

Table 6. Material and building energy requirements for constructing ethanol and biodiesel production facilities. The throughput of each facility is as follows: dry mill ethanol plant (1.14×10^8 L ethanol/year), soybean crushing plant (6.0×10^8 kg soybeans/year) and biodiesel conversion facility (1.14×10^8 L biodiesel/year). Plant material requirements for representative facilities were provided by industry sources (26, 33). The energy used to produce concrete, carbon steel, and stainless steel is assumed to be 2, 25, and 26.5 MJ/kg, respectively (17, 18, 34). We include an additional 50% energy input for construction and assembly. We assume a 20 year plant life for all facilities.

	Dry mill ethanol plant			Soybean crushing plant			Biodiesel conversion facility		
	<i>Material weight</i>	<i>Embodied energy</i>	<i>Ethanol production input energy *</i>	<i>Material weight</i>	<i>Embodied energy</i>	<i>Biodiesel production input energy †</i>	<i>Material weight</i>	<i>Embodied energy</i>	<i>Biodiesel production input energy</i>
			<i>kJ/L</i>			<i>kJ/L</i>			<i>kJ/L</i>
	<i>Mg</i>	<i>GJ</i>		<i>Mg</i>	<i>GJ</i>		<i>Mg</i>	<i>GJ</i>	<i>kJ/L</i>
Concrete	14,200	42.6	18.8	17,800	53.3	21.8	3,600	10.7	4.7
Structural carbon steel	635	23.8	10.5	907	2.7	1.1	272	10.2	4.5
Building siding carbon steel	181	6.8	3.0	272	10.2	4.2	91	3.4	1.5
Carbon steel liquid storage tanks	91	3.4	1.5	91	3.4	1.4	272	10.2	4.5
Stainless steel liquid storage tanks	272	10.8	4.8	45	1.8	0.7	45	1.8	0.8
Stainless steel piping	91	3.6	1.6	45	1.8	0.7	45	1.8	0.8
Carbon steel piping	23	0.9	0.4	45	1.7	0.7	0	0.0	0.0
Other stainless steel equipment	227	9.0	4.0	340	13.5	5.5	113	4.5	2.0
Total		100.9	44.4		88.4	36.1		42.6	18.7

* Allocation calculated by embodied energy divided by throughput.

† A total of 4.89 kg of soybeans are crushed per liter of biodiesel produced.