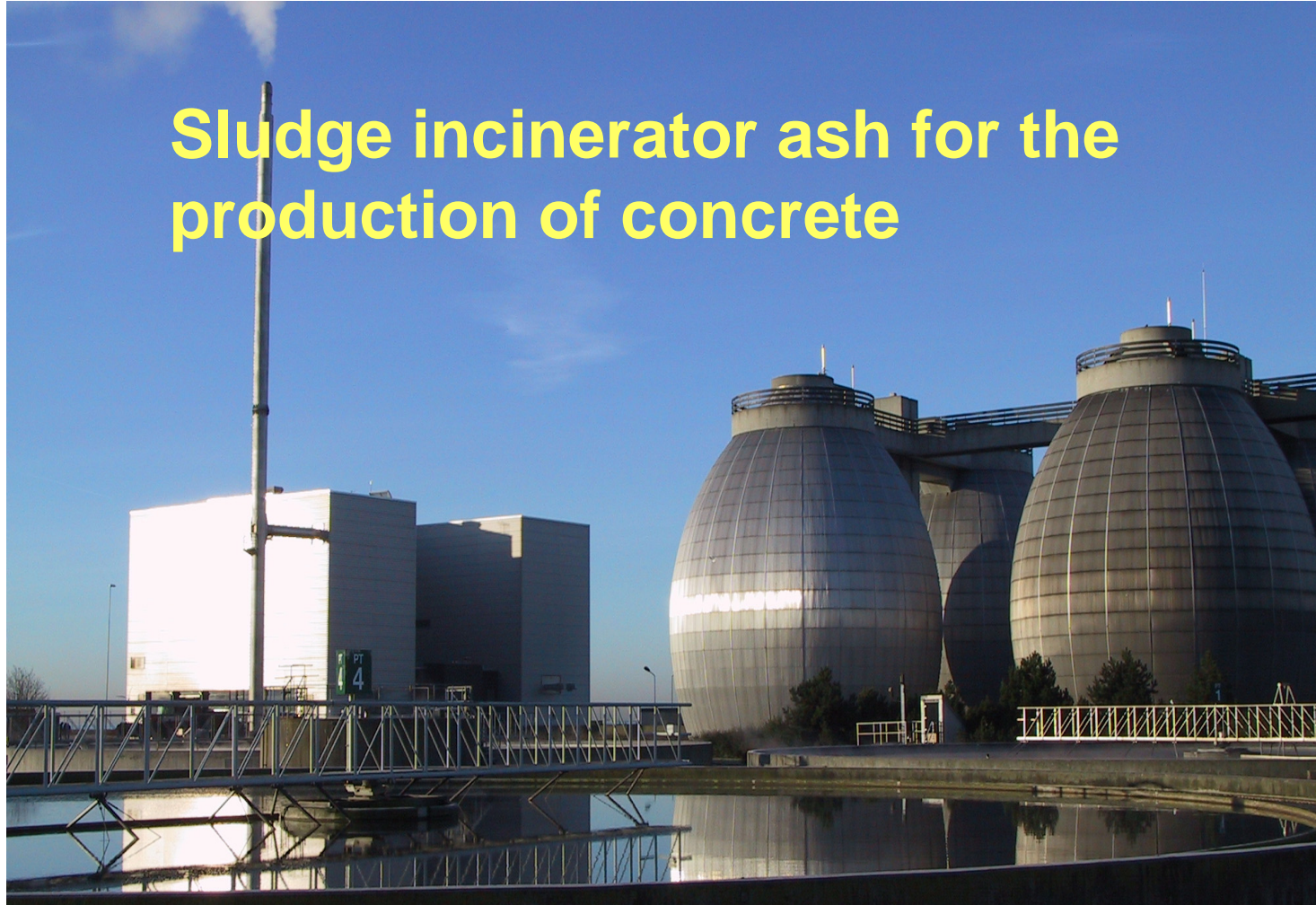


# Sludge incinerator ash for the production of concrete



Nytænkning gennem 100 år

**Funded by:**



**Danish EPA**

**Danish Concrete  
industry**

**WWTP in  
Copenhagen**

## Production of ash

Sludge from the wastewater treatment plant is dried and incinerated

Fluid bed incinerator

In the Copenhagen area 10.000 tonnes per year is landfilled



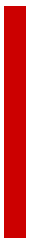
# Composition

	Sludge incinerator ash	CEM I	Fly ash
Ag	1,6	< 0,8	< 0,8
As	16	13	41
Ba	930	323	940
Bi	2,9	0,56	0,55
Cd	9,3	0,8	0,4
Cr	152	27	33
Cu	850	78	22
Hg	11	< 0,3	0,79
Mn	790	156	186
Mo	23	2,8	11
Ni	102	27,7	19,3
Pb	122	13,6	6,7
Sb	9,8	< 0,5	1,1
Tl	0,93	0,32	0,43
V	40	80	68
Zn	1230	103	39

Selected heavy  
metals in ash  
and cement i  
mg/kg



# Sludge incinerator ash compared to ordinary fly ash



# Sludge ash concrete compared to ordinary concrete

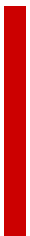
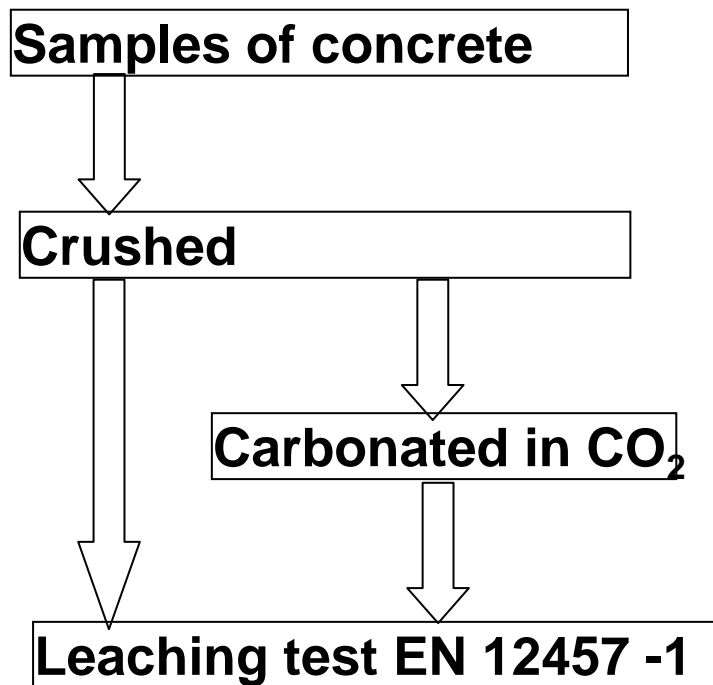


# Concrete samples

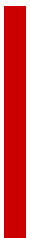
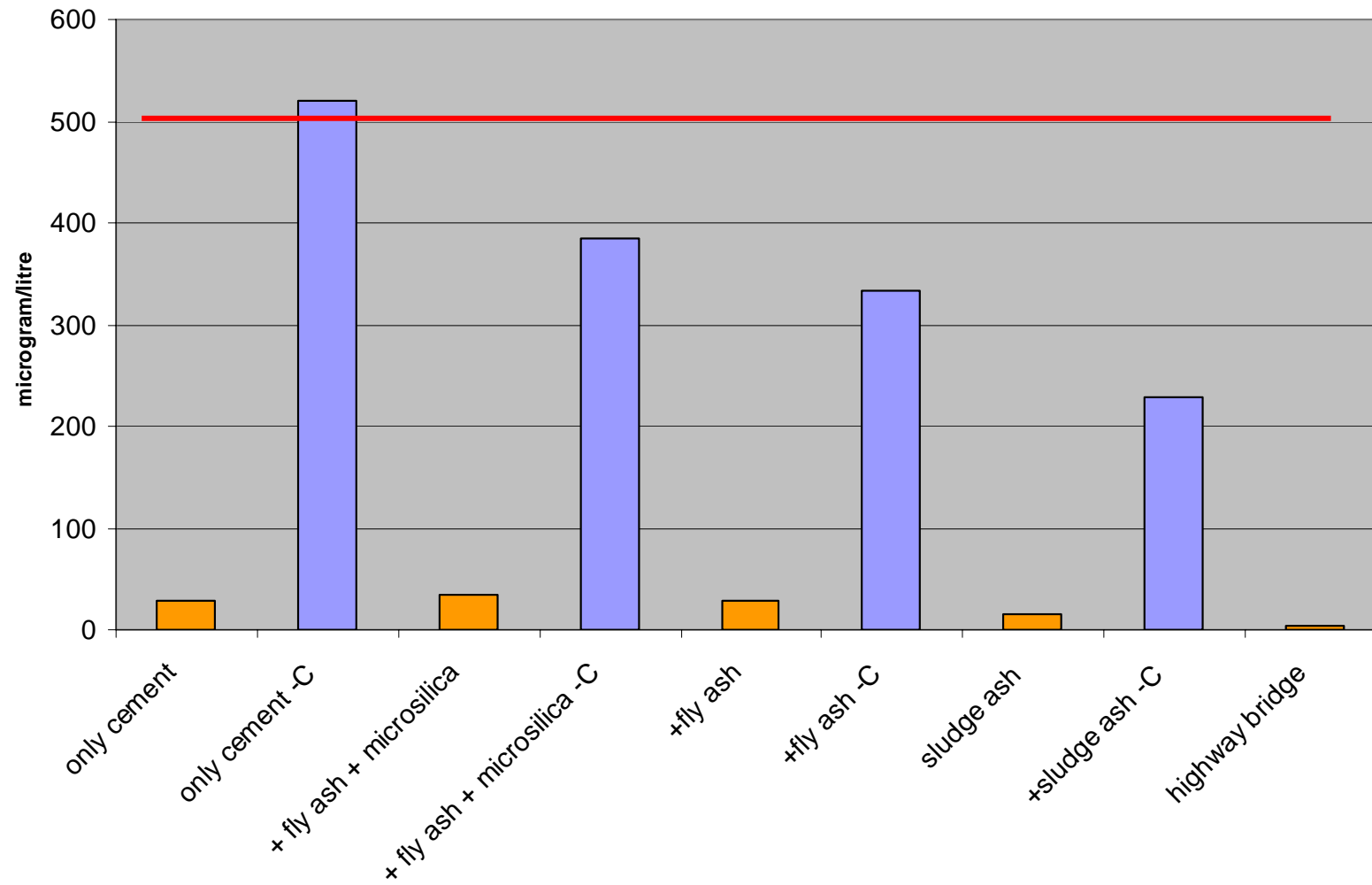
Kg/m<sup>3</sup>

	Cement	Fly ash	Silica fume	Sludge incinerator ash	v/c
only cement	188				0,77
+ fly ash + silica fume	121	79	11		0,75
+fly ash	133	82			0,75
+sludge incinerator ash	184			120	0,89
highway bridge	303		17	31	0,39

# Experiment



# Release of Chromium





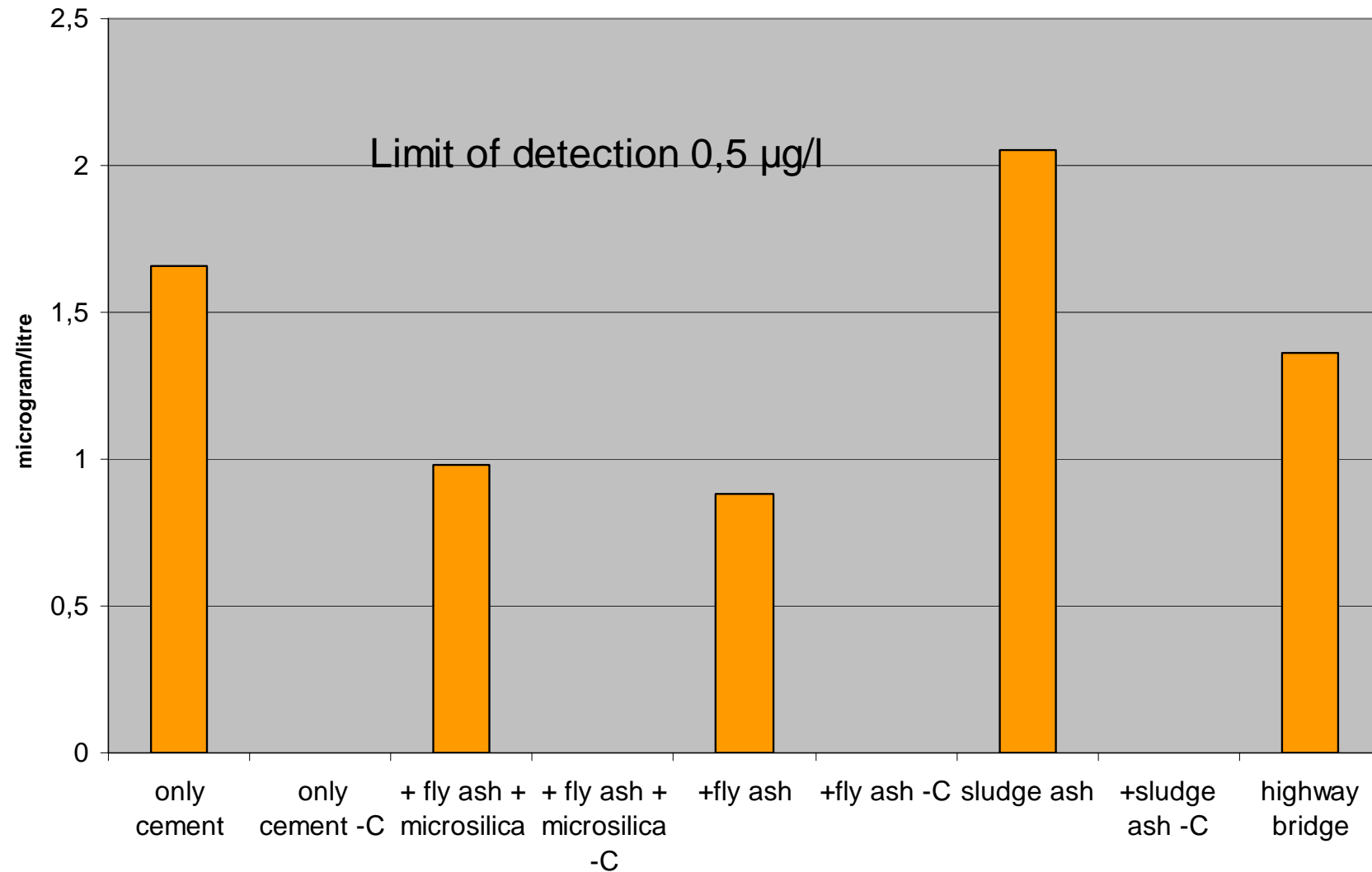
# Danish limit values

Leaching from residues to be used for construction works

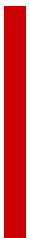
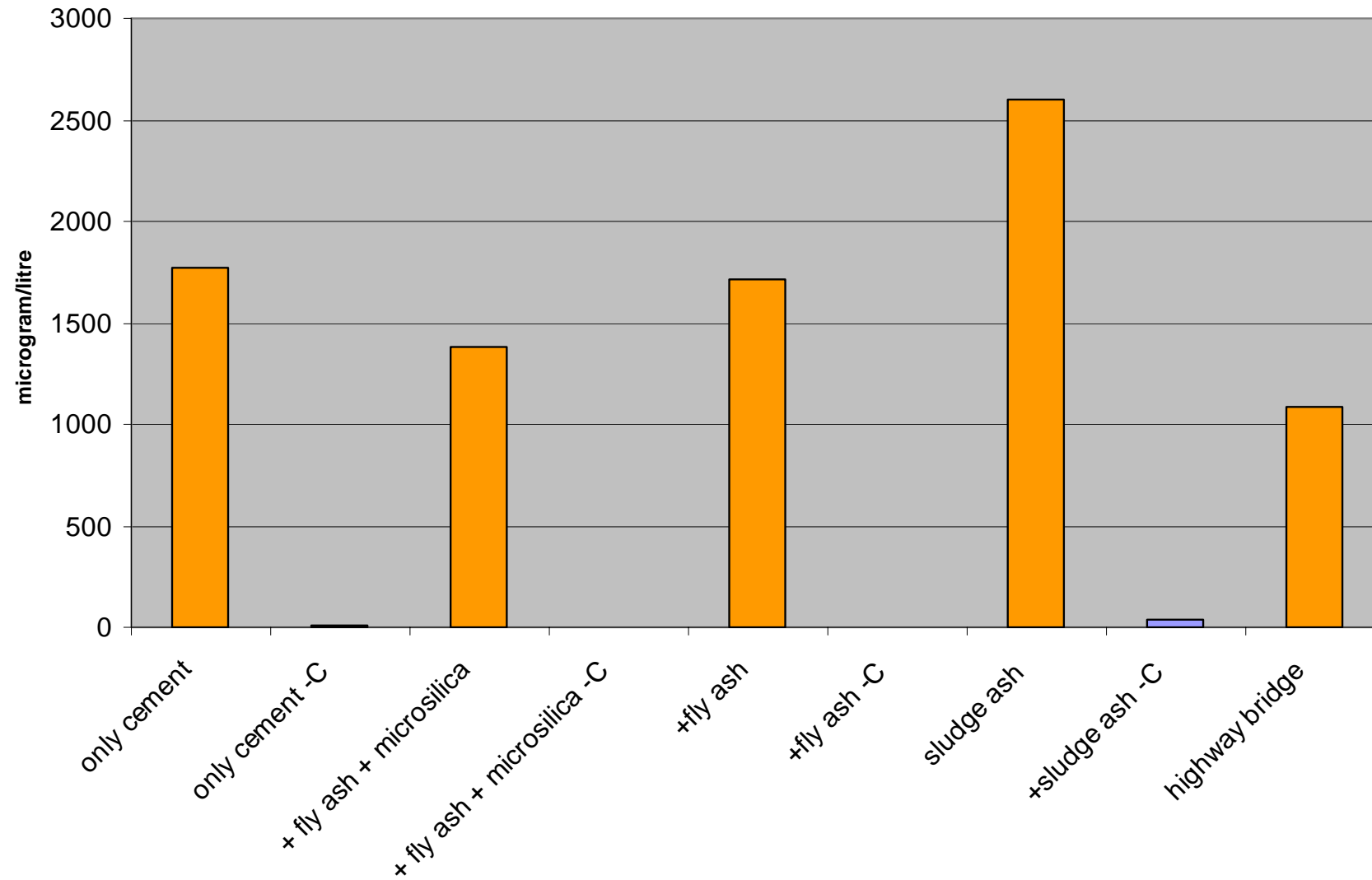
	$\mu\text{g/litre}$
As	50
Ba	4000
Cd	40
Cr	500
Cu	2000
Hg	1
Mn	1000
Ni	70
Pb	100
Zn	1500



# Release of lead



# Release of barium



## How does carbonation affect leaching?

Metal	Reduced	Enhanced
Chromium		X
Barium	X	
Antimony		X
Cadmium		X
Lead	X	
Vanadium		X



**Follow the project on:**

**[www.biocrete.dk](http://www.biocrete.dk)**

