Preservation Recommendations for the Nunavut Inuit Heritage Centre Collections

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Art-e-Facts
November 25, 2022 (2023 Revisions)

Man and Woman
Pie Kukshout, Kangiqliniq 1911-1980, Clay
Government of Nunavut Fine Art Collection. On long term loan to the Winnipeg Art Gallery, 2.70.37

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Executive Summary

The Inuit Heritage Trust (IHT) is leading the feasibility planning process with the support of Nunavut Tunngavik Inc (NTI), Qikiqtani Inuit Association (QIA), Kitikmeot Inuit Association (KitIA), and Kivalliq Inuit Association (KivIA) to build the Nunavut Inuit Heritage Centre (NIHC).[1]

The NIHC would house archaeological, palaeobiology, botany, natural history, historical, fine art and archival collections managed by the Inuit Heritage Trust (IHT) and the Government of Nunavut (GN) presently dispersed throughout Canada in multiple locations. Not counting archival material, the majority of the objects belonging to these collections are stored at the Canadian Museum of Nature's Natural Heritage Campus in Gatineau, at the Winnipeg Art Gallery's Qaumajuq and at Parks Canada's Ottawa Conservation Laboratory (Franklin Collection from the HMS Erebus and HMS Terror National Historic Site).

The purpose of this report is to provide IHT with preservation information and recommendations for the initial NIHC feasibility study. The report is based on observation of conditions in 2021 and early 2022. Comparisons are based on the author's previous involvements with some of the collections. There were significant challenges to carrying out this project due to the loss of digital files[2] when the GN network was affected by a ransomware attack in 2019, followed by the Covid pandemic, which delayed hiring staff to manage the collection.

Several risks to the collections have been documented in this report, most notably the risk of loss of objects and of information about objects in the collection. This type of risk to collections is named dissociation. The loss of digital files, the absence of a central collections database to manage all the collections and keep track of their locations, and the number of unverified objects held by archaeologists may also be in contravention of article 33.2.2 of the Nunavut Agreement.[3]

A survey of collections in their current storage was used to recommend specific storage requirements and to estimate the dimensions of collections storage. Although the decision whether to organize the NIHC collections storage according to communities, material, or a combination of both has not yet been made, housing most of the collections in one large main collection storage room will accommodate whichever approach is chosen.

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[1] IHT (2022), *Nunavut Inuit Heritage Centre Feasibility Study*, Executive Summary

[2] "Most of our records are not digitized. We do not have digital documents for most of the collection. If there are digital copies of the inventories for each box, we have not located them. Individual items (accession numbers) are listed on and/or within boxes, but each box does not have an individual identifier (number) that would make it possible to track an item to a specific box...." Alex Stubbing, Director of Heritage, Government of Nunavut September 2021 email to Torsten Diesel.

[3] The archaeological record of the Nunavut Settlement Area is of spiritual, cultural, religious and educational importance to Inuit. Accordingly, the identification, protection and conservation of archaeological sites and specimens and the interpretation of the archaeological record is of primary importance to Inuit and their involvement is both desirable and necessary.

To maximize use of space, it is assumed high density museum storage compact modular shelving will be installed in most storage areas and in the conservation laboratory.

Budget planning and purchase of storage equipment will only be possible when a decision is made on how the collections will be grouped in storage. Due to inflation, especially the rise of steel prices, and covid related supply change issues, companies were not willing to make long term estimates.

To meet specific requirements for the preservation of the collections, five storage areas and a conservation laboratory are proposed:

Room	Size	Environment
Main Storage	800 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs
Large Objects Storage	110 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs
Dry Storage	30 m^2	Cool Storage environment. 8°C to 16°C and Relative Humidity below 30%.
Frozen Storage	60 m^2	Frozen Storage environment. Temperature between -20°C to -10°C and Relative Humidity is between 35% and 50%*.
Archival Collections	150 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Unstable photo and film media would be stored in the Frozen storage
Conservation Laboratory	85 m^2	Temperature between 18°C and 24°C and Relative Humidity (RH) between 35% and 50%*. Short term fluctuations RH plus or minus 5%, over 3 months acceptable fluctuation is 10% plus or minus. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs

The RH with * are ASHRAE standards used for Category A designation. ASHRAE standards for museums have evolved, and are evolving, based on conservation R&D. Acceptable seasonal fluctuation for cool storage environment would be determined by the Canadian Conservation Institute (CCI) when it reviews requirements for Cultural Property. CCI's expertise on acceptable seasonal variations is required to determine the criteria to choose an HVAC system or systems for the NIHC, otherwise there is a risk that the chosen system will not meet ASHRAE standards or perform as expected at the time of the build.

Preservation Recommendations for the Nunavut Inuit Heritage Centre Collections

Introduction

The purpose of this report is to provide the Inuit Heritage Trust (IHT) with information and recommendations for the feasibility study to build the Nunavut Inuit Heritage Centre (NIHC) in Iqaluit. The NIHC will preserve and make accessible to Inuit, through exhibitions, loans and educational programs, the archaeological, palaeobiology, botany, natural history, historical, fine art and archival collections managed by the Inuit Heritage Trust (IHT) and the Government of Nunavut (GN) in a Category A facility. These collections are presently dispersed throughout Canada in multiple locations. Excluding the archival collections, most of the objects belonging to these collections are stored at the Canadian Museum of Nature's (CMN) Natural Heritage Campus in Gatineau, at the Winnipeg Art Gallery's (WAG) Qaumajuq and at Parks Canada's Ottawa Conservation Laboratory (Franklin Collection from the HMS Erebus and HMS Terror National Historic Site).

From the time Nunavut became a territory in 1999 to 2017, most of IHT and GN managed collections were stored at the Prince of Wales Northern Heritage Centre (PWNHC), Yellowknife, with some exceptions. These collections were housed in ~2000 sq ft climate-controlled space and ~2700 sq ft warehouse space. The GN rented space in the PWNHC, also covering the cost of storage supplies and collections staff salaries tasked to care for the collections. Notable exceptions were archaeology objects on loan to Canadian universities for research, objects on display in Nunavut cultural centres throughout the territory, objects and archival collections in GN managed storage and offices in Iqaluit and objects sent to Ottawa for conservation treatments. Collections entrusted to PWNHC's care were managed by the PWNHC staff and collections database.

Images of Prince of Wales Northern Heritage Centre Storage

Through acquisitions, donations and archaeological excavations, these collections eventually outgrew the allocated storage space at PWNHC. PWNHC 's collections were also growing, and they required more space for storage. GN was informed that the collections would have to be housed elsewhere.

In 2012, the GN began sending archaeological artifacts[4], palaeobiology /botany collected materials and donated objects (traditional items created for the Arctic Odyssey exhibit, the Hargrave Donation, the Duncan Donation, and materials from the Kellett storehouse) to the Canadian Museum of Nature (CMN) for storage. These objects are stored at CMN's Natural Heritage Campus in Gatineau, in the same storage spaces as CMN's collections. Archaeological materials from Nunavut sent to Ottawa for treatment at the Canadian Conservation Institute (CCI) were no longer returned to PWNHC after 2012, they were sent to CMN.

These objects, identified in this report as post-2012 objects, are managed by the CMN staff and collections management database.


A small portion of recently excavated archaeological faunal material is currently being cleaned in the CMN's fossil preparation laboratory.

In 2016, approximately 7400 works of art on paper, textiles, paintings, and sculptures were packed and moved from PWNHC to the Winnipeg Art Gallery (WAG), as part of a long-term loan negotiated by GN. As part of that agreement, costs to preserve and store the collections are covered by the GN.

These objects are now stored or on display in the WAG's newly opened Qaumajuq Centre and are in the process of being professionally photographed. The WAG's collections management database is used to manage these collections.

In 2017, approximately 140,0000 objects comprised of the pre-2012 archaeological, palaeobiology and botany collections, the historical[5] objects collections, archival collections, and the art works not sent to Winnipeg, were moved from PWNHC to CMN's Natural Heritage Campus in Gatineau. GN rented storage spaces in the A-Wing of the facility and office space on the second floor. CMN's A-wing is located

[4] artifact (American spelling) or artefact (Commonwealth spelling). Artifact is used in this report as this spelling has been adopted in CCI texts.
[5] Formerly referred to as ethnology or ethnological collection.

outside CMN's main collection storage rooms which house the post-2012 objects. A few fur garments are stored in CMN's cold storage vault, not a GN space.
These objects, identified in this report as pre-2012 objects, are managed by the GN staff in Gatineau. The GN recently posted a request for proposals to provide a collections management system to manage the collections.

While most of the future NIHC collections are now located in Winnipeg or in the National Capital Region (NCR) at the CMN's Natural Heritage Campus, the remainder are on display in Nunavut cultural centres throughout the territory, in Government of Nunavut managed storage, archives and offices in Iqaluit. Material belonging to the Franklin Collection brought up from the HMS Erebus and HMS Terror National Historic Site (NHS) are in treatment or storage at Parks Canada's Conservation Laboratory in Ottawa. Excavated archaeological material from other Nunavut sites are in treatment at CCI in Ottawa. An unconfirmed number of archaeological objects are being held in Canadian universities for research by the GN permit holders.

The responsibility for managing object loans is divided between GN and CMN. Pre-2012 object loans are managed by GN and post-2012 object loans are managed by CMN. Archives are separate and managed by the GN under the responsibility of Territory's Archivist.

GN Storage Area B in CMN A-Wing


Large unpacked objects stored in area outside GN Storage Area A and B

Part 1 – Survey of Collections

Scope of Work and Photo Documentation

Part of the scope of work was to develop and carry out a methodology and work plan with IHT Archaeologist, Lesley Howse, to identify space and storage requirements for a Nunavut Inuit Heritage Centre (NIHC) that would house GN and IHT managed collections presently stored at the Canadian Museum of Nature (CMN), at the Winnipeg Art Gallery Qaumajuq (WAG), in Canadian universities, Parks Canada, CCI, on loan to Nunavut cultural centres and in GN Iqaluit storage. The work also included providing preservation related information and advice for the feasibility study to the Director of Planning.

This report provides IHT with appropriate, cost efficient and sustainable recommendations for the storage and preservations of IHT and GN managed collections in a new NIHC built to meet designated Category A facility requirements. Only the collections in Winnipeg and the National Capital Region were accessible. Information regarding the other collections was for the most part provided by GN and CMN.

Photographic documentation and inventories of the collections stored at the CMN's Natural Heritage Campus in Gatineau were carried out by Lesley Howse and Elisabeth Joy. The documentation was saved on a USB key and hand delivered by Lesley Howse to Torsten Diesel during a trip to Nunavut in August 2021. Only selected images have been included in this report. Unless otherwise labelled, images in this report were taken by Elisabeth Joy.
No photography was allowed in the WAG storage, but WAG staff shared their images with IHT.

Loans to universities are being tracked by GN staff, but it was not possible to physically inspect them or receive updates from most of the borrowers due to Covid restrictions[6].

All photographs taken in the Parks Canada Ottawa Conservation Centre were sent to IHT separately and selected images have been included in this report. No photographic documentation for the GN Iqaluit storage was received.

Drawer Delta Cabinet #9 in CMN storage


Treated Bell Parks Canada Storage

[6] "…we [GN staff] manage these loans. In most cases, many of the loanees have not been able to access their loaned material because they cannot access their labs due to Covid restrictions, so it has been slow to get a response…" Alex Stubbing, Director of Heritage, GN, September 2021 email to Torsten Diesel.

Challenges

There were significant challenges with regards to accessing the collections and the collections data. Collections data, loan information and digital files related to the move of the collections from PWNHC in 2017 were lost[7] after the GN network was affected by a ransomware attack in 2019. There is no collections management database that contains all the data for the collections individually or jointly managed by GN and IHT. GN staff are in the process of acquiring a collections management database.

The GN pre-2012 collections were moved in 2017 to CMN's Natural Heritage Campus in Gatineau without prior planning for how the storage would be organized. As a result, these collections were mainly left unpacked in the GN storage areas and the GN office area until the current GN collections team was hired.

The Covid pandemic delayed hiring GN staff to manage the GN collections and complete the unpacking and organization of the collection. The pandemic also limited on-site work. There was no overlap between the GN team tasked with moving the collection and the GN staff currently managing the collection. This loss of knowledge is in part mitigated because one of the current GN team members worked with the collection at PWNHC.

Recommendations were made to GN staff, by CMN and CCI in 2016[8], to carry out a space analysis prior to the move. Mapping object locations would have revealed how much and what type of shelving was needed to store the collections. It would also have revealed that there was insufficient space in rooms A and B for conventional shelving and an option would have been to install compact mobile shelving units. CMN and CCI staff had also recommended that CMN's barcoding system be used to track the boxes during and after the move. Barcoding lessens the risk of human error when recording and tracking numbers. This information would normally have been linked with object files in a database. If the boxes had been barcoded, it would probably have facilitated the survey work. Future moves should include implementation of tracking and location updates for all objects in the collection using the most current collection tools to avoid a repeat of this situation.

This report is based on information obtained, and observation of conditions, in 2021 and early 2022. During this period, recently hired GN staff at CMN had started the work to obtain shelving, unpack and inventory the collections. The situation was evolving daily. They inherited a very challenging situation, during challenging times where resources were difficult to access: no database, no tracking system, no shelving, insufficient space to store the collection and limited resources. They have been diligently working to improve the situation, but this takes time.

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[7] "Most of our records are not digitized. We do not have digital documents for most of the collection. If there are digital copies of the inventories for each box, we have not located them. Individual items (accession numbers) are listed on and/or within boxes, but each box does not have an individual identifier (number) that would make it possible to track an item to a specific box...." Alex Stubbing, Director of Heritage, GN September 2021 email to Torsten Diesel.

[8] Notes, July 25, 2016 brainstorming meeting of conservation issues relating to the transfer of collection from PWNHC to CMN storage. GN, CMN and CCI staff were present.

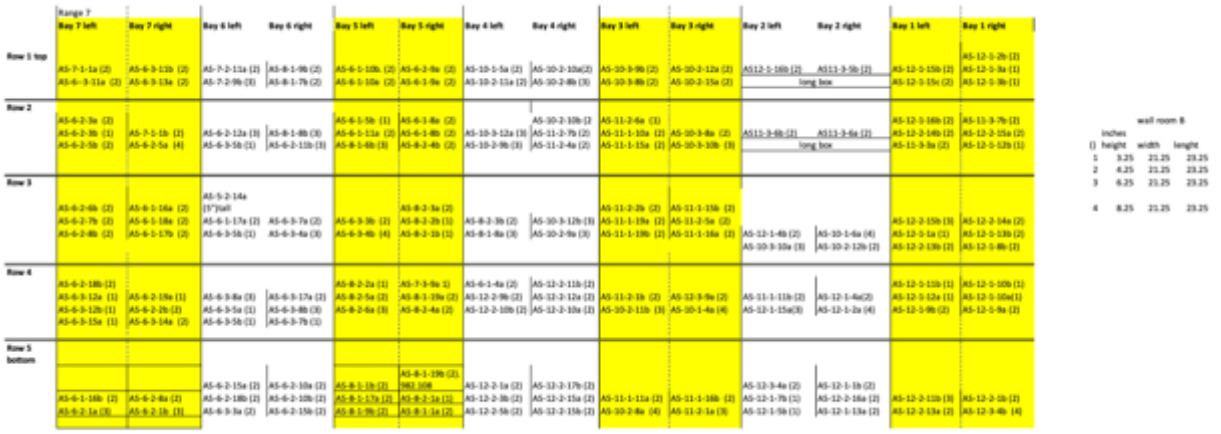
Summary Inventory Challenges

- At the time of the information gathering phase of this report, there was no collections policy or single collection management database with information on all the collections spread out across Canada to consult.
- Due to the delays identified above, collections managed by the GN were not all unpacked or in a permanent location in time for this survey. It was not always possible to locate objects.
- GN storage was overcrowded and space between shelving units was narrow, making access to locate objects at times not possible without risking damage to the artifacts or to staff.
- During the survey period, objects changed locations as the storage was being organized by GN staff to improve conditions
- Existing Excel documents and print outs of existing inventory documents provided to IHT for the GN managed collections in Ottawa were not always complete or up to date.
- Collections jointly managed by IHT and GN were not clearly identified

Lesley Howse working in GN Storage A

The methodology for the report was adapted to work around the challenges, but they did affect the timeline of this report, the access to the collections and the information available to report on.

One task for the survey was to calculate the number and size of shelves needed to store the collections located in room the GN's Storage A. Box sizes and numbers were recorded. There were 4 standard sizes for most of the boxes. The screenshot below maps the box locations and groupings. Because of overcrowding, it was not possible to look for accession numbers and only the numbers visible on the boxes could be used. Once a database is acquired and populated with data, these box numbers should be easily searchable.



Collections Policy and Databases

GN Collections staff based at CMN are working on developing a collections policy and on acquiring a collections database. A collections policy will define what can and cannot be accessioned into a collection. Without this, there are no parameters that can be used to estimate future growth of the collections. For example, would large industrial objects be collected, in which case there would be a significant impact on space requirement. There are also no policies or procedures for GN staff (or IHT) to refer to when managing and caring for the collection, such as loan procedures or handling human remains.

Important treatment information about the objects at CMN is not readily available due to the absence of digital files. There was a concern that some artifacts might be contaminated, but CMN has not been able to locate the treatment files. Normally, this information is prioritized in a collections management database for health and safety reasons. A collections database would also allow the quick identification of sacred material and human remains in the collections and contain individual instructions on how these materials are to be stored and handled.

The GN recently posted a request for proposals to provide a collections management system to manage "its heritage collections … and seeks to implement a museum-focused CMS to manage a multidisciplinary collection (Archaeology, Fine Art, History, Natural history, and Science)[9]. GN Archives staff shared in 2021 that they are also working on acquiring a new collections database. This means there will be two separate databases to manage the collections in the NIHC. It is hoped they will be compatible.

IHT staff have not been involved in the policy development or with developing the requirements for new collections management databases. This contravene article 33.2.2 of the Nunavut Agreement "…the identification, protection and conservation of archaeological sites and specimens and the interpretation of the archaeological record is of primary importance to Inuit and their involvement is both desirable and necessary…". To develop an online tool that will allow communities to access their objects in the NIHC collections, it will be necessary to link the information the collections database or databases, with digital photographs of the objects. If the information in the databases is not up to date, incomplete, cannot be linked to images or is not user friendly on an online platform, then communities will not have online access to their objects. Digitization work should be coordinated with the Digitization Strategy Project to develop tools that will give the Inuit access to their collections.

Collections moved to the WAG have been inventoried, object locations have been entered in the WAG database and there is an on-going project to have the collection professionally photographed. There was also care taken to differentiate similar GN and WAG accession numbers to keep both collections separate in the databases and ensure the accuracy of location information. This database was not accessible from the GN offices in Ottawa. The future GN database should have the capacity to import collections files easily and accurately from the WAG database.

[9] RFP 2022-49 v3.0 Collections MS

Collections managed by CMN are inventoried, object locations and loans are entered in CMN managed database and GN storage is identified.

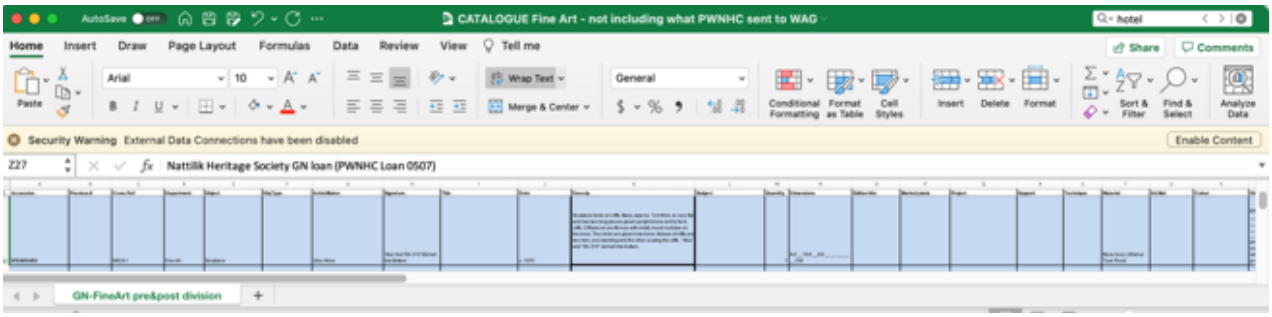
The future GN database should have the capacity to import collections files easily and accurately from the CMN database.

Note: IHT co-ownership is not indicated on the cabinet door label

Delta Cabinet Door Label located in the CMN Sub Fossil Room

Loans to Facilities in Nunavut

In the absence of a collections management database, GN staff are dependent on Excel spread sheets to manage their loans of historical and archaeological objects for exhibition in Nunavut. Borrowers include heritage societies, GN offices and hotels. Information is not easily accessible outside GN offices and there is a risk of misplacing or out of date information if multiple Excel documents are created.



Screen shot "Works of art not sent to WAG" Excel spreadsheet. Line item is a bone sculpture by Gino Akka, accession number 970.003.053, current location listed as on loan to the Nattilik Heritage Society.

Loans to Canadian Universities

Parts of the archaeological collections are held in Canadian universities for research and publication purposes by the GN/IHT issued permit holders who excavated them. GN staff are responsible for managing all pre-2012 loans. CMN staff administers the majority of post-2012 archaeological loans. All loans are to be renewed annually.

The pre-2012 loans date back 20 years or more. The exact number of the pre-2012 loans could not be estimated as information was not available at the time of this review due to Covid access issues and the loss of digital files. It was not possible to observe how these collections are stored and accessed, a concern given archaeology students have limited preventive conservation training and there have been catastrophic losses of collections stored in Canadian university facilities.[10]

[10] A roof fire in the 1980s destroyed archaeological material excavated by Laval University. In 2003, 280 boxes of archaeological material stored at the University of Toronto were mistakenly sent to a dump in Michigan. Total loss in both cases. These are examples of preservation failures in Canadian universities.

It must be noted that significant information about excavated material has[11] and can be lost when archaeologist's notes are not entered in a collections database or saved in physical files. This is in contravention of article 33.2.2 of the Nunavut Agreement.[12]

Not all excavated materials currently being researched are on loan to universities. There are post-2012 archaeological materials stored at CMN accessed by the permit holders on site at provided workspaces.

Post -2012 Faunal materials waiting to be processed stored on heavy duty shelves

The GN staff based at CMN are aware of the issues mentioned above and are working diligently to catch up and address deficiencies. The conditions and management of the collection will undoubtably change in the coming years. It is reiterated that this report is a snapshot between June 2021 and March 2022.

GN Storage Area A in CMN A-Wing

[11] Incidents where archaeologists do not complete their research, or do not submit their excavation notes or reports. The result is irreparable loss of information.

[12] The archaeological record of the Nunavut Settlement Area is of spiritual, cultural, religious and educational importance to Inuit. Accordingly, the identification, protection and conservation of archaeological sites and specimens and the interpretation of the archaeological record is of primary importance to Inuit and their involvement is both desirable and necessary.

Canadian Conservation Institute

Treatment of frozen, wet or underwater artifacts, especially artifacts found in salt water, can require specialized expertise and equipment. Unless the material can be washed and air dried, treatments are often costly and time consuming. The Canadian Conservation Institute and Parks Canada are the two Canadian organisations best equipped to treat archaeological excavated material from the north requiring specialized equipment such as a freeze dryer.

The Canadian Conservation Institute (CCI) has been treating artifacts found in Nunavut for decades. When applying for a permit, GN requires that the archaeologist secure conservation expertise should excavated artifacts requiring specialized treatments be found. CCI does not charge for the treatment of Nunavut excavated materials, but the archaeologist pays the cost to ship the archaeological material to and from CCI. In December 2021, there were 263 artifacts in treatment or awaiting shipping to either CMN or the permit holder's university. Due to Covid, certain university laboratories were closed, and objects could not be shipped to them.

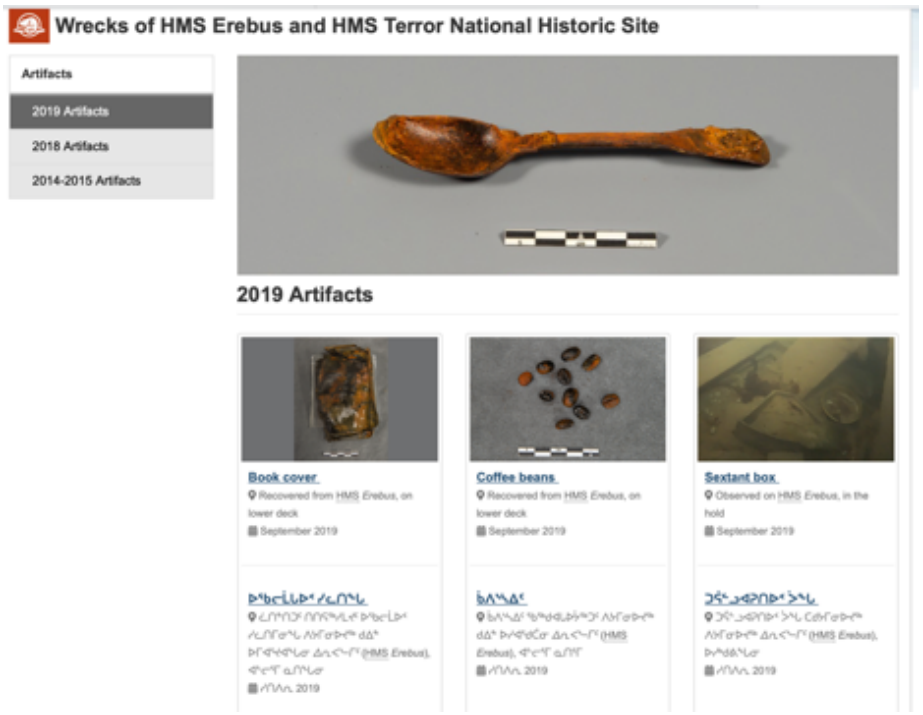
CCI has in the past offered on-site conservation services. The archaeological permit holder was only required to pay for the conservator's travel costs, food and lodging. This service offers a unique opportunity to deliver onsite training in conservation to Inuit students who are working with the archaeologists. The fee for CCI services webpage is: https://www.canada.ca/en/conservation-institute/services/assessment-service-requests/policy-cost-recovery.html#museums_archives_libraries_historic

Nunavut artifacts in CCI Archaeology Laboratory

Parks Canada

In January 2022, there were 449 objects from the HMS Erebus and HMS Terror NHS, at the Parks Canada Ottawa Conservation Laboratory. Most of these objects were in or awaiting treatment, while smaller objects generally have shorter treatment time, large artifacts such as the canon will take several years to treat.

Parks Canada (PC) maintains a database of all objects they have recovered from the HMS Erebus and HMS Terror NHS that is searchable online through trilingual web pages in Inuktitut, English and French. https://www.pc.gc.ca/en/lhn-nhs/nu/epaveswrecks/culture/archeologie-archeology/artefacts-artifacts/2019




Canon in treatment at PC


Parks Canada storage drawers


Parks Canada storage drawers

Observations: Current Storage Conditions After Moves From PWNHC

CMN's Natural Heritage Campus in Gatineau

CMN's Natural Heritage Campus in Gatineau was specifically built to preserve CMN's collections. CMN's curatorial, collections and conservation staff have considerable experience and collections care knowledge. They have established and follow procedures and protocols to preserve the collections. For example, the IPM program protects artifacts from insect or pest infestations, cabinets in their storage areas are raised off the ground to protect artifacts in case of water infiltration and security protocols protects artifacts from theft and vandalism.

The post-2012 material managed by CMN are stored in clean climate-controlled areas and most have been placed on shelves or in cabinets for easy access. This includes Franklin Expedition land finds. Shelves are lined to avoid physical damage to artifacts. The cabinets were purchased from two well-known companies, Delta Designs LTD and Lane Science Equipment Corp., and they are specifically designed for museum collections. There is no concern for these collections. The CMN database keeps track of locations and loans.

Delta Designs LTD cabinets in CMN storage. Cabinets are raised above the ground, objects are easily accessible and the cabinet doors lock as shown in detail photo.

Collections stored in CMN Lane Science Equipment Corp.Cabinets

A small number of furs and clothing collected pre-2012 are being stored in CMN's cold storage.
Some garments are still packed in their transportation box (see photo on the right). Objects on the bottom of the boxes risk being damaged by the weight of the garments above.

Larger heavier boxes containing faunal material are stored on industrial shelves that are built to hold more weight than conventional shelving:

GN Storage Areas

As previously noted, most pre-2012 collections were moved from the PWNHC to two ground floor storage areas located in CMN's A-Wing (storage rooms A&B) or in spaces in the GN offices.

The GN ground floor storage areas are located outside of CMN's storage vaults and do not benefit from the same environmental controls which maintain the storage environment for CMN's collections. Storage room B is supposed to be cool storage, but temperatures in this room were above 16°C, and therefore this is not cool storage as defined by ASHRAE. Dust was observed coating the coroplast boxes, which indicated the storage areas did not benefit from the same level of air filtration.

Newly hired GN staff were dealing with the challenge of locating shelving for the collection, as none had been installed prior to the move. In room A, temporary shelving was secured during Covid, but the shelves are not the type, quality, and size required for the collection. Too many artifact boxes are stacked on top of each other, not only is there a risk of crushing the boxes and damaging the contents, but it makes accessing the objects in the boxes more difficult, especially with the narrow alley. The image below on the left shows that there were sufficient shelves in the PWNHC shelving units to prevent stacking of boxes. Overcrowding also means some objects, including the kayaks, are lying on the floor unsupported. If a water leak were to occur, water on the ground might damage these objects. This information was shared with the GN staff at the time of the survey.

Shelving in storage room B is better suited for the collection and not as overcrowded, but crates in front of the shelving units limit access. As already mentioned, many objects have not been unpacked. Given the concern over dust, this is probably preferrable.

Compared to conditions in GN storage rooms A and B, PWHNC storage in Yellowknife provided better conditions for preservation.

Storage PWNHC: More deeper shelves ensuring boxes are not crushed and are well supported

Shelves too narrow
GN/CMN Storage A

Objects on floor
GN/CMN Storage A

Boxes stacked on top of shelving units in GN/CMN Storage A. Note a warning "Heavy" on the boxes in the left picture. Heavy boxes and objects should always be stored on lower shelves


Photo 1 Photo 2

The kayaks (Photo 1) were moved to CMN before securing shelving that would support them as in the PWNHC example (Photo 2)

GN Storage Area B in CMN A-Wing

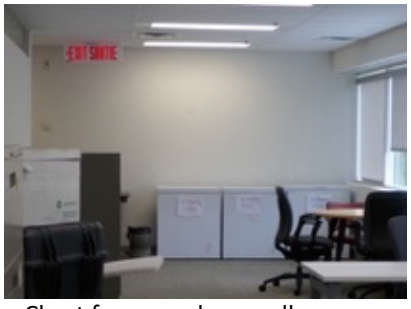
GN Office Space

Collections managed by GN were also moved into the GN office area on the 2nd floor of the CMN building. A section of the office space is dedicated to the collection's physical files, to the storage of archival collection and any art not sent to Winnipeg. The archival materials, consisting of files, photos, film, audio and books, are separately managed by staff working for the Territory's Archivist. This is not a climate controlled space. The door to this area is locked and entry is only possible with a key card. Food and beverages are brought into this area which is not allowed in CMN storage spaces.

Archival Collection

The office area is also used by GN collections staff to hold and process new acquisitions.

There are also three residential chest freezers along the back wall for collections objects. Chest freezers are not recommended for storage of collections because objects tend to be stacked on top of each other and it is difficult to access the ones on the bottom. A better choice would have been commercial upright freezers with shelves for easy access or a walk-in freezer. In case of a power failure, it is not known if these chest freezers would be kept running on a backup system.



Chest freezers along wall

GN art and archival material

Artifacts stored on the floor

When the survey began in 2021, several stacked plastic bins holding archaeological material were concentrated in a room next to the conference room or in the corridors. The weight of the contents caused some bins to split. During the project the bins in the room were relocated as part of GN staff storage improvement.





The office space is not designed for artifact storage. GN staff were in discussions with CMN to secure more storage space.

Ideally, activities such as documentation and accessioning of new acquisitions would be carried out in a climate-controlled area adjacent to the storage rooms equipped with task lighting.

Qaumajuq

As previously mentioned, approximately 7400 works of art on paper, textiles, paintings and sculptures were moved to the WAG in 2016. These objects have been inventoried, their locations are tracked and updated in the database. Care has been taken to identify any objects with accession numbers that are identical to objects in the WAG to avoid misplacing them.

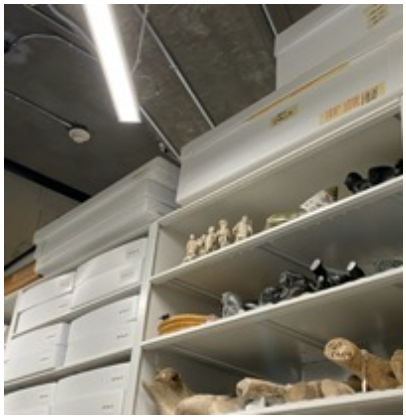
At the time of the survey, the GN sculptures not on display were in the process of being moved to the newly constructed space at the base of Qaumajuq's glass vault. The walls and floor are exposed concrete. Concrete surfaces emit concrete dust, a specific type of dust which is alkaline (pH above 7.0) and can damage collections, if they are not sealed. According to the WAG conservator, the walls and floors inside the vault have been sealed to mitigate this risk. WAG staff were in the process of moving sculptures to shelving units and the re-organization of the sculpture collection was not yet completed. What follows is a summary of the observed storage conditions.

Stone sculptures

Many shelves were overcrowded (due to reorganisation), some sculptures were in direct contact with the metal shelves, and some placed very close to the edges. Most sculptures were not covered to protect from dust. This is particularly important for bone sculptures with porous surfaces. Their surface is very fragile, and they are difficult to clean without being damaged.

Uncovered bone sculptures
(Credit: Image WAG)

Overcrowded shelves
Direct contact with metal shelf
(Credit: Image WAG)



Objects near edges on upper shelves
(Credit: Image WAG)

Not all shelving units at the WAG are overcrowded. In the image on the right, sculptures are protected from physical damage using Ethafoam to line the shelves and to make bumpers to prevent the sculptures from falling off the edges.
The accession numbers are easily visible for quick location. (Credit: Photo WAG)

Cut Ethaform is very abrasive. Ethafoam supports should be lined with a smooth material if the cut surface is in contact with the object. Museum quality Tyvek (Tyvek with no writing or surface coating) is an example of an acceptable product.

Credit: Image WAG

Qaumajuq Glass Vault

A large number of the GN sculptures are visible to visitors in a three story glass vault/display case at the entrance of Qaumajuq. The result is beautiful and engaging. The challenge will be keeping the display case clean, as already a film of dust was visible on the glass shelves.

(Credit: Image WAG website)

Winnipeg is not in an earthquake zone (see map in appendix). Seismic activity does occur close to Iqaluit, therefore any display or storage installation should be designed to mitigate risks of physical damage due to seismic activity.

Dust is a concern for stone sculptures, not only for esthetic reasons. Dust particles can be abrasive, scratching and damaging soft stone surfaces. WAG staff remarked that sculptures arrived dusty. Before packing and moving these sculptures to NIHC, the collection should first be cleaned.

Works of Art on Paper

Works of art on paper are stored in museum quality shallow boxes. They are protected from light damage and dust. In these boxes, they are also protected from physical damage.

There are sufficient shelves to avoid multiple boxes being stacked on top of each other.
Credit: Image WAG

Pottery

There is sufficient space to safely store pottery in the WAG shelving units. Shelves were reinforced with plywood to bear the weight of the collection.

Some shelves have no lip or bar to prevent pottery from falling off the shelf. There are shelves with no Ethafoam lining, so pottery sits directly on the metal surface. The image on the left of pottery storage at PWNHC illustrates the use of bars to prevent objects falling off the shelves and thin Ethafoam sheets were used to protect the objects from physical damage.

Pottery storage PWNHC
Ethafoam cushioning and anti-tip bars

Pottery stored in WAG
Credit: Image WAG

Wall Hangings

Wall hangings are stored either rolled or flat depending on size. The large wall hangings are rolled and suspended to prevent deformation from the weight of the textile. Both methods of storage protect theses textiles from light damage and dust.

Smaller wall hangings have been stacked in large wooden drawers. There is a risk that certain 3D elements may be flattened because of large the number of wall hangings in each drawer. These drawers are too heavy to be moved by one person. The painted wood used to build these drawers is not an ideal material for collections storage. It is recommended that these objects be transferred to shallower archival boxes, made with acid free cardboard or Coroplast, to minimize the weight on top of the bottom textiles and to make access to the collection easier.

Small wall hangings are stored flat in wood drawers
Credit: Image WAG

Storage of rolled wall hangings on metal rods and use of acid free cylinder to roll the textiles at PWNHC

Storage at WAG : rolled wall hangings on cardboard cylinders. Credit: Image WAG

Storage and Display Conditions Loan Objects

Not having access to collections in Canadian universities, GN spaces in Iqaluit or Nunavut Heritage Centres, it was not possible to observe the storage and display conditions of the objects on loan to them. Therefore, there is no information regarding how they are being preserved. For example, what are the security measures in place to protect the collections from theft or physical damage? What are the risks to collection in case of fire or water damage? Are staff trained in object handling?

Summary Risk to Collections – Ten Agents of Deterioration

The international cultural heritage community identifies ten agents of deterioration responsible for damage to collections. The Canadian Conservation Institute (CCI) has based much of its preventive conservation research and publications on preventing or mitigating damage to collections by these ten agents: Incorrect Temperature; Incorrect Relative humidity; Light, ultraviolet and infrared; Pollutants; Fire; Water; Pests and mould; Physical; Thieves and vandals; Dissociation.
https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html

Based on the survey work reported above, the chart below ranks the risks to collections from these ten agents according to location.

Quick Look Risk Chart

	Agent	Risks
1	Dissociation	Dissociation is high on the list of risks to the collection. At the time of the survey, location information was missing for parts of the collection, there was no centralised collections management database (CMD), and objects held by archaeologist or on loan where not accessible. CMN, WAG, Parks Canada and CCI are keeping records of GN/IHT objects in their care with their own CMDs, but there is a risk of information loss when multiple databases are used by different organizations
2	Physical	Objects at risk where there is overcrowding and inadequate support in Qaumajuq and GN storage. *Information not available for objects on loan in other locations* Objects at risk if handled by person with no collections care training
3	Thieves and vandals	Low risk for collections managed by CMN, Qaumajuq, CCI and Parks Canada Medium- high for collections managed by GN because of loss of digital files *Information not available for objects on loan in other locations*
4	Pollutants	Low risk for collections stored at CMN, CCI and Parks Canada Dust on objects in Qaumajuq and in GN storage zones *Information not available for objects on loan in other locations*
5	Incorrect Temperature	Low risk for collections stored at CMN, Qaumajuq, CCI and Parks Canada, except in GN storage zones *Information not available for objects on loan in other locations*
6	Incorrect Relative humidity	Low risk for collections stored at CMN, Qaumajuq, CCI and Parks Canada, except in GN storage zones *Information not available for objects on loan in other locations*
7	Fire	Low risk for collections stored at CMN, Qaumajuq, CCI and Parks Canada *Information not available for objects on loan in other locations*
8	Water	Low risk for collections stored at CMN, Qaumajuq, CCI and Parks Canada, except for objects on floor in GN storage *Information not available for objects on loan in other locations*
9	Light, Ultraviolet and Infrared	Low risk for collections stored CMN, Qaumajuq, CCI and Parks Canada except for objects in GN office space *Information not available for objects on loan in other locations*
10	Pests and mould	Low for collections stored at CMN, Qaumajuq, CCI and Parks Canada which have integrated pest management programs (IPM) *Information not available for objects on loan in other locations*

The level of risk to the collections from each agent depends on the specific vulnerabilities of the materials in the collection and the circumstances. For example, the stone carvings are less vulnerable to deterioration by Light than the textiles.

The collections transferred to the Winnipeg Art Gallery have been inventoried and current locations are entered in a database, protecting them from the risk of dissociation because object can be quickly located, their movements are tracked and information about the objects and who owns it is easily accessed.

Once a collections management system or database is acquired by GN, collections data is entered, maintained, and linked to locations for tracking, the risk of Dissociation will be reduced.

Part 2 – NIHC Space and Preservation Recommendations

Environmental Requirements for Category A Facility Designation

The stated goal of the Nunavut Inuit Heritage Centre is to be a Designated Category A facility. To receive this designation, the NIHC must meet the criteria established by the Department of Canadian Heritage. One of these is the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) control type A1 or A2 for temperature and relative humidity for museums, galleries, archives and libraries. More information can be found at: https://www.canada.ca/en/conservation-institute/services/preventiveconservation/environmental-guidelines-museums/classes-control.html

Temperature

ASHRAE controls for general collections are between 10°C and 25°C, with seasonal fluctuations. ASHRAE specifies that for unstable materials, many of which are found in the NU collection, storage temperature should be much lower. Cooler/cold storage has the added benefit of slowing chemical reactions that cause deterioration of objects when relative humidity is controlled to prevent mould growth.

Adopting a sustainable approach, cold/cool storage for most of the collections not requiring frozen storage, is recommended to building reduce energy costs.

Relative Humidity

ASHRAE type A relative humidity controls for general collections are between 35% and 65%, with seasonal fluctuations. The exceptions are objects in the NIHC collections, such as chloride contaminated archaeological metals from underwater sites and sculptures with pyrite veins, which require dry storage below 35% relative humidity.

The three basic tenets to preserve collections from incorrect relative humidity are:

- Avoid high relative humidity that creates an environment for mould growth or causes unstable materials to corrode.
- Avoid low relative humidity that will cause deterioration in specific materials such as organic materials.
- Avoid fluctuations in relative humidity that cause physical deterioration.

Temperature will affect relative humidity in a given space. Raise the temperature and the relative humidity will be lowered, lower the temperature and the relative humidity will rise. The HVAC system should be designed to maintain seasonal fluctuations within the limits established by the ASHRAE.

Table summarizing ASRAE Type A Controls for museums, galleries, archives and libraries:

ASHRAE A types of control							
		Relative humidity (RH)			**Temperature**		
	Set points	Short-term fluctuations	Maximum Seasonal adjustments from annual average	Long-term Outer Limits	Short-term fluctuations	Maximum Seasonal adjustments from annual average	Long-term Outer Limits
A1	50% RH (or historic annual average for permanent collections) Temperature set between 15 and 25°C	±5% RH	up 10% RH and down 10% RH (over 3 months)	≥ 35% RH ≤ 65% RH	±2°C	up 5°C and down 10°C (progressively, e.g. over 3 months)	≥ 10°C ≤ 25°C
A2		±10% RH	None		±2°C	up 5°C and down 10°C (progressively, e.g. over 3 months)	
Note: Rooms intended for loan exhibitions must handle set point specified in loan agreement, typically 50% RH, 21°C, but sometimes 55% or 60% RH.							

Source: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). "Museums, Galleries, Archives and Libraries." in *ASHRAE Handbook: HVAC Applications, SI edition*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2019, p. 24.24.

- For class 7 (archival material), provide either **at least** ASHRAE control type A1 or A2, **and/or at least one of** the ASHRAE specifications for chemically unstable collections (i.e. cool, cold or frozen storage) – see table below. ASHRAE control type A1, A2 or better, should be provided in the reading rooms, where applicable.

ASHRAE specifications for chemically unstable collections (cool, cold or frozen storage)		
	Relative humidity (RH)	**Temperature setting**
Cool storage	Between 30% and 50% RH	Between 8°C and 16°C
Cold storage		Between 0°C and 8°C
Frozen storage		Between -20°C and 2°C

Source: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). "Museums, Galleries, Archives and Libraries." in ASHRAE Handbook: HVAC Applications, SI edition. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2019, p. 24.25.

- For class 9 (audio-visual collections), provide **at least one of** the ASHRAE specifications for chemically unstable collections (i.e. cool, cold or frozen storage) – see table above.

- **Indemnification:** To qualify for the program, institutions must provide evidence, in the form of temperature and relative humidity charts covering 12 consecutive months, that climate can be controlled to meet **at least** ASHRAE control type A1 or A2 in all areas where indemnified

Building Design

The design of the NIHC building should maximize energy conservation, prioritize low maintenance for sustainability and meet the criteria established by the Department of Canadian Heritage to be designated a Category A facility.

Temperature and Relative Humidity

Funding for museums is often precarious. Once the initial money for a new building is spent, there may not be sufficient funds to fix deficiencies or pay for costly maintenance if errors/omissions are made. A common error in new museum builds has been to assume that basic building codes will suffice. In colder climates, this has led to mold growth when the building envelope was not designed for the interior temperature and relative humidity levels recommended for the collections. A museum's operational budget can significantly increase if the building envelope is an insufficient buffer to maintain an adequate environment for the collections when the outside temperature and relative humidity differ greatly from the interior environment.

The new NIHC will be required to meet most ASHRAE standards for Museums, Galleries, Archives and Libraries to be recognized as a Category A heritage centre. No building in Iqaluit at present meets the temperature and relative humidity requirements for the storage and exhibitions areas. The collections and exhibition areas temperatures and relative humidity can only be maintained if the walls and floors are very well insulated, and the vapour barrier is impervious.

The design should withstand the effects of climate change, identified as one of the "more significant challenges"[i] facing Nunavut[13]. The new NIHC is an opportunity to explore and apply new technologies that are sustainable and lead to better energy conservation.

The author is not an expert in northern climate constructions, the purpose of the following example is to illustrate how the design of a new museum can take advantages of new technologies: The Audain Art Museum, in Whistler BC, is an example of an innovative new museum build targeting the LEED Canada NC 2009 Gold rating. As a result of a high-performance building envelope and the use of air-source heat pumps with heat recovery to generate the building's heating water needs, the overall heating energy saving accounts for 70% of the total energy savings for the building.[14]

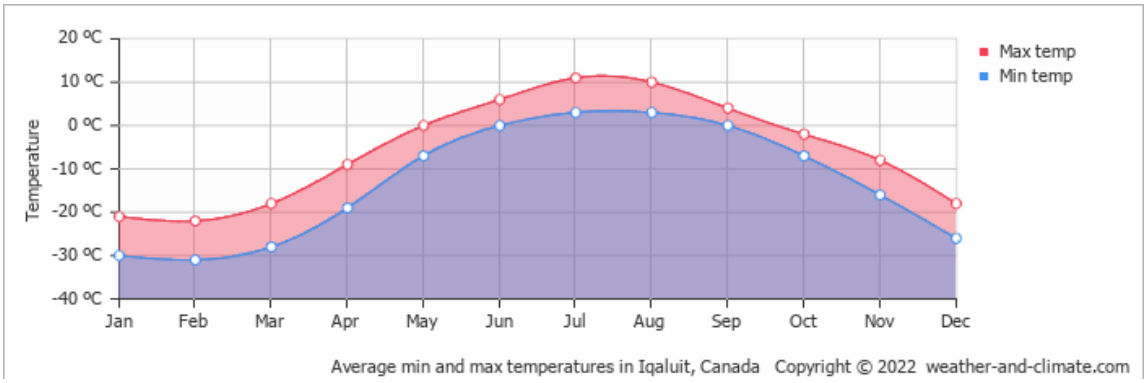
With regards to sustainability, Iqaluit's climate has the advantages over the southern locations of lower temperatures. Cooler temperatures will better preserve materials found in the collections and have deterred the migration of insects that damage collection. A sustainable design for the building would use the colder air to reduce energy consumption to maintain required temperatures in collections storage spaces. For example, skin and fur collections are ideally kept in frozen storage condition which is between -20°C and 0°C and between 30% and 50% relative humidity (RH)[15]. Using the outside cold air for frozen or cold storage areas will be more efficient than the traditional museum model which consists

[13] https://climatechangenunavut.ca/sites/default/files/3154-315_climate_english_reduced_size_1_0.pdf

[14] https://www.ashrae.org/technical-resources/ashrae-journal/featured-articles/heating-accounts-for-70-of-museum-s-energy-savings

[15] ISO, IPI and ASHRAE Handbook 2019, p. 24.24

of heating all the air required for the building, then cooling and de-humidifying or humidifying air before it circulates in the storage or exhibition areas.



In the summer months, some cooling would still be required for the frozen or cold storage areas. Distinct climate zones will be required for collections storage and conservation laboratory areas, exhibition areas, office space and storage and public spaces.
The temperature and relative humidity requirements of the collections varies depending on the materials found in each collection. This report details the requirements in the section describing the different storage rooms.

Insects and Pests

While insect and pest damage are not high risk to the collection in Iqaluit, climate change may allow new species that damage collections to migrate north. A sealed building envelope will reduce this risk. The building design should include an inspection/quarantine room close to the loading bay, to prevent contamination of museum spaces by southern insects, pests or mould inadvertently transported in crates or artifacts.

Pollutants

Air quality for museum collections requires high performance filtration system that will protect artifacts from damage due to particulates, chemical compounds and outdoor pollutants. MERV 12 and higher filtration is recommended. Air quality in Iqaluit is generally very good, but events such as large-scale fires will lower the air quality. Air intake for the building should be away from pollutant sources.

Indoor air quality can be a problem, for the collection and humans, if the HVAC system is not adequate and/or the choice of building materials produce harmful compounds. For example, cement dust produced during construction and by unsealed cement surfaces has a high pH and will damage artifacts. Thorough cleaning of the building will have to be undertaken once construction is finished. Certain paints off-gas and will cause metals to corrode etc. The architect's choice of building materials should be sustainable, easy to maintain and not damage the collections.

One large HVAC system may not be adequate to manage the different zones and will require complicated maintenance. The author has seen/experienced system failures of large HVAC systems not able to balance multiple zones. Air quality is equally important for the health and comfort of the public

and staff. Dedicated exhaust systems for areas such as a kitchen, the conservation laboratory, exhibition preparation area and the loading bay should be installed.

Light

Light can deteriorate materials found in collections by exposure to ultraviolet light, infrared light or prolonged exposure to visible light. There should be no windows in the storage areas and lights should follow recommended guidelines. Light switches in storage could be programmed to turn off automatically if no one is the area. The design of exhibition space should accommodate the need to protect light sensitive objects in textile, natural history, photography, works of art on paper and even modern materials collections. While there are methods to identify light sensitive materials, it is not always possible to test every object. At the opposite ends, objects such metal or stone sculptures can be displayed in higher levels of visible light, if they have not been coated or repaired with a light sensitive product.

The lighting requirements for the NIHC collections and exhibition spaces should be designed by experts in museum lighting who know how to balance the preservation of the collection, energy sustainability and the appropriate lighting to access the collection in storage or on display.

Fire

Fire is one of the greatest threats to museum and the collections within, as demonstrated by the fire that gutted the National Museum in Rio de Janeiro, Brazil in 2018, destroying some 20 million artifacts. The cause was likely a defective air conditioner. Closer to NU, Nain, Labrador, lost important collections in a 2005 fire, including unique recordings of Elders.

A fire burned down an Environment and Climate Change Canada weather station office in Iqaluit, Nunavut Monday April 5th 2021*. Photo: Dustin Patar/Nunatsiaq News.*

Source : https://www.theweathernetwork.com/ca/news/article/environment-canada-suffers-setback-after-fire-destroys-station-iqaluit-nunavut

In the Nunavut Fire Marchal's Office 2019 Annual Report (https://assembly.nu.ca/sites/default/files/TD-340-5(2)-EN-2019-Fire-MArchals-Office-Annual-Report.pdf), 41% of fires in Nunavut were incendiary fire and 30% were undetermined. To avoid and block this threat, the building design should prioritize fire mitigation strategies such as fire walls and doors, favour non-combustible construction materials where possible, and install suppression systems designed to protect museum and archival collections.

New technologies combining micromist and inert gas sprinkler systems using less water have been developed to protect museum collections not only from being destroyed by fire, but also from being damaged by water. These systems will better protect the collection if there is a risk of low water supply or pressure. They will cost more to install initially, but more importantly, it should be confirmed they can

be easily maintained once installed. An example of a micromist and inert gas sprinkler systems is Siemens' Sinorix H2O gas extinguishing system for museum collections.
https://new.siemens.com/global/en/products/buildings/fire-safety/extinguishing/gas-water-combined-system/sinorix-h2o-gas-en.html

A fire suppression system should be decided on in the functional plan, prior to the request for quotes for the building design. It is critical that every component from detection of the fire to activation of the suppression system must work seamlessly together. The choice of system will identify the space it will occupy and the system's compatibility with other monitoring systems needed in the building. There should be a review by the projects architect/engineer consulting team with fire suppression specialists to discussion the pros and cons of each system, such as does the added protection justify the initial investment; given water pressure and availability in Iqaluit, is a micromist system more sustainable versus a wet pipe system? Is there a risk of freezing pipes with a wet pipe system? Etc.

Fire procedures should be determined in consultation with the Iqaluit Fire Marshal and staff should be trained on what to do in case of a fire. These procedures would be part of the NIHC's emergency plan and should be reviewed yearly. Copies of important documents or databases should be kept off site and easily accessible in case of a disaster.

Water

Water is a threat to collections. The envelope of the building should be well sealed to prevent leaks and withstand storms. The building site should not be in a flood or tsunami zone. All rain and ground water should drain away from the building.

The building design should avoid pipes in storage or exhibition areas where a leak could damage objects. If this is not possible, pipes should be insulated to avoid condensation or slow leaks, and auxiliary condensate trays installed under pipes and air conditioning equipment located in collection areas. Water leak sensors should be installed in the collections and exhibition areas. Floors should have drains that carry water away from collection areas, especially critical in areas with sinks or washrooms.

Water freezing can damage pipes and cause leaks, for example during a large-scale power failure. A risk assessment should determine the likelihood of such an event in Iqaluit, and the need to plan for a water shut off and purge system if needed, including the impact on the fire suppression system. Careful consideration should be taken when choosing the fire suppression system to minimize risk of leaks and ensure it is not accidentally turned on. Assuming that the building will be equipped with backup generators, this risk should be mitigated, but the risk assessment should take into consideration potential system failures and how they will be handled.

Physical Damage

Physical damage to the collections can be caused by earthquakes, landslides, vibrations in building (e.g. vibration from visitors walking on certain types of floors have caused objects to fall from their podiums). If earthquakes are a future concern for Iqaluit, the building design should be earthquake proof.
The museum spaces should be designed to avoid overcrowding so that there is enough room to manoeuvre equipment and artifacts.
The loading dock should be easily accessible from the collections and exhibition zones of the NIHC.

Theft and Vandalism

Theft and vandalism can be blocked and deterred by designing security features into the new building. Not only is this approach cost effective, but it also avoids having to install equipment after the build that may take away from the building's esthetics or may not integrate seamlessly with the other building systems.

This design should separate collections and public spaces, preventing access to collections from less secure areas. The design of spaces should reduce the risk of thieves or vandals concealing themselves during opening hours. All doors and windows should be alarmed, motion detectors and cameras installed in all areas, and the alarm system monitored 24/7. Controlled access systems using access control cards or biometric readers limit access to collection zones to authorized staff and visitors, and record who accesses the zones. This technology is continuously evolving. High security doors, windows and locks will be the first defense and should meet museum security and fire code standards.

Dissociation

Dissociation, while less of a building design consideration, can become a factor of deterioration if the storage areas are cluttered or there is no infrastructure for staff to carry out their work in or near the collections. The functional plan for the new building should identify GN/IHT staff primary work locations to ensure the space is suitable to work in. Example: IT and workspaces should be planned in or in proximity of the storage rooms to avoid removal of objects to non-storage areas. Non-collection material should not be stored with collections.

Building Design Summary

The information above introduced and detailed how the building design can avoid or mitigate damage to collections by 10 common agents of deterioration. This is a critical aspect of collections preservation. As stated at the beginning, if a building deficiency or a design error is noticed after construction has started or is finished, the costs are often prohibitive and the corrective work cannot be done if the budget is spent.

The following table makes recommendation on how to prevent damage to collections by the ten agents of deteriorations which are the most common risks to collections.

Table summarising Ten Agents of Deterioration – Quick Look Chart

1	Incorrect Temperature	In order to reduce damage due to incorrect temperatures: • Maintain ASHRAE control type A temperatures for each zone (Cool temperatures will also reduce operational costs and are therefore more sustainable) • Build well insulated floors, walls and ceilings to maintain individual zone environment. • Choose windows that will minimize heat loss • Design HVAC system or systems to maintain environment in multiple zones using high quality monitoring equipment
2	Incorrect Relative humidity	In order to avoid damage due to incorrect relative humidity: • Maintain relative humidity according to ASHRAE museum standards • Establish a dry storage area for humidity sensitive objects • Design HVAC system or systems to maintain environment in multiple zones using high quality monitoring equipment • Ensure building vapour barrier is designed to prevent condensation when exterior temperatures are below freezing • Develop procedure to allow objects to acclimatize before being unpacked
3	Light, ultraviolet and infrared	In order to avoid light damage: • No ultraviolet (UV) or infrared (IR) light sources in collections or exhibitions • No windows in storage areas • Minimize light exposure in storage. Install automatic light systems such as timer switches or motion activated lights. • Appropriate lighting levels in exhibition areas depending on the materials displayed
4	Pollutants	In order to reduce pollutants in the storage areas: • Install filters to protect from airborne outside pollutants created by large events such as the fires at Iqaluit's dump (2014, 2018, 2022) • Avoid the use of construction and storage materials that off-gas • Develop and maintain a Housekeeping plan for collections staff to regularly clean exhibitions and storage collections. The plan should include training for the cleaning staff and detail their responsibilities
5	Fire	In order to mitigate against fire damage: • Install a fire suppression system • Create fire prevention procedures and train staff. Review the plan yearly • Establish a good relationship with the fire department, meeting with them annually, or whenever there is a change in key staff either at the NIHC or in the fire department, to review emergency procedures
6	Water	In order to mitigate against water damage: • Do not build in zone at risk of flooding • The envelope of the building should be well sealed to prevent leaks and withstand storms.

		• Avoid pipes in storage or exhibition areas where a leak could damage objects. Install a low water fire suppression system if feasible • Verify that water from rain or snow melt drains away from building
7	Pests and mould	In order to avoid damage from pest and mould: • Seal the building envelope, especially around doors and windows • Implementation of an integrated pest management (IPM) program • Inspection of objects on arrival, quarantine if suspect pest or mould present • Do not allow food in collections area
8	Physical	In order to avoid physical damage: • Avoid overcrowding • Have enough space to manoeuvre equipment and artifacts • Calculate shelf weight bearing load to support weight of objects • Place heavy objects on bottom shelves • Use adequate artifact supports or mount • Design building to withstand earth movements (e.g. earthquake) • Use appropriate storage supplies for different materials and types of objects • Train collections staff on care and handling procedures
9	Thieves and vandals	In order to avoid theft from the collections: • Security features part of museum design such as high security walls, doors, locks and windows; lighting, alarm and surveillance systems • Develop procedures identifying who can access the collections and when • Plan for security when designing a new exhibition • Ensure the loading bay can be closed and locked
10	Dissociation	In order to avoid dissociation: • Acquire database to track object and include images in database • Develop Staff procedures to ensure accurate and timely tracking of object movement • Number shelving units for easy location of objects before collection is moved into the new building • Avoid overcrowding in storage areas • Consolidate object identification numbers to avoid confusion and differentiate between collection objects and educational material • Identify and limit the number of staff authorized to move objects

Space and Preservation Recommendations

Collection space requirements and preservation recommendations for the new NIHC facility are based on the review of conditions and spaces at CMN, WAG, CCI and Parks Canada detailed in part one of this report, and interviews with GN and CMN staff regarding collections located in Iqaluit or on loan. The Territory's Archivist provided information on archival materials stored in Iqaluit. The estimated storage space for archival materials is based on his information.

Space calculations considered the current need for additional space to house the collections where storage is overcrowded and the estimated projected growth of the collections in the coming years.

If the NIHC collections was to eventually include large industrial objects, such as a fishing boat or large mining equipment, there is no space allocated in this report for these objects. Given the preservation and health and safety challenges of storing large industrial objects, it would be more cost effective to store these collections off-site. Donation of such items should include the funds necessary to cover their preservation.

Estimating Future Growth

The NIHC project would reunite, in Iqaluit, all the collections described in part one of this report. Estimating future growth is necessary, as the collection is predicted to continue growing.

Future growth of any collection is guided by acquisition policies that are part of a museum's collections management policy. The acquisition policy determines what can and cannot be accessioned into the collection. For example, what donations from collectors living in the South can be accepted, what acquisitions are significant to actively collect or when objects in the collection should be deaccessioned. GN Collections staff are in the process of developing a collection policy. Information given by GN was that large industrial objects (mining equipment, 30 ft fishing boat, etc.) will not be included in the collection or stored in the NIHC building.

The rate of growth of the collection will also be affected by the return of long-term loans and repatriation of artifacts, but this would be counterbalanced by other collections going out on long term loans to communities. This could be accommodated by a swing space in storage for high demand loans. Based on discussions with CMN and GN staff, the growth of the collection is estimated at 10 to 15% per year.

Specific Collections Preservation Requirements

There are objects in the NIHC collections that cannot be housed in the one large storage vault because their preservation or space requirements are different. The main storage vault would maintain an environment that preserves the majority of objects in the collections; large objects would be stored in a room equipped with industrial shelving that can withstand the weight of the objects and more space for moving equipment to circulate, and maintain the same environment as the main storage; objects only stable in low relative humidity would be preserved in a small dry storage room; objects unstable at cool or room temperatures would be stored in a frozen storage room; and archives will have a separate storage space in order to meet their operational and preservation requirements. Total estimated space required is 1150 m^2. This does not include the conservation laboratory.

Five storage rooms and a conservation laboratory are recommended to meet distinct collections preservation requirements. The storage space estimates in this report assume most of the collections will be stored in high-density museum compact modular shelving.

Room	Size	Environment
Main Storage	800 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs
Large Objects Storage	110 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs
Dry Storage	30 m^2	Cool Storage environment. 8°C to 16°C and Relative Humidity below 30%.
Frozen Storage	60 m^2	Frozen Storage environment. Temperature between -20°C to -10°C and Relative Humidity is between 35% and 50%*.
Archival Collections	150 m^2	Cool Storage environment. Temperature between 8°C to 16°C and Relative Humidity between 35% and 50%*. Acceptable seasonal variations to be confirmed with Canadian Heritage. Unstable photo and film media would be stored in the Frozen storage
Conservation Laboratory	85 m^2	Temperature between 18°C and 24°C and Relative Humidity (RH) between 35% and 50%*. Short term fluctuations RH plus or minus 5%, over 3 months acceptable fluctuation is 10% plus or minus. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs

ASHRAE standards for museums have evolved, and are evolving, based on conservation R&D. Acceptable seasonal fluctuation for cool storage environment would be determined by the Canadian Conservation Institute (CCI) when it reviews requirements for Cultural Property. CCI's expertise on acceptable seasonal variations is required to determine the criteria to choose an HVAC system or systems for the NIHC, otherwise there is a risk that the chosen system will not meet ASHRAE standards or perform as expected at the time of the build.

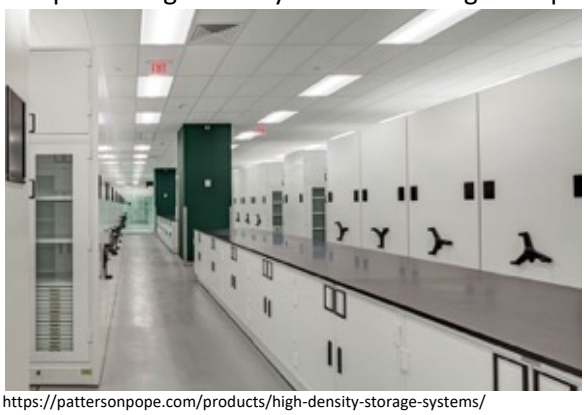
The recommendations for the NIHC conservation laboratory are general. GN recently hired a conservator, too late to have her input in this report. She is one of Canada's most experienced and knowledgeable archaeology conservators. The setup of the laboratory will be influenced by the conservator's work priorities.

High Density Museum Storage Compact Modular Shelving

Due to the high cost of building in Iqaluit, space is at a premium. High density museum storage compact modular shelving will maximize available space and reduce the footprint of the collection. Compact modular shelving is recommended to preserve the collections, ensure safe access, and accommodate planned future growth. When closed, compact modular shelving increases security and reduces light exposure, and offers limited protection against fire and water damage.

Manually operated mobile equipment is recommended because it can still be moved during power outages, is less costly to buy, and easier to maintain.

Examples of High density museum storage compact modular shelving:



https://pattersonpope.com/products/high-density-storage-systems/

https://www.montel.com/en/applications/museum-storage-systems

Storage Units and Ceiling Height

The space between the storage unit top shelves and the ceiling must be great enough to accommodate the HVAC system(.5m), lights and the fire suppression system, as well as space to access equipment or store light boxes on top of compact units. The height options for tall high density museum storage compact modular shelving are between 3-3.66 metres high. Therefore 4 to 5 metres ceiling heights would leave two metres and less space, depending on the options chosen.

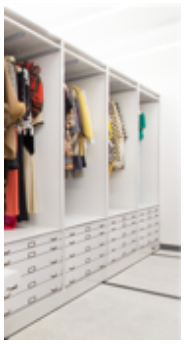
Leaving more than 1.5 m of space between the top of the shelves and the ceiling is not recommended because it increases the likelihood that larger objects or boxes are stacked on top of shelves, making access more difficult and can lead to staff injury. It also increases the volume of the room, which in turn increases the load on the HVAC system.

Boxes stacked on top of shelving units

Collections Storage Space Organization by material or community

The decision to organize the NIHC collections storage according to communities, material, or a combination of both has not yet been decided. Housing most of the collections in one large collection storage room will accommodate whichever approach is chosen. A decision should be made before the shelving units are ordered, as it will dictate the configuration, shelf options and budget.

Examples possible high density museum storage compact modular shelving options:



Spacesaver website

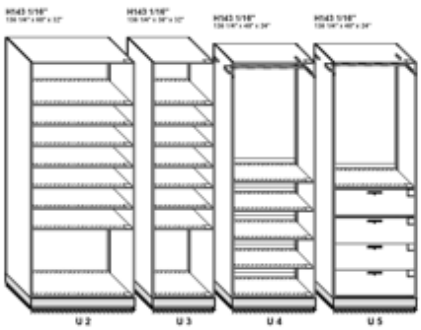
https://pattersonpope.com/industries/museum-storage/

Storing the collection by material or object category would be more economical and reduce time required for planning and installation. The available shelf space would be maximized.

If the decision is made to group objects by communities, several steps would have to be done before a request for quotes could be sent out:

1. Identify all material belonging to the community
2. Identify if sub-groupings are required
3. Identify the type and size of storage equipment best suited to preserve the objects (ie shelf units, rolled storage, drawers, etc.)
4. Plan how future acquisitions would be integrated in the storage
5. Calculate the number of units required for each type of storage equipment (ie, number of shelves, drawers, etc.)

- Note: Step 5 could be included in the request for quotes



Example of shelving row configuration provided by Martin Brisebois of Spacever Solutions Inc, Montreal

For example, a row of shelving units grouped by communities might be a mix of suspended rolled textiles, shelves, and shallow drawers for works of art on paper or small textiles. The advantage of high-density museum storage compact modular shelving is that it allows for multiple configurations in one row. This approach would be more expensive than storage organized by materials and type and will require more time to plan and execute.

Estimating Costs

There are many companies selling compact storage systems and museum specific collection storage equipment and furniture. Compatibility between compact storage and the different storage systems and furniture is a must, as is finding a provider able to service the equipment in Iqaluit.

For the purposes of this report, A rough estimate of costs for storage systems, compact and fixed, could be as high as $2 million, but this figure would depend on which shelving options and configuration are chosen. There is an added caveat that due to inflation and the rise of steel prices, companies are not willing to predict cost increases in the coming years. The war in Ukraine is an added uncertainty. Steel prices have risen over 200% and are forecasted to remain high[16]. The quote for a walk-in freezer included a notice that the freezer could cost "30% more in 4 months".
The estimate[17] to replace the 29 Lane Science equipment Corp. Cabinets currently housing the fossil collection is $2500.00 USD each. Using the July 2022 exchange rate, they would cost $92,948.62 CDN plus taxes, import duties and transportation.

Storage Unit Construction and Materials

Storage furniture and equipment should be fabricated from materials that do not cause damage to the collections. Inferior quality steel will rust, inferior coatings on storage furniture can become powdery and transfer to objects, certain wood products off gas and can corrode objects. Drawers that stick, or are very heavy, may risk damage to objects and staff. The components and installation of the compact unis should limit most vibrations when moved.

Shelf strength is an important consideration as many objects in the collection are heavy (stone sculptures, fossils, etc.) The amount of weight per shelf may be dependent on the which grouping approach is chosen. If grouping by materials, the stone carving shelves would be expected to carry more weight than if there was a mix of wood and stone objects on the shelf in a community grouping.

Ease of access to the objects is an important consideration when choosing shelf dimensions. The stone carvings should be stored on narrower shelves, to avoid having to reach through or over rows of sculptures to access the back ones. Alternatively, some objects are quite deep and require wider shelves to be fully supported. Shelves used for sculptures or pottery should have a fall guard to prevent objects sliding off and sufficient space between shelves should be left to lift the objects off the shelves. This is less of an issue for objects stored in boxes.

[16] https://gensteel.com/building-faqs/steel-building-prices/forecast/
[17] July 26, 2022

Collections Storage Spaces

Main storage Vault (Room 1)

The main storage vault would have a footprint of 800 m^2, house the majority of objects in the collection, and be built to maintain a Cool Storage environment where the temperature is between 8°C to 16°C and the relative humidity is between 35% and 50%. Seasonal temperature variations would take advantage of the climate in Iqaluit to reduce energy costs. The importance of the building envelope and HVAC systems to maintain a stable environment have been discussed elsewhere in this report.

Textiles Storage Options

Flat textiles should be stored rolled or flat depending on their size and 3-dimensionality. Flat textiles are compressed if too many are placed on top of each other in a box and it is difficult to access the textiles at the bottom of the pile. Large deep textile boxes are too heavy to handle safely.
Options for smaller flat textiles are storing them in shallow acid free boxes on shelves or storing them in shallow drawers. Boxes and drawers should not be more than 2 inches deep and shelf height should only allow for a maximum of two stacked boxes, three if the boxes are light.

Part of the preparations to move the flat textiles stored in Winnipeg to Iqaluit would be to purchase flat acid free storage boxes and rehouse them. The number of boxes will depend on the how many are in the collection at the time of the move and which grouping configuration is chosen, material or community.

Larger flat textiles can be stored rolled and suspended or stored flat in textile trays or drawers. The advantage of the rolled system is easier transportation, but textiles will have to be unrolled to be examined. The flat textile trays or drawers give immediate access to the textile but are more expensive. The tray must be able to bear the weight of the textile when fully opened and can be smoothly opened and closed.

Examples compact shelving storage made specifically for textiles:

Delta Designs flat textile tray design https://www.deltadesignsltd.com/our-products/flat-and-rolled-textile/

Works of Art on Paper Storage Options

The GN has invested in housing the works of art on paper in Talas Archival Boxes. The works of art on paper were transported from the PWNHC in these boxes and they are excellent storage containers. The works of art on paper could be stored at the NIHC in these boxes on shelves with a height that only allows for a maximum of two stacked boxes. If more boxes are required, they should not be more than 2 inches deep.

Works of art on paper could also be stored in map cabinet type storage on the mobile shelving. This would be a more expensive option, but as with the flat textiles, give immediate access to the works of art on paper. Given the GN investment in archival boxes, this option is less cost effective.

Carvings and Pottery Storage Options

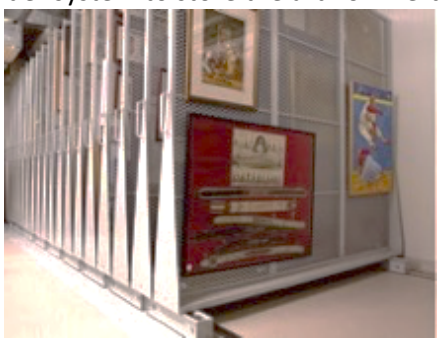
Carvings and pottery should be stored on shelves which are lined with a thin foam if the objects are not seated in a foam support or box. Shelves should have fall guards to prevent objects from toppling off shelf. Carvings, especially porous bone carving, should have a cover to protect from dust if they are not in a closed compact unit. Presently, the main issue is overcrowding on shelves.
The stone carvings should be stored on narrower shelves, to avoid having to reach through or over rows of sculptures to access the back ones. Shelves must be strong enough to bear the weight of the carvings. Weight specifications should be included in any shelving quote.

Before the collections are packed and transported to Iqaluit, dust should be cleaned off. During transportation to Iqaluit, vibrations could cause packing material to rub against the soft stone surfaces. If the sculptures are not cleaned and the dirt is abrasive, it will damage the finish. This work should be carried out under supervision of a conservator who can identify which objects can be cleaned by a collections technician and which objects require treatment by a conservation specialist.

Framed Artwork Storage Options

Paintings and framed works of art should be stored hanging on art storage racks that also can be purchased as elements of compact storage units. Because of the space configuration, a pull-out system is not recommended. Lateral movement systems will integrate well with adjacent compact storage modules. If objects are grouped by community, a decision will have to be made to group the small paintings collection together or use a divider system to store the artwork vertically on the shelves.

Spacesaver floor mounted Lateral Art Rack



https://www.montel.com/en/products/lateral-mobile-art-racks-screens

Archaeology Storage Options

Treated archaeological material are presently stored on open fixed shelving in boxes, in Lane and Delta made cabinets. The Lane and Delta cabinets are excellent, and the recommendation is to either purchase the ones owned by CMN or buy new. They offer greater protection and safer access for the collection than objects in boxes on shelves.

Human remains, and items that have been in contact with human remains, should be stored in locked Delta or Lane cabinets.

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Objects in coroplast boxes

Objects in coroplast boxes

Lane Cabinet #27

Lane Cabinet Drawer

Drawer Delta Cabinet #9

Example of how a 7.32m (24 f) long row of compact shelving with 1.22m (48") wide by 0.91m (36 ") deep shelving (6 bays), could be configured to store a part of the archaeology collection:

- 2 Lane Cabinets side by side would sit on the lower shelf of each bay housing the geological materials
- Above the cabinets would be 7 rows of shelving that would store archaeological material that is presently stored in coroplast boxes
- Height of the modules would be 3.66 m.
- Mechanical assist option

Larger and heavier treated archaeological materials, or materials waiting to be processed, should be stored on more industrial type mobile shelving that have higher weight bearing capacity. This would include shelves for archaeological material from field school that has been stabilized, dried and cleaned.

Large Objects Storage Options (Room 2)

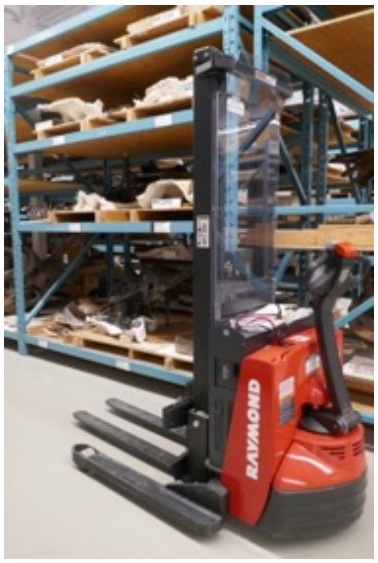
The large objects storage room would have a footprint of 110 m^2, house the objects that are too large for compact shelves or require specialized equipment and more room to move such as the motorcycle, medium sized industrial objects, Kayaks etc.
The room would be built to maintain a Cool Storage environment where the temperature is between 8^oC to 16^oC and the relative humidity is between 35% and 50%.

Kayaks and motorcycle

Object crates could be stored in this space, as they should not be stored in spaces that may be damp or dirty if they are going to be reused for collections.

Example of storage options for larger objects

Adapted storage for kayaks and water crafts



Pallet type heavy duty racking

Dry storage Options (Room 3)

Dry storage would have a footprint of 30m^2. The room would be built to maintain a Cool Storage environment where the temperature is between 8^{o}C to 16^{o}C and the relative humidity is below 30%. The room would store objects such as chloride contaminated metals recovered underwater and sculptures with pyrite veins require dry storage. The low relative humidity required will be easier to maintain in a dedicated room than the alternative option using sealed cabinets or individual containers with silica gel that have to be monitored individually and periodically regenerated. It also avoids containers not being accidently resealed properly when accesses and losing the dry environment.

Artifact stored in low RH at Parks

Frozen Storage Options (Room 4)

Frozen Storage would have a footprint of 60m^2. The room would be built to maintain the Frozen Storage environment where the temperature is between -20^{o}C to -10^{o}C and the relative humidity is between 35% and 50%.
It would house the fur and skin objects currently in frozen storage at CMN; unstable materials such as photographic or film medium and plastics; untreated wet and humid archaeological material that must remain frozen until treated.
The storage equipment would be adapted for the collection. Fur garments that are strong enough, would be hung on padded hangers. Objects that must be stored flat would be lightly padded to maintain their shape and housed in individual coroplast boxes to avoid being crushed or individually on fixed shelving or in drawers. Untreated wet and humid archaeological material would be kept on racks in a "dirty" zone to prevent contamination.
A July 2022 quote from Barr Inc for a walk-in freezer for this space was $43,836.00 USD. The contact warned that the freezer could cost "30% more in 4 months".

Archival Collections Options (Room 5)

Archival Collections would have a footprint of 150m^2. Archival footprint is based on figures provided by the GN, estimating growth, and use of compact storage.
The room would be built to maintain a Cool Storage environment where the temperature is between 8^{o}C to 16^{o}C and the relative humidity is between 35% and 50%. Unstable photo and film media would be stored in the Frozen storage room.

Depending on the type of materials or how the collection will be organized, there are many compact mobile shelving configurations available.

https://pattersonpope.com/industries/museum-storage/

The "Quick Look Chart Ten Agents of Deterioration "– included in this document summarises recommendations on how to prevent damage to collections by the ten agents of deteriorations which are the most common risks to collections.

Conservation Laboratory

A small multifunction laboratory would be able to handle most of the NIHC's conservation needs, staffed by a conservator with objects and exhibitions knowledge and experience. Ideally, this person would have some basic experience with framing works of art on paper. Objects conservators tend to be generalists, with a broad knowledge of materials found in collections, including textiles. There are many opportunities to research ancient (and recent) materials and techniques used to create the objects in the collections. A qualified conservator, with a scientific background, would be an asset to the NIHC team, adding to the knowledge about the collections. Many institutions that loan objects require condition reports on arrival and departure. This work could also be carried out by the conservator or a collections specialist with condition reporting training.

For treatments that are not within the NIHC conservator's field of expertise or available resources, specialized conservators could be contracted to work in the conservation laboratory or objects could be sent to laboratories outside of Nunavut, such as CCI.

The conservation laboratory would occupy 85m^2. The temperature should be maintained between 18^{o}C and 24^{o}C, adjusted for human comfort, and the relative humidity (RH) should be identical to the RH in the main storage room. This multipurpose lab with a small photo studio would be equipped to document and carry out treatments of most objects in the collection (Conservation laboratory tables, seating, lighting, ventilation, cabinets, electrical outlets for equipment and purified water for treatments, basic analytical equipment, compressed air, etc.).

Compact storage
Parks Conservation Laboratory

Different workspaces in
Parks Canada Conservation Laboratory

It would be divided to ensure a clean space for examining and treating objects such as textiles, works of art on paper and sculptures, and a wet/dirty space that can be isolated for stabilizing and cleaning archaeological material. It would be equipped with compact storage to reduce its footprint and, if the room is needed for other purpose, to lock away specialized equipment and hazardous materials. It would have flexible zones that can be opened up if an area is needed to treat a bigger project.

The laboratory would be constructed so that it can be thoroughly cleaned when used for dirty projects such as the seasonal treatment of large quantities of archaeological material at the end of a dig. The floor drainage system must be able to handle spills and possibly hosing down the lab.

The choice of venting or extraction equipment would have to be adapted to working in a cold climate and may be a limiting factor for some treatments.

The design of the NIHC Conservation Laboratory should be the responsibility of the conservator hired to care for the collections and who will work in this space. The layout and equipment of the laboratory will be influenced by their expertise and experience.

Bird
Lucien Tutuk Kabluitok
974.31.3
GN Collection on long term loan to WAG

Conclusion

This report is a summary of observations, mapping documents and discussions with collections staff caring for the GN/IHT collections dispersed throughout Canada. It provides IHT with preservation information and recommendations for the initial NIHC feasibility study. The report is based on observations of conditions in 2021 and early 2022, and many comparisons are based on the author's prior involvements with some of the collections.

Collection moves put objects at risk of loss or damage. Museums, galleries and archives around the world have developed tools and procedures to mitigate risks and protect collections during moves, storage and display. In Canada, the Canadian Conservation Institute "works with heritage institutions and professionals to ensure these heritage collections are preserved and accessible..." and offers many free or subsidized services that can be accessed by the GN and IHT as they move forward with the NIHC project. The GN and IHT staff also have the added advantage of being able to build relationships with WAG, CMN and Parks Canada professionals who share the responsibility to care for the NIHC collections.

While there were significant challenges in carrying out the scope of work for this report due to the loss of digital files and the Covid pandemic, it was a pleasure to work on such unique collections in company of the dedicated IHT and GN teams.

Elisabeth Joy
Art-e-Facts, Principal Consultant / Conseillère principale