Maximizing Sustainable Solutions with Masonry

Recent studies tie a building's energy performance with the quality, construction, and performance of the building envelope. In addition to protecting its occupants from the elements, energy usage can be curbed by maximizing building envelope performance. By allowing selected mass material based systems to work in conjunction with the infrastructure of the building, a masonry building can provide an excellent balance between materials performance and HVAC peak load design strategies.

Building Envelope Performance is based on:

- Thermal Mass
- Thermal Resistance
- Airtightness
- Moisture Tolerance
- Sustainable Details and Materials

Thermal mass materials absorb excess internal heat loads created by people, lights, and equipment and reduce peak loads that result in higher energy usage. Thermal mass reduces temperature swings and increases occupant comfort. To work appropriately, thermal mass should be located inboard of the insulation.
Masonry designs using structural masonry solutions provide a dual purpose—structural and thermal mass. These designs should be communicated to the mechanical engineer to incorporate their energy saving contributions in the design of the HVAC system.

ASHRAE 90.1 recognizes mass construction and reduces insulation requirements on mass walls.

- ASHRAE 90.1 Prescriptive tables provide information for insulation R-Value and also assembly U-Factor.
- Designers should consider the option of incorporating all of the benefits of the assembly and design for a minimum U-Factor.

When considering the addition of insulation materials in a retrofit building, it is advisable to study existing conditions to determine the assembly's ability to address moisture.

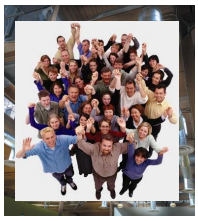
The control of moisture penetration is critical to the performance of a building. Excess moisture causes deterioration of building materials and compromises the r-value performance of the insulation.

Air barrier systems could be provided when a building component or assembly separates interior conditioned space from outdoor or semi-conditioned space.

Building Envelopes:

Design Strategies….Address the Peak

Peak Loads



Peak Performance

ECONOMIES: Thermal Mass + Structure

1. Most interior walls can be unreinforced
2. 8" CMU can easily reach 24'-0" (lightly reinf.)
3. 12" CMU can easily reach 32'-0" (lightly reinf.)
4. consider lightweight CMU
   - quicker construction
   - potential cost savings
5. use actual CMU f'm ★★★★★

Tips & Tricks article International Masonry Institute (IMI) www.imiweb.org

Focus on Entire Wall Assembly for cost effective solutions

Interior Thermal Mass

Absorbs excess heat from internal loads

- People
- Lights
- Equipment

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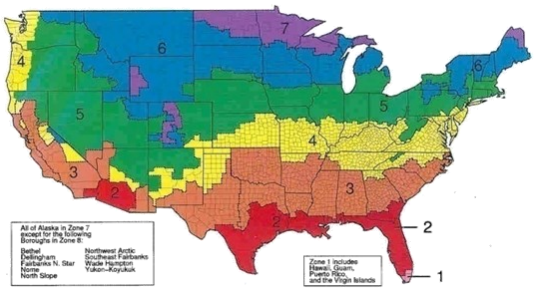
USING ASHRAE 90.1 Section 5 tables



Confirm no more than 40% fenestration
Match project location to climate zone

1. Section 5, Building Envelope provides R-value and U-Factor tables per climate zone
2. Refer to requirement for Opaque elements, Walls Above-Grade; Masonry = “MASS”
3. Remember R-Value is INSULATION only
4. U-Factor listed refers to assembly
5. Gather your full assembly R-value (all materials and air films)
6. Convert your full assembly R-value using formula U factor = 1/R-value

GLASS VERSUS MASS

Curtain walls are NOT the only solution for natural lighting

Loadbearing masonry

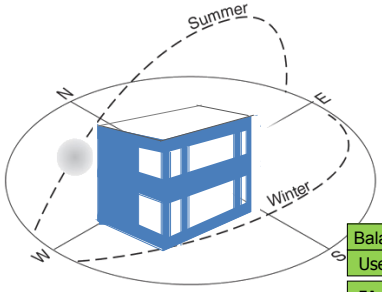
Hybrid masonry

Daylighting and Views

- Loadbearing

hybrid masonry wall – steel frame

Thermal Mass and Glazing



Balance Mass/ Glass

Use Building Orientation

EA 1
Optimize Energy Performance
South - Most windows
East and West – minimize glazing

COST TO PERFORMANCE : Structural Masonry solutions

Sustainable solutions with masonry are optimized when there is a marriage of design strategies related to thermal mass opportunities and glazing opportunities. Additionally, current life cycle cost analysis studies indicate that a high-r value masonry structural solution provides the best present value cost in terms of building today and maintaining in the future.