University Classrooms and Teaching Labs

Owner's Project Requirements – 2026 ASHRAE Design Competition

Table of Contents

1. Introduction 2
2. The Project 2
3. Owner's Requirements 2
4. Budget Considerations and Limitations 3
5. Utility and Service Life Overview 4
6. Building Assumptions 5
7. Codes and Standards 6
8. Competition Requirements 7
9. References 7

1. Introduction

A university in the city of Denver, Colorado is adding a new building to their campus. The goal of the project is to provide a new facility for collaborative classrooms including a mixture of traditional classrooms and teaching labs.

2. The Project

The proposed facility is a new approximately 93,000 square foot (~8,630 square meter), two story facility primarily consisting of classrooms, teaching laboratories and support spaces. The first floor consists of two metal workshops, a kitchen for culinary arts, a computer lab, research labs, a controls lab, a soldering lab, and multipurpose instructional labs. The second floor provides an area where students can study and collaborate together. Both the 1st and 2nd floor contain several classrooms and offices, along with numerous support spaces such as restrooms, utility rooms (mechanical, water, electrical, telecom, etc.) and storage rooms. There is a penthouse available for mechanical systems. As part of the project, HVAC systems are to be designed for this building.

Architect's Building Areas by Level		
Level	Gross Square Feet	Gross Square Meters
Level 01	42,802	3,976
Level 02	43,875	4,076
Penthouse	6,186	575

In addition to designing the HVAC systems and equipment the engineer has been asked to provide recommendations on building envelope components in accordance with ASHRAE 90.1 or design team recommended improvements.

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 safe 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.

Functional Space Use, 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:

Area Name	Associated use/ space	Temperature and Relative Humidity Requirements:
Classroom	classroom	Summer: 75 F (24 C) DB Winter: 72 F (22 C) DB RH: 30-50%
Computer Lab	Computer stations, printers and plotters	
Controls Lab	Electrical equipment and testing	
Kitchen/ Culinary Classroom	Hot plate stations, commercial dishwasher, walk-in freezer, walk-in cooler, kitchen stations 6 kitchen stations (hooded) each with: 6 burner range, gas oven, broiler, fryer	
Instructional Lab	Multi-functional	
Metal Workshop	machining equipment such as lathes, milling, sheet metal break	
Mothers	Nursing room	
Office/ CS	Office, career services	

Storage	Dry storage, building storage, etc	
Quiet room/ Huddle	Acoustics conscience for quiet studying	
Mechanical/Electrical Rooms		55 F DB (13 C) to 85 F DB (30 C) No RH requirement
IT and Telecom Rooms		65 deg F DB (18 deg C) to 70 deg F DB (21 deg C) 20-40% RH

Expected Hours of Operations

1. Estimated hours of operation are:
    a. 7am- 10pm Monday through Saturday, 8am- 5pm Sunday.

The design team shall perform calculations and analysis for your respective competition shown in parenthesis and in accordance with this OPR.

1. Design the system to meet ASHRAE standards as listed in the Codes and Standards section. (All Competitions)
2. The Owner has a desire to follow the ASHRAE Advanced Energy Design Guide for Small to Medium Office Buildings. (All Competitions)
3. Strive to achieve reduced energy consumption and carbon footprint for a high-performance facility 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. (Net Zero Energy Design)
4. Provide excellent indoor environmental quality that provides a comfortable and safe environment for all occupants. (All Competitions)
5. Incorporate design attributes related to improved HVAC system performance, space utilization, acoustical qualities, interior style, and durability of finishes. (All Competitions)
6. Meet the operation and maintenance needs for an easily serviceable, maintainable, and secure facility that has low utility and maintenance costs. (All Competitions)
7. Design that meets the Owner's project budget and lowest life cycle cost. (System Selection and Net Zero Design)
8. Maintain thermal comfort in each space per ASHRAE Standard 55. (All Competitions)
9. Provide ventilation to each space per ASHRAE Standard 62.1. (All Competitions)

10. Provide acoustical controls per ASHRAE Handbooks (i.e. the Chapters on Noise and Vibration Control in HVAC Application, and Sound and Vibration in Fundamentals). (System Selection)
11. Operate the building at positive pressure to prevent unwanted infiltration. (All Competitions)
12. Propose the optimum orientation to minimize energy consumption. Currently, North is shown on the drawings. (Net Zero Design)

4. Budget Considerations and Limitations (Systems Selection and Net Zero Design)

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 $8,000,000 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 (Systems Selection and Net Zero Design)

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 2026 Design Competition.

Utilities

The average electric Business Rate is 0.145 US Dollars per kWh from 7am-11pm and 0.10 US Dollars per kWh from 11pm-7am. There are no seasonal rate periods nor demand charges identified, consider these values as blended rates.

The average natural gas Business Rate is 0.80 US Dollars per therm (100,000 btu's).

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%
- Natural Gas 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. Superior acoustic criteria in all spaces with minimal sound transmission from the adjacent spaces and low noise production from the HVAC systems.
2. Assume the building is standalone, and therefore the HVAC systems are not tied to any central or district energy systems.
3. Assume all the utilities are available to the site (e.g. electricity, natural gas, water and sewer).
4. Document Envelope Recommendations and Electrical Assumptions
5. Not much information is provided for all teaching labs, design teams must make and document assumptions in order to communicate back to the owner expected operational parameters and limitations.

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 154
6. ASHRAE Standard 189.1
7. ASHRAE Standard 241
8. ASHRAE Advanced Energy Design Guide for Achieving Zero Energy in Small to Medium Office Buildings

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

8. Competition Requirements

Please reference the website, https://www.ashrae.org/communities/student-zone/competitions , for each competition requirements and timeline.

9. References

https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards