



National Aeronautics and Space Administration

SECTION 504 COMPLIANCE REVIEW REPORT



Field Museum of Natural History

Chicago, Illinois

Office of Diversity and Equal Opportunity

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Executive Summary

This report reviews compliance by the Field Museum of Natural History (“Museum”) with Section 504 of the Rehabilitation Act of 1973 (“Section 504”).¹ Section 504 prohibits discrimination against qualified individuals with disabilities by Federal fund recipients. The Museum needs to comply with Section 504 in all of its programs and activities due to its receipt of Federal funds, including a grant from NASA. The Museum also needs to comply with Section 504 because of other Federal funding it receives, including grants from other Federal agencies.

In this Executive Summary, NASA details: 1) Compliance Requirements: required actions to correct (i.e., policies, procedures, practices, and facilities that do not currently meet Section 504 compliance standards), 2) Compliance Recommendations: Suggested actions to enhance or strengthen policies, procedures, practices, and facilities that have achieved basic Section 504 compliance, that have been or will be addressed, and 3) Promising Practices: Actions that demonstrate both an advanced level of Section 504 compliance and informal education program delivery that can be shared with and emulated by other science museums.

Based on the information detailed in this report, NASA has determined that the Museum needs to take a number steps listed in this Executive Summary under “Compliance Requirements” to be in full compliance with NASA’s Section 504 regulations. NASA also recommends that the Museum implement the “Compliance Recommendations” identified in this report and share what NASA has identified as “Promising Practices” with other museums, cultural institutions, and disability-advocacy organizations.

The onsite visit to the Museum by the NASA review team, which consisted of NASA staff as well as employees and contractors of Cryptzone, Inc², took place in November 2015. The report was prepared and submitted by Cryptzone to NASA in April 2016. NASA reviewed and edited the draft prepared by Cryptzone and transmitted that draft to the Museum in September 2016. The Museum submitted comments and various factual corrections to the draft on October 31, 2016. This version of the report incorporates the Museum’s comments and edits. For those comments/edits that reflect updated information to a NASA finding of fact, corrective action, recommendation, or promising practice, NASA notes the update in the revised portions of this report and/or with a footnote that the Museum provided updated information in its submitted draft of October 31, 2016.

¹ 29 U.S.C. 794 (2012).

² Cryptzone is NASA’s vendor for Section 504 onsite compliance review services.

Compliance Requirements:

- **Architectural Issues.** The Museum must consider removing and/or making programmatic changes to ensure that the identified physical barriers do not limit access to people with disabilities. This can be achieved through the development and implementation of a transition plan that itemizes removal of barriers, timelines, and budget. In most instances, these inconsistencies make program access more difficult—but not impossible—for people with disabilities. Many of the compliance issues noted in this section involve protruding objects into accessible routes, counter heights, and door widths. In a few cases, the inherent nature of the exhibit (e.g., the Egyptian Tomb exhibit) or the building’s old structure (e.g., marine mammal exhibit) make it impractical to make an exhibit accessible. In this case, it may not be necessary to make the exhibit accessible—but accessible alternatives need to be provided. In this case, we have suggested some alternatives that may meet the program access requirements of Section 504. Lastly, the 3D movie theater has significant accessibility issues that appear to violate the new construction and alterations standards of Section 504, and are noted on page 110 in further detail. These errors are significant and the Museum may need to consider efforts to correct these architectural deficiencies. Accordingly, the Museum must develop and implement a transition plan that identifies physical barriers to accessibility and that meets the requirements of 14 C.F.R. § 1251.301(d).
- **Website and Mobile App Accessibility.** The Museum needs to make accessibility changes to its current website. Some of the identified barriers block access to major sections of the website content. Notably, the “accessibility” page is inaccessible to blind visitors and users with disabilities that require keyboard navigation. The Museum also needs to provide more specific information for users with disabilities on its website, such as the Museum’s nondiscrimination policy, grievance procedure, etc. Additionally, their mobile app has several accessibility issues that needs to be remedied soon.
- The Museum must develop a clear and comprehensive nondiscrimination policy that is made available through the Museum’s website, perhaps as part of an overall accessibility statement. Other brochures, documents, and similar publications should reference this nondiscrimination policy. The policy should also capture other key accessibility information for program participants.
- The Museum must develop a fair and comprehensive grievance process that is published and made available to program participants. This should be located on the Museum’s website, perhaps as part of its accessibility statement.
- The Museum must adopt and implement procedures to ensure that interested individuals, including individuals with vision or hearing disabilities, can obtain information as to the existence and location of services, activities, and facilities that are accessible to and usable

by individuals with disabilities. NASA found little information on the Museum's website that meet these requirements, such as the availability of wheelchairs. The Museum must also provide information on how sign language interpreters and other reasonable accommodations (i.e., auxiliary aids and services) are made available to program participants. This notice, which can be deployed on the Museum's website, should identify why these services are available, relevant points of contact, and any required notice period.

- The Museum must provide Assistive Listening Devices (ALDs) in its lecture halls. In addition, the Museum must ensure that movies in its 3D theater are accessible to visitors with hearing and vision disabilities. This includes installing equipment for rear-window captioning and audio descriptions and seeking out productions that support captioning and audio description whenever possible.
- There are a number of coding issues with the Museum's website and mobile apps that make access by users with disabilities difficult. These deficiencies are carefully itemized below and should be corrected. While specific regulatory standards for the accessibility of websites, mobile apps, and other electronic media do not currently exist under Section 504, the requirement to provide accessibility for these media is generally covered under Section 504's program access requirements and case law.
- Touch panels and digital reading rails need to be accessible for independent access. This report also includes short- and medium-term strategies that the Museum can leverage to ensure program access.

Compliance Recommendations:

This section details some of the Museum's opportunities for improvement in complying with Section 504 and some of their promising practices that should be highlighted and shared.

- In lieu of a self-evaluation, the Museum should use this report as a baseline set of requirements for Section 504 compliance. The Section 504-designated responsible employee should work with the Museum's accessibility committee to address issues identified in this report, beginning with the creation of an action plan with specific milestones.
- The Museum's Section 504-designated responsible employee position should be clarified to all Museum staff so that all accessibility issues are funneled through her office. In addition, she should be provided training in disability-related laws and regulations. She should also report directly to the Museum's leadership in implementing accessibility efforts.
- The Museum's comment card system needs to be strengthened to solicit more meaningful information. This can be done on the card directly or by reference to a URL on the

website. It should also reference the Museum's Section 504 grievance process to ensure that program participants have a clear understanding of the Museum's processes.

- The Museum should consider a number of efforts to ensure that visitors to the Museum enjoy equal participation in the Museum's programs. These strategies should potentially include stronger outreach efforts to the disability community in the Chicago area.
- The Museum should consider using a "secret shopper" program that includes testers with disabilities to ensure that its retail operations and cafeteria also do not unintentionally discriminate against visitors with disabilities.³
- The Museum needs to enhance training efforts to its staff on disability issues, including both general disability training as well as specific training on the policies and procedures that need to be implemented (see Policies and Procedures section, above).

Promising Practices/Exceeds Compliance Requirements:

- The Museum should continue to caption all videos available to the public and program participants.
- The Museum's provision of special tours for individuals with disabilities by docents is an excellent example of how organizations can provide one-on-one accommodations that overcome inherent barriers in its programs, services, or activities. This effort should be continued and highlighted in the organization's website.
- The Museum's Learning Center is a promising practice for its integration of accessibility, from design through execution, and for how it leverages the Museum's extensive collection to make science more tangible for area students with disabilities.
- The Museum's investigation of internal wayfinding technology is noteworthy and should be encouraged, as it promotes a higher degree of access to the Museum's programs. In doing so, however, the Museum must be mindful of the accessibility challenges for mobile apps.
- The Museum often works with parents of children with autism who are unable to wait in long or noisy lines. Under these circumstances, staff are trained to respond quickly and take the parents and children to a quiet area while awaiting their turn. While this can be considered a best practice, the Museum should consider a "fast pass" priority or timed-ticket type of queue access for patrons on the autism spectrum to minimize stress for these visitors and their families, aides, or caregivers.

³ In its 10/31/16 response to the draft onsite review report, the Museum stated that the Audience Insights & Research team will look into the cost of this. Most likely they would be able to start this research in early 2017.

- With respect to architectural accessibility, there are two areas where the Museum performed very well. First, the east entrance to the Museum reflects a detailed and thoughtful understanding of accessibility and is a key element to making the rest of the building accessible. Second, the Museum’s exhibits and interactive elements reveal a focus on accessible and inclusive design that rises above most other science centers and museums.

The remainder of this report addresses accessibility at the Museum from a number of perspectives and is divided into three parts:

1. Policies and Procedures
2. General Program Access
3. Architectural Accessibility

Each of these section begins with a discussion of compliance issues that the NASA Team identified during its review. In addition, there are a number of areas where the Museum exceeds regulatory requirements and implements promising practices in meeting the needs of visitors. These promising practices are also listed at the beginning of these three sections.

Lastly, on January 22, 2016, NASA published notification in the Federal Register that it has revised its Section 504 regulations. The revised Section 504 regulations took effect on February 22, 2016. In the revised regulations, NASA made several key changes to portions of the regulation, which are detailed here, including the adoption of the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design (2010 Standards) as the sole accessibility standard for new construction and alterations to buildings and facilities that receive Federal financial assistance from NASA. All regulations quoted or referenced in this report are from the revised Section 504 regulation. With respect to the architectural accessibility section, NASA references both the UFAS and the 2010 standards for each element not meeting these standards. It must also be noted that only the one standard may be used for ALL new construction and alterations during the above-referenced time period. We further note that on August 11, 2016, the U.S. Department of Justice published notification in the Federal Register that it has revised its Title III Americans with Disabilities Act regulations, to take effect on October 11, 2016. These regulations include an expanded definition of “disability” that NASA has adopted in its revised Section 504 regulations.

NASA expects the Museum to comply with all requirements of the revised Section 504 regulation going forward. NASA’s monitoring of the St. Louis Science Center’s (SLSC’s) efforts to meet the compliance requirements and implement recommendations listed below will be evaluated according to the revised Section 504 regulations.

Section 504 Compliance Review Report

Background

Field Museum Facilities and Operations

The Field Museum of Natural History is one of the world's premier natural history museums. Built originally to house exhibitions from the 1893 Chicago World's Fair, the museum moved in 1921 to its current location, where it is now part of Chicago's lakefront museum campus, along with the Shedd Aquarium and the Adler Planetarium. In addition to being a museum, it is also a preeminent research facility.⁴ Today, it operates as a private institution providing collection-based research, exhibits, and public education.

While the Museum owns its building and its extensive collection, the land that the building occupies is owned by the Chicago Parks District, which leases the land to the Museum at no cost. The Museum's facility is quite large, with public program space occupying 372,316 square feet and, as noted above, considerable additional area for research, archival, and other non-public spaces. While the Museum is entirely responsible for its facility (including maintenance), it shares responsibility for maintaining its grounds with the Chicago Park District. In general, the Museum maintains the grounds within its lease boundaries but does consult with the Park District on some maintenance-related issues.⁵ In 2014, the Museum had 1,228,637 visitors. This total includes paid and free admissions, adult and school groups, special events, and member admissions.⁶

The day-to-day operations of the Museum are overseen by the Museum's president, who also serves as the Museum's chief executive officer. The Museum's president is responsible to the Museum's board of trustees (which comprises 85 members) but reports directly to the board chair. The Museum president is responsible for the functioning and growth of the Museum. Along with the Museum's staff, he is responsible for policy and planning, subject to approval by the board.

The Museum has a large workforce to support its programs.⁷ While the numbers vary throughout the year, the rough ranges of workers at the Museum are approximately:

⁴ The research facility and its programs occupy non-public spaces and were not examined as part of this review.

⁵ Field Museum Response to NASA Information Request (September 18, 2015).

⁶ Field Museum Response to NASA Information Request (September 18, 2015).

⁷ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

- 480-530 full- and part-time employees
- 550-700 volunteers (including approximately 300 docents)
- 150-220 interns

Docents play a key role in interfacing with the public and they are actively recruited.

Field Museum Budget and Funding

The Museum has an annual budget of approximately \$65 million.⁸ The Museum uses a regular process for planning each year’s budget and expenditures. In June, each of the departments and sections at the Museum submits its proposed budget for the upcoming year. This is reviewed by a finance team on the Museum staff, which then submits the proposed budget to the budget committee of the Museum’s board of trustees. The proposed budget then proceeds to the finance committee and executive committee before being voted on by the full board of trustees in November.⁹ Despite this very formal budget-approval process, the Museum can be flexible in terms of making any changes recommended by our review.¹⁰

NASA grants are a small part of the overall funding received by the Museum. NASA awarded a \$276,000 grant to the Field Museum for a research project to study nanodiamonds and micrometeorites.¹¹ While the grant does not fund programs, services, or activities of the Museum to program participants, the Museum has developed some educational programs based on this research.¹²

In addition to this grant from NASA, the Museum also receives funding from the following Federal agencies:

- National Science Foundation

⁸ This does not include capital expenditures, which account for approximately an additional \$9 million.

⁹ Interview of Jim Croft, Martha Alexander, and Pamela Clayburn (Nov. 11, 2015).

¹⁰ Interview of Jim Croft, Martha Alexander, and Pamela Clayburn (Nov. 11, 2015).

¹¹ The NASA funded research project NNX15AC53G is titled, “Premolar Chronology of Silicon Carbide and Atom-Probe Tomography of Meteoritic Nanodiamonds and Presolar Nano-Oxides.” The principal investigator for this grant is Phillip Heck and this grant’s lifecycle is from 1/1/15 to 12/31/17.

¹² The museum has created several videos that describe this fascinating research. One video is available on YouTube at <https://www.youtube.com/watch?v=wpBCJoxGWXk>. A second video describes how the Field Museum research team extracts nanodiamonds and other particles (some only 2nM in diameter) from meteorites. <https://www.fieldmuseum.org/science/blog/video-we-are-all-stardust>.

- Department of the Interior (National Park Service and U.S. Fish and Wildlife Service)
- Institute of Museum and Library Services
- Department of Agriculture (U.S. Forestry Service)
- Department of Commerce (National Oceanic and Atmospheric Administration)
- Environment Protection Agency

This review covers Section 504 compliance by the Museum as a whole, in all of its public-facing programs, services, and activities.¹³ As a private museum, the Museum also has accessibility requirements under Title III of the Americans with Disabilities Act¹⁴. In many instances, the requirements of Title III are virtually identical to counterpart requirements under Section 504. While this review is not intended to review Title III compliance by the Museum, the Museum may find that this report assists with its Title III compliance.

NASA’s Compliance Review of the Museum

In 2015, NASA began its review of Section 504 practices at the Museum. During the course of this review, NASA sent the Museum a detailed information request on June 25, 2015. On September 23, the Museum responded to this information request by providing a detailed response with supporting documents. On November 10-11, the NASA team visited the Field Museum to interview its staff, conduct a thorough architectural review of the public spaces used by the Museum, and review the different forms of information technology used by the Museum. NASA’s onsite review included interviews with the following representatives from the Museum:

Ray DeThorne (Chief Marketing Officer)
 Megan Beckert (Director of Business Enterprises)
 Darnell Williams (Director of Guest Relations)

¹³ The Civil Rights Restoration Act of 1987, Pub. L. No. 100-259, 102 Stat. 28, overturned the Supreme Court decision in *Grove City College v. Bell*, 465 U.S. 555 (1984), by extending the coverage of civil rights laws (including Section 504) beyond the narrow confines of the exact program being funded. Section 504 covers the entirety of a “private organization... which is primarily engaged in the business of providing education... or parks and recreation...” if any portion of that private organization receives Federal financial assistance 29 U.S.C. § 794(b)(3)(ii). While the Museum engages in activities other than education, a substantial portion of its mission is dedicated to education. Whether all of the Museum’s public-facing programs are covered by the Section 504 is a fact-based determination beyond the scope of this report. This may not be relevant, however, as the Museum has expressed interest in being as accessible to people with disabilities as possible throughout our review.

¹⁴ 42 U.S.C. §§12,181 - 189.

Jacob Shuler (Guest Relations and Administrative Supervisor)
Jaap Hoogstraten (Director of Exhibits)
Gretchen Baker (Exhibitions and Planning and Operations Director)
Alvaro Amat (Design Director)
Stacy Dilling (Director of Marketing and Advertising)
Brad Dunn (Web and Digital Communications Director)
Deborah Moskowitz (Vice-President, Science and Education)
Beth Crownover (Director of Learning)
Heidi Rousseau (School Learning Experiences Manager)
Shawn VanDerziel (Chief Human Relations Officer)
Mary Ann Bloom (Docents Manager)
Jolynn Willink (Safety and Benefits Manager)
Charles Katzenmeyer (Vice-President for Institutional Advancement)
Usha Subramanian (Director of Individual Giving)
James Croft (Executive Vice-President and Chief Financial Officer)
Monique Tarleton (Director of Protective Services)
Ernst Pierre Toussaint (Director of Facilities, Planning, and Operations)
Martha Alexander (Budget and Treasury Services Director)
Pamela Clayburn (Grants Compliance Director)
Richard Lariviere (President and Chief Executive Officer)

This report is based on the findings from this NASA site visit (including interviews, documents, and a physical review of the Museum), as well as documents provided by the Museum. Throughout this review process, the Museum has been welcoming and forthcoming with a focus toward full compliance with Section 504 and promoting the best possible experience for program participants with disabilities. This report addresses the current status of the Museum and upcoming projects, discuss any deficiencies, and highlight promising practices identified during the review process.

Discussion

Section 504 prohibits discrimination on the basis of disability. Specifically, Section 504 requires that:

No qualified individual with a disability shall, on the basis of disability, be excluded from participation in, be denied the benefits of, or otherwise be

*subjected to discrimination under any program or activity which receives Federal financial assistance.*¹⁵

This “program access” requirement has been adopted by the NASA nondiscrimination regulations¹⁶. These regulations clarify the program access requirement:

*A recipient shall operate each program or activity to which his part applies so that when each part is viewed in its entirety it is readily accessible to . This paragraph does not require a recipient to make each of its existing facilities or every part of a facility accessible to and usable by individuals with disabilities.*¹⁷

This program access requirement is intended to make Section 504 flexible. For instance, if an existing exhibit includes an inaccessible element that cannot be made accessible, program access would permit the use of an adjacent accessible alternative that conveys the same content and learning opportunities as the inaccessible element.

The NASA Section 504 regulations also itemize specific prohibitions against forms of discriminatory conduct, such as failing to provide equal opportunities to persons with disabilities¹⁸ or failing to provide auxiliary aids or services to ensure effective communication.¹⁹

NASA’s Section 504 regulations also include very specific policy and procedural requirements to help ensure compliance and that program participants are aware of their rights under Section 504. These rights include designating a responsible employee to coordinate Section 504 compliance,²⁰ creating grievance procedures for program participants,²¹ and ensuring that program participants are aware of their rights under Section 504.²²

¹⁵ 29 U.S.C. § 794(a) (2008).

¹⁶ 14 C.F.R. § 1251.103(a) (2016).

¹⁷ 14 C.F.R. § 1251.301(a) (2016).

¹⁸ 14 C.F.R. § 1251.103(b)(1)(i)-(iv) (2016).

¹⁹ 14 C.F.R. § 1251.103(b)(3) and § 1251.112 (2016).

²⁰ 14 C.F.R. § 1251.106 (2016).

²¹ 14 C.F.R. § 1251.106 (2016).

²² 14 C.F.R. § 1251.107 (2016).

This section will review how the Museum currently makes its programs, services, and activities accessible to people with disabilities, dividing this analysis into three sections:

- **Policies and Procedures.** NASA's Section 504 regulations require that grantees adopt specific policies and procedures. This section reviews compliance with these requirements.
- **General Program Access.** This section discusses how programs are made accessible on a day-to-day basis at the Museum.
- **Architectural Accessibility.** Section 504 requires that all new construction and alterations conform to a specific set of architectural guidelines. Further, all spaces used for the Museum's programs, services, and activities need to be held in accessible areas. This section will review the accessibility of these locations.

Each of these sections begins with a review of the significant findings by the NASA team, including potential areas of noncompliance and promising practices. Each section also includes a detailed analysis of the team's findings, a review of the supporting materials and legal materials supporting these findings, and recommendations whenever possible.

Policies and Procedures

Compliance Issues and Recommendations

- In lieu of a self-evaluation, the Museum should use this report as a baseline set of requirements for Section 504 compliance. The Section 504-designated responsible employee should work with the Museum's accessibility committee to address issues identified in this report, beginning with the creation of an action plan with specific milestones.
- The Museum needs to address architectural barriers by developing and implementing a transition plan that, at a minimum, meets the requirements of 14 C.F.R. § 1251.301(d).
- The Museum's Section 504-designated responsible employee position should be clarified to all Museum staff so that all accessibility issues are funneled through her office. In addition, she needs to be given specific training in disability-related laws and regulations. She should also report directly to the Museum's leadership in implementing accessibility efforts.
- The Museum needs to develop a clear and thorough nondiscrimination policy that is made available through the Museum's website, perhaps as part of an overall accessibility statement. Other brochures, documents, and similar publications should reference this nondiscrimination policy. The accessibility statement can also capture other key accessibility information for program participants.
- The Museum's comment card system needs to be strengthened to solicit more meaningful information. This can be done on the card directly or by reference to a URL on the website. It should also reference the Museum's Section 504 grievance process to ensure that program participants have a clear understanding of the Museum's processes.
- The Museum needs to develop a fair and thorough grievance process that is made available to program participants. This should be located on the Museum's website, perhaps as part of its accessibility statement.

Section 504 and the NASA implementing regulation require grantees to adopt policies and procedures that help effectuate Section 504 compliance. In addition, Section 504 requires grantees to provide notice of these policies and procedures. These requirements are discussed in this section.

Self-Evaluation and Transition Plan

NASA's Section 504 regulations, along with the Section 504 regulations of almost every Federal agency, require that grant recipients conduct a self-evaluation of their compliance with Section 504 within one year of first receiving a grant.²³ The Museum conducted an informal self-evaluation²⁴ over a period of years that involved conversations with education, human resources, exhibitions, and facilities personnel. Documentation gathered in those prior years formed the basis of the Section 504 evaluation provided to NASA. It was updated and expanded after the Museum was informed of NASA's site visit in 2015.²⁵ As far as witnesses recalled, the Museum has never had an external accessibility review.²⁶

Further, these Section 504 regulations also require fund recipients to create a transition plan for taking the necessary steps for ensuring program access.²⁷ This transition plan requires that specific actions and milestones be identified and preserved in a document available for public inspection. Specifically,

The plan shall, at a minimum:

(1) Identify physical obstacles in the recipient's facilities that limit the accessibility of its program or activity to individuals with disabilities;

(2) Describe in detail the methods that will be used to make the facilities accessible;

(3) Specify the schedule for taking the steps necessary to achieve full accessibility under paragraph (a) of this section and, if the time period of the transition plan is longer than 1 year, identify steps that will be taken during each year of the transition period; and

²³ 14 C.F.R. § 1251.105(c) (2012).

²⁴ Field Museum Response to NASA Information Request (September 18, 2015). This self-evaluation follows the format of the "Section 504 Self-Evaluation Workbook" developed by the Civil Rights Office of the National Endowment for the Arts. A copy of this document is available at <https://www.arts.gov/open-government/civil-rights-office/section-504-self-evaluation-workbook>.

²⁵ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

²⁶ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015).

²⁷ 14 C.F.R. § 1251.301(d).

(4) Indicate the person responsible for implementation of the plan.²⁸

As noted above, while the Museum has informally conducted a self-evaluation of its compliance with Section 504, it has not developed a transition plan to correct any deficiencies identified in its self-evaluation. As described in more detail below, the Museum has recently appointed a new Section 504 coordinator and created a new accessibility committee to centralize and coordinate its accessibility needs.

While a useful beginning, the Museum's self-evaluation is not thorough enough and does not identify many of the barriers for people with disabilities at the Museum. NASA recommends that the Museum use the findings and facts in this report to revise and improve their self-evaluation. As long as it is a recipient of Federal financial assistance, the Museum must create a written transition/implementation plan as delineated in 14 C.F.R. § 1251.301(d), with specific milestones, to address the deficiencies identified in this report, as this report identifies many of the barriers that people with disabilities will likely face.

Section 504 Coordinator and Accessibility Committees

The NASA Section 504 regulations require grantees to designate a responsible employee for coordinating their compliance with Section 504.

(a) Designation of responsible employee. A recipient that employs 15 or more persons shall designate at least one person to coordinate its efforts to comply with this part.²⁹

Section 504 provides relatively little specific guidance for implementing this requirement. The Department of Justice and NASA regulations, under Title IX of the Education Amendments of 1972, include roughly similar requirements for a designated responsible employee (DRE). Outside the formal regulatory process, the Department of Education has developed technical assistance materials to further inform grant recipients on how to fulfill their Title IX obligations.³⁰ The Department of Justice has recommended that fund recipients abide by these recommendations³¹, and has summarized the responsibilities and job requirements for the DRE.

²⁸ 14 C.F.R. § 1251.301(d).

²⁹ 14 C.F.R. § 1251.106.

³⁰ Department of Education (Office of Civil Rights), *Title IX Grievance Procedures: An Introductory Manual* (2nd ed. 1987), available at <http://www.eric.ed.gov/>.

³¹ Department of Justice, *Questions and Answers Regarding Title IX Procedural Requirements*

Because both Title IX and Section 504 address the responsibilities of Federal fund recipients, this guidance is useful in identifying the duties and skills of the Section 504 DRE. These skills include:

- Providing consultation and information to potential complainants;
- Distributing and receiving grievance forms;
- Notifying parties, scheduling hearings, moderating procedures, monitoring compliance and timeliness, maintaining records, and training staff regarding grievance processes; and
- Providing ongoing training and technical assistance.

The core competencies of the DRE include:

- In-depth knowledge of Section 504 and general related knowledge of Federal and state non-discrimination laws;
- Knowledge of the recipient's grievance procedures and personnel policies/practices; and
- The ability to prepare reports on compliance activities, make recommendations to appropriate decision makers, diagnose, and mediate differences of opinion.

According to the Department of Justice, for the DRE to be effective:

- The functions and responsibilities of the DRE must be clearly delineated and communicated to all levels of the entity, employees, and program participants; and
- The DRE must be provided all information, authority, and necessary access to enforce compliance requirements.

Again, because these requirements are not specifically included as part of Section 504, they should be used as rough guidelines for Section 504 compliance and not as strict requirements. Nevertheless, NASA found that the Museum has not met these guidelines.

First, the Museum has only recently identified a Section 504 DRE and few on the Museum staff know that she fills the role of Section 504 DRE. During the course of NASA's onsite visit to the Museum, NASA found that many staff persons who were interviewed were unable to identify the Museum's Section 504 Coordinator. The Museum's response to NASA's information request in 2015 indicated that coordination of Section 504 compliance (including complaint resolution) was jointly accomplished by the Marketing and Public Engagement Department and the Human

Resources Department.³² However, the Museum has subsequently informed NASA that Jolynn Willink, the Safety and Benefits Manager in the Museum's Human Resources Department, is the Museum's designated responsible employee, and will coordinate its compliance with Section 504 and, over the next year, will attend various compliance trainings and the National ADA Symposium in May 2017.³³

Second, the Museum's Section 504 DRE needs more specialized training in accessibility requirements. Accessibility is a complicated area that requires a good understanding of the needs of many different types of disabilities. It also requires understanding how a complex set of laws and regulations (at the Federal, state, and local level) all overlap, work together, and sometimes conflict. While the DRE does not possess this knowledge currently, there is little reason why this kind of expertise cannot be developed rapidly. In addition, none of the other witnesses interviewed at the Museum possess a better understanding of the different laws and regulations affecting accessibility. Training by organizations like the Great Plains ADA Center or the National Association of ADA Coordinators would likely serve her well in her role as the Section 504 DRE.

Third, it isn't clear that the Museum has given its Section 504 the authority necessary to coordinate Section 504 compliance across the Museum. A successful Section 504 coordinator needs to bring together and coordinate accessibility across a wide range of activities taking place in disparate sections of the Museum. The 504 DRE also need to ensure that sound practices and knowledge are shared throughout the Museum. In this regard, a strong accessibility committee would be very helpful but a strong commitment by the leadership of the Museum to bolstering the Section 504 DRE's role would also be helpful. As noted below, there are a number of accessibility issues facing the Museum. Meeting these issues will be challenging and will take time. In terms of meeting Section 504, the DRE should report to the senior leadership of the Museum.

³² Field Museum Response to NASA Information Request (September 18, 2015). The Museum's Section 504 Self-Evaluation response, which appears to be cut off in the version provided to NASA, may also support this split responsibility between the Marketing & Public Engagement Department and the Human Resources Department for handling Section 504 responsibilities. Field Museum Self-Evaluation, p. 8.

³³ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015); Interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rouleau (Nov. 10, 2015); Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015); Interview with Charles Katzenmeyer and Usha Subramanian (Nov. 10, 2015); Interview with James Croft and Monique Tarleton (Nov. 11, 2015); Interview with Ernst Pierre Toussaint (Nov. 11, 2015).

About one month before the NASA team site visit in November 2015, the Museum has created an accessibility committee.³⁴ This committee includes:

Pamela Clayburn (Grants Compliance Director)
Darnell Williams (Director of Guest Relations)
Beth Crownover (Director of Learning)
Alvaro Amat (Design Director)
Ernst Pierre Toussaint (Director of Facilities, Planning, and Operations)
Jolyn Willink (Safety and Benefits Manager)
Brad Dunn (Web and Digital Communications Director)
Sarah Ebel (Staff Attorney)
Patience Baach (Manager of Audience Insights & Research)

This committee is overseen by Ray DeThorne, Chief Marketing Officer for the Museum.

While the Section 504 regulations do not require the formation of an accessibility committee, having such a committee is a practical necessity for large organizations like the Museum and can dramatically improve Section 504 coordination and compliance. For instance, having an active accessibility committee can help with:

- **Sharing and Coordinating Knowledge and Resources.** In our experience in working with other organizations, we have noticed that knowledge and resources sometimes become “stove-piped” within particular branches or departments of large organizations. This can create inefficiencies and miscommunication each time they encounter accessibility issues. An accessibility committee enables the Museum’s various departments to share their experiences and lessons, coordinate the deployment of accessibility resources, and make the Museum into a best practice for visitors with disabilities.
- **Development of Disability Training.** A Section 504 coordinator, along with a robust accessibility committee, could also help organize and develop better training on disabilities for its staff. Based on our interviews, few people at the Museum receive any regular training focused on disabilities. For the rest of the Museum’s staff, there is no training specific to disabilities. In addition, some alternatives to traditional training that have proven successful by other grantees include:
 - *Disability Panel Presentations.* Other grantees have reached out to different elements of the disability community to share their views in panel

³⁴ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015); Interview with Jim Croft, Martha Alexander, and Pamela Clayburn (Nov. 11, 2015); Interview of Stacy Dilling and Brad Dunn (Nov. 11, 2015); Interview of Jim Croft, Martha Alexander, and Pamela Clayburn (Nov. 11, 2015).

presentations with their staff. Learning from people with different disabilities—each with different first-hand experiences—is a very powerful tool because it reduces abstract principles to the practical impact of the Museum’s actions on people’s lives. These are simple, easy-to-create panel discussions with one or two representatives from each of local area disability groups—most of which would be thrilled by the opportunity to improve learning experiences for their members at a facility as important as the Field Museum.

- *Disability Awareness Training.* Understanding legal obligations is clearly important for compliance, but it does little to ensure that staff are comfortable with disabilities. While our society has gone a long way toward successfully integrating people with disabilities into mainstream society, unseen barriers still remain. Direct experiential disability awareness training led by a trainer with a disability breaks down these barriers immediately.

In its October 31, 2016 response to the draft report, the Museum informed NASA that it will increase disability training for staff. A training program that provides regular and refresher disability training and policy and procedures training will be developed as recommended. Disability Awareness Training for all front-line staff, docents, and volunteers occurred on Nov 1, 2016.

Non-Discrimination Policy

To further ensure that program access, NASA’s Section 504 regulations includes a requirement to provide notice of its nondiscrimination policies. Specifically,

(a) A recipient that employs 15 or more persons shall take appropriate initial and continuing steps to notify participants, beneficiaries, applicants, and employees... that it does not discriminate on the basis of disability in violation of section 504 and this part. The notification shall state, where appropriate, that the recipient does not discriminate in admission or access to, or treatment or employment in, its programs and activities. The notification shall also include an identification of the responsible employee designated pursuant to §1251.106(a)... Methods of initial and continuing notification may include the posting of notices, transmission via electronic mail or text message, publication on the recipient's internet website, or in newspapers and

*magazines, placement of notices in recipient's publication, and distribution of memoranda or other written communications.*³⁵

At the time of the onsite review, NASA found that the Museum did not have a nondiscrimination policy for its visitors and program participants.³⁶ As noted below, the Museum has received relatively little feedback or complaints regarding its accessibility or lack of accessibility. If visitors and other program participants do not know that they have rights under Section 504 and do not have specific contact information for providing feedback, they are unlikely to provide feedback in all but the most extreme situations. To comply with Section 504, the Museum needs to provide a nondiscrimination statement on its printed and electronic media as soon as possible, including a detailed nondiscrimination statement on its website. In its October 31, 2016 response to the draft report, the Museum informed NASA that it will develop a nondiscrimination policy before the end of 2016.

In general, the Museum's website needs to be improved to include better information for people with disabilities. Most of the content of the Museum's accessibility pages should be devoted to program access—and this aspect of these webpages is discussed below in the Program Access section. In addition, these pages should include a detailed Accessibility Statement that includes:

- The Museum's nondiscrimination statement;
- The Museum's grievance process for program participants (plus describes the option of filing a complaint with Federal funding agencies);
- A description of how the Museum will provide assistance to visitors with disabilities (including auxiliary aids and services, such as docent guides or sign language interpreters upon request), the person whom visitors should contact for such a request, and the timeframe needed for making a request;
- A link to the Museum's floor maps, which note the location of accessible features such as entrances and rest rooms; and
- Identification of the Museum's Section 504 Coordinator (including contact information).

³⁵ 14 C.F.R. § 1251.107(a).

³⁶ Museum Response to NASA Information Request. Interview with Ray DeThorne, Stacy Dilling, and Brad Dunn (Nov. 10, 2015); Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015); Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

The Museum informed NASA that an effort is currently underway to pull together all accessibility related information in as few places as possible on the website, to make it easy for users to locate.³⁷

Grievance Procedures

The NASA Section 504 regulation also requires grantees to develop adequate grievance procedures:

(b) Adoption of grievance procedures. A recipient that employs 15 or more persons shall adopt grievance procedures that incorporate appropriate due process standards and that provide for the prompt and equitable resolution of complaints alleging any action prohibited by this part. Such procedures need not to be established with respect to complaints from applicants for employment or from applicants for admission to postsecondary educational institutions.³⁸

NASA found that the Museum has not adopted a Section 504 grievance procedure that would enable its visitors and participants to file internal complaints of discrimination by the Museum on the basis of disability. However, in its October 31, 2016 response to the draft report, the Museum informed NASA that it will develop a grievance procedure, including a separate complaint form for Section 504 complaints, before the end of 2016. Like many other museums and science centers, NASA found that the Museum relies upon the practice of responding to verbal and face-to-face instant complaints and requests for assistance from visitors through docents and other museum guest relations staff, as well as an informal comment card system for complaints and visitor feedback³⁹. These cards can be returned while at the Museum or returned by U.S. mail. They are also available at the Museum's information desks and at the visitor center. Even more commonly, comments come in by email—and these are treated identically to comments that come in through comment cards. Lastly, comments can come in through the Museum's website or even over the phone.⁴⁰

With respect to the current process of complaint intake, investigation, and resolution, the comments, in all cases, are initially triaged by the guest relations staff and logged into a central

³⁷ The Museum's response to NASA's draft review report (October 31, 2016)

³⁸ 14 C.F.R. § 1251.106(b).

³⁹ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

⁴⁰ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015).

Excel spreadsheet before being forwarded to the appropriate department.⁴¹ This system enables them to also quickly sort complaints by type as well as the responsible department. Once they reach the department level, complaints are resolved at the lowest levels first and can be escalated by the complainant up the chain of command (first to manager, then to a vice-president, and ultimately to the president).⁴² This procedure for addressing visitor complaints is not documented, however. The Museum’s docents, who have regular contact with Museum visitors, have never received complaints about accessibility issues and the majority of the comments that they receive are complimentary.⁴³ Museum visitors can also have immediate contact with security personnel (known as “security ambassadors”) at the Museum. The security team also has not received a complaint specific to accessibility—but if they received such a complaint, they would resolve it and use it as a training opportunity.⁴⁴ Unlike a few other grantees, the Museum does not encourage docents or staff members to solicit feedback through comment cards.

In reviewing the Museum’s methods of receiving complaints alleging violations of Section 504, NASA has determined that the current comment card system does not meet the requirements of Section 504 because they provide very little opportunity for visitors to provide detailed information about any complaints that they have at the Museum. For example, the comment cards do not ask for the specific time and date of incident, parties involved in an incident, and requested remedy or other action to be taken by the Museum. Therefore, the comment cards are not a proper communication mechanism for complaints of disability discrimination. NASA does not suggest that the comment cards be revised to document a discrimination complaint, since they are a method for the Museum to solicit feedback, comments, and complaints of a general nature. Rather, the Museum needs to develop and implement a separate 504 complaint form and procedure, for the visitor to document and the Museum to investigate and resolve the complaint that meets the requirement for a grievance procedure under 14 C.F.R. § 1251.106(b).

⁴¹ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); Museum Response to NASA Information Request.

⁴² Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

⁴³ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

⁴⁴ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).



Excellent News - My experience at the museum was great.

Whoops - Improvements needed.

Hello,

Thank you for visiting The Field Museum today. We hope you had an educational and enjoyable experience. We take our visitors' interests and concerns seriously, and welcome any comments or suggestions regarding your visit. Your feedback will help us to improve service for all of our guests.

Thank You,
Ray DeThorne,
Chief Marketing Officer

Dear Ray,

Figure 1 -- Field Museum Comment Cards (Front)

Date & Time of Visit: _____

Name: _____

Address: _____

Email: _____

*The Field Museum does not share information with any outside vendor.

Visit us on the Web at www.fieldmuseum.org.

From: _____

The Field Museum
1400 South Lake Shore Drive
Chicago, Illinois
60605

Figure 2 -- Field Museum Comment Card (Rear)

Again, the Section 504 regulations provide little guidance for the requirements of a sound grievance procedure. The Department of Education’s Title IX technical assistance materials provide more useful benchmarks for an adequate grievance procedure. While recognizing that institutions may be required to adopt unique grievance procedures, the Department of Education material outlines the basic information sought in a complaint process:⁴⁵

- The name, address, and signature of the complainant;
- A sufficient description of the alleged discrimination to let the organization know what occurred;
- The identity of the injured party;
- The name and address of the institution alleged to have discriminated;
- The approximate date(s) on which the alleged discrimination took place; and

⁴⁵ Department of Education (Office of Civil Rights), *Title IX Grievance Procedures: An Introductory Manual* p. 16 (2d ed. 1987).

- Sufficient background information to permit the organization to commence an investigation.

Implicit in the requirement that the Museum adopt a grievance process for program participants, is that the Museum actually document its grievance procedure and make this process available to program participants through the Museum's website. Complainants have due process rights and they should have a clear understanding of where to file complaints, how the complaints will be processed, the timeframe for a response from the museum, and any rights of appeal within the Museum for satisfactorily resolving the complaint. While the Museum seems to follow a consistent process, it currently is not documented and made publicly available. Once a 504 grievance procedure is developed and implemented, the Museum should direct visitors and other museum program participants with 504 program accessibility concerns and complaints to the Museum's accessibility statement (see above) on the Museum's website where the grievance procedure and/or complaint form can be accessed and completed by the aggrieved party. The Museum has informed NASA that the Museum's web team is ready to support putting this and other processes like this one in place to support this grievance procedure.⁴⁶

Based on our review, it appears that the Museum has received relatively few complaints regarding accessibility. Like other civic-minded organizations, the Museum staff appears to go out of their way to accommodate visitors, thus avoiding complaints from being filed. A few witnesses, however, did recall a few complaints related to accessibility.

- One complaint was received from the mother of a hearing-impaired daughter. Based on this complaint, the exhibits department worked with guest relations to ensure that there were more written materials and that captioning was provided.⁴⁷ About 12 years ago, the Museum received a complaint about access to the James Simpson theatre. The Museum resolved this complaint by creating a moveable ramp.⁴⁸ The Museum informed NASA that during a subsequent renovation, the Museum upgraded the James Simpson theatre elevator to make the stage accessible⁴⁹

The Museum also receives comments that suggest a general improvement in accessibility. For instance, the Museum received a comment that the Grand Hall of the Museum was difficult to traverse for wheelchair users. The Museum also received a comment that a staff-only elevator (which was occasionally used by visitors) should be more freely available for visitors with

⁴⁶ Museum's response to NASA's draft report (October 31, 2016).

⁴⁷ Interview of Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

⁴⁸ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015).

⁴⁹ Museum's response to draft review report (October 31, 2016).

disabilities.⁵⁰ The Museum also receives comments that lighting can be too low (a challenge because many exhibits are light-sensitive)⁵¹.

The lack of noteworthy complaints, however, does not obviate the need for improved grievance processes at the Museum. As noted earlier, a strong grievance process is a procedural requirement under the NASA Section 504 regulations for grant recipients. Having a clear grievance process is more than a pro forma requirement; it enables complaints to be addressed in a meaningful way and reduces the chances that legitimate complaints are not filed because complainants believe that they will be ignored or not taken seriously.

General Program Access

Potential Compliance Issues and Recommendations:

- The Museum should consider a number of efforts to ensure that visitors to the Museum enjoy equal participation in the Museum’s programs. These strategies include stronger outreach efforts to the Chicago-area disability community.
- The Museum should consider using a “secret shopper” program that includes testers with disabilities. This will ensure that its retail operations and cafeteria also do not discriminate against visitors with disabilities.
- The Museum must adopt and implement procedures to ensure that interested individuals, including individuals with vision or hearing disabilities, can obtain information as to the existence and location of services, activities, and facilities that are accessible to and usable by individuals with disabilities. NASA found little information on the Museum’s website that meet these requirements, such as the availability of wheelchairs. The Museum must also provide information on how sign language interpreters and other auxiliary aids and services are made available to program participants. This notice, which can be deployed on the Museum’s website, should identify why these services are available, relevant points of contact, and any required notice period. Without a clear understanding of the accommodations made available at the Museum, visitors may be inadvertently subjected to unequal treatment or unable to enjoy the benefits of the Museum’s programs.
- The Museum should continue its efforts at captioning all videos available to the public or otherwise to program participants.

⁵⁰ Interview of Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

⁵¹ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvar Amat (Nov. 10, 2015).

- The Museum needs to do a better job at training its staff on disability issues. This training should include both general disability training as well as specific training on the policies and procedures that need to be implemented (see *Policies and Procedures* section, above).
- The Museum needs to provide assistive listening devices (ALDs) in its lecture halls. In addition, the Museum needs to ensure that movies in its 3D theater are accessible to visitors with hearing and vision disabilities. This includes installing equipment for rear window captioning and audio descriptions, and seeking out productions that support captioning and audio description whenever possible. Lastly, this information needs to be advertised to program participants, preferably through the Museum’s website, and in marketing material for movie productions.
- There are a number of coding issues with the Museum’s website and mobile apps that make access by users with disabilities difficult. These deficiencies are carefully itemized below and should be corrected.
- Touch panels and digital reading rails need to be accessible for independent access. This report also includes short- and medium-term strategies that the Museum can leverage to ensure program access.

Promising Practices:

In addition to the compliance issues noted above, the following promising practices highlight the Museum’s commitment to meeting the needs of visitors with disabilities:

- The Museum’s special tours by its docents are an excellent example of how organizations can provide one-on-one accommodations that overcome inherent barriers in its programs, services, or activities. This effort should be continued and should also be described in the Museum’s website.
- The Museum’s learning center is a promising practice for its integration of accessibility from design through execution and for how it leverages the Museum’s extensive collection to make science more tangible for area students with disabilities.
- The Museum’s investigation of internal wayfinding technology is noteworthy and should be encouraged as it promotes a higher degree of access to the Museum’s programs. In doing so, however, the Museum must be mindful of the accessibility challenges for mobile apps. The Museum indicated to NASA that it is aware of those challenges, which are detailed in the *Mobile App Assessment* section, starting on page 62.⁵²

⁵² The Museum’s response to NASA’s draft report (October 31, 2016).

This section addresses general program access at four levels:

1. **Program Access for General Visitors to the Museum.** This section includes the accessibility of programs at the Museum’s main facility. In general, it focuses on accessibility for the day-to-day visitor at the Museum.
2. **Program Access in Educational Programs and at Camps or Events.** This section addresses the accessibility of the Museum’s educational programs to local schools and the Museum’s overnight and summer camps.
3. **Emergency Evacuation.** This section provides a snapshot of how the needs of people with disabilities are met in emergency situations.
4. **Effective Communication.** This section focuses more specifically on how the needs of individuals with sensory disabilities, particularly those individuals with hearing impairments, are met.
5. **Training.** This section discusses the need for training at the Museum specific to accessibility.
6. **Digital Accessibility.** Closely related to the *Effective Communication* section, this portion of the report addresses the accessibility on the use of digital technologies, such as mobile apps and its website.

[Program Access for General Visitors to the Field Museum](#)

The following section describes how program access is achieved for everyday visitors to the Museum. It focuses on how the museum makes the public aspects of its day-to-day operations accessible to visitors with disabilities, particularly its exhibits, retail establishments and other events generally open to the public.

Docents and Everyday Visitors to the Field Museum

The Museum does a good job at meeting the needs of visitors with disabilities on a day-to-day basis. For instance, the Museum noted that the single biggest accommodation request is providing wheelchairs for older visitors who have difficulty standing for prolonged periods. The Museum often works with mothers of children with autism who are unable to wait in long or noisy lines. In these cases, the Museum staff know to respond quickly and take the parents and children to a quiet area while awaiting their turn. On a few occasions, they have had requests from blind visitors for special tours—in these cases, the Museum’s volunteer team worked with the Lighthouse for the Blind to ensure the tour was understandable and appropriate. NASA

found that the Museum holds [Guided Exhibition Tours for People with Disabilities](#). According to this webpage, the Museum offers five unique tours for ages 8 to adults that are tailored to meet particular needs and preferences of visitors with learning, developmental, and intellectual disabilities. There is a maximum of 10 people per tour, which are held the last Friday of each month year-round. The guest relations staff meet once a week and share stories about how accommodations were made to visitors. On any given day, there are 17 staff members (including three managers) and five volunteers on the Museum floor to assist visitors.⁵³ In addition, there are security officers—all with radios to facilitate quick communications—on the floor who work with the guest relations staff.⁵⁴ This system enables the Museum staff to respond quickly when specific accessibility needs arise.

Docents at the Museum perform a key role in interacting with the public—particularly with visitors with disabilities.⁵⁵ The Museum estimates that they receive about ten requests for special accommodations a year that are geared toward special requests from docents. For instance, the Museum receives requests for special tours from visually-impaired visitors. The Museum generally asks for a lead time of two weeks for meeting accommodation requests. In that time, the Museum will ensure that the docent providing the tour has been specially trained on accommodating and guiding the blind visitor. On occasion, people from the Lighthouse for the Blind come along. Providing this kind of one-on-one accommodations is an excellent example of what Section 504’s program access requirements seek to accomplish. Not all barriers in a facility as complex as the Museum can be made independently accessible to people with disabilities. Section 504’s obligation to make facilities accessible “when viewed in their entirety,” however, allows organization to adopt alternative measures that avoid these barriers.

The Museum should, nevertheless, make this feature more widely known, such as including it among the pages devoted to accessibility at the Museum. This notice should also clearly identify the point-of-contact for such requests at the Museum and the necessary lead time for making a request.

[Outreach to the Disability Community](#)

Compared to other NASA grantees, the Museum has engaged in relatively little outreach to disability groups in the area. The Museum is aware that their direct outreach and polling efforts inadvertently focus on a relatively small sector of Chicago’s diverse population and that

⁵³ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

⁵⁴ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

⁵⁵ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

minority communities and people with disabilities need more focus.⁵⁶ To this end, the Museum anticipates reaching out to local senior centers and the autism community in the future. This lack of outreach may be a temporary phenomenon, as some witnesses recalled of outreach to the disability community (e.g. Lighthouse for the Blind) in the past.⁵⁷

Nevertheless, the Museum should consider a stronger outreach effort to the local disability community. Located in the heart of Chicago, the Museum has access to broader and deeper community resources than almost any other city in the United States. It is also very likely that local disability groups would welcome the opportunity to improve access for its members at a prestigious institution like the Field Museum. One simple strategy is to start with disability panel presentations (discussed in the *Accessibility Committee* section, above).

The Museum informed NASA that in the summer of 2014, the learning center held a day-long training to increase the quality of the team's interactions with disabled visitors. The training included presentations from a panel of three disabled individuals as well as segments conducted by two professionals from the Chicago Cultural Accessibility Consortium. The Museum also informed NASA that it will increase this type of outreach to those in the disability community to improve learning experiences and break down barriers as recommended. The learning center's new Accessibility Days program offered in the PlayLab, piloted in the summer of 2016 and scheduled to become a permanent offering in early winter of 2017, has begun to establish relationships with many area agencies that target diverse learners.⁵⁸

Evaluating Retail and Food Operations

NASA found that the Museum offers onsite food, beverage, dining opportunities, as well as retail merchandise to its visitors and patrons. Retail food and beverages are served to visitors in two restaurants at the Museum: The Field Bistro and Explorer Café. Merchandise (i.e., books, apparel, and souvenirs) can be purchased at the main store, the exhibit store, the Sue store (dedicated to the Sue the Dinosaur exhibit), and the Rockology store. Since September 2013, the Museum has had a contractual partnership with Aramark to manage the Museum's food and beverage programs, including restaurant, retail dining, and catering operations. Aramark is a company headquartered in Philadelphia that provides food, facility, and uniform services to a number of cultural and recreational attractions throughout the United States.⁵⁹ With respect to providing accessible services in these retail locations, Museum staff informed NASA that they

⁵⁶ Interview with Ray DeThorne, Stacy Dilling, and Brad Dunn (Nov. 10, 2015).

⁵⁷ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015); Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

⁵⁸ Museum's response to NASA's draft review report (October 31, 2016)

⁵⁹ "Chicago's Field Museum Partners with ARAMARK to Transform the Food and Beverage Experience" – PR Newswire article, August 26, 2013.

accommodate requests. For example, if a visitor is unable to carry a food tray to a table, Museum staff will carry it for them.⁶⁰

NASA has learned in prior museum/science center onsite reviews that a museum may initiate a “secret shopper” program, whether by the retail service vendor or the museum itself, to measure the typical quality of retail services such as dining and merchandise offered to customers. Other grantees have successfully contracted with services that send representatives to shop at museum gift shops and eat at museum cafeterias while pretending to be ordinary visitors to a museum. At least one NASA grantee has begun inquiries about secret shopper programs specific to disabilities. At the time of the onsite visit, the Museum informed NASA that it did not use a “secret shopper” program to evaluate its customer service.⁶¹ Since the NASA onsite visit, the Museum informed NASA that its audience insights and research team will look into a secret shopper program, most likely starting this research in early 2017⁶²

These programs are important because they address a potential loophole in accessibility programs. At most museums and science centers, cafeterias and retail stores are run by contractors who are outside of the normal operations of the Museum and may not have insight into Section 504 compliance efforts by the larger organization. The Museum should consider using a secret shopper program targeted to disabilities to ensure that its food and retail operations provide a high level of service for the Museum’s visitors with disabilities.

Accommodations for those on the Autism Spectrum

Individuals on the Autism Spectrum typically benefit from accommodation that address sensory impacts caused by light and noise, or modifications made to education programs to address behavior issues (i.e., permitting a one-on-one personal aide to attend a day camp free of charge for a child with autism. The Museum provides, or is considering, services and accommodation to individuals on the autism spectrum.⁶³ For example, at overnight camps, participants who have autism can sleep in quieter areas of the Museum with proper lighting.⁶⁴ The Museum is considering the creation of special extended hours during less busy times. The accessibility days for families will take place on a pre-scheduled Saturday morning in the PlayLab prior to the PlayLab opening to the general public. The date(s) will be announced in advance to the target audience.⁶⁵ This enables visitors with autism to visit the Museum without the noise and

⁶⁰ Interview with Ray DeThorne, Megan Beckert (Nov. 10, 2015).

⁶¹ Interview with Ray DeThorne, Stacy Dilling, and Brad Dunn (Nov. 10, 2015).

⁶² Museum’s response to NASA’s draft review report (October 31, 2016).

⁶³ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015).

⁶⁴ Interview with Education.

⁶⁵ Museum’s response to NASA’s draft review report (October 31, 2016).

distraction that are common during normal hours. This feature is becoming a more common practice at science centers and museums and should be continued.

In addition to the accessibility days for diverse learners described above, the learning center is partnering with an external education vendor to create an app designed especially for learners on the autism spectrum in order to create a high quality Museum and PlayLab visit. The app launched late fall 2016.⁶⁶

Outreach to Program Participants through the Museum's Website

The NASA Section 504 regulations require grantees to adopt and implement procedures to ensure that interested individuals, including individuals with vision or hearing disabilities, can obtain information as to the existence and location of services, activities... that are accessible to and usable by individuals with disabilities, specifically:

*A recipient shall adopt and implement procedures to ensure that interested individuals, including individuals with vision or hearing disabilities, can obtain information as to the existence and location of services, activities, and facilities that are accessible to and usable by individuals with disabilities.*⁶⁷

After hiring a new Chief Marketing Officer in February 2015 and having completed a new redesign of its website, the Museum indicated that comprehensive accessibility information would be placed in the "Plan Your Visit" section of the website.⁶⁸ In April 2016, we reviewed the Museum's website and observed that the "Plan Your Visit" section of the website still contains minimal information about accessibility. Under the "Parking" section of the "Plan Your Visit" portion of the website, there is a notice about the availability of accessible parking at the museum, both at the Museum and at the east side of the Soldier Field parking lot.

⁶⁶ Ibid.

⁶⁷ 14 C.F.R. § 1251.301(f)(1).

⁶⁸ Museum Response to NASA Information Request.

WHEELCHAIR-ACCESSIBLE PARKING

Wheelchair-accessible parking is available in the adjacent east lot on a first-come, first-serve basis.

If the accessible parking lot is full, visitors with accessibility needs should consider parking on the east side of the Soldier Field parking lot, putting them closer to the accessible East Entrance of the Museum. There are elevators at both the west and east entrances of the Soldier Field parking lot.

For questions or help with issues of accessibility, please write to accessibility@fieldmuseum.org, or call 312-665-7695.

*Figure SEQ Figure * ARABIC 3 -- Parking Information*

In addition, the “Maps and Tours” section of the “Plan Your Visit” portion of the website adds a short description of the availability of the wheelchairs on a first-come, first-served basis.

ACCESSIBILITY

Visitors using wheelchairs or strollers may enter the Museum at the East Entrance. Accessible parking is available in the adjacent east lot on a first-come, first-serve basis. Wheelchairs are available for rent on a first-come, first-served basis, at the East Entrance or at the Coat Check rooms.

For questions or help with issues of accessibility, please write to accessibility@fieldmuseum.org, or call 312-665-7695.

Figure 4 -- Accessibility Information

Both of these pages also direct users to accessibility@fieldmuseum.org or a telephone number at the Museum (312-665-7695).

This information is not sufficient for ensuring nondiscrimination toward program participants and does not meet the requirements of the NASA regulation cited in this section. Without a clear understanding of all the accommodations available at the Museum, visitors with disabilities may be inadvertently subjected to unequal treatment or unable to enjoy the benefits of the Museum’s programs.

The Museum informed NASA after the onsite visit that it is currently pulling together all accessibility-related information into one location on the website to make this information easier to find. The Museum also reports that it is conducting an audit with other internal departments to ensure all of the information necessary to develop a section of the site that is helpful to its visitors with disabilities.⁶⁹

⁶⁹ Museum’s response to NASA’s draft review report (October 31, 2016).

Program Access in Educational Programs and Camps or Events

The Museum engages students in the Chicago area through two different programs. First, the Museum engages students and future scientists both at the Museum and outside the Museum. Leveraging the Museum's vast collection of artifacts, its team of highly advanced researchers, and the use of digital technology, the Museum is able to offer Chicago-area students with unique resources that unavailable elsewhere. Second, they offer summer camps (in conjunction with the Shedd Aquarium and the Adler Planetarium) and sleepover events.

Educational Programs

Like other NASA grantees, the Museum is highly dedicated to its mission to encourage learning about science. In this respect, the Museum excels and provides many learning opportunities for children with and without disabilities.⁷⁰ What makes the Museum unique, however, is that it can also leverage one of the world's largest archives of specimens and a large team of scientists to make science more directly engaging than other science centers or museums.

The Museum's Learning Center⁷¹ includes two elements that reflect its strong commitment to making learning programs available to children with disabilities.

- **Crown Family PlayLab.** The Crown Family PlayLab was opened in 2007 and is focused on younger children, mostly ages 2-6. To help ensure that it meets the needs of children, including those with disabilities, the Museum brought together an advisory committee from the Lighthouse for the Blind, Chicago Rehabilitation Institute, Chicago Children's Museum, and the Erickson Institute to help with the overall design and its accessibility. The result is a learning center that meets the needs of both younger children and students with cognitive disabilities. One key way they achieve this goal is to use physical artifacts from the Museum's collection and tactile models to make science more readily accessible.
- **N.W. Harris Learning Collection.** For older students, there is the N.W. Harris Learning Collection. This is a collection of more than 1,200 specimens and artifacts that are made available to teachers and educators.

In addition to the learning center, the Museum also focuses on making science available through different modalities. This increases the opportunities for learning for all visitors—including those with disabilities. For instance, the Museum uses learning stations with

⁷⁰ Interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rouleau (Nov. 10, 2015).

⁷¹ Information about the Museum's Learning Center is available at <https://www.fieldmuseum.org/learning-center>.

touchable specimens, artifacts, and physical models that visitors can touch and feel. This enables visitors with sight impairments with valuable opportunities for learning.

In addition to making science exciting for students who come to the Museum, the Museum also engages in direct outreach to Chicago-area schools. Specifically, the Museum's education and learning department actively participates in providing educational programs and material to schools in the Chicago area. They are part of the Early Elementary Science Program (E2SP), which brings together museums, local universities, and not-for-profit organizations with a goal of improving science comprehension and enthusiasm among PreK-3rd grade children in 10 Chicago Archdiocesan schools. To further support learning, the Museum relies on a number of digital outreach tools, including:

- **Biomechanics Digital Toolkit.** This web-based toolkit is geared toward teachers to help teach science. It combines a suite of lessons, design challenges, and multimedia resources to aid teachers in facilitating learning experiences that challenge students to view biology through the lens of physics. The Museum is in the process of developing similar digital toolkits for each of the major exhibits at the Museum. The Museum informed NASA after the onsite visit that in 2016, it had released the newest digital toolkit focused on the Cyrus Tang Hall of China and launched an onsite video game allowing middle school students to explore themes in Ancient China through select objects found within the Tang Hall of China.⁷²
- **Brain Scoop.** Brain Scoop is a series of online videos that explore science as well as research programs and specimens from the Museum's collection. Brain Scoop is available at <https://www.fieldmuseum.org/science/blog/brain-scoop>.
- **Expeditions at the Field Museum.** Scientists from the Field Museum traverse the globe on various research projects sponsored in whole or part by the Field Museum. *Expeditions at the Field Museum* collects photos, resources, and rich descriptions that bring these resources home to students and patrons of the Field Museum alike. *Expeditions at the Field Museum* is available at <http://expeditions.fieldmuseum.org>.
- **Virtual Visits from the Field.** Lastly, the Field Museum offers *Virtual Visits from the Field* that allows teachers to bring students into the Field Museum through a computer, ask questions of researchers during live sessions, and interact in real time with Museum staff. These visits fall into two general categories: *Meet a Scientist* (also offered as live sessions) and *Lessons from the Field*.

⁷² Museum's response to NASA's draft review report (October 31, 2016).

In terms of accessibility, the Museum’s learning center is clearly a promising practice. The Museum’s careful consideration of disabilities in developing the Crown Family PlayLab reveals a strong dedication to accessibility and a recognition of the needs of students with developmental disabilities. Tactile models and touchable specimens are one of the best ways to make science understandable and “real” to students—particularly students with disabilities. Students who are blind, for instance, may have difficulty understanding visual information as it remains an abstract concept; by contrast, a physical representation can make this abstract concept very tangible and real. Other Museums with extensive collections should look to the Field Museum as an example of how to use their collection to further their educational missions for students with disabilities.

The Museum’s use of digital technologies, such as its digital toolkits, for reaching area students is admirable. While our review did not have time to examine the accessibility of these resources, other witnesses questioned their accessibility.⁷³ The Museum needs to be mindful of accessibility when developing digital resources made available to students and instructors.

Program Access at Camps or Events

The Museum runs relatively few additional programs compared to other museums and science centers.⁷⁴ During these events, the Museum has relatively few problems meeting the needs of visitors with disabilities.

- **Sleepover Events.** One particularly popular event are sleepovers, such as the Dozin’ with the Dinos event (a sleepover with the Museum’s world famous dinosaurs). These events are quite large and popular and can accommodate 125 visitors at each event. The Museum typically runs 10 of these events each year and has about 900 participants. During these events, the most common accessibility requests are electrical power for plugging in CPAP machines. They also receive food allergy requests. Less common are accommodations requests for visitors with autism that, as previously noted, may involve having participants with autism sleep in a quieter area of the Museum with lighting adjusted as necessary.
- **Summer Camps.** The Museum also runs summer camps in conjunction with the Shedd Aquarium and the Adler Planetarium. These camps are each one-week long and operate 9am to 3pm each day (no sleeping over) and they run for four weeks after July 4. The three institutions each hire a number of aides to assist with these programs (usually students from universities who are preparing for education degrees). The Museum also

⁷³ See *Web Accessibility Overview* section, below.

⁷⁴ Interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rouleau (Nov. 10, 2015).

hires extra staff (at least one special education counselor). They typically have about 100-125 students during each of these summer camps. In this case, the Museum has relatively little difficulty meeting requests for specific accommodations. For summer camps, parents fill out an application in advance and the forms identify when students have specific needs. This enables the Museum to anticipate—and adequately prepare for—the needs of summer camp participants with disabilities.

No information uncovered during this review suggest that there are any compliance issues with these camps or sleepover events. Like other science centers and museums that run similar events, the Museum requires an application process some time in advance. This advance notice gives them time to adequately prepare for and meet the needs of participants with disabilities.

Emergency Evacuation

Safety is always a paramount concern to any organization—particularly one with the large number of young visitors like the Museum. The Museum does a very good job with the limitations in place for ensuring the safety of visitors with disabilities. While the Section 504 regulations do not specifically identify emergency response as a key element of program access, emergency response has become a key element because it is a practical reality in today's world. Most organizations have plans in place for handling emergencies and therefore these plans need to consider how they incorporate the needs of people with disabilities.

The Museum appears to do a good job at ensuring that persons with disabilities are able to evacuate the building during an emergency. In general, the guest relations department helps coordinate the evacuation of the facility along the Museum's department of protective services.⁷⁵ In addition, all of the museum's docents are trained in how to evacuate visitors and where specially designated areas of rescue assistance⁷⁶ are for people with disabilities.⁷⁷ To identify these areas of rescue assistance, the Museum worked with the fire department to ensure that they were in easily reachable locations that the fire department and department of

⁷⁵ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (November 10, 2015).

⁷⁶ Modern building codes anticipate emergency evacuation by requiring features like evacuation elevators. These elevators are fundamentally different from normal elevators insofar as they require a separate smoke-free airshaft and a dedicated electrical system. Where such elevators are not required or available, accessibility standards may require designating areas of rescue assistance where people with disabilities can await assistance from emergency services personnel.

⁷⁷ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

protective services staff could easily reach.⁷⁸ The Museum does not have specialized equipment, like evacuation chairs, for assisting visitors with disabilities.⁷⁹ The Museum only occupies three floors and, after consultation with the fire department, the Museum agreed to allow fire department personnel perform the actual evacuation of visitors with mobility impairments. Museum staff makes a room-by-room sweep of public and non-public spaces to ensure that everyone is out of the building. The fire department also makes three separate sweeps of the stairwells (where the areas of rescue assistance are located) to be absolutely sure that visitors with disabilities have been safely evacuated.

The Museum also conducts active shooter training annually⁸⁰. Active shooter drills focus on responding to a gunman at the building who is actively shooting victims at random. Active shooter response usually involves evacuation as well as developing shelters-in-place (e.g., rooms with barricaded doors) and other places to hide from gunmen. People with disabilities are likely at greater risk during an active shooter incident because it may be harder to hide, more difficult to evacuate, and less likely that emergency responders will be able to arrive quickly. The review by the NASA team did not focus on how the Museum ensures that people with disabilities are considered during active shooter exercises. The Museum should work with local law enforcement and possibly experts working in this field to ensure that people with disabilities are considered as part of active shooter response.

Effective Communication

A key component to effective program access is ensuring effective communication with program participants. This section analyzes this vitally important requirement. The NASA regulations provide that:

Recipients shall take appropriate steps to ensure that no individual with a disability is denied the benefits of, excluded from participation in, or otherwise subjected to discrimination in any program or activity receiving Federal financial assistance because of the absence of auxiliary aids for individuals with impaired sensory, manual, or speaking skills.⁸¹

⁷⁸ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

⁷⁹ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

⁸⁰ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

⁸¹ 14 C.F.R. § 1251.103(b)(3).

A recipient shall take appropriate steps to ensure that communications with applicants, participants, beneficiaries, members of the public, and companions with disabilities, are as effective as communications with others.⁸²

This “effective communication” requirement means that Federal fund recipients must take steps to ensure that people with disabilities are not excluded based on disabilities that affect communication. This requirement may include providing sign language interpreters, transcripts, or braille or audio information.⁸³ Because meeting the effective communication requirement is essential for program participants in deriving equal opportunities and benefits from the Museum’s programs, it is essential for meeting the Museum’s overall program access requirements under Section 504.

Sign Language Interpreters

According to the Museum’s self-evaluation, the Museum makes sign-language interpreters and transcripts of presentations available upon request.⁸⁴ This assertion is supported by information obtained from our witness interviews. While the museum does not have an existing contract in place with a sign language interpreter services, they have provided sign language interpreters 5-8 times in the past for special events or lectures and have had little trouble meeting this need.⁸⁵ Other visitors (whether individual visitors or school groups) have also rarely or ever requested sign language interpreters; instead, these visitors usually bring their own interpreters.⁸⁶

While the Museum provides sign-language interpreters upon request, it does not fully meet NASA’s regulatory requirements under Section 504 to provide notice of the availability of this service, as the Museum does not advertise the availability of sign language interpreting services to visitors and program participants. Accordingly, the Museum needs to make their policy more clearly known to program participants. This can include posting this information on the Accessibility Statement of the Museum’s website. This policy should include a statement about

⁸² 14 C.F.R. § 1251.112 Since the onsite review NASA published its revised Section 504 regulations in the Federal Register and this revision includes a subsection on communications with includes specific requirements on the provision of auxiliary aids.

⁸³ The term “auxiliary aids” is defined in the NASA Section 504 definitions at 14 C.F.R. § 1251.102(e).

⁸⁴ Field Museum Self-Evaluation, p. 22.

⁸⁵ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015).

⁸⁶ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); Interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rousseau (Nov. 10, 2015); Interview with Shawn VanDerziel; Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

how the right to effective communication is protected by Section 504, Title III of the ADA, and other state and Federal laws, how to request sign language interpreters and other auxiliary aids or services (including points of contact at the Museum), and the required notice period for the Museum in obtaining these aids or services.

Theaters and Lecture Halls

During the NASA team's architectural review of the Museum, it was noted that the assistive listening devices (ALDs) are not available in any of the lecture halls (including the James Simpson theatre).⁸⁷ ALDs are available, however, in the Museum's new 3D theatre. ALDs are important for ensuring that individuals with hearing loss (including those who use hearing aids) can hear presentations given in lecture halls and, as described below, they are required by Federal regulations. The Museum shall provide ALDs in each assembly area where audible communication is integral to the use of the space, including all lecture halls, theaters, and other assembly areas in the near future. The Museum informed NASA after the onsite visit that it is currently exploring the cost ramifications of installing such a system in these assembly areas, relative to the fact that they anticipate moving the 3D theater in June 2018.⁸⁸

During our review, we did not identify equipment needed for captioning the 3D movies through rear window captioning or other captioning technologies. Also, there is no information on the Museum's website about the availability of captioning in its 3D movie theater. The Museum should ensure that this captioning is available on all movie presentations. This is particularly true given the relatively low cost of such rear window captioning systems.⁸⁹

In addition, laws such as the new 21st Century Communication and Video Accessibility Act⁹⁰ (CVAA) require video programming to include audio descriptions to enable access by blind and visually impaired visitors. Audio descriptions present a synchronized audio track that describes

⁸⁷ See *Architectural Accessibility* section, below.

⁸⁸ Museum's response to NASA's draft review report (October 31, 2016).

⁸⁹ According to the Department of Justice, the cost of deploying a rear window captioning system is relatively low. For digital projection systems, the theater retrofit costs are about \$690- \$1,057 per theater plus about \$430-\$479 in loaned equipment to each patron with a disability. For analog projection systems, the retrofit costs are about \$7,113 per theater plus about \$95 in loaned equipment per patron. See Nondiscrimination on the Basis of Disability by Public Accommodations-Movie Theaters; Movie Captioning and Audio Description, 79 Fed. Reg. 44,976, 45,008-09 (proposed Aug. 1, 2014)(to be codified at 28 C.F.R. pt. 36). Further information, including a copy of the proposed rule, is available at http://www.ada.gov/regs2014/movie_nprm_index.htm.

⁹⁰ Pub. L. 111-260. Further information about the CVAA is available on the Federal Communication Commission (FCC) website at <https://www.fcc.gov/consumers/guides/21st-century-communications-and-video-accessibility-act-cvaa>.

video content—thus making movies accessible to blind and visually impaired visitors. These audio descriptions are transmitted over a wireless headset to the blind moviegoers and such systems can be deployed at relatively little cost.⁹¹ Currently, the Department of Justice is developing a regulation requiring that movie theaters provide support for captioning and audio descriptions.⁹² In addition, recently blind advocates sued AMC Movie Theaters for failing to provide support for audio descriptions.⁹³

As the Museum moves forward with its accessibility efforts, it needs to provide access to audio description technology and should advertise the availability of all accessibility features (rear window captioning, ALD, and audio description support) on its accessibility pages. It should also seek movie productions that include audio descriptions and captioning whenever possible—and identify these movies in its marketing material.

Videos as Part of Exhibits

The Museum provides open captioning on the majority of permanent and temporary exhibition videos.⁹⁴ Older videos may not be captioned but the Museum intends to caption them when resources become available.⁹⁵ The Museum informed NASA after the onsite visit that the Museum has been incorporating captions on older exhibitions, like *Evolving Planet*, *Ancient Americas*, and others, as permitted by budgets. In some instances, (like the Native North American Halls, Northwest Coast and Arctic Peoples, Africa and others) the video technology still relies on cassette and/or older analog technologies, playing on CRT monitors. In those instances, the process will be contingent on the schedule for the replacement of these technologies with digital media. In the interim the Museum will create and will provide

⁹¹ According to the Department of Justice, the cost of deploying an audio description system is relatively low—even lower than deploying a rear window captioning system. For digital projection systems, the theater retrofit costs are about \$625 per theater plus about \$69-\$125 in loaned equipment to each patron with a disability. For analog projection systems, the retrofit costs are about \$467 per theater plus about \$106 in loaned equipment per patron. See *Nondiscrimination on the Basis of Disability by Public Accommodations-Movie Theaters; Movie Captioning and Audio Description*, 79 Fed. Reg. 44,976, 45,008-09 (proposed Aug. 1, 2014)(to be codified at 28 C.F.R. pt. 36). Further information, including a copy of the proposed rule, is available at http://www.ada.gov/regs2014/movie_nprm_index.htm.

⁹² 79 Fed. Register 44976 (Aug. 1, 2014), available at http://www.ada.gov/regs2014/movie_nprm_index.htm.

⁹³ <http://www.nbcnews.com/business/business-news/amc-theatres-sued-discriminating-against-blind-n521756>.

⁹⁴ Museum Response to NASA Information Request; Field Museum Self-Evaluation, p. 22.

⁹⁵ Museum Response to NASA Information Request.

transcripts, depending on budgets.⁹⁶ The Museum should continue its efforts to caption all video content, including legacy content still available to the public or program participants.

In our review of the Museum, we noted that videos sometimes provided details not otherwise available in some exhibits. While most of the videos in the exhibits do provide captioning, many older exhibits (such as in the Hall of Native North Americans) have videos without captioning. Captioning these videos would allow visitors with hearing loss to have access to the video content. In addition, providing access to an accessible written transcript (or providing simultaneous audio description on an attached headset) would allow visitors with vision impairments to benefit from the details provided in these videos.



Figure 5 -- Non-Captioned video sample from the Hall of Native North Americans

Training

Our review revealed an inconsistent degree of training opportunities available to staff members, volunteers, and docents at the Museum. In response to the Museum's self-evaluation's question that asked about the availability of awareness training to sensitize docents, guards, ushers, and other front-line staff about the needs of people with disabilities, the Museum noted that "awareness training sessions are periodic... the learning center held a training session in 2015 for its educators."⁹⁷ Specifically, according to the Museum's information response in 2015, educators from the Museum's learning center attended a 4-1/2 hour training session focused on meeting the needs of visitors with cognitive impairments.⁹⁸ This session was held as part of Chicago's ADA 25 (25th Anniversary of the Americans with Disabilities Act) event and was designed to help understand the needs around accessibility by

⁹⁶ Museum's response to NASA's draft review report (October 31, 2016).

⁹⁷ Field Museum Self-Evaluation, p. 23.

⁹⁸ Museum Response to NASA Information Request.

Chicago cultural institutions.⁹⁹ It also included a panel presentation of positive and negative experiences by cultural institutions in Chicago with a follow-up discussion on universal design principles. The learning center maintains a relationship with the Chicago Cultural Accessibility Forum.¹⁰⁰

While participation in outward-focused training is certainly admirable, there is far less opportunity for inward-focused training on accessibility. In late summer 2015, the docents for the Museum attended training for visitors with disabilities presented by two special education teachers about a range of disabilities.¹⁰¹ In addition, the Chicago Lighthouse for the Blind provides training for docents at the Museum.¹⁰² Apart from the Museum's docents, the other groups that regularly interact with the public include the Museum's guest relations team, the learning center department, and the department of protective services. While there is no evidence suggesting discrimination by these departments, training to these groups around accessibility has been inconsistent or lacking.¹⁰³ Other departments in the Museum reported even less availability of training specific to the needs of visitors with disabilities.¹⁰⁴ While some individuals have received training specific to their profession that relates to disability, these

⁹⁹ Interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rouleau (Nov. 10, 2015).

¹⁰⁰ Museum Response to NASA Information Request. More information about Chicago Cultural Access is available at www.chicagoculturalaccess.org.

¹⁰¹ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

¹⁰² Museum Response to NASA Information Request; Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015). The Museum provides fairly rigorous training for its docents. This includes specific subject-matter training (often with a curator) to ensure thorough subject-matter expertise. Some of the docents have had specific interest in meeting the needs of visitors with disabilities—and the Field Museum sources specialized training. For instance, this may include specialized training from a special education teacher. Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015). Each of the departments provides its own training, particularly if their members have regular interface with the public. Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

¹⁰³ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); interview with Deborah Moskowitz, Philipp Heck, Beth Crownover, and Heidi Rouleau (Nov. 10, 2015); interview with James Croft and Monique Tarleton (Nov. 11, 2015).

¹⁰⁴ Interview with Ray DeThorne and Megan Beckert (Nov. 10, 2015); interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015); interview with Ray DeThorne, Stacy Dilling, and Brad Dunn (Nov. 10, 2015); interview with Charles Katzenmeyer and Usha Subramanian (Nov. 10, 2015); interview with James Croft and Monique Tarleton (Nov. 11, 2015); interview with Ernst Pierre Toussaint (Nov. 11, 2015); interview with James Croft, Martha Alexander, and Pamela Clayburn (Nov. 11, 2015).

training have been outside the Museum.¹⁰⁵ Instead, the Museum lacks regular and refresher training that includes some elements of accessibility training.¹⁰⁶ For instance, orientation training at the Museum is given to all new employees and volunteers. Only one witness mentioned that this training included some elements tangentially related to accessibility. Also, the Museum offers regular refresher training but none of the witnesses mentioned if this training included any elements specific to accessibility.

The Museum informed NASA after the onsite that it will increase disability training for staff. A training program which provides regular and refresher disability training and policy and procedures training will be developed as recommended. An upcoming disability awareness training for all frontline staff, docents, and volunteers was to have occurred on Nov 1, 2016.¹⁰⁷

The one exception to this pattern is training in the department of protective services. Monique Tarleton (Director of Protective Services) mentioned that new employees in the Museum's department of protective services all go through a three-day orientation training.¹⁰⁸ The training runs from general to specific—the first day provides an overview of the museum and the third day is specific to the Museum's policies. The training in DPS includes sensitivity training and unruly behavior training—both of which touch on disability issues. In addition, DPS personnel all go through annual sensitivity training that Monique oversees.

The Museum should focus more heavily on training its staff on disability issues. Because the museum experience is so heavily focused on sense perceptions, people with low vision or hearing loss present some of the greatest learning challenges. At the same time, reaching this audience can be exciting for educators and exhibition staff because it opens entirely new opportunities. Ideas such as cross-disability awareness panels (see *Section 504 Coordinator and Accessibility Committees* section, above) allows staff members to hear the actual life experiences of users with various disabilities in interacting with the Museum and its extensive collection of artifacts. As also noted above, there were a number of policy and procedural corrections that the Museum needs to make in order to comply with Section 504—and the staff needs to be trained on these policies and procedures.

¹⁰⁵ For instance, Alvaro Amat from the Exhibition Team recently attended architectural training conducted by the Chicago Cultural Accessibility Consortium (www.chicagoculturalaccess.org). Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015). In addition, Jolynn Willink also recently received training at the Shedd Aquarium from the Great Lakes ADA Resource Center on developing an accessibility plan. Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

¹⁰⁶ Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

¹⁰⁷ Museum's response to NASA's draft review report (October 31, 2016).

¹⁰⁸ Interview with James Croft and Monique Tarleton (Nov. 11, 2015).

Digital Accessibility

Museums and science centers across the country are increasingly turning to digital technology to deliver educational programming and exhibit information to their visitors. In doing so, they can make exhibits and educational programs simultaneously more immersive and more readily available. But as these technologies become a larger and larger part of the overall experience for science centers and museums, it also becomes more and more critical to ensure that these technologies are accessible to program participants with disabilities.

There is no single way used to make digital technology accessible. Instead, the techniques used to make these technologies vary. This section describes three key technologies used at the Museum:

- Website Accessibility
- Mobile App Accessibility
- Digital Rails and Touch Panel Accessibility

Web Accessibility

This section reviews web accessibility at the Museum. It is divided into two parts. The first part discusses website design efforts at the Museum generally and an overview of the legal basis for requiring website accessibility. The second part focuses on a detailed review of the Museum's website accessibility using the Worldwide Web Consortium (W3C) Web Content Accessibility Guidelines (WCAG 2.0)¹⁰⁹ that was performed by the NASA team's professional accessibility tester. While Section 504 does not have a specific standard that websites must conform to, WCAG 2.0 is the de facto standard for accessibility within the United States and is being required in a growing number of settlement agreements, including settlements with the U.S. Department of Justice.

WCAG 2.0 is a hierarchical set of standards for ensuring web accessibility across multiple disabilities. WCAG 2.0 is broken down into four levels of abstraction. From the highest (most abstract) to the lowest (least abstract), these four levels are:

1. **Principles.** At the highest and most abstract level, WCAG 2.0 has four basic principles (perceivable, operable, usable, and robust).

¹⁰⁹ WCAG 2.0 is available from the W3C's site at <https://www.w3.org/TR/WCAG20/>.

2. **Guidelines.** Under these four principles are 12 guidelines that provide slightly more specificity (e.g., Under the Principle “Perceivable,” Guideline 1.2 is called “Provide Alternatives for Time-Based Media,” which would include captioning and audio descriptions in videos).
3. **Success Criteria.** Under the guidelines are 61 success criteria, which are the most detailed description of a requirement and tell web developers what they need to accomplish. These success criteria are divided in three categories (A, AA, and AAA), each providing a higher level of accessibility. The 61 success criteria break down as:

Level A (25 Success Criteria). These are the most important accessibility guidelines. It is absolutely fundamental to meet all of these requirements.

Level AA (13 Success Criteria). These are slightly less critical accessibility requirements than the AA requirements but still very important to meet.

Level AAA (23 Success Criteria). These success criteria provide the highest level of accessibility. Usually, these are reserved for special situations (e.g., webpages used frequently by users with particular disabilities) and are considered best practices for particular disabilities. Relatively few sites fully meet all of the AAA success criteria and even the W3C acknowledges that fully meeting all of the AAA success criteria is impractical.

Each of these levels assumes that all of the requirements of the more fundamental level are met. Thus to be conformant to WCAG 2.0 AA, a website would need to meet the 13 AA Success Criteria in addition to all of the 25 A Success Criteria. In general, level AA is the most practical level of accessibility used by governments and private organizations. It is also harmonized with the upcoming European accessibility standards for European governments¹¹⁰ and the latest draft of the web-accessibility standards for the U.S. Federal government.¹¹¹ The level AA requirements have also been used in an increasing

¹¹⁰ Accessibility Requirements Suitable for Public Procurement of ICT Products and Services in Europe (EN 301-549), available at <http://www.etsi.org/news-events/news/754-new-european-standard-on-accessibility-requirements-for-public-procurement-of-ict-products-and-services>.

¹¹¹ Information and Communication Technology (ICT) Standards and Guidelines, 80 Fed. Reg. 10,880 (proposed Feb. 27, 2015)(to be codified at 36 C.F.R. pts. 1193-1194, available at <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/proposed-rule>).

number of settlement agreements under the ADA as the yardstick for web-accessibility compliance.¹¹²

4. **Techniques.** Lastly, the most specific level of WCAG 2.0 are the various techniques for meeting each of the success criteria. While highly useful for their code examples and testing methodologies (to verify that a success criteria has been met) and because there are an ever increasing number of ways to code (and make that code accessible), they techniques are guidance and are not prescriptive.

We will use WCAG 2.0 AA as the standard for assessing web accessibility in this report. As noted in the *Detailed Web Accessibility Audit*, below, there are a number of coding errors that are inconsistent with WCAG 2.0 AA. While the Museum's website is generally good when it comes to website accessibility and has few blocking issues that would entirely shut out access by screen reader users, the Museum should correct these errors in an upcoming revision to its website.

In addition to correcting the deficiencies identified in this section, the Museum should also incorporate accessibility in all future iterations of this project. This means that the Museum should build accessibility in throughout the design and development process. Wireframes and conceptual mockups should be independently reviewed for accessibility. Also, code should be regularly tested for accessibility by experienced experts in web accessibility throughout the code development process. Because accessibility is a complex area, the Museum and its contractors may benefit from contracting with a team that focuses entirely on accessibility.

[Web Accessibility Overview](#)

An organization's website is a primary (and increasingly exclusive) way of providing access to information about its programs and services. While neither the Rehabilitation Act nor the Americans with Disabilities Act currently require to follow specific design standards in *all* cases, website accessibility may be required for program access in *some* cases. Where an organization provides information to program participants, it is required to make that information available in a usable accessible format (e.g., large-print, braille, etc.) and this may require that web versions of that content are accessible.¹¹³

¹¹² National Federation of the Blind and the United States v. HRB Digital LLC, No. 1:13-cv-10799-GAO (U.S.D.C. Ma. 2014), available at <http://www.ada.gov/hrb-cd.htm>.

¹¹³ See, e.g., *Martin v. MARTA*, 225 F. Supp.2d 1362 (N.D. Ga. 2002); U.S. Department of Justice, *Accessibility of State and Local Government Websites* (available at <http://www.ada.gov/publicat.htm#anchor-website>). In *Martin*, the court held that program access was violated when a public transit authority failed to provide its schedule.

In August 2014, the Museum substantially redesigned its website in several ways.¹¹⁴ First, the site uses responsive design. This means that, as the browser window is resized, the menus and user-interface choices change to become appropriate for the browser size. Responsive design thus enables the same site to look appropriate on a computer, tablet, or even a smartphone despite their vastly different screen sizes. For instance, menu choices that stretch across the width of a computer screen may be reduced to a single menu button when displayed on a smartphone. Second, accessibility was better incorporated into the design of the website and was a base requirement with the Museum's contractors. Third, the Museum moved to a content management system (CMS) for the website content. A CMS system enables content creators to fill out simple forms on their computers that then get properly formatted automatically on the website. This frees content creators from having to learn hypertext markup language (HTML) or other computer-based scripting or programming languages. Using this CMS, the Museum has approximately 90-100 original content creators (called writers). All content creators are educated on basic web accessibility (e.g., adding alternative text for images). Content is then reviewed by a publisher (frequently scientists at the Museum) who review the content for accuracy and completeness. Once content (such as an article or an update to a webpage) is approved by a publisher, they can send it immediately to the Museum's main website where the CMS system immediately displays it to the public. By separating out these job functions, the CMS system creates a workflow that ensures that at least two individuals have reviewed content before it goes live on the Museum's website. In addition to text and images contributed by writers, publishers can solicit the development of more advanced content (such as videos) to further augment content. The Museum's CMS system was developed by outside contractors and is based on Drupal, a common open-source platform for developing CMS systems. In addition to the CMS system, there was some legacy content that is still accessible from the original site. In particular, there are some downloadable toolkits that mostly comprise a set of Adobe Acrobat (.pdf) documents. These toolkits may be largely inaccessible. In addition, there are several "micro-sites" (separate individual sites outside the CMS system) that include inaccessible video or other content. The Museum's goal is to standardize the toolkits and micro-sites and, if possible, fold them into the more accessible CMS system. To date, no accessibility testing has been performed on the Museum's website. During the site's creation, the Museum did perform some basic usability testing, but nothing related to disabled user testing.

information in an accessible format, including an inaccessible website. While *Martin* is an ADA Title II case, the program access requirements for ADA Title II entities are virtually identical to those for Section 504 recipients.

¹¹⁴ Interview with Ray DeThorne, Stacy Dilling, and Brad Dunn (Nov. 10, 2015).

[Detailed Web Accessibility Audit](#)

As noted above, the following report was prepared by the NASA team’s IT accessibility expert. It provides an in-depth review of the site against the WCAG 2.0 AA guidelines and is intended as a detailed guide for web developers and programmers working on the Museum’s site.

WEBSITE ASSESSMENT OVERVIEW

This report combines a high-level automated and manual review of the Museum’s website. Given the thousands of pages on the site (and possibly subdomains), it is impossible to have an all-encompassing view of the accessibility of the site(s). Nevertheless, this report identifies representative issues that exist on the site—and are likely replicated elsewhere on the site.

This accessibility assessment is based partly on findings from high-level manual evaluation of webpages using assistive technologies, keyboard-only access, and various system settings. This accessibility assessment is also based on findings from an automated scan of webpages using Cryptzone’s Compliance Sheriff™.

The Museum’s website performed very well under an accessibility audit. Many of the common issues identified on most sites have been accounted for on the site. This indicates that the museum has put effort into creating content that complies with the accessibility standards available today. There are still some issues identified that can create an issue for some users. These issues are outlined below.

About Automated Testing

An automated scan was performed on a sampling of 2500 pages from the Museum’s website at <http://www.fieldmuseum.org>. The following are the issues identified from the automated scan. It is important to note that since this effort was based on a sampling of pages from the site there are likely accessibility issues that were not identified and reported on in this review. The intent of the review is to highlight areas where accessibility can be improved so that future site development can take into account these issues and avoid introducing them as content is added or updated.

To perform the automated testing portion, we used Compliance Sheriff,™ an enterprise level, accessibility compliance scanning system. This system is able to scan a website and search the underlying source code for compliance issues. A report is generated based on the scan's results which can provide a baseline measurement for future reports.

About Manual Testing

A manual review using the keyboard and mouse to navigate the site was performed. In addition, testing included the use of assistive technologies such as the JAWS for Windows screen reader. Part of an accessibility assessment includes manually reviewing pages for testing that cannot be easily automated such as:

Keyboard navigation

Usability of form controls

Color used as the only means of conveying information

Proper use of headers and titles

Verifying that text on the pages can be resized properly

Verifying that pages do not interfere with or disable assistive technologies

WEBSITE ASSESSMENT RESULTS

Please note that the specific issues called out below are typically present throughout the pages under review. Every issue on every page is not documented but rather a sample issue is noted so as to direct focus to the types of issue that exist and the appropriate accessibility techniques that should be applied throughout the site. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the issues noted below are being addressed and will be rectified by June 2017. The Museum informed NASA that it will prioritize its most high-traffic pages. However, work will be ongoing to keep the site WCAG Level AA compliant.

WCAG 2.0 Level A Criterion 1.1.1 [Non-text Content]

The intent of this Success Criterion is to make information conveyed by non-text content accessible through the use of a text alternative. Text alternatives are a primary way for

making information accessible because they can be rendered through any sensory modality (for example, visual, auditory or tactile) to match the needs of the user. Providing text alternatives allows the information to be rendered in a variety of ways by a variety of user agents. For example, a person who cannot see a picture can have the text alternative read aloud using synthesized speech. A person who cannot hear an audio file can have the text alternative displayed so that he or she can read it. In the future, text alternatives will also allow information to be more easily translated into sign language or into a simpler form of the same language.

- 1. Image alternative text duplicates link text.** While this is not a blocking issue for users, it does create duplication of content that can make the user experience less enjoyable. In this situation a screen-reader user will hear the link text and image ALT text read together. This creates a repeat of the same information. Often these types of issues can be ignored if they are not pervasive throughout the site. This particular issue is repeated across all pages as it is the Field Museum's logo image link in the upper left hand side of the page. As such, a screen-reader user will experience this over and over again as it is one of the very first things read on the pages. The suggested solution is to apply a blank ALT text attribute to the image since a text equivalent is already being applied to the anchor tag. This will ensure that the text displays even when the image fails to load and will also remove the duplication of link text. See <https://www.w3.org/TR/WCAG20-TECHS/H2>



Figure 6 -- Image link with duplicated text link

- 2. Image element contains no ALT attribute.** Images with no ALT attributes were identified on some pages. When no ALT attribute is provided for an image, assistive technologies will often provide the source string to the user. This can be confusing especially when the source string is very long and/or cryptic. All images require an ALT tag that provide a text equivalent of what the image represents or the text in the image if it is an image of text. If an image is used only for a decorative purpose it would still require an ALT tag but

the value for that tag should be set to empty or null as in ALT= "". See <http://www.w3.org/TR/WCAG20-TECHS/H37.html>.

The Museum's website appears to do quite well in this respect yet there were still some pages in our sampling that were identified as having images with no ALT attribute. They are:

- <http://www.fieldmuseum.org/discover/on-exhibit/greeks/>
- <http://www.fieldmuseum.org/discover/on-exhibit/vikings/>
- <https://www.fieldmuseum.org/about/staff/profile/66>
- <https://www.fieldmuseum.org/at-the-field/programs/summer-worlds-tour>
- <https://www.fieldmuseum.org/blog/case-study>
- <https://www.fieldmuseum.org/discover/on-exhibit/vikings/>
- <https://www.fieldmuseum.org/manu>
- <https://www.fieldmuseum.org/pleistocene-sea-level-maps>
- <https://www.fieldmuseum.org/science/blog/mummies-and-cheetahs-3d>
- <https://www.fieldmuseum.org/science/blog/science-fmnh-ep-42-production-maya-blue>
- <https://www.fieldmuseum.org/science/microsites/dwarf-spider-id-gallery/contributors>
- <https://www.fieldmuseum.org/science/research/area/focus-meteorites/focus-meteorites-history>
- <https://www.fieldmuseum.org/science/research/area/geology-meteorites/meteorites-research>
- <https://www.fieldmuseum.org/science/special-projects/dwarf-spider-id-gallery/about-project>
- <https://www.fieldmuseum.org/science/special-projects/dwarf-spider-id-gallery/can-you-help>
- <https://www.fieldmuseum.org/science/special-projects/gis-science-and-education/gis-science-and-education-projects>
- <https://www.fieldmuseum.org/science/special-projects/gis-science-and-education/gis-science-and-education-interactive-maps>
- <https://www.fieldmuseum.org/science/special-projects/gis-science-and-education/gis-science-and-education-about-us>

- https://www.fieldmuseum.org/vanishing_treasures
- <https://www.fieldmuseum.org/visit/floor-maps-and-tours/tour-app>

3. Figcaption tag text not accessible by all. On many pages of the site the <figcaption> tag is used to provide a caption for various images. The problem is that these captions only appear when the mouse point is hovered over the images. A keyboard user who is tabbing through the content or a screen reader user who is not using a mouse will never be able to access this information. As used on the pages these captions contain information that is critical to the understanding of the content. In this situation the use of the ALT tag may provide the ability to convey the same issue to a screen reader user but will not solve the issue for the keyboard only user. See <http://www.w3.org/TR/WCAG20-TECHS/H37.html>

A good example of this behavior is found on the site's landing page at: <https://www.fieldmuseum.org/>



Figure 7: The figcaption tag text is only displayed with a mouse hover.

4. Meaningful ALT text missing on some images. Many of the images used along with the <figcaption> tag have the ALT text tag in place. Unfortunately, the text used is not

descriptive of the image. For example, on the main landing page of the site the images use the filename as the ALT text. So when a screen reader reads this to a user they are not given enough detail to know what the image link will access. See <http://www.w3.org/TR/WCAG20-TECHS/H37.html>

- 5. At least one label has an invalid FOR attribute value.** The automated scan results identified a label for tag that is invalid. This particular issue is not a blocker but it does affect the user experience as it appears on all the pages scanned for the search field. The label tag in question appears to be a rogue label in the source code as a valid label for tag does exist for the search field. The primary issue here is not so much the rogue label but rather the fact that a screen reader announces the term “search” at least 3 times before the focus is placed in the search text field. The source code in question is listed below. The recommendation would be to remove the rogue label and consider removing the legend tag as well since it does not appear to provide any benefit to the user. This would reduce the number of times the screen reader user would hear the term “search” on each page. See <https://www.w3.org/TR/WCAG20-TECHS/H44.html>. [NOTE: This would also fail under WCAG 2.0 1.3.1 (Info and Relationships), Criterion 3.3.2 (Labels or Instructions) and Criterion 4.1.2 (Name, Role, Value)]

The following is the source code related to the above issue:

```
<form class="search" role="search" action="/about/careers/internships"
method="post" id="search-block-form" accept-charset="UTF-8"><fieldset>

  <legend class="is--visHidden">Search</legend>

  <label for="search_input" class="is--visHidden">Search</label> ● This line is
the rogue label.

  <div class="search_visible">

    <label class="element-invisible" for="edit-search-block-form--2">Search
</label>

    <input title="Enter the terms you wish to search for." class="search_input
form-text" placeholder="Search fieldmuseum.org" type="text" id="edit-search-
block-form--2" name="search_block_form" value="" size="22" maxlength="128" />
```

- 6. EMBED element does not use a NOEMBED element.** The NOEMBED element provides a means for alternative content to be accessed by the user when the EMBED element content is not supported. This helps to ensure the user has access to an equivalent

resource that assistive technologies can access. See <https://www.w3.org/TR/WCAG20-TECHS/H46.html>

While most pages did not have this issue there were few identified in the scan with such situations. One example is found at: <https://www.fieldmuseum.org/evolving-planet-1> where a virtual tour is provided.



Hold and scroll your mouse over the image above to experience the virtual tour.

Figure 8: Some pages contain a virtual tour that use the EMBED element.

- 7. OBJECT element does not have content that provides alternate description.** Closely related to the EMBED and NOEMBED elements noted above, the OBJECT element can be used to provide various types of non-HTML content on a page. When that content is not supported by the browser or by the device, the content within the OBJECT element tags can be used as an alternative means to provide access or a description of the content. See <https://www.w3.org/TR/WCAG20-TECHS/H53.html>. [NOTE: This issue would also fail under WCAG 2.0 1.2.3 (Audio Description or Full Text Alternative)]

While most pages did not have this issue there were few identified in the scan with such situations.



Hold and scroll your mouse over the image above to experience the virtual tour.

Figure 9: Some pages contain a virtual tour that use the OBJECT element.

WCAG 2.0 Level A Criterion 1.3.1 [Info and Relationships]

The intent of this Success Criterion is to ensure that information and relationships that are implied by visual or auditory formatting are preserved when the presentation format changes. For example, the presentation format changes when the content is read by a screen reader or when a user style sheet is substituted for the style sheet provided by the author.

1. Page does not use headers to specification. Header tags provide a means to convey the structure of the content and provide the ability for assistive technology users to more easily navigate to areas of the page. For users to be able to properly relate the content on the page to each other header tags must represent the structure of that content in a hierarchal way. See <https://www.w3.org/TR/WCAG20-TECHS/H42>.

Most pages on the site in our sampling use headers properly. There are a number of page identified in the scan that did not follow this practice. It seems the majority of which are part of the profile pages. An example can be found at: <https://www.fieldmuseum.org/about/staff/profile/296>. At the top of the page the H1 tag is used but then jumps to H3 and then to H5 as shown by the following code snippet from that page:

```
<h1 class="bio__name" itemprop="name">William Parkinson</h1>
  <h3 class="bio__title" itemprop="jobTitle">Associate Curator</h3>
  <h5 class="bio__department">Integrative Research Center</h5>
```

WCAG 2.0 Level AA Criterion 1.4.3 [Contrast Minimum]

1. Contrast issues exists on pages. To ensure that users can read content on the page the contrast between the foreground and background must have a minimum ratio of 4.5:1. For larger text, 18 points or larger non-bold or 14 points or larger bold, this ratio the minimum ratio is 3:1. See <http://www.w3.org/TR/2014/NOTE-WCAG20-TECHS-20140916/G18>. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that this issue will be addressed as the site is redesigned in coordination with the new visual brand identity that's being developed. We anticipate late 2017/early 2018 deployment.

2. Throughout the site there is content that falls outside of the contrast ratio required to meet the accessibility guidelines. Following are some examples that stand out:

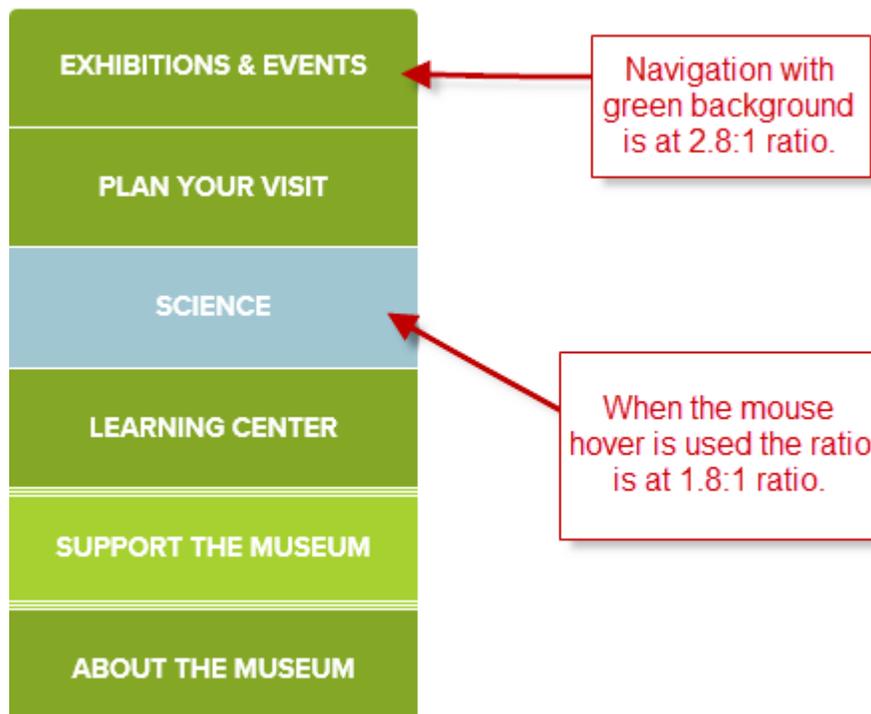


Figure 10: Navigation falls outside required contrast ratio.

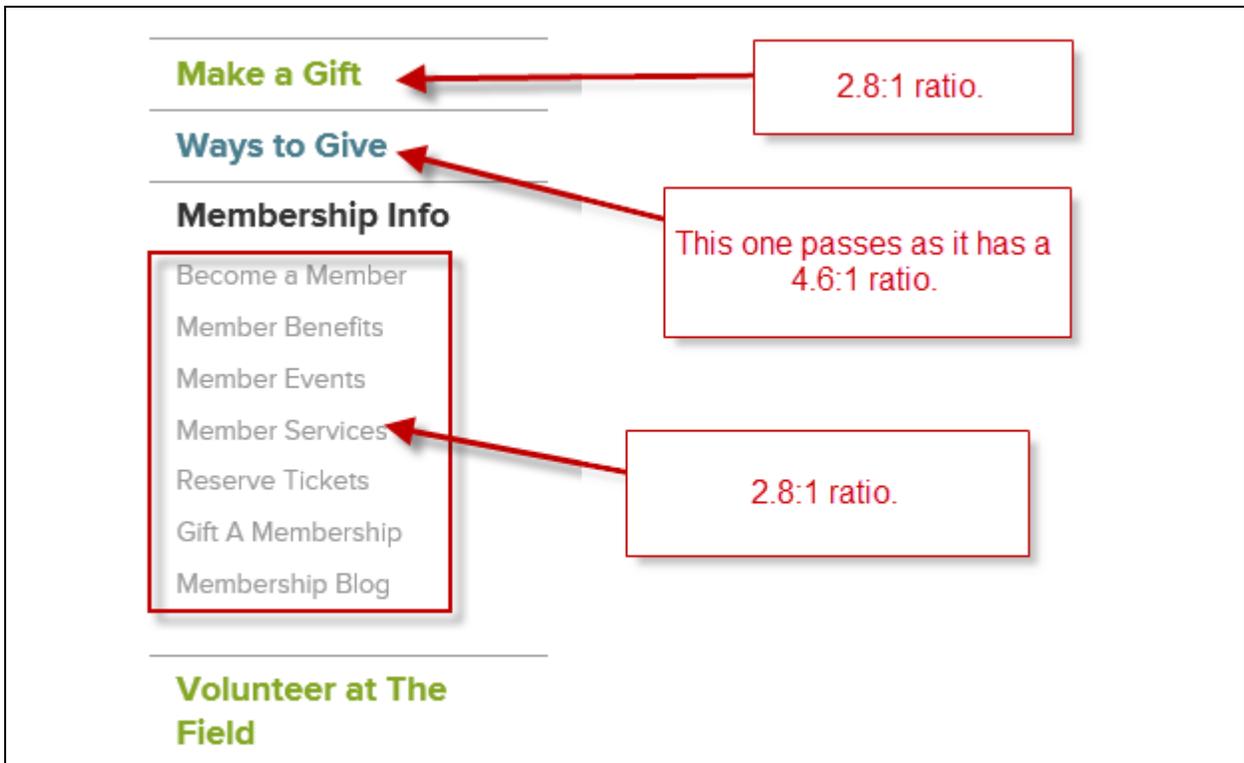


Figure 11: Many links fall outside the required contrast ratio.

WCAG 2.0 Level A Criterion 2.1.1 [Keyboard]

The intent of this success criterion is to ensure that, wherever possible, content can be operated through a keyboard or keyboard interface (so an alternate keyboard can be used). When content can be operated through a keyboard or alternate keyboard, it is operable by people with no vision (who cannot use devices such as mice that require eye-hand coordination) as well as by people who must use alternate keyboards or input devices that act as keyboard emulators. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that it is researching new technologies and techniques to display these tours.

- 1. Virtual tours not keyboard accessible.** Some page on the site provide features such as Virtual Tours. These features require a mouse to operate. If possible, the ability for a keyboard only user to access and use the virtual tours should be included. See <https://www.w3.org/TR/2016/NOTE-WCAG20-TECHS-20160317/G202>



*Hold and scroll your mouse over the image above to experience the virtual tour.
Figure 12: Virtual Tours is an example of content that is not keyboard accessible.*

WCAG 2.0 Level AA Criterion 2.4.7 [Focus Visible]

The purpose of this success criterion is to help a person know which element has the keyboard focus.

The purpose of this success criterion is to help a person know which element among multiple elements has the keyboard focus. If there is only one keyboard actionable control on the screen, the success criterion would be met because the visual design presents only one keyboard actionable item.

Note that a keyboard focus indicator can take different forms. One common way is a caret within the text field to indicate that the text field has the keyboard focus. Another is a visual change to a button to indicate that that button has the keyboard focus. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the issues noted below are being addressed and will be rectified by June 2017. The Museum informed NASA that it will prioritize its most high-traffic pages. However, work will be ongoing to keep the site WCAG Level AA compliant.

1. Most links and controls do show keyboard input focus. One area where this is not done is on the page navigation links. This will prevent a keyboard only user from being able to

confidently navigate and use the navigation. See <http://www.w3.org/TR/2015/NOTE-UNDERSTANDING-WCAG20-20150226/navigation-mechanisms-focus-visible.html>

This issue can be found on the main landing page at: <https://www.fieldmuseum.org/> where the navigation in the left side of the page does not show current keyboard input focus.



Figure 13: Navigation links do not show keyboard focus.

WCAG 2.0 Level A Criterion 3.1.1 [Language of Page]

The intent of this Success Criterion is to ensure that content developers provide information in the webpage that user agents need to present text and other linguistic content correctly. Both assistive technologies and conventional user agents can render text more accurately when the language of the webpage is identified. Screen readers can load the correct pronunciation rules. Visual browsers can display characters and scripts correctly. Media players can show captions correctly. As a result, users with disabilities will be better able to understand the content. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the issues noted below are being addressed and will be rectified by June 2017. The Museum informed NASA that it will

prioritize its most high-traffic pages. However, work will be ongoing to keep the site WCAG Level AA compliant.

1. Use language attributes on the html element. Most pages on the site include the LANG attribute as part of the page markup. There were some pages identified in the scan that have this attribute missing. They are:

- <http://www.fieldmuseum.org/discover/on-exhibit/greeks/>
- <http://www.fieldmuseum.org/discover/on-exhibit/warriors/>
- <https://www.fieldmuseum.org/discover/on-exhibit/china/>
- https://www.fieldmuseum.org/vanishing_treasures
- https://www.fieldmuseum.org/philippine_mammals
- <https://www.fieldmuseum.org/manu>
- <https://www.fieldmuseum.org/discover/on-exhibit/vikings/>
- <https://www.fieldmuseum.org/deepscaly>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/educators/>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/exchange/>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/spirit-stones/>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/daily-life/>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/shared-stories/>
- <http://www.fieldmuseum.org/discover/on-exhibit/china/origins/>
- <http://www.fieldmuseum.org/discover/on-exhibit/vikings/>

Mobile App Accessibility

The Museum has two mobile apps that are designed to support its programs. Both of these apps are available on the iOS (Apple) and Android (Google) platforms. The main app is the main Field Museum app while the other is the now-decommissioned “Specimania” app. Both of these apps were developed by outside contractors. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the native iOS tours app will be assessed by its offsite developer and the Museum will review the costs and steps necessary to make these changes. The Museum committed to providing updates in the process.

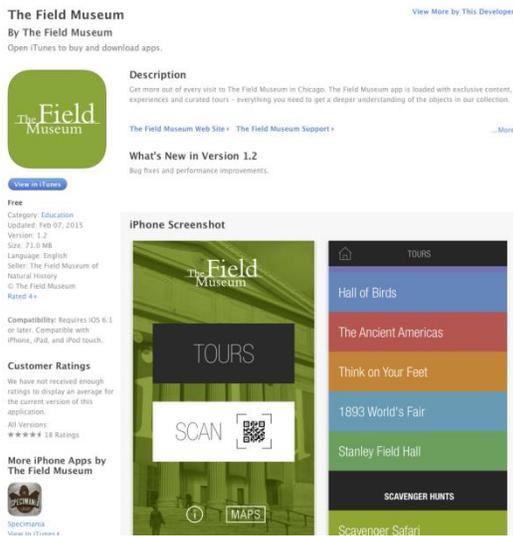


Figure 14 -- Main App

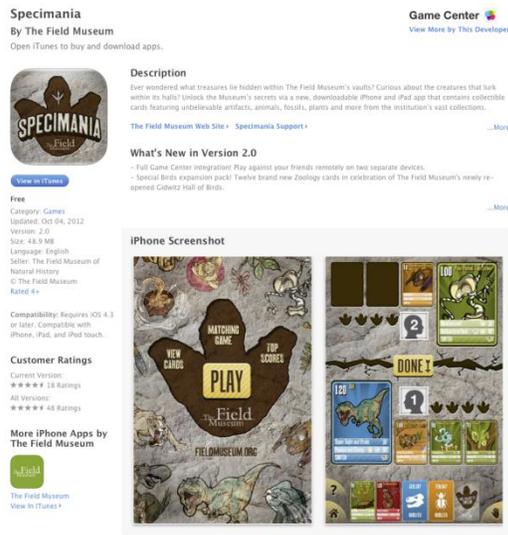


Figure 15 -- Specimania App

A considerable amount of content, which describes the collection and provides maps of the facility, is available within the main Field Museum app. In addition, the app can scan QR codes located on physical signs throughout the Museum to retrieve specific information about exhibits in the app. To support the development of this content, the Museum relies on a web-based content management system (CMS) that is entirely separate from the CMS system used for the Museum's primary website. This app-specific CMS system allows the Museum's Exhibition team and other Museum staff to create and review content that will be pushed to users through the mobile app.¹¹⁵ Currently, the mobile app is not heavily used. It also is not clear if accessibility was a specification to the app's developers. The mobile apps have also never been tested for accessibility.¹¹⁶

During our review of the Museum, however, the mobile apps also present unique learning opportunities and means of access for visitors with disabilities. One feature in the mobile app allows visitors to use their mobile device to identify their location within the Museum and then capture an augmented reality view (obtained by looking at their mobile view while pointing at different objects in a 360 degree panorama) inspired by current exhibit, such as scenes from

¹¹⁵ Interview with Brad Dunn (Nov. 10, 2015).

¹¹⁶ Interview with Brad Dunn (Nov. 10, 2015).

the 1893 Exposition.¹¹⁷ Second, the Museum also is investigating internal wayfinding technology.¹¹⁸ Similar to global positioning system (GPS) technology that enables turn-by-turn navigation in our cars in the exterior world, interior way finding technology leverages interior beacons (using either near field communication, Bluetooth low-energy, or Wi-Fi technologies) to give an interior positioning and turn-by-turn directions inside buildings. Unlike many buildings that have an interior layout that follows a simple grid pattern, science centers and museums tend to have very complex interiors. Thus, an interior wayfinding app would be hugely beneficial to all users—and particularly users with disabilities. NASA has previously recommended that museums and science centers investigate the possibility of using this technology for their interiors.¹¹⁹ These systems are already commercially available and some of them are tailored to identify specific waypoints of interest specific to different disabilities.

The Museum’s mobile apps have not been tested for accessibility.¹²⁰ Given the increasing importance—and very bright future—for mobile apps at the Museum, it is important to conduct a thorough review of the accessibility of the current mobile app. This may help improve accessibility of the mobile app in its current version and help ensure that future versions (that incorporate key new features vital to the Museum’s programs) are also accessible.

The following review of the Museum’s main app was undertaken by the NASA team’s IT accessibility professional. This review focused on the Museum’s main app and did not include the *Specimania* app.¹²¹ As noted in the review, this assessment was done using the Web Content Accessibility Guidelines (WCAG) 2.0. While WCAG 2.0 focuses on web-based technologies and not software (like the mobile app), this choice reflects recent trend in

¹¹⁷ A thorough description of these augmented reality views of the Museum is available at <http://www.enharmonichq.com/portfolio/the-field-museum/>.

¹¹⁸ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015); Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015).

¹¹⁹ See, e.g., NASA Report for the Great Lakes Science Center (Mar. 2016), available at <http://missionstem.nasa.gov/civil-rights-compliance-reports-section-504.html>.

¹²⁰ Interview with Brad Dunn (Nov. 10, 2015).

¹²¹ A review of the *Specimania* app was not undertaken for two reasons. First, the Museum indicated that this app was decommissioned—thus addressing its accessibility shortcomings may be a moot issue. Second, many of the key features for users with disabilities (e.g. interior wayfinding) will likely be incorporated into the main Museum app and not the *Specimania* app.

accessibility.¹²² While it may appear odd to apply web standards to mobile software, the focus of those standards on functional outcomes (as opposed to prescriptive design techniques) makes this application possible. Also, in most cases, mobile platforms like iOS, Android, and Windows Mobile provide application programming interfaces (APIs) that facilitate conformance to the WCAG 2.0 guidelines. Thus, adhering strictly to the accessibility APIs in mobile apps will greatly facilitate conformance to these guidelines.

This mobile app review also is not exhaustive but is intended to highlight key features in the mobile app where accessibility is compromised and should be addressed in future releases of the app. Also, this review is limited to the iOS platform and a similar review should be undertaken for other versions of the mobile app on other platforms.

The Museum should correct these errors in much the same way that it should correct the deficiencies in its website. First, the Museum should fix the deficiencies described in this report. Second, the Museum should also incorporate accessibility in all future mobile app development. This means that the Museum should build accessibility in throughout the design and development process. Wireframes and conceptual mockups should be independently reviewed for accessibility. Also, code should be regularly tested for accessibility by experienced experts in mobile app accessibility throughout the code development process. Because accessibility is a complex area, the Museum and its contractors may benefit from contracting with a team with special expertise and proven experience in mobile app accessibility.

MOBILE APP ASSESSMENT OVERVIEW

A manual accessibility audit was performed on The Chicago Field Museum’s mobile app for iOS devices. This app was downloaded via the Apple App Store and testing was performed on an Apple iPhone 6S running iOS 9.3.0.

¹²² First, WCAG is being referenced for software in a number of regulations. Specifically, both the United States draft Section 508 regulation (*see* <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/proposed-rule>) and the European IT accessibility procurement standard (EN 301-549) (*see* <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/proposed-rule>) use the WCAG 2.0 standards for software. The EN 301-549 standards, in particular, are highly useful in translating these web standards into useful software standards. Second, the Department of Justice has been applying the WCAG 2.0 standards in settlement agreements involving mobile apps. *See, e.g.*, National Federation of the Blind and the United States v. HRB Digital LLC, No. 1:13-cv-10799-GAO (U.S.D.C. Ma. 2014), available at <http://www.ada.gov/hrb-cd.htm>.

The following are the issues identified from the manual accessibility audit. Because testing of the app was done outside of the Field Museum's facility there may be features and functionality that is only available onsite was not included in this effort.

The intent of the review is to highlight areas where accessibility can be improved so that future app development can take into account these issues and avoid such issues in future releases of the app.

The Field Museum's mobile app is a nice addition to the museum's offerings and are to be commented for using available technology to enhance the visitor experience.

As with any type of technology there will be challenges in providing access to as many individuals as possible. Since not all aspects of the app lend themselves to being accessible for all users there are some areas where common issues found in mobile apps can be addressed. Being aware of some of these issues will also help in the planning for future app updates and new apps that may be developed.

Please note, as there is no specific mobile app guidelines to measure accessibility this review will loosely apply the WCAG 2.0 guidelines in order to provide a resource to provide guidance and to measure success.

It is also important to note that some aspects of the mobile app are inherently inaccessible and therefore not reviewed as part of this report. For example maps that are displayed would be problematic to make accessible to a nonvisual user. Future efforts may consider the use of a waypoint navigation system (if available) within the museum that would provide turn by turn directions to the exhibit or provide details on what is surrounding the user based on location within the building.

The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the Museum's mobile app was created quickly in time for the World's Fair exhibition several years ago. The Museum admits that the mobile app is not the best quality, has low usage and is now looking to set it aside in order to create a more user friendly app that better reflects the Museum's commitment to excellence. The Museum also informed NASA that met with the original app developer on November 14, 2016 to discuss scope, timeline, and budget. After discovering the budget and total scope, they'll advise the accessibility committee of the meeting, with a discussion to include options to upgrade the app vs. un-publishing the app from the app store. They got a pretty detailed scope from the developer and developed a budget. Currently this project is in the budget phase and the Museum will discuss future steps next year.

About Mobile App Manual Testing

A manual review of a mobile app consists of using the built in accessibility features of the device's operating system. Typically the majority of issues associated with a mobile app is related to the screen reading feature. This appears to be true in the case of The Chicago Field Museum's app.

MOBILE APP ASSESSMENT RESULTS

Please note that the specific issues called out below are present throughout the application under review. Every issue is not documented but rather a sample issue is noted so as to direct focus to the types of issue that exist and the appropriate accessibility techniques that should be applied.

WCAG 2.0 Level A Criterion 1.1.1 [Non-text Content]

The intent of this success criterion is to make information conveyed by non-text content accessible through the use of a text alternative. Text alternatives are a primary way for making information accessible because they can be rendered through any sensory modality (for example, visual, auditory or tactile) to match the needs of the user. Providing text alternatives allows the information to be rendered in a variety of ways by a variety of user agents. For example, a person who cannot see a picture can have the text alternative read aloud using synthesized speech. A person who cannot hear an audio file can have the text alternative displayed so that he or she can read it. In the future, text alternatives will also allow information to be more easily translated into sign language or into a simpler form of the same language.

- 1. App icon contains identifying text which is not read.** Often mobile apps will make use of a graphic icon which contains text that describes or identifies the app. While there is a text identifier that appears under the icon this text often is used a secondary identifier which may lack sufficient information to describe the application by itself. This creates an issue for screen reader features of a device since the graphic icon does not have a readable text alternative. This is the situation with The Museum's mobile app. The graphic icon contains image text that identifies the app as being Museum's app and the secondary text is presented as "Tours." This creates a situation where the screen reader

identifies the app only as “Tours.” It is recommended to use the text below the icon to properly identify the app for the benefit of non-visual users. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>



Figure 16: The mobile app uses only the graphic icon to identify the app

- 2. Image element on main screen contains no ALT attribute.** Images of text with no alternative text will prevent a non-visual user from access the details represented by the image. This is the case on the opening screen of the mobile app. The image text “The Field Museum” is not read by the VoiceOver screen reader which prevents the nonvisual user from identifying the app, providing an image with alternative text would allow the screen reader to properly identify the app on the opening screen. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>



Figure 17: Image does not provide a text alternative

- 3. Button text doesn't not match what is visually displayed.** On the main screen of the app there is a map button which accesses the facility maps. When using a screen reader to access this button it is read as "Main app button." This can be confusing for a nonvisual user and what is read should accurately reflect that the maps feature of the app will be loaded. Suggest configuring the button text to read "facility maps" or something similar. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>



Figure 18: Maps button is read as "Main app button" which is meaningless to a non-visual user

- 4. Home icon button has alternative text that is confusing.** For mobile applications as well as website, a home icon will represent a direct link to the main screen of the app or page of a website. In the museum app this home icon is read as "Prolog button," which will be confusing to users. Suggest changing this text to "main screen" or "home screen." See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>

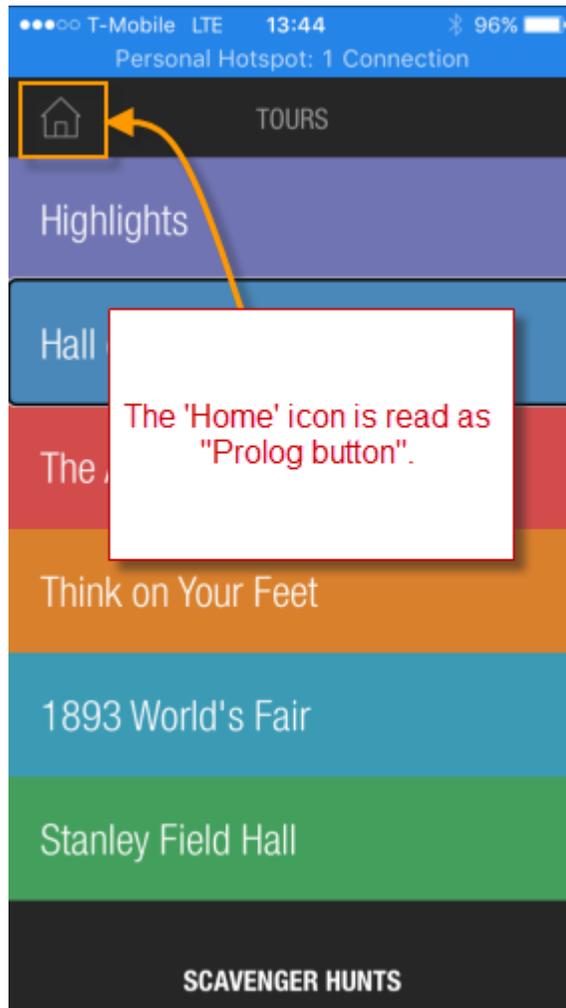


Figure 19: Home icon read as "prolog button"

- 5. An instructions overlay is displayed when entering a tour from the Tours portion of the app.** VoiceOver does not read the content of the instruction overlay but it does read the button in the upper left that is represented with an X. This button is read as "button." Alternative text should be used so this button can be read along with the function it represents. Suggest adding alternative text so it is read as "Close instructions button" or something similar. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>

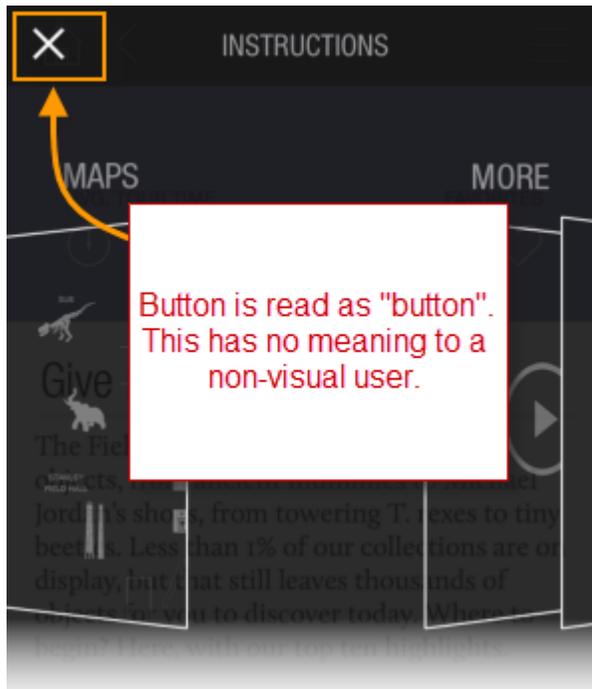


Figure 20: Button has not alternative text to describe its function

- 6. Images lacking descriptive alternative text.** Images shown on the tour do not have alt text. These images are also part of a carousel type of control but the voice over user is not made aware of this and has no way to cycle through the images. Recommend adding descriptive alt text to the image and provide access to the control to cycle through the images. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>

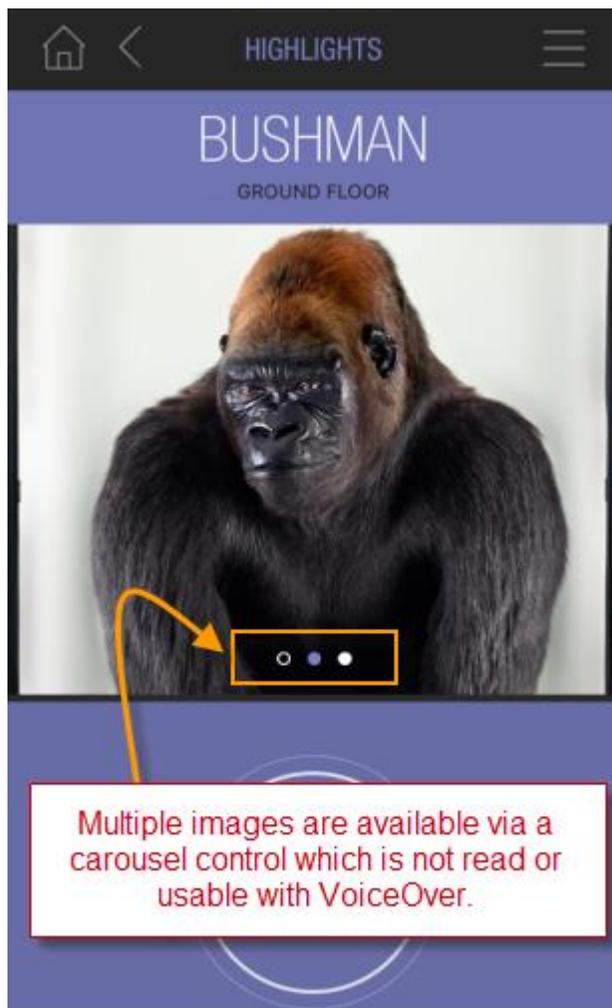


Figure 21: Image do not have alt text and carousel control not usable with VoiceOver

- 7. The apps Scan feature help screen is not read by VoiceOver.** The help screen for the Scans feature is not read at all by VoiceOver. This can be very confusing to the user. Once the screen is cleared the user should be informed to hold the device so it can scan the code. Of course the code to scan would have to be easy to find for a nonvisual person at this point. Consider providing a help screen that is read by the VoiceOver. See <https://www.w3.org/TR/WCAG20-TECHS/G94.html>

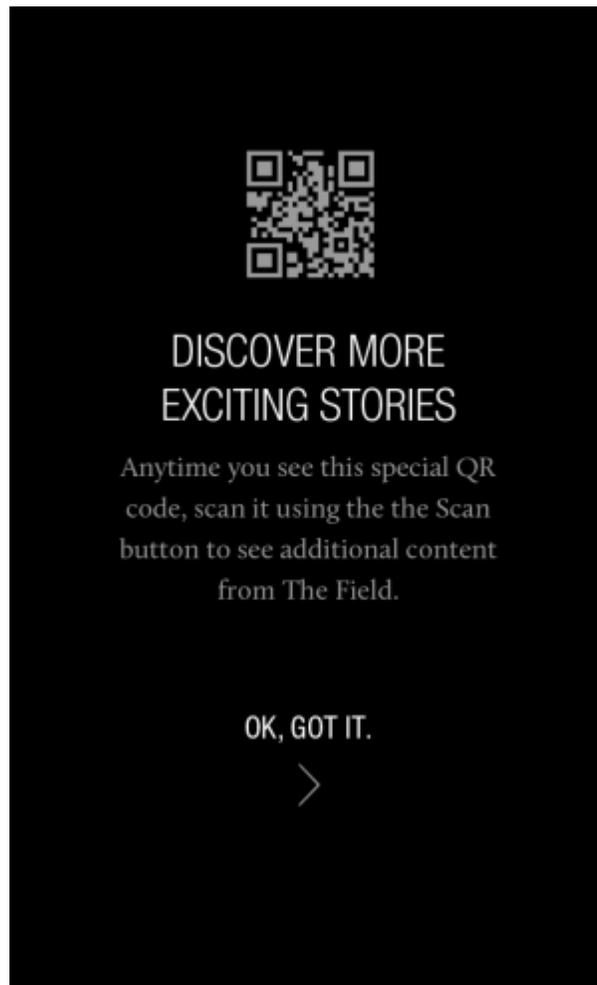


Figure 22: Scan feature help screen not read by VoiceOver

WCAG 2.0 Level A Criterion 1.3.1 [Info and Relationships]

The intent of this success criterion is to ensure that information and relationships that are implied by visual or auditory formatting are preserved when the presentation format changes.

- 1. The control so the tours section of the app contain buttons and button text that all take focus separately with VoiceOver.** In order to ensure that nonvisual users can fully understand controls and their purpose controls should be configured as a single object.

Many times on mobile apps it may appear that label text is overlaid on a button control. In this situation the text is not programmatically linked with the button itself. When text is coded as being part of the button's properties screen readers like VoiceOver can accurately represent this control along with its descriptive text. See <https://www.w3.org/TR/WCAG20-TECHS/G115.html>

On the mobile app on the tours section of the app, buttons and text labels appear as separate controls. Swiping, or moving between the controls with the VoiceOver screen reader has a text label selected first, then a button which is read as "button" and lastly a second button that is read as "button." This can be confusing for the nonvisual user as they are expecting to hear a single button or control selected along with its associated label. Suggest coding buttons and controls in the app so they make use of programmatically linked text labels. Avoid duplicating controls even if they perform the same function.

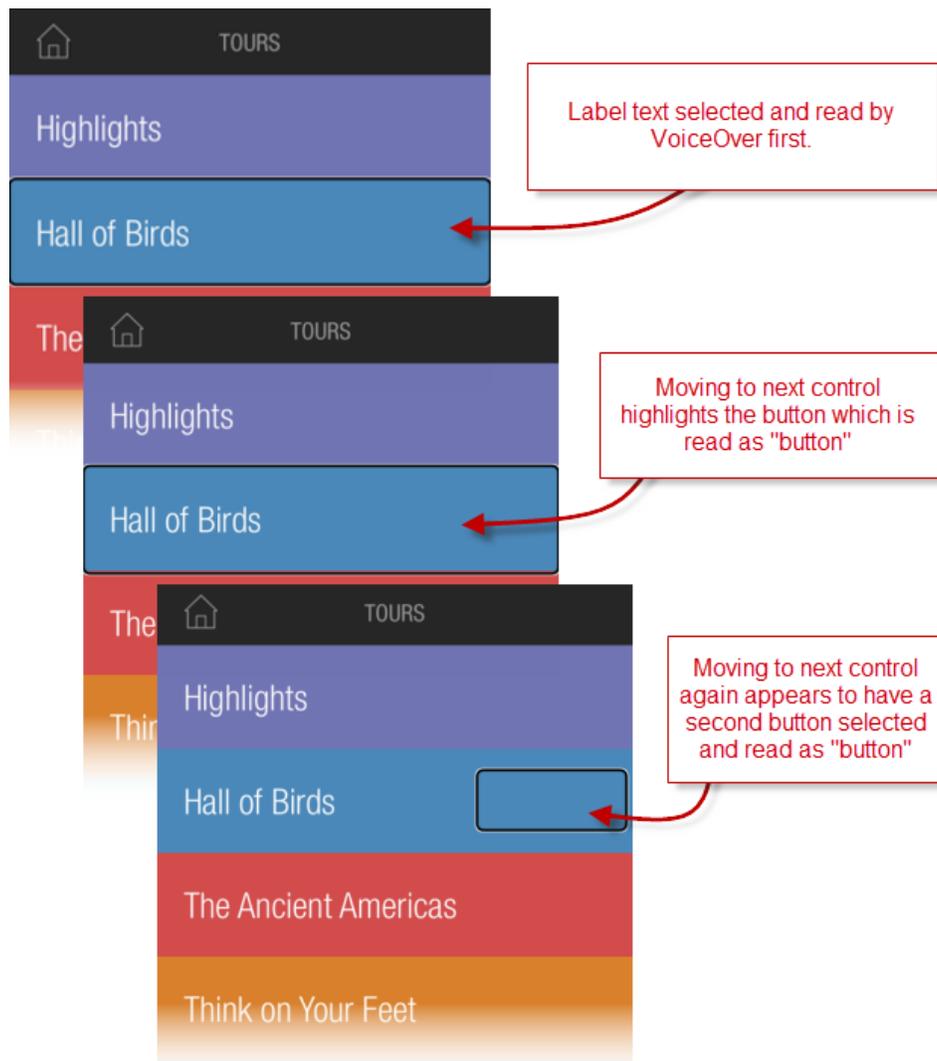


Figure 23: Controls and text labels are not programmatically linked

- 2. Overlay does not take focus and leaves focus on background content.** When selecting a specific tour and after the screens for that tour are loaded, an instructions overlay displays. This overlay is not read by VoiceOver and focus stays on the content behind the overlay. This may not affect a nonvisual user but visually impaired users who can still see but require the assistance of VoiceOver may be confused by this situation. See <https://www.w3.org/TR/WCAG20-TECHS/G115.html>

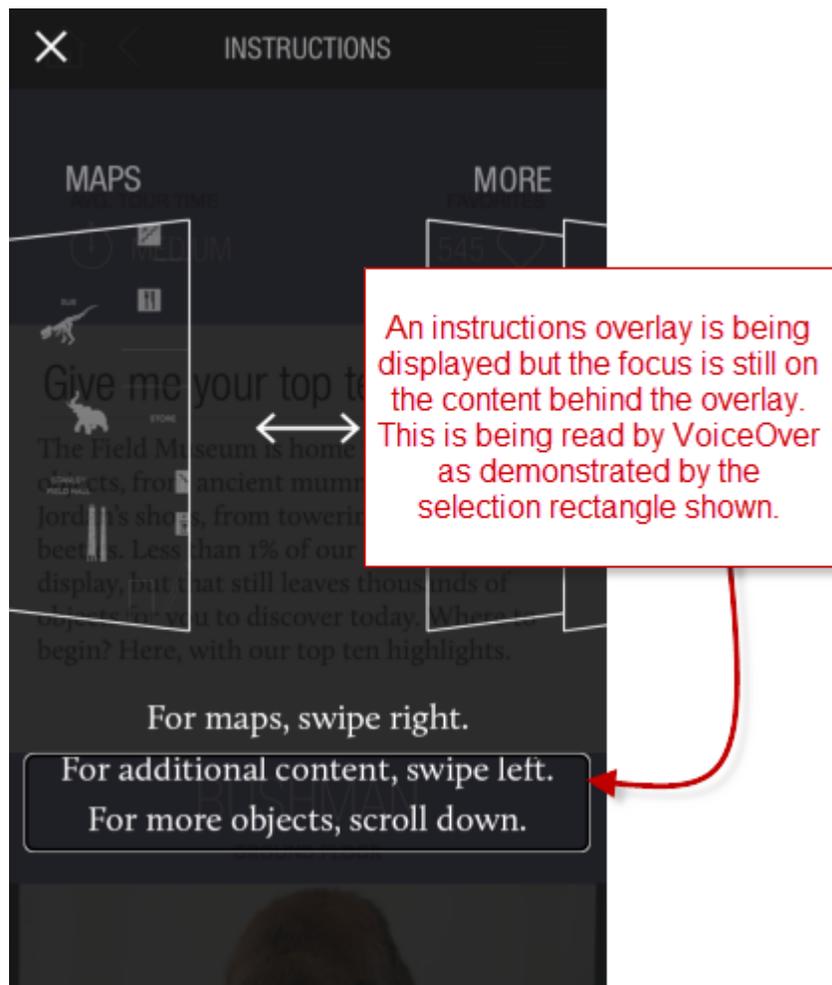


Figure 24: Overlay displayed but focus remains on background content.

WCAG 2.0 Level AA Criterion 3.2.4 [Consistent Identification]

The intent of this success criterion is to ensure consistent identification of functional components that appear repeatedly.

- 1. Use of icon image that represents other features/functions.** In mobile apps it is commonly understood that an informational icon, a lower case 'i' within a circle, represents information about the application. In the mobile app this icon is used to represent the apps settings which would normally be represented by a gear icon. To be

consistent in meaning the gear icon should be used to represent the app settings. See <https://www.w3.org/TR/WCAG20-TECHS/G197.html>

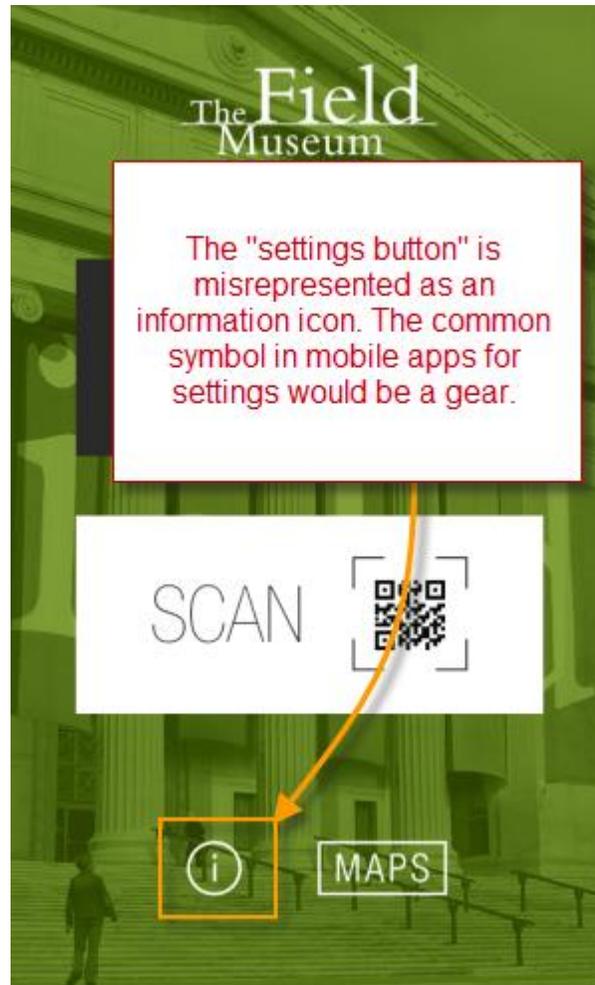


Figure 25: The 'settings' icon is misrepresented by an 'information' icon



Figure 26: A sample gear icon typically used in mobile apps to represent app settings

- 2. Use of icon image that represents other features/functions.** In mobile apps it is commonly understood that an informational icon, a lower case 'i' within a circle, represents information about the application. On the tour menu this icon is used to display a map of the location of the exhibit. It would be better to use an icon that

represents this function. Possibly a map icon or a map pin icon. See <https://www.w3.org/TR/WCAG20-TECHS/G197.html>

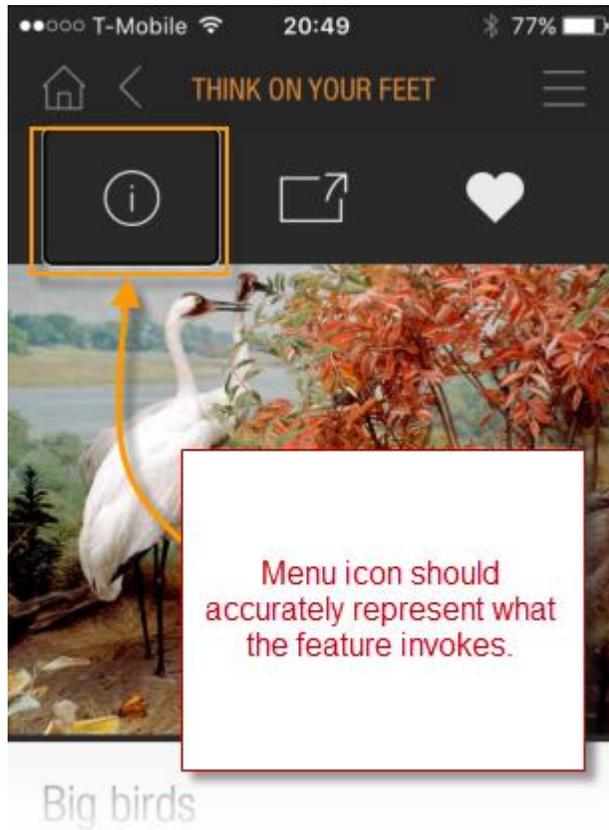


Figure 27: Menu item icon should accurately reflect its feature



Figure 28: Sample icons commonly use in mobile apps to represent maps

WCAG 2.0 Level A Criterion 3.3.1 [Error Identification]

The intent of this success criterion is to ensure that users are aware that an error has occurred and can determine what is wrong. The error message should be as specific as possible.

1. **Scan feature returns to main app screen on error.** When scanning a QR code that is invalid, the app jumps back to the main screen without any indication there was a problem which is also confusing. Consider providing a proper error message when an invalid QR code is scanned. See <https://www.w3.org/TR/WCAG20-TECHS/G83.html>

WCAG 2.0 Level A Criterion 4.1.2 [Name, Role, Value]

The intent of this success criterion is to ensure that assistive technologies (AT) can gather information about, activate (or set) and keep up to date on the status of user interface controls in the content.

1. **Menu button does not visually indicate state.** The menu button in a tour is disabled until one of the items in the tour is selected. After moving to an item the menu then is enabled but visually is not discernable. This is difficult for a nonvisual user to discern and navigate and is also initially difficult for a non-impaired user to discern. See <https://www.w3.org/TR/WCAG20-TECHS/G108.html>



Figure 29: Menu button state not visually discernable

Digital Rails and Touch Panel Accessibility

The Museum uses digital technology throughout its facility in the form of touch panel displays. These are used as navigation aids and to provide exhibit information. The Museum also uses a highly-specialized version of this technology called “digital reading rails” at its major displays, such as the Tyrannosaurus Rex exhibit and its new China Hall exhibits. These custom-designed touch-sensitive panels are integrated into the handrails at these exhibits and allow users to “drill down” into specific information about the exhibit that they are looking at.¹²³ At the time of our site visit in November 2015, the Museum had installed about 50 of these custom-developed devices.

In many respects, these digital technologies (and particularly the digital reading rails) are a promising practice. They provide an outstanding opportunity for visitors to learn exactly what they are interested in when looking at an exhibit. They are also adjustable so they can be easily used while seated in a wheelchair. This highly innovative addition was commissioned by the Museum and all of the programming for these devices is done in-house. As such, it is relatively easy to incorporate video programming and linguistic translations (e.g., all of the digital rail and printed content for the China Hall exhibit space has been translated into Chinese and is available for mobile use through Chinahall.fm).¹²⁴ At the same time, they also present accessibility challenges either because of minor deviations from accessibility standards and more global issues involving access for blind users.

This section is divided into two parts. The first section addresses the more global issues involving the touch panel displays and digital reading rails, with particular emphasis on the needs of blind users. This section also addresses specific steps that the museum can take now to ensure program access. The second section includes an analysis from the NASA team’s IT accessibility expert of specific issues that were found. Both of these sections can be used by the Museum’s contractors and IT staff in designing and installing future versions of these devices to maximize accessibility.

General Concerns about Digital Rails and Touch Panel Displays

Touch panel devices can cause accessibility issues for users with disabilities—and particularly for users with vision impairments. A smooth glass panel without any discernable landmarks is unusable by blind users without feedback through some alternate means (e.g. audio feedback either through a speaker or a headset). Voice feedback paradigms like iOS VoiceOver may be a

¹²³ Interview with Ray DeThorne, Darnell Williams, and Jacob Shuler (Nov. 10, 2015).

¹²⁴ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015).

very useful way to make these technologies accessible. Other strategies exist to make these technologies independently accessible to blind or visually impaired users—and the Museum should definitely consider these strategies for future versions of these technologies.

The Museum currently has a number of workarounds available to help make these technologies accessible.

Exhibit Codes. For instance, the Museum uses a series of numeric exhibit codes that often provides duplicate information to what is available in touch panel displays through a specialized section of the Museum’s website. This appears to be common, for example, for the digital reading rails in the Museum’s China Hall exhibit. This can be a useful workaround for visually impaired users—provided that this portion of the Museum’s site is accessible and that mobile devices are available to visually impaired users at the Museum. It may be the case, for example, that a blind student visiting the Museum does not have a smartphone. This strategy also assumes that blind or visually impaired users know the number of the display. This can be accomplished with a transparent braille panel or sticker adhered to each exhibit display or touch panel. Assuming these steps are made, this can provide a useful way of providing independent program access in the medium term.

Docents. As noted earlier, the Museum uses docents very effectively in providing program access to Museum visitors. Making sure that docents or other trained Museum staff are available near touch panels or digital reading rails to assist users with vision impairments understand content is a highly useful short-term strategy.

Making each touch panel display and smart rail independently accessible without reliance on adjunct technologies is always the preferred solution. Even if the Museum chooses this strategy, however, it may want to still leverage exhibit codes and the Museum’s website to further optimize the user experience. Using touch panel or digital reading rails is a single-user experience—two users can’t “drill down” into separate content at the same time. This is particularly true if the Museum decides to use headphones for audio output. Using exhibit codes, by contrast, enables the Museum to allow multiple users to access this content simultaneously. This optimizes the Museum experience for all users, particularly during peak hours.

[Detailed Digital Rail and Touch Panel Accessibility analysis](#)

The following analysis was prepared by the NASA team’s IT accessibility expert and addresses specific accessibility concerns about the digital reading rails and touch panel displays.

DIGITAL INFORMATION PANELS ASSESSMENT OVERVIEW

A number of different types and styles of digital information panels are provided through the facility. Many of these have been implemented very well and as a result accommodate a larger number of users with disabilities. For example, the digital rails that are part of the China exhibit are positioned so that those in wheelchairs can access the information while at the same time providing comfortable access to those in a standing position. Some of the informational panels in the main corridors provide features to allow moving content on the top of the screen to the bottom of the screen so those with limited reach can make use of the features as well. The Museum has done an excellent job implementing these technologies. Yet, as with most technologies, there is always room for improvement and the following highlight areas of consideration for future updates and retrofitting to abide by accessibility guidelines. The Museum informed NASA after the onsite visit in its October 31, 2016 response to the draft onsite review report that the Museum understands the importance of ensuring accessibility for the digital rails and will make this a priority. Specifically, the Museum will generate a detailed list of fixes and adjustments. Many of these require redesign of the UX interface, which means a significant cost in design fees. Many require an adjustment to the mounting height which can be fixed as part of the architectural accessibility fixes. A plan for these fixes will be contingent on funds available and it will be high in a list of top priorities.

Digital Rails

In house development of the Digital Rails as found in the China exhibit function very well. While the content and devices do not accommodate nonvisual users there is the ability to provide equal access to this content via a web browser. For this to be a complete solution, the content provided via the web would need to meet the WCAG 2.0 Level A & AA guidelines and details on how to access the URL along with details on the exhibit would need to be provided in a way that would allow nonvisual users to easily navigate to the correct information. Following are suggested additional items to enhance the user experience of the Digital Rail panels.

- 1. Pinch gestures.** Some users who suffer from mobility issues may have some difficulty making use of the pinch gestures to zoom in and out. The Digital Rails make heavy use of pinch gestures. This could be enhanced by provided on screen controls to allow for users with mobility issues to use a single finger to move around the screen as well as the ability to zoom in and zoom out without using the pinch gesture.

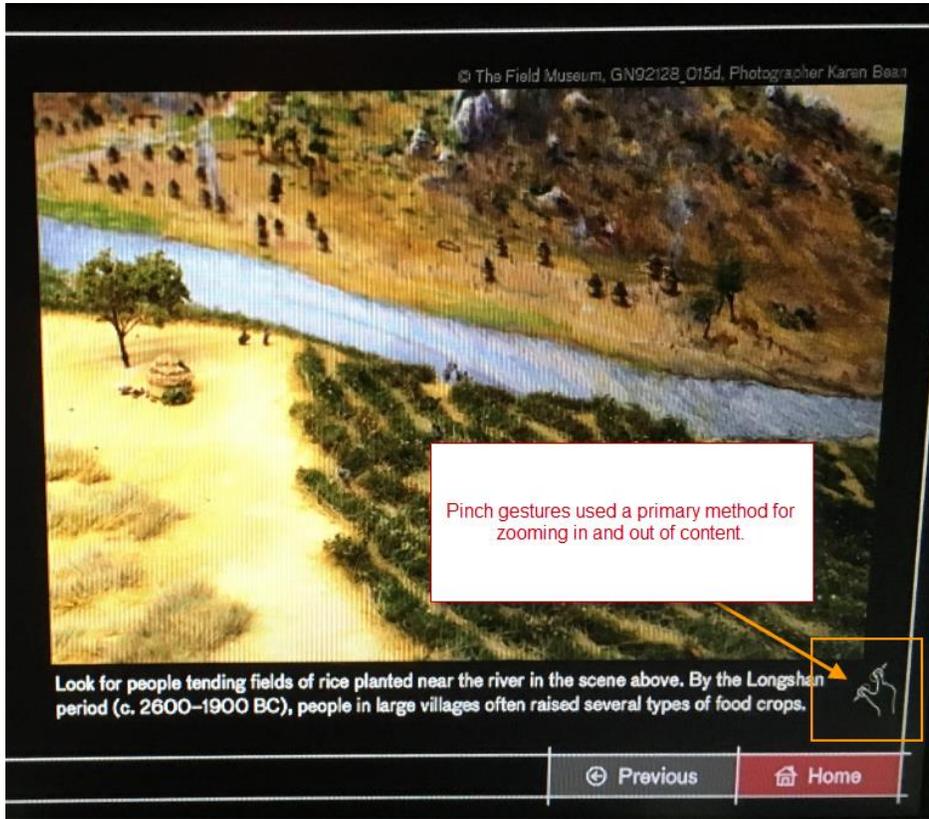


Figure 30: Pinch gestures are used to zoom in and out on the Digital Rails



Figure 31: Pinch gestures can be problematic for those with mobility issues.

- 2. Use of color as only means to convey information.** Some content relies on the use of color to identify information. Consider using patterns or different symbols so those who are color blind will be able to consume the information as well.

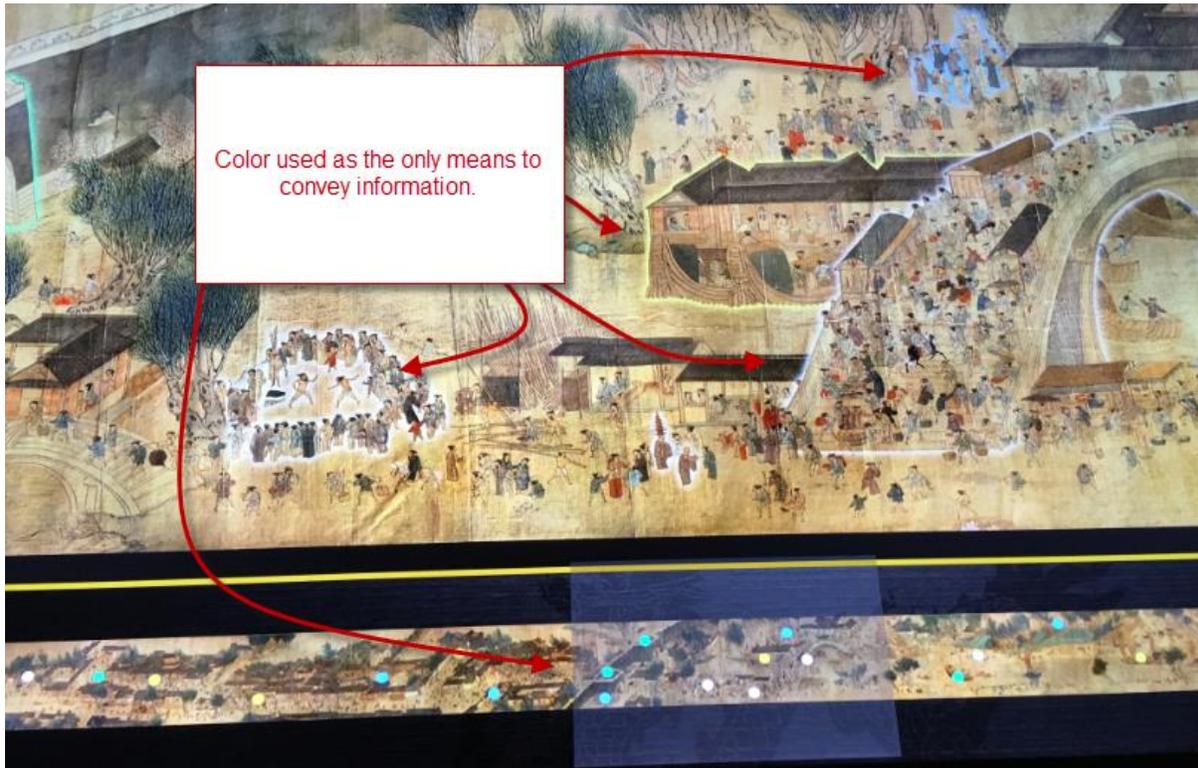


Figure 32: An example of content that relies on color only to convey details



Figure 33: Same content as above shown without color to demonstrate difficulty for those who cannot see colors

Touch Panels

There are a variety of different types of touch panels around the facility. Most of these would benefit by taking care to ensure that the reach distance for touch controls on these panels are not outside the allowable limit for users with limited reach. These situations could be addressed by providing the ability for panels to be raised or lowered to accommodate the reach limit. The upper reach limit for unobstructed panels is 48" max (<https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/ada-standards/chapter-3-building-blocks>. See figure 308.2.1 and figure 308.3.1).

- 1. Some panel displays have touch controls too high.** Consider allowing the panels to be adjustable so they can be lowered to accommodate users with limited reach.



Figure 34: Example of digital panel with touch controls too high



Figure 35: Another example of a digital panel with touch controls too high

Sue the T-Rex Touch Panel

The reach distance for the Sue the T-Rex touch panel is too high for a person who is wheelchair bound. This could be addressed by providing the panel to be raised or lowered to accommodate the reach limit for these users.

- 1. Sue the T-Rex touch panel controls outside of limited reach limits.** Dragging and placing of bones on the panel become outside of the allowable reach limit around the hip bone. Users trying to place bone on the spine may have difficulty in doing so if they are wheelchair bound. Control to rotate the skeleton is also out of allowable range.



Figure 36: Sue the T-Rex touch Panel

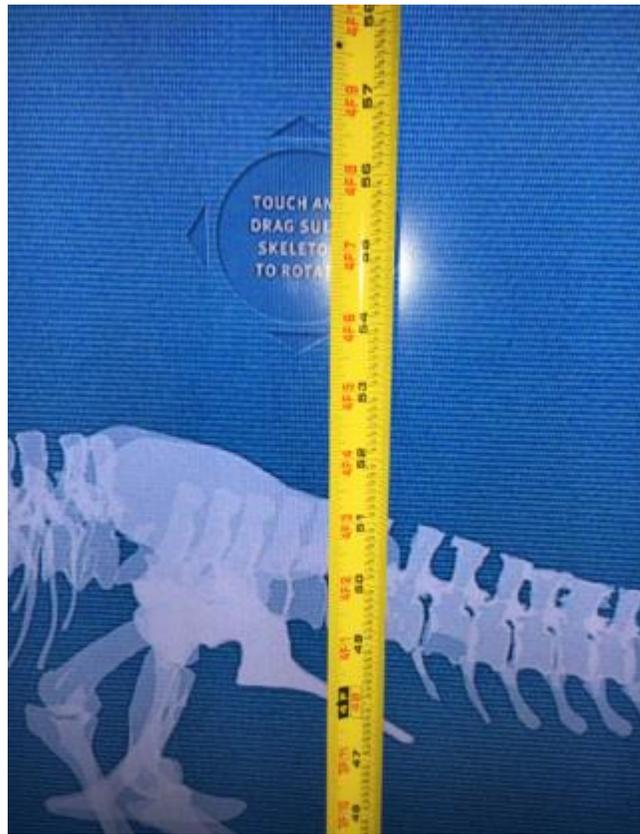


Figure 37: Image showing the ranges above 48"

Information/Directory Panels in Main Halls

The informational and directory panels found in the main halls do an excellent job of providing access to the touch controls for most users and are designed very well. These panels allow a user to swap the top and bottom portions of the panel to allow access to those controls. This greatly helps facilitate the use of the panels by those with limited reach. There are a few areas that fall just outside the allowable range.

- 1. Some touch controls fall just outside of the allowable reach limit.** While most of the controls can be accessed within the reach limit of 48 inches vertical from the floor some of the controls near the top of the half display are just above that limit. A solution would

be to lower the panels a few inches to bring the upper touch controls in line with the reach limit.



Figure 38: Information/Directory panels on the Main and Upper Level

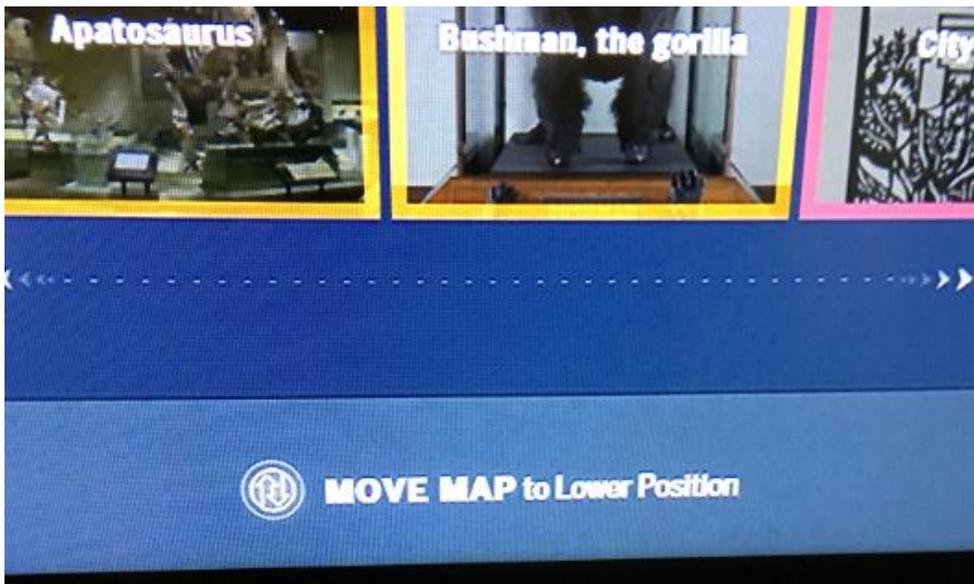


Figure 39: The panels allows for the upper and lower portions to be swapped for easy reach

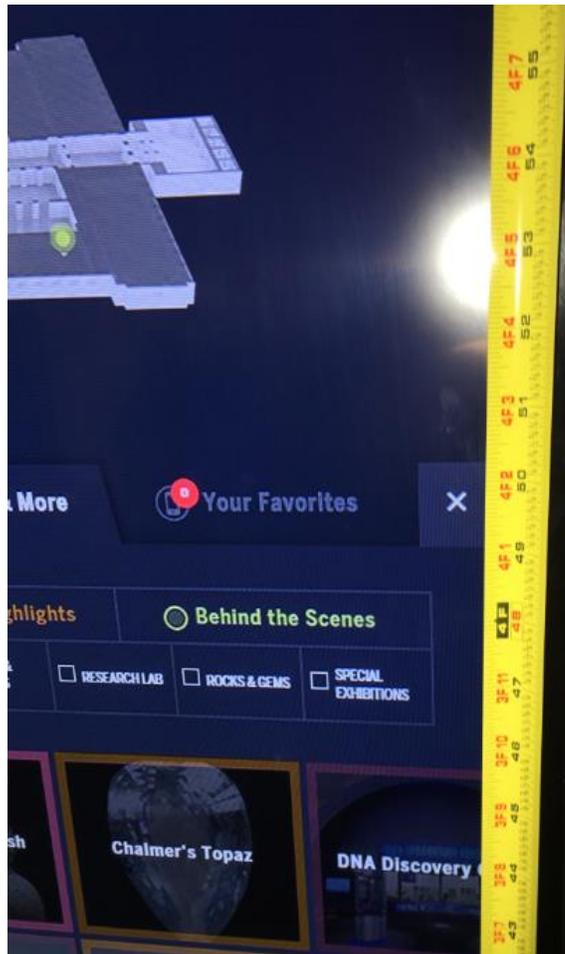


Figure 40: Some of the touch controls fall just outside of the allowable reach limit

Architectural Accessibility

Potential Compliance Issues and Recommendations:

As described in the *Detailed Architectural Report* section, below, there are a number of areas where the Museum's facility does not conform to the applicable Federal standards for accessibility.

In most instances, these inconsistencies make program access more difficult—but not impossible—for people with disabilities. These inconsistencies should be addressed in the near future.

In a few cases, the inherent nature of the exhibit (e.g., the Egyptian Tomb exhibit) or the building's old structure (e.g., marine mammal exhibit) make it impractical to make an exhibit accessible. In this case, it may not be necessary to make the exhibit accessible—but accessible alternatives need to be provided. In this case, we have suggested some alternatives that may meet the program access requirements of Section 504.

Lastly, the 3D movie theater has significant accessibility issues that appear to violate the new construction and alterations standards of Section 504. These errors are significant and the Museum may need to consider efforts to correct these architectural deficiencies.

Promising Practices:

There are two areas where the Museum performed very well with its accessibility. First, the east entrance to the Museum shows a detailed and thoughtful understanding of accessibility and is a key element to making the rest of the building accessible. Second, the Museum's exhibits and interactive elements reveal a focus on accessible and inclusive design that rises above most other science centers and museums.

Architectural Accessibility Overview

In planning exhibits, the Museum indicated that they look to the following design standards:¹²⁵

- 2010 ADA Standards for Accessible Design¹²⁶
- Design for Accessibility: A Cultural Administrator's Handbook (National Endowment for the Arts)¹²⁷

¹²⁵ Museum Response to NASA Information Request.

¹²⁶ Interview of Ernst Pierre Toussaint (Nov. 11, 2015).

¹²⁷ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015). The NEA Handbook is available at <https://www.arts.gov/publications/design-accessibility-cultural-administrators-handbook>.

- Smithsonian Guidelines for Accessible Exhibition Design¹²⁸
- Smithsonian Guidelines for Accessible Design (2011 Revisions)¹²⁹

In general, the Museum endeavors to make the exhibits available in a multisensory experience. For instance, they try to create tactile representations of fragile objects or exhibits that can't otherwise be touched. For instance, in the Mammoth Exhibit, they created tactile representations of the exhibit. They also use tactile maps, such as the one that they created for the giant ancient Mesoamerican city of Teotihuacan near Mexico City. In addition to tactile representations, they also use soundscapes to enhance learning. This layered approach is useful for all visitors, but particularly for visitors with cognitive disabilities.¹³⁰ The Museum has less control over traveling exhibits. However, these exhibits are all reviewed and, if necessary, modified to meet the needs of their audience, including participants with disabilities.¹³¹

Before any exhibit (whether permanent or traveling) opens to the public, other members of the Museum staff perform a walk-through of the exhibits. During this time, safety and accessibility concerns raised. In addition, docents give practical feedback about exhibits, such as lighting or protruding objects that may create barriers for visitors with disabilities.¹³²

In general, the NASA team review found that there were a number of architectural barriers in the facility. Some of these barriers are due to the age of the facility and some of them are due to the complexity and unusual nature of museums and science centers. One significant error, however, was due to the poor architectural design and will need to be corrected at the earliest opportunity. Several witnesses reported on the need for the accessible east entrance to the Museum as an accessibility highlight for the Museum. The NASA team review found that this entrance is a key element to accessibility at the Museum and that accessibility would be much more difficult to accomplish without it—so much so that it is identified as a promising practice. The following section (*Detailed Architectural Report*) includes specific barriers identified by the NASA the team architect. These barriers should be addressed as soon as possible.

¹²⁸ Available from <http://accessible.si.edu/pdf/smithsonian%20Guidelines%20for%20accessible%20design.pdf>.

¹²⁹ Available at <http://si.edu/accessibility/sgad>.

¹³⁰ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015).

¹³¹ Interview with Ray DeThorne, Jaap Hoogstraten, Gretchen Baker, and Alvaro Amat (Nov. 10, 2015).

¹³² Interview with Shawn VanDerziel, Mary Ann Bloom, and Jolynn Willink (Nov. 10, 2015).

Detailed Architectural Report

As noted above, the following section was prepared by the NASA team’s professional architect. It focuses on architectural barriers and promising practices using the Uniform Federal Accessibility Standards. These standards have served as the accessibility benchmark for Federal agencies and fund recipients since 1982. It should be noted that two months after the onsite visit, NASA had issued the revised Section 504 regulations, which changed the accessibility standards to be used for new construction and alterations to existing facilities. The Museum informed NASA in its October 31, 2016 response to the draft onsite report that the NASA-recommended architectural accessibility fixes proposed below will be added to a list of maintenance and repairs and given top priority. Specific measures to address accessibility issues since the onsite visit for specific building/site elements described in the October 31, 2016 response are referenced for each of the affected elements below. The Museum informed NASA that schedule and calendar for these fixes will be contingent on the maintenance budgets and schedules. NASA recommends that such a schedule form the framework for the Museum’s transition plan to address its architectural barriers as required by 14 C.F.R. § 1251.301(d). The regulatory requirements for the contents and development of the transition plan are detailed on page 16 of this report.

The NASA Section 504 regulations distinguish between existing facilities and newly constructed or altered facilities. Newly constructed¹³³ facilities and alterations¹³⁴ must be “readily accessible to and usable by” people with disabilities.¹³⁵ In general, this means that such facilities and alterations must meet the stringent Uniform Federal Accessibility

¹³³ 14 C.F.R. § 1251.302(a) provides,

Design and Construction. Each facility or part of a facility constructed by, on behalf of, or for the use of a recipient shall be designed and constructed in such manner that the facility or part of the facility is readily accessible to and usable by individuals with disabilities.

¹³⁴ 14 C.F.R. § 1251.302(b) provides,

Alteration. Each facility or part of a facility which is altered by, on behalf of, or for the use of a recipient after the effective date of this part in a manner that affects or could affect the usability of the facility or part of the facility shall, to the maximum extent feasible, be altered in such manner that the altered portion of the facility is readily accessible to and usable by individuals with disabilities.

¹³⁵ 14 C.F.R. § 1251.302(a)-(b).

Standards (UFAS) or the 2010 ADA Standards for Accessible Design (The 2010 Standards).¹³⁶ By contrast, for existing facilities, NASA fund recipients must ensure that their programs or activities are accessible “when viewed in their entirety.”¹³⁷

Although not covered by this report, the Field Museum as a private entity has additional accessibility obligations under the Americans with Disabilities Act (ADA)—including the requirement to remove architectural and communications barriers that are “readily achievable” to remove and the requirement to make “path of travel” changes related to alterations under Title III of the ADA.¹³⁸

¹³⁶ 14 C.F.R. § 1251.302(c). UFAS is available at <https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/14-architectural-barriers-act/467-uniform-federal-accessibility-standards>.

¹³⁷ NASA’s Section 504 regulation states,

§ 1251.301 Existing facilities.

(a) Program accessibility. A recipient shall operate each program or activity to which this part applies so that the program or activity, when viewed in its entirety, is readily accessible to individuals with disabilities. This paragraph does not require a recipient to make each of its existing facilities or every part of a facility accessible to and usable by individuals with disabilities.

(b) Methods. A recipient may comply with the requirement of paragraph (a) of this section through such means as redesign of equipment; reassignment of classes or other services to accessible buildings; assignment of aides to beneficiaries; home visits; delivery of health, welfare, or other social services at alternate accessible sites; alteration of existing facilities and construction of new facilities in conformance with the requirements of § 1251.302; or any other methods that result in making its program or activity accessible to individuals with disabilities. A recipient is not required to make structural changes in existing facilities where other methods are effective in achieving compliance with paragraph (a) of this section. In choosing among available methods for meeting the requirement of paragraph (a) of this section, a recipient shall give priority to those methods that offer programs and activities to individuals with disabilities in the most integrated setting appropriate.

14 C.F.R. § 1251.301.

¹³⁸ The ADA’s path of travel obligation is a detailed requirement set forth in the Department of Justice’s Title III regulation, 28 C.F.R. § 36.403 (2010); see also, 42 U.S.C. §12183(b). It requires places of public accommodation, like the Field Museum, to make accessibility upgrades to its existing facility when those upgrades serve primary function areas being directly altered. Further, places of public accommodation like the Field Museum are required to spend up to 20% of the total cost of the alteration in making these upgrades before they are considered “disproportionate” to the cost of the alteration.

Compliance Analysis

As noted above, Section 504 requires the Field Museum to make architectural changes for two separate reasons. Under Section 504 the Field Museum must ensure that all new construction or alterations made prior to January 23, 2017 fully comply with UFAS or the 2010 ADA Accessibility Standards (the 2010 Standards).¹³⁹ Second, the Field Museum must ensure that its programs or activities are offered in accessible locations, which may entail making architectural changes to existing spaces.¹⁴⁰ All new construction and alterations made on or after January 23, 2017 must comply with the 2010 Standards.

¹³⁹ Specifically, the Field Museum must ensure that all new construction or alterations after the Field Museum's first receipt of Federal funding fully complies with UFAS or the 2010 Standards.

¹⁴⁰ Specifically, Federal fund recipients must ensure that their programs or activities are accessible "when viewed in their entirety"—and should make architectural changes where necessary to meet this requirement. NASA's Section 504 regulation states,

§ 1251.301 Existing facilities.

(a) Accessibility. A recipient shall operate each program or activity to which this part applies so that the program or activity, when viewed in its entirety, is readily accessible to individuals with disabilities. This paragraph does not require a recipient to make each of its existing facilities or every part of a facility accessible to and usable by individuals with disabilities.

(b) Methods. A recipient may comply with the requirement of paragraph (a) of this section through such means as redesign of equipment; reassignment of classes or other services to accessible buildings; assignment of aides to beneficiaries; home visits; delivery of health, welfare, or other social services at alternate accessible sites; alteration of existing facilities and construction of new facilities in conformance with the requirements of § 1251.302; or any other methods that result in making its program or activity accessible to individuals with disabilities. A recipient is not required to make structural changes in existing facilities where other methods are effective in achieving compliance with paragraph (a) of this section. In choosing among available methods for meeting the requirement of paragraph (a) of this section, a recipient shall give priority to those methods that offer programs and activities to individuals with disabilities in the most integrated setting appropriate.

14 C.F.R. § 1251.301.

New Construction and Program Access Barriers "Punch List"

The following "Punch List" of accessibility barriers is based on the requirements of UFAS and the 2010 Standards for new construction associated with the actual spaces and elements physically built into facilities. Additionally, barriers associated with movable or non-fixed elements of the facilities, such as tables, chairs, stanchions, barricades, movable display elements, etc., are covered by the program accessibility provisions of Section 504 regulations. These standards for accessibility have been used as a guide to analyze what is accessible and usable for individuals with disabilities under the program accessibility provisions for this facility.

Main Front (South) Entrance Approach Issues

- 1. Main Taxi Drop-off Area along East McFetridge Drive** – The small sign (ISA is 1" high) near the main museum entrance is inadequate to direct people with disabilities arriving by taxi to the designated accessible east entrance – a more prominent sign should direct disabled visitors to the designated accessible east entrance and the drop-off area there. There is no need for the historic entry stair to be made wheelchair accessible. The Museum informed NASA that new temporary signage has been implemented after the onsite visit. The Museum is developing new permanent signage as part of a larger wayfinding plan for the south terraces and sidewalks.

Designated Accessible East Entrance Approach Issues

- 1. Alternate Accessible Taxi Drop-off Area at East Entry** – The accessible parking area and drop-off area improvements serving the accessible east entrance is under the jurisdiction of the City because they are on park property. It is understood that the sidewalk at the recently constructed accessible east entrance facility will not be modified as it is likely on City property, but the surface of this sidewalk has a 5% slope away from the building which will create a cross slope challenge for manual wheelchair users who approach from the drop-off area directly to the east entrance. It is technically compliant with the accessibility standards because there is an alternate, but more circuitous accessible approach along the east-west sidewalk from the Adler Planetarium. On this alternate approach route, the 5% slope is an

acceptable running slope for wheelchair users rather than a challenging cross slope. It would be beneficial to those who contact the accessibility coordinator listed on the Field Museum website to have him/her explain this alternate approach route. The Museum maintains that the sidewalk is beyond the Museum's lease line on City property, but it can contact the City to see if a solution can be implemented (see Fig. 41).



Figure 41 -- Designated Accessible Passenger Loading Area near East Museum Entrance

West Staff Entrance Approach Issues

- 1. Accessible Parking** – The 8 designated accessible parking spaces provided in the staff parking lot (behind a security gate) are made available to disabled visitors on a special request basis. At the time of the NASA site visit, 4 of these accessible parking spaces were rendered inaccessible by the placement of wooden barricades that blocked the use of the access aisles. The only other accessibility barrier at this west entrance approach was the curb ramp serving the accessible parking spaces – it was steeper (at 10%) than the maximum allowable 8.3% and had a 1" high lip at the bottom in violation of UFAS 4.7.2. and 406.1 of the 2010 Standards. The Museum informed NASA that these solutions are attainable with minor modifications and should be completed by the end of 2016.
- 2.** (see Fig. 42)



Figure 42 - Designated Accessible Parking and Approach to Accessible West Museum Entrance

Lower Level Accessibility Issues

1. Accessible East Entrance Lobby Issues -

- a. All stanchion mounted tape barriers in this lobby with only one retractable tape used as aids for queuing visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem. These must also be placed so the space between the tapes is at least 36" wide and the space between opposite stanchion bases is at least 32" wide per UFAS 4.3.3. and 403.5.1 of the 2010 Standards (see Fig. 43).



Figure 43-- Ground Level Ticket Sales Area at Accessible East Entrance

- b. The 42" high ticket sales/service counters lacks a lowered portion (28"-34") to accommodate wheelchair users per UFAS 7.2. The 2010 Standards at 904.4 permits a maximum height of 36".

2. Crown Family Play Lab Issues –

- a. The bottom of the mirror in the unisex restroom in this Play Lab is mounted higher (at 45") than the maximum allowable 40" per UFAS 4.19.6 and the 2010 Standards at 213.3.5. The Museum informed NASA that these solutions are attainable with minor modifications and should be completed by the end of 2016.

3. Underground Adventure Exhibit Issues -

- a. The bottom edge of the TVs in the lobby area just past the reception deck project more (at 8 ½") into the circulation route at 64" AFF in violation of UFAS 4.4. and the 2010 Standards at 307.2. The Museum informed NASA that a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.
- b. The tabletops at the "Take a Closer Look," "Plants need a Diet," and "It's a Dirty Job" displays all project further than 4" into the circulation path above 27" in violation of

UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that the tabletop can be replaced with pedestals that are compliant with the accessibility standards.

- c. (see Fig. 44)



Figure 44-- "Plants need a Diet" Counters in Underground Adventure Exhibit

4. General Ground Floor Circulation Issues –

- a. The wall-mounted TV to the right of the Inside Ancient Egypt exhibit entrance projects further (at 6 ½") into the hallway at 28 ½" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that the mount will be adjusted to reduce height and depth, and a pedestal will be added at the base to make this element cane-detectable.
- b. The 3 guardrails surrounding the "Man-Eater of Mfuwe" exhibit project further (at 12") into the hallway at 31" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that the pedestal base will be extended to eliminate the projection into the hallway.
- c. (see Fig. 45)



Figure 45-- Railings Not Cane Detectable on Ground Level Central Corridor

- a. The wall-mounted TVs and the sign for the Explorer Cafe project further (at 4 ½" – 6") into the hallway above 80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that the mount will be adjusted to reduce height and depth, and/or a pedestal will be added at the base to make this element cane-detectable.

5. Inside Ancient Egypt Lower Level Exhibit Issues -

- a. There is a handrail missing on one side of the ramps leading to the Egyptian Boat display in violation of UFAS 4.8.5 and the 2010 Standards at 405.8. The Museum informed NASA that a handrail will be added.
- b. The bottom 3 feet of the ramp immediately adjacent to the Egyptian Boat display is steeper (at 11.2%) than the maximum allowable 8.3% per UFAS 4.8.2 and the 2010 Standards at 405.2 (see Fig. 46). The Museum informed NASA that extending or modifying this ramp to change the slope could have a major impact in the gallery. This type of construction work would require the de-installation of adjacent displays. It would mean a major modification with major budget implications. A panel and/or

video can be added at the beginning of the ramp to provide an alternate experience for the visitors who cannot use or do not wish to use the ramp. NASA recommends that the Museum address costs and project timeline in the transition plan.



Figure 46-- Steep Ramp at Lower Level "Inside Ancient Egypt" Exhibit

- c. The black pipe rail around the stone cat god statue is higher than 27" and not cane detectable as required by UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that a lower rail will be added to make it cane-detectable.

6. Sea Mammals Exhibits Issues -

- a. These two sunken exhibit areas flank the Rockology store and do not offer an accessible route (only steps in violation of UFAS 4.5.2 and the 2010 Standards at 303.2) down to the exhibit areas. Given the age of the structure and limited space available to install an accessible ramp to these two small exhibition areas, these areas may qualify for an exemption under the "structural impracticability" defined in UFAS at 3.5. (See Fig. 47). Nevertheless, in order to achieve program access, the Museum should still have information available that describes the inaccessible exhibit. One approach may to place signage directing users to a captioned video on the Museum's site that describes the inaccessible exhibit and provides all of the information available had the users been able to reach the display. The Museum

informed NASA that a panel and/or video can be added at the top of the steps to provide an alternate experience for the visitors who cannot access the area.

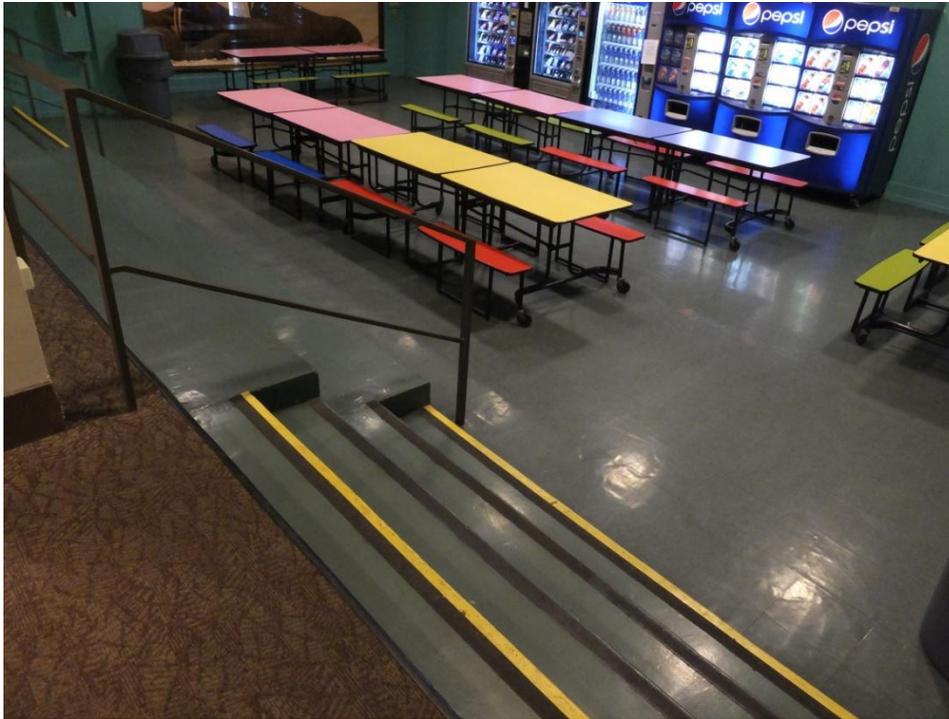


Figure 47-- Inaccessible Sea Mammal Exhibit Area

7. The Siragusa Lunch Room Issues -

- a. All folding lunch room tables lack the accessible knee/toe clearance at least 30" wide, 27" high and 19" deep from the edge of the table per UFAS 4.32.3 and the 2010 Standards at 306 and 902. At each dining area, 5% of seating must be accessible seating per UFAS 5.1 and the 2010 Standards at 226.1. The Museum informed NASA that these custom modifications will require a proposal request and submission for approval and budgeting. The completion date will be based on administration approval. NASA recommends that the Museum address this issue via its transition plan.
- b. Vending machines in this area have operable parts (credit card readers, coin slots, etc.) that are mounted higher (at 67") than the maximum allowable 54" per UFAS 5.4. Please note that the 2010 Standards for vending machines at 228.1 has a maximum allowable height of 48".

8. Rockology Store Issues -

- a. The outside corner of the sales counter projects 7” into the circulation route between 27”- 80” AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that this solution is attainable with minor modifications and should be completed by the end of 2016.

9. N. W. Harris Learning Collection Issues -

- a. The pair of doors at the hallway entrance to this space are too narrow (one leaf offers 28” clear passage width) to allow the minimum required 32” clear passage width per UFAS 4.13.4 and the 2010 Standards at 404.2.2. An acceptable programmatic accommodation would be to allow staff to assist wheelchair users with the opening of both door leafs when needed. The Museum informed NASA that these custom modifications will require a proposal request and submission for approval and budgeting. The completion date will be based on administration approval. NASA recommends that the Museum address this issue via its transition plan.

10. James Simpson Theatre Issues -

- a. There is no evidence that the Field Museum has an assistive listening system to aid hearing impaired audience members with the audio presentation from the PA system provided in these Lecture Halls as required by UFAS 4.1.2(18)(b) and the 2010 Standards at 219.

11. Lecture Hall Issues - The Museum informed NASA that these custom modifications will require a proposal request and submission for approval and budgeting. The completion date will be based on administration approval. NASA recommends that the Museum address this issue via its transition plan.

- a. The ramp approach from the main entrance to the Ward Lecture Hall to the designated accessible wheelchair seating areas in the front row slopes 6.4% without a handrail along the wall per UFAS 4.8.5 and the 2010 Standards at 405.8.
- a. The wheelchair seating area at the front row of Ward Lecture Hall are not level (at 4.3%) as required by UFAS 4.33.4 and the 2010 Standards at 302.
- b. The alternate accessible route from the audience area in Ward Lecture Hall to the raised stage requires exiting the main room entry door and traveling around to an adjacent hallway that lead to a side door to the stage. This side stage door lacks the minimum 18” latch side, pull side maneuvering clearance required by UFAS 4.13.6 and the 2010 Standards at 404.2.4.1 because the side wall angles away from the door frame. Additionally, this side stage door has inaccessible round-knob door hardware

in violation of UFAS 4.13.9 and the 2010 Standards at 404.2.7. Special Note – while it is structurally impracticable to correct, there is a cross slope steeper (at approx. 4%) than the maximum 2% where the hallway approach route to this stage door intersects the main hallway leading from the west entrance lobby. The Museum informed NASA that due to the structural nature of this west entrance this concept will be very difficult to accomplish. NASA recommends that the Museum carefully evaluate this element to determine if it is structurally impracticable, and if so, could alternative means of program access be provided. NASA also recommends that the Museum include a statement of technical infeasibility regarding the element in its transition plan, and make any alterations to the maximum extent feasible.¹⁴¹

- c. The wall mounted fire extinguisher box at the back of Ward Lecture Hall projects further than 4" into the adjacent circulation route between 27"– 80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- d. The entry door into Lecture Hall 2 has inaccessible round-knob door hardware in violation of UFAS 4.13.9 4.13.9 and the 2010 Standards at 404.2.7.
- e. The raised stage in Lecture Hall 2 is not accessible due to steps in violation of UFAS 4.5.2 and the 2010 Standards at 303.2. The Museum informed NASA that this solution will require major renovations and will require longer study and planning to determine feasibility and cost. NASA recommends that the Museum address this issue via its transition plan.
- f. There is no evidence that the Field Museum has an assistive listening system to aid hearing impaired audience members with the audio presentation from the PA system provided in these lecture halls as required by UFAS 4.1.2(18)(b) and the 2010 Standards at 219. The Museum informed NASA that it is currently exploring the cost ramifications of installing such a system. NASA recommends that the Museum address this issue through its self-evaluation and deploy a system as soon as possible.

12. Explorer Café Issues -

- a. All stanchion mounted tape barriers in this area with only one retractable tape used as aids for queuing visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape

¹⁴¹ 2010 Standards at 202.3. The 2010 Standards further define "technically infeasible" as: "With respect to an alteration of a building or a facility, something that has little likelihood of being accomplished because existing structural conditions would require removing or altering a load-bearing member that is an essential part of the structural frame; or because other existing physical or site constraints prohibit modification or addition of elements, spaces, or features that are in full and strict compliance with the minimum requirements."

barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem.

- b. None of the 200+ seats inside the café (and the 42 seats at the outdoor dining area) are at tables with accessible knee/toe clearance at least 30" wide, 27" high and 19" deep from the edge of the table per UFAS 4.32.3 3 and the 2010 Standards at 306 and 902. At each dining area, 5% of seating must be accessible seating per UFAS 5.1 and the 2010 Standards at 226.1. The Museum informed NASA that it will review these recommendations with its food service contractor.

13. West Staff (Special Disabled Guests) Entrance Lobby Issues -

- a. No barriers identified.

Main Level Accessibility Issues

1. Main (South) Entrance Lobby Issues -

- a. All stanchion mounted tape barriers in this lobby (ticket counter, membership counter and coat check counter) with only one retractable tape used as aids for queuing visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem.
- b. The 43 1/2" high "Information" service counter in the Lobby lacks a lowered portion (28"-34") to accommodate wheelchair users per UFAS 7.2. The 2010 Standards at 904.4 permits a maximum height of 36".

2. Main Museum Store Issues -

- a. On each side of the central jewelry display counters is a wooden shelf that projects 6 1/2" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. At the two cash/wrap sales areas in this store, the outside corners of the lowered wooden counters project 6 1/2" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.

3. Founder's Room Issues -

- a. Unable to inspect, but the entrance is accessible.

4. Webber Gallery Issues -

- a. Opposite the entrance of this exhibit, there is a fire hose box that projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. In this area, the Dig Kiosk projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

5. North American Indians Exhibit Issues -

- a. In the Pawnee Earth Lodge room, there are two circular, back-lit displays that project more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that the light box can be slimmer using LED panels and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable. (see Fig. 48)



Figure 48-- Backlit Displays near Pawnee Earth Lodge

6. Northwest Coast & Arctic Peoples Exhibits Issues -

- a. No barriers identified.

7. The Ancient Americas Exhibit Issues -

- a. No barriers identified.

8. Yates Exhibition Center Issues -

- a. There are three similar metal frame video kiosks in this exhibition area which have large speakers hanging off the sides and these speakers are not cane detectable for blind visitors in violation of UFAS 4.4. and the 2010 Standards at 307.2. The Museum informed NASA this exhibition has been replaced by Tattoo. No metal-mounted monitors or mounted speakers are in this gallery anymore (see Fig. 49).



Figure 49 -- Speakers on Monitor Display in Yates Exhibition Center (Mammoth) are not Cane Detectable

9. Holleb (Mammoths and Mastodons) Exhibition Gallery Issues -

- a. All stanchion mounted tape barriers at the entry with only one retractable tape used as aids for queuing visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem.

- b. The monitor mounted on the metal display stand opposite the Mammoth fur touch exhibit projects 5 ¾" into the circulation route above 27" in violation of UFAS 4.4. and the 2010 Standards at 307.2. The Museum informed NASA that this exhibition has been replaced by Terracotta Warriors. No metal-mounted monitors or mounted speakers are in this gallery anymore.
- c. There are three similar metal frame video kiosks in this exhibition area which have large speakers hanging off the sides and these speakers are not cane detectable for blind visitors in violation of UFAS 4.4 and the 2010 Standards at 307.2.

10. Levin Exhibition Gallery Issues -

- a. No barriers identified.

11. Exhibit Store Issues -

- a. The service counter just to the left of the entrance from Stanley Field Hall projects 6" into the circulation route between 27"-80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that it will review these recommendations with its store contractor.

12. North Entrance Issues -

- a. All stanchion mounted tape barriers in this lobby (ticket counter, membership counter, and coat-check counter) with only one retractable tape used as aids for queuing visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem. The Museum informed NASA that it is exploring replacing the tape barriers with more ADA compliant methods.
- b. The wall mounted AED box near the NW stair projects more than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.

13. Stanley Field Hall Issues -

- a. The 43 1/2" high "Information" service counter on the west/central side of this hall lacks a lowered portion (28"-34") to accommodate wheelchair users per UFAS 7.2 The 2010 Standards at 904.4 permits a maximum height of 36".
- b. There are two information kiosks in the central portion of this hall that have glass cases which project more (at 19") than 4" into the circulation route above 27" in violation of UFAS 4.4. and the 2010 Standards at 307.2 (see Fig. 50).



Figure 50 -- Information Kiosks in Stanley Field Hall are not Cane Detectable

- c. There is a wooden donation box in the east/central portion of this hall that projects more (at 8") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that these elements will be replaced with new furniture as part of a larger reorganization plan for this hall.

14. Nature Walk Exhibit Issues -

- a. No barriers identified.

15. World of Birds Exhibit Issues -

- a. There a TV display that projects more (6 ½") than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

16. Messages from the Wilderness Exhibit Issues -

- a. There are a few bulletin board displays that have little roofs over them and the edge of the room projects more than 4" into the circulation route between 27"-80" AFF in

violation of UFAS 4.4 and the 2010 Standards at 307.2 (see Fig. 51). The Museum informed NASA that the little roofs will be eliminated.



Figure 51 -- The Roof over the Bulletin Board is not Cane Detectable in Message from Wilderness Exhibit

17. Mammals of Asia Exhibit Issues -

- a. No barriers identified.

18. World of Mammals Exhibit Issues -

- a. No barriers identified.

19. Rice Gallery & Lions of Tsavo Exhibits Issues -

- a. No barriers identified.

20. Africa Exhibit Issues -

- a. Near the connection between the two halls of this exhibit, there is a fire hose box that projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.
- b. The ramp leading into the "Lakes" display is steeper (at 11.0%) than the maximum 8.3% slope; has handrails on only one side; and, lacks required edge protection per UFAS 4.8.2; 4.8.5 and 4.8.7 as well as 405.2, 405.8 and 405.9 of the 2010 Standards. In this area there is also another ramp that lacks handrails and the "Volcano National Park" display here projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4. and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable. (see Fig. 52)



Figure 52 -- Ramp at Africa Exhibit (Lakes Display) has steep 11.0% Slope

- c. The wood sloped transition at the Gorilla Kiosk TV area has a level change greater (at $\frac{3}{4}$ "") than the maximum allowable $\frac{1}{2}$ " per UFAS 4.5.2 and the 2010 Standards at 303.2.
- d. The ramp at the Africa Alpine exhibition area is steeper (at 10.2%) than the maximum 8.3% slope and has handrails on only one side in violation of UFAS 4.8.2 & 4.8.5.
- e. At approach to the Bamum Art Display, there is a short ramp that is steeper (at 11.7") than the maximum 8.3% allowed by UFAS 4.8.2 as well as 405.2 and 405.8 and of the 2010 Standards. With respect to (e), the Museum informed NASA that some ramp adjustment could be made but changing the slope could have a major impact in the gallery. This type of construction work would require the de-installation of adjacent displays. It would mean a major modification with major budget implications. They Museum offered that a panel and/or video will be added at the beginning of the ramps to provide an alternate experience for the visitors who cannot use or do not wish to use the ramps. NASA recommends implementation of this alternate access or implement the retrofit to achieve full compliance of this building element with the 2010 Standards via its transition plan.

21. Mammals of Africa Exhibit Issues -

- a. No barriers identified.

22. Animal Biology Exhibit Issues -

- a. Near the connection of this exhibit to the Bird Exhibit, there is a fire hose box that projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

23. What is an Animal Exhibit Issues -

- a. At the entrance of this exhibit, there is a fire hose box that projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. At the entrance of this exhibit, there is a fire extinguisher box that projects more than 4" into the circulation route between 27"-80" AFF in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

24. Inside Ancient Egypt Main Level Exhibit Issues – The character of this tomb exhibit is very constricted and while difficult for many wheelchair users to navigate, it would fundamentally alter the nature of the exhibit to make it more accessible. In order to achieve program access, one way to make this inherently inaccessible exhibit accessible would be to

have a display with a captioned video that provides the same information as a walkthrough of the actual tomb. The Museum informed NASA that Video will be added as alternate experience.

25. The Field Bistro Cafe Issues – (The Museum informed NASA that these recommendations will be reviewed with its food service contractor)

- a. All stanchion mounted tape barriers in the Field Bistro (entry queuing line, dining area dividers, and café dividers) with only one retractable tape used as aids for visitors create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem.
- b. The 42" high Field Bistro coffee bar includes a lowered portion, but that portion lacks the required accessible knee/toe clearance for a forward approach is still higher (at 40") than the maximum 34" required by UFAS 4.32.3 and 4.32.4 as well as the 2010 Standards at 306 and 902 (see Fig. 53).



Figure 53 -- Field Bistro Coffee Bar

Upper Level Accessibility Issues

1. Central Atrium Circulation Route Issues – The Museum informed NASA that tactile material will be installed on the floor surface below and adjacent to the protruding object. For others, proposal requests will be submitted for approval and budgeting. The completion date will be based on administration approval. NASA recommends that this issue be addressed in its transition plan.

- a. The wall-mounted drinking fountains near the NW and NE stairs project more (at 18") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. The AED box opposite the head of Sue the Dinosaur projects more (at 5 3/4") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- c. The touch screen display opposite the Sue store projects more (at 10") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- d. The wall-mounted drinking fountain near the NW stair projects more (at 19") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. SEE COMMENT ABOVE
- e. The stanchion mounted tape barriers in the area near the east side elevator and China Exhibit entrance create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem.
- f. The sculptured busts in the corridor outside the Hall of Jades project more (at 16") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- g. The monitor display along the arcade opposite the DNA Discovery Center projects more (at 10 1/2") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- h. The outside corners of the rail protecting this Sue Head exhibit project more (8") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2.

2. Hall of Gems Exhibit Issues -

- a. No barriers identified.

3. DNA Discovery Center Issues -

- a. No barriers identified.

4. Traveling the Pacific Exhibit Issues – The Museum informed NASA that major modification will be done to this hall in coming months and years. These issues will be corrected.

- a. The postcard display near the entrance projects more (at 7") than 4" into the circulation route above 27" in violation of UFAS 4.4.
- b. The barricade at the Lava display is not cane detectable (at 33" AFF) per UFAS 4.4 and the 2010 Standards at 307.2.
- c. The surface of the floor leading out of the "Harsh Paradise" display has a cross slope steeper (at 3.8%-4.0%) than the maximum allowable 2% per UFAS 4.3.7 and the 2010 Standards at 403.3 (see Fig. 54).



Figure 54 -- Traveling the Pacific Exhibit (Harsh Paradise) has 3.8%-4.0% Cross Slope

- d. The "Building Canoes" display projects more (at 19") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

- e. The fire hose box near the entrance of the Tahiti town display projects more (at 9") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that tactile material will be installed on the floor surface below and adjacent to the protruding object. For others, proposal requests will be submitted for approval and budgeting. The completion date will be based on administration approval. NASA recommends that this issue be addressed in its transition plan.
- f. The fire extinguisher box near the exit of the Tahiti town display leading into the Maori Meeting House area projects more (at 9") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- g. The fascia projections on each side of the front elevation of the Maori Meeting House project more (at 16") than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. (see Fig 55) Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.



Figure 55 -- Maori Meeting House Fascia is not Cane Detectable

- h. The fascia tin roof overhangs along the side of the Maori Meeting House as one approaches the accessible entrance door project more (at 7") than 4" into the

circulation route above 27” in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

- i. The accessible rear entry door to the Maori Meeting House exhibit has a closer that is too heavy (at 7 1/2 lbf) and closes faster (at 2 sec.) than the minimum 3 seconds specified in 4.13.10¹⁴² & 4.13.11 and the 2010 Standards at 404.2.9. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016.

5. Marae Gallery Issues –

- a. No barriers identified.

6. Comer Gallery Issues -

- a. The touch screen monitor near the entry door to the adjacent digital media studio projects more (at 7 1/2”) than 4” into the circulation route above 27” in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard, or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

7. Pacific Spirits Exhibit Issues -

- a. The “Exit to Balcony” sign projects more (at 5 1/2”) than 4” into the circulation route above 27” in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. The fire extinguisher box and the TV monitor in the “Honoring the Dead” portion of this exhibit project more than 4” into the circulation route between 27”- 80” in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016.

8. Abbott Hall of Conservation Issues -

- a. The fire hose box near the entrance of the exhibit and the one near the center of the exhibit project more (at 7”- 9”) than 4” into the circulation route above 27” in violation of UFAS 4.4 and the 2010 Standards at 307.2.

¹⁴² The door closing speed in the 2010 Standards at 404.2.8.1 is different: “Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.” For UFAS 4.13.10: “If a door has a closer, then the sweep period of the closer shall be adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 in (75 mm) from the latch, measured to the leading edge of the door.”

9. Tibet Exhibit Issues -

- a. The wall mounted display case (32A4) projects more (at 13") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard, or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

10. Brooker Gallery Issues –

- a. The outside corners of the Lichen display exhibit project more (13") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

11. Fossil Preparation Lab Issues -

- a. The digital monitors along the pipe rail here as well as the corners of the pipe railing project more (at 8") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

12. Sue Store Issues – (The Museum stated that these recommendations will be reviewed with the Museum stores contractor)

- a. The Sue store sign at the entrance projects more (at 6") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- b. The accessible cash/wrap counter is blocked by merchandise that makes it unusable for those with disabilities under UFAS 7.2. and the 2010 Standards at 904. Additionally, the outside corners of the lowered counter here project more (at 6") than 4" into the circulation route between 27" - 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2.

13. 3-D Theater Issues – (The Museum is planning to close and move the current 3D theater not later than June 2018 and as a result would prefer not to invest in solutions to b and c.)

- a. The stanchion mounted tape barriers in the stroller parking area and the visitor queuing area create a protruding object for blind and visually impaired guests prohibited by UFAS 4.4.1 and 204.1 of the 2010 Standards. The use of tape barrier systems with two parallel retractable tapes including one at or below 27" will correct this problem. The Museum stated that it is exploring replacing the tape barriers with more ADA-compliant methods.

- b. The floor on the exterior side of the double entry doors to the theater slopes more (at 4.1%) than the maximum allowable 2% per UFAS 4.13.6 and the 2010 Standards at 404.2.4.1.
- c. UFAS 4.33.3 and the 2010 Standards at 221.2.3 require wheelchair seating locations to “...provide lines of sight comparable to those for all viewing areas...” but in this stadium style theater with 12 different seating platform levels, the wheelchair seats are only available on the floor in the very front row of the theater. This does not offer “...lines of sight comparable to those for all viewing areas...” and will require disabled patrons to crane their necks more than others in order to view the movie. Additionally, this theater which seats between 151-200 people is required by UFAS 4.1.2(18)(a) to provide 6 wheelchair seating spaces – there are currently only 3 wheelchair spaces (the 2010 Standards at 221.2.1.1 call for 5 seating spaces for an area of 151 to 300 people) (see Fig. 56). This theater was installed in July 2009—well after the “line of sight” litigation involving stadium style movie theaters was already well-known within the architectural community. Given this timing, the failure to make this theater accessible should not have occurred.



Figure 56 -- The 3-D Theater with Accessible Seats in Front Row

- d. In the theater, the pipe railing at the screen is not cane detectable as required by UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that this

solution is attainable with minor modifications that will be completed by the end of 2016.

14. Evolving Planet Exhibit Issues -

- a. The fire extinguisher box near the entry of this exhibit projects more than 4" into the circulation route between 27"- 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016.
- b. The wall-mounted video monitor near the entry archway to this exhibit projects more than 4" into the circulation route between 27"- 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2.
- c. The circular wall-mounted "Trilobites" display case projects more (at 9 ½") than 4" into the circulation route between 27"- 80" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that handrails will be added and a pedestal, baseboard, or floor plate will be added at the base to eliminate projection into the path and make this element cane-detectable.

15. Dinosaur Hall Issues

- a. No barriers identified.

16. Plants of the World Exhibit Issues -

- a. No barriers identified.

17. Hall of Jade Exhibit Issues -

- a. No barriers identified.

18. Special "China" Exhibit Issues -

- a. The double glass doors at the exit from the China exhibit to the Plants of the World exhibition space has an automatic door opener which does not open the door more than half way, offering less than the 32" minimum passage width as required by UFAS 4.13.5 and 404.2.3 of the 2010 Standards. The Museum informed NASA that the door mechanism will be checked and fixed.

Public Restroom Accessibility Issues

- 1. Accessible Toilet Stall Issues** – The Museum informed NASA that for several of these issues, the solution is attainable with minor modifications that will be completed by the end of 2016.

- a. The following accessible stall doors lacked accessible pull hardware on the interior side per UFAS 4.17.5 and the 2010 ADA Standards at 604.8.1.2:
 1. The upper-level women's north and south restrooms
 2. The upper-level men's restroom
 3. Lower-level west entrance women's restroom
 4. Lower-level west entrance men's restroom
 5. Lower-level Siragusa women's restroom
 6. Lower-level Siragusa men's restroom
- b. The following accessible toilet stall doors lacked the minimum required stall door pull side, forward approach clearance required by UFAS 4.17.5 and the 2010 ADA Standards at 604.8.1.2: (see Fig. 57):

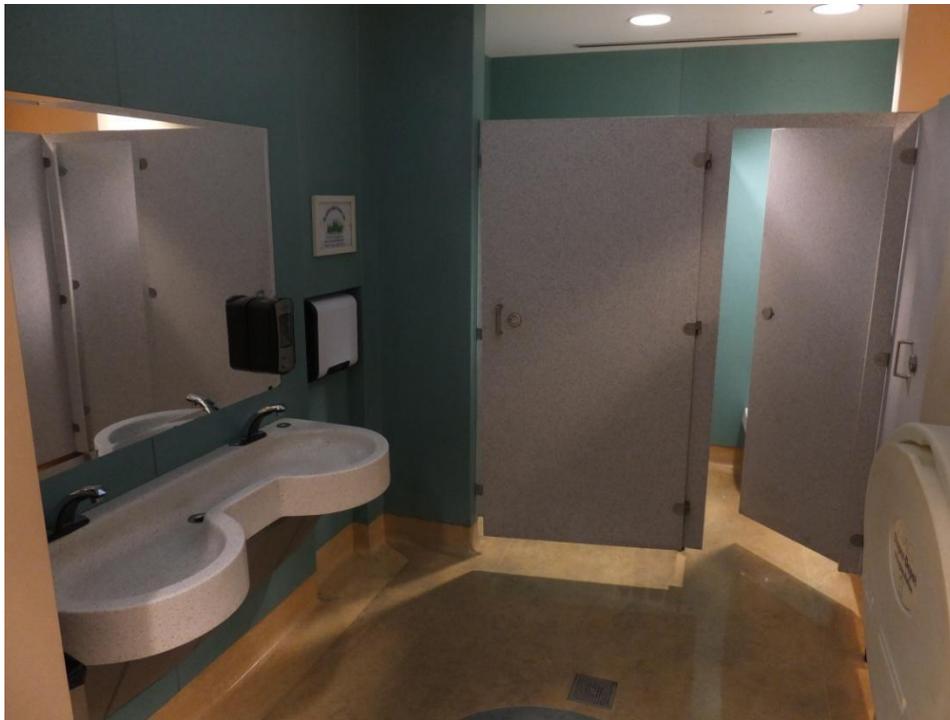


Figure 57 -- Lavatory in Pull Side Acc. Stall Door Maneuvering Clearance – Women's North Upper Floor

1. The upper-level women's north restroom – only 1" latch side clearance due to lavatory
- c. The stall door coat hook in the following restrooms was mounted higher than 54" per 4.22.7 and the 2010 Standards at 604.8.1.2 :
 1. Lower-level west entrance men's restroom (57")

2. Lower-level Siragusa men's restroom (57")

3. Main-level men's restrooms (56")

d. The width of the accessible toilet stalls in the following restrooms are less than the minimum required 60" width specified by UFAS 4.17.3 and the 2010 Standards at 604.3.1 For the accessible stalls in the lower level restrooms near Siragusa lunch room the fact that the underside of the toilet partitions are lower (at 7" typ.) than the minimum 9" toe clearance required by UFAS 4.17.4.¹⁴³ These must be at least 66" wide. The Museum informed NASA that it will raise the toe clearance to 9" and will submit a proposal to the administration for budgeting and establish a completion date on approval. NASA further recommends inclusion of this alteration into the transition plan:

1. Lower-level west entrance women's restroom (56" in Acc. Stall 2): The Museum informed NASA there are two stalls designated as accessible. The noncompliant stall is hampered by the circular design of the washroom. The ADA signage for the noncompliant stall will be removed.

2. The upper-level women's north restroom (57 1/2")

3. The upper-level men's restroom (58 1/2")

4. Lower-level Siragusa women's restroom (59 1/2" but need 66" both acc. stalls)

5. Lower-level Siragusa men's restroom (60" but need 66" both acc. stalls)

e. The front end of the side grab bars in the accessible stall of the following restrooms are positioned closer to the back wall than the minimum 54" required by UFAS 4.17.6 and the 2010 Standards at 604.5.1. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016:

1. Lower-level west entrance women's restroom (48" in both acc. stalls)

2. Lower-level Siragusa men's restroom (47")

3. Lower-level Siragusa women's restroom (48" in both acc. stalls)

¹⁴³ The 2010 Standards at 604.8.1.4 states: "The front partition and at least one side partition shall provide a toe clearance of 9 inches (230 mm) minimum above the finish floor and 6 inches (150 mm) deep minimum beyond the compartment-side face of the partition, exclusive of partition support members. Compartments for children's use shall provide a toe clearance of 12 inches (305 mm) minimum above the finish floor. EXCEPTION: Toe clearance at the front partition is not required in a compartment greater than 62 inches (1575 mm) deep with a wall-hung water closet or 65 inches (1650 mm) deep with a floor-mounted water closet. Toe clearance at the side partition is not required in a compartment greater than 66 inches (1675 mm) wide. Toe clearance at the front partition is not required in a compartment for children's use that is greater than 65 inches (1650 mm) deep."

4. The Upper-level women's south restroom (48")
 5. The Upper-level men's restroom (48")
- f. The length of the rear grab bar in the accessible stall of the following restrooms is less (typically 24") than the minimum 36" required by UFAS 4.17.6 and the 2010 Standards at 604.5.2. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016:
1. Lower-level west entrance women's restroom
 2. Lower-level west entrance women's restroom
 3. Lower-level Siragusa men's restroom
 4. Lower-level Siragusa women's restroom
 5. The upper-level women's north restroom
 6. The upper-level men's restroom
- g. The height of the center of the toilet grab bars in the following public restrooms is higher than the maximum 36" specified in UFAS 4.17.6 and the 2010 Standards at 604.5. The Museum informed NASA that this solution is attainable with minor modifications that will be completed by the end of 2016:
1. Main-level men's restrooms (37" at side grab bar)
 2. The upper-level women's north restroom (37 1/4" at side grab bar)
 3. The upper-level men's restroom (37" at side grab bar)
- h. The height of the toilet seat at the upper-level women's north restroom is higher (at 20 3/4") than the maximum allowable 19" per UFAS 4.16.3 and 2010 Standards at 604.4. The Museum informed NASA that this solution will require custom modifications and a completion date will be established after submitting a proposal to the administration for budgeting and approval. NASA recommends inclusion of this alteration into the transition plan.

2. Lower-level family restroom near the west entry lobby –

- a. The doors leading into this family restroom are not wide enough (offers only 29" clear width) to provide the minimum required 32" clear passage width per UFAS 4.13.5 and 404.2.3 of the 2010 Standards. The Museum informed NASA that grab bars will be installed and that it is looking at the costs to reengineer the family

restroom which is now a gender neutral restroom. A completion date will be established after submitting a proposal to the administration for budgeting and approval. NASA recommends inclusion of this alteration into the transition plan (see Fig. 58).



Figure 58 -- The Family Restroom Ground Level near West Entrance

- b. This restroom lacks adequate space for a 60° turn required by UFAS 4.22.3 and 604.3.1 of the 2010 Standards.
- c. There are not grab bars provided at the toilet.

3. Protruding objects at restrooms – In the following restrooms there are elements that were not cane detectable and projected greater than 4" into the circulation route above 27" in violation of UFAS 4.4 and the 2010 Standards at 307.2. The Museum informed NASA that this solution will require custom modifications and a completion date will be established after submitting a proposal to the administration for budgeting and approval. NASA recommends inclusion of this alteration into the transition plan.

- a. Lower-level west entrance women's restroom – semicircular hand dryer housing (see Fig. 59).



Figure 59 -- The Lower Level Men's Restroom at West Entry has Hand Dryer that is not Cane Detectable

- b. Lower-level west entrance men's restroom
- c. Main-level women's restrooms – drinking fountains left of entry.
- d. Typical drinking fountains at all restrooms lack cane detectable screening elements. The Museum informed NASA that tactile material will be installed on the floor surface below and adjacent to the protruding objects. An example of the transition: rubber material mat flooring to identify the protruding object. The completion date will be based on administration approval. NASA recommends inclusion of this alteration into the transition plan.

4. Breastfeeding room at the lower level Siragusa women's restroom -

- a. The door leading into this family restroom is not wide enough (offers only 29 1/2" clear width) to provide the minimum required 32" clear passage width per UFAS 4.13.5 and 404.2.3 of the 2010 Standards. This solution will require major renovations and will require longer study and planning to determine feasibility and cost. The Museum may need to find another location with increased square footage. NASA recommends inclusion of this alteration into the transition plan.
- b. (see Fig. 60)



Figure 60 -- – Breastfeeding Room near Siragusa Women’s Restroom

- c. The placement of the breastfeeding chair in this small room encroaches into the minimum required pull side, latch side maneuvering clearance per UFAS 4.13.6 and the 2010 Standards at 404.2.4.1.

5. Baby changing stations - In the following restrooms having a baby changing station, the height of the work surface when the table is folded down is higher (typically 36"-38") than the 28"-34" range specified in UFAS 4.32. Note that when considering relocation options for these inaccessible stations, the 2010 ADA Standards do not allow these stations to be included within the clear floor space of accessible toilets.

- a. Lower-level Siragusa men’s restroom
- b. Lower-level Siragusa women’s restroom

- c. The upper-level women's north restroom - The Museum informed NASA that due to space constraints, custom modifications will be necessary and will require a proposal request and submission for approval and budgeting. The completion date will be based on administration approval. NASA recommends inclusion of this alteration into the transition plan.

6. Mirror height issues - The bottom of the reflecting surface of the mirror in the following restrooms are higher than the maximum 40" specified by UFAS 4.19.6 and 603.3 of the 2010 Standards:

- a. Lower-level Siragusa men's restroom (42")
- b. Lower-level Siragusa women's restroom (41 ½")
- c. Main level women's restrooms (41")

Promising Practices

There are two key "promising practices" related to architectural accessibility evident at the Field Museum.

First, and by far the most significant improvement to accessibility at this historic facility, was the recent addition of the east entrance wing that includes automatic door openers to aid individuals with mobility impairments with entering the spaces (see Fig. 61). Secondly, with the rare exceptions noted above, it is evident that significant attention has been paid to making the exhibition displays and interactive elements inclusive for everyone, including people with disabilities.



Figure 61 -- Accessible East Entrance Addition is Promising Practice of The Field Museum