Public Library

Owner's Project Requirements – 2024 ASHRAE Design Competition

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1. Introduction

The city of São Paulo, Brazil is building a new central public library in the heart of the city. The library will consist of a three-story structure with a basement level. The goal of the library to be a community hub to promote education, community involvement, and diversity.

2. The Project

As part of the project, new HVAC systems are to be designed for the new library facility. The building consists of open library space, retail space, café, conference and office rooms, an automated storage and retrieval system along with numerous support spaces such as restrooms, utility rooms (mechanical, water, electrical, telecom, etc.) and storage rooms. Please refer to the attached drawings and additional requirements in the OPR.

3. Owner's Requirements

The design team shall make every effort to provide a safety and sustainable design, taking into account: energy efficiency, occupant health and safety, occupant comfort, functionality, future flexibility as well as maintainability and a 50-year service life.

Space Temperature and Space humidity requirements are defined below, if a space is not listed a general assumption of the space conditions should be made by the design team:

Space Type	Season	Temperature and Relative Humidity Requirements (if any)
Offices, Office Support Areas, Conference rooms, Retail Space, Café	Summer	75°F DB maximum, 50% RH
	Winter	72°F DB minimum
Library spaces	Summer	75°F DB, 50% RH
	Winter	72°F DB minimum
Special Collections/Automated Storage and Retrieval System	Summer	75°F DB, 35-45% RH
	Winter	60°F DB, 30% RH minimum
Storage Rooms	Summer	72°F DB, 50% RH
	Winter	68°F DB
Mechanical equipment rooms and penthouse	Summer	80°F DB
	Winter	65°F DB
Electrical closets	Summer	75°F DB average, 80°F DB maximum
	Winter	65°F DB minimum

Communication closets	Summer	75°F DB average, 80°F DB maximum, 30-55% RH
	Winter	65°F DB minimum

Expected Hours of Operations

1. Estimated hours of operation are:
    a. Offices: 12 hrs/day, 7 days/week
    b. Library: 12 hrs/day, 7 days/week
    c. Community Space: 24 hrs/day, 7 days/week

The design team shall select systems based on the lowest life cycle cost as well as the below goals of the Owner.

1. Design the system to meet ASHRAE standards as listed in the Codes and Standards section.
2. The Owner has a desire to meet an Energy Use Intensity (EUI) target of 50 KBTU/SF/Year.
3. Strive to achieve reduced energy consumption and carbon footprint for a high-performance library space that approaches a Net Zero Energy Building and/or Carbon Neutral Building. Carbon Neutral Building needs to be defined by the design team if it is used in the design.
4. Provide excellent indoor environmental quality that provides a comfortable and safe environment for all occupants.
5. Provide the ability for the open library spaces to be easily modified to allow for updated layouts and exhibits.
6. Incorporate design attributes related to improved HVAC system performance, space utilization, acoustical qualities, interior style, and durability of finishes.
7. Meet the operation and maintenance needs for an easily serviceable, maintainable, and secure facility that has low utility and maintenance costs.
8. Design the meets the Owner's project budget.
9. Maintain thermal comfort in each space per ASHRAE Standard 55.
10. Provide ventilation to each space per ASHRAE Standard 62.1.
11. Provide acoustical controls per ASHRAE Handbooks (i.e. the Chapters on Noise and Vibration Control in HVAC Application, and Sound and Vibration in Fundamentals).
12. Operate the building at positive pressure to prevent unwanted infiltration.
13. HVAC systems shall comply with the ASHRAE recommendations for COVID-19.
14. Propose the optimum orientation to minimize energy consumption. Currently plan north is shown on the drawings.

4. Budget Considerations and Limitations

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

1. Assume the owner's mechanical budget is $10,000,000 US.
2. Life of the HVAC system: 30 years minimum
3. General inflation rate and rate of return as defined in the Utility and Service Life Overview.
4. Utility escalation rate as defined in the Utility and Service Life Overview.

5. Utility and Service Life Overview

General

The purpose of this document is to setup the utility rate structures and elements of the energy economy used in the system selection competition for life cycle costing. It should be noted that the stated situation and numbers may not reflect the reality of the actual energy situation or rates in this region. Regardless, teams should use the values below for the 2024 Design Competition.

Utilities

The average Business Rate is 0.145 US Dollars per kWh. There are no seasonal rate periods nor demand charges known.

Purchase guarantee renewables:

Brazil has different implementation strategies for renewable energy, the electricity sectors capacity is about 174GW which includes their primary source of electricity for Brazil comes from hydroelectric sources, fossil fuel, wind, solar, and nuclear.

Brazil is Latin America's largest renewable energy market which is projected to reach 32% of Brazil's electricity from photovoltaic sources by 2040.

The energy sector has changed over the course of 20 years and ultimately has opened to foreign investment in power generation. The market is divided into two, the regulated power and the free power market. The regulated power is controlled and supervised by the National Electric Energy Agency (ANEEL). The distribution companies can charge and receive a tariff (rate) for the power they supply. On the other hand, the free power market is free to negotiate its own power volumes and prices.

Utility rate structures shall be expected to rise at the following rates of escalation:

- Electrical costs are estimated to rise at the annual rate 3.5%
- Natural Gas costs are estimated to rise at the annual rate of 7%
- Water and Sewer costs are estimated to rise at the annual rate of 3%

Building Service Life

The building is considered a "Long Life" service building and therefore is defined by ASHRAE Standard 189.1 (latest addition) to have an expected minimum service life of 50 years. All building decisions related to the building composition, building structural elements, building systems, and building operation shall include a 50-year life cycle study as the building owner expects a sustainable approach to all building design, construction, and operational elements. Student teams shall include this basis with all building analysis. To complete the life cycle study, the building owner expects the following elements to be included with any analysis.

- General Inflation rate for future cost items (replacement items, maintenance and anticipated future costs) will be 3%

- Owner's Rate of Return for monetary decisions (this is to be used for bringing future costs back to present net worth dollars) will be 4%.

The Life Cycle Analysis shall illustrate a 50-year study and bring all costs back to a total present value sum for each alternative, so the building owner understands in present dollars which alternatives represent the best life cycle value.

6. Building Assumptions

It is assumed that the new building envelope construction and other building systems (e.g. lighting and plumbing) meet ASHRAE 90.1 requirements, while incorporating the owner's project requirements.

1. Compliment surrounding architecture.
2. Superior acoustic criteria in all spaces with minimal sound transmission from the adjacent spaces and low noise production from the HVAC systems.
3. Assume the building is standalone, and therefore the HVAC systems are not tied to any central or district energy systems.
4. Assume all the utilities are provided on site (e.g. electricity, natural gas, water and sewer).
5. Assume the sensible heat load from the Automated Storage and Retrieval System is equivalent to two 50 horsepower electric driven motors.

7. Codes and Standards

Codes as determined by the local Authority Having Jurisdiction (AHJ). Design teams should also utilize the following ASHRAE Standards in the project:

1. ASHRAE Standard 15 and 34
2. ASHRAE standard 55
3. ASHRAE Standard 62.1
4. ASHRAE Standard 90.1
5. ASHRAE Standard 189.1

Use the latest available versions of all ASHRAE Standards and Handbooks.

8. References

Link to standard on ASHRAE Website