

DECC WASTE TECHNICAL NOTE 2: ANNEX A

Cement Type and Performance

Although cement is made from calcium, silicate and aluminate compounds, the actual composition of commercial cement products can vary significantly depending on the particular application. The most common cement product available is Ordinary Portland Cement (OPC).

There are industry standards which provide some quality restrictions to OPC composition and performance. One can choose from rapid hardening, low heat output or sulphate resistant cement for a given application. Many OPC products are manufactured to the American Society of Testing and Materials (ASTM) specifications as follows:

Composition (wt%) and Properties of ASTM Types I to V Cements

	I	II	III	IV	V
Tricalcium silicate	50	45	60	25	40
Dicalcium silicate	25	30	15	50	40
Tricalcium aluminate	12	7	10	5	4
Tetracalcium aluminoferrite	8	12	8	12	10
Fineness ($\text{m}^2.\text{g}^{-1}$)	350	350	450	300	350
Compressive Strength @ 1d (MPa)	7	6	14	3	6
Heat of hydration @ 7d ($\text{J}.\text{g}^{-1}$)	330	250	500	210	250

- Type I Portland cement is a general-purpose cement suitable for all uses where the special properties of other types are not required. It is used in concrete that is not subject to aggressive exposures, such as sulfate attack from soil or water, or to an objectionable temperature rise due to heat generated by hydration. Its uses in concrete include pavements, floors, reinforced concrete buildings, bridges, railway structures, tanks and reservoirs, pipe, masonry units, and other precast concrete products.
- Type II portland cement is used where precaution against moderate sulfate attack is important, as in drainage structures where sulfate concentrations in groundwaters are higher than normal but not unusually severe. Type II cement will usually generate less heat at a slower rate than Type I. If heat-of-hydration maximums are specified, this cement can be used in structures of considerable mass, such as large piers, and heavy abutments and retaining walls. Its use will reduce temperature rise, which is especially important when concrete is placed in warm weather.
- For sulphate resistance application - Type II cement is recommended for concrete that needs moderate sulphate resistance. Type V cement or Type V plus a pozzolan is recommended for high sulphate resistance.