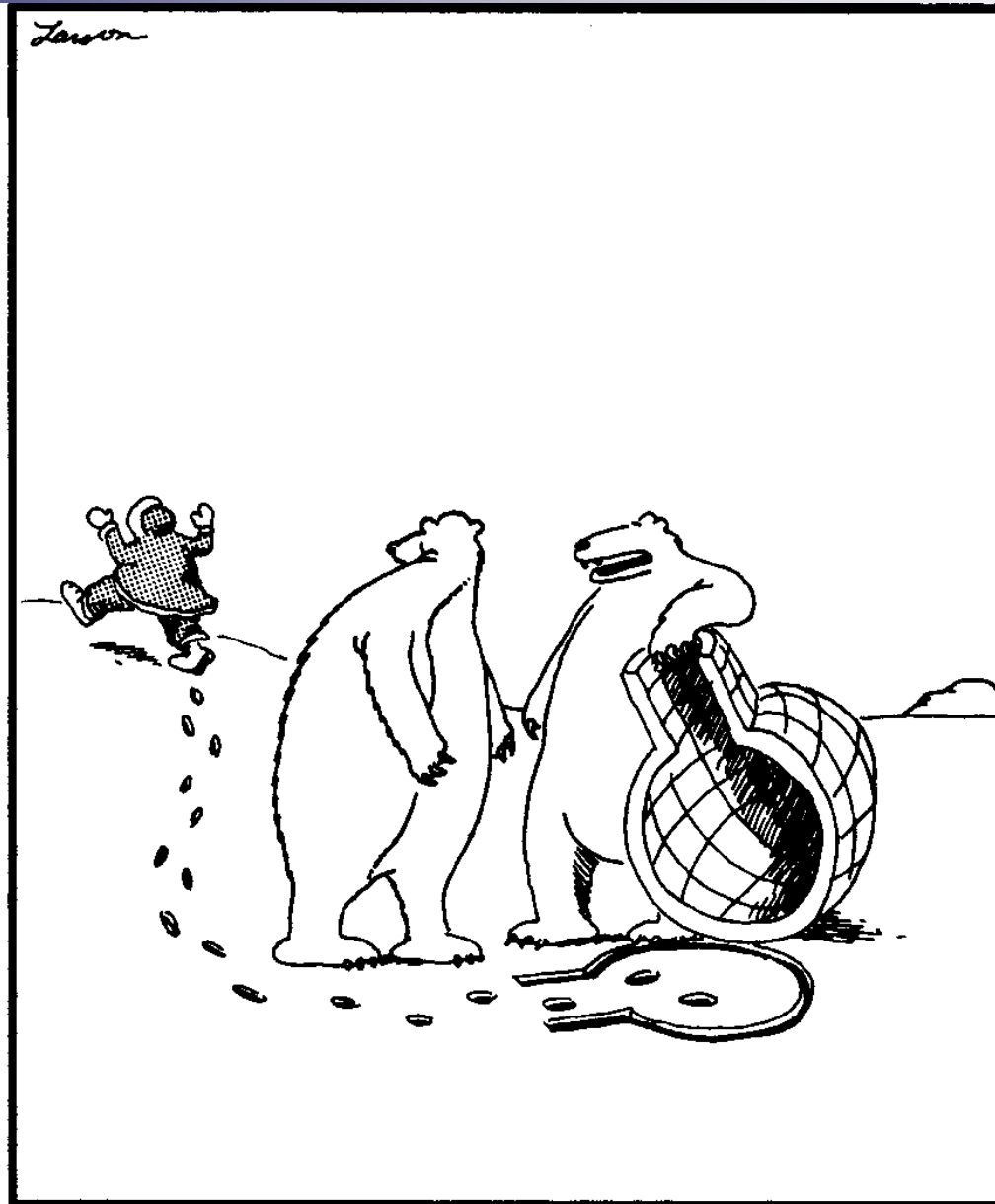




CSA and EN Specifications

NCC Fall Meeting 2009



“I lift, you grab. ... Was that concept just a little too complex, Carl?”

2000

- CEN (Comite European de Normalization)
BS EN197 Specifications now used
- 5 Basic classes of cements
 - CEM I to CEM V

CEM I Portland cement

CEM II Portland-composite cement

CEM III Blastfurnace cement

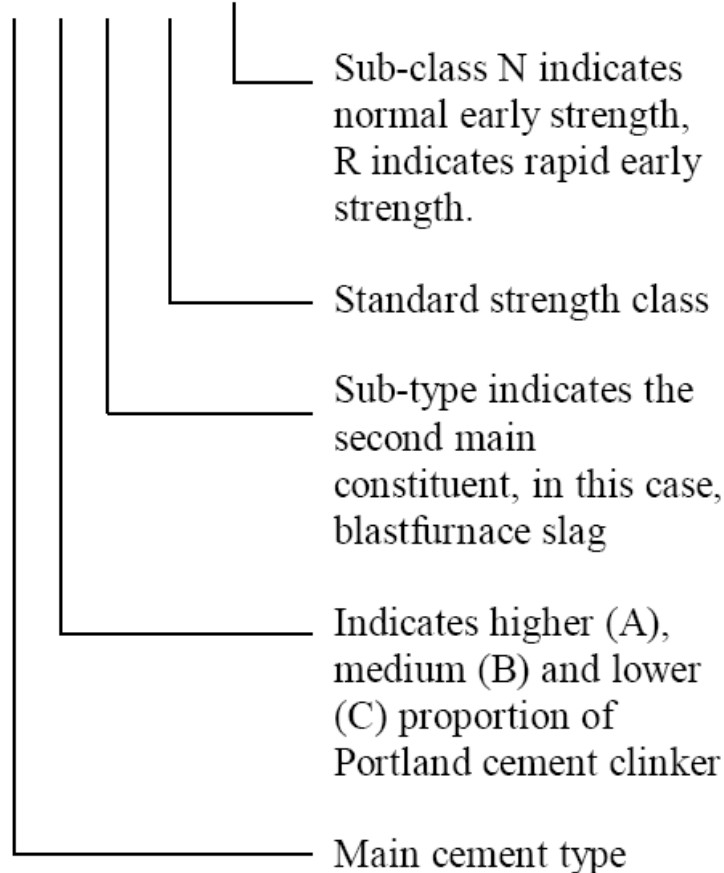
CEM IV Pozzolanic cement

CEM V Composite cement

Constituents of cements

For example, a particular Portland-slag cement to BS EN 197-1 is denoted by:

CEM II/A-S 42.5 N



The possible constituents of factory-produced cements, corresponding to the various cement types in BS EN 197-1 described in Table 1 are:

- main constituent, e.g. Portland cement clinker;
- second main constituent, e.g. fly ash, blastfurnace slag, limestone, silica fume;
- minor additional constituent, e.g. fly ash, blastfurnace slag, limestone, natural pozzolana;
- set regulator, i.e. calcium sulfate;
- additives, e.g. grinding aids, air-entraining agents, pigments.

The code letters used to indicate the sub-type and thus the second main constituent are:

S – blastfurnace slag

D – silica fume;

P – natural pozzolana;

Q – natural calcined pozzolana;

V – siliceous fly ash (e.g. pfa);

W – calcareous fly ash (e.g. high-lime fly ash);

T – burnt shale;

L – limestone;

M – two or more of the above.

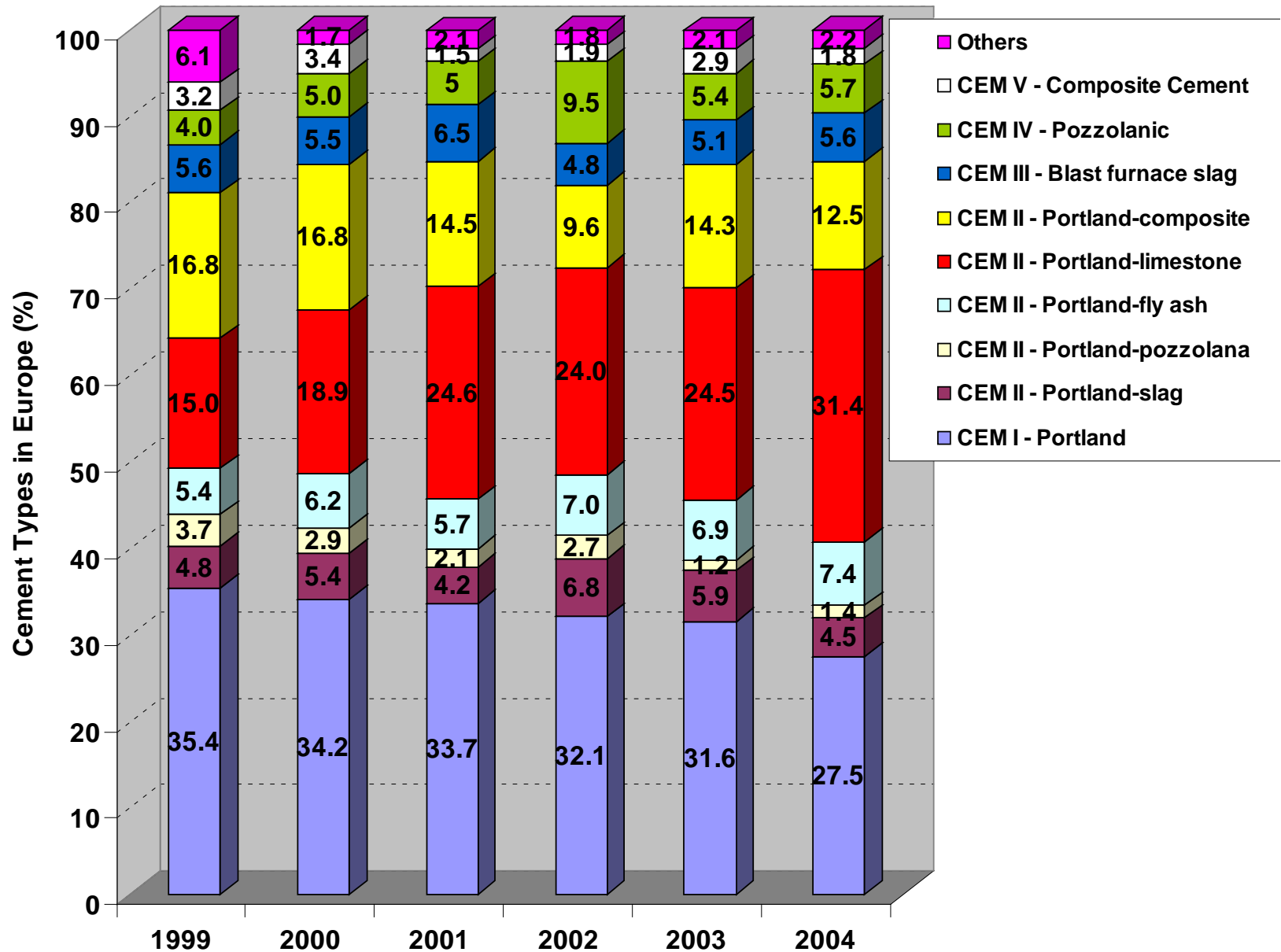
Main types	Notation of the 27 products (types of common cement)		Composition (percentage by mass ^a)										Minor additional constituents	
			Main constituents											
			Clinker K	Blast-furnace slag S	Silica fume D ^b	Pozzolana		Fly ash		Burnt shale T	Limestone			
natural P	natural calcined Q	siliceous V				calcareous W	L	LL						
CEM I	Portland cement	CEM I	95-100	-	-	-	-	-	-	-	-	-	-	0-5
CEM II	Portland-slag cement	CEM II/A-S	80-94	6-20	-	-	-	-	-	-	-	-	-	0-5
		CEM II/B-S	65-79	21-35	-	-	-	-	-	-	-	-	-	0-5
	Portland-silica fume cement	CEM II/A-D	90-94	-	6-10	-	-	-	-	-	-	-	-	0-5
	Portland-pozzolana cement	CEM II/A-P	80-94	-	-	6-20	-	-	-	-	-	-	-	0-5
		CEM II/B-P	65-79	-	-	21-35	-	-	-	-	-	-	-	0-5
		CEM II/A-Q	80-94	-	-	-	6-20	-	-	-	-	-	-	0-5
		CEM II/B-Q	65-79	-	-	-	21-35	-	-	-	-	-	-	0-5
	Portland-fly ash cement	CEM II/A-V	80-94	-	-	-	-	6-20	-	-	-	-	-	0-5
		CEM II/B-V	65-79	-	-	-	-	21-35	-	-	-	-	-	0-5
		CEM II/A-W	80-94	-	-	-	-	-	6-20	-	-	-	-	0-5
		CEM II/B-W	65-79	-	-	-	-	-	21-35	-	-	-	-	0-5
	Portland-burnt shale cement	CEM II/A-T	80-94	-	-	-	-	-	-	6-20	-	-	-	0-5
		CEM II/B-T	65-79	-	-	-	-	-	-	21-35	-	-	-	0-5
	Portland-limestone cement	CEM II/A-L	80-94	-	-	-	-	-	-	-	6-20	-	-	0-5
		CEM II/B-L	65-79	-	-	-	-	-	-	-	21-35	-	-	0-5
		CEM II/A-LL	80-94	-	-	-	-	-	-	-	-	6-20	-	0-5
		CEM II/B-LL	65-79	-	-	-	-	-	-	-	-	21-35	-	0-5
	Portland-composite cement ^c	CEM II/A-M	80-94	<----- 6-20 ----->									0-5	
CEM II/B-M		65-79	<----- 21-35 ----->									0-5		
CEM III	Blastfurnace cement	CEM III/A	35-64	36-65	-	-	-	-	-	-	-	-	-	0-5
		CEM III/B	20-34	66-80	-	-	-	-	-	-	-	-	-	0-5
		CEM III/C	5-19	81-95	-	-	-	-	-	-	-	-	-	0-5
CEM IV	Pozzolanic cement ^c	CEM IV/A	65-89	-	<----- 11-35 ----->					-	-	-	0-5	
		CEM IV/B	45-64	-	<----- 36-55 ----->					-	-	-	0-5	
CEM V	Composite cement ^c	CEM V/A	40-64	18-30	-	<----- 18-30 ----->			-	-	-	-	0-5	
		CEM V/B	20-38	31-50	-	<----- 31-50 ----->			-	-	-	-	0-5	

a The values in the table refer to the sum of the main and minor additional constituents.

b The proportion of silica fume is limited to 10 %.

c In Portland-composite cements CEM II/A-M and CEM II/B-M, in pozzolanic cements CEM IV/A and CEM IV/B and in composite cements CEM V/A and CEM V/B the main constituents other than clinker shall be declared by designation of the cement (for example see clause 8).

European Cements



CSA A3000

CSA A3000 is 'Cementitious Materials Compendium'

All Hydraulic Cements, Blended Cements, SCMs and Test Methods are in this single compendium.

The committee is very small at CSA...the actual voting members for the last cycle was 26 plus an equal number of Associate members (27).

The Meetings run consecutively, none concurrent...so that the entire committee can contribute to the entire document.

Abstentions are NOT permitted

Attendance is MANDATORY

Committee matrix			
Code	Interest Categories	Minimum	Maximum
PI	Producer interest	6	11
UI	User interest	6	11
GI	General interest	6	11

CSA A3000

- A3001- Cementitious Materials for use in Concrete
- A3002- Masonry and Mortar Cement
- A3003- Chemical Test Methods
- A3004- Test Methods
- A3005- Test Equipment

The Direction at CSA?

- Specification is Performance Driven with a “Performance Subcommittee”
- Continued reliance on Performance Testing and less Prescriptive requirements (C1038, C1012)
- Less reliance on items such as Blaine, Strength and C3S...accelerated direction on isocal and XRD...

CSA A3000

■ 1998- CSA Compendium of Individual Standards

- A5 Portland Cements with up to 5% LS addition (1986)
- A8 Masonry Cements
- A23.5 SCMs (Slag, Fly Ash, Silica Fume, Nat Pozzolans)

■ 2004- A3000 Cementitious Materials Compendium

■ 2008- A3000

- Blended Cements (Binary, Ternary, Quaternary)
- Limestone Cements (up to 15% LS)
- ASCMs (Alternative SCMs) no longer Annex but as a Standard Practice
- Most Test Methods harmonized with ASTM

CSA A3000

4.1 Types

The naming practice for portland cement, blended hydraulic cement, and portland-limestone cement shall be as follows:

Portland cement type	Blended hydraulic cement type*	Portland-limestone cement type†‡	Name§
GU	GUb	GUL	General use cement
MS	MSb	–	Moderate sulphate-resistant cement
MH	MHb	MHL	Moderate heat of hydration cement
HE	HEb	HEL	High early-strength cement
LH	LHb	LHL	Low heat of hydration cement
HS	HSb	–	High sulphate-resistant cement

*The suffix "b" indicates that the product is a blended hydraulic cement.

†The suffix "L" indicates that the product is portland-limestone cement.

‡Portland-limestone cements should not be used in an environment subjected to sulphate exposure as defined in Table 3 of CAN/CSA-A23.1.

§See [Annex C](#) for information on previous naming conventions.

CSA A3000

5.1 Types

The naming practice for supplementary cementing materials and blended supplementary cementing materials shall be as follows:

Type	Name
N	Natural pozzolans
F	Fly ash with low calcium oxide (CaO) content
CI	Fly ash with intermediate calcium oxide content
CH	Fly ash with high calcium oxide content
SF	Silica fume with high silicon dioxide (SiO ₂) content
SFI	Silica with intermediate SiO ₂ content
S	Ground granulated blast-furnace slag
BMb	Blended supplementary cementing materials (see Clause 5.2)

Note: For materials other than those listed above that fall outside the scope of this Standard (e.g., quenched ground bottom ash, manufactured and other metallurgical slags, and silica fume with less than 75% SiO₂), see CSA A3004-E1.

CSA A3000

Table 9
Blended hydraulic cement and blended supplementary cementing materials proportions
(See [Clauses 3](#) and [4.2.2.](#))

Component percent limits	Binary blended hydraulic cements produced with				Ternary* and quaternary blended hydraulic cement
	N	FA (F, CI, CH)	S	SF (SF, SFI)	
Supplementary cementing materials, maximum %	40	50	70	15	60
Portland cement, minimum %	60	50	30	85	40

**In a ternary blend containing silica fume and slag, the maximum supplementary cementing materials content shall be increased to 70% and the minimum cement content shall be decreased to 30%.*

Notes:

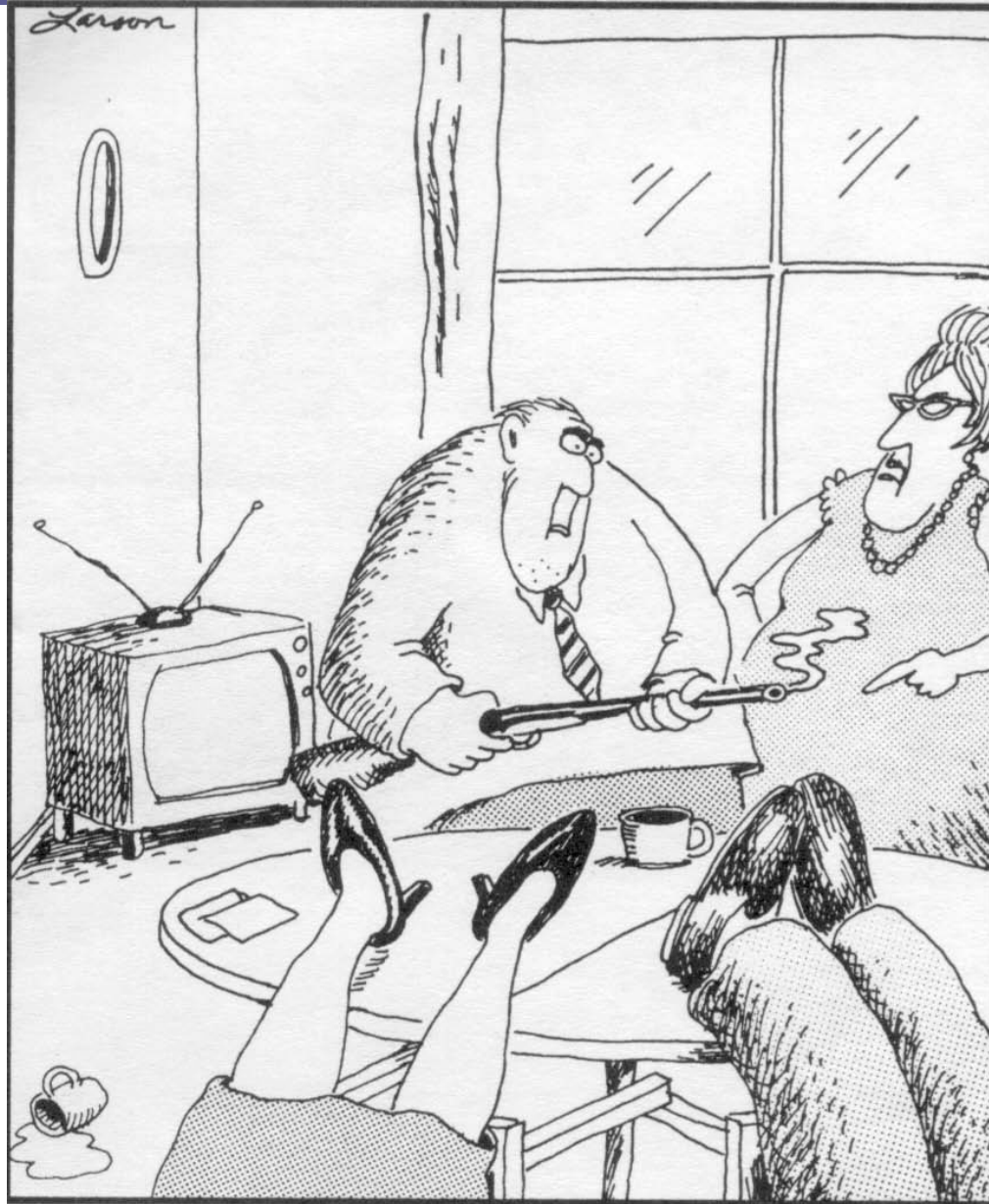
- (1) The proportions of each type of supplementary cementing material in any blended hydraulic cement shall not exceed the individual maxima specified in this table for binary cements. In the case where more than one fly ash is utilized in a blended hydraulic cement, the sum of proportions of the ashes shall not exceed 50%.*
- (2) Blended cements containing natural pozzolans shall have a minimum portland cement content of 60%.*

Where are we headed?

- Canadian GHG legislation previously mandated a 18% reduction in CO₂ emissions and energy based on 2006 figures by 2010 and then a continued indefinite reduction of 2% annually without final limit requirement...based on a clinker or cement baseline (MT/MT or BTU/MT).
- Process CO₂ not included
- ...But all of this is now on hold in order to harmonize with the US efforts...
- CDN government is waiting on the decision of the EPA and US government...

Where are we headed?

- New Administration and recent EPA statements supporting the new Bill to declare CO₂ as a pollutant will require monitoring/reporting emissions exceeding 25kT.
- Expected that we will be under an 80% reduction in TOTAL CO₂ emissions by 2050...
- There is going to be a sense of urgency like we haven't witnessed before...



“That settles it, Carl! ... From now on, you’re getting only decaffeinated coffee!”