



EUCLID CHEMICAL

Water – The best and the worst thing that you can add to your concrete.

Water is a key ingredient in the manufacturing process of concrete. However, it is very critical that the proper amount of water be used in concrete as the quality and quantity can have both beneficial and adverse affects. In general, the less water used the better the quality of the concrete although this must be tempered with the amount of water required for proper mixing, workability, bleeding (if required) and setting.

The water content of concrete can also be influenced by a number of other factors including:

Water content is impacted by:

- ▶ Aggregate type, size and shape
- ▶ Cementing materials type
- ▶ Strength design requirements
- ▶ Environmental conditions
- ▶ Required air content

Water content will have an impact on:

- ▶ Wearing resistance
- ▶ Dusting potential
- ▶ Cracking potential
- ▶ Durability
- ▶ Strength

The addition of one gallon of water to one cubic yard (5L to 1m³) in a typical 3000 psi (20 MPa) concrete can have the following effect:

- Increase the slump by about one inch (25 mm)
- Reduce the compressive strength by about 250 psi (1.7 MPa)
- Increase the possibility of passage of moisture throughout the concrete by up to 50%
- Increase the shrinkage potential by about 10%
- Increase the required set-time for finishing concrete

Concrete Hydration, Setting and Stiffening

Typical concrete placed at 70°F (21°C) concrete temperature and ambient temperature achieves final set in about 6 hours. Concrete and ambient temperatures will affect the setting of the concrete as shown.

Temperature °F (°C)	Approximate Final Set (hours)
30 (-1)	19 +
40 (4)	14:40
50 (10)	10:20
60 (15)	8
70 (21)	6
80 (27)	4
90 (32)	2:40
100 (38)	1:40

- Increasing the water content of a concrete mix can ‘dilute’ the effect of the cement paste which in turn increases the volume, reduces the density, changes setting times and lowers strength.
- Concrete setting times and the hydration process of cement can also be affected by temperature. Hydration time can be altered by as much as 30% for each 10°F (5.5°C) change in ambient temperature. Water can also be used to alter the temperature of the concrete through cooling (typically used in the summer) and heating (for cold-weather placement).
- As concrete hardens, its gross volume remains relatively unchanged. No more mixing water than is absolutely necessary should be used to hydrate cement along with a small amount of water necessary for workability considerations. Additional requirements for workability and placement can be achieved through the proper use of chemical admixtures.