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### Less Cement – The Choice is Concrete Masonry

Concrete tilt-up wall systems have consistently eroded the concrete masonry wall system market for the past several decades. Promoters claim that the concrete tilt-up system is cheaper and faster. Unfortunately these false claims have been made so often that they are now considered fact. Cost studies show that the initial construction costs of concrete masonry walls and concrete tilt-up walls are within a few percentage points of one another, but in the long run concrete tilt-up walls require significantly more long term maintenance (chalking, painting, etc.) than concrete masonry walls. Additionally, a concrete masonry wall can be built in the same time that the casting slab for a concrete tilt-up wall is being prepared.

Future construction projects may not be solely focused on cost. From design inception to construction, impact to the environment will be closely monitored and evaluated. When comparing concrete masonry walls with concrete tilt-up walls we have generally only focused on the cost and schedule. What if we shed some light on the amount of Portland cement consumed by each wall?

For an example, let's assume a structure with 100,000 square feet of wall space. This could be a large warehouse, an industrial subdivision, a housing complex, or less than one mile of freeway sound wall. For argument sake, we will compare a 6-inch thick concrete tilt-up wall and an 8-inch thick concrete masonry wall (this example is based on nominal dimensions to

make the math easier). Which wall system consumes the most cement?

We'll start with the concrete tilt-up wall. Most concrete tilt-up projects require high early strength in the wall so that the wall can be tilted in 3 to 5 days. This is necessary to free up casting space for additional wall panels on the casting slab. We will assume that a concrete mix containing 7 sacks of cementitious materials is utilized with 15 percent of the Portland cement being replaced with fly ash. The structure utilizing concrete tilt-up construction consumes 1,047,010 pounds of Portland cement.

<p><b>6" Thick Concrete Tilt-up Wall</b>  <b>7 sack mix (tilt in 3 to 5 days)</b>  <b>15% replacement with fly-ash</b></p> <p><b>1,047,010 pounds of Portland cement</b></p> <p><b>Requires paint and decorative finish</b></p>
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Now we'll look at a concrete masonry wall. High early strength is not required for concrete masonry. The wall only needs to be strong enough to support itself during the first few weeks of construction. Concrete masonry units are generally cured and meet the strength requirements of ASTM C 90 prior to their shipment to the job site. Concrete masonry units are a very efficient user of Portland cement. On average, concrete masonry units contain the equivalent of 2.5 sacks of Portland cement per cubic yard. In a fully grouted 8-inch thick wall, half the volume of the wall is masonry grout. The strength of masonry grout is only required to be 2,000 psi, or the design  $f'_m$ , whichever is higher. The majority of grout placed in walls in

California and Nevada well exceeds the minimum strength requirement. We will assume a common grout mix containing 7 sacks of cementitious material per cubic yard is utilized with 50 percent of the Portland cement replaced with fly ash. The structure utilizing concrete masonry walls consumes 786,396 pounds of Portland cement.

<p><b>8" Thick Fully Grouted Concrete Masonry Wall</b>  <b>Concrete Masonry Unit - 2.5 sack mix</b>  <b>Grout - 7 sack mix, 50% replacement with fly ash</b></p> <p><b>783,396 pounds of Portland cement</b></p> <p><b>Requires no paint and no decorative finish</b></p>
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An 8-inch thick concrete masonry wall consumes 263,614 pounds less cement than a 6-inch thick concrete tilt-up wall. That is by some measures 329,518 pounds less Carbon Dioxide produced in our environment by building an 8-inch thick concrete masonry wall rather than a 6-inch thick concrete tilt-up wall.

On average, concrete masonry walls require 2.6 pounds less Portland cement for every square foot of wall area even when the concrete tilt-up wall is two inches less in thickness. Concrete masonry requires no paint or decorative finishes for the life of the structure.

Not only is concrete masonry cost effective, and schedule friendly, its use contributes far more than concrete tilt-up walls to the greening of our structures. What is old is new again.

