

**AN ASSESSMENT OF COLLECTIONS STORAGE NEEDS
FOR THE WOODSTOCK ARTISTS ASSOCIATION & MUSEUM
*ONE OF FIVE MUSEUMS IN THE
HUDSON VALLEY VISUAL ART COLLECTIONS CONSORTIUM***

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I. EXECUTIVE SUMMARY

This report is the result of an assessment of the storage needs at the Woodstock Artists Association & Museum (WAAM), one of the five museums in the Hudson Valley Visual Art Collections Consortium (Collections Consortium) by two conservators from the Natural Heritage Trust/New York State Office of Parks, Recreation and Historic Preservation's Bureau of Historic Sites/Peebles Island Resource Center (OPRHP) in July 2012. The assessment and report were funded by a grant from the National Endowment for the Humanities' Humanities Preservation Assistance for Small Institutions Program to WAAM. The goal of this assessment was to help WAAM further plans for its participation in a shared, regional collections storage facility and study center proposed by the Collections Consortium. This report gives recommendations for WAAM to help plan collections storage space in the proposed facility.

The Peebles Island conservators strongly endorse the concept of the regional facility, recognizing that it can be an important improvement for the preservation of collections owned by the five museums forming the Hudson Valley Visual Art Collections Consortium. While a shared facility will not be without challenges, the conservators believe that it will be the most effective and efficient way for the institutions in the Collections Consortium to house their collections.

The conservators' assessments of the collections in the four museums in the Collections Consortium surveyed in this and the previous grants verified the institutions' claims that their storage areas are filled to capacity and that each institution requires more space to house its collections. Indeed, although the conservators wanted to make recommendations for improvements that the institutions could make in their current spaces, they found there was little they could suggest because of the severe lack of space. This is particularly true for WAAM.

The body of this report gives details on storage methodology and space needs for each type of collection that WAAM will need in the shared study/storage facility. The conservators recommend that storage in the new building be organized by material (media) rather than by institution. Although this presents some challenges for management and security, the conservators believe that organizing storage by material will be best in terms of both efficiency (cost effectiveness) and preservation.

The space needs given in this report include only what is needed for the actual storage of collections. The conservators did not evaluate or make recommendations on the space needs for other functions in the building – work spaces, supply storage, study spaces, offices, etc. This report does give general recommendations on the larger preservation concerns in planning for such a facility and recommends that the Collections Consortium work with conservators and specialist consultants in several areas, including mechanical (HVAC) systems and security and fire detection systems, as they continue planning the new building.

The conservators encourage WAAM to continue to make the improvements recommended in their current spaces to both advance their plans for the proposed new building and maximize their current space. The conservators also encourage the fifth member of the Collections Consortium, the Women's Studio Workshop, to secure funding for a similar assessment so that the amount of space needed for the collections of all of the Collections Consortium institutions can be established.

II. INTRODUCTION and METHODOLOGY

In 2010, the Samuel Dorsky Museum of Art issued a Request for Proposals (RFP) for *"an assessment of the term storage needs for approximately 13,000 objects owned by five separate visual arts organizations, including the Dorsky Museum."* (Quotation from RFP.) These five organizations -- the Center for Photography at Woodstock, the Samuel Dorsky Museum of Art, the Women's Studio Workshop, the Woodstock Artists Association & Museum, and the Woodstock Byrdcliffe Guild -- have banded together to form the Hudson Valley Visual Art Collections Consortium (Collections Consortium). The goal of the assessments was to help the Collections Consortium advance planning for the *"development of a regional collections storage facility and study center that will allow important works of art made in the Hudson Valley to be housed in a central location where they can be accessed for purposes of study and exhibition development."* (Quotation from RFP.)

Through a request for proposal and interview process to which a number of qualified consultants responded, the Collections Consortium selected the conservators from the Natural Heritage Trust/New York State Office of Parks, Recreation and Historic Preservation's (OPRHP) Bureau of Historic Sites/Peebles Island Resource Center to be the consultants for these assessments. The Collections Consortium member institutions applied to the National Endowment for the Humanities' (NEH) Humanities Preservation Assistance for Small Institutions Program for funds for the assessments. Three of the five institutions -- the Samuel Dorsky Museum of Art (the Dorsky), the Center for Photography at Woodstock (CPW), and the Woodstock Byrdcliffe Guild (Byrdcliffe) -- were awarded NEH grants in 2011. Peebles Island conservators assessed those collections in the summer of 2011 and completed the report in December 2011.

In 2012, the Woodstock Artists Association & Museum (WAAM) applied for and received a similar grant for OPRHP conservators to assess their c. 2,100 piece collection. Because of the collection's concentration on paintings (c. 500), works on paper (c. 1,200), and photographs (c. 300), OPRHP sent Paper and Photographic Materials Conservator Michele Phillips and Paintings Conservator Mary Betlejeski to WAAM for an on-site visit. During the visit, the conservators surveyed WAAM's collections and their current storage/housing situation. They spoke with staff about storage needs and goals, as well as about the anticipated growth of the WAAM collections. They reviewed lists of types, numbers, and dimensions of the artworks in the collection provided by WAAM staff. Phillips and Betlejeski documented their visit photographically. Following the site visits, Phillips and Betlejeski reviewed their findings with the OPRHP Three-dimensional Objects Conservator, Heidi Miksch, who made recommendations for storage of WAAM's collection of c. 100 sculpture and decorative art pieces.

This report is the result of that assessment. In the report, the Phillips and Betlejeski first review general museum collections storage guidelines. Next, they summarize current storage at WAAM and make recommendations for short-term improvements. Most importantly, they make recommendations for how and in what materials and storage furniture collections should be stored in the proposed new building and calculate the quantity of storage furniture that will be needed. Appendices provide more detail on storage recommendations, references for further information, possible vendors for storage furniture, and a list of storage material suppliers.

III. GENERAL STORAGE STRATEGIES: OVERVIEW OF STORAGE NEEDS

Well-designed storage prolongs the life of all artifacts. It can offer protection from light, dust and dirt, airborne pollutants, insects, and short, abrupt changes in relative humidity and temperature. In addition, it contributes to security and aids in the organization of the collections and retrieval of any artifact, thereby minimizing handling and maximizing accessibility. (American Institute for Conservation Textile Conservation Catalogue, Chapter VIII, p. 1. Washington, DC: American Institute for Conservation, 1998)

As they develop plans for a storage building, WAAM, along with the other Hudson Valley Collections Consortium staff, should recognize that there are many things to consider in addition to the amount of space needed for current and anticipated future collections. These include the building layout and accessibility; a system or system(s) to detect and respond to fire, intrusion, and significant changes in the storage environment; and how to best provide a suitable environment for the collections.

The recommendations for suitable environmental conditions for museum collections are very much in flux. The Collections Consortium staff should stay informed of changing recommendations as they plan the new building. (Please see Appendices 1 and 5 for further discussion of environmental recommendations.)

When the Collections Consortium is ready to hire an architect, it will be wise to find someone who has experience designing or renovating museum collections facilities. The Collections Consortium may also wish to hire specialists to advise on environmental management equipment/methods, on fire and intrusion detection systems, and on design and specifications for a cold storage room for photographs. Contracting with a conservation lab to advise and comment on building design specifics will also help the Collections Consortium obtain the best building possible for the project. (Please see Appendix 3 for references that will help with this part of planning.)

The Collections Consortium will also need to select appropriate storage furniture and storage materials as it develops plans for the new study/storage building. Well-designed storage furniture, i.e., storage units or cabinets, offers both physical and environmental protection to collections. Storage materials -- materials that are in direct contact with collections and used to wrap or support stored collections -- provide collections with support, especially for moving and handling, and offer an additional layer of protection from environmental hazards. The materials that are best for collections vary by type of collection (medium, or materials from which the collections are made), so details of appropriate storage materials are discussed with each type of collection. Appendix 1 provides more details of factors to consider in the design of storage furniture and selection of storage materials.

In designing a museum storage building, the Collections Consortium must consider the methods used to store collections so that they are as safe from physical and environmental damage as they can be. Storage techniques or methods for each object or category of object should be selected to offer maximum stability and protection. Because the storage methods chosen frequently affect the amount of space a collection or collection type will require, this "detail" becomes a part of early planning. Specific recommendations for each type of collection are provided in Appendices 2A – 2D.

Finally, the Collections Consortium must decide early in planning whether each institution in the Collections Consortium will have a separate space within the study/storage building, or whether they will share spaces, with the space organized by use and collection type. This subject was discussed in the preliminary meeting for these assessments. The conservators agree that it will be most efficient in many ways (space use, costs, environmental needs) if the building is organized by use and collection type, rather than by organization. They recognize that organization by use and collection type might require more complex intellectual control measures, security, and monitoring than a building in which

spaces were not as completely shared. The storage recommendations in this report are based on collections in the new building being in shared spaces, but using, as far as possible, storage furniture fitted with doors and locks to permit each institution to limit who has access to its collections.

IV. WOODSTOCK ARTISTS ASSOCIATION & MUSEUM STORAGE NEEDS

A. Introduction

As stated on its website, "since its beginnings in 1919, the Woodstock Artists Association & Museum has been committed to exhibiting and collecting work in all media by area artists and supporting the tradition of Woodstock as the 'Colony of the Arts.' Located in the center of the village of Woodstock, New York, the WAAM functions as a cultural center as well as a repository for the work of American artists associated with the Woodstock Art Colony."

WAAM is a repository for the work of American artists associated with the Woodstock Art Colony, and actively collects work by contemporary artists. The 2,100-object-strong WAAM collection consists of paintings (500 paintings), works on paper (1,200 works), and photographs (300 photographs); the balance of the collection (c. 150 pieces) is primarily sculpture, in various media, and decorative arts.

WAAM has four gallery spaces with an active exhibit program that includes new works, works from its permanent collection, and works from its education program. Exhibits frequently include loans, creating a need for temporary holding spaces in collection storage areas.

B. Current Storage

Collections storage and offices are housed in the basement of the WAAM building. The basement floor is broken up by multiple steps as the poured concrete and tile floors were laid to accommodate irregularities in the foundation. Collections are housed in two rooms, called the Old Vault and the New Vault. These rooms were purpose-built to house collections, but growth and administrative needs mean that New Vault is now used for several purposes.

The New Vault is divided into two chambers. The main chamber has large, vertical-slotted, bin storage units made of painted lumber; some of the slots are padded with carpet. Medium- to large-sized, framed, art works are stored in slotted bin storage and on wheeled A-frame carts. Most of these pieces have cardboard or foam board spacers between them. Some materials are soft-packed (i.e. wrapped in Ethafoam®).

The main chamber in the New Vault also holds large sculpture. Sculptures are provided with padding and floor risers (bases) as space allows. Since this chamber also serves as the holding area for empty, standard-sized, exhibition frames and for non-collection art works donated for WAAM's fundraising auction, it is quite crowded. WAAM houses the non-collections pieces on wheeled carts and marks them clearly as non-collection items.

The ante-chamber to the New Vault holds the preparator's work space and desk, along with photographic equipment, supplies, frames, and two- and three-dimensional artworks. The two-dimensional pieces are housed on wood, vertical-slotted bin storage units and in three, stacked, metal flat-file cabinets. The three-dimensional pieces (smaller sculptures and decorative arts pieces) are housed on heavy-duty, powder-coated, metal shelving units.

The ante-chamber of the New Vault is fitted with a wall-mounted heater and air conditioner. This unit does not appear to be in use as it is blocked by supplies and art works. The New Vault also has a stand-alone, residential-style dehumidifier unit that is not plumbed but emptied regularly by staff.

The Old Vault has sliding, rack-screen storage and two sizes of vertical, slotted-bin storage for framed materials. The rack screen hold unglazed pieces (mostly paintings) and some glazed works-on-paper. The taller slotted-bin storage holds oversized, unglazed paintings. The shorter slotted bin storage holds glazed, smaller pieces, mostly works on paper and photographs. The Old Vault has recently been fitted with wire shelving for storage of unframed, boxed works-on-paper.

The Old Vault has a functioning, stand-alone, plumbed, residential-style dehumidifier, as well as a defunct, centrally plumbed humidification and dehumidification unit. The room is not heated, but is adjacent to spaces that are heated by a forced-air system. Staff visually monitors a digital hygrometer.

More detailed descriptions and evaluation of current storage for each medium follow.

1. Paper and Photographic Materials

The paper and photographic materials collections at WAAM comprise primarily pieces classified as works of art. (See Appendix 2A for discussion of classifications for paper and photographic materials.) These include prints, drawings, pastels, photographic prints, and collages. This assessment was focused on the art works, as WAAM has a dedicated space for its relatively small archival collections. General recommendations for archive storage are included in Appendix 2B should WAAM's archival holdings outgrow the current space for archives.

Staff at WAAM is in the midst of a rehousing project for their paper and photograph collections, for which they are to be commended. These pieces are being removed from (non-artist's) frames and mounted with archival mounting techniques (hinges and corners) into standard-sized storage mats (4-ply back mat with a window mat, interleaved with buffered paper), and fitted into museum-quality, Solander® boxes. The boxes are arranged by media and artist on metal wire rack shelving in the Old Vault.

A significant number of materials remain framed. These are stored hanging on rack-screen storage in the Old Vault and in vertical, slotted-bin storage units in both rooms. WAAM staff has interleaved pieces in bin storage with cardboard and foam board as possible. The bin storage is, however, woefully overcrowded, so interleaving is not as effective as it should be. Overcrowding is exacerbated by the presence of hanging hardware on the framed materials; the hook eyes used as hanging hardware are causing damage to adjacent materials.

2. Paintings

According to WAAM's collection database, their collection of approximately 500 paintings includes about 400 paintings in oil. The remaining c. 100 are in acrylic, mixed media, and miscellaneous paints. Several of the mixed media works incorporate sand or collage elements. The collection includes a variety of primary supports: fabric, plywood, copper, paperboard, and Masonite®. About 20 percent of the paintings do not have frames. Several framed paintings were also noted as being loose in their frames.

The database also recorded the condition of about 80 percent of the collection. In looking at the information in the database, it was clear that different people entered condition information about the paintings; this led to inconsistencies in evaluating condition. Where condition was recorded, each painting was rated on a scale of "con1-con4", with con4 indicating worst condition. Approximately 125 paintings received a "con3" or "con4" rating. These conditions identify paintings with a severe case of cracking, loss, delamination, buckling or other instability. Although the database condition identified numerous paintings with evidence of mold or mildew, there was no evidence of active mold or mildew seen during the assessment.

The paintings are stored in the Old Vault and the New Vault. About 100 paintings hang on 18 double-sided, sliding rack screens in the Old Vault. The screens have a usable area of 81" x 59". The screens average 12 ½" apart. The majority of paintings are hung on the screens with screw eyes and wire. This is not the recommended hanging hardware; on some frames, the hardware is not securely attached.

The remaining paintings are housed in stationary and rolling slot-storage bins, flat on shelving units, or leaning against walls and storage furniture in any available space. These last paintings are vulnerable to damage from where and how they are stored. Very few of the paintings have backing boards attached to their stretchers.

There is not enough space in the two storage vaults to store the existing collection safely, as shown by the paintings standing against walls. Certainly, there is no room for growth of the collection in the current storage areas.

3. Three-dimensional objects

The majority of WAAM's three-dimensional collections are 20th-century ceramics and metals, and modern sculpture. Most of these collections are made of inorganic materials, although the collection does include some wood objects, basketry, and textiles. WAAM also has a few pieces made from modern materials (rubber, resin, and plastic).

WAAM stores its three-dimensional objects in the New Vault. Most of these pieces are on heavy-duty, metal, shelving units, but some are fastened to the walls or placed on wall mounted bracket-and-standard shelves. Larger pieces are stored in the center of the main chamber of the New Vault and stabilized as possible given the cramped space.

The most problematic storage is that for oversized objects. Many large pieces are placed directly on the floor, on top of other storage units, in corners, or in other difficult-to-access locations. Access to the materials on the shelving units is partly blocked by the preparator's work space.

C. Recommendations for improvements

While the focus of this assessment and report is on the storage needs for a future shared study/storage building, there are some improvements that WAAM can make now, in its existing storage areas. These improvements will enhance the preservation of the collections in the current areas as well as help prepare them for storage in the new building. The recommendations below are arranged by medium.

1. Paper and photographic materials

WAAM staff should continue to remove paper and photographic materials from frames and re-house them in standard-sized print boxes. This will make more space for those items that must remain framed for curatorial reasons (artists' frames) and for more shelves for boxed storage.

2. Paintings

WAAM staff can make some improvements in the storage of paintings in the current space. Implementing the recommendations below will enhance the preservation of paintings in their current location and help refine planning for painting storage in the planned new space.

- Re-assess all paintings, to accurately determine stability, condition and needs. Ideally a paintings conservator should do this assessment.
 - Is the painting best stored on a rack screen? Rack screens are the most efficient use of space, for stable, framed paintings.
 - Or, should the painting be stored flat? Store unframed and unstable paintings in horizontal storage units.
 - Unstable paintings -- those with paint flaking or paint loss, those that are delaminating, and those that are falling off their stretchers – should be stored flat.
 - Paintings with heavy or vulnerable collage elements or with sand should be stored flat.
 - Provide (make) travel frames for:
 - All stable, unframed paintings that can hang on the rack-screens.
 - The paintings on Masonite should all be framed to protect that very brittle support during handling.
 - See Appendix 2C for instructions on making travel frames.¹
 - Check that each painting on the rack-screens is hung securely.
 - Each painting should hang by its frame, not by its stretcher.
 - Hanging hardware should be secure. Replace screw eyes used as hanging devices with D-ring hanging devices.
 - Check that the painting is properly installed in its frame.
 - Attach backing boards (such as foam core) to the back of stretchers to protect the painting from punctures.
3. Three-dimensional objects: Three-dimensional objects are so crowded that it is hard to access them for improvements. As possible, large, free-standing pieces should all be given bases, rather than standing directly on the floor. Some reconfiguration of shelving units might permit sculptures and decorative arts pieces on shelves to be better spaced.

D. Recommendations for future storage furniture and space needs

This section discusses the storage furniture and space needs for storage in the proposed shared study/storage building. The calculations of space needs were made from the existing collections, as reported by the WAAM staff and seen during the survey. The storage furniture recommendations are in accordance with the guidelines for storing collections given in Appendices 2A – 2D and incorporate the suggestions for storage improvements made above.

Because the proposed building has not yet been designed, this section does not make specific recommendations for the footprint (square footage) needs for storage. That will need to be determined as part of the building design process. In working through the design, Collections Consortium museums should remember that mobile, or compacting, storage can compress

¹ Although it will be a considerable amount of work to create travel frames for all stable paintings, it is recommended that this work be done. The paintings will be more safely stored hanging on the rack screens and the rack screen storage system will take less space than flat storage shelving units, producing long term savings.

collection space by up to 50%. Mobile storage is appropriate for much of the consortium's collections.

This section does make recommendations for the type, size, and quantity of storage furniture (and in the case of paper and photographic materials, storage materials, or enclosures) needed. These figures are based on current collections; WAAM should estimate how much each type of collection may grow and allocate appropriate storage furniture and space for each as the building is planned.

Please note that the figures below reflect the needs of WAAM's collections only. If the Collections Consortium members decide to store their collections by material rather than by institution, they may be able to reduce the number of storage units needed for some materials.

1. Paper and photographic materials

The storage recommendations for paper and photographic materials have been developed using format-based standards. Format-based standards are defined by size and support material.

Storage needs are listed below based on the arrangement and classification of paper and photographic materials described in Appendix 2A. That appendix also describes how these materials should be prepared for storage.

Sections f) through i) below include recommendations for storing photographs. Note that photographic works – *unframed* photographic prints on paper and/or paper-based supports, as well as any film-based materials -- should be stored in cold storage. It is recommended the Collections Consortium include a purpose-built, commercial cold storage room in the new building. The cold storage room should be sized to accommodate the recommended storage cabinets. (See Appendix 2B for details.) Since photographic materials are best-preserved in cold storage, but only not framed photographic materials can be housed in cold storage, it is recommended that all members of the Collections Consortium develop a program to remove photographs from their exhibition frames and store as much of the collection in flat print box storage as possible.

- a) Works of art, *paper-based, not framed, small/medium-size*: in storage mats in print storage boxes on shelves.
 - Cabinets (semi-custom), with gasketed doors -- 58" wide x 32" deep x 79" high
 - 5 units with 60 shelves for WAAM
 - Shelves at 6" intervals
 - To hold print boxes:
 - ~60 @16" x 20"
 - ~40@ 20" x 24"
 - ~ 35@24" x30"
 - Note that cabinet size is the same as that recommended for paper-based portfolios and bound works of art and for small-/medium-size, not framed photographs. The cabinets for the photographs will be in the cold storage room.

- b) Works of art, *paper-based, not framed, large-size*: in storage mats up to ~36" x ~48" in drawers in flat file cabinets.
 - Flat file cabinet with drawers, standard size -- ~54"wide x 42" deep x 17 "high
 - 4 five-drawer units, or 20 drawers.

- c) Works of art, *paper-based, not framed, oversize* (larger than ~36" x ~48"): ") : Framed and hung on rack-screens, matted and stored in drawers in oversize flat file cabinets, or rolled for storage.
- i. Framed (in exhibition frames) on rack-screen storage.
 - Space needed for these pieces is included in the calculations for storage of works of art, *paper-based, not framed*, below.
 - ii. Matted and stored in flat file cabinets with drawers.
 - Custom oversize flat file cabinet (~98"wide x 62"deep)
 - 1 five-drawer unit. If Collections Consortium institutions are willing to share cabinets, then no separate cabinet is needed for WAAM, as they do not have many pieces for this type of storage.
 - iii. Rolled on tubes, with tubes supported on a rolled storage system.

Note: the need for rolled storage for all types of materials at WAAM is minimal. Any pieces in the WAAM collection that should be stored rolled can be housed on the unit proposed in the 2011 assessment report for the Collections Consortium.
- d) Works of art, *paper-based, framed*: storage depends on type of framing
- i. In exhibition frames
 - Do not store pieces long term in exhibition frames. REMOVE from frames; store as recommended for not-framed, paper-based, works of art.
 - Space needed for these pieces is included in the calculations for storage of works of art, *paper-based, not framed* (above).
 - Provide space in or near a work room for storage of empty exhibition frames.
 - For short term, temporary storage of pieces in exhibition frames:
 - Vertical slotted-bin storage in semi-custom cabinets that could have gasketed doors -- 58" wide x 32" deep x 79" high
 - 2 units with a total of 30 slots
 - Slots ~30" high x 24" deep x ~7" – 8" wide"
 - ii. In historic or otherwise significant frames: on hanging rack-screen storage or on horizontal shelving
 - a. Stable pieces hung on rack screens
 - Hanging racks, 10 feet high x 12 feet wide
 - 1 rack in "Configuration 1" for WAAM
 - 4 racks in "Configuration 2" for WAAM
 - See Appendix 2B for diagram of rack configurations.
 - b. Unstable pieces, and friable media (pastels, charcoal, graphite) placed on horizontal shelves:
 - 92" wide x 48" deep x 106" shelving units
 - 6" between shelves
 - 1 unit with approximately 12 shelves for WAAM
 - Storage units should be fixed, not movable, to reduce risk of damage from vibration.

Works of art, *paper-based, framed*: con't:

- e) Works of art, *paper-based, portfolios and bound materials*: in print storage boxes in cabinets with gasketed doors.
- Cabinets (semi-custom), with gasketed doors -- 58" wide x 32" deep x 79" high
 - 1 unit with approximately 12 shelves. If Collections Consortium institutions are willing to share cabinets, then no separate cabinet is needed for WAAM, as they have few, if any pieces needing this type of storage.
 - Note that cabinet size is the same as that recommended for small-/medium-size, not framed works of art on paper and for small-/medium-size, not framed photographs. The cabinets for the photographs will be in the cold storage room.
- f) Works of art, *photographs, on paper or paper-based supports, not framed, small/medium-size*: in storage mats in print storage boxes in cabinets with gasketed doors in **cold storage room**
- Recommended **cold storage room** ~10 feet wide x 15 feet deep x 10 feet high
 - Cabinets (semi-custom), with gasketed doors -- 58" wide x 32" deep x 79" high (placed in cold storage room)
 - 1 unit with 13 shelves
 - Shelves at 5" - 6" intervals
 - To hold print boxes:
 - ~20 @16" x 20"
 - ~12 @ 20" x 24"
 - ~ 6 @ 24" x30"
 - Note that cabinet size is the same as that recommended for small, not- framed works of art and for paper-based portfolios and bound works of art, as well as for larger, not framed photographs. Only the cabinets for the photographs are in the cold storage room.
- g) Works of art, *photographs, on paper or paper-based supports, not framed, large size* (up to 36" x 48"): in storage mats in cabinets with gasketed doors in cold storage room
- In cold storage room (See size above.)
 - Cabinets (semi-custom), with gasketed doors -- 58" wide x 32" deep x 79" high (placed in cold storage room)
 - 2 units with 40 drawers/shelves are proposed in the 2011 Consortium Assessment. If Collections Consortium institutions are willing to share cabinets, then no separate unit needed for WAAM, as they have few pieces needing this type of storage.
 - Fitted with 18 narrow (~ 2" high) drawers on bottom and 2 shelves on top (film-based materials will be boxed and housed on the shelves of these cabinets; larger, matted photographs will be in the drawers of these cabinets).
 - Note that cabinet size is the same as recommended for small, not-framed works of art, paper-based portfolios and bound works of art, and small, not framed photographs. Only the cabinets for the photographs are in the cold storage room.
- h) Works of art, *photographs, framed*: storage depends on type of framing
- i. In exhibition frames – REMOVE from frames; store as recommended for not-framed photographs.
 - Photographs that are not framed should be stored in the cold storage room.
 - Space needed for these pieces is included in the calculations for storage of works of art, *photographs, not framed* (above).

Works of art, *photographs, on paper or paper-based supports, not framed, small/medium-size*, con't:

- ii. In historic or otherwise significant frames: hanging on rack-screens (as for paintings) or on horizontal shelf ("bakers' rack") storage.
 - *Framed photographs should not be stored in the cold storage room.*
 - Space needed for these pieces is included in the calculations for storage of works of art, *paper-based, framed* (above).
- i) Works of art, *photographs, on non-paper-based supports*: on hanging rack-screen storage (as for paintings)
 - Hanging racks, 10 feet high x 12 feet wide.
 - Space needed for these pieces is included in the calculations for storage of works of art, *paper-based, framed* (above).

2. Paintings

Framed, stable paintings in good condition should be hung on rack-screens for storage. Fragile, unstable paintings and paintings without frames should be placed in flat (horizontal) storage. (See details above on how to decide if a painting is stable or not.) Consider separating the paintings on the racks according to media and support. This may help with organization and with keeping an eye on vulnerable materials should the environment change. De-accessioned paintings and those not belonging to the collection should be stored separately, not intermixed with WAAM's accessioned paintings.

A moveable, or compacting, rack-screen storage system is recommended because it uses space very efficiently. The system can be designed so spaces between the racks are adjustable to accommodate deep frames.

Movable, or compacting, rack-screen storage can be designed in two ways. In sliding rack-screen systems the screens are suspended from tracks on the ceiling and pulled out to allow access to the paintings; this is the system that WAAM now has. Rolling screen units move back and forth along recessed tracks in the floor; the tracks are perpendicular to the rack-screens. Rolling rack-screen storage is recommended as it is safer for the paintings (they are subjected to less movement when the screens are moved) and because it makes more efficient use of space – space is needed for one aisle (moveable by moving the screens on the tracks) to access paintings, rather than an aisle the size of the entire unit. (See Appendix 2B for illustrations of sliding and rolling rack-screen storage.)

WAAM should plan for the following types and quantities of storage furniture for its painting collection:

- a. Rack screen storage on a rolling system for stable, framed paintings:
 - o 43 screens total for paintings -- 10 feet high x 12 feet wide. When planning the Collections Consortium storage needs, please remember that this is the number of screens needed for WAAM only; but the size of the screens is the same as that recommended for the other Consortium institutions
 - 5 screens to accommodate the extra-large paintings. Extra-large paintings are more easily and safely handled if they are hung at the bottom of the screen. The top of the screens can be filled with large, medium and small paintings.
 - 18 screens to accommodate the oversized paintings. The top of the screens can be filled with large, medium and small paintings.
 - 20 additional screens will accommodate the remaining large, medium and small paintings with room to spare.

- Paintings hang on both sides of the screens units.
 - Because so many of WAAM's paintings are very large, there should be space left for an aisle of at least 6 feet between screens to allow for ladders and adequate space for handling (hanging and removing) the paintings.
 - See Appendix 2B for schematic designs for possible lay outs for the Hudson Valley Coalition collections.
- b. Flat storage for fragile and damaged paintings:
- Because most of the WAAM paintings can be hung, dedicated flat storage space for paintings is not required.
 - Paintings for which flat storage is needed can be placed in the area dedicated to works of art on paper storage. One unit, as specified below, will accommodate paintings.
 - 92" wide x 48" deep x 106" shelving units
 - 6" between shelves
 - 1 unit with approximately 12 shelves for WAAM
 - Storage units should be fixed, not movable, to reduce risk of damage from vibration.

3. Three-dimensional objects

Calculations for storage of WAAM's three-dimensional objects were made using the inventory provided by WAAM. To maximize space usage, collections were sorted by size, rather than by artist or medium. This sorting resulted in two types of recommended storage furniture.

- a. Open shelving for large objects – pieces larger than 40" wide x 24" deep x 15" high
- Considerations for open shelving:
 - Open shelving should ideally have access from all four sides. At a minimum, there should be access to the two longer sides. The space for access must be the depth of the shelving plus room for a person or two to walk.
 - Vertical partitions/posts should be added to secure (tall) pieces in place.
 - Open shelving should have dust protection. A dust shield should be attached to the frame of storage unit with Velcro or magnetic tape (i.e., the dust shield should not be draped over objects). The dust shield can be made of fabric, such as light-weight muslin (allows air exchange, but obscures visibility, can be removed and washed); Mylar (allows visibility and minimal air exchange, but can be difficult to handle), or Tyvek (allows air exchange, but obscures visibility, can be removed and washed). Pull-up shades (a.k.a. Roman blinds) are another option for dust protection.
 - Open shelving needs for WAAM:
 - 48" x 96" footprint x 96" high
 - 5 units
 - 2 units should have floor and cover (but no intermediate shelves), for tall, oversized sculpture
 - 3 units should have floor, cover, and one adjustable shelf, for large sculpture (between 15" and 30" tall). Two of these should be arranged with their short ends touching to accommodate 4 benches and a long table.
- b. Closed cabinets for smaller objects -- pieces smaller than 40" wide x 24" deep x 15" high
- Considerations for closed cabinets:
 - The cabinets can be part of a mobile, or compacting, storage system or stationary. There are pros and cons to both systems. Mobile storage systems make better use of space, as they eliminate the need for multiple aisles; these systems can be more easily adapted for growth than stationary units. Stationary units are less expensive and probably pose (slightly) less risk to collections.

- Doors can be solid or have glass window inserts. There are pros and cons for both options. Solid doors eliminate light from the storage unit, while glass allows for visibility of contents without opening unit.
- Cabinets (semi-custom), with gasketed doors for WAAM's three-dimensional collections:
 - Standard size -- 84" tall, 40" wide, 24" deep
 - 1 unit
 - The unit should be fitted with eight, 3" deep drawers; the spacing of the drawers can be arranged to accommodate objects up to 14" tall.

Appendix 1: General Storage Planning

Storage Environment, Furniture/Cabinets, Materials, and Methods

A. Storage Environment

Recommendations for environmental conditions for collections storage are changing. For the last two decades, the general recommendation for North America has been that collections be stored in cool temperatures -- at or below 68° F -- with the relative humidity (RH) controlled between 35-50%, as appropriate for the season, building, and collection material. Other guidelines for managing the environment in collections storage are:

- Seasonal changes should occur slowly and rapid fluctuations should be avoided, as these can cause damage to sensitive materials.
- Maintain RH below 65%. Temperatures over 68° F (20° C), RH above 65%, and lack of air circulation are likely to promote mold growth. If mold growth is already established, however, growth can occur at lower RH.
- Some collections require or benefit greatly from different environmental conditions. For example, unframed photographic materials can be stored frozen, if certain procedures are followed, while acrylic paints should not be stored below 60%, and metals should be stored below 50% RH.
- The HVAC system should be designed with good air filtration to avoid introducing dust and soils into the storage area.
- To protect light-sensitive materials (all organic materials, and collections that include organic materials), the storage area should be designed so that it is completely dark when no one is in it.

Besides installing systems to create an appropriate environment, museums must monitor the environment in the storage areas to be sure that the desired conditions are obtained. Museums should:

- Measure and record temperature and RH in collections spaces either continuously (using a hygromograph or data loggers) or at regular intervals (using a hygrometer or psychrometer).
- Choose a measuring or measuring/recording device that is accurate, use it properly, check it regularly — ideally against a psychrometer, the industry standard — and calibrate it regularly.
- Analyze recorded conditions to check that climate management systems are working properly or to make recommendations for improvements.

Please see Appendix 3 for articles summarizing current recommendations and issues for environmental controls.

B. Storage furniture/cabinets

Most storage furniture for museum collections should be made of powder-coated steel, as testing has shown that powder-coated steel is solvent-free and does not interact negatively with any collection types. Rack screens for hanging framed art works can be made of aluminum. Any other materials used in the storage furniture (e.g., gaskets on doors) should be stable, tested by the manufacturer to be sure they are also "safe" for collections storage. The Collections Consortium should specify in its contracts that storage furniture should pass the appropriate tests before they accept and pay for the furniture. Conservators can do testing to spot check the stability of manufactured products, although if storage furniture is purchased from companies that specialize in museum storage furniture, testing should not be necessary.²

Factors to consider in the design of storage furniture include:

² Tests commonly used for this include the solvent-cure test, a.k.a. MEK rub test, the "Oddly" test, or other corrosion coupon tests.

- Movable or not? If movable, or compacting, units are chosen, the effects of movement and vibration on the stored collections should be considered; the amount and quality of vibration can vary based on the design of the movable system.
- Storage units should be accessible to art transport equipment (carts, dollies, forklifts, etc.).
- Bases of storage units should be elevated at least 4" as a precaution against water damage and to permit cleaning beneath the units.
- Tops of units should not be used as shelves because they leave artifacts and artifact containers unprotected.
- Doors, blinds, curtains, etc. on the storage units are recommended to control dust and light exposure.
- The storage units can be fitted with drawers, shelves, or trays according to the needs of the collections. Adjustable storage space as opposed to fixed shelf, drawer, or suspension spaces will accommodate shifts in collecting directions.

C. Storage Materials

The materials that are best for collections vary by type of collection (medium, or materials from which the collections are made), so details of appropriate storage materials are discussed in Appendices 2A – 2D.

There are, however, some general guidelines:

- All materials that are used in contact with stored artifacts should be archival-quality materials that are not harmful to these objects.
- The surface characteristics of the artifact to be stored can affect the choice of storage materials. For some artifacts, a smooth surface is preferable. For others, some friction between the object and the storage material can be desirable.
- The size, shape, construction, and condition of the object will influence the selection of the storage material. The storage material chosen must provide sufficient support to the object in storage. Ideally, this support will also be sufficient for moving the object from storage; if it is not, an auxiliary moving support must be provided.

D. Storage Techniques

Storage techniques or methods for each object or category of object should be selected to offer maximum stability and protection. As with storage materials, specific recommendations are provided in Appendices 2A – 2D. There are, however, some general principles to keep in mind:

- Storage techniques should be chosen to address the physical requirements of the objects.
- The optimal technique should be chosen based on the object's shape, materials, condition, fabrication, and size.
- The amount of space needed to house a given object is determined by the techniques chosen. Space needed equals the dimensions of the stored object plus (archival-quality) packing materials, including protective box or cover.
- The extent of access to the collections will also influence the technique chosen.
- Labeling is a part of storage technique. The object should be labeled with its accession number. The number should also be on the storage container or shelf. Ideally, photographs and/or description and/or bar code should also be on the storage container.
- The storage technique should provide dust and light protection.

Appendix 2A -- Strategies for Storage of Paper and Photographic Materials: Storage Furniture/Cabinets, Materials and Methods

I. General Storage Strategies

Conservators recommend that paper-based artifacts and photographic materials be stored in a dedicated room(s) or section(s) of the storage area(s). Storage dedicated to paper-based artifacts and photographic materials can make for efficient space use, as these collections are well-suited to consolidation in standardized housing and protective enclosures. Due to their chemical sensitivity, paper-based artifacts and photographic materials benefit from significantly cooler and drier storage environments; these conditions may not be appropriate for other collection materials. Housing paper-based artifacts and photographic materials in the same area means that zones in the HVAC system(s) can be set to create the best the temperature and relative humidity levels for paper-based artifacts and photographic materials.

While photographic materials and paper-based artifacts can be stored in the same general area, segregation of these collections by material within the storage area is imperative. Paper-based artifacts and photographic materials are chemically different from one another and are often incompatible with one another, which can cause adverse effects from adjacent items. Paper-based artifacts should be housed (boxed) separately from photographic materials.

A. Arrangement and Divisions

To economize on space while accommodating the uses and needs of paper-based artifacts and photographic materials, these collections can be put into intellectual divisions: *Works of Art* and *Library/Archive Materials*. These intellectual divisions influence how the materials are handled and housed. Works of art on paper require different storage furniture and will most likely require different security access controls than the library and archive materials. It is recommended that the fine art collections be stored separately from the library and archive collections. WAAM is already following this practice and has a dedicated library/archive space in their current building. General recommendations for archive storage are included here should WAAM's archival holdings outgrow the current space for archives.

Within these two major intellectual divisions, materials can be grouped by material (photographic materials vs. paper-based artifacts); format (framed, unframed, bound, loose items, negatives, etc.); and size. These groupings will make for efficient space use in storage. The recommended groupings (and type of storage) for the Collections Consortium's collections are:

- *Works of Art*
 - Paper-based – not framed
 - Print boxes on shelves
 - Drawers in flat file cabinets
 - Rolled (may be integrated with textile storage)
 - Paper-based – framed
 - Hanging on rack screens
 - Horizontal on racks
 - Vertical in slotted bins – temporary storage
 - Paper-based -- bound/portfolio
 - Print boxes on shelves

- Photographic prints – not framed, on paper or mat board supports
 - Print boxes on shelves in cabinets with gasketed doors in cold storage room
 - Photographic prints – framed and/or on non-paper-based supports (e.g. plexi, aluminum, Sintra®)
 - Hanging on rack screens -- not in cold storage
 - Horizontal on racks – not in cold storage
 - Vertical in slotted bins – temporary storage
- * Note that these guidelines are applicable for any type of photographic print, whether printed in a traditional (e.g. gelatin silver, platinum/palladium) or modern (e.g. Cibachrome, inkjet, digital pigment) technique.

➤ *Library and Archive Materials*

- Paper-based materials – documents
 - Library shelving
 - Document cases on shelves
- Paper-based materials – books
 - Library shelving
- Paper-based -- bound/portfolio
 - Print boxes on shelves
- Photographic materials – film-based materials
 - Boxes on shelves in cabinets with gasketed doors in cold storage room
- Photographic materials – cased images.
 - Boxed on shelves; NOT in cold storage
- Photographic materials – glass plates
 - Library shelving; NOT in cold storage

Detailed recommendations on storage materials, furniture, and methods for each of these categories follow.

B. Storage materials: housing and enclosures

Storage enclosures and housing must be constructed with archival-quality, paper-based products or inert plastics. Archival-quality, paper-based materials are acid-free, lignin-free, and buffered with an alkaline reserve to a pH of ~8.5. Plastic enclosures should be made from one of three known archival-quality (inert) plastics: polyester, polyethylene, or polypropylene. These materials should be free of plasticizers and coatings.

Whether of paper or plastic, enclosures and housing for paper and photographic materials should meet the standards as specified in the International Organization for Standardization (ISO) ISO Standard 18902:2001. With a few exceptions, photographic materials can be enclosed and housed in moderately buffered materials (cyanotype prints are alkaline-sensitive and should be stored in inert or un-buffered materials). The choice between buffered or un-buffered papers is not as crucial as once thought; more important is that the enclosure and housing chosen has passed the PAT test as specified in ISO 14523:1999. The Photographic Activity Test has two components: a test to detect image fading resulting from harmful chemicals in enclosures, and a test to detect staining reactions between enclosures and gelatin.

C. Cold storage

Photographic works that are not framed should be kept in cold storage. Cold storage (as distinct from cool storage -- moderately below room temperature) requires both cooling to maintain a specified temperature and moisture/humidity controls to maintain strict relative humidity levels. Studies have proven that cold storage with humidity control exponentially slows down the inherent chemical decay of photographic materials and is necessary to ensure their preservation.

Cold storage can be either refrigerated (~5°C/41°F) or frozen (-20°C/-4°F). The choice between the two is complex and depends on the degree of chemical decay in the collection, the photographic formats, the frequency with which the collection will be used and accessed, and the budget and staffing of the institution. In addition to the strict temperature and humidity controls, access protocols are necessary to control the risk of and effect of condensation on collection materials. Effective and efficient cold storage requires that materials are packaged and sorted by material format and size as described in general protocols below.

Small collections and/or small items can be housed in free-standing, industrial freezers. Collections stored in these freezers will require a second housing/enclosure to ensure that they remain at the right relative humidity level. Larger items and/or larger collections are better stored in commercial vaults or rooms. Larger commercial vaults can be electronically configured to maintain desired humidity levels and, when cabinets with gasketed door are used, reduce the need for extra packaging.

The volume of materials found in the Hudson Valley Collections Consortium collections makes a cold storage room most practical. Because the decision between refrigerated cold storage and frozen cold storage is dependent on so many factors, the Collections Consortium should hire a consultant who specializes in cold storage to work with them to design this aspect of the new building. (See below for illustrations of a possible cold storage vault and Appendix 3 for references on cold storage.)

II. Storage recommendations by type/format /size of artifact

A. Works of art, paper-based

1. Works of art on paper, *not framed, small/medium-size*: in storage mats in print storage boxes on shelves

With some exceptions noted below, all works of art that are not framed should be prepared with a standard size storage mat. Once in storage mats, these pieces can be stored in boxes. The storage mats should be matched to the box size. The boxes can be stored on shelving units or in cabinets with gasketed doors.

- Materials smaller than 22" x 28" are candidates for print storage boxes on shelving units.
- Flat, deep-lid, print storage boxes are recommended.
- Two or three standard sizes of print storage boxes should be selected. The recommended box sizes are: 16" x 20" x 3", 20" x 24" x 3", 22" x 28" x 3", and 24" x 30" x 3".
- The box sizes should correspond with the standard size of frames in the collections, to accommodate matted materials after exhibit.
- Materials should be provided with four-ply or eight-ply storage mats. Storage mats include a back mat of archival-quality board attached with gummed linen tape to an archival-quality four-ply or eight-ply window mat.

Works of art on paper, *not framed, small/medium-size*, con't:

- Matted artworks should be interleaved with buffered tissue, and placed in an appropriately sized box.
- Boxes can house up to 10 matted objects, depending on the mat depth.
- Boxes should not be stacked on top of one another, but rather laid singly on the shelving within the unit. The unit should be fitted with shelves spaced to maximize the box capacity.

Pastels should be given a deeper, eight-ply window mat. Instead of interleaving, matted pastels should be fitted with their own rigid academy folder, or with a solid top mat. Pastels must be stored horizontally. It is preferable to store pastels on non-moveable shelving units.

2. Works of art, paper-based, *not framed, large size*: in storage mats up to ~36" x ~48" in drawers in flat file cabinets

- Materials larger than 22" x 28" are candidates for storage in drawers in flat file cabinets.
- Materials should be fitted with four-ply storage mats as described above. Sizes should be standardized; pieces can be stacked with mats of the same size. Pieces in mats larger than 24" x 36" should have mats made from 8 -ply board.
- Some commercial flat file cabinet drawers can accommodate standardized mats of 24" x 36" (set side- by-side), or large mats of 32" x 40" and 36" x 48".
- Standard-size flat file cabinets can be fitted with carriages so they can be integrated into a mobile (compacting) storage system.

3. Works of art, paper-based, *not framed, oversize (larger than ~36" x ~48")*: Framed and hung on rack screens, matted and stored in oversize flat file cabinets, or rolled for storage

It best for oversize works of art on paper to be framed to preservation standards and stored on rack screens, as recommended for framed works. (See Appendix 2B for details on framing and hanging framed works on rack screens.)

Those materials that are not easily framed can be given storage mats as described above and stored in large, custom-made, oversize flat file cabinets. It is important that the drawers are not overfilled.

Pieces that are too large for framing and hanging on rack screens or for oversize flat file cabinets, may be, depending on the item, rolled (as a textile is rolled) for storage. It is best to seek advice from a conservator about whether or not a piece is a good candidate for rolling.

- Paper-based artifacts that will be rolled must be provided with an archival-quality support tube (core) at least 6" - 8" in diameter; the tube should extend at least 2" beyond the artifact.
- The rolled artifact should be interleaved with either acid-free tissue or polyester film (Mylar or Mellinex); the choice is determined by the chemical diversity of the components of the object and the need to provide isolation between them.

Works of art, paper-based, *not framed, oversize*, con't:

- The rolled artifact should be secured with bands of polyester film or washed, unbleached, twill tape on the margins of the tube, beyond the artifact. In the case of wall maps, care should be taken to ensure that heavy components, such as dowels, are secured so they do not pull on the primary support.
- Standard sizes for the support lengths (tubes or pipes through tubes) should be chosen for rolled storage. This will simplify the fabrication of support racks.
- Rolled, paper-based artifacts can be stored either on pipes on hanging roll racks or on shelves. If shelves are used, the tubes on which the artifacts are stored should be supported on cradles, to keep the weight of the tube from crushing the bottom layers on the roll. The cradles may be cut from Ethafoam®. The tube must extend beyond the rolled artifact to accommodate the cradles.

4. Works of art, paper-based, *framed*: storage depends on type of framing.

Framed materials include materials that have been placed within exhibition frames, or framed for exhibition in custom-size frames, as well as pieces that have been framed by the artist or are in historic frames. The provenance and context of the frame influence the handling of the materials for storage.

a) Pieces in *exhibition frames*:

- Pieces in standard exhibition frames should be removed from the frames. Storing exhibition frames separately makes it easier to store them safely and is a space saver.
- The matted pieces can be flat stored in print boxes on shelves. (The sizes of the boxes should match the exhibition frames.) This will minimize the risk of damage to the pieces.
- The framing materials (glazing, backing boards, and hanging hardware) should be systematically stored by size to ease re-use and recycling.
 - Glazing should be individually wrapped to keep it from getting scratched; it can be stored along with the backing boards in vertical slot storage.
 - Pieces of glazing should be interleaved with the backing boards.
 - Hanging hardware should be removed from all exhibition frames.
 - Framing materials should be stored in or near a work room, not in collections storage.

While materials should not be stored over the long term in their exhibition frames there is a need for temporary storage of pieces that are waiting to be removed from their exhibition frames or waiting to go into an exhibition. These pieces can be stored in vertical slot storage in cabinets or on shelves.

b) Pieces in *historic or otherwise significant frames*:

- Paper pieces in stable frames that have intrinsic or historical value should remain framed with their original frame components. Many of the frames will require modifications to ensure the contents are framed to preservation standards.
 - The rabbet should be given a barrier of Marvelseal to prevent wood acids from seeping into the primary support or mat materials
 - Acidic mats should be replaced with acid-free mats. For provenance reasons, the original mat can be secured in the back of the frame with a polyester film (Mylar or Mellinex) protective layer.

Works of art, paper-based, *framed, in historic frames*, con't:

- UV-filtering, acrylic glazing should be placed between the mat and the original glass. This also protects the piece from damage should the period glass break.
- An isolating layer of polyester film (Mylar or Mellinex) should be placed between any wood backing boards and the piece.
- If the piece did not have a backing board, a Coroplast backing board should be made. (Coroplast is preferred over foam boards because it is moisture-resistant and chemically inert.)

Pieces in historic or custom-size frames can be stored in two ways: on hanging rack-screen storage (as for paintings) or on horizontal shelf ("bakers' rack") storage.

- Materials with a dimension in one direction larger than 32" should be stored on rack screens.
- Vertical storage is also preferred for stable, smaller materials.
- Please Appendix 2B for details of hanging pieces on rack screens.
- Horizontal storage should be reserved for friable media such as pastels and charcoal and for some collage pieces.

5. Works of art, paper-based, *portfolios and bound materials*: in flat print boxes on shelves.

- Scrap books and portfolios and require different handling than bound library and archive materials.
 - Scrap books and portfolios should be housed in print storage boxes on shelves; they can be near or with storage for not-framed works of art on paper.
 - Treatment of scrap books and portfolios classified as library and archive materials is the same as that for similar materials classified as works of art.
- The covers and pages should be arranged so they are not askew, and if possible should be interleaved, taking care not to can stress the binding with too much interleaving.
- Loose covers and text blocks should be consolidated by tying with twill tape to avoid deforming the covers.
- If the pages are excessively tattered, dog eared or losing fragments, the book or folio should be wrapped in archival-quality tissue before being tied with twill tape.
- The book or folio should then be fitted into a flat print box with all four edges shimmed with Ethafoam blocks to keep it from moving within the box.

B. Works of art, photographic materials

1. Works of art, photographs, on paper and/or paper-based boards, *not framed, small/medium-size*: in storage mats in print storage boxes in cabinets with gasketed doors in cold storage room.

With some exceptions noted below, all photographs that are not framed should be prepared with a standard-sized storage mat. Once in storage mats, these pieces can be stored in boxes. The storage mats should be matched to the box sizes.

- Photographs smaller than 22" x 28", are candidates for print storage boxes in cabinets with gasketed doors in the cold storage room.
- Flat, deep-lid, print storage boxes are recommended.
- Two or three standard sizes of print storage boxes should be selected. The recommended box sizes are: 16" x 20" x 3", 20" x 24" x 3", 22" x 28" x 3", and 24" x 30" x 3".

Works of art, photographs, *not framed, small/medium-size*, con't:

- The box sizes should correspond with the standard sizes of frames in the collections, to accommodate matted materials after exhibit.
 - Materials should be provided with four-ply or eight-ply storage mats. Storage mats include a back mat of archival-quality board attached with gummed linen tape to an archival-quality four-ply or eight-ply window mat.
 - Matted artworks should be interleaved with buffered tissue, and placed in an appropriately sized box.
 - Boxes can house up to 10 matted objects, depending on the mat depth.
2. Works of art, photographs, on paper and/or paper-based boards, *not framed, large-size* (up to 36" x 48"): in storage mats in cabinets with gasketed doors in cold storage room.
- Photographs larger than 22" x 28" should be fitted with four-ply storage mats as described above. Sizes should be standardized; pieces can be stacked with mats of the same size.
 - Pieces in mats larger than 24" x 36" should have mats made from 8 -ply board.
 - The mats should be sized to fit in the size of cabinet to be used.
 - The matted pieces should be placed in storage cabinets with gasketed doors in cold storage.
3. Works of art, photographs, *not framed, oversize (larger than 36" x 48")*: framed and hung on rack screens.

Oversize photographic works of art **must** be framed to preservation standards and stored on rack screens, as recommended for framed works on paper and paintings. (See Appendix 2B for details on framing and hanging framed works on rack screens.) Cold storage is not appropriate for framed materials.

4. Works of art, photographs, *framed*: storage depends on type of framing.

a) Pieces in *exhibition frames*:

- Pieces in standard exhibition frames should be removed from the frames. Storing exhibition frames separately makes it easier to store them safely and is a space saver.
- The matted pieces can be flat stored in print boxes in cabinets with gasketed doors in cold storage room. (The sizes of the boxes should match the exhibition frames.) This will minimize the risk of damage to the pieces.
- The framing materials (glazing, backing boards, and hanging hardware) should be systematically stored by size to ease re-use.
 - Glazing should be individually wrapped to keep it from getting scratched; it can be stored along with the backing boards in vertical slot storage.
 - Pieces of glazing should be interleaved with the backing boards.
 - Hanging hardware should be removed from all exhibition frames.
 - Framing materials should be stored in or near a work room, not in collections storage.

While materials should not be stored over the long term in their exhibition frames there is a need for temporary storage of pieces that are waiting to be removed from their exhibition frames or waiting to go into an exhibition. These pieces can be stored in vertical slot storage in cabinets or on shelves.

Works of art, photographs, *framed*, con't:

b) Pieces in *historic or otherwise significant frames*:

- Photographs in stable frames that have intrinsic or historical value should remain framed with their original frame components. Many of the frames will require modifications to ensure the contents are framed to preservation standards.
 - The rabbet should be given a barrier of Marvelseal to prevent wood acids from seeping into the primary support or mat materials
 - Acidic mats should be replaced with acid-free mats. For provenance reasons, the original mat can be secured in the back of the frame with a polyester film (Mylar or Mellinex) protective layer.
 - UV-filtering, acrylic glazing should be placed between the mat and the original glass. This also protects the piece from damage should the period glass break.
 - An isolating layer of polyester film (Mylar or Mellinex) should be placed between any wood backing boards and the piece.
 - If the piece did not have a backing board, a Coroplast backing board should be made. (Coroplast is preferred over foam boards because it is moisture-resistant and chemically inert.)
- Pieces in historic or custom-size frames can be stored in two ways: on hanging rack-screen storage (as for paintings) or on horizontal shelf ("bakers' rack") storage.
 - Materials with a dimension in one direction larger than 32" should be stored on rack screens.
 - Vertical storage is also preferred for stable, smaller materials.
 - Please Appendix 2B for details of hanging pieces on rack screens.
 - Horizontal storage should be reserved for damaged pieces or pieces with unstable frames.
- Remember that framed photographs should not be stored in the cold storage room.

5. Works of art, photographs, *on non-paper-based supports*: framed and hung on rack screens.

6. Works of art, photographs, *portfolios, etc.*: in print storage boxes on shelves.

- Photography albums and portfolios require different handling than bound library and archive materials. Photography albums and portfolios books should be housed in print storage boxes on shelves.
 - The covers and pages should be arranged so they are not askew, and if possible should be interleaved, taking care not to can stress the binding with too much interleaving.
 - Loose covers and text blocks should be consolidated by tying with twill tape to avoid deforming the covers.
 - If the pages are excessively tattered, dog eared or losing fragments, the book or folio should be wrapped in archival-quality tissue before being tied with twill tape.
 - The book or folio should then be fitted into a flat print box with all four edges shimmed with Ethafoam blocks to keep it from moving within the box.
- Many of these pieces can be stored in the cold storage room, but this is an item-by-item decision that should be made by a conservator.

7. Works of art, photographs, *video and DVD format*: in print storage boxes on shelves.

C. Library and archive materials

Library and archive materials include documents, books, pamphlets, magazines, and some photographic materials; most are approximately legal-sized or smaller.

1. Library and archive materials, paper-based, *documents, pamphlets, magazines*: in flip-top document cases on library shelving or in cabinets that could have gasketed doors.
 - Flip-top document cases (approx 12" high x 15" wide x 4" deep) made from 60 pt. barrier board are recommended as the standard housing for library and archive materials.
 - Barrier board boxes will provide a visual indicator of document housing vs. textile or artifact boxes, which are often made of archival corrugated board.
 - Barrier board boxes are better suited to hold the weight of a volume of paper materials.
 - Items should be placed in flip-top document cases so that they are stored upright on the item's longest edge rather than in stacks.
 - Those archival materials that are too large for document cases can be housed in folders within flat print storage boxes. Any items that would inspire placing document cases on their sides should be prepared for flat storage.
 - It is important to standardize to one size of document case and one or two sizes of print boxes to avoid a jigsaw environment on the shelving units.
 - The standardization of sizing should further carry through to enclosures.
 - The enclosure should be fit to the size of the housing to provide better support for the contents, keep materials from sliding out of order (i.e. maintains collation), keep small items from being misplaced, and provide easier access to the contents.
 - Archival-quality paper folders can be used as enclosures for homogenous paper collections.
 - For any mixed archive collections (including those with photographic materials) or collections with obviously highly acidic papers, it is best to use non-porous and inert enclosures (polyethylene, polypropylene, or polyester film). The need to isolate these materials so they do not damage adjacent papers warrants the expense of the film-based enclosures.
 - Box dividers and spacers for boxes that are not full should be used to ensure materials do not slump or move. Dividers and spacers are sold, precut and scored to fit the boxes.
 - File boxes are acceptable for the initial acquisition of materials and as a short term container until collections are processed, but they should not be used for long-term storage for paper-based artifacts.
 - Generally, file boxes are too large for storage of these artifacts as they do not provide adequate support. Folders in these boxes tend to slump against one another.
 - The depth of the boxes leads to stacks of artifacts that are too large, leading to damage from excessive handling and weight.
 - File boxes also encourage storage of mixed materials that may damage one another.
2. Library and archive materials, paper-based materials, *books*: in phase boxes on library shelving or in cabinets that could have gasketed doors.
 - Books classified as "special collections" should be housed in phase boxes.
 - Phase boxes -- custom made protective enclosures, in either "four-flap" or "clam shell" designs -- offer protection and support to fragile books.
 - Once in phase boxes, special collections books can be stored on shelves.
 - Books should be stored on shelves with their bindings vertical.

3. Library and archive materials, paper-based materials, *scrap books and portfolios*: in phase boxes on library shelving or in cabinets that could have gasketed doors.
 - Scrap books and portfolios and require different handling than bound library and archive materials.
 - Scrap books and portfolios should be housed in print storage boxes on shelves; they can be near or with storage for not-framed works of art on paper.
 - Treatment of scrap books and portfolios classified as library and archive materials is the same as that for similar materials classified as works of art.
 - The covers and pages should be arranged so they are not askew, and if possible should be interleaved, taking care not to can stress the binding with too much interleaving.
 - Loose covers and text blocks should be consolidated by tying with twill tape to avoid deforming the covers.
 - If the pages are excessively tattered, dog eared or losing fragments, the book or folio should be wrapped in archival-quality tissue before being tied with twill tape.
 - The book or portfolio should then be fitted into a flat print box with all four edges shimmed with Ethafoam blocks to keep it from moving within the box.

4. Library and archive materials, photographic materials, *film-based materials -- negatives, slides, reel film*: in individual paper protective enclosures, in barrier-board storage boxes, in cabinets with gasketed doors in cold storage room.
 - Negatives and slides should be housed in individual enclosures: paper sleeves/ envelopes/ folders. The enclosures should be sized to the size of the box.
 - Once sleeved, negatives and slides up to letter/legal size should be housed in flip-top document cases (approx 12" high x 15" wide x 4"deep) or in storage boxes made for the size of the negative/slide. The decision of which size to use should be made based on the variety or lack thereof in the collection.
 - The boxes and document cases should be made from 60 pt. barrier board
 - Barrier board boxes will provide a visual indicator of document housing vs. textile or artifact boxes, which are often made of archival corrugated board.
 - Barrier board boxes are better suited to hold the weight of a volume of negatives.
 - Items should be placed in the boxes so that they are stored upright on the item's longest edge rather than in stacks.
 - Any sheet film materials larger than legal-size should be housed flat in print storage boxes.
 - Reeled film should be stored in commercially available boxes (of 60 pt. barrier board) sized for this material
 - Reeled film must be stored flat (with the reel resting horizontally), not upright.
 - The boxes should be placed in storage cabinets with gasketed doors in cold storage.

5. Library and archive materials, photographic materials, *cased photographs*: in barrier-board storage boxes with padded compartments or in padded drawers, in cabinets with gasketed doors or on shelves in paper storage area
 - Cased photographs should be housed in barrier board storage boxes with compartment trays or in compartments in drawers in cabinets. ;
 - Each compartment should have Ethafoam padded to support and protect the cased photograph.
 - Boxes of cased photographs should be stored horizontally on shelves.
 - Cased photographs should NOT be stored in cold storage.

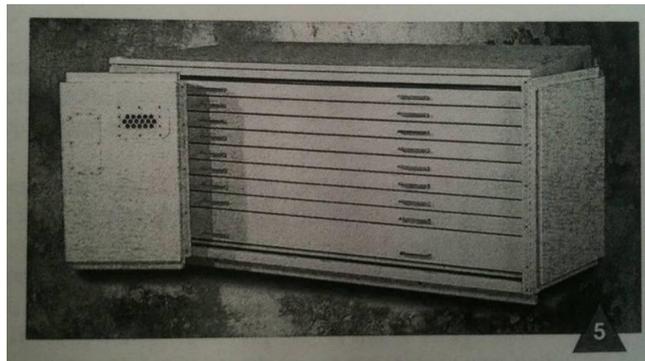
6. Library and archive materials, photographic materials, *glass plates*: in paper enclosures in barrier-board storage boxes, in cabinets with gasketed doors or on shelves in paper storage area
 - Glass plate materials require special mention because even small collections create a weight load that exceeds that of other photographic materials.
 - Glass plates should be housed in paper enclosures sized to fit the box
 - Glass plates must be stored vertically, not flat.
 - Glass plates should NOT be stored in cold storage.

❖ *Please see next pages for images of recommended storage furniture and a cold storage room, as well as a proposed layout for a cold storage room for the Collections Consortium photography collections.*

Semi-Custom Delta Designs Ltd. DDLX cabinets for cold storage room, showing two shelf configurations to accommodate print storage boxes and document cases:



Semi-custom Delta Designs Ltd. DDLX cabinets for oversize paper materials that cannot be framed or rolled (~ 96" wide x 54" deep x 42" high):



Sample flat horizontal storage (92" wide x 48" deep x 106" high, with 6" shelf spacing)
for framed paper and painting that cannot be stored on hanging racks.
Note that racks should have padded, metal shelves, rather than the wood shown here.



Sample of door-fronted cabinets for Library & Archive collections.
 These cabinets are compacting on tracks.
 Alternatively shelving c, 40" wide x 24" deep x 84" high could be
 for Library and Archive collections.



used

Example of a cold storage room:



Henry Wilhelm (left) and Mark McCormick-Goodhart stand in the cold storage room at Wilhelm Imaging Research Inc., in Grinnell, Iowa.

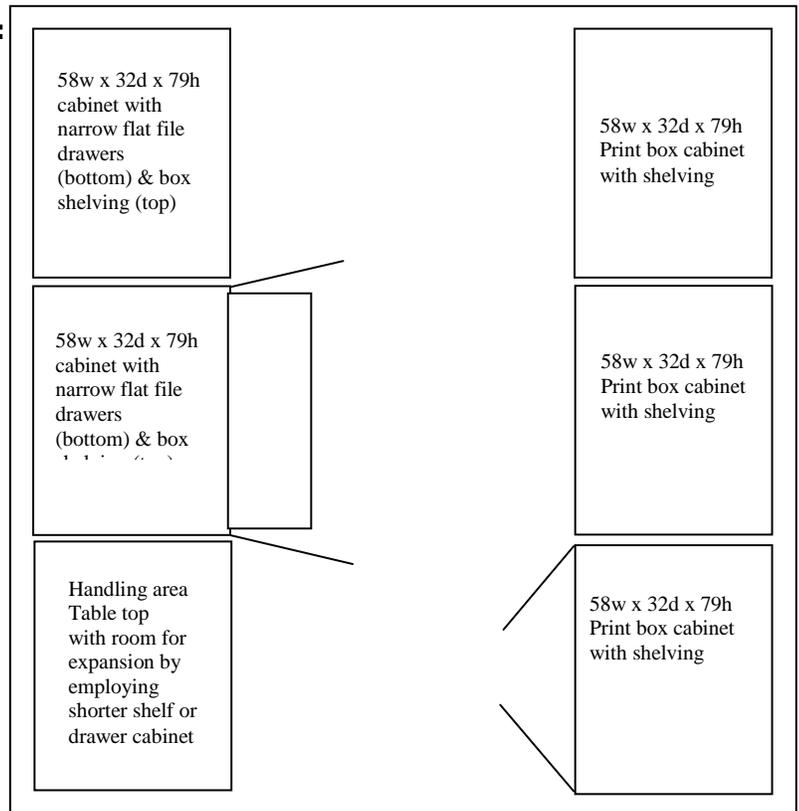
The doors of the cabinets that line the walls are fitted with gaskets that help control humidity levels to protect the negatives, film, and prints stored in the freezer units.

(Photo by Carol Brower Wilhelm - July 2002)

<http://www.wilhelm-research.com/subzero.html>

**Floor plan for proposed cold storage room:
 10' wide x 15' deep x 10' wide**

This room should accommodate current collections for WAAM and the three museums in the 2011 report, with some room for growth.



Appendix 2B -- Strategies for Storage of Paintings: Storage Furniture/Cabinets, Materials and Methods

1. Framed and stable paintings in good condition should be hung on rack screens for storage.³
 - Examine each painting before hanging to ensure that it is in stable condition.
 - Each painting must be hung from a frame; no painting should be hung by its stretcher. Hanging a painting by its stretcher damages the painting by creating a stressful distribution of weight to the stretcher members and the painted canvas.
 - Any painting that is not intended to have a frame may be secured in a travel frame and safely hung on racks.
 - Travel frames are designed to secure the painting without coming in contact with the painted face or sides of the painting.
 - See Appendix 2C for instructions on making a travel frame.
 - Provide each painting with a secure hanging device and method – a D-ring to which a double-sided hook can be fastened.
 - Rolling rack-screen systems are preferred. In these systems, the rack-screens move along tracks installed in the floor; the tracks are perpendicular to the screens.
 - There should be at least 12" between screens when the system is closed.
 - The system should provide space to create an aisle of at least six feet; this will allow safe access for ladders, etc. to hang or remove the paintings.
 - Paintings can be hung on both sides of the screens with a liberal amount of space around each painting to allow for safe handling.
2. Unstable paintings and unframed paintings (those not in travel frames) should be stored horizontally. It is crucial that paintings whose structures are insecure, damaged or otherwise fragile are stored in a horizontal position.
 - Unframed and unstable paintings should be stored on horizontal shelving units.
 - The bottom (and sides, if the unit has closed sides) must be padded with Volara foam or synthetic-fiber, low-pile carpet.
 - Paintings must be placed in a single layer; they should not be stacked.
 - The front of the storage unit should be draped to keep dust out. The dust shield can be made of fabric, such as light-weight muslin, Mylar, or Tyvek. Pull-up shades (a.k.a. Roman blinds) are another option for dust protection.

³ Stable, framed paintings can be stored vertically, either on rack-screen storage or in vertical-bin storage. Rack-screen storage is recommended as it is more efficient and safer for the paintings. Rolling rack-screen units are recommended because the paintings are subject to less movement when the screens are moved and because it makes more efficient use of space – space is needed for one aisle (moveable by moving the screens on the tracks) to access paintings, rather than an aisle the size of the entire unit. See next page for images of sliding and rolling rack screen storage systems.

*Right: Typical sliding rack screen storage, **not recommended***



*Below: Two views of **recommended rolling rack screen storage**:*



Note that this system holds collections made of various media, as recommended for the rolling rack screen system for the Hudson Valley Collections Consortium.

Calculations for rack screen storage needs for the WAAM paintings:

The WAAM paintings collection currently numbers over 500 paintings.
These paintings can be grouped into the following categories:

Small:	Paintings with a maximum dimension of 24" or less.	183 paintings
Medium:	Paintings with a maximum dimension between 24" and 36".	163 paintings
Large:	Paintings with a maximum dimension between 36" and 48".	154 paintings
Oversized:	Paintings with a maximum dimension between 48" and 72".	35 paintings
Extra-large	Paintings with a dimension greater than 72".	10 paintings

For maximum space efficiency for the current collection a total of 43 double-sided screens are required.

Each screen should be 10 feet high by 12 feet wide.

The following are possible hanging configurations for the remaining .

Configuration 1: Front: 1 oversized, 2 large, 2 medium
Back: 1 oversized, 2 large, 2 medium
Eighteen (18) screens of this configuration should accommodate:
36 oversized, 72 large, and 72 medium paintings.

Configuration 2: Front: 2 large, 3 medium, 4 small
Back: 2 large, 3 medium, 4 small
Twenty (20) screens of this configuration should accommodate:
80 large, 120 medium, and 160 small paintings.

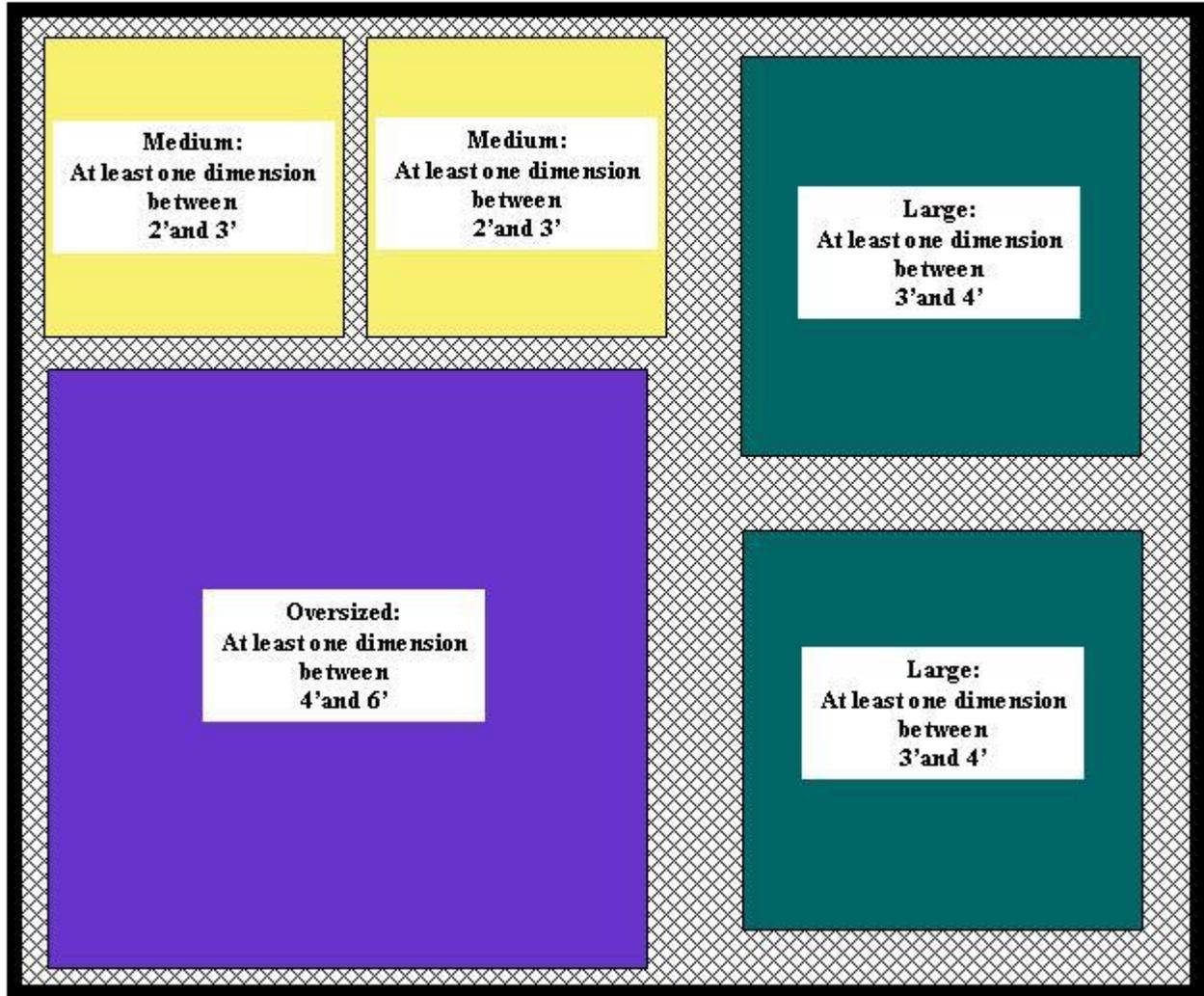
Configuration 3: Front: 1 extra-large, 4 small
Back : 1 extra-large, 4 small
Five (5) screens of this configuration should accommodate:
10 extra-large, and 40 small paintings.

Note that these configurations are for storage planning; when the paintings are hung on the new rack screens, the layout will vary.

Please see following pages for diagrams of the suggested screen configurations.

Screen Configuration 1

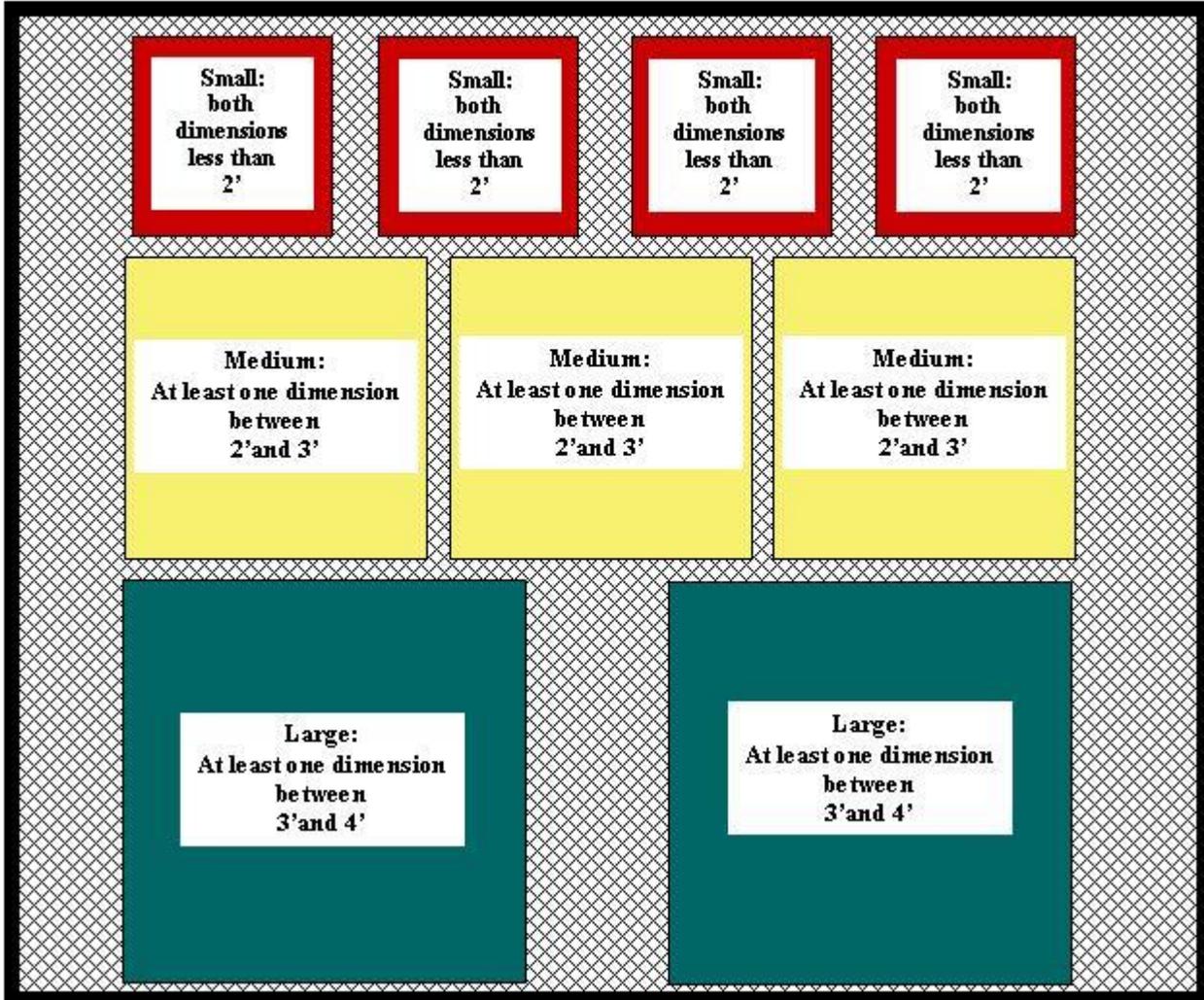
**This configuration should be used on both sides of these screens, so each screen can hold
4 medium-sized paintings, 4 large-sized paintings, and 2 oversized paintings**



Screen Configuration 2

Front / Back

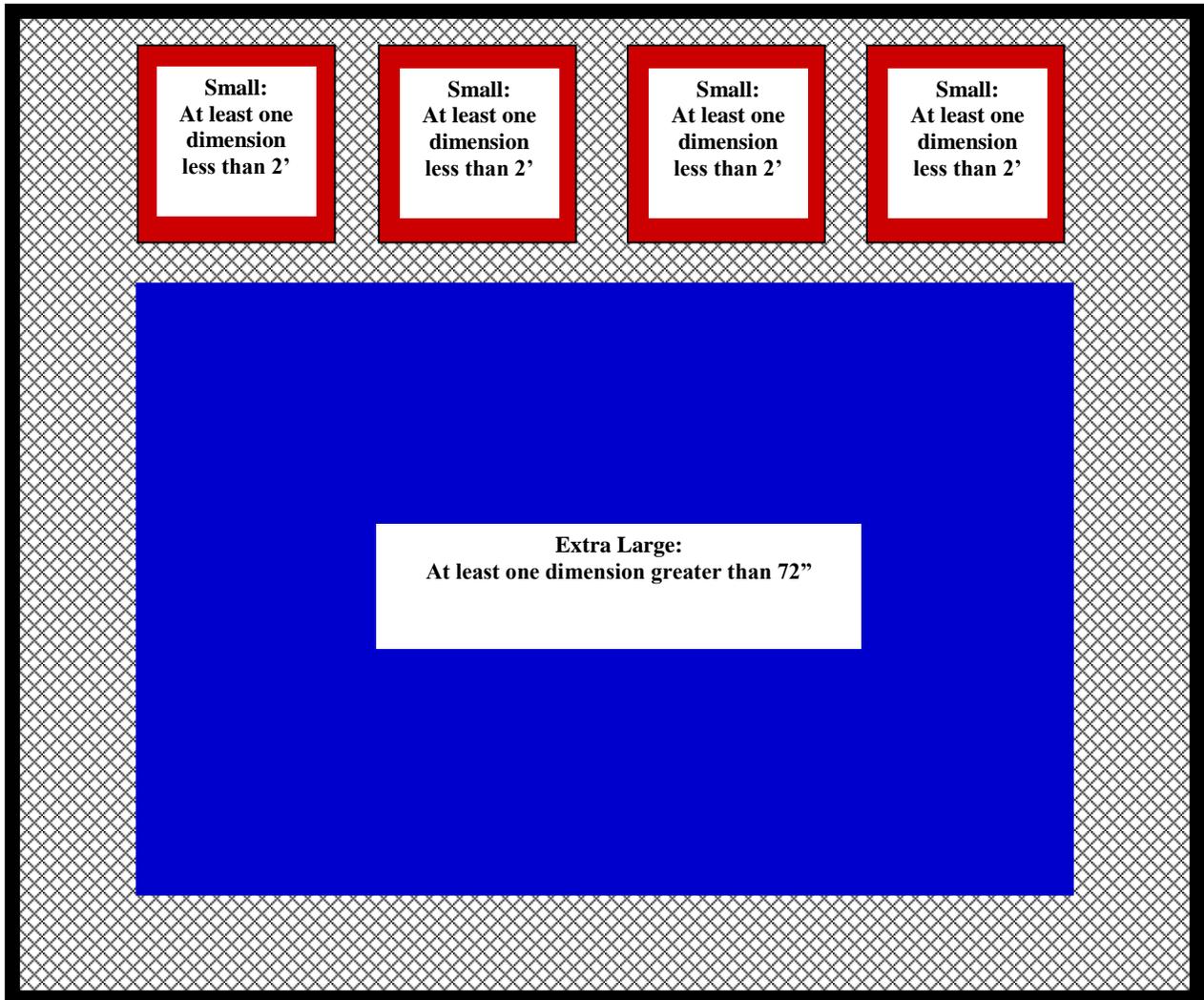
This configuration should be used on both sides of these screens, so each screen can hold 8 small-sized paintings, 6 medium-sized paintings, and 4 large-sized paintings.



Screen Configuration 3

Front / Back

This screen configuration should be used on both sides of the screen so that each screen can hold 2 extra—large sized paintings and at least 8 small sized paintings.



Appendix 2C: Strategies for Framing

Proper Frame Installation for Paintings and Works of Art on Paper

1. Make sure the workspace is clean and padded with moving pads, Ethafoam® or padded blocks.
2. Before turning the frame face down be sure the frame is stable with no loose ornament or gesso.
3. Clean the frame rabbet and then line the rabbet with self- adhesive synthetic felt. (available from www.testfabrics.com)
- 4.



Frame rabbet lined and Fitted with wood shims

5. Test fit the painting in the frame. If the painting is loose in the frame rabbet, cut wood shims and attach them to the sides of the rabbet with double-sided archival-quality tape.
6. Hold the painting in the frame with brass mending plates or offset clips attached to the back of the frame only. (Brass mending plates are available from www.preservationsupplyservices.com)
7. Attach a Fomecore® or Coroplast® backing board to the back of the stretcher with wood screws and finish washers to protect the canvas from punctures. (Note: Always be aware of the face of the canvas when working on the back, make sure it is resting on a soft and clean surface.)
8. Attach D-ring picture hangers to the back of the frame with wood screws. (D-ring hangers, and stainless steel picture wire are available from www.unitedmfrs.com)



Painting installed with brass mending plates

Travel Frame Construction:

This travel frame (Figures 1 and 2) is based on a design used at the National Gallery of Canada. It is suitable for most paintings on canvas, including those whose surfaces or corners are too fragile to be in contact with a travel frame. This travel frame can also serve as a permanent storage frame because no material is in constant contact with the paint surface. Mending plates can be used to attach a painting to this frame, but the screws have to be loosened and tightened for each use. (Taking screws repeatedly in and out of the same screw holes in a travel frame will eventually render the holes incapable of holding the screws; you may wish to consider using threaded T-nut fasteners in the wood to prolong use of the holes.) Multipurpose fasteners, such as 'Oz Clips' or similar hangers used at the Tate Gallery in London, have the advantage that they are permanently attached to the stretcher of a painting (Figure 6). They are used in closed position for display and in open position for attaching the painting to a travel/storage frame. When measuring for this frame, allow adequate hand space between the sides of the painting and the travel frame in order to place, secure, or remove the painting easily.

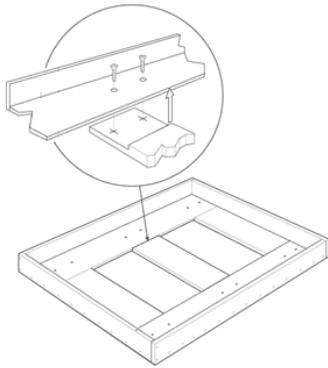


Figure 5. Painting in travel/storage frame.

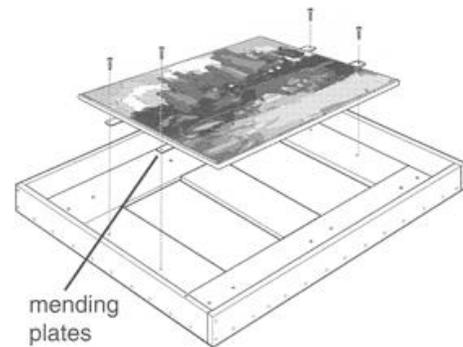


Figure 4. Construction of travel/storage frame.

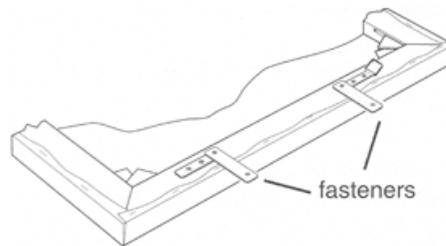


Figure 6. Multipurpose fasteners on painting's stretcher (in open position).

As an alternative to the use of multipurpose fasteners, screws can be used to attach the travel frame directly to the back of the painting's stretcher. However, this can be a risky procedure. The painting and the travel/storage frame need to be supported safely during attachment (e.g., face up on sawhorses) while their backs remain accessible so that screws can be inserted, and screws must not pass through to the front of the stretcher. Drawing a template of the painting's stretcher both on the back and inside of this frame can help position the screws and aid in future repositioning in the frame.

From: *CCI Notes 10/16, "Wrapping a Painting,"* Principal Author – Helen McKay
<http://www.cci-icc.gc.ca/crc/notes/html/10-16-eng.aspx>, accessed November 16, 2011

Appendix 2D -- Strategies for Storage of Three-Dimensional Collections: Storage Furniture/Cabinets, Materials and Methods

The strategies below should be followed when developing storage for any three-dimensional object, no matter what material it is made from or what size it is.

- Every item should have good and easy visual and physical access. Each piece should be visible and accessible without the need to move adjacent pieces.
- Pieces should be placed in stable, non-distorting positions, with auxiliary supports as required.
- No piece should rest directly on the floor. Large pieces can be placed on open storage units or raised up on individual supports.
- Smaller pieces may be stored in archival-quality boxes or in open storage.
 - This decision should be based on the foreseeable frequency of accessing the collection.
 - Boxes might provide more support, while open storage provides more visibility and quicker access.
- Compartmentalization in boxes or drawers should also be considered for small objects. Compartmentalized objects should be housed in individual openings of a size suited for their needs.
- Beyond the use of boxes, drawers and shelving units, racks, vertical bins, or hanging storage systems should be considered. The storage furniture and storage method that will provide the safest, most accessible, and most efficient support to each object or object type should be selected.

The following are illustrations of suggested designs for storage cabinets for small and medium-sized three-dimensional collections:



Shallow drawers spaced to provide sufficient height for storage of ceramics.
Photograph courtesy of New York State Museum.



Shallow drawers closely spaced for storage of small tools.
Photograph courtesy of New York State Museum.

Recommendations for Storage of Objects Made of or Containing Plastics, Rubber, or Synthetic Materials

Most museum collections, including the Dorsky, already have some items that are made, or partly made, of plastics, rubbers, and synthetic materials. As time progresses and the collections continue to grow, modern materials will increase in both number and diversity. These materials present developing preservation challenges, some of which are just beginning to be understood. Current recommendations for preservation of plastics, rubbers, and synthetic materials include:

- Identifying pieces that contain these materials and specifically, which materials (e.g., which plastic, what type of rubber) they contain.
- Providing specific support to those pieces to eliminate distortion and strain.
- Isolating items with unstable materials and placing them in the best environmental conditions available: low light levels, dust-free, stable, mid-range relative humidity, and stable, low temperature levels.
- Monitoring these materials for signs of instability.
- Employing interventive conservation treatments where necessary, either by removing or encapsulating harmful components or by attempting stabilization treatments. (These should only be done by a qualified conservator.)

For more detailed information on the issues and care of rubber, plastics and other synthetic materials, see also:

Canadian Conservation Notes, 15/1. Care of Objects Made of Rubber and Plastic. (R. Scott Williams. Ottawa, Canada: Canadian Heritage, 1997.)

"Care of Plastics: Malignant Plastics." (R. Scott Williams. Western Association for Art Conservation Newsletter. January 2002 Volume 24 Number 1)

Appendix 3 – Selected References for Further Reading

On general museum storage planning:

- Bachmann, K., ed. 1992. *Conservation concerns*. Washington, D.C.: Smithsonian Institution.
- Baril, P. 1997. *Technical bulletin no. 18: Fire prevention programs for museums*. Ottawa: Canadian Conservation Institute.
- Francis, K, et al. eds. 1998. Storage of textiles: issues and methods textile conservators face when planning for textile storage. *Textile Specialty Group Textile conservation catalogue chapter VIII*. Washington, DC: American Institute for Conservation. <http://www.conservation-wiki.com/index>. Accessed October 27, 2011.
- Hilberry, J. D., and S.K. Weinberg. 1981. Museum collections storage: Part 1. *Museum news*, Mar/Apr: 7–21.
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- Hilberry, J. D., and S.K. Weinberg. 1981. Museum collections storage: Part 3. *Museum news*, Jul/Aug:49–60.
- Johnson, E.V. and J.C. Horgan. 1978. *Museums collection storage*. Paris: UNESCO.
(above from AIC Textile Conservation Catalogue – Chapter VIII – Storage)

On environmental controls:

- American Society of Heating, Refrigeration and Air-Conditioning Engineers. 2007. Chapter 21: Museums, Galleries, Archives and Libraries. *2007 ASHRAE Handbook Heating Ventilating, and Air-Conditioning Applications*. Atlanta, GA
- Hatchfield, P. 2011. Crack, shrink, warp, flake: a new look at conservation standards. *Museum news*, Jan/Feb: 40-51.
- Conrad, E. A. 1995. *Balancing Environmental Needs of the Building, the Collection, and the User*. East Norwalk, CT: Landmark Facilities Group.
- Conrad, E. A. 1996. Environmental monitoring as a diagnostic tool. In *Preservation of collections: assessment, evaluation, and mitigation strategies*. Papers presented at the workshop, Norfolk, Virginia, June 10-11, 1996. Washington, DC: American Institute for Conservation of Historic and Artistic Works, 15-20.
- Erhardt, D., C. S. Tumosa and M. F. Mecklenburg. 2007. Applying Science to the Question of Museum Climate. In *Museum Microclimates, Contributions to the Copenhagen Conference, 19 - 23 November 2007*, ed. T. Padfield and K. Borchersen. National Museum of Denmark, 11-18.
- Grattan, D. and S. Michalski. 2010. Environmental Guidelines for Museums - Temperature and Relative Humidity (RH). Ottawa, Canada: Canadian Conservation Institute. www.cci-icc.gc.ca/crc/articles/enviro/index-eng.aspx. Accessed November 30, 2011.
- Mecklenburg, M. F. 2007. Determining the Acceptable Ranges of Relative Humidity and Temperature in Museums and Galleries. Washington, DC: Smithsonian Museum Conservation Institute. www.si.edu/mci/downloads/repor...cklenburg-Part1-RH.pdf and www.si.edu/mci/downloads/repor...lenburg-Part2-Temp.pdf . Accessed November 30, 2011.
- Michalski, S. 2007. [The Ideal Climate, Risk Management, the ASHRAE Chapter, Proofed Fluctuations and Toward a Full Risk Analysis Model](#). Contribution to the Experts' Roundtable on Sustainable Climate Management Strategies, April 2007, Tenerife, Spain.
- Pacifico, M. F., and T. Wilsted. 2009. *Archival and Special Collection Facilities: Guidelines for Archivists, Librarians, Architects, and Engineers*. Chicago, IL: Society of American Archivists.
- Weintraub, S. 2006. The Museum Environment: Transforming the Solution into a Problem. *Collections: A Journal for Museum and Archives Professionals*, 2:3, 195-218.

On cold storage for photographic materials:

McCormick-Goodhart, M.H. 1996. The allowable temperature and relative humidity range for the safe use and storage of photographic materials. *Journal of the Society of Archivists*, 17/No.1

McCormick-Goodhart, M.H. 1996. Temperature and relative humidity recommendations for the safe use and storage of photographic materials. *Final Program and Advance Printing of Paper Summaries, IS&T 49th Annual Conference*. Springfield VA: The Society for Imaging Science and Technology.

McCormick-Goodhart, M.H. 1999. Alternative archival facilities. Presentation at the 14th annual national archives and records administration preservation conference, Washington DC, March 25, 1999.
http://www.wilhelm-research.com/subzero/nat_archives_99.pdf Accessed November 23, 2011.

McCormick-Goodhart, M.H. and H. Wilhelm. No date. The design and operation of a passive humidity-controlled cold storage vault using conventional freezer technology and moisture-sealed cabinets.
http://www.wilhelm-research.com/subzero/WIR_ISTpaper_2004_04_MMG_%201.pdf
Accessed November 23, 2011.

Appendix 4 – Storage Furniture Suppliers

Burroughs Corporation 800 - 748 - 0227 <http://www.borroughs.com/HOME.aspx>

Delta Designs, DDLX series 800 – 656 – 7426 <http://www.deltadesignsltd.com/index.html>

Donnegan Systems/Spacesaver 800 – 222 - 6311
[http://www.donnegansystems.com/Fine Art Museum Storage.html](http://www.donnegansystems.com/Fine_Art_Museum_Storage.html)

Steel Fixture Manufacturing Company 800 – 342 - 9180
<http://www.steelfixture.com/products/museum.shtml>

Viking Metal Cabinet Company 800 – 776 - 7767
<http://www.vikingmetal.com/products/index.asp?cid=1>

Appendix 5 - Suppliers for Storage Materials

Archival Methods -- <http://www.archivalmethods.com/> -- acid-free papers, boards, and boxes;
exhibition frames and mat board

Archivart -- <http://www.archivart.com> -- acid-free papers, boards, and boxes

Art Preservation Services -- <http://www.apsnyc.com/> -- environmental measurement and control
products; archival-quality barrier materials

Artspacers.com -- <http://www.artspacers.com> -- RabbetSpace ® to extend the depth of a frame
rabbet

Bags Unlimited -- <http://www.bagsunlimited.com/> -- polyethylene bags, including "ziplocks"

Conservation Resources -- <http://www.conservationresources.com/> -- acid-free papers, boards,
and boxes; archival-quality barrier materials

Gaylord Bothers -- <http://www.gaylord.com/> -- acid-free papers, boards, and boxes; archival-quality
barrier materials

Hiromi Paper International -- <http://www.hiromipaper.com/> -- acid-free papers

Hollinger Metal Edge Corp -- <http://www.hollingermetaledge.com/> -- acid-free papers, boards,
and boxes; archival-quality barrier materials

Image Permanence Institute -- <http://www.imagepermanenceinstitute.org> -- Climate
Notebook®
dataloggers and software

Invisium -- <http://invisium.com/> UV-filtering acrylic glazing for framing

Light Impressions -- <http://www.lightimpressionsdirect.com> -- acid-free papers, boards, and
boxes; archival-quality barrier materials; exhibition frames, mat boards, and glazing

Masterpak -- <http://www.masterpak-usa.com> -- acid-free papers, boards, and boxes; archival-
quality barrier materials

Museum Services Corporation -- <http://www.museumservicescorporation.com> -- needle-punched
polyester batting, acid-free boards, Coroplast®, welder for encapsulation

Preservation Supply Services -- www.preservationsupplyservices.com -- brass mending plates for
installing
artwork in frames

Quadrant -- <http://www.quadrantmoulding.com/> -- framing supplies (mat board, UV-filtering
glass and acrylic)

Small Corp -- <http://www.smallcorp.com> – exhibition frames, support panels, oversized UV-filtering glazing and mat board

Talas -- <http://talasonline.com> -- acid-free papers, boards, and boxes; archival-quality barrier materials

Test Fabrics-- www.testfabrics.com – self-adhesive, synthetic felt for lining frame rabbets; muslin and other fabrics; needle-punched polyester batting

Tru Vue -- <http://www.tru-vue.com/Museums/products/optium-acrylic> -- UV-filtering glass and acrylic glazing

U Line -- <http://www.uline.com/> -- wheeled platforms for furniture storage and handling

United Manufacturers -- <http://www.unitedmfrs.com> – framing supplies: D-ring hangers and stainless steel picture wire

University Products -- <http://www.archivalsuppliers.com> -- -- acid-free papers, boards, and boxes; archival-quality barrier materials; exhibition frames, mat boards, and framing hardware

Woodworker's Supply -- <http://woodworker.com> – casters for furniture platforms

**Appendix 6 - Compilation of Storage Furniture Recommended for Collections Consortium
UPDATED 2013 to include storage furniture for four institutions**

TYPE OF FURNITURE	DIMENSIONS	QUANTITY NEEDED / INTERIOR FITTINGS	NOTES
RACK SCREEN STORAGE SYSTEM	Footprint for rack screen system: 15 feet x 84 feet (Or 30 feet x 42 feet) 12 feet wide x 10 feet high -- and -- 12 foot wide unit	77 screens -- and -- 1 unit with supports for rolling tubes	<i>The footprint (floor space) for the rolling system includes 12 inches between racks/rolling unit (when closed) and space for a 6 foot aisle.</i> A rolling system with screens for framed works of art (various media) and 3-dimensional objects -- and -- A carriage on the system for large textiles and oversize works of art on paper and photographs that can be rolled.
CABINETS AND SHELVING UNITS THAT COULD BE PLACED ON MOBILE STORAGE SYSTEM:			<i>If a mobile system is selected, sufficient space should be allocated for an aisle that is twice as deep as the deepest unit on the system.</i>
Cabinets (semi-custom), with gasketed doors	58" wide x 32" deep x 79" high	13 cabinets with a total of c. 177 shelves	
Cabinets (semi-custom), with gasketed doors OR open shelves	58" wide x 32" deep x 79" high	3 units with a total of 40 shelves/slots -- and -- 2 cabinets with vertical slotted storage	

An Assessment of Collections Storage Needs for the Woodstock Artists Association & Museum,
one of five museums in the Hudson Valley Visual Art Collections Consortium

Appendix 5

TYPE OF FURNITURE	DIMENSIONS	QUANTITY NEEDED / INTERIOR FITTINGS	NOTES
<i>Cabinets and shelving units that could be placed on mobile storage system (con't):</i>			
Custom oversize flat file cabinet	~98"wide x 62"deep x 17" high	2 five-drawer cabinet	
Flat file cabinet	~54"wide x 42" deep x 17" high (standard size)-	20 five-drawer cabinets with a total of 100 drawers	<i>Existing flat file cabinets can be re-used, but it is recommended that the sizes be standardized if a mobile system is selected.</i>
Shelving units (or cabinets that could have gasketed doors)	48" wide x 24" deep x 84" high	14 units with a total of 70 shelves	<i>Existing shelving in the mobile storage system at the SDMA can be re-used</i>
Cabinets (semi-custom), with gasketed doors	40" wide x 18-24" deep x 84" high	11 units with a total of: 50 - 3" deep drawers -- and -- 35 - 6" deep drawers (3 of the 6" drawers fitted to support small rolled textiles) --and -- 1 unit with 8 - 3" deep drawers	

An Assessment of Collections Storage Needs for the Woodstock Artists Association & Museum,
 one of five museums in the Hudson Valley Visual Art Collections Consortium

Appendix 5

<p>Open shelving</p>	<p>96" wide 48" deep xx 84" high</p>	<p>6 units 4 with only floor and cover; 6 with floor, cover, and one adjustable shelf; 1 with cover and adjustable shelf but no floor</p>	
<p>FIXED SHELVING</p>	<p>92" wide x 48" deep x 106" high</p>	<p>4 units with a total of c. 50 shelves</p>	<p><i>These units --for storage of pastels, charcoal, graphite works of art on paper, and unstable paintings -- should not be movable, to reduce risk of damage from vibration</i></p>
<p>IN COLD STORAGE ROOM:</p> <p>Cabinets (semi- custom), with gasketed doors --</p>	<p>Cold storage room suggested: 10' wide x 15'deep x 10' high</p> <p>Cabinets: 58" wide x 32" deep x 79" high</p>	<p>6 cabinets with a total of 57 shelves and 18 narrow (~2" high) drawers</p>	

Notes: the list above includes only storage furniture, not storage materials or small hardware.