Sustainability & Specimen Display:
a Conflict of Program?

by Jonathan Katz

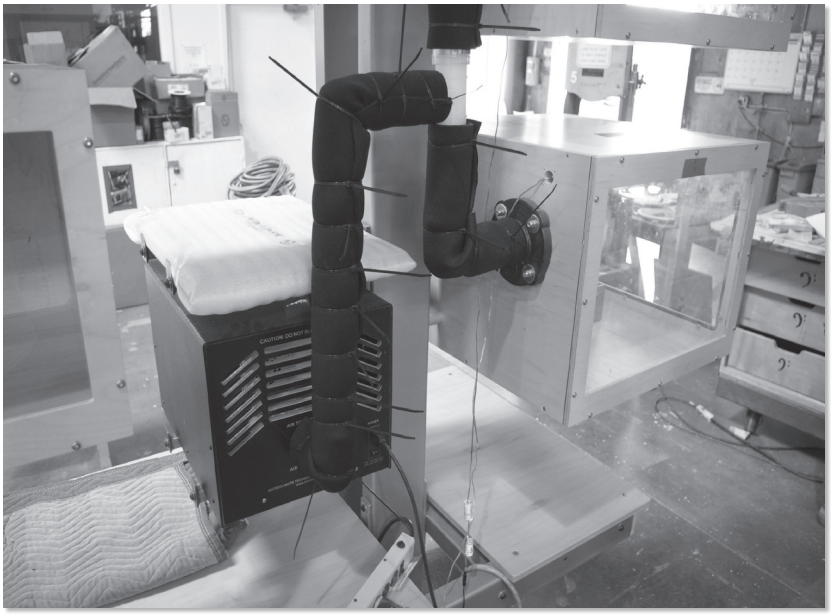
***Jonathan Katz** is CEO of Cinnabar Inc. He may be contacted at jonathank@cinnabar.com.*

This article is adapted from a Case Study originally posted on www.exhibitfiles.org

When the California Academy of Sciences conceived its design program, it was critically important that both the new building and facilities incorporate and demonstrate the Academy's ethos and commitment to the principles of environmental sustainability. This objective resulted, of course, in Renzo Piano's now widely celebrated LEED Platinum building. But the realization of these principles did not end with the building itself: when the time came to develop exhibitions, the Academy's commitment to sustainability was not only primary; it was and is literally on display.

The Needs of Exhibits vs. the Nature of the Building

This attitude figured prominently in Cinnabar's work for the Academy, as producer of 35,000 sf of exhibits for the main floor of the new Kimball Museum of Natural History. In our lead role overseeing the team conceiving, designing, and fabricating exhibits, we confronted the substantial conflict between the particular needs of various exhibits and the nature of the building that would contain them. Successfully reconciling these contradictory needs—to control light, temperature, humidity, and outside contaminants within the "green" framework—was our challenge.



Test monitoring a prototype typical exhibit case (right). Environmental control unit (left). Photo by Jeff Ingalls.

The Academy building has interior public spaces openly ventilated to the outside and extensively illuminated by daylight. Facing the two main exhibit halls, the east and west walls of the building stand 36 feet high and 126 feet wide. Constructed of the clearest glass obtainable, when clean the windows are practically invisible. The architect stated that he wanted people inside the building to feel that they are in Golden Gate Park, connected to nature.

Beyond the obvious "green" tropes of "reduce, reuse, and recycle," the Academy wanted to extend the concept of sustainability to include an evolutionary approach to exhibition content —that is, to create exhibit systems that could be flexible. This led us to devise an easily reconfigurable, modular exhibit platform that could accommodate change, whether in small adjustments and additions, or re-worked into substantially new exhibits. This was soon dubbed the "kit of parts" approach.

Sustainability and the Display of "The Real Thing"

A baseline of authenticity for a natural history museum is the display of artifacts and specimens from its research collections. A central goal of the exhibition design

Successfully reconciling these contradictory needs—to control light, temperature, humidity, and outside contaminants within the "green" framework—was our challenge.

program for the Academy was to enable the widespread display of scientific specimens in the public space. In a digital world where avatars, replications, simulations, and virtual existence are becoming implicit substitutes for the real, the collections of real things found in museums provide an opportunity for visitors to see original objects, an increasingly rare experience. These objects are links to all the spheres explored in the exhibition experience: they are sources of knowledge, confirmations of fact, symbols of authenticity, and triggers for the imagination.

West Wall of the Academy. Photo by Joe Fletcher.

The programs of sustainability and specimen display were, therefore, core tenets established for the main floor exhibits of the new Academy—and at the same time they embodied a conflict, a primary challenge that was imperative to address and resolve. To meet the Academy's key goal of having extensive and varied public display of scientific specimens from its research collections, and for Collection Managers to allow them to be displayed, we had to adhere to conditions that would preserve the scientific integrity of those specimens. Yet our LEED Platinum certified space, with its natural ventilation, open-to-the-outdoors environment replete with airborne flora & fauna, fluctuations in temperature and humidity and strong daylight, made meeting specimen display and storage specifications very difficult.

In addition to these specimen preservation requirements, we based the design of all the exhibit elements, including display cases, on sustainable principles. This meant criteria such as carbon footprint, adaptability and re-use, materials, and cost were all constraining factors in achieving display conditions that met specimen preservation standards. Because

Galapagos exhibition with east facing exterior behind. Photo by Joe Fletcher.

(continued from page 67)

…sustainability and specimen display were, therefore, core tenets… and at the same time they embodied a conflict, a primary challenge that was imperative to address and resolve.

the facility was not yet finished, the building engineers were able to provide only the broadest of projections in terms of temperature and humidity fluctuation data, making us realize that the humans in the space could tolerate far wider environmental variations than the specimens.

"Kit of Parts" Design

The "kit of parts" design of the exhibit modules and their component parts (including display cases of various sizes and configurations) shaped solutions to this tension between program goals. As the interior space is open to outside air, the specimen display cases themselves had to control temperature, humidity, airborne contaminants & pests, and light levels—all with little or no help from the building systems.

We developed parameters for case design by categorizing case types needed in relation to the display and preservation criteria of specimens to be displayed. Case types ranged from a simple box with minimal control, to a case with full environmental control: humidity, temperature, ultraviolet spectrum, lighting intensity, and instrumentation, not to mention accessibility, security, and maintenance. This called for the most difficult type of design: keeping it simple and affordable! We arrived at a standard case typology with three levels of performance. The case material is birch/alder FSC plywood, sealed with a factory-applied UV-cured, modified acrylic coating on both sides. A key function of the sealant/stain is to limit off-gassing of VOCs (Volatile Organic Compounds), both from the wood and the applied material. The transparent material is two-ply laminated glass, with UV filtering (98%) in the lamination layer. Interior clips retain the glass and the case walls, when removable, are sealed with a rubber gasket. These materials were selected on the basis of carbon footprint, recyclability, flexibility, and, in relative terms, low cost.

Our light control strategy was straightforward. We designed cases with cut-in glass panels, placed to optimize viewer sightlines, which resulted in greatly reduced transparent surface area. We also faced cases with their viewing sides away from the windows whenever possible. In several instances, such as in the Galapagos finches exhibition, cases have a hinged lid that must be lifted to turn on LED illumination to see the contents. Not only did this result in a dramatic reduction of light exposure to the specimens, but the act of lifting the lid also stimulated viewers' curiosity and motivated them to look more closely.

In cases where temperature control was essential, we used a modular solid-state system similar to a miniature heat pump that circulates temperature-controlled air. Due to the limited capacity of these units, it became necessary to add an insulation sandwich within the walls of most of these cases.

For the most part, humidity control was

Sensitive, low cost, networked sensors to measure environmental variables such as temperature and humidity will enable data collection and monitoring of display methodologies.

achieved through the use of renewable desiccant packs, sized to the volume of each case. These can be serviced via separate, sealed ports so that the entire case does not need to be opened.

Learning from the Project Over Time

As the exhibits change and evolve, Collection Managers, working with exhibition staff, will continue measuring the critical environmental factors in the public spaces for the effective display of specimens. Sensitive, low cost, networked sensors to measure environmental variables such as temperature and humidity will enable data collection and monitoring of display methodologies. As data is gathered, we will be able to assess the efficacy of various solutions and make adjustments in design and systems with the goal of putting more specimens on public display. As a type of industrial design project, a five-year timeline makes sense.

Overall, sustainable design is a question of resource trade-offs while keeping an eye on the big picture. At the moment, 100% green is not feasible, especially if one accords value to other criteria, such as effective communication techniques. A sustainability initiative should be understood as a strategy executed over time. A sustainability strategy executed over an institutional lifecycle takes into account a great range of inputs and actions—the facility and exhibitions are simply two activity centers in a much more complex input/output equation. We believe that over time, the Academy will keep its position as a flagship of sustainability, and become even more prominent in that regard because it operates as a green facility whose green mandate was carried through on the inside of the building as well as the outside. By extending the view to how the facility would operate—taking into account the people and their activities as part of the building—the Academy will continue to tread with as light a carbon footprint as possible, fulfilling and embodying its educational mission.

Exhibit module showing integration of specimens, video, graphics, and lightbox images. Photo by Jeff Ingalls.