

PELELIU WORLD WAR II MUSEUM INTERIOR DESIGN AND
JAPANESE AIR HEADQUARTERS AND MUSEUM STABILIZATION PROJECT
Peleliu State, Republic of Palau



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Figure 1. Japanese Air Headquarters Building

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1 INTRODUCTION

1.1 Historical Overview

1.2 Maps

1.3 Project Approach

1.4 Consultant Team

1.5 Acknowledgements

1.6 Limitations

1.1 HISTORICAL OVERVIEW



Figure 2. Japanese Air Headquarters

Peleliu Battlefield includes all of Peleliu Island, which is in the southernmost part of the major Palau Islands. Peleliu is 30 miles south of Koror, the capital of the Republic of Palau, and 500 miles east of the Philippine Islands. It is six miles in length and two miles in width. Today, its people live primarily in two villages that were reconstructed after World War II (WWII): Klouklubed, the center of Japanese operations during WWII and capital of Peleliu, and Imelchol. Both villages are near the north end of the island.

The battle for Peleliu Island was the longest and one of the most hard-fought battles in the entire WWII Central Pacific amphibious operations. In contrast to earlier combat where the Japanese had vainly attempted to annihilate the enemy on the beaches, Peleliu's defenses were organized with the main line of resistance established inland, artillery and mortar fire registered on the beaches, and defenses skillfully arranged in depth in order to sustain resistance to an attack while destroying the enemy. Although the Japanese troops lost the battle, their new tactics enabled them to inflict heavy losses on American Marines and Army forces and to hold out for 74 days. Peleliu marked the conclusion of the Central Pacific drive toward the Philippines.

Today Peleliu is one of the most intact battlefields in the world, retaining most of the original Japanese buildings and defensive structures. Essentially, no repairs or significant modifications have been made. In particular, the highly visible and dramatic battle damage to the reinforced concrete buildings is largely unchanged since the war.

1.2 MAPS

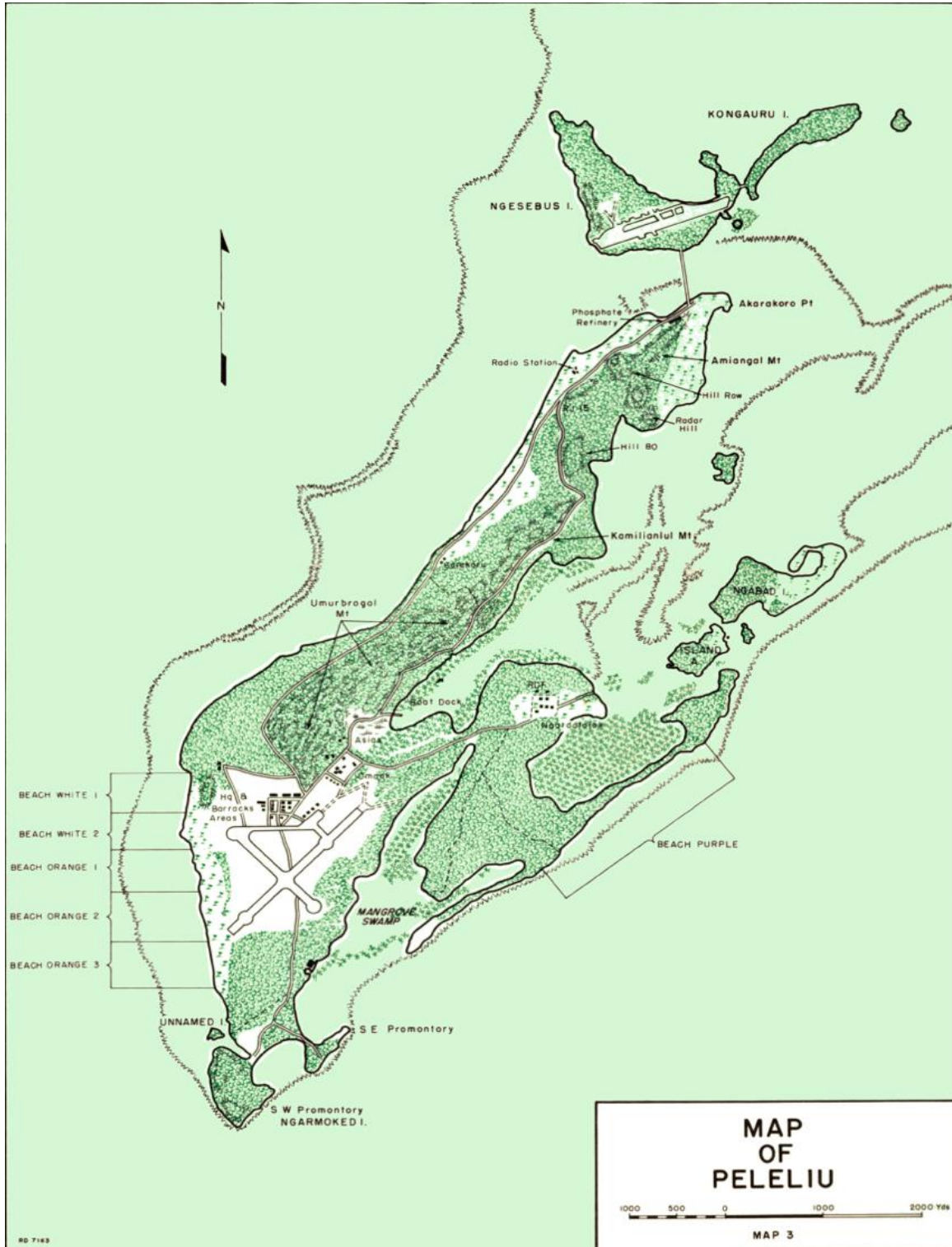


Figure 3. Peleliu 1944



Figure 4. Peleliu 2016

1.3 PROJECT APPROACH

Our team, composed of a historical architect, structural engineer and museum design consultant, arrived in Koror on June 3, 2016, had initial meeting with Palau Bureau of Cultural and Historical Preservation/Historic Preservation Office (HPO) staff on June 4th and 5th, and transferred by boat to Peleliu on June 6th. We worked from June 6th thru June 10th and then transferred back to Koror on June 11th and had meetings with Palau HPO staff on June 11th and 12th. The two sites in the study are 1930s era-type buildings constructed of cast-in-place concrete by the Japanese:

1. Peleliu WWII Museum
2. Japanese Air Headquarters Building

The following work was performed during our visit:

- Reviewed all pertinent existing photographs, maps and reports provided by the HPO. Some documentation in digital format was delivered to ARCHITEXAS, the historical architect, prior to arrival on site and other documents were reviewed during the course of work.
- Scheduled a site visit allowing participation of the HPO and other associated parties identified. The Governor of Peleliu provided site access and logistics through the HPO.
- The historical architect/lead investigator and other team members met the Secretary of the Interior's Standards for Professional Qualifications. The engineer has experience in the treatment of historic concrete resources located in tropical climates. The museum design consultant has experience in WWII Pacific War museum exhibit design.
- ARCHITEXAS and their sub-consultants first submitted a draft report for comments followed by this final report, as called for in the agreement. This report summarizes the observations, recommendations, and demonstrations provided during the site visit.
- The team inspected two sites (Japanese Air Headquarters and WWII Museum) and made recommendations for preservation and interpretation improvements at each structure. Select sample treatments were undertaken on-site.
- Specific concerns at the Museum for which the team made recommendations include:
 1. Cracks and leaks
 2. Need for painting or coatings
 3. Roofing improvements
 4. Structural stabilization
 5. Outside toilet facility
 6. Improved exhibit displays and visitor experience
 7. Temperature and humidity control requirements
 8. Storage requirements
 9. Removal of vegetation from the building exterior and adjacent site
- Specific concerns at the Japanese Air Headquarters for which the team made recommendations include:
 1. Shoring requirements
 2. Removal of vegetation from the building exterior and adjacent site
 3. Safety railings

1.4 CONSULTANT TEAM

Consultant team members required for the execution of this project included historical architects, a structural engineer and a museum exhibit designer familiar with and experienced in similar project work. The Historical Architect was responsible for the coordination of all project activities and production of the final report will head the project. The Historical Architect subcontracted with the structural engineer, museum exhibit designer, and other members of the team and coordinated their activities, and incorporated their findings and recommendations into the final report.



Figure 5. Project Team; Top Row (left to right) Chris Frison, Sunny O. Ngirmang, Stanley O. Graves, Scott Burghardt, Patrick Sparks, Larry Irsik, Craig Melde; Bottom Row (left to right) Derek Benjamin, Calvin Emesiochel, Errolflynn T. Kloulechad

The consultant team was headed by Stanley O. Graves, FAIA of ARCHITEXAS in Austin, Texas and Patrick Sparks, P.E., structural engineer with Sparks Engineering, Inc. from San Antonio, Texas. The team also included Larry Irsik, and Craig Melde, historical architects with ARCHITEXAS, and Chris Frison, museum design consultant. The Planning and Development and field work was conducted between July 5 and 10, 2016.

1.5 ACKNOWLEDGEMENTS

Palau Bureau of Cultural and Historical Preservation Staff

The authors are grateful for the assistance of Ms. Sunny O. Ngirmang, Director/Historic Preservation Officer, Palau Bureau of Cultural and Historical Preservation, and Mr. Calvin T. Emesiochel, Deputy Historic Preservation Officer, Errolflynn T. Kloulechad, Compliance Officer, and Derek Benjamin, Archeological Surveyor. They provided invaluable help with their extensive knowledge of the battlefield sites, local community and cultural resources.



State of Peleliu

We also wish to thank Governor Temmy L. Shmull for his cooperation and support during our time in the State of Peleliu.

Concrete Preservation Institute

We thank the Concrete Preservation Institute for technical support and for the use of specialized testing and repair equipment; Scott Burghardt, Director of Operations at CPI for the donation of his valuable time and travel, and his guidance in concrete repair.

BASF Corporation

We also thank BASF for their generous donation of roof repair and waterproofing products used on the Museum building.

Peleliu Museum Coordinator

We appreciate the assistance and guidance provided by Sharla Paulus, Peleliu WWII Museum Coordinator.

Local Peleliu Workers

We appreciate the invaluable assistance of the following local workers who provided construction labor at the WW II Museum building.

- Cain Iekar
- Ebony Oyama
- Raygaly Ichiro
- Tarkong Esebei
- Golt Oyama
- Albonso Keptot

1.6 LIMITATIONS

The architectural, structural, and museum assessments were based on visual field observations of readily accessible areas. The recommendations are based on the observed conditions at the subject property at the time of the assessment. Other conditions may exist, or develop over time, which were not found during the assessment. These recommendations do not represent a final design or specification. Additional investigation will be required as part of any comprehensive program or design leading to construction.

2 ARCHITECTURAL ASSESSMENT

- 2.1 Subject Buildings
- 2.2 Architectural Assessment
- 2.3 Project Accomplishments
- 2.4 Japanese Air Headquarters Museum Vision

2.1 SUBJECT BUILDINGS

Peleliu WW II Museum

Building Description

This single level, heavily reinforced concrete structure follows a standardized design type repeated by the Japanese at numerous Central Pacific bases. The building was constructed as an ammunitions storage warehouse/bunker and sustained moderate damage during the battle of Peleliu. It has been lightly modified to house a Peleliu WWII Museum with a collection of artifacts and exhibits on display.



Figure 6. Peleliu WWII Museum

Japanese Air Headquarters

Building Description

The Japanese Air Headquarters Building is among the most, if not the most, historically significant building associated with the Peleliu invasion. It served as the command and control facility for the airfield and capturing the airfield was the primary goal of the invasion.

The structure is a type-built late 1930s era Japanese military air headquarters facility. It was located adjacent to the taxi way linking the two landing strips of the airfield and was the hub of numerous air support facilities in the area.



Figure 7. The Japanese Air Headquarters, as it looked after the initial phase of battle in the fall of 1944

The two-story building consists of a front administrative section with an attached fortified radio transmitting and receiving section and a one-story wing with mess, latrine and bathing facilities.

The main building features open porches on three sides. It has roof terraces facing the airfields and over the one-story wing. The building is oriented along an east-west axis with its main entry on the south side.

The administrative section was constructed using a reinforced cast-in-place concrete frame with concrete floor and roof slabs, which are supported by a grid of beams spanning column-to-column throughout. The first floor is structurally suspended, having been cast on arch-shaped forms. The fortified bunker structure has thick load-bearing reinforced concrete walls on the exterior, with a single large central column supporting the second floor and roof slabs. The second floor is a two-way slab on beams, while the thick roof slab is a densely reinforced flat plate to resist bombardment.



Figure 8. Japanese Air Headquarters, 2013

The building had steel windows and doors. Those in the radio facility section were protected by massive vault-type blast doors and shutters. The interior finishes were utilitarian but of high quality. The hallway floors were of finely textured scored cement and there was wood block parquet in the office spaces. The walls were of smooth plaster applied either directly to the concrete structure or on metal lath. The walls and columns typically had a terrazzo-like wainscot. The ceilings appear to have been exposed concrete or suspended plaster.

2.2 ARCHITECTURAL ASSESSMENT OF THE PELELIU WWII MUSEUM BUILDING

An exterior and interior assessment with recommendations follows. It corresponds to keyed elevations and plans in Figures 14, 15 and 16.

Exterior Assessment Key Notes and Recommendations:

1. New entry doors and frames to replicate historic; painted black.
2. Relocate power service to the east side of the building with an underground feed.
3. Slope the perimeter grade to drain, typical.
4. Provide a French drain with filter fabric that utilizes coral rock around the building perimeter to reduce rising water migration at the base of the structure.
5. Remove the existing concrete entry stoop and replace with a flat concrete landing with perimeter steps that is the same width as the entry opening. Provide an inclined sidewalk at the left side of the entry landing.
6. Provide a stainless steel drip edge at the overhanging concrete canopies, typical.
7. Replace the entry porch light with an appropriate LED fixture. Consider adding LED building up-lighting and site lighting.
8. Add a panel or plaque with interpretation at the existing electrical panel location.
9. Remove the abandoned PVC conduit, typical.
10. Remove miscellaneous site debris and tree stumps, typical.
11. Create exterior displays with winding paths on the east side of the building. The paths can be hard packed sand with low rock edging.
12. Remove the power pole near the building and provide underground service from the service pole near the street.
13. Carefully remove vegetation from the face of the building and develop a maintenance plan to keep vegetation from re-establishing.
14. Remove wood frames, screens, and windows. Replace with historic metal windows.



Figure 9. Exterior Conditions of Museum Building



Figure 10. Exterior Conditions of Museum Building



Figure 11. Exterior Conditions of Museum Building

15. Replace poor quality concrete patching around windows on the south side, typical.
16. Remove miscellaneous non-historic wall attachments, typical.
17. Consolidate conduit penetrations, typical.
18. Provide underground wiring to A/C units.
19. Repair or replace HVAC units that are not working.
20. Relocate A/C unit on the west side to the south edge.
21. Catch roof runoff with splash blocks.
22. Extend scuppers to allow discharge beyond the face of the building.
23. Patch and conserve concrete and steel reinforcing at battle damage but leave evidence of impact intact.
24. Screen HVAC units on the west side.
25. Remove existing Plexiglas at battle damage openings and replace with clear acrylic or laminated glass that is shaped to fit the openings. The connecting frame from the glass to the concrete opening should be minimized.

Interior Assessment Key Notes and Recommendations:

26. Remove flooring and provide a self-leveling topping and new flooring.
27. Replace windows with steel and clear glass to match the historic windows.
28. Relocate HVAC lines at windows so they enter the building low at the existing vents and travel vertically on the plaster wall up to the units.
29. Patch major deterioration that is not related to bomb damage. Reconstruct cornice that is damaged on the south wall.
30. Improve lighting throughout with new LED light fixtures
31. Replace the existing fans with large diameter industrial style fans.
32. Remove paint from the walls and ceilings to expose the original concrete finish.
33. Repair failing concrete patches, typical.
34. Repair cracks at columns.
35. Replace the reception desk with a lower, more inviting desk.



Figure 12. Interior of Museum Building



Figure 13. Interior of Museum Building

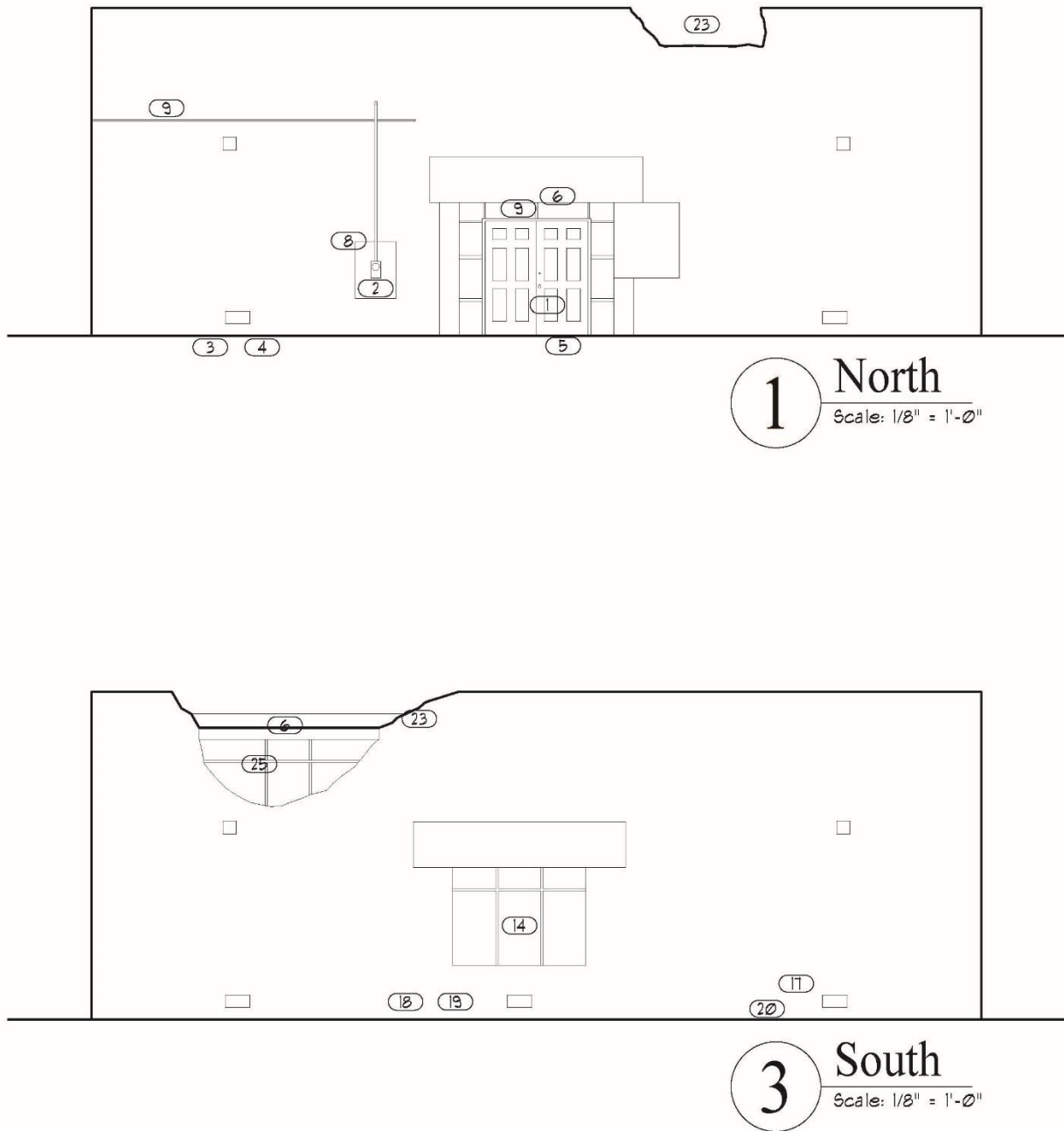


Figure 14. Museum Elevations with Keyed Notes

(Note: drawings are for graphic representation only and are not to scale)

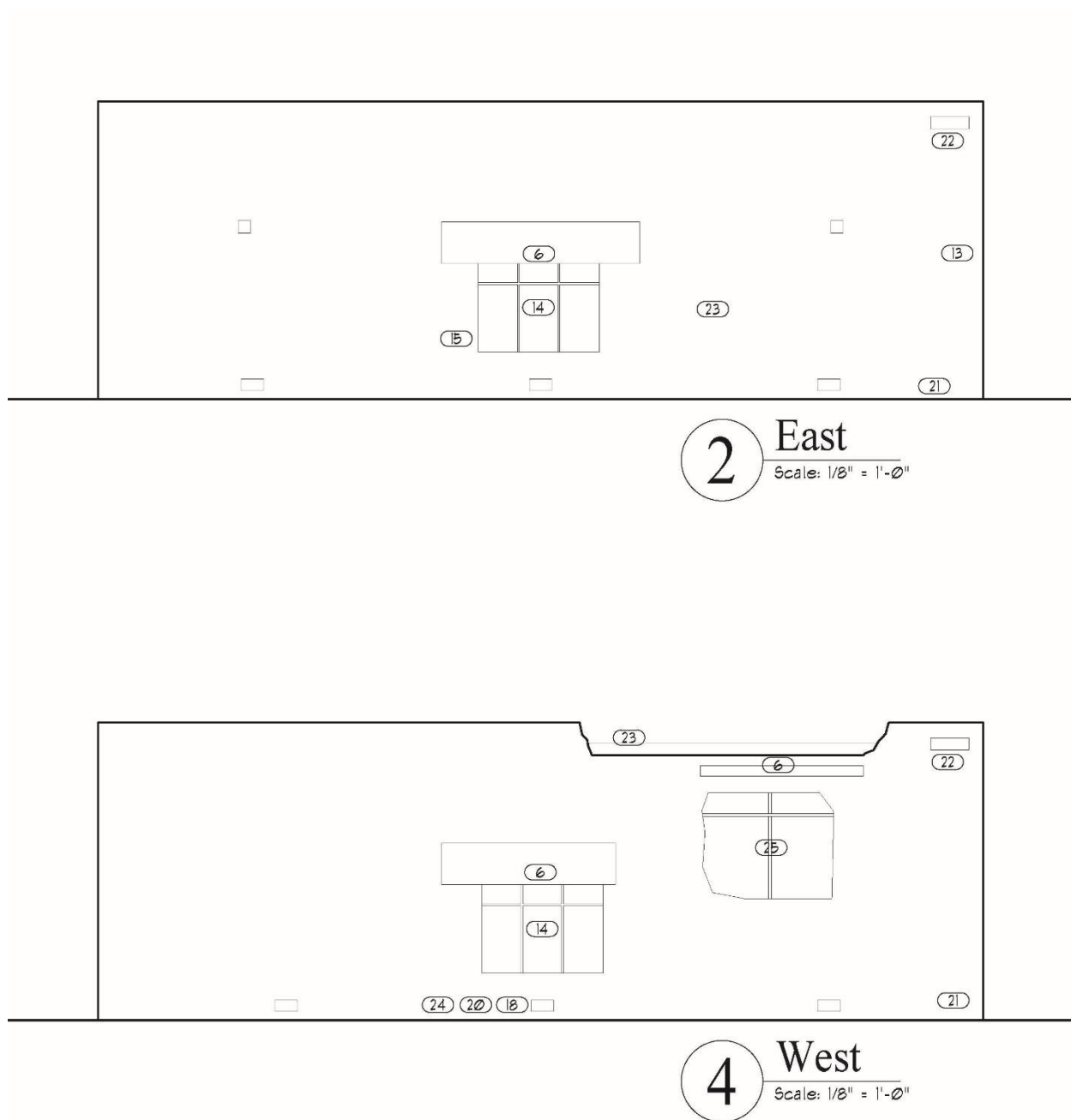


Figure 15. Museum Elevations with Keyed Notes

(Note: drawings are for graphic representation only and are not to scale)

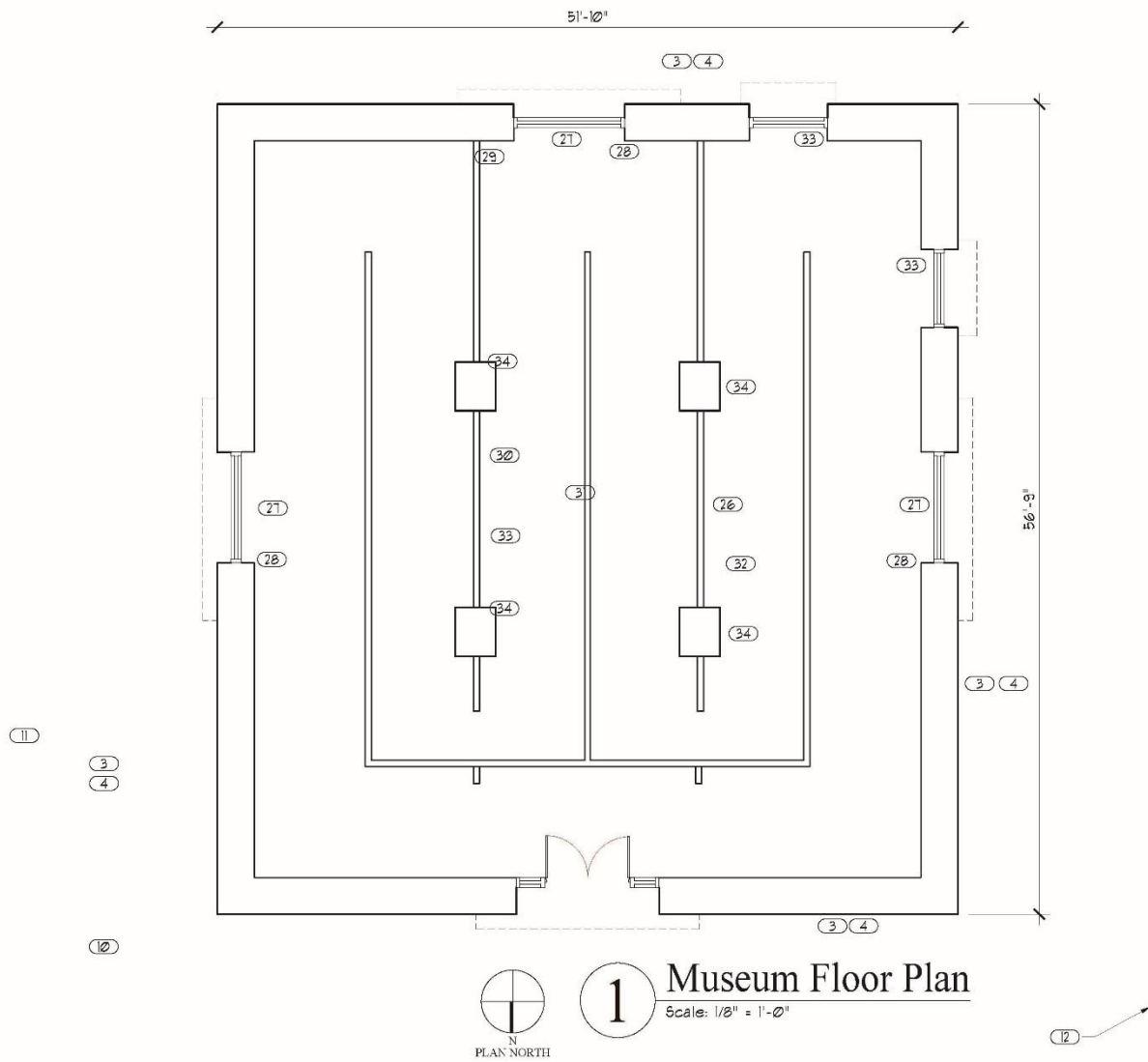


Figure 16. Museum Floor Plans with Keyed Notes

(Note: drawings are for graphic representation only and are not to scale)

2.3 PROJECT ACCOMPLISHMENTS

Peleliu WWII Museum

1. *Roofing*: Loose and spalling top coating material and vegetation was removed from the roof, the roof was power washed to remove dirt and biological growth, drainage paths were cut with grinders at ponded areas, low areas were infilled with patching material, exposed rebar was treated at blast areas, and the entire roof was coated with a cementitious waterproofing material.
2. *Front Door*: The severely damaged and deteriorated entry door was repaired and painted.
3. *Re-Alkalization Demonstration*: Sparks Engineering set up a re-alkalization demonstration at an east wall blast damage area.
4. *Vegetation Treatment and Removal*: Exterior vegetation was removed or treated with an herbicide.
5. *Prototype Museum Display Case and Exhibit*: A prototype display case was patterned after wartime ammunition boxes and was used as a U.S. machine gun display.
6. *Metal Object Conversation*: Several museum metal objects were treated to arrest corrosion.
7. *Collection Documentation*: D|G Studios documented the existing collections.
8. *Building and Site Conditions Assessment and Recommendations*: ARCHITEXAS conducted a building and site assessment of the buildings and made recommendations.
9. *Structural Assessment and Recommendations*: Sparks Engineering, Inc. conducted a building and site assessment of the buildings and made recommendations.

Japanese Air Headquarters

1. *Vegetation Treatment and Removal*: Limited vegetation removal on the second floor.
2. *Temporary Shoring*: Temporary column shoring was undertaken at four critical locations on the first floor where blast damage affected the integrity of the structure.
3. *Prototype Cable Railing Installation*: A sample cable railing protection system at the second floor was begun.
4. *Building and Site Conditions Assessment and Recommendations*: ARCHITEXAS conducted a building assessment of the buildings and made recommendations.
5. *Structural Assessment and Recommendations*: Sparks Engineering, Inc. conducted a building and site assessment of the buildings and made recommendations.

2.4 JAPANESE AIR HEADQUARTERS VISION

An excellent opportunity exists to tie the interpretation of this building into that of the main Power Plant and the Air Control Building by clearing the vegetation obstructing the view between these relatively close buildings. This would allow visitors to arrive and park at the Air HQ, tour this building and receive contextual information for the other two sites with the ability to walk to them on their own.

The Japanese Air Headquarters building is the most historically significant building associated with the Peleliu invasion. Capturing the airfield was the primary goal of the invasion, and the building served as the command and control facility for the airfield. Given the historical significance and the quality of the original design, the Air Headquarters building offers a significant opportunity to become the permanent location of the island's main museum and visitor's center. The arrangement and size of spaces available in the building can provide an exemplary museum experience that can capture the historical significance of Peleliu before, during and after the invasion.

After U.S. invasion, the Japanese Air Headquarters was heavily damaged due to intense bombardment which provides an interpretive opportunity. The elegantly designed yet utilitarian building constructed by the Japanese juxtaposed with the significant damage inflicted by the U.S. forces provides an appropriate setting to illustrate and convey the significance of this invasion.

The design approach would center on providing a visitor experience that could convey the Japanese situation before the invasion and the U.S occupation after the invasion. Large battle blast apertures can be incorporated into the permanent design while portions of the original Japanese setting can be reconstructed.

Another exhibit opportunity can be the Palauan experience before, during and after WWII. The building is of a size that could accommodate an area to convey the local, indigenous impact.



Figure 18. Exterior of Japanese Air Headquarters



Figure 17. Interior Staircase at Japanese Air Headquarters

Overall Preservation and Architectural Approach

- Conserve and restore the basic original design of open porches surrounding enclosed functional spaces.
- Conserve and rehabilitate the original fortified two-story bunker.
- Conserve and rehabilitate the one-story service wing with the original mess, latrine and bathing facilities.
- Conserve and rehabilitate the roof terraces over the one-story wing.
- Conserve and interpret the existing blast damaged areas including the roof areas.
- Conserve all existing original, extant building elements.
- Isolate blast areas and create new spaces with glass enclosures.
- New construction and infill shall be differentiated and of compatible design.

Program and Design

- Create a visitor reception area on the first level.
- Enclose the central three bays on the first level with glass and restore some of the original finishes, including the plaster ceilings and parquet wood flooring. Rehabilitate the first level of the fortified bunker to house the Japanese era exhibit.
- Enclose the central three bays on the second level with glass and restore some of the original finishes, including the plaster ceilings and parquet wood flooring. Rehabilitate the first level of the fortified bunker to house the U.S.-era exhibit. This would require a new bridge across the bomb blast area to access the second level of the fortified bunker.
- Maintain the open central blast-damaged bays on the first and second levels and roof area for exterior display of exhibits. These areas could potentially be the Palauan exhibit area.
- Utilize the service wing for office/administrative, food service and restroom functions.
- Rehabilitate or reconstruct the adjacent corrugated Quonset huts as large exterior display space for battle items such as tanks, trucks, jeeps, larger guns, etc.

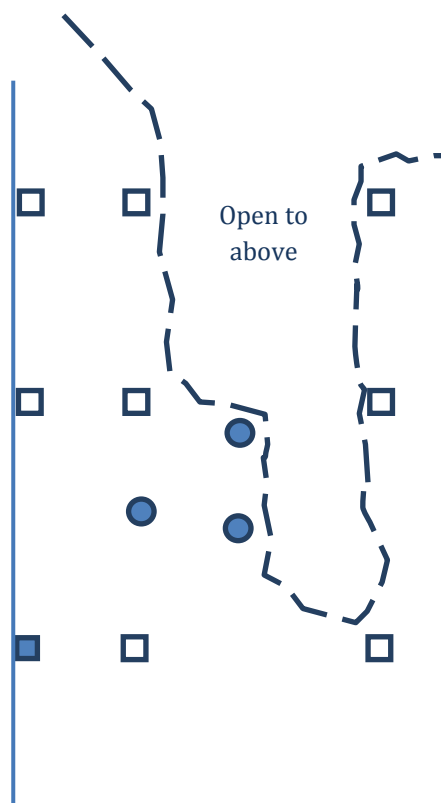
The existing Peleliu WWII Museum blockhouse could be utilized as a visitor orientation experience featuring an overview of the invasion in a large format video presentation. The road leading to the Japanese Air Headquarters could then be enhanced with interpretive markers and signage.

3 STRUCTURAL ASSESSMENT

- 3.1 Air Headquarters Building Structural Assessment
- 3.2 Museum Building Structural Assessment
- 3.3 Recommendations

3.1 AIR HEADQUARTERS BUILDING STRUCTURAL ASSESSMENT

As identified in the 2013 report by Graves and Sparks, several areas of the Japanese Air Headquarters building have been in need of immediate shoring. During the current study, we installed four shoring posts, as shown in Figure 19, as a demonstration of possible ways to provided support. One of the posts was made from locally available preservative-treated 2x6s, and three of the posts were made from locally harvested logs about 6-inches to 8-inches in diameter. Note that the posts should be considered temporary because of the risk of decay and the possibility of vandalism.



These four shoring posts are merely a demonstration of the use of available materials to support severely damaged structural elements.

Figure 19. Locations of temporary shoring installed as demonstration.

3.2 MUSEUM BUILDING STRUCTURAL ASSESSMENT

The museum building is a cast-in-place reinforced concrete warehouse of the same general structural design as the other fortified buildings on Peleliu.

The roof slab is approximately one-meter thick and is reinforced with both top and bottom rebar mats of 25-mm bars spaced about 130 mm on-center each way (Figure 20). The walls of the building have similar double mats, but the bars are about 16 mm diameter. Using Ground Penetrating Radar¹, we found that the columns have a double mat of rebar within 100 mm of the surface.

Cracking

There are two types of cracking in the Museum Building, both localized: impact fractures due directly to bombardment (Figure 21), and cracking caused by expansion of the corroding steel reinforcement. With regard to the latter cause, the worst corrosion is occurring around the edges of the battle-damaged areas, and where moisture levels are continually high (around the windows, column bases, column heads). The building has remarkably low deterioration, considering the battle damage and exposure to moisture.

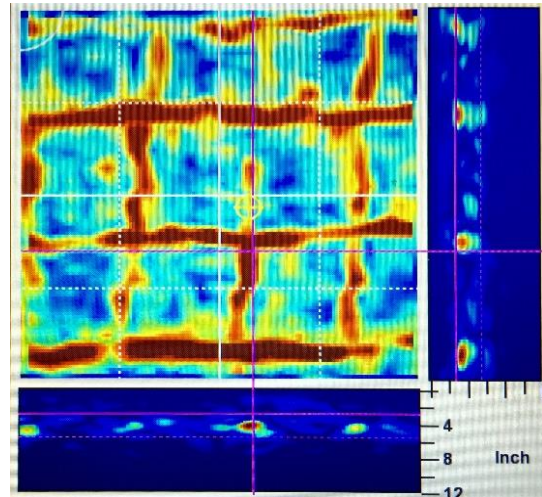


Figure 20. Ground Penetrating Radar image of rebar mat in roof of Museum Building

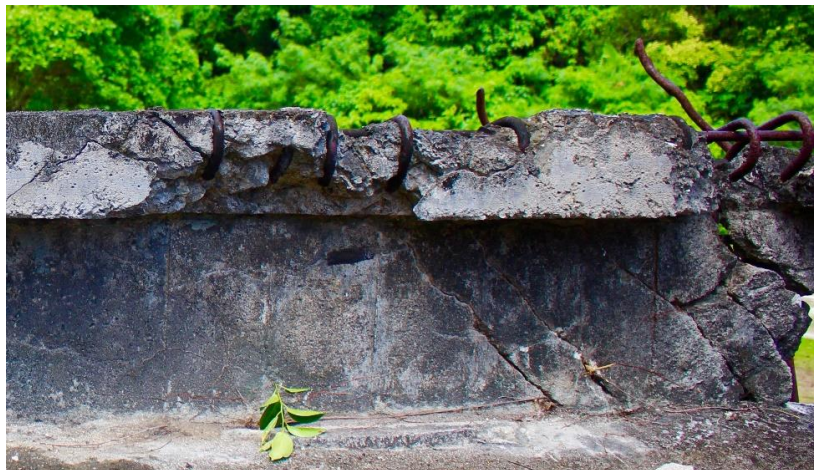


Figure 21. Inside face of south parapet showing fractures emanating from artillery battle damage.

Carbonation and Chlorides

Carbonation and chlorides are the two main determinants for vulnerability of corrosion of rebar in concrete.

Carbonation is the natural process of cement absorbing carbon dioxide from the atmosphere, by which the cement reverts to limestone. The initial high alkalinity of the cement protects the

reinforcement, but over time carbonation reduces the pH of the concrete, allowing the steel to rust. The rate of carbonation is affected by the porosity of the concrete and environmental factors. Our previous field testing in 2013 indicated that the depth of carbonation had reached the reinforcing

¹ Hilti PS 1000 Ground Penetrating Radar Unit.

steel on some of the buildings, especially in the vicinity of the battle damage. We also noted that the higher cement fraction used in the fortified buildings, vis-à-vis the administrative buildings, accounts for the relatively higher durability of the fortified construction.

At the Museum Building, we tested for the depth of carbonation at two locations: at the west parapet and on the south wall just below a blast-damaged area. In both locations, we found that the depth of carbonation was in the range of only 4 mm to 7 mm (Figure 22).

Our limited testing for salts at the Museum Building revealed an exceptionally low level of chlorides (less than 500 ppm) in the concrete. This is consistent with salts testing we performed in 2013 that also showed low chloride levels. The low rate of carbonation, combined with the low levels of salts in the concrete, account for the remarkable durability of the Museum Building.

It is important to note that the vegetation growth on the Museum Building, as well as the other buildings at Peleliu, is a major contributor to deterioration. The vines and roots invade all available crevices, widen cracks, channel and retain moisture.

Realkalization Trial



Figure 23. Battle-damage on east side. Shaded box indicates area of the realkalization trial.



Figure 22. Freshly broken concrete sample taken at parapet, showing carbonated and non-carbonated zones. The carbonated zones can be identified by the warm color tone of the cement matrix (yellow litmus) and non-carbonated by the gray-tone cement matrix (blue litmus)

Realkalization was identified in our 2013 report as possible conservation treatment to extend the life of the reinforced concrete. Realkalization is a process for increasing the pH of the carbonated concrete to a high enough level (~ 11.0) so the reinforcing steel will not corrode. During the present site study, we set up a limited electrochemical realkalization trial at one of the artillery damage zones on the east side of the building to demonstrate the method. Electrochemical

realkalization has the potential to slow or halt corrosion of rebar in carbonated concrete. In the trial, we used a stainless steel mesh electrode, sodium carbonate solution in a cellulose medium to convey the current, and a digital power source capable of constant-current output. Based on the voltage required to attain the calculated current (~ 0.10 Amp/ft²) we estimated the resistivity of the concrete to be quite low, on the order of 6,000 to 7,000 Ohm-cm. This low value is probably due to the porosity of the coral aggregate. We applied the system to a four square-foot area at the bottom of the blast hole (Figure 23) for a period of about 36 hours. Normally, the current would be applied for at least four days, but in our case the time was limited. While the treatment period was too short to fully demonstrate effectiveness, we believe that realkalization is the best available process for conserving the battle damage and for reducing the rate of deterioration of the building.

Roof Coating

Roof leaks have been an ongoing concern at the Museum Building, and there were reportedly at least two previous campaigns to repair the topping on the flat roof slab. Stopping the roof leaks was an important goal for the present study. Our investigation of the roof revealed some important findings: the structural roof slab is heavily reinforced, largely uncarbonated, and is not cracked. And, the two active leaks are due to vegetation growth through the window openings at the blast damage on the south west corner. In addition, vegetation growth through the parapet-to-roof joint is a major risk factor for future leaks and deterioration.

The waterproofing system chosen for the Museum building consisted of a BASF Master Builder high-performance roof-coating system, which was donated to the project by BASF via the Concrete Preservation Institute:

Concrete patching mortar	Emaco N 426: Hand packing material
Seal joints and cracks at parapets	MasterSeal 590: Fast setting, water-stop
Cementitious waterproof coating	MasterSeal 581 with Emaco A 660 Acrylic modifier

The application of this roof system was accomplished during the site study by a team of workers provided by the State of Peleliu, assisted and directed by Scott Burghardt of CPI.

3.3 RECOMMENDATIONS

Intervention is needed now to conserve the concrete structure. Simple measures can make a major difference in the long-term preservation of the Museum Building.

We recommend the following concrete conservation protocol:

1. Vegetation removal – vigilant and detailed efforts are needed remove and prevent regrowth of lichen, moss, vines, ferns, and trees. The use of an approved herbicide is essential.
2. Cleaning – the exterior concrete surfaces, including cracks and joints, must be thoroughly cleaned of soiling.
3. Realkalization – it appears that electrochemical realkalization offers the best option for conserving the edges of battle-damaged areas.
4. Micro grout-injection - inject all battle-damage cracking with an appropriate ultra-fine grout to protect the concrete from water infiltration and carbonation.
5. Selective and limited repair of spalls – use a repair mortar that matches the aggregate mineralogy and binder characteristics of the original concrete.

This recommended protocol will require further development to establish technique and specifications. Work of this sort is best done from a careful, methodical conservation approach, rather than via construction contracting.

4 PELELIU WWII MUSEUM EXHIBIT REPORT

- 4.1 Overview
- 4.2 Exterior Approach and Interpretation
- 4.3 Museum Environment
- 4.4 Short Term Recommendations
- 4.5 Conclusion

4.1 OVERVIEW

This report reflects our recommendations and comments based on on-site observation and research that can immediately make the Japanese bunker a more captivating and sustainable visitor experience. There are long term suggestions we would like to offer as well, to make not only the Peleliu WWII Museum bunker, but the rest of the islands attractions a series of captivating destinations that will enliven its cultural and historical aspects. There are several unused structures currently located on the island that are being neglected and ignored that could provide key pieces of interpretive information. Examples of such are the air control tower, as well as pillboxes that linked the Japanese fortifications together. Without making pieces available, visitors aren't able to grab the complexity and struggle of both Japanese and American forces in those fateful days in 1944.

To help provide context and cultural connection to the islanders, we would also like to utilize historical aspects of Palauans on the island, and the effect that the conflict had leading up to the invasion. We would suggest adding these elements at the dock area to start with, so visitor can understand what life was like before the Japanese occupation, during the conflict, and lasting effects of the WWII on the Palauan culture.

In the interpretation of structures, landmarks, and large artifacts, we strive to remove or relocate any dissimilar modern system from the visual character of the main approach. We want to decompress the visitor as if they were walking back in time to 1944 and what this structure might have appeared like days before the American attack. Air conditioners and other mechanical systems should be hidden from view and not distract from the true character of the historical building facade. These simple steps can greatly enhance the structure's interpretation and appreciation.

We would suggest keeping the state of the museum to the time just after control of the bunker had been taken and just after cleanup. Visitors would have a deeper understanding of the interior feel of the space as well as conditions Japanese soldiers would have endured. This same concept would be utilized in all of the spaces and structures on the island.

4.2 EXTERIOR APPROACH AND INTERPRETATION

The exterior site and approach needs to give a clean and concise message from the arrival at the island docks through each of the islands' destinations. While we are only looking at the Japanese bunker site, we suggest that all sites and locations throughout the island utilize the same signage look and feel to create a branded experience that will aid in the overall appreciation and visitor experience of the island.

In addition to the site identification, we would also suggest an island wide wayfinding and navigational signage system to help orientate visitors. The last component falls in-between wayfinding and interpretive components and is an element we call "breadcrumbs". These "breadcrumb" interpretive pieces provide the connective interstitial experiences between primary, secondary and tertiary sites. These "breadcrumbs" would provide additional points of interest and

talking points for guided tours as they navigate the island and explore events that happened in 1944.

We are suggesting waterjet-cut corten steel to be the primary material for both the signage, as well as interpretive pieces. Corten is a resilient material that resists corrosion and naturally patinas over time, adding depth, texture and richness. It also has a character similar to the artifacts that still remain on the island which will blend and add to the overall brand experience.

4.3 MUSEUM ENVIRONMENT

Ceiling

During the time of the occupation, the ceiling had a wooden drop ceiling and we would suggest returning the ceiling back to a look closer to the original. This is a long term goal, but not an immediate need. The inclusion of the original wooden drop ceiling would have three main benefits. The first is that it would add back the original character to the space giving it a greater feel of authenticity. The second would be to help buffer sounds. Lastly, it would help conceal new track lighting not originally included in the construction.

Floor

To maintain the original feel of the bunker environment, we would suggest removing the current floor tiles and returning the surface back to the original slab. The easiest solution is to remove the tile, leveling the surface and pour a leveling topping slab which can be polished and sealed to create a neutral base flooring that won't distract the eye or detract from the context of the bunker environment.

Interior Walls

We would suggest removing the newly constructed walls and partition sections. While these new wall sections provide adequate surface to display imagery, they inhibit and divide the flow of the space, cutting off both the visitors and the reception staff. This limits visibility and affects the overall security of the site. The new concept uses scrim materials for the major graphic surfaces which provide a balance of large scale imagery and translucency to the overall exhibit space.

The other part of this equation is the interior physical bunker walls. We will rely on the expertise of both our concrete preservation specialist and well as architects to determine if the interior paint needs to be removed to control moisture mitigation through the exterior walls. In either instance, a grey or white surface will provide a neutral background to support our storyline.

Lighting

The lighting in the space could be vastly improved to enhance the collection and the overall quality of light in the space. Currently there are only four 3-bulb light fixtures with compact fluorescent bulbs that provide illumination for the entire gallery. We would suggest adding a series of LED track fixtures to allow for adequate and even light distributions. The layout of the track could follow a simple grid and be flexible enough for future needs if they arise. The current use of CFL needs to be changed to LED as soon as possible, to prevent harmful UV deteriorated light from coming in contact with artifacts. While the "windows provide adequate illumination", they do not provide the

optimal or even ideal condition for the artifact. The filtering and control of the exterior natural light will need to be addressed in the architectural sections.

Storage

Storage is critical for the space. There may be a better way to facilitate the storage of objects and cataloging methodology. We would suggest the Museum use flexible cases that would not only display an object, but also provide storage underneath. This storage would be concealed behind a cabinet face that could easily lift off using a French cleat system. Inside the base of the display cabinets, there would be useable space where artifacts could be stored in sealed plastic containers. Desiccant gel packets should be inserted in any sealed containers to prevent potential humidity. By sealing both the exterior and interior components of the case, we would provide a stable environment to preserve these artifacts.

The storage/display cases themselves would be a set size, allowing for mass production and modularity. We would suggest two types of cases: a flattop and shallow case. The flattop case would be as the name suggests and be a platform to present non-sensitive, easily secured artifacts. These would be secured to the tops of the case work with steel or brass mounts and displayed in a manner that suggests that they should not be touched. These mounts would be painted so that they do not distract from the artifact or infer that they are a part of the artifacts mechanical operation.

The shallow cases would be 6-10" deep cases with a Plexiglas top. This case would have a rubber seal around the edges, and lip that they would drop into. This type of case would be for smaller artifacts that require more security than the open case could afford. It would be used in conjunction with vertical graphics to provide the context to visitors to help fill gaps in the narrative.

Organization

The layout and flow of the museum should be conducive to a timeline driven learning experience. Visitors need to understand the *who, what, why, when, and where* to truly appreciate the experience. The organization and layout of the space should be clean concise open and clear to prevent confusion and potentially result in disinterest.

We typically use an approach called ADROIT: Arrival, Decompression, Reception, Orientation, Interpretation and Takeaway as our basis for interpretive and physical exhibit development. This specific sequence is a time-tested and proven approach that informs and educates visitors as they move into and through a historical, educational, or entertainment destination. This process can easily be applied to this project in a macro (island-wide) or micro (site-specific) application. The approach eases the visitor into the story slowly, building interest as they reach the critical mass of storyline climax. The correct process controls the information absorption and pathways, so even if they "streak through" they will still digest information in a sequential manner.

We have also included in the addendums a cost-effective case work design, graphic system, and super graphic combination. These can make an immediate impact on the equality of the displays and extend the visitor experience, providing a more meaningful tour stop. This immediate solution is modular and flexible enough to allow expansion or relocation of the system as necessary. If in the future the main museum is relocated or sister locations are created on the island as suggested.

Storyline

As mentioned above, visitors need to be reminded of the *who, what, when, why, and where*. It is best for visitors to understand broad, bigger picture concepts before drilled into detailed narratives. Because of this we are suggesting a yellow brick road hub and spoke approach. We want to first provide visitors with the larger context of the what happened in a compressed time lapsed history summary that takes them from early Palau to the German occupation, Japanese occupation, and finally slowing done as they approach August 1944 days before Peleliu D-Day. The final narrative explains the decisions that leadership was making that made a lasting impact on thousands of lives on this narrow strip of land.

The visitor needs to appreciate Peleliu for its historical context, and understand the controversy that surrounds it today. Starting with the history of the Palauans and continuing to describe their multiple occupations, war years, and the return of Peleliu to Palauan people. This is a complex and interesting story which can't be ignored, and needs to be told as part of the interwoven story of Peleliu.

After this brief introduction space, visitors will be guided up to the landing and through a series of graphic panels indicating D+1, D+4 and so forth, until the fight ends and the island is considered controlled. This large linear D-day graphic panel system allows the visitor to follow the battle sequence more easily, and in the proper order. Graphic, text, quotes, and artifacts will reinforce this dating system and will engage and enrich the visitor's tour.

The end gallery will discuss conservation, preservation, and honor the soldiers who gave their lives for their country. There is a great deal of content available in the current facility, as well as from exterior resources to support this interpretive approach.

We recommend a story driven approach. Every object, picture, and media piece needs to tell a story that will capture the visitor and draw him or her into the story. These elements need to be used in the right combination to succeed. When the balance is off, the information can be underwhelming or confusing to the visitor. In conjunction with National Archive images, the current museum can tell an impactful story, but the sequence and balance requires modification to truly be successful.

Artifacts

The museum has a number of interesting artifacts that need to be presented in a context that allows the visitor to understand its relevance to the bigger picture

When large artifacts in the museum are presented out of context, it can create confusion. We would suggest presenting the larger artifacts in their actual orientation, and provide a photographic backdrop of the object in actual use.

Smaller artifacts can be powerful storytelling vehicles if presented in the right contextual manner. For instance, to the average visitor may already have a feel for what soldiers would have experience in terms of heat and humidity. Now envision a display of canteens, one or more, and a simple quote from a marine talking about how the temperature was over 115 degrees Fahrenheit and how their

canteens were empty and the water was fouled. Being able to transport our visitor to the conditions of that piece of history connects them to the story and creates empathy for the subject.

Conservation

Conservation of the artifacts is critical to their long-term preservation. There are immediate and long-term actions that we can suggest to aid in long-term preservation. To this end we would suggest that all air conditioners be running simultaneously, to provide the most beneficial environment for artifact sustainability. We would also suggest including a more substantial dehumidification system to remove as much moisture from the air as possible. Current average conditions are around 83 degrees Fahrenheit and 67% humidity. Currently the air conditioners are turned off every night and the average temperatures go up to 85 degrees Fahrenheit with humidity levels around 76%. These varied temperature and humidity fluctuations have a profound effect on the condition of the artifacts.

The addendum to this report discusses standards and practices suggested to prolong the life of all objects in the museum. A number of the artifacts will be required to be removed and properly conserved at an offsite location.

4.4 SHORT TERM RECOMMENDATIONS

Paper/Cloth

Original uniforms, clothing, and personal items need to be removed from displays and archived in controlled storage. Replicas should be made for display. The condition of these artifacts will continuously deteriorate in their current environment, potentially leading to long-term or irreversible damage. An alternate solution is to rotate paper and cloth items a minimum once per month and remove them from their display to extend their life.

Steel objects

Peleliu is a harsh environment for steel objects. Saltwater, heat, and humidity are the ideal conditions for rust that will slowly eat away at the objects in the museum. The majority of the museum's artifacts were collected from the surrounding jungle and were not properly treated before display. While they are in the building and semi-protected, the deterioration has only slowed. Proper off site conservation needs to occur to allow the survival of these artifacts, especially for items that are in extremely poor condition.

Aluminum

The majorities of the aluminum items are in fair condition and could sustain with minimal on-site conservation.

Photographs

Original photography and letters need to be removed from displays and replicas made. Conditions at the museum will and are deteriorating the quality of the objects as well as their lifespan. An alternate solution is to rotate personal photos, and memory albums a minimum of once a month and remove them from display to extend their life.

4.5 CONCLUSION

Due to the complexity of the island, we would suggest an island-wide master plan that can truly evolve and engage the entire island by providing connecting storyline elements from the dock to various destinations on the island. This master plan will both enhance the overall interpretation of the island but will also add additional interpretive information that the tours can utilize to foster appreciation and create an international travel destination like no other in the Pacific.

5 FINAL SUMMARY

5.1 Final Project Summary

5.2 Next Steps

5.1 FINAL PROJECT SUMMARY

Both of the buildings that are the subject of this report are of the utmost historical significance in telling the story of the 1944 Battle of Peleliu and its aftermath.

The preservation of the buildings necessitates important interventions for which time is of the essence. Removal and on-going control of vegetation continues to a top priority. Water management in the form of a new protective roof for the Museum was a major accomplishment of this site visit. The limited repair, shoring and vegetation removal at the Air Headquarters was also an important step in the long-term preservation of this most significant resource.

The exhibit and interpretation recommendations of this report will tell a more complete and interesting story. They will hopefully hold the attention of the visitor for a lengthy duration and create a more meaningful experience. This enhanced experience should result in increased visitation and support for the amazing history of Peleliu!

We are now at a critical juncture in the life-cycle of the buildings. When reinforced concrete buildings such as these reach 70 to 75 years old and are subject to long-deferred maintenance, they typically exhibit ever-accelerating deterioration. At this point, the carbonation of the concrete will have reached the reinforcement in many areas. If the recommended preservation approach is initiated soon, there is an opportunity to dramatically extend the life of these buildings. Delay in applying protective measures will put increase the risk of losing the buildings to decay and, with them, an irreplaceable link to the globally significant events which they so powerfully represent.

5.2 NEXT STEPS

There are numerous recommendations, strategies and treatment options outlined in this report and it will certainly take some time for them to be fully analyzed, funded and implemented. We offer the following outline of steps as a recommended approach to move the overall project forward:

1. Ensure widespread buy-in or acceptance by all stakeholders of the report's overall conclusions and recommendations. This may need to involve public meetings and presentations by both HPO and NPS officials as well as the authors of this study. A well-promoted conference could also be considered as an educational, outreach and feedback opportunity.
2. Conduct follow-up on-site workshops and training events with the Japanese Air Headquarters and Peleliu WWII Museum Building as the initial focus of preservation efforts. This will allow local work to be concentrated at the two high profile sites. These can be then be used as models to be followed at the other sites. The invitees to this workshop could include both local representation and invitees from throughout Micronesia and beyond.
3. In conjunction with the above training efforts, develop detailed measured drawings of the Air Headquarters. These will serve as the basis for developing preliminary architectural plans and specifications for the preservation, stabilization and reuse of this building. With this level of planning, more accurate and specific cost estimates for discreet scopes of work can be developed.

4. Fundraising efforts should now be in full swing. Major potential donors both nationally and internationally should be approached, and depending on the degree of success, a phased or full-scale preservation effort can be designed and implemented.
5. A comprehensive Master Plan should be undertaken to fully explore and develop the Visions and Recommendations of this report.

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6.1 Bibliography

6.1 BIBLIOGRAPHY

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7 APPENDIX

- 7.1 Peleliu Exhibit Design Charrette
- 7.2 Peleliu Museum Conservation Manual



Introduction and Overview

* What are we trying to accomplish today?



Charrette Goals

The goal of the sessions is to develop a deeper understanding of the visitor experience and the relationship they will have to the overall physical space. These documents will become the foundation for the development of both of the exhibits as well as the basis for the site and museum programs.

- 1) Understand the relationship of the stories to the physical space
- 2) Understand the needs and requirements of the exhibit and architectural program
- 3) Develop a baseline for space allocation



Learning Concepts

We all carry our own mental “image dictionaries” of words. Any given word means different things to different people.

Remember that visitors really need to understand the whole (the big picture, the theme) before they can more easily find and understand the parts of the whole.

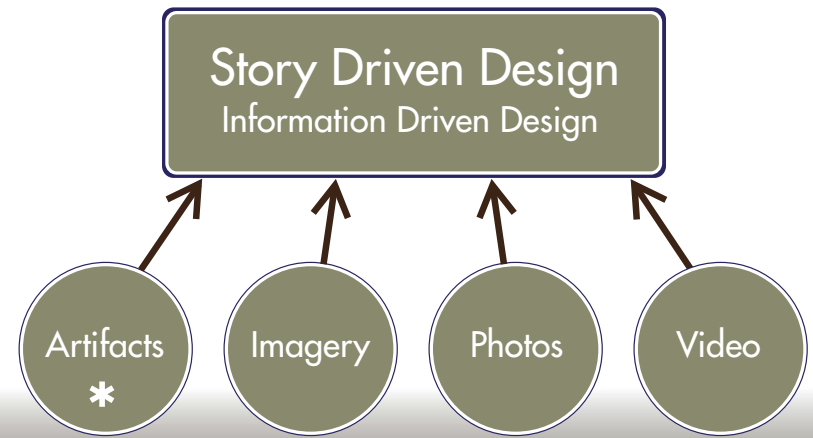
*10 percent of what they hear
30 percent of what they read
50 percent of what they see
90 percent of what they do*



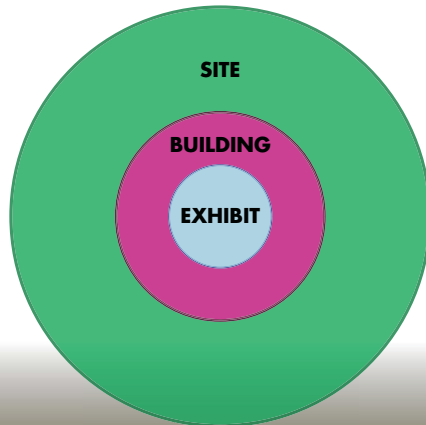
Goals & Objectives

MISSION:

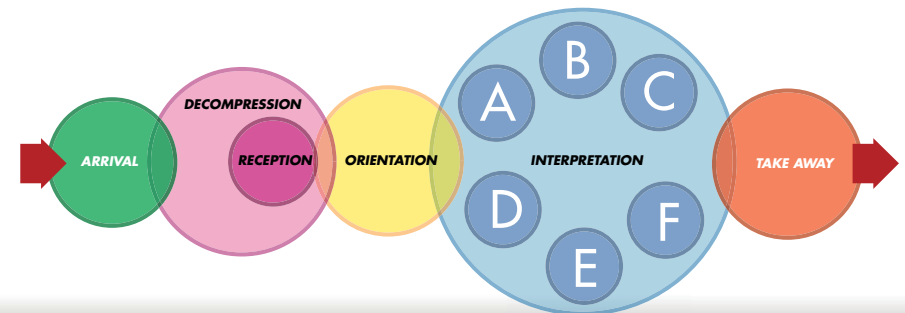
Educate & inform visitors about the history of US and Japanese Military operations on the island of Pelilu during WWII.



Defining the Visitor Experience



Adroit Sequence

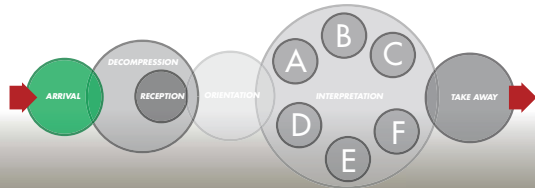


Arrival & Entry

* The Experience begins in the parking lot and continues to experience.

– This also starts from the web site to the Experience

* The pathways from the parking lot to the experience entry need to be clearly identified.



Exterior Arrival & Entry

* What type of Iconic Element best represents the Exhibit and its goals?

· Architectural Feature

· Monument

· Sculpture

· Artifact

· Graphics

Exterior Arrival & Entry



FRONTIER TEXAS



NATIONAL MUSEUM OF THE PACIFIC WAR

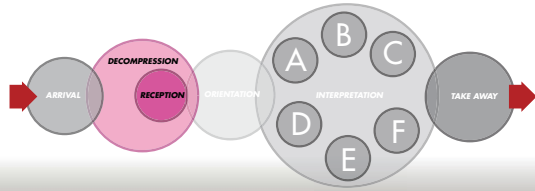
Interior Arrival & Entry



U.S. STEEL

Reception/Decompression

- * Welcome and immersing the visitor.
 - * "Pre-show" Messaging.
 - * Probably one physical space.



Reception/Decompression



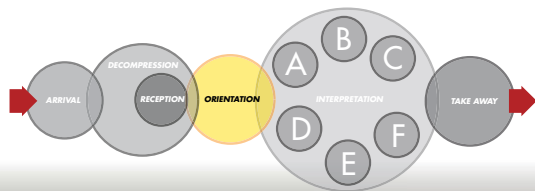
NATIONAL MUSEUM OF THE PACIFIC WAR



U.S. STEEL

Orientation

- * Theater Experience vs. Open Gallery.
 - * What messages will be included?
- * What will be our theme for the experience.



Orientation Examples



U.S. STEEL

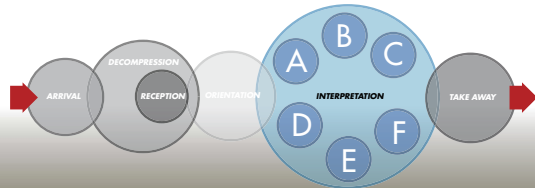


NATIONAL MUSEUM OF THE PACIFIC WAR

Interpretation

- * Artifacts
- * Technology
- * Experiences
- * Techniques
- * Materials

The story line and story matrix will be the road map for these components



Interpretation



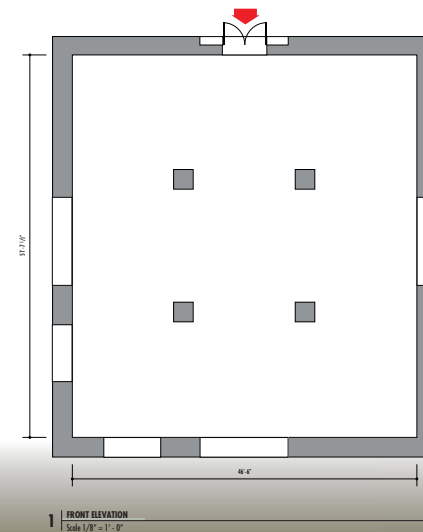
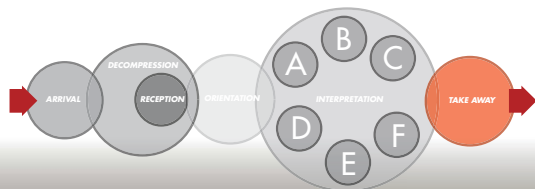
U.S. STEEL

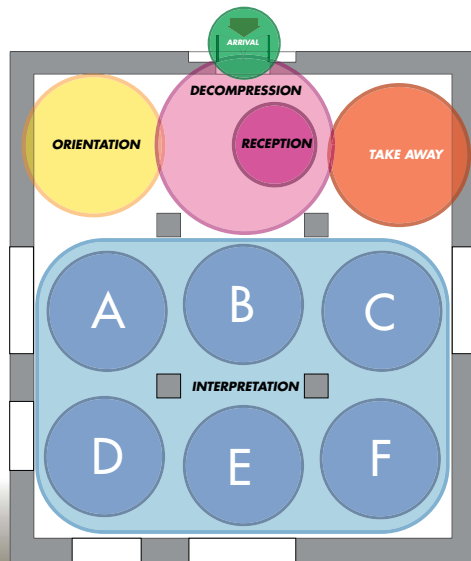


NATIONAL MUSEUM OF THE PACIFIC WAR

Take Away

- * Gift Shop
- * Brochures
- * Web site





PELILU | MEMORIAL AND MUSUEM
Exhibit Design Charrette

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Defining the Visitor Experience

* In what sequence do we want the visitors to move and how can we facilitate that experience with the unique characteristics of the space?

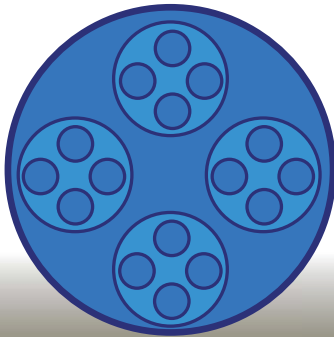
– By layering the content in selected locations specific to the circulation patterns of the different user group.

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Exhibit Design Charrette

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Defining the Message Hierarchy

Work from big messages to small



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Exhibit Design Charrette

06.04.16 21

Defining the Message Hierarchy

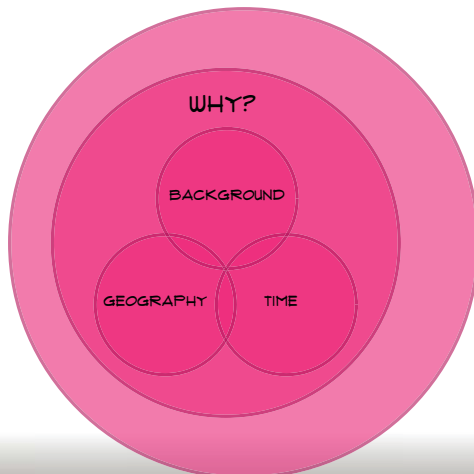
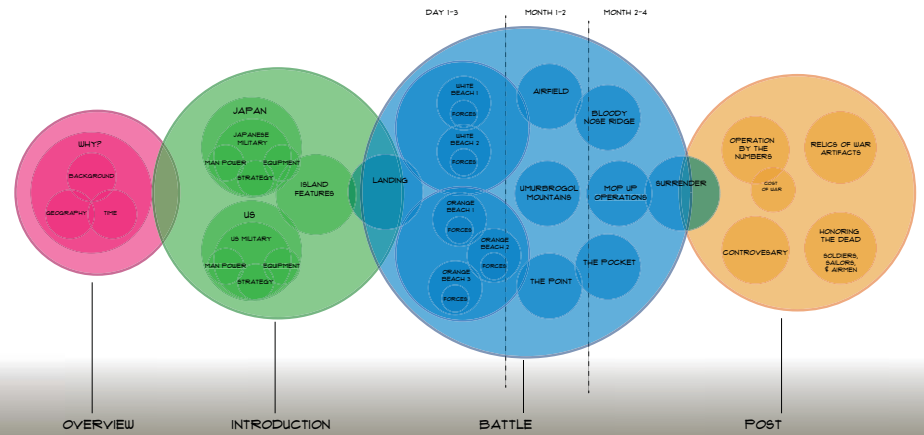
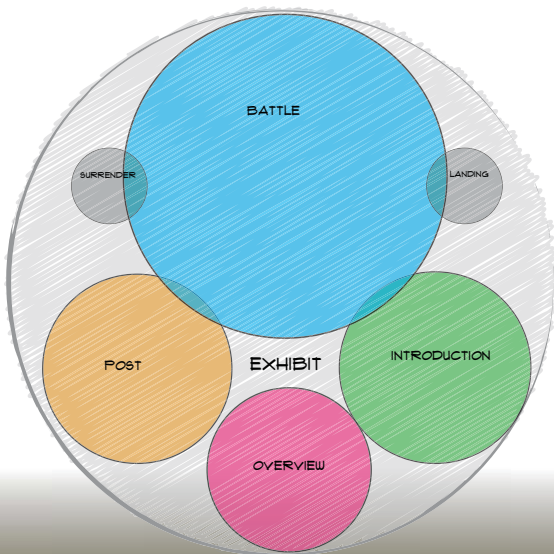
* What are the 2–5 big messages we need to tell?

- 1) GEOGRAPHY/TOPOGRAPHY
- 2) BATTLE
- 3) LIVING MUSEUM
- 4) PRESERVATION
- 5)

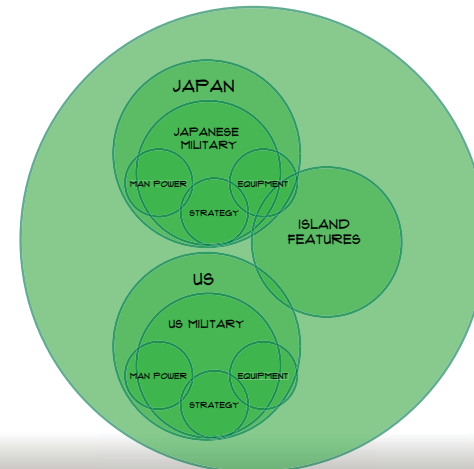
HOW SHOULD THESE BE ORGANIZED - BY YEAR, LOCATION, OR BY SUBJECT ?

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Exhibit Design Charrette

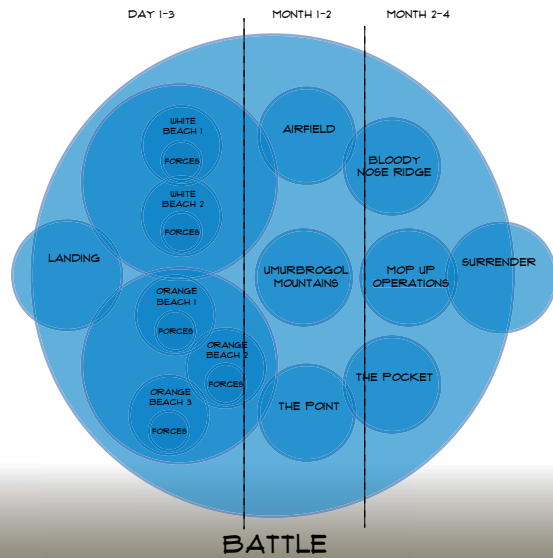
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OVERVIEW

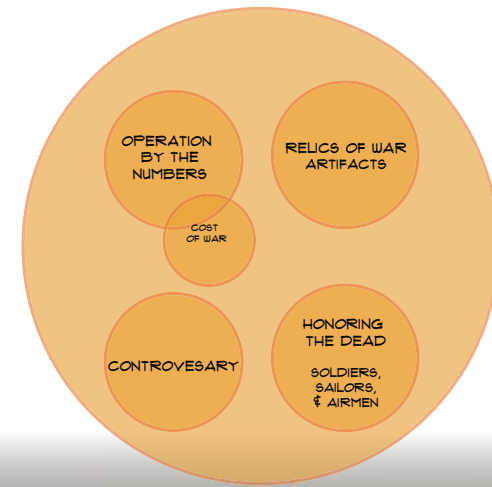


INTRODUCTION



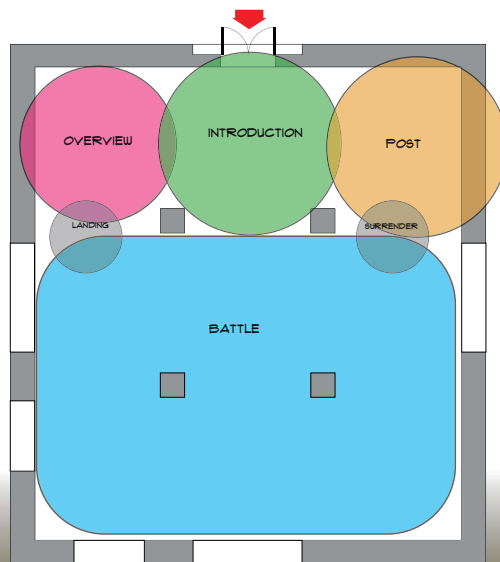
BATTLE
PELILU | MEMORIAL AND MUSUEM
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POST
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Defining the Message Hierarchy

* What are the 3–5 supporting messages for this message hierarchy?

- **Who**
- **What**
- **When**
- **Why**
- **Where**

PELILU | MEMORIAL AND MUSUEM
 Exhibit Design Charrette

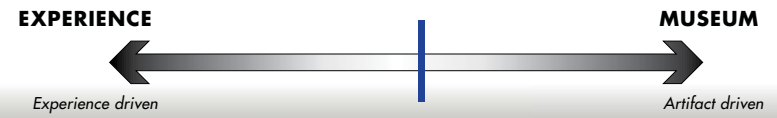
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Identify Functional Issues for Facility Operations

- * How do functional areas relate to one another?
- * What's public, what's private?
- * How will the visitor move through the Experience?

What is Our Vision for This Experience?

- * What is our statement?
- * Who are we appealing to?
- * Is this a Experience or Museum?



Who is Our Audience

- * Students
- * Families
- * Amateur Historians
- * Tourists
- * Researchers
- * Media Groups

Defining the Visitor Experience

- * What are their average ages?
 - 8 to 80

Defining the Visitor Experience

- * What are their average ages?
- * Are there cultural or language differences?
 - English, Spanish, Japanese, Other

Defining the Visitor Experience

- * What are their average ages?
- * Are there cultural or language differences?
- * What size of group will normally be going through the Exhibit?
 - On an average day : 5- 10
 - On an average Weekend single day: 25 - 30
 - Initial opening first year numbers will be larger

Defining the Visitor Experience

- * What are their average ages?
- * Are there cultural or language differences?
- * What size of group will normally be going through the Exhibit?
- * How long is the visitors stay?
 - Intended length: 2-4 hours

Defining the Visitor Experience

- * What are their average ages?
- * Are there cultural or language differences?
- * What size of group will normally be going through the Exhibit?
- * How long is the visitors stay?
- * What is the necessary degree of flexibility for changing messages?
 - Graphic Panels, Case Work, AV Elements

Resources

- * The categories, condition, and quality of materials and possible artifacts to be displayed.
- * What do we have to display?
 - What do we want to display
- * What resources do we have in terms of photos, artwork?

Artifacts

- How do we treat artifacts?
- How will we integrate the artifacts into the environment?
- How will we utilize the artifacts in the environment?
 - How can we build in flexibility for rotation?
 - Are we going to restore/remake the artifacts?
- What level of conservation do we want to achieve?

Hands on Experiences

- * What kinds of things do we anticipate the visitor doing?

- 1) Computer Interactives
- 2) Hands on Interactives
- 3) Large Scale Video
- 4) Graphic Panels
- 5) Audio Interactives

Techniques

- Eliciting emotions through the stories
 - Touching all five senses

Technology

- * Availability
- * Media Protection
- * Maintenance and Repair
 - * Updating
- * Use and Appropriateness

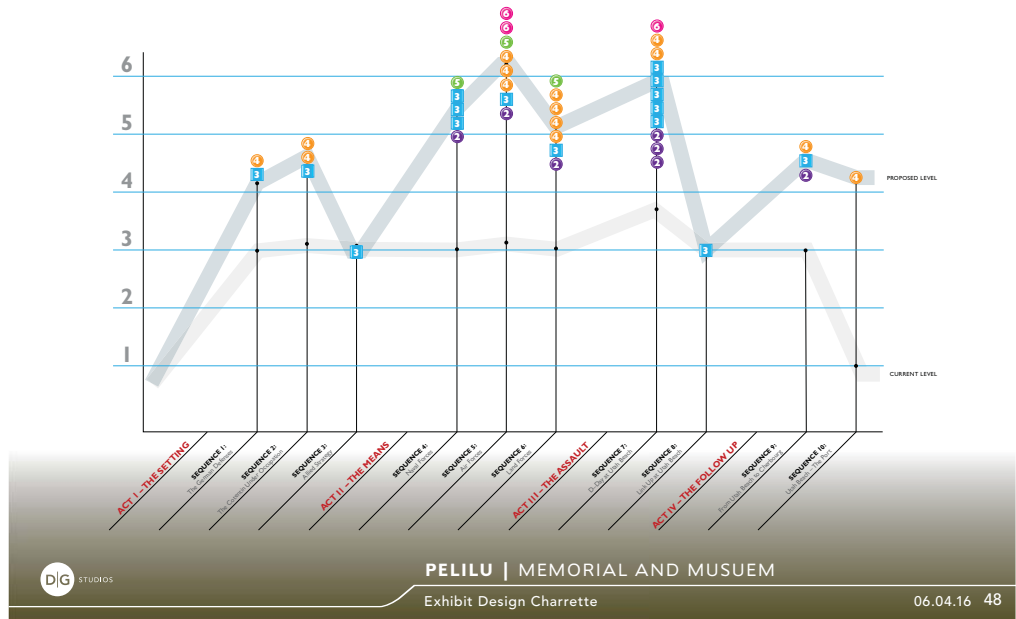
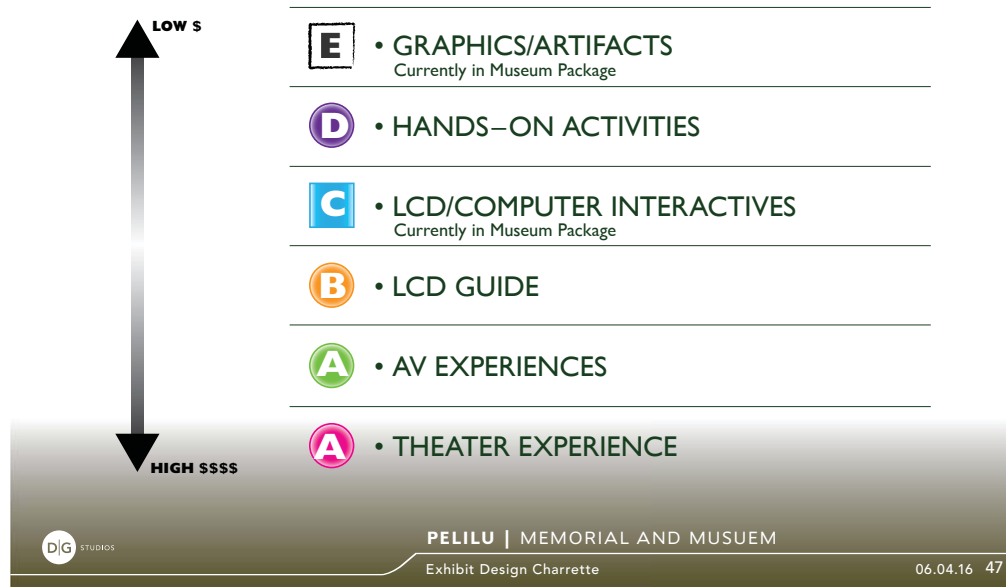
Technology

- * Virtual Guides
- * Audio Wands
- * Special Effects
- * Sound Focusers
- * MP3 Repeaters
- * Vintage Film
- * Video Projections
- * Computer Interactive
- * Ipods

Visitor Experience Levels

- A** Level 10 – Theater Experience
- B** Level 8 – Audio Visual Experiences
- C** Level 6 – Computer Interactives
- E** Level 4 – Hands on Interactives
- D** Level 2 – Graphic Panels

On a visitor experience impact scale of 1–10



C

Level 6 – Computer Interactives



DIG STUDIOS

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D

Level 4 – Hands on Physical Interactives



DIG STUDIOS

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Exhibit Design Charrette

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E

Level 2 – Graphic Panels



DIG STUDIOS

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Exhibit Design Charrette

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E

Level 2 – Graphic



DIG STUDIOS

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Exhibit Design Charrette

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EXHIBIT FACTORS

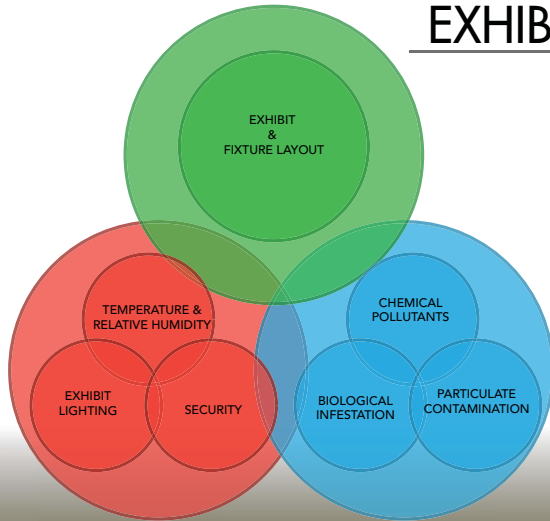


EXHIBIT FACTORS

Exhibit & Fixture Layout

Temperature & Relative Humidity

Contamination

Exhibit Lighting

Emergency / Security

EXHIBIT & FIXTURE LAYOUT

There is no standard design or layout for exhibit gallery space in museums. However, there are a few "rules of thumb":

Keep the topic in mind when considering design elements.
Make the space "user-friendly" for all patrons.

Remember safety issues for patrons and security issues for artifacts.

Mounts should provide protection and safety for an artifact.

Labels should be easy to read and brief.

The design should enhance the artifacts.

TEMPERATURE & RELATIVE HUMIDITY

Avoid drastic changes in humidity and temperature at all times.

Temperature and humidity guidelines are the same for both storage areas as well as exhibit galleries.

Do not put artifacts near the entry/exit doors in order to avoid extreme changes in temperature and humidity.

Avoid extreme changes in temperature or humidity.

Any changes in temperature or humidity should be gradual.

Temperatures should be: 65 to 75 F | Humidity level is: 45 - 60 %

EXHIBIT LIGHTING

Exposure to light causes irreversible damage to organic materials

Limit Light levels in storage

Limit exposure to ultra-violet light

Keep light levels in the exhibit gallery at the lowest level possible.

SECURITY

Floor plans should be as unobtrusive as possible, providing few “blind” spots.

Mounts should provide adequate security without obstructing or intruding.

Anticipate human-caused damage, such as vandalism or theft.

Cases should be locked or otherwise secured.

Create physical barriers such as railings to protect large artifacts.

Provide the appropriate level of protection.

EMERGENCY

Develop fire protection and emergency response plans. The plans should minimize threats to museum objects, protecting them during a disaster, during their evacuation, and after a disaster.

Perform a risk assessment and address potential problems. Anticipate the types of damage that may occur to display objects.

DETERIORATIONS

PARTICULATE CONTAMINATION CHEMICAL POLLUTANTS.

Deterioration are forces that act upon objects causing chemical and physical damage. Contaminants disintegrate, discolor or corrode all types of objects, especially reactive and porous materials.

PEST CONTROL | BIOLOGICAL INFESTATION

PEST CONTROL

Museum pests come in many different forms: insects, mites, rodents, bats, birds, and fungi and the two most common types are insects and fungi.

BIOLOGICAL INFESTATION

Biological deterioration is found principally in the form of insects and fungi.

Continuous biological decay is dependant upon four conditions.

- supply of oxygen
- supply of moisture
- supply of food
- moderate temperature range.



PELLU

MEMORIAL & MUSEUM

conservation manual



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PELILU WWII MEMORIAL AND MUSEUM

I. MISSION STATEMENT

The central purpose of a successful museum is found in its mission statement. The mission statement describes specific areas of research and education that the museum will focus upon.

Sample questions to ask when writing a mission statement:

- Whom do you serve and why?
- What service do you provide that is different from other museums in your area?
- How and what methods will you use to reach your stated purpose?

II. WHAT IS THE PURPOSE OF AN EXHIBIT?

a. EDUCATIONAL PROGRAMMING

- Does your program fit your museum's mission?
- Does your program involve the visitor?
- How do you evaluate the success of your program?
- What do you want the visitor to learn from this program?
- For what age group is the program targeted? Is it appropriate?
- How does an educational program enhance understanding of the museum exhibit or museum collection?
- When creating an educational program, keep in mind learning styles and physical abilities of the targeted participants. It is essential to maintain historical accuracy, yet it is desirable to be sensitive to material that may be considered offensive to various cultures or ethnic groups.
- When research, design and construction begins, these thoughts should be in the minds of the exhibit team:
- What do we want our visitors to learn from this exhibit? What is the purpose of this exhibit?
- How does this exhibit's story fit into what is/was going on in the rest of the world?
- Why should the visitor care about this story, what makes it unique?

b. COLLECTIONS MANAGEMENT POLICY

A collection policy should address the following:

What is the museum collecting? How do the items relate to the mission statement and fulfill your purpose?

- How are items acquired?
- Who decides what is accepted?
- How will the museum properly care for the object?
- How will the museum handle donor requests/restrictions?
- If the museum purchases items, who has the authority to make offers?

- How are collections processed, recorded and cared for?

c. COLLECTION ACCESS

Who can have collection access and for what specific purpose? May the collection be photographed or replicated?

Lending and Borrowing

- Will the museum lend its artifacts?
- To whom will you lend? (i.e.: only museums with suitable facilities and for specific periods of time?)
- Will your museum borrow? If so, for how long and can you insure borrowed materials?
- Deaccessioning Who decides?
- As a courtesy notify the original donor, through a good faith effort, that deaccession procedures have begun.
- Will the museum transfer or trade with other museums?
- If the museum decides to sell the item, do so only at auction.
- The board and staff should not be allowed to bid at auction of deaccessioned materials.
- Apply revenue from the sale to the museum's collection support.
- Destroy materials that pose a threat to the collection or public safety.

Security Procedures

- Who has access keys?
- Who is notified in emergencies and is there a back-up person?
- Are appropriate measures taken for fire protection?
- Are appropriate measures taken for theft protection?
- Emergency Response Procedures
- Fire (during and after hours) Severe weather alert
- Theft
- Flood
- Collection & Facilities
- Recovery Plan Museum Organization
- Recommendations and procedures to aid staff and visitors to locate artifacts and to increase the life span of the collection.

Legal forms of ownership

- **Temporary Receipt:** Issued when an item has been brought into a museum for consideration to become accessioned. It is a document that has two functions. It informs the museum who brought what into the museum for consideration. It is a paper-trail item, forcing the museum to DO something with the item. This avoids an item from becoming "shelved" and/or misplaced for a long time.
- **Deed of Gift:** This form is issued when the item has been officially accepted into the museum. It is a legal document that transfers ownership of the material from

the donor to the museum. This document must be signed and dated by both the owner or legal representative and a museum official.

REGISTRATION METHODS AND COLLECTION STORAGE DOCUMENTATION

When the artifact has been accepted into the collection, begin an acquisition file.

An ideal file would include the following:

- A copy of the temporary receipt
- A deed of gift
- A photograph of the artifact
- Biography or history about/of the donor History of the object
- The object worksheet
- An 8283 form (If necessary, an IRS document which the donor completes)
- Condition report or conservation records
- Finding Aids - Created in order for the staff and the researching public to easily find the object.
- Object catalogue card (May be produced by computer) It contains the following information:
 - Accession number in the trinomial system. For example: 1999.001.1
 - 1999 = Year of Donation from the Deed of Gift
 - .001 = Chronological order of donations received that year
 - .1 = object number
 - Nomenclature (object name)
 - classification (or other system of identification)
 - Date of acquisition, taken from the Temporary Receipt Date of transfer, (legal title): taken from the Deed of Gift
 - The object's complete three dimensional measurements
 - Description of the object. Written with
 - enough detail that the artifact can be visualized (i.e.: color, material, function, etc.)
 - Markings: The maker of the object, etc.
 - Donor provenance: The story behind the object
 - Location: Where the object is stored or on display. Should have initials of the person who moved it there
 - Accession Log - a book, binder or other bound item that is a record of day to day accession happenings. It would include the following information:
 - Accession Number Log in date
 - What the item is Who gave it.

When this book is full, it is sent to the museum's archives as a permanent record of museum activities.

NOTE: A computer is a tool for cataloging, but should not be relied upon to store your catalog information. A paper, manual catalog should also be maintained. As a general

rule, all cataloguing should have a backup file.

- The creation of an alphabetical donor catalogue is useful for quickly finding and locating an artifact when only the donor's name is known.
- Physical numbering of artifacts - Every artifact must have a physical marking on it, not unlike a tattoo. There are different methods for different artifacts. Always place the number or tag in an unobtrusive area.

DO NOT USE:

- staples
- metal tags
- engraving
- nail polish
- metal prongs
- wire
- spray varnish
- ball point pen
- masking tape or any sticky tape iron-on tags or adhesive paper tags

Do use:

- paper tags with cotton strings twill tape (for garments and flat textiles) varnish with ink "Sharpie Pens" may be used on twill tape, but the tape must then be washed in soapy water and completely dried before it is attached to the artifact.

Loan forms

- These forms are a record of the artifact and an agreement of required conditions to display the artifact.
- Request a facilities report of the institution that is borrowing the artifact/s that will include environmental and security conditions.
- There are two forms needed: an incoming loan form and an out-going loan form. Both contain the following information and are kept in working files for the duration of the artifact's display.
- Lender Information Credit Line to be used on label, credit panel or publication and promotional materials
- Purpose of the loan: research, exhibition, etc.
- Beginning and ending dates of the loan agreement
- Description of the object, including maker or origin, materials, dimensions, and accessories such as containers or bases
- A photograph of the artifact may be included with the form
- Insurance value

III. ENVIRONMENTAL CONDITIONS

a. TEMPERATURE AND HUMIDITY LEVELS

- Avoid drastic changes in humidity and temperature at all times.
- As a general rule, temperature and humidity guidelines set for storage areas are appropriate for exhibit gallery areas as well.
- If the exhibit gallery contains a door used by the public to enter and exit the museum, do not put artifacts near the door in order to avoid extreme changes in temperature and humidity.
- Extreme changes in temperature or humidity must be avoided at all times.
- Any changes in temperature or humidity should be gradual.
- As a general rule, temperatures should be kept near room temperature: 65 to 75 F. Storage areas can be as low as 65 to 70 F
- Generally, a safe humidity level is: 45 - 60 %
- Evaluate your building periodically. Does it have leaks?
- Is the HVAC system working properly?

NOTE: A museum should consult with a conservator and/or HVAC engineer experienced with museum environments in order to establish optimum conditions for its particular collections. Historic house museums may have entirely different needs than the guidelines offered here. An environmental survey may be needed.

Exhibit gallery temperature ranges are suggested between 65° and 75° F throughout the year, allowing seasonal fluctuations between the two extremes, but holding daily fluctuations to $\pm 5^\circ$ F. would suggest maintaining the relative humidity between 40% and 55% RH throughout the year, allowing seasonal fluctuations between the two extremes, but holding daily fluctuations to $\pm 5\%$. The air handling units must be designed for both humidification and dehumidification. Humidification should be a clean steam injection system (such as an electronic steam humidifier), or atomized air system using clean water.

The system should be maintained 24 hours per day, 365 days per year. Once a set point is programmed, daily fluctuations must not exceed 5° F and/or 5 percent relative humidity. Relative humidity levels represented in a range indicate minimum and maximum set points. Seasonal movement between these set points must not exceed 5% per month while staying within the $\pm 5\%$ daily band restriction.

We would like to shoot for a filtration system for the exhibits with a MERV rating of 14 or greater. We would also suggest to install preliminary filters with lower MERV ratings to extend the service life of the system.

b. LIGHT LEVELS

Exposure to light causes irreversible damage to organic materials, especially textiles and paper.

- Light levels in storage: Brightness and UV levels are damaging to collections and should be controlled.

- Limit exposure to ultra-violet light by covering windows with shades, drapes or UV film.
- Place UV tube filters over florescent light bulbs.
- Keep light levels in the exhibit gallery at the lowest level that allows the visitor to comfortably read labels and navigate throughout the exhibit.
- Use indirect lighting, do not focus lights on sensitive material.
- Consult with a certified electrician if electrical work must be done in the gallery or exhibit cases.
- Keep lights off when no one is in the storage area
- Refrain from storing any artifact in an area with sunlight

Typically lighting levels in artifact rich environments are in the range of 20-25 ft candles in the typical exhibit areas that have graphic panels and casework. There will be anomalies throughout the galleries that have lower or higher light levels depending on the intended theatrical effect we want to achieve. For the majority of the lighting we are leaning towards ceramic metal halide 39 watt.

c. SECURITY

- Floor plans should be as unobtrusive as possible, providing few “blind” spots and the ability for staff or guards to view visitors with ease.
- Mounts should provide adequate security without obstructing or intruding upon an object.
- During exhibit planning, anticipate human-caused damage, such as vandalism or theft, and try to plan deterrents, incidents of theft may require additional security measures.
- Cases should be locked or otherwise secured with items such as security screws.
- Create physical barriers such as railings to protect large artifacts from human contact.
- Provide the appropriate level of protection. Tailor security features to the vulnerability of the objects. Highly vulnerable and valuable objects require more sophisticated protection measures than others.
- Use secure case hardware. Mount objects to panels or shelves, bolt freestanding cases to the floor, and lock exhibit cases.
- Facilitate authorized curatorial access to the objects. Each object in an exhibit should be readily removable without having to remove or disturb adjacent objects.

d. EMERGENCY PREPAREDNESS AND FIRE PROTECTION

- Develop fire protection and emergency response plans. The museum staff should have an emergency plan for each exhibit space. The plans should minimize threats to museum objects, protecting them during a disaster, during their evacuation, and after a disaster.

- Perform a risk assessment and address potential problems. Anticipate the types of damage that may occur to display objects. For example, avoid placing objects, especially if they are water-sensitive, in the path of fire sprinkler heads.
-

e. Fire Suppression

- The Fire system should be designed to limit the maximum anticipated loss from any single fire event to a maximum of 300 cubic feet of exhibits destroyed. The exhibit systems for exhibit areas should be separately zoned from other building areas, to prevent unnecessary damage as well in the event of a fire in another portion of the building.

IV. STORAGE

a. Storage shelving material

- It is best to use stable materials in the construction of shelving. However, if for example, unstable materials need to be used because of financial reasons, there are precautions that may be taken to minimize harmful effects.
- Seal all wood with a water-based polyurethane sealant (recommended: Camger Gloss Polyglase Waterborne finish - phone (508)528-5787) or contact
- MarvaSeal. Covering the wood with metal foil will work also.
- Used industrial shelving is an option for ready-made storage solutions.
- Cover the shelving with stable materials appropriate to the collection: i.e.,
- ethafoam, volara.
- Use dust covers for open shelving. Unbleached cotton muslin works well
- for many solutions. Cloroplast and Tyvec are equally successful.
- In an ideal situation, purchase powder pigment coated metal shelves.
- If using wood, it is recommended to use Medite II particle board.

b. Boxing material

Always use stable materials when boxing artifacts.

- All boxes should be made of acid-free, archival material which may be found at several suppliers such as:
Gaylord
University Supply
Talas
Light Impressions
- Textiles that are stored in boxes should have as few folds as possible.
- Choose a box size appropriate to the artifact. Do not "stuff" the artifact into a box that will harm the item in the long run.
- Line the box with acid-free tissue and pad any folds in textiles with acid-

free tissue.

- Label the exterior of the box with its contents.
- Avoid layering garments in the box when possible. If unavoidable, place the most fragile objects on top.

c. House keeping

- Museums should have a routine schedule of basic cleaning that includes sweeping, vacuuming, and eliminating clutter, food stuffs and trash. Particular attention to frequently used visitor areas, such as restrooms or lobbies, will enhance the museum experience for the visitor.
- A schedule should be kept for cleaning the artifacts and exhibit cases. Due to the sensitive nature of many artifacts, museum personnel should consult with a conservator for correct cleaning methods appropriate for particular artifacts.

VIII. EXHIBIT GALLERY

a. CONDITIONS

There is no standard design or layout for exhibit gallery space in museums. Exhibit design plans will always vary from topic to topic and space to space. However, there are a few "rules of thumb" that should be adhered to:

- Keep the topic in mind when considering design elements.
- Make the space "user-friendly" for all patrons, including those with physical limitations, children, the elderly and large groups.
- Remember safety issues for patrons and security issues for artifacts.
- All construction materials should be made of inert materials or sealed with coatings that are water based.
- Mounts should provide protection and safety for an artifact, yet be as undetectable as possible.
- Labels should be easy to read and brief.
- The design should enhance the artifacts without distracting the visitor and overwhelming the artifact.

b. AMERICANS WITH DISABILITIES ACT (ADA) SPECIFICATIONS:

Accessibility to public places should follow state and federal guidelines for individuals with disabilities, under the Americans with Disabilities Act of 1990.

General guidelines include:

- Railings and barriers should be at a height so that objects and labels can be viewed from a wheelchair.
- Aisle widths should be no smaller than four feet, (ideally the aisles would accommodate two wheelchairs side by side.)
- Turn around space should be no smaller than five feet.
- The bottom of exhibit cases should be no higher than 27 inches from the floor.

c. CASEWORK CONSTRUCTION

Acidic environment inside an artifact case can accelerate the rate at which organic artifacts deteriorate. From a preservation point of view, it is advantageous to reduce or remove any acid content from a case, and to minimize its air exchange rate.

There are two reasons most artifact cases are built from wood. It is inexpensive, and it easy to work. However wood is made up of cellulose tannic acids and lignin, as well as resins and formaldehydes. Wood inside a case must be sealed, and even then sealing does not stop the harmful acid from eventually getting out. Conservation requires either a non-permeable barrier such as Foil type seal, or multiple layers of sealant, but ultimately, wood should be removed entirely from the case.

Some of the most important problems involved in artifact preservation are light levels, ambient vibration, security, and humidity control, but the focus of this study is primarily on: the pursuit of a non-entropic environment through the removal of all wood products from case interiors, and through achieving an airtight seal.

XIV. POTENTIAL ARTIFACT CONDITIONS

a. Pest control

An integrated pest management system (IPM) should be utilized by museums to control pests. The goal of the IPM for museum collections is:

- To protect the museum and its collection from pests which damage the collections.
- To reduce the amount of pesticides used in the facility because they have been found to damage some collections and cause health problems for the staff and visitors.
- To utilize a combination of monitoring and control practices, including staff vigilance, regular observation.

b. Particulate Contamination

- Enclose sensitive objects. Use high-efficiency filters in HVAC equipment to remove particles down to 1–0.3 microns (60–80%). Change filters regularly.
- Use localized filtration equipment. If improving filtration throughout the museum is not feasible, consider using room-sized units in construction areas or within the exhibit space.

c. Chemical Pollutants

- Monitor pollutants. Assess the air quality within the museum to establish the ambient level of contaminants. This knowledge will point to the measures necessary to meet the conservation criteria for an exhibit.
- Incorporate chemical filters in the environmental systems. For susceptible

- collections or in highly polluted locations, include activated charcoal or potassium permanganate filters in the environmental system.
- Provide air circulation. Adequate air circulation will lower total concentrations; high rates of airflow over or near objects, however, increases their exposure. Design the exhibit layout to minimize the objects' exposure to pollutants.
- Select stable construction materials. Avoid materials known to outgas, become acidic, or lose their physical or chemical stability with age.
- Aerate the exhibition space before object installation. Allow time for initial levels of outgassing from new materials to dissipate.
- Enclose sensitive collections. Cases that incorporate a chemical pollutant scavenger provide a high level of protection for sensitive objects.

d. Biological Infestation

- Examine objects for signs of infestation and active mold as part of the preliminary condition check. If signs of infestation are found, consult a conservator about treatment options.
- Design exhibits to inhibit infestations. Make sure the exhibit area is insect-proof by screening open windows or doors, filling gaps in the building construction, and avoiding gaps and undercuts where dust can collect.
- Enclose objects. When the risk of infestation is high, place susceptible objects inside well-sealed cases or sealed acrylic boxes to prevent new infestation. Limit the gaps and holes to prevent insect entry.
- Avoid introducing insects through props and unchecked exhibit materials. Do not use wool carpets and other materials that attract and harbor insects. Avoid using organic exhibit props. Fumigate vegetative props or expose them to freezing temperatures before bringing them into the museum.
- Control human behaviors that encourage infestation. During exhibit production and installation and after the exhibit opens, never allow food in the object holding areas or the exhibit space, even if no objects are in the area.

XV. FABRICATION

a. CONSTRUCTION MATERIALS

All construction materials used for cases and platforms should be free of acid and other harmful volatile materials. If plywood must be used, choose either the marine grade exterior plywood AA or BB, or MDO board painted with latex paint.

- As a precaution, when using any wood, seal it with a water-based polyurethane sealant or high quality latex paint.
- After painting, let the case "cure" for a minimum of three weeks before any artifact is installed.
- The case should have vents to allow air exchange.
- Only inert materials should touch an artifact. Do not place an artifact directly on an unstable surface.
- Appropriate buffers are:

Mylar
Ethafoam
Undyed cotton or linen Formica

b. PROPS WITHIN AN EXHIBIT ENVIRONMENT

Props are often helpful to create a mood or ambience in a vignette or room setting. Remember that purchased or found props may have hidden dangers that can harm or contaminate artifacts or the museum environment.

All props brought into a museum should be free of fungi insects, or other pests. Dry or combustible materials such as paper, cloth or insect- free/mold-free leaves should be treated with a flame retardant.

c. INSTALLATION OF ARTIFACTS

- Handle all artifacts as seldom as possible.
- Always use white gloves with appropriate artifacts.
- All construction must be completed before artifacts are installed in cases, dioramas or on walls.
- When moving or installing large artifacts, use two or more people where appropriate. Never handle an artifact by a thin or delicate attachment.
- Always cradle an artifact with two hands at its heaviest or most stable area.

XVI. LABELS AND LABEL PRODUCTION

Labels convey basic information about the exhibit subject and the objects. All information conveyed in the labels must be documented and, to the best of the knowledge of the researcher, accurate. All labels should be designed for ease in reading, for both visibility and for comprehension.

a. The Basic Label Types Are:

Title Panel or Title: Contains the title of the exhibit and subtitle, if any.

- Primary Label: Provides general information for an area, case or
- Secondary Label: This label provides more information, Interpretation about the artifacts found under the primary label.
- Identification Label (ID label): Provides the basic information about the artifact.
- An example of an Identification Label: section in an exhibit. or description
Cooking Pot
Iron
1843
Loan: The Smithsonian Institution

b. Label Readability

- Use dark letters on a light background.
- White on black for large amounts of
- Text produces viewer fatigue.
- Never produce label text in type smaller than 18 pt. (3/16"), ID labels

should not be in type smaller than 12 pt. (standard typewriter height). Generally, the larger the type, the easier to read.

- Fonts, (type style) should be chosen for readability. Fancy or flamboyant type should be avoided for label text, but may be used. Where appropriate for short titles.

c. Additional Label Concerns

- Label text should be targeted to an 8th grade reading level with sentences that are to the point and brief.
- NEVER attach a label to an artifact. In general labels should be mounted on a stiff backing board of either foam core or mat board.
- Avoid creating long paragraphs, as visitors generally do not linger over lengthy copy.
- Every exhibit should contain a credit label that conveys the following information:
 - The exhibition team Institutions or individuals who loaned artifacts or graphics to the exhibit.
 - Donor names who donated artifacts to the museum that are used in the exhibit. Financial donors to the exhibit.
 - Volunteers who worked on the exhibit.

d. Placement of labels.

- Place the label so that the visitor can clearly view the object the label describes. Always place labels in a comfortable viewing range for all visitors, including those with disabilities.
- A generally accepted viewing range is between 36" to 67" from the ground. Do not lay labels flat on the bottom of a case. Tilt the label so that it may be read by those with bifocals and those who may be in wheel chairs. Title or Title Panels for cases or areas Tend to be dramatic Contain a graphic element that represents the exhibit subject and is easily identifiable.

XVII. MOUNTS

All mounts for artifacts that are going on display need to be well enough made that they are not ugly or obtrusive. A good display mount is first functional, and then as unobtrusive as possible. The observer's eye acknowledges the mount but does not concentrate on it. There is nothing quite so distracting to a small mounted artifact than a crudely finished Plexiglas base. This is because the nature of Plexiglas calls for crisp lines and defined and transparent edges.

Choose mount materials for their inertness, appropriateness to the job and their unobtrusive appearance. Light is reflected and refracted differently through clear plastic than other materials. Wood, for example, is different than plastic and should be treated in such a way that it harmonizes. Imagine a fine print framed with a mat that has crookedly cut edges. Or the fabric-covered base of a

display case covered in creases. Work neatly and carefully, even if it takes a considerable amount of extra time.

Often the display mounts in a museum will be made with the material which is most familiar to the staff member responsible for them. This is fine up to a point, but there are cases where some materials are used in excess and may not be the most appropriate for the job. For example, displays where everything has been mounted with Plexiglas can distract from the main point of the exhibit.

Mounts must not have an effect on the object. Barrier materials, such as Mylar, should separate objects from potential damage, such as painted surfaces.

There are two basic types of mounts:

1. Custom made and fit.
2. General (shelves, stock forms). In order to construct mounts, you need to be familiar with basic hand tools and how to use them. This does not mean you have to be craftsmen or machinists, but a minimum basic competence is necessary. Also, you need to look closely at the object and read through all of its documentation, especially conservation reports. Discuss potential problems with a conservator.

Exhibit object mounting guidelines

(Copied from U.S. Park Service Guidelines)

There are many different methods of constructing an exhibit mount for any one object, however, all must be governed by the criterion that they provide long-term protection for the object while on exhibit. The exhibit mount is where the object comes into physical contact with the exhibit, and careful design and construction of mounts is necessary to avoid introducing a new source of damage for the object.

Mounts should be designed to protect their objects during the total period of the exhibition. A properly mounted object is protected from slippage, jarring, and other movements due to air currents, ambient vibration, and visitor movement. Exhibit mounting is critical to the preservation of the displayed materials and requires a set of highly complex skills. It is convenient to separate exhibit mounts into two categories which represent their complexity and accordingly the skills required of the mount maker.

a. Basic mount making rules

- No object should be altered to suit the mount.
- Support objects completely. Check how the object is made and where it is stable/unstable and where a mount can be put safely. Weak material, such as unfired pottery, needs as much support as possible.
- Place object at it's center of gravity. If it is placed off center, you introduce stress.

- Make patterns for your mounts. Do not try an unfinished mount on the artifact. Make a mock object, if necessary. Analyze the pattern to see how the mount is to be placed. After fabricating the mount, place it next to the object, as close as possible without touching it. If it provides good support, clean and pad the mount before fitting it on the artifact.

b. Type of mounts:

Type 1: Custom fit, object specific mounts. Requires object handling, measurement and fitting. Frequently requires consultation with a conservator. Requires design and fabrication by highly qualified, mounting specialist

Type 2: Generic, non-fitted mounts. Requires no object handling and fitting. Requires only rough measurements. Generally requires no consultation with a conservator. Requires no special qualifications of its mount fabricator.

c. Mount design guidelines:

- No object can be altered or repaired to accommodate exhibit mounting.
- Mounts should provide adequate support to prevent physical stress or unbalanced weight distribution on the object. The object's center of gravity or original intended attitude should be considered.
- No mount should be permanently attached to any object and easy access to the object should be afforded for curatorial maintenance and emergency removal.
- The fastening system must be based on a mechanical design and not adhesives or sticky substance.
- Mounts must anticipate in their design the tendency for organic materials to droop, sag, or experience dimensional changes.
- Vibration and abrasion should be minimized by the nature of mount's design and material selected for construction.
- Susceptible objects should not be subjected to creasing and folding or deformation by the placement of heavy objects directly on top of them.
- Fragile objects, including all textiles, should be supported over a great area as practical.
- The mount must secure objects that are displayed in the open to be reasonably safe from theft.

d. Fastening and material selection guidelines:

- Original objects must not be drilled, trimmed, tracked, nailed, screwed down or glued down. (NO use of museum wax, silicone rubber, or tapes).
- Fastening system must be based on a mechanical design and not an adhesive or sticky substance.
- Original clamps, hooks, strings, straps already attached to objects should not be used for support or to take the weight of the object.
- An object should never be forced to fit in a bracket, cradle or other

exhibit space. Straps or brackets should support and hold objects, not distort or scratch them). Cradles should gently support objects, not compress them.

- Exhibit mounts should employ inert materials, particularly in the areas of contact with artifacts.
- Mounts should not utilize unstable dyed fabrics and materials. These colorants can be transferred to the display object and therefore testing of fabrics is required.
- Sharp edges should be removed from all materials in close proximity to the displayed object and padding used whenever necessary.
- Only high quality padding and cushioning materials should be used: polyethylene foam, polyester batting and felt material, 100% cotton fabric, acid-free buffered tissue paper.
- Metal and wood products must be sealed with conservation-approved coatings.
- High grade, conservation approved, manikin or other supports may be used as a display of garments. They may be constructed and padded with inert materials (i.e., polyester fiberfill, polyethylene foam) or buffered from direct contact with cotton fabric.
- Muslin linings and backing are often needed to reinforce and protect these garments and other textiles. These are to be applied by qualified conservator.
- Persons measuring, fitting or installing objects on their mounts will wear clean gloves to prevent soiling of the object. (Glazed ceramics and glass objects are the exception).

d. Basic mount making rules and materials

- Mounts should be designed to protect an object in its case or area during the exhibition life. The object will not fall off or from a mount due to jarring or bumps to the case by visitors.
- Original artifacts **MUST NEVER** be drilled, trimmed, tacked, nailed, screwed, or glued down. A properly mounted artifact will be exactly the same when removed from the mount as it was when installed into the mount.
- Do not use original hooks, strings, straps or handles on the artifacts as supports. Always create a mount that will bear the body of the artifact. Never put weight on thin or delicate parts of an item.
- Never strain an artifact to fit a bracket, mount or exhibit space.
- Mounts should not be made of materials that will harm the artifact. Use non-volatile materials such as: brass, Plexiglas (best case scenario, choose UV Plexiglas) and acid-free mat board
- Original documents, artwork and photographs (if they **MUST** be displayed without reproducing them) should be framed and matted with acid-free board with a Plexiglas cover.

e. Photographs

- Don't display precious photos. Instead, get a digital copy made and frame that one. This is easily and cheaply done at any local photo store.
- If you insist on displaying an old photo, avoid regular frames with glass plates, as moisture can seep in and adhere the glass to the picture. Instead, have it professionally mounted and framed. Pay extra for archival or "museum-quality" glass -- it cuts out ultraviolet light.

f. Negatives

- Remove your negatives from the plastic or paper sleeves they came in. Instead, keep them organized in what is known as "inert plastic" (non-PVC), or in acid-free envelopes.
- Handle them carefully so as not to leave fingerprints.
- Negatives do best in a cold place. (But not the attic, garage or basement!)
- Very old, glass negatives should be stored on their edges (not one on top of another) in an archival box.

g. Photos

- Store photos in plastic sleeves or acid-free envelopes. If you write on the back of the photo, use soft pencil. Pens and markers can cause damage over time.
- Don't assume that photos stored in an old black paper album are doomed to deteriorate quickly. Removing photos from the album can cause even more damage. Leave them be, just store them in a cool, dry environment.
- Avoid albums with self-sticking (or "magnetic") pages.
- Mount photos in albums with acid-free pages and use acid-free or plastic corners to secure the photos. Glues and tape can permanently harm the photos. If the photos are too large for photo corners, use archival paper hinging tape, which can be found at good photo and art supply stores.

h. Linens

- First identify the fabric(s) and the approximate age of the item, so you can know how to care for it. (Link to fabric analysis piece when it's completed) Local libraries are good sources for books on identifying vintage textiles. A nearby museum will also offer good suggestions and may also have a library you can use. (See list for books)
- If the fabric is not too fragile, the item should be properly cleaned before storage.
- Before doing anything, spot test the fabric. Touch a moistened cotton swab to the different colors and areas, if dye transfers to the swab-stop! Contact a local conservator for help.
- Never dry-clean: Delicate fabric can't take the harsh chemicals.
- Gentle cleaning agents such as Orvus are recommended by some experts. It can be found at quilting supply stores, as well as animal supply stores (it is

also an equine soap).

- After the item is cleaned, it should be stored in an acid-free container.
- Roll heavy objects like quilts around a tube that has first been covered in acid-free tissue.
- Avoid folding. If you must fold, fold around acid-free tissue to prevent splits where the fabric is folded.
- Do not store textiles on bare wood shelves or cedar boxes as oils from the woods will discolor the fabric.
- Never store your textiles in plastic bags. The airless environment suffocates the fabric.

i. Books and Loose Family Papers

- Have any repairs to the books done by a professional conservator.
- For books with fragile bindings or any other loose collection of documents, have a specific box made for the book of acid-free materials. This will protect the materials from the elements and from rough handling.
- Protect book dust jackets. Acetate covers, like those used in libraries can be bought from archival supply stores.
- If your books are suffering from mold, brush the fuzz off with a soft cloth. However, the tell-tale brown spots known as "foxing," are signs of mold damage from long ago, and unfortunately, there's nothing to be done about it. The only recourse is to prevent mold growth in the future. A dehumidifier will help.
- The smell that's closely associated with old books is mildew and is usually caused by a cold, damp environment. Immediately remove the books from the area and -here's the only time you can do this with these old things - place them in the sun for a brief sunbath to dry them out. You can also place them in a dry room with a fan on low.

j. Display of textiles

- Wear clean white gloves when handling textiles.
- NEVER pin or tape anything to a textile.
- Inspect the item for pests, especially wool items
- Display large flat textiles on a muslin covered panel tilted at a slope. This avoids putting stress on the artifact if it is displayed vertically.
- Do not allow the item to come in direct contact with glass or Plexiglas.
- Any support system that displays a garment must be well padded at the areas where pressure from gravity will occur. For example: at the seams of the shoulders.
- Rotate or exchange textiles and garments during a long term exhibit to reduce environmental damage.
- Make the display form fit the garment. NEVER force the garment onto the form.

k. Graphic reproductions

- Best practice is to have a photo-negative created of the original so that a negative can be kept on file for future use and safe keeping. This also eliminates repeated exposure to handling and light, thereby extending the life of the object or photograph.
- If need be, make photocopies or color photocopies of originals as seldom as possible.
- NEVER EVER mount original photographs with anything BUT archival corners.
- ONLY reproductions, (never originals) may be permanently mounted to a backing board.
- Use Plexiglas in frames
- Always use reproductions when originals are too fragile to withstand exhibition.