

Embodied Energy to Manufacture Expanded Shale, Clay and Slate (ESCS) Lightweight Aggregate

Based on 2006 information that ESCSI received from 13 plants, the embodied energy numbers are compared with the results from the 2000 CTL report. The 13 plants include the eleven plants in the CTL report plus two additional large plants. The lower energy numbers reflect plant improvements, that larger kilns are more efficient than smaller ones, and that the addition of coolers and pre-heaters lower energy consumption.

Embodied Energy for Dry ESCS Lightweight Aggregate

Items	CTL (2/17/2000) Ton	ESCSI (11/30/2006) Ton	ESCSI (11/30/2006) CY
Number of plants participating	11	13	13
Quantity of material represented	2,063,000 ton	3,825,000 ton	6,160,000 cy
Material density (weighted average)	?	1242 lbs/cy 46 lbs/cf	1242 lbs/cy 46 lbs/cf
	MBtu/ton	MBtu/ton	MBtu/cy
Kiln Fuel (weighted average)	2.21	2.016	1.253
Electrical ⁽¹⁾	.08	.08	.05
Mobile equipment ⁽²⁾	.04	.04	.025
Transportation ⁽³⁾	.023	.023	.014
Total (weighted average)	2.36	2.16	1.34

- (1) In 2006, only half of the plants participating reported electrical usage, therefore, the CTL number was used in 2006.
- (2) Mobile Equipment – this includes the energy to haul raw material from the quarry to the plant. CTL used an average haul road of 0.67 miles with a 50-ton capacity quarry truck.
- (3) The CTL number was used and represents the transportation energy used mainly in delivery of coal and flue gas scrubbing agents.

Carbon Dioxide Emissions:

CTL reported 350.5 lbs CO₂/ton. In 2006, not enough plants reported to establish a revised amount.

In summary:

Embodied energy to produce ESCS: 2.16 MBtu/ton or 1.34 MBtu/cy of aggregate.
Carbon dioxide: 350.5 lbs/ton or 218 lbs CO₂/cy of ESCS aggregate.