

Building with Pests in Mind



Canada



Background

History of the Natural Heritage Building (NHB)

Pre 1997

- CMN Staff and Collections were spread out over more than 14 buildings throughout the Ottawa capital region



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The Canadian Museum of Nature (CMN) currently calls two main buildings home: the Natural Heritage Building (NHB), the corporate headquarters and curatorial facility, and the Victoria Memorial Museum Building (VMMB), where visitors can view specimens on display.

Prior to the 1997 opening of the NHB, the CMN staff and collections were spread out over more than fourteen buildings throughout the Ottawa capital region. The much anticipated move to one central location was a chance for the CMN to incorporate principles of preventive conservation into the actual building design.

Background

History of the Natural Heritage Building (NHB)

Pre 1997

- CMN Staff and Collections were spread out over more than 14 buildings throughout the Ottawa capital region
- Move to one central location for offices and storage provided the chance to incorporate principles of preventive conservation into the actual building design



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The NHB was designed with many integrated pest management (IPM) related building features. Over the past fourteen years many of these features have continued to work as originally intended, with some requiring adjustments in order to gain their optimum functionality. Additional IPM features that were not originally considered at the time of construction have also been added.

Today I am going to briefly outline some of these features. There are many more I couldn't cover today due to time restraints, but there is a table available for whoever would like a copy.

We also realize that very few of us will ever be as lucky as us to have the opportunity to design a new building, but many of these features can be retrofitted to existing buildings.

Building Exterior

Building Envelope

- Foundation, Walls and Roof
- Exterior Doors



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Building Envelope

A building envelope can be defined as that which separates the exterior environment from the interior environment of a building. The building envelope of the NHB was created to be the primary protective barrier between pests and the valuable national collections held within.

Foundation, Walls and Roof

Efforts were made to ensure that all cracks and holes in the exterior of the building were properly sealed. This included sealing around all conduit lines, piping and ventilation ducts coming into, and going out of, the NHB. In addition, all vents were fitted with screens to prevent pests from gaining access to the building. If pests do make it past the first set of screens they are eventually trapped in the second level of screening found within the various mechanical rooms.

Exterior doors

All main entrances to the NHB utilize two sets of doors. All exterior doors are equipped with tight fitting sweeps on the bottom, weather stripping along both sides and across the top to prevent any gaps through which pests could gain access through. These IPM related features are

successful although they do require regular inspection and replacement as normal wear and tear will reduce their effectiveness.

Building Exterior

Building Envelope

- Foundation, Walls and Roof
- Exterior Doors
- Loading Dock
 - Cargo Bay Doors



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Loading dock cargo bay doors

A few years after moving into the NHB nesting and roosting activity by pigeons on top of the cargo bay door was discovered. Bird netting (wire screening) was installed above the doors, meant to discourage bird activity, and decrease the chance of other pests that are routinely found in nesting sites like dermestids and clothing moths. It was a successful addition, however, regular inspection and maintenance is necessary to ensure its continued functionality.

Building Exterior

Building Envelope

- Foundation, Walls and Roof
- Exterior Doors
- Loading Dock
 - Cargo Bay Doors
- Windows
- Lighting



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Windows

The NHB was designed with windows that do not open. As far as IPM related design is concerned this is the best possible scenario for reducing the introduction of pests to the building.

Lighting

In most cases, an effort was made to position exterior lights away from entrances to the building and to direct light away from the entrances. Sodium vapour lighting was used, which is less attractive to pests and also saves energy.

Building Exterior

Landscaping

- Vegetation Free Zone



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Landscaping

An integral part of the NHB design and IPM deals with the landscaping and maintenance of the environment in close proximity to the building.

Vegetation free zone

A one metre (three foot) wide vegetation free zone surrounds the entire perimeter of the building exterior. It is constructed from durable landscape cloth covered by pea gravel with a metal barrier running along its border. This vegetation free zone allows for easier visual inspections. It prevents rodent burrows, plant colonization and insect harbourage. To ensure its effectiveness regular maintenance in the form of weeding is required. While labour intense, hand weeding has been preferred over chemical treatment with systemic herbicides or torch treatments.

Building Exterior

Landscaping

- Vegetation Free Zone
- No Window Boxes or Elevated Planters
- No Building Contact by Trees or Shrubs



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No window boxes or elevated planters

Although they can be attractive in appearance, window boxes and elevated planters were left out of the final NHB design due to their ability to provide excellent harbourage opportunities for pests such as rodents. Elevated planters also have a tendency to accumulate debris and food trash which in turn would attract additional pests.

No building contact by trees or shrubs

Vegetation that comes in contact with any part of the building can be used by climbing pests to gain access to it. Trees and shrubs this close to the building also interfere with visual inspections while increasing moisture content along the foundation walls and providing shelter for pests. Regular pruning is necessary to keep this IPM building design feature working effectively.

BUT – Recent decision to replace the roof with a Green Roof.

Building Exterior

Landscaping

- Vegetation Free Zone
- No Window Boxes or Elevated Planters
- No Building Contact by Trees or Shrubs
- Ground Slopes Away from the Building



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Ground slopes away from building

The ground around NHB slopes away from the building exterior. This gradual slope away from the exterior walls eliminates areas of standing water and reduces areas of high moisture forming along the building foundation. This in turn decreases chances of mould and mildew growth that have been known to support pests. Over time the ground can settle and the slope begin to erode, and annual inspections and maintenance to ensure the ground continues to slope away from the building help to ensure that this remains a useful IPM related building feature.

Building Interior

NHB Layout

- Three Separate Collection Pods



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The NHB was designed to strategically separate certain areas of the building and incorporate particular features to assist with pest management.

Three separate collection pods

The collections are all stored in the same area of the NHB, and separated into 3 separate pods. Each collection pod is surrounded by corridors and further divided into smaller collection rooms within each pod. No collection pod has exterior windows or walls, which significantly reduces the risk of pests.

Building Interior

NHB Layout

- Three Separate Collection Pods
- Dynamic Buffer Zone around Collection Pods



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Dynamic Buffer Zone (DBZ) around collection pods

Between the exterior walls of the NHB and the collection pod walls there is a dynamic buffer zone. This is essentially a narrow corridor that helps with environmental control and pest management. If pests do gain access to the building they have to cross the DBZ before they reach interior doors (used as emergency exits only) leading to the collection pods. This feature has shown to be very successful. We monitor both sides of the interior doors (DBZ and pods) and there is a significant difference in the number of pests discovered in the DBZ compared to the number found in collection pods, with the DBZ accounting for the largest number.

Building Interior

NHB Layout

- Three Separate Collection Pods
- Dynamic Buffer Zone around Collection Pods
- Cafeteria Away from Collections
- Offices and Research Labs Away from Collections



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Cafeteria away from collections

The cafeteria was designed to be a completely separate wing from all staff working areas and the collection pods. This provides a structural barrier via walls, as well as one of distance, between it and the collections. Although staff are permitted to eat at their desks, they are provided with sealed plastic containers to house food, are encouraged to store lunches in available fridges and to eat in the cafeteria.

Offices and research labs away from collections

The offices for collections and research staff are in a separate area in proximity to, but physically separate from the collection pods and research labs. Not having the offices and labs incorporated into the collection storage areas decreases the chance of pests being inadvertently brought in by staff in bags or on shoes. This was part of the original design; however, for a variety of reasons many staff members who also have space available in lab areas have taken to working primarily in these locations. As these lab spaces begin to function more as office spaces, IPM procedures are sometimes being forgotten. A space allocation project is currently underway that aims to improve and optimize the office and lab spaces available to staff. This should also minimize expectations of individuals to treat lab space as their primary office.

Building Interior

NHB Layout

- Three Separate Collection Pods
- Dynamic Buffer Zone around Collection Pods
- Cafeteria Away from Collections
- Offices and Research Labs Away from Collections
- Dedicated Garbage Room off Loading Dock



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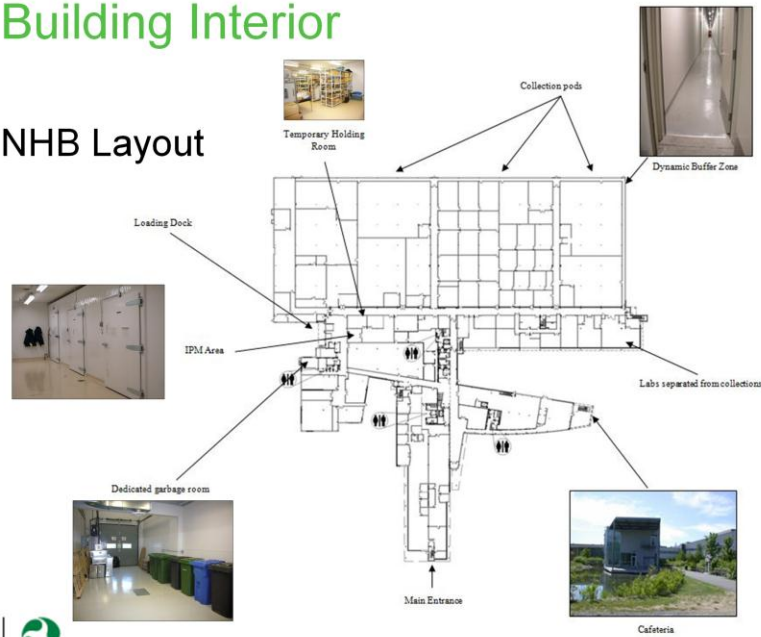


Dedicated garbage room off of loading dock

All garbage that is collected in the building is stored in an isolated, sealed room off of the loading dock and away from collection areas until pick up.

Building Interior

NHB Layout



Here you can see a layout of the NHB highlighting some of the features I have been discussing.

Building Interior

NHB Layout

- Three Separate Collection Pods
- Dynamic Buffer Zone around Collection Pods
- Cafeteria Away from Collections
- Offices and Research Labs Away from Collections
- Dedicated Garbage Room off Loading Dock
- Single Story Collection Storage
- Central Security Desk

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Single storey collection storage

No second storey above the collection pods reduces the risk of pests entering via connections to floors above.

Central security desk

All visitors and staff must pass by security upon entering the NHB. They are trained to provide all visitors with a brief orientation that includes not bringing bags, food or drink into the collection areas, nor any living plants.

Building Interior

Dedicated IPM Areas

- Packing/Unpacking Room



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Packing/unpacking room

A Packing and Unpacking room is located directly off of the loading dock. All specimens travelling into the building move through this room, where they are unpacked from boxes and crates. It is designed to prevent possibly infested packing material from moving into the collection areas. Any specimens that are destined for the collection pods or labs that cannot be frozen are inspected in this area. Although a great feature, it tends to become a habitat for pests due to packing material and boxes piling up and making the area difficult to clean. Sticky trap inspection consistently shows pest activity in this room.

Building Interior

Dedicated IPM Areas

- Packing/Unpacking Room
- Freezers



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Freezers

Directly off of the packing/unpacking room is a room that contains three walk in freezers. As a precautionary measure, all incoming materials that are suitable for freezing and destined for the collection pods and labs are cold-treated for seven days at -30° Celsius. One freezer has proven sufficient for such short term treatments. The other two freezers now hold Collection and Research material for longer periods of time. Cold treatment extends beyond specimens to any case goods or hardware destined for the collection pods which could be harbouring unseen pests.

Building Interior

Dedicated IPM Areas

- Packing/Unpacking Room
- Freezers
- CO₂ Bubble



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CO₂ Bubble

When the NHB was built a CO₂ bubble was purchased and a separate room was designed to house it. The bubble was a large, rigid frame model that proved to be oversized relative to our ongoing requirements. Due to its operating costs and low request levels a new home was eventually found for it within a partner museum requiring this type of conservation resource. Cold-treatments remain a key IPM strategy.

On the few occasions when it has been necessary to treat specimens that cannot undergo freezing, the CO₂ bubble at the Canadian Museum of Civilization has been used with good results. This room is now being used as a “dirty lab” for researchers to look at materials brought in from field work that cannot be put through the freezers or allowed to enter into the collections and labs section of the NHB. This has proven a valuable addition to our IPM program.

Building Interior

Dedicated IPM Areas

- Packing/Unpacking Room
- Freezers
- CO₂ Bubble
- Temporary Holding Room



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Temporary Holding Room

The Temporary Holding Room is designed to house specimens that cannot be treated or inspected in a timely fashion, and therefore cannot be brought into the collection areas. It is located directly off the packing and unpacking room. In theory this is a great feature. However, the reality is that this room has a tendency to become a repository for all sorts of materials, not just specimens, and not so temporary. This feature requires a high level of organizational discipline to remain true to its intended purpose.

Building Interior

Collection Pods

- Four Separate HVAC Zones



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Within the collection pods, specific IPM related building design features assist in preventing, monitoring, and controlling pests.

Four separate HVAC zones

The collections are divided into four separate heating, ventilation and air conditioning (HVAC) zones based on environmental requirements, plus a fifth system loop serving the DBZ. These separate HVAC zones result in no mixing of air between the different zones and no chance of pests migrating through the ductwork from one zone to another. In addition, these four zones are all completely separate from the rest of the NHB.

Building Interior

Collection Pods

- Four Separate HVAC Zones
- Designated Fur Vault



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Designated fur vault

The NHB was designed with a fur vault in order to house what is one of the most susceptible collections for pest infestation. The fur vault is kept at 10° Celsius to discourage pests from entering the space, and to slow them down if they do.

Building Interior

Collection Pods

- Four Separate HVAC Zones
- Designated Fur Vault
- Restricted Access



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Restricted access

All individuals allowed access to the collections and labs areas must first receive an orientation that includes pest management policies and procedures. These areas are also only accessible using swipe cards, which can only be granted after the proper orientation.

Building Interior

Collection Pods

Doors

- Sweeps
- Double Doors



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Sweeps

All collection pod doors had high quality sweeps to prevent pests from gaining access through any gaps underneath. Originally all doors had thresholds but pushing carts over these caused an increase risk of damage to specimens and were therefore removed. To eliminate the gap created the original sweeps were replaced with automatic door bottoms (ADB). The concept was good in principle, but due to improper installation many of the doors no longer close properly. This has resulted in some of them being left ajar and creating a greater opening for pests to enter than if the original sweeps had been left on. It is now recommended that the sweeps are refitted.

Double doors to collection pods

Double doors leading to the collection pods and labs help prevent any pests that make it into this section of the NHB from migrating in from the corridors.

Building Interior

Collection Pods

Walls, Ceilings and Floors

- Light Coloured Walls
- Light Coloured Floors
- No Carpeting
- No Baseboards in Pods or Labs



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Certain wall and ceiling choices assist in pest management.

Light colour on walls

The decision to have all walls done in a light palette was primarily to assist with visual inspections.

Light coloured flooring

The light colour and low pattern flooring in the NHB helps with spotting pests. All collection pods, labs, corridors and collection and research offices incorporate this feature.

No carpeting

Floors covered in carpeting hinder the detection of pests, gather possible food sources and make cleaning spills more difficult. The only area in the whole NHB where carpet can be found is in the administrative work areas. There was a managerial decision during the design phase that the risk to the collections from synthetic carpeting in the administrative areas is a manageable risk. This carpeting is low-pile.

Building Interior

Collection Pods

Walls, Ceilings and Floors

- Light Coloured Walls
- Light Coloured Floors
- No Carpeting
- No Baseboards in Pods or Labs



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No baseboards in collection pods or labs

All collection pods and labs have floors that curve up along the wall with no baseboards. This reduces cracks and crevices for pests to inhabit and helps facilitate proper cleaning. The combination of this cove-moulded floor and an epoxy paint finish have been an important feature and are preferred over a vinyl mop rail which offers shelter to pests.

Building Interior

Collection Pods

Walls, Ceilings and Floors

- Light Coloured Walls
- Light Coloured Floors
- No Carpeting
- No Baseboards in Pods or Labs
- No Suspended Ceilings



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No suspended ceilings

The open ceilings and exposed pipe/duct work eliminates areas that are hard to clean, prevents build up of flies which could be a food source and eliminates a possible breeding area. This feature also aids in visual inspection.

Building Interior

Collection Pods

Cabinets and Shelving

- Good Seals on Cabinets



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Good seals on cabinets

Well sealed cabinets prevent pests from gaining access to cabinets, and if there is an infestation, from escaping and going elsewhere. The new cabinets obtained for the move to the NHB came with new gaskets. Seals on older cabinets are being replaced with new ones as time and money allows, with a preference for closed cell silicon rubber.

Building Interior

Collection Pods

Cabinets and Shelving

- Good Seals on Cabinets
- Cabinets Moveable by Forklift



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Cabinets moveable by forklift.

The cabinets in the collections that are deemed the most susceptible to pest infestation (Botany, Birds and Mammals) are moveable by forklift and fit into the walk in freezers. If an infestation is ever discovered the entire cabinet can be easily treated. This feature has only been utilized once when a cabinet from the bird collection was placed in the freezer. The operation did work as planned.

Building Interior

Collection Pods

Cabinets and Shelving

- Good Seals on Cabinets
- Cabinets Moveable by Forklift
- Open Shelving



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Open shelving

Open shelving in some collection rooms is beneficial for visual inspections. The open shelving discourages dark areas popular for pest breeding and reduces any harbourage of pests.

Conclusion

Fourteen years later, it could be argued that the NHB continues to remain a “best practices” model for how to design a building to house museum collections.



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From the outset the CMN staff involved with the design of the NHB strove to incorporate IPM preventive conservation measures into the building plan. Fourteen years later, it could be argued that the NHB continues to remain a “best practices” model for how to design a building to house museum collections. Some changes and additions to the original building design have taken place over the years, but the NHB remains a vast improvement over the various buildings that were once home to the collections in the past. The IPM related building features need to be reviewed and reconsidered on a regular basis and building maintenance and inspections must continue, with changes being made when necessary.

It could be argued that our program is almost TOO successful, since we’ve had few pest problems, we find ourselves occasionally trying to convince facilities and management that the costs and upkeep are necessary, and the reason it IS successful.

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