



**New York State  
Parks, Recreation and  
Historic Preservation**

## **Invitation for Bids**

**C003623**

# **Bayard Cutting Arboretum Visitor Center Exhibit Fabrication and Installation**

**July 26, 2023**

# **Exhibit B**

## **Exhibit Specifications**

### **Designated Contact(s)**

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## 1. Division 1 – Project Management

### 1.1 Introduction

Schedule, coordinate, oversee, and manage work produced and installed under this contract.

### 1.2 Contacts

The Contractor's Project Manager (Project Manager) shall be the single point of contact between the Contractor, the Office of Parks Recreation and Historic Preservation (OPRHP) and the exhibit designer.

### 1.3 Specific Requirements

The Contractor's Project Manager shall be in contact with the OPRHP Director's Representative, on no less than a weekly basis. The Project Manager shall perform the following work:

- A. **Quality Control** - Provide quality control to ensure that all elements of project work meet the requirements of the contract specifications and that all modifications are implemented. Provide routine inspections of shop-fabricated work and subcontracted work. Oversee quality of all work during installation. Ensure that all work not acceptable or non-compliant with the specifications is corrected prior to inspection or review by OPRHP.
- B. **Schedule** – Propose a production & installation schedule that includes key production milestones, shop reviews, shipment, delivery and installation dates that conform to the start and completion dates published above. Track work progress to ensure that the project is completed according to the schedule. Alert the Director's Representative should progress not meet key milestones. Should progress not meet key milestones, provide a recovery schedule to show how to maintain the completion date. Coordinate and confirm the dates for shipment, delivery, and installation of the work at the exhibit site with the Director's Representative.
- C. **Meetings** - Meet with OPRHP in accordance with this Division, 1.4, Meetings and Inspections.
- D. **Travel** - In accordance with this Division, 1.5, Travel.
- E. **OPRHP-Furnished Materials** – Receive all OPRHP-furnished materials and inspect the materials to ensure that the quality is suitable for use in the exhibit. The Project Manager shall notify the Director's Representative immediately if OPRHP- furnished materials are not received in sufficient time to meet critical milestones, if damaged, or when use of the material would result in an unsatisfactory product.
- F. **Organize Resource Materials** - Identify and compile all resource material into a production package and ensure that this material is forwarded to the appropriate unit or person within the Contractor's organization for use in the project.
- G. **Accessibility Guidelines** – Project shall comply with all requirements of the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities as well as the Smithsonian Guidelines for Accessible Exhibit Design for components including but not limited to the label design, content, platform materials, finishes and clearance dimensions as shown in the Appendix A drawings.
- H. **Submittals** - Coordinate all Contractor's submittals and review them for legibility, accuracy, completeness, and compliance with contract requirements. Forward all submittals to the Director's Representative and the exhibit designer for review and approval. Receive all reviewed submittals and take appropriate action according to the approval or rejection by the Director's Representative.

1. **Approved Submittals** - Ensure that all changes, revisions, or additions are noted, and fabrication drawings and instructions are updated and forwarded to the Director's Representative.
  2. **Rejected Submittals** - When submittals are rejected, the Director's Representative or the exhibit designer will notify the Project Manager, in writing, identifying the reasons for rejection. The Project Manager shall revise and/or correct and resubmit, identifying changes.
- I. **Final Inspection** - Inspect completed work, including that of subcontractors, prior to final inspection by the Director's Representative and shipment to the site. Ensure that all elements of the project are complete and ready for the final inspection. The Project Manager shall notify the Director's Representative prior to the inspection if any elements will not be ready for final inspection as scheduled.
- J. **Delivery and Installation** - Ensure that all work is delivered and installed as scheduled. In the event that the Director's Representative reports problems during or after shipment, delivery, and/or installation, the Project Manager shall:
1. Determine the nature of the reported problem, damage, or production error and provide a proposal for resolution to the Director's Representative for review and approval; and
  2. Ensure that approved corrections or repairs are made in a satisfactory manner within the time scheduled by the Director's Representative.
- K. **Closeout Package** - Compile, prepare, and forward a closeout package to the Director's Representative in accordance with Division 9, Project Closeout.

#### 1.4 Meetings and Inspections

The Project Manager shall meet with the Director's Representative as specified below. After all scheduled meetings, the Project Manager shall prepare and provide written documentation to the Director's Representative enumerating all issues discussed and decisions made relative to the project.

- A. **Post-award Conference** - The minimum agenda for this meeting includes the following:
1. General project review, including discussion of the following:
    - a. OPRHP and exhibit designer responsibilities.
    - b. Specifications and other work requirements.
    - c. Special contract requirements.
    - d. Correspondence procedures.
    - e. Subcontractors.
    - f. Delays and extensions.
    - g. Contract modifications.
    - h. Changes.
    - i. Submittals.
    - j. Project schedule.
    - k. Orientation to Bayard Cutting Arboretum Visitor Center, including key personnel, location, and special conditions onsite; and
    - l. Billing and payment procedures.
  2. Provide OPRHP-furnished material to the Contractor, including:
    - a. Revised exhibit drawings, if necessary.
    - b. Draft production-ready graphics files; and
    - c. Botanical model artifacts.

3. Review of exhibit plan and design.
4. Review of OPRHP-furnished reference and source materials.
5. Inspect and measure artifacts, verifying final dimensions.

B. **Progress Meetings and Inspections** - the Director's Representative will schedule one progress meeting to coincide with project work inspection at the Contractor's facility. The minimum agenda for the progress meeting includes the following:

1. Inspection of work in progress and completed work.
2. Identification of problem areas and discussion of proposed solutions.
3. Review of schedule.
4. Discussion of planned progress during succeeding work period; and
5. Discussion of work standards and practices to maintain quality.

C. **Pre-installation Meeting** - the Director's Representative will meet with the Project Manager, Installation Team, and others of the Contractor's staff, at the Contractor's facility or via teleconference, prior to shipping and installation of the exhibits. The minimum agenda for the Pre-Installation Meeting includes the following:

1. Inspection of the fully setup staged exhibits as specified in Division 8, Setup and Installation.
2. Review of existing conditions at the installation site, identifying potential problems and proposed solutions.
3. Review of installation schedule, including:
  - a. Sequence in which work will be shipped, unloaded, setup, and installed; and
  - b. Projected work schedule onsite, including working days and hours.
4. Review of preliminary maintenance manual in accordance with Division 9, Project Closeout.

## 1.5 Travel

The Project Manager shall anticipate traveling to Bayard Cutting Arboretum Visitor Center in Great River, New York in order to attend meetings and perform other duties required under the contract; however, attendance may occur via teleconference (e.g., through Microsoft Teams or equivalent) upon approval by the Director's Representative.

A. **Post-award Conference** - The Project Manager shall travel to Bayard Cutting Arboretum Visitor Center in Great River, NY or to Peebles Island Resource Center in Cohoes, NY in order to attend the post-award conference.

B. **Site Visits** - The Project Manager shall travel to Bayard Cutting Arboretum Visitor Center in Great River, New York to review existing conditions prior to fabrication of the exhibits. The Project Manager shall make additional trips to the site as required in order to review conditions that have changed or to examine artifacts not available to be viewed previously. At a minimum, the Project Manager shall perform the following:

1. Assess existing conditions for onsite work. Take detailed measurements of the exhibit space to ensure proper fit of all exhibit elements. The Contractor shall assess locations of heating and ventilation ducts, doors, windows, lighting fixtures, wall switches and controls, security system alarms and sensors, changes in floor level, floor finishes, ceiling beams, building structures and finishes, and other elements which impact on proper fit and operation of the exhibits;

2. Assess existing conditions which impact on the installation of the exhibits, including unloading areas, doorway clearances, curbs, stairs, elevators, available storage areas, available areas for setup of power tool workstations, offsite facilities for disposal of debris, parking, and local availability of food, gas, hardware, and other supplies and services.
  3. Assess existing electrical and lighting systems for determination of their impact on installation and operation of all exhibit elements.
  4. Inspect and measure artifacts, verifying final dimensions; and
  5. Meet with the General Contractor, to exchange contact information for future coordination of work and to review and inspect the ongoing progress of the General Contractor's work as it relates to the exhibits.
- C. **Installation** - Travel to Bayard Cutting Arboretum Visitor Center to oversee installation of exhibits at the site by the Installation Team, and to submit the Final Maintenance Manuals to OPRHP, in accordance with Division 8, Setup and Installation, 8.4, G.

## 2. Division 2 - Fabrication Drawings

### 2.1 Introduction

Provide drawings for review and approval detailing proposed fabrication of all structures indicated in the OPRHP-furnished exhibit design drawings. Provide drawings documenting fabrication of the completed exhibits, including illustrations describing operational and maintenance procedures.

### 2.2 Specifications

- A. **Review all measurements** relating to the fabrication and installation of work required under this contract.
- B. **Prepare Fabrication Drawings and Revised Fabrication Drawings** - Incorporate all changes required into fabrication drawings and all additional elements specified in individual task orders that were not included in the exhibit design drawings. Fabrication drawings shall include the followings that are changed from, or in addition to, the OPRHP-furnished exhibit design drawings:
1. **Plan, Elevation, and Section View Drawings** indicating final dimensions and layouts.
  2. **Materials, Finishes, Colors, and Hardware** identified, including manufacturer's name and associated color, finish, or product identification number. Provide up-to-date information on all colors, finishes, and products.
    - a. materials, seams, overlaps, grain direction, structural connections
    - b. exposed fasteners, and adhesives
    - c. finishes, edge treatments, and visible technique
    - d. equipment specifications including source and model number
    - e. blocking, internal chases, and wiring routes
    - f. wiring diagrams, devices, and cable specifications
  3. **Exhibit Elements in Drawings Identified and Numbered** in accordance with original OPRHP-furnished exhibit design drawings and in accordance with the exhibit numbering system used in the contract documents.
  4. **After review of submittal**, revise and resubmit if so indicated; identify changes made since previous submittal.

- C. **Clearly indicate any deviations from these drawings and specifications**, include statement of reason(s) for deviation for OPRHP's review and approval.
- D. **Substitutions as "Approved Equal" or "Equivalent"** to a manufacturer or supplier's product indicated in these drawings and specifications are to be proposed inclusive of the following, and as required to fully evaluate comparable products:
1. make and/or model number
  2. dimensions, physical properties, and appearance
  3. qualities, function, service performance
- All substitutions are subject to OPRHP's approval.
- E. **Provide catalog cuts for all equipment and hardware**, as specified in Division 3, Samples/Mockups/Prototypes, 3.2.A.
- F. **Execute Shop Drawings** to illustrate access into the exhibits for maintenance and repairs by the park staff. Drawings shall include, but are not limited to, access into all exhibit artifact cases, audiovisual equipment, lighting equipment, and storage areas inside the exhibits. The shop drawings shall be incorporated into all copies of the maintenance manual.
- G. **Prepare Artifact Mount Drawings**, in accordance with Division 7, Conservation Guidelines, 7.7, B.
- H. **Prepare a Preliminary Maintenance Manual** in accordance with this Division, 2.4.F.
- I. **Prepare As-Built Drawings** in accordance with this Division, 2.4, G.

### 2.3 Materials

The Contractor shall provide all materials for the production of work included in this Division.

### 2.4 Execution

- A. **Drawing Technique – General** - Drawing sheet size shall match the OPRHP-furnished exhibit design drawings. Each drawing shall be identified with the project name, exhibit number, sheet number, and date of submittal.
- B. **Fabrication Drawings** - The Contractor shall prepare and submit, for review and approval by the Director's Representative, one paper hard copy set of fabrication drawings to the Director's Representative in addition to drawings in PDF format to both the Director's Representative and the exhibit designer.
- C. **Revised Fabrication Drawings** - The Contractor shall prepare and submit revised fabrication drawings incorporating all corrections or revisions required by the Director's Representative if necessary.
- D. **Shop Drawings** - The Contractor shall prepare shop drawings for inclusion into the maintenance manual in accordance with Division 9, Project Closeout. The shop drawings shall illustrate access into exhibit artifact cases, audiovisual equipment, lighting equipment, storage areas within the exhibits, and any other maintenance and operation procedures which require illustrations to supplement the written instructions.

The drawings shall be prepared for an 8-1/2" x 11" format and shall be punched for a three-ring binder. The drawings shall include notations to clearly communicate the step-by-step procedures for operating locking mechanisms, opening access doors, removing silica gel, replacing lamps, and all other relevant maintenance procedures. The Contractor shall be responsible for making the instructions accurate and



clear for the site staff. The alternative use of photographic images to illustrate the instructions instead of drawings is acceptable if the images provide equal or greater clarity of information.

- E. **Artifact Mount Drawings** - Artifact mounting is included in this scope of work. The Contractor shall provide artifact mount drawings for review and approval by the Director's Representative. The drawings shall illustrate all custom hardware to be used to mount artifacts in the exhibit, identifying relevant artifact number, dimensions, materials, and finishes. Where identical mounts are to be used for multiple artifacts, the Contractor may submit a typical drawing that identifies the artifacts referred to by number. Materials and finishes shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018, and Division 7, Conservation Guidelines, of these Specifications.
- F. **Preliminary Maintenance Manual** - Maintenance manuals shall be prepared and submitted to the Director's Representative on the following schedule: a preliminary draft of the maintenance manual shall be submitted with the fabrication drawings and catalog cuts; completed maintenance manuals shall be submitted at the installation of the exhibits; and one print copy and an electronic version (PDF) of the completed maintenance manual shall be submitted with the closeout package.

Prepare a preliminary maintenance manual for review and approval by the Director's Representative. The preliminary maintenance manual shall be assembled into a three-ring binder and shall include, at a minimum, a table of contents, tabbed and labeled page dividers for each section including those sections for which no content is available at this time, and all content information that is appropriate for development at this phase of the project such as catalog cuts, maintenance instructions, list of vendors, suppliers, and subcontractors.

1. **Assembly of Maintenance Manual** - Pages shall be 8-1/2" x 11" sheets and shall be punched and inserted into three-ring binders. Insert a full-length sheet of card stock into the sleeve along the spine of the binder labeled "Maintenance manual," the name of the project, site, and month/year of installation.

Organize the manual in sections in accordance with 2.4, F.2, and separate each section with labeled and tabbed dividers. Organize content of the maintenance manual to facilitate easy use as a reference document. Include page numbers or headers and organize information in a logical manner.

The maintenance manual shall consist of two volumes, the second of which shall be dedicated to the operation and maintenance of the audiovisual equipment.

## 2. Volume 1, Content of Maintenance Manual

- a. **Title Page** - Provide a title page with the name of the exhibit, the site, and installation date.
- b. **Table of Contents** - Provide a list of contents.
- c. **Contract Information** - Provide name, address, and telephone number for all Contractors and suppliers who produced work for the exhibit, identifying the portion of the work which they provided.
- d. **Cleaning Instructions** - Provide instructions for cleaning all exhibit structures, finishes, graphic panels, tactile models, and screen-printed material. Include brand names of recommended cleaning materials. Provide the name, address, telephone number, and website (if applicable) of the manufacturers or distributors of the cleaning products. Listed cleaning products shall correspond with supplies included in the maintenance kit furnished by the Contractor. "Not to be used" materials and techniques shall be identified.
- e. **Repair Instructions** - Describe specific techniques for repairing damage to exhibit surface materials such as: wood and painted finishes, screen printed areas, plastic laminates, faux finishes, fabric, metal, acrylic, polycarbonate, and glass.

- f. **Artifact Care and Handling** - Provide information or direction for care, maintenance, and cleaning of the artifact mounts, including how to detach the object from the mount. Provide copies of all final artifact mount drawings.
- g. **Product List and Catalog Cuts** - List brand names of off-the-shelf products purchased for use in the exhibit and the name, address, telephone number, and website address (if applicable). Provide legible machine copies of catalog cuts for all products listed. However, if copy of original cannot be produced without loss of readability, original catalog cuts shall be provided. Include at least one original copy of the manufacturer's information packed with Contractor purchased off-the-shelf equipment, inserted into 8- 1/2" x 11" clear plastic sleeves, punched for three-ring binders.
- h. **Warranties** - Provide manufacturer's warranties for all off-the- shelf equipment purchased by the Contractor.
- i. **Access Instructions** – Provide visuals clearly and sufficiently illustrating access to artifacts, desiccant, lighting equipment, mechanical devices, and audiovisual equipment within the exhibits. The illustrations shall include the exhibit number(s), step- by-step instructions, and any other information relevant to opening or dismantling the structures. The illustrations shall be accomplished in one or both of the following ways:
  - 1) Shop or exploded view drawings, as specified in this Division, 2.4, D.
  - 2) Photographs combined with text, showing a person following the step-by-step instructions. Include close-up views of specialized locks or hardware, identified by captions.
- j. **Electrical and Mechanical Instructions** - Provide maintenance and operation instructions for all lighting, electrical, and mechanical equipment as follows:
  - 1) **Wiring Diagrams** - Include as-built wiring diagrams for all lighting and equipment installed by the Contractor. Include a copy of OPRHP-furnished instructions for repair or replacement of audiovisual equipment.
  - 2) **Catalog Cuts** - Catalog cuts and manufacturer's printed instructions for all connectors, transformers, adapters, power strips, clocks, sensors, timers, ventilation fans, thermostats, motors, switches, pushbuttons, or other electrical, mechanical, or lighting equipment.
- k. **Color and Finish Samples**
  - 1) Provide actual samples of all materials used in the exhibit such as: woods, veneers, masonry, metal trim, laminates, fabrics, carpets, paints, and inks. Material shall be mounted on 8-1/2" x 11" white illustration board, clearly labeled with the color name and number, the manufacturer's brand name, and other pertinent product identification, keyed to the drawings for location.
  - 2) One 8-1/2" x 11" mounted sample shall be provided for each type of digital output print and for each screen-printing ink color and substrate combination used in the exhibit.
  - 3) Samples of specialized techniques such as sandblasted or etched graphics or finishes shall also be provided.
- l. **As-Built Exhibit Drawings** - Include one copy of as-built exhibit drawings printed onto 11" x 17" sheets as specified in this Division, 2.4, G.

### 3. Volume 2, Audiovisual Operations Manual

The Contractor shall provide a separate notebook that contains the audiovisual operations manual. This manual shall describe the operation and simple troubleshooting of the audiovisual systems specified in individual task orders. Each copy shall include the owner's operating/ service manuals for each item of equipment used in the specified system. The manual content minimum shall be:

- a. **Title Page** - Provide a title page with the name of the exhibit, the site, and installation date
- b. **Table of Contents** - Provide a list of contents

- c. Systems Block diagram(s), 11"x17"
- d. Systems Overview description(s)
- e. Daily System Startup and Shutdown Procedures
- f. System Adjustments
  - 1) Audio
  - 2) Video
- g. Troubleshooting Guide
  - 1) Video
  - 2) Audio
  - 3) Controls
- h. Maintenance Procedures
  - 1) Describe routine procedures required with time intervals. This includes audiovisual programs, lighting equipment, computer interactive displays, mechanical interactive displays, and other electrical, electronic or mechanical equipment provided and/or installed by the Contractor.
  - 2) For each audiovisual display, provide a list of parts needed for routine maintenance with make, model, time frequency needed, quantity per year, and price as of what date.
  - 3) Provide a written cost estimate at installation for annual maintenance services for audiovisual equipment or audiovisual systems. This information may be used by OPRHP to procure future maintenance of the completed system, separate from this contract.
- i. As-built wiring diagrams for each audiovisual system. Provide hard copies as well as the electronic files in PDF format.
- j. A hard copy and electronic version of the final control program(s).
- k. The manufacturer's installation, maintenance, and user instruction manuals for all components of the system. When electronic versions are available, they shall be included.
- l. Provide manufacturer's warranties for all off-the-shelf equipment purchased by the Contractor. Include documentation for date of purchase of the equipment.

G. **As-Built Drawings** - The Contractor shall prepare a completed set of as-built drawings containing all approved revisions and additions to the fabrication drawings and any subsequent changes to the original plan. The as-built drawings shall be submitted in the maintenance manuals in accordance with this Division. All original drawings produced under this contract will be the property of the OPRHP.

### 3. Division 3 - Samples/Mock-ups Prototypes

#### 3.1 Introduction

Provide samples for all materials, colors, and finishes specified for the exhibits. The awarded contractor will be responsible for submitting within ten (10) business days from the Post-Award Conference a schedule of submittals, arranged in chronological order by dates required by project schedule. Schedule must include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates.

Contractor must also include additional time for making corrections or revisions to submittals noted by the Director's Representative and additional time for handling and reviewing submittals required by those corrections.

- Initial Review: Allow OPRHP seven (7) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Director's Representative will advise Contractor when a submittal being processed must be delayed for coordination.
- Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
- Resubmittal Review: Allow OPRHP seven (7) calendar days for review of each resubmittal.

### 3.2 Specifications

A. **Catalog Cuts** – Catalog cuts shall be provided for all specialized hardware and off-the-shelf items provided by the Contractor, including:

1. Lighting fixtures and associated hardware.
2. Electronic and electrical equipment and hardware, including audiovisual equipment, computer systems, control systems, cables, pushbuttons, and ventilation fans.
3. Security hardware and locks.
4. Specialized cabinet hardware, including hinges, casters, drawer pulls, door handles, levelers, etc.; and
5. Specialized fasteners, including cable hanging systems, wall or floor anchors, and other fasteners specified for anchoring or supporting exhibit structures in place.

Catalog cuts shall be legible originals or copies. When more than one product is shown on a page, highlight, circle, or otherwise identify the specific product, including all appropriate specifications such as model or part number, color, size, etc.

B. **Materials and Finishes Samples** – All samples shall be identified with the brand name, number, color name and number, and the manufacturer's name, address, and telephone number.

#### 1. Finish Samples

- a. **Paint** - Paint colors mixed to match the specified exhibit color, applied to substrate of same material to be used in the exhibit. All samples shall be identified with exhibit color number.
- b. **Plastic laminate**
- c. **Wood** - Solid wood or wood veneer finish in specified species of wood and thickness and with specified finish, such as stain, sealant, or oil finish.
- d. **Metal** - Finish and metal specified, including but not limited to, paint, powder coating, patina, and anodized finish.

2. **Glazing** - Glass or acrylic glazing and vitrines, in specified type and thickness.

C. **Graphics** - Graphic media, including but not limited to, samples of digital and photographic prints, mounting and over laminating, vinyl cutouts, and high-pressure laminate. Graphic media samples shall represent typical images, colors, and typography specified in the exhibit.

#### 1. Digital Output Graphic Proofs -

##### a. Paper Proofs

- 1) Provide full-size (100%) paper or electronic (PDF) proofs for all graphic images and layouts. Proofs shall be full- color and include final, high-resolution scanned images.
- 2) Proofs that have been reviewed by the Director's Representative and require changes shall be corrected and resubmitted as revised proofs.
  - a) Each sheet shall be identified with the following minimum information:
    - Project Name (Bayard Cutting Arboretum Visitor Center Exhibits)
    - Exhibit label number(s)
    - Font(s)

- Type size(s)
  - Date of submittal
- b) For large murals, it is acceptable for the Contractor to submit the proof in sections. For reference in assembling the sections, the Contractor shall submit a reduced-scale print of the entire mural on one sheet, with the seams marked.
- b. **Production Samples**
- 1) Provide a maximum of 3 full-size (100%), full-color graphic samples of images and layouts. The samples shall be produced using the final output media specified (e.g.: inkjet, Lambda, screen print), with final colors and resolution.
  - 2) Production samples shall represent all combinations of colors, typography, and types of images as they will appear in the final panels.
  - 3) One copy of each sample shall be submitted.
2. **Mounting and Over laminating** – Provide one 8" by 10" sample of a mounted and laminated print for each type of mounting substrate and overlamine specified on the drawings.
3. **Other Graphic Samples** – Provide samples of vinyl cutouts, dimensional letters, direct print and all other graphic elements specified for the project.
- D. **Mock-ups** - Mock-ups are full-scale representations of portions of an exhibit for the purpose of review and testing of exhibit elements that are undeveloped and need further evaluation.
1. **01 Museum of Trees** – Provide one mockup of a glass display cloche as shown on X412 demonstrating how the artifact is secured and slides in and out of the shelf.
  2. **02 Tree Science** – Provide one mockup of a discovery box and its associated hardware for the mechanic of the drawer.
- E. **Prototypes** - Prototypes are portions of an exhibit such as an artifact case or an interactive mechanism that has a particular need to be reviewed and tested prior to fabrication of more elements of the same design. **No prototypes are required for this project.**

## 4. Division 4 - Exhibit Structures

### 4.1 Introduction

Provide fabrication of all exhibit elements including cabinetry, panels, platforms, artifact cases, cabinets or kiosks containing computer equipment, vitrines, or other elements that constitute the basic structural elements of the exhibits.

### 4.2 Quality Assurance

Refer to the Architectural Woodwork's Institute (AWI) quality standards for cabinetry and laminate work. All manufacturer's printed recommendations for materials, coatings, and adhesives are a part of these specifications. Copies of the publication, **AWI Quality Standards**, are available from:

Architectural Woodwork Institute  
46179 Westlake Drive, Suite 120  
Potomac Falls, Virginia 20165 571-323-3636  
[www.awinet.org](http://www.awinet.org)

All materials and fabrication methods for artifact cases, including all structures to be installed inside artifact cases, shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

### 4.3 Product Handling

Store lumber and millwork in a dry location – raw materials and finished assemblies to be protected from moisture damage and extreme temperature fluctuation. Do not expose wood to extreme changes in temperature or humidity. Protect panels, cases, and other structures from damage during handling, production, storage, shipping, and installation.

### 4.4 Materials

A. **Wood Products** – As specified on the drawings and in accordance with the following.

1. **Plywood** - For exhibit finish substrate and structure use shall be White Oak Grade A-1 ply veneer core, plain-sliced, unless noted otherwise.
2. **Medium Density Fiberboard (MDF)** - Artifact case structures and pedestals or platforms for use inside artifact cases shall be fabricated using Medex® or Medite II, industrial grade medium density fiberboard (MDF) manufactured with a formaldehyde-free binder which meets the requirements of ANSI A208.2-2002.

Medite II, as manufactured by Sierrapine, Ltd.  
1050 Melody Lane, Suite 160  
Roseville, California 95678  
800-676-3339

[www.sierrapine.com](http://www.sierrapine.com) Or approved equal

3. **Framing Lumber** - Number 2 Grade Poplar, Douglas Fir, or Number 1 Grade Southern Pine.

B. **Plastics** - As specified on the drawings and in accordance with the following.

1. **Artifact Vitrines** - Plastic glazing for artifact cases or vitrines shall be ¼" clear, UV-filtering cast acrylic sheet, as specified below.

Plexiglas, G UF-3, as manufactured by: Altuglas International  
c/o Arkema, Inc. 100 PA Rt. 413  
Bristol, Pennsylvania 19007  
215-419-7000 [http:// www.altuglasint.com](http://www.altuglasint.com) Or approved equal

Acrylite OP-2, as manufactured by: Evonik Cyro LLC  
299 Jefferson Road  
Rockaway, New Jersey 07866 800-631-5384  
[www.acrylite.net](http://www.acrylite.net) Or approved equal

2. **Subsurface Laminated Graphics** -

- a. Exhibit graphics which are output as paper prints and exposed to higher-than-normal wear from visitor use shall be subsurface laminated to clear, non-glare cast acrylic or polycarbonate sheet, in accordance with Division 6, Graphics, 6.10, and then mounted to a rigid substrate. Examples of exhibit graphics which are considered as receiving higher than normal wear include the following:
  - Panels mounted with a mainly horizontal orientation.
  - Instructional label panels adjacent to push buttons, interactive devices, models, and maps.
  - Cut-out graphics, as an alternative to the standard for fabrication of cut-out graphics as a phenolic resin graphic panel, in accordance with Division 6, Graphics, 6.10, E.

- b. Non-glare cast acrylic sheet shall be as manufactured by Altuglas International or Evonik Cyro LLC. Non-glare polycarbonate sheet, as manufactured by:

GE Plastics  
One Plastics Avenue  
Pittsfield, Massachusetts 01201  
413-448-7110  
[www.geplastics.com](http://www.geplastics.com) Or approved equal

3. **Moderately Expanded PVC Sheet** - Moderately expanded PVC sheet **shall not** be used for fabrication of any elements which are to be installed in the interior of an artifact case, including panels, pedestals, or graphic substrates.

C. **Metals** - As specified on the drawings and in accordance with the following.

1. **Steel** - Steel for fabrication of exhibit structures shall be as recommended by the American Society for Testing and Materials (ASTM) for the application specified.

American Society for Testing and Materials  
100 Barr Harbor Drive  
West Conshohocken, Pennsylvania 19428-2959  
610-832-9585  
[www.astm.org](http://www.astm.org)

- a. All carbon steel plate and extrusions to be C1008, C1010, C1018 or equivalent grade, and meet ASTM A109 or A36.
- b. Steel pipe to meet ASTM A53/A53M and be standard (schedule 40) or thick wall (schedule 80) as required for structural performance of intended use.
2. **Aluminum** - Extrusions for structural supports shall be 6060-T or 6063- T52 alloy and anodized or painted.
- a. All aluminum to meet ASTM B209 or ASTM B221 and be Alloy 6063-T52 or equivalent grade for extrusions, and Alloy 5005-H34 or equivalent for sheet.
- b. Aluminum finishes, unless noted otherwise:

As-Fabricated: AA-M12  
Clear Anodic: AA-M12C22A41

D. **Glass** - As specified on the drawings and in accordance with the following. All glass shall be either tempered or laminated safety glass.

1. **Laminated Glass** - Polyvinyl butyral (PVB) UV-filtering layer between two laminations. All glass to be used as glazing for artifact cases shall be clear, UV-filtering laminated glass.
2. **Tempered Glass** - Fully-tempered glass which breaks into small cubes if broken.
3. **Anti-Reflective Glass** - AMIRAN anti-reflective glass, in thickness as specified on the drawings or approved equal. AMIRAN used for artifact case glazing shall be laminated. AMIRAN is manufactured by:

SCHOTT North American, Inc.  
555 Taxter Road  
Elmsford, New York 10523  
914-831-2200

[www.us.schott.com](http://www.us.schott.com) Or approved equal

- E. **Gasketing** - Gasketing - The Contractor shall use only silicone gasketing in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018. Manufacturers of silicone gasket materials include the following:

Rogers Corporation BISCO™ Silicones One Technology Drive  
P.O. Box 188  
Rogers, Connecticut 06263-0188  
860-744-9605

[www.rogers-corp.com/bmu/info.htm](http://www.rogers-corp.com/bmu/info.htm) Or approved equal

Clean Seal, Inc.  
21900 West Ireland Road South Bend, Indiana 46614  
800-366-3682

[www.cleanseal.com](http://www.cleanseal.com) Or approved equal

Delta Designs, Ltd.  
P.O. Box 1733  
Topeka, Kansas 66601  
785-234-2244 / 800-656-7426

[www.deltadesignsltd.com](http://www.deltadesignsltd.com) Or approved equal

Netherland Rubber Company  
2931 Exon Avenue  
Cincinnati, Ohio 45241  
800-733-6107

[www.netherlandrubber.com](http://www.netherlandrubber.com) Or approved equal

- F. **Adhesives and Sealants** - As specified on the drawings or as recommended in the manufacturer's specifications for installation of materials. All adhesives and sealants to be used on the internal surfaces of artifact cases or for case furnishings such as platforms, pedestals, or panels shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

1. **High Pressure Laminate Adhesive**

- a. **Laminate-to-Substrate** - Use a nonpigmented contact cement or the manufacturer's recommended adhesive.
- b. **Laminate-to-Laminate** - Use a nonpigmented two-part epoxy or the manufacturer's recommended adhesive.

2. **Glass** - Silicone SCS1201 clear, white or black, as manufactured by: General Electric Company

GE Silicones  
260 Hudson River Road Waterford, New York 12188  
518-237-3330 / 800-332-3390

[www.gesilicones.com](http://www.gesilicones.com) Or approved equal

3. **Artifact Case Wood Sealant** - Seal all exposed wood inside artifact cases which shares the same air space with the artifacts and desiccant chamber so that artifacts will not be harmed by volatile chemicals outgassing into the air inside the case. Exposed wood inside case furnishings such as platforms, pedestals, or panels shall also be sealed. Surfaces already finished with high-pressure laminate do not need additional sealant. Sealants shall be in accordance with National



Park Service Exhibit Conservation Guidelines, second edition, 2018. Follow manufacturer's specifications for application of the finish.

Camger 1-175 Series Poly Preserve Aliphatic Urethane Barrier  
As Manufactured by Camger Chemical Systems, Inc.  
364 Main Street  
Norfolk, Massachusetts 02056  
508-528-5787  
[www.camger.com](http://www.camger.com) Or approved equal

4. **Artifact Case Crack and Gap Sealant** - To ensure a tight seal, fill all seams which could allow air exchange with outside air using silicone, acrylic latex, or acrylic latex silicone caulk, which is neutral curing, does not emit acetic acid during curing, and has low volatile organic compounds (VOC's). Examples of some acceptable neutral curing caulks, and caulks with low VOC's, include the following:

- a. Dow Corning neutral-curing silicone glass sealant, as manufactured by:

The Dow Chemical Company 2030 Dow Center  
Midland, Michigan 48674  
989-636-1000  
[www.dowcorning.com](http://www.dowcorning.com) Or approved equal

- b. OSI Pro-Series VP-275™ multi-purpose silicone sealant, neutral- curing, as manufactured by:

Henkel Consumer Adhesives 7405 Production Drive  
Mentor, Ohio 44060  
800-321-0253  
[www.osiproseries.com](http://www.osiproseries.com) Or approved equal

- c. Liquid nails super caulk, indoor-outdoor acrylic latex caulk, as manufactured by:

MACCO  
15885 West Sprague Road Strongsville, Ohio 44136  
800-545-2643  
[www.liquidnails.com](http://www.liquidnails.com) Or approved equal

- d. DAP® ALEX PLUS® acrylic latex caulk plus silicone, as manufactured by:

DAP Inc.  
2400 Boston Street Suite 200  
Baltimore, Maryland 21224-4723  
888-327-8477  
[www.dap.com](http://www.dap.com) Or approved equal

- e. Red Devil 25-Year acrylic latex interior wall and wood caulk, and Red Devil LIFETIME® siliconized acrylic adhesive sealant, as manufactured by:

Red Devil, Incorporated 4175 Webb Street  
Pryor, Oklahoma 74361  
918-825-5744  
[www.reddevil.com](http://www.reddevil.com) Or approved equal

5. **General Purpose Caulk** - Clear silicone rubber, standard grade RTV Silicone Number 108, as manufactured by the General Electric Company, as specified in this Division, 4.4, F., 2.

6. **Acrylic Cement** - Weld-On 40 adhesives, as manufactured by:

IPS Corporation  
455 West Victoria Street Compton, California 90220  
310-898-3300 / 800-421-2677  
[www.ipscorp.com](http://www.ipscorp.com) Or approved equal

7. **Graphic Mounting Adhesives** - In accordance with Division 6, Graphics, 6.10.

8. **Artifact Case Curing Time** - All artifact case adhesives, sealants, and finishes shall be allowed to cure while exposed to the fabrication shop environment for a minimum of two weeks prior to enclosing the case structure and installing the artifacts. The Contractor shall be responsible for consulting the manufacturers' technical data to verify exact conditions of time, temperature, and humidity for the adhesives, sealants, and finishes to fully cure.

- G. **Finishes** - As specified on the drawings and in accordance with the following. Finishes inside artifact cases shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

1. **Plastic Laminates** - High pressure decorative laminates shall meet the minimum performance standards of the International Organization of Standardization (ISO) ISO-4586-2:2004 and the National Electrical Manufacturer's Association, LD3-2005. Laminate shall be Grade 10, general purpose grade, with the exception of curved, vertical surfaces, then Grade 20, vertical postforming grade is acceptable.

2. **Paint**

- a. **Artifact Case Interiors** - Use paints with a low Volatile Organic Compound (VOC) rating for surfaces inside the artifact chamber, in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

- b. **Aluminum and Steel** - Use Polane T polyurethane enamel and primer, as manufactured by:

The Sherwin-Williams Company 101 Prospect Avenue, Northwest  
Cleveland, Ohio 44115-1075  
800-474-3794  
[www.sherwin.com](http://www.sherwin.com) Or approved equal

3. **Powder Coating** - As manufactured

by: TIGER Drylac U.S.A., Inc. Headquarters  
1261 East Belmont Street Ontario, California 91761  
909-930-9100  
[www.tigerdrylac.com](http://www.tigerdrylac.com) Or approved equal

4. **Fabric** - Fabric for use inside artifact cases shall be in accordance with the drawings and National Park Service Exhibit Conservation Guidelines, second edition, 2018.

H. **Hardware**

1. **Rough** - Nails, screws, bolts, nuts, washers, anchors, threaded inserts, flush clips, and similar items of proper size and number to secure materials in place. Any fasteners used in areas where moisture is a factor shall be galvanized or aluminum.

2. **Finish** - Hinges, key-hole fasteners, concealed hinges, cam locks, slides, push locks and keys, casters, levelers, handles, and knobs as specified on approved drawings and catalog cuts. All doors in exhibit structures which provide access to interior storage cabinetry and audiovisual equipment shall be fastened with concealed hinges and provided with locks. Locks that are installed as multiples shall be keyed alike.

## 4.2 Execution

### A. Woodworking - General

1. **Requirements** – Exhibit Contractor shall adhere to the following requirements:
  - a. Composite wood products to be formaldehyde-free or at minimum low voc per FSC guidelines.
  - b. Use of wood from timber harvested from old-growth forests is not permitted.
  - c. Wood from timber recovered from riverbeds or otherwise abandoned, or reclaimed from buildings is permitted, unless otherwise noted, provided it is clean and certifiably free of contamination. Source must be identified.
  - d. The finish of all wood surfaces and edges shall be smooth and even. No saw, sanding, scribing, or other tool marks shall be visible. No branding shall be visible.
  - e. All openings shall have clean, square corners. Rounded corners left by router or milling bits will not be accepted.
  - f. Finish surfaces and edges exposed to the public shall be smooth and 'splinter proof'.
  - g. No assembly screws or nails to be visible on finished, exposed surfaces unless noted otherwise. Small finish nail holes, if present, to be concealed with matching wood filler and sanded to fully disappear.
  - h. Adhesives to be recommended by Contractor to suit application. Adhesives shall be formaldehyde free, non-voc off-gassing.
  - i. All hinging hardware and locking devices to be fully concealed, with the exception of minimal allen key access to Southco latches.
  - j. Components scribed to fit on site will be free of gaps and maintain consistent spacing of maximum 1/32" between the piece and abutting components. Do not use additional overlay trim for this purpose.
  - k. Cabinetry to be set and secured to assure they are rigid, plumb, and level.
  - l. Contractor to pay close attention to grain direction as specified in the drawings
2. **Quality Standards** - AWI Quality Standards are by reference made part of this Specification. Unless otherwise clearly detailed or specified in individual task orders, all cabinetry shall be fabricated to conform to AWI Quality Standards, Section 400, for custom grade material and workmanship.
3. **Cabinetry** - All casework shall be plant assembled. Cases too large for access into the exhibit area shall be made in detachable sections with provisions for assembly inside the exhibit space.
  - a. **Fabrication Methods** - All faceplates, panel ends, and doors shall be of mortise and tenon or doweled fabrication, glued under pressure, with nails only furnishing the pressure. All nails shall be properly set for filling. Filled areas shall be sanded smooth to receive laminate, paint, or other specified finish. Edges of panels and signs shall be filled, sanded smooth, and finished or covered with material matching the panel face. Edges shall not be left unfinished unless otherwise specified on the drawings.
  - b. **Shelving** - Unless otherwise specified in individual task orders, any shelving used as part of the interior of cabinets shall be 3/4" Birch plywood. At a minimum, audiovisual equipment shelving shall have 12" square center portions of perforated metal to allow

ventilation around equipment. The Contractor shall be responsible for ensuring that each shelf is fabricated of material of sufficient strength for the piece of equipment for which it is intended.

4. **Architectural Millwork** - Fabricate and assemble units complete in the shop, insofar as their dimensions will permit for transportation and proper handling. All woodwork shall be shop finished and delivered to the installation site with protective covering. Use solid stock for frames, jambs, heads, stops, and edges. Where veneer plywood is used, trim exposed edges with hardwood without face nailings. Accurately fit and align separate parts.

Provide ample screw, glue-and-bolt blocks, draw-bolts, tongues, grooves, splines, dowels, tenons, mortises, and other means of fastening to render the work substantial, rigid, and permanently secured in the proper position. Provide material to permit scribing to walls, floors, and related work. Provide sufficient allowance for shrinkage occurring after installation. Provide mitered corners at doorframes with hairline joints. Fit and adjust doors to achieve smooth and noiseless operation. Exposed fasteners are unacceptable without prior approval from the Director's Representative or the exhibit designer. Countersink face nails and face screws, fill with plastic wood or wood plugs, sand flush to surface, and finish without visible markings.

- B. **Artifact Case Fabrication** - All materials and fabrication methods for artifact cases, including all structures to be installed inside artifact cases, shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

1. **Sealed Case Environment** - To ensure that artifact case vitrines are as airtight as possible, seal all seams which could allow air exchange with the air outside the artifact and silica gel chambers.
2. **Silica Gel Chambers** - Chambers that house silica gel shall be fabricated to maximize exchange of air with the chamber containing the artifacts and minimize exchange of air outside of the case. The chamber shall provide a sealed, stable environment necessary to protect the artifact(s) in the case.
3. **Acrylic Edges** – All acrylics edges shall be rounded and polished. Welded seams to be free of bubbles, streaks, or other imperfections

### C. Finishes

1. **Requirements** – Exhibit Contractor shall adhere to the following requirements
  - a. All finishes to allow for minimum 2 week drying time before installation of artifacts.
  - b. All wood surfaces to be finished with (2) coats BioShield Hard Oil. [www.bioshieldpaint.com](http://www.bioshieldpaint.com)
  - c. Interactive Map Table (Exhibit 05) hardwood nosing to be finished with (2) coats of Modern Masters MasterClear Supreme Acrylic Polycarbonate-Polyurethane, Matte finish (MCS901)
  - d. All painted surfaces to be Benjamin Moore Eco Spec line, unless noted otherwise
  - e. All stained wood highlights achieved with custom solution of Jacquard Procion MX Fiber Reactive dye, or as otherwise noted. Contractor to score grain as required to prevent bleeding of color outside of defined areas
1. **Substrates** - Surfaces scheduled to receive etching, sandblasting, paint, laminate, photo mounts, and graphic prints, shall be made true and even with joints and nail holes filled, and shall be primed, sealed, and properly supported to prevent warping or bending.
2. **Paint** - All exposed surfaces to receive paint shall be finished smooth. Finished paint surface shall be without runs, sags, and other imperfections. Match colors specified on the drawings. Colors

shall be consistent from surface-to-surface. Paint shall be applied under dry, dust- free conditions, in accordance with the manufacturer's specifications. Edges, crevices, corners, and joints shall be thoroughly cleaned. Painting shall be of uniform thickness. All exposed edges of painted panels shall be filled, sanded, and painted to match the panel face unless otherwise specified on the drawings.

3. **Plastic Laminate** - All laminate and substrate shall be stored together for at least 72 hours and assembled in an environment of approximately 70 degrees Fahrenheit and 50 percent relative humidity. Face of the substrates shall be sanded smooth and free of grease, wax, dust, or other contaminants which interfere with adhesion. Control of the glue line and its thickness and uniformity of spread shall be given constant attention. Spot bonding shall never be used. Cover all areas where contact is made with adhesive. IN ALL CASES, THE ADHESIVE MANUFACTURER'S INSTRUCTIONS FOR USE SHALL BE FOLLOWED. Avoid chipping of laminate by the saw blade. Finish smooth edges on curved cut by sawing the part oversize and finish it by routing, filing, or sanding. When cutting laminate, make certain to prevent hairline cracks or over-cutting at inside corners. Inside corners shall be rounded to prevent corner cracking.
  4. **Veneer** - All veneer shall be ordered in a minimum 3:1 ratio per square foot of plywood substrate required. Face veneer shall be flat sliced with adjacent pieces randomly matched. The maximum width of sapwood per flitch shall not exceed two inches. Panel face assembly shall be running matched. Veneer millwork shall not be sequence matched. All edges shall be veneer banded on all four edges for final use in the exhibit.
  5. **Panel Edges and Backs, Concealed Areas** - Finish in accordance with the following unless specified otherwise on the drawings.
    - a. **Concealed Areas** - Those areas completely enclosed by solid opaque framing and skin. No finish required.
    - b. **Semi-Exposed Areas** - Those areas only visible by opening doors or access panels. Finish with wood sealer.
    - c. **Flat Panels, Framed** - The back side of plywood or other framed material. A minimum of two coats flat lacquer primer for the surface.
    - d. **Flat Panels, Unframed** – The back side of plywood or other material without framing such as cabinet doors and applied panels. A minimum of three coats of paint, laminate backing sheet, or other finish equal in density and weight to that specified on the drawings for the exposed surface.
    - e. **Edges** - All exposed edges of panels, plaques, and graphic prints shall be fitted and sanded smooth. Edges shall be finished to match adjoining surfaces as specified on the drawings.
    - f. **Panel Backs** - Backs of panels shall be finished with spray- applied lacquer finish or laminate backing sheet in color specified on the drawings.
- B. **Plastic** - Follow manufacturer's printed instructions. Cut material to the size specified on the drawings, allowing for expansion and contraction. Welded joints shall be free of gaps and bubbles, continuously sealed, and absolutely clear. All exposed edges shall be hand polished, no flame polishing. Surfaces of acrylic shall be free of scratches, stains, or other imperfections.
- C. **Metal Work** - Fabricate to detail and finish as specified on the drawings. All metals shall be prepared and finished in accordance with the finish manufacturer's specifications. Ease all sharp edges and corners on horizontal or angled panel frames or railings.
1. **Requirements** – Exhibit Contractor shall adhere to the following requirements:

- a. Exposed surfaces are to be smooth, free of blemishes, seams, roller marks, or trade names.
- b. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of +/- 1/32" unless noted otherwise. Remove sharp or rough edges on exposed surfaces.
- c. All welds to be continuous, ground smooth, and finished and blended with adjacent surface to fully conceal. Materials and methods are to minimize distortion and develop strength and corrosion resistance of base materials. Fusion should be achieved without undercut or overlap. Remove welding flux immediately.
- d. Exposed connections to be formed with hairline joints, be flush and smooth, using concealed fasteners or welds. Exposed fasteners, where necessary or a design element, are specified in casework details.
- e. All finishes to be applied after fabrication and or assembly of element. Finishes to be even, free of streaks or bubbles, or color variation.
- f. All ferrous metals used in any assemblies to be clear coated with rust preventive, whether or not visible on exterior. All exposed steel powder coated as specified on drawings.

2. **Welding** - Use appropriate welding materials, grind welds smooth, and ease all sharp or ragged edges. Standards for welding shall be as recommended by:

American Welding Society 550 NW LeJeune Road  
P.O. Box 351040  
Miami, Florida 33126  
305-443-9353 / 800-443-9353  
[www.aws.org](http://www.aws.org)

3. **Fasteners** - Use appropriate fasteners for fabrication of metal structures, as recommended by the organizations specified under this Division, 4.4, C., Metals.
- a. Unless otherwise noted, exposed fasteners to be Type 316 stainless steel.

- D. **Glass** - Material shall be cut to size as specified on the drawings, allowing for expansion and contraction. Surfaces shall be free of scratches, bubbles, stains, rough edges, or other imperfections.

1. **Laminated Safety Glass** - All exposed edges shall be eased and finely ground to be smooth, with broad surfaces free of imperfections.
2. **Tempered Safety Glass** – All exposed edges shall be polished, with broad surfaces free of visible tong marks or any other imperfections.

- E. **Finish Hardware or Fasteners** - Shall be applied and installed so they are fully functional. Screws shall be countersunk to flush level with surface, free of burrs, and at a 90-degree angle to the surface plane.

1. Concealed fasteners to be corrosion resistant:
  - a. Hex head anchor bolts, ASTM A449 zinc coating
  - b. Plain flat washers, ASME B18.22.1 zinc coating

- F. **Security Hardware**

1. Provide locks for all access doors to artifacts, audiovisual equipment, cabinets or kiosks containing computer equipment, and storage areas in accordance with approved drawings and catalog cuts.

2. Install locks so that the hardware is concealed yet easily accessible. Locks may be installed behind removable outer panels, on the unexposed underside of structures, or as otherwise specified on the drawings. Unless specified otherwise in the drawings, access doors to chambers not requiring locks (such as silica gel chambers) shall be hinged panels using the same hardware as panels used to conceal the locks.
3. All locks shall be keyed alike, with the exception of donation boxes. Donation box locks shall be keyed separately from all other exhibit locks.
4. For hardware requiring special tools, such as tamperproof screws and cam locks, the Contractor shall provide a minimum of two of each tool required.

## 5. Division 5 – Electrical/Electronic

### 5.1 Introduction

Purchase, fabricate, assemble, install and thoroughly test all electrical, electronic, and mechanical devices; this includes lighting built into exhibit structures. Install audiovisual equipment into exhibit structures, including electrical components to provide and ensure fully operational audiovisual systems for each exhibit unit.

The Contractor shall be responsible for providing power distribution systems within the cabinetry in accordance with these drawings and tying these systems into the Visitor Center electrical system provided by the Visitor Center's Electrical Contractor. The Contractor shall be responsible for verifying amount and voltage of power needed.

Install pre-wired exhibit structures in the building; provide power and data distribution from floor & wall outlets to the exhibit structures as described in the exhibit drawings.

### 5.2 Quality Assurance

The National Electrical Code (NEC) shall be the required standard for all electrical work. In the event other codes, state and local, are in effect at the final exhibit site, they shall be included as part of this specification and requirements. All manufacturers printed recommendations for materials are a part of this specification. Standards for other trades are included as part of this contract.

Information on the NEC is available at: [www.necdirect.org](http://www.necdirect.org)

Persons trained and experienced in the fabrication, installation, and implementation of professional audiovisual, video, and sound reinforcement shall perform all assembly, fabrication, and installation work. All installation practices shall be adhered to as described in pertinent chapters of the following publications or their latest published edition:

- "Audio Systems Design and Installation," Author: Philip Giddings, Focal Press
- "Sound System Engineering", Second Edition Authors: Don and Carolyn Davis, Howard W. Sams & Co.

In addition, all requirements of the latest published edition including, but not limited to, the following shall apply unless otherwise noted. In case of conflict between cited or referenced standards, the more stringent example or standard shall apply.

- National Electrical Code (N.E.C.)
- Federal Communications Commission (F.C.C.)
- Society of Motion Picture and Television Engineers (S.M.P.T.E.)
- American Society for Testing Materials (A.S.T.M.)

- Electronic Industries Association (E.I.A.)
- Handbook for Riggers, 1977 Revised Edition, W.G. Newberry; Calgary, Alberta Canada
- Basic Principles for Suspended Loudspeaker Systems, Technical Notes Volume 1, Number 19, JBL Professional Division

### 5.3 Product Handling

Store electrical, electronic, and mechanical components in a dry location. Do not expose to extreme changes in temperature and humidity. Protect components from damage during shipping, handling, storage, and installation. Pack components in containers in which components were shipped from the manufacturer. Exercise care so as not to damage electrical and electronic components. Store in a protected environment.

### 5.4 Testing

Electrical, electronic, and mechanical components of exhibits, including audiovisual equipment and lighting, shall be tested in the contractor's fabrication shop prior to delivery to the site. The Contractor shall ensure that all equipment is fully operational prior to installation at the site.

### 5.5 Materials

#### A. Electrical - Materials shall be new and U/L approved.

1. **Wiring** - Wiring for high voltage applications shall be as required under the latest version of the NEC. Provide plenum rated cables of the types specified where required by the NEC or other governing building codes.
2. **Conduit** - All conduit within exhibit structures shall be 3/4" electric metallic tubing unless specified otherwise.
3. **Outlets** - Multi-outlet power strips with integral circuit breaker and grounded outlets.
4. **Surge Protection** – Provide an electrical surge suppression system dedicated to each audiovisual system, all fiber optic illuminators, and each interactive electronic exhibit. Size the suppression device to accommodate the maximum load plus 100 percent.

#### B. Lighting

1. **Fixtures** - Provide fixtures and accessories as specified in the exhibit drawings.
2. **Lamps** - As required to make illuminated exhibit elements complete and fully functional.
3. **Controls** - Lighting dimmer controls as specified in the exhibit drawings.

#### C. Audiovisual Equipment - The Contractor will be provided by Owner with all audiovisual equipment as specified in the exhibit drawings. Cables, connectors, racks, and mounting accessories required for the proper installation and operation of the equipment shall be provided by the Contractor unless specified otherwise.

All materials furnished by the Contractor shall be new and all work completed to the satisfaction of the Director's Representative.

The Contractor shall protect all equipment against cosmetic and operational damage and shall replace equipment damaged while in the contractor's possession.



1. **Computers** - The Contractor shall install all Owner provided equipment as specified in the exhibit drawings.
2. **Cables** - The Contractor shall purchase and install cables as specified in the exhibit drawings in order to make the exhibits perform per design intent.
3. **Connectors** - The Contractor shall purchase and install connectors as specified in the exhibit drawings.
4. **Pushbuttons** - The Contractor shall purchase and install pushbuttons as specified in the exhibit drawings.
5. **Relays** - The Contractor shall purchase and install relays as specified in the exhibit drawings.
6. **Equipment Racks** - The Contractor shall install requirement equipment on the existing equipment racks as specified in the exhibit drawings

**D. Mechanical**

1. **Ventilation Fans** - Fans shall be provided as necessary to vent heat out of enclosed environments in which equipment or lighting is installed. Provide fans of type and quantity to replace the enclosed volume of air a minimum of every two minutes. No individual fan shall contribute more than 35 dBa of noise to the environment.
2. **Thermostat** - Provide line voltage thermostat as necessary to achieve the temperature control specified under this Division, 5.6, D., 3., Heat Ventilation.

**5.6 Execution**

**A. Electrical** - The Contractor shall obtain all requirements pertaining to the most recent state and local codes:

1. **Power** - Circuits within each installed exhibit structure shall be distributed from one two or four-gang box mounted inside the exhibit structure. The box shall be connected to the power source (120-volt AC) through flexible conduit. Power supplies for the lighting systems and lighting shall be hard wired to the power source (120-volt AC) through flexible conduit. Provide sufficient extra length of flexible conduit to accommodate movement of power supply on sliding access shelf. All connections to power sources shall be made at the locations specified on the drawings.

The Contractor shall evaluate power supply versus power demand to determine appropriateness of existing circuits.

It shall be the responsibility of the Contractor to advise the Director's Representative if total power service requirements for any exhibit structure exceeds what's available in the visitor center.

The Contractor shall ensure that power cables do not cause interference with audiovisual signal cables.

2. **Coordination** - Provide secondary distribution lines and one three-prong grounded female receptacle within each applicable exhibit unit for hook-up of electrical equipment.
  - a. Contractor to coordinate with the Visitor Center Electric Contractor or hire licensed electrical contractor to install any required hardwire connections within cases as noted in the drawings

3. **Craftsmanship** - Circuits shall be clearly and neatly labeled with special operating and maintenance instructions mounted on descriptive panels with each applicable exhibit unit. Run wiring exposed to minor potential physical damage in electric metallic tubing. Run inaccessible wiring in conduit. All conduit, junction boxes, fixtures, and equipment shall be neatly and securely attached to support members and concealed.
  - a. All wires shall be run so as not to be seen by the public. All visible wires (exclusive of control room) shall be encased in black split loom, unless specified otherwise
  - b. All controls and connectors shall be covered or located so they are inaccessible by the public while still accessible for service or in case of emergency
  - c. All transformers, drivers, and electrical connections to be contained in non-combustible housing, equivalent to NEMA 1 enclosures.
  - d. All cables to be neatly run and held in place with cable clips. Excess runs will be neatly looped, and zip tied. Cables will be positioned and secured with unencumbered access to equipment controls.
4. **Access** - Ensure serviceability to each and every piece of equipment. Provide cutouts and access panels to facilitate maintenance. Avoid alterations to exposed surfaces.
  - a. All access hatches and panels shall be operable by one person of normal strength and dexterity. Means shall be provided to ensure the proper alignment of and access hatches and panels when closed or replaced. No hinges shall be visible (unless drawn otherwise) and any fasteners and locks shall be as unobtrusive as possible.
5. **Support** - Provide additional support such as clip angles, plates, brackets, thrust blocks, bushings, and bearings necessary to reinforce exhibit structures, and devices relative to "hands-on" use and abuse of each exhibit.
6. **Termination of Wiring** - Conductors shall be terminated at ends where attached to components using crimp-type lugs if the component possesses screw-type terminals. Where the component has only soldering lugs, connection shall be by good quality electrical joint using rosin core solder. Connection of conductors and wiring, one to another, shall be by the application of screw -type terminal strips and spade lug connectors. Such terminations shall be located in a National Electrical Manufacturers Association (NEMA) rated enclosure. All crimp connections shall be accomplished by ratchet type production crimp tools. The use of any adhesive insulating tape is not acceptable.
7. **Surge Suppression** - For each audiovisual exhibit, provide an electrical surge suppression system dedicated to that exhibit. Size the suppression device to accommodate the audiovisual system maximum load plus 100 percent.

## B. Lighting

1. **Interior Exhibit Structure** - The contractor shall install all required lighting in interior exhibit structures. The contractor shall ensure with the Director's Representative and/or Lighting Designer that the lighting levels and heat output to ensure that proper environment of case interiors is met during the first inspection of the case fabrication at the contractor's facility. Final balance and final adjustments will need to be made on site following exhibit installation for final approval by Director's Representative and/or Lighting Designer.
2. **Other Lighting including Track Lighting** – The contractor shall wire and install all drivers, dimmers, additional track, fixtures, lamps, such that they are ready for balancing and final adjustment by the Director's Representative and/or Lighting Designer. All light fixtures, extension

ords, power bars shall be CE or UL certified. Hardwired or custom assemblies will be done by a licensed electrician. Power connectors and plugs to be determined by the installer and comply with the strictest local and national codes.

3. **Ceiling Recess or Wall Mount** - Recessed ceiling and wall mounted lighting is not in Contractor's scope.
4. **Remote Source Lighting**
  - a. Optimum performance and safety shall be critical in developing the remote source lighting system. The efficiency of light transmission depends on the constituent materials, the quality of the bond between the core and cladding, hardware connectors, and polishing of fiber ends. Selection of fiber and illuminator shall result in a minimum Color Rendering Index (CRI) rating of 90 and a maximum lighting loss of four percent per running foot length. Methods of reducing footcandle levels without affecting color temperature shall include the use of mechanical diagrams, lighting screens installed at the lighting source, or neutral density filters mounted on or attached to the lenses. Fiber runs shall not exceed 25-feet. Illuminators shall utilize lighting sources with a minimum lamp life rating of 1500-hours.
  - b. During the exhibit installation, the contractor shall install and connect all remote source lighting system components to the power source.
5. Final Lighting of Installed Exhibits – Final focus of overhead track lighting is not in Contractor's scope

### C. Audiovisual Equipment

1. **Shop Fabrication** - The contractor shall be responsible for ensuring that audiovisual equipment will fit and operate with the exhibit structures.
  - a. The contractor shall install pushbuttons in the exhibit structures and wire them to be fully operational at the time of the final inspection. The pushbutton assembly shall fit snugly into the panel with the outermost ring sitting flush against the panel surface. The contractor shall label the attached wiring to clearly identify what component activates when pushed.
  - c. The contractor shall test all audiovisual equipment to ensure operation.
  - d. The contractor shall ensure that all audiovisual equipment has adequate heat ventilation while operating in the exhibits, and there is access to the equipment for OPRHP staff to perform maintenance or repairs.
  - e. The contractor shall ship audiovisual equipment and hardware in their possession to Bayard Cutting Arboretum Visitor Center.
2. **Installation** - The contractor shall install all audiovisual components in the exhibits. The contractor shall connect all audiovisual components to assemble the systems and connect them to the appropriate power source.
  - a. Installed equipment shall be easily accessible for cleaning, adjustment, replacement, and routine maintenance, have proper ventilation, and shall provide safety and convenience for the operator.
  - b. Before connecting any equipment to electrical power outlets, contractor shall confirm and coordinate all voltages and polarities
  - c. Contractor shall install all AV Equipment such that it is securely anchored in place and will not shift from set position. Attention will be paid to location of building HVAC systems or other factors that could cause vibration of projectors or other equipment sensitively calibrated. Use vibration isolation mounts as required.

- d. AV hardware for select installations will be purchased in advance by the Owner, who will be producing mock-ups for review by the Owner. The contractor is encouraged to attend these mock-up sessions for coordination. Contractor shall arrange for the pick-up and transportation of any AV equipment from the Designer's studio to the site for final installation
- e. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked as to their function. Custom panel nomenclature shall be engraved, etched, or screened. The contractor shall submit a schedule and diagrams of the proposed identification marks to the Director's Representative for review and approval.
- f. With the exception of portable equipment, all boxes, conduits, cabinets, equipment, and related wiring shall be firmly mounted in place. Mounting shall be plumb and square.
- g. Care shall be exercised in wiring the systems to avoid damage to cables and equipment. All joints and connections shall be made with rosin core solder or with mechanical connectors approved by the Director's Representative. Crimp type connections shall be accomplished with manufacturer recommended ratchet type crimping tools. Cables shall be free of splices between terminations at the specified equipment. Unused conductors, shields, or drain wires shall be dressed under heat shrink tubing, not cut.
- h. Wires and cables shall be formed into harnesses that are tied and supported in accordance with accepted engineering practice. Care shall be taken to bundle and secure all cables that interconnect electronic devices integral to the exhibit with destinations outside the exhibit. Where applicable, harnessing and bundling of cables shall also accommodate movement of exhibit on casters to provide access to the rear or interior of the exhibit.
- i. Harnessed cables shall be combed straight. Harnesses with intertwining members are unacceptable. Each cable that breaks out from a harness for termination shall be provided with a service loop. Cables shall be formed in either a vertical or horizontal relationship to equipment, controls, components, or terminations.
- j. Power cables, control cables, and high-level cables shall be run on the left side of an equipment rack, as viewed from the rear. All other cables shall be run on the right side of an equipment rack, as viewed from the rear.
- k. Cables, except video cables, which must be cut to an electrical length, shall be cut to the length dictated by the run. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.
- l. Cables shall not be installed with a bend radius less than that recommended by the cable manufacturer.
- m. Cables, regardless of length, shall be marked with a unique ID number, with the source and input/output port name, within 3-6 inches of both ends. There shall be no unmarked cables in the system. Marking codes used on cables shall correspond to codes shown on drawings, run sheets, and patch panels. Labels shall be any of the following styles: self-laminating; heat shrunk with electronically printed text; or electronically printed wrap-around numbers with clear shrink wrap over them.
- n. Terminal blocks or connectors shall be provided for all cables that interface with racks, cabinets, consoles, or equipment modules. All control panel cables shall be terminated on their own terminal strip in the rack, all bussing of the cables shall be done on the controller side of the terminal strip.
- o. Unless specified by make and model in the design package the use of gender adapters, video or audio connection adapters, and prefabricated, molded, or modular connecting cables are prohibited for use in these systems. The low-quality generic cables that are shipped with players are prohibited.
- p. Provide the audiovisual system free of artifacts such as hum, noise, or distortion of any level above that specified by the manufacturers of the equipment specified and/or provided. System components and related wiring shall be located to minimize

electromagnetic and electrostatic hum, spurious oscillation, wiring length, and shall provide proper ventilation, safety, and convenience for the operator.

- q. The Contractor shall verify all circuits and extensions for correct connection, continuity, and phasing. The Contractor shall make all adjustments and modifications so that all systems are operational.
- r. Following substantial completion of all AV installations, Contractor to provide commissioning, adjustments, programming and acceptance testing of all systems

## D. Mechanical

1. **General** - The Contractor shall install mechanical devices in accordance with manufacturer's written instructions in the exhibit structures and wire them to be fully operational at the time of final inspection.
2. **Support Hardware** - All hardware shall be of a grade equal to at least five times the rated load weight of the equipment supported.
3. **Heat Ventilation** - The Contractor shall determine total heat loads of all active equipment used in the exhibit structures. The Contractor shall provide convection vents and/or cooling fans with thermostats as necessary to prevent the equipment environment's temperature from rising above 100 degrees Fahrenheit, or above the equipment's maximum operating temperature, whichever is less.
  - a. Fans shall be selected and installed to provide the maximum amount of airflow with the minimum amount of noise, in accordance with this Division, 5.5, C., Audiovisual Equipment.
  - b. Convection vents shall be located to maximize intake of cool air as close to the floor as possible and exhaust of warm air out of the top of the exhibit. Convection air flow inside the exhibit shall flow unimpeded through casework containing the audiovisual and lighting equipment.
  - c. Ballasts for fluorescent fixtures and illuminators for fiber optic systems shall be located where heat ventilation can be maximized and shall be as remote as possible from artifact cases and audiovisual equipment.
4. **Testing** - The Contractor shall test environmental conditions for all operating equipment for heat build-up, in their shop and again on-site after the exhibits have been installed, but before the artifacts are installed. Test by operating the equipment for a minimum of two consecutive hours with all ventilation controls in place. Do not open and close the environment during the test; do not open the environment to read the temperature; use a sensing device inside the environment with a remote read-out.

## 6. Division 6 - Graphics

### 6.1 Introduction

Provide fabrication of all exhibit graphics. Draft print-ready graphics files will be OPRHP-furnished to the Contractor in a digital format at the post-award conference.

### 6.2 Specific Requirements

A. Review all OPRHP-furnished materials. Work includes:

1. Inventory of the OPRHP-furnished sources to ensure that the actual sources match the accompanying inventory list.

2. Inspection of each source to ensure that it is acceptable for use in the exhibit.
  3. Verify that For Position Only (FPO) files match the OPRHP-furnished sources.
  4. Compare the graphic layouts with the structural design drawings to verify that the final output size of each graphic layout matches the size of the corresponding panel.
  5. Verify the fit and cropping of images within graphic layouts; and
  6. Verify that all required files and fonts are furnished with digital files.
- B. Produce Sample Proofs - Produce and submit intermediate proofs, samples, and revised layouts for review and approval by the Director's Representative and exhibit designer.
1. Color test proofs on final substrates for each output type (e.g., lightbox, direct printing, photo reprographics, labels, test panels) will be produced for Designer review and sign-off before final production. Allow for minimum three (3) round of color proofing, and three (3) rounds of corrected sample for final sign-off.
  2. Output to be crisp, legible, unpixellated, and absent streaks, stripes, or other printing anomalies. Contractor to advise the Exhibit Designers if any images are of insufficient resolution for size output.
- C. Produce Final Graphic Media - Produce all final graphic media. Media includes, but is not limited to, digital output processes, photographic prints and transparencies, photo-etched or sandblasted materials, high pressure laminate, direct print to aluminum, and cut-out lettering.
- D. Contractor to coordinate final sizes and mounting strategy of all graphic reproduction with casework.
- E. There will be no exposed mounting fasteners visible on front of graphics, unless noted otherwise.

### 6.3 Review of Material

Upon receipt of the OPRHP-furnished graphic materials and digital files, the Contractor shall review all graphic, photographic, and text materials prior to production.

- A. Inspect all OPRHP-furnished graphic sources to ensure that they correspond to the accompanying inventory list, typically specified on the project database.
- B. Inspect the quality of each source to ensure that it is suitable for use in the exhibit.
  1. OPRHP-furnished photographic negatives, prints, transparencies, or other media to be scanned by the Contractor shall be checked to verify that a high-quality image can be obtained at the final resolution and size required.
  2. Inspect OPRHP-furnished digital files to ensure that they are scanned at a resolution that is suitable for production of a high-quality print at the specified output.
- C. Compare each image source against the corresponding FPO on the OPRHP-furnished design drawings or graphic layouts to ensure the images match, and against the layouts to ensure that they correspond properly.
- D. Compare the OPRHP-furnished graphic layouts with the design drawings and verify that the dimension of each graphic layout matches the corresponding structural panel.

- E. Verify that the proposed cropping, orientation, and dimensions of images will fit within the layout as designed.
- F. Digital files shall be checked against the drawings and the exhibit plan to ensure that all layouts and required fonts are provided and that the material is complete and ready for production.
- G. The Contractor shall check the digital files against OPRHP-furnished color samples and correct the digital files as necessary to ensure that the final output colors shall match the samples. Any errors, inconsistencies, omissions, or incorrect identification shall be brought to the attention of the Director's Representative.
- H. Provide to the Director's Representative a written report entitled "Inventory of OPRHP-furnished graphic sources" that identifies missing, incorrect, inadequate, or damaged OPRHP-furnished materials as soon as possible after receipt of OPRHP-furnished materials and prior to submittal of samples and proofs.

#### 6.4 Handling of Source Material

Provide professional care and handling of source materials. The Contractor shall provide protection from loss and physical damage at all times. Certified mail and written receipts or tracking numbers shall be used in transferring sources to and from photographic and graphic processors. All OPRHP-furnished source materials shall be returned to OPRHP unaltered and undamaged. No retouching or other alteration on original OPRHP-furnished prints, negatives, transparencies, or digital files is permitted.

- A. **Handling of Photographs** – Photographic material shall be handled wearing white cotton gloves or powder-free latex examination gloves.

#### B. Archival Storage Materials

- 1. Digital files shall be archived on USB flash drive, or other digital media as approved by OPRHP.
- 2. Negatives, transparencies, and prints shall be stored in archival protectors as specified below, as manufactured by the following or approved equal:

Light Impressions  
P.O. Box 787  
Brea, California 92822-0787  
800-828-6216

[www.lightimpressionsdirect.com](http://www.lightimpressionsdirect.com) Or approved equal

- a. 4" x 5" negatives and color transparencies, place in TransView sleeves, clear, Item Number 5313, and HD PolyChron envelopes, Item Number 20567.
  - b. 8" x 10" prints, place in a HD PolyChron envelope, Item Number 20570.
  - c. 8" x 10" negatives and color transparencies, place in TransView sleeve, clear, Item Number 5315 and HD PolyChron envelope, Item Number 20570.
  - d. Place negatives, transparencies and prints in archival top loaders, Item Number 3225, for inclusion in binder.
- C. Binder - The Contractor shall assemble photographic source materials in three-ring binders using archival sleeves, as identified in this Division, 6.4, B., Archival Storage Materials. Each prepared image shall be inserted into an 8-1/2" x 11" archival quality polypropylene sleeve punched with three holes to fit into a three-ring binder.

#### 1. Specifications for Binder Content:

- a. **Digital Files** - Digital files shall be archived as specified in this Division, 6.5, B., including high-resolution scans of graphic images and final versions of graphic layout files which have been modified by the Contractor to make them production-ready. Each USB flash drive shall contain a "Read Me" or text file that shall be printed out and included in the three-ring binder. The "Read Me" files shall contain the following information about all files included on that disk:
  - 1) List of all file names, making clear the location of all files in the exhibit. The Contractor shall name all files using the identification numbers in the OPRHP-furnished exhibit plan. Exhibit numbering shall be in accordance with the project numbering system. File names shall end in the appropriate program extension so that the program needed to open the file may be easily determined.
  - 2) Software program used, including the version number.
  - 3) Location of all linked files. The linked files shall be included on the same disk whenever possible.
  - 4) All fonts used.
- b. **Labeling of Media** - Each disk shall be labeled with basic information on the project name and contents or number keyed to the printed "Read Me" files located in the three-ring binder.
- c. **Graphic Schedule** - The Contractor shall update the OPRHP-furnished graphic schedule and graphic facsimiles to reflect as-built conditions and submit the updated schedules as a hard copy and as a digital file.

## 6.5 Graphic Production Files

- A. Software - The most current version, or one major release prior to the most current version of the following software is acceptable:
  1. Adobe InDesign for graphic layout files.
  2. Adobe Photoshop for image (raster based continuous tone) files.
  3. Adobe Illustrator for vector based graphic illustration work.
  4. Adobe Acrobat for PDF (portable document format) files.

Substitution of other software programs shall be approved, in advance, by the Director's Representative.

- B. **File Structure** - All files generated by the Contractor shall have a specific structure and shall be encoded on storage media as appropriate for the volume of data in a universal format that can be read by current operating systems.

The files and file structures shall be as follows:

1. For Raster Files (continuous tone image files) there shall be four folders:
  - a. **Raw Files** - This folder shall contain unimproved scan files, supplied files, and digital camera raw files (in Adobe DNG format). These files may be 16 bits per channel or 8 bits per channel RGB. File names shall follow the format: IM-00-000Raw. The appropriate file extension shall be appended to the file name.



- b. **Working Files** - This folder shall contain layered psd files (Photoshop native file format). These are the files in which all work has been done. All work shall be done on layers and be available for further editing. File names shall follow the format: IM-00-000Work.psd
- c. **FPO (For Position Only) Image Files** - This folder shall contain low- resolution versions of images used for developmental purposes. The FPO image files are linked to the graphic layout files prior to final output of the exhibit graphics. These files shall be produced at a quality level sufficient to provide a clear representation of the image as it will appear in the final exhibit, balanced against the need for a manageable file size that can be easily stored, transmitted and printed. Compressed image formats such as JPG are acceptable for FPO files. The FPO images shall be cropped and scaled to match the Final Files they are representing. These files shall be 8 bits per channel RGB and shall have the current Adobe profile embedded.

File names shall follow the format: IM-00-000FPO. The appropriate file extension shall be appended to the file

- d. **Final Files** - This folder shall contain the result of flattening the working files. These are the files linked to the layouts. These files shall be 8 bits per channel RGB and shall have the Adobe 1998 profile embedded.
2. **Vector Illustration Files** - These files shall be created in Adobe Illustrator and shall be organized into layers determined by the content in the document. In addition:
- a. Supporting information shall be located in the document margin and shall be placed on a separate layer. This data includes but is not limited to the file name, and date or revision number.
  - b. Vector illustrations shall be designated as images in the content management system. File names shall follow the format:

IM-00-000Dev.ai for design development level vector illustrations. IM-00-000Prod.ai for production level vector illustrations.

- 3. **Linked Files** are raster or vector files required by the primary file in order to print correctly. Graphic layout files often require one or more linked image files. Supporting files shall always be linked to, not embedded in, the primary file. Approved formats for linked files are tif, pdf, psd, and ai.
- 4. **PDF Files** are used for electronic distribution, viewing, and printing of review documents. Unless otherwise approved in advance by OPRHP, PDF files shall not be used for final exhibit production output. The PDF file name shall be identical to the file from which it was created, with the .pdf extension replacing the original file's extension.

C. **Color Management** - The design and production processes shall be color managed from beginning to end using ICC (International Color Consortium) and ColorSync color management as follows:

- 1. All raster image and vector files shall be RGB files.
- 2. Color working space shall be Adobe RGB (1998). The Adobe RGB (1998) profile shall be embedded in all RGB files.
- 3. Color settings for InDesign and other Adobe applications shall be US Prepress Defaults. Important settings in this context are:

Enable Color Management  
Working Space: RGB; Adobe RGB (1998) Conversion Options:

Engine: Adobe ACE  
Intent: Relative Colorimetric Use Black Point Compensation

All soft proof color evaluations shall be made in this in this environment.

4. The D50 standard viewing conditions ANSI PH2.30-1989 for graphic arts and photography - color prints, transparencies, and photomechanical reproductions - viewing conditions shall apply, and all hard copy color evaluations will be made in this environment.
5. All defined colors swatches in InDesign and Illustrator shall be set to Color Type: Process. ICC color management information is available from:

International Color Consortium  
1899 Preston White Drive Reston, Virginia 20191  
7 03-264-7200  
[www.color.org](http://www.color.org)

#### **D. Fonts**

1. The Contractor shall provide all font files necessary to view, edit, and print all graphic layouts produced under this contract.
2. The Contractor is responsible for meeting all software licensing requirements of the font copyright owner. The requirement to provide font licenses may be waived when the fonts and licenses are specified as OPRHP-furnished in the individual task order.

#### **E. Requirements for Production-quality Image Scanning**

1. Prior to scanning, the Contractor shall review the resolution, cropping, and final size of the production image that will be created from the scan. The Contractor shall notify the Director's Representative if the quality of the source image is not suitable.
2. Scans requiring extreme enlargements of the source image shall be performed using a process and equipment capable of providing high quality results. This shall include the wet mounting of transparencies and negatives and/or use a drum scanner when necessary. The Contractor shall consult with the Director's Representative to determine when specialized processes and equipment are necessary.
3. The following scanning specifications shall be followed:
  - a. Resolution: 300 dpi at final image size and cropping,
  - b. Color Space: RGB or Grayscale,
  - c. Profile: Adobe RGB (1998) or Gray Gamma 2.2,
  - d. File type: PSD, TIFF, PDF with no compression, or DNG.

#### **6.6 Samples**

The Contractor shall provide the samples for OPRHP review and approval as specified in Division 3, Samples/Mock-ups/Prototypes, 3.2, C, Graphics.

#### **6.7 Corrections to Digital Files and Proofs**

- A. The Contractor shall be responsible for the correctness of all Contractor-generated layouts, and to all contractor-generated changes or corrections.

- B. The Contractor shall make corrections to the digital layouts and files when any of the following are specified:
1. When text is found to be incorrect, either due to errors in the original text or in preparation of the layouts;
  2. When original graphics cannot be obtained or are found to be incorrect, or the use rights cannot be purchased and substitutions have to be found;
  3. When readability of text is found to be unacceptable and adjustments to the layout and/or font size are needed to enhance contrast between text and the background; and/or
  4. When color settings in digital files are inconsistent with the color specifications for each output media as specified on the OPRHP- furnished color sample board and exhibit plan drawings.

## 6.8 Graphic Output

### A. Digital Output

1. Archival Inkjet Prints – The Contractor shall provide inkjet prints using archival inks on glossy substrate at high resolution, with no visible dot patterns, graining, or banding.

Prints may also be specified on other materials including, but not limited to, paper, fabric, scrim, and vinyl.

2. Digital High-Pressure Laminate - Digital high-pressure laminate from 1/16" (1.5mm) to 1" (25mm) in thickness, with a black solid phenolic resin core and a matte finish, as manufactured by the following or approved equal:

iZone  
2526 Charter Oak Dr., Suite 100  
Temple, Texas 76502  
888-464-9663  
[www.izoneimaging.com](http://www.izoneimaging.com)

Fossil Industries  
44 Jefryn Boulevard  
Deer Park, NY 11729  
631-254-9200  
[www.fossilgraphics.com](http://www.fossilgraphics.com)

FOLIA Industries Inc.  
58 York, Huntingdon QC Canada  
J0S 1H0  
888-264-6122  
[www.folia.ca](http://www.folia.ca)

3. Direct dye print to metal powder coated sublimation with UV-resistance coating – High resolution, large format, as manufactured by the following or approved equal:

Duralux  
Coral Springs, FL 33065  
954-755-6021  
[www.duraluxpanels.com](http://www.duraluxpanels.com)

4. Diachromatic print shall be dual color filament 3D printing using polylactic acid (PLA) material as manufactured by the following or approved equal:

MatterHackers Quantum PLA Filament

20321 Valencia Cir

Lake Forest, CA 92630

<http://www.matterhackers.com/store/c/matterhackers-quantum-pla>

- B. **Vinyl Cut-Out Letters and Shapes** - 3M Scotchcal HP Series 220, in colors as specified on the drawings, as manufactured by the following or approved equal:

Gerber Scientific Products, Inc. 83 Gerber Road

South Windsor, Connecticut 06074

800-222-7446 /860-643-1515

[www.gspinc.com](http://www.gspinc.com)

## 6.9 Image Quality

- A. **Contractor Inspection and Acceptance** - All OPRHP-furnished source material shall be inspected by the Contractor for final determination as to acceptability and use as intended output media. If the source material is found to be unacceptable, the Contractor shall notify OPRHP prior to processing or using the material.

1. **Digital Scans** –The Contractor shall scan artwork, photographs, and other material to be used for digital output at the resolution recommended for the particular output device used, based on the final size and detail of the image.
2. **Digital Output** – Colors in the final image shall match color samples, original artwork, or photographic images. The Contractor shall save the original scan on digital storage media in accordance with this Division, 6.5, Graphic Production Files.

- B. **Quality Control** - The Contractor shall be responsible for the quality and durability of images produced and installed. The Contractor shall bear the costs associated with replacement or repair of those images that are unsatisfactory after installation because of improper techniques, use of inferior materials, improper handling, mounting, or installation.

- C. **Image Quality** - The following are required for acceptable graphic output media:

1. Prints and transparencies shall have high color saturation and correct color balance, and all colors shall match consistently from panel-to-panel.
2. The Contractor shall adjust cropping of images to achieve a correct finished size, for subject matter, and for best overall composition. Seams shall be located away from text and important images. The Contractor shall allow for necessary bleed and trimming.
3. The Contractor shall ensure evenly balanced backlighting of display transparencies, including proper diffusion sheeting, control of lighting intensity, and even distribution of lighting across all areas of the image.

- D. **Consistency** - The Contractor shall ensure consistency of panels that are intended to line up to form one large image or are part of a group.

1. Murals and Multi-Panel Images - Images that are mounted on more than one panel shall line up exactly from panel-to-panel. All colors and tones shall remain consistent. Seams shall be equally

spaced and shall occur so that all panels that make up the mural are equal width; as an exception, the outermost panels may be narrower in width as long as both outer panels are of equal width. Seams shall not occur through text that is part of the printed panel, nor through significant details in graphic images that are part of the printed panel.

2. Panel Groups - Panels of the same output type that form part of an exhibit grouping shall be made consistent in color balance, tones, contrast, and mounting methods, unless specified otherwise in individual task orders.

## 6.10 Mounting and Over laminating

Graphics images and layouts that are output on paper, including digital inkjet prints and prints on photographic paper, shall be mounted on a rigid and stable support substrate, and shall be covered with a clear overlamine layer to protect them from minor physical damage and ultraviolet light. The following mounting methods are acceptable:

### A. Mounting to Aluminum, with MACtac Overlamine

1. Materials – Mount the print to anodized aluminum with MACtac Permacolor, Permatrans Mounting Film, IP2100 Series. The surface of the print is protected with MACtac Permacolor Permagard Premium Overlaminating Film, IP7300 Series Lustre finish. MACtac as manufactured by the following or approved equal:

Bemis Company, Inc. 222 South Ninth Street Suite 2300  
Minneapolis, Minnesota 55402-4099  
612-376-3000  
[www.mactac.com](http://www.mactac.com)

#### 2. Execution

- a. **Substrates** - Prior to use, all aluminum shall be washed clean of residual manufacturing chemicals, dirt, oil, or foreign substances to ensure a good bond. Cut panels evenly, to the correct dimensions, and finish edges. Aluminum shall be anodized prior to use as a photo substrate to provide corrosion resistance.
  - b. **Mounting to Substrate** - A cold roll system press shall be used to mount print with MACtac IP2100 mounting film in accordance with the manufacturer's specifications. Print shall be securely mounted to substrate surface, free from wrinkles, blisters, scratches, rips, tears, adhesive residue, or other imperfections. Trim print square and clean, and lightly ease all aluminum edges with fine grit sandpaper on sanding block, held at 45-degree angle. Corners shall be well fastened and eased, with no untrimmed pieces left. Substrate and print shall remain flat, true, and even after mounting.
  - c. **Protective Coating** – Apply clear film MACtac IP7300 overlamine so that it is wrapped around print and aluminum sandwich and adhered to back of aluminum substrate for a two- inch overlap. Overlamine film shall only be applied after all aluminum and print edges are trimmed clean and square. The Contractor shall ensure that the clear film overlamine provides a continuous bond with the print. The overlamine shall be free of bubbles, scratches, dirt, indentations, and impressions from packing material used for transport and storage of overlaminated print.
3. **Unacceptable Mounting Substrates** - Moderately Expanded PVC Sheet (Sintra®) is not acceptable for use as a graphic substrate.

### B. Subsurface Mounting to Non-Glare Acrylic or Polycarbonate

1. **Materials** - Mount the print behind non-glare Plexiglas or Acrylite acrylic, or non-glare Lexan polycarbonate sheet, using MACtac Permacolor, Permatrans Mounting Film, IP2100 Series, as manufactured by Bemis Company, Inc., this Division, 6.10, A.1.
  2. **Execution** - Bevel all edges at a 45° angle or round off edges, whichever is specified in the drawings, polish all edges, and ease all sharp corners.
- C. **Subsurface Mounting for Non-Flat Mounting Configurations** - Graphic prints to be mounted to curved surfaces and cylinders shall be mounted as follows unless specified otherwise on the drawings or in individual task orders:
1. **Materials** - MACtac Permacolor IP6000 Lustex®, 15 mil, with pressure- sensitive adhesive on one side and low-gloss textured surface, as manufactured by Bemis Company, Inc., this Division, 6.10, A., or approved equal.
  2. **Execution** - Follow all manufacturer's recommendations for laminating of the graphic, temperature and humidity ranges, bending radius, and other factors so as to maximize the exhibit's durability during the life of the exhibit. If the edges of the graphic panel are to be exposed to frequent touching by visitors, it is recommended that the edges be protected by a molding or frame.
- D. **Application to Exhibit Structure** - The Contractor shall apply finished graphics to, or install on, exhibit structures and panels as specified on the drawings. Exact measurement and precise alignment shall be required.

Graphics substrates shall be adhered to exhibit walls and panels using 3M VHB Double-Coated Foam Tape, as manufactured by the following or approved equal:

3M Industrial Specialties Division 3M 220-8E-04  
St. Paul, Minnesota 55144  
800-227-5085 / 612-733-4813  
[www.3m.com/bonding/](http://www.3m.com/bonding/)

Apply tape along the perimeter of the rear of the substrate, one inch in from the edge, with another strip across the middle at the widest point. Use 1/16" thick x 1" wide tape, or width and thickness sufficient to support the substrate as recommended by the manufacturer.

- E. **Cutouts** - The following methods of fabricating graphic cutouts are acceptable.
1. Digital high pressure laminate panels shall be the default standard material for cutout graphic panels unless specified otherwise on the drawings. Two methods of production are acceptable:
    - a. Digital high pressure laminate panels with a thickness of ½" thick, or thicker (which are self-supporting), and have a solid black phenolic resin core; or
    - b. Digital high pressure laminate panels, less than ½" thick, laminated to MDF, with the edges and back of the MDF painted black. Sand the edges smooth and fill and sand all imperfections.
  2. Subsurface mount a print to non-glare Plexiglas or Acrylite acrylic, or non- glare Lexan polycarbonate sheet using MACtac Permacolor, Permatrans Mounting Film, IP2100 Series, or subsurface mount the print to MACtac IP6000 Lustex®. Adhere the mounted print to MDF and cut out the graphic image. Sand the edges smooth and fill and sand all imperfections. Paint edges and back of the cutout in accordance with the colors specified on the drawings.

3. For any of the fabrication methods specified above, cut out the image, following the crop lines as specified on the graphic references. All edges and back shall be smooth and finished, and all laminated layers shall be tightly adhered.

## 6.11 Bird Friendly Window Application

This section includes requirements for the supply and installation of visible markers onto all of the exterior glazed surfaces to reduce the incidence of bird collisions:

- A. **Pre-installation Conference** - Conduct pre-installation meeting before installing bird friendly markers in conjunction with installation of mockup attended by Director Representative, Contractor and Exhibit Designer.
- B. **Samples for verification** - Submit two (2) samples 12"X12" for each type of marker specified.
- C. **Materials Manufacturer:**

FeatherFriendly® Technologies Inc.  
2207 Dunwin Dr.  
Mississauga, Ont., L5L1X1  
8888741755  
Or approved equal.
- D. **Materials** - Markers shall be manufactured from premium exterior grade film with permanent exterior grade adhesive and may use one or more of the following products:
  1. Symmetry dot pattern visible markers, 6mm (1/4") diameter and spaced 50mm (2"). Symmetry series by Feather Friendly® in a 2" X 2" pattern.
  2. Harmony dot pattern visible markers, 6mm (1/4") diameter and spaced 50mm (2"). Harmony series by Feather Friendly® in a 2" X 2" pattern.
  3. Rain dot pattern visible markers, 6mm (1/4") diameter and spaced 50mm (2") X 100mm (4"). Rain series by Feather Friendly® in a 2" X 4" pattern.
  4. Horizon dot pattern visible markers, 6mm (1/4") thickness and spaced 100mm (4") x 44mm (1.75"). Horizon series by Feather Friendly® in a 4" X 1.75" pattern.
  5. Serenity dot pattern visible markers, 6mm (1/4") thickness and spaced 58mm (2.25") X 32mm (1.25"). Serenity series by Feather Friendly® in a 2.25" X 1.25" pattern.
  6. Affinity linear pattern visible markers, 6mm (1/4") diameter and spaced 89mm (3.5") X 19mm (0.75"). Affinity series by Feather Friendly® in a 3.5" X 0.75" pattern
  7. Balance linear pattern visible markers, 6mm (1/4") diameter and spaced 13mm (0.5") X 89mm (3.5"). Balance series by Feather Friendly® in a 0.5" X 3.5" pattern.
  8. Sequence linear pattern visible markers, 6mm (1/4") diameter and spaced 25mm (1") X 44mm (1.75") x 50mm mm (2"). Sequence series by Feather Friendly® in a 1" X 1.75" x 2" pattern.
  9. Sunburst linear pattern visible markers, 6mm (1/4") diameter and spaced 38mm (1.5") X 38mm (1.5"). Sunburst series by Feather Friendly® in a 1.5" X 1.5" pattern.
  10. Unity linear pattern visible markers, 6mm (1/4") diameter and spaced 41mm (1.625") X 100mm (4"). Unity series by Feather Friendly® in a 1.625" X 4" pattern.
  11. Custom design: Owner may elect to install a custom designed product.
- E. **Delivery, Storage and Handling** - Deliver and store packaged materials in their original containers with manufacturer's labels and seals intact. Store flat at room temperature, avoid humidity. Keep out of sunlight in a clean, dry area.
- F. **Preparation** - Clean glass surfaces of substances that could impair glazing film bond including mildew, oil, grease, dirt, and other foreign materials immediately before installation of markers.

- G. **Installation** - Install in accordance with manufacturer's instructions and the contract documents, plumb, true, and level over clean glazing. Execute work using qualified personnel skilled in installations similar to this product, design, and scope
1. First surface applied
  2. No missing markers
  3. Even placement of markers
  4. Consistent spacing of markers
  5. Horizontal alignment of markers on adjoining windows
- H. **Cleaning and Protection** - Progress Cleaning: Leave work area clean at the end of each workday. Final Cleaning: At completion of installation, ensure all windows and frames are thoroughly cleaned.
- I. **Closeout Submittals** - Submit manufacturer's written instructions for cleaning solutions, materials, and procedures. Submit name and contact information of original installation contractor.

## 6.12 Graphic Panels for Exterior Use

For graphic output manufactured for exterior use, including digital high-pressure laminate (phenolic resin panels), and other processes, the Contractor shall submit samples in accordance with Division 3,3.2, B, Materials and Finishes Samples. The Contractor shall include the manufacturer's technical specifications for review and approval by the Director's Representative.

## 7. Division 7 - Conservation Guidelines

### 7.1 Introduction

Provide design and fabrication of artifact mounts, installation of artifacts into exhibit cases, and silica gel humidity ballast for conditioning of exhibit cases.

### 7.2 Quality Assurance

All materials and fabrication methods for mounting of artifacts, artifact cases, and all structures or materials to be installed inside artifact cases, shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018.

### 7.3 Artifact Categories

- A. Artifacts are those objects which can be considered non-replaceable for cultural, scientific, or historic reasons, which are one-of-a-kind, which have a high monetary value, or which are delicate because of their condition, materials, and construction. Artifacts shall be handled, mounted, and installed in accordance with the guidelines contained in this Division.
- B. Reproductions, Replicas, Props, Models, or Facsimiles are those objects which are replaceable, and which were fabricated or purchased for the exhibit. These objects are not required to be mounted and protected in accordance with the guidelines contained in this Division but shall be mounted and installed in accordance with fabrication details approved by OPRHP as specified in Division 2, Fabrication Drawings.

### 7.4 Specific Requirements

- A. Travel to Bayard Cutting Arboretum Visitor Center in Great River, New York, and/or Peebles Island Resource Center in Cohoes, NY, to inspect, measure, photograph, and produce templates needed for artifact mount production.



- B. Design individual custom mounts for artifacts and production of preliminary and final mount drawings for review and approval by the Director's Representative.
- C. Ensure fit of all artifacts within the casework as designed by review of artifact dimensions and adjustments to casework dimensions as required.
- D. Storage of replaceable objects at the Contractor's facility during the fabrication process and transportation of the objects to the installation site.
- E. Fabrication of custom mounts for artifacts.
- F. Installation of custom mounts, mounting systems, and artifacts on panels, platforms, and in cases.
- G. The Contractor shall be responsible for setting up a facility at the exhibit installation site to modify or alter pre-made case elements and artifact mounts.
- H. Reassemble and clean cases after artifacts are mounted.
- I. Provide and install silica gel humidity ballast into artifact cases.
- J. Adjust lighting on artifacts and test light levels to ensure footcandle limits are not exceeded.

## 7.5 Artifact Handling

- A. **Damage** - The Contractor shall utilize extreme care and abide by the Specifications set forth in this Division. Should the Contractor break, chip, fracture, scratch, or otherwise damage any artifact, the Contractor shall immediately notify the Director's Representative. The Contractor shall not attempt any repair, treatment, or preservation procedure. The OPRHP will execute any repairs.
- B. **Security** - The Contractor shall be responsible for the safety and security of artifacts in their possession. During the time the artifacts are being photographed, measured, fit, or installed in a OPRHP facility, the Contractor shall handle the artifact with care and shall ensure that it is returned to the authorized personnel when work is not in progress or has been completed. The security of artifacts stored in a OPRHP facility is the responsibility of OPRHP. The Contractor shall not leave artifacts in an exposed and unsecured area.
- C. **Storage** - The Contractor shall store only replaceable objects at their facility. The Contractor shall store the objects in a lockable, protected area to eliminate damage and theft. Access to the objects shall be limited to the Contractor and his staff. All objects shall be locked up when not in use. All non-replaceable artifacts will remain at a OPRHP facility during the design and fabrication of the mounts. The Contractor shall measure, examine, and fit mounts of non-replaceable artifacts at the Peebles Island Resource Center, in Cohoes New York.
- D. **Transport** - The Contractor shall only transport replaceable objects to the installation site that were stored at their facility during fabrication of the exhibits. OPRHP will provide transportation of non-replaceable artifacts to the installation site.

## 7.6 Materials

- A. **Artifact Case Materials** - In accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018 and Division 4, Exhibit Structures.

B. **Silica Gel** - In accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018, Section 5.

C. **Artifact Mounts**

1. **General** - The Contractor shall use the same type and quality of materials for mounting artifacts and replaceable objects. Fabrication materials shall be of the highest quality and shall be non-damaging to the displayed artifacts. All mount making materials that will be used for onsite mounting shall be available at the final inspection for review and approval by OPRHP.
2. **Materials Considered Safe for Use with Artifact Mounts** - In accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018. The following are commonly used acceptable mount materials:
  - a. **Plastic** - Rigid acrylic and polycarbonate.
  - b. **Metal** - Brass, with silicone rubber, acrylic resin, or foam barrier between the artifact and the metal.
  - c. **Cushioning Material** - Polyethylene foam, polyester felt, fabric- covered polyester batting, 100 percent cotton fabric, acid-free buffered tissue paper.

D. **Packing Materials**

OPRHP will transport non-replaceable artifacts to the installation site. Packing materials for non-replaceable artifacts is Not In Contract.

7.7 **Execution**

A. **Artifact Case Fabrication** - In accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018, Division 4, Exhibit Structures, and the drawings.

B. **Mount Fabrication** - In accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018, and the drawings.

1. **Mount Design Drawings** - The Contractor shall provide drawings of proposed mounts for artifacts, including identification of materials and fastening hardware, to the Director's Representative for review and approval prior to fabrication, in accordance with Division 2, Fabrication Drawings.
2. **Mounting Systems** - When work requires design of a modular or flexible component display system for use in the exhibit, the system shall be designed so that as much as possible of the individual parts can be prefabricated and fit together onsite. Artifact mount design shall be coordinated with in accordance with 7.7 B 3 – Mount Design Guidelines.

3. **Mount Design Guidelines**

- a. Mounting design and materials shall be in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018. Materials shall be compatible with the artifact and shall be inert, cushion the artifact, and have smooth edges. Replacement and repair of existing mounts shall be of like design and materials unless otherwise specified on the drawings.
- b. Mounts shall provide adequate support to prevent physical stress or unbalanced weight distribution on the artifact. The center of gravity and original intended use shall be considered.

- c. Mounts shall not be permanently attached to any artifact. Each artifact shall be easily removable from its mount in the event of curatorial maintenance or emergency.
- d. Fastening system shall be based on mechanical design and use no adhesives or sticky substances.
- e. Mounts shall be designed to minimize vibration and abrasion.
- f. Mounts shall protect artifacts from theft.

#### **4. Mount Fabrication**

- a. Original artifacts shall never be drilled, trimmed, tacked, nailed, screwed down, or glued down. The Contractor shall not use "museum wax", silicone rubber, or adhesive tapes.
- b. Original clamps, hooks, strings, and straps already attached to the artifacts shall not be used for support or to take weight off of the artifact.
- c. Mounts shall not utilize fabrics or materials that contain unstable dyes which could transfer colorants to artifacts.
- d. Sharp edges shall be removed from materials in close proximity to the displayed artifacts.
- e. An artifact shall never be forced to fit in a bracket, cradle, or other mount. The mount shall support, not compress; straps or brackets shall fit snugly, not tightly.
- f. Clamps and brackets shall be padded with non-abrasive, inert materials.
- g. Replacement mounts shall be of the like kind and materials unless otherwise specified on the drawings.

#### **C. Artifact Handling**

- 1. Do not smoke, eat, or drink while working with artifacts.
- 2. Avoid haste while handling artifacts; use both hands when carrying an artifact.
- 3. In moving any artifact or group of artifacts, avoid travel shock.
- 4. Clean hands prior to handling artifacts. Wear white, lint-free, clean cotton gloves when handling artifacts.
- 5. Wear no jewelry that may scratch artifacts.
- 6. Use more than one person in moving a cumbersome or heavy artifact.
- 7. Know the nature of the artifact you are going to handle: structural compositions, weak, and strong elements.
- 8. Limit the number of artifacts put in a carrying box. Never put lightweight and heavy artifacts in the same container. Always use separation battens, padding, or some kind of cushioning material between pieces when more than one artifact is put in a single box.
- 9. Never discard any packing or padding material until it has been thoroughly searched, especially if breakage of the unpacked artifacts is known to have occurred.
- 10. All OPRHP tags shall remain with the item for identification; when possible, tags shall remain tied to the item. Do not discard any tags removed from artifacts to be displayed; return them to OPRHP.

- D. **Transportation** - In the event that replaceable objects are sent to the Contractor from OPRHP, the package will contain an inventory list. If for any reason this list is missing, the Contractor shall contact the Director's Representative immediately. When unpacking the objects, the Contractor shall examine each

object and indicate on the list that the individual item(s) have been received, note the condition of the object(s), and return a copy to OPRHP.

When shipping or returning objects or mounts, the Contractor shall include a copy of the shipping list and shall make an additional listing of the mounts. The object(s) shall be repacked in the original packing material and container. The object(s) shall be returned to the address provided by OPRHP.

## E. Installation

1. **Handling** - Handling of artifacts at the installation site shall be in accordance with this Division, 7.7, C., Artifact Handling. Provide a clean, undisturbed work area at the exhibit site away from visitor access and any conditions that could be harmful to the artifacts, such as extremes of temperature and humidity, direct sunlight, smoke, and materials unsafe for direct contact. All identification tags removed from artifacts when they are mounted in the exhibit shall be turned over to OPRHP. Do not discard any identification tags or remove them prior to final installation of the artifact. Place removed tags in a box or other small container designated for that purpose as specified by OPRHP onsite.
2. **Rehabilitation** - When repairing or replacing an existing mount, care shall be taken not to damage, disturb, or otherwise impact negatively on other artifacts in a display. If the repair or replacement of a mount calls for complete removal of all artifacts in a case, the Contractor shall not undertake this task. Arrangements shall be made with the Director's Representative prior to disassembly of an artifact case so that artifacts removed from an artifact case during repair of a mount can be secured by park staff.
3. **Installation of Silica Gel** – Unless otherwise specified in individual task orders, the Contractor shall furnish and install silica gel humidity ballast for the artifact cases in accordance with this Division, 7.6, B., Silica Gel, and in accordance with Division 4, 4.5, B., 2, Silica Gel Chambers.  
  
Silica gel shall be conditioned to the required relative humidity level, provided in the required quantity per case, and packaged in bags or containers in accordance with National Park Service Exhibit Conservation Guidelines, second edition, 2018. Conditioned silica gel shall be kept in the container from the manufacturer or in a vapor-proof bag, tightly closed, until immediately before installation into the artifact case, so as to maintain the conditioned humidity level as long as possible prior to installation.
4. **Artifact Case Lighting** – Unless otherwise specified in individual task orders, the Contractor shall aim and adjust all lighting on artifacts in accordance with required footcandle levels furnished by OPRHP for each object. The Contractor shall use an approved light meter to check the light intensity on each object or group of objects. No light levels shall exceed the footcandle limit.
5. **Clean and Close Artifact Cases** - Upon completion of artifact mounting, adjustment of lighting, installation of silica gel, and all other objects to be installed in the case, the Contractor shall clean the inside of the case one last time using a clean cloth. No spray cleaner shall be sprayed inside the case. Do not open and clean the case during or after other work that may raise dust levels in the vicinity of the case, such as vacuuming or dusting of adjacent exhibit structures.

The Contractor shall close and lock the case as soon as possible in the installation process so as to limit exposure of the artifacts to unconditioned air, excess light, insects, and damage or theft in the installation work area.

## 8. Division 8 - Setup and Installation

### 8.1 Introduction

Provide setup and installation of all exhibit elements so that they are complete, fully operational, and ready for use.

### 8.2 Specific Requirements

- A. Pre-installation meeting at the Contractor's facility.
- B. Staging of the exhibits and audiovisual components at the Contractor's facility, for inspection by OPRHP prior to final packing or crating for installation.
- C. Packaging and shipping of exhibit elements and materials to the site.
- D. On-site installation of exhibit elements and materials.
- E. Professional lighting of the installed exhibits.
- F. Delivery of the maintenance manuals and maintenance kit.
- G. Walk-through inspection of completed exhibits, with operational training for park staff.
- H. Punch list corrections of work that OPRHP has inspected and determined is unacceptable.
- I. Photography of the completed, operational exhibit.

### 8.3 Materials

- A. **Wood Crates** - The Contractor shall fabricate or supply wood crates, using CDX plywood and pine framing in thickness required, based on size of crate. Crates shall be fastened using galvanized nails and screws for crate top.
- B. **Packing Materials** - The Contractor shall pack materials using polyethylene air bubble cushioning material such as "bubble pack", flexible corrugated packing material, polyfoam peanuts, and/or heavy blankets.
- C. **Installation Tools and Materials** - The Contractor shall provide all installation tools and materials in sufficient number to accomplish the job, such as a vacuum cleaner, ladders, tools, trash bags, cleaning materials, interior and exterior protective covers, barriers, and "No Admittance" signs.

### 8.4 Execution

- A. **Pre-Installation Meeting** - The Project Manager and members of the Contractor's installation team shall meet with the Director's Representative either at the Contractor's facility or via teleconference to discuss the project and review work at the time of the exhibit staging.
- B. **Staging and Demonstration**
  - 1. **Setup** - Prior to shipping the exhibit elements to the site for installation, a thorough inspection of the completed and functioning exhibits will be made by the Director's Representative at the Contractor's facility. The Contractor shall place all exhibit units in exactly the same configuration

and dimensioned area as they will be installed. Focal points specified on the floor plan shall be laid out on the floor with masking tape.

2. **Demonstration** - All units shall be fully operational at the time of final inspection. Exhibit units with built-in lighting, electrical, mechanical, and audiovisual equipment shall be connected to power sources. The Contractor shall demonstrate that each operation is fully functional, in accordance with Division 5, Electrical/Electronic.

#### C. Packing and Shipping

1. **Structures** - Structures shall be blanket-wrapped with all attached exhibit elements protected.
2. **Audiovisual Equipment** – Audiovisual equipment shall be shipped in original shipping box from manufacturer with all original packing materials in place.
3. **Graphics** – During storage prior to the installation and during transportation to the installation site, the Contractor shall use flat, smooth- surfaced materials between graphics which are mounted and protected with overlamine film. The Contractor shall ensure that dust, dirt, sawdust, bubble wrap, Styrofoam sheet or peanuts, and the rear surfaces of other graphic panels do not come in contact with the face of overlamine prints and leave impressions in the overlamine surface. Mounted prints with patterns impressed into the overlamine film are unacceptable.
4. **Shipping** - The Contractor shall pack and crate all materials which shall be shipped by their own or commercial carrier in such a manner that they will arrive at the designated site undamaged. If exhibit elements are damaged in transit, the Contractor shall bear the full responsibility for repair or replacement.

#### D. Installation

1. **Installation Team** - The Contractor shall provide adequate personnel to install the exhibits, including the Project Manager. The Contractor shall provide all required tools and materials in sufficient number to accomplish the job.
2. **Demolition** - No demolition is anticipated for this project.
3. **Cleanup** - The Contractor shall maintain all areas in a clean condition on a daily basis and provide means of preventing dirt or waste material from being tracked into adjacent areas of the building.
  - a. The Contractor shall provide bags and containers for storage of trash. The Contractor shall be responsible for removing waste materials generated during installation from the site. The Contractor shall not dispose of their waste in dumpsters or containers that belong to OPRHP or to other Contractor's working on-site.
  - b. Drilling and cutting shall be completed prior to the installation of artifacts, models, original art, and audiovisual equipment to avoid excessive dust and debris that may damage the sensitive items. On-site work shall be phased so that drilling, cutting, rough carpentry, sanding, and use of finishes or adhesives is accomplished, followed by a thorough cleanup and allowance for dust to settle and fumes to dissipate. Protective paper or plastic floor coverings that are torn or thoroughly soiled shall be replaced with clean material. Then, installation of the sensitive materials and equipment can proceed.
  - c. The Contractor shall thoroughly clean exhibit surfaces to remove handprints, dust, and miscellaneous markings generated during the installation.

- d. The Contractor shall handle all acrylic, glass, and graphic panels with clean gloves to minimize handprints of natural skin oils. Panels shall be thoroughly cleaned until all dust, prints, and smears are removed from the face and rear surfaces. Acceptable materials for cleaning acrylic are specified in this Division, 8.4, H, 3, Cleaning Materials.
  - e. The Contractor shall provide labor, materials, equipment, and supplies for final cleaning of the exhibit site, including vacuuming the entire exhibit space. For carpeted spaces, vacuuming equipment shall be appropriate for professional cleaning of carpeting; shop vacuums are not acceptable. The use of equipment belonging to the OPRHP is not acceptable.
4. **Storage** - Exhibit elements shall be stored at the exhibit site during installation. Prior to the installation, the Contractor shall plan how storage shall be accomplished so as to provide protection of the exhibit elements and minimize disruption of park operations. The Contractor shall discuss their plan with the Director's Representative for review and approval prior to the installation.
  5. **Existing Work** - The Contractor shall request authorization from OPRHP prior to cutting, drilling, altering, or removing material within the building. Work that is replaced shall match existing work. Anything damaged or defaced within the building due to the Contractor's error during installation shall be restored to the original condition by the Contractor. Restoration work shall be coordinated with the Director's Representative.
  6. **Protection** - The Contractor shall provide adequate protection for parts of the building, its contents, and occupants wherever work under this contract is being performed. This includes dust protection where required and protective coverings for interior surfaces and furnishings adjacent to the work area. The Contractor shall provide cardboard, plastic, or heavy kraft paper for the floor of the exhibit and adjacent work areas; use Masonite in adequate thicknesses to protect floors from indentations and other damage when heavy loads will be wheeled over, or temporarily stored on, the floor. The Contractor shall provide barriers and post "No Admittance" signs. The Contractor shall also ensure that artifacts are not left unattended and that they are stored in a secure location when the work site is unattended.
- E. **Final Lighting of Installed Exhibits** – Upon completion of the on-site work, the Contractor shall ensure that all lighting of installed exhibits is functional and meet the design intent.
- F. **Walk-Through Inspection** - Upon completion of the on-site work, the Contractor shall conduct a final walk-through inspection of the exhibits with the Director's Representative, the exhibit designer and site staff. The Contractor shall notify the Director's Representative ahead of time when the walk-through can be scheduled and shall assemble installation team members with the appropriate expertise to demonstrate the equipment and answer questions.
1. The inspection shall identify punch-list items (items that need to be corrected by the Contractor). The Contractor shall record and maintain a list of the punch-list items as they are identified by the Director's Representative and provide a copy of the list to the Director's Representative after the walk-through inspection.
  2. The Contractor shall demonstrate operation of all electrical, mechanical elements, and audiovisual components in the exhibit. The exhibit shall be fully operational at the time of the walk-through inspection.
  3. The Contractor shall demonstrate access into exhibit structures for maintenance purposes, including artifact cases, silica gel chambers, lighting chambers, and all other electrical and electronic equipment, including audiovisual equipment.

- G. **Maintenance Manual** - Provide two copies of the final maintenance manual to OPRHP at the installation. A third copy shall be submitted to OPRHP as part of the closeout package, as specified in Division 9, Project Closeout. Assemble the maintenance manuals as specified in Division 2, Fabrication Drawings.
- H. **Maintenance Kit**
1. **Container** - A heavy-duty plastic storage container with a lid.
  2. **Touch-up Materials** - Bottles or cans of each paint, stain, wax, and other finishes used on the exhibit, with tightly fitted lids or caps, and clear identification of the contents on firmly attached labels. For each type of finish, provide appropriate solvents and brushes or other tools as required to apply the finish. Provide a minimum of one full quart of each paint and stain, one two-ounce bottle of each screen ink, and one full quart of each type of protective finish, such as polyurethane, except as otherwise specified on individual task orders.
  3. **Cleaning Materials** - Cleaning materials for each type of surface in the exhibit, including glass, acrylic, plastic laminate, metal, and wood. Provide one full bottle of each type of cleaner. Provide appropriate applicators for use with each type of cleaning product in sufficient quantities to clean the entire exhibit for a minimum of 60 days. All cleaning materials shall be listed in the maintenance manual, with manufacturer's address, telephone number, and website address (if applicable). If the exhibit includes acrylic glazing or surfaces, provide the following materials for cleaning acrylic:
    - a. Brillianize, as manufactured by the following or approved equal:

The Brillianize Company Kleenmaster Products  
4966 Industrial Highway  
Benicia, California 94510  
800-445-9344 / 707-751-0656  
[www.brillianize.com](http://www.brillianize.com)
    - b. WypAll Plus All-Purpose Wipers, as manufactured the following or approved equal  

Kimberly-Clark Corporation  
World Headquarters 351 Phelps Drive  
Irving, Texas 75038  
972-281-1200  
[www.kimberly-clark.com](http://www.kimberly-clark.com)
  4. **Keys and Tools** - All keys to exhibit locks and specialized tools, including screwdrivers for tamperproof screws, wrenches for roto locks, and allen (hex) wrenches, or any other specialized tool which shall be used for case access, mobility, or security. Provide three copies of each type of key and tool. Each key and tool shall be identified with the exhibit project name and number.
- I. **Operational Training Session** - After inspection and acceptance of the installed exhibits, the Contractor shall conduct an operational training session for site staff.
1. During the training session, the Contractor shall provide and identify the components of the maintenance kit, assembled in accordance with this Division, 8.4, H.
  2. The training session shall include, but not be limited to:
    - a. Day-to-day cleaning of the exhibits.



- b. Minor repair and touch-up procedures.
- c. Access into exhibit structures, including operating locks and tamperproof hardware, opening hinged doors, removing and replacing cover panels, removing and inserting silica gel desiccant, changing lamps in lighting fixtures, and removing and replacing mounted artifacts, models, and life-size figures; and
- d. Start-up and shutdown procedures for audiovisual equipment, lighting, and other electrical equipment, including troubleshooting in the event of a power outage, lightening surge, or other potential hazard.

J. **Completion of Punch List Work** - The Contractor shall clarify with the Director's Representative all work that is part of the punch list and provide a schedule and plan for its completion.

K. **Photography of the Completed Exhibit** - The Contractor shall document the completed, operational exhibit with digital photographs that clearly show the overall exhibit, with additional photos of each of the exhibit areas and close-up photos that show the details within each exhibit area. The quality of the photos shall be within a range of contrast that clearly shows the details of the exhibit without being washed-out or too dark. Submit photographs to OPRHP as specified in Division 9, Project Closeout, 9.4, A., 8.

## 9. Division 9 - Project Closeout

### 9.1 Introduction

Prepare and organize all exhibit production material for submittal to OPRHP and closeout of the project.

### 9.2 Specific Requirements

Assemble, organize, and submit a Closeout Package consisting of all OPRHP- furnished references and graphic sources, along with all materials generated during the production process including drawings, digital files, samples, one copy of the final maintenance manual, and photographs of the installed exhibits.

### 9.3 Closeout Package Materials

- A. Digital Media - Materials in accordance with Division 6, 6.4, Handling of Source Materials.
- B. Photo Negatives and Source Materials - Materials in accordance with Division 6, 6.4, Handling of Source Materials.
- C. Maintenance Manual - In accordance with Division 2, Fabrication Drawings.
- D. Photographs of the Installed Exhibits – In accordance with this Division, 9.4, A.8.

### 9.4 Execution

#### A. Closeout Package

##### 1. Digital Media

- a. **As-Built Exhibit Plan Database** - Stored a USB flash drive.
- b. **As-Built Graphic Layouts** - Stored on a USB flash drive accordance with Division 6, 6.4, Handling of Source Material.
- c. **High-resolution Scans of Art and Photos** - Stored on a USB flash drive in accordance with Division 6, 6.4, Handling of Source Material.
- d. **Digital Photos of the Completed, Operational Exhibit** - As specified in this Division 9.4, A8.

2. **Photo Negatives and Sources** – Assembled and organized in accordance with Division 6, 6.4, Handling of Source Material.
3. **Artwork** - Digital artwork shall be stored on a USB flash drive in accordance with Division 6, 6.4, Handling of Source Material. OPRHP-furnished and Contractor-produced artwork, sketches, and layouts shall be placed in acid-free folders or wrapped in acid-free paper. Identify all artwork by project name and graphic number.
4. **Drawings and Plans** - OPRHP-furnished exhibit drawings and planning documents.
5. **OPRHP-Furnished References** - The Contractor shall return all OPRHP-furnished reference materials.
6. **Samples** - All samples, models, and mock-ups required as submittals to the Director's Representative for review are the property of OPRHP, including samples returned to the Contractor for reference or stored in the Contractor's shop. the Director's Representative will inform the Contractor which samples are no longer of use and can be discarded and which shall be included in the closeout package.
7. **Maintenance Manual** - One copy shall be provided by the Contractor in the closeout package.
8. **Photographs of the Installed Exhibits** – The Contractor shall submit photographs of the installed exhibits on a USB flash drive in Digital format.

**B. Storage of Exhibit Resource Materials at the Contractor's Facility**

1. **During Fabrication** - The Contractor shall ensure that all OPRHP- furnished books, negatives, archival, and resource materials are stored in a safe place and remain in the same condition as they were received.
2. **After Project Completion** - The Contractor shall store copies of digital files used during the project at their facility for a minimum of one year following the installation of the exhibit. The Contractor shall provide a copy of all digital files on a USB flash drive.