

Rare Document Storage and Archives

Owner's Project Requirements – 2020 ASHRAE Design Competition

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Introduction

A private owner has decided to build a new 17,500 square foot (1,625 square meter) document storage and archive center in Mumbai, India. The new facility's purpose is to store rare documents, books, manuscripts, photos, and audio recordings in a manner that will ensure the preservation of historical items for future generations. Administrators will grant visitors permission to inspect materials. Visitors cannot remove materials from the controlled environment.

The Project

The project is to create a new building that will provide storage and access to rare materials in a safe manner that prevents deterioration by the environmental elements. The owner will allow visitor access to inspect materials from the collection onsite, within a controlled environment. Items from the collection must remain onsite. The project will be a design/bid/build project delivery method with a design team, a general contractor and an independent commissioning authority.

Building space types include library stacks, archive storage, lecture area, conference rooms, enclosed offices, telecommunications, vestibules, storage areas, and a small apartment for invited guest speakers. The apartment includes a bedroom, bathroom, kitchenette, and guest living quarters.

The building operates from 8:00 to 18:00 six days per week. The building is not open on Sunday. There are no temperature or relative humidity setbacks during unoccupied operation for spaces where materials are stored.

Particulates in the outdoor air are of concern. Outdoor air should be treated and/or cleaned to ensure harmful particulates cannot damage materials within the building.

Owner's Directives

The design team shall make every effort to provide a sustainable design, taking into account: energy efficiency, health and safety, occupant comfort, functionality, longevity, flexibility, and serviceability/maintainability.

The design team shall select systems based on the lowest possible life cycle cost that includes first cost of materials and long term operating costs, as well as other owner goals.

- This project should use the latest innovative technologies and concept to meet ASHRAE Standard 189.1
- Excellent indoor environmental quality that ensures materials are not damaged
- Excellent indoor environmental quality that facilitate occupants' use of the space by providing a comfortable and safe environment while avoiding the design attributes related to poor HVAC system performance, poor space utilization, poor acoustical qualities, inconsistent interior style, and low durability of finishes.
- Maximize usable space including reducing the amount of space needed above ceilings in order to provide maximum ceiling heights
- Operation and maintenance needs are for an easily serviceable, maintainable, and secure facility that has low utility and maintenance costs
- Provide a building which has the best life cycle cost for the applicable climate and the owner's budget
- Document storage areas must be maintained to a temperature of 65°F ± 2°F with relative humidity maintained at 40% ± 10% over an hour
- Certain document viewing areas must be maintained to a temperature of 70°F ± 2°F with relative humidity maintained at 50% ± 10% over an hour
- The building must be operated at positive pressure to prevent unwanted infiltration
- All ventilation air must be filtered to prevent harmful contaminants from damaging items in the collection

Design Requirements

	Occupancy	Cooling	Heating	Sound
Archives	08:00—18:00 Monday – Saturday No occupancy on Sunday	65°F ± 2°F 40% RH ± 10%	65°F ± 2°F 40% RH ± 10%	NC 40
Audio/Visual		Occupied: 75°F Unoccupied: 80°F	Occupied: 70°F Unoccupied: 60°F	NC 35
Computer Catalog				NC 30
Conference Room				NC 30
Display				NC 35
Enclosed Office				NC 30
Librarians				NC 40
Lobby				NC 40
Lounge				NC 40
Meeting Room				NC 30
Rare Book Collection				65°F ± 2°F 40% RH ± 10%
Rare Book Librarian		65°F ± 2°F 50% RH ± 10%	65°F ± 2°F 50% RH ± 10%	NC 30
Rare Book Reading		70°F ± 2°F 50% RH ± 10%	70°F ± 2°F 50% RH ± 10%	NC 30
Reading		Occupied: 75°F Unoccupied: 80°F	Occupied: 70°F Unoccupied: 60°F	NC 30
Stacks	NC 35			
Stairwell	NC 40			
Vestibule	NC 35			

The team shall design the Rare Book Reading and Archive spaces to meet the requirements of a Class 7 clean room space to preserve the collection. The design team must provide details on how the clean space designation is achieved.

This includes at a minimum, the following:

- HVAC system selection and requirements
- Filtration system requirements and design (and how these will be achieved)
- Design and layout of ductwork, piping, and equipment within each space
- Space pressurization relative to adjacent rooms
- Ongoing testing and inspection plans to ensure clean room status is maintained for the life of the facility
- Maintenance of the equipment and filter changes while maintaining space temperature and humidity
- System controls and alarms

Budget Considerations and Limitations

The approach to allocating resources for the HVAC systems is to examine life cycle costs, including capital investment, operating cost, maintenance costs, and employee productivity. The key values are:

- Assume the owner's budget is 350 USD/ft² (3,767 USD/m²)
- Life of the building: 50 years
- Return on investment: 7%
- Inflation rate: 3%
- Utility escalation rate based on a 10-year average increase for utility provider (water, gas, etc.) in the area.

Building Assumptions

Assume building envelope construction and all insulating values meet ASHRAE Standard 189.1 minimum values with additional information below. Owner's primary goals for the building:

- Synergy with surrounding architecture
- Exterior walls to be masonry mass wall construction
- All floors to be concrete poured as slab on grade
- Double-glazed, fixed windows, one-half inch air space, low emissivity coating on third surface, bronze tint
- Superior acoustic criteria in all spaces with minimal sound transmission from the adjacent spaces and low noise produced from HVAC systems
- Assume utilities are available on site including natural gas (8 psig/55 kPa from main), electrical power (400V/3 phase/50 Hertz) with expected demand required to connect, city water (60 psig/414 kPa), and city sewer

Codes and Standards

Codes as determined by the local Authority Having Jurisdiction (AHJ)

- ASHRAE Standard 15
- ASHRAE Standard 34
- ASHRAE Standard 55
- ASHRAE Standard 62.1
- ASHRAE Standard 90.1
- ASHRAE Standard 189.1
- ASHRAE Handbooks

Use the latest available versions of all ASHRAE Standards.