QUOIN CORNER

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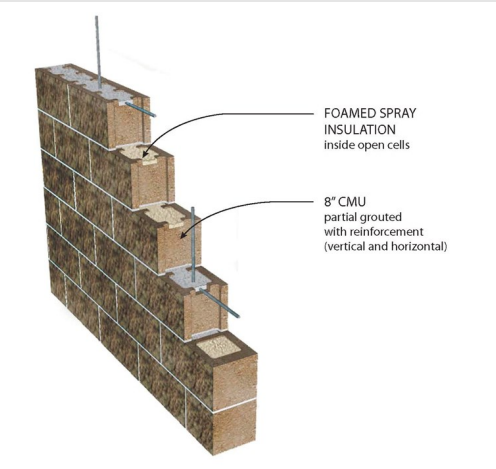


Figure 1

CMU Wall Performance

By

Harold Friberg

Executive Director

A recent study authored by Tom Young, PE of the Northwest Concrete Masonry Association and Tim Johnson, PE and Ryan Schwartz, EIT with Cushing Terrell, examined how partially grouted, integrally insulated CMU walls perform based upon energy modeling. The modeling used the Chapter 11 Energy Cost Budget Method and Appendix G Performance Rating Method compliance paths in ASHRAE 90.1-2016.

The study used a prototype of a 35,000 ft² school gymnasium with 30 ft tall walls, based upon a model provided by the US Department of Energy. The performance of the integrally insulated CMU wall was compared to code baseline walls of U-0.104 and U-0.124. The study provides information on code compliance using the whole-building modeling methods and compares annual building energy costs in Portland, OR. The exterior wall assemblies are the only variable in the modeling analyses.

The prototype Mass Wall assembly is 12" wide CMU with grout placed in the cells every 32" vertically and 48" horizontally. The remaining un-grouted cells are filled with integral insulation and this wall assembly has a U-Factor of U-0.233 or R-Value of R-4.292. (see figure 1)

The Chapter 11 Mass Wall assembly is 12" wide CMU with grout placed in the cells 32" vertically and 48" horizontally. However, in this case, the remaining cells are not filled with integral insulation. An interior metal framed wall is added with a 1" airspace and a composite R-5 insulation is used. The interior is finished with 5/8" thickness of gypsum board which created a wall assembly U-Factor of U-0.104 or R-Value of 9.615. (see figure 2)

The Appendix G Wall assembly is a 4” thick steel frame that is finished on the exterior with 5/8” exterior gypsum board covered with 1” thick stucco. The cavity between the studs is insulated with a composite R-6 insulation and the interior is finished with 5/8” gypsum board. The wall assembly U-Factor is U-0.124 or R-Value of 8.065. (similar to figure 3)

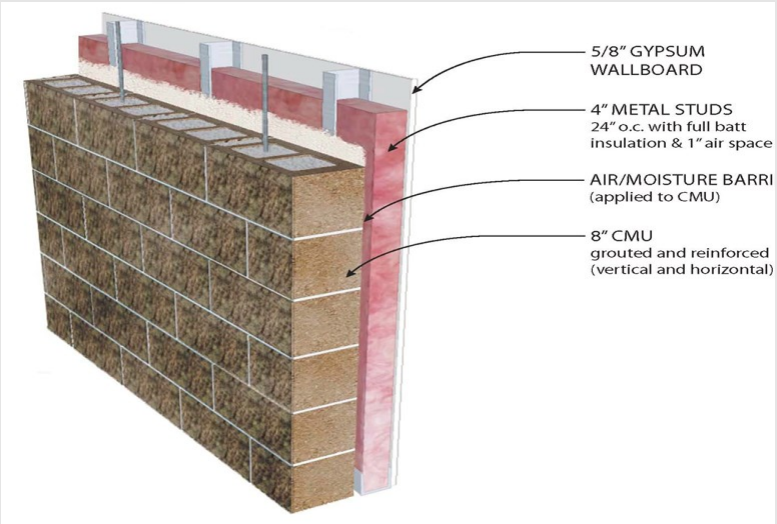


Figure 2

To comply with the Chapter 11 Energy Cost Budget Method, the proposed model energy cost must be less than the Chapter 11 model energy cost. To comply with the Appendix G Performance Rating Method, the proposed energy cost divided by the baseline model energy cost, must be less than the target index. The target index is based upon building type and climate zone and in this case the target index is .537, meaning an energy cost savings of 46.3% relative to the 2004 baseline is needed to comply.

The results of the study disclosed that the integrally insulated mass wall annual energy costs were 1.6% higher than the Chapter 11 mass wall, therefore, the integrally insulated mass wall did not directly comply with the requirements of Chapter 11. However, it should be noted that the annual energy costs for the integrally insulated mass wall were only $484 more than the Chapter 11 mass wall. Also reducing the Lighting Power Density for the building by 10% resulted in an annual energy savings of $323 for the prototype mass wall assembly. (see figure 4)

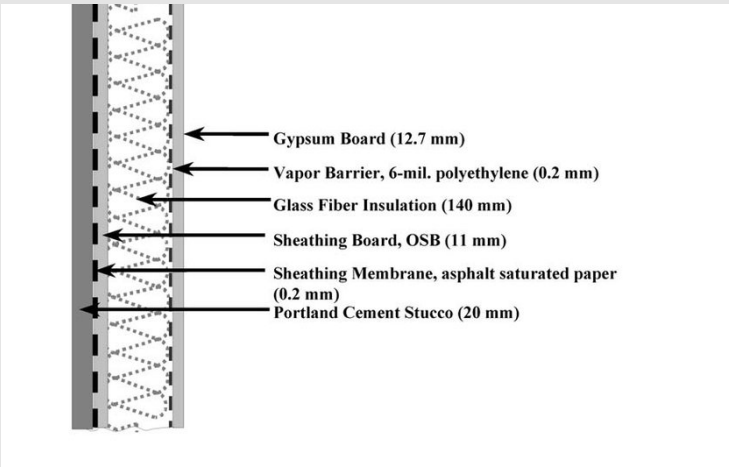


Figure 3

When comparing the prototype Mass Wall versus the Appendix G Wall assembly, the prototype wall does not comply since the annual energy costs for the protype wall are reduced by 26.4% versus the 46.3% reduction required to comply. (see figure 5) This appears to be a difficult compliance path to use for any buildings or wall systems as the required energy cost reduction targets are very restrictive.

Ch 11 Energy Cost Budget Method Compliance				
Model	Annual Energy Cost (USD)	% Energy Cost Savings	Total Site Energy (kbtu)	% Energy Savings
Chapter 11 Mass Wall (U-0.104)	$31,260	-	1,152,138	-
Proposed Mass Wall (U-0.25)	$31,826	-1.8%	1,275,034	-10.7%
10% LPD Reduction (U-0.25)	$31,023	0.8%	1,263,807	-9.7%

Figure 4

The authors summary of the study helps to understand the results, “By itself the integral-insulated mass wall does not comply with either compliance path for this building type. Coupling the mass wall with a 10% lighting power density (LPD) reduction from the code maximum value does reduce the energy cost enough to comply with the Chapter 11 path, but compliance with the Appendix G path requires more extensive energy cost saving measures. However, the total annual energy cost for the gym is only 1.6 percent ($484/year) greater with the integral insulated wall compared to the Chapter 11 baseline wall.”

App G Performance Rating Method Compliance					
Model	Annual Energy Cost (USD)	% Energy Cost Savings	Performance Cost Index	Total Site Energy (kbtu)	% Energy Savings
App G Steel Frame Wall (U-0.124)	$43,003	-	0.537	1,398,324	-
Chapter 11 Mass Wall (U-0.104)	$31,260	27%	0.727	1,152,138	18%
Proposed Mass Wall (U-0.25)	$31,826	26%	0.740	1,275,034	9%
10% LPD Reduction (U-0.25)	$31,023	28%	0.721	1,263,807	10%

Figure 5

The authors further explain, **"The additional cost required to add interior insulation and finish to the CMU wall would likely not provide the building owner with a reasonable payback period. It does not appear to be cost-effective to require the use of the higher insulated CMU wall to meet the prescriptive (baseline) code requirements."**

A couple of the benefits of using Concrete Masonry Units when designing a gymnasium are durability and maintenance costs. Both of these benefits are lost if the design requires the use of a drywall interior. A basketball bounced off an exposed CMU wall will not damage the wall, while the less durable surface, created when using drywall, will likely need to be repaired thereby increasing the maintenance costs.

For more information regarding this energy modeling study please contact the Masonry Institute of Oregon at harold@mioctio.org.

Resources: CMU Wall Performance-High School Gymnasium Portland-Evaluating the Energy Impacts of Concrete Masonry Wall Construction in the Pacific Northwest, September 15, 2020, Authors: Northwest Concrete Masonry Association, Tom Young PE Executive Director; Cushing Terrell, Tim Johnson PE. BEMP LEED AP; Cushing Terrell, Ryan Schwartz EIT

SAVE THE DATE

What: Annual Masonry & Ceramic Tile Institute Golf Tournament

Where: Langdon Farms Golf Club

When: Friday July 23, 2021 7:45 am Shotgun Start

2020 is in the rearview mirror and we are looking forward to 2021. One way to do that is to plan to attend the annual Masonry & Ceramic Tile Institute's Golf Tournament. The course at Langdon Farms is reserved and we are planning another fantastic event to include contests, prizes and lunch. Get the clubs polished and prepare for a fun day of golf. For more information contact Harold Friberg at harold@mioctio.org or 503-354-7309

WHY TILE

Ceramic tile facades for a visual impact with sustainability performance

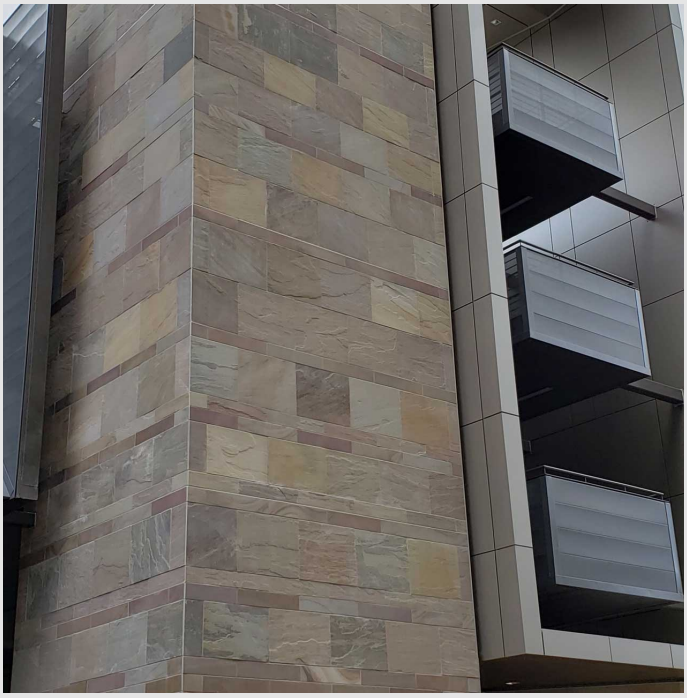


Photo courtesy of WhyTile.com

Advantages

Thermal and acoustic insulation

Contribution to green building certification credits

Protection from daily weather and adverse environmental conditions

Advantages

Adaptable installation for original or refurbished construction

Unique style options for statement architecture and branding

Photo courtesy of WhyTile.com

Resources: Why Tile https://whytile.com/guide/room-types/facades/

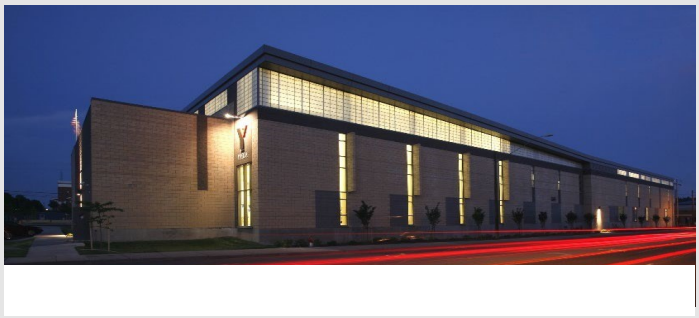
Northwest Masonry Buildings Receive USRC Silver Rating

The Northwest Concrete Masonry Association (NWCMA) is pleased to announce that the Central Spokane YMCA/YWCA and Parkrose Middle School (Portland, OR) recently achieved the U.S. Resiliency Council (USRC) Silver Rating. The USRC Building Rating System describes the expected impacts of an earthquake or other natural disaster on buildings. The Silver Rating indicates achievement of key performance targets including limited building damage and a shortened operational recovery time after a major seismic event. Most importantly, loss of life caused directly by building damage is not anticipated.

Tom Young, Executive Director of NWCMA, explains, "A resilient building is an asset to a community. In addition to being a good long-term investment it can often serve as a recovery operations center or provide shelter to a community impacted by a natural disaster."

The Parkrose Middle School is a two-story 140,000 sq. ft. structure designed by Dull Olson Weekes – IBI Group Architects, Inc. and KPFF Consulting Engineers.

It is an excellent example of an all-masonry cavity wall system incorporating interior exposed concrete masonry structural walls with a brick veneer exterior. The school has also received several other design awards as well as LEED Gold status and is a huge source of pride within the community.



Central Spokane YMCA/YWCA

Parkrose Middle School

The Central Spokane YMCA/YWCA is a two-story load- bearing masonry building designed by ALSC Architects and Coffman Engineers. It utilizes both 8" and 12" concrete masonry shear walls. This was the first time the YMCA and YWCA combined resources into one facility which was designed to meet a silver LEED certification.

Achieving the USRC Silver Rating recognizes the inherent resiliency of these reinforced masonry buildings which were the first two rated under the USRC Getting-to-Silver initiative.

When a natural disaster such as an earthquake strikes, it is critical to have safe buildings that sustain minimal damage and quickly achieve functionality. Resilient buildings perform well and contribute to resilient communities.

Resource: Northwest Concrete Masonry Association, Mill Creek, Washington, Press release dated July 9, 2020

Upcoming Events

Strength Design of Masonry Night School
Presented by The Masonry Society

Session 1 – Introduction to Strength Design of Masonry and Design Methodologies, Presented by John Hochwalt, PE, SE – February 3, 2021 @ 7 pm ET

Session 2 – Strength Design of Beams, Presented by Richard M. Bennett, PhD., PE – February 10, 2021 @ 7 pm ET

Session 3 – Strength Design of Walls for Axial Load and Out-of-Plane Loads, Presented by Richard M. Bennett, PhD., PE – February 17, 2021 @ 7 pm ET

Session 4 – Strength Design of Walls for In-Plane Loads & Seismic Detailing, Presented by John Hochwalt, PE, SE – February 24, 2021 @ 7 pm ET

Session 5 – Strength Design of Columns and Pilasters & System Behavior, Presented by John Hochwalt, PE, SE – March 3, 2021 @ 7 pm ET

Session 6 – Strength Design Requirements for Reinforcement & Connectors, Presented by Richard M. Bennett, PhD., PE – March 10, 2021 @ 7 pm ET

Registration information available at :https://masonrysociety.org/masonry-night-school-continues-with-strength-design-course/

Mason Contractors Association of America
Annual Meeting
February 7 —February 10, 2021
South Sea Island Resort
Captiva, Florida
Register at: https://masonrybuyersguide.com/annualmeeting/#Registration

National Concrete Masonry Association
2021 Virtual Annual Meeting
February 2— 4, 2021
Register at: https://ncma.org/events/ncma-annual-convention/