

Design and Construction of Dry Single-Wythe Lightweight Concrete Masonry Exterior Walls

Discussion. Single-wythe concrete masonry walls are widely used because of their installation efficiency, thermal savings, superior fire rating and life cycle economy for the owner. In order to be successful, the wall design must anticipate and be detailed appropriately to resist water penetration. With proper design that is suitable for the local climate and building use, single-wythe lightweight cmu walls will have water penetration resistance comparable to normal weight masonry.

There are several important factors to understand about single-wythe masonry:

- Single-wythe cmu walls can have leakage issues since they have no drainage cavity. Without a cavity, crack control is even more important in design.
- Any density cmu can work with proper design.
- Block need to be manufactured so that they are appropriate for exterior wall applications. Manufacturing considerations include a quality mix design, overall aggregate grading, admixtures, proper water content and adequate machine compaction. Concrete density as affected by aggregate density is not a factor, but compaction density during production of the cmu definitely is, for both lightweight and normal weight cmu. **Don't confuse the two.**
- Water-resistant single-wythe walls are designed with redundancy: for example, including proper weeps and flashing, plus integral water repellent admixture in the block and mortar.



Lightweight CMU with first generation integral water repellent admixture after water penetration test



Lightweight CMU with current generation integral water repellent admixture after water penetration test

Photo credit: ACM Chemistries, Inc.

Best practices. ESCSI Recommends:

- Well compacted, fine textured expanded shale, clay and slate (ESCS) lightweight cmu with integral water repellent admixture. Block producers need to work with their lightweight and normal weight aggregate suppliers and their admixture suppliers to develop mixes optimized for walls that will be in single-wythe exterior applications.
- Proper single-wythe design details including control joints for crack control.
- Proper workmanship and inspection.
- Appropriate exterior surface coating in addition to integral water repellent.

References

- NCMA Tek 19-2B, Design for Dry Single-Wythe Concrete Masonry Walls, 2012
- Designing and Building Dry Single-Wythe Block Walls, Masonry Advisory Council, 2011
- Water Resistant Single-Wythe Concrete Masonry Walls, International Masonry institute, 2002