NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR

Conserve O Gram

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Museum Collection Storage Space: Is An Insulated Modular Structure Right For Your Collection?

An insulated modular structure (IMS), such as those manufactured by Bally Engineered Structures (Bally, Pennsylvania) is often used for collection storage in National Park Service (NPS) sites. However, an IMS may not always be the right choice. Occasionally, modular structures have been used in some situations where other options might have been more appropriate.

The IMS is usually assembled from panels made of polyurethane foam sandwiched between sheets of galvanized steel, stainless steel, or aluminum. The panels are strong and self-supporting and lock together. In construction, they are similar to large room-size walk-in refrigerators. Bally structures erected inside other buildings at Harpers Ferry National Historical Park (West Virginia), and Fort Pulaski National Monument (Georgia), and at several other NPS sites and public museums have been very effective in economically maintaining interior environments that meet NPS standards for the storage of museum collections. For results of tests run on the IMS in each of these parks, see Cultural Resources Management Bulletin, *CRM,* Volume 15, Number 4 (1992), "Collection Storage - Making a Case for Microenvironments."

Ideally, the decision to use an IMS for collection storage should be the culmination of a careful study of all available storage options. Those options could include converting existing space to collection storage, constructing new storage space using conventional building methods, erecting an IMS, leasing commercial storage space, or arranging for storage in a regional center (e.g. Federal or non-Federal repository). A Collection Storage Plan is a viable way to examine all the options for storing the collection.

Regardless of the means decided upon by the park and Region to correct storage space deficiencies, the space must meet the collection storage requirements specified in the *Cultural Resource Management Guideline* (NPS-28), the NPS *Museum Handbook*, Part I, (Rev 9/90), and Special Directive 80-1, "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections" (revised 1990) and its accompanying Department of the Interior Checklist for Preservation, Protection and Documentation of Museum Property (As Amended for Use by the NPS).

The following factors should be taken into account when considering an IMS for collection storage:

- An IMS is superinsulated and sealed to tightly control the infiltration and exfiltration of air. It is ideally suited for creating space that can maintain very stable relative humidity and temperature conditions.

- An IMS is highly recommended for use as a room within another structure, especially when the construction of a new building for collection storage would intrude on the historic scene.

An IMS is particularly useful in a historic building, where environmental conditions maintained for the preservation of the museum collection may conflict with the conditions necessary for preservation of the building itself.

An IMS will allow the desired conditions to be maintained inside collection storage space without needing to maintain the same conditions throughout the entire building, thereby avoiding potential damage to historic fabric. See Cultural Resources Management Bulletin, *CRM Preservation Tech Notes*, "Museum Collection Storage," Number 1 (1985), for additional information.

- An IMS can be used outside as a stand-alone structure, but only when properly designed for exterior use. The most important design feature distinguishing an IMS for outside use from one for inside use is the incorporation of an additional roofing system on structures used outside. A structure for outside use also may require added reinforcement for structural strength, wind resistance and snow loading, depending upon its size and the weather conditions to which it could be exposed.

- An IMS with a roof panel span greater than 17′ and used inside another building and an IMS with a roof panel span greater than 14′ used outside requires the addition of structural steel supports. Supports can be either internal columns supporting one or more steel beams or web trusses, or external overhead steel beams from which the ceiling panels are suspended.

- The floor for an IMS, when used inside another building, usually is made of pre-fabricated floor panels. The panels are simply assembled on the existing floor and shimmed to level. When the structure is used outside, the floor panels must be placed on a level concrete slab raised at least 4"-6" above the highest surrounding grade of the land. However, a concrete slab installed with a vapor barrier and rigid foam insulation having an R-value of at least 15 can be used in lieu of the floor panels. Regardless of the type of floor used, care must be taken to ensure that the level of the slab is at least 4"-6" above the highest grade of the surrounding ground and that the joint between the slab and wall or slab and the floor panels is tightly sealed with a long lasting sealant, such as silicone.

- The load exerted on the floor of a host building by a Bally structure is 4 pounds per square foot (sf) of floor, ceiling, and wall panels. For example, a 10′ wide x 10′ long x 10′ high structure would have a floor area of 100 sf (10 x 10 = 100), a ceiling area of 100 sf (10 x 10 = 100) and wall areas of 400 sf (10 x 10 = 100 x 4 walls = 400) for a total panel area of 600 sf. (600 sf x 4 pounds per square foot = 2400 pounds). Thus, a structure with a footprint of 100 sf would weigh 2400 pounds and would exert a load of 24 pounds per square foot on the floor of the host structure. This weight excludes the weight of any structural steel supports for structures with ceiling panel spans greater than 17′. Of course, this weight does not take into account the contents of the Bally structure either.

- Take into consideration severe weather conditions such as hurricanes and tornadoes. When dangerous conditions can be expected, an IMS should be used only as a room within an existing structure. In such cases, the host structure should be made as weather- and damage-resistant as possible.

  When circumstances dictate that an IMS is the best means to create collection storage space, but it can be used only outside as a stand-alone structure, it should be designed to withstand the severest conditions expected for that locality.

- An IMS can be designed to sustain a maximum wind load of 150 mph and withstand any snow load. However, engineers need to know early in the design process if the building needs to meet special requirements.

- An IMS can be considered no more fire-resistant than a building of wood-frame construction. According to literature provided by Bally Engineered Structures, the polyurethane foam interior of their panels will burn, but in the process, it chars instead of melts and therefore tends to insulate, rather than contribute to flame spread.

- An IMS can be simpler to procure than a conventional building because it is considered to be an item of equipment rather than a structure. Approval to buy equipment normally can be obtained more easily and quickly than approval to construct a building.

- An IMS can be constructed quickly and, consequently, can be put into service in much less time than a conventional structure. The modular prefabricated panels are simply latched together in very little time.

- An IMS costs up to 50% less than a conventionally constructed building of the same storage capacity.

- Once an IMS is designed and the building is received at the park, modifications in the use, design or configuration of the structure should be cleared through the manufacturer. Changing the shape or configuration of the structure or erecting an interior structure outside could cause the structure to lose effectiveness or even to fail.

- Air conditioning and heating equipment may be needed to achieve optimum interior environmental conditions within an IMS for museum collections storage. See *Conserve O Gram* 4/8, "Selecting Environmental Control Systems for Insulated Modular Structures."

Typically, many museums and historic structures have problems storing their collections. Objects often are stored in multiple buildings as well as separate rooms where storage conditions are not optimal and security and accountability are questionable. The use of an IMS allows museum staff to consolidate collections in one storage facility which can provide both satisfactory environmental conditions and improved physical security.

Checklist

Use this checklist as a guide to determine whether an IMS meets a park's needs and, if so, what type will be best suited for the site and the collection.

1. Does the park need additional environmentally controlled space to store museum collections? Yes___ No___

2. Does the park have a structure (historic or otherwise) that can be adapted to house the collection storage function in either renovated space or in an IMS? Yes___ No___

3. Is it easier or less expensive to purchase an IMS than to build a conventional structure of the same storage characteristics? Yes___ No___

4. Can an IMS be erected outside? If so, can it be designed to withstand the severest weather conditions expected? Yes___ No___

   a. Can the winds exceed the 150 mph maximum wind load of an IMS? Yes___ No___

   b. Can the IMS be built to withstand the severest snow loads anticipated? Yes___ No___

5. Will the IMS

   a. Be of a size to require a reinforced roof (17 feet maximum roof panel span inside and 14 feet maximum roof panel span outside)? Yes___ No___

   b. Require interior columns and steel beams or trusses for a structure used outside? Yes___ No___

c. Require external overhead beams for a structure used inside? Yes___ No___

6. If the IMS is constructed inside, will prefabricated floor panels be used? Yes___ No___

   If not, will the floor be insulated using conventional materials? Yes___ No___

7. If the IMS is constructed outside, can the supporting concrete slab be installed 4"-6" above grade? Yes___ No___

8. For an IMS built outside,

   a. Will prefabricated floor panels be used? Yes___ No___

   b. Or will a vapor barrier and rigid foam insulation be installed in the slab? Yes___ No___

9. If the IMS is built inside, can the host structure support the weight load of the IMS, storage equipment and objects to be stored? Yes___ No___

10. Will environmental conditioning equipment be necessary to achieve optimum interior conditions? Yes___ No___

Sources

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References

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