

W1.41							
Quality Control Formulae							
Sr No	Item	symbol	unit	formula		normal range	
1.01	loss of ignition	L.O.I	%	$0.44\text{CaCO}_3 + 0.524\text{MgCO}_3$		37-39	
	CaCO ₃		%				
	MgCO ₃		%				
		L.O.I.					
1.02	silica ratio (modulus)	SR	ratio	$\text{SR}=\text{SiO}_2/(\text{Al}_2\text{O}_3+\text{Fe}_2\text{O}_3)$		1.2-2.4	
	SiO ₂		%			ave. 2.4-2.7	
	Al ₂ O ₃		%				
	Fe ₂ O ₃		%				
1.03	alumina ratio	A/F	ratio	$\text{A/F}=\text{Al}_2\text{O}_3/\text{Fe}_2\text{O}_3$		1-4,	
	Al ₂ O ₃		%			ave 1.5-2.5	
	Fe ₂ O ₃		%				
1.04	lime saturation factor	LSF	ratio				
a	A/F > 0.64			$\text{LSF}=\text{CaO}/(2.8*\text{SiO}_2+1.65*\text{Al}_2\text{O}_3+0.35*\text{Fe}_2\text{O}_3)$			
	CaO		%				
	SiO ₂		%				
	Al ₂ O ₃		%				
	Fe ₂ O ₃		%				

Sr No	Item	symbol	unit	formula	normal range
b	A/F < 0.64			$LSF = CaO / (2.8 \cdot SiO_2 + 1.1 \cdot Al_2O_3 + 0.7 \cdot Fe_2O_3)$	90-95 for OPC
	CaO		%		
	SiO ₂		%		95-98 for
	Al ₂ O ₃		%		high alumina
	Fe ₂ O ₃		%		cement
1.05	hydraulic modulus	HM	ratio	$HM = CaO / (SiO_2 + Al_2O_3 + Fe_2O_3)$	1.7-2.2 for OPC
	CaO		%		0.5- 0.55 for
	SiO ₂		%		high alumina
	Al ₂ O ₃		%		cement
	Fe ₂ O ₃		%		
1.06	percent liquid	L	%	$L = 1.13C_3A + 1.35C_4AF + MgO + Alkalies$	
	C ₃ A			$C_3A = 2.65 \cdot Al_2O_3 - 1.692 \cdot Fe_2O_3$	
	C ₄ AF			$C_4AF = 3.043 \cdot Fe_2O_3$	
	A/F => 0.64				
	C ₃ S			$C_3S = 4.071 \cdot CaO - (7.602 \cdot SiO_2 + 6.718 \cdot Al_2O_3 + 1.43 \cdot Fe_2O_3 + 2.852 \cdot SO_3)$	45-55
	C ₂ S			$C_2S = 2.867 \cdot SiO_2 - 0.7544 \cdot C_3S$	25-35
	A/F = < 0.64			$C_3S = 4.071 \cdot CaO - (7.602 \cdot SiO_2 + 4.479 \cdot Al_2O_3 + 2.859 \cdot Fe_2O_3 + 2.852 \cdot SO_3)$	
				$C_2S = 2.867 \cdot SiO_2 - 0.7544 \cdot C_3S$	
				$C_3A = 0$	
1.07	burnability index	BI		$BI = C_3S / (C_4AF + C_3A)$	2.8-3.5
1.08	burnability factor	BF		$BF = LSF + 10 \cdot SR - 3 \cdot (MgO + Alkalies)$	100-110
			source:	Cement Managers Handbook	