Chapter 4
Exhibition Materials

Integrating efficient resource management in the conceptual stage of an exhibition can be an important contribution to sustainable development. Since many material resources are used to produce permanent, temporary or travelling exhibitions, you will need to take several factors into account, beginning with the design stage. Exhibition design offers an excellent opportunity to demonstrate your sustainable development leadership to your stakeholders.

1. Designing an exhibit

Photo: Granby Zoo.

Eco-design, green design, and sustainable or "responsible" design are all terms that designate design approaches in line with the principles of sustainable development. It relates to the philosophy of designing physical objects, the built environment and services to comply with the principles of economic, social, and ecological sustainability. The intention of sustainable design is to "eliminate negative environmental impact completely through skillful, sensitive design." It requires using only renewable resources, minimizing environmental impact and connecting people to the natural environment. Throughout the design process, from tendering to end of life cycle, consideration should be given to all products and services used – from the extraction of raw materials to their disposal, to all relevant environmental criteria such as raw material consumption, water and energy use, discharges into water and air, waste production and so on.[1]

There are tools to help integrate eco-design into your projects, such as international standard ISO 2002 (http://www.iso.org) which requires the integration of environmental aspects into every stage of product design and development.

Other aspects to consider when designing an exhibition or project include:

- Promoting the use of low-impact materials
- Extending the period of use of a product by improving its sturdiness and flexibility
- Reducing pollution by choosing eco-certified products
- Keeping natural resource consumption to a minimum
- Reducing waste by reducing size whenever possible
- Reducing packaging weight by using recyclable and/or recycled packaging materials or reusing products
- Using recycling containers
- Ensuring easy disassembly and reassembly for travelling exhibitions
- Designing modular systems which can be reused
- Accounting for the energy consumption of the materials and equipment used
- Avoid using products which include volatile organic compounds

[1]http://en.wikipedia.org/wiki/Sustainable_design

Temporary exhibitions
Temporary exhibits tend to use a lot of material resources over a short period of time. Trying to design cabinets and furniture that take into account sustainable design will greatly lessen the wasted material.

Travelling exhibits
When designing a travelling exhibit, size, weight and modularity need to be considered. Designing exhibits that will fit in standard size crates will help reduce waste. The Science and Nature Museum of Sherbrooke has developed a system in which all their travelling exhibits fit in three different box sizes.

2. Materials and finishes

Rigorous planning makes it possible to use materials and finishes that have a lesser impact on the environment, especially in terms of carbon emissions.

It is important to take into account the entire life cycle of materials. The Athena Institute (http://www.athenasmi.org/about/lcaModel.html) offers a good model for this approach.

Built by students at the University of California, the Green Design Wiki offers good information and examples of materials and finish choices: http://www.greendesignwiki.com/index.php?title=Materials_and_Finishes_%28Indoor_Environmental_Quality%29

A. Wood

Wood offers many environmental advantages:
- Lower environmental footprint than other building materials such as steel or concrete, in terms of embodied energy, air and water pollution, and greenhouse gas emissions
- Better insulating value than steel or concrete, which reduces the need for heating and cooling
- Recyclable and biodegradable: it is the only major building material that is renewable and carbon-neutral
- Structurally sound: in adverse natural conditions such earthquakes and high winds, wood structures are proven to be among the safest building systems

When using wood, it is recommended to seek a certified wood product, without formaldehyde or with a minimal or null degassing, and requiring a minimum of transport during its life cycle. Both the Canadian Wood Council (http://www.cwc.ca/) and the Centre for Expertise in Commercial Wood Construction (French only: http://www.ceco-bois.com/) offer good information.

Engineered wood
Engineered wood products include glulam (glued-laminated timber), parallel strand lumber (PSL), laminated veneer lumber (LVL), plywood, and oriented strandboard (OSB), waferboard, prefabricated wood trusses and wood joists.

Engineered wood products usually are considered sustainable. Entire trees, regardless of species, shape, and age can be used to make engineered wood products.

Some wood products, for example, make use of smaller trees, species not commonly used for lumber, or use chips and particles generated as by-products from other production processes. A key advantage of engineered wood products is that they are very stable and offer greater structural strength than typical wood building materials. This means that wood joists and beams can be used instead of steel ones in many building projects. Increasingly, builders are using engineered wood products for joists, beams, studs, window and door frames.

Specialty engineered wood products offer unique characteristics suitable for building diverse end-use products such as boats, truck bodies and even upholstered furniture. Engineered wood products can be designed and ordered to specification, thereby reducing construction waste. This helps to balance demand for the larger trees and more desirable wood species.

For example, buildings meeting the requirements of Canada's C-2000 program can use structural members of engineered wood products that can potentially reduce construction waste by up to 75%.

Rapid regrowth wood
There are different products made from rapid regrowth wood species such as laminated strand lumber (LSL), manufactured from indigenous Canadian wood with fast rejuvenation which were not traditionally used commercially. There are also several products made from rapid regrowth tropical wood, such Durapalm (http://www.durapalm.com) and Plyboo (http://www.plyboo.com).

Perdure
Perdure, or high temperature wood treatment, is an ecological substitute for chemically treated wood, which extends the service life of wood and can applied to all species. The wood is treated at a high temperature without chemicals, sterilizing the wood and offering protection against insects and micro-organisms. With several advantages on the environmental view, wood products issued from Perdure technology use less expensive species, allowing production of less expensive exotic wood substitutes. Environment Canada offers good information on this technology:
http://www.qc.ec.gc.ca/dpe/publication/Perdure_en.pdf

Lauan
Lauan is a veneer wood. See the following sites for more information:
http://www.insidewoodworking.com/lumber/luanplywood.html
http://en.wikipedia.org/wiki/Lauan

MDF
Medium-density fibreboard (http://en.wikipedia.org/wiki/Medium-density_fibreboard) is an engineered wood which has multiple advantages:
- Almost isotropic, that is it shows homogeneous physical properties in the three dimensions
- Its fine texture is attractive
- Cheaper than solid wood
- Available in various thicknesses
- Uses first thinning wood (small diameter trees that can't be used as solid wood)
- Can be flame resistant, arched, lacquered or melamine-faced (UB)
- Can be to a certain extent waterproof (for indoor use and temporary exposure to humidity)

B. Cardboard

Cardboard is also often used in exhibit design since it has the same durability as wood. It is generally made from recycled materials, and its malleability allows for the reproduction of ancient furniture and ancient objects that do not have the conventional geometrical forms we see nowadays.

http://www.caprakarton.com/creations.html
http://toutankarton.canalblog.com/

Note that these objects and furniture are usually light, affordable and can be protected with "green" coating such as silk paper and recycled water-based paint. Vitrification treatment can also make them water and stain repellent.

C. Green fabrics

The raw materials of green fabrics come from plants or animals. The manufacturing process respects well-defined specifications and minimizes environmental risk**.**

D. Formaldehyde-free materials

According to both Health Canada and Environment Canada, low-molecular weight aldehydes, such as formaldehyde, are highly flammable reactive compounds. At room temperature formaldehyde is a reactive gas.

Various exhibition materials can be sources of gas emissions, such as pressed wood panels or any other product made with adhesives that contain formaldehyde, as well as varnishes, paints, carpets, dyes and curtains.

Public Works and Government Services offers a good publication *The Environmentally Responsible Construction and Renovation Handbook*:
http://www.tpsgc-pwgsc.gc.ca/biens-property/gd-env-cnstrctn/page-3-eng.html

E. Low or no-VOC adhesives

Use low-toxic or water-based adhesives for carpeting. Conventional glues are very high in VOCs and off-gas for long periods of time. Choose water-based glues or natural, plant-based glues. Pure silicone is efficient with windows and bathrooms: when dry, the silicone becomes non-toxic. Latex or other water-based sealers can be used anywhere indoors. Be careful with bathroom and kitchen sealers as some contain fungicides which trigger allergies in some people.

F. Low or no-VOC paints, stains and sealants

When designing an exhibit, choosing your paints, stains, and sealants is an important part of the sustainable development approach. VOCs are made of carbon and hydrogen that can turn into gas in the air. Paints often contain VOCs. Oil and latex-based paints contain toxic chemicals that cannot be subsequently processed. These organic chemicals, such as cyanide, evaporate easily into the atmosphere, and contribute to global warming. Instead of traditional paints, look for no-VOC paints, made with talc powder, clay or chalk, as they have a lesser environmental impact.

G. Recycled plastics and glass

Not only does recycling reduce waste volume, and in turn any resulting pollution (some materials take decades, if not centuries, to break down); it also saves natural resources as it reduces the need to extract new raw materials.

Lexan
Lexan (http://en.wikipedia.org/wiki/Lexan) is a good alternative to Plexiglas as it is highly durable, malleable and resistant to sunlight.

H. Plastics with a natural compound base

Bioplastics (http://www.greendesignwiki.com/index.php?title=Bio-based_plastics_%28alternatives_to_acrylic%29) are a form of plastics derived from vegetable oils, wood fibres and starches. They contain no petroleum and have less impact on the environment.

I. Carpets and floor coverings

When choosing your floor covering, you need to consider not only the product materials themselves, but also the sustainability of those materials, the products that will be used for their maintenance and whether the product is recyclable at the end of its life cycle. Many so-called sustainable floor coverings emit high levels of VOCs and cannot be recycled nor reused. There are many alternatives, such as flooring made of bamboo or cork, modular carpeting, concrete, linoleum and other coverings made from recycled and recyclable materials.

http://www.greendesignwiki.com/index.php?title=Carpeting_%26_Flooring

3. Graphic design and sustainable signage

Inks, lamination and other processes used for graphics and signage in your institution can have a significant impact on the environment. Design consultant Naomi Pearson offers good information: http://naomipearson.com/getStarted_p3.html

A. Inks and printing processes

Inks contain various components. A common VOC in conventional lithographic printing ink is high-boiling aliphatic petroleum distillate. This distillate is used to dissolve the resins that bind to the substrate during printing. The amount of ink VOC that is released into the atmosphere depends on the process: heatset inks release 80% of their VOCs, while sheet-fed inks release only 5%. The current standard level for VOCs in environmentally friendly inks is less than 18% (by weight) for sheet-fed inks, less than 30% for sheet-fed varnishes, and less than 40% for heatset inks and heatset overprint varnishes. There are now many vegetable or soy-based inks on the market: http://www.greendesignwiki.com/index.php?title=Printing_Inks

B. Printing media

The printing media must also be considered. Paper choice should be based on factors such as lifecycle management and/or forest resource management. Paper from certified manufacturers, Environmental Choice Program (ECP), or using pulp from a sustainably managed forest is a good option. The Forestry Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI) and the CSA Sustainable Forest Management Standard (CSA/SFMS) set reliable standards.

For more information visit these sites:
http://www.greendesignwiki.com/index.php?title=Printing_Substrates
http://www.canopyplanet.org/

4. End of exhibition: Materials disposal

You can minimize waste from exhibitions and their materials by planning to reuse or recycle the various components from the outset. Here are a few factors to consider at the end of an exhibition:

- Reuse the furniture
- Reuse the panels
- Hold a furniture swap/sale
- Update the content of previous exhibitions
- Hold travelling exhibitions
- Rent or loan materials to other museums

Museums, science centres and zoos may also create an electronic bulletin board where they can post material to exchange and give items from different exhibit.

5. References and tools

A. Exhibition design

- Green Design Wiki
  http://www.greendesignwiki.com/index.php?title=Main_Page#Get_Started
- ECODESIGN software
  http://www.ecodesign.at/pilot/ONLINE/ENGLISH/INDEX.HTM
- How to create an exhibition
  http://www.sites.si.edu/exhibitions/exhibits/greenRevolution/index.htm
- Madison Children's Museum
  http://www.madisonchildrensmuseum.org/about-mcm/sustainability-commitment
  http://www.greenexhibits.org/intro.shtml
  http://www.greenexhibits.org/dream/exhibits.shtml
- A Quebec-France eco-design project (French only)
  http://www.eco-conception.fr/retourseconomiques.html
- Travelling exhibitions
  http://www.greendesignwiki.com/resources/SustainableExhibitDesign.pdf
  http://www.naturesciences.qc.ca/index_eng.html
- For booths and/or exhibitors
  http://www.exhibitoronline.com/topics/greenexhibiting.asp
- SMQ guide to travelling exhibits (French only)
  http://www.smq.qc.ca/publicsspec/guidesel/expoitinerantes/index.htm
- Twitter
  http://twitter.com/greenmuseum
- Design consultants
  http://www.ideum.ca/English/indexe.html
  http://perennia.org/

B. Materials

- Life cycle analysis of different materials
  http://www.athenasmi.org/about/lcaModel.html
- EcoLogo offers a list of certified materials
  http://www.ecologo.org/fr/ (French only)
  http://www.ecologo.org/en/greenproducts/
- Public Works and Government Services Canada guide for eco-friendly construction and renovation
  http://www.tpsgc-pwgsc.gc.ca/biens-property/gd-env-cnstrctn/index-eng.html
- Wood
  http://www.sfmcanada.org/english/sfm-certification.asp
  http://www.cwc.org
  http://www.cecobois.org
  http://woodweb.com/http://www.canadawood.cn/english/g/prod_ew_intro.html
- Plastic
  http://www.chej.org/BESAFE/pvc/bioplastics.htm
- Tiles (French only)
  http://www.proacoustique.com/
- Materials disposal: Matériaux pour les Arts Montréal (French only)
  http://www.mamontreal.qc.ca/
- Materials
  http://www.kingston.ac.uk/~kx19789/rematerialise/html_and_flash/searchwelcome.htm
- Finished and recycled materials
  http://naomipearson.com/getStarted_p4.html
- Signage
  http://ecosignage.org/index.html
- Paint
  www.sico.ca/
  www.betonel.com/en/index.php
  www.benjaminmoore.com
  www.sherwinwilliams.com
  www.coatingsworld.com
  www.americanclay.com
- Design materials
  http://www.buildinggreen.com/menus/index.cfm