# MEMORANDUM

**DATE:** October 19, 2011

**TO:** Bob Smet

**FROM:** Les Morrow
Environmental Toxicologist
Toxicity Assessment Unit, Illinois EPA

**SUBJECT:** Hazardous Air Pollutant Evaluation for Universal Cement, LLC, Chicago, Illinois

In conjunction with a Prevention of Significant Deterioration (PSD) air permit application, the Illinois Environmental Protection Agency (Illinois EPA) performed an evaluation of potential concerns arising from hazardous air pollutant emissions from the proposed Universal Cement, Chicago, Illinois facility. Estimated facility-associated emissions of industry-related HAP pollutants were modeled to sensitive receptors and nearby residential areas. None of the modeled concentrations exceeded Illinois EPA generated comparison values designed to be protective of the general population including sensitive individuals.

The Illinois EPA HAP evaluation utilized several assumptions regarding the identity of pollutants associated with this industry and their emission rates. The USEPA document, Compilation of Air Pollutant Emission Factors, January 1995, was used for both needs. While this document provides emission factors from the mid-1990s, Universal Cement plans to employ state-of-the-art technology which reduces emission rates and in turn would reduce the modeled impacts used in this analysis. The net effect is that impacts upon the neighboring communities should be much less than was calculated.

The Illinois EPA identified three sensitive populations near the facility for specific evaluation: a day care center, an elementary school, and a high school. In addition, three nearby residential areas were identified for evaluation. A grid-work of modeled air concentrations for the criteria pollutants had been submitted to the Illinois EPA as part of the permit application. Of the modeled criteria pollutants, $SO_2$ most closely imitates the dispersion properties of the HAPs of concern. For each HAP, a dilution factor relative to $SO_2$ was calculated and applied to the modeled concentration for $SO_2$. Although the modeled HAP values are proxy concentrations, they are not expected to underestimate otherwise modeled concentrations. For the Illinois EPA analysis, the closest modeled concentration for the three sensitive populations

and the highest modeled concentration within the three residential areas were compared to acceptable air concentrations.

The Illinois EPA maintains a database of acceptable ambient air concentrations for numerous air pollutants. Acceptable concentrations are determined using USEPA and other state and government toxicology factors. These factors either predict cancer incidence or identify a non-cancer effect level. These factors were used by the Illinois EPA to calculate concentrations which will not cause harm when continuously inhaled.

Results from the comparison of acceptable ambient concentrations to the modeled HAP concentrations show no modeled concentration exceeding the acceptable values. Three pollutants, although lower than their acceptable levels, consistently approached their respective thresholds. These three are arsenic, chromium, and benzene. Concentrations of arsenic and benzene are about one to two one-hundredths of their acceptable levels. These results are well below a level for concern. Chromium concentrations are about two to four tenths of its acceptable level. Chromium exists in predominantly two forms, one harmless and another which can lead to cancer. This analysis treated all chromium emissions as harmful. This assumption is incorrect and the consequence is an over-estimation of the impact of chromium. Reanalysis using actual emission rates based on the new state-of-the-art technology and using only the harmful form of chromium would result in lower modeled impacts on the area.

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Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Day Care Center**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.42E-06 | 2.30E-04 | I-URF | 1.1E-02 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 1.33E-07 | 4.20E-04 | I-URF | 3.2E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 4.43E-07 | 5.60E-04 | I-URF | 7.9E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 4.23E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 2.82E-05 | 8.30E-05 | I-URF | 3.4E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 1.81E-04 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 3.22E-03 | 2.00E+01 | I-RfC | 1.6E-04 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 1.43E-04 | 1.50E-01 | NAAQS | 9.5E-04 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.42E-06 | 3.00E-01 | I-RfC | 8.1E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 1.73E-04 | 5.00E-02 | I-RfC | 3.5E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 4.03E-05 | 2.00E+01 | C-REL | 2.0E-06 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 2.42E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 3.22E-03 | 1.30E-01 | I-URF | 2.5E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 2.62E-08 | 9.10E-04 | C-IUR | 2.9E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 8.66E-09 | 9.10E-03 | C-IUR | 9.5E-07 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 1.13E-07 | 9.10E-03 | C-IUR | 1.2E-05 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 1.57E-08 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 3.02E-08 | 9.10E-03 | C-IUR | 3.3E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 1.23E-06 | 4.00E-01 | P-cRfC | 3.1E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 1.91E-05 | 4.20E-01 | I-URF | 4.6E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 8.66E-06 | 5.00E+00 | I-RfC | 1.7E-06 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 2.22E-05 | 7.00E-02 | I-RfC | 3.2E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 3.22E-06 | 5.00E+01 | P-cRfC | 6.4E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 7.65E-05 | 9.00E+01 | I-RfC | 8.5E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 3.22E-08 | 9.10E-02 | C-IUR | 3.5E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 8.26E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 1.27E-07 | 8.30E-04 | C-IUR | 1.5E-04 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 3.83E-06 | 1.00E+03 | I-RfC | 3.8E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 1.77E-06 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 3.83E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 9.26E-05 | 7.70E-02 | I-URF | 1.2E-03 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 1.75E-08 | 9.10E-03 | C-IUR | 1.9E-06 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 6.04E-06 | 5.00E+03 | I-RfC | 1.2E-09 |

Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Day Care Center**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 9.67E-05 | 2.13E+00 | I-URF | 4.5E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 8.46E-07 | 5.80E+01 | OT | 1.5E-08 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 3.42E-04 | 3.00E+00 | I-RfC | 1.1E-04 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 7.85E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 2.22E-05 | 2.00E+02 | C-REL | 1.1E-07 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 8.86E-07 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 3.02E-07 | 1.00E+03 | I-RfC | 3.0E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 3.83E-05 | 5.00E+03 | I-RfC | 7.7E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 1.43E-10 | 2.63E-08 | D-URF | 5.4E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 2.62E-05 | 1.00E+02 | I-RfC | 2.6E-07 |

* = Includes multiple chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

[b] = Fuel usage during normal operation of the facility.

[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.

Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **George Washington High School**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.82E-06 | 2.30E-04 | I-URF | 1.2E-02 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 1.55E-07 | 4.20E-04 | I-URF | 3.7E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 5.17E-07 | 5.60E-04 | I-URF | 9.2E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 4.94E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 3.29E-05 | 8.30E-05 | I-URF | 4.0E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 2.12E-04 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 3.76E-03 | 2.00E+01 | I-RfC | 1.9E-04 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 1.67E-04 | 1.50E-01 | NAAQS | 1.1E-03 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.82E-06 | 3.00E-01 | I-RfC | 9.4E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 2.02E-04 | 5.00E-02 | I-RfC | 4.0E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 4.70E-05 | 2.00E+01 | C-REL | 2.4E-06 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 2.82E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 3.76E-03 | 1.30E-01 | I-URF | 2.9E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 3.06E-08 | 9.10E-04 | C-IUR | 3.4E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 1.01E-08 | 9.10E-03 | C-IUR | 1.1E-06 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 1.32E-07 | 9.10E-03 | C-IUR | 1.4E-05 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 1.83E-08 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 3.53E-08 | 9.10E-03 | C-IUR | 3.9E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 1.43E-06 | 4.00E-01 | P-cRfC | 3.6E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 2.23E-05 | 4.20E-01 | I-URF | 5.3E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 1.01E-05 | 5.00E+00 | I-RfC | 2.0E-06 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 2.59E-05 | 7.00E-02 | I-RfC | 3.7E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 3.76E-06 | 5.00E+01 | P-cRfC | 7.5E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 8.94E-05 | 9.00E+01 | I-RfC | 9.9E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 3.76E-08 | 9.10E-02 | C-IUR | 4.1E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 9.64E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 1.48E-07 | 8.30E-04 | C-IUR | 1.8E-04 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 4.47E-06 | 1.00E+03 | I-RfC | 4.5E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 2.07E-06 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 4.47E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 1.08E-04 | 7.70E-02 | I-URF | 1.4E-03 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 2.05E-08 | 9.10E-03 | C-IUR | 2.2E-06 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 7.06E-06 | 5.00E+03 | I-RfC | 1.4E-09 |

Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **George Washington High School**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 1.13E-04 | 2.13E+00 | I-URF | 5.3E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 9.88E-07 | 5.80E+01 | OT | 1.7E-08 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 4.00E-04 | 3.00E+00 | I-RfC | 1.3E-04 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 9.17E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 2.59E-05 | 2.00E+02 | C-REL | 1.3E-07 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 1.03E-06 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 3.53E-07 | 1.00E+03 | I-RfC | 3.5E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 4.47E-05 | 5.00E+03 | I-RfC | 8.9E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 1.67E-10 | 2.63E-08 | D-URF | 6.4E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 3.06E-05 | 1.00E+02 | I-RfC | 3.1E-07 |

* = Includes multiple chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

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[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.

Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Virgil Grissom Elementry School**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.18E-06 | 2.30E-04 | I-URF | 5.14E-03 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 6.50E-08 | 4.20E-04 | I-URF | 1.55E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 2.17E-07 | 5.60E-04 | I-URF | 3.87E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 2.07E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 1.38E-05 | 8.30E-05 | I-URF | 1.66E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 8.87E-05 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 1.58E-03 | 2.00E+01 | I-RfC | 7.88E-05 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 7.00E-05 | 1.50E-01 | NAAQS | 4.66E-04 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.18E-06 | 3.00E-01 | I-RfC | 3.94E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 8.47E-05 | 5.00E-02 | I-RfC | 1.69E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 1.97E-05 | 2.00E+01 | C-REL | 9.85E-07 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 1.18E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 1.58E-03 | 1.30E-01 | I-URF | 1.21E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 1.28E-08 | 9.10E-04 | C-IUR | 1.41E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 4.24E-09 | 9.10E-03 | C-IUR | 4.66E-07 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 5.52E-08 | 9.10E-03 | C-IUR | 6.06E-06 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 7.69E-09 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 1.48E-08 | 9.10E-03 | C-IUR | 1.62E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 6.01E-07 | 4.00E-01 | P-cRfC | 1.50E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 9.36E-06 | 4.20E-01 | I-URF | 2.23E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 4.24E-06 | 5.00E+00 | I-RfC | 8.47E-07 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 1.08E-05 | 7.00E-02 | I-RfC | 1.55E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 1.58E-06 | 5.00E+01 | P-cRfC | 3.15E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 3.74E-05 | 9.00E+01 | I-RfC | 4.16E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 1.58E-08 | 9.10E-02 | C-IUR | 1.73E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 4.04E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 6.21E-08 | 8.30E-04 | C-IUR | 7.48E-05 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 1.87E-06 | 1.00E+03 | I-RfC | 1.87E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 8.67E-07 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 1.87E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 4.53E-05 | 7.70E-02 | I-URF | 5.89E-04 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 8.57E-09 | 9.10E-03 | C-IUR | 9.42E-07 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 2.96E-06 | 5.00E+03 | I-RfC | 5.91E-10 |

Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Virgil Grissom Elementry School**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 4.73E-05 | 2.13E+00 | I-URF | 2.22E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 4.14E-07 | 5.80E+01 | OT | 7.14E-09 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 1.68E-04 | 3.00E+00 | I-RfC | 5.58E-05 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 3.84E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 1.08E-05 | 2.00E+02 | C-REL | 5.42E-08 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 4.34E-07 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 1.48E-07 | 1.00E+03 | I-RfC | 1.48E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 1.87E-05 | 5.00E+03 | I-RfC | 3.74E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 7.00E-11 | 2.63E-08 | D-URF | 2.66E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 1.28E-05 | 1.00E+02 | I-RfC | 1.28E-07 |

* = Includes multiple chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

[b] = Fuel usage during normal operation of the facility.

[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **East Side Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.46E-06 | 2.30E-04 | I-URF | 1.1E-02 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 1.35E-07 | 4.20E-04 | I-URF | 3.2E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 4.51E-07 | 5.60E-04 | I-URF | 8.0E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 4.30E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 2.87E-05 | 8.30E-05 | I-URF | 3.5E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 1.84E-04 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 3.28E-03 | 2.00E+01 | I-RfC | 1.6E-04 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 1.45E-04 | 1.50E-01 | NAAQS | 9.7E-04 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 2.46E-06 | 3.00E-01 | I-RfC | 8.2E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 1.76E-04 | 5.00E-02 | I-RfC | 3.5E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 4.10E-05 | 2.00E+01 | C-REL | 2.0E-06 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 2.46E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 3.28E-03 | 1.30E-01 | I-URF | 2.5E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 2.66E-08 | 9.10E-04 | C-IUR | 2.9E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 8.81E-09 | 9.10E-03 | C-IUR | 9.7E-07 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 1.15E-07 | 9.10E-03 | C-IUR | 1.3E-05 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 1.60E-08 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 3.07E-08 | 9.10E-03 | C-IUR | 3.4E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 1.25E-06 | 4.00E-01 | P-cRfC | 3.1E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 1.95E-05 | 4.20E-01 | I-URF | 4.6E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 8.81E-06 | 5.00E+00 | I-RfC | 1.8E-06 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 2.25E-05 | 7.00E-02 | I-RfC | 3.2E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 3.28E-06 | 5.00E+01 | P-cRfC | 6.6E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 7.79E-05 | 9.00E+01 | I-RfC | 8.7E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 3.28E-08 | 9.10E-02 | C-IUR | 3.6E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 8.40E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 1.29E-07 | 8.30E-04 | C-IUR | 1.6E-04 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 3.89E-06 | 1.00E+03 | I-RfC | 3.9E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 1.80E-06 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 3.89E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 9.42E-05 | 7.70E-02 | I-URF | 1.2E-03 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 1.78E-08 | 9.10E-03 | C-IUR | 2.0E-06 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 6.15E-06 | 5.00E+03 | I-RfC | 1.2E-09 |

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **East Side Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 9.83E-05 | 2.13E+00 | I-URF | 4.6E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 8.61E-07 | 5.80E+01 | OT | 1.5E-08 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 3.48E-04 | 3.00E+00 | I-RfC | 1.2E-04 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 7.99E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 2.25E-05 | 2.00E+02 | C-REL | 1.1E-07 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 9.02E-07 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 3.07E-07 | 1.00E+03 | I-RfC | 3.1E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 3.89E-05 | 5.00E+03 | I-RfC | 7.8E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 1.45E-10 | 2.63E-08 | D-URF | 5.5E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 2.66E-05 | 1.00E+02 | I-RfC | 2.7E-07 |

* = Includes multiple chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

[b] = Fuel usage during normal operation of the facility.

[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Hegewisch Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.86E-06 | 2.30E-04 | I-URF | 8.1E-03 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 1.02E-07 | 4.20E-04 | I-URF | 2.4E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 3.41E-07 | 5.60E-04 | I-URF | 6.1E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 3.26E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 2.17E-05 | 8.30E-05 | I-URF | 2.6E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 1.40E-04 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 2.48E-03 | 2.00E+01 | I-RfC | 1.2E-04 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 1.10E-04 | 1.50E-01 | NAAQS | 7.3E-04 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.86E-06 | 3.00E-01 | I-RfC | 6.2E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 1.33E-04 | 5.00E-02 | I-RfC | 2.7E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 3.10E-05 | 2.00E+01 | C-REL | 1.6E-06 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 1.86E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 2.48E-03 | 1.30E-01 | I-URF | 1.9E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 2.02E-08 | 9.10E-04 | C-IUR | 2.2E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 6.67E-09 | 9.10E-03 | C-IUR | 7.3E-07 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 8.69E-08 | 9.10E-03 | C-IUR | 9.5E-06 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 1.21E-08 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 2.33E-08 | 9.10E-03 | C-IUR | 2.6E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 9.46E-07 | 4.00E-01 | P-cRfC | 2.4E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 1.47E-05 | 4.20E-01 | I-URF | 3.5E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 6.67E-06 | 5.00E+00 | I-RfC | 1.3E-06 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 1.71E-05 | 7.00E-02 | I-RfC | 2.4E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 2.48E-06 | 5.00E+01 | P-cRfC | 5.0E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 5.90E-05 | 9.00E+01 | I-RfC | 6.6E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 2.48E-08 | 9.10E-02 | C-IUR | 2.7E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 6.36E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 9.78E-08 | 8.30E-04 | C-IUR | 1.2E-04 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 2.95E-06 | 1.00E+03 | I-RfC | 2.9E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 1.37E-06 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 2.95E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 7.14E-05 | 7.70E-02 | I-URF | 9.3E-04 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 1.35E-08 | 9.10E-03 | C-IUR | 1.5E-06 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 4.65E-06 | 5.00E+03 | I-RfC | 9.3E-10 |

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **Hegewisch Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 7.45E-05 | 2.13E+00 | I-URF | 3.5E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 6.52E-07 | 5.80E+01 | OT | 1.1E-08 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 2.64E-04 | 3.00E+00 | I-RfC | 8.8E-05 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 6.05E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 1.71E-05 | 2.00E+02 | C-REL | 8.5E-08 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 6.83E-07 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 2.33E-07 | 1.00E+03 | I-RfC | 2.3E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 2.95E-05 | 5.00E+03 | I-RfC | 5.9E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 1.10E-10 | 2.63E-08 | D-URF | 4.2E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 2.02E-05 | 1.00E+02 | I-RfC | 2.0E-07 |

* = Includes multiple chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

[b] = Fuel usage during normal operation of the facility.

[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **South Deering Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Arsenic | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.20E-06 | 2.30E-04 | I-URF | 5.2E-03 |
| Beryllium | * | 6.6E-07 | 145.83 | 9.62E-05 | 6.61E-08 | 4.20E-04 | I-URF | 1.6E-04 |
| Cadmium | * | 2.2E-06 | 145.83 | 3.21E-04 | 2.20E-07 | 5.60E-04 | I-URF | 3.9E-04 |
| Chloride | 7782-50-5 | 2.1E-03 | 145.83 | 3.06E-01 | 2.10E-04 | NA | | NA |
| Chromium | * | 1.4E-04 | 145.83 | 2.04E-02 | 1.40E-05 | 8.30E-05 | I-URF | 1.7E-01 |
| Fluoride | 7782-41-4 | 9.0E-04 | 145.83 | 1.31E-01 | 9.02E-05 | NA | | NA |
| HCl | 7647-01-0 | 1.6E-02 | 145.83 | 2.33E+00 | 1.60E-03 | 2.00E+01 | I-RfC | 8.0E-05 |
| Lead | * | 7.1E-04 | 145.83 | 1.04E-01 | 7.11E-05 | 1.50E-01 | NAAQS | 4.7E-04 |
| Mercury | * | 1.2E-05 | 145.83 | 1.75E-03 | 1.20E-06 | 3.00E-01 | I-RfC | 4.0E-06 |
| Manganese | * | 8.6E-04 | 145.83 | 1.25E-01 | 8.62E-05 | 5.00E-02 | I-RfC | 1.7E-03 |
| Selenium | * | 2.0E-04 | 145.83 | 2.92E-02 | 2.00E-05 | 2.00E+01 | C-REL | 1.0E-06 |
| | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1.2E-04 | 145.83 | 1.75E-02 | 1.20E-05 | NA | | NA |
| Benzene | 71-43-2 | 1.6E-02 | 145.83 | 2.33E+00 | 1.60E-03 | 1.30E-01 | I-URF | 1.2E-02 |
| Benzo(a)pyrene | 50-32-8 | 1.3E-07 | 145.83 | 1.90E-05 | 1.30E-08 | 9.10E-04 | C-IUR | 1.4E-05 |
| Benzo(a)anthracene | 56-55-3 | 4.3E-08 | 145.83 | 6.27E-06 | 4.31E-09 | 9.10E-03 | C-IUR | 4.7E-07 |
| Benzo(b)fluoranthene | 205-99-2 | 5.6E-07 | 145.83 | 8.17E-05 | 5.61E-08 | 9.10E-03 | C-IUR | 6.2E-06 |
| Benzo(g,h,i)fluoranthene | 191-24-2 | 7.8E-08 | 145.83 | 1.14E-05 | 7.81E-09 | NA | | NA |
| Benzo(k)fluoranthene | 207-08-9 | 1.5E-07 | 145.83 | 2.19E-05 | 1.50E-08 | 9.10E-03 | C-IUR | 1.7E-06 |
| Biphenyl | 95-52-4 | 6.1E-06 | 145.83 | 8.90E-04 | 6.11E-07 | 4.00E-01 | P-cRfC | 1.5E-06 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 9.5E-05 | 145.83 | 1.39E-02 | 9.52E-06 | 4.20E-01 | I-URF | 2.3E-05 |
| Bromomethane | 74-83-9 | 4.3E-05 | 145.83 | 6.27E-03 | 4.31E-06 | 5.00E+00 | I-RfC | 8.6E-07 |
| Carbon disulfide | 75-15-0 | 1.1E-04 | 145.83 | 1.60E-02 | 1.10E-05 | 7.00E-02 | I-RfC | 1.6E-04 |
| Chlorobenzene | 108-90-7 | 1.6E-05 | 145.83 | 2.33E-03 | 1.60E-06 | 5.00E+01 | P-cRfC | 3.2E-08 |
| Chloromethane | 74-87-3 | 3.8E-04 | 145.83 | 5.54E-02 | 3.81E-05 | 9.00E+01 | I-RfC | 4.2E-07 |
| Chrysene | 218-01-9 | 1.6E-07 | 145.83 | 2.33E-05 | 1.60E-08 | 9.10E-02 | C-IUR | 1.8E-07 |
| Di-n-butylphthalate | 84-74-2 | 4.1E-05 | 145.83 | 5.98E-03 | 4.11E-06 | NA | | NA |
| Dibenz(a,h)anthracene | 53-70-3 | 6.3E-07 | 145.83 | 9.19E-05 | 6.31E-08 | 8.30E-04 | C-IUR | 7.6E-05 |
| Ethylbenzene | 101-41-4 | 1.9E-05 | 145.83 | 2.77E-03 | 1.90E-06 | 1.00E+03 | I-RfC | 1.9E-09 |
| Fluoranthene | 206-44-0 | 8.8E-06 | 145.83 | 1.28E-03 | 8.82E-07 | NA | | NA |
| Fluorene | 86-73-7 | 1.9E-05 | 145.83 | 2.77E-03 | 1.90E-06 | NA | | NA |
| Formaldehyde | 50-00-0 | 4.6E-04 | 145.83 | 6.71E-02 | 4.61E-05 | 7.70E-02 | I-URF | 6.0E-04 |
| Indeno(1,2,3-c,d)pyrene | 193-39-5 | 8.7E-08 | 145.83 | 1.27E-05 | 8.72E-09 | 9.10E-03 | C-IUR | 9.6E-07 |
| Methyl ethyl ketone | 78-93-3 | 3.0E-05 | 145.83 | 4.37E-03 | 3.01E-06 | 5.00E+03 | I-RfC | 6.0E-10 |

Highest Modeled Air Concentration Compared To Acceptable Ambient Levels
Universal Cement, LLC, Chicago, Illinois

Area of Concern: **South Deering Residential Area**

| Pollutant | CASRN | Emission Factor[a] (lb/ton) | Kiln Throughput[b] (ton/hr) | Emission Rate[c] (lb/hr) | Highest Modeled Impact[d] (μg/m³) | Acceptable Ambient Concentration[e] (μg/m³) | AAC Basis[f] | Index of Concern[g] (modeled /AAC) |
|---|---|---|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | 4.8E-04 | 145.83 | 7.00E-02 | 4.81E-05 | 2.13E+00 | I-URF | 2.3E-05 |
| Methylnaphthalene | 1321-94-4 | 4.2E-06 | 145.83 | 6.12E-04 | 4.21E-07 | 5.80E+01 | OT | 7.3E-09 |
| Naphthalene | 91-20-3 | 1.7E-03 | 145.83 | 2.48E-01 | 1.70E-04 | 3.00E+00 | I-RfC | 5.7E-05 |
| Phenanthrene | 85-01-8 | 3.9E-04 | 145.83 | 5.69E-02 | 3.91E-05 | NA | | NA |
| Phenol | 108-95-2 | 1.1E-04 | 145.83 | 1.60E-02 | 1.10E-05 | 2.00E+02 | C-REL | 5.5E-08 |
| Pyrene | 129-00-0 | 4.4E-06 | 145.83 | 6.42E-04 | 4.41E-07 | NA | | NA |
| Styrene | 100-42-5 | 1.5E-06 | 145.83 | 2.19E-04 | 1.50E-07 | 1.00E+03 | I-RfC | 1.5E-10 |
| Toluene | 108-88-3 | 1.9E-04 | 145.83 | 2.77E-02 | 1.90E-05 | 5.00E+03 | I-RfC | 3.8E-09 |
| Total dioxins/furans | * | 7.1E-10 | 145.83 | 1.04E-07 | 7.11E-11 | 2.63E-08 | D-URF | 2.7E-03 |
| Xylenes | 1330-20-7 | 1.3E-04 | 145.83 | 1.90E-02 | 1.30E-05 | 1.00E+02 | I-RfC | 1.3E-07 |

* = Includes several chemical abstract service registry numbers containing the named pollutant.

NOTES:

[a] = From USEPA AP-42, Tables 11.6-9, Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns (except for mercury). Actual emission factors are expected to be far below levels in this table.

[b] = Fuel usage during normal operation of the facility.

[c] = Amount of pollutant released every hour.

[d] = Modeled concentration at nearest receptor point.

[e] = Calculated air concentration that is expected to produce no harm to an individual continuously exposed.

[f] = Source of toxicological value used to calculate the acceptable ambient concentration:

I-URF = IRIS Unit Risk Factor for carcinogens.
I-RfC = IRIS Reference Concentration for non-carcinogens.
NAAQS = Rolling 3-month average for lead.
C-REL = California Reference Exposure Level for non-carcinogens.
C-IUR = California Inhalation Unit Risk for carcinogens.
P-cRfC = PPRTV Chronic Reference Concentration for non-carcinogens.
OT = Odor Threshhold.
D-URF = DRAFT Unit Risk Factor for 2,3,7,8-TCDD.

[g] = Modeled Impact concentration/ Acceptable Ambient Concentration. Values of 1.0E+00 or greater indicate concern.