



Element, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL  
Your Element Contact: Scott Pilkington (07825 991 537)  
E: scott.pilkington@element.com

**Stack Emissions Testing Report Commissioned by**  
Irish Cement Ltd

**Installation Name & Address**  
Irish Cement Ltd  
Castlemungret  
County Limerick

Industrial Emissions Licence: P0029-06

**Stack Reference**  
A2-01 Kiln 6

**Dates of the Monitoring Campaign**  
18th to 20th July 2023

**Job Reference Number**  
EMT06515

<b>Report Written by</b>
Keith Miller Team Leader MCERTS Level 2 MM 02 135 TE1 TE2 TE3 TE4

<b>Report Approved by</b>
John McBride Senior Team Leader MCERTS Level 2 MM 04 515 TE1 TE2 TE3 TE4

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14th August 2023

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<b>Signature of Report Approver</b>


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## Executive Summary

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### MONITORING OBJECTIVES

Irish Cement Ltd, County Limerick  
A2-01 Kiln 6  
18th to 20th July 2023

#### Overall Aim of the Monitoring Campaign

Element were commissioned by Irish Cement Ltd to carry out stack emissions testing on the A2-01 Kiln 6 at County Limerick.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

#### Special Requirements

There were no special requirements.

#### Target Parameters

Total Particulate Matter, Sulphur Dioxide, Cadmium & Thallium, Heavy Metals, Mercury, Dioxins & Furans, PCBs, Hydrogen Fluoride, Ammonia, Hydrogen Chloride, Total VOCs (as Carbon), Oxides of Nitrogen (as NO<sub>2</sub>), Carbon Monoxide

## Executive Summary

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### MONITORING RESULTS

Irish Cement Ltd, County Limerick

A2-01 Kiln 6

18th to 20th July 2023

where MU = Measurement Uncertainty associated with the Result

Parameter	Concentration				Mass Emission			
	Units	Result	MU +/-	Limit	Units	Result	MU +/-	Limit
Total Particulate Matter	<sup>1</sup> mg/m <sup>3</sup>	0.16	0.46	10	g/hr	43.8	125	-
Sulphur Dioxide	<sup>1</sup> mg/m <sup>3</sup>	7.7	0.56	50	g/hr	2093	196	-
Cadmium & Thallium	<sup>1</sup> mg/m <sup>3</sup>	0.0048	0.00079	0.05	g/hr	1.2	0.21	-
Heavy Metals	<sup>1</sup> mg/m <sup>3</sup>	0.012	0.0024	0.5	g/hr	3.1	0.64	-
Mercury	mg/m <sup>3</sup>	0.013	0.0030	0.05	g/hr	3.4	0.84	-
<b>Dioxins &amp; Furans Upper Limit (worst case where &lt;LOD = LOD)</b>								
Dioxins & Furans (NATO I-TEQ)	<sup>1</sup> ng/m <sup>3</sup>	0.0014	0.00030	0.1	µg/hr	0.39	0.084	-
Dioxins & Furans (WHO TEQ Humans / Mammals)	<sup>1</sup> ng/m <sup>3</sup>	0.0017	0.00036	-	µg/hr	0.47	0.10	-
Dioxins & Furans (WHO TEQ Fish)	<sup>1</sup> ng/m <sup>3</sup>	0.0019	0.00039	-	µg/hr	0.51	0.11	-
Dioxins & Furans (WHO TEQ Birds)	<sup>1</sup> ng/m <sup>3</sup>	0.0033	0.00069	-	µg/hr	0.90	0.20	-
<b>Dioxins &amp; Furans Lower Limit (best case where &lt;LOD = 0)</b>								
Dioxins & Furans (NATO I-TEQ)	<sup>1</sup> ng/m <sup>3</sup>	0.000073	0.000015	-	µg/hr	0.020	0.0043	-
Dioxins & Furans (WHO TEQ Humans / Mammals)	<sup>1</sup> ng/m <sup>3</sup>	0.000071	0.000015	-	µg/hr	0.019	0.0042	-
Dioxins & Furans (WHO TEQ Fish)	<sup>1</sup> ng/m <sup>3</sup>	0.000037	0.000008	-	µg/hr	0.010	0.0022	-
Dioxins & Furans (WHO TEQ Birds)	<sup>1</sup> ng/m <sup>3</sup>	0.00067	0.00014	-	µg/hr	0.18	0.039	-
<b>PCBs Upper Limit (worst case where &lt;LOD = LOD)</b>								
PCBs (WHO TEQ Humans / Mammals)	<sup>1</sup> ng/m <sup>3</sup>	0.00017	0.000035	-	µg/hr	0.045	0.0098	-
PCBs (WHO TEQ Fish)	<sup>1</sup> ng/m <sup>3</sup>	0.000013	0.0000026	-	µg/hr	0.0034	0.00073	-
PCBs (WHO TEQ Birds)	<sup>1</sup> ng/m <sup>3</sup>	0.0016	0.00034	-	µg/hr	0.44	0.095	-
<b>PCBs Lower Limit (best case where &lt;LOD = 0)</b>								
PCBs (WHO TEQ Humans / Mammals)	<sup>1</sup> ng/m <sup>3</sup>	0.000068	0.000014	-	µg/hr	0.019	0.0040	-
PCBs (WHO TEQ Fish)	<sup>1</sup> ng/m <sup>3</sup>	0.0000077	0.0000016	-	µg/hr	0.0021	0.00045	-
PCBs (WHO TEQ Birds)	<sup>1</sup> ng/m <sup>3</sup>	0.0015	0.00032	-	µg/hr	0.41	0.089	-
Hydrogen Fluoride	<sup>1</sup> mg/m <sup>3</sup>	0.051	0.0066	1	g/hr	12.8	1.8	-
Ammonia	<sup>1</sup> mg/m <sup>3</sup>	25.7	4.7	50	g/hr	6497	1259	-
Hydrogen Chloride	<sup>1</sup> mg/m <sup>3</sup>	1.9	0.12	10	g/hr	475	40.9	-
Total VOCs (as Carbon)	<sup>1</sup> mg/m <sup>3</sup>	19.9	0.89	25	g/hr	5040	376	-
Oxides of Nitrogen (as NO <sub>2</sub> )	<sup>1</sup> mg/m <sup>3</sup>	412	15.3	500	g/hr	104224	7322	-
Carbon Monoxide	<sup>1</sup> mg/m <sup>3</sup>	348	12.8	1500	g/hr	87916	6171	-
Carbon Dioxide	% v/v Dry	20.1	0.49					
Oxygen	% v/v Dry	9.7	0.23					
Water Vapour	% v/v	10.9	0.52					
Stack Gas Temperature	°C	145						
Stack Gas Velocity	m/s	22.2	0.87					
Volumetric Flow Rate (ACTUAL)	m <sup>3</sup> /hr	425270	25399					
Volumetric Flow Rate (REF)	<sup>1</sup> m <sup>3</sup> /hr	252768	15096					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.

<sup>1</sup> Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 10% oxygen.

## Executive Summary

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### MONITORING DATE(S) & TIMES

Irish Cement Ltd, County Limerick

A2-01 Kiln 6

18th to 20th July 2023

Parameter	Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins	
Total Particulate Matter	R1	mg/m <sup>3</sup>	0.16	g/hr	43.8	18/07/2023	16:20 - 17:25	60
Total Particulate Matter	R2	mg/m <sup>3</sup>	0.16	g/hr	43.8	18/07/2023	17:45 - 18:50	60
Total Particulate Matter	R3	mg/m <sup>3</sup>	0.16	g/hr	43.8	19/07/2023	06:00 - 07:05	60
Sulphur Dioxide	R1	mg/m <sup>3</sup>	5.6	g/hr	1521	18/07/2023	16:20 - 17:25	60
Sulphur Dioxide	R2	mg/m <sup>3</sup>	10.7	g/hr	2911	18/07/2023	17:45 - 18:50	60
Sulphur Dioxide	R3	mg/m <sup>3</sup>	6.8	g/hr	1845	19/07/2023	06:00 - 07:05	60
Cadmium & Thallium	R1	mg/m <sup>3</sup>	0.010	g/hr	2.5	20/07/2023	06:00 - 07:05	60
Cadmium & Thallium	R2	mg/m <sup>3</sup>	0.0025	g/hr	0.64	20/07/2023	07:15 - 08:20	60
Cadmium & Thallium	R3	mg/m <sup>3</sup>	0.0018	g/hr	0.47	20/07/2023	09:50 - 10:55	60
Heavy Metals	R1	mg/m <sup>3</sup>	0.012	g/hr	3.0	20/07/2023	06:00 - 07:05	60
Heavy Metals	R2	mg/m <sup>3</sup>	0.010	g/hr	2.5	20/07/2023	07:15 - 08:20	60
Heavy Metals	R3	mg/m <sup>3</sup>	0.015	g/hr	3.7	20/07/2023	09:50 - 10:55	60
Mercury	R1	mg/m <sup>3</sup>	0.011	g/hr	3.1	20/07/2023	11:05 - 12:10	60
Mercury	R2	mg/m <sup>3</sup>	0.015	g/hr	4.0	20/07/2023	12:20 - 13:25	60
Mercury	R3	mg/m <sup>3</sup>	0.012	g/hr	3.2	20/07/2023	13:35 - 14:40	60
Dioxins & Furans (NATO)	R1	ng/m <sup>3</sup>	0.0014	µg/hr	0.38	18/07/2023	10:00 - 16:10	360
Dioxins & Furans (NATO)	R2	ng/m <sup>3</sup>	0.0016	µg/hr	0.42	19/07/2023	07:15 - 13:20	360
Dioxins & Furans (NATO)	R3	ng/m <sup>3</sup>	0.0014	µg/hr	0.37	19/07/2023	13:35 - 19:40	360
PCBs	R1	ng/m <sup>3</sup>	0.00014	µg/hr	0.037	18/07/2023	10:00 - 16:10	360
PCBs	R2	ng/m <sup>3</sup>	0.00019	µg/hr	0.052	19/07/2023	07:15 - 13:20	360
PCBs	R3	ng/m <sup>3</sup>	0.00017	µg/hr	0.047	19/07/2023	13:35 - 19:40	360
Hydrogen Fluoride	R1	mg/m <sup>3</sup>	0.090	g/hr	22.7	18/07/2023	11:00 - 12:00	60
Hydrogen Fluoride	R2	mg/m <sup>3</sup>	< 0.032	g/hr	< 8.0	18/07/2023	12:15 - 13:15	60
Hydrogen Fluoride	R3	mg/m <sup>3</sup>	< 0.031	g/hr	< 7.8	18/07/2023	13:30 - 14:30	60
Ammonia	R1	mg/m <sup>3</sup>	24.4	g/hr	6165	19/07/2023	11:00 - 12:00	60
Ammonia	R2	mg/m <sup>3</sup>	25.0	g/hr	6329	19/07/2023	12:15 - 13:15	60
Ammonia	R3	mg/m <sup>3</sup>	27.7	g/hr	6998	19/07/2023	13:30 - 14:30	60
Hydrogen Chloride	R1	mg/m <sup>3</sup>	3.1	g/hr	785	19/07/2023	07:00 - 08:00	60
Hydrogen Chloride	R2	mg/m <sup>3</sup>	1.3	g/hr	327	19/07/2023	08:15 - 09:15	60
Hydrogen Chloride	R3	mg/m <sup>3</sup>	1.2	g/hr	314	19/07/2023	09:30 - 10:30	60
Total VOCs (as Carbon)	R1	mg/m <sup>3</sup>	19.9	g/hr	5040	18/07/2023	14:00 - 22:00	480
Oxides of Nitrogen (as NO <sub>2</sub> )	R1	mg/m <sup>3</sup>	412	g/hr	104224	18/07/2023	14:00 - 22:00	480
Carbon Monoxide	R1	mg/m <sup>3</sup>	348	g/hr	87916	18/07/2023	14:00 - 22:00	480
Carbon Dioxide	R1	% v/v	20.1			18/07/2023	14:00 - 22:00	480
Oxygen	R1	% v/v	9.5			18/07/2023	14:00 - 22:00	480
Velocity Traverse	R1					18/07/2023	09:00 - 09:45	

All results are expressed at the respective reference conditions.