, and window condensation at the midrange RH levels during cold winter months. Older buildings are most prone to condensation problems, due to their masonry construction and the lack of sufficient insulation or thermal window systems. The cost of continually repairing damage done by condensation is quite significant.

The band labeled **Deliquescent Salts, Ceramics** largely refers to archaeological ceramics that have been excavated, and which have absorbed salts dissolved in groundwater. **Bronze Disease** reactivates at higher RH levels.

The band labeled **Cellulose** refers to the chemical degradation of objects such as paper and wood. At low RH, cellulose cross-links and at high RH levels it hydrolyzes. The most severe damage to wood is usually caused by biological attack. The band labeled **Protein, Bone** refers to anthropological and natural history collections. **Pyrite Oxidation** refers to the decomposition of a type of mineral, whereas the last band, labeled **Mineral Hydrates**, indicates that there really is no single environment that can accommodate this entire class of minerals.

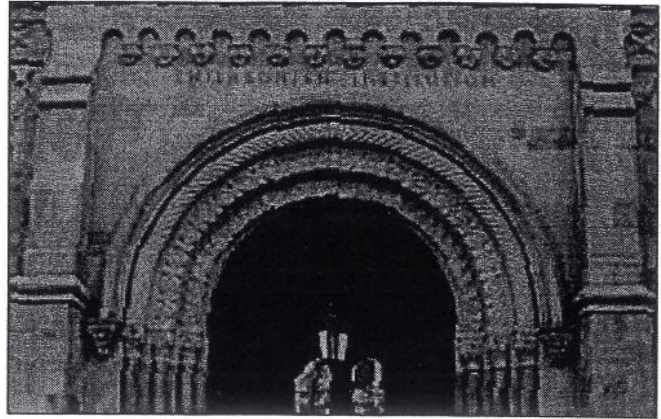
The band labeled **Unstable Glass** refers to alkaline glass that often degrades while still appearing normal.



It takes very low RH levels to significantly reduce the decomposition process.

One of the important features demonstrated by the chart is that there is really no single environment that accommodates all the requirements of both the collections and the buildings. Factoring in energy costs can have a significant impact on the environmental set-points. If a building is required to bring in significant fresh air, as is often required by local codes, then running at a lower RH level in the winter and higher RH in the summer makes economic sense. It is going to be up to the individual institutions to determine the types of collections that they collect and exhibit, and the environment needed to maintain them. It is also important to consider the building's ability to safely maintain a controlled environment, along with the associated energy costs. 🏠

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References:

1. Erhardt, D. and Mecklenburg, M.F., "Relative Humidity Re-examined," IIC Preprints, Contributions to the Ottawa Congress, Preventive Conservation Practice, Theory and Research, (1994), 32-38.

Management of Energy Consumption — continued from page 15

consumption changes from one year to the next. For example, if say one week was a bit cooler — that is, the heating degree-days were higher than during the same week last year — we would expect consumption of electricity to go down, use of chilled water to decrease, gas consumption to go up, and more use of the central heating. This is not always the case, however, as what can make a big difference is the number of visitors, the hours of opening and any number of other similar factors.

Energy managers can use this information to plot a graph of energy consumption against degree-days. This graph will produce a straight line, which can give the energy manager two important items of information. Where the line meets the y-axis (Energy Consumption), the energy manager can tell how much energy the building consumes at the base temperature: that is, with no heat loss or heat gain from outside. From the slope of the line, the energy manager can calculate how much energy the building should consume for any particular degree-day. This will indicate whether or not the building is still operating efficiently. To conclude, degree-

days can be a very simple indicator of what is happening, or they can be a powerful tool for predicting future energy consumption and if an existing is still operating efficiently.

Can We Demonstrate Best Practices?

When considering best practices, we should first consider what should we be doing. Below I list the basics of good management.

- Set realistic achievement.
- Design a system of measurement.
- Review the results.

To consider each of these statements, first set a realistic goal. We want to manage energy consumption. We have discussed how often to record energy consumption, from quarterly to weekly. With modern energy meters we could record energy consumption every half-hour, and with modern software packages that manage energy consumption, they will read these meters directly. However we are only considering our cheap and cheerful spreadsheet, so I would suggest weekly

is just about right. We also discussed what we could record: that is, all energy consumption that has a meter you can read, including water consumption.

Design a system of measurement; I think my suggested spreadsheet can be considered a system of measurement. Finally, review the results. Comparing each individual, weekly energy consumption with the previous year really achieves this, and this is why I think my suggested spreadsheet qualifies as a best practice.

I think the only thing I have omitted to mention is how to get a copy of this spreadsheet. That is quite simple: just e-mail me at j.plumb@nls.uk and I will send you a copy. I did mention that the spreadsheet is a Microsoft Excel spreadsheet, which comes complete with all the calculations. So while the copy is free of cost, you will need to fine-tune the calculations to get the correct results for your facility. It did take me a while, but I can assure you the results are worthwhile.

Happy Managing. 🏠

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IAMFA 2005 — Basque-ing in Bilbao

At the Guggenheim Museum Bilbao, we are working on preparations for IAMFA's upcoming annual conference, which will take place in September 2005. Innovation will be the central theme of the conference, through a careful blend of topics which combine the practical and the theoretical in a series of talks scheduled for the three days of the conference.

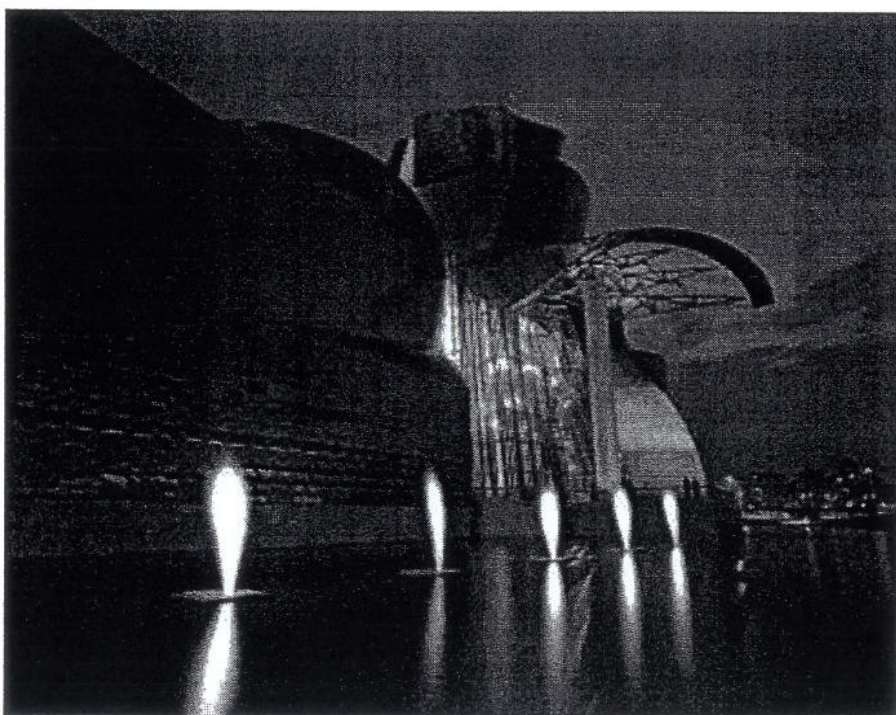
These talks will be given in different institutions located near the Guggenheim Museum Bilbao, which was designed by architect Frank O. Gehry. The Museum is located in an area of the city called Abandoibarra: the work of the famous architect and urban planner Cesar Pelli. We are going to propose the recently opened Sheraton Hotel, also located near the Museum, as the first meeting place for conference attendees.

The first day of the conference will be held in the Guggenheim Museum itself, where we will offer a number of subjects focusing mainly on our own experience. Although the final details for the conference will be set out in later issues of *Papyrus*, we would like to give you a foretaste of some of the topics we expect to include in the program.

Given that the architectural features of this singular building are of great interest to many people, our program kicks off with a presentation by a collaborating architect from the local engineering company that supervised the Museum's construction. Through this presentation, we will try to give attendees an idea of the challenges involved in this project, the search for solutions, and the results obtained.

Another subject we propose to examine is general accessibility. Over the years, customer satisfaction has been one of the basic precepts of the Museum's operation. As a result, our aim throughout 2003 was to make progress in this field by implementing a continuous improvement system which focused upon ensuring accessibility to the Museum for everyone — including not only persons with physical disabilities, but also the elderly, children, the blind, the deaf and the mentally handicapped. Although this system has been in place for only a short time, it has allowed us to see that there are no limits to this subject, and that a policy of continuous improvement may be the ideal tool. The rapid development of technology and a greater social

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The Guggenheim Museum Bilbao at night.

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