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PART 3: SPECIFIC STANDARDS

Section A. Introduction

- 3.1 General. This part describes specific standards for Presidential libraries, including site requirements; general structural criteria; heating, ventilation, and air conditioning standards; fire safety; security; floor loadings; finishes; lighting; and glazing. These specific standards all affect the quality of the building and its ability to store textual, nontextual, and artifact holdings so that they are secure and will not degrade over time. All of the considerations noted in this Part will provide for a library that preserves and protects Presidential holdings while providing an attractive and functional facility for visitors, researchers, and employees.
- 3.2 Scope. Within these standards, there are requirements and recommendations. Requirements are mandatory to preserve, secure, and protect the holdings. Recommendations are based on the successful completion of a number of past projects.
- 3.3 Edition. The latest edition of each code in effect at the time of design contract award must be used throughout the project's design and construction.
- 3.4 New technologies. Although these standards make certain requirements and recommendations based on decades of experience with building projects, NARA acknowledges that building technology continues to evolve at a rapid pace. NARA will consider more recent technology when this technology is appropriate for the project, has been in practice for a length of time sufficient to evaluate results, and meets the environmental, security, fire protection, and other critical needs for the completed Presidential library. Before using new technologies, designers must receive approval from the Archivist or his designated delegate.
- 3.5 LEED-NC Certification. All new construction projects must be certified through the Leadership in Energy and Environmental Design (LEED) Green Building Rating System of the U.S. Green Building Council and achieve a minimum of LEED "Silver" Level. The design must still meet all other requirements of the Architectural and Design Standards when implementing any LEED features for credit.

Section B. Siting Requirements

- 3.6 General considerations.
- 3.6.1 Building site locations, circulation, access, and parking area designs must consider security of the building and holdings from vandalism, acts of terrorism, intrusion, natural disasters, and potential for industrial emergencies. Site locations must also consider environmental conditions such as wind, light, drainage, and other site effects on the operations of the building. Potential impacts to wetlands must be identified if applicable.
- 3.6.2 NARA does not have a specific requirement for the amount of acreage for a Presidential library. The size of the site may vary due to its location.

- 3.6.3 The site must be large enough to accommodate the building footprint, site access and service roads, sufficient parking (see paragraph 3.10), and sufficient tour bus or mass transit loading areas. In addition the site must provide enough area for required storm water management areas. The site must be sufficient to accommodate a turning radius for a 53-foot delivery truck and provide circulation for trash pickup from designated dumpster areas. The site must also be large enough to provide separation between drop off areas, parking, loading, and the building to provide for at least Level III security of the building as defined by the U.S. Marshall's Service (described further in Section I of this part).
- 3.6.4 A complete site survey must be completed for any site selected for a Presidential library construction project. This survey must include a boundary survey description of the property and a legal title search. The survey must include any easement locations and existing benchmarks. In addition, the adequacy of adjacent land must also be considered in the event of any future expansion of the facility. Land and facilities to be deeded to the United States or made available to NARA for use as a library must be free from any encumbrances on the title.
- 3.6.5 A complete geological investigation must also be completed for any site selected for a Presidential library construction project. In general it should address such issues as depth to bedrock and groundwater, soil strata, percolations rates, and pavement and underdrain recommendations as required per site.
- 3.6.6 State and local requirements to assess and resolve impact on archaeological sites and historic preservation must be fulfilled prior to transfer to NARA.
- 3.7 Landscaping Requirements.
- 3.7.1 If NARA is to be responsible for the maintenance and repair of outdoor areas, the site acreage must be sized to keep grounds care costs to a reasonable level.
- 3.7.2 If NARA is to be responsible for the maintenance and repair of outdoor areas, landscaping must also be planned for low maintenance, water control, and integrated pest management.
- 3.7.3 In all cases, vegetation must not be planted within 18 inches of the foundation to provide for hardscaping around the foundation of the building and to reduce the potential for the entrance of pests and insects into the building. This vegetation-free zone must be sloped away from the foundation and consist of gravel or decorative aggregate with appropriate drainage. A landscaping scheme should include under story plants no higher than three feet tall at maturity, and a tree canopy with limbs at least seven feet above the ground at maturity to allow light from fixtures to fall on the pedestrian route, so trees and shrubs do not obstruct lighting. The landscaping scheme must ensure that trees are planted far enough away from the building so that they do not touch or overhang the roof and that the roots will not affect the foundation of the building.

3.8 Floodplain requirements.

- 3.8.1 NARA requires that any library structure or supporting building (such as a cooling/heating plant, parking garage, storage facility, or emergency generator support building) must be located at least 5 feet above and 100 feet away from any 100-year flood level (floodplain).
- 3.8.2 A portion (up to 50%) of a surface parking area may be located in a floodplain if there are no suitable site alternatives and if the impact of construction in a floodplain or wetland is fully evaluated. Access roads to the library building must not be located on a floodplain and must allow for complete access (360°) to the building perimeter.
- 3.8.3 Evaluation of site alternatives must include a detailed evaluation of the impact on wetlands. If construction of parking and appurtenances must occur in a floodplain or wetland, then NARA will consider these locations only if no other alternatives are shown by the Foundation to be available.

3.9 Zoning and historic preservation considerations.

- 3.9.1 Foundation-supported projects are subject to local codes. State and local codes must be followed for all zoning requirements, including setbacks, height, coverage, traffic requirements, open space, and floor area ratios. The local jurisdiction for the project must be consulted for requirements, and a process for public review of the project must be developed. Contact must be made with the highway department of the local jurisdiction, the utility companies, local police, local fire department and fire marshal, telephone company, and other public works agencies that will provide services to the facility.
 - 3.9.2 For existing libraries under the control of NARA, Section 106 of the Historic Preservation Act must be considered in all design and construction projects if there are historic structures on the property or if the proposed project impacts a historic district. Any project at an existing library that might have an adverse impact on other adjacent historic properties must be considered a potential review project under Section 106. During the evaluation of projects at existing libraries, the potential for historic impact must be evaluated and mitigation strategies developed to deal with any adverse consequences.
 - 3.9.3 Foundation projects for new Presidential libraries are not bound by National Environmental Policy Act (NEPA) guidelines, but the NEPA guidelines do provide a methodology to look at site alternatives and provide for an assessment strategy of many competing sites. An environmental assessment provides an evaluation of wetlands and flood plains, traffic, historic impacts, and other factors. For projects at existing libraries, NEPA guidelines must be followed.
- 3.10 Parking/public access. Parking, bus drop offs, and parking spaces for persons with disabilities must be designed to accommodate peak visitation periods. NARA has found that

for the typical Presidential library this requires as many as 400 total spaces, with the following subdivision for special parking spaces:

- 3.10.1 Visitor parking – at least 50 spaces must be provided for visitor parking; more are recommended.
- 3.10.2 Tour and school bus - at least 7 spaces must be provided for buses.
- 3.10.3 Handicap Accessibility - at least 5% of all parking spaces must be handicap accessible.
- 3.10.4 Van - at least 3 spaces (but not less than required by code) must be handicap accessible van parking spaces with an access aisle of 96 inches (2440 mm) wide.
- 3.10.5 Staff Parking – at least 40 spaces must be provided for staff use, including an appropriate number of handicap accessible parking spaces as required by code.

NOTE: Please note that these requirements exceed ADA requirements and are based on experience at the existing Presidential libraries.

- 3.11 Emergency vehicle access. Site selection must also consider the access and egress from the site. Road systems around the site must be capable of allowing evacuation of people in the event of an emergency. Roads, fire lanes, and parking areas must permit unrestricted access for emergency vehicles. The entire length of roads, fire lanes, and turn-around must be designed for the weight and turning radius of fire trucks and must provide sufficient width and clearance for emergency vehicle access. The public entrance must be readily accessible to emergency vehicles. At a minimum, one of the long sides of every building must be accessible to fire department equipment. Designers of Presidential libraries must review access by fire equipment with the local fire department.
- 3.12 Site utilities.
 - 3.12.1 Water supply. Every building must have water supplied from a dependable public or private water main system. The library must have a continuous site fire loop connected to the water main. The capacity of the loop must be determined by the maximum fire flow of the building being provided by a portion of the loop if one section of the loop is inoperable. Service lines less than 150 feet long may be tied into mains with a Wye connection. Where feasible, NARA-controlled space and Foundation-controlled space should be separately metered. Required horizontal and vertical separations must be maintained throughout the site. Minimum pipe cover requirements must be maintained. Hydrants must be located appropriately to provide the required fire fighting coverage. Adequate pressures must be verified early to determine if any upsizing will be needed to serve the new facility. Metering, backflow prevention, and Post Indicator Valve requirements must be confirmed with the local water company.
 - 3.12.2 Sanitary sewer. Cleanouts must be provided on all sanitary sewer and storm drainage lines at approximately 5 feet away from the building and at all line bends

where manholes are not used. Required horizontal and vertical separations should be maintained throughout the site. Minimum pipe cover and slope requirements should be maintained. On lines longer than 150 feet, manholes must be provided. The design must use gravity flow and not sewage ejection.

3.12.3 Storm drainage system.

3.12.3.1 The storm drainage system conveys storm water collected on site to an acceptable point of discharge. The storm drains must be separated from sanitary sewers within the property limits, even in cities where separate public systems are not yet available. A storm drainage system may consist of an open system of ditches, channels, and culverts or of a piped system with inlets and manholes.

3.12.3.2 In most cases, building roof drainage must be collected by the plumbing system and discharged into the storm drains. The storm drainage system must be designed for a 25-year storm frequency, unless local criteria are more stringent.

3.12.3.3 Storm water design must address any local requirements with regards to water quality and quantity regulations.

3.12.4 Electric power. The primary power from the network to the building must be run underground in conduit from the property line. All conduits for the primary power must have at least 50% spare conduit (empty) capacity to allow the utility company to pull new power feeds in the event a conductor or power feed fails and must be abandoned in place. The designer must consider providing for a redundant primary feeder. Where feasible, NARA-controlled space and Foundation-controlled space should be separately metered.

3.12.5 Telephone systems. The primary telephone line to the building must be run underground in conduit from the property line. Designers must consult with NARA regarding the current telephone system recommended for usage in the facility.

3.12.6 Erosion Control. Sediment and erosion control measures must be incorporated into site design. Both temporary and permanent measures must be addressed. Sequencing should be spelled out and coordinated with construction activities.

3.13 Pools and fountains. Pools, fountains, and their related equipment are prohibited on any grounds and within any buildings that will be transferred to NARA and NARA will not assume the liability of operating or maintaining any pools or fountains or their related equipment. Pools, fountains, and their related equipment may be located on grounds not transferred to NARA, provided that the pools, fountains, and equipment are a minimum of 75 feet from the nearest NARA structure and that the pool or fountain is at least 10 feet below the foundation of the NARA structure.

Section C. General Building Criteria

- 3.14 Codes and standards. NARA has adopted several codes and standards that govern Federal construction throughout the United States and its territories. These codes follow.
- 3.14.1 Building codes. Except as noted below, NARA requires the use of the latest International Building Code (IBC) for each Presidential library project. For egress requirements, the provisions of the National Fire Protection Association (NFPA) 101, Life Safety Code, must be followed instead of the egress requirements of the National Model Building Code. All electrical work must follow the provisions of NFPA 70, National Electric Code.
- 3.14.1.1 Conflicts between codes and NARA requirements. It is NARA policy to make maximum use of equivalency clauses in all the codes to ensure flexibility. If there is a conflict between a code requirement and a NARA requirement, the more stringent requirement must prevail.
- 3.14.1.2 Deviations from building code provisions. The design standards listed in this standard, to the extent that they exceed provisions of the building code, take precedence. Additional, specific deviations from codes are discussed in this standard where applicable.
- 3.14.2 Local building code.
- 3.14.2.1 For new library construction projects, Foundations must comply with all local building codes when the local code is more restrictive than national standards or NARA requirements. The Foundation must provide an occupancy permit for the completed construction project from the local code official or jurisdiction certifying that all code requirements have been met. If title to the land and/or library building is not being transferred, a copy of the occupancy permit must be provided.
- 3.14.2.2 For renovations or additions to a library that are undertaken by the Foundation, local codes must be followed when the local code is more restrictive than national standards or NARA requirements. For renovations or additions undertaken by NARA via government contract, NARA will give consideration to local codes in accordance with 40 U.S.C. § 3312. NARA is under no obligation to conform to state or local laws, regulations, and codes, except with respect to local codes relating to seismic safety and storm water drainage.
- 3.15 Structural integrity against fire and other disasters. The facility must be constructed with non-combustible materials and building elements, including roofs, walls, columns, and floors. Fire protection systems and structural system of the facility must be designed by a licensed fire protection engineer and a licensed structural engineer to avoid catastrophic failure of the structure due to an uncontrolled fire on one or more levels. The facility must be designed in accordance with regional building codes to provide protection from building

collapse or failure of essential equipment from earthquake hazards, tornadoes, hurricanes, and other potential natural and industrial disasters.

- 3.16 Seismic safety. Presidential libraries must be designed to provide a high level of protection for both the structure and major operating equipment in the event of an earthquake or other seismic event per the International Building Code (IBC). Even in areas of low seismic activity, designers must consider certain features of seismic resistant design, since many of these features add safety from other threats to the building. Executive Order 12699 (Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction) is applicable to all Presidential library construction, including major renovations or additions.
- 3.16.1 Building configuration in earthquake zones. For new building designs in IBC Seismic Design Categories C, D, E, and F, buildings must be structurally symmetrical. If the buildings are not symmetrical (L, T, or U shaped), the buildings must be separated by seismic joints into distinct, rectangular structural units. Large mass elements, such as stairwells and elevator shafts, must be located so that the eccentricity between the center of mass and the center of rigidity of the floor plan does not exceed 15 percent about either orthogonal axis. In Seismic Design Categories C, D, E, and F, stairwells and elevator shafts must not extend significantly beyond the building façade.
- 3.16.2 Attachment of nonstructural elements. All nonstructural elements, components, and equipment located within a building or on the site (including all storage furniture) must be anchored to withstand wind and seismic loads. Mobile storage units must be designed and installed to sustain the same loads as the main structure itself. Shelf guards must be installed on all holdings shelving units. Exhibit cases must be built and secured to provide maximum structural stability in order to prevent collapse during seismic activity. Objects on exhibit must be mounted to prevent dislocation during an event and must also be cushioned to prevent damage in the event of movement during a seismic event.
- 3.16.3 Ceilings and suspension systems. Additional hanger wires must be installed for each suspended ceiling lighting fixture. Suspended ceilings, including air diffusers, light fixtures, and speakers, must be braced in accordance with the provisions of the IBC seismic design requirements. Additional hangers and support for mechanical elements above suspended ceilings must also be used. (Suspended ceilings are not permitted in textual, nontextual, and artifact holdings storage rooms.)
- 3.16.4 Mechanical and electrical equipment anchorage. Mechanical, electrical, and plumbing equipment must be anchored to prevent overturning or sliding due to lateral forces, including wind and seismic activity. For lateral load parameters relating to wind or seismic activity, the designers must follow the provisions of the applicable national code.
- 3.16.5 Reference publications. The following documents contain specific additional guidance on seismic design standards:

- 3.16.5.1 Federal Emergency Management Agency (FEMA) publications:
 - 3.16.5.1.1 National Earthquake Hazard Reduction Program (NEHRP): Recommended Guide to Application of the NEHRP Recommended Provisions in Earthquake-Resistant Building Design (No. 140)
 - 3.16.5.1.2 Improving Seismic Safety of New Buildings: A Non-technical Explanation (No. 99)
 - 3.16.5.1.3 Seismic Considerations, Office Buildings (No. 153)
 - 3.16.5.1.4 Handbook of Techniques for the Seismic Rehabilitation of Existing Buildings (No. 172)
 - 3.16.5.1.5 Handbook for the Seismic Evaluation of Existing Buildings (No. 178)
 - 3.16.5.1.6 Interim Guidelines: Evaluation, Repair, Modification and Design of Welded Moment Frame Structures (No. 267)
- 3.16.5.2 American Institute of Timber Construction: Timber Construction Manual
- 3.16.5.3 National Forest Products Association:
 - 3.16.5.3.1 National Design Specification for Stress Grade Lumber and Its Fastenings
- 3.16.5.4 Sheet Metal and Air Conditioning Contractors' National Association:
 - 3.16.5.4.1 Seismic Restraint Manual: Guidelines for Mechanical Systems
- 3.16.5.5 Other professional standards:
 - 3.16.5.5.1 Minimum Design Loads for Buildings and Other Structures, ASCE 7.
 - 3.16.5.5.2 ASME/ANSI A17.1a-, PART 24, "Elevator Safety Requirements for Seismic Risk Zone 2 (A, B, or C) or Greater" change
 - 3.16.5.5.3 NFPA 13, Installation of Sprinkler Systems

3.17 Longevity of construction.

- 3.17.1 Presidential library holdings are permanent. Therefore, library buildings must be

designed with long operating life expectancies for all major systems, including the structural and major mechanical and electrical systems and site utilities.

- 3.17.2 While building systems, such as mechanical units, pumps, and other equipment can be expected to have shorter useful lives, the basic structure of the building, including foundations, walls, roofs, soffits, and window systems, must be designed for permanency. The structural systems must be of such quality and workmanship that, except for routine repairs and maintenance, the basic structure will have a useful life of over 100 years. Therefore, NARA recommends that the entire library building structure be concrete, steel, or masonry. Exterior walls must be masonry or other durable products, not composite wall systems or spray on or trowel applications over steel studs and gypsum. Non-load bearing walls in the permanent exhibit gallery do not need to meet the 100-year rule.
- 3.17.3 Mechanical equipment, boilers, chillers, electrical switchgear, and air handling equipment must be specified and designed to operate at least 20 years or more, and products capable of having warranties for such periods of time must be considered and used to the fullest extent possible. To the extent feasible, locate equipment and design doors and access corridors to facilitate future replacement of equipment.
- 3.17.4 All mechanical, electrical, plumbing, and other building systems must be designed to allow easy and cost-efficient maintenance. System components, such as Heating, Ventilation, and Air Conditioning (HVAC) filters, must be located so they can be accessed and serviced with a minimum of effort and expense. Design documents must show required maintenance access (i.e., coil pull areas, filter replacement access, lamp replacement access, etc.). To the extent feasible, doors and access corridors must be located to facilitate future replacement of equipment. These requirements extend to the museum exhibit galleries where holdings on display must be secured against theft and vandalism, but easily accessible for object rotation and case maintenance. Likewise, systems must be designed so that eventual replacement can be accomplished with minimum expense. Local service providers must be able to service equipment such as fire detection and suppression systems and specialized HVAC systems.
- 3.18 Class A materials. Building finish materials, wearing surfaces, wall covering, cabinets, equipment, and other features of the building must be selected to have long wear capabilities and must be capable of meeting the demands of a public facility. They must be durable, easy to clean and maintain, and meet Class A building standards as defined by the Building Owners and Managers Association. Finishes must also have flame and smoke spread limitations. To the extent possible, floor surfaces such as carpets and tile, wall covering such as heavy duty vinyl, and fixtures must have a minimum wear life of at least 20 years.
- 3.19 Quality workmanship. As important as the selection of materials, the care taken in installation contributes to long lasting use and low maintenance and wear. The project design and the specifications for construction must establish high standards for installation of all building systems. An additional safeguard that ensures quality workmanship will be

the certification by the Construction Quality Manager (CQM). Section 1.19.3 in Part 1 provides the items that must be certified in compliance with the design and specification requirements by the CQM.

3.20 Leak-proof design and construction. Water leaks through the roof structure or due to plumbing leaks are a constant threat to holdings. The design and construction of a Presidential library must consider the potential dangers from leaks and implement every feasible method to guard against leaks during and after construction. Methods include carefully designing the storm drainage systems; eliminating all water pipes over and within holdings storage, processing and research rooms, and exhibit galleries (other than fire suppression pipe systems); and installing water detection sensors in the holdings storage, processing and research rooms, and exhibit galleries; and in any mechanical and computer rooms and in any other location that may contain holdings or where water is generated or used and the likelihood of a leak is high. All drains and traps must be screened to prevent pests from entering the building through the plumbing system. The roofing membrane and flashing must be designed to be easily accessible for replacement during the life of the building. Roofs over all holdings storage areas must be designed with a slope to prevent water ponding.

3.20.1 To protect holdings from water damage, mechanical rooms and mechanical equipment including water tanks and cooling towers must not be located over any holdings storage, processing or research rooms, or permanent and temporary museum exhibit galleries. When major equipment is located adjacent to holdings storage, special precautions must be taken to guard against water infiltration. These measures may include drain pans, recessed floors, and sump pumps.

3.20.2 Piping (with the exception of sprinkler piping) must not run through or directly above any holdings storage room or exhibit gallery. Pipes must not run through or directly above processing or research rooms.

3.20.3 In a new facility, to eliminate problems with moisture and water infiltration, holdings storage, processing rooms, and exhibit galleries must not be located below grade. When holdings storage, processing rooms, or exhibit galleries are located below grade in an existing facility, additional measures must be undertaken to prevent water and moisture infiltration into the holdings storage or other holdings-related spaces.

3.20.4 Holdings storage, processing and research rooms, and exhibit galleries must never be located under parking lots, plazas, driveways, or roadways where traffic can impact the integrity of the roofing system and cause leakage into storage rooms. They also must never be located under gardens, courtyards, or plazas.

3.21 ADA accessibility requirements.

3.21.1 Access to buildings and grounds must comply with Federal regulations implementing the Architectural Barriers Act (42 U.S.C. 4151) and the Americans with Disabilities Act (ADA) (42 U.S.C. 12101). Section 8 of the Accessibility

Guidelines for Buildings and Facilities (28 CFR Part 36) provides specific information on research room requirements. Particular attention must be given to the public entrances, doors and door hardware, signage, restrooms, parking and bus loading areas, and seating in theaters and lecture rooms. The exhibits must also meet these requirements and must be an area of particular concern and sensitivity in design considerations. The design must evaluate all paths from public transportation to all areas in the building and must ensure that the pathways are fully accessible as defined by the Accessibility Guidelines for Buildings and Facilities.

- 3.21.2 All programs offered by a Federal agency must be accessible and fully meet all statutory requirements for telephones for the hearing impaired, assisted listening devices, and other equipment to enable persons with disabilities equal access to programs and facilities.

3.22 Loading dock.

- 3.22.1 The loading dock must be designed to accommodate a 53-foot tractor trailer with sufficient room for the truck and trailer to maneuver into the loading dock area. The loading dock must have at least two loading bays to accommodate two delivery vehicles at a time. Door height to the loading dock must allow for height differences in a loaded and unloaded truck and trailer. The 48" high platform must have a dock leveler to receive trucks of varying heights. Loading dock area must be sized to allow use of fork lift.
- 3.22.2 The loading dock must be located under a protective canopy and fully protected from the weather so that the last 10-12 feet of the rear of a 53-foot full-size tractor trailer will be covered from the weather during unloading. The loading dock equipment must be specified to meet loading and impacts as outlined in later sections.
- 3.22.3 Exterior overhead doors at loading docks and service entrances to the loading dock must have a one-hour fire rating to protect the loading dock from exterior fire exposures.
- 3.22.4 The loading dock must be kept under negative air pressure relative to the critical areas of the facility. Loading docks must have an air supply and exhaust system that is separate from the remainder of the facility. The air intakes and returns must be designed such that lower quality air and environment cannot affect the critical areas and must have direct venting to the outdoors.
- 3.22.5 Security must be a particular concern in the design of loading docks. The loading dock will receive all major and most minor shipments to the library. Security cameras or other monitoring equipment must be provided in this area. The Security Control Center must also be near the loading dock, but within the building core.
- 3.22.6 NARA strongly recommends two loading docks and receiving rooms, one for NARA holdings and exhibits and another for such functions as food services

deliveries, trash removal, and office supplies deliveries. In all cases, the path from the loading dock to food services and trash collection points must not pass through holdings storage, processing rooms, exhibit galleries, or production rooms.

3.23 Freight and passenger elevators.

3.23.1 The building elevators must be located to meet the functional requirement of the building. Each building is required to have an objective study on the number and type of elevators required to meet the needs of that building. The passenger elevators for the building must be sized to meet ADA requirements for accessibility and to meet the requirements for movement of people and materials between floors. All elevators shall be required to meet the following:

3.23.1.1 ASME A17.5, latest edition – Elevator and Escalator Electrical Equipment

3.23.1.2 NFPA 70, latest edition – National Electric Code

3.23.1.3 Local Fire Authority and all other codes, ordinances and laws applicable within the governing jurisdiction

3.23.1.4 NFPA 101, latest edition – Life Safety Code

3.23.1.5 ADA - American Disabilities Act

3.23.2 If any holdings storage or exhibit production shops are located on a different level than the loading dock and exhibit galleries, the freight elevator must be sized to accommodate crates and artifacts of varying sizes, some oversized, and exhibit cases and partitions fabricated in house. Elevators must be designed in accordance with ANSI A-17.1, latest edition, and freight elevators must be constructed of durable finishes such as end grain wood flooring. The main freight elevator must have minimum dimensions of 10 feet by 10 feet and door dimensions of 10 feet wide by 12 feet high. It must have a lifting capacity of at least 4,500 pounds minimum and be designed for Class A loading.

3.24 Doorways and passageways. The doors and passageways in the building must be sized to meet ADA requirements for accessibility and to meet the requirements for movement of people and materials between spaces. In addition, the following spaces require larger openings.

3.24.1 Doors from all textual, nontextual, and artifact storage rooms to any corridors or adjoining processing rooms or other support spaces must be double width, at least six feet wide with two 3-foot leaves. An additional door at least three feet wide may also be provided for use by staff without records.

3.24.2 The door to the artifact storage room, exhibit production room, and temporary exhibit gallery must be a minimum of 12 feet high.

- 3.24.3 Door widths for the staff and volunteer lounges must be sufficient to allow for the movement of vending machines into and out of the room.
 - 3.24.4 The exhibit production shop must have double doors opening from the corridor and the paint shop. The doorways must be as wide as the corridor and as high as the ceiling.
 - 3.24.5 All doors to the paint shop, whether from a corridor or the exhibit production shop, must be fire-rated double doors compatible with wall rating. Each leaf of these doors must be not less than 36 inches and not more than 42 inches wide.
 - 3.24.6 The receiving room must have a doorway at least 8 feet wide and 12 feet high to the loading dock. A combination of a personnel door and an overhead coiling door is recommended. The designers must provide a travel route for large items from the receiving room through the building that is not restricted in any way by a lower ceiling or narrower doorway opening.
 - 3.24.7 Service corridors must be at least 8 feet wide. The corridor leading from the loading dock to the artifact storage room, exhibit production shop and temporary exhibit gallery must have a 12-foot high ceiling at a minimum.
- 3.25 Insulation and vapor barriers. Proper building insulation lowers the cost of operating the building. NARA standards require certain levels of insulation in all walls, roofs, and window wall applications.
- 3.25.1 NARA requires the following minimum building envelope insulation requirements. Where the local or national code exceeds these minimum requirement values, the designers must use the most extensive local or national codes.
 - 3.25.1.1 Minimum roof insulation standard is R-30.
 - 3.25.1.2 Minimum wall insulation standard is R-19.
 - 3.25.1.3 Minimum window wall insulated panel standard is R-10.
 - 3.25.1.4 Insulated glazing is required throughout the facility.
 - 3.25.2 Insulation materials used for the Presidential library building must be tested for fire performance characteristics as determined by the ASTM test method indicated below:
 - 3.25.2.1 Surface Burning Characteristics: ASTM E-84.
 - 3.25.2.2 Fire Resistance Ratings: ASTM E-119.
 - 3.25.2.3 Combustion Characteristics: ASTM E-136.
 - 3.25.3 Formaldehyde-based insulation and foamed-in-place insulation must be avoided

throughout the Library and must not be used in holdings storage rooms, processing rooms, or exhibit galleries.

- 3.25.4 Vapor barriers must be installed along the entire exterior of the library and between any two areas that have different humidity and temperature requirements.

3.26 Entrance vestibules and door seals.

- 3.26.1 Uncontrolled infiltration of air into the building results in mechanical operating inefficiencies and high utility costs. This is especially the case due to the Presidential library's need for strict temperature and humidity controls in its holdings rooms. Doors, windows, and other building penetrations are the primary sources of infiltration and must be designed to be sealed tightly.

- 3.26.2 Mechanical joints must be well-constructed to allow a minimum of gap. In addition to appropriate caulks or sealant, backer rod must be used to close gaps.

- 3.26.3 The main building entrances, including the entrances that serve the public, visitors, and researchers, must include a vestibule or a revolving door to control infiltration at these major points. Secondary exterior doors, including fire exits, overhead doors at the loading dock, and staff entrances must be provided with doors that securely seal when closed to prevent infiltration of air, dust, and pests. The maximum clearance around doors including between door and frame, between meeting edges of doors, and between the door and sill or floor must not exceed a one-eighth-inch gap.

- 3.26.4 Collection vestibules must be considered as a means to stabilize the environment in critical areas such as holdings storage and processing rooms and exhibit galleries. The processing rooms can serve as a vestibule to the holdings storage rooms. Doorways, duct runs, sprinkler runs, and all other penetrations in storage rooms must be well-sealed as appropriate to limit the flow of air in and out of the room. NARA must test and pre-approve gasket and caulk products.

3.27 Fireproofing.

- 3.27.1 General requirements. The fire resistance ratings of structural elements and construction assemblies must be in accordance with ASTM E-119.

- 3.27.2 Sprayed-on fireproofing. Sprayed-on fireproofing must not be used in critical areas (as defined in Part 1). In addition to code requirements listed in the National Building Code to be used by the designers, cementitious fireproofing used on Presidential library buildings must be specified to meet the following minimum requirements:

- 3.27.2.1 Deflection: No cracking, spalling, or delamination. Test method ASTM E-759.

- 3.27.2.2 Impact on Bonding: No cracking, spalling, or delamination. Test method ASTM E-760.

- 3.27.2.3 Corrosion Resistance: No corrosion. Test method ASTM E-937.
 - 3.27.2.4 Air Erosion: Maximum weight loss of 0.25 g./sq. ft. in 24 hours. Test method ASTM E-859.
 - 3.27.2.5 Surface Burning Characteristics: Maximum flame spread rating of 10 or less for concealed fireproofing, 5 or less for exposed fireproofing, and smoke development rating of 0. Test method ASTM E-84.
 - 3.27.2.6 Concealed Sprayed-on Fireproofing, Medium Density: The following are additional minimum requirements for concealed cementitious fireproofing:
 - 3.27.2.6.1 Density: The greater of 22 lb./cu. ft. or the density required to attain the required fire resistance rating. Test method ASTM E-605.
 - 3.27.2.6.2 Thickness: The greater of 3/8 inch or the thickness required for the fire resistive design. Test method ASTM E-605.
 - 3.27.2.6.3 Bond Strength: 2,000 psf, minimum. Test method ASTM E-736.
 - 3.27.2.6.4 Compressive Strength: 100 psi, minimum. Test method ASTM E-761.
 - 3.27.2.7 Exposed Sprayed-on Fireproofing, High Density: The following are additional minimum requirements for exposed cementitious fireproofing:
 - 3.27.2.7.1 Density: The greater of 40 lb./cu. ft. or the density required to attain the required fire resistance rating. Test method ASTM E-605.
 - 3.27.2.7.2 Thickness: The greater of 3/8 inch or the thickness required for the fire resistive design. Test method ASTM E-605.
 - 3.27.2.7.3 Bond Strength: 10,000 psf, minimum. Test method ASTM E-736.
 - 3.27.2.7.4 Compressive Strength: 550 psi. Test method ASTM E-761.
 - 3.27.2.8 Exposed sprayed-on fireproofing is acceptable for use in non-critical spaces such as mechanical rooms. Use high density materials at interior and exterior exposed locations.
- 3.28 “Smart” building (communications and IT cabling/cable ways). This paragraph specifies the 2006 requirements for a library computer communications system; however, due to the rapid changes in technology, the designers must consult with NARA information technology (IT) staff to determine the most current network technical specifications.
- 3.28.1 The building must include a state-of-the-art LAN/WAN computer communications

system, including a cable backbone linking the computer room and the concentrators and routers, Intermediate Distribution Frames (IDF), and IDF to work station cabling. Backbone cables can be a mix of category 6 cables and 50/125-micron multimode fiber. Optical Fiber MIC Interlocking Armored Plenum Cable (2 – 24 Fiber) may be installed. This cable does not require conduit or Inner Duct.

- 3.28.2 There should be a master power shutdown located just inside the computer room for emergency power shutdown. If a diesel generator is located onsite, the computer room should be connected to the generator and capable of receiving its power from the generator. The MDF and IDF should have a non-water based fire suppression system.
- 3.28.3 The building should comply with the most current version of the Commercial Building Wiring Standards and Building Infrastructure Standards:
- 3.23.3.1 TIA/EIA-568-A-1995 covering commercial building telecommunication wiring standards.
 - 3.23.3.2 TIA/EIA-578-A updates.
 - 3.23.3.3 TIA-568-B.1-2000 updates covering commercial building telecommunications wiring standards.
 - 3.23.3.4 TIA/EIA-569-A-1995 covering commercial building standards for telecommunications pathways and spaces.
 - 3.23.3.5 TIA/EIA-606-1994 covering building infrastructure administration standards. (Not network management systems.)
- 3.28.4 The LAN/WAN and telecommunications IDFs must be located in dedicated communications closets (security and fire alarm system components may share the communications closets, but electrical distribution panels must be in a separate closet). The communications closets should be vertically stacked whenever possible. All communications closets must be air conditioned in relation to the amount of humidity and heat gain from the equipment located therein, based on manufacturer's information for that equipment. All communications closets containing telecommunications, telephone, or computer equipment must meet the environmental air quality requirements for the library computer room and include power supported by the uninterruptible battery backup power systems (UPS).
- 3.28.5 A plan for communications wiring, equipment, and installation must be developed as part of the library design so that all communications systems are installed prior to acceptance of the library by NARA. Wiring for these systems must be pre-installed, tested for continuity, low loss, and specified data transmission capabilities prior to acceptance of the library. All main cabling or fiber optic cables must be run in conduit or in cable trays. Loose wiring must not be run above ceiling plenums. A wire tray or J hooks must be used in the ceilings. An appropriate number of voice

and data communications jacks must be installed in each workspace. Designers must consult with NARA about specific communications requirements for individual rooms; however, at least two outlets must be installed in every work area (work area is defined to be the work space associated with one worker).

- 3.28.6 NARA recommends two faceplate connection standards as stipulated in the standards referenced in paragraph 3.29.2. Both of these refer to connecting twisted pairs to an RJ-45 style faceplate. The two methods swap the position of the orange and green pairs on the connector. Ethernet and Fast Ethernet both work with either method as long as it is implemented the same way at every outlet in the facility. The face plates must have dual 4-pair RJ-45 jacks mounted on the upper portion of the face plate for data. The RJ-45 must comply with the EIA568-B or AT&T WECO connection scheme. Fiber optic cables must be terminated using SC connectors.¹
- 3.28.7 All computer wiring must terminate on 110 style connection blocks with termination strips with front or side access via RJ-45 ports. Blocks must be 4-pair category 6 rated with detachable legs and label holders. Each port must be terminated with all 4 pairs at both ends (faceplate and cross connection block). All field (horizontal) wiring must be terminated on the bottom of the block, leaving the top open for cross connecting jumper cables (vertical cables). 110 style terminal blocks must be used to terminate all telephone cables (4 pairs).
- 3.28.8 For computer rooms, cabling must be run under a raised flooring system with cable trays or J hooks provided to keep the cabling off the floor. For nontextual processing rooms, cabling should be run under a raised flooring system with cable trays or J hooks provided to keep the cabling off the floor. Cable trays must be used in all major corridors and must be located above the finished ceiling.
- 3.28.9 High quality and low loss cabling must be provided. All LAN/WAN local cabling and telephone cabling must be fire retardant “open air plenum” rated, meeting all Federal and local fire codes. The cable must be 4-pair 24 AWG cable compliant with UL cable certification programs for category 6 wiring, and must be run separate from coaxial cabling and other systems. Wiring must meet the flame and smoke generation requirements for security and fire alarm wiring and be plenum rated when used in any ceiling plenums or when the wiring is not run in conduit. Where coaxial cabling is used for security monitoring, LAN/WAN, or video, the coaxial cables must be run in metal conduit or separated at least three feet from other cable systems.
- 3.28.10 Technology will continue to push the requirements for new connections and equipment. Therefore, additional patch panels and punch down blocks -- 50% above the requirement for initial occupancy -- must be provided as part of the building systems to allow for future connections to routers, phone switches, and other

¹ Currently SC is the most widely deployed connector and is the connector of choice for future facilities design. Moreover, Fast Ethernet vendors will likely stick with SC, because SC is used for fiber in 100/1000 Mb/s Ethernet designs.

communication equipment at a later date. All local computer and telephone wiring must terminate on 110-style connecting blocks with termination strips. The blocks must be 4-pair category 6 rated with detachable legs and label holders. All field wiring must be terminated on the bottom of the block leaving the top open for cross connecting jumper cables.

- 3.28.11 Special function equipment (such as video readers, video conferencing and telecommunication equipment, and other high data output equipment) must have fiber optic cable connections directly to the equipment.
- 3.28.12 Electrical systems providing power for communications equipment, including telephone, building management, and LAN/WAN must include UPS and have line current power conditioning. These emergency systems must also be placed on the standby emergency generator.
- 3.29 System warranties with NARA as the beneficiary. At the time of delivery of the project to NARA, the building warranties must be fully assigned to NARA for management. The general contractor warranty on the building for the first year of occupancy must also be assigned to NARA. NARA also requires the following specific warranty times as a minimum.
 - 3.29.1 Roof - 20 years.
 - 3.29.2 Mechanical equipment.
 - 3.29.2.1 Compressors - 10 years.
 - 3.29.2.2 Air handling units (AHU) motors - 1 year.
 - 3.29.2.3 AHU coils – 10 years.
 - 3.29.2.4 Terminal and fan coil units (coils and motors) – 1 year.
 - 3.29.2.5 Cooling towers – 5 years.
 - 3.29.3 Electrical equipment.
 - 3.29.3.1 Transformers - 20 years.
 - 3.29.3.2 Switchgear - 20 years.
 - 3.29.3.3 Lighting Ballasts - 3 years.
 - 3.29.4 Carpet - 10 years (up to 20 years to the fullest extent possible).
 - 3.29.5 Window walls, seals, and insulation - 10 years.
 - 3.29.6 Doors.

- 3.29.6.1 Wood doors - 5 years.
- 3.29.6.2 Fire Rated doors - 10 years.
- 3.29.6.3 Hardware - 2 years.

3.30 Energy conservation.

3.30.1 Energy efficiency requirements. The design of the building should meet the requirements of new buildings as contained in ASHRAE/IES (American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society) Standard 90.1. In addition, the Department of Energy's (DoE) Performance Standards for New Commercial and Multi-Family High-Rise Residential Buildings (10 CFR Part 435 Subpart A) contain energy performance goals that apply to commercial buildings. Where these DoE performance standards do not conflict with achieving the required environmental conditions, NARA strongly recommends using this structured approach to energy efficient design. This approach provides design flexibility while assuring a minimum level of efficiency. The Foundation must provide energy data to NARA at the earliest stage possible during the design process.

3.30.2 Preservation considerations. NARA requires that maintaining appropriate environmental conditions for its holdings takes precedence over short-term energy savings. While NARA understands the need for energy efficient buildings and compliance with energy-savings requirements, energy efficiency alone must not be the guiding principle to system or building design. Preservation of holdings in perpetuity must always be the core precept for building design.

3.30.3 Energy analysis.

3.30.3.1 An energy analysis is an important predictor of the energy costs of building operations. The Foundation must provide an energy analysis to NARA as early in the design process as is feasible.

3.30.3.2 Designers must use current, industry-accepted software programs to simulate energy consumption and efficiency based on the proposed library design. At a minimum, the chosen software must be capable of accepting the following input parameters: weather data, fuel data, building orientation, building width and length, building mass, number of stories, exterior wall construction, roof construction, glazing in walls and roof, type of glass used, and solar screening devices. The selected software must also be able to compare all appropriate mechanical systems options and provide alternative life-cycle cost analysis for selection of the mechanical system. Software parameters must include temperature and relative humidity set points.

3.30.3.3 Energy consumption goals for lighting and major mechanical systems

must be set for the energy analysis. Presidential libraries must be capable of operating efficiently at less than 100,000 BTU/sq ft (energy use budget). This is not a requirement, but provides a target for the designers. An energy budget for the facility must be developed reporting the cost of energy uses in dollar value per square foot and BTU per square foot, and by major building use, such as lighting, power, heating and ventilation equipment, and air-conditioning and humidification/dehumidification equipment. Buildings that have projected operating costs above 100,000 BTU/sq ft must be evaluated for potential energy conservation efforts, and new projects must be designed with an energy budget in mind. NARA must report to Congress prior to acceptance of the library the anticipated operational costs of the library and explain any reasons for higher than anticipated costs.

3.30.4 Additional requirements. In addition to ASHRAE/ANSI standard 90.1, the following guidelines must be incorporated in all new Presidential library projects.

3.30.4.1 Mechanical.

3.30.4.1.1 Variable Frequency Drives (VFD) for air handling units and chilled water circulating pumps must be used for all non-critical spaces. A constant air supply must be supplied to critical areas.

3.30.4.1.2 Night set backs must be used on all non-essential air handling units. Set backs must not be used on air handling units servicing holdings storage rooms, processing rooms, and exhibit galleries.

3.30.4.1.3 Free cooling must be implemented for air handling units, chillers, and cooling towers except those supplying critical areas.

3.30.4.1.4 Waste heat recovery, runaround, and economizer must be incorporated in the design of HVAC systems.

3.30.4.2 Plumbing. Water conservation must be incorporated in the plumbing design of the Presidential library building. The designer must use minimum flow rate plumbing fixtures. The following flow rate guidelines must be incorporated:

Figure 3-1: Flow rate guidelines

| | |
|--------------------------------------|------------------------------|
| Lavatory faucets | 1.5 gallons per minute (gpm) |
| Shower | 2.0 gpm |
| Kitchen and custodial closet faucets | 2.2 gpm |
| The maximum flow rate for hot | 0.5 gpm |

| | |
|-----------------------|---------------------------|
| water lavatory faucet | |
| Urinals | 1 gallons per flush (gpf) |
| Water closets | 1.6 gpf |
| Outlet temperature | 105° F |

3.30.4.3 Electrical.

3.30.4.3.1 Electrical wiring must be installed according to NFPA 70 National Electrical Code. In addition to ground fault circuit interrupters to prevent electrocution, arc-fault circuit interrupters must be installed on all electrical circuits.

3.30.4.3.2 Exterior lighting must be controlled by a lighting control system or energy management system.

3.30.4.3.3 Higher efficiency motors must be used.

3.30.4.3.4 Use of occupancy sensors for lighting control is highly recommended for low traffic area. Sensors must be used in exhibit galleries and holdings storage whenever feasible.

3.30.4.3.5 T-8 lamps with electronic ballasts must be used in all Presidential libraries for office and general fluorescent lighting.

3.30.5 Energy management system. A stand-alone Direct Digital Control (DDC) system with a remote computer in the facility manager's office and with a remote monitoring system in the Security Control Center must be provided. In addition the capability must be provided for off-site monitoring of the system. The systems must be supplied by a reputable manufacturer of building management systems. The system must include a computer, printer, controllers, sensors, controlled devices, wiring, and a portable operator's plug-in terminal. The system must also be programmable and able to perform all energy management functions and be BACnet compatible.

3.30.6 Sensors.

3.30.6.1 For critical areas control and monitoring should not be in return duct. Locate sensors within the room and average them for your control/monitor

3.30.6.2 Temperature and relative humidity sensors must be located within all critical areas. Depending on the size of the room and the configuration of the systems, multiple sensors may be required in a single room in order to maintain NARA requirements. When multiple sensors are required, data must be averaged.

- 3.30.6.3 AHUs in non-critical areas must be controlled off of a return air sensor and monitored by room sensors.
- 3.30.6.4 The outdoor temperature and relative humidity must also be monitored.
- 3.30.6.5 The sensitivity of sensors must be within 2°F and 2% relative humidity. The energy management system must allow viewing of the current temperature and relative humidity in any holdings storage room or exhibit gallery. The management system must be capable of organizing temperature and relative humidity information by room and graph or chart this information in a variety of ways. The system must be able to store the information for at least 60 days and must allow the information to be saved to system external media, such as compact disk.

3.31 Post-occupancy.

- 3.31.1 Adjustments. Within the first year of occupancy, necessary services to make final adjustments to the finish hardware must be provided by the Foundation at its cost. Adjustments to the HVAC and lighting equipment must be provided to meet the requirements established in this standard. Within 60 days after the first year of occupancy, a meeting must be held by a representative of the foundation and of the general contractor with the Library's facility manager and a representative from preservation programs to discuss his or her observations of the operation of the HVAC system. Any necessary adjustments must be made at that time to the HVAC air balance and reported to NARA.
- 3.31.2 Renovation safeguards. Protection of the holdings and existing building during any addition or renovation to an existing Presidential library must be of paramount importance. Any work using a potential source of ignition, including but not limited to hot pots, heat guns, welding, or torch cutting must be pre-approved by the NARA on-site project supervisor. A daily permit must be received before daily work begins, and the contractor and NARA supervisor must review safety procedures. These procedures must include a work environment as free as possible of fuel for fire, protection of the area including portable fire extinguishers, and where required by code, fire blankets. In addition, any work must have at least two workers present at all times, one of whom has the responsibility to monitor and respond to any ignitions. A post-work inspection of the location must also be completed. Any solvents or solvent-containing materials such as rags and brushes must be placed in a fire-safe container, and the contents removed at the end of each workday. Contractors are responsible for maintaining a clean worksite and for constructing temporary barriers to contain dust and debris. In addition, dust must be controlled by maintaining the work area at a negative pressure.

Section D. Roofing and Skylights

- 3.32 Roofing. NARA requires the use of roofing systems available with minimum of 20-year warranty. The most stringent standards are required for roofs over holdings storage areas.

NARA must approve the use of any roofing materials not already on this list.

3.32.1 Applicable standards. Roofing design must follow the recommendations of the National Roofing Contractors Association (NRCA) as contained in NRCA publication, NRCA Roofing and Waterproofing Manual. The design of metal flashing, trim, and roofing must follow the recommendations of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) publication, Architectural Sheet Metal Manual. Additional standards for roofing and insulation systems include:

3.32.1.1 AIA Masterspec 07561 for Hot-Fluid Applied Roofing.

3.32.1.2 AIA Masterspec 07511 for Built-up Asphalt Roofing.

3.32.1.3 AIA Masterspec 07552 for SBS-Modified Bituminous Membrane Roofing.

3.32.1.4 UL 790 Class A, Fire Resistance of Roof Covering Materials.

3.32.1.5 ASTM E-108 Class A, Fire Tests of Roof Materials.

3.32.2 Flat roofing. Nominally "flat" roofing over concrete substrate must use one of the following systems:

3.32.2.1 Hot-Fluid Applied Rubberized Asphalt Roofing System (IRMA or PMR):

3.32.2.1.1 Roofing system to comply with requirements of CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing" and CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing.

3.32.2.1.2 Components:

3.32.2.1.2.1 Substrate: Normal-weight concrete, compressive strength 2500 psi, minimum.

3.32.2.1.2.2 Roofing Membrane: Single-component, 215-mil thick, reinforced, 100 percent solids, hot fluid-applied, rubberized asphalt.

3.32.2.1.2.3 Separator Sheet: Over asphalt membrane.

3.32.2.1.2.4 Insulation: Rigid ASTM C 578 Type VI extruded polystyrene insulation. Use ASTM C 578 Type VII insulation at high traffic roofs. Insulation to have rabbeted edges for drainage. R-value requirements identified in other sections of standards.

- 3.32.2.1.2.5 Fabric Mat: For protection of insulation.
 - 3.32.2.1.2.6 Topping: Stone aggregate or concrete roof pavers, or a combination of the two materials.
 - 3.32.2.1.2.7 Walkways: Concrete pavers.
 - 3.32.2.1.2.8 Warranty: 20 years, minimum.
- 3.32.2.2 Built-up Asphalt Roofing System:
- 3.32.2.2.1 Performance and Installation Requirements: Design per ASCE 7, and FMG listing requirements. Install per NRCA Manual “The NRCA Roofing and Waterproofing Manual” and ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing" requirements.
 - 3.32.2.2.2 Components:
 - 3.32.2.2.2.1 Substrate: Concrete.
 - 3.32.2.2.2.2 Vapor Retarder: Designer to determine requirements for vapor retarder.
 - 3.32.2.2.2.3 Insulation: Rigid polyisocyanurate insulation. R-value requirements indicated in other sections of standards.
 - 3.32.2.2.2.4 Cover Board: Over insulation.
 - 3.32.2.2.2.5 Roofing: 4-ply built-up roofing system with ASTM D 2178 Type VI felts.
 - 3.32.2.2.2.6 Topping: Aggregate topping in hot asphalt flood coat or mineral surfaced cap sheet (4th ply).
 - 3.32.2.2.2.7 Walkways: Mineral-surfaced asphaltic pads or rubber pads.
 - 3.32.2.2.2.8 Warranty: 20 years, minimum.
 - 3.32.2.3 SBS-Modified Bituminous Membrane Roofing System:
 - 3.32.2.3.1 Performance and Installation Requirements: Design per ASCE 7, FMG listing, or SPRI design guide requirements. Install per NRCA Manual “The NRCA Roofing and Waterproofing Manual” and ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" requirements.

- 3.32.2.3.2 Components:
 - 3.32.2.3.2.1 Substrate: Concrete
 - 3.32.2.3.2.2 Vapor Retarder: Designer to determine requirements for vapor retarder.
 - 3.32.2.3.2.3 Insulation: Rigid polyisocyanurate insulation. R-value requirements indicated in other sections of standards.
 - 3.32.2.3.2.4 Cover Board: Over insulation.
 - 3.32.2.3.2.5 Roofing: 3-ply built-up roofing system with two plies of ASTM D 2178 Type VI felts and one top ply of ASTM D 6162 SBS-modified felt.
 - 3.32.2.3.2.6 Topping: Aggregate topping in hot asphalt flood coat or mineral-surfaced SBS-modified cap sheet (3rd ply).
 - 3.32.2.3.2.7 Walkways: Mineral-surfaced asphaltic pads or rubber pads.
 - 3.32.2.3.2.8 Warranty: 20 years, minimum.
- 3.32.3 Nominally “flat” roofing over metal substrate must use one of the following systems:
 - 3.32.3.1 Built-up Asphalt Roofing System:
 - 3.32.3.1.1 Performance and Installation Requirements: Design per ASCE 7, and FMG listing requirements. Install per NRCA Manual “The NRCA Roofing and Waterproofing Manual” and ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing" requirements.
 - 3.32.3.1.2 Components:
 - 3.32.3.1.2.1 Substrate: Metal decking.
 - 3.32.3.1.2.2 Substrate Board (Thermal Barrier): Designer to determine requirements per applicable building code.
 - 3.32.3.1.2.3 Vapor Retarder: Designer to determine requirements for vapor retarder. Provide

- substrate board for application of vapor retarder.
 - 3.32.3.1.2.4 Insulation: Rigid polyisocyanurate insulation. R-value requirements indicated in other sections of standards.
 - 3.32.3.1.2.5 Cover Board: Over insulation.
 - 3.32.3.1.2.6 Roofing: 4-ply built-up roofing system with ASTM D 2178 Type VI felts.
 - 3.32.3.1.2.7 Topping: Aggregate topping in hot asphalt flood coat or mineral surfaced cap sheet (4th ply).
 - 3.32.3.1.2.8 Walkways: Mineral-surfaced asphaltic pads or rubber pads.
 - 3.32.3.1.2.9 Warranty: 20 years, minimum.
- 3.32.3.2 SBS-Modified Bituminous Membrane Roofing System:
- 3.32.3.2.1 Performance and Installation Requirements: Design per ASCE 7, FMG listing, or SPRI design guide requirements. Install per NRCA Manual "The NRCA Roofing and Waterproofing Manual" and ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" requirements.
 - 3.32.3.2.2 Components:
 - 3.32.3.2.2.1 Substrate: Metal decking.
 - 3.32.3.2.2.2 Substrate Board (Thermal Barrier): Designer to determine requirements per applicable building code.
 - 3.32.3.2.2.3 Vapor Retarder: Designer to determine requirements for vapor retarder. Provide substrate board for application of vapor retarder.
 - 3.32.3.2.2.4 Insulation: Rigid polyisocyanurate insulation. R-value requirements indicated other sections of standards.
 - 3.32.3.2.2.5 Cover Board: Over insulation.

- 3.32.3.2.2.6 Roofing: 3-ply built-up roofing system with two plies of ASTM D 2178 Type VI felts and one top ply of ASTM D 6162 SBS-modified felt.
 - 3.32.3.2.2.7 Topping: Aggregate topping in hot asphalt flood coat or mineral-surfaced SBS-modified cap sheet (3rd ply).
 - 3.32.3.2.2.8 Walkways: Mineral-surfaced asphaltic pads or rubber pads.
 - 3.32.3.2.2.9 Warranty: 20 years, minimum.
- 3.33 Roof drainage. Dead level roofs are prohibited. Roof drains or scuppers are the only low points permitted. All roofs should provide (preferred, but not required) a minimum slope to roof drains of 4% (1/2" per foot) on roofing surfaces. All roofs must provide (required minimum) a minimum slope to roof drains of 2% (1/4" per foot) on roofing surfaces and meet the requirements listed in NRCA for slope for specific roof type. The piping must be properly clamped and provided with hangers and supports. Roof drain piping must be well planned so that drains and drain pipes do not run over or through the holdings storage, processing, or research rooms, or the exhibit galleries. Any renovations to existing buildings must comply with this requirement. When it can be proven that compliance is not possible, supplemental measures must be provided to prevent water leaks. A water detection system connected to the security or building emergency system must be included and connected to the water detection sensors in the holdings storage, processing and research rooms, and exhibit galleries; and in any mechanical and computer rooms and in any other location that may contain holdings or where water is generated or used and the likelihood of a leak is high.
- 3.34 Access to roof. An interior permanent stair must be provided to permit access to roof-mounted equipment and to facilitate roof maintenance. Roof access must not be through holdings storage, research rooms, exhibit galleries, or processing rooms.
- 3.35 Roof-mounted equipment.
- 3.35.1 Major HVAC equipment must not be mounted on the roof of a new facility. Small fans and vents can be roof mounted but must not be located over any critical areas. For existing buildings, roof-mounted equipment must be kept to a minimum and must be housed in penthouses or screened by walls. Penthouses and screen walls must be integrated into the building design and constructed of the same or similar materials used elsewhere on the building exterior. Certain linear roof-mounted equipment, such as antennae, lightning rods, flagpoles, etc., does not have to be screened, but these elements must be integrated into the building design. The building rooftop configuration must provide the space and strength to accommodate equipment for satellite, microwave, and cellular telephone antennae. Equipment must be mounted with sufficient roof clearance to allow future replacement of the

roof without the need for disconnecting or removing the equipment. HVAC equipment must not be mounted on the roof of a new facility to allow future replacement of the roof without the need for disconnecting or removing the equipment. Any equipment mounted on the roof of an existing building must be panned and drained.

- 3.35.2 For maintenance purposes, walkways must be provided on the roof along routes to, from, and around equipment. Where walkways are within 3 feet of a vertical drop of 12 inches or more, handrails must be provided. With the exception of walkways, building elements must not be supported by the roofing system. With the exception of walkways, do not place roof mounted-equipment in direct contact with the roofing system (roofing protection required.)
- 3.35.3 Equipment must not be mounted on any roof over holdings storage rooms or exhibit galleries. In addition, no roof penetrations are permitted over holdings storage and processing rooms or exhibit galleries.

3.36 Skylights and sloped glazing.

- 3.36.1 Skylights. Skylights are defined as windows or roof accessories that are pre-fabricated assemblies shipped ready for installation. NARA strongly recommends against use of skylights. Skylights are prohibited over holdings storage, processing, and research rooms and exhibit galleries. If used in other areas, skylight design must follow the guidelines of the AAMA Standard 1600 and must have a slope greater than 25%. Skylights must use low emissivity glass and filter 99% of UV radiation below 380 nM. Pre-fabricated skylight assemblies must be factory tested in accordance with ASTM E331 using a differential static pressure of at least 12 pounds per square foot on the system, with no water penetration occurring. Placement must be calculated to prevent glare or overheating in the building interior. Condensation gutters and a path for carrying the condensation away from the framing must be provided.
- 3.36.2 Sloped glazing. Sloped glazing is defined as field-assembled windows or roof accessories designed to admit light. Sloped glazing must not be used in a Presidential library.

Section E. Floor Loadings and Special Requirements

3.37 Floor design live loads and special requirements.

3.37.1

Figure 3-2 details the design floor live loads and special requirements by type of space. In an existing building, the floor load limit must be established for each holdings storage and processing rooms and exhibit gallery areas by a licensed structural engineer. In holdings storage rooms, the limit must take into consideration the weight of the specific type(s) of holdings to be stored, height and type of the

shelving or storage equipment and resulting concentrated loads on the floor, the width of the aisles, the configuration of the space, etc. The allowable load limit must be posted in a conspicuous place and must not be exceeded.

Figure 3-2: Floor design live loads and special requirements

| Area | Floor Load lbs/sq ft | Special Requirements |
|-------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Offices, conference room, research rooms | 100 | Provide either raised access floor *** or under-floor cable raceways providing access to the cable tray through poke through fittings or access panels at not more than 5 foot intervals. |
| Security Control Center | 125 | Raised access floor ***; Provide the capability of holding a five drawer safe and a weapons safe. |
| Processing rooms | 200 live load | Anti-static floor covering. Carpet must not be used. |
| Computer room | 200 | Raised access flooring ***; anti-static floor covering. |
| Staff lounges | 100 | Easy to clean. |
| Corridors --general --material movement | 100 250 | A smooth surface is required to facilitate moving holdings. No carpeting is allowed in corridors connecting records spaces. |
| Mechanical/electrical rooms and exhibit production shop | 150* | None |
| Stairs and lobbies | 100 | None |
| Roofs | 30** | None |
| Auditorium/Orientation theater | 100 | None |
| Loading dock and receiving room | 250 | The loading dock must have at least two loading bays to accommodate two delivery vehicles. The loading dock must be equipped with one dock leveler capable of holding at least 20,000 pounds of live load on the lift platform. The dock levelers should also be capable of resisting the gross moving load of a tractor trailer and should withstand 35,000 lb of force without permanent deflection or distortion. |
| Museum permanent exhibit gallery | 250 | Permanent exhibit gallery should be capable of supporting an automobile as part of the exhibit. |
| Museum temporary exhibit gallery | 250 | Raised access floor *** |
| Holdings storage rooms including textual, nontextual and artifact rooms | 350 | Floor deflection must be limited to $L/750$, where L is span in inches when compact shelving is used. Proposed system must be reviewed to confirm adequacy of load and rail deflection requirements. |

| Area | Floor Load lbs/sq ft | Special Requirements |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|
| Door thresholds, inclines, and elevator gaps | To match greater of adjacent space requirements | Must be as smooth as possible to facilitate moving holdings and prevent bumping. |
| <p>* Or actual equipment weight if higher.</p> <p>** Increase as required for snow drift conditions</p> <p>***Raised access floor assemblies must be designed for required floor live load, including concentrated loads, and shall include seismic bracing as required by IBC.</p> | | |

Section F. Heating, Ventilation, and Air Conditioning

3.38 General approach.

- 3.38.1 The purpose of HVAC systems in Presidential library buildings is to provide a safe, clean, comfortable, and healthy environment for the occupants and to ensure the preservation of all holdings. Ideally, the systems must work so well that the building occupants are not aware of them. Precise design of the systems and specialized equipment is essential in order to provide the environmental standards necessary for long-term preservation of holdings. The spaces where holdings will be stored, processed, and displayed require specialized environmental conditions, maintained continuously. NARA owns and operates its buildings much longer than the private sector. Consequently, a high level of durability and the ability to replace machinery during the life of the building at a reasonable cost must be important design criteria. Systems must also be designed for energy efficiency (refer to paragraph.3.30.1), and the design must allow for ease of maintenance.
- 3.38.2 There are several options available when designing systems for a Presidential library building. Advances in technology make it tempting to pursue the elusive “state of the art” in modern designs. Yet reliability must not be sacrificed for sophistication. To best serve NARA facilities, designers must use proven systems assembled in a straightforward manner. A computer-based building automation system (BAS) that monitors and automatically controls lighting, elevators, heating, ventilating, air conditioning, humidification, and dehumidification is critical to the efficient operation of the modern Presidential library building. During the design review process, NARA reserves the right to decline any HVAC technology or application.
- 3.38.3 The HVAC system for a Presidential library must be designed to provide specific requirements. The HVAC system in a Presidential library requires more space than in a typical building, and the HVAC systems must be located in particular areas. A licensed mechanical engineer experienced in developing specialized environmental systems (for example for museums, libraries, archives, or scientific institutions) must design the HVAC systems from the initial design stages through

commissioning.

- 3.38.4 In the design and selection of the appropriate HVAC systems, economics and energy conservation must be considered in arriving at optimum design solutions that will maintain the critical environment for long-term preservation of holdings. (Refer to paragraph 3.30.2). While economical operation and energy conservation issues are important, the critical design element must be to maintain the strict environmental controls needed for protective, long-term storage of holdings. Careful attention must be given to such design factors as siting, orientation, insulation alternatives, fenestration, glazing type, and natural ventilation. All holdings rooms must be considered “critical areas” when designing the system(s).
- 3.38.5 Mechanical systems must be designed to respond to the local climate and make best use of natural resources.
- 3.38.6 The HVAC system must undergo a pre-occupancy purge sufficient to test the systems and to remove construction dust from the ductwork and system components. The systems serving critical areas must be operable three months prior to moving holdings into the building. This will allow the system to be monitored and any necessary adjustments to be made prior to holdings exposure. All systems, both general and critical, must continue to be monitored for 12 months after NARA accepts the building, and the designer must make any adjustment necessary to provide the environments required in this Standard.
- 3.39 Codes and standards.
- 3.39.1 The standards listed here are intended as guidelines for building-wide design. They are mandatory only where referenced as such in the text of the chapter. The list is not meant to restrict the use of additional guides or standards.
- 3.39.1.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals.
- 3.39.1.2 ASHRAE Handbook - HVAC Applications, Chapter 20, Museums, Libraries, and Archives.
- 3.39.1.3 ASHRAE/ANSI 15, Safety Standard for Refrigeration Systems
- 3.39.1.4 ASHRAE 52.2, Methods of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.
- 3.39.1.5 ASHRAE 55, Thermal Environmental Conditions for Human Occupancy.
- 3.39.1.6 ASHRAE 62-2004, Ventilation for Acceptable Indoor Air Quality.
- 3.39.1.7 ASHRAE/IES 90.1, Energy Conservation Standards.

- 3.39.1.8 ASHRAE 100, Energy Conservation in Existing Buildings.
- 3.39.1.9 National Fire Protection Association (NFPA) Standards 90, 90A, 90B, 92, and 96.
- 3.39.1.10 Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Manuals
- 3.39.1.11 Sound attenuation, including mechanical equipment [Naval Facilities Guide Specs. (NFGS) 15070, sound criteria, duct work: SMACNA APIDC, 1975, SMACNA; ASMM 1993]
- 3.39.1.12 Sound attenuators:
 - 3.39.1.12.1 Air Movement Control Association (AMCA) Standards 300, 301, 302, 303, 330.
 - 3.39.1.12.2 ASHRAE 68, Laboratory Method of Testing to Determine the Sound Power in a Duct. .
 - 3.39.1.12.3 ANSI S1.1, S1.4, S12.1.
 - 3.39.1.12.4 Air-Conditioning and Refrigeration Institute (ARI), ARI 575.
 - 3.39.1.12.5 Acoustical Society of America (ASA), ASA 16, 47, 49.
 - 3.39.1.12.6 American Society of Testing and Materials (ASTM), ASTM E-90, E-477, E-596.
- 3.39.2 Additional standards applicable for the critical areas of the Presidential library building are listed below. These standards should be incorporated into the design of storage rooms:
 - 3.39.2.1 Textual storage:
 - 3.39.2.1.1 NISO-TR01, Technical Report 1: Environmental Guidelines for the Storage of Paper Records.
 - 3.39.2.1.2 ANSI/NISO Z39.79, Environmental Conditions for Exhibiting Library and Archival Materials.
 - 3.39.2.2 Nontextual storage:
 - 3.39.2.2.1 ISO 18911 Imaging Materials - Processed Safety Photographic Films - Storage Practices.
 - 3.39.2.2.2 ISO 18918 Imaging Materials - Processed Photographic Plates - Storage Practices.

- 3.39.2.2.3 ISO 18920 Imaging Materials - Processed Photographic Reflection Prints - Storage Practices.
- 3.39.2.2.4 ISO 18923 Imaging Materials - Polyester-base Magnetic Tape - Storage Practices
- 3.39.2.2.5 ISO 18925 Imaging Materials – Optical Disk Media - Storage Practices
- 3.39.2.2.6 SMPTE RP-131 Storage of Motion Picture Films.
- 3.39.2.2.7 SMPTE RP-103 Care, Storage, Operation, Handling, and Shipping of Video Tape for Television.
- 3.39.2.3 Cold Storage Room:
 - 3.39.2.3.1 ASHRAE/ANSI 15-70.
 - 3.39.2.3.2 ARI 420, Unit Coolers for Refrigeration
 - 3.39.2.3.3 ARI 520, Positive Displacement Condensing Units
 - 3.39.2.3.4 NEMA 70.
- 3.39.2.4 Air filtration systems:
 - 3.39.2.4.1 ASHRAE 52.2 Methods of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.
 - 3.39.2.4.2 Instrument Society of America (ISA) Standards S71.04. Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.
- 3.39.3 Additional guidance. The following publications will be useful in understanding the overall design goals for the Presidential library.
 - 3.39.3.1 NARA 1571 Archival Storage Standards (incorporated into these standards).
 - 3.39.3.2 NARA 1605 Exhibits (upon issuance).
 - 3.39.3.3 Conservation Environment Guidelines for Libraries and Archives. New York State Program for the Conservation and Preservation of Library Research Materials. University of the State of New York. William P. Lull with Paul N. Banks, 1990.
 - 3.39.3.4 Exhibit Conservation Guidelines: Incorporating Conservation into Exhibit Planning, Design and Production. National Park Service. Toby

Raphael, 1999.

- 3.39.3.5 Airborne Pollutants in Museums, Galleries and Archives: Risk Assessment, Control Strategies and Preservation Management. Canadian Conservation Institute, Ottawa. Jean Tetreault, 2003.

3.40 HVAC design criteria.

- 3.40.1 The facility must be designed so that environmental parameters are achieved and not compromised. In order to ensure critical areas are maintained on a continuous basis while allowing for energy efficiency measures in non-critical areas, careful attention must be paid to the adjacency requirements established in Part 2.
- 3.40.2 Holdings storage and processing rooms must be served from separate, dedicated HVAC system(s) from those serving the remainder of the facility. The system(s) may be stand-alone units or fully integrated systems. The exhibit galleries must also be serviced by a separate, dedicated system(s) capable of providing different temperature and humidity levels in each permanent and temporary gallery. All other areas of the building may share the same HVAC system(s) although certain areas may require additional controls.
- 3.40.3 Holdings storage and processing rooms and exhibit galleries must be isolated from sources of pollutants and particulates, such as the loading dock, machine rooms, or spaces where woodworking, painting, or cooking take place. Doors to the holdings rooms must not open directly onto the loading dock, machine rooms, locations where woodworking or painting take place, or other similar areas. The air intakes and returns must be designed so that lower quality air and environment does not affect the critical areas and must have direct venting to the outdoors.
- 3.40.4 The entire building must be under positive pressure. Additionally, certain spaces of the building must be under positive pressure relative to one another, as specified in Part 2. In particular, the holdings storage rooms must be kept under positive air pressure. Some spaces in the building including the loading dock, exhibit production rooms, and areas where food is prepared must be kept under negative pressure in relation to adjacent spaces.
- 3.40.5 All-air systems are preferred for the entire Presidential library, but are required for critical areas including holdings storage.
- 3.40.6 Outdoor air design criteria must be based on weather data tabulated in the latest edition of the ASHRAE Handbook of Fundamentals. Winter design conditions must be based on the 99% column dry-bulb temperature in the ASHRAE table. Summer design conditions must be based on the 2.5% column dry-bulb temperature with its corresponding mean coincident wet-bulb temperature. In critical areas that require temperature and relative humidity to be maintained to close tolerances, cooling loads must be based on the 1% column dry-bulb temperature with its corresponding mean coincident wet-bulb temperature.

- 3.40.7 The building envelope must be airtight, with fresh air, outside air, and make-up air intake achieved through a deliberate system. Intake air must be integrated into the return side of the HVAC system, undergoing the same filtration and climate conditioning as the re-circulated air. This is especially important for critical areas. A building-wide air filtration system must be installed to provide particulate filtration in all public and staff areas. Outside air intake grills/louvers must include a balancing damper or electronically operated damper to control air intake. All outside air intake grills/louvers must be located at least 12 feet above the ground level to prevent the introduction of contaminants in the supply air.
- 3.40.8 The building envelope must be humidity tolerant, allowing the relative humidity standards to be maintained without damage to the structure. New buildings and additions must be designed to be humidity-tolerant. The ability of existing buildings to withstand the relative humidity standards must be carefully considered. Existing buildings may require specialized weatherproofing or insulation products and designs. The holdings storage rooms must be provided with sufficient insulation to support a stable, continuous level of relative humidity and temperature.
- 3.40.9 Storage rooms are used to house holdings in a protective environment to ensure their long-term preservation. In general, staff members work in holdings storage rooms for less than one hour at a time and often for less than thirty minutes at a time. Staff workstations are prohibited in the storage rooms.
- 3.41 Temperature and relative humidity standards. The library must be designed to achieve and maintain specific interior environmental standards, both for reasons of health and for the long-term preservation of the holdings housed in the facility.
- 3.41.1 Figure 3-3: Temperature and relative humidity standards states the requirements for any NARA archival facility in North America with which the Presidential library buildings must comply. The design of the building and environmental control systems must provide the temperature and relative humidity standards stated in Figure 3-3. The requirements vary according to building area, with the most stringent requirements in holdings storage rooms and exhibit cases displaying certain types of holdings and the holdings processing rooms. The temperature and relative humidity levels are based on current research. NARA will revise its archival storage standards periodically to reflect new research. The Foundation and designers will be provided with any relevant changes during the earliest stages of the concept design phase.
- 3.41.2 Figure 3-3 specifies the maximum acceptable temperatures in holdings storage and processing rooms and in the exhibit galleries. The acceptable range for a relative humidity set point in holdings storage and processing rooms and exhibit galleries is also specified. For textual and nontextual holdings and artifacts, designers must consult NARA staff to determine appropriate set points within an approved range. In general, use cooler temperature and drier relative humidity set points for textual and nontextual holdings whenever possible, as these conditions extend the life and significantly enhance the preservation of the holdings.

- 3.41.3 Although Figure 3-3 establishes certain basic criteria, NARA must review the preservation requirements for each holdings storage and processing area at the start of each project. This review may result in additional requirements. Likewise, the conservation criteria for each exhibit project will establish the specific environmental requirements for the project.
- 3.41.4 Environmental standards in holdings storage and processing rooms and exhibit galleries must be maintained 24 hours per day, 365 days per year. Once a set point is programmed, daily fluctuations must not exceed either 5° F or 5% relative humidity. When a range is given for relative humidity levels, the range indicates the allowable minimum and maximum humidity. Seasonal movement (drift) within the set point range must not exceed 5% per month while staying within a 5% change during any 24-hour period. NARA must approve any plan to allow seasonal movement.
- 3.41.5 Environmental control systems for the general building must be designed to provide efficient and economical seasonal climate control. Seasonal relative humidity drift may occur in actual operation of the general building system(s) to reconcile energy efficiency and external climate extremes in certain geographical locations and with certain building types. The building must be designed to accommodate the environmental requirements in a highly energy efficient manner.
- 3.41.6 Temperature and relative humidity conditions in holdings storage and processing rooms and exhibit galleries must be continuously monitored and must be recorded at intervals that are frequent enough and in a sufficient number of locations, to demonstrate and confirm compliance with this Standard (see Figure 3-3). Sensors, thermostats, and hygrometers must be located inside the critical areas, not within the return ducts. This monitoring system must control the operation of the HVAC system. Independent, ambient room monitoring is also required and may be provided through the automated control system or as a separate monitoring system of data loggers.

Figure 3-3: Temperature and relative humidity standards

(Designers must consult with NARA concerning set points)

| Building Area | Dry Bulb Temperature | Relative Humidity Set Point | Comments |
|-----------------------|-----------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Textual storage rooms | Maximum 65°F* | 35 - 45%** | Files, cards, bound volumes, computer printout and other papers Cartographic records including maps, charts, architectural drawings, posters |

| Building Area | Dry Bulb Temperature | Relative Humidity Set Point | Comments |
|--------------------------------------------------|-----------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nontextual Storage Room | Maximum 65°F* | 35% ** | Black and white non-acetate/non-nitrate motion and still picture negatives/film, photographic paper prints, x-rays, and microforms; magnetic/electronic media including computer tapes and disks, video tapes, audio tapes, and optical disks |
| Cold Storage Room (Black and white media) | Maximum 35°F* | 35% ** | Black and white acetate motion and still picture negatives/film, x-rays, and microforms; diazo and vesicular microfilm (not including reference copies); color still and motion picture negatives/film, slides, and prints Modern digitally produced prints (ink jet, dye sublimation, electrophotographic, and thermal) |
| Transition/barrier room | Maximum 50°F* | 35% ** | Adjacent to cold storage room(s) |
| Artifact Storage Room | Maximum 65°F* | 35 - 45% ** | Presidential gifts |
| Processing Rooms (textual, nontextual, artifact) | 70°F ± 5° | 35-45% ** | Nontextual processing room requires exhaust system vented to the outside. |
| Research Rooms | 70°F ± 5° | 35-50% ** | Research rooms adjacent to storage or processing rooms may be on the same HVAC system; 24-hour control is not required UNLESS materials will be left out for prolonged periods (not standard practice). |
| Exhibit Galleries | 70°F ± 5° | 35-50% ** | Specific microclimates (cases, sealed frames) may be required for some collections as per conservation criteria. Items loaned from other institutions may require tighter RH control as per loan agreements |
| Exhibit Production, Clean and paint Rooms | 70°F ± 5° | 30-45% ** | Dust collection system required. Requires exhaust system vented to outside |
| Computer Room | 65 °F | 35% ± 5% | |

| Building Area | Dry Bulb Temperature | Relative Humidity Set Point | Comments |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Public and staff areas | 70-76 °F | 35-50% | Including Presidential Suite, offices, lobbies, theater/auditorium, conference rooms, food service, and staff lounge. |
| <p>* Specifies the maximum acceptable temperature in areas where records are stored and the maximum acceptable temperature set point for areas where records are exhibited, processed, or used. Cooler temperature set points and within the specified range drier relative humidity set points should be used for these media whenever possible in order to improve the preservation of the records. Magnetic/electronic media must not be stored at a temperature lower than 46°F.</p> <p>** Once a set point is established, the relative humidity within holdings storage, processing and research rooms, and exhibit galleries must not fluctuate more than a total of 5% within any 24 hour period.</p> | | | |

3.42 Particulate and gaseous pollutants.

- 3.42.1 Particulates and gaseous pollutants may damage holdings in the Library. While some effects, such as the tarnishing of silver, may be obvious fairly quickly, decades may pass before other deterioration caused by low levels of pollutants is apparent. To reduce this risk, Figure 4 specifies concentrations for pollutants that are not to be exceeded within critical holdings spaces. Experience shows that these low levels, while challenging, can be achieved with current air filtration technology. The study of pollutant damage is very complex, and NARA will revise its archival storage standards periodically to reflect new research. The Foundation and designers will be provided with any relevant changes during the earliest stages of the concept design phase.
- 3.42.2 Prior to moving holdings into the building, the quality of re-circulated air in critical spaces must be certified through testing. Analysis of direct air sampling through access points located on both the up and down side of the filters is the preferred method. NARA acknowledges that new construction may have difficulty meeting the standards. It is strongly recommended that an aeration time of at least four weeks be built into the project schedule. During the aeration period, running the HVAC system with the filtration systems on a continuous basis will reduce levels of pollutants. When test results show that concentrations of pollutants exceed the limits established in Figure 3-4, NARA reserves the right to require additional measures to bring the levels closer to those specified in Figure 3-4. All corrective work or adjustments must be performed at the expense of the Foundation and must be completed before holdings are moved into the spaces.
- 3.42.3 In addition to pre-occupancy monitoring, the holdings storage and processing rooms and the exhibit galleries must be tested six months after the building is turned over to NARA, with the anticipation of meeting the requirements in Figure 3-4. All

corrective work or adjustments must be performed at the expense of the Foundation.

Figure 3-4: Particulate and Gaseous Standards.

| Contaminant Description | Holdings Storage Rooms, Processing Rooms, and Exhibit Cases with original materials |
|--------------------------------|--------------------------------------------------------------------------------------------|
| Particulates | MERV 14 or higher |
| Sulfur Dioxide | 1 ppb; 2.7 micrograms per cubic meter |
| Nitrogen Dioxide | 2.6 ppb; 5.0 micrograms per cubic meter |
| Ozone | 2.0 ppb; 4.0 micrograms per cubic meter |
| Formaldehyde | 4.0 ppb; 5.0 micrograms per cubic meter |
| Acetic Acid | 4.0 ppb; 10.0 micrograms per cubic meter |

3.43 Air handling units.

- 3.43.1 The types of air handling units (AHU) must be determined by using the most economical energy saving system for the particular application. The following criteria must be used for design of air handling units.
- 3.43.2 Any air handling unit having outside air supplied directly to it must be provided with freeze protection. In general-purpose systems, the freeze-stat must be installed in the air stream between preheat coil and the chilled water coil a minimum of 12 inches down stream of the heating coil.
- 3.43.3 Variable air volume systems (VAV) must not be used in critical areas including holdings storage and processing rooms, research rooms and exhibit galleries. When VAV boxes with electric reheat are used to serve general building spaces, they must have multiple stage electric heating coils. VAV systems require separate controls to provide adequate outside air supply year round.
- 3.43.4 If the design of air handling unit permits, designers should provide two-way control valves for the unit's chilled water coil.
- 3.43.5 Outside air intake grills/louvers must be located at least 12 feet above the ground and away from sources of external pollution, including areas of vehicular traffic, loading docks, and locations where automobiles, buses, and trucks idle. Locate all intakes away from exhausts, up wind if there is a preferred wind direction, so that no exhaust air can re-enter the building.
- 3.43.6 Crawl spaces under floors should be ventilated using building exhaust air (used conditioned air supply).
- 3.43.7 Loading docks must have an air supply and exhaust system that is separate from the remainder of the facility. Restrooms, janitorial closets, food service, nontextual processing, and exhibit production and clean rooms must be separately vented to the outside of the building, with exhaust vents placed away from the HVAC intake vents to prevent contamination of the building air supply.

- 3.43.8 Fire dampers must be installed in accordance with NFPA codes in all ducts, except fume hood exhausts, passing through walls, floors, or roof with a two hour or greater rating.
- 3.43.9 A smoke sensor must be installed in the supply and return air plenums for each air handling unit in accordance with NFPA codes.
- 3.43.10 Louvers for 100% outdoor air units must be designed at an inlet velocity of 250 feet per minute (FPM) based on the free area.
- 3.43.11 Air handling unit casings must be designed for 1 ½ times the working pressure of the fans. The allowable deflection must be $1/360 L$, where L is the longest span of each panel in the assembly.
- 3.43.12 Main air handling units (over 50,000 cubic feet per minute (CFM) capacity) must have air locks on the pressurized side of the fans. NARA recommends that units be smaller than 20,000 CFM.
- 3.43.13 Main air handling units (over 50,000 CFM capacity) must have a monorail or gantry over the supply fans such that the fan assembly can be lifted off the base and lowered onto a cart. This removal design must also be equipped with a removable curb section at the fan chamber door.
- 3.43.14 Main air handling units (over 50,000 CFM capacity) must have doors for access to the fan chamber. NARA recommends removable casing panels. These must be large enough to permit the fan assembly to be removed with a cart.
- 3.43.15 All make-up air handling units must have floor drains in each section; this is not required in a sound trap section if this is a separate section.
- 3.43.16 Inlets, coil sections, and humidifier sections must have drain pans and drains.
- 3.43.17 All fan chamber access doors in built up air handling unit casings must have reinforced steel frames.
- 3.43.18 Humidifiers must be installed with 100% of the make-up air capacity in the base unit and 100% capacity in the zone ducts. Monitors and alarms must alert staff to over-production of humidity or a leak in water supply lines. Humidifiers should be on the supply side of the unit and should be sized based on the intended design parameters. The humidifier must be in a stainless steel duct section and must include a drain section to remove any moisture that condenses out of the air. There must also be a humidistat down stream from the humidifier that detects excessive humidity and shuts the humidifier down rather than relying on the humidity sensors in the space.
- 3.43.19 All pipes must be tested and found to be watertight prior to concealment in walls, floors, or false ceilings.

- 3.43.20 Dehumidification systems that provide reheat of cooled air must be considered as a design option. Desiccant dehumidification systems must also be considered.
- 3.43.21 The water source to humidification units must remove salts and other chemicals dissolved or carried by the water. Acceptable filtration systems include reverse osmosis and deionization.
- 3.43.22 NARA requires both primary and secondary pumping for chilled water systems of 100 tons or larger.
- 3.43.23 All coils must be ARI certified. All coils in air handling units must be sized at 500 FPM maximum.
- 3.43.24 Access space between coil sections must have 24 inch clearance. Equipment must be located and positioned to allow easy access for maintenance.
- 3.43.25 Penthouse access. HVAC equipment must not be mounted on the roof of a new facility and must not be located above any holdings storage or processing room or above exhibit galleries in any library. However, HVAC equipment may already be located on the roof of some existing buildings or required on rooftops due to land-use restrictions. In these cases, the following guidelines must be followed:
- 3.43.25.1 At least one interior stairwell required for all areas under 20,000 sq ft.
- 3.43.25.2 At least two interior stairwells required for all areas over 20,000 sq ft.
- 3.43.25.3 An equipment lift is required from first floor to the penthouse floor and to the roof if equipment is installed on the roof (4000 lb. minimum rated capacity).
- 3.43.25.4 Access panels must be provided in penthouse walls to accommodate removal of large equipment.
- 3.43.25.5 Change in elevation of penthouse floor or roof requires a ramp with a pitch of 1 in 12 constructed to move heavy equipment.
- 3.43.26 Heavy wet equipment must be located on reinforced concrete floor slab, with appropriate floor drains. All deionized (DI) skids (if any) must be in diked areas with appropriate floor drains.
- 3.44 Critical air handling units.
- 3.44.1 Air handling units.
- 3.44.1.1 In addition to air handler unit criteria listed above in paragraph 42, these additional requirements apply for critical areas (see definition part 1). The AHUs serving the holdings storage, processing, and research rooms and exhibit galleries must provide an environment that meets NARA

standards of air filtration, temperature, and relative humidity. All air-handling units serving critical areas (see Figure 3-4) must contain both gas-phase filtration and particulate filtration systems. Both the return air and make-up air must be filtered in the holdings storage and processing rooms and the exhibit galleries. The filtration media and its systems must be cost effective and efficient. The air filtration system must use the latest technology to monitor the levels of pollutant gases and particulates within the holdings storage and processing rooms and exhibit galleries in order to determine when the filters are no longer operating effectively. Filters must be easy to access and change.

3.44.1.2 Air handling units serving holdings storage and processing rooms must provide constant air volume and must provide sufficient air exchanges to maintain requirements for temperature, relative humidity, and pollutant control. The number of air exchanges is determined by the planned size of the room, volume of holdings, volatile organic compounds emitted within the room, occupancy, etc. The system must provide good air mixing throughout the room. In general, external fresh air intake must be limited to the amount required to allow human occupancy (Indoor Air Quality) and to maintain a positive pressure in storage and processing rooms. Air economizers must not be used in critical areas. Make-up air handling and main supply air handling units which support holdings storage and processing rooms and galleries must be designed for full backup and not simply air flow. Redundant equipment such as fans, heating and cooling coils, humidification supply, pumps, and controls must be considered. Final arrangement must be determined in the design. Controls must insure automatic switch over. The designer must have two or more units serving the critical areas. 100% redundancy can then be provided by one additional unit or with load transfers from non-critical areas.

3.44.1.3 Air handling units and other mechanical units must not be located within the holdings and processing rooms. Exceptions include certain stand-alone designs. The AHUs in the holdings storage areas must not exceed a motor size of 1 HP. Cooling coils and associated fans may be located within the cold storage room(s). However, the remaining mechanical components must be placed outside of the cold storage room.

3.44.2 Gas-phase filtration system. To achieve the standards stated in Figure 3-4, a gas-phase filtration system must be incorporated in all air handling units serving the holdings storage and processing rooms and exhibit galleries. The gas-phase filtration system must control gas-phase contaminants including aromatic, aliphatic, oxygenated hydrocarbons, chlorinated hydrocarbons, and inorganic acid/basic compound. The operation of the air purification system may be a combination of chemisorption, adsorption, and catalytic processes. The system must be designed to allow periodic monitoring of the filter performance by providing sampling ports in the air flow before and after the filters. The gas-phase

filter must be located before the final particulate filter.

- 3.44.3 Particulate filtration system. Removal of particulate materials from the air stream of the holdings storage and processing rooms and exhibit galleries must be a priority and must achieve the standards stated in Figure 3-4. The particulate filtration system for these areas must have a Minimum Efficiency Reporting Rating (MERV) of 14 or greater based on ASHRAE 52.2, "Methods of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size." To extend the service life of the system, preliminary filters with lower MERV ratings should be installed. A pressure drop measurement system or other equipment must be provided to determine when the particulate filters need to be changed. Filters must be easy to access and change. Interior stand alone designs, such as may be used in cool/cold storage area, must have an automatic shut-off feature installed in case of equipment failure to prevent heat build-up inside the storage area.
- 3.44.4 Humidification control systems. Humidity control is a critical function of the air handling units serving the holdings storage and processing rooms and the exhibit galleries. The air-handling units must be designed for both humidification and dehumidification. Humidification must be achieved by a clean steam injection system (such as an electronic steam humidifier), an atomized air system using clean water, or equivalent system located down stream of the gas filtration system. Failsafe systems to ensure that relative humidity in critical areas does not exceed those specified in Figure 3-3 are required. Humidification units and water supplies and drains must be designed to prevent any water leakage or overflow. The design of the system must ensure that the system does not generate or harbor microorganisms. In order to meet the standards in Figure 3-4, reheat of cooled air or desiccant systems may be required as part of the dehumidification control system.
- 3.45 Ductwork. The location and design of ductwork must ensure proper functioning of the HVAC system.
- 3.45.1 The ductwork inside storage and processing rooms must be kept at a minimum while supplying the required critical environments specified in Figure 3-3 and Figure 3-4. Ductwork must not pass through a storage room to supply another area. Location of the vents and return ducts must provide even air mixing and a constant environment throughout the space while maintaining and maximizing useable space for storage equipment.
- 3.45.2 Holdings must not be housed directly adjacent to vents or returns. This requirement will necessitate coordination between the HVAC system(s) design and the layout of storage furniture. Likewise, ductwork throughout the exhibit galleries must be designed to provide both the required environment and the maximum amount of useable space. Location of ducts, vents, and returns must be coordinated with the exhibit designer and NARA.
- 3.45.3 Ductwork must be sealed to provide a leakage rate less than 3%.

- 3.45.4 Long runs in ductwork and multiple corners must be avoided in the design of supply systems. The design must prevent duct linings from becoming moist from humidification steam or water spray or from condensation.
- 3.45.5 Prior to occupancy, all ducts must be cleaned by a purge using outdoor air. Any area acting as a return plenum such as above drop ceilings must be cleaned of building dust and debris.
- 3.46 Vibration isolation, acoustical isolation, and seismic design.
- 3.46.1 Design of the library's mechanical and ventilation systems must provide for very high vibration and acoustical isolation of noise transmissions from the mechanical equipment, duct noise, and noise from diffusers and other equipment. An acoustical and noise control consultant must be used to design all vibration and noise control (NC) isolation measures and review the proposed equipment and connections to all mechanical systems. All rooms in the library must meet strict noise criteria (at least an NC 35 rating).
- 3.46.1.1 Mechanical equipment must be specified with manufacturer-certified, low noise characteristics. All equipment must be fully isolated from mechanical ductwork, piping, and other connections to prevent any noise transmission and vibration from the mechanical system to the structure or into library spaces.
- 3.46.1.2 Noise control between the mechanical room and other areas begins in the room in which the mechanical equipment is located. Mechanical and equipment rooms, including pump, generator, and boiler rooms, must have fire-retardant sound absorption on all walls to absorb equipment noise and prevent noise transmission through the walls to other parts of the library. Storage and processing rooms must not be affected by vibration. Storage rooms must meet ISO 2631-2 Evaluation of human exposure to whole-body vibration – Part 2: Continuous and Shock-induced Vibrations in Buildings (1 to 80 Hz) Standard for operating rooms.
- 3.46.1.3 Mechanical equipment placed within ceiling plenums and occupied rooms, such as terminal units, variable air volume units, and fan coil units must have manufacturer-certified, low noise characteristics and include vibration and isolation dampers and flexible duct connectors to damper equipment vibration to ductwork, piping, ceiling assembly, and the building structure.
- 3.46.1.4 All mechanical equipment must be designed to withstand lateral forces of seismic activity and provide vibration isolation control. Vibration isolation with built-in seismic restraints should be used.
- 3.46.1.5 Seismic restraints are required for all mechanical equipment in structures

that fall within Seismic Design Category B or higher. Where this is not feasible, seismic bumpers must be designed to restrain the equipment. If bumpers are used, the clearance between the bumper and the equipment shall be no greater than 6.35 mm. Unless a rigorous analysis, performed at the option of the mechanical equipment manufacturer, indicates a lesser force to be appropriate, bumpers must be designed to resist the following seismic force:

$$F_p = \frac{0.4a_p S_{DS} W_p}{R_p / I_p} [1 + 2(z/h)]$$

Where:

- F_p = Seismic design force centered at the component's center of gravity and distributed relative to the component's mass distribution.
- S_{DS} = Spectral acceleration, short period, as determined from IBC 2003 chapter 16, and ASCE 7-02 section 9.4.1.2.5.
- a_p = Component amplification factor. Varies from 1.00 to 2.50 (determine appropriate value from IBC 2003, chapter 16, and ASCE 7-02, table 9.6.3.2).
- I_p = Component importance factor (1.50, unless specified otherwise by NARA).
- W_p = Component operating weight.
- R_p = Component response modification factor. Varies from 1.50 to 5.00 (determine appropriate value from IBC 2003, chapter 16, and ASCE 7-02, table 9.6.3.2).
- z = Height in structure of point of attachment of component with respect to the base. For items at or below the base, z shall be taken as 0. The value of z/h need not exceed 1.0.
- h = Average roof height of structure with respect to the base.

F_p need not be taken as greater than:

$$F_p = 1.6 S_{DS} I_p W_p$$

F_p shall not be taken as less than:

$$F_p = 0.3 S_{DS} I_p W_p$$

3.46.2 Mechanical room isolation. Floating isolation floors must be considered for major mechanical rooms located in penthouses or at intermediate levels in mid-rise and high-rise construction.

3.46.3 Mechanical chases. Mechanical chases must be closed at top and bottom, and at the entrance to the mechanical room. Any piping and ductwork must be isolated as it

enters the shaft to prevent propagation of vibration to the building structure. All openings for ducts and piping must be sealed. However, shafts dedicated to gas piping must be ventilated.

- 3.46.4 Isolators. Isolators must be specified by type and by deflection, not by isolation efficiency. See ASHRAE Guide for Selection of Vibration Isolators for types and minimum deflections. Specifications must be worded so that isolation performance becomes the responsibility of the equipment supplier.
- 3.46.5 Concrete inertia bases. Inertia bases must be provided for reciprocating and centrifugal chillers, air compressors, all pumps, axial fans above 300 RPM, and centrifugal fans above 35 kW.
- 3.46.6 Ductwork. Fan vibrations must be reduced immediately outside any mechanical room wall by acoustically coating the duct or by wrapping the duct.
- 3.46.7 Piping hangers and isolation. Isolation hangers must be used for all piping in mechanical rooms and adjacent spaces up to a 45 feet distance from vibrating equipment. The piping hangers closest to the equipment must have the same deflection characteristics as the equipment isolators. Other hangers must be spring hangers. Piping hangers must maintain the required slope and alignment for proper operation of the equipment. Pipes must not be supported from other pipes.
- 3.47 Special systems for energy efficiency. The designer must incorporate the following special systems in the design where possible.
 - 3.47.1 Heat recovery. Heat recovery uses heat generated by internal loads or mechanical equipment within a building to the fullest extent possible before rejecting it. This minimizes the amount of heat that must be added for comfort conditioning.
 - 3.47.2 Heat reclaim chillers. Heat recovery chillers must be considered for buildings that will require cooling year round. If used in conjunction with air-side economizer cycles, a careful control design is required to prevent the two approaches from working against each other.
 - 3.47.3 Exhaust air heat recovery. Where more than 1900 liters per section (L/s) of air is exhausted and replaced by heated make-up air, heat recovery must be considered.
 - 3.47.4 Heat exchangers. The condenser water system or a separate 24-hour critical load system may be connected via heat exchanger to the hot water heating system.
 - 3.47.5 Thermal storage. Thermal storage systems use previously manufactured ice or chilled water rather than running chillers on demand. Their major advantage lies in the ability to control time of day electrical demand. Thermal storage must be considered on all building projects with large cooling loads. It can be an important operating cost consideration if the power company employs demand charges, ratchet clauses, or time of use charges. With thermal storage, refrigeration machinery may be run at the time the lowest electrical rates are in effect. With refrigeration running

at night and fans and pumps during the day, power usage is evened out. In the evaluation of this cooling option, a detailed comparison of rate structures is required.

3.48 Mechanical rooms requirements.

3.48.1 At least one four-inch floor drain with trap primer must be provided per floor in each mechanical equipment room. The drain must be located out of a walking area but not under any equipment. The floor must be designed and poured to ensure that the drain is at the lowest point and that water anywhere on the floor runs to the drain.

3.48.2 At least one domestic water line hose bib must be provided in each floor of each mechanical room for coil washing.

3.48.3 Suspended air handlers are not permitted.

3.48.4 Equipment rooms with other equipment than those items directly related to air handling equipment must not be used for return air plenums. The use of rooms as plenums is prohibited.

3.49 Exhibit cases. Exhibit cases displaying original holdings are required to maintain a specified environment. The conservation criteria for the exhibit will identify any holdings that must be displayed in specially designed and constructed exhibit cases. At least one example of each case design must be prototyped in order for NARA to evaluate performance. NARA reserves the right to reject case designs when they do not provide appropriate environmental storage conditions for holdings on display.

3.50 Specialty areas: cold storage. The following paragraphs briefly describe the required cold storage design and systems for cold storage rooms. NARA staff will provide additional guidance as necessary.

3.50.1 Applicable standards. The environmental room design and installation must conform to applicable codes, ordinances, and regulations governing the use and safety of refrigerants, including ASHRAE/ANSI 15, ARI 420, ARI 520, ANSI B9.1, NEMA 70.

3.50.2 Mechanical system. The mechanical system for the cold storage room(s) must consist of two independent systems for 100% redundancy consisting of dual air handlers and refrigeration units designed to operate alternately. Cooling coils and associated fans and sensors may be located in the cold storage room, but all other equipment and controls must not be located inside the cold storage, nontextual, or processing rooms, or other storage areas or within another cold environment area. Refrigeration and dehumidification systems for cold storage and nontextual rooms must be readily accessible for repair.

3.50.3 Mechanical components. Complete components of the mechanical system must consist of:

- 3.50.3.1 Cold room evaporator unit, including cooling coil (for cold storage and nontextual room), coil fan motor, and heating coil (if applicable).
 - 3.50.3.2 Condensing unit with high/low pressure control.
 - 3.50.3.3 Refrigerant piping.
 - 3.50.3.4 Humidifier.
 - 3.50.3.5 Dehumidifier/desiccant wheel system with particulate filtration.
 - 3.50.3.6 Absorber system and purifying device to filter gaseous pollutants, especially acetic acid.
 - 3.50.3.7 Particulate filtration system meeting standards established in Figure 3-4.
- 3.50.4 Instrument and control system. The system must include the main temperature control featuring an open tip thermistor sensor for rapid response to temperature fluctuation. Temperature deviation from the set point must not be greater than 5° F, while remaining below 35° F. Relative humidity fluctuation must not exceed 5% controlled via humidistat.
- 3.50.5 Alarm and safety control system. The storage room must be equipped with an electronic high/low alarm and safety control. This must include high and low temperature set point and high and low humidity set point.
- 3.50.6 Temperature and humidity recorder. Automatic temperature and relative humidity monitoring system with display and record capability must be provided in each control panel. The system must have the ability to detect temperature from 0-100°F and relative humidity from 0-100%. The thermostat and humidistat must be accurate to within 2°F and 2% relative humidity.
- 3.50.7 Room shell materials. Prefabricated, all-metal clad insulated construction must be used.
- 3.50.8 Room interiors. A complete aesthetic environment must be achieved with consideration to the following:
- 3.50.8.1 Minimum lighting level.
 - 3.50.8.2 Maximum working volume air movement rate.
 - 3.50.8.3 Interior sound levels.
 - 3.50.8.4 Light reflectance characteristics of finishes.
 - 3.50.8.5 Maintenance and ease of underfoot consideration for floor covering.

3.51 HVAC monitoring and controls.

3.51.1 The heating and air conditioning system must be provided with a computer-controlled central building automated management system that:

3.51.1.1 Monitors the temperature throughout the building and temperature and relative humidity in all holdings storage and processing rooms, in the exhibit galleries, within certain exhibit cases designed to maintain a particular environment, and the external air temperature and relative humidity;

3.51.1.2 Evaluates the operating status of all major pieces of equipment;

3.51.1.3 Turns equipment on and off to meet changes in environment, both inside and out;

3.51.1.4 Evaluates operating conditions;

3.51.1.5 Sends operating alarms;

3.51.1.6 Provides for lowest cost energy use of the system;

3.51.1.7 Is connected to all portions of the building; and

3.51.1.8 Is capable of recording temperature and relative humidity data at intervals frequent enough to confirm operation to specifications.

3.51.2 Operating alarms must monitor for relative humidity and temperature. Sensitivity of the monitors must allow for precise control of each space to provide the criteria established in Figure 3-3. The temperature sensors must be accurate to plus or minus 2°F or better, and humidity sensors must be accurate to plus or minus 2% relative humidity or better. Airflow rate must also be monitored to alert staff when particulate filters need to be changed.

3.51.3 The system must be direct digitally controlled, providing digital signals from each piece of system equipment to the central control computer. However, internal control of specific pieces of equipment (such as dampers and other devices) may have a pneumatic operating system, provided that the main parameters of the equipment operation can still be controlled by the central unit.

3.51.4 Cold storage rooms must pass a performance test before being accepted by NARA. The test must be done in a loaded condition. The building designers or appropriate subcontractor must certify cold storage room performance.

3.51.5 The systems serving critical areas should be fully operable three months prior, but must be fully operable one month prior to moving holdings into the building. This will allow the systems to be monitored and any necessary adjustments to be made prior to holdings exposure. All systems, both general and critical, must continue to

be monitored for 12 months after NARA accepts the building, and the designer must make any adjustment necessary to provide the environments required in this Standard.

3.52 Control system monitoring from the Security Control Center.

3.52.1 The building automated management system must be capable of being monitored in the Security Control Center and in the facility manager's office. It must have a graphical user interface (Windows-capable recommended), be user friendly, and show operating conditions of the equipment and alarms on a color monitor. The user interface should show a floor plan and room-by-room status against the required operating conditions so that the security staff can quickly note any problems and advise appropriate staff.

3.52.2 Monitoring stations for the HVAC system must include the Security Control Center and the facility manager's office. Remote download and access to the system by modem is also required and the capabilities to connect to the system by laptop computer at various locations in the building, including the major mechanical and equipment rooms, holdings storage and processing rooms, and exhibit galleries. The building automation management system should be compatible with the National Archives at College Park and National Archives Building System or provide an interface that is compatible with the system so that alarms from the building alarm system can be monitored from National Archives at College Park or the National Archives Building if necessary. However, library building automation management system must be of the most current, tested, and reliable model feasible regardless of compatibility with any systems in NARA's Washington, DC, facilities.

3.52.3 The system must be designed with redundancy so that modules in the system can continue operating and controlling the environment if the central station is not operating.

Section G. Electrical Systems

3.53 General design criteria. Wiring, electrical components, and electrical appliances must comply with NFPA 70, National Electrical Code.

3.53.1 Energy conservation. Lighting is the largest single factor that determines the overall energy consumption of a building. The overall efficiency of the lighting system depends both on the individual components and on the interaction of components in a system. A good controls strategy that eliminates lighting in unoccupied spaces and reduces it where day lighting is available can contribute significantly to energy conservation. The best way to institute such controls is through an energy management system (EMS).

3.53.2 Visual impact. Options regarding the location and selection of electrical work that will have a visual impact on the interior and exterior of the building must be closely coordinated with the architectural design. This includes colors and finishes of lights,

outlets, and switches.

- 3.53.3 Equipment grounding conductor. All low voltage power distribution systems must be supplemented with a separate, green insulated equipment grounding conductor.
 - 3.53.4 Lightning protection. Lightning protection must be evaluated in accordance with NFPA 78. Buildings in the “moderate to severe” category of exposure and higher must be equipped with a UL listed lightning protection system. The system must be carefully designed to ensure that static discharges are provided with an adequate path to ground. Surge arresters on the building electrical equipment must also be in conformance with NFPA 78 and UL 96.
 - 3.53.5 Cathodic protection. The need for corrosion protection for conduits and for all other underground piping and buried metals on the project must be evaluated through soil resistivity and pH testing.
 - 3.53.6 Site considerations. The routing of site utilities and location of manholes must be determined early in the design process. The utility company must furnish power at the main utilization voltage of 480Y/277V.
- 3.54 Electrical system. The design of electrical systems must meet the following criteria.
- 3.54.1 Motors must meet the following characteristics:
 - 3.54.1.1 Motors must be rated for a 40 degree Celsius environment with a maximum 50 degree Celsius temperature rise for continuous duty at full load (CLASS A insulation).
 - 3.54.1.2 Electrical motors must be sized for loads imposed by the normal service operation of the equipment to preclude horsepower requirements in excess of 90% of the nameplate horsepower.
 - 3.54.1.3 Electrical motors must have sufficient torque to accelerate the full load connected to the full rated speed within 20 seconds with 80% of the rated voltage maintained at the motor terminals during the starting period. The motors must be selected for across the line full voltage starting unless noted otherwise.
 - 3.54.1.4 Services factor must be 1.15 for polyphase motors and 1.35 for single phase motors.
 - 3.54.1.5 The motor nameplate horsepower multiplied by the motor nameplate service factor must be at least 15% greater than the driven equipment operating range maximum brake horsepower.
 - 3.54.1.6 Motors controlled by a Variable Frequency Drive (VFD) shall be inverter rated. VFD controlled motor construction shall comply with NEMA standard MG-1 Part 31.

- 3.54.1.7 Within critical areas, motors are limited to 1 hp.
- 3.54.1.8 Designers must provide a minimum allowable motor efficiency chart by horsepower for all equipment installed in the Library. Designers must list exceptions which do not require premium high efficiency motors, i.e., smoke purge fans. See Figure 3-5: Motor Efficiency Chart.

Figure 3-5: Motor Efficiency Chart

| Horsepower | Motor Efficiency |
|------------|------------------|
| 1 HP | 83% |
| 5 HP | 88% |
| 7.5 HP | 90% |
| 10 HP | 91% |
| 15 HP | 92% |
| 20 HP | 92% |
| 25 HP | 92% |
| 40 HP | 93% |

- 3.54.2 Electrical substations must be ring bused together. Electrical substations must be loaded to no more than 65% of their rating.
- 3.54.3 All transfer switches must be fed from distribution panels or substation, not through another transfer switch.
- 3.54.4 Public address (PA) system must have zone cable layout running perpendicular to museum layouts to insure multiple zone coverage to areas large enough to have multiple speakers.
- 3.54.5 The emergency lighting system, and the fire detection and controls system, must have dedicated auto transfer switches serviced from a distribution panel feed from an auto start emergency generator in conformance with NFPA-70.
- 3.54.6 The emergency generator must have an uninterruptible fuel supply or a day tank with enough fuel to last six hours under full load. An alarm system must report the status of the generator to the Security Control Center with low level fuel alarm reporting with no less than one hour left with generator at full load.
- 3.55 Emergency/Standby power generator.
- 3.55.1 Standby generator. The building requires a standby generator for emergency power supply. Generators must be located at least 100 feet from communications frame equipment to avoid radio frequency interference.
- 3.55.2 Emergency power loads. Emergency power must be provided for the following functions:

- 3.55.2.1 Egress and exit lighting.
 - 3.55.2.2 Fire alarm system, including the public address system.
 - 3.55.2.3 Generator auxiliaries and accessories.
 - 3.55.2.4 Smoke control systems.
 - 3.55.2.5 Fire pump.
 - 3.55.2.6 Lighting - main corridor lighting (25% of lamps).
- 3.55.3 Standby loads. The systems listed below should be specified as Standby loads not Emergency. NFPA defines these systems separately. All can be run on the same generator.
- 3.55.3.1 Telephone switch and telephone system.
 - 3.55.3.2 Security systems.
 - 3.55.3.3 Mechanical control systems.
 - 3.55.3.4 Building automation and management systems.
 - 3.55.3.5 Elevators (one per bank with transferable power to elevators in the bank) IBC Section 3003 requires that standby power be manually transferable to all elevators in each bank, and automatically transfer standby power in sequence if sufficient power is not provided for transfer to all elevators simultaneously.)
 - 3.55.3.6 Sump pumps.
 - 3.55.3.7 Sewage ejector pumps.
 - 3.55.3.8 Exhaust fans removing toxic, explosive, or flammable fumes.
 - 3.55.3.9 Uninterruptible power systems serving computer rooms.
 - 3.55.3.10 Air conditioning systems for computer and UPS rooms.
 - 3.55.3.11 Exhaust fan in UPS battery rooms.
 - 3.55.3.12 Power and lighting for fire control center and security control center.
 - 3.55.3.13 Mobile shelving.
- 3.55.4 Emergency generator standard. The standby emergency generator set must meet or exceed the NFPA 110, Standard for Emergency and Standby Power Systems, Type 10 (10 seconds to full load), Class 6 (6 hours of capacity), Level 1. Level 1 defines

the most stringent equipment performance requirements for applications where failure of the equipment to perform could result in loss of human life or serious injuries. All Level 1 equipment is permanently installed.

- 3.55.5 Capacity. The engine generator must be sized to approximately 110 percent of the design load; ideally it must run at 50 percent to 80 percent of its rated capacity after the effect of the inrush current declines. When sizing the generator, designers must consider the inrush current of the motors that are automatically started simultaneously. The initial voltage drop on generator output due to starting currents of loads must not exceed 15 percent.
- 3.55.6 Fuel supply. Natural gas is preferred for the fuel supply. However, the supply must not be interruptible. Otherwise, the design must provide for a diesel fuel supply for the backup generator with at least 6 hours of fuel capacity.
- 3.55.7 Electrical substation rooms. Substation rooms must not have liquid piping systems (other than sprinkler piping), storage systems, or roof penetrations within the area except for battery rack and a portable self contained eye-wash unit if required.
- 3.55.8 Monitoring of facilities equipment. All points must report back to the Security Control Center and the facility manager's office.
- 3.55.9 Normal and alternate power. Normal and alternate power through 110V/20A outlets must be installed on every other building column in all facilities support areas, penthouses, basement areas, chiller rooms, HVAC rooms, and boiler rooms.
- 3.55.10 Welding outlets. 208V/-50A-3 phase must be located on 150 foot centers in all penthouses, chiller rooms, and boiler rooms.
- 3.55.11 Electrical panel boards. Electrical panel boards must have a minimum of 15% spare capacity for future modifications. The spare spaces must have a standard 20 amp breaker installed in them.
- 3.55.12 High-voltage electrical distribution equipment. High-voltage electrical distribution equipment (i.e., 13.2kv or higher switchgear and transformers) must not be installed in holdings storage and processing rooms.
- 3.55.13 UL rating. All appliances must be UL rated for commercial use, or if an appliance with a UL rating for household use is installed, it must be connected to a UL listed manual shutoff timer.
- 3.55.14 Vibrations. Storage and processing rooms must not be affected by vibration. Storage rooms should meet ISO 2631-2:1989 Evaluation of human exposure to whole-body vibration – Part 2: Continuous and shock-induced vibrations in buildings (1 to 80 Hz) Standard for operating rooms

Section H. Fire and Life Safety

3.56 General requirements.

3.56.1 Life safety code. Fire safety is a critically important consideration for Presidential library design. General fire and life safety for occupants and visitors is provided in NFPA 101, Life Safety Code, and these requirements must be included in all library designs. The location of exit points for the building and means of egress from building areas and spaces must follow the NFPA requirements, while also allowing for access control and security to the building. Emergency exit doors must be equipped with delayed egress locks in accordance with the constraints set forth in section 7.2.1.6.1 of the Life Safety Code.

3.56.2 Specialized NFPA guidance. Fire protection design criteria and criteria for planning for fire emergencies for libraries, museums, archives, and record centers are provided in the following NFPA publications. These guidelines must be used as a source of information during the planning of fire protection systems and construction:

3.56.2.1 NFPA 13, *Standard for the Installation of Sprinkler Systems*

3.56.2.2 NFPA 14, *Standard for the Installation of Standpipe and Hose Systems* (coordinate connections with local fire department and utility company)

3.56.2.3 NFPA 232, *Standard for the Protection of Records*

3.56.2.4 NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*

3.56.2.5 NFPA 909, *Protection of Cultural Resources including Museums, Libraries, Places of Worship, and Historic Properties*

3.56.2.6 NFPA 2001, *Clean Agent Fire Extinguishing Systems*

3.56.2.7 When the holdings include nitrate motion picture film or nitrate sheet film, a separate storage room must be provided that meets the requirements of NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Film*.

3.56.3 Design considerations. Fire protection design must include the following critical elements:

3.56.3.1 Compartmentalization of spaces to prevent migration of fire.

3.56.3.2 Structural design to prevent building collapse and allow the building to remain operational after a fire.

3.56.3.3 Alarms and alarm communications to signal presence and location of

fire.

- 3.56.3.4 Means of egress for visitors and staff.
- 3.56.3.5 Control of smoke migration within the building and through the building systems.
- 3.56.3.6 Fire suppression through an automatic suppression system. The fire suppression system must be designed to limit the maximum anticipated loss from any single fire event to a maximum of 100 cubic feet of holdings destroyed.
- 3.56.3.7 Water supply to the building and site.
- 3.56.3.8 Sprinkler systems for holdings storage rooms must be zoned separately from other building areas.
- 3.56.3.9 The quantity of holdings stored in a single fire compartment must not exceed 125,000 cubic feet.
- 3.56.3.10 Construction materials used in walls, ceilings, and floors must be rated as Class 2 (flame-spread rating of 25 or less) as tested according to the ASTM E-84 and must have a smoke development rating below 450.
- 3.56.3.11 Ignition prevention through the choice of furniture, wall covering, and fixtures that lower the flame spread and smoke generation.
- 3.56.3.12 Furniture and equipment must also be chosen with the lowest possible flame spread ratings. (See part 4, par. 1c for requirements.)
- 3.56.3.13 Roof rated for fire resistance at 1/2 hour minimum, 1 hour maximum.

3.57 Separation of functions.

- 3.57.1 Fire walls provide superior protection when compared to fire barriers (i.e., fire separation assemblies). Fire walls are fire resistance rated walls and supporting construction that are independent of other structural building elements, and are able to remain intact with complete building collapse on one side of the wall. The location of fire walls must allow for a continuous wall assembly from exterior wall to exterior wall, and from the ground slab through the roof structure (e.g., parapet). This higher level of protection is preferred for archival storage where design constraints allow. Where fire walls are deemed not possible or feasible by NARA such as for building storage areas located within the building on single or portion of the floors, fire barriers (i.e., fire separation assemblies) and supporting structural construction must be provided.
- 3.57.2 Specific fire resistance rating for fire walls or fire barriers must be designed to protect the storage archives as follows:

- 3.57.2.1 Between adjacent holdings storage rooms - 4 hour rating.
- 3.57.2.2 Between holdings storage and adjacent spaces - 2 hour rating.
- 3.57.2.3 Between processing rooms and adjacent spaces – 2 hour rating.
- 3.57.2.4 Columns within holdings storage spaces - 2 hour rating.
- 3.57.2.5 Between exhibit production, clean rooms, catering kitchen, and other similar functions - 2 hour rating.
- 3.57.2.6 Between paint rooms and other spaces – 4 hour rating
- 3.57.2.7 Between exhibit galleries and other functions - 2 hour rating.
- 3.57.2.8 Between mechanical spaces and other functions - 2 hour rating.
- 3.57.2.9 Exterior overhead doors at loading docks and service entrances to the loading dock must have a one-hour fire rating to protect the loading dock from exterior fire exposures.

3.58 Smoke detection system requirements.

- 3.58.1 All Presidential libraries must have an approved, supervised automatic fire alarm and detection system providing full-building coverage. Fire detection systems must meet the requirements of NFPA 72, National Fire Alarm Code. These systems must be fully addressable, direct digital control systems, including Listed Integral Sensitivity Testing. Smoke and fire detection devices must be located to provide a 99% reliability of detecting the origin of fire within less than 5 minutes. At a minimum, photoelectric-type detectors must be used in holdings storage and processing rooms and in exhibit galleries. Spacing of detectors must consider the ceiling design. Smoke detection is required under raised flooring and in HVAC supply and return air ducts. Special consideration must also be given to the exhibit production room and paint shop, where particulates may interfere with the detection system.
- 3.58.2 Design of the system must include consideration for the ease of maintenance, easy finding of faults, and simplicity of finding the location of an alarm. Testing of all installed fire alarm systems and equipment shall be in accordance with the requirements of NFPA 72.

3.59 Automatic sprinklers and other extinguishing equipment. Automatic sprinkler protection must be provided in all new Presidential library construction. This is a NARA requirement. Sprinkler system or other automatic suppression systems must provide coverage for the entire building.

3.59.1 General sprinkler system requirements.

- 3.59.1.1 The sprinkler systems must comply with NFPA 13, *Standard for the Installation of Sprinkler Systems* and the following supplemental requirements. All building areas must be protected with sprinklers, including stairs and landings on every level, elevator machine rooms, telephone rooms, telephone frame rooms, boiler rooms, electrical closets, electrical switchgear rooms, transformer areas, receiving rooms, and mechanical rooms.
- 3.59.1.2 The sprinkler system must be hydraulically designed. Calculation for all records storage areas using static shelving or other open-shelf equipment 12 feet or less in height must be Ordinary Hazard Group 2, Storage Occupancy requirements of NFPA 13. The design must incorporate Quick Response (QR) 165 degrees Fahrenheit sprinkler heads (RTI=50) spaced on 10 foot by 10 foot grid, with a minimum flow density of 0.3 gpm for the most remote 1,500 feet squared area. For most areas, a sprinkler system must be provided. Clean agent systems in compliance with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, or pre-action sprinkler systems must be used in cold storage rooms and other areas subject to freezing, and may be used in computer rooms and electrical and telephone closets. Water cut off valves to the sprinkler systems must be clearly marked and readily accessible to NARA staff and contractors. Designers should consider using lower temperature (135 or 155 degree F) sprinkler heads.
- 3.59.1.3 A licensed fire protection engineer must design the automatic sprinkler system. Primary design of the system by the system installation contractor or subcontractor is not acceptable. Any subsequent installation drawings, shop drawings, and equipment submittals must be reviewed by the design engineer for verification with the initial design. The actual location of all sprinkler heads and sprinkler piping, including risers, valves, flow control zones, and alarm equipment must be shown on the construction documents.
- 3.59.1.4 The location of all sprinkler heads must be carefully considered to provide both protection for the building and its contents. Locations of sprinkler heads must not conflict with any other equipment, including the doors or other operable parts of mechanical and electrical equipment. In collection storage areas, sprinkler heads must be located to provide maximum useable height in the room while providing protection for the stored materials. Sprinkler heads must not be located where heat from equipment might cause activation of the system.
- 3.59.1.5 Sprinkler heads in locations such as the receiving room and exhibit production room that may be damaged must be protected with wire cages.
- 3.59.1.6 Sprinkler system piping must be kept to a minimum in the holdings

storage and processing rooms, while providing adequate coverage for the space.

- 3.59.1.7 All exposed water supply piping for fire suppression must be painted red and the pipes must be labeled with direction markers and identification. Concealed piping (above suspended ceilings) must be appropriately color-banded every 10 feet. Distribution piping for fire suppression must be marked with a 4-inch red band every 10 feet. If the sprinkler piping in the museum space is exposed, it may be banded instead of entirely painted red.
- 3.59.1.8 Delivery of clean water (potable, not pond) in the event of sprinkler activation is of paramount importance. The system must be designed using piping that can be installed cleanly and that will not corrode. The sprinkler designer/installer must provide assessment of local water supply to determine the need for preventative measures to eliminate microbiologically influenced corrosion (MIC) of the sprinkler piping.
- 3.59.2 Compact shelving: special requirements. NARA strongly encourages the use of some compact shelving to maximize storage space. However, areas with compact shelving must incorporate special NARA requirements that include providing electrically operated shelving that automatically separates the rows of shelving to create minimum 5-inch aisles upon activation of a smoke detector, water flow alarm, or manual alarm. Fire protection for records stored on 8-box high compact shelving (111" inches tall) requires wet-pipe automatic sprinkler system with 165° F quick response sprinklers (RTI=50) spaced on a maximum of 100 ft² per sprinkler and with design for a minimum flow density of 0.30 gpm/ft² over the most remote 1,500 ft² of floor area. Designers should consider using lower temperature (135° or 155° F) sprinkler heads.
- 3.59.3 Alternative designs. Alternative designs for sprinkler systems for compact shelving storage higher than 111" will require independent full-scale testing or computer modeling (conducted in accordance with section 3.106.2) before approval by NARA for use in Presidential libraries.
- 3.59.4 Cold storage room requirements. Clean agent systems that comply with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, or pre-action sprinkler systems must be used in cold storage rooms and other areas subject to temperatures below 40°F, and may be used in holdings storage rooms. The pre-action sprinkler system shall be double interlock type which admits water to sprinkler piping upon operation of both detection devices and automatic sprinklers. These systems also may be used in computer rooms and electrical and telephone closets.
- 3.59.5 Exhibit galleries. Exhibit casework must not obstruct air flow around fire detectors and must not block the discharge pattern from the fire suppression system. See obstruction criteria of NFPA 13 and other applicable reference criteria. Exhibit cases must not be designed to include the fire detection or suppression systems.

Cases must be capable of protecting contents from fire for 30 minutes and must be designed to withstand discharge from sprinkler heads and fire hoses. When cases include internal mechanical or electrical equipment, fire detection must be integral to the case. In order to limit toxic fumes in the event of a fire and to provide maximum protection for holdings on display, laminated glass must be used for casework and framing.

- 3.59.6 Fire pump and loop fire line. As provided by NFPA 20, *Standard for the Installation of Fire Pumps*, installation of a fire pump must be provided when adequate water pressure is not assured. A 2-hour water supply is required, and the location of standpipes and connections must be coordinated with the local fire department and utility company. A loop fire line must be provided around the building to assure water flow to meet the sprinkler system demand. (Sizing of the loop should be based on the hydraulic calculations and water supply analysis to ensure adequate water supply to meet design requirements. Design basis should account for both the site fire flow and the sprinkler system demand.)
- 3.59.7 Standpipes. All standpipes must be connected to the water supply, be permanently pressurized, and be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems*. Whenever possible, standpipes must be close to, but not inside, holdings storage rooms. Dry automatic standpipes must only be used in spaces subject to freezing. Risers and cross-connections must be designed to meet hydraulic requirements for standpipe hose streams plus automatic sprinklers, if applicable. In fully sprinklered buildings, the minimum flow in any riser must be at least 500 gpm. Additional interconnections, at the tops of risers, for example, may be considered to improve hydraulic characteristics. This is done to reduce pipe sizes as compared to code prescriptive minimums.
- 3.59.8 Fire department hose outlets. On each 6-inch fire main riser, fire department hose outlets suitable in size for the local responding fire department, must be provided. These outlets must be located at each story and must not be more than 40 inches above the floor level. Each outlet must be located in the stair shaft and have easily removable 3-inch and 2-inch (or 2-1/2 inch) caps as confirmed by local fire jurisdiction. Threads on the outlets must be compatible with the local fire department hose connections.
- 3.59.9 Fire hose and fire hose cabinets. Fire hoses must only be provided if required by the local fire department for their use. In that case, hose cabinets must be marked "For Fire Department Use Only."
- 3.59.10 Fire extinguishers. The library must be supplied with the number, size, and type of portable fire extinguisher required by NFPA 10, *Portable Fire Extinguishers*. The extinguishers must be in recessed cabinets.
- 3.59.11 Zone valves. Control valves must be zoned to allow maintenance in one area without disabling the entire system. Zoning is also required to turn off the system in

areas no longer requiring suppression.

- 3.59.12 Testing. There must be a successful pre-occupancy testing of the alarm and suppression systems in accordance with NFPA 72 and 13. Drains and test connections must be included in the system design.
- 3.59.13 Manual alarm stations. In addition the requirements for manual pull stations at the exits under the *Life Safety Code*, NFPA 101, they must be located in or near an egress door of the holdings storage rooms, the processing rooms and the exhibit production room.
- 3.59.14 Renovations. The fire detection and suppression systems must remain operable during the addition to or renovation of an existing NARA Presidential library. If this is not possible, measures must be implemented to provide fire detection and response protection for the building and collections.
- 3.60 Special requirements for HVAC systems.
- 3.60.1 Cooling towers. Cooling towers must be constructed from stainless steel. Cooling towers over 2,120 cubic feet in size built with combustible fill must be provided with automatic sprinkler systems, as defined by NFPA 214. This requirement applies to single towers. A series of single towers with common piping but separated by at least 5 feet would not require sprinklers if they were each less than 2,120 cubic feet. Combustible casings are acceptable in cooling towers provided the fill and drift eliminators are non-combustible (Polyvinyl chloride and fire retardant treated fiberglass reinforced plastic are classified as combustible). In determining cooling tower requirements, use the definitions of NFPA 220 for combustible and non-combustible materials.
- 3.60.2 Main shut-off of air handling system. Presidential libraries must have a central control system for the fire protection system. Through the fire control center, it must be possible to shut down the air handling system manually, overriding automatic controls. This shut-off switch must be located in the fire control panel.
- 3.60.3 Duct smoke detectors. Duct smoke detectors must be provided as part of the fire detection system. Smoke detectors must be placed in the supply and return ducts of the air handling units and be designed to shut down the individual air handling unit if smoke is detected in its system. Like all smoke detectors, duct smoke detectors must be connected to the building fire alarm system.
- 3.61 Building-wide emergency PA system. The building must be equipped with a building-wide emergency public address (PA) system that can be operated from the Security Control Center and by the fire department at the building fire annunciation panel in the event that the fire department or local Fire Marshal requires that the building annunciation panel be located in a place other than the main entrance. The PA system must be connected to the emergency power system. The PA system must be able to broadcast throughout the library. NARA recommends that it also have the capability to broadcast to the grounds around the

building.

3.62 Fire alarm panel.

3.62.1 The main fire alarm control panel must be located in the Security Control Center which is attended 24 hours per day, seven days per week. Some jurisdictions require that a fire alarm annunciator panel be located near the main entrance. If this requirement applies, fire alarm annunciator panels must be provided at both the main entrance and at the Security Control Center. (Depending on building size, some jurisdictions may require more than one annunciator.)

3.62.2 The fire alarm system must monitor the status of all smoke and heat rise detectors, pull stations, fire suppression system valves, and system trouble conditions, including smoke detectors that require maintenance and cleaning. The system must report any alarms or trouble conditions to the security control center on a computer monitor in a graphics display format showing building floor layout and device identification that allows touch-screen acknowledgement, silencing, and resetting of the alarms. Trouble alarms may also be reported to the facility manager's office. The fire alarm monitoring system must be direct digital controlled so that the actual location of a troubled sensor or device is readily identified and temporarily disabled without affecting the whole system. The system must be provided with a dedicated connection to transmit a signal to a remote UL listed central station fire alarm monitoring service or municipal fire department.

3.62.3 The fire alarm system should be compatible with Archives II Alarm Monitoring equipment for the 24 hour remote monitoring capability (or an interface unit must be provided to make the fire alarm system compatible with the Archives II system) so that a remote signal can be sent to Archives II in the event of an alarm or a trouble signal when the Library is not occupied. However, library building fire alarm system must be of the most current, tested, and reliable model feasible regardless of compatibility with any systems in Archives II.

3.63 Occupancy criteria for fire safety and protection. The following occupancy criteria apply to these functional areas of a Presidential library.

3.63.1 Exhibit galleries. The exhibit galleries must be rated for Assembly Occupancy and at least two means of egress must be provided. Unsupervised means of egress must use delayed egress locks with local alarms.

3.63.2 Storage areas. The textual and general nontextual storage; sensitive compartmentalized information facility storage; and artifact storage must be designated as Storage Occupancies, Ordinary Hazard Group 2.

3.63.3 Cold storage. Cold storage areas are classified as Storage Occupancies, and are rated as Ordinary Hazard, Group 2. Cold storage areas are subject to freezing; therefore, these areas must be protected by either a pre-action system or by clean agent systems.

- 3.63.4 Processing, production, and paint rooms. Processing rooms must be designed as Business Occupancy. The exhibit production rooms and the nontextual holdings processing room are rated Business Occupancy with special requirements for dust or fume extraction. The paint room must be designed as Hazardous Occupancy with special requirements to safely house paints and other flammable materials. Provide approved portable flammable liquid storage containers for housing such small quantities of these materials except while in use.
- 3.63.5 Public entrance and lobby. The public entrance and lobby area must be designed for Assembly Occupancy. The auditorium, education office/classroom, food service, and orientation theater must also be designed for Assembly Occupancy and must have at least two means of egress. Unsupervised means of egress must use delayed egress locks with local alarms. An exhaust hood is required over any grease cooking area.
- 3.63.6 Offices, research rooms, and computer rooms. All must be designed as Business Occupancy. If raised flooring is used in the computer room or other office area, smoke detectors must be installed under the raised floor.
- 3.63.7 Loading dock and service areas. The loading dock, receiving, and service areas must be designed as Storage Occupancy and rated as Ordinary Hazard Group 2. The loading dock, including the canopy area of the dock, must have a pre-action fire suppression system if this area is subject to freezing. The loading dock must be under negative pressure relative to the entire building. The receiving rooms must also be under negative pressure relative to the rest of the building.
- 3.64 Mandatory NFPA standards. Fire protection design features must be provided as required by the National Fire Protection Association (NFPA) National Fire Code. Applicable standards are listed as follows.
- 3.64.1 General fire and safety.
- 3.64.1.1 NFPA 101, *Life Safety Code*
 - 3.64.1.2 NFPA 78, *Lightning Protection Code*
 - 3.64.1.3 NFPA 909, *Protection of Cultural Resources, including museums, libraries, places of worship, and historic properties*
 - 3.64.1.4 NFPA 110, *Emergency and Standby Power Systems* (Type 10, Class 6, Category A or B, Level 1 system is required.)
 - 3.64.1.5 NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*
- 3.64.2 Sprinkler and fire suppression codes.
- 3.64.2.1 NFPA 20, *Installation of Centrifugal Fire Pumps*

- 3.64.2.2 NFPA 22, *Water Tanks for Private Fire Protection* (2-hour supply needed)
 - 3.64.2.3 NFPA 24, *Installation of Private Fire Service Mains*
 - 3.64.2.4 NFPA 25, *Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*
 - 3.64.2.5 NFPA 26, *Supervision of Valves Controlling Water Supplies*
 - 3.64.2.6 NFPA 13, *Installation of Sprinkler Systems*
 - 3.64.2.7 NFPA 10, *Portable Fire Extinguisher*
 - 3.64.2.8 NFPA 14, *Standpipe and Hose Systems* (coordinate connections with local fire department and utility company)
 - 3.64.2.9 NFPA 75, *Protection of Electronic Computer/Data Processing Equipment*
 - 3.64.2.10 NFPA 92A, *Smoke Control Systems*
 - 3.64.2.11 NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*
 - 3.64.2.12 NFPA 17, *Standard on Dry Chemical Extinguishing Systems*.
- 3.64.3 Fire stops, including mechanical piping, electrical risers. ASTM E-814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*.
- 3.64.4 Smoke detection and alarm systems. NFPA 72, *National Fire Alarm Code*.

Section I. Security

- 3.65 Overview. Presidential libraries present unique security design issues. The security design must recognize the public functions of the building (museum, research rooms, and assembly functions) and the irreplaceable nature of the textual, nontextual, and artifact holdings. Head of State gifts, in addition to having high monetary value, also have diplomatic significance. Hand-written or hand-annotated Presidential documents have high monetary value and historical significance. Some of the holdings of a Presidential library are national security classified at the most sensitive levels, while other unclassified documents have either special access restrictions (e.g., Privacy Act materials) or are donor-restricted. Presidential libraries often host major events attended by former Presidents and other world leaders. Presidential libraries also have the potential to attract demonstrations. In the current threat environment, they also represent significant targets for terrorist attacks.
- 3.66 Vulnerability assessment and mitigation.
- 3.66.1 Vulnerability assessment. A formal vulnerability assessment must be conducted for

each library at the earliest design phase. The U.S. Marshal's Service publication *Vulnerability Assessment of Federal Facilities*, dated June 28, 1995, provides a useful format for conducting a formal vulnerability assessment and determining specific mitigation approaches. This manual defines 5 levels of building risk, based on the size and occupancy of typical Federal facilities. By size and number of employees, the normal Presidential library would be classified as a Level III facility. However, the high volume of public visitors, the sensitivity of the library's holdings, and other factors described above require additional mitigation measures that are typical of a Level IV facility. For the assessment, assume that Homeland Security Advisory System (HSAS) threat level YELLOW/ELEVATED is the "normal" operational mode for the Presidential library, and that occasional sustained operational periods (days to weeks) will occur at HSAS threat level ORANGE/HIGH. Although Presidential libraries are expected to be closed to the public during HSAS threat level RED/HIGH, the building design must support the protection of the holdings with a normal level of security staffing at this threat level. Also include in the assessment the possibility that staff and the public may be sheltered in the library during the threat.

- 3.66.2 Mandatory mitigation approaches. NARA provides armed security guard coverage for all Presidential libraries. The following additional security features must be provided:
- 3.66.2.1 Exclusive security stand-off (buffer) zone of at least 100 feet around all portions of the building.
 - 3.66.2.2 Blast resistant exterior walls and structure (including glazing).
 - 3.66.2.3 Full "airport" personnel and package screening of all visitors must be conducted in a security vestibule prior to entrance to the facility. The security vestibule cannot be part of a code-required emergency exit path.
 - 3.66.2.4 Comprehensive intrusion detection system. The designers must consult with NARA to determine current specifications for approved intrusion detection systems.
 - 3.66.2.5 Perimeter lighting as defined in paragraph 3.97 of this standard, capable of full operation under standby power.
 - 3.66.2.6 Closed circuit television monitoring of the entire exclusive security stand-off zone, with additional coverage of exterior public parking areas, access drives, loading areas, and building exits and at other locations outlined in Figure 3-6.
 - 3.66.2.7 Emergency lighting and power from a reliable backup generator.
 - 3.66.2.8 Under current Federal government policy, the Building Access Control, Intrusion Detection, and CCTV systems must be networked to allow for

integration with remote monitoring stations at geographically removed locations.

- 3.67 Exclusive security stand-off zone. The exclusive security stand-off zone must be capable of excluding a 15,000 pound vehicle traveling, at 30 miles per hour. Controlled employee parking and handicapped and ceremonial drop-off areas may be located within the exclusive security stand-off zone provided the access point(s) are controlled by active vehicle barrier systems. Vehicle barriers must be controllable from the access point and also remotely from the security control center.
- 3.68 Blast resistant exterior walls and structure (including glazing). The exterior walls (including glazing and doors) and structure must provide a “high” level of protection against a 220-pound bomb located outside of the exclusive security stand-off zone. A “high” level of protection is defined as no significant structural damage; exterior wall components may be damaged, but are repairable; no significant injuries to occupants or damage to contents.
- 3.69 General intrusion detection system.
- 3.69.1 Scope. The general intrusion detection system must monitor all exterior doors, windows, and designated interior spaces. The general intrusion detection system must be a high-quality, commercial system meeting the requirements of UL Standard 1076, Proprietary Burglar Alarm Systems, UL Standard 639, Intrusion Detection Units, and UL Standard 634, Connectors and Switches for Use with Burglar Alarm Systems at the Grade/Class “A” level. Alarms and trouble/tamper indications must be displayed on a terminal capable of displaying graphically the location of the alarm. The terminal must also be capable of displaying pre-programmed response instructions specific to the individual alarm condition. All intrusion alarms must be interfaced with the CCTV system to provide automatic call up and display of cameras in proximity of the alarm. All alarm and trouble transactions must be logged to a printer and be maintained in system memory for a minimum period of seven days. Two terminals are required: the terminal located in the Security Control Center must be capable of displaying all alarm and trouble conditions, and provide for guard acknowledgement (comment capability is highly recommended but not required), but must not be capable of reprogramming system parameters (inclusive of date, time, and secure/access mode changes) or shunting alarm points; the second, supervisory, terminal must be located in the facility manager’s office, and must be capable of producing event logging reports and reprogramming system parameters and shunting alarm points. The supervisory terminal must be protected by a physical access barrier (e.g. high security key lock or “token” access control) in addition to having password access protection. The system must be capable of sending alarms and supervisory signals by reliable and secure (128-bit encryption) communication to a central monitoring station as designated by NARA. Under current Federal government policy, the Building Access Control, Intrusion Detection, and CCTV systems must be networked to allow for integration with remote monitoring stations at geographically removed locations. All hardware, software, and licensing will be provided at the central monitoring location that will be fully compatible with the library intrusion detection

system.

- 3.69.2 Exterior doors. All exterior doors must be monitored by door contacts suited to the particular door type. Staff entrance door(s) must be designed to allow the building access control system to shunt the alarm contact during predefined access hours. Unsupervised emergency exit doors (i.e., not normally under constant observation by staff or security personnel) must be equipped with delayed egress locking devices with local alarms. If the local fire code permits, the delay must be set to 30 seconds rather than the standard 15 seconds. Delay must be adjustable/programmable up to 30 seconds.
- 3.69.3 Windows. All exterior windows within 10 feet of grade level must be monitored by sonic glass break detectors or by beam motion detectors. NARA recommends against using vibration detectors or window foil detectors as they are prone to false alarms and failures.
- 3.69.4 Textual and nontextual holdings storage rooms (including cold storage rooms). All doors to holdings storage rooms, including cold storage rooms, must be monitored by door contacts. Monitoring of the door contacts must be “active” at all time; however, during predefined access hours, the building access system must be able to shunt the contacts from the “exposed” side, and a Request to Exit (REX) device must be able to shunt the contacts from the secure side. A “door held open” alarm condition must be reported after 30 seconds. Motion detectors must also be provided in general storage areas and actively monitored during secure mode.
- 3.69.5 Artifact storage rooms. General artifact holdings storage rooms must be provided with the same monitoring features as required for general textual and nontextual holdings storage rooms.
- 3.69.6 Secure artifact holdings storage area.
- 3.69.6.1 When the secure artifact holdings area is a separate room, the requirements of paragraphs 3.70.5 and 3.70.6.2 apply.
- 3.69.6.2 All doors providing access to the secure museum artifact holdings storage area must be monitored by balanced magnetic contacts. Monitoring of the door contacts must be “active” at all time; however, during predefined access hours, a zone control keypad located within the protected space may establish an operation mode when the building access system can shunt the contacts from the “exposed” side (this shunting transaction must be logged to the security system, including the identity of the access card used to implement the shunting), and a Request to Exit (REX) devices must be able to shunt the contacts from the secure side during “operational” mode. A “door held open” alarm condition must be reported after 30 seconds. Total-coverage motion detection must be provided in the secure museum artifact storage areas and actively monitored during secure mode. Provision must also be made

for storage device-specific alarm contacts for exceptional requirements.

- 3.69.7 Museum exhibit galleries. Motion detectors must be provided in all museum exhibit galleries and actively monitored during secure mode. Motion detectors must be capable of working in low ambient light conditions down to 30 Lux. All exhibit cases must be lockable and tamper-proof while providing prompt access by NARA staff for maintenance and rotation of holdings. For holdings on open display, NARA requires a perimeter alarm or pressure alarms. The temporary exhibit gallery must support wireless case alarms.
- 3.69.8 Museum gift store. The museum gift store must be protected by appropriate detection devices, and CCTV coverage. In addition to intrusion detection, a duress alarm must be provided at each cash register location and in the museum gift store manager's office.
- 3.69.9 Mechanical and electrical rooms. Access doors to all mechanical and electrical rooms must be monitored by door position switches. A shunting capability must be provided, either in connection with the building access system or by a high-security key shunt.
- 3.69.10 Communications and security closets. Communications closets that do not contain security equipment must be protected like mechanical and electrical rooms. Security closets and communications closets that contain security monitoring equipment must be protected by balanced magnetic contacts. Monitoring of the door contacts must be "active" at all times; however, during predefined access hours, the building access system must be able to shunt the contacts from the "exposed" side (this shunting transaction must be logged to the security system, including the identity of the access card used to implement the shunting), and a Request to Exit (REX) device must be able to shunt the contacts from the secure side. A "door held open" alarm condition must be reported after 30 seconds.
- 3.70 Closed Circuit Television (CCTV). A state-of-the-art digital CCTV monitoring system must be provided.
- 3.70.1 All interior cameras must be color. "Mini-dome" housings are preferred. All exterior cameras must be dual-mode, color during daylight, and low-light monochrome at night. Exterior cameras will be pole-mounted at a height of 16 feet and at least 50 feet from the building. When cameras are mounted on exterior light poles, the video signal must be protected from any electrical wiring to prevent electromagnetic interference from power lines. Figure 3-6: Security devices and locations (mandatory locations) lists the required types of cameras.
- 3.70.2 All camera signals must be digitally recorded (4 frames per second in normal mode; at least 16 frames per second in alarm mode). Camera recording must be motion activated. System storage must be in digital video recorded format and adequate to provide a minimum of 30 days of recording of all cameras. The recording system must be able to provide copies of both image and system/control data via CD-ROM,

DVD, or similar digital media. The system controller must support up to 16 frames per monitor (with dynamic reconfiguration: full screen; four quadrant, one or four frames per quadrant), and at least 3 monitors.

- 3.70.3 Each monitor must be an active matrix, thin film transistor (TFT) liquid crystal display (LCD), 20 inch viewable, with a native resolution of at least 1280 x 1024 dpi. The CCTV system must be interfaced with the intrusion and access control systems to provide automatic call up and display of cameras for selected alarm activations and card access events.
- 3.70.4 All CCTV system components must be supported by battery back-up capable of operating for 10 minutes at full load, and on the emergency generator circuit. System must work in low light conditions of 30 Lux.
- 3.70.5 Security systems provided in adjacent Foundation-controlled buildings must be compatible with security systems installed in any NARA-controlled building if NARA provides security on a reimbursable basis in Foundation-controlled spaces.

3.71 Sensitive Compartmented Information Facility (SCIF) intrusion detection system.

- 3.71.1 The SCIF (or vault) must be protected by a separate, highly specialized intrusion detection system that meets the requirements of Director of Central Intelligence Directive 6/9 (“DCID 6/9”). The requirements of this system significantly exceed the requirements for a UL Class AA system. In addition to UL listing, all components of the system must be approved for use by the CIA.
- 3.71.2 The security control panel, central processor, and event logging printer for this system must be located within the protected vault. All doors must be monitored by balanced magnetic switches. In addition, all vault doors must be monitored by a heat detector. One hundred percent volumetric monitoring is required. If a false ceiling covers the vault, it must also be provided with volumetric monitoring. Any openings exceeding 90 square inches must be secured by bars on 6-inch centers in both directions and have an inspection port within the secure area.
- 3.71.3 The system must be provided with a minimum of 24 hours (recommended is 72 hours) battery back-up and be supplied by the emergency generator circuit. Manual switching between “secure” and “access” modes located within the vault is required. All alarm reporting circuits external to the vault must be fully supervised by a DES encrypted signal. All alarm and trouble/tamper conditions must be reported to both the on-site Security Control Center and to an approved external monitoring site.

3.72 Security Control Center.

- 3.72.1 The Security Control Center must be located within the building core (i.e., not adjacent to any exterior wall) and must be protected at National Institute of Justice (NIJ) level III against ballistic attack. Any glazing to an interior corridor must be ballistic rated. For new libraries, entrance to the Security Control Center must be via

a “man-lock” vestibule, with both doors controlled by the building access control system. For existing libraries, NARA recommends that entrance to the Security Control Center be via a “man-lock” vestibule, with both doors controlled by the building access control system. All electrical equipment, including general room lighting, must be supported by the emergency generator.

3.72.2 A Security Control Center console must be provided in the Security Control Center with access to all features of the security and building systems. At the Security Control Center console, a single operator must be able to clearly view the CCTV monitors, the security alarm graphic display, access control system display, HVAC control system display, fire control panel and annunciator graphic display, and emergency generator and stand-by power status. This is likely to require either an “L” or a “U” configuration. The console must be supported by an Uninterruptible Power Supply (UPS) capable of supporting all systems and monitors for at least 10 minutes.

3.72.3 The Security Control Center will also provide offices for the security staff, including an approved safe for guard weapons and ammunition.

3.73 Access control system.

3.73.1 Each Presidential library must be provided with a state-of-the-art “proximity smart card” based access system capable of being integrated with the security control system. The system must meet the requirements of ISO/IEC 7810: Identification Card Physical Characteristics, ISO/IEC 14443: ID Cards Contact Less Integrated Circuit Cards (Proximity Cards), and ISO/IEC Smart Card Interoperability. The locations requiring access card control are listed in Figure 3-6. Each access card must have a unique identification.

3.73.2 The access control system must be interfaced with the CCTV system to provide automatic call up and display of selected cameras in proximity of card readers programmed for event tracking. The access control system must support a minimum of 128 (256 preferred) access zone/time segments. It must be capable of recording all access attempts and of producing hard-copy reports of all transactions. The system must support a minimum of 512 authorized users.

3.73.3 Access to supervisory and programming functions must be restricted to a single terminal located in the Facility Manager’s office. The supervisory terminal must be physically secured (i.e., high security key or “token”) in addition to being password protected.

3.73.4 System memory must provide sufficient capability to record all transactions occurring over a week’s time, and tape backup must be available and provide copies of both image and system/control data via CD-ROM, DVD, or similar digital media. Backup of system memory to tape must not interrupt normal operations.

3.73.5 Access system controlled electronic locks must “fail safe” only for exterior

emergency exit doors. All other access system controlled electronic locks must “fail secure.”

3.74 General building hardware.

- 3.74.1 General. Door hardware is the first line of defense in the development of a secure building and a lasting building. Door hardware must be security type and heavy duty for maximum wear resistance and must also comply with all Americans with Disabilities Act requirements. Mechanical and electronic locking hardware (including magnetic locking systems) must be capable of withstanding a pull of over 300 pounds at the door handle without failure of the electronic lock. Doors with electronic locks will lock upon closure. (Coordinate door locking with NFPA 101 requirements. Limited use of delayed locking and controlled access arrangements are allowed on egress doors by NFPA 101.)
- 3.74.2 Exterior doors. All single-leaf exterior doors must have externally mounted security astragals. Doors designed solely for emergency exit use must have no external hardware. Multiple leaf external doors equipped with panic hardware must be monitored by CCTV and be alarmed during secure mode.
- 3.74.3 Sensitive compartmented information facility (SCIF) door(s). SCIF (or vault) doors must be solid-wood core and permanent drywall construction with an approved digital electronic combination lock (type “X-09” as of December 2006). The initial door of the SCIF vestibule must be secured by the card access system.
- 3.74.4 Cipher locks. Cipher locks may be used as “day gate” locks, but cannot be considered as the primary lock for any secured area.
- 3.74.5 Locksets. All the building locksets must be compatible with the MEDECO lock cylinders and cams. NARA will work with the contractor to provide approval to purchase and install NARA-exclusive MEDECO licensed keys and cylinders to prevent the unauthorized duplication of keys in conjunction with the NARA key and lock custodian for the building.

Figure 3-6: Security devices and locations (mandatory locations)

| Location | Card Acc. | Intrusion Detection | CCTV Camera | Duress Alarm | Local Alarm | Additional Locking |
|------------------|------------------|----------------------------|--------------------|---------------------|--------------------|---------------------------|
| Access roads | | | PTZ E | | | |
| Site perimeter | | | PTZ E | | | |
| Site gates | Y | GL/I | PTZ E | | | R |
| Exclusion zone | | GL/I | PTZ E | | | R |
| Employee Parking | Y | GL/I | PTZ+IRS E | CB | | R |
| Delivery access | | GL/I | PTZ+IRS E | | | R |
| Public Parking | | | PTZ E | CB | | |

| Location | Card Acc. | Intrusion Detection | CCTV Camera | Duress Alarm | Local Alarm | Additional Locking |
|-------------------------------------------------------|-----------|---------------------|-------------|--------------|-------------|--------------------|
| Grounds | | | PTZ E | CB | | |
| Entrance Security Vestibules | Y | DC/M | PTZ+ 2S I | Y | | M |
| Entrances | Y | DC | 2S I | | | M |
| Emergency Exits | | DC | 2S I | | Y | Delay |
| Restricted Corridors | Y | | 2S I | | | |
| Loading dock doors | | DC | PTZ+S I | | | M |
| Public Elevators | | | | E | | |
| Staff Elevators | Y | | | E | | |
| Freight Elevators | Y | | | E | | |
| “Exit” stairwells | | | S/flight I | | | |
| Restricted stairwell doors | Y | | S I | | | |
| Visitor Information | | | PTZ I | Y | | |
| Museum gift shop | Y | DC/M | PTZ+S I | Y | | M |
| Staff Offices | | DC/M | | | | M |
| Facility Manager’s Office | | DC/M | | | | M+C |
| Computer rooms | | DC/M | | | | M+C |
| Guard Stations | | | S I | | | M |
| Security Control Center | Y | DC | | OS | | M |
| Electrical/Mechanical Rooms | | DC | | | | M |
| Communications Closet | Y | DC | | | | M |
| Security Closet | Y | BM | | | | M |
| SCIF Vestibule | Y | BM/M | S I | | | M+C |
| SCIF Vault | Y | DCID6/9 | | Y | | DEC |
| Holdings Storage | Y | DC/M | | | | M+C |
| Processing and production rooms | Y | DC/M | | | | M |
| Research Rooms | | DC | 2PTZ I | Y | | M |
| Nontextual Research Rooms | Y | DC/M | 2PTZ I | | | M+C |
| Museum exhibit galleries | Y | DC/M+WL | Multiple I | Y | | M |
| Public assembly | | | Multiple I | | | |
| Artifact Holdings Storage and Processing (High Value) | Y | DC/M | 2PTZ I | | | M+C DEC+C |
| Exhibit Preparation | Y | DC | | Y | | M+C |

| Location | Card Acc. | Intrusion Detection | CCTV Camera | Duress Alarm | Local Alarm | Additional Locking |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------------------------|
| Codes: | | | | | | |
| Intrusion Detection: | | CCTV: | | Duress Alarm: | | Additional Locking: |
| GL/I = Ground Loop with Intercom DC = Door Contact /M = Motion Detection BM = Balance Magnetic Door Contacts WL = Wireless Case Alarm System | PTZ = Pan-Tilt-Zoom IRS = Infrared Stationary (license plate camera) S = Stationary Multiple = design specific E = Exterior Camera I = Interior Camera | CB = "Code Blue" station Y = Regular Duress Alarm E = Elevator emergency intercom OS = Off-site | R = Remote unlocking M = Mechanical Lock Delay = Delayed Release emergency exit hardware C = Cipher Lock DEC = Digital Electronic Combination Lock ("X-09") | | | |

Section J. Finishes

3.75 General considerations.

3.75.1 The finishes on all wall, floor, and wearing surfaces must not only be attractive, but also highly durable. The choice of floor and wall coverings, construction materials, and other decorative elements must also be guided by the need to limit volatile organic compounds (VOCs) and other outgassing chemicals that can contaminate the air. Limiting the levels of airborne pollutants to the requirements established in Figure 3-4 is important both for visitor and staff comfort and the long-term preservation of the collections.

3.75.2 Fire control in libraries includes the careful selection of all building construction materials for fire safety. This includes all materials for walls, display board, museum cases, and other built-in construction. The flame spread of all wood and plastic products, and carpets, must be less than 25 with smoke generation less than 45, as tested according to ASTM E-84.

3.76 Gaseous pollutants including volatile compounds (VOCs), acidic, sulfurous, and other harmful airborne contaminates. The specification of all finishes in the library must minimize outgassing, especially in holdings storage and processing rooms, and in exhibit galleries and cases. Refer to Figure 3-4 for specific pollutant levels for type of area (storage, processing, public spaces).

3.76.1 The largest sources of gaseous pollutants are construction materials, sealants, adhesives, carpets, ceiling finishes, wall finishes, paints, and furniture. Controlling emissions from gaseous pollutants will require careful selection of materials.

3.76.1.1 NARA must approve all carpets, paints, varnishes, wall coverings, and other finish materials in holdings storage and processing rooms.

3.76.1.2 NARA must approve all construction and finish materials used in the construction of the permanent and temporary exhibits, including wood boards, surface finishes, flooring, paints, ceiling finishes, graphic panels, and case finish materials.

- 3.76.1.3 NARA must approve and may test or direct the testing of materials to determine suitability and render approval. Sufficient time to undertake testing must be incorporated into planning and construction schedules; NARA should be involved in discussion of materials proposed for use in critical areas at least 12-24 months before installation of materials. Testing of samples should begin six or more months before installation.
- 3.76.2 Although NARA will need to test many of the construction materials and finishes used in the library, careful selection of proposed materials will eliminate the products most likely to outgas significant quantities of harmful, unacceptable pollutants. Designers should propose paints, sealants, caulks, wood products, foams, and other materials rated as having low or no VOC emissions.
- 3.76.3 Prohibited materials: The following materials are prohibited from use in holdings storage and processing rooms, exhibit galleries, and exhibit cases that will house original holdings. These materials should not be used anywhere else within the Presidential library.
- 3.76.3.1 Cellulose nitrate lacquers and adhesives.
- 3.76.3.2 Cellulose diacetate fabrics.
- 3.76.3.3 Polyurethane products, especially foams and carpet pads but including most polyurethane paints and varnishes.
- 3.76.3.4 Oil-based and alkyd resin paints and varnishes, and oil-based caulks and glazing compounds.
- 3.76.3.5 Latex paint that is based on vinyl acrylic, or styrene acrylic latex. Acrylic latex is generally acceptable.
- 3.76.3.6 Acid-curing silicone sealants and adhesives or similar products that emit acetic acid during cure.
- 3.76.3.7 Products that release ammonia during cure.
- 3.76.3.8 Sulfur containing materials that could release SO₂ such as natural and synthetic sulfur vulcanized rubber, animal glue, wool, sulfur-based dyes, and disodium phosphate fire retardant treatments.
- 3.76.3.9 Most pressure sensitive adhesives and contact cements and adhesives.
- 3.76.3.10 Polyvinyl chlorine polymers (PVCs).
- 3.76.3.11 Formaldehyde emitting compounds, especially urea-formaldehyde, such as might be found in particleboard, interior-grade plywood, and formaldehyde-finished fabrics and wall coverings.

- 3.76.3.12 Woods such as oak known to have high acid content and any wood or wood product that is not sealed to prevent offgassing.
 - 3.76.3.13 Vinyl.
 - 3.76.3.14 Amine based products.
 - 3.76.3.15 Biocides.
 - 3.76.3.16 Cellulose acetate containing fabrics and films.
 - 3.76.3.17 Unsealed concrete, due to its production of fine particulate, alkaline dust.
 - 3.76.3.18 Self-leveling floor compounds.
- 3.76.4 Aeration. A minimum aeration time of four weeks between the time construction is completed and collections are moved into the building must be built into the schedule. During this purge, the HVAC system must be run on a continuous, 24-hour basis.
- 3.77 Floor and wall coverings.
- 3.77.1 All exposed concrete slabs (including spaces beneath raised flooring systems) should be sealed to prevent dusting over time.
 - 3.77.2 Carpet used in Presidential libraries requires particularly careful selection. Carpet tiles are preferred. Carpets are prohibited in holdings storage rooms.
 - 3.77.3 Carpet, pads, and adhesives installed in holdings processing and research rooms and the exhibit galleries must be approved and may be tested by NARA prior to installation. Based on previous NARA projects, several samples may need to be tested before a carpet meets approval. Therefore, the testing process must begin at least 100 days prior to anticipated installation. To increase the likelihood of approval, the designer must select low or no VOC products that meet the Carpet and Rug Institute's Indoor Air Quality Standards (Green Label Program).
 - 3.77.4 Carpets must have a fire rating of PASS in accordance with Underwriter Laboratories, Flame Ratings for Carpets, and meet the requirements of the Federal Government under its Surface Flammability of Carpets, Critical Radiant Flux of Floor Covering Systems. The carpet anti-static control must be permanent. Carpets must meet the following test criteria:
 - 3.77.4.1 Fire resistance, 16 CFR 1630, *Standards for the Surface Flammability of Carpets*
 - 3.77.4.2 *Radiant flux* provided by NFPA 101
 - 3.77.4.3 *Flammability*:

- 3.77.4.3.1 Pill Test: Must Pass.
- 3.77.4.3.2 Radiant (Direct Glue) ASTM E-648: Must be Class 1.
- 3.77.4.3.3 ASTM E-648: flammability average results must not exceed 0.22 watts/cm squared per radiant panel test
- 3.77.4.3.4 NBS Smoke Density: ASTM E-662.
- 3.77.4.3.5 Flaming Mode: Must be <450.
- 3.77.4.3.6 Non-Flaming mode: Must be <450.
- 3.77.4.4 *Static:*
 - 3.77.4.4.1 AATCC-134: acceptable static build-up shall be maximum 3.5 kilovolts at 70 degree F and 20% relative humidity
 - 3.77.4.4.2 Permanent Fiber.
 - 3.77.4.4.3 Electric Resistance: NFPA 99: Must Pass.
 - 3.77.4.4.4 Burrough Method: NFPA 99: Must Pass.
- 3.77.5 The carpet adhesive must be non-wet adhesive, micro-encapsulated tackifier impregnated into cushion backing solvent free adhesive (as recommended by manufacturer) for interior installation of vinyl backed carpet. Acrylic based adhesive must be non-flammable, water based, and alkali resistant, mildew-resistant, freeze-thaw stable. Adhesive must release from substrate without leaving residue.
- 3.77.6 A carpet edge guard must be provided. The designer must specify either aluminum or vinyl edge or transition in color suitable for the particular installation. Edge guard attachment must be made by mechanical fasteners or glued down with an acceptable, low VOC adhesive that meets the Carpet and Rug Institute's Indoor Air Quality Adhesive Testing Program.
- 3.77.7 The adhesive seam sealer must be completely chemical weld/fuse backing together at the seam site.
- 3.77.8 Carpet must not be used on walls.
- 3.77.9 Criteria for selection of floor coverings other than carpet and for wall coverings must include
 - 3.77.9.1 Vinyl Tile: Meet ASTM F 1066, Class 1 requirement; Surface Burning Characteristics, ASTM E-84.
 - 3.77.9.2 Wall Coverings and Fire-Test-Response Characteristics: Meet CFFA-W-

101-D, Type II or Type III requirements, as applicable.

3.77.9.2.1 Surface Burning Characteristics: ASTM E 84.

3.77.9.2.2 Fire Growth Contribution (Textile Wall Covering): NFPA 265 and Method A, IBC 2003.

3.77.10 Fabrics used in holdings processing rooms and in exhibit galleries and cases must be chosen based on several criteria. The fabric must meet the flammability and smoke spread requirements stated in paragraph 4.3. In addition, the fabric must be approved by NARA for chemical stability. For any use inside an exhibit case, the fabric must also be tested for water fastness and light-fastness. Any felt used in exhibit construction and mount making must be synthetic and must be approved by NARA. Foams used in the exhibit must be polyethylene cross-linked with radiation or foamed with inert gas or be another inert pre-approved foam.

3.78 Storage and processing rooms. Holdings storage rooms and exhibit cases housing original holdings have the most restrictive pollutant requirements of any space within the Presidential library, followed by the processing rooms (See Figure 3-4). Carpet, vinyl tiles, and wall coverings must not be used in these areas. The floor, wall, and ceiling in storage and processing rooms must be primed and painted to prevent dust. All construction and finish materials used in holdings storage and processing rooms must be pre-approved by NARA. General requirements are:

3.78.1 A water-based acrylic latex paint approved by NARA must be used for walls and ceiling.

3.78.2 Storage floors must be concrete, sealed to prevent dust and provide an easily cleanable surface. A low VOC acrylic membrane-curing compound must be used for the concrete floors of the storage rooms, followed by two coats of a floor epoxy. The VOC outgassing of any epoxy and floor coatings in holdings storage and processing rooms must be limited by restricting the use of toluene and xylene in the floor coating mix.

3.78.3 NARA must approve sealants, caulks, gaskets, and weather-stripping used in the storage rooms.

3.79 Painted metal surfaces.

3.79.1 Storage furniture. While certain aluminum or stainless steel metal storage furniture and metal elements in storage rooms may be left bare, it is most common for storage furniture to have a coated surface. A powder-coating system must be used to paint all painted metal shelving surfaces (including map cases, museum cabinets, etc.) in all holdings storage rooms. The powder-coating polymer must be a polyester epoxy hybrid or best equivalent available that passes NARA-conducted or independent lab tests for hardness, coating stability, bending, coating adhesion, and coating durability. The paint must not exceed the outgassing limits specified in Figure 3-4.

Powder coating must not be applied to metal surfaces onsite in the storage area. See also paragraph 4.2.

3.79.2 Standard test methods. NARA standard test methods for painted or powder coated finished metal surfaces are as follows:

- 3.79.2.1 Test for Hardness (ASTM D Method 3363-00 Standard Test Method for Film Hardness by Pencil Test).
- 3.79.2.2 Test for Chemical Resistance of Coatings and Finishes (ASTM 3363).
- 3.79.2.3 Test for Coating Softening on Exposure to Chemical Vapors (ASTM 3363).
- 3.79.2.4 Test for Coating Stability (tested by 2 methods ASTM D-4526 Practice for Determination of Volatiles in Polymers by Headspace Gas Chromatography and Thermogravimetric Analysis).
- 3.79.2.5 Test for Coating Adhesion (ASTM D-3359 Method B Method for Measuring Adhesion by Tape Test).
- 3.79.2.6 Test for Coating Durability (modification of ASTM D-4060 Standard test Method for Abrasion Resistance of Organic Coating by the Taber Abraser).
- 3.79.2.7 Bend Test. (ASTM D522-93a Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings)

3.79.3 Limits. The following limits must be used for the tests specified in par. 3.79.2:

3.79.3.1 Hardness: (ASTM Method 3363): In the case of liquid exposure, the coating must not be softened immediately afterwards by more than three hardness units and after 24 hours, show softening of one hardness unit or less. In the case of vapor exposure, the coating must not soften more than one hardness unit immediately after exposure. Both the liquid and vapor test are evaluated by the gouge and scratch method and after either test the coating must show a hardness of HB or better. The liquid exposure is as follows:

3.79.3.1.1 Phase 1: Perform the pencil test to determine the baseline hardness of the coating.

3.79.3.1.2 Phase 2: A two-hour vapor exposure in a sealed container after which the metal is immediately tested for hardness. The hardness level should not have changed more than three pencil units from the baseline hardness test. Coatings to be tested using the following chemicals:

cold water
3.5% ammonia in water
5% sodium hydroxide in water
5% thymol in ethanol
insecticide containing diazion
insecticide containing bendicard
insecticide containing propoxur
insecticide containing resmethrin
chlorinated cleaning solution
quaternary ammonium salts
carbon disulfide
5% sodium carbonate in water

3.79.3.1.3 Phase 3: The coated metal is totally immersed in a chemical for 24 hours after which the metal is immediately tested for hardness. The hardness level of the metal should not change more three pencil units from the baseline tests. Coating to be tested using the following chemicals:

cold water
3.5% ammonia in water
5% sodium hydroxide in water
5% thymol in ethanol
insecticide containing diazion
insecticide containing bendicard
insecticide containing propoxur
insecticide containing resmethrin
chlorinated cleaning solution
quaternary ammonium salts
carbon disulfide
5% sodium carbonate in water

3.79.3.2 Coating Stability: (ASTM D-4526):

3.79.3.2.1 The cured coating must be evaluated by GC/MS headspace analysis after 1 hour at 120°C, and there must be no aldehydes, low molecular weight organic acids, or solvents found (if any are found, amounts must be identified and approved).

3.79.3.2.2 The thermogravimetric analysis of the cured coating when heated from 30° to 700°C at 10 degrees/min in dry air must show less than 1% weight loss between 40° and 270°C.

3.79.3.3 Coating Adhesion: (ASTM D-3359 Method B) The coating must meet classification 5B.

3.79.3.4 Coating Durability: (modification of ASTM D-4060) 1,000 cycles of the

Tabor Abraser equipped with CS-10 wheels, under 1 Kg load must not remove more than 65 mg of sample.

3.79.3.5 Bend Test: 20-gauge coated steel panel bent around a ¼ inch rod to an angle of 180 degrees must show no cracking, flaking, or loss of coating.

3.79.4 Ceiling pipes and exterior stack walls. Any ceiling pipe and the exterior stack wall metal panels must be coated with an acrylic primer (water reducible) covered by two latex paint coats.

3.80 Exhibit galleries and cases. Construction materials and finishes used throughout the galleries must be chosen according to the requirements stated in these standards. In addition, exhibit cases that display original holdings, or that may display holdings in the future, are required to meet additional restrictions of VOCs and acidity levels within the display chamber. The conservation criteria must identify any holdings of concern. The use of wood or wood products in the production of display chambers must be avoided in favor of other materials such as aluminum panels, acid-free paper honeycomb panel, high-density polyethylene, aluminum/polyethylene laminates, glass, and stable plastic sheets. Use of wood within the display chamber of an exhibit case may require isolation using a vapor barrier laminate or foil. In addition, exhibit cases displaying original holdings must be finished then aerated for four weeks prior to installation of holdings.

3.81 Insulation. Although insulation is not a finish product, it is included in this section due to its significance in regards to outgassing. Formaldehyde-based insulation and foam in place insulation must be avoided throughout the Library and must not be used in holdings storage rooms or exhibit galleries.

3.82 Specific finish requirements by location. Figure 3-7 provides specific finish requirements by location. These are to be provided unless a special finish, such as hard wood flooring, is proposed and accepted by NARA.

Figure 3-7: Finishes

| Location | Floor | Wall | Special Requirements |
|---------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Office area | Carpet, minimum of 32 ounce per sq. yd. | Medium duty wall covering | Carpet must have anti-static control at a maximum of 3.5 kV. |
| Public entrance and lobby | High traffic and heavy duty use finish | High wearability, heavy duty wear rating | Wall covering must have a flame spread rating of less than 25 and a smoke rating of less than 45. Entrance vestibules must have a mat system to prevent dirt and moisture from being tracked into the facility. Floor finishes at entrances must take into consideration the possibility of moisture being tracked in and must be resistant to slippage. |

| Location | Floor | Wall | Special Requirements |
|----------------------------------|------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Processing rooms | Tile | Medium duty wear rating | Tile must have anti-static control at a maximum of 2.0 kV. |
| Exhibit production | Sealed Concrete | Medium duty wear rating | Exterior corners require edge protection. |
| Loading dock | Hard industrial epoxy floor finish | Sealed or painted masonry | All epoxy floor coverings to meet the requirements in these standards. |
| Materials movement corridor | Hard industrial epoxy floor finish | Sealed or painted masonry or heavy duty wear rated | Exterior corners require edge protection. |
| Security control center | Carpet | Medium duty wear rating wall covering | Carpet must have anti-static control at a maximum of 3.5 kV. |
| Computer room | Carpet | Medium duty wear rating | Carpet must have anti-static control at a maximum of 3.5 kV. |
| Holdings storage rooms | Epoxy floor coating | Sealed and painted masonry | Seal concrete with a low volatile organic compound (VOC) acrylic membrane curing compound followed by a floor epoxy. |
| Research room | Carpet | Medium duty wear rating wall covering | Wall coverings must have a flame spread rating of less than 25 and a smoke rating of less than 45 per ASTM E 84. Carpet must conform to ASTM E 648 Class 1 requirements. Carpet must have anti-static control at a maximum of 3.5 kV. |
| Museum temporary exhibit gallery | Carpet | Heavy duty wear rating | Access flooring must be provided for wiring and video and data for the exhibits. |
| Museum permanent exhibit gallery | Heavy duty | Heavy duty wear rating | Wall coverings must have a flame spread rating of less than 25 and a smoke rating of less than 50. |
| Exhibit cases | | | All stainless or aluminum metal. Other paint system, laminate system, or textile must be used inside the exhibit cases must be pre-approved by NARA. |

3.83 Concrete epoxy-related work.

3.83.1 Epoxy materials used for the Presidential library building must have the following

characteristics and properties:

- 3.83.1.1 All epoxy materials used in general construction for the Presidential library must be a two-part epoxy adhesive material and must be of epichlorohydrinamine type.
 - 3.83.1.2 The epoxy must be sensitive to the presence of water and moisture and must be capable of application and of strength development even when applied to damp surfaces having a temperature of 40 degrees or above.
 - 3.83.1.3 The epoxy used must develop a minimum strength of 2000 psi in tension and 4000 psi in compression at the end of seven days.
 - 3.83.1.4 Epoxies used must not deteriorate under approximately 200 freeze thaw cycles.
 - 3.83.1.5 Epoxy mortar must be non-sagging.
- 3.83.2 Repair methods involving epoxy during the course of a project may include: epoxy injection of cracks, epoxy or polymer mortar patching, epoxy grouted dowels or reinforcing steel, and fresh concrete to hardened concrete bonding.
- 3.83.3 All concrete floors of holdings storage rooms must be sealed with a low volatile organic compound (VOC) acrylic membrane curing compound, followed by application of a floor epoxy. Limit the VOC off-gassing of any epoxy and floor coatings in any area where records are processed, used, stored, or exhibited to less than 0.1 part per million by restricting the use of toluene and xylene in the floor coating mix.
- 3.84 Epoxy - applicable standards. The applicable epoxy related work standards are:
- 3.84.1 American Society for Testing and Materials (ASTM) C881, *Standard Specifications for Epoxy-Resin-Base Bonding Systems for Concrete*
 - 3.84.2 American Concrete Institute (ACI):
 - 3.84.2.1 ACI 503, *Use of Epoxy Compounds with Concrete*
 - 3.84.2.2 ACI 503.1, *Standard Specification for Bonding, Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive*
 - 3.84.2.3 ACI 503.2, *Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi component Epoxy Adhesive*
 - 3.84.2.4 ACI 503.4, *Standard Specification for Repairing Concrete with Epoxy Mortars*

3.85 Use of wood products.

- 3.85.1 Plywood and other wood-based boards present special concerns because most boards outgas unacceptable amounts of formaldehyde and other pollutants. This is particularly significant to the preservation of holdings displayed in exhibit cases. While paragraph 4.2 can be used to select wood products for general construction purposes, NARA must approve all materials used in the exhibit construction. Any wood product used in exhibit cases must be pre-approved by NARA, and its use requires additional measures to limit outgassing and acidity, such as isolation of the wood or the use of a pollutant filtration system within the case.
- 3.85.2 Wood products must not be used inside holdings storage or processing rooms, and wood products must be limited to the fullest extent possible in research rooms to prevent damage to holdings.
- 3.85.3 Particle board, pressboard, and similar wood composite panels must not be used for office furniture in archival or museum staff offices or holdings storage, processing and research rooms, and exhibit galleries. Use of these products is discouraged throughout the Presidential library.

3.86 Finish carpentry - applicable standards.

- 3.86.1 Lumber standards: Designers must comply with PS 20 “American Softwood Lumber Standard” for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- 3.86.2 Plywood standards: Designers must comply with PS 1, US Department of Commerce, “U.S. Product Standard for Construction and Industrial Plywood” for plywood and for products not manufactured under PS 1 with APA-PRP-405, Performance Wood Panels. Softwood plywood bonded with exterior adhesive systems based on phenol-formaldehyde and hardwood plywood meeting ANSI/HPVA HP-1 emit lower levels of formaldehyde and are preferred.
- 3.86.3 Paneling - applicable standards: Designers must comply with applicable requirements of ANSI/HPVA HP-1, Hardwood Veneer Plywood Paneling: Manufacturers stock hardwood plywood panels.
- 3.86.4 Woodwork - applicable standards: Designers must comply with the following standards.
- 3.86.4.1 Hardboard: ANSI/AHA A1 35.4.
 - 3.86.4.2 High Pressure Laminate: NEMA LD 3.
 - 3.86.4.3 Medium Density Fiberboard: ANSI A208.2.
 - 3.86.4.4 Particle boards: ANSI A208.1.

- 3.86.4.5 Softwood Plywood: PS 1.
- 3.86.4.6 Hardwood Plywood: ANSI/HPVA HP-1.
- 3.86.5 Formaldehyde emission levels: Whenever possible, designers must use exterior grade plywood. Designers must comply with formaldehyde emission requirements of each voluntary standard referenced below:
 - 3.86.5.1 Particle boards: NPA 8. (ANSI A208.1).
 - 3.86.5.2 Particle board flooring: ANSI grades “PBU”, “D2”, or “D3”.
 - 3.86.5.3 Medium Density Fiberboard: NPA 9. (ANSI A208.2).
 - 3.86.5.4 Hardwood Plywood: HPM FE. (ANSI/HPVA HP-1).

Section K. Lighting

3.87 General considerations.

- 3.87.1 Lighting design for Presidential libraries is complex. Good lighting provides a pleasant environment for visitors and illumination necessary for staff functions. Lighting systems are a maintenance concern and generally represent 25% of the energy budget. Lighting in all areas, natural and artificial, also has an impact on the long-term preservation of Presidential holdings.
- 3.87.2 The energy provided by visible light, both natural and from artificial sources, causes deterioration of textual and nontextual holdings and artifacts. This damage results in fading and color shifts in ink and other media, photographs, textiles, furniture, and a wide range of other holdings. Infrared radiation (heat), visible light, and ultraviolet (UV) radiation below 400 nm cause the physical breakdown of paper, photographs, textiles, and other organic materials. The damage caused by light is not reversible and cannot be changed through any conservation treatment. Therefore the level of infrared radiation, visible light, and UV radiation must be strictly controlled in holdings storage, research and processing rooms, and exhibit galleries and natural daylight is prohibited in these areas.
- 3.87.3 Because damage caused by light exposure is cumulative, measures to limit the total length of exposure must be implemented. Motion or occupancy sensing activation of selected artificial lighting is required in storage rooms and exhibit galleries. Natural lighting must be excluded from storage and processing rooms altogether. In a new facility natural light must be excluded from exhibit galleries. Renovations to an existing gallery with natural light must prohibit natural light to every extent possible and must filter and control any natural light that cannot be excluded.
- 3.87.4 Heat produced by lamps and lighting power sources also accelerates deterioration. Therefore, storage shelving and holdings work surfaces must not be heated by direct lighting sources, including task lighting in storage, processing, and research rooms.

Exhibit lighting must not heat the surface of holdings or heat the internal temperature of any exhibit case.

3.87.5 The lighting design must include a consideration of lamp replacements. Lamp replacement must not require the use of scaffolding.

3.87.6 See Figure 3-8 for a summary of lighting requirements.

Figure 3-8: Lighting

| Area | Light Level in Lux | Maximum UV Level in microwatts per lumen | Dimmers or Sensors Required |
|-------------------|--------------------|------------------------------------------|-----------------------------------|
| Exhibit Galleries | 30-200 | 10 | both dimmers and sensors required |
| Storage Rooms | 200-500 | 10 | sensor activated |
| Processing Rooms | 200-500 | 10 | occupancy sensors |
| Research Rooms | 200-500 | 10 | occupancy sensors |

3.88 Energy efficient lighting standards. To achieve the goal of energy conservation within the context of effective lighting design, the following lighting design principles must be considered:

3.88.1 Designers must minimize the lighting demand load by using controls other than simple on and off switches such as automatic dimmers and sensors. Automatic lighting controls must be placed in staff restrooms, mechanical and electrical rooms, custodial storage areas, and in loading dock areas. These areas will still require emergency lighting, but the main lighting can be controlled by infrared or ultrasonic sensors which detect occupancy. Storage rooms must also be considered for automatic lighting controls. For example, within compact shelving units, aisle lighting must be activated when a carriage is accessed.

3.88.2 If higher lighting levels are required due to visual task difficulty, individual visual differences, glare factors, or varying visual tasks, localized task lights must be used to supplement the general lighting in the space.

3.88.3 Task lighting must be limited to the required work location in the storage and processing rooms, museum exhibit galleries, and offices. The task lights must be placed so that they minimize direct glare and ceiling reflections. The ratio of supplementary task luminance to general or ambient luminance must not be in excess of 3 to 1. Uniform distribution of general lighting may be more appropriate than individual task lights in work spaces that are densely occupied.

3.88.4 Lighting equipment that will provide high lighting efficiency while meeting criteria for low power consumption must be used. High efficiency lamps having the appropriate luminous efficacy, life expectancy, color temperature, and color rendering characteristics must be used. Important ballast considerations include ballast factor, power factor, noise rating, and start and restart characteristics. All

tube florescent fixtures must be T-8 with high efficiency electronic ballasts.

- 3.88.5 Designers must not use low efficiency lamps, such as incandescent, except for applications where their color characteristics or point source capabilities cannot be duplicated. The use of low efficiency “extended service” incandescent lamps must be limited to applications where lamp access is difficult or maintenance costs are prohibitive.
- 3.89 Museum permanent exhibit gallery.
- 3.89.1 The conservation criteria developed to protect NARA holdings selected for an exhibit must state lighting levels and any other lighting requirements. A lighting plan for all exhibit spaces is required as part of the 50% architectural design review. This plan must convey the type of lighting systems proposed for use, the location of both lamps and any power sources or transformers, and the type of lamps including wattage and spread. A lighting study will be helpful in determining whether or not the proposed lighting plan is acceptable. A lighting study must include estimated total Lux falling on locations where holdings are to be displayed. NARA reserves the right to require a mock up of case lighting to determine suitability and the application of lighting standards.
- 3.89.2 Due to specific requirements for different types of holdings, the lighting system must be designed for adjustability and flexibility. The lighting system must be capable of providing a typical exhibit light level range of 30-200 Lux. Dimmers and sensors to control light falling on original collection material must always be considered and must be included when specified in the conservation criteria.
- 3.89.3 The amount of UV produced by any light source must be as little as possible, but must not exceed 10 microwatts/lumen. Filters, specialized low UV lamps, or other specialized control measures will usually be required to meet these UV requirements. Alternatively, for some applications, UV filtration can be provided via case and frame glazing.
- 3.89.4 Holdings must not be lit with natural lighting. Glazing must not be used in exhibit galleries except as outlined in this paragraph. Under rare exceptions, natural lighting may be allowed, for example, to illuminate certain non-sensitive holdings such as metal or stone sculpture. NARA must approve any such exceptions early in the design process, and special measures as identified by NARA to protect the object from heat or excessive light must be undertaken.
- 3.89.5 Fiber optic lighting for case illumination is preferred. When fiber optic lighting is used inside an exhibit case, the light source (illuminator) must be physically separated from the display chamber, and heat generated must be dissipated according to manufacturer’s specifications.
- 3.89.6 In order to protect materials from heat build-up, incandescent and fluorescent lighting systems that illuminate holdings inside exhibit cases must be external to the

exhibit case (i.e., track lighting outside of case). Lights must be kept at a distance sufficient to prevent any heating of holdings. Generally, this will require a distance between lights and the holdings of 24 inches when using fluorescent lights and 36 inches when using incandescent or halogen lights.

- 3.89.7 When external lighting is not feasible, all lighting sources must be located in a lighting chamber that is physically separated from the display chamber housing holdings. The lighting chamber must be vented, and a fan to dissipate heat may be required, depending on the case design and location. Renovation to existing cases must comply with these requirements.
- 3.89.8 Unless otherwise desirable for effect, lamps used throughout the exhibit galleries must have a color temperature of or close to 3500° K. A “white” light must be provided even at the lowest required light levels.
- 3.89.9 Measurements of the light falling on any holdings (textual, nontextual, or artifact) must be evaluated with a properly calibrated light meter that is equipped to measure both the levels of light and the proportional levels of UV. Renovations to an existing exhibit must incorporate these standards and must include testing to confirm compliance.
- 3.89.10 The holdings must not be illuminated during non-public hours. Lighting design must allow for lights to be turned on and off either through a computerized program or master switch(es). Ambient night-time lighting must be confined to aisles and must be no more than 30 Lux. In addition, sensors must be located to limit light exposure of the holdings when a gallery is unoccupied during public hours.
- 3.89.11 A separate lighting system must be provided for security and maintenance of galleries. The case lighting system and any external lighting that falls on exhibited holdings must not serve as the maintenance lighting system.
- 3.89.12 A final lighting maintenance plan must be provided that identifies the precise location of each lamp and its specifications, including wattage, beam type and aim, and angle of adjustment.
- 3.90 Museum temporary exhibit gallery. The museum temporary exhibit lighting levels must meet those of the museum permanent exhibit gallery. In addition, all temporary exhibit lighting systems must be controllable through dimmers.
- 3.91 Storage areas. Lighting must be motion activated (or carriage activated in compact shelving areas) in all textual, nontextual, or artifact holdings storage rooms. Normal light levels must provide at least 200 Lux, but not more than 500 Lux measured 36 inches above the floor level. Levels of ultraviolet radiation must not exceed 10 microwatts/lumen. Fluorescent lamps must be a minimum of 24 inches away from any holdings. Incandescent lighting must be at least 36 inches away from holdings.

- 3.92 Processing rooms. Levels of ultraviolet radiation measured from the light source must not exceed 10 microwatts/lumen. Measurements of the light falling in the processing rooms must be evaluated, and UV filters fitted on windows, florescent tubes, or other lighting fixtures to meet these requirements. Provision must be made for supplemental task lighting where short-term use of higher lighting levels is required. To prevent damage from heat build-up, fluorescent lamps must be located at least 24 inches and incandescent or halogen tungsten lamps at least 36 inches from the work surfaces.
- 3.93 Public entrance and lobby. Public entrances and lobby areas may have sufficient amounts of sunlight to make total reliance on artificial lighting unnecessary. Dimmers, louvers, or shades should be provided in these areas to control glare and sunlight. There must be a gradual transition from such brightly-lit areas into the less brightly-lit exhibit galleries.
- 3.94 Orientation theater/auditorium. These areas must be equipped with dimmers that can be operated by library staff to adjust the lighting to levels appropriate for particular functions.
- 3.95 Research rooms.
- 3.95.1 Ambient lighting of at least 200 Lux must be supplemented by task lighting to achieve 750 Lux at the work surface. Levels of ultraviolet radiation at the work surface must not exceed 10 microwatts/lumen.
- 3.95.2 The nontextual research room must include areas used for viewing video tapes and digital images and listening to recorded tapes. Lighting controls must provide a range from 750 to 200 Lux at the work surface. Noise control ratings of less than 40 are required for this area, including the mechanical and ventilation equipment.
- 3.95.3 The textual research room must include an area for viewing microfilm. Lighting controls must allow dimming the lighting levels to 200 Lux or below. Textual research room must have additional outlets for research for laptops.
- 3.96 Emergency lighting. The building must be provided with emergency exit lighting as required by NFPA and emergency lighting must be provided for all emergency exit areas. Emergency lighting, connected to the building emergency system, must be provided in all public rooms with one emergency lighting fixture for every 250 square feet of space. Emergency lighting providing at least 50 Lux must be provided in all storage and processing areas and in the exhibit production rooms. In rooms where a darkened environment is sometime required (i.e., nontextual processing and research room), the emergency fixtures must be separately switched and clearly labeled and illuminated so that they can be switched on in a power failure.
- 3.97 Perimeter lighting.
- 3.97.1 The following are examples of effective site lighting levels: at vehicular and pedestrian entrance, 15 horizontal maintained foot candles; and for perimeter and vehicular and pedestrian circulation areas, 5 horizontal maintained foot candles.
- 3.97.2 In most circumstances, perimeter lighting should be continuous above the boundary

of the exclusion zone (100 feet from building) with minimal hot and cold spots and sufficient to support CCTV and other surveillance. However, for safety reasons and issues related to camera technology, lower levels may be desirable. Other codes or standards may restrict site lighting levels.

- 3.97.3 Lighting for parking areas should meet a higher standard than determined by the Illuminations Engineering Society of North America (IESNA) Subcommittee on Off-Roadway Facilities. The minimum for parking areas should be 2.00 foot candles for horizontal illumination at pavement with a vertical illumination of 1 foot candle 5 feet above the pavement and a uniformity ratio between 4:1 and 20:1.
- 3.98 Ease of use. All lighting systems must be designed and installed to allow ease of maintenance. The bulbs and filters must be easily located and changed.

Section L. Glazing

3.99 General considerations.

- 3.99.1 Natural lighting can be attractive and lower the requirements for artificial lighting. However natural light also contributes to the aging and fading of furnishings and holdings. Glazing in certain areas of Presidential libraries must be limited, and in all areas, the glazing must control ultraviolet and infrared radiation.
- 3.99.2 Exterior glazing is prohibited in textual, audiovisual, and artifact storage and processing rooms, and in all museum exhibit galleries. Any glazing incorporated into the general assembly and visitor services areas must meet safety requirements and must filter out ultraviolet radiation. Natural lighting in any area must not affect any museum exhibit gallery.
- 3.99.3 Where glazing is provided, it must have ultraviolet filtration sufficient to filter out 99% of the UV radiation below 400 nanometers wavelength. In any area with natural lighting, including offices, the amount of UV radiation from natural light on the work surface must not exceed 10 microwatts per square lumen. Filtration must be provided by a UV filtering interlayer, which also provides strength to the glass for security purposes. A UV filtering film applied on the surface of the glazing is not acceptable. Filtration applied to original windows on an historic property must use appropriate methods as determined by an historic preservation architect.
- 3.99.4 The choice of double or triple glazed windows must be based on climate and energy conservation requirements. Highly reflective glass which produces mirror images must be used with care to avoid creating glare in surrounding streets and buildings. Safety glass must be used in all windows and window walls to 10 feet above the floor and exterior grade. Generally, the glazing system must withstand normal thermal movement, wind loading, water and air infiltration, and impact loading (where applicable), without failure including loss or glass breakage.

Glazing must be insulated to restrict heat loss and gain.

3.100 Safety glass.

3.100.1 Safety glass must be provided at all building entrances and in all windows and window walls to 10 feet above the floor and exterior grade. All glazing to 10 feet above grade around the building must have a break safety of 400 ft-lbs and be two ply with at least a 0.03 inch plastic interlayer (0.06 to 0.09 inch is preferred).

3.100.2 In accordance with the safety standards for glazing provided in this Part, entrance doors and glass must be a Category II as provided by the Consumer Products Safety Commission and have a break safety of at least 400 foot pounds and be two ply, with at least a 0.03 inch plastic interlayer.

3.100.3 Glazing must also have the capabilities of resisting a blast of 50 pounds of TNT from a distance of 45 feet from the building. The properties of the glass must be such that the glass will not shatter.

3.100.4 Cases in the permanent exhibit gallery must be glazed with safety glass. This includes case fronts and smaller case bonnets. Laminated glass tested in accordance with ASTM F1233 will be resistance to breakage by blunt force and shatterproof and will be bullet and blast resistant.

3.101 Security glazing. Any glazing in secure areas, such as vision panels in the Security Control Center, must be of laminated glass and be burglary and forced-entry resistant in accordance with Underwriters Laboratory Test UL 972. Laminated glass with an interlayer can satisfy the requirements of UL 972. A simple construction of two layers of glass of 9/16 inch total thickness including a 0.090 inch or greater interlayer will meet these requirements.

3.102 Condensation resistance. Windows must have a condensation resistance factor (CRF) adequate to prevent condensation from forming on the interior surfaces of the windows and frames. The CRF can be determined by testing in accordance with AAMA 1502.7, Voluntary Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Sections. Where a CRF in excess of 60 is required, windows must not be used unless some condensation can be tolerated or other methods are used to prevent or remove condensation.

3.103 Additional standards applicable to glazing.

3.103.1 FGMA Publications: FGMA Glazing Manual.

3.103.2 AAMA Publications: AAMA TIR-A7 Sloped Glazing Guidelines and Glass Design for Sloped Glazing.

3.103.3 LSGA Publications: LSGA Design Guide.

3.103.4 SIGMA Publications: TM-3000 Vertical Glazing Guidelines and TB-3001 Sloped Glazing Guidelines.

- 3.103.5 Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.
- 3.103.6 Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E-152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- 3.103.7 Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E-163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- 3.103.8 16 CFR 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.
- 3.103.9 ASTM C920, Elastomeric Joint Sealant.
- 3.103.10 SAFETY ANSI Z97.1.
- 3.103.11 Fire Resistant ASTM E-152.
- 3.103.12 Insulated Glass Criteria - IGCC International Glass Cert. Council.
- 3.103.13 ASTM C 1036 - TYPE 1.

Section M. Plumbing

3.104 General approach.

- 3.104.1 The purpose of plumbing systems in Presidential library buildings is to provide a safe system of plumbing and its components for the occupants and support to the mechanical systems required for this space. The installation of the systems shall ensure the preservation of all holdings. Ideally, the systems must work so well that the building occupants are not aware of them. Precise design of the systems and specialized equipment is essential in order to provide the environmental standards necessary for long-term preservation of holdings, while attempting to eliminate water damage in these critical areas. A high level of durability and the ability to replace system components during the life of the building at a reasonable cost must be important design criteria. Systems must also be designed for energy efficiency (see paragraph 3.30), and the design must allow for ease of maintenance.
- 3.104.2 In the design and selection of the appropriate plumbing systems and components, economics and energy conservation must be considered in selections and implementation that will maintain the critical spaces. The general concept and guideline is to provide areas where drainage and supply systems do not occur immediately adjacent to or above areas of archival storage. There shall be no storage of liquids above the level of document storage. In addition, fluids such as natural gas, or fuel oil shall not be installed or utilized for fired

equipment requirements, these shall occur beyond the fire rated enclosure. The appropriate rating of the separation shall be as determined in the Fire and Life Safety section.

- 3.104.3 Plumbing equipment and systems must make best use of available natural resources. All components of the systems shall be in compliance with NARA standards and in compliance with the local authorities having jurisdiction.
 - 3.104.4 The plumbing system must undergo a pre-occupancy testing of the systems to verify proper operation of system components. The systems serving critical areas should be fully operable 3 months prior, but must be fully operable 1 month prior to moving holdings into the building. This will allow the systems to be monitored and any necessary adjustments to be made prior to holdings exposure. All systems, both general and critical, must continue to be monitored for 12 months after NARA accepts the building, and the designer must make any adjustment necessary to provide the environments required in this Standard.
- 3.105 Plumbing codes and standards.
- 3.105.1 The basis for the plumbing design must be the International Plumbing Code 2003 (or latest edition). In addition, the local code authorities and their requirements shall be incorporated into the design. Variations and requests for relief from the local requirements shall be reviewed and approved with the project team.
 - 3.105.2 The standards listed here are intended as guidelines for building-wide design. They are mandatory only where referenced as such in the text of the chapter. The list is not meant to restrict the use of additional guides or standards.
 - 3.105.2.1 American Society of Plumbing Engineers, (ASPE) Handbook of Fundamentals.
 - 3.105.2.2 ASHRAE/ANSI 15, Safety Standard for Refrigeration Systems
 - 3.105.2.3 ASHRAE/IES 90.1, Energy Conservation Standards.
 - 3.105.2.4 ASHRAE 100, Energy Conservation in Existing Buildings.
 - 3.105.2.5 National Fire Protection Association (NFPA) Standards 54, 90, 90A, 90B, 92, and 96.
 - 3.105.2.6 Sound attenuation, including mechanical equipment [Naval Facilities Guide Specs. (NFGS) 15070, sound criteria, duct work: SMACNA APIDC, 1975, SMACNA; ASMM 1993]

Section N. Shelving

3.106 Approval of shelving configurations

3.106.1 NARA maintains a list of shelving configurations (including fire suppression and fire detection system specifications) that have been approved as meeting NARA's maximum loss criteria (see 3.107.2). The list is available from the Office of Presidential Libraries.

3.106.2 If a shelving configuration other than one previously approved by NARA is being considered, the proposed shelving configuration (including the proposed fire suppression and fire detection systems) must be evaluated by the designer and approved by NARA for conformance with NARA's maximum loss criteria (see 3.107.2).

3.106.2.1 The method of evaluation of the proposed shelving configuration must be either by live fire testing performed at a nationally recognized live fire testing facility or by computer modeling.

3.106.2.2 If computer modeling is used, the computer mode used must be a computational fluid dynamics mode such as Fire Dynamics Simulation (FDS) or equivalent. The FDS mode, which was developed by the National Institute of Standards and Technology in Gaithersburg, Maryland, and has been used in previous NARA fire studies, is a mode of fire-driven fluid flow. The software solves numerically a form of the Navier-Stokes equation appropriate for low-speed, thermally-driven flow with an emphasis on smoke and heat transport from fires. The most current version of FDS must be used in evaluating the proposed shelving configuration.

3.107 General requirements for preservation-quality steel storage shelving.

3.107.1 The Foundation must furnish all archival quality steel storage shelving and all associated supervision, personnel, tools, materials, and transportation necessary for its installation.

3.107.2 Only all-steel storage shelving, either stainless or industrial style is acceptable for archival storage. Each shelving unit must have solid steel shelves. The top, canopy, shelf specified for all archival shelving units is not used for storage, but to facilitate the distribution of water from fused sprinklers in the event of a stack fire in order to limit the maximum anticipated loss in any single fire event to less than 300 cubic feet of archives destroyed. For certain specialized artifact storage units, aluminum may be acceptable.

3.107.3 Storage shelving, as appropriate to the library's need, may be either fixed (static) type or compact mobile type, including electrically-operated. NARA will work with the designer to develop a shelving plan appropriate for the size and quantity

of holdings and artifacts some of which vary greatly in size and diversity.

- 3.107.4 The storage shelving to be provided and installed by the Foundation must be new and comply with very strict performance specifications in order to achieve optimal fire safety and archival preservation. For textual holdings, the shelving is also intended to achieve an optimal archival storage capacity through use of a standard shelf-size, 16" deep x 40" wide, designed to accommodate precisely most of the holdings in either or both of the in-use standard boxes having outside dimensions, 10-1/2" high x 5-1/4" wide x 12-1/2" long, for letter size holdings, or 10-1/2" high x 5-1/4" wide x 15-1/2" long, for legal size holdings.
- 3.107.5 Oversize textual, non-textual, or artifacts may require use of special shelving, or racking systems, in terms of other shelf sizes and configurations. Such systems must be industrial style, preservation quality, with the shelves rated at least 50 pounds of load carrying capacity for each cubic foot of storage space provided. Shelving plans for holdings requiring special configurations, particularly non-textual and artifact holdings, must be coordinated with NARA and the final plan must be approved by NARA.
- 3.107.6 The shelving arrays must be open or skeleton type unless otherwise required for non-textual or artifact holdings, except that side panels of full height must be installed to close both ends of all shelving rows on the main aisle side of the units.
- 3.107.7 The shelving must be installed, braced, and otherwise secured to prevent deflection, lean, or collapse under full load during normal use. Specifications for the design and testing of shelving are based on ANSI MH28.2 Shelving Manufacturers Association (SMA).
- 3.107.8 Installed shelving systems, including compact mobile shelving, must be laterally braced against seismic forces as required by the International Building Code (IBC) either through top bracing or rotational restraint at the base. All storage shelving must also be designed and installed to provide seismic bracing that meets the applicable local building code.
- 3.107.9 Shelves and shelving carriages must have a maximum structural deflection of L/320. Heavy duty 18-gauge four post steel shelving and 11-gauge steel shelf supports are specified for maximum stability.
- 3.107.10 All shelves must be adjustable at a maximum of 1-1/2 inch intervals.
- 3.107.11 Shelving for textual and nontextual holdings must include a pull-out work shelf, sized 15" deep x 37" wide, in lieu of the 3rd standard shelf above the floor in one shelving unit at the middle of each 36" wide records service aisle.
- 3.107.12 Preservation quality finishes, as specified in the Archival Storage Standards, NARA 1571, must be applied to all industrial style shelving and to other archival or museum storage equipment. Such equipment must have a dry powder epoxy

coated finish, parchment color #27769 per Federal Standard 595a, or other equally light reflective color. Certain aluminum equipment for artifact storage may not require a coating.

- 3.107.13 Preservation-quality archival storage shelving, especially of the type and sizes needed, is not normally a stocked product. Thus, time must be allowed for preservation testing and review, special ordering, and manufacturing.
- 3.108 Performance specification for fixed type shelving for archives.
- 3.108.1 Adjustable fixed (static) type steel shelving, as typified in the Army's Federal Specifications AA-S-1048 (as approved by the General Services Administration), on Steel Storage Shelving Clip-Type, may be appropriate for the storage of certain oversize archival records or artifacts in Presidential libraries.
- 3.108.2 Overall height of 144 or less inches is specified for the top surface of the top canopy shelf for all fixed shelving units installed in Presidential libraries. This overall height is specified for optimal space, storage, stack lighting, operational, and fire safety reasons.
- 3.108.3 For holdings, at least nine shelves, including the unused top canopy shelf, are required per shelving unit (except selected units with a substitute special pull-out work shelf). All shelving units must be overall size 16" deep x 40" wide, outside dimensions, with a minimum load carrying capacity of 200 pounds per shelf. The shelving units are installed in back-to-back double faced rows (32" deep overall). Outside dimensions have a 1/32- inch +/- tolerance. All shelves are to be spaced on 13" vertical centers above a 2" high base closure on the face of all installed units on both sides of the 36" wide records service aisles.
- 3.108.4 The fixed type shelving units must be installed exclusively in double faced (back-to-back) rows, 32" in depth overall. All units must be bolted or clipped together within the double rows through the adjoining uprights at the approximate center of the upper, middle, and lower one-third of their height, as a minimum.
- 3.108.5 For holdings, on the face of all installed shelving units, at least 11" of clear vertical storage space must be provided between each level of all of the installed shelves, measured from the top shelf surface to the bottom of the flange of the shelf immediately above (in order to accommodate the 10-1/2" high standard-size archival storage boxes).
- 3.108.6 On the face of all installed shelving units, at least 38" of clear horizontal storage space must be provided between the posts on all of the 40" wide shelving units, measured near surface on the left upright to the near surface of the right upright (in order to accommodate and service 7 standard-size, 5-3/16" wide, archival storage boxes per shelf).

- 3.108.7 2” high base closures must be provided and bolted or otherwise firmly attached to the face of all installed units so that archives stored on the bottom shelves throughout the facility will be not less than 3” above the floor finish in order to eliminate or minimize their damage from sprinkler discharge or from domestic water spills.
- 3.108.8 Access to all shelved archives or other stored material is from standard 36” wide service aisles (NFPA Standard 101, *Life Safety Code*).
- 3.108.9 Higher shelving with additional shelves may be required to house the holdings, depending upon the volume and nature of the overall library collections, although any higher shelving configuration other than that set forth above must be approved by NARA before installation.
- 3.108.10 All 40-inch shelving base closures must be bolted or otherwise securely fastened to the shelving units, at both ends, in order to withstand the impact of such ladder movements without the base closures becoming detached or bending.
- 3.108.11 End panels (partitions), 32” wide x 144” high, must be installed on both ends of all shelving rows on the sides of the units facing the main aisles.
- 3.109 Performance specification for compact mobile shelving for archives.
- 3.109.1 NARA recommends the use of some high-density, compact mobile shelving, electrically operated, on wheeled carriages that move on low-profile steel rails recessed in the concrete floors, as one practical method of achieving the long-term required storage capacity within the space limits of the endowment formula. Approximately twice the volume of material can be stored in the same space as fixed shelving.
- 3.109.2 Based on full-scale records fire tests, the mobile shelving must be designed with a “fire park” mode controlled with the building’s fire management system so that when a fire alarm is activated, or after hours, all rows of shelving automatically open approximately 4” to 6” in width and then lock in place in order to create flue spaces between the rows for fire suppression and air circulation. The mobile shelving also must be designed with state-of-the-art safety sensors and devices for lighting, security, and archival operations.
- 3.109.3 Overall height of 111 inches is specified for the top surface of the top canopy shelf for all compact mobile shelving units in order to limit the anticipated burn loss in a single fire event to less than 300 cubic feet of archives destroyed. This goal stems from NARA’s series of full-scale fire tests with records stored in compact mobile shelving at Underwriters Laboratories (UL). NARA approval must be obtained for arrays of mobile shelving higher than 111 inches; a successful full-scale records fire test must be conducted at a nationally recognized live fire testing laboratory or computer modeling (conducted in accordance with section 3.106.2) before approval by NARA.

- 3.109.4 The overall height of 111 inches is specified for all compact mobile shelving for optimal space, storage, stack lighting, operational, and fire safety reasons. Higher arrays of mobile shelving for installation in Presidential libraries must have prior approval by NARA. Approval is contingent upon a successful full-scale records fire test must be conducted at a nationally recognized live fire testing laboratory or computer modeling (conducted in accordance with section 3.106.2).
- 3.109.5 Nine shelves, including the unused top canopy shelf, are required per shelving unit (except selected units with a substitute special pull-out work shelf). All shelving units must be overall size 16" deep x 40" wide, outside dimensions, with a minimum load carrying capacity of 200 pounds per shelf. The shelving units are to be installed in back-to-back double faced rows (32" deep). Both outside dimensions have a 1/32-inch +/- tolerance. All shelves are to be spaced on 13-inch vertical centers above a base closure not to exceed 7-inches in height on the face of all units in the rows which open to 36" wide service aisles.
- 3.109.6 The mobile shelving units must be installed exclusively in back-to-back double faced rows, 32" in depth. All units must be bolted or clipped together within the double rows through the adjoining uprights at the approximate center of the upper, middle, and lower one-third of their height, as a minimum.
- 3.109.7 On the face of all shelving units, at least 11" of clear vertical shelf storage space must be provided between each level of all installed shelves, measured from the top of the shelf surface to the bottom of the flange of the shelf immediately above (in order to accommodate the 10-1/2" high standard size archival storage boxes).
- 3.109.8 On the face of all units, at least 38" of clear horizontal shelf storage space must be provided between the posts on all of the 40" wide shelving units, measured near surface of the left upright to the near surface of the right upright (in order to accommodate and service 7 standard size, 5-1/4" wide, archival storage boxes per shelf).
- 3.109.9 Base closures, not to exceed 6" in height, must be provided and bolted or otherwise firmly attached to the face of all uprights or bottom shelf flanges so that all archives stored on the bottom shelves throughout the facility will be at least 6" but not more than 7" above the floor finish to eliminate or minimize their damage from sprinkler discharge or domestic water spills.
- 3.109.10 Access to the shelved archives or other stored material must be from an electronically "moveable" service aisle of at least 36" in width within each array of compact mobile shelving (NFPA Standard 101, *Life Safety Code*).

- 3.109.11 32" wide x 111" high end panels (partitions) must be installed on both ends of all rows on the sides of the units facing the main aisles. If shelving higher than 111" is installed, the high end panels must meet the same height. (See 3.106.2 for requirements for shelving higher than 111".)