

Arch 463
ECS
Fall 99

Name _____

Quiz #3

“The Epitome: A Passive Solar Workplace”

For this problem you are the passive design consultant for an environmental quality advocacy group that wants to “walk the talk” by occupying a building that serves as a working example of a range of passive heating and cooling strategies. The Taos, NM-based group has leased a small, 25' x 30' two-story, CMU-framed building. The lease has a remodel-to-suit clause of which the group intends to take full advantage. Their requirements for the remodel are to provide passive heating and cooling systems for each thermal zone.

The CMU Frame. The exterior walls are currently uninsulated 8" CMUs with a few nondescript windows. The flat, well-insulated roof is supported by the walls and an interior post and beam system that forms a 10'+5'+10' x 10'+10'+10' grid. Both stories have a 10' floor to ceiling height. Total fenestration for the remodeled building is limited to 20% of its 1,350 sq.ft. floor area—15 @ 3' x 6' windows (installed vertically or horizontally). Two 4' x 8' skylights may be installed. A second fire exit will be provided by an external stair.

Program. The advocacy group needs the following spaces:

<u>Space</u>	<u>Size</u>	<u>Notes</u>
Bathroom	10' x 5'	
Conference	10' x 15'	seats 10 at a table or 30 w/o
Hallways	5' wide	as needed
Janitor	10' x 5'	
Library	10' x 15'	
3 Offices	@ 10' x 10'	
Reception	10' x 15'	open to above, includes vertical circ.
Storage	10' x 10'	
Workroom	10' x 10'	copier, sink, range, microwave, fridge

Most spaces are used from 8 am until 6 pm on weekdays. The reception, library, workroom, and conference room will experience nighttime and weekend use.

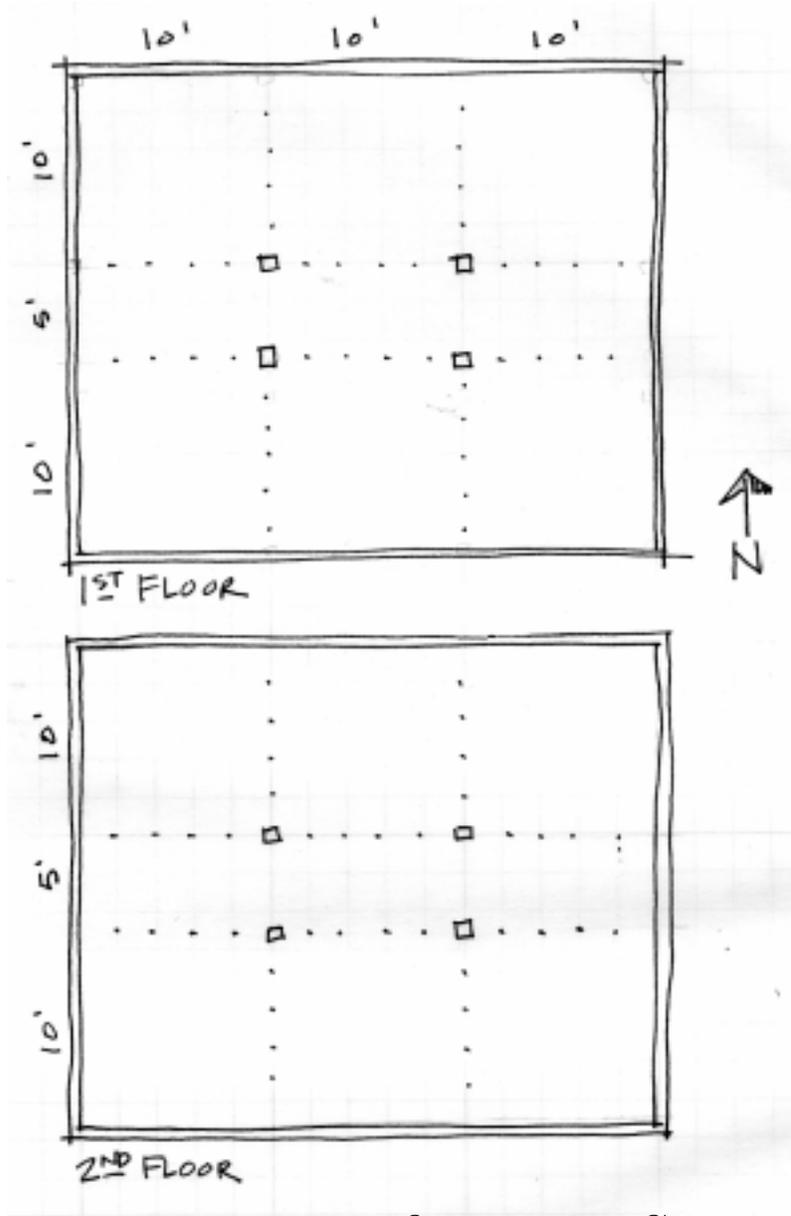
Systems. The building must demonstrate direct, indirect, and isolated gain systems. It also must include ventilation, shading, and thermal mass cooling systems. Daylighting must be used throughout the building. Each system must be used appropriately to demonstrate its inherent effectiveness.

Climate. Taos at 36° NL experiences 300+ sunny days each year. Summers are hot and dry, while winters are clear and cold. The site is subject to diurnal thermal winds that blow toward the mountains to the east during the day and from the mountains at night. There are no prevailing winds.

Design

3 points

1. Show the layout of the required spaces on the plans provided. Indicate locations for the fifteen 3' x 6' windows and the skylights, if used. Identify the thermal zones for the building and give your rationale for the zoning. Explain the strengths of your scheme and the trade-offs you made.

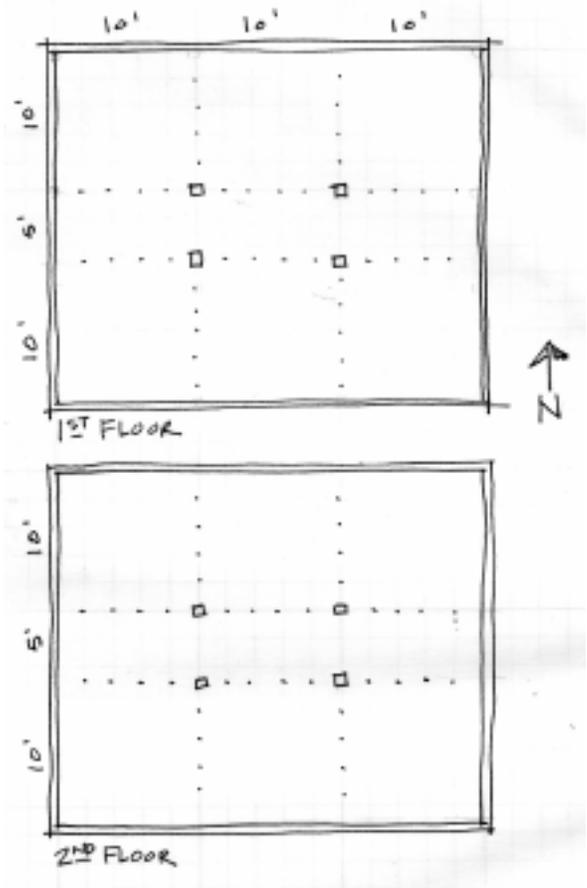
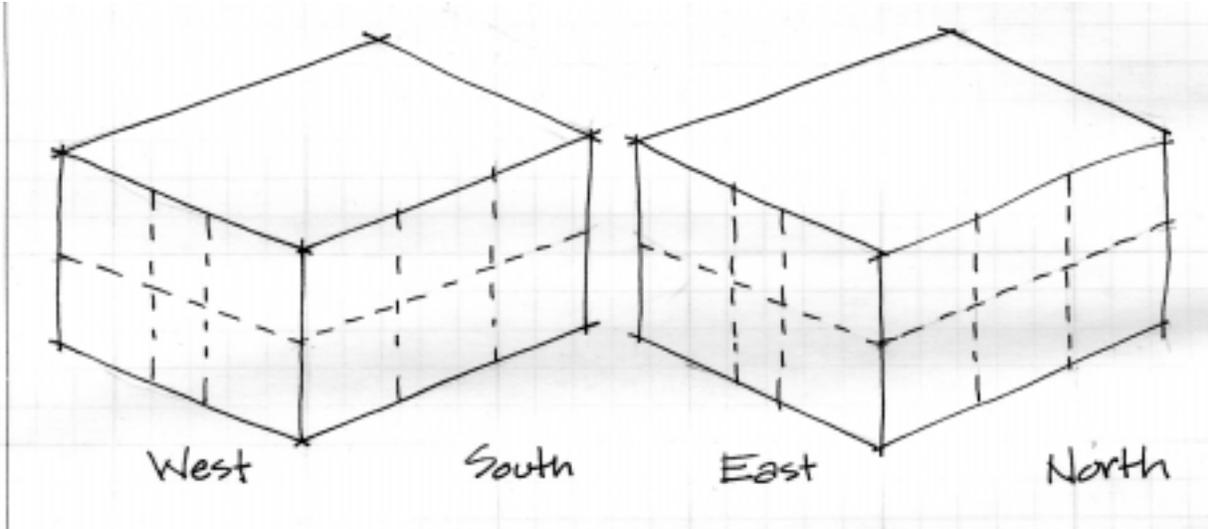


Space	Size
Bathroom	10' x 5'
Conference	10' x 15'
Hallways	5' wide
Janitor	10' x 5'
Library	10' x 15'
3 Offices	@ 10' x 10'
Reception	10' x 15'
Storage	10' x 10'
Workroom	10' x 10'

Passive Heating

2. Show each of the three required passive solar heating systems—(1) **direct**, (2) **indirect**, and (3) **isolated gain** on the plans and axonometrics below. Show windows, rooms, and passive systems elements on the plans and axons. Give a rationale for why each system is appropriate for the space it serves.

3.5 points



Passive Cooling

3. **Show** each of the three required passive cooling systems—(a) ventilation, (b) shading, and (c) thermal mass on the plans and axonometrics below. **Show** windows, rooms, and passive systems elements on the plans and axons. **Give** a rationale for why each system is appropriate for the space it serves.

3.5 points

