Relation between water/cement ratio and average compressive strength of concrete, according to ACI 211.1–91

Average compressive strength at 28 days MPa	Effective water/cement ratio (by mass) Non-air entrained concrete	Air-entrained concrete
45	0.38	–
40	0.43	–
35	0.48	0.40
30	0.55	0.46
25	0.62	0.53
20	0.70	0.61
15	0.80	0.71

Requirements of ACI 318-89 for W/C ratio and Strength for Special Exposure Conditions

	Exposure Condition	*Maximum W/C ratio, normal density aggregate concrete*	*Minimum design strength, low density aggregate concrete MPa*
I.	Concrete Intended to be Watertight		
	(a) Exposed to fresh water	0.5	25
	(b) exposed to brackish or sea water	0.45	30
II	Concrete exposed to freezing and thawing in a moist condition:		
	(a) kerbs, gutters, gaurd rails or thin sections	0.45	30
	(b) other elements	0.50	25
	(c) in presense of de-icing chemicals	0.45	30
III.	For corrosion protection of reinforced concrete exposed to de-icing salts, brackish water, sea water or spray from these sources	0.40	33

Type of Construction	*Range of Slump mm*
Reinforced foundation walls and footings	20–80
Plain footings, caissons and substructure walls	20–80
Beams and reinforced walls	20–100
Building columns	20–100
Pavements and slabs	20–80
Mass Concrete	20–80

Approximate requirements for mixing water and air content for different workabilities and nominal maximum size of Aggregates according to ACI 211.1-91

Workability or Air content	*Water Content, Kg/m³ of concrete for indicated maximum aggregate size*							
	10 mm	*12.5 mm*	*20mm*	*25 mm*	40 mm	50 mm	70 mm	150 mm
	Non-air-entrained concrete							
Slump								
30–50 mm	205	200	185	180	160	155	145	125
80–100 mm	225	215	200	195	175	170	160	140
150–180 mm	240	230	210	205	185	180	170	–
Approximate entrapped air content per cent	3	2.5	2	1.5	1	0.5	0.3	0.2
	Air-entrained Concrete							
Slump								
30–50 mm	180	175	165	160	145	140	135	120
80–100 mm	200	190	180	175	160	155	150	135
150–180 mm	215	205	190	185	170	165	160	–
Recommended average total air content percent								
Mild exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Extreme exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

Dry Bulk Volume of Coarse Aggregate per Unit Volume of Concrete as given by ACI 211.1—91

Maximum Size of Aggregate	*Bulk volume of dry rodded coarse aggregate per unit volume of concrete for fineness modulus of sand of*			
F.M.	2.40	2.60	2.80	3.00
10	0.50	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
20	0.66	0.64	0.62	0.60
25	0.71	0.69	0.67	0.65
40	0.75	0.73	0.71	0.69
50	0.78	0.76	0.74	0.72
70	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81

First estimate of density (unit weight) of fresh concrete as given by ACI 211.1-91

Maximum size of	*First estimate of density (unit weight) of fresh concrete*	
aggregate mm	*Non-air-entrained kg/m³*	*Air-entrained kg/m³*
10	2285	2190
12.5	2315	2235
20	2355	2280
25	2375	2315
40	2420	2355
50	2445	2375
70	2465	2400
150	2505	2435