

Arch 463
ECS
Fall 2000

Name _____

Quiz #3

"Rethinking Wall Details"

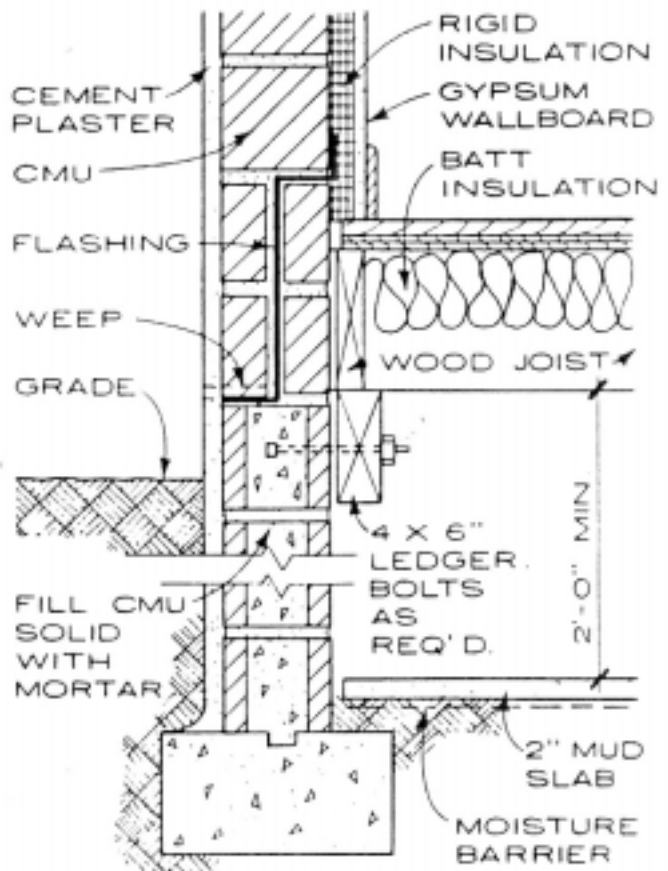
For this problem you are the energy consultant for a builder who wants to revise the standard details he uses for small commercial buildings in Latah County, Idaho. He is especially interested in improving the annual thermal performance of his buildings.

The CMU Wall. The current standard wall features an exterior finish of 3/4" Cement Plaster, 8" Grout-Filled CMUs, 1" Rigid Insulation, and 1/2" Gypsum Wallboard. The thermal properties of the materials are:

cement plaster	$k=5.0$
CMU w/grout fill	$C=0.8$
rigid insulation	$R=5.0/\text{inch}$
gypsum wallboard	$R=0.45$

Kit-of-Parts. The builder wants to maintain the same aesthetic for his new buildings while improving their thermal performance. Therefore, you should use the same interior and exterior finish materials as the old walls did. The insulation, since it's hidden, can be of any proven type. A fiberglass batt insulation system should include wood studs and/or trusses. The latest R-value information on straw bales is that $R = 27.5$ for standard 19" wide bales.

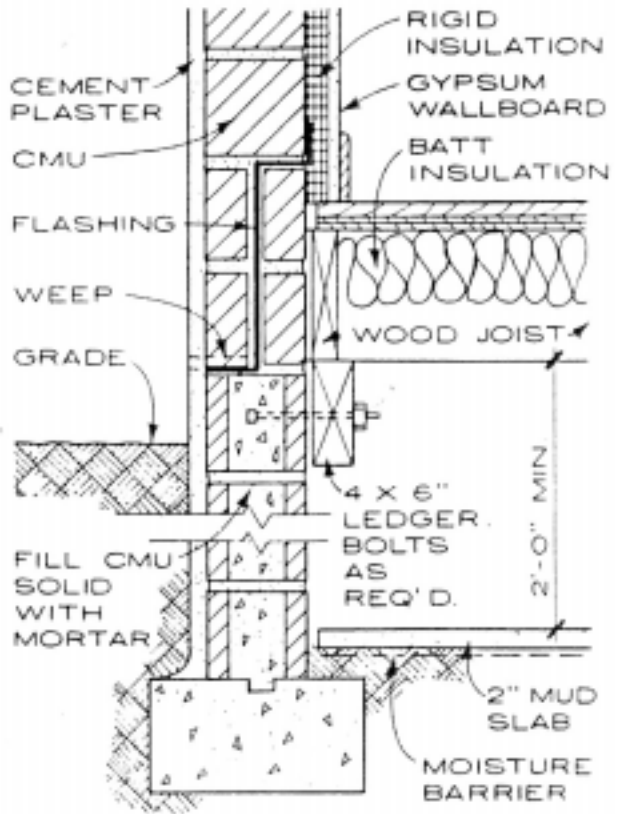
The Climate Context. Small commercial buildings in Latah County experience a need for heating during the short, overcast winters (design temperature 5°F) and for cooling during the hot, dry summers. During the warmest weather, diurnal temperature change exceeds 30°F.



Exterior wall detail at footing.

1. Calculate the R-value of the existing wall.
Show your work.

3 points

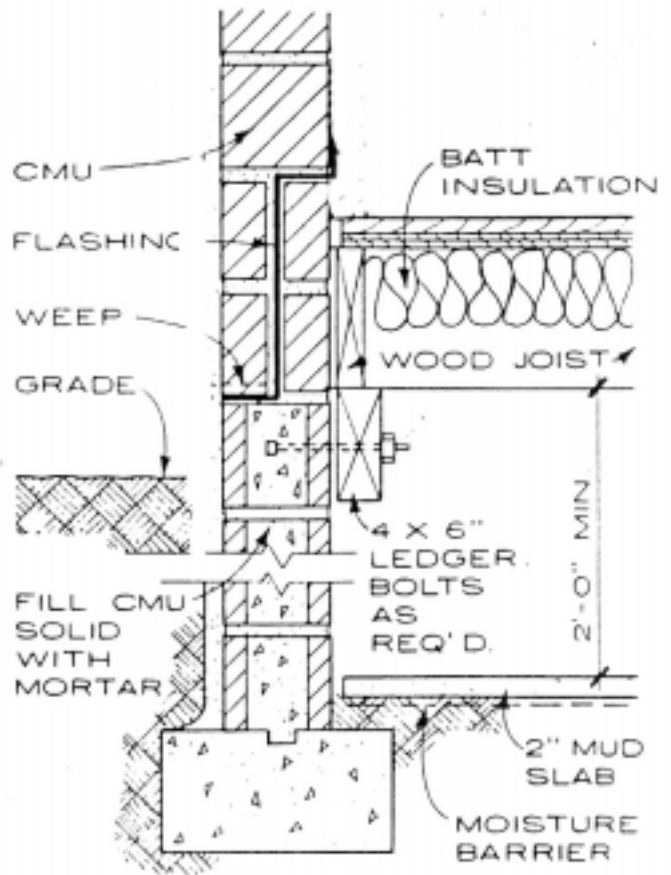


2. Critique the design of the existing wall in terms of its thermal performance in the Latah County climate.

2 points

3. Redesign the wall for better thermal performance and calculate the R-value of the redesigned wall. Show your improvements in the sketch to the right.

3 points



4. Give three examples of how your design improves upon the thermal performance of the old wall and meets the thermal intentions of the builder.

2 points