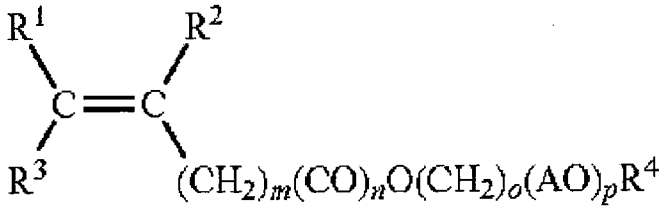
We claim:

1. A method for achieving low-to-mid-range reduction of hydration water in concrete or mortar mixes using at least one polycarboxylate comb copolymer, comprising:

combining with water and cement to form a hydratable cementitious mixture, wherein low-range and mid-range water reduction is achieved at below 12 percent water cut and wherein the water/cement ratio is at least 0.45 and no greater than 0.75, at least one air detraining agent and the at least one polycarboxylate comb copolymer having a weight average molecular weight of 14,000-25,000, the at least one polycarboxylate comb copolymer being formed from the following monomer components:

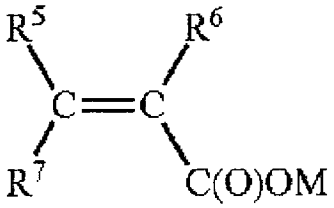
(A) polyoxyalkylene monomer represented by structural formula:




wherein $R^1$ and $R^2$ individually represent hydrogen atom or methyl group; $R^3$ represents hydrogen or —COOM group wherein M is a hydrogen atom or an alkali metal; $(AO)_p$ represents linear repeating ethylene oxide groups and "p" represents the average number of repeating ethylene oxide

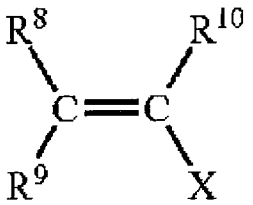
groups and is an integer from 5 to 23; "m" represents an integer of 0 to 2; "n" represents an integer of 0 or 1; "o" represents an integer of 0 to 4; and $R^4$ represents a hydrogen atom or $C_1$ to $C_4$ alkyl group;

(B) unsaturated carboxylic acid monomer represented by structural formula:




wherein $R^5$ and $R^6$ individually represent hydrogen atom or methyl group; $R^7$ represents hydrogen or —COOM group; M is a hydrogen atom or an alkali metal; and

(C) unsaturated, water-soluble hydrophilic monomer represented by structural formula:



wherein $R^8$, $R^9$ and $R^{10}$ each independently represent a hydrogen atom or methyl group;

X represents $C(O)NH_2$, $C(O)NHR^{11}$, $C(O)NR^{12}R^{13}$, $SO_3H$, $C_6H_4SO_3H$, $C(O)NHC(CH_3)_2CH_2SO_3H$, or mixture thereof, wherein $R^{11}$, $R^{12}$, and $R^{13}$ each independently represent a $C_1$ to $C_5$ alkyl group; and

wherein the molar ratio of component (A) to component (B) is from 20:80 to 30:70, and further wherein the molar ratio of component (C) to the sum of component (A) and component (B) is 0:100 to 10:90; and

wherein the at least one polycarboxylate comb copolymer is devoid of oxyalkylene units having three or more carbon atoms, and is devoid of branched oxyalkylene units.

**2**. The method of claim **1** wherein the hydratable cementitious mixture is a concrete having a cement to concrete ratio within the range of 240 to 340 $kg/m^3$.

**3**. The method of claim **1** wherein, in the first component (A) polyoxyalkylene monomer, "**p**" is an integer of 5 to 15.

**4**. The method of claim **1** wherein, in the first component (A) polyoxyalkylene monomer, "**p**" is an integer of 8 to 12.

**5**. The method of claim **1** wherein, in the first component (A) polyoxyalkylene monomer, $R^4$ represents a methyl ($C_1$) group.

**6**. The method of claim **1** further comprising adding to the cement and water at least one additional admixture selected from the group consisting of an alkanolamine, a second air detraining agent which is different from the at least one air detraining agent, an air-entraining agent which is different from said alkanolamine, and mixtures thereof.

**7**. The method of claim **6** wherein the at least one additional admixture is mixed with the copolymer prior to combining with said cement and water.

**8**. The method of claim **1** wherein the molar ratio of component (A) to component (B) is from 25:75 to and including 30:70.

**9**. The method of claim **1** wherein the at least one polycarboxylate comb copolymer has a weight-average molecular weight of 15,000-20,000.

**10**. The method of claim **1** wherein the at least one polycarboxylate comb copolymer consists essentially of constituents formed from using only monomer components (A), (B), and (C).

**11**. The method of claim **1** wherein the molar ratio of component (C) to the sum of component (A) and component (B) is 0.25:99.75 to 10:90.

**12**. A cementitious material made by the method of claim **1**.